# ANALYTICAL REPORT

Job Number: 160-22327-1

Job Description: WR 111 - Little Mountain Test Annex

For:
EA Engineering, Science, and Technology
7995 E. Prentice Ave, Suite 206E
Greenwood Village, CO 80111

Attention: Pamela J Moss

Approved for release.
Stephanie K Rothmeyer
Project Manager I
6/12/2017 12:35 PM

Stephanie K Rothmeyer, Project Manager I
4955 Yarrow Street, Arvada, CO, 80002
(303)736-0182
stephanie.rothmeyer@testamericainc.com
06/12/2017

The test results in this report relate only to the samples in this report and meet all requirements of NELAC, with any exceptions noted. Pursuant to NELAP, this report shall not be reproduced except in full, without the written approval of the laboratory. All questions regarding this report should be directed to the TestAmerica Denver Project Manager.

The Lab Certification ID# is 4025.

Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.

# Table of Contents

# Table of Contents

## Qualifiers

### Rad

| Qualifier | Qualifier Description |
|---|---|
| U | Undetected at the Limit of Detection. |

## Glossary

| Abbreviation | These commonly used abbreviations may or may not be present in this report. |
|---|---|
| ¤ | Listed under the "D" column to designate that the result is reported on a dry weight basis |
| %R | Percent Recovery |
| CFL | Contains Free Liquid |
| CNF | Contains No Free Liquid |
| DER | Duplicate Error Ratio (normalized absolute difference) |
| Dil Fac | Dilution Factor |
| DL | Detection Limit (DoD/DOE) |
| DL, RA, RE, IN | Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample |
| DLC | Decision Level Concentration (Radiochemistry) |
| EDL | Estimated Detection Limit (Dioxin) |
| LOD | Limit of Detection (DoD/DOE) |
| LOQ | Limit of Quantitation (DoD/DOE) |
| MDA | Minimum Detectable Activity (Radiochemistry) |
| MDC | Minimum Detectable Concentration (Radiochemistry) |
| MDL | Method Detection Limit |
| ML | Minimum Level (Dioxin) |
| NC | Not Calculated |
| ND | Not Detected at the reporting limit (or MDL or EDL if shown) |
| PQL | Practical Quantitation Limit |
| QC | Quality Control |
| RER | Relative Error Ratio (Radiochemistry) |
| RL | Reporting Limit or Requested Limit (Radiochemistry) |
| RPD | Relative Percent Difference, a measure of the relative difference between two points |
| TEF | Toxicity Equivalent Factor (Dioxin) |
| TEQ | Toxicity Equivalent Quotient (Dioxin) |

# CASE NARRATIVE

## Client: EA Engineering, Science, and Technology

## Project: WR 111 - Little Mountain Test Annex

## Report Number: 160-22327-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

**RECEIPT**

The samples were received on 5/15/2017 at 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 18.0º C.

The Sampler field on the COC was not filled out. The client was notified on 5/15/17.

**RADIUM-226 & OTHER GAMMA EMITTERS (GS)**

Samples SU01-EXB-026-SS-P-01 (160-22327-1), SU01-EXB-023-SS-P-01 (160-22327-2), SU01-EXB-076-SS-P-01 (160-22327-3), SU02-EXB-051-SS-P-01 (160-22327-4), SU01-EXB-083-SS-P-00 (160-22327-5), SU01-EXB-084-SS-P-00 (160-22327-6), SU01-EXB-085-SS-P-00 (160-22327-7), SU01-EXB-086-SS-P-00 (160-22327-8), SU03-S-087-SS-P-00 (160-22327-9), SU03-S-088-SS-P-00 (160-22327-10) and SU03-S-089-SS-P-00 (160-22327-11) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with EPA 901.1. The samples were leached on 05/15/2017, prepared on 05/17/2017 and analyzed on 06/07/2017.

Americium-241, Cesium-137 and Cobalt-60 exceeded the RPD limit for the duplicate of sample SU01-EXB-026-SS-P-01 (160-22327-1). Refer to the QC report for details.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

# Detection Summary

Client: EA Engineering, Science, and Technology
Project/Site: WR 111 - Little Mountain Test Annex

TestAmerica Job ID: 160-22327-1

## Client Sample ID: SU01-EXB-026-SS-P-01 — Lab Sample ID: 160-22327-1

No Detections.

## Client Sample ID: SU01-EXB-023-SS-P-01 — Lab Sample ID: 160-22327-2

No Detections.

## Client Sample ID: SU01-EXB-076-SS-P-01 — Lab Sample ID: 160-22327-3

No Detections.

## Client Sample ID: SU02-EXB-051-SS-P-01 — Lab Sample ID: 160-22327-4

No Detections.

## Client Sample ID: SU01-EXB-083-SS-P-00 — Lab Sample ID: 160-22327-5

No Detections.

## Client Sample ID: SU01-EXB-084-SS-P-00 — Lab Sample ID: 160-22327-6

No Detections.

## Client Sample ID: SU01-EXB-085-SS-P-00 — Lab Sample ID: 160-22327-7

No Detections.

## Client Sample ID: SU01-EXB-086-SS-P-00 — Lab Sample ID: 160-22327-8

No Detections.

## Client Sample ID: SU03-S-087-SS-P-00 — Lab Sample ID: 160-22327-9

No Detections.

## Client Sample ID: SU03-S-088-SS-P-00 — Lab Sample ID: 160-22327-10

No Detections.

## Client Sample ID: SU03-S-089-SS-P-00 — Lab Sample ID: 160-22327-11

No Detections.

This Detection Summary does not include radiochemical test results.

## Client Sample ID: SU01-EXB-026-SS-P-01 — Lab Sample ID: 160-22327-1

**Date Collected: 05/10/17 14:30** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.15 | | 0.262 | 0.288 | 0.500 | 0.183 | pCi/g | 05/17/17 12:55 | 06/07/17 09:57 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.725 | | 0.132 | 0.145 | 0.100 | 0.0700 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 1.39 | | 0.178 | 0.213 | 0.100 | 0.0541 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| *Tracer* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Thorium-229* | *85.9* | | *30 - 110* | *05/18/17 13:59* | *06/08/17 19:02* | *1* |

## Client Sample ID: SU01-EXB-023-SS-P-01 — Lab Sample ID: 160-22327-2

**Date Collected: 05/10/17 14:35** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.913 | | 0.170 | 0.195 | 0.500 | 0.128 | pCi/g | 05/17/17 12:55 | 06/07/17 09:54 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.639 | | 0.117 | 0.129 | 0.100 | 0.0424 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 1.47 | | 0.176 | 0.216 | 0.100 | 0.0406 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| *Tracer* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Thorium-229* | *87.1* | | *30 - 110* | *05/18/17 13:59* | *06/08/17 19:02* | *1* |

## Client Sample ID: SU01-EXB-076-SS-P-01 — Lab Sample ID: 160-22327-3

**Date Collected: 05/10/17 14:40** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.27 | | 0.214 | 0.251 | 0.500 | 0.158 | pCi/g | 05/17/17 12:55 | 06/07/17 09:58 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.826 | | 0.137 | 0.153 | 0.100 | 0.0499 | pCi/g | 05/18/17 13:59 | 06/10/17 16:17 | 1 |
| Thorium-232 | 0.822 | | 0.136 | 0.152 | 0.100 | 0.0461 | pCi/g | 05/18/17 13:59 | 06/10/17 16:17 | 1 |

## Client Sample ID: SU01-EXB-076-SS-P-01 — Lab Sample ID: 160-22327-3

**Date Collected: 05/10/17 14:40** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Tracer | %Yield | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| Thorium-229 | 83.3 | | 30 - 110 | 05/18/17 13:59 | 06/10/17 16:17 | 1 |

## Client Sample ID: SU02-EXB-051-SS-P-01 — Lab Sample ID: 160-22327-4

**Date Collected: 05/10/17 14:35** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 2.51 | | 0.322 | 0.414 | 0.500 | 0.192 | pCi/g | 05/17/17 12:55 | 06/07/17 09:53 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 2.14 | | 0.215 | 0.280 | 0.100 | 0.0464 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 2.19 | | 0.216 | 0.284 | 0.100 | 0.0295 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| Tracer | %Yield | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| Thorium-229 | 82.8 | | 30 - 110 | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

## Client Sample ID: SU01-EXB-083-SS-P-00 — Lab Sample ID: 160-22327-5

**Date Collected: 05/11/17 12:15** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.63 | | 0.326 | 0.367 | 0.500 | 0.232 | pCi/g | 05/17/17 12:55 | 06/07/17 09:54 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 1.86 | | 0.197 | 0.251 | 0.100 | 0.0381 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 1.30 | | 0.163 | 0.196 | 0.100 | 0.0154 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| Tracer | %Yield | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| Thorium-229 | 87.8 | | 30 - 110 | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

## Client Sample ID: SU01-EXB-084-SS-P-00 — Lab Sample ID: 160-22327-6

**Date Collected: 05/11/17 12:20** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.54 | | 0.253 | 0.299 | 0.500 | 0.182 | pCi/g | 05/17/17 12:55 | 06/07/17 09:59 | 1 |

## Client Sample ID: SU01-EXB-084-SS-P-00 — Lab Sample ID: 160-22327-6

**Date Collected: 05/11/17 12:20** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 1.18 | | 0.156 | 0.185 | 0.100 | 0.0334 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 1.28 | | 0.162 | 0.194 | 0.100 | 0.0421 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| *Tracer* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Thorium-229* | *91.6* | | *30 - 110* | *05/18/17 13:59* | *06/08/17 19:02* | *1* |

## Client Sample ID: SU01-EXB-085-SS-P-00 — Lab Sample ID: 160-22327-7

**Date Collected: 05/11/17 13:05** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.55 | | 0.267 | 0.312 | 0.500 | 0.204 | pCi/g | 05/17/17 12:55 | 06/07/17 10:01 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 2.43 | | 0.213 | 0.295 | 0.100 | 0.0426 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 1.22 | | 0.150 | 0.182 | 0.100 | 0.0138 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| *Tracer* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Thorium-229* | *91.9* | | *30 - 110* | *05/18/17 13:59* | *06/08/17 19:02* | *1* |

## Client Sample ID: SU01-EXB-086-SS-P-00 — Lab Sample ID: 160-22327-8

**Date Collected: 05/11/17 13:10** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.18 | | 0.252 | 0.280 | 0.500 | 0.206 | pCi/g | 05/17/17 12:55 | 06/07/17 09:56 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 1.24 | | 0.149 | 0.182 | 0.100 | 0.0327 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 0.976 | | 0.131 | 0.155 | 0.100 | 0.0244 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| *Tracer* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Thorium-229* | *103* | | *30 - 110* | *05/18/17 13:59* | *06/08/17 19:02* | *1* |

## Client Sample ID: SU03-S-087-SS-P-00 — Lab Sample ID: 160-22327-9

**Date Collected: 05/11/17 13:15** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.67 | | 0.305 | 0.352 | 0.500 | 0.215 | pCi/g | 05/17/17 12:55 | 06/07/17 09:55 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 5.62 | | 0.341 | 0.582 | 0.100 | 0.0285 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 1.89 | | 0.198 | 0.254 | 0.100 | 0.0379 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| *Tracer* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Thorium-229* | *92.5* | | *30 - 110* | *05/18/17 13:59* | *06/08/17 19:02* | *1* |

## Client Sample ID: SU03-S-088-SS-P-00 — Lab Sample ID: 160-22327-10

**Date Collected: 05/11/17 13:20** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.93 | | 0.298 | 0.359 | 0.500 | 0.197 | pCi/g | 05/17/17 12:55 | 06/07/17 11:15 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 4.95 | | 0.318 | 0.524 | 0.100 | 0.0377 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 1.76 | | 0.189 | 0.240 | 0.100 | 0.0335 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

| *Tracer* | *%Yield* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Thorium-229* | *88.5* | | *30 - 110* | *05/18/17 13:59* | *06/08/17 19:02* | *1* |

## Client Sample ID: SU03-S-089-SS-P-00 — Lab Sample ID: 160-22327-11

**Date Collected: 05/11/17 13:25** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

### Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.48 | | 0.215 | 0.265 | 0.500 | 0.107 | pCi/g | 05/17/17 12:55 | 06/07/17 11:23 | 1 |

### Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

| Analyte | Result | Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 1.24 | | 0.161 | 0.191 | 0.100 | 0.0381 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |
| Thorium-232 | 0.920 | | 0.138 | 0.158 | 0.100 | 0.0154 | pCi/g | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

## Client Sample ID: SU03-S-089-SS-P-00

## Lab Sample ID: 160-22327-11

**Date Collected: 05/11/17 13:25**
**Date Received: 05/15/17 09:30**

**Matrix: Solid**

| Tracer | %Yield | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| Thorium-229 | 81.2 | | 30 - 110 | 05/18/17 13:59 | 06/08/17 19:02 | 1 |

# Tracer/Carrier Summary

Client: EA Engineering, Science, and Technology
Project/Site: WR 111 - Little Mountain Test Annex

TestAmerica Job ID: 160-22327-1

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

**Matrix: Solid** **Prep Type: Total/NA**

| | | Percent Yield (Acceptance Limits) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Lab Sample ID** | **Client Sample ID** | **Th-229 (30-110)** | | | | | | |
| 160-22327-1 | SU01-EXB-026-SS-P-01 | 85.9 | | | | | | |
| 160-22327-1 DU | SU01-EXB-026-SS-P-01 | 91.2 | | | | | | |
| 160-22327-2 | SU01-EXB-023-SS-P-01 | 87.1 | | | | | | |
| 160-22327-3 | SU01-EXB-076-SS-P-01 | 83.3 | | | | | | |
| 160-22327-4 | SU02-EXB-051-SS-P-01 | 82.8 | | | | | | |
| 160-22327-5 | SU01-EXB-083-SS-P-00 | 87.8 | | | | | | |
| 160-22327-6 | SU01-EXB-084-SS-P-00 | 91.6 | | | | | | |
| 160-22327-7 | SU01-EXB-085-SS-P-00 | 91.9 | | | | | | |
| 160-22327-8 | SU01-EXB-086-SS-P-00 | 103 | | | | | | |
| 160-22327-9 | SU03-S-087-SS-P-00 | 92.5 | | | | | | |
| 160-22327-10 | SU03-S-088-SS-P-00 | 88.5 | | | | | | |
| 160-22327-11 | SU03-S-089-SS-P-00 | 81.2 | | | | | | |
| LCS 160-309374/2-A | Lab Control Sample | 95.7 | | | | | | |
| MB 160-309374/1-A | Method Blank | 93.5 | | | | | | |

**Tracer/Carrier Legend**

Th-229 = Thorium-229

## Method: 901.1 - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID: MB 160-309155/1-A** — **Client Sample ID: Method Blank**
**Matrix: Solid** — **Prep Type: Total/NA**
**Analysis Batch: 312292** — **Prep Batch: 309155**

| Analyte | MB Result | MB Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.09557 | U | 0.283 | 0.284 | 0.500 | 0.481 | pCi/g | 05/17/17 12:55 | 06/07/17 09:55 | 1 |

**Lab Sample ID: LCS 160-309155/2-A** — **Client Sample ID: Lab Control Sample**
**Matrix: Solid** — **Prep Type: Total/NA**
**Analysis Batch: 312295** — **Prep Batch: 309155**

| Analyte | | | Spike Added | LCS Result | LCS Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Americium-241 | | | 97.0 | 96.89 | | 10.2 | | 1.20 | pCi/g | 100 | 87 - 116 | | |
| Cesium-137 | | | 29.0 | 28.38 | | 3.03 | | 0.244 | pCi/g | 98 | 87 - 120 | | |
| Cobalt-60 | | | 15.0 | 15.10 | | 1.57 | | 0.0997 | pCi/g | 100 | 87 - 115 | | |

**Lab Sample ID: 160-22327-1 DU** — **Client Sample ID: SU01-EXB-026-SS-P-01**
**Matrix: Solid** — **Prep Type: Total/NA**
**Analysis Batch: 312295** — **Prep Batch: 309155**

| Analyte | Sample Result | Sample Qual | | DU Result | DU Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | | | RER | RER Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.15 | | | 1.218 | | 0.307 | 0.500 | 0.259 | pCi/g | | | 0.11 | 1 |

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

**Lab Sample ID: MB 160-309374/1-A** — **Client Sample ID: Method Blank**
**Matrix: Solid** — **Prep Type: Total/NA**
**Analysis Batch: 312929** — **Prep Batch: 309374**

| Analyte | MB Result | MB Qualifier | Count Uncert. (2σ+/-) | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.04086 | U | 0.0340 | 0.0342 | 0.100 | 0.0447 | pCi/g | 05/18/17 13:59 | 06/10/17 16:17 | 1 |
| Thorium-232 | 0.002568 | U | 0.0206 | 0.0206 | 0.100 | 0.0472 | pCi/g | 05/18/17 13:59 | 06/10/17 16:17 | 1 |

| *Tracer* | *MB %Yield* | *MB Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *Thorium-229* | *93.5* | | *30 - 110* | *05/18/17 13:59* | *06/10/17 16:17* | *1* |

**Lab Sample ID: LCS 160-309374/2-A** — **Client Sample ID: Lab Control Sample**
**Matrix: Solid** — **Prep Type: Total/NA**
**Analysis Batch: 312785** — **Prep Batch: 309374**

| Analyte | | | Spike Added | LCS Result | LCS Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | | | 24.5 | 25.03 | | 2.32 | 0.100 | 0.0824 | pCi/g | 102 | 81 - 118 | | |

| *Tracer* | *LCS %Yield* | *LCS Qualifier* | *Limits* |
|---|---|---|---|
| *Thorium-229* | *95.7* | | *30 - 110* |

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

**Lab Sample ID: 160-22327-1 DU**
**Matrix: Solid**
**Analysis Batch: 312787**

**Client Sample ID: SU01-EXB-026-SS-P-01**
**Prep Type: Total/NA**
**Prep Batch: 309374**

| Analyte | Sample Result | Sample Qual | | DU Result | DU Qual | Total Uncert. (2σ+/-) | LOQ | MDC | Unit | | | RER | RER Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.725 | | | 0.6509 | | 0.129 | 0.100 | 0.0618 | pCi/g | | | 0.27 | 1 |
| Thorium-232 | 1.39 | | | 1.369 | | 0.201 | 0.100 | 0.0379 | pCi/g | | | 0.06 | 1 |

| *Tracer* | *DU %Yield* | *DU Qualifier* | *Limits* |
|---|---|---|---|
| *Thorium-229* | *91.2* | | *30 - 110* |

## Rad

### Leach Batch: 308589

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 160-22327-1 | SU01-EXB-026-SS-P-01 | Total/NA | Solid | Dry and Grind | |
| 160-22327-2 | SU01-EXB-023-SS-P-01 | Total/NA | Solid | Dry and Grind | |
| 160-22327-3 | SU01-EXB-076-SS-P-01 | Total/NA | Solid | Dry and Grind | |
| 160-22327-4 | SU02-EXB-051-SS-P-01 | Total/NA | Solid | Dry and Grind | |
| 160-22327-5 | SU01-EXB-083-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-22327-6 | SU01-EXB-084-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-22327-7 | SU01-EXB-085-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-22327-8 | SU01-EXB-086-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-22327-9 | SU03-S-087-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-22327-10 | SU03-S-088-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-22327-11 | SU03-S-089-SS-P-00 | Total/NA | Solid | Dry and Grind | |
| 160-22327-1 DU | SU01-EXB-026-SS-P-01 | Total/NA | Solid | Dry and Grind | |

### Prep Batch: 309155

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 160-22327-1 | SU01-EXB-026-SS-P-01 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-2 | SU01-EXB-023-SS-P-01 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-3 | SU01-EXB-076-SS-P-01 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-4 | SU02-EXB-051-SS-P-01 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-5 | SU01-EXB-083-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-6 | SU01-EXB-084-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-7 | SU01-EXB-085-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-8 | SU01-EXB-086-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-9 | SU03-S-087-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-10 | SU03-S-088-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| 160-22327-11 | SU03-S-089-SS-P-00 | Total/NA | Solid | Fill_Geo-21 | 308589 |
| MB 160-309155/1-A | Method Blank | Total/NA | Solid | Fill_Geo-21 | |
| LCS 160-309155/2-A | Lab Control Sample | Total/NA | Solid | Fill_Geo-21 | |
| 160-22327-1 DU | SU01-EXB-026-SS-P-01 | Total/NA | Solid | Fill_Geo-21 | 308589 |

### Prep Batch: 309374

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 160-22327-1 | SU01-EXB-026-SS-P-01 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-2 | SU01-EXB-023-SS-P-01 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-3 | SU01-EXB-076-SS-P-01 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-4 | SU02-EXB-051-SS-P-01 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-5 | SU01-EXB-083-SS-P-00 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-6 | SU01-EXB-084-SS-P-00 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-7 | SU01-EXB-085-SS-P-00 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-8 | SU01-EXB-086-SS-P-00 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-9 | SU03-S-087-SS-P-00 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-10 | SU03-S-088-SS-P-00 | Total/NA | Solid | ExtChrom | 308589 |
| 160-22327-11 | SU03-S-089-SS-P-00 | Total/NA | Solid | ExtChrom | 308589 |
| MB 160-309374/1-A | Method Blank | Total/NA | Solid | ExtChrom | |
| LCS 160-309374/2-A | Lab Control Sample | Total/NA | Solid | ExtChrom | |
| 160-22327-1 DU | SU01-EXB-026-SS-P-01 | Total/NA | Solid | ExtChrom | 308589 |

# Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: WR 111 - Little Mountain Test Annex

TestAmerica Job ID: 160-22327-1

## Client Sample ID: SU01-EXB-026-SS-P-01 — Lab Sample ID: 160-22327-1

**Date Collected: 05/10/17 14:30**
**Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312291 | 06/07/17 09:57 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312786 | 06/08/17 19:02 | ALD | TAL SL |

## Client Sample ID: SU01-EXB-023-SS-P-01 — Lab Sample ID: 160-22327-2

**Date Collected: 05/10/17 14:35**
**Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312296 | 06/07/17 09:54 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312788 | 06/08/17 19:02 | ALD | TAL SL |

## Client Sample ID: SU01-EXB-076-SS-P-01 — Lab Sample ID: 160-22327-3

**Date Collected: 05/10/17 14:40**
**Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312294 | 06/07/17 09:58 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312931 | 06/10/17 16:17 | ALD | TAL SL |

## Client Sample ID: SU02-EXB-051-SS-P-01 — Lab Sample ID: 160-22327-4

**Date Collected: 05/10/17 14:35**
**Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312301 | 06/07/17 09:53 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312790 | 06/08/17 19:02 | ALD | TAL SL |

## Client Sample ID: SU01-EXB-083-SS-P-00 — Lab Sample ID: 160-22327-5

**Date Collected: 05/11/17 12:15** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312302 | 06/07/17 09:54 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312791 | 06/08/17 19:02 | ALD | TAL SL |

## Client Sample ID: SU01-EXB-084-SS-P-00 — Lab Sample ID: 160-22327-6

**Date Collected: 05/11/17 12:20** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312299 | 06/07/17 09:59 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312792 | 06/08/17 19:02 | ALD | TAL SL |

## Client Sample ID: SU01-EXB-085-SS-P-00 — Lab Sample ID: 160-22327-7

**Date Collected: 05/11/17 13:05** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312300 | 06/07/17 10:01 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312793 | 06/08/17 19:02 | ALD | TAL SL |

## Client Sample ID: SU01-EXB-086-SS-P-00 — Lab Sample ID: 160-22327-8

**Date Collected: 05/11/17 13:10** — **Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312290 | 06/07/17 09:56 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312794 | 06/08/17 19:02 | ALD | TAL SL |

# Lab Chronicle

Client: EA Engineering, Science, and Technology
Project/Site: WR 111 - Little Mountain Test Annex

TestAmerica Job ID: 160-22327-1

## Client Sample ID: SU03-S-087-SS-P-00 — Lab Sample ID: 160-22327-9

**Date Collected: 05/11/17 13:15**
**Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312293 | 06/07/17 09:55 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312795 | 06/08/17 19:02 | ALD | TAL SL |

## Client Sample ID: SU03-S-088-SS-P-00 — Lab Sample ID: 160-22327-10

**Date Collected: 05/11/17 13:20**
**Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312296 | 06/07/17 11:15 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312796 | 06/08/17 19:02 | ALD | TAL SL |

## Client Sample ID: SU03-S-089-SS-P-00 — Lab Sample ID: 160-22327-11

**Date Collected: 05/11/17 13:25**
**Matrix: Solid**
**Date Received: 05/15/17 09:30**

| Prep Type | Batch Type | Batch Method | Run | Dilution Factor | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | Fill_Geo-21 | | | 309155 | 05/17/17 12:55 | KRS | TAL SL |
| Total/NA | Analysis | 901.1 | | 1 | 312294 | 06/07/17 11:23 | CDR | TAL SL |
| Total/NA | Leach | Dry and Grind | | | 308589 | 05/15/17 15:49 | DRO | TAL SL |
| Total/NA | Prep | ExtChrom | | | 309374 | 05/18/17 13:59 | MBC | TAL SL |
| Total/NA | Analysis | A-01-R | | 1 | 312798 | 06/08/17 19:02 | ALD | TAL SL |

**Laboratory References:**

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

# Accreditation/Certification Summary

Client: EA Engineering, Science, and Technology
Project/Site: WR 111 - Little Mountain Test Annex

TestAmerica Job ID: 160-22327-1

## Laboratory: TestAmerica St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

| Authority | Program | EPA Region | Identification Number | Expiration Date |
|---|---|---|---|---|
| Alaska | State Program | 10 | MO00054 | 06-30-17 * |
| California | State Program | 9 | 2886 | 03-31-18 * |
| Connecticut | State Program | 1 | PH-0241 | 03-31-19 |
| Florida | NELAP | 4 | E87689 | 06-30-17 * |
| Illinois | NELAP | 5 | 200023 | 11-30-17 |
| Iowa | State Program | 7 | 373 | 02-01-18 |
| Kansas | NELAP | 7 | E-10236 | 10-31-17 |
| Kentucky (DW) | State Program | 4 | 90125 | 12-31-17 |
| L-A-B | DoD ELAP | | L2305 | 04-06-19 |
| Louisiana | NELAP | 6 | 04080 | 06-30-17 * |
| Louisiana (DW) | NELAP | 6 | LA170011 | 12-31-17 |
| Maryland | State Program | 3 | 310 | 09-30-17 |
| Missouri | State Program | 7 | 780 | 06-30-17 * |
| Nevada | State Program | 9 | MO000542017-1 | 07-31-17 * |
| New Jersey | NELAP | 2 | MO002 | 06-30-17 * |
| New York | NELAP | 2 | 11616 | 03-31-18 |
| North Dakota | State Program | 8 | R207 | 06-30-17 * |
| NRC | NRC | | 24-24817-01 | 12-31-22 |
| Oklahoma | State Program | 6 | 9997 | 08-31-17 |
| Pennsylvania | NELAP | 3 | 68-00540 | 02-21-18 |
| South Carolina | State Program | 4 | 85002001 | 06-30-17 * |
| Texas | NELAP | 6 | T104704193-16-10 | 07-31-17 * |
| US Fish & Wildlife | Federal | | LE058448-0 | 10-31-17 |
| USDA | Federal | | P330-17-0028 | 02-02-20 |
| Utah | NELAP | 8 | MO000542016-8 | 07-31-17 * |
| Virginia | NELAP | 3 | 460230 | 06-14-18 |
| Washington | State Program | 10 | C592 | 08-30-17 |
| West Virginia DEP | State Program | 3 | 381 | 08-31-17 * |

## Laboratory: TestAmerica Denver

The accreditations/certifications listed below are applicable to this report.

| Authority | Program | EPA Region | Identification Number | Expiration Date |
|---|---|---|---|---|
| A2LA | DoD ELAP | | 2907.01 | 10-31-17 |
| Utah | NELAP | 8 | CO00026 | 07-31-17 |

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

# Method Summary

Client: EA Engineering, Science, and Technology
Project/Site: WR 111 - Little Mountain Test Annex

TestAmerica Job ID: 160-22327-1

| Method | Method Description | Protocol | Laboratory |
|---|---|---|---|
| 901.1 | Radium-226 & Other Gamma Emitters (GS) | EPA | TAL SL |
| A-01-R | Isotopic Thorium (Alpha Spectrometry) | DOE | TAL SL |

**Protocol References:**

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

**Laboratory References:**

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

# Sample Summary

Client: EA Engineering, Science, and Technology
Project/Site: WR 111 - Little Mountain Test Annex

TestAmerica Job ID: 160-22327-1

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received |
|---|---|---|---|---|
| 160-22327-1 | SU01-EXB-026-SS-P-01 | Solid | 05/10/17 14:30 | 05/15/17 09:30 |
| 160-22327-2 | SU01-EXB-023-SS-P-01 | Solid | 05/10/17 14:35 | 05/15/17 09:30 |
| 160-22327-3 | SU01-EXB-076-SS-P-01 | Solid | 05/10/17 14:40 | 05/15/17 09:30 |
| 160-22327-4 | SU02-EXB-051-SS-P-01 | Solid | 05/10/17 14:35 | 05/15/17 09:30 |
| 160-22327-5 | SU01-EXB-083-SS-P-00 | Solid | 05/11/17 12:15 | 05/15/17 09:30 |
| 160-22327-6 | SU01-EXB-084-SS-P-00 | Solid | 05/11/17 12:20 | 05/15/17 09:30 |
| 160-22327-7 | SU01-EXB-085-SS-P-00 | Solid | 05/11/17 13:05 | 05/15/17 09:30 |
| 160-22327-8 | SU01-EXB-086-SS-P-00 | Solid | 05/11/17 13:10 | 05/15/17 09:30 |
| 160-22327-9 | SU03-S-087-SS-P-00 | Solid | 05/11/17 13:15 | 05/15/17 09:30 |
| 160-22327-10 | SU03-S-088-SS-P-00 | Solid | 05/11/17 13:20 | 05/15/17 09:30 |
| 160-22327-11 | SU03-S-089-SS-P-00 | Solid | 05/11/17 13:25 | 05/15/17 09:30 |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-22327-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| **82232-334_00001** | 06/03/60 | | Eckert & Ziegler, Lot 82232-334 | | (Purchased Reagent) | | Americium-241 | 7.281 Bq |
| | | | | | | | Pu-239 | 7.137 Bq |
| | | | | | | | Thorium-230 | 7.63 Bq |
| **82233-334_00001** | 06/03/60 | | Eckert & Zigler, Lot 82233-334 | | (Purchased Reagent) | | Americium-241 | 5.114 Bq |
| | | | | | | | Pu-239 | 6.064 Bq |
| | | | | | | | Thorium-230 | 4.95 Bq |
| **82234-334_00001** | 06/02/60 | | Eckert & Zigler, Lot 82234-334 | | (Purchased Reagent) | | Americium-241 | 5.652 Bq |
| | | | | | | | Pu-239 | 5.936 Bq |
| | | | | | | | Thorium-230 | 5.685 Bq |
| **82235-334_00001** | 06/04/60 | | Eckert & Ziegler, Lot 82235-334 | | (Purchased Reagent) | | Americium-241 | 7.466 Bq |
| | | | | | | | Pu-239 | 6.897 Bq |
| | | | | | | | Thorium-230 | 7.167 Bq |
| **82236-334_00001** | 06/02/60 | | Eckert & Ziegler, Lot 82236-334 | | (Purchased Reagent) | | Americium-241 | 6.891 Bq |
| | | | | | | | Pu-239 | 6.664 Bq |
| | | | | | | | Thorium-230 | 7.107 Bq |
| **82237-334_00003** | 06/01/60 | | Eckert & Ziegler, Lot 82237-334 | | (Purchased Reagent) | | Americium-241 | 5.608 Bq |
| | | | | | | | Pu-239 | 6.424 Bq |
| | | | | | | | Thorium-230 | 5.856 Bq |
| **82238-334_00001** | 06/01/60 | | Eckert & Ziegler, Lot 82238-334 | | (Purchased Reagent) | | Americium-241 | 5.932 Bq |
| | | | | | | | Pu-239 | 6.753 Bq |
| | | | | | | | Thorium-230 | 7.099 Bq |
| **82240-334_00001** | 06/08/60 | | Eckert & Ziegler, Lot 82240-334 | | (Purchased Reagent) | | Americium-241 | 8.298 Bq |
| | | | | | | | Pu-239 | 7.163 Bq |
| | | | | | | | Thorium-230 | 6.304 Bq |
| **82241-334_00001** | 06/08/60 | | Eckert & Ziegler, Lot 82241-334 | | (Purchased Reagent) | | Americium-241 | 6.638 Bq |
| | | | | | | | Pu-239 | 6.797 Bq |
| | | | | | | | Thorium-230 | 6.629 Bq |
| **82242-334_00001** | 06/08/60 | | Eckert & Ziegler, Lot 82242-334 | | (Purchased Reagent) | | Americium-241 | 7.145 Bq |
| | | | | | | | Pu-239 | 6.414 Bq |
| | | | | | | | Thorium-230 | 6.583 Bq |
| **82243-334_00001** | 06/09/60 | | Eckert & Ziegler, Lot 82243-334 | | (Purchased Reagent) | | Americium-241 | 6.39 Bq |
| | | | | | | | Pu-239 | 5.979 Bq |
| | | | | | | | Thorium-230 | 5.856 Bq |
| **82244-334_00001** | 06/09/60 | | Eckert & Zigler, Lot 82244-334 | | (Purchased Reagent) | | Americium-241 | 6.897 Bq |
| | | | | | | | Pu-239 | 6.717 Bq |
| | | | | | | | Thorium-230 | 7.352 Bq |
| **82245-334_00001** | 06/09/60 | | Eckert & Ziegler, Lot 82245-334 | | (Purchased Reagent) | | Americium-241 | 5.528 Bq |
| | | | | | | | Pu-239 | 5.437 Bq |
| | | | | | | | Thorium-230 | 6.727 Bq |
| **82246-334_00001** | 06/09/60 | | Eckert & Ziegler, Lot 82246-334 | | (Purchased Reagent) | | Americium-241 | 6.002 Bq |
| | | | | | | | Pu-239 | 5.353 Bq |
| | | | | | | | Thorium-230 | 5.57 Bq |
| **82247-334_00001** | 06/10/60 | | Eckert & Ziegler, Lot 82247-334 | | (Purchased Reagent) | | Americium-241 | 6.291 Bq |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-22327-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Pu-239 | 5.746 Bq |
| | | | | | | | Thorium-230 | 6.251 Bq |
| **Marn Soil_00002** | 03/01/16 | Eckert & Ziegler, Lot 83814-334 | | | (Purchased Reagent) | | Americium-241 | 2870 Bq |
| | | | | | | | Cd-109 | 39231 Bq |
| | | | | | | | Ce-139 | 1302 Bq |
| | | | | | | | Cesium-137 | 1087 Bq |
| | | | | | | | Co-57 | 849 Bq |
| | | | | | | | Cobalt-60 | 1788 Bq |
| | | | | | | | Hg-203 | 2820 Bq |
| | | | | | | | Pb-210 | 35040 Bq |
| | | | | | | | Sn-113 | 2306 Bq |
| | | | | | | | Y-88 | 3762 Bq |
| **MarnSolid_00002** | 02/09/17 | Eckert & Ziegler, Lot 90099 | | | (Purchased Reagent) | | Americium-241 | 2797 Bq |
| | | | | | | | Cd-109 | 39337 Bq |
| | | | | | | | Ce-139 | 1320 Bq |
| | | | | | | | Cesium-137 | 1122 Bq |
| | | | | | | | Co-57 | 870 Bq |
| | | | | | | | Hg-203 | 2814 Bq |
| | | | | | | | Pb-210 | 35883 Bq |
| | | | | | | | Sn-113 | 2322 Bq |
| | | | | | | | Y-88 | 3821 Bq |
| **Source A_00001** | 04/01/59 | 02/23/11 | water, Lot 79670-334 | 0.9986 Source | Gamma Ampuole_00001 | 0.9986 g | Americium-241 | 9.4429 Bq |
| | | | | | | | Cd-109 | 132.909 Bq |
| | | | | | | | Ce-139 | 4.4538 Bq |
| | | | | | | | Cesium-137 | 3.7296 Bq |
| | | | | | | | Co-57 | 2.9513 Bq |
| | | | | | | | Cobalt-60 | 6.2002 Bq |
| | | | | | | | Hg-203 | 9.6996 Bq |
| | | | | | | | Sn-113 | 7.6266 Bq |
| | | | | | | | Y-88 | 12.712 Bq |
| .Gamma Ampuole_00001 | 04/07/59 | Analytics, Lot 79670-334 | | | (Purchased Reagent) | | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| **Source C_00001** | 04/01/59 | 02/23/12 | water, Lot 79670-334 | 1.0148 g | Gamma Ampuole_00001 | 1.0148 g | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-22327-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| .Gamma Ampuole_00001 | 04/07/59 | | Analytics, Lot 79670-334 | | (Purchased Reagent) | | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| **Source D_00001** | 04/01/59 | 02/23/11 | water, Lot 79670-334 | 0.9781 g | Gamma Ampuole_00001 | 0.9781 g | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| .Gamma Ampuole_00001 | 04/07/59 | | Analytics, Lot 79670-334 | | (Purchased Reagent) | | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| **Source E_00001** | 04/01/59 | 02/23/11 | water, Lot 79670-334 | 1.0205 g | Gamma Ampuole_00001 | 1.0205 g | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |
| .Gamma Ampuole_00001 | 04/07/59 | | Analytics, Lot 79670-334 | | (Purchased Reagent) | | Americium-241 | 9442.9 Bq |
| | | | | | | | Cd-109 | 132909 Bq |
| | | | | | | | Ce-139 | 4453.8 Bq |
| | | | | | | | Cesium-137 | 3729.6 Bq |
| | | | | | | | Co-57 | 2951.3 Bq |
| | | | | | | | Cobalt-60 | 6200.2 Bq |
| | | | | | | | Hg-203 | 9699.6 Bq |
| | | | | | | | Sn-113 | 7626.6 Bq |
| | | | | | | | Y-88 | 12712 Bq |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-22327-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| **Source F_00001** | 01/01/61 | 02/23/11 | water, Lot 83725-334 | 10 mL | Gamma Ampuole_00003 | 2.0327 mL | Americium-241 | 1846.42 Bq |
| | | | | | | | Cd-109 | 26819.3 Bq |
| | | | | | | | Ce-139 | 890.424 Bq |
| | | | | | | | Cesium-137 | 743.562 Bq |
| | | | | | | | Co-57 | 580.6 Bq |
| | | | | | | | Cobalt-60 | 1222.38 Bq |
| | | | | | | | Hg-203 | 1926.02 Bq |
| | | | | | | | Sn-113 | 1576.93 Bq |
| | | | | | | | Y-88 | 2572.87 Bq |
| .Gamma Ampuole_00003 | 01/19/61 | | Analytics, Lot 83725-334 | | (Purchased Reagent) | | Americium-241 | 9083.6 Bq |
| | | | | | | | Cd-109 | 131939 Bq |
| | | | | | | | Ce-139 | 4380.5 Bq |
| | | | | | | | Cesium-137 | 3658 Bq |
| | | | | | | | Co-57 | 2856.3 Bq |
| | | | | | | | Cobalt-60 | 6013.6 Bq |
| | | | | | | | Hg-203 | 9475.2 Bq |
| | | | | | | | Sn-113 | 7757.8 Bq |
| | | | | | | | Y-88 | 12657.4 Bq |
| **Source G_00001** | 01/01/61 | 01/01/11 | water, Lot 83725-334 | 10 mL | Gamma Ampuole_00003 | 1.8639 g | Americium-241 | 1693.09 Bq |
| | | | | | | | Cd-109 | 24592.1 Bq |
| | | | | | | | Ce-139 | 816.481 Bq |
| | | | | | | | Cesium-137 | 681.815 Bq |
| | | | | | | | Co-57 | 532.386 Bq |
| | | | | | | | Cobalt-60 | 1120.87 Bq |
| | | | | | | | Hg-203 | 1766.08 Bq |
| | | | | | | | Sn-113 | 1445.98 Bq |
| | | | | | | | Y-88 | 2359.21 Bq |
| .Gamma Ampuole_00003 | 01/19/61 | | Analytics, Lot 83725-334 | | (Purchased Reagent) | | Americium-241 | 9083.6 Bq |
| | | | | | | | Cd-109 | 131939 Bq |
| | | | | | | | Ce-139 | 4380.5 Bq |
| | | | | | | | Cesium-137 | 3658 Bq |
| | | | | | | | Co-57 | 2856.3 Bq |
| | | | | | | | Cobalt-60 | 6013.6 Bq |
| | | | | | | | Hg-203 | 9475.2 Bq |
| | | | | | | | Sn-113 | 7757.8 Bq |
| | | | | | | | Y-88 | 12657.4 Bq |
| **Source H_00002** | 01/01/51 | 01/01/12 | wataer, Lot 83725-334 | 10 mL | Gamma Ampuole_00003 | 2.1184 g | Americium-241 | 1924.27 Bq |
| | | | | | | | Cd-109 | 27950 Bq |
| | | | | | | | Ce-139 | 927.965 Bq |
| | | | | | | | Cesium-137 | 774.911 Bq |
| | | | | | | | Co-57 | 605.079 Bq |
| | | | | | | | Cobalt-60 | 1273.92 Bq |
| | | | | | | | Hg-203 | 2007.23 Bq |
| | | | | | | | Sn-113 | 1643.41 Bq |
| | | | | | | | Y-88 | 2681.34 Bq |
| .Gamma Ampuole_00003 | 01/19/61 | | Analytics, Lot 83725-334 | | (Purchased Reagent) | | Americium-241 | 9083.6 Bq |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-22327-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Cd-109 | 131939 Bq |
| | | | | | | | Ce-139 | 4380.5 Bq |
| | | | | | | | Cesium-137 | 3658 Bq |
| | | | | | | | Co-57 | 2856.3 Bq |
| | | | | | | | Cobalt-60 | 6013.6 Bq |
| | | | | | | | Hg-203 | 9475.2 Bq |
| | | | | | | | Sn-113 | 7757.8 Bq |
| | | | | | | | Y-88 | 12657.4 Bq |
| **Source I_00001** | 01/01/61 | 01/01/12 | wataer, Lot 83725-334 | 10 mL | Gamma Ampuole_00003 | 1.9559 g | Americium-241 | 1776.66 Bq |
| | | | | | | | Cd-109 | 25806 Bq |
| | | | | | | | Ce-139 | 856.782 Bq |
| | | | | | | | Cesium-137 | 715.468 Bq |
| | | | | | | | Co-57 | 558.664 Bq |
| | | | | | | | Cobalt-60 | 1176.2 Bq |
| | | | | | | | Hg-203 | 1853.25 Bq |
| | | | | | | | Sn-113 | 1517.35 Bq |
| | | | | | | | Y-88 | 2475.66 Bq |
| .Gamma Ampuole_00003 | 01/19/61 | Analytics, Lot 83725-334 | | | (Purchased Reagent) | | Americium-241 | 9083.6 Bq |
| | | | | | | | Cd-109 | 131939 Bq |
| | | | | | | | Ce-139 | 4380.5 Bq |
| | | | | | | | Cesium-137 | 3658 Bq |
| | | | | | | | Co-57 | 2856.3 Bq |
| | | | | | | | Cobalt-60 | 6013.6 Bq |
| | | | | | | | Hg-203 | 9475.2 Bq |
| | | | | | | | Sn-113 | 7757.8 Bq |
| | | | | | | | Y-88 | 12657.4 Bq |
| **Th-229_00022** | 03/26/18 | 03/24/17 | 0.1M HNO3, Lot n/a | 500 mL | Th-229_00017 | 15 mL | At-217 | 67.2296 dpm/mL |
| | | | | | | | Thorium-229 | 67.2296 dpm/mL |
| .Th-229_00017 | 03/26/18 | 08/20/14 | 0.1M HNO3, Lot n/a | 100 mL | Th-229_00016 | 5.0464 g | At-217 | 2240.99 dpm/mL |
| | | | | | | | Thorium-229 | 2240.99 dpm/mL |
| ..Th-229_00016 | 08/06/64 | Analytics, Lot 97790 | | | (Purchased Reagent) | | At-217 | 740.127 Bq/g |
| | | | | | | | Thorium-229 | 740.127 Bq/g |
| **TRM-2_00002** | 03/20/50 | DOE, Lot TRM-2 | | | (Purchased Reagent) | | Pb-210 | 22.1 pCi/g |
| | | | | | | | Radium-226 | 25.4 pCi/g |
| | | | | | | | Thorium-230 | 24.5 pCi/g |
| | | | | | | | U-234 | 6.2 pCi/g |
| | | | | | | | U-238 | 6 pCi/g |
| **Tuna Can LCS_00006** | 09/29/17 | Analytics, Lot 74139-334 | | | (Purchased Reagent) | | Americium-241 | 219 dpm/g |
| | | | | | | | Cesium-137 | 82.3 dpm/g |
| | | | | | | | Cobalt-60 | 136 dpm/g |
| **Tuna Can_00002** | 02/03/15 | Eckert & Ziegler, Lot 81427-334 | | | (Purchased Reagent) | | Americium-241 | 1164 Bq |
| | | | | | | | Cd-109 | 16063 Bq |
| | | | | | | | Ce-139 | 546 Bq |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-22327-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Cesium-137 | 465 Bq |
| | | | | | | | Co-57 | 357 Bq |
| | | | | | | | Cobalt-60 | 742 Bq |
| | | | | | | | Hg-203 | 1208 Bq |
| | | | | | | | Pb-210 | 15186 Bq |
| | | | | | | | Sn-113 | 943 Bq |
| | | | | | | | Y-88 | 1571 Bq |
| **Tuna Can_00003** | 02/09/17 | Eckert & Ziegler, Lot 90099 | | | (Purchased Reagent) | | Americium-241 | 1164 Bq |
| | | | | | | | Cd-109 | 16373 Bq |
| | | | | | | | Ce-139 | 549 Bq |
| | | | | | | | Cesium-137 | 467 Bq |
| | | | | | | | Co-57 | 362 Bq |
| | | | | | | | Cobalt-60 | 735 Bq |
| | | | | | | | Hg-203 | 1171 Bq |
| | | | | | | | Pb-210 | 14936 Bq |
| | | | | | | | Sn-113 | 967 Bq |
| | | | | | | | Y-88 | 1590 Bq |
| **Tuna Can_00006** | 03/01/16 | Eckert & Ziegler, Lot 83814-334 | | | (Purchased Reagent) | | Americium-241 | 1195 Bq |
| | | | | | | | Cd-109 | 16353 Bq |
| | | | | | | | Ce-139 | 543 Bq |
| | | | | | | | Cesium-137 | 453 Bq |
| | | | | | | | Co-57 | 354 Bq |
| | | | | | | | Cobalt-60 | 745 Bq |
| | | | | | | | Hg-203 | 1175 Bq |
| | | | | | | | Pb-210 | 14606 Bq |
| | | | | | | | Sn-113 | 961 Bq |
| | | | | | | | Y-88 | 1568 Bq |

# Reagent

# 82232-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82232-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 3-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 7.630E+00 | 4420-4800 | 7.540E+04 | 0.7 | 1.1 | 2.6 |
| Pu-239 | 7.137E+00 | 4950-5240 | 2.410E+04 | 0.7 | 1.1 | 2.6 |
| Am-241 | 7.281E+00 | 5280-5600 | 4.326E+02 | 0.7 | 1.1 | 2.6 |
| Total Activity | 2.210E+01 | 3000-8000 | | 0.4 | 1.1 | 2.3 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82233-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82233-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 3-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 4.950E+00 | 4420-4800 | 7.540E+04 | 0.8 | 1.1 | 2.7 |
| Pu-239 | 6.064E+00 | 4950-5240 | 2.410E+04 | 0.7 | 1.1 | 2.6 |
| Am-241 | 5.114E+00 | 5280-5600 | 4.326E+02 | 0.8 | 1.1 | 2.7 |
| Total Activity | 1.616E+01 | 3000-8000 | | 0.1 | 1.1 | 2.2 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82234-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82234-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 2-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 5.685E+00 | 4420-4800 | 7.540E+04 | 0.9 | 1.1 | 2.8 |
| Pu-239 | 5.936E+00 | 4950-5240 | 2.410E+04 | 0.9 | 1.1 | 2.8 |
| Am-241 | 5.652E+00 | 5280-5600 | 4.326E+02 | 0.9 | 1.1 | 2.8 |
| Total Activity | 1.732E+01 | 3000-8000 | | 0.5 | 1.1 | 2.4 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

---

# 82235-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82235-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 4-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 7.167E+00 | 4420-4800 | 7.540E+04 | 0.8 | 1.1 | 2.7 |
| Pu-239 | 6.897E+00 | 4950-5240 | 2.410E+04 | 0.8 | 1.1 | 2.7 |
| Am-241 | 7.466E+00 | 5280-5600 | 4.326E+02 | 0.8 | 1.1 | 2.7 |
| Total Activity | 2.161E+01 | 3000-8000 | | 0.5 | 1.1 | 2.4 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1958

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06·24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82236-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82236-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 2-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 7.107E+00 | 4420-4800 | 7.540E+04 | 0.7 | 1.1 | 2.6 |
| Pu-239 | 6.664E+00 | 4950-5240 | 2.410E+04 | 0.8 | 1.1 | 2.7 |
| Am-241 | 6.891E+00 | 5280-5600 | 4.326E+02 | 0.7 | 1.1 | 2.6 |
| Total Activity | 2.071E+01 | 3000-8000 | | 0.4 | 1.1 | 2.3 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82237-334_00003

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82237-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 1-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 5.856E+00 | 4420-4800 | 7.540E+04 | 1.0 | 1.1 | 3.0 |
| Pu-239 | 6.424E+00 | 4950-5240 | 2.410E+04 | 0.9 | 1.1 | 2.8 |
| Am-241 | 5.608E+00 | 5280-5600 | 4.326E+02 | 1.0 | 1.1 | 3.0 |
| Total Activity | 1.793E+01 | 3000-8000 | | 0.6 | 1.1 | 2.5 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1958

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82238-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82238-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 1-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 7.099E+00 | 4420-4800 | 7.540E+04 | 1.0 | 1.1 | 3.0 |
| Pu-239 | 6.753E+00 | 4950-5240 | 2.410E+04 | 1.1 | 1.1 | 3.1 |
| Am-241 | 5.932E+00 | 5280-5600 | 4.326E+02 | 1.1 | 1.1 | 3.1 |
| Total Activity | 1.983E+01 | 3000-8000 | | 0.8 | 1.1 | 2.7 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1958

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

ACCREDITED SOURCE CALIBRATION LABORATORY
HEALTH PHYSICS SOCIETY
FOUNDED 1956

# Reagent

# 82240-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82240-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 8-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 6.304E+00 | 4420-4800 | 7.540E+04 | 0.9 | 1.1 | 2.8 |
| Pu-239 | 7.163E+00 | 4950-5240 | 2.410E+04 | 0.8 | 1.1 | 2.7 |
| Am-241 | 8.298E+00 | 5280-5600 | 4.326E+02 | 0.8 | 1.1 | 2.7 |
| Total Activity | 2.182E+01 | 3000-8000 | | 0.5 | 1.1 | 2.4 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1958



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82241-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82241-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 8-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 6.629E+00 | 4420-4800 | 7.540E+04 | 0.8 | 1.1 | 2.7 |
| Pu-239 | 6.797E+00 | 4950-5240 | 2.410E+04 | 0.8 | 1.1 | 2.7 |
| Am-241 | 6.638E+00 | 5280-5600 | 4.326E+02 | 0.8 | 1.1 | 2.7 |
| Total Activity | 2.011E+01 | 3000-8000 | | 0.4 | 1.1 | 2.3 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82242-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82242-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 8-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 6.583E+00 | 4420-4800 | 7.540E+04 | 0.9 | 1.1 | 2.8 |
| Pu-239 | 6.414E+00 | 4950-5240 | 2.410E+04 | 0.9 | 1.1 | 2.8 |
| Am-241 | 7.145E+00 | 5280-5600 | 4.326E+02 | 0.9 | 1.1 | 2.8 |
| Total Activity | 2.018E+01 | 3000-8000 | | 0.6 | 1.1 | 2.5 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1958

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82243-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82243-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 9-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 5.856E+00 | 4420-4800 | 7.540E+04 | 0.8 | 1.1 | 2.7 |
| Pu-239 | 5.979E+00 | 4950-5240 | 2.410E+04 | 0.8 | 1.1 | 2.7 |
| Am-241 | 6.390E+00 | 5280-5600 | 4.326E+02 | 0.8 | 1.1 | 2.7 |
| Total Activity | 1.827E+01 | 3000-8000 | | 0.3 | 1.1 | 2.3 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1966

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

---

# 82244-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82244-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 9-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 7.352E+00 | 4420-4800 | 7.540E+04 | 0.8 | 1.1 | 2.7 |
| Pu-239 | 6.717E+00 | 4950-5240 | 2.410E+04 | 0.9 | 1.1 | 2.8 |
| Am-241 | 6.897E+00 | 5280-5600 | 4.326E+02 | 0.9 | 1.1 | 2.8 |
| Total Activity | 2.101E+01 | 3000-8000 | | 0.6 | 1.1 | 2.5 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82245-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82245-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 9-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 6.727E+00 | 4420-4800 | 7.540E+04 | 1.0 | 1.1 | 3.0 |
| Pu-239 | 5.437E+00 | 4950-5240 | 2.410E+04 | 1.1 | 1.1 | 3.1 |
| Am-241 | 5.528E+00 | 5280-5600 | 4.326E+02 | 1.1 | 1.1 | 3.1 |
| Total Activity | 1.773E+01 | 3000-8000 | | 0.8 | 1.1 | 2.7 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1958

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06·24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82246-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82246-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 9-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 5.570E+00 | 4420-4800 | 7.540E+04 | 1.0 | 1.1 | 3.0 |
| Pu-239 | 5.353E+00 | 4950-5240 | 2.410E+04 | 1.0 | 1.1 | 3.0 |
| Am-241 | 6.002E+00 | 5280-5600 | 4.326E+02 | 1.0 | 1.1 | 3.0 |
| Total Activity | 1.696E+01 | 3000-8000 | | 0.7 | 1.1 | 2.6 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06·24·2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# 82247-334_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

82247-334

24.1 mm Diameter x 0.65 mm Thick Stainless Steel Disk

**Customer:** Test America/St. Louis
**P.O. No.:** 2355182, Item 1

This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined by alpha spectroscopy. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

**Reference Date:** 10-Jun-2010 12:00 PM EST

| Isotope | Activity (Bq) | Energy Range (keV) | Half-Life, years | Uncertainty* Type (%) $u_A$ | $u_B$ | U |
|---|---|---|---|---|---|---|
| Th-230 | 6.251E+00 | 4420-4800 | 7.540E+04 | 0.9 | 1.1 | 2.8 |
| Pu-239 | 5.746E+00 | 4950-5240 | 2.410E+04 | 0.9 | 1.1 | 2.8 |
| Am-241 | 6.291E+00 | 5280-5600 | 4.326E+02 | 0.9 | 1.1 | 2.8 |
| Total Activity | 1.832E+01 | 3000-8000 | | 0.6 | 1.1 | 2.5 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1956

**Comments:**
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

CAUTION: Active material deposited on the unmarked surface. Handle carefully to prevent scratching or damaging the active surface of this source (i.e., use Teflon coated forceps). Store in the container provided when not in use.

Source Calibrated by: _____
A. Chen, Spectroscopist

QA Approved: _____ Date: 06-24-2010
E. A. Taskaev, QA Manager Alternate

# Reagent

# Gamma Ampuole_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

### 79670-334

5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2303925, Item 1
**Calibration Date:** 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 157860 | ——— | 3.390E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 462.60 | 1.691E+05 | 4.798E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Co-57 | 122.1 | 271.79 | 8.904E+04 | 2.526E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 137.6 | 1.256E+05 | 3.563E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Hg-203 | 279.2 | 46.61 | 2.788E+05 | 7.910E+03 | 0.3 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 115.1 | 1.725E+05 | 4.894E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 10983 | 1.120E+05 | 3.178E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 106.6 | 4.205E+05 | 1.193E+04 | 0.8 | 1.1 | 2.7 | HPGe |
| Co-60 | 1173.2 | 1925.4 | 2.184E+05 | 6.196E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Co-60 | 1332.5 | 1925.4 | 2.185E+05 | 6.199E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Y-88 | 1836.1 | 106.6 | 4.444E+05 | 1.261E+04 | 0.7 | 1.1 | 2.6 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

# Reagent

# Gamma Ampuole_00003

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION
## Standard Radionuclide Source

### 83725-334
### 5 mL Liquid in Flame Sealed Vial

**Customer:** Test America St. Louis/Earth City, MO
**P.O. No.:** 2397508, Item 1
**Reference Date:** 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.028066

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 1.580E+05 | ——— | 3.261E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.697E+05 | 4.763E+03 | 0.8 | 1.7 | 3.8 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.711E+04 | 2.445E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.247E+05 | 3.500E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.753E+05 | 7.727E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.769E+05 | 4.965E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.109E+05 | 3.113E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.224E+05 | 1.186E+04 | 0.5 | 1.1 | 2.4 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.142E+05 | 6.012E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.143E+05 | 6.015E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.472E+05 | 1.255E+04 | 0.5 | 1.1 | 2.4 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

**Comments:**
5.30203 grams 4M HCl solution with approximately 30 μg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the reference date.

Source Prepared by: MITaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: _____ Date: 13/JAN/11
J. D. McCorvey, QA Manager Alternate

# Reagent

# Marn Soil_00002

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

## 83814-334

### 1.0 Liter Sand in 1 Liter Wide Mouth HDPE Silgan Jar

**Customer:** Test America St. Louis
**P.O. No.:** 2395112, Item 1
**Reference Date:** 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.016927

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Pb-210 | 46.5 | 8.120E+03 | ——— | 3.021E+03 | 0.1 | 2.1 | 4.1 | 4π LS |
| Am-241 | 59.5 | 1.580E+05 | ——— | 2.090E+03 | 0.1 | 1.7 | 3.5 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.697E+05 | 2.873E+03 | 0.8 | 2.3 | 4.9 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.711E+04 | 1.475E+03 | 0.5 | 2.0 | 4.1 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.247E+05 | 2.111E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.753E+05 | 4.660E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.769E+05 | 2.994E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.109E+05 | 1.877E+03 | 0.7 | 1.9 | 4.0 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.224E+05 | 7.150E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.142E+05 | 3.626E+03 | 0.6 | 1.9 | 4.0 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.143E+05 | 3.627E+03 | 0.6 | 1.9 | 4.0 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.472E+05 | 7.570E+03 | 0.5 | 1.9 | 3.9 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS FOUNDED 1956 SOCIETY



Corporate Office
Laboratory

**Comments:**
1550 grams of sand. Homogeneous down to 10 gram aliquot.
This standard will expire one year after the reference date.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 2/11/11
J. D. McCorvey, QA Manager Alternate

# Reagent

# MarnSolid_00002

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

90099

1.0 Liter Sand in 1 Liter Wide Mouth HDPE Silgan Jar

**Customer:** TestAmerica St. Louis / Earth City, MO
**P.O. No.:** 2454150, Item 1
**Reference Date:** 01-Jan-2012 12:00 PM EST **Grams of Master Source:** 0.017180

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty*, % Type $u_A$ | $u_B$ | U | Calibration Method* |
|---|---|---|---|---|---|---|---|---|
| Pb-210 | 46.5 | 8.109E+03 | ——— | 3.094E+03 | 0.1 | 2.1 | 4.1 | 4π LS |
| Am-241 | 59.5 | 1.580E+05 | ——— | 2.037E+03 | 0.1 | 1.7 | 3.5 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.677E+05 | 2.881E+03 | 0.5 | 2.3 | 4.7 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.795E+04 | 1.511E+03 | 0.4 | 2.0 | 4.1 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.245E+05 | 2.139E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.707E+05 | 4.651E+03 | 0.3 | 1.9 | 3.8 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.755E+05 | 3.015E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.128E+05 | 1.938E+03 | 0.7 | 1.9 | 4.0 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.228E+05 | 7.264E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.084E+05 | 3.580E+03 | 0.6 | 1.9 | 4.0 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.084E+05 | 3.581E+03 | 0.7 | 1.9 | 4.0 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.476E+05 | 7.690E+03 | 0.7 | 1.9 | 4.0 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

**Comments:**
1550 grams of sand. Homogenous down to 10 grams aliquot.
This standard will expire one year after the reference date.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 30 JAN 12
J.D. McCorvey, Counting Room Manager

# Reagent

---

# Source A_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

### 79670-334

5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2303925, Item 1
**Calibration Date:** 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 157860 | ——— | 3.390E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 462.60 | 1.691E+05 | 4.798E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Co-57 | 122.1 | 271.79 | 8.904E+04 | 2.526E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 137.6 | 1.256E+05 | 3.563E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Hg-203 | 279.2 | 46.61 | 2.788E+05 | 7.910E+03 | 0.3 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 115.1 | 1.725E+05 | 4.894E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 10983 | 1.120E+05 | 3.178E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 106.6 | 4.205E+05 | 1.193E+04 | 0.8 | 1.1 | 2.7 | HPGe |
| Co-60 | 1173.2 | 1925.4 | 2.184E+05 | 6.196E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Co-60 | 1332.5 | 1925.4 | 2.185E+05 | 6.199E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Y-88 | 1836.1 | 106.6 | 4.444E+05 | 1.261E+04 | 0.7 | 1.1 | 2.6 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

# Reagent

---

# Source C_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

### 79670-334

5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2303925, Item 1
**Calibration Date:** 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 157860 | ——— | 3.390E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 462.60 | 1.691E+05 | 4.798E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Co-57 | 122.1 | 271.79 | 8.904E+04 | 2.526E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 137.6 | 1.256E+05 | 3.563E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Hg-203 | 279.2 | 46.61 | 2.788E+05 | 7.910E+03 | 0.3 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 115.1 | 1.725E+05 | 4.894E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 10983 | 1.120E+05 | 3.178E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 106.6 | 4.205E+05 | 1.193E+04 | 0.8 | 1.1 | 2.7 | HPGe |
| Co-60 | 1173.2 | 1925.4 | 2.184E+05 | 6.196E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Co-60 | 1332.5 | 1925.4 | 2.185E+05 | 6.199E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Y-88 | 1836.1 | 106.6 | 4.444E+05 | 1.261E+04 | 0.7 | 1.1 | 2.6 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

# Reagent

---

# Source D_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

### 79670-334

5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2303925, Item 1
**Calibration Date:** 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 157860 | ——— | 3.390E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 462.60 | 1.691E+05 | 4.798E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Co-57 | 122.1 | 271.79 | 8.904E+04 | 2.526E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 137.6 | 1.256E+05 | 3.563E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Hg-203 | 279.2 | 46.61 | 2.788E+05 | 7.910E+03 | 0.3 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 115.1 | 1.725E+05 | 4.894E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 10983 | 1.120E+05 | 3.178E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 106.6 | 4.205E+05 | 1.193E+04 | 0.8 | 1.1 | 2.7 | HPGe |
| Co-60 | 1173.2 | 1925.4 | 2.184E+05 | 6.196E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Co-60 | 1332.5 | 1925.4 | 2.185E+05 | 6.199E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Y-88 | 1836.1 | 106.6 | 4.444E+05 | 1.261E+04 | 0.7 | 1.1 | 2.6 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

# Reagent

---

# Source E_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

### 79670-334

5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2303925, Item 1
**Calibration Date:** 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 157860 | ——— | 3.390E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 462.60 | 1.691E+05 | 4.798E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Co-57 | 122.1 | 271.79 | 8.904E+04 | 2.526E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 137.6 | 1.256E+05 | 3.563E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Hg-203 | 279.2 | 46.61 | 2.788E+05 | 7.910E+03 | 0.3 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 115.1 | 1.725E+05 | 4.894E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 10983 | 1.120E+05 | 3.178E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 106.6 | 4.205E+05 | 1.193E+04 | 0.8 | 1.1 | 2.7 | HPGe |
| Co-60 | 1173.2 | 1925.4 | 2.184E+05 | 6.196E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Co-60 | 1332.5 | 1925.4 | 2.185E+05 | 6.199E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Y-88 | 1836.1 | 106.6 | 4.444E+05 | 1.261E+04 | 0.7 | 1.1 | 2.6 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

# Reagent

---

# Source F_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION
## Standard Radionuclide Source

### 83725-334
### 5 mL Liquid in Flame Sealed Vial

**Customer:** Test America St. Louis/Earth City, MO
**P.O. No.:** 2397508, Item 1
**Reference Date:** 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.028066

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 1.580E+05 | ——— | 3.261E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.697E+05 | 4.763E+03 | 0.8 | 1.7 | 3.8 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.711E+04 | 2.445E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.247E+05 | 3.500E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.753E+05 | 7.727E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.769E+05 | 4.965E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.109E+05 | 3.113E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.224E+05 | 1.186E+04 | 0.5 | 1.1 | 2.4 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.142E+05 | 6.012E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.143E+05 | 6.015E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.472E+05 | 1.255E+04 | 0.5 | 1.1 | 2.4 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

**Comments:**
5.30203 grams 4M HCl solution with approximately 30 μg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the reference date.

Source Prepared by: MITaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: _____ Date: 13/JAN/11
J. D. McCorvey, QA Manager Alternate

# Reagent

---

# Source G_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

### 79670-334

5 mL Liquid in Flame Sealed Vial

**Customer:** TestAmerica St. Louis
**P.O. No.:** 2303925, Item 1
**Calibration Date:** 01-Apr-2009 12:00 EST **Grams of Master Source:** 0.028371

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 157860 | ——— | 3.390E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 462.60 | 1.691E+05 | 4.798E+03 | 0.4 | 1.7 | 3.5 | HPGe |
| Co-57 | 122.1 | 271.79 | 8.904E+04 | 2.526E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 137.6 | 1.256E+05 | 3.563E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Hg-203 | 279.2 | 46.61 | 2.788E+05 | 7.910E+03 | 0.3 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 115.1 | 1.725E+05 | 4.894E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 10983 | 1.120E+05 | 3.178E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 106.6 | 4.205E+05 | 1.193E+04 | 0.8 | 1.1 | 2.7 | HPGe |
| Co-60 | 1173.2 | 1925.4 | 2.184E+05 | 6.196E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Co-60 | 1332.5 | 1925.4 | 2.185E+05 | 6.199E+03 | 0.7 | 1.1 | 2.6 | HPGe |
| Y-88 | 1836.1 | 106.6 | 4.444E+05 | 1.261E+04 | 0.7 | 1.1 | 2.6 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
5.31740 grams 4M HCl solution with approximately 30 microg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the calibration date.

Source Prepared by: [signature] for
W. Mao, Radiochemist

QA Approved: [signature] Date: 5-13-09
D. M. Montgomery, QA Manager

End of Certificate



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION
## Standard Radionuclide Source

### 83725-334
### 5 mL Liquid in Flame Sealed Vial

**Customer:** Test America St. Louis/Earth City, MO
**P.O. No.:** 2397508, Item 1
**Reference Date:** 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.028066

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 1.580E+05 | ——— | 3.261E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.697E+05 | 4.763E+03 | 0.8 | 1.7 | 3.8 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.711E+04 | 2.445E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.247E+05 | 3.500E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.753E+05 | 7.727E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.769E+05 | 4.965E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.109E+05 | 3.113E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.224E+05 | 1.186E+04 | 0.5 | 1.1 | 2.4 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.142E+05 | 6.012E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.143E+05 | 6.015E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.472E+05 | 1.255E+04 | 0.5 | 1.1 | 2.4 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)


**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355
**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

**Comments:**
5.30203 grams 4M HCl solution with approximately 30 μg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the reference date.

Source Prepared by: MITaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: _____ Date: 13/JAN/11
J. D. McCorvey, QA Manager Alternate

# Reagent

---

# Source H_00002

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION
## Standard Radionuclide Source

### 83725-334
### 5 mL Liquid in Flame Sealed Vial

**Customer:** Test America St. Louis/Earth City, MO
**P.O. No.:** 2397508, Item 1
**Reference Date:** 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.028066

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 1.580E+05 | ——— | 3.261E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.697E+05 | 4.763E+03 | 0.8 | 1.7 | 3.8 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.711E+04 | 2.445E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.247E+05 | 3.500E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.753E+05 | 7.727E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.769E+05 | 4.965E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.109E+05 | 3.113E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.224E+05 | 1.186E+04 | 0.5 | 1.1 | 2.4 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.142E+05 | 6.012E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.143E+05 | 6.015E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.472E+05 | 1.255E+04 | 0.5 | 1.1 | 2.4 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)


**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355
**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

**Comments:**
5.30203 grams 4M HCl solution with approximately 30 μg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the reference date.

Source Prepared by: MITaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: _____ Date: 13/JAN/11
J. D. McCorvey, QA Manager Alternate

# Reagent

---

# Source I_00001

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION
## Standard Radionuclide Source

### 83725-334
### 5 mL Liquid in Flame Sealed Vial

**Customer:** Test America St. Louis/Earth City, MO
**P.O. No.:** 2397508, Item 1
**Reference Date:** 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.028066

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Am-241 | 59.5 | 1.580E+05 | ——— | 3.261E+03 | 0.1 | 0.9 | 1.8 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.697E+05 | 4.763E+03 | 0.8 | 1.7 | 3.8 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.711E+04 | 2.445E+03 | 0.5 | 1.3 | 2.8 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.247E+05 | 3.500E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.753E+05 | 7.727E+03 | 0.4 | 1.1 | 2.3 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.769E+05 | 4.965E+03 | 0.5 | 1.1 | 2.4 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.109E+05 | 3.113E+03 | 0.7 | 1.2 | 2.8 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.224E+05 | 1.186E+04 | 0.5 | 1.1 | 2.4 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.142E+05 | 6.012E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.143E+05 | 6.015E+03 | 0.6 | 1.1 | 2.5 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.472E+05 | 1.255E+04 | 0.5 | 1.1 | 2.4 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

**Comments:**
5.30203 grams 4M HCl solution with approximately 30 μg/g each of Cd, Co, Ce, Hg, Sn, Cs, and Y carriers.

This standard will expire one year after the reference date.

Source Prepared by: MITaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: _____ Date: 13/JAN/11
J. D. McCorvey, QA Manager Alternate

# Reagent

# Th-229_00016

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404•352•8677
Fax 404•352•2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

97790

Th-229 5 mL Liquid in Flame Sealed Vial

430569
ID: Th-229_00016
Exp:08/06/64 Prpd:SCB Opn:08/20/14
Th-229 Ampoule

**Customer:** TestAmerica - St. Louis
**P.O. No.:** 2573570, Item 1 Product Code: 8229

This standard radionuclide source was prepared gravimetrically from a master solution, calibrated by Eckert & Ziegler Analytics. The master solution was calibrated by liquid scintillation counting. Radionuclide calibration and purity were checked by germanium gamma-ray spectrometry, liquid scintillation counting, and/or alpha spectrometry, as applicable. The nuclear decay rate and reference date for this source are given below. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Isotope | Half-Life, Days | Activity (Bq) | Uncertainty* , % Type $u_A$ | $u_B$ | U | Reference Date (12:00 PM EST) |
|---|---|---|---|---|---|---|
| Th-229 | 2.681E+06 | 3.761E+03 | 0.5 | 1.5 | 3.1 | 08/06/2014 |

***Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
Impurities: α-impurities: Th-228 2.83E-01 Bq, Th-230 2.33E+01 Bq, Th-232 1.51E0 Bq; γ-impurities (other than decay products)<0.1%.
5.08156 g 0.5M HNO3 solution. Carrier free.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QC Approved: _____ Date: 06 AUG 14
A. Chen, Spectroscopist

ACCREDITED SOURCE CALIBRATION LABORATORY HEALTH PHYSICS SOCIETY FOUNDED 1958

ANA Form005 Rev. —



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

**U.S. DEPARTMENT OF COMMERCE**
National Institute of Standards & Technology
Gaithersburg, MD 20899

# Certificate of Participation

## *Eckert & Ziegler Analytics*
## *Atlanta, Georgia*

is a participant for the period January 1, 2014, through December 31, 2014, in a radioactivity measurements assurance program conducted by the National Institute of Standards and Technology, in cooperation with NRMAP Incorporated. Continued participation is evidenced by dated Reports of Traceability issued for particular radionuclides, which indicate the deviation of the participant's reported value from that measured by the National Institute of Standards and Technology. The significance of these Reports is addressed below.*

For the Director,

Michael P. Unterweger, Leader
Radioactivity Group
Physical Measurement Laboratory

*As guidance for the proper use of Reports of Traceability, it should be emphasized that the National Institute of Standards and Technology is concerned only with fostering good measurements capability and consistency with the national measurements system. The assurance of the proper application of that capability to the ultimate consumer products is the responsibility of each manufacturer of these products and of the Federal regulatory agencies.

A continuing traceability program in radioactivity demonstrates, to the degree established by the periodic assays of calibrated radioactivity samples, a continuing competence to maintain the methods and standards necessary for accurate measurement. Such a program cannot, however, endorse each and every measurement nor the final product, any more than a spot check can vouch for every unchecked item. Care should be taken, therefore, not to imply such endorsement. The proper use of this Report is governed by section 200.114 of Title 15 of the Code of Federal Regulations. These regulations may be met if Reports are quoted only in their entirety. Excerpts out of context may be misleading.

1380 Seaboard Industrial Boulevard
Atlanta, Georgia 30318 USA
Phone (404) 352-8677 • Fax (404) 352-2837
Email: analytics@ezag.com (Tax EIN: 58-1406082)

Eckert & Ziegler
Analytics

# Recommended Procedure for Opening the Flame Sealed Vial

1) If the solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the standard.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood.

3) Shake the vial to wet the entire inside surface of the vial. Return the vial to the upright position.

4) Check that all of the liquid has drained out of the neck of the vial. If necessary, gently tap the neck to speed the process.

5) The Wheaton vials we use are pre-scored.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the vial upright and wrap with soft tissue, such as Chem Wipes, around the tip of the vial and secure with tape (see picture). Snap off the top of the vial by pressing the pre-scored part of the neck away towards you while pulling the tip of the vial away from you.

8) Transfer the solution from the vial using a pycnometer or pipet with a dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any unused solution in a flame sealed glass vial, if possible, to minimize the evaporation loss.

# Reagent

# Th-229_00022

St. Louis Radiological Standard Verification

Printed: 3/27/2017 3:59 PM

Standard ID Number: Th-229_00022
True Value = 67.214 dpm/mL
Date Analyzed: 3/26/2017

Radionuclide: Th-229

| | Replicates | |
|---|---|---|
| #1 | 71.07 | dpm/mL |
| #2 | 70.53 | dpm/mL |
| #3 | 68.25 | dpm/mL |

Mean = 69.95

1 sigma = 1.49679658

1.96 sigma = 2.933721

True Value minus 5% = 63.8533 (True Value - 5%)
True Value plus 5% = 70.5747 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DoD/DOE Consolidated QSM and LANL Statements of Work

1st Reviewed By/Date: ALD 3/27/17

2nd Reviewed By/Date: RM 3·28·17

# Decay Calculations

**Raw Sample/Standard Information**

| | | | |
|---|---|---|---|
| **Initial Date/Time ($t_0$):** | 8/6/2014 0:00 | | |
| **Decayto Date/Time (t):** | 3/26/17 0:00 | | |
| **Initial Activity ($A_0$):** | 67.23 dpm | | |
| **Initial Aliquot:** | 1 mL | | |
| **Initial Conc:** | 67.22958 dpm/mL | | |
| ***Soln. Density:** | 1 g/mL | | |
| **Nuclide:** | Th-229 | | |
| **Half-Life (days):** | 2897163 | decay days | fraction |
| ****Decay Factor:** | 0.9998 | 963.00 | 0.00033 |
| **Decay Corr Activity:** | 6.7214E+01 dpm | | |
| **Decay Corr Conc:** | 6.7214E+01 dpm/mL | | |

**Conversion/Calculations**

| | |
|---|---|
| **Final Activity Unit:** | dpm |
| **Activity Unit Factor:** | 1.00000 |
| **Final Volume Unit:** | mL |
| **Volume Unit Factor:** | 1.000 |
| **Final Concentration:** | 6.7214E+01 dpm/mL |
| **Aliquot Volume:** | 1.0000E+00 mL |
| **Final Activity (A):** | 6.7214E+01 dpm |

** Uses basic decay equation: $A = A_0 * \exp(-\ln(2)*(t-t_0)/(\text{half-life})$

* Soln. Density to be used when converting from liquid expressed in mass (g) units to liquid units (mL), and is only applied in that case.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:25:08PM 3/27/2017

## Sample

Sample Name: Ver1 Type: Sample
Spectrum #1 Analysis #1
:
Sample Collection Date:
Comment:

Sample Volume : 0.10 Sample Units: mL
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

## Batch

Batch Name: Th-229 Tracer Ver
AnalysisResultsID: 188141
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

## Tracer

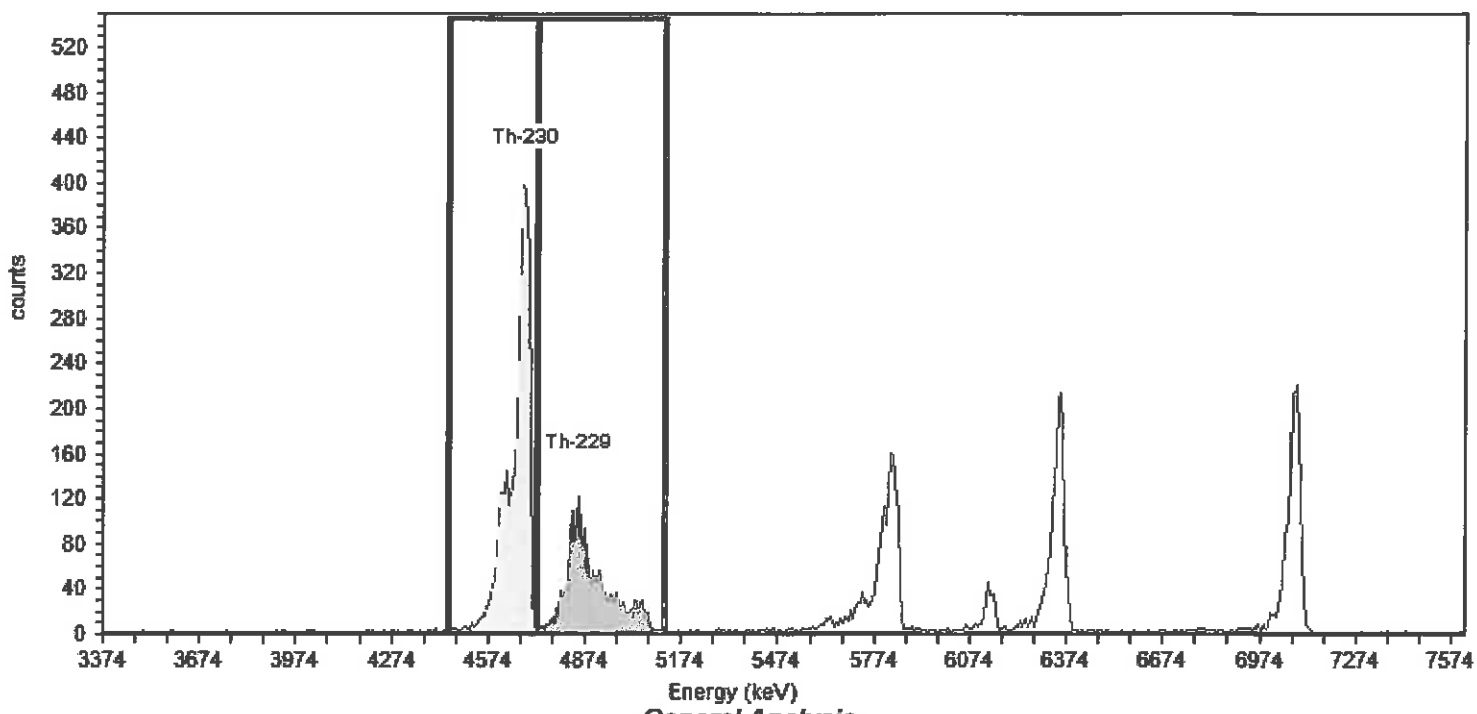
Tracer Name: Th-230_00029
Tracer Activity: 44.56 DPM / mL x (Vol.) 0.30 mL = 13.37 DPM
Tracer Ref. Date: 8/8/2013 11:19:32AM

Tracer Nuclide: Th-230
Tracer Recovery: 109.07%

## Acquisition

Detector: AV159 SN: 50-05/II5
Acquisition Start Date: 3/26/2017 10:10:52PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 3/17/2017 11:40:19AM
Bkgd Info: Sample: ICB;AV159; Det: AV159; Spectrum #1; 3/17/2017 11:40:19 AM

Energy Calibration: IC-9884;AV159-20161110
Efficiency Calibration:IC-9884;AV159-20161110
Calibration Date: 11/11/2016 2:38:12PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 23.11% +/- 0.34% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute Interactive ROI Analysis
Decay Correction:3/26/2017 10:10:04PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Th-230 | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4724.2 | 21.1 | 99.7 | 3228 | 3.0000 | 3225.00 | 1.458E+002 | DPM/mL |
| Th-229 | 4848.0 | 4,845.3 | 2.7 | 4724.2 | 5119.5 | 84.0 | 99.8 | 1718 | 2.0000 | 1716.00 | 7.107E+001 | DPM/mL |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:25:22PM 3/27/2017

## Sample

Sample Name: Ver2 Type: Sample
Spectrum #1 Analysis #1
:
Sample Collection Date:
Comment:

Sample Volume : 0.10 Sample Units: mL
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

## Batch

Batch Name: Th-229 Tracer Ver
AnalysisResultsID: 188138
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

## Tracer

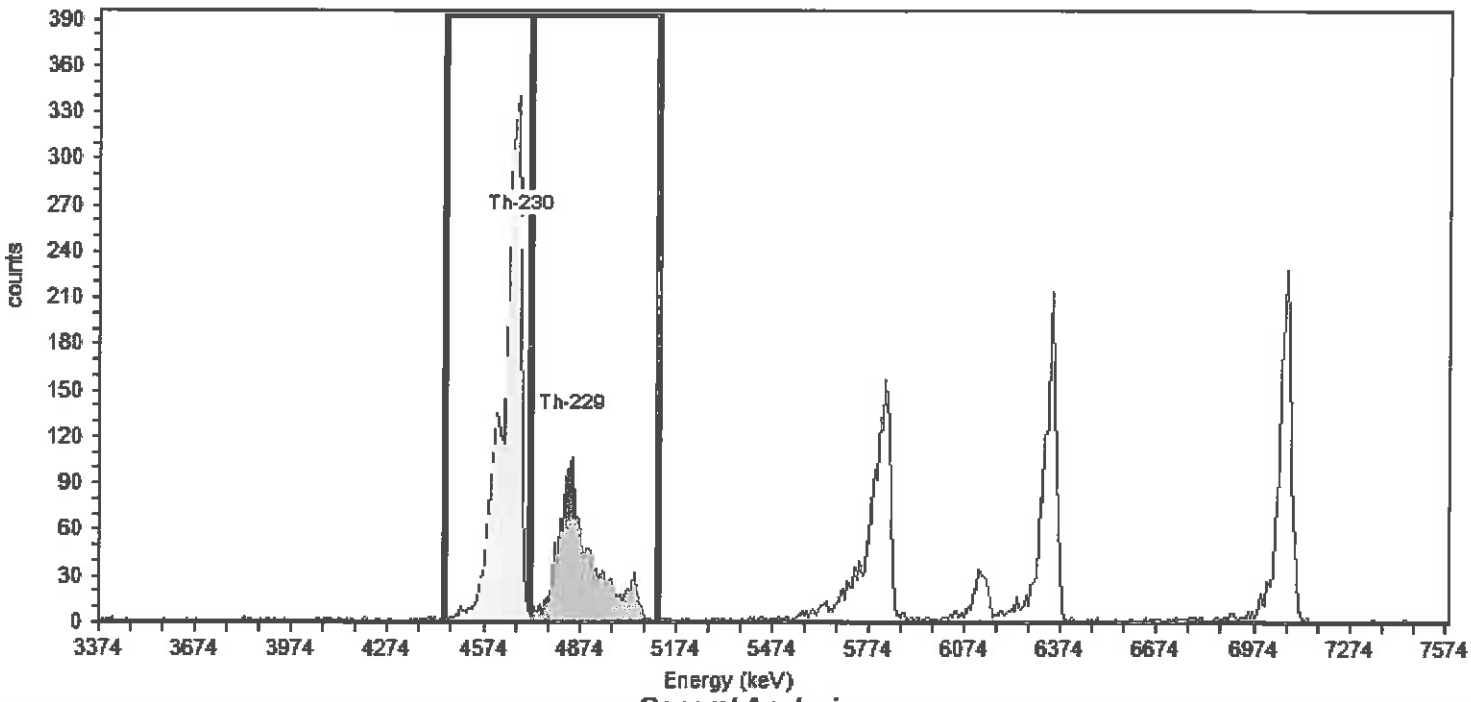
Tracer Name: Th-230_00029
Tracer Activity: 44.56 DPM / mL x (Vol.) 0.30 mL = 13.37 DPM
Tracer Ref. Date: 8/8/2013 11:19:32AM

Tracer Nuclide: Th-230
Tracer Recovery: 96.37%

## Acquisition

Detector: AV160 SN: 50-05/II6
Acquisition Start Date: 3/26/2017 10:10:53PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 3/16/2017 12:13:55PM
Bkgd Info: Sample: ICB;AV160; Det: AV160; Spectrum #1; 3/16/2017 12:13:55 PM

Energy Calibration: IC-9885;AV160-20161110
Efficiency Calibration:IC-9885;AV160-20161110
Calibration Date: 11/11/2016 2:38:21PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 24.69% +/- 0.37% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th-230_Tracer
Decay Correction:3/26/2017 10:10:04PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Th-230 | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 25.2 | 99.7 | 3048 | 3.0310 | 3044.49 | 1.288E+002 | DPM/mL |
| Th-229 | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 80.1 | 99.8 | 1610 | 2.0310 | 1607.81 | 7.053E+001 | DPM/mL |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:25:35PM 3/27/2017

## Sample

Sample Name: Ver3 Type: Sample
Spectrum #1 Analysis #1
:
Sample Collection Date:
Comment:

Sample Volume : 0.10 Sample Units: mL
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

## Batch

Batch Name: Th-229 Tracer Ver
AnalysisResultsID: 188137
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

## Tracer

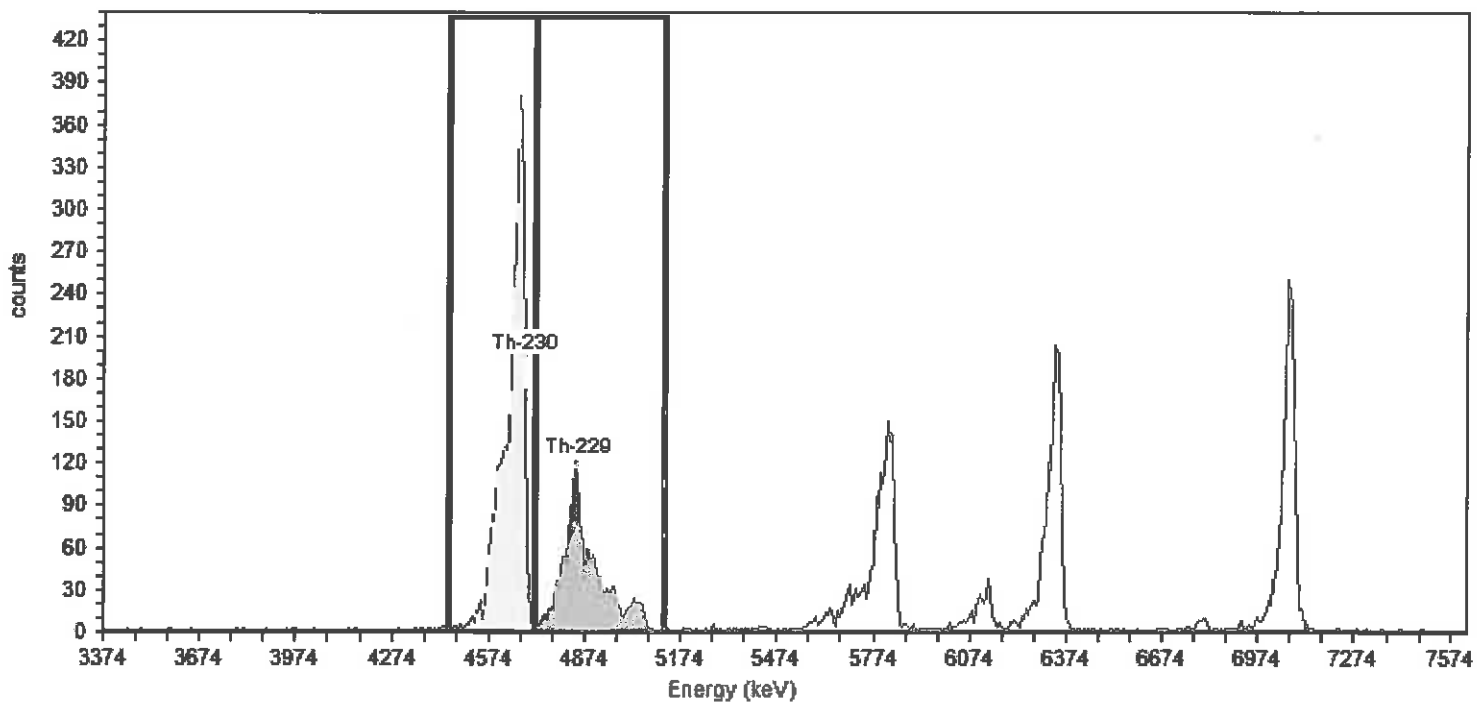
Tracer Name: Th-230_00029
Tracer Activity: 44.56 DPM / mL x (Vol.) 0.30 mL = 13.37 DPM
Tracer Ref. Date: 8/8/2013 11:19:32AM

Tracer Nuclide: Th-230
Tracer Recovery: 105.56%

## Acquisition

Detector: AV161 SN: 50-05/II7
Acquisition Start Date: 3/26/2017 10:10:53PM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 3/16/2017 12:13:55PM
Bkgd Info: Sample: ICB;AV161; Det: AV161; Spectrum #1; 3/16/2017 12:13:55 PM

Energy Calibration: IC-9886;AV161-20161110
Efficiency Calibration:IC-9886;AV161-20161110
Calibration Date: 11/11/2016 2:38:34PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 23.08% +/- 0.32% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th-230_Tracer
Decay Correction:3/26/2017 10:10:04PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Th-230 | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 21.6 | 99.7 | 3118 | 0.0000 | 3117.51 | 1.411E+002 | DPM/mL |
| Th-229 | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 94.2 | 99.8 | 1597 | 4.0000 | 1593.06 | 6.825E+001 | DPM/mL |

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Th-229 tracer verification (coppt)

**Aliquot Only**

Batch No. : —

Balance ID : —

| No. | Sample Number | Aliquot ( g / mL ) | Crucible ID | Dilution |
|---|---|---|---|---|
| 1 | Ver. 1 | 0.1 | 159 | |
| 2 | 2 | 1 | 160 | |
| 3 | 3 | | 161 | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| 21 | | | | |
| 22 | | | | |
| 23 | | | | |
| 24 | | | | |

*Note: If a section below is not used, marked the N/A box and initial & date next to the N/A. i.e. Mark the N/A box if a tracer is not added to the sample(s) then initial and date next to the N/A*

**Tracer** ☐ N/A

Initials / Date

Isotope : Th-230

Std Sol'n No. : Th-230-00034

Vol (mL) : 0.3

Ref Activity (dpm/mL) : 44.5646

Act Ref Date : 08-08-13

**Samples Spiked and Traced By:** SUB 3/24/17 (Initials / Date)

**Verification Signature & Date:** JM 3/24/17 (Initials / Date)

**LCS Standard** ☐ N/A

Initials / Date

Isotope : Th-229

Std Sol'n ID. : Th-229-00022

Vol (mL) : 0.1

Ref Activity (dpm/mL) : 67.22958

Act Ref Date : 08-16-14

**SOP's applied in preparing these samples. Mark box to left for all that apply:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ☐ | ST-RC-0003 Rev. | ☐ | ST-RC-0040 Rev. | ☐ | ST-RC-0110 Rev. | | |
| ☐ | ST-RC-0004 Rev. | ☐ | ST-RC-0041 Rev. | ☐ | ST-RC-0120 Rev. | | |
| ☐ | ST-RC-0014 Rev. | ☐ | ST-RC-0050 Rev. | ☐ | ST-RC-0232 Rev. | | |
| ☐ | ST-RC-0020 Rev. | ☐ | ST-RC-0090 Rev. | ☐ | ST-RC-0238 Rev. | | |
| ☐ | ST-RC-0021 Rev. | ☐ | ST-RC-0100 Rev. | ☐ | ST-RC-0240 Rev. | | |
| | | | | ☐ | ST-RC-0241 Rev. | | |
| | | | | ☐ | ST-RC-0242 Rev. | | |
| | | | | ☐ | ST-RC-5016 Rev. | | |
| | | | | ☐ | | | |
| | | | | ☐ | | | |

**Isotope(s)**

| | | | |
|---|---|---|---|
| αβ ☐ | Iso Pu ☐ | Tc-99 ☐ | Iso Cm ☐ |
| Iso Am ☐ | Ra ☐ | Iso Th ☑ | Pu-241 ☐ |
| KPA ☐ | Sr ☐ | Iso U ☐ | Th-229 ☐ |
| Np ☐ | TAR ☐ | C-14 ☐ | Cl-36 ☐ |

| Count Time | | Matrix | |
|---|---|---|---|
| Long Count | ☑ | Soil | ☐ |
| Short Count | ☐ | $H_2O$ | ☐ |

Prepared By : _____

Date : _____

Reviewed by: _____

Date: _____



\\Slsvr01\RAD\MasterForms\RAD-0045 Rev(3)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Th-229_00022

# Reagent ID: Th-229_00022

| | | | |
|---|---|---|---|
| | | Expiration Date: | 08/01/2017 |
| Description: | Th-229 Tracer | Laboratory: | TestAmerica St. Louis |
| No. of Bottles: | 1 | Prepared By: | Bernsen, Sarah C |
| Storage Location: | RAD Actinide STDs | Solvent: | 0.1M HNO3 |
| Reagent Volume: | 500.000 mL | Solvent Lot: | n/a |
| Creation Date: | 03/24/2017 | | |
| Open Date: | | | |
| Container(s): | 1135302 | | |
| Comment: | | | |

## Reagent Analyte Information

| Analyte | Source ID | Source Exp. Date | Source Conc. | Source Conc. Units | Final Conc. | Final Conc. Units |
|---|---|---|---|---|---|---|
| At-217 | Th-229_00017 | 08/01/2017 | 2240.98600 | dpm/mL | 67.22958 | dpm/mL |
| Th-229 | Th-229_00017 | 08/01/2017 | 2240.98600 | dpm/mL | 67.22958 | dpm/mL |

## Source Reagents

| Reagent | Description | Type | Expiration | Vendor | Vendor Lot # | Vendor Cat Lot # | Volume Used | Volume Units |
|---|---|---|---|---|---|---|---|---|
| Th-229_00017 | Th-229 Parent | | 08/01/17 | | | | 15.00000 | mL |

# Reagent

---

# TRM-2_00002

## Perry, Doug E

**From:** Salmi, Douglas R
**Sent:** March 20, 2000 10:48 AM
**To:** Perry, Doug E; Puissant, Pamela M
**Subject:** FW: SRMs for radiochemistry LCSs

Pam, Doug
FYI

-----Original Message-----
From: Minteer@aol.com [mailto:Minteer@aol.com]
Sent: March 20, 2000 10:36 AM
To: drsalmi@sandia.gov
Cc: dbourne@doeal.gov; GLDechant@aol.com; crandallb@quanterra.com
Subject: SRMs for radiochemistry LCSs

Doug:

As we discussed by telephone, please send approximately 500 grams each of PEM-1, TRM-2, and NBHD to STL St. Louis. These are to be used by STL as laboratory control samples. As with our other laboratories, STL will be asked to provide summaries of the data obtained in quarterly progress reports. This is not to assess their proficiency, but rather to help us develop interlaboratory acceptance criteria. The known values (given below) for PEM and TRM are good because the samples are well characterized. The known values for NBHD result from a single analysis and hence should be taken as estimates. All the values below are in pCi/g.

PEM-1:

| Parameter | Result | Std. Dev. |
|---|---|---|
| Pu-238 | 8.03 | 0.37 |
| Pu-239 | 41.0 | 3.0 |
| Am-241 | 32.5 | 1.1 |
| Cs-137 | 73.5 | 0.9 |
| U-234 | 5.99 | 0.2 |
| U-235 | 0.27 | 0.04 |
| U-238 | 18.1 | 0.5 |

TRM-2

| Parameter | Result | Uncertainty |
|---|---|---|
| U-238 | 6.0 | +/- 4.0 |
| U-234 | 6.2 | +/- 4.0 |
| Th-230 | 24.5 | +/- 0.6 |
| Ra-226 | 25.4 | +/- 0.9 |
| Pb-210 | 22.1 | +/- 1.2 |

NBHD

| Parameter | Result | Uncertainty |
|---|---|---|
| Am-241 | 1.47 | +/- 0.28 |
| Ra-226 | 67.3 | +/- 5.5 |
| U-234 | 174 | none available |
| U-235 | 8.7 | " |
| U-238 | 212 | " |
| Cs-137 | 52.1 | +/- 4.6 |
| Pb-210 | 78.3 | +/- 2.4 |
| Pu-239/40 | 4.7 | +/- 0.63 |
| Pu-238 | 0.3 | +/- 0.11 |
| Th-230 | 83.4 | +/- 6.5 |

# Reagent

# Tuna Can LCS_00006

Rec'd : 12-26-06

ANALYTICS
An Isotope Products Laboratories Company

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION
## Standard Radionuclide Source

### 74139-334
### 1.0 Liter Sand in 1 Liter Wide Mouth HDPE "S" Bottle

**Customer:** Severn Trent Laboratories/Earth City, MO
**P.O. No.:** 2169577, Item 1
**Calibration Date:** 01-Oct-2006 12:00 EST **Grams of Master Source:** 0.01552

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Analytics maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST."

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Pb-210 | 46.5 | 8145.9 | ——— | 3079.8 | 0.33 | 1.46 | 2.99 | 4π LS |
| Am-241 | 59.5 | 157860 | ——— | 2034.3 | 0.33 | 1.46 | 2.99 | 4π LS |
| Cd-109 | 88.0 | 462.60 | 189000 | 2933.5 | 0.57 | 1.70 | 3.59 | HPGe |
| Co-57 | 122.1 | 271.79 | 94570 | 1467.8 | 0.34 | 1.30 | 2.69 | HPGe |
| Ce-139 | 165.9 | 137.6 | 133800 | 2076.7 | 0.35 | 1.10 | 2.31 | HPGe |
| Hg-203 | 279.2 | 46.61 | 295300 | 4583 | 0.40 | 1.10 | 2.34 | HPGe |
| Sn-113 | 391.7 | 115.1 | 185600 | 2880.7 | 0.42 | 1.10 | 2.35 | HPGe |
| Cs-137 | 661.7 | 10983 | 116700 | 1811.3 | 0.70 | 1.20 | 2.78 | HPGe |
| Y-88 | 898.0 | 106.60 | 455400 | 7068 | 0.50 | 1.10 | 2.42 | HPGe |
| Co-60 | 1173.2 | 1925.4 | 226900 | 3522 | 0.60 | 1.10 | 2.51 | HPGe |
| Co-60 | 1332.5 | 1925.4 | 227000 | 3523 | 0.90 | 1.10 | 2.84 | HPGe |
| Y-88 | 1836.1 | 106.6 | 481200 | 7469 | 0.90 | 1.10 | 2.84 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

**Comments:**
1550 grams of sand. NOTE: Homogeneity was checked by the addition of Tc-99 tracer to the solution used to spike the sand. Ten 10-gram aliquots were removed after mixing and counted to measure the Tc-99. The standard deviation for the 10 measurements was 1.3% with a range of 4.8%. This demonstrates reasonable homogeneity for this source material down to a 10-gram aliquot.
This standard will expire one year after the calibration date.

Source Prepared by: MTaskaeva
M. I. Taskaeva, Radiochemist

QA Approved: _____, for Date: 12-21-06
D. M. Montgomery, QA Manager

End of Certificate



Corporate Office
24937 Avenue Tibbitts Valencia, California 91355

Laboratory
1380 Seaboard Industrial Blvd. Atlanta, Georgia, 30318

## St. Louis Radiological Standard Reverification Form

Standard ID Number: Tuna Can LCS_00006 (1012459)
True Value = 97.08 pCi/g
Date Analyzed: 9/29/2016

Radionuclide: Gamma LCS Am-241

| | Replicates | |
|---|---|---|
| #1 | 96.82 | pCi/g |
| #2 | 96.69 | pCi/g |
| #3 | 97.75 | pCi/g |

Mean = 97.08667

1 sigma = 0.578129

1.96 sigma = 1.133133

True Value minus 5% = 92.226 (True Value - 5%)
True Value plus 5% = 101.934 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 10/03/16

SOP Reference: STL-QA-0002, Current Revision

## St. Louis Radiological Standard Reverification Form

Standard ID Number: Tuna Can LCS_00006 (112459)
True Value = 29.45 pCi/g
Date Analyzed: 9/29/2016

Radionuclide: Gamma LCS Cs-137

| | Replicates | |
|---|---|---|
| #1 | 28.26 | pCi/g |
| #2 | 28.64 | pCi/g |
| #3 | 28.37 | pCi/g |

Mean = 28.42333

1 sigma = 0.195533

1.96 sigma = 0.383246

True Value minus 5% = 27.9775 (True Value - 5%)
True Value plus 5% = 30.9225 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 10/03/16

SOP Reference: STL-QA-0002, Current Revision

## St. Louis Radiological Standard Reverification Form

Standard ID Number: Tuna Can LCS_00006 (1012459)
True Value = 16.46 pCi/g
Date Analyzed: 9/29/116

Radionuclide: Gamma LCS Co-60

| | Replicates | |
|---|---|---|
| #1 | 16.04 | pCi/g |
| #2 | 15.77 | pCi/g |
| #3 | 16.14 | pCi/g |

Mean = 15.98333

1 sigma = 0.191398

1.96 sigma = 0.375141

True Value minus 5% = 15.637 (True Value - 5%)
True Value plus 5% = 17.283 (True Value + 5%)

**Accuracy:**
**Mean value within 5% of Certified (True) Value?** **Yes** **(Acceptance Criteria)**

**Precision:**
**1.96 sigma Value Within 10% of Mean Value?** **Yes** **(Acceptance Criteria)**

**Standard Reverification Acceptable?** **Yes**

Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Jody Watson 10/3/16

SOP Reference: STL-QA-0002, Current Revision

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## Analysis Report for Gamma Spectroscopy

**Batch:** 272277 **Operator:**

| SampID | WRKNO | Aliquot | Sigma | Instrument | Detector | CountDateTime | CountDuration |
|---|---|---|---|---|---|---|---|
| LCS 160-272277~2- | LCS | 341.90g | 1.00 | GammaVision | GV15 | 9 / 29 / 16 13:06 | 30 |

| Analyte | Cmpnd# | Activity | TotalUnc | CountUnc | MDA | MLCC | Act/MDA | |
|---|---|---|---|---|---|---|---|---|
| AC-228 | 11136 | -2.044E-001pCi/g | 5.500E-001 | 5.499E-001 | 1.436E+000 | 6.946E-001 | -0.14 | 0.5500 |
| AG-108M | 10982 | -1.018E-001pCi/g | 9.743E-002 | 9.729E-002 | 3.075E-001 | 1.497E-001 | -0.33 | 0.0974 |
| AG-110M | 10973 | 5.076E-002pCi/g | 4.575E-002 | 4.567E-002 | 7.684E-001 | 3.751E-001 | 0.07 | 0.0457 |
| AM-241 | 10818 | 9.682E+001pCi/g | 5.100E+000 | 8.709E-001 | 1.290E+000 | 6.388E-001 | 75.07 | 5.0999 |
| BA-133 | 10469 | -1.624E-001pCi/g | 1.661E-001 | 1.659E-001 | 5.506E-001 | 2.703E-001 | -0.29 | 0.1661 |
| BA-140 | 10463 | -1.425E-001pCi/g | 1.058E-001 | 1.055E-001 | 1.079E+000 | 5.219E-001 | -0.13 | 0.1058 |
| BE-7 | 10435 | 1.275E-001pCi/g | 1.233E+000 | 1.233E+000 | 4.134E+000 | 2.030E+000 | 0.03 | 1.2334 |
| BI-207 | 10195 | 1.058E-001pCi/g | 7.194E-002 | 7.173E-002 | 2.372E-001 | 1.139E-001 | 0.45 | 0.0719 |
| BI-210M | 10173 | 8.477E-002pCi/g | 9.587E-002 | 9.574E-002 | 4.994E-001 | 2.447E-001 | 0.17 | 0.0959 |
| BI-212 | 10160 | 1.553E+000pCi/g | 1.216E+000 | 1.214E+000 | 4.030E+000 | 1.941E+000 | 0.39 | 1.2163 |
| BI-214 | 10154 | 8.681E-002pCi/g | 3.647E-002 | 3.619E-002 | 1.088E+000 | 5.336E-001 | 0.08 | 0.0365 |
| CD-109 | 9254 | 0.000E+000pCi/g | 3.288E+000 | 3.288E+000 | 1.089E+001 | 5.402E+000 | 0.00 | 3.2880 |
| CD-113M | 17462 | -1.456E+003pCi/g | 1.073E+003 | 1.069E+003 | 3.536E+003 | 1.727E+003 | -0.41 | 1,072.9969 |
| CE-139 | 9241 | 7.398E-002pCi/g | 7.038E-002 | 7.003E-002 | 2.323E-001 | 1.140E-001 | 0.32 | 0.0704 |
| CE-141 | 9235 | 1.679E-002pCi/g | 1.287E-001 | 1.287E-001 | 3.270E-001 | 1.601E-001 | 0.05 | 0.1287 |
| CE-144 | 9221 | -5.823E-001pCi/g | 1.611E+000 | 1.610E+000 | 2.809E+000 | 1.390E+000 | -0.21 | 1.6107 |
| CF-249 | 9215 | -3.279E-002pCi/g | 1.794E-001 | 1.794E-001 | 6.001E-001 | 2.950E-001 | -0.05 | 0.1794 |
| CF-251 | 13690 | -4.067E-001pCi/g | 3.994E-001 | 3.978E-001 | 1.002E+000 | 4.903E-001 | -0.41 | 0.3994 |
| CO-56 | 8704 | 1.139E-001pCi/g | 1.826E-001 | 1.825E-001 | 3.036E-001 | 1.454E-001 | 0.38 | 0.1826 |
| CO-57 | 13694 | 4.528E-001pCi/g | 4.266E-001 | 4.260E-001 | 1.102E+000 | 5.361E-001 | 0.41 | 0.4266 |
| CO-58 | 8698 | -1.658E-001pCi/g | 1.376E-001 | 1.373E-001 | 4.558E-001 | 2.217E-001 | -0.36 | 0.1376 |
| CO-60 | 8692 | 1.604E+001pCi/g | 8.400E-001 | 2.396E-001 | 9.914E-002 | 4.016E-002 | 161.75 | 0.8400 |
| CR-51 | 8604 | -9.651E-001pCi/g | 1.169E+000 | 1.168E+000 | 3.438E+000 | 1.690E+000 | -0.28 | 1.1689 |
| CS-134 | 8553 | 6.593E-002pCi/g | 8.889E-002 | 8.882E-002 | 5.089E-001 | 2.495E-001 | 0.13 | 0.0889 |
| CS-136 | 8546 | 1.258E-001pCi/g | 1.227E-001 | 1.225E-001 | 4.083E-001 | 1.980E-001 | 0.31 | 0.1227 |
| CS-137 | 8539 | 2.826E+001pCi/g | 1.520E+000 | 3.844E-001 | 2.878E-001 | 1.379E-001 | 98.20 | 1.5198 |
| EU-152 | 7145 | 5.245E-001pCi/g | 5.014E-001 | 5.007E-001 | 1.782E+000 | 8.797E-001 | 0.29 | 0.5014 |
| EU-154 | 7138 | 4.532E-001pCi/g | 3.576E-001 | 3.568E-001 | 3.623E+000 | 1.758E+000 | 0.13 | 0.3576 |
| EU-155 | 7131 | 3.186E-001pCi/g | 4.804E-001 | 4.800E-001 | 1.590E+000 | 7.880E-001 | 0.20 | 0.4804 |
| FE-59 | 7073 | -4.662E-001pCi/g | 2.724E-001 | 2.714E-001 | 8.335E-001 | 4.027E-001 | -0.56 | 0.2724 |
| GA-68 | 18005 | -2.864E+000pCi/g | 6.167E+000 | 6.165E+000 | 1.352E+001 | 6.483E+000 | -0.21 | 6.1671 |
| GD-153 | 6824 | -2.389E-001pCi/g | 3.642E-001 | 3.639E-001 | 1.205E+000 | 5.975E-001 | -0.20 | 0.3642 |
| HF-181 | 6495 | 2.232E-002pCi/g | 9.381E-002 | 9.380E-002 | 5.455E-001 | 2.678E-001 | 0.04 | 0.0938 |
| HG-203 | 6466 | -1.176E-001pCi/g | 9.784E-002 | 9.761E-002 | 3.233E-001 | 1.585E-001 | -0.36 | 0.0978 |
| I-131 | 6380 | 1.345E-001pCi/g | 1.325E-001 | 1.323E-001 | 2.783E-001 | 1.352E-001 | 0.48 | 0.1325 |
| IR-192 | 6303 | 1.051E-001pCi/g | 1.544E-001 | 1.543E-001 | 5.121E-001 | 2.528E-001 | 0.21 | 0.1544 |
| K-40 | 6148 | -3.414E-001pCi/g | 3.403E+000 | 3.403E+000 | 1.694E+000 | 7.511E-001 | -0.20 | 3.4027 |
| LA-140 | 6096 | 6.964E-002pCi/g | 2.842E-002 | 2.818E-002 | 6.304E-002 | 1.993E-002 | 1.10 | 0.0284 |
| MN-54 | 5382 | 9.032E-003pCi/g | 1.343E-001 | 1.343E-001 | 3.074E-001 | 1.474E-001 | 0.03 | 0.1343 |
| NA-22 | 5201 | 7.656E-002pCi/g | 4.569E-002 | 4.553E-002 | 1.483E-001 | 6.510E-002 | 0.52 | 0.0457 |
| NB-94 | 5160 | -6.911E-003pCi/g | 8.527E-002 | 8.527E-002 | 2.509E-001 | 1.199E-001 | -0.03 | 0.0853 |
| NB-95 | 5154 | -1.314E-001pCi/g | 1.080E-001 | 1.078E-001 | 3.580E-001 | 1.732E-001 | -0.37 | 0.1080 |
| ND-147 | 5083 | 2.116E-001pCi/g | 7.933E-001 | 7.932E-001 | 1.870E+000 | 9.017E-001 | 0.11 | 0.7933 |
| NP-237 | 4757 | -5.339E-001pCi/g | 9.394E-001 | 9.389E-001 | 3.110E+000 | 1.543E+000 | -0.17 | 0.9394 |
| NP-239 | 4751 | 2.951E-001pCi/g | 4.471E-001 | 4.467E-001 | 1.480E+000 | 7.333E-001 | 0.20 | 0.4471 |
| PA-231 | 4541 | 0.000E+000pCi/g | 1.548E+000 | 1.548E+000 | 1.296E+001 | 6.385E+000 | 0.00 | 1.5484 |
| PA-233 | 4535 | 2.505E-001pCi/g | 3.660E-001 | 3.657E-001 | 1.214E+000 | 5.993E-001 | 0.21 | 0.3660 |
| PA-234 | 4528 | 9.127E-002pCi/g | 1.542E-001 | 1.541E-001 | 1.714E+000 | 8.480E-001 | 0.05 | 0.1542 |
| PA-234M | 19453 | 2.654E+001pCi/g | 1.513E+001 | 1.507E+001 | 5.612E+001 | 2.718E+001 | 0.47 | 15.1341 |
| PB-210 | 4467 | 8.473E+002pCi/g | 5.040E+001 | 8.041E+000 | 1.484E+001 | 7.350E+000 | 57.08 | 50.3970 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 4454 | 5.507E-001pCi/g | 1.742E-001 | 1.705E-001 | 3.941E-001 | 1.917E-001 | 1.40 | 0.1742 |
| PB-214 | 4448 | 4.656E-001pCi/g | 1.811E-001 | 1.795E-001 | 4.906E-001 | 2.371E-001 | 0.95 | 0.1811 |
| PM-144 | 19585 | -9.279E-002pCi/g | 8.379E-002 | 8.365E-002 | 2.603E-001 | 1.247E-001 | -0.36 | 0.0838 |
| PM-146 | 2464 | 3.553E-001pCi/g | 2.541E-001 | 2.534E-001 | 6.570E-001 | 3.117E-001 | 0.54 | 0.2541 |
| RH-106 | 1882 | 0.000E+000pCi/g | 4.336E-001 | 4.336E-001 | 5.120E+000 | 2.511E+000 | 0.00 | 0.4336 |
| RU-103 | 1828 | -1.980E-002pCi/g | 1.475E-001 | 1.475E-001 | 2.961E-001 | 1.436E-001 | -0.07 | 0.1475 |
| SB-124 | 1784 | 1.062E-001pCi/g | 8.303E-002 | 8.285E-002 | 5.042E-001 | 2.473E-001 | 0.21 | 0.0830 |
| SB-125 | 1777 | 4.580E-001pCi/g | 3.330E-001 | 3.322E-001 | 8.845E-001 | 4.300E-001 | 0.52 | 0.3330 |
| SC-46 | 1739 | -2.124E-001pCi/g | 1.825E-001 | 1.822E-001 | 6.042E-001 | 2.955E-001 | -0.35 | 0.1825 |
| SN-113 | 1570 | 1.126E-001pCi/g | 1.827E-001 | 1.826E-001 | 6.081E-001 | 2.988E-001 | 0.19 | 0.1827 |
| SN-126 | 17459 | -1.643E+000pCi/g | 3.686E+000 | 3.685E+000 | 1.217E+001 | 6.066E+000 | -0.13 | 3.6865 |
| TA-182 | 1301 | 4.928E-001pCi/g | 2.524E-001 | 2.512E-001 | 1.407E+000 | 6.803E-001 | 0.35 | 0.2524 |
| TC-99M | 17412 | -2.091E-002pCi/g | 1.038E-001 | 1.038E-001 | 3.452E-001 | 1.707E-001 | -0.06 | 0.1038 |
| TH-227 | 1058 | 5.331E+000pCi/g | 2.061E+000 | 2.040E+000 | 6.682E+000 | 3.307E+000 | 0.80 | 2.0609 |
| TH-229 | 1046 | -1.252E+000pCi/g | 1.725E+000 | 1.722E+000 | 4.349E+000 | 2.130E+000 | -0.29 | 1.7249 |
| TH-234 | 1027 | -4.940E+000pCi/g | 6.015E+000 | 6.009E+000 | 3.121E+001 | 1.555E+001 | -0.16 | 6.0150 |
| TL-208 | 929 | 4.162E-001pCi/g | 1.180E-001 | 1.160E-001 | 2.299E-001 | 1.095E-001 | 1.81 | 0.1180 |
| U-235 | 281 | 4.038E-001pCi/g | 3.951E-001 | 3.946E-001 | 2.769E+000 | 1.369E+000 | 0.15 | 0.3951 |
| Y-88 | 74 | 5.514E-002pCi/g | 1.992E-002 | 1.971E-002 | 3.695E-001 | 1.776E-001 | 0.15 | 0.0199 |
| ZN-65 | 31 | 0.000E+000pCi/g | 1.231E-001 | 1.231E-001 | 1.061E+000 | 5.145E-001 | 0.00 | 0.1231 |
| ZR-95 | 7 | 7.816E-003pCi/g | 2.150E-001 | 2.150E-001 | 4.933E-001 | 2.360E-001 | 0.02 | 0.2150 |

## *Laboratory Control Sample Information*

| Sample ID | WRKNO | Analyte | Activity | | StdAdded | Recovery | ZFactor |
|---|---|---|---|---|---|---|---|
| LCS 160-272277~2-A | LCS 160-272277~2-A | CS-137 | 2.826E+001 | pCi/g | 2.945E+001 | 95.99% | -0.5385 |
| | | CO-60 | 1.604E+001 | pCi/g | 1.646E+001 | 97.45% | -0.3492 |
| | | AM-241 | 9.682E+001 | pCi/g | 9.708E+001 | 99.74% | -0.0356 |

## *Sample Duplicate Information*

| Sample ID | Dup Sample ID | Analyte | Samp Activity | Dup Activity | RPD | RER | DER | Flag | ZFactor |
|---|---|---|---|---|---|---|---|---|---|

## *Blanks Information*

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## Analysis Report for Gamma Spectroscopy

**Batch:** 272277 **Operator:**

| SampID | WRKNO | Aliquot | Sigma | Instrument | Detector | CountDateTime | CountDuration |
|---|---|---|---|---|---|---|---|
| LCS 160-272277~2- | LCS | 341.90g | 1.00 | GammaVision | GV05 | 9 / 29 / 16 19:17 | 30 |

| Analyte | Cmpnd# | Activity | TotalUnc | CountUnc | MDA | MLCC | Act/MDA | |
|---|---|---|---|---|---|---|---|---|
| AC-228 | 11136 | 6.948E-001pCi/g | 4.428E-001 | 4.413E-001 | 1.386E+000 | 6.661E-001 | 0.50 | 0.4428 |
| AG-108M | 10982 | -4.815E-002pCi/g | 1.360E-001 | 1.359E-001 | 3.314E-001 | 1.611E-001 | -0.15 | 0.1360 |
| AG-110M | 10973 | -6.551E-002pCi/g | 5.828E-002 | 5.819E-002 | 7.502E-001 | 3.646E-001 | -0.09 | 0.0583 |
| AM-241 | 10818 | 9.669E+001pCi/g | 5.084E+000 | 8.185E-001 | 1.163E+000 | 5.751E-001 | 83.11 | 5.0845 |
| BA-133 | 10469 | -1.677E-001pCi/g | 1.639E-001 | 1.637E-001 | 5.438E-001 | 2.661E-001 | -0.31 | 0.1639 |
| BA-140 | 10463 | 7.654E-001pCi/g | 4.133E-001 | 4.114E-001 | 9.742E-001 | 4.664E-001 | 0.79 | 0.4133 |
| BE-7 | 10435 | -5.190E-001pCi/g | 1.221E+000 | 1.221E+000 | 3.698E+000 | 1.806E+000 | -0.14 | 1.2210 |
| BI-207 | 10195 | 1.327E-001pCi/g | 2.286E-001 | 2.285E-001 | 5.028E-001 | 2.394E-001 | 0.26 | 0.2286 |
| BI-210M | 10173 | 1.105E-001pCi/g | 1.761E-001 | 1.760E-001 | 4.963E-001 | 2.426E-001 | 0.22 | 0.1761 |
| BI-212 | 10160 | -8.056E-001pCi/g | 1.326E+000 | 1.326E+000 | 4.824E+000 | 2.326E+000 | -0.17 | 1.3264 |
| BI-214 | 10154 | -3.129E-001pCi/g | 1.874E-001 | 1.867E-001 | 1.276E+000 | 6.260E-001 | -0.25 | 0.1874 |
| CD-109 | 9254 | 1.605E+000pCi/g | 2.280E+000 | 2.278E+000 | 7.558E+000 | 3.734E+000 | 0.21 | 2.2797 |
| CD-113M | 17462 | -1.293E+003pCi/g | 1.131E+003 | 1.128E+003 | 3.745E+003 | 1.826E+003 | -0.35 | 1,131.1129 |
| CE-139 | 9241 | -6.545E-002pCi/g | 8.083E-002 | 8.059E-002 | 2.679E-001 | 1.316E-001 | -0.24 | 0.0808 |
| CE-141 | 9235 | 7.536E-003pCi/g | 1.415E-001 | 1.415E-001 | 4.733E-001 | 2.330E-001 | 0.02 | 0.1415 |
| CE-144 | 9221 | 1.609E-001pCi/g | 5.660E-001 | 5.659E-001 | 1.890E+000 | 9.298E-001 | 0.09 | 0.5660 |
| CF-249 | 9215 | -5.097E-002pCi/g | 4.175E-002 | 4.166E-002 | 6.544E-001 | 3.214E-001 | -0.08 | 0.0417 |
| CF-251 | 13690 | 2.258E-001pCi/g | 3.420E-001 | 3.414E-001 | 9.101E-001 | 4.433E-001 | 0.25 | 0.3420 |
| CO-56 | 8704 | -2.777E-003pCi/g | 1.256E-001 | 1.256E-001 | 3.392E-001 | 1.622E-001 | -0.01 | 0.1256 |
| CO-57 | 13694 | 0.000E+000pCi/g | 3.371E-002 | 3.371E-002 | 2.220E-001 | 1.091E-001 | 0.00 | 0.0337 |
| CO-58 | 8698 | 1.419E-001pCi/g | 1.238E-001 | 1.236E-001 | 4.114E-001 | 1.985E-001 | 0.34 | 0.1238 |
| CO-60 | 8692 | 1.577E+001pCi/g | 8.296E-001 | 2.480E-001 | 5.871E-002 | 1.856E-002 | 268.60 | 0.8296 |
| CR-51 | 8604 | 8.429E-001pCi/g | 8.344E-001 | 8.332E-001 | 2.771E+000 | 1.352E+000 | 0.30 | 0.8344 |
| CS-134 | 8553 | -1.864E-002pCi/g | 1.769E-002 | 1.766E-002 | 5.873E-001 | 2.880E-001 | -0.03 | 0.0177 |
| CS-136 | 8546 | 1.666E-002pCi/g | 1.960E-002 | 1.958E-002 | 4.831E-001 | 2.344E-001 | 0.03 | 0.0196 |
| CS-137 | 8539 | 2.864E+001pCi/g | 1.546E+000 | 4.128E-001 | 3.089E-001 | 1.474E-001 | 92.72 | 1.5462 |
| EU-152 | 7145 | 2.755E-001pCi/g | 3.412E-001 | 3.409E-001 | 1.401E+000 | 6.875E-001 | 0.20 | 0.3412 |
| EU-154 | 7138 | 1.747E-001pCi/g | 1.106E-001 | 1.102E-001 | 3.597E+000 | 1.737E+000 | 0.05 | 0.1106 |
| EU-155 | 7131 | 2.480E-001pCi/g | 3.696E-001 | 3.694E-001 | 1.226E+000 | 6.054E-001 | 0.20 | 0.3696 |
| FE-59 | 7073 | 1.492E-001pCi/g | 1.439E-001 | 1.437E-001 | 7.280E-001 | 3.478E-001 | 0.20 | 0.1439 |
| GA-68 | 18005 | -6.353E+000pCi/g | 7.244E+000 | 7.235E+000 | 1.575E+001 | 7.557E+000 | -0.40 | 7.2435 |
| GD-153 | 6824 | 5.593E-002pCi/g | 1.741E-001 | 1.741E-001 | 5.826E-001 | 2.858E-001 | 0.10 | 0.1741 |
| HF-181 | 6495 | 1.366E-001pCi/g | 1.060E-001 | 1.057E-001 | 4.948E-001 | 2.417E-001 | 0.28 | 0.1060 |
| HG-203 | 6466 | 2.250E-002pCi/g | 1.022E-001 | 1.022E-001 | 2.611E-001 | 1.269E-001 | 0.09 | 0.1022 |
| I-131 | 6380 | 2.210E-002pCi/g | 1.184E-002 | 1.179E-002 | 2.971E-001 | 1.441E-001 | 0.07 | 0.0118 |
| IR-192 | 6303 | 8.284E-002pCi/g | 7.520E-002 | 7.504E-002 | 3.258E-001 | 1.592E-001 | 0.25 | 0.0752 |
| K-40 | 6148 | 7.507E-001pCi/g | 5.361E-001 | 5.347E-001 | 1.327E+000 | 5.540E-001 | 0.57 | 0.5361 |
| LA-140 | 6096 | 8.699E-002pCi/g | 7.949E-002 | 7.936E-002 | 1.364E-001 | 5.501E-002 | 0.64 | 0.0795 |
| MN-54 | 5382 | -1.165E-001pCi/g | 1.521E-001 | 1.520E-001 | 3.439E-001 | 1.646E-001 | -0.34 | 0.1521 |
| NA-22 | 5201 | -2.814E-002pCi/g | 5.797E-002 | 5.795E-002 | 2.055E-001 | 9.236E-002 | -0.14 | 0.0580 |
| NB-94 | 5160 | 6.783E-002pCi/g | 6.927E-002 | 6.918E-002 | 2.389E-001 | 1.130E-001 | 0.28 | 0.0693 |
| NB-95 | 5154 | -1.620E-001pCi/g | 1.191E-001 | 1.188E-001 | 3.935E-001 | 1.900E-001 | -0.41 | 0.1191 |
| ND-147 | 5083 | -6.514E-001pCi/g | 8.776E-001 | 8.768E-001 | 2.138E+000 | 1.031E+000 | -0.30 | 0.8776 |
| NP-237 | 4757 | -4.627E-001pCi/g | 7.177E-001 | 7.172E-001 | 2.379E+000 | 1.176E+000 | -0.19 | 0.7177 |
| NP-239 | 4751 | 2.276E-001pCi/g | 3.340E-001 | 3.337E-001 | 1.108E+000 | 5.467E-001 | 0.21 | 0.3340 |
| PA-231 | 4541 | 0.000E+000pCi/g | 1.373E+000 | 1.373E+000 | 1.362E+001 | 6.701E+000 | 0.00 | 1.3729 |
| PA-233 | 4535 | 2.236E-001pCi/g | 3.060E-001 | 3.057E-001 | 1.017E+000 | 4.997E-001 | 0.22 | 0.3060 |
| PA-234 | 4528 | 2.928E-001pCi/g | 4.437E-001 | 4.434E-001 | 1.312E+000 | 6.465E-001 | 0.22 | 0.4437 |
| PA-234M | 19453 | 2.108E+001pCi/g | 1.857E+001 | 1.854E+001 | 6.416E+001 | 3.107E+001 | 0.33 | 18.5748 |
| PB-210 | 4467 | 8.671E+002pCi/g | 5.159E+001 | 8.329E+000 | 1.461E+001 | 7.229E+000 | 59.34 | 51.5925 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 4454 | 7.463E-001pCi/g | 1.602E-001 | 1.528E-001 | 3.656E-001 | 1.769E-001 | 2.04 | 0.1602 |
| PB-214 | 4448 | 2.370E-001pCi/g | 2.355E-001 | 2.351E-001 | 7.474E-001 | 3.643E-001 | 0.32 | 0.2355 |
| PM-144 | 19585 | 7.285E-002pCi/g | 5.436E-002 | 5.422E-002 | 2.571E-001 | 1.222E-001 | 0.28 | 0.0544 |
| PM-146 | 2464 | 1.040E-001pCi/g | 3.321E-001 | 3.321E-001 | 7.921E-001 | 3.765E-001 | 0.13 | 0.3321 |
| RA-226 | 1950 | -4.839E-001pCi/g | 3.042E+000 | 3.042E+000 | 5.837E+000 | 2.855E+000 | -0.08 | 3.0419 |
| RH-106 | 1882 | -3.016E-001pCi/g | 9.937E-001 | 9.936E-001 | 3.367E+000 | 1.626E+000 | -0.09 | 0.9937 |
| RU-103 | 1828 | -6.222E-002pCi/g | 1.352E-001 | 1.352E-001 | 3.240E-001 | 1.568E-001 | -0.19 | 0.1352 |
| SB-124 | 1784 | -4.848E-002pCi/g | 4.616E-002 | 4.609E-002 | 5.906E-001 | 2.896E-001 | -0.08 | 0.0462 |
| SB-125 | 1777 | 3.726E-001pCi/g | 5.015E-001 | 5.012E-001 | 9.624E-001 | 4.671E-001 | 0.39 | 0.5015 |
| SC-46 | 1739 | -1.934E-001pCi/g | 1.709E-001 | 1.706E-001 | 5.668E-001 | 2.757E-001 | -0.34 | 0.1709 |
| SN-113 | 1570 | -1.832E-001pCi/g | 6.511E-002 | 6.443E-002 | 6.636E-001 | 3.257E-001 | -0.28 | 0.0651 |
| SN-126 | 17459 | -3.558E-001pCi/g | 8.245E-001 | 8.243E-001 | 2.749E+000 | 1.352E+000 | -0.13 | 0.8245 |
| TA-182 | 1301 | 6.142E-001pCi/g | 5.525E-001 | 5.517E-001 | 1.835E+000 | 8.906E-001 | 0.33 | 0.5525 |
| TC-99M | 17412 | -6.331E-002pCi/g | 7.898E-002 | 7.890E-002 | 2.620E-001 | 1.290E-001 | -0.24 | 0.0790 |
| TH-227 | 1058 | 1.965E+000pCi/g | 1.983E+000 | 1.980E+000 | 6.552E+000 | 3.239E+000 | 0.30 | 1.9825 |
| TH-229 | 1046 | 3.332E-001pCi/g | 3.014E-001 | 3.002E-001 | 4.053E+000 | 1.977E+000 | 0.08 | 0.3014 |
| TH-234 | 1027 | 5.142E-001pCi/g | 1.278E+000 | 1.278E+000 | 6.351E+000 | 3.118E+000 | 0.08 | 1.2779 |
| TL-208 | 929 | 3.882E-001pCi/g | 9.932E-002 | 9.725E-002 | 2.123E-001 | 9.976E-002 | 1.83 | 0.0993 |
| U-235 | 281 | -5.267E-001pCi/g | 7.677E-001 | 7.672E-001 | 2.130E+000 | 1.049E+000 | -0.25 | 0.7677 |
| Y-88 | 74 | 1.200E-001pCi/g | 1.531E-001 | 1.529E-001 | 3.472E-001 | 1.653E-001 | 0.35 | 0.1531 |
| ZN-65 | 31 | -4.722E-001pCi/g | 4.068E-001 | 4.061E-001 | 1.349E+000 | 6.559E-001 | -0.35 | 0.4068 |
| ZR-95 | 7 | 4.516E-001pCi/g | 1.936E-001 | 1.922E-001 | 4.383E-001 | 2.068E-001 | 1.03 | 0.1936 |

## *Laboratory Control Sample Information*

| Sample ID | WRKNO | Analyte | Activity | | StdAdded | Recovery | ZFactor |
|---|---|---|---|---|---|---|---|
| LCS 160-272277~2-A | LCS 160-272277~2-A | CS-137 | 2.864E+001 | pCi/g | 2.944E+001 | 97.28% | -0.3615 |
| | | CO-60 | 1.577E+001 | pCi/g | 1.646E+001 | 95.82% | -0.5732 |
| | | AM-241 | 9.669E+001 | pCi/g | 9.708E+001 | 99.60% | -0.0539 |

## *Sample Duplicate Information*

| Sample ID | Dup Sample ID | Analyte | Samp Activity | Dup Activity | RPD | RER | DER | Flag | ZFactor |
|---|---|---|---|---|---|---|---|---|---|

## *Blanks Information*

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## Analysis Report for Gamma Spectroscopy

**Batch:** 272277 **Operator:**

| SampID | WRKNO | Aliquot | Sigma | Instrument | Detector | CountDateTime | CountDuration |
|---|---|---|---|---|---|---|---|
| LCS 160-272277~2- | LCS | 341.90g | 1.00 | GammaVision | GV10 | 9 / 30 / 16 19:13 | 30 |

| Analyte | Cmpnd# | Activity | TotalUnc | CountUnc | MDA | MLCC | Act/MDA | |
|---|---|---|---|---|---|---|---|---|
| AC-228 | 11136 | 5.161E-001pCi/g | 4.930E-001 | 4.923E-001 | 1.066E+000 | 5.139E-001 | 0.48 | 0.4930 |
| AG-108M | 10982 | -1.283E-001pCi/g | 3.696E-002 | 3.637E-002 | 2.872E-001 | 1.401E-001 | -0.45 | 0.0370 |
| AG-110M | 10973 | -2.436E-001pCi/g | 2.130E-001 | 2.126E-001 | 7.050E-001 | 3.451E-001 | -0.35 | 0.2130 |
| AM-241 | 10818 | 9.775E+001pCi/g | 5.141E+000 | 8.314E-001 | 1.213E+000 | 6.008E-001 | 80.58 | 5.1409 |
| BA-133 | 10469 | 7.040E-002pCi/g | 1.351E-001 | 1.350E-001 | 4.510E-001 | 2.211E-001 | 0.16 | 0.1351 |
| BA-140 | 10463 | 1.818E-001pCi/g | 1.964E-001 | 1.962E-001 | 8.653E-001 | 4.175E-001 | 0.21 | 0.1964 |
| BE-7 | 10435 | -6.992E-001pCi/g | 1.118E+000 | 1.117E+000 | 3.720E+000 | 1.828E+000 | -0.19 | 1.1175 |
| BI-207 | 10195 | 8.667E-002pCi/g | 7.816E-002 | 7.803E-002 | 2.212E-001 | 1.066E-001 | 0.39 | 0.0782 |
| BI-210M | 10173 | 6.373E-002pCi/g | 1.358E-001 | 1.357E-001 | 3.452E-001 | 1.681E-001 | 0.18 | 0.1358 |
| BI-212 | 10160 | 1.530E+000pCi/g | 1.367E+000 | 1.365E+000 | 4.535E+000 | 2.206E+000 | 0.34 | 1.3671 |
| BI-214 | 10154 | 5.778E-001pCi/g | 1.375E-001 | 1.341E-001 | 3.590E-001 | 1.707E-001 | 1.61 | 0.1375 |
| CD-109 | 9254 | 1.642E+000pCi/g | 2.301E+000 | 2.299E+000 | 7.619E+000 | 3.770E+000 | 0.22 | 2.3006 |
| CD-113M | 17462 | 9.148E+000pCi/g | 9.992E+002 | 9.992E+002 | 3.367E+003 | 1.646E+003 | 0.00 | 999.2489 |
| CE-139 | 9241 | -2.055E-002pCi/g | 6.937E-002 | 6.934E-002 | 2.318E-001 | 1.139E-001 | -0.09 | 0.0694 |
| CE-141 | 9235 | 1.025E-001pCi/g | 7.847E-002 | 7.830E-002 | 2.128E-001 | 1.033E-001 | 0.48 | 0.0785 |
| CE-144 | 9221 | -4.688E-001pCi/g | 5.253E-001 | 5.247E-001 | 1.741E+000 | 8.573E-001 | -0.27 | 0.5253 |
| CF-249 | 9215 | 1.362E-001pCi/g | 1.495E-001 | 1.494E-001 | 4.985E-001 | 2.448E-001 | 0.27 | 0.1495 |
| CF-251 | 13690 | -3.095E-001pCi/g | 3.513E-001 | 3.502E-001 | 9.286E-001 | 4.543E-001 | -0.33 | 0.3513 |
| CO-56 | 8704 | 1.879E-002pCi/g | 1.572E-002 | 1.569E-002 | 2.803E-001 | 1.350E-001 | 0.07 | 0.0157 |
| CO-57 | 13694 | 9.703E-002pCi/g | 5.787E-002 | 5.764E-002 | 1.624E-001 | 7.956E-002 | 0.60 | 0.0579 |
| CO-58 | 8698 | 2.483E-003pCi/g | 9.680E-002 | 9.680E-002 | 3.289E-001 | 1.594E-001 | 0.01 | 0.0968 |
| CO-60 | 8692 | 1.614E+001pCi/g | 8.382E-001 | 2.145E-001 | 1.235E-001 | 5.442E-002 | 130.66 | 0.8382 |
| CR-51 | 8604 | -3.859E-001pCi/g | 8.135E-001 | 8.132E-001 | 2.716E+000 | 1.332E+000 | -0.14 | 0.8135 |
| CS-134 | 8553 | 1.234E-001pCi/g | 1.022E-001 | 1.020E-001 | 4.481E-001 | 2.199E-001 | 0.28 | 0.1022 |
| CS-136 | 8546 | 1.085E-001pCi/g | 7.572E-002 | 7.546E-002 | 2.841E-001 | 1.370E-001 | 0.38 | 0.0757 |
| CS-137 | 8539 | 2.837E+001pCi/g | 1.515E+000 | 3.427E-001 | 2.201E-001 | 1.050E-001 | 128.88 | 1.5151 |
| EU-152 | 7145 | 4.455E-001pCi/g | 3.696E-001 | 3.689E-001 | 1.216E+000 | 5.980E-001 | 0.37 | 0.3696 |
| EU-154 | 7138 | -8.727E-001pCi/g | 8.178E-001 | 8.165E-001 | 2.720E+000 | 1.317E+000 | -0.32 | 0.8178 |
| EU-155 | 7131 | 2.450E-001pCi/g | 3.372E-001 | 3.369E-001 | 1.118E+000 | 5.521E-001 | 0.22 | 0.3372 |
| FE-59 | 7073 | 2.567E-001pCi/g | 2.385E-001 | 2.382E-001 | 5.017E-001 | 2.396E-001 | 0.51 | 0.2385 |
| GA-68 | 18005 | -3.762E+000pCi/g | 5.213E+000 | 5.209E+000 | 1.136E+001 | 5.457E+000 | -0.33 | 5.2128 |
| GD-153 | 6824 | -1.804E-001pCi/g | 2.541E-001 | 2.539E-001 | 8.419E-001 | 4.162E-001 | -0.21 | 0.2541 |
| HF-181 | 6495 | 9.232E-002pCi/g | 1.044E-001 | 1.043E-001 | 4.959E-001 | 2.437E-001 | 0.19 | 0.1044 |
| HG-203 | 6466 | 9.088E-002pCi/g | 8.062E-002 | 8.045E-002 | 2.668E-001 | 1.306E-001 | 0.34 | 0.0806 |
| I-131 | 6380 | 1.416E-002pCi/g | 1.182E-002 | 1.180E-002 | 2.746E-001 | 1.339E-001 | 0.05 | 0.0118 |
| IR-192 | 6303 | -3.206E-003pCi/g | 3.257E-003 | 3.251E-003 | 5.126E-001 | 2.534E-001 | -0.01 | 0.0033 |
| K-40 | 6148 | -6.666E-002pCi/g | 7.052E-001 | 7.052E-001 | 1.635E+000 | 7.434E-001 | -0.04 | 0.7052 |
| LA-140 | 6096 | 2.337E-002pCi/g | 2.000E-002 | 1.996E-002 | 2.006E-001 | 9.142E-002 | 0.12 | 0.0200 |
| MN-54 | 5382 | 1.200E-001pCi/g | 1.052E-001 | 1.050E-001 | 2.364E-001 | 1.131E-001 | 0.51 | 0.1052 |
| NA-22 | 5201 | 4.984E-002pCi/g | 3.571E-002 | 3.562E-002 | 1.182E-001 | 5.202E-002 | 0.42 | 0.0357 |
| NB-94 | 5160 | 3.947E-002pCi/g | 6.204E-002 | 6.201E-002 | 2.207E-001 | 1.058E-001 | 0.18 | 0.0620 |
| NB-95 | 5154 | -1.353E-001pCi/g | 9.204E-002 | 9.177E-002 | 3.033E-001 | 1.468E-001 | -0.45 | 0.0920 |
| ND-147 | 5083 | -8.055E-001pCi/g | 7.738E-001 | 7.724E-001 | 1.795E+000 | 8.692E-001 | -0.45 | 0.7738 |
| NP-237 | 4757 | -4.782E-001pCi/g | 6.851E-001 | 6.846E-001 | 2.269E+000 | 1.123E+000 | -0.21 | 0.6851 |
| NP-239 | 4751 | -2.392E-001pCi/g | 3.314E-001 | 3.311E-001 | 1.098E+000 | 5.427E-001 | -0.22 | 0.3314 |
| PA-231 | 4541 | -2.858E+000pCi/g | 4.644E+000 | 4.642E+000 | 1.540E+001 | 7.616E+000 | -0.19 | 4.6444 |
| PA-233 | 4535 | -3.087E-003pCi/g | 1.223E-001 | 1.223E-001 | 1.280E+000 | 6.331E-001 | 0.00 | 0.1223 |
| PA-234 | 4528 | 6.645E-001pCi/g | 3.995E-001 | 3.981E-001 | 5.016E-001 | 2.427E-001 | 1.32 | 0.3995 |
| PA-234M | 19453 | 1.019E+001pCi/g | 7.871E+000 | 7.854E+000 | 5.194E+001 | 2.527E+001 | 0.20 | 7.8710 |
| PB-210 | 4467 | 8.424E+002pCi/g | 5.010E+001 | 7.962E+000 | 1.486E+001 | 7.359E+000 | 56.69 | 50.1004 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 4454 | 7.213E-001pCi/g | 1.549E-001 | 1.477E-001 | 3.494E-001 | 1.699E-001 | 2.06 | 0.1549 |
| PB-214 | 4448 | 3.560E-001pCi/g | 1.635E-001 | 1.624E-001 | 4.269E-001 | 2.062E-001 | 0.83 | 0.1635 |
| PM-144 | 19585 | 4.197E-002pCi/g | 5.362E-002 | 5.358E-002 | 2.115E-001 | 1.012E-001 | 0.20 | 0.0536 |
| PM-146 | 2464 | 1.534E-001pCi/g | 1.432E-001 | 1.429E-001 | 6.480E-001 | 3.101E-001 | 0.24 | 0.1432 |
| RA-226 | 1950 | 4.820E-001pCi/g | 1.940E+000 | 1.940E+000 | 5.198E+000 | 2.545E+000 | 0.09 | 1.9401 |
| RH-106 | 1882 | -1.076E+000pCi/g | 8.905E-001 | 8.888E-001 | 2.950E+000 | 1.433E+000 | -0.36 | 0.8905 |
| RU-103 | 1828 | 5.218E-002pCi/g | 9.724E-002 | 9.721E-002 | 2.375E-001 | 1.149E-001 | 0.22 | 0.0972 |
| SB-124 | 1784 | 6.289E-002pCi/g | 1.316E-001 | 1.316E-001 | 4.394E-001 | 2.156E-001 | 0.14 | 0.1316 |
| SB-125 | 1777 | -4.060E-001pCi/g | 2.384E-001 | 2.375E-001 | 9.120E-001 | 4.454E-001 | -0.45 | 0.2384 |
| SC-46 | 1739 | -1.325E-001pCi/g | 1.242E-001 | 1.241E-001 | 5.329E-001 | 2.611E-001 | -0.25 | 0.1242 |
| SN-113 | 1570 | 1.363E-001pCi/g | 1.516E-001 | 1.514E-001 | 5.030E-001 | 2.469E-001 | 0.27 | 0.1516 |
| SN-126 | 17459 | 7.980E-001pCi/g | 7.805E-001 | 7.794E-001 | 2.583E+000 | 1.272E+000 | 0.31 | 0.7805 |
| TA-182 | 1301 | 3.939E-001pCi/g | 3.736E-001 | 3.730E-001 | 1.242E+000 | 6.027E-001 | 0.32 | 0.3736 |
| TC-99M | 17412 | -6.172E-002pCi/g | 7.271E-002 | 7.262E-002 | 2.410E-001 | 1.188E-001 | -0.26 | 0.0727 |
| TH-227 | 1058 | 1.284E+000pCi/g | 1.960E+000 | 1.958E+000 | 6.493E+000 | 3.214E+000 | 0.20 | 1.9597 |
| TH-229 | 1046 | 1.458E+000pCi/g | 1.568E+000 | 1.564E+000 | 3.942E+000 | 1.930E+000 | 0.37 | 1.5684 |
| TH-234 | 1027 | -1.796E+000pCi/g | 5.751E+000 | 5.750E+000 | 6.531E+000 | 3.215E+000 | -0.27 | 5.7506 |
| TL-208 | 929 | 1.957E-001pCi/g | 1.575E-001 | 1.572E-001 | 2.636E-001 | 1.271E-001 | 0.74 | 0.1575 |
| U-235 | 281 | 2.796E-001pCi/g | 5.431E-001 | 5.429E-001 | 1.808E+000 | 8.902E-001 | 0.15 | 0.5431 |
| Y-88 | 74 | -2.025E-001pCi/g | 1.338E-001 | 1.334E-001 | 3.814E-001 | 1.849E-001 | -0.53 | 0.1338 |
| ZN-65 | 31 | 2.825E-001pCi/g | 2.450E-001 | 2.446E-001 | 8.132E-001 | 3.940E-001 | 0.35 | 0.2450 |
| ZR-95 | 7 | -1.550E-001pCi/g | 1.946E-001 | 1.944E-001 | 4.389E-001 | 2.107E-001 | -0.35 | 0.1946 |

## *Laboratory Control Sample Information*

| Sample ID | WRKNO | Analyte | Activity | | StdAdded | Recovery | ZFactor |
|---|---|---|---|---|---|---|---|
| LCS 160-272277~2-A | LCS 160-272277~2-A | CS-137 | 2.837E+001 | pCi/g | 2.944E+001 | 96.35% | -0.4918 |
| | | CO-60 | 1.614E+001 | pCi/g | 1.645E+001 | 98.11% | -0.2592 |
| | | AM-241 | 9.775E+001 | pCi/g | 9.708E+001 | 100.69% | 0.0929 |

## *Sample Duplicate Information*

| Sample ID | Dup Sample ID | Analyte | Samp Activity | Dup Activity | RPD | RER | DER | Flag | ZFactor |
|---|---|---|---|---|---|---|---|---|---|

## *Blanks Information*

| SampID | WRKNO | Analyte | Activity | UncTotal | ZFactor |
|---|---|---|---|---|---|

# Reagent

# Tuna Can_00002

Rc'd 2/3/10

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

81427-334

1.0 Liter Sand in 1 Liter HDPE Silgan Jar

**Customer:** TestAmerica/St. Louis, MO
**P.O. No.:** 2339090, Item 1
**Reference Date:** 01-Jan-2010 12:00 PM EST **Grams of Master Source:** 0.017570

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Pb-210 | 46.5 | 8.120E+03 | ——— | 3.141E+03 | 0.1 | 2.1 | 4.1 | 4π LS |
| Am-241 | 59.5 | 1.580E+05 | ——— | 2.034E+03 | 0.1 | 1.7 | 3.5 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.606E+05 | 2.822E+03 | 0.4 | 2.3 | 4.7 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.471E+04 | 1.488E+03 | 0.5 | 2.0 | 4.1 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.209E+05 | 2.124E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.726E+05 | 4.790E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.672E+05 | 2.938E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.096E+05 | 1.926E+03 | 0.6 | 1.9 | 4.0 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.077E+05 | 7.163E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.055E+05 | 3.611E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.056E+05 | 3.612E+03 | 0.7 | 1.9 | 4.0 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.308E+05 | 7.569E+03 | 0.5 | 1.9 | 3.9 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)



**Corporate Office**
24937 Avenue Tibbitts Valencia, California 91355

**Laboratory**
1380 Seaboard Industrial Blvd. Atlanta, Georgia 30318

**Comments:**
1550 grams of sand.
This standard will expire one year after the reference date.

Source Prepared by: _____
W. Mao, Radiochemist

QA Approved: _____ Date: 2/1/10
J. D. McCorvey, QA Manager Alternate

# Reagent

# **Tuna Can_00003**

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

90099

1.0 Liter Sand in 1 Liter Wide Mouth HDPE Silgan Jar

**Customer:** TestAmerica St. Louis / Earth City, MO
**P.O. No.:** 2454150, Item 1
**Reference Date:** 01-Jan-2012 12:00 PM EST **Grams of Master Source:** 0.017180

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Additional radionuclides were added gravimetrically from solutions calibrated by gamma-ray spectrometry, ionization chamber, or liquid scintillation counting. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 2, July 2007, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty*, % Type $u_A$ | $u_B$ | U | Calibration Method* |
|---|---|---|---|---|---|---|---|---|
| Pb-210 | 46.5 | 8.109E+03 | ——— | 3.094E+03 | 0.1 | 2.1 | 4.1 | 4π LS |
| Am-241 | 59.5 | 1.580E+05 | ——— | 2.037E+03 | 0.1 | 1.7 | 3.5 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.677E+05 | 2.881E+03 | 0.5 | 2.3 | 4.7 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.795E+04 | 1.511E+03 | 0.4 | 2.0 | 4.1 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.245E+05 | 2.139E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.707E+05 | 4.651E+03 | 0.3 | 1.9 | 3.8 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.755E+05 | 3.015E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.128E+05 | 1.938E+03 | 0.7 | 1.9 | 4.0 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.228E+05 | 7.264E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.084E+05 | 3.580E+03 | 0.6 | 1.9 | 4.0 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.084E+05 | 3.581E+03 | 0.7 | 1.9 | 4.0 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.476E+05 | 7.690E+03 | 0.7 | 1.9 | 4.0 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)

**Comments:**
1550 grams of sand. Homogenous down to 10 grams aliquot.
This standard will expire one year after the reference date.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 30 JAN 12
J.D. McCorvey, Counting Room Manager

# Reagent

# Tuna Can_00006

Eckert & Ziegler
Analytics

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404·352·8677
Fax 404·352·2837
www.analyticsinc.com

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

## 83814-334

### 1.0 Liter Sand in 1 Liter Wide Mouth HDPE Silgan Jar

**Customer:** Test America St. Louis
**P.O. No.:** 2395112, Item 1
**Reference Date:** 01-Jan-2011 12:00 PM EST **Grams of Master Source:** 0.016927

This standard radionuclide source was prepared using aliquots measured gravimetrically from master radionuclide solutions. Calibration and purity were checked using a germanium gamma spectrometer system. At the time of calibration no interfering gamma-ray emitting impurities were detected. The gamma-ray emission rates for the most intense gamma-ray lines are given. Eckert & Ziegler Analytics (EZA) maintains traceability to the National Institute of Standards and Technology through a Measurements Assurance Program as described in USNRC Regulatory Guide 4.15, Revision 1, February, 1979, and compliance with ANSI N42.22-1995, "Traceability of Radioactive Sources to NIST." EZA is accredited by the Health Physics Society (HPS) for the production of NIST-traceable sources, and this source was produced in accordance with the HPS accreditation requirements. Customers may report any concerns with the accreditation program to the HPS Secretariat, 1313 Dolley Madison Blvd., Ste. 402, McLean, VA 22101.

| Nuclide | Gamma-Ray Energy (keV) | Half-Life, Days | Master Source* γps/gram | This Source γps | Uncertainty, % Type $u_A$ | $u_B$ | U | Calibration Method |
|---|---|---|---|---|---|---|---|---|
| Pb-210 | 46.5 | 8.120E+03 | ——— | 3.021E+03 | 0.1 | 2.1 | 4.1 | 4π LS |
| Am-241 | 59.5 | 1.580E+05 | ——— | 2.090E+03 | 0.1 | 1.7 | 3.5 | 4π LS |
| Cd-109 | 88.0 | 4.626E+02 | 1.697E+05 | 2.873E+03 | 0.8 | 2.3 | 4.9 | HPGe |
| Co-57 | 122.1 | 2.718E+02 | 8.711E+04 | 1.475E+03 | 0.5 | 2.0 | 4.1 | HPGe |
| Ce-139 | 165.9 | 1.376E+02 | 1.247E+05 | 2.111E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Hg-203 | 279.2 | 4.661E+01 | 2.753E+05 | 4.660E+03 | 0.4 | 1.9 | 3.9 | HPGe |
| Sn-113 | 391.7 | 1.151E+02 | 1.769E+05 | 2.994E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Cs-137 | 661.7 | 1.098E+04 | 1.109E+05 | 1.877E+03 | 0.7 | 1.9 | 4.0 | HPGe |
| Y-88 | 898.0 | 1.066E+02 | 4.224E+05 | 7.150E+03 | 0.5 | 1.9 | 3.9 | HPGe |
| Co-60 | 1173.2 | 1.925E+03 | 2.142E+05 | 3.626E+03 | 0.6 | 1.9 | 4.0 | HPGe |
| Co-60 | 1332.5 | 1.925E+03 | 2.143E+05 | 3.627E+03 | 0.6 | 1.9 | 4.0 | HPGe |
| Y-88 | 1836.1 | 1.066E+02 | 4.472E+05 | 7.570E+03 | 0.5 | 1.9 | 3.9 | HPGe |

* Master Source refers to Analytics' 8-isotope mixture which is calibrated quarterly.

**Calibration Methods:** 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results."

(Certificate continued on reverse side)



Corporate Office
Laboratory

**Comments:**
1550 grams of sand. Homogeneous down to 10 gram aliquot.
This standard will expire one year after the reference date.

Source Prepared by: _____
Z. Dimitrova, Radiochemist

QA Approved: _____ Date: 2/11/11
J. D. McCorvey, QA Manager Alternate

# ALPHA SPECTROSCOPY

# Method A-01-R Th

## Isotopic Thorium (Alpha Spectrometry) by Method A-01-R

# Prep Batch: 309374

## Preparation, Extraction Chromatography Resin Actinide Separation

# Alpha Spectroscopy Analysis Detail Report
# Prep Batch: 309374

Lab ID: MB 160-309374/1-A
Client ID:
Sigma: 2

Analyzed: 06/10/17 16:17
Detector: AV150
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | MB Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.04086 | 0.0340 | 0.0342 | U | pCi/g | 0.100 | 0.0447 | 312929 |
| Thorium-232 | 0.002568 | 0.0206 | 0.0206 | U | pCi/g | 0.100 | 0.0472 | 312929 |

| Tracer | MB Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.832 | 0.235 | 0.335 | | pCi/g | 0.0601 | 3.03 | 93.5 | 30 - 110 |

Lab ID: LCS 160-309374/2-A
Client ID:
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV64
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | LCS Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 25.03 | 0.977 | 2.32 | | pCi/g | 0.100 | 0.0824 | 312785 |

| Tracer | LCS Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 5.728 | 0.459 | 0.665 | | pCi/g | 0.0509 | 5.98 | 95.7 | 30 - 110 |

Lab ID: 160-22327-1
Client ID: SU01-EXB-026-SS-P-01
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV65
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.725 | 0.132 | 0.145 | | pCi/g | 0.100 | 0.0700 | 312786 |
| Thorium-232 | 1.39 | 0.178 | 0.213 | | pCi/g | 0.100 | 0.0541 | 312786 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.60 | 0.226 | 0.315 | | pCi/g | 0.0677 | 3.03 | 85.9 | 30 - 110 |

Lab ID: 160-22327-1 DU
Client ID: SU01-EXB-026-SS-P-01
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV66
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | DU Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.6509 | 0.117 | 0.129 | | pCi/g | 0.100 | 0.0618 | 312787 |
| Thorium-232 | 1.369 | 0.165 | 0.201 | | pCi/g | 0.100 | 0.0379 | 312787 |

| Tracer | DU Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.770 | 0.224 | 0.323 | | pCi/g | 0.0136 | 3.04 | 91.2 | 30 - 110 |

# Alpha Spectroscopy Analysis Detail Report
# Prep Batch: 309374

Lab ID: 160-22327-2
Client ID: SU01-EXB-023-SS-P-01
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV68
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.639 | 0.117 | 0.129 | | pCi/g | 0.100 | 0.0424 | 312788 |
| Thorium-232 | 1.47 | 0.176 | 0.216 | | pCi/g | 0.100 | 0.0406 | 312788 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.66 | 0.221 | 0.314 | | pCi/g | 0.0422 | 3.05 | 87.1 | 30 - 110 |

Lab ID: 160-22327-3
Client ID: SU01-EXB-076-SS-P-01
Sigma: 2

Analyzed: 06/10/17 16:17
Detector: AV155
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 0.826 | 0.137 | 0.153 | | pCi/g | 0.100 | 0.0499 | 312931 |
| Thorium-232 | 0.822 | 0.136 | 0.152 | | pCi/g | 0.100 | 0.0461 | 312931 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.54 | 0.217 | 0.304 | | pCi/g | 0.0398 | 3.05 | 83.3 | 30 - 110 |

Lab ID: 160-22327-4
Client ID: SU02-EXB-051-SS-P-01
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV70
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 2.14 | 0.215 | 0.280 | | pCi/g | 0.100 | 0.0464 | 312790 |
| Thorium-232 | 2.19 | 0.216 | 0.284 | | pCi/g | 0.100 | 0.0295 | 312790 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.51 | 0.212 | 0.298 | | pCi/g | 0.0384 | 3.03 | 82.8 | 30 - 110 |

Lab ID: 160-22327-5
Client ID: SU01-EXB-083-SS-P-00
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV71
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 1.86 | 0.197 | 0.251 | | pCi/g | 0.100 | 0.0381 | 312791 |
| Thorium-232 | 1.30 | 0.163 | 0.196 | | pCi/g | 0.100 | 0.0154 | 312791 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.68 | 0.221 | 0.316 | | pCi/g | 0.0335 | 3.05 | 87.8 | 30 - 110 |

# Alpha Spectroscopy Analysis Detail Report
# Prep Batch: 309374

Lab ID: 160-22327-6
Client ID: SU01-EXB-084-SS-P-00
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV72
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 1.18 | 0.156 | 0.185 | | pCi/g | 0.100 | 0.0334 | 312792 |
| Thorium-232 | 1.28 | 0.162 | 0.194 | | pCi/g | 0.100 | 0.0421 | 312792 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.80 | 0.229 | 0.328 | | pCi/g | 0.0344 | 3.05 | 91.6 | 30 - 110 |

Lab ID: 160-22327-7
Client ID: SU01-EXB-085-SS-P-00
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV73
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 2.43 | 0.213 | 0.295 | | pCi/g | 0.100 | 0.0426 | 312793 |
| Thorium-232 | 1.22 | 0.150 | 0.182 | | pCi/g | 0.100 | 0.0138 | 312793 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.79 | 0.219 | 0.321 | | pCi/g | 0.0283 | 3.03 | 91.9 | 30 - 110 |

Lab ID: 160-22327-8
Client ID: SU01-EXB-086-SS-P-00
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV74
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 1.24 | 0.149 | 0.182 | | pCi/g | 0.100 | 0.0327 | 312794 |
| Thorium-232 | 0.976 | 0.131 | 0.155 | | pCi/g | 0.100 | 0.0244 | 312794 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 3.09 | 0.238 | 0.352 | | pCi/g | 0.0337 | 3.00 | 103 | 30 - 110 |

Lab ID: 160-22327-9
Client ID: SU03-S-087-SS-P-00
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV75
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 5.62 | 0.341 | 0.582 | | pCi/g | 0.100 | 0.0285 | 312795 |
| Thorium-232 | 1.89 | 0.198 | 0.254 | | pCi/g | 0.100 | 0.0379 | 312795 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.81 | 0.232 | 0.331 | | pCi/g | 0.0384 | 3.04 | 92.5 | 30 - 110 |

# Alpha Spectroscopy Analysis Detail Report
# Prep Batch: 309374

Lab ID: 160-22327-10
Client ID: SU03-S-088-SS-P-00
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV76
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 4.95 | 0.318 | 0.524 | | pCi/g | 0.100 | 0.0377 | 312796 |
| Thorium-232 | 1.76 | 0.189 | 0.240 | | pCi/g | 0.100 | 0.0335 | 312796 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.69 | 0.222 | 0.317 | | pCi/g | 0.0300 | 3.04 | 88.5 | 30 - 110 |

Lab ID: 160-22327-11
Client ID: SU03-S-089-SS-P-00
Sigma: 2

Analyzed: 06/08/17 19:02
Detector: AV79
Dil Fac: 1

Decay Corrected: No
Yield Truncated: No
Ts: 400

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Thorium-230 | 1.24 | 0.161 | 0.191 | | pCi/g | 0.100 | 0.0381 | 312798 |
| Thorium-232 | 0.920 | 0.138 | 0.158 | | pCi/g | 0.100 | 0.0154 | 312798 |

| Tracer | Result | Count Unc | Total Unc | Qualifier | Unit | MDC | Spike Added | % Rec | % Rec Limits |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-229 | 2.45 | 0.203 | 0.289 | | pCi/g | 0.0232 | 3.02 | 81.2 | 30 - 110 |

## Quality Control Summary

| Method Blank ID: | Analyte | Parent Result | Spike Added | MB Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB 160-309374/1-A | Thorium-230 | | | 0.04086 | U | pCi/g | | | | | | | 2.38928881 |
| MB 160-309374/1-A | Thorium-232 | | | 0.002568 | U | pCi/g | | | | | | | .24869443 |

| Lab Control Sample ID: | Analyte | Parent Result | Spike Added | LCS Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LCS 160-309374/2-A | Thorium-230 | | 24.5 | 25.03 | | pCi/g | 102 | 81 - 118 | | | | | .3315068045 |

| Duplicate ID: | Analyte | Parent Result | Spike Added | DU Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160-22327-1 | Thorium-230 | 0.725 | | 0.6509 | | pCi/g | | | 11 | 0.27 | 0.77 | 1 | |
| 160-22327-1 | Thorium-232 | 1.39 | | 1.369 | | pCi/g | | | 2 | 0.06 | 0.16 | 1 | |

Glossary:

Ts = Count Duration, Sample

# ALPHA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis  Job No.: 160-22327-1

SDG No.:

Batch Number: 309374  Batch Start Date: 05/18/17 13:59  Batch Analyst: Colbert, Madalyn B

Batch Method: ExtChrom  Batch End Date: 06/07/17 12:19

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | Th-229 00022 | TRM-2 00002 | | | |
|---|---|---|---|---|---|---|---|---|---|
| MB 160-309374/1 | | ExtChrom, A-01-R | | 1.0 g | 0.1 mL | | | | |
| LCS 160-309374/2 | | ExtChrom, A-01-R | | 0.5060 g | 0.1 mL | 0.506 g | | | |
| 160-22327-A-1-A | SU01-EXB-026-SS-P-01 | ExtChrom, A-01-R | T | 0.9994 g | 0.1 mL | | | | |
| 160-22327-A-1-A DU | SU01-EXB-026-SS-P-01 | ExtChrom, A-01-R | T | 0.9963 g | 0.1 mL | | | | |
| 160-22327-A-2-A | SU01-EXB-023-SS-P-01 | ExtChrom, A-01-R | T | 0.9936 g | 0.1 mL | | | | |
| 160-22327-A-3-A | SU01-EXB-076-SS-P-01 | ExtChrom, A-01-R | T | 0.9929 g | 0.1 mL | | | | |
| 160-22327-A-4-A | SU02-EXB-051-SS-P-01 | ExtChrom, A-01-R | T | 1.0007 g | 0.1 mL | | | | |
| 160-22327-A-5-A | SU01-EXB-083-SS-P-00 | ExtChrom, A-01-R | T | 0.9914 g | 0.1 mL | | | | |
| 160-22327-A-6-A | SU01-EXB-084-SS-P-00 | ExtChrom, A-01-R | T | 0.9914 g | 0.1 mL | | | | |
| 160-22327-A-7-A | SU01-EXB-085-SS-P-00 | ExtChrom, A-01-R | T | 0.9989 g | 0.1 mL | | | | |
| 160-22327-A-8-A | SU01-EXB-086-SS-P-00 | ExtChrom, A-01-R | T | 1.0093 g | 0.1 mL | | | | |
| 160-22327-A-9-A | SU03-S-087-SS-P-00 | ExtChrom, A-01-R | T | 0.9958 g | 0.1 mL | | | | |
| 160-22327-A-10-A | SU03-S-088-SS-P-00 | ExtChrom, A-01-R | T | 0.9946 g | 0.1 mL | | | | |
| 160-22327-A-11-A | SU03-S-089-SS-P-00 | ExtChrom, A-01-R | T | 1.0022 g | 0.1 mL | | | | |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

ALPHA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis  Job No.: 160-22327-1

SDG No.:

Batch Number: 309374  Batch Start Date: 05/18/17 13:59  Batch Analyst: Colbert, Madalyn B

Batch Method: ExtChrom  Batch End Date: 06/07/17 12:19

| Batch Notes | |
|---|---|
| Balance ID | 0034150037 |
| Analyst ID - Column | nmn |
| Column Date | 6/6/17 |
| Analyst ID - CoPrecipitation | nmn |
| CoPrecipitation Date | 6/7/17 |
| Pipette ID | Rad104 |
| Analyst ID - Reagent Drop Witness | nmn per scb |
| Analyst ID - Reagent Drop | scb |
| SOP Number | ST-RC-0003, ST-RC-0004, ST-RC-0100, ST-RC-0242 |

| Basis | Basis Description |
|---|---|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:57:08PM 6/10/2017

## Sample

Sample Name: MB 160-309374/1-A Type: Blank
Spectrum #1 Analysis #1
: MB 160-309374/1-A
Sample Collection Date: 6/7/2017 12:19:00PM
Comment:

Sample Weight : 1.00 Sample Units: g
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

## Batch

Batch Name: 309374
AnalysisResultsID: 193844
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

## Tracer

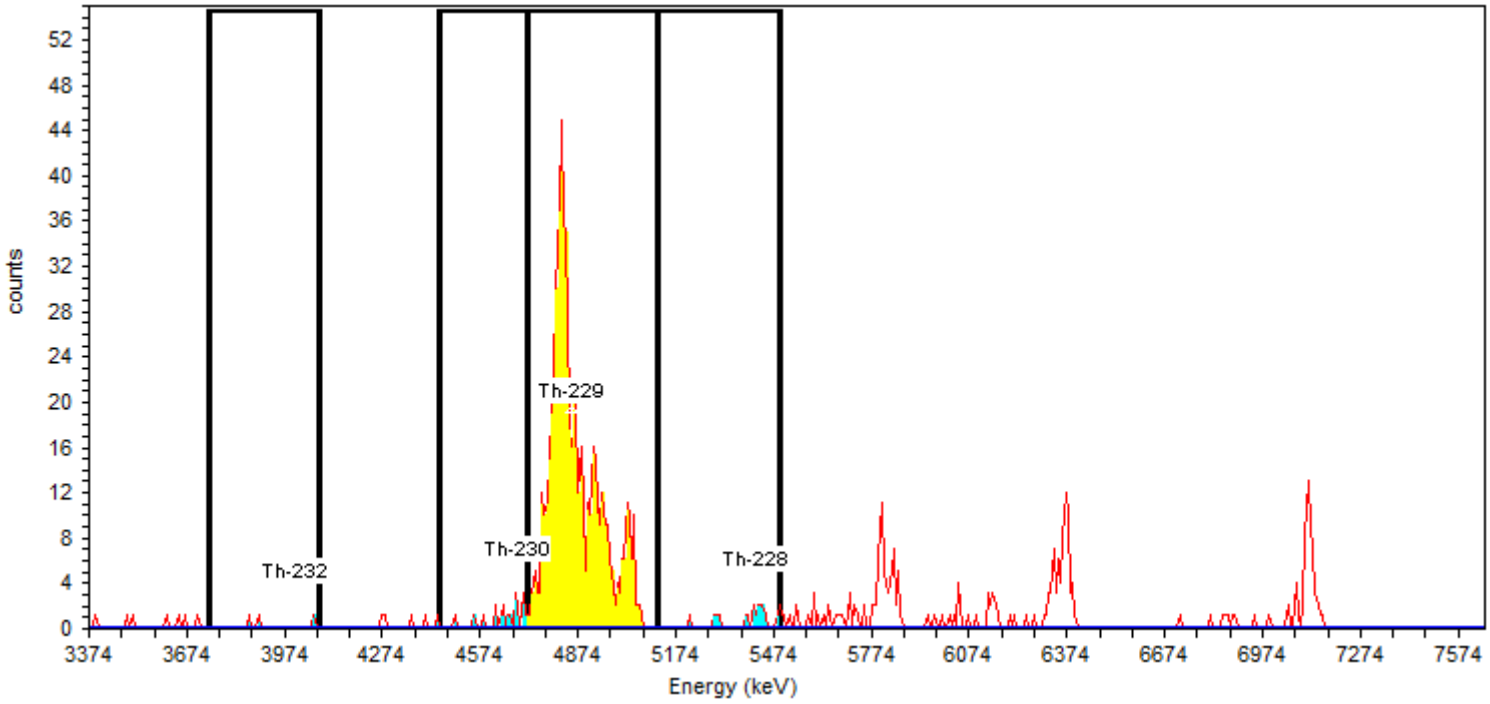
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 9:07:15AM

Tracer Nuclide: Th-229
Tracer Recovery: 92.23%

## Acquisition

Detector: AV150 SN: 50-05/R4
Acquisition Start Date: 6/10/2017 4:17:01PM
Live Time: 400.00 min.
Real Time: 400.02 min.
Background Date: 5/12/2017 3:53:12PM
Bkgd Info: Sample: ICB;AV150; Det: AV150; Spectrum #1; 5/12/2017 3:53:12 PM

Energy Calibration: IC-8876;AV150-20161110
Efficiency Calibration:IC-8876;AV150-20161110
Calibration Date: 11/11/2016 2:36:42PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 23.39% +/- 0.28% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction:6/10/2017 4:15:37PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 10.3 | 100.2 | 3 | 2.5000 | 0.50 | 2.604E-003 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 15.7 | 99.7 | 20 | 2.5129 | 17.80 | 9.315E-002 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 71.3 | 99.6 | 583 | 4.9596 | 578.04 | 2.793E+000 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 50.4 | 99.8 | 19 | 8.6967 | 10.22 | 5.345E-002 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:32:39AM 6/12/2017

## Sample

Sample Name: MB 160-309374/1-A Type: Blank
Spectrum #1 Analysis #1
: MB 160-309374/1-A
Sample Collection Date: 6/7/2017 12:19:00PM
Comment:

Sample Weight : 1.00 Sample Units: g
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

## Batch

Batch Name: 309374
AnalysisResultsID: 193938
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

## Tracer

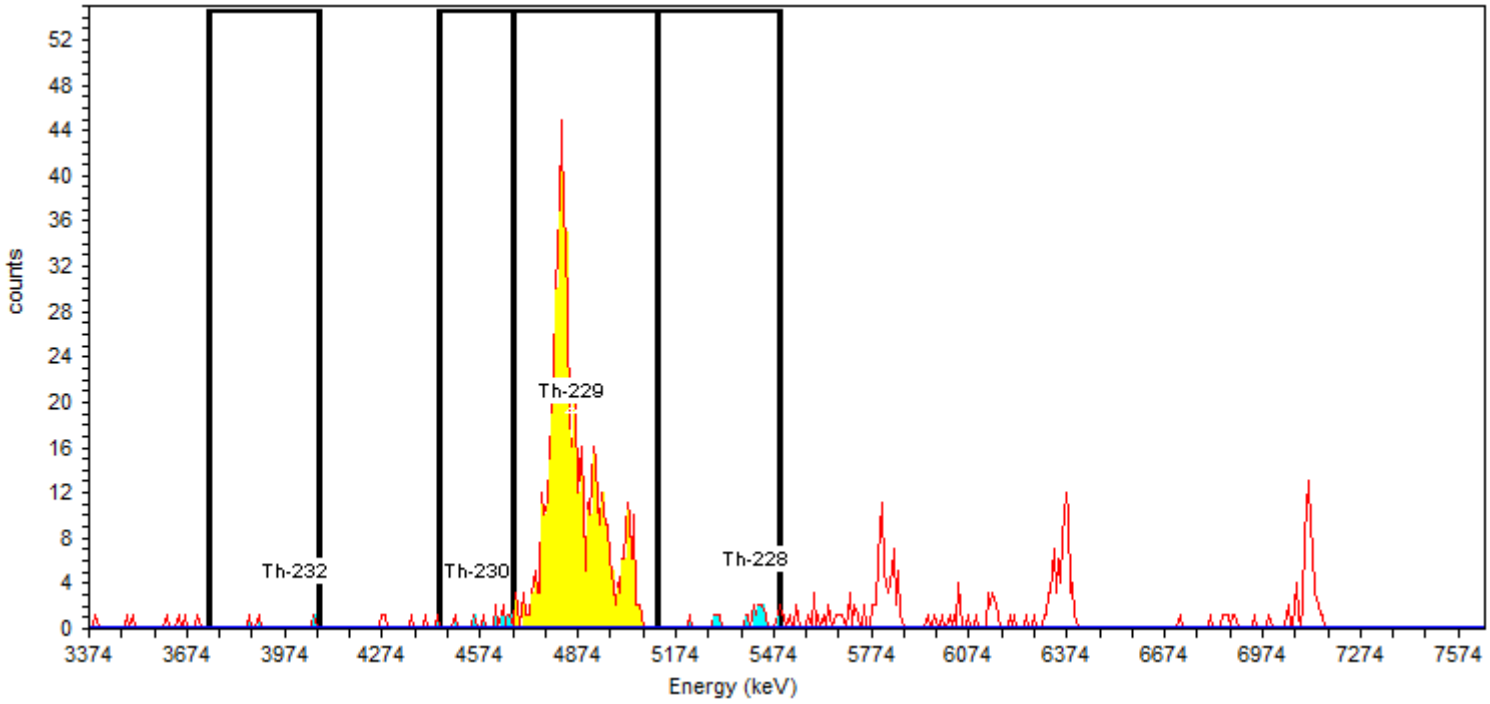
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 9:07:15AM

Tracer Nuclide: Th-229
Tracer Recovery: 93.55%

## Acquisition

Detector: AV150 SN: 50-05/R4
Acquisition Start Date: 6/10/2017 4:17:01PM
Live Time: 400.00 min.
Real Time: 400.02 min.
Background Date: 5/12/2017 3:53:12PM
Bkgd Info: Sample: ICB;AV150; Det: AV150; Spectrum #1; 5/12/2017 3:53:12 PM

Energy Calibration: IC-8876;AV150-20161110
Efficiency Calibration:IC-8876;AV150-20161110
Calibration Date: 11/11/2016 2:36:42PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 23.39% +/- 0.28% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute Interactive ROI Analysis
Decay Correction:6/10/2017 4:15:37PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/12/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 10.3 | 100.2 | 3 | 2.5000 | 0.50 | 2.568E-003 | pCi/g |
| **Th-230** | 4560.2 | 4,687.5 | -127.3 | 4448.3 | 4672.0 | 32.9 | 99.7 | 10 | 2.0833 | 7.92 | 4.086E-002 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4672.0 | 5119.5 | 71.3 | 99.8 | 593 | 5.8333 | 587.17 | 2.833E+000 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 50.4 | 99.8 | 19 | 8.6967 | 10.22 | 5.270E-002 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:44:37AM 6/9/2017

## Sample

Sample Name: LCS 160-309374/2-A
SampleType: Control
: LCS 160-309374/2-A
Sample Collection Date: 6/7/2017 12:19:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.5060g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699863

Analyst: 60040

## Tracer

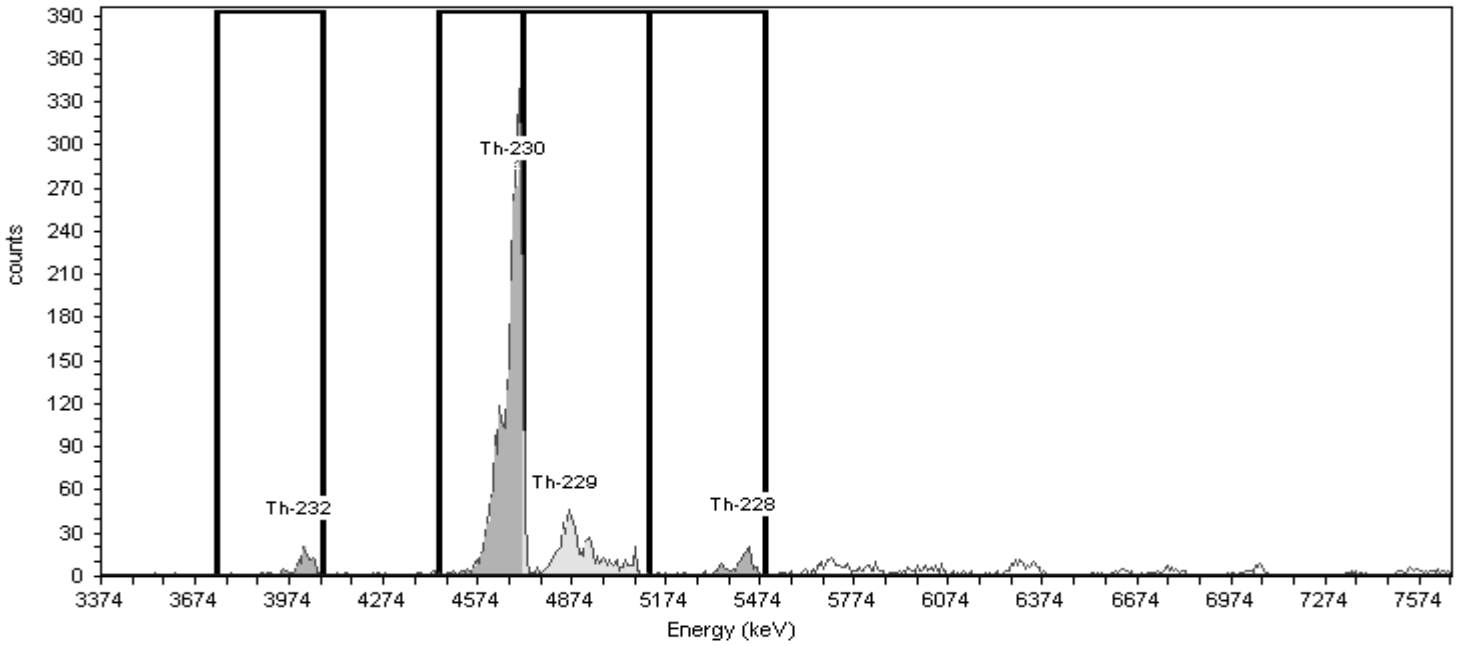
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 121.21%

## Acquisition

Detector: AV64
Serial Number: 43-028v3
Acquisition Start Date: 6/8/2017 7:02:44PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/22/2017 8:35:23AM
Background Info: Sample: ICB;AV64; Det: AV64; Spectrum #1; May-22-2017 08:35

Calibration Name: IC-8875;AV64-20160831
Calibration Date: 8/31/2016 12:49:19PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.50% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 45.6 | 100.2 | 123 | 0.4167 | 122.58 | 0.917 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 64.9 | 99.7 | 2559 | 1.6538 | 2557.66 | 19.228 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | .0 | 99.6 | 797 | 1.2371 | 795.45 | 7.255 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 41.4 | 99.8 | 150 | 4.1667 | 145.90 | 1.097 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:51:29AM 6/9/2017

## Sample

Sample Name: LCS 160-309374/2-A
SampleType: Control
: LCS 160-309374/2-A
Sample Collection Date: 6/7/2017 12:19:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.5060g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699891

Analyst: 60040

## Tracer

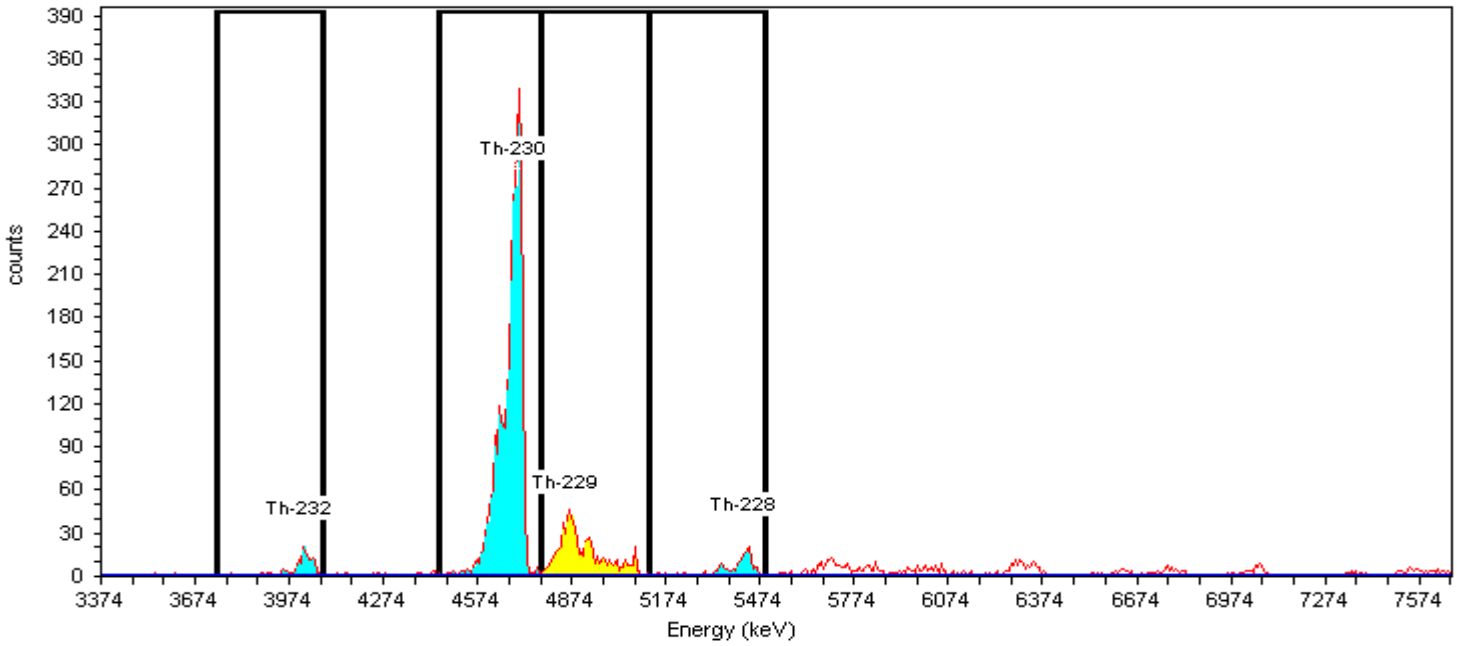
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 95.73%

## Acquisition

Detector: AV64
Serial Number: 43-028v3
Acquisition Start Date: 6/8/2017 7:02:44PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/22/2017 8:35:23AM
Background Info: Sample: ICB;AV64; Det: AV64; Spectrum #1; May-22-2017 08:35

Calibration Name: IC-8875;AV64-20160831
Calibration Date: 8/31/2016 12:49:19PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 24.50% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 45.6 | 100.2 | 123 | 0.4167 | 122.58 | 1.161 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4776.4 | 54.7 | 99.7 | 2632 | 2.0833 | 2629.92 | 25.034 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4776.4 | 5119.5 | 67.8 | 98.8 | 623 | 0.4167 | 622.58 | 5.730 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 41.4 | 99.8 | 150 | 4.1667 | 145.90 | 1.389 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:44:47AM 6/9/2017

## Sample

Sample Name: 160-22327-A-1-D
SampleType: Sample
: 160-22327-A-1-D
Sample Collection Date: 5/10/2017 2:30:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9994g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699864

Analyst: 60040

## Tracer

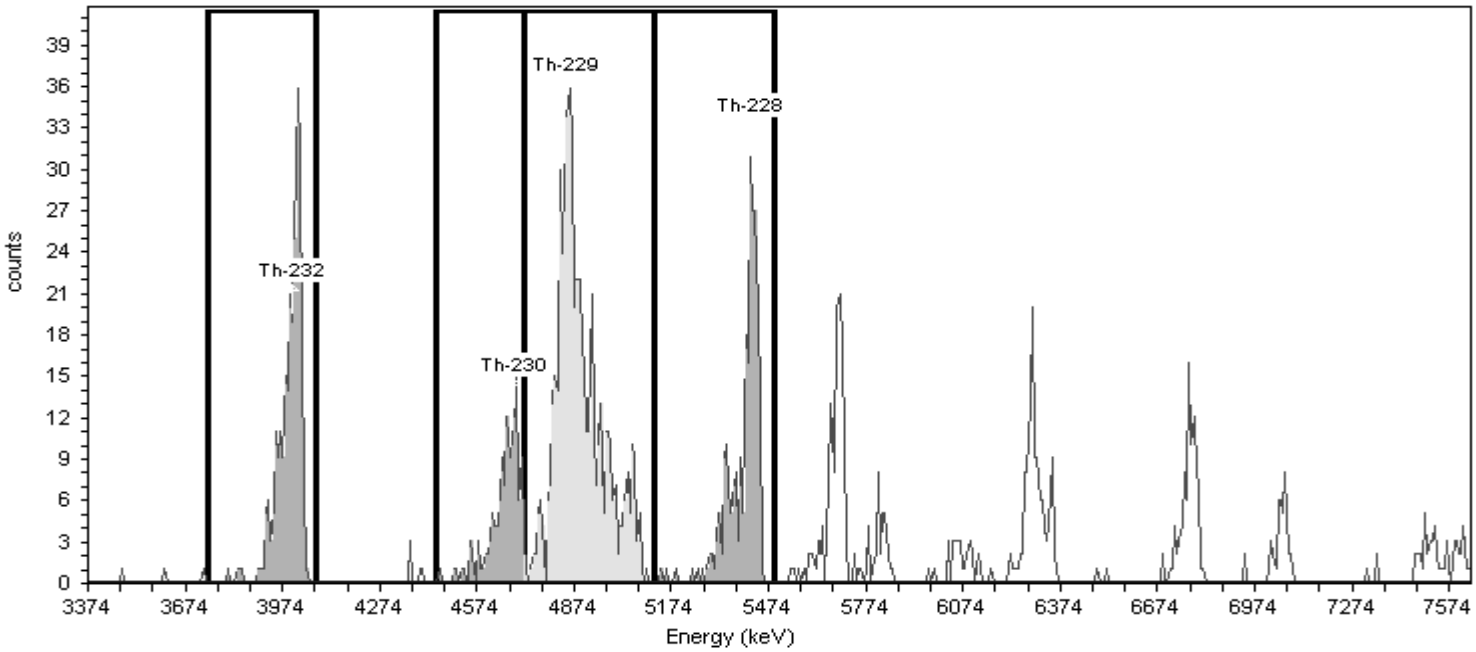
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 86.37%

## Acquisition

Detector: AV65
Serial Number: 44-049JJ1
Acquisition Start Date: 6/8/2017 7:02:44PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/22/2017 8:35:24AM
Background Info: Sample: ICB;AV65; Det: AV65; Spectrum #1; May-22-2017 08:35

Calibration Name: IC-8876;AV65-20160831a
Calibration Date: 8/31/2016 12:49:33PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 23.43% +/- 0.28% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 49.2 | 100.2 | 252 | 2.9167 | 249.08 | 1.384 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 46.2 | 99.7 | 133 | 5.4167 | 127.52 | 0.712 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 90.7 | 99.6 | 550 | 7.9167 | 542.02 | 2.617 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 54.5 | 99.8 | 238 | 6.2500 | 231.75 | 1.295 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:03:21AM 6/9/2017

## Sample

Sample Name: 160-22327-A-1-D
SampleType: Sample
: 160-22327-A-1-D
Sample Collection Date: 5/10/2017 2:30:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9994g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699901

Analyst: 60040

## Tracer

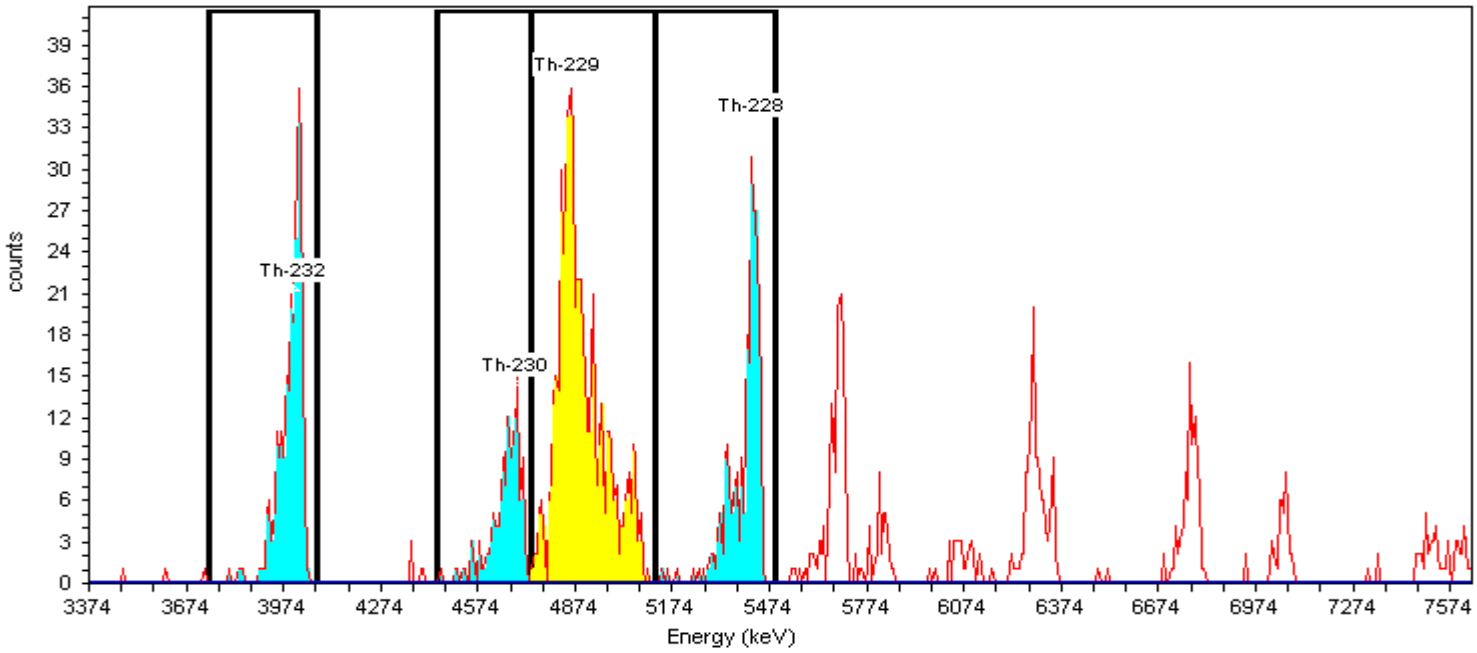
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 85.90%

## Acquisition

Detector: AV65
Serial Number: 44-049JJ1
Acquisition Start Date: 6/8/2017 7:02:44PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/22/2017 8:35:24AM
Background Info: Sample: ICB;AV65; Det: AV65; Spectrum #1; May-22-2017 08:35

Calibration Name: IC-8876;AV65-20160831a
Calibration Date: 8/31/2016 12:49:33PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 23.43% +/- 0.28% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 49.2 | 100.2 | 252 | 2.9167 | 249.08 | 1.392 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4739.1 | 57.2 | 99.7 | 135 | 5.8333 | 129.17 | 0.725 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4739.1 | 5119.5 | 90.7 | 99.6 | 547 | 7.9167 | 539.08 | 2.603 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 54.5 | 99.8 | 238 | 6.2500 | 231.75 | 1.302 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:44:56AM 6/9/2017

## Sample

Sample Name: 160-22327-A-1-E DU
SampleType: Sample
: 160-22327-A-1-E DU
Sample Collection Date: 5/10/2017 2:30:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9963g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699865

Analyst: 60040

## Tracer

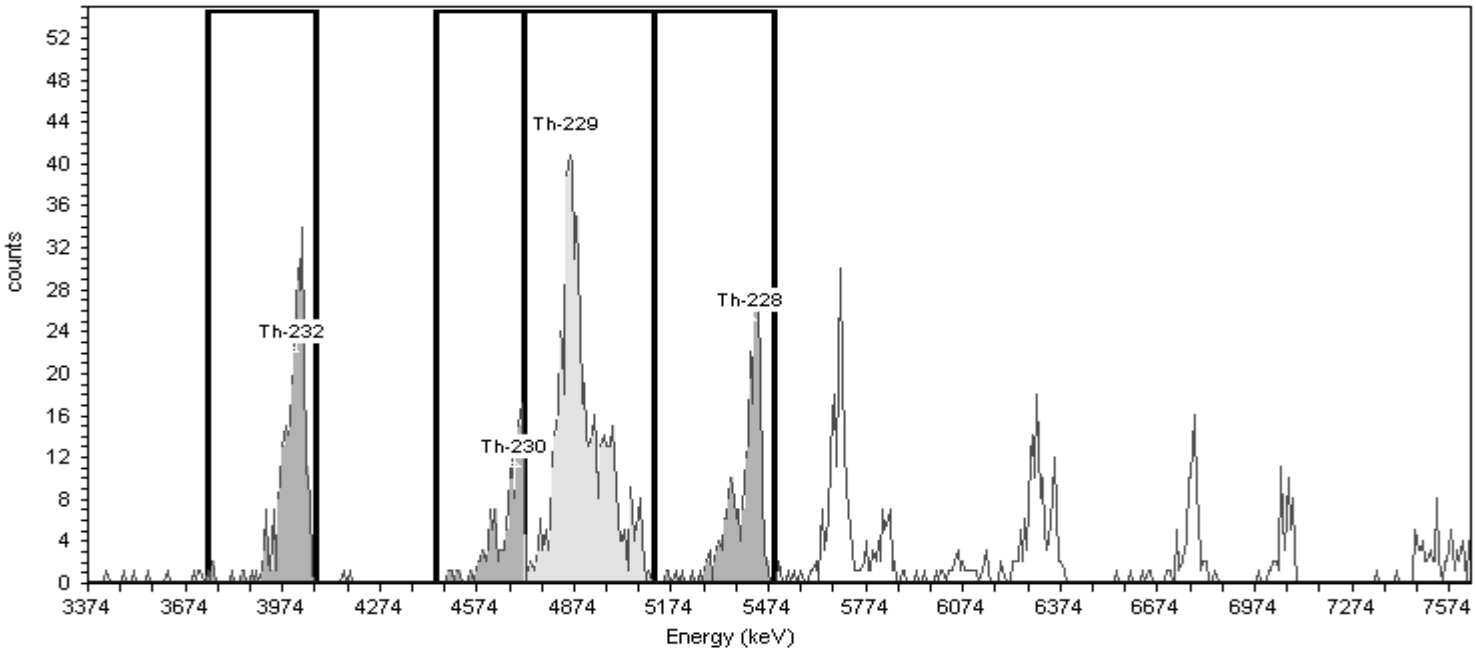
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 92.46%

## Acquisition

Detector: AV66
Serial Number: 48-158EE2
Acquisition Start Date: 6/8/2017 7:02:46PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:13AM
Background Info: Sample: ICB;AV66; Det: AV66; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-8877;AV66-20160831a
Calibration Date: 8/31/2016 12:49:47PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.06% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 19.2 | 100.2 | 279 | 1.4271 | 277.15 | 1.349 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 17.3 | 99.7 | 136 | 5.9617 | 129.76 | 0.635 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 76.4 | 99.6 | 621 | 0.0000 | 620.72 | 2.810 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 39.3 | 99.8 | 237 | 4.5833 | 232.42 | 1.138 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:01:54AM 6/9/2017

## Sample

Sample Name: 160-22327-A-1-E DU
SampleType: Sample
: 160-22327-A-1-E DU
Sample Collection Date: 5/10/2017 2:30:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9963g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699900

Analyst: 60040

## Tracer

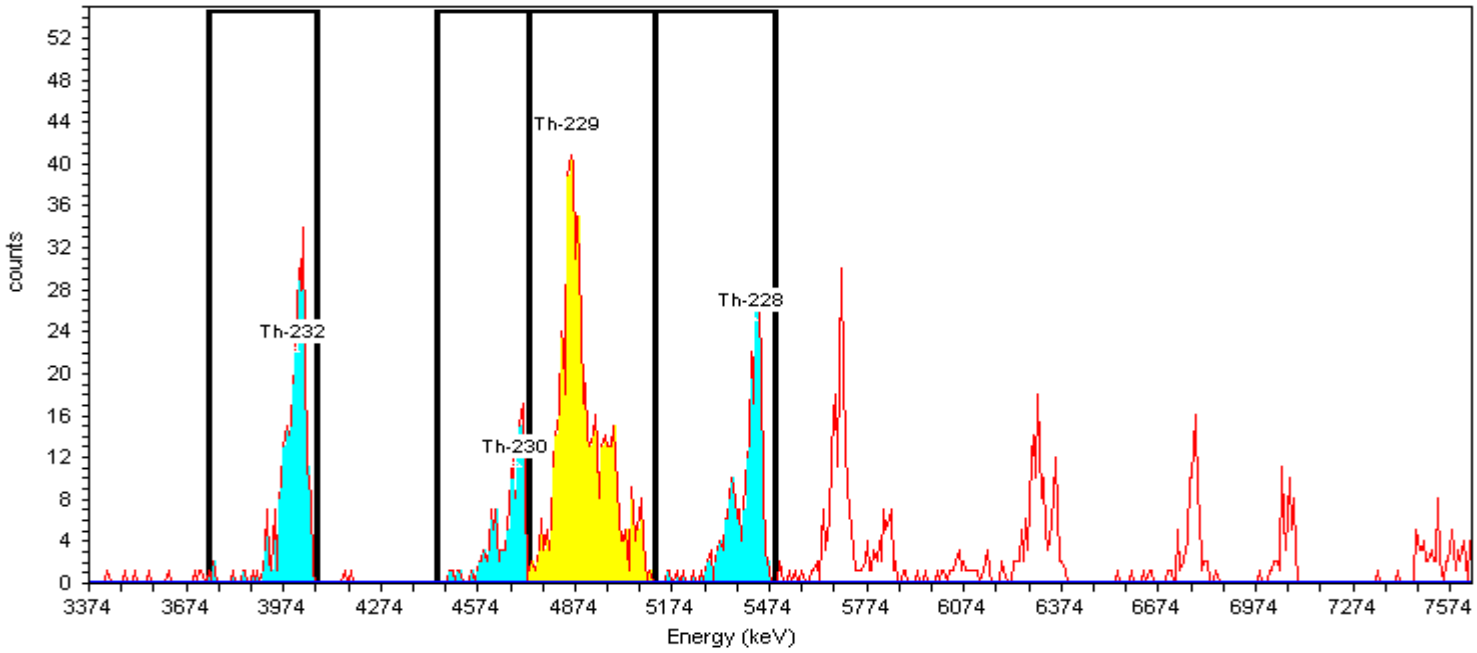
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 91.16%

## Acquisition

Detector: AV66
Serial Number: 48-158EE2
Acquisition Start Date: 6/8/2017 7:02:46PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:13AM
Background Info: Sample: ICB;AV66; Det: AV66; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-8877;AV66-20160831a
Calibration Date: 8/31/2016 12:49:47PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 25.06% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 19.2 | 100.2 | 279 | 1.4271 | 277.15 | 1.369 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4731.7 | 30.0 | 99.7 | 137 | 5.8333 | 131.17 | 0.651 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4731.7 | 5119.5 | 76.4 | 99.6 | 612 | 0.0000 | 612.00 | 2.771 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 39.3 | 99.8 | 237 | 4.5833 | 232.42 | 1.154 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:45:05AM 6/9/2017

## Sample

Sample Name: 160-22327-A-2-C
SampleType: Sample
: 160-22327-A-2-C
Sample Collection Date: 5/10/2017 2:35:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9936g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699866

Analyst: 60040

## Tracer

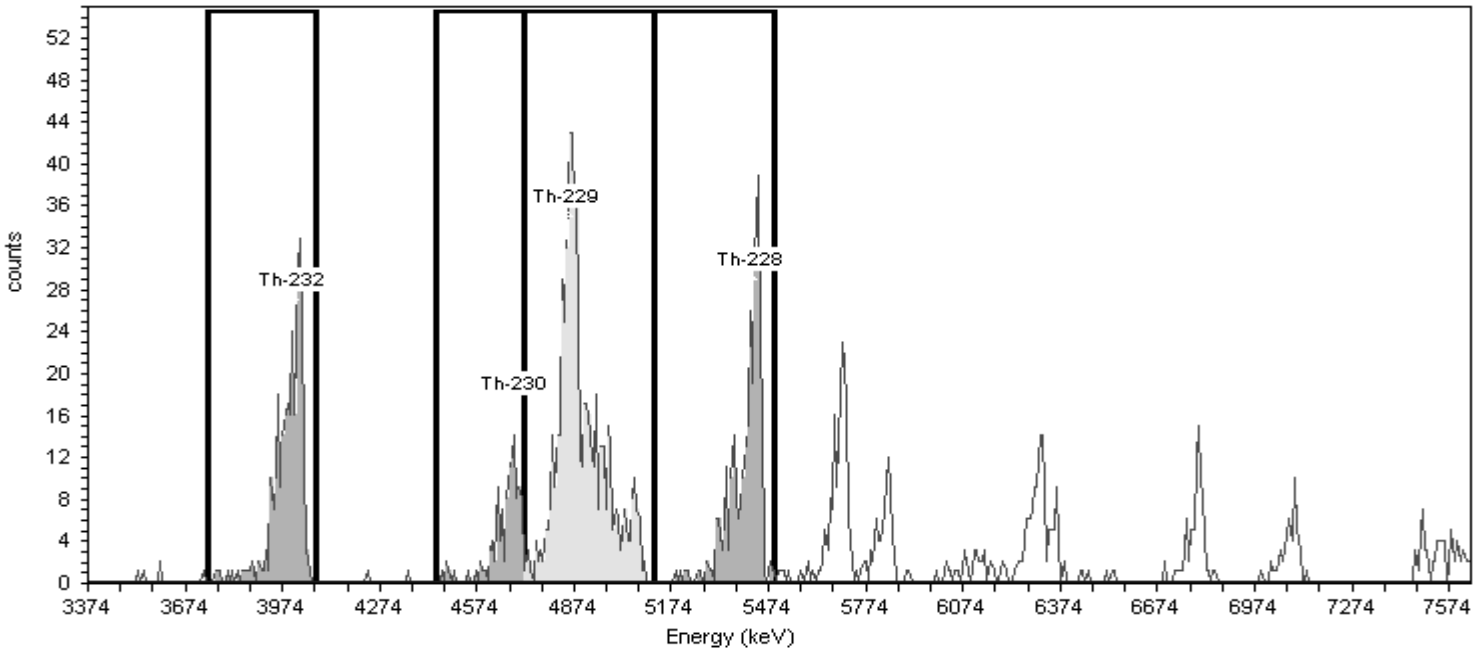
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 87.83%

## Acquisition

Detector: AV68
Serial Number: 50-60-V2
Acquisition Start Date: 6/8/2017 7:02:47PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:14AM
Background Info: Sample: ICB;AV68; Det: AV68; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9520;AV68-20160831
Calibration Date: 8/31/2016 12:50:01PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.78% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 37.6 | 100.2 | 283 | 1.4756 | 281.52 | 1.463 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 50.3 | 99.7 | 113 | 1.6538 | 111.38 | 0.582 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 65.1 | 99.6 | 586 | 2.9038 | 583.13 | 2.677 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 41.2 | 99.8 | 286 | 5.4167 | 280.50 | 1.466 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:00:27AM 6/9/2017

## Sample

Sample Name: 160-22327-A-2-C
SampleType: Sample
: 160-22327-A-2-C
Sample Collection Date: 5/10/2017 2:35:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9936g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699899

Analyst: 60040

## Tracer

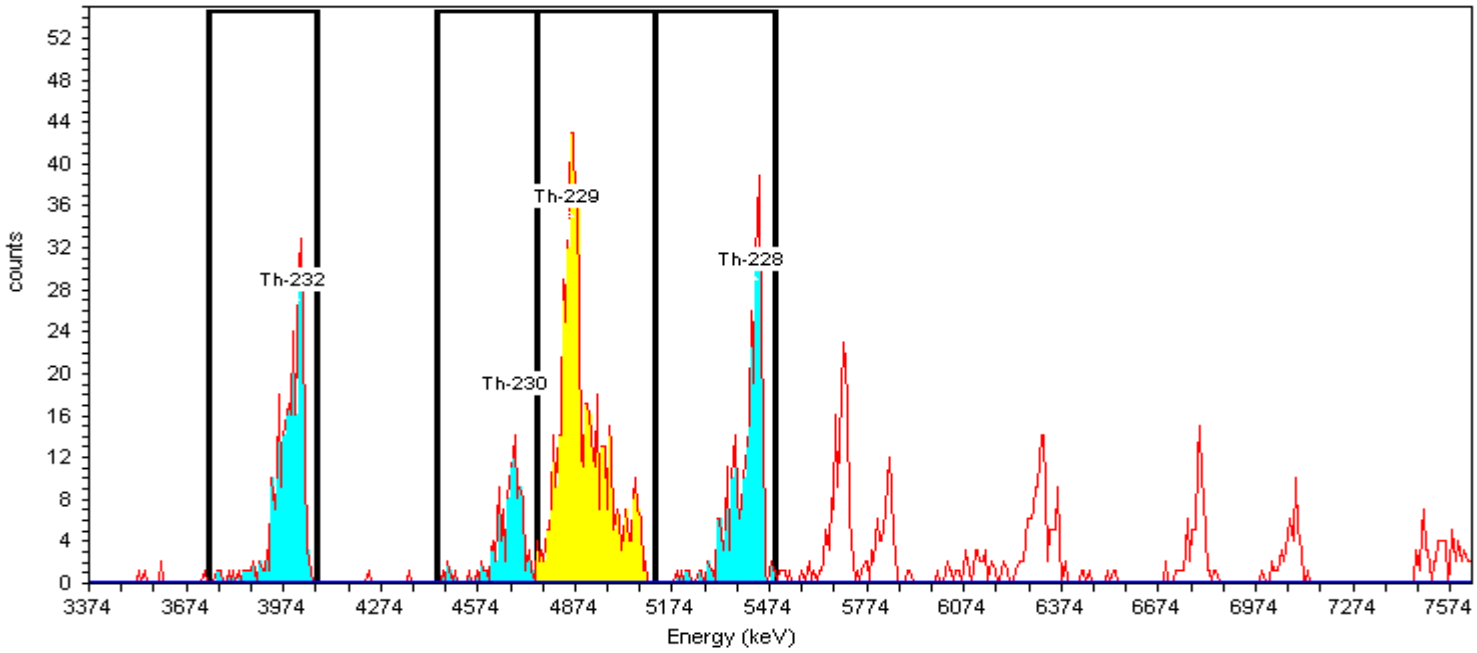
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 87.14%

## Acquisition

Detector: AV68
Serial Number: 50-60-V2
Acquisition Start Date: 6/8/2017 7:02:47PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:14AM
Background Info: Sample: ICB;AV68; Det: AV68; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9520;AV68-20160831
Calibration Date: 8/31/2016 12:50:01PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 24.78% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 37.6 | 100.2 | 283 | 1.4756 | 281.52 | 1.475 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4754.1 | 63.5 | 99.7 | 123 | 1.6667 | 121.33 | 0.639 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4754.1 | 5119.5 | 65.1 | 99.6 | 581 | 2.5000 | 578.50 | 2.656 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 41.2 | 99.8 | 286 | 5.4167 | 280.50 | 1.477 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:57:20PM 6/10/2017

## Sample

Sample Name: 160-22327-A-3-C Type: Sample
Spectrum #1 Analysis #1
: 160-22327-A-3-C
Sample Collection Date: 5/10/2017 2:40:00PM
Comment:

Sample Weight : 0.99 Sample Units: g
First Stage Dilution: N/A
Aliquot: N/A Aliquot Fraction: N/A
Dilution 2: N/A
Lab Preparation:

## Batch

Batch Name: 309374
AnalysisResultsID: 193845
Description:

Client Name: Undefined
Client Contact:
Analyst: 60040

## Tracer

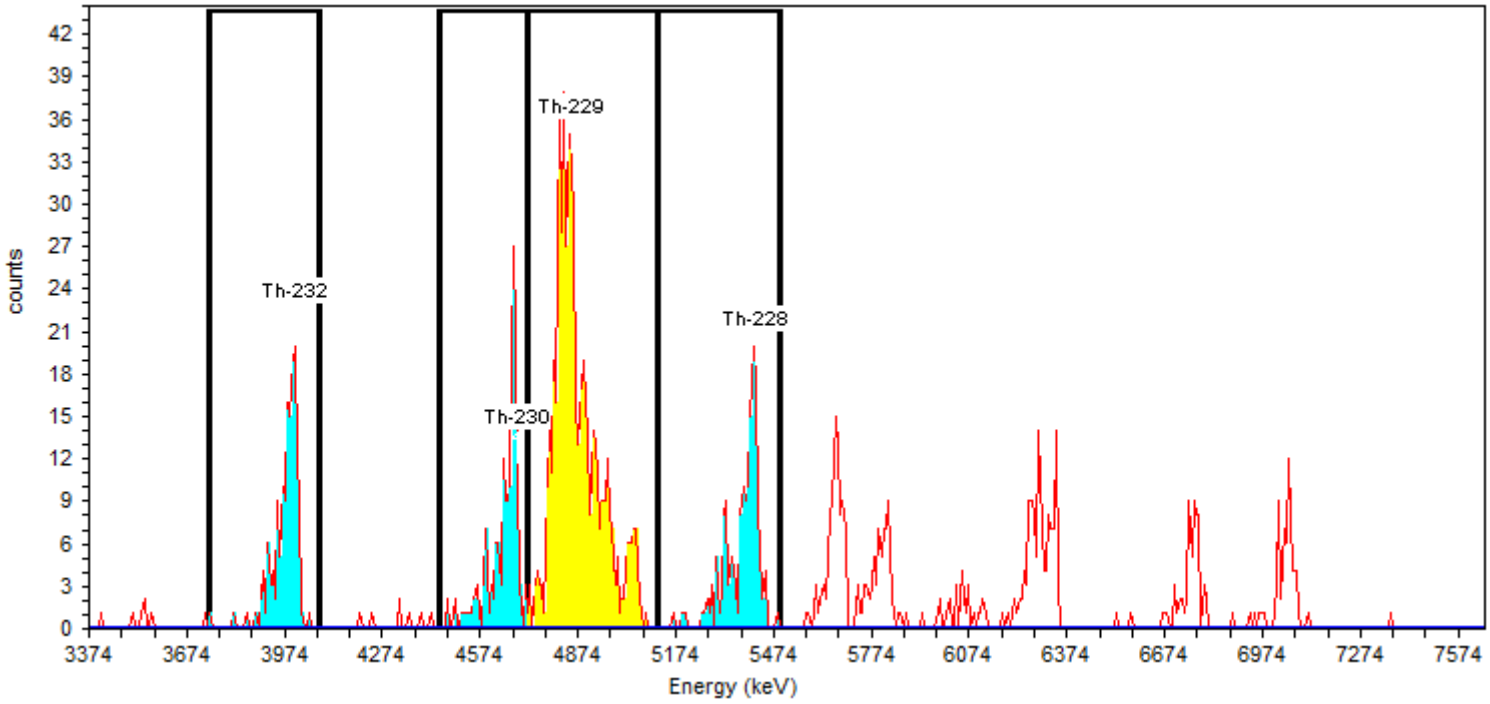
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 9:07:15AM

Tracer Nuclide: Th-229
Tracer Recovery: 83.35%

## Acquisition

Detector: AV155 SN: 50-05/II1
Acquisition Start Date: 6/10/2017 4:17:02PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 5/15/2017 9:12:19AM
Bkgd Info: Sample: ICB;AV155; Det: AV155; Spectrum #1; 5/15/2017 9:12:19 AM

Energy Calibration: IC-9793;AV155-20161110
Efficiency Calibration:IC-9793;AV155-20161110
Calibration Date: 11/11/2016 2:37:33PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 24.72% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction:6/10/2017 4:15:35PM
MDA Constants: Kα = 1.64 , Kβ = 1.64

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 54.0 | 100.2 | 152 | 1.8923 | 149.68 | 8.223E-001 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 20.8 | 99.7 | 152 | 2.3716 | 149.69 | 8.265E-001 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 82.8 | 99.6 | 554 | 2.0833 | 551.98 | 2.542E+000 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 53.2 | 99.8 | 163 | 5.8333 | 157.17 | 8.672E-001 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:45:25AM 6/9/2017

## Sample

Sample Name: 160-22327-A-4-C
SampleType: Sample
: 160-22327-A-4-C
Sample Collection Date: 5/10/2017 2:35:00PM

Spectrum #2 Analysis #1
Sample Weight : 1.0007g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699868

Analyst: 60040

## Tracer

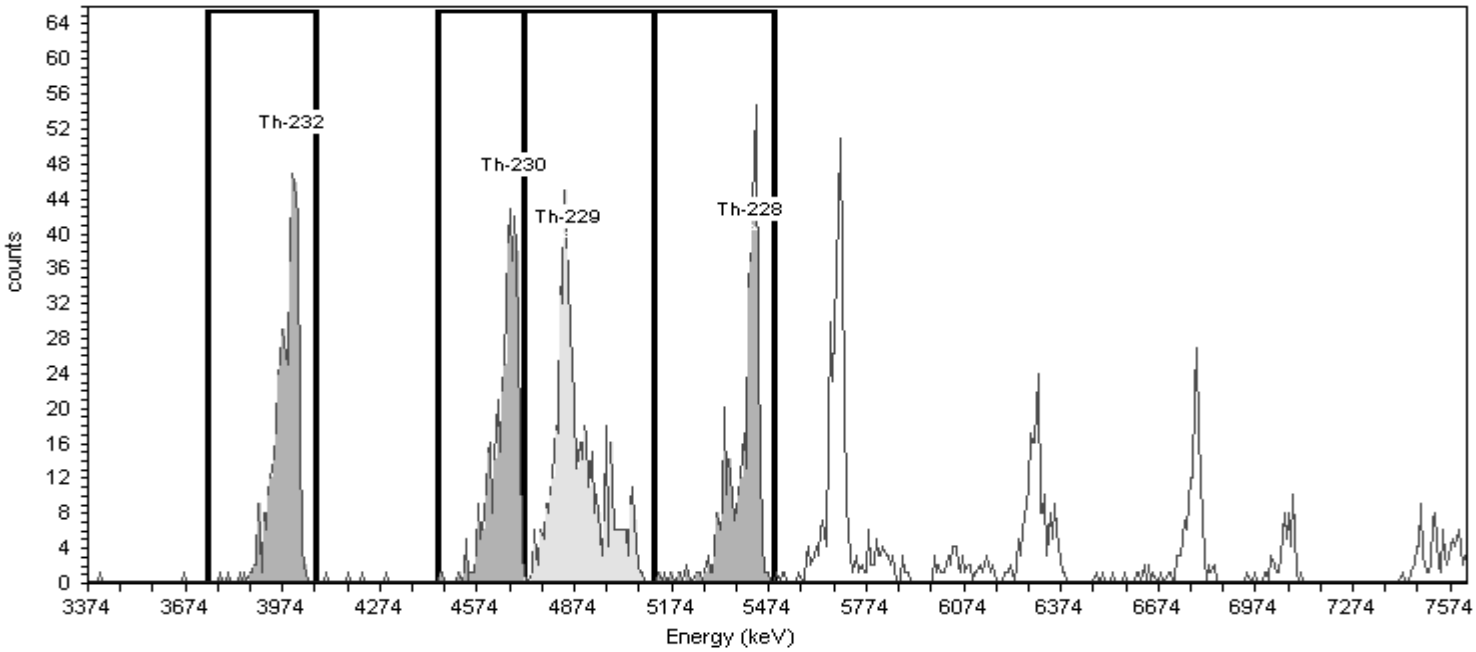
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 82.97%

## Acquisition

Detector: AV70
Serial Number: 48-158FF1
Acquisition Start Date: 6/8/2017 7:02:50PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:16AM
Background Info: Sample: ICB;AV70; Det: AV70; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9792;AV70-20160830
Calibration Date: 8/31/2016 8:44:32AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.41% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 76.8 | 100.2 | 411 | 0.4167 | 410.58 | 2.187 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 35.1 | 99.7 | 400 | 2.0833 | 397.89 | 2.130 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 66.4 | 99.6 | 567 | 2.0833 | 564.89 | 2.511 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 54.8 | 99.8 | 380 | 3.7139 | 376.37 | 2.016 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:57:32AM 6/9/2017

## Sample

Sample Name: 160-22327-A-4-C
SampleType: Sample
: 160-22327-A-4-C
Sample Collection Date: 5/10/2017 2:35:00PM

Spectrum #2 Analysis #1
Sample Weight : 1.0007g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699897

Analyst: 60040

## Tracer

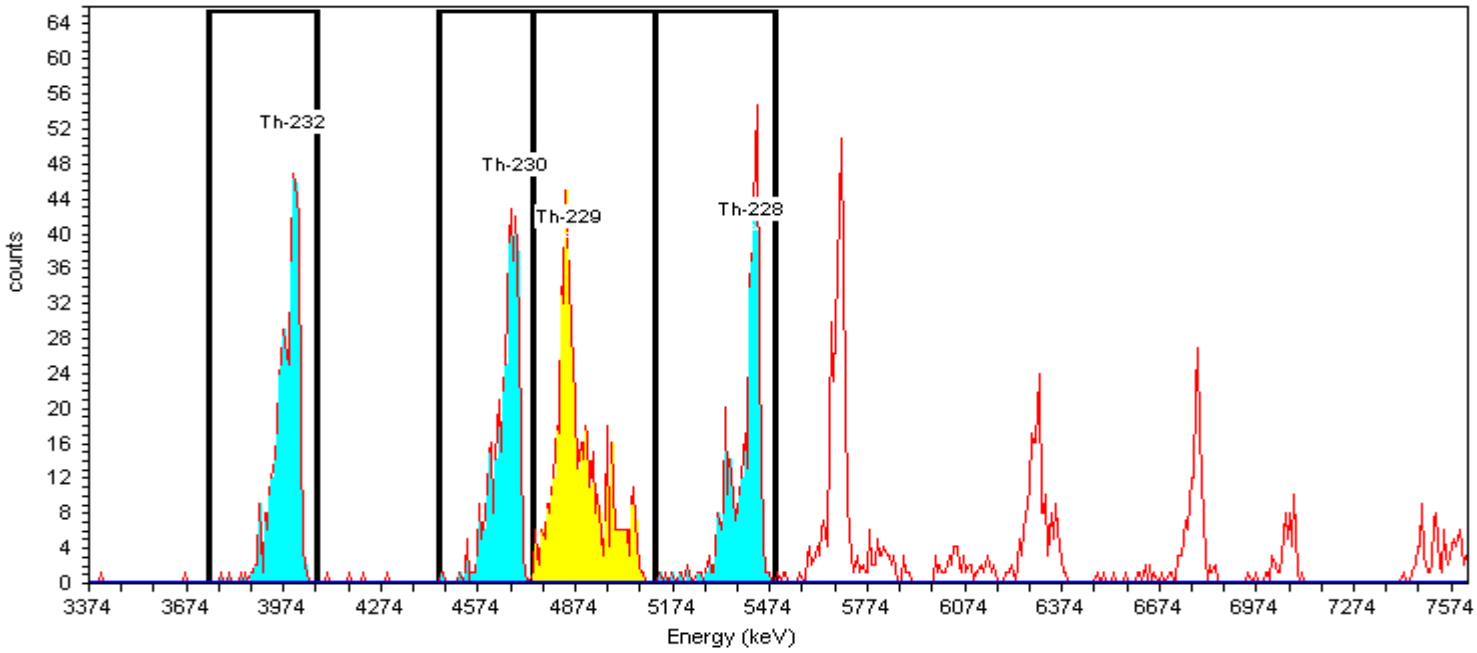
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 82.83%

## Acquisition

Detector: AV70
Serial Number: 48-158FF1
Acquisition Start Date: 6/8/2017 7:02:50PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:16AM
Background Info: Sample: ICB;AV70; Det: AV70; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9792;AV70-20160830
Calibration Date: 8/31/2016 8:44:32AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 25.41% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 76.8 | 100.2 | 411 | 0.4167 | 410.58 | 2.191 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4739.1 | 64.0 | 99.7 | 401 | 2.0833 | 398.92 | 2.139 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4739.1 | 5119.5 | 66.4 | 99.6 | 566 | 2.0833 | 563.92 | 2.507 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 54.8 | 99.8 | 380 | 3.7139 | 376.37 | 2.019 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:42:48AM 6/9/2017

## Sample

Sample Name: 160-22327-A-5-C
SampleType: Sample
: 160-22327-A-5-C
Sample Collection Date: 5/11/2017 12:15:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9914g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699855

Analyst: 60040

## Tracer

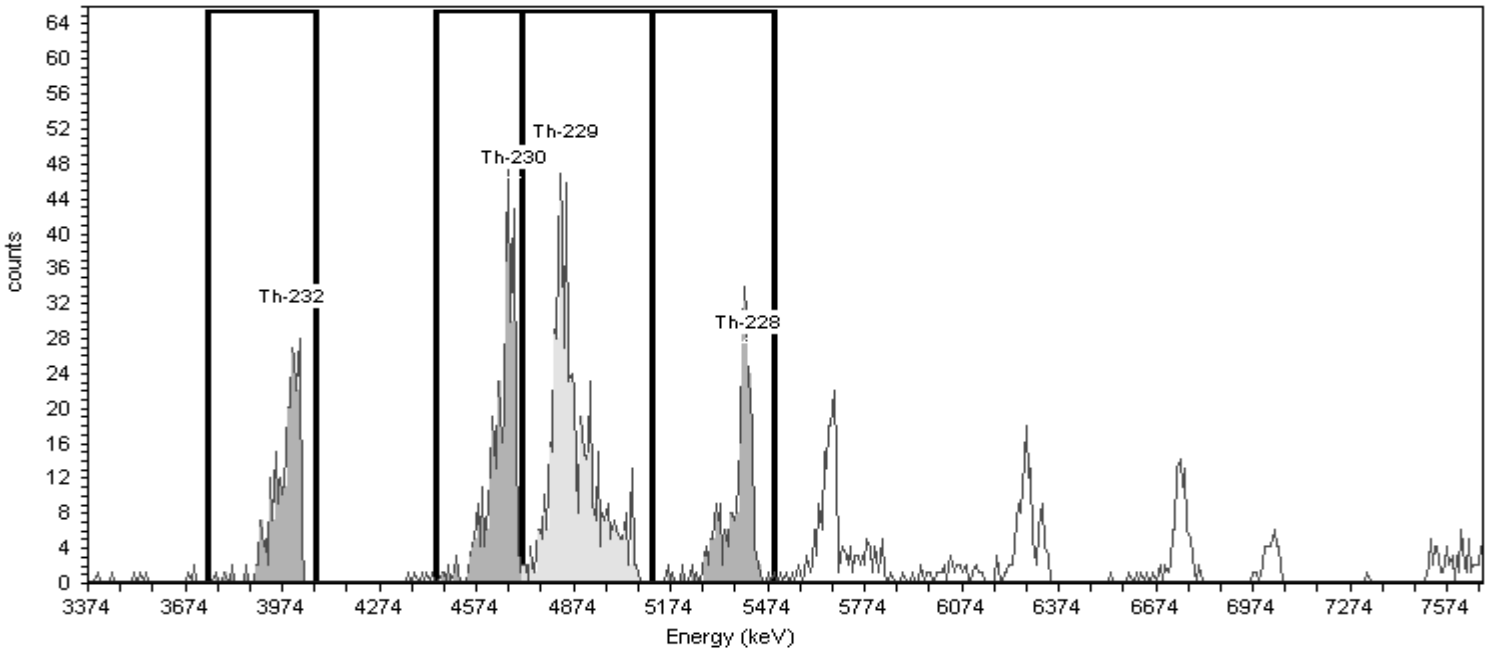
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 88.19%

## Acquisition

Detector: AV71
Serial Number: 48-158EE6
Acquisition Start Date: 6/8/2017 7:02:51PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:17AM
Background Info: Sample: ICB;AV71; Det: AV71; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9793;AV71-20160830
Calibration Date: 8/31/2016 8:44:46AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.11% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 62.4 | 100.2 | 252 | 0.0000 | 252.00 | 1.290 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 27.7 | 99.7 | 356 | 1.1216 | 354.88 | 1.826 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 72.2 | 99.6 | 594 | 0.8600 | 593.14 | 2.694 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 50.4 | 99.8 | 258 | 5.4433 | 252.47 | 1.300 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:56:11AM 6/9/2017

## Sample

Sample Name: 160-22327-A-5-C
SampleType: Sample
: 160-22327-A-5-C
Sample Collection Date: 5/11/2017 12:15:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9914g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699896

Analyst: 60040

## Tracer

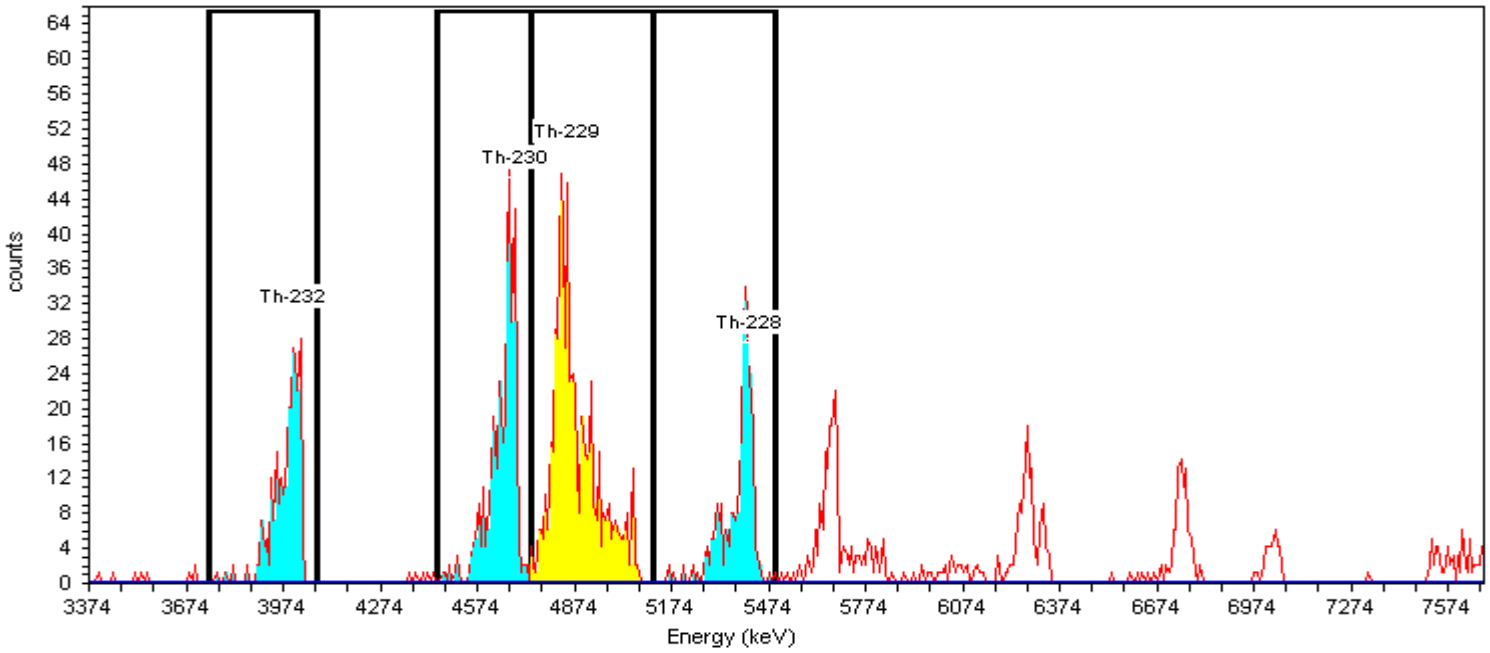
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 87.83%

## Acquisition

Detector: AV71
Serial Number: 48-158EE6
Acquisition Start Date: 6/8/2017 7:02:51PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:17AM
Background Info: Sample: ICB;AV71; Det: AV71; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9793;AV71-20160830
Calibration Date: 8/31/2016 8:44:46AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 25.11% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 62.4 | 100.2 | 252 | 0.0000 | 252.00 | 1.295 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4739.1 | 63.1 | 99.7 | 362 | 1.2500 | 360.75 | 1.864 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4739.1 | 5119.5 | 72.2 | 99.6 | 592 | 1.2500 | 590.75 | 2.683 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 50.4 | 99.8 | 258 | 5.4433 | 252.47 | 1.305 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:43:18AM 6/9/2017

## Sample

Sample Name: 160-22327-A-6-C
SampleType: Sample
: 160-22327-A-6-C
Sample Collection Date: 5/11/2017 12:20:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9914g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699856

Analyst: 60040

## Tracer

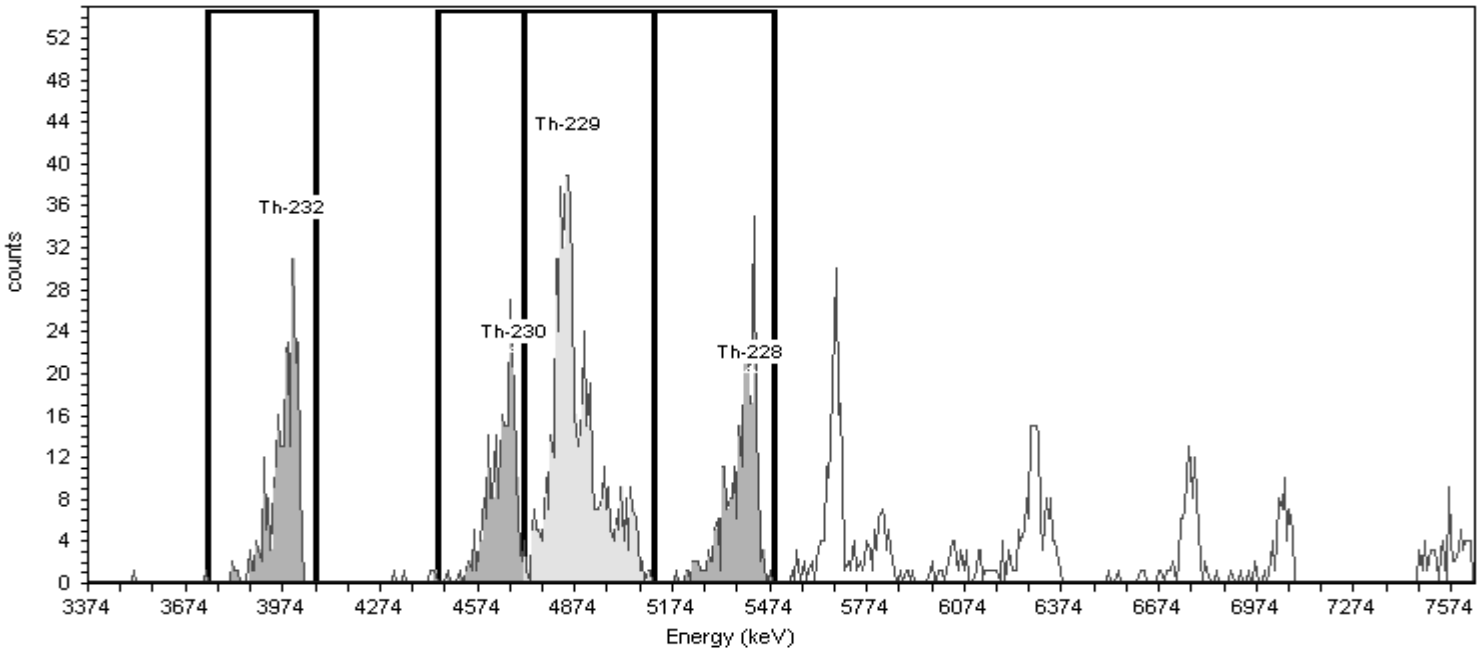
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 92.21%

## Acquisition

Detector: AV72
Serial Number: 48-05a21
Acquisition Start Date: 6/8/2017 7:02:52PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:18AM
Background Info: Sample: ICB;AV72; Det: AV72; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9794;AV72-20160830
Calibration Date: 8/31/2016 8:45:00AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.48% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 78.7 | 100.2 | 255 | 1.8577 | 253.14 | 1.271 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 26.9 | 99.7 | 228 | 0.8333 | 227.38 | 1.148 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 71.8 | 99.6 | 606 | 1.2500 | 604.66 | 2.817 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 62.7 | 99.8 | 271 | 7.4639 | 263.54 | 1.331 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:55:18AM 6/9/2017

## Sample

Sample Name: 160-22327-A-6-C
SampleType: Sample
: 160-22327-A-6-C
Sample Collection Date: 5/11/2017 12:20:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9914g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699895

Analyst: 60040

## Tracer

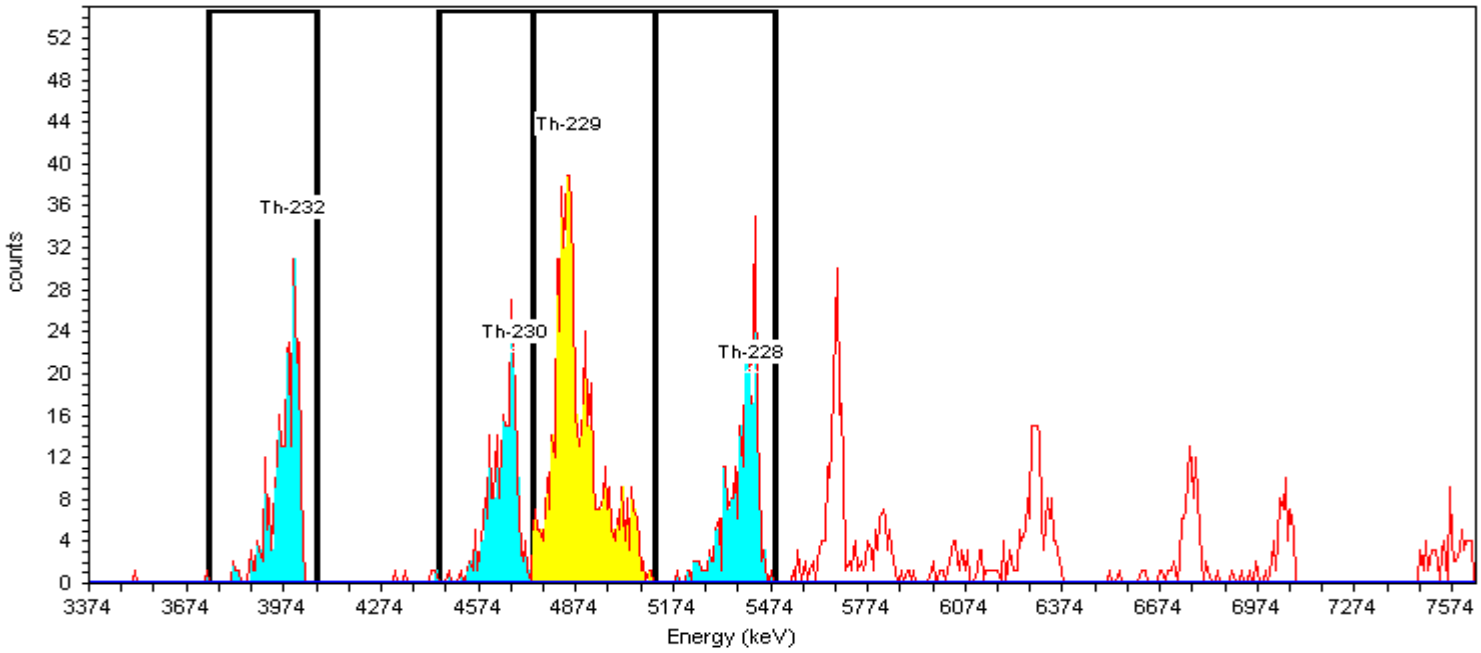
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 91.62%

## Acquisition

Detector: AV72
Serial Number: 48-05a21
Acquisition Start Date: 6/8/2017 7:02:52PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:18AM
Background Info: Sample: ICB;AV72; Det: AV72; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9794;AV72-20160830
Calibration Date: 8/31/2016 8:45:00AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$
Efficiency: 24.48% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 78.7 | 100.2 | 255 | 1.8577 | 253.14 | 1.280 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4739.1 | 82.3 | 99.7 | 234 | 0.8333 | 233.17 | 1.185 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4739.1 | 5119.5 | 71.8 | 99.6 | 602 | 1.2500 | 600.75 | 2.799 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 62.7 | 99.8 | 271 | 7.4639 | 263.54 | 1.340 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:43:27AM 6/9/2017

## Sample

Sample Name: 160-22327-A-7-C
SampleType: Sample
: 160-22327-A-7-C
Sample Collection Date: 5/11/2017 1:05:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9989g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699857

Analyst: 60040

## Tracer

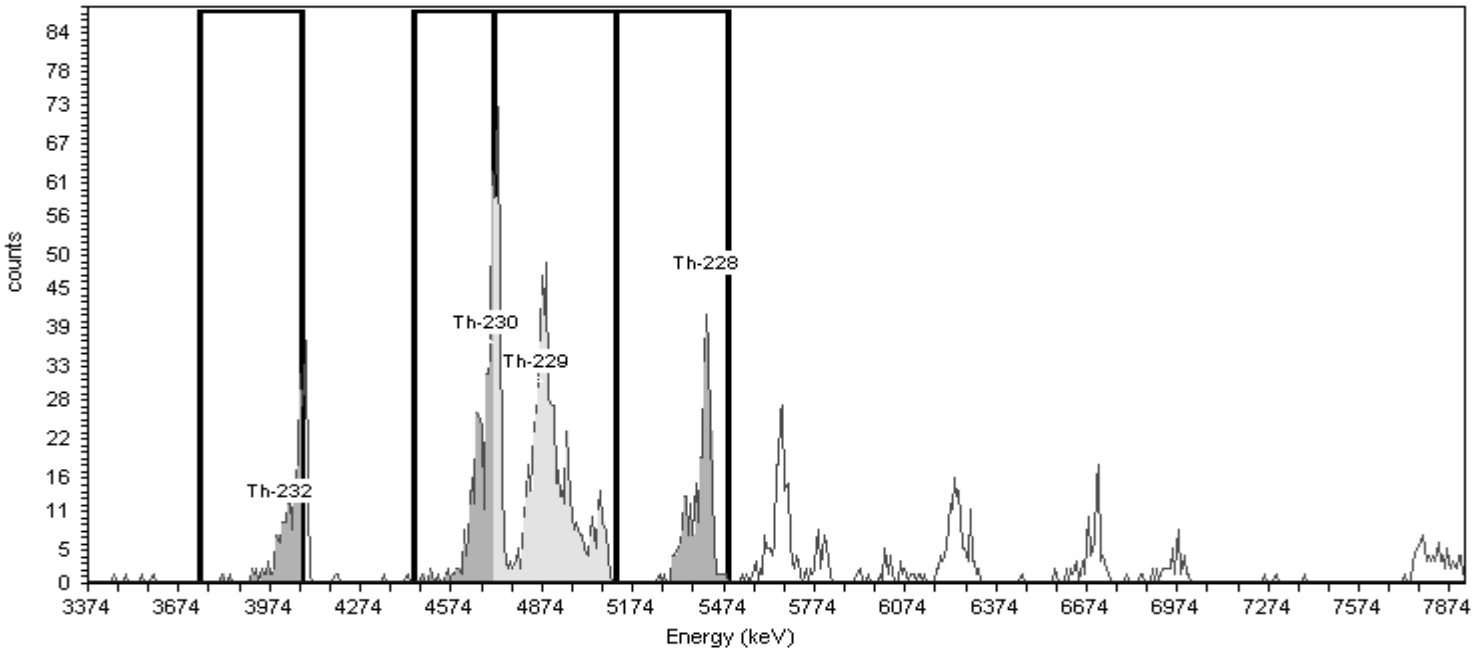
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 109.64%

## Acquisition

Detector: AV73
Serial Number: 46-03321
Acquisition Start Date: 6/8/2017 7:02:54PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:19AM
Background Info: Sample: ICB;AV73; Det: AV73; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9795;AV73-20160901
Calibration Date: 9/1/2016 12:03:04PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 26.51% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 6.7 | 100.2 | 153 | 0.0000 | 153.29 | 0.593 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 13.2 | 99.7 | 379 | 2.0704 | 377.36 | 1.468 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | .0 | 99.6 | 780 | 1.6538 | 778.78 | 3.324 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 50.5 | 99.8 | 289 | 4.5472 | 284.45 | 1.107 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:54:14AM 6/9/2017

## Sample

Sample Name: 160-22327-A-7-C
SampleType: Sample
: 160-22327-A-7-C
Sample Collection Date: 5/11/2017 1:05:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9989g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699894

Analyst: 60040

## Tracer

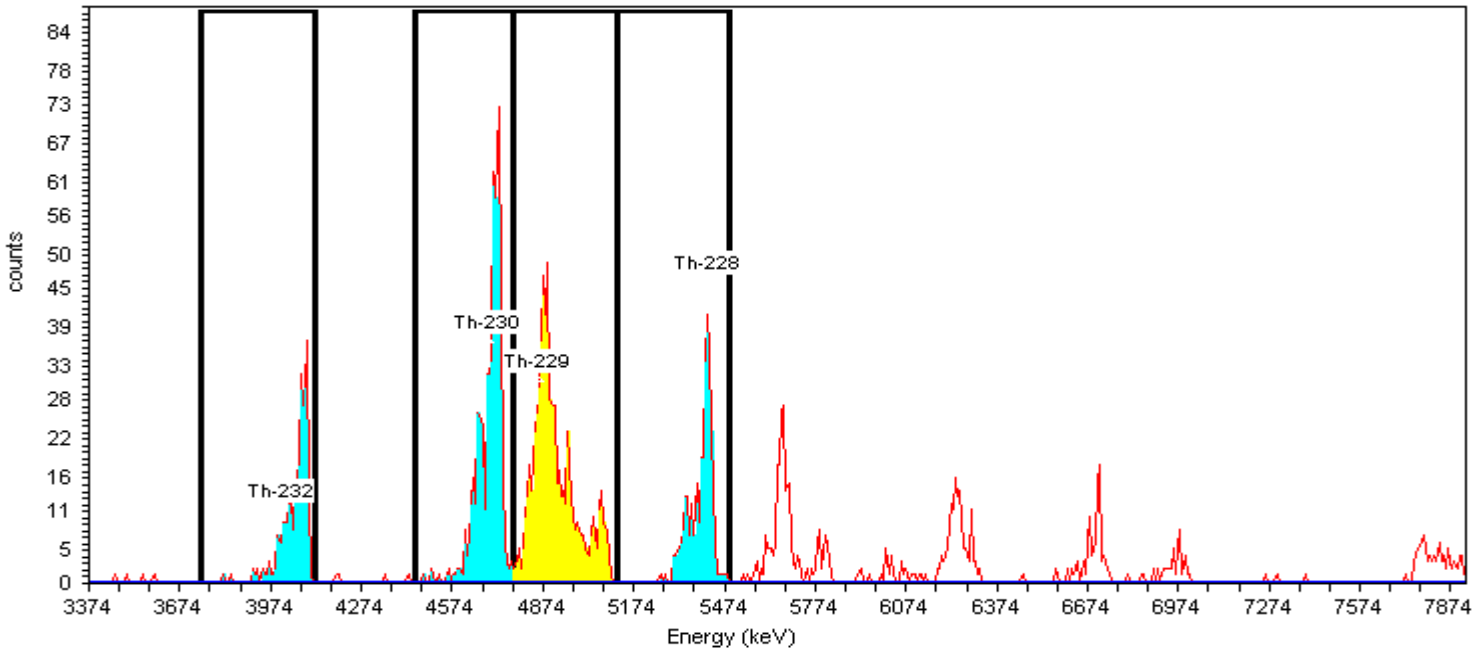
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 91.94%

## Acquisition

Detector: AV73
Serial Number: 46-03321
Acquisition Start Date: 6/8/2017 7:02:54PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:19AM
Background Info: Sample: ICB;AV73; Det: AV73; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9795;AV73-20160901
Calibration Date: 9/1/2016 12:03:04PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 26.51% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3739.8 | 4120.2 | 20.3 | 100.2 | 264 | 0.0000 | 264.00 | 1.219 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4776.4 | 57.6 | 99.7 | 527 | 2.5000 | 524.50 | 2.433 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4776.4 | 5119.5 | 74.1 | 98.8 | 648 | 0.8333 | 647.17 | 2.787 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 50.5 | 99.8 | 289 | 4.5472 | 284.45 | 1.320 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:43:36AM 6/9/2017

## Sample

Sample Name: 160-22327-A-8-C
SampleType: Sample
: 160-22327-A-8-C
Sample Collection Date: 5/11/2017 1:10:00PM

Spectrum #2 Analysis #1
Sample Weight : 1.0093g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699858

Analyst: 60040

## Tracer

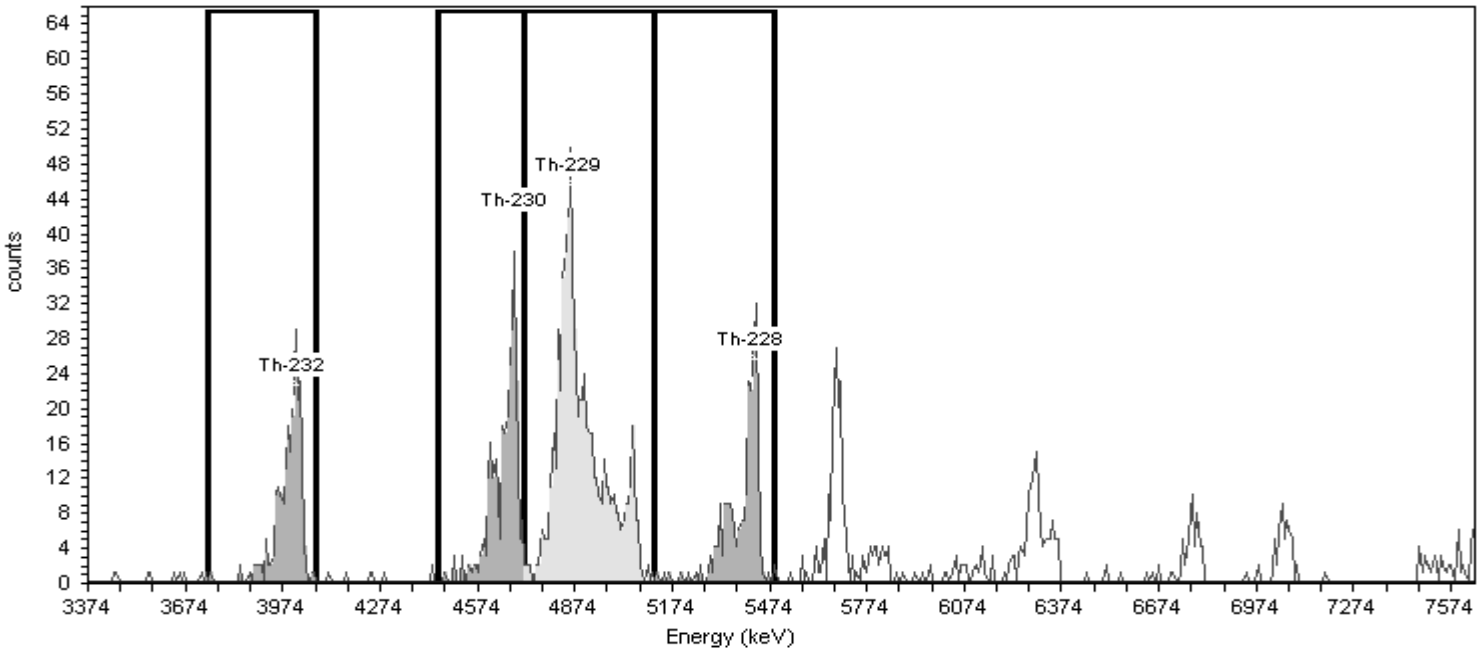
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 103.48%

## Acquisition

Detector: AV74
Serial Number: 50-051C6
Acquisition Start Date: 6/8/2017 7:02:57PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/22/2017 8:35:25AM
Background Info: Sample: ICB;AV74; Det: AV74; Spectrum #1; May-22-2017 08:35

Calibration Name: IC-9817;AV74-20160830a
Calibration Date: 8/31/2016 8:45:45AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.52% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 56.5 | 100.2 | 222 | 0.4167 | 221.47 | 0.972 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 30.2 | 99.7 | 278 | 1.2500 | 276.75 | 1.221 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 75.7 | 99.6 | 681 | 1.2500 | 679.81 | 3.105 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 52.0 | 99.8 | 238 | 2.5000 | 235.39 | 1.039 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:53:20AM 6/9/2017

## Sample

Sample Name: 160-22327-A-8-C
SampleType: Sample
: 160-22327-A-8-C
Sample Collection Date: 5/11/2017 1:10:00PM

Spectrum #2 Analysis #1
Sample Weight : 1.0093g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699893

Analyst: 60040

## Tracer

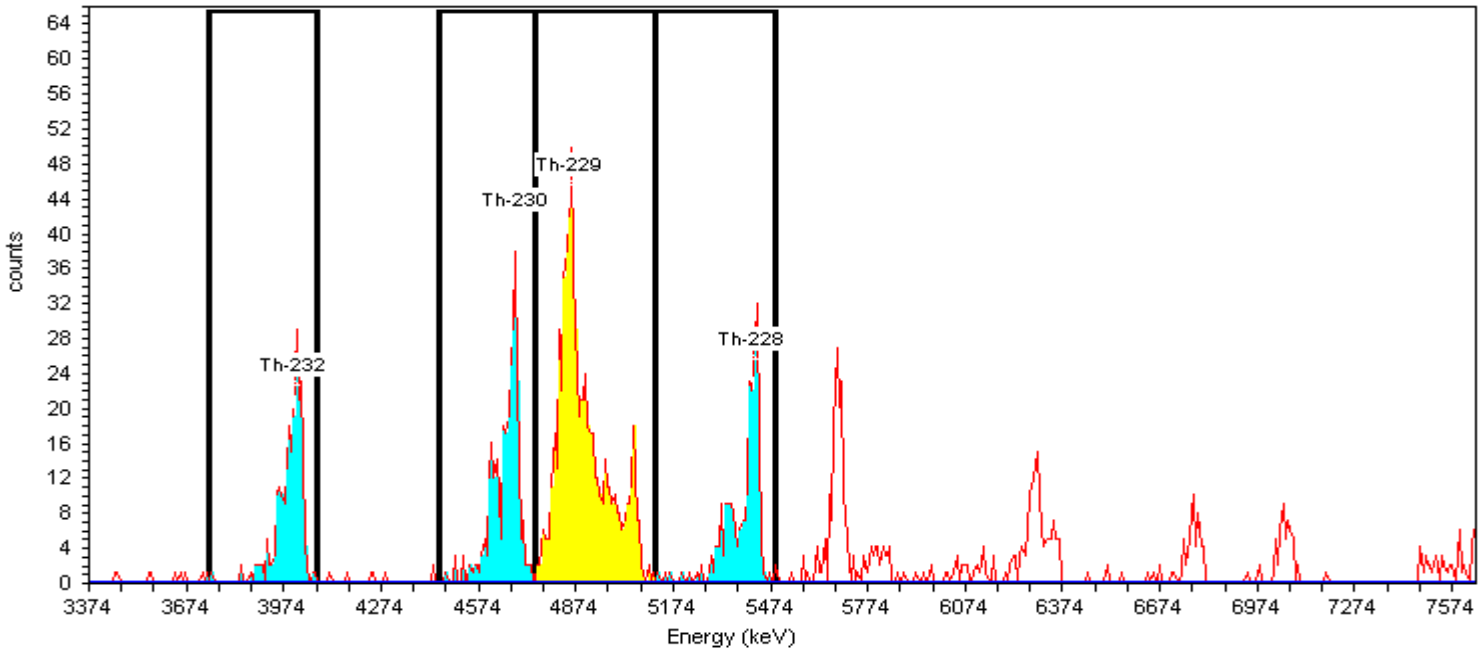
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 103.01%

## Acquisition

Detector: AV74
Serial Number: 50-051C6
Acquisition Start Date: 6/8/2017 7:02:57PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/22/2017 8:35:25AM
Background Info: Sample: ICB;AV74; Det: AV74; Spectrum #1; May-22-2017 08:35

Calibration Name: IC-9817;AV74-20160830a
Calibration Date: 8/31/2016 8:45:45AM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 24.52% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 56.5 | 100.2 | 222 | 0.4167 | 221.47 | 0.976 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4746.6 | 60.4 | 99.7 | 282 | 1.2500 | 280.75 | 1.244 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4746.6 | 5119.5 | 75.7 | 99.6 | 678 | 1.2500 | 676.75 | 3.091 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 52.0 | 99.8 | 238 | 2.5000 | 235.39 | 1.043 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:43:45AM 6/9/2017

## Sample

Sample Name: 160-22327-A-9-C
SampleType: Sample
: 160-22327-A-9-C
Sample Collection Date: 5/11/2017 1:15:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9958g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699859

Analyst: 60040

## Tracer

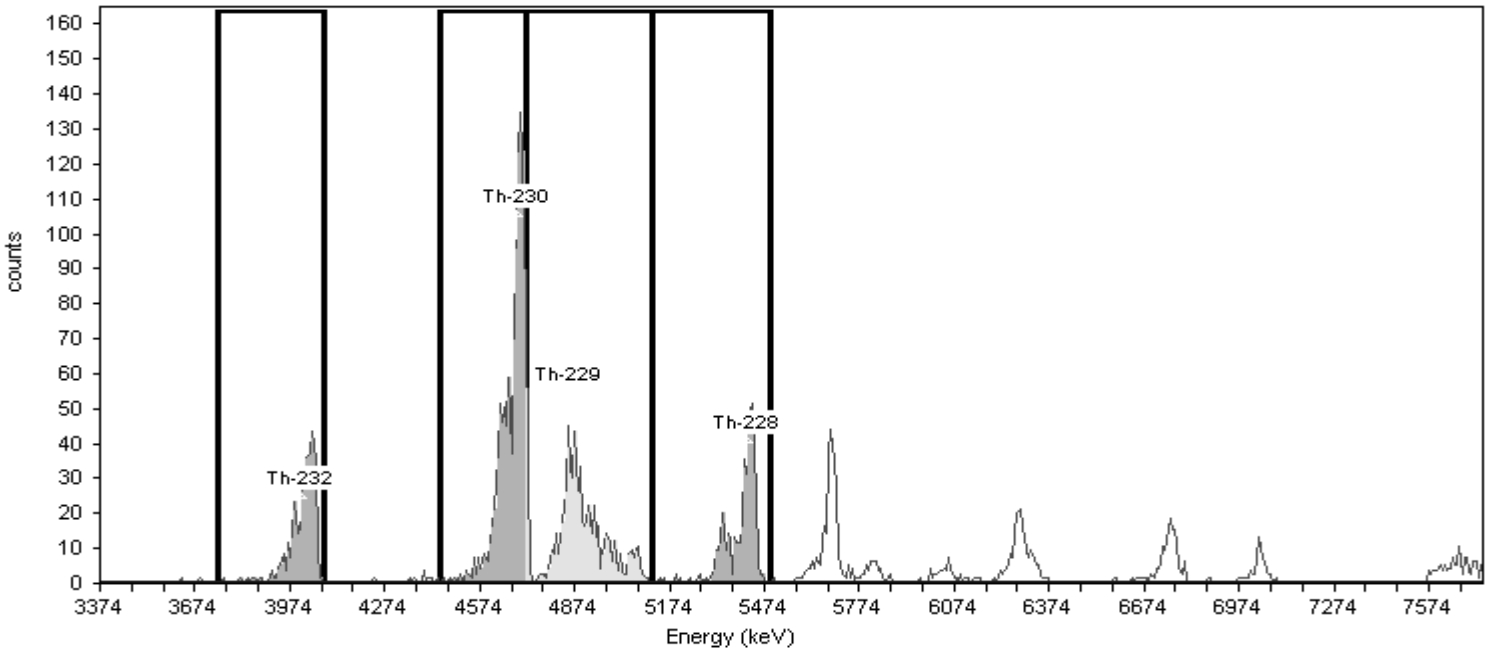
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 105.26%

## Acquisition

Detector: AV75
Serial Number: 51-082B4
Acquisition Start Date: 6/8/2017 7:02:57PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:21AM
Background Info: Sample: ICB;AV75; Det: AV75; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9884;AV75-20160727
Calibration Date: 8/25/2016 2:31:50PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 23.79% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 32.6 | 100.2 | 370 | 1.2500 | 369.21 | 1.664 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 64.8 | 99.7 | 1052 | 0.4167 | 1051.47 | 4.762 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | .0 | 99.6 | 673 | 1.6667 | 670.91 | 3.201 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 48.2 | 99.8 | 389 | 2.0833 | 386.92 | 1.753 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:52:18AM 6/9/2017

## Sample

Sample Name: 160-22327-A-9-C
SampleType: Sample
: 160-22327-A-9-C
Sample Collection Date: 5/11/2017 1:15:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9958g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699892

Analyst: 60040

## Tracer

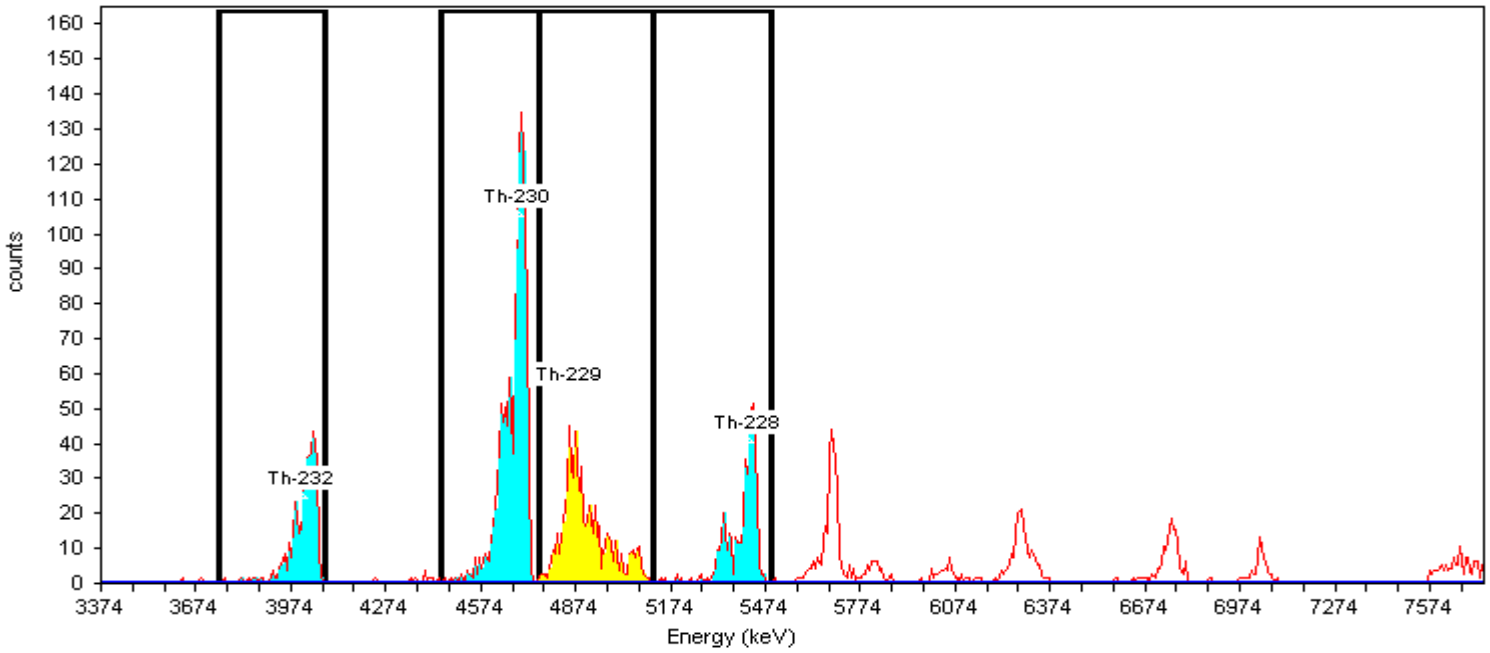
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 92.46%

## Acquisition

Detector: AV75
Serial Number: 51-082B4
Acquisition Start Date: 6/8/2017 7:02:57PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:21AM
Background Info: Sample: ICB;AV75; Det: AV75; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9884;AV75-20160727
Calibration Date: 8/25/2016 2:31:50PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 23.79% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 32.6 | 100.2 | 370 | 1.2500 | 369.21 | 1.894 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4754.1 | 45.9 | 99.7 | 1091 | 0.4167 | 1090.58 | 5.623 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4754.1 | 5119.5 | 75.6 | 99.6 | 591 | 1.6667 | 589.33 | 2.812 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 48.2 | 99.8 | 389 | 2.0833 | 386.92 | 1.996 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:43:54AM 6/9/2017

## Sample

Sample Name: 160-22327-A-10-C
SampleType: Sample
: 160-22327-A-10-C
Sample Collection Date: 5/11/2017 1:20:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9946g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699860

Analyst: 60040

## Tracer

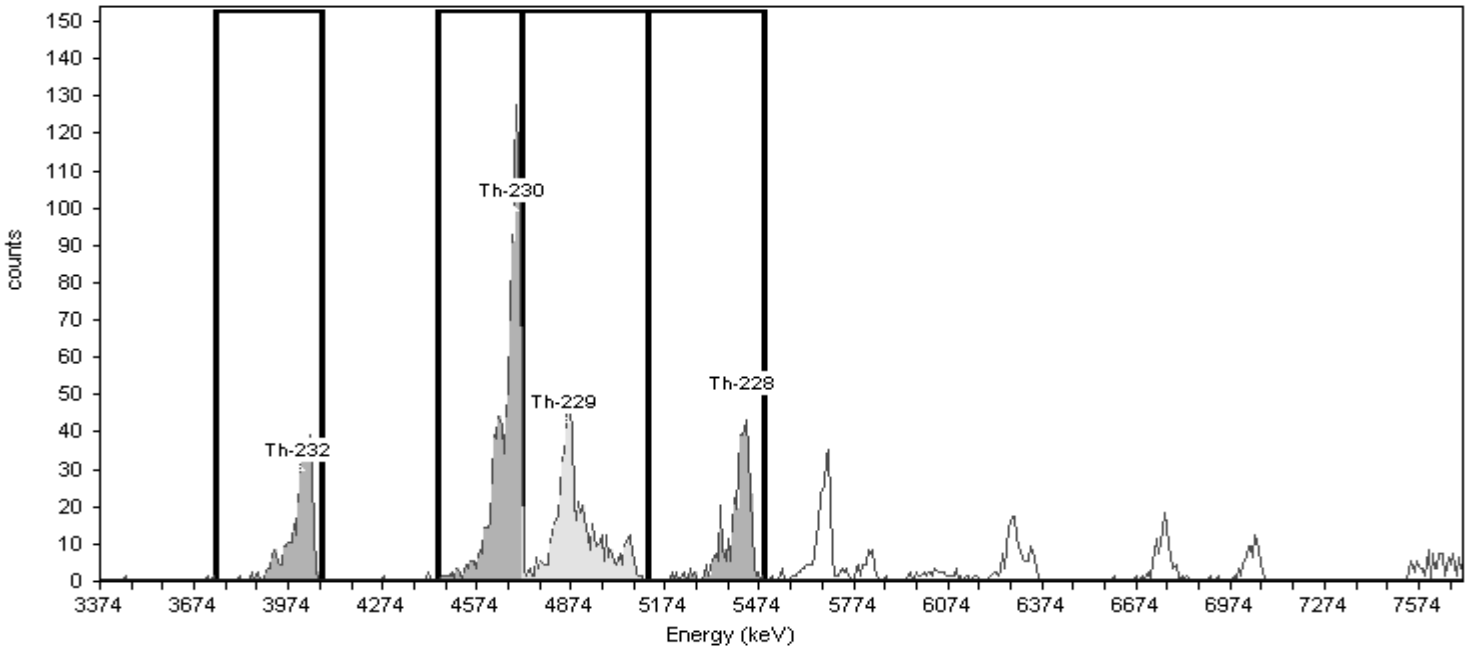
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 94.12%

## Acquisition

Detector: AV76
Serial Number: 50-060-f4
Acquisition Start Date: 6/8/2017 7:02:58PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:22AM
Background Info: Sample: ICB;AV76; Det: AV76; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9885;AV76-20160727
Calibration Date: 8/25/2016 2:32:23PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.09% +/- 0.37% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 26.7 | 100.2 | 346 | 0.8333 | 345.17 | 1.651 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 54.9 | 99.7 | 953 | 0.8333 | 952.11 | 4.578 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 68.6 | 99.6 | 634 | 1.2500 | 632.70 | 2.866 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 55.7 | 99.8 | 371 | 5.0000 | 366.00 | 1.761 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:06:03AM 6/9/2017

## Sample

Sample Name: 160-22327-A-10-C
SampleType: Sample
: 160-22327-A-10-C
Sample Collection Date: 5/11/2017 1:20:00PM

Spectrum #2 Analysis #1
Sample Weight : 0.9946g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699903

Analyst: 60040

## Tracer

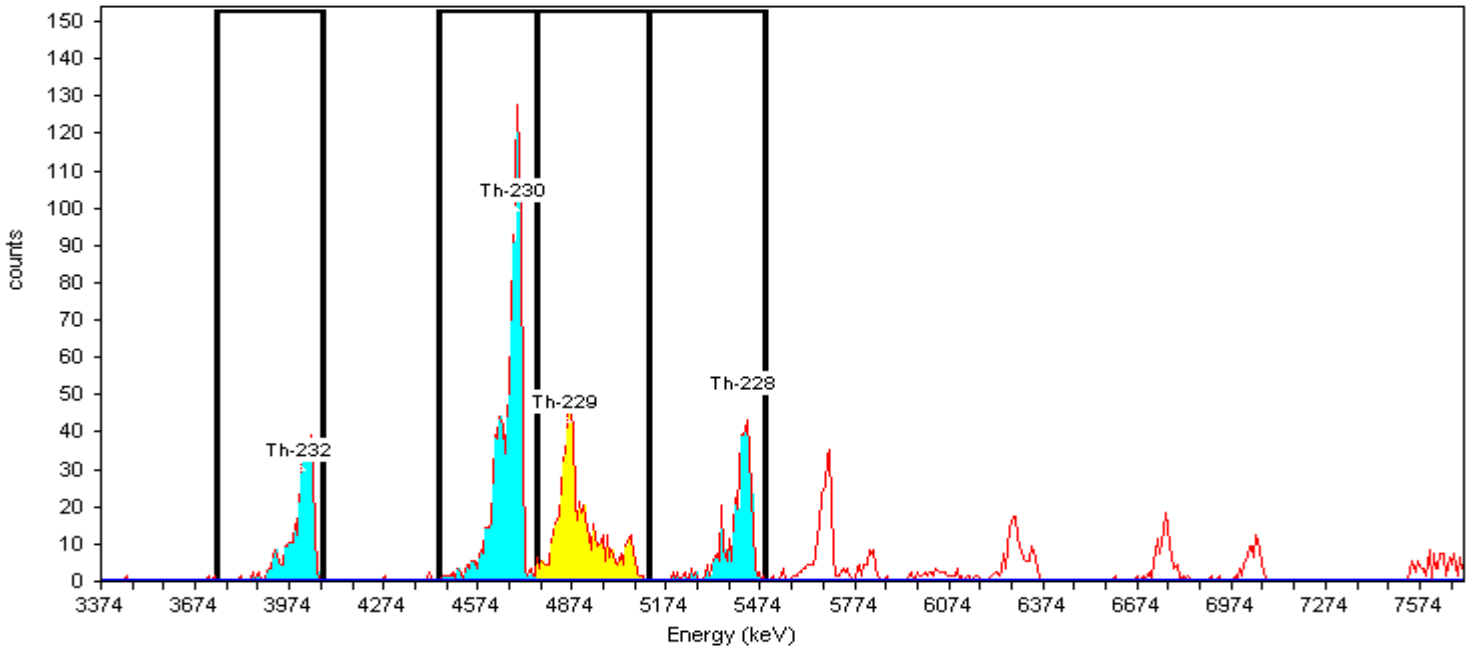
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 88.50%

## Acquisition

Detector: AV76
Serial Number: 50-060-f4
Acquisition Start Date: 6/8/2017 7:02:58PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/19/2017 10:36:22AM
Background Info: Sample: ICB;AV76; Det: AV76; Spectrum #2; May-19-2017 10:36

Calibration Name: IC-9885;AV76-20160727
Calibration Date: 8/25/2016 2:32:23PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 25.09% +/- 0.37% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 26.7 | 100.2 | 346 | 0.8333 | 345.17 | 1.756 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4761.5 | 52.5 | 99.7 | 969 | 1.2500 | 967.75 | 4.949 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4761.5 | 5119.5 | 68.6 | 99.0 | 592 | 0.8333 | 591.17 | 2.695 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 55.7 | 99.8 | 371 | 5.0000 | 366.00 | 1.872 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:44:05AM 6/9/2017

## Sample

Sample Name: 160-22327-A-11-C
SampleType: Sample
: 160-22327-A-11-C
Sample Collection Date: 5/11/2017 1:25:00PM

Spectrum #2 Analysis #1
Sample Weight : 1.0022g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699861

Analyst: 60040

## Tracer

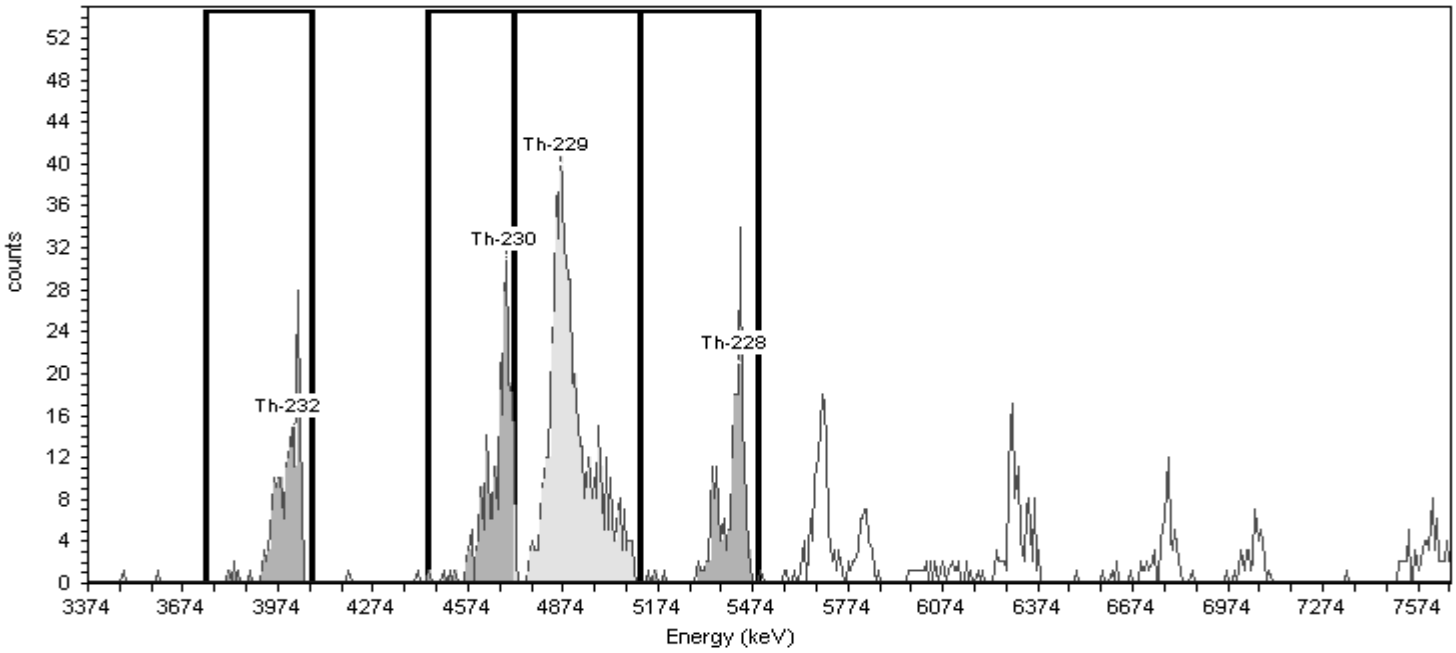
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 82.98%

## Acquisition

Detector: AV79
Serial Number: 46-033Q5
Acquisition Start Date: 6/8/2017 7:02:59PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/22/2017 8:35:31AM
Background Info: Sample: ICB;AV79; Det: AV79; Spectrum #1; May-22-2017 08:35

Calibration Name: IC-8874;AV79-20160727
Calibration Date: 8/25/2016 2:33:26PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 26.87% +/- 0.38% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 17.2 | 100.2 | 179 | 0.0000 | 179.00 | 0.900 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4446.0 | 4717.0 | 40.8 | 99.7 | 238 | 1.2500 | 237.10 | 1.199 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4717.0 | 5119.0 | 82.2 | 99.6 | 598 | 0.4167 | 597.24 | 2.507 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 47.2 | 99.8 | 191 | 7.5000 | 183.59 | 0.929 | pCi/g |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:04:39AM 6/9/2017

## Sample

Sample Name: 160-22327-A-11-C
SampleType: Sample
: 160-22327-A-11-C
Sample Collection Date: 5/11/2017 1:25:00PM

Spectrum #2 Analysis #1
Sample Weight : 1.0022g
Aliquot: N/A Aliquot Fraction: N/A

## Batch

Batch Name: 309374
AnalysisID: 699902

Analyst: 60040

## Tracer

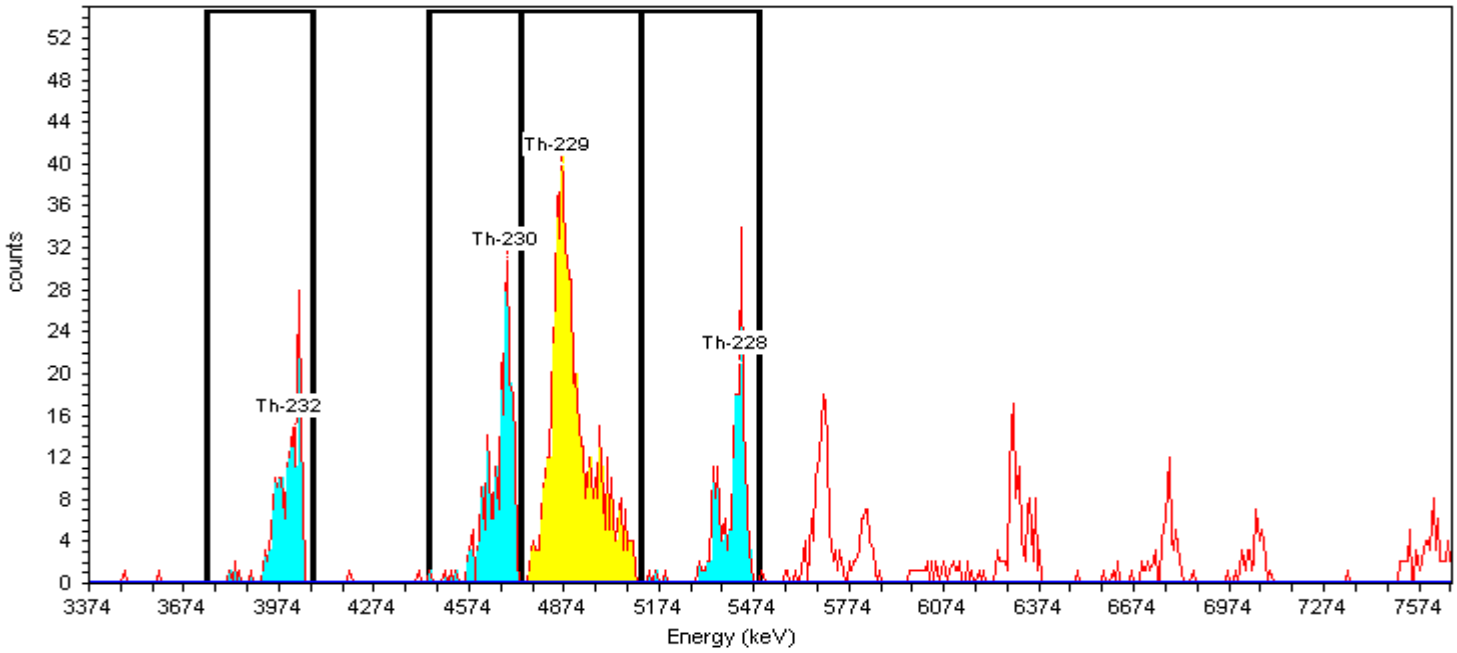
Tracer Name: Th-229_00022
Tracer Activity: 67.23 DPM/mL x (Vol.)0.10 mL = 6.72 DPM
Tracer Ref. Date: 8/6/2014 12:00:07PM

Tracer Nuclide: Th-229
Tracer Recovery: 81.22%

## Acquisition

Detector: AV79
Serial Number: 46-033Q5
Acquisition Start Date: 6/8/2017 7:02:59PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 5/22/2017 8:35:31AM
Background Info: Sample: ICB;AV79; Det: AV79; Spectrum #1; May-22-2017 08:35

Calibration Name: IC-8874;AV79-20160727
Calibration Date: 8/25/2016 2:33:26PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$
Efficiency: 26.87% +/- 0.38% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 6/7/2017 6:08:57PM
MDA Constants: Kα = 1.65 , Kβ = 1.65

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for tailing. 06/09/2017 ALD

## Nuclide Summary (ROI)

| Nuclide | Peak Energy keV | Peak Expected keV | Peak Diff keV | ROI Start keV | ROI End keV | FWHM keV | B.R. % | Gross Counts | Bkgd Counts | Net Counts | Activity | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Th-232** | 3999.0 | 4,010.0 | -11.0 | 3743.0 | 4072.0 | 17.2 | 100.2 | 179 | 0.0000 | 179.00 | 0.920 | pCi/g |
| **Th-230** | 4688.0 | 4,687.5 | 0.5 | 4448.3 | 4739.1 | 38.9 | 99.7 | 241 | 1.2500 | 239.75 | 1.238 | pCi/g |
| **Th-229** | 4848.0 | 4,845.3 | 2.7 | 4739.1 | 5119.5 | 82.2 | 99.6 | 585 | 0.4167 | 584.58 | 2.454 | pCi/g |
| **Th-228** | 5420.0 | 5,423.3 | -3.3 | 5119.0 | 5493.0 | 47.2 | 99.8 | 191 | 7.5000 | 183.59 | 0.949 | pCi/g |

# Daily Checks

# Alpha Spectroscopy Daily Pulser Check

## Analysis Date: 06/08/17

| | | Gross Counts | | | FWHM (keV) | | | Pulser Center | | | Energy (keV) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Detector | Analysis Date | Result | Criteria | P/F | Result | Criteria | P/F | Result | Criteria | P/F | Result | Criteria | P/F |
| AV64 | 06/08/17 14:01 | 7188 | 6862.2 - 7584.6 | Pass | 15.5 | 10 - 20 | Pass | 225.0 | 220.0 - 230.0 | Pass | 5045 | 5004.8 - 5084.8 | Pass |
| AV65 | 06/08/17 14:01 | 7184 | 6859.6 - 7581.7 | Pass | 15.9 | 10 - 20 | Pass | 223.0 | 218.2 - 228.2 | Pass | 5030 | 4991.3 - 5071.3 | Pass |
| AV66 | 06/08/17 14:01 | 7193 | 6868.0 - 7591.0 | Pass | 14.2 | 10 - 20 | Pass | 224.0 | 218.2 - 228.2 | Pass | 5038 | 4991.3 - 5071.3 | Pass |
| AV68 | 06/08/17 14:01 | 7255 | 7086.2 - 7832.1 | Pass | 13.2 | 10 - 20 | Pass | 223.0 | 218.3 - 228.3 | Pass | 5030 | 4992.0 - 5072.0 | Pass |
| AV70 | 06/08/17 14:01 | 7442 | 7081.3 - 7826.7 | Pass | 15.9 | 10 - 20 | Pass | 216.1 | 212.0 - 222.0 | Pass | 4979 | 4945.2 - 5025.2 | Pass |
| AV71 | 06/08/17 14:01 | 7444 | 7078.8 - 7823.9 | Pass | 15.2 | 10 - 20 | Pass | 214.1 | 209.0 - 219.0 | Pass | 4964 | 4922.6 - 5002.6 | Pass |
| AV72 | 06/08/17 14:01 | 7449 | 7079.4 - 7824.6 | Pass | 13.7 | 10 - 20 | Pass | 216.0 | 209.9 - 219.9 | Pass | 4978 | 4929.9 - 5009.9 | Pass |
| AV73 | 06/08/17 14:01 | 7447 | 6928.4 - 7657.7 | Pass | 13.4 | 10 - 20 | Pass | 223.0 | 216.1 - 226.1 | Pass | 5030 | 4975.9 - 5055.9 | Pass |
| AV74 | 06/08/17 14:01 | 7016 | 6852.9 - 7574.3 | Pass | 13.2 | 10 - 20 | Pass | 224.9 | 219.2 - 229.2 | Pass | 5044 | 4999.1 - 5079.1 | Pass |
| AV75 | 06/08/17 14:01 | 7371 | 6998.8 - 7735.5 | Pass | 12.8 | 10 - 20 | Pass | 222.0 | 217.0 - 227.0 | Pass | 5023 | 4982.5 - 5062.5 | Pass |
| AV76 | 06/08/17 14:01 | 7476 | 7102.4 - 7850.0 | Pass | 11.5 | 10 - 20 | Pass | 234.0 | 229.0 - 239.0 | Pass | 5112 | 5072.2 - 5152.2 | Pass |
| AV79 | 06/08/17 14:01 | 7541 | 7158.6 - 7912.2 | Pass | 14.2 | 10 - 20 | Pass | 221.9 | 217.0 - 227.0 | Pass | 5022 | 4982.8 - 5062.8 | Pass |

## Analysis Date: 06/10/17

| | | Gross Counts | | | FWHM (keV) | | | Pulser Center | | | Energy (keV) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Detector | Analysis Date | Result | Criteria | P/F | Result | Criteria | P/F | Result | Criteria | P/F | Result | Criteria | P/F |
| AV150 | 06/10/17 09:44 | 5989 | 5715.1 - 6316.7 | Pass | 15.6 | 10 - 20 | Pass | 224.2 | 219.0 - 229.0 | Pass | 5039 | 4997.6 - 5077.6 | Pass |
| AV155 | 06/10/17 09:44 | 5915 | 5704.2 - 6304.6 | Pass | 12.1 | 10 - 20 | Pass | 222.0 | 215.9 - 225.9 | Pass | 5023 | 4974.5 - 5054.5 | Pass |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:14:50PM 6/8/2017

## Sample

Sample Name: Pulser;AV64
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

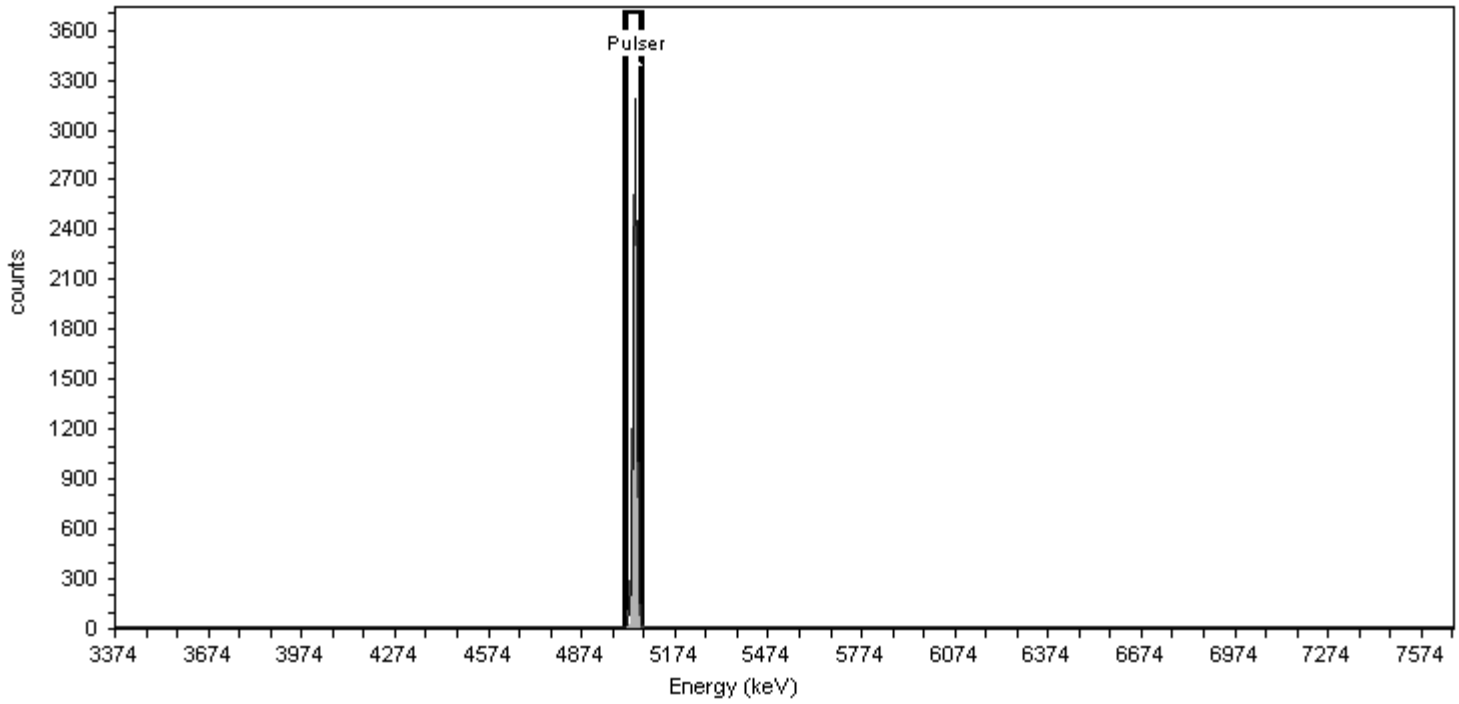
## Acquisition

Detector: AV64 , SN: 43-028v3
Acquisition Start Date: 6/8/2017 2:01:38PM
Live Time: 1.00 min.
Real Time: 1.01 min.
Calibration Name: IC-8875;AV64-20160831
Calibration Date: 8/31/2016 12:49:19PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.50% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5045.028 | 5018.602 | 5071.454 | 15.53 | 7,100.34 | 7,188.45 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:15:19PM 6/8/2017

## Sample

Sample Name: Pulser;AV65
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

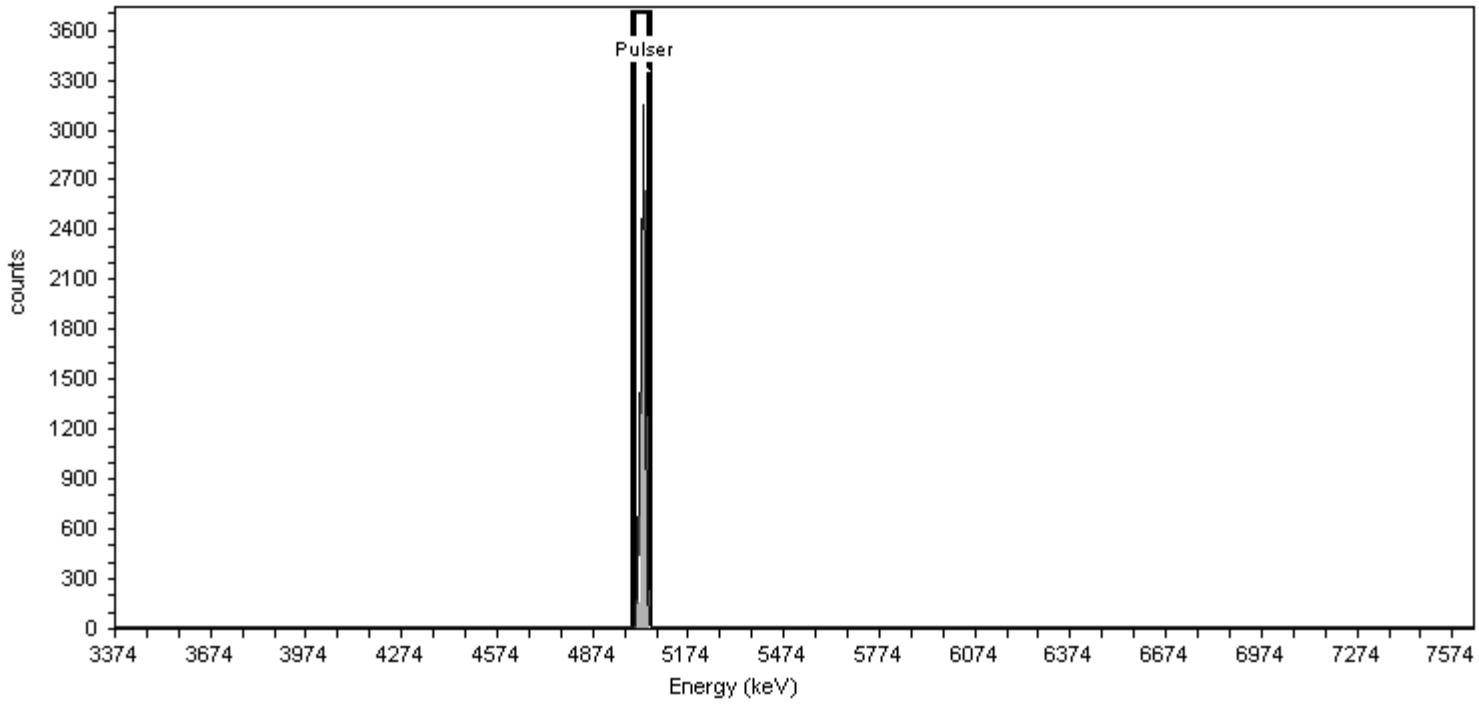
## Acquisition

Detector: AV65 , SN: 44-049JJ1
Acquisition Start Date: 6/8/2017 2:01:38PM
Live Time: 1.00 min.
Real Time: 1.01 min.
Calibration Name: IC-8876;AV65-20160831a
Calibration Date: 8/31/2016 12:49:33PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 23.43% +/- 0.28% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5029.752 | 5002.730 | 5056.773 | 15.87 | 7,185.30 | 7,184.44 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:15:27PM 6/8/2017

## Sample

Sample Name: Pulser;AV66
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

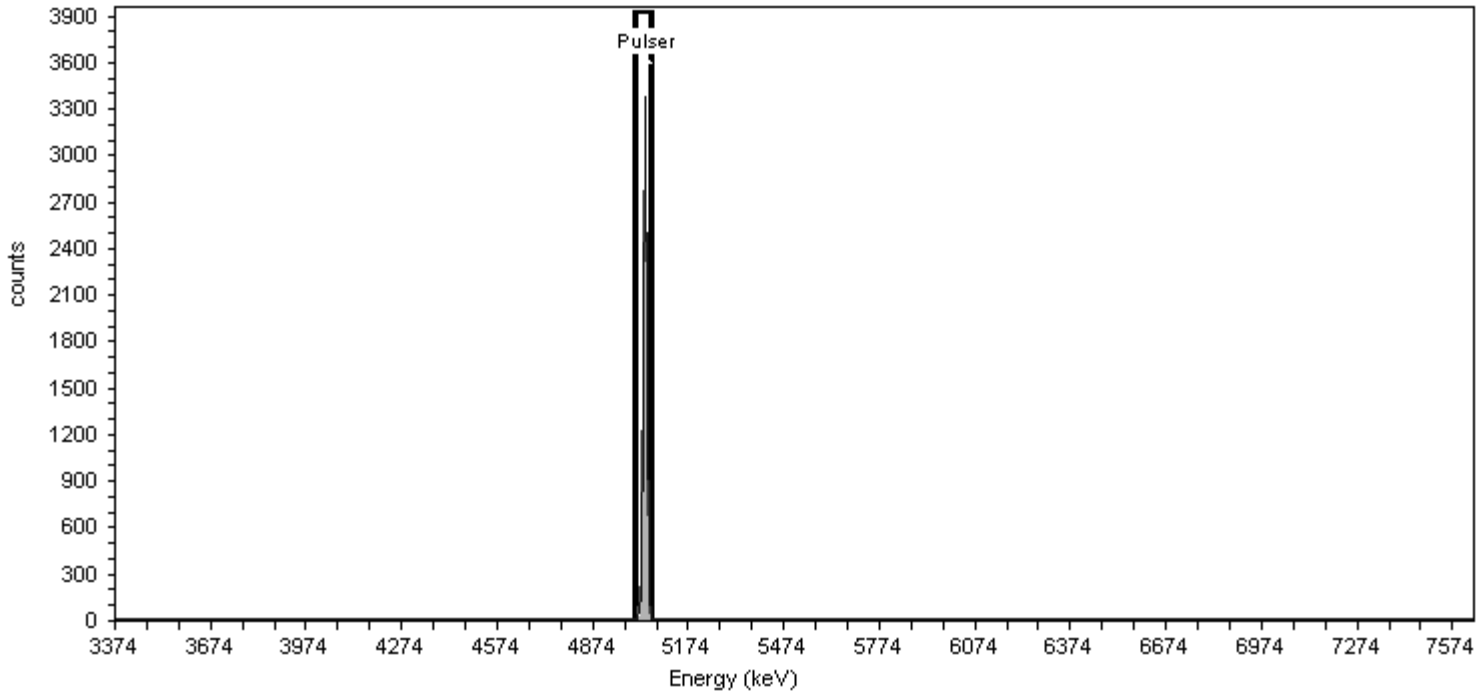
## Acquisition

Detector: AV66 , SN: 48-158EE2
Acquisition Start Date: 6/8/2017 2:01:39PM
Live Time: 1.00 min.
Real Time: 1.01 min.
Calibration Name: IC-8877;AV66-20160831a
Calibration Date: 8/31/2016 12:49:47PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 25.06% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5037.665 | 5013.521 | 5061.809 | 14.18 | 6,880.65 | 7,193.01 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:15:36PM 6/8/2017

## Sample

Sample Name: Pulser;AV68
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

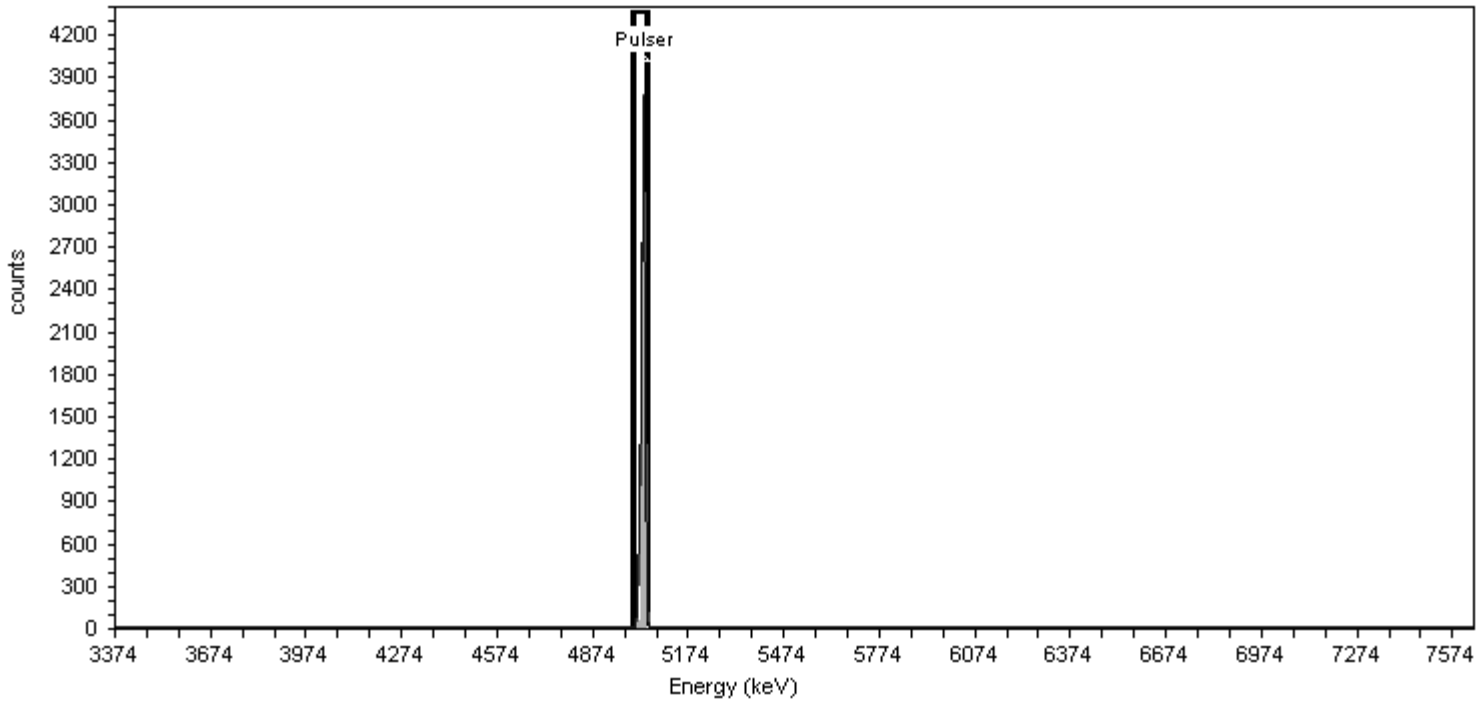
## Acquisition

Detector: AV68 , SN: 50-60-V2
Acquisition Start Date: 6/8/2017 2:01:40PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-9520;AV68-20160831
Calibration Date: 8/31/2016 12:50:01PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$

Efficiency: 24.78% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5029.622 | 5007.220 | 5052.023 | 13.16 | 7,121.80 | 7,254.55 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:07:59PM 6/8/2017

## Sample

Sample Name: Pulser;AV70
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

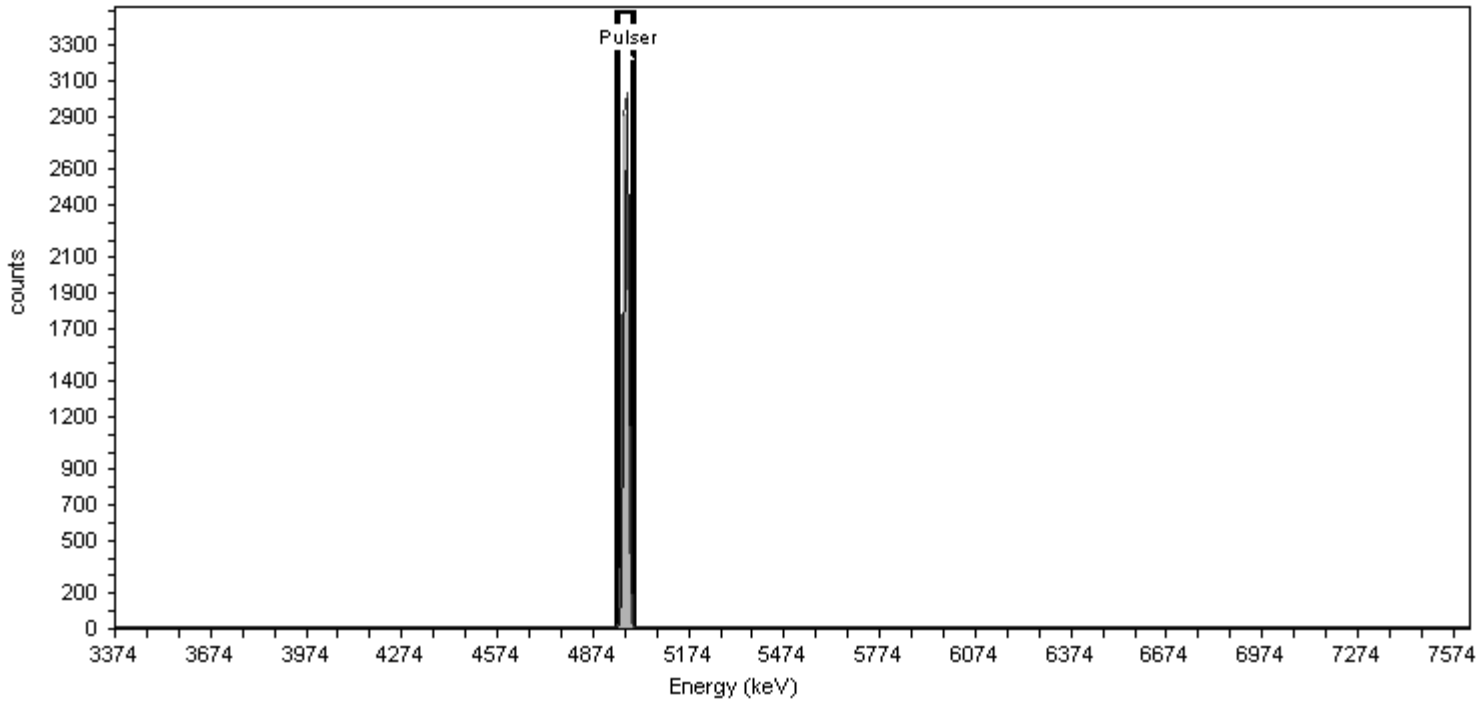
## Acquisition

Detector: AV70 , SN: 48-158FF1
Acquisition Start Date: 6/8/2017 2:01:43PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-9792;AV70-20160830
Calibration Date: 8/31/2016 8:44:32AM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 25.41% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 4978.773 | 4951.707 | 5005.840 | 15.90 | 6,910.82 | 7,441.59 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:08:20PM 6/8/2017

## Sample

Sample Name: Pulser;AV71
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

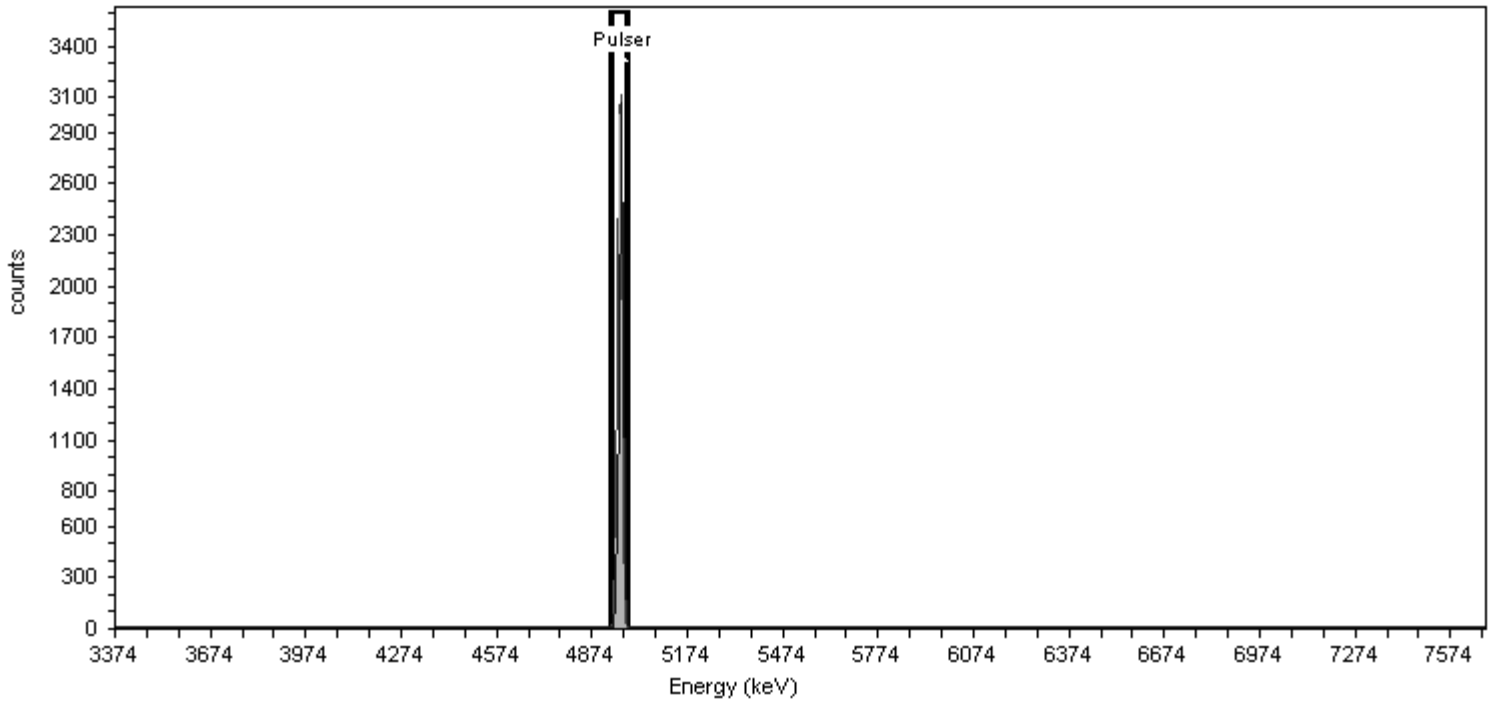
## Acquisition

Detector: AV71 , SN: 48-158EE6
Acquisition Start Date: 6/8/2017 2:01:45PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-9793;AV71-20160830
Calibration Date: 8/31/2016 8:44:46AM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 25.11% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 4963.949 | 4938.148 | 4989.749 | 15.16 | 6,765.31 | 7,444.13 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:08:29PM 6/8/2017

## Sample

Sample Name: Pulser;AV72
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

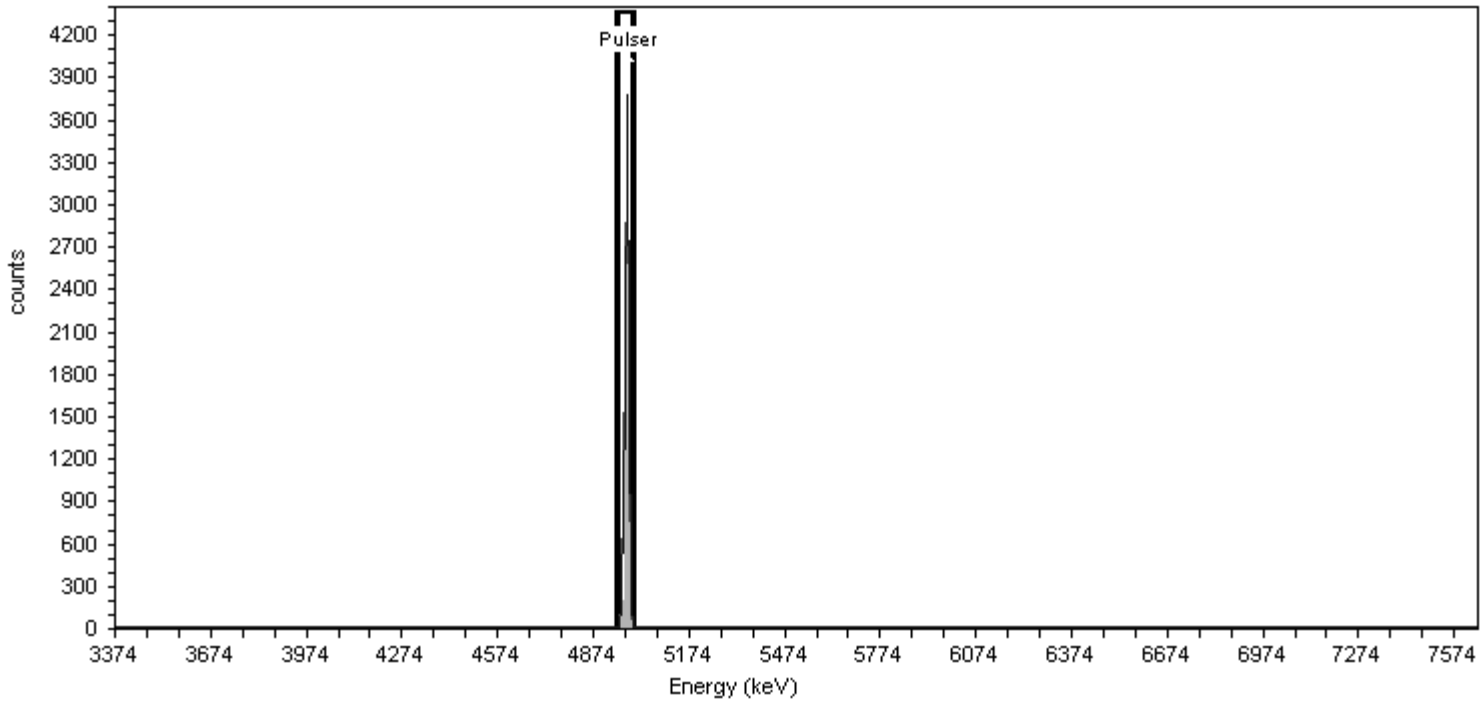
## Acquisition

Detector: AV72 , SN: 48-05a21
Acquisition Start Date: 6/8/2017 2:01:47PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-9794;AV72-20160830
Calibration Date: 8/31/2016 8:45:00AM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.48% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 4977.955 | 4954.556 | 5001.354 | 13.75 | 7,444.98 | 7,449.34 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:08:38PM 6/8/2017

## Sample

Sample Name: Pulser;AV73
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

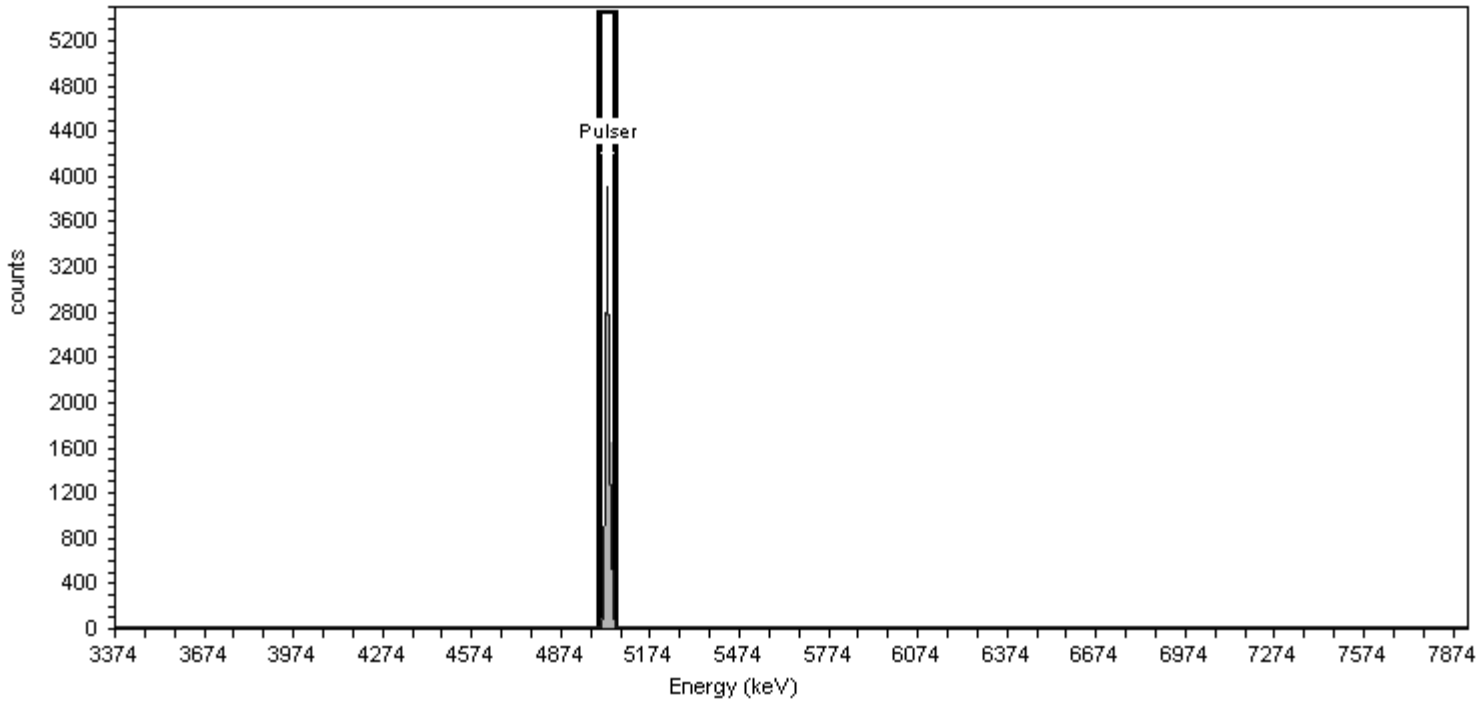
## Acquisition

Detector: AV73 , SN: 46-03321
Acquisition Start Date: 6/8/2017 2:01:48PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-9795;AV73-20160901
Calibration Date: 9/1/2016 12:03:04PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 26.51% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5029.957 | 5007.153 | 5052.760 | 13.40 | 7,517.95 | 7,446.75 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:08:47PM 6/8/2017

## Sample

Sample Name: Pulser;AV74
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017b
Description:

Analyst: 60040

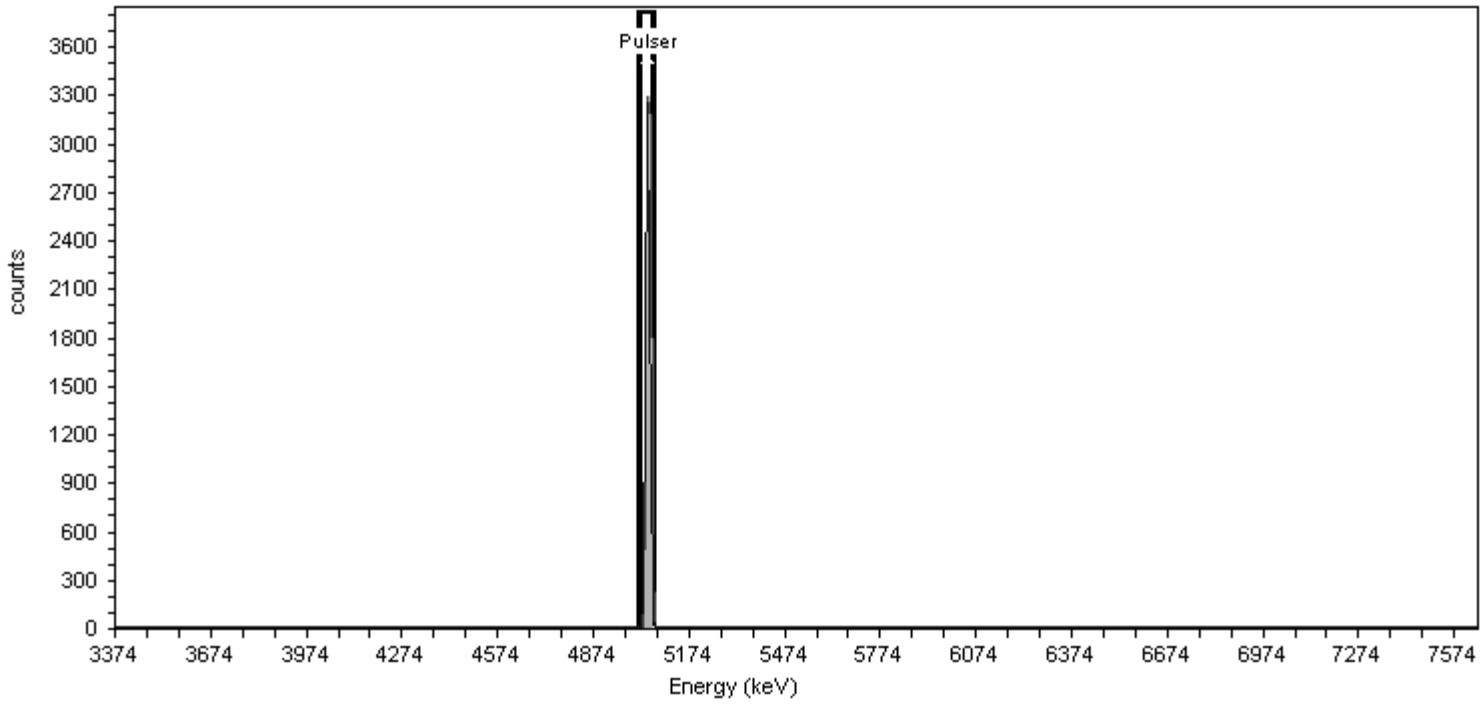
## Acquisition

Detector: AV74 , SN: 50-051C6
Acquisition Start Date: 6/8/2017 2:01:49PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-9817;AV74-20160830a
Calibration Date: 8/31/2016 8:45:45AM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.52% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5044.020 | 5021.573 | 5066.467 | 13.19 | 6,231.10 | 7,016.40 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:08:56PM 6/8/2017

## Sample

Sample Name: Pulser;AV75
Comment:

Spectrum #5 Analysis #1

## Batch

Batch Name: May2017c
Description:

Analyst: 60040

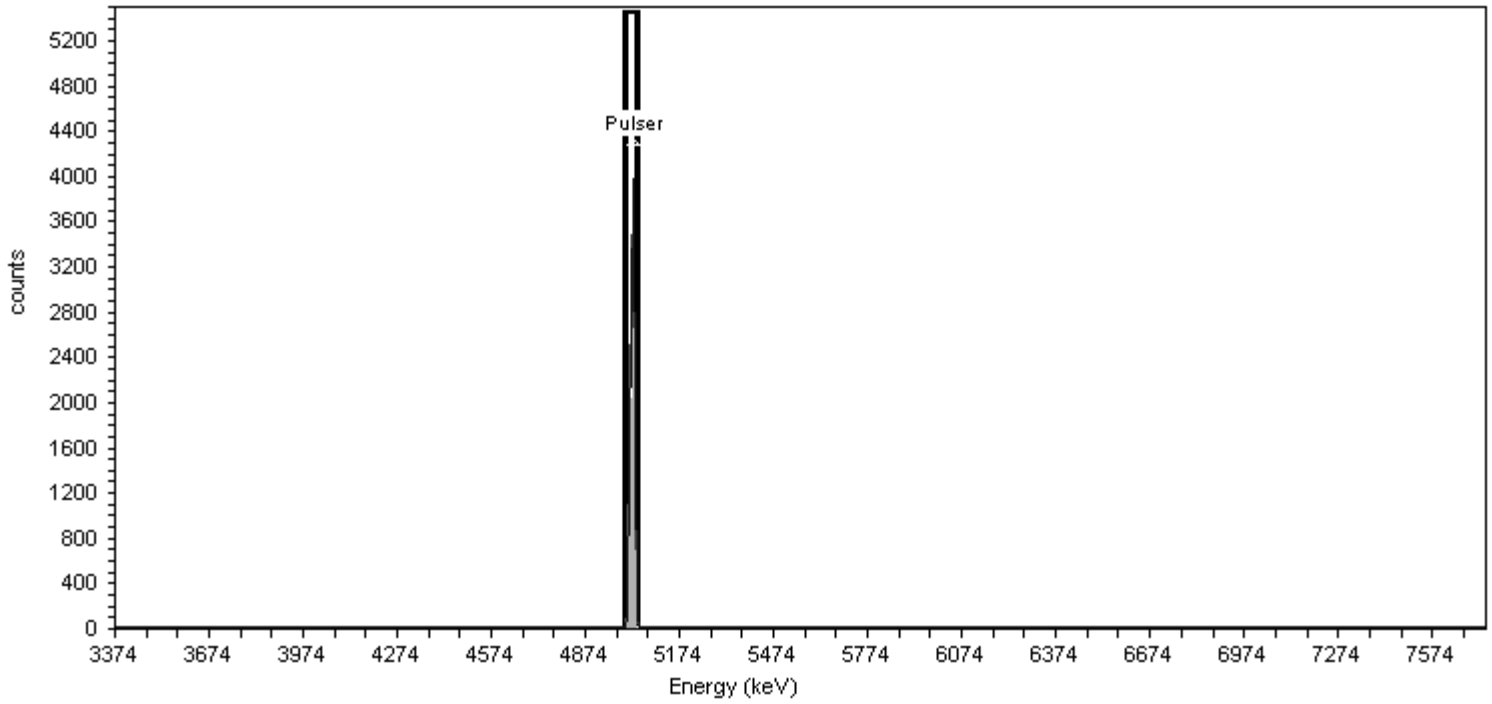
## Acquisition

Detector: AV75 , SN: 51-082B4
Acquisition Start Date: 6/8/2017 2:01:50PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-9884;AV75-20160727
Calibration Date: 8/25/2016 2:31:50PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$

Efficiency: 23.79% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5022.674 | 5000.854 | 5044.493 | 12.82 | 7,305.18 | 7,371.25 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:09:05PM 6/8/2017

## Sample

Sample Name: Pulser;AV76
Comment:

Spectrum #5 Analysis #1

## Batch

Batch Name: May2017c
Description:

Analyst: 60040

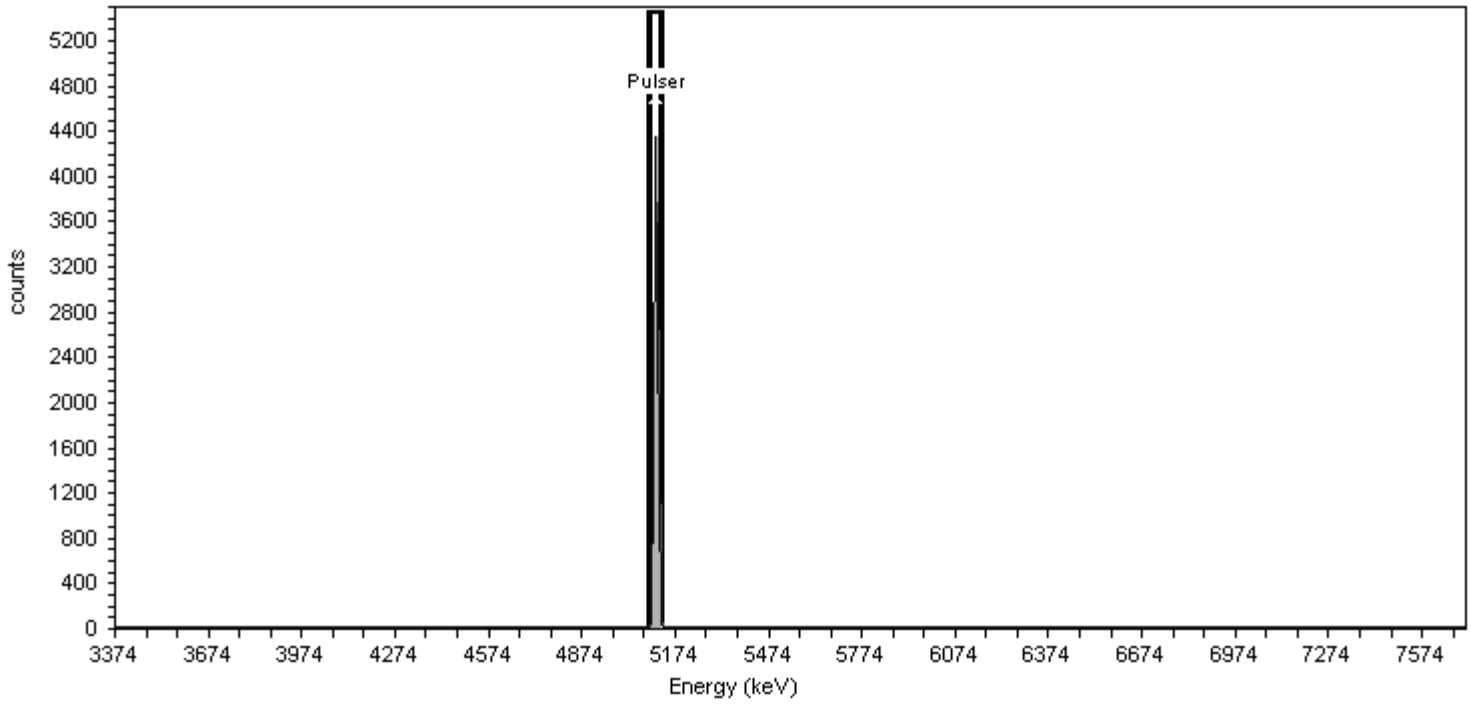
## Acquisition

Detector: AV76 , SN: 50-060-f4
Acquisition Start Date: 6/8/2017 2:01:53PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-9885;AV76-20160727
Calibration Date: 8/25/2016 2:32:23PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$

Efficiency: 25.09% +/- 0.37% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5111.889 | 5092.260 | 5131.519 | 11.53 | 7,192.18 | 7,475.57 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:09:24PM 6/8/2017

## Sample

Sample Name: Pulser;AV79
Comment:

Spectrum #4 Analysis #1

## Batch

Batch Name: May2017c
Description:

Analyst: 60040

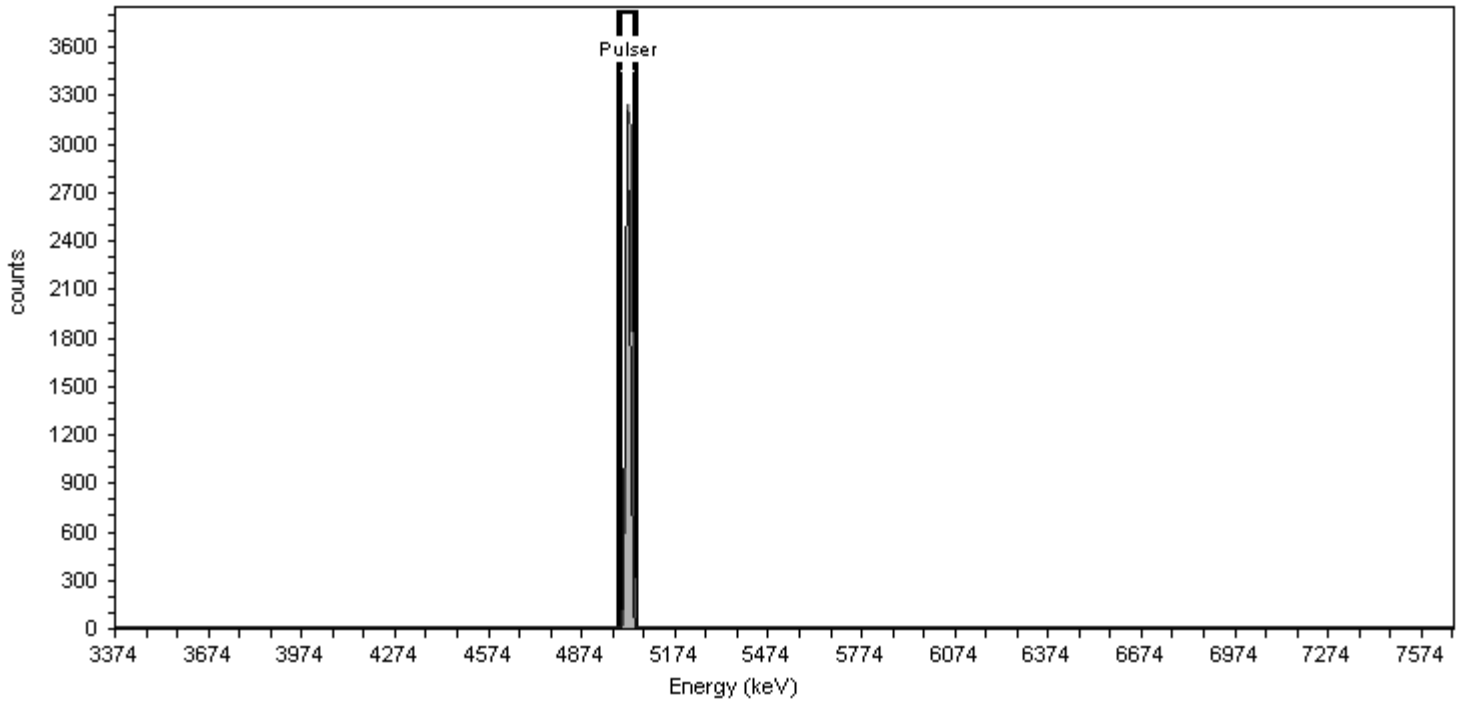
## Acquisition

Detector: AV79 , SN: 46-033Q5
Acquisition Start Date: 6/8/2017 2:01:56PM
Live Time: 1.00 min.
Real Time: 1.02 min.
Calibration Name: IC-8874;AV79-20160727
Calibration Date: 8/25/2016 2:33:26PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$

Efficiency: 26.87% +/- 0.38% TPU(2 sigma)




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5021.714 | 4997.551 | 5045.878 | 14.20 | 6,591.92 | 7,541.25 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:06:05AM 6/10/2017

## Sample

Sample Name: Pulser;AV150
Comment:

Spectrum #24 Analysis #1

## Batch

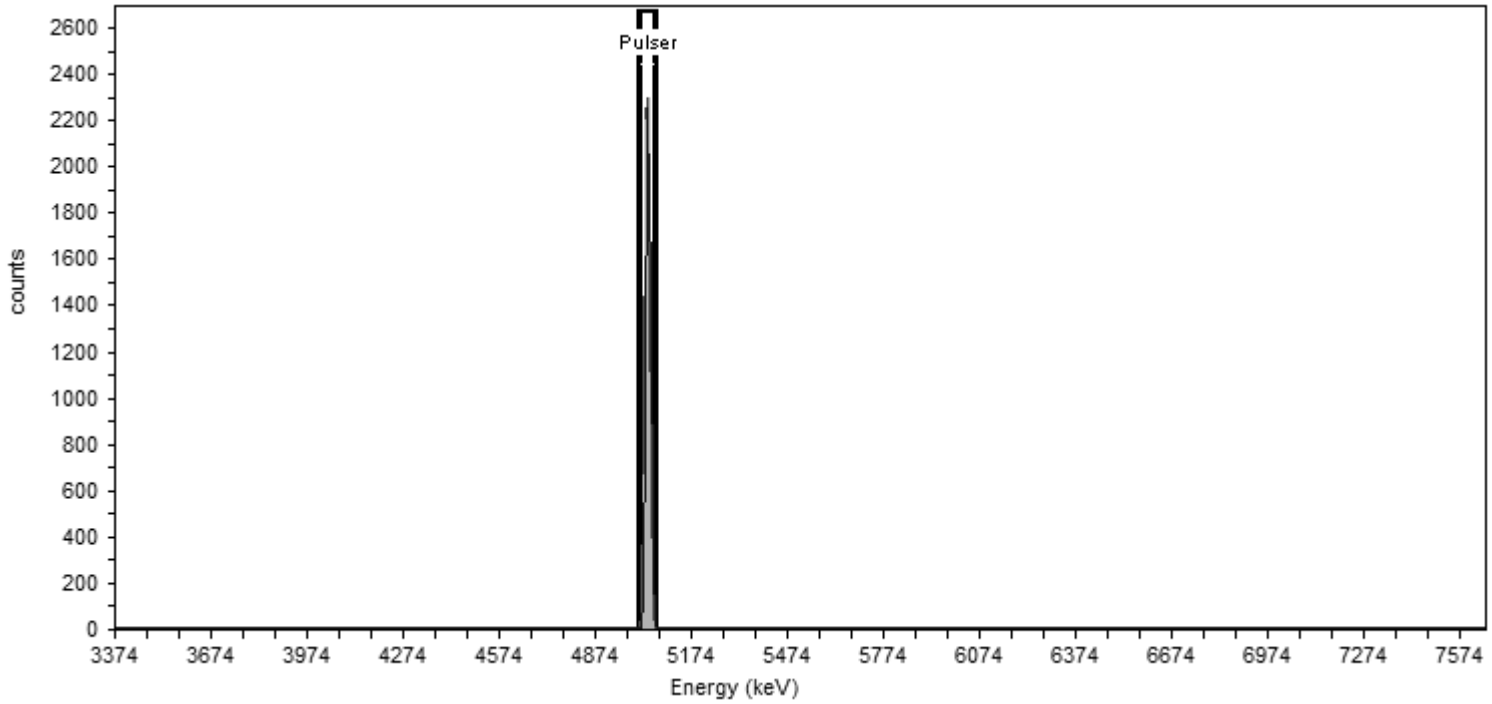
Batch Name: May2017a
Description:

## Acquisition

Detector: AV150 , SN: 50-05/R4
Acquisition Start Date: 6/10/2017 9:44:54AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-8876;AV150-20161110
Calibration Date: 11/11/2016 2:36:42PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5038.721 | 5012.122 | 5065.321 | 15.63 | 5,137.86 | 5,989.22 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Pulser Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
10:06:16AM 6/10/2017

## Sample

Sample Name: Pulser;AV155
Comment:

Spectrum #24 Analysis #1

## Batch

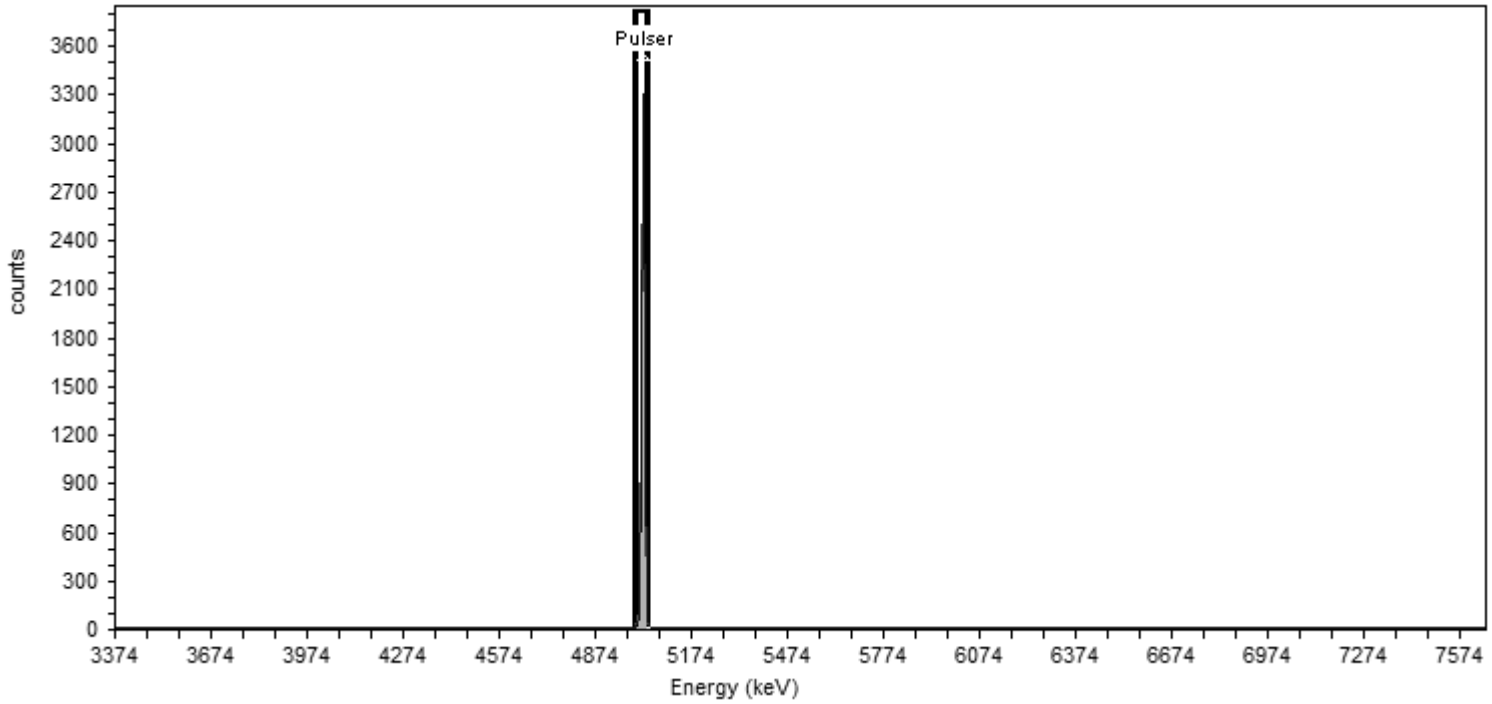
Batch Name: May2017a
Description:

## Acquisition

Detector: AV155 , SN: 50-05/II1
Acquisition Start Date: 6/10/2017 9:44:57AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-9793;AV155-20161110
Calibration Date: 11/11/2016 2:37:33PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$




## General Analysis

Analysis Method: Peak Fit Analysis

## Nuclide Summary (Peak Search)

| Nuclide | Peak Energy keV | Start Energy keV | End Energy keV | FWHM keV | Fit Area | Gross Counts |
|---|---|---|---|---|---|---|
| Pulser | 5022.656 | 5002.019 | 5043.294 | 12.12 | 5,756.62 | 5,915.46 |

# Initial Calibrations

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:49:22PM 8/31/2016

## Calibration

Sample Name: IC-8875;AV64-20160831
Description:
Detector: AV64

Calibration Date: 8/31/2016 12:49:19PM
Analyst: 60040

## Source Info

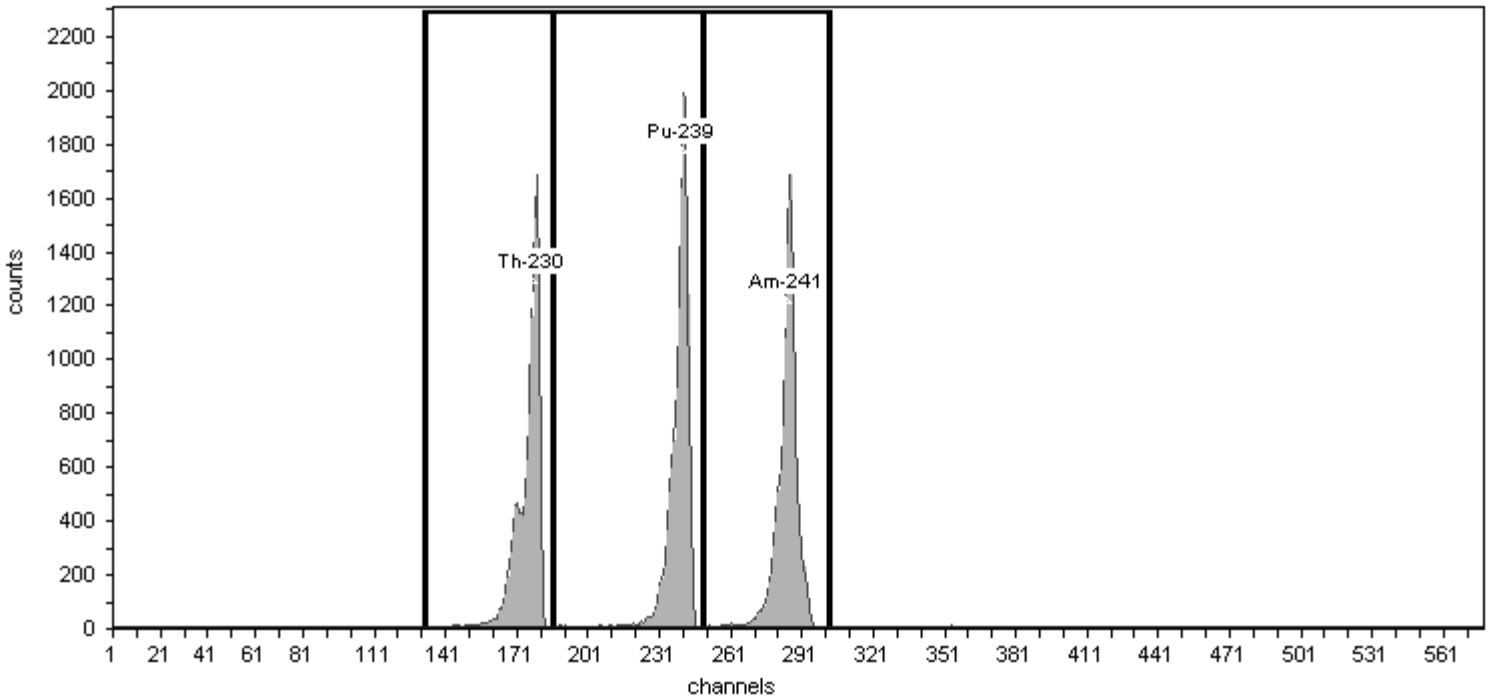
Certificate ID: 82234-334
Prepared by: Analytics

Certification Date: 6/2/2010 12:00:00PM
Description:

## Acquisition

Detector: AV64 , SN: 43-028v3
Acquisition Start Date: 8/31/2016 9:16:20AM
Live Time: 140.02 min.
Real Time: 140.12 min.
Efficiency: 24.50% +/- 0.35% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 11,289.00 | 80.63 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 12,771.00 | 91.21 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 11,429.00 | 81.63 |

FWHM<100 keV
for all peaks.
08/31/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:49:37PM 8/31/2016

## Calibration

Sample Name: IC-8876;AV65-20160831a
Description:
Detector: AV65

Calibration Date: 8/31/2016 12:49:33PM
Analyst: 60040

## Source Info

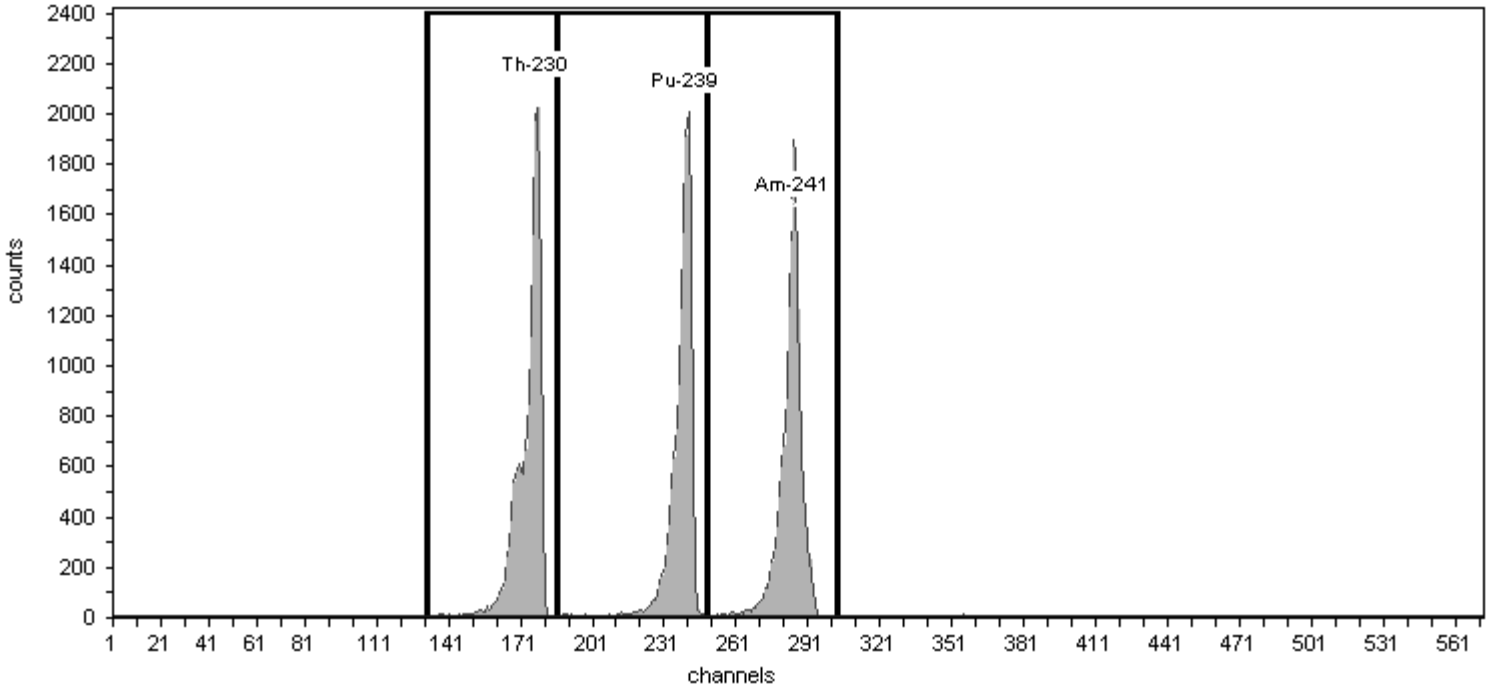
Certificate ID: 82235-334
Prepared by: Analytics

Certification Date: 6/4/2010 12:00:00PM
Description:

## Acquisition

Detector: AV65 , SN: 44-049JJ1
Acquisition Start Date: 8/31/2016 9:31:41AM
Live Time: 140.00 min.
Real Time: 140.09 min.
Efficiency: 23.43% +/- 0.28% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 14,538.00 | 103.84 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 13,502.00 | 96.44 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 14,225.00 | 101.61 |

FWHM<100 keV
for all peaks.
08/31/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:49:51PM 8/31/2016

## Calibration

Sample Name: IC-8877;AV66-20160831a
Description:
Detector: AV66

Calibration Date: 8/31/2016 12:49:47PM
Analyst: 60040

## Source Info

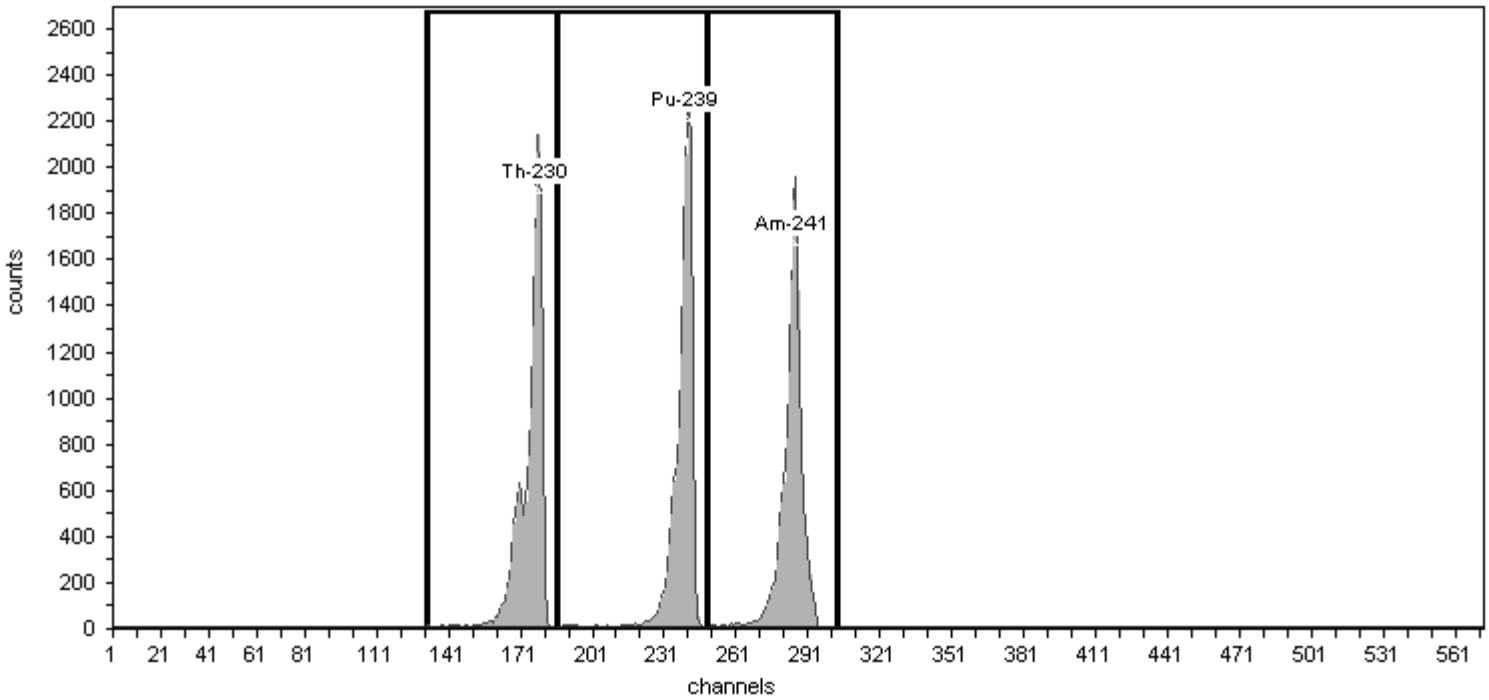
Certificate ID: 82236-334
Prepared by: Analytics

Certification Date: 6/2/2010 12:00:00PM
Description:

## Acquisition

Detector: AV66 , SN: 48-158EE2
Acquisition Start Date: 8/31/2016 9:32:05AM
Live Time: 140.00 min.
Real Time: 140.09 min.
Efficiency: 25.06% +/- 0.30% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 14,419.00 | 102.99 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 14,750.00 | 105.36 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 14,306.00 | 102.19 |

FWHM<100 keV
for all peaks.
08/31/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:50:05PM 8/31/2016

## Calibration

Sample Name: IC-9520;AV68-20160831
Description:
Detector: AV68

Calibration Date: 8/31/2016 12:50:01PM
Analyst: 60040

## Source Info

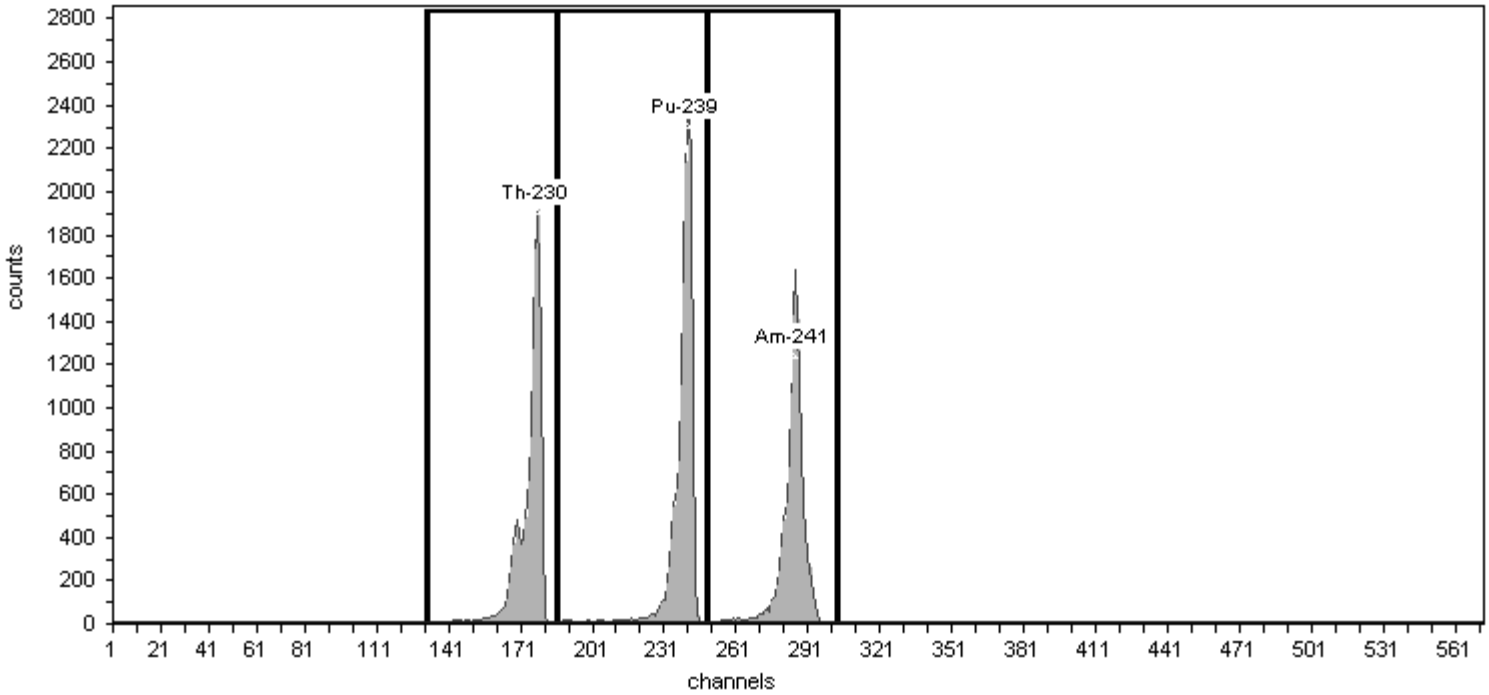
Certificate ID: 82237-334
Prepared by: Analytics

Certification Date: 6/1/2010 12:00:00PM
Description:

## Acquisition

Detector: AV68 , SN: 50-60-V2
Acquisition Start Date: 8/31/2016 9:15:17AM
Live Time: 140.00 min.
Real Time: 140.01 min.
Efficiency: 24.78% +/- 0.35% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 11,767.00 | 84.05 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 13,999.00 | 99.99 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 11,368.00 | 81.20 |

FWHM<100 keV
for all peaks.
08/31/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:44:36AM 8/31/2016

## Calibration

Sample Name: IC-9792;AV70-20160830
Description:
Detector: AV70

Calibration Date: 8/31/2016 8:44:32AM
Analyst: 60040

## Source Info

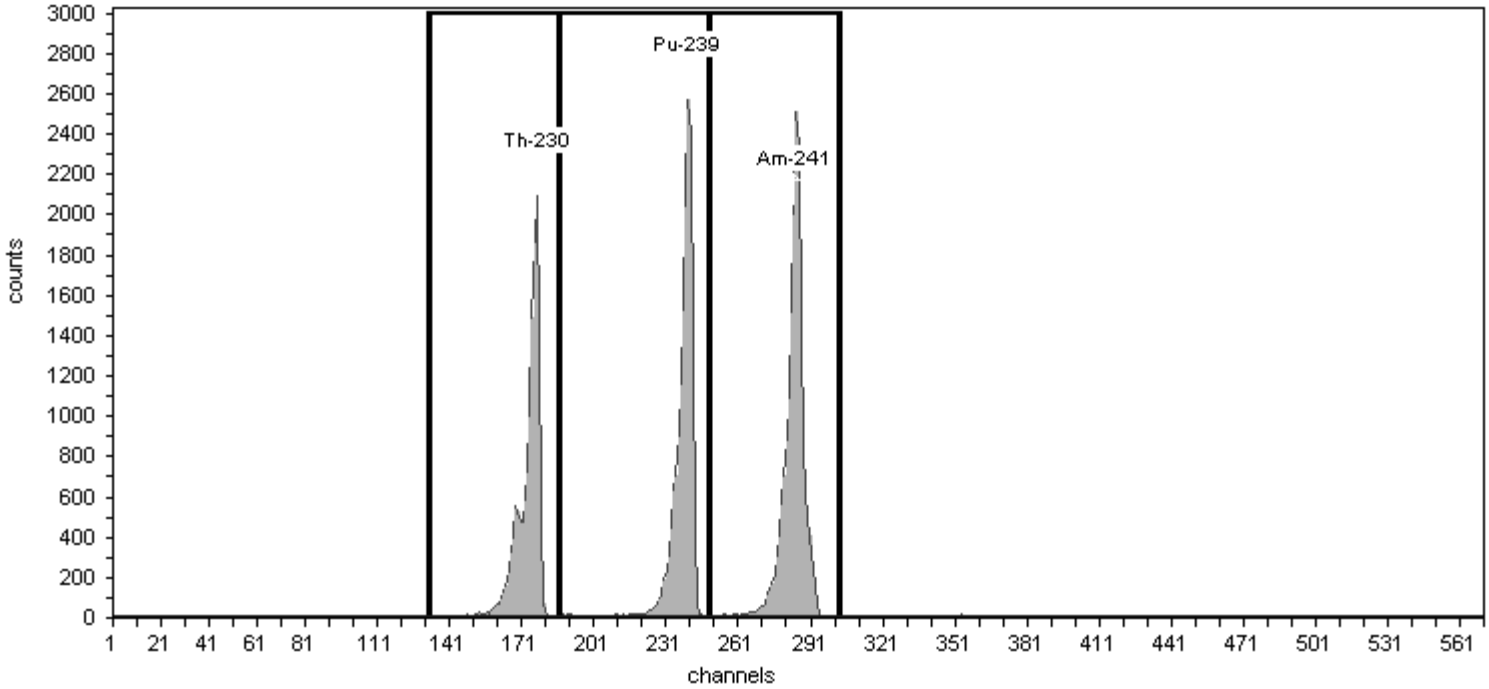
Certificate ID: 82240-334
Prepared by: Analytics

Certification Date: 6/8/2010 12:00:00PM
Description:

## Acquisition

Detector: AV70 , SN: 48-158FF1
Acquisition Start Date: 8/30/2016 2:57:23PM
Live Time: 140.00 min.
Real Time: 140.07 min.
Efficiency: 25.41% +/- 0.30% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 13,365.00 | 95.46 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 15,436.00 | 110.26 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 17,493.00 | 124.95 |

FWHM<100 keV
for all peaks.
08/31/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:44:50AM 8/31/2016

## Calibration

Sample Name: IC-9793;AV71-20160830
Description:
Detector: AV71

Calibration Date: 8/31/2016 8:44:46AM
Analyst: 60040

## Source Info

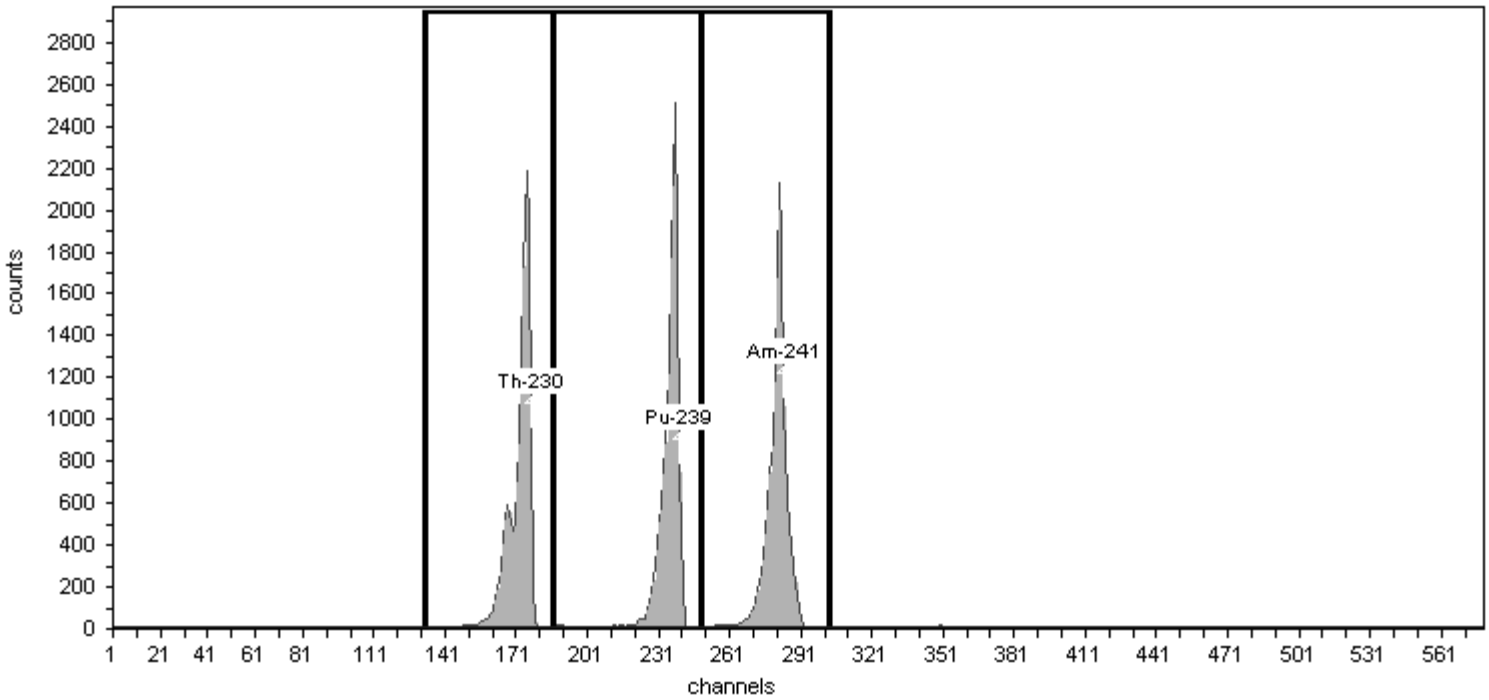
Certificate ID: 82241-334
Prepared by: Analytics

Certification Date: 6/8/2010 12:00:00PM
Description:

## Acquisition

Detector: AV71 , SN: 48-158EE6
Acquisition Start Date: 8/30/2016 2:57:42PM
Live Time: 140.00 min.
Real Time: 140.08 min.
Efficiency: 25.11% +/- 0.31% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 13,851.00 | 98.94 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 14,362.00 | 102.59 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 13,976.00 | 99.83 |

FWHM<100 keV
for all peaks.
08/31/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:45:04AM 8/31/2016

## Calibration

Sample Name: IC-9794;AV72-20160830
Description:
Detector: AV72

Calibration Date: 8/31/2016 8:45:00AM
Analyst: 60040

## Source Info

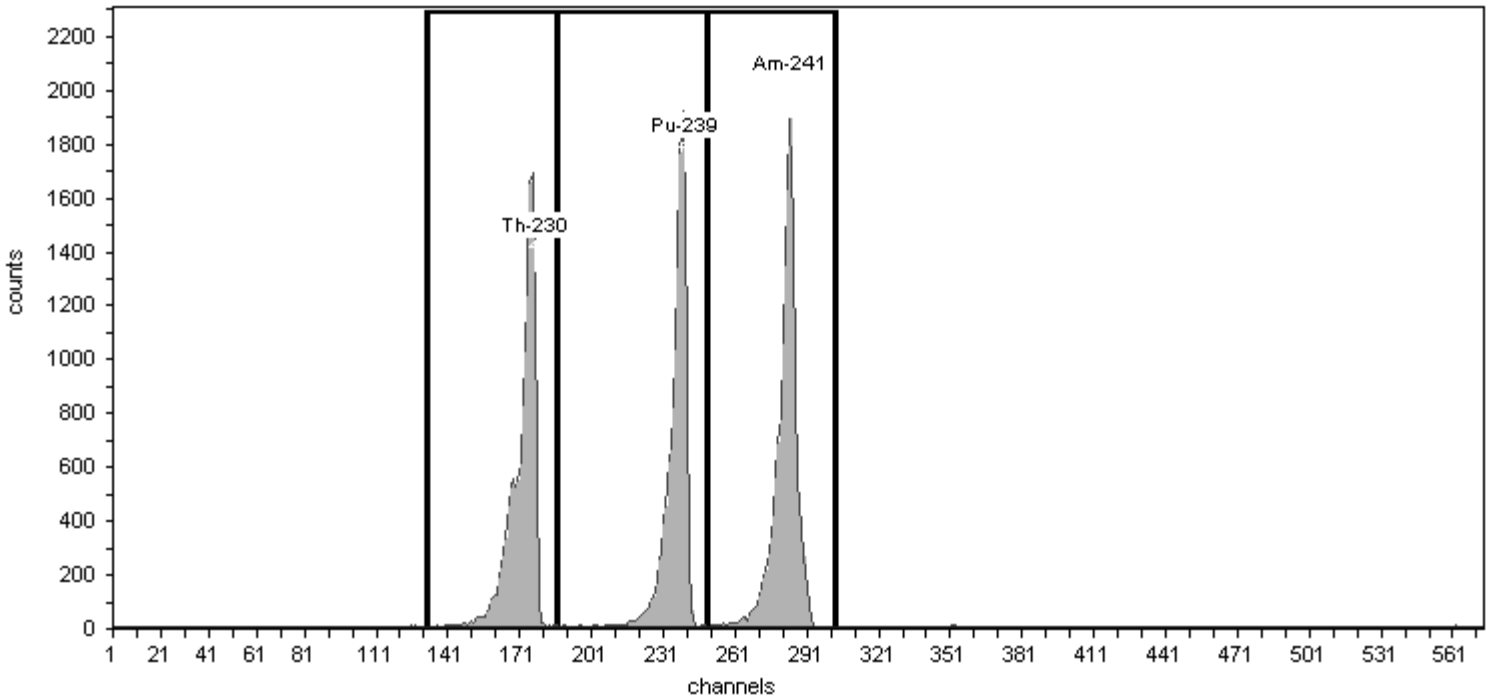
Certificate ID: 82242-334
Prepared by: Analytics

Certification Date: 6/8/2010 12:00:00PM
Description:

## Acquisition

Detector: AV72 , SN: 48-05a21
Acquisition Start Date: 8/30/2016 2:58:13PM
Live Time: 140.00 min.
Real Time: 140.08 min.
Efficiency: 24.48% +/- 0.31% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 13,462.00 | 96.16 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 13,350.00 | 95.36 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 14,475.00 | 103.39 |

FWHM<100 keV
for all peaks.
08/31/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:03:08PM 9/1/2016

## Calibration

Sample Name: IC-9795;AV73-20160901
Description:
Detector: AV73

Calibration Date: 9/1/2016 12:03:04PM
Analyst: 60040

## Source Info

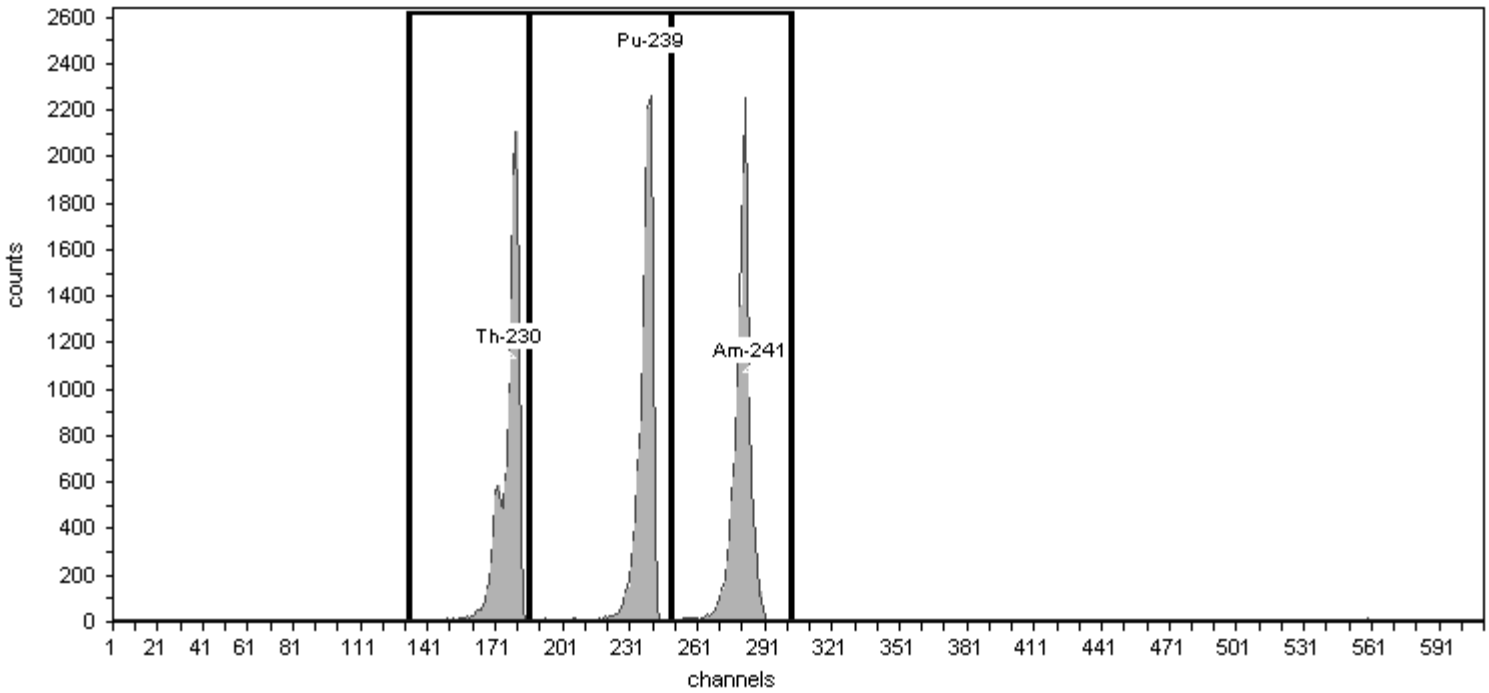
Certificate ID: 82243-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV73 , SN: 46-03321
Acquisition Start Date: 9/1/2016 8:34:59AM
Live Time: 140.00 min.
Real Time: 140.01 min.
Efficiency: 26.51% +/- 0.35% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 13,014.00 | 92.96 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 13,249.00 | 94.64 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 14,195.00 | 101.39 |

FWHM<100 keV
for all peaks.
09/01/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:45:49AM 8/31/2016

## Calibration

Sample Name: IC-9817;AV74-20160830a
Description:
Detector: AV74

Calibration Date: 8/31/2016 8:45:45AM
Analyst: 60040

## Source Info

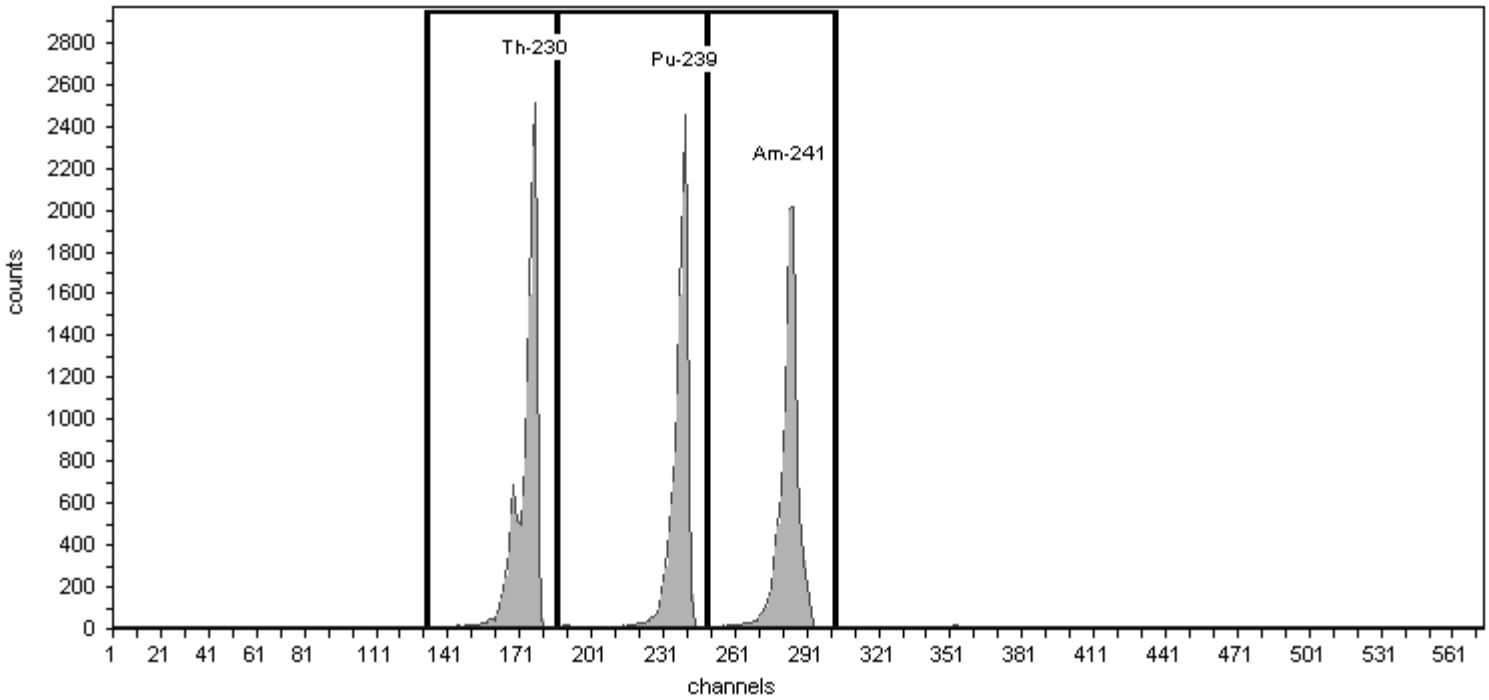
Certificate ID: 82244-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV74 , SN: 50-051C6
Acquisition Start Date: 8/30/2016 3:07:55PM
Live Time: 140.00 min.
Real Time: 140.08 min.
Efficiency: 24.52% +/- 0.30% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 15,289.00 | 109.21 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 13,793.00 | 98.52 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 13,975.00 | 99.82 |

FWHM<100 keV
for all peaks.
08/31/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:16:59PM 8/25/2016

## Calibration

Sample Name: IC-9884;AV75-20160727
Description:
Detector: AV75

Calibration Date: 8/25/2016 2:31:50PM
Analyst: 60040

## Source Info

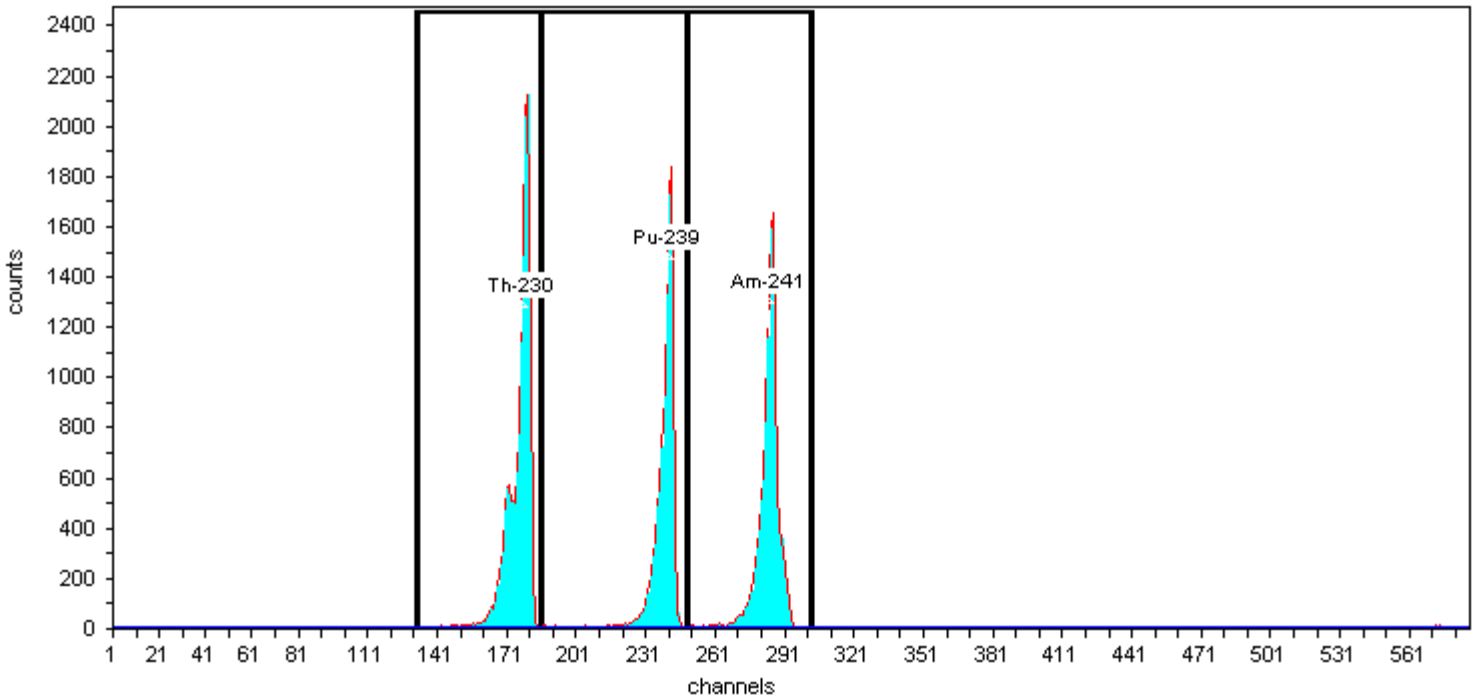
Certificate ID: 82245-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV75 , SN: 51-082B4
Acquisition Start Date: 7/27/2016 2:56:01PM
Live Time: 140.00 min.
Real Time: 140.11 min.
Efficiency: 23.79% +/- 0.35% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 13,567.00 | 96.91 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 10,702.00 | 76.44 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 10,985.00 | 78.46 |

FWHM<100 keV
for all peaks.
ALD 08/25/2016

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:17:26PM 8/25/2016

## Calibration

Sample Name: IC-9885;AV76-20160727
Description:
Detector: AV76

Calibration Date: 8/25/2016 2:32:23PM
Analyst: 60040

## Source Info

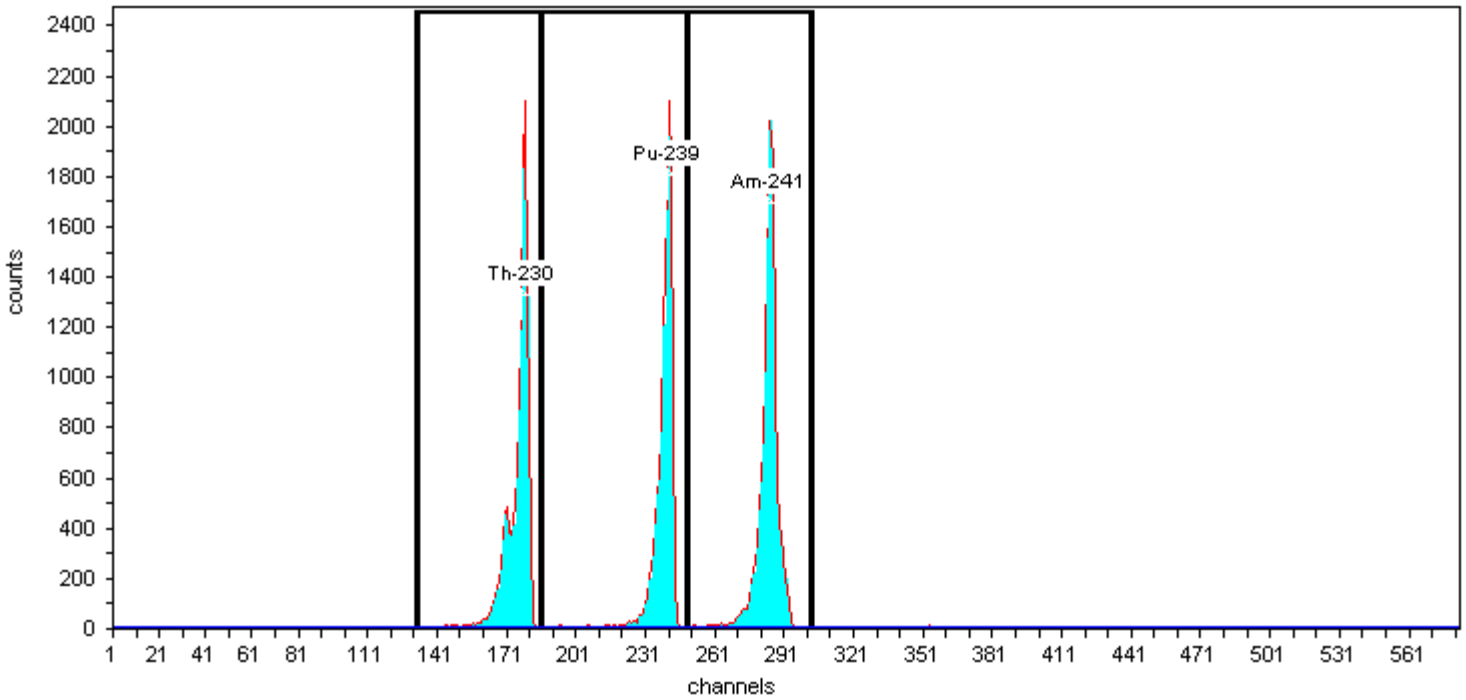
Certificate ID: 82246-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV76 , SN: 50-060-f4
Acquisition Start Date: 7/27/2016 2:56:53PM
Live Time: 140.00 min.
Real Time: 140.11 min.
Efficiency: 25.09% +/- 0.37% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 11,704.00 | 83.60 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 11,302.00 | 80.73 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 12,554.00 | 89.67 |

FWHM<100 keV
for all peaks.
ALD 08/25/2016

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:18:07PM 8/25/2016

## Calibration

Sample Name: IC-8874;AV79-20160727
Description:
Detector: AV79

Calibration Date: 8/25/2016 2:33:26PM
Analyst: 60040

## Source Info

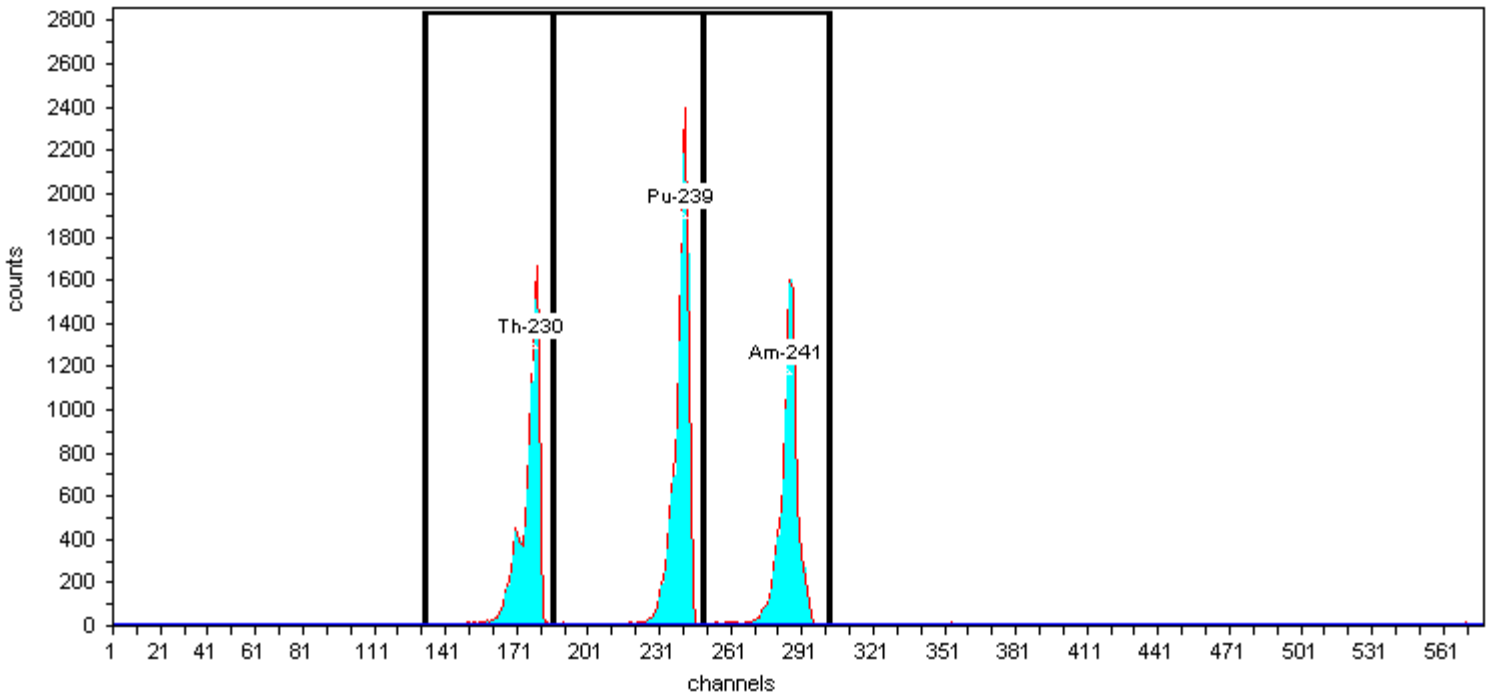
Certificate ID: 82233-334
Prepared by: Analytics

Certification Date: 6/3/2010 12:00:00PM
Description:

## Acquisition

Detector: AV79 , SN: 46-033Q5
Acquisition Start Date: 7/27/2016 2:59:36PM
Live Time: 140.00 min.
Real Time: 140.12 min.
Efficiency: 26.87% +/- 0.38% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / $Ch^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 10,857.00 | 77.55 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 14,165.00 | 101.18 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 11,257.00 | 80.41 |

FWHM<100 keV
for all peaks.
ALD 08/25/2016

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:40:26PM 11/11/2016

## Calibration

Sample Name: IC-8876;AV150-20161110
Description:
Detector: AV150

Analyst: 60040
Analysis Date: 11/11/2016 2:36:42PM
Calibration Type: Energy And Efficiency

## Source Info

Certificate ID: 82235-334
Prepared by: Analytics
Description:

Certification Date: 6/4/2010 12:00:00PM

## Acquisition

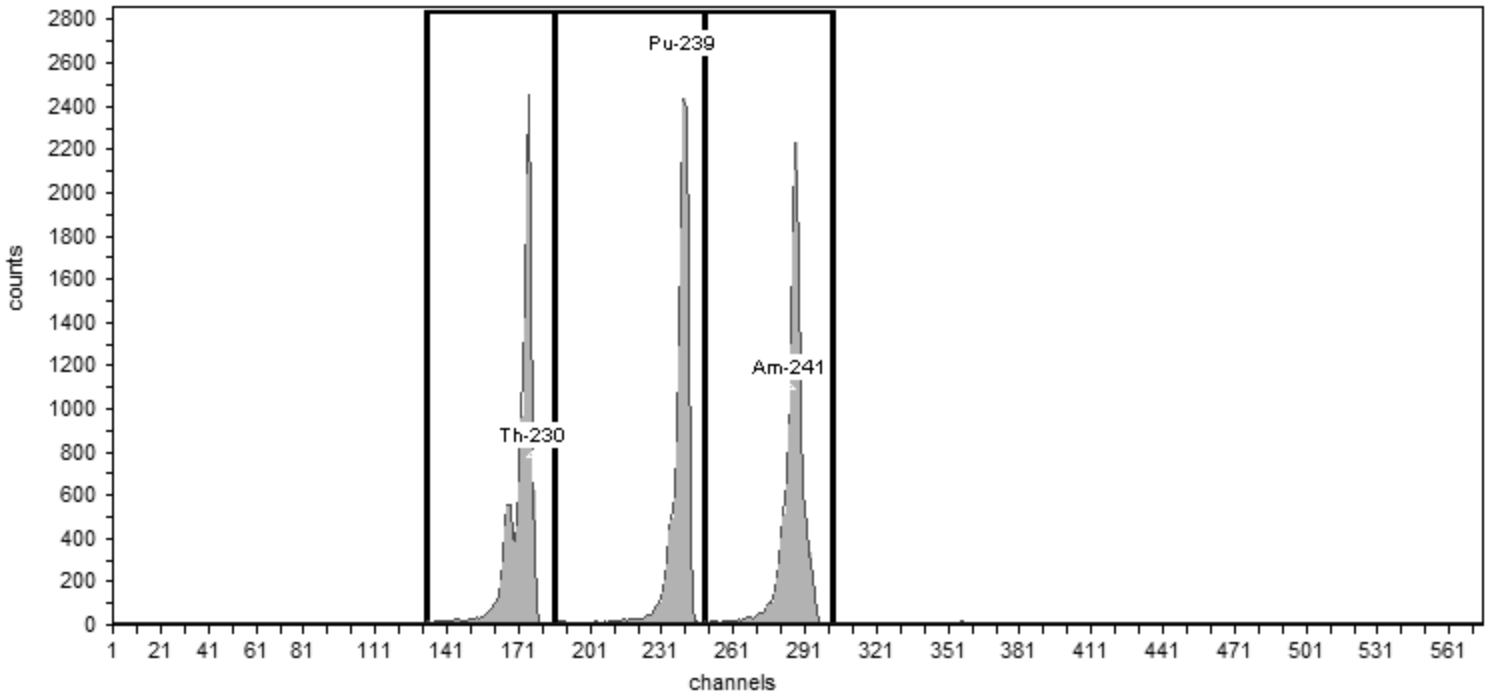
Detector: AV150 , SN: 50-05/R4
Acquisition Start Date: 11/10/2016 12:20:19PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Efficiency Calibration Name: IC-8876;AV150-20161110

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 23.39% +/- 0.28% TPU(2 sigma)




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy keV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4,687.50 | 132 | 186 | 29.22 | 14,193.00 | 101.38 |
| Pu-239 | 240 | 5,155.40 | 186 | 249 | 33.44 | 13,739.00 | 98.14 |
| Am-241 | 284 | 5,485.70 | 249 | 303 | 32.24 | 14,256.00 | 101.83 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:39:43PM 11/11/2016

## Calibration

Sample Name: IC-9793;AV155-20161110
Description:
Detector: AV155

Analyst: 60040
Analysis Date: 11/11/2016 2:37:33PM
Calibration Type: Energy And Efficiency

## Source Info

Certificate ID: 82241-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

## Acquisition

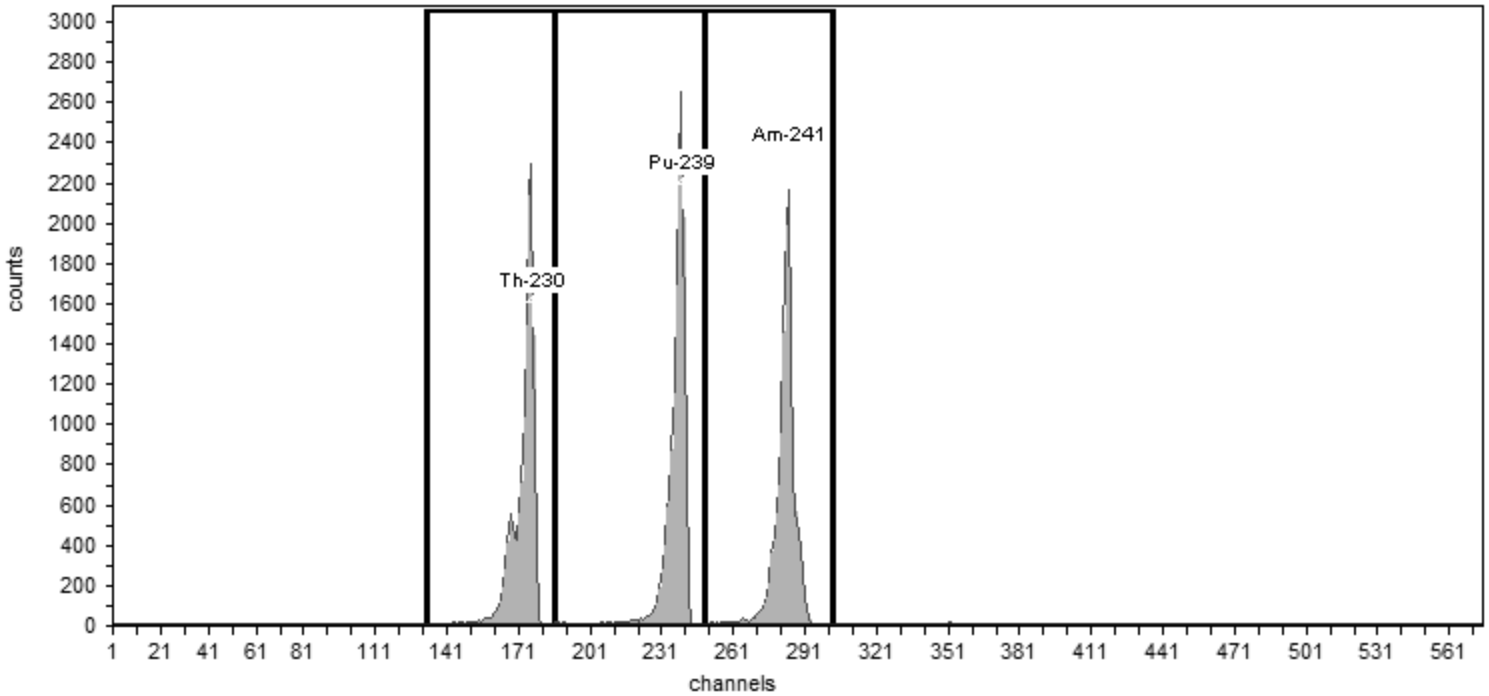
Detector: AV155 , SN: 50-05/II1
Acquisition Start Date: 11/10/2016 12:22:03PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Efficiency Calibration Name: IC-9793;AV155-20161110

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.72% +/- 0.31% TPU(2 sigma)




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy keV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4,687.50 | 132 | 186 | 30.12 | 13,541.00 | 96.72 |
| Pu-239 | 240 | 5,155.40 | 186 | 249 | 31.89 | 14,391.00 | 102.79 |
| Am-241 | 284 | 5,485.70 | 249 | 303 | 31.60 | 13,614.00 | 97.24 |

# Initial Calibration Verifications

# Alpha Spectroscopy Calibration Summary

## Detector: AV64

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267744/1 | 08/31/16 09:16 | 82234-334_00001 | 0.2450 | 0.20-0.32 | | |
| ICV 160-268892/1 | 09/02/16 13:12 | 82247-334_00001 | 0.2457 | 0.20-0.32 | 100.3 | 95-105 |
| CCV 160-310350/1 | 05/23/17 14:13 | 82234-334_00001 | 0.2329 | 0.20-0.32 | 95.1 | 95-105 |

## Detector: AV65

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267745/1 | 08/31/16 09:31 | 82235-334_00001 | 0.2343 | 0.20-0.32 | | |
| ICV 160-268893/1 | 09/02/16 13:15 | 82234-334_00001 | 0.2286 | 0.20-0.32 | 97.6 | 95-105 |
| CCV 160-310351/1 | 05/23/17 14:17 | 82235-334_00001 | 0.2244 | 0.20-0.32 | 95.8 | 95-105 |

## Detector: AV66

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267746/1 | 08/31/16 09:32 | 82236-334_00001 | 0.2506 | 0.20-0.32 | | |
| ICV 160-268894/1 | 09/02/16 13:15 | 82238-334_00001 | 0.2463 | 0.20-0.32 | 98.3 | 95-105 |
| CCV 160-310352/1 | 05/23/17 14:14 | 82236-334_00001 | 0.2477 | 0.20-0.32 | 98.8 | 95-105 |

## Detector: AV68

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267747/1 | 08/31/16 09:15 | 82237-334_00003 | 0.2478 | 0.20-0.32 | | |
| ICV 160-268895/1 | 09/02/16 13:14 | 82242-334_00001 | 0.2361 | 0.20-0.32 | 95.3 | 95-105 |
| CCV 160-310353/1 | 05/23/17 14:14 | 82237-334_00003 | 0.2437 | 0.20-0.32 | 98.3 | 95-105 |

## Detector: AV70

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267723/1 | 08/30/16 14:57 | 82240-334_00001 | 0.2541 | 0.20-0.32 | | |
| ICV 160-268897/1 | 09/02/16 13:17 | 82232-334_00001 | 0.2586 | 0.20-0.32 | 101.7 | 95-105 |
| CCV 160-310355/1 | 05/23/17 12:57 | 82240-334_00001 | 0.2463 | 0.20-0.32 | 96.9 | 95-105 |

## Detector: AV71

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267724/1 | 08/30/16 14:57 | 82241-334_00001 | 0.2511 | 0.20-0.32 | | |
| ICV 160-268898/1 | 09/02/16 13:12 | 82246-334_00001 | 0.2523 | 0.20-0.32 | 100.5 | 95-105 |
| CCV 160-310356/1 | 05/23/17 12:57 | 82241-334_00001 | 0.2484 | 0.20-0.32 | 98.9 | 95-105 |

## Detector: AV72

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267725/1 | 08/30/16 14:58 | 82242-334_00001 | 0.2448 | 0.20-0.32 | | |
| ICV 160-268899/1 | 09/02/16 13:17 | 82237-334_00003 | 0.2522 | 0.20-0.32 | 103.1 | 95-105 |
| CCV 160-310357/1 | 05/23/17 12:58 | 82242-334_00001 | 0.2355 | 0.20-0.32 | 96.2 | 95-105 |

## Detector: AV73

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267748/1 | 09/01/16 08:34 | 82243-334_00001 | 0.2651 | 0.20-0.32 | | |
| ICV 160-268900/1 | 09/02/16 13:18 | 82233-334_00001 | 0.2691 | 0.20-0.32 | 101.5 | 95-105 |
| CCV 160-310358/1 | 05/23/17 12:58 | 82243-334_00001 | 0.2628 | 0.20-0.32 | 99.1 | 95-105 |

# Alpha Spectroscopy Calibration Summary

## Detector: AV74

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267726/1 | 08/30/16 15:07 | 82244-334_00001 | 0.2452 | 0.20-0.32 | | |
| ICV 160-268901/1 | 09/02/16 13:13 | 82245-334_00001 | 0.2352 | 0.20-0.32 | 95.9 | 95-105 |
| CCV 160-310359/1 | 05/23/17 13:03 | 82244-334_00001 | 0.2364 | 0.20-0.32 | 96.4 | 95-105 |

## Detector: AV75

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267667/2 | 07/27/16 14:56 | 82245-334_00001 | 0.2379 | 0.20-0.32 | | |
| ICV 160-268902/1 | 09/02/16 13:13 | 82244-334_00001 | 0.2468 | 0.20-0.32 | 103.7 | 95-105 |
| CCV 160-310360/1 | 05/23/17 12:59 | 82245-334_00001 | 0.2286 | 0.20-0.32 | 96.1 | 95-105 |

## Detector: AV76

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267668/1 | 07/27/16 14:56 | 82246-334_00001 | 0.2509 | 0.20-0.32 | | |
| ICV 160-268903/1 | 09/02/16 13:14 | 82241-334_00001 | 0.2528 | 0.20-0.32 | 100.7 | 95-105 |
| CCV 160-310361/1 | 05/23/17 12:59 | 82246-334_00001 | 0.2458 | 0.20-0.32 | 98.0 | 95-105 |

## Detector: AV79

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-267671/1 | 07/27/16 14:59 | 82233-334_00001 | 0.2687 | 0.20-0.32 | | |
| ICV 160-268906/1 | 09/02/16 14:36 | 82243-334_00001 | 0.2638 | 0.20-0.32 | 98.2 | 95-105 |
| CCV 160-310363/1 | 05/23/17 13:00 | 82233-334_00001 | 0.2672 | 0.20-0.32 | 99.5 | 95-105 |

## Detector: AV150

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-279038/1 | 11/10/16 12:20 | 82235-334_00001 | 0.2339 | 0.20-0.32 | | |
| ICV 160-284325/1 | 12/16/16 08:42 | 82234-334_00001 | 0.2259 | 0.20-0.32 | 96.6 | 95-105 |
| CCV 160-309276/1 | 05/17/17 13:06 | 82235-334_00001 | 0.2246 | 0.20-0.32 | 96.0 | 95-105 |

## Detector: AV155

| Lab Sample ID | Analysis Date | Reagent ID | Efficiency | Efficiency Limits | Efficiency Recovery | Recovery Limits |
|---|---|---|---|---|---|---|
| IC 160-279043/1 | 11/10/16 12:22 | 82241-334_00001 | 0.2472 | 0.20-0.32 | | |
| ICV 160-284330/1 | 12/16/16 08:38 | 82246-334_00001 | 0.2494 | 0.20-0.32 | 100.9 | 95-105 |
| CCV 160-309280/1 | 05/17/17 09:17 | 82241-334_00001 | 0.2393 | 0.20-0.32 | 96.8 | 95-105 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:21:32PM 9/2/2016

## Calibration

Sample Name: ICV-9886;AV64-20160902
Description:
Detector: AV64

Calibration Date: 9/2/2016 2:21:29PM
Analyst: 60040

## Source Info

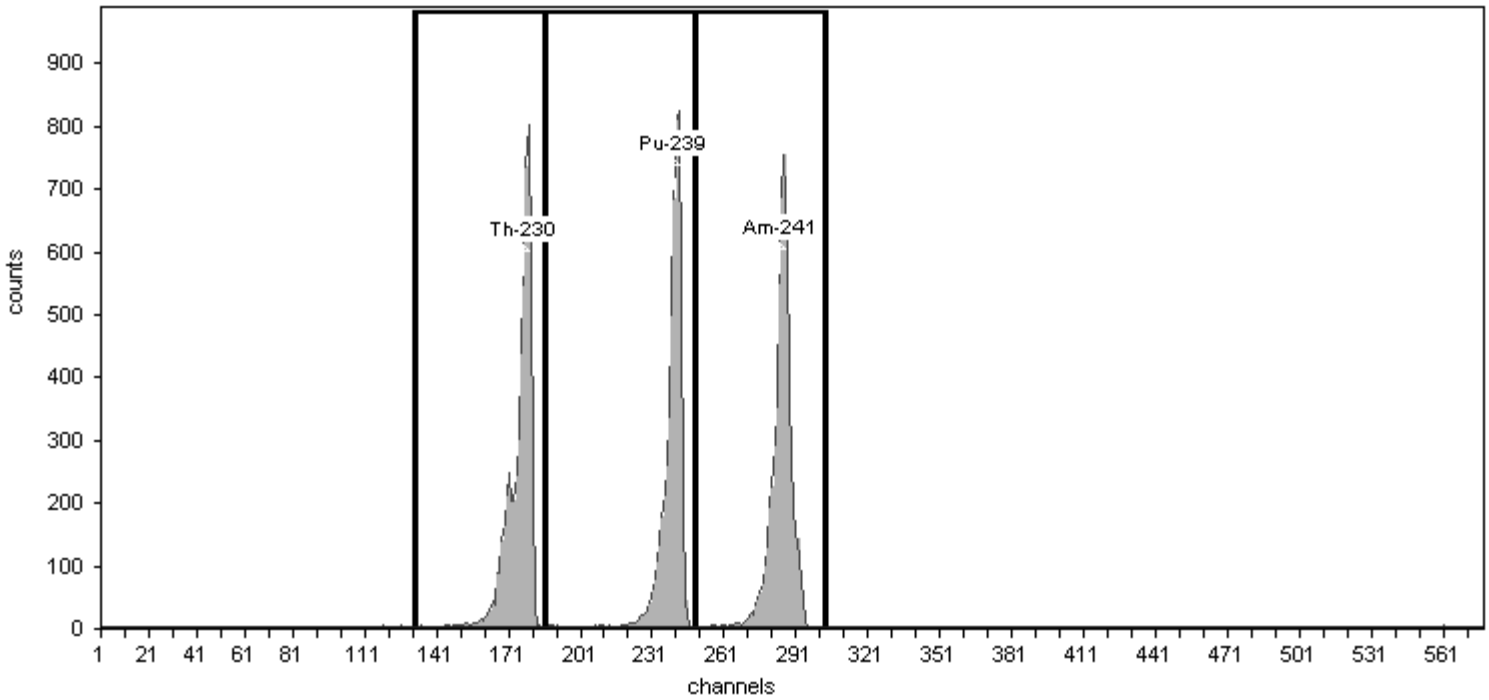
Certificate ID: 82247-334
Prepared by: Analytics

Certification Date: 6/10/2010 12:00:00PM
Description:

## Acquisition

Detector: AV64 , SN: 43-028v3
Acquisition Start Date: 9/2/2016 1:12:10PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 24.57% +/- 0.44% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,476.00 | 91.27 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,164.00 | 86.07 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,493.00 | 91.55 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:22:54PM 9/2/2016

## Calibration

Sample Name: ICV-8875;AV65-20160902
Description:
Detector: AV65

Calibration Date: 9/2/2016 2:22:50PM
Analyst: 60040

## Source Info

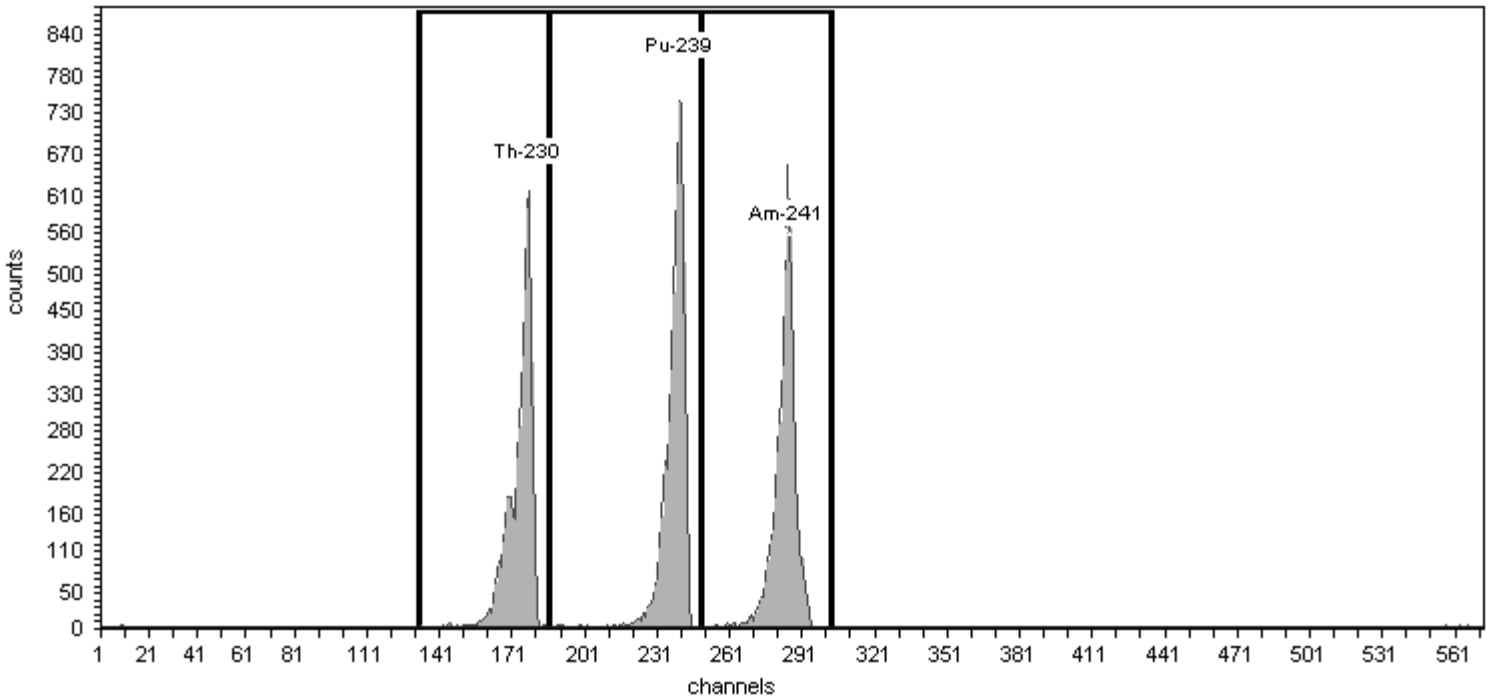
Certificate ID: 82234-334
Prepared by: Analytics

Certification Date: 6/2/2010 12:00:00PM
Description:

## Acquisition

Detector: AV65 , SN: 44-049JJ1
Acquisition Start Date: 9/2/2016 1:15:20PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 22.86% +/- 0.44% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 4,497.00 | 74.95 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,126.00 | 85.43 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 4,572.00 | 76.20 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:23:07PM 9/2/2016

## Calibration

Sample Name: ICV-8879;AV66-20160902
Description:
Detector: AV66

Calibration Date: 9/2/2016 2:23:04PM
Analyst: 60040

## Source Info

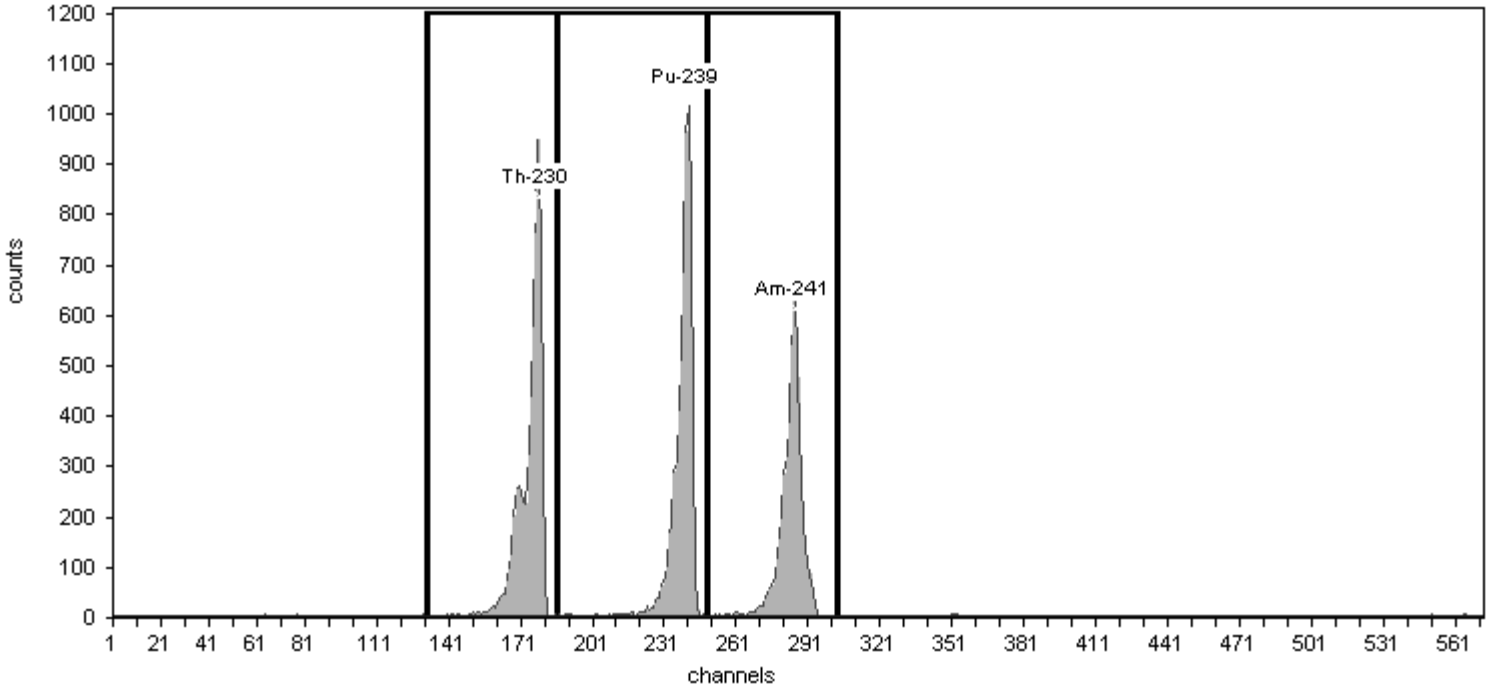
Certificate ID: 82238-334
Prepared by: Analytics

Certification Date: 6/1/2010 12:00:00PM
Description:

## Acquisition

Detector: AV66 , SN: 48-158EE2
Acquisition Start Date: 9/2/2016 1:15:45PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 24.63% +/- 0.43% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 6,190.00 | 103.17 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 6,267.00 | 104.45 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,064.00 | 84.40 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:22:41PM 9/2/2016

## Calibration

Sample Name: ICV-9794;AV68-20160902
Description:
Detector: AV68

Calibration Date: 9/2/2016 2:22:37PM
Analyst: 60040

## Source Info

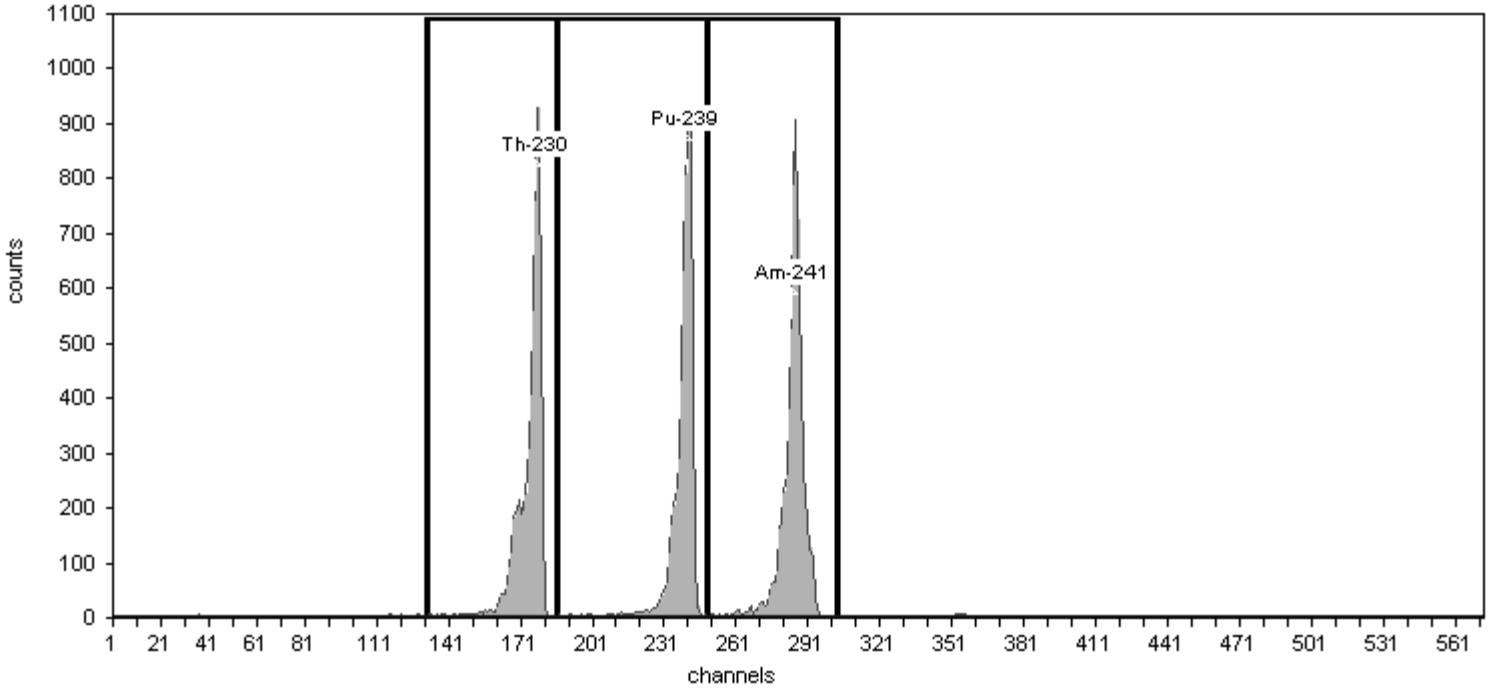
Certificate ID: 82242-334
Prepared by: Analytics

Certification Date: 6/8/2010 12:00:00PM
Description:

## Acquisition

Detector: AV68 , SN: 50-60-V2
Acquisition Start Date: 9/2/2016 1:14:41PM
Live Time: 60.00 min.
Real Time: 60.05 min.
Efficiency: 23.61% +/- 0.41% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,496.00 | 91.60 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,597.00 | 93.28 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,982.00 | 99.70 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:23:50PM 9/2/2016

## Calibration

Sample Name: ICV-7107;AV70-20160902
Description:
Detector: AV70

Calibration Date: 9/2/2016 2:23:45PM
Analyst: 60040

## Source Info

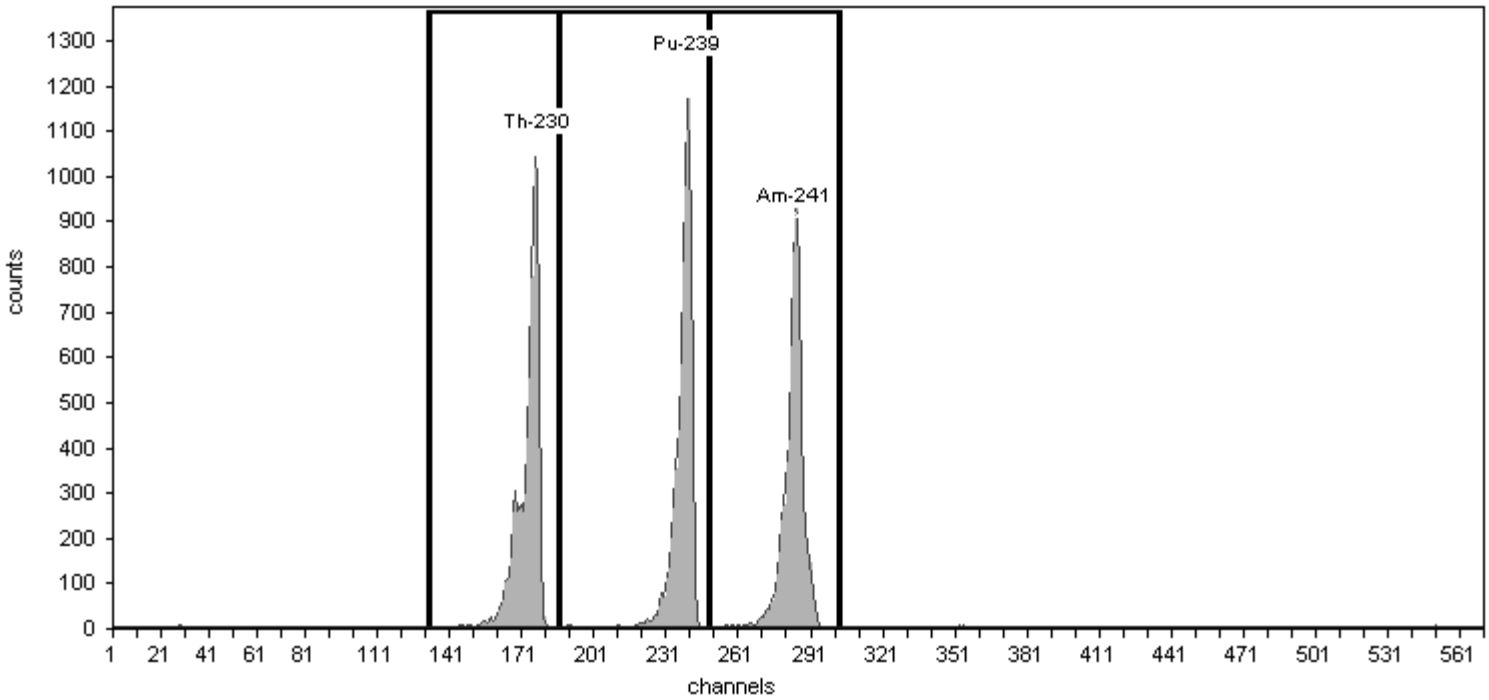
Certificate ID: 82232-334
Prepared by: Analytics

Certification Date: 6/3/2010 12:00:00PM
Description:

## Acquisition

Detector: AV70 , SN: 48-158FF1
Acquisition Start Date: 9/2/2016 1:17:08PM
Live Time: 60.00 min.
Real Time: 60.04 min.
Efficiency: 25.86% +/- 0.40% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 6,932.00 | 115.53 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 6,915.00 | 115.25 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 6,637.00 | 110.62 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:21:47PM 9/2/2016

## Calibration

Sample Name: ICV-9885;AV71-20160902
Description:
Detector: AV71

Calibration Date: 9/2/2016 2:21:44PM
Analyst: 60040

## Source Info

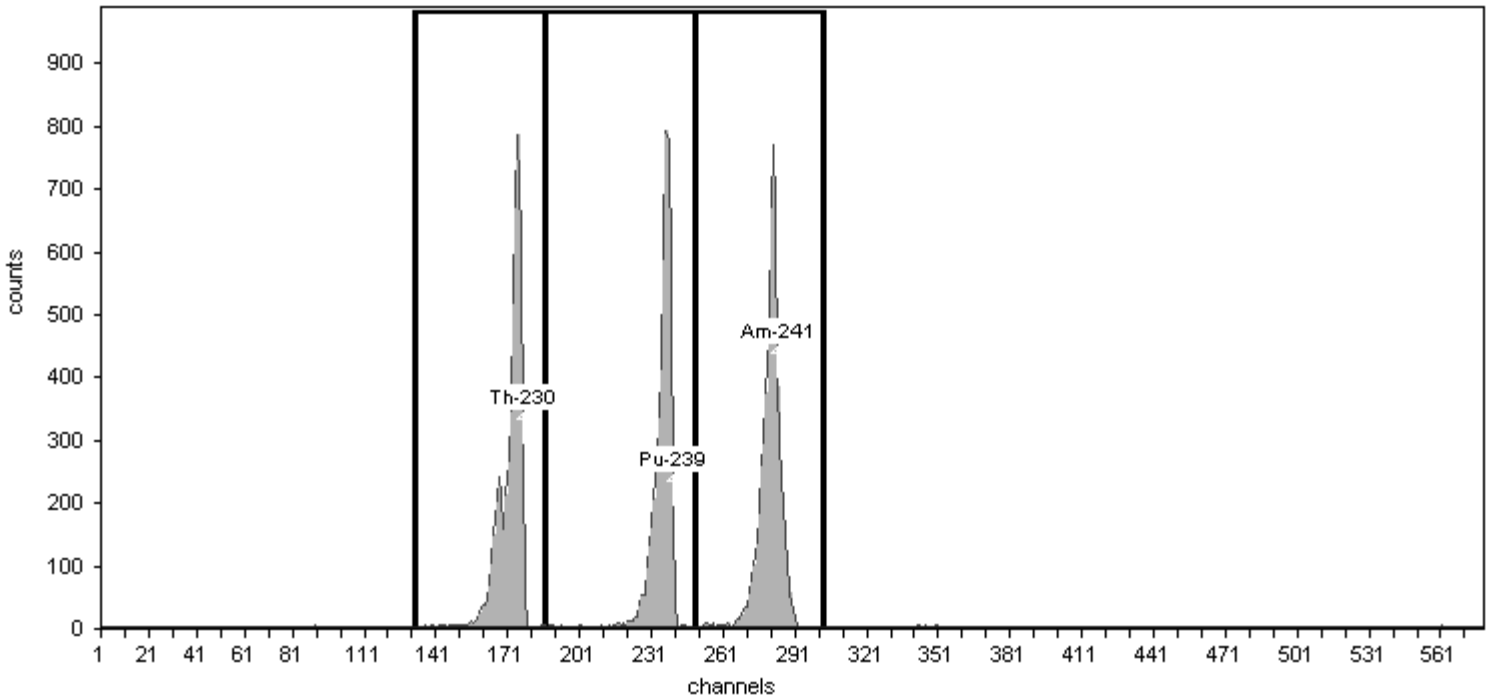
Certificate ID: 82246-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV71 , SN: 48-158EE6
Acquisition Start Date: 9/2/2016 1:12:41PM
Live Time: 60.00 min.
Real Time: 60.05 min.
Efficiency: 25.23% +/- 0.48% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,120.00 | 85.33 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 4,819.00 | 80.32 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,384.00 | 89.73 |

FWHM<100 keV for all peaks. 09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:24:05PM 9/2/2016

## Calibration

Sample Name: ICV-9520;AV72-20160902
Description:
Detector: AV72

Calibration Date: 9/2/2016 2:24:01PM
Analyst: 60040

## Source Info

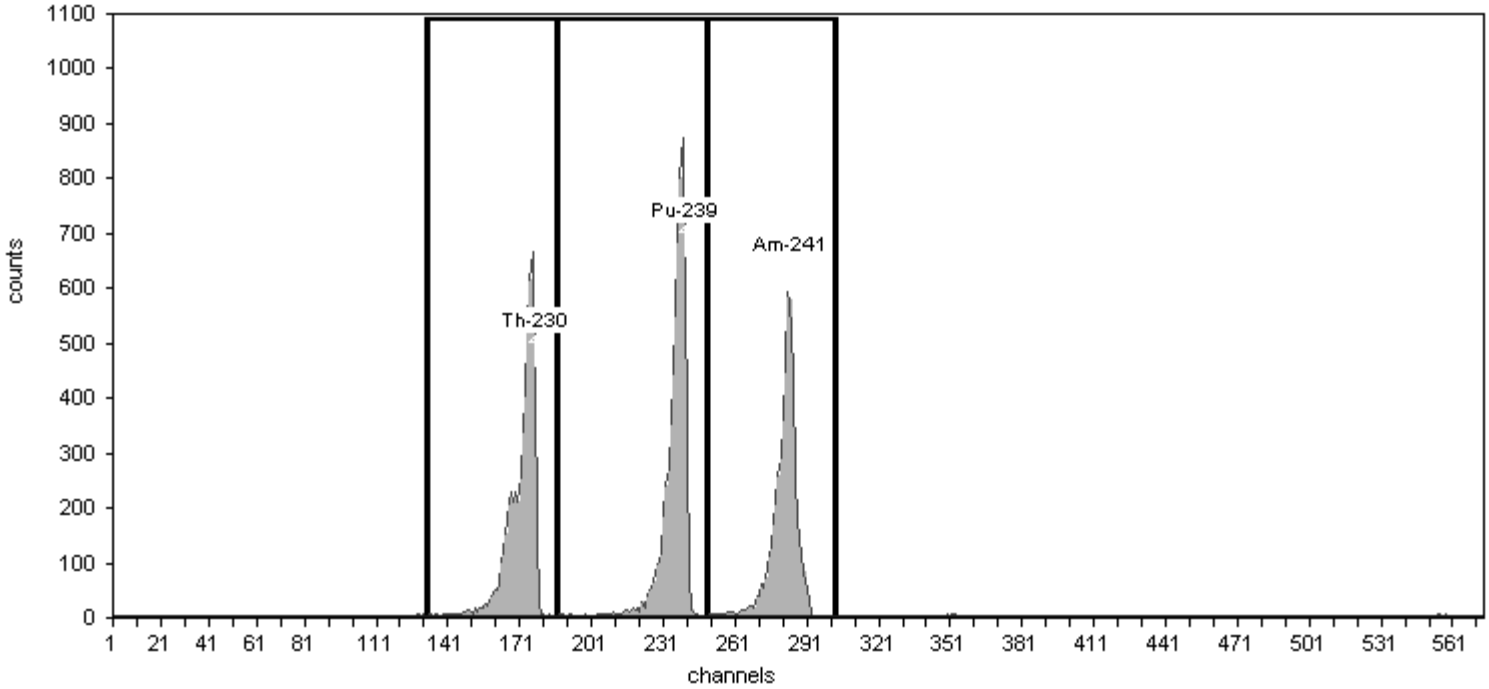
Certificate ID: 82237-334
Prepared by: Analytics

Certification Date: 6/1/2010 12:00:00PM
Description:

## Acquisition

Detector: AV72 , SN: 48-05a21
Acquisition Start Date: 9/2/2016 1:17:25PM
Live Time: 60.00 min.
Real Time: 60.04 min.
Efficiency: 25.22% +/- 0.46% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,232.00 | 87.20 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 6,129.00 | 102.15 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 4,847.00 | 80.78 |

FWHM<100 keV for all peaks. 09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:24:19PM 9/2/2016

## Calibration

Sample Name: ICV-8874;AV73-20160902
Description:
Detector: AV73

Calibration Date: 9/2/2016 2:24:16PM
Analyst: 60040

## Source Info

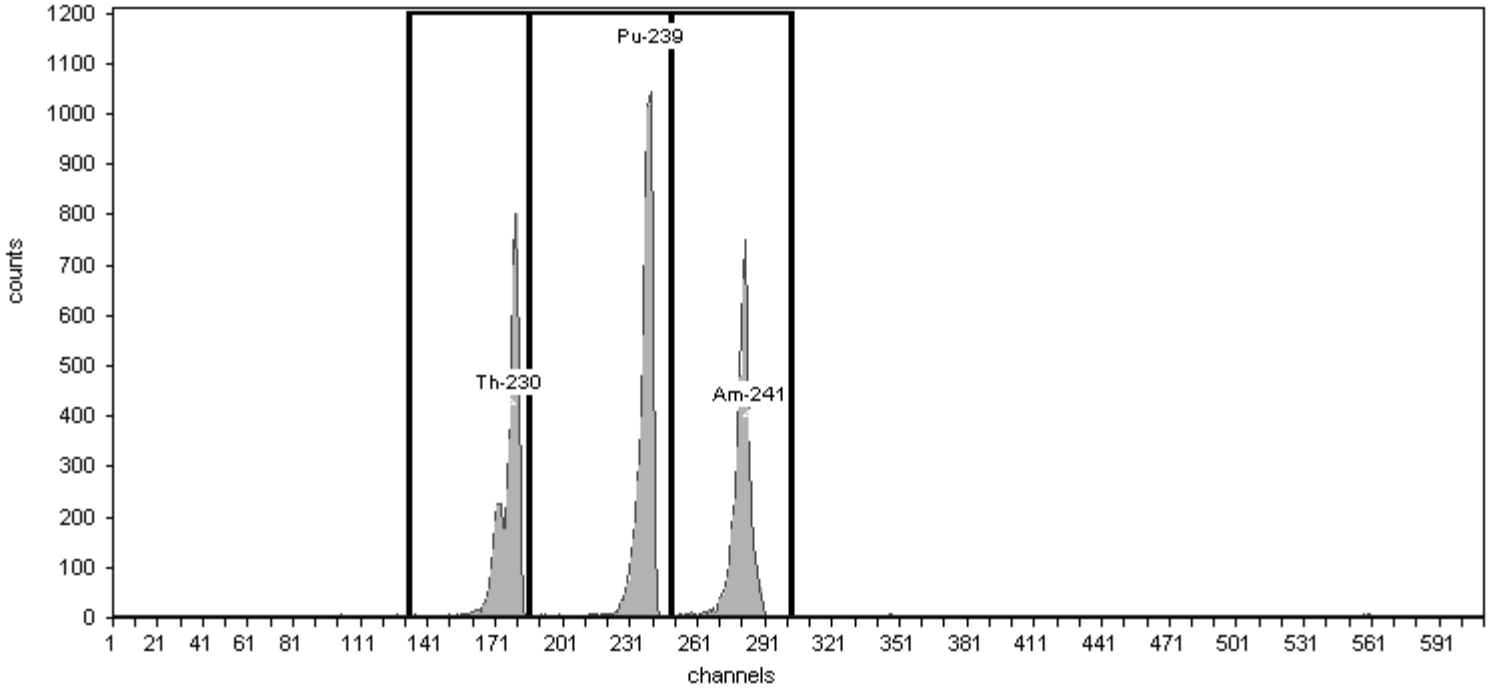
Certificate ID: 82233-334
Prepared by: Analytics

Certification Date: 6/3/2010 12:00:00PM
Description:

## Acquisition

Detector: AV73 , SN: 46-03321
Acquisition Start Date: 9/2/2016 1:18:03PM
Live Time: 60.00 min.
Real Time: 60.04 min.
Efficiency: 26.91% +/- 0.50% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 4,753.00 | 79.22 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 6,007.00 | 100.12 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 4,817.00 | 80.28 |

FWHM<100 keV for all peaks. 09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:22:01PM 9/2/2016

## Calibration

Sample Name: ICV-9884;AV74-20160902
Description:
Detector: AV74

Calibration Date: 9/2/2016 2:21:58PM
Analyst: 60040

## Source Info

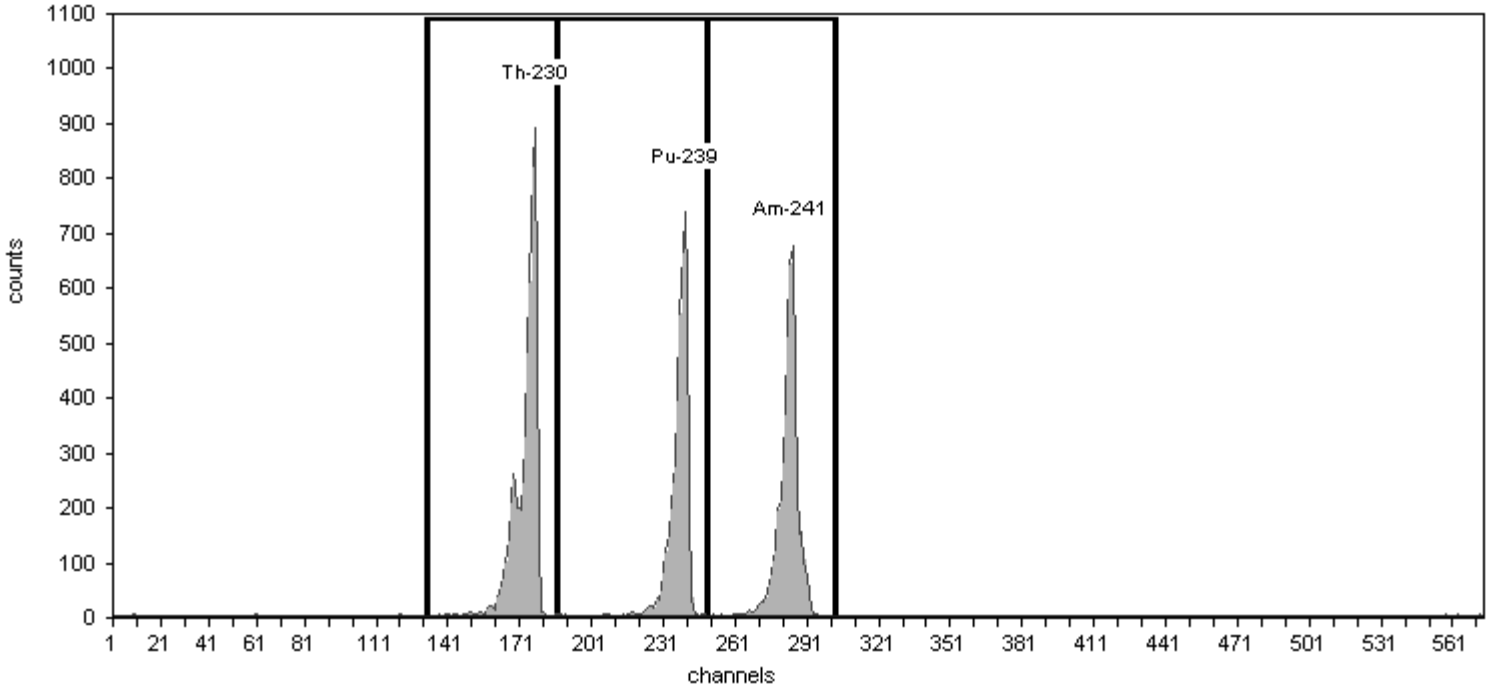
Certificate ID: 82245-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV74 , SN: 50-051C6
Acquisition Start Date: 9/2/2016 1:13:13PM
Live Time: 60.00 min.
Real Time: 60.05 min.
Efficiency: 23.52% +/- 0.45% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,772.00 | 96.20 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 4,516.00 | 75.27 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 4,646.00 | 77.43 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:22:15PM 9/2/2016

## Calibration

Sample Name: ICV-9817;AV75-20160902
Description:
Detector: AV75

Calibration Date: 9/2/2016 2:22:11PM
Analyst: 60040

## Source Info

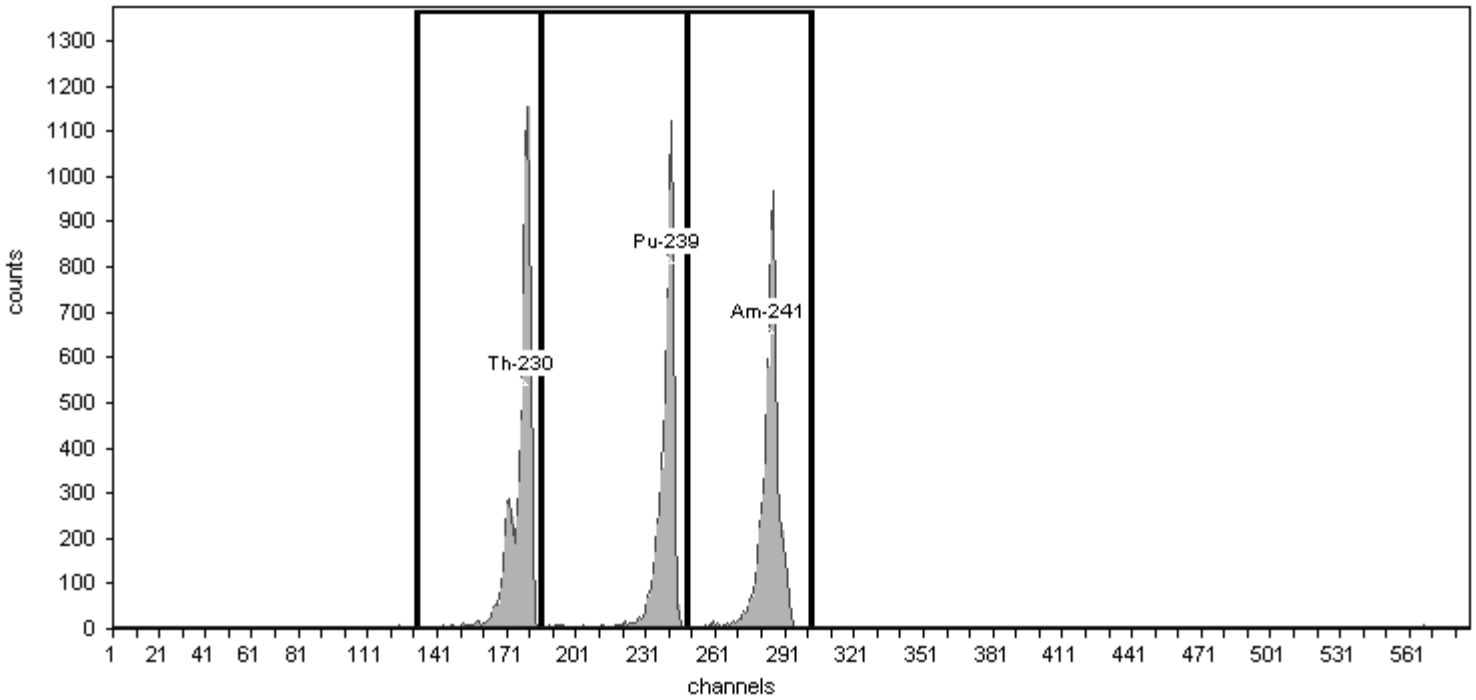
Certificate ID: 82244-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV75 , SN: 51-082B4
Acquisition Start Date: 9/2/2016 1:13:40PM
Live Time: 60.00 min.
Real Time: 60.02 min.
Efficiency: 24.68% +/- 0.41% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 6,609.00 | 110.15 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,987.00 | 99.78 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,980.00 | 99.67 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:22:28PM 9/2/2016

## Calibration

Sample Name: ICV-9793;AV76-20160902
Description:
Detector: AV76

Calibration Date: 9/2/2016 2:22:24PM
Analyst: 60040

## Source Info

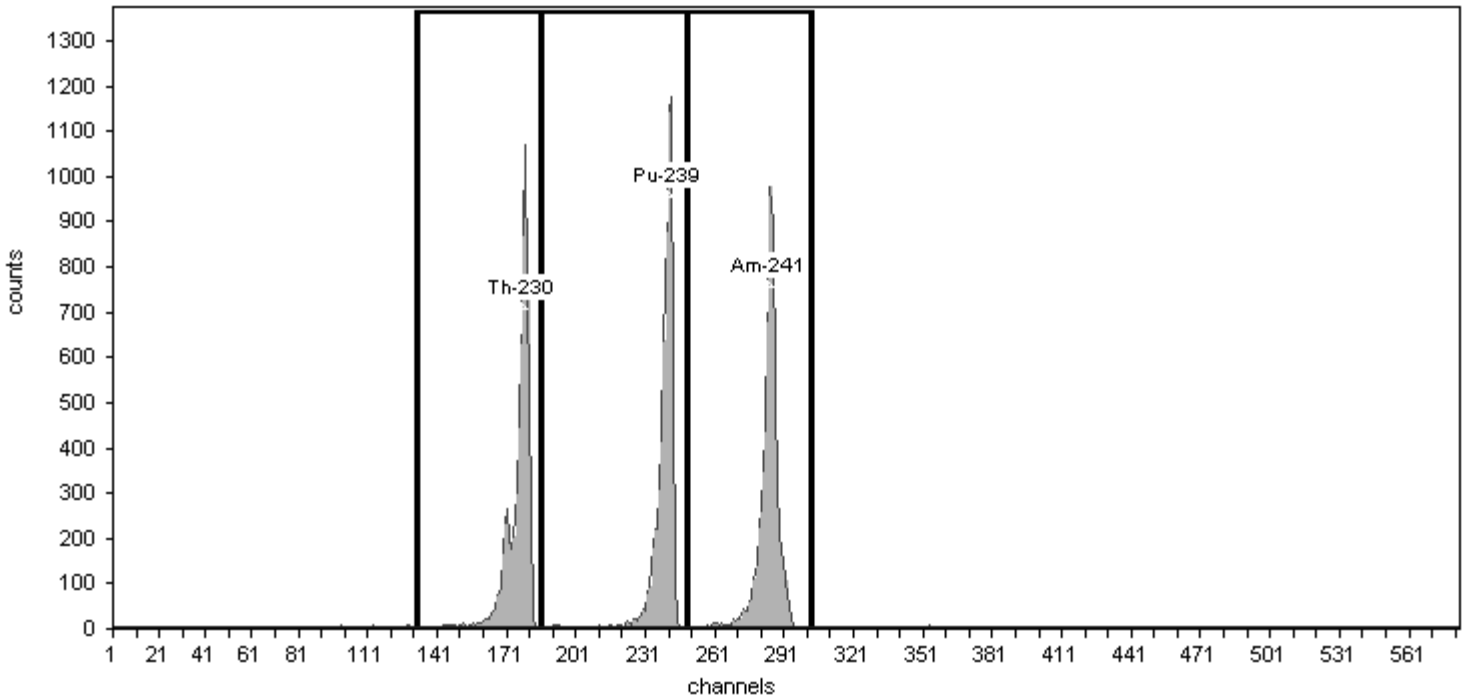
Certificate ID: 82241-334
Prepared by: Analytics

Certification Date: 6/8/2010 12:00:00PM
Description:

## Acquisition

Detector: AV76 , SN: 50-060-f4
Acquisition Start Date: 9/2/2016 1:14:14PM
Live Time: 60.00 min.
Real Time: 60.02 min.
Efficiency: 25.28% +/- 0.42% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,981.00 | 99.68 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 6,249.00 | 104.15 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,974.00 | 99.57 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:40:03PM 9/2/2016

## Calibration

Sample Name: ICV-9795;AV79-20160902
Description:
Detector: AV79

Calibration Date: 9/2/2016 3:39:59PM
Analyst: 60040

## Source Info

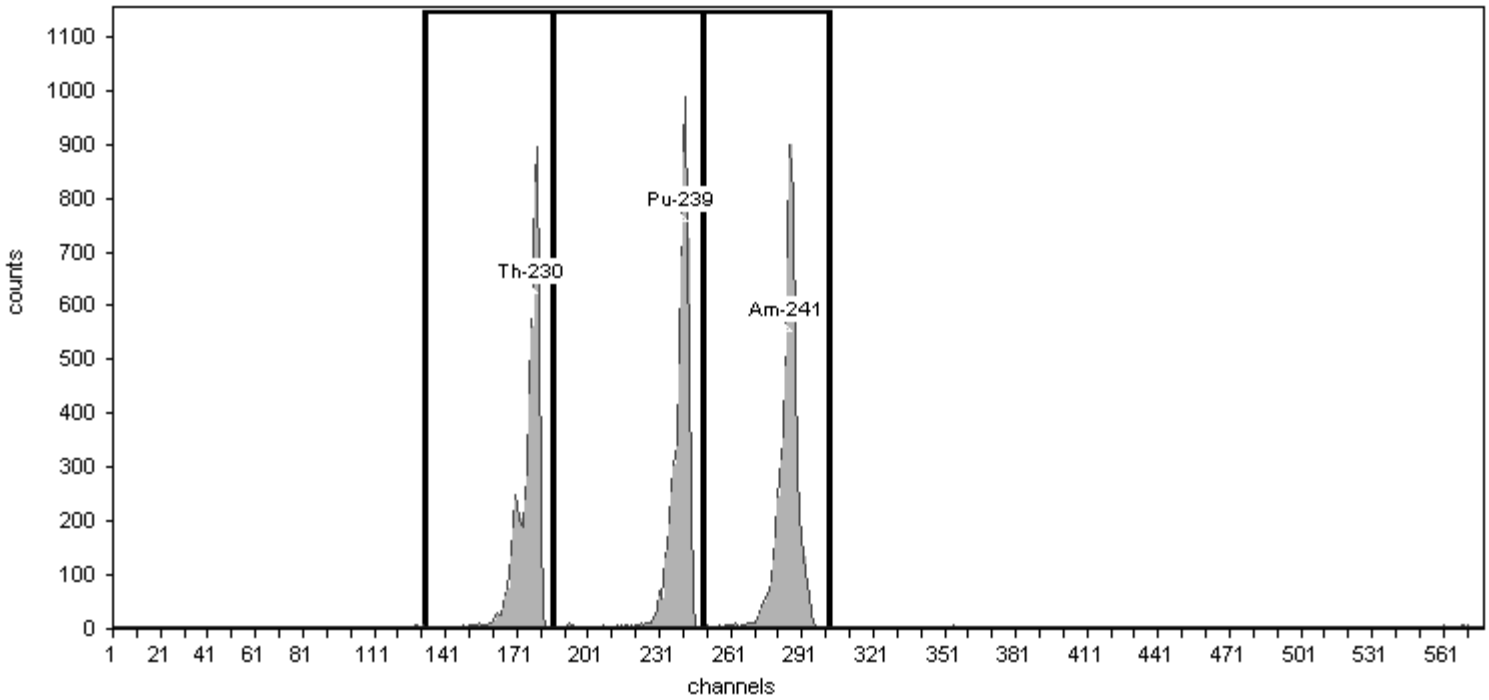
Certificate ID: 82243-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV79 , SN: 46-033Q5
Acquisition Start Date: 9/2/2016 2:36:00PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 26.38% +/- 0.46% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,551.00 | 92.52 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,724.00 | 95.40 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,978.00 | 99.63 |

FWHM<100 keV
for all peaks.
09/07/2016 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:49:39AM 12/16/2016

## Calibration

Sample Name: ICV-8875;AV150-20161216
Description:
Detector: AV150

Analyst: 60040
Analysis Date: 12/16/2016 9:49:38AM
Calibration Type: Energy And Efficiency

## Source Info

Certificate ID: 82234-334
Prepared by: Analytics
Description:

Certification Date: 6/2/2010 12:00:00PM

## Acquisition

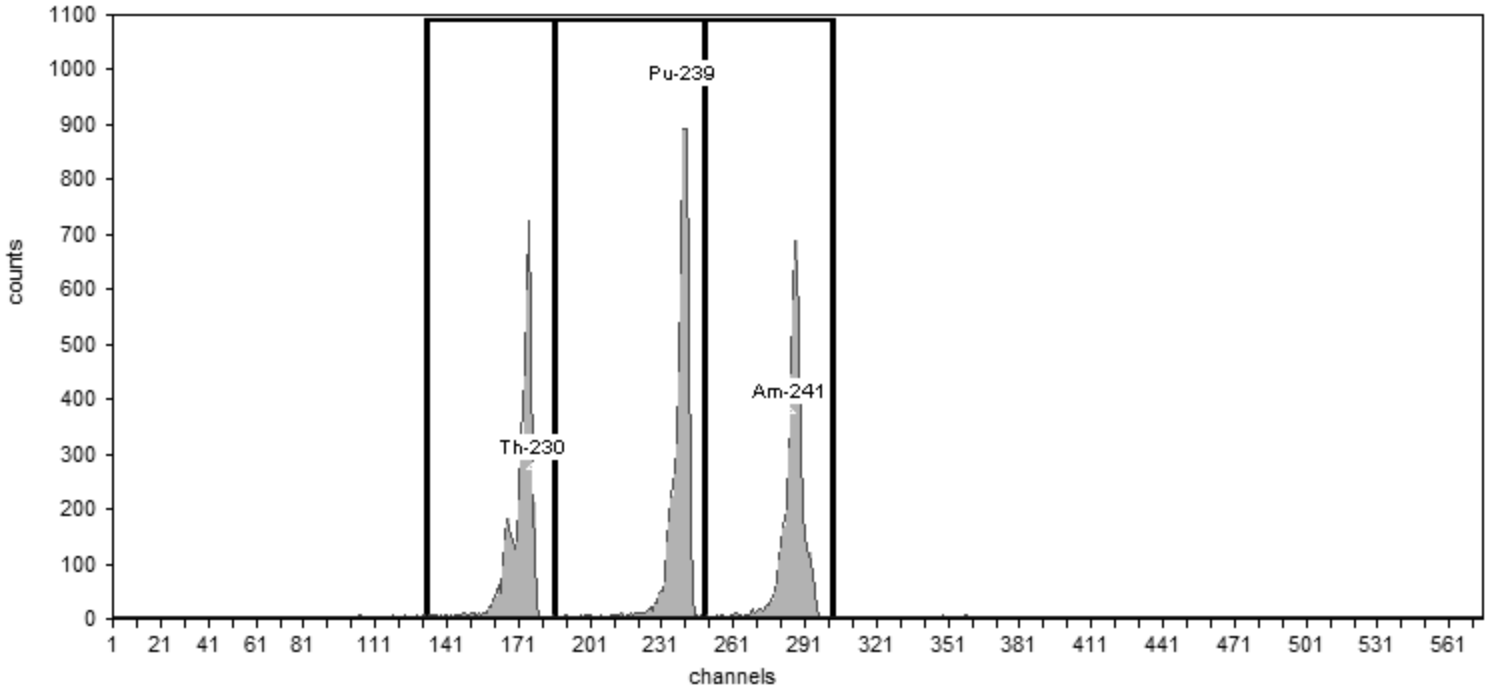
Detector: AV150 , SN: 50-05/R4
Acquisition Start Date: 12/16/2016 8:42:15AM

Live Time: 60.00 min.
Real Time: 60.00 min.

Efficiency Calibration Name: ICV-8875;AV150-2016121

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency: 22.59% +/- 0.44% TPU(2 sigma)




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy keV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4,687.50 | 132 | 186 | 31.68 | 4,365.00 | 72.75 |
| Pu-239 | 240 | 5,155.40 | 186 | 249 | 32.22 | 5,130.00 | 85.50 |
| Am-241 | 284 | 5,485.70 | 249 | 303 | 34.67 | 4,546.00 | 75.77 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
9:48:48AM 12/16/2016

## Calibration

Sample Name: ICV-9885;AV155-20161216
Description:
Detector: AV155

Analyst: 60040
Analysis Date: 12/16/2016 9:48:46AM
Calibration Type: Energy And Efficiency

## Source Info

Certificate ID: 82246-334
Prepared by: Analytics
Description:

Certification Date: 6/9/2010 12:00:00PM

## Acquisition

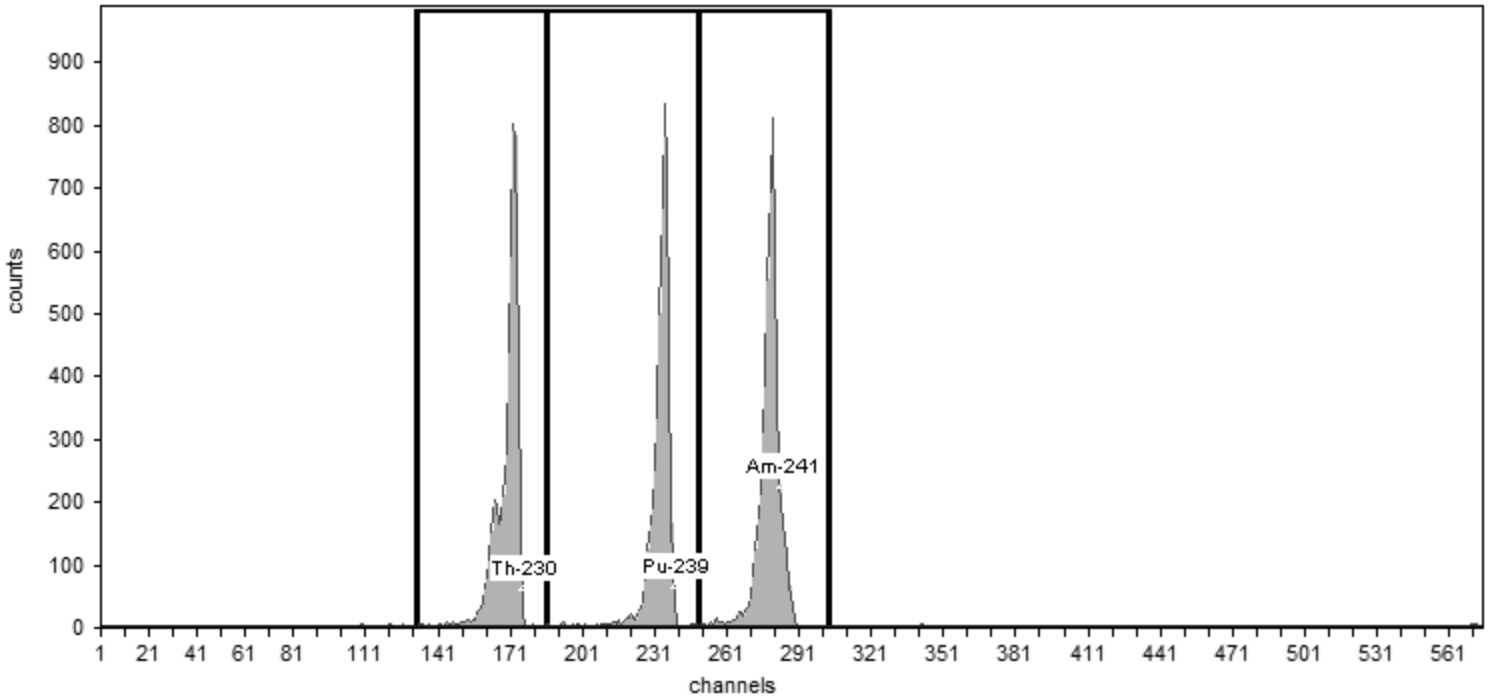
Detector: AV155 , SN: 50-05/II1
Acquisition Start Date: 12/16/2016 8:38:46AM

Live Time: 60.00 min.
Real Time: 60.00 min.

Efficiency Calibration Name: ICV-9885;AV155-2016121

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.94% +/- 0.48% TPU(2 sigma)




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy keV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4,687.50 | 132 | 186 | 32.14 | 5,003.00 | 83.38 |
| Pu-239 | 240 | 5,155.40 | 186 | 249 | 34.46 | 4,781.00 | 79.68 |
| Am-241 | 284 | 5,485.70 | 249 | 303 | 35.89 | 5,357.00 | 89.28 |

# Monthly Calibration Verifications

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:34:39PM 5/23/2017

## Calibration

Sample Name: CCV-8875;AV64-20170523
Description:
Detector: AV64

Calibration Date: 5/23/2017 3:34:36PM
Analyst: 60040

## Source Info

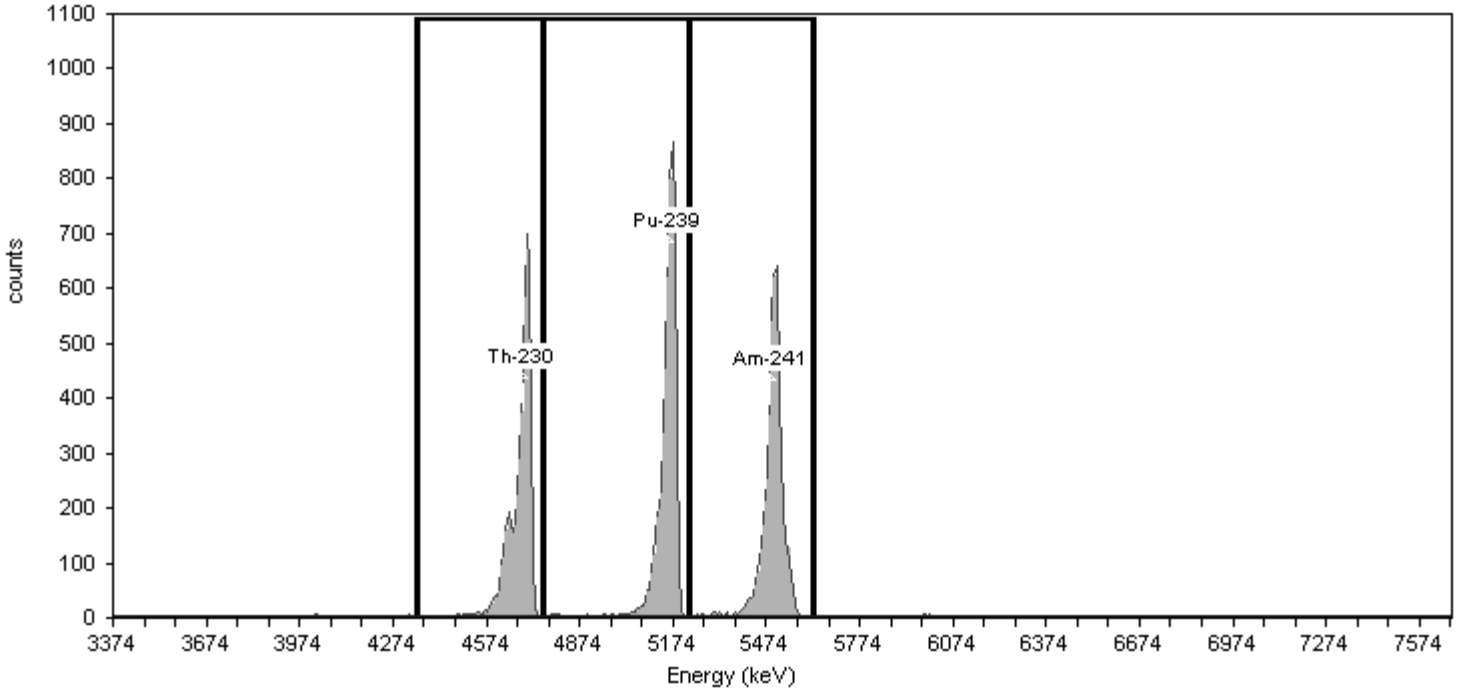
Certificate ID: 82234-334
Prepared by: Analytics

Certification Date: 6/2/2010 12:00:00PM
Description:

## Acquisition

Detector: AV64 , SN: 43-028v3
Acquisition Start Date: 5/23/2017 2:13:44PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 23.29% +/- 0.44% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 4,571.00 | 76.18 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,301.00 | 88.35 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 4,594.00 | 76.57 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:35:20PM 5/23/2017

## Calibration

Sample Name: CCV-8876;AV65-20170523a
Description:
Detector: AV65

Calibration Date: 5/23/2017 3:35:16PM
Analyst: 60040

## Source Info

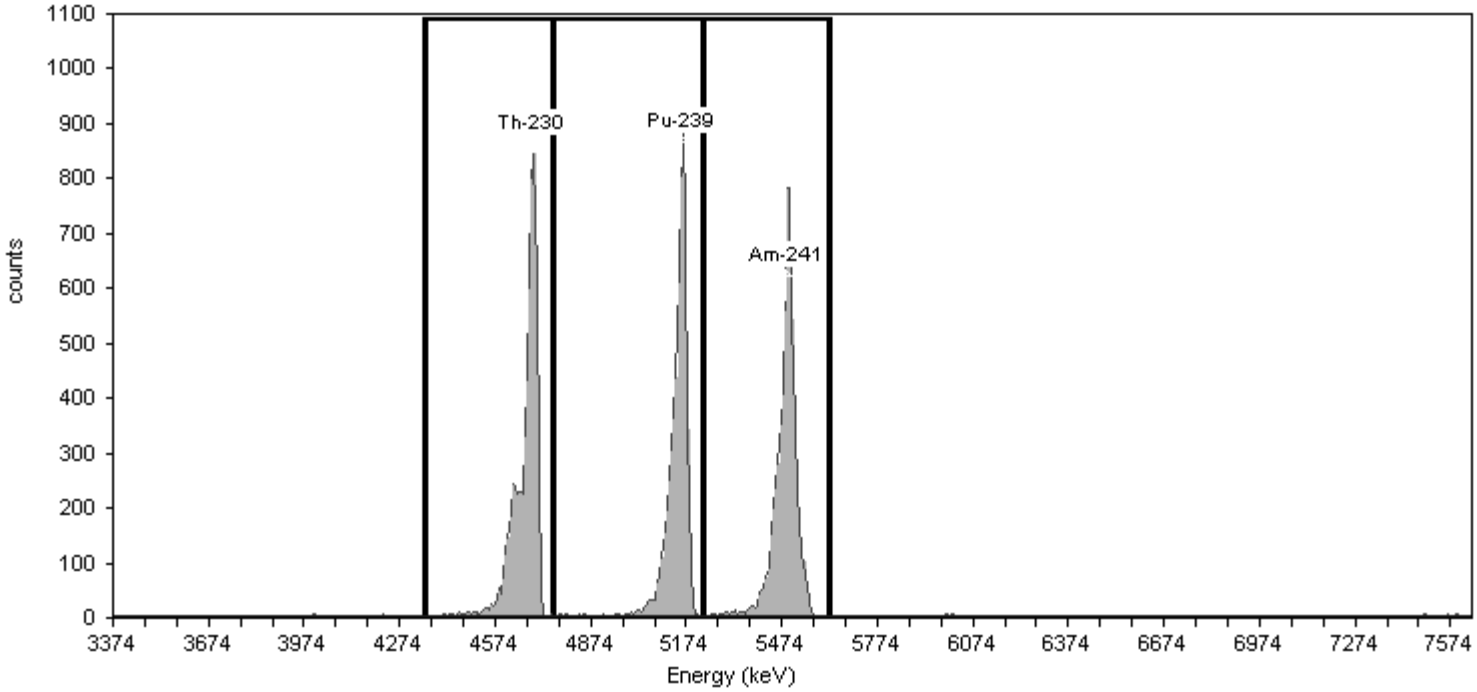
Certificate ID: 82235-334
Prepared by: Analytics

Certification Date: 6/4/2010 12:00:00PM
Description:

## Acquisition

Detector: AV65 , SN: 44-049JJ1
Acquisition Start Date: 5/23/2017 2:17:59PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 22.44% +/- 0.38% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,888.00 | 98.13 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,659.00 | 94.32 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,796.00 | 96.60 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:34:52PM 5/23/2017

## Calibration

Sample Name: CCV-8877;AV66-20170523
Description:
Detector: AV66

Calibration Date: 5/23/2017 3:34:49PM
Analyst: 60040

## Source Info

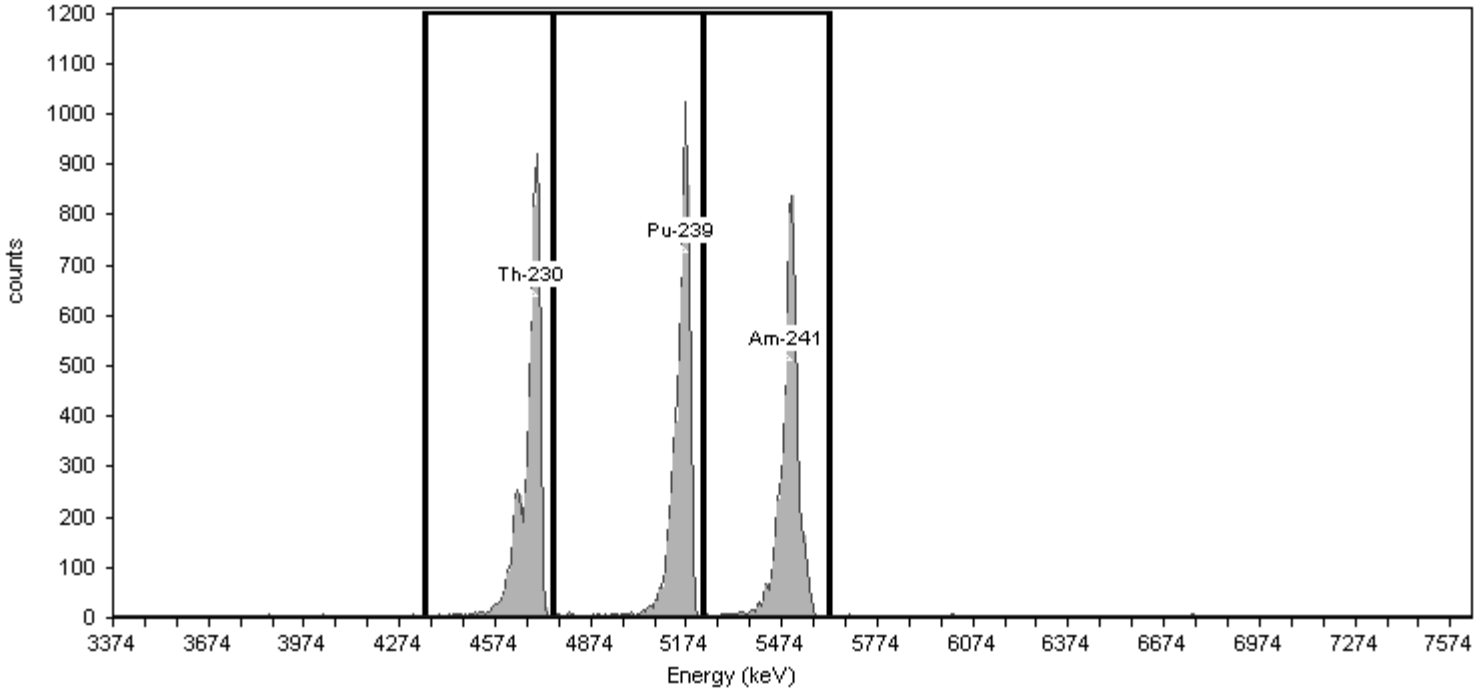
Certificate ID: 82236-334
Prepared by: Analytics

Certification Date: 6/2/2010 12:00:00PM
Description:

## Acquisition

Detector: AV66 , SN: 48-158EE2
Acquisition Start Date: 5/23/2017 2:14:30PM
Live Time: 60.02 min.
Real Time: 60.06 min.
Efficiency: 24.77% +/- 0.41% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 6,193.00 | 103.19 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 6,233.00 | 103.86 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,969.00 | 99.46 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
3:35:06PM 5/23/2017

## Calibration

Sample Name: CCV-9520;AV68-20170523
Description:
Detector: AV68

Calibration Date: 5/23/2017 3:35:03PM
Analyst: 60040

## Source Info

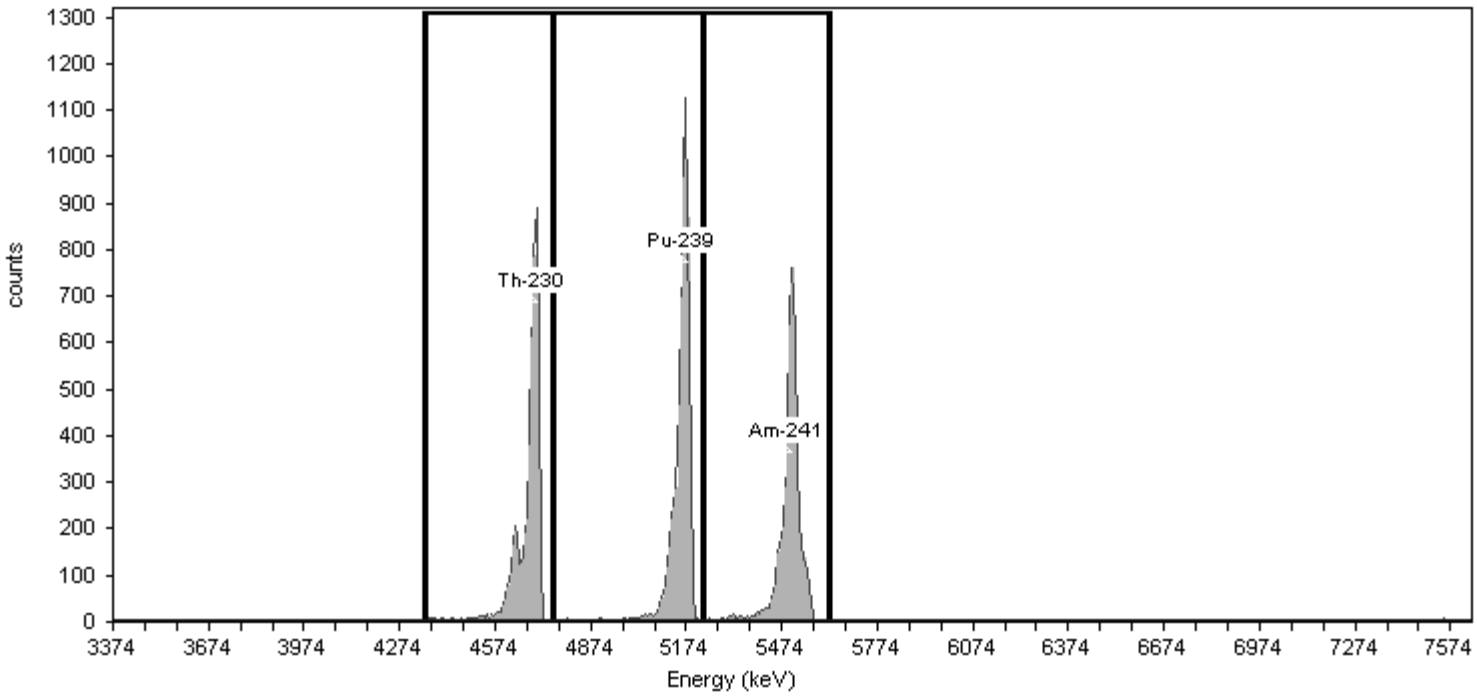
Certificate ID: 82237-334
Prepared by: Analytics

Certification Date: 6/1/2010 12:00:00PM
Description:

## Acquisition

Detector: AV68 , SN: 50-60-V2
Acquisition Start Date: 5/23/2017 2:14:53PM
Live Time: 60.00 min.
Real Time: 60.01 min.
Efficiency: 24.37% +/- 0.45% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 4,986.00 | 83.10 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,891.00 | 98.18 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 4,771.00 | 79.52 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:00:04PM 5/23/2017

## Calibration

Sample Name: CCV-9792;AV70-20170523
Description:
Detector: AV70

Calibration Date: 5/23/2017 2:00:01PM
Analyst: 60040

## Source Info

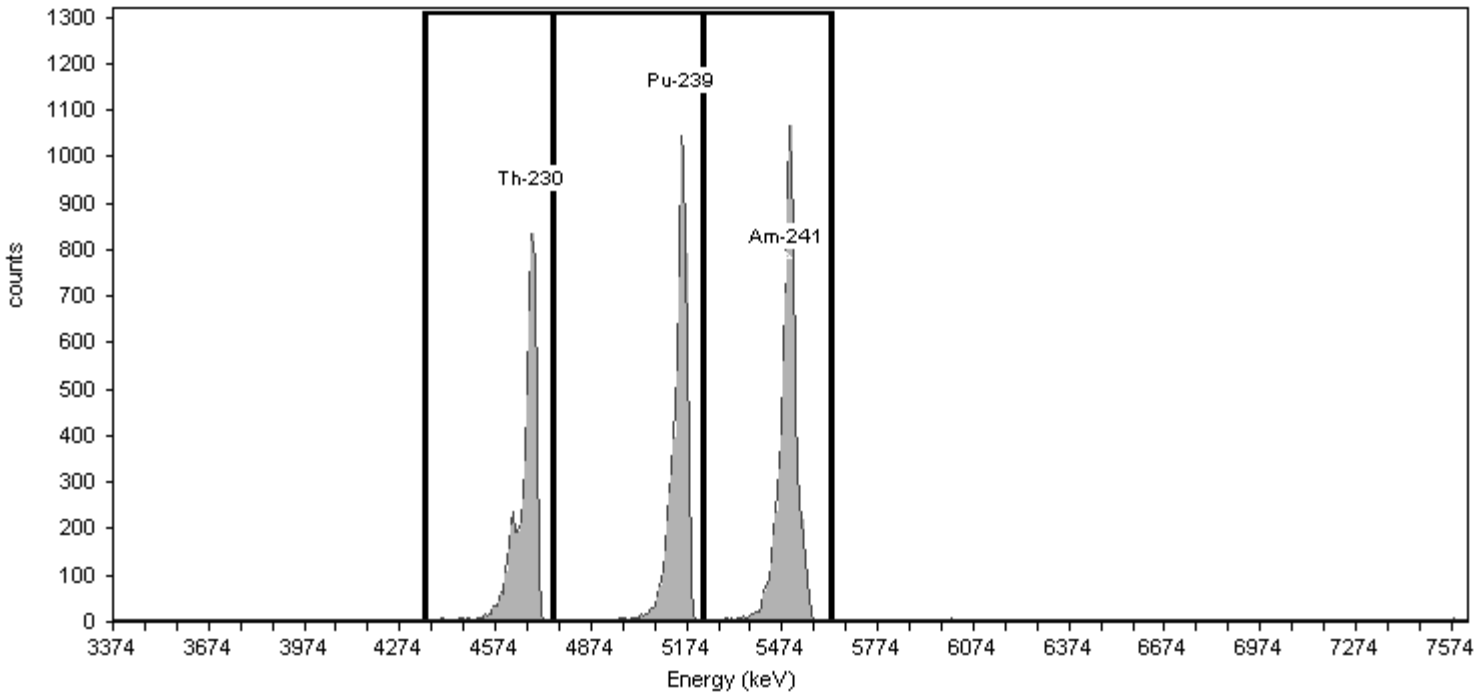
Certificate ID: 82240-334
Prepared by: Analytics

Certification Date: 6/8/2010 12:00:00PM
Description:

## Acquisition

Detector: AV70 , SN: 48-158FF1
Acquisition Start Date: 5/23/2017 12:57:28PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 24.63% +/- 0.40% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,526.00 | 92.10 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 6,370.00 | 106.17 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 7,326.00 | 122.10 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:00:34PM 5/23/2017

## Calibration

Sample Name: CCV-9793;AV71-20170523
Description:
Detector: AV71

Calibration Date: 5/23/2017 2:00:30PM
Analyst: 60040

## Source Info

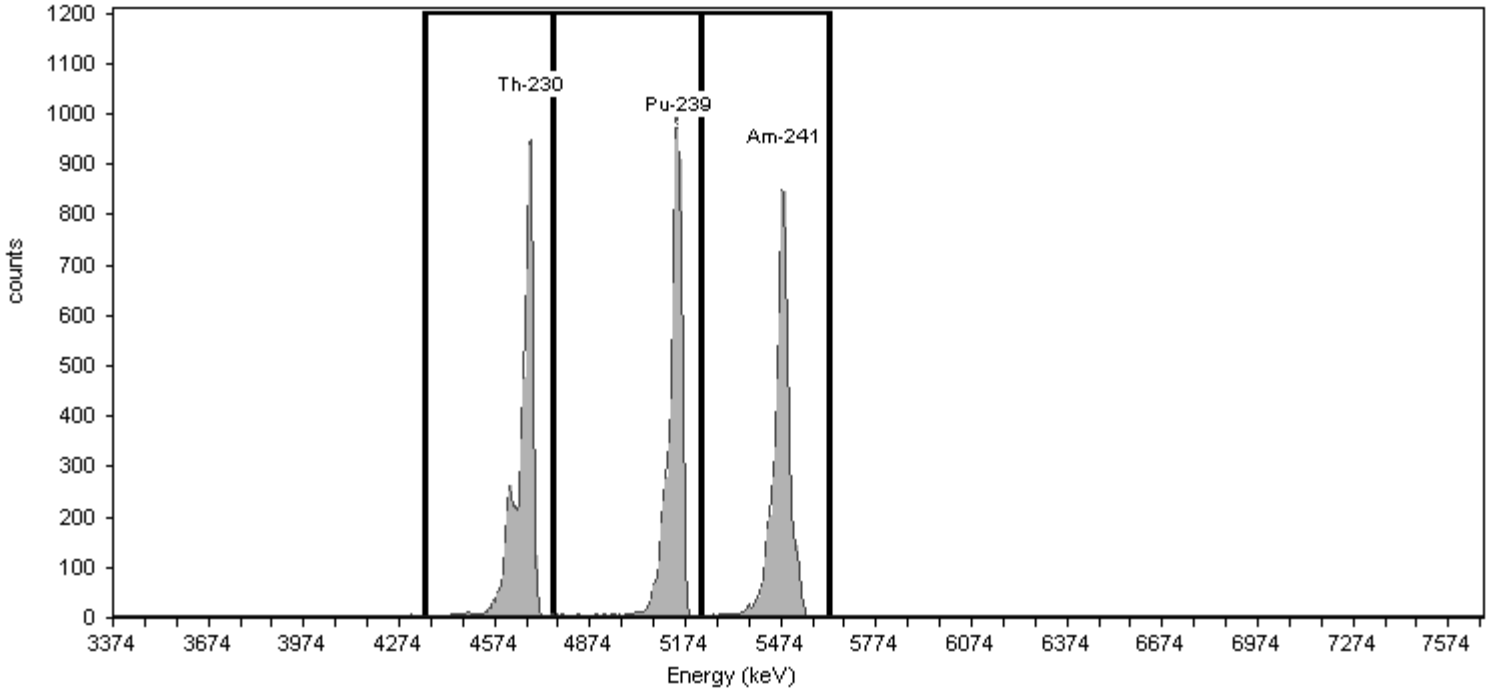
Certificate ID: 82241-334
Prepared by: Analytics

Certification Date: 6/8/2010 12:00:00PM
Description:

## Acquisition

Detector: AV71 , SN: 48-158EE6
Acquisition Start Date: 5/23/2017 12:57:48PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 24.84% +/- 0.42% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,952.00 | 99.20 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 6,099.00 | 101.65 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,829.00 | 97.15 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:01:02PM 5/23/2017

## Calibration

Sample Name: CCV-9794;AV72-20170523
Description:
Detector: AV72

Calibration Date: 5/23/2017 2:00:59PM
Analyst: 60040

## Source Info

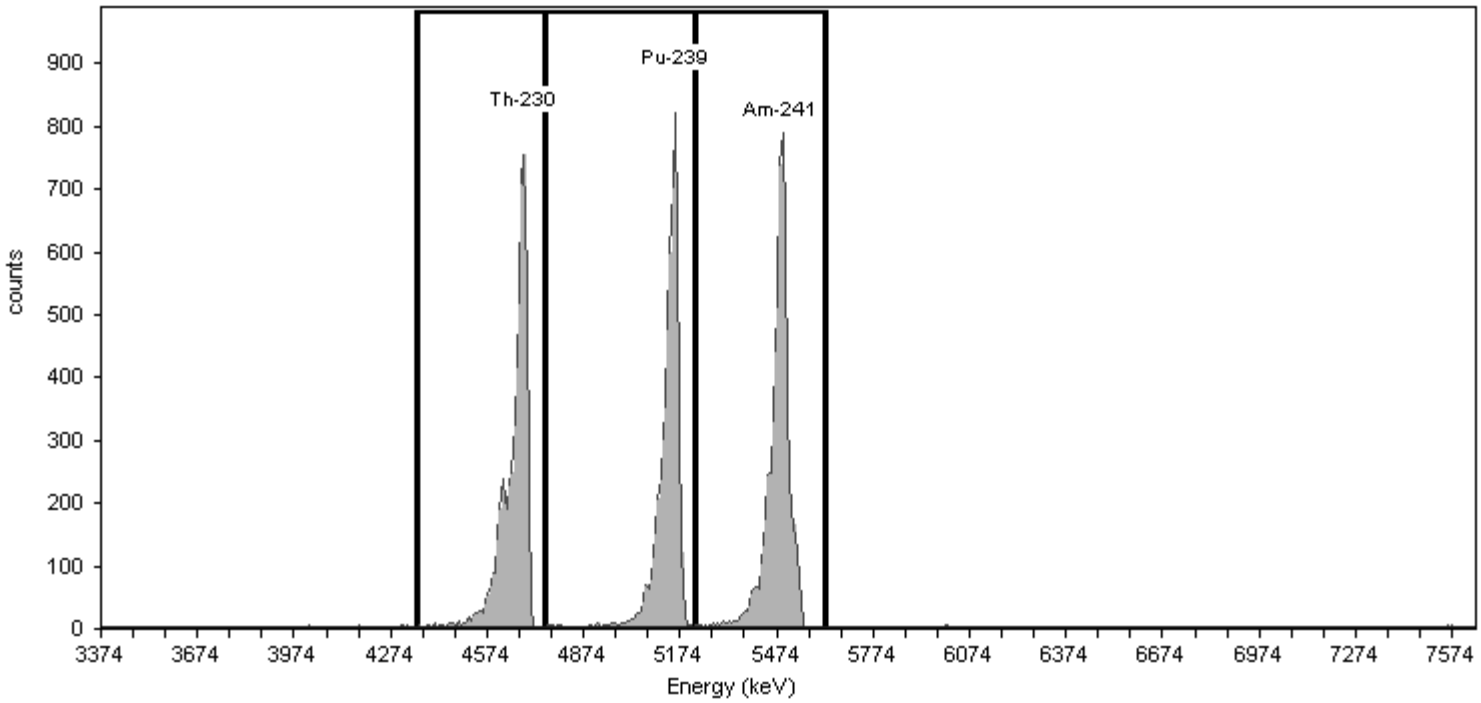
Certificate ID: 82242-334
Prepared by: Analytics

Certification Date: 6/8/2010 12:00:00PM
Description:

## Acquisition

Detector: AV72 , SN: 48-05a21
Acquisition Start Date: 5/23/2017 12:58:11PM
Live Time: 60.00 min.
Real Time: 60.05 min.
Efficiency: 23.55% +/- 0.41% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,503.00 | 91.72 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,519.00 | 91.98 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,996.00 | 99.93 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:01:29PM 5/23/2017

## Calibration

Sample Name: CCV-9795;AV73-20170523
Description:
Detector: AV73

Calibration Date: 5/23/2017 2:01:26PM
Analyst: 60040

## Source Info

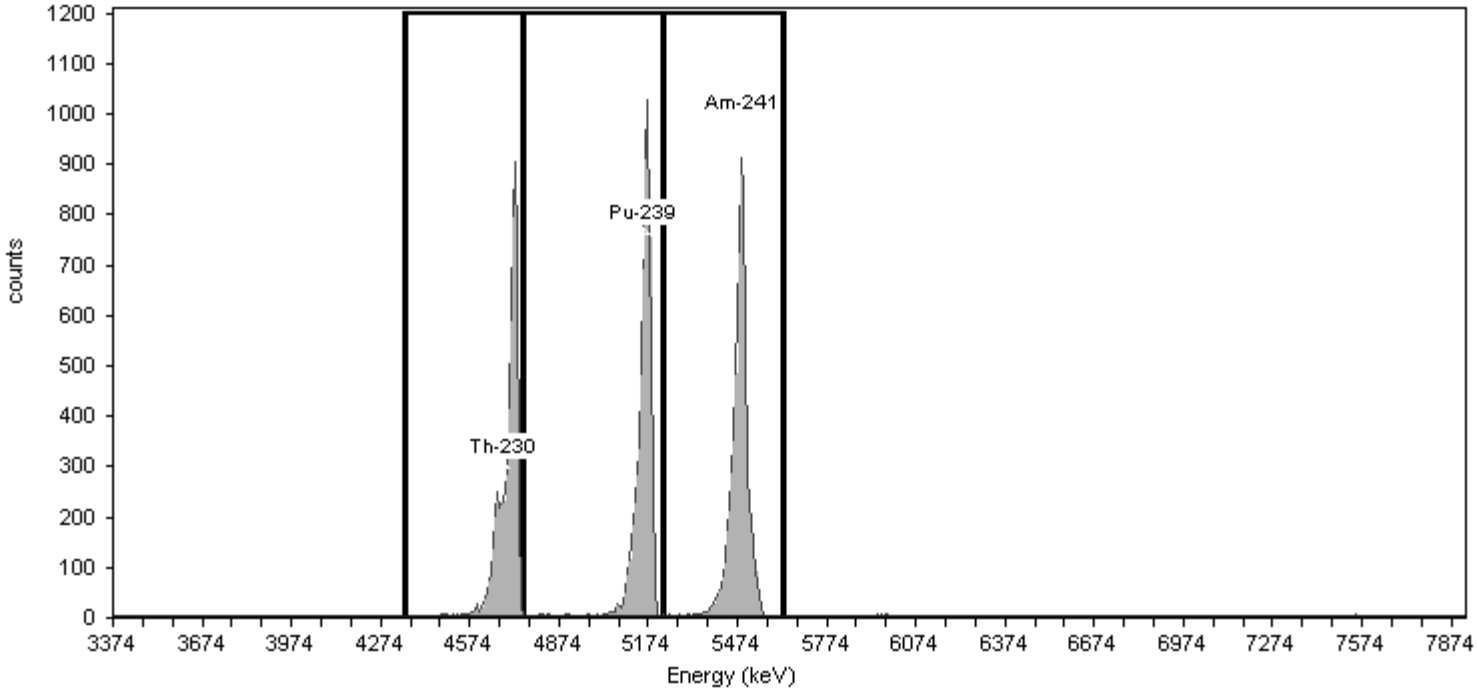
Certificate ID: 82243-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV73 , SN: 46-03321
Acquisition Start Date: 5/23/2017 12:58:31PM
Live Time: 60.00 min.
Real Time: 60.04 min.
Efficiency: 26.28% +/- 0.46% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,555.00 | 92.58 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,639.00 | 93.98 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,984.00 | 99.73 |

FWHM<100 keV for all peaks. 05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:03:46PM 5/23/2017

## Calibration

Sample Name: CCV-9817;AV74-20170523a
Description:
Detector: AV74

Calibration Date: 5/23/2017 2:03:43PM
Analyst: 60040

## Source Info

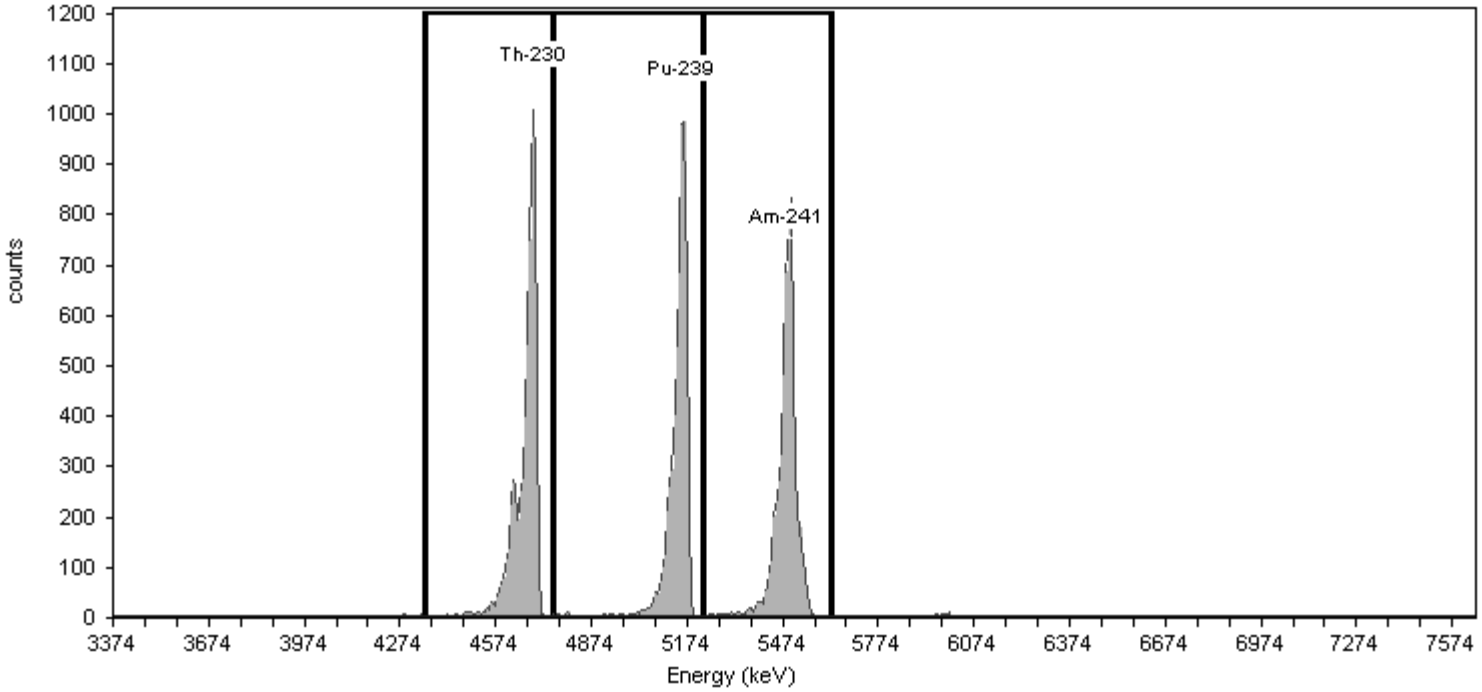
Certificate ID: 82244-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV74 , SN: 50-051C6
Acquisition Start Date: 5/23/2017 1:03:50PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 23.64% +/- 0.40% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 6,230.00 | 103.83 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,809.00 | 96.82 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,747.00 | 95.78 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:59:51PM 5/23/2017

## Calibration

Sample Name: CCV-9884;AV75-20170523
Description:
Detector: AV75

Calibration Date: 5/23/2017 1:59:47PM
Analyst: 60040

## Source Info

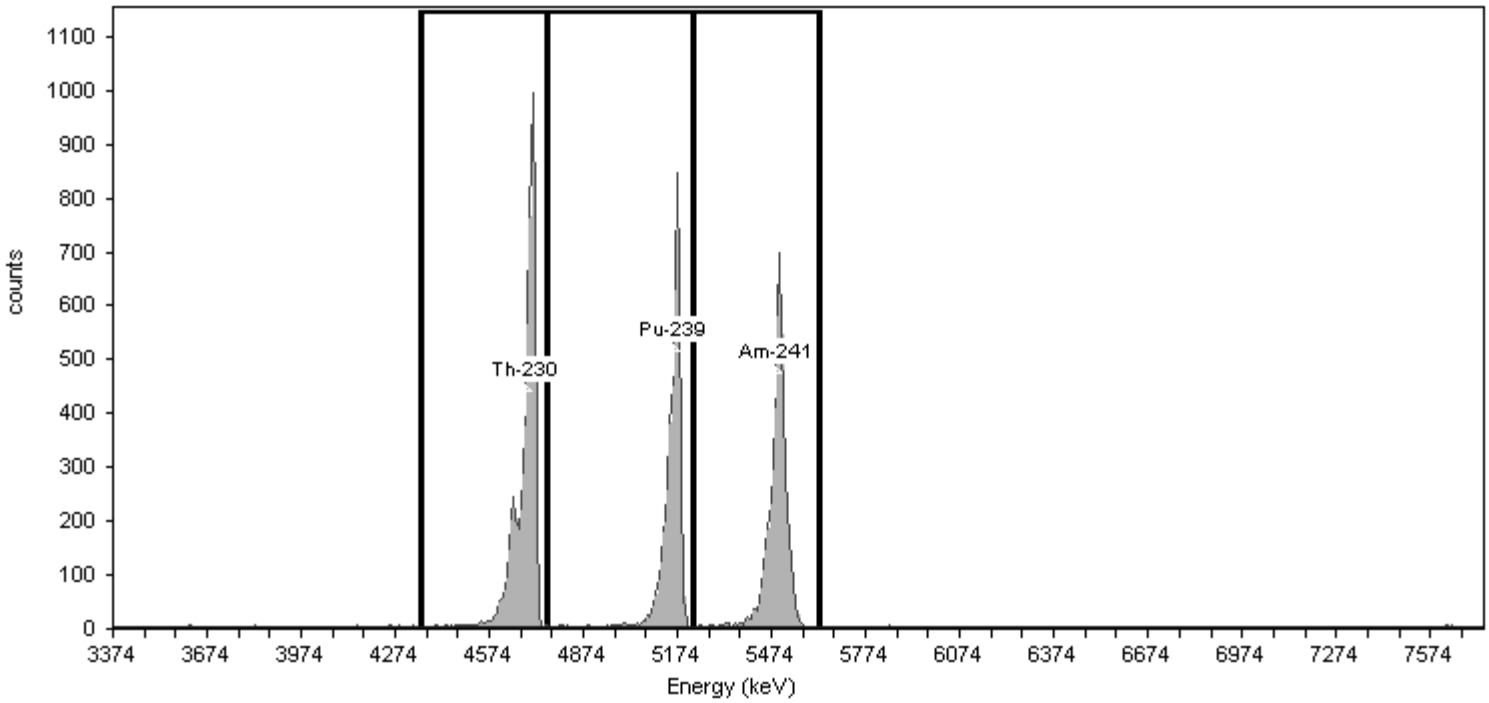
Certificate ID: 82245-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV75 , SN: 51-082B4
Acquisition Start Date: 5/23/2017 12:59:10PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 22.86% +/- 0.44% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 5,616.00 | 93.60 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 4,436.00 | 73.93 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 4,462.00 | 74.37 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:00:18PM 5/23/2017

## Calibration

Sample Name: CCV-9885;AV76-20170523
Description:
Detector: AV76

Calibration Date: 5/23/2017 2:00:14PM
Analyst: 60040

## Source Info

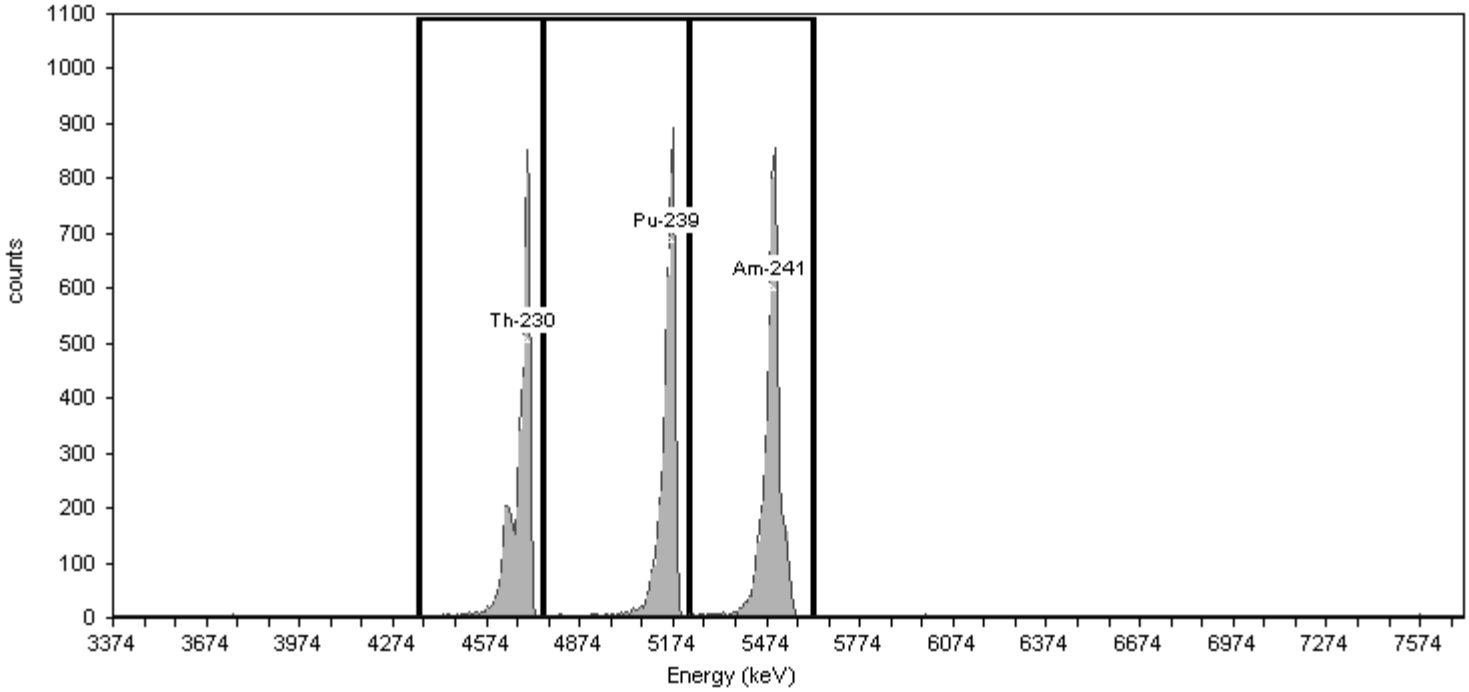
Certificate ID: 82246-334
Prepared by: Analytics

Certification Date: 6/9/2010 12:00:00PM
Description:

## Acquisition

Detector: AV76 , SN: 50-060-f4
Acquisition Start Date: 5/23/2017 12:59:33PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 24.58% +/- 0.47% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 4,923.00 | 82.05 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 4,723.00 | 78.72 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 5,275.00 | 87.92 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:01:15PM 5/23/2017

## Calibration

Sample Name: CCV-8874;AV79-20170523
Description:
Detector: AV79

Calibration Date: 5/23/2017 2:01:12PM
Analyst: 60040

## Source Info

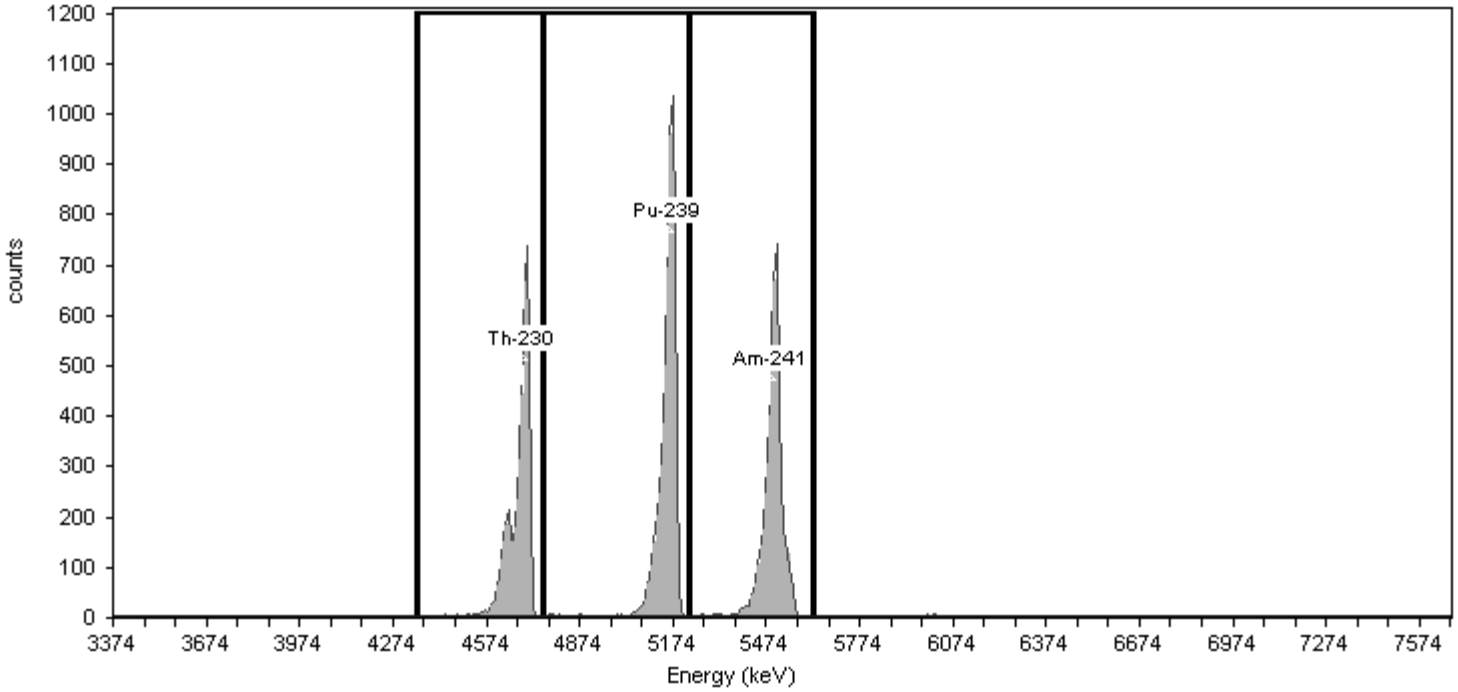
Certificate ID: 82233-334
Prepared by: Analytics

Certification Date: 6/3/2010 12:00:00PM
Description:

## Acquisition

Detector: AV79 , SN: 46-033Q5
Acquisition Start Date: 5/23/2017 1:00:17PM
Live Time: 60.00 min.
Real Time: 60.03 min.
Efficiency: 26.72% +/- 0.50% TPU(2 sigma)

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy MeV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4.69 | 132 | 186 | 0.00 | 4,578.00 | 76.30 |
| Pu-239 | 240 | 5.16 | 186 | 249 | 0.00 | 5,986.00 | 99.77 |
| Am-241 | 284 | 5.49 | 249 | 303 | 0.00 | 4,905.00 | 81.75 |

FWHM<100 keV
for all peaks.
05/23/2017 ALD

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:08:42PM 5/17/2017

## Calibration

Sample Name: CCV-8876;AV150-20170517a
Description:
Detector: AV150

Analyst: 60040
Analysis Date: 5/17/2017 2:08:41PM
Calibration Type: Energy And Efficiency

## Source Info

Certificate ID: 82235-334
Prepared by: Analytics
Description:

Certification Date: 6/4/2010 12:00:00PM

## Acquisition

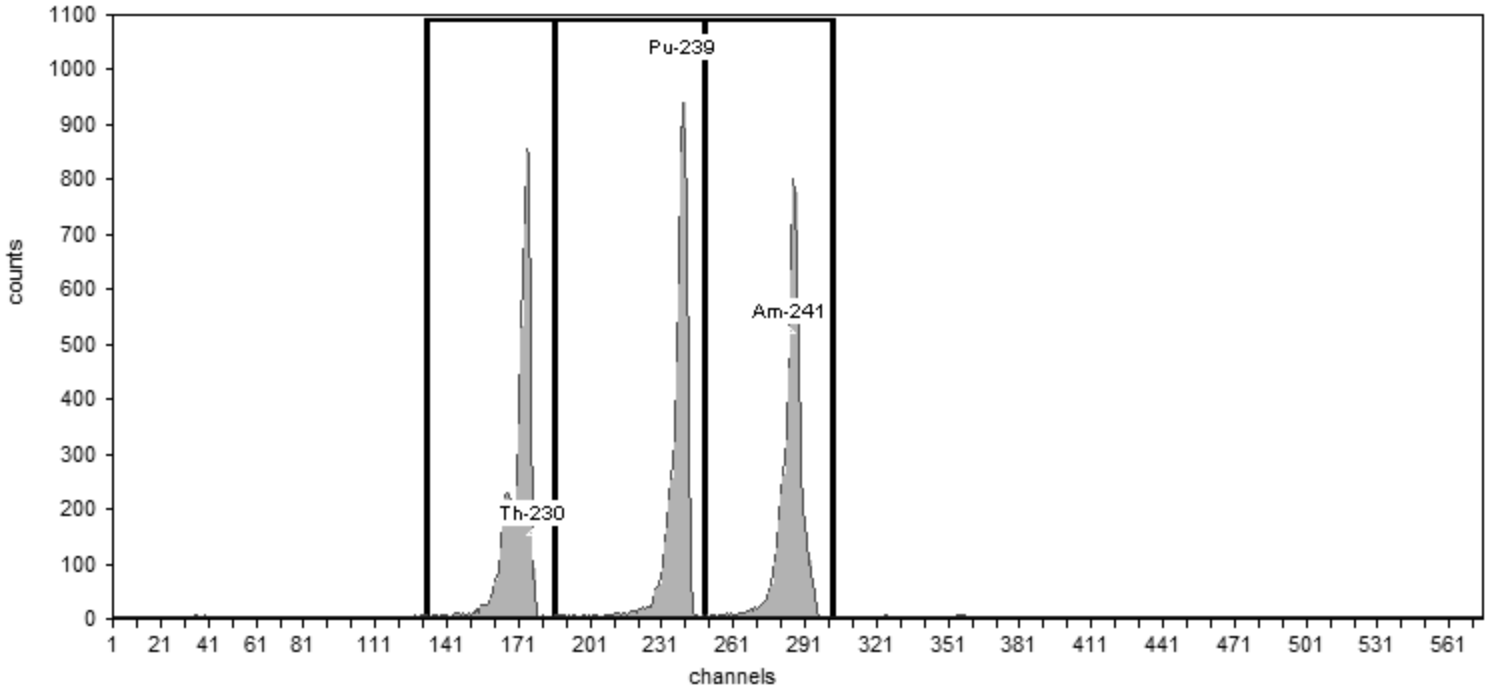
Detector: AV150 , SN: 50-05/R4
Acquisition Start Date: 5/17/2017 1:06:09PM

Live Time: 60.00 min.
Real Time: 60.00 min.

Efficiency Calibration Name: CCV-8876;AV150-201705

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 22.46% +/- 0.38% TPU(2 sigma)




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy keV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4,687.50 | 132 | 186 | 34.93 | 5,888.00 | 98.13 |
| Pu-239 | 240 | 5,155.40 | 186 | 249 | 34.99 | 5,692.00 | 94.87 |
| Am-241 | 284 | 5,485.70 | 249 | 303 | 36.54 | 5,779.00 | 96.32 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Calibration Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:51:32PM 5/17/2017

## Calibration

Sample Name: CCV-9793;AV155-20170517
Description:
Detector: AV155

Analyst: 60040
Analysis Date: 5/17/2017 12:51:31PM
Calibration Type: Energy And Efficiency

## Source Info

Certificate ID: 82241-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

## Acquisition

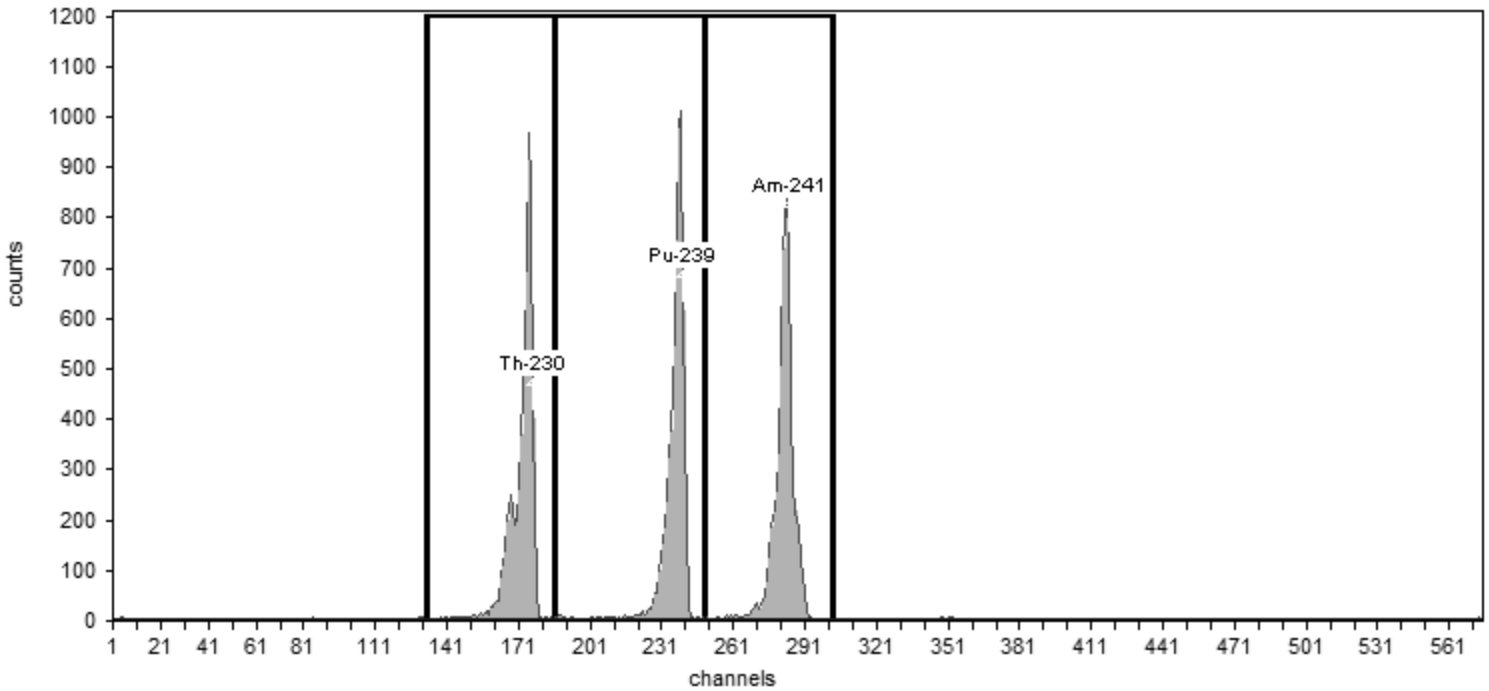
Detector: AV155 , SN: 50-05/II1
Acquisition Start Date: 5/17/2017 9:17:35AM

Live Time: 60.00 min.
Real Time: 60.00 min.

Efficiency Calibration Name: CCV-9793;AV155-201705

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency: 23.93% +/- 0.41% TPU(2 sigma)




## General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

## Nuclide Activity Summary

| Nuclide | Peak Channel | Peak Energy keV | ROI Start Channel | ROI End Channel | Peak FWHM keV | Gross Counts | Net Count Rate (cpm) |
|---|---|---|---|---|---|---|---|
| Th-230 | 177 | 4,687.50 | 132 | 186 | 30.83 | 5,762.00 | 96.03 |
| Pu-239 | 240 | 5,155.40 | 186 | 249 | 33.41 | 5,810.00 | 96.83 |
| Am-241 | 284 | 5,485.70 | 249 | 303 | 33.39 | 5,654.00 | 94.23 |

# Monthly Backgrounds

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:37:45AM 5/23/2017

## Sample

Sample Name: ICB;AV64
Comment:

Spectrum #1 Analysis #1

## Batch

Batch Name: May2017a
Description:

Analyst: 60040

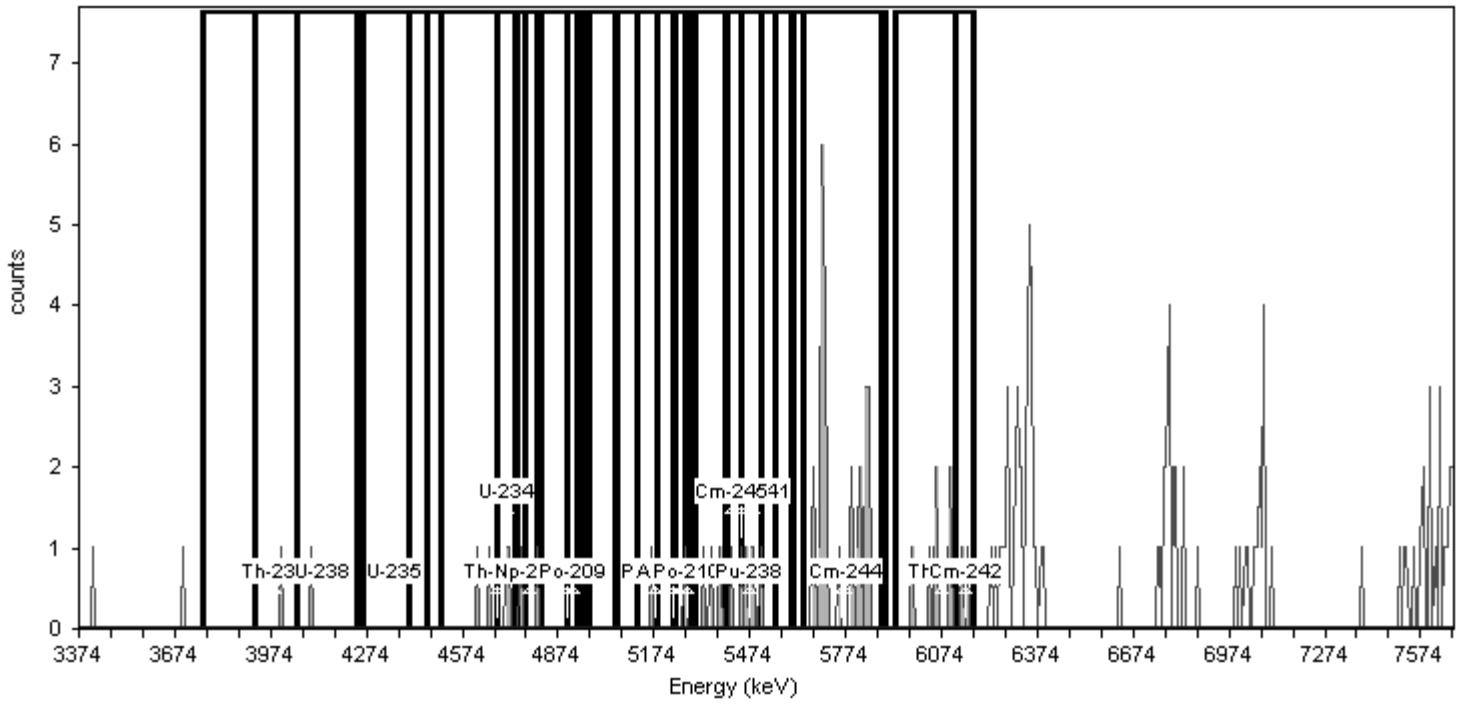
## Acquisition

Detector: AV64 , SN: 43-028v3
Acquisition Start Date: 5/22/2017 8:35:23AM
Live Time: 960.00 min.
Real Time: 960.00 min.
Calibration Name: IC-8875;AV64-20160831
Calibration Date: 8/31/2016 12:49:19PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.50% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 146.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 1.00 | 1.042E-003 | 1.473E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 0.00 | 0.000E+000 | 1.473E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 4.00 | 4.167E-003 | 2.329E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 6.00 | 6.250E-003 | 2.756E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 4.00 | 4.167E-003 | 2.329E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 2.00 | 2.083E-003 | 1.804E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 1.00 | 1.042E-003 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 1.00 | 1.042E-003 | 1.473E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 5.00 | 5.208E-003 | 2.552E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 10.00 | 1.042E-002 | 3.455E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 1.00 | 1.042E-003 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 10.00 | 1.042E-002 | 3.455E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 9.00 | 9.375E-003 | 3.294E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 2.00 | 2.083E-003 | 1.804E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 31.00 | 3.229E-002 | 5.893E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 31.00 | 3.229E-002 | 5.893E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 8.00 | 8.333E-003 | 3.125E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 2.00 | 2.083E-003 | 1.804E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:38:03AM 5/23/2017

## Sample

Sample Name: ICB;AV65
Comment:

Spectrum #1 Analysis #1

## Batch

Batch Name: May2017a
Description:

Analyst: 60040

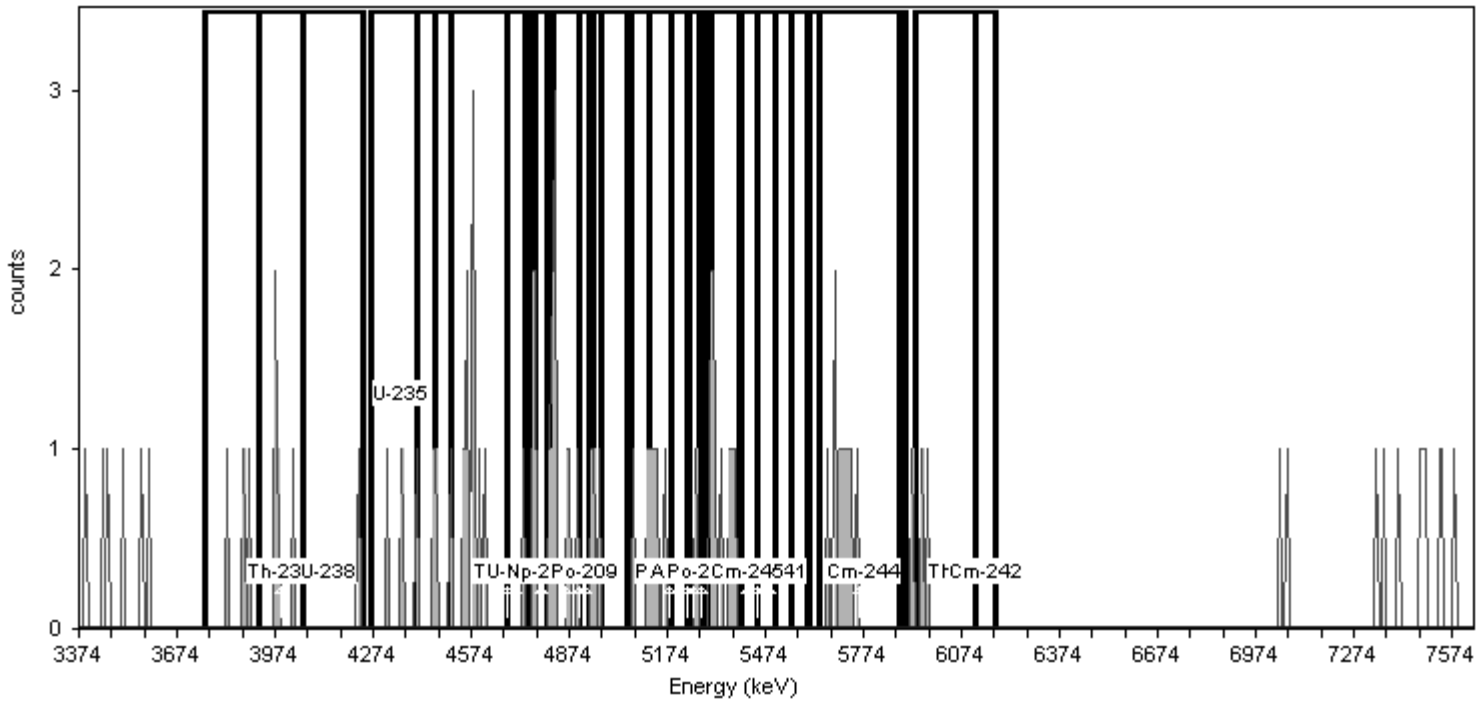
## Acquisition

Detector: AV65 , SN: 44-049JJ1
Acquisition Start Date: 5/22/2017 8:35:24AM
Live Time: 960.00 min.
Real Time: 960.00 min.
Calibration Name: IC-8876;AV65-20160831a
Calibration Date: 8/31/2016 12:49:33PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 23.43% +/- 0.28% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 88.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 7.00 | 7.292E-003 | 2.946E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 5.00 | 5.208E-003 | 2.552E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 5.00 | 5.208E-003 | 2.552E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 15.00 | 1.563E-002 | 4.167E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 19.00 | 1.979E-002 | 4.658E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 16.00 | 1.667E-002 | 4.295E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 19.00 | 1.979E-002 | 4.658E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 2.00 | 2.083E-003 | 1.804E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 7.00 | 7.292E-003 | 2.946E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 10.00 | 1.042E-002 | 3.455E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 17.00 | 1.771E-002 | 4.419E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 10.00 | 1.042E-002 | 3.455E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 1.00 | 1.042E-003 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 9.00 | 9.375E-003 | 3.294E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 9.00 | 9.375E-003 | 3.294E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 10.00 | 1.042E-002 | 3.455E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 10.00 | 1.042E-002 | 3.455E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 2.00 | 2.083E-003 | 1.804E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 0.00 | 0.000E+000 | 1.473E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:50:13AM 5/20/2017

## Sample

Sample Name: ICB;AV66
Comment:

Spectrum #2 Analysis #1

## Batch

Batch Name: May2017
Description:

Analyst: 60040

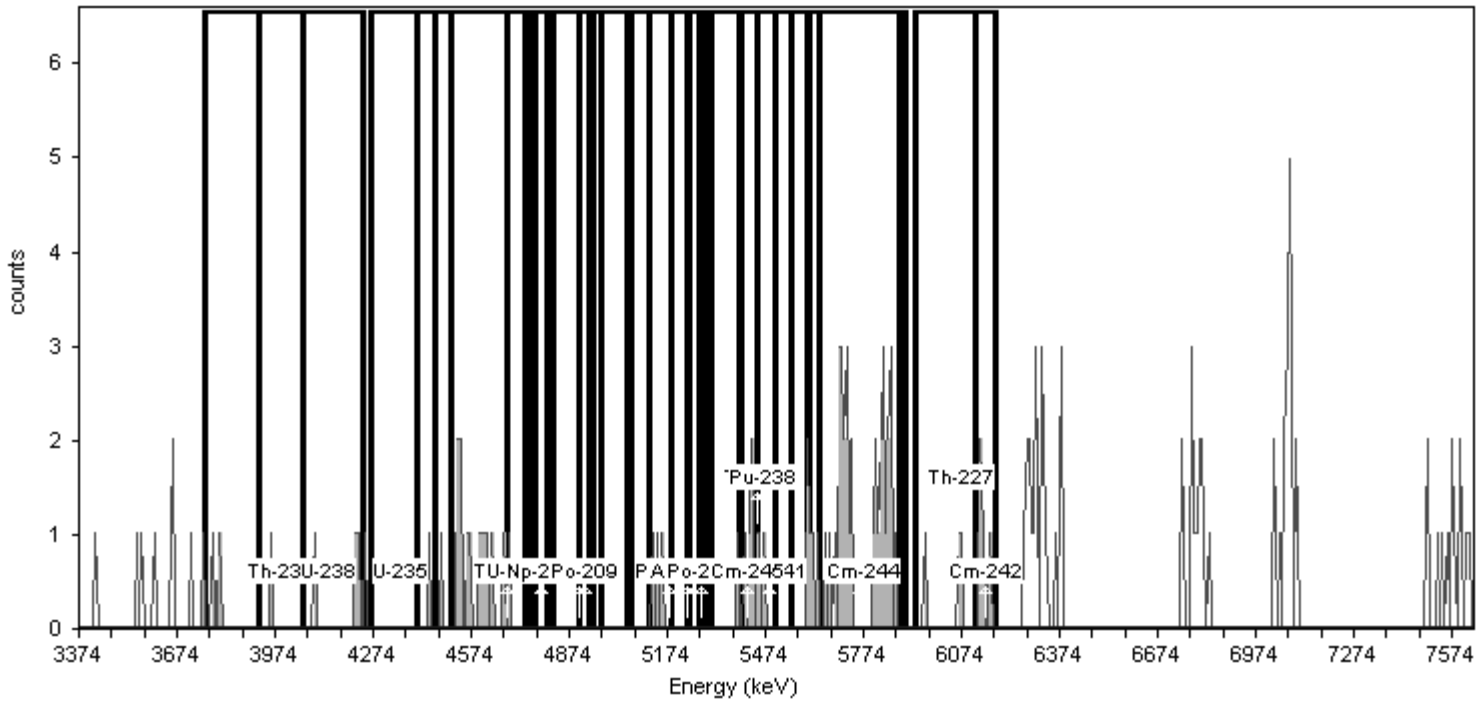
## Acquisition

Detector: AV66 , SN: 48-158EE2
Acquisition Start Date: 5/19/2017 10:36:13AM
Live Time: 960.00 min.
Real Time: 960.01 min.
Calibration Name: IC-8877;AV66-20160831a
Calibration Date: 8/31/2016 12:49:47PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 25.06% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 152.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 4.00 | 4.167E-003 | 2.329E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 1.00 | 1.042E-003 | 1.473E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 15.00 | 1.563E-002 | 4.167E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 13.00 | 1.354E-002 | 3.898E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 1.00 | 1.042E-003 | 1.473E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 0.00 | 0.000E+000 | 1.473E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 0.00 | 0.000E+000 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 3.00 | 3.125E-003 | 2.083E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 4.00 | 4.167E-003 | 2.329E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 8.00 | 8.333E-003 | 3.125E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 8.00 | 8.333E-003 | 3.125E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 10.00 | 1.042E-002 | 3.455E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 5.00 | 5.208E-003 | 2.552E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 36.00 | 3.750E-002 | 6.336E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 33.00 | 3.437E-002 | 6.074E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 7.00 | 7.292E-003 | 2.946E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 4.00 | 4.167E-003 | 2.329E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:50:22AM 5/20/2017

## Sample

Sample Name: ICB;AV68
Comment:

Spectrum #2 Analysis #1

## Batch

Batch Name: May2017
Description:

Analyst: 60040

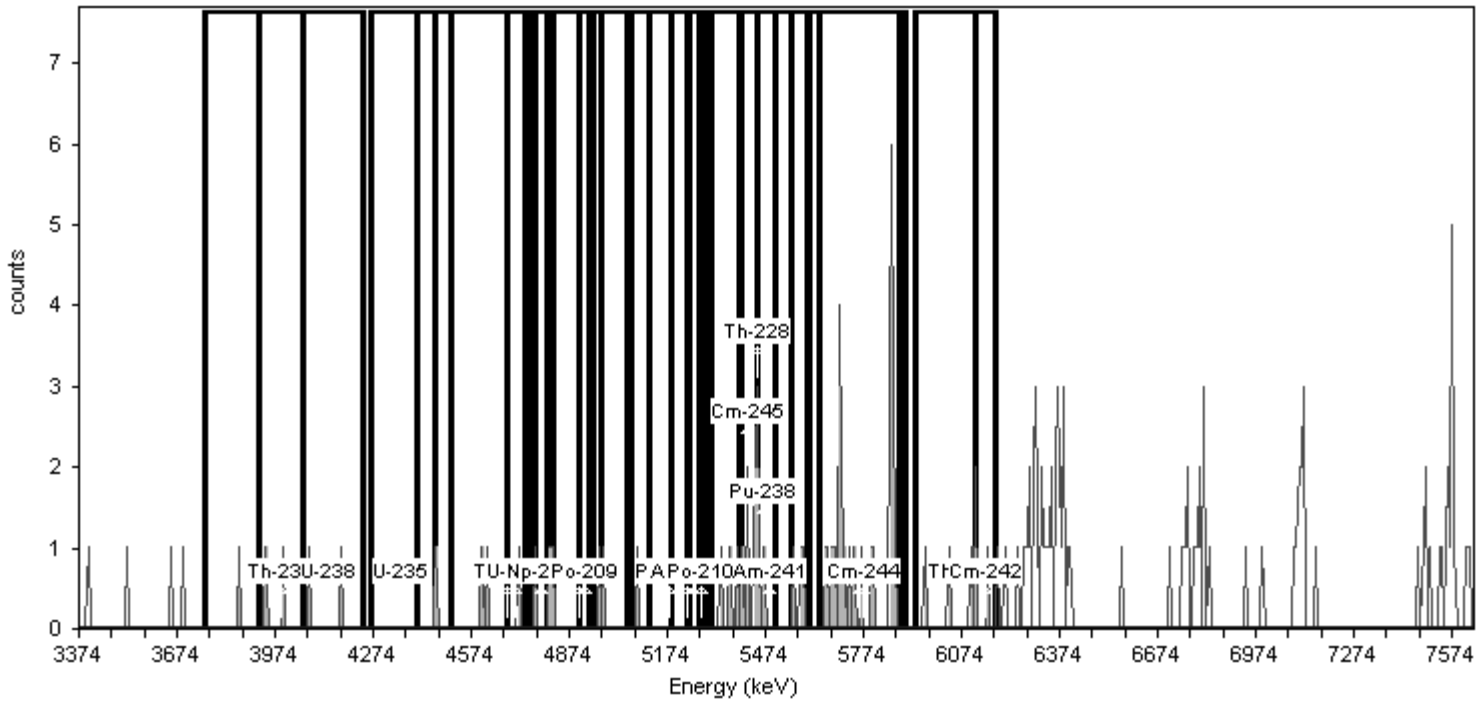
## Acquisition

Detector: AV68 , SN: 50-60-V2
Acquisition Start Date: 5/19/2017 10:36:14AM
Live Time: 960.00 min.
Real Time: 960.01 min.
Calibration Name: IC-9520;AV68-20160831
Calibration Date: 8/31/2016 12:50:01PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.78% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 141.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 4.00 | 4.167E-003 | 2.329E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 1.00 | 1.042E-003 | 1.473E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 4.00 | 4.167E-003 | 2.329E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 6.00 | 6.250E-003 | 2.756E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 4.00 | 4.167E-003 | 2.329E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 6.00 | 6.250E-003 | 2.756E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 1.00 | 1.042E-003 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 2.00 | 2.083E-003 | 1.804E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 1.00 | 1.042E-003 | 1.473E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 5.00 | 5.208E-003 | 2.552E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 13.00 | 1.354E-002 | 3.898E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 13.00 | 1.354E-002 | 3.898E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 16.00 | 1.667E-002 | 4.295E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 8.00 | 8.333E-003 | 3.125E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 26.00 | 2.708E-002 | 5.413E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 26.00 | 2.708E-002 | 5.413E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 6.00 | 6.250E-003 | 2.756E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 3.00 | 3.125E-003 | 2.083E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:50:40AM 5/20/2017

## Sample

Sample Name: ICB;AV70
Comment:

Spectrum #2 Analysis #1

## Batch

Batch Name: May2017
Description:

Analyst: 60040

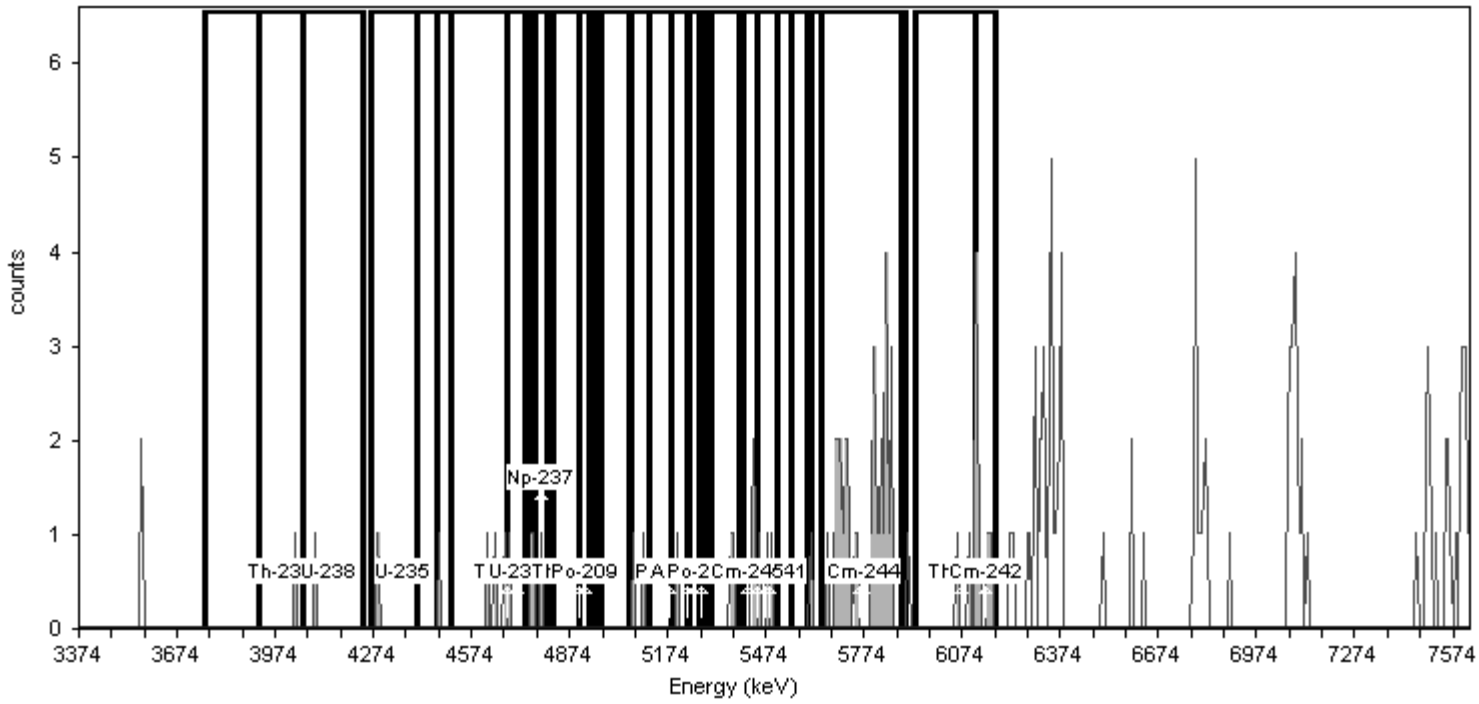
## Acquisition

Detector: AV70 , SN: 48-158FF1
Acquisition Start Date: 5/19/2017 10:36:16AM
Live Time: 960.00 min.
Real Time: 960.01 min.
Calibration Name: IC-9792;AV70-20160830
Calibration Date: 8/31/2016 8:44:32AM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 25.41% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 155.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 1.00 | 1.042E-003 | 1.473E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 1.00 | 1.042E-003 | 1.473E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 5.00 | 5.208E-003 | 2.552E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 7.00 | 7.292E-003 | 2.946E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 4.00 | 4.167E-003 | 2.329E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 5.00 | 5.208E-003 | 2.552E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 1.00 | 1.042E-003 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 3.00 | 3.125E-003 | 2.083E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 5.00 | 5.208E-003 | 2.552E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 9.00 | 9.375E-003 | 3.294E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 8.00 | 8.333E-003 | 3.125E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 8.00 | 8.333E-003 | 3.125E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 3.00 | 3.125E-003 | 2.083E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 33.00 | 3.437E-002 | 6.074E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 32.00 | 3.333E-002 | 5.984E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 9.00 | 9.375E-003 | 3.294E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 7.00 | 7.292E-003 | 2.946E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:50:49AM 5/20/2017

## Sample

Sample Name: ICB;AV71
Comment:

Spectrum #2 Analysis #1

## Batch

Batch Name: May2017
Description:

Analyst: 60040

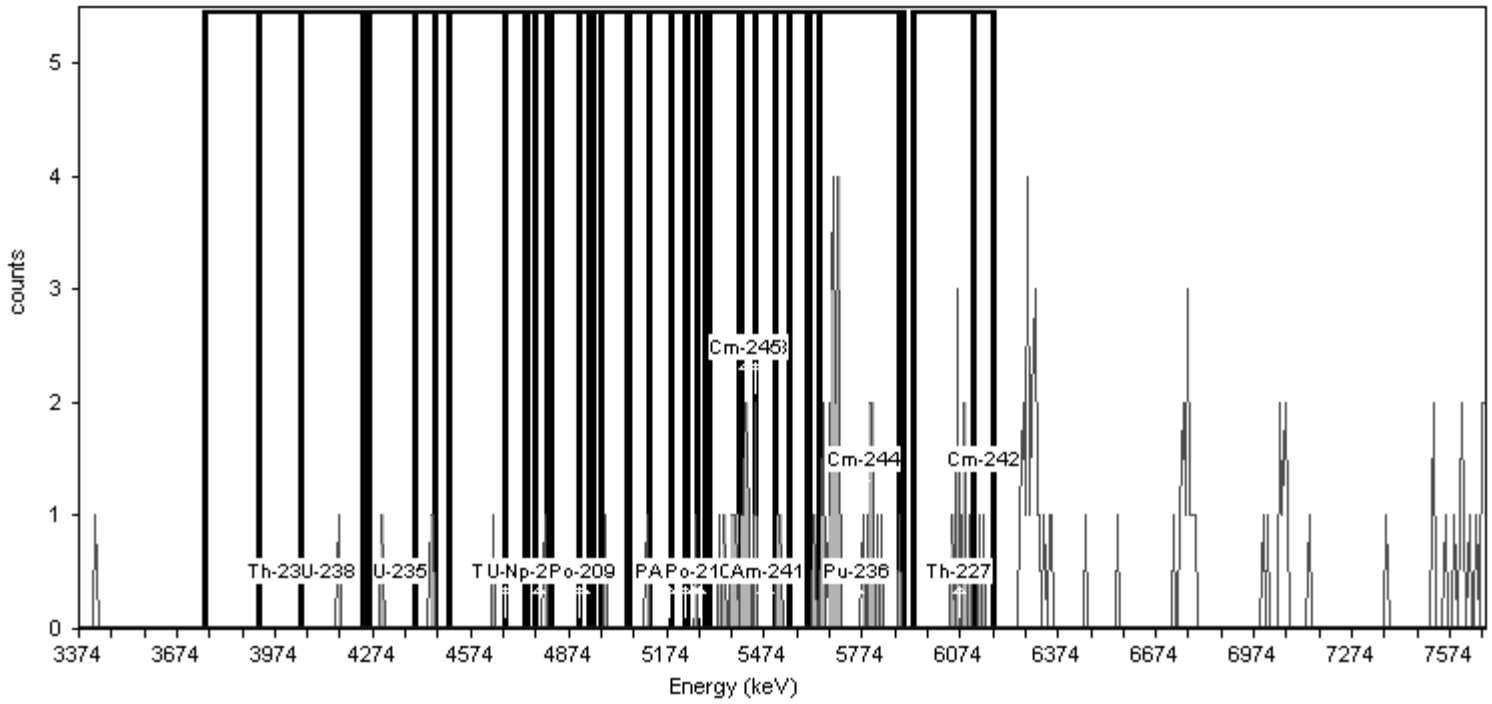
## Acquisition

Detector: AV71 , SN: 48-158EE6
Acquisition Start Date: 5/19/2017 10:36:17AM
Live Time: 960.00 min.
Real Time: 960.01 min.
Calibration Name: IC-9793;AV71-20160830
Calibration Date: 8/31/2016 8:44:46AM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 25.11% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 115.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 0.00 | 0.000E+000 | 1.473E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 1.00 | 1.042E-003 | 1.473E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 3.00 | 3.125E-003 | 2.083E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 2.00 | 2.083E-003 | 1.804E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 1.00 | 1.042E-003 | 1.473E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 3.00 | 3.125E-003 | 2.083E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 1.00 | 1.042E-003 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 2.00 | 2.083E-003 | 1.804E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 8.00 | 8.333E-003 | 3.125E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 13.00 | 1.354E-002 | 3.898E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 1.00 | 1.042E-003 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 14.00 | 1.458E-002 | 4.034E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 14.00 | 1.458E-002 | 4.034E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 7.00 | 7.292E-003 | 2.946E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 26.00 | 2.708E-002 | 5.413E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 25.00 | 2.604E-002 | 5.311E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 9.00 | 9.375E-003 | 3.294E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 2.00 | 2.083E-003 | 1.804E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:50:58AM 5/20/2017

## Sample

Sample Name: ICB;AV72
Comment:

Spectrum #2 Analysis #1

## Batch

Batch Name: May2017
Description:

Analyst: 60040

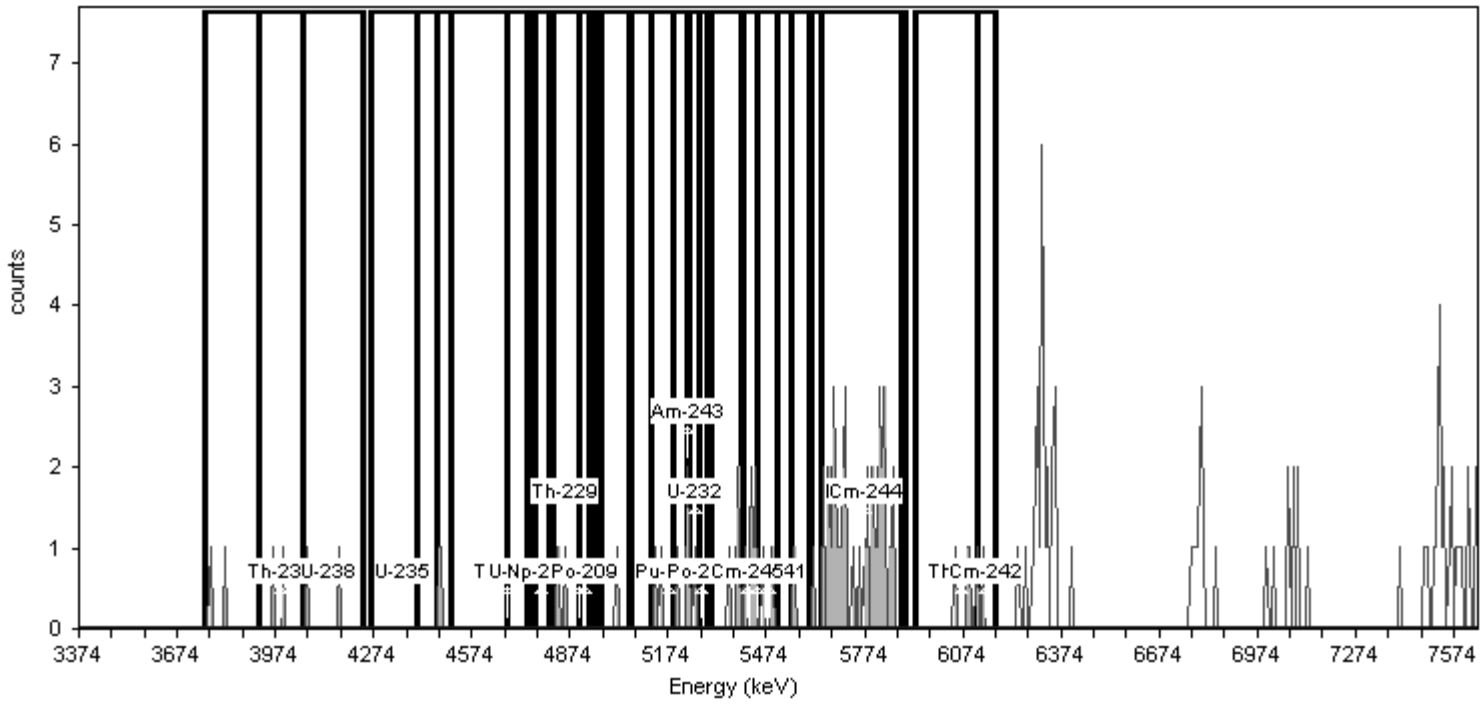
## Acquisition

Detector: AV72 , SN: 48-05a21
Acquisition Start Date: 5/19/2017 10:36:18AM
Live Time: 960.00 min.
Real Time: 960.01 min.
Calibration Name: IC-9794;AV72-20160830
Calibration Date: 8/31/2016 8:45:00AM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.48% +/- 0.31% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 138.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 4.00 | 4.167E-003 | 2.329E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 4.00 | 4.167E-003 | 2.329E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 0.00 | 0.000E+000 | 1.473E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 2.00 | 2.083E-003 | 1.804E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 3.00 | 3.125E-003 | 2.083E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 0.00 | 0.000E+000 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 7.00 | 7.292E-003 | 2.946E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 7.00 | 7.292E-003 | 2.946E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 10.00 | 1.042E-002 | 3.455E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 16.00 | 1.667E-002 | 4.295E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 4.00 | 4.167E-003 | 2.329E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 11.00 | 1.146E-002 | 3.608E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 12.00 | 1.250E-002 | 3.756E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 6.00 | 6.250E-003 | 2.756E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 39.00 | 4.062E-002 | 6.588E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 38.00 | 3.958E-002 | 6.505E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 5.00 | 5.208E-003 | 2.552E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 2.00 | 2.083E-003 | 1.804E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:51:17AM 5/20/2017

## Sample

Sample Name: ICB;AV73
Comment:

Spectrum #2 Analysis #1

## Batch

Batch Name: May2017
Description:

Analyst: 60040

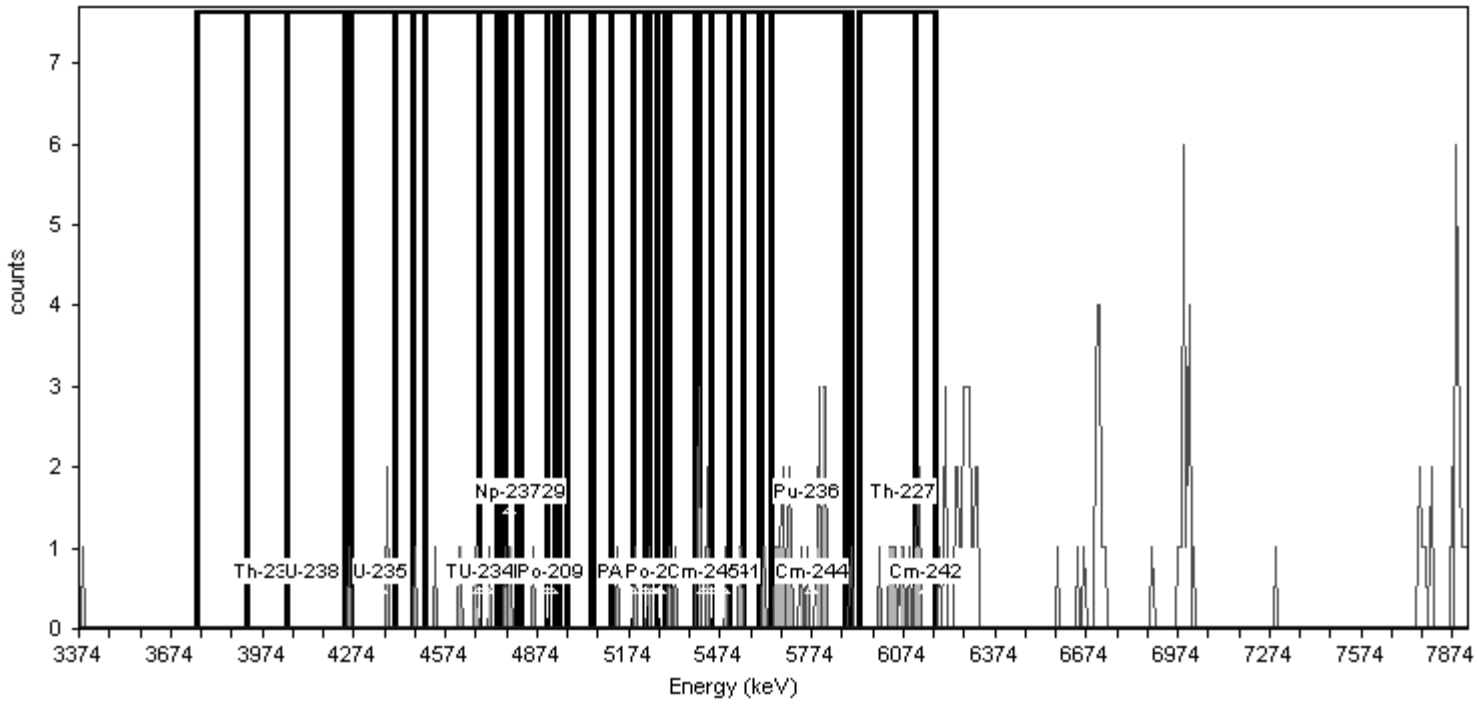
## Acquisition

Detector: AV73 , SN: 46-03321
Acquisition Start Date: 5/19/2017 10:36:19AM
Live Time: 960.00 min.
Real Time: 960.01 min.
Calibration Name: IC-9795;AV73-20160901
Calibration Date: 9/1/2016 12:03:04PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 26.51% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 139.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 0.00 | 0.000E+000 | 1.473E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 0.00 | 0.000E+000 | 1.473E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 2.00 | 2.083E-003 | 1.804E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 5.00 | 5.208E-003 | 2.552E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 6.00 | 6.250E-003 | 2.756E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 4.00 | 4.167E-003 | 2.329E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 3.00 | 3.125E-003 | 2.083E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 2.00 | 2.083E-003 | 1.804E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 3.00 | 3.125E-003 | 2.083E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 4.00 | 4.167E-003 | 2.329E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 8.00 | 8.333E-003 | 3.125E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 10.00 | 1.042E-002 | 3.455E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 1.00 | 1.042E-003 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 10.00 | 1.042E-002 | 3.455E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 10.00 | 1.042E-002 | 3.455E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 5.00 | 5.208E-003 | 2.552E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 22.00 | 2.292E-002 | 4.996E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 22.00 | 2.292E-002 | 4.996E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 11.00 | 1.146E-002 | 3.608E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 3.00 | 3.125E-003 | 2.083E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:38:23AM 5/23/2017

## Sample

Sample Name: ICB;AV74
Comment:

Spectrum #1 Analysis #1

## Batch

Batch Name: May2017a
Description:

Analyst: 60040

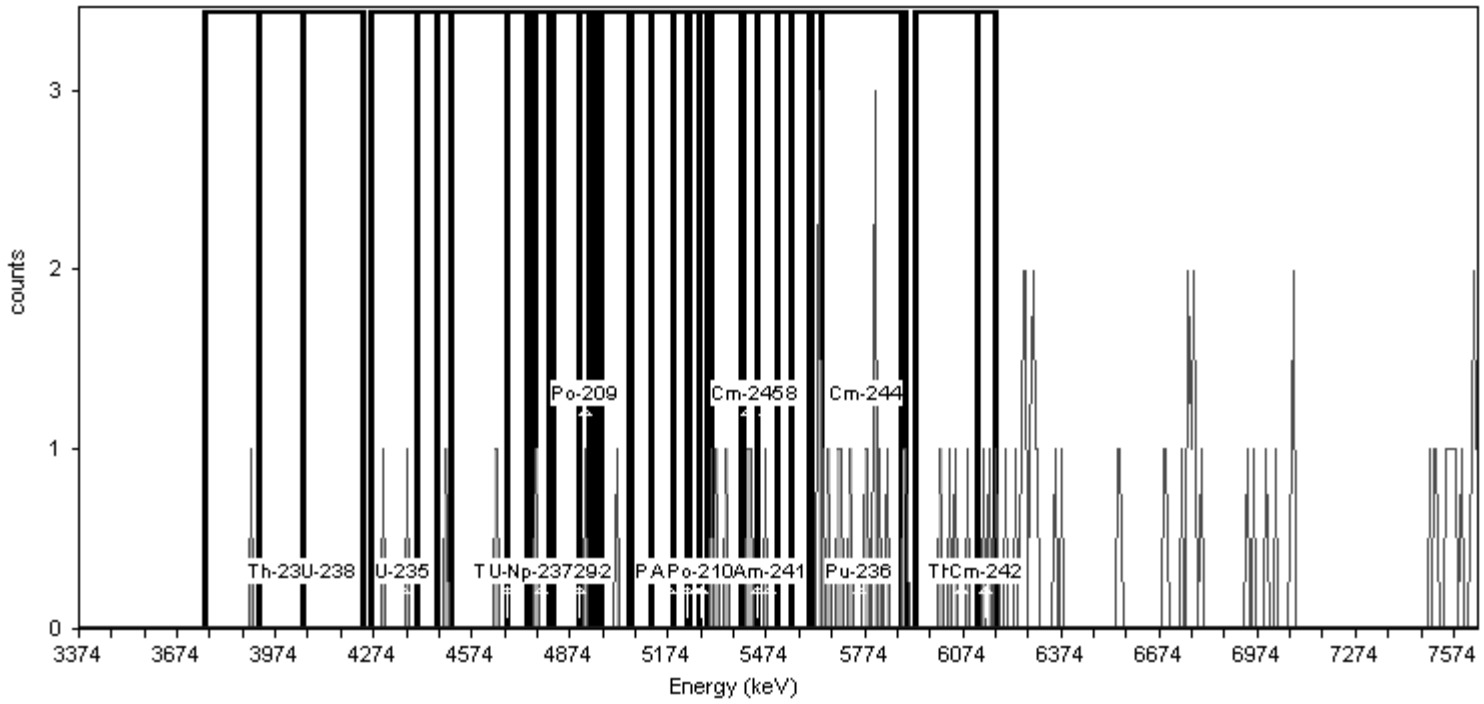
## Acquisition

Detector: AV74 , SN: 50-051C6
Acquisition Start Date: 5/22/2017 8:35:25AM
Live Time: 960.00 min.
Real Time: 960.00 min.
Calibration Name: IC-9817;AV74-20160830a
Calibration Date: 8/31/2016 8:45:45AM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 24.52% +/- 0.30% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 85.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 1.00 | 1.042E-003 | 1.473E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 0.00 | 0.000E+000 | 1.473E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 2.00 | 2.083E-003 | 1.804E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 3.00 | 3.125E-003 | 2.083E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 2.00 | 2.083E-003 | 1.804E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 3.00 | 3.125E-003 | 2.083E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 1.00 | 1.042E-003 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 1.00 | 1.042E-003 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 1.00 | 1.042E-003 | 1.473E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 1.00 | 1.042E-003 | 1.473E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 3.00 | 3.125E-003 | 2.083E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 6.00 | 6.250E-003 | 2.756E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 6.00 | 6.250E-003 | 2.756E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 6.00 | 6.250E-003 | 2.756E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 2.00 | 2.083E-003 | 1.804E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 15.00 | 1.563E-002 | 4.167E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 14.00 | 1.458E-002 | 4.034E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 7.00 | 7.292E-003 | 2.946E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 3.00 | 3.125E-003 | 2.083E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:51:35AM 5/20/2017

## Sample

Sample Name: ICB;AV75
Comment:

Spectrum #2 Analysis #1

## Batch

Batch Name: May2017
Description:

Analyst: 60040

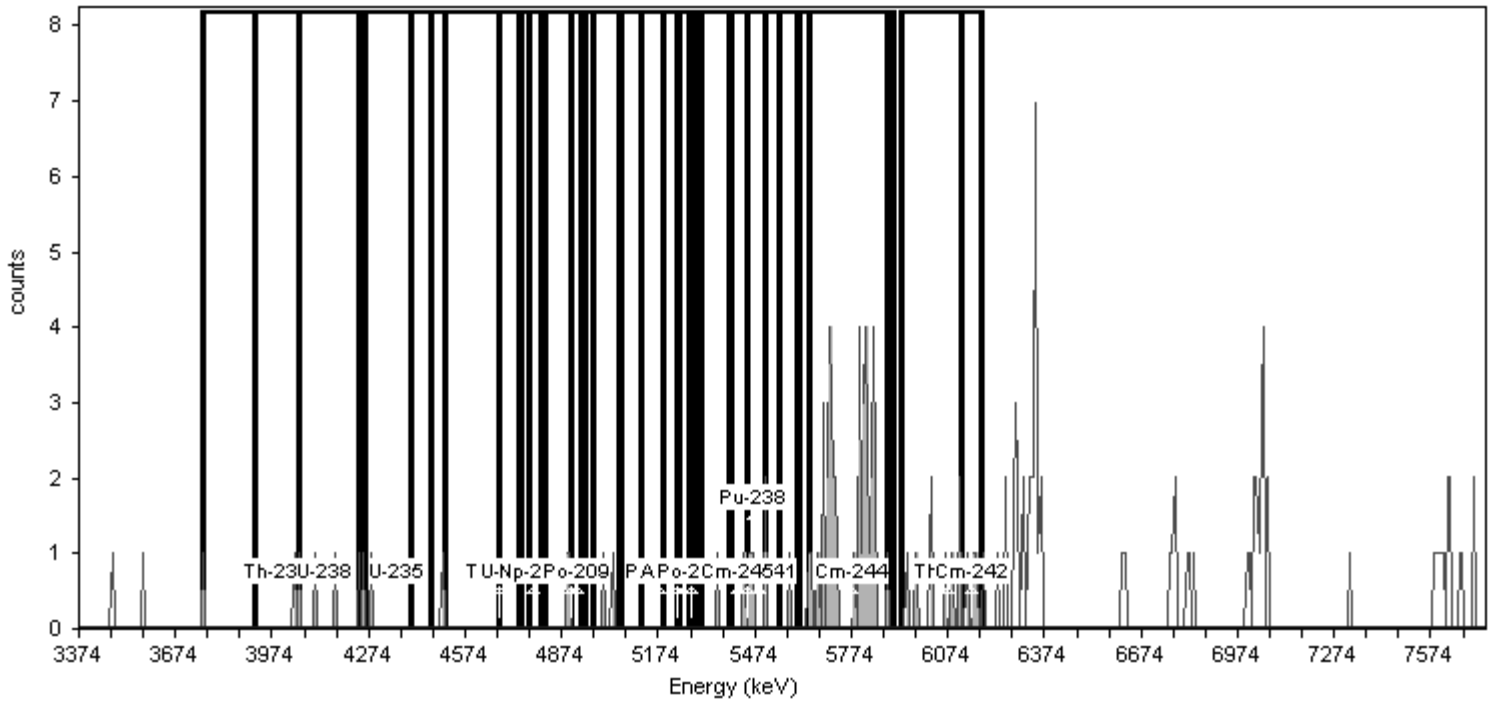
## Acquisition

Detector: AV75 , SN: 51-082B4
Acquisition Start Date: 5/19/2017 10:36:21AM
Live Time: 960.00 min.
Real Time: 960.02 min.
Calibration Name: IC-9884;AV75-20160727
Calibration Date: 8/25/2016 2:31:50PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 23.79% +/- 0.35% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 141.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 5.00 | 5.208E-003 | 2.552E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 1.00 | 1.042E-003 | 1.473E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 1.00 | 1.042E-003 | 1.473E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 2.00 | 2.083E-003 | 1.804E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 4.00 | 4.167E-003 | 2.329E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 0.00 | 0.000E+000 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 2.00 | 2.083E-003 | 1.804E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 0.00 | 0.000E+000 | 1.473E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 1.00 | 1.042E-003 | 1.473E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 7.00 | 7.292E-003 | 2.946E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 7.00 | 7.292E-003 | 2.946E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 8.00 | 8.333E-003 | 3.125E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 1.00 | 1.042E-003 | 1.473E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 40.00 | 4.167E-002 | 6.670E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 40.00 | 4.167E-002 | 6.670E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 11.00 | 1.146E-002 | 3.608E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 3.00 | 3.125E-003 | 2.083E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
2:51:44AM 5/20/2017

## Sample

Sample Name: ICB;AV76
Comment:

Spectrum #2 Analysis #1

## Batch

Batch Name: May2017
Description:

Analyst: 60040

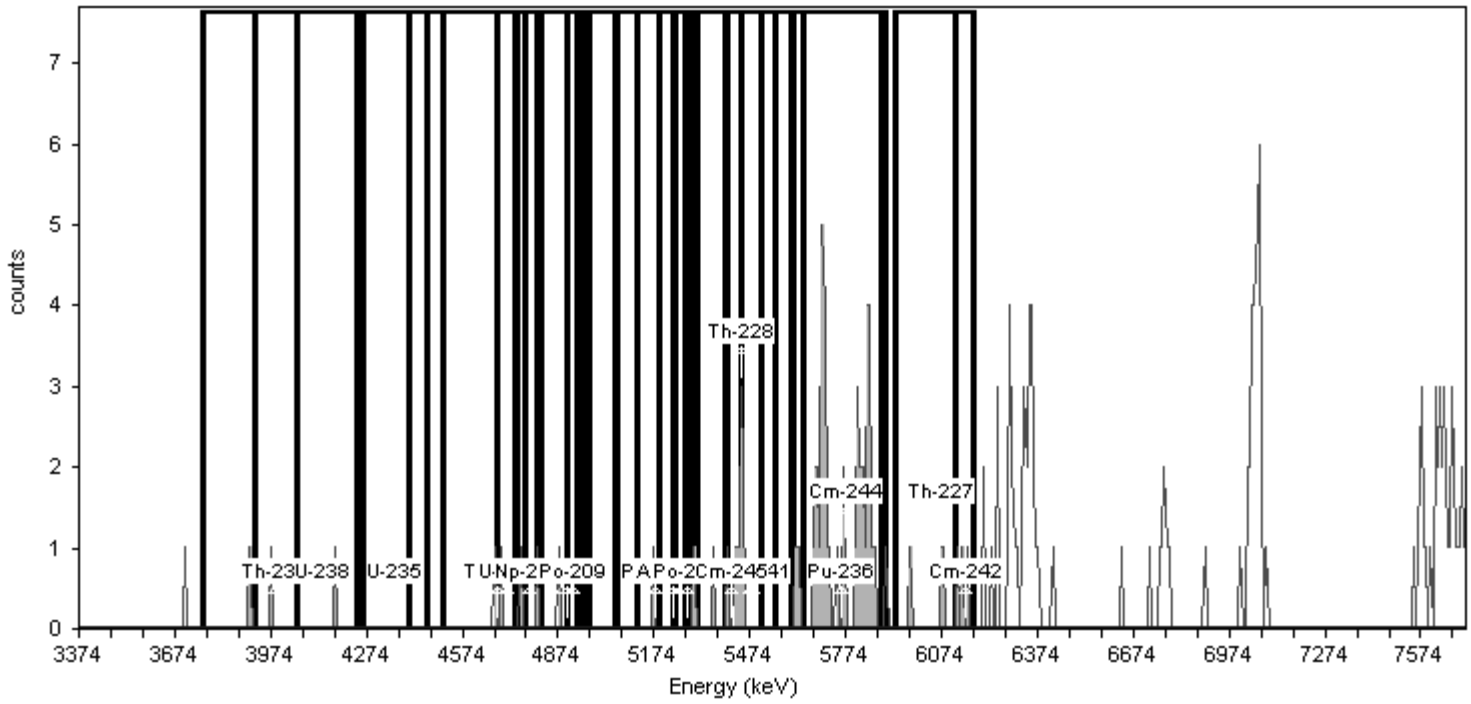
## Acquisition

Detector: AV76 , SN: 50-060-f4
Acquisition Start Date: 5/19/2017 10:36:22AM
Live Time: 960.00 min.
Real Time: 960.02 min.
Calibration Name: IC-9885;AV76-20160727
Calibration Date: 8/25/2016 2:32:23PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 25.09% +/- 0.37% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 173.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 0.00 | 0.000E+000 | 1.473E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 4.00 | 4.167E-003 | 2.329E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 4.00 | 4.167E-003 | 2.329E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 3.00 | 3.125E-003 | 2.083E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 1.00 | 1.042E-003 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 1.00 | 1.042E-003 | 1.473E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 2.00 | 2.083E-003 | 1.804E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 4.00 | 4.167E-003 | 2.329E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 11.00 | 1.146E-002 | 3.608E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 11.00 | 1.146E-002 | 3.608E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 11.00 | 1.146E-002 | 3.608E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 7.00 | 7.292E-003 | 2.946E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 42.00 | 4.375E-002 | 6.831E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 41.00 | 4.271E-002 | 6.751E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 6.00 | 6.250E-003 | 2.756E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 3.00 | 3.125E-003 | 2.083E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Background Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
12:38:49AM 5/23/2017

## Sample

Sample Name: ICB;AV79
Comment:

Spectrum #1 Analysis #1

## Batch

Batch Name: May2017a
Description:

Analyst: 60040

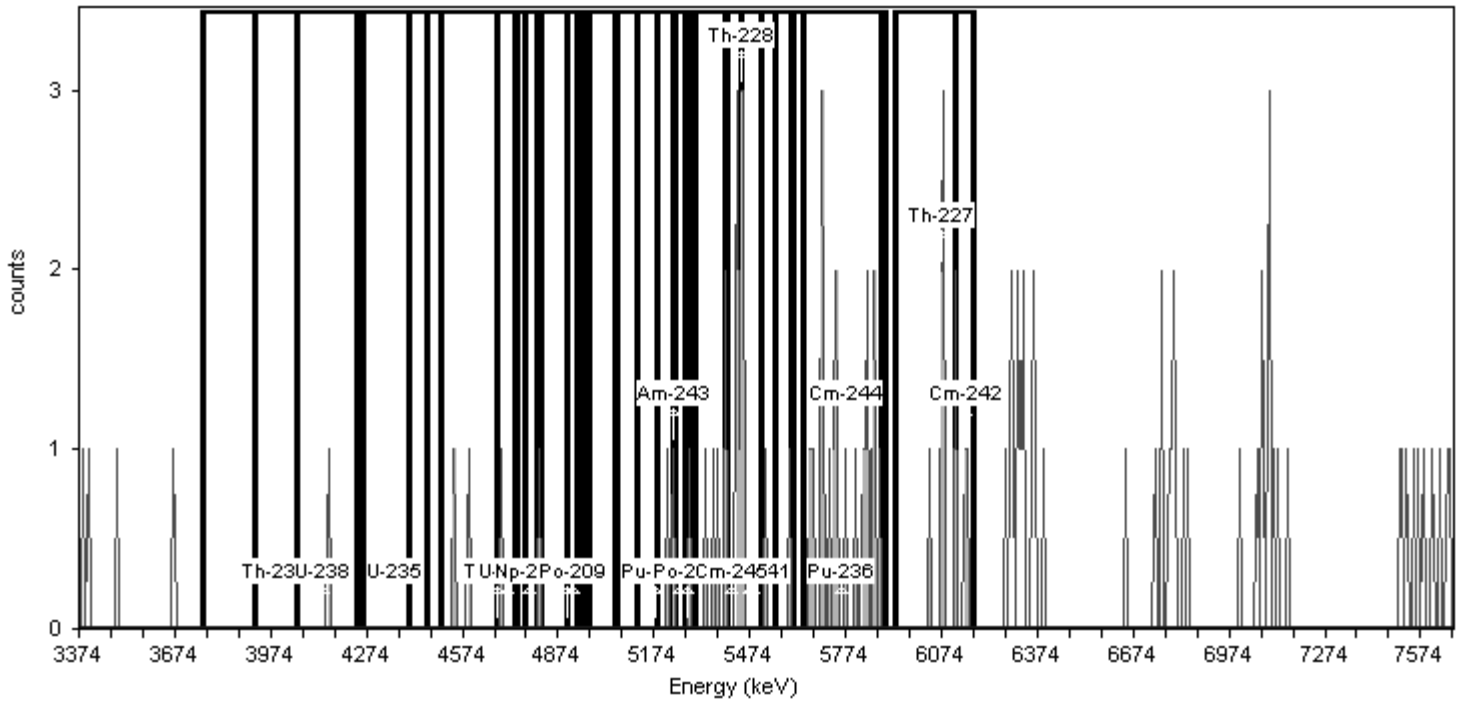
## Acquisition

Detector: AV79 , SN: 46-033Q5
Acquisition Start Date: 5/22/2017 8:35:31AM
Live Time: 960.00 min.
Real Time: 960.01 min.
Calibration Name: IC-8874;AV79-20160727
Calibration Date: 8/25/2016 2:33:26PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$

Efficiency: 26.87% +/- 0.38% TPU(2 sigma)




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 104.00

## *Nuclide Summary (ROI)*

| RegionName | Peak Energy (MeV) | Start Energy (MeV) | End Energy (MeV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3.99 | 3.75 | 4.05 | 0.00 | 0.000E+000 | 1.473E-003 |
| U-238 | 4.14 | 3.92 | 4.24 | 1.00 | 1.042E-003 | 1.473E-003 |
| U-235 | 4.36 | 4.26 | 4.46 | 0.00 | 0.000E+000 | 1.473E-003 |
| Th-230 | 4.68 | 4.40 | 4.75 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-234 | 4.71 | 4.51 | 4.82 | 4.00 | 4.167E-003 | 2.329E-003 |
| Pu-242 | 4.90 | 4.68 | 4.95 | 2.00 | 2.083E-003 | 1.804E-003 |
| Th-229 | 4.86 | 4.74 | 5.12 | 1.00 | 1.042E-003 | 1.473E-003 |
| Np-237 | 4.78 | 4.77 | 4.81 | 0.00 | 0.000E+000 | 1.473E-003 |
| Po-209 | 4.92 | 4.90 | 4.93 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5.18 | 4.97 | 5.24 | 2.00 | 2.083E-003 | 1.804E-003 |
| Am-243 | 5.23 | 5.05 | 5.31 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-232 | 5.25 | 5.06 | 5.40 | 8.00 | 8.333E-003 | 3.125E-003 |
| Th-228 | 5.45 | 5.19 | 5.51 | 18.00 | 1.875E-002 | 4.541E-003 |
| Po-210 | 5.28 | 5.23 | 5.29 | 2.00 | 2.083E-003 | 1.804E-003 |
| Pu-238 | 5.47 | 5.27 | 5.55 | 17.00 | 1.771E-002 | 4.419E-003 |
| Am-241 | 5.48 | 5.30 | 5.60 | 17.00 | 1.771E-002 | 4.419E-003 |
| Cm-245 | 5.42 | 5.40 | 5.45 | 9.00 | 9.375E-003 | 3.294E-003 |
| Pu-236 | 5.76 | 5.61 | 5.89 | 18.00 | 1.875E-002 | 4.541E-003 |
| Cm-244 | 5.78 | 5.64 | 5.90 | 18.00 | 1.875E-002 | 4.541E-003 |
| Th-227 | 6.07 | 5.93 | 6.18 | 10.00 | 1.042E-002 | 3.455E-003 |
| Cm-242 | 6.15 | 6.12 | 6.18 | 4.00 | 4.167E-003 | 2.329E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
8:19:48AM 5/15/2017

## Sample

Sample Name: ICB;AV150
Comment:

Spectrum #1 Analysis #1
Analyst: 60040

## Batch

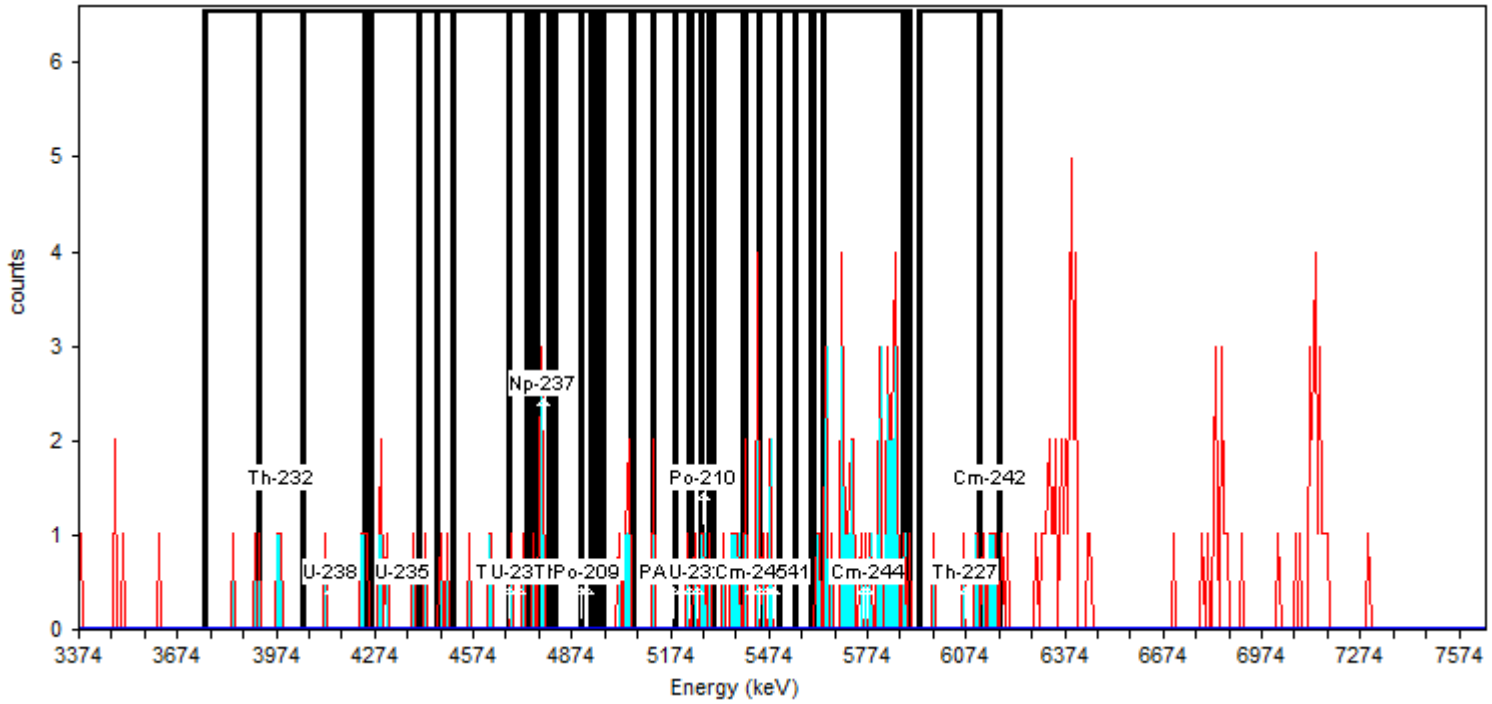
Batch Name: May2017
Description:

## Acquisition

Detector: AV150 , SN: 50-05/R4
Acquisition Start Date: 5/12/2017 3:53:12PM
Live Time: 960.00 min.
Real Time: 960.28 min.
Calibration Name: IC-8876;AV150-20161110
Calibration Date: 11/11/2016 2:36:42PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 172.00

## Nuclide Summary (ROI)

| RegionName | Peak Energy (keV) | Start Energy (keV) | End Energy (keV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3,985.93 | 3,754.75 | 4,053.05 | 6.00 | 6.250E-003 | 2.756E-003 |
| U-238 | 4,135.08 | 3,918.81 | 4,239.49 | 7.00 | 7.292E-003 | 2.946E-003 |
| U-235 | 4,358.81 | 4,261.86 | 4,463.21 | 6.00 | 6.250E-003 | 2.756E-003 |
| Th-230 | 4,679.48 | 4,403.55 | 4,746.60 | 8.00 | 8.333E-003 | 3.125E-003 |
| U-234 | 4,709.31 | 4,507.96 | 4,821.17 | 11.00 | 1.146E-002 | 3.608E-003 |
| Pu-242 | 4,903.21 | 4,679.48 | 4,947.95 | 8.00 | 8.333E-003 | 3.125E-003 |
| Th-229 | 4,858.46 | 4,739.14 | 5,119.48 | 12.00 | 1.250E-002 | 3.756E-003 |
| Np-237 | 4,783.89 | 4,768.97 | 4,806.26 | 5.00 | 5.208E-003 | 2.552E-003 |
| Po-209 | 4,918.12 | 4,903.21 | 4,933.04 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5,179.14 | 4,970.33 | 5,238.80 | 7.00 | 7.292E-003 | 2.946E-003 |
| Am-243 | 5,231.34 | 5,052.36 | 5,305.92 | 7.00 | 7.292E-003 | 2.946E-003 |
| U-232 | 5,253.71 | 5,059.82 | 5,402.86 | 14.00 | 1.458E-002 | 4.034E-003 |
| Th-228 | 5,447.61 | 5,186.59 | 5,507.27 | 19.00 | 1.979E-002 | 4.658E-003 |
| Po-210 | 5,276.09 | 5,231.34 | 5,291.00 | 4.00 | 4.167E-003 | 2.329E-003 |
| Pu-238 | 5,469.98 | 5,268.63 | 5,552.01 | 17.00 | 1.771E-002 | 4.419E-003 |
| Am-241 | 5,484.90 | 5,298.46 | 5,604.22 | 14.00 | 1.458E-002 | 4.034E-003 |
| Cm-245 | 5,417.78 | 5,395.41 | 5,447.61 | 6.00 | 6.250E-003 | 2.756E-003 |
| Pu-236 | 5,760.83 | 5,611.67 | 5,887.60 | 40.00 | 4.167E-002 | 6.670E-003 |
| Cm-244 | 5,775.74 | 5,641.51 | 5,902.52 | 39.00 | 4.062E-002 | 6.588E-003 |
| Th-227 | 6,074.04 | 5,932.35 | 6,178.45 | 8.00 | 8.333E-003 | 3.125E-003 |
| Cm-242 | 6,148.62 | 6,118.79 | 6,178.45 | 4.00 | 4.167E-003 | 2.329E-003 |

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# Alpha-Spectroscopy Analysis Report

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
1:13:15AM 5/16/2017

## Sample

Sample Name: ICB;AV155
Comment:

Spectrum #1 Analysis #1
Analyst: 60040

## Batch

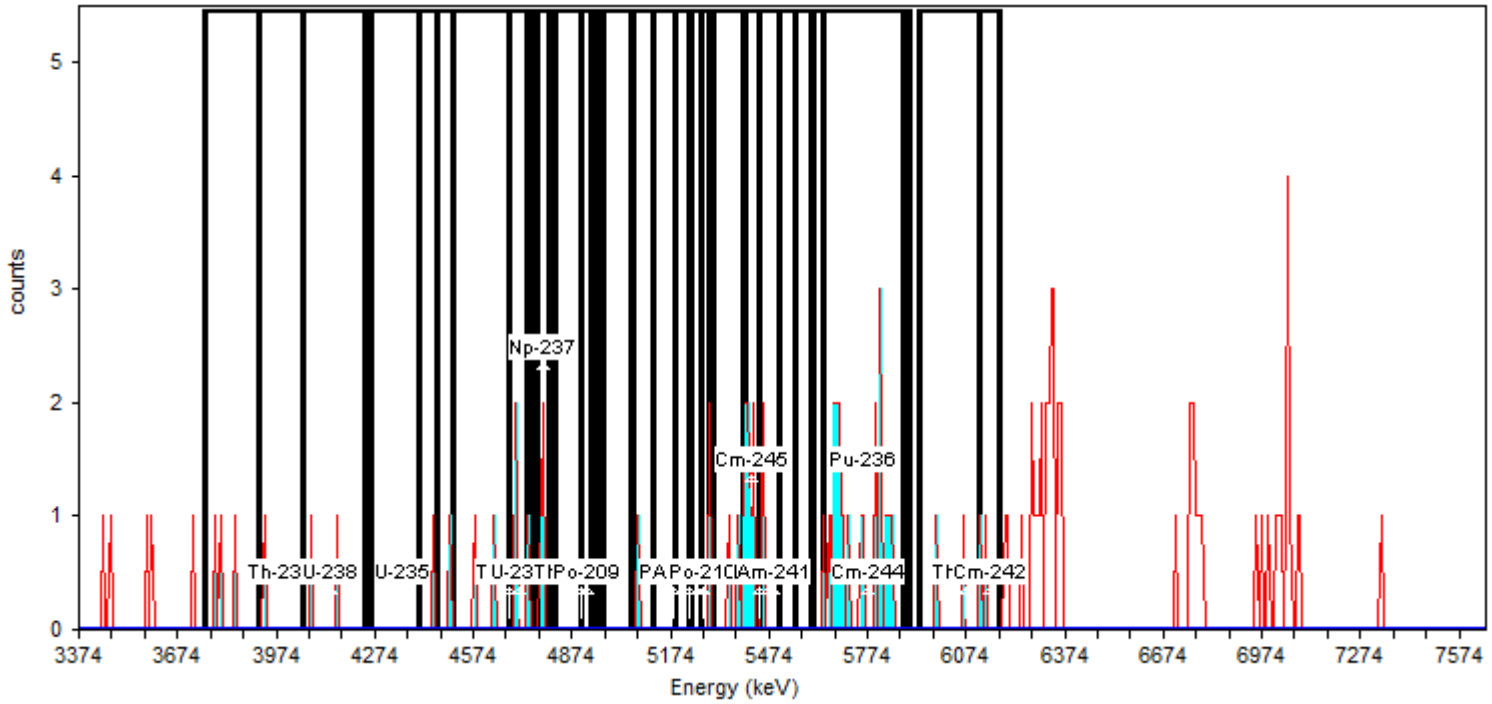
Batch Name: May2017a
Description:

## Acquisition

Detector: AV155 , SN: 50-05/II1
Acquisition Start Date: 5/15/2017 9:12:19AM
Live Time: 960.00 min.
Real Time: 960.00 min.
Calibration Name: IC-9793;AV155-20161110
Calibration Date: 11/11/2016 2:37:33PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch$^2$




## General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI
Nuclide Library: Background ROI Library
Total Background Counts: 110.00

## Nuclide Summary (ROI)

| RegionName | Peak Energy (keV) | Start Energy (keV) | End Energy (keV) | GrossCounts | Count Rate (CPM) | CR Uncertainty (CPM) |
|---|---|---|---|---|---|---|
| Th-232 | 3,985.93 | 3,754.75 | 4,053.05 | 4.00 | 4.167E-003 | 2.329E-003 |
| U-238 | 4,135.08 | 3,918.81 | 4,239.49 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-235 | 4,358.81 | 4,261.86 | 4,463.21 | 1.00 | 1.042E-003 | 1.473E-003 |
| Th-230 | 4,679.48 | 4,403.55 | 4,746.60 | 7.00 | 7.292E-003 | 2.946E-003 |
| U-234 | 4,709.31 | 4,507.96 | 4,821.17 | 8.00 | 8.333E-003 | 3.125E-003 |
| Pu-242 | 4,903.21 | 4,679.48 | 4,947.95 | 6.00 | 6.250E-003 | 2.756E-003 |
| Th-229 | 4,858.46 | 4,739.14 | 5,119.48 | 5.00 | 5.208E-003 | 2.552E-003 |
| Np-237 | 4,783.89 | 4,768.97 | 4,806.26 | 3.00 | 3.125E-003 | 2.083E-003 |
| Po-209 | 4,918.12 | 4,903.21 | 4,933.04 | 0.00 | 0.000E+000 | 1.473E-003 |
| Pu-239 | 5,179.14 | 4,970.33 | 5,238.80 | 1.00 | 1.042E-003 | 1.473E-003 |
| Am-243 | 5,231.34 | 5,052.36 | 5,305.92 | 3.00 | 3.125E-003 | 2.083E-003 |
| U-232 | 5,253.71 | 5,059.82 | 5,402.86 | 8.00 | 8.333E-003 | 3.125E-003 |
| Th-228 | 5,447.61 | 5,186.59 | 5,507.27 | 14.00 | 1.458E-002 | 4.034E-003 |
| Po-210 | 5,276.09 | 5,231.34 | 5,291.00 | 2.00 | 2.083E-003 | 1.804E-003 |
| Pu-238 | 5,469.98 | 5,268.63 | 5,552.01 | 14.00 | 1.458E-002 | 4.034E-003 |
| Am-241 | 5,484.90 | 5,298.46 | 5,604.22 | 12.00 | 1.250E-002 | 3.756E-003 |
| Cm-245 | 5,417.78 | 5,395.41 | 5,447.61 | 8.00 | 8.333E-003 | 3.125E-003 |
| Pu-236 | 5,760.83 | 5,611.67 | 5,887.60 | 22.00 | 2.292E-002 | 4.996E-003 |
| Cm-244 | 5,775.74 | 5,641.51 | 5,902.52 | 22.00 | 2.292E-002 | 4.996E-003 |
| Th-227 | 6,074.04 | 5,932.35 | 6,178.45 | 4.00 | 4.167E-003 | 2.329E-003 |
| Cm-242 | 6,148.62 | 6,118.79 | 6,178.45 | 2.00 | 2.083E-003 | 1.804E-003 |

# Run Logs

# Alpha Spectroscopy Run Log

## Detector: AV64

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/31/16 09:16 | 140.015 332031 25 | IC 160-267744/1 | | 267744 | | | PS |
| 09/02/16 13:12 | 60 | ICV 160-268892/1 | | 268892 | | | PS |
| 05/22/17 08:35 | 960 | ICB 160-309988/1 | | 309988 | | | PS |
| 05/23/17 14:13 | 60 | CCV 160-310350/1 | | 310350 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312785/1 | | 312785 | | | ALD |
| 06/08/17 19:02 | 400 | LCS 160-309374/2-A | | 312785 | 309374 | A-01-R | ALD |

## Detector: AV65

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/31/16 09:31 | 140 | IC 160-267745/1 | | 267745 | | | PS |
| 09/02/16 13:15 | 60 | ICV 160-268893/1 | | 268893 | | | PS |
| 05/22/17 08:35 | 960 | ICB 160-309989/1 | | 309989 | | | PS |
| 05/23/17 14:17 | 60 | CCV 160-310351/1 | | 310351 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312786/1 | | 312786 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-1 | SU01-EXB-026-SS-P-01 | 312786 | 309374 | A-01-R | ALD |

## Detector: AV66

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/31/16 09:32 | 140 | IC 160-267746/1 | | 267746 | | | PS |
| 09/02/16 13:15 | 60 | ICV 160-268894/1 | | 268894 | | | PS |
| 05/19/17 10:36 | 960 | ICB 160-309943/1 | | 309943 | | | PS |
| 05/23/17 14:14 | 60 | CCV 160-310352/1 | | 310352 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312787/1 | | 312787 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-1 DU | SU01-EXB-026-SS-P-01 DU | 312787 | 309374 | A-01-R | ALD |

## Detector: AV68

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/31/16 09:15 | 140 | IC 160-267747/1 | | 267747 | | | PS |
| 09/02/16 13:14 | 60 | ICV 160-268895/1 | | 268895 | | | PS |
| 05/19/17 10:36 | 960 | ICB 160-309944/1 | | 309944 | | | PS |
| 05/23/17 14:14 | 60 | CCV 160-310353/1 | | 310353 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312788/1 | | 312788 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-2 | SU01-EXB-023-SS-P-01 | 312788 | 309374 | A-01-R | ALD |

## Detector: AV70

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/30/16 14:57 | 140 | IC 160-267723/1 | | 267723 | | | PS |
| 09/02/16 13:17 | 60 | ICV 160-268897/1 | | 268897 | | | PS |
| 05/19/17 10:36 | 960 | ICB 160-309947/1 | | 309947 | | | PS |
| 05/23/17 12:57 | 60 | CCV 160-310355/1 | | 310355 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312790/1 | | 312790 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-4 | SU02-EXB-051-SS-P-01 | 312790 | 309374 | A-01-R | ALD |

# Alpha Spectroscopy Run Log

## Detector: AV71

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/30/16 14:57 | 140 | IC 160-267724/1 | | 267724 | | | PS |
| 09/02/16 13:12 | 60 | ICV 160-268898/1 | | 268898 | | | PS |
| 05/19/17 10:36 | 960 | ICB 160-309948/1 | | 309948 | | | PS |
| 05/23/17 12:57 | 60 | CCV 160-310356/1 | | 310356 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312791/1 | | 312791 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-5 | SU01-EXB-083-SS-P-00 | 312791 | 309374 | A-01-R | ALD |

## Detector: AV72

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/30/16 14:58 | 140 | IC 160-267725/1 | | 267725 | | | PS |
| 09/02/16 13:17 | 60 | ICV 160-268899/1 | | 268899 | | | PS |
| 05/19/17 10:36 | 960 | ICB 160-309949/1 | | 309949 | | | PS |
| 05/23/17 12:58 | 60 | CCV 160-310357/1 | | 310357 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312792/1 | | 312792 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-6 | SU01-EXB-084-SS-P-00 | 312792 | 309374 | A-01-R | ALD |

## Detector: AV73

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 09/01/16 08:34 | 140 | IC 160-267748/1 | | 267748 | | | PS |
| 09/02/16 13:18 | 60 | ICV 160-268900/1 | | 268900 | | | PS |
| 05/19/17 10:36 | 960 | ICB 160-309950/1 | | 309950 | | | PS |
| 05/23/17 12:58 | 60 | CCV 160-310358/1 | | 310358 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312793/1 | | 312793 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-7 | SU01-EXB-085-SS-P-00 | 312793 | 309374 | A-01-R | ALD |

## Detector: AV74

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 08/30/16 15:07 | 140 | IC 160-267726/1 | | 267726 | | | PS |
| 09/02/16 13:13 | 60 | ICV 160-268901/1 | | 268901 | | | PS |
| 05/22/17 08:35 | 960 | ICB 160-309990/1 | | 309990 | | | PS |
| 05/23/17 13:03 | 60 | CCV 160-310359/1 | | 310359 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312794/1 | | 312794 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-8 | SU01-EXB-086-SS-P-00 | 312794 | 309374 | A-01-R | ALD |

## Detector: AV75

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/27/16 14:41 | 1 | PULSER 160-267667/1 | | 267667 | | | |
| 07/27/16 14:56 | 140 | IC 160-267667/2 | | 267667 | | | PS |
| 09/02/16 13:13 | 60 | ICV 160-268902/1 | | 268902 | | | PS |
| 05/19/17 10:36 | 960 | ICB 160-309952/1 | | 309952 | | | PS |
| 05/23/17 12:59 | 60 | CCV 160-310360/1 | | 310360 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312795/1 | | 312795 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-9 | SU03-S-087-SS-P-00 | 312795 | 309374 | A-01-R | ALD |

## Detector: AV76

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/27/16 14:56 | 140 | IC 160-267668/1 | | 267668 | | | PS |

# Alpha Spectroscopy Run Log

## Detector: AV76 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 09/02/16 13:14 | 60 | ICV 160-268903/1 | | 268903 | | | PS |
| 05/19/17 10:36 | 960 | ICB 160-309953/1 | | 309953 | | | PS |
| 05/23/17 12:59 | 60 | CCV 160-310361/1 | | 310361 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312796/1 | | 312796 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-10 | SU03-S-088-SS-P-00 | 312796 | 309374 | A-01-R | ALD |

## Detector: AV79

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/27/16 14:59 | 140 | IC 160-267671/1 | | 267671 | | | PS |
| 09/02/16 14:36 | 60 | ICV 160-268906/1 | | 268906 | | | PS |
| 05/22/17 08:35 | 960 | ICB 160-309993/1 | | 309993 | | | PS |
| 05/23/17 13:00 | 60 | CCV 160-310363/1 | | 310363 | | | PS |
| 06/08/17 14:01 | 1 | PULSER 160-312798/1 | | 312798 | | | ALD |
| 06/08/17 19:02 | 400 | 160-22327-11 | SU03-S-089-SS-P-00 | 312798 | 309374 | A-01-R | ALD |

## Detector: AV150

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 11/10/16 12:20 | 140 | IC 160-279038/1 | | 279038 | | | PS |
| 12/16/16 08:42 | 60 | ICV 160-284325/1 | | 284325 | | | PS |
| 05/12/17 15:53 | 960 | ICB 160-308617/1 | | 308617 | | | PS |
| 05/17/17 13:06 | 60 | CCV 160-309276/1 | | 309276 | | | PS |
| 06/10/17 09:29 | 1 | PULSER 160-312929/1 | | 312929 | | | |
| 06/10/17 09:44 | 1 | PULSER 160-312929/2 | | 312929 | | | ALD |
| 06/10/17 16:17 | 400 | MB 160-309374/1-A | | 312929 | 309374 | A-01-R | ALD |

## Detector: AV155

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 11/10/16 12:22 | 140 | IC 160-279043/1 | | 279043 | | | PS |
| 12/16/16 08:38 | 60 | ICV 160-284330/1 | | 284330 | | | PS |
| 05/15/17 09:12 | 960 | ICB 160-308911/1 | | 308911 | | | PS |
| 05/17/17 09:17 | 60 | CCV 160-309280/1 | | 309280 | | | PS |
| 06/10/17 09:29 | 1 | PULSER 160-312931/1 | | 312931 | | | |
| 06/10/17 09:44 | 1 | PULSER 160-312931/2 | | 312931 | | | ALD |
| 06/10/17 16:17 | 400 | 160-22327-3 | SU01-EXB-076-SS-P-01 | 312931 | 309374 | A-01-R | ALD |

# GAMMA SPECTROSCOPY

# Method 901.1
# Ra-226

---

## Radium-226 & Other Gamma Emitters (GS) by Method 901.1

# Prep Batch: 309155

## Fill Geometry, 21-Day In-Growth

# Gamma Spectroscopy Analysis Detail Report
# Prep Batch: 309155

Lab ID: MB 160-309155/1-A Analyzed: 06/07/17 09:55 Ts: 30 Sigma: 2
Client ID: Detector: GV8 Decay Corrected: No

| Analyte | MB Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | -0.09557 | 0.283 | 0.284 | U | pCi/g | 0.500 | 0.481 | 312292 |

Lab ID: LCS 160-309155/2-A Analyzed: 06/07/17 10:00 Ts: 30 Sigma: 2
Client ID: Detector: GV10 Decay Corrected: No

| Analyte | LCS Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Americium-241 | 96.89 | 1.64 | 10.2 | | pCi/g | | 1.20 | 312295 |
| Cesium-137 | 28.38 | 0.696 | 3.03 | | pCi/g | | 0.244 | 312295 |
| Cobalt-60 | 15.10 | 0.408 | 1.57 | | pCi/g | | 0.0997 | 312295 |

Lab ID: 160-22327-1 Analyzed: 06/07/17 09:57 Ts: 30 Sigma: 2
Client ID: SU01-EXB-026-SS-P-01 Detector: GV5 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.15 | 0.262 | 0.288 | | pCi/g | 0.500 | 0.183 | 312291 |

Lab ID: 160-22327-1 DU Analyzed: 06/07/17 11:20 Ts: 30 Sigma: 2
Client ID: SU01-EXB-026-SS-P-01 Detector: GV10 Decay Corrected: No

| Analyte | DU Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.218 | 0.280 | 0.307 | | pCi/g | 0.500 | 0.259 | 312295 |

Lab ID: 160-22327-2 Analyzed: 06/07/17 09:54 Ts: 30 Sigma: 2
Client ID: SU01-EXB-023-SS-P-01 Detector: GV9 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 0.913 | 0.170 | 0.195 | | pCi/g | 0.500 | 0.128 | 312296 |

Lab ID: 160-22327-3 Analyzed: 06/07/17 09:58 Ts: 30 Sigma: 2
Client ID: SU01-EXB-076-SS-P-01 Detector: GV13 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.27 | 0.214 | 0.251 | | pCi/g | 0.500 | 0.158 | 312294 |

# Gamma Spectroscopy Analysis Detail Report
# Prep Batch: 309155

Lab ID: 160-22327-4 Analyzed: 06/07/17 09:53 Ts: 30 Sigma: 2
Client ID: SU02-EXB-051-SS-P-01 Detector: GV14 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 2.51 | 0.322 | 0.414 | | pCi/g | 0.500 | 0.192 | 312301 |

Lab ID: 160-22327-5 Analyzed: 06/07/17 09:54 Ts: 30 Sigma: 2
Client ID: SU01-EXB-083-SS-P-00 Detector: GV15 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.63 | 0.326 | 0.367 | | pCi/g | 0.500 | 0.232 | 312302 |

Lab ID: 160-22327-6 Analyzed: 06/07/17 09:59 Ts: 30 Sigma: 2
Client ID: SU01-EXB-084-SS-P-00 Detector: GV16 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.54 | 0.253 | 0.299 | | pCi/g | 0.500 | 0.182 | 312299 |

Lab ID: 160-22327-7 Analyzed: 06/07/17 10:01 Ts: 30 Sigma: 2
Client ID: SU01-EXB-085-SS-P-00 Detector: GV17 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.55 | 0.267 | 0.312 | | pCi/g | 0.500 | 0.204 | 312300 |

Lab ID: 160-22327-8 Analyzed: 06/07/17 09:56 Ts: 30 Sigma: 2
Client ID: SU01-EXB-086-SS-P-00 Detector: GV7 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.18 | 0.252 | 0.280 | | pCi/g | 0.500 | 0.206 | 312290 |

Lab ID: 160-22327-9 Analyzed: 06/07/17 09:55 Ts: 30 Sigma: 2
Client ID: SU03-S-087-SS-P-00 Detector: GV3 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.67 | 0.305 | 0.352 | | pCi/g | 0.500 | 0.215 | 312293 |

# Gamma Spectroscopy Analysis Detail Report
# Prep Batch: 309155

Lab ID: 160-22327-10 Analyzed: 06/07/17 11:15 Ts: 30 Sigma: 2
Client ID: SU03-S-088-SS-P-00 Detector: GV9 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.93 | 0.298 | 0.359 | | pCi/g | 0.500 | 0.197 | 312296 |

Lab ID: 160-22327-11 Analyzed: 06/07/17 11:23 Ts: 30 Sigma: 2
Client ID: SU03-S-089-SS-P-00 Detector: GV13 Decay Corrected: No

| Analyte | Result | Count Unc | Total Unc | Qualifier | Unit | LOQ | MDC | Anly Batch |
|---|---|---|---|---|---|---|---|---|
| Radium-226 | 1.48 | 0.215 | 0.265 | | pCi/g | 0.500 | 0.107 | 312294 |

## Quality Control Summary

| Method Blank ID: | Analyte | Parent Result | Spike Added | MB Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB 160-309155/1-A | Radium-226 | | | -0.09557 | U | pCi/g | | | | | | | -.67394121 |

| Lab Control Sample ID: | Analyte | Parent Result | Spike Added | LCS Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LCS 160-309155/2-A | Americium-241 | | 97.0 | 96.89 | | pCi/g | 100 | 87 - 116 | | | | | -.0113187354 |
| LCS 160-309155/2-A | Cesium-137 | | 29.0 | 28.38 | | pCi/g | 98 | 87 - 120 | | | | | -.2771373841 |
| LCS 160-309155/2-A | Cobalt-60 | | 15.0 | 15.10 | | pCi/g | 100 | 87 - 115 | | | | | .0547460599 |

| Duplicate ID: | Analyte | Parent Result | Spike Added | DU Result | Qualifier | Unit | % Rec | % Rec Limits | RPD | RER | DER | RER Limit | Z Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160-22327-1 | Radium-226 | 1.15 | | 1.218 | | pCi/g | | | 6 | 0.11 | 0.31 | 1 | |

Glossary:

Ts = Count Duration, Sample

# GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis  Job No.: 160-22327-1

SDG No.:

Batch Number: 309155  Batch Start Date: 05/17/17 12:55  Batch Analyst: Slama, Kurt R

Batch Method: Fill_Geo-21  Batch End Date: 05/17/17 13:54

| Lab Sample ID | Client Sample ID | Method Chain | Basis | TareWeight | GrossWeight | InitialAmount | IngDecDate1 | IngDecDate3 | Geometry |
|---|---|---|---|---|---|---|---|---|---|
| MB 160-309155/1 | | Fill_Geo-21, 901.1 | | | | 291.18 g | 5/17/17 | 6/7/17 | tuna can |
| LCS 160-309155/2 | | Fill_Geo-21, 901.1 | | | | 341.9 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-1-A | SU01-EXB-026-SS-P-01 | Fill_Geo-21, 901.1 | T | 47.1 g | 312.9 g | 265.8 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-1-A DU | SU01-EXB-026-SS-P-01 | Fill_Geo-21, 901.1 | T | 47.1 g | 312.9 g | 265.8 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-2-A | SU01-EXB-023-SS-P-01 | Fill_Geo-21, 901.1 | T | 47.1 g | 373.2 g | 326.1 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-3-A | SU01-EXB-076-SS-P-01 | Fill_Geo-21, 901.1 | T | 46.5 g | 384.3 g | 337.8 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-4-A | SU02-EXB-051-SS-P-01 | Fill_Geo-21, 901.1 | T | 47.0 g | 344.2 g | 297.2 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-5-A | SU01-EXB-083-SS-P-00 | Fill_Geo-21, 901.1 | T | 47.4 g | 331.9 g | 284.5 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-6-A | SU01-EXB-084-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.6 g | 331.0 g | 284.4 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-7-A | SU01-EXB-085-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.6 g | 347.8 g | 301.2 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-8-A | SU01-EXB-086-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.7 g | 336.6 g | 289.9 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-9-A | SU03-S-087-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.9 g | 318.5 g | 271.6 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-10-A | SU03-S-088-SS-P-00 | Fill_Geo-21, 901.1 | T | 47.1 g | 319.3 g | 272.2 g | 5/17/17 | 6/7/17 | tuna can |
| 160-22327-A-11-A | SU03-S-089-SS-P-00 | Fill_Geo-21, 901.1 | T | 46.8 g | 304.1 g | 257.3 g | 5/17/17 | 6/7/17 | tuna can |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | Tuna Can LCS 00006 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MB 160-309155/1 | | Fill_Geo-21, 901.1 | | | | | | | |
| LCS 160-309155/2 | | Fill_Geo-21, 901.1 | | # g | | | | | |
| 160-22327-A-1-A | SU01-EXB-026-SS-P-01 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-1-A DU | SU01-EXB-026-SS-P-01 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-2-A | SU01-EXB-023-SS-P-01 | Fill_Geo-21, 901.1 | T | | | | | | |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-22327-1

SDG No.:

Batch Number: 309155 Batch Start Date: 05/17/17 12:55 Batch Analyst: Slama, Kurt R

Batch Method: Fill_Geo-21 Batch End Date: 05/17/17 13:54

| Lab Sample ID | Client Sample ID | Method Chain | Basis | Tuna Can LCS 00006 | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 160-22327-A-3-A | SU01-EXB-076-SS-P-01 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-4-A | SU02-EXB-051-SS-P-01 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-5-A | SU01-EXB-083-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-6-A | SU01-EXB-084-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-7-A | SU01-EXB-085-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-8-A | SU01-EXB-086-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-9-A | SU03-S-087-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-10-A | SU03-S-088-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |
| 160-22327-A-11-A | SU03-S-089-SS-P-00 | Fill_Geo-21, 901.1 | T | | | | | | |

| Batch Notes | |
|---|---|
| Balance ID | 1121432711 |
| SOP Number | ST-RC-0003 ST-RC-0025 |

| Basis | Basis Description |
|---|---|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

Test America St. Louis  Spectrum ID: 8_Gamma_20171467

Sample Description: 309155_Gamma_MB 160-309155~1-A
Detector: Detector # 8
Batch ID: 309155
Work Order Number: Gamma
Lot Number: MB 160-309155~1-A

Decay to Time: 6/7/2017 09:54  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:55:00  Real Time: 1847 sec
Analysis Time: 6/7/2017 10:26  Dead Time: 2.52 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 8_Soil_TunaCan.Clb
Efficiency Cal Desc: 8_Soil_TunaCan_90099_032712
Efficiency Cal Date: 3/28/2012 10:35
Energy Cal Date: 2/28/2012 10:34
Library: Client_Long_Rev11.lib
Bkgd Correction File: 8_2017-06-04_1048.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | 2.005E+00 | 117.9 | 2.363E+00 | 2.365E+00 | 8.210E+00 |
| NA-22 | 0.000E+00 | 1.#INF | 1.602E-01 | 1.602E-01 | 5.904E-01 |
| K-40 | -2.815E-01 | 1584.3 | 4.460E+00 | 4.460E+00 | 1.138E+01 |
| Sc-46 | -4.640E-01 | 92.0 | 4.268E-01 | 4.274E-01 | 1.456E+00 |
| CR-51 | -2.175E+00 | 196.8 | 4.280E+00 | 4.282E+00 | 1.458E+01 |
| MN-54 | 3.349E-01 | 40.8 | 1.367E-01 | 1.378E-01 | 4.114E-01 |
| FE-59 | 2.858E-01 | 37.8 | 1.080E-01 | 1.090E-01 | 2.590E+00 |
| Co-56 | -8.196E-01 | 87.6 | 7.182E-01 | 7.195E-01 | 1.658E+00 |
| CO-57 | -1.120E-01 | 172.8 | 1.935E-01 | 1.936E-01 | 6.651E-01 |
| CO-58 | -1.551E-01 | 167.4 | 2.597E-01 | 2.598E-01 | 9.484E-01 |
| CO-60 | 0.000E+00 | 1.#INF | 1.664E-01 | 1.664E-01 | 6.133E-01 |
| ZN-65 | 0.000E+00 | 1.#INF | 1.411E-01 | 1.411E-01 | 2.461E+00 |
| NB-94 | -1.480E-01 | 270.8 | 4.008E-01 | 4.009E-01 | 9.940E-01 |
| ZR-95 | 3.146E-02 | 1385.6 | 4.359E-01 | 4.359E-01 | 1.206E+00 |
| NB-95 | 0.000E+00 | 1.#INF | 5.202E-02 | 5.202E-02 | 1.100E+00 |
| RU-103 | -2.397E-01 | 129.3 | 3.099E-01 | 3.101E-01 | 7.795E-01 |
| RH-106 | 2.187E+00 | 246.2 | 5.384E+00 | 5.385E+00 | 1.863E+01 |
| AG-108M | -2.397E-02 | 909.7 | 2.180E-01 | 2.180E-01 | 5.906E-01 |
| AG-110M | 3.450E-01 | 40.8 | 1.409E-01 | 1.420E-01 | 1.520E+00 |
| SN-113 | 3.582E-01 | 111.6 | 3.998E-01 | 4.002E-01 | 1.373E+00 |
| SB-124 | -4.772E-01 | 136.0 | 6.489E-01 | 6.494E-01 | 2.203E+00 |
| SB-125 | 4.737E-01 | 98.7 | 4.677E-01 | 4.684E-01 | 1.307E+00 |
| I-131 | -5.755E-03 | 522.8 | 3.009E-02 | 3.009E-02 | 5.499E-01 |
| Gd-153 | 0.000E+00 | 1.#INF | 4.481E-02 | 4.481E-02 | 3.022E+00 |
| Ga-68 | -2.473E+00 | 501.7 | 1.240E+01 | 1.240E+01 | 3.247E+01 |
| Tc-99m | 0.000E+00 | 1.#INF | 8.609E-02 | 8.609E-02 | 7.674E-01 |
| BA-133 | 4.275E-01 | 115.2 | 4.925E-01 | 4.930E-01 | 1.272E+00 |
| CS-134 | -1.322E-01 | 80.7 | 1.067E-01 | 1.069E-01 | 2.329E+00 |
| CS-137 | -3.033E-02 | 1322.4 | 4.011E-01 | 4.011E-01 | 1.465E+00 |
| CE-139 | 9.899E-02 | 180.4 | 1.785E-01 | 1.788E-01 | 6.225E-01 |
| Ba-140 | 1.452E+00 | 37.8 | 5.489E-01 | 5.540E-01 | 1.169E+00 |
| La-140 | -6.804E-02 | 846.3 | 5.758E-01 | 5.758E-01 | 1.409E+00 |
| CE-141 | -2.980E-01 | 146.9 | 4.376E-01 | 4.379E-01 | 1.489E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | -4.965E-01 | 348.3 | 1.729E+00 | 1.729E+00 | 5.975E+00 |
| PM-144 | 1.292E-01 | 250.6 | 3.237E-01 | 3.238E-01 | 8.209E-01 |
| EU-152 | 1.126E+00 | 31.6 | 3.562E-01 | 3.610E-01 | 4.516E+00 |
| EU-154 | 4.359E+00 | 22.4 | 9.747E-01 | 1.000E+00 | 9.369E+00 |
| EU-155 | 2.192E-01 | 222.5 | 4.877E-01 | 4.879E-01 | 4.224E+00 |
| HF-181 | 8.334E-02 | 153.8 | 1.281E-01 | 1.282E-01 | 1.204E+00 |
| Ta-182 | 0.000E+00 | 1.#INF | 4.109E-01 | 4.109E-01 | 3.584E+00 |
| Hg-203 | 1.779E-01 | 129.9 | 2.311E-01 | 2.313E-01 | 8.012E-01 |
| TL-208 | 4.949E-01 | 50.2 | 2.486E-01 | 2.500E-01 | 6.079E-01 |
| pm-146 | 2.874E-01 | 97.8 | 2.812E-01 | 2.816E-01 | 2.534E+00 |
| y-88 | 3.801E-01 | 40.8 | 1.552E-01 | 1.564E-01 | 4.668E-01 |
| Cd-113m | 7.295E+02 | 353.6 | 2.579E+03 | 2.580E+03 | 9.316E+03 |
| Cd-109 | -3.762E-01 | 1925.2 | 7.243E+00 | 7.243E+00 | 2.483E+01 |
| Cf-251 | -6.612E-01 | 158.1 | 1.045E+00 | 1.047E+00 | 2.784E+00 |
| Cf-249 | 0.000E+00 | 1.#INF | 1.424E-01 | 1.424E-01 | 1.503E+00 |
| Sn-126 | 0.000E+00 | 1.#INF | 4.459E-01 | 4.459E-01 | 8.033E+00 |
| PB-210 | 3.042E+00 | 200.3 | 6.091E+00 | 6.094E+00 | 2.129E+01 |
| PB-212 | -8.134E-01 | 62.6 | 5.089E-01 | 5.116E-01 | 1.644E+00 |
| PB-214 | 6.290E-02 | 138.7 | 8.726E-02 | 8.732E-02 | 2.238E+00 |
| BI-207 | -1.662E-01 | 162.0 | 2.693E-01 | 2.694E-01 | 9.565E-01 |
| BI-212 | -8.412E+00 | 89.5 | 7.529E+00 | 7.542E+00 | 2.535E+01 |
| BI-214 | -1.030E+00 | 148.3 | 1.527E+00 | 1.528E+00 | 5.179E+00 |
| BI-210M | 4.033E-01 | 96.1 | 3.878E-01 | 3.885E-01 | 1.111E+00 |
| AC-228 | 1.509E+00 | 72.9 | 1.100E+00 | 1.103E+00 | 2.647E+00 |
| TH-227 | -2.962E+00 | 122.0 | 3.612E+00 | 3.616E+00 | 1.231E+01 |
| TH-229 | -3.653E+00 | 113.4 | 4.142E+00 | 4.152E+00 | 1.094E+01 |
| TH-234 | -1.048E+01 | 58.6 | 6.141E+00 | 6.165E+00 | 2.271E+01 |
| PA-231 | 5.396E+00 | 133.2 | 7.190E+00 | 7.196E+00 | 3.419E+01 |
| PA-233 | 3.402E-01 | 188.5 | 6.414E-01 | 6.416E-01 | 3.323E+00 |
| PA-234 | 5.697E-01 | 145.0 | 8.262E-01 | 8.267E-01 | 2.841E+00 |
| PA-234M | 3.062E+00 | 658.6 | 2.016E+01 | 2.016E+01 | 1.831E+02 |
| U-235 | 3.038E-01 | 98.6 | 2.995E-01 | 2.999E-01 | 6.296E+00 |
| AM-241 | -1.930E-01 | 356.5 | 6.879E-01 | 6.880E-01 | 2.429E+00 |
| Np-237 | 8.687E-01 | 216.9 | 1.884E+00 | 1.885E+00 | 6.417E+00 |
| Ir-192 | 1.024E-01 | 275.5 | 2.820E-01 | 2.821E-01 | 1.390E+00 |
| Cs-136 | 2.507E-02 | 547.7 | 1.373E-01 | 1.373E-01 | 1.059E+00 |
| Np-239 | -1.949E-02 | 5855.9 | 1.141E+00 | 1.141E+00 | 3.917E+00 |
| Nd-147 | -3.138E+00 | 94.4 | 2.962E+00 | 2.968E+00 | 7.195E+00 |
| Total | 7.604E+02 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_MB 160-309155~1-A

Spectrum Filename: C:\User\SPC\Det8\8_Gamma_20171467.An1

Acquisition information
Start time: 6/7/2017 9:55:00 AM
Live time: 1800
Real time: 1847
Dead time: 2.52 %
Detector ID: 8

Detector system
Ge 8 SN/174

Calibration
Filename: 8_Soil_TunaCan.Clb
8_Soil_TunaCan_90099_032712

Energy Calibration
Created: 2/28/2012 10:34:41 AM
Zero offset: 0.052 keV
Gain: 0.250 keV/channel
Quadratic: 5.282E-10 keV/channel^2

Efficiency Calibration
Created: 3/28/2012 10:35:20 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.39 %
Log(Eff): -1.098764E-01 + (-4.958544E-01*Log(E) ) + ( -2.572270E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.71 %
Log(Eff): -2.525301E+01 + ( 9.398253E+00*Log(E) ) + ( -1.000034E+00*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.55keV )
Stop channel: 8000 (  1999.97keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3
Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:54:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 8_2017-06-04_1048.PBC 6/4/2017 10:48:07 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 1 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 1.0000

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 47.19 | 5. | 200.26 | 1.01 | 2.005E-02 | 46.54 | 4.250 | PBC<MDA | PB210 |
| 59.54 | -4. | 356.46 | 1.02 | 2.881E-02 | 59.54 | 35.900 | PBC<MDA | AM241 |
| 63.29 | -22. | 58.61 | 1.03 | 3.093E-02 | 63.29 | 3.810 | PBC<MDA | TH234 |
| 80.99 | 3. | 384.87 | 1.04 | 3.821E-02 | 80.99 | 34.060 | PBC<MDA | BA133 |
| 86.49 | 8. | 216.88 | 1.04 | 3.959E-02 | 86.49 | 13.100 | PBC<MDA | Np237 |
| | | | | | 86.54 | 30.700 | 3.706E-01 | EU155 |
| | | | | | 86.94 | 9.040 | 1.256E+00 | Sn126 |
| 86.54 | 8. | 222.50 | 1.04 | 3.961E-02 | 86.49 | 13.100 | PBC<MDA | Np237 |
| | | | | | 86.54 | 30.700 | 3.706E-01 | EU155 |
| | | | | | 86.94 | 9.040 | 1.256E+00 | Sn126 |
| 92.60 | 14. | 87.94 | 0.93 | 4.072E-02 | 92.59 | 5.584 | 3.441E+00 | TH234 |
| | | | | | 93.35 | 5.561 | 3.446E+00 | AC228 |
| 123.10 | 10. | 123.88 | 1.07 | 4.138E-02 | 123.10 | 40.790 | PBC<MDA | EU154 |
| 131.29 | 7. | 145.03 | 1.08 | 4.061E-02 | 131.29 | 18.000 | PBC<MDA | PA234 |
| 133.02 | 8. | 153.77 | 1.08 | 4.041E-02 | 133.02 | 43.300 | PBC<MDA | HF181 |
| | | | | | 133.54 | 11.090 | 9.317E-01 | CE144 |
| 143.79 | -5. | 247.12 | 1.09 | 3.899E-02 | 143.79 | 10.960 | PBC<MDA | U235 |
| 162.66 | 6. | 164.58 | 1.10 | 3.593E-02 | 162.66 | 6.220 | PBC<MDA | Ba140 |
| 165.85 | 5. | 180.36 | 1.10 | 3.629E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |
| 185.85 | 14. | 73.34 | 0.83 | 3.328E-02 | | | | |
| 205.33 | 7. | 98.58 | 1.13 | 3.083E-02 | 205.33 | 5.010 | PBC<MDA | U235 |
| 263.70 | 2. | 353.55 | 1.18 | 2.539E-02 | 263.70 | 0.006 | PBC<MDA | Cd113m |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 265.83 | 8. | 96.14 | 1.18 | 2.523E-02 | 265.83 | 50.000 | PBC<MDA | BI210M |
| 279.20 | 6. | 129.88 | 1.19 | 2.427E-02 | 279.20 | 81.460 | PBC<MDA | Hg203 |
| 284.30 | 1. | 881.29 | 1.19 | 2.393E-02 | 284.30 | 6.140 | PBC<MDA | I131 |
| 295.09 | 6. | 159.97 | 1.20 | 2.324E-02 | 295.09 | 19.300 | PBC<MDA | PB214 |
| 300.03 | 6. | 169.73 | 1.20 | 2.294E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 5.833E+00 | PA231 |
| | | | | | 300.18 | 6.200 | 2.315E+00 | PA233 |
| 300.07 | 6. | 179.40 | 1.20 | 2.293E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 5.833E+00 | PA231 |
| | | | | | 300.18 | 6.200 | 2.315E+00 | PA233 |
| 300.18 | 6. | 188.55 | 1.20 | 2.293E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 5.834E+00 | PA231 |
| | | | | | 300.18 | 6.200 | 2.315E+00 | PA233 |
| 302.65 | 6. | 197.03 | 1.21 | 2.278E-02 | 302.65 | 2.880 | PBC<MDA | PA231 |
| | | | | | 302.85 | 18.330 | 7.897E-01 | BA133 |
| 302.85 | 6. | 205.38 | 1.21 | 2.277E-02 | 302.65 | 2.880 | PBC<MDA | PA231 |
| | | | | | 302.85 | 18.330 | 7.898E-01 | BA133 |
| 304.85 | 6. | 213.17 | 1.21 | 2.265E-02 | 304.85 | 4.290 | PBC<MDA | Ba140 |
| | | | | | 304.90 | 28.000 | 5.204E-01 | BI210M |
| 304.90 | 6. | 220.93 | 1.21 | 2.265E-02 | 304.85 | 4.290 | PBC<MDA | Ba140 |
| | | | | | 304.90 | 28.000 | 5.204E-01 | BI210M |
| 308.44 | 5. | 275.47 | 1.21 | 2.244E-02 | 308.44 | 31.750 | PBC<MDA | Ir192 |
| 356.00 | 7. | 115.20 | 1.25 | 2.002E-02 | 356.00 | 62.050 | PBC<MDA | BA133 |
| 391.69 | 8. | 111.60 | 1.27 | 1.855E-02 | 391.69 | 64.000 | PBC<MDA | SN113 |
| 427.88 | 1. | 404.15 | 1.30 | 1.728E-02 | 427.88 | 29.600 | PBC<MDA | SB125 |
| 453.88 | 5. | 104.03 | 1.32 | 1.647E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 463.37 | 5. | 98.74 | 1.32 | 1.620E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 477.60 | 6. | 117.85 | 1.33 | 1.580E-02 | 477.60 | 10.520 | PBC<MDA | BE7 |
| 511.86 | 18. | 79.87 | 2.61 | 1.494E-02 | 511.86 | 20.000 | PBC<MDA | RH106 |
| 537.26 | 7. | 37.80 | 1.37 | 1.436E-02 | 537.26 | 24.390 | PBC<MDA | Ba140 |
| 563.24 | 3. | 170.71 | 1.39 | 1.381E-02 | 563.24 | 8.350 | PBC<MDA | CS134 |
| 569.32 | 5. | 95.92 | 1.40 | 1.369E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 2.475E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 2.077E-01 | BI207 |
| 583.02 | 11. | 50.24 | 1.40 | 1.342E-02 | 583.02 | 84.500 | PBC<MDA | TL208 |
| 621.92 | 5. | 246.17 | 1.43 | 1.273E-02 | 621.92 | 9.930 | PBC<MDA | RH106 |
| 696.54 | 3. | 250.62 | 1.48 | 1.158E-02 | 696.54 | 99.000 | PBC<MDA | PM144 |
| 735.72 | 5. | 97.83 | 1.51 | 1.107E-02 | 735.72 | 22.500 | PBC<MDA | pm146 |
| 766.41 | 1. | 857.32 | 1.53 | 1.070E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 1.178E+01 | PA234M |
| 785.42 | 9. | 33.33 | 1.54 | 1.048E-02 | 785.42 | 1.280 | 3.728E+01 | BI212 |
| 795.87 | 1. | 371.98 | 1.54 | 1.036E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 834.85 | 6. | 40.82 | 1.57 | 9.955E-03 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 860.56 | 1. | 979.80 | 1.59 | 9.703E-03 | 860.56 | 12.420 | PBC<MDA | TL208 |
| 880.53 | 1. | 357.07 | 1.60 | 9.517E-03 | 880.53 | 6.000 | PBC<MDA | PA234 |
| 898.04 | 6. | 40.82 | 1.61 | 9.360E-03 | 898.04 | 93.700 | PBC<MDA | y88 |
| 911.07 | 6. | 91.81 | 1.62 | 9.247E-03 | 911.07 | 29.000 | PBC<MDA | AC228 |
| 937.49 | 6. | 40.82 | 1.63 | 9.026E-03 | 937.49 | 34.360 | PBC<MDA | AG110M |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 968.97 | 6. | 113.22 | 1.65 | 8.776E-03 | 968.97 | 17.460 | PBC<MDA | AC228 |
| 996.33 | 20. | 22.36 | 1.67 | 8.571E-03 | 996.33 | 10.600 | 1.223E+01 | EU154 |
| 1037.84 | 2. | 255.77 | 1.69 | 8.278E-03 | 1037.84 | 14.130 | PBC<MDA | Co56 |
| 1048.07 | 1. | 547.72 | 1.70 | 8.209E-03 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1112.07 | 10. | 31.62 | 1.74 | 7.803E-03 | 1112.07 | 13.644 | 5.218E+00 | EU152 |
| 1291.60 | 7. | 37.80 | 1.84 | 6.860E-03 | 1291.60 | 43.200 | PBC<MDA | FE59 |
| 1408.00 | 7. | 37.80 | 1.90 | 6.366E-03 | 1408.00 | 21.005 | PBC<MDA | EU152 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 370.20 | 92.60 | 60. | 14. | 3.459E+02 | 87.94 | 0.928 | - c |
| 743.25 | 185.85 | 35. | 14. | 4.127E+02 | 73.34 | 0.834 | - c |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.96 | 46.54 | 41. | 5. | 0.003 | 200.26 | 1.012s |
| TH-227 | 200.37 | 50.14 | 65. | -10. | -0.005 | 121.96 | 1.015s |
| AM-241 | 237.95 | 59.54 | 83. | -4. | -0.002 | 356.46 | 1.022s |
| TH-234 | 252.96 | 63.29 | 95. | -22. | -0.012 | 58.61 | 1.025s |
| Sn-126 | 256.93 | 64.28 | 79. | 0. | 0.000 | 1000.00 | 1.026s |
| BA-133 | 323.77 | 80.99 | 29. | 3. | 0.001 | 384.87 | 1.039s |
| Np-237 | 345.77 | 86.49 | 151. | 8. | 0.005 | 216.88 | 1.043s |
| EU-155 | 345.98 | 86.54 | 159. | 8. | 0.005 | 222.50 | 1.043s |
| Sn-126 | 347.57 | 86.94 | 215. | -10. | -0.006 | 204.24 | 1.044s |
| Sn-126 | 350.09 | 87.57 | 204. | -10. | -0.006 | 199.33 | 1.044s |
| Nd-147 | 364.21 | 91.10 | 193. | 0. | 0.000 | 1000.00 | 1.047s |
| TH-234 | 370.17 | 92.59 | 193. | 0. | 0.000 | 1000.00 | 1.048D |
| AC-228 | 373.21 | 93.35 | 193. | 0. | 0.000 | 1000.00 | 1.049s |
| Gd-153 | 389.81 | 97.50 | 193. | 0. | 0.000 | 1000.00 | 1.052s |
| Np-239 | 397.81 | 99.50 | 193. | 0. | 0.000 | 1000.00 | 1.053 |
| Gd-153 | 412.62 | 103.20 | 193. | 0. | 0.000 | 1000.00 | 1.056 |
| Np-239 | 414.62 | 103.70 | 193. | 0. | 0.000 | 1000.00 | 1.057s |
| EU-155 | 421.07 | 105.31 | 193. | 0. | 0.000 | 1000.00 | 1.058s |
| EU-152 | 486.92 | 121.78 | 60. | -12. | -0.007 | 93.54 | 1.071s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CO-57 | 488.06 | 122.06 | 73. | -7. | -0.004 | 172.78 | 1.071s |
| EU-154 | 492.22 | 123.10 | 64. | 10. | 0.005 | 123.88 | 1.072s |
| PA-234 | 525.00 | 131.29 | 55. | 7. | 0.004 | 145.03 | 1.078s |
| HF-181 | 531.92 | 133.02 | 63. | 8. | 0.004 | 153.77 | 1.079s |
| CE-144 | 533.98 | 133.54 | 95. | -4. | -0.002 | 348.27 | 1.080s |
| HF-181 | 545.02 | 136.30 | 91. | 0. | 0.000 | 1000.00 | 1.082 |
| CO-57 | 545.72 | 136.47 | 91. | 0. | 0.000 | 1000.00 | 1.082 |
| Tc-99m | 561.86 | 140.51 | 91. | 0. | 0.000 | 1000.00 | 1.085s |
| U-235 | 574.97 | 143.79 | 96. | -5. | -0.003 | 247.12 | 1.087 |
| CE-141 | 581.59 | 145.44 | 103. | -10. | -0.006 | 146.86 | 1.089s |
| Ba-140 | 650.47 | 162.66 | 43. | 6. | 0.003 | 164.58 | 1.102s |
| U-235 | 653.35 | 163.38 | 49. | 0. | 0.000 | 1000.00 | 1.102s |
| CE-139 | 663.24 | 165.85 | 41. | 5. | 0.003 | 180.36 | 1.104s |
| Cf-251 | 706.23 | 176.60 | 33. | -7. | -0.004 | 158.11 | 1.112s |
| TH-229 | 773.87 | 193.51 | 29. | -9. | -0.005 | 113.39 | 1.125s |
| U-235 | 821.17 | 205.33 | 11. | 7. | 0.004 | 98.58 | 1.134 |
| TH-229 | 843.24 | 210.85 | 36. | -6. | -0.003 | 200.00 | 1.138s |
| Cf-251 | 907.84 | 227.00 | 28. | -3. | -0.002 | 350.13 | 1.151 |
| PB-212 | 954.37 | 238.63 | 49. | -17. | -0.010 | 62.57 | 1.159 |
| EU-152 | 978.62 | 244.69 | 48. | -14. | -0.008 | 100.52 | 1.164s |
| TH-227 | 1024.81 | 256.24 | 24. | -1. | -0.001 | 964.37 | 1.172s |
| Cd-113m | 1054.65 | 263.70 | 24. | 2. | 0.001 | 353.55 | 1.178s |
| BI-210M | 1063.18 | 265.83 | 23. | 8. | 0.004 | 96.14 | 1.179s |
| TL-208 | 1108.99 | 277.28 | 35. | -4. | -0.002 | 215.06 | 1.188s |
| Hg-203 | 1116.66 | 279.20 | 31. | 6. | 0.004 | 129.88 | 1.189s |
| I-131 | 1137.05 | 284.30 | 20. | 1. | 0.001 | 881.29 | 1.193s |
| PB-214 | 1180.22 | 295.09 | 42. | 6. | 0.003 | 159.97 | 1.201s |
| PB-212 | 1199.98 | 300.03 | 48. | 6. | 0.003 | 169.73 | 1.205s |
| PA-231 | 1200.14 | 300.07 | 53. | 6. | 0.003 | 179.40 | 1.205s |
| PA-233 | 1200.58 | 300.18 | 59. | 6. | 0.003 | 188.55 | 1.205 |
| PA-231 | 1210.46 | 302.65 | 65. | 6. | 0.003 | 197.03 | 1.207s |
| BA-133 | 1211.27 | 302.85 | 71. | 6. | 0.003 | 205.38 | 1.207s |
| Ba-140 | 1219.26 | 304.85 | 77. | 6. | 0.003 | 213.17 | 1.208s |
| BI-210M | 1219.45 | 304.90 | 83. | 6. | 0.003 | 220.93 | 1.208s |
| Ir-192 | 1233.62 | 308.44 | 89. | 5. | 0.003 | 275.47 | 1.211s |
| PA-233 | 1247.91 | 312.01 | 94. | 0. | 0.000 | 1000.00 | 1.214s |
| Ir-192 | 1265.82 | 316.49 | 94. | 0. | 0.000 | 1000.00 | 1.217 |
| CR-51 | 1280.20 | 320.08 | 135. | -8. | -0.005 | 196.82 | 1.219s |
| La-140 | 1314.91 | 328.76 | 64. | -8. | -0.004 | 145.77 | 1.226s |
| Cf-249 | 1333.63 | 333.44 | 72. | 0. | 0.000 | 1000.00 | 1.229s |
| AC-228 | 1353.15 | 338.32 | 72. | 0. | 0.000 | 1000.00 | 1.233s |
| Cs-136 | 1362.15 | 340.57 | 72. | 0. | 0.000 | 1000.00 | 1.234s |
| EU-152 | 1377.01 | 344.29 | 80. | -10. | -0.005 | 135.16 | 1.237s |
| HF-181 | 1383.19 | 345.83 | 94. | -6. | -0.003 | 230.58 | 1.238s |
| PB-214 | 1407.60 | 351.93 | 36. | -4. | -0.002 | 226.67 | 1.243s |
| BA-133 | 1423.87 | 356.00 | 30. | 7. | 0.004 | 115.20 | 1.245s |
| I-131 | 1457.81 | 364.48 | 8. | -1. | -0.001 | 562.73 | 1.252s |
| BA-133 | 1535.24 | 383.84 | 39. | -5. | -0.003 | 194.04 | 1.266s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Cf-249 | 1551.68 | 387.95 | 43. | 0. | 0.000 | 1000.00 | 1.269s |
| SN-113 | 1566.64 | 391.69 | 33. | 8. | 0.004 | 111.60 | 1.271s |
| SB-125 | 1711.39 | 427.88 | 4. | 1. | 0.001 | 404.15 | 1.297s |
| AG-108M | 1735.64 | 433.94 | 9. | -1. | 0.000 | 909.67 | 1.301s |
| pm-146 | 1815.41 | 453.88 | 4. | 5. | 0.003 | 104.03 | 1.315s |
| SB-125 | 1853.36 | 463.37 | 8. | 5. | 0.003 | 98.74 | 1.322s |
| Ir-192 | 1872.14 | 468.06 | 27. | -6. | -0.003 | 127.37 | 1.325s |
| BE-7 | 1910.28 | 477.60 | 22. | 6. | 0.003 | 117.85 | 1.332s |
| HF-181 | 1927.89 | 482.00 | 28. | 0. | 0.000 | 1000.00 | 1.335s |
| RU-103 | 1988.12 | 497.05 | 13. | -6. | -0.003 | 129.28 | 1.346s |
| RH-106 | 2047.36 | 511.86 | 28. | 18. | 0.010 | 79.87 | 2.606 |
| Nd-147 | 2123.91 | 531.00 | 22. | -11. | -0.006 | 94.39 | 1.369s |
| Ba-140 | 2148.95 | 537.26 | 0. | 7. | 0.004 | 37.80 | 1.373s |
| CS-134 | 2252.86 | 563.24 | 4. | 3. | 0.001 | 170.71 | 1.391s |
| CS-134 | 2277.20 | 569.32 | 9. | 5. | 0.003 | 95.92 | 1.395s |
| PA-234 | 2277.80 | 569.47 | 14. | 0. | 0.000 | 1000.00 | 1.395s |
| BI-207 | 2278.73 | 569.70 | 19. | -4. | -0.002 | 162.02 | 1.396s |
| TL-208 | 2332.01 | 583.02 | 4. | 11. | 0.006 | 50.24 | 1.405s |
| SB-125 | 2401.92 | 600.50 | 96. | -11. | -0.006 | 129.29 | 1.416s |
| SB-124 | 2410.85 | 602.73 | 107. | -11. | -0.006 | 135.99 | 1.418 |
| CS-134 | 2418.76 | 604.71 | 118. | -11. | -0.006 | 142.37 | 1.419s |
| BI-214 | 2437.17 | 609.31 | 129. | -11. | -0.006 | 148.29 | 1.422s |
| RU-103 | 2441.12 | 610.30 | 140. | -10. | -0.005 | 175.32 | 1.423s |
| AG-108M | 2457.05 | 614.28 | 150. | 0. | 0.000 | 1000.00 | 1.426s |
| PM-144 | 2472.18 | 618.06 | 150. | 0. | 0.000 | 1000.00 | 1.428s |
| RH-106 | 2487.60 | 621.92 | 72. | 5. | 0.003 | 246.17 | 1.431s |
| SB-125 | 2543.49 | 635.89 | 4. | -1. | -0.001 | 237.17 | 1.440s |
| I-131 | 2547.83 | 636.97 | 12. | -3. | -0.002 | 171.05 | 1.441s |
| AG-110M | 2630.98 | 657.76 | 22. | -6. | -0.004 | 110.41 | 1.455s |
| PM-144 | 2786.11 | 696.54 | 9. | 3. | 0.001 | 250.62 | 1.480s |
| NB-94 | 2810.46 | 702.63 | 14. | -3. | -0.002 | 270.80 | 1.484s |
| SB-124 | 2891.09 | 722.79 | 23. | -9. | -0.005 | 82.40 | 1.497s |
| AG-108M | 2891.70 | 722.94 | 32. | 0. | 0.000 | 1000.00 | 1.498s |
| EU-154 | 2893.37 | 723.36 | 32. | 0. | 0.000 | 1000.00 | 1.498s |
| ZR-95 | 2896.74 | 724.20 | 33. | -4. | -0.002 | 209.17 | 1.498s |
| BI-212 | 2908.63 | 727.17 | 59. | -13. | -0.007 | 89.50 | 1.500s |
| pm-146 | 2942.83 | 735.72 | 5. | 5. | 0.003 | 97.83 | 1.506s |
| pm-146 | 2988.59 | 747.16 | 9. | -1. | -0.001 | 493.71 | 1.513s |
| AG-110M | 3055.73 | 763.94 | 12. | -3. | -0.002 | 158.75 | 1.524s |
| NB-95 | 3063.11 | 765.79 | 16. | 0. | 0.000 | 1000.00 | 1.525s |
| PA-234M | 3065.60 | 766.41 | 16. | 1. | 0.000 | 857.32 | 1.526s |
| BI-212 | 3141.64 | 785.42 | 0. | 9. | 0.005 | 33.33 | 1.538s |
| CS-134 | 3183.43 | 795.87 | 9. | 1. | 0.001 | 371.98 | 1.544s |
| CS-134 | 3207.77 | 801.95 | 19. | -8. | -0.004 | 88.39 | 1.548s |
| CO-58 | 3243.06 | 810.78 | 10. | -3. | -0.002 | 167.41 | 1.554s |
| La-140 | 3263.04 | 815.77 | 13. | 0. | 0.000 | 1000.00 | 1.557s |
| Cs-136 | 3273.97 | 818.50 | 13. | 0. | 0.000 | 1000.00 | 1.559s |
| MN-54 | 3339.36 | 834.85 | 0. | 6. | 0.003 | 40.82 | 1.569s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Co-56 | 3387.05 | 846.77 | 33. | -15. | -0.008 | 87.63 | 1.577s |
| TL-208 | 3442.23 | 860.56 | 9. | 1. | 0.000 | 979.80 | 1.585s |
| NB-94 | 3484.36 | 871.10 | 6. | -1. | -0.001 | 314.93 | 1.592s |
| EU-154 | 3492.89 | 873.23 | 14. | -5. | -0.003 | 109.77 | 1.593s |
| PA-234 | 3522.10 | 880.53 | 11. | 1. | 0.001 | 357.07 | 1.598s |
| PA-234 | 3532.94 | 883.24 | 12. | 0. | 0.000 | 1000.00 | 1.599s |
| AG-110M | 3538.71 | 884.68 | 12. | 0. | 0.000 | 1000.00 | 1.600s |
| Sc-46 | 3557.10 | 889.28 | 22. | -8. | -0.004 | 91.98 | 1.603s |
| y-88 | 3592.14 | 898.04 | 0. | 6. | 0.003 | 40.82 | 1.608s |
| AC-228 | 3644.26 | 911.07 | 5. | 6. | 0.003 | 91.81 | 1.616s |
| AG-110M | 3749.96 | 937.49 | 0. | 6. | 0.003 | 40.82 | 1.633s |
| PA-234 | 3784.07 | 946.02 | 0. | 0. | 0.000 | 1000.00 | 1.638s |
| EU-152 | 3856.43 | 964.11 | 24. | -10. | -0.006 | 76.67 | 1.649s |
| AC-228 | 3875.88 | 968.97 | 18. | 6. | 0.003 | 113.22 | 1.652s |
| EU-154 | 3985.31 | 996.33 | 0. | 20. | 0.011 | 22.36 | 1.668s |
| PA-234M | 4003.99 | 1001.00 | 20. | 0. | 0.000 | 1000.00 | 1.671s |
| EU-154 | 4019.10 | 1004.77 | 20. | 0. | 0.000 | 1000.00 | 1.673s |
| Co-56 | 4151.36 | 1037.84 | 5. | 2. | 0.001 | 255.77 | 1.693s |
| Cs-136 | 4192.29 | 1048.07 | 6. | 1. | 0.000 | 547.72 | 1.698s |
| BI-207 | 4254.65 | 1063.66 | 10. | -3. | -0.002 | 238.82 | 1.708s |
| Ga-68 | 4309.61 | 1077.40 | 5. | -1. | -0.001 | 501.66 | 1.716s |
| FE-59 | 4397.02 | 1099.25 | 15. | -4. | -0.002 | 218.66 | 1.728s |
| EU-152 | 4448.32 | 1112.07 | 0. | 10. | 0.006 | 31.62 | 1.736s |
| ZN-65 | 4462.20 | 1115.55 | 10. | 0. | 0.000 | 1000.00 | 1.738s |
| BI-214 | 4481.17 | 1120.29 | 10. | 0. | 0.000 | 1000.00 | 1.740s |
| Sc-46 | 4482.22 | 1120.55 | 10. | 0. | 0.000 | 1000.00 | 1.740s |
| Ta-182 | 4485.22 | 1121.30 | 10. | 0. | 0.000 | 1000.00 | 1.741s |
| CO-60 | 4692.97 | 1173.24 | 5. | -2. | -0.001 | 255.77 | 1.770s |
| Ta-182 | 4756.23 | 1189.05 | 0. | 0. | 0.000 | 1000.00 | 1.779s |
| Ta-182 | 4885.67 | 1221.41 | 16. | -11. | -0.006 | 89.35 | 1.797s |
| Co-56 | 4953.16 | 1238.28 | 0. | 0. | 0.000 | 1000.00 | 1.806s |
| NA-22 | 5098.16 | 1274.53 | 0. | 0. | 0.000 | 1000.00 | 1.826s |
| EU-154 | 5098.22 | 1274.54 | 0. | 0. | 0.000 | 1000.00 | 1.826s |
| FE-59 | 5166.43 | 1291.60 | 0. | 7. | 0.004 | 37.80 | 1.835s |
| CO-60 | 5330.06 | 1332.50 | 0. | 0. | 0.000 | 1000.00 | 1.857s |
| AG-110M | 5537.25 | 1384.30 | 0. | 0. | 0.000 | 1000.00 | 1.884s |
| EU-152 | 5632.07 | 1408.00 | 0. | 7. | 0.004 | 37.80 | 1.896s |
| La-140 | 6384.93 | 1596.21 | 6. | -1. | 0.000 | 846.32 | 1.990s |
| SB-124 | 6764.03 | 1690.98 | 0. | 0. | 0.000 | 1000.00 | 2.034s |
| BI-214 | 7058.07 | 1764.49 | 0. | 0. | 0.000 | 1000.00 | 2.067s |
| Co-56 | 7085.51 | 1771.35 | 0. | 0. | 0.000 | 1000.00 | 2.070s |
| y-88 | 7344.36 | 1836.06 | 0. | 0. | 0.000 | 1000.00 | 2.098s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | 2.0050E+00 | | | | 5.31E+01 | |
| | | | 477.60 | 2.005E+00 | ?( | 8.210E+00 1.18E+02 1.05E+01 | G |
| K-40 | N | -2.8151E-01 | | | | 4.66E+11 | |
| | | | 1460.83 | -2.815E-01 | %( | 1.138E+01 1.58E+03 1.07E+01 | G |
| Sc-46 | F | -4.6400E-01 | | | | 8.38E+01 | |
| | | | 889.28 | -4.640E-01 | ?( | 1.456E+00 9.20E+01 1.00E+02 | G |
| | | | 1120.55 | 0.000E+00 | + | 1.250E+00 1.00E+03 1.00E+02 | G |
| CR-51 | F | -2.1746E+00 | | | | 2.77E+01 | |
| | | | 320.08 | -2.175E+00 | ?( | 1.458E+01 1.97E+02 9.94E+00 | G |
| MN-54 | C | 3.3492E-01 | | | | 3.12E+02 | |
| | | | 834.85 | 3.349E-01 | ?( | 4.114E-01 4.08E+01 1.00E+02 | G |
| FE-59 | F | 2.8577E-01 | | | | 4.45E+01 | |
| | | | 1099.25 | -4.991E-01 | ?( | 2.590E+00 2.19E+02 5.65E+01 | G |
| | | | 1291.60 | 1.312E+00 | ?( | 1.382E+00 3.78E+01 4.32E+01 | G |
| Co-56 | C | -8.1960E-01 | | | | 7.73E+01 | |
| | | | 846.77 | -8.196E-01 | ?( | 1.658E+00 8.76E+01 9.99E+01 | G |
| | | | 1238.28 | 0.000E+00 | + | 8.711E-01 1.00E+03 6.61E+01 | G |
| | | | 1037.84 | 9.500E-01 | + | 6.237E+00 2.56E+02 1.41E+01 | G |
| | | | 1771.35 | 0.000E+00 | + | 5.079E+00 1.00E+03 1.55E+01 | A |
| CO-57 | C | -1.1202E-01 | | | | 2.72E+02 | |
| | | | 122.06 | -1.120E-01 | ?( | 6.651E-01 1.73E+02 8.56E+01 | G |
| | | | 136.47 | 0.000E+00 | + | 6.135E+00 1.00E+03 1.07E+01 | G |
| CO-58 | C | -1.5512E-01 | | | | 7.09E+01 | |
| | | | 810.78 | -1.551E-01 | ?( | 9.484E-01 1.67E+02 9.95E+01 | G |
| NB-94 | I | -1.4802E-01 | | | | 7.41E+06 | |
| | | | 702.63 | -1.480E-01 | ?( | 9.940E-01 2.71E+02 9.79E+01 | G |
| | | | 871.10 | -6.756E-02 | + | 8.271E-01 3.15E+02 9.99E+01 | G |
| ZR-95 | I | 3.1455E-02 | | | | 6.40E+01 | |
| | | | 756.73 | 3.146E-02 | %( | 1.206E+00 1.39E+03 5.45E+01 | G |
| | | | 724.20 | -4.488E-01 | + | 3.308E+00 2.09E+02 4.42E+01 | G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| RU-103 | I | -2.3971E-01 | | | | | 3.93E+01 | |
| | | | 497.05 | -2.397E-01 | &( | 7.795E-01 | 1.29E+02 | 9.09E+01 G |
| | | | 610.30 | -7.256E+00 | + | 4.323E+01 | 1.75E+02 | 5.75E+00 GA |
| RH-106 | I | 2.1869E+00 | | | | | 3.74E+02 | |
| | | | 621.92 | 2.187E+00 | ?( | 1.863E+01 | 2.46E+02 | 9.93E+00 G |
| | | | 1050.36 | -7.244E-01 | % | 6.600E+01 | 2.28E+03 | 1.56E+00 G |
| | | | 511.86 | 3.370E+00 | & | 5.090E+00 | 7.99E+01 | 2.00E+01 GA |
| AG-108M | C | -2.3965E-02 | | | | | 1.53E+05 | |
| | | | 433.94 | -2.397E-02 | ?( | 5.906E-01 | 9.10E+02 | 9.05E+01 G |
| | | | 722.94 | 0.000E+00 | + | 1.583E+00 | 1.00E+03 | 9.08E+01 G |
| | | | 614.28 | 0.000E+00 | + | 2.872E+00 | 1.00E+03 | 8.98E+01 G |
| AG-110M | F | 3.4503E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | 0.000E+00 | ?( | 1.520E+00 | 1.00E+03 | 7.27E+01 G |
| | | | 657.76 | -3.141E-01 | + | 1.199E+00 | 1.10E+02 | 9.46E+01 G |
| | | | 937.49 | 1.075E+00 | ?( | 1.320E+00 | 4.08E+01 | 3.44E+01 G |
| | | | 1384.30 | 0.000E+00 | - | 2.609E+00 | 1.00E+03 | 2.43E+01 G |
| | | | 763.94 | -7.750E-01 | + | 4.435E+00 | 1.59E+02 | 2.23E+01 G |
| SN-113 | F | 3.5823E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | 3.582E-01 | &( | 1.373E+00 | 1.12E+02 | 6.40E+01 G |
| SB-124 | F | -4.7721E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | -4.772E-01 | ?( | 2.203E+00 | 1.36E+02 | 9.83E+01 G |
| | | | 1690.98 | 0.000E+00 | + | 1.579E+00 | 1.00E+03 | 4.78E+01 G |
| | | | 722.79 | -4.118E+00 | + | 1.146E+01 | 8.24E+01 | 1.08E+01 G |
| SB-125 | I | 4.7368E-01 | | | | | 1.01E+03 | |
| | | | 427.88 | 1.086E-01 | ?( | 1.307E+00 | 4.04E+02 | 2.96E+01 G |
| | | | 600.50 | -2.615E+00 | + | 1.148E+01 | 1.29E+02 | 1.79E+01 G |
| | | | 635.89 | -5.242E-01 | + | 4.879E+00 | 2.37E+02 | 1.13E+01 G |
| | | | 463.37 | 1.506E+00 | ?( | 5.206E+00 | 9.87E+01 | 1.05E+01 G |
| I-131 | I | -5.7552E-03 | | | | | 8.02E+00 | |
| | | | 364.48 | -3.461E-02 | ?( | 5.499E-01 | 5.63E+02 | 8.17E+01 G |
| | | | 284.30 | 3.781E-01 | &( | 8.905E+00 | 8.81E+02 | 6.14E+00 G |
| | | | 636.97 | -1.863E+00 | + | 1.157E+01 | 1.71E+02 | 7.17E+00 G |
| Ga-68 | C | -2.4726E+00 | | | | | 4.71E-02 | |
| | | | 1077.40 | -2.473E+00 | ?( | 3.247E+01 | 5.02E+02 | 3.30E+00 G |
| BA-133 | F | 4.2748E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | 3.204E-01 | ?( | 1.272E+00 | 1.15E+02 | 6.20E+01 G |
| | | | 302.85 | 7.898E-01 | ?( | 5.598E+00 | 2.05E+02 | 1.83E+01 G |
| | | | 383.84 | -1.538E+00 | + | 1.044E+01 | 1.94E+02 | 8.94E+00 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 80.99 | 1.138E-01 | - | 1.193E+00 | 3.85E+02 | 3.41E+01 GA |
| CS-134 | I | -1.3219E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | -4.821E-01 | ?( | 2.329E+00 | 1.42E+02 | 9.76E+01 G |
| | | | 795.87 | 7.313E-02 | + | 1.038E+00 | 3.72E+02 | 8.55E+01 G |
| | | | 569.32 | 1.319E+00 | &( | 4.404E+00 | 9.59E+01 | 1.54E+01 G |
| | | | 801.95 | -4.727E+00 | + | 1.424E+01 | 8.84E+01 | 8.69E+00 G |
| | | | 563.24 | 1.285E+00 | ?( | 5.979E+00 | 1.71E+02 | 8.35E+00 G |
| CS-137 | I | -3.0334E-02 | | | | | 1.10E+04 | |
| | | | 661.66 | -3.033E-02 | %(P | 1.465E+00 | 1.32E+03 | 8.52E+01 G |
| CE-139 | F | 9.8992E-02 | | | | | 1.38E+02 | |
| | | | 165.85 | 9.899E-02 | *( | 6.225E-01 | 1.80E+02 | 7.99E+01 G |
| Ba-140 | I | 1.4522E+00 | | | | | 1.28E+01 | |
| | | | 537.26 | 1.111E+00 | ?( | 1.169E+00 | 3.78E+01 | 2.44E+01 G |
| | | | 162.66 | 1.450E+00 | ?( | 8.285E+00 | 1.65E+02 | 6.22E+00 G |
| | | | 304.85 | 3.397E+00 | ?( | 2.496E+01 | 2.13E+02 | 4.29E+00 G |
| La-140 | I | -6.8040E-02 | | | | | 1.28E+01 | |
| | | | 1596.21 | -6.804E-02 | ?( | 1.409E+00 | 8.46E+02 | 9.54E+01 G |
| | | | 487.02 | 5.234E-02 | % | 2.125E+00 | 1.12E+03 | 4.55E+01 G |
| | | | 328.76 | -1.026E+00 | & | 5.130E+00 | 1.46E+02 | 2.03E+01 G |
| | | | 815.77 | 0.000E+00 | + | 4.537E+00 | 1.00E+03 | 2.33E+01 G |
| CE-141 | I | -2.9797E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | -2.980E-01 | ( | 1.489E+00 | 1.47E+02 | 4.82E+01 G |
| CE-144 | I | -4.9651E-01 | | | | | 2.85E+02 | |
| | | | 133.54 | -4.965E-01 | ?( | 5.975E+00 | 3.48E+02 | 1.11E+01 G |
| PM-144 | C | 1.2917E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | 1.292E-01 | ?( | 8.209E-01 | 2.51E+02 | 9.90E+01 G |
| | | | 618.06 | 0.000E+00 | - | 2.617E+00 | 1.00E+03 | 9.91E+01 G |
| EU-152 | F | 1.1264E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | -9.803E-01 | &( | 4.516E+00 | 1.35E+02 | 2.65E+01 G |
| | | | 1112.07 | 5.218E+00 | ?( | 3.846E+00 | 3.16E+01 | 1.36E+01 G |
| | | | 121.78 | -5.786E-01 | & | 1.826E+00 | 9.35E+01 | 2.86E+01 G |
| | | | 778.92 | 1.356E-01 | % | 5.199E+00 | 1.39E+03 | 1.29E+01 G |
| | | | 964.11 | -4.285E+00 | + | 1.102E+01 | 7.67E+01 | 1.46E+01 G |
| | | | 244.69 | -3.817E+00 | + | 9.543E+00 | 1.01E+02 | 7.58E+00 G |
| | | | 1408.00 | 2.908E+00 | ? | 3.062E+00 | 3.78E+01 | 2.10E+01 GA |
| EU-154 | I | 4.3591E+00 | | | | | 3.14E+03 | |
| | | | 873.23 | -2.441E+00 | ?( | 9.369E+00 | 1.10E+02 | 1.23E+01 G |
| | | | 123.10 | 3.127E-01 | + | 1.321E+00 | 1.24E+02 | 4.08E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 1274.54 | 0.000E+00 | + | 1.677E+00 | 1.00E+03 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | + | 7.115E+00 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | 0.000E+00 | + | 8.537E+00 | 1.00E+03 | 1.80E+01 G |
| | | | 996.33 | 1.223E+01 | ?( | 4.507E+00 | 2.24E+01 | 1.06E+01 G |
| EU-155 | I | 2.1921E-01 | | | | | 1.81E+03 | |
| | | | 105.31 | 0.000E+00 | ?( | 4.224E+00 | 1.00E+03 | 2.12E+01 G |
| | | | 86.54 | 3.706E-01 | ?( | 2.807E+00 | 2.22E+02 | 3.07E+01 G |
| HF-181 | F | 8.3335E-02 | | | | | 4.24E+01 | |
| | | | 482.00 | 0.000E+00 | ?( | 1.204E+00 | 1.00E+03 | 8.05E+01 G |
| | | | 133.02 | 2.383E-01 | ?( | 1.259E+00 | 1.54E+02 | 4.33E+01 G |
| | | | 345.83 | -1.088E+00 | + | 8.628E+00 | 2.31E+02 | 1.51E+01 G |
| | | | 136.30 | 0.000E+00 | - | 1.119E+01 | 1.00E+03 | 5.85E+00 G |
| Hg-203 | F | 1.7795E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | 1.779E-01 | ?( | 8.012E-01 | 1.30E+02 | 8.15E+01 G |
| TL-208 | N | 4.9487E-01 | | | | | 6.98E+02 | |
| | | | 583.02 | 5.224E-01 | ?( | 6.079E-01 | 5.02E+01 | 8.45E+01 G |
| | | | 277.28 | -1.443E+00 | - | 1.092E+01 | 2.15E+02 | 6.31E+00 G |
| | | | 860.56 | 3.073E-01 | ?( | 7.812E+00 | 9.80E+02 | 1.24E+01 G |
| pm-146 | C | 2.8744E-01 | | | | | 2.02E+03 | |
| | | | 747.16 | -1.994E-01 | ?( | 2.534E+00 | 4.94E+02 | 3.40E+01 G |
| | | | 735.72 | 1.168E+00 | ?( | 2.850E+00 | 9.78E+01 | 2.25E+01 G |
| | | | 453.88 | 2.373E-01 | ?( | 6.440E-01 | 1.04E+02 | 6.50E+01 G |
| y-88 | F | 3.8006E-01 | | | | | 1.07E+02 | |
| | | | 898.04 | 3.801E-01 | ?( | 4.668E-01 | 4.08E+01 | 9.37E+01 G |
| | | | 1836.06 | 0.000E+00 | - | 8.180E-01 | 1.00E+03 | 9.92E+01 G |
| Cd-113m | | 7.2951E+02 | | | | | 5.33E+03 | |
| | | | 263.70 | 7.295E+02 | ?( | 9.316E+03 | 3.54E+02 | 6.00E-03 K |
| Cd-109 | F | -3.7623E-01 | | | | | 4.53E+02 | |
| | | | 88.04 | -3.762E-01 | &( | 2.483E+01 | 1.93E+03 | 3.79E+00 G |
| Cf-251 | T | -6.6118E-01 | | | | | 3.28E+05 | |
| | | | 176.60 | -6.612E-01 | ?( | 2.784E+00 | 1.58E+02 | 1.70E+01 G |
| | | | 227.00 | -9.273E-01 | & | 8.460E+00 | 3.50E+02 | 6.30E+00 GA |
| PB-210 | N | 3.0419E+00 | | | | | 8.14E+03 | |
| | | | 46.54 | 3.042E+00 | &( | 2.129E+01 | 2.00E+02 | 4.25E+00 G |
| PB-212 | N | -8.1335E-01 | | | | | 6.98E+02 | |
| | | | 238.63 | -8.133E-01 | ?(P | 1.644E+00 | 6.26E+01 | 4.33E+01 G |
| | | | 300.03 | 4.374E+00 | ? | 2.574E+01 | 1.70E+02 | 3.28E+00 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| PB-214 | N | 6.2901E-02 | | | | | 5.84E+05 | |
| | | | 351.93 | -2.803E-01 | ( | 2.238E+00 | 2.27E+02 | 3.76E+01 G |
| | | | 295.09 | 7.315E-01 | ?( | 4.062E+00 | 1.60E+02 | 1.93E+01 G |
| | | | 242.00 | -3.546E-02 | % | 9.902E+00 | 7.84E+03 | 7.43E+00 GA |
| BI-207 | C | -1.6619E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | -1.662E-01 | &( | 9.565E-01 | 1.62E+02 | 9.77E+01 G |
| | | | 1063.66 | -2.760E-01 | + | 1.605E+00 | 2.39E+02 | 7.45E+01 G |
| BI-212 | N | -8.4123E+00 | | | | | 6.98E+02 | |
| | | | 727.17 | -8.412E+00 | ?( | 2.535E+01 | 8.95E+01 | 7.55E+00 G |
| | | | 785.42 | 3.728E+01 | ? | 3.053E+01 | 3.33E+01 | 1.28E+00 GA |
| BI-214 | N | -1.0297E+00 | | | | | 5.84E+05 | |
| | | | 609.31 | -1.030E+00 | ?( | 5.179E+00 | 1.48E+02 | 4.61E+01 G |
| | | | 1120.29 | 0.000E+00 | + | 8.278E+00 | 1.00E+03 | 1.51E+01 G |
| | | | 1764.49 | 0.000E+00 | + | 5.088E+00 | 1.00E+03 | 1.54E+01 G |
| BI-210M | T | 4.0330E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | 3.377E-01 | ?( | 1.111E+00 | 9.61E+01 | 5.00E+01 G |
| | | | 304.90 | 5.204E-01 | ?( | 3.960E+00 | 2.21E+02 | 2.80E+01 G |
| AC-228 | N | 1.5091E+00 | | | | | 2.10E+03 | |
| | | | 911.07 | 1.164E+00 | &( | 2.647E+00 | 9.18E+01 | 2.90E+01 G |
| | | | 968.97 | 2.082E+00 | ?( | 8.202E+00 | 1.13E+02 | 1.75E+01 G |
| | | | 338.32 | 0.000E+00 | & | 9.372E+00 | 1.00E+03 | 1.20E+01 G |
| | | | 93.35 | 0.000E+00 | - | 1.650E+01 | 1.00E+03 | 5.56E+00 XA |
| TH-227 | N | -2.9616E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | -2.962E+00 | ?( | 1.231E+01 | 1.22E+02 | 8.00E+00 G |
| | | | 256.24 | -3.057E-01 | + | 7.808E+00 | 9.64E+02 | 7.00E+00 G |
| TH-229 | N | -3.6527E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | -3.653E+00 | ?( | 1.094E+01 | 1.13E+02 | 4.40E+00 G |
| | | | 210.85 | -3.691E+00 | + | 1.887E+01 | 2.00E+02 | 2.99E+00 G |
| TH-234 | N | -1.0477E+01 | | | | | 1.63E+12 | |
| | | | 63.29 | -1.048E+01 | *(P | 2.271E+01 | 5.86E+01 | 3.81E+00 G |
| | | | | | | | | Energy duplication |
| | | | 92.59 | 0.000E+00 | + | 1.648E+01 | 1.00E+03 | 5.58E+00 G |
| PA-231 | N | 5.3963E+00 | | | | | 1.20E+07 | |
| | | | 302.65 | 5.024E+00 | ?( | 3.419E+01 | 1.97E+02 | 2.88E+00 G |
| | | | 300.07 | 5.833E+00 | ?( | 3.623E+01 | 1.79E+02 | 2.46E+00 G |
| PA-233 | C | 3.4016E-01 | | | | | 7.82E+08 | |
| | | | 312.01 | 0.000E+00 | ?( | 3.323E+00 | 1.00E+03 | 3.60E+01 G |
| | | | 300.18 | 2.315E+00 | &( | 1.510E+01 | 1.89E+02 | 6.20E+00 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

PA-234   N   5.6968E-01                                     1.63E+12
                          131.29 5.697E-01 ?(  2.841E+00 1.45E+02 1.80E+01 G
                          946.02 0.000E+00 -   3.412E+00 1.00E+03 1.34E+01 G
                          569.47 0.000E+00 &   9.973E+00 1.00E+03 8.20E+00 G
                          883.24 0.000E+00 -   1.149E+01 1.00E+03 9.60E+00 G
                          880.53 1.297E+00 ?   1.744E+01 3.57E+02 6.00E+00 GA

PA-234M  N   3.0617E+00                                     1.63E+12
                         1001.00 0.000E+00 ?(  1.831E+02 1.00E+03 8.37E-01 G
                          766.41 1.178E+01 ?(  3.772E+02 8.57E+02 2.94E-01 G

U-235    N   3.0380E-01                                     2.57E+11
                          143.79-6.804E-01 ?(P 6.296E+00 2.47E+02 1.10E+01 G
                          205.33 2.457E+00 ?(  6.535E+00 9.86E+01 5.01E+00 G
                          163.38 0.000E+00 &   1.079E+01 1.00E+03 5.08E+00 G

AM-241   T  -1.9299E-01                                     1.58E+05
                           59.54-1.930E-01 &(P 2.429E+00 3.56E+02 3.59E+01 G

Np-237   F   8.6873E-01                                     2.14E+06
                           86.49 8.687E-01 ?(  6.417E+00 2.17E+02 1.31E+01 G

Ir-192   F   1.0237E-01                                     7.40E+01
                          316.49 0.000E+00 &(  1.390E+00 1.00E+03 8.70E+01 G
                          468.06-4.074E-01 +   1.802E+00 1.27E+02 5.18E+01 G
                          308.44 3.830E-01 ?(  3.641E+00 2.75E+02 3.18E+01 G

Cs-136   F   2.5067E-02                                     1.30E+01
                          818.50 0.000E+00 ?(  1.059E+00 1.00E+03 1.00E+02 G
                         1048.07 5.640E-02 ?(  1.221E+00 5.48E+02 8.00E+01 G
                          340.57 0.000E+00 -   2.413E+00 1.00E+03 4.69E+01 G

Np-239   T  -1.9487E-02                                     2.36E+00
                          103.70 0.000E+00 &   3.738E+00 1.00E+03 2.40E+01 X
                          106.13-1.949E-02 %(  3.917E+00 5.86E+03 2.27E+01 G
                           99.50 0.000E+00 +   6.019E+00 1.00E+03 1.50E+01 X

Nd-147      -3.1382E+00                                     1.11E+01
                          531.00-3.138E+00 ?(  7.195E+00 9.44E+01 1.30E+01 G
                           91.10 0.000E+00 +   3.271E+00 1.00E+03 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
```

@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity | |
|---|---|---|---|---|---|---|---|
| TH-227 | 50.14 | 65. | -10. | -0.005 | 121.96 | -2.962E+00 | |
| AM-241 | 59.54 | 83. | -4. | -0.002 | 356.46 | -1.930E-01 | P |
| TH-234 | 63.29 | 95. | -22. | -0.012 | 58.61 | -1.048E+01 | P |
| BA-133 | 80.99 | 29. | 3. | 0.001 | 384.87 | 1.138E-01 | |
| Np-237 | 86.49 | 151. | 8. | 0.005 | 216.88 | 8.687E-01 | |
| EU-155 | 86.54 | 159. | 8. | 0.005 | 222.50 | 3.706E-01 | |
| Sn-126 | 86.94 | 215. | -10. | -0.006 | 204.24 | -1.589E+00 | |
| Sn-126 | 87.57 | 204. | -10. | -0.006 | 199.33 | -3.819E-01 | |
| EU-152 | 121.78 | 60. | -12. | -0.007 | 93.54 | -5.786E-01 | |
| CO-57 | 122.06 | 73. | -7. | -0.004 | 172.78 | -1.120E-01 | |
| EU-154 | 123.10 | 64. | 10. | 0.005 | 123.88 | 3.127E-01 | |
| PA-234 | 131.29 | 55. | 7. | 0.004 | 145.03 | 5.697E-01 | |
| HF-181 | 133.02 | 63. | 8. | 0.004 | 153.77 | 2.383E-01 | |
| CE-144 | 133.54 | 95. | -4. | -0.002 | 348.27 | -4.965E-01 | |
| U-235 | 143.79 | 96. | -5. | -0.003 | 247.12 | -6.804E-01 | P |
| CE-141 | 145.44 | 103. | -10. | -0.006 | 146.86 | -2.980E-01 | |
| CE-139 | 165.85 | 41. | 5. | 0.003 | 180.36 | 9.899E-02 | |
| Cf-251 | 176.60 | 33. | -7. | -0.004 | 158.11 | -6.612E-01 | |
| TH-229 | 193.51 | 29. | -9. | -0.005 | 113.39 | -3.653E+00 | |
| U-235 | 205.33 | 11. | 7. | 0.004 | 98.58 | 2.457E+00 | |
| TH-229 | 210.85 | 36. | -6. | -0.003 | 200.00 | -3.691E+00 | |
| Cf-251 | 227.00 | 28. | -3. | -0.002 | 350.13 | -9.273E-01 | |
| PB-212 | 238.63 | 49. | -17. | -0.010 | 62.57 | -8.133E-01 | P |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| EU-152 | 244.69 | 48. | -14. | -0.008 | 100.52 | -3.817E+00 | |
| TH-227 | 256.24 | 24. | -1. | -0.001 | 964.37 | -3.057E-01 | |
| Cd-113m | 263.70 | 24. | 2. | 0.001 | 353.55 | 7.295E+02 | |
| BI-210M | 265.83 | 23. | 8. | 0.004 | 96.14 | 3.377E-01 | |
| TL-208 | 277.28 | 35. | -4. | -0.002 | 215.06 | -1.443E+00 | |
| Hg-203 | 279.20 | 31. | 6. | 0.004 | 129.88 | 1.779E-01 | |
| I-131 | 284.30 | 20. | 1. | 0.001 | 881.29 | 3.781E-01 | |
| PB-214 | 295.09 | 42. | 6. | 0.003 | 159.97 | 7.315E-01 | |
| PB-212 | 300.03 | 48. | 6. | 0.003 | 169.73 | 4.374E+00 | |
| PA-231 | 300.07 | 53. | 6. | 0.003 | 179.40 | 5.833E+00 | |
| PA-233 | 300.18 | 59. | 6. | 0.003 | 188.55 | 2.315E+00 | |
| PA-231 | 302.65 | 65. | 6. | 0.003 | 197.03 | 5.024E+00 | |
| BA-133 | 302.85 | 71. | 6. | 0.003 | 205.38 | 7.898E-01 | |
| BI-210M | 304.90 | 83. | 6. | 0.003 | 220.93 | 5.204E-01 | |
| Ir-192 | 308.44 | 89. | 5. | 0.003 | 275.47 | 3.830E-01 | |
| CR-51 | 320.08 | 135. | -8. | -0.005 | 196.82 | -2.175E+00 | |
| La-140 | 328.76 | 64. | -8. | -0.004 | 145.77 | -1.026E+00 | |
| EU-152 | 344.29 | 80. | -10. | -0.005 | 135.16 | -9.803E-01 | |
| HF-181 | 345.83 | 94. | -6. | -0.003 | 230.58 | -1.088E+00 | |
| PB-214 | 351.93 | 36. | -4. | -0.002 | 226.67 | -2.803E-01 | |
| BA-133 | 356.00 | 30. | 7. | 0.004 | 115.20 | 3.204E-01 | |
| I-131 | 364.48 | 8. | -1. | -0.001 | 562.73 | -3.461E-02 | |
| BA-133 | 383.84 | 39. | -5. | -0.003 | 194.04 | -1.538E+00 | |
| SN-113 | 391.69 | 33. | 8. | 0.004 | 111.60 | 3.582E-01 | |
| SB-125 | 427.88 | 4. | 1. | 0.001 | 404.15 | 1.086E-01 | |
| AG-108M | 433.94 | 9. | -1. | 0.000 | 909.67 | -2.397E-02 | |
| pm-146 | 453.88 | 4. | 5. | 0.003 | 104.03 | 2.373E-01 | |
| SB-125 | 463.37 | 8. | 5. | 0.003 | 98.74 | 1.506E+00 | |
| Ir-192 | 468.06 | 27. | -6. | -0.003 | 127.37 | -4.074E-01 | |
| BE-7 | 477.60 | 22. | 6. | 0.003 | 117.85 | 2.005E+00 | |
| RU-103 | 497.05 | 13. | -6. | -0.003 | 129.28 | -2.397E-01 | |
| RH-106 | 511.86 | 28. | 18. | 0.010 | 79.87 | 3.370E+00 | |
| Nd-147 | 531.00 | 22. | -11. | -0.006 | 94.39 | -3.138E+00 | |
| CS-134 | 563.24 | 4. | 3. | 0.001 | 170.71 | 1.285E+00 | |
| CS-134 | 569.32 | 9. | 5. | 0.003 | 95.92 | 1.319E+00 | |
| BI-207 | 569.70 | 19. | -4. | -0.002 | 162.02 | -1.662E-01 | |
| TL-208 | 583.02 | 4. | 11. | 0.006 | 50.24 | 5.224E-01 | |
| SB-125 | 600.50 | 96. | -11. | -0.006 | 129.29 | -2.615E+00 | |
| SB-124 | 602.73 | 107. | -11. | -0.006 | 135.99 | -4.772E-01 | |
| CS-134 | 604.71 | 118. | -11. | -0.006 | 142.37 | -4.821E-01 | |
| BI-214 | 609.31 | 129. | -11. | -0.006 | 148.29 | -1.030E+00 | |
| RU-103 | 610.30 | 140. | -10. | -0.005 | 175.32 | -7.256E+00 | |
| RH-106 | 621.92 | 72. | 5. | 0.003 | 246.17 | 2.187E+00 | |
| SB-125 | 635.89 | 4. | -1. | -0.001 | 237.17 | -5.242E-01 | |
| I-131 | 636.97 | 12. | -3. | -0.002 | 171.05 | -1.863E+00 | |
| AG-110M | 657.76 | 22. | -6. | -0.004 | 110.41 | -3.141E-01 | |
| PM-144 | 696.54 | 9. | 3. | 0.001 | 250.62 | 1.292E-01 | |
| NB-94 | 702.63 | 14. | -3. | -0.002 | 270.80 | -1.480E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| SB-124 | 722.79 | 23. | -9. | -0.005 | 82.40 | -4.118E+00 | |
| ZR-95 | 724.20 | 33. | -4. | -0.002 | 209.17 | -4.488E-01 | |
| BI-212 | 727.17 | 59. | -13. | -0.007 | 89.50 | -8.412E+00 | |
| pm-146 | 735.72 | 5. | 5. | 0.003 | 97.83 | 1.168E+00 | |
| pm-146 | 747.16 | 9. | -1. | -0.001 | 493.71 | -1.994E-01 | |
| AG-110M | 763.94 | 12. | -3. | -0.002 | 158.75 | -7.750E-01 | |
| PA-234M | 766.41 | 16. | 1. | 0.000 | 857.32 | 1.178E+01 | |
| BI-212 | 785.42 | 0. | 9. | 0.005 | 33.33 | 3.728E+01 | |
| CS-134 | 795.87 | 9. | 1. | 0.001 | 371.98 | 7.313E-02 | |
| CS-134 | 801.95 | 19. | -8. | -0.004 | 88.39 | -4.727E+00 | |
| CO-58 | 810.78 | 10. | -3. | -0.002 | 167.41 | -1.551E-01 | |
| MN-54 | 834.85 | 0. | 6. | 0.003 | 40.82 | 3.349E-01 | |
| Co-56 | 846.77 | 33. | -15. | -0.008 | 87.63 | -8.196E-01 | |
| TL-208 | 860.56 | 9. | 1. | 0.000 | 979.80 | 3.073E-01 | |
| NB-94 | 871.10 | 6. | -1. | -0.001 | 314.93 | -6.756E-02 | |
| EU-154 | 873.23 | 14. | -5. | -0.003 | 109.77 | -2.441E+00 | |
| PA-234 | 880.53 | 11. | 1. | 0.001 | 357.07 | 1.297E+00 | |
| Sc-46 | 889.28 | 22. | -8. | -0.004 | 91.98 | -4.640E-01 | |
| y-88 | 898.04 | 0. | 6. | 0.003 | 40.82 | 3.801E-01 | |
| AC-228 | 911.07 | 5. | 6. | 0.003 | 91.81 | 1.164E+00 | |
| AG-110M | 937.49 | 0. | 6. | 0.003 | 40.82 | 1.075E+00 | |
| EU-152 | 964.11 | 24. | -10. | -0.006 | 76.67 | -4.285E+00 | |
| AC-228 | 968.97 | 18. | 6. | 0.003 | 113.22 | 2.082E+00 | |
| EU-154 | 996.33 | 0. | 20. | 0.011 | 22.36 | 1.223E+01 | |
| Co-56 | 1037.84 | 5. | 2. | 0.001 | 255.77 | 9.500E-01 | |
| Cs-136 | 1048.07 | 6. | 1. | 0.000 | 547.72 | 5.640E-02 | |
| BI-207 | 1063.66 | 10. | -3. | -0.002 | 238.82 | -2.760E-01 | |
| Ga-68 | 1077.40 | 5. | -1. | -0.001 | 501.66 | -2.473E+00 | |
| FE-59 | 1099.25 | 15. | -4. | -0.002 | 218.66 | -4.991E-01 | |
| EU-152 | 1112.07 | 0. | 10. | 0.006 | 31.62 | 5.218E+00 | |
| CO-60 | 1173.24 | 5. | -2. | -0.001 | 255.77 | -1.492E-01 | |
| Ta-182 | 1221.41 | 16. | -11. | -0.006 | 89.35 | -3.093E+00 | |
| FE-59 | 1291.60 | 0. | 7. | 0.004 | 37.80 | 1.312E+00 | |
| EU-152 | 1408.00 | 0. | 7. | 0.004 | 37.80 | 2.908E+00 | |
| La-140 | 1596.21 | 6. | -1. | 0.000 | 846.32 | -6.804E-02 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | 2.0050E+00 | 2.0050E+00 | 1.179E+02% | 8.21E+00 |
| NA-22 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 5.90E-01 |
| K-40 | #A | -2.8151E-01 | -2.8151E-01 | 1.584E+03% | 1.14E+01 |
| Sc-46 | #A | -4.6400E-01 | -4.6400E-01 | 9.198E+01% | 1.46E+00 |
| CR-51 | #A | -2.1745E+00 | -2.1746E+00 | 1.968E+02% | 1.46E+01 |

| | | | | | |
|---|---|---|---|---|---|
| MN-54 | #A | 3.3492E-01 | 3.3492E-01 | 4.082E+01% | 4.11E-01 |
| FE-59 | #A | 2.8576E-01 | 2.8577E-01 | 3.780E+01% | 2.59E+00 |
| Co-56 | #A | -8.1959E-01 | -8.1960E-01 | 8.763E+01% | 1.66E+00 |
| CO-57 | #A | -1.1202E-01 | -1.1202E-01 | 1.728E+02% | 6.65E-01 |
| CO-58 | #A | -1.5512E-01 | -1.5512E-01 | 1.674E+02% | 9.48E-01 |
| CO-60 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 6.13E-01 |
| ZN-65 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.46E+00 |
| NB-94 | #A | -1.4802E-01 | -1.4802E-01 | 2.708E+02% | 9.94E-01 |
| ZR-95 | #A | 3.1455E-02 | 3.1455E-02 | 1.386E+03% | 1.21E+00 |
| NB-95 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.10E+00 |
| RU-103 | #A | -2.3971E-01 | -2.3971E-01 | 1.293E+02% | 7.80E-01 |
| RH-106 | #A | 2.1869E+00 | 2.1869E+00 | 2.462E+02% | 1.86E+01 |
| AG-108M | #A | -2.3965E-02 | -2.3965E-02 | 9.097E+02% | 5.91E-01 |
| AG-110M | #A | 3.4503E-01 | 3.4503E-01 | 4.082E+01% | 1.52E+00 |
| SN-113 | #A | 3.5823E-01 | 3.5823E-01 | 1.116E+02% | 1.37E+00 |
| SB-124 | #A | -4.7720E-01 | -4.7721E-01 | 1.360E+02% | 2.20E+00 |
| SB-125 | #A | 4.7368E-01 | 4.7368E-01 | 9.874E+01% | 1.31E+00 |
| I-131 | #A | -5.7549E-03 | -5.7552E-03 | 5.228E+02% | 5.50E-01 |
| Gd-153 | #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 3.02E+00 |
| Ga-68 | #A | -2.4474E+00 | -2.4726E+00 | 5.017E+02% | 3.25E+01 |
| Tc-99m | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 7.67E-01 |
| BA-133 | #A | 4.2748E-01 | 4.2748E-01 | 1.152E+02% | 1.27E+00 |
| CS-134 | #A | -1.3219E-01 | -1.3219E-01 | 8.070E+01% | 2.33E+00 |
| CS-137 | #A | -3.0334E-02 | -3.0334E-02 | 1.322E+03% | 1.47E+00 |
| CE-139 | #A | 9.8992E-02 | 9.8992E-02 | 1.804E+02% | 6.22E-01 |
| Ba-140 | # | 1.4521E+00 | 1.4522E+00 | 3.780E+01% | 1.17E+00 |
| La-140 | #A | -6.8037E-02 | -6.8040E-02 | 8.463E+02% | 1.41E+00 |
| CE-141 | #A | -2.9796E-01 | -2.9797E-01 | 1.469E+02% | 1.49E+00 |
| CE-144 | #A | -4.9651E-01 | -4.9651E-01 | 3.483E+02% | 5.98E+00 |
| PM-144 | #A | 1.2917E-01 | 1.2917E-01 | 2.506E+02% | 8.21E-01 |
| EU-152 | #A | 1.1264E+00 | 1.1264E+00 | 3.162E+01% | 4.52E+00 |
| EU-154 | #A | 4.3591E+00 | 4.3591E+00 | 2.236E+01% | 9.37E+00 |
| EU-155 | #A | 2.1921E-01 | 2.1921E-01 | 2.225E+02% | 4.22E+00 |
| HF-181 | #A | 8.3334E-02 | 8.3335E-02 | 1.538E+02% | 1.20E+00 |
| Ta-182 | #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 3.58E+00 |
| Hg-203 | #A | 1.7795E-01 | 1.7795E-01 | 1.299E+02% | 8.01E-01 |
| TL-208 | #A | 4.9487E-01 | 4.9487E-01 | 5.024E+01% | 6.08E-01 |
| pm-146 | #A | 2.8744E-01 | 2.8744E-01 | 9.783E+01% | 2.53E+00 |
| y-88 | #A | 3.8006E-01 | 3.8006E-01 | 4.082E+01% | 4.67E-01 |
| Cd-113m | #A | 7.2951E+02 | 7.2951E+02 | 3.536E+02% | 9.32E+03 |
| Cd-109 | #A | -3.7623E-01 | -3.7623E-01 | 1.925E+03% | 2.48E+01 |
| Cf-251 | #A | -6.6118E-01 | -6.6118E-01 | 1.581E+02% | 2.78E+00 |
| Cf-249 | #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 1.50E+00 |
| Sn-126 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 8.03E+00 |
| PB-210 | #A | 3.0419E+00 | 3.0419E+00 | 2.003E+02% | 2.13E+01 |
| PB-212 | #A | -8.1335E-01 | -8.1335E-01 | 6.257E+01% | 1.64E+00 |
| PB-214 | #A | 6.2901E-02 | 6.2901E-02 | 1.387E+02% | 2.24E+00 |
| BI-207 | #A | -1.6619E-01 | -1.6619E-01 | 1.620E+02% | 9.56E-01 |
| BI-212 | #A | -8.4123E+00 | -8.4123E+00 | 8.950E+01% | 2.54E+01 |

| | | | | |
|---|---|---|---|---|
| BI-214 #A | -1.0297E+00 | -1.0297E+00 | 1.483E+02% | 5.18E+00 |
| BI-210M#A | 4.0330E-01 | 4.0330E-01 | 9.614E+01% | 1.11E+00 |
| AC-228 #A | 1.5091E+00 | 1.5091E+00 | 7.288E+01% | 2.65E+00 |
| TH-227 #A | -2.9616E+00 | -2.9616E+00 | 1.220E+02% | 1.23E+01 |
| TH-229 #A | -3.6527E+00 | -3.6527E+00 | 1.134E+02% | 1.09E+01 |
| TH-234 #A | -1.0477E+01 | -1.0477E+01 | 5.861E+01% | 2.27E+01 |
| PA-231 #A | 5.3963E+00 | 5.3963E+00 | 1.332E+02% | 3.42E+01 |
| PA-233 #A | 3.4016E-01 | 3.4016E-01 | 1.885E+02% | 3.32E+00 |
| PA-234 #A | 5.6968E-01 | 5.6968E-01 | 1.450E+02% | 2.84E+00 |
| PA-234M#A | 3.0617E+00 | 3.0617E+00 | 6.586E+02% | 1.83E+02 |
| U-235 #A | 3.0380E-01 | 3.0380E-01 | 9.858E+01% | 6.30E+00 |
| AM-241 #A | -1.9299E-01 | -1.9299E-01 | 3.565E+02% | 2.43E+00 |
| Np-237 #A | 8.6873E-01 | 8.6873E-01 | 2.169E+02% | 6.42E+00 |
| Ir-192 #A | 1.0237E-01 | 1.0237E-01 | 2.755E+02% | 1.39E+00 |
| Cs-136 #A | 2.5066E-02 | 2.5067E-02 | 5.477E+02% | 1.06E+00 |
| Np-239 #A | -1.9483E-02 | -1.9487E-02 | 5.856E+03% | 3.92E+00 |
| Nd-147 #A | -3.1381E+00 | -3.1382E+00 | 9.439E+01% | 7.19E+00 |

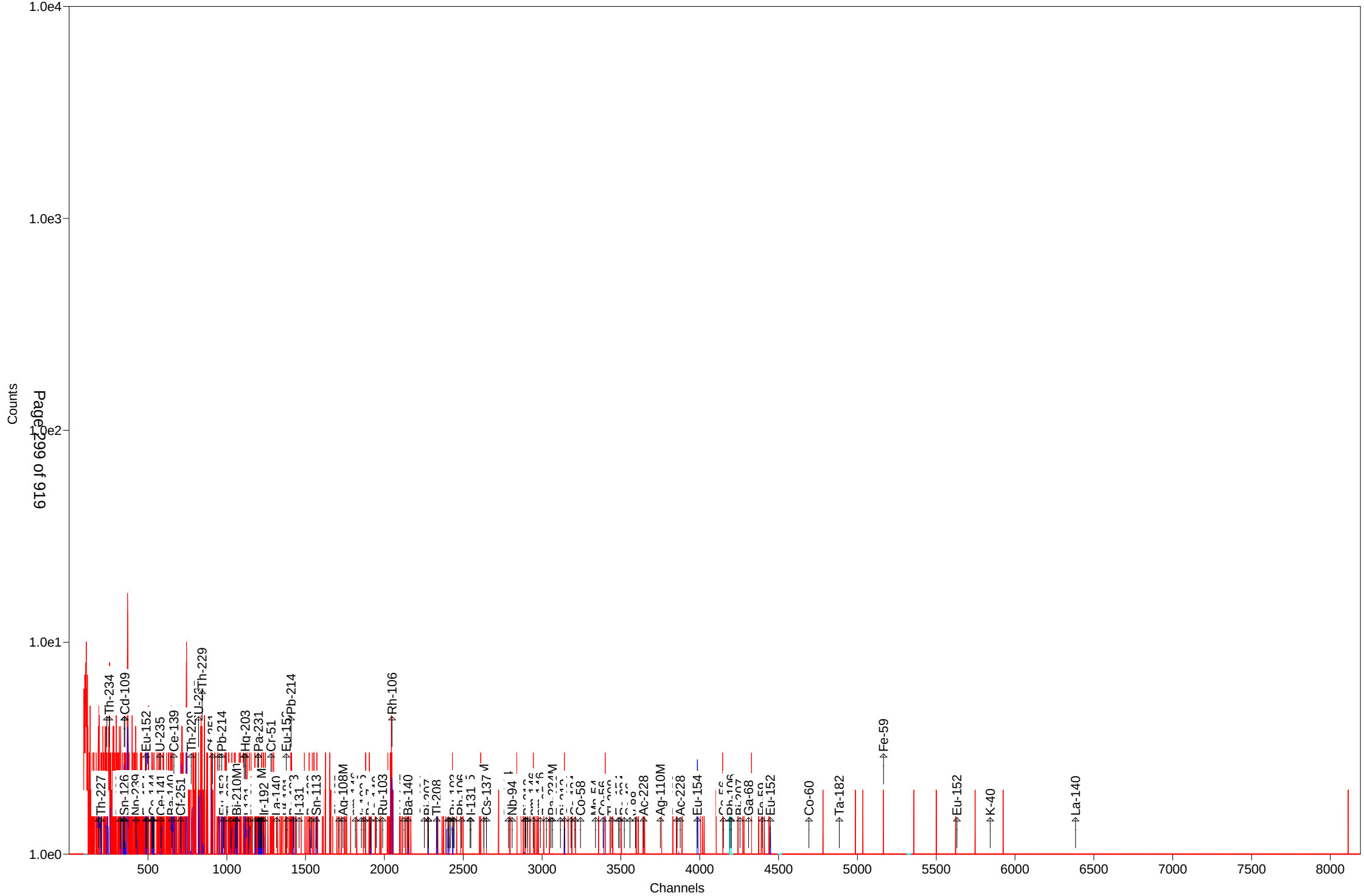
# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.5 to  2000.0 keV)  0.000E+00  Bq/Sample
Total Decayed Activity (  37.5 to  2000.0 keV) 0.0000000E+00  Bq/Sample

The library has energies which are not separable.

309155_Gamma_MB 160-309155~1-A. 8_Gamma_20171467.spc.



Test America St. Louis  Spectrum ID: 10_Gamma_20171629

Sample Description: 309155_Gamma_LCS 160-309155~2-A
Detector: Detector #10
Batch ID: 309155
Work Order Number: Gamma
Lot Number: LCS 160-309155~2-A

Decay to Time: 6/7/2017 09:59  Live Time: 1800 sec
Acquisition Time: 6/7/2017 10:00:19  Real Time: 1807 sec
Analysis Time: 6/7/2017 10:30  Dead Time: 0.38 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 10_Soil_TunaCan.Clb
Efficiency Cal Desc: 10_Soil_TunaCan_90099_032812
Efficiency Cal Date: 4/2/2012 15:35
Energy Cal Date: 2/23/2012 09:27
Library: Client_Long_Rev11.lib
Bkgd Correction File: 10_2017-06-04_0221.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | 1.190E+01 | 106.3 | 1.265E+01 | 1.267E+01 | 4.205E+01 |
| NA-22 | 4.416E-02 | 987.4 | 4.360E-01 | 4.360E-01 | 1.605E+00 |
| K-40 | 5.290E+00 | 109.1 | 5.772E+00 | 5.779E+00 | 1.269E+01 |
| Sc-46 | -1.947E+00 | 85.1 | 1.657E+00 | 1.660E+00 | 5.499E+00 |
| CR-51 | -8.916E+00 | 175.8 | 1.568E+01 | 1.569E+01 | 5.209E+01 |
| MN-54 | -1.549E+00 | 95.6 | 1.482E+00 | 1.484E+00 | 3.330E+00 |
| FE-59 | 9.407E-01 | 336.7 | 3.167E+00 | 3.168E+00 | 6.745E+00 |
| Co-56 | 1.372E+00 | 59.6 | 8.172E-01 | 8.202E-01 | 2.712E+00 |
| CO-57 | 0.000E+00 | 1.#INF | 4.851E-01 | 4.851E-01 | 2.611E+00 |
| CO-58 | 3.613E-01 | 355.4 | 1.284E+00 | 1.284E+00 | 4.336E+00 |
| CO-60 | 1.910E+02 | 1.4 | 2.581E+00 | 9.929E+00 | 1.261E+00 |
| ZN-65 | 0.000E+00 | 1.#INF | 1.669E+00 | 1.669E+00 | 1.037E+01 |
| NB-94 | 7.922E-01 | 84.4 | 6.689E-01 | 6.702E-01 | 2.678E+00 |
| ZR-95 | 1.806E+00 | 89.6 | 1.617E+00 | 1.620E+00 | 4.167E+00 |
| NB-95 | -3.450E-01 | 270.0 | 9.313E-01 | 9.314E-01 | 3.163E+00 |
| RU-103 | 8.262E-01 | 144.0 | 1.189E+00 | 1.190E+00 | 2.898E+00 |
| RH-106 | -1.411E+01 | 130.7 | 1.845E+01 | 1.846E+01 | 6.135E+01 |
| AG-108M | 5.575E-01 | 182.5 | 1.018E+00 | 1.018E+00 | 3.457E+00 |
| AG-110M | -1.596E-01 | 81.2 | 1.297E-01 | 1.299E-01 | 7.396E+00 |
| SN-113 | -8.682E-01 | 232.5 | 2.018E+00 | 2.019E+00 | 6.736E+00 |
| SB-124 | -1.314E+00 | 129.6 | 1.704E+00 | 1.705E+00 | 5.668E+00 |
| SB-125 | 4.468E+00 | 69.7 | 3.113E+00 | 3.122E+00 | 1.008E+01 |
| I-131 | 2.308E+00 | 82.6 | 1.905E+00 | 1.909E+00 | 3.068E+00 |
| Gd-153 | 2.174E+00 | 144.5 | 3.141E+00 | 3.144E+00 | 1.042E+01 |
| Ga-68 | 5.395E+01 | 105.4 | 5.687E+01 | 5.695E+01 | 1.241E+02 |
| Tc-99m | -7.585E-01 | 112.0 | 8.492E-01 | 8.503E-01 | 2.818E+00 |
| BA-133 | -1.798E+00 | 100.8 | 1.812E+00 | 1.815E+00 | 6.016E+00 |
| CS-134 | 1.201E+00 | 79.8 | 9.586E-01 | 9.607E-01 | 5.748E+00 |
| CS-137 | 3.590E+02 | 1.2 | 4.402E+00 | 1.919E+01 | 3.083E+00 |
| CE-139 | -8.716E-01 | 108.0 | 9.411E-01 | 9.447E-01 | 3.123E+00 |
| Ba-140 | 2.739E+00 | 170.3 | 4.666E+00 | 4.668E+00 | 1.094E+01 |
| La-140 | 5.179E-01 | 156.1 | 8.085E-01 | 8.090E-01 | 1.169E+00 |
| CE-141 | 6.218E-01 | 221.3 | 1.376E+00 | 1.376E+00 | 3.665E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 5.904E+00 | 113.8 | 6.720E+00 | 6.726E+00 | 2.230E+01 |
| PM-144 | -6.339E-01 | 171.9 | 1.090E+00 | 1.090E+00 | 2.574E+00 |
| EU-152 | 7.871E+00 | 45.6 | 3.587E+00 | 3.610E+00 | 6.146E+00 |
| EU-154 | 1.075E+01 | 61.6 | 6.628E+00 | 6.651E+00 | 2.889E+01 |
| EU-155 | 1.426E+00 | 138.7 | 1.978E+00 | 1.979E+00 | 1.477E+01 |
| HF-181 | 1.653E+00 | 108.4 | 1.791E+00 | 1.793E+00 | 5.654E+00 |
| Ta-182 | -7.559E-01 | 150.4 | 1.137E+00 | 1.138E+00 | 1.565E+01 |
| Hg-203 | -1.593E-01 | 609.1 | 9.705E-01 | 9.706E-01 | 3.263E+00 |
| TL-208 | 4.014E+00 | 30.1 | 1.207E+00 | 1.224E+00 | 2.583E+00 |
| pm-146 | -4.437E+00 | 89.4 | 3.969E+00 | 3.976E+00 | 8.910E+00 |
| y-88 | 1.891E+00 | 88.2 | 1.668E+00 | 1.671E+00 | 3.617E+00 |
| Cd-113m | -1.526E+04 | 90.8 | 1.386E+04 | 1.389E+04 | 4.596E+04 |
| Cd-109 | -2.009E+01 | 133.1 | 2.673E+01 | 2.676E+01 | 8.862E+01 |
| Cf-251 | -1.212E+00 | 342.0 | 4.145E+00 | 4.146E+00 | 1.107E+01 |
| Cf-249 | 1.739E+00 | 110.6 | 1.923E+00 | 1.925E+00 | 6.388E+00 |
| Sn-126 | -2.108E-01 | 4990.0 | 1.052E+01 | 1.052E+01 | 3.515E+01 |
| PB-210 | 9.984E+03 | 1.0 | 1.012E+02 | 5.949E+02 | 2.028E+02 |
| PB-212 | 6.738E+00 | 28.0 | 1.886E+00 | 1.936E+00 | 4.536E+00 |
| PB-214 | -3.763E+00 | 76.5 | 2.880E+00 | 2.886E+00 | 9.342E+00 |
| BI-207 | 2.362E-01 | 129.4 | 3.057E-01 | 3.059E-01 | 2.723E+00 |
| BI-212 | 1.068E+01 | 141.7 | 1.513E+01 | 1.514E+01 | 5.074E+01 |
| BI-214 | 1.004E-01 | 120.1 | 1.206E-01 | 1.207E-01 | 1.234E+01 |
| BI-210M | -2.460E-01 | 701.4 | 1.725E+00 | 1.725E+00 | 5.788E+00 |
| AC-228 | 1.590E+01 | 22.1 | 3.521E+00 | 3.613E+00 | 9.926E+00 |
| TH-227 | 4.174E+01 | 58.0 | 2.422E+01 | 2.433E+01 | 7.976E+01 |
| TH-229 | 9.881E-01 | 70.7 | 6.988E-01 | 7.033E-01 | 5.451E+01 |
| TH-234 | -6.966E+01 | 104.9 | 7.306E+01 | 7.315E+01 | 1.883E+02 |
| PA-231 | -6.309E+00 | 824.0 | 5.198E+01 | 5.198E+01 | 1.733E+02 |
| PA-233 | 0.000E+00 | 1.#INF | 1.641E+00 | 1.641E+00 | 1.419E+01 |
| PA-234 | 3.662E+00 | 99.1 | 3.630E+00 | 3.635E+00 | 1.475E+01 |
| PA-234M | 0.000E+00 | 1.#INF | 1.193E+02 | 1.193E+02 | 7.010E+02 |
| U-235 | 2.073E-01 | 657.3 | 1.363E+00 | 1.363E+00 | 2.205E+01 |
| AM-241 | 1.226E+03 | 0.8 | 1.036E+01 | 6.445E+01 | 1.516E+01 |
| Np-237 | 5.652E+00 | 137.3 | 7.760E+00 | 7.767E+00 | 2.573E+01 |
| Ir-192 | 1.010E+00 | 168.6 | 1.703E+00 | 1.704E+00 | 5.658E+00 |
| Cs-136 | 2.563E+00 | 33.1 | 8.487E-01 | 8.613E-01 | 4.254E+00 |
| Np-239 | -2.940E+00 | 140.2 | 4.121E+00 | 4.125E+00 | 1.367E+01 |
| Nd-147 | 1.581E+00 | 550.1 | 8.698E+00 | 8.699E+00 | 2.052E+01 |
| Total | 1.198E+04 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_LCS 160-309155~2-A

Spectrum Filename: C:\User\SPC\Det10\10_Gamma_20171629.An1

Acquisition information
Start time: 6/7/2017 10:00:19 AM
Live time: 1800
Real time: 1807
Dead time: 0.38 %
Detector ID: 10

Detector system
Ge10 S/N08316756

Calibration
Filename: 10_Soil_TunaCan.Clb
10_Soil_TunaCan_90099_032812

Energy Calibration
Created: 2/23/2012 9:27:47 AM
Zero offset: 0.044 keV
Gain: 0.250 keV/channel
Quadratic: -1.974E-08 keV/channel^2

Efficiency Calibration
Created: 4/2/2012 3:35:54 PM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.76 %
Log(Eff): -5.833467E-01 + (-3.986081E-01*Log(E) ) + ( -2.634340E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.87 %
Log(Eff): -2.530844E+01 + ( 9.416612E+00*Log(E) ) + ( -1.001096E+00*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G800W064
Start channel: 100 ( 25.05keV )
Stop channel: 8000 ( 1999.70keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/( 1.0000E+00* 1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:59:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 10_2017-06-04_0221.PBC<br>6/4/2017 2:21:52 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 24 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0802

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 31.98 | 186. | 23.59 | 1.03 | 9.102E-03 | | | | |
| 36.39 | 354. | 17.75 | 1.25 | 1.234E-02 | | | | |
| 46.51 | 16567. | 1.13 | 0.93 | 2.002E-02 | 46.54 | 4.250 | 1.081E+04 | PB210 |
| 50.14 | 136. | 58.02 | 0.83 | 2.267E-02 | 50.14 | 8.000 | PBC<MDA | TH227 |
| 59.54 | 22863. | 0.84 | 0.95 | 2.887E-02 | 59.54 | 35.900 | 1.226E+03 | AM241 |
| 86.49 | 53. | 137.30 | 0.87 | 3.981E-02 | 86.49 | 13.100 | PBC<MDA | Np237 |
| | | | | | 86.54 | 30.700 | 2.411E+00 | EU155 |
| 86.54 | 53. | 138.67 | 0.87 | 3.982E-02 | 86.49 | 13.100 | PBC<MDA | Np237 |
| | | | | | 86.54 | 30.700 | 2.411E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 8.170E+00 | Sn126 |
| 92.59 | 7. | 977.79 | 0.87 | 4.096E-02 | 92.59 | 5.584 | PBC<MDA | TH234 |
| 97.50 | 49. | 144.53 | 0.88 | 4.160E-02 | 97.50 | 30.000 | PBC<MDA | Gd153 |
| 99.50 | 25. | 282.32 | 0.88 | 4.179E-02 | 99.50 | 15.000 | PBC<MDA | Np239 |
| 123.10 | 48. | 94.13 | 0.91 | 4.173E-02 | 123.10 | 40.790 | PBC<MDA | EU154 |
| 132.87 | 60. | 54.22 | 1.09 | 4.079E-02 | 133.02 | 43.300 | 1.878E+00 | HF181 |
| | | | | | 133.54 | 11.090 | 7.341E+00 | CE144 |
| 136.30 | 12. | 467.27 | 0.92 | 4.038E-02 | 136.30 | 5.850 | PBC<MDA | HF181 |
| | | | | | 136.47 | 10.680 | 1.527E+00 | CO57 |
| 145.44 | 21. | 221.27 | 0.93 | 3.912E-02 | 145.44 | 48.200 | PBC<MDA | CE141 |
| 160.70 | 34. | 62.52 | 0.30 | 3.665E-02 | | | | |
| 162.36 | 6. | 743.17 | 0.95 | 3.619E-02 | 162.66 | 6.220 | PBC<MDA | Ba140 |
| | | | | | 163.38 | 5.080 | 1.964E+00 | U235 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 194.40 | 36. | 65.41 | 0.98 | 3.286E-02 | 193.51 | 4.400 | 1.395E+01 | TH229 |
| 195.64 | 40. | 64.28 | 0.98 | 3.272E-02 | | | | |
| 210.85 | 47. | 104.69 | 0.99 | 3.110E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 238.50 | 150. | 27.99 | 0.42 | 2.857E-02 | 238.63 | 43.300 | 6.738E+00 | PB212 |
| 256.07 | 42. | 100.37 | 1.04 | 2.720E-02 | 256.24 | 7.000 | PBC<MDA | TH227 |
| 284.30 | 20. | 199.78 | 1.07 | 2.531E-02 | 284.30 | 6.140 | PBC<MDA | I131 |
| 295.38 | 95. | 30.30 | 1.01 | 2.465E-02 | 295.09 | 19.300 | PBC<MDA | PB214 |
| 300.03 | 22. | 295.99 | 1.08 | 2.438E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 2.023E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 8.028E+00 | PA233 |
| 316.49 | 37. | 168.56 | 1.10 | 2.348E-02 | 316.49 | 87.040 | PBC<MDA | Ir192 |
| 328.76 | 12. | 327.72 | 1.11 | 2.286E-02 | 328.76 | 20.300 | PBC<MDA | La140 |
| 338.56 | 29. | 92.36 | 2.40 | 2.241E-02 | 338.32 | 12.010 | PBC<MDA | AC228 |
| 344.69 | 45. | 53.47 | 0.68 | 2.213E-02 | 344.29 | 26.500 | PBC<MDA | EU152 |
| 364.48 | 40. | 99.62 | 1.15 | 2.126E-02 | 364.48 | 81.700 | PBC<MDA | I131 |
| 383.84 | 42. | 108.81 | 1.16 | 2.049E-02 | 383.84 | 8.940 | PBC<MDA | BA133 |
| 387.95 | 42. | 110.62 | 1.17 | 2.033E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 463.37 | 40. | 107.38 | 1.24 | 1.790E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 477.60 | 39. | 106.34 | 1.25 | 1.751E-02 | 477.60 | 10.520 | PBC<MDA | BE7 |
| 482.00 | 40. | 108.35 | 1.26 | 1.740E-02 | 482.00 | 80.500 | PBC<MDA | HF181 |
| 498.05 | 23. | 143.96 | 1.27 | 1.701E-02 | 497.05 | 90.900 | PBC<MDA | RU103 |
| 511.86 | 8. | 716.16 | 2.54 | 1.666E-02 | 511.86 | 20.000 | PBC<MDA | RH106 |
| 531.00 | 6. | 550.08 | 1.30 | 1.622E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 537.26 | 19. | 170.35 | 1.31 | 1.608E-02 | 537.26 | 24.390 | PBC<MDA | Ba140 |
| 569.47 | 13. | 166.35 | 1.34 | 1.541E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 5.570E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 4.674E-01 | BI207 |
| 582.99 | 92. | 30.06 | 2.21 | 1.514E-02 | 583.02 | 84.500 | 4.014E+00 | TL208 |
| 609.31 | -11. | 400.45 | 1.38 | 1.466E-02 | 609.31 | 46.090 | PBC<MDA | BI214 |
| 610.30 | 22. | 208.32 | 1.38 | 1.464E-02 | 610.30 | 5.750 | PBC<MDA | RU103 |
| 614.28 | 25. | 182.55 | 1.38 | 1.457E-02 | 614.28 | 89.850 | PBC<MDA | AG108M |
| 635.89 | 28. | 69.67 | 1.40 | 1.421E-02 | 635.89 | 11.310 | PBC<MDA | SB125 |
| 636.97 | 18. | 107.30 | 1.40 | 1.419E-02 | 636.97 | 7.170 | PBC<MDA | I131 |
| 661.57 | 7597. | 1.23 | 1.47 | 1.380E-02 | 661.66 | 85.210 | 3.590E+02 | CS137 |
| 671.47 | 14. | 56.70 | 0.45 | 1.365E-02 | | | | |
| 702.63 | 7. | 408.50 | 1.46 | 1.319E-02 | 702.63 | 97.900 | PBC<MDA | NB94 |
| 724.20 | 15. | 166.02 | 1.48 | 1.290E-02 | 724.20 | 44.150 | PBC<MDA | ZR95 |
| 727.17 | 19. | 141.67 | 1.48 | 1.286E-02 | 727.17 | 7.550 | PBC<MDA | BI212 |
| 756.73 | 25. | 89.56 | 1.51 | 1.248E-02 | 756.73 | 54.460 | PBC<MDA | ZR95 |
| 795.87 | 28. | 79.82 | 1.54 | 1.202E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 26. | 93.81 | 1.55 | 1.195E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 810.96 | 8. | 355.38 | 1.56 | 1.185E-02 | 810.78 | 99.460 | PBC<MDA | CO58 |
| 818.50 | 30. | 89.80 | 1.56 | 1.177E-02 | 818.50 | 100.000 | PBC<MDA | Cs136 |
| 846.77 | 29. | 84.99 | 1.59 | 1.147E-02 | 846.77 | 99.935 | PBC<MDA | Co56 |
| 860.45 | 26. | 107.46 | 1.60 | 1.133E-02 | 860.56 | 12.420 | PBC<MDA | TL208 |
| 871.10 | 26. | 84.44 | 1.61 | 1.123E-02 | 871.10 | 99.890 | PBC<MDA | NB94 |
| 873.23 | 23. | 93.15 | 1.61 | 1.121E-02 | 873.23 | 12.270 | PBC<MDA | EU154 |
| 880.53 | 34. | 82.62 | 1.62 | 1.114E-02 | 880.53 | 6.000 | PBC<MDA | PA234 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 883.24 | 29. | 99.15 | 1.62 | 1.111E-02 | 883.24 | 9.600 | PBC<MDA | PA234 |
| 898.04 | 35. | 88.21 | 1.63 | 1.097E-02 | 898.04 | 93.700 | PBC<MDA | y88 |
| 910.95 | 73. | 35.96 | 1.41 | 1.086E-02 | 911.07 | 29.000 | 1.288E+01 | AC228 |
| 937.49 | 31. | 106.71 | 1.67 | 1.062E-02 | 937.49 | 34.360 | PBC<MDA | AG110M |
| 946.02 | 4. | 861.74 | 1.67 | 1.055E-02 | 946.02 | 13.400 | PBC<MDA | PA234 |
| 964.05 | 31. | 79.55 | 1.69 | 1.040E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 968.91 | 68. | 25.85 | 1.69 | 1.036E-02 | 968.97 | 17.460 | 2.091E+01 | AC228 |
| 1004.77 | 38. | 80.77 | 1.72 | 1.008E-02 | 1004.77 | 18.010 | PBC<MDA | EU154 |
| 1048.07 | 56. | 33.12 | 1.76 | 9.757E-03 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1063.66 | 15. | 192.83 | 1.77 | 9.648E-03 | 1063.66 | 74.500 | PBC<MDA | BI207 |
| 1077.40 | 26. | 105.40 | 1.78 | 9.553E-03 | 1077.40 | 3.300 | PBC<MDA | Ga68 |
| 1101.41 | 9. | 336.71 | 1.80 | 9.407E-03 | 1099.25 | 56.500 | PBC<MDA | FE59 |
| 1112.07 | 26. | 97.45 | 1.81 | 9.324E-03 | 1112.07 | 13.644 | PBC<MDA | EU152 |
| 1173.14 | 3009. | 1.92 | 1.94 | 8.948E-03 | 1173.24 | 99.900 | 1.870E+02 | CO60 |
| 1221.41 | 5. | 224.30 | 1.90 | 8.674E-03 | 1221.41 | 27.000 | PBC<MDA | Ta182 |
| 1238.28 | 13. | 83.50 | 1.91 | 8.582E-03 | 1238.28 | 66.070 | PBC<MDA | Co56 |
| 1274.53 | 1. | 987.42 | 1.94 | 8.393E-03 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 1.254E-01 | EU154 |
| 1332.43 | 2845. | 1.90 | 2.01 | 8.108E-03 | 1332.50 | 99.980 | 1.950E+02 | CO60 |
| 1384.30 | 2. | 248.05 | 2.03 | 7.871E-03 | 1384.30 | 24.290 | PBC<MDA | AG110M |
| 1460.83 | 8. | 109.13 | 2.08 | 7.547E-03 | 1460.83 | 10.670 | PBC<MDA | K40 |
| 1596.21 | 4. | 156.12 | 2.18 | 7.039E-03 | 1596.21 | 95.400 | PBC<MDA | La140 |
| 1764.49 | 6. | 120.12 | 2.30 | 6.504E-03 | 1764.49 | 15.400 | PBC<MDA | BI214 |
| 1771.35 | 8. | 80.18 | 2.31 | 6.484E-03 | 1771.35 | 15.480 | PBC<MDA | Co56 |
| 1836.06 | 3. | 242.22 | 2.35 | 6.302E-03 | 1836.06 | 99.200 | PBC<MDA | y88 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 127.67 | 31.98 | 548. | 186. | 2.042E+04 | 23.59 | 1.030 | - | s |
| 145.34 | 36.39 | 1078. | 354. | 2.870E+04 | 17.75 | 1.245 | - | s |
| 642.15 | 160.70 | 259. | 40. | 1.084E+03 | 59.46 | 0.944 | - | sD |
| 777.10 | 194.39 | 265. | 36. | 1.108E+03 | 65.41 | 0.978 | - | sc |
| 782.07 | 195.64 | 308. | 40. | 1.218E+03 | 64.28 | 0.979 | - | sc |
| 1180.93 | 295.38 | 222. | 95. | 3.868E+03 | 30.30 | 1.009 | - | M |
| 2685.03 | 671.47 | 24. | 14. | 1.063E+03 | 56.70 | 0.446 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.90 | 46.54 | 4377. | 15307. | 8.504 | 1.01 | 0.827D |
| TH-227 | 200.30 | 50.14 | 3058. | 136. | 0.076 | 58.02 | 0.831D |
| AM-241 | 237.87 | 59.54 | 3612. | 22863. | 12.702 | 0.84 | 0.948 |
| TH-234 | 252.87 | 63.29 | 7284. | -148. | -0.082 | 104.88 | 0.845s |
| BA-133 | 323.64 | 80.99 | 1143. | -47. | -0.026 | 127.95 | 0.863s |
| Np-237 | 345.64 | 86.49 | 2626. | 53. | 0.029 | 137.30 | 0.868s |
| EU-155 | 345.85 | 86.54 | 2680. | 53. | 0.029 | 138.67 | 0.868s |
| Sn-126 | 347.44 | 86.94 | 2754. | -55. | -0.031 | 135.79 | 0.869 |
| Sn-126 | 349.95 | 87.57 | 2699. | -55. | -0.031 | 134.33 | 0.870s |
| Cd-109 | 351.83 | 88.04 | 2652. | -55. | -0.031 | 133.08 | 0.870s |
| Nd-147 | 364.07 | 91.10 | 2707. | -13. | -0.007 | 558.11 | 0.873s |
| TH-234 | 370.03 | 92.59 | 2340. | 7. | 0.004 | 977.79 | 0.875s |
| AC-228 | 373.07 | 93.35 | 2581. | -11. | -0.006 | 630.42 | 0.875 |
| Gd-153 | 389.66 | 97.50 | 2465. | 49. | 0.027 | 144.53 | 0.880s |
| Np-239 | 397.66 | 99.50 | 2514. | 25. | 0.014 | 282.32 | 0.882 |
| Gd-153 | 412.45 | 103.20 | 2539. | 0. | 0.000 | 1000.00 | 0.885s |
| Np-239 | 414.45 | 103.70 | 2539. | 0. | 0.000 | 1000.00 | 0.886s |
| EU-155 | 420.90 | 105.31 | 2539. | 0. | 0.000 | 1000.00 | 0.888s |
| Np-239 | 424.16 | 106.13 | 2495. | -51. | -0.028 | 140.20 | 0.888s |
| EU-152 | 486.72 | 121.78 | 1232. | -28. | -0.016 | 175.21 | 0.905s |
| CO-57 | 487.86 | 122.06 | 1261. | 0. | 0.000 | 1000.00 | 0.905s |
| EU-154 | 492.02 | 123.10 | 1012. | 48. | 0.027 | 94.13 | 0.906s |
| PA-234 | 524.79 | 131.29 | 1717. | -24. | -0.013 | 243.35 | 0.914s |
| HF-181 | 531.70 | 133.02 | 1435. | -43. | -0.024 | 124.57 | 0.916 |
| CE-144 | 533.76 | 133.54 | 1467. | 48. | 0.027 | 113.81 | 0.916 |
| HF-181 | 544.80 | 136.30 | 1526. | 12. | 0.007 | 467.27 | 0.919s |
| Tc-99m | 561.63 | 140.51 | 1365. | -47. | -0.026 | 111.95 | 0.924s |
| CE-141 | 581.35 | 145.44 | 682. | 21. | 0.012 | 221.27 | 0.928s |
| Ba-140 | 650.20 | 162.66 | 1205. | -35. | -0.020 | 140.33 | 0.946s |
| U-235 | 653.08 | 163.38 | 1164. | 6. | 0.004 | 743.17 | 0.947s |
| CE-139 | 662.97 | 165.85 | 1201. | -46. | -0.025 | 107.97 | 0.949s |
| Cf-251 | 705.94 | 176.60 | 620. | -13. | -0.007 | 341.97 | 0.960 |
| TH-229 | 773.55 | 193.51 | 897. | -45. | -0.025 | 95.12 | 0.977 |
| TH-229 | 842.89 | 210.85 | 667. | 47. | 0.026 | 104.69 | 0.994 |
| PB-212 | 953.45 | 238.50 | 445. | 150. | 0.083 | 27.99 | 0.418s |
| PB-214 | 967.44 | 242.00 | 1310. | -49. | -0.027 | 106.30 | 1.025s |
| EU-152 | 978.22 | 244.69 | 1530. | -37. | -0.021 | 148.82 | 1.028 |
| TH-227 | 1024.40 | 256.24 | 488. | 42. | 0.023 | 100.37 | 1.039 |
| Cd-113m | 1054.23 | 263.70 | 774. | -44. | -0.024 | 90.78 | 1.047s |
| BI-210M | 1062.75 | 265.83 | 845. | -6. | -0.003 | 701.38 | 1.049s |
| TL-208 | 1108.54 | 277.28 | 544. | -15. | -0.008 | 226.17 | 1.060s |
| Hg-203 | 1116.21 | 279.20 | 662. | -6. | -0.003 | 609.13 | 1.062s |
| I-131 | 1136.60 | 284.30 | 466. | 20. | 0.011 | 199.78 | 1.067s |
| PB-214 | 1179.75 | 295.09 | 525. | -45. | -0.025 | 93.42 | 1.078 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| PB-212 | 1199.51 | 300.03 | 2077. | 22. | 0.012 | 295.99 | 1.083 |
| PA-231 | 1199.67 | 300.07 | 2099. | 0. | 0.000 | 1000.00 | 1.083s |
| PA-233 | 1200.11 | 300.18 | 2130. | -42. | -0.023 | 156.50 | 1.083s |
| PA-231 | 1209.98 | 302.65 | 2128. | -8. | -0.004 | 824.02 | 1.085s |
| BA-133 | 1210.79 | 302.85 | 2136. | 0. | 0.000 | 1000.00 | 1.086s |
| Ba-140 | 1218.78 | 304.85 | 2136. | 0. | 0.000 | 1000.00 | 1.087s |
| BI-210M | 1218.97 | 304.90 | 2136. | 0. | 0.000 | 1000.00 | 1.088 |
| Ir-192 | 1233.14 | 308.44 | 2136. | 0. | 0.000 | 1000.00 | 1.091s |
| PA-233 | 1247.42 | 312.01 | 2136. | 0. | 0.000 | 1000.00 | 1.094s |
| Ir-192 | 1265.33 | 316.49 | 1944. | 37. | 0.021 | 168.56 | 1.099s |
| CR-51 | 1279.70 | 320.08 | 2117. | -37. | -0.021 | 175.85 | 1.102s |
| La-140 | 1314.40 | 328.76 | 414. | 12. | 0.006 | 327.72 | 1.111s |
| Cf-249 | 1333.11 | 333.44 | 447. | -22. | -0.012 | 178.43 | 1.115s |
| AC-228 | 1353.58 | 338.56 | 212. | 29. | 0.016 | 92.36 | 2.404s |
| Cs-136 | 1361.63 | 340.57 | 1164. | -43. | -0.024 | 114.43 | 1.122 |
| EU-152 | 1378.12 | 344.69 | 178. | 45. | 0.025 | 53.47 | 0.682s |
| HF-181 | 1382.66 | 345.83 | 949. | -9. | -0.005 | 479.45 | 1.128s |
| PB-214 | 1407.06 | 351.93 | 840. | -55. | -0.031 | 76.52 | 1.133s |
| BA-133 | 1423.33 | 356.00 | 936. | -43. | -0.024 | 100.79 | 1.137s |
| I-131 | 1457.26 | 364.48 | 400. | 40. | 0.022 | 99.62 | 1.146s |
| BA-133 | 1534.67 | 383.84 | 1016. | 42. | 0.023 | 108.81 | 1.164s |
| Cf-249 | 1551.10 | 387.95 | 1058. | 42. | 0.023 | 110.62 | 1.168s |
| SN-113 | 1566.06 | 391.69 | 1092. | -20. | -0.011 | 232.46 | 1.172s |
| pm-146 | 1814.77 | 453.88 | 532. | -19. | -0.011 | 238.78 | 1.231s |
| SB-125 | 1852.71 | 463.37 | 887. | 40. | 0.022 | 107.38 | 1.240s |
| Ir-192 | 1871.48 | 468.06 | 922. | -34. | -0.019 | 128.69 | 1.245s |
| BE-7 | 1909.62 | 477.60 | 861. | 39. | 0.022 | 106.34 | 1.254s |
| HF-181 | 1927.22 | 482.00 | 900. | 40. | 0.022 | 108.35 | 1.258s |
| RU-103 | 1987.44 | 497.05 | 280. | 23. | 0.013 | 143.96 | 1.272s |
| RH-106 | 2046.67 | 511.86 | 547. | 8. | 0.005 | 716.16 | 2.536 |
| Nd-147 | 2123.20 | 531.00 | 260. | 6. | 0.003 | 550.08 | 1.304s |
| Ba-140 | 2148.24 | 537.26 | 256. | 19. | 0.011 | 170.35 | 1.310 |
| CS-134 | 2252.14 | 563.24 | 234. | -16. | -0.009 | 196.75 | 1.334 |
| CS-134 | 2276.47 | 569.32 | 229. | -9. | -0.005 | 249.08 | 1.340s |
| PA-234 | 2277.07 | 569.47 | 216. | 13. | 0.007 | 166.35 | 1.340s |
| BI-207 | 2278.00 | 569.70 | 233. | -13. | -0.007 | 172.60 | 1.340 |
| TL-208 | 2331.12 | 582.99 | 149. | 92. | 0.051 | 30.06 | 2.212s |
| SB-125 | 2401.18 | 600.50 | 1009. | -34. | -0.019 | 132.03 | 1.368 |
| SB-124 | 2410.10 | 602.73 | 974. | -34. | -0.019 | 129.61 | 1.370s |
| CS-134 | 2418.02 | 604.71 | 984. | -5. | -0.003 | 914.58 | 1.372s |
| BI-214 | 2436.42 | 609.31 | 1000. | -11. | -0.006 | 400.45 | 1.376 |
| RU-103 | 2440.37 | 610.30 | 1011. | 22. | 0.012 | 208.32 | 1.377 |
| AG-108M | 2456.30 | 614.28 | 1014. | 25. | 0.014 | 182.55 | 1.381s |
| PM-144 | 2471.42 | 618.06 | 937. | -25. | -0.014 | 175.46 | 1.385 |
| RH-106 | 2486.84 | 621.92 | 1116. | -36. | -0.020 | 130.72 | 1.388s |
| SB-125 | 2542.73 | 635.89 | 176. | 28. | 0.016 | 69.67 | 1.401s |
| I-131 | 2547.07 | 636.97 | 178. | 18. | 0.010 | 107.30 | 1.402s |
| AG-110M | 2630.21 | 657.76 | 7927. | -33. | -0.018 | 380.42 | 1.421s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CS-137 | 2645.44 | 661.57 | 180. | 7597. | 4.221 | 1.23 | 1.467 |
| PM-144 | 2785.33 | 696.54 | 156. | -15. | -0.008 | 171.92 | 1.456s |
| NB-94 | 2809.68 | 702.63 | 163. | 7. | 0.004 | 408.50 | 1.461s |
| SB-124 | 2890.30 | 722.79 | 315. | -34. | -0.019 | 76.43 | 1.479s |
| AG-108M | 2890.91 | 722.94 | 349. | -31. | -0.017 | 88.20 | 1.480s |
| EU-154 | 2892.58 | 723.36 | 380. | 0. | 0.000 | 1000.00 | 1.480s |
| ZR-95 | 2895.95 | 724.20 | 316. | 15. | 0.009 | 166.02 | 1.481s |
| BI-212 | 2907.84 | 727.17 | 340. | 19. | 0.010 | 141.67 | 1.483s |
| pm-146 | 2942.04 | 735.72 | 201. | -26. | -0.014 | 118.73 | 1.491 |
| pm-146 | 2987.80 | 747.16 | 201. | -34. | -0.019 | 89.45 | 1.501s |
| ZR-95 | 3026.07 | 756.73 | 107. | 25. | 0.014 | 89.56 | 1.510s |
| NB-95 | 3062.31 | 765.79 | 210. | -8. | -0.004 | 269.95 | 1.518s |
| PA-234M | 3064.81 | 766.41 | 199. | -4. | -0.002 | 481.50 | 1.518s |
| EU-152 | 3114.84 | 778.92 | 252. | -39. | -0.022 | 87.65 | 1.529s |
| BI-212 | 3140.84 | 785.42 | 205. | -29. | -0.016 | 105.26 | 1.535s |
| CS-134 | 3182.63 | 795.87 | 234. | 28. | 0.016 | 79.82 | 1.544s |
| CS-134 | 3206.97 | 801.95 | 279. | 26. | 0.014 | 93.81 | 1.550s |
| CO-58 | 3242.26 | 810.78 | 367. | 8. | 0.004 | 355.38 | 1.557s |
| La-140 | 3262.25 | 815.77 | 375. | 0. | 0.000 | 1000.00 | 1.562s |
| Cs-136 | 3273.17 | 818.50 | 352. | 30. | 0.017 | 89.80 | 1.564 |
| MN-54 | 3338.56 | 834.85 | 205. | -32. | -0.018 | 95.64 | 1.579s |
| Co-56 | 3386.25 | 846.77 | 131. | 29. | 0.016 | 84.99 | 1.589s |
| TL-208 | 3441.43 | 860.56 | 163. | 26. | 0.014 | 107.46 | 1.601s |
| NB-94 | 3483.57 | 871.10 | 228. | 26. | 0.014 | 84.44 | 1.610 |
| EU-154 | 3492.10 | 873.23 | 218. | 23. | 0.013 | 93.15 | 1.612s |
| PA-234 | 3521.30 | 880.53 | 372. | 34. | 0.019 | 82.62 | 1.618s |
| PA-234 | 3532.15 | 883.24 | 406. | 29. | 0.016 | 99.15 | 1.620s |
| AG-110M | 3537.92 | 884.68 | 505. | -40. | -0.022 | 81.24 | 1.622s |
| Sc-46 | 3556.31 | 889.28 | 524. | -39. | -0.022 | 85.11 | 1.626s |
| y-88 | 3591.35 | 898.04 | 190. | 35. | 0.019 | 88.21 | 1.633s |
| AC-228 | 3643.00 | 910.95 | 132. | 73. | 0.041 | 35.96 | 1.413 |
| AG-110M | 3749.18 | 937.49 | 220. | 31. | 0.017 | 106.71 | 1.667 |
| PA-234 | 3783.30 | 946.02 | 245. | 4. | 0.002 | 861.74 | 1.674s |
| EU-152 | 3855.67 | 964.11 | 280. | 31. | 0.017 | 79.55 | 1.690s |
| AC-228 | 3875.11 | 968.97 | 121. | 68. | 0.038 | 25.85 | 1.694D |
| EU-154 | 3984.56 | 996.33 | 468. | -31. | -0.017 | 101.35 | 1.717s |
| PA-234M | 4003.24 | 1001.00 | 498. | 0. | 0.000 | 1000.00 | 1.721s |
| EU-154 | 4018.35 | 1004.77 | 461. | 38. | 0.021 | 80.77 | 1.724s |
| Co-56 | 4150.64 | 1037.84 | 190. | -9. | -0.005 | 338.36 | 1.751s |
| Cs-136 | 4191.56 | 1048.07 | 144. | 56. | 0.031 | 33.12 | 1.760s |
| RH-106 | 4200.73 | 1050.36 | 296. | -37. | -0.021 | 67.37 | 1.762s |
| BI-207 | 4253.94 | 1063.66 | 170. | 15. | 0.008 | 192.83 | 1.773 |
| Ga-68 | 4308.91 | 1077.40 | 150. | 26. | 0.014 | 105.40 | 1.784s |
| FE-59 | 4396.33 | 1099.25 | 176. | 9. | 0.005 | 336.71 | 1.802s |
| EU-152 | 4447.64 | 1112.07 | 308. | 26. | 0.014 | 97.45 | 1.812 |
| ZN-65 | 4461.53 | 1115.55 | 334. | 0. | 0.000 | 1000.00 | 1.815s |
| BI-214 | 4480.50 | 1120.29 | 334. | 0. | 0.000 | 1000.00 | 1.819 |
| Sc-46 | 4481.55 | 1120.55 | 334. | 0. | 0.000 | 1000.00 | 1.819 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Ta-182 | 4484.55 | 1121.30 | 360. | -14. | -0.007 | 200.48 | 1.820 |
| CO-60 | 4691.97 | 1173.14 | 53. | 3009. | 1.671 | 1.92 | 1.942 |
| Ta-182 | 4755.62 | 1189.05 | 85. | -21. | -0.012 | 100.78 | 1.875s |
| Ta-182 | 4885.10 | 1221.41 | 27. | 5. | 0.003 | 224.30 | 1.900s |
| Co-56 | 4952.60 | 1238.28 | 21. | 13. | 0.007 | 83.50 | 1.914s |
| NA-22 | 5097.65 | 1274.53 | 21. | 1. | 0.000 | 987.42 | 1.942s |
| EU-154 | 5097.71 | 1274.54 | 22. | 0. | 0.000 | 1000.00 | 1.942s |
| FE-59 | 5165.94 | 1291.60 | 40. | -17. | -0.009 | 91.95 | 1.956s |
| CO-60 | 5329.32 | 1332.43 | 11. | 2845. | 1.580 | 1.90 | 2.008 |
| AG-110M | 5536.89 | 1384.30 | 6. | 2. | 0.001 | 248.05 | 2.027s |
| K-40 | 5843.16 | 1460.83 | 11. | 8. | 0.004 | 109.13 | 2.084s |
| La-140 | 6384.95 | 1596.21 | 6. | 4. | 0.002 | 156.12 | 2.183s |
| SB-124 | 6764.26 | 1690.98 | 12. | -4. | -0.002 | 215.06 | 2.250s |
| BI-214 | 7058.47 | 1764.49 | 20. | 6. | 0.003 | 120.12 | 2.301s |
| Co-56 | 7085.93 | 1771.35 | 17. | 8. | 0.004 | 80.18 | 2.305s |
| y-88 | 7344.95 | 1836.06 | 6. | 3. | 0.001 | 242.22 | 2.349s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | 1.1901E+01 | | | | 5.31E+01 | |
| | | | 477.60 | 1.190E+01 | &( | 4.205E+01 1.06E+02 | 1.05E+01 G |
| NA-22 | C | 4.4157E-02 | | | | 9.50E+02 | |
| | | | 1274.53 | 4.416E-02 | ?( | 1.605E+00 9.87E+02 | 9.99E+01 G |
| K-40 | N | 5.2896E+00 | | | | 4.66E+11 | |
| | | | 1460.83 | 5.290E+00 | ?( | 1.269E+01 1.09E+02 | 1.07E+01 G |
| Sc-46 | F | -1.9473E+00 | | | | 8.38E+01 | |
| | | | 889.28 | -1.947E+00 | ?( | 5.499E+00 8.51E+01 | 1.00E+02 G |
| | | | 1120.55 | 0.000E+00 | + | 5.267E+00 1.00E+03 | 1.00E+02 G |
| CR-51 | F | -8.9162E+00 | | | | 2.77E+01 | |
| | | | 320.08 | -8.916E+00 | ?( | 5.209E+01 1.76E+02 | 9.94E+00 G |
| MN-54 | C | -1.5494E+00 | | | | 3.12E+02 | |
| | | | 834.85 | -1.549E+00 | &( | 3.330E+00 9.56E+01 | 1.00E+02 G |
| FE-59 | F | 9.4072E-01 | | | | 4.45E+01 | |
| | | | 1099.25 | 9.407E-01 | &( | 6.745E+00 3.37E+02 | 5.65E+01 G |
| | | | 1291.60 | -2.580E+00 | + | 4.963E+00 9.19E+01 | 4.32E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Co-56 | C 1.3717E+00 | | | | | 7.73E+01 | |
| | | 846.77 | 1.416E+00 | &( | 2.712E+00 | 8.50E+01 | 9.99E+01 G |
| | | 1238.28 | 1.304E+00 | ?( | 2.374E+00 | 8.35E+01 | 6.61E+01 G |
| | | 1037.84 | -3.599E+00 | + | 2.677E+01 | 3.38E+02 | 1.41E+01 G |
| | | 1771.35 | 4.439E+00 | ? | 1.203E+01 | 8.02E+01 | 1.55E+01 A |
| CO-58 | C 3.6125E-01 | | | | | 7.09E+01 | |
| | | 810.78 | 3.613E-01 | ?( | 4.336E+00 | 3.55E+02 | 9.95E+01 G |
| CO-60 | F 1.9098E+02 | | | | | 1.93E+03 | |
| | | 1332.50 | 1.950E+02 | ( | 1.261E+00 | 1.90E+00 | 1.00E+02 G |
| | | 1173.24 | 1.870E+02 | ( | 2.284E+00 | 1.92E+00 | 9.99E+01 G |
| NB-94 | I 7.9221E-01 | | | | | 7.41E+06 | |
| | | 702.63 | 2.867E-01 | ?( | 2.678E+00 | 4.09E+02 | 9.79E+01 G |
| | | 871.10 | 1.288E+00 | ?( | 3.619E+00 | 8.44E+01 | 9.99E+01 G |
| ZR-95 | I 1.8057E+00 | | | | | 6.40E+01 | |
| | | 756.73 | 2.057E+00 | ( | 4.167E+00 | 8.96E+01 | 5.45E+01 G |
| | | 724.20 | 1.496E+00 | &( | 8.349E+00 | 1.66E+02 | 4.42E+01 G |
| NB-95 | I -3.4497E-01 | | | | | 6.40E+01 | |
| | | 765.79 | -3.450E-01 | ?( | 3.163E+00 | 2.70E+02 | 9.98E+01 G |
| RU-103 | I 8.2617E-01 | | | | | 3.93E+01 | |
| | | 497.05 | 8.262E-01 | &( | 2.898E+00 | 1.44E+02 | 9.09E+01 G |
| | | 610.30 | 1.432E+01 | & | 9.954E+01 | 2.08E+02 | 5.75E+00 GA |
| RH-106 | I -1.4114E+01 | | | | | 3.74E+02 | |
| | | 621.92 | -1.411E+01 | ?( | 6.135E+01 | 1.31E+02 | 9.93E+00 G |
| | | 1050.36 | -1.362E+02 | + | 3.033E+02 | 6.74E+01 | 1.56E+00 G |
| | | 511.86 | 1.390E+00 | & | 1.862E+01 | 7.16E+02 | 2.00E+01 GA |
| AG-108M | C 5.5746E-01 | | | | | 1.53E+05 | |
| | | 433.94 | 6.543E-02 | %( | 3.457E+00 | 2.16E+03 | 9.05E+01 G |
| | | 722.94 | -1.449E+00 | + | 4.251E+00 | 8.82E+01 | 9.08E+01 G |
| | | 614.28 | 1.053E+00 | &( | 6.410E+00 | 1.83E+02 | 8.98E+01 G |
| AG-110M | F -1.5960E-01 | | | | | 2.50E+02 | |
| | | 884.68 | -2.746E+00 | ( | 7.396E+00 | 8.12E+01 | 7.27E+01 G |
| | | 657.76 | -1.404E+00 | & | 1.769E+01 | 3.80E+02 | 9.46E+01 G |
| | | 937.49 | 4.718E+00 | &( | 1.093E+01 | 1.07E+02 | 3.44E+01 G |
| | | 1384.30 | 6.781E-01 | ?( | 4.011E+00 | 2.48E+02 | 2.43E+01 G |
| | | 763.94 | -6.706E-02 | % | 1.375E+01 | 5.98E+03 | 2.23E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| SN-113 | F | -8.6817E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | -8.682E-01 | ?( | 6.736E+00 | 2.32E+02 | 6.40E+01 G |
| SB-124 | F | -1.3143E+00 | | | | | 6.02E+01 | |
| | | | 602.73 | -1.314E+00 | ( | 5.668E+00 | 1.30E+02 | 9.83E+01 G |
| | | | 1690.98 | -6.913E-01 | + | 3.258E+00 | 2.15E+02 | 4.78E+01 G |
| | | | 722.79 | -1.342E+01 | + | 3.400E+01 | 7.64E+01 | 1.08E+01 G |
| SB-125 | I | 4.4682E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | -9.900E-02 | &( | 1.008E+01 | 4.16E+03 | 2.96E+01 G |
| | | | 600.50 | -7.200E+00 | + | 3.163E+01 | 1.32E+02 | 1.79E+01 G |
| | | | 635.89 | 9.673E+00 | &( | 2.231E+01 | 6.97E+01 | 1.13E+01 G |
| | | | 463.37 | 1.176E+01 | ?( | 4.195E+01 | 1.07E+02 | 1.05E+01 G |
| I-131 | I | 2.3078E+00 | | | | | 8.02E+00 | |
| | | | 364.48 | 1.274E+00 | ( | 3.068E+00 | 9.96E+01 | 8.17E+01 G |
| | | | 284.30 | 7.269E+00 | ?( | 3.692E+01 | 2.00E+02 | 6.14E+00 G |
| | | | 636.97 | 9.843E+00 | ( | 3.543E+01 | 1.07E+02 | 7.17E+00 G |
| Gd-153 | F | 2.1736E+00 | | | | | 2.42E+02 | |
| | | | 97.50 | 2.174E+00 | &( | 1.042E+01 | 1.45E+02 | 3.00E+01 G |
| | | | 103.20 | 0.000E+00 | & | 1.440E+01 | 1.00E+03 | 2.18E+01 G |
| Ga-68 | C | 5.3953E+01 | | | | | 4.71E-02 | |
| | | | 1077.40 | 5.395E+01 | ?( | 1.241E+02 | 1.05E+02 | 3.30E+00 G |
| Tc-99m | I | -7.5855E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | -7.585E-01 | ?( | 2.818E+00 | 1.12E+02 | 8.93E+01 G |
| BA-133 | F | -1.7982E+00 | | | | | 3.85E+03 | |
| | | | 356.00 | -1.798E+00 | &( | 6.016E+00 | 1.01E+02 | 6.20E+01 G |
| | | | 302.85 | 0.000E+00 | & | 2.729E+01 | 1.00E+03 | 1.83E+01 G |
| | | | 383.84 | 1.270E+01 | ? | 4.588E+01 | 1.09E+02 | 8.94E+00 GA |
| | | | 80.99 | -2.011E+00 | + | 6.810E+00 | 1.28E+02 | 3.41E+01 GA |
| CS-134 | I | 1.2011E+00 | | | | | 7.54E+02 | |
| | | | 604.71 | -1.875E-01 | ?( | 5.748E+00 | 9.15E+02 | 9.76E+01 G |
| | | | 795.87 | 1.508E+00 | &( | 3.998E+00 | 7.98E+01 | 8.55E+01 G |
| | | | 569.32 | -2.031E+00 | & | 1.715E+01 | 2.49E+02 | 1.54E+01 G |
| | | | 801.95 | 1.378E+01 | ( | 4.310E+01 | 9.38E+01 | 8.69E+00 G |
| | | | 563.24 | -6.853E+00 | + | 3.169E+01 | 1.97E+02 | 8.35E+00 G |
| CS-137 | I | 3.5904E+02 | | | | | 1.10E+04 | |
| | | | 661.66 | 3.590E+02 | ( | 3.083E+00 | 1.23E+00 | 8.52E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| CE-139 | F | -8.7157E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | -8.716E-01 | ?( | 3.123E+00 | 1.08E+02 | 7.99E+01 G |
| Ba-140 | I | 2.7391E+00 | | | | | 1.28E+01 | |
| | | | 537.26 | 2.739E+00 | &( | 1.094E+01 | 1.70E+02 | 2.44E+01 G |
| | | | 162.66 | -8.669E+00 | + | 4.046E+01 | 1.40E+02 | 6.22E+00 G |
| | | | 304.85 | 0.000E+00 | & | 1.171E+02 | 1.00E+03 | 4.29E+00 G |
| La-140 | I | 5.1788E-01 | | | | | 1.28E+01 | |
| | | | 1596.21 | 3.309E-01 | ?( | 1.169E+00 | 1.56E+02 | 9.54E+01 G |
| | | | 487.02 | -1.459E-01 | & | 1.058E+01 | 2.16E+03 | 4.55E+01 G |
| | | | 328.76 | 1.396E+00 | @( | 1.168E+01 | 3.28E+02 | 2.03E+01 G |
| | | | 815.77 | 0.000E+00 | - | 1.880E+01 | 1.00E+03 | 2.33E+01 G |
| CE-141 | I | 6.2180E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | 6.218E-01 | &( | 3.665E+00 | 2.21E+02 | 4.82E+01 G |
| CE-144 | I | 5.9043E+00 | | | | | 2.85E+02 | |
| | | | 133.54 | 5.904E+00 | &( | 2.230E+01 | 1.14E+02 | 1.11E+01 G |
| PM-144 | C | -6.3388E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | -6.339E-01 | ?( | 2.574E+00 | 1.72E+02 | 9.90E+01 G |
| | | | 618.06 | -9.596E-01 | + | 5.616E+00 | 1.75E+02 | 9.91E+01 G |
| EU-152 | F | 7.8715E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | 4.263E+00 | ( | 6.146E+00 | 5.35E+01 | 2.65E+01 G |
| | | | 1112.07 | 1.135E+01 | ( | 3.690E+01 | 9.75E+01 | 1.36E+01 G |
| | | | 121.78 | -1.325E+00 | & | 7.730E+00 | 1.75E+02 | 2.86E+01 G |
| | | | 778.92 | -1.373E+01 | - | 2.695E+01 | 8.77E+01 | 1.29E+01 G |
| | | | 964.11 | 1.117E+01 | ?( | 2.949E+01 | 7.96E+01 | 1.46E+01 G |
| | | | 244.69 | -9.761E+00 | - | 4.828E+01 | 1.49E+02 | 7.58E+00 G |
| | | | 1408.00 | 2.270E-01 | % | 6.265E+00 | 1.19E+03 | 2.10E+01 GA |
| EU-154 | I | 1.0752E+01 | | | | | 3.14E+03 | |
| | | | 873.23 | 9.290E+00 | &( | 2.889E+01 | 9.31E+01 | 1.23E+01 G |
| | | | 123.10 | 1.578E+00 | & | 4.927E+00 | 9.41E+01 | 4.08E+01 G |
| | | | 1274.54 | 0.000E+00 | - | 4.621E+00 | 1.00E+03 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | - | 1.990E+01 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | 1.175E+01 | ?( | 3.146E+01 | 8.08E+01 | 1.80E+01 G |
| | | | 996.33 | -1.585E+01 | & | 5.348E+01 | 1.01E+02 | 1.06E+01 G |
| EU-155 | I | 1.4262E+00 | | | | | 1.81E+03 | |
| | | | 105.31 | 0.000E+00 | &( | 1.477E+01 | 1.00E+03 | 2.12E+01 G |
| | | | 86.54 | 2.411E+00 | ?( | 1.109E+01 | 1.39E+02 | 3.07E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| HF-181 | F | 1.6530E+00 | | | | | 4.24E+01 | |
| | | | 482.00 | 1.571E+00 | ?( | 5.654E+00 | 1.08E+02 | 8.05E+01 G |
| | | | 133.02 | -1.364E+00 | + | 5.641E+00 | 1.25E+02 | 4.33E+01 G |
| | | | 345.83 | -1.522E+00 | & | 2.444E+01 | 4.79E+02 | 1.51E+01 G |
| | | | 136.30 | 2.786E+00 | &( | 4.345E+01 | 4.67E+02 | 5.85E+00 G |
| Ta-182 | F | -7.5591E-01 | | | | | 1.14E+02 | |
| | | | 1121.30 | -2.319E+00 | ?( | 1.565E+01 | 2.00E+02 | 3.49E+01 G |
| | | | 1221.41 | 1.265E+00 | ?( | 6.351E+00 | 2.24E+02 | 2.70E+01 G |
| | | | 1189.05 | -8.261E+00 | + | 1.772E+01 | 1.01E+02 | 1.62E+01 G |
| Hg-203 | F | -1.5933E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | -1.593E-01 | ?( | 3.263E+00 | 6.09E+02 | 8.15E+01 G |
| TL-208 | N | 4.0138E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 4.014E+00 | (P | 2.583E+00 | 3.01E+01 | 8.45E+01 G |
| | | | 277.28 | -5.017E+00 | - | 3.807E+01 | 2.26E+02 | 6.31E+00 G |
| | | | 860.56 | 1.013E+01 | + | 2.457E+01 | 1.07E+02 | 1.24E+01 G |
| pm-146 | C | -4.4374E+00 | | | | | 2.02E+03 | |
| | | | 747.16 | -4.437E+00 | ?( | 8.910E+00 | 8.94E+01 | 3.40E+01 G |
| | | | 735.72 | -4.971E+00 | + | 1.331E+01 | 1.19E+02 | 2.25E+01 G |
| | | | 453.88 | -8.937E-01 | & | 5.183E+00 | 2.39E+02 | 6.50E+01 G |
| y-88 | F | 1.8910E+00 | | | | | 1.07E+02 | |
| | | | 898.04 | 1.891E+00 | ?( | 3.617E+00 | 8.82E+01 | 9.37E+01 G |
| | | | 1836.06 | 2.370E-01 | - | 1.283E+00 | 2.42E+02 | 9.92E+01 G |
| Cd-113m | | -1.5263E+04 | | | | | 5.33E+03 | |
| | | | 263.70 | -1.526E+04 | ?( | 4.596E+04 | 9.08E+01 | 6.00E-03 K |
| Cd-109 | F | -2.0088E+01 | | | | | 4.53E+02 | |
| | | | 88.04 | -2.009E+01 | ( | 8.862E+01 | 1.33E+02 | 3.79E+00 G |
| Cf-251 | T | -1.2120E+00 | | | | | 3.28E+05 | |
| | | | 176.60 | -1.212E+00 | &( | 1.107E+01 | 3.42E+02 | 1.70E+01 G |
| | | | 227.00 | 8.947E-01 | & | 3.621E+01 | 1.59E+03 | 6.30E+00 GA |
| Cf-249 | T | 1.7387E+00 | | | | | 1.28E+05 | |
| | | | 387.95 | 1.739E+00 | &( | 6.388E+00 | 1.11E+02 | 6.60E+01 G |
| | | | 333.44 | -3.534E+00 | & | 1.602E+01 | 1.78E+02 | 1.55E+01 G |
| Sn-126 | | -2.1082E-01 | | | | | 3.65E+07 | |
| | | | 87.57 | -2.034E+00 | + | 9.058E+00 | 1.34E+02 | 3.75E+01 GA |
| | | | 64.28 | -2.108E-01 | %( | 3.515E+01 | 4.99E+03 | 9.70E+00 G |
| | | | 86.94 | -8.459E+00 | + | 3.808E+01 | 1.36E+02 | 9.04E+00 GA |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

PB-210   N   9.9835E+03                                      8.14E+03
                          46.54 9.984E+03  (P 2.028E+02 1.01E+00 4.25E+00 G

PB-212   N   6.7377E+00                                      6.98E+02
                         238.63 6.738E+00 *(P 4.536E+00 2.80E+01 4.33E+01 G
                         300.03 1.517E+01     1.494E+02 2.96E+02 3.28E+00 GA

PB-214   N  -3.7629E+00                                      5.84E+05
                         351.93-3.763E+00 *(P 9.342E+00 7.65E+01 3.76E+01 G
                         295.09-5.267E+00 + P 1.278E+01 9.34E+01 1.93E+01 G
                         242.00-1.284E+01 +   4.528E+01 1.06E+02 7.43E+00 GA

BI-207   C   2.3625E-01                                      1.18E+04
                         569.70-4.674E-01  (  2.723E+00 1.73E+02 9.77E+01 G
                        1063.66 1.159E+00  (  4.906E+00 1.93E+02 7.45E+01 G

BI-212   N   1.0680E+01                                      6.98E+02
                         727.17 1.068E+01 ?(  5.074E+01 1.42E+02 7.55E+00 G
                         785.42-1.049E+02 &   2.484E+02 1.05E+02 1.28E+00 GA

BI-214   N   1.0036E-01                                      5.84E+05
                         609.31-9.163E-01  (P 1.234E+01 4.00E+02 4.61E+01 G
                        1120.29 0.000E+00 +   3.487E+01 1.00E+03 1.51E+01 G
                        1764.49 3.143E+00 ?(  1.316E+01 1.20E+02 1.54E+01 G

BI-210M  T  -2.4595E-01                                      1.10E+09
                         265.83-2.460E-01 &(  5.788E+00 7.01E+02 5.00E+01 G
                         304.90 0.000E+00 +   1.795E+01 1.00E+03 2.80E+01 G

AC-228   N   1.5901E+01                                      2.10E+03
                         911.07 1.288E+01  (  9.926E+00 3.60E+01 2.90E+01 G
                         968.97 2.091E+01  (  1.657E+01 2.59E+01 1.75E+01 G
                         338.32 5.918E+00 -   1.458E+01 9.24E+01 1.20E+01 G
                          93.35-2.775E+00 -   5.824E+01 6.30E+02 5.56E+00 XA

TH-227   N   4.1742E+01                                      7.95E+03
                          50.14 4.174E+01  (  7.976E+01 5.80E+01 8.00E+00 G
                         256.24 1.215E+01 -   3.081E+01 1.00E+02 7.00E+00 G

TH-229   N   9.8805E-01                                      2.68E+06
                         193.51-1.727E+01  (  5.451E+01 9.51E+01 4.40E+00 G
                         210.85 2.786E+01  (  7.355E+01 1.05E+02 2.99E+00 G

TH-234   N  -6.9659E+01                                      1.63E+12
                          63.29-6.966E+01 *(P 1.883E+02 1.05E+02 3.81E+00 G
                          92.59 1.702E+00 + P 5.541E+01 9.78E+02 5.58E+00 G
```

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

PA-231   N  -6.3086E+00                                     1.20E+07
                         302.65-6.309E+00 ?(  1.733E+02 8.24E+02 2.88E+00 G
                         300.07 0.000E+00 &   2.003E+02 1.00E+03 2.46E+00 G

PA-234   N   3.6617E+00                                     1.63E+12
                         131.29-1.821E+00 ?(  1.475E+01 2.43E+02 1.80E+01 G
                         946.02 1.572E+00 ?(  2.973E+01 8.62E+02 1.34E+01 G
                         569.47 5.570E+00 &(  3.128E+01 1.66E+02 8.20E+00 G
                         883.24 1.523E+01 &(  5.029E+01 9.91E+01 9.60E+00 G
                         880.53 2.806E+01 ?   7.696E+01 8.26E+01 6.00E+00 GA

U-235    N   2.0735E-01                                     2.57E+11
                         143.79-6.071E-01 &(P 2.205E+01 1.08E+03 1.10E+01 G
                         205.33-1.751E+00 %   4.459E+01 1.00E+03 5.01E+00 G
                         163.38 1.964E+00 &(  4.886E+01 7.43E+02 5.08E+00 G

AM-241   T   1.2257E+03                                     1.58E+05
                          59.54 1.226E+03  (  1.516E+01 8.45E-01 3.59E+01 G

Np-237   F   5.6522E+00                                     2.14E+06
                          86.49 5.652E+00 ?(  2.573E+01 1.37E+02 1.31E+01 G

Ir-192   F   1.0102E+00                                     7.40E+01
                         316.49 1.010E+00 ?(  5.658E+00 1.69E+02 8.70E+01 G
                         468.06-2.034E+00 +   8.710E+00 1.29E+02 5.18E+01 G
                         308.44 0.000E+00 -   1.596E+01 1.00E+03 3.18E+01 G

Cs-136   F   2.5625E+00                                     1.30E+01
                         818.50 1.424E+00 ?(  4.254E+00 8.98E+01 1.00E+02 G
                        1048.07 3.986E+00 ?(  4.173E+00 3.31E+01 8.00E+01 G
                         340.57-2.260E+00 -   8.590E+00 1.14E+02 4.69E+01 G

Np-239   T  -2.9397E+00                                     2.36E+00
                         103.70 0.000E+00 &   1.307E+01 1.00E+03 2.40E+01 X
                         106.13-2.940E+00 &(  1.367E+01 1.40E+02 2.27E+01 G
                          99.50 2.232E+00 &   2.095E+01 2.82E+02 1.50E+01 X

Nd-147       1.5813E+00                                     1.11E+01
                         531.00 1.581E+00 ?(  2.052E+01 5.50E+02 1.30E+01 G
                          91.10-6.364E-01 +   1.182E+01 5.58E+02 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
```

@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity | |
|---|---|---|---|---|---|---|---|
| TH-234 | 63.29 | 7284. | -148. | -0.082 | 104.88 | -6.966E+01 | P |
| BA-133 | 80.99 | 1143. | -47. | -0.026 | 127.95 | -2.011E+00 | |
| Np-237 | 86.49 | 2626. | 53. | 0.029 | 137.30 | 5.652E+00 | |
| EU-155 | 86.54 | 2680. | 53. | 0.029 | 138.67 | 2.411E+00 | |
| Sn-126 | 86.94 | 2754. | -55. | -0.031 | 135.79 | -8.459E+00 | |
| Sn-126 | 87.57 | 2699. | -55. | -0.031 | 134.33 | -2.034E+00 | |
| Cd-109 | 88.04 | 2652. | -55. | -0.031 | 133.08 | -2.009E+01 | |
| Nd-147 | 91.10 | 2707. | -13. | -0.007 | 558.11 | -6.364E-01 | |
| TH-234 | 92.59 | 2340. | 7. | 0.004 | 977.79 | 1.702E+00 | P |
| Gd-153 | 97.50 | 2465. | 49. | 0.027 | 144.53 | 2.174E+00 | |
| Np-239 | 99.50 | 2514. | 25. | 0.014 | 282.32 | 2.232E+00 | |
| Np-239 | 106.13 | 2495. | -51. | -0.028 | 140.20 | -2.940E+00 | |
| EU-154 | 123.10 | 1012. | 48. | 0.027 | 94.13 | 1.578E+00 | |
| PA-234 | 131.29 | 1717. | -24. | -0.013 | 243.35 | -1.821E+00 | |
| HF-181 | 133.02 | 1435. | -43. | -0.024 | 124.57 | -1.364E+00 | |
| HF-181 | 136.30 | 1526. | 12. | 0.007 | 467.27 | 2.786E+00 | |
| Tc-99m | 140.51 | 1365. | -47. | -0.026 | 111.95 | -7.585E-01 | |
| CE-141 | 145.44 | 682. | 21. | 0.012 | 221.27 | 6.218E-01 | |
| Ba-140 | 162.66 | 1205. | -35. | -0.020 | 140.33 | -8.669E+00 | |
| CE-139 | 165.85 | 1201. | -46. | -0.025 | 107.97 | -8.716E-01 | |
| Cf-251 | 176.60 | 620. | -13. | -0.007 | 341.97 | -1.212E+00 | |
| PB-214 | 242.00 | 1310. | -49. | -0.027 | 106.30 | -1.284E+01 | |
| Cd-113m | 263.70 | 774. | -44. | -0.024 | 90.78 | -1.526E+04 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-210M | 265.83 | 845. | -6. | -0.003 | 701.38 | -2.460E-01 | |
| Hg-203 | 279.20 | 662. | -6. | -0.003 | 609.13 | -1.593E-01 | |
| I-131 | 284.30 | 466. | 20. | 0.011 | 199.78 | 7.269E+00 | |
| PB-214 | 295.09 | 525. | -45. | -0.025 | 93.42 | -5.267E+00 | P |
| PA-233 | 300.18 | 2130. | -42. | -0.023 | 156.50 | -1.541E+01 | |
| PA-231 | 302.65 | 2128. | -8. | -0.004 | 824.02 | -6.309E+00 | |
| Ir-192 | 316.49 | 1944. | 37. | 0.021 | 168.56 | 1.010E+00 | |
| CR-51 | 320.08 | 2117. | -37. | -0.021 | 175.85 | -8.916E+00 | |
| La-140 | 328.76 | 414. | 12. | 0.006 | 327.72 | 1.396E+00 | |
| Cf-249 | 333.44 | 447. | -22. | -0.012 | 178.43 | -3.534E+00 | |
| Cs-136 | 340.57 | 1164. | -43. | -0.024 | 114.43 | -2.260E+00 | |
| HF-181 | 345.83 | 949. | -9. | -0.005 | 479.45 | -1.522E+00 | |
| PB-214 | 351.93 | 840. | -55. | -0.031 | 76.52 | -3.763E+00 | P |
| BA-133 | 356.00 | 936. | -43. | -0.024 | 100.79 | -1.798E+00 | |
| I-131 | 364.48 | 400. | 40. | 0.022 | 99.62 | 1.274E+00 | |
| BA-133 | 383.84 | 1016. | 42. | 0.023 | 108.81 | 1.270E+01 | |
| Cf-249 | 387.95 | 1058. | 42. | 0.023 | 110.62 | 1.739E+00 | |
| SN-113 | 391.69 | 1092. | -20. | -0.011 | 232.46 | -8.682E-01 | |
| pm-146 | 453.88 | 532. | -19. | -0.011 | 238.78 | -8.937E-01 | |
| SB-125 | 463.37 | 887. | 40. | 0.022 | 107.38 | 1.176E+01 | |
| Ir-192 | 468.06 | 922. | -34. | -0.019 | 128.69 | -2.034E+00 | |
| BE-7 | 477.60 | 861. | 39. | 0.022 | 106.34 | 1.190E+01 | |
| HF-181 | 482.00 | 900. | 40. | 0.022 | 108.35 | 1.571E+00 | |
| RH-106 | 511.86 | 547. | 8. | 0.005 | 716.16 | 1.390E+00 | |
| Nd-147 | 531.00 | 260. | 6. | 0.003 | 550.08 | 1.581E+00 | |
| Ba-140 | 537.26 | 256. | 19. | 0.011 | 170.35 | 2.739E+00 | |
| CS-134 | 563.24 | 234. | -16. | -0.009 | 196.75 | -6.853E+00 | |
| CS-134 | 569.32 | 229. | -9. | -0.005 | 249.08 | -2.031E+00 | |
| PA-234 | 569.47 | 216. | 13. | 0.007 | 166.35 | 5.570E+00 | |
| SB-125 | 600.50 | 1009. | -34. | -0.019 | 132.03 | -7.200E+00 | |
| SB-124 | 602.73 | 974. | -34. | -0.019 | 129.61 | -1.314E+00 | |
| CS-134 | 604.71 | 984. | -5. | -0.003 | 914.58 | -1.875E-01 | |
| BI-214 | 609.31 | 1000. | -11. | -0.006 | 400.45 | -9.163E-01 | P |
| PM-144 | 618.06 | 937. | -25. | -0.014 | 175.46 | -9.596E-01 | |
| RH-106 | 621.92 | 1116. | -36. | -0.020 | 130.72 | -1.411E+01 | |
| SB-125 | 635.89 | 176. | 28. | 0.016 | 69.67 | 9.673E+00 | |
| I-131 | 636.97 | 178. | 18. | 0.010 | 107.30 | 9.843E+00 | |
| AG-110M | 657.76 | 7927. | -33. | -0.018 | 380.42 | -1.404E+00 | |
| PM-144 | 696.54 | 156. | -15. | -0.008 | 171.92 | -6.339E-01 | |
| NB-94 | 702.63 | 163. | 7. | 0.004 | 408.50 | 2.867E-01 | |
| SB-124 | 722.79 | 315. | -34. | -0.019 | 76.43 | -1.342E+01 | |
| ZR-95 | 724.20 | 316. | 15. | 0.009 | 166.02 | 1.496E+00 | |
| BI-212 | 727.17 | 340. | 19. | 0.010 | 141.67 | 1.068E+01 | |
| pm-146 | 735.72 | 201. | -26. | -0.014 | 118.73 | -4.971E+00 | |
| pm-146 | 747.16 | 201. | -34. | -0.019 | 89.45 | -4.437E+00 | |
| ZR-95 | 756.73 | 107. | 25. | 0.014 | 89.56 | 2.057E+00 | |
| NB-95 | 765.79 | 210. | -8. | -0.004 | 269.95 | -3.450E-01 | |
| PA-234M | 766.41 | 199. | -4. | -0.002 | 481.50 | -6.367E+01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-212 | 785.42 | 205. | -29. | -0.016 | 105.26 | -1.049E+02 | |
| CS-134 | 795.87 | 234. | 28. | 0.016 | 79.82 | 1.508E+00 | |
| CS-134 | 801.95 | 279. | 26. | 0.014 | 93.81 | 1.378E+01 | |
| Cs-136 | 818.50 | 352. | 30. | 0.017 | 89.80 | 1.424E+00 | |
| MN-54 | 834.85 | 205. | -32. | -0.018 | 95.64 | -1.549E+00 | |
| Co-56 | 846.77 | 131. | 29. | 0.016 | 84.99 | 1.416E+00 | |
| NB-94 | 871.10 | 228. | 26. | 0.014 | 84.44 | 1.288E+00 | |
| EU-154 | 873.23 | 218. | 23. | 0.013 | 93.15 | 9.290E+00 | |
| PA-234 | 880.53 | 372. | 34. | 0.019 | 82.62 | 2.806E+01 | |
| PA-234 | 883.24 | 406. | 29. | 0.016 | 99.15 | 1.523E+01 | |
| AG-110M | 884.68 | 505. | -40. | -0.022 | 81.24 | -2.746E+00 | |
| Sc-46 | 889.28 | 524. | -39. | -0.022 | 85.11 | -1.947E+00 | |
| y-88 | 898.04 | 190. | 35. | 0.019 | 88.21 | 1.891E+00 | |
| AG-110M | 937.49 | 220. | 31. | 0.017 | 106.71 | 4.718E+00 | |
| PA-234 | 946.02 | 245. | 4. | 0.002 | 861.74 | 1.572E+00 | |
| EU-154 | 996.33 | 468. | -31. | -0.017 | 101.35 | -1.585E+01 | |
| EU-154 | 1004.77 | 461. | 38. | 0.021 | 80.77 | 1.175E+01 | |
| Co-56 | 1037.84 | 190. | -9. | -0.005 | 338.36 | -3.599E+00 | |
| Cs-136 | 1048.07 | 144. | 56. | 0.031 | 33.12 | 3.986E+00 | |
| RH-106 | 1050.36 | 296. | -37. | -0.021 | 67.37 | -1.362E+02 | |
| Ga-68 | 1077.40 | 150. | 26. | 0.014 | 105.40 | 5.395E+01 | |
| Ta-182 | 1121.30 | 360. | -14. | -0.007 | 200.48 | -2.319E+00 | |
| Ta-182 | 1189.05 | 85. | -21. | -0.012 | 100.78 | -8.261E+00 | |
| Ta-182 | 1221.41 | 27. | 5. | 0.003 | 224.30 | 1.265E+00 | |
| Co-56 | 1238.28 | 21. | 13. | 0.007 | 83.50 | 1.304E+00 | |
| NA-22 | 1274.53 | 21. | 1. | 0.000 | 987.42 | 4.416E-02 | |
| AG-110M | 1384.30 | 6. | 2. | 0.001 | 248.05 | 6.781E-01 | |
| K-40 | 1460.83 | 11. | 8. | 0.004 | 109.13 | 5.290E+00 | |
| La-140 | 1596.21 | 6. | 4. | 0.002 | 156.12 | 3.309E-01 | |
| SB-124 | 1690.98 | 12. | -4. | -0.002 | 215.06 | -6.913E-01 | |
| BI-214 | 1764.49 | 20. | 6. | 0.003 | 120.12 | 3.143E+00 | |
| Co-56 | 1771.35 | 17. | 8. | 0.004 | 80.18 | 4.439E+00 | |
| y-88 | 1836.06 | 6. | 3. | 0.001 | 242.22 | 2.370E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | 1.1901E+01 | 1.1901E+01 | 1.063E+02% | 4.20E+01 |
| NA-22 | #A | 4.4157E-02 | 4.4157E-02 | 9.874E+02% | 1.61E+00 |
| K-40 | #A | 5.2896E+00 | 5.2896E+00 | 1.091E+02% | 1.27E+01 |
| Sc-46 | #A | -1.9473E+00 | -1.9473E+00 | 8.511E+01% | 5.50E+00 |
| CR-51 | #A | -8.9159E+00 | -8.9162E+00 | 1.758E+02% | 5.21E+01 |
| MN-54 | #A | -1.5493E+00 | -1.5494E+00 | 9.564E+01% | 3.33E+00 |
| FE-59 | #A | 9.4070E-01 | 9.4072E-01 | 3.367E+02% | 6.75E+00 |

| | | | | | |
|---|---|---|---|---|---|
| Co-56 | #A | 1.3717E+00 | 1.3717E+00 | 5.957E+01% | 2.71E+00 |
| CO-57 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.61E+00 |
| CO-58 | #A | 3.6125E-01 | 3.6125E-01 | 3.554E+02% | 4.34E+00 |
| CO-60 | | 1.9098E+02 | 1.9098E+02 | 1.351E+00% | 1.26E+00 |
| ZN-65 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.04E+01 |
| NB-94 | #A | 7.9221E-01 | 7.9221E-01 | 8.444E+01% | 2.68E+00 |
| ZR-95 | #A | 1.8057E+00 | 1.8057E+00 | 8.956E+01% | 4.17E+00 |
| NB-95 | #A | -3.4497E-01 | -3.4497E-01 | 2.700E+02% | 3.16E+00 |
| RU-103 | A | 8.2616E-01 | 8.2617E-01 | 1.440E+02% | 2.90E+00 |
| RH-106 | #A | -1.4114E+01 | -1.4114E+01 | 1.307E+02% | 6.14E+01 |
| AG-108M | #A | 5.5746E-01 | 5.5746E-01 | 1.825E+02% | 3.46E+00 |
| AG-110M | #A | -1.5960E-01 | -1.5960E-01 | 8.124E+01% | 7.40E+00 |
| SN-113 | #A | -8.6817E-01 | -8.6817E-01 | 2.325E+02% | 6.74E+00 |
| SB-124 | #A | -1.3143E+00 | -1.3143E+00 | 1.296E+02% | 5.67E+00 |
| SB-125 | #A | 4.4682E+00 | 4.4682E+00 | 6.967E+01% | 1.01E+01 |
| I-131 | #A | 2.3077E+00 | 2.3078E+00 | 8.256E+01% | 3.07E+00 |
| Gd-153 | #A | 2.1736E+00 | 2.1736E+00 | 1.445E+02% | 1.04E+01 |
| Ga-68 | #A | 5.3232E+01 | 5.3953E+01 | 1.054E+02% | 1.24E+02 |
| Tc-99m | #A | -7.5664E-01 | -7.5855E-01 | 1.120E+02% | 2.82E+00 |
| BA-133 | #A | -1.7982E+00 | -1.7982E+00 | 1.008E+02% | 6.02E+00 |
| CS-134 | #A | 1.2011E+00 | 1.2011E+00 | 7.982E+01% | 5.75E+00 |
| CS-137 | | 3.5904E+02 | 3.5904E+02 | 1.226E+00% | 3.08E+00 |
| CE-139 | #A | -8.7157E-01 | -8.7157E-01 | 1.080E+02% | 3.12E+00 |
| Ba-140 | #A | 2.7389E+00 | 2.7391E+00 | 1.703E+02% | 1.09E+01 |
| La-140 | #A | 5.1785E-01 | 5.1788E-01 | 1.561E+02% | 1.17E+00 |
| CE-141 | #A | 6.2179E-01 | 6.2180E-01 | 2.213E+02% | 3.67E+00 |
| CE-144 | A | 5.9043E+00 | 5.9043E+00 | 1.138E+02% | 2.23E+01 |
| PM-144 | #A | -6.3388E-01 | -6.3388E-01 | 1.719E+02% | 2.57E+00 |
| EU-152 | | 7.8715E+00 | 7.8715E+00 | 4.556E+01% | 6.15E+00 |
| EU-154 | #A | 1.0752E+01 | 1.0752E+01 | 6.164E+01% | 2.89E+01 |
| EU-155 | #A | 1.4262E+00 | 1.4262E+00 | 1.387E+02% | 1.48E+01 |
| HF-181 | #A | 1.6529E+00 | 1.6530E+00 | 1.084E+02% | 5.65E+00 |
| Ta-182 | #A | -7.5591E-01 | -7.5591E-01 | 1.504E+02% | 1.56E+01 |
| Hg-203 | #A | -1.5933E-01 | -1.5933E-01 | 6.091E+02% | 3.26E+00 |
| TL-208 | | 4.0138E+00 | 4.0138E+00 | 3.006E+01% | 2.58E+00 |
| pm-146 | #A | -4.4374E+00 | -4.4374E+00 | 8.945E+01% | 8.91E+00 |
| y-88 | #A | 1.8910E+00 | 1.8910E+00 | 8.821E+01% | 3.62E+00 |
| Cd-113m | #A | -1.5263E+04 | -1.5263E+04 | 9.078E+01% | 4.60E+04 |
| Cd-109 | #A | -2.0088E+01 | -2.0088E+01 | 1.331E+02% | 8.86E+01 |
| Cf-251 | #A | -1.2120E+00 | -1.2120E+00 | 3.420E+02% | 1.11E+01 |
| Cf-249 | #A | 1.7387E+00 | 1.7387E+00 | 1.106E+02% | 6.39E+00 |
| Sn-126 | #A | -2.1082E-01 | -2.1082E-01 | 4.990E+03% | 3.51E+01 |
| PB-210 | | 9.9835E+03 | 9.9835E+03 | 1.013E+00% | 2.03E+02 |
| PB-212 | | 6.7377E+00 | 6.7377E+00 | 2.799E+01% | 4.54E+00 |
| PB-214 | #A | -3.7629E+00 | -3.7629E+00 | 7.652E+01% | 9.34E+00 |
| BI-207 | A | 2.3625E-01 | 2.3625E-01 | 1.294E+02% | 2.72E+00 |
| BI-212 | #A | 1.0680E+01 | 1.0680E+01 | 1.417E+02% | 5.07E+01 |
| BI-214 | #A | 1.0036E-01 | 1.0036E-01 | 1.201E+02% | 1.23E+01 |
| BI-210M | #A | -2.4595E-01 | -2.4595E-01 | 7.014E+02% | 5.79E+00 |

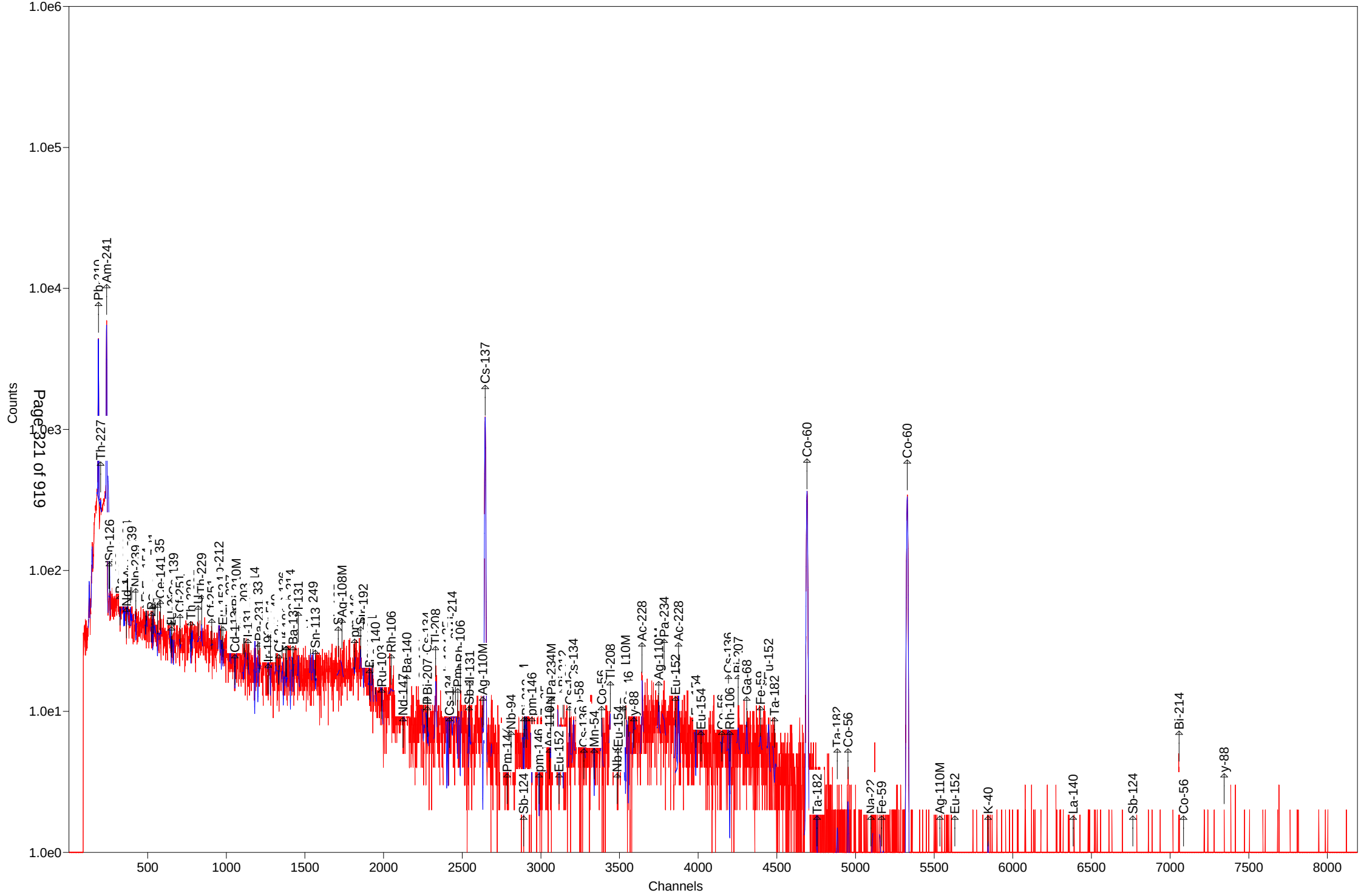
| | | | | |
|---|---|---|---|---|
| AC-228 | 1.5901E+01 | 1.5901E+01 | 2.214E+01% | 9.93E+00 |
| TH-227 #A | 4.1742E+01 | 4.1742E+01 | 5.802E+01% | 7.98E+01 |
| TH-229  A | 9.8805E-01 | 9.8805E-01 | 7.073E+01% | 5.45E+01 |
| TH-234 #A | -6.9659E+01 | -6.9659E+01 | 1.049E+02% | 1.88E+02 |
| PA-231 #A | -6.3086E+00 | -6.3086E+00 | 8.240E+02% | 1.73E+02 |
| PA-233 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.42E+01 |
| PA-234 #A | 3.6617E+00 | 3.6617E+00 | 9.915E+01% | 1.48E+01 |
| PA-234M#A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 7.01E+02 |
| U-235  #A | 2.0735E-01 | 2.0735E-01 | 6.573E+02% | 2.21E+01 |
| AM-241 | 1.2257E+03 | 1.2257E+03 | 8.449E-01% | 1.52E+01 |
| Np-237 #A | 5.6522E+00 | 5.6522E+00 | 1.373E+02% | 2.57E+01 |
| Ir-192 #A | 1.0102E+00 | 1.0102E+00 | 1.686E+02% | 5.66E+00 |
| Cs-136 #A | 2.5624E+00 | 2.5625E+00 | 3.312E+01% | 4.25E+00 |
| Np-239 #A | -2.9389E+00 | -2.9397E+00 | 1.402E+02% | 1.37E+01 |
| Nd-147 #A | 1.5812E+00 | 1.5813E+00 | 5.501E+02% | 2.05E+01 |

  # - All peaks for activity calculation had bad shape.
  * - Activity omitted from total
  & - Activity omitted from total and all peaks had bad shape.
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded

----------  S U M M A R Y  ----------

Total Activity (  25.1 to  1999.7 keV)  1.184E+04  Bq/Sample
Total Decayed Activity (  25.1 to  1999.7 keV) 1.1835527E+04  Bq/Sample

309155_Gamma_LCS 160-309155~2-A. 10_Gamma_20171629.spc.



Test America St. Louis  Spectrum ID: 5_Gamma_20171421

Sample Description: 309155_Gamma_160-22327-A-1-B
Detector: Detector # 5
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-1-B

Decay to Time: 6/7/2017 09:57  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:57:43  Real Time: 1809 sec
Analysis Time: 6/7/2017 10:28  Dead Time: 0.51 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 5_Soil_TunaCan.Clb
Efficiency Cal Desc: 5_Soil_TunaCan_90099_032612
Efficiency Cal Date: 3/27/2012 17:20
Energy Cal Date: 2/28/2012 19:35
Library: Client_Long_Rev11.lib
Bkgd Correction File: 5_2017-06-04_1024.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | -5.627E+00 | 94.3 | 5.308E+00 | 5.316E+00 | 1.787E+01 |
| NA-22 | 1.068E+00 | 30.2 | 3.220E-01 | 3.264E-01 | 7.156E-01 |
| K-40 | 1.949E+02 | 7.2 | 1.410E+01 | 1.727E+01 | 7.519E+00 |
| Sc-46 | 3.385E-02 | 82.2 | 2.784E-02 | 2.789E-02 | 2.504E+00 |
| CR-51 | 4.508E-03 | 86263.1 | 3.889E+00 | 3.889E+00 | 1.365E+01 |
| MN-54 | 5.044E-01 | 94.8 | 4.782E-01 | 4.789E-01 | 1.153E+00 |
| FE-59 | 1.062E+00 | 106.3 | 1.128E+00 | 1.129E+00 | 2.646E+00 |
| Co-56 | 1.483E+00 | 41.0 | 6.079E-01 | 6.126E-01 | 1.737E+00 |
| CO-57 | 2.853E-01 | 180.6 | 5.152E-01 | 5.154E-01 | 1.163E+00 |
| CO-58 | 5.982E-01 | 91.3 | 5.460E-01 | 5.469E-01 | 1.855E+00 |
| CO-60 | -2.687E-01 | 285.0 | 7.659E-01 | 7.661E-01 | 1.807E+00 |
| ZN-65 | 1.449E+00 | 101.8 | 1.475E+00 | 1.477E+00 | 5.038E+00 |
| NB-94 | 4.213E-01 | 25.0 | 1.053E-01 | 1.076E-01 | 1.592E+00 |
| ZR-95 | -5.751E-01 | 212.9 | 1.224E+00 | 1.225E+00 | 3.045E+00 |
| NB-95 | -5.494E-01 | 134.2 | 7.375E-01 | 7.381E-01 | 2.523E+00 |
| RU-103 | -4.849E-02 | 1179.0 | 5.717E-01 | 5.717E-01 | 1.487E+00 |
| RH-106 | 1.370E-01 | 96.6 | 1.323E-01 | 1.325E-01 | 3.445E+01 |
| AG-108M | -4.350E-02 | 1302.6 | 5.667E-01 | 5.667E-01 | 1.463E+00 |
| AG-110M | 5.285E-01 | 128.5 | 6.789E-01 | 6.794E-01 | 2.374E+00 |
| SN-113 | 6.627E-01 | 127.2 | 8.429E-01 | 8.435E-01 | 2.856E+00 |
| SB-124 | 6.696E-01 | 189.0 | 1.266E+00 | 1.266E+00 | 3.639E+00 |
| SB-125 | 2.301E+00 | 84.0 | 1.931E+00 | 1.935E+00 | 3.821E+00 |
| I-131 | 4.765E-01 | 99.8 | 4.755E-01 | 4.762E-01 | 1.165E+00 |
| Gd-153 | -2.330E-01 | 429.5 | 1.000E+00 | 1.001E+00 | 3.417E+00 |
| Ga-68 | 1.494E+01 | 176.1 | 2.631E+01 | 2.632E+01 | 6.204E+01 |
| Tc-99m | -3.817E-01 | 125.6 | 4.796E-01 | 4.801E-01 | 1.606E+00 |
| BA-133 | -2.292E-01 | 136.9 | 3.137E-01 | 3.140E-01 | 4.022E+00 |
| CS-134 | 3.469E-03 | 31645.9 | 1.098E+00 | 1.098E+00 | 3.761E+00 |
| CS-137 | -9.864E-01 | 83.5 | 8.241E-01 | 8.257E-01 | 2.761E+00 |
| CE-139 | -2.085E-01 | 225.9 | 4.711E-01 | 4.715E-01 | 1.596E+00 |
| Ba-140 | 1.543E+00 | 104.1 | 1.606E+00 | 1.608E+00 | 4.118E+00 |
| La-140 | -7.399E-02 | 155.9 | 1.154E-01 | 1.154E-01 | 2.696E+00 |
| CE-141 | 6.442E-01 | 130.1 | 8.380E-01 | 8.386E-01 | 2.811E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 0.000E+00 | 1.#INF | 1.113E+00 | 1.113E+00 | 1.227E+01 |
| PM-144 | -6.493E-01 | 137.2 | 8.907E-01 | 8.913E-01 | 2.144E+00 |
| EU-152 | 1.518E+00 | 89.5 | 1.359E+00 | 1.362E+00 | 8.298E+00 |
| EU-154 | 1.236E-01 | 424.3 | 5.245E-01 | 5.245E-01 | 1.229E+01 |
| EU-155 | -1.427E+00 | 102.8 | 1.467E+00 | 1.469E+00 | 4.913E+00 |
| HF-181 | 9.189E-01 | 93.0 | 8.548E-01 | 8.561E-01 | 2.224E+00 |
| Ta-182 | -4.258E-01 | 72.3 | 3.079E-01 | 3.086E-01 | 1.098E+01 |
| Hg-203 | -5.029E-01 | 111.7 | 5.618E-01 | 5.625E-01 | 1.892E+00 |
| TL-208 | 6.675E+00 | 10.8 | 7.226E-01 | 8.013E-01 | 1.040E+00 |
| pm-146 | 5.243E-01 | 155.7 | 8.165E-01 | 8.170E-01 | 4.030E+00 |
| y-88 | 5.659E-01 | 130.3 | 7.375E-01 | 7.380E-01 | 1.763E+00 |
| Cd-113m | 2.168E+03 | 223.6 | 4.849E+03 | 4.851E+03 | 1.683E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 3.112E+00 | 3.112E+00 | 5.083E+01 |
| Cf-251 | -2.130E+00 | 104.4 | 2.224E+00 | 2.232E+00 | 5.983E+00 |
| Cf-249 | -6.513E-01 | 138.1 | 8.993E-01 | 8.999E-01 | 3.045E+00 |
| Sn-126 | -2.770E+00 | 174.3 | 4.828E+00 | 4.830E+00 | 1.627E+01 |
| PB-210 | 1.952E+01 | 73.9 | 1.442E+01 | 1.446E+01 | 4.102E+01 |
| PB-212 | 2.104E+01 | 5.7 | 1.190E+00 | 1.808E+00 | 1.790E+00 |
| PB-214 | 1.308E+01 | 9.3 | 1.223E+00 | 1.400E+00 | 2.952E+00 |
| BI-207 | 5.054E-01 | 75.5 | 3.816E-01 | 3.825E-01 | 1.279E+00 |
| BI-212 | 9.708E+00 | 85.8 | 8.330E+00 | 8.345E+00 | 2.804E+01 |
| BI-214 | 1.134E+01 | 11.4 | 1.289E+00 | 1.417E+00 | 1.801E+00 |
| BI-210M | 1.310E-01 | 517.7 | 6.780E-01 | 6.781E-01 | 2.359E+00 |
| AC-228 | 2.084E+01 | 8.1 | 1.688E+00 | 1.995E+00 | 1.860E+00 |
| TH-227 | 1.137E+00 | 51.0 | 5.798E-01 | 5.831E-01 | 2.024E+01 |
| TH-229 | 1.312E+01 | 56.3 | 7.393E+00 | 7.468E+00 | 1.951E+01 |
| TH-234 | 3.453E+01 | 33.5 | 1.157E+01 | 1.171E+01 | 3.160E+01 |
| PA-231 | 1.419E+01 | 143.0 | 2.029E+01 | 2.031E+01 | 6.843E+01 |
| PA-233 | -1.250E+00 | 144.9 | 1.811E+00 | 1.813E+00 | 6.099E+00 |
| PA-234 | 7.770E-01 | 113.2 | 8.791E-01 | 8.800E-01 | 7.635E+00 |
| PA-234M | 0.000E+00 | 1.#INF | 9.463E+00 | 9.463E+00 | 2.261E+02 |
| U-235 | -3.064E+00 | 129.0 | 3.954E+00 | 3.957E+00 | 1.324E+01 |
| AM-241 | 2.138E-01 | 648.3 | 1.386E+00 | 1.386E+00 | 4.001E+00 |
| Np-237 | -2.943E+00 | 164.1 | 4.829E+00 | 4.832E+00 | 1.612E+01 |
| Ir-192 | 4.728E-01 | 97.2 | 4.597E-01 | 4.606E-01 | 1.465E+00 |
| Cs-136 | 6.690E-02 | 943.4 | 6.311E-01 | 6.311E-01 | 2.249E+00 |
| Np-239 | 1.073E+00 | 134.0 | 1.438E+00 | 1.439E+00 | 4.837E+00 |
| Nd-147 | 3.583E-01 | 964.4 | 3.455E+00 | 3.455E+00 | 9.151E+00 |
| Total | 2.565E+03 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-1-B

Spectrum Filename: C:\User\SPC\Det5\5_Gamma_20171421.An1

Acquisition information
Start time: 6/7/2017 9:57:43 AM
Live time: 1800
Real time: 1809
Dead time: 0.51 %
Detector ID: 5

Detector system
Ge 5 SN/157

Calibration
Filename: 5_Soil_TunaCan.Clb
5_Soil_TunaCan_90099_032612

Energy Calibration
Created: 2/28/2012 7:35:48 PM
Zero offset: 0.158 keV
Gain: 0.250 keV/channel
Quadratic: 3.911E-08 keV/channel^2

Efficiency Calibration
Created: 3/27/2012 5:20:37 PM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.87 %
Log(Eff): 6.466115E-01 + (-7.830454E-01*Log(E) ) + ( -4.117504E-03*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.43 %
Log(Eff): -2.462251E+01 + ( 9.075211E+00*Log(E) ) + ( -9.664422E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.62keV )
Stop channel: 8000 (  2000.81keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:57:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 5_2017-06-04_1024.PBC<br>6/4/2017 10:24:23 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 24 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.2271

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.54 | 27. | 73.87 | 0.78 | 1.788E-02 | 46.54 | 4.250 | PBC<MDA | PB210 |
| 59.54 | 4. | 648.32 | 0.80 | 2.533E-02 | 59.54 | 35.900 | PBC<MDA | AM241 |
| 63.24 | 64. | 33.50 | 0.80 | 2.712E-02 | 63.29 | 3.810 | 3.453E+01 | TH234 |
| 74.81 | 158. | 12.56 | 0.81 | 3.152E-02 | | | | |
| 77.14 | 262. | 8.61 | 0.82 | 3.221E-02 | | | | |
| 86.98 | 76. | 27.04 | 0.87 | 3.444E-02 | 86.49 | 13.100 | 9.342E+00 | Np237 |
| | | | | | 86.54 | 30.700 | 3.985E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.351E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | PBC<MDA | Sn126 |
| 92.90 | 91. | 25.26 | 1.27 | 3.536E-02 | 92.59 | 5.584 | PBC<MDA | TH234 |
| | | | | | 93.35 | 5.561 | 2.571E+01 | AC228 |
| 106.13 | 16. | 134.04 | 0.84 | 3.620E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 122.40 | 7. | 269.16 | 0.86 | 3.582E-02 | 122.06 | 85.600 | PBC<MDA | CO57 |
| 129.14 | 45. | 32.43 | 0.56 | 3.529E-02 | | | | |
| 136.04 | 10. | 240.90 | 0.88 | 3.457E-02 | 136.30 | 5.850 | PBC<MDA | HF181 |
| | | | | | 136.47 | 10.680 | 1.555E+00 | CO57 |
| 145.44 | 19. | 130.07 | 0.88 | 3.351E-02 | 145.44 | 48.200 | PBC<MDA | CE141 |
| 167.46 | 24. | 48.95 | 0.36 | 3.108E-02 | | | | |
| 186.11 | 65. | 25.39 | 0.86 | 2.849E-02 | | | | |
| 193.51 | 29. | 56.34 | 0.93 | 2.758E-02 | 193.51 | 4.400 | PBC<MDA | TH229 |
| 238.75 | 350. | 6.98 | 0.80 | 2.318E-02 | 238.63 | 43.300 | 1.934E+01 | PB212 |
| 242.13 | 55. | 23.58 | 0.98 | 2.293E-02 | 242.00 | 7.430 | 1.779E+01 | PB214 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 256.24 | 27. | 50.98 | 1.00 | 2.186E-02 | 256.24 | 7.000 | PBC<MDA | TH227 |
| 263.70 | 5. | 223.61 | 1.00 | 2.135E-02 | 263.70 | 0.006 | PBC<MDA | Cd113m |
| 265.83 | 2. | 517.69 | 1.00 | 2.121E-02 | 265.83 | 50.000 | PBC<MDA | BI210M |
| 277.29 | 43. | 29.01 | 1.02 | 2.048E-02 | 277.28 | 6.310 | 1.856E+01 | TL208 |
| 284.30 | 2. | 697.32 | 1.02 | 2.006E-02 | 284.30 | 6.140 | PBC<MDA | I131 |
| 295.19 | 93. | 13.87 | 1.01 | 1.944E-02 | 295.09 | 19.300 | 1.371E+01 | PB214 |
| 299.96 | 7. | 140.58 | 1.04 | 1.918E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 7.999E+00 | PA231 |
| | | | | | 300.18 | 6.200 | 3.175E+00 | PA233 |
| 300.09 | 12. | 82.10 | 1.04 | 1.918E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 1.419E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 5.633E+00 | PA233 |
| 302.67 | 14. | 142.96 | 1.04 | 1.904E-02 | 302.65 | 2.880 | PBC<MDA | PA231 |
| | | | | | 302.85 | 18.330 | 2.231E+00 | BA133 |
| 302.85 | 9. | 220.69 | 1.04 | 1.903E-02 | 302.65 | 2.880 | PBC<MDA | PA231 |
| | | | | | 302.85 | 18.330 | 1.487E+00 | BA133 |
| 316.49 | 12. | 102.50 | 1.05 | 1.835E-02 | 316.49 | 87.040 | PBC<MDA | Ir192 |
| 328.76 | 4. | 406.20 | 1.07 | 1.778E-02 | 328.76 | 20.300 | PBC<MDA | La140 |
| 338.42 | 89. | 14.17 | 1.11 | 1.736E-02 | 338.32 | 12.010 | 2.371E+01 | AC228 |
| 345.83 | 11. | 154.49 | 1.08 | 1.705E-02 | 345.83 | 15.070 | PBC<MDA | HF181 |
| 352.14 | 145. | 12.54 | 1.07 | 1.679E-02 | 351.93 | 37.600 | 1.277E+01 | PB214 |
| 364.48 | 11. | 99.80 | 1.10 | 1.632E-02 | 364.48 | 81.700 | PBC<MDA | I131 |
| 391.69 | 12. | 127.19 | 1.12 | 1.537E-02 | 391.69 | 64.000 | PBC<MDA | SN113 |
| 427.88 | 9. | 127.50 | 1.16 | 1.428E-02 | 427.88 | 29.600 | PBC<MDA | SB125 |
| 453.88 | 4. | 281.37 | 1.18 | 1.360E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 463.37 | 11. | 96.28 | 1.19 | 1.336E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 468.06 | 7. | 165.26 | 1.20 | 1.325E-02 | 468.06 | 51.750 | PBC<MDA | Ir192 |
| 482.00 | 12. | 103.65 | 1.21 | 1.293E-02 | 482.00 | 80.500 | PBC<MDA | HF181 |
| 511.86 | 53. | 39.71 | 2.48 | 1.230E-02 | 511.86 | 20.000 | 1.197E+01 | RH106 |
| 531.00 | 1. | 964.37 | 1.25 | 1.193E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 537.26 | 8. | 104.08 | 1.26 | 1.181E-02 | 537.26 | 24.390 | PBC<MDA | Ba140 |
| 569.70 | 10. | 75.50 | 1.29 | 1.125E-02 | 569.32 | 15.380 | 3.210E+00 | CS134 |
| | | | | | 569.47 | 8.200 | 6.022E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 5.054E-01 | BI207 |
| 583.45 | 112. | 10.83 | 1.64 | 1.103E-02 | 583.02 | 84.500 | 6.675E+00 | TL208 |
| 600.50 | 10. | 194.71 | 1.31 | 1.076E-02 | 600.50 | 17.860 | PBC<MDA | SB125 |
| 602.73 | 10. | 199.39 | 1.32 | 1.073E-02 | 602.73 | 98.260 | PBC<MDA | SB124 |
| 609.56 | 100. | 11.37 | 1.50 | 1.063E-02 | 609.31 | 46.090 | 1.134E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 9.099E+01 | RU103 |
| 610.30 | 2. | 927.55 | 1.32 | 1.062E-02 | 610.30 | 5.750 | PBC<MDA | RU103 |
| 722.79 | 3. | 321.25 | 1.42 | 9.217E-03 | 722.79 | 10.810 | PBC<MDA | SB124 |
| | | | | | 722.94 | 90.840 | 2.212E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 9.943E-01 | EU154 |
| 727.47 | 12. | 85.81 | 1.42 | 9.170E-03 | 727.17 | 7.550 | PBC<MDA | BI212 |
| 735.72 | 2. | 374.72 | 1.43 | 9.081E-03 | 735.72 | 22.500 | PBC<MDA | pm146 |
| 747.16 | 6. | 155.74 | 1.44 | 8.965E-03 | 747.16 | 34.000 | PBC<MDA | pm146 |
| 778.92 | 2. | 398.21 | 1.46 | 8.657E-03 | 778.92 | 12.940 | PBC<MDA | EU152 |
| 783.29 | 7. | 97.18 | 1.47 | 8.597E-03 | 785.42 | 1.280 | PBC<MDA | BI212 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 810.78 | 9. | 91.27 | 1.49 | 8.371E-03 | 810.78 | 99.460 | PBC<MDA | CO58 |
| 815.77 | 6. | 155.93 | 1.49 | 8.328E-03 | 815.77 | 23.280 | PBC<MDA | La140 |
| 818.50 | 1. | 943.40 | 1.50 | 8.305E-03 | 818.50 | 100.000 | PBC<MDA | Cs136 |
| 834.85 | 7. | 94.80 | 1.51 | 8.168E-03 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 860.58 | 12. | 90.99 | 1.53 | 7.963E-03 | 860.56 | 12.420 | PBC<MDA | TL208 |
| 871.10 | 16. | 25.00 | 1.54 | 7.882E-03 | 871.10 | 99.890 | 1.129E+00 | NB94 |
| 880.53 | 5. | 93.32 | 1.54 | 7.812E-03 | 880.53 | 6.000 | PBC<MDA | PA234 |
| 883.24 | 5. | 113.15 | 1.55 | 7.791E-03 | 883.24 | 9.600 | PBC<MDA | PA234 |
| 884.68 | 5. | 128.47 | 1.55 | 7.781E-03 | 884.68 | 72.680 | PBC<MDA | AG110M |
| 898.04 | 7. | 130.32 | 1.56 | 7.684E-03 | 898.04 | 93.700 | PBC<MDA | y88 |
| 911.64 | 77. | 11.40 | 1.29 | 7.591E-03 | 911.07 | 29.000 | 1.943E+01 | AC228 |
| 964.11 | 6. | 193.12 | 1.61 | 7.239E-03 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 969.03 | 48. | 16.14 | 1.49 | 7.209E-03 | 968.97 | 17.460 | 2.119E+01 | AC228 |
| 1004.77 | 1. | 424.26 | 1.64 | 6.992E-03 | 1004.77 | 18.010 | PBC<MDA | EU154 |
| 1037.84 | 15. | 41.72 | 1.66 | 6.805E-03 | 1037.84 | 14.130 | 8.667E+00 | Co56 |
| 1050.36 | 8. | 96.61 | 1.67 | 6.736E-03 | 1050.36 | 1.560 | PBC<MDA | RH106 |
| 1077.40 | 5. | 176.07 | 1.69 | 6.594E-03 | 1077.40 | 3.300 | PBC<MDA | Ga68 |
| 1099.25 | 7. | 106.27 | 1.71 | 6.484E-03 | 1099.25 | 56.500 | PBC<MDA | FE59 |
| 1112.07 | 8. | 89.55 | 1.72 | 6.421E-03 | 1112.07 | 13.644 | PBC<MDA | EU152 |
| 1115.55 | 8. | 101.79 | 1.72 | 6.404E-03 | 1115.55 | 50.600 | PBC<MDA | ZN65 |
| 1120.09 | 8. | 112.60 | 1.72 | 6.381E-03 | 1120.29 | 15.100 | PBC<MDA | BI214 |
| | | | | | 1120.55 | 99.987 | 7.375E-01 | Sc46 |
| | | | | | 1121.30 | 34.900 | 2.114E+00 | Ta182 |
| 1120.55 | 8. | 122.63 | 1.72 | 6.380E-03 | 1120.29 | 15.100 | 4.883E+00 | BI214 |
| | | | | | 1120.55 | 99.987 | 7.375E-01 | Sc46 |
| | | | | | 1121.30 | 34.900 | 2.114E+00 | Ta182 |
| 1221.41 | 8. | 95.58 | 1.79 | 5.934E-03 | 1221.41 | 27.000 | PBC<MDA | Ta182 |
| 1238.28 | 21. | 40.98 | 1.80 | 5.866E-03 | 1238.28 | 66.070 | 3.058E+00 | Co56 |
| 1274.53 | 11. | 30.15 | 1.83 | 5.725E-03 | 1274.53 | 99.940 | 1.068E+00 | NA22 |
| | | | | | 1274.54 | 35.190 | 3.033E+00 | EU154 |
| 1408.00 | 4. | 152.39 | 1.91 | 5.264E-03 | 1408.00 | 21.005 | PBC<MDA | EU152 |
| 1461.33 | 191. | 7.24 | 2.34 | 5.103E-03 | 1460.83 | 10.670 | 1.949E+02 | K40 |
| 1764.48 | 7. | 70.80 | 2.11 | 4.351E-03 | 1764.49 | 15.400 | PBC<MDA | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 298.87 | 74.84 | 117. | 158. | 5.005E+03 | 12.56 | 0.813 | - D |
| 308.18 | 77.16 | 124. | 262. | 8.147E+03 | 8.61 | 0.815 | - D |
| 347.59 | 86.98 | 108. | 76. | 2.197E+03 | 27.04 | 0.867 | - M |
| 516.36 | 129.14 | 56. | 45. | 1.275E+03 | 32.43 | 0.559 | - s |
| 669.77 | 167.46 | 38. | 24. | 7.722E+02 | 48.95 | 0.355 | - s |
| 744.41 | 186.11 | 67. | 65. | 2.292E+03 | 25.39 | 0.860 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.69 | 46.54 | 131. | 27. | 0.015 | 73.87 | 0.783s |
| TH-227 | 200.11 | 50.14 | 144. | -19. | -0.011 | 108.92 | 0.787s |
| AM-241 | 237.72 | 59.54 | 182. | 4. | 0.002 | 648.32 | 0.797s |
| TH-234 | 252.74 | 63.29 | 145. | 64. | 0.036 | 33.50 | 0.801 |
| Sn-126 | 256.71 | 64.28 | 263. | -13. | -0.007 | 174.28 | 0.802 |
| BA-133 | 323.61 | 80.99 | 223. | -23. | -0.013 | 115.86 | 0.819s |
| Np-237 | 345.63 | 86.49 | 753. | -24. | -0.013 | 164.10 | 0.825 |
| EU-155 | 345.84 | 86.54 | 607. | 22. | 0.012 | 160.83 | 0.825s |
| Sn-126 | 347.43 | 86.94 | 629. | 5. | 0.003 | 668.46 | 0.825 |
| Sn-126 | 349.95 | 87.57 | 638. | -4. | -0.002 | 625.43 | 0.826 |
| Cd-109 | 351.83 | 88.04 | 634. | 0. | 0.000 | 1000.00 | 0.826s |
| Nd-147 | 364.08 | 91.10 | 634. | 0. | 0.000 | 1000.00 | 0.829s |
| TH-234 | 370.05 | 92.59 | 679. | -42. | -0.023 | 56.43 | 0.831 |
| AC-228 | 371.28 | 92.90 | 125. | 91. | 0.051 | 25.26 | 1.266s |
| Gd-153 | 389.70 | 97.50 | 184. | -4. | -0.002 | 429.47 | 0.836s |
| Np-239 | 397.71 | 99.50 | 210. | -14. | -0.008 | 150.51 | 0.838s |
| Np-239 | 414.52 | 103.70 | 234. | 0. | 0.000 | 1000.00 | 0.842s |
| EU-155 | 420.98 | 105.31 | 195. | -20. | -0.011 | 102.83 | 0.844s |
| Np-239 | 424.25 | 106.13 | 218. | 16. | 0.009 | 134.04 | 0.845s |
| EU-152 | 486.88 | 121.78 | 163. | -18. | -0.010 | 103.04 | 0.861s |
| CO-57 | 488.03 | 122.06 | 174. | 7. | 0.004 | 269.16 | 0.861s |
| EU-154 | 492.18 | 123.10 | 178. | -6. | -0.003 | 335.29 | 0.862s |
| PA-234 | 524.99 | 131.29 | 326. | -11. | -0.006 | 241.21 | 0.871s |
| HF-181 | 531.91 | 133.02 | 315. | 0. | 0.000 | 1000.00 | 0.872s |
| CE-144 | 533.97 | 133.54 | 315. | 0. | 0.000 | 1000.00 | 0.873s |
| HF-181 | 545.02 | 136.30 | 317. | -7. | -0.004 | 345.51 | 0.876s |
| CO-57 | 545.72 | 136.47 | 305. | 10. | 0.006 | 240.90 | 0.876s |
| Tc-99m | 561.88 | 140.51 | 315. | -20. | -0.011 | 125.64 | 0.880 |
| U-235 | 574.99 | 143.79 | 336. | -20. | -0.011 | 129.03 | 0.883s |
| CE-141 | 581.61 | 145.44 | 287. | 19. | 0.010 | 130.07 | 0.885s |
| Ba-140 | 650.54 | 162.66 | 276. | -19. | -0.010 | 126.84 | 0.902s |
| U-235 | 653.42 | 163.38 | 213. | -18. | -0.010 | 118.60 | 0.903s |
| CE-139 | 663.32 | 165.85 | 221. | -9. | -0.005 | 225.95 | 0.905s |
| Cf-251 | 706.34 | 176.60 | 123. | -19. | -0.011 | 104.43 | 0.916s |
| TH-229 | 774.03 | 193.51 | 73. | 29. | 0.016 | 56.34 | 0.933s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| U-235 | 821.35 | 205.33 | 93. | -9. | -0.005 | 187.08 | 0.945s |
| TH-229 | 843.44 | 210.85 | 163. | -23. | -0.013 | 100.45 | 0.950s |
| Cf-251 | 908.08 | 227.00 | 90. | -14. | -0.008 | 123.51 | 0.966s |
| PB-212 | 954.64 | 238.63 | 40. | 380. | 0.211 | 5.65 | 0.978D |
| PB-214 | 968.10 | 242.00 | 55. | 55. | 0.030 | 23.58 | 0.981D |
| EU-152 | 978.89 | 244.69 | 620. | -16. | -0.009 | 220.79 | 0.984s |
| TH-227 | 1025.11 | 256.24 | 48. | 27. | 0.015 | 50.98 | 0.995s |
| Cd-113m | 1054.97 | 263.70 | 60. | 5. | 0.003 | 223.61 | 1.002s |
| BI-210M | 1063.50 | 265.83 | 82. | 2. | 0.001 | 517.69 | 1.005s |
| TL-208 | 1109.33 | 277.28 | 57. | 43. | 0.024 | 29.01 | 1.016s |
| Hg-203 | 1117.00 | 279.20 | 133. | -15. | -0.008 | 111.71 | 1.017 |
| I-131 | 1137.41 | 284.30 | 55. | 2. | 0.001 | 697.32 | 1.022s |
| PB-214 | 1181.01 | 295.19 | 22. | 93. | 0.051 | 13.87 | 1.013s |
| PB-212 | 1200.37 | 300.03 | 49. | 7. | 0.004 | 140.58 | 1.038D |
| PA-231 | 1200.53 | 300.07 | 230. | 12. | 0.007 | 82.10 | 1.038D |
| PA-233 | 1200.97 | 300.18 | 217. | 0. | 0.000 | 1000.00 | 1.038 |
| PA-231 | 1210.86 | 302.65 | 194. | 14. | 0.008 | 142.96 | 1.040 |
| BA-133 | 1211.66 | 302.85 | 208. | 9. | 0.005 | 220.69 | 1.040 |
| Ba-140 | 1219.66 | 304.85 | 217. | 0. | 0.000 | 1000.00 | 1.042s |
| BI-210M | 1219.85 | 304.90 | 217. | 0. | 0.000 | 1000.00 | 1.042s |
| Ir-192 | 1234.03 | 308.44 | 217. | 0. | 0.000 | 1000.00 | 1.046s |
| PA-233 | 1248.32 | 312.01 | 230. | -15. | -0.008 | 144.87 | 1.049s |
| Ir-192 | 1266.25 | 316.49 | 72. | 12. | 0.007 | 102.50 | 1.053s |
| La-140 | 1315.35 | 328.76 | 62. | 4. | 0.002 | 406.20 | 1.065 |
| Cf-249 | 1334.08 | 333.44 | 59. | -2. | -0.001 | 863.25 | 1.070s |
| AC-228 | 1354.02 | 338.42 | 20. | 89. | 0.049 | 14.17 | 1.114 |
| Cs-136 | 1362.62 | 340.57 | 208. | -14. | -0.008 | 153.57 | 1.077s |
| EU-152 | 1377.49 | 344.29 | 195. | -9. | -0.005 | 230.20 | 1.080 |
| HF-181 | 1383.66 | 345.83 | 146. | 11. | 0.006 | 154.49 | 1.082s |
| PB-214 | 1408.92 | 352.14 | 44. | 145. | 0.081 | 12.54 | 1.073 |
| BA-133 | 1424.36 | 356.00 | 239. | -14. | -0.008 | 162.07 | 1.091s |
| I-131 | 1458.32 | 364.48 | 29. | 11. | 0.006 | 99.80 | 1.099s |
| BA-133 | 1535.78 | 383.84 | 117. | -14. | -0.008 | 112.39 | 1.117 |
| Cf-249 | 1552.22 | 387.95 | 131. | -12. | -0.007 | 138.08 | 1.121s |
| SN-113 | 1567.19 | 391.69 | 106. | 12. | 0.007 | 127.19 | 1.125s |
| SB-125 | 1711.99 | 427.88 | 32. | 9. | 0.005 | 127.50 | 1.158s |
| pm-146 | 1816.05 | 453.88 | 32. | 4. | 0.002 | 281.37 | 1.182s |
| SB-125 | 1854.01 | 463.37 | 50. | 11. | 0.006 | 96.28 | 1.191 |
| Ir-192 | 1872.79 | 468.06 | 61. | 7. | 0.004 | 165.26 | 1.195s |
| BE-7 | 1910.94 | 477.59 | 79. | -14. | -0.008 | 94.33 | 1.204s |
| HF-181 | 1928.56 | 482.00 | 70. | 12. | 0.007 | 103.65 | 1.208s |
| La-140 | 1948.65 | 487.02 | 40. | -13. | -0.007 | 96.82 | 1.212s |
| RH-106 | 2048.06 | 511.86 | 60. | 53. | 0.029 | 39.71 | 2.485s |
| Nd-147 | 2124.62 | 531.00 | 24. | 1. | 0.001 | 964.37 | 1.252s |
| Ba-140 | 2149.67 | 537.26 | 16. | 8. | 0.004 | 104.08 | 1.258s |
| CS-134 | 2253.60 | 563.24 | 40. | -9. | -0.005 | 141.57 | 1.280 |
| CS-134 | 2277.94 | 569.32 | 33. | -3. | -0.002 | 251.00 | 1.286s |
| BI-207 | 2279.47 | 569.70 | 24. | 10. | 0.006 | 75.50 | 1.286s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| TL-208 | 2334.47 | 583.45 | 10. | 112. | 0.062 | 10.83 | 1.644s |
| SB-125 | 2402.69 | 600.50 | 192. | 10. | 0.006 | 194.71 | 1.313s |
| SB-124 | 2411.61 | 602.73 | 203. | 10. | 0.006 | 199.39 | 1.315s |
| BI-214 | 2438.92 | 609.56 | 8. | 100. | 0.056 | 11.37 | 1.504 |
| RU-103 | 2441.89 | 610.30 | 160. | 2. | 0.001 | 927.55 | 1.322s |
| AG-108M | 2457.82 | 614.28 | 162. | 0. | 0.000 | 1000.00 | 1.325s |
| PM-144 | 2472.94 | 618.06 | 162. | 0. | 0.000 | 1000.00 | 1.328 |
| RH-106 | 2488.37 | 621.92 | 175. | -11. | -0.006 | 167.62 | 1.332s |
| AG-110M | 2631.76 | 657.76 | 48. | -3. | -0.002 | 350.28 | 1.362s |
| CS-137 | 2647.36 | 661.66 | 71. | -15. | -0.008 | 83.54 | 1.366s |
| PM-144 | 2786.90 | 696.54 | 52. | -11. | -0.006 | 137.17 | 1.395s |
| NB-94 | 2811.25 | 702.63 | 26. | -5. | -0.003 | 212.92 | 1.400s |
| SB-124 | 2891.88 | 722.79 | 56. | 3. | 0.002 | 321.25 | 1.417s |
| AG-108M | 2892.48 | 722.94 | 59. | 0. | 0.000 | 1000.00 | 1.417s |
| EU-154 | 2894.16 | 723.36 | 59. | 0. | 0.000 | 1000.00 | 1.418s |
| ZR-95 | 2897.53 | 724.20 | 66. | -8. | -0.005 | 145.14 | 1.418s |
| BI-212 | 2909.41 | 727.17 | 48. | 12. | 0.007 | 85.81 | 1.421s |
| pm-146 | 2943.61 | 735.72 | 13. | 2. | 0.001 | 374.72 | 1.428s |
| pm-146 | 2989.37 | 747.16 | 17. | 6. | 0.003 | 155.74 | 1.437s |
| ZR-95 | 3027.65 | 756.73 | 26. | -5. | -0.003 | 212.92 | 1.445 |
| AG-110M | 3056.50 | 763.94 | 30. | -8. | -0.005 | 99.68 | 1.451s |
| NB-95 | 3063.89 | 765.79 | 63. | -9. | -0.005 | 134.23 | 1.453s |
| PA-234M | 3066.38 | 766.41 | 87. | -10. | -0.006 | 135.65 | 1.453s |
| EU-152 | 3116.41 | 778.92 | 19. | 2. | 0.001 | 398.21 | 1.463s |
| BI-212 | 3142.41 | 785.42 | 9. | 7. | 0.004 | 97.18 | 1.468s |
| CO-58 | 3243.82 | 810.78 | 29. | 9. | 0.005 | 91.27 | 1.489s |
| La-140 | 3263.80 | 815.77 | 34. | 6. | 0.003 | 155.93 | 1.493s |
| Cs-136 | 3274.72 | 818.50 | 44. | 1. | 0.001 | 943.40 | 1.495s |
| MN-54 | 3340.10 | 834.85 | 9. | 7. | 0.004 | 94.80 | 1.508s |
| Co-56 | 3387.78 | 846.77 | 23. | -8. | -0.005 | 127.75 | 1.518s |
| TL-208 | 3442.95 | 860.56 | 23. | 12. | 0.007 | 90.99 | 1.529s |
| NB-94 | 3485.08 | 871.10 | 0. | 16. | 0.009 | 25.00 | 1.537s |
| EU-154 | 3493.61 | 873.23 | 16. | 0. | 0.000 | 1000.00 | 1.539s |
| PA-234 | 3522.80 | 880.53 | 10. | 5. | 0.003 | 93.32 | 1.544s |
| PA-234 | 3533.64 | 883.24 | 16. | 5. | 0.003 | 113.15 | 1.547s |
| AG-110M | 3539.41 | 884.68 | 21. | 5. | 0.003 | 128.47 | 1.547s |
| Sc-46 | 3557.79 | 889.28 | 48. | -9. | -0.005 | 109.62 | 1.551s |
| y-88 | 3592.83 | 898.04 | 19. | 7. | 0.004 | 130.32 | 1.558s |
| AC-228 | 3647.21 | 911.64 | 0. | 77. | 0.043 | 11.40 | 1.292 |
| AG-110M | 3750.60 | 937.49 | 23. | -5. | -0.003 | 196.95 | 1.589s |
| EU-152 | 3857.05 | 964.11 | 56. | 6. | 0.003 | 193.12 | 1.609s |
| AC-228 | 3876.71 | 969.03 | 3. | 48. | 0.027 | 16.14 | 1.487 |
| PA-234M | 4004.55 | 1001.00 | 21. | 0. | 0.000 | 1000.00 | 1.636s |
| EU-154 | 4019.65 | 1004.77 | 15. | 1. | 0.001 | 424.26 | 1.639s |
| Co-56 | 4151.87 | 1037.84 | 5. | 15. | 0.008 | 41.72 | 1.664s |
| Cs-136 | 4192.77 | 1048.07 | 20. | -3. | -0.002 | 218.58 | 1.671s |
| RH-106 | 4201.93 | 1050.36 | 22. | 8. | 0.004 | 96.61 | 1.673s |
| BI-207 | 4255.11 | 1063.66 | 25. | -2. | -0.001 | 554.15 | 1.682s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Ga-68 | 4310.04 | 1077.40 | 15. | 5. | 0.003 | 176.07 | 1.692s |
| FE-59 | 4397.41 | 1099.25 | 10. | 7. | 0.004 | 106.27 | 1.708 |
| EU-152 | 4448.68 | 1112.07 | 24. | 8. | 0.005 | 89.55 | 1.717s |
| ZN-65 | 4462.56 | 1115.55 | 33. | 8. | 0.005 | 101.79 | 1.720s |
| BI-214 | 4481.51 | 1120.29 | 41. | 8. | 0.005 | 112.60 | 1.723s |
| Sc-46 | 4482.57 | 1120.55 | 50. | 8. | 0.005 | 122.63 | 1.723s |
| Ta-182 | 4485.56 | 1121.30 | 78. | -12. | -0.007 | 108.50 | 1.724s |
| CO-60 | 4693.21 | 1173.24 | 30. | -3. | -0.002 | 405.52 | 1.760s |
| Ta-182 | 4756.42 | 1189.05 | 20. | -2. | -0.001 | 496.66 | 1.771s |
| Ta-182 | 4885.79 | 1221.41 | 11. | 8. | 0.005 | 95.58 | 1.793 |
| Co-56 | 4953.23 | 1238.28 | 11. | 21. | 0.012 | 40.98 | 1.804s |
| NA-22 | 5098.13 | 1274.53 | 0. | 11. | 0.006 | 30.15 | 1.828s |
| EU-154 | 5098.19 | 1274.54 | 11. | 0. | 0.000 | 1000.00 | 1.828s |
| FE-59 | 5166.35 | 1291.60 | 16. | -2. | -0.001 | 460.07 | 1.840s |
| CO-60 | 5329.85 | 1332.50 | 11. | -3. | -0.001 | 285.04 | 1.866s |
| EU-152 | 5631.62 | 1408.00 | 5. | 4. | 0.002 | 152.39 | 1.914s |
| K-40 | 5844.73 | 1461.33 | 0. | 191. | 0.106 | 7.24 | 2.335s |
| La-140 | 6383.73 | 1596.21 | 17. | -5. | -0.003 | 198.49 | 2.024s |
| SB-124 | 6762.39 | 1690.98 | 11. | -4. | -0.002 | 188.42 | 2.076s |
| BI-214 | 7056.06 | 1764.49 | 10. | 7. | 0.004 | 70.80 | 2.114s |
| Co-56 | 7083.46 | 1771.35 | 7. | 0. | 0.000 | 1000.00 | 2.117s |
| y-88 | 7341.96 | 1836.06 | 0. | 0. | 0.000 | 1000.00 | 2.149s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | -5.6274E+00 | | | | 5.31E+01 | |
| | | | 477.60 | -5.627E+00 | ?( | 1.787E+01 9.43E+01 1.05E+01 | G |
| NA-22 | C | 1.0681E+00 | | | | 9.50E+02 | |
| | | | 1274.53 | 1.068E+00 | ?( | 7.156E-01 3.02E+01 9.99E+01 | G |
| K-40 | N | 1.9487E+02 | | | | 4.66E+11 | |
| | | | 1460.83 | 1.949E+02 | ( | 7.519E+00 7.24E+00 1.07E+01 | G |
| Sc-46 | F | 3.3849E-02 | | | | 8.38E+01 | |
| | | | 889.28 | -6.699E-01 | ?( | 2.504E+00 1.10E+02 1.00E+02 | G |
| | | | 1120.55 | 7.375E-01 | ?( | 3.097E+00 1.23E+02 1.00E+02 | G |
| CR-51 | F | 4.5080E-03 | | | | 2.77E+01 | |
| | | | 320.08 | 4.508E-03 | %( | 1.365E+01 8.63E+04 9.94E+00 | G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| MN-54 | C | 5.0440E-01 | | | | | 3.12E+02 | |
| | | | 834.85 | 5.044E-01 | ?( | 1.153E+00 | 9.48E+01 | 1.00E+02 G |
| FE-59 | F | 1.0616E+00 | | | | | 4.45E+01 | |
| | | | 1099.25 | 1.062E+00 | ?( | 2.646E+00 | 1.06E+02 | 5.65E+01 G |
| | | | 1291.60 | -4.543E-01 | & | 4.850E+00 | 4.60E+02 | 4.32E+01 G |
| Co-56 | C | 1.4832E+00 | | | | | 7.73E+01 | |
| | | | 846.77 | -5.739E-01 | ?( | 1.737E+00 | 1.28E+02 | 9.99E+01 G |
| | | | 1238.28 | 3.058E+00 | &( | 2.570E+00 | 4.10E+01 | 6.61E+01 G |
| | | | 1037.84 | 8.667E+00 | &( | 7.587E+00 | 4.17E+01 | 1.41E+01 G |
| | | | 1771.35 | 0.000E+00 | - | 1.269E+01 | 1.00E+03 | 1.55E+01 A |
| CO-57 | C | 2.8526E-01 | | | | | 2.72E+02 | |
| | | | 122.06 | 1.268E-01 | ?( | 1.163E+00 | 2.69E+02 | 8.56E+01 G |
| | | | 136.47 | 1.555E+00 | ?( | 1.265E+01 | 2.41E+02 | 1.07E+01 G |
| CO-58 | C | 5.9825E-01 | | | | | 7.09E+01 | |
| | | | 810.78 | 5.982E-01 | &( | 1.855E+00 | 9.13E+01 | 9.95E+01 G |
| CO-60 | F | -2.6871E-01 | | | | | 1.93E+03 | |
| | | | 1332.50 | -2.687E-01 | ?( | 1.807E+00 | 2.85E+02 | 1.00E+02 G |
| | | | 1173.24 | -2.718E-01 | & | 2.558E+00 | 4.06E+02 | 9.99E+01 G |
| ZN-65 | F | 1.4489E+00 | | | | | 2.44E+02 | |
| | | | 1115.55 | 1.449E+00 | ?( | 5.038E+00 | 1.02E+02 | 5.06E+01 G |
| NB-94 | I | 4.2133E-01 | | | | | 7.41E+06 | |
| | | | 702.63 | -3.006E-01 | ?( | 1.592E+00 | 2.13E+02 | 9.79E+01 G |
| | | | 871.10 | 1.129E+00 | ?( | 5.200E-01 | 2.50E+01 | 9.99E+01 G |
| ZR-95 | I | -5.7507E-01 | | | | | 6.40E+01 | |
| | | | 756.73 | -5.751E-01 | ?( | 3.045E+00 | 2.13E+02 | 5.45E+01 G |
| | | | 724.20 | -1.117E+00 | + | 5.554E+00 | 1.45E+02 | 4.42E+01 G |
| NB-95 | I | -5.4945E-01 | | | | | 6.40E+01 | |
| | | | 765.79 | -5.494E-01 | ?( | 2.523E+00 | 1.34E+02 | 9.98E+01 G |
| RU-103 | I | -4.8494E-02 | | | | | 3.93E+01 | |
| | | | 497.05 | -4.849E-02 | %( | 1.487E+00 | 1.18E+03 | 9.09E+01 G |
| | | | 610.30 | 1.761E+00 | ? | 5.611E+01 | 9.28E+02 | 5.75E+00 GA |
| RH-106 | I | 1.3696E-01 | | | | | 3.74E+02 | |
| | | | 621.92 | -6.070E+00 | ?( | 3.445E+01 | 1.68E+02 | 9.93E+00 G |
| | | | 1050.36 | 3.965E+01 | ?( | 1.312E+02 | 9.66E+01 | 1.56E+00 G |
| | | | 511.86 | 1.197E+01 | | 8.765E+00 | 3.97E+01 | 2.00E+01 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| AG-108M | C | -4.3504E-02 | | | | | 1.53E+05 | |
| | | | 433.94 | -4.350E-02 | %( | 1.463E+00 | 1.30E+03 | 9.05E+01 G |
| | | | 722.94 | 0.000E+00 | + | 2.555E+00 | 1.00E+03 | 9.08E+01 G |
| | | | 614.28 | 0.000E+00 | + | 3.631E+00 | 1.00E+03 | 8.98E+01 G |
| AG-110M | F | 5.2846E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | 5.285E-01 | &( | 2.374E+00 | 1.28E+02 | 7.27E+01 G |
| | | | 657.76 | -1.668E-01 | - | 2.056E+00 | 3.50E+02 | 9.46E+01 G |
| | | | 937.49 | -1.164E+00 | & | 5.502E+00 | 1.97E+02 | 3.44E+01 G |
| | | | 1384.30 | -1.428E-01 | % | 5.770E+00 | 1.58E+03 | 2.43E+01 G |
| | | | 763.94 | -2.361E+00 | + | 8.041E+00 | 9.97E+01 | 2.23E+01 G |
| SN-113 | F | 6.6269E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | 6.627E-01 | &( | 2.856E+00 | 1.27E+02 | 6.40E+01 G |
| SB-124 | F | 6.6962E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | 5.388E-01 | ?( | 3.639E+00 | 1.99E+02 | 9.83E+01 G |
| | | | 1690.98 | -1.117E+00 | + | 4.742E+00 | 1.88E+02 | 4.78E+01 G |
| | | | 722.79 | 1.859E+00 | ?( | 2.090E+01 | 3.21E+02 | 1.08E+01 G |
| SB-125 | I | 2.3005E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | 1.183E+00 | ?( | 3.821E+00 | 1.27E+02 | 2.96E+01 G |
| | | | 600.50 | 2.951E+00 | ?( | 1.947E+01 | 1.95E+02 | 1.79E+01 G |
| | | | 635.89 | -3.192E-01 | % | 1.443E+01 | 1.25E+03 | 1.13E+01 G |
| | | | 463.37 | 4.351E+00 | ?( | 1.418E+01 | 9.63E+01 | 1.05E+01 G |
| I-131 | I | 4.7648E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | 4.445E-01 | ?( | 1.165E+00 | 9.98E+01 | 8.17E+01 G |
| | | | 284.30 | 9.022E-01 | &( | 1.681E+01 | 6.97E+02 | 6.14E+00 G |
| | | | 636.97 | -5.042E-01 | % | 2.167E+01 | 1.71E+03 | 7.17E+00 G |
| Gd-153 | F | -2.3295E-01 | | | | | 2.42E+02 | |
| | | | 97.50 | -2.330E-01 | ?( | 3.417E+00 | 4.29E+02 | 3.00E+01 G |
| | | | 103.20 | -2.352E-02 | % | 5.214E+00 | 6.48E+03 | 2.18E+01 G |
| Ga-68 | C | 1.4943E+01 | | | | | 4.71E-02 | |
| | | | 1077.40 | 1.494E+01 | ?( | 6.204E+01 | 1.76E+02 | 3.30E+00 G |
| Tc-99m | I | -3.8171E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | -3.817E-01 | ?( | 1.606E+00 | 1.26E+02 | 8.93E+01 G |
| BA-133 | F | -2.2916E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -7.361E-01 | ?( | 4.022E+00 | 1.62E+02 | 6.20E+01 G |
| | | | 302.85 | 1.487E+00 | ?( | 1.112E+01 | 2.21E+02 | 1.83E+01 G |
| | | | 383.84 | -5.570E+00 | + | 2.112E+01 | 1.12E+02 | 8.94E+00 GA |
| | | | 80.99 | -1.146E+00 | + | 3.554E+00 | 1.16E+02 | 3.41E+01 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| CS-134 | I | 3.4686E-03 | | | | | 7.54E+02 | |
| | | | 604.71 | 3.469E-03 | %( | 3.761E+00 | 3.16E+04 | 9.76E+01 G |
| | | | 795.87 | 7.639E-02 | % | 2.091E+00 | 1.13E+03 | 8.55E+01 G |
| | | | 569.32 | -1.070E+00 | + | 9.506E+00 | 2.51E+02 | 1.54E+01 G |
| | | | 801.95 | -5.045E-01 | % | 1.729E+01 | 1.38E+03 | 8.69E+00 G |
| | | | 563.24 | -5.274E+00 | & | 1.886E+01 | 1.42E+02 | 8.35E+00 G |
| CS-137 | I | -9.8639E-01 | | | | | 1.10E+04 | |
| | | | 661.66 | -9.864E-01 | ?( | 2.761E+00 | 8.35E+01 | 8.52E+01 G |
| CE-139 | F | -2.0850E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | -2.085E-01 | &( | 1.596E+00 | 2.26E+02 | 7.99E+01 G |
| Ba-140 | I | 1.5429E+00 | | | | | 1.28E+01 | |
| | | | 537.26 | 1.543E+00 | ( | 4.118E+00 | 1.04E+02 | 2.44E+01 G |
| | | | 162.66 | -5.405E+00 | + | 2.299E+01 | 1.27E+02 | 6.22E+00 G |
| | | | 304.85 | 0.000E+00 | - | 4.881E+01 | 1.00E+03 | 4.29E+00 G |
| La-140 | I | -7.3994E-02 | | | | | 1.28E+01 | |
| | | | 1596.21 | -6.149E-01 | ?( | 2.696E+00 | 1.98E+02 | 9.54E+01 G |
| | | | 487.02 | -1.270E+00 | + | 3.065E+00 | 9.68E+01 | 4.55E+01 G |
| | | | 328.76 | 5.644E-01 | &( | 6.080E+00 | 4.06E+02 | 2.03E+01 G |
| | | | 815.77 | 1.586E+00 | ?( | 8.616E+00 | 1.56E+02 | 2.33E+01 G |
| CE-141 | I | 6.4423E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | 6.442E-01 | ?( | 2.811E+00 | 1.30E+02 | 4.82E+01 G |
| PM-144 | C | -6.4931E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | -6.493E-01 | ?( | 2.144E+00 | 1.37E+02 | 9.90E+01 G |
| | | | 618.06 | 0.000E+00 | & | 3.309E+00 | 1.00E+03 | 9.91E+01 G |
| EU-152 | F | 1.5182E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | -1.062E+00 | ( | 8.298E+00 | 2.30E+02 | 2.65E+01 G |
| | | | 1112.07 | 5.352E+00 | ?( | 1.630E+01 | 8.95E+01 | 1.36E+01 G |
| | | | 121.78 | -9.764E-01 | + | 3.374E+00 | 1.03E+02 | 2.86E+01 G |
| | | | 778.92 | 1.157E+00 | ?( | 1.133E+01 | 3.98E+02 | 1.29E+01 G |
| | | | 964.11 | 2.938E+00 | ( | 1.967E+01 | 1.93E+02 | 1.46E+01 G |
| | | | 244.69 | -5.179E+00 | + | 3.831E+01 | 2.21E+02 | 7.58E+00 G |
| | | | 1408.00 | 1.842E+00 | ? | 6.769E+00 | 1.52E+02 | 2.10E+01 GA |
| EU-154 | I | 1.2363E-01 | | | | | 3.14E+03 | |
| | | | 873.23 | 0.000E+00 | &( | 1.229E+01 | 1.00E+03 | 1.23E+01 G |
| | | | 123.10 | -2.159E-01 | & | 2.469E+00 | 3.35E+02 | 4.08E+01 G |
| | | | 1274.54 | 0.000E+00 | ?( | 5.010E+00 | 1.00E+03 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | ?( | 1.149E+01 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | 5.882E-01 | ?( | 9.246E+00 | 4.24E+02 | 1.80E+01 G |
| | | | 996.33 | -2.481E-01 | % | 1.766E+01 | 1.92E+03 | 1.06E+01 G |

| Nuclide | | Ave activity | Energy | | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|---|
| EU-155 | I | -1.4266E+00 | | | | | | 1.81E+03 | |
| | | | 105.31 | -1.427E+00 | &( | 4.913E+00 | 1.03E+02 | 2.12E+01 | G |
| | | | 86.54 | 1.151E+00 | + | 6.189E+00 | 1.61E+02 | 3.07E+01 | G |
| HF-181 | F | 9.1894E-01 | | | | | | 4.24E+01 | |
| | | | 482.00 | 6.341E-01 | ?( | 2.224E+00 | 1.04E+02 | 8.05E+01 | G |
| | | | 133.02 | 0.000E+00 | - | 3.138E+00 | 1.00E+03 | 4.33E+01 | G |
| | | | 345.83 | 2.440E+00 | ?( | 1.278E+01 | 1.54E+02 | 1.51E+01 | G |
| | | | 136.30 | -2.014E+00 | + | 2.354E+01 | 3.46E+02 | 5.85E+00 | G |
| Ta-182 | F | -4.2580E-01 | | | | | | 1.14E+02 | |
| | | | 1121.30 | -2.991E+00 | &( | 1.098E+01 | 1.09E+02 | 3.49E+01 | G |
| | | | 1221.41 | 2.890E+00 | ( | 6.217E+00 | 9.56E+01 | 2.70E+01 | G |
| | | | 1189.05 | -1.130E+00 | + | 1.331E+01 | 4.97E+02 | 1.62E+01 | G |
| Hg-203 | F | -5.0292E-01 | | | | | | 4.66E+01 | |
| | | | 279.20 | -5.029E-01 | ( | 1.892E+00 | 1.12E+02 | 8.15E+01 | G |
| TL-208 | N | 6.6748E+00 | | | | | | 6.98E+02 | |
| | | | 583.02 | 6.675E+00 | ( | 1.040E+00 | 1.08E+01 | 8.45E+01 | G |
| | | | 277.28 | 1.856E+01 | + | 1.627E+01 | 2.90E+01 | 6.31E+00 | G |
| | | | 860.56 | 6.674E+00 | ?( | 1.417E+01 | 9.10E+01 | 1.24E+01 | G |
| pm-146 | C | 5.2427E-01 | | | | | | 2.02E+03 | |
| | | | 747.16 | 1.033E+00 | &( | 4.030E+00 | 1.56E+02 | 3.40E+01 | G |
| | | | 735.72 | 5.438E-01 | ?( | 5.305E+00 | 3.75E+02 | 2.25E+01 | G |
| | | | 453.88 | 2.515E-01 | ?( | 1.828E+00 | 2.81E+02 | 6.50E+01 | G |
| y-88 | F | 5.6588E-01 | | | | | | 1.07E+02 | |
| | | | 898.04 | 5.659E-01 | &( | 1.763E+00 | 1.30E+02 | 9.37E+01 | G |
| | | | 1836.06 | 0.000E+00 | - | 9.809E-01 | 1.00E+03 | 9.92E+01 | G |
| Cd-113m | | 2.1684E+03 | | | | | | 5.33E+03 | |
| | | | 263.70 | 2.168E+03 | ( | 1.683E+04 | 2.24E+02 | 6.00E-03 | K |
| Cf-251 | T | -2.1299E+00 | | | | | | 3.28E+05 | |
| | | | 176.60 | -2.130E+00 | ?( | 5.983E+00 | 1.04E+02 | 1.70E+01 | G |
| | | | 227.00 | -5.107E+00 | + | 1.712E+01 | 1.24E+02 | 6.30E+00 | GA |
| Cf-249 | T | -6.5131E-01 | | | | | | 1.28E+05 | |
| | | | 387.95 | -6.513E-01 | ?( | 3.045E+00 | 1.38E+02 | 6.60E+01 | G |
| | | | 333.44 | -3.397E-01 | + | 7.828E+00 | 8.63E+02 | 1.55E+01 | G |
| Sn-126 | | -2.7702E+00 | | | | | | 3.65E+07 | |
| | | | 87.57 | -1.564E-01 | + P | 5.164E+00 | 6.25E+02 | 3.75E+01 | GA |
| | | | 64.28 | -2.770E+00 | ( | 1.627E+01 | 1.74E+02 | 9.70E+00 | G |
| | | | 86.94 | 9.488E-01 | + | 2.134E+01 | 6.68E+02 | 9.04E+00 | GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| PB-210 | N | 1.9516E+01 | | | | | 8.14E+03 | |
| | | | 46.54 | 1.952E+01 | *(P | 4.102E+01 | 7.39E+01 | 4.25E+00 G |
| PB-212 | N | 2.1044E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 2.104E+01 | (P | 1.790E+00 | 5.65E+00 | 4.33E+01 G |
| | | | 300.03 | 5.999E+00 | } | 3.120E+01 | 1.41E+02 | 3.28E+00 GA |
| PB-214 | N | 1.3085E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.277E+01 | (P | 2.952E+00 | 1.25E+01 | 3.76E+01 G |
| | | | 295.09 | 1.371E+01 | *(P | 3.665E+00 | 1.39E+01 | 1.93E+01 G |
| | | | 242.00 | 1.779E+01 | + | 1.220E+01 | 2.36E+01 | 7.43E+00 GA |
| BI-207 | C | 5.0536E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | 5.054E-01 | &( | 1.279E+00 | 7.55E+01 | 9.77E+01 G |
| | | | 1063.66 | -2.238E-01 | - | 2.910E+00 | 5.54E+02 | 7.45E+01 G |
| BI-212 | N | 9.7076E+00 | | | | | 6.98E+02 | |
| | | | 727.17 | 9.708E+00 | ?( | 2.804E+01 | 8.58E+01 | 7.55E+00 G |
| | | | 785.42 | 3.645E+01 | & | 8.555E+01 | 9.72E+01 | 1.28E+00 GA |
| BI-214 | N | 1.1337E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.134E+01 | ( | 1.801E+00 | 1.14E+01 | 4.61E+01 G |
| | | | 1120.29 | 4.882E+00 | - | 1.881E+01 | 1.13E+02 | 1.51E+01 G |
| | | | 1764.49 | 6.085E+00 | - | 1.436E+01 | 7.08E+01 | 1.54E+01 G |
| BI-210M | T | 1.3098E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | 1.310E-01 | ?( | 2.359E+00 | 5.18E+02 | 5.00E+01 G |
| | | | 304.90 | 0.000E+00 | - | 7.480E+00 | 1.00E+03 | 2.80E+01 G |
| AC-228 | N | 2.0835E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 1.943E+01 | ( | 1.860E+00 | 1.14E+01 | 2.90E+01 G |
| | | | 968.97 | 2.119E+01 | ( | 4.759E+00 | 1.61E+01 | 1.75E+01 G |
| | | | 338.32 | 2.371E+01 | ( | 6.275E+00 | 1.42E+01 | 1.20E+01 G |
| | | | 93.35 | 2.571E+01 | * | 1.548E+01 | 2.53E+01 | 5.56E+00 XA |
| TH-227 | N | 1.1373E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | -6.549E+00 | ?( | 2.024E+01 | 1.09E+02 | 8.00E+00 G |
| | | | 256.24 | 9.922E+00 | ?( | 1.266E+01 | 5.10E+01 | 7.00E+00 G |
| TH-229 | N | 1.3122E+01 | | | | | 2.68E+06 | |
| | | | 193.51 | 1.312E+01 | &( | 1.951E+01 | 5.63E+01 | 4.40E+00 G |
| | | | 210.85 | -1.673E+01 | - | 4.503E+01 | 1.00E+02 | 2.99E+00 G |
| TH-234 | N | 3.4532E+01 | | | | | 1.63E+12 | |
| | | | 63.29 | 3.453E+01 | (P | 3.160E+01 | 3.35E+01 | 3.81E+00 G |
| | | | 92.59 | -1.183E+01 | - P | 3.503E+01 | 5.64E+01 | 5.58E+00 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

PA-231   N   1.4193E+01                                     1.20E+07
                         302.65 1.419E+01 ?(  6.843E+01 1.43E+02 2.88E+00 G
                         300.07 1.419E+01 }   8.641E+01 8.21E+01 2.46E+00 G

PA-233   C  -1.2503E+00                                     7.82E+08
                         312.01-1.250E+00 *(  6.099E+00 1.45E+02 3.60E+01 G
                         300.18 0.000E+00 +   3.335E+01 1.00E+03 6.20E+00 G

PA-234   N   7.7696E-01                                     1.63E+12
                         131.29-9.382E-01 ?(  7.635E+00 2.41E+02 1.80E+01 G
                         946.02-3.758E-01 %   1.288E+01 1.38E+03 1.34E+01 G
                         569.47 4.015E-01 &   1.893E+01 1.31E+03 8.20E+00 G
                         883.24 3.993E+00 ?(  1.578E+01 1.13E+02 9.60E+00 G
                         880.53 6.495E+00 &   2.097E+01 9.33E+01 6.00E+00 GA

U-235    N  -3.0645E+00                                     2.57E+11
                         143.79-3.064E+00 &(  1.324E+01 1.29E+02 1.10E+01 G
                         205.33-3.941E+00 +   2.015E+01 1.87E+02 5.01E+00 G
                         163.38-6.264E+00 +   2.494E+01 1.19E+02 5.08E+00 G

AM-241   T   2.1380E-01                                     1.58E+05
                          59.54 2.138E-01 *(P 4.001E+00 6.48E+02 3.59E+01 G

Np-237   F  -2.9429E+00                                     2.14E+06
                          86.49-2.943E+00  (  1.612E+01 1.64E+02 1.31E+01 G

Ir-192   F   4.7279E-01                                     7.40E+01
                         316.49 4.227E-01 ?(  1.465E+00 1.03E+02 8.70E+01 G
                         468.06 5.571E-01 &(  3.171E+00 1.65E+02 5.18E+01 G
                         308.44 0.000E+00 &   6.660E+00 1.00E+03 3.18E+01 G

Cs-136   F   6.6896E-02                                     1.30E+01
                         818.50 6.690E-02 ?(  2.249E+00 9.43E+02 1.00E+02 G
                        1048.07-3.087E-01 &   2.423E+00 2.19E+02 8.00E+01 G
                         340.57-9.262E-01 +   4.799E+00 1.54E+02 4.69E+01 G

Np-239   T   1.0727E+00                                     2.36E+00
                         103.70 0.000E+00 -   4.738E+00 1.00E+03 2.40E+01 X
                         106.13 1.073E+00 ?(  4.837E+00 1.34E+02 2.27E+01 G
                          99.50-1.427E+00 +   7.241E+00 1.51E+02 1.50E+01 X

Nd-147       3.5831E-01                                     1.11E+01
                         531.00 3.583E-01 &(  9.151E+00 9.64E+02 1.30E+01 G
                          91.10 0.000E+00 -   6.718E+00 1.00E+03 2.83E+01 G
   ( - This peak used in the nuclide activity average.
```

```
  * - Peak is too wide, but only one peak in library.
  ! - Peak is part of a multiplet and this area went
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                        Peak Codes:
  T - Thermal Neutron Activation        G - Gamma Ray
  F - Fast Neutron Activation           X - X-Ray
  I - Fission Product                   P - Positron Decay
  N - Naturally Occurring Isotope       S - Single-Escape
  P - Photon Reaction                   D - Double-Escape
  C - Charged Particle Reaction         K - Key Line
  M - No MDA Calculation                A - Not in Average
  R - Coincidence Corrected             C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity | |
|---|---|---|---|---|---|---|---|
| PB-210 | 46.54 | 131. | 27. | 0.015 | 73.87 | 1.952E+01 | P |
| TH-227 | 50.14 | 144. | -19. | -0.011 | 108.92 | -6.549E+00 | |
| AM-241 | 59.54 | 182. | 4. | 0.002 | 648.32 | 2.138E-01 | P |
| BA-133 | 80.99 | 223. | -23. | -0.013 | 115.86 | -1.146E+00 | |
| Np-237 | 86.49 | 753. | -24. | -0.013 | 164.10 | -2.943E+00 | |
| EU-155 | 86.54 | 607. | 22. | 0.012 | 160.83 | 1.151E+00 | |
| Gd-153 | 97.50 | 184. | -4. | -0.002 | 429.47 | -2.330E-01 | |
| Np-239 | 99.50 | 210. | -14. | -0.008 | 150.51 | -1.427E+00 | |
| EU-155 | 105.31 | 195. | -20. | -0.011 | 102.83 | -1.427E+00 | |
| Np-239 | 106.13 | 218. | 16. | 0.009 | 134.04 | 1.073E+00 | |
| EU-152 | 121.78 | 163. | -18. | -0.010 | 103.04 | -9.764E-01 | |
| EU-154 | 123.10 | 178. | -6. | -0.003 | 335.29 | -2.159E-01 | |
| PA-234 | 131.29 | 326. | -11. | -0.006 | 241.21 | -9.382E-01 | |
| HF-181 | 136.30 | 317. | -7. | -0.004 | 345.51 | -2.014E+00 | |
| Tc-99m | 140.51 | 315. | -20. | -0.011 | 125.64 | -3.817E-01 | |
| U-235 | 143.79 | 336. | -20. | -0.011 | 129.03 | -3.064E+00 | |
| CE-141 | 145.44 | 287. | 19. | 0.010 | 130.07 | 6.442E-01 | |
| Ba-140 | 162.66 | 276. | -19. | -0.010 | 126.84 | -5.405E+00 | |
| U-235 | 163.38 | 213. | -18. | -0.010 | 118.60 | -6.264E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CE-139 | 165.85 | 221. | -9. | -0.005 | 225.95 | -2.085E-01 | |
| Cf-251 | 176.60 | 123. | -19. | -0.011 | 104.43 | -2.130E+00 | |
| TH-229 | 193.51 | 73. | 29. | 0.016 | 56.34 | 1.312E+01 | |
| U-235 | 205.33 | 93. | -9. | -0.005 | 187.08 | -3.941E+00 | |
| TH-229 | 210.85 | 163. | -23. | -0.013 | 100.45 | -1.673E+01 | |
| Cf-251 | 227.00 | 90. | -14. | -0.008 | 123.51 | -5.107E+00 | |
| EU-152 | 244.69 | 620. | -16. | -0.009 | 220.79 | -5.179E+00 | |
| TH-227 | 256.24 | 48. | 27. | 0.015 | 50.98 | 9.922E+00 | |
| Cd-113m | 263.70 | 60. | 5. | 0.003 | 223.61 | 2.168E+03 | |
| BI-210M | 265.83 | 82. | 2. | 0.001 | 517.69 | 1.310E-01 | |
| Hg-203 | 279.20 | 133. | -15. | -0.008 | 111.71 | -5.029E-01 | |
| I-131 | 284.30 | 55. | 2. | 0.001 | 697.32 | 9.022E-01 | |
| BA-133 | 302.85 | 208. | 9. | 0.005 | 220.69 | 1.487E+00 | |
| PA-233 | 312.01 | 230. | -15. | -0.008 | 144.87 | -1.250E+00 | |
| Ir-192 | 316.49 | 72. | 12. | 0.007 | 102.50 | 4.227E-01 | |
| La-140 | 328.76 | 62. | 4. | 0.002 | 406.20 | 5.644E-01 | |
| Cf-249 | 333.44 | 59. | -2. | -0.001 | 863.25 | -3.397E-01 | |
| Cs-136 | 340.57 | 208. | -14. | -0.008 | 153.57 | -9.262E-01 | |
| EU-152 | 344.29 | 195. | -9. | -0.005 | 230.20 | -1.062E+00 | |
| HF-181 | 345.83 | 146. | 11. | 0.006 | 154.49 | 2.440E+00 | |
| BA-133 | 356.00 | 239. | -14. | -0.008 | 162.07 | -7.361E-01 | |
| I-131 | 364.48 | 29. | 11. | 0.006 | 99.80 | 4.445E-01 | |
| BA-133 | 383.84 | 117. | -14. | -0.008 | 112.39 | -5.570E+00 | |
| Cf-249 | 387.95 | 131. | -12. | -0.007 | 138.08 | -6.513E-01 | |
| SN-113 | 391.69 | 106. | 12. | 0.007 | 127.19 | 6.627E-01 | |
| SB-125 | 427.88 | 32. | 9. | 0.005 | 127.50 | 1.183E+00 | |
| pm-146 | 453.88 | 32. | 4. | 0.002 | 281.37 | 2.515E-01 | |
| SB-125 | 463.37 | 50. | 11. | 0.006 | 96.28 | 4.351E+00 | |
| Ir-192 | 468.06 | 61. | 7. | 0.004 | 165.26 | 5.571E-01 | |
| BE-7 | 477.59 | 79. | -14. | -0.008 | 94.33 | -5.627E+00 | |
| HF-181 | 482.00 | 70. | 12. | 0.007 | 103.65 | 6.341E-01 | |
| La-140 | 487.02 | 40. | -13. | -0.007 | 96.82 | -1.270E+00 | |
| RH-106 | 511.86 | 60. | 53. | 0.029 | 39.71 | 1.197E+01 | |
| Nd-147 | 531.00 | 24. | 1. | 0.001 | 964.37 | 3.583E-01 | |
| Ba-140 | 537.26 | 16. | 8. | 0.004 | 104.08 | 1.543E+00 | |
| CS-134 | 563.24 | 40. | -9. | -0.005 | 141.57 | -5.274E+00 | |
| CS-134 | 569.32 | 33. | -3. | -0.002 | 251.00 | -1.070E+00 | |
| BI-207 | 569.70 | 24. | 10. | 0.006 | 75.50 | 5.054E-01 | |
| SB-125 | 600.50 | 192. | 10. | 0.006 | 194.71 | 2.951E+00 | |
| SB-124 | 602.73 | 203. | 10. | 0.006 | 199.39 | 5.388E-01 | |
| RU-103 | 610.30 | 160. | 2. | 0.001 | 927.55 | 1.761E+00 | |
| RH-106 | 621.92 | 175. | -11. | -0.006 | 167.62 | -6.070E+00 | |
| AG-110M | 657.76 | 48. | -3. | -0.002 | 350.28 | -1.668E-01 | |
| CS-137 | 661.66 | 71. | -15. | -0.008 | 83.54 | -9.864E-01 | |
| PM-144 | 696.54 | 52. | -11. | -0.006 | 137.17 | -6.493E-01 | |
| NB-94 | 702.63 | 26. | -5. | -0.003 | 212.92 | -3.006E-01 | |
| SB-124 | 722.79 | 56. | 3. | 0.002 | 321.25 | 1.859E+00 | |
| ZR-95 | 724.20 | 66. | -8. | -0.005 | 145.14 | -1.117E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| pm-146 | 735.72 | 13. | 2. | 0.001 | 374.72 | 5.438E-01 | |
| pm-146 | 747.16 | 17. | 6. | 0.003 | 155.74 | 1.033E+00 | |
| ZR-95 | 756.73 | 26. | -5. | -0.003 | 212.92 | -5.751E-01 | |
| AG-110M | 763.94 | 30. | -8. | -0.005 | 99.68 | -2.361E+00 | |
| NB-95 | 765.79 | 63. | -9. | -0.005 | 134.23 | -5.494E-01 | |
| PA-234M | 766.41 | 87. | -10. | -0.006 | 135.65 | -2.153E+02 | |
| EU-152 | 778.92 | 19. | 2. | 0.001 | 398.21 | 1.157E+00 | |
| CO-58 | 810.78 | 29. | 9. | 0.005 | 91.27 | 5.982E-01 | |
| La-140 | 815.77 | 34. | 6. | 0.003 | 155.93 | 1.586E+00 | |
| Cs-136 | 818.50 | 44. | 1. | 0.001 | 943.40 | 6.690E-02 | |
| MN-54 | 834.85 | 9. | 7. | 0.004 | 94.80 | 5.044E-01 | |
| Co-56 | 846.77 | 23. | -8. | -0.005 | 127.75 | -5.739E-01 | |
| NB-94 | 871.10 | 0. | 16. | 0.009 | 25.00 | 1.129E+00 | |
| PA-234 | 880.53 | 10. | 5. | 0.003 | 93.32 | 6.495E+00 | |
| PA-234 | 883.24 | 16. | 5. | 0.003 | 113.15 | 3.993E+00 | |
| AG-110M | 884.68 | 21. | 5. | 0.003 | 128.47 | 5.285E-01 | |
| Sc-46 | 889.28 | 48. | -9. | -0.005 | 109.62 | -6.699E-01 | |
| y-88 | 898.04 | 19. | 7. | 0.004 | 130.32 | 5.659E-01 | |
| AG-110M | 937.49 | 23. | -5. | -0.003 | 196.95 | -1.164E+00 | |
| EU-152 | 964.11 | 56. | 6. | 0.003 | 193.12 | 2.938E+00 | |
| EU-154 | 1004.77 | 15. | 1. | 0.001 | 424.26 | 5.882E-01 | |
| Co-56 | 1037.84 | 5. | 15. | 0.008 | 41.72 | 8.667E+00 | |
| Cs-136 | 1048.07 | 20. | -3. | -0.002 | 218.58 | -3.087E-01 | |
| RH-106 | 1050.36 | 22. | 8. | 0.004 | 96.61 | 3.965E+01 | |
| BI-207 | 1063.66 | 25. | -2. | -0.001 | 554.15 | -2.238E-01 | |
| Ga-68 | 1077.40 | 15. | 5. | 0.003 | 176.07 | 1.494E+01 | |
| FE-59 | 1099.25 | 10. | 7. | 0.004 | 106.27 | 1.062E+00 | |
| EU-152 | 1112.07 | 24. | 8. | 0.005 | 89.55 | 5.352E+00 | |
| ZN-65 | 1115.55 | 33. | 8. | 0.005 | 101.79 | 1.449E+00 | |
| Sc-46 | 1120.55 | 50. | 8. | 0.005 | 122.63 | 7.375E-01 | |
| CO-60 | 1173.24 | 30. | -3. | -0.002 | 405.52 | -2.718E-01 | |
| Co-56 | 1238.28 | 11. | 21. | 0.012 | 40.98 | 3.058E+00 | |
| FE-59 | 1291.60 | 16. | -2. | -0.001 | 460.07 | -4.543E-01 | |
| CO-60 | 1332.50 | 11. | -3. | -0.001 | 285.04 | -2.687E-01 | |
| EU-152 | 1408.00 | 5. | 4. | 0.002 | 152.39 | 1.842E+00 | |
| La-140 | 1596.21 | 17. | -5. | -0.003 | 198.49 | -6.149E-01 | |
| SB-124 | 1690.98 | 11. | -4. | -0.002 | 188.42 | -1.117E+00 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty 1 Sigma Counting | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | -5.6274E+00 | -5.6274E+00 | 9.433E+01% | 1.79E+01 |
| NA-22 | # | 1.0681E+00 | 1.0681E+00 | 3.015E+01% | 7.16E-01 |
| K-40 | | 1.9487E+02 | 1.9487E+02 | 7.236E+00% | 7.52E+00 |
| Sc-46 | #A | 3.3849E-02 | 3.3849E-02 | 8.224E+01% | 2.50E+00 |
| CR-51 | #A | 4.5079E-03 | 4.5080E-03 | 8.626E+04% | 1.36E+01 |
| MN-54 | #A | 5.0440E-01 | 5.0440E-01 | 9.480E+01% | 1.15E+00 |
| FE-59 | #A | 1.0616E+00 | 1.0616E+00 | 1.063E+02% | 2.65E+00 |
| Co-56 | #A | 1.4832E+00 | 1.4832E+00 | 4.098E+01% | 1.74E+00 |
| CO-57 | #A | 2.8526E-01 | 2.8526E-01 | 1.806E+02% | 1.16E+00 |
| CO-58 | #A | 5.9825E-01 | 5.9825E-01 | 9.127E+01% | 1.86E+00 |
| CO-60 | #A | -2.6871E-01 | -2.6871E-01 | 2.850E+02% | 1.81E+00 |
| ZN-65 | #A | 1.4489E+00 | 1.4489E+00 | 1.018E+02% | 5.04E+00 |
| NB-94 | #A | 4.2133E-01 | 4.2133E-01 | 2.500E+01% | 1.59E+00 |
| ZR-95 | #A | -5.7507E-01 | -5.7507E-01 | 2.129E+02% | 3.04E+00 |
| NB-95 | #A | -5.4945E-01 | -5.4945E-01 | 1.342E+02% | 2.52E+00 |
| RU-103 | #A | -4.8493E-02 | -4.8494E-02 | 1.179E+03% | 1.49E+00 |
| RH-106 | #A | 1.3696E-01 | 1.3696E-01 | 9.661E+01% | 3.44E+01 |
| AG-108M | #A | -4.3504E-02 | -4.3504E-02 | 1.303E+03% | 1.46E+00 |
| AG-110M | #A | 5.2846E-01 | 5.2846E-01 | 1.285E+02% | 2.37E+00 |
| SN-113 | #A | 6.6269E-01 | 6.6269E-01 | 1.272E+02% | 2.86E+00 |
| SB-124 | #A | 6.6962E-01 | 6.6962E-01 | 1.890E+02% | 3.64E+00 |
| SB-125 | #A | 2.3005E+00 | 2.3005E+00 | 8.396E+01% | 3.82E+00 |
| I-131 | #A | 4.7646E-01 | 4.7648E-01 | 9.980E+01% | 1.16E+00 |
| Gd-153 | #A | -2.3295E-01 | -2.3295E-01 | 4.295E+02% | 3.42E+00 |
| Ga-68 | #A | 1.4834E+01 | 1.4943E+01 | 1.761E+02% | 6.20E+01 |
| Tc-99m | #A | -3.8119E-01 | -3.8171E-01 | 1.256E+02% | 1.61E+00 |
| BA-133 | #A | -2.2916E-01 | -2.2916E-01 | 1.369E+02% | 4.02E+00 |
| CS-134 | #A | 3.4686E-03 | 3.4686E-03 | 3.165E+04% | 3.76E+00 |
| CS-137 | #A | -9.8639E-01 | -9.8639E-01 | 8.354E+01% | 2.76E+00 |
| CE-139 | #A | -2.0850E-01 | -2.0850E-01 | 2.259E+02% | 1.60E+00 |
| Ba-140 | #A | 1.5428E+00 | 1.5429E+00 | 1.041E+02% | 4.12E+00 |
| La-140 | #A | -7.3992E-02 | -7.3994E-02 | 1.559E+02% | 2.70E+00 |
| CE-141 | #A | 6.4423E-01 | 6.4423E-01 | 1.301E+02% | 2.81E+00 |
| CE-144 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.23E+01 |
| PM-144 | #A | -6.4931E-01 | -6.4931E-01 | 1.372E+02% | 2.14E+00 |
| EU-152 | #A | 1.5182E+00 | 1.5182E+00 | 8.955E+01% | 8.30E+00 |
| EU-154 | #A | 1.2363E-01 | 1.2363E-01 | 4.243E+02% | 1.23E+01 |
| EU-155 | #A | -1.4266E+00 | -1.4266E+00 | 1.028E+02% | 4.91E+00 |
| HF-181 | #A | 9.1893E-01 | 9.1894E-01 | 9.302E+01% | 2.22E+00 |
| Ta-182 | A | -4.2580E-01 | -4.2580E-01 | 7.230E+01% | 1.10E+01 |
| Hg-203 | #A | -5.0291E-01 | -5.0292E-01 | 1.117E+02% | 1.89E+00 |
| TL-208 | | 6.6748E+00 | 6.6748E+00 | 1.083E+01% | 1.04E+00 |
| pm-146 | #A | 5.2427E-01 | 5.2427E-01 | 1.557E+02% | 4.03E+00 |

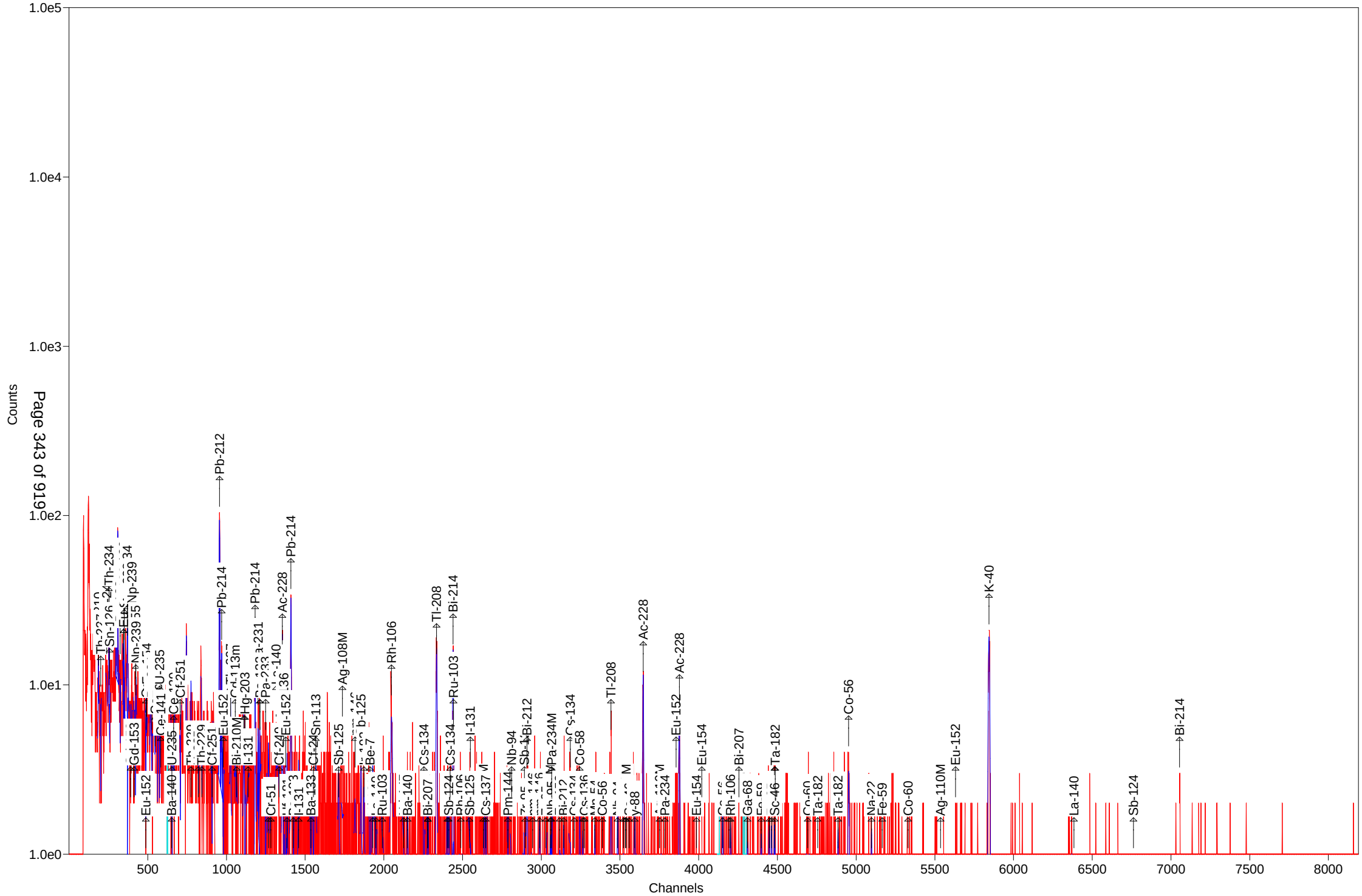
| | | | | | |
|---|---|---|---|---|---|
| y-88 #A | 5.6588E-01 | 5.6588E-01 | 1.303E+02% | | 1.76E+00 |
| Cd-113m#A | 2.1684E+03 | 2.1684E+03 | 2.236E+02% | | 1.68E+04 |
| Cd-109 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 5.08E+01 |
| Cf-251 #A | -2.1299E+00 | -2.1299E+00 | 1.044E+02% | | 5.98E+00 |
| Cf-249 #A | -6.5131E-01 | -6.5131E-01 | 1.381E+02% | | 3.05E+00 |
| Sn-126 A | -2.7702E+00 | -2.7702E+00 | 1.743E+02% | | 1.63E+01 |
| PB-210 #A | 1.9516E+01 | 1.9516E+01 | 7.387E+01% | | 4.10E+01 |
| PB-212 | 2.1044E+01 | 2.1044E+01 | 5.652E+00% | | 1.79E+00 |
| PB-214 | 1.3085E+01 | 1.3085E+01 | 9.349E+00% | | 2.95E+00 |
| BI-207 #A | 5.0536E-01 | 5.0536E-01 | 7.550E+01% | | 1.28E+00 |
| BI-212 #A | 9.7076E+00 | 9.7076E+00 | 8.581E+01% | | 2.80E+01 |
| BI-214 | 1.1337E+01 | 1.1337E+01 | 1.137E+01% | | 1.80E+00 |
| BI-210M#A | 1.3098E-01 | 1.3098E-01 | 5.177E+02% | | 2.36E+00 |
| AC-228 | 2.0835E+01 | 2.0835E+01 | 8.104E+00% | | 1.86E+00 |
| TH-227 #A | 1.1373E+00 | 1.1373E+00 | 5.098E+01% | | 2.02E+01 |
| TH-229 #A | 1.3122E+01 | 1.3122E+01 | 5.634E+01% | | 1.95E+01 |
| TH-234 # | 3.4532E+01 | 3.4532E+01 | 3.350E+01% | | 3.16E+01 |
| PA-231 #A | 1.4193E+01 | 1.4193E+01 | 1.430E+02% | | 6.84E+01 |
| PA-233 #A | -1.2503E+00 | -1.2503E+00 | 1.449E+02% | | 6.10E+00 |
| PA-234 #A | 7.7696E-01 | 7.7696E-01 | 1.132E+02% | | 7.64E+00 |
| PA-234M#A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 2.26E+02 |
| U-235 #A | -3.0645E+00 | -3.0645E+00 | 1.290E+02% | | 1.32E+01 |
| AM-241 #A | 2.1380E-01 | 2.1380E-01 | 6.483E+02% | | 4.00E+00 |
| Np-237 #A | -2.9429E+00 | -2.9429E+00 | 1.641E+02% | | 1.61E+01 |
| Ir-192 #A | 4.7279E-01 | 4.7279E-01 | 9.723E+01% | | 1.46E+00 |
| Cs-136 #A | 6.6894E-02 | 6.6896E-02 | 9.434E+02% | | 2.25E+00 |
| Np-239 #A | 1.0726E+00 | 1.0727E+00 | 1.340E+02% | | 4.84E+00 |
| Nd-147 #A | 3.5830E-01 | 3.5831E-01 | 9.644E+02% | | 9.15E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  2000.8 keV)  2.678E+02  Bq/Sample
Total Decayed Activity (  37.6 to  2000.8 keV) 2.6784842E+02  Bq/Sample

309155_Gamma_160-22327-A-1-B. 5_Gamma_20171421.spc.



Test America St. Louis  Spectrum ID: 10_Gamma_20171630

Sample Description: 309155_Gamma_160-22327-A-1-C DU
Detector: Detector #10
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-1-C DU

Decay to Time: 6/7/2017 11:20  Live Time: 1800 sec
Acquisition Time: 6/7/2017 11:20:59  Real Time: 1802 sec
Analysis Time: 6/7/2017 11:51  Dead Time: 0.10 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 10_Soil_TunaCan.Clb
Efficiency Cal Desc: 10_Soil_TunaCan_90099_032812
Efficiency Cal Date: 4/2/2012 15:35
Energy Cal Date: 2/23/2012 09:27
Library: Client_Long_Rev11.lib
Bkgd Correction File: 10_2017-06-04_0221.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | 2.563E+00 | 165.3 | 4.237E+00 | 4.239E+00 | 1.448E+01 |
| NA-22 | 4.474E-01 | 61.8 | 2.765E-01 | 2.774E-01 | 8.923E-01 |
| K-40 | 2.339E+02 | 5.4 | 1.270E+01 | 1.745E+01 | 5.085E+00 |
| Sc-46 | -3.350E-02 | 1592.2 | 5.334E-01 | 5.334E-01 | 1.889E+00 |
| CR-51 | 0.000E+00 | 1.#INF | 1.479E+00 | 1.479E+00 | 2.062E+01 |
| MN-54 | 1.610E-01 | 242.4 | 3.904E-01 | 3.904E-01 | 9.654E-01 |
| FE-59 | 3.445E-01 | 97.2 | 3.349E-01 | 3.353E-01 | 2.232E+00 |
| Co-56 | -3.392E-01 | 164.8 | 5.588E-01 | 5.591E-01 | 1.326E+00 |
| CO-57 | 7.980E-02 | 384.7 | 3.070E-01 | 3.070E-01 | 1.047E+00 |
| CO-58 | -2.356E-01 | 220.0 | 5.183E-01 | 5.185E-01 | 1.800E+00 |
| CO-60 | 4.737E-01 | 89.3 | 4.229E-01 | 4.236E-01 | 9.460E-01 |
| ZN-65 | 0.000E+00 | 1.#INF | 1.669E-01 | 1.669E-01 | 4.755E+00 |
| NB-94 | -2.437E-01 | 259.2 | 6.316E-01 | 6.318E-01 | 1.486E+00 |
| ZR-95 | 3.541E-01 | 216.9 | 7.680E-01 | 7.683E-01 | 1.867E+00 |
| NB-95 | 3.600E-01 | 131.1 | 4.719E-01 | 4.723E-01 | 1.619E+00 |
| RU-103 | 1.437E-01 | 244.9 | 3.519E-01 | 3.520E-01 | 9.174E-01 |
| RH-106 | 7.748E-01 | 483.9 | 3.749E+00 | 3.750E+00 | 9.517E+00 |
| AG-108M | 3.272E-02 | 1242.3 | 4.064E-01 | 4.064E-01 | 1.053E+00 |
| AG-110M | 5.378E-01 | 96.7 | 5.200E-01 | 5.207E-01 | 2.552E+00 |
| SN-113 | 4.952E-01 | 119.0 | 5.893E-01 | 5.899E-01 | 1.998E+00 |
| SB-124 | 3.959E-01 | 37.8 | 1.496E-01 | 1.510E-01 | 3.186E+00 |
| SB-125 | -2.638E-01 | 101.0 | 2.666E-01 | 2.669E-01 | 3.959E+00 |
| I-131 | 2.789E-01 | 80.9 | 2.256E-01 | 2.261E-01 | 1.316E+00 |
| Gd-153 | -4.601E-01 | 302.5 | 1.392E+00 | 1.392E+00 | 4.682E+00 |
| Ga-68 | -1.240E+01 | 204.8 | 2.540E+01 | 2.541E+01 | 5.837E+01 |
| Tc-99m | 2.878E-01 | 123.0 | 3.539E-01 | 3.543E-01 | 1.188E+00 |
| BA-133 | -3.792E-01 | 160.4 | 6.084E-01 | 6.088E-01 | 3.532E+00 |
| CS-134 | 4.723E-01 | 91.7 | 4.331E-01 | 4.338E-01 | 3.215E+00 |
| CS-137 | 1.890E-01 | 297.9 | 5.632E-01 | 5.633E-01 | 1.957E+00 |
| CE-139 | 3.436E-01 | 109.3 | 3.755E-01 | 3.769E-01 | 1.260E+00 |
| Ba-140 | -8.819E-01 | 73.5 | 6.483E-01 | 6.499E-01 | 5.526E+00 |
| La-140 | -1.405E+00 | 81.6 | 1.146E+00 | 1.149E+00 | 2.336E+00 |
| CE-141 | 5.293E-01 | 123.5 | 6.539E-01 | 6.545E-01 | 2.195E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 0.000E+00 | 1.#INF | 1.058E+00 | 1.058E+00 | 1.081E+01 |
| PM-144 | 2.817E-02 | 2019.3 | 5.689E-01 | 5.689E-01 | 1.411E+00 |
| EU-152 | 1.108E+00 | 66.5 | 7.371E-01 | 7.394E-01 | 7.439E+00 |
| EU-154 | 8.797E-01 | 37.0 | 3.253E-01 | 3.285E-01 | 1.427E+01 |
| EU-155 | 0.000E+00 | 1.#INF | 7.963E-01 | 7.963E-01 | 6.607E+00 |
| HF-181 | 0.000E+00 | 1.#INF | 1.122E-01 | 1.122E-01 | 1.983E+00 |
| Ta-182 | 1.566E+00 | 121.6 | 1.903E+00 | 1.905E+00 | 6.646E+00 |
| Hg-203 | -1.596E-01 | 266.7 | 4.257E-01 | 4.258E-01 | 1.458E+00 |
| TL-208 | 7.070E+00 | 9.8 | 6.918E-01 | 7.830E-01 | 1.089E+00 |
| pm-146 | 2.203E+00 | 50.0 | 1.101E+00 | 1.107E+00 | 2.962E+00 |
| y-88 | 1.362E-01 | 37.8 | 5.149E-02 | 5.195E-02 | 1.525E+00 |
| Cd-113m | -3.819E+03 | 150.8 | 5.757E+03 | 5.763E+03 | 1.953E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 1.403E+01 | 1.403E+01 | 4.722E+01 |
| Cf-251 | 5.594E-01 | 340.6 | 1.905E+00 | 1.906E+00 | 5.206E+00 |
| Cf-249 | 6.043E-01 | 98.0 | 5.922E-01 | 5.930E-01 | 1.631E+00 |
| Sn-126 | -8.991E-01 | 542.2 | 4.875E+00 | 4.875E+00 | 1.650E+01 |
| PB-210 | 2.776E+01 | 47.6 | 1.320E+01 | 1.330E+01 | 3.484E+01 |
| PB-212 | 1.880E+01 | 5.8 | 1.099E+00 | 1.639E+00 | 2.088E+00 |
| PB-214 | 1.338E+01 | 8.8 | 1.181E+00 | 1.370E+00 | 2.475E+00 |
| BI-207 | 1.183E-01 | 176.1 | 2.083E-01 | 2.084E-01 | 1.368E+00 |
| BI-212 | 2.594E+01 | 20.0 | 5.193E+00 | 5.365E+00 | 8.933E+00 |
| BI-214 | 1.198E+01 | 11.5 | 1.378E+00 | 1.512E+00 | 2.547E+00 |
| BI-210M | -3.910E-01 | 185.6 | 7.256E-01 | 7.260E-01 | 2.467E+00 |
| AC-228 | 2.198E+01 | 8.0 | 1.752E+00 | 2.080E+00 | 3.247E+00 |
| TH-227 | -5.933E+00 | 139.6 | 8.284E+00 | 8.290E+00 | 2.776E+01 |
| TH-229 | 2.577E+00 | 137.0 | 3.530E+00 | 3.536E+00 | 2.183E+01 |
| TH-234 | 1.676E+01 | 54.0 | 9.058E+00 | 9.100E+00 | 2.941E+01 |
| PA-231 | 1.163E+01 | 126.3 | 1.468E+01 | 1.470E+01 | 6.652E+01 |
| PA-233 | 7.330E-01 | 178.8 | 1.310E+00 | 1.311E+00 | 5.591E+00 |
| PA-234 | 1.787E+00 | 105.1 | 1.878E+00 | 1.880E+00 | 6.509E+00 |
| PA-234M | 2.672E+02 | 18.3 | 4.885E+01 | 5.068E+01 | 1.006E+02 |
| U-235 | 2.647E+00 | 121.3 | 3.209E+00 | 3.212E+00 | 9.969E+00 |
| AM-241 | -3.753E-01 | 379.0 | 1.422E+00 | 1.422E+00 | 3.851E+00 |
| Np-237 | 0.000E+00 | 1.#INF | 4.505E+00 | 4.505E+00 | 1.502E+01 |
| Ir-192 | 0.000E+00 | 1.#INF | 1.438E-01 | 1.438E-01 | 2.336E+00 |
| Cs-136 | 4.138E-01 | 99.8 | 4.128E-01 | 4.135E-01 | 1.935E+00 |
| Np-239 | 3.096E-01 | 565.0 | 1.749E+00 | 1.749E+00 | 5.904E+00 |
| Nd-147 | -2.460E+00 | 147.6 | 3.632E+00 | 3.634E+00 | 8.799E+00 |
| Total | 6.814E+02 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-1-C DU

Spectrum Filename: C:\User\SPC\Det10\10_Gamma_20171630.An1

Acquisition information
Start time: 6/7/2017 11:20:59 AM
Live time: 1800
Real time: 1802
Dead time: 0.10 %
Detector ID: 10

Detector system
Ge10 S/N08316756

Calibration
Filename: 10_Soil_TunaCan.Clb
10_Soil_TunaCan_90099_032812

Energy Calibration
Created: 2/23/2012 9:27:47 AM
Zero offset: 0.044 keV
Gain: 0.250 keV/channel
Quadratic: -1.974E-08 keV/channel^2

Efficiency Calibration
Created: 4/2/2012 3:35:54 PM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.76 %
Log(Eff): -5.833467E-01 + (-3.986081E-01*Log(E) ) + ( -2.634340E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.87 %
Log(Eff): -2.530844E+01 + ( 9.416612E+00*Log(E) ) + ( -1.001096E+00*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 100 (  25.05keV )
Stop channel: 8000 (  1999.70keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3
Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 11:20:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 10_2017-06-04_0221.PBC 6/4/2017 2:21:52 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 25 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1601

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.30 | 43. | 47.57 | 1.17 | 2.004E-02 | 46.54 | 4.250 | PBC<MDA | PB210 |
| 63.36 | 36. | 54.04 | 0.84 | 3.101E-02 | 63.29 | 3.810 | PBC<MDA | TH234 |
| 74.72 | 155. | 13.63 | 0.86 | 3.627E-02 | | | | |
| 77.21 | 218. | 11.04 | 0.86 | 3.717E-02 | | | | |
| 87.27 | 73. | 24.85 | 0.87 | 3.999E-02 | 86.49 | 13.100 | 7.734E+00 | Np237 |
| | | | | | 86.54 | 30.700 | 3.299E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.118E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 2.686E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 2.651E+01 | Cd109 |
| 89.84 | 66. | 27.15 | 0.87 | 4.050E-02 | | | | |
| 92.53 | 4. | 524.25 | 0.87 | 4.096E-02 | 92.59 | 5.584 | PBC<MDA | TH234 |
| 93.29 | 27. | 137.74 | 0.88 | 4.107E-02 | 93.35 | 5.561 | PBC<MDA | AC228 |
| 106.13 | 5. | 564.99 | 0.89 | 4.217E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 121.78 | 19. | 101.55 | 0.90 | 4.182E-02 | 121.78 | 28.580 | PBC<MDA | EU152 |
| | | | | | 122.06 | 85.600 | 2.928E-01 | CO57 |
| 122.06 | 5. | 384.67 | 0.90 | 4.180E-02 | 121.78 | 28.580 | PBC<MDA | EU152 |
| | | | | | 122.06 | 85.600 | 7.980E-02 | CO57 |
| 131.29 | 12. | 222.80 | 0.91 | 4.097E-02 | 131.29 | 18.000 | PBC<MDA | PA234 |
| 140.51 | 18. | 122.96 | 0.92 | 3.983E-02 | 140.51 | 89.300 | PBC<MDA | Tc99m |
| 143.79 | 11. | 202.93 | 0.93 | 3.936E-02 | 143.79 | 10.960 | PBC<MDA | U235 |
| 145.44 | 18. | 123.55 | 0.93 | 3.912E-02 | 145.44 | 48.200 | PBC<MDA | CE141 |
| 162.66 | 20. | 109.15 | 0.95 | 3.631E-02 | 162.66 | 6.220 | PBC<MDA | Ba140 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 165.85 | 18. | 109.27 | 0.95 | 3.656E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |
| 176.60 | 6. | 340.61 | 0.96 | 3.505E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |
| 185.69 | 68. | 27.08 | 1.26 | 3.389E-02 | | | | |
| 205.33 | 15. | 132.78 | 0.99 | 3.166E-02 | 205.33 | 5.010 | PBC<MDA | U235 |
| 208.97 | 51. | 25.64 | 0.88 | 3.129E-02 | | | | |
| 210.85 | 15. | 136.97 | 0.99 | 3.110E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 238.50 | 400. | 7.39 | 1.20 | 2.858E-02 | 238.63 | 43.300 | 1.796E+01 | PB212 |
| 241.86 | 58. | 27.41 | 1.03 | 2.830E-02 | 242.00 | 7.430 | 1.519E+01 | PB214 |
| 244.69 | 18. | 214.05 | 1.03 | 2.808E-02 | 244.69 | 7.580 | PBC<MDA | EU152 |
| 277.32 | 15. | 78.46 | 0.93 | 2.576E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| 295.07 | 121. | 14.05 | 1.22 | 2.466E-02 | 295.09 | 19.300 | 1.415E+01 | PB214 |
| 300.07 | 14. | 174.59 | 1.08 | 2.438E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 1.257E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 4.989E+00 | PA233 |
| 300.18 | 14. | 178.76 | 1.08 | 2.437E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 1.257E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 4.989E+00 | PA233 |
| 300.45 | 53. | 22.81 | 0.89 | 2.438E-02 | 300.03 | 3.280 | 3.671E+01 | PB212 |
| | | | | | 300.07 | 2.460 | 4.895E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 1.943E+01 | PA233 |
| 302.65 | 14. | 182.42 | 1.09 | 2.423E-02 | 302.65 | 2.880 | PBC<MDA | PA231 |
| | | | | | 302.85 | 18.330 | 1.702E+00 | BA133 |
| 302.85 | 4. | 568.54 | 1.09 | 2.422E-02 | 302.65 | 2.880 | PBC<MDA | PA231 |
| | | | | | 302.85 | 18.330 | 5.540E-01 | BA133 |
| 328.76 | 6. | 230.76 | 1.11 | 2.286E-02 | 328.76 | 20.300 | PBC<MDA | La140 |
| 333.44 | 9. | 157.72 | 1.12 | 2.264E-02 | 333.44 | 15.510 | PBC<MDA | Cf249 |
| 337.93 | 119. | 12.96 | 1.19 | 2.243E-02 | 338.32 | 12.010 | 2.464E+01 | AC228 |
| 351.77 | 191. | 10.69 | 1.16 | 2.180E-02 | 351.93 | 37.600 | 1.298E+01 | PB214 |
| 383.84 | 5. | 220.04 | 1.16 | 2.049E-02 | 383.84 | 8.940 | PBC<MDA | BA133 |
| 387.95 | 10. | 116.32 | 1.17 | 2.033E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 391.69 | 12. | 119.02 | 1.17 | 2.020E-02 | 391.69 | 64.000 | PBC<MDA | SN113 |
| 453.88 | 10. | 121.66 | 1.23 | 1.817E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 477.60 | 8. | 165.33 | 1.25 | 1.751E-02 | 477.60 | 10.520 | PBC<MDA | BE7 |
| 497.05 | 4. | 244.95 | 1.27 | 1.701E-02 | 497.05 | 90.900 | PBC<MDA | RU103 |
| 511.86 | 60. | 40.14 | 2.54 | 1.666E-02 | 511.86 | 20.000 | 1.001E+01 | RH106 |
| 569.47 | 8. | 136.93 | 1.34 | 1.541E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 3.518E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 2.952E-01 | BI207 |
| 583.14 | 163. | 9.79 | 1.42 | 1.514E-02 | 583.02 | 84.500 | 7.074E+00 | TL208 |
| 600.50 | 9. | 264.72 | 1.37 | 1.482E-02 | 600.50 | 17.860 | PBC<MDA | SB125 |
| 609.32 | 149. | 11.50 | 1.22 | 1.466E-02 | 609.31 | 46.090 | 1.227E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 9.843E+01 | RU103 |
| 621.92 | 2. | 483.91 | 1.39 | 1.444E-02 | 621.92 | 9.930 | PBC<MDA | RH106 |
| 636.97 | 9. | 80.89 | 1.40 | 1.419E-02 | 636.97 | 7.170 | PBC<MDA | I131 |
| 661.71 | 4. | 297.91 | 1.42 | 1.380E-02 | 661.66 | 85.210 | PBC<MDA | CS137 |
| 727.34 | 45. | 20.02 | 1.41 | 1.286E-02 | 727.17 | 7.550 | 2.594E+01 | BI212 |
| 735.72 | 18. | 50.00 | 1.49 | 1.275E-02 | 735.72 | 22.500 | PBC<MDA | pm146 |
| 747.16 | 10. | 93.10 | 1.50 | 1.260E-02 | 747.16 | 34.000 | PBC<MDA | pm146 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 756.73 | 4. | 216.89 | 1.51 | 1.248E-02 | 756.73 | 54.460 | PBC<MDA | ZR95 |
| 763.94 | 4. | 208.55 | 1.52 | 1.240E-02 | 763.94 | 22.280 | PBC<MDA | AG110M |
| 765.79 | 8. | 131.10 | 1.52 | 1.237E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 1.223E+02 | PA234M |
| 766.41 | 12. | 84.64 | 1.52 | 1.237E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 1.804E+02 | PA234M |
| 778.92 | 8. | 105.33 | 1.53 | 1.222E-02 | 778.92 | 12.940 | PBC<MDA | EU152 |
| 785.86 | 19. | 47.66 | 1.54 | 1.214E-02 | 785.42 | 1.280 | PBC<MDA | BI212 |
| 795.87 | 9. | 99.93 | 1.54 | 1.202E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 11. | 91.70 | 1.55 | 1.195E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 818.50 | 12. | 99.76 | 1.56 | 1.177E-02 | 818.50 | 100.000 | PBC<MDA | Cs136 |
| 834.96 | 3. | 242.38 | 1.58 | 1.160E-02 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 860.32 | 18. | 31.24 | 2.74 | 1.133E-02 | 860.56 | 12.420 | 7.038E+00 | TL208 |
| 911.22 | 118. | 11.81 | 1.52 | 1.086E-02 | 911.07 | 29.000 | 2.076E+01 | AC228 |
| 946.02 | 5. | 176.07 | 1.67 | 1.055E-02 | 946.02 | 13.400 | PBC<MDA | PA234 |
| 964.11 | 8. | 149.84 | 1.69 | 1.040E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 969.10 | 72. | 16.26 | 1.69 | 1.036E-02 | 968.97 | 17.460 | 2.217E+01 | AC228 |
| 996.33 | 7. | 36.98 | 1.72 | 1.014E-02 | 996.33 | 10.600 | PBC<MDA | EU154 |
| 1001.00 | 41. | 18.28 | 1.72 | 1.011E-02 | 1001.00 | 0.837 | 2.672E+02 | PA234M |
| 1048.07 | 3. | 208.17 | 1.76 | 9.757E-03 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1063.66 | 5. | 176.07 | 1.77 | 9.648E-03 | 1063.66 | 74.500 | PBC<MDA | BI207 |
| 1120.20 | 28. | 28.43 | 1.82 | 9.271E-03 | 1120.29 | 15.100 | 1.111E+01 | BI214 |
| | | | | | 1120.55 | 99.987 | 1.678E+00 | Sc46 |
| 1121.21 | 7. | 151.75 | 1.82 | 9.265E-03 | 1120.55 | 99.987 | PBC<MDA | Sc46 |
| | | | | | 1121.30 | 34.900 | 1.274E+00 | Ta182 |
| 1173.24 | 3. | 398.43 | 1.86 | 8.948E-03 | 1173.24 | 99.900 | PBC<MDA | CO60 |
| 1188.86 | 6. | 189.97 | 1.87 | 8.856E-03 | 1189.05 | 16.200 | PBC<MDA | Ta182 |
| 1274.53 | 7. | 61.79 | 1.94 | 8.393E-03 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 1.271E+00 | EU154 |
| 1274.54 | 4. | 135.47 | 1.94 | 8.393E-03 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 7.359E-01 | EU154 |
| 1291.60 | 9. | 97.22 | 1.96 | 8.307E-03 | 1291.60 | 43.200 | PBC<MDA | FE59 |
| 1332.50 | 7. | 89.28 | 1.99 | 8.108E-03 | 1332.50 | 99.980 | PBC<MDA | CO60 |
| 1384.30 | 6. | 96.69 | 2.03 | 7.871E-03 | 1384.30 | 24.290 | PBC<MDA | AG110M |
| 1460.62 | 339. | 5.43 | 1.93 | 7.547E-03 | 1460.83 | 10.670 | 2.339E+02 | K40 |
| 1690.98 | 7. | 37.80 | 2.25 | 6.726E-03 | 1690.98 | 47.790 | PBC<MDA | SB124 |
| 1764.06 | 32. | 17.68 | 2.30 | 6.504E-03 | 1764.49 | 15.400 | 1.775E+01 | BI214 |
| 1836.06 | 7. | 37.80 | 2.35 | 6.302E-03 | 1836.06 | 99.200 | PBC<MDA | y88 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 298.58 | 74.67 | 145. | 155. | 4.269E+03 | 13.63 | 0.856 | - D |
| 308.52 | 77.16 | 178. | 218. | 5.855E+03 | 11.04 | 0.859 | - sD |
| 359.08 | 89.91 | 136. | 62. | 1.523E+03 | 29.64 | 0.872 | - D |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 742.28 | 185.69 | 91. | 68. | 2.017E+03 | 27.08 | 1.261 | - sM |
| 835.39 | 208.97 | 40. | 51. | 1.630E+03 | 25.64 | 0.878 | - M |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 184.95 | 46.30 | 118. | 43. | 0.024 | 47.57 | 1.166s |
| TH-227 | 200.30 | 50.14 | 356. | -19. | -0.011 | 139.62 | 0.831s |
| AM-241 | 237.87 | 59.54 | 220. | -7. | -0.004 | 378.95 | 0.841 |
| TH-234 | 252.87 | 63.29 | 165. | 36. | 0.020 | 54.04 | 0.845D |
| Sn-126 | 256.83 | 64.28 | 358. | -5. | -0.003 | 542.20 | 0.846s |
| BA-133 | 323.64 | 80.99 | 223. | -5. | -0.003 | 500.51 | 0.863s |
| Np-237 | 345.64 | 86.49 | 881. | 0. | 0.000 | 160.72 | 0.868A |
| EU-155 | 345.85 | 86.54 | 854. | -28. | -0.016 | 147.17 | 0.868s |
| Sn-126 | 347.44 | 86.94 | 788. | -28. | -0.016 | 141.42 | 0.869s |
| Sn-126 | 349.95 | 87.57 | 717. | 21. | 0.012 | 97.65 | 0.870D |
| TH-234 | 370.03 | 92.59 | 214. | 4. | 0.002 | 524.25 | 0.875D |
| AC-228 | 373.07 | 93.35 | 697. | 27. | 0.015 | 137.74 | 0.875 |
| Gd-153 | 389.66 | 97.50 | 483. | -10. | -0.006 | 302.49 | 0.880s |
| Np-239 | 397.66 | 99.50 | 494. | 0. | 0.000 | 1000.00 | 0.882 |
| Gd-153 | 412.45 | 103.20 | 494. | 0. | 0.000 | 1000.00 | 0.885s |
| Np-239 | 414.45 | 103.70 | 494. | 0. | 0.000 | 1000.00 | 0.886s |
| EU-155 | 420.90 | 105.31 | 494. | 0. | 0.000 | 1000.00 | 0.888 |
| Np-239 | 424.16 | 106.13 | 451. | 5. | 0.003 | 564.99 | 0.888s |
| EU-152 | 486.72 | 121.78 | 174. | 19. | 0.010 | 101.55 | 0.905 |
| CO-57 | 487.86 | 122.06 | 193. | 5. | 0.003 | 384.67 | 0.905 |
| EU-154 | 492.02 | 123.10 | 186. | -12. | -0.007 | 157.07 | 0.906s |
| PA-234 | 524.79 | 131.29 | 322. | 12. | 0.006 | 222.80 | 0.914 |
| HF-181 | 531.70 | 133.02 | 334. | 0. | 0.000 | 1000.00 | 0.916s |
| CE-144 | 533.76 | 133.54 | 334. | 0. | 0.000 | 1000.00 | 0.916s |
| HF-181 | 544.80 | 136.30 | 334. | 0. | 0.000 | 1000.00 | 0.919s |
| CO-57 | 545.49 | 136.47 | 365. | -23. | -0.013 | 117.98 | 0.919s |
| Tc-99m | 561.63 | 140.51 | 232. | 18. | 0.010 | 122.96 | 0.924s |
| U-235 | 574.73 | 143.79 | 257. | 11. | 0.006 | 202.93 | 0.927s |
| CE-141 | 581.35 | 145.44 | 237. | 18. | 0.010 | 123.55 | 0.928s |
| Ba-140 | 650.20 | 162.66 | 228. | 20. | 0.011 | 109.15 | 0.946s |
| CE-139 | 662.97 | 165.85 | 186. | 18. | 0.010 | 109.27 | 0.949s |
| Cf-251 | 705.94 | 176.60 | 130. | 6. | 0.003 | 340.61 | 0.960 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| TH-229 | 773.55 | 193.51 | 136. | -5. | -0.003 | 469.23 | 0.977s |
| U-235 | 820.83 | 205.33 | 190. | 15. | 0.008 | 132.78 | 0.989 |
| TH-229 | 842.89 | 210.85 | 205. | 15. | 0.008 | 136.97 | 0.994s |
| Cf-251 | 907.47 | 227.00 | 121. | -11. | -0.006 | 189.50 | 1.010 |
| PB-212 | 953.99 | 238.63 | 88. | 419. | 0.233 | 5.85 | 1.022D |
| PB-214 | 967.44 | 242.00 | 95. | 58. | 0.032 | 27.41 | 1.025D |
| EU-152 | 978.22 | 244.69 | 693. | 18. | 0.010 | 214.05 | 1.028s |
| TH-227 | 1024.40 | 256.24 | 77. | -9. | -0.005 | 185.43 | 1.039s |
| Cd-113m | 1054.23 | 263.70 | 132. | -11. | -0.006 | 150.76 | 1.047s |
| BI-210M | 1062.75 | 265.83 | 145. | -9. | -0.005 | 185.58 | 1.049s |
| TL-208 | 1108.71 | 277.32 | 39. | 15. | 0.008 | 78.46 | 0.934 |
| Hg-203 | 1116.21 | 279.20 | 125. | -6. | -0.003 | 266.67 | 1.062s |
| I-131 | 1136.60 | 284.30 | 84. | -18. | -0.010 | 99.44 | 1.067s |
| PB-214 | 1179.69 | 295.07 | 40. | 121. | 0.067 | 14.05 | 1.225s |
| PB-212 | 1201.17 | 300.45 | 22. | 53. | 0.029 | 22.81 | 0.887s |
| PA-231 | 1199.67 | 300.07 | 274. | 14. | 0.008 | 174.59 | 1.083s |
| PA-233 | 1200.11 | 300.18 | 287. | 14. | 0.008 | 178.76 | 1.083s |
| PA-231 | 1209.98 | 302.65 | 301. | 14. | 0.008 | 182.42 | 1.085s |
| BA-133 | 1210.79 | 302.85 | 315. | 4. | 0.002 | 568.54 | 1.086s |
| Ba-140 | 1218.78 | 304.85 | 319. | 0. | 0.000 | 1000.00 | 1.087 |
| BI-210M | 1218.97 | 304.90 | 319. | 0. | 0.000 | 1000.00 | 1.088 |
| Ir-192 | 1233.14 | 308.44 | 319. | 0. | 0.000 | 1000.00 | 1.091s |
| PA-233 | 1247.42 | 312.01 | 319. | 0. | 0.000 | 1000.00 | 1.094s |
| Ir-192 | 1265.33 | 316.49 | 319. | 0. | 0.000 | 1000.00 | 1.099s |
| CR-51 | 1279.70 | 320.08 | 319. | 0. | 0.000 | 1000.00 | 1.102s |
| La-140 | 1314.40 | 328.76 | 59. | 6. | 0.004 | 230.76 | 1.111s |
| Cf-249 | 1333.11 | 333.44 | 55. | 9. | 0.005 | 157.72 | 1.115s |
| AC-228 | 1351.07 | 337.93 | 26. | 119. | 0.066 | 12.96 | 1.191 |
| Cs-136 | 1361.63 | 340.57 | 281. | -16. | -0.009 | 149.43 | 1.122s |
| EU-152 | 1376.49 | 344.29 | 265. | -16. | -0.009 | 144.78 | 1.126s |
| PB-214 | 1406.40 | 351.77 | 53. | 191. | 0.106 | 10.69 | 1.158s |
| BA-133 | 1423.33 | 356.00 | 314. | -16. | -0.009 | 160.44 | 1.137s |
| I-131 | 1457.26 | 364.48 | 68. | -4. | -0.002 | 406.71 | 1.146s |
| BA-133 | 1534.67 | 383.84 | 57. | 5. | 0.003 | 220.04 | 1.164s |
| Cf-249 | 1551.10 | 387.95 | 62. | 10. | 0.006 | 116.32 | 1.168s |
| SN-113 | 1566.06 | 391.69 | 88. | 12. | 0.006 | 119.02 | 1.172 |
| SB-125 | 1710.77 | 427.88 | 64. | -16. | -0.009 | 101.04 | 1.207s |
| pm-146 | 1814.77 | 453.88 | 36. | 10. | 0.006 | 121.66 | 1.231s |
| SB-125 | 1852.71 | 463.37 | 85. | -2. | -0.001 | 655.74 | 1.240s |
| BE-7 | 1909.62 | 477.60 | 94. | 8. | 0.005 | 165.33 | 1.254s |
| HF-181 | 1927.22 | 482.00 | 103. | 0. | 0.000 | 1000.00 | 1.258s |
| La-140 | 1947.31 | 487.02 | 110. | -8. | -0.005 | 185.10 | 1.263s |
| RU-103 | 1987.44 | 497.05 | 24. | 4. | 0.002 | 244.95 | 1.272s |
| RH-106 | 2046.67 | 511.86 | 80. | 60. | 0.033 | 40.14 | 2.536s |
| Nd-147 | 2123.20 | 531.00 | 43. | -9. | -0.005 | 147.64 | 1.304s |
| Ba-140 | 2148.24 | 537.26 | 61. | -17. | -0.009 | 98.49 | 1.310s |
| CS-134 | 2252.14 | 563.24 | 30. | -6. | -0.004 | 181.90 | 1.334s |
| CS-134 | 2276.47 | 569.32 | 52. | -11. | -0.006 | 97.49 | 1.340s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| PA-234 | 2277.07 | 569.47 | 56. | 8. | 0.004 | 136.93 | 1.340s |
| BI-207 | 2278.00 | 569.70 | 54. | -2. | -0.001 | 451.53 | 1.340s |
| TL-208 | 2331.74 | 583.14 | 23. | 163. | 0.091 | 9.79 | 1.418 |
| SB-125 | 2401.18 | 600.50 | 290. | 9. | 0.005 | 264.72 | 1.368s |
| SB-124 | 2410.10 | 602.73 | 299. | 0. | 0.000 | 1000.00 | 1.370s |
| CS-134 | 2418.02 | 604.71 | 299. | 0. | 0.000 | 1000.00 | 1.372s |
| BI-214 | 2436.47 | 609.32 | 37. | 149. | 0.083 | 11.50 | 1.221 |
| RU-103 | 2440.37 | 610.30 | 299. | 0. | 0.000 | 1000.00 | 1.377s |
| AG-108M | 2456.30 | 614.28 | 299. | 0. | 0.000 | 1000.00 | 1.381s |
| RH-106 | 2486.84 | 621.92 | 22. | 2. | 0.001 | 483.91 | 1.388s |
| SB-125 | 2542.73 | 635.89 | 32. | -2. | -0.001 | 406.20 | 1.401s |
| I-131 | 2547.07 | 636.97 | 22. | 9. | 0.005 | 80.89 | 1.402s |
| AG-110M | 2630.21 | 657.76 | 47. | -13. | -0.007 | 79.57 | 1.421s |
| CS-137 | 2645.80 | 661.66 | 69. | 4. | 0.002 | 297.91 | 1.424s |
| NB-94 | 2809.68 | 702.63 | 47. | -6. | -0.003 | 259.16 | 1.461s |
| SB-124 | 2890.30 | 722.79 | 106. | -9. | -0.005 | 165.18 | 1.479s |
| AG-108M | 2890.91 | 722.94 | 97. | 0. | 0.000 | 1000.00 | 1.480s |
| EU-154 | 2892.58 | 723.36 | 97. | 0. | 0.000 | 1000.00 | 1.480s |
| ZR-95 | 2895.95 | 724.20 | 97. | 0. | 0.000 | 1000.00 | 1.481s |
| BI-212 | 2908.53 | 727.34 | 8. | 45. | 0.025 | 20.02 | 1.406 |
| pm-146 | 2942.04 | 735.72 | 14. | 18. | 0.010 | 50.00 | 1.491s |
| pm-146 | 2987.80 | 747.16 | 19. | 10. | 0.006 | 93.10 | 1.501s |
| ZR-95 | 3026.07 | 756.73 | 19. | 4. | 0.002 | 216.89 | 1.510s |
| AG-110M | 3054.93 | 763.94 | 39. | 4. | 0.002 | 208.55 | 1.516s |
| NB-95 | 3062.31 | 765.79 | 51. | 8. | 0.004 | 131.10 | 1.518s |
| PA-234M | 3064.81 | 766.41 | 44. | 12. | 0.007 | 84.64 | 1.518s |
| EU-152 | 3114.84 | 778.92 | 14. | 8. | 0.004 | 105.33 | 1.529s |
| BI-212 | 3140.84 | 785.42 | 14. | 19. | 0.011 | 47.66 | 1.535s |
| CS-134 | 3182.63 | 795.87 | 34. | 9. | 0.005 | 99.93 | 1.544s |
| CS-134 | 3206.97 | 801.95 | 43. | 11. | 0.006 | 91.70 | 1.550s |
| CO-58 | 3242.26 | 810.78 | 58. | -5. | -0.003 | 220.00 | 1.557s |
| La-140 | 3262.25 | 815.77 | 70. | -13. | -0.007 | 93.07 | 1.562 |
| Cs-136 | 3273.17 | 818.50 | 68. | 12. | 0.007 | 99.76 | 1.564s |
| MN-54 | 3338.56 | 834.85 | 14. | 3. | 0.002 | 242.38 | 1.579s |
| Co-56 | 3386.25 | 846.77 | 28. | -7. | -0.004 | 164.75 | 1.589s |
| TL-208 | 3440.47 | 860.32 | 3. | 18. | 0.010 | 31.24 | 2.737s |
| NB-94 | 3483.57 | 871.10 | 36. | -7. | -0.004 | 126.97 | 1.610s |
| EU-154 | 3492.10 | 873.23 | 49. | -3. | -0.002 | 335.00 | 1.612s |
| PA-234 | 3521.30 | 880.53 | 52. | -3. | -0.001 | 386.09 | 1.618s |
| PA-234 | 3532.15 | 883.24 | 54. | 0. | 0.000 | 1000.00 | 1.620s |
| AG-110M | 3537.92 | 884.68 | 54. | 0. | 0.000 | 1000.00 | 1.622s |
| y-88 | 3591.35 | 898.04 | 30. | -7. | -0.004 | 176.13 | 1.633s |
| AC-228 | 3644.09 | 911.22 | 11. | 118. | 0.065 | 11.81 | 1.517 |
| AG-110M | 3749.18 | 937.49 | 40. | -16. | -0.009 | 88.34 | 1.667s |
| PA-234 | 3783.30 | 946.02 | 15. | 5. | 0.003 | 176.07 | 1.674s |
| EU-152 | 3855.67 | 964.11 | 73. | 8. | 0.005 | 149.84 | 1.690s |
| AC-228 | 3875.11 | 968.97 | 33. | 72. | 0.040 | 16.26 | 1.694 |
| EU-154 | 3984.56 | 996.33 | 0. | 7. | 0.004 | 36.98 | 1.717s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| PA-234M | 4003.24 | 1001.00 | 7. | 41. | 0.023 | 18.28 | 1.721s |
| EU-154 | 4018.35 | 1004.77 | 58. | -6. | -0.003 | 185.04 | 1.724s |
| Co-56 | 4150.64 | 1037.84 | 25. | -2. | -0.001 | 554.15 | 1.751s |
| Cs-136 | 4191.56 | 1048.07 | 18. | 3. | 0.002 | 208.17 | 1.760 |
| RH-106 | 4200.73 | 1050.36 | 42. | -15. | -0.008 | 66.33 | 1.762s |
| BI-207 | 4253.94 | 1063.66 | 15. | 5. | 0.003 | 176.07 | 1.773s |
| Ga-68 | 4308.91 | 1077.40 | 30. | -6. | -0.003 | 204.80 | 1.784s |
| FE-59 | 4396.33 | 1099.25 | 16. | -4. | -0.002 | 232.74 | 1.802s |
| EU-152 | 4447.64 | 1112.07 | 68. | -3. | -0.002 | 405.55 | 1.812s |
| ZN-65 | 4461.53 | 1115.55 | 65. | 0. | 0.000 | 1000.00 | 1.815s |
| BI-214 | 4480.50 | 1120.29 | 18. | 28. | 0.016 | 28.43 | 1.819D |
| Sc-46 | 4481.55 | 1120.55 | 65. | 0. | 0.000 | 1000.00 | 1.819 |
| Ta-182 | 4484.55 | 1121.30 | 60. | 7. | 0.004 | 151.75 | 1.820s |
| CO-60 | 4692.35 | 1173.24 | 21. | 3. | 0.001 | 398.43 | 1.862s |
| Ta-182 | 4755.62 | 1189.05 | 21. | 6. | 0.003 | 189.97 | 1.875s |
| Ta-182 | 4885.10 | 1221.41 | 37. | -2. | -0.001 | 598.81 | 1.900s |
| Co-56 | 4952.60 | 1238.28 | 43. | -8. | -0.004 | 197.00 | 1.914s |
| NA-22 | 5097.65 | 1274.53 | 5. | 7. | 0.004 | 61.79 | 1.942s |
| EU-154 | 5097.71 | 1274.54 | 12. | 4. | 0.002 | 135.47 | 1.942s |
| FE-59 | 5165.94 | 1291.60 | 11. | 9. | 0.005 | 97.22 | 1.956s |
| CO-60 | 5329.62 | 1332.50 | 6. | 7. | 0.004 | 89.28 | 1.987s |
| AG-110M | 5536.89 | 1384.30 | 6. | 6. | 0.004 | 96.69 | 2.027s |
| EU-152 | 5631.75 | 1408.00 | 28. | -12. | -0.007 | 105.15 | 2.045s |
| K-40 | 5842.30 | 1460.62 | 0. | 339. | 0.188 | 5.43 | 1.930 |
| La-140 | 6384.95 | 1596.21 | 30. | -17. | -0.009 | 81.60 | 2.183s |
| SB-124 | 6764.26 | 1690.98 | 0. | 7. | 0.004 | 37.80 | 2.250s |
| BI-214 | 7058.47 | 1764.49 | 0. | 32. | 0.018 | 17.68 | 2.301 |
| Co-56 | 7085.93 | 1771.35 | 32. | 0. | 0.000 | 1000.00 | 2.305s |
| y-88 | 7344.95 | 1836.06 | 0. | 7. | 0.004 | 37.80 | 2.349s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | 2.5629E+00 | | | | | 5.31E+01 |
| | | | 477.60 | 2.563E+00 | &( | 1.448E+01 | 1.65E+02 1.05E+01 G |
| NA-22 | C | 4.4739E-01 | | | | | 9.50E+02 |
| | | | 1274.53 | 4.474E-01 | ?( | 8.923E-01 | 6.18E+01 9.99E+01 G |
| K-40 | N | 2.3389E+02 | | | | | 4.66E+11 |
| | | | 1460.83 | 2.339E+02 | ( | 5.085E+00 | 5.43E+00 1.07E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Sc-46 | F -3.3504E-02 | | | | | 8.38E+01 | |
| | | 889.28 | -3.350E-02 | %( | 1.889E+00 | 1.59E+03 | 1.00E+02 G |
| | | 1120.55 | 0.000E+00 | + | 2.414E+00 | 1.00E+03 | 1.00E+02 G |
| MN-54 | C 1.6105E-01 | | | | | 3.12E+02 | |
| | | 834.85 | 1.610E-01 | ?( | 9.654E-01 | 2.42E+02 | 1.00E+02 G |
| FE-59 | F 3.4446E-01 | | | | | 4.45E+01 | |
| | | 1099.25 | -4.181E-01 | ?( | 2.232E+00 | 2.33E+02 | 5.65E+01 G |
| | | 1291.60 | 1.342E+00 | ?( | 2.848E+00 | 9.72E+01 | 4.32E+01 G |
| Co-56 | C -3.3918E-01 | | | | | 7.73E+01 | |
| | | 846.77 | -3.392E-01 | ?( | 1.326E+00 | 1.65E+02 | 9.99E+01 G |
| | | 1238.28 | -7.511E-01 | & | 3.248E+00 | 1.97E+02 | 6.61E+01 G |
| | | 1037.84 | -7.999E-01 | + | 1.040E+01 | 5.54E+02 | 1.41E+01 G |
| | | 1771.35 | 0.000E+00 | + | 1.609E+01 | 1.00E+03 | 1.55E+01 A |
| CO-57 | C 7.9798E-02 | | | | | 2.72E+02 | |
| | | 122.06 | 7.980E-02 | ?( | 1.047E+00 | 3.85E+02 | 8.56E+01 G |
| | | 136.47 | -2.998E+00 | & | 1.182E+01 | 1.18E+02 | 1.07E+01 G |
| CO-58 | C -2.3560E-01 | | | | | 7.09E+01 | |
| | | 810.78 | -2.356E-01 | ?( | 1.800E+00 | 2.20E+02 | 9.95E+01 G |
| CO-60 | F 4.7367E-01 | | | | | 1.93E+03 | |
| | | 1332.50 | 4.737E-01 | ?( | 9.460E-01 | 8.93E+01 | 1.00E+02 G |
| | | 1173.24 | 1.657E-01 | - | 1.506E+00 | 3.98E+02 | 9.99E+01 G |
| NB-94 | I -2.4373E-01 | | | | | 7.41E+06 | |
| | | 702.63 | -2.437E-01 | ?( | 1.486E+00 | 2.59E+02 | 9.79E+01 G |
| | | 871.10 | -3.467E-01 | + | 1.519E+00 | 1.27E+02 | 9.99E+01 G |
| ZR-95 | I 3.5411E-01 | | | | | 6.40E+01 | |
| | | 756.73 | 3.541E-01 | ?( | 1.867E+00 | 2.17E+02 | 5.45E+01 G |
| | | 724.20 | 0.000E+00 | - | 4.741E+00 | 1.00E+03 | 4.42E+01 G |
| NB-95 | I 3.5997E-01 | | | | | 6.40E+01 | |
| | | 765.79 | 3.600E-01 | &( | 1.619E+00 | 1.31E+02 | 9.98E+01 G |
| RU-103 | I 1.4368E-01 | | | | | 3.93E+01 | |
| | | 497.05 | 1.437E-01 | ?( | 9.174E-01 | 2.45E+02 | 9.09E+01 G |
| | | 610.30 | 0.000E+00 | - | 5.495E+01 | 1.00E+03 | 5.75E+00 GA |
| RH-106 | I 7.7480E-01 | | | | | 3.74E+02 | |
| | | 621.92 | 7.748E-01 | ?( | 9.517E+00 | 4.84E+02 | 9.93E+00 G |
| | | 1050.36 | -5.484E+01 | + | 1.203E+02 | 6.63E+01 | 1.56E+00 G |
| | | 511.86 | 1.001E+01 | ? | 7.403E+00 | 4.01E+01 | 2.00E+01 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| AG-108M | C | 3.2716E-02 | | | | | 1.53E+05 | |
| | | | 433.94 | 3.272E-02 | %( | 1.053E+00 | 1.24E+03 | 9.05E+01 G |
| | | | 722.94 | 0.000E+00 | - | 2.301E+00 | 1.00E+03 | 9.08E+01 G |
| | | | 614.28 | 0.000E+00 | & | 3.534E+00 | 1.00E+03 | 8.98E+01 G |
| AG-110M | F | 5.3775E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | 0.000E+00 | ?( | 2.552E+00 | 1.00E+03 | 7.27E+01 G |
| | | | 657.76 | -5.508E-01 | & | 1.468E+00 | 7.96E+01 | 9.46E+01 G |
| | | | 937.49 | -2.495E+00 | + | 4.898E+00 | 8.83E+01 | 3.44E+01 G |
| | | | 1384.30 | 1.840E+00 | ?( | 4.011E+00 | 9.67E+01 | 2.43E+01 G |
| | | | 763.94 | 8.717E-01 | ?( | 6.374E+00 | 2.09E+02 | 2.23E+01 G |
| SN-113 | F | 4.9517E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | 4.952E-01 | ?( | 1.998E+00 | 1.19E+02 | 6.40E+01 G |
| SB-124 | F | 3.9586E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | 0.000E+00 | ?( | 3.186E+00 | 1.00E+03 | 9.83E+01 G |
| | | | 1690.98 | 1.210E+00 | ?( | 1.274E+00 | 3.78E+01 | 4.78E+01 G |
| | | | 722.79 | -3.580E+00 | + | 2.016E+01 | 1.65E+02 | 1.08E+01 G |
| SB-125 | I | -2.6383E-01 | | | | | 1.01E+03 | |
| | | | 427.88 | -1.584E+00 | ?( | 3.959E+00 | 1.01E+02 | 2.96E+01 G |
| | | | 600.50 | 1.924E+00 | ?( | 1.722E+01 | 2.65E+02 | 1.79E+01 G |
| | | | 635.89 | -6.915E-01 | & | 1.005E+01 | 4.06E+02 | 1.13E+01 G |
| | | | 463.37 | -5.928E-01 | + | 1.354E+01 | 6.56E+02 | 1.05E+01 G |
| I-131 | I | 2.7890E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | -1.280E-01 | &( | 1.316E+00 | 4.07E+02 | 8.17E+01 G |
| | | | 284.30 | -6.360E+00 | + | 1.627E+01 | 9.94E+01 | 6.14E+00 G |
| | | | 636.97 | 4.915E+00 | ?( | 1.342E+01 | 8.09E+01 | 7.17E+00 G |
| Gd-153 | F | -4.6005E-01 | | | | | 2.42E+02 | |
| | | | 97.50 | -4.601E-01 | ?( | 4.682E+00 | 3.02E+02 | 3.00E+01 G |
| | | | 103.20 | 0.000E+00 | + | 6.440E+00 | 1.00E+03 | 2.18E+01 G |
| Ga-68 | C | -1.2403E+01 | | | | | 4.71E-02 | |
| | | | 1077.40 | -1.240E+01 | ?( | 5.837E+01 | 2.05E+02 | 3.30E+00 G |
| Tc-99m | I | 2.8783E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | 2.878E-01 | ?( | 1.188E+00 | 1.23E+02 | 8.93E+01 G |
| BA-133 | F | -3.7925E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -6.549E-01 | ?( | 3.532E+00 | 1.60E+02 | 6.20E+01 G |
| | | | 302.85 | 5.540E-01 | ?( | 1.068E+01 | 5.69E+02 | 1.83E+01 G |
| | | | 383.84 | 1.503E+00 | ? | 1.149E+01 | 2.20E+02 | 8.94E+00 GA |
| | | | 80.99 | -2.266E-01 | + | 3.074E+00 | 5.01E+02 | 3.41E+01 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| CS-134 | I | 4.7233E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | 0.000E+00 | &( | 3.215E+00 | 1.00E+03 | 9.76E+01 G |
| | | | 795.87 | 4.738E-01 | &( | 1.615E+00 | 9.99E+01 | 8.55E+01 G |
| | | | 569.32 | -2.578E+00 | & | 8.512E+00 | 9.75E+01 | 1.54E+01 G |
| | | | 801.95 | 5.764E+00 | ?( | 1.788E+01 | 9.17E+01 | 8.69E+00 G |
| | | | 563.24 | -2.713E+00 | + | 1.215E+01 | 1.82E+02 | 8.35E+00 G |
| CS-137 | I | 1.8904E-01 | | | | | 1.10E+04 | |
| | | | 661.66 | 1.890E-01 | ?( | 1.957E+00 | 2.98E+02 | 8.52E+01 G |
| CE-139 | F | 3.4363E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | 3.436E-01 | ?( | 1.260E+00 | 1.09E+02 | 7.99E+01 G |
| Ba-140 | I | -8.8194E-01 | | | | | 1.28E+01 | |
| | | | 537.26 | -2.361E+00 | ?( | 5.526E+00 | 9.85E+01 | 2.44E+01 G |
| | | | 162.66 | 4.919E+00 | ?( | 1.798E+01 | 1.09E+02 | 6.22E+00 G |
| | | | 304.85 | 0.000E+00 | & | 4.616E+01 | 1.00E+03 | 4.29E+00 G |
| La-140 | I | -1.4048E+00 | | | | | 1.28E+01 | |
| | | | 1596.21 | -1.405E+00 | ?( | 2.336E+00 | 8.16E+01 | 9.54E+01 G |
| | | | 487.02 | -5.775E-01 | + | 3.650E+00 | 1.85E+02 | 4.55E+01 G |
| | | | 328.76 | 7.546E-01 | + | 4.597E+00 | 2.31E+02 | 2.03E+01 G |
| | | | 815.77 | -2.697E+00 | + | 8.452E+00 | 9.31E+01 | 2.33E+01 G |
| CE-141 | I | 5.2931E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | 5.293E-01 | ?( | 2.195E+00 | 1.24E+02 | 4.82E+01 G |
| PM-144 | C | 2.8173E-02 | | | | | 3.63E+02 | |
| | | | 696.54 | 2.817E-02 | %( | 1.411E+00 | 2.02E+03 | 9.90E+01 G |
| | | | 618.06 | 1.288E-02 | % | 3.169E+00 | 7.22E+03 | 9.91E+01 G |
| EU-152 | F | 1.1080E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | -1.528E+00 | ?( | 7.439E+00 | 1.45E+02 | 2.65E+01 G |
| | | | 1112.07 | -1.268E+00 | + | 1.795E+01 | 4.06E+02 | 1.36E+01 G |
| | | | 121.78 | 8.767E-01 | ?( | 2.983E+00 | 1.02E+02 | 2.86E+01 G |
| | | | 778.92 | 2.812E+00 | ?( | 7.080E+00 | 1.05E+02 | 1.29E+01 G |
| | | | 964.11 | 3.039E+00 | ?( | 1.559E+01 | 1.50E+02 | 1.46E+01 G |
| | | | 244.69 | 4.568E+00 | ?( | 3.273E+01 | 2.14E+02 | 7.58E+00 G |
| | | | 1408.00 | -4.200E+00 | + | 9.370E+00 | 1.05E+02 | 2.10E+01 GA |
| EU-154 | I | 8.7970E-01 | | | | | 3.14E+03 | |
| | | | 873.23 | -1.212E+00 | ?( | 1.427E+01 | 3.35E+02 | 1.23E+01 G |
| | | | 123.10 | -4.080E-01 | + | 2.166E+00 | 1.57E+02 | 4.08E+01 G |
| | | | 1274.54 | 7.359E-01 | ?( | 3.557E+00 | 1.35E+02 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | - | 1.034E+01 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | -1.835E+00 | + | 1.174E+01 | 1.85E+02 | 1.80E+01 G |
| | | | 996.33 | 3.778E+00 | &( | 3.809E+00 | 3.70E+01 | 1.06E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Ta-182 | F | 1.5657E+00 | | | | | 1.14E+02 | |
| | | | 1121.30 | 1.274E+00 | ?( | 6.646E+00 | 1.52E+02 | 3.49E+01 G |
| | | | 1221.41 | -5.535E-01 | - | 7.397E+00 | 5.99E+02 | 2.70E+01 G |
| | | | 1189.05 | 2.194E+00 | ?( | 9.384E+00 | 1.90E+02 | 1.62E+01 G |
| Hg-203 | F | -1.5964E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | -1.596E-01 | ?( | 1.458E+00 | 2.67E+02 | 8.15E+01 G |
| TL-208 | N | 7.0697E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 7.074E+00 | (P | 1.089E+00 | 9.79E+00 | 8.45E+01 G |
| | | | 277.28 | 5.127E+00 | - | 1.087E+01 | 7.85E+01 | 6.31E+00 G |
| | | | 860.56 | 7.038E+00 | ( | 4.342E+00 | 3.12E+01 | 1.24E+01 G |
| pm-146 | C | 2.2027E+00 | | | | | 2.02E+03 | |
| | | | 747.16 | 1.353E+00 | &( | 2.962E+00 | 9.31E+01 | 3.40E+01 G |
| | | | 735.72 | 3.486E+00 | ?( | 3.902E+00 | 5.00E+01 | 2.25E+01 G |
| | | | 453.88 | 4.704E-01 | - | 1.443E+00 | 1.22E+02 | 6.50E+01 G |
| y-88 | F | 1.3622E-01 | | | | | 1.07E+02 | |
| | | | 898.04 | -3.782E-01 | ?( | 1.525E+00 | 1.76E+02 | 9.37E+01 G |
| | | | 1836.06 | 6.221E-01 | ?( | 6.550E-01 | 3.78E+01 | 9.92E+01 G |
| Cd-113m | | -3.8190E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | -3.819E+03 | ?( | 1.953E+04 | 1.51E+02 | 6.00E-03 K |
| Cf-251 | T | 5.5937E-01 | | | | | 3.28E+05 | |
| | | | 176.60 | 5.594E-01 | ( | 5.206E+00 | 3.41E+02 | 1.70E+01 G |
| | | | 227.00 | -3.281E+00 | + | 1.610E+01 | 1.89E+02 | 6.30E+00 GA |
| Cf-249 | T | 6.0435E-01 | | | | | 1.28E+05 | |
| | | | 387.95 | 4.117E-01 | ?( | 1.631E+00 | 1.16E+02 | 6.60E+01 G |
| | | | 333.44 | 1.424E+00 | @( | 5.897E+00 | 1.58E+02 | 1.55E+01 G |
| Sn-126 | | -8.9909E-01 | | | | | 3.65E+07 | |
| | | | 87.57 | 7.684E-01 | } | 4.718E+00 | 9.76E+01 | 3.75E+01 GA |
| | | | 64.28 | -8.991E-01 | ?( | 1.650E+01 | 5.42E+02 | 9.70E+00 G |
| | | | 86.94 | -4.361E+00 | } | 2.056E+01 | 1.41E+02 | 9.04E+00 GA |
| PB-210 | N | 2.7755E+01 | | | | | 8.14E+03 | |
| | | | 46.54 | 2.776E+01 | *(P | 3.484E+01 | 4.76E+01 | 4.25E+00 G |
| PB-212 | N | 1.8800E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 1.880E+01 | (P | 2.088E+00 | 5.85E+00 | 4.33E+01 G |
| | | | 300.03 | 3.671E+01 | + | 1.713E+01 | 2.28E+01 | 3.28E+00 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| PB-214 | N | 1.3376E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.298E+01 | @(P | 2.475E+00 | 1.07E+01 | 3.76E+01 G |
| | | | 295.09 | 1.415E+01 | *(P | 3.746E+00 | 1.40E+01 | 1.93E+01 G |
| | | | 242.00 | 1.519E+01 | | 1.275E+01 | 2.74E+01 | 7.43E+00 GA |
| BI-207 | C | 1.1830E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | -8.610E-02 | &( | 1.368E+00 | 4.52E+02 | 9.77E+01 G |
| | | | 1063.66 | 3.865E-01 | ?( | 1.604E+00 | 1.76E+02 | 7.45E+01 G |
| BI-212 | N | 2.5938E+01 | | | | | 6.98E+02 | |
| | | | 727.17 | 2.594E+01 | ( | 8.933E+00 | 2.00E+01 | 7.55E+00 G |
| | | | 785.42 | 6.793E+01 | + | 7.202E+01 | 4.77E+01 | 1.28E+00 GA |
| BI-214 | N | 1.1980E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.227E+01 | (P | 2.547E+00 | 1.15E+01 | 4.61E+01 G |
| | | | 1120.29 | 1.111E+01 | ( | 8.848E+00 | 2.84E+01 | 1.51E+01 G |
| | | | 1764.49 | 1.775E+01 | + | 4.088E+00 | 1.77E+01 | 1.54E+01 G |
| BI-210M | T | -3.9102E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | -3.910E-01 | ?( | 2.467E+00 | 1.86E+02 | 5.00E+01 G |
| | | | 304.90 | 0.000E+00 | & | 7.073E+00 | 1.00E+03 | 2.80E+01 G |
| AC-228 | N | 2.1981E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.076E+01 | ( | 3.247E+00 | 1.18E+01 | 2.90E+01 G |
| | | | 968.97 | 2.217E+01 | ?( | 9.031E+00 | 1.63E+01 | 1.75E+01 G |
| | | | 338.32 | 2.464E+01 | ( | 5.433E+00 | 1.30E+01 | 1.20E+01 G |
| | | | 93.35 | 6.660E+00 | - | 3.059E+01 | 1.38E+02 | 5.56E+00 XA |
| TH-227 | N | -5.9333E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | -5.933E+00 | &( | 2.776E+01 | 1.40E+02 | 8.00E+00 G |
| | | | 256.24 | -2.626E+00 | + | 1.272E+01 | 1.85E+02 | 7.00E+00 G |
| TH-229 | N | 2.5774E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | -1.788E+00 | ?( | 2.183E+01 | 4.69E+02 | 4.40E+00 G |
| | | | 210.85 | 9.001E+00 | &( | 4.152E+01 | 1.37E+02 | 2.99E+00 G |
| TH-234 | N | 1.6761E+01 | | | | | 1.63E+12 | |
| | | | 63.29 | 1.676E+01 | (P | 2.941E+01 | 5.40E+01 | 3.81E+00 G |
| | | | 92.59 | 9.684E-01 | - P | 1.721E+01 | 5.24E+02 | 5.58E+00 G |
| PA-231 | N | 1.1630E+01 | | | | | 1.20E+07 | |
| | | | 302.65 | 1.083E+01 | ?( | 6.652E+01 | 1.82E+02 | 2.88E+00 G |
| | | | 300.07 | 1.257E+01 | @( | 7.395E+01 | 1.75E+02 | 2.46E+00 G |
| PA-233 | C | 7.3301E-01 | | | | | 7.82E+08 | |
| | | | 312.01 | 0.000E+00 | ?( | 5.591E+00 | 1.00E+03 | 3.60E+01 G |
| | | | 300.18 | 4.989E+00 | @( | 3.004E+01 | 1.79E+02 | 6.20E+00 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

PA-234   N   1.7871E+00                                     1.63E+12
                          131.29 8.664E-01 ?(  6.509E+00 2.23E+02 1.80E+01 G
                          946.02 1.965E+00 ?(  8.158E+00 1.76E+02 1.34E+01 G
                          569.47 3.518E+00 &(  1.653E+01 1.37E+02 8.20E+00 G
                          883.24 0.000E+00 -   1.930E+01 1.00E+03 9.60E+00 G
                          880.53-2.217E+00 +   3.010E+01 3.86E+02 6.00E+00 GA

PA-234M  N   2.6724E+02                                     1.63E+12
                         1001.00 2.672E+02 ?(  1.006E+02 1.83E+01 8.37E-01 G
                          766.41 1.804E+02 &   5.138E+02 8.46E+01 2.94E-01 G

U-235    N   2.6467E+00                                     2.57E+11
                          143.79 1.458E+00 *(P 9.969E+00 2.03E+02 1.10E+01 G
                          205.33 5.247E+00 &(  2.347E+01 1.33E+02 5.01E+00 G
                          163.38 2.533E-01 %   2.301E+01 2.66E+03 5.08E+00 G

AM-241   T  -3.7528E-01                                     1.58E+05
                           59.54-3.753E-01 ?(  3.851E+00 3.79E+02 3.59E+01 G

Cs-136   F   4.1378E-01                                     1.30E+01
                          818.50 5.740E-01 ?(  1.935E+00 9.98E+01 1.00E+02 G
                         1048.07 2.135E-01 ?(  1.600E+00 2.08E+02 8.00E+01 G
                          340.57-8.544E-01 +   4.292E+00 1.49E+02 4.69E+01 G

Np-239   T   3.0959E-01                                     2.36E+00
                          103.70 0.000E+00 -   5.847E+00 1.00E+03 2.40E+01 X
                          106.13 3.096E-01 ?(  5.904E+00 5.65E+02 2.27E+01 G
                           99.50 0.000E+00 -   9.419E+00 1.00E+03 1.50E+01 X

Nd-147      -2.4597E+00                                     1.11E+01
                          531.00-2.460E+00 ?(  8.799E+00 1.48E+02 1.30E+01 G
                           91.10 3.679E-07 %   6.235E+00 5.04E+08 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
```

library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity | |
|---|---|---|---|---|---|---|---|
| TH-227 | 50.14 | 356. | -19. | -0.011 | 139.62 | -5.933E+00 | |
| AM-241 | 59.54 | 220. | -7. | -0.004 | 378.95 | -3.753E-01 | |
| BA-133 | 80.99 | 223. | -5. | -0.003 | 500.51 | -2.266E-01 | |
| EU-155 | 86.54 | 854. | -28. | -0.016 | 147.17 | -1.287E+00 | |
| Gd-153 | 97.50 | 483. | -10. | -0.006 | 302.49 | -4.601E-01 | |
| Np-239 | 106.13 | 451. | 5. | 0.003 | 564.99 | 3.096E-01 | |
| EU-152 | 121.78 | 174. | 19. | 0.010 | 101.55 | 8.767E-01 | |
| CO-57 | 122.06 | 193. | 5. | 0.003 | 384.67 | 7.980E-02 | |
| EU-154 | 123.10 | 186. | -12. | -0.007 | 157.07 | -4.080E-01 | |
| PA-234 | 131.29 | 322. | 12. | 0.006 | 222.80 | 8.664E-01 | |
| CO-57 | 136.47 | 365. | -23. | -0.013 | 117.98 | -2.998E+00 | |
| Tc-99m | 140.51 | 232. | 18. | 0.010 | 122.96 | 2.878E-01 | |
| U-235 | 143.79 | 257. | 11. | 0.006 | 202.93 | 1.458E+00 | P |
| CE-141 | 145.44 | 237. | 18. | 0.010 | 123.55 | 5.293E-01 | |
| Ba-140 | 162.66 | 228. | 20. | 0.011 | 109.15 | 4.919E+00 | |
| CE-139 | 165.85 | 186. | 18. | 0.010 | 109.27 | 3.436E-01 | |
| TH-229 | 193.51 | 136. | -5. | -0.003 | 469.23 | -1.788E+00 | |
| U-235 | 205.33 | 190. | 15. | 0.008 | 132.78 | 5.247E+00 | |
| TH-229 | 210.85 | 205. | 15. | 0.008 | 136.97 | 9.001E+00 | |
| EU-152 | 244.69 | 693. | 18. | 0.010 | 214.05 | 4.568E+00 | |
| TH-227 | 256.24 | 77. | -9. | -0.005 | 185.43 | -2.626E+00 | |
| Cd-113m | 263.70 | 132. | -11. | -0.006 | 150.76 | -3.819E+03 | |
| BI-210M | 265.83 | 145. | -9. | -0.005 | 185.58 | -3.910E-01 | |
| Hg-203 | 279.20 | 125. | -6. | -0.003 | 266.67 | -1.596E-01 | |
| I-131 | 284.30 | 84. | -18. | -0.010 | 99.44 | -6.360E+00 | |
| PA-231 | 300.07 | 274. | 14. | 0.008 | 174.59 | 1.257E+01 | |
| PA-233 | 300.18 | 287. | 14. | 0.008 | 178.76 | 4.989E+00 | |
| PA-231 | 302.65 | 301. | 14. | 0.008 | 182.42 | 1.083E+01 | |
| BA-133 | 302.85 | 315. | 4. | 0.002 | 568.54 | 5.540E-01 | |
| La-140 | 328.76 | 59. | 6. | 0.004 | 230.76 | 7.546E-01 | |
| Cf-249 | 333.44 | 55. | 9. | 0.005 | 157.72 | 1.424E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Cs-136 | 340.57 | 281. | -16. | -0.009 | 149.43 | -8.544E-01 | |
| EU-152 | 344.29 | 265. | -16. | -0.009 | 144.78 | -1.528E+00 | |
| BA-133 | 356.00 | 314. | -16. | -0.009 | 160.44 | -6.549E-01 | |
| I-131 | 364.48 | 68. | -4. | -0.002 | 406.71 | -1.280E-01 | |
| BA-133 | 383.84 | 57. | 5. | 0.003 | 220.04 | 1.503E+00 | |
| Cf-249 | 387.95 | 62. | 10. | 0.006 | 116.32 | 4.117E-01 | |
| SN-113 | 391.69 | 88. | 12. | 0.006 | 119.02 | 4.952E-01 | |
| SB-125 | 427.88 | 64. | -16. | -0.009 | 101.04 | -1.584E+00 | |
| pm-146 | 453.88 | 36. | 10. | 0.006 | 121.66 | 4.704E-01 | |
| SB-125 | 463.37 | 85. | -2. | -0.001 | 655.74 | -5.928E-01 | |
| BE-7 | 477.60 | 94. | 8. | 0.005 | 165.33 | 2.563E+00 | |
| La-140 | 487.02 | 110. | -8. | -0.005 | 185.10 | -5.775E-01 | |
| RU-103 | 497.05 | 24. | 4. | 0.002 | 244.95 | 1.437E-01 | |
| RH-106 | 511.86 | 80. | 60. | 0.033 | 40.14 | 1.001E+01 | |
| Nd-147 | 531.00 | 43. | -9. | -0.005 | 147.64 | -2.460E+00 | |
| Ba-140 | 537.26 | 61. | -17. | -0.009 | 98.49 | -2.361E+00 | |
| CS-134 | 563.24 | 30. | -6. | -0.004 | 181.90 | -2.713E+00 | |
| CS-134 | 569.32 | 52. | -11. | -0.006 | 97.49 | -2.578E+00 | |
| PA-234 | 569.47 | 56. | 8. | 0.004 | 136.93 | 3.518E+00 | |
| BI-207 | 569.70 | 54. | -2. | -0.001 | 451.53 | -8.610E-02 | |
| SB-125 | 600.50 | 290. | 9. | 0.005 | 264.72 | 1.924E+00 | |
| RH-106 | 621.92 | 22. | 2. | 0.001 | 483.91 | 7.748E-01 | |
| SB-125 | 635.89 | 32. | -2. | -0.001 | 406.20 | -6.915E-01 | |
| I-131 | 636.97 | 22. | 9. | 0.005 | 80.89 | 4.915E+00 | |
| AG-110M | 657.76 | 47. | -13. | -0.007 | 79.57 | -5.508E-01 | |
| NB-94 | 702.63 | 47. | -6. | -0.003 | 259.16 | -2.437E-01 | |
| SB-124 | 722.79 | 106. | -9. | -0.005 | 165.18 | -3.580E+00 | |
| pm-146 | 735.72 | 14. | 18. | 0.010 | 50.00 | 3.486E+00 | |
| pm-146 | 747.16 | 19. | 10. | 0.006 | 93.10 | 1.353E+00 | |
| ZR-95 | 756.73 | 19. | 4. | 0.002 | 216.89 | 3.541E-01 | |
| AG-110M | 763.94 | 39. | 4. | 0.002 | 208.55 | 8.717E-01 | |
| NB-95 | 765.79 | 51. | 8. | 0.004 | 131.10 | 3.600E-01 | |
| EU-152 | 778.92 | 14. | 8. | 0.004 | 105.33 | 2.812E+00 | |
| CS-134 | 795.87 | 34. | 9. | 0.005 | 99.93 | 4.738E-01 | |
| CS-134 | 801.95 | 43. | 11. | 0.006 | 91.70 | 5.764E+00 | |
| CO-58 | 810.78 | 58. | -5. | -0.003 | 220.00 | -2.356E-01 | |
| La-140 | 815.77 | 70. | -13. | -0.007 | 93.07 | -2.697E+00 | |
| Cs-136 | 818.50 | 68. | 12. | 0.007 | 99.76 | 5.740E-01 | |
| Co-56 | 846.77 | 28. | -7. | -0.004 | 164.75 | -3.392E-01 | |
| NB-94 | 871.10 | 36. | -7. | -0.004 | 126.97 | -3.467E-01 | |
| EU-154 | 873.23 | 49. | -3. | -0.002 | 335.00 | -1.212E+00 | |
| PA-234 | 880.53 | 52. | -3. | -0.001 | 386.09 | -2.217E+00 | |
| y-88 | 898.04 | 30. | -7. | -0.004 | 176.13 | -3.782E-01 | |
| AG-110M | 937.49 | 40. | -16. | -0.009 | 88.34 | -2.495E+00 | |
| PA-234 | 946.02 | 15. | 5. | 0.003 | 176.07 | 1.965E+00 | |
| EU-152 | 964.11 | 73. | 8. | 0.005 | 149.84 | 3.039E+00 | |
| EU-154 | 996.33 | 0. | 7. | 0.004 | 36.98 | 3.778E+00 | |
| EU-154 | 1004.77 | 58. | -6. | -0.003 | 185.04 | -1.835E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Co-56 | 1037.84 | 25. | -2. | -0.001 | 554.15 | -7.999E-01 | |
| Cs-136 | 1048.07 | 18. | 3. | 0.002 | 208.17 | 2.135E-01 | |
| RH-106 | 1050.36 | 42. | -15. | -0.008 | 66.33 | -5.484E+01 | |
| BI-207 | 1063.66 | 15. | 5. | 0.003 | 176.07 | 3.865E-01 | |
| Ga-68 | 1077.40 | 30. | -6. | -0.003 | 204.80 | -1.240E+01 | |
| FE-59 | 1099.25 | 16. | -4. | -0.002 | 232.74 | -4.181E-01 | |
| EU-152 | 1112.07 | 68. | -3. | -0.002 | 405.55 | -1.268E+00 | |
| CO-60 | 1173.24 | 21. | 3. | 0.001 | 398.43 | 1.657E-01 | |
| Co-56 | 1238.28 | 43. | -8. | -0.004 | 197.00 | -7.511E-01 | |
| NA-22 | 1274.53 | 5. | 7. | 0.004 | 61.79 | 4.474E-01 | |
| EU-154 | 1274.54 | 12. | 4. | 0.002 | 135.47 | 7.359E-01 | |
| FE-59 | 1291.60 | 11. | 9. | 0.005 | 97.22 | 1.342E+00 | |
| CO-60 | 1332.50 | 6. | 7. | 0.004 | 89.28 | 4.737E-01 | |
| AG-110M | 1384.30 | 6. | 6. | 0.004 | 96.69 | 1.840E+00 | |
| EU-152 | 1408.00 | 28. | -12. | -0.007 | 105.15 | -4.200E+00 | |
| La-140 | 1596.21 | 30. | -17. | -0.009 | 81.60 | -1.405E+00 | |
| SB-124 | 1690.98 | 0. | 7. | 0.004 | 37.80 | 1.210E+00 | |
| y-88 | 1836.06 | 0. | 7. | 0.004 | 37.80 | 6.221E-01 | |

P - Peakbackground subtraction

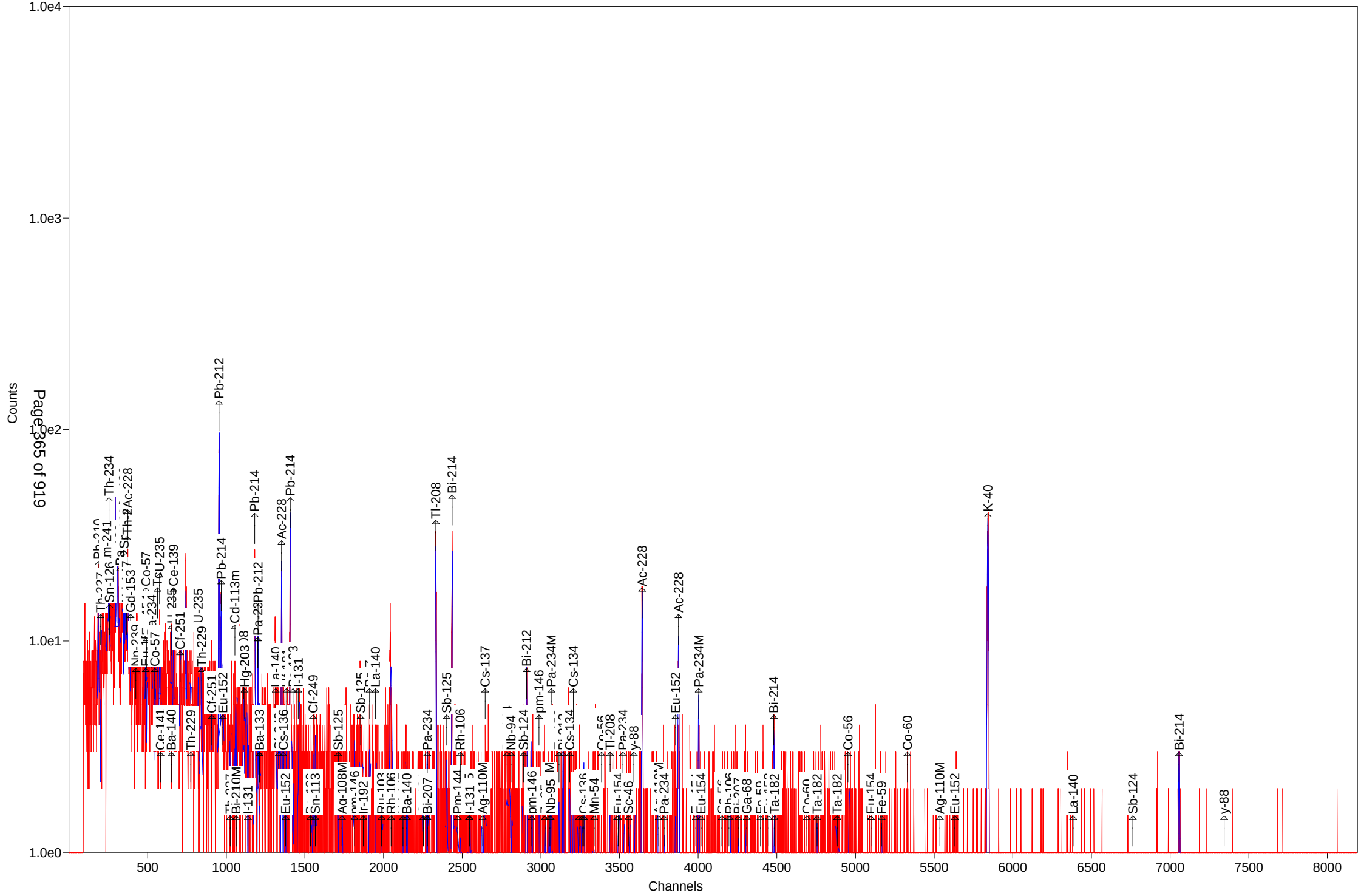
***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | 2.5629E+00 | 2.5629E+00 | 1.653E+02% | 1.45E+01 |
| NA-22 | #A | 4.4739E-01 | 4.4739E-01 | 6.179E+01% | 8.92E-01 |
| K-40 | | 2.3389E+02 | 2.3389E+02 | 5.431E+00% | 5.08E+00 |
| Sc-46 | #A | -3.3504E-02 | -3.3504E-02 | 1.592E+03% | 1.89E+00 |
| CR-51 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.06E+01 |
| MN-54 | #A | 1.6105E-01 | 1.6105E-01 | 2.424E+02% | 9.65E-01 |
| FE-59 | #A | 3.4445E-01 | 3.4446E-01 | 9.722E+01% | 2.23E+00 |
| Co-56 | #A | -3.3918E-01 | -3.3918E-01 | 1.648E+02% | 1.33E+00 |
| CO-57 | #A | 7.9798E-02 | 7.9798E-02 | 3.847E+02% | 1.05E+00 |
| CO-58 | #A | -2.3560E-01 | -2.3560E-01 | 2.200E+02% | 1.80E+00 |
| CO-60 | #A | 4.7367E-01 | 4.7367E-01 | 8.928E+01% | 9.46E-01 |
| ZN-65 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 4.75E+00 |
| NB-94 | #A | -2.4373E-01 | -2.4373E-01 | 2.592E+02% | 1.49E+00 |
| ZR-95 | #A | 3.5411E-01 | 3.5411E-01 | 2.169E+02% | 1.87E+00 |
| NB-95 | #A | 3.5997E-01 | 3.5997E-01 | 1.311E+02% | 1.62E+00 |
| RU-103 | #A | 1.4368E-01 | 1.4368E-01 | 2.449E+02% | 9.17E-01 |
| RH-106 | #A | 7.7480E-01 | 7.7480E-01 | 4.839E+02% | 9.52E+00 |
| AG-108M | #A | 3.2716E-02 | 3.2716E-02 | 1.242E+03% | 1.05E+00 |
| AG-110M | #A | 5.3775E-01 | 5.3775E-01 | 9.669E+01% | 2.55E+00 |
| SN-113 | #A | 4.9516E-01 | 4.9517E-01 | 1.190E+02% | 2.00E+00 |
| SB-124 | #A | 3.9586E-01 | 3.9586E-01 | 3.780E+01% | 3.19E+00 |
| SB-125 | #A | -2.6383E-01 | -2.6383E-01 | 1.010E+02% | 3.96E+00 |

| | | | | | |
|---|---|---|---|---|---|
| I-131 | #A | 2.7889E-01 | 2.7890E-01 | 8.089E+01% | 1.32E+00 |
| Gd-153 | #A | -4.6005E-01 | -4.6005E-01 | 3.025E+02% | 4.68E+00 |
| Ga-68 | #A | -1.2279E+01 | -1.2403E+01 | 2.048E+02% | 5.84E+01 |
| Tc-99m | #A | 2.8729E-01 | 2.8783E-01 | 1.230E+02% | 1.19E+00 |
| BA-133 | #A | -3.7925E-01 | -3.7925E-01 | 1.604E+02% | 3.53E+00 |
| CS-134 | #A | 4.7233E-01 | 4.7233E-01 | 9.170E+01% | 3.21E+00 |
| CS-137 | #A | 1.8904E-01 | 1.8904E-01 | 2.979E+02% | 1.96E+00 |
| CE-139 | #A | 3.4362E-01 | 3.4363E-01 | 1.093E+02% | 1.26E+00 |
| Ba-140 | #A | -8.8191E-01 | -8.8194E-01 | 7.351E+01% | 5.53E+00 |
| La-140 | #A | -1.4047E+00 | -1.4048E+00 | 8.160E+01% | 2.34E+00 |
| CE-141 | #A | 5.2930E-01 | 5.2931E-01 | 1.235E+02% | 2.19E+00 |
| CE-144 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.08E+01 |
| PM-144 | #A | 2.8173E-02 | 2.8173E-02 | 2.019E+03% | 1.41E+00 |
| EU-152 | #A | 1.1080E+00 | 1.1080E+00 | 6.652E+01% | 7.44E+00 |
| EU-154 | #A | 8.7970E-01 | 8.7970E-01 | 3.698E+01% | 1.43E+01 |
| EU-155 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 6.61E+00 |
| HF-181 | #A | 0.0000E+00 | 0.0000E+00 | 5.774E+02% | 1.98E+00 |
| Ta-182 | #A | 1.5657E+00 | 1.5657E+00 | 1.216E+02% | 6.65E+00 |
| Hg-203 | #A | -1.5963E-01 | -1.5964E-01 | 2.667E+02% | 1.46E+00 |
| TL-208 | | 7.0697E+00 | 7.0697E+00 | 9.786E+00% | 1.09E+00 |
| pm-146 | #A | 2.2027E+00 | 2.2027E+00 | 5.000E+01% | 2.96E+00 |
| y-88 | #A | 1.3622E-01 | 1.3622E-01 | 3.780E+01% | 1.53E+00 |
| Cd-113m | #A | -3.8190E+03 | -3.8190E+03 | 1.508E+02% | 1.95E+04 |
| Cd-109 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 4.72E+01 |
| Cf-251 | A | 5.5937E-01 | 5.5937E-01 | 3.406E+02% | 5.21E+00 |
| Cf-249 | #A | 6.0435E-01 | 6.0435E-01 | 9.799E+01% | 1.63E+00 |
| Sn-126 | #A | -8.9909E-01 | -8.9909E-01 | 5.422E+02% | 1.65E+01 |
| PB-210 | #A | 2.7755E+01 | 2.7755E+01 | 4.757E+01% | 3.48E+01 |
| PB-212 | | 1.8800E+01 | 1.8800E+01 | 5.848E+00% | 2.09E+00 |
| PB-214 | # | 1.3376E+01 | 1.3376E+01 | 8.828E+00% | 2.47E+00 |
| BI-207 | #A | 1.1830E-01 | 1.1830E-01 | 1.761E+02% | 1.37E+00 |
| BI-212 | | 2.5938E+01 | 2.5938E+01 | 2.002E+01% | 8.93E+00 |
| BI-214 | | 1.1980E+01 | 1.1980E+01 | 1.150E+01% | 2.55E+00 |
| BI-210M | #A | -3.9102E-01 | -3.9102E-01 | 1.856E+02% | 2.47E+00 |
| AC-228 | | 2.1980E+01 | 2.1981E+01 | 7.971E+00% | 3.25E+00 |
| TH-227 | #A | -5.9333E+00 | -5.9333E+00 | 1.396E+02% | 2.78E+01 |
| TH-229 | #A | 2.5774E+00 | 2.5774E+00 | 1.370E+02% | 2.18E+01 |
| TH-234 | #A | 1.6761E+01 | 1.6761E+01 | 5.404E+01% | 2.94E+01 |
| PA-231 | #A | 1.1630E+01 | 1.1630E+01 | 1.263E+02% | 6.65E+01 |
| PA-233 | #A | 7.3301E-01 | 7.3301E-01 | 1.788E+02% | 5.59E+00 |
| PA-234 | #A | 1.7871E+00 | 1.7871E+00 | 1.051E+02% | 6.51E+00 |
| PA-234M | # | 2.6724E+02 | 2.6724E+02 | 1.828E+01% | 1.01E+02 |
| U-235 | #A | 2.6467E+00 | 2.6467E+00 | 1.213E+02% | 9.97E+00 |
| AM-241 | #A | -3.7528E-01 | -3.7528E-01 | 3.790E+02% | 3.85E+00 |
| Np-237 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.50E+01 |
| Ir-192 | #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 2.34E+00 |
| Cs-136 | #A | 4.1377E-01 | 4.1378E-01 | 9.976E+01% | 1.94E+00 |
| Np-239 | #A | 3.0952E-01 | 3.0959E-01 | 5.650E+02% | 5.90E+00 |
| Nd-147 | #A | -2.4596E+00 | -2.4597E+00 | 1.476E+02% | 8.80E+00 |

```
  # - All peaks for activity calculation had bad shape.
  * - Activity omitted from total
  & - Activity omitted from total and all peaks had bad shape.
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   25.1 to  1999.7 keV)     3.776E+02  Bq/Sample
Total Decayed Activity (   25.1 to  1999.7 keV) 3.7755109E+02  Bq/Sample
```

309155_Gamma_160-22327-A-1-C DU. 10_Gamma_20171630.spc.



Test America St. Louis  Spectrum ID: 9_Gamma_20171607

Sample Description: 309155_Gamma_160-22327-A-2-B
Detector: Detector # 9
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-2-B

Decay to Time: 6/7/2017 09:53  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:54:00  Real Time: 1802 sec
Analysis Time: 6/7/2017 10:24  Dead Time: 0.13 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 9_Soil_TunaCan.Clb
Efficiency Cal Desc: 9_Soil_TunaCan_90099_050312
Efficiency Cal Date: 6/14/2012 10:19
Energy Cal Date: 3/1/2012 13:57
Library: Client_Long_Rev11.lib
Bkgd Correction File: 9_2017-06-04_0241.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | 2.295E-01 | 1640.1 | 3.764E+00 | 3.764E+00 | 1.300E+01 |
| NA-22 | 3.916E-01 | 71.8 | 2.813E-01 | 2.820E-01 | 9.397E-01 |
| K-40 | 2.414E+02 | 4.7 | 1.135E+01 | 1.678E+01 | 3.936E+00 |
| Sc-46 | 2.436E-01 | 186.6 | 4.545E-01 | 4.546E-01 | 1.567E+00 |
| CR-51 | 0.000E+00 | 1.#INF | 1.530E+00 | 1.530E+00 | 2.218E+01 |
| MN-54 | 7.326E-02 | 780.5 | 5.718E-01 | 5.718E-01 | 1.306E+00 |
| FE-59 | -1.606E-01 | 646.8 | 1.039E+00 | 1.039E+00 | 2.335E+00 |
| Co-56 | 1.246E+00 | 22.4 | 2.788E-01 | 2.860E-01 | 1.122E+00 |
| CO-57 | 0.000E+00 | 1.#INF | 1.374E-01 | 1.374E-01 | 1.052E+00 |
| CO-58 | -5.906E-01 | 81.0 | 4.782E-01 | 4.791E-01 | 1.598E+00 |
| CO-60 | -1.940E-01 | 309.0 | 5.994E-01 | 5.995E-01 | 1.317E+00 |
| ZN-65 | -8.339E-01 | 163.4 | 1.363E+00 | 1.363E+00 | 4.643E+00 |
| NB-94 | 5.303E-01 | 88.5 | 4.691E-01 | 4.699E-01 | 1.572E+00 |
| ZR-95 | 1.559E+00 | 48.3 | 7.533E-01 | 7.576E-01 | 1.622E+00 |
| NB-95 | -1.036E-01 | 557.7 | 5.779E-01 | 5.779E-01 | 1.987E+00 |
| RU-103 | -9.113E-02 | 512.8 | 4.673E-01 | 4.674E-01 | 1.135E+00 |
| RH-106 | 4.919E-01 | 915.2 | 4.502E+00 | 4.502E+00 | 1.065E+01 |
| AG-108M | -4.834E-01 | 70.7 | 3.418E-01 | 3.427E-01 | 1.134E+00 |
| AG-110M | -3.034E-01 | 59.4 | 1.801E-01 | 1.808E-01 | 2.606E+00 |
| SN-113 | -2.782E-01 | 230.4 | 6.408E-01 | 6.410E-01 | 2.177E+00 |
| SB-124 | -5.682E-01 | 151.2 | 8.589E-01 | 8.594E-01 | 2.877E+00 |
| SB-125 | 1.155E+00 | 106.8 | 1.234E+00 | 1.235E+00 | 2.939E+00 |
| I-131 | -3.168E-01 | 137.5 | 4.357E-01 | 4.360E-01 | 1.082E+00 |
| Gd-153 | 1.665E-01 | 1622.0 | 2.701E+00 | 2.701E+00 | 8.991E+00 |
| Ga-68 | -4.764E+00 | 432.5 | 2.060E+01 | 2.060E+01 | 4.616E+01 |
| Tc-99m | 3.628E-01 | 151.4 | 5.493E-01 | 5.496E-01 | 1.830E+00 |
| BA-133 | -5.982E-01 | 150.5 | 9.003E-01 | 9.008E-01 | 3.017E+00 |
| CS-134 | 2.711E-01 | 71.9 | 1.949E-01 | 1.954E-01 | 2.838E+00 |
| CS-137 | -4.683E-01 | 105.8 | 4.952E-01 | 4.958E-01 | 1.672E+00 |
| CE-139 | 0.000E+00 | 1.#INF | 2.421E-01 | 2.421E-01 | 1.328E+00 |
| Ba-140 | -2.876E-01 | 532.0 | 1.530E+00 | 1.530E+00 | 3.762E+00 |
| La-140 | 5.655E-01 | 84.8 | 4.794E-01 | 4.804E-01 | 9.071E-01 |
| CE-141 | 6.173E-01 | 154.8 | 9.559E-01 | 9.564E-01 | 3.188E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 0.000E+00 | 1.#INF | 1.464E+00 | 1.464E+00 | 1.440E+01 |
| PM-144 | -5.210E-01 | 89.7 | 4.676E-01 | 4.684E-01 | 1.568E+00 |
| EU-152 | 2.414E+00 | 89.3 | 2.156E+00 | 2.159E+00 | 6.983E+00 |
| EU-154 | 5.169E-01 | 83.8 | 4.334E-01 | 4.342E-01 | 1.438E+01 |
| EU-155 | 1.273E+00 | 99.2 | 1.262E+00 | 1.264E+00 | 4.210E+00 |
| HF-181 | -9.529E-02 | 76.2 | 7.259E-02 | 7.275E-02 | 1.486E+00 |
| Ta-182 | -2.519E-07 | 741455204.3 | 1.868E+00 | 1.868E+00 | 6.513E+00 |
| Hg-203 | -4.463E-01 | 100.3 | 4.476E-01 | 4.484E-01 | 1.496E+00 |
| TL-208 | 7.592E+00 | 8.3 | 6.329E-01 | 7.455E-01 | 9.166E-01 |
| pm-146 | 4.389E-01 | 116.6 | 5.118E-01 | 5.123E-01 | 3.086E+00 |
| y-88 | 8.269E-02 | 496.7 | 4.107E-01 | 4.107E-01 | 9.737E-01 |
| Cd-113m | 2.034E+03 | 195.4 | 3.975E+03 | 3.977E+03 | 1.359E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 2.220E+01 | 2.220E+01 | 7.391E+01 |
| Cf-251 | 1.771E+00 | 94.1 | 1.666E+00 | 1.674E+00 | 4.249E+00 |
| Cf-249 | 0.000E+00 | 1.#INF | 2.674E-01 | 2.674E-01 | 2.078E+00 |
| Sn-126 | 1.263E+00 | 392.4 | 4.958E+00 | 4.959E+00 | 1.667E+01 |
| PB-210 | 1.099E+01 | 95.1 | 1.045E+01 | 1.047E+01 | 3.493E+01 |
| PB-212 | 2.798E+01 | 3.8 | 1.056E+00 | 2.095E+00 | 1.367E+00 |
| PB-214 | 1.225E+01 | 7.9 | 9.708E-01 | 1.161E+00 | 2.127E+00 |
| BI-207 | 1.077E-01 | 290.7 | 3.131E-01 | 3.131E-01 | 1.092E+00 |
| BI-212 | 5.042E+01 | 10.6 | 5.369E+00 | 5.973E+00 | 5.954E+00 |
| BI-214 | 1.101E+01 | 9.3 | 1.026E+00 | 1.174E+00 | 1.544E+00 |
| BI-210M | -7.580E-01 | 83.5 | 6.331E-01 | 6.347E-01 | 2.109E+00 |
| AC-228 | 2.155E+01 | 7.5 | 1.609E+00 | 1.949E+00 | 2.501E+00 |
| TH-227 | 5.528E+00 | 105.6 | 5.839E+00 | 5.847E+00 | 1.951E+01 |
| TH-229 | 3.609E+00 | 194.1 | 7.006E+00 | 7.012E+00 | 1.942E+01 |
| TH-234 | 8.410E+00 | 107.6 | 9.046E+00 | 9.057E+00 | 4.146E+01 |
| PA-231 | -1.332E+01 | 169.1 | 2.253E+01 | 2.254E+01 | 7.528E+01 |
| PA-233 | 0.000E+00 | 1.#INF | 2.431E-01 | 2.431E-01 | 6.016E+00 |
| PA-234 | -3.102E-02 | 135.1 | 4.191E-02 | 4.194E-02 | 8.925E+00 |
| PA-234M | 0.000E+00 | 1.#INF | 3.701E+01 | 3.701E+01 | 2.029E+02 |
| U-235 | 2.268E+00 | 196.0 | 4.444E+00 | 4.445E+00 | 1.483E+01 |
| AM-241 | -1.463E+00 | 113.5 | 1.661E+00 | 1.662E+00 | 5.525E+00 |
| Np-237 | 0.000E+00 | 1.#INF | 6.647E+00 | 6.647E+00 | 2.208E+01 |
| Ir-192 | 0.000E+00 | 1.#INF | 2.417E-01 | 2.417E-01 | 2.513E+00 |
| Cs-136 | 2.900E-01 | 65.7 | 1.905E-01 | 1.913E-01 | 1.725E+00 |
| Np-239 | 1.204E+00 | 85.6 | 1.031E+00 | 1.034E+00 | 3.433E+00 |
| Nd-147 | 5.546E-01 | 192.5 | 1.067E+00 | 1.068E+00 | 6.998E+00 |
| Total | 2.455E+03 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-2-B

Spectrum Filename: C:\User\SPC\Det9\9_Gamma_20171607.An1

Acquisition information
Start time: 6/7/2017 9:54:00 AM
Live time: 1800
Real time: 1802
Dead time: 0.13 %
Detector ID: 9

Detector system
Ge9 S/N100228730

Calibration
Filename: 9_Soil_TunaCan.Clb
9_Soil_TunaCan_90099_050312

Energy Calibration
Created: 3/1/2012 1:57:17 PM
Zero offset: 0.074 keV
Gain: 0.250 keV/channel
Quadratic: -2.269E-08 keV/channel^2

Efficiency Calibration
Created: 6/14/2012 10:19:51 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.30 %
Log(Eff): -8.079856E-01 + (-2.367265E-01*Log(E) ) + ( -3.950640E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.42 %
Log(Eff): -2.387916E+01 + ( 8.875647E+00*Log(E) ) + ( -9.401100E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 100 (  25.08keV )
Stop channel: 8000 (  1999.34keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3
Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:53:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 9_2017-06-04_0241.PBC 6/4/2017 2:41:35 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 27 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1274

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.54 | 22. | 95.14 | 1.00 | 2.577E-02 | 46.54 | 4.250 | PBC<MDA | PB210 |
| 50.14 | 23. | 105.62 | 1.00 | 2.900E-02 | 50.14 | 8.000 | PBC<MDA | TH227 |
| 63.29 | 31. | 107.56 | 1.01 | 3.921E-02 | 63.29 | 3.810 | PBC<MDA | TH234 |
| 65.12 | 9. | 392.43 | 1.02 | 3.987E-02 | 64.28 | 9.700 | PBC<MDA | Sn126 |
| 74.76 | 289. | 8.99 | 1.03 | 4.568E-02 | | | | |
| 77.24 | 423. | 6.47 | 1.03 | 4.679E-02 | | | | |
| 84.78 | 36. | 55.54 | 1.03 | 4.953E-02 | | | | |
| 87.24 | 140. | 16.24 | 1.04 | 5.025E-02 | 86.49 | 13.100 | 1.186E+01 | Np237 |
| | | | | | 86.54 | 30.700 | 5.058E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.714E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 4.117E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 4.064E+01 | Cd109 |
| 91.10 | 32. | 234.14 | 1.04 | 5.124E-02 | 91.10 | 28.300 | PBC<MDA | Nd147 |
| 92.59 | 32. | 235.13 | 1.04 | 5.156E-02 | 92.59 | 5.584 | PBC<MDA | TH234 |
| 93.16 | 133. | 23.05 | 1.00 | 5.171E-02 | 93.35 | 5.561 | 2.566E+01 | AC228 |
| 99.35 | 28. | 58.64 | 0.36 | 5.264E-02 | 99.50 | 15.000 | 1.946E+00 | Np239 |
| 105.31 | 26. | 99.16 | 1.05 | 5.318E-02 | 105.31 | 21.200 | PBC<MDA | EU155 |
| 106.13 | 26. | 85.64 | 1.05 | 5.323E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 121.78 | 10. | 259.31 | 1.07 | 5.305E-02 | 121.78 | 28.580 | PBC<MDA | EU152 |
| | | | | | 122.06 | 85.600 | 1.183E-01 | CO57 |
| 123.10 | 18. | 124.82 | 1.07 | 5.296E-02 | 123.10 | 40.790 | PBC<MDA | EU154 |
| 128.90 | 89. | 27.04 | 0.75 | 5.243E-02 | | | | |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 141.49 | 29. | 151.41 | 1.09 | 5.091E-02 | 140.51 | 89.300 | PBC<MDA | Tc99m |
| 143.79 | 23. | 195.96 | 1.09 | 5.039E-02 | 143.79 | 10.960 | PBC<MDA | U235 |
| 145.44 | 27. | 154.85 | 1.09 | 5.012E-02 | 145.44 | 48.200 | PBC<MDA | CE141 |
| 177.00 | 25. | 94.08 | 1.12 | 4.549E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |
| 185.89 | 64. | 26.78 | 0.73 | 4.400E-02 | | | | |
| 194.43 | 10. | 267.46 | 1.14 | 4.287E-02 | 193.51 | 4.400 | PBC<MDA | TH229 |
| 210.88 | 10. | 281.42 | 1.15 | 4.052E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 238.48 | 762. | 4.54 | 1.17 | 3.734E-02 | 238.63 | 43.300 | 2.619E+01 | PB212 |
| 241.89 | 95. | 18.52 | 1.18 | 3.697E-02 | 242.00 | 7.430 | 1.914E+01 | PB214 |
| 263.70 | 8. | 195.36 | 1.20 | 3.489E-02 | 263.70 | 0.006 | PBC<MDA | Cd113m |
| 276.86 | 61. | 30.17 | 1.81 | 3.372E-02 | 277.28 | 6.310 | 1.584E+01 | TL208 |
| 295.14 | 145. | 13.24 | 1.20 | 3.231E-02 | 295.09 | 19.300 | 1.293E+01 | PB214 |
| 299.97 | 56. | 22.94 | 1.24 | 3.195E-02 | 300.03 | 3.280 | 2.961E+01 | PB212 |
| | | | | | 300.07 | 2.460 | 3.948E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 1.567E+01 | PA233 |
| 338.19 | 146. | 15.41 | 1.26 | 2.941E-02 | 338.32 | 12.010 | 2.297E+01 | AC228 |
| 340.57 | 22. | 130.75 | 1.27 | 2.927E-02 | 340.57 | 46.900 | PBC<MDA | Cs136 |
| 344.29 | 22. | 130.50 | 1.28 | 2.905E-02 | 344.29 | 26.500 | PBC<MDA | EU152 |
| 345.83 | 20. | 133.98 | 1.28 | 2.896E-02 | 345.83 | 15.070 | PBC<MDA | HF181 |
| 351.79 | 247. | 9.84 | 1.43 | 2.861E-02 | 351.93 | 37.600 | 1.275E+01 | PB214 |
| 427.88 | 15. | 106.79 | 1.35 | 2.491E-02 | 427.88 | 29.600 | PBC<MDA | SB125 |
| 435.36 | 11. | 49.30 | 0.65 | 2.460E-02 | | | | |
| 453.88 | 12. | 126.01 | 1.37 | 2.388E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 487.02 | 15. | 94.23 | 1.40 | 2.269E-02 | 487.02 | 45.500 | PBC<MDA | La140 |
| 511.86 | 91. | 28.33 | 2.67 | 2.188E-02 | 511.86 | 20.000 | 1.155E+01 | RH106 |
| 563.24 | 11. | 128.56 | 1.47 | 2.040E-02 | 563.24 | 8.350 | PBC<MDA | CS134 |
| 569.70 | 4. | 290.69 | 1.47 | 2.023E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 1.283E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 1.077E-01 | BI207 |
| 583.14 | 227. | 8.34 | 1.46 | 1.988E-02 | 583.02 | 84.500 | 7.510E+00 | TL208 |
| 609.39 | 176. | 9.31 | 1.20 | 1.925E-02 | 609.31 | 46.090 | 1.101E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 8.837E+01 | RU103 |
| 614.28 | 17. | 164.90 | 1.51 | 1.913E-02 | 614.28 | 89.850 | PBC<MDA | AG108M |
| 621.92 | 2. | 915.19 | 1.51 | 1.896E-02 | 621.92 | 9.930 | PBC<MDA | RH106 |
| 657.76 | 15. | 75.10 | 1.54 | 1.818E-02 | 657.76 | 94.640 | PBC<MDA | AG110M |
| 702.63 | 16. | 88.46 | 1.58 | 1.730E-02 | 702.63 | 97.900 | PBC<MDA | NB94 |
| 726.95 | 116. | 10.65 | 1.78 | 1.686E-02 | 727.17 | 7.550 | 5.042E+01 | BI212 |
| 735.72 | 10. | 116.62 | 1.61 | 1.671E-02 | 735.72 | 22.500 | PBC<MDA | pm146 |
| 756.73 | 25. | 48.30 | 1.62 | 1.635E-02 | 756.73 | 54.460 | PBC<MDA | ZR95 |
| 786.70 | 18. | 48.88 | 1.65 | 1.590E-02 | 785.42 | 1.280 | PBC<MDA | BI212 |
| 801.95 | 16. | 86.48 | 1.66 | 1.565E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 815.77 | 3. | 457.45 | 1.67 | 1.544E-02 | 815.77 | 23.280 | PBC<MDA | La140 |
| 834.85 | 2. | 780.49 | 1.69 | 1.517E-02 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 860.18 | 27. | 45.03 | 1.71 | 1.482E-02 | 860.56 | 12.420 | 8.149E+00 | TL208 |
| 880.53 | 13. | 81.81 | 1.72 | 1.456E-02 | 880.53 | 6.000 | PBC<MDA | PA234 |
| 883.24 | 6. | 188.41 | 1.72 | 1.453E-02 | 883.24 | 9.600 | PBC<MDA | PA234 |
| 889.28 | 6. | 186.59 | 1.73 | 1.445E-02 | 889.28 | 99.984 | PBC<MDA | Sc46 |
| 898.04 | 2. | 496.66 | 1.74 | 1.434E-02 | 898.04 | 93.700 | PBC<MDA | y88 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 911.20 | 154. | 9.38 | 1.56 | 1.418E-02 | 911.07 | 29.000 | 2.087E+01 | AC228 |
| 964.11 | 14. | 121.89 | 1.79 | 1.357E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 968.97 | 96. | 11.62 | 1.83 | 1.352E-02 | 968.97 | 17.460 | 2.268E+01 | AC228 |
| 996.33 | 12. | 93.24 | 1.81 | 1.323E-02 | 996.33 | 10.600 | PBC<MDA | EU154 |
| 1048.07 | 12. | 65.70 | 1.85 | 1.271E-02 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1119.99 | 56. | 19.76 | 2.07 | 1.206E-02 | 1120.29 | 15.100 | 1.718E+01 | BI214 |
| | | | | | 1120.55 | 99.987 | 2.596E+00 | Sc46 |
| | | | | | 1121.30 | 34.900 | 7.440E+00 | Ta182 |
| 1238.28 | 47. | 22.37 | 1.98 | 1.114E-02 | 1238.28 | 66.070 | 3.523E+00 | Co56 |
| 1274.53 | 8. | 71.84 | 2.01 | 1.088E-02 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 1.112E+00 | EU154 |
| 1384.30 | 7. | 85.58 | 2.08 | 1.018E-02 | 1384.30 | 24.290 | PBC<MDA | AG110M |
| 1460.74 | 452. | 4.70 | 2.08 | 9.749E-03 | 1460.83 | 10.670 | 2.414E+02 | K40 |
| 1596.21 | 8. | 84.78 | 2.22 | 9.069E-03 | 1596.21 | 95.400 | PBC<MDA | La140 |
| 1764.78 | 11. | 63.76 | 2.31 | 8.350E-03 | 1764.49 | 15.400 | PBC<MDA | BI214 |
| 1771.35 | 8. | 89.84 | 2.32 | 8.323E-03 | 1771.35 | 15.480 | PBC<MDA | Co56 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 298.63 | 74.69 | 193. | 289. | 6.326E+03 | 8.99 | 1.025 | - | sD |
| 308.56 | 77.17 | 162. | 423. | 9.030E+03 | 6.47 | 1.027 | - | sD |
| 337.74 | 84.63 | 191. | 39. | 7.787E+02 | 53.22 | 1.034 | - | sD |
| 396.98 | 99.35 | 88. | 28. | 5.255E+02 | 58.64 | 0.357 | - | s |
| 515.13 | 128.90 | 140. | 89. | 1.698E+03 | 27.04 | 0.745 | - | s |
| 743.06 | 185.89 | 82. | 64. | 1.466E+03 | 26.78 | 0.731 | - | s |
| 1740.79 | 435.36 | 8. | 11. | 4.404E+02 | 49.30 | 0.650 | - | sM |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.80 | 46.54 | 202. | 22. | 0.012 | 95.14 | 0.998s |
| TH-227 | 200.20 | 50.14 | 286. | 23. | 0.013 | 105.62 | 1.001s |
| AM-241 | 237.77 | 59.54 | 753. | -35. | -0.019 | 113.50 | 1.010s |
| TH-234 | 252.77 | 63.29 | 545. | 31. | 0.017 | 107.56 | 1.014s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Sn-126 | 256.74 | 64.28 | 591. | 9. | 0.005 | 392.43 | 1.015s |
| BA-133 | 323.56 | 80.99 | 3109. | -32. | -0.018 | 246.66 | 1.031 |
| Np-237 | 345.55 | 86.49 | 3065. | 0. | 0.000 | 243.67 | 1.036A |
| EU-155 | 345.76 | 86.54 | 3033. | -32. | -0.018 | 242.40 | 1.036D |
| Sn-126 | 347.35 | 86.94 | 2956. | 10. | 0.006 | 246.92 | 1.037D |
| Sn-126 | 349.87 | 87.57 | 2820. | 43. | 0.024 | 59.29 | 1.037D |
| Nd-147 | 363.99 | 91.10 | 2853. | 32. | 0.018 | 234.14 | 1.041s |
| TH-234 | 369.94 | 92.59 | 2885. | 32. | 0.018 | 235.13 | 1.042 |
| AC-228 | 372.24 | 93.16 | 193. | 133. | 0.074 | 23.05 | 1.001 |
| Np-239 | 397.58 | 99.50 | 574. | -17. | -0.009 | 200.26 | 1.049s |
| EU-155 | 420.82 | 105.31 | 315. | 26. | 0.014 | 99.16 | 1.054 |
| Np-239 | 424.09 | 106.13 | 238. | 26. | 0.015 | 85.64 | 1.055s |
| EU-152 | 486.65 | 121.78 | 309. | 10. | 0.005 | 259.31 | 1.070s |
| CO-57 | 487.80 | 122.06 | 319. | 0. | 0.000 | 1000.00 | 1.070 |
| EU-154 | 491.95 | 123.10 | 253. | 18. | 0.010 | 124.82 | 1.071s |
| PA-234 | 524.72 | 131.29 | 1010. | -23. | -0.013 | 193.76 | 1.079 |
| CE-144 | 533.69 | 133.54 | 987. | 0. | 0.000 | 1000.00 | 1.081s |
| HF-181 | 544.74 | 136.30 | 987. | 0. | 0.000 | 1000.00 | 1.084s |
| CO-57 | 545.43 | 136.47 | 987. | 0. | 0.000 | 1000.00 | 1.084s |
| Tc-99m | 561.57 | 140.51 | 936. | 29. | 0.016 | 151.41 | 1.088s |
| U-235 | 574.67 | 143.79 | 964. | 23. | 0.013 | 195.96 | 1.091s |
| CE-141 | 581.29 | 145.44 | 850. | 27. | 0.015 | 154.85 | 1.092s |
| Ba-140 | 650.15 | 162.66 | 396. | -30. | -0.017 | 95.35 | 1.108s |
| U-235 | 653.03 | 163.38 | 351. | -4. | -0.002 | 709.25 | 1.109s |
| CE-139 | 662.92 | 165.85 | 355. | 0. | 0.000 | 1000.00 | 1.111s |
| Cf-251 | 705.90 | 176.60 | 147. | 25. | 0.014 | 94.08 | 1.122s |
| TH-229 | 773.52 | 193.51 | 184. | 10. | 0.006 | 267.46 | 1.137s |
| U-235 | 820.80 | 205.33 | 244. | -31. | -0.017 | 99.73 | 1.148s |
| TH-229 | 842.87 | 210.85 | 204. | 10. | 0.006 | 281.42 | 1.153s |
| PB-212 | 953.97 | 238.63 | 63. | 814. | 0.452 | 3.77 | 1.179D |
| PB-214 | 967.43 | 242.00 | 106. | 95. | 0.053 | 18.52 | 1.182D |
| EU-152 | 978.21 | 244.69 | 1225. | -25. | -0.014 | 196.05 | 1.185s |
| TH-227 | 1024.40 | 256.24 | 132. | 0. | 0.000 | 1000.00 | 1.195s |
| Cd-113m | 1054.23 | 263.70 | 108. | 8. | 0.004 | 195.36 | 1.202s |
| BI-210M | 1062.75 | 265.83 | 184. | -24. | -0.013 | 83.52 | 1.204s |
| TL-208 | 1106.87 | 276.86 | 63. | 61. | 0.034 | 30.17 | 1.814s |
| Hg-203 | 1116.22 | 279.20 | 232. | -22. | -0.012 | 100.29 | 1.216s |
| I-131 | 1136.61 | 284.30 | 116. | -3. | -0.002 | 705.27 | 1.221 |
| PB-214 | 1179.77 | 295.09 | 60. | 127. | 0.070 | 12.42 | 1.231D |
| PB-212 | 1199.52 | 300.03 | 54. | 56. | 0.031 | 22.94 | 1.235D |
| PA-231 | 1199.68 | 300.07 | 690. | -21. | -0.012 | 178.00 | 1.235 |
| PA-233 | 1200.12 | 300.18 | 699. | -22. | -0.012 | 172.08 | 1.235 |
| PA-231 | 1210.00 | 302.65 | 677. | -22. | -0.012 | 169.10 | 1.237 |
| BA-133 | 1210.81 | 302.85 | 655. | -8. | -0.004 | 457.88 | 1.238 |
| Ba-140 | 1218.80 | 304.85 | 647. | 0. | 0.000 | 1000.00 | 1.240 |
| BI-210M | 1218.99 | 304.90 | 647. | 0. | 0.000 | 1000.00 | 1.240 |
| Ir-192 | 1233.16 | 308.44 | 647. | 0. | 0.000 | 1000.00 | 1.243s |
| PA-233 | 1247.44 | 312.01 | 647. | 0. | 0.000 | 1000.00 | 1.246s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Ir-192 | 1265.35 | 316.49 | 647. | 0. | 0.000 | 1000.00 | 1.250s |
| CR-51 | 1279.73 | 320.08 | 647. | 0. | 0.000 | 1000.00 | 1.253 |
| La-140 | 1314.43 | 328.76 | 542. | -22. | -0.012 | 151.71 | 1.261s |
| Cf-249 | 1333.15 | 333.44 | 520. | -11. | -0.006 | 296.93 | 1.265s |
| AC-228 | 1352.66 | 338.32 | 429. | 22. | 0.012 | 134.37 | 1.270 |
| Cs-136 | 1361.66 | 340.57 | 407. | 22. | 0.012 | 130.75 | 1.272s |
| EU-152 | 1376.53 | 344.29 | 407. | 22. | 0.012 | 130.50 | 1.275s |
| HF-181 | 1382.70 | 345.83 | 344. | 20. | 0.011 | 133.98 | 1.276s |
| PB-214 | 1406.54 | 351.79 | 68. | 247. | 0.137 | 9.84 | 1.431 |
| BA-133 | 1423.37 | 356.00 | 398. | -19. | -0.011 | 150.49 | 1.285s |
| I-131 | 1457.31 | 364.48 | 80. | -13. | -0.007 | 137.53 | 1.293s |
| BA-133 | 1534.73 | 383.84 | 177. | -7. | -0.004 | 271.43 | 1.310s |
| Cf-249 | 1551.17 | 387.95 | 184. | 0. | 0.000 | 1000.00 | 1.314s |
| SN-113 | 1566.12 | 391.69 | 188. | -8. | -0.005 | 230.39 | 1.317s |
| SB-125 | 1710.86 | 427.88 | 61. | 15. | 0.009 | 106.79 | 1.349s |
| AG-108M | 1735.10 | 433.94 | 84. | -19. | -0.011 | 70.71 | 1.354 |
| pm-146 | 1814.87 | 453.88 | 52. | 12. | 0.007 | 126.01 | 1.372s |
| Ir-192 | 1871.59 | 468.06 | 62. | -17. | -0.009 | 99.25 | 1.384s |
| HF-181 | 1927.34 | 482.00 | 100. | -19. | -0.011 | 76.18 | 1.396s |
| La-140 | 1947.43 | 487.02 | 87. | 15. | 0.008 | 94.23 | 1.400s |
| RU-103 | 1987.56 | 497.05 | 69. | -3. | -0.002 | 512.83 | 1.409s |
| RH-106 | 2046.81 | 511.86 | 84. | 91. | 0.051 | 28.33 | 2.672s |
| Nd-147 | 2123.35 | 531.00 | 48. | -5. | -0.003 | 305.52 | 1.438s |
| Ba-140 | 2148.39 | 537.26 | 48. | -3. | -0.001 | 532.02 | 1.444s |
| CS-134 | 2252.30 | 563.24 | 42. | 11. | 0.006 | 128.56 | 1.466 |
| CS-134 | 2276.64 | 569.32 | 56. | -7. | -0.004 | 155.84 | 1.471s |
| PA-234 | 2277.24 | 569.47 | 63. | 0. | 0.000 | 1000.00 | 1.471s |
| BI-207 | 2278.16 | 569.70 | 60. | 4. | 0.002 | 290.69 | 1.471s |
| TL-208 | 2331.92 | 583.14 | 29. | 227. | 0.126 | 8.34 | 1.456 |
| SB-125 | 2401.36 | 600.50 | 444. | -19. | -0.011 | 154.72 | 1.497s |
| SB-124 | 2410.29 | 602.73 | 425. | -19. | -0.011 | 151.18 | 1.499s |
| CS-134 | 2418.21 | 604.71 | 405. | -19. | -0.011 | 150.05 | 1.500 |
| BI-214 | 2436.93 | 609.39 | 22. | 176. | 0.098 | 9.31 | 1.201 |
| RU-103 | 2440.56 | 610.30 | 322. | -17. | -0.009 | 154.14 | 1.505s |
| AG-108M | 2456.49 | 614.28 | 369. | 17. | 0.009 | 164.90 | 1.508 |
| RH-106 | 2487.04 | 621.92 | 51. | 2. | 0.001 | 915.19 | 1.515s |
| SB-125 | 2542.94 | 635.89 | 70. | -21. | -0.011 | 61.64 | 1.526s |
| I-131 | 2547.28 | 636.97 | 90. | -2. | -0.001 | 758.00 | 1.527s |
| AG-110M | 2630.43 | 657.76 | 53. | 15. | 0.008 | 75.10 | 1.544s |
| CS-137 | 2646.03 | 661.66 | 88. | -13. | -0.007 | 105.75 | 1.548 |
| PM-144 | 2785.58 | 696.54 | 97. | -16. | -0.009 | 89.74 | 1.576s |
| NB-94 | 2809.93 | 702.63 | 94. | 16. | 0.009 | 88.46 | 1.581s |
| SB-124 | 2890.57 | 722.79 | 192. | -17. | -0.009 | 120.10 | 1.598s |
| AG-108M | 2891.17 | 722.94 | 175. | -17. | -0.009 | 115.00 | 1.598 |
| BI-212 | 2907.23 | 726.95 | 6. | 116. | 0.064 | 10.65 | 1.783s |
| pm-146 | 2942.31 | 735.72 | 28. | 10. | 0.006 | 116.62 | 1.608s |
| pm-146 | 2988.08 | 747.16 | 37. | -2. | -0.001 | 559.34 | 1.617s |
| ZR-95 | 3026.36 | 756.73 | 25. | 25. | 0.014 | 48.30 | 1.625s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AG-110M | 3055.23 | 763.94 | 126. | -26. | -0.014 | 64.17 | 1.631 |
| NB-95 | 3062.61 | 765.79 | 140. | -3. | -0.002 | 557.70 | 1.632s |
| PA-234M | 3065.10 | 766.41 | 156. | -6. | -0.003 | 314.20 | 1.633s |
| EU-152 | 3115.14 | 778.92 | 40. | 0. | 0.000 | 1000.00 | 1.643s |
| BI-212 | 3141.15 | 785.42 | 28. | 18. | 0.010 | 48.88 | 1.648s |
| CS-134 | 3182.95 | 795.87 | 79. | -5. | -0.003 | 263.74 | 1.656s |
| CS-134 | 3207.29 | 801.95 | 86. | 16. | 0.009 | 86.48 | 1.661s |
| CO-58 | 3242.59 | 810.78 | 80. | -16. | -0.009 | 80.96 | 1.668s |
| La-140 | 3262.58 | 815.77 | 77. | 3. | 0.002 | 457.45 | 1.672s |
| Cs-136 | 3273.50 | 818.50 | 94. | -8. | -0.005 | 167.86 | 1.674s |
| MN-54 | 3338.91 | 834.85 | 50. | 2. | 0.001 | 780.49 | 1.687s |
| Co-56 | 3386.61 | 846.77 | 35. | -7. | -0.004 | 189.61 | 1.696s |
| TL-208 | 3441.80 | 860.56 | 25. | 27. | 0.015 | 45.03 | 1.707 |
| NB-94 | 3483.94 | 871.10 | 63. | -19. | -0.010 | 63.97 | 1.715s |
| EU-154 | 3492.47 | 873.23 | 89. | -10. | -0.005 | 139.38 | 1.717s |
| PA-234 | 3521.68 | 880.53 | 53. | 13. | 0.007 | 81.81 | 1.722s |
| PA-234 | 3532.53 | 883.24 | 67. | 6. | 0.003 | 188.41 | 1.724s |
| AG-110M | 3538.30 | 884.68 | 101. | -18. | -0.010 | 82.28 | 1.725s |
| Sc-46 | 3556.69 | 889.28 | 67. | 6. | 0.004 | 186.59 | 1.729s |
| y-88 | 3591.74 | 898.04 | 20. | 2. | 0.001 | 496.66 | 1.736s |
| AC-228 | 3644.40 | 911.20 | 12. | 154. | 0.086 | 9.38 | 1.560 |
| AG-110M | 3749.60 | 937.49 | 55. | -20. | -0.011 | 83.06 | 1.766s |
| PA-234 | 3783.72 | 946.02 | 40. | -7. | -0.004 | 202.20 | 1.772s |
| EU-152 | 3856.11 | 964.11 | 136. | 14. | 0.008 | 121.89 | 1.786 |
| AC-228 | 3875.54 | 968.97 | 7. | 96. | 0.054 | 11.62 | 1.832 |
| EU-154 | 3985.03 | 996.33 | 53. | 12. | 0.006 | 93.24 | 1.810s |
| PA-234M | 4003.71 | 1001.00 | 65. | 0. | 0.000 | 1000.00 | 1.814s |
| EU-154 | 4018.82 | 1004.77 | 89. | -17. | -0.009 | 83.35 | 1.816s |
| Co-56 | 4151.13 | 1037.84 | 37. | -7. | -0.004 | 192.95 | 1.841s |
| Cs-136 | 4192.07 | 1048.07 | 27. | 12. | 0.007 | 65.70 | 1.848s |
| RH-106 | 4201.23 | 1050.36 | 53. | -12. | -0.007 | 88.45 | 1.850s |
| BI-207 | 4254.46 | 1063.66 | 32. | -4. | -0.002 | 325.32 | 1.860s |
| Ga-68 | 4309.44 | 1077.40 | 32. | -3. | -0.002 | 432.48 | 1.870s |
| FE-59 | 4396.88 | 1099.25 | 32. | -2. | -0.001 | 646.79 | 1.886s |
| EU-152 | 4448.20 | 1112.07 | 124. | -16. | -0.009 | 100.81 | 1.895s |
| ZN-65 | 4462.09 | 1115.55 | 108. | -9. | -0.005 | 163.41 | 1.897s |
| BI-214 | 4479.89 | 1119.99 | 11. | 56. | 0.031 | 19.76 | 2.070 |
| Ta-182 | 4756.25 | 1189.05 | 45. | -13. | -0.007 | 121.55 | 1.949 |
| Ta-182 | 4885.75 | 1221.41 | 62. | -23. | -0.013 | 84.05 | 1.972 |
| Co-56 | 4953.27 | 1238.28 | 11. | 47. | 0.026 | 22.37 | 1.984 |
| NA-22 | 5098.35 | 1274.53 | 11. | 8. | 0.004 | 71.84 | 2.008s |
| EU-154 | 5098.40 | 1274.54 | 19. | 0. | 0.000 | 1000.00 | 2.008s |
| FE-59 | 5166.65 | 1291.60 | 45. | -17. | -0.010 | 94.21 | 2.020s |
| CO-60 | 5330.37 | 1332.50 | 23. | -4. | -0.002 | 308.96 | 2.047s |
| AG-110M | 5537.69 | 1384.30 | 6. | 7. | 0.004 | 85.58 | 2.082s |
| K-40 | 5843.65 | 1460.74 | 0. | 452. | 0.251 | 4.70 | 2.082 |
| La-140 | 6385.95 | 1596.21 | 6. | 8. | 0.004 | 84.78 | 2.215s |
| SB-124 | 6765.35 | 1690.98 | 13. | -3. | -0.001 | 337.04 | 2.272s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-214 | 7059.65 | 1764.49 | 21. | 11. | 0.006 | 63.76 | 2.314s |
| Co-56 | 7087.11 | 1771.35 | 22. | 8. | 0.004 | 89.84 | 2.318s |
| y-88 | 7346.20 | 1836.06 | 0. | 0. | 0.000 | 1000.00 | 2.354s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | C | 2.2947E-01 | | | | | 5.31E+01 | |
| | | | 477.60 | 2.295E-01 | %( | 1.300E+01 | 1.64E+03 | 1.05E+01 G |
| NA-22 | C | 3.9159E-01 | | | | | 9.50E+02 | |
| | | | 1274.53 | 3.916E-01 | ?( | 9.397E-01 | 7.18E+01 | 9.99E+01 G |
| K-40 | N | 2.4141E+02 | | | | | 4.66E+11 | |
| | | | 1460.83 | 2.414E+02 | ( | 3.936E+00 | 4.70E+00 | 1.07E+01 G |
| Sc-46 | F | 2.4356E-01 | | | | | 8.38E+01 | |
| | | | 889.28 | 2.436E-01 | ?( | 1.567E+00 | 1.87E+02 | 1.00E+02 G |
| | | | 1120.55 | 8.788E-08 | % | 2.240E+00 | 7.30E+08 | 1.00E+02 G |
| MN-54 | C | 7.3256E-02 | | | | | 3.12E+02 | |
| | | | 834.85 | 7.326E-02 | ( | 1.306E+00 | 7.80E+02 | 1.00E+02 G |
| FE-59 | F | -1.6062E-01 | | | | | 4.45E+01 | |
| | | | 1099.25 | -1.606E-01 | ?( | 2.335E+00 | 6.47E+02 | 5.65E+01 G |
| | | | 1291.60 | -2.070E+00 | + | 4.071E+00 | 9.42E+01 | 4.32E+01 G |
| Co-56 | C | 1.2461E+00 | | | | | 7.73E+01 | |
| | | | 846.77 | -2.593E-01 | ?( | 1.122E+00 | 1.90E+02 | 9.99E+01 G |
| | | | 1238.28 | 3.523E+00 | ?( | 1.389E+00 | 2.24E+01 | 6.61E+01 G |
| | | | 1037.84 | -2.251E+00 | + | 9.571E+00 | 1.93E+02 | 1.41E+01 G |
| | | | 1771.35 | 3.478E+00 | ? | 1.064E+01 | 8.98E+01 | 1.55E+01 A |
| CO-58 | C | -5.9061E-01 | | | | | 7.09E+01 | |
| | | | 810.78 | -5.906E-01 | ?( | 1.598E+00 | 8.10E+01 | 9.95E+01 G |
| CO-60 | F | -1.9402E-01 | | | | | 1.93E+03 | |
| | | | 1332.50 | -1.940E-01 | &( | 1.317E+00 | 3.09E+02 | 1.00E+02 G |
| | | | 1173.24 | 1.594E-02 | % | 1.281E+00 | 3.53E+03 | 9.99E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| ZN-65 | F | -8.3385E-01 | | | | | 2.44E+02 | |
| | | | 1115.55 | -8.339E-01 | ?( | 4.643E+00 | 1.63E+02 | 5.06E+01 G |
| NB-94 | I | 5.3033E-01 | | | | | 7.41E+06 | |
| | | | 702.63 | 5.303E-01 | ?( | 1.572E+00 | 8.85E+01 | 9.79E+01 G |
| | | | 871.10 | -7.144E-01 | + | 1.507E+00 | 6.40E+01 | 9.99E+01 G |
| ZR-95 | I | 1.5595E+00 | | | | | 6.40E+01 | |
| | | | 756.73 | 1.559E+00 | ?( | 1.622E+00 | 4.83E+01 | 5.45E+01 G |
| | | | 724.20 | 5.678E-07 | % | 4.276E+00 | 2.18E+08 | 4.42E+01 G |
| NB-95 | I | -1.0362E-01 | | | | | 6.40E+01 | |
| | | | 765.79 | -1.036E-01 | ?( | 1.987E+00 | 5.58E+02 | 9.98E+01 G |
| RU-103 | I | -9.1127E-02 | | | | | 3.93E+01 | |
| | | | 497.05 | -9.113E-02 | ?( | 1.135E+00 | 5.13E+02 | 9.09E+01 G |
| | | | 610.30 | -8.377E+00 | + | 4.337E+01 | 1.54E+02 | 5.75E+00 GA |
| RH-106 | I | 4.9190E-01 | | | | | 3.74E+02 | |
| | | | 621.92 | 4.919E-01 | ?( | 1.065E+01 | 9.15E+02 | 9.93E+00 G |
| | | | 1050.36 | -3.461E+01 | & | 1.031E+02 | 8.84E+01 | 1.56E+00 G |
| | | | 511.86 | 1.155E+01 | ? | 5.765E+00 | 2.83E+01 | 2.00E+01 GA |
| AG-108M | C | -4.8338E-01 | | | | | 1.53E+05 | |
| | | | 433.94 | -4.834E-01 | ( | 1.134E+00 | 7.07E+01 | 9.05E+01 G |
| | | | 722.94 | -6.020E-01 | + | 2.327E+00 | 1.15E+02 | 9.08E+01 G |
| | | | 614.28 | 5.387E-01 | + | 2.982E+00 | 1.65E+02 | 8.98E+01 G |
| AG-110M | F | -3.0340E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | -9.484E-01 | ?( | 2.606E+00 | 8.23E+01 | 7.27E+01 G |
| | | | 657.76 | 4.736E-01 | + | 1.186E+00 | 7.51E+01 | 9.46E+01 G |
| | | | 937.49 | -2.374E+00 | & | 4.345E+00 | 8.31E+01 | 3.44E+01 G |
| | | | 1384.30 | 1.627E+00 | ?( | 3.100E+00 | 8.56E+01 | 2.43E+01 G |
| | | | 763.94 | -3.991E+00 | + | 8.450E+00 | 6.42E+01 | 2.23E+01 G |
| SN-113 | F | -2.7816E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | -2.782E-01 | ?( | 2.177E+00 | 2.30E+02 | 6.40E+01 G |
| SB-124 | F | -5.6816E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | -5.682E-01 | ?( | 2.877E+00 | 1.51E+02 | 9.83E+01 G |
| | | | 1690.98 | -3.584E-01 | + | 2.593E+00 | 3.37E+02 | 4.78E+01 G |
| | | | 722.79 | -5.058E+00 | + | 2.042E+01 | 1.20E+02 | 1.08E+01 G |
| SB-125 | I | 1.1554E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | 1.155E+00 | ?( | 2.939E+00 | 1.07E+02 | 2.96E+01 G |
| | | | 600.50 | -3.113E+00 | + | 1.613E+01 | 1.55E+02 | 1.79E+01 G |
| | | | 635.89 | -5.416E+00 | & | 1.099E+01 | 6.16E+01 | 1.13E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 463.37 | 2.256E-01 % | | 1.174E+01 | 1.50E+03 | 1.05E+01 G |
| I-131 | I | -3.1677E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | -3.168E-01 ?( | | 1.082E+00 | 1.38E+02 | 8.17E+01 G |
| | | | 284.30 | -8.188E-01 + | | 1.444E+01 | 7.05E+02 | 6.14E+00 G |
| | | | 636.97 | -7.397E-01 + | | 1.951E+01 | 7.58E+02 | 7.17E+00 G |
| Gd-153 | F | 1.6650E-01 | | | | | 2.42E+02 | |
| | | | 97.50 | 1.665E-01 %( | | 8.991E+00 | 1.62E+03 | 3.00E+01 G |
| | | | 103.20 | -4.583E-08 % | | 5.415E+00 | 3.50E+09 | 2.18E+01 G |
| Ga-68 | C | -4.7640E+00 | | | | | 4.71E-02 | |
| | | | 1077.40 | -4.764E+00 &( | | 4.616E+01 | 4.32E+02 | 3.30E+00 G |
| Tc-99m | I | 3.6277E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | 3.628E-01 &( | | 1.830E+00 | 1.51E+02 | 8.93E+01 G |
| BA-133 | F | -5.9820E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -5.982E-01 ?( | | 3.017E+00 | 1.50E+02 | 6.20E+01 G |
| | | | 302.85 | -7.569E-01 + | | 1.164E+01 | 4.58E+02 | 1.83E+01 G |
| | | | 383.84 | -1.617E+00 + | | 1.494E+01 | 2.71E+02 | 8.94E+00 GA |
| | | | 80.99 | -1.082E+00 + | | 8.867E+00 | 2.47E+02 | 3.41E+01 GA |
| CS-134 | I | 2.7111E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | -5.644E-01 ( | | 2.838E+00 | 1.50E+02 | 9.76E+01 G |
| | | | 795.87 | -1.995E-01 + | | 1.820E+00 | 2.64E+02 | 8.55E+01 G |
| | | | 569.32 | -1.249E+00 + | | 6.707E+00 | 1.56E+02 | 1.54E+01 G |
| | | | 801.95 | 6.470E+00 ?( | | 1.875E+01 | 8.65E+01 | 8.69E+00 G |
| | | | 563.24 | 3.587E+00 ?( | | 1.073E+01 | 1.29E+02 | 8.35E+00 G |
| CS-137 | I | -4.6831E-01 | | | | | 1.10E+04 | |
| | | | 661.66 | -4.683E-01 ?( | | 1.672E+00 | 1.06E+02 | 8.52E+01 G |
| Ba-140 | I | -2.8759E-01 | | | | | 1.28E+01 | |
| | | | 537.26 | -2.876E-01 ?( | | 3.762E+00 | 5.32E+02 | 2.44E+01 G |
| | | | 162.66 | -5.730E+00 + | | 1.819E+01 | 9.54E+01 | 6.22E+00 G |
| | | | 304.85 | 0.000E+00 & | | 4.968E+01 | 1.00E+03 | 4.29E+00 G |
| La-140 | I | 5.6546E-01 | | | | | 1.28E+01 | |
| | | | 1596.21 | 4.950E-01 ?( | | 9.071E-01 | 8.48E+01 | 9.54E+01 G |
| | | | 487.02 | 7.860E-01 ?( | | 2.490E+00 | 9.42E+01 | 4.55E+01 G |
| | | | 328.76 | -2.000E+00 + | | 1.014E+01 | 1.52E+02 | 2.03E+01 G |
| | | | 815.77 | 4.232E-01 ( | | 6.741E+00 | 4.57E+02 | 2.33E+01 G |
| CE-141 | I | 6.1734E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | 6.173E-01 &( | | 3.188E+00 | 1.55E+02 | 4.82E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| PM-144 | C -5.2101E-01 | | | | | 3.63E+02 | |
| | | 696.54 | -5.210E-01 | ?( | 1.568E+00 | 8.97E+01 | 9.90E+01 G |
| | | 618.06 | -6.738E-07 | & | 2.775E+00 | 1.21E+08 | 9.91E+01 G |
| EU-152 | F 2.4144E+00 | | | | | 4.94E+03 | |
| | | 344.29 | 1.600E+00 | ?( | 6.983E+00 | 1.31E+02 | 2.65E+01 G |
| | | 1112.07 | -5.418E+00 | + | 1.835E+01 | 1.01E+02 | 1.36E+01 G |
| | | 121.78 | 3.542E-01 | - | 3.102E+00 | 2.59E+02 | 2.86E+01 G |
| | | 778.92 | 0.000E+00 | - | 8.637E+00 | 1.00E+03 | 1.29E+01 G |
| | | 964.11 | 3.893E+00 | &( | 1.601E+01 | 1.22E+02 | 1.46E+01 G |
| | | 244.69 | -5.069E+00 | + | 3.312E+01 | 1.96E+02 | 7.58E+00 G |
| | | 1408.00 | 8.777E-02 | % | 6.556E+00 | 3.35E+03 | 2.10E+01 GA |
| EU-154 | I 5.1688E-01 | | | | | 3.14E+03 | |
| | | 873.23 | -3.030E+00 | ?( | 1.438E+01 | 1.39E+02 | 1.23E+01 G |
| | | 123.10 | 4.715E-01 | + | 1.975E+00 | 1.25E+02 | 4.08E+01 G |
| | | 1274.54 | 0.000E+00 | + | 3.340E+00 | 1.00E+03 | 3.52E+01 G |
| | | 723.36 | -2.166E-01 | % | 9.371E+00 | 1.25E+03 | 2.02E+01 G |
| | | 1004.77 | -3.924E+00 | + | 1.094E+01 | 8.33E+01 | 1.80E+01 G |
| | | 996.33 | 4.623E+00 | ?( | 1.456E+01 | 9.32E+01 | 1.06E+01 G |
| EU-155 | I 1.2730E+00 | | | | | 1.81E+03 | |
| | | 105.31 | 1.273E+00 | &( | 4.210E+00 | 9.92E+01 | 2.12E+01 G |
| | | 86.54 | -1.164E+00 | - | 9.368E+00 | 2.42E+02 | 3.07E+01 G |
| HF-181 | F -9.5288E-02 | | | | | 4.24E+01 | |
| | | 482.00 | -5.861E-01 | ?( | 1.486E+00 | 7.62E+01 | 8.05E+01 G |
| | | 133.02 | 1.884E-07 | % | 3.683E+00 | 5.82E+08 | 4.33E+01 G |
| | | 345.83 | 2.526E+00 | &( | 1.134E+01 | 1.34E+02 | 1.51E+01 G |
| | | 136.30 | 0.000E+00 | + | 2.749E+01 | 1.00E+03 | 5.85E+00 G |
| Ta-182 | F -2.5191E-07 | | | | | 1.14E+02 | |
| | | 1121.30 | -2.519E-07 | %( | 6.513E+00 | 7.41E+08 | 3.49E+01 G |
| | | 1221.41 | -4.157E+00 | + | 7.218E+00 | 8.40E+01 | 2.70E+01 G |
| | | 1189.05 | -3.975E+00 | + | 1.016E+01 | 1.22E+02 | 1.62E+01 G |
| Hg-203 | F -4.4633E-01 | | | | | 4.66E+01 | |
| | | 279.20 | -4.463E-01 | ?( | 1.496E+00 | 1.00E+02 | 8.15E+01 G |
| TL-208 | N 7.5922E+00 | | | | | 6.98E+02 | |
| | | 583.02 | 7.510E+00 | (P | 9.166E-01 | 8.34E+00 | 8.45E+01 G |
| | | 277.28 | 1.584E+01 | + | 1.039E+01 | 3.02E+01 | 6.31E+00 G |
| | | 860.56 | 8.149E+00 | ?( | 7.850E+00 | 4.50E+01 | 1.24E+01 G |
| pm-146 | C 4.3888E-01 | | | | | 2.02E+03 | |
| | | 747.16 | -2.309E-01 | ?( | 3.086E+00 | 5.59E+02 | 3.40E+01 G |
| | | 735.72 | 1.478E+00 | ?( | 4.045E+00 | 1.17E+02 | 2.25E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 453.88 | 4.296E-01 | ?( | 1.300E+00 | 1.26E+02 | 6.50E+01 G |
| y-88 | F | 8.2691E-02 | | | | | 1.07E+02 | |
| | | | 898.04 | 8.269E-02 | &( | 9.737E-01 | 4.97E+02 | 9.37E+01 G |
| | | | 1836.06 | 0.000E+00 | - | 5.109E-01 | 1.00E+03 | 9.92E+01 G |
| Cd-113m | | 2.0345E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | 2.034E+03 | ?( | 1.359E+04 | 1.95E+02 | 6.00E-03 K |
| Cf-251 | T | 1.7712E+00 | | | | | 3.28E+05 | |
| | | | 176.60 | 1.771E+00 | ?( | 4.249E+00 | 9.41E+01 | 1.70E+01 G |
| | | | 227.00 | -2.285E-01 | % | 1.491E+01 | 2.63E+03 | 6.30E+00 GA |
| Sn-126 | | 1.2634E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | 1.263E+00 | } | 7.357E+00 | 5.93E+01 | 3.75E+01 GA |
| | | | 64.28 | 1.263E+00 | &( | 1.667E+01 | 3.92E+02 | 9.70E+00 G |
| | | | 86.94 | 1.263E+00 | } | 3.134E+01 | 2.47E+02 | 9.04E+00 GA |
| PB-210 | N | 1.0988E+01 | | | | | 8.14E+03 | |
| | | | 46.54 | 1.099E+01 | ( | 3.493E+01 | 9.51E+01 | 4.25E+00 G |
| PB-212 | N | 2.7978E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 2.798E+01 | (P | 1.367E+00 | 3.77E+00 | 4.33E+01 G |
| | | | 300.03 | 2.961E+01 | | 1.961E+01 | 2.29E+01 | 3.28E+00 GA |
| PB-214 | N | 1.2253E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.275E+01 | (P | 2.127E+00 | 9.84E+00 | 3.76E+01 G |
| | | | 295.09 | 1.128E+01 | ( | 3.467E+00 | 1.24E+01 | 1.93E+01 G |
| | | | 242.00 | 1.914E+01 | + | 1.027E+01 | 1.85E+01 | 7.43E+00 GA |
| BI-207 | C | 1.0770E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | 1.077E-01 | ?( | 1.092E+00 | 2.91E+02 | 9.77E+01 G |
| | | | 1063.66 | -2.374E-01 | + | 1.725E+00 | 3.25E+02 | 7.45E+01 G |
| BI-212 | N | 5.0421E+01 | | | | | 6.98E+02 | |
| | | | 727.17 | 5.042E+01 | ( | 5.954E+00 | 1.06E+01 | 7.55E+00 G |
| | | | 785.42 | 4.790E+01 | & | 7.473E+01 | 4.89E+01 | 1.28E+00 GA |
| BI-214 | N | 1.1012E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.101E+01 | ( | 1.544E+00 | 9.31E+00 | 4.61E+01 G |
| | | | 1120.29 | 1.718E+01 | + | 5.469E+00 | 1.98E+01 | 1.51E+01 G |
| | | | 1764.49 | 4.920E+00 | - | 1.032E+01 | 6.38E+01 | 1.54E+01 G |
| BI-210M | T | -7.5804E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | -7.580E-01 | ?( | 2.109E+00 | 8.35E+01 | 5.00E+01 G |
| | | | 304.90 | 0.000E+00 | + | 7.613E+00 | 1.00E+03 | 2.80E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| AC-228 | N | 2.1549E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.087E+01 | ( | 2.501E+00 | 9.38E+00 | 2.90E+01 G |
| | | | 968.97 | 2.268E+01 | ( | 3.470E+00 | 1.16E+01 | 1.75E+01 G |
| | | | 338.32 | 3.472E+00 | - | 1.561E+01 | 1.34E+02 | 1.20E+01 G |
| | | | 93.35 | 2.566E+01 | | 1.304E+01 | 2.31E+01 | 5.56E+00 XA |
| TH-227 | N | 5.5282E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | 5.528E+00 | &( | 1.951E+01 | 1.06E+02 | 8.00E+00 G |
| | | | 256.24 | 0.000E+00 | & | 1.255E+01 | 1.00E+03 | 7.00E+00 G |
| TH-229 | N | 3.6092E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | 2.946E+00 | &( | 1.942E+01 | 2.67E+02 | 4.40E+00 G |
| | | | 210.85 | 4.586E+00 | ?( | 3.176E+01 | 2.81E+02 | 2.99E+00 G |
| TH-234 | N | 8.4102E+00 | | | | | 1.63E+12 | |
| | | | 63.29 | 1.157E+01 | *( | 4.146E+01 | 1.08E+02 | 3.81E+00 G |
| | | | 92.59 | 6.251E+00 | &( | 4.882E+01 | 2.35E+02 | 5.58E+00 G |
| PA-231 | N | -1.3322E+01 | | | | | 1.20E+07 | |
| | | | 302.65 | -1.332E+01 | ?( | 7.528E+01 | 1.69E+02 | 2.88E+00 G |
| | | | 300.07 | -1.487E+01 | + | 8.847E+01 | 1.78E+02 | 2.46E+00 G |
| PA-234 | N | -3.1015E-02 | | | | | 1.63E+12 | |
| | | | 131.29 | -1.381E+00 | ?( | 8.925E+00 | 1.94E+02 | 1.80E+01 G |
| | | | 946.02 | -2.107E+00 | + | 9.688E+00 | 2.02E+02 | 1.34E+01 G |
| | | | 569.47 | 0.000E+00 | + | 1.329E+01 | 1.00E+03 | 8.20E+00 G |
| | | | 883.24 | 2.500E+00 | ?( | 1.624E+01 | 1.88E+02 | 9.60E+00 G |
| | | | 880.53 | 8.517E+00 | ? | 2.336E+01 | 8.18E+01 | 6.00E+00 GA |
| U-235 | N | 2.2677E+00 | | | | | 2.57E+11 | |
| | | | 143.79 | 2.268E+00 | &( | 1.483E+01 | 1.96E+02 | 1.10E+01 G |
| | | | 205.33 | -8.384E+00 | + | 2.031E+01 | 9.97E+01 | 5.01E+00 G |
| | | | 163.38 | -8.760E-01 | + | 2.105E+01 | 7.09E+02 | 5.08E+00 G |
| AM-241 | T | -1.4630E+00 | | | | | 1.58E+05 | |
| | | | 59.54 | -1.463E+00 | &( | 5.525E+00 | 1.14E+02 | 3.59E+01 G |
| Cs-136 | F | 2.9001E-01 | | | | | 1.30E+01 | |
| | | | 818.50 | -3.006E-01 | &( | 1.725E+00 | 1.68E+02 | 1.00E+02 G |
| | | | 1048.07 | 6.738E-01 | ?( | 1.463E+00 | 6.57E+01 | 8.00E+01 G |
| | | | 340.57 | 8.947E-01 | ?( | 3.913E+00 | 1.31E+02 | 4.69E+01 G |
| Np-239 | T | 1.2042E+00 | | | | | 2.36E+00 | |
| | | | 103.70 | -4.161E-08 | % | 4.916E+00 | 3.50E+09 | 2.40E+01 X |
| | | | 106.13 | 1.204E+00 | ?( | 3.433E+00 | 8.56E+01 | 2.27E+01 G |
| | | | 99.50 | -1.199E+00 | - | 8.045E+00 | 2.00E+02 | 1.50E+01 X |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Nd-147       5.5457E-01                                        1.11E+01
                            531.00-9.362E-01 &(  6.998E+00 3.06E+02 1.30E+01 G
                             91.10 1.239E+00 ?(  9.639E+00 2.34E+02 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
```

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| PB-210 | 46.54 | 202. | 22. | 0.012 | 95.14 | 1.099E+01 |
| TH-227 | 50.14 | 286. | 23. | 0.013 | 105.62 | 5.528E+00 |
| AM-241 | 59.54 | 753. | -35. | -0.019 | 113.50 | -1.463E+00 |
| TH-234 | 63.29 | 545. | 31. | 0.017 | 107.56 | 1.157E+01 |
| BA-133 | 80.99 | 3109. | -32. | -0.018 | 246.66 | -1.082E+00 |
| EU-155 | 86.54 | 3033. | -32. | -0.018 | 242.40 | -1.164E+00 |
| Nd-147 | 91.10 | 2853. | 32. | 0.018 | 234.14 | 1.239E+00 |
| TH-234 | 92.59 | 2885. | 32. | 0.018 | 235.13 | 6.251E+00 |
| Np-239 | 99.50 | 574. | -17. | -0.009 | 200.26 | -1.199E+00 |
| EU-155 | 105.31 | 315. | 26. | 0.014 | 99.16 | 1.273E+00 |
| Np-239 | 106.13 | 238. | 26. | 0.015 | 85.64 | 1.204E+00 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| EU-152 | 121.78 | 309. | 10. | 0.005 | 259.31 | 3.542E-01 | |
| EU-154 | 123.10 | 253. | 18. | 0.010 | 124.82 | 4.715E-01 | |
| PA-234 | 131.29 | 1010. | -23. | -0.013 | 193.76 | -1.381E+00 | |
| U-235 | 143.79 | 964. | 23. | 0.013 | 195.96 | 2.268E+00 | |
| CE-141 | 145.44 | 850. | 27. | 0.015 | 154.85 | 6.173E-01 | |
| Ba-140 | 162.66 | 396. | -30. | -0.017 | 95.35 | -5.730E+00 | |
| U-235 | 163.38 | 351. | -4. | -0.002 | 709.25 | -8.760E-01 | |
| U-235 | 205.33 | 244. | -31. | -0.017 | 99.73 | -8.384E+00 | |
| EU-152 | 244.69 | 1225. | -25. | -0.014 | 196.05 | -5.069E+00 | |
| Cd-113m | 263.70 | 108. | 8. | 0.004 | 195.36 | 2.034E+03 | |
| BI-210M | 265.83 | 184. | -24. | -0.013 | 83.52 | -7.580E-01 | |
| Hg-203 | 279.20 | 232. | -22. | -0.012 | 100.29 | -4.463E-01 | |
| I-131 | 284.30 | 116. | -3. | -0.002 | 705.27 | -8.188E-01 | |
| PA-231 | 300.07 | 690. | -21. | -0.012 | 178.00 | -1.487E+01 | |
| PA-233 | 300.18 | 699. | -22. | -0.012 | 172.08 | -6.142E+00 | |
| PA-231 | 302.65 | 677. | -22. | -0.012 | 169.10 | -1.332E+01 | |
| BA-133 | 302.85 | 655. | -8. | -0.004 | 457.88 | -7.569E-01 | |
| La-140 | 328.76 | 542. | -22. | -0.012 | 151.71 | -2.000E+00 | |
| Cf-249 | 333.44 | 520. | -11. | -0.006 | 296.93 | -1.317E+00 | |
| Cs-136 | 340.57 | 407. | 22. | 0.012 | 130.75 | 8.947E-01 | |
| EU-152 | 344.29 | 407. | 22. | 0.012 | 130.50 | 1.600E+00 | |
| HF-181 | 345.83 | 344. | 20. | 0.011 | 133.98 | 2.526E+00 | |
| BA-133 | 356.00 | 398. | -19. | -0.011 | 150.49 | -5.982E-01 | |
| I-131 | 364.48 | 80. | -13. | -0.007 | 137.53 | -3.168E-01 | |
| BA-133 | 383.84 | 177. | -7. | -0.004 | 271.43 | -1.617E+00 | |
| SN-113 | 391.69 | 188. | -8. | -0.005 | 230.39 | -2.782E-01 | |
| SB-125 | 427.88 | 61. | 15. | 0.009 | 106.79 | 1.155E+00 | |
| pm-146 | 453.88 | 52. | 12. | 0.007 | 126.01 | 4.296E-01 | |
| Ir-192 | 468.06 | 62. | -17. | -0.009 | 99.25 | -7.662E-01 | |
| HF-181 | 482.00 | 100. | -19. | -0.011 | 76.18 | -5.861E-01 | |
| La-140 | 487.02 | 87. | 15. | 0.008 | 94.23 | 7.860E-01 | |
| RU-103 | 497.05 | 69. | -3. | -0.002 | 512.83 | -9.113E-02 | |
| RH-106 | 511.86 | 84. | 91. | 0.051 | 28.33 | 1.155E+01 | |
| Nd-147 | 531.00 | 48. | -5. | -0.003 | 305.52 | -9.362E-01 | |
| Ba-140 | 537.26 | 48. | -3. | -0.001 | 532.02 | -2.876E-01 | |
| CS-134 | 563.24 | 42. | 11. | 0.006 | 128.56 | 3.587E+00 | |
| CS-134 | 569.32 | 56. | -7. | -0.004 | 155.84 | -1.249E+00 | |
| BI-207 | 569.70 | 60. | 4. | 0.002 | 290.69 | 1.077E-01 | |
| SB-125 | 600.50 | 444. | -19. | -0.011 | 154.72 | -3.113E+00 | |
| SB-124 | 602.73 | 425. | -19. | -0.011 | 151.18 | -5.682E-01 | |
| CS-134 | 604.71 | 405. | -19. | -0.011 | 150.05 | -5.644E-01 | |
| RU-103 | 610.30 | 322. | -17. | -0.009 | 154.14 | -8.377E+00 | |
| RH-106 | 621.92 | 51. | 2. | 0.001 | 915.19 | 4.919E-01 | |
| SB-125 | 635.89 | 70. | -21. | -0.011 | 61.64 | -5.416E+00 | |
| I-131 | 636.97 | 90. | -2. | -0.001 | 758.00 | -7.397E-01 | |
| AG-110M | 657.76 | 53. | 15. | 0.008 | 75.10 | 4.736E-01 | |
| CS-137 | 661.66 | 88. | -13. | -0.007 | 105.75 | -4.683E-01 | |
| PM-144 | 696.54 | 97. | -16. | -0.009 | 89.74 | -5.210E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| NB-94 | 702.63 | 94. | 16. | 0.009 | 88.46 | 5.303E-01 | |
| SB-124 | 722.79 | 192. | -17. | -0.009 | 120.10 | -5.058E+00 | |
| pm-146 | 735.72 | 28. | 10. | 0.006 | 116.62 | 1.478E+00 | |
| pm-146 | 747.16 | 37. | -2. | -0.001 | 559.34 | -2.309E-01 | |
| ZR-95 | 756.73 | 25. | 25. | 0.014 | 48.30 | 1.559E+00 | |
| AG-110M | 763.94 | 126. | -26. | -0.014 | 64.17 | -3.991E+00 | |
| NB-95 | 765.79 | 140. | -3. | -0.002 | 557.70 | -1.036E-01 | |
| PA-234M | 766.41 | 156. | -6. | -0.003 | 314.20 | -6.611E+01 | |
| CS-134 | 795.87 | 79. | -5. | -0.003 | 263.74 | -1.995E-01 | |
| CS-134 | 801.95 | 86. | 16. | 0.009 | 86.48 | 6.470E+00 | |
| CO-58 | 810.78 | 80. | -16. | -0.009 | 80.96 | -5.906E-01 | |
| La-140 | 815.77 | 77. | 3. | 0.002 | 457.45 | 4.232E-01 | |
| Cs-136 | 818.50 | 94. | -8. | -0.005 | 167.86 | -3.006E-01 | |
| MN-54 | 834.85 | 50. | 2. | 0.001 | 780.49 | 7.326E-02 | |
| NB-94 | 871.10 | 63. | -19. | -0.010 | 63.97 | -7.144E-01 | |
| EU-154 | 873.23 | 89. | -10. | -0.005 | 139.38 | -3.030E+00 | |
| PA-234 | 880.53 | 53. | 13. | 0.007 | 81.81 | 8.517E+00 | |
| PA-234 | 883.24 | 67. | 6. | 0.003 | 188.41 | 2.500E+00 | |
| AG-110M | 884.68 | 101. | -18. | -0.010 | 82.28 | -9.484E-01 | |
| Sc-46 | 889.28 | 67. | 6. | 0.004 | 186.59 | 2.436E-01 | |
| y-88 | 898.04 | 20. | 2. | 0.001 | 496.66 | 8.269E-02 | |
| AG-110M | 937.49 | 55. | -20. | -0.011 | 83.06 | -2.374E+00 | |
| PA-234 | 946.02 | 40. | -7. | -0.004 | 202.20 | -2.107E+00 | |
| EU-152 | 964.11 | 136. | 14. | 0.008 | 121.89 | 3.893E+00 | |
| EU-154 | 996.33 | 53. | 12. | 0.006 | 93.24 | 4.623E+00 | |
| EU-154 | 1004.77 | 89. | -17. | -0.009 | 83.35 | -3.924E+00 | |
| Cs-136 | 1048.07 | 27. | 12. | 0.007 | 65.70 | 6.738E-01 | |
| RH-106 | 1050.36 | 53. | -12. | -0.007 | 88.45 | -3.461E+01 | |
| BI-207 | 1063.66 | 32. | -4. | -0.002 | 325.32 | -2.374E-01 | |
| Ga-68 | 1077.40 | 32. | -3. | -0.002 | 432.48 | -4.764E+00 | |
| FE-59 | 1099.25 | 32. | -2. | -0.001 | 646.79 | -1.606E-01 | |
| EU-152 | 1112.07 | 124. | -16. | -0.009 | 100.81 | -5.418E+00 | |
| ZN-65 | 1115.55 | 108. | -9. | -0.005 | 163.41 | -8.339E-01 | |
| Ta-182 | 1189.05 | 45. | -13. | -0.007 | 121.55 | -3.975E+00 | |
| Ta-182 | 1221.41 | 62. | -23. | -0.013 | 84.05 | -4.157E+00 | |
| NA-22 | 1274.53 | 11. | 8. | 0.004 | 71.84 | 3.916E-01 | |
| FE-59 | 1291.60 | 45. | -17. | -0.010 | 94.21 | -2.070E+00 | |
| CO-60 | 1332.50 | 23. | -4. | -0.002 | 308.96 | -1.940E-01 | |
| AG-110M | 1384.30 | 6. | 7. | 0.004 | 85.58 | 1.627E+00 | |
| La-140 | 1596.21 | 6. | 8. | 0.004 | 84.78 | 4.950E-01 | |
| SB-124 | 1690.98 | 13. | -3. | -0.001 | 337.04 | -3.584E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty 1 Sigma Counting | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | 2.2947E-01 | 2.2947E-01 | 1.640E+03% | 1.30E+01 |
| NA-22 | #A | 3.9159E-01 | 3.9159E-01 | 7.184E+01% | 9.40E-01 |
| K-40 | | 2.4141E+02 | 2.4141E+02 | 4.704E+00% | 3.94E+00 |
| Sc-46 | #A | 2.4356E-01 | 2.4356E-01 | 1.866E+02% | 1.57E+00 |
| CR-51 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.22E+01 |
| MN-54 | #A | 7.3256E-02 | 7.3256E-02 | 7.805E+02% | 1.31E+00 |
| FE-59 | #A | -1.6062E-01 | -1.6062E-01 | 6.468E+02% | 2.33E+00 |
| Co-56 | #C | 1.2461E+00 | 1.2461E+00 | 2.237E+01% | 1.12E+00 |
| CO-57 | #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 1.05E+00 |
| CO-58 | #A | -5.9061E-01 | -5.9061E-01 | 8.096E+01% | 1.60E+00 |
| CO-60 | #A | -1.9402E-01 | -1.9402E-01 | 3.090E+02% | 1.32E+00 |
| ZN-65 | #A | -8.3385E-01 | -8.3385E-01 | 1.634E+02% | 4.64E+00 |
| NB-94 | #A | 5.3033E-01 | 5.3033E-01 | 8.846E+01% | 1.57E+00 |
| ZR-95 | #A | 1.5595E+00 | 1.5595E+00 | 4.830E+01% | 1.62E+00 |
| NB-95 | #A | -1.0362E-01 | -1.0362E-01 | 5.577E+02% | 1.99E+00 |
| RU-103 | #A | -9.1125E-02 | -9.1127E-02 | 5.128E+02% | 1.13E+00 |
| RH-106 | #A | 4.9190E-01 | 4.9190E-01 | 9.152E+02% | 1.07E+01 |
| AG-108M | A | -4.8338E-01 | -4.8338E-01 | 7.071E+01% | 1.13E+00 |
| AG-110M | #A | -3.0340E-01 | -3.0340E-01 | 5.936E+01% | 2.61E+00 |
| SN-113 | #A | -2.7816E-01 | -2.7816E-01 | 2.304E+02% | 2.18E+00 |
| SB-124 | #A | -5.6816E-01 | -5.6816E-01 | 1.512E+02% | 2.88E+00 |
| SB-125 | #A | 1.1554E+00 | 1.1554E+00 | 1.068E+02% | 2.94E+00 |
| I-131 | #A | -3.1675E-01 | -3.1677E-01 | 1.375E+02% | 1.08E+00 |
| Gd-153 | #A | 1.6650E-01 | 1.6650E-01 | 1.622E+03% | 8.99E+00 |
| Ga-68 | #A | -4.7155E+00 | -4.7640E+00 | 4.325E+02% | 4.62E+01 |
| Tc-99m | #A | 3.6207E-01 | 3.6277E-01 | 1.514E+02% | 1.83E+00 |
| BA-133 | #A | -5.9820E-01 | -5.9820E-01 | 1.505E+02% | 3.02E+00 |
| CS-134 | #A | 2.7111E-01 | 2.7111E-01 | 7.190E+01% | 2.84E+00 |
| CS-137 | #A | -4.6831E-01 | -4.6831E-01 | 1.058E+02% | 1.67E+00 |
| CE-139 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.33E+00 |
| Ba-140 | #A | -2.8758E-01 | -2.8759E-01 | 5.320E+02% | 3.76E+00 |
| La-140 | #A | 5.6544E-01 | 5.6546E-01 | 8.478E+01% | 9.07E-01 |
| CE-141 | #A | 6.1733E-01 | 6.1734E-01 | 1.548E+02% | 3.19E+00 |
| CE-144 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.44E+01 |
| PM-144 | #A | -5.2101E-01 | -5.2101E-01 | 8.974E+01% | 1.57E+00 |
| EU-152 | #A | 2.4144E+00 | 2.4144E+00 | 8.928E+01% | 6.98E+00 |
| EU-154 | #A | 5.1688E-01 | 5.1688E-01 | 8.385E+01% | 1.44E+01 |
| EU-155 | #A | 1.2730E+00 | 1.2730E+00 | 9.916E+01% | 4.21E+00 |
| HF-181 | #A | -9.5287E-02 | -9.5288E-02 | 7.618E+01% | 1.49E+00 |
| Ta-182 | #A | -2.5191E-07 | -2.5191E-07 | 7.415E+08% | 6.51E+00 |
| Hg-203 | #A | -4.4633E-01 | -4.4633E-01 | 1.003E+02% | 1.50E+00 |
| TL-208 | | 7.5922E+00 | 7.5922E+00 | 8.336E+00% | 9.17E-01 |
| pm-146 | #A | 4.3888E-01 | 4.3888E-01 | 1.166E+02% | 3.09E+00 |

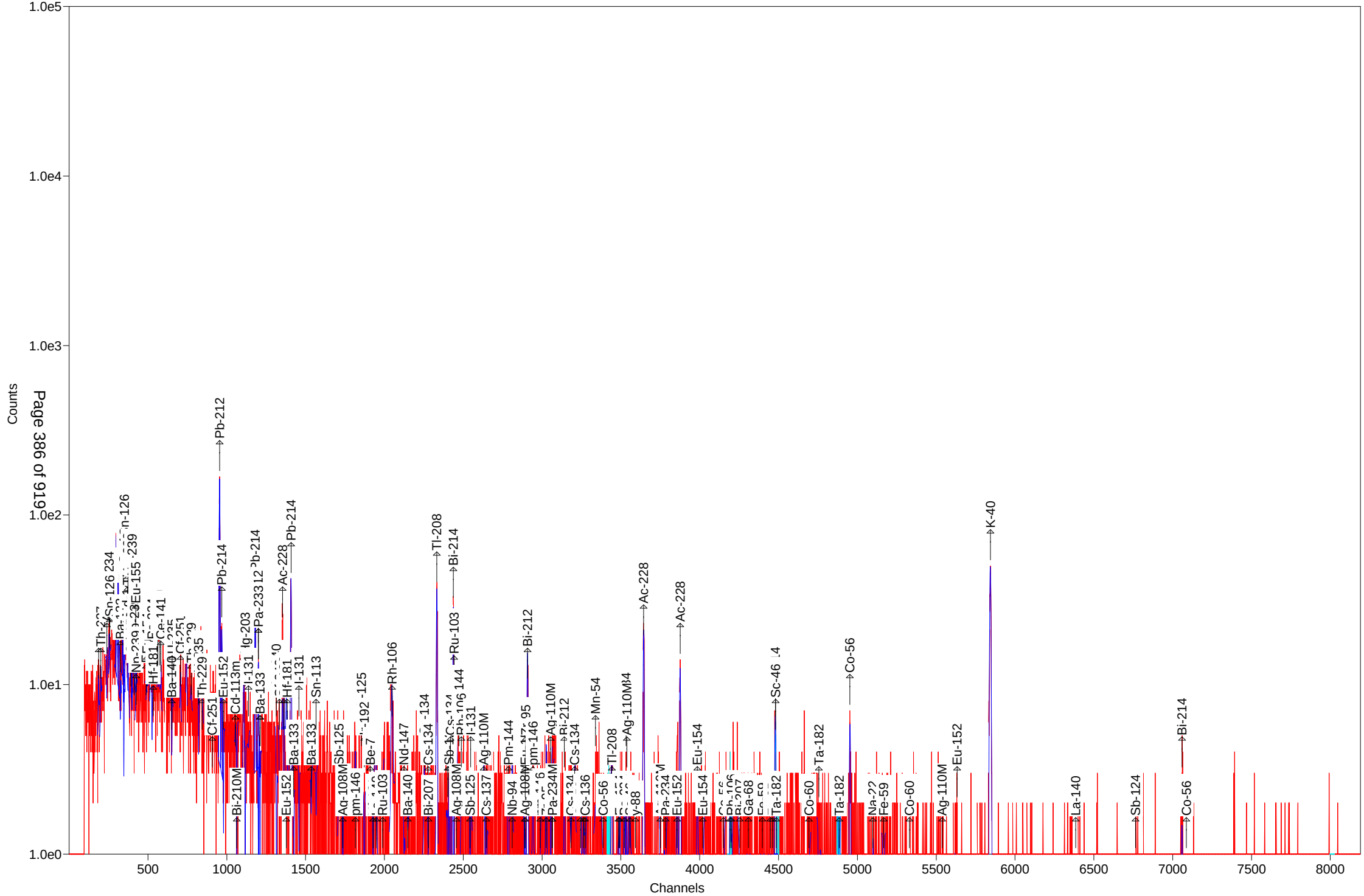
| | | | | | |
|---|---|---|---|---|---|
| y-88 #A | 8.2690E-02 | 8.2691E-02 | 4.967E+02% | | 9.74E-01 |
| Cd-113m#A | 2.0345E+03 | 2.0345E+03 | 1.954E+02% | | 1.36E+04 |
| Cd-109 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 7.39E+01 |
| Cf-251 #A | 1.7712E+00 | 1.7712E+00 | 9.408E+01% | | 4.25E+00 |
| Cf-249 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 2.08E+00 |
| Sn-126 #A | 1.2634E+00 | 1.2634E+00 | 3.924E+02% | | 1.67E+01 |
| PB-210 #A | 1.0988E+01 | 1.0988E+01 | 9.514E+01% | | 3.49E+01 |
| PB-212 | 2.7978E+01 | 2.7978E+01 | 3.773E+00% | | 1.37E+00 |
| PB-214 | 1.2253E+01 | 1.2253E+01 | 7.924E+00% | | 2.13E+00 |
| BI-207 #A | 1.0770E-01 | 1.0770E-01 | 2.907E+02% | | 1.09E+00 |
| BI-212 # | 5.0421E+01 | 5.0421E+01 | 1.065E+01% | | 5.95E+00 |
| BI-214 | 1.1012E+01 | 1.1012E+01 | 9.314E+00% | | 1.54E+00 |
| BI-210M#A | -7.5804E-01 | -7.5804E-01 | 8.352E+01% | | 2.11E+00 |
| AC-228 | 2.1549E+01 | 2.1549E+01 | 7.466E+00% | | 2.50E+00 |
| TH-227 #A | 5.5282E+00 | 5.5282E+00 | 1.056E+02% | | 1.95E+01 |
| TH-229 #A | 3.6092E+00 | 3.6092E+00 | 1.941E+02% | | 1.94E+01 |
| TH-234 #A | 8.4102E+00 | 8.4102E+00 | 1.076E+02% | | 4.15E+01 |
| PA-231 #A | -1.3322E+01 | -1.3322E+01 | 1.691E+02% | | 7.53E+01 |
| PA-233 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 6.02E+00 |
| PA-234 #A | -3.1015E-02 | -3.1015E-02 | 1.351E+02% | | 8.92E+00 |
| PA-234M#A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 2.03E+02 |
| U-235 #A | 2.2677E+00 | 2.2677E+00 | 1.960E+02% | | 1.48E+01 |
| AM-241 #A | -1.4630E+00 | -1.4630E+00 | 1.135E+02% | | 5.52E+00 |
| Np-237 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 2.21E+01 |
| Ir-192 #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | | 2.51E+00 |
| Cs-136 #A | 2.9000E-01 | 2.9001E-01 | 6.570E+01% | | 1.72E+00 |
| Np-239 #A | 1.2040E+00 | 1.2042E+00 | 8.564E+01% | | 3.43E+00 |
| Nd-147 #A | 5.5455E-01 | 5.5457E-01 | 1.925E+02% | | 7.00E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  25.1 to  1999.3 keV)  3.722E+02  Bq/Sample
Total Decayed Activity (  25.1 to  1999.3 keV) 3.7221509E+02  Bq/Sample

309155_Gamma_160-22327-A-2-B. 9_Gamma_20171607.spc.



Test America St. Louis  Spectrum ID: 13_Gamma_20171200

Sample Description: 309155_Gamma_160-22327-A-3-B
Detector: Detector #13
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-3-B

Decay to Time: 6/7/2017 09:57  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:58:09  Real Time: 1805 sec
Analysis Time: 6/7/2017 10:28  Dead Time: 0.26 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 13_Soil_TunaCan.Clb
Efficiency Cal Desc: 13_Soil_TunaCan_90099_032712
Efficiency Cal Date: 3/29/2012 07:50
Energy Cal Date: 2/23/2012 09:31
Library: Client_Long_Rev11.lib
Bkgd Correction File: 13_2017-06-04_0332.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | -4.806E+00 | 98.7 | 4.742E+00 | 4.748E+00 | 1.585E+01 |
| NA-22 | -4.229E-01 | 108.2 | 4.577E-01 | 4.582E-01 | 1.564E+00 |
| K-40 | 3.337E+02 | 4.1 | 1.352E+01 | 2.178E+01 | 7.439E+00 |
| Sc-46 | 7.048E-02 | 103.4 | 7.287E-02 | 7.296E-02 | 1.862E+00 |
| CR-51 | 2.118E+00 | 332.8 | 7.049E+00 | 7.050E+00 | 2.361E+01 |
| MN-54 | -7.004E-02 | 818.3 | 5.732E-01 | 5.732E-01 | 1.305E+00 |
| FE-59 | 2.966E-01 | 166.2 | 4.931E-01 | 4.933E-01 | 2.232E+00 |
| Co-56 | 1.091E+00 | 46.6 | 5.083E-01 | 5.114E-01 | 9.213E-01 |
| CO-57 | -3.522E-02 | 807.6 | 2.844E-01 | 2.844E-01 | 9.666E-01 |
| CO-58 | -7.023E-01 | 77.3 | 5.426E-01 | 5.438E-01 | 1.806E+00 |
| CO-60 | 4.885E-01 | 87.8 | 4.288E-01 | 4.295E-01 | 9.298E-01 |
| ZN-65 | 1.012E+00 | 140.2 | 1.419E+00 | 1.419E+00 | 4.806E+00 |
| NB-94 | 1.403E-01 | 192.0 | 2.693E-01 | 2.694E-01 | 1.649E+00 |
| ZR-95 | -4.175E-01 | 256.0 | 1.069E+00 | 1.069E+00 | 2.402E+00 |
| NB-95 | -6.067E-01 | 103.6 | 6.285E-01 | 6.293E-01 | 2.107E+00 |
| RU-103 | 3.480E-02 | 1316.8 | 4.583E-01 | 4.583E-01 | 1.115E+00 |
| RH-106 | 1.490E-01 | 99.9 | 1.489E-01 | 1.491E-01 | 3.071E+01 |
| AG-108M | 3.959E-02 | 1022.7 | 4.049E-01 | 4.049E-01 | 9.861E-01 |
| AG-110M | 0.000E+00 | 1.#INF | 2.253E-01 | 2.253E-01 | 2.409E+00 |
| SN-113 | 7.093E-01 | 106.4 | 7.546E-01 | 7.554E-01 | 2.522E+00 |
| SB-124 | -1.598E-01 | 232.2 | 3.709E-01 | 3.710E-01 | 3.012E+00 |
| SB-125 | 3.595E-01 | 236.5 | 8.499E-01 | 8.501E-01 | 3.153E+00 |
| I-131 | 3.688E-01 | 93.5 | 3.447E-01 | 3.452E-01 | 1.166E+00 |
| Gd-153 | -1.338E+00 | 168.9 | 2.259E+00 | 2.260E+00 | 7.503E+00 |
| Ga-68 | -5.068E+00 | 420.2 | 2.130E+01 | 2.130E+01 | 4.741E+01 |
| Tc-99m | -1.634E-01 | 393.6 | 6.432E-01 | 6.433E-01 | 2.147E+00 |
| BA-133 | 2.104E-01 | 449.7 | 9.463E-01 | 9.463E-01 | 3.188E+00 |
| CS-134 | 8.243E-01 | 76.2 | 6.280E-01 | 6.295E-01 | 3.004E+00 |
| CS-137 | 2.296E-02 | 1928.7 | 4.428E-01 | 4.428E-01 | 1.549E+00 |
| CE-139 | 4.615E-01 | 94.2 | 4.348E-01 | 4.370E-01 | 1.446E+00 |
| Ba-140 | -3.434E-02 | 5146.8 | 1.767E+00 | 1.767E+00 | 4.159E+00 |
| La-140 | 2.233E-01 | 99.7 | 2.225E-01 | 2.229E-01 | 1.411E+00 |
| CE-141 | -8.489E-01 | 142.4 | 1.209E+00 | 1.210E+00 | 4.018E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | -3.327E+00 | 142.7 | 4.748E+00 | 4.752E+00 | 1.579E+01 |
| PM-144 | -2.619E-01 | 167.8 | 4.395E-01 | 4.397E-01 | 1.501E+00 |
| EU-152 | 8.466E-01 | 124.6 | 1.055E+00 | 1.056E+00 | 7.447E+00 |
| EU-154 | -3.151E+00 | 101.8 | 3.209E+00 | 3.213E+00 | 1.089E+01 |
| EU-155 | 4.147E+00 | 31.6 | 1.310E+00 | 1.329E+00 | 3.062E+00 |
| HF-181 | 2.576E-01 | 211.9 | 5.459E-01 | 5.461E-01 | 1.854E+00 |
| Ta-182 | -1.905E+00 | 126.5 | 2.411E+00 | 2.413E+00 | 8.120E+00 |
| Hg-203 | 4.382E-01 | 84.0 | 3.681E-01 | 3.690E-01 | 1.227E+00 |
| TL-208 | 8.592E+00 | 7.3 | 6.302E-01 | 7.719E-01 | 8.645E-01 |
| pm-146 | -2.160E+00 | 88.6 | 1.915E+00 | 1.918E+00 | 4.200E+00 |
| y-88 | -7.906E-02 | 780.5 | 6.171E-01 | 6.171E-01 | 1.410E+00 |
| Cd-113m | 3.948E+03 | 129.6 | 5.117E+03 | 5.124E+03 | 1.722E+04 |
| Cd-109 | -1.091E+01 | 174.8 | 1.906E+01 | 1.907E+01 | 6.331E+01 |
| Cf-251 | -1.900E+00 | 116.9 | 2.220E+00 | 2.226E+00 | 5.398E+00 |
| Cf-249 | -7.990E-01 | 92.7 | 7.406E-01 | 7.418E-01 | 2.468E+00 |
| Sn-126 | 1.847E+00 | 290.7 | 5.370E+00 | 5.371E+00 | 1.799E+01 |
| PB-210 | 9.664E-01 | 1474.8 | 1.425E+01 | 1.425E+01 | 4.822E+01 |
| PB-212 | 2.889E+01 | 3.7 | 1.068E+00 | 2.152E+00 | 1.556E+00 |
| PB-214 | 1.685E+01 | 5.7 | 9.528E-01 | 1.294E+00 | 1.909E+00 |
| BI-207 | 6.606E-02 | 394.7 | 2.607E-01 | 2.608E-01 | 1.342E+00 |
| BI-212 | 2.831E+01 | 21.3 | 6.031E+00 | 6.208E+00 | 1.069E+01 |
| BI-214 | 1.582E+01 | 8.4 | 1.335E+00 | 1.568E+00 | 1.970E+00 |
| BI-210M | 3.446E-01 | 175.3 | 6.041E-01 | 6.045E-01 | 2.044E+00 |
| AC-228 | 2.749E+01 | 5.8 | 1.592E+00 | 2.122E+00 | 9.519E-01 |
| TH-227 | -7.177E+00 | 102.8 | 7.381E+00 | 7.392E+00 | 1.873E+01 |
| TH-229 | -9.448E-01 | 93.0 | 8.787E-01 | 8.819E-01 | 2.120E+01 |
| TH-234 | 9.408E+00 | 138.9 | 1.307E+01 | 1.308E+01 | 4.361E+01 |
| PA-231 | -1.403E+01 | 174.2 | 2.444E+01 | 2.445E+01 | 8.155E+01 |
| PA-233 | 0.000E+00 | 1.#INF | 2.586E-01 | 2.586E-01 | 6.466E+00 |
| PA-234 | -5.649E-01 | 114.1 | 6.446E-01 | 6.453E-01 | 9.503E+00 |
| PA-234M | 5.930E+01 | 81.6 | 4.839E+01 | 4.848E+01 | 2.394E+02 |
| U-235 | 0.000E+00 | 1.#INF | 1.713E+00 | 1.713E+00 | 1.719E+01 |
| AM-241 | 1.428E+00 | 107.1 | 1.529E+00 | 1.531E+00 | 5.085E+00 |
| Np-237 | 0.000E+00 | 1.#INF | 5.930E+00 | 5.930E+00 | 1.969E+01 |
| Ir-192 | 0.000E+00 | 1.#INF | 1.892E-01 | 1.892E-01 | 2.701E+00 |
| Cs-136 | -7.897E-01 | 86.7 | 6.845E-01 | 6.860E-01 | 2.282E+00 |
| Np-239 | -1.835E+00 | 159.6 | 2.927E+00 | 2.930E+00 | 9.721E+00 |
| Nd-147 | 1.980E+00 | 139.9 | 2.770E+00 | 2.772E+00 | 6.684E+00 |
| Total | 4.497E+03 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-3-B

Spectrum Filename: C:\User\SPC\Det13\13_Gamma_20171200.An1

Acquisition information
Start time: 6/7/2017 9:58:09 AM
Live time: 1800
Real time: 1805
Dead time: 0.26 %
Detector ID: 13

Detector system
Ge13 SN/10064006

Calibration
Filename: 13_Soil_TunaCan.Clb
13_Soil_TunaCan_90099_032712

Energy Calibration
Created: 2/23/2012 9:31:24 AM
Zero offset: 0.036 keV
Gain: 0.250 keV/channel
Quadratic: -2.347E-08 keV/channel^2

Efficiency Calibration
Created: 3/29/2012 7:50:26 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.91 %
Log(Eff): -5.308398E-01 + (-3.057754E-01*Log(E) ) + ( -3.437570E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.60 %
Log(Eff): -2.292218E+01 + ( 8.455931E+00*Log(E) ) + ( -8.924057E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 100 (  25.05keV )
Stop channel: 8000 (  1999.54keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:57:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 13_2017-06-04_0332.PBC 6/4/2017 3:32:55 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 29 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.1550

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 60.10 | 35. | 107.07 | 1.03 | 3.802E-02 | 59.54 | 35.900 | PBC<MDA | AM241 |
| 63.29 | 26. | 138.92 | 1.03 | 4.068E-02 | 63.29 | 3.810 | PBC<MDA | TH234 |
| 64.28 | 13. | 290.73 | 1.03 | 4.135E-02 | 64.28 | 9.700 | PBC<MDA | Sn126 |
| 74.78 | 342. | 8.98 | 1.04 | 4.730E-02 | | | | |
| 77.02 | 529. | 6.09 | 1.05 | 4.833E-02 | | | | |
| 87.13 | 165. | 14.45 | 1.06 | 5.200E-02 | 86.49 | 13.100 | 1.351E+01 | Np237 |
| | | | | | 86.54 | 30.700 | 5.762E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.952E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 4.690E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 4.629E+01 | Cd109 |
| 89.92 | 118. | 19.49 | 1.06 | 5.275E-02 | | | | |
| 93.17 | 153. | 14.76 | 1.06 | 5.353E-02 | 93.35 | 5.561 | 2.863E+01 | AC228 |
| 105.52 | 87. | 31.58 | 1.60 | 5.518E-02 | 105.31 | 21.200 | 4.147E+00 | EU155 |
| | | | | | 106.13 | 22.700 | 3.870E+00 | Np239 |
| 121.78 | 4. | 605.12 | 1.09 | 5.530E-02 | 121.78 | 28.580 | PBC<MDA | EU152 |
| | | | | | 122.06 | 85.600 | 5.283E-02 | CO57 |
| 166.04 | 33. | 94.20 | 1.13 | 5.020E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |
| 185.77 | 154. | 19.65 | 0.77 | 4.651E-02 | | | | |
| 210.85 | 22. | 151.48 | 1.17 | 4.279E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 227.00 | 27. | 96.88 | 1.19 | 4.071E-02 | 227.00 | 6.300 | PBC<MDA | Cf251 |
| 238.54 | 792. | 4.94 | 1.00 | 3.936E-02 | 238.63 | 43.300 | 2.582E+01 | PB212 |
| 241.93 | 107. | 19.12 | 1.20 | 3.897E-02 | 242.00 | 7.430 | 2.059E+01 | PB214 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 263.70 | 16. | 129.61 | 1.22 | 3.674E-02 | 263.70 | 0.006 | PBC<MDA | Cd113m |
| 265.83 | 11. | 175.29 | 1.22 | 3.654E-02 | 265.83 | 50.000 | PBC<MDA | BI210M |
| 277.45 | 26. | 82.15 | 1.23 | 3.549E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| 279.20 | 23. | 84.00 | 1.23 | 3.532E-02 | 279.20 | 81.460 | PBC<MDA | Hg203 |
| 284.30 | 22. | 93.47 | 1.24 | 3.488E-02 | 284.30 | 6.140 | PBC<MDA | I131 |
| 295.02 | 202. | 12.15 | 1.08 | 3.399E-02 | 295.09 | 19.300 | 1.711E+01 | PB214 |
| 300.42 | 74. | 29.42 | 0.69 | 3.357E-02 | 300.03 | 3.280 | 3.731E+01 | PB212 |
| | | | | | 300.07 | 2.460 | 4.975E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 1.974E+01 | PA233 |
| 321.42 | 12. | 332.83 | 1.27 | 3.211E-02 | 320.08 | 9.940 | PBC<MDA | CR51 |
| 338.28 | 203. | 11.05 | 1.26 | 3.088E-02 | 338.32 | 12.010 | 3.041E+01 | AC228 |
| 351.90 | 345. | 7.01 | 0.98 | 3.003E-02 | 351.93 | 37.600 | 1.697E+01 | PB214 |
| 356.00 | 7. | 449.72 | 1.30 | 2.979E-02 | 356.00 | 62.050 | PBC<MDA | BA133 |
| 391.69 | 23. | 106.37 | 1.34 | 2.782E-02 | 391.69 | 64.000 | PBC<MDA | SN113 |
| 453.88 | 10. | 156.97 | 1.39 | 2.502E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 463.37 | 7. | 236.45 | 1.40 | 2.465E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 482.00 | 9. | 211.92 | 1.42 | 2.395E-02 | 482.00 | 80.500 | PBC<MDA | HF181 |
| 487.02 | 18. | 99.66 | 1.42 | 2.377E-02 | 487.02 | 45.500 | PBC<MDA | La140 |
| 511.86 | 162. | 16.19 | 2.69 | 2.292E-02 | 511.86 | 20.000 | 1.964E+01 | RH106 |
| 531.00 | 10. | 139.89 | 1.46 | 2.230E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 563.24 | 18. | 91.83 | 1.49 | 2.135E-02 | 563.24 | 8.350 | PBC<MDA | CS134 |
| 569.47 | 8. | 180.00 | 1.49 | 2.118E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 2.666E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 2.237E-01 | BI207 |
| 583.33 | 272. | 7.33 | 1.22 | 2.080E-02 | 583.02 | 84.500 | 8.592E+00 | TL208 |
| 609.43 | 266. | 8.44 | 1.43 | 2.014E-02 | 609.31 | 46.090 | 1.592E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 1.278E+02 | RU103 |
| 702.63 | 6. | 278.43 | 1.60 | 1.809E-02 | 702.63 | 97.900 | PBC<MDA | NB94 |
| 727.50 | 68. | 21.30 | 1.97 | 1.763E-02 | 727.17 | 7.550 | 2.831E+01 | BI212 |
| 735.72 | 8. | 187.71 | 1.63 | 1.747E-02 | 735.72 | 22.500 | PBC<MDA | pm146 |
| 766.41 | 21. | 81.60 | 1.66 | 1.694E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 2.318E+02 | PA234M |
| 785.45 | 15. | 88.67 | 1.67 | 1.663E-02 | 785.42 | 1.280 | PBC<MDA | BI212 |
| 795.87 | 18. | 76.19 | 1.68 | 1.646E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 17. | 85.12 | 1.69 | 1.636E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 846.77 | 26. | 46.61 | 1.72 | 1.569E-02 | 846.77 | 99.935 | PBC<MDA | Co56 |
| 860.79 | 36. | 25.46 | 1.56 | 1.550E-02 | 860.56 | 12.420 | 1.039E+01 | TL208 |
| 871.10 | 3. | 264.58 | 1.74 | 1.536E-02 | 871.10 | 99.890 | PBC<MDA | NB94 |
| 911.41 | 214. | 6.84 | 1.30 | 1.483E-02 | 911.07 | 29.000 | 2.764E+01 | AC228 |
| 964.11 | 15. | 124.58 | 1.82 | 1.419E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 969.25 | 119. | 13.16 | 1.23 | 1.414E-02 | 968.97 | 17.460 | 2.685E+01 | AC228 |
| 1004.77 | 13. | 86.70 | 1.85 | 1.374E-02 | 1004.77 | 18.010 | PBC<MDA | EU154 |
| 1050.36 | 13. | 103.16 | 1.89 | 1.328E-02 | 1050.36 | 1.560 | PBC<MDA | RH106 |
| 1063.66 | 3. | 394.67 | 1.90 | 1.315E-02 | 1063.66 | 74.500 | PBC<MDA | BI207 |
| 1112.07 | 12. | 134.17 | 1.93 | 1.269E-02 | 1112.07 | 13.644 | PBC<MDA | EU152 |
| 1115.55 | 12. | 140.23 | 1.94 | 1.266E-02 | 1115.55 | 50.600 | PBC<MDA | ZN65 |
| 1120.55 | 12. | 145.93 | 1.94 | 1.262E-02 | 1120.29 | 15.100 | 3.408E+00 | BI214 |
| | | | | | 1120.55 | 99.987 | 5.148E-01 | Sc46 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| | | | | | 1121.30 | 34.900 | 1.476E+00 | Ta182 |
| 1120.57 | 82. | 12.11 | 2.01 | 1.262E-02 | 1120.29 | 15.100 | 2.400E+01 | BI214 |
| | | | | | 1120.55 | 99.987 | 3.626E+00 | Sc46 |
| | | | | | 1121.30 | 34.900 | 1.039E+01 | Ta182 |
| 1238.28 | 19. | 82.38 | 2.03 | 1.166E-02 | 1238.28 | 66.070 | PBC<MDA | Co56 |
| 1291.60 | 6. | 166.25 | 2.07 | 1.127E-02 | 1291.60 | 43.200 | PBC<MDA | FE59 |
| 1332.50 | 10. | 87.78 | 2.10 | 1.100E-02 | 1332.50 | 99.980 | PBC<MDA | CO60 |
| 1408.00 | 5. | 209.76 | 2.16 | 1.052E-02 | 1408.00 | 21.005 | PBC<MDA | EU152 |
| 1460.77 | 654. | 4.05 | 1.73 | 1.021E-02 | 1460.83 | 10.670 | 3.337E+02 | K40 |
| 1690.98 | 2. | 382.88 | 2.35 | 9.068E-03 | 1690.98 | 47.790 | PBC<MDA | SB124 |
| 1763.29 | 38. | 19.57 | 2.40 | 8.758E-03 | 1764.49 | 15.400 | 1.552E+01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 298.82 | 74.76 | 300. | 343. | 7.257E+03 | 8.94 | 1.045 | - sD |
| 307.78 | 77.00 | 247. | 535. | 1.107E+04 | 6.00 | 1.047 | - sD |
| 347.50 | 87.13 | 217. | 167. | 3.220E+03 | 14.66 | 1.056 | - sD |
| 358.67 | 89.93 | 214. | 133. | 2.518E+03 | 17.83 | 1.059 | - sD |
| 742.61 | 186.17 | 157. | 154. | 3.308E+03 | 19.65 | 0.771 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| TH-227 | 200.32 | 50.14 | 288. | -31. | -0.017 | 102.84 | 1.021s |
| AM-241 | 237.89 | 59.54 | 688. | 35. | 0.019 | 107.07 | 1.030s |
| TH-234 | 252.89 | 63.29 | 652. | 26. | 0.015 | 138.92 | 1.034s |
| Sn-126 | 256.85 | 64.28 | 745. | 13. | 0.007 | 290.73 | 1.035 |
| BA-133 | 323.66 | 80.99 | 1970. | -42. | -0.023 | 150.98 | 1.051s |
| Np-237 | 345.65 | 86.49 | 2605. | 0. | 0.000 | 186.58 | 1.056A |
| EU-155 | 345.86 | 86.54 | 2448. | 91. | 0.050 | 28.68 | 1.056D |
| Sn-126 | 347.45 | 86.94 | 2409. | -39. | -0.022 | 179.42 | 1.056 |
| Sn-126 | 349.97 | 87.57 | 2370. | -39. | -0.022 | 177.87 | 1.057D |
| Cd-109 | 351.85 | 88.04 | 2290. | -39. | -0.022 | 174.77 | 1.057s |
| Nd-147 | 364.09 | 91.10 | 2251. | -39. | -0.022 | 172.83 | 1.060s |
| TH-234 | 370.04 | 92.59 | 2212. | -39. | -0.022 | 171.12 | 1.062s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AC-228 | 373.08 | 93.35 | 180. | 153. | 0.085 | 14.76 | 1.062D |
| Gd-153 | 389.67 | 97.50 | 2173. | -39. | -0.022 | 168.87 | 1.066s |
| Np-239 | 397.67 | 99.50 | 2134. | -39. | -0.022 | 167.06 | 1.068s |
| Gd-153 | 412.46 | 103.20 | 2094. | -39. | -0.022 | 165.02 | 1.071 |
| Np-239 | 414.46 | 103.70 | 2055. | -39. | -0.022 | 163.40 | 1.072s |
| EU-155 | 421.76 | 105.52 | 176. | 87. | 0.049 | 31.58 | 1.604s |
| Np-239 | 424.18 | 106.13 | 2161. | -41. | -0.023 | 159.57 | 1.074s |
| EU-152 | 486.74 | 121.78 | 368. | 4. | 0.002 | 605.12 | 1.089s |
| CO-57 | 487.88 | 122.06 | 292. | -3. | -0.002 | 807.60 | 1.089s |
| EU-154 | 492.03 | 123.10 | 326. | -10. | -0.005 | 270.53 | 1.090 |
| PA-234 | 524.80 | 131.29 | 1257. | -36. | -0.020 | 140.32 | 1.098s |
| HF-181 | 531.71 | 133.02 | 1271. | -36. | -0.020 | 140.84 | 1.100 |
| CE-144 | 533.77 | 133.54 | 1307. | -36. | -0.020 | 142.74 | 1.100 |
| HF-181 | 544.81 | 136.30 | 1343. | -36. | -0.020 | 144.33 | 1.103 |
| CO-57 | 545.50 | 136.47 | 1379. | -36. | -0.020 | 146.21 | 1.103 |
| Tc-99m | 561.64 | 140.51 | 1426. | -14. | -0.008 | 393.65 | 1.106s |
| U-235 | 574.74 | 143.79 | 1440. | 0. | 0.000 | 1000.00 | 1.110s |
| CE-141 | 581.36 | 145.44 | 1507. | -39. | -0.022 | 142.41 | 1.111s |
| Ba-140 | 650.21 | 162.66 | 558. | -35. | -0.019 | 96.85 | 1.127 |
| U-235 | 653.08 | 163.38 | 375. | -21. | -0.012 | 132.40 | 1.128s |
| CE-139 | 662.98 | 165.85 | 476. | 33. | 0.019 | 94.20 | 1.130s |
| Cf-251 | 705.95 | 176.60 | 272. | -28. | -0.016 | 116.86 | 1.140s |
| TH-229 | 773.56 | 193.51 | 248. | -29. | -0.016 | 107.93 | 1.156s |
| U-235 | 820.84 | 205.33 | 284. | -34. | -0.019 | 98.09 | 1.167s |
| TH-229 | 842.90 | 210.85 | 284. | 22. | 0.012 | 151.48 | 1.172 |
| Cf-251 | 907.48 | 227.00 | 176. | 27. | 0.015 | 96.88 | 1.186s |
| PB-212 | 953.99 | 238.63 | 93. | 886. | 0.492 | 3.70 | 1.197D |
| PB-214 | 967.44 | 242.00 | 157. | 107. | 0.060 | 19.12 | 1.200D |
| EU-152 | 978.22 | 244.69 | 1401. | -29. | -0.016 | 185.66 | 1.203s |
| TH-227 | 1024.40 | 256.24 | 164. | -16. | -0.009 | 158.69 | 1.213s |
| Cd-113m | 1054.23 | 263.70 | 198. | 16. | 0.009 | 129.61 | 1.220s |
| BI-210M | 1062.75 | 265.83 | 192. | 11. | 0.006 | 175.29 | 1.222 |
| TL-208 | 1108.54 | 277.28 | 210. | 26. | 0.014 | 82.15 | 1.232 |
| Hg-203 | 1116.21 | 279.20 | 170. | 23. | 0.013 | 84.00 | 1.234 |
| I-131 | 1136.60 | 284.30 | 100. | 22. | 0.012 | 93.47 | 1.239 |
| PB-214 | 1179.75 | 295.09 | 53. | 196. | 0.109 | 8.87 | 1.249D |
| PB-212 | 1199.51 | 300.03 | 63. | 53. | 0.029 | 25.47 | 1.253D |
| PA-231 | 1199.67 | 300.07 | 931. | -24. | -0.013 | 179.14 | 1.253s |
| PA-233 | 1200.11 | 300.18 | 907. | -24. | -0.013 | 176.83 | 1.253s |
| PA-231 | 1209.98 | 302.65 | 883. | -24. | -0.013 | 174.17 | 1.255s |
| BA-133 | 1210.79 | 302.85 | 859. | -24. | -0.013 | 171.75 | 1.256s |
| Ba-140 | 1218.78 | 304.85 | 834. | -4. | -0.002 | 953.62 | 1.257s |
| BI-210M | 1218.97 | 304.90 | 830. | 0. | 0.000 | 1000.00 | 1.257s |
| Ir-192 | 1233.14 | 308.44 | 830. | 0. | 0.000 | 1000.00 | 1.261s |
| PA-233 | 1247.42 | 312.01 | 830. | 0. | 0.000 | 1000.00 | 1.264s |
| Ir-192 | 1265.33 | 316.49 | 830. | 0. | 0.000 | 1000.00 | 1.268s |
| CR-51 | 1279.70 | 320.08 | 814. | 12. | 0.007 | 332.83 | 1.271s |
| La-140 | 1314.40 | 328.76 | 632. | -24. | -0.013 | 152.59 | 1.279s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AC-228 | 1352.63 | 338.32 | 50. | 187. | 0.104 | 9.05 | 1.288D |
| Cs-136 | 1361.62 | 340.57 | 539. | -25. | -0.014 | 133.06 | 1.290s |
| EU-152 | 1376.48 | 344.29 | 514. | -25. | -0.014 | 129.70 | 1.293s |
| HF-181 | 1382.65 | 345.83 | 489. | -25. | -0.014 | 126.43 | 1.294s |
| PB-214 | 1406.92 | 351.90 | 60. | 345. | 0.192 | 7.01 | 0.975s |
| BA-133 | 1423.33 | 356.00 | 492. | 7. | 0.004 | 449.72 | 1.303s |
| BA-133 | 1534.67 | 383.84 | 275. | -27. | -0.015 | 90.48 | 1.328s |
| Cf-249 | 1551.10 | 387.95 | 291. | -27. | -0.015 | 92.69 | 1.332s |
| SN-113 | 1566.06 | 391.69 | 281. | 23. | 0.013 | 106.37 | 1.335s |
| pm-146 | 1814.77 | 453.88 | 61. | 10. | 0.006 | 156.97 | 1.390s |
| SB-125 | 1852.71 | 463.37 | 147. | 7. | 0.004 | 236.45 | 1.399 |
| Ir-192 | 1871.48 | 468.06 | 183. | -15. | -0.009 | 127.47 | 1.403 |
| BE-7 | 1909.62 | 477.60 | 223. | -22. | -0.012 | 98.67 | 1.411s |
| HF-181 | 1927.22 | 482.00 | 175. | 9. | 0.005 | 211.92 | 1.415s |
| La-140 | 1947.31 | 487.02 | 160. | 18. | 0.010 | 99.66 | 1.419s |
| RH-106 | 2046.68 | 511.86 | 77. | 162. | 0.090 | 16.19 | 2.691s |
| Nd-147 | 2123.21 | 531.00 | 48. | 10. | 0.006 | 139.89 | 1.458s |
| CS-134 | 2252.15 | 563.24 | 56. | 18. | 0.010 | 91.83 | 1.486s |
| CS-134 | 2276.48 | 569.32 | 93. | -21. | -0.012 | 67.60 | 1.491s |
| PA-234 | 2277.07 | 569.47 | 108. | 8. | 0.005 | 180.00 | 1.491s |
| BI-207 | 2278.00 | 569.70 | 103. | 0. | 0.000 | 1000.00 | 1.491s |
| TL-208 | 2332.53 | 583.33 | 28. | 272. | 0.151 | 7.33 | 1.216 |
| SB-125 | 2401.19 | 600.50 | 532. | -20. | -0.011 | 166.77 | 1.518s |
| SB-124 | 2410.11 | 602.73 | 512. | -12. | -0.007 | 262.63 | 1.519s |
| CS-134 | 2418.03 | 604.71 | 500. | 0. | 0.000 | 1000.00 | 1.521s |
| BI-214 | 2436.91 | 609.43 | 42. | 266. | 0.148 | 8.44 | 1.428 |
| RU-103 | 2440.38 | 610.30 | 500. | 0. | 0.000 | 1000.00 | 1.526s |
| AG-108M | 2456.31 | 614.28 | 500. | 0. | 0.000 | 1000.00 | 1.529 |
| PM-144 | 2471.43 | 618.06 | 500. | 0. | 0.000 | 1000.00 | 1.533s |
| RH-106 | 2486.85 | 621.92 | 519. | -19. | -0.011 | 171.11 | 1.536s |
| I-131 | 2547.08 | 636.97 | 80. | -22. | -0.012 | 87.89 | 1.549 |
| AG-110M | 2630.23 | 657.76 | 51. | -9. | -0.005 | 117.06 | 1.566s |
| PM-144 | 2785.35 | 696.54 | 98. | -8. | -0.005 | 167.83 | 1.599s |
| NB-94 | 2809.70 | 702.63 | 114. | 6. | 0.003 | 278.43 | 1.604s |
| SB-124 | 2890.33 | 722.79 | 158. | -18. | -0.010 | 102.47 | 1.621s |
| EU-154 | 2892.61 | 723.36 | 140. | 0. | 0.000 | 1000.00 | 1.622s |
| ZR-95 | 2895.98 | 724.20 | 147. | -8. | -0.005 | 212.97 | 1.622s |
| BI-212 | 2909.20 | 727.50 | 24. | 68. | 0.038 | 21.30 | 1.969s |
| pm-146 | 2942.07 | 735.72 | 45. | 8. | 0.004 | 187.71 | 1.632s |
| pm-146 | 2987.83 | 747.16 | 80. | -23. | -0.013 | 88.65 | 1.641s |
| ZR-95 | 3026.11 | 756.73 | 65. | -7. | -0.004 | 256.02 | 1.649s |
| AG-110M | 3054.97 | 763.94 | 148. | -28. | -0.016 | 63.86 | 1.655s |
| NB-95 | 3062.35 | 765.79 | 174. | -18. | -0.010 | 103.60 | 1.657s |
| PA-234M | 3064.84 | 766.41 | 133. | 21. | 0.012 | 81.60 | 1.657s |
| EU-152 | 3114.88 | 778.92 | 90. | -20. | -0.011 | 70.60 | 1.668s |
| BI-212 | 3140.88 | 785.42 | 85. | 15. | 0.009 | 88.67 | 1.673s |
| CS-134 | 3182.67 | 795.87 | 90. | 18. | 0.010 | 76.19 | 1.682s |
| CS-134 | 3207.01 | 801.95 | 90. | 17. | 0.009 | 85.12 | 1.687s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CO-58 | 3242.31 | 810.78 | 114. | -20. | -0.011 | 77.25 | 1.694s |
| La-140 | 3262.29 | 815.77 | 134. | -13. | -0.007 | 133.16 | 1.698s |
| Cs-136 | 3273.21 | 818.50 | 186. | -23. | -0.013 | 86.68 | 1.700s |
| MN-54 | 3338.61 | 834.85 | 55. | -2. | -0.001 | 818.28 | 1.714 |
| Co-56 | 3386.31 | 846.77 | 25. | 26. | 0.014 | 46.61 | 1.723s |
| TL-208 | 3442.39 | 860.79 | 12. | 36. | 0.020 | 25.46 | 1.555 |
| NB-94 | 3483.63 | 871.10 | 30. | 3. | 0.002 | 264.58 | 1.743s |
| EU-154 | 3492.16 | 873.23 | 54. | -11. | -0.006 | 101.84 | 1.745s |
| PA-234 | 3521.37 | 880.53 | 85. | -8. | -0.005 | 160.55 | 1.751s |
| PA-234 | 3532.21 | 883.24 | 94. | 0. | 0.000 | 1000.00 | 1.753s |
| AG-110M | 3537.98 | 884.68 | 94. | 0. | 0.000 | 1000.00 | 1.754 |
| Sc-46 | 3556.37 | 889.28 | 106. | -10. | -0.006 | 146.50 | 1.758s |
| y-88 | 3591.42 | 898.04 | 50. | -2. | -0.001 | 780.49 | 1.765s |
| AC-228 | 3644.91 | 911.41 | 0. | 214. | 0.119 | 6.84 | 1.298s |
| AG-110M | 3749.25 | 937.49 | 53. | -3. | -0.002 | 501.00 | 1.797s |
| PA-234 | 3783.37 | 946.02 | 43. | -2. | -0.001 | 894.20 | 1.803s |
| EU-152 | 3855.75 | 964.11 | 178. | 15. | 0.009 | 124.58 | 1.818 |
| AC-228 | 3876.31 | 969.25 | 21. | 119. | 0.066 | 13.16 | 1.225s |
| EU-154 | 3984.66 | 996.33 | 82. | -19. | -0.011 | 70.57 | 1.844s |
| EU-154 | 4018.45 | 1004.77 | 22. | 13. | 0.007 | 86.70 | 1.850s |
| Co-56 | 4150.74 | 1037.84 | 75. | -24. | -0.014 | 82.96 | 1.876s |
| Cs-136 | 4191.67 | 1048.07 | 87. | -24. | -0.013 | 59.40 | 1.884 |
| RH-106 | 4200.83 | 1050.36 | 85. | 13. | 0.007 | 103.16 | 1.886s |
| BI-207 | 4254.05 | 1063.66 | 21. | 3. | 0.001 | 394.67 | 1.896s |
| Ga-68 | 4309.03 | 1077.40 | 37. | -3. | -0.002 | 420.24 | 1.907s |
| FE-59 | 4396.46 | 1099.25 | 32. | 0. | 0.000 | 1000.00 | 1.924s |
| EU-152 | 4447.77 | 1112.07 | 116. | 12. | 0.006 | 134.17 | 1.934s |
| ZN-65 | 4461.66 | 1115.55 | 128. | 12. | 0.006 | 140.23 | 1.937s |
| BI-214 | 4481.74 | 1120.57 | 4. | 82. | 0.046 | 12.11 | 2.006 |
| Sc-46 | 4481.68 | 1120.55 | 140. | 12. | 0.006 | 145.93 | 1.941 |
| Ta-182 | 4484.68 | 1121.30 | 175. | -15. | -0.008 | 126.52 | 1.941 |
| CO-60 | 4692.51 | 1173.24 | 51. | -3. | -0.002 | 561.25 | 1.981s |
| Ta-182 | 4755.78 | 1189.05 | 51. | 0. | 0.000 | 1000.00 | 1.993 |
| Ta-182 | 4885.27 | 1221.41 | 79. | -26. | -0.015 | 81.93 | 2.017 |
| Co-56 | 4952.78 | 1238.28 | 40. | 19. | 0.010 | 82.38 | 2.030s |
| NA-22 | 5097.85 | 1274.53 | 40. | -9. | -0.005 | 108.24 | 2.057s |
| EU-154 | 5097.90 | 1274.54 | 48. | 0. | 0.000 | 1000.00 | 2.057s |
| FE-59 | 5166.14 | 1291.60 | 17. | 6. | 0.003 | 166.25 | 2.070s |
| CO-60 | 5329.84 | 1332.50 | 11. | 10. | 0.005 | 87.78 | 2.100s |
| AG-110M | 5537.14 | 1384.30 | 18. | -2. | -0.001 | 517.20 | 2.138s |
| EU-152 | 5632.00 | 1408.00 | 18. | 5. | 0.003 | 209.76 | 2.155s |
| K-40 | 5843.20 | 1460.77 | 6. | 654. | 0.364 | 4.05 | 1.729 |
| La-140 | 6385.31 | 1596.21 | 19. | -2. | -0.001 | 545.82 | 2.288s |
| SB-124 | 6764.67 | 1690.98 | 6. | 2. | 0.001 | 382.88 | 2.353s |
| BI-214 | 7058.94 | 1764.49 | 8. | 38. | 0.021 | 19.57 | 2.402s |
| Co-56 | 7086.40 | 1771.35 | 48. | -2. | -0.001 | 399.00 | 2.407s |
| y-88 | 7345.46 | 1836.06 | 13. | -3. | -0.002 | 284.60 | 2.449s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | -4.8058E+00 | | | | 5.31E+01 | |
| | | | 477.60 | -4.806E+00 | ?( | 1.585E+01 9.87E+01 1.05E+01 | G |
| NA-22 | C | -4.2287E-01 | | | | 9.50E+02 | |
| | | | 1274.53 | -4.229E-01 | ?( | 1.564E+00 1.08E+02 9.99E+01 | G |
| K-40 | N | 3.3371E+02 | | | | 4.66E+11 | |
| | | | 1460.83 | 3.337E+02 | ( | 7.439E+00 4.05E+00 1.07E+01 | G |
| Sc-46 | F | 7.0484E-02 | | | | 8.38E+01 | |
| | | | 889.28 | -3.738E-01 | ?( | 1.862E+00 1.46E+02 1.00E+02 | G |
| | | | 1120.55 | 5.148E-01 | ( | 2.544E+00 1.46E+02 1.00E+02 | G |
| CR-51 | F | 2.1179E+00 | | | | 2.77E+01 | |
| | | | 320.08 | 2.118E+00 | &( | 2.361E+01 3.33E+02 9.94E+00 | G |
| MN-54 | C | -7.0045E-02 | | | | 3.12E+02 | |
| | | | 834.85 | -7.004E-02 | ?( | 1.305E+00 8.18E+02 1.00E+02 | G |
| FE-59 | F | 2.9660E-01 | | | | 4.45E+01 | |
| | | | 1099.25 | 0.000E+00 | ?( | 2.232E+00 1.00E+03 5.65E+01 | G |
| | | | 1291.60 | 6.845E-01 | ?( | 2.501E+00 1.66E+02 4.32E+01 | G |
| Co-56 | C | 1.0907E+00 | | | | 7.73E+01 | |
| | | | 846.77 | 9.210E-01 | &( | 9.213E-01 4.66E+01 9.99E+01 | G |
| | | | 1238.28 | 1.347E+00 | ?( | 2.312E+00 8.24E+01 6.61E+01 | G |
| | | | 1037.84 | -7.163E+00 | - | 1.261E+01 8.30E+01 1.41E+01 | G |
| | | | 1771.35 | -1.028E+00 | - | 1.446E+01 3.99E+02 1.55E+01 | A |
| CO-57 | C | -3.5218E-02 | | | | 2.72E+02 | |
| | | | 122.06 | -3.522E-02 | ?( | 9.666E-01 8.08E+02 8.56E+01 | G |
| | | | 136.47 | -3.486E+00 | + | 1.695E+01 1.46E+02 1.07E+01 | G |
| CO-58 | C | -7.0233E-01 | | | | 7.09E+01 | |
| | | | 810.78 | -7.023E-01 | ?( | 1.806E+00 7.73E+01 9.95E+01 | G |
| CO-60 | F | 4.8853E-01 | | | | 1.93E+03 | |
| | | | 1332.50 | 4.885E-01 | ?( | 9.298E-01 8.78E+01 1.00E+02 | G |
| | | | 1173.24 | -1.371E-01 | - | 1.645E+00 5.61E+02 9.99E+01 | G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| ZN-65 | F | 1.0116E+00 | | | | | 2.44E+02 | |
| | | | 1115.55 | 1.012E+00 | &( | 4.806E+00 | 1.40E+02 | 5.06E+01 G |
| NB-94 | I | 1.4025E-01 | | | | | 7.41E+06 | |
| | | | 702.63 | 1.725E-01 | ?( | 1.649E+00 | 2.78E+02 | 9.79E+01 G |
| | | | 871.10 | 1.087E-01 | &( | 1.023E+00 | 2.65E+02 | 9.99E+01 G |
| ZR-95 | I | -4.1749E-01 | | | | | 6.40E+01 | |
| | | | 756.73 | -4.175E-01 | ?( | 2.402E+00 | 2.56E+02 | 5.45E+01 G |
| | | | 724.20 | -5.811E-01 | + | 4.215E+00 | 2.13E+02 | 4.42E+01 G |
| NB-95 | I | -6.0671E-01 | | | | | 6.40E+01 | |
| | | | 765.79 | -6.067E-01 | ?( | 2.107E+00 | 1.04E+02 | 9.98E+01 G |
| RU-103 | I | 3.4804E-02 | | | | | 3.93E+01 | |
| | | | 497.05 | 3.480E-02 | &( | 1.115E+00 | 1.32E+03 | 9.09E+01 G |
| | | | 610.30 | 0.000E+00 | - | 5.135E+01 | 1.00E+03 | 5.75E+00 GA |
| RH-106 | I | 1.4900E-01 | | | | | 3.74E+02 | |
| | | | 621.92 | -5.359E+00 | &( | 3.071E+01 | 1.71E+02 | 9.93E+00 G |
| | | | 1050.36 | 3.521E+01 | ?( | 1.226E+02 | 1.03E+02 | 1.56E+00 G |
| | | | 511.86 | 1.964E+01 | ? | 5.285E+00 | 1.62E+01 | 2.00E+01 GA |
| AG-108M | C | 3.9593E-02 | | | | | 1.53E+05 | |
| | | | 433.94 | 3.959E-02 | %( | 9.861E-01 | 1.02E+03 | 9.05E+01 G |
| | | | 722.94 | -3.992E-04 | % | 1.998E+00 | 1.45E+05 | 9.08E+01 G |
| | | | 614.28 | 0.000E+00 | - | 3.302E+00 | 1.00E+03 | 8.98E+01 G |
| SN-113 | F | 7.0934E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | 7.093E-01 | &( | 2.522E+00 | 1.06E+02 | 6.40E+01 G |
| SB-124 | F | -1.5978E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | -3.414E-01 | ?( | 3.012E+00 | 2.63E+02 | 9.83E+01 G |
| | | | 1690.98 | 2.137E-01 | ?( | 1.851E+00 | 3.83E+02 | 4.78E+01 G |
| | | | 722.79 | -5.171E+00 | + | 1.777E+01 | 1.02E+02 | 1.08E+01 G |
| SB-125 | I | 3.5945E-01 | | | | | 1.01E+03 | |
| | | | 427.88 | -7.188E-02 | &( | 3.153E+00 | 1.81E+03 | 2.96E+01 G |
| | | | 600.50 | -3.016E+00 | & | 1.684E+01 | 1.67E+02 | 1.79E+01 G |
| | | | 635.89 | 8.394E-02 | & | 8.698E+00 | 4.35E+03 | 1.13E+01 G |
| | | | 463.37 | 1.579E+00 | ( | 1.273E+01 | 2.36E+02 | 1.05E+01 G |
| I-131 | I | 3.6878E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | -2.322E-02 | %( | 1.166E+00 | 2.08E+03 | 8.17E+01 G |
| | | | 284.30 | 5.585E+00 | ( | 1.279E+01 | 9.35E+01 | 6.14E+00 G |
| | | | 636.97 | -8.829E+00 | + | 1.762E+01 | 8.79E+01 | 7.17E+00 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Gd-153 | F | -1.3377E+00 | | | | | 2.42E+02 | |
| | | | 97.50 | -1.338E+00 | &( | 7.503E+00 | 1.69E+02 | 3.00E+01 G |
| | | | 103.20 | -1.826E+00 | & | 1.001E+01 | 1.65E+02 | 2.18E+01 G |
| Ga-68 | C | -5.0683E+00 | | | | | 4.71E-02 | |
| | | | 1077.40 | -5.068E+00 | ?( | 4.741E+01 | 4.20E+02 | 3.30E+00 G |
| Tc-99m | I | -1.6339E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | -1.634E-01 | ?( | 2.147E+00 | 3.94E+02 | 8.93E+01 G |
| BA-133 | F | 2.1041E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | 2.104E-01 | ?( | 3.188E+00 | 4.50E+02 | 6.20E+01 G |
| | | | 302.85 | -2.206E+00 | & | 1.265E+01 | 1.72E+02 | 1.83E+01 G |
| | | | 383.84 | -5.838E+00 | + | 1.760E+01 | 9.05E+01 | 8.94E+00 GA |
| | | | 80.99 | -1.364E+00 | + | 6.841E+00 | 1.51E+02 | 3.41E+01 GA |
| CS-134 | I | 8.2427E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | 0.000E+00 | ?( | 3.004E+00 | 1.00E+03 | 9.76E+01 G |
| | | | 795.87 | 7.298E-01 | &( | 1.852E+00 | 7.62E+01 | 8.55E+01 G |
| | | | 569.32 | -3.638E+00 | + | 8.139E+00 | 6.76E+01 | 1.54E+01 G |
| | | | 801.95 | 6.450E+00 | ?( | 1.838E+01 | 8.51E+01 | 8.69E+00 G |
| | | | 563.24 | 5.574E+00 | ( | 1.171E+01 | 9.18E+01 | 8.35E+00 G |
| CS-137 | I | 2.2956E-02 | | | | | 1.10E+04 | |
| | | | 661.66 | 2.296E-02 | %( | 1.549E+00 | 1.93E+03 | 8.52E+01 G |
| CE-139 | F | 4.6151E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | 4.615E-01 | ?( | 1.446E+00 | 9.42E+01 | 7.99E+01 G |
| Ba-140 | I | -3.4338E-02 | | | | | 1.28E+01 | |
| | | | 537.26 | -3.434E-02 | &( | 4.159E+00 | 5.15E+03 | 2.44E+01 G |
| | | | 162.66 | -6.304E+00 | + | 2.030E+01 | 9.69E+01 | 6.22E+00 G |
| | | | 304.85 | -1.672E+00 | + | 5.352E+01 | 9.54E+02 | 4.29E+00 G |
| La-140 | I | 2.2331E-01 | | | | | 1.28E+01 | |
| | | | 1596.21 | -1.225E-01 | ?( | 1.411E+00 | 5.46E+02 | 9.54E+01 G |
| | | | 487.02 | 9.485E-01 | ?( | 3.168E+00 | 9.97E+01 | 4.55E+01 G |
| | | | 328.76 | -2.043E+00 | & | 1.041E+01 | 1.53E+02 | 2.03E+01 G |
| | | | 815.77 | -1.862E+00 | + | 8.384E+00 | 1.33E+02 | 2.33E+01 G |
| CE-141 | I | -8.4894E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | -8.489E-01 | ( | 4.018E+00 | 1.42E+02 | 4.82E+01 G |
| CE-144 | I | -3.3267E+00 | | | | | 2.85E+02 | |
| | | | 133.54 | -3.327E+00 | &( | 1.579E+01 | 1.43E+02 | 1.11E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| PM-144 | C | -2.6188E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | -2.619E-01 | &( | 1.501E+00 | 1.68E+02 | 9.90E+01 G |
| | | | 618.06 | 0.000E+00 | + | 3.008E+00 | 1.00E+03 | 9.91E+01 G |
| EU-152 | F | 8.4662E-01 | | | | | 4.94E+03 | |
| | | | 344.29 | -1.720E+00 | &( | 7.447E+00 | 1.30E+02 | 2.65E+01 G |
| | | | 1112.07 | 3.737E+00 | ?( | 1.699E+01 | 1.34E+02 | 1.36E+01 G |
| | | | 121.78 | 1.582E-01 | &( | 3.240E+00 | 6.05E+02 | 2.86E+01 G |
| | | | 778.92 | -5.154E+00 | & | 1.207E+01 | 7.06E+01 | 1.29E+01 G |
| | | | 964.11 | 4.150E+00 | ( | 1.740E+01 | 1.25E+02 | 1.46E+01 G |
| | | | 244.69 | -5.429E+00 | + | 3.356E+01 | 1.86E+02 | 7.58E+00 G |
| | | | 1408.00 | 1.257E+00 | & | 5.652E+00 | 2.10E+02 | 2.10E+01 GA |
| EU-154 | I | -3.1512E+00 | | | | | 3.14E+03 | |
| | | | 873.23 | -3.151E+00 | ?( | 1.089E+01 | 1.02E+02 | 1.23E+01 G |
| | | | 123.10 | -2.343E-01 | & | 2.140E+00 | 2.71E+02 | 4.08E+01 G |
| | | | 1274.54 | 0.000E+00 | + | 4.865E+00 | 1.00E+03 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | + | 8.979E+00 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | 2.888E+00 | & | 5.469E+00 | 8.67E+01 | 1.80E+01 G |
| | | | 996.33 | -7.286E+00 | + | 1.706E+01 | 7.06E+01 | 1.06E+01 G |
| EU-155 | I | 4.1473E+00 | | | | | 1.81E+03 | |
| | | | 105.31 | 4.147E+00 | *( | 3.062E+00 | 3.16E+01 | 2.12E+01 G |
| | | | 86.54 | 3.163E+00 | } | 8.144E+00 | 2.87E+01 | 3.07E+01 G |
| HF-181 | F | 2.5760E-01 | | | | | 4.24E+01 | |
| | | | 482.00 | 2.576E-01 | ?( | 1.854E+00 | 2.12E+02 | 8.05E+01 G |
| | | | 133.02 | -8.508E-01 | + | 3.985E+00 | 1.41E+02 | 4.33E+01 G |
| | | | 345.83 | -3.037E+00 | + | 1.282E+01 | 1.26E+02 | 1.51E+01 G |
| | | | 136.30 | -6.360E+00 | + | 3.052E+01 | 1.44E+02 | 5.85E+00 G |
| Ta-182 | F | -1.9055E+00 | | | | | 1.14E+02 | |
| | | | 1121.30 | -1.905E+00 | ( | 8.120E+00 | 1.27E+02 | 3.49E+01 G |
| | | | 1221.41 | -4.583E+00 | + | 7.720E+00 | 8.19E+01 | 2.70E+01 G |
| | | | 1189.05 | 0.000E+00 | + | 1.025E+01 | 1.00E+03 | 1.62E+01 G |
| Hg-203 | F | 4.3821E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | 4.382E-01 | ?( | 1.227E+00 | 8.40E+01 | 8.15E+01 G |
| TL-208 | N | 8.5921E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 8.592E+00 | ( | 8.645E-01 | 7.33E+00 | 8.45E+01 G |
| | | | 277.28 | 6.376E+00 | - | 1.743E+01 | 8.21E+01 | 6.31E+00 G |
| | | | 860.56 | 1.039E+01 | + | 5.441E+00 | 2.55E+01 | 1.24E+01 G |
| pm-146 | C | -2.1597E+00 | | | | | 2.02E+03 | |
| | | | 747.16 | -2.160E+00 | ?( | 4.200E+00 | 8.86E+01 | 3.40E+01 G |
| | | | 735.72 | 1.130E+00 | + | 4.800E+00 | 1.88E+02 | 2.25E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 453.88 | 3.530E-01 | + | 1.333E+00 | 1.57E+02 | 6.50E+01 G |
| y-88 | F | -7.9063E-02 | | | | | 1.07E+02 | |
| | | | 898.04 | -7.906E-02 | ?( | 1.410E+00 | 7.80E+02 | 9.37E+01 G |
| | | | 1836.06 | -2.202E-01 | + | 1.303E+00 | 2.85E+02 | 9.92E+01 G |
| Cd-113m | | 3.9481E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | 3.948E+03 | ?( | 1.722E+04 | 1.30E+02 | 6.00E-03 K |
| Cd-109 | F | -1.0907E+01 | | | | | 4.53E+02 | |
| | | | 88.04 | -1.091E+01 | ?( | 6.331E+01 | 1.75E+02 | 3.79E+00 G |
| Cf-251 | T | -1.8997E+00 | | | | | 3.28E+05 | |
| | | | 176.60 | -1.900E+00 | ?( | 5.398E+00 | 1.17E+02 | 1.70E+01 G |
| | | | 227.00 | 5.924E+00 | ? | 1.398E+01 | 9.69E+01 | 6.30E+00 GA |
| Cf-249 | T | -7.9903E-01 | | | | | 1.28E+05 | |
| | | | 387.95 | -7.990E-01 | ?( | 2.468E+00 | 9.27E+01 | 6.60E+01 G |
| | | | 333.44 | 3.522E-02 | & | 1.339E+01 | 1.13E+04 | 1.55E+01 G |
| Sn-126 | | 1.8470E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | -1.105E+00 | + | 6.525E+00 | 1.78E+02 | 3.75E+01 GA |
| | | | 64.28 | 1.847E+00 | ( | 1.799E+01 | 2.91E+02 | 9.70E+00 G |
| | | | 86.94 | -4.595E+00 | + | 2.738E+01 | 1.79E+02 | 9.04E+00 GA |
| PB-210 | N | 9.6643E-01 | | | | | 8.14E+03 | |
| | | | 46.54 | 9.664E-01 | %( | 4.822E+01 | 1.47E+03 | 4.25E+00 G |
| PB-212 | N | 2.8888E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 2.889E+01 | ( | 1.556E+00 | 3.70E+00 | 4.33E+01 G |
| | | | 300.03 | 2.651E+01 | - | 2.007E+01 | 2.55E+01 | 3.28E+00 GA |
| PB-214 | N | 1.6851E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.697E+01 | ( | 1.909E+00 | 7.01E+00 | 3.76E+01 G |
| | | | 295.09 | 1.661E+01 | ( | 3.112E+00 | 8.87E+00 | 1.93E+01 G |
| | | | 242.00 | 2.059E+01 | + | 1.171E+01 | 1.91E+01 | 7.43E+00 GA |
| BI-207 | C | 6.6062E-02 | | | | | 1.18E+04 | |
| | | | 569.70 | 0.000E+00 | ?( | 1.342E+00 | 1.00E+03 | 9.77E+01 G |
| | | | 1063.66 | 1.527E-01 | ?( | 1.375E+00 | 3.95E+02 | 7.45E+01 G |
| BI-212 | N | 2.8312E+01 | | | | | 6.98E+02 | |
| | | | 727.17 | 2.831E+01 | ( | 1.069E+01 | 2.13E+01 | 7.55E+00 G |
| | | | 785.42 | 4.018E+01 | ? | 1.195E+02 | 8.87E+01 | 1.28E+00 GA |
| BI-214 | N | 1.5818E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.592E+01 | ( | 1.970E+00 | 8.44E+00 | 4.61E+01 G |
| | | | 1120.29 | 2.400E+01 | + | 3.392E+00 | 1.21E+01 | 1.51E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 1764.49 | 1.552E+01 | ?( | 6.657E+00 | 1.96E+01 | 1.54E+01 G |
| BI-210M | T | 3.4464E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | 3.446E-01 | ?( | 2.044E+00 | 1.75E+02 | 5.00E+01 G |
| | | | 304.90 | 0.000E+00 | - | 8.180E+00 | 1.00E+03 | 2.80E+01 G |
| AC-228 | N | 2.7489E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.764E+01 | ( | 9.519E-01 | 6.84E+00 | 2.90E+01 G |
| | | | 968.97 | 2.685E+01 | ( | 5.377E+00 | 1.32E+01 | 1.75E+01 G |
| | | | 338.32 | 2.804E+01 | ( | 5.332E+00 | 9.05E+00 | 1.20E+01 G |
| | | | 93.35 | 2.863E+01 | | 1.216E+01 | 1.48E+01 | 5.56E+00 XA |
| TH-227 | N | -7.1771E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | -7.177E+00 | *( | 1.873E+01 | 1.03E+02 | 8.00E+00 G |
| | | | 256.24 | -3.389E+00 | + | 1.321E+01 | 1.59E+02 | 7.00E+00 G |
| TH-229 | N | -9.4479E-01 | | | | | 2.68E+06 | |
| | | | 193.51 | -8.078E+00 | &( | 2.120E+01 | 1.08E+02 | 4.40E+00 G |
| | | | 210.85 | 9.553E+00 | &( | 3.528E+01 | 1.51E+02 | 2.99E+00 G |
| TH-234 | N | 9.4084E+00 | | | | | 1.63E+12 | |
| | | | 63.29 | 9.408E+00 | ( | 4.361E+01 | 1.39E+02 | 3.81E+00 G |
| | | | 92.59 | -7.277E+00 | + | 4.136E+01 | 1.71E+02 | 5.58E+00 G |
| PA-231 | N | -1.4033E+01 | | | | | 1.20E+07 | |
| | | | 302.65 | -1.403E+01 | &( | 8.155E+01 | 1.74E+02 | 2.88E+00 G |
| | | | 300.07 | -1.630E+01 | + | 9.743E+01 | 1.79E+02 | 2.46E+00 G |
| PA-234 | N | -5.6487E-01 | | | | | 1.63E+12 | |
| | | | 131.29 | -2.037E+00 | ?( | 9.503E+00 | 1.40E+02 | 1.80E+01 G |
| | | | 946.02 | -4.797E-01 | + | 9.540E+00 | 8.94E+02 | 1.34E+01 G |
| | | | 569.47 | 2.666E+00 | ?( | 1.638E+01 | 1.80E+02 | 8.20E+00 G |
| | | | 883.24 | 0.000E+00 | + | 1.821E+01 | 1.00E+03 | 9.60E+00 G |
| | | | 880.53 | -5.067E+00 | + | 2.782E+01 | 1.61E+02 | 6.00E+00 GA |
| PA-234M | N | 5.9298E+01 | | | | | 1.63E+12 | |
| | | | 1001.00 | -1.285E+00 | %( | 2.394E+02 | 5.35E+03 | 8.37E-01 G |
| | | | 766.41 | 2.318E+02 | ?( | 6.305E+02 | 8.16E+01 | 2.94E-01 G |
| AM-241 | T | 1.4280E+00 | | | | | 1.58E+05 | |
| | | | 59.54 | 1.428E+00 | &( | 5.085E+00 | 1.07E+02 | 3.59E+01 G |
| Cs-136 | F | -7.8967E-01 | | | | | 1.30E+01 | |
| | | | 818.50 | -7.897E-01 | ?( | 2.282E+00 | 8.67E+01 | 1.00E+02 G |
| | | | 1048.07 | -1.234E+00 | + | 2.407E+00 | 5.94E+01 | 8.00E+01 G |
| | | | 340.57 | -9.619E-01 | + | 4.274E+00 | 1.33E+02 | 4.69E+01 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Np-239   T  -1.8346E+00                                      2.36E+00
                          103.70-1.658E+00 +   8.999E+00 1.63E+02 2.40E+01 X
                          106.13-1.835E+00 &(  9.721E+00 1.60E+02 2.27E+01 G
                           99.50-2.666E+00 +   1.479E+01 1.67E+02 1.50E+01 X

Nd-147       1.9800E+00                                      1.11E+01
                          531.00 1.980E+00 ?(  6.684E+00 1.40E+02 1.30E+01 G
                           91.10-1.443E+00 +   8.284E+00 1.73E+02 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  1 Sigma %
 ____________________________________________________________________________
 TH-227      50.14       288.       -31.    -0.017   102.84  -7.177E+00
 TH-234      63.29       652.        26.     0.015   138.92   9.408E+00
 BA-133      80.99      1970.       -42.    -0.023   150.98  -1.364E+00
 Cd-109      88.04      2290.       -39.    -0.022   174.77  -1.091E+01
 Nd-147      91.10      2251.       -39.    -0.022   172.83  -1.443E+00
 TH-234      92.59      2212.       -39.    -0.022   171.12  -7.277E+00
```

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Gd-153 | 97.50 | 2173. | -39. | -0.022 | 168.87 | -1.338E+00 | |
| Np-239 | 99.50 | 2134. | -39. | -0.022 | 167.06 | -2.666E+00 | |
| Gd-153 | 103.20 | 2094. | -39. | -0.022 | 165.02 | -1.826E+00 | |
| Np-239 | 103.70 | 2055. | -39. | -0.022 | 163.40 | -1.658E+00 | |
| Np-239 | 106.13 | 2161. | -41. | -0.023 | 159.57 | -1.835E+00 | |
| EU-152 | 121.78 | 368. | 4. | 0.002 | 605.12 | 1.582E-01 | |
| CO-57 | 122.06 | 292. | -3. | -0.002 | 807.60 | -3.522E-02 | |
| EU-154 | 123.10 | 326. | -10. | -0.005 | 270.53 | -2.343E-01 | |
| PA-234 | 131.29 | 1257. | -36. | -0.020 | 140.32 | -2.037E+00 | |
| HF-181 | 133.02 | 1271. | -36. | -0.020 | 140.84 | -8.508E-01 | |
| CE-144 | 133.54 | 1307. | -36. | -0.020 | 142.74 | -3.327E+00 | |
| HF-181 | 136.30 | 1343. | -36. | -0.020 | 144.33 | -6.360E+00 | |
| CO-57 | 136.47 | 1379. | -36. | -0.020 | 146.21 | -3.486E+00 | |
| Tc-99m | 140.51 | 1426. | -14. | -0.008 | 393.65 | -1.634E-01 | |
| CE-141 | 145.44 | 1507. | -39. | -0.022 | 142.41 | -8.489E-01 | |
| Ba-140 | 162.66 | 558. | -35. | -0.019 | 96.85 | -6.304E+00 | |
| U-235 | 163.38 | 375. | -21. | -0.012 | 132.40 | -4.633E+00 | |
| Cf-251 | 176.60 | 272. | -28. | -0.016 | 116.86 | -1.900E+00 | |
| TH-229 | 193.51 | 248. | -29. | -0.016 | 107.93 | -8.078E+00 | |
| U-235 | 205.33 | 284. | -34. | -0.019 | 98.09 | -8.696E+00 | |
| TH-229 | 210.85 | 284. | 22. | 0.012 | 151.48 | 9.553E+00 | |
| Cf-251 | 227.00 | 176. | 27. | 0.015 | 96.88 | 5.924E+00 | |
| EU-152 | 244.69 | 1401. | -29. | -0.016 | 185.66 | -5.429E+00 | |
| TH-227 | 256.24 | 164. | -16. | -0.009 | 158.69 | -3.389E+00 | |
| Cd-113m | 263.70 | 198. | 16. | 0.009 | 129.61 | 3.948E+03 | |
| BI-210M | 265.83 | 192. | 11. | 0.006 | 175.29 | 3.446E-01 | |
| Hg-203 | 279.20 | 170. | 23. | 0.013 | 84.00 | 4.382E-01 | |
| PA-231 | 300.07 | 931. | -24. | -0.013 | 179.14 | -1.630E+01 | |
| PA-233 | 300.18 | 907. | -24. | -0.013 | 176.83 | -6.470E+00 | |
| PA-231 | 302.65 | 883. | -24. | -0.013 | 174.17 | -1.403E+01 | |
| BA-133 | 302.85 | 859. | -24. | -0.013 | 171.75 | -2.206E+00 | |
| Ba-140 | 304.85 | 834. | -4. | -0.002 | 953.62 | -1.672E+00 | |
| La-140 | 328.76 | 632. | -24. | -0.013 | 152.59 | -2.043E+00 | |
| Cs-136 | 340.57 | 539. | -25. | -0.014 | 133.06 | -9.619E-01 | |
| EU-152 | 344.29 | 514. | -25. | -0.014 | 129.70 | -1.720E+00 | |
| HF-181 | 345.83 | 489. | -25. | -0.014 | 126.43 | -3.037E+00 | |
| BA-133 | 356.00 | 492. | 7. | 0.004 | 449.72 | 2.104E-01 | |
| BA-133 | 383.84 | 275. | -27. | -0.015 | 90.48 | -5.838E+00 | |
| Cf-249 | 387.95 | 291. | -27. | -0.015 | 92.69 | -7.990E-01 | |
| SN-113 | 391.69 | 281. | 23. | 0.013 | 106.37 | 7.093E-01 | |
| pm-146 | 453.88 | 61. | 10. | 0.006 | 156.97 | 3.530E-01 | |
| SB-125 | 463.37 | 147. | 7. | 0.004 | 236.45 | 1.579E+00 | |
| Ir-192 | 468.06 | 183. | -15. | -0.009 | 127.47 | -6.728E-01 | |
| BE-7 | 477.60 | 223. | -22. | -0.012 | 98.67 | -4.806E+00 | |
| HF-181 | 482.00 | 175. | 9. | 0.005 | 211.92 | 2.576E-01 | |
| La-140 | 487.02 | 160. | 18. | 0.010 | 99.66 | 9.485E-01 | |
| RH-106 | 511.86 | 77. | 162. | 0.090 | 16.19 | 1.964E+01 | |
| Nd-147 | 531.00 | 48. | 10. | 0.006 | 139.89 | 1.980E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CS-134 | 563.24 | 56. | 18. | 0.010 | 91.83 | 5.574E+00 | |
| CS-134 | 569.32 | 93. | -21. | -0.012 | 67.60 | -3.638E+00 | |
| PA-234 | 569.47 | 108. | 8. | 0.005 | 180.00 | 2.666E+00 | |
| SB-125 | 600.50 | 532. | -20. | -0.011 | 166.77 | -3.016E+00 | |
| SB-124 | 602.73 | 512. | -12. | -0.007 | 262.63 | -3.414E-01 | |
| RH-106 | 621.92 | 519. | -19. | -0.011 | 171.11 | -5.359E+00 | |
| AG-110M | 657.76 | 51. | -9. | -0.005 | 117.06 | -2.778E-01 | |
| PM-144 | 696.54 | 98. | -8. | -0.005 | 167.83 | -2.619E-01 | |
| NB-94 | 702.63 | 114. | 6. | 0.003 | 278.43 | 1.725E-01 | |
| SB-124 | 722.79 | 158. | -18. | -0.010 | 102.47 | -5.171E+00 | |
| ZR-95 | 724.20 | 147. | -8. | -0.005 | 212.97 | -5.811E-01 | |
| pm-146 | 735.72 | 45. | 8. | 0.004 | 187.71 | 1.130E+00 | |
| pm-146 | 747.16 | 80. | -23. | -0.013 | 88.65 | -2.160E+00 | |
| ZR-95 | 756.73 | 65. | -7. | -0.004 | 256.02 | -4.175E-01 | |
| AG-110M | 763.94 | 148. | -28. | -0.016 | 63.86 | -4.140E+00 | |
| NB-95 | 765.79 | 174. | -18. | -0.010 | 103.60 | -6.067E-01 | |
| PA-234M | 766.41 | 133. | 21. | 0.012 | 81.60 | 2.318E+02 | |
| EU-152 | 778.92 | 90. | -20. | -0.011 | 70.60 | -5.154E+00 | |
| CS-134 | 795.87 | 90. | 18. | 0.010 | 76.19 | 7.298E-01 | |
| CS-134 | 801.95 | 90. | 17. | 0.009 | 85.12 | 6.450E+00 | |
| CO-58 | 810.78 | 114. | -20. | -0.011 | 77.25 | -7.023E-01 | |
| La-140 | 815.77 | 134. | -13. | -0.007 | 133.16 | -1.862E+00 | |
| Cs-136 | 818.50 | 186. | -23. | -0.013 | 86.68 | -7.897E-01 | |
| MN-54 | 834.85 | 55. | -2. | -0.001 | 818.28 | -7.004E-02 | |
| NB-94 | 871.10 | 30. | 3. | 0.002 | 264.58 | 1.087E-01 | |
| EU-154 | 873.23 | 54. | -11. | -0.006 | 101.84 | -3.151E+00 | |
| PA-234 | 880.53 | 85. | -8. | -0.005 | 160.55 | -5.067E+00 | |
| Sc-46 | 889.28 | 106. | -10. | -0.006 | 146.50 | -3.738E-01 | |
| y-88 | 898.04 | 50. | -2. | -0.001 | 780.49 | -7.906E-02 | |
| AG-110M | 937.49 | 53. | -3. | -0.002 | 501.00 | -3.715E-01 | |
| PA-234 | 946.02 | 43. | -2. | -0.001 | 894.20 | -4.797E-01 | |
| EU-152 | 964.11 | 178. | 15. | 0.009 | 124.58 | 4.150E+00 | |
| EU-154 | 996.33 | 82. | -19. | -0.011 | 70.57 | -7.286E+00 | |
| EU-154 | 1004.77 | 22. | 13. | 0.007 | 86.70 | 2.888E+00 | |
| Cs-136 | 1048.07 | 87. | -24. | -0.013 | 59.40 | -1.234E+00 | |
| RH-106 | 1050.36 | 85. | 13. | 0.007 | 103.16 | 3.521E+01 | |
| BI-207 | 1063.66 | 21. | 3. | 0.001 | 394.67 | 1.527E-01 | |
| Ga-68 | 1077.40 | 37. | -3. | -0.002 | 420.24 | -5.068E+00 | |
| EU-152 | 1112.07 | 116. | 12. | 0.006 | 134.17 | 3.737E+00 | |
| ZN-65 | 1115.55 | 128. | 12. | 0.006 | 140.23 | 1.012E+00 | |
| Sc-46 | 1120.55 | 140. | 12. | 0.006 | 145.93 | 5.148E-01 | |
| Ta-182 | 1121.30 | 175. | -15. | -0.008 | 126.52 | -1.905E+00 | |
| CO-60 | 1173.24 | 51. | -3. | -0.002 | 561.25 | -1.371E-01 | |
| Ta-182 | 1221.41 | 79. | -26. | -0.015 | 81.93 | -4.583E+00 | |
| NA-22 | 1274.53 | 40. | -9. | -0.005 | 108.24 | -4.229E-01 | |
| FE-59 | 1291.60 | 17. | 6. | 0.003 | 166.25 | 6.845E-01 | |
| CO-60 | 1332.50 | 11. | 10. | 0.005 | 87.78 | 4.885E-01 | |
| AG-110M | 1384.30 | 18. | -2. | -0.001 | 517.20 | -4.290E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| EU-152 | 1408.00 | 18. | 5. | 0.003 | 209.76 | 1.257E+00 | |
| La-140 | 1596.21 | 19. | -2. | -0.001 | 545.82 | -1.225E-01 | |
| SB-124 | 1690.98 | 6. | 2. | 0.001 | 382.88 | 2.137E-01 | |
| y-88 | 1836.06 | 13. | -3. | -0.002 | 284.60 | -2.202E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | -4.8057E+00 | -4.8058E+00 | 9.867E+01% | 1.58E+01 |
| NA-22 | #A | -4.2287E-01 | -4.2287E-01 | 1.082E+02% | 1.56E+00 |
| K-40 | | 3.3371E+02 | 3.3371E+02 | 4.052E+00% | 7.44E+00 |
| Sc-46 | #A | 7.0483E-02 | 7.0484E-02 | 1.034E+02% | 1.86E+00 |
| CR-51 | A | 2.1178E+00 | 2.1179E+00 | 3.328E+02% | 2.36E+01 |
| MN-54 | #A | -7.0045E-02 | -7.0045E-02 | 8.183E+02% | 1.31E+00 |
| FE-59 | #A | 2.9659E-01 | 2.9660E-01 | 1.662E+02% | 2.23E+00 |
| Co-56 | # | 1.0907E+00 | 1.0907E+00 | 4.661E+01% | 9.21E-01 |
| CO-57 | #A | -3.5218E-02 | -3.5218E-02 | 8.076E+02% | 9.67E-01 |
| CO-58 | #A | -7.0232E-01 | -7.0233E-01 | 7.725E+01% | 1.81E+00 |
| CO-60 | #A | 4.8853E-01 | 4.8853E-01 | 8.778E+01% | 9.30E-01 |
| ZN-65 | #A | 1.0116E+00 | 1.0116E+00 | 1.402E+02% | 4.81E+00 |
| NB-94 | #A | 1.4025E-01 | 1.4025E-01 | 1.920E+02% | 1.65E+00 |
| ZR-95 | #A | -4.1749E-01 | -4.1749E-01 | 2.560E+02% | 2.40E+00 |
| NB-95 | #A | -6.0670E-01 | -6.0671E-01 | 1.036E+02% | 2.11E+00 |
| RU-103 | #A | 3.4804E-02 | 3.4804E-02 | 1.317E+03% | 1.11E+00 |
| RH-106 | #A | 1.4900E-01 | 1.4900E-01 | 9.990E+01% | 3.07E+01 |
| AG-108M | #A | 3.9593E-02 | 3.9593E-02 | 1.023E+03% | 9.86E-01 |
| AG-110M | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.41E+00 |
| SN-113 | #A | 7.0933E-01 | 7.0934E-01 | 1.064E+02% | 2.52E+00 |
| SB-124 | #A | -1.5978E-01 | -1.5978E-01 | 2.322E+02% | 3.01E+00 |
| SB-125 | #A | 3.5945E-01 | 3.5945E-01 | 2.365E+02% | 3.15E+00 |
| I-131 | A | 3.6875E-01 | 3.6878E-01 | 9.347E+01% | 1.17E+00 |
| Gd-153 | #A | -1.3377E+00 | -1.3377E+00 | 1.689E+02% | 7.50E+00 |
| Ga-68 | #A | -5.0091E+00 | -5.0683E+00 | 4.202E+02% | 4.74E+01 |
| Tc-99m | #A | -1.6303E-01 | -1.6339E-01 | 3.936E+02% | 2.15E+00 |
| BA-133 | #A | 2.1041E-01 | 2.1041E-01 | 4.497E+02% | 3.19E+00 |
| CS-134 | #A | 8.2427E-01 | 8.2427E-01 | 7.619E+01% | 3.00E+00 |
| CS-137 | #A | 2.2956E-02 | 2.2956E-02 | 1.929E+03% | 1.55E+00 |
| CE-139 | #A | 4.6151E-01 | 4.6151E-01 | 9.420E+01% | 1.45E+00 |
| Ba-140 | #A | -3.4337E-02 | -3.4338E-02 | 5.147E+03% | 4.16E+00 |
| La-140 | #A | 2.2330E-01 | 2.2331E-01 | 9.966E+01% | 1.41E+00 |
| CE-141 | #A | -8.4892E-01 | -8.4894E-01 | 1.424E+02% | 4.02E+00 |
| CE-144 | #A | -3.3267E+00 | -3.3267E+00 | 1.427E+02% | 1.58E+01 |
| PM-144 | #A | -2.6188E-01 | -2.6188E-01 | 1.678E+02% | 1.50E+00 |
| EU-152 | #A | 8.4662E-01 | 8.4662E-01 | 1.246E+02% | 7.45E+00 |

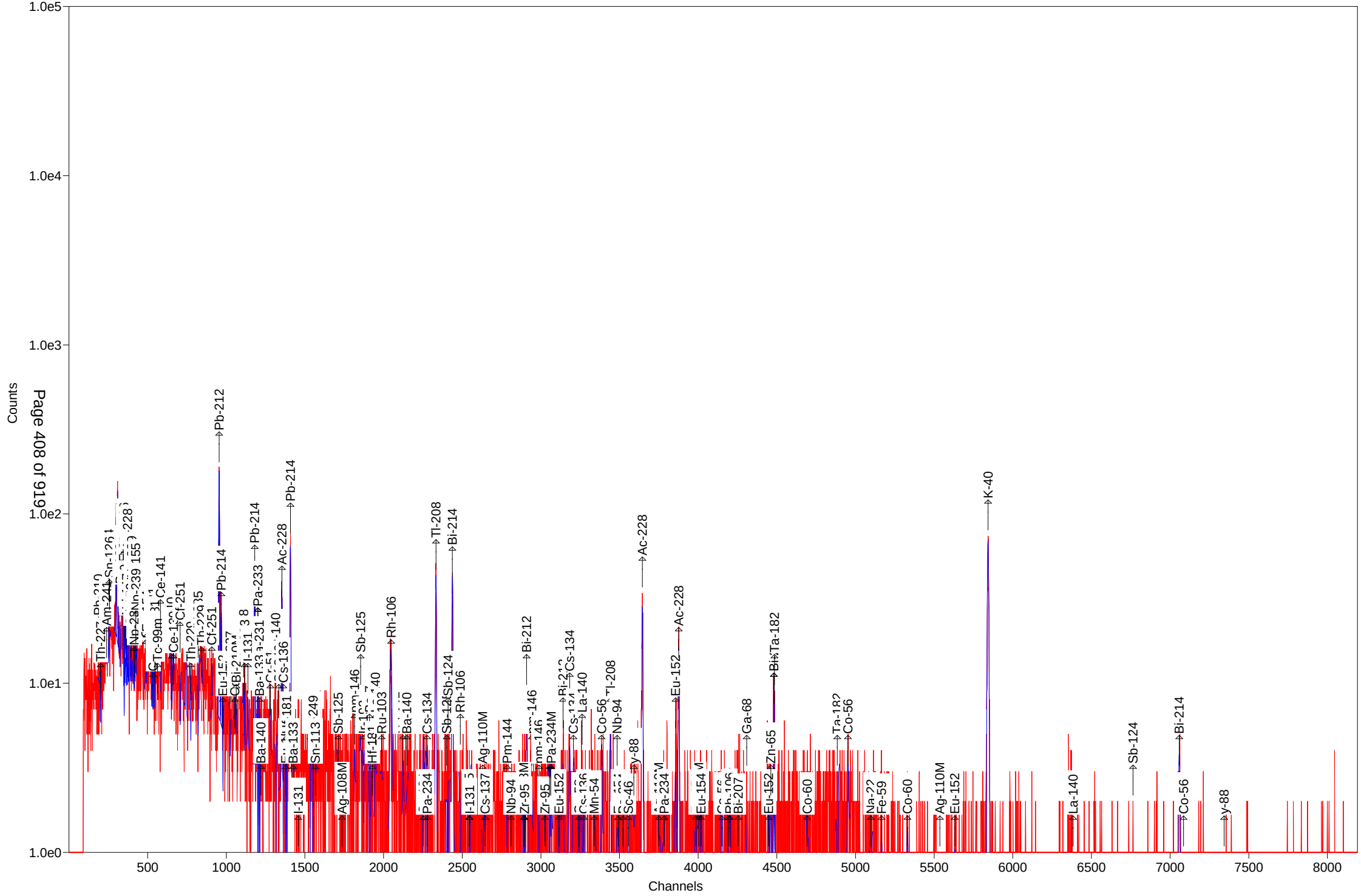
| | | | | |
|---|---|---|---|---|
| EU-154 #A | -3.1512E+00 | -3.1512E+00 | 1.018E+02% | 1.09E+01 |
| EU-155 # | 4.1473E+00 | 4.1473E+00 | 3.158E+01% | 3.06E+00 |
| HF-181 #A | 2.5760E-01 | 2.5760E-01 | 2.119E+02% | 1.85E+00 |
| Ta-182 #A | -1.9055E+00 | -1.9055E+00 | 1.265E+02% | 8.12E+00 |
| Hg-203 #A | 4.3821E-01 | 4.3821E-01 | 8.400E+01% | 1.23E+00 |
| TL-208 | 8.5921E+00 | 8.5921E+00 | 7.335E+00% | 8.65E-01 |
| pm-146 #A | -2.1597E+00 | -2.1597E+00 | 8.865E+01% | 4.20E+00 |
| y-88 #A | -7.9063E-02 | -7.9063E-02 | 7.805E+02% | 1.41E+00 |
| Cd-113m#A | 3.9481E+03 | 3.9481E+03 | 1.296E+02% | 1.72E+04 |
| Cd-109 #A | -1.0907E+01 | -1.0907E+01 | 1.748E+02% | 6.33E+01 |
| Cf-251 #A | -1.8997E+00 | -1.8997E+00 | 1.169E+02% | 5.40E+00 |
| Cf-249 #A | -7.9903E-01 | -7.9903E-01 | 9.269E+01% | 2.47E+00 |
| Sn-126 A | 1.8470E+00 | 1.8470E+00 | 2.907E+02% | 1.80E+01 |
| PB-210 #A | 9.6643E-01 | 9.6643E-01 | 1.475E+03% | 4.82E+01 |
| PB-212 | 2.8888E+01 | 2.8888E+01 | 3.697E+00% | 1.56E+00 |
| PB-214 | 1.6851E+01 | 1.6851E+01 | 5.654E+00% | 1.91E+00 |
| BI-207 #A | 6.6062E-02 | 6.6062E-02 | 3.947E+02% | 1.34E+00 |
| BI-212 | 2.8312E+01 | 2.8312E+01 | 2.130E+01% | 1.07E+01 |
| BI-214 | 1.5818E+01 | 1.5818E+01 | 8.440E+00% | 1.97E+00 |
| BI-210M#A | 3.4464E-01 | 3.4464E-01 | 1.753E+02% | 2.04E+00 |
| AC-228 | 2.7489E+01 | 2.7489E+01 | 5.791E+00% | 9.52E-01 |
| TH-227 #A | -7.1771E+00 | -7.1771E+00 | 1.028E+02% | 1.87E+01 |
| TH-229 #A | -9.4479E-01 | -9.4479E-01 | 9.300E+01% | 2.12E+01 |
| TH-234 #A | 9.4084E+00 | 9.4084E+00 | 1.389E+02% | 4.36E+01 |
| PA-231 #A | -1.4033E+01 | -1.4033E+01 | 1.742E+02% | 8.16E+01 |
| PA-233 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 6.47E+00 |
| PA-234 #A | -5.6487E-01 | -5.6487E-01 | 1.141E+02% | 9.50E+00 |
| PA-234M#A | 5.9298E+01 | 5.9298E+01 | 8.160E+01% | 2.39E+02 |
| U-235 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.72E+01 |
| AM-241 #A | 1.4280E+00 | 1.4280E+00 | 1.071E+02% | 5.09E+00 |
| Np-237 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.97E+01 |
| Ir-192 #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 2.70E+00 |
| Cs-136 #A | -7.8964E-01 | -7.8967E-01 | 8.668E+01% | 2.28E+00 |
| Np-239 #A | -1.8342E+00 | -1.8346E+00 | 1.596E+02% | 9.72E+00 |
| Nd-147 #A | 1.9799E+00 | 1.9800E+00 | 1.399E+02% | 6.68E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  25.0 to  1999.5 keV)  4.638E+02  Bq/Sample
Total Decayed Activity (  25.0 to  1999.5 keV) 4.6380258E+02  Bq/Sample

309155_Gamma_160-22327-A-3-B. 13_Gamma_20171200.spc.



Test America St. Louis  Spectrum ID: 14_Gamma_20171411

Sample Description: 309155_Gamma_160-22327-A-4-B
Detector: Detector #14
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-4-B

Decay to Time: 6/7/2017 09:53  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:53:29  Real Time: 1805 sec
Analysis Time: 6/7/2017 10:24  Dead Time: 0.27 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 14_Soil_TunaCan.Clb
Efficiency Cal Desc: 14_TunaCan_90099_042312
Efficiency Cal Date: 4/23/2012 11:29
Energy Cal Date: 2/28/2012 10:48
Library: Client_Long_Rev11.lib
Bkgd Correction File: 14_2017-06-04_0502.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | -9.299E-01 | 435.9 | 4.053E+00 | 4.054E+00 | 1.408E+01 |
| NA-22 | 6.501E-01 | 61.2 | 3.976E-01 | 3.990E-01 | 1.294E+00 |
| K-40 | 2.543E+02 | 5.5 | 1.387E+01 | 1.902E+01 | 5.579E+00 |
| Sc-46 | 7.596E-01 | 101.6 | 7.715E-01 | 7.725E-01 | 2.599E+00 |
| CR-51 | 1.159E+00 | 356.3 | 4.128E+00 | 4.128E+00 | 1.414E+01 |
| MN-54 | 6.486E-01 | 92.7 | 6.012E-01 | 6.022E-01 | 1.397E+00 |
| FE-59 | -7.915E-01 | 145.5 | 1.151E+00 | 1.152E+00 | 2.663E+00 |
| Co-56 | 4.783E-01 | 92.2 | 4.409E-01 | 4.415E-01 | 1.700E+00 |
| CO-57 | 0.000E+00 | 1.#INF | 3.708E-01 | 3.708E-01 | 1.458E+01 |
| CO-58 | 5.733E-01 | 90.2 | 5.170E-01 | 5.179E-01 | 1.745E+00 |
| CO-60 | 5.989E-01 | 119.0 | 7.128E-01 | 7.134E-01 | 1.598E+00 |
| ZN-65 | 0.000E+00 | 1.#INF | 1.807E-01 | 1.807E-01 | 6.896E+00 |
| NB-94 | 5.326E-01 | 93.3 | 4.970E-01 | 4.977E-01 | 1.201E+00 |
| ZR-95 | 2.707E-01 | 292.9 | 7.930E-01 | 7.931E-01 | 1.914E+00 |
| NB-95 | 6.916E-01 | 90.3 | 6.246E-01 | 6.256E-01 | 2.098E+00 |
| RU-103 | 3.703E-02 | 1112.1 | 4.118E-01 | 4.118E-01 | 1.076E+00 |
| RH-106 | 7.116E+00 | 143.4 | 1.020E+01 | 1.021E+01 | 4.193E+01 |
| AG-108M | 4.566E-01 | 94.7 | 4.326E-01 | 4.332E-01 | 1.123E+00 |
| AG-110M | 6.067E-01 | 79.6 | 4.832E-01 | 4.842E-01 | 3.862E+00 |
| SN-113 | 6.421E-01 | 123.9 | 7.958E-01 | 7.965E-01 | 2.682E+00 |
| SB-124 | 3.699E-01 | 259.9 | 9.612E-01 | 9.614E-01 | 4.235E+00 |
| SB-125 | 2.116E+00 | 70.7 | 1.495E+00 | 1.499E+00 | 3.878E+00 |
| I-131 | 3.771E-01 | 142.2 | 5.363E-01 | 5.367E-01 | 1.125E+00 |
| Gd-153 | 1.104E+00 | 83.2 | 9.180E-01 | 9.204E-01 | 3.500E+00 |
| Ga-68 | 5.335E+01 | 40.9 | 2.184E+01 | 2.204E+01 | 4.614E+01 |
| Tc-99m | -3.811E-01 | 130.8 | 4.985E-01 | 4.990E-01 | 1.665E+00 |
| BA-133 | -7.207E-01 | 202.1 | 1.457E+00 | 1.457E+00 | 4.879E+00 |
| CS-134 | 4.965E-01 | 87.8 | 4.361E-01 | 4.369E-01 | 4.319E+00 |
| CS-137 | -8.674E-01 | 88.3 | 7.661E-01 | 7.674E-01 | 2.565E+00 |
| CE-139 | -4.485E-01 | 112.5 | 5.044E-01 | 5.062E-01 | 1.684E+00 |
| Ba-140 | 1.793E+00 | 95.9 | 1.720E+00 | 1.722E+00 | 4.268E+00 |
| La-140 | 2.824E-02 | 38.5 | 1.087E-02 | 1.097E-02 | 2.507E+00 |
| CE-141 | -5.775E-01 | 155.7 | 8.994E-01 | 8.999E-01 | 3.010E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | -3.308E+00 | 136.6 | 4.519E+00 | 4.522E+00 | 1.506E+01 |
| PM-144 | 1.906E-01 | 259.6 | 4.949E-01 | 4.950E-01 | 1.487E+00 |
| EU-152 | 3.763E+00 | 38.9 | 1.465E+00 | 1.478E+00 | 8.647E+00 |
| EU-154 | 5.360E+00 | 56.6 | 3.031E+00 | 3.044E+00 | 1.136E+01 |
| EU-155 | 0.000E+00 | 1.#INF | 1.202E+00 | 1.202E+00 | 5.532E+00 |
| HF-181 | 7.406E-01 | 97.2 | 7.198E-01 | 7.208E-01 | 1.735E+00 |
| Ta-182 | 1.328E+00 | 88.8 | 1.180E+00 | 1.182E+00 | 9.577E+00 |
| Hg-203 | -5.009E-01 | 113.7 | 5.696E-01 | 5.703E-01 | 1.910E+00 |
| TL-208 | 9.092E+00 | 9.7 | 8.830E-01 | 1.001E+00 | 1.387E+00 |
| pm-146 | -1.464E+00 | 135.6 | 1.985E+00 | 1.987E+00 | 4.787E+00 |
| y-88 | 6.205E-01 | 90.7 | 5.626E-01 | 5.635E-01 | 1.320E+00 |
| Cd-113m | 5.752E+03 | 98.4 | 5.660E+03 | 5.673E+03 | 1.900E+04 |
| Cd-109 | 1.007E+01 | 168.3 | 1.696E+01 | 1.697E+01 | 5.649E+01 |
| Cf-251 | 1.121E+00 | 202.3 | 2.268E+00 | 2.270E+00 | 6.122E+00 |
| Cf-249 | 8.863E-01 | 96.4 | 8.547E-01 | 8.559E-01 | 2.650E+00 |
| Sn-126 | -2.401E+00 | 248.6 | 5.970E+00 | 5.971E+00 | 2.002E+01 |
| PB-210 | 1.104E+00 | 1415.1 | 1.562E+01 | 1.562E+01 | 4.520E+01 |
| PB-212 | 2.651E+01 | 4.8 | 1.278E+00 | 2.139E+00 | 2.384E+00 |
| PB-214 | 3.213E+01 | 5.1 | 1.633E+00 | 2.336E+00 | 2.713E+00 |
| BI-207 | 1.984E-01 | 200.1 | 3.968E-01 | 3.970E-01 | 1.380E+00 |
| BI-212 | 4.172E+01 | 15.4 | 6.408E+00 | 6.764E+00 | 1.055E+01 |
| BI-214 | 2.758E+01 | 6.4 | 1.768E+00 | 2.276E+00 | 2.111E+00 |
| BI-210M | -7.876E-01 | 99.6 | 7.841E-01 | 7.855E-01 | 2.626E+00 |
| AC-228 | 3.085E+01 | 6.9 | 2.113E+00 | 2.635E+00 | 1.393E+00 |
| TH-227 | -1.424E+00 | 516.9 | 7.359E+00 | 7.359E+00 | 2.107E+01 |
| TH-229 | 4.523E+00 | 188.4 | 8.523E+00 | 8.531E+00 | 2.306E+01 |
| TH-234 | 3.192E+01 | 31.0 | 9.879E+00 | 1.002E+01 | 3.119E+01 |
| PA-231 | -9.228E+00 | 235.6 | 2.174E+01 | 2.174E+01 | 7.322E+01 |
| PA-233 | -1.297E+00 | 104.5 | 1.355E+00 | 1.357E+00 | 4.537E+00 |
| PA-234 | 5.560E-01 | 79.6 | 4.424E-01 | 4.433E-01 | 8.874E+00 |
| PA-234M | 6.161E+01 | 106.0 | 6.528E+01 | 6.536E+01 | 2.230E+02 |
| U-235 | -4.216E-01 | 913.1 | 3.849E+00 | 3.849E+00 | 1.299E+01 |
| AM-241 | 1.295E+00 | 111.9 | 1.450E+00 | 1.451E+00 | 4.088E+00 |
| Np-237 | 2.710E+00 | 179.1 | 4.853E+00 | 4.855E+00 | 1.617E+01 |
| Ir-192 | 6.466E-01 | 79.9 | 5.165E-01 | 5.179E-01 | 1.525E+00 |
| Cs-136 | 3.984E-01 | 127.9 | 5.095E-01 | 5.100E-01 | 2.004E+00 |
| Np-239 | 1.261E+00 | 120.0 | 1.513E+00 | 1.514E+00 | 5.058E+00 |
| Nd-147 | 3.076E+00 | 96.6 | 2.972E+00 | 2.977E+00 | 7.469E+00 |
| Total | 6.382E+03 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-4-B

Spectrum Filename: C:\User\SPC\Det14\14_Gamma_20171411.An1

Acquisition information
Start time: 6/7/2017 9:53:29 AM
Live time: 1800
Real time: 1805
Dead time: 0.27 %
Detector ID: 14

Detector system
Ge14 SN/11080670

Calibration
Filename: 14_Soil_TunaCan.Clb
14_TunaCan_90099_042312

Energy Calibration
Created: 2/28/2012 10:48:23 AM
Zero offset: 0.130 keV
Gain: 0.250 keV/channel
Quadratic: -2.050E-08 keV/channel^2

Efficiency Calibration
Created: 4/23/2012 11:29:47 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.02 %
Log(Eff): 2.101260E-01 + (-5.951973E-01*Log(E) ) + ( -1.605331E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.28 %
Log(Eff): -2.391492E+01 + ( 8.828985E+00*Log(E) ) + ( -9.371496E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G800W064
Start channel: 100 ( 25.14keV )
Stop channel: 8000 ( 1999.51keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/( 1.0000E+00* 1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:53:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 14_2017-06-04_0502.PBC 6/4/2017 5:02:37 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 37 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.2205

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 59.54 | 26. | 111.93 | 0.76 | 3.065E-02 | 59.54 | 35.900 | PBC<MDA | AM241 |
| 63.45 | 72. | 30.95 | 0.77 | 3.281E-02 | 63.29 | 3.810 | 3.192E+01 | TH234 |
| 65.99 | 31. | 50.32 | 0.72 | 3.423E-02 | | | | |
| 74.78 | 245. | 11.76 | 0.78 | 3.812E-02 | | | | |
| 77.24 | 444. | 7.05 | 0.78 | 3.901E-02 | | | | |
| 87.16 | 121. | 17.80 | 0.79 | 4.179E-02 | 86.49 | 13.100 | 1.230E+01 | Np237 |
| | | | | | 86.54 | 30.700 | 5.245E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.777E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 4.271E+00 | Sn126 |
| 88.03 | 29. | 168.33 | 0.79 | 4.196E-02 | 88.04 | 3.790 | PBC<MDA | Cd109 |
| 89.95 | 81. | 25.04 | 0.79 | 4.235E-02 | | | | |
| 92.87 | 127. | 18.29 | 0.80 | 4.285E-02 | 92.59 | 5.584 | 2.474E+01 | TH234 |
| | | | | | 93.35 | 5.561 | 2.955E+01 | AC228 |
| 97.50 | 22. | 113.27 | 0.80 | 4.345E-02 | 97.50 | 30.000 | PBC<MDA | Gd153 |
| 103.20 | 23. | 121.83 | 0.81 | 4.392E-02 | 103.20 | 21.800 | PBC<MDA | Gd153 |
| 103.70 | 11. | 246.22 | 0.81 | 4.395E-02 | 103.70 | 24.000 | PBC<MDA | Np239 |
| 106.13 | 23. | 119.97 | 0.81 | 4.406E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 121.78 | 10. | 136.79 | 0.83 | 4.380E-02 | 121.78 | 28.580 | PBC<MDA | EU152 |
| | | | | | 122.06 | 85.600 | 1.546E-01 | CO57 |
| 123.10 | 22. | 105.38 | 0.83 | 4.372E-02 | 123.10 | 40.790 | PBC<MDA | EU154 |
| 136.30 | 16. | 220.46 | 0.84 | 4.245E-02 | 136.30 | 5.850 | PBC<MDA | HF181 |
| | | | | | 136.47 | 10.680 | 1.999E+00 | CO57 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 141.31 | 29. | 60.30 | 0.31 | 4.182E-02 | 140.51 | 89.300 | 4.382E-01 | Tc99m |
| 162.66 | 8. | 342.78 | 0.87 | 3.853E-02 | 162.66 | 6.220 | PBC<MDA | Ba140 |
| 176.60 | 13. | 202.29 | 0.88 | 3.692E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |
| 193.36 | 12. | 188.43 | 0.90 | 3.443E-02 | 193.51 | 4.400 | PBC<MDA | TH229 |
| 227.00 | 15. | 133.09 | 0.93 | 3.046E-02 | 227.00 | 6.300 | PBC<MDA | Cf251 |
| 238.22 | 609. | 5.35 | 1.11 | 2.935E-02 | 238.63 | 43.300 | 2.666E+01 | PB212 |
| 241.62 | 85. | 49.74 | 0.95 | 2.900E-02 | 242.00 | 7.430 | PBC<MDA | PB214 |
| 244.32 | 21. | 213.69 | 0.95 | 2.875E-02 | 244.69 | 7.580 | PBC<MDA | EU152 |
| 263.70 | 17. | 98.41 | 0.97 | 2.714E-02 | 263.70 | 0.006 | PBC<MDA | Cd113m |
| 277.03 | 55. | 33.08 | 1.19 | 2.610E-02 | 277.28 | 6.310 | 1.855E+01 | TL208 |
| 294.83 | 304. | 8.42 | 1.14 | 2.489E-02 | 295.09 | 19.300 | 3.521E+01 | PB214 |
| 299.59 | 68. | 21.21 | 1.11 | 2.455E-02 | 300.03 | 3.280 | 4.692E+01 | PB212 |
| | | | | | 300.07 | 2.460 | 6.256E+01 | PA231 |
| 308.44 | 17. | 140.18 | 1.01 | 2.403E-02 | 308.44 | 31.750 | PBC<MDA | Ir192 |
| 316.49 | 17. | 100.55 | 1.02 | 2.355E-02 | 316.49 | 87.040 | PBC<MDA | Ir192 |
| 320.08 | 5. | 356.27 | 1.03 | 2.334E-02 | 320.08 | 9.940 | PBC<MDA | CR51 |
| 328.76 | 43. | 38.50 | 1.03 | 2.286E-02 | 328.76 | 20.300 | 5.148E+00 | La140 |
| 333.44 | 17. | 102.24 | 1.04 | 2.261E-02 | 333.44 | 15.510 | PBC<MDA | Cf249 |
| 337.92 | 159. | 14.33 | 0.91 | 2.237E-02 | 338.32 | 12.010 | 3.290E+01 | AC228 |
| 340.57 | 16. | 167.90 | 1.05 | 2.224E-02 | 340.57 | 46.900 | PBC<MDA | Cs136 |
| 343.25 | 14. | 186.60 | 1.05 | 2.205E-02 | 344.29 | 26.500 | PBC<MDA | EU152 |
| 351.53 | 452. | 5.92 | 1.44 | 2.169E-02 | 351.93 | 37.600 | 3.079E+01 | PB214 |
| 364.48 | 9. | 142.21 | 1.07 | 2.109E-02 | 364.48 | 81.700 | PBC<MDA | I131 |
| 383.84 | 16. | 115.07 | 1.09 | 2.025E-02 | 383.84 | 8.940 | PBC<MDA | BA133 |
| 387.95 | 11. | 163.55 | 1.09 | 2.008E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 391.69 | 15. | 123.94 | 1.09 | 1.993E-02 | 391.69 | 64.000 | PBC<MDA | SN113 |
| 428.22 | 3. | 433.36 | 1.13 | 1.859E-02 | 427.88 | 29.600 | PBC<MDA | SB125 |
| 433.94 | 14. | 94.74 | 1.13 | 1.838E-02 | 433.94 | 90.480 | PBC<MDA | AG108M |
| 464.68 | 20. | 70.66 | 1.16 | 1.745E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 468.06 | 10. | 166.36 | 1.17 | 1.731E-02 | 468.06 | 51.750 | PBC<MDA | Ir192 |
| 482.00 | 13. | 97.19 | 1.18 | 1.691E-02 | 482.00 | 80.500 | PBC<MDA | HF181 |
| 487.02 | 13. | 103.68 | 1.18 | 1.677E-02 | 487.02 | 45.500 | PBC<MDA | La140 |
| 511.86 | 73. | 37.76 | 2.46 | 1.612E-02 | 511.86 | 20.000 | 1.263E+01 | RH106 |
| 531.00 | 11. | 96.62 | 1.23 | 1.566E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 537.26 | 12. | 95.90 | 1.23 | 1.551E-02 | 537.26 | 24.390 | PBC<MDA | Ba140 |
| 569.32 | 8. | 137.60 | 1.26 | 1.481E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 3.431E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 2.879E-01 | BI207 |
| 569.70 | 5. | 200.05 | 1.26 | 1.481E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 2.364E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 1.984E-01 | BI207 |
| 582.77 | 201. | 9.71 | 1.53 | 1.454E-02 | 583.02 | 84.500 | 9.092E+00 | TL208 |
| 599.01 | 13. | 245.80 | 1.29 | 1.419E-02 | 600.50 | 17.860 | PBC<MDA | SB125 |
| 602.73 | 11. | 295.59 | 1.29 | 1.415E-02 | 602.73 | 98.260 | PBC<MDA | SB124 |
| 609.14 | 321. | 6.41 | 1.68 | 1.403E-02 | 609.31 | 46.090 | 2.758E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 2.213E+02 | RU103 |
| 618.06 | 12. | 259.61 | 1.30 | 1.387E-02 | 618.06 | 99.100 | PBC<MDA | PM144 |
| 621.69 | 11. | 276.13 | 1.31 | 1.380E-02 | 621.92 | 9.930 | PBC<MDA | RH106 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 636.97 | 2. | 593.27 | 1.32 | 1.354E-02 | 636.97 | 7.170 | PBC<MDA | I131 |
| 657.76 | 12. | 79.65 | 1.34 | 1.319E-02 | 657.76 | 94.640 | PBC<MDA | AG110M |
| 702.63 | 12. | 93.31 | 1.38 | 1.251E-02 | 702.63 | 97.900 | PBC<MDA | NB94 |
| 724.20 | 4. | 402.35 | 1.40 | 1.221E-02 | 724.20 | 44.150 | PBC<MDA | ZR95 |
| 726.73 | 69. | 15.36 | 1.56 | 1.217E-02 | 727.17 | 7.550 | 4.172E+01 | BI212 |
| 756.73 | 2. | 425.82 | 1.43 | 1.179E-02 | 756.73 | 54.460 | PBC<MDA | ZR95 |
| 765.79 | 14. | 90.32 | 1.43 | 1.167E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 2.349E+02 | PA234M |
| 779.62 | 7. | 134.73 | 1.44 | 1.151E-02 | 778.92 | 12.940 | PBC<MDA | EU152 |
| 785.94 | 41. | 22.50 | 1.42 | 1.144E-02 | 785.42 | 1.280 | 1.543E+02 | BI212 |
| 795.87 | 14. | 87.83 | 1.46 | 1.131E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 810.78 | 11. | 90.19 | 1.47 | 1.115E-02 | 810.78 | 99.460 | PBC<MDA | CO58 |
| 815.77 | 3. | 359.34 | 1.48 | 1.109E-02 | 815.77 | 23.280 | PBC<MDA | La140 |
| 834.85 | 13. | 92.70 | 1.49 | 1.088E-02 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 859.81 | 41. | 22.50 | 2.62 | 1.062E-02 | 860.56 | 12.420 | 1.713E+01 | TL208 |
| 871.10 | 2. | 524.21 | 1.52 | 1.052E-02 | 871.10 | 99.890 | PBC<MDA | NB94 |
| 873.23 | 11. | 74.28 | 1.52 | 1.049E-02 | 873.23 | 12.270 | PBC<MDA | EU154 |
| 889.28 | 14. | 101.58 | 1.54 | 1.034E-02 | 889.28 | 99.984 | PBC<MDA | Sc46 |
| 898.04 | 11. | 90.67 | 1.54 | 1.026E-02 | 898.04 | 93.700 | PBC<MDA | y88 |
| 910.85 | 157. | 7.98 | 1.52 | 1.014E-02 | 911.07 | 29.000 | 2.967E+01 | AC228 |
| 946.02 | 10. | 89.36 | 1.58 | 9.832E-03 | 946.02 | 13.400 | PBC<MDA | PA234 |
| 963.88 | 21. | 38.93 | 1.60 | 9.682E-03 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 968.74 | 95. | 12.39 | 1.60 | 9.642E-03 | 968.97 | 17.460 | 3.139E+01 | AC228 |
| 996.33 | 11. | 85.28 | 1.62 | 9.425E-03 | 996.33 | 10.600 | PBC<MDA | EU154 |
| 1001.00 | 9. | 105.96 | 1.63 | 9.389E-03 | 1001.00 | 0.837 | PBC<MDA | PA234M |
| 1048.07 | 8. | 127.88 | 1.66 | 9.043E-03 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1050.36 | 6. | 143.37 | 1.66 | 9.027E-03 | 1050.36 | 1.560 | PBC<MDA | RH106 |
| 1077.40 | 24. | 40.93 | 1.69 | 8.841E-03 | 1077.40 | 3.300 | 5.335E+01 | Ga68 |
| 1120.10 | 78. | 14.48 | 1.09 | 8.562E-03 | 1120.29 | 15.100 | 3.352E+01 | BI214 |
| | | | | | 1120.55 | 99.987 | 5.063E+00 | Sc46 |
| 1189.05 | 2. | 606.22 | 1.77 | 8.153E-03 | 1189.05 | 16.200 | PBC<MDA | Ta182 |
| 1221.41 | 12. | 88.83 | 1.79 | 7.975E-03 | 1221.41 | 27.000 | PBC<MDA | Ta182 |
| 1238.28 | 16. | 92.18 | 1.80 | 7.886E-03 | 1238.28 | 66.070 | PBC<MDA | Co56 |
| 1274.53 | 9. | 61.17 | 1.83 | 7.700E-03 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 1.846E+00 | EU154 |
| 1274.54 | 3. | 196.27 | 1.83 | 7.700E-03 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 6.824E-01 | EU154 |
| 1332.50 | 8. | 119.02 | 1.87 | 7.423E-03 | 1332.50 | 99.980 | PBC<MDA | CO60 |
| 1384.30 | 8. | 95.58 | 1.91 | 7.192E-03 | 1384.30 | 24.290 | PBC<MDA | AG110M |
| 1460.74 | 336. | 5.46 | 1.57 | 6.879E-03 | 1460.83 | 10.670 | 2.543E+02 | K40 |
| 1690.98 | 1. | 427.57 | 2.10 | 6.091E-03 | 1690.98 | 47.790 | PBC<MDA | SB124 |
| 1764.44 | 74. | 11.62 | 1.58 | 5.878E-03 | 1764.49 | 15.400 | 4.541E+01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 264.01 | 65.99 | 147. | 33. | 9.756E+02 | 54.20 | 0.768 | - sD |
| 298.50 | 74.80 | 291. | 245. | 6.417E+03 | 11.76 | 0.777 | - sD |
| 308.34 | 77.26 | 267. | 444. | 1.137E+04 | 7.05 | 0.780 | - sD |
| 359.40 | 90.02 | 222. | 67. | 1.579E+03 | 33.78 | 0.793 | - D |
| 564.90 | 141.31 | 97. | 27. | 6.547E+02 | 54.38 | 0.846 | - sD |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| TH-227 | 199.98 | 50.14 | 234. | -5. | -0.003 | 516.91 | 0.751s |
| AM-241 | 237.55 | 59.54 | 282. | 26. | 0.014 | 111.93 | 0.761s |
| TH-234 | 252.55 | 63.29 | 210. | 72. | 0.040 | 30.95 | 0.765D |
| Sn-126 | 256.52 | 64.28 | 597. | -14. | -0.008 | 248.64 | 0.766 |
| BA-133 | 323.33 | 80.99 | 354. | -30. | -0.016 | 108.61 | 0.784s |
| Np-237 | 345.33 | 86.49 | 1121. | 27. | 0.015 | 179.07 | 0.789A |
| EU-155 | 345.54 | 86.54 | 1244. | -29. | -0.016 | 174.32 | 0.790s |
| Sn-126 | 347.13 | 86.94 | 1152. | 29. | 0.016 | 82.86 | 0.790D |
| Sn-126 | 349.65 | 87.57 | 1135. | 29. | 0.016 | 83.07 | 0.791D |
| Cd-109 | 351.53 | 88.04 | 1164. | 29. | 0.016 | 168.33 | 0.791A |
| TH-234 | 369.72 | 92.59 | 271. | 79. | 0.044 | 31.55 | 0.796D |
| AC-228 | 372.76 | 93.35 | 1131. | 29. | 0.016 | 163.35 | 0.797s |
| Gd-153 | 389.36 | 97.50 | 290. | 22. | 0.012 | 113.27 | 0.801s |
| Np-239 | 397.36 | 99.50 | 312. | 0. | 0.000 | 1000.00 | 0.803s |
| Gd-153 | 412.15 | 103.20 | 391. | 23. | 0.013 | 121.83 | 0.807s |
| Np-239 | 414.15 | 103.70 | 364. | 11. | 0.006 | 246.22 | 0.807s |
| EU-155 | 420.60 | 105.31 | 375. | 0. | 0.000 | 1000.00 | 0.809s |
| Np-239 | 423.87 | 106.13 | 359. | 23. | 0.013 | 119.97 | 0.810s |
| EU-152 | 486.43 | 121.78 | 94. | 10. | 0.006 | 136.79 | 0.826D |
| CO-57 | 487.58 | 122.06 | 301. | 0. | 0.000 | 101.92 | 0.826A |
| EU-154 | 491.73 | 123.10 | 246. | 22. | 0.012 | 105.38 | 0.828 |
| PA-234 | 524.50 | 131.29 | 674. | -28. | -0.016 | 131.64 | 0.836s |
| HF-181 | 531.42 | 133.02 | 702. | -28. | -0.016 | 134.07 | 0.838s |
| CE-144 | 533.47 | 133.54 | 730. | -28. | -0.016 | 136.60 | 0.838s |
| HF-181 | 544.52 | 136.30 | 638. | 16. | 0.009 | 220.46 | 0.841s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CO-57 | 545.21 | 136.47 | 622. | 0. | 0.000 | 1000.00 | 0.841A |
| Tc-99m | 561.35 | 140.51 | 519. | -25. | -0.014 | 130.82 | 0.845s |
| U-235 | 574.45 | 143.79 | 494. | -3. | -0.002 | 913.13 | 0.849s |
| CE-141 | 581.07 | 145.44 | 508. | -21. | -0.011 | 155.74 | 0.850s |
| Ba-140 | 649.93 | 162.66 | 372. | 8. | 0.004 | 342.78 | 0.868s |
| U-235 | 652.81 | 163.38 | 380. | 0. | 0.000 | 1000.00 | 0.869s |
| CE-139 | 662.70 | 165.85 | 382. | -25. | -0.014 | 112.46 | 0.871s |
| Cf-251 | 705.68 | 176.60 | 203. | 13. | 0.007 | 202.29 | 0.882s |
| TH-229 | 773.30 | 193.51 | 167. | 12. | 0.007 | 188.43 | 0.899s |
| U-235 | 820.58 | 205.33 | 173. | -5. | -0.003 | 441.41 | 0.912s |
| TH-229 | 842.65 | 210.85 | 237. | -27. | -0.015 | 103.73 | 0.917s |
| Cf-251 | 907.23 | 227.00 | 127. | 15. | 0.009 | 133.09 | 0.933s |
| PB-212 | 953.75 | 238.63 | 123. | 606. | 0.336 | 4.82 | 0.945D |
| PB-214 | 967.21 | 242.00 | 860. | 85. | 0.047 | 49.74 | 0.948s |
| EU-152 | 977.99 | 244.69 | 1012. | 21. | 0.012 | 213.69 | 0.951s |
| TH-227 | 1024.17 | 256.24 | 127. | -12. | -0.006 | 174.15 | 0.962s |
| Cd-113m | 1054.01 | 263.70 | 129. | 17. | 0.009 | 98.41 | 0.970s |
| BI-210M | 1062.53 | 265.83 | 172. | -19. | -0.011 | 99.56 | 0.972s |
| TL-208 | 1107.30 | 277.03 | 69. | 55. | 0.031 | 33.08 | 1.190s |
| Hg-203 | 1115.99 | 279.20 | 226. | -19. | -0.011 | 113.70 | 0.985s |
| I-131 | 1136.39 | 284.30 | 132. | -5. | -0.003 | 432.20 | 0.990s |
| PB-214 | 1178.53 | 294.84 | 70. | 300. | 0.167 | 8.27 | 1.138 |
| PB-212 | 1197.54 | 299.59 | 40. | 68. | 0.038 | 21.21 | 1.107s |
| PA-231 | 1199.46 | 300.07 | 409. | -18. | -0.010 | 156.28 | 1.006s |
| PA-233 | 1199.90 | 300.18 | 390. | -19. | -0.010 | 152.75 | 1.006 |
| PA-231 | 1209.78 | 302.65 | 372. | -12. | -0.006 | 235.56 | 1.008s |
| Ir-192 | 1232.94 | 308.44 | 260. | 17. | 0.009 | 140.18 | 1.014s |
| PA-233 | 1247.22 | 312.01 | 209. | -20. | -0.011 | 104.49 | 1.018s |
| Ir-192 | 1265.13 | 316.49 | 132. | 17. | 0.009 | 100.55 | 1.022 |
| CR-51 | 1279.51 | 320.08 | 146. | 5. | 0.003 | 356.27 | 1.026s |
| La-140 | 1314.21 | 328.76 | 66. | 43. | 0.024 | 38.50 | 1.034s |
| Cf-249 | 1332.92 | 333.44 | 77. | 17. | 0.009 | 102.24 | 1.039s |
| AC-228 | 1350.82 | 337.92 | 72. | 159. | 0.088 | 14.33 | 0.912s |
| Cs-136 | 1361.44 | 340.57 | 346. | 16. | 0.009 | 167.90 | 1.045s |
| EU-152 | 1376.30 | 344.29 | 359. | 14. | 0.008 | 186.60 | 1.049s |
| HF-181 | 1382.47 | 345.83 | 373. | 0. | 0.000 | 1000.00 | 1.050 |
| PB-214 | 1405.27 | 351.53 | 63. | 452. | 0.251 | 5.92 | 1.436s |
| BA-133 | 1423.15 | 356.00 | 602. | -17. | -0.010 | 202.14 | 1.060 |
| I-131 | 1457.08 | 364.48 | 48. | 9. | 0.005 | 142.21 | 1.069s |
| BA-133 | 1534.50 | 383.84 | 153. | 16. | 0.009 | 115.07 | 1.087s |
| Cf-249 | 1550.94 | 387.95 | 169. | 11. | 0.006 | 163.55 | 1.091s |
| SN-113 | 1565.90 | 391.69 | 160. | 15. | 0.008 | 123.94 | 1.095 |
| SB-125 | 1710.63 | 427.88 | 59. | 3. | 0.002 | 433.36 | 1.129s |
| AG-108M | 1734.87 | 433.94 | 44. | 14. | 0.008 | 94.74 | 1.135s |
| pm-146 | 1814.64 | 453.88 | 64. | -8. | -0.004 | 198.96 | 1.154s |
| SB-125 | 1852.59 | 463.37 | 88. | 20. | 0.011 | 70.66 | 1.163s |
| Ir-192 | 1871.36 | 468.06 | 139. | 10. | 0.006 | 166.36 | 1.167s |
| BE-7 | 1909.50 | 477.60 | 84. | -3. | -0.002 | 435.89 | 1.176s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| HF-181 | 1927.10 | 482.00 | 73. | 13. | 0.007 | 97.19 | 1.180s |
| La-140 | 1947.19 | 487.02 | 44. | 13. | 0.007 | 103.68 | 1.185s |
| RH-106 | 2046.57 | 511.86 | 107. | 73. | 0.041 | 37.76 | 2.458s |
| Nd-147 | 2123.11 | 531.00 | 28. | 11. | 0.006 | 96.62 | 1.225s |
| Ba-140 | 2148.15 | 537.26 | 32. | 12. | 0.007 | 95.90 | 1.231s |
| CS-134 | 2252.06 | 563.24 | 64. | 0. | 0.000 | 1000.00 | 1.255s |
| CS-134 | 2276.40 | 569.32 | 50. | 8. | 0.004 | 137.60 | 1.260s |
| PA-234 | 2276.99 | 569.47 | 57. | 0. | 0.000 | 1000.00 | 1.261s |
| BI-207 | 2277.92 | 569.70 | 51. | 5. | 0.003 | 200.05 | 1.261s |
| TL-208 | 2330.18 | 582.77 | 36. | 201. | 0.112 | 9.71 | 1.529s |
| SB-125 | 2401.12 | 600.50 | 479. | 13. | 0.007 | 245.80 | 1.289s |
| SB-124 | 2410.04 | 602.73 | 491. | 11. | 0.006 | 295.59 | 1.291s |
| CS-134 | 2417.96 | 604.71 | 502. | 0. | 0.000 | 1000.00 | 1.292s |
| BI-214 | 2435.68 | 609.14 | 22. | 321. | 0.178 | 6.41 | 1.676s |
| RU-103 | 2440.31 | 610.30 | 502. | 0. | 0.000 | 1000.00 | 1.297s |
| AG-108M | 2456.25 | 614.28 | 502. | 0. | 0.000 | 1000.00 | 1.301s |
| PM-144 | 2471.37 | 618.06 | 479. | 12. | 0.007 | 259.61 | 1.304s |
| RH-106 | 2486.79 | 621.92 | 467. | 11. | 0.006 | 276.13 | 1.308s |
| SB-125 | 2542.69 | 635.89 | 70. | -17. | -0.010 | 72.99 | 1.320 |
| I-131 | 2547.03 | 636.97 | 82. | 2. | 0.001 | 593.27 | 1.321s |
| AG-110M | 2630.18 | 657.76 | 42. | 12. | 0.007 | 79.65 | 1.339s |
| CS-137 | 2645.77 | 661.66 | 110. | -17. | -0.010 | 88.32 | 1.343s |
| PM-144 | 2785.32 | 696.54 | 43. | -2. | -0.001 | 579.58 | 1.374 |
| NB-94 | 2809.67 | 702.63 | 26. | 12. | 0.007 | 93.31 | 1.379s |
| SB-124 | 2890.31 | 722.79 | 181. | -19. | -0.011 | 100.57 | 1.396s |
| AG-108M | 2890.91 | 722.94 | 162. | -19. | -0.011 | 95.30 | 1.397s |
| EU-154 | 2892.59 | 723.36 | 142. | -19. | -0.011 | 89.70 | 1.397s |
| ZR-95 | 2895.96 | 724.20 | 113. | 4. | 0.002 | 402.35 | 1.398s |
| BI-212 | 2906.08 | 726.73 | 10. | 69. | 0.038 | 15.36 | 1.562s |
| pm-146 | 2942.05 | 735.72 | 52. | -17. | -0.009 | 90.16 | 1.408s |
| pm-146 | 2987.81 | 747.16 | 48. | -11. | -0.006 | 135.62 | 1.417s |
| ZR-95 | 3026.09 | 756.73 | 17. | 2. | 0.001 | 425.82 | 1.426s |
| AG-110M | 3054.96 | 763.94 | 58. | -12. | -0.007 | 91.04 | 1.432s |
| NB-95 | 3062.34 | 765.79 | 78. | 14. | 0.008 | 90.32 | 1.433s |
| PA-234M | 3064.83 | 766.41 | 98. | -19. | -0.011 | 77.17 | 1.434s |
| EU-152 | 3114.87 | 778.92 | 22. | 7. | 0.004 | 134.73 | 1.444s |
| BI-212 | 3142.96 | 785.94 | 8. | 41. | 0.023 | 22.50 | 1.416s |
| CS-134 | 3182.67 | 795.87 | 35. | 14. | 0.008 | 87.83 | 1.459s |
| CS-134 | 3207.01 | 801.95 | 56. | -18. | -0.010 | 93.12 | 1.464s |
| CO-58 | 3242.31 | 810.77 | 48. | 11. | 0.006 | 90.19 | 1.471s |
| La-140 | 3262.30 | 815.77 | 59. | 3. | 0.002 | 359.34 | 1.475s |
| MN-54 | 3338.63 | 834.85 | 28. | 13. | 0.007 | 92.70 | 1.492s |
| Co-56 | 3386.32 | 846.77 | 42. | -6. | -0.003 | 232.74 | 1.501s |
| TL-208 | 3438.50 | 859.81 | 8. | 41. | 0.023 | 22.50 | 2.620s |
| NB-94 | 3483.65 | 871.10 | 37. | 2. | 0.001 | 524.21 | 1.522s |
| EU-154 | 3492.19 | 873.23 | 26. | 11. | 0.006 | 74.28 | 1.523s |
| PA-234 | 3521.39 | 880.53 | 92. | -16. | -0.009 | 88.42 | 1.529s |
| PA-234 | 3532.24 | 883.24 | 107. | -7. | -0.004 | 227.28 | 1.531s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AG-110M | 3538.01 | 884.68 | 114. | 0. | 0.000 | 1000.00 | 1.533s |
| Sc-46 | 3556.40 | 889.28 | 96. | 14. | 0.008 | 101.58 | 1.536s |
| y-88 | 3591.45 | 898.04 | 19. | 11. | 0.006 | 90.67 | 1.543s |
| AC-228 | 3642.69 | 910.85 | 0. | 157. | 0.087 | 7.98 | 1.521 |
| AG-110M | 3749.30 | 937.49 | 42. | -11. | -0.006 | 128.56 | 1.576s |
| PA-234 | 3783.42 | 946.02 | 14. | 10. | 0.005 | 89.36 | 1.582s |
| EU-152 | 3855.80 | 964.11 | 22. | 21. | 0.012 | 38.93 | 1.597D |
| AC-228 | 3875.25 | 968.97 | 22. | 95. | 0.053 | 12.39 | 1.600D |
| EU-154 | 3984.71 | 996.33 | 41. | 11. | 0.006 | 85.28 | 1.622s |
| PA-234M | 4003.39 | 1001.00 | 38. | 9. | 0.005 | 105.96 | 1.626s |
| EU-154 | 4018.51 | 1004.77 | 72. | -13. | -0.007 | 99.12 | 1.629s |
| Co-56 | 4150.81 | 1037.84 | 30. | -3. | -0.002 | 405.52 | 1.655s |
| Cs-136 | 4191.74 | 1048.07 | 20. | 8. | 0.004 | 127.88 | 1.663s |
| RH-106 | 4200.91 | 1050.36 | 34. | 6. | 0.003 | 143.37 | 1.665 |
| BI-207 | 4254.12 | 1063.66 | 30. | -6. | -0.003 | 204.80 | 1.675s |
| Ga-68 | 4309.10 | 1077.40 | 15. | 24. | 0.013 | 40.93 | 1.685s |
| FE-59 | 4396.54 | 1099.25 | 20. | -7. | -0.004 | 145.45 | 1.702s |
| ZN-65 | 4461.74 | 1115.55 | 121. | 0. | 0.000 | 1000.00 | 1.714s |
| BI-214 | 4479.97 | 1120.10 | 9. | 78. | 0.043 | 14.48 | 1.095s |
| Sc-46 | 4481.77 | 1120.55 | 120. | -13. | -0.007 | 122.35 | 1.718s |
| CO-60 | 4692.60 | 1173.24 | 40. | -9. | -0.005 | 158.05 | 1.757s |
| Ta-182 | 4755.88 | 1189.05 | 30. | 2. | 0.001 | 606.22 | 1.769 |
| Ta-182 | 4885.38 | 1221.41 | 21. | 12. | 0.007 | 88.83 | 1.792 |
| Co-56 | 4952.89 | 1238.28 | 37. | 16. | 0.009 | 92.18 | 1.805s |
| NA-22 | 5097.96 | 1274.53 | 11. | 9. | 0.005 | 61.17 | 1.831 |
| EU-154 | 5098.01 | 1274.54 | 20. | 3. | 0.002 | 196.27 | 1.831 |
| FE-59 | 5166.25 | 1291.60 | 43. | -18. | -0.010 | 87.34 | 1.843s |
| CO-60 | 5329.96 | 1332.50 | 16. | 8. | 0.004 | 119.02 | 1.871s |
| AG-110M | 5537.26 | 1384.30 | 11. | 8. | 0.005 | 95.58 | 1.907s |
| EU-152 | 5632.13 | 1408.00 | 21. | -5. | -0.003 | 201.56 | 1.923s |
| K-40 | 5843.21 | 1460.74 | 0. | 336. | 0.187 | 5.46 | 1.571 |
| La-140 | 6385.44 | 1596.21 | 28. | -13. | -0.007 | 97.55 | 2.044s |
| SB-124 | 6764.81 | 1690.98 | 6. | 1. | 0.001 | 427.57 | 2.102s |
| BI-214 | 7058.85 | 1764.44 | 0. | 74. | 0.041 | 11.62 | 1.582s |
| Co-56 | 7086.53 | 1771.35 | 74. | 0. | 0.000 | 1000.00 | 2.149s |
| y-88 | 7345.59 | 1836.06 | 6. | 0. | 0.000 | 1000.00 | 2.185s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | C | -9.2993E-01 | | | | | 5.31E+01 | |
| | | | 477.60 | -9.299E-01 | ?( | 1.408E+01 | 4.36E+02 1.05E+01 | G |
| NA-22 | C | 6.5008E-01 | | | | | 9.50E+02 | |
| | | | 1274.53 | 6.501E-01 | ?( | 1.294E+00 | 6.12E+01 9.99E+01 | G |
| K-40 | N | 2.5433E+02 | | | | | 4.66E+11 | |
| | | | 1460.83 | 2.543E+02 | ( | 5.579E+00 | 5.46E+00 1.07E+01 | G |
| Sc-46 | F | 7.5955E-01 | | | | | 8.38E+01 | |
| | | | 889.28 | 7.596E-01 | ?( | 2.599E+00 | 1.02E+02 1.00E+02 | G |
| | | | 1120.55 | -8.438E-01 | + | 3.489E+00 | 1.22E+02 1.00E+02 | G |
| CR-51 | F | 1.1586E+00 | | | | | 2.77E+01 | |
| | | | 320.08 | 1.159E+00 | ?( | 1.414E+01 | 3.56E+02 9.94E+00 | G |
| MN-54 | C | 6.4858E-01 | | | | | 3.12E+02 | |
| | | | 834.85 | 6.486E-01 | ?( | 1.397E+00 | 9.27E+01 1.00E+02 | G |
| FE-59 | F | -7.9146E-01 | | | | | 4.45E+01 | |
| | | | 1099.25 | -7.915E-01 | ?( | 2.663E+00 | 1.45E+02 5.65E+01 | G |
| | | | 1291.60 | -2.983E+00 | + | 5.597E+00 | 8.73E+01 4.32E+01 | G |
| Co-56 | C | 4.7827E-01 | | | | | 7.73E+01 | |
| | | | 846.77 | -3.100E-01 | ?( | 1.700E+00 | 2.33E+02 9.99E+01 | G |
| | | | 1238.28 | 1.671E+00 | ?( | 3.325E+00 | 9.22E+01 6.61E+01 | G |
| | | | 1037.84 | -1.294E+00 | + | 1.218E+01 | 4.06E+02 1.41E+01 | G |
| | | | 1771.35 | 0.000E+00 | - | 2.621E+01 | 1.00E+03 1.55E+01 | A |
| CO-58 | C | 5.7330E-01 | | | | | 7.09E+01 | |
| | | | 810.78 | 5.733E-01 | ?( | 1.745E+00 | 9.02E+01 9.95E+01 | G |
| CO-60 | F | 5.9888E-01 | | | | | 1.93E+03 | |
| | | | 1332.50 | 5.989E-01 | &( | 1.598E+00 | 1.19E+02 1.00E+02 | G |
| | | | 1173.24 | -6.071E-01 | + | 2.171E+00 | 1.58E+02 9.99E+01 | G |
| NB-94 | I | 5.3263E-01 | | | | | 7.41E+06 | |
| | | | 702.63 | 5.326E-01 | &( | 1.201E+00 | 9.33E+01 9.79E+01 | G |
| | | | 871.10 | 8.815E-02 | - | 1.649E+00 | 5.24E+02 9.99E+01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| ZR-95 | I 2.7073E-01 | | | | | 6.40E+01 | |
| | | 756.73 | 1.752E-01 | ?( | 1.914E+00 | 4.26E+02 | 5.45E+01 G |
| | | 724.20 | 3.886E-01 | ?( | 5.389E+00 | 4.02E+02 | 4.42E+01 G |
| NB-95 | I 6.9157E-01 | | | | | 6.40E+01 | |
| | | 765.79 | 6.916E-01 | &( | 2.098E+00 | 9.03E+01 | 9.98E+01 G |
| RU-103 | I 3.7030E-02 | | | | | 3.93E+01 | |
| | | 497.05 | 3.703E-02 | %( | 1.076E+00 | 1.11E+03 | 9.09E+01 G |
| | | 610.30 | 0.000E+00 | - | 7.386E+01 | 1.00E+03 | 5.75E+00 GA |
| RH-106 | I 7.1156E+00 | | | | | 3.74E+02 | |
| | | 621.92 | 4.515E+00 | ?( | 4.193E+01 | 2.76E+02 | 9.93E+00 G |
| | | 1050.36 | 2.367E+01 | ( | 1.179E+02 | 1.43E+02 | 1.56E+00 G |
| | | 511.86 | 1.263E+01 | ? | 8.758E+00 | 3.78E+01 | 2.00E+01 GA |
| AG-108M | C 4.5659E-01 | | | | | 1.53E+05 | |
| | | 433.94 | 4.566E-01 | ?( | 1.123E+00 | 9.47E+01 | 9.05E+01 G |
| | | 722.94 | -9.714E-01 | + | 3.098E+00 | 9.53E+01 | 9.08E+01 G |
| | | 614.28 | 0.000E+00 | & | 4.752E+00 | 1.00E+03 | 8.98E+01 G |
| AG-110M | F 6.0670E-01 | | | | | 2.50E+02 | |
| | | 884.68 | 0.000E+00 | ?( | 3.862E+00 | 1.00E+03 | 7.27E+01 G |
| | | 657.76 | 5.482E-01 | &( | 1.464E+00 | 7.96E+01 | 9.46E+01 G |
| | | 937.49 | -1.796E+00 | + | 5.372E+00 | 1.29E+02 | 3.44E+01 G |
| | | 1384.30 | 2.650E+00 | ?( | 5.702E+00 | 9.56E+01 | 2.43E+01 G |
| | | 763.94 | -2.665E+00 | + | 8.177E+00 | 9.10E+01 | 2.23E+01 G |
| SN-113 | F 6.4210E-01 | | | | | 1.15E+02 | |
| | | 391.69 | 6.421E-01 | &( | 2.682E+00 | 1.24E+02 | 6.40E+01 G |
| SB-124 | F 3.6985E-01 | | | | | 6.02E+01 | |
| | | 602.73 | 4.260E-01 | ?( | 4.235E+00 | 2.96E+02 | 9.83E+01 G |
| | | 1690.98 | 2.545E-01 | ?( | 2.634E+00 | 4.28E+02 | 4.78E+01 G |
| | | 722.79 | -8.160E+00 | & | 2.748E+01 | 1.01E+02 | 1.08E+01 G |
| SB-125 | I 2.1164E+00 | | | | | 1.01E+03 | |
| | | 427.88 | 3.366E-01 | ?( | 3.878E+00 | 4.33E+02 | 2.96E+01 G |
| | | 600.50 | 2.777E+00 | &( | 2.294E+01 | 2.46E+02 | 1.79E+01 G |
| | | 635.89 | -6.223E+00 | + | 1.511E+01 | 7.30E+01 | 1.13E+01 G |
| | | 463.37 | 6.022E+00 | &( | 1.412E+01 | 7.07E+01 | 1.05E+01 G |
| I-131 | I 3.7715E-01 | | | | | 8.02E+00 | |
| | | 364.48 | 3.010E-01 | ?( | 1.125E+00 | 1.42E+02 | 8.17E+01 G |
| | | 284.30 | -1.767E+00 | + | 1.988E+01 | 4.32E+02 | 6.14E+00 G |
| | | 636.97 | 1.245E+00 | ?( | 2.573E+01 | 5.93E+02 | 7.17E+00 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Gd-153 | F | 1.1036E+00 | | | | | 2.42E+02 | |
| | | | 97.50 | 9.235E-01 | &( | 3.500E+00 | 1.13E+02 | 3.00E+01 G |
| | | | 103.20 | 1.351E+00 | ?( | 5.504E+00 | 1.22E+02 | 2.18E+01 G |
| Ga-68 | C | 5.3351E+01 | | | | | 4.71E-02 | |
| | | | 1077.40 | 5.335E+01 | ?( | 4.614E+01 | 4.09E+01 | 3.30E+00 G |
| Tc-99m | I | -3.8106E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | -3.811E-01 | &( | 1.665E+00 | 1.31E+02 | 8.93E+01 G |
| BA-133 | F | -7.2067E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -7.207E-01 | ?( | 4.879E+00 | 2.02E+02 | 6.20E+01 G |
| | | | 302.85 | -2.372E-07 | % | 1.133E+01 | 1.41E+09 | 1.83E+01 G |
| | | | 383.84 | 4.784E+00 | & | 1.852E+01 | 1.15E+02 | 8.94E+00 GA |
| | | | 80.99 | -1.200E+00 | + | 3.668E+00 | 1.09E+02 | 3.41E+01 GA |
| CS-134 | I | 4.9654E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | 0.000E+00 | ?( | 4.319E+00 | 1.00E+03 | 9.76E+01 G |
| | | | 795.87 | 8.237E-01 | ?( | 1.731E+00 | 8.78E+01 | 8.55E+01 G |
| | | | 569.32 | 1.829E+00 | @( | 8.656E+00 | 1.38E+02 | 1.54E+01 G |
| | | | 801.95 | -1.003E+01 | + | 2.137E+01 | 9.31E+01 | 8.69E+00 G |
| | | | 563.24 | 0.000E+00 | - | 1.781E+01 | 1.00E+03 | 8.35E+00 G |
| CS-137 | I | -8.6744E-01 | | | | | 1.10E+04 | |
| | | | 661.66 | -8.674E-01 | ?( | 2.565E+00 | 8.83E+01 | 8.52E+01 G |
| CE-139 | F | -4.4850E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | -4.485E-01 | *( | 1.684E+00 | 1.12E+02 | 7.99E+01 G |
| Ba-140 | I | 1.7931E+00 | | | | | 1.28E+01 | |
| | | | 537.26 | 1.777E+00 | &( | 4.268E+00 | 9.59E+01 | 2.44E+01 G |
| | | | 162.66 | 1.855E+00 | ?( | 2.146E+01 | 3.43E+02 | 6.22E+00 G |
| | | | 304.85 | 1.019E-06 | & | 4.867E+01 | 1.41E+09 | 4.29E+00 G |
| La-140 | I | 2.8237E-02 | | | | | 1.28E+01 | |
| | | | 1596.21 | -1.215E+00 | ?( | 2.507E+00 | 9.75E+01 | 9.54E+01 G |
| | | | 487.02 | 9.463E-01 | + | 2.447E+00 | 1.04E+02 | 4.55E+01 G |
| | | | 328.76 | 5.148E+00 | &( | 4.857E+00 | 3.85E+01 | 2.03E+01 G |
| | | | 815.77 | 6.585E-01 | ?( | 8.281E+00 | 3.59E+02 | 2.33E+01 G |
| CE-141 | I | -5.7749E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | -5.775E-01 | ?( | 3.010E+00 | 1.56E+02 | 4.82E+01 G |
| CE-144 | I | -3.3078E+00 | | | | | 2.85E+02 | |
| | | | 133.54 | -3.308E+00 | ( | 1.506E+01 | 1.37E+02 | 1.11E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| PM-144 | C | 1.9063E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | -1.039E-01 | &( | 1.487E+00 | 5.80E+02 | 9.90E+01 G |
| | | | 618.06 | 4.849E-01 | ?( | 4.232E+00 | 2.60E+02 | 9.91E+01 G |
| EU-152 | F | 3.7627E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | 1.378E+00 | &( | 8.647E+00 | 1.87E+02 | 2.65E+01 G |
| | | | 1112.07 | 1.576E-01 | % | 2.548E+01 | 4.66E+03 | 1.36E+01 G |
| | | | 121.78 | 4.629E-01 | } | 2.128E+00 | 1.37E+02 | 2.86E+01 G |
| | | | 778.92 | 2.735E+00 | ?( | 9.099E+00 | 1.35E+02 | 1.29E+01 G |
| | | | 964.11 | 8.153E+00 | ( | 9.701E+00 | 3.89E+01 | 1.46E+01 G |
| | | | 244.69 | 5.395E+00 | ?( | 3.849E+01 | 2.14E+02 | 7.58E+00 G |
| | | | 1408.00 | -1.989E+00 | + | 9.038E+00 | 2.02E+02 | 2.10E+01 GA |
| EU-154 | I | 5.3605E+00 | | | | | 3.14E+03 | |
| | | | 873.23 | 4.571E+00 | ?( | 1.136E+01 | 7.43E+01 | 1.23E+01 G |
| | | | 123.10 | 6.706E-01 | - | 2.364E+00 | 1.05E+02 | 4.08E+01 G |
| | | | 1274.54 | 6.824E-01 | - | 4.793E+00 | 1.96E+02 | 3.52E+01 G |
| | | | 723.36 | -4.367E+00 | - | 1.310E+01 | 8.97E+01 | 2.02E+01 G |
| | | | 1004.77 | -4.175E+00 | - | 1.397E+01 | 9.91E+01 | 1.80E+01 G |
| | | | 996.33 | 6.275E+00 | &( | 1.803E+01 | 8.53E+01 | 1.06E+01 G |
| HF-181 | F | 7.4060E-01 | | | | | 4.24E+01 | |
| | | | 482.00 | 5.294E-01 | ( | 1.735E+00 | 9.72E+01 | 8.05E+01 G |
| | | | 133.02 | -8.456E-01 | + | 3.780E+00 | 1.34E+02 | 4.33E+01 G |
| | | | 345.83 | 0.000E+00 | & | 1.556E+01 | 1.00E+03 | 1.51E+01 G |
| | | | 136.30 | 3.648E+00 | ?( | 2.694E+01 | 2.20E+02 | 5.85E+00 G |
| Ta-182 | F | 1.3282E+00 | | | | | 1.14E+02 | |
| | | | 1121.30 | 9.302E-02 | %( | 9.577E+00 | 2.96E+03 | 3.49E+01 G |
| | | | 1221.41 | 3.217E+00 | ( | 6.252E+00 | 8.88E+01 | 2.70E+01 G |
| | | | 1189.05 | 8.412E-01 | ( | 1.188E+01 | 6.06E+02 | 1.62E+01 G |
| Hg-203 | F | -5.0093E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | -5.009E-01 | ?( | 1.910E+00 | 1.14E+02 | 8.15E+01 G |
| TL-208 | N | 9.0924E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 9.092E+00 | ( | 1.387E+00 | 9.71E+00 | 8.45E+01 G |
| | | | 277.28 | 1.855E+01 | + | 1.397E+01 | 3.31E+01 | 6.31E+00 G |
| | | | 860.56 | 1.713E+01 | + | 6.808E+00 | 2.25E+01 | 1.24E+01 G |
| pm-146 | C | -1.4637E+00 | | | | | 2.02E+03 | |
| | | | 747.16 | -1.464E+00 | ?( | 4.787E+00 | 1.36E+02 | 3.40E+01 G |
| | | | 735.72 | -3.472E+00 | & | 7.437E+00 | 9.02E+01 | 2.25E+01 G |
| | | | 453.88 | -3.855E-01 | + | 1.927E+00 | 1.99E+02 | 6.50E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| y-88 | F | 6.2046E-01 | | | | | 1.07E+02 | |
| | | | 898.04 | 6.205E-01 | ?( | 1.320E+00 | 9.07E+01 | 9.37E+01 G |
| | | | 1836.06 | 0.000E+00 | - | 1.391E+00 | 1.00E+03 | 9.92E+01 G |
| Cd-113m | | 5.7518E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | 5.752E+03 | ?( | 1.900E+04 | 9.84E+01 | 6.00E-03 K |
| Cd-109 | F | 1.0075E+01 | | | | | 4.53E+02 | |
| | | | | | | | Derived Ave Activity | |
| | | | 88.04 | 1.007E+01 | }( | 5.649E+01 | 1.68E+02 | 3.79E+00 G |
| Cf-251 | T | 1.1213E+00 | | | | | 3.28E+05 | |
| | | | 176.60 | 1.121E+00 | *( | 6.122E+00 | 2.02E+02 | 1.70E+01 G |
| | | | 227.00 | 4.439E+00 | | 1.597E+01 | 1.33E+02 | 6.30E+00 GA |
| Cf-249 | T | 8.8626E-01 | | | | | 1.28E+05 | |
| | | | 387.95 | 4.786E-01 | &( | 2.650E+00 | 1.64E+02 | 6.60E+01 G |
| | | | 333.44 | 2.621E+00 | ?( | 6.908E+00 | 1.02E+02 | 1.55E+01 G |
| Sn-126 | | -2.4011E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | 1.020E+00 | } | 5.652E+00 | 8.31E+01 | 3.75E+01 GA |
| | | | 64.28 | -2.401E+00 | ?( | 2.002E+01 | 2.49E+02 | 9.70E+00 G |
| | | | 86.94 | 4.241E+00 | } | 2.370E+01 | 8.29E+01 | 9.04E+00 GA |
| PB-210 | N | 1.1039E+00 | | | | | 8.14E+03 | |
| | | | 46.54 | 1.104E+00 | %(P | 4.520E+01 | 1.42E+03 | 4.25E+00 G |
| PB-212 | N | 2.6509E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 2.651E+01 | ( | 2.384E+00 | 4.82E+00 | 4.33E+01 G |
| | | | 300.03 | 4.692E+01 | + | 2.220E+01 | 2.12E+01 | 3.28E+00 GA |
| PB-214 | N | 3.2126E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 3.079E+01 | ( | 2.713E+00 | 5.92E+00 | 3.76E+01 G |
| | | | 295.09 | 3.473E+01 | ( | 4.827E+00 | 8.27E+00 | 1.93E+01 G |
| | | | 242.00 | 2.203E+01 | & | 3.594E+01 | 4.97E+01 | 7.43E+00 GA |
| BI-207 | C | 1.9836E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | 1.984E-01 | *( | 1.380E+00 | 2.00E+02 | 9.77E+01 G |
| | | | 1063.66 | -5.008E-01 | + | 2.357E+00 | 2.05E+02 | 7.45E+01 G |
| BI-212 | N | 4.1717E+01 | | | | | 6.98E+02 | |
| | | | 727.17 | 4.172E+01 | *( | 1.055E+01 | 1.54E+01 | 7.55E+00 G |
| | | | 785.42 | 1.543E+02 | + | 6.134E+01 | 2.25E+01 | 1.28E+00 GA |
| BI-214 | N | 2.7578E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 2.758E+01 | ( | 2.111E+00 | 6.41E+00 | 4.61E+01 G |
| | | | 1120.29 | 3.352E+01 | + | 7.172E+00 | 1.45E+01 | 1.51E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 1764.49 | 4.541E+01 | + | 4.523E+00 | 1.16E+01 | 1.54E+01 G |
| BI-210M | T | -7.8758E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | -7.876E-01 | ?( | 2.626E+00 | 9.96E+01 | 5.00E+01 G |
| | | | 304.90 | -1.561E-07 | & | 7.458E+00 | 1.41E+09 | 2.80E+01 G |
| AC-228 | N | 3.0846E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.967E+01 | ( | 1.393E+00 | 7.98E+00 | 2.90E+01 G |
| | | | 968.97 | 3.139E+01 | ( | 8.087E+00 | 1.24E+01 | 1.75E+01 G |
| | | | 338.32 | 3.290E+01 | @( | 8.744E+00 | 1.43E+01 | 1.20E+01 G |
| | | | 93.35 | 6.822E+00 | - | 3.712E+01 | 1.63E+02 | 5.56E+00 XA |
| TH-227 | N | -1.4236E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | -1.424E+00 | &( | 2.107E+01 | 5.17E+02 | 8.00E+00 G |
| | | | 256.24 | -3.337E+00 | + | 1.578E+01 | 1.74E+02 | 7.00E+00 G |
| TH-229 | N | 4.5230E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | 4.523E+00 | ?( | 2.306E+01 | 1.88E+02 | 4.40E+00 G |
| | | | 210.85 | -1.548E+01 | + | 4.288E+01 | 1.04E+02 | 2.99E+00 G |
| TH-234 | N | 3.1917E+01 | | | | | 1.63E+12 | |
| | | | 63.29 | 3.192E+01 | (P | 3.119E+01 | 3.10E+01 | 3.81E+00 G |
| | | | 92.59 | 1.841E+01 | - P | 1.845E+01 | 3.16E+01 | 5.58E+00 G |
| PA-231 | N | -9.2282E+00 | | | | | 1.20E+07 | |
| | | | 302.65 | -9.228E+00 | ?( | 7.322E+01 | 2.36E+02 | 2.88E+00 G |
| | | | 300.07 | -1.702E+01 | + | 8.917E+01 | 1.56E+02 | 2.46E+00 G |
| PA-233 | C | -1.2967E+00 | | | | | 7.82E+08 | |
| | | | 312.01 | -1.297E+00 | ?( | 4.537E+00 | 1.04E+02 | 3.60E+01 G |
| | | | 300.18 | -6.757E+00 | & | 3.460E+01 | 1.53E+02 | 6.20E+00 G |
| PA-234 | N | 5.5605E-01 | | | | | 1.63E+12 | |
| | | | 131.29 | -2.022E+00 | *( | 8.874E+00 | 1.32E+02 | 1.80E+01 G |
| | | | 946.02 | 4.019E+00 | ?( | 8.495E+00 | 8.94E+01 | 1.34E+01 G |
| | | | 569.47 | 0.000E+00 | - | 1.733E+01 | 1.00E+03 | 8.20E+00 G |
| | | | 883.24 | -3.644E+00 | + | 2.839E+01 | 2.27E+02 | 9.60E+00 G |
| | | | 880.53 | -1.417E+01 | + | 4.200E+01 | 8.84E+01 | 6.00E+00 GA |
| PA-234M | N | 6.1613E+01 | | | | | 1.63E+12 | |
| | | | 1001.00 | 6.161E+01 | &( | 2.230E+02 | 1.06E+02 | 8.37E-01 G |
| | | | 766.41 | -3.078E+02 | & | 7.912E+02 | 7.72E+01 | 2.94E-01 G |
| U-235 | N | -4.2156E-01 | | | | | 2.57E+11 | |
| | | | 143.79 | -4.216E-01 | ( | 1.299E+01 | 9.13E+02 | 1.10E+01 G |
| | | | 205.33 | -1.797E+00 | + | 2.159E+01 | 4.41E+02 | 5.01E+00 G |
| | | | 163.38 | 0.000E+00 | + | 2.664E+01 | 1.00E+03 | 5.08E+00 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

AM-241   T   1.2952E+00                                      1.58E+05
                           59.54 1.295E+00 ?(  4.088E+00 1.12E+02 3.59E+01 G

Np-237   F   2.7100E+00                                      2.14E+06
                                                            Derived Ave Activity
                           86.49 2.710E+00 }(  1.617E+01 1.79E+02 1.31E+01 G

Ir-192   F   6.4657E-01                                      7.40E+01
                          316.49 4.516E-01 &(  1.525E+00 1.01E+02 8.70E+01 G
                          468.06 6.324E-01 ?(  3.573E+00 1.66E+02 5.18E+01 G
                          308.44 1.204E+00 ?(  5.673E+00 1.40E+02 3.18E+01 G

Cs-136   F   3.9839E-01                                      1.30E+01
                          818.50 1.674E-02 %(  2.004E+00 3.39E+03 1.00E+02 G
                         1048.07 6.144E-01 ?(  1.809E+00 1.28E+02 8.00E+01 G
                          340.57 8.437E-01 ?(  4.760E+00 1.68E+02 4.69E+01 G

Np-239   T   1.2607E+00                                      2.36E+00
                          103.70 5.815E-01 ?   4.826E+00 2.46E+02 2.40E+01 X
                          106.13 1.261E+00 ?(  5.058E+00 1.20E+02 2.27E+01 G
                           99.50 0.000E+00 -   7.215E+00 1.00E+03 1.50E+01 X

Nd-147       3.0759E+00                                      1.11E+01
                          531.00 3.076E+00 &(  7.469E+00 9.66E+01 1.30E+01 G
                           91.10 1.298E-01 %   7.543E+00 1.74E+03 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
```

I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| TH-227 | 50.14 | 234. | -5. | -0.003 | 516.91 | -1.424E+00 |
| AM-241 | 59.54 | 282. | 26. | 0.014 | 111.93 | 1.295E+00 |
| BA-133 | 80.99 | 354. | -30. | -0.016 | 108.61 | -1.200E+00 |
| EU-155 | 86.54 | 1244. | -29. | -0.016 | 174.32 | -1.251E+00 |
| Gd-153 | 97.50 | 290. | 22. | 0.012 | 113.27 | 9.235E-01 |
| Gd-153 | 103.20 | 391. | 23. | 0.013 | 121.83 | 1.351E+00 |
| Np-239 | 103.70 | 364. | 11. | 0.006 | 246.22 | 5.815E-01 |
| Np-239 | 106.13 | 359. | 23. | 0.013 | 119.97 | 1.261E+00 |
| EU-154 | 123.10 | 246. | 22. | 0.012 | 105.38 | 6.706E-01 |
| PA-234 | 131.29 | 674. | -28. | -0.016 | 131.64 | -2.022E+00 |
| HF-181 | 133.02 | 702. | -28. | -0.016 | 134.07 | -8.456E-01 |
| CE-144 | 133.54 | 730. | -28. | -0.016 | 136.60 | -3.308E+00 |
| HF-181 | 136.30 | 638. | 16. | 0.009 | 220.46 | 3.648E+00 |
| Tc-99m | 140.51 | 519. | -25. | -0.014 | 130.82 | -3.811E-01 |
| U-235 | 143.79 | 494. | -3. | -0.002 | 913.13 | -4.216E-01 |
| CE-141 | 145.44 | 508. | -21. | -0.011 | 155.74 | -5.775E-01 |
| Ba-140 | 162.66 | 372. | 8. | 0.004 | 342.78 | 1.855E+00 |
| CE-139 | 165.85 | 382. | -25. | -0.014 | 112.46 | -4.485E-01 |
| Cf-251 | 176.60 | 203. | 13. | 0.007 | 202.29 | 1.121E+00 |
| U-235 | 205.33 | 173. | -5. | -0.003 | 441.41 | -1.797E+00 |
| Cf-251 | 227.00 | 127. | 15. | 0.009 | 133.09 | 4.439E+00 |
| TH-227 | 256.24 | 127. | -12. | -0.006 | 174.15 | -3.337E+00 |
| Cd-113m | 263.70 | 129. | 17. | 0.009 | 98.41 | 5.752E+03 |
| BI-210M | 265.83 | 172. | -19. | -0.011 | 99.56 | -7.876E-01 |
| Hg-203 | 279.20 | 226. | -19. | -0.011 | 113.70 | -5.009E-01 |
| I-131 | 284.30 | 132. | -5. | -0.003 | 432.20 | -1.767E+00 |
| PA-231 | 300.07 | 409. | -18. | -0.010 | 156.28 | -1.702E+01 |
| PA-233 | 300.18 | 390. | -19. | -0.010 | 152.75 | -6.757E+00 |
| PA-231 | 302.65 | 372. | -12. | -0.006 | 235.56 | -9.228E+00 |
| Ir-192 | 308.44 | 260. | 17. | 0.009 | 140.18 | 1.204E+00 |
| PA-233 | 312.01 | 209. | -20. | -0.011 | 104.49 | -1.297E+00 |
| Ir-192 | 316.49 | 132. | 17. | 0.009 | 100.55 | 4.516E-01 |
| CR-51 | 320.08 | 146. | 5. | 0.003 | 356.27 | 1.159E+00 |
| La-140 | 328.76 | 66. | 43. | 0.024 | 38.50 | 5.148E+00 |
| Cf-249 | 333.44 | 77. | 17. | 0.009 | 102.24 | 2.621E+00 |
| Cs-136 | 340.57 | 346. | 16. | 0.009 | 167.90 | 8.437E-01 |
| BA-133 | 356.00 | 602. | -17. | -0.010 | 202.14 | -7.207E-01 |
| I-131 | 364.48 | 48. | 9. | 0.005 | 142.21 | 3.010E-01 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BA-133 | 383.84 | 153. | 16. | 0.009 | 115.07 | 4.784E+00 | |
| Cf-249 | 387.95 | 169. | 11. | 0.006 | 163.55 | 4.786E-01 | |
| SN-113 | 391.69 | 160. | 15. | 0.008 | 123.94 | 6.421E-01 | |
| AG-108M | 433.94 | 44. | 14. | 0.008 | 94.74 | 4.566E-01 | |
| pm-146 | 453.88 | 64. | -8. | -0.004 | 198.96 | -3.855E-01 | |
| Ir-192 | 468.06 | 139. | 10. | 0.006 | 166.36 | 6.324E-01 | |
| BE-7 | 477.60 | 84. | -3. | -0.002 | 435.89 | -9.299E-01 | |
| HF-181 | 482.00 | 73. | 13. | 0.007 | 97.19 | 5.294E-01 | |
| La-140 | 487.02 | 44. | 13. | 0.007 | 103.68 | 9.463E-01 | |
| Nd-147 | 531.00 | 28. | 11. | 0.006 | 96.62 | 3.076E+00 | |
| Ba-140 | 537.26 | 32. | 12. | 0.007 | 95.90 | 1.777E+00 | |
| CS-134 | 569.32 | 50. | 8. | 0.004 | 137.60 | 1.829E+00 | |
| BI-207 | 569.70 | 51. | 5. | 0.003 | 200.05 | 1.984E-01 | |
| SB-124 | 602.73 | 491. | 11. | 0.006 | 295.59 | 4.260E-01 | |
| PM-144 | 618.06 | 479. | 12. | 0.007 | 259.61 | 4.849E-01 | |
| I-131 | 636.97 | 82. | 2. | 0.001 | 593.27 | 1.245E+00 | |
| AG-110M | 657.76 | 42. | 12. | 0.007 | 79.65 | 5.482E-01 | |
| CS-137 | 661.66 | 110. | -17. | -0.010 | 88.32 | -8.674E-01 | |
| PM-144 | 696.54 | 43. | -2. | -0.001 | 579.58 | -1.039E-01 | |
| NB-94 | 702.63 | 26. | 12. | 0.007 | 93.31 | 5.326E-01 | |
| SB-124 | 722.79 | 181. | -19. | -0.011 | 100.57 | -8.160E+00 | |
| AG-108M | 722.94 | 162. | -19. | -0.011 | 95.30 | -9.714E-01 | |
| EU-154 | 723.36 | 142. | -19. | -0.011 | 89.70 | -4.367E+00 | |
| ZR-95 | 724.20 | 113. | 4. | 0.002 | 402.35 | 3.886E-01 | |
| pm-146 | 735.72 | 52. | -17. | -0.009 | 90.16 | -3.472E+00 | |
| pm-146 | 747.16 | 48. | -11. | -0.006 | 135.62 | -1.464E+00 | |
| ZR-95 | 756.73 | 17. | 2. | 0.001 | 425.82 | 1.752E-01 | |
| AG-110M | 763.94 | 58. | -12. | -0.007 | 91.04 | -2.665E+00 | |
| NB-95 | 765.79 | 78. | 14. | 0.008 | 90.32 | 6.916E-01 | |
| PA-234M | 766.41 | 98. | -19. | -0.011 | 77.17 | -3.078E+02 | |
| CS-134 | 795.87 | 35. | 14. | 0.008 | 87.83 | 8.237E-01 | |
| CS-134 | 801.95 | 56. | -18. | -0.010 | 93.12 | -1.003E+01 | |
| CO-58 | 810.77 | 48. | 11. | 0.006 | 90.19 | 5.733E-01 | |
| La-140 | 815.77 | 59. | 3. | 0.002 | 359.34 | 6.585E-01 | |
| MN-54 | 834.85 | 28. | 13. | 0.007 | 92.70 | 6.486E-01 | |
| Co-56 | 846.77 | 42. | -6. | -0.003 | 232.74 | -3.100E-01 | |
| NB-94 | 871.10 | 37. | 2. | 0.001 | 524.21 | 8.815E-02 | |
| EU-154 | 873.23 | 26. | 11. | 0.006 | 74.28 | 4.571E+00 | |
| PA-234 | 880.53 | 92. | -16. | -0.009 | 88.42 | -1.417E+01 | |
| PA-234 | 883.24 | 107. | -7. | -0.004 | 227.28 | -3.644E+00 | |
| Sc-46 | 889.28 | 96. | 14. | 0.008 | 101.58 | 7.596E-01 | |
| y-88 | 898.04 | 19. | 11. | 0.006 | 90.67 | 6.205E-01 | |
| AG-110M | 937.49 | 42. | -11. | -0.006 | 128.56 | -1.796E+00 | |
| PA-234 | 946.02 | 14. | 10. | 0.005 | 89.36 | 4.019E+00 | |
| EU-154 | 996.33 | 41. | 11. | 0.006 | 85.28 | 6.275E+00 | |
| PA-234M | 1001.00 | 38. | 9. | 0.005 | 105.96 | 6.161E+01 | |
| EU-154 | 1004.77 | 72. | -13. | -0.007 | 99.12 | -4.175E+00 | |
| Co-56 | 1037.84 | 30. | -3. | -0.002 | 405.52 | -1.294E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Cs-136 | 1048.07 | 20. | 8. | 0.004 | 127.88 | 6.144E-01 | |
| BI-207 | 1063.66 | 30. | -6. | -0.003 | 204.80 | -5.008E-01 | |
| FE-59 | 1099.25 | 20. | -7. | -0.004 | 145.45 | -7.915E-01 | |
| Sc-46 | 1120.55 | 120. | -13. | -0.007 | 122.35 | -8.438E-01 | |
| CO-60 | 1173.24 | 40. | -9. | -0.005 | 158.05 | -6.071E-01 | |
| Ta-182 | 1189.05 | 30. | 2. | 0.001 | 606.22 | 8.412E-01 | |
| Ta-182 | 1221.41 | 21. | 12. | 0.007 | 88.83 | 3.217E+00 | |
| Co-56 | 1238.28 | 37. | 16. | 0.009 | 92.18 | 1.671E+00 | |
| NA-22 | 1274.53 | 11. | 9. | 0.005 | 61.17 | 6.501E-01 | |
| EU-154 | 1274.54 | 20. | 3. | 0.002 | 196.27 | 6.824E-01 | |
| FE-59 | 1291.60 | 43. | -18. | -0.010 | 87.34 | -2.983E+00 | |
| CO-60 | 1332.50 | 16. | 8. | 0.004 | 119.02 | 5.989E-01 | |
| AG-110M | 1384.30 | 11. | 8. | 0.005 | 95.58 | 2.650E+00 | |
| La-140 | 1596.21 | 28. | -13. | -0.007 | 97.55 | -1.215E+00 | |
| SB-124 | 1690.98 | 6. | 1. | 0.001 | 427.57 | 2.545E-01 | |

P - Peakbackground subtraction

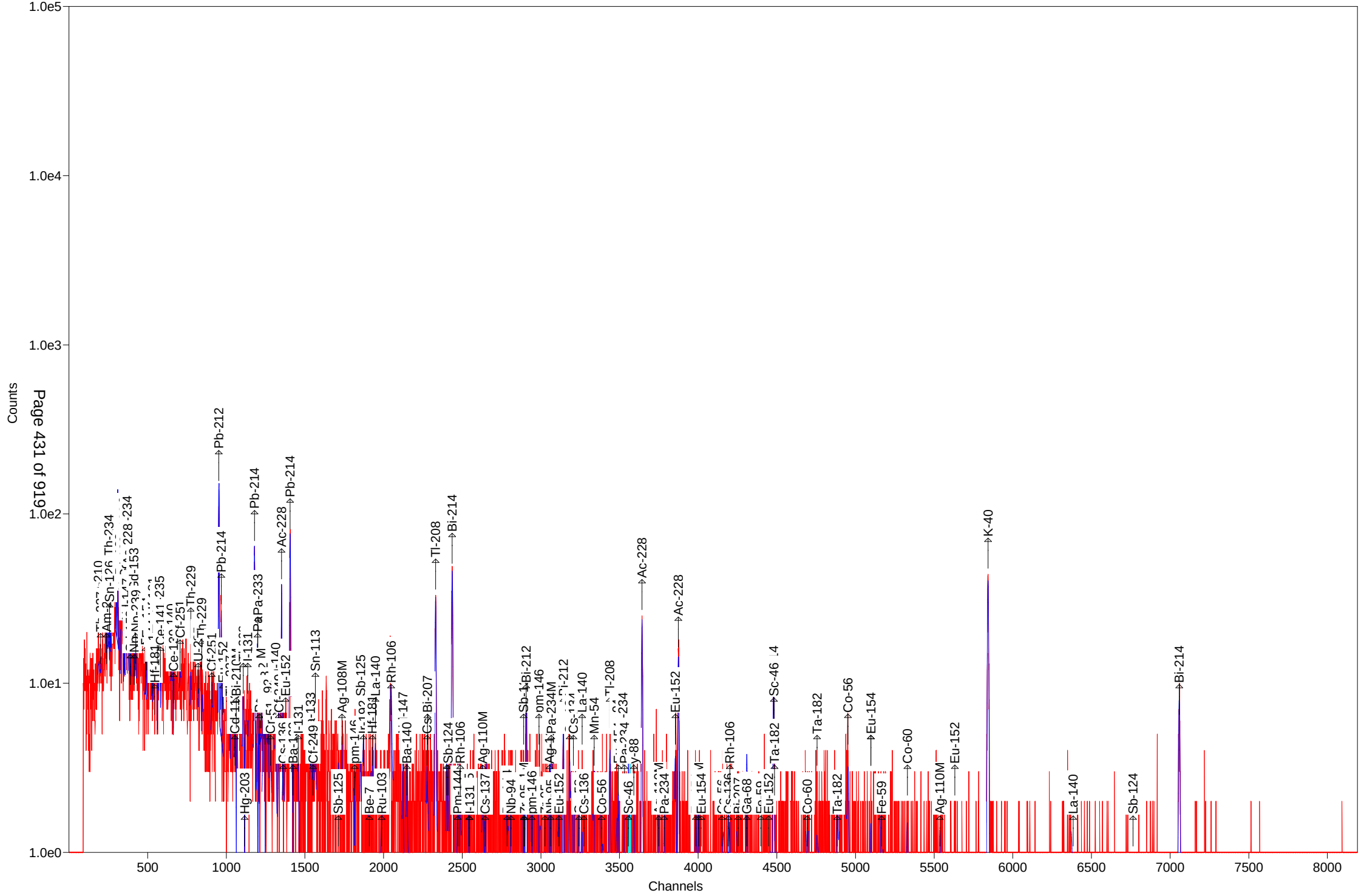
***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | -9.2993E-01 | -9.2993E-01 | 4.359E+02% | 1.41E+01 |
| NA-22 | #A | 6.5008E-01 | 6.5008E-01 | 6.117E+01% | 1.29E+00 |
| K-40 | | 2.5433E+02 | 2.5433E+02 | 5.455E+00% | 5.58E+00 |
| Sc-46 | #A | 7.5955E-01 | 7.5955E-01 | 1.016E+02% | 2.60E+00 |
| CR-51 | #A | 1.1586E+00 | 1.1586E+00 | 3.563E+02% | 1.41E+01 |
| MN-54 | #A | 6.4858E-01 | 6.4858E-01 | 9.270E+01% | 1.40E+00 |
| FE-59 | #A | -7.9146E-01 | -7.9146E-01 | 1.455E+02% | 2.66E+00 |
| Co-56 | #A | 4.7827E-01 | 4.7827E-01 | 9.218E+01% | 1.70E+00 |
| CO-57 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.46E+01 |
| CO-58 | #A | 5.7330E-01 | 5.7330E-01 | 9.019E+01% | 1.75E+00 |
| CO-60 | #A | 5.9888E-01 | 5.9888E-01 | 1.190E+02% | 1.60E+00 |
| ZN-65 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 6.90E+00 |
| NB-94 | #A | 5.3263E-01 | 5.3263E-01 | 9.331E+01% | 1.20E+00 |
| ZR-95 | #A | 2.7073E-01 | 2.7073E-01 | 2.929E+02% | 1.91E+00 |
| NB-95 | #A | 6.9157E-01 | 6.9157E-01 | 9.032E+01% | 2.10E+00 |
| RU-103 | #A | 3.7030E-02 | 3.7030E-02 | 1.112E+03% | 1.08E+00 |
| RH-106 | A | 7.1156E+00 | 7.1156E+00 | 1.434E+02% | 4.19E+01 |
| AG-108M | #A | 4.5659E-01 | 4.5659E-01 | 9.474E+01% | 1.12E+00 |
| AG-110M | #A | 6.0670E-01 | 6.0670E-01 | 7.965E+01% | 3.86E+00 |
| SN-113 | #A | 6.4210E-01 | 6.4210E-01 | 1.239E+02% | 2.68E+00 |
| SB-124 | #A | 3.6985E-01 | 3.6985E-01 | 2.599E+02% | 4.23E+00 |
| SB-125 | #A | 2.1164E+00 | 2.1164E+00 | 7.066E+01% | 3.88E+00 |
| I-131 | #A | 3.7714E-01 | 3.7715E-01 | 1.422E+02% | 1.12E+00 |
| Gd-153 | #A | 1.1036E+00 | 1.1036E+00 | 8.318E+01% | 3.50E+00 |
| Ga-68 | # | 5.3088E+01 | 5.3351E+01 | 4.093E+01% | 4.61E+01 |

| | | | | | |
|---|---|---|---|---|---|
| Tc-99m | #A | -3.8070E-01 | -3.8106E-01 | 1.308E+02% | 1.66E+00 |
| BA-133 | #A | -7.2067E-01 | -7.2067E-01 | 2.021E+02% | 4.88E+00 |
| CS-134 | #A | 4.9654E-01 | 4.9654E-01 | 8.783E+01% | 4.32E+00 |
| CS-137 | #A | -8.6744E-01 | -8.6744E-01 | 8.832E+01% | 2.56E+00 |
| CE-139 | #A | -4.4850E-01 | -4.4850E-01 | 1.125E+02% | 1.68E+00 |
| Ba-140 | #A | 1.7930E+00 | 1.7931E+00 | 9.590E+01% | 4.27E+00 |
| La-140 | #A | 2.8236E-02 | 2.8237E-02 | 3.850E+01% | 2.51E+00 |
| CE-141 | #A | -5.7749E-01 | -5.7749E-01 | 1.557E+02% | 3.01E+00 |
| CE-144 | #A | -3.3078E+00 | -3.3078E+00 | 1.366E+02% | 1.51E+01 |
| PM-144 | #A | 1.9063E-01 | 1.9063E-01 | 2.596E+02% | 1.49E+00 |
| EU-152 | A | 3.7627E+00 | 3.7627E+00 | 3.893E+01% | 8.65E+00 |
| EU-154 | #A | 5.3605E+00 | 5.3605E+00 | 5.655E+01% | 1.14E+01 |
| EU-155 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 5.53E+00 |
| HF-181 | #A | 7.4060E-01 | 7.4060E-01 | 9.719E+01% | 1.74E+00 |
| Ta-182 | #A | 1.3282E+00 | 1.3282E+00 | 8.883E+01% | 9.58E+00 |
| Hg-203 | #A | -5.0093E-01 | -5.0093E-01 | 1.137E+02% | 1.91E+00 |
| TL-208 | | 9.0924E+00 | 9.0924E+00 | 9.711E+00% | 1.39E+00 |
| pm-146 | #A | -1.4637E+00 | -1.4637E+00 | 1.356E+02% | 4.79E+00 |
| y-88 | #A | 6.2045E-01 | 6.2046E-01 | 9.067E+01% | 1.32E+00 |
| Cd-113m | #A | 5.7518E+03 | 5.7518E+03 | 9.841E+01% | 1.90E+04 |
| Cd-109 | #A | 1.0075E+01 | 1.0075E+01 | 1.683E+02% | 5.65E+01 |
| Cf-251 | #A | 1.1213E+00 | 1.1213E+00 | 2.023E+02% | 6.12E+00 |
| Cf-249 | #A | 8.8626E-01 | 8.8626E-01 | 9.644E+01% | 2.65E+00 |
| Sn-126 | #A | -2.4011E+00 | -2.4011E+00 | 2.486E+02% | 2.00E+01 |
| PB-210 | #A | 1.1039E+00 | 1.1039E+00 | 1.415E+03% | 4.52E+01 |
| PB-212 | | 2.6509E+01 | 2.6509E+01 | 4.821E+00% | 2.38E+00 |
| PB-214 | | 3.2126E+01 | 3.2126E+01 | 5.085E+00% | 2.71E+00 |
| BI-207 | #A | 1.9836E-01 | 1.9836E-01 | 2.001E+02% | 1.38E+00 |
| BI-212 | # | 4.1717E+01 | 4.1717E+01 | 1.536E+01% | 1.05E+01 |
| BI-214 | | 2.7578E+01 | 2.7578E+01 | 6.412E+00% | 2.11E+00 |
| BI-210M | #A | -7.8758E-01 | -7.8758E-01 | 9.956E+01% | 2.63E+00 |
| AC-228 | | 3.0846E+01 | 3.0846E+01 | 6.851E+00% | 1.39E+00 |
| TH-227 | #A | -1.4236E+00 | -1.4236E+00 | 5.169E+02% | 2.11E+01 |
| TH-229 | #A | 4.5230E+00 | 4.5230E+00 | 1.884E+02% | 2.31E+01 |
| TH-234 | # | 3.1917E+01 | 3.1917E+01 | 3.095E+01% | 3.12E+01 |
| PA-231 | #A | -9.2282E+00 | -9.2282E+00 | 2.356E+02% | 7.32E+01 |
| PA-233 | #A | -1.2967E+00 | -1.2967E+00 | 1.045E+02% | 4.54E+00 |
| PA-234 | #A | 5.5605E-01 | 5.5605E-01 | 7.955E+01% | 8.87E+00 |
| PA-234M | #A | 6.1613E+01 | 6.1613E+01 | 1.060E+02% | 2.23E+02 |
| U-235 | #A | -4.2156E-01 | -4.2156E-01 | 9.131E+02% | 1.30E+01 |
| AM-241 | #A | 1.2952E+00 | 1.2952E+00 | 1.119E+02% | 4.09E+00 |
| Np-237 | #A | 2.7100E+00 | 2.7100E+00 | 1.791E+02% | 1.62E+01 |
| Ir-192 | #A | 6.4657E-01 | 6.4657E-01 | 7.989E+01% | 1.52E+00 |
| Cs-136 | #A | 3.9838E-01 | 3.9839E-01 | 1.279E+02% | 2.00E+00 |
| Np-239 | #A | 1.2606E+00 | 1.2607E+00 | 1.200E+02% | 5.06E+00 |
| Nd-147 | #A | 3.0758E+00 | 3.0759E+00 | 9.662E+01% | 7.47E+00 |

```
  # - All peaks for activity calculation had bad shape.
  * - Activity omitted from total
  & - Activity omitted from total and all peaks had bad shape.
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   25.1 to  1999.5 keV)     4.541E+02  Bq/Sample
Total Decayed Activity (   25.1 to  1999.5 keV) 4.5411185E+02  Bq/Sample
```

309155_Gamma_160-22327-A-4-B. 14_Gamma_20171411.spc.



Test America St. Louis  Spectrum ID: 15_Gamma_20171219

Sample Description: 309155_Gamma_160-22327-A-5-B
Detector: Detector #15
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-5-B

Decay to Time: 6/7/2017 09:54  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:54:29  Real Time: 1801 sec
Analysis Time: 6/7/2017 10:25  Dead Time: 0.08 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 15_Soil_TunaCan.Clb
Efficiency Cal Desc: 15_TunaCan_90099_032212
Efficiency Cal Date: 3/22/2012 13:03
Energy Cal Date: 2/28/2012 16:29
Library: Client_Long_Rev11.lib
Bkgd Correction File: 15_2017-06-04_0500.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | 3.947E+00 | 104.7 | 4.132E+00 | 4.137E+00 | 1.400E+01 |
| NA-22 | -1.972E-01 | 287.5 | 5.668E-01 | 5.669E-01 | 2.048E+00 |
| K-40 | 2.582E+02 | 5.9 | 1.519E+01 | 2.013E+01 | 6.585E+00 |
| Sc-46 | 8.286E-01 | 58.7 | 4.862E-01 | 4.880E-01 | 1.411E+00 |
| CR-51 | 5.121E+00 | 147.3 | 7.544E+00 | 7.549E+00 | 2.529E+01 |
| MN-54 | -3.902E-02 | 1822.8 | 7.112E-01 | 7.112E-01 | 1.717E+00 |
| FE-59 | -1.138E+00 | 139.6 | 1.588E+00 | 1.589E+00 | 3.514E+00 |
| Co-56 | -4.741E-01 | 144.7 | 6.861E-01 | 6.865E-01 | 1.622E+00 |
| CO-57 | 0.000E+00 | 1.#INF | 2.434E-01 | 2.434E-01 | 1.352E+00 |
| CO-58 | 5.930E-01 | 90.6 | 5.374E-01 | 5.382E-01 | 1.819E+00 |
| CO-60 | 2.980E-01 | 95.6 | 2.849E-01 | 2.853E-01 | 1.575E+00 |
| ZN-65 | -2.458E+00 | 88.4 | 2.174E+00 | 2.177E+00 | 7.284E+00 |
| NB-94 | 6.039E-01 | 92.4 | 5.582E-01 | 5.591E-01 | 1.303E+00 |
| ZR-95 | 3.750E-01 | 148.7 | 5.575E-01 | 5.578E-01 | 2.494E+00 |
| NB-95 | 7.446E-01 | 94.0 | 7.001E-01 | 7.012E-01 | 2.357E+00 |
| RU-103 | 4.604E-01 | 99.3 | 4.572E-01 | 4.578E-01 | 1.108E+00 |
| RH-106 | -6.519E+00 | 172.7 | 1.126E+01 | 1.126E+01 | 3.790E+01 |
| AG-108M | 4.932E-01 | 53.1 | 2.617E-01 | 2.629E-01 | 1.463E+00 |
| AG-110M | 5.934E-01 | 96.7 | 5.738E-01 | 5.746E-01 | 2.824E+00 |
| SN-113 | -9.071E-01 | 111.5 | 1.011E+00 | 1.012E+00 | 3.392E+00 |
| SB-124 | 1.315E+00 | 40.7 | 5.350E-01 | 5.393E-01 | 3.733E+00 |
| SB-125 | 1.275E+00 | 141.6 | 1.806E+00 | 1.807E+00 | 3.987E+00 |
| I-131 | -1.818E-01 | 306.6 | 5.573E-01 | 5.573E-01 | 1.411E+00 |
| Gd-153 | 0.000E+00 | 1.#INF | 3.988E-01 | 3.988E-01 | 8.782E+00 |
| Ga-68 | -1.031E+01 | 305.2 | 3.146E+01 | 3.147E+01 | 7.277E+01 |
| Tc-99m | 0.000E+00 | 1.#INF | 2.272E-01 | 2.272E-01 | 2.169E+00 |
| BA-133 | -8.466E-01 | 151.0 | 1.278E+00 | 1.279E+00 | 4.287E+00 |
| CS-134 | 2.667E-01 | 154.6 | 4.122E-01 | 4.124E-01 | 3.843E+00 |
| CS-137 | 4.317E-01 | 170.0 | 7.340E-01 | 7.343E-01 | 2.516E+00 |
| CE-139 | 4.755E-01 | 102.7 | 4.885E-01 | 4.906E-01 | 1.632E+00 |
| Ba-140 | 5.539E-02 | 3609.7 | 1.999E+00 | 1.999E+00 | 5.010E+00 |
| La-140 | 4.965E-01 | 104.2 | 5.175E-01 | 5.182E-01 | 1.991E+00 |
| CE-141 | -9.603E-01 | 144.8 | 1.390E+00 | 1.391E+00 | 4.631E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 0.000E+00 | 1.#INF | 1.770E+00 | 1.771E+00 | 1.661E+01 |
| PM-144 | -9.530E-01 | 90.9 | 8.666E-01 | 8.680E-01 | 1.979E+00 |
| EU-152 | 1.915E+00 | 139.5 | 2.673E+00 | 2.674E+00 | 8.969E+00 |
| EU-154 | 1.008E+00 | 91.9 | 9.267E-01 | 9.281E-01 | 1.583E+01 |
| EU-155 | 2.128E+00 | 175.5 | 3.735E+00 | 3.737E+00 | 1.243E+01 |
| HF-181 | 8.723E-02 | 101.2 | 8.831E-02 | 8.842E-02 | 2.399E+00 |
| Ta-182 | 2.918E+00 | 59.8 | 1.744E+00 | 1.750E+00 | 8.302E+00 |
| Hg-203 | -6.522E-01 | 87.6 | 5.713E-01 | 5.725E-01 | 1.906E+00 |
| TL-208 | 8.077E+00 | 9.5 | 7.643E-01 | 8.716E-01 | 9.839E-01 |
| pm-146 | -1.828E+00 | 127.6 | 2.333E+00 | 2.335E+00 | 5.413E+00 |
| y-88 | 1.263E+00 | 22.9 | 2.897E-01 | 2.968E-01 | 4.898E-01 |
| Cd-113m | 4.238E+03 | 113.2 | 4.797E+03 | 4.805E+03 | 1.628E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 2.170E+01 | 2.170E+01 | 7.220E+01 |
| Cf-251 | 2.176E+00 | 99.2 | 2.158E+00 | 2.167E+00 | 5.521E+00 |
| Cf-249 | -8.209E-01 | 109.5 | 8.985E-01 | 8.995E-01 | 3.017E+00 |
| Sn-126 | 1.142E+00 | 556.9 | 6.361E+00 | 6.362E+00 | 2.143E+01 |
| PB-210 | -1.368E+01 | 149.2 | 2.041E+01 | 2.042E+01 | 6.140E+01 |
| PB-212 | 2.051E+01 | 5.7 | 1.174E+00 | 1.772E+00 | 2.100E+00 |
| PB-214 | 1.875E+01 | 7.6 | 1.417E+00 | 1.719E+00 | 2.069E+00 |
| BI-207 | 1.345E-01 | 250.8 | 3.372E-01 | 3.373E-01 | 1.421E+00 |
| BI-212 | -2.953E-01 | 2947.7 | 8.704E+00 | 8.704E+00 | 3.051E+01 |
| BI-214 | 1.717E+01 | 10.0 | 1.715E+00 | 1.933E+00 | 2.443E+00 |
| BI-210M | -3.722E-01 | 186.2 | 6.932E-01 | 6.935E-01 | 2.369E+00 |
| AC-228 | 2.370E+01 | 8.3 | 1.962E+00 | 2.304E+00 | 3.684E+00 |
| TH-227 | 6.933E+00 | 104.4 | 7.238E+00 | 7.248E+00 | 2.420E+01 |
| TH-229 | -1.083E+01 | 97.4 | 1.056E+01 | 1.059E+01 | 2.689E+01 |
| TH-234 | 2.240E+01 | 42.7 | 9.562E+00 | 9.634E+00 | 3.065E+01 |
| PA-231 | -1.711E+01 | 147.2 | 2.518E+01 | 2.519E+01 | 8.437E+01 |
| PA-233 | 0.000E+00 | 1.#INF | 6.932E-01 | 6.932E-01 | 7.025E+00 |
| PA-234 | 2.163E+00 | 50.1 | 1.084E+00 | 1.090E+00 | 9.979E+00 |
| PA-234M | 3.671E+01 | 88.9 | 3.263E+01 | 3.268E+01 | 2.877E+02 |
| U-235 | 1.279E+00 | 192.4 | 2.462E+00 | 2.463E+00 | 1.734E+01 |
| AM-241 | -1.227E+00 | 144.8 | 1.776E+00 | 1.778E+00 | 5.942E+00 |
| Np-237 | -3.567E+00 | 187.2 | 6.678E+00 | 6.681E+00 | 2.221E+01 |
| Ir-192 | 3.699E-01 | 99.3 | 3.673E-01 | 3.679E-01 | 2.938E+00 |
| Cs-136 | -7.795E-01 | 91.1 | 7.099E-01 | 7.113E-01 | 2.389E+00 |
| Np-239 | 1.914E+00 | 173.2 | 3.316E+00 | 3.318E+00 | 1.104E+01 |
| Nd-147 | 2.059E+00 | 173.0 | 3.562E+00 | 3.564E+00 | 8.762E+00 |
| Total | 4.690E+03 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-5-B

Spectrum Filename: C:\User\SPC\Det15\15_Gamma_20171219.An1

Acquisition information
Start time: 6/7/2017 9:54:29 AM
Live time: 1800
Real time: 1801
Dead time: 0.08 %
Detector ID: 15

Detector system
Ge15 SN/11012216

Calibration
Filename: 15_Soil_TunaCan.Clb
15_TunaCan_90099_032212

Energy Calibration
Created: 2/28/2012 4:29:17 PM
Zero offset: 0.044 keV
Gain: 0.250 keV/channel
Quadratic: -3.267E-08 keV/channel^2

Efficiency Calibration
Created: 3/22/2012 1:03:01 PM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.00 %
Log(Eff): -6.894897E-01 + (-3.290613E-01*Log(E) ) + ( -3.875629E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.13 %
Log(Eff): -2.362677E+01 + ( 8.666669E+00*Log(E) ) + ( -9.214638E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 100 (  25.06keV )
Stop channel: 8000 (  1999.52keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3
Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:54:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 15_2017-06-04_0500.PBC 6/4/2017 5:00:17 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 24 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1431

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 50.14 | 22. | 104.40 | 0.95 | 2.192E-02 | 50.14 | 8.000 | PBC<MDA | TH227 |
| 63.28 | 45. | 42.68 | 0.96 | 2.924E-02 | 63.29 | 3.810 | PBC<MDA | TH234 |
| 64.27 | 6. | 556.93 | 0.96 | 2.970E-02 | 64.28 | 9.700 | PBC<MDA | Sn126 |
| 74.70 | 200. | 12.23 | 0.97 | 3.378E-02 | | | | |
| 77.17 | 284. | 8.85 | 0.97 | 3.454E-02 | | | | |
| 87.24 | 120. | 21.79 | 0.94 | 3.692E-02 | 86.49 | 13.100 | 1.387E+01 | Np237 |
| | | | | | 86.54 | 30.700 | 5.919E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 2.006E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 4.821E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 4.759E+01 | Cd109 |
| 92.56 | 45. | 47.72 | 0.99 | 3.776E-02 | 92.59 | 5.584 | PBC<MDA | TH234 |
| 105.06 | 31. | 175.48 | 1.00 | 3.876E-02 | 105.31 | 21.200 | PBC<MDA | EU155 |
| 106.13 | 30. | 173.23 | 1.00 | 3.878E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 123.10 | 23. | 91.93 | 1.02 | 3.840E-02 | 123.10 | 40.790 | PBC<MDA | EU154 |
| 165.85 | 23. | 102.75 | 1.06 | 3.392E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |
| 176.60 | 22. | 99.16 | 1.07 | 3.240E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |
| 185.92 | 74. | 25.70 | 0.93 | 3.121E-02 | | | | |
| 205.33 | 11. | 192.43 | 1.09 | 2.900E-02 | 205.33 | 5.010 | PBC<MDA | U235 |
| 210.85 | 15. | 155.32 | 1.10 | 2.844E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 227.00 | 17. | 95.96 | 1.11 | 2.691E-02 | 227.00 | 6.300 | PBC<MDA | Cf251 |
| 238.74 | 404. | 7.37 | 0.87 | 2.591E-02 | 238.63 | 43.300 | 1.999E+01 | PB212 |
| 242.13 | 72. | 22.00 | 1.12 | 2.565E-02 | 242.00 | 7.430 | 2.088E+01 | PB214 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 263.70 | 11. | 113.18 | 1.14 | 2.403E-02 | 263.70 | 0.006 | PBC<MDA | Cd113m |
| 279.37 | 15. | 91.31 | 1.15 | 2.313E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| | | | | | 279.20 | 81.460 | 4.348E-01 | Hg203 |
| 295.39 | 147. | 12.97 | 1.22 | 2.205E-02 | 295.09 | 19.300 | 1.919E+01 | PB214 |
| 300.09 | 42. | 34.92 | 1.13 | 2.177E-02 | 300.03 | 3.280 | 3.255E+01 | PB212 |
| | | | | | 300.07 | 2.460 | 4.341E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 1.723E+01 | PA233 |
| 320.08 | 19. | 147.31 | 1.19 | 2.070E-02 | 320.08 | 9.940 | PBC<MDA | CR51 |
| 338.27 | 100. | 14.83 | 1.06 | 1.983E-02 | 338.32 | 12.010 | 2.329E+01 | AC228 |
| 344.29 | 18. | 139.54 | 1.21 | 1.956E-02 | 344.29 | 26.500 | PBC<MDA | EU152 |
| 345.83 | 17. | 148.04 | 1.21 | 1.949E-02 | 345.83 | 15.070 | PBC<MDA | HF181 |
| 351.94 | 241. | 7.75 | 1.19 | 1.923E-02 | 351.93 | 37.600 | 1.852E+01 | PB214 |
| 453.88 | 8. | 163.22 | 1.30 | 1.571E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 463.37 | 9. | 154.77 | 1.31 | 1.545E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 468.06 | 14. | 99.28 | 1.32 | 1.533E-02 | 468.06 | 51.750 | PBC<MDA | Ir192 |
| 477.60 | 11. | 104.69 | 1.32 | 1.508E-02 | 477.60 | 10.520 | PBC<MDA | BE7 |
| 487.02 | 11. | 104.22 | 1.33 | 1.485E-02 | 487.02 | 45.500 | PBC<MDA | La140 |
| 497.05 | 11. | 99.31 | 1.34 | 1.460E-02 | 497.05 | 90.900 | PBC<MDA | RU103 |
| 511.86 | 99. | 17.21 | 2.60 | 1.426E-02 | 511.86 | 20.000 | 1.929E+01 | RH106 |
| 531.00 | 7. | 173.02 | 1.37 | 1.384E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 563.24 | 3. | 364.69 | 1.39 | 1.319E-02 | 563.24 | 8.350 | PBC<MDA | CS134 |
| 583.07 | 158. | 9.46 | 1.43 | 1.282E-02 | 583.02 | 84.500 | 8.077E+00 | TL208 |
| 600.50 | 12. | 197.34 | 1.42 | 1.251E-02 | 600.50 | 17.860 | PBC<MDA | SB125 |
| 602.73 | 12. | 201.22 | 1.43 | 1.247E-02 | 602.73 | 98.260 | PBC<MDA | SB124 |
| 609.43 | 167. | 9.99 | 1.43 | 1.236E-02 | 609.31 | 46.090 | 1.628E+01 | BI214 |
| 610.30 | 12. | 196.53 | 1.43 | 1.235E-02 | 610.30 | 5.750 | PBC<MDA | RU103 |
| 614.28 | 12. | 202.58 | 1.43 | 1.228E-02 | 614.28 | 89.850 | PBC<MDA | AG108M |
| 661.66 | 8. | 170.03 | 1.47 | 1.155E-02 | 661.66 | 85.210 | PBC<MDA | CS137 |
| 702.63 | 12. | 92.44 | 1.50 | 1.098E-02 | 702.63 | 97.900 | PBC<MDA | NB94 |
| 722.79 | 17. | 40.69 | 1.52 | 1.072E-02 | 722.79 | 10.810 | PBC<MDA | SB124 |
| | | | | | 722.94 | 90.840 | 9.836E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 4.421E+00 | EU154 |
| 722.94 | 17. | 53.07 | 1.52 | 1.072E-02 | 722.79 | 10.810 | 8.264E+00 | SB124 |
| | | | | | 722.94 | 90.840 | 9.836E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 4.421E+00 | EU154 |
| 723.36 | 7. | 139.43 | 1.52 | 1.072E-02 | 722.79 | 10.810 | PBC<MDA | SB124 |
| | | | | | 722.94 | 90.840 | 4.260E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 1.915E+00 | EU154 |
| 724.20 | 7. | 148.67 | 1.52 | 1.071E-02 | 724.20 | 44.150 | PBC<MDA | ZR95 |
| 765.79 | 14. | 94.03 | 1.55 | 1.021E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 2.529E+02 | PA234M |
| 766.41 | 8. | 88.86 | 1.55 | 1.021E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 1.412E+02 | PA234M |
| 795.87 | 6. | 154.56 | 1.57 | 9.887E-03 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 810.78 | 10. | 90.61 | 1.59 | 9.733E-03 | 810.78 | 99.460 | PBC<MDA | CO58 |
| 861.02 | 22. | 41.91 | 1.62 | 9.252E-03 | 860.56 | 12.420 | 1.064E+01 | TL208 |
| 889.28 | 8. | 83.44 | 1.64 | 8.996E-03 | 889.28 | 99.984 | PBC<MDA | Sc46 |
| 898.04 | 19. | 22.94 | 1.65 | 8.921E-03 | 898.04 | 93.700 | 1.263E+00 | y88 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 911.53 | 103. | 12.15 | 1.64 | 8.811E-03 | 911.07 | 29.000 | 2.232E+01 | AC228 |
| 946.02 | 16. | 50.13 | 1.68 | 8.531E-03 | 946.02 | 13.400 | PBC<MDA | PA234 |
| 969.54 | 69. | 15.78 | 1.96 | 8.357E-03 | 968.97 | 17.460 | 2.627E+01 | AC228 |
| 1048.07 | 4. | 162.02 | 1.75 | 7.808E-03 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1063.66 | 4. | 250.83 | 1.76 | 7.709E-03 | 1063.66 | 74.500 | PBC<MDA | BI207 |
| 1120.26 | 17. | 89.29 | 1.80 | 7.368E-03 | 1120.29 | 15.100 | PBC<MDA | BI214 |
| | | | | | 1120.55 | 99.987 | 1.251E+00 | Sc46 |
| 1120.55 | 15. | 82.52 | 1.80 | 7.367E-03 | 1120.29 | 15.100 | 7.669E+00 | BI214 |
| | | | | | 1120.55 | 99.987 | 1.158E+00 | Sc46 |
| | | | | | 1121.30 | 34.900 | 3.321E+00 | Ta182 |
| 1121.28 | 14. | 81.71 | 1.80 | 7.362E-03 | 1120.55 | 99.987 | PBC<MDA | Sc46 |
| | | | | | 1121.30 | 34.900 | 3.032E+00 | Ta182 |
| 1173.24 | 8. | 95.58 | 1.84 | 7.076E-03 | 1173.24 | 99.900 | PBC<MDA | CO60 |
| 1219.65 | 9. | 87.23 | 1.87 | 6.830E-03 | 1221.41 | 27.000 | PBC<MDA | Ta182 |
| 1384.30 | 6. | 96.69 | 1.97 | 6.114E-03 | 1384.30 | 24.290 | PBC<MDA | AG110M |
| 1408.00 | 4. | 137.50 | 1.98 | 6.023E-03 | 1408.00 | 21.005 | PBC<MDA | EU152 |
| 1461.20 | 289. | 5.88 | 2.45 | 5.828E-03 | 1460.83 | 10.670 | 2.582E+02 | K40 |
| 1596.21 | 3. | 302.33 | 2.09 | 5.382E-03 | 1596.21 | 95.400 | PBC<MDA | La140 |
| 1766.16 | 27. | 19.25 | 2.18 | 4.916E-03 | 1764.49 | 15.400 | 1.981E+01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 298.39 | 74.71 | 199. | 200. | 5.919E+03 | 12.23 | 0.972 | - D |
| 308.29 | 77.19 | 174. | 284. | 8.224E+03 | 8.85 | 0.975 | - D |
| 742.99 | 185.92 | 84. | 74. | 2.370E+03 | 25.70 | 0.927 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.84 | 46.54 | 366. | -20. | -0.011 | 149.21 | 0.946s |
| TH-227 | 200.23 | 50.14 | 250. | 22. | 0.012 | 104.40 | 0.950s |
| AM-241 | 237.79 | 59.54 | 483. | -22. | -0.012 | 144.76 | 0.958s |
| TH-234 | 252.78 | 63.29 | 159. | 45. | 0.025 | 42.68 | 0.962D |
| Sn-126 | 256.75 | 64.28 | 541. | 6. | 0.003 | 556.93 | 0.963s |
| BA-133 | 323.54 | 80.99 | 1181. | -32. | -0.018 | 152.62 | 0.978 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Np-237 | 345.53 | 86.49 | 1661. | -31. | -0.017 | 187.21 | 0.983D |
| EU-155 | 345.74 | 86.54 | 1631. | 19. | 0.011 | 111.81 | 0.983D |
| Sn-126 | 347.33 | 86.94 | 1520. | 7. | 0.004 | 323.44 | 0.984D |
| Sn-126 | 349.84 | 87.57 | 1409. | 29. | 0.016 | 75.02 | 0.984D |
| Cd-109 | 351.72 | 88.04 | 1489. | 0. | 0.000 | 177.10 | 0.985A |
| Nd-147 | 363.95 | 91.10 | 1383. | -31. | -0.017 | 170.22 | 0.987s |
| TH-234 | 369.91 | 92.59 | 204. | 45. | 0.025 | 47.72 | 0.989D |
| AC-228 | 372.95 | 93.35 | 1459. | -15. | -0.008 | 359.08 | 0.990s |
| Gd-153 | 389.54 | 97.50 | 1474. | 0. | 0.000 | 1000.00 | 0.993s |
| Np-239 | 397.53 | 99.50 | 1474. | 0. | 0.000 | 1000.00 | 0.995s |
| Gd-153 | 412.32 | 103.20 | 1474. | 0. | 0.000 | 1000.00 | 0.998s |
| Np-239 | 414.32 | 103.70 | 1474. | 0. | 0.000 | 1000.00 | 0.999s |
| EU-155 | 420.77 | 105.31 | 1510. | 31. | 0.017 | 175.48 | 1.001 |
| Np-239 | 424.03 | 106.13 | 1365. | 30. | 0.017 | 173.23 | 1.001s |
| EU-152 | 486.57 | 121.78 | 255. | -21. | -0.012 | 109.73 | 1.016 |
| CO-57 | 487.72 | 122.06 | 276. | 0. | 0.000 | 1000.00 | 1.016 |
| EU-154 | 491.87 | 123.10 | 210. | 23. | 0.013 | 91.93 | 1.017s |
| PA-234 | 524.63 | 131.29 | 656. | -25. | -0.014 | 148.29 | 1.024 |
| CE-144 | 533.60 | 133.54 | 683. | 0. | 0.000 | 1000.00 | 1.026s |
| HF-181 | 544.63 | 136.30 | 683. | 0. | 0.000 | 1000.00 | 1.029s |
| CO-57 | 545.33 | 136.47 | 683. | 0. | 0.000 | 1000.00 | 1.029s |
| Tc-99m | 561.46 | 140.51 | 683. | 0. | 0.000 | 1000.00 | 1.032s |
| U-235 | 574.56 | 143.79 | 683. | 0. | 0.000 | 1000.00 | 1.036s |
| CE-141 | 581.17 | 145.44 | 937. | -30. | -0.017 | 144.77 | 1.037s |
| Ba-140 | 650.01 | 162.66 | 266. | -18. | -0.010 | 126.94 | 1.053s |
| U-235 | 652.88 | 163.38 | 288. | -20. | -0.011 | 119.24 | 1.053s |
| CE-139 | 662.77 | 165.85 | 272. | 23. | 0.013 | 102.75 | 1.055s |
| Cf-251 | 705.73 | 176.60 | 125. | 22. | 0.012 | 99.16 | 1.065s |
| TH-229 | 773.33 | 193.51 | 176. | -26. | -0.014 | 97.45 | 1.080s |
| U-235 | 820.60 | 205.33 | 117. | 11. | 0.006 | 192.43 | 1.091s |
| TH-229 | 842.65 | 210.85 | 158. | 15. | 0.009 | 155.32 | 1.096 |
| Cf-251 | 907.22 | 227.00 | 73. | 17. | 0.010 | 95.96 | 1.110s |
| PB-212 | 953.72 | 238.63 | 73. | 414. | 0.230 | 5.72 | 1.120D |
| PB-214 | 967.17 | 242.00 | 88. | 72. | 0.040 | 22.00 | 1.123D |
| Cd-113m | 1053.94 | 263.70 | 72. | 11. | 0.006 | 113.18 | 1.142s |
| BI-210M | 1062.46 | 265.83 | 107. | -8. | -0.004 | 186.25 | 1.144 |
| TL-208 | 1108.25 | 277.28 | 82. | 15. | 0.008 | 91.31 | 1.154s |
| Hg-203 | 1115.91 | 279.20 | 175. | -22. | -0.012 | 87.59 | 1.156s |
| I-131 | 1136.30 | 284.30 | 104. | -21. | -0.011 | 99.60 | 1.160s |
| PB-214 | 1180.63 | 295.39 | 50. | 147. | 0.082 | 12.97 | 1.223 |
| PB-212 | 1199.42 | 300.09 | 41. | 42. | 0.023 | 34.92 | 1.135 |
| PA-231 | 1199.35 | 300.07 | 427. | -19. | -0.011 | 154.40 | 1.174 |
| PA-233 | 1199.79 | 300.18 | 408. | -19. | -0.011 | 150.95 | 1.174 |
| PA-231 | 1209.66 | 302.65 | 389. | -19. | -0.011 | 147.18 | 1.176s |
| Ba-140 | 1218.46 | 304.85 | 402. | 0. | 0.000 | 1000.00 | 1.178s |
| BI-210M | 1218.64 | 304.90 | 402. | 0. | 0.000 | 1000.00 | 1.178s |
| Ir-192 | 1232.81 | 308.44 | 402. | 0. | 0.000 | 1000.00 | 1.181 |
| PA-233 | 1247.09 | 312.01 | 402. | 0. | 0.000 | 1000.00 | 1.184s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Ir-192 | 1265.00 | 316.49 | 402. | 0. | 0.000 | 1000.00 | 1.188 |
| CR-51 | 1279.37 | 320.08 | 381. | 19. | 0.011 | 147.31 | 1.191s |
| La-140 | 1314.06 | 328.76 | 410. | -19. | -0.010 | 155.41 | 1.199s |
| Cf-249 | 1332.77 | 333.44 | 391. | -19. | -0.010 | 151.40 | 1.203s |
| AC-228 | 1352.09 | 338.27 | 31. | 100. | 0.055 | 14.83 | 1.059s |
| Cs-136 | 1361.28 | 340.57 | 373. | -19. | -0.010 | 149.29 | 1.209s |
| EU-152 | 1376.13 | 344.29 | 302. | 18. | 0.010 | 139.54 | 1.212s |
| HF-181 | 1382.30 | 345.83 | 323. | 17. | 0.010 | 148.04 | 1.213s |
| PB-214 | 1406.73 | 351.94 | 27. | 241. | 0.134 | 7.75 | 1.193 |
| BA-133 | 1422.97 | 356.00 | 361. | -18. | -0.010 | 150.97 | 1.222s |
| I-131 | 1456.89 | 364.48 | 60. | -5. | -0.003 | 306.59 | 1.229s |
| BA-133 | 1534.29 | 383.84 | 155. | -17. | -0.010 | 104.37 | 1.246s |
| Cf-249 | 1550.72 | 387.95 | 172. | -17. | -0.010 | 109.45 | 1.249s |
| SN-113 | 1565.67 | 391.69 | 203. | -18. | -0.010 | 111.48 | 1.253 |
| SB-125 | 1710.36 | 427.88 | 48. | -4. | -0.002 | 342.78 | 1.283s |
| AG-108M | 1734.60 | 433.94 | 60. | -3. | -0.002 | 508.81 | 1.288s |
| pm-146 | 1814.35 | 453.88 | 39. | 8. | 0.004 | 163.22 | 1.304s |
| SB-125 | 1852.29 | 463.37 | 100. | 9. | 0.005 | 154.77 | 1.312s |
| Ir-192 | 1871.05 | 468.06 | 92. | 14. | 0.008 | 99.28 | 1.316s |
| BE-7 | 1909.18 | 477.60 | 64. | 11. | 0.006 | 104.69 | 1.324 |
| HF-181 | 1926.79 | 482.00 | 112. | -11. | -0.006 | 138.12 | 1.328s |
| La-140 | 1946.87 | 487.02 | 64. | 11. | 0.006 | 104.22 | 1.332s |
| RU-103 | 1987.00 | 497.05 | 26. | 11. | 0.006 | 99.31 | 1.340s |
| RH-106 | 2046.22 | 511.86 | 28. | 99. | 0.055 | 17.21 | 2.602s |
| Nd-147 | 2122.75 | 531.00 | 30. | 7. | 0.004 | 173.02 | 1.368s |
| CS-134 | 2251.67 | 563.24 | 35. | 3. | 0.002 | 364.69 | 1.394s |
| CS-134 | 2276.00 | 569.32 | 36. | -4. | -0.002 | 217.94 | 1.399s |
| PA-234 | 2276.59 | 569.47 | 40. | 0. | 0.000 | 1000.00 | 1.399s |
| BI-207 | 2277.52 | 569.70 | 41. | -1. | -0.001 | 687.39 | 1.399s |
| TL-208 | 2330.99 | 583.07 | 12. | 158. | 0.087 | 9.46 | 1.425 |
| SB-125 | 2400.69 | 600.50 | 280. | 12. | 0.007 | 197.34 | 1.424s |
| SB-124 | 2409.62 | 602.73 | 292. | 12. | 0.007 | 201.22 | 1.425s |
| BI-214 | 2436.42 | 609.43 | 23. | 167. | 0.093 | 9.99 | 1.432 |
| RU-103 | 2439.88 | 610.30 | 281. | 12. | 0.007 | 196.53 | 1.431s |
| AG-108M | 2455.81 | 614.28 | 293. | 12. | 0.007 | 202.58 | 1.435s |
| PM-144 | 2470.93 | 618.06 | 305. | 0. | 0.000 | 1000.00 | 1.437s |
| RH-106 | 2486.35 | 621.92 | 292. | -14. | -0.008 | 172.70 | 1.440s |
| SB-125 | 2542.23 | 635.89 | 58. | -15. | -0.008 | 76.30 | 1.451s |
| AG-110M | 2629.71 | 657.76 | 72. | -16. | -0.009 | 78.22 | 1.469s |
| CS-137 | 2645.30 | 661.66 | 81. | 8. | 0.004 | 170.03 | 1.472s |
| PM-144 | 2784.82 | 696.54 | 61. | -19. | -0.010 | 90.94 | 1.499s |
| NB-94 | 2809.17 | 702.63 | 23. | 12. | 0.006 | 92.44 | 1.503s |
| SB-124 | 2889.79 | 722.79 | 16. | 17. | 0.010 | 40.69 | 1.519 |
| AG-108M | 2890.40 | 722.94 | 33. | 17. | 0.010 | 53.07 | 1.519 |
| EU-154 | 2892.07 | 723.36 | 50. | 7. | 0.004 | 139.43 | 1.519 |
| ZR-95 | 2895.44 | 724.20 | 58. | 7. | 0.004 | 148.67 | 1.520s |
| pm-146 | 2941.53 | 735.72 | 33. | -2. | -0.001 | 731.57 | 1.529s |
| pm-146 | 2987.29 | 747.16 | 47. | -12. | -0.006 | 127.62 | 1.537s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AG-110M | 3054.42 | 763.94 | 84. | -20. | -0.011 | 68.04 | 1.550s |
| NB-95 | 3061.80 | 765.79 | 76. | 14. | 0.008 | 94.03 | 1.551s |
| PA-234M | 3064.30 | 766.41 | 19. | 8. | 0.004 | 88.86 | 1.552s |
| EU-152 | 3114.33 | 778.92 | 37. | -15. | -0.009 | 88.21 | 1.561s |
| BI-212 | 3140.33 | 785.42 | 37. | -3. | -0.002 | 392.68 | 1.566s |
| CS-134 | 3182.12 | 795.87 | 40. | 6. | 0.003 | 154.56 | 1.574s |
| CS-134 | 3206.46 | 801.95 | 93. | -17. | -0.010 | 82.05 | 1.578s |
| CO-58 | 3241.75 | 810.78 | 39. | 10. | 0.006 | 90.61 | 1.585s |
| La-140 | 3261.74 | 815.77 | 49. | 0. | 0.000 | 1000.00 | 1.589s |
| Cs-136 | 3272.66 | 818.50 | 69. | -14. | -0.008 | 91.07 | 1.591s |
| Co-56 | 3385.75 | 846.77 | 28. | -8. | -0.004 | 144.70 | 1.612 |
| TL-208 | 3440.93 | 860.56 | 14. | 22. | 0.012 | 41.91 | 1.622 |
| NB-94 | 3483.06 | 871.10 | 31. | -7. | -0.004 | 121.12 | 1.629s |
| PA-234 | 3531.64 | 883.24 | 43. | 0. | 0.000 | 1000.00 | 1.638s |
| AG-110M | 3537.42 | 884.68 | 43. | 0. | 0.000 | 1000.00 | 1.639s |
| Sc-46 | 3555.81 | 889.28 | 19. | 8. | 0.004 | 83.44 | 1.642s |
| y-88 | 3590.85 | 898.04 | 0. | 19. | 0.011 | 22.94 | 1.649s |
| AC-228 | 3644.81 | 911.53 | 9. | 103. | 0.057 | 12.15 | 1.644 |
| AG-110M | 3748.69 | 937.49 | 30. | -3. | -0.002 | 405.52 | 1.677s |
| PA-234 | 3782.81 | 946.02 | 10. | 16. | 0.009 | 50.13 | 1.683s |
| EU-152 | 3855.18 | 964.11 | 134. | -16. | -0.009 | 108.07 | 1.696s |
| AC-228 | 3876.89 | 969.54 | 9. | 69. | 0.038 | 15.78 | 1.965 |
| EU-154 | 3984.09 | 996.33 | 41. | -7. | -0.004 | 129.37 | 1.718s |
| PA-234M | 4002.77 | 1001.00 | 49. | 0. | 0.000 | 1000.00 | 1.722s |
| Co-56 | 4150.18 | 1037.84 | 40. | -17. | -0.010 | 84.44 | 1.747s |
| Cs-136 | 4191.11 | 1048.07 | 19. | 4. | 0.002 | 162.02 | 1.754s |
| RH-106 | 4200.27 | 1050.36 | 30. | -5. | -0.003 | 161.25 | 1.755s |
| BI-207 | 4253.49 | 1063.66 | 20. | 4. | 0.002 | 250.83 | 1.765s |
| Ga-68 | 4308.47 | 1077.40 | 30. | -4. | -0.002 | 305.16 | 1.774s |
| FE-59 | 4395.90 | 1099.25 | 27. | -9. | -0.005 | 139.63 | 1.789s |
| EU-152 | 4447.22 | 1112.07 | 115. | -17. | -0.009 | 95.13 | 1.797s |
| ZN-65 | 4461.11 | 1115.55 | 99. | -17. | -0.009 | 88.44 | 1.800s |
| BI-214 | 4480.08 | 1120.29 | 101. | 17. | 0.009 | 89.29 | 1.803s |
| Sc-46 | 4481.13 | 1120.55 | 73. | 15. | 0.009 | 82.52 | 1.803s |
| Ta-182 | 4484.13 | 1121.30 | 59. | 14. | 0.008 | 81.71 | 1.803s |
| CO-60 | 4691.97 | 1173.24 | 11. | 8. | 0.005 | 95.58 | 1.838s |
| Ta-182 | 4755.25 | 1189.05 | 16. | -3. | -0.002 | 308.52 | 1.848s |
| Ta-182 | 4884.75 | 1221.41 | 11. | 9. | 0.005 | 87.23 | 1.869 |
| Co-56 | 4952.26 | 1238.28 | 43. | -4. | -0.002 | 408.28 | 1.879s |
| NA-22 | 5097.34 | 1274.53 | 21. | -2. | -0.001 | 287.49 | 1.902s |
| EU-154 | 5097.40 | 1274.54 | 24. | 0. | 0.000 | 1000.00 | 1.902s |
| FE-59 | 5165.64 | 1291.60 | 37. | -18. | -0.010 | 82.40 | 1.913s |
| AG-110M | 5536.68 | 1384.30 | 6. | 6. | 0.004 | 96.69 | 1.970s |
| EU-152 | 5631.56 | 1408.00 | 6. | 4. | 0.002 | 137.50 | 1.984s |
| K-40 | 5844.51 | 1461.20 | 0. | 289. | 0.161 | 5.88 | 2.448s |
| La-140 | 6384.98 | 1596.21 | 11. | 3. | 0.001 | 302.33 | 2.092s |
| SB-124 | 6764.43 | 1690.98 | 12. | -7. | -0.004 | 125.36 | 2.142s |
| BI-214 | 7058.76 | 1764.49 | 0. | 27. | 0.015 | 19.25 | 2.181 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Co-56 | 7086.23 | 1771.35 | 27. | 0. | 0.000 | 1000.00 | 2.184s |
| y-88 | 7345.35 | 1836.06 | 6. | -2. | -0.001 | 304.14 | 2.216s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | 3.9469E+00 | | | | 5.31E+01 | |
| | | | 477.60 | 3.947E+00 | ?( | 1.400E+01 1.05E+02 1.05E+01 | G |
| NA-22 | C | -1.9716E-01 | | | | 9.50E+02 | |
| | | | 1274.53 | -1.972E-01 | ?( | 2.048E+00 2.87E+02 9.99E+01 | G |
| K-40 | N | 2.5820E+02 | | | | 4.66E+11 | |
| | | | 1460.83 | 2.582E+02 | ( | 6.585E+00 5.88E+00 1.07E+01 | G |
| Sc-46 | F | 8.2865E-01 | | | | 8.38E+01 | |
| | | | 889.28 | 4.988E-01 | &( | 1.411E+00 8.34E+01 1.00E+02 | G |
| | | | 1120.55 | 1.158E+00 | ?( | 3.200E+00 8.25E+01 1.00E+02 | G |
| CR-51 | F | 5.1209E+00 | | | | 2.77E+01 | |
| | | | 320.08 | 5.121E+00 | ?( | 2.529E+01 1.47E+02 9.94E+00 | G |
| MN-54 | C | -3.9020E-02 | | | | 3.12E+02 | |
| | | | 834.85 | -3.902E-02 | &( | 1.717E+00 1.82E+03 1.00E+02 | G |
| FE-59 | F | -1.1376E+00 | | | | 4.45E+01 | |
| | | | 1099.25 | -1.138E+00 | ?( | 3.514E+00 1.40E+02 5.65E+01 | G |
| | | | 1291.60 | -3.483E+00 | + | 6.168E+00 8.24E+01 4.32E+01 | G |
| Co-56 | C | -4.7414E-01 | | | | 7.73E+01 | |
| | | | 846.77 | -4.741E-01 | &( | 1.622E+00 1.45E+02 9.99E+01 | G |
| | | | 1238.28 | -4.569E-01 | + | 4.130E+00 4.08E+02 6.61E+01 | G |
| | | | 1037.84 | -8.579E+00 | + | 1.607E+01 8.44E+01 1.41E+01 | G |
| | | | 1771.35 | 0.000E+00 | + | 1.973E+01 1.00E+03 1.55E+01 | A |
| CO-58 | C | 5.9305E-01 | | | | 7.09E+01 | |
| | | | 810.78 | 5.930E-01 | ?( | 1.819E+00 9.06E+01 9.95E+01 | G |
| CO-60 | F | 2.9802E-01 | | | | 1.93E+03 | |
| | | | 1332.50 | -5.857E-02 | %( | 1.575E+00 1.12E+03 1.00E+02 | G |
| | | | 1173.24 | 6.549E-01 | ?( | 1.409E+00 9.56E+01 9.99E+01 | G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| ZN-65 | F | -2.4583E+00 | | | | | 2.44E+02 | |
| | | | 1115.55 | -2.458E+00 | ?( | 7.284E+00 | 8.84E+01 | 5.06E+01 G |
| NB-94 | I | 6.0389E-01 | | | | | 7.41E+06 | |
| | | | 702.63 | 6.039E-01 | &( | 1.303E+00 | 9.24E+01 | 9.79E+01 G |
| | | | 871.10 | -4.151E-01 | - | 1.736E+00 | 1.21E+02 | 9.99E+01 G |
| ZR-95 | I | 3.7499E-01 | | | | | 6.40E+01 | |
| | | | 756.73 | -3.296E-02 | %( | 2.494E+00 | 3.08E+03 | 5.45E+01 G |
| | | | 724.20 | 8.782E-01 | ?( | 4.488E+00 | 1.49E+02 | 4.42E+01 G |
| NB-95 | I | 7.4458E-01 | | | | | 6.40E+01 | |
| | | | 765.79 | 7.446E-01 | ?( | 2.357E+00 | 9.40E+01 | 9.98E+01 G |
| RU-103 | I | 4.6037E-01 | | | | | 3.93E+01 | |
| | | | 497.05 | 4.604E-01 | &( | 1.108E+00 | 9.93E+01 | 9.09E+01 G |
| | | | 610.30 | 9.538E+00 | ? | 6.323E+01 | 1.97E+02 | 5.75E+00 GA |
| RH-106 | I | -6.5186E+00 | | | | | 3.74E+02 | |
| | | | 621.92 | -6.519E+00 | ?( | 3.790E+01 | 1.73E+02 | 9.93E+00 G |
| | | | 1050.36 | -2.285E+01 | & | 1.290E+02 | 1.61E+02 | 1.56E+00 G |
| | | | 511.86 | 1.929E+01 | ? | 5.331E+00 | 1.72E+01 | 2.00E+01 GA |
| AG-108M | C | 4.9317E-01 | | | | | 1.53E+05 | |
| | | | 433.94 | -1.131E-01 | ?( | 1.463E+00 | 5.09E+02 | 9.05E+01 G |
| | | | 722.94 | 9.836E-01 | ?( | 1.687E+00 | 5.31E+01 | 9.08E+01 G |
| | | | 614.28 | 6.078E-01 | ?( | 4.153E+00 | 2.03E+02 | 8.98E+01 G |
| AG-110M | F | 5.9344E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | 0.000E+00 | ?( | 2.824E+00 | 1.00E+03 | 7.27E+01 G |
| | | | 657.76 | -8.168E-01 | + | 2.133E+00 | 7.82E+01 | 9.46E+01 G |
| | | | 937.49 | -5.642E-01 | + | 5.310E+00 | 4.06E+02 | 3.44E+01 G |
| | | | 1384.30 | 2.369E+00 | ?( | 5.163E+00 | 9.67E+01 | 2.43E+01 G |
| | | | 763.94 | -4.912E+00 | & | 1.107E+01 | 6.80E+01 | 2.23E+01 G |
| SN-113 | F | -9.0706E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | -9.071E-01 | ?( | 3.392E+00 | 1.11E+02 | 6.40E+01 G |
| SB-124 | F | 1.3147E+00 | | | | | 6.02E+01 | |
| | | | 602.73 | 5.501E-01 | ?( | 3.733E+00 | 2.01E+02 | 9.83E+01 G |
| | | | 1690.98 | -1.593E+00 | + | 4.290E+00 | 1.25E+02 | 4.78E+01 G |
| | | | 722.79 | 8.264E+00 | ?( | 1.023E+01 | 4.07E+01 | 1.08E+01 G |
| SB-125 | I | 1.2754E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | -4.557E-01 | ?( | 3.987E+00 | 3.43E+02 | 2.96E+01 G |
| | | | 600.50 | 3.013E+00 | ?( | 2.006E+01 | 1.97E+02 | 1.79E+01 G |
| | | | 635.89 | -6.175E+00 | + | 1.572E+01 | 7.63E+01 | 1.13E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 463.37 | 3.204E+00 | ( | 1.690E+01 | 1.55E+02 | 1.05E+01 G |
| I-131 | I -1.8176E-01 | | | | | 8.02E+00 | |
| | | 364.48 | -1.818E-01 | ?( | 1.411E+00 | 3.07E+02 | 8.17E+01 G |
| | | 284.30 | -8.199E+00 | + | 2.003E+01 | 9.96E+01 | 6.14E+00 G |
| | | 636.97 | -6.503E-01 | & | 2.835E+01 | 1.24E+03 | 7.17E+00 G |
| Ga-68 | C -1.0309E+01 | | | | | 4.71E-02 | |
| | | 1077.40 | -1.031E+01 | ?( | 7.277E+01 | 3.05E+02 | 3.30E+00 G |
| BA-133 | F -8.4663E-01 | | | | | 3.85E+03 | |
| | | 356.00 | -8.466E-01 | &( | 4.287E+00 | 1.51E+02 | 6.20E+01 G |
| | | 302.85 | -1.946E-01 | % | 1.346E+01 | 2.04E+03 | 1.83E+01 G |
| | | 383.84 | -5.992E+00 | & | 2.099E+01 | 1.04E+02 | 8.94E+00 GA |
| | | 80.99 | -1.470E+00 | + | 7.468E+00 | 1.53E+02 | 3.41E+01 GA |
| CS-134 | I 2.6670E-01 | | | | | 7.54E+02 | |
| | | 604.71 | 3.398E-02 | &( | 3.843E+00 | 3.32E+03 | 9.76E+01 G |
| | | 795.87 | 3.942E-01 | ?( | 2.114E+00 | 1.55E+02 | 8.55E+01 G |
| | | 569.32 | -1.105E+00 | + | 8.475E+00 | 2.18E+02 | 1.54E+01 G |
| | | 801.95 | -1.129E+01 | + | 3.096E+01 | 8.20E+01 | 8.69E+00 G |
| | | 563.24 | 1.682E+00 | &( | 1.521E+01 | 3.65E+02 | 8.35E+00 G |
| CS-137 | I 4.3167E-01 | | | | | 1.10E+04 | |
| | | 661.66 | 4.317E-01 | ?( | 2.516E+00 | 1.70E+02 | 8.52E+01 G |
| CE-139 | F 4.7545E-01 | | | | | 1.38E+02 | |
| | | 165.85 | 4.755E-01 | &( | 1.632E+00 | 1.03E+02 | 7.99E+01 G |
| Ba-140 | I 5.5389E-02 | | | | | 1.28E+01 | |
| | | 537.26 | 5.539E-02 | %( | 5.010E+00 | 3.61E+03 | 2.44E+01 G |
| | | 162.66 | -4.892E+00 | + | 2.083E+01 | 1.27E+02 | 6.22E+00 G |
| | | 304.85 | 0.000E+00 | - | 5.791E+01 | 1.00E+03 | 4.29E+00 G |
| La-140 | I 4.9651E-01 | | | | | 1.28E+01 | |
| | | 1596.21 | 2.885E-01 | ?( | 1.991E+00 | 3.02E+02 | 9.54E+01 G |
| | | 487.02 | 9.326E-01 | ?( | 3.293E+00 | 1.04E+02 | 4.55E+01 G |
| | | 328.76 | -2.514E+00 | + | 1.310E+01 | 1.55E+02 | 2.03E+01 G |
| | | 815.77 | 0.000E+00 | - | 8.708E+00 | 1.00E+03 | 2.33E+01 G |
| CE-141 | I -9.6033E-01 | | | | | 3.25E+01 | |
| | | 145.44 | -9.603E-01 | ?( | 4.631E+00 | 1.45E+02 | 4.82E+01 G |
| PM-144 | C -9.5300E-01 | | | | | 3.63E+02 | |
| | | 696.54 | -9.530E-01 | ?( | 1.979E+00 | 9.09E+01 | 9.90E+01 G |
| | | 618.06 | 0.000E+00 | + | 3.859E+00 | 1.00E+03 | 9.91E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| EU-152 | F 1.9152E+00 | | | | | 4.94E+03 | |
| | | 344.29 | 1.915E+00 | ?( | 8.969E+00 | 1.40E+02 | 2.65E+01 G |
| | | 1112.07 | -9.080E+00 | & | 2.898E+01 | 9.51E+01 | 1.36E+01 G |
| | | 121.78 | -1.061E+00 | & | 3.896E+00 | 1.10E+02 | 2.86E+01 G |
| | | 778.92 | -6.546E+00 | + | 1.330E+01 | 8.82E+01 | 1.29E+01 G |
| | | 964.11 | -7.071E+00 | + | 2.571E+01 | 1.08E+02 | 1.46E+01 G |
| | | 244.69 | -9.136E-01 | % | 3.788E+01 | 1.23E+03 | 7.58E+00 G |
| | | 1408.00 | 1.903E+00 | ? | 6.062E+00 | 1.37E+02 | 2.10E+01 GA |
| EU-154 | I 1.0080E+00 | | | | | 3.14E+03 | |
| | | 873.23 | 1.652E-01 | %( | 1.583E+01 | 2.67E+03 | 1.23E+01 G |
| | | 123.10 | 8.120E-01 | ( | 2.491E+00 | 9.19E+01 | 4.08E+01 G |
| | | 1274.54 | 0.000E+00 | - | 6.091E+00 | 1.00E+03 | 3.52E+01 G |
| | | 723.36 | 1.915E+00 | &( | 9.184E+00 | 1.39E+02 | 2.02E+01 G |
| | | 1004.77 | -1.270E-01 | % | 1.358E+01 | 3.00E+03 | 1.80E+01 G |
| | | 996.33 | -4.711E+00 | + | 2.099E+01 | 1.29E+02 | 1.06E+01 G |
| EU-155 | I 2.1284E+00 | | | | | 1.81E+03 | |
| | | 105.31 | 2.128E+00 | ?( | 1.243E+01 | 1.75E+02 | 2.12E+01 G |
| | | 86.54 | 9.544E-01 | } | 9.389E+00 | 1.12E+02 | 3.07E+01 G |
| HF-181 | F 8.7231E-02 | | | | | 4.24E+01 | |
| | | 482.00 | -5.120E-01 | ?( | 2.399E+00 | 1.38E+02 | 8.05E+01 G |
| | | 133.02 | -8.007E-02 | % | 4.242E+00 | 1.57E+03 | 4.33E+01 G |
| | | 345.83 | 3.288E+00 | ?( | 1.634E+01 | 1.48E+02 | 1.51E+01 G |
| | | 136.30 | 0.000E+00 | - | 3.174E+01 | 1.00E+03 | 5.85E+00 G |
| Ta-182 | F 2.9175E+00 | | | | | 1.14E+02 | |
| | | 1121.30 | 3.032E+00 | ?( | 8.302E+00 | 8.17E+01 | 3.49E+01 G |
| | | 1221.41 | 2.769E+00 | &( | 5.401E+00 | 8.72E+01 | 2.70E+01 G |
| | | 1189.05 | -1.471E+00 | - | 1.047E+01 | 3.09E+02 | 1.62E+01 G |
| Hg-203 | F -6.5220E-01 | | | | | 4.66E+01 | |
| | | 279.20 | -6.522E-01 | ?( | 1.906E+00 | 8.76E+01 | 8.15E+01 G |
| TL-208 | N 8.0773E+00 | | | | | 6.98E+02 | |
| | | 583.02 | 8.077E+00 | ( | 9.839E-01 | 9.46E+00 | 8.45E+01 G |
| | | 277.28 | 5.584E+00 | & | 1.713E+01 | 9.13E+01 | 6.31E+00 G |
| | | 860.56 | 1.064E+01 | + | 9.740E+00 | 4.19E+01 | 1.24E+01 G |
| pm-146 | C -1.8280E+00 | | | | | 2.02E+03 | |
| | | 747.16 | -1.828E+00 | ?( | 5.413E+00 | 1.28E+02 | 3.40E+01 G |
| | | 735.72 | -3.895E-01 | + | 6.858E+00 | 7.32E+02 | 2.25E+01 G |
| | | 453.88 | 4.351E-01 | + | 1.730E+00 | 1.63E+02 | 6.50E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| y-88 | F | 1.2628E+00 | | | | | 1.07E+02 | |
| | | | 898.04 | 1.263E+00 | ?( | 4.898E-01 | 2.29E+01 | 9.37E+01 G |
| | | | 1836.06 | -2.363E-01 | - | 1.668E+00 | 3.04E+02 | 9.92E+01 G |
| Cd-113m | | 4.2384E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | 4.238E+03 | ?( | 1.628E+04 | 1.13E+02 | 6.00E-03 K |
| Cf-251 | T | 2.1763E+00 | | | | | 3.28E+05 | |
| | | | 176.60 | 2.176E+00 | *( | 5.521E+00 | 9.92E+01 | 1.70E+01 G |
| | | | 227.00 | 5.652E+00 | & | 1.396E+01 | 9.60E+01 | 6.30E+00 GA |
| Cf-249 | T | -8.2090E-01 | | | | | 1.28E+05 | |
| | | | 387.95 | -8.209E-01 | ?( | 3.017E+00 | 1.09E+02 | 6.60E+01 G |
| | | | 333.44 | -3.339E+00 | + | 1.694E+01 | 1.51E+02 | 1.55E+01 G |
| Sn-126 | | 1.1422E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | 1.142E+00 | } | 7.116E+00 | 7.50E+01 | 3.75E+01 GA |
| | | | 64.28 | 1.142E+00 | ?( | 2.143E+01 | 5.57E+02 | 9.70E+00 G |
| | | | 86.94 | 1.142E+00 | } | 3.074E+01 | 3.23E+02 | 9.04E+00 GA |
| PB-210 | N | -1.3676E+01 | | | | | 8.14E+03 | |
| | | | 46.54 | -1.368E+01 | *(P | 6.140E+01 | 1.49E+02 | 4.25E+00 G |
| PB-212 | N | 2.0513E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 2.051E+01 | (P | 2.100E+00 | 5.72E+00 | 4.33E+01 G |
| | | | 300.03 | 3.255E+01 | + | 2.537E+01 | 3.49E+01 | 3.28E+00 GA |
| PB-214 | N | 1.8747E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.852E+01 | ( | 2.069E+00 | 7.75E+00 | 3.76E+01 G |
| | | | 295.09 | 1.919E+01 | ( | 4.656E+00 | 1.30E+01 | 1.93E+01 G |
| | | | 242.00 | 2.088E+01 | | 1.356E+01 | 2.20E+01 | 7.43E+00 GA |
| BI-207 | C | 1.3445E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | -5.800E-02 | ( | 1.421E+00 | 6.87E+02 | 9.77E+01 G |
| | | | 1063.66 | 3.869E-01 | ?( | 2.278E+00 | 2.51E+02 | 7.45E+01 G |
| BI-212 | N | -2.9530E-01 | | | | | 6.98E+02 | |
| | | | 727.17 | -2.953E-01 | %( | 3.051E+01 | 2.95E+03 | 7.55E+00 G |
| | | | 785.42 | -1.447E+01 | + | 1.354E+02 | 3.93E+02 | 1.28E+00 GA |
| BI-214 | N | 1.7168E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.628E+01 | ( | 2.443E+00 | 9.99E+00 | 4.61E+01 G |
| | | | 1120.29 | 8.283E+00 | - | 2.478E+01 | 8.93E+01 | 1.51E+01 G |
| | | | 1764.49 | 1.981E+01 | &( | 5.409E+00 | 1.92E+01 | 1.54E+01 G |

| Nuclide | | Ave activity | Energy | | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|---|
| BI-210M | T | -3.7218E-01 | | | | | | 1.10E+09 | |
| | | | 265.83 | -3.722E-01 | ( | 2.369E+00 | 1.86E+02 | 5.00E+01 | G |
| | | | 304.90 | 0.000E+00 | + | 8.873E+00 | 1.00E+03 | 2.80E+01 | G |
| AC-228 | N | 2.3700E+01 | | | | | | 2.10E+03 | |
| | | | 911.07 | 2.232E+01 | ( | 3.684E+00 | 1.21E+01 | 2.90E+01 | G |
| | | | 968.97 | 2.627E+01 | ( | 6.355E+00 | 1.58E+01 | 1.75E+01 | G |
| | | | 338.32 | 2.329E+01 | ( | 6.701E+00 | 1.48E+01 | 1.20E+01 | G |
| | | | 93.35 | -3.980E+00 | - | 4.769E+01 | 3.59E+02 | 5.56E+00 | XA |
| TH-227 | N | 6.9331E+00 | | | | | | 7.95E+03 | |
| | | | 50.14 | 6.933E+00 | *( | 2.420E+01 | 1.04E+02 | 8.00E+00 | G |
| | | | 256.24 | -1.077E-01 | % | 1.470E+01 | 5.16E+03 | 7.00E+00 | G |
| TH-229 | N | -1.0835E+01 | | | | | | 2.68E+06 | |
| | | | 193.51 | -1.083E+01 | ?( | 2.689E+01 | 9.74E+01 | 4.40E+00 | G |
| | | | 210.85 | 1.002E+01 | + | 4.001E+01 | 1.55E+02 | 2.99E+00 | G |
| TH-234 | N | 2.2404E+01 | | | | | | 1.63E+12 | |
| | | | 63.29 | 2.240E+01 | (P | 3.065E+01 | 4.27E+01 | 3.81E+00 | G |
| | | | 92.59 | 1.183E+01 | - P | 1.825E+01 | 4.77E+01 | 5.58E+00 | G |
| PA-231 | N | -1.7105E+01 | | | | | | 1.20E+07 | |
| | | | 302.65 | -1.711E+01 | &( | 8.437E+01 | 1.47E+02 | 2.88E+00 | G |
| | | | 300.07 | -1.985E+01 | + | 1.027E+02 | 1.54E+02 | 2.46E+00 | G |
| PA-234 | N | 2.1629E+00 | | | | | | 1.63E+12 | |
| | | | 131.29 | -2.016E+00 | ?( | 9.979E+00 | 1.48E+02 | 1.80E+01 | G |
| | | | 946.02 | 7.776E+00 | ?( | 8.479E+00 | 5.01E+01 | 1.34E+01 | G |
| | | | 569.47 | 0.000E+00 | - | 1.668E+01 | 1.00E+03 | 8.20E+00 | G |
| | | | 883.24 | 0.000E+00 | - | 2.135E+01 | 1.00E+03 | 9.60E+00 | G |
| | | | 880.53 | -6.804E-01 | % | 3.383E+01 | 1.39E+03 | 6.00E+00 | GA |
| PA-234M | N | 3.6715E+01 | | | | | | 1.63E+12 | |
| | | | 1001.00 | 0.000E+00 | ?( | 2.877E+02 | 1.00E+03 | 8.37E-01 | G |
| | | | 766.41 | 1.412E+02 | ?( | 4.279E+02 | 8.89E+01 | 2.94E-01 | G |
| U-235 | N | 1.2795E+00 | | | | | | 2.57E+11 | |
| | | | 143.79 | 0.000E+00 | &( | 1.734E+01 | 1.00E+03 | 1.10E+01 | G |
| | | | 205.33 | 4.079E+00 | ?( | 2.034E+01 | 1.92E+02 | 5.01E+00 | G |
| | | | 163.38 | -6.659E+00 | + | 2.659E+01 | 1.19E+02 | 5.08E+00 | G |
| AM-241 | T | -1.2271E+00 | | | | | | 1.58E+05 | |
| | | | 59.54 | -1.227E+00 | ?( | 5.942E+00 | 1.45E+02 | 3.59E+01 | G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Np-237   F  -3.5668E+00                                      2.14E+06
                           86.49-3.567E+00 !(  2.221E+01 1.87E+02 1.31E+01 G

Ir-192   F   3.6991E-01                                      7.40E+01
                          316.49 0.000E+00 ?(  2.938E+00 1.00E+03 8.70E+01 G
                          468.06 9.921E-01 ?(  3.317E+00 9.93E+01 5.18E+01 G
                          308.44 0.000E+00 &   7.895E+00 1.00E+03 3.18E+01 G

Cs-136   F  -7.7955E-01                                      1.30E+01
                          818.50-7.795E-01 &(  2.389E+00 9.11E+01 1.00E+02 G
                         1048.07 3.558E-01 &   2.048E+00 1.62E+02 8.00E+01 G
                          340.57-1.111E+00 +   5.563E+00 1.49E+02 4.69E+01 G

Np-239   T   1.9140E+00                                      2.36E+00
                          103.70 0.000E+00 -   1.086E+01 1.00E+03 2.40E+01 X
                          106.13 1.914E+00 ?(  1.104E+01 1.73E+02 2.27E+01 G
                           99.50 0.000E+00 -   1.749E+01 1.00E+03 1.50E+01 X

Nd-147       2.0586E+00                                      1.11E+01
                          531.00 2.059E+00 ?(  8.762E+00 1.73E+02 1.30E+01 G
                           91.10-1.624E+00 +   9.200E+00 1.70E+02 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
```

M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity | |
|---|---|---|---|---|---|---|---|
| PB-210 | 46.54 | 366. | -20. | -0.011 | 149.21 | -1.368E+01 | P |
| TH-227 | 50.14 | 250. | 22. | 0.012 | 104.40 | 6.933E+00 | |
| AM-241 | 59.54 | 483. | -22. | -0.012 | 144.76 | -1.227E+00 | |
| BA-133 | 80.99 | 1181. | -32. | -0.018 | 152.62 | -1.470E+00 | |
| Np-237 | 86.49 | 1661. | -31. | -0.017 | 187.21 | -3.567E+00 | |
| Nd-147 | 91.10 | 1383. | -31. | -0.017 | 170.22 | -1.624E+00 | |
| Np-239 | 106.13 | 1365. | 30. | 0.017 | 173.23 | 1.914E+00 | |
| EU-152 | 121.78 | 255. | -21. | -0.012 | 109.73 | -1.061E+00 | |
| EU-154 | 123.10 | 210. | 23. | 0.013 | 91.93 | 8.120E-01 | |
| PA-234 | 131.29 | 656. | -25. | -0.014 | 148.29 | -2.016E+00 | |
| CE-141 | 145.44 | 937. | -30. | -0.017 | 144.77 | -9.603E-01 | |
| Ba-140 | 162.66 | 266. | -18. | -0.010 | 126.94 | -4.892E+00 | |
| U-235 | 163.38 | 288. | -20. | -0.011 | 119.24 | -6.659E+00 | |
| CE-139 | 165.85 | 272. | 23. | 0.013 | 102.75 | 4.755E-01 | |
| Cf-251 | 176.60 | 125. | 22. | 0.012 | 99.16 | 2.176E+00 | |
| U-235 | 205.33 | 117. | 11. | 0.006 | 192.43 | 4.079E+00 | |
| Cf-251 | 227.00 | 73. | 17. | 0.010 | 95.96 | 5.652E+00 | |
| Cd-113m | 263.70 | 72. | 11. | 0.006 | 113.18 | 4.238E+03 | |
| BI-210M | 265.83 | 107. | -8. | -0.004 | 186.25 | -3.722E-01 | |
| Hg-203 | 279.20 | 175. | -22. | -0.012 | 87.59 | -6.522E-01 | |
| I-131 | 284.30 | 104. | -21. | -0.011 | 99.60 | -8.199E+00 | |
| PA-231 | 300.07 | 427. | -19. | -0.011 | 154.40 | -1.985E+01 | |
| PA-233 | 300.18 | 408. | -19. | -0.011 | 150.95 | -7.881E+00 | |
| PA-231 | 302.65 | 389. | -19. | -0.011 | 147.18 | -1.711E+01 | |
| CR-51 | 320.08 | 381. | 19. | 0.011 | 147.31 | 5.121E+00 | |
| La-140 | 328.76 | 410. | -19. | -0.010 | 155.41 | -2.514E+00 | |
| Cf-249 | 333.44 | 391. | -19. | -0.010 | 151.40 | -3.339E+00 | |
| Cs-136 | 340.57 | 373. | -19. | -0.010 | 149.29 | -1.111E+00 | |
| EU-152 | 344.29 | 302. | 18. | 0.010 | 139.54 | 1.915E+00 | |
| HF-181 | 345.83 | 323. | 17. | 0.010 | 148.04 | 3.288E+00 | |
| BA-133 | 356.00 | 361. | -18. | -0.010 | 150.97 | -8.466E-01 | |
| I-131 | 364.48 | 60. | -5. | -0.003 | 306.59 | -1.818E-01 | |
| BA-133 | 383.84 | 155. | -17. | -0.010 | 104.37 | -5.992E+00 | |
| Cf-249 | 387.95 | 172. | -17. | -0.010 | 109.45 | -8.209E-01 | |
| SN-113 | 391.69 | 203. | -18. | -0.010 | 111.48 | -9.071E-01 | |
| SB-125 | 427.88 | 48. | -4. | -0.002 | 342.78 | -4.557E-01 | |
| AG-108M | 433.94 | 60. | -3. | -0.002 | 508.81 | -1.131E-01 | |
| pm-146 | 453.88 | 39. | 8. | 0.004 | 163.22 | 4.351E-01 | |
| SB-125 | 463.37 | 100. | 9. | 0.005 | 154.77 | 3.204E+00 | |
| Ir-192 | 468.06 | 92. | 14. | 0.008 | 99.28 | 9.921E-01 | |
| BE-7 | 477.60 | 64. | 11. | 0.006 | 104.69 | 3.947E+00 | |
| HF-181 | 482.00 | 112. | -11. | -0.006 | 138.12 | -5.120E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| La-140 | 487.02 | 64. | 11. | 0.006 | 104.22 | 9.326E-01 | |
| RU-103 | 497.05 | 26. | 11. | 0.006 | 99.31 | 4.604E-01 | |
| RH-106 | 511.86 | 28. | 99. | 0.055 | 17.21 | 1.929E+01 | |
| Nd-147 | 531.00 | 30. | 7. | 0.004 | 173.02 | 2.059E+00 | |
| CS-134 | 563.24 | 35. | 3. | 0.002 | 364.69 | 1.682E+00 | |
| CS-134 | 569.32 | 36. | -4. | -0.002 | 217.94 | -1.105E+00 | |
| BI-207 | 569.70 | 41. | -1. | -0.001 | 687.39 | -5.800E-02 | |
| SB-125 | 600.50 | 280. | 12. | 0.007 | 197.34 | 3.013E+00 | |
| SB-124 | 602.73 | 292. | 12. | 0.007 | 201.22 | 5.501E-01 | |
| RU-103 | 610.30 | 281. | 12. | 0.007 | 196.53 | 9.538E+00 | |
| AG-108M | 614.28 | 293. | 12. | 0.007 | 202.58 | 6.078E-01 | |
| RH-106 | 621.92 | 292. | -14. | -0.008 | 172.70 | -6.519E+00 | |
| SB-125 | 635.89 | 58. | -15. | -0.008 | 76.30 | -6.175E+00 | |
| AG-110M | 657.76 | 72. | -16. | -0.009 | 78.22 | -8.168E-01 | |
| CS-137 | 661.66 | 81. | 8. | 0.004 | 170.03 | 4.317E-01 | |
| PM-144 | 696.54 | 61. | -19. | -0.010 | 90.94 | -9.530E-01 | |
| NB-94 | 702.63 | 23. | 12. | 0.006 | 92.44 | 6.039E-01 | |
| SB-124 | 722.79 | 16. | 17. | 0.010 | 40.69 | 8.264E+00 | |
| AG-108M | 722.94 | 33. | 17. | 0.010 | 53.07 | 9.836E-01 | |
| EU-154 | 723.36 | 50. | 7. | 0.004 | 139.43 | 1.915E+00 | |
| ZR-95 | 724.20 | 58. | 7. | 0.004 | 148.67 | 8.782E-01 | |
| pm-146 | 735.72 | 33. | -2. | -0.001 | 731.57 | -3.895E-01 | |
| pm-146 | 747.16 | 47. | -12. | -0.006 | 127.62 | -1.828E+00 | |
| AG-110M | 763.94 | 84. | -20. | -0.011 | 68.04 | -4.912E+00 | |
| NB-95 | 765.79 | 76. | 14. | 0.008 | 94.03 | 7.446E-01 | |
| PA-234M | 766.41 | 19. | 8. | 0.004 | 88.86 | 1.412E+02 | |
| EU-152 | 778.92 | 37. | -15. | -0.009 | 88.21 | -6.546E+00 | |
| BI-212 | 785.42 | 37. | -3. | -0.002 | 392.68 | -1.447E+01 | |
| CS-134 | 795.87 | 40. | 6. | 0.003 | 154.56 | 3.942E-01 | |
| CS-134 | 801.95 | 93. | -17. | -0.010 | 82.05 | -1.129E+01 | |
| CO-58 | 810.78 | 39. | 10. | 0.006 | 90.61 | 5.930E-01 | |
| Cs-136 | 818.50 | 69. | -14. | -0.008 | 91.07 | -7.795E-01 | |
| Co-56 | 846.77 | 28. | -8. | -0.004 | 144.70 | -4.741E-01 | |
| NB-94 | 871.10 | 31. | -7. | -0.004 | 121.12 | -4.151E-01 | |
| Sc-46 | 889.28 | 19. | 8. | 0.004 | 83.44 | 4.988E-01 | |
| AG-110M | 937.49 | 30. | -3. | -0.002 | 405.52 | -5.642E-01 | |
| PA-234 | 946.02 | 10. | 16. | 0.009 | 50.13 | 7.776E+00 | |
| EU-152 | 964.11 | 134. | -16. | -0.009 | 108.07 | -7.071E+00 | |
| EU-154 | 996.33 | 41. | -7. | -0.004 | 129.37 | -4.711E+00 | |
| Co-56 | 1037.84 | 40. | -17. | -0.010 | 84.44 | -8.579E+00 | |
| Cs-136 | 1048.07 | 19. | 4. | 0.002 | 162.02 | 3.558E-01 | |
| RH-106 | 1050.36 | 30. | -5. | -0.003 | 161.25 | -2.285E+01 | |
| BI-207 | 1063.66 | 20. | 4. | 0.002 | 250.83 | 3.869E-01 | |
| Ga-68 | 1077.40 | 30. | -4. | -0.002 | 305.16 | -1.031E+01 | |
| FE-59 | 1099.25 | 27. | -9. | -0.005 | 139.63 | -1.138E+00 | |
| EU-152 | 1112.07 | 115. | -17. | -0.009 | 95.13 | -9.080E+00 | |
| ZN-65 | 1115.55 | 99. | -17. | -0.009 | 88.44 | -2.458E+00 | |
| Sc-46 | 1120.55 | 73. | 15. | 0.009 | 82.52 | 1.158E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CO-60 | 1173.24 | 11. | 8. | 0.005 | 95.58 | 6.549E-01 | |
| Co-56 | 1238.28 | 43. | -4. | -0.002 | 408.28 | -4.569E-01 | |
| NA-22 | 1274.53 | 21. | -2. | -0.001 | 287.49 | -1.972E-01 | |
| FE-59 | 1291.60 | 37. | -18. | -0.010 | 82.40 | -3.483E+00 | |
| AG-110M | 1384.30 | 6. | 6. | 0.004 | 96.69 | 2.369E+00 | |
| EU-152 | 1408.00 | 6. | 4. | 0.002 | 137.50 | 1.903E+00 | |
| La-140 | 1596.21 | 11. | 3. | 0.001 | 302.33 | 2.885E-01 | |
| SB-124 | 1690.98 | 12. | -7. | -0.004 | 125.36 | -1.593E+00 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

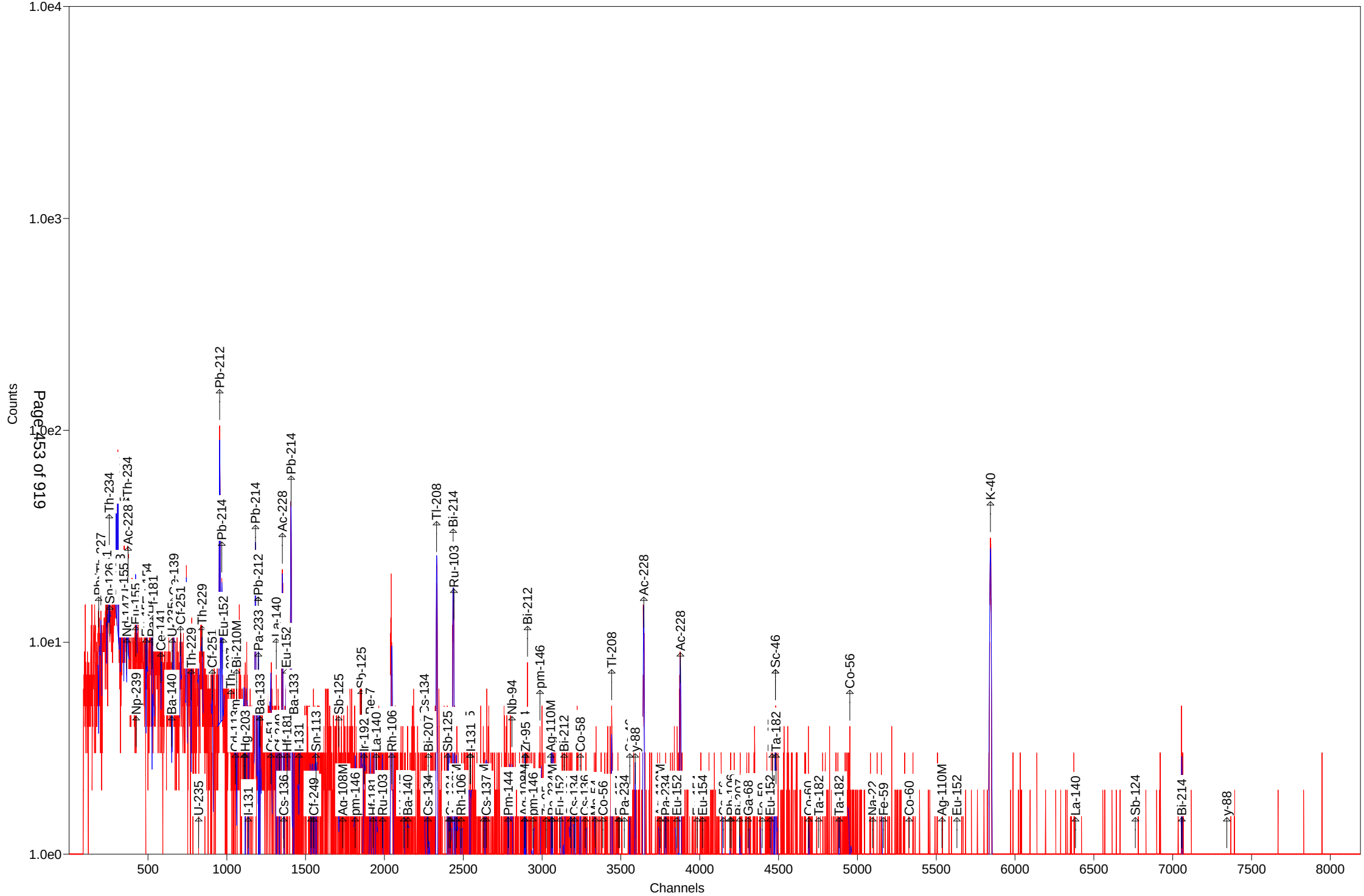
| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | 3.9469E+00 | 3.9469E+00 | 1.047E+02% | 1.40E+01 |
| NA-22 | #A | -1.9716E-01 | -1.9716E-01 | 2.875E+02% | 2.05E+00 |
| K-40 | | 2.5820E+02 | 2.5820E+02 | 5.882E+00% | 6.58E+00 |
| Sc-46 | #A | 8.2865E-01 | 8.2865E-01 | 5.867E+01% | 1.41E+00 |
| CR-51 | #A | 5.1209E+00 | 5.1209E+00 | 1.473E+02% | 2.53E+01 |
| MN-54 | #A | -3.9020E-02 | -3.9020E-02 | 1.823E+03% | 1.72E+00 |
| FE-59 | #A | -1.1376E+00 | -1.1376E+00 | 1.396E+02% | 3.51E+00 |
| Co-56 | #A | -4.7413E-01 | -4.7414E-01 | 1.447E+02% | 1.62E+00 |
| CO-57 | #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 1.35E+00 |
| CO-58 | #A | 5.9304E-01 | 5.9305E-01 | 9.061E+01% | 1.82E+00 |
| CO-60 | #A | 2.9802E-01 | 2.9802E-01 | 9.558E+01% | 1.58E+00 |
| ZN-65 | #A | -2.4583E+00 | -2.4583E+00 | 8.844E+01% | 7.28E+00 |
| NB-94 | #A | 6.0389E-01 | 6.0389E-01 | 9.244E+01% | 1.30E+00 |
| ZR-95 | #A | 3.7499E-01 | 3.7499E-01 | 1.487E+02% | 2.49E+00 |
| NB-95 | #A | 7.4457E-01 | 7.4458E-01 | 9.403E+01% | 2.36E+00 |
| RU-103 | #A | 4.6037E-01 | 4.6037E-01 | 9.931E+01% | 1.11E+00 |
| RH-106 | #A | -6.5186E+00 | -6.5186E+00 | 1.727E+02% | 3.79E+01 |
| AG-108M | #A | 4.9317E-01 | 4.9317E-01 | 5.307E+01% | 1.46E+00 |
| AG-110M | #A | 5.9344E-01 | 5.9344E-01 | 9.669E+01% | 2.82E+00 |
| SN-113 | #A | -9.0705E-01 | -9.0706E-01 | 1.115E+02% | 3.39E+00 |
| SB-124 | #A | 1.3147E+00 | 1.3147E+00 | 4.069E+01% | 3.73E+00 |
| SB-125 | #A | 1.2754E+00 | 1.2754E+00 | 1.416E+02% | 3.99E+00 |
| I-131 | #A | -1.8175E-01 | -1.8176E-01 | 3.066E+02% | 1.41E+00 |
| Gd-153 | #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 8.78E+00 |
| Ga-68 | #A | -1.0259E+01 | -1.0309E+01 | 3.052E+02% | 7.28E+01 |
| Tc-99m | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.17E+00 |
| BA-133 | #A | -8.4663E-01 | -8.4663E-01 | 1.510E+02% | 4.29E+00 |
| CS-134 | #A | 2.6670E-01 | 2.6670E-01 | 1.546E+02% | 3.84E+00 |
| CS-137 | #A | 4.3167E-01 | 4.3167E-01 | 1.700E+02% | 2.52E+00 |
| CE-139 | #A | 4.7545E-01 | 4.7545E-01 | 1.027E+02% | 1.63E+00 |
| Ba-140 | #A | 5.5388E-02 | 5.5389E-02 | 3.610E+03% | 5.01E+00 |
| La-140 | #A | 4.9650E-01 | 4.9651E-01 | 1.042E+02% | 1.99E+00 |

| | | | | |
|---|---|---|---|---|
| CE-141 #A | -9.6033E-01 | -9.6033E-01 | 1.448E+02% | 4.63E+00 |
| CE-144 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.66E+01 |
| PM-144 #A | -9.5300E-01 | -9.5300E-01 | 9.094E+01% | 1.98E+00 |
| EU-152 #A | 1.9152E+00 | 1.9152E+00 | 1.395E+02% | 8.97E+00 |
| EU-154 #A | 1.0080E+00 | 1.0080E+00 | 9.193E+01% | 1.58E+01 |
| EU-155 #A | 2.1284E+00 | 2.1284E+00 | 1.755E+02% | 1.24E+01 |
| HF-181 #A | 8.7231E-02 | 8.7231E-02 | 1.012E+02% | 2.40E+00 |
| Ta-182 #A | 2.9175E+00 | 2.9175E+00 | 5.976E+01% | 8.30E+00 |
| Hg-203 #A | -6.5220E-01 | -6.5220E-01 | 8.759E+01% | 1.91E+00 |
| TL-208 | 8.0773E+00 | 8.0773E+00 | 9.462E+00% | 9.84E-01 |
| pm-146 #A | -1.8280E+00 | -1.8280E+00 | 1.276E+02% | 5.41E+00 |
| y-88 # | 1.2628E+00 | 1.2628E+00 | 2.294E+01% | 4.90E-01 |
| Cd-113m#A | 4.2384E+03 | 4.2384E+03 | 1.132E+02% | 1.63E+04 |
| Cd-109 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 7.22E+01 |
| Cf-251 #A | 2.1763E+00 | 2.1763E+00 | 9.916E+01% | 5.52E+00 |
| Cf-249 #A | -8.2090E-01 | -8.2090E-01 | 1.095E+02% | 3.02E+00 |
| Sn-126 #A | 1.1422E+00 | 1.1422E+00 | 5.569E+02% | 2.14E+01 |
| PB-210 #A | -1.3676E+01 | -1.3676E+01 | 1.492E+02% | 6.14E+01 |
| PB-212 | 2.0513E+01 | 2.0513E+01 | 5.723E+00% | 2.10E+00 |
| PB-214 | 1.8747E+01 | 1.8747E+01 | 7.556E+00% | 2.07E+00 |
| BI-207 #A | 1.3445E-01 | 1.3445E-01 | 2.508E+02% | 1.42E+00 |
| BI-212 #A | -2.9529E-01 | -2.9530E-01 | 2.948E+03% | 3.05E+01 |
| BI-214 | 1.7168E+01 | 1.7168E+01 | 9.987E+00% | 2.44E+00 |
| BI-210M#A | -3.7218E-01 | -3.7218E-01 | 1.862E+02% | 2.37E+00 |
| AC-228 | 2.3700E+01 | 2.3700E+01 | 8.277E+00% | 3.68E+00 |
| TH-227 #A | 6.9331E+00 | 6.9331E+00 | 1.044E+02% | 2.42E+01 |
| TH-229 A | -1.0835E+01 | -1.0835E+01 | 9.745E+01% | 2.69E+01 |
| TH-234 A | 2.2404E+01 | 2.2404E+01 | 4.268E+01% | 3.07E+01 |
| PA-231 #A | -1.7105E+01 | -1.7105E+01 | 1.472E+02% | 8.44E+01 |
| PA-233 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 7.03E+00 |
| PA-234 #A | 2.1629E+00 | 2.1629E+00 | 5.013E+01% | 9.98E+00 |
| PA-234M#A | 3.6715E+01 | 3.6715E+01 | 8.886E+01% | 2.88E+02 |
| U-235 #A | 1.2795E+00 | 1.2795E+00 | 1.924E+02% | 1.73E+01 |
| AM-241 #A | -1.2271E+00 | -1.2271E+00 | 1.448E+02% | 5.94E+00 |
| Np-237 #A | -3.5668E+00 | -3.5668E+00 | 1.872E+02% | 2.22E+01 |
| Ir-192 #A | 3.6991E-01 | 3.6991E-01 | 9.928E+01% | 2.94E+00 |
| Cs-136 #A | -7.7954E-01 | -7.7955E-01 | 9.107E+01% | 2.39E+00 |
| Np-239 #A | 1.9138E+00 | 1.9140E+00 | 1.732E+02% | 1.10E+01 |
| Nd-147 #A | 2.0586E+00 | 2.0586E+00 | 1.730E+02% | 8.76E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
-----------------------------   S U M M A R Y   -----------------------------
Total Activity (   25.1 to  1999.5 keV)     3.688E+02  Bq/Sample
Total Decayed Activity (   25.1 to  1999.5 keV) 3.6880954E+02  Bq/Sample
```

309155_Gamma_160-22327-A-5-B. 15_Gamma_20171219.spc.



Test America St. Louis  Spectrum ID: 16_Gamma_20171318

Sample Description: 309155_Gamma_160-22327-A-6-B
Detector: Detector #16
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-6-B

Decay to Time: 6/7/2017 09:58  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:59:16  Real Time: 1816 sec
Analysis Time: 6/7/2017 10:29  Dead Time: 0.88 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 16_Soil_TunaCan.Clb
Efficiency Cal Desc: 16_TunaCan_90099_071012
Efficiency Cal Date: 7/13/2012 09:47
Energy Cal Date: 2/28/2012 09:35
Library: Client_Long_Rev11.lib
Bkgd Correction File: 16_2017-06-04_0508.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | 5.861E-01 | 777.6 | 4.557E+00 | 4.557E+00 | 1.569E+01 |
| NA-22 | -5.908E-01 | 89.4 | 5.285E-01 | 5.293E-01 | 1.789E+00 |
| K-40 | 2.676E+02 | 4.8 | 1.282E+01 | 1.876E+01 | 4.524E+00 |
| Sc-46 | 5.989E-01 | 87.6 | 5.247E-01 | 5.256E-01 | 1.764E+00 |
| CR-51 | -5.217E-01 | 872.6 | 4.552E+00 | 4.553E+00 | 1.554E+01 |
| MN-54 | 3.008E-01 | 176.1 | 5.298E-01 | 5.300E-01 | 1.213E+00 |
| FE-59 | 5.296E-01 | 190.0 | 1.006E+00 | 1.006E+00 | 2.265E+00 |
| Co-56 | 7.765E-01 | 83.2 | 6.461E-01 | 6.474E-01 | 1.227E+00 |
| CO-57 | -1.061E-01 | 353.7 | 3.753E-01 | 3.753E-01 | 1.267E+00 |
| CO-58 | -8.703E-01 | 81.3 | 7.079E-01 | 7.094E-01 | 2.360E+00 |
| CO-60 | 4.422E-01 | 85.6 | 3.786E-01 | 3.792E-01 | 8.432E-01 |
| ZN-65 | -1.709E+00 | 101.2 | 1.730E+00 | 1.732E+00 | 5.812E+00 |
| NB-94 | 3.042E-01 | 72.6 | 2.208E-01 | 2.213E-01 | 1.870E+00 |
| ZR-95 | 3.493E-01 | 81.7 | 2.853E-01 | 2.859E-01 | 2.647E+00 |
| NB-95 | 0.000E+00 | 1.#INF | 9.889E-02 | 9.889E-02 | 1.854E+00 |
| RU-103 | 4.598E-01 | 93.2 | 4.285E-01 | 4.292E-01 | 1.025E+00 |
| RH-106 | 3.530E-01 | 53.6 | 1.892E-01 | 1.901E-01 | 1.711E+01 |
| AG-108M | -1.369E-01 | 378.3 | 5.177E-01 | 5.178E-01 | 1.253E+00 |
| AG-110M | 3.112E-01 | 25.0 | 7.779E-02 | 7.940E-02 | 2.699E+00 |
| SN-113 | 6.146E-01 | 104.7 | 6.434E-01 | 6.441E-01 | 2.163E+00 |
| SB-124 | 4.274E-01 | 215.5 | 9.211E-01 | 9.214E-01 | 3.102E+00 |
| SB-125 | 3.296E+00 | 26.4 | 8.716E-01 | 8.877E-01 | 3.223E+00 |
| I-131 | 1.935E-01 | 186.5 | 3.610E-01 | 3.611E-01 | 1.145E+00 |
| Gd-153 | 1.298E+00 | 167.7 | 2.177E+00 | 2.178E+00 | 7.240E+00 |
| Ga-68 | -4.950E+00 | 444.4 | 2.200E+01 | 2.200E+01 | 4.970E+01 |
| Tc-99m | -4.198E-01 | 145.7 | 6.115E-01 | 6.120E-01 | 2.037E+00 |
| BA-133 | -1.976E-01 | 532.3 | 1.052E+00 | 1.052E+00 | 3.556E+00 |
| CS-134 | 8.818E-01 | 67.6 | 5.961E-01 | 5.979E-01 | 3.183E+00 |
| CS-137 | -7.732E-01 | 79.6 | 6.151E-01 | 6.165E-01 | 2.052E+00 |
| CE-139 | 3.883E-01 | 96.0 | 3.727E-01 | 3.745E-01 | 1.244E+00 |
| Ba-140 | -2.482E+00 | 90.0 | 2.233E+00 | 2.237E+00 | 5.279E+00 |
| La-140 | 9.937E-01 | 30.2 | 2.996E-01 | 3.042E-01 | 5.414E-01 |
| CE-141 | -7.582E-01 | 143.3 | 1.086E+00 | 1.087E+00 | 3.619E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 7.567E-01 | 578.7 | 4.379E+00 | 4.379E+00 | 1.469E+01 |
| PM-144 | 3.514E-01 | 110.0 | 3.865E-01 | 3.869E-01 | 1.780E+00 |
| EU-152 | 1.639E+00 | 198.4 | 3.252E+00 | 3.253E+00 | 8.400E+00 |
| EU-154 | 3.549E-01 | 63.4 | 2.252E-01 | 2.259E-01 | 1.458E+01 |
| EU-155 | 0.000E+00 | 1.#INF | 8.968E-01 | 8.968E-01 | 1.030E+01 |
| HF-181 | 3.840E-01 | 150.3 | 5.772E-01 | 5.776E-01 | 2.080E+00 |
| Ta-182 | 1.851E+00 | 34.3 | 6.357E-01 | 6.424E-01 | 7.305E+00 |
| Hg-203 | 3.715E-01 | 105.3 | 3.913E-01 | 3.919E-01 | 1.316E+00 |
| TL-208 | 8.087E+00 | 8.8 | 7.093E-01 | 8.241E-01 | 9.671E-01 |
| pm-146 | 8.919E-01 | 138.4 | 1.235E+00 | 1.236E+00 | 2.934E+00 |
| y-88 | -1.453E-01 | 437.4 | 6.353E-01 | 6.353E-01 | 1.466E+00 |
| Cd-113m | -4.121E+02 | 1290.4 | 5.317E+03 | 5.317E+03 | 1.832E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 1.842E+01 | 1.842E+01 | 6.127E+01 |
| Cf-251 | 1.924E+00 | 97.7 | 1.881E+00 | 1.889E+00 | 4.802E+00 |
| Cf-249 | 4.570E-01 | 167.2 | 7.640E-01 | 7.643E-01 | 2.070E+00 |
| Sn-126 | -2.171E+00 | 265.7 | 5.769E+00 | 5.770E+00 | 1.934E+01 |
| PB-210 | -8.588E+00 | 157.2 | 1.350E+01 | 1.351E+01 | 4.632E+01 |
| PB-212 | 1.943E+01 | 5.4 | 1.048E+00 | 1.637E+00 | 1.966E+00 |
| PB-214 | 1.729E+01 | 6.7 | 1.160E+00 | 1.467E+00 | 2.000E+00 |
| BI-207 | 3.401E-01 | 95.6 | 3.250E-01 | 3.255E-01 | 1.361E+00 |
| BI-212 | 3.637E+01 | 13.6 | 4.935E+00 | 5.284E+00 | 6.276E+00 |
| BI-214 | 1.617E+01 | 8.2 | 1.329E+00 | 1.572E+00 | 1.917E+00 |
| BI-210M | -8.772E-01 | 99.7 | 8.748E-01 | 8.763E-01 | 2.138E+00 |
| AC-228 | 2.241E+01 | 6.7 | 1.504E+00 | 1.889E+00 | 3.555E+00 |
| TH-227 | -6.917E+00 | 105.8 | 7.321E+00 | 7.331E+00 | 2.442E+01 |
| TH-229 | 4.514E+00 | 172.1 | 7.769E+00 | 7.778E+00 | 2.002E+01 |
| TH-234 | 1.479E+01 | 53.0 | 7.841E+00 | 7.879E+00 | 2.551E+01 |
| PA-231 | 1.319E+01 | 120.0 | 1.584E+01 | 1.585E+01 | 7.013E+01 |
| PA-233 | 1.841E+00 | 97.1 | 1.787E+00 | 1.790E+00 | 4.406E+00 |
| PA-234 | 1.763E+00 | 148.0 | 2.610E+00 | 2.611E+00 | 8.705E+00 |
| PA-234M | 1.072E+02 | 62.3 | 6.683E+01 | 6.705E+01 | 2.195E+02 |
| U-235 | -1.621E+00 | 142.9 | 2.316E+00 | 2.318E+00 | 1.601E+01 |
| AM-241 | -1.974E+00 | 58.5 | 1.154E+00 | 1.159E+00 | 5.743E+00 |
| Np-237 | 0.000E+00 | 1.#INF | 5.538E+00 | 5.538E+00 | 1.842E+01 |
| Ir-192 | 4.551E-01 | 123.6 | 5.624E-01 | 5.631E-01 | 1.886E+00 |
| Cs-136 | -9.084E-01 | 91.9 | 8.345E-01 | 8.362E-01 | 2.788E+00 |
| Np-239 | 1.639E+00 | 168.1 | 2.754E+00 | 2.755E+00 | 9.162E+00 |
| Nd-147 | 9.462E-01 | 322.6 | 3.052E+00 | 3.053E+00 | 7.525E+00 |
| Total | 5.562E+02 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-6-B

Spectrum Filename: C:\User\SPC\Det16\16_Gamma_20171318.An1

Acquisition information
Start time: 6/7/2017 9:59:16 AM
Live time: 1800
Real time: 1816
Dead time: 0.88 %
Detector ID: 16

Detector system
Ge16 SN/11012217

Calibration
Filename: 16_Soil_TunaCan.Clb
16_TunaCan_90099_071012

Energy Calibration
Created: 2/28/2012 9:35:31 AM
Zero offset: 0.050 keV
Gain: 0.250 keV/channel
Quadratic: -2.285E-08 keV/channel^2

Efficiency Calibration
Created: 7/13/2012 9:47:24 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.01 %
Log(Eff): 1.477416E-02 + (-5.514266E-01*Log(E) ) + ( -1.443482E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.17 %
Log(Eff): -2.408438E+01 + ( 8.948554E+00*Log(E) ) + ( -9.513599E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 100 (  25.06keV )
Stop channel: 8000 (  1999.64keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:58:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 16_2017-06-04_0508.PBC 6/4/2017 5:08:04 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 24 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0918

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.45 | -15. | 157.21 | 0.96 | 2.352E-02 | 46.54 | 4.250 | PBC<MDA | PB210 |
| 63.84 | 88. | 31.54 | 0.47 | 3.594E-02 | 63.29 | 3.810 | PBC<MDA | TH234 |
| | | | | | 64.28 | 9.700 | 1.393E+01 | Sn126 |
| 74.71 | 172. | 15.85 | 0.99 | 4.134E-02 | | | | |
| 77.22 | 336. | 8.67 | 0.99 | 4.232E-02 | | | | |
| 87.20 | 136. | 18.81 | 0.87 | 4.531E-02 | 86.49 | 13.100 | 1.281E+01 | Np237 |
| | | | | | 86.54 | 30.700 | 5.463E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.851E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 4.449E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 4.392E+01 | Cd109 |
| 92.95 | 161. | 17.27 | 0.97 | 4.644E-02 | 92.59 | 5.584 | 2.602E+01 | TH234 |
| | | | | | 93.35 | 5.561 | 3.458E+01 | AC228 |
| 97.50 | 33. | 167.66 | 1.01 | 4.707E-02 | 97.50 | 30.000 | PBC<MDA | Gd153 |
| 99.50 | 22. | 251.17 | 1.01 | 4.728E-02 | 99.50 | 15.000 | PBC<MDA | Np239 |
| 106.13 | 32. | 168.05 | 1.01 | 4.769E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 123.10 | 26. | 91.95 | 1.03 | 4.721E-02 | 123.10 | 40.790 | PBC<MDA | EU154 |
| 131.29 | 26. | 148.03 | 1.04 | 4.639E-02 | 131.29 | 18.000 | PBC<MDA | PA234 |
| 133.02 | 27. | 150.33 | 1.04 | 4.618E-02 | 133.02 | 43.300 | PBC<MDA | HF181 |
| | | | | | 133.54 | 11.090 | 2.883E+00 | CE144 |
| 133.54 | 7. | 578.67 | 1.04 | 4.612E-02 | 133.02 | 43.300 | PBC<MDA | HF181 |
| | | | | | 133.54 | 11.090 | 7.567E-01 | CE144 |
| 165.85 | 23. | 95.99 | 1.07 | 4.156E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 176.60 | 23. | 97.74 | 1.08 | 3.977E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |
| 193.51 | 13. | 172.12 | 1.09 | 3.730E-02 | 193.51 | 4.400 | PBC<MDA | TH229 |
| 205.33 | 7. | 294.02 | 1.11 | 3.577E-02 | 205.33 | 5.010 | PBC<MDA | U235 |
| 227.00 | 10. | 212.09 | 1.13 | 3.332E-02 | 227.00 | 6.300 | PBC<MDA | Cf251 |
| 238.55 | 464. | 6.36 | 1.12 | 3.217E-02 | 238.63 | 43.300 | 1.853E+01 | PB212 |
| 241.94 | 97. | 17.02 | 1.14 | 3.185E-02 | 242.00 | 7.430 | 2.272E+01 | PB214 |
| 244.69 | 19. | 205.95 | 1.14 | 3.160E-02 | 244.69 | 7.580 | PBC<MDA | EU152 |
| 277.28 | 11. | 132.05 | 1.17 | 2.890E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| 279.20 | 16. | 105.34 | 1.17 | 2.876E-02 | 279.20 | 81.460 | PBC<MDA | Hg203 |
| 284.30 | 4. | 472.14 | 1.18 | 2.839E-02 | 284.30 | 6.140 | PBC<MDA | I131 |
| 295.18 | 157. | 11.50 | 0.95 | 2.764E-02 | 295.09 | 19.300 | 1.639E+01 | PB214 |
| 299.57 | 19. | 144.72 | 1.19 | 2.732E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 1.569E+01 | PA231 |
| 300.07 | 19. | 148.29 | 1.19 | 2.732E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 1.569E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 6.227E+00 | PA233 |
| 300.18 | 19. | 151.80 | 1.19 | 2.731E-02 | 300.07 | 2.460 | PBC<MDA | PA231 |
| | | | | | 300.18 | 6.200 | 6.227E+00 | PA233 |
| 302.65 | 16. | 188.82 | 1.19 | 2.715E-02 | 302.65 | 2.880 | PBC<MDA | PA231 |
| | | | | | 302.85 | 18.330 | 1.739E+00 | BA133 |
| 312.01 | 19. | 121.02 | 1.20 | 2.656E-02 | 312.01 | 36.000 | PBC<MDA | PA233 |
| 316.49 | 19. | 123.57 | 1.21 | 2.629E-02 | 316.49 | 87.040 | PBC<MDA | Ir192 |
| 328.76 | 17. | 163.53 | 1.22 | 2.559E-02 | 328.76 | 20.300 | PBC<MDA | La140 |
| 333.44 | 17. | 167.15 | 1.22 | 2.533E-02 | 333.44 | 15.510 | PBC<MDA | Cf249 |
| 338.35 | 129. | 10.94 | 1.58 | 2.506E-02 | 338.32 | 12.010 | 2.381E+01 | AC228 |
| 340.57 | 17. | 169.74 | 1.23 | 2.494E-02 | 340.57 | 46.900 | PBC<MDA | Cs136 |
| 345.83 | 10. | 169.89 | 1.23 | 2.467E-02 | 345.83 | 15.070 | PBC<MDA | HF181 |
| 351.79 | 288. | 7.70 | 1.05 | 2.437E-02 | 351.93 | 37.600 | 1.746E+01 | PB214 |
| 383.84 | 12. | 125.86 | 1.27 | 2.288E-02 | 383.84 | 8.940 | PBC<MDA | BA133 |
| 391.69 | 16. | 104.67 | 1.27 | 2.255E-02 | 391.69 | 64.000 | PBC<MDA | SN113 |
| 427.41 | 16. | 96.91 | 1.31 | 2.115E-02 | 427.88 | 29.600 | PBC<MDA | SB125 |
| 462.97 | 48. | 26.44 | 1.71 | 1.996E-02 | 463.37 | 10.470 | 1.263E+01 | SB125 |
| 477.60 | 2. | 777.57 | 1.35 | 1.952E-02 | 477.60 | 10.520 | PBC<MDA | BE7 |
| 497.05 | 14. | 93.20 | 1.37 | 1.896E-02 | 497.05 | 90.900 | PBC<MDA | RU103 |
| 511.86 | 88. | 31.28 | 2.63 | 1.856E-02 | 511.86 | 20.000 | 1.317E+01 | RH106 |
| 531.00 | 4. | 322.59 | 1.40 | 1.807E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 563.24 | 8. | 151.02 | 1.43 | 1.730E-02 | 563.24 | 8.350 | PBC<MDA | CS134 |
| 569.70 | 5. | 245.24 | 1.43 | 1.716E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 1.908E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 1.601E-01 | BI207 |
| 583.12 | 208. | 8.77 | 1.41 | 1.687E-02 | 583.02 | 84.500 | 8.087E+00 | TL208 |
| 599.69 | 12. | 212.03 | 1.46 | 1.651E-02 | 600.50 | 17.860 | PBC<MDA | SB125 |
| 602.73 | 12. | 215.50 | 1.46 | 1.646E-02 | 602.73 | 98.260 | PBC<MDA | SB124 |
| 604.71 | 12. | 218.94 | 1.46 | 1.642E-02 | 604.71 | 97.620 | PBC<MDA | CS134 |
| 609.34 | 219. | 8.22 | 1.50 | 1.633E-02 | 609.31 | 46.090 | 1.617E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 1.298E+02 | RU103 |
| 618.06 | 12. | 137.84 | 1.47 | 1.616E-02 | 618.06 | 99.100 | PBC<MDA | PM144 |
| 636.90 | 4. | 241.38 | 1.49 | 1.583E-02 | 635.89 | 11.310 | PBC<MDA | SB125 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| | | | | | 636.97 | 7.170 | 1.798E+00 | I131 |
| 636.97 | 5. | 186.55 | 1.49 | 1.581E-02 | 635.89 | 11.310 | PBC<MDA | SB125 |
| | | | | | 636.97 | 7.170 | 2.451E+00 | I131 |
| 657.76 | 8. | 147.90 | 1.51 | 1.543E-02 | 657.76 | 94.640 | PBC<MDA | AG110M |
| 696.54 | 8. | 171.39 | 1.54 | 1.479E-02 | 696.54 | 99.000 | PBC<MDA | PM144 |
| 724.20 | 14. | 81.68 | 1.57 | 1.437E-02 | 724.20 | 44.150 | PBC<MDA | ZR95 |
| 726.93 | 71. | 13.57 | 0.90 | 1.433E-02 | 727.17 | 7.550 | 3.637E+01 | BI212 |
| 747.16 | 8. | 138.45 | 1.59 | 1.404E-02 | 747.16 | 34.000 | PBC<MDA | pm146 |
| 766.41 | 16. | 82.32 | 1.60 | 1.378E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 2.148E+02 | PA234M |
| 786.08 | 34. | 22.38 | 5.50 | 1.353E-02 | 785.42 | 1.280 | 1.080E+02 | BI212 |
| 795.87 | 15. | 67.61 | 1.63 | 1.340E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 11. | 93.67 | 1.64 | 1.332E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 834.85 | 7. | 176.13 | 1.66 | 1.293E-02 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 860.63 | 43. | 20.18 | 2.65 | 1.264E-02 | 860.56 | 12.420 | 1.516E+01 | TL208 |
| 871.10 | 13. | 72.57 | 1.69 | 1.253E-02 | 871.10 | 99.890 | PBC<MDA | NB94 |
| 880.53 | 9. | 123.92 | 1.70 | 1.243E-02 | 880.53 | 6.000 | PBC<MDA | PA234 |
| 889.28 | 13. | 87.61 | 1.71 | 1.234E-02 | 889.28 | 99.984 | PBC<MDA | Sc46 |
| 911.17 | 127. | 11.84 | 1.40 | 1.211E-02 | 911.07 | 29.000 | 2.008E+01 | AC228 |
| 964.11 | 9. | 198.41 | 1.77 | 1.161E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 969.11 | 92. | 12.08 | 2.12 | 1.157E-02 | 968.97 | 17.460 | 2.530E+01 | AC228 |
| 996.33 | 13. | 78.97 | 1.80 | 1.133E-02 | 996.33 | 10.600 | PBC<MDA | EU154 |
| 1001.00 | 12. | 93.63 | 1.81 | 1.129E-02 | 1001.00 | 0.837 | PBC<MDA | PA234M |
| 1004.77 | 10. | 115.35 | 1.81 | 1.126E-02 | 1004.77 | 18.010 | PBC<MDA | EU154 |
| 1037.84 | 6. | 218.16 | 1.84 | 1.099E-02 | 1037.84 | 14.130 | PBC<MDA | Co56 |
| 1048.07 | 4. | 239.79 | 1.84 | 1.091E-02 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1050.36 | 13. | 68.24 | 1.85 | 1.089E-02 | 1050.36 | 1.560 | PBC<MDA | RH106 |
| 1063.66 | 8. | 95.58 | 1.86 | 1.079E-02 | 1063.66 | 74.500 | PBC<MDA | BI207 |
| 1099.25 | 6. | 189.97 | 1.89 | 1.052E-02 | 1099.25 | 56.500 | PBC<MDA | FE59 |
| 1120.81 | 70. | 15.65 | 1.95 | 1.037E-02 | 1120.29 | 15.100 | 2.465E+01 | BI214 |
| | | | | | 1120.55 | 99.987 | 3.724E+00 | Sc46 |
| | | | | | 1121.30 | 34.900 | 1.067E+01 | Ta182 |
| 1121.30 | 12. | 114.00 | 1.91 | 1.037E-02 | 1120.29 | 15.100 | PBC<MDA | BI214 |
| | | | | | 1120.55 | 99.987 | 6.608E-01 | Sc46 |
| | | | | | 1121.30 | 34.900 | 1.894E+00 | Ta182 |
| 1221.41 | 8. | 34.35 | 1.99 | 9.717E-03 | 1221.41 | 27.000 | 1.795E+00 | Ta182 |
| 1238.28 | 20. | 83.21 | 2.00 | 9.617E-03 | 1238.28 | 66.070 | PBC<MDA | Co56 |
| 1274.54 | 6. | 160.13 | 2.03 | 9.409E-03 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 9.508E-01 | EU154 |
| 1332.50 | 7. | 85.60 | 2.08 | 9.097E-03 | 1332.50 | 99.980 | PBC<MDA | CO60 |
| 1384.30 | 16. | 25.00 | 2.12 | 8.837E-03 | 1384.30 | 24.290 | 4.141E+00 | AG110M |
| 1460.85 | 436. | 4.79 | 1.90 | 8.482E-03 | 1460.83 | 10.670 | 2.676E+02 | K40 |
| 1596.21 | 11. | 30.15 | 2.29 | 7.928E-03 | 1596.21 | 95.400 | 8.081E-01 | La140 |
| 1764.48 | 50. | 14.14 | 2.43 | 7.342E-03 | 1764.49 | 15.400 | 2.457E+01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 298.50 | 74.71 | 285. | 172. | 4.158E+03 | 15.85 | 0.985 | - sD |
| 308.53 | 77.22 | 254. | 336. | 7.931E+03 | 8.67 | 0.988 | - D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.86 | 46.54 | 299. | -15. | -0.009 | 157.21 | 0.959s |
| TH-227 | 200.26 | 50.14 | 375. | -26. | -0.015 | 105.84 | 0.963s |
| AM-241 | 237.83 | 59.54 | 671. | -42. | -0.024 | 58.45 | 0.971s |
| TH-234 | 252.82 | 63.29 | 164. | 36. | 0.020 | 53.03 | 0.975D |
| Sn-126 | 256.79 | 64.28 | 658. | -14. | -0.008 | 265.74 | 0.976s |
| BA-133 | 323.60 | 80.99 | 1372. | -35. | -0.020 | 149.37 | 0.991s |
| Np-237 | 345.59 | 86.49 | 1722. | 0. | 0.000 | 188.02 | 0.996A |
| EU-155 | 345.80 | 86.54 | 1768. | -33. | -0.018 | 182.91 | 0.996s |
| Sn-126 | 347.39 | 86.94 | 1651. | -33. | -0.018 | 176.76 | 0.997s |
| Sn-126 | 349.91 | 87.57 | 1540. | 29. | 0.016 | 81.94 | 0.997D |
| Cd-109 | 351.79 | 88.04 | 1618. | 0. | 0.000 | 174.82 | 0.998A |
| Nd-147 | 364.02 | 91.10 | 1569. | 0. | 0.000 | 1000.00 | 1.001s |
| TH-234 | 369.98 | 92.59 | 271. | 28. | 0.016 | 84.70 | 1.002D |
| AC-228 | 373.02 | 93.35 | 1545. | 33. | 0.018 | 170.03 | 1.003s |
| Gd-153 | 389.61 | 97.50 | 1514. | 33. | 0.018 | 167.66 | 1.007s |
| Np-239 | 397.61 | 99.50 | 1547. | 22. | 0.012 | 251.17 | 1.008s |
| Gd-153 | 412.40 | 103.20 | 1569. | 0. | 0.000 | 1000.00 | 1.012s |
| Np-239 | 414.40 | 103.70 | 1569. | 0. | 0.000 | 1000.00 | 1.012s |
| EU-155 | 420.85 | 105.31 | 1569. | 0. | 0.000 | 1000.00 | 1.014s |
| Np-239 | 424.11 | 106.13 | 1423. | 32. | 0.018 | 168.05 | 1.014s |
| EU-152 | 486.67 | 121.78 | 341. | -29. | -0.016 | 93.24 | 1.029s |
| CO-57 | 487.81 | 122.06 | 370. | -8. | -0.004 | 353.68 | 1.029s |
| EU-154 | 491.96 | 123.10 | 279. | 26. | 0.015 | 91.95 | 1.030s |
| PA-234 | 524.73 | 131.29 | 756. | 26. | 0.015 | 148.03 | 1.038s |
| HF-181 | 531.64 | 133.02 | 782. | 27. | 0.015 | 150.33 | 1.039 |
| CE-144 | 533.70 | 133.54 | 809. | 7. | 0.004 | 578.67 | 1.040 |
| HF-181 | 544.74 | 136.30 | 816. | 0. | 0.000 | 1000.00 | 1.042 |
| CO-57 | 545.43 | 136.47 | 940. | -29. | -0.016 | 148.51 | 1.042 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Tc-99m | 561.57 | 140.51 | 911. | -30. | -0.016 | 145.67 | 1.046s |
| U-235 | 574.67 | 143.79 | 881. | -30. | -0.016 | 142.92 | 1.049s |
| CE-141 | 581.29 | 145.44 | 861. | -29. | -0.016 | 143.26 | 1.050 |
| Ba-140 | 650.14 | 162.66 | 288. | -9. | -0.005 | 268.74 | 1.066s |
| U-235 | 653.01 | 163.38 | 297. | 0. | 0.000 | 1000.00 | 1.067s |
| CE-139 | 662.90 | 165.85 | 236. | 23. | 0.013 | 95.99 | 1.069s |
| Cf-251 | 705.88 | 176.60 | 143. | 23. | 0.013 | 97.74 | 1.079s |
| TH-229 | 773.49 | 193.51 | 147. | 13. | 0.007 | 172.12 | 1.094s |
| U-235 | 820.76 | 205.33 | 121. | 7. | 0.004 | 294.02 | 1.105s |
| TH-229 | 842.82 | 210.85 | 220. | -20. | -0.011 | 140.53 | 1.110s |
| Cf-251 | 907.40 | 227.00 | 117. | 10. | 0.005 | 212.09 | 1.125s |
| PB-212 | 953.91 | 238.63 | 100. | 487. | 0.271 | 5.39 | 1.136D |
| PB-214 | 967.37 | 242.00 | 87. | 97. | 0.054 | 17.02 | 1.139D |
| EU-152 | 978.14 | 244.69 | 791. | 19. | 0.011 | 205.95 | 1.141s |
| TH-227 | 1024.32 | 256.24 | 148. | -23. | -0.013 | 105.64 | 1.152s |
| BI-210M | 1062.67 | 265.83 | 137. | -24. | -0.013 | 99.72 | 1.160 |
| TL-208 | 1108.46 | 277.28 | 100. | 11. | 0.006 | 132.05 | 1.171s |
| Hg-203 | 1116.13 | 279.20 | 128. | 16. | 0.009 | 105.34 | 1.173s |
| I-131 | 1136.52 | 284.30 | 92. | 4. | 0.002 | 472.14 | 1.177 |
| PB-214 | 1180.01 | 295.18 | 45. | 163. | 0.091 | 10.98 | 0.950 |
| PB-212 | 1199.42 | 300.03 | 368. | 19. | 0.011 | 144.72 | 1.191 |
| PA-231 | 1199.58 | 300.07 | 386. | 19. | 0.011 | 148.29 | 1.192 |
| PA-233 | 1200.02 | 300.18 | 405. | 19. | 0.011 | 151.80 | 1.192 |
| PA-231 | 1209.90 | 302.65 | 424. | 16. | 0.009 | 188.82 | 1.194s |
| BA-133 | 1210.70 | 302.85 | 440. | 0. | 0.000 | 1000.00 | 1.194s |
| Ba-140 | 1218.69 | 304.85 | 440. | 0. | 0.000 | 1000.00 | 1.196s |
| BI-210M | 1218.88 | 304.90 | 440. | 0. | 0.000 | 1000.00 | 1.196s |
| PA-233 | 1247.34 | 312.01 | 246. | 19. | 0.010 | 121.02 | 1.202s |
| Ir-192 | 1265.24 | 316.49 | 259. | 19. | 0.010 | 123.57 | 1.206s |
| CR-51 | 1279.62 | 320.08 | 224. | -2. | -0.001 | 872.60 | 1.210s |
| La-140 | 1314.31 | 328.76 | 398. | 17. | 0.010 | 163.53 | 1.217s |
| Cf-249 | 1333.02 | 333.44 | 394. | 17. | 0.009 | 167.15 | 1.222s |
| AC-228 | 1352.65 | 338.35 | 20. | 129. | 0.072 | 10.94 | 1.579s |
| Cs-136 | 1361.54 | 340.57 | 411. | 17. | 0.009 | 169.74 | 1.228s |
| HF-181 | 1382.56 | 345.83 | 65. | 10. | 0.005 | 169.89 | 1.233s |
| PB-214 | 1406.42 | 351.79 | 42. | 288. | 0.160 | 7.70 | 1.049 |
| BA-133 | 1423.24 | 356.00 | 400. | -5. | -0.003 | 532.31 | 1.242s |
| I-131 | 1457.16 | 364.48 | 64. | -3. | -0.002 | 525.29 | 1.250s |
| BA-133 | 1534.57 | 383.84 | 118. | 12. | 0.007 | 125.86 | 1.267s |
| Cf-249 | 1551.01 | 387.95 | 130. | 0. | 0.000 | 1000.00 | 1.271s |
| SN-113 | 1565.96 | 391.69 | 132. | 16. | 0.009 | 104.67 | 1.274 |
| SB-125 | 1710.67 | 427.88 | 52. | 16. | 0.009 | 96.91 | 1.307s |
| AG-108M | 1734.91 | 433.94 | 74. | -5. | -0.003 | 378.27 | 1.312s |
| pm-146 | 1814.67 | 453.88 | 91. | -13. | -0.007 | 152.33 | 1.330s |
| SB-125 | 1851.00 | 462.97 | 24. | 48. | 0.026 | 26.44 | 1.715s |
| Ir-192 | 1871.38 | 468.06 | 165. | -18. | -0.010 | 103.25 | 1.342 |
| BE-7 | 1909.51 | 477.60 | 141. | 2. | 0.001 | 777.57 | 1.351s |
| HF-181 | 1927.12 | 482.00 | 143. | 0. | 0.000 | 1000.00 | 1.355s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| RU-103 | 1987.33 | 497.05 | 39. | 14. | 0.008 | 93.20 | 1.368s |
| RH-106 | 2046.57 | 511.86 | 98. | 88. | 0.049 | 31.28 | 2.631s |
| Nd-147 | 2123.10 | 531.00 | 39. | 4. | 0.002 | 322.59 | 1.398s |
| Ba-140 | 2148.14 | 537.26 | 69. | -20. | -0.011 | 89.98 | 1.404s |
| CS-134 | 2252.03 | 563.24 | 30. | 8. | 0.004 | 151.02 | 1.427s |
| CS-134 | 2276.36 | 569.32 | 63. | -12. | -0.007 | 99.09 | 1.432s |
| PA-234 | 2276.96 | 569.47 | 75. | 0. | 0.000 | 1000.00 | 1.432s |
| BI-207 | 2277.89 | 569.70 | 68. | 5. | 0.003 | 245.24 | 1.432s |
| TL-208 | 2331.54 | 583.12 | 22. | 208. | 0.115 | 8.77 | 1.406 |
| SB-125 | 2401.07 | 600.50 | 341. | 12. | 0.007 | 212.03 | 1.460s |
| SB-124 | 2409.99 | 602.73 | 353. | 12. | 0.007 | 215.50 | 1.462s |
| CS-134 | 2417.91 | 604.71 | 366. | 12. | 0.007 | 218.94 | 1.463s |
| BI-214 | 2436.44 | 609.34 | 25. | 219. | 0.122 | 8.22 | 1.497s |
| PM-144 | 2471.31 | 618.06 | 120. | 12. | 0.006 | 137.84 | 1.475s |
| RH-106 | 2486.73 | 621.92 | 100. | -18. | -0.010 | 82.71 | 1.479s |
| SB-125 | 2542.62 | 635.89 | 37. | 4. | 0.002 | 241.38 | 1.491s |
| I-131 | 2546.96 | 636.97 | 41. | 5. | 0.003 | 186.55 | 1.492s |
| AG-110M | 2630.10 | 657.76 | 66. | 8. | 0.004 | 147.90 | 1.510 |
| CS-137 | 2645.69 | 661.66 | 96. | -18. | -0.010 | 79.56 | 1.513s |
| PM-144 | 2785.22 | 696.54 | 90. | 8. | 0.004 | 171.39 | 1.544 |
| SB-124 | 2890.19 | 722.79 | 194. | -22. | -0.012 | 92.81 | 1.567s |
| AG-108M | 2890.80 | 722.94 | 172. | -22. | -0.012 | 87.71 | 1.567s |
| EU-154 | 2892.47 | 723.36 | 117. | -15. | -0.008 | 103.56 | 1.567s |
| ZR-95 | 2895.84 | 724.20 | 62. | 14. | 0.008 | 81.68 | 1.568s |
| BI-212 | 2906.76 | 726.93 | 4. | 71. | 0.039 | 13.57 | 0.899s |
| pm-146 | 2941.93 | 735.72 | 51. | -6. | -0.004 | 243.25 | 1.578s |
| pm-146 | 2987.69 | 747.16 | 23. | 8. | 0.004 | 138.45 | 1.588 |
| ZR-95 | 3025.97 | 756.73 | 51. | -5. | -0.003 | 288.25 | 1.596 |
| AG-110M | 3054.82 | 763.94 | 74. | -12. | -0.007 | 105.41 | 1.602s |
| NB-95 | 3062.21 | 765.79 | 86. | 0. | 0.000 | 1000.00 | 1.604s |
| PA-234M | 3064.70 | 766.41 | 75. | 16. | 0.009 | 82.32 | 1.605s |
| EU-152 | 3114.73 | 778.92 | 51. | -10. | -0.006 | 150.34 | 1.615s |
| BI-212 | 3143.37 | 786.08 | 4. | 34. | 0.019 | 22.38 | 5.496s |
| CS-134 | 3182.53 | 795.87 | 44. | 15. | 0.008 | 67.61 | 1.630s |
| CS-134 | 3206.86 | 801.95 | 51. | 11. | 0.006 | 93.67 | 1.635s |
| CO-58 | 3242.16 | 810.78 | 130. | -21. | -0.011 | 81.34 | 1.643s |
| La-140 | 3262.14 | 815.77 | 151. | -21. | -0.011 | 86.89 | 1.647s |
| Cs-136 | 3273.06 | 818.50 | 184. | -21. | -0.012 | 91.87 | 1.649s |
| MN-54 | 3338.46 | 834.85 | 30. | 7. | 0.004 | 176.13 | 1.663s |
| TL-208 | 3441.60 | 860.63 | 5. | 43. | 0.024 | 20.18 | 2.649s |
| NB-94 | 3483.47 | 871.10 | 38. | 13. | 0.007 | 72.57 | 1.695s |
| EU-154 | 3492.00 | 873.23 | 65. | -12. | -0.007 | 99.30 | 1.696s |
| PA-234 | 3521.21 | 880.53 | 53. | 9. | 0.005 | 123.92 | 1.703s |
| PA-234 | 3532.05 | 883.24 | 62. | 0. | 0.000 | 1000.00 | 1.705s |
| AG-110M | 3537.82 | 884.68 | 78. | -16. | -0.009 | 83.23 | 1.706s |
| Sc-46 | 3556.21 | 889.28 | 61. | 13. | 0.007 | 87.61 | 1.710s |
| y-88 | 3591.26 | 898.04 | 35. | -3. | -0.002 | 437.37 | 1.718s |
| AC-228 | 3643.80 | 911.17 | 18. | 127. | 0.071 | 11.84 | 1.401 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AG-110M | 3749.09 | 937.49 | 45. | 0. | 0.000 | 1000.00 | 1.751s |
| EU-152 | 3855.58 | 964.11 | 149. | 9. | 0.005 | 198.41 | 1.774s |
| AC-228 | 3875.58 | 969.11 | 7. | 92. | 0.051 | 12.08 | 2.125 |
| EU-154 | 3984.48 | 996.33 | 43. | 13. | 0.007 | 78.97 | 1.801s |
| PA-234M | 4003.15 | 1001.00 | 55. | 12. | 0.007 | 93.63 | 1.805s |
| EU-154 | 4018.27 | 1004.77 | 57. | 10. | 0.005 | 115.35 | 1.808s |
| Co-56 | 4150.56 | 1037.84 | 32. | 6. | 0.003 | 218.16 | 1.836 |
| Cs-136 | 4191.49 | 1048.07 | 44. | 4. | 0.002 | 239.79 | 1.845s |
| RH-106 | 4200.65 | 1050.36 | 32. | 13. | 0.007 | 68.24 | 1.847s |
| BI-207 | 4253.86 | 1063.66 | 11. | 8. | 0.005 | 95.58 | 1.858s |
| Ga-68 | 4308.84 | 1077.40 | 27. | -3. | -0.001 | 444.41 | 1.870s |
| FE-59 | 4396.27 | 1099.25 | 21. | 6. | 0.003 | 189.97 | 1.888s |
| EU-152 | 4447.58 | 1112.07 | 142. | -16. | -0.009 | 107.29 | 1.899s |
| ZN-65 | 4461.46 | 1115.55 | 126. | -16. | -0.009 | 101.22 | 1.901s |
| BI-214 | 4482.52 | 1120.81 | 6. | 70. | 0.039 | 15.65 | 1.947s |
| Ta-182 | 4484.49 | 1121.30 | 93. | 12. | 0.007 | 114.00 | 1.906 |
| CO-60 | 4692.30 | 1173.24 | 62. | -13. | -0.007 | 141.54 | 1.950s |
| Ta-182 | 4755.57 | 1189.05 | 40. | -9. | -0.005 | 173.78 | 1.963 |
| Ta-182 | 4885.06 | 1221.41 | 0. | 8. | 0.005 | 34.35 | 1.990 |
| Co-56 | 4952.57 | 1238.28 | 45. | 20. | 0.011 | 83.21 | 2.004s |
| NA-22 | 5097.62 | 1274.53 | 35. | -10. | -0.006 | 89.44 | 2.034s |
| EU-154 | 5097.68 | 1274.54 | 38. | 6. | 0.003 | 160.13 | 2.034s |
| CO-60 | 5329.61 | 1332.50 | 6. | 7. | 0.004 | 85.60 | 2.081s |
| AG-110M | 5536.89 | 1384.30 | 0. | 16. | 0.009 | 25.00 | 2.124s |
| EU-152 | 5631.75 | 1408.00 | 24. | -7. | -0.004 | 173.21 | 2.143s |
| K-40 | 5843.25 | 1460.85 | 0. | 436. | 0.242 | 4.79 | 1.898 |
| La-140 | 6385.02 | 1596.21 | 0. | 11. | 0.006 | 30.15 | 2.294s |
| SB-124 | 6764.37 | 1690.98 | 6. | -1. | -0.001 | 476.64 | 2.369s |
| BI-214 | 7058.61 | 1764.49 | 0. | 50. | 0.028 | 14.14 | 2.427s |
| Co-56 | 7086.08 | 1771.35 | 61. | -8. | -0.005 | 134.78 | 2.433s |
| y-88 | 7345.12 | 1836.06 | 13. | -6. | -0.004 | 152.27 | 2.483s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | 5.8608E-01 | | | | 5.31E+01 | |
| | | | 477.60 | 5.861E-01 | ?( | 1.569E+01 7.78E+02 1.05E+01 | G |
| NA-22 | C | -5.9083E-01 | | | | 9.50E+02 | |
| | | | 1274.53 | -5.908E-01 | &( | 1.789E+00 8.94E+01 9.99E+01 | G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| K-40 | N | 2.6763E+02 | | | | | 4.66E+11 | |
| | | | 1460.83 | 2.676E+02 | ( | 4.524E+00 | 4.79E+00 | 1.07E+01 G |
| Sc-46 | F | 5.9889E-01 | | | | | 8.38E+01 | |
| | | | 889.28 | 5.989E-01 | ?( | 1.764E+00 | 8.76E+01 | 1.00E+02 G |
| | | | 1120.55 | -6.033E-02 | % | 2.765E+00 | 1.32E+03 | 1.00E+02 G |
| CR-51 | F | -5.2172E-01 | | | | | 2.77E+01 | |
| | | | 320.08 | -5.217E-01 | ( | 1.554E+01 | 8.73E+02 | 9.94E+00 G |
| MN-54 | C | 3.0079E-01 | | | | | 3.12E+02 | |
| | | | 834.85 | 3.008E-01 | ?( | 1.213E+00 | 1.76E+02 | 1.00E+02 G |
| FE-59 | F | 5.2957E-01 | | | | | 4.45E+01 | |
| | | | 1099.25 | 5.296E-01 | ?( | 2.265E+00 | 1.90E+02 | 5.65E+01 G |
| | | | 1291.60 | 9.205E-02 | % | 3.799E+00 | 1.88E+03 | 4.32E+01 G |
| Co-56 | C | 7.7651E-01 | | | | | 7.73E+01 | |
| | | | 846.77 | -4.345E-02 | %( | 1.227E+00 | 1.21E+03 | 9.99E+01 G |
| | | | 1238.28 | 1.724E+00 | ?( | 2.980E+00 | 8.32E+01 | 6.61E+01 G |
| | | | 1037.84 | 2.147E+00 | &( | 1.040E+01 | 2.18E+02 | 1.41E+01 G |
| | | | 1771.35 | -4.150E+00 | + | 1.915E+01 | 1.35E+02 | 1.55E+01 A |
| CO-57 | C | -1.0610E-01 | | | | | 2.72E+02 | |
| | | | 122.06 | -1.061E-01 | ( | 1.267E+00 | 3.54E+02 | 8.56E+01 G |
| | | | 136.47 | -3.347E+00 | + | 1.656E+01 | 1.49E+02 | 1.07E+01 G |
| CO-58 | C | -8.7031E-01 | | | | | 7.09E+01 | |
| | | | 810.78 | -8.703E-01 | ?( | 2.360E+00 | 8.13E+01 | 9.95E+01 G |
| CO-60 | F | 4.4222E-01 | | | | | 1.93E+03 | |
| | | | 1332.50 | 4.422E-01 | ?( | 8.432E-01 | 8.56E+01 | 1.00E+02 G |
| | | | 1173.24 | -7.402E-01 | + | 2.193E+00 | 1.42E+02 | 9.99E+01 G |
| ZN-65 | F | -1.7092E+00 | | | | | 2.44E+02 | |
| | | | 1115.55 | -1.709E+00 | ?( | 5.812E+00 | 1.01E+02 | 5.06E+01 G |
| NB-94 | I | 3.0420E-01 | | | | | 7.41E+06 | |
| | | | 702.63 | 2.574E-02 | %( | 1.870E+00 | 2.09E+03 | 9.79E+01 G |
| | | | 871.10 | 5.771E-01 | ?( | 1.396E+00 | 7.26E+01 | 9.99E+01 G |
| ZR-95 | I | 3.4927E-01 | | | | | 6.40E+01 | |
| | | | 756.73 | -3.911E-01 | ?( | 2.647E+00 | 2.88E+02 | 5.45E+01 G |
| | | | 724.20 | 1.262E+00 | ?( | 3.454E+00 | 8.17E+01 | 4.42E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| RU-103 | I | 4.5981E-01 | | | | | 3.93E+01 | |
| | | | 497.05 | 4.598E-01 | &( | 1.025E+00 | 9.32E+01 | 9.09E+01 G |
| | | | 610.30 | 9.869E-01 | % | 5.530E+01 | 1.65E+03 | 5.75E+00 GA |
| RH-106 | I | 3.5299E-01 | | | | | 3.74E+02 | |
| | | | 621.92 | -6.192E+00 | ?( | 1.711E+01 | 8.27E+01 | 9.93E+00 G |
| | | | 1050.36 | 4.202E+01 | &( | 9.508E+01 | 6.82E+01 | 1.56E+00 G |
| | | | 511.86 | 1.317E+01 | ? | 7.310E+00 | 3.13E+01 | 2.00E+01 GA |
| AG-108M | C | -1.3687E-01 | | | | | 1.53E+05 | |
| | | | 433.94 | -1.369E-01 | ?( | 1.253E+00 | 3.78E+02 | 9.05E+01 G |
| | | | 722.94 | -9.258E-01 | + | 2.710E+00 | 8.77E+01 | 9.08E+01 G |
| | | | 614.28 | -1.162E-06 | % | 3.563E+00 | 9.03E+07 | 8.98E+01 G |
| AG-110M | F | 3.1115E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | -9.689E-01 | ?( | 2.699E+00 | 8.32E+01 | 7.27E+01 G |
| | | | 657.76 | 3.043E-01 | + | 1.543E+00 | 1.48E+02 | 9.46E+01 G |
| | | | 937.49 | 0.000E+00 | + | 4.632E+00 | 1.00E+03 | 3.44E+01 G |
| | | | 1384.30 | 4.141E+00 | ?( | 1.908E+00 | 2.50E+01 | 2.43E+01 G |
| | | | 763.94 | -2.166E+00 | + | 7.725E+00 | 1.05E+02 | 2.23E+01 G |
| SN-113 | F | 6.1463E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | 6.146E-01 | ?( | 2.163E+00 | 1.05E+02 | 6.40E+01 G |
| SB-124 | F | 4.2744E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | 4.274E-01 | ?( | 3.102E+00 | 2.16E+02 | 9.83E+01 G |
| | | | 1690.98 | -2.043E-01 | + | 2.213E+00 | 4.77E+02 | 4.78E+01 G |
| | | | 722.79 | -7.778E+00 | + | 2.411E+01 | 9.28E+01 | 1.08E+01 G |
| SB-125 | I | 3.2964E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | 1.396E+00 | ?( | 3.223E+00 | 9.69E+01 | 2.96E+01 G |
| | | | 600.50 | 2.342E+00 | &( | 1.673E+01 | 2.12E+02 | 1.79E+01 G |
| | | | 635.89 | 1.138E+00 | &( | 9.679E+00 | 2.41E+02 | 1.13E+01 G |
| | | | 463.37 | 1.263E+01 | ( | 6.853E+00 | 2.64E+01 | 1.05E+01 G |
| I-131 | I | 1.9352E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | -8.589E-02 | ( | 1.145E+00 | 5.25E+02 | 8.17E+01 G |
| | | | 284.30 | 1.275E+00 | ?( | 1.511E+01 | 4.72E+02 | 6.14E+00 G |
| | | | 636.97 | 2.451E+00 | ?( | 1.596E+01 | 1.87E+02 | 7.17E+00 G |
| Gd-153 | F | 1.2982E+00 | | | | | 2.42E+02 | |
| | | | 97.50 | 1.298E+00 | ?( | 7.240E+00 | 1.68E+02 | 3.00E+01 G |
| | | | 103.20 | 0.000E+00 | & | 1.004E+01 | 1.00E+03 | 2.18E+01 G |
| Ga-68 | C | -4.9501E+00 | | | | | 4.71E-02 | |
| | | | 1077.40 | -4.950E+00 | ?( | 4.970E+01 | 4.44E+02 | 3.30E+00 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Tc-99m | I | -4.1979E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | -4.198E-01 | ( | 2.037E+00 | 1.46E+02 | 8.93E+01 G |
| BA-133 | F | -1.9764E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -1.976E-01 | ?( | 3.556E+00 | 5.32E+02 | 6.20E+01 G |
| | | | 302.85 | 0.000E+00 | + | 1.122E+01 | 1.00E+03 | 1.83E+01 G |
| | | | 383.84 | 3.395E+00 | ? | 1.445E+01 | 1.26E+02 | 8.94E+00 GA |
| | | | 80.99 | -1.320E+00 | + | 6.557E+00 | 1.49E+02 | 3.41E+01 GA |
| CS-134 | I | 8.8176E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | 4.318E-01 | ?( | 3.183E+00 | 2.19E+02 | 9.76E+01 G |
| | | | 795.87 | 7.289E-01 | ?( | 1.632E+00 | 6.76E+01 | 8.55E+01 G |
| | | | 569.32 | -2.490E+00 | + | 8.343E+00 | 9.91E+01 | 1.54E+01 G |
| | | | 801.95 | 5.455E+00 | ?( | 1.727E+01 | 9.37E+01 | 8.69E+00 G |
| | | | 563.24 | 2.948E+00 | ?( | 1.091E+01 | 1.51E+02 | 8.35E+00 G |
| CS-137 | I | -7.7318E-01 | | | | | 1.10E+04 | |
| | | | 661.66 | -7.732E-01 | ?( | 2.052E+00 | 7.96E+01 | 8.52E+01 G |
| CE-139 | F | 3.8827E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | 3.883E-01 | &( | 1.244E+00 | 9.60E+01 | 7.99E+01 G |
| Ba-140 | I | -2.4820E+00 | | | | | 1.28E+01 | |
| | | | 537.26 | -2.482E+00 | ?( | 5.279E+00 | 9.00E+01 | 2.44E+01 G |
| | | | 162.66 | -1.944E+00 | + | 1.766E+01 | 2.69E+02 | 6.22E+00 G |
| | | | 304.85 | 0.000E+00 | + | 4.817E+01 | 1.00E+03 | 4.29E+00 G |
| La-140 | I | 9.9370E-01 | | | | | 1.28E+01 | |
| | | | 1596.21 | 8.081E-01 | ?( | 5.414E-01 | 3.02E+01 | 9.54E+01 G |
| | | | 487.02 | 8.459E-02 | % | 3.653E+00 | 1.25E+03 | 4.55E+01 G |
| | | | 328.76 | 1.866E+00 | ( | 1.024E+01 | 1.64E+02 | 2.03E+01 G |
| | | | 815.77 | -3.745E+00 | - | 1.086E+01 | 8.69E+01 | 2.33E+01 G |
| CE-141 | I | -7.5816E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | -7.582E-01 | ( | 3.619E+00 | 1.43E+02 | 4.82E+01 G |
| CE-144 | I | 7.5669E-01 | | | | | 2.85E+02 | |
| | | | 133.54 | 7.567E-01 | &( | 1.469E+01 | 5.79E+02 | 1.11E+01 G |
| PM-144 | C | 3.5144E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | 3.034E-01 | ( | 1.780E+00 | 1.71E+02 | 9.90E+01 G |
| | | | 618.06 | 3.994E-01 | ?( | 1.866E+00 | 1.38E+02 | 9.91E+01 G |
| EU-152 | F | 1.6388E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | 1.269E-01 | %( | 8.400E+00 | 1.96E+03 | 2.65E+01 G |
| | | | 1112.07 | -6.315E+00 | + | 2.277E+01 | 1.07E+02 | 1.36E+01 G |
| | | | 121.78 | -1.175E+00 | + | 3.649E+00 | 9.32E+01 | 2.86E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 778.92 | -3.258E+00 | + | 1.138E+01 | 1.50E+02 | 1.29E+01 G |
| | | | 964.11 | 2.894E+00 | ( | 1.953E+01 | 1.98E+02 | 1.46E+01 G |
| | | | 244.69 | 4.507E+00 | ?( | 3.103E+01 | 2.06E+02 | 7.58E+00 G |
| | | | 1408.00 | -2.122E+00 | + | 7.743E+00 | 1.73E+02 | 2.10E+01 GA |
| EU-154 | I | 3.5493E-01 | | | | | 3.14E+03 | |
| | | | 873.23 | -4.345E+00 | ?( | 1.458E+01 | 9.93E+01 | 1.23E+01 G |
| | | | 123.10 | 7.589E-01 | + | 2.325E+00 | 9.20E+01 | 4.08E+01 G |
| | | | 1274.54 | 9.508E-01 | & | 5.296E+00 | 1.60E+02 | 3.52E+01 G |
| | | | 723.36 | -2.915E+00 | + | 1.016E+01 | 1.04E+02 | 2.02E+01 G |
| | | | 1004.77 | 2.649E+00 | + | 1.041E+01 | 1.15E+02 | 1.80E+01 G |
| | | | 996.33 | 5.795E+00 | ?( | 1.534E+01 | 7.90E+01 | 1.06E+01 G |
| HF-181 | F | 3.8396E-01 | | | | | 4.24E+01 | |
| | | | 482.00 | 0.000E+00 | ( | 2.080E+00 | 1.00E+03 | 8.05E+01 G |
| | | | 133.02 | 7.373E-01 | &( | 3.697E+00 | 1.50E+02 | 4.33E+01 G |
| | | | 345.83 | 1.420E+00 | ?( | 6.041E+00 | 1.70E+02 | 1.51E+01 G |
| | | | 136.30 | 0.000E+00 | & | 2.819E+01 | 1.00E+03 | 5.85E+00 G |
| Ta-182 | F | 1.8508E+00 | | | | | 1.14E+02 | |
| | | | 1121.30 | 1.894E+00 | ( | 7.305E+00 | 1.14E+02 | 3.49E+01 G |
| | | | 1221.41 | 1.795E+00 | ( | 1.561E+00 | 3.43E+01 | 2.70E+01 G |
| | | | 1189.05 | -2.997E+00 | + | 1.109E+01 | 1.74E+02 | 1.62E+01 G |
| Hg-203 | F | 3.7148E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | 3.715E-01 | ?( | 1.316E+00 | 1.05E+02 | 8.15E+01 G |
| TL-208 | N | 8.0868E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 8.087E+00 | ( | 9.671E-01 | 8.77E+00 | 8.45E+01 G |
| | | | 277.28 | 3.351E+00 | - | 1.502E+01 | 1.32E+02 | 6.31E+00 G |
| | | | 860.56 | 1.516E+01 | + | 4.707E+00 | 2.02E+01 | 1.24E+01 G |
| pm-146 | C | 8.9195E-01 | | | | | 2.02E+03 | |
| | | | 747.16 | 8.919E-01 | &( | 2.934E+00 | 1.38E+02 | 3.40E+01 G |
| | | | 735.72 | -1.101E+00 | + | 6.274E+00 | 2.43E+02 | 2.25E+01 G |
| | | | 453.88 | -5.484E-01 | + | 1.990E+00 | 1.52E+02 | 6.50E+01 G |
| y-88 | F | -1.4525E-01 | | | | | 1.07E+02 | |
| | | | 898.04 | -1.453E-01 | ?( | 1.466E+00 | 4.37E+02 | 9.37E+01 G |
| | | | 1836.06 | -4.981E-01 | + | 1.551E+00 | 1.52E+02 | 9.92E+01 G |
| Cd-113m | | -4.1209E+02 | | | | | 5.33E+03 | |
| | | | 263.70 | -4.121E+02 | %( | 1.832E+04 | 1.29E+03 | 6.00E-03 K |
| Cf-251 | T | 1.9244E+00 | | | | | 3.28E+05 | |
| | | | 176.60 | 1.924E+00 | &( | 4.802E+00 | 9.77E+01 | 1.70E+01 G |
| | | | 227.00 | 2.558E+00 | ? | 1.408E+01 | 2.12E+02 | 6.30E+00 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Cf-249 | T | 4.5704E-01 | | | | | 1.28E+05 | |
| | | | 387.95 | 0.000E+00 | ?( | 2.070E+00 | 1.00E+03 | 6.60E+01 G |
| | | | 333.44 | 2.402E+00 | *( | 1.347E+01 | 1.67E+02 | 1.55E+01 G |
| Sn-126 | | -2.1710E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | 9.532E-01 | } | 6.056E+00 | 8.19E+01 | 3.75E+01 GA |
| | | | 64.28 | -2.171E+00 | &( | 1.934E+01 | 2.66E+02 | 9.70E+00 G |
| | | | 86.94 | -4.437E+00 | } | 2.608E+01 | 1.77E+02 | 9.04E+00 GA |
| PB-210 | N | -8.5882E+00 | | | | | 8.14E+03 | |
| | | | 46.54 | -8.588E+00 | ?(P | 4.632E+01 | 1.57E+02 | 4.25E+00 G |
| PB-212 | N | 1.9433E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 1.943E+01 | (P | 1.966E+00 | 5.39E+00 | 4.33E+01 G |
| | | | 300.03 | 1.176E+01 | - | 5.706E+01 | 1.45E+02 | 3.28E+00 GA |
| PB-214 | N | 1.7292E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.746E+01 | ( | 2.000E+00 | 7.70E+00 | 3.76E+01 G |
| | | | 295.09 | 1.697E+01 | ( | 3.537E+00 | 1.10E+01 | 1.93E+01 G |
| | | | 242.00 | 2.272E+01 | + | 1.086E+01 | 1.70E+01 | 7.43E+00 GA |
| BI-207 | C | 3.4006E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | 1.601E-01 | ?( | 1.361E+00 | 2.45E+02 | 9.77E+01 G |
| | | | 1063.66 | 5.762E-01 | ?( | 1.240E+00 | 9.56E+01 | 7.45E+01 G |
| BI-212 | N | 3.6372E+01 | | | | | 6.98E+02 | |
| | | | 727.17 | 3.637E+01 | ( | 6.276E+00 | 1.36E+01 | 7.55E+00 G |
| | | | 785.42 | 1.080E+02 | + | 3.980E+01 | 2.24E+01 | 1.28E+00 GA |
| BI-214 | N | 1.6170E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.617E+01 | @(P | 1.917E+00 | 8.22E+00 | 4.61E+01 G |
| | | | 1120.29 | 2.465E+01 | + | 5.175E+00 | 1.56E+01 | 1.51E+01 G |
| | | | 1764.49 | 2.457E+01 | + | 3.621E+00 | 1.41E+01 | 1.54E+01 G |
| BI-210M | T | -8.7724E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | -8.772E-01 | &( | 2.138E+00 | 9.97E+01 | 5.00E+01 G |
| | | | 304.90 | 0.000E+00 | + | 7.380E+00 | 1.00E+03 | 2.80E+01 G |
| AC-228 | N | 2.2407E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.008E+01 | ( | 3.555E+00 | 1.18E+01 | 2.90E+01 G |
| | | | 968.97 | 2.530E+01 | ( | 4.137E+00 | 1.21E+01 | 1.75E+01 G |
| | | | 338.32 | 2.381E+01 | ( | 4.346E+00 | 1.09E+01 | 1.20E+01 G |
| | | | 93.35 | 7.060E+00 | - | 3.993E+01 | 1.70E+02 | 5.56E+00 XA |
| TH-227 | N | -6.9167E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | -6.917E+00 | &( | 2.442E+01 | 1.06E+02 | 8.00E+00 G |
| | | | 256.24 | -5.970E+00 | + | 1.542E+01 | 1.06E+02 | 7.00E+00 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| TH-229 | N | 4.5138E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | 4.514E+00 | *( | 2.002E+01 | 1.72E+02 | 4.40E+00 G |
| | | | 210.85 | -1.058E+01 | + | 3.801E+01 | 1.41E+02 | 2.99E+00 G |
| TH-234 | N | 1.4786E+01 | | | | | 1.63E+12 | |
| | | | 63.29 | 1.479E+01 | (P | 2.551E+01 | 5.30E+01 | 3.81E+00 G |
| | | | 92.59 | 6.098E+00 | - P | 1.704E+01 | 8.47E+01 | 5.58E+00 G |
| PA-231 | N | 1.3194E+01 | | | | | 1.20E+07 | |
| | | | 302.65 | 1.106E+01 | ?( | 7.013E+01 | 1.89E+02 | 2.88E+00 G |
| | | | 300.07 | 1.569E+01 | ?( | 7.797E+01 | 1.48E+02 | 2.46E+00 G |
| PA-233 | C | 1.8408E+00 | | | | | 7.82E+08 | |
| | | | 312.01 | 1.086E+00 | ( | 4.406E+00 | 1.21E+02 | 3.60E+01 G |
| | | | 300.18 | 6.227E+00 | ?( | 3.168E+01 | 1.52E+02 | 6.20E+00 G |
| PA-234 | N | 1.7628E+00 | | | | | 1.63E+12 | |
| | | | 131.29 | 1.763E+00 | ?( | 8.705E+00 | 1.48E+02 | 1.80E+01 G |
| | | | 946.02 | 3.520E-01 | % | 9.156E+00 | 1.10E+03 | 1.34E+01 G |
| | | | 569.47 | 0.000E+00 | - | 1.696E+01 | 1.00E+03 | 8.20E+00 G |
| | | | 883.24 | 0.000E+00 | - | 1.839E+01 | 1.00E+03 | 9.60E+00 G |
| | | | 880.53 | 6.457E+00 | ? | 2.737E+01 | 1.24E+02 | 6.00E+00 GA |
| PA-234M | N | 1.0721E+02 | | | | | 1.63E+12 | |
| | | | 1001.00 | 6.941E+01 | ?( | 2.195E+02 | 9.36E+01 | 8.37E-01 G |
| | | | 766.41 | 2.148E+02 | &( | 5.917E+02 | 8.23E+01 | 2.94E-01 G |
| U-235 | N | -1.6206E+00 | | | | | 2.57E+11 | |
| | | | 143.79 | -3.362E+00 | ( | 1.601E+01 | 1.43E+02 | 1.10E+01 G |
| | | | 205.33 | 2.188E+00 | ?( | 1.673E+01 | 2.94E+02 | 5.01E+00 G |
| | | | 163.38 | 0.000E+00 | & | 2.202E+01 | 1.00E+03 | 5.08E+00 G |
| AM-241 | T | -1.9744E+00 | | | | | 1.58E+05 | |
| | | | 59.54 | -1.974E+00 | (P | 5.743E+00 | 5.85E+01 | 3.59E+01 G |
| Ir-192 | F | 4.5513E-01 | | | | | 7.40E+01 | |
| | | | 316.49 | 4.551E-01 | &( | 1.886E+00 | 1.24E+02 | 8.70E+01 G |
| | | | 468.06 | -9.791E-01 | + | 3.390E+00 | 1.03E+02 | 5.18E+01 G |
| | | | 308.44 | -1.960E-01 | % | 8.034E+00 | 1.22E+03 | 3.18E+01 G |
| Cs-136 | F | -9.0838E-01 | | | | | 1.30E+01 | |
| | | | 818.50 | -9.084E-01 | ?( | 2.788E+00 | 9.19E+01 | 1.00E+02 G |
| | | | 1048.07 | 2.547E-01 | + | 2.141E+00 | 2.40E+02 | 8.00E+01 G |
| | | | 340.57 | 8.109E-01 | + | 4.618E+00 | 1.70E+02 | 4.69E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Np-239 T | 1.6386E+00 | | | | | 2.36E+00 | |
| | | 103.70 | 0.000E+00 | - | 9.114E+00 | 1.00E+03 | 2.40E+01 X |
| | | 106.13 | 1.639E+00 | &( | 9.162E+00 | 1.68E+02 | 2.27E+01 G |
| | | 99.50 | 1.742E+00 | * | 1.457E+01 | 2.51E+02 | 1.50E+01 X |
| Nd-147 | 9.4617E-01 | | | | | 1.11E+01 | |
| | | 531.00 | 9.462E-01 | ?( | 7.525E+00 | 3.23E+02 | 1.30E+01 G |
| | | 91.10 | 0.000E+00 | - | 7.972E+00 | 1.00E+03 | 2.83E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity | |
|---|---|---|---|---|---|---|---|
| PB-210 | 46.54 | 299. | -15. | -0.009 | 157.21 | -8.588E+00 | P |
| TH-227 | 50.14 | 375. | -26. | -0.015 | 105.84 | -6.917E+00 | |
| AM-241 | 59.54 | 671. | -42. | -0.024 | 58.45 | -1.974E+00 | P |
| BA-133 | 80.99 | 1372. | -35. | -0.020 | 149.37 | -1.320E+00 | |
| EU-155 | 86.54 | 1768. | -33. | -0.018 | 182.91 | -1.309E+00 | |
| Gd-153 | 97.50 | 1514. | 33. | 0.018 | 167.66 | 1.298E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Np-239 | 99.50 | 1547. | 22. | 0.012 | 251.17 | 1.742E+00 | |
| Np-239 | 106.13 | 1423. | 32. | 0.018 | 168.05 | 1.639E+00 | |
| EU-152 | 121.78 | 341. | -29. | -0.016 | 93.24 | -1.175E+00 | |
| CO-57 | 122.06 | 370. | -8. | -0.004 | 353.68 | -1.061E-01 | |
| EU-154 | 123.10 | 279. | 26. | 0.015 | 91.95 | 7.589E-01 | |
| PA-234 | 131.29 | 756. | 26. | 0.015 | 148.03 | 1.763E+00 | |
| HF-181 | 133.02 | 782. | 27. | 0.015 | 150.33 | 7.373E-01 | |
| CE-144 | 133.54 | 809. | 7. | 0.004 | 578.67 | 7.567E-01 | |
| CO-57 | 136.47 | 940. | -29. | -0.016 | 148.51 | -3.347E+00 | |
| Tc-99m | 140.51 | 911. | -30. | -0.016 | 145.67 | -4.198E-01 | |
| U-235 | 143.79 | 881. | -30. | -0.016 | 142.92 | -3.362E+00 | |
| CE-141 | 145.44 | 861. | -29. | -0.016 | 143.26 | -7.582E-01 | |
| Ba-140 | 162.66 | 288. | -9. | -0.005 | 268.74 | -1.944E+00 | |
| CE-139 | 165.85 | 236. | 23. | 0.013 | 95.99 | 3.883E-01 | |
| Cf-251 | 176.60 | 143. | 23. | 0.013 | 97.74 | 1.924E+00 | |
| TH-229 | 193.51 | 147. | 13. | 0.007 | 172.12 | 4.514E+00 | |
| U-235 | 205.33 | 121. | 7. | 0.004 | 294.02 | 2.188E+00 | |
| TH-229 | 210.85 | 220. | -20. | -0.011 | 140.53 | -1.058E+01 | |
| Cf-251 | 227.00 | 117. | 10. | 0.005 | 212.09 | 2.558E+00 | |
| EU-152 | 244.69 | 791. | 19. | 0.011 | 205.95 | 4.507E+00 | |
| TH-227 | 256.24 | 148. | -23. | -0.013 | 105.64 | -5.970E+00 | |
| BI-210M | 265.83 | 137. | -24. | -0.013 | 99.72 | -8.772E-01 | |
| Hg-203 | 279.20 | 128. | 16. | 0.009 | 105.34 | 3.715E-01 | |
| I-131 | 284.30 | 92. | 4. | 0.002 | 472.14 | 1.275E+00 | |
| PA-231 | 300.07 | 386. | 19. | 0.011 | 148.29 | 1.569E+01 | |
| PA-233 | 300.18 | 405. | 19. | 0.011 | 151.80 | 6.227E+00 | |
| PA-231 | 302.65 | 424. | 16. | 0.009 | 188.82 | 1.106E+01 | |
| PA-233 | 312.01 | 246. | 19. | 0.010 | 121.02 | 1.086E+00 | |
| Ir-192 | 316.49 | 259. | 19. | 0.010 | 123.57 | 4.551E-01 | |
| CR-51 | 320.08 | 224. | -2. | -0.001 | 872.60 | -5.217E-01 | |
| Cf-249 | 333.44 | 394. | 17. | 0.009 | 167.15 | 2.402E+00 | |
| Cs-136 | 340.57 | 411. | 17. | 0.009 | 169.74 | 8.109E-01 | |
| HF-181 | 345.83 | 65. | 10. | 0.005 | 169.89 | 1.420E+00 | |
| BA-133 | 356.00 | 400. | -5. | -0.003 | 532.31 | -1.976E-01 | |
| I-131 | 364.48 | 64. | -3. | -0.002 | 525.29 | -8.589E-02 | |
| BA-133 | 383.84 | 118. | 12. | 0.007 | 125.86 | 3.395E+00 | |
| SN-113 | 391.69 | 132. | 16. | 0.009 | 104.67 | 6.146E-01 | |
| AG-108M | 433.94 | 74. | -5. | -0.003 | 378.27 | -1.369E-01 | |
| pm-146 | 453.88 | 91. | -13. | -0.007 | 152.33 | -5.484E-01 | |
| Ir-192 | 468.06 | 165. | -18. | -0.010 | 103.25 | -9.791E-01 | |
| BE-7 | 477.60 | 141. | 2. | 0.001 | 777.57 | 5.861E-01 | |
| RU-103 | 497.05 | 39. | 14. | 0.008 | 93.20 | 4.598E-01 | |
| RH-106 | 511.86 | 98. | 88. | 0.049 | 31.28 | 1.317E+01 | |
| Nd-147 | 531.00 | 39. | 4. | 0.002 | 322.59 | 9.462E-01 | |
| Ba-140 | 537.26 | 69. | -20. | -0.011 | 89.98 | -2.482E+00 | |
| CS-134 | 563.24 | 30. | 8. | 0.004 | 151.02 | 2.948E+00 | |
| CS-134 | 569.32 | 63. | -12. | -0.007 | 99.09 | -2.490E+00 | |
| BI-207 | 569.70 | 68. | 5. | 0.003 | 245.24 | 1.601E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| SB-124 | 602.73 | 353. | 12. | 0.007 | 215.50 | 4.274E-01 | |
| CS-134 | 604.71 | 366. | 12. | 0.007 | 218.94 | 4.318E-01 | |
| PM-144 | 618.06 | 120. | 12. | 0.006 | 137.84 | 3.994E-01 | |
| RH-106 | 621.92 | 100. | -18. | -0.010 | 82.71 | -6.192E+00 | |
| I-131 | 636.97 | 41. | 5. | 0.003 | 186.55 | 2.451E+00 | |
| AG-110M | 657.76 | 66. | 8. | 0.004 | 147.90 | 3.043E-01 | |
| CS-137 | 661.66 | 96. | -18. | -0.010 | 79.56 | -7.732E-01 | |
| PM-144 | 696.54 | 90. | 8. | 0.004 | 171.39 | 3.034E-01 | |
| SB-124 | 722.79 | 194. | -22. | -0.012 | 92.81 | -7.778E+00 | |
| AG-108M | 722.94 | 172. | -22. | -0.012 | 87.71 | -9.258E-01 | |
| EU-154 | 723.36 | 117. | -15. | -0.008 | 103.56 | -2.915E+00 | |
| ZR-95 | 724.20 | 62. | 14. | 0.008 | 81.68 | 1.262E+00 | |
| pm-146 | 735.72 | 51. | -6. | -0.004 | 243.25 | -1.101E+00 | |
| pm-146 | 747.16 | 23. | 8. | 0.004 | 138.45 | 8.919E-01 | |
| ZR-95 | 756.73 | 51. | -5. | -0.003 | 288.25 | -3.911E-01 | |
| AG-110M | 763.94 | 74. | -12. | -0.007 | 105.41 | -2.166E+00 | |
| PA-234M | 766.41 | 75. | 16. | 0.009 | 82.32 | 2.148E+02 | |
| EU-152 | 778.92 | 51. | -10. | -0.006 | 150.34 | -3.258E+00 | |
| CS-134 | 795.87 | 44. | 15. | 0.008 | 67.61 | 7.289E-01 | |
| CS-134 | 801.95 | 51. | 11. | 0.006 | 93.67 | 5.455E+00 | |
| CO-58 | 810.78 | 130. | -21. | -0.011 | 81.34 | -8.703E-01 | |
| Cs-136 | 818.50 | 184. | -21. | -0.012 | 91.87 | -9.084E-01 | |
| MN-54 | 834.85 | 30. | 7. | 0.004 | 176.13 | 3.008E-01 | |
| NB-94 | 871.10 | 38. | 13. | 0.007 | 72.57 | 5.771E-01 | |
| EU-154 | 873.23 | 65. | -12. | -0.007 | 99.30 | -4.345E+00 | |
| PA-234 | 880.53 | 53. | 9. | 0.005 | 123.92 | 6.457E+00 | |
| AG-110M | 884.68 | 78. | -16. | -0.009 | 83.23 | -9.689E-01 | |
| Sc-46 | 889.28 | 61. | 13. | 0.007 | 87.61 | 5.989E-01 | |
| y-88 | 898.04 | 35. | -3. | -0.002 | 437.37 | -1.453E-01 | |
| EU-152 | 964.11 | 149. | 9. | 0.005 | 198.41 | 2.894E+00 | |
| EU-154 | 996.33 | 43. | 13. | 0.007 | 78.97 | 5.795E+00 | |
| PA-234M | 1001.00 | 55. | 12. | 0.007 | 93.63 | 6.941E+01 | |
| EU-154 | 1004.77 | 57. | 10. | 0.005 | 115.35 | 2.649E+00 | |
| Co-56 | 1037.84 | 32. | 6. | 0.003 | 218.16 | 2.147E+00 | |
| Cs-136 | 1048.07 | 44. | 4. | 0.002 | 239.79 | 2.547E-01 | |
| RH-106 | 1050.36 | 32. | 13. | 0.007 | 68.24 | 4.202E+01 | |
| BI-207 | 1063.66 | 11. | 8. | 0.005 | 95.58 | 5.762E-01 | |
| Ga-68 | 1077.40 | 27. | -3. | -0.001 | 444.41 | -4.950E+00 | |
| FE-59 | 1099.25 | 21. | 6. | 0.003 | 189.97 | 5.296E-01 | |
| EU-152 | 1112.07 | 142. | -16. | -0.009 | 107.29 | -6.315E+00 | |
| ZN-65 | 1115.55 | 126. | -16. | -0.009 | 101.22 | -1.709E+00 | |
| Ta-182 | 1121.30 | 93. | 12. | 0.007 | 114.00 | 1.894E+00 | |
| CO-60 | 1173.24 | 62. | -13. | -0.007 | 141.54 | -7.402E-01 | |
| Ta-182 | 1189.05 | 40. | -9. | -0.005 | 173.78 | -2.997E+00 | |
| Ta-182 | 1221.41 | 0. | 8. | 0.005 | 34.35 | 1.795E+00 | |
| Co-56 | 1238.28 | 45. | 20. | 0.011 | 83.21 | 1.724E+00 | |
| NA-22 | 1274.53 | 35. | -10. | -0.006 | 89.44 | -5.908E-01 | |
| EU-154 | 1274.54 | 38. | 6. | 0.003 | 160.13 | 9.508E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CO-60 | 1332.50 | 6. | 7. | 0.004 | 85.60 | 4.422E-01 | |
| AG-110M | 1384.30 | 0. | 16. | 0.009 | 25.00 | 4.141E+00 | |
| EU-152 | 1408.00 | 24. | -7. | -0.004 | 173.21 | -2.122E+00 | |
| SB-124 | 1690.98 | 6. | -1. | -0.001 | 476.64 | -2.043E-01 | |
| Co-56 | 1771.35 | 61. | -8. | -0.005 | 134.78 | -4.150E+00 | |
| y-88 | 1836.06 | 13. | -6. | -0.004 | 152.27 | -4.981E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

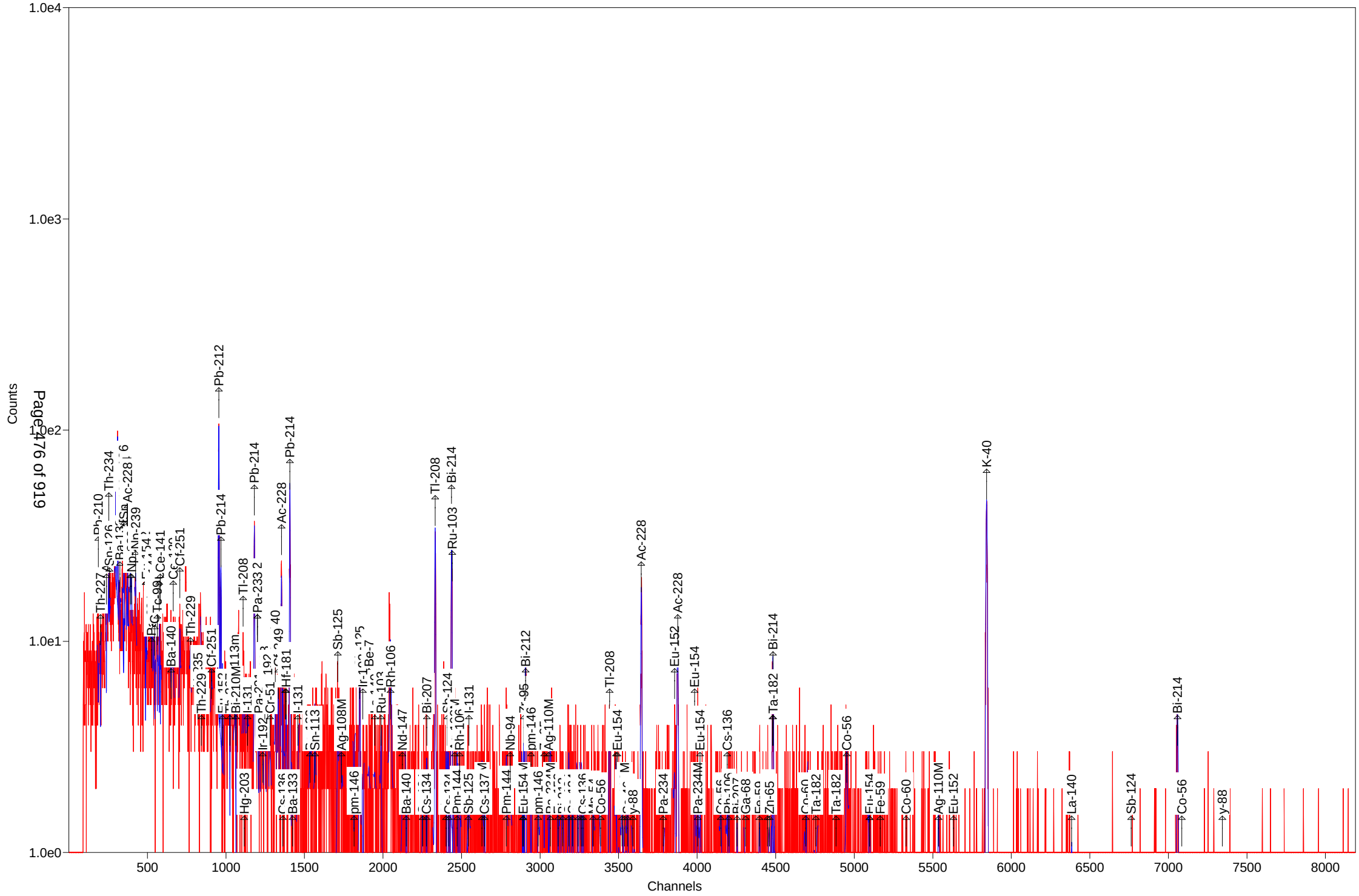
| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | 5.8607E-01 | 5.8608E-01 | 7.776E+02% | 1.57E+01 |
| NA-22 | #A | -5.9083E-01 | -5.9083E-01 | 8.944E+01% | 1.79E+00 |
| K-40 | | 2.6763E+02 | 2.6763E+02 | 4.789E+00% | 4.52E+00 |
| Sc-46 | #A | 5.9889E-01 | 5.9889E-01 | 8.761E+01% | 1.76E+00 |
| CR-51 | #A | -5.2170E-01 | -5.2172E-01 | 8.726E+02% | 1.55E+01 |
| MN-54 | #A | 3.0078E-01 | 3.0079E-01 | 1.761E+02% | 1.21E+00 |
| FE-59 | #A | 5.2957E-01 | 5.2957E-01 | 1.900E+02% | 2.26E+00 |
| Co-56 | #A | 7.7651E-01 | 7.7651E-01 | 8.321E+01% | 1.23E+00 |
| CO-57 | #A | -1.0610E-01 | -1.0610E-01 | 3.537E+02% | 1.27E+00 |
| CO-58 | #A | -8.7030E-01 | -8.7031E-01 | 8.134E+01% | 2.36E+00 |
| CO-60 | #A | 4.4222E-01 | 4.4222E-01 | 8.560E+01% | 8.43E-01 |
| ZN-65 | #A | -1.7092E+00 | -1.7092E+00 | 1.012E+02% | 5.81E+00 |
| NB-94 | #A | 3.0420E-01 | 3.0420E-01 | 7.257E+01% | 1.87E+00 |
| ZR-95 | #A | 3.4927E-01 | 3.4927E-01 | 8.168E+01% | 2.65E+00 |
| NB-95 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.85E+00 |
| RU-103 | #A | 4.5980E-01 | 4.5981E-01 | 9.320E+01% | 1.03E+00 |
| RH-106 | #A | 3.5299E-01 | 3.5299E-01 | 5.361E+01% | 1.71E+01 |
| AG-108M | #A | -1.3687E-01 | -1.3687E-01 | 3.783E+02% | 1.25E+00 |
| AG-110M | #A | 3.1115E-01 | 3.1115E-01 | 2.500E+01% | 2.70E+00 |
| SN-113 | #A | 6.1463E-01 | 6.1463E-01 | 1.047E+02% | 2.16E+00 |
| SB-124 | #A | 4.2743E-01 | 4.2744E-01 | 2.155E+02% | 3.10E+00 |
| SB-125 | #C | 3.2964E+00 | 3.2964E+00 | 2.644E+01% | 3.22E+00 |
| I-131 | #A | 1.9351E-01 | 1.9352E-01 | 1.865E+02% | 1.14E+00 |
| Gd-153 | #A | 1.2982E+00 | 1.2982E+00 | 1.677E+02% | 7.24E+00 |
| Ga-68 | #A | -4.8864E+00 | -4.9501E+00 | 4.444E+02% | 4.97E+01 |
| Tc-99m | #A | -4.1877E-01 | -4.1979E-01 | 1.457E+02% | 2.04E+00 |
| BA-133 | #A | -1.9764E-01 | -1.9764E-01 | 5.323E+02% | 3.56E+00 |
| CS-134 | #A | 8.8175E-01 | 8.8176E-01 | 6.761E+01% | 3.18E+00 |
| CS-137 | #A | -7.7318E-01 | -7.7318E-01 | 7.956E+01% | 2.05E+00 |
| CE-139 | #A | 3.8827E-01 | 3.8827E-01 | 9.599E+01% | 1.24E+00 |
| Ba-140 | #A | -2.4819E+00 | -2.4820E+00 | 8.998E+01% | 5.28E+00 |
| La-140 | # | 9.9365E-01 | 9.9370E-01 | 3.015E+01% | 5.41E-01 |
| CE-141 | #A | -7.5814E-01 | -7.5816E-01 | 1.433E+02% | 3.62E+00 |
| CE-144 | #A | 7.5669E-01 | 7.5669E-01 | 5.787E+02% | 1.47E+01 |

| | | | | |
|---|---|---|---|---|
| PM-144 #A | 3.5144E-01 | 3.5144E-01 | 1.100E+02% | 1.78E+00 |
| EU-152 #A | 1.6388E+00 | 1.6388E+00 | 1.984E+02% | 8.40E+00 |
| EU-154 #A | 3.5493E-01 | 3.5493E-01 | 6.344E+01% | 1.46E+01 |
| EU-155 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.03E+01 |
| HF-181 #A | 3.8396E-01 | 3.8396E-01 | 1.503E+02% | 2.08E+00 |
| Ta-182 #A | 1.8508E+00 | 1.8508E+00 | 3.435E+01% | 7.31E+00 |
| Hg-203 #A | 3.7147E-01 | 3.7148E-01 | 1.053E+02% | 1.32E+00 |
| TL-208 | 8.0868E+00 | 8.0868E+00 | 8.771E+00% | 9.67E-01 |
| pm-146 #A | 8.9195E-01 | 8.9195E-01 | 1.384E+02% | 2.93E+00 |
| y-88 #A | -1.4525E-01 | -1.4525E-01 | 4.374E+02% | 1.47E+00 |
| Cd-113m#B | -4.1209E+02 | -4.1209E+02 | 1.290E+03% | 1.83E+04 |
| Cd-109 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 6.13E+01 |
| Cf-251 #A | 1.9244E+00 | 1.9244E+00 | 9.774E+01% | 4.80E+00 |
| Cf-249 #A | 4.5704E-01 | 4.5704E-01 | 1.672E+02% | 2.07E+00 |
| Sn-126 #A | -2.1710E+00 | -2.1710E+00 | 2.657E+02% | 1.93E+01 |
| PB-210 #A | -8.5882E+00 | -8.5882E+00 | 1.572E+02% | 4.63E+01 |
| PB-212 | 1.9433E+01 | 1.9433E+01 | 5.393E+00% | 1.97E+00 |
| PB-214 | 1.7292E+01 | 1.7292E+01 | 6.708E+00% | 2.00E+00 |
| BI-207 #A | 3.4006E-01 | 3.4006E-01 | 9.558E+01% | 1.36E+00 |
| BI-212 | 3.6372E+01 | 3.6372E+01 | 1.357E+01% | 6.28E+00 |
| BI-214 # | 1.6170E+01 | 1.6170E+01 | 8.219E+00% | 1.92E+00 |
| BI-210M#A | -8.7724E-01 | -8.7724E-01 | 9.972E+01% | 2.14E+00 |
| AC-228 | 2.2407E+01 | 2.2407E+01 | 6.713E+00% | 3.55E+00 |
| TH-227 #A | -6.9167E+00 | -6.9167E+00 | 1.058E+02% | 2.44E+01 |
| TH-229 #A | 4.5138E+00 | 4.5138E+00 | 1.721E+02% | 2.00E+01 |
| TH-234 #A | 1.4786E+01 | 1.4786E+01 | 5.303E+01% | 2.55E+01 |
| PA-231 #A | 1.3194E+01 | 1.3194E+01 | 1.200E+02% | 7.01E+01 |
| PA-233 #A | 1.8408E+00 | 1.8408E+00 | 9.707E+01% | 4.41E+00 |
| PA-234 #A | 1.7628E+00 | 1.7628E+00 | 1.480E+02% | 8.70E+00 |
| PA-234M#A | 1.0721E+02 | 1.0721E+02 | 6.234E+01% | 2.19E+02 |
| U-235 #A | -1.6206E+00 | -1.6206E+00 | 1.429E+02% | 1.60E+01 |
| AM-241 #A | -1.9744E+00 | -1.9744E+00 | 5.845E+01% | 5.74E+00 |
| Np-237 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.84E+01 |
| Ir-192 #A | 4.5512E-01 | 4.5513E-01 | 1.236E+02% | 1.89E+00 |
| Cs-136 #A | -9.0833E-01 | -9.0838E-01 | 9.187E+01% | 2.79E+00 |
| Np-239 #A | 1.6381E+00 | 1.6386E+00 | 1.681E+02% | 9.16E+00 |
| Nd-147 #A | 9.4611E-01 | 9.4617E-01 | 3.226E+02% | 7.52E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

```
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   25.1 to  1999.6 keV)     4.022E+02  Bq/Sample
Total Decayed Activity (   25.1 to  1999.6 keV) 4.0218051E+02  Bq/Sample
```

309155_Gamma_160-22327-A-6-B. 16_Gamma_20171318.spc.



Test America St. Louis  Spectrum ID: 17_Gamma_20171231

Sample Description: 309155_Gamma_160-22327-A-7-B
Detector: Detector #17
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-7-B

Decay to Time: 6/7/2017 10:00  Live Time: 1800 sec
Acquisition Time: 6/7/2017 10:01:01  Real Time: 1856 sec
Analysis Time: 6/7/2017 10:32  Dead Time: 3.04 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 17_Soil_TunaCan.Clb
Efficiency Cal Desc: 17_TunaCan_90099_032612
Efficiency Cal Date: 4/12/2012 09:28
Energy Cal Date: 2/29/2012 10:33
Library: Client_Long_Rev11.lib
Bkgd Correction File: 17_2017-06-04_1349.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | -2.403E+00 | 155.1 | 3.726E+00 | 3.728E+00 | 1.275E+01 |
| NA-22 | 2.533E-01 | 150.0 | 3.799E-01 | 3.801E-01 | 1.352E+00 |
| K-40 | 2.559E+02 | 5.1 | 1.299E+01 | 1.845E+01 | 4.861E+00 |
| Sc-46 | 6.402E-01 | 69.1 | 4.425E-01 | 4.437E-01 | 1.489E+00 |
| CR-51 | 3.177E+00 | 107.7 | 3.420E+00 | 3.425E+00 | 1.154E+01 |
| MN-54 | -3.054E-02 | 1822.8 | 5.568E-01 | 5.568E-01 | 1.344E+00 |
| FE-59 | -1.399E+00 | 108.7 | 1.520E+00 | 1.522E+00 | 3.395E+00 |
| Co-56 | 1.489E-01 | 218.7 | 3.255E-01 | 3.256E-01 | 1.525E+00 |
| CO-57 | 0.000E+00 | 1.#INF | 2.114E-01 | 2.114E-01 | 1.197E+00 |
| CO-58 | -4.355E-01 | 130.4 | 5.681E-01 | 5.686E-01 | 1.936E+00 |
| CO-60 | -3.931E-01 | 218.2 | 8.576E-01 | 8.578E-01 | 1.905E+00 |
| ZN-65 | 0.000E+00 | 1.#INF | 7.314E-01 | 7.314E-01 | 6.067E+00 |
| NB-94 | -3.564E-01 | 186.6 | 6.650E-01 | 6.652E-01 | 1.604E+00 |
| ZR-95 | 4.688E-01 | 178.2 | 8.355E-01 | 8.358E-01 | 2.068E+00 |
| NB-95 | -8.605E-02 | 529.2 | 4.553E-01 | 4.553E-01 | 1.603E+00 |
| RU-103 | 2.748E-01 | 151.0 | 4.150E-01 | 4.153E-01 | 1.053E+00 |
| RH-106 | 6.174E-02 | 17387.4 | 1.073E+01 | 1.073E+01 | 3.637E+01 |
| AG-108M | 3.024E-01 | 127.0 | 3.842E-01 | 3.845E-01 | 1.011E+00 |
| AG-110M | 1.889E-01 | 31.6 | 5.975E-02 | 6.052E-02 | 2.788E+00 |
| SN-113 | -9.918E-02 | 779.2 | 7.728E-01 | 7.728E-01 | 2.649E+00 |
| SB-124 | 1.533E+00 | 23.8 | 3.644E-01 | 3.730E-01 | 3.725E+00 |
| SB-125 | 1.840E+00 | 75.1 | 1.382E+00 | 1.385E+00 | 3.528E+00 |
| I-131 | -1.937E-01 | 291.1 | 5.640E-01 | 5.641E-01 | 1.475E+00 |
| Gd-153 | 5.148E-04 | 83.7 | 4.308E-04 | 4.320E-04 | 3.812E+00 |
| Ga-68 | -5.958E+00 | 467.1 | 2.783E+01 | 2.783E+01 | 6.391E+01 |
| Tc-99m | 3.652E-01 | 127.9 | 4.671E-01 | 4.675E-01 | 1.561E+00 |
| BA-133 | 5.063E-01 | 220.2 | 1.115E+00 | 1.115E+00 | 3.752E+00 |
| CS-134 | 8.513E-01 | 26.2 | 2.228E-01 | 2.271E-01 | 3.693E+00 |
| CS-137 | 2.636E+00 | 19.6 | 5.164E-01 | 5.343E-01 | 9.822E-01 |
| CE-139 | 1.272E-01 | 339.0 | 4.313E-01 | 4.315E-01 | 1.462E+00 |
| Ba-140 | 3.425E-01 | 177.0 | 6.063E-01 | 6.065E-01 | 4.741E+00 |
| La-140 | 9.836E-01 | 49.5 | 4.867E-01 | 4.895E-01 | 1.092E+00 |
| CE-141 | -2.955E-01 | 257.5 | 7.609E-01 | 7.610E-01 | 2.055E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | -3.375E+00 | 133.9 | 4.521E+00 | 4.524E+00 | 1.507E+01 |
| PM-144 | 1.751E-01 | 328.8 | 5.756E-01 | 5.757E-01 | 1.410E+00 |
| EU-152 | 6.868E-01 | 266.2 | 1.829E+00 | 1.829E+00 | 7.531E+00 |
| EU-154 | 2.168E+00 | 85.6 | 1.856E+00 | 1.859E+00 | 1.592E+01 |
| EU-155 | 0.000E+00 | 1.#INF | 1.036E+00 | 1.036E+00 | 5.634E+00 |
| HF-181 | 4.299E-01 | 123.5 | 5.310E-01 | 5.315E-01 | 1.801E+00 |
| Ta-182 | 3.814E+00 | 35.6 | 1.357E+00 | 1.370E+00 | 6.068E+00 |
| Hg-203 | -5.037E-01 | 103.5 | 5.214E-01 | 5.222E-01 | 1.746E+00 |
| TL-208 | 7.977E+00 | 8.7 | 6.934E-01 | 8.075E-01 | 1.077E+00 |
| pm-146 | 4.139E-01 | 97.1 | 4.018E-01 | 4.024E-01 | 3.737E+00 |
| y-88 | 3.788E-01 | 130.3 | 4.937E-01 | 4.940E-01 | 1.180E+00 |
| Cd-113m | -7.220E+03 | 84.3 | 6.085E+03 | 6.103E+03 | 2.029E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 1.591E+01 | 1.591E+01 | 5.341E+01 |
| Cf-251 | 3.861E-01 | 516.2 | 1.993E+00 | 1.994E+00 | 5.439E+00 |
| Cf-249 | 5.198E-01 | 121.0 | 6.290E-01 | 6.296E-01 | 2.125E+00 |
| Sn-126 | 4.622E+00 | 104.0 | 4.806E+00 | 4.813E+00 | 1.604E+01 |
| PB-210 | 1.856E+01 | 62.3 | 1.156E+01 | 1.161E+01 | 3.157E+01 |
| PB-212 | 2.290E+01 | 4.9 | 1.128E+00 | 1.862E+00 | 1.878E+00 |
| PB-214 | 1.873E+01 | 7.7 | 1.440E+00 | 1.738E+00 | 2.354E+00 |
| BI-207 | 2.940E-02 | 1356.8 | 3.989E-01 | 3.989E-01 | 1.406E+00 |
| BI-212 | 4.741E+00 | 164.5 | 7.801E+00 | 7.805E+00 | 2.664E+01 |
| BI-214 | 1.732E+01 | 8.6 | 1.486E+00 | 1.738E+00 | 2.275E+00 |
| BI-210M | -8.404E-01 | 100.5 | 8.444E-01 | 8.459E-01 | 2.825E+00 |
| AC-228 | 2.748E+01 | 6.6 | 1.800E+00 | 2.282E+00 | 2.245E+00 |
| TH-227 | -5.009E+00 | 126.0 | 6.313E+00 | 6.319E+00 | 1.795E+01 |
| TH-229 | 4.205E+00 | 136.4 | 5.735E+00 | 5.745E+00 | 2.235E+01 |
| TH-234 | 2.570E+00 | 98.3 | 2.526E+00 | 2.530E+00 | 4.154E+01 |
| PA-231 | -1.492E+01 | 135.9 | 2.028E+01 | 2.030E+01 | 6.796E+01 |
| PA-233 | 1.059E+00 | 151.8 | 1.609E+00 | 1.610E+00 | 5.401E+00 |
| PA-234 | 2.413E-01 | 82.5 | 1.992E-01 | 1.996E-01 | 8.870E+00 |
| PA-234M | 1.021E+02 | 61.2 | 6.244E+01 | 6.265E+01 | 2.278E+02 |
| U-235 | -2.294E-01 | 1653.9 | 3.793E+00 | 3.793E+00 | 1.283E+01 |
| AM-241 | 9.944E-01 | 137.4 | 1.367E+00 | 1.368E+00 | 3.872E+00 |
| Np-237 | 0.000E+00 | 1.#INF | 5.248E+00 | 5.248E+00 | 1.748E+01 |
| Ir-192 | 4.402E-01 | 90.6 | 3.986E-01 | 3.994E-01 | 1.273E+00 |
| Cs-136 | -7.978E-01 | 91.1 | 7.268E-01 | 7.282E-01 | 2.434E+00 |
| Np-239 | -8.003E-01 | 194.3 | 1.555E+00 | 1.556E+00 | 5.230E+00 |
| Nd-147 | 2.824E+00 | 97.1 | 2.744E+00 | 2.748E+00 | 6.897E+00 |
| Total | 5.164E+02 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-7-B

Spectrum Filename: C:\User\SPC\Det17\17_Gamma_20171231.An1

Acquisition information
Start time: 6/7/2017 10:01:01 AM
Live time: 1800
Real time: 1856
Dead time: 3.04 %
Detector ID: 17

Detector system
Ge17 SN/11080671

Calibration
Filename: 17_Soil_TunaCan.Clb
17_TunaCan_90099_032612

Energy Calibration
Created: 2/29/2012 10:33:23 AM
Zero offset: 0.108 keV
Gain: 0.250 keV/channel
Quadratic: -2.584E-08 keV/channel^2

Efficiency Calibration
Created: 4/12/2012 9:28:42 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.91 %
Log(Eff): -5.264190E-01 + (-4.024164E-01*Log(E) ) + ( -2.604461E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.00 %
Log(Eff): -2.343889E+01 + ( 8.582715E+00*Log(E) ) + ( -9.075430E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 100 (  25.12keV )
Stop channel: 8000 (  1999.54keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3
Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 10:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 17_2017-06-04_1349.PBC 6/4/2017 1:49:56 PM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 26 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1270

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.32 | 61. | 28.72 | 0.78 | 2.085E-02 | 46.54 | 4.250 | PBC<MDA | PB210 |
| 59.54 | 19. | 137.45 | 0.79 | 2.957E-02 | 59.54 | 35.900 | PBC<MDA | AM241 |
| 63.25 | 44. | 53.31 | 0.83 | 3.162E-02 | 63.29 | 3.810 | PBC<MDA | TH234 |
| 65.06 | 26. | 103.98 | 0.79 | 3.216E-02 | 64.28 | 9.700 | PBC<MDA | Sn126 |
| 74.89 | 240. | 10.13 | 0.80 | 3.682E-02 | | | | |
| 77.23 | 325. | 7.99 | 0.80 | 3.765E-02 | | | | |
| 80.99 | 17. | 161.79 | 0.81 | 3.884E-02 | 80.99 | 34.060 | PBC<MDA | BA133 |
| 87.29 | 129. | 17.10 | 0.81 | 4.042E-02 | 86.49 | 13.100 | 1.360E+01 | Np237 |
| | | | | | 86.54 | 30.700 | 5.800E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.965E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 4.721E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 4.660E+01 | Cd109 |
| 90.14 | 83. | 22.45 | 0.82 | 4.100E-02 | | | | |
| 93.02 | 107. | 18.59 | 0.82 | 4.150E-02 | 92.59 | 5.584 | PBC<MDA | TH234 |
| | | | | | 93.35 | 5.561 | 2.570E+01 | AC228 |
| 99.50 | 23. | 115.05 | 0.82 | 4.234E-02 | 99.50 | 15.000 | PBC<MDA | Np239 |
| 103.20 | 22. | 118.86 | 0.83 | 4.265E-02 | 103.20 | 21.800 | PBC<MDA | Gd153 |
| 103.70 | 5. | 573.98 | 0.83 | 4.269E-02 | 103.70 | 24.000 | PBC<MDA | Np239 |
| 140.51 | 23. | 127.89 | 0.86 | 4.119E-02 | 140.51 | 89.300 | PBC<MDA | Tc99m |
| 162.66 | 14. | 176.99 | 0.88 | 3.813E-02 | 162.66 | 6.220 | PBC<MDA | Ba140 |
| 165.85 | 7. | 338.97 | 0.89 | 3.825E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |
| 176.60 | 4. | 516.25 | 0.90 | 3.667E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 209.13 | 103. | 20.06 | 0.66 | 3.271E-02 | | | | |
| 210.85 | 19. | 136.40 | 0.93 | 3.253E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 227.00 | 33. | 48.70 | 0.94 | 3.093E-02 | 227.00 | 6.300 | PBC<MDA | Cf251 |
| 238.50 | 533. | 4.92 | 0.95 | 2.990E-02 | 238.63 | 43.300 | 2.290E+01 | PB212 |
| 241.77 | 103. | 16.09 | 0.96 | 2.962E-02 | 242.00 | 7.430 | 2.595E+01 | PB214 |
| 277.36 | 41. | 33.76 | 1.84 | 2.694E-02 | 277.28 | 6.310 | 1.329E+01 | TL208 |
| 295.18 | 160. | 13.26 | 1.00 | 2.579E-02 | 295.09 | 19.300 | 1.782E+01 | PB214 |
| 299.95 | 48. | 29.98 | 1.45 | 2.550E-02 | 300.03 | 3.280 | 3.222E+01 | PB212 |
| | | | | | 300.07 | 2.460 | 4.296E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 1.705E+01 | PA233 |
| 312.01 | 17. | 151.84 | 1.02 | 2.481E-02 | 312.01 | 36.000 | PBC<MDA | PA233 |
| 316.49 | 14. | 101.99 | 1.03 | 2.456E-02 | 316.49 | 87.040 | PBC<MDA | Ir192 |
| 320.08 | 14. | 107.65 | 1.03 | 2.437E-02 | 320.08 | 9.940 | PBC<MDA | CR51 |
| 328.76 | 18. | 106.07 | 1.04 | 2.391E-02 | 328.76 | 20.300 | PBC<MDA | La140 |
| 338.23 | 134. | 13.78 | 0.90 | 2.344E-02 | 338.32 | 12.010 | 2.635E+01 | AC228 |
| 351.85 | 296. | 7.80 | 0.81 | 2.280E-02 | 351.93 | 37.600 | 1.919E+01 | PB214 |
| 356.00 | 13. | 220.24 | 1.06 | 2.261E-02 | 356.00 | 62.050 | PBC<MDA | BA133 |
| 387.95 | 13. | 121.01 | 1.09 | 2.127E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 427.88 | 6. | 234.82 | 1.13 | 1.983E-02 | 427.88 | 29.600 | PBC<MDA | SB125 |
| 433.94 | 10. | 127.05 | 1.13 | 1.963E-02 | 433.94 | 90.480 | PBC<MDA | AG108M |
| 463.37 | 13. | 89.13 | 1.16 | 1.872E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 468.06 | 10. | 149.65 | 1.16 | 1.859E-02 | 468.06 | 51.750 | PBC<MDA | Ir192 |
| 482.00 | 11. | 123.53 | 1.18 | 1.820E-02 | 482.00 | 80.500 | PBC<MDA | HF181 |
| 487.02 | 12. | 99.91 | 1.18 | 1.806E-02 | 487.02 | 45.500 | PBC<MDA | La140 |
| 497.05 | 8. | 151.04 | 1.19 | 1.779E-02 | 497.05 | 90.900 | PBC<MDA | RU103 |
| 511.86 | 124. | 21.09 | 2.45 | 1.742E-02 | 511.86 | 20.000 | 1.983E+01 | RH106 |
| 531.00 | 11. | 97.14 | 1.22 | 1.696E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 583.17 | 192. | 8.69 | 1.40 | 1.584E-02 | 583.02 | 84.500 | 7.977E+00 | TL208 |
| 609.23 | 220. | 8.58 | 1.38 | 1.533E-02 | 609.31 | 46.090 | 1.732E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 1.390E+02 | RU103 |
| 635.89 | 10. | 75.09 | 1.31 | 1.486E-02 | 635.89 | 11.310 | PBC<MDA | SB125 |
| 662.05 | 58. | 19.59 | 1.52 | 1.443E-02 | 661.66 | 85.210 | 2.636E+00 | CS137 |
| 696.54 | 4. | 328.75 | 1.36 | 1.389E-02 | 696.54 | 99.000 | PBC<MDA | PM144 |
| 722.79 | 53. | 23.77 | 1.39 | 1.351E-02 | 722.79 | 10.810 | 2.029E+01 | SB124 |
| | | | | | 722.94 | 90.840 | 2.415E+00 | AG108M |
| | | | | | 723.36 | 20.220 | 1.085E+01 | EU154 |
| 727.17 | 9. | 164.53 | 1.39 | 1.345E-02 | 727.17 | 7.550 | PBC<MDA | BI212 |
| 735.72 | 10. | 97.07 | 1.40 | 1.333E-02 | 735.72 | 22.500 | PBC<MDA | pm146 |
| 756.73 | 6. | 178.21 | 1.41 | 1.306E-02 | 756.73 | 54.460 | PBC<MDA | ZR95 |
| 763.94 | 4. | 239.79 | 1.42 | 1.296E-02 | 763.94 | 22.280 | PBC<MDA | AG110M |
| 766.41 | 13. | 76.79 | 1.42 | 1.293E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 1.913E+02 | PA234M |
| 785.42 | 10. | 120.40 | 1.44 | 1.270E-02 | 785.42 | 1.280 | PBC<MDA | BI212 |
| 795.87 | 44. | 26.17 | 1.45 | 1.257E-02 | 795.87 | 85.530 | 2.291E+00 | CS134 |
| 801.95 | 4. | 224.47 | 1.45 | 1.250E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 815.77 | 12. | 92.70 | 1.47 | 1.234E-02 | 815.77 | 23.280 | PBC<MDA | La140 |
| 860.65 | 54. | 19.37 | 1.96 | 1.185E-02 | 860.56 | 12.420 | 2.050E+01 | TL208 |
| 873.23 | 5. | 257.19 | 1.51 | 1.172E-02 | 873.23 | 12.270 | PBC<MDA | EU154 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 880.53 | 9. | 92.16 | 1.52 | 1.165E-02 | 880.53 | 6.000 | PBC<MDA | PA234 |
| 883.24 | 9. | 103.19 | 1.52 | 1.162E-02 | 883.24 | 9.600 | PBC<MDA | PA234 |
| 889.28 | 9. | 98.99 | 1.53 | 1.156E-02 | 889.28 | 99.984 | PBC<MDA | Sc46 |
| 898.04 | 7. | 130.32 | 1.53 | 1.148E-02 | 898.04 | 93.700 | PBC<MDA | y88 |
| 911.36 | 162. | 8.60 | 1.23 | 1.135E-02 | 911.07 | 29.000 | 2.731E+01 | AC228 |
| 964.11 | 6. | 266.24 | 1.59 | 1.088E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 969.07 | 97. | 11.07 | 1.21 | 1.083E-02 | 968.97 | 17.460 | 2.853E+01 | AC228 |
| 996.33 | 11. | 85.61 | 1.62 | 1.061E-02 | 996.33 | 10.600 | PBC<MDA | EU154 |
| 1001.00 | 11. | 95.22 | 1.62 | 1.057E-02 | 1001.00 | 0.837 | PBC<MDA | PA234M |
| 1004.77 | 1. | 764.53 | 1.62 | 1.054E-02 | 1004.77 | 18.010 | PBC<MDA | EU154 |
| 1037.84 | 4. | 218.66 | 1.65 | 1.028E-02 | 1037.84 | 14.130 | PBC<MDA | Co56 |
| 1120.20 | 12. | 113.71 | 1.72 | 9.697E-03 | 1120.29 | 15.100 | PBC<MDA | BI214 |
| | | | | | 1120.55 | 99.987 | PBC<MDA | Sc46 |
| 1120.55 | 15. | 96.50 | 1.72 | 9.696E-03 | 1120.29 | 15.100 | PBC<MDA | BI214 |
| | | | | | 1120.55 | 99.987 | 8.384E-01 | Sc46 |
| | | | | | 1121.30 | 34.900 | 2.403E+00 | Ta182 |
| 1121.22 | 10. | 105.09 | 1.72 | 9.691E-03 | 1120.55 | 99.987 | PBC<MDA | Sc46 |
| | | | | | 1121.30 | 34.900 | 1.700E+00 | Ta182 |
| 1188.67 | 11. | 85.41 | 1.77 | 9.263E-03 | 1189.05 | 16.200 | PBC<MDA | Ta182 |
| 1221.86 | 28. | 35.57 | 0.34 | 9.073E-03 | 1221.41 | 27.000 | 6.464E+00 | Ta182 |
| 1238.38 | 40. | 21.67 | 0.69 | 8.976E-03 | 1238.28 | 66.070 | 3.716E+00 | Co56 |
| 1274.53 | 4. | 150.00 | 1.84 | 8.779E-03 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 7.193E-01 | EU154 |
| 1384.30 | 10. | 31.62 | 1.93 | 8.233E-03 | 1384.30 | 24.290 | 2.778E+00 | AG110M |
| 1408.00 | 14. | 26.73 | 1.94 | 8.125E-03 | 1408.00 | 21.005 | 4.558E+00 | EU152 |
| 1460.89 | 388. | 5.08 | 1.72 | 7.894E-03 | 1460.83 | 10.670 | 2.559E+02 | K40 |
| 1596.21 | 6. | 96.69 | 2.09 | 7.364E-03 | 1596.21 | 95.400 | PBC<MDA | La140 |
| 1690.98 | 10. | 31.62 | 2.16 | 7.037E-03 | 1690.98 | 47.790 | 1.652E+00 | SB124 |
| 1764.28 | 11. | 65.14 | 2.21 | 6.804E-03 | 1764.49 | 15.400 | PBC<MDA | BI214 |
| 1771.35 | 11. | 79.25 | 2.22 | 6.783E-03 | 1771.35 | 15.480 | PBC<MDA | Co56 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 298.97 | 74.88 | 175. | 240. | 6.522E+03 | 10.13 | 0.802 | - | D |
| 308.31 | 77.21 | 174. | 325. | 8.635E+03 | 7.99 | 0.804 | - | D |
| 359.76 | 90.09 | 145. | 82. | 2.001E+03 | 23.49 | 0.816 | - | D |
| 835.69 | 209.13 | 81. | 103. | 3.149E+03 | 20.06 | 0.664 | - | s |
| 4952.94 | 1238.38 | 7. | 40. | 4.419E+03 | 21.67 | 0.690 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 184.77 | 46.32 | 106. | 30. | 0.017 | 62.29 | 0.775 |
| TH-227 | 200.03 | 50.14 | 156. | -17. | -0.009 | 126.03 | 0.778s |
| AM-241 | 237.59 | 59.54 | 234. | 19. | 0.011 | 137.45 | 0.787s |
| TH-234 | 252.59 | 63.29 | 352. | -3. | -0.002 | 765.51 | 0.791 |
| Sn-126 | 256.56 | 64.28 | 351. | 26. | 0.014 | 103.98 | 0.792s |
| BA-133 | 323.36 | 80.99 | 261. | 17. | 0.009 | 161.79 | 0.807s |
| Np-237 | 345.35 | 86.49 | 1227. | 0. | 0.000 | 173.85 | 0.813A |
| EU-155 | 345.56 | 86.54 | 1212. | -31. | -0.017 | 160.83 | 0.813s |
| Sn-126 | 347.15 | 86.94 | 1109. | 3. | 0.002 | 854.95 | 0.813D |
| Sn-126 | 349.67 | 87.57 | 998. | 66. | 0.036 | 35.27 | 0.814D |
| TH-234 | 369.74 | 92.59 | 233. | 23. | 0.013 | 98.29 | 0.818D |
| AC-228 | 372.78 | 93.35 | 973. | 31. | 0.017 | 143.84 | 0.819s |
| Gd-153 | 389.37 | 97.50 | 325. | -22. | -0.012 | 117.83 | 0.823s |
| Np-239 | 397.37 | 99.50 | 349. | 23. | 0.013 | 115.05 | 0.825s |
| Gd-153 | 412.16 | 103.20 | 340. | 22. | 0.012 | 118.86 | 0.828s |
| Np-239 | 414.16 | 103.70 | 362. | 5. | 0.003 | 573.98 | 0.829s |
| EU-155 | 420.61 | 105.31 | 367. | 0. | 0.000 | 1000.00 | 0.830s |
| Np-239 | 423.88 | 106.13 | 363. | -14. | -0.008 | 194.31 | 0.831s |
| CO-57 | 487.57 | 122.06 | 267. | 0. | 0.000 | 1000.00 | 0.846s |
| EU-154 | 491.73 | 123.10 | 265. | -24. | -0.013 | 98.42 | 0.847s |
| PA-234 | 524.49 | 131.29 | 645. | -28. | -0.016 | 128.87 | 0.855s |
| HF-181 | 531.41 | 133.02 | 673. | -28. | -0.016 | 131.35 | 0.856s |
| CE-144 | 533.46 | 133.54 | 701. | -28. | -0.016 | 133.94 | 0.857s |
| HF-181 | 544.50 | 136.30 | 730. | -28. | -0.016 | 136.12 | 0.859s |
| CO-57 | 545.20 | 136.47 | 742. | -29. | -0.016 | 135.73 | 0.859s |
| Tc-99m | 561.34 | 140.51 | 437. | 23. | 0.013 | 127.89 | 0.863 |
| CE-141 | 581.05 | 145.44 | 223. | -10. | -0.006 | 257.52 | 0.868s |
| Ba-140 | 649.90 | 162.66 | 300. | 14. | 0.008 | 176.99 | 0.884s |
| U-235 | 652.78 | 163.38 | 314. | 0. | 0.000 | 1000.00 | 0.885s |
| CE-139 | 662.67 | 165.85 | 278. | 7. | 0.004 | 338.97 | 0.887s |
| Cf-251 | 705.64 | 176.60 | 157. | 4. | 0.002 | 516.25 | 0.897s |
| U-235 | 820.52 | 205.33 | 355. | -21. | -0.012 | 129.93 | 0.924s |
| TH-229 | 842.58 | 210.85 | 320. | 19. | 0.010 | 136.40 | 0.929s |
| Cf-251 | 907.16 | 227.00 | 73. | 33. | 0.019 | 48.70 | 0.944s |
| PB-212 | 953.67 | 238.63 | 78. | 533. | 0.296 | 4.92 | 0.954D |
| PB-214 | 967.13 | 242.00 | 98. | 99. | 0.055 | 17.31 | 0.957D |
| EU-152 | 977.91 | 244.69 | 940. | -9. | -0.005 | 500.13 | 0.960s |
| TH-227 | 1024.08 | 256.24 | 140. | -16. | -0.009 | 133.95 | 0.971s |
| Cd-113m | 1053.91 | 263.70 | 157. | -22. | -0.012 | 84.27 | 0.978s |
| BI-210M | 1062.44 | 265.83 | 212. | -21. | -0.012 | 100.48 | 0.979s |
| TL-208 | 1108.55 | 277.36 | 44. | 41. | 0.023 | 33.76 | 1.844s |
| Hg-203 | 1115.89 | 279.20 | 200. | -20. | -0.011 | 103.52 | 0.992s |
| PB-214 | 1179.79 | 295.18 | 71. | 160. | 0.089 | 13.26 | 0.995 |
| PB-212 | 1198.86 | 299.95 | 42. | 48. | 0.027 | 29.98 | 1.450s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| PA-231 | 1199.35 | 300.07 | 384. | -20. | -0.011 | 143.54 | 1.011s |
| PA-233 | 1199.79 | 300.18 | 365. | -20. | -0.011 | 139.90 | 1.011s |
| PA-231 | 1209.66 | 302.65 | 345. | -20. | -0.011 | 135.89 | 1.013 |
| BA-133 | 1210.47 | 302.85 | 346. | -20. | -0.011 | 136.05 | 1.013 |
| Ba-140 | 1218.46 | 304.85 | 366. | -20. | -0.011 | 139.50 | 1.015 |
| Ir-192 | 1232.82 | 308.44 | 386. | 0. | 0.000 | 1000.00 | 1.019s |
| PA-233 | 1247.10 | 312.01 | 326. | 17. | 0.009 | 151.84 | 1.022s |
| Ir-192 | 1265.01 | 316.49 | 99. | 14. | 0.008 | 101.99 | 1.026s |
| CR-51 | 1279.38 | 320.08 | 104. | 14. | 0.008 | 107.65 | 1.029s |
| La-140 | 1314.07 | 328.76 | 99. | 18. | 0.010 | 106.07 | 1.037s |
| AC-228 | 1351.96 | 338.23 | 46. | 134. | 0.074 | 13.78 | 0.895s |
| Cs-136 | 1361.30 | 340.57 | 302. | -4. | -0.002 | 703.63 | 1.048s |
| EU-152 | 1376.16 | 344.29 | 298. | 0. | 0.000 | 1000.00 | 1.051s |
| HF-181 | 1382.33 | 345.83 | 298. | 0. | 0.000 | 1000.00 | 1.053 |
| PB-214 | 1406.41 | 351.85 | 52. | 296. | 0.164 | 7.80 | 0.807 |
| BA-133 | 1423.00 | 356.00 | 390. | 13. | 0.007 | 220.24 | 1.062 |
| I-131 | 1456.93 | 364.48 | 95. | -6. | -0.004 | 291.14 | 1.070s |
| BA-133 | 1534.34 | 383.84 | 205. | -18. | -0.010 | 116.80 | 1.087s |
| Cf-249 | 1550.77 | 387.95 | 120. | 13. | 0.007 | 121.01 | 1.091 |
| SN-113 | 1565.73 | 391.69 | 176. | -2. | -0.001 | 779.18 | 1.094s |
| SB-125 | 1710.44 | 427.88 | 55. | 6. | 0.003 | 234.82 | 1.127s |
| AG-108M | 1734.69 | 433.94 | 40. | 10. | 0.005 | 127.05 | 1.132s |
| pm-146 | 1814.44 | 453.88 | 80. | -14. | -0.008 | 127.91 | 1.150 |
| SB-125 | 1852.38 | 463.37 | 64. | 13. | 0.007 | 89.13 | 1.158 |
| Ir-192 | 1871.15 | 468.06 | 99. | 10. | 0.005 | 149.65 | 1.163s |
| BE-7 | 1909.29 | 477.59 | 79. | -8. | -0.005 | 155.07 | 1.171s |
| HF-181 | 1926.89 | 482.00 | 92. | 11. | 0.006 | 123.53 | 1.175s |
| La-140 | 1946.98 | 487.02 | 32. | 12. | 0.006 | 99.91 | 1.180s |
| RU-103 | 1987.11 | 497.05 | 36. | 8. | 0.004 | 151.04 | 1.188s |
| RH-106 | 2046.35 | 511.86 | 87. | 124. | 0.069 | 21.09 | 2.452s |
| Nd-147 | 2122.88 | 531.00 | 28. | 11. | 0.006 | 97.14 | 1.219 |
| Ba-140 | 2147.92 | 537.26 | 48. | -3. | -0.002 | 455.83 | 1.224s |
| CS-134 | 2251.82 | 563.24 | 60. | -4. | -0.002 | 382.43 | 1.247s |
| CS-134 | 2276.15 | 569.32 | 48. | -3. | -0.002 | 331.66 | 1.252s |
| PA-234 | 2276.75 | 569.47 | 57. | -4. | -0.002 | 261.26 | 1.253s |
| TL-208 | 2331.56 | 583.17 | 25. | 192. | 0.107 | 8.69 | 1.399 |
| SB-125 | 2400.86 | 600.50 | 468. | -16. | -0.009 | 192.45 | 1.280s |
| SB-124 | 2409.78 | 602.73 | 452. | -16. | -0.009 | 188.90 | 1.282s |
| CS-134 | 2417.70 | 604.71 | 436. | -14. | -0.008 | 206.94 | 1.284s |
| BI-214 | 2435.79 | 609.23 | 32. | 220. | 0.122 | 8.58 | 1.383 |
| RU-103 | 2440.05 | 610.30 | 422. | 0. | 0.000 | 1000.00 | 1.288s |
| AG-108M | 2455.98 | 614.28 | 422. | 0. | 0.000 | 1000.00 | 1.292s |
| PM-144 | 2471.11 | 618.06 | 422. | 0. | 0.000 | 1000.00 | 1.295s |
| SB-125 | 2542.41 | 635.89 | 24. | 10. | 0.006 | 75.09 | 1.311s |
| I-131 | 2546.75 | 636.97 | 57. | -11. | -0.006 | 104.22 | 1.312s |
| AG-110M | 2629.90 | 657.76 | 163. | -17. | -0.010 | 107.23 | 1.330s |
| CS-137 | 2647.06 | 662.05 | 17. | 58. | 0.032 | 19.59 | 1.517s |
| PM-144 | 2785.03 | 696.54 | 48. | 4. | 0.002 | 328.75 | 1.363s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| NB-94 | 2809.38 | 702.63 | 61. | -9. | -0.005 | 186.57 | 1.368s |
| SB-124 | 2890.01 | 722.79 | 54. | 53. | 0.030 | 23.77 | 1.386s |
| AG-108M | 2890.61 | 722.94 | 107. | 0. | 0.000 | 1000.00 | 1.386s |
| EU-154 | 2892.29 | 723.36 | 107. | 0. | 0.000 | 1000.00 | 1.386s |
| ZR-95 | 2895.66 | 724.20 | 107. | 0. | 0.000 | 1000.00 | 1.387s |
| BI-212 | 2907.54 | 727.17 | 97. | 9. | 0.005 | 164.53 | 1.390 |
| pm-146 | 2941.74 | 735.72 | 22. | 10. | 0.006 | 97.07 | 1.397 |
| pm-146 | 2987.51 | 747.16 | 35. | -5. | -0.003 | 261.67 | 1.407s |
| ZR-95 | 3025.79 | 756.73 | 26. | 6. | 0.003 | 178.21 | 1.415s |
| AG-110M | 3054.64 | 763.94 | 44. | 4. | 0.002 | 239.79 | 1.421s |
| NB-95 | 3062.03 | 765.79 | 55. | -2. | -0.001 | 529.15 | 1.423s |
| PA-234M | 3064.52 | 766.41 | 44. | 13. | 0.007 | 76.79 | 1.423s |
| EU-152 | 3114.56 | 778.92 | 39. | -4. | -0.002 | 322.59 | 1.434s |
| BI-212 | 3140.56 | 785.42 | 35. | 10. | 0.006 | 120.40 | 1.440 |
| CS-134 | 3182.35 | 795.87 | 22. | 44. | 0.025 | 26.17 | 1.448s |
| CS-134 | 3206.69 | 801.95 | 22. | 4. | 0.002 | 224.47 | 1.454s |
| CO-58 | 3241.99 | 810.78 | 75. | -10. | -0.005 | 130.44 | 1.461s |
| La-140 | 3261.97 | 815.77 | 61. | 12. | 0.007 | 92.70 | 1.465s |
| Cs-136 | 3272.90 | 818.50 | 121. | -18. | -0.010 | 91.10 | 1.467s |
| TL-208 | 3441.54 | 860.65 | 10. | 54. | 0.030 | 19.37 | 1.962s |
| NB-94 | 3483.32 | 871.10 | 74. | -19. | -0.011 | 68.04 | 1.512s |
| EU-154 | 3491.85 | 873.23 | 68. | 5. | 0.003 | 257.19 | 1.514s |
| PA-234 | 3521.06 | 880.53 | 31. | 9. | 0.005 | 92.16 | 1.520 |
| PA-234 | 3531.90 | 883.24 | 40. | 9. | 0.005 | 103.19 | 1.522s |
| AG-110M | 3537.67 | 884.68 | 72. | -13. | -0.007 | 96.76 | 1.523s |
| Sc-46 | 3556.06 | 889.28 | 37. | 9. | 0.005 | 98.99 | 1.527s |
| y-88 | 3591.11 | 898.04 | 19. | 7. | 0.004 | 130.32 | 1.534s |
| AC-228 | 3644.39 | 911.36 | 5. | 162. | 0.090 | 8.60 | 1.232 |
| AG-110M | 3748.95 | 937.49 | 33. | -8. | -0.004 | 162.22 | 1.567s |
| PA-234 | 3783.07 | 946.02 | 33. | -2. | -0.001 | 731.57 | 1.574s |
| EU-152 | 3855.45 | 964.11 | 106. | 6. | 0.003 | 266.24 | 1.589s |
| AC-228 | 3875.28 | 969.07 | 4. | 97. | 0.054 | 11.07 | 1.210s |
| EU-154 | 3984.36 | 996.33 | 41. | 11. | 0.006 | 85.61 | 1.616s |
| PA-234M | 4003.04 | 1001.00 | 52. | 11. | 0.006 | 95.22 | 1.620s |
| EU-154 | 4018.15 | 1004.77 | 65. | 1. | 0.001 | 764.53 | 1.623s |
| Co-56 | 4150.45 | 1037.84 | 15. | 4. | 0.002 | 218.66 | 1.650s |
| Cs-136 | 4191.39 | 1048.07 | 62. | -18. | -0.010 | 65.24 | 1.658s |
| RH-106 | 4200.55 | 1050.36 | 78. | -6. | -0.003 | 221.07 | 1.661s |
| BI-207 | 4253.77 | 1063.66 | 45. | -13. | -0.007 | 116.79 | 1.671s |
| Ga-68 | 4308.74 | 1077.40 | 40. | -3. | -0.002 | 467.06 | 1.683s |
| FE-59 | 4396.18 | 1099.25 | 45. | -14. | -0.008 | 108.68 | 1.700s |
| EU-152 | 4447.49 | 1112.07 | 129. | -9. | -0.005 | 185.57 | 1.711s |
| ZN-65 | 4461.38 | 1115.55 | 120. | 0. | 0.000 | 1000.00 | 1.713 |
| BI-214 | 4480.35 | 1120.29 | 81. | 12. | 0.006 | 113.71 | 1.717s |
| Sc-46 | 4481.41 | 1120.55 | 92. | 15. | 0.008 | 96.50 | 1.717 |
| Ta-182 | 4484.41 | 1121.30 | 54. | 10. | 0.006 | 105.09 | 1.718s |
| CO-60 | 4692.24 | 1173.24 | 25. | 0. | 0.000 | 1000.00 | 1.760s |
| Ta-182 | 4755.52 | 1189.05 | 15. | 11. | 0.006 | 85.41 | 1.772s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Ta-182 | 4886.82 | 1221.86 | 14. | 28. | 0.016 | 35.57 | 0.341s |
| Co-56 | 4952.53 | 1238.28 | 72. | -15. | -0.009 | 81.63 | 1.812s |
| NA-22 | 5097.60 | 1274.53 | 16. | 4. | 0.002 | 150.00 | 1.840s |
| EU-154 | 5097.66 | 1274.54 | 20. | 0. | 0.000 | 1000.00 | 1.840s |
| FE-59 | 5165.90 | 1291.60 | 21. | -1. | -0.001 | 792.15 | 1.854s |
| CO-60 | 5329.61 | 1332.50 | 32. | -6. | -0.003 | 218.16 | 1.886s |
| AG-110M | 5536.92 | 1384.30 | 0. | 10. | 0.006 | 31.62 | 1.926s |
| EU-152 | 5631.79 | 1408.00 | 0. | 14. | 0.008 | 26.73 | 1.944s |
| K-40 | 5843.49 | 1460.89 | 0. | 388. | 0.216 | 5.08 | 1.724 |
| La-140 | 6385.15 | 1596.21 | 6. | 6. | 0.004 | 96.69 | 2.087s |
| SB-124 | 6764.55 | 1690.98 | 0. | 10. | 0.006 | 31.62 | 2.157s |
| BI-214 | 7058.84 | 1764.49 | 20. | 11. | 0.006 | 65.14 | 2.211s |
| Co-56 | 7086.31 | 1771.35 | 32. | 11. | 0.006 | 79.25 | 2.216s |
| y-88 | 7345.39 | 1836.06 | 12. | -5. | -0.003 | 173.21 | 2.262s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | -2.4026E+00 | | | | 5.31E+01 | |
| | | | 477.60 | -2.403E+00 | ( | 1.275E+01 1.55E+02 1.05E+01 | G |
| NA-22 | C | 2.5329E-01 | | | | 9.50E+02 | |
| | | | 1274.53 | 2.533E-01 | &( | 1.352E+00 1.50E+02 9.99E+01 | G |
| K-40 | N | 2.5591E+02 | | | | 4.66E+11 | |
| | | | 1460.83 | 2.559E+02 | ( | 4.861E+00 5.08E+00 1.07E+01 | G |
| Sc-46 | F | 6.4018E-01 | | | | 8.38E+01 | |
| | | | 889.28 | 4.419E-01 | &( | 1.489E+00 9.90E+01 1.00E+02 | G |
| | | | 1120.55 | 8.384E-01 | ( | 2.722E+00 9.65E+01 1.00E+02 | G |
| CR-51 | F | 3.1772E+00 | | | | 2.77E+01 | |
| | | | 320.08 | 3.177E+00 | ?( | 1.154E+01 1.08E+02 9.94E+00 | G |
| MN-54 | C | -3.0545E-02 | | | | 3.12E+02 | |
| | | | 834.85 | -3.054E-02 | %( | 1.344E+00 1.82E+03 1.00E+02 | G |
| FE-59 | F | -1.3991E+00 | | | | 4.45E+01 | |
| | | | 1099.25 | -1.399E+00 | ?( | 3.395E+00 1.09E+02 5.65E+01 | G |
| | | | 1291.60 | -1.973E-01 | + | 3.587E+00 7.92E+02 4.32E+01 | G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Co-56 | C 1.4888E-01 | | | | | 7.73E+01 | |
| | | 846.77 | -4.633E-02 | %( | 1.525E+00 | 1.38E+03 | 9.99E+01 G |
| | | 1238.28 | -1.446E+00 | + | 3.949E+00 | 8.16E+01 | 6.61E+01 G |
| | | 1037.84 | 1.530E+00 | ?( | 7.938E+00 | 2.19E+02 | 1.41E+01 G |
| | | 1771.35 | 5.768E+00 | ? | 1.535E+01 | 7.93E+01 | 1.55E+01 A |
| CO-58 | C -4.3553E-01 | | | | | 7.09E+01 | |
| | | 810.78 | -4.355E-01 | &( | 1.936E+00 | 1.30E+02 | 9.95E+01 G |
| CO-60 | F -3.9312E-01 | | | | | 1.93E+03 | |
| | | 1332.50 | -3.931E-01 | ?( | 1.905E+00 | 2.18E+02 | 1.00E+02 G |
| | | 1173.24 | 0.000E+00 | + | 1.546E+00 | 1.00E+03 | 9.99E+01 G |
| NB-94 | I -3.5643E-01 | | | | | 7.41E+06 | |
| | | 702.63 | -3.564E-01 | ?( | 1.604E+00 | 1.87E+02 | 9.79E+01 G |
| | | 871.10 | -8.975E-01 | + | 2.022E+00 | 6.80E+01 | 9.99E+01 G |
| ZR-95 | I 4.6882E-01 | | | | | 6.40E+01 | |
| | | 756.73 | 4.688E-01 | ?( | 2.068E+00 | 1.78E+02 | 5.45E+01 G |
| | | 724.20 | 0.000E+00 | & | 4.749E+00 | 1.00E+03 | 4.42E+01 G |
| NB-95 | I -8.6048E-02 | | | | | 6.40E+01 | |
| | | 765.79 | -8.605E-02 | ?( | 1.603E+00 | 5.29E+02 | 9.98E+01 G |
| RU-103 | I 2.7477E-01 | | | | | 3.93E+01 | |
| | | 497.05 | 2.748E-01 | &( | 1.053E+00 | 1.51E+02 | 9.09E+01 G |
| | | 610.30 | 0.000E+00 | - | 6.210E+01 | 1.00E+03 | 5.75E+00 GA |
| RH-106 | I 6.1740E-02 | | | | | 3.74E+02 | |
| | | 621.92 | 6.174E-02 | %( | 3.637E+01 | 1.74E+04 | 9.93E+00 G |
| | | 1050.36 | -2.014E+01 | + | 1.535E+02 | 2.21E+02 | 1.56E+00 G |
| | | 511.86 | 1.983E+01 | ? | 7.350E+00 | 2.11E+01 | 2.00E+01 GA |
| AG-108M | C 3.0239E-01 | | | | | 1.53E+05 | |
| | | 433.94 | 3.024E-01 | ?( | 1.011E+00 | 1.27E+02 | 9.05E+01 G |
| | | 722.94 | 0.000E+00 | - | 2.305E+00 | 1.00E+03 | 9.08E+01 G |
| | | 614.28 | 0.000E+00 | - | 3.993E+00 | 1.00E+03 | 8.98E+01 G |
| AG-110M | F 1.8893E-01 | | | | | 2.50E+02 | |
| | | 884.68 | -8.543E-01 | ?( | 2.788E+00 | 9.68E+01 | 7.27E+01 G |
| | | 657.76 | -7.007E-01 | + | 2.522E+00 | 1.07E+02 | 9.46E+01 G |
| | | 937.49 | -1.116E+00 | & | 4.270E+00 | 1.62E+02 | 3.44E+01 G |
| | | 1384.30 | 2.778E+00 | ?( | 2.047E+00 | 3.16E+01 | 2.43E+01 G |
| | | 763.94 | 7.694E-01 | ?( | 6.467E+00 | 2.40E+02 | 2.23E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| SN-113 | F | -9.9179E-02 | | | | | 1.15E+02 | |
| | | | 391.69 | -9.918E-02 | ( | 2.649E+00 | 7.79E+02 | 6.40E+01 G |
| SB-124 | F | 1.5333E+00 | | | | | 6.02E+01 | |
| | | | 602.73 | -5.877E-01 | &( | 3.725E+00 | 1.89E+02 | 9.83E+01 G |
| | | | 1690.98 | 1.652E+00 | ?( | 1.218E+00 | 3.16E+01 | 4.78E+01 G |
| | | | 722.79 | 2.029E+01 | ?( | 1.402E+01 | 2.38E+01 | 1.08E+01 G |
| SB-125 | I | 1.8399E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | 5.680E-01 | ?( | 3.528E+00 | 2.35E+02 | 2.96E+01 G |
| | | | 600.50 | -3.220E+00 | + | 2.079E+01 | 1.92E+02 | 1.79E+01 G |
| | | | 635.89 | 3.368E+00 | ?( | 8.470E+00 | 7.51E+01 | 1.13E+01 G |
| | | | 463.37 | 3.785E+00 | ( | 1.135E+01 | 8.91E+01 | 1.05E+01 G |
| I-131 | I | -1.9372E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | -1.937E-01 | ?( | 1.475E+00 | 2.91E+02 | 8.17E+01 G |
| | | | 284.30 | 2.278E-01 | % | 1.897E+01 | 3.18E+03 | 6.14E+00 G |
| | | | 636.97 | -5.581E+00 | + | 1.974E+01 | 1.04E+02 | 7.17E+00 G |
| Gd-153 | F | 5.1481E-04 | | | | | 2.42E+02 | |
| | | | 97.50 | -9.671E-01 | ?( | 3.812E+00 | 1.18E+02 | 3.00E+01 G |
| | | | 103.20 | 1.332E+00 | ?( | 5.296E+00 | 1.19E+02 | 2.18E+01 G |
| Ga-68 | C | -5.9575E+00 | | | | | 4.71E-02 | |
| | | | 1077.40 | -5.958E+00 | ?( | 6.391E+01 | 4.67E+02 | 3.30E+00 G |
| Tc-99m | I | 3.6522E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | 3.652E-01 | ( | 1.561E+00 | 1.28E+02 | 8.93E+01 G |
| BA-133 | F | 5.0633E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | 5.063E-01 | ?( | 3.752E+00 | 2.20E+02 | 6.20E+01 G |
| | | | 302.85 | -2.346E+00 | + | 1.070E+01 | 1.36E+02 | 1.83E+01 G |
| | | | 383.84 | -5.139E+00 | + | 2.015E+01 | 1.17E+02 | 8.94E+00 GA |
| | | | 80.99 | 7.140E-01 | ? | 3.276E+00 | 1.62E+02 | 3.41E+01 GA |
| CS-134 | I | 8.5130E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | -5.312E-01 | ?( | 3.693E+00 | 2.07E+02 | 9.76E+01 G |
| | | | 795.87 | 2.291E+00 | ?( | 1.261E+00 | 2.62E+01 | 8.55E+01 G |
| | | | 569.32 | -6.724E-01 | & | 7.843E+00 | 3.32E+02 | 1.54E+01 G |
| | | | 801.95 | 2.216E+00 | ?( | 1.248E+01 | 2.24E+02 | 8.69E+00 G |
| | | | 563.24 | -1.638E+00 | + | 1.589E+01 | 3.82E+02 | 8.35E+00 G |
| CS-137 | I | 2.6361E+00 | | | | | 1.10E+04 | |
| | | | 661.66 | 2.636E+00 | ( | 9.822E-01 | 1.96E+01 | 8.52E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| CE-139 | F | 1.2724E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | 1.272E-01 | ?( | 1.462E+00 | 3.39E+02 | 7.99E+01 G |
| Ba-140 | I | 3.4254E-01 | | | | | 1.28E+01 | |
| | | | 537.26 | -4.064E-01 | ?( | 4.741E+00 | 4.56E+02 | 2.44E+01 G |
| | | | 162.66 | 3.279E+00 | ?( | 1.954E+01 | 1.77E+02 | 6.22E+00 G |
| | | | 304.85 | -1.009E+01 | + | 4.716E+01 | 1.40E+02 | 4.29E+00 G |
| La-140 | I | 9.8360E-01 | | | | | 1.28E+01 | |
| | | | 1596.21 | 5.008E-01 | ?( | 1.092E+00 | 9.67E+01 | 9.54E+01 G |
| | | | 487.02 | 7.841E-01 | &( | 1.966E+00 | 9.99E+01 | 4.55E+01 G |
| | | | 328.76 | 2.060E+00 | ?( | 5.616E+00 | 1.06E+02 | 2.03E+01 G |
| | | | 815.77 | 2.413E+00 | ?( | 7.543E+00 | 9.27E+01 | 2.33E+01 G |
| CE-141 | I | -2.9546E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | -2.955E-01 | ?( | 2.055E+00 | 2.58E+02 | 4.82E+01 G |
| CE-144 | I | -3.3750E+00 | | | | | 2.85E+02 | |
| | | | 133.54 | -3.375E+00 | &( | 1.507E+01 | 1.34E+02 | 1.11E+01 G |
| PM-144 | C | 1.7510E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | 1.751E-01 | ?( | 1.410E+00 | 3.29E+02 | 9.90E+01 G |
| | | | 618.06 | 0.000E+00 | - | 3.637E+00 | 1.00E+03 | 9.91E+01 G |
| EU-152 | F | 6.8680E-01 | | | | | 4.94E+03 | |
| | | | 344.29 | 0.000E+00 | &( | 7.531E+00 | 1.00E+03 | 2.65E+01 G |
| | | | 1112.07 | -3.672E+00 | + | 2.321E+01 | 1.86E+02 | 1.36E+01 G |
| | | | 121.78 | 4.545E-02 | % | 3.577E+00 | 2.31E+03 | 2.86E+01 G |
| | | | 778.92 | -1.344E+00 | + | 1.069E+01 | 3.23E+02 | 1.29E+01 G |
| | | | 964.11 | 1.933E+00 | ?( | 1.769E+01 | 2.66E+02 | 1.46E+01 G |
| | | | 244.69 | -2.168E+00 | + | 3.632E+01 | 5.00E+02 | 7.58E+00 G |
| | | | 1408.00 | 4.558E+00 | & | 2.399E+00 | 2.67E+01 | 2.10E+01 GA |
| EU-154 | I | 2.1681E+00 | | | | | 3.14E+03 | |
| | | | 873.23 | 1.784E+00 | ?( | 1.592E+01 | 2.57E+02 | 1.23E+01 G |
| | | | 123.10 | -7.627E-01 | + | 2.506E+00 | 9.84E+01 | 4.08E+01 G |
| | | | 1274.54 | 0.000E+00 | & | 4.235E+00 | 1.00E+03 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | - | 1.036E+01 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | 4.373E-01 | &( | 1.175E+01 | 7.65E+02 | 1.80E+01 G |
| | | | 996.33 | 5.553E+00 | ?( | 1.602E+01 | 8.56E+01 | 1.06E+01 G |
| HF-181 | F | 4.2986E-01 | | | | | 4.24E+01 | |
| | | | 482.00 | 4.299E-01 | ?( | 1.801E+00 | 1.24E+02 | 8.05E+01 G |
| | | | 133.02 | -8.629E-01 | + | 3.779E+00 | 1.31E+02 | 4.33E+01 G |
| | | | 345.83 | 0.000E+00 | - | 1.328E+01 | 1.00E+03 | 1.51E+01 G |
| | | | 136.30 | -6.461E+00 | + | 2.932E+01 | 1.36E+02 | 5.85E+00 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Ta-182 | F | 3.8142E+00 | | | | | 1.14E+02 | |
| | | | 1121.30 | 1.700E+00 | ?( | 6.068E+00 | 1.05E+02 | 3.49E+01 G |
| | | | 1221.41 | 6.464E+00 | ( | 4.498E+00 | 3.56E+01 | 2.70E+01 G |
| | | | 1189.05 | 3.953E+00 | ?( | 7.685E+00 | 8.54E+01 | 1.62E+01 G |
| Hg-203 | F | -5.0367E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | -5.037E-01 | &( | 1.746E+00 | 1.04E+02 | 8.15E+01 G |
| TL-208 | N | 7.9766E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 7.977E+00 | (P | 1.077E+00 | 8.69E+00 | 8.45E+01 G |
| | | | 277.28 | 1.329E+01 | + | 1.103E+01 | 3.38E+01 | 6.31E+00 G |
| | | | 860.56 | 2.050E+01 | + | 6.490E+00 | 1.94E+01 | 1.24E+01 G |
| pm-146 | C | 4.1392E-01 | | | | | 2.02E+03 | |
| | | | 747.16 | -5.785E-01 | ?( | 3.737E+00 | 2.62E+02 | 3.40E+01 G |
| | | | 735.72 | 1.914E+00 | &( | 4.519E+00 | 9.71E+01 | 2.25E+01 G |
| | | | 453.88 | -6.297E-01 | + | 1.996E+00 | 1.28E+02 | 6.50E+01 G |
| y-88 | F | 3.7881E-01 | | | | | 1.07E+02 | |
| | | | 898.04 | 3.788E-01 | &( | 1.180E+00 | 1.30E+02 | 9.37E+01 G |
| | | | 1836.06 | -4.247E-01 | + | 1.601E+00 | 1.73E+02 | 9.92E+01 G |
| Cd-113m | | -7.2204E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | -7.220E+03 | ?( | 2.029E+04 | 8.43E+01 | 6.00E-03 K |
| Cf-251 | T | 3.8613E-01 | | | | | 3.28E+05 | |
| | | | 176.60 | 3.861E-01 | ?( | 5.439E+00 | 5.16E+02 | 1.70E+01 G |
| | | | 227.00 | 9.543E+00 | & | 1.215E+01 | 4.87E+01 | 6.30E+00 GA |
| Cf-249 | T | 5.1983E-01 | | | | | 1.28E+05 | |
| | | | 387.95 | 5.198E-01 | &( | 2.125E+00 | 1.21E+02 | 6.60E+01 G |
| | | | 333.44 | -2.017E-01 | & | 6.884E+00 | 1.29E+03 | 1.55E+01 G |
| Sn-126 | | 4.6223E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | 2.402E+00 | } | 5.485E+00 | 3.53E+01 | 3.75E+01 GA |
| | | | 64.28 | 4.622E+00 | &( | 1.604E+01 | 1.04E+02 | 9.70E+00 G |
| | | | 86.94 | 4.389E-01 | } | 2.405E+01 | 8.55E+02 | 9.04E+00 GA |
| PB-210 | N | 1.8557E+01 | | | | | 8.14E+03 | |
| | | | 46.54 | 1.856E+01 | (P | 3.157E+01 | 6.23E+01 | 4.25E+00 G |
| PB-212 | N | 2.2901E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 2.290E+01 | (P | 1.878E+00 | 4.92E+00 | 4.33E+01 G |
| | | | 300.03 | 3.222E+01 | + | 2.198E+01 | 3.00E+01 | 3.28E+00 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| PB-214 | N | 1.8725E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.919E+01 | (P | 2.354E+00 | 7.80E+00 | 3.76E+01 G |
| | | | 295.09 | 1.782E+01 | (P | 4.693E+00 | 1.33E+01 | 1.93E+01 G |
| | | | 242.00 | 2.506E+01 + | | 1.232E+01 | 1.73E+01 | 7.43E+00 GA |
| BI-207 | C | 2.9404E-02 | | | | | 1.18E+04 | |
| | | | 569.70 | 2.940E-02 %( | | 1.406E+00 | 1.36E+03 | 9.77E+01 G |
| | | | 1063.66 | -9.607E-01 + | | 2.510E+00 | 1.17E+02 | 7.45E+01 G |
| BI-212 | N | 4.7415E+00 | | | | | 6.98E+02 | |
| | | | 727.17 | 4.741E+00 ( | | 2.664E+01 | 1.65E+02 | 7.55E+00 G |
| | | | 785.42 | 3.532E+01 | | 1.031E+02 | 1.20E+02 | 1.28E+00 GA |
| BI-214 | N | 1.7320E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.732E+01 | (P | 2.275E+00 | 8.58E+00 | 4.61E+01 G |
| | | | 1120.29 | 4.396E+00 - | P | 1.692E+01 | 1.14E+02 | 1.51E+01 G |
| | | | 1764.49 | 5.768E+00 - | | 1.239E+01 | 6.51E+01 | 1.54E+01 G |
| BI-210M | T | -8.4040E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | -8.404E-01 &( | | 2.825E+00 | 1.00E+02 | 5.00E+01 G |
| | | | 304.90 | -2.737E-02 % | | 7.411E+00 | 7.98E+03 | 2.80E+01 G |
| AC-228 | N | 2.7477E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.731E+01 ( | | 2.245E+00 | 8.60E+00 | 2.90E+01 G |
| | | | 968.97 | 2.853E+01 ( | | 3.475E+00 | 1.11E+01 | 1.75E+01 G |
| | | | 338.32 | 2.635E+01 *( | | 6.739E+00 | 1.38E+01 | 1.20E+01 G |
| | | | 93.35 | 7.432E+00 - | | 3.560E+01 | 1.44E+02 | 5.56E+00 XA |
| TH-227 | N | -5.0095E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | -5.009E+00 ?( | | 1.795E+01 | 1.26E+02 | 8.00E+00 G |
| | | | 256.24 | -4.462E+00 + | | 1.613E+01 | 1.34E+02 | 7.00E+00 G |
| TH-229 | N | 4.2046E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | -2.441E-01 %( | | 2.235E+01 | 3.34E+03 | 4.40E+00 G |
| | | | 210.85 | 1.075E+01 ?( | | 4.918E+01 | 1.36E+02 | 2.99E+00 G |
| TH-234 | N | 2.5703E+00 | | | | | 1.63E+12 | |
| | | | 63.29 | -1.597E+00 ?(P | | 4.154E+01 | 7.66E+02 | 3.81E+00 G |
| | | | 92.59 | 5.414E+00 (P | | 1.771E+01 | 9.83E+01 | 5.58E+00 G |
| PA-231 | N | -1.4924E+01 | | | | | 1.20E+07 | |
| | | | 302.65 | -1.492E+01 ?( | | 6.796E+01 | 1.36E+02 | 2.88E+00 G |
| | | | 300.07 | -1.732E+01 + | | 8.332E+01 | 1.44E+02 | 2.46E+00 G |
| PA-233 | C | 1.0594E+00 | | | | | 7.82E+08 | |
| | | | 312.01 | 1.059E+00 ?( | | 5.401E+00 | 1.52E+02 | 3.60E+01 G |
| | | | 300.18 | -6.877E+00 + | | 3.224E+01 | 1.40E+02 | 6.20E+00 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

PA-234   N   2.4129E-01                                     1.63E+12
                          131.29-2.064E+00 ?(  8.870E+00 1.29E+02 1.80E+01 G
                          946.02-6.262E-01 &   1.103E+01 7.32E+02 1.34E+01 G
                          569.47-1.752E+00 +   1.595E+01 2.61E+02 8.20E+00 G
                          883.24 4.564E+00 ?(  1.605E+01 1.03E+02 9.60E+00 G
                          880.53 7.275E+00 ?   2.277E+01 9.22E+01 6.00E+00 GA

PA-234M  N   1.0209E+02                                     1.63E+12
                         1001.00 7.075E+01 ?(  2.278E+02 9.52E+01 8.37E-01 G
                          766.41 1.913E+02 ?(  4.913E+02 7.68E+01 2.94E-01 G

U-235    N  -2.2935E-01                                     2.57E+11
                          143.79-2.294E-01 &(P 1.283E+01 1.65E+03 1.10E+01 G
                          205.33-6.965E+00 +   3.030E+01 1.30E+02 5.01E+00 G
                          163.38 0.000E+00 +   2.453E+01 1.00E+03 5.08E+00 G

AM-241   T   9.9436E-01                                     1.58E+05
                           59.54 9.944E-01 &(  3.872E+00 1.37E+02 3.59E+01 G

Ir-192   F   4.4016E-01                                     7.40E+01
                          316.49 3.706E-01 &(  1.273E+00 1.02E+02 8.70E+01 G
                          468.06 5.571E-01 ?(  2.839E+00 1.50E+02 5.18E+01 G
                          308.44 0.000E+00 -   6.592E+00 1.00E+03 3.18E+01 G

Cs-136   F  -7.9777E-01                                     1.30E+01
                          818.50-7.978E-01 &(  2.434E+00 9.11E+01 1.00E+02 G
                         1048.07-1.241E+00 +   2.675E+00 6.52E+01 8.00E+01 G
                          340.57-1.777E-01 +   4.247E+00 7.04E+02 4.69E+01 G

Np-239   T  -8.0031E-01                                     2.36E+00
                          103.70 2.552E-01 +   4.958E+00 5.74E+02 2.40E+01 X
                          106.13-8.003E-01 &(  5.230E+00 1.94E+02 2.27E+01 G
                           99.50 2.041E+00     7.850E+00 1.15E+02 1.50E+01 X

Nd-147       2.8243E+00                                     1.11E+01
                          531.00 2.824E+00  (  6.897E+00 9.71E+01 1.30E+01 G
                           91.10 3.636E-07 %   7.050E+00 5.78E+08 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
```

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| TH-227 | 50.14 | 156. | -17. | -0.009 | 126.03 | -5.009E+00 |
| AM-241 | 59.54 | 234. | 19. | 0.011 | 137.45 | 9.944E-01 |
| BA-133 | 80.99 | 261. | 17. | 0.009 | 161.79 | 7.140E-01 |
| EU-155 | 86.54 | 1212. | -31. | -0.017 | 160.83 | -1.384E+00 |
| Gd-153 | 97.50 | 325. | -22. | -0.012 | 117.83 | -9.671E-01 |
| Np-239 | 99.50 | 349. | 23. | 0.013 | 115.05 | 2.041E+00 |
| Gd-153 | 103.20 | 340. | 22. | 0.012 | 118.86 | 1.332E+00 |
| Np-239 | 103.70 | 362. | 5. | 0.003 | 573.98 | 2.552E-01 |
| Np-239 | 106.13 | 363. | -14. | -0.008 | 194.31 | -8.003E-01 |
| EU-154 | 123.10 | 265. | -24. | -0.013 | 98.42 | -7.627E-01 |
| PA-234 | 131.29 | 645. | -28. | -0.016 | 128.87 | -2.064E+00 |
| HF-181 | 133.02 | 673. | -28. | -0.016 | 131.35 | -8.629E-01 |
| CE-144 | 133.54 | 701. | -28. | -0.016 | 133.94 | -3.375E+00 |
| HF-181 | 136.30 | 730. | -28. | -0.016 | 136.12 | -6.461E+00 |
| CO-57 | 136.47 | 742. | -29. | -0.016 | 135.73 | -3.580E+00 |
| CE-141 | 145.44 | 223. | -10. | -0.006 | 257.52 | -2.955E-01 |
| Ba-140 | 162.66 | 300. | 14. | 0.008 | 176.99 | 3.279E+00 |
| CE-139 | 165.85 | 278. | 7. | 0.004 | 338.97 | 1.272E-01 |
| Cf-251 | 176.60 | 157. | 4. | 0.002 | 516.25 | 3.861E-01 |
| U-235 | 205.33 | 355. | -21. | -0.012 | 129.93 | -6.965E+00 |
| TH-229 | 210.85 | 320. | 19. | 0.010 | 136.40 | 1.075E+01 |
| Cf-251 | 227.00 | 73. | 33. | 0.019 | 48.70 | 9.543E+00 |
| EU-152 | 244.69 | 940. | -9. | -0.005 | 500.13 | -2.168E+00 |
| TH-227 | 256.24 | 140. | -16. | -0.009 | 133.95 | -4.462E+00 |
| Cd-113m | 263.70 | 157. | -22. | -0.012 | 84.27 | -7.220E+03 |
| BI-210M | 265.83 | 212. | -21. | -0.012 | 100.48 | -8.404E-01 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Hg-203 | 279.20 | 200. | -20. | -0.011 | 103.52 | -5.037E-01 | |
| PA-231 | 300.07 | 384. | -20. | -0.011 | 143.54 | -1.732E+01 | |
| PA-233 | 300.18 | 365. | -20. | -0.011 | 139.90 | -6.877E+00 | |
| PA-231 | 302.65 | 345. | -20. | -0.011 | 135.89 | -1.492E+01 | |
| BA-133 | 302.85 | 346. | -20. | -0.011 | 136.05 | -2.346E+00 | |
| Ba-140 | 304.85 | 366. | -20. | -0.011 | 139.50 | -1.009E+01 | |
| PA-233 | 312.01 | 326. | 17. | 0.009 | 151.84 | 1.059E+00 | |
| Ir-192 | 316.49 | 99. | 14. | 0.008 | 101.99 | 3.706E-01 | |
| CR-51 | 320.08 | 104. | 14. | 0.008 | 107.65 | 3.177E+00 | |
| La-140 | 328.76 | 99. | 18. | 0.010 | 106.07 | 2.060E+00 | |
| Cs-136 | 340.57 | 302. | -4. | -0.002 | 703.63 | -1.777E-01 | |
| BA-133 | 356.00 | 390. | 13. | 0.007 | 220.24 | 5.063E-01 | |
| I-131 | 364.48 | 95. | -6. | -0.004 | 291.14 | -1.937E-01 | |
| BA-133 | 383.84 | 205. | -18. | -0.010 | 116.80 | -5.139E+00 | |
| Cf-249 | 387.95 | 120. | 13. | 0.007 | 121.01 | 5.198E-01 | |
| SN-113 | 391.69 | 176. | -2. | -0.001 | 779.18 | -9.918E-02 | |
| SB-125 | 427.88 | 55. | 6. | 0.003 | 234.82 | 5.680E-01 | |
| AG-108M | 433.94 | 40. | 10. | 0.005 | 127.05 | 3.024E-01 | |
| pm-146 | 453.88 | 80. | -14. | -0.008 | 127.91 | -6.297E-01 | |
| SB-125 | 463.37 | 64. | 13. | 0.007 | 89.13 | 3.785E+00 | |
| Ir-192 | 468.06 | 99. | 10. | 0.005 | 149.65 | 5.571E-01 | |
| BE-7 | 477.59 | 79. | -8. | -0.005 | 155.07 | -2.403E+00 | |
| HF-181 | 482.00 | 92. | 11. | 0.006 | 123.53 | 4.299E-01 | |
| La-140 | 487.02 | 32. | 12. | 0.006 | 99.91 | 7.841E-01 | |
| RU-103 | 497.05 | 36. | 8. | 0.004 | 151.04 | 2.748E-01 | |
| RH-106 | 511.86 | 87. | 124. | 0.069 | 21.09 | 1.983E+01 | |
| Nd-147 | 531.00 | 28. | 11. | 0.006 | 97.14 | 2.824E+00 | |
| Ba-140 | 537.26 | 48. | -3. | -0.002 | 455.83 | -4.064E-01 | |
| CS-134 | 563.24 | 60. | -4. | -0.002 | 382.43 | -1.638E+00 | |
| CS-134 | 569.32 | 48. | -3. | -0.002 | 331.66 | -6.724E-01 | |
| PA-234 | 569.47 | 57. | -4. | -0.002 | 261.26 | -1.752E+00 | |
| SB-125 | 600.50 | 468. | -16. | -0.009 | 192.45 | -3.220E+00 | |
| SB-124 | 602.73 | 452. | -16. | -0.009 | 188.90 | -5.877E-01 | |
| CS-134 | 604.71 | 436. | -14. | -0.008 | 206.94 | -5.312E-01 | |
| SB-125 | 635.89 | 24. | 10. | 0.006 | 75.09 | 3.368E+00 | |
| I-131 | 636.97 | 57. | -11. | -0.006 | 104.22 | -5.581E+00 | |
| AG-110M | 657.76 | 163. | -17. | -0.010 | 107.23 | -7.007E-01 | |
| PM-144 | 696.54 | 48. | 4. | 0.002 | 328.75 | 1.751E-01 | |
| NB-94 | 702.63 | 61. | -9. | -0.005 | 186.57 | -3.564E-01 | |
| SB-124 | 722.79 | 54. | 53. | 0.030 | 23.77 | 2.029E+01 | |
| BI-212 | 727.17 | 97. | 9. | 0.005 | 164.53 | 4.741E+00 | |
| pm-146 | 735.72 | 22. | 10. | 0.006 | 97.07 | 1.914E+00 | |
| pm-146 | 747.16 | 35. | -5. | -0.003 | 261.67 | -5.785E-01 | |
| ZR-95 | 756.73 | 26. | 6. | 0.003 | 178.21 | 4.688E-01 | |
| AG-110M | 763.94 | 44. | 4. | 0.002 | 239.79 | 7.694E-01 | |
| NB-95 | 765.79 | 55. | -2. | -0.001 | 529.15 | -8.605E-02 | |
| PA-234M | 766.41 | 44. | 13. | 0.007 | 76.79 | 1.913E+02 | |
| EU-152 | 778.92 | 39. | -4. | -0.002 | 322.59 | -1.344E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BI-212 | 785.42 | 35. | 10. | 0.006 | 120.40 | 3.532E+01 | |
| CS-134 | 795.87 | 22. | 44. | 0.025 | 26.17 | 2.291E+00 | |
| CS-134 | 801.95 | 22. | 4. | 0.002 | 224.47 | 2.216E+00 | |
| CO-58 | 810.78 | 75. | -10. | -0.005 | 130.44 | -4.355E-01 | |
| La-140 | 815.77 | 61. | 12. | 0.007 | 92.70 | 2.413E+00 | |
| Cs-136 | 818.50 | 121. | -18. | -0.010 | 91.10 | -7.978E-01 | |
| NB-94 | 871.10 | 74. | -19. | -0.011 | 68.04 | -8.975E-01 | |
| EU-154 | 873.23 | 68. | 5. | 0.003 | 257.19 | 1.784E+00 | |
| PA-234 | 880.53 | 31. | 9. | 0.005 | 92.16 | 7.275E+00 | |
| PA-234 | 883.24 | 40. | 9. | 0.005 | 103.19 | 4.564E+00 | |
| AG-110M | 884.68 | 72. | -13. | -0.007 | 96.76 | -8.543E-01 | |
| Sc-46 | 889.28 | 37. | 9. | 0.005 | 98.99 | 4.419E-01 | |
| y-88 | 898.04 | 19. | 7. | 0.004 | 130.32 | 3.788E-01 | |
| AG-110M | 937.49 | 33. | -8. | -0.004 | 162.22 | -1.116E+00 | |
| PA-234 | 946.02 | 33. | -2. | -0.001 | 731.57 | -6.262E-01 | |
| EU-152 | 964.11 | 106. | 6. | 0.003 | 266.24 | 1.933E+00 | |
| EU-154 | 996.33 | 41. | 11. | 0.006 | 85.61 | 5.553E+00 | |
| PA-234M | 1001.00 | 52. | 11. | 0.006 | 95.22 | 7.075E+01 | |
| EU-154 | 1004.77 | 65. | 1. | 0.001 | 764.53 | 4.373E-01 | |
| Co-56 | 1037.84 | 15. | 4. | 0.002 | 218.66 | 1.530E+00 | |
| Cs-136 | 1048.07 | 62. | -18. | -0.010 | 65.24 | -1.241E+00 | |
| RH-106 | 1050.36 | 78. | -6. | -0.003 | 221.07 | -2.014E+01 | |
| BI-207 | 1063.66 | 45. | -13. | -0.007 | 116.79 | -9.607E-01 | |
| Ga-68 | 1077.40 | 40. | -3. | -0.002 | 467.06 | -5.958E+00 | |
| FE-59 | 1099.25 | 45. | -14. | -0.008 | 108.68 | -1.399E+00 | |
| EU-152 | 1112.07 | 129. | -9. | -0.005 | 185.57 | -3.672E+00 | |
| Sc-46 | 1120.55 | 92. | 15. | 0.008 | 96.50 | 8.384E-01 | |
| Co-56 | 1238.28 | 72. | -15. | -0.009 | 81.63 | -1.446E+00 | |
| NA-22 | 1274.53 | 16. | 4. | 0.002 | 150.00 | 2.533E-01 | |
| FE-59 | 1291.60 | 21. | -1. | -0.001 | 792.15 | -1.973E-01 | |
| CO-60 | 1332.50 | 32. | -6. | -0.003 | 218.16 | -3.931E-01 | |
| AG-110M | 1384.30 | 0. | 10. | 0.006 | 31.62 | 2.778E+00 | |
| EU-152 | 1408.00 | 0. | 14. | 0.008 | 26.73 | 4.558E+00 | |
| La-140 | 1596.21 | 6. | 6. | 0.004 | 96.69 | 5.008E-01 | |
| SB-124 | 1690.98 | 0. | 10. | 0.006 | 31.62 | 1.652E+00 | |
| Co-56 | 1771.35 | 32. | 11. | 0.006 | 79.25 | 5.768E+00 | |
| y-88 | 1836.06 | 12. | -5. | -0.003 | 173.21 | -4.247E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty 1 Sigma Counting | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | -2.4026E+00 | -2.4026E+00 | 1.551E+02% | 1.27E+01 |
| NA-22 | #A | 2.5329E-01 | 2.5329E-01 | 1.500E+02% | 1.35E+00 |
| K-40 | | 2.5591E+02 | 2.5591E+02 | 5.077E+00% | 4.86E+00 |
| Sc-46 | #A | 6.4017E-01 | 6.4018E-01 | 6.912E+01% | 1.49E+00 |
| CR-51 | #A | 3.1771E+00 | 3.1772E+00 | 1.077E+02% | 1.15E+01 |
| MN-54 | #A | -3.0545E-02 | -3.0545E-02 | 1.823E+03% | 1.34E+00 |
| FE-59 | #A | -1.3991E+00 | -1.3991E+00 | 1.087E+02% | 3.39E+00 |
| Co-56 | #A | 1.4888E-01 | 1.4888E-01 | 2.187E+02% | 1.52E+00 |
| CO-57 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.20E+00 |
| CO-58 | #A | -4.3553E-01 | -4.3553E-01 | 1.304E+02% | 1.94E+00 |
| CO-60 | #A | -3.9312E-01 | -3.9312E-01 | 2.182E+02% | 1.90E+00 |
| ZN-65 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 6.07E+00 |
| NB-94 | #A | -3.5643E-01 | -3.5643E-01 | 1.866E+02% | 1.60E+00 |
| ZR-95 | #A | 4.6882E-01 | 4.6882E-01 | 1.782E+02% | 2.07E+00 |
| NB-95 | #A | -8.6048E-02 | -8.6048E-02 | 5.292E+02% | 1.60E+00 |
| RU-103 | #A | 2.7477E-01 | 2.7477E-01 | 1.510E+02% | 1.05E+00 |
| RH-106 | #A | 6.1740E-02 | 6.1740E-02 | 1.739E+04% | 3.64E+01 |
| AG-108M | #A | 3.0239E-01 | 3.0239E-01 | 1.270E+02% | 1.01E+00 |
| AG-110M | #A | 1.8893E-01 | 1.8893E-01 | 3.162E+01% | 2.79E+00 |
| SN-113 | #A | -9.9178E-02 | -9.9179E-02 | 7.792E+02% | 2.65E+00 |
| SB-124 | #A | 1.5333E+00 | 1.5333E+00 | 2.377E+01% | 3.73E+00 |
| SB-125 | #A | 1.8399E+00 | 1.8399E+00 | 7.509E+01% | 3.53E+00 |
| I-131 | #A | -1.9371E-01 | -1.9372E-01 | 2.911E+02% | 1.47E+00 |
| Gd-153 | #A | 5.1481E-04 | 5.1481E-04 | 8.369E+01% | 3.81E+00 |
| Ga-68 | #A | -5.8959E+00 | -5.9575E+00 | 4.671E+02% | 6.39E+01 |
| Tc-99m | A | 3.6451E-01 | 3.6522E-01 | 1.279E+02% | 1.56E+00 |
| BA-133 | #A | 5.0633E-01 | 5.0633E-01 | 2.202E+02% | 3.75E+00 |
| CS-134 | #A | 8.5130E-01 | 8.5130E-01 | 2.617E+01% | 3.69E+00 |
| CS-137 | # | 2.6361E+00 | 2.6361E+00 | 1.959E+01% | 9.82E-01 |
| CE-139 | #A | 1.2724E-01 | 1.2724E-01 | 3.390E+02% | 1.46E+00 |
| Ba-140 | #A | 3.4252E-01 | 3.4254E-01 | 1.770E+02% | 4.74E+00 |
| La-140 | #A | 9.8357E-01 | 9.8360E-01 | 4.948E+01% | 1.09E+00 |
| CE-141 | #A | -2.9546E-01 | -2.9546E-01 | 2.575E+02% | 2.05E+00 |
| CE-144 | #A | -3.3750E+00 | -3.3750E+00 | 1.339E+02% | 1.51E+01 |
| PM-144 | #A | 1.7510E-01 | 1.7510E-01 | 3.288E+02% | 1.41E+00 |
| EU-152 | #A | 6.8680E-01 | 6.8680E-01 | 2.662E+02% | 7.53E+00 |
| EU-154 | #A | 2.1681E+00 | 2.1681E+00 | 8.561E+01% | 1.59E+01 |
| EU-155 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 5.63E+00 |
| HF-181 | #A | 4.2985E-01 | 4.2986E-01 | 1.235E+02% | 1.80E+00 |
| Ta-182 | A | 3.8142E+00 | 3.8142E+00 | 3.557E+01% | 6.07E+00 |
| Hg-203 | #A | -5.0366E-01 | -5.0367E-01 | 1.035E+02% | 1.75E+00 |
| TL-208 | | 7.9766E+00 | 7.9766E+00 | 8.693E+00% | 1.08E+00 |
| pm-146 | #A | 4.1392E-01 | 4.1392E-01 | 9.707E+01% | 3.74E+00 |

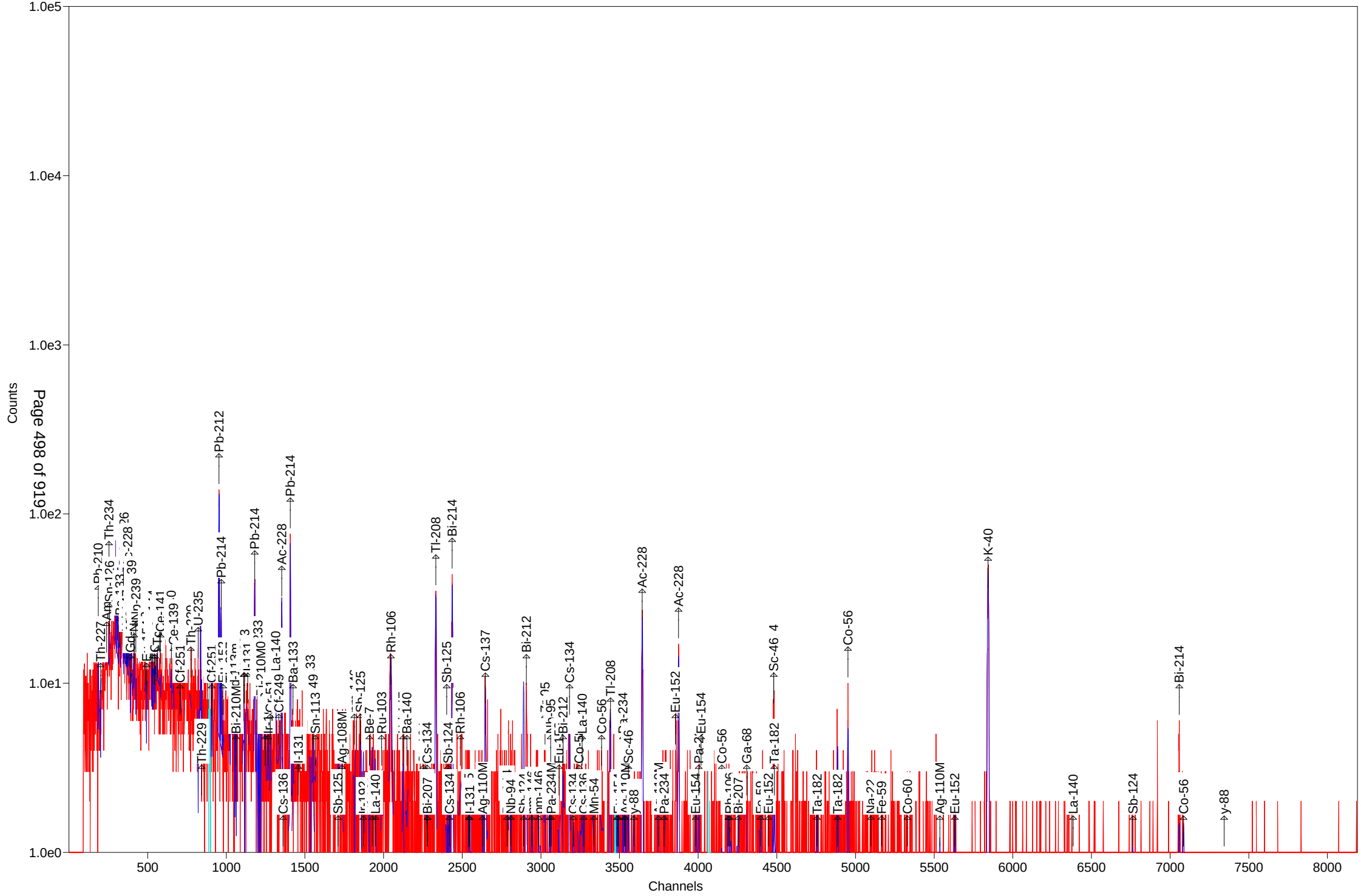
| | | | | | |
|---|---|---|---|---|---|
| y-88 #A | 3.7881E-01 | 3.7881E-01 | 1.303E+02% | | 1.18E+00 |
| Cd-113m#A | -7.2204E+03 | -7.2204E+03 | 8.427E+01% | | 2.03E+04 |
| Cd-109 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 5.34E+01 |
| Cf-251 #A | 3.8613E-01 | 3.8613E-01 | 5.162E+02% | | 5.44E+00 |
| Cf-249 #A | 5.1983E-01 | 5.1983E-01 | 1.210E+02% | | 2.13E+00 |
| Sn-126 A | 4.6223E+00 | 4.6223E+00 | 1.040E+02% | | 1.60E+01 |
| PB-210 A | 1.8557E+01 | 1.8557E+01 | 6.229E+01% | | 3.16E+01 |
| PB-212 | 2.2901E+01 | 2.2901E+01 | 4.925E+00% | | 1.88E+00 |
| PB-214 | 1.8725E+01 | 1.8725E+01 | 7.691E+00% | | 2.35E+00 |
| BI-207 #A | 2.9404E-02 | 2.9404E-02 | 1.357E+03% | | 1.41E+00 |
| BI-212 #A | 4.7415E+00 | 4.7415E+00 | 1.645E+02% | | 2.66E+01 |
| BI-214 | 1.7320E+01 | 1.7320E+01 | 8.581E+00% | | 2.27E+00 |
| BI-210M#A | -8.4040E-01 | -8.4040E-01 | 1.005E+02% | | 2.82E+00 |
| AC-228 | 2.7477E+01 | 2.7477E+01 | 6.551E+00% | | 2.24E+00 |
| TH-227 #A | -5.0095E+00 | -5.0095E+00 | 1.260E+02% | | 1.79E+01 |
| TH-229 #A | 4.2046E+00 | 4.2046E+00 | 1.364E+02% | | 2.24E+01 |
| TH-234 #A | 2.5703E+00 | 2.5703E+00 | 9.829E+01% | | 4.15E+01 |
| PA-231 #A | -1.4924E+01 | -1.4924E+01 | 1.359E+02% | | 6.80E+01 |
| PA-233 #A | 1.0594E+00 | 1.0594E+00 | 1.518E+02% | | 5.40E+00 |
| PA-234 #A | 2.4129E-01 | 2.4129E-01 | 8.255E+01% | | 8.87E+00 |
| PA-234M#A | 1.0209E+02 | 1.0209E+02 | 6.116E+01% | | 2.28E+02 |
| U-235 #A | -2.2935E-01 | -2.2935E-01 | 1.654E+03% | | 1.28E+01 |
| AM-241 #A | 9.9436E-01 | 9.9436E-01 | 1.374E+02% | | 3.87E+00 |
| Np-237 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 1.75E+01 |
| Ir-192 #A | 4.4015E-01 | 4.4016E-01 | 9.055E+01% | | 1.27E+00 |
| Cs-136 #A | -7.9773E-01 | -7.9777E-01 | 9.110E+01% | | 2.43E+00 |
| Np-239 #A | -8.0014E-01 | -8.0031E-01 | 1.943E+02% | | 5.23E+00 |
| Nd-147 #A | 2.8242E+00 | 2.8243E+00 | 9.714E+01% | | 6.90E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  25.1 to  1999.5 keV)  3.715E+02  Bq/Sample
Total Decayed Activity (  25.1 to  1999.5 keV) 3.7150055E+02  Bq/Sample

309155_Gamma_160-22327-A-7-B. 17_Gamma_20171231.spc.



Test America St. Louis  Spectrum ID: 7_Gamma_20171003

Sample Description: 309155_Gamma_160-22327-A-8-B
Detector: Detector # 7
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-8-B

Decay to Time: 6/7/2017 09:56  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:56:21  Real Time: 1832 sec
Analysis Time: 6/7/2017 10:27  Dead Time: 1.76 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 7_Soil_TunaCan.Clb
Efficiency Cal Desc: 7_TunaCan_90099_032712
Efficiency Cal Date: 3/16/2012 11:45
Energy Cal Date: 2/23/2012 08:40
Library: Client_Long_Rev11.lib
Bkgd Correction File: 7_2017-06-04_0230.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | -4.586E+00 | 104.8 | 4.808E+00 | 4.813E+00 | 1.614E+01 |
| NA-22 | -1.212E+00 | 54.7 | 6.625E-01 | 6.653E-01 | 2.152E+00 |
| K-40 | 2.593E+02 | 5.2 | 1.359E+01 | 1.899E+01 | 5.250E+00 |
| Sc-46 | -4.280E-01 | 131.3 | 5.620E-01 | 5.624E-01 | 1.921E+00 |
| CR-51 | 0.000E+00 | 1.#INF | 1.290E+00 | 1.290E+00 | 1.882E+01 |
| MN-54 | 4.884E-01 | 100.8 | 4.925E-01 | 4.931E-01 | 1.155E+00 |
| FE-59 | 7.325E-02 | 79.3 | 5.811E-02 | 5.822E-02 | 3.018E+00 |
| Co-56 | 1.391E+00 | 47.0 | 6.538E-01 | 6.577E-01 | 1.060E+00 |
| CO-57 | -1.246E-02 | 2157.4 | 2.688E-01 | 2.688E-01 | 9.161E-01 |
| CO-58 | -3.139E-01 | 158.4 | 4.973E-01 | 4.976E-01 | 1.713E+00 |
| CO-60 | 4.659E-02 | 1190.6 | 5.547E-01 | 5.547E-01 | 1.286E+00 |
| ZN-65 | -1.763E+00 | 107.7 | 1.898E+00 | 1.900E+00 | 6.389E+00 |
| NB-94 | -1.738E-01 | 302.9 | 5.265E-01 | 5.265E-01 | 1.251E+00 |
| ZR-95 | 6.793E-01 | 110.3 | 7.491E-01 | 7.500E-01 | 1.942E+00 |
| NB-95 | -4.672E-01 | 137.0 | 6.399E-01 | 6.404E-01 | 2.172E+00 |
| RU-103 | 3.527E-01 | 98.7 | 3.480E-01 | 3.485E-01 | 8.430E-01 |
| RH-106 | 3.076E+00 | 109.0 | 3.352E+00 | 3.356E+00 | 8.234E+00 |
| AG-108M | -4.549E-01 | 101.0 | 4.596E-01 | 4.602E-01 | 1.137E+00 |
| AG-110M | 6.158E-01 | 33.3 | 2.053E-01 | 2.077E-01 | 2.322E+00 |
| SN-113 | 4.050E-01 | 127.4 | 5.160E-01 | 5.165E-01 | 1.752E+00 |
| SB-124 | 3.800E-01 | 217.1 | 8.249E-01 | 8.251E-01 | 2.786E+00 |
| SB-125 | 2.058E+00 | 84.0 | 1.729E+00 | 1.732E+00 | 3.004E+00 |
| I-131 | 7.578E-01 | 73.6 | 5.576E-01 | 5.590E-01 | 9.477E-01 |
| Gd-153 | 8.613E-01 | 102.9 | 8.863E-01 | 8.879E-01 | 3.674E+00 |
| Ga-68 | -2.311E+01 | 126.1 | 2.914E+01 | 2.917E+01 | 6.359E+01 |
| Tc-99m | -3.034E-01 | 115.1 | 3.492E-01 | 3.497E-01 | 1.166E+00 |
| BA-133 | -5.986E-01 | 170.2 | 1.019E+00 | 1.019E+00 | 3.418E+00 |
| CS-134 | 5.395E-02 | 131.1 | 7.073E-02 | 7.079E-02 | 3.116E+00 |
| CS-137 | 5.631E-01 | 90.8 | 5.116E-01 | 5.124E-01 | 1.723E+00 |
| CE-139 | 2.984E-01 | 102.2 | 3.049E-01 | 3.062E-01 | 1.020E+00 |
| Ba-140 | 3.388E+00 | 37.3 | 1.263E+00 | 1.276E+00 | 2.809E+00 |
| La-140 | 8.517E-01 | 40.0 | 3.404E-01 | 3.433E-01 | 1.630E+00 |
| CE-141 | 5.589E-01 | 168.1 | 9.393E-01 | 9.398E-01 | 3.133E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 4.734E-01 | 599.8 | 2.840E+00 | 2.840E+00 | 9.581E+00 |
| PM-144 | -7.614E-01 | 91.5 | 6.966E-01 | 6.977E-01 | 1.589E+00 |
| EU-152 | 2.289E+00 | 89.2 | 2.042E+00 | 2.045E+00 | 6.014E+00 |
| EU-154 | 1.246E+01 | 22.6 | 2.815E+00 | 2.886E+00 | 1.525E+01 |
| EU-155 | 5.812E-01 | 156.1 | 9.075E-01 | 9.080E-01 | 5.117E+00 |
| HF-181 | -2.368E-01 | 94.6 | 2.239E-01 | 2.243E-01 | 2.327E+00 |
| Ta-182 | 3.812E-01 | 83.1 | 3.169E-01 | 3.175E-01 | 9.289E+00 |
| Hg-203 | -1.730E-01 | 231.8 | 4.011E-01 | 4.012E-01 | 1.365E+00 |
| TL-208 | 6.681E+00 | 9.7 | 6.453E-01 | 7.324E-01 | 8.712E-01 |
| pm-146 | 7.724E-01 | 150.1 | 1.159E+00 | 1.160E+00 | 2.786E+00 |
| y-88 | 2.608E-01 | 176.1 | 4.592E-01 | 4.594E-01 | 1.083E+00 |
| Cd-113m | -2.238E+03 | 197.6 | 4.423E+03 | 4.425E+03 | 1.510E+04 |
| Cd-109 | 3.939E+00 | 285.9 | 1.126E+01 | 1.126E+01 | 3.770E+01 |
| Cf-251 | 7.053E-02 | 2239.4 | 1.579E+00 | 1.579E+00 | 4.121E+00 |
| Cf-249 | 5.093E-01 | 91.6 | 4.663E-01 | 4.670E-01 | 1.567E+00 |
| Sn-126 | 4.112E+00 | 100.7 | 4.142E+00 | 4.148E+00 | 1.380E+01 |
| PB-210 | 7.859E-01 | 1574.7 | 1.238E+01 | 1.238E+01 | 4.201E+01 |
| PB-212 | 1.650E+01 | 5.8 | 9.577E-01 | 1.434E+00 | 1.987E+00 |
| PB-214 | 1.621E+01 | 7.7 | 1.248E+00 | 1.506E+00 | 1.844E+00 |
| BI-207 | 3.752E-01 | 100.8 | 3.783E-01 | 3.788E-01 | 1.328E+00 |
| BI-212 | 3.664E+01 | 14.2 | 5.219E+00 | 5.555E+00 | 6.850E+00 |
| BI-214 | 1.269E+01 | 10.6 | 1.350E+00 | 1.502E+00 | 2.214E+00 |
| BI-210M | 5.351E-01 | 95.4 | 5.105E-01 | 5.115E-01 | 1.714E+00 |
| AC-228 | 1.982E+01 | 8.5 | 1.687E+00 | 1.967E+00 | 1.258E+00 |
| TH-227 | 6.967E+00 | 46.4 | 3.232E+00 | 3.254E+00 | 9.375E+00 |
| TH-229 | 5.391E+00 | 106.2 | 5.725E+00 | 5.741E+00 | 1.493E+01 |
| TH-234 | -1.873E+01 | 47.6 | 8.912E+00 | 8.965E+00 | 3.598E+01 |
| PA-231 | 0.000E+00 | 1.#INF | 4.814E+00 | 4.814E+00 | 6.191E+01 |
| PA-233 | 0.000E+00 | 1.#INF | 2.523E-01 | 2.523E-01 | 5.083E+00 |
| PA-234 | -4.122E-01 | 121.6 | 5.011E-01 | 5.016E-01 | 6.108E+00 |
| PA-234M | 7.286E+01 | 75.3 | 5.483E+01 | 5.495E+01 | 2.499E+02 |
| U-235 | 1.096E+00 | 73.9 | 8.099E-01 | 8.118E-01 | 1.467E+01 |
| AM-241 | 7.944E-01 | 146.9 | 1.167E+00 | 1.168E+00 | 3.132E+00 |
| Np-237 | 7.273E+00 | 42.8 | 3.115E+00 | 3.141E+00 | 1.017E+01 |
| Ir-192 | 3.120E-01 | 97.5 | 3.042E-01 | 3.048E-01 | 2.128E+00 |
| Cs-136 | 5.218E-01 | 82.7 | 4.314E-01 | 4.324E-01 | 1.910E+00 |
| Np-239 | -2.603E-01 | 563.7 | 1.467E+00 | 1.467E+00 | 4.939E+00 |
| Nd-147 | 3.220E-01 | 160.9 | 5.181E-01 | 5.185E-01 | 7.877E+00 |
| Total | 5.078E+02 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-8-B

Spectrum Filename: C:\User\SPC\Det7\7_Gamma_20171003.An1

Acquisition information
Start time: 6/7/2017 9:56:21 AM
Live time: 1800
Real time: 1832
Dead time: 1.76 %
Detector ID: 7

Detector system
Ge 7 SN/154

Calibration
Filename: 7_Soil_TunaCan.Clb
7_TunaCan_90099_032712

Energy Calibration
Created: 2/23/2012 8:40:56 AM
Zero offset: 0.117 keV
Gain: 0.250 keV/channel
Quadratic: 3.508E-09 keV/channel^2

Efficiency Calibration
Created: 3/16/2012 11:45:14 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.87 %
Log(Eff): 6.716580E-01 + (-6.166540E-01*Log(E) ) + ( -2.065917E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.48 %
Log(Eff): -2.689695E+01 + ( 1.019544E+01*Log(E) ) + ( -1.081671E+00*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.61keV )
Stop channel: 8000 (  2000.13keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3
Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:56:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 7_2017-06-04_0230.PBC 6/4/2017 2:30:42 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 25 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1548

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 49.96 | 28. | 46.38 | 1.15 | 2.841E-02 | 50.14 | 8.000 | PBC<MDA | TH227 |
| 59.36 | 19. | 146.90 | 0.85 | 3.701E-02 | 59.54 | 35.900 | PBC<MDA | AM241 |
| 64.28 | 29. | 100.73 | 0.86 | 4.080E-02 | 64.28 | 9.700 | PBC<MDA | Sn126 |
| 74.80 | 168. | 15.64 | 0.87 | 4.758E-02 | | | | |
| 77.03 | 294. | 10.30 | 0.87 | 4.876E-02 | | | | |
| 86.54 | 26. | 156.15 | 0.88 | 5.281E-02 | 86.49 | 13.100 | PBC<MDA | Np237 |
| | | | | | 86.54 | 30.700 | 8.832E-01 | EU155 |
| | | | | | 86.94 | 9.040 | 2.992E+00 | Sn126 |
| 86.81 | 91. | 42.83 | 0.88 | 5.279E-02 | 86.49 | 13.100 | PBC<MDA | Np237 |
| | | | | | 86.54 | 30.700 | 3.103E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.051E+01 | Sn126 |
| 86.94 | 26. | 158.56 | 0.88 | 5.294E-02 | 86.49 | 13.100 | PBC<MDA | Np237 |
| | | | | | 86.54 | 30.700 | 8.835E-01 | EU155 |
| | | | | | 86.94 | 9.040 | 2.993E+00 | Sn126 |
| 87.89 | 52. | 45.74 | 0.88 | 5.314E-02 | 87.57 | 37.500 | PBC<MDA | Sn126 |
| | | | | | 88.04 | 3.790 | 1.419E+01 | Cd109 |
| 88.27 | 14. | 285.92 | 0.88 | 5.329E-02 | 87.57 | 37.500 | PBC<MDA | Sn126 |
| | | | | | 88.04 | 3.790 | 3.939E+00 | Cd109 |
| 91.10 | 26. | 160.92 | 0.88 | 5.415E-02 | 91.10 | 28.300 | PBC<MDA | Nd147 |
| 93.08 | 71. | 37.53 | 0.91 | 5.470E-02 | 93.35 | 5.561 | 1.303E+01 | AC228 |
| 97.50 | 23. | 144.57 | 0.89 | 5.550E-02 | 97.50 | 30.000 | PBC<MDA | Gd153 |
| 99.50 | 22. | 143.96 | 0.89 | 5.580E-02 | 99.50 | 15.000 | PBC<MDA | Np239 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 103.20 | 22. | 146.48 | 0.90 | 5.622E-02 | 103.20 | 21.800 | PBC<MDA | Gd153 |
| 103.70 | 22. | 149.45 | 0.90 | 5.626E-02 | 103.70 | 24.000 | PBC<MDA | Np239 |
| 133.54 | 5. | 599.80 | 0.93 | 5.459E-02 | 133.54 | 11.090 | PBC<MDA | CE144 |
| 145.44 | 25. | 168.06 | 0.94 | 5.237E-02 | 145.44 | 48.200 | PBC<MDA | CE141 |
| 163.38 | 21. | 98.32 | 0.96 | 4.826E-02 | 163.38 | 5.080 | PBC<MDA | U235 |
| 165.85 | 21. | 102.18 | 0.96 | 4.881E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |
| 193.51 | 19. | 106.20 | 0.99 | 4.294E-02 | 193.51 | 4.400 | PBC<MDA | TH229 |
| 205.33 | 21. | 109.09 | 1.01 | 4.086E-02 | 205.33 | 5.010 | PBC<MDA | U235 |
| 210.85 | 11. | 223.25 | 1.01 | 3.997E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 238.67 | 461. | 7.02 | 1.21 | 3.601E-02 | 238.63 | 43.300 | 1.642E+01 | PB212 |
| 242.12 | 83. | 21.19 | 1.04 | 3.560E-02 | 242.00 | 7.430 | 1.753E+01 | PB214 |
| 244.69 | 23. | 179.84 | 1.05 | 3.526E-02 | 244.69 | 7.580 | PBC<MDA | EU152 |
| 265.83 | 16. | 95.40 | 1.07 | 3.288E-02 | 265.83 | 50.000 | PBC<MDA | BI210M |
| 277.18 | 56. | 21.13 | 1.86 | 3.172E-02 | 277.28 | 6.310 | 1.554E+01 | TL208 |
| 295.31 | 180. | 13.07 | 1.42 | 3.007E-02 | 295.09 | 19.300 | 1.717E+01 | PB214 |
| 299.77 | 14. | 197.17 | 1.10 | 2.966E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 1.066E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 4.231E+00 | PA233 |
| 328.76 | 38. | 39.96 | 1.13 | 2.744E-02 | 328.76 | 20.300 | PBC<MDA | La140 |
| 338.34 | 113. | 16.07 | 1.01 | 2.677E-02 | 338.32 | 12.010 | 1.953E+01 | AC228 |
| 340.57 | 7. | 329.77 | 1.15 | 2.662E-02 | 340.57 | 46.900 | PBC<MDA | Cs136 |
| 345.83 | 14. | 155.56 | 1.15 | 2.627E-02 | 345.83 | 15.070 | PBC<MDA | HF181 |
| 351.77 | 279. | 7.75 | 1.59 | 2.589E-02 | 351.93 | 37.600 | 1.591E+01 | PB214 |
| 364.48 | 12. | 116.67 | 1.17 | 2.511E-02 | 364.48 | 81.700 | PBC<MDA | I131 |
| 383.84 | 14. | 83.92 | 1.19 | 2.402E-02 | 383.84 | 8.940 | PBC<MDA | BA133 |
| 387.95 | 14. | 91.56 | 1.19 | 2.380E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 391.69 | 11. | 127.41 | 1.20 | 2.360E-02 | 391.69 | 64.000 | PBC<MDA | SN113 |
| 427.88 | 14. | 100.51 | 1.23 | 2.186E-02 | 427.88 | 29.600 | PBC<MDA | SB125 |
| 463.37 | 17. | 89.24 | 1.27 | 2.040E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 468.06 | 16. | 97.51 | 1.27 | 2.022E-02 | 468.06 | 51.750 | PBC<MDA | Ir192 |
| 487.02 | 16. | 117.72 | 1.29 | 1.954E-02 | 487.02 | 45.500 | PBC<MDA | La140 |
| 497.05 | 11. | 98.66 | 1.30 | 1.919E-02 | 497.05 | 90.900 | PBC<MDA | RU103 |
| 511.86 | 81. | 26.79 | 2.56 | 1.870E-02 | 511.86 | 20.000 | 1.203E+01 | RH106 |
| 537.26 | 27. | 37.29 | 1.34 | 1.793E-02 | 537.26 | 24.390 | 3.388E+00 | Ba140 |
| 569.47 | 5. | 256.90 | 1.37 | 1.704E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 1.989E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 1.669E-01 | BI207 |
| 569.70 | 12. | 100.81 | 1.37 | 1.703E-02 | 569.32 | 15.380 | 2.473E+00 | CS134 |
| | | | | | 569.47 | 8.200 | 4.640E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 3.894E-01 | BI207 |
| 583.31 | 167. | 9.66 | 1.38 | 1.669E-02 | 583.02 | 84.500 | 6.567E+00 | TL208 |
| 600.50 | 11. | 213.13 | 1.40 | 1.626E-02 | 600.50 | 17.860 | PBC<MDA | SB125 |
| 602.73 | 11. | 217.08 | 1.40 | 1.621E-02 | 602.73 | 98.260 | PBC<MDA | SB124 |
| 609.53 | 169. | 10.63 | 1.64 | 1.605E-02 | 609.31 | 46.090 | 1.269E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 1.019E+02 | RU103 |
| 621.92 | 9. | 108.99 | 1.42 | 1.576E-02 | 621.92 | 9.930 | PBC<MDA | RH106 |
| 636.97 | 11. | 89.69 | 1.43 | 1.543E-02 | 636.97 | 7.170 | PBC<MDA | I131 |
| 657.76 | 14. | 79.54 | 1.45 | 1.500E-02 | 657.76 | 94.640 | PBC<MDA | AG110M |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 661.66 | 13. | 90.84 | 1.46 | 1.492E-02 | 661.66 | 85.210 | PBC<MDA | CS137 |
| 724.20 | 12. | 110.28 | 1.51 | 1.378E-02 | 724.20 | 44.150 | PBC<MDA | ZR95 |
| 726.88 | 68. | 14.25 | 1.89 | 1.373E-02 | 727.17 | 7.550 | 3.664E+01 | BI212 |
| 747.16 | 6. | 150.07 | 1.53 | 1.340E-02 | 747.16 | 34.000 | PBC<MDA | pm146 |
| 756.73 | 5. | 224.40 | 1.54 | 1.325E-02 | 756.73 | 54.460 | PBC<MDA | ZR95 |
| 766.41 | 19. | 75.26 | 1.55 | 1.310E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 2.803E+02 | PA234M |
| 778.92 | 12. | 89.19 | 1.56 | 1.291E-02 | 778.92 | 12.940 | PBC<MDA | EU152 |
| 785.57 | 12. | 92.58 | 1.57 | 1.281E-02 | 785.42 | 1.280 | PBC<MDA | BI212 |
| 795.87 | 8. | 131.10 | 1.58 | 1.266E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 2. | 556.78 | 1.58 | 1.258E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 818.50 | 12. | 101.32 | 1.60 | 1.235E-02 | 818.50 | 100.000 | PBC<MDA | Cs136 |
| 834.85 | 11. | 100.83 | 1.61 | 1.213E-02 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 846.77 | 11. | 86.64 | 1.62 | 1.198E-02 | 846.77 | 99.935 | PBC<MDA | Co56 |
| 860.73 | 20. | 33.63 | 1.63 | 1.181E-02 | 860.56 | 12.420 | 7.458E+00 | TL208 |
| 873.23 | 15. | 77.76 | 1.64 | 1.166E-02 | 873.23 | 12.270 | PBC<MDA | EU154 |
| 880.53 | 9. | 107.83 | 1.65 | 1.157E-02 | 880.53 | 6.000 | PBC<MDA | PA234 |
| 898.04 | 5. | 176.07 | 1.66 | 1.137E-02 | 898.04 | 93.700 | PBC<MDA | y88 |
| 911.70 | 119. | 9.17 | 0.85 | 1.122E-02 | 911.07 | 29.000 | 2.032E+01 | AC228 |
| 964.11 | 10. | 158.11 | 1.72 | 1.066E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 968.99 | 64. | 17.61 | 0.38 | 1.062E-02 | 968.97 | 17.460 | 1.918E+01 | AC228 |
| 996.33 | 40. | 22.60 | 1.75 | 1.035E-02 | 996.33 | 10.600 | 2.008E+01 | EU154 |
| 1048.07 | 9. | 82.67 | 1.79 | 9.890E-03 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1063.66 | 5. | 229.68 | 1.80 | 9.759E-03 | 1063.66 | 74.500 | PBC<MDA | BI207 |
| 1119.87 | 73. | 16.07 | 2.33 | 9.311E-03 | 1120.29 | 15.100 | 2.871E+01 | BI214 |
| | | | | | 1120.55 | 99.987 | 4.337E+00 | Sc46 |
| 1221.41 | 13. | 83.15 | 1.92 | 8.608E-03 | 1221.41 | 27.000 | PBC<MDA | Ta182 |
| 1238.28 | 27. | 47.01 | 1.94 | 8.501E-03 | 1238.28 | 66.070 | 2.704E+00 | Co56 |
| 1291.60 | 10. | 87.40 | 1.98 | 8.180E-03 | 1291.60 | 43.200 | PBC<MDA | FE59 |
| 1384.30 | 9. | 33.33 | 2.04 | 7.678E-03 | 1384.30 | 24.290 | 2.681E+00 | AG110M |
| 1408.00 | 4. | 221.56 | 2.06 | 7.560E-03 | 1408.00 | 21.005 | PBC<MDA | EU152 |
| 1460.96 | 364. | 5.24 | 2.27 | 7.309E-03 | 1460.83 | 10.670 | 2.593E+02 | K40 |
| 1596.21 | 2. | 424.26 | 2.19 | 6.737E-03 | 1596.21 | 95.400 | PBC<MDA | La140 |
| 1764.78 | 41. | 15.62 | 2.29 | 6.141E-03 | 1764.49 | 15.400 | 2.408E+01 | BI214 |

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 298.77 | 74.65 | 262. | 168. | 3.534E+03 | 15.64 | 0.867 | - | sD |
| 307.69 | 76.88 | 312. | 294. | 6.031E+03 | 10.30 | 0.869 | - | sD |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| TH-227 | 199.39 | 49.96 | 58. | 28. | 0.016 | 46.38 | 1.148s |
| AM-241 | 237.70 | 59.54 | 240. | 19. | 0.011 | 146.90 | 0.850 |
| TH-234 | 252.71 | 63.29 | 425. | -51. | -0.029 | 47.58 | 0.854s |
| Sn-126 | 256.68 | 64.28 | 421. | 29. | 0.016 | 100.73 | 0.856 |
| BA-133 | 323.52 | 80.99 | 303. | -29. | -0.016 | 108.54 | 0.874 |
| Np-237 | 345.53 | 86.49 | 706. | 91. | 0.050 | 42.83 | 0.880s |
| EU-155 | 345.74 | 86.54 | 797. | 26. | 0.014 | 156.15 | 0.880s |
| Sn-126 | 347.33 | 86.94 | 823. | 26. | 0.014 | 158.56 | 0.880 |
| Sn-126 | 349.85 | 87.57 | 805. | 52. | 0.029 | 45.74 | 0.881D |
| Cd-109 | 351.73 | 88.04 | 831. | 14. | 0.008 | 285.92 | 0.881A |
| Nd-147 | 363.97 | 91.10 | 857. | 26. | 0.014 | 160.92 | 0.885s |
| TH-234 | 369.93 | 92.59 | 987. | -51. | -0.028 | 50.44 | 0.886s |
| AC-228 | 371.88 | 93.08 | 194. | 71. | 0.040 | 37.53 | 0.911s |
| Gd-153 | 389.57 | 97.50 | 531. | 23. | 0.013 | 144.57 | 0.892s |
| Np-239 | 397.57 | 99.50 | 489. | 22. | 0.012 | 143.96 | 0.894s |
| Gd-153 | 412.38 | 103.20 | 511. | 22. | 0.012 | 146.48 | 0.898s |
| Np-239 | 414.38 | 103.70 | 533. | 22. | 0.012 | 149.45 | 0.898 |
| Np-239 | 424.10 | 106.13 | 569. | -6. | -0.003 | 563.72 | 0.901 |
| EU-152 | 486.69 | 121.78 | 274. | -25. | -0.014 | 96.04 | 0.918s |
| EU-154 | 491.98 | 123.10 | 288. | -12. | -0.006 | 210.95 | 0.919 |
| PA-234 | 524.77 | 131.29 | 518. | -27. | -0.015 | 121.58 | 0.928s |
| HF-181 | 531.68 | 133.02 | 544. | -27. | -0.015 | 124.36 | 0.930 |
| CE-144 | 533.74 | 133.54 | 476. | 5. | 0.003 | 599.80 | 0.930 |
| HF-181 | 544.79 | 136.30 | 522. | -27. | -0.015 | 119.68 | 0.933s |
| CO-57 | 545.48 | 136.47 | 549. | -9. | -0.005 | 350.79 | 0.933 |
| Tc-99m | 561.63 | 140.51 | 410. | -25. | -0.014 | 115.10 | 0.938s |
| U-235 | 574.73 | 143.79 | 1034. | -28. | -0.015 | 165.95 | 0.941s |
| CE-141 | 581.35 | 145.44 | 898. | 25. | 0.014 | 168.06 | 0.943s |
| Ba-140 | 650.24 | 162.66 | 355. | -25. | -0.014 | 108.34 | 0.961s |
| U-235 | 653.11 | 163.38 | 201. | 21. | 0.012 | 98.32 | 0.962s |
| CE-139 | 663.01 | 165.85 | 219. | 21. | 0.012 | 102.18 | 0.965s |
| TH-229 | 773.64 | 193.51 | 106. | 19. | 0.010 | 106.20 | 0.994s |
| U-235 | 820.94 | 205.33 | 139. | 21. | 0.011 | 109.09 | 1.007s |
| TH-229 | 843.01 | 210.85 | 180. | 11. | 0.006 | 223.25 | 1.012s |
| Cf-251 | 907.62 | 227.00 | 161. | -24. | -0.013 | 102.18 | 1.029s |
| PB-212 | 954.15 | 238.63 | 130. | 463. | 0.257 | 5.80 | 1.041D |
| PB-214 | 967.61 | 242.00 | 115. | 83. | 0.046 | 21.19 | 1.045D |
| EU-152 | 978.39 | 244.69 | 868. | 23. | 0.013 | 179.84 | 1.048s |
| TH-227 | 1024.59 | 256.24 | 128. | -22. | -0.012 | 99.56 | 1.060s |
| Cd-113m | 1054.43 | 263.70 | 121. | -8. | -0.004 | 197.64 | 1.067s |
| BI-210M | 1062.96 | 265.83 | 106. | 16. | 0.009 | 95.40 | 1.070 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| TL-208 | 1108.38 | 277.18 | 28. | 56. | 0.031 | 21.13 | 1.862s |
| Hg-203 | 1116.44 | 279.20 | 168. | -8. | -0.004 | 231.84 | 1.083s |
| I-131 | 1136.83 | 284.30 | 95. | -17. | -0.010 | 108.09 | 1.089 |
| PB-214 | 1180.86 | 295.30 | 69. | 176. | 0.098 | 13.29 | 1.412s |
| PB-212 | 1199.76 | 300.03 | 374. | 14. | 0.008 | 197.17 | 1.105 |
| PA-231 | 1199.92 | 300.07 | 388. | 0. | 0.000 | 1000.00 | 1.105s |
| PA-233 | 1200.36 | 300.18 | 388. | 0. | 0.000 | 1000.00 | 1.105s |
| PA-231 | 1210.24 | 302.65 | 388. | 0. | 0.000 | 1000.00 | 1.107s |
| BA-133 | 1211.05 | 302.85 | 388. | 0. | 0.000 | 1000.00 | 1.108s |
| Ba-140 | 1219.04 | 304.85 | 388. | 0. | 0.000 | 1000.00 | 1.110s |
| BI-210M | 1219.23 | 304.90 | 388. | 0. | 0.000 | 1000.00 | 1.110s |
| Ir-192 | 1233.41 | 308.44 | 388. | 0. | 0.000 | 1000.00 | 1.113 |
| PA-233 | 1247.69 | 312.01 | 388. | 0. | 0.000 | 1000.00 | 1.117s |
| Ir-192 | 1265.61 | 316.49 | 388. | 0. | 0.000 | 1000.00 | 1.122s |
| CR-51 | 1279.99 | 320.08 | 388. | 0. | 0.000 | 1000.00 | 1.125s |
| La-140 | 1314.69 | 328.76 | 95. | 38. | 0.021 | 39.96 | 1.134s |
| Cf-249 | 1333.41 | 333.44 | 209. | -20. | -0.011 | 105.63 | 1.139s |
| AC-228 | 1353.00 | 338.34 | 50. | 113. | 0.063 | 16.07 | 1.012 |
| Cs-136 | 1361.93 | 340.57 | 238. | 7. | 0.004 | 329.77 | 1.146s |
| EU-152 | 1376.80 | 344.29 | 245. | 0. | 0.000 | 1000.00 | 1.150s |
| HF-181 | 1382.97 | 345.83 | 226. | 14. | 0.008 | 155.56 | 1.151s |
| PB-214 | 1406.75 | 351.77 | 40. | 279. | 0.155 | 7.75 | 1.587s |
| BA-133 | 1423.66 | 356.00 | 417. | -17. | -0.010 | 170.21 | 1.162s |
| I-131 | 1457.59 | 364.48 | 48. | 12. | 0.007 | 116.67 | 1.170s |
| BA-133 | 1535.03 | 383.84 | 65. | 14. | 0.008 | 83.92 | 1.189s |
| Cf-249 | 1551.47 | 387.95 | 80. | 14. | 0.008 | 91.56 | 1.193 |
| SN-113 | 1566.43 | 391.69 | 93. | 11. | 0.006 | 127.41 | 1.197s |
| SB-125 | 1711.18 | 427.88 | 48. | 14. | 0.008 | 100.51 | 1.233s |
| AG-108M | 1735.43 | 433.94 | 64. | -16. | -0.009 | 101.04 | 1.239s |
| pm-146 | 1815.20 | 453.88 | 64. | -3. | -0.002 | 525.29 | 1.258s |
| SB-125 | 1853.15 | 463.37 | 108. | 17. | 0.009 | 89.24 | 1.268s |
| Ir-192 | 1871.93 | 468.06 | 110. | 16. | 0.009 | 97.51 | 1.272s |
| BE-7 | 1910.07 | 477.60 | 155. | -17. | -0.010 | 104.82 | 1.282s |
| HF-181 | 1927.68 | 482.00 | 187. | -18. | -0.010 | 107.53 | 1.286s |
| La-140 | 1947.77 | 487.02 | 160. | 16. | 0.009 | 117.72 | 1.291 |
| RU-103 | 1987.91 | 497.05 | 26. | 11. | 0.006 | 98.66 | 1.301s |
| RH-106 | 2047.15 | 511.86 | 60. | 81. | 0.045 | 26.79 | 2.565s |
| Nd-147 | 2123.70 | 531.00 | 43. | -4. | -0.002 | 313.79 | 1.333 |
| Ba-140 | 2148.74 | 537.26 | 17. | 27. | 0.015 | 37.29 | 1.339s |
| CS-134 | 2276.99 | 569.32 | 65. | -17. | -0.009 | 71.32 | 1.369s |
| PA-234 | 2277.59 | 569.47 | 80. | 5. | 0.003 | 256.90 | 1.370 |
| BI-207 | 2278.51 | 569.70 | 63. | 12. | 0.006 | 100.81 | 1.370s |
| TL-208 | 2332.96 | 583.31 | 17. | 167. | 0.093 | 9.66 | 1.379s |
| SB-125 | 2401.71 | 600.50 | 263. | 11. | 0.006 | 213.13 | 1.399s |
| SB-124 | 2410.64 | 602.73 | 274. | 11. | 0.006 | 217.08 | 1.401s |
| CS-134 | 2418.55 | 604.71 | 339. | -10. | -0.005 | 268.45 | 1.403s |
| BI-214 | 2437.83 | 609.53 | 33. | 169. | 0.094 | 10.63 | 1.641s |
| RU-103 | 2440.91 | 610.30 | 329. | 0. | 0.000 | 1000.00 | 1.408s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AG-108M | 2456.84 | 614.28 | 329. | 0. | 0.000 | 1000.00 | 1.412s |
| RH-106 | 2487.38 | 621.92 | 19. | 9. | 0.005 | 108.99 | 1.419s |
| SB-125 | 2543.28 | 635.89 | 52. | -5. | -0.003 | 222.69 | 1.432s |
| I-131 | 2547.62 | 636.97 | 46. | 11. | 0.006 | 89.69 | 1.433s |
| AG-110M | 2630.77 | 657.76 | 57. | 14. | 0.008 | 79.54 | 1.452s |
| CS-137 | 2646.36 | 661.66 | 62. | 13. | 0.007 | 90.84 | 1.455s |
| PM-144 | 2785.90 | 696.54 | 65. | -19. | -0.011 | 91.50 | 1.487s |
| NB-94 | 2810.25 | 702.63 | 37. | -4. | -0.002 | 302.94 | 1.493s |
| SB-124 | 2890.87 | 722.79 | 121. | -14. | -0.008 | 115.02 | 1.511s |
| AG-108M | 2891.48 | 722.94 | 107. | -13. | -0.007 | 116.43 | 1.511s |
| EU-154 | 2893.15 | 723.36 | 94. | 0. | 0.000 | 1000.00 | 1.511s |
| ZR-95 | 2896.52 | 724.20 | 78. | 12. | 0.007 | 110.28 | 1.512s |
| BI-212 | 2907.25 | 726.88 | 5. | 68. | 0.038 | 14.25 | 1.892s |
| pm-146 | 2942.61 | 735.72 | 37. | -4. | -0.002 | 302.94 | 1.523 |
| pm-146 | 2988.37 | 747.16 | 19. | 6. | 0.004 | 150.07 | 1.533s |
| ZR-95 | 3026.65 | 756.73 | 23. | 5. | 0.003 | 224.40 | 1.541s |
| AG-110M | 3055.51 | 763.94 | 85. | -6. | -0.003 | 221.11 | 1.548s |
| NB-95 | 3062.89 | 765.79 | 108. | -11. | -0.006 | 136.97 | 1.549s |
| PA-234M | 3065.38 | 766.41 | 97. | 19. | 0.011 | 75.26 | 1.550s |
| EU-152 | 3115.41 | 778.92 | 23. | 12. | 0.007 | 89.19 | 1.561s |
| BI-212 | 3141.41 | 785.42 | 23. | 12. | 0.006 | 92.58 | 1.567s |
| CS-134 | 3183.20 | 795.87 | 51. | 8. | 0.004 | 131.10 | 1.576s |
| CS-134 | 3207.54 | 801.95 | 61. | 2. | 0.001 | 556.78 | 1.581s |
| CO-58 | 3242.84 | 810.78 | 58. | -7. | -0.004 | 158.44 | 1.589s |
| La-140 | 3262.82 | 815.77 | 80. | -17. | -0.009 | 80.20 | 1.593s |
| Cs-136 | 3273.74 | 818.50 | 73. | 12. | 0.007 | 101.32 | 1.596s |
| MN-54 | 3339.13 | 834.85 | 23. | 11. | 0.006 | 100.83 | 1.610s |
| Co-56 | 3386.82 | 846.77 | 19. | 11. | 0.006 | 86.64 | 1.620s |
| TL-208 | 3442.00 | 860.56 | 5. | 20. | 0.011 | 33.63 | 1.632s |
| NB-94 | 3484.13 | 871.10 | 50. | -16. | -0.009 | 67.31 | 1.641s |
| EU-154 | 3492.66 | 873.23 | 62. | 15. | 0.008 | 77.76 | 1.643s |
| PA-234 | 3521.86 | 880.53 | 39. | 9. | 0.005 | 107.83 | 1.649 |
| PA-234 | 3532.70 | 883.24 | 48. | 0. | 0.000 | 1000.00 | 1.652 |
| AG-110M | 3538.47 | 884.68 | 48. | 0. | 0.000 | 1000.00 | 1.653s |
| Sc-46 | 3556.86 | 889.28 | 63. | -9. | -0.005 | 131.29 | 1.657 |
| y-88 | 3591.90 | 898.04 | 15. | 5. | 0.003 | 176.07 | 1.664s |
| AC-228 | 3646.53 | 911.70 | 0. | 119. | 0.066 | 9.17 | 0.850s |
| AG-110M | 3749.71 | 937.49 | 55. | -20. | -0.011 | 86.32 | 1.697s |
| PA-234 | 3783.82 | 946.02 | 40. | -12. | -0.007 | 119.41 | 1.704s |
| EU-152 | 3856.18 | 964.11 | 120. | 10. | 0.006 | 158.11 | 1.719s |
| AC-228 | 3875.71 | 968.99 | 14. | 64. | 0.036 | 17.61 | 0.376s |
| EU-154 | 3985.06 | 996.33 | 20. | 40. | 0.022 | 22.60 | 1.746s |
| PA-234M | 4003.73 | 1001.00 | 60. | 0. | 0.000 | 1000.00 | 1.750s |
| EU-154 | 4018.84 | 1004.77 | 72. | -11. | -0.006 | 117.52 | 1.753s |
| Co-56 | 4151.10 | 1037.84 | 45. | -12. | -0.007 | 126.24 | 1.780s |
| Cs-136 | 4192.02 | 1048.07 | 21. | 9. | 0.005 | 82.67 | 1.788 |
| RH-106 | 4201.18 | 1050.36 | 50. | -7. | -0.004 | 154.43 | 1.790s |
| BI-207 | 4254.38 | 1063.66 | 21. | 5. | 0.003 | 229.68 | 1.801s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Ga-68 | 4309.34 | 1077.40 | 37. | -11. | -0.006 | 126.09 | 1.812s |
| FE-59 | 4396.74 | 1099.25 | 32. | -10. | -0.006 | 132.41 | 1.829s |
| EU-152 | 4448.04 | 1112.07 | 139. | -16. | -0.009 | 109.31 | 1.839s |
| ZN-65 | 4461.92 | 1115.55 | 123. | -15. | -0.008 | 107.66 | 1.842s |
| BI-214 | 4479.22 | 1119.87 | 10. | 73. | 0.040 | 16.07 | 2.329s |
| Sc-46 | 4481.94 | 1120.55 | 108. | 0. | 0.000 | 1000.00 | 1.846s |
| Ta-182 | 4484.94 | 1121.30 | 122. | -10. | -0.006 | 152.23 | 1.846 |
| CO-60 | 4692.68 | 1173.24 | 43. | -13. | -0.007 | 120.54 | 1.886s |
| Ta-182 | 4755.93 | 1189.05 | 37. | -6. | -0.004 | 222.86 | 1.899 |
| Ta-182 | 4885.37 | 1221.41 | 21. | 13. | 0.007 | 83.15 | 1.923 |
| Co-56 | 4952.84 | 1238.28 | 27. | 27. | 0.015 | 47.01 | 1.936s |
| NA-22 | 5097.84 | 1274.53 | 40. | -18. | -0.010 | 54.66 | 1.963s |
| EU-154 | 5097.89 | 1274.54 | 58. | -4. | -0.002 | 301.98 | 1.963s |
| FE-59 | 5166.10 | 1291.60 | 11. | 10. | 0.005 | 87.40 | 1.975s |
| AG-110M | 5536.89 | 1384.30 | 0. | 9. | 0.005 | 33.33 | 2.042s |
| EU-152 | 5631.70 | 1408.00 | 11. | 4. | 0.002 | 221.56 | 2.059s |
| K-40 | 5843.53 | 1460.96 | 0. | 364. | 0.202 | 5.24 | 2.267s |
| La-140 | 6384.49 | 1596.21 | 12. | 2. | 0.001 | 424.26 | 2.185s |
| SB-124 | 6763.55 | 1690.98 | 12. | -5. | -0.003 | 173.21 | 2.245s |
| BI-214 | 7057.56 | 1764.49 | 0. | 41. | 0.023 | 15.62 | 2.290s |
| Co-56 | 7084.99 | 1771.35 | 41. | 0. | 0.000 | 1000.00 | 2.294s |
| y-88 | 7343.81 | 1836.06 | 0. | 0. | 0.000 | 1000.00 | 2.332s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | -4.5864E+00 | | | | 5.31E+01 | |
| | | | 477.60 | -4.586E+00 | ?( | 1.614E+01 1.05E+02 1.05E+01 | G |
| NA-22 | C | -1.2120E+00 | | | | 9.50E+02 | |
| | | | 1274.53 | -1.212E+00 | ?( | 2.152E+00 5.47E+01 9.99E+01 | G |
| K-40 | N | 2.5931E+02 | | | | 4.66E+11 | |
| | | | 1460.83 | 2.593E+02 | @( | 5.250E+00 5.24E+00 1.07E+01 | G |
| Sc-46 | F | -4.2802E-01 | | | | 8.38E+01 | |
| | | | 889.28 | -4.280E-01 | ?( | 1.921E+00 1.31E+02 1.00E+02 | G |
| | | | 1120.55 | 0.000E+00 | + | 3.052E+00 1.00E+03 1.00E+02 | G |
| MN-54 | C | 4.8844E-01 | | | | 3.12E+02 | |
| | | | 834.85 | 4.884E-01 | ?( | 1.155E+00 1.01E+02 1.00E+02 | G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| FE-59 | F | 7.3247E-02 | | | | | 4.45E+01 | |
| | | | 1099.25 | -1.038E+00 | ?( | 3.018E+00 | 1.32E+02 | 5.65E+01 G |
| | | | 1291.60 | 1.527E+00 | ?( | 2.892E+00 | 8.74E+01 | 4.32E+01 G |
| Co-56 | C | 1.3907E+00 | | | | | 7.73E+01 | |
| | | | 846.77 | 5.227E-01 | ?( | 1.060E+00 | 8.66E+01 | 9.99E+01 G |
| | | | 1238.28 | 2.704E+00 | &( | 2.648E+00 | 4.70E+01 | 6.61E+01 G |
| | | | 1037.84 | -4.728E+00 | + | 1.339E+01 | 1.26E+02 | 1.41E+01 G |
| | | | 1771.35 | 0.000E+00 | - | 1.909E+01 | 1.00E+03 | 1.55E+01 A |
| CO-57 | C | -1.2458E-02 | | | | | 2.72E+02 | |
| | | | 122.06 | -1.246E-02 | %( | 9.161E-01 | 2.16E+03 | 8.56E+01 G |
| | | | 136.47 | -9.124E-01 | + | 1.076E+01 | 3.51E+02 | 1.07E+01 G |
| CO-58 | C | -3.1390E-01 | | | | | 7.09E+01 | |
| | | | 810.78 | -3.139E-01 | ?( | 1.713E+00 | 1.58E+02 | 9.95E+01 G |
| CO-60 | F | 4.6592E-02 | | | | | 1.93E+03 | |
| | | | 1332.50 | 4.659E-02 | %( | 1.286E+00 | 1.19E+03 | 1.00E+02 G |
| | | | 1173.24 | -7.889E-01 | + | 2.065E+00 | 1.21E+02 | 9.99E+01 G |
| ZN-65 | F | -1.7628E+00 | | | | | 2.44E+02 | |
| | | | 1115.55 | -1.763E+00 | ?( | 6.389E+00 | 1.08E+02 | 5.06E+01 G |
| NB-94 | I | -1.7378E-01 | | | | | 7.41E+06 | |
| | | | 702.63 | -1.738E-01 | ?( | 1.251E+00 | 3.03E+02 | 9.79E+01 G |
| | | | 871.10 | -7.618E-01 | + | 1.698E+00 | 6.73E+01 | 9.99E+01 G |
| ZR-95 | I | 6.7931E-01 | | | | | 6.40E+01 | |
| | | | 756.73 | 3.594E-01 | &( | 1.942E+00 | 2.24E+02 | 5.45E+01 G |
| | | | 724.20 | 1.074E+00 | ?( | 4.011E+00 | 1.10E+02 | 4.42E+01 G |
| NB-95 | I | -4.6722E-01 | | | | | 6.40E+01 | |
| | | | 765.79 | -4.672E-01 | &( | 2.172E+00 | 1.37E+02 | 9.98E+01 G |
| RU-103 | I | 3.5272E-01 | | | | | 3.93E+01 | |
| | | | 497.05 | 3.527E-01 | ?( | 8.430E-01 | 9.87E+01 | 9.09E+01 G |
| | | | 610.30 | 0.000E+00 | - | 5.259E+01 | 1.00E+03 | 5.75E+00 GA |
| RH-106 | I | 3.0759E+00 | | | | | 3.74E+02 | |
| | | | 621.92 | 3.076E+00 | ?( | 8.234E+00 | 1.09E+02 | 9.93E+00 G |
| | | | 1050.36 | -2.405E+01 | + | 1.283E+02 | 1.54E+02 | 1.56E+00 G |
| | | | 511.86 | 1.203E+01 | ? | 5.763E+00 | 2.68E+01 | 2.00E+01 GA |
| AG-108M | C | -4.5485E-01 | | | | | 1.53E+05 | |
| | | | 433.94 | -4.549E-01 | ?( | 1.137E+00 | 1.01E+02 | 9.05E+01 G |
| | | | 722.94 | -5.734E-01 | + | 2.256E+00 | 1.16E+02 | 9.08E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 614.28 | 0.000E+00 | & | 3.385E+00 | 1.00E+03 | 8.98E+01 G |
| AG-110M | F | 6.1578E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | 0.000E+00 | ?( | 2.322E+00 | 1.00E+03 | 7.27E+01 G |
| | | | 657.76 | 5.587E-01 | &( | 1.487E+00 | 7.95E+01 | 9.46E+01 G |
| | | | 937.49 | -2.894E+00 | + | 5.510E+00 | 8.63E+01 | 3.44E+01 G |
| | | | 1384.30 | 2.681E+00 | ?( | 2.195E+00 | 3.33E+01 | 2.43E+01 G |
| | | | 763.94 | -1.139E+00 | + | 8.670E+00 | 2.21E+02 | 2.23E+01 G |
| SN-113 | F | 4.0501E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | 4.050E-01 | ?( | 1.752E+00 | 1.27E+02 | 6.40E+01 G |
| SB-124 | F | 3.7999E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | 3.800E-01 | ?( | 2.786E+00 | 2.17E+02 | 9.83E+01 G |
| | | | 1690.98 | -9.100E-01 | + | 3.431E+00 | 1.73E+02 | 4.78E+01 G |
| | | | 722.79 | -5.176E+00 | + | 2.009E+01 | 1.15E+02 | 1.08E+01 G |
| SB-125 | I | 2.0580E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | 1.202E+00 | @( | 3.004E+00 | 1.01E+02 | 2.96E+01 G |
| | | | 600.50 | 2.081E+00 | ?( | 1.498E+01 | 2.13E+02 | 1.79E+01 G |
| | | | 635.89 | -1.483E+00 | - | 1.151E+01 | 2.23E+02 | 1.13E+01 G |
| | | | 463.37 | 4.440E+00 | ( | 1.327E+01 | 8.92E+01 | 1.05E+01 G |
| I-131 | I | 7.5779E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | 3.250E-01 | ?( | 9.477E-01 | 1.17E+02 | 8.17E+01 G |
| | | | 284.30 | -5.050E+00 | + | 1.405E+01 | 1.08E+02 | 6.14E+00 G |
| | | | 636.97 | 5.690E+00 | ?( | 1.723E+01 | 8.97E+01 | 7.17E+00 G |
| Gd-153 | F | 8.6132E-01 | | | | | 2.42E+02 | |
| | | | 97.50 | 7.602E-01 | ?( | 3.674E+00 | 1.45E+02 | 3.00E+01 G |
| | | | 103.20 | 1.000E+00 | &( | 4.900E+00 | 1.46E+02 | 2.18E+01 G |
| Ga-68 | C | -2.3110E+01 | | | | | 4.71E-02 | |
| | | | 1077.40 | -2.311E+01 | ?( | 6.359E+01 | 1.26E+02 | 3.30E+00 G |
| Tc-99m | I | -3.0344E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | -3.034E-01 | ?( | 1.166E+00 | 1.15E+02 | 8.93E+01 G |
| BA-133 | F | -5.9864E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -5.986E-01 | ( | 3.418E+00 | 1.70E+02 | 6.20E+01 G |
| | | | 302.85 | 0.000E+00 | + | 9.733E+00 | 1.00E+03 | 1.83E+01 G |
| | | | 383.84 | 3.713E+00 | ? | 1.045E+01 | 8.39E+01 | 8.94E+00 GA |
| | | | 80.99 | -9.326E-01 | + | 2.699E+00 | 1.09E+02 | 3.41E+01 GA |
| CS-134 | I | 5.3953E-02 | | | | | 7.54E+02 | |
| | | | 604.71 | -3.440E-01 | ?( | 3.116E+00 | 2.68E+02 | 9.76E+01 G |
| | | | 795.87 | 4.103E-01 | ?( | 1.846E+00 | 1.31E+02 | 8.55E+01 G |
| | | | 569.32 | -3.604E+00 | + | 8.539E+00 | 7.13E+01 | 1.54E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 801.95 | 1.016E+00 | ?( | 1.988E+01 | 5.57E+02 | 8.69E+00 G |
| | | | 563.24 | -2.579E-01 | % | 1.349E+01 | 2.12E+03 | 8.35E+00 G |
| CS-137 | I | 5.6311E-01 | | | | | 1.10E+04 | |
| | | | 661.66 | 5.631E-01 | ?( | 1.723E+00 | 9.08E+01 | 8.52E+01 G |
| CE-139 | F | 2.9843E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | 2.984E-01 | ?( | 1.020E+00 | 1.02E+02 | 7.99E+01 G |
| Ba-140 | I | 3.3881E+00 | | | | | 1.28E+01 | |
| | | | 537.26 | 3.388E+00 | ?( | 2.809E+00 | 3.73E+01 | 2.44E+01 G |
| | | | 162.66 | -4.613E+00 | - | 1.668E+01 | 1.08E+02 | 6.22E+00 G |
| | | | 304.85 | 0.000E+00 | & | 4.182E+01 | 1.00E+03 | 4.29E+00 G |
| La-140 | I | 8.5175E-01 | | | | | 1.28E+01 | |
| | | | 1596.21 | 1.729E-01 | ?( | 1.630E+00 | 4.24E+02 | 9.54E+01 G |
| | | | 487.02 | 9.717E-01 | &( | 3.850E+00 | 1.18E+02 | 4.55E+01 G |
| | | | 328.76 | 3.773E+00 | ?( | 4.809E+00 | 4.00E+01 | 2.03E+01 G |
| | | | 815.77 | -3.201E+00 | + | 8.576E+00 | 8.02E+01 | 2.33E+01 G |
| CE-141 | I | 5.5893E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | 5.589E-01 | ( | 3.133E+00 | 1.68E+02 | 4.82E+01 G |
| CE-144 | I | 4.7344E-01 | | | | | 2.85E+02 | |
| | | | 133.54 | 4.734E-01 | ?( | 9.581E+00 | 6.00E+02 | 1.11E+01 G |
| PM-144 | C | -7.6136E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | -7.614E-01 | ?( | 1.589E+00 | 9.15E+01 | 9.90E+01 G |
| | | | 618.06 | 7.074E-02 | % | 3.030E+00 | 1.26E+03 | 9.91E+01 G |
| EU-152 | F | 2.2889E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | 0.000E+00 | ?( | 6.014E+00 | 1.00E+03 | 2.65E+01 G |
| | | | 1112.07 | -6.803E+00 | + | 2.501E+01 | 1.09E+02 | 1.36E+01 G |
| | | | 121.78 | -8.639E-01 | + | 2.768E+00 | 9.60E+01 | 2.86E+01 G |
| | | | 778.92 | 4.035E+00 | ?( | 8.387E+00 | 8.92E+01 | 1.29E+01 G |
| | | | 964.11 | 3.567E+00 | ?( | 1.918E+01 | 1.58E+02 | 1.46E+01 G |
| | | | 244.69 | 4.847E+00 | ?( | 2.910E+01 | 1.80E+02 | 7.58E+00 G |
| | | | 1408.00 | 1.283E+00 | ? | 6.437E+00 | 2.22E+02 | 2.10E+01 GA |
| EU-154 | I | 1.2457E+01 | | | | | 3.14E+03 | |
| | | | 873.23 | 5.870E+00 | ?( | 1.525E+01 | 7.78E+01 | 1.23E+01 G |
| | | | 123.10 | -2.799E-01 | & | 1.992E+00 | 2.11E+02 | 4.08E+01 G |
| | | | 1274.54 | -6.889E-01 | - | 7.267E+00 | 3.02E+02 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | - | 9.542E+00 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | -3.169E+00 | - | 1.266E+01 | 1.18E+02 | 1.80E+01 G |
| | | | 996.33 | 2.008E+01 | ?( | 1.201E+01 | 2.26E+01 | 1.06E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| EU-155 | I | 5.8115E-01 | | | | | 1.81E+03 | |
| | | | 105.31 | 1.437E-01 | &( | 5.117E+00 | 1.06E+03 | 2.12E+01 G |
| | | | 86.54 | 8.832E-01 | &( | 4.601E+00 | 1.56E+02 | 3.07E+01 G |
| HF-181 | F | -2.3682E-01 | | | | | 4.24E+01 | |
| | | | 482.00 | -6.454E-01 | &( | 2.327E+00 | 1.08E+02 | 8.05E+01 G |
| | | | 133.02 | -6.303E-01 | + | 2.615E+00 | 1.24E+02 | 4.33E+01 G |
| | | | 345.83 | 1.946E+00 | ?( | 1.020E+01 | 1.56E+02 | 1.51E+01 G |
| | | | 136.30 | -4.798E+00 | & | 1.915E+01 | 1.20E+02 | 5.85E+00 G |
| Ta-182 | F | 3.8118E-01 | | | | | 1.14E+02 | |
| | | | 1121.30 | -1.797E+00 | ( | 9.289E+00 | 1.52E+02 | 3.49E+01 G |
| | | | 1221.41 | 3.196E+00 | ( | 5.793E+00 | 8.31E+01 | 2.70E+01 G |
| | | | 1189.05 | -2.462E+00 | + | 1.212E+01 | 2.23E+02 | 1.62E+01 G |
| Hg-203 | F | -1.7300E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | -1.730E-01 | &( | 1.365E+00 | 2.32E+02 | 8.15E+01 G |
| TL-208 | N | 6.6810E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 6.567E+00 | *( | 8.712E-01 | 9.66E+00 | 8.45E+01 G |
| | | | 277.28 | 1.554E+01 | + | 7.596E+00 | 2.11E+01 | 6.31E+00 G |
| | | | 860.56 | 7.458E+00 | ?( | 4.973E+00 | 3.36E+01 | 1.24E+01 G |
| pm-146 | C | 7.7240E-01 | | | | | 2.02E+03 | |
| | | | 747.16 | 7.724E-01 | &( | 2.786E+00 | 1.50E+02 | 3.40E+01 G |
| | | | 735.72 | -7.877E-01 | & | 5.668E+00 | 3.03E+02 | 2.25E+01 G |
| | | | 453.88 | -1.234E-01 | & | 1.645E+00 | 5.25E+02 | 6.50E+01 G |
| y-88 | F | 2.6081E-01 | | | | | 1.07E+02 | |
| | | | 898.04 | 2.608E-01 | &( | 1.083E+00 | 1.76E+02 | 9.37E+01 G |
| | | | 1836.06 | 0.000E+00 | - | 6.973E-01 | 1.00E+03 | 9.92E+01 G |
| Cd-113m | | -2.2377E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | -2.238E+03 | &( | 1.510E+04 | 1.98E+02 | 6.00E-03 K |
| Cd-109 | F | 3.9388E+00 | | | | | 4.53E+02 | |
| | | | | | | | Derived Ave Activity | |
| | | | 88.04 | 3.939E+00 | }( | 3.770E+01 | 2.86E+02 | 3.79E+00 G |
| Cf-251 | T | 7.0530E-02 | | | | | 3.28E+05 | |
| | | | 176.60 | 7.053E-02 | &( | 4.121E+00 | 2.24E+03 | 1.70E+01 G |
| | | | 227.00 | -5.572E+00 | + | 1.453E+01 | 1.02E+02 | 6.30E+00 GA |
| Cf-249 | T | 5.0927E-01 | | | | | 1.28E+05 | |
| | | | 387.95 | 5.093E-01 | &( | 1.567E+00 | 9.16E+01 | 6.60E+01 G |
| | | | 333.44 | -2.616E+00 | & | 9.253E+00 | 1.06E+02 | 1.55E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Sn-126 | | 4.1124E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | 1.438E+00 | } | 3.762E+00 | 4.57E+01 | 3.75E+01 GA |
| | | | 64.28 | 4.112E+00 | ( | 1.380E+01 | 1.01E+02 | 9.70E+00 G |
| | | | 86.94 | 2.993E+00 | | 1.583E+01 | 1.59E+02 | 9.04E+00 GA |
| PB-210 | N | 7.8590E-01 | | | | | 8.14E+03 | |
| | | | 46.54 | 7.859E-01 | %(P | 4.201E+01 | 1.57E+03 | 4.25E+00 G |
| PB-212 | N | 1.6502E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 1.650E+01 | ( | 1.987E+00 | 5.80E+00 | 4.33E+01 G |
| | | | 300.03 | 7.994E+00 | - | 5.300E+01 | 1.97E+02 | 3.28E+00 GA |
| PB-214 | N | 1.6214E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.591E+01 | *( | 1.844E+00 | 7.75E+00 | 3.76E+01 G |
| | | | 295.09 | 1.681E+01 | @( | 3.972E+00 | 1.33E+01 | 1.93E+01 G |
| | | | 242.00 | 1.753E+01 | | 1.105E+01 | 2.12E+01 | 7.43E+00 GA |
| BI-207 | C | 3.7522E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | 3.894E-01 | ?( | 1.328E+00 | 1.01E+02 | 9.77E+01 G |
| | | | 1063.66 | 3.566E-01 | ?( | 1.852E+00 | 2.30E+02 | 7.45E+01 G |
| BI-212 | N | 3.6635E+01 | | | | | 6.98E+02 | |
| | | | 727.17 | 3.664E+01 | *( | 6.850E+00 | 1.42E+01 | 7.55E+00 G |
| | | | 785.42 | 3.951E+01 | ? | 8.542E+01 | 9.26E+01 | 1.28E+00 GA |
| BI-214 | N | 1.2691E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.269E+01 | *( | 2.214E+00 | 1.06E+01 | 4.61E+01 G |
| | | | 1120.29 | 2.871E+01 | + | 6.990E+00 | 1.61E+01 | 1.51E+01 G |
| | | | 1764.49 | 2.408E+01 | + | 4.329E+00 | 1.56E+01 | 1.54E+01 G |
| BI-210M | T | 5.3509E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | 5.351E-01 | &( | 1.714E+00 | 9.54E+01 | 5.00E+01 G |
| | | | 304.90 | 0.000E+00 | - | 6.408E+00 | 1.00E+03 | 2.80E+01 G |
| AC-228 | N | 1.9816E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.032E+01 | ( | 1.258E+00 | 9.17E+00 | 2.90E+01 G |
| | | | 968.97 | 1.918E+01 | ( | 6.038E+00 | 1.76E+01 | 1.75E+01 G |
| | | | 338.32 | 1.953E+01 | ( | 6.162E+00 | 1.61E+01 | 1.20E+01 G |
| | | | 93.35 | 1.303E+01 | - | 1.234E+01 | 3.75E+01 | 5.56E+00 XA |
| TH-227 | N | 6.9670E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | 6.967E+00 | ( | 9.375E+00 | 4.64E+01 | 8.00E+00 G |
| | | | 256.24 | -5.101E+00 | - | 1.299E+01 | 9.96E+01 | 7.00E+00 G |
| TH-229 | N | 5.3907E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | 5.474E+00 | ?( | 1.493E+01 | 1.06E+02 | 4.40E+00 G |
| | | | 210.85 | 5.269E+00 | ?( | 3.030E+01 | 2.23E+02 | 2.99E+00 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| TH-234 | N -1.8731E+01 | | | | | 1.63E+12 | |
| | | 63.29 | -1.873E+01 | (P | 3.598E+01 | 4.76E+01 | 3.81E+00 G |
| | | 92.59 | -9.244E+00 | + P | 2.722E+01 | 5.04E+01 | 5.58E+00 G |
| PA-234 | N -4.1219E-01 | | | | | 1.63E+12 | |
| | | 131.29 | -1.506E+00 | ?( | 6.108E+00 | 1.22E+02 | 1.80E+01 G |
| | | 946.02 | -4.587E+00 | + | 1.230E+01 | 1.19E+02 | 1.34E+01 G |
| | | 569.47 | 1.989E+00 | ( | 1.765E+01 | 2.57E+02 | 8.20E+00 G |
| | | 883.24 | 0.000E+00 | + | 1.755E+01 | 1.00E+03 | 9.60E+00 G |
| | | 880.53 | 6.936E+00 | | 2.556E+01 | 1.08E+02 | 6.00E+00 GA |
| PA-234M | N 7.2857E+01 | | | | | 1.63E+12 | |
| | | 1001.00 | 0.000E+00 | ?( | 2.499E+02 | 1.00E+03 | 8.37E-01 G |
| | | 766.41 | 2.803E+02 | &( | 7.018E+02 | 7.53E+01 | 2.94E-01 G |
| U-235 | N 1.0964E+00 | | | | | 2.57E+11 | |
| | | 143.79 | -2.652E+00 | ?( | 1.467E+01 | 1.66E+02 | 1.10E+01 G |
| | | 205.33 | 5.608E+00 | ?( | 1.566E+01 | 1.09E+02 | 5.01E+00 G |
| | | 163.38 | 4.734E+00 | ( | 1.557E+01 | 9.83E+01 | 5.08E+00 G |
| AM-241 | T 7.9439E-01 | | | | | 1.58E+05 | |
| | | 59.54 | 7.944E-01 | ?( | 3.132E+00 | 1.47E+02 | 3.59E+01 G |
| Np-237 | F 7.2732E+00 | | | | | 2.14E+06 | |
| | | 86.49 | 7.273E+00 | &( | 1.017E+01 | 4.28E+01 | 1.31E+01 G |
| Ir-192 | F 3.1199E-01 | | | | | 7.40E+01 | |
| | | 316.49 | 0.000E+00 | ?( | 2.128E+00 | 1.00E+03 | 8.70E+01 G |
| | | 468.06 | 8.367E-01 | ?( | 2.741E+00 | 9.75E+01 | 5.18E+01 G |
| | | 308.44 | 0.000E+00 | & | 5.707E+00 | 1.00E+03 | 3.18E+01 G |
| Cs-136 | F 5.2180E-01 | | | | | 1.30E+01 | |
| | | 818.50 | 5.580E-01 | ?( | 1.910E+00 | 1.01E+02 | 1.00E+02 G |
| | | 1048.07 | 6.086E-01 | ?( | 1.702E+00 | 8.27E+01 | 8.00E+01 G |
| | | 340.57 | 2.967E-01 | ?( | 3.322E+00 | 3.30E+02 | 4.69E+01 G |
| Np-239 | T -2.6025E-01 | | | | | 2.36E+00 | |
| | | 103.70 | 9.086E-01 | ? | 4.541E+00 | 1.49E+02 | 2.40E+01 X |
| | | 106.13 | -2.603E-01 | &( | 4.939E+00 | 5.64E+02 | 2.27E+01 G |
| | | 99.50 | 1.459E+00 | & | 7.024E+00 | 1.44E+02 | 1.50E+01 X |
| Nd-147 | 3.2199E-01 | | | | | 1.11E+01 | |
| | | 531.00 | -1.022E+00 | ?( | 7.877E+00 | 3.14E+02 | 1.30E+01 G |
| | | 91.10 | 9.395E-01 | ?( | 5.043E+00 | 1.61E+02 | 2.83E+01 G |

( - This peak used in the nuclide activity average.

```
  * - Peak is too wide, but only one peak in library.
  ! - Peak is part of a multiplet and this area went
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                        Peak Codes:
  T - Thermal Neutron Activation        G - Gamma Ray
  F - Fast Neutron Activation           X - X-Ray
  I - Fission Product                   P - Positron Decay
  N - Naturally Occurring Isotope       S - Single-Escape
  P - Photon Reaction                   D - Double-Escape
  C - Charged Particle Reaction         K - Key Line
  M - No MDA Calculation                A - Not in Average
  R - Coincidence Corrected             C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity | |
|---|---|---|---|---|---|---|---|
| TH-234 | 63.29 | 425. | -51. | -0.029 | 47.58 | -1.873E+01 | P |
| BA-133 | 80.99 | 303. | -29. | -0.016 | 108.54 | -9.326E-01 | |
| EU-155 | 86.54 | 797. | 26. | 0.014 | 156.15 | 8.832E-01 | |
| Nd-147 | 91.10 | 857. | 26. | 0.014 | 160.92 | 9.395E-01 | |
| TH-234 | 92.59 | 987. | -51. | -0.028 | 50.44 | -9.244E+00 | P |
| Gd-153 | 97.50 | 531. | 23. | 0.013 | 144.57 | 7.602E-01 | |
| Np-239 | 99.50 | 489. | 22. | 0.012 | 143.96 | 1.459E+00 | |
| Gd-153 | 103.20 | 511. | 22. | 0.012 | 146.48 | 1.000E+00 | |
| Np-239 | 103.70 | 533. | 22. | 0.012 | 149.45 | 9.086E-01 | |
| Np-239 | 106.13 | 569. | -6. | -0.003 | 563.72 | -2.603E-01 | |
| EU-152 | 121.78 | 274. | -25. | -0.014 | 96.04 | -8.639E-01 | |
| EU-154 | 123.10 | 288. | -12. | -0.006 | 210.95 | -2.799E-01 | |
| HF-181 | 133.02 | 544. | -27. | -0.015 | 124.36 | -6.303E-01 | |
| CE-144 | 133.54 | 476. | 5. | 0.003 | 599.80 | 4.734E-01 | |
| HF-181 | 136.30 | 522. | -27. | -0.015 | 119.68 | -4.798E+00 | |
| CO-57 | 136.47 | 549. | -9. | -0.005 | 350.79 | -9.124E-01 | |
| Tc-99m | 140.51 | 410. | -25. | -0.014 | 115.10 | -3.034E-01 | |
| U-235 | 143.79 | 1034. | -28. | -0.015 | 165.95 | -2.652E+00 | |
| CE-141 | 145.44 | 898. | 25. | 0.014 | 168.06 | 5.589E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| U-235 | 163.38 | 201. | 21. | 0.012 | 98.32 | 4.734E+00 | |
| CE-139 | 165.85 | 219. | 21. | 0.012 | 102.18 | 2.984E-01 | |
| TH-229 | 193.51 | 106. | 19. | 0.010 | 106.20 | 5.474E+00 | |
| U-235 | 205.33 | 139. | 21. | 0.011 | 109.09 | 5.608E+00 | |
| TH-229 | 210.85 | 180. | 11. | 0.006 | 223.25 | 5.269E+00 | |
| Cf-251 | 227.00 | 161. | -24. | -0.013 | 102.18 | -5.572E+00 | |
| EU-152 | 244.69 | 868. | 23. | 0.013 | 179.84 | 4.847E+00 | |
| Cd-113m | 263.70 | 121. | -8. | -0.004 | 197.64 | -2.238E+03 | |
| BI-210M | 265.83 | 106. | 16. | 0.009 | 95.40 | 5.351E-01 | |
| Hg-203 | 279.20 | 168. | -8. | -0.004 | 231.84 | -1.730E-01 | |
| I-131 | 284.30 | 95. | -17. | -0.010 | 108.09 | -5.050E+00 | |
| La-140 | 328.76 | 95. | 38. | 0.021 | 39.96 | 3.773E+00 | |
| Cf-249 | 333.44 | 209. | -20. | -0.011 | 105.63 | -2.616E+00 | |
| Cs-136 | 340.57 | 238. | 7. | 0.004 | 329.77 | 2.967E-01 | |
| HF-181 | 345.83 | 226. | 14. | 0.008 | 155.56 | 1.946E+00 | |
| BA-133 | 356.00 | 417. | -17. | -0.010 | 170.21 | -5.986E-01 | |
| I-131 | 364.48 | 48. | 12. | 0.007 | 116.67 | 3.250E-01 | |
| BA-133 | 383.84 | 65. | 14. | 0.008 | 83.92 | 3.713E+00 | |
| Cf-249 | 387.95 | 80. | 14. | 0.008 | 91.56 | 5.093E-01 | |
| SN-113 | 391.69 | 93. | 11. | 0.006 | 127.41 | 4.050E-01 | |
| SB-125 | 427.88 | 48. | 14. | 0.008 | 100.51 | 1.202E+00 | |
| AG-108M | 433.94 | 64. | -16. | -0.009 | 101.04 | -4.549E-01 | |
| pm-146 | 453.88 | 64. | -3. | -0.002 | 525.29 | -1.234E-01 | |
| SB-125 | 463.37 | 108. | 17. | 0.009 | 89.24 | 4.440E+00 | |
| Ir-192 | 468.06 | 110. | 16. | 0.009 | 97.51 | 8.367E-01 | |
| BE-7 | 477.60 | 155. | -17. | -0.010 | 104.82 | -4.586E+00 | |
| HF-181 | 482.00 | 187. | -18. | -0.010 | 107.53 | -6.454E-01 | |
| La-140 | 487.02 | 160. | 16. | 0.009 | 117.72 | 9.717E-01 | |
| RU-103 | 497.05 | 26. | 11. | 0.006 | 98.66 | 3.527E-01 | |
| RH-106 | 511.86 | 60. | 81. | 0.045 | 26.79 | 1.203E+01 | |
| Nd-147 | 531.00 | 43. | -4. | -0.002 | 313.79 | -1.022E+00 | |
| CS-134 | 569.32 | 65. | -17. | -0.009 | 71.32 | -3.604E+00 | |
| BI-207 | 569.70 | 63. | 12. | 0.006 | 100.81 | 3.894E-01 | |
| SB-125 | 600.50 | 263. | 11. | 0.006 | 213.13 | 2.081E+00 | |
| SB-124 | 602.73 | 274. | 11. | 0.006 | 217.08 | 3.800E-01 | |
| CS-134 | 604.71 | 339. | -10. | -0.005 | 268.45 | -3.440E-01 | |
| RH-106 | 621.92 | 19. | 9. | 0.005 | 108.99 | 3.076E+00 | |
| SB-125 | 635.89 | 52. | -5. | -0.003 | 222.69 | -1.483E+00 | |
| I-131 | 636.97 | 46. | 11. | 0.006 | 89.69 | 5.690E+00 | |
| AG-110M | 657.76 | 57. | 14. | 0.008 | 79.54 | 5.587E-01 | |
| CS-137 | 661.66 | 62. | 13. | 0.007 | 90.84 | 5.631E-01 | |
| PM-144 | 696.54 | 65. | -19. | -0.011 | 91.50 | -7.614E-01 | |
| NB-94 | 702.63 | 37. | -4. | -0.002 | 302.94 | -1.738E-01 | |
| SB-124 | 722.79 | 121. | -14. | -0.008 | 115.02 | -5.176E+00 | |
| AG-108M | 722.94 | 107. | -13. | -0.007 | 116.43 | -5.734E-01 | |
| ZR-95 | 724.20 | 78. | 12. | 0.007 | 110.28 | 1.074E+00 | |
| pm-146 | 735.72 | 37. | -4. | -0.002 | 302.94 | -7.877E-01 | |
| pm-146 | 747.16 | 19. | 6. | 0.004 | 150.07 | 7.724E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| ZR-95 | 756.73 | 23. | 5. | 0.003 | 224.40 | 3.594E-01 | |
| AG-110M | 763.94 | 85. | -6. | -0.003 | 221.11 | -1.139E+00 | |
| NB-95 | 765.79 | 108. | -11. | -0.006 | 136.97 | -4.672E-01 | |
| PA-234M | 766.41 | 97. | 19. | 0.011 | 75.26 | 2.803E+02 | |
| EU-152 | 778.92 | 23. | 12. | 0.007 | 89.19 | 4.035E+00 | |
| CS-134 | 795.87 | 51. | 8. | 0.004 | 131.10 | 4.103E-01 | |
| CS-134 | 801.95 | 61. | 2. | 0.001 | 556.78 | 1.016E+00 | |
| CO-58 | 810.78 | 58. | -7. | -0.004 | 158.44 | -3.139E-01 | |
| La-140 | 815.77 | 80. | -17. | -0.009 | 80.20 | -3.201E+00 | |
| Cs-136 | 818.50 | 73. | 12. | 0.007 | 101.32 | 5.580E-01 | |
| MN-54 | 834.85 | 23. | 11. | 0.006 | 100.83 | 4.884E-01 | |
| NB-94 | 871.10 | 50. | -16. | -0.009 | 67.31 | -7.618E-01 | |
| EU-154 | 873.23 | 62. | 15. | 0.008 | 77.76 | 5.870E+00 | |
| Sc-46 | 889.28 | 63. | -9. | -0.005 | 131.29 | -4.280E-01 | |
| y-88 | 898.04 | 15. | 5. | 0.003 | 176.07 | 2.608E-01 | |
| AG-110M | 937.49 | 55. | -20. | -0.011 | 86.32 | -2.894E+00 | |
| EU-152 | 964.11 | 120. | 10. | 0.006 | 158.11 | 3.567E+00 | |
| EU-154 | 996.33 | 20. | 40. | 0.022 | 22.60 | 2.008E+01 | |
| EU-154 | 1004.77 | 72. | -11. | -0.006 | 117.52 | -3.169E+00 | |
| Cs-136 | 1048.07 | 21. | 9. | 0.005 | 82.67 | 6.086E-01 | |
| RH-106 | 1050.36 | 50. | -7. | -0.004 | 154.43 | -2.405E+01 | |
| BI-207 | 1063.66 | 21. | 5. | 0.003 | 229.68 | 3.566E-01 | |
| Ga-68 | 1077.40 | 37. | -11. | -0.006 | 126.09 | -2.311E+01 | |
| FE-59 | 1099.25 | 32. | -10. | -0.006 | 132.41 | -1.038E+00 | |
| EU-152 | 1112.07 | 139. | -16. | -0.009 | 109.31 | -6.803E+00 | |
| ZN-65 | 1115.55 | 123. | -15. | -0.008 | 107.66 | -1.763E+00 | |
| Ta-182 | 1121.30 | 122. | -10. | -0.006 | 152.23 | -1.797E+00 | |
| CO-60 | 1173.24 | 43. | -13. | -0.007 | 120.54 | -7.889E-01 | |
| Ta-182 | 1189.05 | 37. | -6. | -0.004 | 222.86 | -2.462E+00 | |
| Ta-182 | 1221.41 | 21. | 13. | 0.007 | 83.15 | 3.196E+00 | |
| NA-22 | 1274.53 | 40. | -18. | -0.010 | 54.66 | -1.212E+00 | |
| EU-154 | 1274.54 | 58. | -4. | -0.002 | 301.98 | -6.889E-01 | |
| FE-59 | 1291.60 | 11. | 10. | 0.005 | 87.40 | 1.527E+00 | |
| AG-110M | 1384.30 | 0. | 9. | 0.005 | 33.33 | 2.681E+00 | |
| EU-152 | 1408.00 | 11. | 4. | 0.002 | 221.56 | 1.283E+00 | |
| La-140 | 1596.21 | 12. | 2. | 0.001 | 424.26 | 1.729E-01 | |
| SB-124 | 1690.98 | 12. | -5. | -0.003 | 173.21 | -9.100E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty 1 Sigma Counting | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | -4.5864E+00 | -4.5864E+00 | 1.048E+02% | 1.61E+01 |
| NA-22 | #A | -1.2120E+00 | -1.2120E+00 | 5.466E+01% | 2.15E+00 |
| K-40 | # | 2.5931E+02 | 2.5931E+02 | 5.241E+00% | 5.25E+00 |
| Sc-46 | #A | -4.2802E-01 | -4.2802E-01 | 1.313E+02% | 1.92E+00 |
| CR-51 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.88E+01 |
| MN-54 | #A | 4.8844E-01 | 4.8844E-01 | 1.008E+02% | 1.15E+00 |
| FE-59 | #A | 7.3246E-02 | 7.3247E-02 | 7.933E+01% | 3.02E+00 |
| Co-56 | # | 1.3907E+00 | 1.3907E+00 | 4.701E+01% | 1.06E+00 |
| CO-57 | #A | -1.2458E-02 | -1.2458E-02 | 2.157E+03% | 9.16E-01 |
| CO-58 | #A | -3.1389E-01 | -3.1390E-01 | 1.584E+02% | 1.71E+00 |
| CO-60 | #A | 4.6592E-02 | 4.6592E-02 | 1.191E+03% | 1.29E+00 |
| ZN-65 | #A | -1.7628E+00 | -1.7628E+00 | 1.077E+02% | 6.39E+00 |
| NB-94 | #A | -1.7378E-01 | -1.7378E-01 | 3.029E+02% | 1.25E+00 |
| ZR-95 | #A | 6.7931E-01 | 6.7931E-01 | 1.103E+02% | 1.94E+00 |
| NB-95 | #A | -4.6722E-01 | -4.6722E-01 | 1.370E+02% | 2.17E+00 |
| RU-103 | #A | 3.5272E-01 | 3.5272E-01 | 9.866E+01% | 8.43E-01 |
| RH-106 | #A | 3.0759E+00 | 3.0759E+00 | 1.090E+02% | 8.23E+00 |
| AG-108M | #A | -4.5485E-01 | -4.5485E-01 | 1.010E+02% | 1.14E+00 |
| AG-110M | #A | 6.1578E-01 | 6.1578E-01 | 3.333E+01% | 2.32E+00 |
| SN-113 | #A | 4.0501E-01 | 4.0501E-01 | 1.274E+02% | 1.75E+00 |
| SB-124 | #A | 3.7999E-01 | 3.7999E-01 | 2.171E+02% | 2.79E+00 |
| SB-125 | #A | 2.0580E+00 | 2.0580E+00 | 8.399E+01% | 3.00E+00 |
| I-131 | #A | 7.5777E-01 | 7.5779E-01 | 7.358E+01% | 9.48E-01 |
| Gd-153 | #A | 8.6131E-01 | 8.6132E-01 | 1.029E+02% | 3.67E+00 |
| Ga-68 | #A | -2.3027E+01 | -2.3110E+01 | 1.261E+02% | 6.36E+01 |
| Tc-99m | #A | -3.0324E-01 | -3.0344E-01 | 1.151E+02% | 1.17E+00 |
| BA-133 | #A | -5.9864E-01 | -5.9864E-01 | 1.702E+02% | 3.42E+00 |
| CS-134 | #A | 5.3953E-02 | 5.3953E-02 | 1.311E+02% | 3.12E+00 |
| CS-137 | #A | 5.6311E-01 | 5.6311E-01 | 9.084E+01% | 1.72E+00 |
| CE-139 | #A | 2.9843E-01 | 2.9843E-01 | 1.022E+02% | 1.02E+00 |
| Ba-140 | # | 3.3880E+00 | 3.3881E+00 | 3.729E+01% | 2.81E+00 |
| La-140 | #A | 8.5174E-01 | 8.5175E-01 | 3.996E+01% | 1.63E+00 |
| CE-141 | #A | 5.5893E-01 | 5.5893E-01 | 1.681E+02% | 3.13E+00 |
| CE-144 | #A | 4.7344E-01 | 4.7344E-01 | 5.998E+02% | 9.58E+00 |
| PM-144 | #A | -7.6136E-01 | -7.6136E-01 | 9.150E+01% | 1.59E+00 |
| EU-152 | #A | 2.2889E+00 | 2.2889E+00 | 8.919E+01% | 6.01E+00 |
| EU-154 | #A | 1.2457E+01 | 1.2457E+01 | 2.260E+01% | 1.52E+01 |
| EU-155 | #A | 5.8115E-01 | 5.8115E-01 | 1.561E+02% | 5.12E+00 |
| HF-181 | #A | -2.3682E-01 | -2.3682E-01 | 9.455E+01% | 2.33E+00 |
| Ta-182 | #A | 3.8118E-01 | 3.8118E-01 | 8.315E+01% | 9.29E+00 |
| Hg-203 | #A | -1.7300E-01 | -1.7300E-01 | 2.318E+02% | 1.36E+00 |
| TL-208 | | 6.6809E+00 | 6.6810E+00 | 9.658E+00% | 8.71E-01 |
| pm-146 | #A | 7.7240E-01 | 7.7240E-01 | 1.501E+02% | 2.79E+00 |

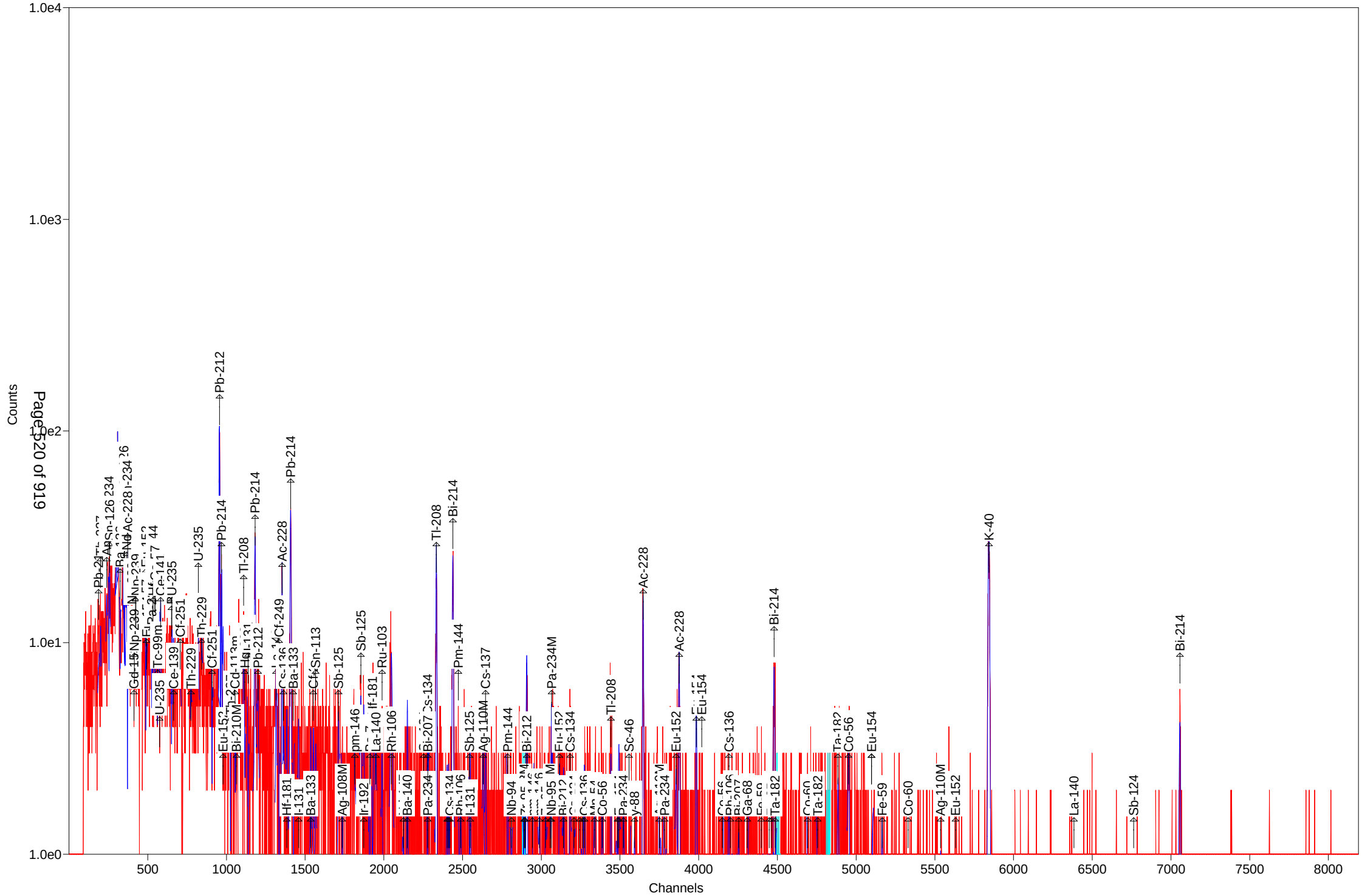
| | | | | | |
|---|---|---|---|---|---|
| y-88 #A | 2.6081E-01 | 2.6081E-01 | 1.761E+02% | | 1.08E+00 |
| Cd-113m#A | -2.2377E+03 | -2.2377E+03 | 1.976E+02% | | 1.51E+04 |
| Cd-109 #A | 3.9388E+00 | 3.9388E+00 | 2.859E+02% | | 3.77E+01 |
| Cf-251 #A | 7.0530E-02 | 7.0530E-02 | 2.239E+03% | | 4.12E+00 |
| Cf-249 #A | 5.0927E-01 | 5.0927E-01 | 9.156E+01% | | 1.57E+00 |
| Sn-126 A | 4.1124E+00 | 4.1124E+00 | 1.007E+02% | | 1.38E+01 |
| PB-210 #A | 7.8590E-01 | 7.8590E-01 | 1.575E+03% | | 4.20E+01 |
| PB-212 # | 1.6502E+01 | 1.6502E+01 | 5.803E+00% | | 1.99E+00 |
| PB-214 | 1.6214E+01 | 1.6214E+01 | 7.695E+00% | | 1.84E+00 |
| BI-207 #A | 3.7522E-01 | 3.7522E-01 | 1.008E+02% | | 1.33E+00 |
| BI-212 # | 3.6635E+01 | 3.6635E+01 | 1.425E+01% | | 6.85E+00 |
| BI-214 # | 1.2691E+01 | 1.2691E+01 | 1.063E+01% | | 2.21E+00 |
| BI-210M#A | 5.3509E-01 | 5.3509E-01 | 9.540E+01% | | 1.71E+00 |
| AC-228 | 1.9816E+01 | 1.9816E+01 | 8.513E+00% | | 1.26E+00 |
| TH-227 A | 6.9670E+00 | 6.9670E+00 | 4.638E+01% | | 9.38E+00 |
| TH-229 #A | 5.3907E+00 | 5.3907E+00 | 1.062E+02% | | 1.49E+01 |
| TH-234 #A | -1.8731E+01 | -1.8731E+01 | 4.758E+01% | | 3.60E+01 |
| PA-231 #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | | 6.19E+01 |
| PA-233 #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | | 5.08E+00 |
| PA-234 A | -4.1219E-01 | -4.1219E-01 | 1.216E+02% | | 6.11E+00 |
| PA-234M#A | 7.2857E+01 | 7.2857E+01 | 7.526E+01% | | 2.50E+02 |
| U-235 #A | 1.0964E+00 | 1.0964E+00 | 7.387E+01% | | 1.47E+01 |
| AM-241 #A | 7.9439E-01 | 7.9439E-01 | 1.469E+02% | | 3.13E+00 |
| Np-237 #A | 7.2732E+00 | 7.2732E+00 | 4.283E+01% | | 1.02E+01 |
| Ir-192 #A | 3.1199E-01 | 3.1199E-01 | 9.751E+01% | | 2.13E+00 |
| Cs-136 #A | 5.2179E-01 | 5.2180E-01 | 8.267E+01% | | 1.91E+00 |
| Np-239 #A | -2.6023E-01 | -2.6025E-01 | 5.637E+02% | | 4.94E+00 |
| Nd-147 #A | 3.2198E-01 | 3.2199E-01 | 1.609E+02% | | 7.88E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  2000.1 keV)  3.821E+02  Bq/Sample
Total Decayed Activity (  37.6 to  2000.1 keV) 3.8209290E+02  Bq/Sample

309155_Gamma_160-22327-A-8-B. 7_Gamma_20171003.spc.



Test America St. Louis  Spectrum ID: 3_Gamma_20170907

Sample Description: 309155_Gamma_160-22327-A-9-B
Detector: Detector # 3
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-9-B

Decay to Time: 6/7/2017 09:55  Live Time: 1800 sec
Acquisition Time: 6/7/2017 09:55:32  Real Time: 1802 sec
Analysis Time: 6/7/2017 10:26  Dead Time: 0.12 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 3_Soil_TunaCan.Clb
Efficiency Cal Desc: 3_Soil_TunaCan_90099_032712
Efficiency Cal Date: 3/28/2012 11:26
Energy Cal Date: 2/28/2012 19:25
Library: Client_Long_Rev11.lib
Bkgd Correction File: 3_2017-06-04_1020.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | 3.412E+00 | 108.1 | 3.688E+00 | 3.692E+00 | 1.247E+01 |
| NA-22 | 2.027E-01 | 209.3 | 4.242E-01 | 4.243E-01 | 1.514E+00 |
| K-40 | 2.852E+02 | 4.8 | 1.378E+01 | 2.007E+01 | 1.150E+01 |
| Sc-46 | -8.317E-01 | 92.1 | 7.660E-01 | 7.672E-01 | 2.565E+00 |
| CR-51 | 0.000E+00 | 1.#INF | 1.947E+00 | 1.947E+00 | 2.415E+01 |
| MN-54 | 1.084E+00 | 46.2 | 5.005E-01 | 5.036E-01 | 1.109E+00 |
| FE-59 | 5.048E-01 | 87.8 | 4.431E-01 | 4.438E-01 | 2.568E+00 |
| Co-56 | 1.226E+00 | 31.0 | 3.800E-01 | 3.852E-01 | 1.217E+00 |
| CO-57 | 2.190E-01 | 184.4 | 4.038E-01 | 4.039E-01 | 1.072E+00 |
| CO-58 | -1.945E-01 | 260.6 | 5.068E-01 | 5.069E-01 | 1.760E+00 |
| CO-60 | -7.342E-01 | 129.9 | 9.540E-01 | 9.547E-01 | 2.017E+00 |
| ZN-65 | -5.844E-02 | 2619.0 | 1.530E+00 | 1.531E+00 | 5.330E+00 |
| NB-94 | 4.029E-02 | 172.2 | 6.937E-02 | 6.941E-02 | 1.298E+00 |
| ZR-95 | 7.246E-01 | 137.9 | 9.991E-01 | 9.998E-01 | 2.337E+00 |
| NB-95 | 6.933E-01 | 79.0 | 5.478E-01 | 5.489E-01 | 1.829E+00 |
| RU-103 | -2.307E-01 | 219.9 | 5.074E-01 | 5.076E-01 | 1.279E+00 |
| RH-106 | 6.775E-01 | 598.3 | 4.053E+00 | 4.054E+00 | 1.422E+01 |
| AG-108M | 3.003E-01 | 127.8 | 3.838E-01 | 3.841E-01 | 9.664E-01 |
| AG-110M | 1.345E-01 | 370.9 | 4.988E-01 | 4.989E-01 | 2.489E+00 |
| SN-113 | 6.005E-01 | 120.2 | 7.219E-01 | 7.225E-01 | 2.431E+00 |
| SB-124 | 4.108E-01 | 226.5 | 9.306E-01 | 9.308E-01 | 3.136E+00 |
| SB-125 | 1.519E+00 | 73.3 | 1.114E+00 | 1.117E+00 | 3.415E+00 |
| I-131 | 6.368E-01 | 88.8 | 5.657E-01 | 5.667E-01 | 1.067E+00 |
| Gd-153 | -1.081E+00 | 146.3 | 1.582E+00 | 1.583E+00 | 5.276E+00 |
| Ga-68 | 7.270E+00 | 241.6 | 1.756E+01 | 1.757E+01 | 4.032E+01 |
| Tc-99m | -3.737E-01 | 116.3 | 4.347E-01 | 4.352E-01 | 1.451E+00 |
| BA-133 | -7.350E-01 | 152.3 | 1.119E+00 | 1.120E+00 | 3.750E+00 |
| CS-134 | 6.056E-01 | 68.8 | 4.167E-01 | 4.179E-01 | 3.517E+00 |
| CS-137 | 5.145E+00 | 11.7 | 6.019E-01 | 6.587E-01 | 9.086E-01 |
| CE-139 | -4.145E-01 | 102.9 | 4.265E-01 | 4.283E-01 | 1.425E+00 |
| Ba-140 | 1.628E+00 | 97.2 | 1.583E+00 | 1.585E+00 | 3.919E+00 |
| La-140 | -8.465E-02 | 38.3 | 3.241E-02 | 3.272E-02 | 2.146E+00 |
| CE-141 | -3.610E-02 | 2302.8 | 8.312E-01 | 8.312E-01 | 2.810E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | -3.289E+00 | 126.7 | 4.169E+00 | 4.172E+00 | 1.389E+01 |
| PM-144 | 5.054E-01 | 62.6 | 3.164E-01 | 3.175E-01 | 1.276E+00 |
| EU-152 | 1.975E+00 | 109.3 | 2.159E+00 | 2.161E+00 | 7.372E+00 |
| EU-154 | 3.369E+00 | 51.5 | 1.734E+00 | 1.743E+00 | 1.038E+01 |
| EU-155 | 0.000E+00 | 1.#INF | 8.542E-01 | 8.542E-01 | 7.849E+00 |
| HF-181 | 4.504E-01 | 111.1 | 5.005E-01 | 5.010E-01 | 1.693E+00 |
| Ta-182 | 1.743E+00 | 85.3 | 1.486E+00 | 1.489E+00 | 5.803E+00 |
| Hg-203 | -3.180E-01 | 133.0 | 4.230E-01 | 4.234E-01 | 1.430E+00 |
| TL-208 | 9.005E+00 | 8.9 | 8.038E-01 | 9.297E-01 | 1.257E+00 |
| pm-146 | 3.118E-01 | 121.9 | 3.799E-01 | 3.803E-01 | 3.914E+00 |
| y-88 | 2.386E-01 | 127.4 | 3.039E-01 | 3.041E-01 | 1.029E+00 |
| Cd-113m | -7.451E+02 | 779.7 | 5.809E+03 | 5.810E+03 | 1.994E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 1.473E+01 | 1.473E+01 | 4.943E+01 |
| Cf-251 | 1.003E+00 | 184.9 | 1.855E+00 | 1.857E+00 | 5.029E+00 |
| Cf-249 | 1.184E+00 | 48.9 | 5.793E-01 | 5.825E-01 | 2.313E+00 |
| Sn-126 | 4.451E+00 | 108.9 | 4.848E+00 | 4.854E+00 | 1.617E+01 |
| PB-210 | 4.238E+01 | 31.6 | 1.338E+01 | 1.361E+01 | 3.335E+01 |
| PB-212 | 2.733E+01 | 4.4 | 1.210E+00 | 2.142E+00 | 2.005E+00 |
| PB-214 | 1.638E+01 | 7.6 | 1.250E+00 | 1.512E+00 | 2.004E+00 |
| BI-207 | 1.354E-01 | 259.8 | 3.518E-01 | 3.519E-01 | 1.229E+00 |
| BI-212 | 2.887E+01 | 22.6 | 6.534E+00 | 6.704E+00 | 1.236E+01 |
| BI-214 | 1.682E+01 | 9.1 | 1.535E+00 | 1.766E+00 | 2.161E+00 |
| BI-210M | -4.624E-01 | 155.3 | 7.181E-01 | 7.186E-01 | 2.429E+00 |
| AC-228 | 2.603E+01 | 7.4 | 1.920E+00 | 2.334E+00 | 2.660E+00 |
| TH-227 | 5.142E+00 | 144.4 | 7.426E+00 | 7.432E+00 | 2.490E+01 |
| TH-229 | -4.236E+00 | 195.5 | 8.281E+00 | 8.288E+00 | 2.240E+01 |
| TH-234 | 1.851E+01 | 48.7 | 9.024E+00 | 9.075E+00 | 2.929E+01 |
| PA-231 | -1.455E+01 | 165.7 | 2.411E+01 | 2.412E+01 | 8.069E+01 |
| PA-233 | 0.000E+00 | 1.#INF | 3.781E-01 | 3.781E-01 | 6.550E+00 |
| PA-234 | 1.220E+00 | 67.5 | 8.240E-01 | 8.264E-01 | 8.134E+00 |
| PA-234M | 9.295E+01 | 58.8 | 5.463E+01 | 5.483E+01 | 1.610E+02 |
| U-235 | -3.002E+00 | 119.2 | 3.580E+00 | 3.584E+00 | 1.195E+01 |
| AM-241 | -4.539E-01 | 333.7 | 1.515E+00 | 1.515E+00 | 4.079E+00 |
| Np-237 | 0.000E+00 | 1.#INF | 4.544E+00 | 4.544E+00 | 1.523E+01 |
| Ir-192 | 0.000E+00 | 1.#INF | 1.117E-01 | 1.117E-01 | 2.736E+00 |
| Cs-136 | 2.197E-01 | 157.9 | 3.469E-01 | 3.471E-01 | 1.845E+00 |
| Np-239 | 1.160E+00 | 154.4 | 1.791E+00 | 1.793E+00 | 5.990E+00 |
| Nd-147 | 2.010E+00 | 92.0 | 1.850E+00 | 1.854E+00 | 8.435E+00 |
| Total | 6.156E+02 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-9-B

Spectrum Filename: C:\User\SPC\Det3\3_Gamma_20170907.An1

Acquisition information
Start time: 6/7/2017 9:55:32 AM
Live time: 1800
Real time: 1802
Dead time: 0.12 %
Detector ID: 3

Detector system
Ge 3 SN/242

Calibration
Filename: 3_Soil_TunaCan.Clb
3_Soil_TunaCan_90099_032712

Energy Calibration
Created: 2/28/2012 7:25:37 PM
Zero offset: 0.122 keV
Gain: 0.250 keV/channel
Quadratic: 3.421E-08 keV/channel^2

Efficiency Calibration
Created: 3/28/2012 11:26:55 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.64 %
Log(Eff): -6.102019E-01 + (-3.642282E-01*Log(E) ) + ( -2.895398E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.29 %
Log(Eff): -2.525141E+01 + ( 9.446449E+00*Log(E) ) + ( -1.005974E+00*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.59keV )
Stop channel: 8000 (  2000.59keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3
Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 9:55:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 3_2017-06-04_1020.PBC 6/4/2017 10:20:14 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 28 cutoff: 5.00E+01 %
Energy Calibration
Normalized diff: 0.1604

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.37 | 72. | 31.56 | 0.83 | 2.200E-02 | 46.54 | 4.250 | 4.238E+01 | PB210 |
| 50.14 | 19. | 144.42 | 0.82 | 2.503E-02 | 50.14 | 8.000 | PBC<MDA | TH227 |
| 63.17 | 43. | 48.74 | 0.84 | 3.416E-02 | 63.29 | 3.810 | PBC<MDA | TH234 |
| 64.16 | 27. | 108.94 | 0.84 | 3.475E-02 | 64.28 | 9.700 | PBC<MDA | Sn126 |
| 72.83 | 56. | 38.00 | 0.85 | 3.910E-02 | | | | |
| 74.86 | 238. | 11.22 | 0.85 | 3.996E-02 | | | | |
| 77.10 | 428. | 6.77 | 0.85 | 4.083E-02 | | | | |
| 87.27 | 137. | 16.36 | 0.86 | 4.387E-02 | 86.49 | 13.100 | 1.333E+01 | Np237 |
| | | | | | 86.54 | 30.700 | 5.685E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.927E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 4.629E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 4.569E+01 | Cd109 |
| 90.03 | 74. | 26.31 | 0.86 | 4.445E-02 | | | | |
| 91.10 | 29. | 156.38 | 0.86 | 4.465E-02 | 91.10 | 28.300 | PBC<MDA | Nd147 |
| 92.53 | 23. | 106.98 | 0.87 | 4.491E-02 | 92.59 | 5.584 | PBC<MDA | TH234 |
| 93.29 | 29. | 151.63 | 0.87 | 4.503E-02 | 93.35 | 5.561 | PBC<MDA | AC228 |
| 106.13 | 22. | 154.43 | 0.88 | 4.614E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 121.78 | 7. | 319.41 | 0.90 | 4.566E-02 | 121.78 | 28.580 | PBC<MDA | EU152 |
| | | | | | 122.06 | 85.600 | 1.043E-01 | CO57 |
| 136.47 | 20. | 184.39 | 0.91 | 4.397E-02 | 136.30 | 5.850 | PBC<MDA | HF181 |
| | | | | | 136.47 | 10.680 | 2.354E+00 | CO57 |
| 162.66 | 6. | 387.30 | 0.94 | 3.943E-02 | 162.66 | 6.220 | PBC<MDA | Ba140 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 176.60 | 12. | 184.94 | 0.95 | 3.802E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |
| 238.40 | 638. | 5.53 | 0.83 | 3.107E-02 | 238.63 | 43.300 | 2.636E+01 | PB212 |
| 241.79 | 20. | 216.14 | 1.02 | 3.075E-02 | 242.00 | 7.430 | PBC<MDA | PB214 |
| 244.69 | 20. | 217.81 | 1.02 | 3.052E-02 | 244.69 | 7.580 | PBC<MDA | EU152 |
| 277.29 | 26. | 45.51 | 0.85 | 2.801E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| 294.81 | 213. | 9.41 | 0.98 | 2.685E-02 | 295.09 | 19.300 | 2.186E+01 | PB214 |
| 300.05 | 73. | 24.22 | 1.10 | 2.652E-02 | 300.03 | 3.280 | 4.672E+01 | PB212 |
| | | | | | 300.07 | 2.460 | 6.230E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 2.473E+01 | PA233 |
| 328.76 | 44. | 38.29 | 1.11 | 2.489E-02 | 328.76 | 20.300 | 4.876E+00 | La140 |
| 333.44 | 25. | 48.93 | 1.11 | 2.464E-02 | 333.44 | 15.510 | PBC<MDA | Cf249 |
| 338.07 | 148. | 11.32 | 1.09 | 2.440E-02 | 338.32 | 12.010 | 2.711E+01 | AC228 |
| 340.57 | 16. | 157.91 | 1.12 | 2.428E-02 | 340.57 | 46.900 | PBC<MDA | Cs136 |
| 344.29 | 15. | 164.98 | 1.12 | 2.409E-02 | 344.29 | 26.500 | PBC<MDA | EU152 |
| 351.65 | 246. | 8.34 | 1.12 | 2.374E-02 | 351.93 | 37.600 | 1.534E+01 | PB214 |
| 364.48 | 13. | 112.09 | 1.14 | 2.315E-02 | 364.48 | 81.700 | PBC<MDA | I131 |
| 383.84 | 16. | 109.90 | 1.16 | 2.231E-02 | 383.84 | 8.940 | PBC<MDA | BA133 |
| 387.95 | 16. | 115.18 | 1.17 | 2.215E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 391.69 | 15. | 120.22 | 1.17 | 2.200E-02 | 391.69 | 64.000 | PBC<MDA | SN113 |
| 433.94 | 10. | 127.80 | 1.21 | 2.045E-02 | 433.94 | 90.480 | PBC<MDA | AG108M |
| 453.88 | 11. | 121.85 | 1.23 | 1.980E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 462.48 | 65. | 25.04 | 0.71 | 1.953E-02 | 463.37 | 10.470 | 1.768E+01 | SB125 |
| 477.60 | 12. | 108.10 | 1.25 | 1.909E-02 | 477.60 | 10.520 | PBC<MDA | BE7 |
| 482.00 | 12. | 111.11 | 1.26 | 1.896E-02 | 482.00 | 80.500 | PBC<MDA | HF181 |
| 487.02 | 12. | 128.00 | 1.26 | 1.882E-02 | 487.02 | 45.500 | PBC<MDA | La140 |
| 511.86 | 50. | 50.84 | 2.54 | 1.815E-02 | 511.86 | 20.000 | 7.716E+00 | RH106 |
| 531.00 | 15. | 97.08 | 1.31 | 1.767E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 537.26 | 13. | 97.24 | 1.31 | 1.752E-02 | 537.26 | 24.390 | PBC<MDA | Ba140 |
| 563.24 | 4. | 371.37 | 1.34 | 1.693E-02 | 563.24 | 8.350 | PBC<MDA | CS134 |
| 569.32 | 13. | 68.81 | 1.34 | 1.680E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 5.326E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 4.469E-01 | BI207 |
| 569.70 | 4. | 259.81 | 1.34 | 1.679E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 1.614E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 1.354E-01 | BI207 |
| 582.84 | 220. | 9.34 | 1.52 | 1.651E-02 | 583.02 | 84.500 | 8.759E+00 | TL208 |
| 600.50 | 12. | 223.06 | 1.37 | 1.615E-02 | 600.50 | 17.860 | PBC<MDA | SB125 |
| 602.73 | 12. | 226.51 | 1.37 | 1.611E-02 | 602.73 | 98.260 | PBC<MDA | SB124 |
| 609.07 | 207. | 10.03 | 1.33 | 1.599E-02 | 609.31 | 46.090 | 1.563E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 1.254E+02 | RU103 |
| 618.06 | 12. | 83.10 | 1.39 | 1.582E-02 | 618.06 | 99.100 | PBC<MDA | PM144 |
| 621.92 | 2. | 598.30 | 1.39 | 1.574E-02 | 621.92 | 9.930 | PBC<MDA | RH106 |
| 635.89 | 13. | 73.33 | 1.41 | 1.549E-02 | 635.89 | 11.310 | PBC<MDA | SB125 |
| 636.97 | 7. | 137.86 | 1.41 | 1.547E-02 | 636.97 | 7.170 | PBC<MDA | I131 |
| 661.40 | 119. | 11.70 | 1.55 | 1.504E-02 | 661.66 | 85.210 | 5.145E+00 | CS137 |
| 696.54 | 15. | 93.65 | 1.46 | 1.448E-02 | 696.54 | 99.000 | PBC<MDA | PM144 |
| 727.12 | 55. | 22.64 | 1.51 | 1.402E-02 | 727.17 | 7.550 | 2.887E+01 | BI212 |
| 756.73 | 10. | 137.89 | 1.52 | 1.361E-02 | 756.73 | 54.460 | PBC<MDA | ZR95 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 765.79 | 17. | 79.01 | 1.53 | 1.349E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 2.355E+02 | PA234M |
| 766.41 | 15. | 73.52 | 1.53 | 1.348E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 2.107E+02 | PA234M |
| 785.53 | 26. | 19.61 | 1.62 | 1.323E-02 | 785.42 | 1.280 | 8.526E+01 | BI212 |
| 795.87 | 15. | 74.53 | 1.56 | 1.310E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 14. | 90.42 | 1.56 | 1.303E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 834.85 | 25. | 46.16 | 1.59 | 1.264E-02 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 860.08 | 39. | 16.01 | 1.25 | 1.236E-02 | 860.56 | 12.420 | 1.412E+01 | TL208 |
| 871.10 | 3. | 172.19 | 1.62 | 1.224E-02 | 871.10 | 99.890 | PBC<MDA | NB94 |
| 873.23 | 11. | 74.10 | 1.63 | 1.222E-02 | 873.23 | 12.270 | PBC<MDA | EU154 |
| 880.53 | 11. | 85.40 | 1.63 | 1.214E-02 | 880.53 | 6.000 | PBC<MDA | PA234 |
| 883.24 | 9. | 115.00 | 1.64 | 1.211E-02 | 883.24 | 9.600 | PBC<MDA | PA234 |
| 898.04 | 7. | 127.38 | 1.65 | 1.196E-02 | 898.04 | 93.700 | PBC<MDA | y88 |
| 910.95 | 157. | 9.07 | 1.26 | 1.183E-02 | 911.07 | 29.000 | 2.547E+01 | AC228 |
| 937.49 | 3. | 370.93 | 1.68 | 1.158E-02 | 937.49 | 34.360 | PBC<MDA | AG110M |
| 946.02 | 9. | 114.22 | 1.69 | 1.150E-02 | 946.02 | 13.400 | PBC<MDA | PA234 |
| 964.11 | 15. | 119.97 | 1.71 | 1.133E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 968.78 | 93. | 16.37 | 1.03 | 1.129E-02 | 968.97 | 17.460 | 2.621E+01 | AC228 |
| 996.33 | 9. | 82.14 | 1.74 | 1.105E-02 | 996.33 | 10.600 | PBC<MDA | EU154 |
| 1001.00 | 9. | 91.71 | 1.74 | 1.101E-02 | 1001.00 | 0.837 | PBC<MDA | PA234M |
| 1004.77 | 9. | 107.77 | 1.74 | 1.098E-02 | 1004.77 | 18.010 | PBC<MDA | EU154 |
| 1048.07 | 3. | 264.58 | 1.78 | 1.063E-02 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1077.40 | 4. | 241.60 | 1.81 | 1.041E-02 | 1077.40 | 3.300 | PBC<MDA | Ga68 |
| 1120.12 | 16. | 57.89 | 1.85 | 1.010E-02 | 1120.29 | 15.100 | PBC<MDA | BI214 |
| | | | | | 1120.55 | 99.987 | 8.647E-01 | Sc46 |
| 1120.55 | 14. | 69.58 | 1.85 | 1.010E-02 | 1120.29 | 15.100 | 5.227E+00 | BI214 |
| | | | | | 1120.55 | 99.987 | 7.895E-01 | Sc46 |
| | | | | | 1121.30 | 34.900 | 2.263E+00 | Ta182 |
| 1121.38 | 13. | 85.28 | 1.85 | 1.010E-02 | 1120.55 | 99.987 | PBC<MDA | Sc46 |
| | | | | | 1121.30 | 34.900 | 2.025E+00 | Ta182 |
| 1221.41 | 6. | 189.55 | 1.93 | 9.449E-03 | 1221.41 | 27.000 | PBC<MDA | Ta182 |
| 1238.28 | 35. | 30.99 | 1.95 | 9.349E-03 | 1238.28 | 66.070 | 3.148E+00 | Co56 |
| 1274.53 | 3. | 209.28 | 1.98 | 9.142E-03 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 5.756E-01 | EU154 |
| 1291.60 | 10. | 87.78 | 1.99 | 9.048E-03 | 1291.60 | 43.200 | PBC<MDA | FE59 |
| 1408.00 | 4. | 221.56 | 2.09 | 8.458E-03 | 1408.00 | 21.005 | PBC<MDA | EU152 |
| 1461.14 | 450. | 4.83 | 2.32 | 8.216E-03 | 1460.83 | 10.670 | 2.852E+02 | K40 |
| 1765.05 | 12. | 62.05 | 2.37 | 7.075E-03 | 1764.49 | 15.400 | PBC<MDA | BI214 |
| 1771.35 | 12. | 75.76 | 2.38 | 7.054E-03 | 1771.35 | 15.480 | PBC<MDA | Co56 |
| 1836.06 | 2. | 382.88 | 2.43 | 6.854E-03 | 1836.06 | 99.200 | PBC<MDA | y88 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 291.08 | 72.83 | 196. | 56. | 1.428E+03 | 38.00 | 0.846 | - D |
| 299.20 | 74.86 | 236. | 238. | 5.947E+03 | 11.22 | 0.848 | - D |
| 308.16 | 77.10 | 204. | 428. | 1.047E+04 | 6.77 | 0.850 | - D |
| 359.68 | 90.03 | 175. | 76. | 1.713E+03 | 27.13 | 0.864 | - sD |
| 1850.54 | 462.48 | 40. | 65. | 3.328E+03 | 25.04 | 0.710 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.13 | 46.37 | 133. | 72. | 0.040 | 31.56 | 0.834 |
| TH-227 | 200.24 | 50.14 | 349. | 19. | 0.010 | 144.42 | 0.822s |
| AM-241 | 237.85 | 59.54 | 303. | -9. | -0.005 | 333.68 | 0.832 |
| TH-234 | 252.87 | 63.29 | 200. | 43. | 0.024 | 48.74 | 0.836D |
| Sn-126 | 256.84 | 64.28 | 419. | 27. | 0.015 | 108.94 | 0.837s |
| BA-133 | 323.73 | 80.99 | 330. | -30. | -0.016 | 110.85 | 0.854s |
| EU-155 | 345.96 | 86.54 | 1086. | -29. | -0.016 | 164.37 | 0.860D |
| Sn-126 | 347.55 | 86.94 | 1019. | 26. | 0.014 | 93.42 | 0.860D |
| Sn-126 | 350.08 | 87.57 | 951. | 94. | 0.052 | 24.96 | 0.861D |
| Cd-109 | 351.96 | 88.04 | 979. | 0. | 0.000 | 1000.00 | 0.862A |
| Nd-147 | 364.21 | 91.10 | 993. | 29. | 0.016 | 156.38 | 0.865s |
| TH-234 | 370.17 | 92.59 | 277. | 23. | 0.013 | 106.98 | 0.866D |
| AC-228 | 373.21 | 93.35 | 937. | 29. | 0.016 | 151.63 | 0.867s |
| Gd-153 | 389.83 | 97.50 | 744. | -27. | -0.015 | 146.33 | 0.871s |
| Np-239 | 397.83 | 99.50 | 771. | -27. | -0.015 | 148.53 | 0.873s |
| Gd-153 | 412.64 | 103.20 | 798. | -27. | -0.015 | 150.37 | 0.877 |
| Np-239 | 414.64 | 103.70 | 824. | -20. | -0.011 | 201.43 | 0.878 |
| EU-155 | 421.10 | 105.31 | 845. | 0. | 0.000 | 1000.00 | 0.879s |
| Np-239 | 424.37 | 106.13 | 559. | 22. | 0.012 | 154.43 | 0.880s |
| EU-152 | 487.00 | 121.78 | 271. | 7. | 0.004 | 319.41 | 0.896s |
| CO-57 | 488.14 | 122.06 | 243. | -3. | -0.002 | 664.08 | 0.897s |
| EU-154 | 492.30 | 123.10 | 258. | -9. | -0.005 | 250.08 | 0.898s |
| PA-234 | 525.11 | 131.29 | 609. | -29. | -0.016 | 121.51 | 0.906 |
| HF-181 | 532.03 | 133.02 | 638. | -29. | -0.016 | 124.06 | 0.908s |
| CE-144 | 534.09 | 133.54 | 667. | -29. | -0.016 | 126.73 | 0.909s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| HF-181 | 545.14 | 136.30 | 697. | -29. | -0.016 | 129.01 | 0.911s |
| CO-57 | 545.83 | 136.47 | 663. | 20. | 0.011 | 184.39 | 0.912s |
| Tc-99m | 561.99 | 140.51 | 420. | -25. | -0.014 | 116.33 | 0.916s |
| U-235 | 575.10 | 143.79 | 445. | -25. | -0.014 | 119.25 | 0.919s |
| Ba-140 | 650.65 | 162.66 | 298. | 6. | 0.004 | 387.30 | 0.939s |
| U-235 | 653.53 | 163.38 | 304. | 0. | 0.000 | 1000.00 | 0.939s |
| CE-139 | 663.43 | 165.85 | 284. | -24. | -0.013 | 102.90 | 0.942 |
| Cf-251 | 706.45 | 176.60 | 143. | 12. | 0.006 | 184.94 | 0.953s |
| TH-229 | 774.13 | 193.51 | 170. | -12. | -0.007 | 195.49 | 0.970 |
| U-235 | 821.46 | 205.33 | 169. | -13. | -0.007 | 193.86 | 0.982s |
| TH-229 | 843.54 | 210.85 | 235. | -27. | -0.015 | 105.97 | 0.988 |
| Cf-251 | 908.18 | 227.00 | 165. | -8. | -0.004 | 302.46 | 1.004 |
| PB-212 | 954.74 | 238.63 | 97. | 661. | 0.367 | 4.43 | 1.016D |
| PB-214 | 968.20 | 242.00 | 959. | 20. | 0.011 | 216.14 | 1.019s |
| EU-152 | 978.99 | 244.69 | 979. | 20. | 0.011 | 217.81 | 1.022 |
| TH-227 | 1025.21 | 256.24 | 147. | -22. | -0.012 | 106.75 | 1.034 |
| Cd-113m | 1055.07 | 263.70 | 164. | -2. | -0.001 | 779.71 | 1.041s |
| BI-210M | 1063.60 | 265.83 | 168. | -12. | -0.007 | 155.31 | 1.044s |
| TL-208 | 1109.47 | 277.29 | 38. | 26. | 0.014 | 45.51 | 0.847 |
| Hg-203 | 1117.10 | 279.20 | 143. | -13. | -0.007 | 133.01 | 1.057s |
| I-131 | 1137.51 | 284.30 | 110. | -8. | -0.004 | 247.80 | 1.062s |
| PB-214 | 1179.58 | 294.81 | 51. | 204. | 0.113 | 9.97 | 0.985s |
| PB-212 | 1200.54 | 300.05 | 50. | 73. | 0.041 | 24.22 | 1.105 |
| PA-231 | 1200.63 | 300.07 | 572. | -20. | -0.011 | 172.00 | 1.078 |
| PA-233 | 1201.07 | 300.18 | 553. | -20. | -0.011 | 169.05 | 1.078 |
| PA-231 | 1210.95 | 302.65 | 533. | -20. | -0.011 | 165.66 | 1.081s |
| BA-133 | 1211.76 | 302.85 | 513. | -20. | -0.011 | 162.56 | 1.081s |
| Ba-140 | 1219.75 | 304.85 | 506. | -20. | -0.011 | 161.12 | 1.083 |
| Ir-192 | 1234.12 | 308.44 | 526. | 0. | 0.000 | 1000.00 | 1.086s |
| PA-233 | 1248.42 | 312.01 | 526. | 0. | 0.000 | 1000.00 | 1.090 |
| Ir-192 | 1266.34 | 316.49 | 526. | 0. | 0.000 | 1000.00 | 1.094s |
| CR-51 | 1280.73 | 320.08 | 526. | 0. | 0.000 | 1000.00 | 1.098s |
| La-140 | 1315.45 | 328.76 | 70. | 44. | 0.025 | 38.29 | 1.107s |
| Cf-249 | 1334.18 | 333.44 | 37. | 25. | 0.014 | 48.93 | 1.111s |
| AC-228 | 1352.69 | 338.07 | 42. | 143. | 0.079 | 11.82 | 1.091 |
| Cs-136 | 1362.71 | 340.57 | 294. | 16. | 0.009 | 157.91 | 1.119s |
| EU-152 | 1377.58 | 344.29 | 310. | 15. | 0.008 | 164.98 | 1.122 |
| HF-181 | 1383.75 | 345.83 | 325. | 0. | 0.000 | 1000.00 | 1.124s |
| PB-214 | 1407.04 | 351.65 | 40. | 263. | 0.146 | 7.63 | 1.121 |
| BA-133 | 1424.46 | 356.00 | 423. | -19. | -0.011 | 152.27 | 1.134s |
| I-131 | 1458.41 | 364.48 | 52. | 13. | 0.007 | 112.09 | 1.142s |
| BA-133 | 1535.87 | 383.84 | 140. | 16. | 0.009 | 109.90 | 1.162s |
| Cf-249 | 1552.32 | 387.95 | 156. | 16. | 0.009 | 115.18 | 1.165 |
| SN-113 | 1567.28 | 391.69 | 160. | 15. | 0.008 | 120.22 | 1.169s |
| AG-108M | 1736.34 | 433.94 | 40. | 10. | 0.006 | 127.80 | 1.211s |
| pm-146 | 1816.14 | 453.88 | 44. | 11. | 0.006 | 121.85 | 1.230s |
| SB-125 | 1854.10 | 463.37 | 160. | -13. | -0.007 | 137.07 | 1.240s |
| Ir-192 | 1872.88 | 468.06 | 182. | -17. | -0.009 | 116.96 | 1.244s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BE-7 | 1911.04 | 477.60 | 83. | 12. | 0.007 | 108.10 | 1.254s |
| HF-181 | 1928.65 | 482.00 | 88. | 12. | 0.007 | 111.11 | 1.258s |
| La-140 | 1948.75 | 487.02 | 118. | 12. | 0.007 | 128.00 | 1.263s |
| RU-103 | 1988.90 | 497.05 | 60. | -7. | -0.004 | 219.93 | 1.273s |
| RH-106 | 2048.16 | 511.86 | 93. | 50. | 0.028 | 50.84 | 2.537s |
| Nd-147 | 2124.72 | 531.00 | 48. | 15. | 0.008 | 97.08 | 1.306s |
| Ba-140 | 2149.77 | 537.26 | 35. | 13. | 0.007 | 97.24 | 1.312s |
| CS-134 | 2253.70 | 563.24 | 52. | 4. | 0.002 | 371.37 | 1.337s |
| CS-134 | 2278.04 | 569.32 | 35. | 13. | 0.007 | 68.81 | 1.342 |
| PA-234 | 2278.64 | 569.47 | 58. | -3. | -0.002 | 341.52 | 1.343 |
| BI-207 | 2279.57 | 569.70 | 52. | 4. | 0.002 | 259.81 | 1.343 |
| TL-208 | 2332.12 | 582.84 | 38. | 228. | 0.126 | 8.93 | 1.522 |
| SB-125 | 2402.79 | 600.50 | 334. | 12. | 0.006 | 223.06 | 1.372s |
| SB-124 | 2411.71 | 602.73 | 346. | 12. | 0.007 | 226.51 | 1.374s |
| CS-134 | 2419.63 | 604.71 | 430. | -15. | -0.008 | 195.42 | 1.376s |
| BI-214 | 2437.09 | 609.07 | 31. | 223. | 0.124 | 9.13 | 1.331 |
| RU-103 | 2441.99 | 610.30 | 415. | -15. | -0.008 | 191.28 | 1.382s |
| PM-144 | 2473.05 | 618.06 | 42. | 12. | 0.007 | 83.10 | 1.389s |
| RH-106 | 2488.47 | 621.92 | 64. | 2. | 0.001 | 598.30 | 1.392s |
| SB-125 | 2544.37 | 635.89 | 38. | 13. | 0.007 | 73.33 | 1.406s |
| I-131 | 2548.71 | 636.97 | 44. | 7. | 0.004 | 137.86 | 1.407s |
| AG-110M | 2631.87 | 657.76 | 212. | -19. | -0.010 | 113.35 | 1.427s |
| CS-137 | 2646.43 | 661.40 | 15. | 119. | 0.066 | 11.70 | 1.554s |
| PM-144 | 2787.02 | 696.54 | 42. | 15. | 0.008 | 93.65 | 1.463s |
| NB-94 | 2811.37 | 702.63 | 42. | -2. | -0.001 | 691.01 | 1.469s |
| SB-124 | 2892.00 | 722.79 | 103. | -2. | -0.001 | 721.11 | 1.488s |
| AG-108M | 2892.61 | 722.94 | 101. | 0. | 0.000 | 1000.00 | 1.488s |
| EU-154 | 2894.28 | 723.36 | 101. | 0. | 0.000 | 1000.00 | 1.488s |
| ZR-95 | 2897.65 | 724.20 | 101. | 0. | 0.000 | 1000.00 | 1.489s |
| BI-212 | 2909.35 | 727.12 | 20. | 55. | 0.031 | 22.64 | 1.512 |
| pm-146 | 2943.74 | 735.72 | 65. | -16. | -0.009 | 107.85 | 1.500s |
| pm-146 | 2989.50 | 747.16 | 42. | 0. | 0.000 | 1000.00 | 1.510s |
| ZR-95 | 3027.78 | 756.73 | 37. | 10. | 0.005 | 137.89 | 1.519s |
| AG-110M | 3056.63 | 763.94 | 82. | -20. | -0.011 | 68.79 | 1.526s |
| NB-95 | 3064.02 | 765.79 | 80. | 17. | 0.009 | 79.01 | 1.528s |
| PA-234M | 3066.51 | 766.41 | 54. | 15. | 0.008 | 73.52 | 1.528s |
| EU-152 | 3116.54 | 778.92 | 56. | -19. | -0.010 | 88.68 | 1.540 |
| BI-212 | 3143.00 | 785.53 | 0. | 26. | 0.014 | 19.61 | 1.625 |
| CS-134 | 3184.33 | 795.87 | 57. | 15. | 0.008 | 74.53 | 1.556 |
| CS-134 | 3208.67 | 801.95 | 77. | 14. | 0.008 | 90.42 | 1.561s |
| CO-58 | 3243.96 | 810.78 | 66. | -4. | -0.002 | 260.58 | 1.569s |
| La-140 | 3263.94 | 815.77 | 71. | 0. | 0.000 | 1000.00 | 1.574s |
| MN-54 | 3340.25 | 834.85 | 23. | 25. | 0.014 | 46.16 | 1.591s |
| TL-208 | 3441.15 | 860.08 | 0. | 39. | 0.022 | 16.01 | 1.250 |
| NB-94 | 3485.23 | 871.10 | 16. | 3. | 0.002 | 172.19 | 1.625s |
| EU-154 | 3493.77 | 873.23 | 29. | 11. | 0.006 | 74.10 | 1.627s |
| PA-234 | 3522.96 | 880.53 | 41. | 11. | 0.006 | 85.40 | 1.633s |
| PA-234 | 3533.80 | 883.24 | 53. | 9. | 0.005 | 115.00 | 1.636s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AG-110M | 3539.58 | 884.68 | 62. | 0. | 0.000 | 1000.00 | 1.637s |
| Sc-46 | 3557.96 | 889.28 | 129. | -18. | -0.010 | 92.10 | 1.641s |
| y-88 | 3593.00 | 898.04 | 15. | 7. | 0.004 | 127.38 | 1.649s |
| AC-228 | 3644.63 | 910.95 | 9. | 157. | 0.087 | 9.07 | 1.258s |
| AG-110M | 3750.78 | 937.49 | 25. | 3. | 0.002 | 370.93 | 1.685s |
| PA-234 | 3784.89 | 946.02 | 20. | 9. | 0.005 | 114.22 | 1.692s |
| EU-152 | 3857.23 | 964.11 | 145. | 15. | 0.008 | 119.97 | 1.709s |
| AC-228 | 3875.90 | 968.78 | 26. | 93. | 0.052 | 16.37 | 1.032s |
| EU-154 | 3986.08 | 996.33 | 20. | 9. | 0.005 | 82.14 | 1.737s |
| PA-234M | 4004.75 | 1001.00 | 27. | 9. | 0.005 | 91.71 | 1.742s |
| EU-154 | 4019.86 | 1004.77 | 38. | 9. | 0.005 | 107.77 | 1.745s |
| Cs-136 | 4192.99 | 1048.07 | 30. | 3. | 0.002 | 264.58 | 1.783s |
| RH-106 | 4202.15 | 1050.36 | 42. | -3. | -0.002 | 310.91 | 1.785s |
| BI-207 | 4255.33 | 1063.66 | 32. | -4. | -0.002 | 325.32 | 1.797s |
| Ga-68 | 4310.28 | 1077.40 | 16. | 4. | 0.002 | 241.60 | 1.809s |
| FE-59 | 4397.65 | 1099.25 | 27. | -2. | -0.001 | 708.52 | 1.828s |
| EU-152 | 4448.93 | 1112.07 | 114. | -14. | -0.008 | 108.82 | 1.839s |
| BI-214 | 4481.77 | 1120.29 | 34. | 16. | 0.009 | 57.89 | 1.847 |
| Sc-46 | 4482.82 | 1120.55 | 43. | 14. | 0.008 | 69.58 | 1.847 |
| Ta-182 | 4485.82 | 1121.30 | 54. | 13. | 0.007 | 85.28 | 1.847 |
| CO-60 | 4693.48 | 1173.24 | 37. | -4. | -0.002 | 324.08 | 1.892s |
| Ta-182 | 4756.71 | 1189.05 | 43. | -6. | -0.003 | 265.36 | 1.906 |
| Ta-182 | 4886.09 | 1221.41 | 27. | 6. | 0.004 | 189.55 | 1.934 |
| Co-56 | 4953.53 | 1238.28 | 16. | 35. | 0.019 | 30.99 | 1.948s |
| NA-22 | 5098.46 | 1274.53 | 23. | 3. | 0.002 | 209.28 | 1.979s |
| FE-59 | 5166.69 | 1291.60 | 11. | 10. | 0.005 | 87.78 | 1.993s |
| CO-60 | 5330.21 | 1332.50 | 40. | -12. | -0.006 | 129.95 | 2.028s |
| AG-110M | 5537.27 | 1384.30 | 17. | -5. | -0.003 | 198.49 | 2.071s |
| EU-152 | 5632.02 | 1408.00 | 11. | 4. | 0.002 | 221.56 | 2.090s |
| K-40 | 5844.42 | 1461.14 | 11. | 450. | 0.250 | 4.83 | 2.325 |
| La-140 | 6384.26 | 1596.21 | 30. | -15. | -0.008 | 91.89 | 2.242s |
| SB-124 | 6763.00 | 1690.98 | 19. | -5. | -0.003 | 221.06 | 2.317s |
| BI-214 | 7056.73 | 1764.49 | 20. | 12. | 0.006 | 62.05 | 2.373s |
| Co-56 | 7084.14 | 1771.35 | 33. | 12. | 0.006 | 75.76 | 2.379s |
| y-88 | 7342.69 | 1836.06 | 6. | 2. | 0.001 | 382.88 | 2.428s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | 3.4120E+00 | | | | 5.31E+01 | |
| | | | 477.60 | 3.412E+00 | ?( | 1.247E+01 | 1.08E+02 1.05E+01 G |

(Page 10 of 22)

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| NA-22 | C 2.0269E-01 | | | | | 9.50E+02 | |
| | | 1274.53 | 2.027E-01 | ?( | 1.514E+00 | 2.09E+02 | 9.99E+01 G |
| K-40 | N 2.8517E+02 | | | | | 4.66E+11 | |
| | | 1460.83 | 2.852E+02 | (P | 1.150E+01 | 4.83E+00 | 1.07E+01 G |
| Sc-46 | F -8.3173E-01 | | | | | 8.38E+01 | |
| | | 889.28 | -8.317E-01 | ?( | 2.565E+00 | 9.21E+01 | 1.00E+02 G |
| | | 1120.55 | 7.895E-01 | + | 1.824E+00 | 6.96E+01 | 1.00E+02 G |
| MN-54 | C 1.0843E+00 | | | | | 3.12E+02 | |
| | | 834.85 | 1.084E+00 | *( | 1.109E+00 | 4.62E+01 | 1.00E+02 G |
| FE-59 | F 5.0476E-01 | | | | | 4.45E+01 | |
| | | 1099.25 | -1.599E-01 | ?( | 2.568E+00 | 7.09E+02 | 5.65E+01 G |
| | | 1291.60 | 1.374E+00 | ?( | 2.615E+00 | 8.78E+01 | 4.32E+01 G |
| Co-56 | C 1.2261E+00 | | | | | 7.73E+01 | |
| | | 846.77 | -4.445E-02 | %( | 1.217E+00 | 1.13E+03 | 9.99E+01 G |
| | | 1238.28 | 3.148E+00 | ?( | 1.920E+00 | 3.10E+01 | 6.61E+01 G |
| | | 1037.84 | -3.670E-01 | % | 1.036E+01 | 1.21E+03 | 1.41E+01 G |
| | | 1771.35 | 5.944E+00 | ? | 1.507E+01 | 7.58E+01 | 1.55E+01 A |
| CO-57 | C 2.1897E-01 | | | | | 2.72E+02 | |
| | | 122.06 | -4.741E-02 | &( | 1.072E+00 | 6.64E+02 | 8.56E+01 G |
| | | 136.47 | 2.354E+00 | &( | 1.452E+01 | 1.84E+02 | 1.07E+01 G |
| CO-58 | C -1.9451E-01 | | | | | 7.09E+01 | |
| | | 810.78 | -1.945E-01 | ?( | 1.760E+00 | 2.61E+02 | 9.95E+01 G |
| CO-60 | F -7.3415E-01 | | | | | 1.93E+03 | |
| | | 1332.50 | -7.342E-01 | ?( | 2.017E+00 | 1.30E+02 | 1.00E+02 G |
| | | 1173.24 | -2.472E-01 | + | 1.779E+00 | 3.24E+02 | 9.99E+01 G |
| ZN-65 | F -5.8437E-02 | | | | | 2.44E+02 | |
| | | 1115.55 | -5.844E-02 | %( | 5.330E+00 | 2.62E+03 | 5.06E+01 G |
| NB-94 | I 4.0290E-02 | | | | | 7.41E+06 | |
| | | 702.63 | -7.891E-02 | ?( | 1.298E+00 | 6.91E+02 | 9.79E+01 G |
| | | 871.10 | 1.571E-01 | ?( | 9.700E-01 | 1.72E+02 | 9.99E+01 G |
| ZR-95 | I 7.2460E-01 | | | | | 6.40E+01 | |
| | | 756.73 | 7.246E-01 | ?( | 2.337E+00 | 1.38E+02 | 5.45E+01 G |
| | | 724.20 | 0.000E+00 | - | 4.433E+00 | 1.00E+03 | 4.42E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| NB-95 | I | 6.9326E-01 | | | | | 6.40E+01 | |
| | | | 765.79 | 6.933E-01 | ?( | 1.829E+00 | 7.90E+01 | 9.98E+01 G |
| RU-103 | I | -2.3073E-01 | | | | | 3.93E+01 | |
| | | | 497.05 | -2.307E-01 | ?( | 1.279E+00 | 2.20E+02 | 9.09E+01 G |
| | | | 610.30 | -9.195E+00 | + | 5.907E+01 | 1.91E+02 | 5.75E+00 GA |
| RH-106 | I | 6.7748E-01 | | | | | 3.74E+02 | |
| | | | 621.92 | 6.775E-01 | ( | 1.422E+01 | 5.98E+02 | 9.93E+00 G |
| | | | 1050.36 | -1.006E+01 | + | 1.104E+02 | 3.11E+02 | 1.56E+00 G |
| | | | 511.86 | 7.716E+00 | ? | 7.304E+00 | 5.08E+01 | 2.00E+01 GA |
| AG-108M | C | 3.0030E-01 | | | | | 1.53E+05 | |
| | | | 433.94 | 3.003E-01 | ?( | 9.664E-01 | 1.28E+02 | 9.05E+01 G |
| | | | 722.94 | 0.000E+00 | - | 2.152E+00 | 1.00E+03 | 9.08E+01 G |
| | | | 614.28 | -9.351E-02 | % | 3.730E+00 | 1.18E+03 | 8.98E+01 G |
| AG-110M | F | 1.3448E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | 0.000E+00 | ?( | 2.489E+00 | 1.00E+03 | 7.27E+01 G |
| | | | 657.76 | -7.213E-01 | + | 2.742E+00 | 1.13E+02 | 9.46E+01 G |
| | | | 937.49 | 4.189E-01 | ?( | 3.632E+00 | 3.71E+02 | 3.44E+01 G |
| | | | 1384.30 | -1.334E+00 | + | 5.850E+00 | 1.98E+02 | 2.43E+01 G |
| | | | 763.94 | -3.629E+00 | + | 8.271E+00 | 6.88E+01 | 2.23E+01 G |
| SN-113 | F | 6.0048E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | 6.005E-01 | &( | 2.431E+00 | 1.20E+02 | 6.40E+01 G |
| SB-124 | F | 4.1083E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | 4.108E-01 | ?( | 3.136E+00 | 2.27E+02 | 9.83E+01 G |
| | | | 1690.98 | -7.941E-01 | + | 3.657E+00 | 2.21E+02 | 4.78E+01 G |
| | | | 722.79 | -7.298E-01 | + | 1.825E+01 | 7.21E+02 | 1.08E+01 G |
| SB-125 | I | 1.5191E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | 9.088E-02 | &( | 3.415E+00 | 1.47E+03 | 2.96E+01 G |
| | | | 600.50 | 2.251E+00 | ( | 1.692E+01 | 2.23E+02 | 1.79E+01 G |
| | | | 635.89 | 4.102E+00 | ?( | 1.003E+01 | 7.33E+01 | 1.13E+01 G |
| | | | 463.37 | -3.627E+00 | + | 1.679E+01 | 1.37E+02 | 1.05E+01 G |
| I-131 | I | 6.3677E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | 3.819E-01 | ?( | 1.067E+00 | 1.12E+02 | 8.17E+01 G |
| | | | 284.30 | -2.629E+00 | + | 1.695E+01 | 2.48E+02 | 6.14E+00 G |
| | | | 636.97 | 3.540E+00 | &( | 1.683E+01 | 1.38E+02 | 7.17E+00 G |
| Gd-153 | F | -1.0810E+00 | | | | | 2.42E+02 | |
| | | | 97.50 | -1.081E+00 | ( | 5.276E+00 | 1.46E+02 | 3.00E+01 G |
| | | | 103.20 | -1.483E+00 | + | 7.437E+00 | 1.50E+02 | 2.18E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Ga-68 | C | 7.2702E+00 | | | | | 4.71E-02 | |
| | | | 1077.40 | 7.270E+00 | ?( | 4.032E+01 | 2.42E+02 | 3.30E+00 G |
| Tc-99m | I | -3.7367E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | -3.737E-01 | &( | 1.451E+00 | 1.16E+02 | 8.93E+01 G |
| BA-133 | F | -7.3499E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -7.350E-01 | ?( | 3.750E+00 | 1.52E+02 | 6.20E+01 G |
| | | | 302.85 | -2.288E+00 | + | 1.245E+01 | 1.63E+02 | 1.83E+01 G |
| | | | 383.84 | 4.357E+00 | ? | 1.611E+01 | 1.10E+02 | 8.94E+00 GA |
| | | | 80.99 | -1.144E+00 | + | 3.379E+00 | 1.11E+02 | 3.41E+01 GA |
| CS-134 | I | 6.0562E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | -5.359E-01 | ?( | 3.517E+00 | 1.95E+02 | 9.76E+01 G |
| | | | 795.87 | 7.582E-01 | &( | 1.883E+00 | 7.45E+01 | 8.55E+01 G |
| | | | 569.32 | 2.839E+00 | ( | 6.483E+00 | 6.88E+01 | 1.54E+01 G |
| | | | 801.95 | 7.046E+00 | ?( | 2.141E+01 | 9.04E+01 | 8.69E+00 G |
| | | | 563.24 | 1.572E+00 | ?( | 1.427E+01 | 3.71E+02 | 8.35E+00 G |
| CS-137 | I | 5.1445E+00 | | | | | 1.10E+04 | |
| | | | 661.66 | 5.145E+00 | ( | 9.086E-01 | 1.17E+01 | 8.52E+01 G |
| CE-139 | F | -4.1449E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | -4.145E-01 | &( | 1.425E+00 | 1.03E+02 | 7.99E+01 G |
| Ba-140 | I | 1.6276E+00 | | | | | 1.28E+01 | |
| | | | 537.26 | 1.677E+00 | ?( | 3.919E+00 | 9.72E+01 | 2.44E+01 G |
| | | | 162.66 | 1.435E+00 | ?( | 1.883E+01 | 3.87E+02 | 6.22E+00 G |
| | | | 304.85 | -9.839E+00 | & | 5.307E+01 | 1.61E+02 | 4.29E+00 G |
| La-140 | I | -8.4652E-02 | | | | | 1.28E+01 | |
| | | | 1596.21 | -1.140E+00 | ?( | 2.146E+00 | 9.19E+01 | 9.54E+01 G |
| | | | 487.02 | 7.978E-01 | + | 3.456E+00 | 1.28E+02 | 4.55E+01 G |
| | | | 328.76 | 4.876E+00 | ?( | 4.576E+00 | 3.83E+01 | 2.03E+01 G |
| | | | 815.77 | 0.000E+00 | + | 7.788E+00 | 1.00E+03 | 2.33E+01 G |
| CE-141 | I | -3.6097E-02 | | | | | 3.25E+01 | |
| | | | 145.44 | -3.610E-02 | %( | 2.810E+00 | 2.30E+03 | 4.82E+01 G |
| CE-144 | I | -3.2895E+00 | | | | | 2.85E+02 | |
| | | | 133.54 | -3.289E+00 | ?( | 1.389E+01 | 1.27E+02 | 1.11E+01 G |
| PM-144 | C | 5.0541E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | 5.916E-01 | &( | 1.276E+00 | 9.36E+01 | 9.90E+01 G |
| | | | 618.06 | 4.193E-01 | ?( | 1.172E+00 | 8.31E+01 | 9.91E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| EU-152 | F | 1.9752E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | 1.329E+00 | ?( | 7.372E+00 | 1.65E+02 | 2.65E+01 G |
| | | | 1112.07 | -5.729E+00 | + | 2.101E+01 | 1.09E+02 | 1.36E+01 G |
| | | | 121.78 | 3.122E-01 | &( | 3.379E+00 | 3.19E+02 | 2.86E+01 G |
| | | | 778.92 | -5.979E+00 | + | 1.212E+01 | 8.87E+01 | 1.29E+01 G |
| | | | 964.11 | 4.882E+00 | ( | 1.974E+01 | 1.20E+02 | 1.46E+01 G |
| | | | 244.69 | 4.905E+00 | ?( | 3.567E+01 | 2.18E+02 | 7.58E+00 G |
| | | | 1408.00 | 1.147E+00 | ? | 5.753E+00 | 2.22E+02 | 2.10E+01 GA |
| EU-154 | I | 3.3690E+00 | | | | | 3.14E+03 | |
| | | | 873.23 | 4.190E+00 | ?( | 1.038E+01 | 7.41E+01 | 1.23E+01 G |
| | | | 123.10 | -2.741E-01 | & | 2.320E+00 | 2.50E+02 | 4.08E+01 G |
| | | | 1274.54 | -1.151E-01 | % | 4.624E+00 | 1.10E+03 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | - | 9.671E+00 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | 2.409E+00 | ?( | 8.875E+00 | 1.08E+02 | 1.80E+01 G |
| | | | 996.33 | 4.049E+00 | ?( | 1.125E+01 | 8.21E+01 | 1.06E+01 G |
| HF-181 | F | 4.5042E-01 | | | | | 4.24E+01 | |
| | | | 482.00 | 4.504E-01 | ?( | 1.693E+00 | 1.11E+02 | 8.05E+01 G |
| | | | 133.02 | -8.407E-01 | + | 3.477E+00 | 1.24E+02 | 4.33E+01 G |
| | | | 345.83 | 0.000E+00 | - | 1.331E+01 | 1.00E+03 | 1.51E+01 G |
| | | | 136.30 | -6.310E+00 | + | 2.713E+01 | 1.29E+02 | 5.85E+00 G |
| Ta-182 | F | 1.7431E+00 | | | | | 1.14E+02 | |
| | | | 1121.30 | 2.025E+00 | ( | 5.803E+00 | 8.53E+01 | 3.49E+01 G |
| | | | 1221.41 | 1.379E+00 | ( | 5.830E+00 | 1.90E+02 | 2.70E+01 G |
| | | | 1189.05 | -2.014E+00 | - | 1.178E+01 | 2.65E+02 | 1.62E+01 G |
| Hg-203 | F | -3.1802E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | -3.180E-01 | &( | 1.430E+00 | 1.33E+02 | 8.15E+01 G |
| TL-208 | N | 9.0049E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 9.067E+00 | ( | 1.257E+00 | 8.93E+00 | 8.45E+01 G |
| | | | 277.28 | 8.172E+00 | ( | 9.881E+00 | 4.55E+01 | 6.31E+00 G |
| | | | 860.56 | 1.412E+01 | + | 2.668E+00 | 1.60E+01 | 1.24E+01 G |
| pm-146 | C | 3.1179E-01 | | | | | 2.02E+03 | |
| | | | 747.16 | 0.000E+00 | ?( | 3.914E+00 | 1.00E+03 | 3.40E+01 G |
| | | | 735.72 | -2.902E+00 | + | 7.173E+00 | 1.08E+02 | 2.25E+01 G |
| | | | 453.88 | 4.749E-01 | ?( | 1.451E+00 | 1.22E+02 | 6.50E+01 G |
| y-88 | F | 2.3855E-01 | | | | | 1.07E+02 | |
| | | | 898.04 | 3.469E-01 | ?( | 1.029E+00 | 1.27E+02 | 9.37E+01 G |
| | | | 1836.06 | 1.362E-01 | ?( | 1.180E+00 | 3.83E+02 | 9.92E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Cd-113m | | -7.4507E+02 | | | | | 5.33E+03 | |
| | | | 263.70 | -7.451E+02 | ( | 1.994E+04 | 7.80E+02 | 6.00E-03 K |
| Cf-251 | T | 1.0029E+00 | | | | | 3.28E+05 | |
| | | | 176.60 | 1.003E+00 | ?( | 5.029E+00 | 1.85E+02 | 1.70E+01 G |
| | | | 227.00 | -2.196E+00 | + | 1.718E+01 | 3.02E+02 | 6.30E+00 GA |
| Cf-249 | T | 1.1839E+00 | | | | | 1.28E+05 | |
| | | | 387.95 | 5.967E-01 | ( | 2.313E+00 | 1.15E+02 | 6.60E+01 G |
| | | | 333.44 | 3.683E+00 | &( | 4.496E+00 | 4.89E+01 | 1.55E+01 G |
| Sn-126 | | 4.4506E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | 3.158E+00 | } | 4.936E+00 | 2.50E+01 | 3.75E+01 GA |
| | | | 64.28 | 4.451E+00 | &( | 1.617E+01 | 1.09E+02 | 9.70E+00 G |
| | | | 86.94 | 3.612E+00 | } | 2.125E+01 | 9.34E+01 | 9.04E+00 GA |
| PB-210 | N | 4.2382E+01 | | | | | 8.14E+03 | |
| | | | 46.54 | 4.238E+01 | (P | 3.335E+01 | 3.16E+01 | 4.25E+00 G |
| PB-212 | N | 2.7328E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 2.733E+01 | (P | 2.005E+00 | 4.43E+00 | 4.33E+01 G |
| | | | 300.03 | 4.672E+01 | + | 2.274E+01 | 2.42E+01 | 3.28E+00 GA |
| PB-214 | N | 1.6380E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.638E+01 | ( | 2.004E+00 | 7.63E+00 | 3.76E+01 G |
| | | | 295.09 | 2.186E+01 | + P | 3.871E+00 | 9.97E+00 | 1.93E+01 G |
| | | | 242.00 | 4.953E+00 | & | 3.575E+01 | 2.16E+02 | 7.43E+00 GA |
| BI-207 | C | 1.3541E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | 1.354E-01 | ( | 1.229E+00 | 2.60E+02 | 9.77E+01 G |
| | | | 1063.66 | -2.837E-01 | + | 2.062E+00 | 3.25E+02 | 7.45E+01 G |
| BI-212 | N | 2.8866E+01 | | | | | 6.98E+02 | |
| | | | 727.17 | 2.887E+01 | ( | 1.236E+01 | 2.26E+01 | 7.55E+00 G |
| | | | 785.42 | 8.526E+01 | + | 2.417E+01 | 1.96E+01 | 1.28E+00 GA |
| BI-214 | N | 1.6819E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.682E+01 | ( | 2.161E+00 | 9.13E+00 | 4.61E+01 G |
| | | | 1120.29 | 5.725E+00 | - | 1.082E+01 | 5.79E+01 | 1.51E+01 G |
| | | | 1764.49 | 5.943E+00 | - | 1.210E+01 | 6.21E+01 | 1.54E+01 G |
| BI-210M | T | -4.6236E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | -4.624E-01 | &( | 2.429E+00 | 1.55E+02 | 5.00E+01 G |
| | | | 304.90 | -7.726E-03 | & | 8.286E+00 | 3.17E+04 | 2.80E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| AC-228 | N | 2.6027E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.547E+01 | ( | 2.660E+00 | 9.07E+00 | 2.90E+01 G |
| | | | 968.97 | 2.621E+01 | ( | 7.460E+00 | 1.64E+01 | 1.75E+01 G |
| | | | 338.32 | 2.711E+01 | (P | 6.247E+00 | 1.18E+01 | 1.20E+01 G |
| | | | 93.35 | 6.384E+00 | - | 3.225E+01 | 1.52E+02 | 5.56E+00 XA |
| TH-227 | N | 5.1420E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | 5.142E+00 | ?( | 2.490E+01 | 1.44E+02 | 8.00E+00 G |
| | | | 256.24 | -5.815E+00 | & | 1.587E+01 | 1.07E+02 | 7.00E+00 G |
| TH-229 | N | -4.2360E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | -4.236E+00 | ( | 2.240E+01 | 1.95E+02 | 4.40E+00 G |
| | | | 210.85 | -1.513E+01 | + | 4.077E+01 | 1.06E+02 | 2.99E+00 G |
| TH-234 | N | 1.8514E+01 | | | | | 1.63E+12 | |
| | | | 63.29 | 1.851E+01 | (P | 2.929E+01 | 4.87E+01 | 3.81E+00 G |
| | | | 92.59 | 4.985E+00 | - P | 1.778E+01 | 1.07E+02 | 5.58E+00 G |
| PA-231 | N | -1.4552E+01 | | | | | 1.20E+07 | |
| | | | 302.65 | -1.455E+01 | ?( | 8.069E+01 | 1.66E+02 | 2.88E+00 G |
| | | | 300.07 | -1.690E+01 | + | 9.725E+01 | 1.72E+02 | 2.46E+00 G |
| PA-234 | N | 1.2204E+00 | | | | | 1.63E+12 | |
| | | | 131.29 | -2.008E+00 | &( | 8.134E+00 | 1.22E+02 | 1.80E+01 G |
| | | | 946.02 | 3.245E+00 | &( | 8.491E+00 | 1.14E+02 | 1.34E+01 G |
| | | | 569.47 | -1.292E+00 | + | 1.543E+01 | 3.42E+02 | 8.20E+00 G |
| | | | 883.24 | 4.448E+00 | ?( | 1.745E+01 | 1.15E+02 | 9.60E+00 G |
| | | | 880.53 | 8.658E+00 | & | 2.491E+01 | 8.54E+01 | 6.00E+00 GA |
| PA-234M | N | 9.2946E+01 | | | | | 1.63E+12 | |
| | | | 1001.00 | 5.159E+01 | &( | 1.610E+02 | 9.17E+01 | 8.37E-01 G |
| | | | 766.41 | 2.107E+02 | ?( | 5.160E+02 | 7.35E+01 | 2.94E-01 G |
| U-235 | N | -3.0024E+00 | | | | | 2.57E+11 | |
| | | | 143.79 | -3.002E+00 | ?( | 1.195E+01 | 1.19E+02 | 1.10E+01 G |
| | | | 205.33 | -4.086E+00 | + | 2.040E+01 | 1.94E+02 | 5.01E+00 G |
| | | | 163.38 | 0.000E+00 | + | 2.337E+01 | 1.00E+03 | 5.08E+00 G |
| AM-241 | T | -4.5390E-01 | | | | | 1.58E+05 | |
| | | | 59.54 | -4.539E-01 | &( | 4.079E+00 | 3.34E+02 | 3.59E+01 G |
| Cs-136 | F | 2.1967E-01 | | | | | 1.30E+01 | |
| | | | 818.50 | -1.443E-02 | %( | 1.845E+00 | 3.64E+03 | 1.00E+02 G |
| | | | 1048.07 | 1.959E-01 | ?( | 1.844E+00 | 2.65E+02 | 8.00E+01 G |
| | | | 340.57 | 7.593E-01 | ?( | 4.032E+00 | 1.58E+02 | 4.69E+01 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

Np-239   T   1.1600E+00                                      2.36E+00
                          103.70-1.020E+00 &   6.862E+00 2.01E+02 2.40E+01 X
                          106.13 1.160E+00 &(  5.990E+00 1.54E+02 2.27E+01 G
                           99.50-2.158E+00 +   1.069E+01 1.49E+02 1.50E+01 X

Nd-147       2.0105E+00                                      1.11E+01
                          531.00 3.641E+00 &(  8.435E+00 9.71E+01 1.30E+01 G
                           91.10 1.262E+00 ?(  6.574E+00 1.56E+02 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| TH-227 | 50.14 | 349. | 19. | 0.010 | 144.42 | 5.142E+00 |
| AM-241 | 59.54 | 303. | -9. | -0.005 | 333.68 | -4.539E-01 |
| BA-133 | 80.99 | 330. | -30. | -0.016 | 110.85 | -1.144E+00 |
| EU-155 | 86.54 | 1086. | -29. | -0.016 | 164.37 | -1.182E+00 |
| Nd-147 | 91.10 | 993. | 29. | 0.016 | 156.38 | 1.262E+00 |
| Gd-153 | 97.50 | 744. | -27. | -0.015 | 146.33 | -1.081E+00 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Np-239 | 99.50 | 771. | -27. | -0.015 | 148.53 | -2.158E+00 | |
| Gd-153 | 103.20 | 798. | -27. | -0.015 | 150.37 | -1.483E+00 | |
| Np-239 | 103.70 | 824. | -20. | -0.011 | 201.43 | -1.020E+00 | |
| Np-239 | 106.13 | 559. | 22. | 0.012 | 154.43 | 1.160E+00 | |
| EU-152 | 121.78 | 271. | 7. | 0.004 | 319.41 | 3.122E-01 | |
| CO-57 | 122.06 | 243. | -3. | -0.002 | 664.08 | -4.741E-02 | |
| EU-154 | 123.10 | 258. | -9. | -0.005 | 250.08 | -2.741E-01 | |
| PA-234 | 131.29 | 609. | -29. | -0.016 | 121.51 | -2.008E+00 | |
| HF-181 | 133.02 | 638. | -29. | -0.016 | 124.06 | -8.407E-01 | |
| CE-144 | 133.54 | 667. | -29. | -0.016 | 126.73 | -3.289E+00 | |
| HF-181 | 136.30 | 697. | -29. | -0.016 | 129.01 | -6.310E+00 | |
| CO-57 | 136.47 | 663. | 20. | 0.011 | 184.39 | 2.354E+00 | |
| Tc-99m | 140.51 | 420. | -25. | -0.014 | 116.33 | -3.737E-01 | |
| U-235 | 143.79 | 445. | -25. | -0.014 | 119.25 | -3.002E+00 | |
| Ba-140 | 162.66 | 298. | 6. | 0.004 | 387.30 | 1.435E+00 | |
| CE-139 | 165.85 | 284. | -24. | -0.013 | 102.90 | -4.145E-01 | |
| Cf-251 | 176.60 | 143. | 12. | 0.006 | 184.94 | 1.003E+00 | |
| TH-229 | 193.51 | 170. | -12. | -0.007 | 195.49 | -4.236E+00 | |
| U-235 | 205.33 | 169. | -13. | -0.007 | 193.86 | -4.086E+00 | |
| TH-229 | 210.85 | 235. | -27. | -0.015 | 105.97 | -1.513E+01 | |
| Cf-251 | 227.00 | 165. | -8. | -0.004 | 302.46 | -2.196E+00 | |
| EU-152 | 244.69 | 979. | 20. | 0.011 | 217.81 | 4.905E+00 | |
| TH-227 | 256.24 | 147. | -22. | -0.012 | 106.75 | -5.815E+00 | |
| Cd-113m | 263.70 | 164. | -2. | -0.001 | 779.71 | -7.451E+02 | |
| BI-210M | 265.83 | 168. | -12. | -0.007 | 155.31 | -4.624E-01 | |
| Hg-203 | 279.20 | 143. | -13. | -0.007 | 133.01 | -3.180E-01 | |
| I-131 | 284.30 | 110. | -8. | -0.004 | 247.80 | -2.629E+00 | |
| PA-231 | 300.07 | 572. | -20. | -0.011 | 172.00 | -1.690E+01 | |
| PA-233 | 300.18 | 553. | -20. | -0.011 | 169.05 | -6.706E+00 | |
| PA-231 | 302.65 | 533. | -20. | -0.011 | 165.66 | -1.455E+01 | |
| BA-133 | 302.85 | 513. | -20. | -0.011 | 162.56 | -2.288E+00 | |
| Ba-140 | 304.85 | 506. | -20. | -0.011 | 161.12 | -9.839E+00 | |
| La-140 | 328.76 | 70. | 44. | 0.025 | 38.29 | 4.876E+00 | |
| Cf-249 | 333.44 | 37. | 25. | 0.014 | 48.93 | 3.683E+00 | |
| Cs-136 | 340.57 | 294. | 16. | 0.009 | 157.91 | 7.593E-01 | |
| EU-152 | 344.29 | 310. | 15. | 0.008 | 164.98 | 1.329E+00 | |
| BA-133 | 356.00 | 423. | -19. | -0.011 | 152.27 | -7.350E-01 | |
| I-131 | 364.48 | 52. | 13. | 0.007 | 112.09 | 3.819E-01 | |
| BA-133 | 383.84 | 140. | 16. | 0.009 | 109.90 | 4.357E+00 | |
| Cf-249 | 387.95 | 156. | 16. | 0.009 | 115.18 | 5.967E-01 | |
| SN-113 | 391.69 | 160. | 15. | 0.008 | 120.22 | 6.005E-01 | |
| AG-108M | 433.94 | 40. | 10. | 0.006 | 127.80 | 3.003E-01 | |
| pm-146 | 453.88 | 44. | 11. | 0.006 | 121.85 | 4.749E-01 | |
| SB-125 | 463.37 | 160. | -13. | -0.007 | 137.07 | -3.627E+00 | |
| Ir-192 | 468.06 | 182. | -17. | -0.009 | 116.96 | -9.240E-01 | |
| BE-7 | 477.60 | 83. | 12. | 0.007 | 108.10 | 3.412E+00 | |
| HF-181 | 482.00 | 88. | 12. | 0.007 | 111.11 | 4.504E-01 | |
| La-140 | 487.02 | 118. | 12. | 0.007 | 128.00 | 7.978E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| RU-103 | 497.05 | 60. | -7. | -0.004 | 219.93 | -2.307E-01 | |
| RH-106 | 511.86 | 93. | 50. | 0.028 | 50.84 | 7.716E+00 | |
| Nd-147 | 531.00 | 48. | 15. | 0.008 | 97.08 | 3.641E+00 | |
| Ba-140 | 537.26 | 35. | 13. | 0.007 | 97.24 | 1.677E+00 | |
| CS-134 | 563.24 | 52. | 4. | 0.002 | 371.37 | 1.572E+00 | |
| CS-134 | 569.32 | 35. | 13. | 0.007 | 68.81 | 2.839E+00 | |
| PA-234 | 569.47 | 58. | -3. | -0.002 | 341.52 | -1.292E+00 | |
| BI-207 | 569.70 | 52. | 4. | 0.002 | 259.81 | 1.354E-01 | |
| SB-125 | 600.50 | 334. | 12. | 0.006 | 223.06 | 2.251E+00 | |
| SB-124 | 602.73 | 346. | 12. | 0.007 | 226.51 | 4.108E-01 | |
| CS-134 | 604.71 | 430. | -15. | -0.008 | 195.42 | -5.359E-01 | |
| RU-103 | 610.30 | 415. | -15. | -0.008 | 191.28 | -9.195E+00 | |
| PM-144 | 618.06 | 42. | 12. | 0.007 | 83.10 | 4.193E-01 | |
| RH-106 | 621.92 | 64. | 2. | 0.001 | 598.30 | 6.775E-01 | |
| SB-125 | 635.89 | 38. | 13. | 0.007 | 73.33 | 4.102E+00 | |
| I-131 | 636.97 | 44. | 7. | 0.004 | 137.86 | 3.540E+00 | |
| AG-110M | 657.76 | 212. | -19. | -0.010 | 113.35 | -7.213E-01 | |
| PM-144 | 696.54 | 42. | 15. | 0.008 | 93.65 | 5.916E-01 | |
| NB-94 | 702.63 | 42. | -2. | -0.001 | 691.01 | -7.891E-02 | |
| SB-124 | 722.79 | 103. | -2. | -0.001 | 721.11 | -7.298E-01 | |
| pm-146 | 735.72 | 65. | -16. | -0.009 | 107.85 | -2.902E+00 | |
| ZR-95 | 756.73 | 37. | 10. | 0.005 | 137.89 | 7.246E-01 | |
| AG-110M | 763.94 | 82. | -20. | -0.011 | 68.79 | -3.629E+00 | |
| NB-95 | 765.79 | 80. | 17. | 0.009 | 79.01 | 6.933E-01 | |
| PA-234M | 766.41 | 54. | 15. | 0.008 | 73.52 | 2.107E+02 | |
| EU-152 | 778.92 | 56. | -19. | -0.010 | 88.68 | -5.979E+00 | |
| CS-134 | 795.87 | 57. | 15. | 0.008 | 74.53 | 7.582E-01 | |
| CS-134 | 801.95 | 77. | 14. | 0.008 | 90.42 | 7.046E+00 | |
| CO-58 | 810.78 | 66. | -4. | -0.002 | 260.58 | -1.945E-01 | |
| MN-54 | 834.85 | 23. | 25. | 0.014 | 46.16 | 1.084E+00 | |
| NB-94 | 871.10 | 16. | 3. | 0.002 | 172.19 | 1.571E-01 | |
| EU-154 | 873.23 | 29. | 11. | 0.006 | 74.10 | 4.190E+00 | |
| PA-234 | 880.53 | 41. | 11. | 0.006 | 85.40 | 8.658E+00 | |
| PA-234 | 883.24 | 53. | 9. | 0.005 | 115.00 | 4.448E+00 | |
| Sc-46 | 889.28 | 129. | -18. | -0.010 | 92.10 | -8.317E-01 | |
| y-88 | 898.04 | 15. | 7. | 0.004 | 127.38 | 3.469E-01 | |
| AG-110M | 937.49 | 25. | 3. | 0.002 | 370.93 | 4.189E-01 | |
| PA-234 | 946.02 | 20. | 9. | 0.005 | 114.22 | 3.245E+00 | |
| EU-152 | 964.11 | 145. | 15. | 0.008 | 119.97 | 4.882E+00 | |
| EU-154 | 996.33 | 20. | 9. | 0.005 | 82.14 | 4.049E+00 | |
| PA-234M | 1001.00 | 27. | 9. | 0.005 | 91.71 | 5.159E+01 | |
| EU-154 | 1004.77 | 38. | 9. | 0.005 | 107.77 | 2.409E+00 | |
| Cs-136 | 1048.07 | 30. | 3. | 0.002 | 264.58 | 1.959E-01 | |
| RH-106 | 1050.36 | 42. | -3. | -0.002 | 310.91 | -1.006E+01 | |
| BI-207 | 1063.66 | 32. | -4. | -0.002 | 325.32 | -2.837E-01 | |
| Ga-68 | 1077.40 | 16. | 4. | 0.002 | 241.60 | 7.270E+00 | |
| FE-59 | 1099.25 | 27. | -2. | -0.001 | 708.52 | -1.599E-01 | |
| EU-152 | 1112.07 | 114. | -14. | -0.008 | 108.82 | -5.729E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Sc-46 | 1120.55 | 43. | 14. | 0.008 | 69.58 | 7.895E-01 | |
| Ta-182 | 1121.30 | 54. | 13. | 0.007 | 85.28 | 2.025E+00 | |
| CO-60 | 1173.24 | 37. | -4. | -0.002 | 324.08 | -2.472E-01 | |
| Ta-182 | 1189.05 | 43. | -6. | -0.003 | 265.36 | -2.014E+00 | |
| Ta-182 | 1221.41 | 27. | 6. | 0.004 | 189.55 | 1.379E+00 | |
| NA-22 | 1274.53 | 23. | 3. | 0.002 | 209.28 | 2.027E-01 | |
| FE-59 | 1291.60 | 11. | 10. | 0.005 | 87.78 | 1.374E+00 | |
| CO-60 | 1332.50 | 40. | -12. | -0.006 | 129.95 | -7.342E-01 | |
| AG-110M | 1384.30 | 17. | -5. | -0.003 | 198.49 | -1.334E+00 | |
| EU-152 | 1408.00 | 11. | 4. | 0.002 | 221.56 | 1.147E+00 | |
| La-140 | 1596.21 | 30. | -15. | -0.008 | 91.89 | -1.140E+00 | |
| SB-124 | 1690.98 | 19. | -5. | -0.003 | 221.06 | -7.941E-01 | |
| y-88 | 1836.06 | 6. | 2. | 0.001 | 382.88 | 1.362E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | 3.4120E+00 | 3.4120E+00 | 1.081E+02% | 1.25E+01 |
| NA-22 | #A | 2.0269E-01 | 2.0269E-01 | 2.093E+02% | 1.51E+00 |
| K-40 | | 2.8517E+02 | 2.8517E+02 | 4.833E+00% | 1.15E+01 |
| Sc-46 | #A | -8.3173E-01 | -8.3173E-01 | 9.210E+01% | 2.57E+00 |
| CR-51 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.41E+01 |
| MN-54 | #A | 1.0843E+00 | 1.0843E+00 | 4.616E+01% | 1.11E+00 |
| FE-59 | #A | 5.0475E-01 | 5.0476E-01 | 8.778E+01% | 2.57E+00 |
| Co-56 | #C | 1.2261E+00 | 1.2261E+00 | 3.099E+01% | 1.22E+00 |
| CO-57 | #A | 2.1897E-01 | 2.1897E-01 | 1.844E+02% | 1.07E+00 |
| CO-58 | #A | -1.9451E-01 | -1.9451E-01 | 2.606E+02% | 1.76E+00 |
| CO-60 | #A | -7.3415E-01 | -7.3415E-01 | 1.299E+02% | 2.02E+00 |
| ZN-65 | #A | -5.8437E-02 | -5.8437E-02 | 2.619E+03% | 5.33E+00 |
| NB-94 | #A | 4.0290E-02 | 4.0290E-02 | 1.722E+02% | 1.30E+00 |
| ZR-95 | #A | 7.2460E-01 | 7.2460E-01 | 1.379E+02% | 2.34E+00 |
| NB-95 | #A | 6.9326E-01 | 6.9326E-01 | 7.901E+01% | 1.83E+00 |
| RU-103 | #A | -2.3073E-01 | -2.3073E-01 | 2.199E+02% | 1.28E+00 |
| RH-106 | #A | 6.7748E-01 | 6.7748E-01 | 5.983E+02% | 1.42E+01 |
| AG-108M | #A | 3.0030E-01 | 3.0030E-01 | 1.278E+02% | 9.66E-01 |
| AG-110M | #A | 1.3448E-01 | 1.3448E-01 | 3.709E+02% | 2.49E+00 |
| SN-113 | #A | 6.0047E-01 | 6.0048E-01 | 1.202E+02% | 2.43E+00 |
| SB-124 | #A | 4.1083E-01 | 4.1083E-01 | 2.265E+02% | 3.14E+00 |
| SB-125 | #A | 1.5191E+00 | 1.5191E+00 | 7.333E+01% | 3.42E+00 |
| I-131 | #A | 6.3675E-01 | 6.3677E-01 | 8.884E+01% | 1.07E+00 |
| Gd-153 | #A | -1.0810E+00 | -1.0810E+00 | 1.463E+02% | 5.28E+00 |
| Ga-68 | #A | 7.2306E+00 | 7.2702E+00 | 2.416E+02% | 4.03E+01 |
| Tc-99m | #A | -3.7328E-01 | -3.7367E-01 | 1.163E+02% | 1.45E+00 |
| BA-133 | #A | -7.3499E-01 | -7.3499E-01 | 1.523E+02% | 3.75E+00 |

| | | | | |
|---|---|---|---|---|
| CS-134 #A | 6.0562E-01 | 6.0562E-01 | 6.881E+01% | 3.52E+00 |
| CS-137 # | 5.1445E+00 | 5.1445E+00 | 1.170E+01% | 9.09E-01 |
| CE-139 #A | -4.1449E-01 | -4.1449E-01 | 1.029E+02% | 1.42E+00 |
| Ba-140 #A | 1.6275E+00 | 1.6276E+00 | 9.724E+01% | 3.92E+00 |
| La-140 #A | -8.4651E-02 | -8.4652E-02 | 3.829E+01% | 2.15E+00 |
| CE-141 #A | -3.6097E-02 | -3.6097E-02 | 2.303E+03% | 2.81E+00 |
| CE-144 #A | -3.2895E+00 | -3.2895E+00 | 1.267E+02% | 1.39E+01 |
| PM-144 #A | 5.0541E-01 | 5.0541E-01 | 6.260E+01% | 1.28E+00 |
| EU-152 #A | 1.9752E+00 | 1.9752E+00 | 1.093E+02% | 7.37E+00 |
| EU-154 #A | 3.3690E+00 | 3.3690E+00 | 5.148E+01% | 1.04E+01 |
| EU-155 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 7.85E+00 |
| HF-181 #A | 4.5042E-01 | 4.5042E-01 | 1.111E+02% | 1.69E+00 |
| Ta-182 #A | 1.7431E+00 | 1.7431E+00 | 8.528E+01% | 5.80E+00 |
| Hg-203 #A | -3.1802E-01 | -3.1802E-01 | 1.330E+02% | 1.43E+00 |
| TL-208 | 9.0049E+00 | 9.0049E+00 | 8.926E+00% | 1.26E+00 |
| pm-146 #A | 3.1179E-01 | 3.1179E-01 | 1.219E+02% | 3.91E+00 |
| y-88 #A | 2.3855E-01 | 2.3855E-01 | 1.274E+02% | 1.03E+00 |
| Cd-113m#A | -7.4507E+02 | -7.4507E+02 | 7.797E+02% | 1.99E+04 |
| Cd-109 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 4.94E+01 |
| Cf-251 #A | 1.0029E+00 | 1.0029E+00 | 1.849E+02% | 5.03E+00 |
| Cf-249 #A | 1.1839E+00 | 1.1839E+00 | 4.893E+01% | 2.31E+00 |
| Sn-126 #A | 4.4506E+00 | 4.4506E+00 | 1.089E+02% | 1.62E+01 |
| PB-210 | 4.2382E+01 | 4.2382E+01 | 3.156E+01% | 3.34E+01 |
| PB-212 | 2.7328E+01 | 2.7328E+01 | 4.427E+00% | 2.01E+00 |
| PB-214 | 1.6380E+01 | 1.6380E+01 | 7.633E+00% | 2.00E+00 |
| BI-207 #A | 1.3541E-01 | 1.3541E-01 | 2.598E+02% | 1.23E+00 |
| BI-212 | 2.8866E+01 | 2.8866E+01 | 2.264E+01% | 1.24E+01 |
| BI-214 | 1.6819E+01 | 1.6819E+01 | 9.126E+00% | 2.16E+00 |
| BI-210M#A | -4.6236E-01 | -4.6236E-01 | 1.553E+02% | 2.43E+00 |
| AC-228 | 2.6027E+01 | 2.6027E+01 | 7.376E+00% | 2.66E+00 |
| TH-227 #A | 5.1420E+00 | 5.1420E+00 | 1.444E+02% | 2.49E+01 |
| TH-229 #A | -4.2360E+00 | -4.2360E+00 | 1.955E+02% | 2.24E+01 |
| TH-234 #A | 1.8514E+01 | 1.8514E+01 | 4.874E+01% | 2.93E+01 |
| PA-231 #A | -1.4552E+01 | -1.4552E+01 | 1.657E+02% | 8.07E+01 |
| PA-233 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 6.55E+00 |
| PA-234 #A | 1.2204E+00 | 1.2204E+00 | 6.752E+01% | 8.13E+00 |
| PA-234M#A | 9.2946E+01 | 9.2946E+01 | 5.877E+01% | 1.61E+02 |
| U-235 #A | -3.0024E+00 | -3.0024E+00 | 1.192E+02% | 1.20E+01 |
| AM-241 #A | -4.5390E-01 | -4.5390E-01 | 3.337E+02% | 4.08E+00 |
| Np-237 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.52E+01 |
| Ir-192 #A | 0.0000E+00 | 0.0000E+00 | 7.071E+02% | 2.74E+00 |
| Cs-136 #A | 2.1967E-01 | 2.1967E-01 | 1.579E+02% | 1.85E+00 |
| Np-239 #A | 1.1598E+00 | 1.1600E+00 | 1.544E+02% | 5.99E+00 |
| Nd-147 #A | 2.0104E+00 | 2.0105E+00 | 9.203E+01% | 8.43E+00 |

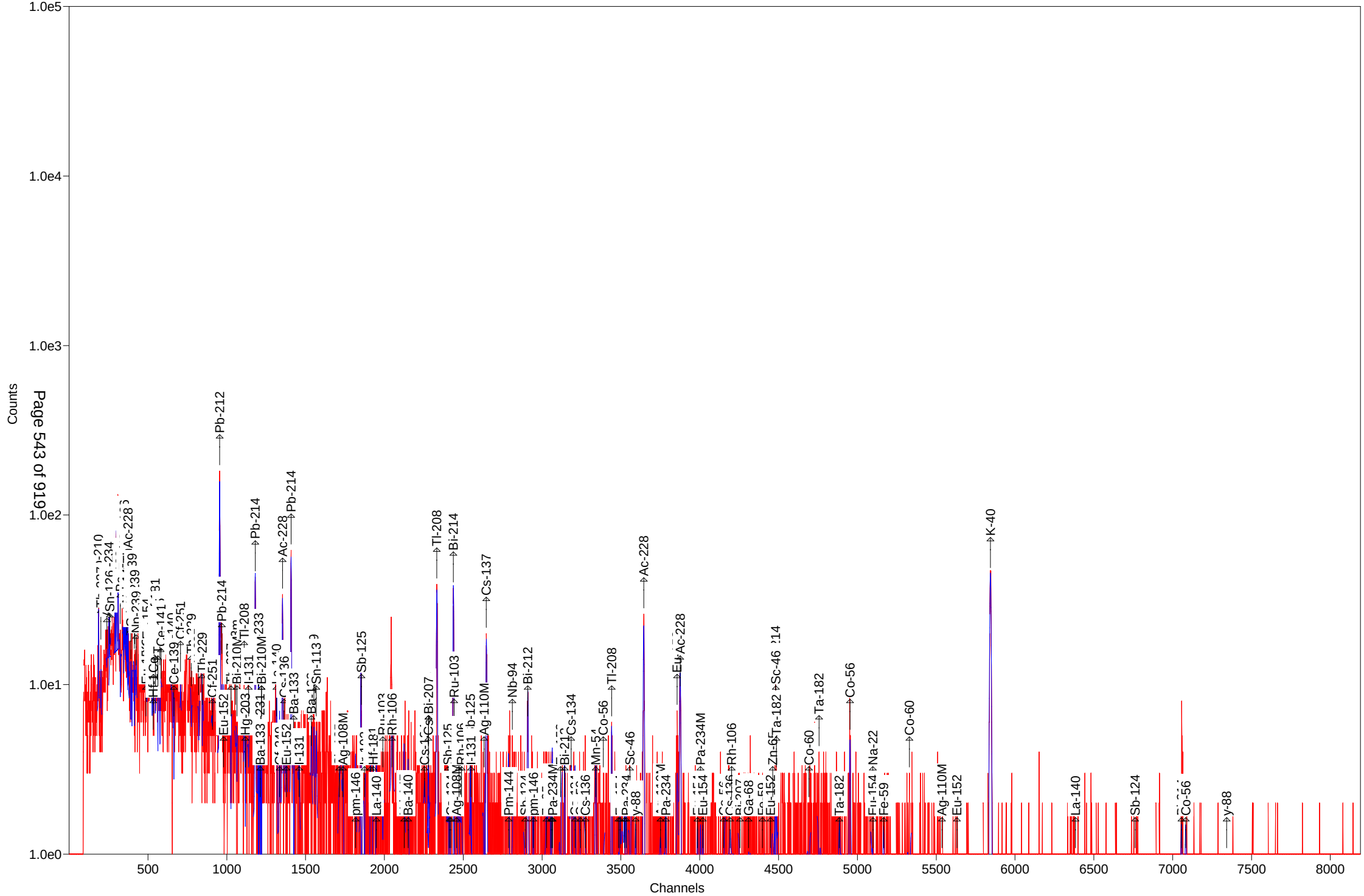
# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  2000.6 keV)  4.756E+02  Bq/Sample
Total Decayed Activity (  37.6 to  2000.6 keV) 4.7563907E+02  Bq/Sample

309155_Gamma_160-22327-A-9-B. 3_Gamma_20170907.spc.



Test America St. Louis  Spectrum ID: 9_Gamma_20171608

Sample Description: 309155_Gamma_160-22327-A-10-B
Detector: Detector # 9
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-10-B

Decay to Time: 6/7/2017 11:15  Live Time: 1800 sec
Acquisition Time: 6/7/2017 11:15:24  Real Time: 1803 sec
Analysis Time: 6/7/2017 11:45  Dead Time: 0.14 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 9_Soil_TunaCan.Clb
Efficiency Cal Desc: 9_Soil_TunaCan_90099_050312
Efficiency Cal Date: 6/14/2012 10:19
Energy Cal Date: 3/1/2012 13:57
Library: Client_Long_Rev11.lib
Bkgd Correction File: 9_2017-06-04_0241.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | 3.684E+00 | 97.9 | 3.607E+00 | 3.612E+00 | 1.211E+01 |
| NA-22 | 1.073E+00 | 21.8 | 2.341E-01 | 2.401E-01 | 3.764E-01 |
| K-40 | 2.651E+02 | 4.7 | 1.234E+01 | 1.834E+01 | 7.372E+00 |
| Sc-46 | 5.768E-02 | 806.9 | 4.654E-01 | 4.654E-01 | 1.630E+00 |
| CR-51 | 0.000E+00 | 1.#INF | 1.344E+00 | 1.344E+00 | 2.379E+01 |
| MN-54 | 7.692E-01 | 51.7 | 3.973E-01 | 3.993E-01 | 8.626E-01 |
| FE-59 | -1.747E+00 | 82.9 | 1.448E+00 | 1.450E+00 | 3.084E+00 |
| Co-56 | 1.261E+00 | 29.5 | 3.722E-01 | 3.778E-01 | 1.046E+00 |
| CO-57 | 7.037E-01 | 38.1 | 2.684E-01 | 2.710E-01 | 6.327E-01 |
| CO-58 | -2.400E-02 | 1932.6 | 4.639E-01 | 4.639E-01 | 1.623E+00 |
| CO-60 | 1.517E-01 | 113.3 | 1.718E-01 | 1.720E-01 | 1.160E+00 |
| ZN-65 | -1.518E+00 | 99.0 | 1.502E+00 | 1.504E+00 | 5.043E+00 |
| NB-94 | 4.772E-01 | 84.6 | 4.038E-01 | 4.046E-01 | 1.354E+00 |
| ZR-95 | 5.109E-01 | 94.2 | 4.813E-01 | 4.821E-01 | 2.008E+00 |
| NB-95 | -2.290E-01 | 207.8 | 4.760E-01 | 4.762E-01 | 1.634E+00 |
| RU-103 | 4.018E-01 | 90.6 | 3.639E-01 | 3.645E-01 | 8.697E-01 |
| RH-106 | 4.427E+00 | 80.3 | 3.554E+00 | 3.561E+00 | 1.189E+01 |
| AG-108M | -2.573E-01 | 167.4 | 4.307E-01 | 4.309E-01 | 1.034E+00 |
| AG-110M | 0.000E+00 | 1.#INF | 1.490E-01 | 1.490E-01 | 2.226E+00 |
| SN-113 | -7.028E-01 | 102.4 | 7.195E-01 | 7.204E-01 | 2.406E+00 |
| SB-124 | -1.045E-01 | 40.8 | 4.264E-02 | 4.299E-02 | 3.219E+00 |
| SB-125 | 4.496E+00 | 21.0 | 9.436E-01 | 9.712E-01 | 3.035E+00 |
| I-131 | 7.424E-01 | 69.3 | 5.146E-01 | 5.161E-01 | 9.744E-01 |
| Gd-153 | -1.299E+00 | 162.7 | 2.112E+00 | 2.114E+00 | 7.020E+00 |
| Ga-68 | 2.053E+01 | 85.4 | 1.752E+01 | 1.756E+01 | 3.825E+01 |
| Tc-99m | 0.000E+00 | 1.#INF | 1.698E-01 | 1.698E-01 | 1.831E+00 |
| BA-133 | -7.050E-01 | 138.3 | 9.753E-01 | 9.760E-01 | 3.262E+00 |
| CS-134 | 4.477E-01 | 56.4 | 2.526E-01 | 2.537E-01 | 3.243E+00 |
| CS-137 | 6.490E+00 | 9.4 | 6.111E-01 | 6.982E-01 | 8.638E-01 |
| CE-139 | 2.569E-01 | 138.4 | 3.555E-01 | 3.564E-01 | 1.194E+00 |
| Ba-140 | 7.190E-02 | 2301.4 | 1.655E+00 | 1.655E+00 | 4.064E+00 |
| La-140 | 1.284E-01 | 424.3 | 5.449E-01 | 5.449E-01 | 1.211E+00 |
| CE-141 | -8.509E-01 | 137.1 | 1.167E+00 | 1.168E+00 | 3.879E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 1.149E+00 | 363.0 | 4.171E+00 | 4.171E+00 | 1.396E+01 |
| PM-144 | 2.524E-01 | 126.3 | 3.188E-01 | 3.190E-01 | 1.095E+00 |
| EU-152 | 1.681E+00 | 109.4 | 1.840E+00 | 1.842E+00 | 7.924E+00 |
| EU-154 | 8.466E-01 | 177.6 | 1.503E+00 | 1.504E+00 | 1.211E+01 |
| EU-155 | 1.824E+00 | 168.4 | 3.070E+00 | 3.072E+00 | 1.020E+01 |
| HF-181 | 5.586E-01 | 90.2 | 5.038E-01 | 5.047E-01 | 1.695E+00 |
| Ta-182 | -2.620E+00 | 86.2 | 2.258E+00 | 2.261E+00 | 7.540E+00 |
| Hg-203 | 4.545E-01 | 83.1 | 3.778E-01 | 3.787E-01 | 1.259E+00 |
| TL-208 | 9.334E+00 | 7.5 | 7.037E-01 | 8.542E-01 | 9.425E-01 |
| pm-146 | 1.185E+00 | 49.9 | 5.909E-01 | 5.941E-01 | 2.496E+00 |
| y-88 | -4.135E-02 | 1304.5 | 5.393E-01 | 5.393E-01 | 1.252E+00 |
| Cd-113m | -5.263E+03 | 96.4 | 5.073E+03 | 5.085E+03 | 1.698E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 1.818E+01 | 1.818E+01 | 6.042E+01 |
| Cf-251 | -1.485E+00 | 130.4 | 1.936E+00 | 1.941E+00 | 4.949E+00 |
| Cf-249 | 8.430E-02 | 743.4 | 6.267E-01 | 6.267E-01 | 2.143E+00 |
| Sn-126 | 4.781E+00 | 103.2 | 4.935E+00 | 4.941E+00 | 1.251E+01 |
| PB-210 | 7.272E+00 | 164.5 | 1.196E+01 | 1.197E+01 | 4.027E+01 |
| PB-212 | 2.562E+01 | 4.2 | 1.072E+00 | 1.973E+00 | 1.788E+00 |
| PB-214 | 1.506E+01 | 6.7 | 1.007E+00 | 1.276E+00 | 2.090E+00 |
| BI-207 | 2.576E-01 | 137.5 | 3.541E-01 | 3.544E-01 | 1.209E+00 |
| BI-212 | 2.437E+01 | 21.8 | 5.319E+00 | 5.468E+00 | 1.009E+01 |
| BI-214 | 1.939E+01 | 7.7 | 1.500E+00 | 1.807E+00 | 1.980E+00 |
| BI-210M | -5.176E-01 | 137.7 | 7.130E-01 | 7.136E-01 | 2.397E+00 |
| AC-228 | 2.186E+01 | 7.8 | 1.695E+00 | 2.029E+00 | 2.547E+00 |
| TH-227 | -6.771E+00 | 103.1 | 6.978E+00 | 6.988E+00 | 2.326E+01 |
| TH-229 | 6.379E-01 | 222.4 | 1.419E+00 | 1.420E+00 | 2.040E+01 |
| TH-234 | -4.839E-01 | 2675.3 | 1.295E+01 | 1.295E+01 | 4.364E+01 |
| PA-231 | 0.000E+00 | 1.#INF | 6.312E+00 | 6.312E+00 | 7.900E+01 |
| PA-233 | 5.541E-01 | 344.8 | 1.911E+00 | 1.911E+00 | 6.407E+00 |
| PA-234 | 1.515E+00 | 142.3 | 2.156E+00 | 2.158E+00 | 8.284E+00 |
| PA-234M | 5.165E+01 | 73.9 | 3.817E+01 | 3.826E+01 | 1.856E+02 |
| U-235 | -3.775E+00 | 134.1 | 5.061E+00 | 5.065E+00 | 1.683E+01 |
| AM-241 | 1.345E+00 | 112.9 | 1.519E+00 | 1.520E+00 | 5.057E+00 |
| Np-237 | 0.000E+00 | 1.#INF | 5.520E+00 | 5.520E+00 | 1.834E+01 |
| Ir-192 | 2.736E-01 | 116.0 | 3.174E-01 | 3.179E-01 | 2.696E+00 |
| Cs-136 | 3.246E-01 | 113.1 | 3.672E-01 | 3.677E-01 | 1.254E+00 |
| Np-239 | 1.111E+00 | 252.7 | 2.807E+00 | 2.808E+00 | 9.344E+00 |
| Nd-147 | 5.349E-01 | 577.8 | 3.091E+00 | 3.091E+00 | 7.560E+00 |
| Total | 5.057E+02 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-10-B

Spectrum Filename: C:\User\SPC\Det9\9_Gamma_20171608.An1

Acquisition information
Start time: 6/7/2017 11:15:24 AM
Live time: 1800
Real time: 1803
Dead time: 0.14 %
Detector ID: 9

Detector system
Ge9 S/N100228730

Calibration
Filename: 9_Soil_TunaCan.Clb
9_Soil_TunaCan_90099_050312

Energy Calibration
Created: 3/1/2012 1:57:17 PM
Zero offset: 0.074 keV
Gain: 0.250 keV/channel
Quadratic: -2.269E-08 keV/channel^2

Efficiency Calibration
Created: 6/14/2012 10:19:51 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.30 %
Log(Eff): -8.079856E-01 + (-2.367265E-01*Log(E) ) + ( -3.950640E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.42 %
Log(Eff): -2.387916E+01 + ( 8.875647E+00*Log(E) ) + ( -9.401100E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 100 (  25.08keV )
Stop channel: 8000 (  1999.34keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 11:15:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 9_2017-06-04_0241.PBC 6/4/2017 2:41:35 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 30 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0819

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.77 | 14. | 164.46 | 1.00 | 2.577E-02 | 46.54 | 4.250 | PBC<MDA | PB210 |
| 59.54 | 32. | 112.90 | 1.01 | 3.659E-02 | 59.54 | 35.900 | PBC<MDA | AM241 |
| 64.28 | 33. | 103.22 | 1.02 | 3.987E-02 | 64.28 | 9.700 | PBC<MDA | Sn126 |
| 74.86 | 292. | 9.14 | 1.03 | 4.576E-02 | | | | |
| 77.22 | 462. | 6.32 | 1.03 | 4.681E-02 | | | | |
| 86.56 | 40. | 60.26 | 1.04 | 5.010E-02 | 86.49 | 13.100 | PBC<MDA | Np237 |
| | | | | | 86.54 | 30.700 | 1.458E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 4.940E+00 | Sn126 |
| 87.59 | 106. | 22.66 | 1.04 | 5.038E-02 | 87.57 | 37.500 | PBC<MDA | Sn126 |
| | | | | | 88.04 | 3.790 | 3.089E+01 | Cd109 |
| 93.32 | 171. | 18.44 | 1.60 | 5.170E-02 | 92.59 | 5.584 | 3.300E+01 | TH234 |
| | | | | | 93.35 | 5.561 | 3.304E+01 | AC228 |
| 105.86 | 37. | 168.35 | 1.05 | 5.318E-02 | 105.31 | 21.200 | PBC<MDA | EU155 |
| | | | | | 106.13 | 22.700 | 1.702E+00 | Np239 |
| 106.13 | 24. | 252.67 | 1.05 | 5.323E-02 | 105.31 | 21.200 | PBC<MDA | EU155 |
| | | | | | 106.13 | 22.700 | 1.111E+00 | Np239 |
| 121.91 | 58. | 38.15 | 0.81 | 5.303E-02 | 121.78 | 28.580 | 2.107E+00 | EU152 |
| | | | | | 122.06 | 85.600 | 7.037E-01 | CO57 |
| 131.29 | 30. | 142.30 | 1.08 | 5.216E-02 | 131.29 | 18.000 | PBC<MDA | PA234 |
| 133.02 | 30. | 144.44 | 1.08 | 5.195E-02 | 133.02 | 43.300 | PBC<MDA | HF181 |
| | | | | | 133.54 | 11.090 | 2.855E+00 | CE144 |
| 133.54 | 12. | 363.01 | 1.08 | 5.189E-02 | 133.02 | 43.300 | PBC<MDA | HF181 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| | | | | | 133.54 | 11.090 | 1.149E+00 | CE144 |
| 165.85 | 18. | 138.39 | 1.11 | 4.736E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |
| 210.85 | 11. | 272.78 | 1.15 | 4.052E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 238.46 | 714. | 5.69 | 1.19 | 3.734E-02 | 238.63 | 43.300 | 2.456E+01 | PB212 |
| 241.87 | 133. | 14.31 | 1.18 | 3.697E-02 | 242.00 | 7.430 | 2.687E+01 | PB214 |
| 244.69 | 24. | 204.26 | 1.18 | 3.670E-02 | 244.69 | 7.580 | PBC<MDA | EU152 |
| 276.77 | 17. | 102.39 | 1.21 | 3.372E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| 279.20 | 22. | 83.12 | 1.22 | 3.356E-02 | 279.20 | 81.460 | PBC<MDA | Hg203 |
| 284.30 | 20. | 94.95 | 1.22 | 3.315E-02 | 284.30 | 6.140 | PBC<MDA | I131 |
| 295.13 | 198. | 12.35 | 0.75 | 3.231E-02 | 295.09 | 19.300 | 1.764E+01 | PB214 |
| 300.11 | 54. | 24.93 | 1.24 | 3.195E-02 | 300.03 | 3.280 | 2.855E+01 | PB212 |
| | | | | | 300.07 | 2.460 | 3.806E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 1.511E+01 | PA233 |
| 312.17 | 11. | 344.84 | 1.25 | 3.110E-02 | 312.01 | 36.000 | PBC<MDA | PA233 |
| 338.33 | 172. | 13.16 | 1.03 | 2.940E-02 | 338.32 | 12.010 | 2.706E+01 | AC228 |
| 351.93 | 294. | 8.09 | 1.18 | 2.860E-02 | 351.93 | 37.600 | 1.521E+01 | PB214 |
| 363.57 | 16. | 101.04 | 1.29 | 2.791E-02 | 364.48 | 81.700 | PBC<MDA | I131 |
| 383.84 | 19. | 99.98 | 1.31 | 2.691E-02 | 383.84 | 8.940 | PBC<MDA | BA133 |
| 387.95 | 3. | 743.41 | 1.31 | 2.671E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 453.88 | 30. | 49.88 | 1.37 | 2.388E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 463.37 | 81. | 20.99 | 1.38 | 2.352E-02 | 463.37 | 10.470 | 1.827E+01 | SB125 |
| 468.06 | 16. | 116.03 | 1.38 | 2.335E-02 | 468.06 | 51.750 | PBC<MDA | Ir192 |
| 477.60 | 16. | 97.90 | 1.39 | 2.301E-02 | 477.60 | 10.520 | PBC<MDA | BE7 |
| 482.00 | 15. | 108.06 | 1.40 | 2.286E-02 | 482.00 | 80.500 | PBC<MDA | HF181 |
| 497.05 | 15. | 90.56 | 1.41 | 2.236E-02 | 497.05 | 90.900 | PBC<MDA | RU103 |
| 511.86 | 113. | 25.50 | 2.67 | 2.188E-02 | 511.86 | 20.000 | 1.434E+01 | RH106 |
| 531.00 | 3. | 577.78 | 1.44 | 2.130E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 563.24 | 15. | 93.50 | 1.47 | 2.040E-02 | 563.24 | 8.350 | PBC<MDA | CS134 |
| 569.70 | 9. | 137.49 | 1.47 | 2.023E-02 | 569.32 | 15.380 | 1.636E+00 | CS134 |
| | | | | | 569.47 | 8.200 | 3.069E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 2.576E-01 | BI207 |
| 583.28 | 282. | 7.54 | 1.41 | 1.988E-02 | 583.02 | 84.500 | 9.334E+00 | TL208 |
| 609.32 | 304. | 7.74 | 1.15 | 1.925E-02 | 609.31 | 46.090 | 1.907E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 1.530E+02 | RU103 |
| 618.06 | 1. | 964.99 | 1.51 | 1.904E-02 | 618.06 | 99.100 | PBC<MDA | PM144 |
| 621.92 | 15. | 80.28 | 1.51 | 1.896E-02 | 621.92 | 9.930 | PBC<MDA | RH106 |
| 661.70 | 180. | 9.42 | 1.64 | 1.810E-02 | 661.66 | 85.210 | 6.490E+00 | CS137 |
| 696.54 | 8. | 126.29 | 1.58 | 1.741E-02 | 696.54 | 99.000 | PBC<MDA | PM144 |
| 702.63 | 15. | 84.63 | 1.58 | 1.730E-02 | 702.63 | 97.900 | PBC<MDA | NB94 |
| 724.20 | 15. | 94.21 | 1.60 | 1.691E-02 | 724.20 | 44.150 | PBC<MDA | ZR95 |
| 727.19 | 56. | 21.82 | 0.72 | 1.686E-02 | 727.17 | 7.550 | 2.437E+01 | BI212 |
| 735.72 | 9. | 133.96 | 1.61 | 1.671E-02 | 735.72 | 22.500 | PBC<MDA | pm146 |
| 747.16 | 13. | 86.23 | 1.62 | 1.651E-02 | 747.16 | 34.000 | PBC<MDA | pm146 |
| 766.41 | 17. | 73.89 | 1.63 | 1.620E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 1.987E+02 | PA234M |
| 795.87 | 15. | 78.00 | 1.66 | 1.574E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 14. | 87.33 | 1.66 | 1.565E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 818.50 | 9. | 113.13 | 1.67 | 1.540E-02 | 818.50 | 100.000 | PBC<MDA | Cs136 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 834.85 | 21. | 51.65 | 1.69 | 1.517E-02 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 846.77 | 4. | 305.16 | 1.70 | 1.501E-02 | 846.77 | 99.935 | PBC<MDA | Co56 |
| 860.50 | 16. | 86.58 | 1.71 | 1.482E-02 | 860.56 | 12.420 | PBC<MDA | TL208 |
| 880.53 | 40. | 25.50 | 1.72 | 1.456E-02 | 880.53 | 6.000 | 2.544E+01 | PA234 |
| 889.28 | 2. | 806.91 | 1.73 | 1.445E-02 | 889.28 | 99.984 | PBC<MDA | Sc46 |
| 911.27 | 157. | 9.38 | 1.84 | 1.418E-02 | 911.07 | 29.000 | 2.121E+01 | AC228 |
| 946.02 | 4. | 279.32 | 1.77 | 1.377E-02 | 946.02 | 13.400 | PBC<MDA | PA234 |
| 964.11 | 16. | 109.44 | 1.79 | 1.357E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 968.91 | 98. | 12.34 | 1.63 | 1.352E-02 | 968.97 | 17.460 | 2.295E+01 | AC228 |
| 1004.77 | 5. | 177.57 | 1.82 | 1.314E-02 | 1004.77 | 18.010 | PBC<MDA | EU154 |
| 1077.40 | 13. | 85.36 | 1.87 | 1.244E-02 | 1077.40 | 3.300 | PBC<MDA | Ga68 |
| 1120.27 | 67. | 14.06 | 0.80 | 1.206E-02 | 1120.29 | 15.100 | 2.039E+01 | BI214 |
| | | | | | 1120.55 | 99.987 | 3.079E+00 | Sc46 |
| 1173.24 | 10. | 113.27 | 1.94 | 1.163E-02 | 1173.24 | 99.900 | PBC<MDA | CO60 |
| 1189.05 | 9. | 147.99 | 1.95 | 1.150E-02 | 1189.05 | 16.200 | PBC<MDA | Ta182 |
| 1221.41 | 11. | 120.97 | 1.97 | 1.126E-02 | 1221.41 | 27.000 | PBC<MDA | Ta182 |
| 1238.28 | 39. | 29.52 | 1.98 | 1.114E-02 | 1238.28 | 66.070 | 2.944E+00 | Co56 |
| 1274.53 | 21. | 21.82 | 2.01 | 1.088E-02 | 1274.53 | 99.940 | 1.073E+00 | NA22 |
| | | | | | 1274.54 | 35.190 | 3.046E+00 | EU154 |
| 1291.60 | 6. | 166.25 | 2.02 | 1.077E-02 | 1291.60 | 43.200 | PBC<MDA | FE59 |
| 1408.00 | 7. | 85.00 | 2.10 | 1.004E-02 | 1408.00 | 21.005 | PBC<MDA | EU152 |
| 1460.83 | 496. | 4.66 | 1.73 | 9.749E-03 | 1460.83 | 10.670 | 2.651E+02 | K40 |
| 1596.21 | 2. | 424.26 | 2.22 | 9.069E-03 | 1596.21 | 95.400 | PBC<MDA | La140 |
| 1690.98 | 6. | 40.82 | 2.27 | 8.649E-03 | 1690.98 | 47.790 | PBC<MDA | SB124 |
| 1764.74 | 35. | 21.46 | 2.31 | 8.350E-03 | 1764.49 | 15.400 | 1.498E+01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 299.04 | 74.85 | 210. | 292. | 6.382E+03 | 9.14 | 1.025 | - | D |
| 308.47 | 77.21 | 194. | 462. | 9.865E+03 | 6.32 | 1.027 | - | D |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.80 | 46.54 | 271. | 14. | 0.008 | 164.46 | 0.998s |
| TH-227 | 200.20 | 50.14 | 410. | -28. | -0.016 | 103.06 | 1.001s |
| AM-241 | 237.77 | 59.54 | 629. | 32. | 0.018 | 112.90 | 1.010 |
| Sn-126 | 256.74 | 64.28 | 328. | 33. | 0.018 | 103.22 | 1.015 |
| BA-133 | 323.56 | 80.99 | 1571. | -37. | -0.021 | 150.72 | 1.031s |
| Np-237 | 345.55 | 86.49 | 2107. | 0. | 0.000 | 179.21 | 1.036A |
| EU-155 | 345.76 | 86.54 | 2017. | 40. | 0.022 | 60.26 | 1.036D |
| Sn-126 | 347.35 | 86.94 | 1980. | -36. | -0.020 | 173.76 | 1.037 |
| Sn-126 | 349.87 | 87.57 | 1810. | 106. | 0.059 | 22.66 | 1.037D |
| Cd-109 | 351.75 | 88.04 | 1944. | 0. | 0.000 | 171.97 | 1.038A |
| Nd-147 | 363.99 | 91.10 | 1773. | -37. | -0.020 | 163.86 | 1.041s |
| TH-234 | 369.94 | 92.59 | 1737. | -37. | -0.020 | 161.96 | 1.042s |
| AC-228 | 372.86 | 93.32 | 190. | 171. | 0.095 | 18.44 | 1.600s |
| Gd-153 | 389.58 | 97.50 | 1768. | -37. | -0.020 | 162.66 | 1.047s |
| Np-239 | 397.58 | 99.50 | 1805. | -37. | -0.020 | 164.02 | 1.049s |
| Gd-153 | 412.37 | 103.20 | 1841. | -31. | -0.017 | 199.69 | 1.052s |
| Np-239 | 414.37 | 103.70 | 1872. | 0. | 0.000 | 1000.00 | 1.053s |
| EU-155 | 420.82 | 105.31 | 1922. | 37. | 0.021 | 168.35 | 1.054s |
| Np-239 | 424.09 | 106.13 | 1851. | 24. | 0.013 | 252.67 | 1.055s |
| EU-152 | 486.65 | 121.78 | 261. | -27. | -0.015 | 86.50 | 1.070s |
| CO-57 | 487.18 | 121.91 | 110. | 58. | 0.032 | 38.15 | 0.805s |
| EU-154 | 491.95 | 123.10 | 338. | -30. | -0.017 | 87.92 | 1.071s |
| PA-234 | 524.72 | 131.29 | 868. | 30. | 0.016 | 142.30 | 1.079s |
| HF-181 | 531.64 | 133.02 | 898. | 30. | 0.016 | 144.44 | 1.081s |
| CE-144 | 533.69 | 133.54 | 927. | 12. | 0.007 | 363.01 | 1.081s |
| HF-181 | 544.74 | 136.30 | 939. | 0. | 0.000 | 1000.00 | 1.084 |
| CO-57 | 545.43 | 136.47 | 939. | 0. | 0.000 | 1000.00 | 1.084 |
| Tc-99m | 561.57 | 140.51 | 939. | 0. | 0.000 | 1000.00 | 1.088 |
| U-235 | 574.67 | 143.79 | 1247. | -38. | -0.021 | 134.07 | 1.091s |
| CE-141 | 581.29 | 145.44 | 1268. | -37. | -0.021 | 137.12 | 1.092 |
| Ba-140 | 650.15 | 162.66 | 332. | -4. | -0.002 | 574.13 | 1.108 |
| U-235 | 653.03 | 163.38 | 336. | 0. | 0.000 | 1000.00 | 1.109s |
| CE-139 | 662.92 | 165.85 | 284. | 18. | 0.010 | 138.39 | 1.111 |
| Cf-251 | 705.90 | 176.60 | 202. | -21. | -0.011 | 130.42 | 1.122s |
| TH-229 | 773.52 | 193.51 | 204. | -8. | -0.004 | 351.34 | 1.137s |
| U-235 | 820.80 | 205.33 | 244. | -31. | -0.017 | 99.73 | 1.148s |
| TH-229 | 842.87 | 210.85 | 232. | 11. | 0.006 | 272.78 | 1.153s |
| Cf-251 | 907.45 | 227.00 | 172. | -27. | -0.015 | 98.36 | 1.168s |
| PB-212 | 953.97 | 238.63 | 112. | 745. | 0.414 | 4.18 | 1.179D |
| PB-214 | 967.43 | 242.00 | 114. | 133. | 0.074 | 14.31 | 1.182D |
| EU-152 | 978.21 | 244.69 | 1190. | 24. | 0.013 | 204.26 | 1.185s |
| TH-227 | 1024.40 | 256.24 | 148. | -21. | -0.012 | 115.50 | 1.195s |
| Cd-113m | 1054.23 | 263.70 | 173. | -20. | -0.011 | 96.39 | 1.202s |
| BI-210M | 1062.75 | 265.83 | 240. | -16. | -0.009 | 137.74 | 1.204s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| TL-208 | 1108.55 | 277.28 | 143. | 17. | 0.009 | 102.39 | 1.215 |
| Hg-203 | 1116.22 | 279.20 | 162. | 22. | 0.012 | 83.12 | 1.216 |
| I-131 | 1136.61 | 284.30 | 88. | 20. | 0.011 | 94.95 | 1.221 |
| PB-214 | 1179.77 | 295.09 | 73. | 166. | 0.092 | 10.65 | 1.231D |
| PB-212 | 1199.52 | 300.03 | 63. | 54. | 0.030 | 24.93 | 1.235D |
| PA-231 | 1199.68 | 300.07 | 757. | -10. | -0.006 | 374.56 | 1.235s |
| PA-233 | 1200.12 | 300.18 | 747. | 0. | 0.000 | 1000.00 | 1.235 |
| PA-231 | 1210.00 | 302.65 | 747. | 0. | 0.000 | 1000.00 | 1.237s |
| BA-133 | 1210.81 | 302.85 | 747. | 0. | 0.000 | 1000.00 | 1.238s |
| BI-210M | 1218.99 | 304.90 | 747. | 0. | 0.000 | 1000.00 | 1.240 |
| Ir-192 | 1233.16 | 308.44 | 747. | 0. | 0.000 | 1000.00 | 1.243s |
| PA-233 | 1247.44 | 312.01 | 736. | 11. | 0.006 | 344.84 | 1.246s |
| Ir-192 | 1265.35 | 316.49 | 747. | 0. | 0.000 | 1000.00 | 1.250s |
| CR-51 | 1279.73 | 320.08 | 747. | 0. | 0.000 | 1000.00 | 1.253 |
| La-140 | 1314.43 | 328.76 | 549. | -21. | -0.012 | 159.29 | 1.261s |
| Cf-249 | 1333.15 | 333.44 | 528. | 0. | 0.000 | 1000.00 | 1.265s |
| AC-228 | 1352.70 | 338.33 | 68. | 172. | 0.096 | 13.16 | 1.028 |
| Cs-136 | 1361.66 | 340.57 | 528. | 0. | 0.000 | 1000.00 | 1.272s |
| EU-152 | 1376.53 | 344.29 | 528. | 0. | 0.000 | 1000.00 | 1.275s |
| HF-181 | 1382.70 | 345.83 | 678. | -26. | -0.014 | 143.68 | 1.276s |
| PB-214 | 1407.08 | 351.93 | 66. | 294. | 0.164 | 8.09 | 1.184 |
| BA-133 | 1423.37 | 356.00 | 466. | -22. | -0.012 | 138.35 | 1.285s |
| I-131 | 1457.31 | 364.48 | 64. | 16. | 0.009 | 101.04 | 1.293s |
| BA-133 | 1534.73 | 383.84 | 177. | 19. | 0.011 | 99.98 | 1.310s |
| Cf-249 | 1551.17 | 387.95 | 196. | 3. | 0.001 | 743.41 | 1.314s |
| SN-113 | 1566.12 | 391.69 | 231. | -21. | -0.012 | 102.38 | 1.317 |
| SB-125 | 1710.86 | 427.88 | 65. | -5. | -0.003 | 332.16 | 1.349s |
| AG-108M | 1735.10 | 433.94 | 69. | -10. | -0.006 | 167.40 | 1.354s |
| pm-146 | 1814.87 | 453.88 | 48. | 30. | 0.017 | 49.88 | 1.372s |
| SB-125 | 1852.82 | 463.37 | 104. | 81. | 0.045 | 20.99 | 1.380 |
| Ir-192 | 1871.59 | 468.06 | 164. | 16. | 0.009 | 116.03 | 1.384s |
| BE-7 | 1909.73 | 477.60 | 116. | 16. | 0.009 | 97.90 | 1.392s |
| HF-181 | 1927.34 | 482.00 | 132. | 15. | 0.009 | 108.06 | 1.396s |
| La-140 | 1947.43 | 487.02 | 147. | 0. | 0.000 | 1000.00 | 1.400 |
| RU-103 | 1987.56 | 497.05 | 39. | 15. | 0.008 | 90.56 | 1.409s |
| RH-106 | 2046.81 | 511.86 | 105. | 113. | 0.063 | 25.50 | 2.672s |
| Nd-147 | 2123.35 | 531.00 | 56. | 3. | 0.001 | 577.78 | 1.438s |
| CS-134 | 2252.30 | 563.24 | 42. | 15. | 0.008 | 93.50 | 1.466s |
| CS-134 | 2276.64 | 569.32 | 70. | -12. | -0.007 | 102.74 | 1.471s |
| PA-234 | 2277.24 | 569.47 | 82. | 0. | 0.000 | 1000.00 | 1.471s |
| BI-207 | 2278.16 | 569.70 | 75. | 9. | 0.005 | 137.49 | 1.471s |
| TL-208 | 2332.47 | 583.28 | 31. | 282. | 0.157 | 7.54 | 1.414 |
| SB-125 | 2401.36 | 600.50 | 554. | -19. | -0.010 | 178.83 | 1.497s |
| SB-124 | 2410.29 | 602.73 | 535. | -19. | -0.010 | 175.60 | 1.499s |
| CS-134 | 2418.21 | 604.71 | 533. | -20. | -0.011 | 168.78 | 1.500s |
| BI-214 | 2436.66 | 609.32 | 38. | 304. | 0.169 | 7.74 | 1.150s |
| RU-103 | 2440.56 | 610.30 | 513. | -20. | -0.011 | 165.19 | 1.505s |
| PM-144 | 2471.62 | 618.06 | 83. | 1. | 0.001 | 964.99 | 1.512s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| RH-106 | 2487.04 | 621.92 | 65. | 15. | 0.008 | 80.28 | 1.515s |
| SB-125 | 2542.94 | 635.89 | 42. | 0. | 0.000 | 1000.00 | 1.526s |
| I-131 | 2547.28 | 636.97 | 59. | -8. | -0.004 | 145.83 | 1.527 |
| AG-110M | 2630.43 | 657.76 | 233. | -5. | -0.003 | 464.56 | 1.544s |
| CS-137 | 2646.18 | 661.70 | 21. | 180. | 0.100 | 9.42 | 1.638 |
| PM-144 | 2785.58 | 696.54 | 45. | 8. | 0.004 | 126.29 | 1.576s |
| NB-94 | 2809.93 | 702.63 | 68. | 15. | 0.008 | 84.63 | 1.581s |
| SB-124 | 2890.57 | 722.79 | 146. | -18. | -0.010 | 95.52 | 1.598s |
| AG-108M | 2891.17 | 722.94 | 127. | -11. | -0.006 | 145.01 | 1.598s |
| EU-154 | 2892.85 | 723.36 | 116. | 0. | 0.000 | 1000.00 | 1.598s |
| ZR-95 | 2896.22 | 724.20 | 97. | 15. | 0.009 | 94.21 | 1.599s |
| BI-212 | 2908.20 | 727.19 | 19. | 56. | 0.031 | 21.82 | 0.719s |
| pm-146 | 2942.31 | 735.72 | 33. | 9. | 0.005 | 133.96 | 1.608s |
| pm-146 | 2988.08 | 747.16 | 23. | 13. | 0.007 | 86.23 | 1.617s |
| ZR-95 | 3026.36 | 756.73 | 40. | 0. | 0.000 | 1000.00 | 1.625s |
| AG-110M | 3055.23 | 763.94 | 50. | -4. | -0.002 | 254.95 | 1.631s |
| NB-95 | 3062.61 | 765.79 | 93. | -7. | -0.004 | 207.85 | 1.632s |
| PA-234M | 3065.10 | 766.41 | 71. | 17. | 0.009 | 73.89 | 1.633s |
| EU-152 | 3115.14 | 778.92 | 35. | 0. | 0.000 | 1000.00 | 1.643s |
| BI-212 | 3141.15 | 785.42 | 93. | -14. | -0.008 | 98.91 | 1.648 |
| CS-134 | 3182.95 | 795.87 | 63. | 15. | 0.008 | 78.00 | 1.656s |
| CS-134 | 3207.29 | 801.95 | 69. | 14. | 0.008 | 87.33 | 1.661s |
| La-140 | 3262.58 | 815.77 | 83. | 0. | 0.000 | 1000.00 | 1.672s |
| Cs-136 | 3273.50 | 818.50 | 47. | 9. | 0.005 | 113.13 | 1.674s |
| MN-54 | 3338.91 | 834.85 | 20. | 21. | 0.012 | 51.65 | 1.687s |
| Co-56 | 3386.61 | 846.77 | 30. | 4. | 0.002 | 305.16 | 1.696s |
| TL-208 | 3441.80 | 860.56 | 35. | 16. | 0.009 | 86.58 | 1.707 |
| NB-94 | 3483.94 | 871.10 | 55. | -11. | -0.006 | 102.70 | 1.715s |
| PA-234 | 3521.68 | 880.53 | 32. | 40. | 0.022 | 25.50 | 1.722 |
| PA-234 | 3532.53 | 883.24 | 72. | 0. | 0.000 | 1000.00 | 1.724 |
| AG-110M | 3538.30 | 884.68 | 72. | 0. | 0.000 | 1000.00 | 1.725s |
| Sc-46 | 3556.69 | 889.28 | 72. | 2. | 0.001 | 806.91 | 1.729s |
| AC-228 | 3644.69 | 911.27 | 12. | 157. | 0.087 | 9.38 | 1.839 |
| AG-110M | 3749.60 | 937.49 | 45. | -12. | -0.007 | 126.24 | 1.766s |
| PA-234 | 3783.72 | 946.02 | 25. | 4. | 0.002 | 279.32 | 1.772s |
| EU-152 | 3856.11 | 964.11 | 154. | 16. | 0.009 | 109.44 | 1.786 |
| AC-228 | 3875.30 | 968.91 | 10. | 98. | 0.054 | 12.34 | 1.627 |
| PA-234M | 4003.71 | 1001.00 | 54. | 0. | 0.000 | 1000.00 | 1.814s |
| EU-154 | 4018.82 | 1004.77 | 40. | 5. | 0.003 | 177.57 | 1.816s |
| Co-56 | 4151.13 | 1037.84 | 48. | -15. | -0.008 | 108.12 | 1.841s |
| Cs-136 | 4192.07 | 1048.07 | 33. | -1. | -0.001 | 618.47 | 1.848s |
| RH-106 | 4201.23 | 1050.36 | 42. | -7. | -0.004 | 143.35 | 1.850s |
| Ga-68 | 4309.44 | 1077.40 | 21. | 13. | 0.007 | 85.36 | 1.870s |
| FE-59 | 4396.88 | 1099.25 | 59. | -22. | -0.012 | 82.87 | 1.886s |
| EU-152 | 4448.20 | 1112.07 | 146. | -17. | -0.010 | 100.94 | 1.895s |
| ZN-65 | 4462.09 | 1115.55 | 129. | -17. | -0.009 | 98.97 | 1.897s |
| BI-214 | 4481.00 | 1120.27 | 4. | 67. | 0.037 | 14.06 | 0.799s |
| Sc-46 | 4482.12 | 1120.55 | 112. | 0. | 0.000 | 1000.00 | 1.901s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Ta-182 | 4485.12 | 1121.30 | 136. | -20. | -0.011 | 86.16 | 1.901 |
| CO-60 | 4692.96 | 1173.24 | 21. | 10. | 0.005 | 113.27 | 1.938s |
| Ta-182 | 4756.25 | 1189.05 | 28. | 9. | 0.005 | 147.99 | 1.949 |
| Ta-182 | 4885.75 | 1221.41 | 28. | 11. | 0.006 | 120.97 | 1.972 |
| Co-56 | 4953.27 | 1238.28 | 17. | 39. | 0.022 | 29.52 | 1.984s |
| NA-22 | 5098.35 | 1274.53 | 0. | 21. | 0.012 | 21.82 | 2.008 |
| EU-154 | 5098.40 | 1274.54 | 21. | 0. | 0.000 | 1000.00 | 2.008 |
| FE-59 | 5166.65 | 1291.60 | 17. | 6. | 0.003 | 166.25 | 2.020s |
| CO-60 | 5330.37 | 1332.50 | 17. | -3. | -0.002 | 327.45 | 2.047s |
| AG-110M | 5537.69 | 1384.30 | 23. | -4. | -0.002 | 308.96 | 2.082s |
| EU-152 | 5632.56 | 1408.00 | 6. | 7. | 0.004 | 85.00 | 2.097s |
| K-40 | 5844.02 | 1460.83 | 6. | 496. | 0.276 | 4.66 | 1.732 |
| La-140 | 6385.95 | 1596.21 | 12. | 2. | 0.001 | 424.26 | 2.215s |
| SB-124 | 6765.35 | 1690.98 | 0. | 6. | 0.003 | 40.82 | 2.272s |
| BI-214 | 7059.65 | 1764.49 | 10. | 35. | 0.019 | 21.46 | 2.314s |
| y-88 | 7346.20 | 1836.06 | 0. | 0. | 0.000 | 1000.00 | 2.354s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| Nuclide Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| BE-7 | C | 3.6842E+00 | | | | | 5.31E+01 | |
| | | | 477.60 | 3.684E+00 | ?( | 1.211E+01 | 9.79E+01 | 1.05E+01 G |
| NA-22 | C | 1.0726E+00 | | | | | 9.50E+02 | |
| | | | 1274.53 | 1.073E+00 | ?( | 3.764E-01 | 2.18E+01 | 9.99E+01 G |
| K-40 | N | 2.6509E+02 | | | | | 4.66E+11 | |
| | | | 1460.83 | 2.651E+02 | ( | 7.372E+00 | 4.66E+00 | 1.07E+01 G |
| Sc-46 | F | 5.7681E-02 | | | | | 8.38E+01 | |
| | | | 889.28 | 5.768E-02 | ?( | 1.630E+00 | 8.07E+02 | 1.00E+02 G |
| | | | 1120.55 | 0.000E+00 | & | 2.397E+00 | 1.00E+03 | 1.00E+02 G |
| MN-54 | C | 7.6919E-01 | | | | | 3.12E+02 | |
| | | | 834.85 | 7.692E-01 | ?( | 8.626E-01 | 5.17E+01 | 1.00E+02 G |
| FE-59 | F | -1.7469E+00 | | | | | 4.45E+01 | |
| | | | 1099.25 | -1.747E+00 | ?( | 3.084E+00 | 8.29E+01 | 5.65E+01 G |
| | | | 1291.60 | 7.166E-01 | + | 2.618E+00 | 1.66E+02 | 4.32E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Co-56 | C 1.2611E+00 | | | | | 7.73E+01 | |
| | | 846.77 | 1.482E-01 | ?( | 1.046E+00 | 3.05E+02 | 9.99E+01 G |
| | | 1238.28 | 2.944E+00 | ( | 1.655E+00 | 2.95E+01 | 6.61E+01 G |
| | | 1037.84 | -4.604E+00 | + | 1.074E+01 | 1.08E+02 | 1.41E+01 G |
| | | 1771.35 | -2.156E-01 | % | 1.472E+01 | 1.91E+03 | 1.55E+01 A |
| CO-57 | C 7.0371E-01 | | | | | 2.72E+02 | |
| | | 122.06 | 7.037E-01 | *( | 6.327E-01 | 3.81E+01 | 8.56E+01 G |
| | | 136.47 | 0.000E+00 | - | 1.470E+01 | 1.00E+03 | 1.07E+01 G |
| CO-58 | C -2.4002E-02 | | | | | 7.09E+01 | |
| | | 810.78 | -2.400E-02 | &( | 1.623E+00 | 1.93E+03 | 9.95E+01 G |
| CO-60 | F 1.5167E-01 | | | | | 1.93E+03 | |
| | | 1332.50 | -1.587E-01 | ?( | 1.160E+00 | 3.27E+02 | 1.00E+02 G |
| | | 1173.24 | 4.623E-01 | ?( | 1.159E+00 | 1.13E+02 | 9.99E+01 G |
| ZN-65 | F -1.5179E+00 | | | | | 2.44E+02 | |
| | | 1115.55 | -1.518E+00 | ?( | 5.043E+00 | 9.90E+01 | 5.06E+01 G |
| NB-94 | I 4.7720E-01 | | | | | 7.41E+06 | |
| | | 702.63 | 4.772E-01 | ( | 1.354E+00 | 8.46E+01 | 9.79E+01 G |
| | | 871.10 | -4.041E-01 | & | 1.408E+00 | 1.03E+02 | 9.99E+01 G |
| ZR-95 | I 5.1092E-01 | | | | | 6.40E+01 | |
| | | 756.73 | 0.000E+00 | &( | 2.008E+00 | 1.00E+03 | 5.45E+01 G |
| | | 724.20 | 1.141E+00 | &( | 3.611E+00 | 9.42E+01 | 4.42E+01 G |
| NB-95 | I -2.2902E-01 | | | | | 6.40E+01 | |
| | | 765.79 | -2.290E-01 | ?( | 1.634E+00 | 2.08E+02 | 9.98E+01 G |
| RU-103 | I 4.0182E-01 | | | | | 3.93E+01 | |
| | | 497.05 | 4.018E-01 | ( | 8.697E-01 | 9.06E+01 | 9.09E+01 G |
| | | 610.30 | -9.842E+00 | + | 5.443E+01 | 1.65E+02 | 5.75E+00 GA |
| RH-106 | I 4.4271E+00 | | | | | 3.74E+02 | |
| | | 621.92 | 4.427E+00 | ?( | 1.189E+01 | 8.03E+01 | 9.93E+00 G |
| | | 1050.36 | -1.871E+01 | + | 9.269E+01 | 1.43E+02 | 1.56E+00 G |
| | | 511.86 | 1.434E+01 | ? | 6.405E+00 | 2.55E+01 | 2.00E+01 GA |
| AG-108M | C -2.5730E-01 | | | | | 1.53E+05 | |
| | | 433.94 | -2.573E-01 | ?( | 1.034E+00 | 1.67E+02 | 9.05E+01 G |
| | | 722.94 | -4.061E-01 | + | 1.997E+00 | 1.45E+02 | 9.08E+01 G |
| | | 614.28 | -2.725E-02 | % | 3.434E+00 | 3.73E+03 | 8.98E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| SN-113 | F | -7.0283E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | -7.028E-01 | &( | 2.406E+00 | 1.02E+02 | 6.40E+01 G |
| SB-124 | F | -1.0445E-01 | | | | | 6.02E+01 | |
| | | | 602.73 | -5.475E-01 | ?( | 3.219E+00 | 1.76E+02 | 9.83E+01 G |
| | | | 1690.98 | 8.065E-01 | ?( | 9.906E-01 | 4.08E+01 | 4.78E+01 G |
| | | | 722.79 | -5.592E+00 | + | 1.789E+01 | 9.55E+01 | 1.08E+01 G |
| SB-125 | I | 4.4960E+00 | | | | | 1.01E+03 | |
| | | | 427.88 | -3.767E-01 | ?( | 3.035E+00 | 3.32E+02 | 2.96E+01 G |
| | | | 600.50 | -3.000E+00 | + | 1.796E+01 | 1.79E+02 | 1.79E+01 G |
| | | | 635.89 | 0.000E+00 | + | 8.670E+00 | 1.00E+03 | 1.13E+01 G |
| | | | 463.37 | 1.827E+01 | ( | 1.133E+01 | 2.10E+01 | 1.05E+01 G |
| I-131 | I | 7.4236E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | 3.899E-01 | &( | 9.744E-01 | 1.01E+02 | 8.17E+01 G |
| | | | 284.30 | 5.433E+00 | ( | 1.267E+01 | 9.50E+01 | 6.14E+00 G |
| | | | 636.97 | -3.190E+00 | + | 1.598E+01 | 1.46E+02 | 7.17E+00 G |
| Gd-153 | F | -1.2987E+00 | | | | | 2.42E+02 | |
| | | | 97.50 | -1.299E+00 | &( | 7.020E+00 | 1.63E+02 | 3.00E+01 G |
| | | | 103.20 | -1.466E+00 | + | 9.740E+00 | 2.00E+02 | 2.18E+01 G |
| Ga-68 | C | 2.0526E+01 | | | | | 4.71E-02 | |
| | | | 1077.40 | 2.053E+01 | &( | 3.825E+01 | 8.54E+01 | 3.30E+00 G |
| BA-133 | F | -7.0499E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -7.050E-01 | ?( | 3.262E+00 | 1.38E+02 | 6.20E+01 G |
| | | | 302.85 | 0.000E+00 | + | 1.242E+01 | 1.00E+03 | 1.83E+01 G |
| | | | 383.84 | 4.463E+00 | | 1.494E+01 | 1.00E+02 | 8.94E+00 GA |
| | | | 80.99 | -1.263E+00 | + | 6.329E+00 | 1.51E+02 | 3.41E+01 GA |
| CS-134 | I | 4.4769E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | -5.739E-01 | ?( | 3.243E+00 | 1.69E+02 | 9.76E+01 G |
| | | | 795.87 | 6.289E-01 | ?( | 1.639E+00 | 7.80E+01 | 8.55E+01 G |
| | | | 569.32 | -2.142E+00 | + | 7.442E+00 | 1.03E+02 | 1.54E+01 G |
| | | | 801.95 | 5.781E+00 | ?( | 1.695E+01 | 8.73E+01 | 8.69E+00 G |
| | | | 563.24 | 4.985E+00 | &( | 1.073E+01 | 9.35E+01 | 8.35E+00 G |
| CS-137 | I | 6.4903E+00 | | | | | 1.10E+04 | |
| | | | 661.66 | 6.490E+00 | ( | 8.638E-01 | 9.42E+00 | 8.52E+01 G |
| CE-139 | F | 2.5692E-01 | | | | | 1.38E+02 | |
| | | | 165.85 | 2.569E-01 | ?( | 1.194E+00 | 1.38E+02 | 7.99E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Ba-140 | I | 7.1895E-02 | | | | | 1.28E+01 | |
| | | | 537.26 | 7.190E-02 | &( | 4.064E+00 | 2.30E+03 | 2.44E+01 G |
| | | | 162.66 | -8.570E-01 | + | 1.667E+01 | 5.74E+02 | 6.22E+00 G |
| | | | 304.85 | 7.190E-02 | } | 5.279E+01 | 1.16E+03 | 4.29E+00 G |
| La-140 | I | 1.2843E-01 | | | | | 1.28E+01 | |
| | | | 1596.21 | 1.284E-01 | ?( | 1.211E+00 | 4.24E+02 | 9.54E+01 G |
| | | | 487.02 | 0.000E+00 | - | 3.186E+00 | 1.00E+03 | 4.55E+01 G |
| | | | 328.76 | -1.916E+00 | & | 1.021E+01 | 1.59E+02 | 2.03E+01 G |
| | | | 815.77 | 0.000E+00 | - | 6.993E+00 | 1.00E+03 | 2.33E+01 G |
| CE-141 | I | -8.5093E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | -8.509E-01 | ( | 3.879E+00 | 1.37E+02 | 4.82E+01 G |
| CE-144 | I | 1.1489E+00 | | | | | 2.85E+02 | |
| | | | 133.54 | 1.149E+00 | ?( | 1.396E+01 | 3.63E+02 | 1.11E+01 G |
| PM-144 | C | 2.5240E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | 2.524E-01 | ?( | 1.095E+00 | 1.26E+02 | 9.90E+01 G |
| | | | 618.06 | 3.954E-02 | & | 1.332E+00 | 9.65E+02 | 9.91E+01 G |
| EU-152 | F | 1.6814E+00 | | | | | 4.94E+03 | |
| | | | 344.29 | 0.000E+00 | ?( | 7.924E+00 | 1.00E+03 | 2.65E+01 G |
| | | | 1112.07 | -5.852E+00 | + | 1.982E+01 | 1.01E+02 | 1.36E+01 G |
| | | | 121.78 | -9.920E-01 | + | 2.856E+00 | 8.65E+01 | 2.86E+01 G |
| | | | 778.92 | 0.000E+00 | ?( | 8.126E+00 | 1.00E+03 | 1.29E+01 G |
| | | | 964.11 | 4.606E+00 | ?( | 1.694E+01 | 1.09E+02 | 1.46E+01 G |
| | | | 244.69 | 4.795E+00 | ?( | 3.265E+01 | 2.04E+02 | 7.58E+00 G |
| | | | 1408.00 | 1.921E+00 | ? | 3.635E+00 | 8.50E+01 | 2.10E+01 GA |
| EU-154 | I | 8.4662E-01 | | | | | 3.14E+03 | |
| | | | 873.23 | 3.090E-01 | %( | 1.211E+01 | 1.11E+03 | 1.23E+01 G |
| | | | 123.10 | -7.779E-01 | + | 2.275E+00 | 8.79E+01 | 4.08E+01 G |
| | | | 1274.54 | 0.000E+00 | - | 3.491E+00 | 1.00E+03 | 3.52E+01 G |
| | | | 723.36 | 0.000E+00 | & | 8.589E+00 | 1.00E+03 | 2.02E+01 G |
| | | | 1004.77 | 1.213E+00 | ?( | 7.512E+00 | 1.78E+02 | 1.80E+01 G |
| | | | 996.33 | -1.321E-01 | % | 1.456E+01 | 3.10E+03 | 1.06E+01 G |
| EU-155 | I | 1.8235E+00 | | | | | 1.81E+03 | |
| | | | 105.31 | 1.824E+00 | &( | 1.020E+01 | 1.68E+02 | 2.12E+01 G |
| | | | 86.54 | 1.458E+00 | } | 7.657E+00 | 6.03E+01 | 3.07E+01 G |
| HF-181 | F | 5.5861E-01 | | | | | 4.24E+01 | |
| | | | 482.00 | 4.662E-01 | ?( | 1.695E+00 | 1.08E+02 | 8.05E+01 G |
| | | | 133.02 | 7.303E-01 | ?( | 3.515E+00 | 1.44E+02 | 4.33E+01 G |
| | | | 345.83 | -3.294E+00 | & | 1.579E+01 | 1.44E+02 | 1.51E+01 G |
| | | | 136.30 | 0.000E+00 | - | 2.682E+01 | 1.00E+03 | 5.85E+00 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| Ta-182 | F | -2.6203E+00 | | | | | 1.14E+02 | |
| | | | 1121.30 | -2.620E+00 | ( | 7.540E+00 | 8.62E+01 | 3.49E+01 G |
| | | | 1221.41 | 1.949E+00 | + | 5.028E+00 | 1.21E+02 | 2.70E+01 G |
| | | | 1189.05 | 2.584E+00 | + | 8.202E+00 | 1.48E+02 | 1.62E+01 G |
| Hg-203 | F | 4.5452E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | 4.545E-01 | ?( | 1.259E+00 | 8.31E+01 | 8.15E+01 G |
| TL-208 | N | 9.3342E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 9.334E+00 | (P | 9.425E-01 | 7.54E+00 | 8.45E+01 G |
| | | | 277.28 | 4.438E+00 | - | 1.526E+01 | 1.02E+02 | 6.31E+00 G |
| | | | 860.56 | 4.740E+00 | - | 9.139E+00 | 8.66E+01 | 1.24E+01 G |
| pm-146 | C | 1.1845E+00 | | | | | 2.02E+03 | |
| | | | 747.16 | 1.244E+00 | &( | 2.496E+00 | 8.62E+01 | 3.40E+01 G |
| | | | 735.72 | 1.379E+00 | ?( | 4.337E+00 | 1.34E+02 | 2.25E+01 G |
| | | | 453.88 | 1.086E+00 | *( | 1.249E+00 | 4.99E+01 | 6.50E+01 G |
| y-88 | F | -4.1345E-02 | | | | | 1.07E+02 | |
| | | | 898.04 | -4.135E-02 | %( | 1.252E+00 | 1.30E+03 | 9.37E+01 G |
| | | | 1836.06 | 0.000E+00 | + | 5.109E-01 | 1.00E+03 | 9.92E+01 G |
| Cd-113m | | -5.2631E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | -5.263E+03 | &( | 1.698E+04 | 9.64E+01 | 6.00E-03 K |
| Cf-251 | T | -1.4848E+00 | | | | | 3.28E+05 | |
| | | | 176.60 | -1.485E+00 | &( | 4.949E+00 | 1.30E+02 | 1.70E+01 G |
| | | | 227.00 | -6.085E+00 | & | 1.459E+01 | 9.84E+01 | 6.30E+00 GA |
| Cf-249 | T | 8.4296E-02 | | | | | 1.28E+05 | |
| | | | 387.95 | 8.430E-02 | ?( | 2.143E+00 | 7.43E+02 | 6.60E+01 G |
| | | | 333.44 | 0.000E+00 | & | 1.324E+01 | 1.00E+03 | 1.55E+01 G |
| Sn-126 | | 4.7813E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | 3.130E+00 | } | 5.909E+00 | 2.27E+01 | 3.75E+01 GA |
| | | | 64.28 | 4.781E+00 | ( | 1.251E+01 | 1.03E+02 | 9.70E+00 G |
| | | | 86.94 | -4.454E+00 | - | 2.571E+01 | 1.74E+02 | 9.04E+00 GA |
| PB-210 | N | 7.2716E+00 | | | | | 8.14E+03 | |
| | | | 46.54 | 7.272E+00 | ?( | 4.027E+01 | 1.64E+02 | 4.25E+00 G |
| PB-212 | N | 2.5616E+01 | | | | | 6.98E+02 | |
| | | | 238.63 | 2.562E+01 | (P | 1.788E+00 | 4.18E+00 | 4.33E+01 G |
| | | | 300.03 | 2.855E+01 | + | 2.107E+01 | 2.49E+01 | 3.28E+00 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| PB-214 | N | 1.5059E+01 | | | | | 5.84E+05 | |
| | | | 351.93 | 1.521E+01 | (P | 2.090E+00 | 8.09E+00 | 3.76E+01 G |
| | | | 295.09 | 1.477E+01 | ( | 3.792E+00 | 1.07E+01 | 1.93E+01 G |
| | | | 242.00 | 2.687E+01 | + | 1.062E+01 | 1.43E+01 | 7.43E+00 GA |
| BI-207 | C | 2.5756E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | 2.576E-01 | ?( | 1.209E+00 | 1.37E+02 | 9.77E+01 G |
| | | | 1063.66 | -7.913E-02 | % | 1.851E+00 | 1.05E+03 | 7.45E+01 G |
| BI-212 | N | 2.4374E+01 | | | | | 6.98E+02 | |
| | | | 727.17 | 2.437E+01 | ( | 1.009E+01 | 2.18E+01 | 7.55E+00 G |
| | | | 785.42 | -3.913E+01 | - | 1.303E+02 | 9.89E+01 | 1.28E+00 GA |
| BI-214 | N | 1.9394E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.907E+01 | ( | 1.980E+00 | 7.74E+00 | 4.61E+01 G |
| | | | 1120.29 | 2.039E+01 | ( | 3.728E+00 | 1.41E+01 | 1.51E+01 G |
| | | | 1764.49 | 1.498E+01 | - | 7.642E+00 | 2.15E+01 | 1.54E+01 G |
| BI-210M | T | -5.1763E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | -5.176E-01 | &( | 2.397E+00 | 1.38E+02 | 5.00E+01 G |
| | | | 304.90 | 0.000E+00 | } | 8.167E+00 | 1.00E+03 | 2.80E+01 G |
| AC-228 | N | 2.1863E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 2.121E+01 | ( | 2.547E+00 | 9.38E+00 | 2.90E+01 G |
| | | | 968.97 | 2.295E+01 | ( | 4.192E+00 | 1.23E+01 | 1.75E+01 G |
| | | | 338.32 | 2.706E+01 | + | 6.472E+00 | 1.32E+01 | 1.20E+01 G |
| | | | 93.35 | 3.304E+01 | + | 1.293E+01 | 1.84E+01 | 5.56E+00 XA |
| TH-227 | N | -6.7706E+00 | | | | | 7.95E+03 | |
| | | | 50.14 | -6.771E+00 | ?( | 2.326E+01 | 1.03E+02 | 8.00E+00 G |
| | | | 256.24 | -4.685E+00 | + | 1.325E+01 | 1.16E+02 | 7.00E+00 G |
| TH-229 | N | 6.3789E-01 | | | | | 2.68E+06 | |
| | | | 193.51 | -2.356E+00 | @( | 2.040E+01 | 3.51E+02 | 4.40E+00 G |
| | | | 210.85 | 5.044E+00 | ?( | 3.379E+01 | 2.73E+02 | 2.99E+00 G |
| TH-234 | N | -4.8387E-01 | | | | | 1.63E+12 | |
| | | | 63.29 | -4.839E-01 | %( | 4.364E+01 | 2.68E+03 | 3.81E+00 G |
| | | | 92.59 | -7.059E+00 | & | 3.800E+01 | 1.62E+02 | 5.58E+00 G |
| PA-233 | C | 5.5409E-01 | | | | | 7.82E+08 | |
| | | | 312.01 | 5.541E-01 | ?( | 6.407E+00 | 3.45E+02 | 3.60E+01 G |
| | | | 300.18 | 0.000E+00 | - | 3.649E+01 | 1.00E+03 | 6.20E+00 G |
| PA-234 | N | 1.5154E+00 | | | | | 1.63E+12 | |
| | | | 131.29 | 1.747E+00 | ( | 8.284E+00 | 1.42E+02 | 1.80E+01 G |
| | | | 946.02 | 1.204E+00 | ?( | 7.830E+00 | 2.79E+02 | 1.34E+01 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments
                          569.47 0.000E+00 -   1.504E+01 1.00E+03 8.20E+00 G
                          883.24 0.000E+00 -   1.683E+01 1.00E+03 9.60E+00 G
                          880.53 2.544E+01 ?   1.849E+01 2.55E+01 6.00E+00 GA

PA-234M  N   5.1653E+01                                      1.63E+12
                         1001.00 0.000E+00 ?(  1.856E+02 1.00E+03 8.37E-01 G
                          766.41 1.987E+02 ?(  4.887E+02 7.39E+01 2.94E-01 G

U-235    N  -3.7753E+00                                      2.57E+11
                          143.79-3.775E+00  (  1.683E+01 1.34E+02 1.10E+01 G
                          205.33-8.384E+00 &   2.031E+01 9.97E+01 5.01E+00 G
                          163.38 0.000E+00 +   2.061E+01 1.00E+03 5.08E+00 G

AM-241   T   1.3451E+00                                      1.58E+05
                           59.54 1.345E+00 &(  5.057E+00 1.13E+02 3.59E+01 G

Ir-192   F   2.7359E-01                                      7.40E+01
                          316.49 0.000E+00 &(  2.696E+00 1.00E+03 8.70E+01 G
                          468.06 7.337E-01 &(  2.864E+00 1.16E+02 5.18E+01 G
                          308.44 0.000E+00 &   7.260E+00 1.00E+03 3.18E+01 G

Cs-136   F   3.2463E-01                                      1.30E+01
                          818.50 3.246E-01 ?(  1.254E+00 1.13E+02 1.00E+02 G
                         1048.07-7.284E-02 -   1.618E+00 6.18E+02 8.00E+01 G
                          340.57 0.000E+00 -   4.444E+00 1.00E+03 4.69E+01 G

Np-239   T   1.1110E+00                                      2.36E+00
                          103.70 0.000E+00 -   8.913E+00 1.00E+03 2.40E+01 X
                          106.13 1.111E+00  (  9.344E+00 2.53E+02 2.27E+01 G
                           99.50-2.589E+00 &   1.411E+01 1.64E+02 1.50E+01 X

Nd-147       5.3493E-01                                      1.11E+01
                          531.00 5.349E-01 ?(  7.560E+00 5.78E+02 1.30E+01 G
                           91.10-1.399E+00 +   7.621E+00 1.64E+02 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
```

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| TH-227 | 50.14 | 410. | -28. | -0.016 | 103.06 | -6.771E+00 |
| AM-241 | 59.54 | 629. | 32. | 0.018 | 112.90 | 1.345E+00 |
| BA-133 | 80.99 | 1571. | -37. | -0.021 | 150.72 | -1.263E+00 |
| Nd-147 | 91.10 | 1773. | -37. | -0.020 | 163.86 | -1.399E+00 |
| TH-234 | 92.59 | 1737. | -37. | -0.020 | 161.96 | -7.059E+00 |
| Gd-153 | 97.50 | 1768. | -37. | -0.020 | 162.66 | -1.299E+00 |
| Np-239 | 99.50 | 1805. | -37. | -0.020 | 164.02 | -2.589E+00 |
| Gd-153 | 103.20 | 1841. | -31. | -0.017 | 199.69 | -1.466E+00 |
| Np-239 | 106.13 | 1851. | 24. | 0.013 | 252.67 | 1.111E+00 |
| EU-152 | 121.78 | 261. | -27. | -0.015 | 86.50 | -9.920E-01 |
| EU-154 | 123.10 | 338. | -30. | -0.017 | 87.92 | -7.779E-01 |
| PA-234 | 131.29 | 868. | 30. | 0.016 | 142.30 | 1.747E+00 |
| HF-181 | 133.02 | 898. | 30. | 0.016 | 144.44 | 7.303E-01 |
| CE-144 | 133.54 | 927. | 12. | 0.007 | 363.01 | 1.149E+00 |
| U-235 | 143.79 | 1247. | -38. | -0.021 | 134.07 | -3.775E+00 |
| CE-141 | 145.44 | 1268. | -37. | -0.021 | 137.12 | -8.509E-01 |
| CE-139 | 165.85 | 284. | 18. | 0.010 | 138.39 | 2.569E-01 |
| Cf-251 | 176.60 | 202. | -21. | -0.011 | 130.42 | -1.485E+00 |
| TH-229 | 193.51 | 204. | -8. | -0.004 | 351.34 | -2.356E+00 |
| U-235 | 205.33 | 244. | -31. | -0.017 | 99.73 | -8.384E+00 |
| TH-229 | 210.85 | 232. | 11. | 0.006 | 272.78 | 5.044E+00 |
| Cf-251 | 227.00 | 172. | -27. | -0.015 | 98.36 | -6.085E+00 |
| EU-152 | 244.69 | 1190. | 24. | 0.013 | 204.26 | 4.795E+00 |
| TH-227 | 256.24 | 148. | -21. | -0.012 | 115.50 | -4.685E+00 |
| Cd-113m | 263.70 | 173. | -20. | -0.011 | 96.39 | -5.263E+03 |
| BI-210M | 265.83 | 240. | -16. | -0.009 | 137.74 | -5.176E-01 |
| Hg-203 | 279.20 | 162. | 22. | 0.012 | 83.12 | 4.545E-01 |
| PA-231 | 300.07 | 757. | -10. | -0.006 | 374.56 | -7.371E+00 |
| La-140 | 328.76 | 549. | -21. | -0.012 | 159.29 | -1.916E+00 |
| HF-181 | 345.83 | 678. | -26. | -0.014 | 143.68 | -3.294E+00 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| BA-133 | 356.00 | 466. | -22. | -0.012 | 138.35 | -7.050E-01 | |
| BA-133 | 383.84 | 177. | 19. | 0.011 | 99.98 | 4.463E+00 | |
| Cf-249 | 387.95 | 196. | 3. | 0.001 | 743.41 | 8.430E-02 | |
| SN-113 | 391.69 | 231. | -21. | -0.012 | 102.38 | -7.028E-01 | |
| AG-108M | 433.94 | 69. | -10. | -0.006 | 167.40 | -2.573E-01 | |
| pm-146 | 453.88 | 48. | 30. | 0.017 | 49.88 | 1.086E+00 | |
| Ir-192 | 468.06 | 164. | 16. | 0.009 | 116.03 | 7.337E-01 | |
| BE-7 | 477.60 | 116. | 16. | 0.009 | 97.90 | 3.684E+00 | |
| HF-181 | 482.00 | 132. | 15. | 0.009 | 108.06 | 4.662E-01 | |
| RU-103 | 497.05 | 39. | 15. | 0.008 | 90.56 | 4.018E-01 | |
| RH-106 | 511.86 | 105. | 113. | 0.063 | 25.50 | 1.434E+01 | |
| Nd-147 | 531.00 | 56. | 3. | 0.001 | 577.78 | 5.349E-01 | |
| CS-134 | 563.24 | 42. | 15. | 0.008 | 93.50 | 4.985E+00 | |
| CS-134 | 569.32 | 70. | -12. | -0.007 | 102.74 | -2.142E+00 | |
| BI-207 | 569.70 | 75. | 9. | 0.005 | 137.49 | 2.576E-01 | |
| SB-124 | 602.73 | 535. | -19. | -0.010 | 175.60 | -5.475E-01 | |
| CS-134 | 604.71 | 533. | -20. | -0.011 | 168.78 | -5.739E-01 | |
| RU-103 | 610.30 | 513. | -20. | -0.011 | 165.19 | -9.842E+00 | |
| PM-144 | 618.06 | 83. | 1. | 0.001 | 964.99 | 3.954E-02 | |
| RH-106 | 621.92 | 65. | 15. | 0.008 | 80.28 | 4.427E+00 | |
| AG-110M | 657.76 | 233. | -5. | -0.003 | 464.56 | -1.507E-01 | |
| PM-144 | 696.54 | 45. | 8. | 0.004 | 126.29 | 2.524E-01 | |
| NB-94 | 702.63 | 68. | 15. | 0.008 | 84.63 | 4.772E-01 | |
| SB-124 | 722.79 | 146. | -18. | -0.010 | 95.52 | -5.592E+00 | |
| AG-108M | 722.94 | 127. | -11. | -0.006 | 145.01 | -4.061E-01 | |
| ZR-95 | 724.20 | 97. | 15. | 0.009 | 94.21 | 1.141E+00 | |
| pm-146 | 735.72 | 33. | 9. | 0.005 | 133.96 | 1.379E+00 | |
| pm-146 | 747.16 | 23. | 13. | 0.007 | 86.23 | 1.244E+00 | |
| AG-110M | 763.94 | 50. | -4. | -0.002 | 254.95 | -6.143E-01 | |
| NB-95 | 765.79 | 93. | -7. | -0.004 | 207.85 | -2.290E-01 | |
| PA-234M | 766.41 | 71. | 17. | 0.009 | 73.89 | 1.987E+02 | |
| CS-134 | 795.87 | 63. | 15. | 0.008 | 78.00 | 6.289E-01 | |
| CS-134 | 801.95 | 69. | 14. | 0.008 | 87.33 | 5.781E+00 | |
| Cs-136 | 818.50 | 47. | 9. | 0.005 | 113.13 | 3.246E-01 | |
| MN-54 | 834.85 | 20. | 21. | 0.012 | 51.65 | 7.692E-01 | |
| NB-94 | 871.10 | 55. | -11. | -0.006 | 102.70 | -4.041E-01 | |
| PA-234 | 880.53 | 32. | 40. | 0.022 | 25.50 | 2.544E+01 | |
| Sc-46 | 889.28 | 72. | 2. | 0.001 | 806.91 | 5.768E-02 | |
| AG-110M | 937.49 | 45. | -12. | -0.007 | 126.24 | -1.399E+00 | |
| PA-234 | 946.02 | 25. | 4. | 0.002 | 279.32 | 1.204E+00 | |
| EU-152 | 964.11 | 154. | 16. | 0.009 | 109.44 | 4.606E+00 | |
| EU-154 | 1004.77 | 40. | 5. | 0.003 | 177.57 | 1.213E+00 | |
| Cs-136 | 1048.07 | 33. | -1. | -0.001 | 618.47 | -7.284E-02 | |
| RH-106 | 1050.36 | 42. | -7. | -0.004 | 143.35 | -1.871E+01 | |
| Ga-68 | 1077.40 | 21. | 13. | 0.007 | 85.36 | 2.053E+01 | |
| FE-59 | 1099.25 | 59. | -22. | -0.012 | 82.87 | -1.747E+00 | |
| EU-152 | 1112.07 | 146. | -17. | -0.010 | 100.94 | -5.852E+00 | |
| ZN-65 | 1115.55 | 129. | -17. | -0.009 | 98.97 | -1.518E+00 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Ta-182 | 1121.30 | 136. | -20. | -0.011 | 86.16 | -2.620E+00 | |
| CO-60 | 1173.24 | 21. | 10. | 0.005 | 113.27 | 4.623E-01 | |
| Ta-182 | 1189.05 | 28. | 9. | 0.005 | 147.99 | 2.584E+00 | |
| Ta-182 | 1221.41 | 28. | 11. | 0.006 | 120.97 | 1.949E+00 | |
| FE-59 | 1291.60 | 17. | 6. | 0.003 | 166.25 | 7.166E-01 | |
| CO-60 | 1332.50 | 17. | -3. | -0.002 | 327.45 | -1.587E-01 | |
| AG-110M | 1384.30 | 23. | -4. | -0.002 | 308.96 | -8.235E-01 | |
| EU-152 | 1408.00 | 6. | 7. | 0.004 | 85.00 | 1.921E+00 | |
| La-140 | 1596.21 | 12. | 2. | 0.001 | 424.26 | 1.284E-01 | |
| SB-124 | 1690.98 | 0. | 6. | 0.003 | 40.82 | 8.065E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | 3.6842E+00 | 3.6842E+00 | 9.790E+01% | 1.21E+01 |
| NA-22 | # | 1.0726E+00 | 1.0726E+00 | 2.182E+01% | 3.76E-01 |
| K-40 | | 2.6509E+02 | 2.6509E+02 | 4.656E+00% | 7.37E+00 |
| Sc-46 | #A | 5.7681E-02 | 5.7681E-02 | 8.069E+02% | 1.63E+00 |
| CR-51 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.38E+01 |
| MN-54 | #A | 7.6919E-01 | 7.6919E-01 | 5.165E+01% | 8.63E-01 |
| FE-59 | #A | -1.7468E+00 | -1.7469E+00 | 8.287E+01% | 3.08E+00 |
| Co-56 | #C | 1.2611E+00 | 1.2611E+00 | 2.952E+01% | 1.05E+00 |
| CO-57 | # | 7.0371E-01 | 7.0371E-01 | 3.815E+01% | 6.33E-01 |
| CO-58 | #A | -2.4001E-02 | -2.4002E-02 | 1.933E+03% | 1.62E+00 |
| CO-60 | #A | 1.5167E-01 | 1.5167E-01 | 1.133E+02% | 1.16E+00 |
| ZN-65 | #A | -1.5179E+00 | -1.5179E+00 | 9.897E+01% | 5.04E+00 |
| NB-94 | #A | 4.7720E-01 | 4.7720E-01 | 8.463E+01% | 1.35E+00 |
| ZR-95 | #A | 5.1092E-01 | 5.1092E-01 | 9.421E+01% | 2.01E+00 |
| NB-95 | #A | -2.2902E-01 | -2.2902E-01 | 2.078E+02% | 1.63E+00 |
| RU-103 | #A | 4.0182E-01 | 4.0182E-01 | 9.056E+01% | 8.70E-01 |
| RH-106 | #A | 4.4271E+00 | 4.4271E+00 | 8.028E+01% | 1.19E+01 |
| AG-108M | #A | -2.5730E-01 | -2.5730E-01 | 1.674E+02% | 1.03E+00 |
| AG-110M | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.23E+00 |
| SN-113 | #A | -7.0283E-01 | -7.0283E-01 | 1.024E+02% | 2.41E+00 |
| SB-124 | #A | -1.0445E-01 | -1.0445E-01 | 4.082E+01% | 3.22E+00 |
| SB-125 | #C | 4.4960E+00 | 4.4960E+00 | 2.099E+01% | 3.04E+00 |
| I-131 | A | 7.4235E-01 | 7.4236E-01 | 6.933E+01% | 9.74E-01 |
| Gd-153 | #A | -1.2987E+00 | -1.2987E+00 | 1.627E+02% | 7.02E+00 |
| Ga-68 | #A | 2.0443E+01 | 2.0526E+01 | 8.536E+01% | 3.82E+01 |
| Tc-99m | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 1.83E+00 |
| BA-133 | #A | -7.0499E-01 | -7.0499E-01 | 1.383E+02% | 3.26E+00 |
| CS-134 | #A | 4.4769E-01 | 4.4769E-01 | 5.642E+01% | 3.24E+00 |
| CS-137 | | 6.4903E+00 | 6.4903E+00 | 9.416E+00% | 8.64E-01 |
| CE-139 | #A | 2.5692E-01 | 2.5692E-01 | 1.384E+02% | 1.19E+00 |

| | | | | | |
|---|---|---|---|---|---|
| Ba-140 #A | 7.1894E-02 | 7.1895E-02 | 2.301E+03% | | 4.06E+00 |
| La-140 #A | 1.2843E-01 | 1.2843E-01 | 4.243E+02% | | 1.21E+00 |
| CE-141 #A | -8.5093E-01 | -8.5093E-01 | 1.371E+02% | | 3.88E+00 |
| CE-144 #A | 1.1489E+00 | 1.1489E+00 | 3.630E+02% | | 1.40E+01 |
| PM-144 #A | 2.5240E-01 | 2.5240E-01 | 1.263E+02% | | 1.09E+00 |
| EU-152 #A | 1.6814E+00 | 1.6814E+00 | 1.094E+02% | | 7.92E+00 |
| EU-154 #A | 8.4662E-01 | 8.4662E-01 | 1.776E+02% | | 1.21E+01 |
| EU-155  A | 1.8235E+00 | 1.8235E+00 | 1.684E+02% | | 1.02E+01 |
| HF-181 #A | 5.5860E-01 | 5.5861E-01 | 9.020E+01% | | 1.70E+00 |
| Ta-182 #A | -2.6203E+00 | -2.6203E+00 | 8.616E+01% | | 7.54E+00 |
| Hg-203 #A | 4.5452E-01 | 4.5452E-01 | 8.312E+01% | | 1.26E+00 |
| TL-208 | 9.3342E+00 | 9.3342E+00 | 7.539E+00% | | 9.43E-01 |
| pm-146 #A | 1.1845E+00 | 1.1845E+00 | 4.988E+01% | | 2.50E+00 |
| y-88  #A | -4.1345E-02 | -4.1345E-02 | 1.304E+03% | | 1.25E+00 |
| Cd-113m#A | -5.2631E+03 | -5.2631E+03 | 9.639E+01% | | 1.70E+04 |
| Cd-109 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 6.04E+01 |
| Cf-251 #A | -1.4848E+00 | -1.4848E+00 | 1.304E+02% | | 4.95E+00 |
| Cf-249 #A | 8.4296E-02 | 8.4296E-02 | 7.434E+02% | | 2.14E+00 |
| Sn-126  A | 4.7813E+00 | 4.7813E+00 | 1.032E+02% | | 1.25E+01 |
| PB-210 #A | 7.2716E+00 | 7.2716E+00 | 1.645E+02% | | 4.03E+01 |
| PB-212 | 2.5616E+01 | 2.5616E+01 | 4.183E+00% | | 1.79E+00 |
| PB-214 | 1.5059E+01 | 1.5059E+01 | 6.690E+00% | | 2.09E+00 |
| BI-207 #A | 2.5756E-01 | 2.5756E-01 | 1.375E+02% | | 1.21E+00 |
| BI-212 | 2.4374E+01 | 2.4374E+01 | 2.182E+01% | | 1.01E+01 |
| BI-214 | 1.9394E+01 | 1.9394E+01 | 7.735E+00% | | 1.98E+00 |
| BI-210M#A | -5.1763E-01 | -5.1763E-01 | 1.377E+02% | | 2.40E+00 |
| AC-228 | 2.1863E+01 | 2.1863E+01 | 7.751E+00% | | 2.55E+00 |
| TH-227 #A | -6.7706E+00 | -6.7706E+00 | 1.031E+02% | | 2.33E+01 |
| TH-229 #A | 6.3789E-01 | 6.3789E-01 | 2.224E+02% | | 2.04E+01 |
| TH-234 #A | -4.8387E-01 | -4.8387E-01 | 2.675E+03% | | 4.36E+01 |
| PA-231 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 7.90E+01 |
| PA-233 #A | 5.5409E-01 | 5.5409E-01 | 3.448E+02% | | 6.41E+00 |
| PA-234 #A | 1.5154E+00 | 1.5154E+00 | 1.423E+02% | | 8.28E+00 |
| PA-234M#A | 5.1653E+01 | 5.1653E+01 | 7.389E+01% | | 1.86E+02 |
| U-235  #A | -3.7753E+00 | -3.7753E+00 | 1.341E+02% | | 1.68E+01 |
| AM-241 #A | 1.3451E+00 | 1.3451E+00 | 1.129E+02% | | 5.06E+00 |
| Np-237 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 1.83E+01 |
| Ir-192 #A | 2.7358E-01 | 2.7359E-01 | 1.160E+02% | | 2.70E+00 |
| Cs-136 #A | 3.2462E-01 | 3.2463E-01 | 1.131E+02% | | 1.25E+00 |
| Np-239 #A | 1.1109E+00 | 1.1110E+00 | 2.527E+02% | | 9.34E+00 |
| Nd-147 #A | 5.3492E-01 | 5.3493E-01 | 5.778E+02% | | 7.56E+00 |

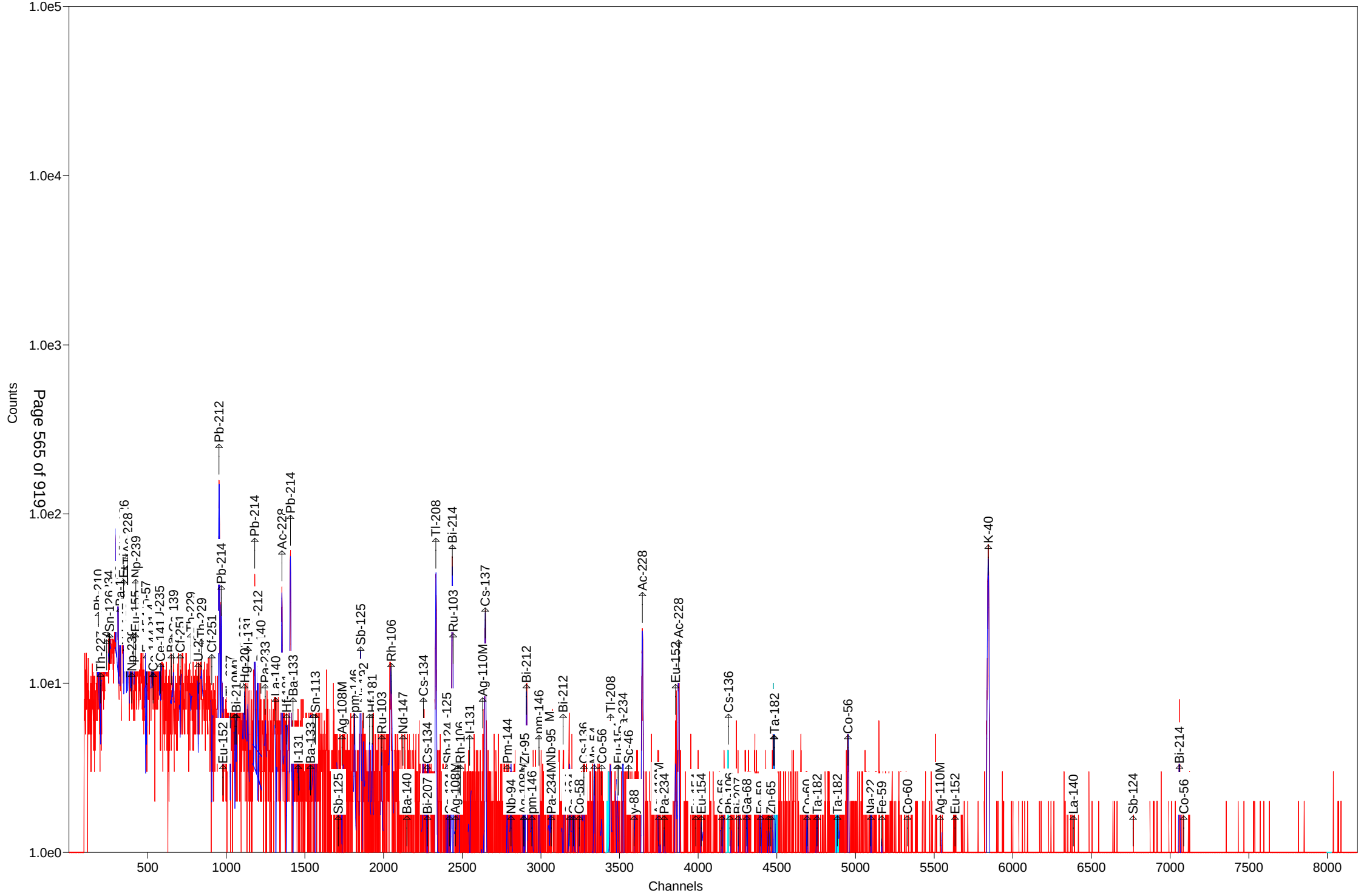
# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  25.1 to  1999.3 keV)  3.879E+02  Bq/Sample
Total Decayed Activity (  25.1 to  1999.3 keV) 3.8792303E+02  Bq/Sample

309155_Gamma_160-22327-A-10-B. 9_Gamma_20171608.spc.



Test America St. Louis  Spectrum ID: 13_Gamma_20171201

Sample Description: 309155_Gamma_160-22327-A-11-B
Detector: Detector #13
Batch ID: 309155
Work Order Number: Gamma
Lot Number: 160-22327-A-11-B

Decay to Time: 6/7/2017 11:22  Live Time: 1800 sec
Acquisition Time: 6/7/2017 11:23:01  Real Time: 1804 sec
Analysis Time: 6/7/2017 11:53  Dead Time: 0.23 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 13_Soil_TunaCan.Clb
Efficiency Cal Desc: 13_Soil_TunaCan_90099_032712
Efficiency Cal Date: 3/29/2012 07:50
Energy Cal Date: 2/23/2012 09:31
Library: Client_Long_Rev11.lib
Bkgd Correction File: 13_2017-06-04_0332.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | -4.298E+00 | 98.9 | 4.253E+00 | 4.259E+00 | 1.424E+01 |
| NA-22 | 2.602E-01 | 133.5 | 3.473E-01 | 3.476E-01 | 1.215E+00 |
| K-40 | 2.391E+02 | 4.6 | 1.104E+01 | 1.648E+01 | 3.758E+00 |
| Sc-46 | 5.505E-01 | 96.7 | 5.324E-01 | 5.331E-01 | 1.790E+00 |
| CR-51 | 3.607E+00 | 161.8 | 5.838E+00 | 5.841E+00 | 1.953E+01 |
| MN-54 | 4.174E-01 | 87.4 | 3.649E-01 | 3.656E-01 | 8.248E-01 |
| FE-59 | -7.164E-01 | 152.4 | 1.092E+00 | 1.092E+00 | 2.394E+00 |
| Co-56 | 7.439E-01 | 82.0 | 6.099E-01 | 6.111E-01 | 9.213E-01 |
| CO-57 | -2.622E-01 | 95.1 | 2.493E-01 | 2.497E-01 | 8.327E-01 |
| CO-58 | 4.534E-01 | 80.8 | 3.662E-01 | 3.670E-01 | 1.228E+00 |
| CO-60 | 2.022E-01 | 246.9 | 4.990E-01 | 4.991E-01 | 1.108E+00 |
| ZN-65 | -1.376E+00 | 104.6 | 1.440E+00 | 1.441E+00 | 4.840E+00 |
| NB-94 | 2.278E-01 | 39.4 | 8.985E-02 | 9.063E-02 | 1.566E+00 |
| ZR-95 | 4.880E-01 | 126.6 | 6.178E-01 | 6.183E-01 | 1.551E+00 |
| NB-95 | 2.025E-01 | 215.4 | 4.364E-01 | 4.365E-01 | 1.502E+00 |
| RU-103 | -2.958E-01 | 138.4 | 4.095E-01 | 4.097E-01 | 9.837E-01 |
| RH-106 | -1.950E+00 | 104.1 | 2.029E+00 | 2.032E+00 | 2.794E+01 |
| AG-108M | -4.434E-01 | 96.7 | 4.287E-01 | 4.293E-01 | 1.015E+00 |
| AG-110M | 8.312E-01 | 27.7 | 2.305E-01 | 2.344E-01 | 2.683E+00 |
| SN-113 | -8.322E-02 | 640.6 | 5.331E-01 | 5.331E-01 | 1.833E+00 |
| SB-124 | 4.412E-02 | 56.9 | 2.512E-02 | 2.523E-02 | 2.690E+00 |
| SB-125 | 4.021E-01 | 85.7 | 3.445E-01 | 3.451E-01 | 3.153E+00 |
| I-131 | 5.859E-01 | 74.0 | 4.334E-01 | 4.345E-01 | 9.351E-01 |
| Gd-153 | 4.491E-02 | 4044.0 | 1.816E+00 | 1.816E+00 | 6.075E+00 |
| Ga-68 | 1.215E+01 | 119.0 | 1.446E+01 | 1.447E+01 | 3.242E+01 |
| Tc-99m | 3.456E-01 | 142.9 | 4.938E-01 | 4.941E-01 | 1.646E+00 |
| BA-133 | -5.614E-01 | 155.1 | 8.709E-01 | 8.713E-01 | 2.919E+00 |
| CS-134 | 6.726E-01 | 65.8 | 4.425E-01 | 4.439E-01 | 2.525E+00 |
| CS-137 | 4.081E+00 | 10.6 | 4.330E-01 | 4.822E-01 | 5.879E-01 |
| CE-139 | 8.541E-02 | 410.2 | 3.503E-01 | 3.504E-01 | 1.186E+00 |
| Ba-140 | -6.524E-01 | 243.2 | 1.587E+00 | 1.587E+00 | 3.719E+00 |
| La-140 | 2.249E-01 | 111.8 | 2.514E-01 | 2.517E-01 | 1.411E+00 |
| CE-141 | -3.134E-01 | 283.4 | 8.882E-01 | 8.883E-01 | 2.973E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 2.639E+00 | 144.6 | 3.816E+00 | 3.818E+00 | 1.272E+01 |
| PM-144 | -4.416E-01 | 96.4 | 4.258E-01 | 4.264E-01 | 1.433E+00 |
| EU-152 | 9.426E-01 | 123.8 | 1.167E+00 | 1.168E+00 | 6.784E+00 |
| EU-154 | 8.195E-01 | 89.1 | 7.304E-01 | 7.316E-01 | 8.828E+00 |
| EU-155 | 0.000E+00 | 1.#INF | 7.832E-01 | 7.832E-01 | 5.602E+00 |
| HF-181 | -3.791E-01 | 103.7 | 3.932E-01 | 3.936E-01 | 1.969E+00 |
| Ta-182 | 2.927E+00 | 29.7 | 8.684E-01 | 8.806E-01 | 6.331E+00 |
| Hg-203 | 3.795E-01 | 81.6 | 3.095E-01 | 3.103E-01 | 1.033E+00 |
| TL-208 | 5.405E+00 | 12.8 | 6.918E-01 | 7.464E-01 | 1.091E+00 |
| pm-146 | 3.396E-01 | 180.0 | 6.112E-01 | 6.114E-01 | 3.045E+00 |
| y-88 | -2.767E-01 | 202.2 | 5.595E-01 | 5.597E-01 | 1.272E+00 |
| Cd-113m | 1.344E+03 | 264.3 | 3.552E+03 | 3.553E+03 | 1.223E+04 |
| Cd-109 | 0.000E+00 | 1.#INF | 1.513E+01 | 1.513E+01 | 5.032E+01 |
| Cf-251 | 1.560E+00 | 104.3 | 1.627E+00 | 1.633E+00 | 3.978E+00 |
| Cf-249 | 7.509E-01 | 97.7 | 7.332E-01 | 7.343E-01 | 1.660E+00 |
| Sn-126 | 4.078E+00 | 124.8 | 5.087E+00 | 5.092E+00 | 1.695E+01 |
| PB-210 | 1.147E+01 | 107.7 | 1.235E+01 | 1.237E+01 | 4.127E+01 |
| PB-212 | 1.824E+01 | 4.7 | 8.603E-01 | 1.460E+00 | 1.344E+00 |
| PB-214 | 1.400E+01 | 6.1 | 8.514E-01 | 1.120E+00 | 1.613E+00 |
| BI-207 | 1.342E-01 | 201.0 | 2.698E-01 | 2.699E-01 | 9.394E-01 |
| BI-212 | -5.913E+00 | 110.4 | 6.526E+00 | 6.533E+00 | 2.200E+01 |
| BI-214 | 1.412E+01 | 7.3 | 1.025E+00 | 1.261E+00 | 1.014E+00 |
| BI-210M | -2.230E-01 | 219.9 | 4.903E-01 | 4.905E-01 | 1.675E+00 |
| AC-228 | 1.584E+01 | 10.2 | 1.618E+00 | 1.808E+00 | 1.980E+00 |
| TH-227 | 6.116E-02 | 9075.6 | 5.550E+00 | 5.550E+00 | 1.891E+01 |
| TH-229 | -1.950E+00 | 360.2 | 7.023E+00 | 7.025E+00 | 1.738E+01 |
| TH-234 | 1.288E+01 | 24.1 | 3.106E+00 | 3.179E+00 | 4.335E+01 |
| PA-231 | -1.285E+01 | 172.1 | 2.212E+01 | 2.213E+01 | 7.389E+01 |
| PA-233 | 0.000E+00 | 1.#INF | 2.003E-01 | 2.003E-01 | 5.758E+00 |
| PA-234 | -6.805E-01 | 137.9 | 9.382E-01 | 9.388E-01 | 7.754E+00 |
| PA-234M | 4.930E+01 | 70.3 | 3.468E+01 | 3.477E+01 | 1.916E+02 |
| U-235 | -5.190E-01 | 92.2 | 4.788E-01 | 4.795E-01 | 1.315E+01 |
| AM-241 | 1.193E+00 | 125.5 | 1.497E+00 | 1.499E+00 | 4.991E+00 |
| Np-237 | 0.000E+00 | 1.#INF | 4.676E+00 | 4.676E+00 | 1.555E+01 |
| Ir-192 | 6.768E-02 | 366.5 | 2.481E-01 | 2.481E-01 | 2.406E+00 |
| Cs-136 | 4.459E-01 | 71.1 | 3.172E-01 | 3.182E-01 | 1.303E+00 |
| Np-239 | 1.097E+00 | 110.8 | 1.216E+00 | 1.218E+00 | 4.062E+00 |
| Nd-147 | 2.044E+00 | 129.6 | 2.650E+00 | 2.652E+00 | 6.397E+00 |
| Total | 1.771E+03 | | | | |

Analyst: kody Saulters

Sample description
309155_Gamma_160-22327-A-11-B

Spectrum Filename: C:\User\SPC\Det13\13_Gamma_20171201.An1

Acquisition information
Start time: 6/7/2017 11:23:01 AM
Live time: 1800
Real time: 1804
Dead time: 0.23 %
Detector ID: 13

Detector system
Ge13 SN/10064006

Calibration
Filename: 13_Soil_TunaCan.Clb
13_Soil_TunaCan_90099_032712

Energy Calibration
Created: 2/23/2012 9:31:24 AM
Zero offset: 0.036 keV
Gain: 0.250 keV/channel
Quadratic: -2.347E-08 keV/channel^2

Efficiency Calibration
Created: 3/29/2012 7:50:26 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.91 %
Log(Eff): -5.308398E-01 + (-3.057754E-01*Log(E) ) + ( -3.437570E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.60 %
Log(Eff): -2.292218E+01 + ( 8.455931E+00*Log(E) ) + ( -8.924057E-01*Log(E)^2 )

Library Files
Main analysis library: Client_Long_Rev11.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 100 (  25.05keV )
Stop channel: 8000 (  1999.54keV )
Peak rejection level: 1000.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 6/7/2017 11:22:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 13_2017-06-04_0332.PBC 6/4/2017 3:32:55 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 28 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.1232

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 37.33 | 16. | 58.51 | 0.67 | 1.819E-02 | | | | |
| 46.54 | 24. | 107.73 | 1.02 | 2.705E-02 | 46.54 | 4.250 | PBC<MDA | PB210 |
| 59.46 | 29. | 125.53 | 1.03 | 3.802E-02 | 59.54 | 35.900 | PBC<MDA | AM241 |
| 62.66 | 47. | 51.40 | 0.49 | 4.026E-02 | 63.29 | 3.810 | 1.685E+01 | TH234 |
| 64.21 | 29. | 124.76 | 1.03 | 4.135E-02 | 64.28 | 9.700 | PBC<MDA | Sn126 |
| 67.74 | 22. | 63.21 | 0.35 | 4.352E-02 | | | | |
| 74.77 | 258. | 9.87 | 1.04 | 4.731E-02 | | | | |
| 76.98 | 401. | 6.67 | 1.05 | 4.833E-02 | | | | |
| 87.14 | 146. | 15.81 | 1.01 | 5.201E-02 | 86.49 | 13.100 | 1.198E+01 | Np237 |
| | | | | | 86.54 | 30.700 | 5.109E+00 | EU155 |
| | | | | | 86.94 | 9.040 | 1.731E+01 | Sn126 |
| | | | | | 87.57 | 37.500 | 4.159E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 4.105E+01 | Cd109 |
| 92.63 | 78. | 24.11 | 1.06 | 5.337E-02 | 92.59 | 5.584 | 1.448E+01 | TH234 |
| 93.39 | 33. | 165.01 | 1.06 | 5.353E-02 | 93.35 | 5.561 | PBC<MDA | AC228 |
| 106.13 | 25. | 110.85 | 1.07 | 5.524E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 121.78 | 15. | 123.83 | 1.09 | 5.530E-02 | 121.78 | 28.580 | PBC<MDA | EU152 |
| | | | | | 122.06 | 85.600 | 1.761E-01 | CO57 |
| 123.10 | 10. | 223.61 | 1.09 | 5.523E-02 | 123.10 | 40.790 | PBC<MDA | EU154 |
| 134.42 | 29. | 144.60 | 1.10 | 5.430E-02 | 133.54 | 11.090 | PBC<MDA | CE144 |
| 136.30 | 13. | 322.75 | 1.10 | 5.397E-02 | 136.30 | 5.850 | PBC<MDA | HF181 |
| | | | | | 136.47 | 10.680 | 1.209E+00 | CO57 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 140.51 | 29. | 142.87 | 1.11 | 5.341E-02 | 140.51 | 89.300 | PBC<MDA | Tc99m |
| 165.85 | 6. | 410.19 | 1.13 | 5.020E-02 | 165.85 | 79.900 | PBC<MDA | CE139 |
| 176.60 | 23. | 104.26 | 1.14 | 4.817E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |
| 205.33 | 20. | 131.25 | 1.17 | 4.356E-02 | 205.33 | 5.010 | PBC<MDA | U235 |
| 209.44 | 78. | 23.04 | 0.94 | 4.298E-02 | | | | |
| 238.46 | 531. | 6.23 | 1.13 | 3.937E-02 | 238.63 | 43.300 | 1.732E+01 | PB212 |
| 241.93 | 103. | 16.33 | 1.20 | 3.897E-02 | 242.00 | 7.430 | 1.982E+01 | PB214 |
| 263.70 | 5. | 264.28 | 1.22 | 3.674E-02 | 263.70 | 0.006 | PBC<MDA | Cd113m |
| 277.48 | 10. | 170.89 | 1.23 | 3.549E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| 279.20 | 20. | 81.57 | 1.23 | 3.532E-02 | 279.20 | 81.460 | PBC<MDA | Hg203 |
| 284.30 | 3. | 556.78 | 1.24 | 3.488E-02 | 284.30 | 6.140 | PBC<MDA | I131 |
| 295.12 | 170. | 10.19 | 0.96 | 3.399E-02 | 295.09 | 19.300 | 1.444E+01 | PB214 |
| 299.98 | 39. | 33.09 | 1.25 | 3.360E-02 | 300.03 | 3.280 | PBC<MDA | PB212 |
| | | | | | 300.07 | 2.460 | 2.639E+01 | PA231 |
| | | | | | 300.18 | 6.200 | 1.047E+01 | PA233 |
| 320.08 | 21. | 161.84 | 1.27 | 3.211E-02 | 320.08 | 9.940 | PBC<MDA | CR51 |
| 328.76 | 17. | 160.38 | 1.28 | 3.151E-02 | 328.76 | 20.300 | PBC<MDA | La140 |
| 333.44 | 17. | 163.42 | 1.28 | 3.120E-02 | 333.44 | 15.510 | PBC<MDA | Cf249 |
| 338.43 | 135. | 13.96 | 1.40 | 3.087E-02 | 338.32 | 12.010 | 2.022E+01 | AC228 |
| 340.57 | 17. | 166.09 | 1.29 | 3.074E-02 | 340.57 | 46.900 | PBC<MDA | Cs136 |
| 344.29 | 17. | 169.11 | 1.29 | 3.050E-02 | 344.29 | 26.500 | PBC<MDA | EU152 |
| 351.78 | 274. | 8.07 | 1.07 | 3.004E-02 | 351.93 | 37.600 | 1.350E+01 | PB214 |
| 364.48 | 7. | 238.12 | 1.31 | 2.929E-02 | 364.48 | 81.700 | PBC<MDA | I131 |
| 383.84 | 15. | 100.95 | 1.33 | 2.823E-02 | 383.84 | 8.940 | PBC<MDA | BA133 |
| 387.95 | 15. | 106.95 | 1.33 | 2.802E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 453.88 | 5. | 297.77 | 1.39 | 2.502E-02 | 453.88 | 65.000 | PBC<MDA | pm146 |
| 463.37 | 18. | 85.67 | 1.40 | 2.465E-02 | 463.37 | 10.470 | PBC<MDA | SB125 |
| 468.06 | 4. | 366.54 | 1.40 | 2.447E-02 | 468.06 | 51.750 | PBC<MDA | Ir192 |
| 487.02 | 16. | 111.79 | 1.42 | 2.377E-02 | 487.02 | 45.500 | PBC<MDA | La140 |
| 511.86 | 106. | 23.72 | 2.69 | 2.292E-02 | 511.86 | 20.000 | 1.285E+01 | RH106 |
| 531.00 | 11. | 129.64 | 1.46 | 2.230E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 563.24 | 7. | 231.25 | 1.49 | 2.135E-02 | 563.24 | 8.350 | PBC<MDA | CS134 |
| 569.32 | 14. | 65.79 | 1.49 | 2.118E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 4.386E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 3.681E-01 | BI207 |
| 569.47 | 4. | 235.14 | 1.49 | 2.118E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 1.372E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 1.151E-01 | BI207 |
| 569.70 | 5. | 201.00 | 1.49 | 2.117E-02 | 569.32 | 15.380 | PBC<MDA | CS134 |
| | | | | | 569.47 | 8.200 | 1.599E+00 | PA234 |
| | | | | | 569.70 | 97.740 | 1.342E-01 | BI207 |
| 583.15 | 173. | 12.80 | 1.26 | 2.081E-02 | 583.02 | 84.500 | 5.475E+00 | TL208 |
| 604.71 | 15. | 178.75 | 1.52 | 2.025E-02 | 604.71 | 97.620 | PBC<MDA | CS134 |
| 609.18 | 233. | 7.26 | 1.38 | 2.014E-02 | 609.31 | 46.090 | 1.392E+01 | BI214 |
| | | | | | 610.30 | 5.750 | 1.118E+02 | RU103 |
| 636.97 | 13. | 73.98 | 1.55 | 1.948E-02 | 636.97 | 7.170 | PBC<MDA | I131 |
| 661.61 | 118. | 10.61 | 1.45 | 1.894E-02 | 661.66 | 85.210 | 4.081E+00 | CS137 |
| 722.79 | 16. | 56.94 | 1.62 | 1.771E-02 | 722.79 | 10.810 | PBC<MDA | SB124 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| | | | | | 722.94 | 90.840 | 5.562E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 2.500E+00 | EU154 |
| 722.94 | 11. | 93.66 | 1.62 | 1.771E-02 | 722.79 | 10.810 | 3.271E+00 | SB124 |
| | | | | | 722.94 | 90.840 | 3.893E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 1.750E+00 | EU154 |
| 723.36 | 11. | 102.67 | 1.62 | 1.770E-02 | 722.79 | 10.810 | PBC<MDA | SB124 |
| | | | | | 722.94 | 90.840 | 3.894E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 1.750E+00 | EU154 |
| 724.20 | 6. | 235.21 | 1.62 | 1.769E-02 | 724.20 | 44.150 | PBC<MDA | ZR95 |
| 747.16 | 7. | 202.20 | 1.64 | 1.727E-02 | 747.16 | 34.000 | PBC<MDA | pm146 |
| 756.73 | 9. | 126.60 | 1.65 | 1.710E-02 | 756.73 | 54.460 | PBC<MDA | ZR95 |
| 765.79 | 6. | 215.44 | 1.66 | 1.695E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 6.879E+01 | PA234M |
| 766.41 | 17. | 70.34 | 1.66 | 1.694E-02 | 765.79 | 99.790 | PBC<MDA | NB95 |
| | | | | | 766.41 | 0.294 | 1.896E+02 | PA234M |
| 785.42 | 11. | 96.42 | 1.67 | 1.663E-02 | 785.42 | 1.280 | PBC<MDA | BI212 |
| 795.87 | 13. | 77.65 | 1.68 | 1.646E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 2. | 606.03 | 1.69 | 1.636E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 810.78 | 13. | 80.78 | 1.69 | 1.623E-02 | 810.78 | 99.460 | PBC<MDA | CO58 |
| 815.77 | 3. | 401.55 | 1.70 | 1.615E-02 | 815.77 | 23.280 | PBC<MDA | La140 |
| 818.50 | 9. | 118.67 | 1.70 | 1.611E-02 | 818.50 | 100.000 | PBC<MDA | Cs136 |
| 834.85 | 12. | 87.44 | 1.71 | 1.587E-02 | 834.85 | 99.980 | PBC<MDA | MN54 |
| 846.77 | 8. | 141.88 | 1.72 | 1.569E-02 | 846.77 | 99.935 | PBC<MDA | Co56 |
| 860.09 | 17. | 85.03 | 1.73 | 1.550E-02 | 860.56 | 12.420 | PBC<MDA | TL208 |
| 871.10 | 15. | 39.44 | 1.74 | 1.536E-02 | 871.10 | 99.890 | PBC<MDA | NB94 |
| 889.28 | 15. | 96.71 | 1.76 | 1.511E-02 | 889.28 | 99.984 | PBC<MDA | Sc46 |
| 911.28 | 123. | 10.21 | 1.85 | 1.483E-02 | 911.07 | 29.000 | 1.584E+01 | AC228 |
| 937.49 | 11. | 89.35 | 1.80 | 1.451E-02 | 937.49 | 34.360 | PBC<MDA | AG110M |
| 946.02 | 3. | 398.43 | 1.80 | 1.441E-02 | 946.02 | 13.400 | PBC<MDA | PA234 |
| 964.11 | 5. | 344.45 | 1.82 | 1.419E-02 | 964.11 | 14.605 | PBC<MDA | EU152 |
| 968.41 | 94. | 17.95 | 1.63 | 1.414E-02 | 968.97 | 17.460 | 2.108E+01 | AC228 |
| 1004.77 | 9. | 89.13 | 1.85 | 1.374E-02 | 1004.77 | 18.010 | PBC<MDA | EU154 |
| 1048.07 | 9. | 71.15 | 1.88 | 1.330E-02 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1050.36 | 6. | 124.51 | 1.89 | 1.328E-02 | 1050.36 | 1.560 | PBC<MDA | RH106 |
| 1077.40 | 8. | 119.02 | 1.91 | 1.301E-02 | 1077.40 | 3.300 | PBC<MDA | Ga68 |
| 1120.30 | 68. | 14.25 | 0.77 | 1.262E-02 | 1120.29 | 15.100 | 1.992E+01 | BI214 |
| | | | | | 1120.55 | 99.987 | 3.009E+00 | Sc46 |
| 1121.39 | 10. | 142.78 | 1.94 | 1.261E-02 | 1120.55 | 99.987 | PBC<MDA | Sc46 |
| | | | | | 1121.30 | 34.900 | 1.304E+00 | Ta182 |
| 1189.05 | 25. | 29.67 | 1.99 | 1.204E-02 | 1189.05 | 16.200 | 7.216E+00 | Ta182 |
| 1221.41 | 14. | 83.93 | 2.02 | 1.179E-02 | 1221.41 | 27.000 | PBC<MDA | Ta182 |
| 1238.28 | 20. | 82.17 | 2.03 | 1.166E-02 | 1238.28 | 66.070 | PBC<MDA | Co56 |
| 1275.57 | 5. | 133.46 | 2.06 | 1.139E-02 | 1274.53 | 99.940 | PBC<MDA | NA22 |
| | | | | | 1274.54 | 35.190 | 7.391E-01 | EU154 |
| 1332.50 | 4. | 246.86 | 2.10 | 1.100E-02 | 1332.50 | 99.980 | PBC<MDA | CO60 |
| 1384.30 | 13. | 27.74 | 2.14 | 1.066E-02 | 1384.30 | 24.290 | 2.788E+00 | AG110M |
| 1408.00 | 1. | 600.00 | 2.16 | 1.052E-02 | 1408.00 | 21.005 | PBC<MDA | EU152 |
| 1460.85 | 469. | 4.62 | 1.99 | 1.021E-02 | 1460.83 | 10.670 | 2.391E+02 | K40 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 1763.13 | 36. | 21.04 | 2.40 | 8.758E-03 | 1764.49 | 15.400 | 1.469E+01 | BI214 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 149.10 | 37.33 | 34. | 16. | 8.886E+02 | 58.51 | 0.670 | - s |
| 270.37 | 67.74 | 123. | 43. | 9.792E+02 | 39.92 | 1.038 | - sD |
| 298.78 | 74.79 | 196. | 258. | 5.463E+03 | 9.87 | 1.045 | - sD |
| 307.64 | 77.01 | 156. | 401. | 8.288E+03 | 6.67 | 1.047 | - D |
| 837.28 | 209.44 | 70. | 78. | 1.815E+03 | 23.04 | 0.940 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.92 | 46.54 | 315. | 24. | 0.013 | 107.73 | 1.018 |
| AM-241 | 237.89 | 59.54 | 662. | 29. | 0.016 | 125.53 | 1.030s |
| TH-234 | 252.89 | 63.29 | 644. | 29. | 0.016 | 123.39 | 1.034s |
| Sn-126 | 256.85 | 64.28 | 660. | 29. | 0.016 | 124.76 | 1.035s |
| BA-133 | 323.66 | 80.99 | 1569. | -37. | -0.021 | 150.61 | 1.051s |
| Np-237 | 345.65 | 86.49 | 1616. | 0. | 0.000 | 177.44 | 1.056A |
| EU-155 | 345.86 | 86.54 | 1566. | -33. | -0.018 | 172.51 | 1.056s |
| Sn-126 | 347.45 | 86.94 | 1470. | 2. | 0.001 | 935.83 | 1.056D |
| Sn-126 | 349.97 | 87.57 | 1361. | 89. | 0.050 | 23.46 | 1.057D |
| Cd-109 | 351.85 | 88.04 | 1437. | 0. | 0.000 | 165.11 | 1.057A |
| Nd-147 | 364.09 | 91.10 | 1394. | -21. | -0.012 | 251.33 | 1.060s |
| TH-234 | 370.04 | 92.59 | 137. | 78. | 0.043 | 24.11 | 1.062D |
| AC-228 | 373.08 | 93.35 | 1449. | 33. | 0.018 | 165.01 | 1.062s |
| Np-239 | 397.67 | 99.50 | 601. | -14. | -0.008 | 255.36 | 1.068s |
| Gd-153 | 412.46 | 103.20 | 612. | 0. | 0.000 | 1000.00 | 1.071 |
| Np-239 | 414.46 | 103.70 | 612. | 0. | 0.000 | 1000.00 | 1.072 |
| EU-155 | 420.91 | 105.31 | 612. | 0. | 0.000 | 1000.00 | 1.074 |
| Np-239 | 424.18 | 106.13 | 364. | 25. | 0.014 | 110.85 | 1.074 |
| EU-152 | 486.74 | 121.78 | 165. | 15. | 0.008 | 123.83 | 1.089s |
| CO-57 | 487.88 | 122.06 | 214. | -22. | -0.012 | 95.09 | 1.089s |
| EU-154 | 492.03 | 123.10 | 237. | 10. | 0.005 | 223.61 | 1.090s |
| PA-234 | 524.80 | 131.29 | 831. | -29. | -0.016 | 144.01 | 1.098s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| HF-181 | 531.71 | 133.02 | 802. | -29. | -0.016 | 141.35 | 1.100s |
| CE-144 | 533.77 | 133.54 | 841. | 29. | 0.016 | 144.60 | 1.100s |
| HF-181 | 544.81 | 136.30 | 813. | 13. | 0.007 | 322.75 | 1.103s |
| CO-57 | 545.50 | 136.47 | 475. | -31. | -0.017 | 102.11 | 1.103s |
| Tc-99m | 561.64 | 140.51 | 831. | 29. | 0.016 | 142.87 | 1.106 |
| U-235 | 574.74 | 143.79 | 834. | -32. | -0.018 | 129.66 | 1.110s |
| CE-141 | 581.36 | 145.44 | 817. | -14. | -0.008 | 283.43 | 1.111s |
| Ba-140 | 650.21 | 162.66 | 325. | -28. | -0.015 | 94.00 | 1.127s |
| U-235 | 653.08 | 163.38 | 353. | -3. | -0.002 | 805.07 | 1.128s |
| CE-139 | 662.98 | 165.85 | 317. | 6. | 0.003 | 410.19 | 1.130s |
| Cf-251 | 705.95 | 176.60 | 144. | 23. | 0.013 | 104.26 | 1.140s |
| TH-229 | 773.56 | 193.51 | 164. | -7. | -0.004 | 360.18 | 1.156s |
| U-235 | 820.84 | 205.33 | 323. | 20. | 0.011 | 131.25 | 1.167s |
| TH-229 | 842.90 | 210.85 | 343. | 0. | 0.000 | 1000.00 | 1.172s |
| Cf-251 | 907.48 | 227.00 | 176. | -27. | -0.015 | 96.88 | 1.186s |
| PB-212 | 953.99 | 238.63 | 68. | 559. | 0.311 | 4.72 | 1.197D |
| PB-214 | 967.44 | 242.00 | 91. | 103. | 0.057 | 16.33 | 1.200D |
| EU-152 | 978.22 | 244.69 | 942. | -9. | -0.005 | 494.50 | 1.203s |
| TH-227 | 1024.40 | 256.24 | 124. | -15. | -0.008 | 147.62 | 1.213 |
| Cd-113m | 1054.23 | 263.70 | 97. | 5. | 0.003 | 264.28 | 1.220s |
| BI-210M | 1062.75 | 265.83 | 126. | -7. | -0.004 | 219.88 | 1.222 |
| TL-208 | 1108.54 | 277.28 | 146. | 10. | 0.006 | 170.89 | 1.232 |
| Hg-203 | 1116.21 | 279.20 | 119. | 20. | 0.011 | 81.57 | 1.234s |
| I-131 | 1136.60 | 284.30 | 72. | 3. | 0.002 | 556.78 | 1.239s |
| PB-214 | 1179.75 | 295.09 | 41. | 177. | 0.098 | 9.11 | 1.248D |
| PB-212 | 1199.51 | 300.03 | 65. | 39. | 0.022 | 33.09 | 1.253D |
| PA-231 | 1199.67 | 300.07 | 766. | -22. | -0.012 | 177.57 | 1.253s |
| PA-233 | 1200.11 | 300.18 | 744. | -22. | -0.012 | 175.01 | 1.253s |
| PA-231 | 1209.98 | 302.65 | 722. | -22. | -0.012 | 172.11 | 1.255s |
| BA-133 | 1210.79 | 302.85 | 700. | -22. | -0.012 | 169.45 | 1.256s |
| Ba-140 | 1218.78 | 304.85 | 677. | -22. | -0.012 | 166.54 | 1.257s |
| Ir-192 | 1233.14 | 308.44 | 655. | 0. | 0.000 | 1000.00 | 1.261s |
| PA-233 | 1247.42 | 312.01 | 655. | 0. | 0.000 | 1000.00 | 1.264s |
| Ir-192 | 1265.33 | 316.49 | 655. | 0. | 0.000 | 1000.00 | 1.268s |
| CR-51 | 1279.70 | 320.08 | 552. | 21. | 0.012 | 161.84 | 1.271s |
| La-140 | 1314.40 | 328.76 | 372. | 17. | 0.010 | 160.38 | 1.279 |
| Cf-249 | 1333.11 | 333.44 | 390. | 17. | 0.010 | 163.42 | 1.283s |
| AC-228 | 1353.06 | 338.43 | 44. | 135. | 0.075 | 13.96 | 1.402 |
| Cs-136 | 1361.62 | 340.57 | 407. | 17. | 0.010 | 166.09 | 1.290s |
| EU-152 | 1376.48 | 344.29 | 424. | 17. | 0.010 | 169.11 | 1.293s |
| HF-181 | 1382.65 | 345.83 | 468. | -11. | -0.006 | 286.18 | 1.294s |
| PB-214 | 1406.47 | 351.78 | 42. | 274. | 0.152 | 8.07 | 1.069 |
| BA-133 | 1423.33 | 356.00 | 410. | -19. | -0.010 | 155.11 | 1.303s |
| I-131 | 1457.25 | 364.48 | 65. | 7. | 0.004 | 238.12 | 1.311s |
| BA-133 | 1534.67 | 383.84 | 112. | 15. | 0.009 | 100.95 | 1.328s |
| Cf-249 | 1551.10 | 387.95 | 127. | 15. | 0.009 | 106.95 | 1.332 |
| SN-113 | 1566.06 | 391.69 | 145. | -3. | -0.001 | 640.58 | 1.335s |
| SB-125 | 1710.77 | 427.88 | 78. | -11. | -0.006 | 166.64 | 1.367s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| AG-108M | 1735.01 | 433.94 | 74. | -19. | -0.010 | 96.67 | 1.373s |
| pm-146 | 1814.77 | 453.88 | 52. | 5. | 0.003 | 297.77 | 1.390 |
| SB-125 | 1852.71 | 463.37 | 104. | 18. | 0.010 | 85.67 | 1.399s |
| Ir-192 | 1871.48 | 468.06 | 113. | 4. | 0.002 | 366.54 | 1.403s |
| BE-7 | 1909.62 | 477.60 | 179. | -20. | -0.011 | 98.95 | 1.411s |
| HF-181 | 1927.22 | 482.00 | 198. | -20. | -0.011 | 103.70 | 1.415s |
| La-140 | 1947.31 | 487.02 | 144. | 16. | 0.009 | 111.79 | 1.419s |
| RU-103 | 1987.44 | 497.05 | 56. | -11. | -0.006 | 138.41 | 1.428s |
| RH-106 | 2046.68 | 511.86 | 77. | 106. | 0.059 | 23.72 | 2.691s |
| Nd-147 | 2123.21 | 531.00 | 43. | 11. | 0.006 | 129.64 | 1.458 |
| Ba-140 | 2148.25 | 537.26 | 51. | -6. | -0.004 | 243.25 | 1.463s |
| CS-134 | 2252.15 | 563.24 | 51. | 7. | 0.004 | 231.25 | 1.486s |
| CS-134 | 2276.48 | 569.32 | 34. | 14. | 0.008 | 65.79 | 1.491s |
| PA-234 | 2277.07 | 569.47 | 49. | 4. | 0.002 | 235.14 | 1.491s |
| BI-207 | 2278.00 | 569.70 | 48. | 5. | 0.003 | 201.00 | 1.491s |
| TL-208 | 2331.77 | 583.15 | 47. | 173. | 0.096 | 12.80 | 1.261 |
| SB-125 | 2401.19 | 600.50 | 423. | -17. | -0.009 | 175.99 | 1.518s |
| SB-124 | 2410.11 | 602.73 | 406. | -17. | -0.009 | 172.33 | 1.519s |
| CS-134 | 2418.03 | 604.71 | 350. | 15. | 0.008 | 178.75 | 1.521s |
| BI-214 | 2435.91 | 609.18 | 9. | 233. | 0.129 | 7.26 | 1.380 |
| RU-103 | 2440.38 | 610.30 | 365. | 4. | 0.002 | 661.31 | 1.526s |
| AG-108M | 2456.31 | 614.28 | 369. | 0. | 0.000 | 1000.00 | 1.529s |
| PM-144 | 2471.43 | 618.06 | 369. | 0. | 0.000 | 1000.00 | 1.533s |
| RH-106 | 2486.85 | 621.92 | 427. | -18. | -0.010 | 166.78 | 1.536s |
| SB-125 | 2542.74 | 635.89 | 51. | -9. | -0.005 | 117.06 | 1.548s |
| I-131 | 2547.08 | 636.97 | 41. | 13. | 0.007 | 73.98 | 1.549s |
| AG-110M | 2630.23 | 657.76 | 192. | -18. | -0.010 | 110.98 | 1.566s |
| CS-137 | 2645.60 | 661.61 | 10. | 118. | 0.066 | 10.61 | 1.451 |
| PM-144 | 2785.35 | 696.54 | 88. | -14. | -0.008 | 96.42 | 1.599s |
| NB-94 | 2809.70 | 702.63 | 103. | -3. | -0.002 | 481.12 | 1.604s |
| SB-124 | 2890.33 | 722.79 | 34. | 16. | 0.009 | 56.94 | 1.621s |
| AG-108M | 2890.93 | 722.94 | 50. | 11. | 0.006 | 93.66 | 1.621s |
| EU-154 | 2892.61 | 723.36 | 61. | 11. | 0.006 | 102.67 | 1.622s |
| ZR-95 | 2895.98 | 724.20 | 97. | 6. | 0.003 | 235.21 | 1.622s |
| BI-212 | 2907.86 | 727.17 | 115. | -14. | -0.008 | 110.38 | 1.625s |
| pm-146 | 2942.07 | 735.72 | 55. | -19. | -0.010 | 89.66 | 1.632 |
| pm-146 | 2987.83 | 747.16 | 40. | 7. | 0.004 | 202.20 | 1.641s |
| ZR-95 | 3026.11 | 756.73 | 25. | 9. | 0.005 | 126.60 | 1.649s |
| AG-110M | 3054.97 | 763.94 | 80. | -9. | -0.005 | 142.03 | 1.655s |
| NB-95 | 3062.35 | 765.79 | 85. | 6. | 0.003 | 215.44 | 1.657s |
| PA-234M | 3064.84 | 766.41 | 63. | 17. | 0.009 | 70.34 | 1.657 |
| BI-212 | 3140.88 | 785.42 | 21. | 11. | 0.006 | 96.42 | 1.673s |
| CS-134 | 3182.67 | 795.87 | 45. | 13. | 0.007 | 77.65 | 1.682s |
| CS-134 | 3207.01 | 801.95 | 67. | 2. | 0.001 | 606.03 | 1.687s |
| CO-58 | 3242.31 | 810.78 | 50. | 13. | 0.007 | 80.78 | 1.694s |
| La-140 | 3262.29 | 815.77 | 63. | 3. | 0.002 | 401.55 | 1.698s |
| Cs-136 | 3273.21 | 818.50 | 57. | 9. | 0.005 | 118.67 | 1.700s |
| MN-54 | 3338.61 | 834.85 | 20. | 12. | 0.007 | 87.44 | 1.714s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Co-56 | 3386.31 | 846.77 | 25. | 8. | 0.004 | 141.88 | 1.723s |
| TL-208 | 3441.49 | 860.56 | 40. | 17. | 0.009 | 85.03 | 1.735 |
| NB-94 | 3483.63 | 871.10 | 10. | 15. | 0.008 | 39.44 | 1.743s |
| EU-154 | 3492.16 | 873.23 | 34. | -2. | -0.001 | 418.33 | 1.745s |
| PA-234 | 3521.37 | 880.53 | 85. | -17. | -0.010 | 79.61 | 1.751 |
| PA-234 | 3532.21 | 883.24 | 103. | -15. | -0.008 | 98.18 | 1.753s |
| AG-110M | 3537.98 | 884.68 | 118. | 0. | 0.000 | 1000.00 | 1.754s |
| Sc-46 | 3556.37 | 889.28 | 97. | 15. | 0.008 | 96.71 | 1.758s |
| y-88 | 3591.42 | 898.04 | 40. | -7. | -0.004 | 202.20 | 1.765s |
| AC-228 | 3644.39 | 911.28 | 7. | 123. | 0.068 | 10.21 | 1.849 |
| AG-110M | 3749.25 | 937.49 | 16. | 11. | 0.006 | 89.35 | 1.797s |
| PA-234 | 3783.37 | 946.02 | 21. | 3. | 0.001 | 398.43 | 1.803s |
| EU-152 | 3855.75 | 964.11 | 136. | 5. | 0.003 | 344.45 | 1.818s |
| AC-228 | 3872.97 | 968.41 | 28. | 94. | 0.052 | 17.95 | 1.628 |
| EU-154 | 3984.66 | 996.33 | 57. | -7. | -0.004 | 164.32 | 1.844s |
| PA-234M | 4003.33 | 1001.00 | 63. | 0. | 0.000 | 1000.00 | 1.847s |
| EU-154 | 4018.45 | 1004.77 | 28. | 9. | 0.005 | 89.13 | 1.850s |
| Co-56 | 4150.74 | 1037.84 | 32. | -10. | -0.006 | 132.41 | 1.876s |
| Cs-136 | 4191.67 | 1048.07 | 16. | 9. | 0.005 | 71.15 | 1.884s |
| RH-106 | 4200.83 | 1050.36 | 30. | 6. | 0.004 | 124.51 | 1.886s |
| BI-207 | 4254.05 | 1063.66 | 27. | -2. | -0.001 | 708.52 | 1.896s |
| Ga-68 | 4309.03 | 1077.40 | 16. | 8. | 0.004 | 119.02 | 1.907s |
| FE-59 | 4396.46 | 1099.25 | 37. | -9. | -0.005 | 152.36 | 1.924s |
| EU-152 | 4447.77 | 1112.07 | 148. | -18. | -0.010 | 99.44 | 1.934s |
| ZN-65 | 4461.66 | 1115.55 | 130. | -16. | -0.009 | 104.60 | 1.937s |
| BI-214 | 4480.67 | 1120.30 | 5. | 68. | 0.038 | 14.25 | 0.773s |
| Sc-46 | 4481.68 | 1120.55 | 114. | 0. | 0.000 | 1000.00 | 1.941s |
| Ta-182 | 4484.68 | 1121.30 | 104. | 10. | 0.006 | 142.78 | 1.941 |
| CO-60 | 4692.51 | 1173.24 | 45. | -15. | -0.009 | 106.10 | 1.981s |
| Ta-182 | 4755.78 | 1189.05 | 6. | 25. | 0.014 | 29.67 | 1.993 |
| Ta-182 | 4885.27 | 1221.41 | 23. | 14. | 0.008 | 83.93 | 2.017 |
| Co-56 | 4952.78 | 1238.28 | 45. | 20. | 0.011 | 82.17 | 2.030s |
| NA-22 | 5097.85 | 1274.53 | 23. | 5. | 0.003 | 133.46 | 2.057s |
| EU-154 | 5097.90 | 1274.54 | 28. | 0. | 0.000 | 1000.00 | 2.057s |
| FE-59 | 5166.14 | 1291.60 | 28. | -6. | -0.004 | 201.07 | 2.070s |
| CO-60 | 5329.84 | 1332.50 | 17. | 4. | 0.002 | 246.86 | 2.100s |
| AG-110M | 5537.14 | 1384.30 | 0. | 13. | 0.007 | 27.74 | 2.138s |
| EU-152 | 5632.00 | 1408.00 | 6. | 1. | 0.001 | 600.00 | 2.155s |
| K-40 | 5843.52 | 1460.85 | 0. | 469. | 0.261 | 4.62 | 1.988 |
| La-140 | 6385.31 | 1596.21 | 19. | -6. | -0.003 | 184.97 | 2.288s |
| SB-124 | 6764.67 | 1690.98 | 6. | -2. | -0.001 | 275.72 | 2.353s |
| BI-214 | 7058.94 | 1764.49 | 10. | 36. | 0.020 | 21.04 | 2.402 |
| y-88 | 7345.46 | 1836.06 | 13. | -8. | -0.005 | 116.96 | 2.449s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| BE-7 | C | -4.2984E+00 | | | | | 5.31E+01 | | |
| | | | 477.60 | -4.298E+00 | ?( | 1.424E+01 | 9.89E+01 | 1.05E+01 | G |
| NA-22 | C | 2.6023E-01 | | | | | 9.50E+02 | | |
| | | | 1274.53 | 2.602E-01 | &( | 1.215E+00 | 1.33E+02 | 9.99E+01 | G |
| K-40 | N | 2.3913E+02 | | | | | 4.66E+11 | | |
| | | | 1460.83 | 2.391E+02 | ( | 3.758E+00 | 4.62E+00 | 1.07E+01 | G |
| Sc-46 | F | 5.5049E-01 | | | | | 8.38E+01 | | |
| | | | 889.28 | 5.505E-01 | ?( | 1.790E+00 | 9.67E+01 | 1.00E+02 | G |
| | | | 1120.55 | 0.000E+00 | - | 2.310E+00 | 1.00E+03 | 1.00E+02 | G |
| CR-51 | F | 3.6072E+00 | | | | | 2.77E+01 | | |
| | | | 320.08 | 3.607E+00 | ?( | 1.953E+01 | 1.62E+02 | 9.94E+00 | G |
| MN-54 | C | 4.1738E-01 | | | | | 3.12E+02 | | |
| | | | 834.85 | 4.174E-01 | ?( | 8.248E-01 | 8.74E+01 | 1.00E+02 | G |
| FE-59 | F | -7.1644E-01 | | | | | 4.45E+01 | | |
| | | | 1099.25 | -7.164E-01 | ?( | 2.394E+00 | 1.52E+02 | 5.65E+01 | G |
| | | | 1291.60 | -7.225E-01 | + | 3.139E+00 | 2.01E+02 | 4.32E+01 | G |
| Co-56 | C | 7.4391E-01 | | | | | 7.73E+01 | | |
| | | | 846.77 | 2.834E-01 | ?( | 9.213E-01 | 1.42E+02 | 9.99E+01 | G |
| | | | 1238.28 | 1.440E+00 | ( | 2.459E+00 | 8.22E+01 | 6.61E+01 | G |
| | | | 1037.84 | -2.934E+00 | + | 8.529E+00 | 1.32E+02 | 1.41E+01 | G |
| | | | 1771.35 | -2.055E-01 | % | 1.418E+01 | 1.93E+03 | 1.55E+01 | A |
| CO-57 | C | -2.6218E-01 | | | | | 2.72E+02 | | |
| | | | 122.06 | -2.622E-01 | &( | 8.327E-01 | 9.51E+01 | 8.56E+01 | G |
| | | | 136.47 | -2.956E+00 | + | 1.005E+01 | 1.02E+02 | 1.07E+01 | G |
| CO-58 | C | 4.5335E-01 | | | | | 7.09E+01 | | |
| | | | 810.78 | 4.534E-01 | ?( | 1.228E+00 | 8.08E+01 | 9.95E+01 | G |
| CO-60 | F | 2.0215E-01 | | | | | 1.93E+03 | | |
| | | | 1332.50 | 2.022E-01 | ?( | 1.108E+00 | 2.47E+02 | 1.00E+02 | G |
| | | | 1173.24 | -7.008E-01 | + | 1.558E+00 | 1.06E+02 | 9.99E+01 | G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| ZN-65 | F | -1.3762E+00 | | | | | 2.44E+02 | |
| | | | 1115.55 | -1.376E+00 | ?( | 4.840E+00 | 1.05E+02 | 5.06E+01 G |
| NB-94 | I | 2.2781E-01 | | | | | 7.41E+06 | |
| | | | 702.63 | -9.408E-02 | ?( | 1.566E+00 | 4.81E+02 | 9.79E+01 G |
| | | | 871.10 | 5.433E-01 | ?( | 6.319E-01 | 3.94E+01 | 9.99E+01 G |
| ZR-95 | I | 4.8798E-01 | | | | | 6.40E+01 | |
| | | | 756.73 | 5.368E-01 | ?( | 1.551E+00 | 1.27E+02 | 5.45E+01 G |
| | | | 724.20 | 4.278E-01 | ?( | 3.458E+00 | 2.35E+02 | 4.42E+01 G |
| NB-95 | I | 2.0255E-01 | | | | | 6.40E+01 | |
| | | | 765.79 | 2.025E-01 | ?( | 1.502E+00 | 2.15E+02 | 9.98E+01 G |
| RU-103 | I | -2.9584E-01 | | | | | 3.93E+01 | |
| | | | 497.05 | -2.958E-01 | &( | 9.837E-01 | 1.38E+02 | 9.09E+01 G |
| | | | 610.30 | 1.968E+00 | ? | 4.406E+01 | 6.61E+02 | 5.75E+00 GA |
| RH-106 | I | -1.9498E+00 | | | | | 3.74E+02 | |
| | | | 621.92 | -4.995E+00 | ?( | 2.794E+01 | 1.67E+02 | 9.93E+00 G |
| | | | 1050.36 | 1.744E+01 | ?( | 7.516E+01 | 1.25E+02 | 1.56E+00 G |
| | | | 511.86 | 1.285E+01 | ? | 5.285E+00 | 2.37E+01 | 2.00E+01 GA |
| AG-108M | C | -4.4344E-01 | | | | | 1.53E+05 | |
| | | | 433.94 | -4.434E-01 | ?( | 1.015E+00 | 9.67E+01 | 9.05E+01 G |
| | | | 722.94 | 3.893E-01 | & | 1.233E+00 | 9.37E+01 | 9.08E+01 G |
| | | | 614.28 | 0.000E+00 | + | 2.849E+00 | 1.00E+03 | 8.98E+01 G |
| AG-110M | F | 8.3123E-01 | | | | | 2.50E+02 | |
| | | | 884.68 | 0.000E+00 | ?( | 2.683E+00 | 1.00E+03 | 7.27E+01 G |
| | | | 657.76 | -5.575E-01 | + | 2.076E+00 | 1.11E+02 | 9.46E+01 G |
| | | | 937.49 | 1.206E+00 | ?( | 2.380E+00 | 8.94E+01 | 3.44E+01 G |
| | | | 1384.30 | 2.788E+00 | ?( | 1.581E+00 | 2.77E+01 | 2.43E+01 G |
| | | | 763.94 | -1.346E+00 | + | 6.525E+00 | 1.42E+02 | 2.23E+01 G |
| SN-113 | F | -8.3223E-02 | | | | | 1.15E+02 | |
| | | | 391.69 | -8.322E-02 | ?( | 1.833E+00 | 6.41E+02 | 6.40E+01 G |
| SB-124 | F | 4.4121E-02 | | | | | 6.02E+01 | |
| | | | 602.73 | -4.652E-01 | ?( | 2.690E+00 | 1.72E+02 | 9.83E+01 G |
| | | | 1690.98 | -2.991E-01 | + | 1.851E+00 | 2.76E+02 | 4.78E+01 G |
| | | | 722.79 | 4.673E+00 | &( | 8.671E+00 | 5.69E+01 | 1.08E+01 G |
| SB-125 | I | 4.0212E-01 | | | | | 1.01E+03 | |
| | | | 427.88 | -7.907E-01 | &( | 3.153E+00 | 1.67E+02 | 2.96E+01 G |
| | | | 600.50 | -2.549E+00 | + | 1.505E+01 | 1.76E+02 | 1.79E+01 G |
| | | | 635.89 | -2.266E+00 | + | 9.062E+00 | 1.17E+02 | 1.13E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | 463.37 | 3.774E+00 | ( | 1.082E+01 | 8.57E+01 | 1.05E+01 G |
| I-131 | I | 5.8589E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | 1.625E-01 | ?( | 9.351E-01 | 2.38E+02 | 8.17E+01 G |
| | | | 284.30 | 7.783E-01 | ?( | 1.096E+01 | 5.57E+02 | 6.14E+00 G |
| | | | 636.97 | 5.245E+00 | ?( | 1.295E+01 | 7.40E+01 | 7.17E+00 G |
| Gd-153 | F | 4.4908E-02 | | | | | 2.42E+02 | |
| | | | 97.50 | 4.491E-02 | &( | 6.075E+00 | 4.04E+03 | 3.00E+01 G |
| | | | 103.20 | 0.000E+00 | - | 5.466E+00 | 1.00E+03 | 2.18E+01 G |
| Ga-68 | C | 1.2147E+01 | | | | | 4.71E-02 | |
| | | | 1077.40 | 1.215E+01 | ?( | 3.242E+01 | 1.19E+02 | 3.30E+00 G |
| Tc-99m | I | 3.4560E-01 | | | | | 2.51E-01 | |
| | | | 140.51 | 3.456E-01 | ( | 1.646E+00 | 1.43E+02 | 8.93E+01 G |
| BA-133 | F | -5.6143E-01 | | | | | 3.85E+03 | |
| | | | 356.00 | -5.614E-01 | ?( | 2.919E+00 | 1.55E+02 | 6.20E+01 G |
| | | | 302.85 | -2.021E+00 | + | 1.144E+01 | 1.69E+02 | 1.83E+01 G |
| | | | 383.84 | 3.371E+00 | ? | 1.144E+01 | 1.01E+02 | 8.94E+00 GA |
| | | | 80.99 | -1.221E+00 | + | 6.115E+00 | 1.51E+02 | 3.41E+01 GA |
| CS-134 | I | 6.7263E-01 | | | | | 7.54E+02 | |
| | | | 604.71 | 4.203E-01 | ?( | 2.525E+00 | 1.79E+02 | 9.76E+01 G |
| | | | 795.87 | 5.160E-01 | ( | 1.341E+00 | 7.76E+01 | 8.55E+01 G |
| | | | 569.32 | 2.338E+00 | ?( | 5.084E+00 | 6.58E+01 | 1.54E+01 G |
| | | | 801.95 | 7.520E-01 | ?( | 1.597E+01 | 6.06E+02 | 8.69E+00 G |
| | | | 563.24 | 2.077E+00 | ( | 1.125E+01 | 2.31E+02 | 8.35E+00 G |
| CS-137 | I | 4.0805E+00 | | | | | 1.10E+04 | |
| | | | 661.66 | 4.081E+00 | ( | 5.879E-01 | 1.06E+01 | 8.52E+01 G |
| CE-139 | F | 8.5411E-02 | | | | | 1.38E+02 | |
| | | | 165.85 | 8.541E-02 | ?( | 1.186E+00 | 4.10E+02 | 7.99E+01 G |
| Ba-140 | I | -6.5242E-01 | | | | | 1.28E+01 | |
| | | | 537.26 | -6.524E-01 | ?( | 3.719E+00 | 2.43E+02 | 2.44E+01 G |
| | | | 162.66 | -4.984E+00 | & | 1.561E+01 | 9.40E+01 | 6.22E+00 G |
| | | | 304.85 | -8.686E+00 | & | 4.833E+01 | 1.67E+02 | 4.29E+00 G |
| La-140 | I | 2.2490E-01 | | | | | 1.28E+01 | |
| | | | 1596.21 | -3.676E-01 | ?( | 1.411E+00 | 1.85E+02 | 9.54E+01 G |
| | | | 487.02 | 8.016E-01 | ?( | 3.015E+00 | 1.12E+02 | 4.55E+01 G |
| | | | 328.76 | 1.495E+00 | &( | 8.047E+00 | 1.60E+02 | 2.03E+01 G |
| | | | 815.77 | 4.182E-01 | ?( | 5.873E+00 | 4.02E+02 | 2.33E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| CE-141 | I | -3.1337E-01 | | | | | 3.25E+01 | |
| | | | 145.44 | -3.134E-01 | ?( | 2.973E+00 | 2.83E+02 | 4.82E+01 G |
| CE-144 | I | 2.6389E+00 | | | | | 2.85E+02 | |
| | | | 133.54 | 2.639E+00 | &( | 1.272E+01 | 1.45E+02 | 1.11E+01 G |
| PM-144 | C | -4.4160E-01 | | | | | 3.63E+02 | |
| | | | 696.54 | -4.416E-01 | ?( | 1.433E+00 | 9.64E+01 | 9.90E+01 G |
| | | | 618.06 | 0.000E+00 | + | 2.595E+00 | 1.00E+03 | 9.91E+01 G |
| EU-152 | F | 9.4258E-01 | | | | | 4.94E+03 | |
| | | | 344.29 | 1.196E+00 | &( | 6.784E+00 | 1.69E+02 | 2.65E+01 G |
| | | | 1112.07 | -5.708E+00 | + | 1.903E+01 | 9.94E+01 | 1.36E+01 G |
| | | | 121.78 | 5.273E-01 | &( | 2.199E+00 | 1.24E+02 | 2.86E+01 G |
| | | | 778.92 | 2.566E-01 | & | 9.563E+00 | 1.05E+03 | 1.29E+01 G |
| | | | 964.11 | 1.295E+00 | &( | 1.530E+01 | 3.44E+02 | 1.46E+01 G |
| | | | 244.69 | -1.667E+00 | + | 2.761E+01 | 4.94E+02 | 7.58E+00 G |
| | | | 1408.00 | 2.514E-01 | ? | 3.551E+00 | 6.00E+02 | 2.10E+01 GA |
| EU-154 | I | 8.1946E-01 | | | | | 3.14E+03 | |
| | | | 873.23 | -5.908E-01 | &( | 8.828E+00 | 4.18E+02 | 1.23E+01 G |
| | | | 123.10 | 2.425E-01 | ( | 1.835E+00 | 2.24E+02 | 4.08E+01 G |
| | | | 1274.54 | 0.000E+00 | - | 3.793E+00 | 1.00E+03 | 3.52E+01 G |
| | | | 723.36 | 1.750E+00 | ?( | 6.088E+00 | 1.03E+02 | 2.02E+01 G |
| | | | 1004.77 | 2.042E+00 | ?( | 6.175E+00 | 8.91E+01 | 1.80E+01 G |
| | | | 996.33 | -2.525E+00 | + | 1.431E+01 | 1.64E+02 | 1.06E+01 G |
| HF-181 | F | -3.7912E-01 | | | | | 4.24E+01 | |
| | | | 482.00 | -5.670E-01 | ( | 1.969E+00 | 1.04E+02 | 8.05E+01 G |
| | | | 133.02 | -6.749E-01 | & | 3.180E+00 | 1.41E+02 | 4.33E+01 G |
| | | | 345.83 | -1.303E+00 | & | 1.255E+01 | 2.86E+02 | 1.51E+01 G |
| | | | 136.30 | 2.206E+00 | ?( | 2.385E+01 | 3.23E+02 | 5.85E+00 G |
| Ta-182 | F | 2.9267E+00 | | | | | 1.14E+02 | |
| | | | 1121.30 | 1.304E+00 | ( | 6.331E+00 | 1.43E+02 | 3.49E+01 G |
| | | | 1221.41 | 2.450E+00 | ( | 4.347E+00 | 8.39E+01 | 2.70E+01 G |
| | | | 1189.05 | 7.216E+00 | ( | 3.932E+00 | 2.97E+01 | 1.62E+01 G |
| Hg-203 | F | 3.7950E-01 | | | | | 4.66E+01 | |
| | | | 279.20 | 3.795E-01 | ?( | 1.033E+00 | 8.16E+01 | 8.15E+01 G |
| TL-208 | N | 5.4046E+00 | | | | | 6.98E+02 | |
| | | | 583.02 | 5.475E+00 | ( | 1.091E+00 | 1.28E+01 | 8.45E+01 G |
| | | | 277.28 | 2.522E+00 | - | 1.463E+01 | 1.71E+02 | 6.31E+00 G |
| | | | 860.56 | 4.923E+00 | ?( | 9.287E+00 | 8.50E+01 | 1.24E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| pm-146 | C | 3.3960E-01 | | | | 2.02E+03 | | |
| | | | 747.16 | 6.623E-01 | ?( | 3.045E+00 | 2.02E+02 | 3.40E+01 G |
| | | | 735.72 | -2.659E+00 | + | 5.266E+00 | 8.97E+01 | 2.25E+01 G |
| | | | 453.88 | 1.708E-01 | ?( | 1.241E+00 | 2.98E+02 | 6.50E+01 G |
| y-88 | F | -2.7672E-01 | | | | 1.07E+02 | | |
| | | | 898.04 | -2.767E-01 | ?( | 1.272E+00 | 2.02E+02 | 9.37E+01 G |
| | | | 1836.06 | -5.506E-01 | + | 1.303E+00 | 1.17E+02 | 9.92E+01 G |
| Cd-113m | | 1.3440E+03 | | | | 5.33E+03 | | |
| | | | 263.70 | 1.344E+03 | ?( | 1.223E+04 | 2.64E+02 | 6.00E-03 K |
| Cf-251 | T | 1.5605E+00 | | | | 3.28E+05 | | |
| | | | 176.60 | 1.560E+00 | ?( | 3.978E+00 | 1.04E+02 | 1.70E+01 G |
| | | | 227.00 | -5.924E+00 | + | 1.398E+01 | 9.69E+01 | 6.30E+00 GA |
| Cf-249 | T | 7.5088E-01 | | | | 1.28E+05 | | |
| | | | 387.95 | 4.613E-01 | &( | 1.660E+00 | 1.07E+02 | 6.60E+01 G |
| | | | 333.44 | 1.983E+00 | ?( | 1.087E+01 | 1.63E+02 | 1.55E+01 G |
| Sn-126 | | 4.0777E+00 | | | | 3.65E+07 | | |
| | | | 87.57 | 2.543E+00 | } | 4.963E+00 | 2.35E+01 | 3.75E+01 GA |
| | | | 64.28 | 4.078E+00 | ?( | 1.695E+01 | 1.25E+02 | 9.70E+00 G |
| | | | 86.94 | 2.826E-01 | } | 2.146E+01 | 9.36E+02 | 9.04E+00 GA |
| PB-210 | N | 1.1468E+01 | | | | 8.14E+03 | | |
| | | | 46.54 | 1.147E+01 | ( | 4.127E+01 | 1.08E+02 | 4.25E+00 G |
| PB-212 | N | 1.8244E+01 | | | | 6.98E+02 | | |
| | | | 238.63 | 1.824E+01 | ( | 1.344E+00 | 4.72E+00 | 4.33E+01 G |
| | | | 300.03 | 1.979E+01 | | 2.027E+01 | 3.31E+01 | 3.28E+00 GA |
| PB-214 | N | 1.3998E+01 | | | | 5.84E+05 | | |
| | | | 351.93 | 1.350E+01 | ( | 1.613E+00 | 8.07E+00 | 3.76E+01 G |
| | | | 295.09 | 1.497E+01 | ( | 2.763E+00 | 9.11E+00 | 1.93E+01 G |
| | | | 242.00 | 1.982E+01 | + | 9.034E+00 | 1.63E+01 | 7.43E+00 GA |
| BI-207 | C | 1.3422E-01 | | | | 1.18E+04 | | |
| | | | 569.70 | 1.342E-01 | &( | 9.394E-01 | 2.01E+02 | 9.77E+01 G |
| | | | 1063.66 | -9.455E-02 | + | 1.519E+00 | 7.09E+02 | 7.45E+01 G |
| BI-212 | N | -5.9127E+00 | | | | 6.98E+02 | | |
| | | | 727.17 | -5.913E+00 | &( | 2.200E+01 | 1.10E+02 | 7.55E+00 G |
| | | | 785.42 | 2.872E+01 | ? | 6.282E+01 | 9.64E+01 | 1.28E+00 GA |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| BI-214 | N | 1.4117E+01 | | | | | 5.84E+05 | |
| | | | 609.31 | 1.392E+01 | ( | 1.014E+00 | 7.26E+00 | 4.61E+01 G |
| | | | 1120.29 | 1.992E+01 | + | 3.725E+00 | 1.42E+01 | 1.51E+01 G |
| | | | 1764.49 | 1.469E+01 | &( | 7.287E+00 | 2.10E+01 | 1.54E+01 G |
| BI-210M | T | -2.2300E-01 | | | | | 1.10E+09 | |
| | | | 265.83 | -2.230E-01 | ?( | 1.675E+00 | 2.20E+02 | 5.00E+01 G |
| | | | 304.90 | -9.553E-03 | & | 7.286E+00 | 2.26E+04 | 2.80E+01 G |
| AC-228 | N | 1.5844E+01 | | | | | 2.10E+03 | |
| | | | 911.07 | 1.584E+01 | ( | 1.980E+00 | 1.02E+01 | 2.90E+01 G |
| | | | 968.97 | 2.108E+01 | + | 6.192E+00 | 1.79E+01 | 1.75E+01 G |
| | | | 338.32 | 2.022E+01 | + | 5.036E+00 | 1.40E+01 | 1.20E+01 G |
| | | | 93.35 | 6.123E+00 | - | 3.361E+01 | 1.65E+02 | 5.56E+00 XA |
| TH-227 | N | 6.1159E-02 | | | | | 7.95E+03 | |
| | | | 50.14 | 6.116E-02 | %( | 1.891E+01 | 9.08E+03 | 8.00E+00 G |
| | | | 256.24 | -3.177E+00 | & | 1.156E+01 | 1.48E+02 | 7.00E+00 G |
| TH-229 | N | -1.9499E+00 | | | | | 2.68E+06 | |
| | | | 193.51 | -1.950E+00 | ?( | 1.738E+01 | 3.60E+02 | 4.40E+00 G |
| | | | 210.85 | 0.000E+00 | & | 3.865E+01 | 1.00E+03 | 2.99E+00 G |
| TH-234 | N | 1.2884E+01 | | | | | 1.63E+12 | |
| | | | 63.29 | 1.054E+01 | ?( | 4.335E+01 | 1.23E+02 | 3.81E+00 G |
| | | | 92.59 | 1.448E+01 | ( | 1.066E+01 | 2.41E+01 | 5.58E+00 G |
| PA-231 | N | -1.2852E+01 | | | | | 1.20E+07 | |
| | | | 302.65 | -1.285E+01 | ?( | 7.389E+01 | 1.72E+02 | 2.88E+00 G |
| | | | 300.07 | -1.493E+01 | + | 8.855E+01 | 1.78E+02 | 2.46E+00 G |
| PA-234 | N | -6.8047E-01 | | | | | 1.63E+12 | |
| | | | 131.29 | -1.615E+00 | ( | 7.754E+00 | 1.44E+02 | 1.80E+01 G |
| | | | 946.02 | 7.675E-01 | & | 6.975E+00 | 3.98E+02 | 1.34E+01 G |
| | | | 569.47 | 1.372E+00 | ?( | 1.127E+01 | 2.35E+02 | 8.20E+00 G |
| | | | 883.24 | -5.757E+00 | + | 1.901E+01 | 9.82E+01 | 9.60E+00 G |
| | | | 880.53 | -1.047E+01 | + | 2.782E+01 | 7.96E+01 | 6.00E+00 GA |
| PA-234M | N | 4.9296E+01 | | | | | 1.63E+12 | |
| | | | 1001.00 | 0.000E+00 | ?( | 1.916E+02 | 1.00E+03 | 8.37E-01 G |
| | | | 766.41 | 1.896E+02 | ?( | 4.428E+02 | 7.03E+01 | 2.94E-01 G |
| U-235 | N | -5.1903E-01 | | | | | 2.57E+11 | |
| | | | 143.79 | -3.045E+00 | ?( | 1.315E+01 | 1.30E+02 | 1.10E+01 G |
| | | | 205.33 | 5.006E+00 | &( | 2.202E+01 | 1.31E+02 | 5.01E+00 G |
| | | | 163.38 | -7.306E-01 | + | 1.994E+01 | 8.05E+02 | 5.08E+00 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| AM-241 | T | 1.1929E+00 | | | | | 1.58E+05 | |
| | | | 59.54 | 1.193E+00 | ?( | 4.991E+00 | 1.26E+02 | 3.59E+01 G |
| Ir-192 | F | 6.7676E-02 | | | | | 7.40E+01 | |
| | | | 316.49 | 0.000E+00 | ?( | 2.406E+00 | 1.00E+03 | 8.70E+01 G |
| | | | 468.06 | 1.815E-01 | ?( | 2.291E+00 | 3.67E+02 | 5.18E+01 G |
| | | | 308.44 | 0.000E+00 | - | 6.477E+00 | 1.00E+03 | 3.18E+01 G |
| Cs-136 | F | 4.4588E-01 | | | | | 1.30E+01 | |
| | | | 818.50 | 3.219E-01 | ?( | 1.303E+00 | 1.19E+02 | 1.00E+02 G |
| | | | 1048.07 | 4.700E-01 | ?( | 1.115E+00 | 7.11E+01 | 8.00E+01 G |
| | | | 340.57 | 6.691E-01 | ?( | 3.728E+00 | 1.66E+02 | 4.69E+01 G |
| Np-239 | T | 1.0973E+00 | | | | | 2.36E+00 | |
| | | | 103.70 | 0.000E+00 | - | 4.961E+00 | 1.00E+03 | 2.40E+01 X |
| | | | 106.13 | 1.097E+00 | &( | 4.062E+00 | 1.11E+02 | 2.27E+01 G |
| | | | 99.50 | -9.265E-01 | & | 7.936E+00 | 2.55E+02 | 1.50E+01 X |
| Nd-147 | | 2.0438E+00 | | | | | 1.11E+01 | |
| | | | 531.00 | 2.044E+00 | ?( | 6.397E+00 | 1.30E+02 | 1.30E+01 G |
| | | | 91.10 | -7.805E-01 | - | 6.540E+00 | 2.51E+02 | 2.83E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line

M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| PB-210 | 46.54 | 315. | 24. | 0.013 | 107.73 | 1.147E+01 |
| BA-133 | 80.99 | 1569. | -37. | -0.021 | 150.61 | -1.221E+00 |
| EU-155 | 86.54 | 1566. | -33. | -0.018 | 172.51 | -1.139E+00 |
| Nd-147 | 91.10 | 1394. | -21. | -0.012 | 251.33 | -7.805E-01 |
| Np-239 | 99.50 | 601. | -14. | -0.008 | 255.36 | -9.265E-01 |
| Np-239 | 106.13 | 364. | 25. | 0.014 | 110.85 | 1.097E+00 |
| EU-152 | 121.78 | 165. | 15. | 0.008 | 123.83 | 5.273E-01 |
| CO-57 | 122.06 | 214. | -22. | -0.012 | 95.09 | -2.622E-01 |
| EU-154 | 123.10 | 237. | 10. | 0.005 | 223.61 | 2.425E-01 |
| PA-234 | 131.29 | 831. | -29. | -0.016 | 144.01 | -1.615E+00 |
| HF-181 | 133.02 | 802. | -29. | -0.016 | 141.35 | -6.749E-01 |
| HF-181 | 136.30 | 813. | 13. | 0.007 | 322.75 | 2.206E+00 |
| CO-57 | 136.47 | 475. | -31. | -0.017 | 102.11 | -2.956E+00 |
| U-235 | 143.79 | 834. | -32. | -0.018 | 129.66 | -3.045E+00 |
| CE-141 | 145.44 | 817. | -14. | -0.008 | 283.43 | -3.134E-01 |
| Ba-140 | 162.66 | 325. | -28. | -0.015 | 94.00 | -4.984E+00 |
| U-235 | 163.38 | 353. | -3. | -0.002 | 805.07 | -7.306E-01 |
| CE-139 | 165.85 | 317. | 6. | 0.003 | 410.19 | 8.541E-02 |
| Cf-251 | 176.60 | 144. | 23. | 0.013 | 104.26 | 1.560E+00 |
| TH-229 | 193.51 | 164. | -7. | -0.004 | 360.18 | -1.950E+00 |
| U-235 | 205.33 | 323. | 20. | 0.011 | 131.25 | 5.006E+00 |
| Cf-251 | 227.00 | 176. | -27. | -0.015 | 96.88 | -5.924E+00 |
| EU-152 | 244.69 | 942. | -9. | -0.005 | 494.50 | -1.667E+00 |
| TH-227 | 256.24 | 124. | -15. | -0.008 | 147.62 | -3.177E+00 |
| Cd-113m | 263.70 | 97. | 5. | 0.003 | 264.28 | 1.344E+03 |
| BI-210M | 265.83 | 126. | -7. | -0.004 | 219.88 | -2.230E-01 |
| Hg-203 | 279.20 | 119. | 20. | 0.011 | 81.57 | 3.795E-01 |
| I-131 | 284.30 | 72. | 3. | 0.002 | 556.78 | 7.783E-01 |
| PA-231 | 300.07 | 766. | -22. | -0.012 | 177.57 | -1.493E+01 |
| PA-233 | 300.18 | 744. | -22. | -0.012 | 175.01 | -5.925E+00 |
| PA-231 | 302.65 | 722. | -22. | -0.012 | 172.11 | -1.285E+01 |
| BA-133 | 302.85 | 700. | -22. | -0.012 | 169.45 | -2.021E+00 |
| Ba-140 | 304.85 | 677. | -22. | -0.012 | 166.54 | -8.686E+00 |
| CR-51 | 320.08 | 552. | 21. | 0.012 | 161.84 | 3.607E+00 |
| La-140 | 328.76 | 372. | 17. | 0.010 | 160.38 | 1.495E+00 |
| Cf-249 | 333.44 | 390. | 17. | 0.010 | 163.42 | 1.983E+00 |
| Cs-136 | 340.57 | 407. | 17. | 0.010 | 166.09 | 6.691E-01 |
| EU-152 | 344.29 | 424. | 17. | 0.010 | 169.11 | 1.196E+00 |
| HF-181 | 345.83 | 468. | -11. | -0.006 | 286.18 | -1.303E+00 |
| BA-133 | 356.00 | 410. | -19. | -0.010 | 155.11 | -5.614E-01 |
| I-131 | 364.48 | 65. | 7. | 0.004 | 238.12 | 1.625E-01 |
| BA-133 | 383.84 | 112. | 15. | 0.009 | 100.95 | 3.371E+00 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Cf-249 | 387.95 | 127. | 15. | 0.009 | 106.95 | 4.613E-01 | |
| SN-113 | 391.69 | 145. | -3. | -0.001 | 640.58 | -8.322E-02 | |
| SB-125 | 427.88 | 78. | -11. | -0.006 | 166.64 | -7.907E-01 | |
| AG-108M | 433.94 | 74. | -19. | -0.010 | 96.67 | -4.434E-01 | |
| pm-146 | 453.88 | 52. | 5. | 0.003 | 297.77 | 1.708E-01 | |
| SB-125 | 463.37 | 104. | 18. | 0.010 | 85.67 | 3.774E+00 | |
| Ir-192 | 468.06 | 113. | 4. | 0.002 | 366.54 | 1.815E-01 | |
| BE-7 | 477.60 | 179. | -20. | -0.011 | 98.95 | -4.298E+00 | |
| HF-181 | 482.00 | 198. | -20. | -0.011 | 103.70 | -5.670E-01 | |
| La-140 | 487.02 | 144. | 16. | 0.009 | 111.79 | 8.016E-01 | |
| RU-103 | 497.05 | 56. | -11. | -0.006 | 138.41 | -2.958E-01 | |
| RH-106 | 511.86 | 77. | 106. | 0.059 | 23.72 | 1.285E+01 | |
| Nd-147 | 531.00 | 43. | 11. | 0.006 | 129.64 | 2.044E+00 | |
| Ba-140 | 537.26 | 51. | -6. | -0.004 | 243.25 | -6.524E-01 | |
| CS-134 | 563.24 | 51. | 7. | 0.004 | 231.25 | 2.077E+00 | |
| CS-134 | 569.32 | 34. | 14. | 0.008 | 65.79 | 2.338E+00 | |
| PA-234 | 569.47 | 49. | 4. | 0.002 | 235.14 | 1.372E+00 | |
| BI-207 | 569.70 | 48. | 5. | 0.003 | 201.00 | 1.342E-01 | |
| SB-125 | 600.50 | 423. | -17. | -0.009 | 175.99 | -2.549E+00 | |
| SB-124 | 602.73 | 406. | -17. | -0.009 | 172.33 | -4.652E-01 | |
| CS-134 | 604.71 | 350. | 15. | 0.008 | 178.75 | 4.203E-01 | |
| RU-103 | 610.30 | 365. | 4. | 0.002 | 661.31 | 1.968E+00 | |
| RH-106 | 621.92 | 427. | -18. | -0.010 | 166.78 | -4.995E+00 | |
| SB-125 | 635.89 | 51. | -9. | -0.005 | 117.06 | -2.266E+00 | |
| I-131 | 636.97 | 41. | 13. | 0.007 | 73.98 | 5.245E+00 | |
| AG-110M | 657.76 | 192. | -18. | -0.010 | 110.98 | -5.575E-01 | |
| PM-144 | 696.54 | 88. | -14. | -0.008 | 96.42 | -4.416E-01 | |
| NB-94 | 702.63 | 103. | -3. | -0.002 | 481.12 | -9.408E-02 | |
| SB-124 | 722.79 | 34. | 16. | 0.009 | 56.94 | 4.673E+00 | |
| AG-108M | 722.94 | 50. | 11. | 0.006 | 93.66 | 3.893E-01 | |
| EU-154 | 723.36 | 61. | 11. | 0.006 | 102.67 | 1.750E+00 | |
| ZR-95 | 724.20 | 97. | 6. | 0.003 | 235.21 | 4.278E-01 | |
| BI-212 | 727.17 | 115. | -14. | -0.008 | 110.38 | -5.913E+00 | |
| pm-146 | 735.72 | 55. | -19. | -0.010 | 89.66 | -2.659E+00 | |
| pm-146 | 747.16 | 40. | 7. | 0.004 | 202.20 | 6.623E-01 | |
| ZR-95 | 756.73 | 25. | 9. | 0.005 | 126.60 | 5.368E-01 | |
| AG-110M | 763.94 | 80. | -9. | -0.005 | 142.03 | -1.346E+00 | |
| NB-95 | 765.79 | 85. | 6. | 0.003 | 215.44 | 2.025E-01 | |
| PA-234M | 766.41 | 63. | 17. | 0.009 | 70.34 | 1.896E+02 | |
| BI-212 | 785.42 | 21. | 11. | 0.006 | 96.42 | 2.872E+01 | |
| CS-134 | 795.87 | 45. | 13. | 0.007 | 77.65 | 5.160E-01 | |
| CS-134 | 801.95 | 67. | 2. | 0.001 | 606.03 | 7.520E-01 | |
| CO-58 | 810.78 | 50. | 13. | 0.007 | 80.78 | 4.534E-01 | |
| La-140 | 815.77 | 63. | 3. | 0.002 | 401.55 | 4.182E-01 | |
| Cs-136 | 818.50 | 57. | 9. | 0.005 | 118.67 | 3.219E-01 | |
| MN-54 | 834.85 | 20. | 12. | 0.007 | 87.44 | 4.174E-01 | |
| Co-56 | 846.77 | 25. | 8. | 0.004 | 141.88 | 2.834E-01 | |
| NB-94 | 871.10 | 10. | 15. | 0.008 | 39.44 | 5.433E-01 | |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| EU-154 | 873.23 | 34. | -2. | -0.001 | 418.33 | -5.908E-01 | |
| PA-234 | 880.53 | 85. | -17. | -0.010 | 79.61 | -1.047E+01 | |
| PA-234 | 883.24 | 103. | -15. | -0.008 | 98.18 | -5.757E+00 | |
| Sc-46 | 889.28 | 97. | 15. | 0.008 | 96.71 | 5.505E-01 | |
| y-88 | 898.04 | 40. | -7. | -0.004 | 202.20 | -2.767E-01 | |
| AG-110M | 937.49 | 16. | 11. | 0.006 | 89.35 | 1.206E+00 | |
| PA-234 | 946.02 | 21. | 3. | 0.001 | 398.43 | 7.675E-01 | |
| EU-152 | 964.11 | 136. | 5. | 0.003 | 344.45 | 1.295E+00 | |
| EU-154 | 996.33 | 57. | -7. | -0.004 | 164.32 | -2.525E+00 | |
| EU-154 | 1004.77 | 28. | 9. | 0.005 | 89.13 | 2.042E+00 | |
| Co-56 | 1037.84 | 32. | -10. | -0.006 | 132.41 | -2.934E+00 | |
| Cs-136 | 1048.07 | 16. | 9. | 0.005 | 71.15 | 4.700E-01 | |
| RH-106 | 1050.36 | 30. | 6. | 0.004 | 124.51 | 1.744E+01 | |
| BI-207 | 1063.66 | 27. | -2. | -0.001 | 708.52 | -9.455E-02 | |
| Ga-68 | 1077.40 | 16. | 8. | 0.004 | 119.02 | 1.215E+01 | |
| FE-59 | 1099.25 | 37. | -9. | -0.005 | 152.36 | -7.164E-01 | |
| EU-152 | 1112.07 | 148. | -18. | -0.010 | 99.44 | -5.708E+00 | |
| ZN-65 | 1115.55 | 130. | -16. | -0.009 | 104.60 | -1.376E+00 | |
| Ta-182 | 1121.30 | 104. | 10. | 0.006 | 142.78 | 1.304E+00 | |
| CO-60 | 1173.24 | 45. | -15. | -0.009 | 106.10 | -7.008E-01 | |
| Ta-182 | 1189.05 | 6. | 25. | 0.014 | 29.67 | 7.216E+00 | |
| Ta-182 | 1221.41 | 23. | 14. | 0.008 | 83.93 | 2.450E+00 | |
| Co-56 | 1238.28 | 45. | 20. | 0.011 | 82.17 | 1.440E+00 | |
| FE-59 | 1291.60 | 28. | -6. | -0.004 | 201.07 | -7.225E-01 | |
| CO-60 | 1332.50 | 17. | 4. | 0.002 | 246.86 | 2.022E-01 | |
| AG-110M | 1384.30 | 0. | 13. | 0.007 | 27.74 | 2.788E+00 | |
| EU-152 | 1408.00 | 6. | 1. | 0.001 | 600.00 | 2.514E-01 | |
| La-140 | 1596.21 | 19. | -6. | -0.003 | 184.97 | -3.676E-01 | |
| SB-124 | 1690.98 | 6. | -2. | -0.001 | 275.72 | -2.991E-01 | |
| y-88 | 1836.06 | 13. | -8. | -0.005 | 116.96 | -5.506E-01 | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | -4.2984E+00 | -4.2984E+00 | 9.895E+01% | 1.42E+01 |
| NA-22 | #A | 2.6023E-01 | 2.6023E-01 | 1.335E+02% | 1.21E+00 |
| K-40 | | 2.3913E+02 | 2.3913E+02 | 4.618E+00% | 3.76E+00 |
| Sc-46 | #A | 5.5049E-01 | 5.5049E-01 | 9.671E+01% | 1.79E+00 |
| CR-51 | #A | 3.6072E+00 | 3.6072E+00 | 1.618E+02% | 1.95E+01 |
| MN-54 | #A | 4.1738E-01 | 4.1738E-01 | 8.744E+01% | 8.25E-01 |
| FE-59 | #A | -7.1644E-01 | -7.1644E-01 | 1.524E+02% | 2.39E+00 |
| Co-56 | #A | 7.4391E-01 | 7.4391E-01 | 8.198E+01% | 9.21E-01 |
| CO-57 | #A | -2.6218E-01 | -2.6218E-01 | 9.509E+01% | 8.33E-01 |
| CO-58 | #A | 4.5335E-01 | 4.5335E-01 | 8.078E+01% | 1.23E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CO-60 | #A | 2.0215E-01 | 2.0215E-01 | 2.469E+02% | 1.11E+00 |
| ZN-65 | #A | -1.3762E+00 | -1.3762E+00 | 1.046E+02% | 4.84E+00 |
| NB-94 | #A | 2.2781E-01 | 2.2781E-01 | 3.944E+01% | 1.57E+00 |
| ZR-95 | #A | 4.8798E-01 | 4.8798E-01 | 1.266E+02% | 1.55E+00 |
| NB-95 | #A | 2.0255E-01 | 2.0255E-01 | 2.154E+02% | 1.50E+00 |
| RU-103 | #A | -2.9583E-01 | -2.9584E-01 | 1.384E+02% | 9.84E-01 |
| RH-106 | #A | -1.9498E+00 | -1.9498E+00 | 1.041E+02% | 2.79E+01 |
| AG-108M | #A | -4.4344E-01 | -4.4344E-01 | 9.667E+01% | 1.01E+00 |
| AG-110M | #A | 8.3123E-01 | 8.3123E-01 | 2.774E+01% | 2.68E+00 |
| SN-113 | #A | -8.3222E-02 | -8.3223E-02 | 6.406E+02% | 1.83E+00 |
| SB-124 | #A | 4.4121E-02 | 4.4121E-02 | 5.694E+01% | 2.69E+00 |
| SB-125 | #A | 4.0212E-01 | 4.0212E-01 | 8.567E+01% | 3.15E+00 |
| I-131 | #A | 5.8586E-01 | 5.8589E-01 | 7.398E+01% | 9.35E-01 |
| Gd-153 | #A | 4.4908E-02 | 4.4908E-02 | 4.044E+03% | 6.08E+00 |
| Ga-68 | #A | 1.2021E+01 | 1.2147E+01 | 1.190E+02% | 3.24E+01 |
| Tc-99m | A | 3.4492E-01 | 3.4560E-01 | 1.429E+02% | 1.65E+00 |
| BA-133 | #A | -5.6143E-01 | -5.6143E-01 | 1.551E+02% | 2.92E+00 |
| CS-134 | #A | 6.7263E-01 | 6.7263E-01 | 6.579E+01% | 2.53E+00 |
| CS-137 | | 4.0805E+00 | 4.0805E+00 | 1.061E+01% | 5.88E-01 |
| CE-139 | #A | 8.5410E-02 | 8.5411E-02 | 4.102E+02% | 1.19E+00 |
| Ba-140 | #A | -6.5240E-01 | -6.5242E-01 | 2.432E+02% | 3.72E+00 |
| La-140 | #A | 2.2489E-01 | 2.2490E-01 | 1.118E+02% | 1.41E+00 |
| CE-141 | #A | -3.1336E-01 | -3.1337E-01 | 2.834E+02% | 2.97E+00 |
| CE-144 | A | 2.6389E+00 | 2.6389E+00 | 1.446E+02% | 1.27E+01 |
| PM-144 | #A | -4.4160E-01 | -4.4160E-01 | 9.642E+01% | 1.43E+00 |
| EU-152 | #A | 9.4258E-01 | 9.4258E-01 | 1.238E+02% | 6.78E+00 |
| EU-154 | #A | 8.1946E-01 | 8.1946E-01 | 8.913E+01% | 8.83E+00 |
| EU-155 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 5.60E+00 |
| HF-181 | #A | -3.7912E-01 | -3.7912E-01 | 1.037E+02% | 1.97E+00 |
| Ta-182 | #A | 2.9266E+00 | 2.9267E+00 | 2.967E+01% | 6.33E+00 |
| Hg-203 | #A | 3.7950E-01 | 3.7950E-01 | 8.157E+01% | 1.03E+00 |
| TL-208 | | 5.4046E+00 | 5.4046E+00 | 1.280E+01% | 1.09E+00 |
| pm-146 | #A | 3.3960E-01 | 3.3960E-01 | 1.800E+02% | 3.04E+00 |
| y-88 | #A | -2.7672E-01 | -2.7672E-01 | 2.022E+02% | 1.27E+00 |
| Cd-113m | #A | 1.3440E+03 | 1.3440E+03 | 2.643E+02% | 1.22E+04 |
| Cd-109 | #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 5.03E+01 |
| Cf-251 | #A | 1.5605E+00 | 1.5605E+00 | 1.043E+02% | 3.98E+00 |
| Cf-249 | #A | 7.5088E-01 | 7.5088E-01 | 9.765E+01% | 1.66E+00 |
| Sn-126 | #A | 4.0777E+00 | 4.0777E+00 | 1.248E+02% | 1.70E+01 |
| PB-210 | #A | 1.1468E+01 | 1.1468E+01 | 1.077E+02% | 4.13E+01 |
| PB-212 | | 1.8244E+01 | 1.8244E+01 | 4.716E+00% | 1.34E+00 |
| PB-214 | | 1.3998E+01 | 1.3998E+01 | 6.083E+00% | 1.61E+00 |
| BI-207 | #A | 1.3422E-01 | 1.3422E-01 | 2.010E+02% | 9.39E-01 |
| BI-212 | #A | -5.9127E+00 | -5.9127E+00 | 1.104E+02% | 2.20E+01 |
| BI-214 | | 1.4117E+01 | 1.4117E+01 | 7.263E+00% | 1.01E+00 |
| BI-210M | #A | -2.2300E-01 | -2.2300E-01 | 2.199E+02% | 1.68E+00 |
| AC-228 | | 1.5844E+01 | 1.5844E+01 | 1.021E+01% | 1.98E+00 |
| TH-227 | #A | 6.1159E-02 | 6.1159E-02 | 9.076E+03% | 1.89E+01 |
| TH-229 | #A | -1.9499E+00 | -1.9499E+00 | 3.602E+02% | 1.74E+01 |

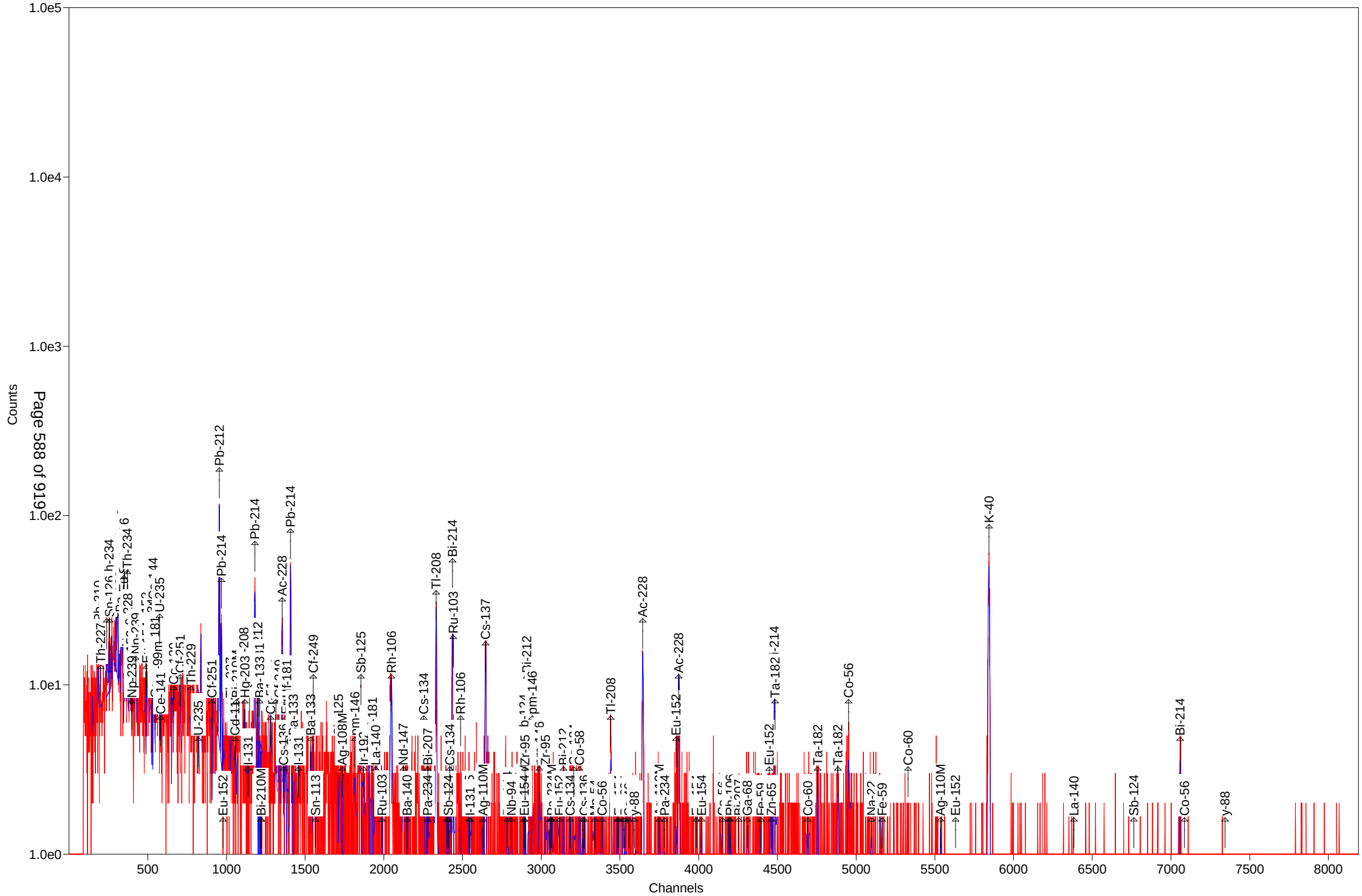
| | | | | | |
|---|---|---|---|---|---|
| TH-234 #A | 1.2884E+01 | 1.2884E+01 | 2.411E+01% | | 4.34E+01 |
| PA-231 #A | -1.2852E+01 | -1.2852E+01 | 1.721E+02% | | 7.39E+01 |
| PA-233 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 5.76E+00 |
| PA-234 #A | -6.8047E-01 | -6.8047E-01 | 1.379E+02% | | 7.75E+00 |
| PA-234M#A | 4.9296E+01 | 4.9296E+01 | 7.034E+01% | | 1.92E+02 |
| U-235 #A | -5.1903E-01 | -5.1903E-01 | 9.225E+01% | | 1.31E+01 |
| AM-241 #A | 1.1929E+00 | 1.1929E+00 | 1.255E+02% | | 4.99E+00 |
| Np-237 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | | 1.56E+01 |
| Ir-192 #A | 6.7676E-02 | 6.7676E-02 | 3.665E+02% | | 2.41E+00 |
| Cs-136 #A | 4.4586E-01 | 4.4588E-01 | 7.115E+01% | | 1.30E+00 |
| Np-239 #A | 1.0970E+00 | 1.0973E+00 | 1.108E+02% | | 4.06E+00 |
| Nd-147 #A | 2.0437E+00 | 2.0438E+00 | 1.296E+02% | | 6.40E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  25.0 to  1999.5 keV)  3.108E+02  Bq/Sample
Total Decayed Activity (  25.0 to  1999.5 keV) 3.1081271E+02  Bq/Sample

309155_Gamma_160-22327-A-11-B. 13_Gamma_20171201.spc.



# Daily Checks

Test America
St. Louis
Background Check

Spectrum: 3_20170607001_BG
Description: Background Contamination Check
Acquired: 6/7/2017 12:08:45 AM
Detector: Detector # 3
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 2.39 | 2.13 | 2.22 | 2.38 | 2.56 | 2.65 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 3_20170607002_QCAsLeft
Description: Quality control Check (QC Source 'C') Post Stabilization
Acquired: 6/7/2017 1:27:14 AM
Detector: Detector # 3
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.55 | 59.79 | 60.04 | PASS |
| FWHM | 0.81 | 0.00 | 0.00 | 0.82 | 1.91 | 2.01 | PASS |
| ActivityDiff | 647.00 | -5.00 | -4.00 | 1.20 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.46 | 0.00 | 0.00 | 1.42 | 3.16 | 3.26 | PASS |
| ActivityDiff | 606.50 | -5.00 | -4.00 | -1.30 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5330.70 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.63 | 1333.01 | 1333.26 | PASS |
| FWHM | 2.07 | 0.00 | 0.00 | 1.89 | 4.27 | 4.37 | PASS |
| ActivityDiff | 1183.00 | -5.00 | -4.00 | -3.46 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 5_20170607001_QCAsLeft
Description: Quality control Check (QC Source 'A') Post Stabilization
Acquired: 6/7/2017 12:30:05 AM
Detector: Detector # 5
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.59 | 59.79 | 60.04 | PASS |
| FWHM | 0.74 | 0.00 | 0.00 | 0.74 | 1.84 | 1.94 | PASS |
| ActivityDiff | 636.60 | -5.00 | -4.00 | -1.61 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.36 | 0.00 | 0.00 | 1.34 | 3.06 | 3.16 | PASS |
| ActivityDiff | 596.80 | -5.00 | -4.00 | -1.65 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5331.70 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.97 | 1333.01 | 1333.26 | PASS |
| FWHM | 1.90 | 0.00 | 0.00 | 1.97 | 4.10 | 4.20 | PASS |
| ActivityDiff | 1164.20 | -5.00 | -4.00 | -2.19 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 5_20170607002_BG
Description: Background Contamination Check
Acquired: 6/7/2017 1:05:21 AM
Detector: Detector # 5
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.45 | 1.30 | 1.35 | 1.39 | 1.55 | 1.60 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 7_20170607001_QCAsLeft
Description: Quality control Check (QC Source 'C') Post Stabilization
Acquired: 6/7/2017 12:32:30 AM
Detector: Detector # 7
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.58 | 59.04 | 59.29 | 59.58 | 59.79 | 60.04 | PASS |
| FWHM | 0.84 | 0.00 | 0.00 | 1.36 | 1.94 | 2.04 | PASS |
| ActivityDiff | 647.00 | -5.00 | -4.00 | 4.91 | 4.00 | 5.00 | High OOT |
| QA-662 | | | | | | | |
| FWHM | 1.45 | 0.00 | 0.00 | 1.84 | 3.15 | 3.25 | PASS |
| ActivityDiff | 606.50 | -5.00 | -4.00 | 0.06 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5331.00 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.83 | 1333.01 | 1333.26 | PASS |
| FWHM | 1.98 | 0.00 | 0.00 | 2.34 | 4.18 | 4.28 | PASS |
| ActivityDiff | 1183.00 | -5.00 | -4.00 | 1.25 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 7_20170607002_BG
Description: Background Contamination Check
Acquired: 6/7/2017 1:07:23 AM
Detector: Detector # 7
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.30 | 1.16 | 1.21 | 1.25 | 1.40 | 1.45 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 8_20170607001_QCAsLeft
Description: Quality control Check (QC Source 'D') Post Stabilization
Acquired: 6/7/2017 12:34:15 AM
Detector: Detector # 8
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.53 | 59.79 | 60.04 | PASS |
| FWHM | 1.10 | 0.00 | 0.00 | 0.83 | 2.20 | 2.30 | PASS |
| ActivityDiff | 650.60 | -5.00 | -4.00 | 2.07 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.53 | 0.00 | 0.00 | 1.37 | 3.23 | 3.33 | PASS |
| ActivityDiff | 609.90 | -5.00 | -4.00 | 3.00 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5330.50 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.62 | 1333.01 | 1333.26 | PASS |
| FWHM | 1.90 | 0.00 | 0.00 | 1.81 | 4.10 | 4.20 | PASS |
| ActivityDiff | 1189.70 | -5.00 | -4.00 | 2.27 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 8_20170607002_BG
Description: Background Contamination Check
Acquired: 6/7/2017 1:22:17 AM
Detector: Detector # 8
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.56 | 1.39 | 1.45 | 1.58 | 1.68 | 1.74 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 9_20170607001_QCAsLeft
Description: Quality control Check (QC Source 'E') Post Stabilization
Acquired: 6/7/2017 12:30:16 AM
Detector: Detector # 9
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.58 | 59.79 | 60.04 | PASS |
| FWHM | 1.08 | 0.00 | 0.00 | 0.95 | 2.18 | 2.28 | PASS |
| ActivityDiff | 649.44 | -5.00 | -4.00 | -1.92 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.62 | 0.00 | 0.00 | 1.53 | 3.32 | 3.42 | PASS |
| ActivityDiff | 607.56 | -5.00 | -4.00 | 0.04 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5330.10 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.45 | 1333.01 | 1333.26 | PASS |
| FWHM | 2.12 | 0.00 | 0.00 | 1.98 | 4.32 | 4.42 | PASS |
| ActivityDiff | 1191.31 | -5.00 | -4.00 | -2.99 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 9_20170607002_BG
Description: Background Contamination Check
Acquired: 6/7/2017 1:04:41 AM
Detector: Detector # 9
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.89 | 1.53 | 1.65 | 1.84 | 2.14 | 2.26 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 10_20170607001_QCAsLeft
Description: Quality control Check (QC Source 'F') Post Stabilization
Acquired: 6/7/2017 12:32:58 AM
Detector: Detector #10
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.56 | 59.79 | 60.04 | PASS |
| FWHM | 0.84 | 0.00 | 0.00 | 0.93 | 1.94 | 2.04 | PASS |
| ActivityDiff | 670.63 | -5.00 | -4.00 | 0.23 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.43 | 0.00 | 0.00 | 1.51 | 3.13 | 3.23 | PASS |
| ActivityDiff | 643.00 | -5.00 | -4.00 | -0.88 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5329.20 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.40 | 1333.01 | 1333.26 | PASS |
| FWHM | 2.01 | 0.00 | 0.00 | 2.08 | 4.21 | 4.31 | PASS |
| ActivityDiff | 1234.50 | -5.00 | -4.00 | 2.32 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 10_20170607002_BG
Description: Background Contamination Check
Acquired: 6/7/2017 1:07:25 AM
Detector: Detector #10
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 2.34 | 1.91 | 2.05 | 2.55 | 2.63 | 2.78 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 13_20170607001_QCAsLeft
Description: Quality control Check (QC Source 'I') Post Stabilization
Acquired: 6/7/2017 1:23:19 AM
Detector: Detector #13
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.55 | 59.79 | 60.04 | PASS |
| FWHM | 1.02 | 0.00 | 0.00 | 0.85 | 2.12 | 2.22 | PASS |
| ActivityDiff | 638.00 | -5.00 | -4.00 | 3.95 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.57 | 0.00 | 0.00 | 1.46 | 3.27 | 3.37 | PASS |
| ActivityDiff | 609.00 | -5.00 | -4.00 | 4.67 | 4.00 | 5.00 | High OOT |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5330.00 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.55 | 1333.01 | 1333.26 | PASS |
| FWHM | 2.08 | 0.00 | 0.00 | 2.01 | 4.28 | 4.38 | PASS |
| ActivityDiff | 1176.00 | -5.00 | -4.00 | 1.39 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 13_20170607002_BG
Description: Background Contamination Check
Acquired: 6/7/2017 1:43:22 AM
Detector: Detector #13
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.91 | 1.71 | 1.77 | 1.78 | 2.04 | 2.10 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 14_20170607001_BG
Description: Background Contamination Check
Acquired: 6/7/2017 12:07:33 AM
Detector: Detector #14
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.80 | 1.66 | 1.71 | 1.84 | 1.90 | 1.94 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 14_20170607002_QCAsLeft
Description: Quality control Check (QC Source 'E') Post Stabilization
Acquired: 6/7/2017 1:28:20 AM
Detector: Detector #14
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 238.00 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.65 | 59.79 | 60.04 | PASS |
| FWHM | 0.76 | 0.00 | 0.00 | 0.90 | 1.86 | 1.96 | PASS |
| ActivityDiff | 671.90 | -5.00 | -4.00 | 1.25 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.35 | 0.00 | 0.00 | 1.42 | 3.05 | 3.15 | PASS |
| ActivityDiff | 628.85 | -5.00 | -4.00 | 0.58 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5329.30 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.36 | 1333.01 | 1333.26 | PASS |
| FWHM | 1.91 | 0.00 | 0.00 | 1.99 | 4.11 | 4.21 | PASS |
| ActivityDiff | 1224.59 | -5.00 | -4.00 | -1.01 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 15_20170607001_BG
Description: Background Contamination Check
Acquired: 6/7/2017 12:08:58 AM
Detector: Detector #15
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.68 | 1.59 | 1.62 | 1.72 | 1.74 | 1.77 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 15_20170607002_QCAsLeft
Description: Quality control Check (QC Source 'F') Post Stabilization
Acquired: 6/7/2017 1:30:15 AM
Detector: Detector #15
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.57 | 59.79 | 60.04 | PASS |
| FWHM | 0.95 | 0.00 | 0.00 | 0.91 | 2.05 | 2.15 | PASS |
| ActivityDiff | 670.56 | -5.00 | -4.00 | 0.75 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.51 | 0.00 | 0.00 | 1.45 | 3.21 | 3.31 | PASS |
| ActivityDiff | 668.76 | -5.00 | -4.00 | 1.23 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5330.50 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.81 | 1333.01 | 1333.26 | PASS |
| FWHM | 1.99 | 0.00 | 0.00 | 1.93 | 4.19 | 4.29 | PASS |
| ActivityDiff | 1277.79 | -5.00 | -4.00 | 0.99 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 16_20170607001_BG
Description: Background Contamination Check
Acquired: 6/7/2017 12:10:32 AM
Detector: Detector #16
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 2.68 | 2.51 | 2.56 | 2.68 | 2.80 | 2.86 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 16_20170607002_QCAsLeft
Description: Quality control Check (QC Source 'G') Post Stabilization
Acquired: 6/7/2017 1:32:38 AM
Detector: Detector #16
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 237.90 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.55 | 59.79 | 60.04 | PASS |
| FWHM | 0.96 | 0.00 | 0.00 | 0.99 | 2.06 | 2.16 | PASS |
| ActivityDiff | 602.10 | -5.00 | -4.00 | 2.38 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.53 | 0.00 | 0.00 | 1.49 | 3.23 | 3.33 | PASS |
| ActivityDiff | 571.13 | -5.00 | -4.00 | -0.62 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5330.30 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.69 | 1333.01 | 1333.26 | PASS |
| FWHM | 2.09 | 0.00 | 0.00 | 2.09 | 4.29 | 4.39 | PASS |
| ActivityDiff | 1139.05 | -5.00 | -4.00 | 0.65 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Background Check

Spectrum: 17_20170607001_BG
Description: Background Contamination Check
Acquired: 6/7/2017 12:12:34 AM
Detector: Detector #17
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 2.32 | 2.18 | 2.23 | 2.31 | 2.42 | 2.46 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

Test America
St. Louis
Quality Control Check

Spectrum: 17_20170607002_QCAsLeft
Description: Quality control Check (QC Source 'H') Post Stabilization
Acquired: 6/7/2017 1:47:15 AM
Detector: Detector #17
Quality Control Evaluation Criteria:
1) Notify Supervisor if 'AS FOUND' parameters exceed Tolerance or Control Limits.
2) Place out of service if 'AS LEFT' parameters exceed Tolerance or Control Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| QA-60 | | | | | | | |
| Channel | 238.00 | 236.00 | 237.00 | 238.00 | 239.00 | 240.00 | PASS |
| Energy | 59.54 | 59.04 | 59.29 | 59.65 | 59.79 | 60.04 | PASS |
| FWHM | 0.77 | 0.00 | 0.00 | 0.78 | 1.87 | 1.97 | PASS |
| ActivityDiff | 691.00 | -5.00 | -4.00 | 1.82 | 4.00 | 5.00 | PASS |
| QA-662 | | | | | | | |
| FWHM | 1.37 | 0.00 | 0.00 | 1.35 | 3.07 | 3.17 | PASS |
| ActivityDiff | 659.00 | -5.00 | -4.00 | -0.78 | 4.00 | 5.00 | PASS |
| QA-1332 | | | | | | | |
| Channel | 5330.00 | 5327.00 | 5328.00 | 5329.70 | 5332.00 | 5333.00 | PASS |
| Energy | 1332.51 | 1331.76 | 1332.01 | 1332.52 | 1333.01 | 1333.26 | PASS |
| FWHM | 1.88 | 0.00 | 0.00 | 1.81 | 4.08 | 4.18 | PASS |
| ActivityDiff | 1274.00 | -5.00 | -4.00 | -1.34 | 4.00 | 5.00 | PASS |

Analyst: Tim Toolen Reviewer: kody Saulters

# Initial Calibrations

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge3 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 15038 | 100.7 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1231.1 | 105.8 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 16045 | 98.1 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 348.66 | 96.3 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 542.18 | 98.8 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1190.9 | 101.7 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 974.14 | 100.9 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 465.73 | 99.7 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1562.9 | 98.3 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 732.25 | 99.7 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 726.4 | 98.9 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1616.3 | 101.7 |

Reviewed By: Jody Watson

Date: 3/28/2012

Calibration Data from file: 3_Soil_TunaCan.Clb
Energy Calibration Date: 3/28/2012 Time: 11:26:42 AM
Efficiency Calibration Date: 3/28/2012 Time: 11:26:55 AM

Calibration Description:
3_Soil_TunaCan_90099_032712

Energy Calibration Fit
Energy = 0.1475 +0.249738*Channel +3.68165e-008*Channel**2
FWHM (ch) = 3.1011 +0.001004*Channel -1.23886e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.95 | 46.54 | 46.59 | -0.10% | 0.82 | 0.82 | 0.35% |
| 237.88 | 59.54 | 59.56 | -0.03% | 0.81 | 0.83 | -2.35% |
| 351.51 | 88.03 | 87.94 | 0.11% | 0.85 | 0.86 | -1.11% |
| 487.69 | 122.06 | 121.95 | 0.09% | 0.89 | 0.90 | -0.30% |
| 663.54 | 165.85 | 165.87 | -0.01% | 0.96 | 0.94 | 1.71% |
| 1117.25 | 279.17 | 279.21 | -0.02% | 1.06 | 1.05 | 1.21% |
| 1567.81 | 391.69 | 391.78 | -0.02% | 1.16 | 1.16 | -0.08% |
| 2647.99 | 661.66 | 661.71 | -0.01% | 1.42 | 1.42 | -0.09% |
| 3593.39 | 898.02 | 898.03 | -0.00% | 1.68 | 1.64 | 2.32% |
| 4693.77 | 1173.24 | 1173.17 | 0.01% | 1.85 | 1.89 | -1.87% |
| 5330.55 | 1332.50 | 1332.44 | 0.00% | 2.01 | 2.03 | -0.79% |
| 7343.39 | 1836.01 | 1836.06 | -0.00% | 2.47 | 2.45 | 0.53% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.6409 %
Ln(Eff) = -0.6102 -0.364228*Ln(Eng) -0.028954*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.2945 %
Ln(Eff) = -25.2514 +9.446449*Ln(Eng) -1.00597*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 2.1302E-002 | 2.2144E-002 | -3.95% |
| 59.54 | 3.3461E-002 | 3.1823E-002 | 4.89% |
| 88.03 | 4.3165E-002 | 4.4041E-002 | -2.03% |
| 122.06 | 4.3938E-002 | 4.5635E-002 | -3.86% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 3.9111E-002 | 3.9630E-002 | -1.33% |
| 279.17 | 2.8374E-002 | 2.7881E-002 | 1.74% |
| 391.69 | 2.2192E-002 | 2.1995E-002 | 0.89% |
| 661.66 | 1.5033E-002 | 1.5039E-002 | -0.04% |
| 898.02 | 1.1768E-002 | 1.1963E-002 | -1.66% |
| 1173.24 | 9.7156E-003 | 9.7485E-003 | -0.34% |
| 1332.50 | 8.7374E-003 | 8.8303E-003 | -1.06% |
| 1836.01 | 6.9703E-003 | 6.8546E-003 | 1.66% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  3/28/2012 11:31:04 AM
TestAmerica                      Spectrum name: 3_TunaCan_20120996.An1

Sample description
     3_TunaCan_90099_32712


Spectrum Filename: C:\User\SPC\Det3\3_TunaCan_20120996.An1

Acquisition information
       Start time:                 3/27/2012 6:49:29 PM
       Live time:               3600
       Real time:               3659
       Dead time:                  1.62 %
       Detector ID:                   3

Detector system
     Ge 3 SN/131


Calibration
       Filename:                   3_Soil_TunaCan.Clb
     3_Soil_TunaCan_90099_032712


       Energy Calibration
            Created:               3/28/2012 11:26:42 AM
            Zero offset:           0.147 keV
            Gain:                  0.250 keV/channel
            Quadratic:             3.682E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/28/2012 11:26:55 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.64 %
            Log(Eff):             -6.102019E-01 + (-3.642282E-01*Log(E) ) +
                                   ( -2.895398E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.29 %
            Log(Eff):             -2.525141E+01 + ( 9.446449E+00*Log(E) ) +
                                   ( -1.005974E+00*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.61keV )
       Stop channel:            8000 (  2000.41keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (1087) Env32 G53W4.25 3/28/2012 11:31:04 AM
TestAmerica Spectrum name: 3_TunaCan_20120996.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2012 11:00:00 AM |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0476

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.59 | 50574. | 0.65 | 0.82 | 2.218E-02 | 46.54 | 4.250 | 1.504E+04 | Pb210 |
| 59.56 | 50333. | 0.68 | 0.81 | 3.183E-02 | 59.54 | 35.700 | 1.231E+03 | AM241 |
| 70.80 | 1766. | 9.08 | 0.85 | 3.816E-02 | | | | |
| 72.87 | 3614. | 4.56 | 0.85 | 3.911E-02 | | | | |
| 74.96 | 1613. | 9.70 | 0.85 | 3.999E-02 | | | | |
| 87.94 | 80693. | 0.50 | 0.85 | 4.402E-02 | 88.03 | 3.610 | 1.605E+04 | CD109 |
| 121.95 | 39343. | 0.74 | 0.89 | 4.564E-02 | 122.06 | 85.600 | 3.487E+02 | CO57 |
| 136.41 | 4721. | 3.34 | 0.95 | 4.398E-02 | | | | |
| 165.87 | 40014. | 0.68 | 0.96 | 3.963E-02 | 165.85 | 79.900 | 5.422E+02 | Ce139 |
| 255.13 | 1516. | 9.66 | 0.98 | 2.966E-02 | | | | |
| 279.21 | 26998. | 0.85 | 1.06 | 2.788E-02 | 279.17 | 81.500 | 1.191E+03 | Hg203 |
| 391.78 | 29352. | 0.72 | 1.16 | 2.199E-02 | 391.69 | 64.000 | 9.741E+02 | SN113 |
| 661.71 | 21369. | 0.89 | 1.42 | 1.504E-02 | 661.66 | 85.210 | 4.657E+02 | CS137 |
| 898.02 | 35979. | 0.66 | 1.68 | 1.196E-02 | 898.02 | 93.700 | 1.563E+03 | Y898 |
| 1173.16 | 24887. | 0.79 | 1.85 | 9.749E-03 | 1173.24 | 99.900 | 7.323E+02 | Co1173 |
| 1332.44 | 22381. | 0.80 | 2.01 | 8.831E-03 | 1332.50 | 99.982 | 7.264E+02 | Co1332 |
| 1836.03 | 22571. | 0.73 | 2.47 | 6.855E-03 | 1836.01 | 99.200 | 1.616E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 282.89 | 70.78 | 11968. | 1765. | 4.626E+04 | 9.08 | 0.845 | - | D |
| 291.19 | 72.85 | 11762. | 3610. | 9.232E+04 | 4.56 | 0.847 | - | D |
| 299.57 | 74.94 | 11439. | 1606. | 4.017E+04 | 9.74 | 0.849 | - | D |
| 545.58 | 136.41 | 6353. | 4721. | 1.073E+05 | 3.34 | 0.952 | - | |

ORTEC g v - i (1087) Env32 G53W4.25 3/28/2012 11:31:04 AM
TestAmerica Spectrum name: 3_TunaCan_20120996.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 1020.86 | 255.13 | 4778. | 1516. | 5.109E+04 | 9.66 | 0.975 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.95 | 46.59 | 15712. | 50574. | 14.048 | 0.65 | 0.824 |
| AM-241 | 237.88 | 59.56 | 16997. | 50333. | 13.981 | 0.68 | 0.815 |
| CD-109 | 351.51 | 87.94 | 18663. | 80693. | 22.415 | 0.50 | 0.853 |
| CO-57 | 487.69 | 121.95 | 10697. | 39343. | 10.929 | 0.74 | 0.893 |
| Ce-139 | 663.54 | 165.87 | 7740. | 40014. | 11.115 | 0.68 | 0.956 |
| Hg-203 | 1117.25 | 279.21 | 5084. | 26998. | 7.499 | 0.85 | 1.064 |
| SN-113 | 1567.81 | 391.78 | 3251. | 29352. | 8.153 | 0.72 | 1.160 |
| CS-137 | 2647.99 | 661.71 | 2996. | 21369. | 5.936 | 0.89 | 1.417 |
| Y-898 | 3593.36 | 898.02 | 2796. | 35979. | 9.994 | 0.66 | 1.677 |
| Co-1173 | 4693.73 | 1173.16 | 1727. | 24887. | 6.913 | 0.79 | 1.854 |
| Co-1332 | 5330.55 | 1332.44 | 1300. | 22381. | 6.217 | 0.80 | 2.010 |
| Y-1836 | 7343.29 | 1836.03 | 413. | 22571. | 6.270 | 0.73 | 2.474 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.5038E+04 | | | | | 8.15E+03 |
| | | | 46.54 | 1.504E+04 | ( | 1.745E+02 | 6.50E-01 4.25E+00 G |
| AM-241 | | 1.2311E+03 | | | | | 1.58E+05 |
| | | | 59.54 | 1.231E+03 | ( | 1.493E+01 | 6.75E-01 3.57E+01 G |
| CD-109 | | 1.6045E+04 | | | | | 4.63E+02 |
| | | | 88.03 | 1.605E+04 | ( | 1.271E+02 | 4.98E-01 3.61E+00 G |
| CO-57 | | 3.4866E+02 | | | | | 2.72E+02 |
| | | | 122.06 | 3.487E+02 | ( | 4.295E+00 | 7.36E-01 8.56E+01 G |

ORTEC g v - i (1087) Env32 G53W4.25 3/28/2012 11:31:04 AM
TestAmerica Spectrum name: 3_TunaCan_20120996.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ce-139 | 5.4218E+02 | | | | | | 1.38E+02 |
| | | 165.85 | 5.422E+02 | ( | 5.592E+00 | 6.78E-01 | 7.99E+01 G |
| Hg-203 | 1.1909E+03 | | | | | | 4.66E+01 |
| | | 279.17 | 1.191E+03 | ( | 1.478E+01 | 8.48E-01 | 8.15E+01 G |
| SN-113 | 9.7414E+02 | | | | | | 1.15E+02 |
| | | 391.69 | 9.741E+02 | ( | 8.908E+00 | 7.23E-01 | 6.40E+01 G |
| CS-137 | 4.6573E+02 | | | | | | 1.10E+04 |
| | | 661.66 | 4.657E+02 | ( | 5.618E+00 | 8.92E-01 | 8.52E+01 G |
| Y-898 | 1.5629E+03 | | | | | | 1.07E+02 |
| | | 898.02 | 1.563E+03 | ( | 1.082E+01 | 6.55E-01 | 9.37E+01 G |
| Co-1173 | 7.3225E+02 | | | | | | 1.93E+03 |
| | | 1173.24 | 7.323E+02 | ( | 5.778E+00 | 7.93E-01 | 9.99E+01 G |
| Co-1332 | 7.2640E+02 | | | | | | 1.93E+03 |
| | | 1332.50 | 7.264E+02 | ( | 5.541E+00 | 8.01E-01 | 1.00E+02 G |
| Y-1836 | 1.6163E+03 | | | | | | 1.07E+02 |
| | | 1836.01 | 1.616E+03 | ( | 6.976E+00 | 7.29E-01 | 9.92E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |

ORTEC g v - i (1087) Env32 G53W4.25 3/28/2012 11:31:04 AM
TestAmerica Spectrum name: 3_TunaCan_20120996.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq | Time Corrected Activity Bq | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|---|
| Pb-210 | 1.4927E+04 | 1.5038E+04 | 6.504E-01% | 1.74E+02 |
| AM-241 | 1.2307E+03 | 1.2311E+03 | 6.752E-01% | 1.49E+01 |
| CD-109 | 1.4098E+04 | 1.6045E+04 | 4.981E-01% | 1.27E+02 |
| CO-57 | 2.7976E+02 | 3.4866E+02 | 7.363E-01% | 4.30E+00 |
| Ce-139 | 3.5103E+02 | 5.4218E+02 | 6.778E-01% | 5.59E+00 |
| Hg-203 | 3.3004E+02 | 1.1909E+03 | 8.480E-01% | 1.48E+01 |
| SN-113 | 5.7920E+02 | 9.7414E+02 | 7.232E-01% | 8.91E+00 |
| CS-137 | 4.6320E+02 | 4.6573E+02 | 8.922E-01% | 5.62E+00 |
| Y-898 | 8.9159E+02 | 1.5629E+03 | 6.551E-01% | 1.08E+01 |
| Co-1173 | 7.0984E+02 | 7.3225E+02 | 7.934E-01% | 5.78E+00 |
| Co-1332 | 7.0417E+02 | 7.2640E+02 | 8.009E-01% | 5.54E+00 |
| Y-1836 | 9.2205E+02 | 1.6163E+03 | 7.286E-01% | 6.98E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 77.1 to 2000.4 keV) 3.549E+04 Bq
Total Decayed Activity ( 77.1 to 2000.4 keV) 4.0473316E+04 Bq

Analyzed by: _____
Admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica

# Gamma Verification per Geometry

Detector: Ge5

Geometry: Tunacan

Reference date 1/1/2012

Calibration Standard: 90099

Standard volume g / vial 1550

Standard volume transferred in g / geometry 317.8

lab ID# of cal standard Rad12-0007

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14353 | 96.2 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1230.2 | 105.7 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 16101 | 98.4 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 347.72 | 96.1 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 538.4 | 98.1 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1208.4 | 103.2 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 972.07 | 100.6 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 462.35 | 99.0 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1559.3 | 98.1 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 722.51 | 98.4 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 739.67 | 100.7 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1613.8 | 101.5 |

Reviewed By: Jody Watson

Date: 3/27/2012

Calibration Data from file: 5_Soil_TunaCan.Clb
Energy Calibration Date: 3/27/2012 Time: 5:20:02 PM
Efficiency Calibration Date: 3/27/2012 Time: 5:20:37 PM

Calibration Description:
5_Soil_TunaCan_90099_032612

Energy Calibration Fit
Energy = 0.1351 +0.249831*Channel +2.72022e-008*Channel**2
FWHM (ch) = 2.8138 +0.001050*Channel -2.57606e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 186.01 | 46.54 | 46.61 | -0.15% | 0.74 | 0.75 | -1.17% |
| 237.86 | 59.54 | 59.56 | -0.04% | 0.74 | 0.77 | -4.07% |
| 351.46 | 88.03 | 87.95 | 0.10% | 0.80 | 0.79 | 1.28% |
| 487.52 | 122.06 | 121.94 | 0.10% | 0.85 | 0.83 | 2.66% |
| 663.26 | 165.85 | 165.85 | 0.00% | 0.88 | 0.87 | 0.98% |
| 1116.90 | 279.17 | 279.20 | -0.01% | 0.97 | 0.99 | -2.35% |
| 1567.36 | 391.69 | 391.78 | -0.02% | 1.12 | 1.10 | 1.78% |
| 2647.45 | 661.66 | 661.74 | -0.01% | 1.38 | 1.35 | 1.91% |
| 3592.51 | 898.02 | 898.01 | 0.00% | 1.55 | 1.56 | -1.11% |
| 4692.96 | 1173.24 | 1173.18 | 0.00% | 1.77 | 1.79 | -1.18% |
| 5329.72 | 1332.50 | 1332.44 | 0.00% | 1.93 | 1.92 | 0.31% |
| 7342.77 | 1836.01 | 1836.05 | -0.00% | 2.29 | 2.29 | 0.24% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.8682 %
Ln(Eff) = 0.6466 -0.783045*Ln(Eng) -0.0041175*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.4296 %
Ln(Eff) = -24.6225 +9.075211*Ln(Eng) -0.966442*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 1.7205E-002 | 1.7882E-002 | -3.93% |
| 59.54 | 2.6619E-002 | 2.5335E-002 | 4.82% |
| 88.03 | 3.4045E-002 | 3.4617E-002 | -1.68% |
| 122.06 | 3.4394E-002 | 3.5819E-002 | -4.15% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 3.0704E-002 | 3.1331E-002 | -2.04% |
| 279.17 | 2.1030E-002 | 2.0365E-002 | 3.17% |
| 391.69 | 1.5475E-002 | 1.5370E-002 | 0.68% |
| 661.66 | 9.8486E-003 | 9.9244E-003 | -0.77% |
| 898.02 | 7.5404E-003 | 7.6837E-003 | -1.90% |
| 1173.24 | 6.0360E-003 | 6.1381E-003 | -1.69% |
| 1332.50 | 5.5560E-003 | 5.5144E-003 | 0.75% |
| 1836.01 | 4.2722E-003 | 4.2078E-003 | 1.51% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  3/27/2012 5:22:03 PM
TestAmerica                      Spectrum name: 5_TunaCan_20120810.An1

Sample description
     5_TunaCan_90099_032612


Spectrum Filename: C:\User\SPC\Det5\5_TunaCan_20120810.An1

Acquisition information
       Start time:                 3/26/2012 3:05:42 PM
       Live time:               3600
       Real time:               3652
       Dead time:                  1.44 %
       Detector ID:                   5

Detector system
     Ge 5 SN/157


Calibration
       Filename:                   5_Soil_TunaCan.Clb
     5_Soil_TunaCan_90099_032612


       Energy Calibration
            Created:               3/27/2012 5:20:02 PM
            Zero offset:           0.135 keV
            Gain:                  0.250 keV/channel
            Quadratic:             2.720E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/27/2012 5:20:37 PM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.87 %
            Log(Eff):              6.466115E-01 + (-7.830454E-01*Log(E) ) +
                                   ( -4.117504E-03*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.43 %
            Log(Eff):             -2.462251E+01 + ( 9.075211E+00*Log(E) ) +
                                   ( -9.664422E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.61keV )
       Stop channel:            8000 (  2000.53keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (1087) Env32 G53W4.25 3/27/2012 5:22:03 PM
TestAmerica Spectrum name: 5_TunaCan_20120810.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2012 11:00:00 AM |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0527

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.61 | 38986. | 0.74 | 0.74 | 1.793E-02 | 46.54 | 4.250 | 1.435E+04 | Pb210 |
| 59.56 | 40041. | 0.74 | 0.74 | 2.535E-02 | 59.54 | 35.700 | 1.230E+03 | AM241 |
| 70.85 | 1493. | 9.22 | 0.78 | 3.019E-02 | | | | |
| 72.87 | 2354. | 5.96 | 0.78 | 3.089E-02 | | | | |
| 87.95 | 63754. | 0.53 | 0.80 | 3.460E-02 | 88.03 | 3.610 | 1.610E+04 | CD109 |
| 121.94 | 30888. | 0.76 | 0.85 | 3.583E-02 | 122.06 | 85.600 | 3.477E+02 | CO57 |
| 136.41 | 3768. | 3.80 | 0.89 | 3.457E-02 | | | | |
| 165.85 | 31597. | 0.74 | 0.88 | 3.066E-02 | 165.85 | 79.900 | 5.384E+02 | Ce139 |
| 279.20 | 20358. | 0.87 | 0.97 | 2.036E-02 | 279.17 | 81.500 | 1.208E+03 | Hg203 |
| 391.78 | 20611. | 0.93 | 1.12 | 1.537E-02 | 391.69 | 64.000 | 9.721E+02 | SN113 |
| 661.74 | 14000. | 1.10 | 1.38 | 9.923E-03 | 661.66 | 85.210 | 4.623E+02 | CS137 |
| 898.01 | 23228. | 0.82 | 1.55 | 7.684E-03 | 898.02 | 93.700 | 1.559E+03 | Y898 |
| 1173.18 | 15468. | 0.93 | 1.77 | 6.138E-03 | 1173.24 | 99.900 | 7.225E+02 | Co1173 |
| 1332.44 | 14238. | 0.98 | 1.93 | 5.515E-03 | 1332.50 | 99.982 | 7.397E+02 | Co1332 |
| 1836.04 | 13938. | 0.87 | 2.30 | 4.208E-03 | 1836.01 | 99.200 | 1.614E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 291.16 | 72.88 | 8722. | 2253. | 7.295E+04 | 7.09 | 0.801 | - |
| 545.44 | 136.41 | 5274. | 3768. | 1.090E+05 | 3.80 | 0.888 | - |

ORTEC g v - i (1087) Env32 G53W4.25 3/27/2012 5:22:03 PM
TestAmerica Spectrum name: 5_TunaCan_20120810.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 186.01 | 46.61 | 12895. | 38986. | 10.829 | 0.74 | 0.743 |
| AM-241 | 237.86 | 59.56 | 13293. | 40041. | 11.122 | 0.74 | 0.735 |
| CD-109 | 351.46 | 87.95 | 12894. | 63754. | 17.710 | 0.53 | 0.805 |
| CO-57 | 487.52 | 121.94 | 6935. | 30888. | 8.580 | 0.76 | 0.852 |
| Ce-139 | 663.26 | 165.85 | 5616. | 31597. | 8.777 | 0.74 | 0.883 |
| Hg-203 | 1116.90 | 279.20 | 2848. | 20358. | 5.655 | 0.87 | 0.966 |
| SN-113 | 1567.36 | 391.78 | 3046. | 20611. | 5.725 | 0.93 | 1.119 |
| CS-137 | 2647.45 | 661.74 | 1982. | 14000. | 3.889 | 1.10 | 1.380 |
| Y-898 | 3592.51 | 898.01 | 1944. | 23228. | 6.452 | 0.82 | 1.547 |
| Co-1173 | 4692.96 | 1173.18 | 847. | 15468. | 4.297 | 0.93 | 1.774 |
| Co-1332 | 5329.75 | 1332.44 | 693. | 14238. | 3.955 | 0.98 | 1.927 |
| Y-1836 | 7342.72 | 1836.04 | 102. | 13938. | 3.872 | 0.87 | 2.295 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4353E+04 | | | | | | 8.15E+03 | |
| | | | 46.54 | 1.435E+04 | ( | 1.958E+02 | 7.44E-01 | 4.25E+00 | G |
| AM-241 | | 1.2302E+03 | | | | | | 1.58E+05 | |
| | | | 59.54 | 1.230E+03 | ( | 1.659E+01 | 7.44E-01 | 3.57E+01 | G |
| CD-109 | | 1.6101E+04 | | | | | | 4.63E+02 | |
| | | | 88.03 | 1.610E+04 | ( | 1.343E+02 | 5.28E-01 | 3.61E+00 | G |
| CO-57 | | 3.4772E+02 | | | | | | 2.72E+02 | |
| | | | 122.06 | 3.477E+02 | ( | 4.399E+00 | 7.60E-01 | 8.56E+01 | G |

ORTEC g v - i (1087) Env32 G53W4.25 3/27/2012 5:22:03 PM
TestAmerica Spectrum name: 5_TunaCan_20120810.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ce-139 | 5.3840E+02 | | | | | 1.38E+02 | |
| | | 165.85 | 5.384E+02 | ( | 5.997E+00 | 7.36E-01 | 7.99E+01 G |
| Hg-203 | 1.2084E+03 | | | | | 4.66E+01 | |
| | | 279.17 | 1.208E+03 | ( | 1.492E+01 | 8.69E-01 | 8.15E+01 G |
| SN-113 | 9.7207E+02 | | | | | 1.15E+02 | |
| | | 391.69 | 9.721E+02 | ( | 1.226E+01 | 9.31E-01 | 6.40E+01 G |
| CS-137 | 4.6235E+02 | | | | | 1.10E+04 | |
| | | 661.66 | 4.623E+02 | ( | 6.941E+00 | 1.10E+00 | 8.52E+01 G |
| Y-898 | 1.5593E+03 | | | | | 1.07E+02 | |
| | | 898.02 | 1.559E+03 | ( | 1.397E+01 | 8.19E-01 | 9.37E+01 G |
| Co-1173 | 7.2251E+02 | | | | | 1.93E+03 | |
| | | 1173.24 | 7.225E+02 | ( | 6.463E+00 | 9.30E-01 | 9.99E+01 G |
| Co-1332 | 7.3967E+02 | | | | | 1.93E+03 | |
| | | 1332.50 | 7.397E+02 | ( | 6.515E+00 | 9.82E-01 | 1.00E+02 G |
| Y-1836 | 1.6138E+03 | | | | | 1.07E+02 | |
| | | 1836.01 | 1.614E+03 | ( | 5.776E+00 | 8.71E-01 | 9.92E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape

ORTEC g v - i (1087) Env32 G53W4.25 3/27/2012 5:22:03 PM
TestAmerica Spectrum name: 5_TunaCan_20120810.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq | Time Corrected Activity Bq | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|---|
| Pb-210 | 1.4250E+04 | 1.4353E+04 | 7.439E-01% | 1.96E+02 |
| AM-241 | 1.2297E+03 | 1.2302E+03 | 7.442E-01% | 1.66E+01 |
| CD-109 | 1.4172E+04 | 1.6101E+04 | 5.277E-01% | 1.34E+02 |
| CO-57 | 2.7983E+02 | 3.4772E+02 | 7.604E-01% | 4.40E+00 |
| Ce-139 | 3.5061E+02 | 5.3840E+02 | 7.359E-01% | 6.00E+00 |
| Hg-203 | 3.4071E+02 | 1.2084E+03 | 8.687E-01% | 1.49E+01 |
| SN-113 | 5.8200E+02 | 9.7207E+02 | 9.315E-01% | 1.23E+01 |
| CS-137 | 4.5987E+02 | 4.6235E+02 | 1.097E+00% | 6.94E+00 |
| Y-898 | 8.9620E+02 | 1.5593E+03 | 8.189E-01% | 1.40E+01 |
| Co-1173 | 7.0069E+02 | 7.2251E+02 | 9.300E-01% | 6.46E+00 |
| Co-1332 | 7.1733E+02 | 7.3967E+02 | 9.821E-01% | 6.52E+00 |
| Y-1836 | 9.2756E+02 | 1.6138E+03 | 8.711E-01% | 5.78E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.6 to 2000.5 keV) 3.491E+04 Bq
Total Decayed Activity ( 37.6 to 2000.5 keV) 3.9848164E+04 Bq

Analyzed by: _____
Admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge7 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14726 | 98.7 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1241.6 | 106.7 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 15976 | 97.6 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 346.77 | 95.8 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 539.48 | 98.3 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1199.2 | 102.4 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 976.76 | 101.1 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 467.66 | 100.2 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1567.3 | 98.6 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 726.23 | 98.9 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 719.64 | 98.0 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1635.7 | 102.9 |

Reviewed By: Jody Watson

Date: 3/16/2012

Calibration Data from file: 7_Soil_TunaCan.Clb
Energy Calibration Date: 3/16/2012 Time: 11:44:50 AM
Efficiency Calibration Date: 3/16/2012 Time: 11:45:14 AM

Calibration Description:
7_TunaCan_90099_030512

Energy Calibration Fit
Energy = 0.1533 +0.249954*Channel +6.71576e-009*Channel**2
FWHM (ch) = 3.2969 +0.001030*Channel -2.25091e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.73 | 46.54 | 46.58 | -0.08% | 0.86 | 0.87 | -1.80% |
| 237.72 | 59.54 | 59.57 | -0.06% | 0.86 | 0.88 | -3.29% |
| 351.56 | 88.03 | 88.03 | 0.00% | 0.91 | 0.91 | -0.17% |
| 487.42 | 122.06 | 121.99 | 0.06% | 0.97 | 0.95 | 2.36% |
| 662.55 | 165.85 | 165.76 | 0.05% | 1.00 | 0.99 | 1.26% |
| 1116.52 | 279.17 | 279.24 | -0.03% | 1.13 | 1.10 | 1.85% |
| 1566.54 | 391.69 | 391.73 | -0.01% | 1.21 | 1.21 | -0.23% |
| 2646.25 | 661.66 | 661.64 | 0.00% | 1.47 | 1.47 | 0.54% |
| 3591.85 | 898.02 | 898.04 | -0.00% | 1.66 | 1.68 | -1.15% |
| 4692.53 | 1173.24 | 1173.22 | 0.00% | 1.92 | 1.91 | 0.69% |
| 5329.58 | 1332.50 | 1332.49 | 0.00% | 2.02 | 2.04 | -0.87% |
| 7343.37 | 1836.01 | 1836.02 | -0.00% | 2.42 | 2.41 | 0.28% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.8690 %
Ln(Eff) = 0.6717 -0.616654*Ln(Eng) -0.0206592*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.4845 %
Ln(Eff) = -26.8969 +10.195443*Ln(Eng) -1.08167*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 2.3732E-002 | 2.4829E-002 | -4.62% |
| 59.54 | 3.9252E-002 | 3.7016E-002 | 5.70% |
| 88.03 | 5.1999E-002 | 5.3285E-002 | -2.47% |
| 122.06 | 5.3679E-002 | 5.6057E-002 | -4.43% |
| 165.85 | ========== | Knee | ========== |
| 165.85 | 4.7932E-002 | 4.8811E-002 | -1.83% |
| 279.17 | 3.2322E-002 | 3.1541E-002 | 2.42% |
| 391.69 | 2.3837E-002 | 2.3601E-002 | 0.99% |
| 661.66 | 1.4947E-002 | 1.4924E-002 | 0.15% |
| 898.02 | 1.1205E-002 | 1.1367E-002 | -1.45% |
| 1173.24 | 8.8255E-003 | 8.9287E-003 | -1.17% |
| 1332.50 | 7.7833E-003 | 7.9508E-003 | -2.15% |
| 1836.01 | 6.0876E-003 | 5.9192E-003 | 2.77% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14941.00 | 635.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 967.19 | 619.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 467.08 | 398.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1590.20 | 1490.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 735.15 | 735.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1590.70 | 1578.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  2/28/2014 11:43:43 AM
TestAmerica                      Spectrum name: 7_TunaCan_20120388.An1

Sample description
     7_TunaCan_90099_030512


Spectrum Filename: C:\User\SPC\Det7\7_TunaCan_20120388.An1

Acquisition information
       Start time:                 3/5/2012 2:07:36 PM
       Live time:               3600
       Real time:               3721
       Dead time:                  3.25 %
       Detector ID:                    7

Detector system
     Ge 7 SN/154


Calibration
       Filename:                   7_Soil_TunaCan.Clb
     7_TunaCan_90099_032712


       Energy Calibration
            Created:               3/16/2012 11:44:50 AM
            Zero offset:           0.153 keV
            Gain:                  0.250 keV/channel
            Quadratic:             6.716E-09 keV/channel^2

       Efficiency Calibration
            Created:               3/16/2012 11:45:14 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.87 %
            Log(Eff):              6.716580E-01 + (-6.166540E-01*Log(E) ) +
                                   ( -2.065917E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.48 %
            Log(Eff):             -2.689695E+01 + ( 1.019544E+01*Log(E) ) +
                                   ( -1.081671E+00*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.65keV )
       Stop channel:            8000 (  2000.21keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (1087) Env32 G53W4.25 2/28/2014 11:43:43 AM
TestAmerica Spectrum name: 7_TunaCan_20120388.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2012 11:00:00 AM |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0324

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.63 | 53946. | 0.53 | 0.87 | 2.487E-02 | 46.54 | 4.250 | 1.428E+04 | Pb210 |
| 59.57 | 59050. | 0.65 | 0.86 | 3.704E-02 | 59.54 | 35.700 | 1.242E+03 | AM241 |
| 70.74 | 2770. | 6.58 | 0.90 | 4.527E-02 | | | | |
| 72.95 | 4536. | 4.27 | 0.90 | 4.661E-02 | | | | |
| 88.03 | 100494. | 0.43 | 0.91 | 5.328E-02 | 88.03 | 3.610 | 1.598E+04 | CD109 |
| 121.99 | 50865. | 0.71 | 0.97 | 5.606E-02 | 122.06 | 85.600 | 3.468E+02 | CO57 |
| 136.41 | 6524. | 3.77 | 0.93 | 5.411E-02 | | | | |
| 165.76 | 54838. | 0.57 | 1.00 | 4.767E-02 | 165.85 | 79.900 | 5.395E+02 | Ce139 |
| 255.13 | 1772. | 7.37 | 1.21 | 3.404E-02 | | | | |
| 279.24 | 42776. | 0.59 | 1.13 | 3.153E-02 | 279.17 | 81.500 | 1.199E+03 | Hg203 |
| 391.73 | 36096. | 0.66 | 1.21 | 2.360E-02 | 391.69 | 64.000 | 9.768E+02 | SN113 |
| 661.68 | 21323. | 0.77 | 1.47 | 1.492E-02 | 661.66 | 85.210 | 4.677E+02 | CS137 |
| 898.03 | 39603. | 0.63 | 1.66 | 1.137E-02 | 898.02 | 93.700 | 1.567E+03 | Y898 |
| 1173.21 | 22788. | 0.85 | 1.92 | 8.929E-03 | 1173.24 | 99.900 | 7.262E+02 | Co1173 |
| 1332.49 | 20124. | 0.85 | 2.02 | 7.951E-03 | 1332.50 | 99.982 | 7.196E+02 | Co1332 |
| 1836.00 | 22787. | 0.70 | 2.43 | 5.919E-03 | 1836.01 | 99.200 | 1.636E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 282.41 | 70.73 | 15146. | 2828. | 6.248E+04 | 6.43 | 0.896 | - | D |
| 291.25 | 72.94 | 16305. | 4682. | 1.005E+05 | 4.12 | 0.899 | - | D |
| 545.11 | 136.41 | 12980. | 6524. | 1.206E+05 | 3.77 | 0.932 | - | |
| 1020.07 | 255.13 | 4580. | 1772. | 5.204E+04 | 7.37 | 1.209 | - | |

ORTEC g v - i (1087) Env32 G53W4.25 2/28/2014 11:43:43 AM
TestAmerica Spectrum name: 7_TunaCan_20120388.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.73 | 46.58 | 19825. | 55636. | 15.454 | 0.65 | 0.856 |
| AM-241 | 237.72 | 59.57 | 21942. | 59050. | 16.403 | 0.65 | 0.857 |
| CD-109 | 351.56 | 88.03 | 21396. | 100494. | 27.915 | 0.43 | 0.912 |
| CO-57 | 487.42 | 121.99 | 16859. | 50865. | 14.129 | 0.71 | 0.971 |
| Ce-139 | 662.55 | 165.76 | 9893. | 54838. | 15.233 | 0.57 | 1.005 |
| Hg-203 | 1116.52 | 279.24 | 5111. | 42776. | 11.882 | 0.59 | 1.126 |
| SN-113 | 1566.54 | 391.73 | 4106. | 36096. | 10.027 | 0.66 | 1.211 |
| CS-137 | 2646.33 | 661.66 | 2922. | 21323. | 5.923 | 0.77 | 1.466D |
| Y-898 | 3591.84 | 898.03 | 3210. | 39603. | 11.001 | 0.63 | 1.659 |
| Co-1173 | 4692.50 | 1173.21 | 1804. | 22788. | 6.330 | 0.85 | 1.924 |
| Co-1332 | 5329.58 | 1332.49 | 1286. | 20124. | 5.590 | 0.85 | 2.020 |
| Y-1836 | 7343.30 | 1836.00 | 283. | 22787. | 6.330 | 0.70 | 2.426 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Peak Code | MDA Value Bq | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4726E+04 | 46.54 | 1.473E+04 | ( | 1.744E+02 | 8.15E+03 6.52E-01 4.25E+00 G |
| AM-241 | | 1.2416E+03 | 59.54 | 1.242E+03 | ( | 1.457E+01 | 1.58E+05 6.49E-01 3.57E+01 G |
| CD-109 | | 1.5976E+04 | 88.03 | 1.598E+04 | ( | 1.088E+02 | 4.63E+02 4.29E-01 3.61E+00 G |
| CO-57 | | 3.4677E+02 | 122.06 | 3.468E+02 | ( | 4.144E+00 | 2.72E+02 7.08E-01 8.56E+01 G |

ORTEC g v - i (1087) Env32 G53W4.25 2/28/2014 11:43:43 AM
TestAmerica Spectrum name: 7_TunaCan_20120388.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ce-139 | 5.3948E+02 | | | | | 1.38E+02 | |
| | | 165.85 | 5.395E+02 | ( | 4.586E+00 | 5.65E-01 | 7.99E+01 G |
| Hg-203 | 1.1992E+03 | | | | | 4.66E+01 | |
| | | 279.17 | 1.199E+03 | ( | 9.415E+00 | 5.92E-01 | 8.15E+01 G |
| SN-113 | 9.7676E+02 | | | | | 1.15E+02 | |
| | | 391.69 | 9.768E+02 | ( | 8.153E+00 | 6.55E-01 | 6.40E+01 G |
| CS-137 | 4.6766E+02 | | | | | 1.10E+04 | |
| | | 661.66 | 4.677E+02 | ( | 5.584E+00 | 7.73E-01 | 8.52E+01 G |
| Y-898 | 1.5673E+03 | | | | | 1.07E+02 | |
| | | 898.02 | 1.567E+03 | ( | 1.056E+01 | 6.29E-01 | 9.37E+01 G |
| Co-1173 | 7.2623E+02 | | | | | 1.93E+03 | |
| | | 1173.24 | 7.262E+02 | ( | 6.394E+00 | 8.53E-01 | 9.99E+01 G |
| Co-1332 | 7.1964E+02 | | | | | 1.93E+03 | |
| | | 1332.50 | 7.196E+02 | ( | 6.072E+00 | 8.54E-01 | 1.00E+02 G |
| Y-1836 | 1.6357E+03 | | | | | 1.07E+02 | |
| | | 1836.01 | 1.636E+03 | ( | 5.819E+00 | 7.02E-01 | 9.92E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape

ORTEC g v - i (1087) Env32 G53W4.25 2/28/2014 11:43:43 AM
TestAmerica Spectrum name: 7_TunaCan_20120388.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq | Time Corrected Activity Bq | Uncertainty Counting 1 Sigma | MDA |
|---|---|---|---|---|
| Pb-210 | 1.4646E+04 | 1.4726E+04 | 6.521E-01% | 1.74E+02 |
| AM-241 | 1.2413E+03 | 1.2416E+03 | 6.489E-01% | 1.46E+01 |
| CD-109 | 1.4512E+04 | 1.5976E+04 | 4.292E-01% | 1.09E+02 |
| CO-57 | 2.9445E+02 | 3.4677E+02 | 7.076E-01% | 4.14E+00 |
| Ce-139 | 3.9059E+02 | 5.3948E+02 | 5.652E-01% | 4.59E+00 |
| Hg-203 | 4.6224E+02 | 1.1992E+03 | 5.917E-01% | 9.42E+00 |
| SN-113 | 6.6381E+02 | 9.7676E+02 | 6.552E-01% | 8.15E+00 |
| CS-137 | 4.6577E+02 | 4.6766E+02 | 7.730E-01% | 5.58E+00 |
| Y-898 | 1.0329E+03 | 1.5673E+03 | 6.291E-01% | 1.06E+01 |
| Co-1173 | 7.0966E+02 | 7.2623E+02 | 8.534E-01% | 6.39E+00 |
| Co-1332 | 7.0321E+02 | 7.1964E+02 | 8.542E-01% | 6.07E+00 |
| Y-1836 | 1.0780E+03 | 1.6357E+03 | 7.017E-01% | 5.82E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 701.8 to 2000.2 keV) 3.620E+04 Bq
Total Decayed Activity ( 701.8 to 2000.2 keV) 4.0121711E+04 Bq

Analyzed by: _____
Admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge8 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14960 | 100.2 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1240.5 | 106.6 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 16066 | 98.2 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 345.12 | 95.4 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 536.34 | 97.7 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1218.2 | 104.1 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 967.15 | 100.1 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 465.86 | 99.8 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1552.1 | 97.6 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 724.48 | 98.7 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 729.98 | 99.4 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1627.2 | 102.4 |

Reviewed By: Jody Watson

Date: 3/28/2012

Calibration Data from file: 8_Soil_TunaCan.Clb
Energy Calibration Date: 3/28/2012 Time: 10:35:07 AM
Efficiency Calibration Date: 3/28/2012 Time: 10:35:20 AM

Calibration Description:
8_Soil_TunaCan_90099_032712

Energy Calibration Fit
Energy = 0.0505 +0.250025*Channel +8.06699e-010*Channel**2
FWHM (ch) = 3.6351 +0.000832*Channel -2.49195e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.74 | 46.54 | 46.49 | 0.11% | 0.94 | 0.95 | -0.61% |
| 237.86 | 59.54 | 59.52 | 0.03% | 0.95 | 0.96 | -1.36% |
| 351.89 | 88.03 | 88.03 | -0.00% | 0.97 | 0.98 | -1.63% |
| 488.04 | 122.06 | 122.07 | -0.01% | 1.01 | 1.01 | 0.12% |
| 663.26 | 165.85 | 165.88 | -0.02% | 1.07 | 1.04 | 2.17% |
| 1116.59 | 279.17 | 279.23 | -0.02% | 1.15 | 1.13 | 1.73% |
| 1566.40 | 391.69 | 391.69 | -0.00% | 1.22 | 1.22 | 0.24% |
| 2645.92 | 661.66 | 661.60 | 0.01% | 1.39 | 1.42 | -1.95% |
| 3591.62 | 898.02 | 898.05 | -0.00% | 1.61 | 1.58 | 2.16% |
| 4692.17 | 1173.24 | 1173.23 | 0.00% | 1.74 | 1.75 | -0.61% |
| 5329.14 | 1332.50 | 1332.49 | 0.00% | 1.82 | 1.84 | -1.05% |
| 7342.97 | 1836.01 | 1836.02 | -0.00% | 2.11 | 2.10 | 0.42% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.3942 %
Ln(Eff) = -0.1099 -0.495854*Ln(Eng) -0.0257227*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.7131 %
Ln(Eff) = -25.2530 +9.398253*Ln(Eng) -1.00003*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 1.9170E-002 | 2.0055E-002 | -4.62% |
| 59.54 | 3.0526E-002 | 2.8813E-002 | 5.61% |
| 88.03 | 3.9175E-002 | 3.9918E-002 | -1.90% |
| 122.06 | 3.9509E-002 | 4.1457E-002 | -4.93% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 3.5429E-002 | 3.6291E-002 | -2.43% |
| 279.17 | 2.5270E-002 | 2.4275E-002 | 3.94% |
| 391.69 | 1.8582E-002 | 1.8550E-002 | 0.17% |
| 661.66 | 1.2089E-002 | 1.2090E-002 | -0.01% |
| 898.02 | 9.1435E-003 | 9.3604E-003 | -2.37% |
| 1173.24 | 7.3487E-003 | 7.4527E-003 | -1.42% |
| 1332.50 | 6.6398E-003 | 6.6776E-003 | -0.57% |
| 1836.01 | 5.1654E-003 | 5.0457E-003 | 2.32% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  3/28/2012 10:36:01 AM
TestAmerica                      Spectrum name: 8_TunaCan_20120676.An1

Sample description
     8_TunaCan_90099_032712


Spectrum Filename: C:\User\SPC\Det8\8_TunaCan_20120676.An1

Acquisition information
       Start time:                 3/27/2012 10:58:29 AM
       Live time:               3600
       Real time:               3655
       Dead time:                  1.49 %
       Detector ID:                   8

Detector system
     Ge 8 SN/174


Calibration
       Filename:                   8_Soil_TunaCan.Clb
     8_Soil_TunaCan_90099_032712


       Energy Calibration
            Created:               3/28/2012 10:35:07 AM
            Zero offset:           0.050 keV
            Gain:                  0.250 keV/channel
            Quadratic:             8.067E-10 keV/channel^2

       Efficiency Calibration
            Created:               3/28/2012 10:35:20 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.39 %
            Log(Eff):             -1.098764E-01 + (-4.958544E-01*Log(E) ) +
                                   ( -2.572270E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.71 %
            Log(Eff):             -2.525301E+01 + ( 9.398253E+00*Log(E) ) +
                                   ( -1.000034E+00*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.55keV )
       Stop channel:            8000 (  2000.30keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (1087) Env32 G53W4.25 3/28/2012 10:36:01 AM
TestAmerica Spectrum name: 8_TunaCan_20120676.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2012 11:00:00 AM |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0205

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.54 | 43426. | 0.60 | 0.95 | 2.002E-02 | 46.54 | 4.250 | 1.426E+04 | Pb210 |
| 59.52 | 45918. | 0.77 | 0.95 | 2.880E-02 | 59.54 | 35.700 | 1.240E+03 | AM241 |
| 72.86 | 2434. | 6.68 | 0.97 | 3.542E-02 | | | | |
| 88.03 | 73269. | 0.53 | 0.97 | 3.992E-02 | 88.03 | 3.610 | 1.607E+04 | CD109 |
| 122.07 | 35407. | 0.77 | 1.01 | 4.146E-02 | 122.06 | 85.600 | 3.451E+02 | CO57 |
| 136.51 | 4312. | 4.44 | 1.06 | 3.999E-02 | | | | |
| 165.88 | 36308. | 0.76 | 1.07 | 3.629E-02 | 165.85 | 79.900 | 5.363E+02 | Ce139 |
| 279.23 | 24162. | 0.88 | 1.15 | 2.427E-02 | 279.17 | 81.500 | 1.218E+03 | Hg203 |
| 391.69 | 24625. | 0.77 | 1.22 | 1.855E-02 | 391.69 | 64.000 | 9.671E+02 | SN113 |
| 661.60 | 17184. | 1.10 | 1.39 | 1.209E-02 | 661.66 | 85.210 | 4.659E+02 | CS137 |
| 898.05 | 28015. | 0.71 | 1.61 | 9.360E-03 | 898.02 | 93.700 | 1.552E+03 | Y898 |
| 1173.23 | 18826. | 0.79 | 1.74 | 7.453E-03 | 1173.24 | 99.900 | 7.245E+02 | Co1173 |
| 1332.49 | 17010. | 0.84 | 1.82 | 6.678E-03 | 1332.50 | 99.982 | 7.300E+02 | Co1332 |
| 1836.02 | 16762. | 0.79 | 2.11 | 5.046E-03 | 1836.01 | 99.200 | 1.627E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 291.19 | 72.85 | 12003. | 2434. | 6.872E+04 | 6.68 | 0.969 | - | D |
| 545.78 | 136.51 | 8432. | 4312. | 1.078E+05 | 4.44 | 1.059 | - | |

ORTEC g v - i (1087) Env32 G53W4.25 3/28/2012 10:36:01 AM
TestAmerica Spectrum name: 8_TunaCan_20120676.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.74 | 46.49 | 17505. | 45568. | 12.658 | 0.76 | 0.942 |
| AM-241 | 237.86 | 59.52 | 18397. | 45918. | 12.755 | 0.77 | 0.945 |
| CD-109 | 351.89 | 88.03 | 17370. | 73269. | 20.353 | 0.53 | 0.966 |
| CO-57 | 488.04 | 122.07 | 9639. | 35407. | 9.835 | 0.77 | 1.010 |
| Ce-139 | 663.26 | 165.88 | 8356. | 36308. | 10.085 | 0.76 | 1.067 |
| Hg-203 | 1116.59 | 279.23 | 4382. | 24162. | 6.712 | 0.88 | 1.153 |
| SN-113 | 1566.40 | 391.69 | 2677. | 24625. | 6.840 | 0.77 | 1.223 |
| CS-137 | 2645.92 | 661.60 | 3145. | 17184. | 4.773 | 1.10 | 1.389 |
| Y-898 | 3591.62 | 898.05 | 1881. | 28015. | 7.782 | 0.71 | 1.611 |
| Co-1173 | 4692.17 | 1173.23 | 650. | 18826. | 5.229 | 0.79 | 1.738 |
| Co-1332 | 5329.14 | 1332.49 | 576. | 17010. | 4.725 | 0.84 | 1.822 |
| Y-1836 | 7342.97 | 1836.02 | 111. | 16762. | 4.656 | 0.79 | 2.110 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4960E+04 | | | | | 8.15E+03 |
| | | | 46.54 | 1.496E+04 | ( | 2.033E+02 7.55E-01 4.25E+00 | G |
| AM-241 | | 1.2405E+03 | | | | | 1.58E+05 |
| | | | 59.54 | 1.240E+03 | ( | 1.715E+01 7.72E-01 3.57E+01 | G |
| CD-109 | | 1.6066E+04 | | | | | 4.63E+02 |
| | | | 88.03 | 1.607E+04 | ( | 1.353E+02 5.26E-01 3.61E+00 | G |
| CO-57 | | 3.4512E+02 | | | | | 2.72E+02 |
| | | | 122.06 | 3.451E+02 | ( | 4.486E+00 7.68E-01 8.56E+01 | G |

ORTEC g v - i (1087) Env32 G53W4.25 3/28/2012 10:36:01 AM
TestAmerica Spectrum name: 8_TunaCan_20120676.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ce-139 | 5.3634E+02 | | | | | 1.38E+02 | |
| | | 165.85 | 5.363E+02 | ( | 6.333E+00 | 7.56E-01 | 7.99E+01 G |
| Hg-203 | 1.2182E+03 | | | | | 4.66E+01 | |
| | | 279.17 | 1.218E+03 | ( | 1.569E+01 | 8.81E-01 | 8.15E+01 G |
| SN-113 | 9.6715E+02 | | | | | 1.15E+02 | |
| | | 391.69 | 9.671E+02 | ( | 9.575E+00 | 7.73E-01 | 6.40E+01 G |
| CS-137 | 4.6586E+02 | | | | | 1.10E+04 | |
| | | 661.66 | 4.659E+02 | ( | 7.158E+00 | 1.10E+00 | 8.52E+01 G |
| Y-898 | 1.5521E+03 | | | | | 1.07E+02 | |
| | | 898.02 | 1.552E+03 | ( | 1.135E+01 | 7.10E-01 | 9.37E+01 G |
| Co-1173 | 7.2448E+02 | | | | | 1.93E+03 | |
| | | 1173.24 | 7.245E+02 | ( | 4.676E+00 | 7.93E-01 | 9.99E+01 G |
| Co-1332 | 7.2998E+02 | | | | | 1.93E+03 | |
| | | 1332.50 | 7.300E+02 | ( | 4.916E+00 | 8.45E-01 | 1.00E+02 G |
| Y-1836 | 1.6272E+03 | | | | | 1.07E+02 | |
| | | 1836.01 | 1.627E+03 | ( | 5.029E+00 | 7.91E-01 | 9.92E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape

ORTEC g v - i (1087) Env32 G53W4.25 3/28/2012 10:36:01 AM
TestAmerica Spectrum name: 8_TunaCan_20120676.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq | Time Corrected Activity Bq | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|---|
| Pb-210 | 1.4851E+04 | 1.4960E+04 | 7.555E-01% | 2.03E+02 |
| AM-241 | 1.2400E+03 | 1.2405E+03 | 7.719E-01% | 1.71E+01 |
| CD-109 | 1.4124E+04 | 1.6066E+04 | 5.260E-01% | 1.35E+02 |
| CO-57 | 2.7715E+02 | 3.4512E+02 | 7.681E-01% | 4.49E+00 |
| Ce-139 | 3.4782E+02 | 5.3634E+02 | 7.558E-01% | 6.33E+00 |
| Hg-203 | 3.3925E+02 | 1.2182E+03 | 8.812E-01% | 1.57E+01 |
| SN-113 | 5.7617E+02 | 9.6715E+02 | 7.729E-01% | 9.58E+00 |
| CS-137 | 4.6334E+02 | 4.6586E+02 | 1.105E+00% | 7.16E+00 |
| Y-898 | 8.8728E+02 | 1.5521E+03 | 7.104E-01% | 1.13E+01 |
| Co-1173 | 7.0239E+02 | 7.2448E+02 | 7.931E-01% | 4.68E+00 |
| Co-1332 | 7.0772E+02 | 7.2998E+02 | 8.450E-01% | 4.92E+00 |
| Y-1836 | 9.3024E+02 | 1.6272E+03 | 7.905E-01% | 5.03E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 82.3 to 2000.3 keV) 3.545E+04 Bq
Total Decayed Activity ( 82.3 to 2000.3 keV) 4.0432598E+04 Bq

Analyzed by: _____
Admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge9 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14240 | 95.4 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1244.5 | 107.0 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 15902 | 97.2 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 347.48 | 96.0 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 535.87 | 97.6 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1216.7 | 103.9 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 970.65 | 100.5 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 466.58 | 99.9 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1552.5 | 97.7 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 727.12 | 99.0 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 719.75 | 98.0 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1638.8 | 103.1 |

Reviewed By: Jody Watson

Date: 6/14/2012

Calibration Data from file: 9_Soil_TunaCan.Clb
Energy Calibration Date: 6/14/2012 Time: 10:19:40 AM
Efficiency Calibration Date: 6/14/2012 Time: 10:19:51 AM

Calibration Description:
9_Soil_TunaCan_90099_050312

Energy Calibration Fit
Energy = 0.0875 +0.250109*Channel -2.0385e-008*Channel**2
FWHM (ch) = 4.1690 +0.000934*Channel -2.36522e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.85 | 46.54 | 46.57 | -0.06% | 1.07 | 1.09 | -1.37% |
| 237.85 | 59.54 | 59.58 | -0.06% | 1.08 | 1.10 | -1.96% |
| 351.79 | 88.03 | 88.07 | -0.05% | 1.12 | 1.12 | -0.18% |
| 487.79 | 122.06 | 122.08 | -0.02% | 1.14 | 1.16 | -1.17% |
| 662.64 | 165.85 | 165.81 | 0.02% | 1.23 | 1.19 | 2.51% |
| 1115.53 | 279.17 | 279.07 | 0.04% | 1.30 | 1.30 | 0.44% |
| 1565.74 | 391.69 | 391.64 | 0.01% | 1.43 | 1.39 | 2.81% |
| 2645.81 | 661.66 | 661.69 | -0.00% | 1.60 | 1.62 | -0.83% |
| 3591.21 | 898.02 | 898.02 | 0.00% | 1.80 | 1.80 | -0.02% |
| 4692.44 | 1173.24 | 1173.26 | -0.00% | 2.01 | 2.01 | 0.18% |
| 5329.80 | 1332.50 | 1332.54 | -0.00% | 2.09 | 2.12 | -1.38% |
| 7344.77 | 1836.01 | 1835.98 | 0.00% | 2.45 | 2.44 | 0.55% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.3038 %
Ln(Eff) = -0.8080 -0.236727*Ln(Eng) -0.0395064*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.4241 %
Ln(Eff) = -23.8792 +8.875647*Ln(Eng) -0.94011*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 2.4596E-002 | 2.5767E-002 | -4.76% |
| 59.54 | 3.8891E-002 | 3.6589E-002 | 5.92% |
| 88.03 | 4.9059E-002 | 5.0504E-002 | -2.95% |
| 122.06 | 5.0886E-002 | 5.3031E-002 | -4.22% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 4.6197E-002 | 4.7361E-002 | -2.52% |
| 279.17 | 3.4900E-002 | 3.3566E-002 | 3.82% |
| 391.69 | 2.6668E-002 | 2.6526E-002 | 0.53% |
| 661.66 | 1.8125E-002 | 1.8099E-002 | 0.14% |
| 898.02 | 1.4012E-002 | 1.4341E-002 | -2.34% |
| 1173.24 | 1.1507E-002 | 1.1627E-002 | -1.05% |
| 1332.50 | 1.0296E-002 | 1.0501E-002 | -2.00% |
| 1836.01 | 8.3305E-003 | 8.0796E-003 | 3.01% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  6/14/2012 10:20:07 AM
TestAmerica, Inc                Spectrum name: 9_TunaCan_20120147.An1

Sample description
     9_TunaCan_90099_050312


Spectrum Filename: C:\User\SPC\Det9\9_TunaCan_20120147.An1

Acquisition information
       Start time:                 5/3/2012 1:37:42 PM
       Live time:               3600
       Real time:               3661
       Dead time:                  1.65 %
       Detector ID:                    9

Detector system
     Ge 9 SN/100113


Calibration
       Filename:                   9_Soil_TunaCan.Clb
     9_Soil_TunaCan_90099_050312


       Energy Calibration
            Created:               6/14/2012 10:19:40 AM
            Zero offset:           0.088 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.039E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/14/2012 10:19:51 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.30 %
            Log(Eff):             -8.079856E-01 + (-2.367265E-01*Log(E) ) +
                                   ( -3.950640E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.42 %
            Log(Eff):             -2.387916E+01 + ( 8.875647E+00*Log(E) ) +
                                   ( -9.401100E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.60keV )
       Stop channel:            8000 (  1999.66keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (1087) Env32 G53W4.25 6/14/2012 10:20:07 AM
TestAmerica, Inc Spectrum name: 9_TunaCan_20120147.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2012 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0265

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.57 | 55553. | 0.67 | 1.07 | 2.579E-02 | 46.54 | 4.250 | 1.424E+04 | Pb210 |
| 59.56 | 58492. | 0.66 | 1.08 | 3.660E-02 | 59.54 | 35.700 | 1.245E+03 | AM241 |
| 88.07 | 86792. | 0.48 | 1.12 | 5.052E-02 | 88.03 | 3.610 | 1.590E+04 | CD109 |
| 122.08 | 41484. | 0.73 | 1.14 | 5.303E-02 | 122.06 | 85.600 | 3.475E+02 | CO57 |
| 136.48 | 5266. | 4.55 | 1.22 | 5.150E-02 | | | | |
| 165.81 | 39272. | 0.74 | 1.23 | 4.626E-02 | 165.85 | 79.900 | 5.359E+02 | Ce139 |
| 279.06 | 19221. | 1.24 | 1.30 | 3.358E-02 | 279.17 | 81.500 | 1.217E+03 | Hg203 |
| 391.64 | 28263. | 0.86 | 1.43 | 2.653E-02 | 391.69 | 64.000 | 9.707E+02 | SN113 |
| 661.69 | 25703. | 0.90 | 1.61 | 1.810E-02 | 661.66 | 85.210 | 4.666E+02 | CS137 |
| 898.02 | 33728. | 0.69 | 1.80 | 1.434E-02 | 898.02 | 93.700 | 1.552E+03 | Y898 |
| 1173.24 | 29087. | 0.72 | 2.01 | 1.163E-02 | 1173.24 | 99.900 | 7.271E+02 | Co1173 |
| 1332.54 | 26026. | 0.70 | 2.09 | 1.050E-02 | 1332.50 | 99.982 | 7.198E+02 | Co1332 |
| 1835.94 | 21237. | 0.73 | 2.46 | 8.080E-03 | 1836.01 | 99.200 | 1.639E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 545.34 | 136.48 | 10776. | 5266. | 1.023E+05 | 4.55 | 1.225 | - |

ORTEC g v - i (1087) Env32 G53W4.25 6/14/2012 10:20:07 AM
TestAmerica, Inc Spectrum name: 9_TunaCan_20120147.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.85 | 46.57 | 18837. | 55553. | 15.431 | 0.67 | 1.071 |
| AM-241 | 237.79 | 59.56 | 19448. | 58492. | 16.248 | 0.66 | 1.078 |
| CD-109 | 351.79 | 88.07 | 19261. | 86792. | 24.109 | 0.48 | 1.122 |
| CO-57 | 487.79 | 122.08 | 11232. | 41484. | 11.523 | 0.73 | 1.142 |
| Ce-139 | 662.64 | 165.81 | 9084. | 39272. | 10.909 | 0.74 | 1.225 |
| Hg-203 | 1115.51 | 279.06 | 6250. | 19221. | 5.339 | 1.24 | 1.302 |
| SN-113 | 1565.73 | 391.64 | 4864. | 28263. | 7.851 | 0.86 | 1.434 |
| CS-137 | 2645.81 | 661.69 | 4037. | 25703. | 7.140 | 0.90 | 1.605 |
| Y-898 | 3591.21 | 898.02 | 2958. | 33728. | 9.369 | 0.69 | 1.803 |
| Co-1173 | 4692.36 | 1173.24 | 1710. | 29087. | 8.080 | 0.72 | 2.014 |
| Co-1332 | 5329.80 | 1332.54 | 1048. | 26026. | 7.229 | 0.70 | 2.088 |
| Y-1836 | 7344.62 | 1835.94 | 304. | 21237. | 5.899 | 0.73 | 2.457 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4240E+04 | | | | | 8.15E+03 | | |
| | | | 46.54 | 1.424E+04 | ( | 1.646E+02 | 6.67E-01 | 4.25E+00 | G |
| AM-241 | | 1.2445E+03 | | | | | 1.58E+05 | | |
| | | | 59.54 | 1.245E+03 | ( | 1.388E+01 | 6.60E-01 | 3.57E+01 | G |
| CD-109 | | 1.5902E+04 | | | | | 4.63E+02 | | |
| | | | 88.03 | 1.590E+04 | ( | 1.190E+02 | 4.84E-01 | 3.61E+00 | G |
| CO-57 | | 3.4748E+02 | | | | | 2.72E+02 | | |
| | | | 122.06 | 3.475E+02 | ( | 4.159E+00 | 7.31E-01 | 8.56E+01 | G |

ORTEC g v - i (1087) Env32 G53W4.25 6/14/2012 10:20:07 AM
TestAmerica, Inc Spectrum name: 9_TunaCan_20120147.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ce-139 | 5.3587E+02 | | | | | 1.38E+02 | |
| | | 165.85 | 5.359E+02 | ( | 6.097E+00 | 7.41E-01 | 7.99E+01 G |
| Hg-203 | 1.2167E+03 | | | | | 4.66E+01 | |
| | | 279.17 | 1.217E+03 | ( | 2.349E+01 | 1.24E+00 | 8.15E+01 G |
| SN-113 | 9.7065E+02 | | | | | 1.15E+02 | |
| | | 391.69 | 9.707E+02 | ( | 1.125E+01 | 8.60E-01 | 6.40E+01 G |
| CS-137 | 4.6658E+02 | | | | | 1.10E+04 | |
| | | 661.66 | 4.666E+02 | ( | 5.424E+00 | 8.98E-01 | 8.52E+01 G |
| Y-898 | 1.5525E+03 | | | | | 1.07E+02 | |
| | | 898.02 | 1.552E+03 | ( | 1.179E+01 | 6.92E-01 | 9.37E+01 G |
| Co-1173 | 7.2712E+02 | | | | | 1.93E+03 | |
| | | 1173.24 | 7.271E+02 | ( | 4.884E+00 | 7.20E-01 | 9.99E+01 G |
| Co-1332 | 7.1975E+02 | | | | | 1.93E+03 | |
| | | 1332.50 | 7.198E+02 | ( | 4.248E+00 | 6.98E-01 | 1.00E+02 G |
| Y-1836 | 1.6388E+03 | | | | | 1.07E+02 | |
| | | 1836.01 | 1.639E+03 | ( | 6.479E+00 | 7.29E-01 | 9.92E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape

ORTEC g v - i (1087) Env32 G53W4.25 6/14/2012 10:20:07 AM
TestAmerica, Inc Spectrum name: 9_TunaCan_20120147.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq | Time Corrected Activity Bq | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|---|
| Pb-210 | 1.4091E+04 | 1.4240E+04 | 6.667E-01% | 1.65E+02 |
| AM-241 | 1.2439E+03 | 1.2445E+03 | 6.605E-01% | 1.39E+01 |
| CD-109 | 1.3223E+04 | 1.5902E+04 | 4.843E-01% | 1.19E+02 |
| CO-57 | 2.5385E+02 | 3.4748E+02 | 7.313E-01% | 4.16E+00 |
| Ce-139 | 2.8828E+02 | 5.3587E+02 | 7.410E-01% | 6.10E+00 |
| Hg-203 | 1.9517E+02 | 1.2167E+03 | 1.239E+00% | 2.35E+01 |
| SN-113 | 4.6244E+02 | 9.7065E+02 | 8.599E-01% | 1.13E+01 |
| CS-137 | 4.6297E+02 | 4.6658E+02 | 8.981E-01% | 5.42E+00 |
| Y-898 | 6.9723E+02 | 1.5525E+03 | 6.917E-01% | 1.18E+01 |
| Co-1173 | 6.9559E+02 | 7.2712E+02 | 7.204E-01% | 4.88E+00 |
| Co-1332 | 6.8854E+02 | 7.1975E+02 | 6.982E-01% | 4.25E+00 |
| Y-1836 | 7.3602E+02 | 1.6388E+03 | 7.291E-01% | 6.48E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.6 to 1999.7 keV) 3.304E+04 Bq
Total Decayed Activity ( 37.6 to 1999.7 keV) 3.9561668E+04 Bq

Analyzed by: _____
admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica, Inc

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge10 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14660 | 98.2 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1221.4 | 105.0 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 15863 | 96.9 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 346.12 | 95.6 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 543.06 | 98.9 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1191.2 | 101.8 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 969.93 | 100.4 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 471.21 | 100.9 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1557.6 | 98.0 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 737.21 | 100.4 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 719.59 | 98.0 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1619 | 101.9 |

Reviewed By: Megan McAfee

Date: 4/6/2012

Calibration Data from file: 10_Soil_TunaCan.Clb
Energy Calibration Date: 4/2/2012 Time: 3:35:38 PM
Efficiency Calibration Date: 4/2/2012 Time: 3:35:54 PM

Calibration Description:
10_Soil_TunaCan_90099_032812

Energy Calibration Fit
Energy = 0.0542 +0.250120*Channel -1.87307e-008*Channel**2
FWHM (ch) = 3.1690 +0.001020*Channel -2.41135e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.88 | 46.54 | 46.55 | -0.01% | 0.84 | 0.84 | -0.20% |
| 238.01 | 59.54 | 59.58 | -0.07% | 0.83 | 0.85 | -2.57% |
| 351.88 | 88.03 | 88.06 | -0.04% | 0.86 | 0.88 | -2.42% |
| 487.87 | 122.06 | 122.08 | -0.01% | 0.92 | 0.92 | 0.55% |
| 662.83 | 165.85 | 165.83 | 0.01% | 0.96 | 0.96 | 0.14% |
| 1115.82 | 279.17 | 279.12 | 0.02% | 1.09 | 1.07 | 1.44% |
| 1565.63 | 391.69 | 391.60 | 0.02% | 1.19 | 1.18 | 1.45% |
| 2645.68 | 661.66 | 661.66 | 0.00% | 1.46 | 1.43 | 2.58% |
| 3591.23 | 898.02 | 898.05 | -0.00% | 1.64 | 1.63 | 0.85% |
| 4692.23 | 1173.24 | 1173.26 | -0.00% | 1.85 | 1.86 | -0.19% |
| 5329.49 | 1332.50 | 1332.53 | -0.00% | 1.90 | 1.98 | -3.98% |
| 7344.24 | 1836.01 | 1835.98 | 0.00% | 2.37 | 2.34 | 1.35% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.7618 %
Ln(Eff) = -0.5833 -0.398608*Ln(Eng) -0.0263434*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.8719 %
Ln(Eff) = -25.3084 +9.416612*Ln(Eng) -1.0011*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 1.9368E-002 | 2.0043E-002 | -3.49% |
| 59.54 | 3.0114E-002 | 2.8867E-002 | 4.14% |
| 88.03 | 3.9971E-002 | 4.0137E-002 | -0.42% |
| 122.06 | 3.9953E-002 | 4.1801E-002 | -4.63% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 3.6138E-002 | 3.6559E-002 | -1.16% |
| 279.17 | 2.6096E-002 | 2.5635E-002 | 1.76% |
| 391.69 | 2.0201E-002 | 2.0196E-002 | 0.03% |
| 661.66 | 1.3952E-002 | 1.3795E-002 | 1.13% |
| 898.02 | 1.0759E-002 | 1.0975E-002 | -2.01% |
| 1173.24 | 8.9778E-003 | 8.9476E-003 | 0.34% |
| 1332.50 | 7.9472E-003 | 8.1078E-003 | -2.02% |
| 1836.01 | 6.4190E-003 | 6.3018E-003 | 1.82% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  4/2/2012 3:36:24 PM
TestAmerica, Inc                Spectrum name: 10_TunaCan_20120700.An1

Sample description
     10_TunaCan_90099_032812


Spectrum Filename: C:\User\SPC\Det10\10_TunaCan_20120700.An1

Acquisition information
       Start time:                 3/28/2012 10:11:57 PM
       Live time:               3600
       Real time:               3656
       Dead time:                  1.53 %
       Detector ID:                   10

Detector system
     Ge10 S/N08316756


Calibration
       Filename:                   10_Soil_TunaCan.Clb
     10_Soil_TunaCan_90099_032812


       Energy Calibration
            Created:               4/2/2012 3:35:38 PM
            Zero offset:           0.054 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.873E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/2/2012 3:35:54 PM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.76 %
            Log(Eff):             -5.833467E-01 + (-3.986081E-01*Log(E) ) +
                                   ( -2.634340E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.87 %
            Log(Eff):             -2.530844E+01 + ( 9.416612E+00*Log(E) ) +
                                   ( -1.001096E+00*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.57keV )
       Stop channel:            8000 (  1999.81keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (1087) Env32 G53W4.25 4/2/2012 3:36:24 PM
TestAmerica, Inc Spectrum name: 10_TunaCan_20120700.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2012 11:00:00 AM |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0255

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.57 | 43863. | 0.59 | 0.84 | 2.005E-02 | 46.54 | 4.250 | 1.441E+04 | Pb210 |
| 59.58 | 45298. | 0.69 | 0.83 | 2.889E-02 | 59.54 | 35.700 | 1.221E+03 | AM241 |
| 72.96 | 2442. | 6.30 | 0.87 | 3.560E-02 | | | | |
| 84.94 | 2009. | 7.44 | 0.88 | 3.944E-02 | | | | |
| 88.08 | 74392. | 0.41 | 0.88 | 4.014E-02 | 88.03 | 3.610 | 1.626E+04 | CD109 |
| 122.08 | 35671. | 0.76 | 0.92 | 4.180E-02 | 122.06 | 85.600 | 3.461E+02 | CO57 |
| 136.45 | 4670. | 4.12 | 1.00 | 4.036E-02 | | | | |
| 165.83 | 36761. | 0.70 | 0.96 | 3.576E-02 | 165.85 | 79.900 | 5.431E+02 | Ce139 |
| 279.12 | 24413. | 0.86 | 1.09 | 2.564E-02 | 279.17 | 81.500 | 1.191E+03 | Hg203 |
| 391.62 | 26536. | 0.66 | 1.18 | 2.020E-02 | 391.69 | 64.000 | 9.658E+02 | SN113 |
| 661.66 | 19831. | 0.99 | 1.46 | 1.380E-02 | 661.66 | 85.210 | 4.712E+02 | CS137 |
| 898.04 | 32651. | 0.66 | 1.65 | 1.097E-02 | 898.02 | 93.700 | 1.558E+03 | Y898 |
| 1173.25 | 22988. | 0.78 | 1.85 | 8.948E-03 | 1173.24 | 99.900 | 7.372E+02 | Co1173 |
| 1332.53 | 20348. | 0.81 | 1.90 | 8.108E-03 | 1332.50 | 99.982 | 7.196E+02 | Co1332 |
| 1835.97 | 20632. | 0.72 | 2.37 | 6.302E-03 | 1836.01 | 99.200 | 1.619E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 291.52 | 72.97 | 9835. | 2140. | 6.011E+04 | 7.87 | 0.819 | - D |
| 339.41 | 84.93 | 10153. | 2009. | 1.138E+04 | 7.44 | 0.879 | - lD |
| 545.36 | 136.45 | 8100. | 4670. | 1.157E+05 | 4.12 | 0.997 | - |

ORTEC g v - i (1087) Env32 G53W4.25 4/2/2012 3:36:24 PM
TestAmerica, Inc Spectrum name: 10_TunaCan_20120700.An1

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.88 | 46.55 | 14555. | 44623. | 12.395 | 0.70 | 0.838 |
| AM-241 | 238.01 | 59.58 | 14179. | 45298. | 12.583 | 0.69 | 0.832 |
| CD-109 | 351.88 | 88.06 | 16760. | 72583. | 20.162 | 0.53 | 0.861 |
| CO-57 | 487.87 | 122.08 | 9414. | 35671. | 9.909 | 0.76 | 0.921 |
| Ce-139 | 662.83 | 165.83 | 6853. | 36761. | 10.211 | 0.70 | 0.960 |
| Hg-203 | 1115.82 | 279.12 | 4312. | 24413. | 6.781 | 0.86 | 1.085 |
| SN-113 | 1565.63 | 391.60 | 2812. | 26651. | 7.403 | 0.75 | 1.195 |
| CS-137 | 2645.68 | 661.66 | 3120. | 19831. | 5.509 | 0.99 | 1.463 |
| Y-898 | 3591.20 | 898.04 | 2240. | 32651. | 9.070 | 0.66 | 1.645 |
| Co-1173 | 4692.19 | 1173.25 | 1228. | 22988. | 6.385 | 0.78 | 1.855 |
| Co-1332 | 5329.49 | 1332.53 | 943. | 20348. | 5.652 | 0.81 | 1.903 |
| Y-1836 | 7344.20 | 1835.97 | 192. | 20632. | 5.731 | 0.72 | 2.374 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Peak Code | MDA Value Bq | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4660E+04 | | | | | 8.15E+03 |
| | | | 46.54 | 1.466E+04 | ( | 1.856E+02 7.02E-01 4.25E+00 | G |
| AM-241 | | 1.2214E+03 | | | | | 1.58E+05 |
| | | | 59.54 | 1.221E+03 | ( | 1.504E+01 6.89E-01 3.57E+01 | G |
| CD-109 | | 1.5863E+04 | | | | | 4.63E+02 |
| | | | 88.03 | 1.586E+04 | ( | 1.324E+02 5.25E-01 3.61E+00 | G |
| CO-57 | | 3.4612E+02 | | | | | 2.72E+02 |
| | | | 122.06 | 3.461E+02 | ( | 4.413E+00 7.59E-01 8.56E+01 | G |

ORTEC g v - i (1087) Env32 G53W4.25 4/2/2012 3:36:24 PM
TestAmerica, Inc Spectrum name: 10_TunaCan_20120700.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ce-139 | 5.4306E+02 | | | | | 1.38E+02 | |
| | | 165.85 | 5.431E+02 | ( | 5.739E+00 | 6.95E-01 | 7.99E+01 G |
| Hg-203 | 1.1912E+03 | | | | | 4.66E+01 | |
| | | 279.17 | 1.191E+03 | ( | 1.506E+01 | 8.64E-01 | 8.15E+01 G |
| SN-113 | 9.6993E+02 | | | | | 1.15E+02 | |
| | | 391.69 | 9.699E+02 | ( | 9.093E+00 | 7.48E-01 | 6.40E+01 G |
| CS-137 | 4.7121E+02 | | | | | 1.10E+04 | |
| | | 661.66 | 4.712E+02 | ( | 6.249E+00 | 9.90E-01 | 8.52E+01 G |
| Y-898 | 1.5576E+03 | | | | | 1.07E+02 | |
| | | 898.02 | 1.558E+03 | ( | 1.065E+01 | 6.63E-01 | 9.37E+01 G |
| Co-1173 | 7.3721E+02 | | | | | 1.93E+03 | |
| | | 1173.24 | 7.372E+02 | ( | 5.325E+00 | 7.81E-01 | 9.99E+01 G |
| Co-1332 | 7.1959E+02 | | | | | 1.93E+03 | |
| | | 1332.50 | 7.196E+02 | ( | 5.158E+00 | 8.09E-01 | 1.00E+02 G |
| Y-1836 | 1.6190E+03 | | | | | 1.07E+02 | |
| | | 1836.01 | 1.619E+03 | ( | 5.280E+00 | 7.25E-01 | 9.92E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape

ORTEC g v - i (1087) Env32 G53W4.25 4/2/2012 3:36:24 PM
TestAmerica, Inc Spectrum name: 10_TunaCan_20120700.An1

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq | Time Corrected Activity Bq | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|---|
| Pb-210 | 1.4551E+04 | 1.4660E+04 | 7.015E-01% | 1.86E+02 |
| AM-241 | 1.2210E+03 | 1.2214E+03 | 6.886E-01% | 1.50E+01 |
| CD-109 | 1.3915E+04 | 1.5863E+04 | 5.250E-01% | 1.32E+02 |
| CO-57 | 2.7692E+02 | 3.4612E+02 | 7.591E-01% | 4.41E+00 |
| Ce-139 | 3.4959E+02 | 5.4306E+02 | 6.952E-01% | 5.74E+00 |
| Hg-203 | 3.2458E+02 | 1.1912E+03 | 8.644E-01% | 1.51E+01 |
| SN-113 | 5.7274E+02 | 9.6993E+02 | 7.483E-01% | 9.09E+00 |
| CS-137 | 4.6862E+02 | 4.7121E+02 | 9.901E-01% | 6.25E+00 |
| Y-898 | 8.8197E+02 | 1.5576E+03 | 6.628E-01% | 1.07E+01 |
| Co-1173 | 7.1436E+02 | 7.3721E+02 | 7.806E-01% | 5.33E+00 |
| Co-1332 | 6.9728E+02 | 7.1959E+02 | 8.092E-01% | 5.16E+00 |
| Y-1836 | 9.1677E+02 | 1.6190E+03 | 7.248E-01% | 5.28E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.6 to 1999.8 keV) 3.489E+04 Bq
Total Decayed Activity ( 37.6 to 1999.8 keV) 3.9899750E+04 Bq

Analyzed by: _____
admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica, Inc

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge13 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14299 | 95.8 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1236 | 106.2 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 16083 | 98.3 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 346.19 | 95.7 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 539.42 | 98.3 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1201.9 | 102.7 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 968.01 | 100.2 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 474.76 | 101.7 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1545.1 | 97.2 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 719.78 | 98.0 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 727.89 | 99.1 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1632.3 | 102.7 |

Reviewed By: Jody Watson

Date: 3/29/2012

Calibration Data from file: 13_Soil_TunaCan.Clb
Energy Calibration Date: 3/29/2012 Time: 7:50:00 AM
Efficiency Calibration Date: 3/29/2012 Time: 7:50:26 AM

Calibration Description:
13_Soil_TunaCan_90099_032712

Energy Calibration Fit
Energy = 0.0722 +0.250086*Channel -2.12895e-008*Channel**2
FWHM (ch) = 3.9604 +0.000908*Channel -1.76283e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.95 | 46.54 | 46.58 | -0.08% | 1.03 | 1.03 | -0.55% |
| 237.92 | 59.54 | 59.57 | -0.05% | 1.03 | 1.04 | -1.74% |
| 351.94 | 88.03 | 88.09 | -0.06% | 1.05 | 1.07 | -1.59% |
| 488.07 | 122.06 | 122.13 | -0.05% | 1.10 | 1.10 | 0.25% |
| 663.06 | 165.85 | 165.88 | -0.02% | 1.17 | 1.14 | 2.38% |
| 1115.49 | 279.17 | 279.01 | 0.06% | 1.24 | 1.24 | 0.44% |
| 1565.36 | 391.69 | 391.49 | 0.05% | 1.36 | 1.33 | 1.77% |
| 2646.08 | 661.66 | 661.67 | -0.00% | 1.55 | 1.56 | -0.89% |
| 3591.99 | 898.02 | 898.10 | -0.01% | 1.75 | 1.75 | -0.09% |
| 4693.06 | 1173.24 | 1173.27 | -0.00% | 1.96 | 1.96 | -0.07% |
| 5330.52 | 1332.50 | 1332.56 | -0.00% | 2.06 | 2.07 | -0.45% |
| 7345.62 | 1836.01 | 1835.96 | 0.00% | 2.42 | 2.42 | 0.26% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.9134 %
Ln(Eff) = -0.5308 -0.305775*Ln(Eng) -0.0343757*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.5969 %
Ln(Eff) = -22.9222 +8.455931*Ln(Eng) -0.892406*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 2.5932E-002 | 2.7053E-002 | -4.32% |
| 59.54 | 4.0139E-002 | 3.8023E-002 | 5.27% |
| 88.03 | 5.1336E-002 | 5.2255E-002 | -1.79% |
| 122.06 | 5.2852E-002 | 5.5285E-002 | -4.60% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 4.9293E-002 | 5.0203E-002 | -1.85% |
| 279.17 | 3.6281E-002 | 3.5323E-002 | 2.64% |
| 391.69 | 2.7897E-002 | 2.7825E-002 | 0.26% |
| 661.66 | 1.9294E-002 | 1.8934E-002 | 1.86% |
| 898.02 | 1.4585E-002 | 1.4999E-002 | -2.84% |
| 1173.24 | 1.1920E-002 | 1.2168E-002 | -2.08% |
| 1332.50 | 1.0902E-002 | 1.0995E-002 | -0.86% |
| 1836.01 | 8.7053E-003 | 8.4769E-003 | 2.62% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  3/29/2012 12:11:47 PM   Page  1
TestAmerica, Inc                Spectrum name: 13_TunaCan_20120186.An1

Sample description
     13_TunaCan_90099_032712


Spectrum Filename: C:\User\Cal\Spectra\Det13\13_TunaCan_20120186.An1

Acquisition information
       Start time:                 3/27/2012 3:23:25 PM
       Live time:               3600
       Real time:               3670
       Dead time:                  1.92 %
       Detector ID:                   13

Detector system
     Ge13 SN/10064006


Calibration
       Filename:                   13_Soil_TunaCan.Clb
     13_Soil_TunaCan_90099_032712


       Energy Calibration
            Created:               3/29/2012 7:50:00 AM
            Zero offset:           0.072 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.129E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/29/2012 7:50:26 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.91 %
            Log(Eff):             -5.308398E-01 + (-3.057754E-01*Log(E) ) +
                                   ( -3.437570E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.60 %
            Log(Eff):             -2.292218E+01 + ( 8.455931E+00*Log(E) ) +
                                   ( -8.924057E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.58keV )
       Stop channel:            8000 (  1999.40keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (1087) Env32  G53W4.25  3/29/2012 12:11:47 PM   Page  2
TestAmerica, Inc                Spectrum name: 13_TunaCan_20120186.An1
                                      Page 1
```

```
       Random error:                4.0000000E+00
       Systematic error:            4.0000000E+00
       Fraction Limit:              0.000%
       Background width:            average of three points.

       Half lives decay limit:     12.000
       Activity range factor:       2.000
       Min. step backg. energy      0.000
       Multiplet shift channel      2.000

Corrections                          Status          Comments
       Decay correct to date:         YES       1/1/2012 11:00:00 AM
       Decay during acquisition:      NO
       Decay during collection:       NO
       True coincidence correction:   NO
       Peaked background correction:  NO
       Absorption (Internal):         NO
       Geometry correction:           NO
       Random summing:                NO


total peaks alloc.   12 cutoff: 5.00E+01%
       Energy Calibration
            Normalized diff:       0.0495
```

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.58 | 58754. | 0.66 | 1.03 | 2.709E-02 | 46.54 | 4.250 | 1.430E+04 | Pb210 |
| 59.57 | 60379. | 0.66 | 1.03 | 3.805E-02 | 59.54 | 35.700 | 1.236E+03 | AM241 |
| 70.81 | 1954. | 9.69 | 1.05 | 4.529E-02 | | | | |
| 72.99 | 3363. | 5.52 | 1.06 | 4.644E-02 | | | | |
| 88.09 | 95988. | 0.44 | 1.05 | 5.227E-02 | 88.03 | 3.610 | 1.608E+04 | CD109 |
| 122.13 | 47342. | 0.70 | 1.10 | 5.528E-02 | 122.06 | 85.600 | 3.462E+02 | CO57 |
| 136.50 | 6079. | 3.90 | 1.17 | 5.395E-02 | | | | |
| 165.88 | 50468. | 0.66 | 1.17 | 5.020E-02 | 165.85 | 79.900 | 5.394E+02 | Ce139 |
| 254.99 | 1887. | 8.59 | 1.10 | 3.760E-02 | | | | |
| 279.01 | 34595. | 0.73 | 1.24 | 3.534E-02 | 279.17 | 81.500 | 1.202E+03 | Hg203 |
| 391.49 | 36929. | 0.70 | 1.36 | 2.783E-02 | 391.69 | 64.000 | 9.680E+02 | SN113 |
| 661.67 | 27425. | 0.90 | 1.55 | 1.893E-02 | 661.66 | 85.210 | 4.748E+02 | CS137 |
| 898.10 | 44634. | 0.61 | 1.75 | 1.500E-02 | 898.02 | 93.700 | 1.545E+03 | Y898 |
| 1173.26 | 30535. | 0.69 | 1.96 | 1.217E-02 | 1173.24 | 99.900 | 7.198E+02 | Co1173 |
| 1332.55 | 27926. | 0.70 | 2.06 | 1.099E-02 | 1332.50 | 99.982 | 7.279E+02 | Co1332 |
| 1835.94 | 28215. | 0.64 | 2.43 | 8.477E-03 | 1836.01 | 99.200 | 1.632E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 282.85 | 70.83 | 16957. | 1954. | 4.315E+04 | 9.69 | 1.054 | - | D |
| 291.58 | 73.01 | 15573. | 3363. | 7.242E+04 | 5.52 | 1.056 | - | D |
| 545.57 | 136.50 | 11563. | 6079. | 1.127E+05 | 3.90 | 1.173 | - | |
| 1019.41 | 254.99 | 5852. | 1887. | 5.018E+04 | 8.59 | 1.098 | - | |



s - Peak fails shape tests.

D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.95 | 46.58 | 20947. | 58754. | 16.321 | 0.66 | 1.027 |
| AM-241 | 237.92 | 59.57 | 22064. | 60379. | 16.772 | 0.66 | 1.026 |
| CD-109 | 351.94 | 88.09 | 20029. | 95988. | 26.663 | 0.44 | 1.053 |
| CO-57 | 488.07 | 122.13 | 14046. | 47342. | 13.151 | 0.70 | 1.103 |
| Ce-139 | 663.06 | 165.88 | 11600. | 50468. | 14.019 | 0.66 | 1.167 |
| Hg-203 | 1115.49 | 279.01 | 5938. | 34595. | 9.610 | 0.73 | 1.243 |
| SN-113 | 1565.36 | 391.49 | 4998. | 36929. | 10.258 | 0.70 | 1.359 |
| CS-137 | 2646.08 | 661.67 | 4975. | 27425. | 7.618 | 0.90 | 1.546 |
| Y-898 | 3591.97 | 898.10 | 3847. | 44634. | 12.398 | 0.61 | 1.747 |
| Co-1173 | 4693.01 | 1173.26 | 1833. | 30535. | 8.482 | 0.69 | 1.958 |
| Co-1332 | 5330.51 | 1332.55 | 1457. | 27926. | 7.757 | 0.70 | 2.064 |
| Y-1836 | 7345.55 | 1835.94 | 482. | 28215. | 7.838 | 0.64 | 2.427 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4299E+04 | | | | 8.15E+03 | |
| | | | 46.54 | 1.430E+04 | ( | 1.648E+02 6.58E-01 4.25E+00 | G |
| AM-241 | | 1.2360E+03 | | | | 1.58E+05 | |
| | | | 59.54 | 1.236E+03 | ( | 1.423E+01 6.62E-01 3.57E+01 | G |
| CD-109 | | 1.6083E+04 | | | | 4.63E+02 | |
| | | | 88.03 | 1.608E+04 | ( | 1.110E+02 4.41E-01 3.61E+00 | G |
| CO-57 | | 3.4619E+02 | | | | 2.72E+02 | |
| | | | 122.06 | 3.462E+02 | ( | 4.058E+00 7.02E-01 8.56E+01 | G |

ORTEC g v - i (1087) Env32 G53W4.25 3/29/2012 12:11:47 PM Page 4
TestAmerica, Inc Spectrum name: 13_TunaCan_20120186.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| Ce-139 | 5.3942E+02 | | | | 1.38E+02 | |
| | | 165.85 | 5.394E+02 | ( | 5.393E+00 6.58E-01 7.99E+01 | G |
| Hg-203 | 1.2019E+03 | | | | 4.66E+01 | |
| | | 279.17 | 1.202E+03 | ( | 1.257E+01 7.27E-01 8.15E+01 | G |
| SN-113 | 9.6801E+02 | | | | 1.15E+02 | |
| | | 391.69 | 9.680E+02 | ( | 8.706E+00 6.96E-01 6.40E+01 | G |

```
CS-137       4.7476E+02                                      1.10E+04
                          661.66 4.748E+02  (  5.737E+00 8.98E-01 8.52E+01 G

Y-898        1.5451E+03                                      1.07E+02
                          898.02 1.545E+03  (  1.010E+01 6.13E-01 9.37E+01 G

Co-1173      7.1978E+02                                      1.93E+03
                         1173.24 7.198E+02  (  4.767E+00 6.89E-01 9.99E+01 G

Co-1332      7.2789E+02                                      1.93E+03
                         1332.50 7.279E+02  (  4.706E+00 7.04E-01 1.00E+02 G

Y-1836       1.6323E+03                                      1.07E+02
                         1836.01 1.632E+03  (  6.075E+00 6.40E-01 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
```

```
      ORTEC g v - i (1087) Env32  G53W4.25  3/29/2012 12:11:47 PM   Page  5
 TestAmerica, Inc                Spectrum name: 13_TunaCan_20120186.An1

   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  1 Sigma %
 ____________________________________________________________________________
   P - Peakbackground subtraction

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  1 Sigma
 Nuclide     Activity       Activity       Counting                   MDA
                Bq             Bq
```

| | | | | |
|---|---|---|---|---|
| Pb-210 | 1.4195E+04 | 1.4299E+04 | 6.581E-01% | 1.65E+02 |
| AM-241 | 1.2356E+03 | 1.2360E+03 | 6.618E-01% | 1.42E+01 |
| CD-109 | 1.4134E+04 | 1.6083E+04 | 4.413E-01% | 1.11E+02 |
| CO-57 | 2.7789E+02 | 3.4619E+02 | 7.023E-01% | 4.06E+00 |
| Ce-139 | 3.4949E+02 | 5.3942E+02 | 6.584E-01% | 5.39E+00 |
| Hg-203 | 3.3381E+02 | 1.2019E+03 | 7.272E-01% | 1.26E+01 |
| SN-113 | 5.7605E+02 | 9.6801E+02 | 6.961E-01% | 8.71E+00 |
| CS-137 | 4.7218E+02 | 4.7476E+02 | 8.976E-01% | 5.74E+00 |
| Y-898 | 8.8221E+02 | 1.5451E+03 | 6.126E-01% | 1.01E+01 |
| Co-1173 | 6.9779E+02 | 7.1978E+02 | 6.892E-01% | 4.77E+00 |
| Co-1332 | 7.0565E+02 | 7.2789E+02 | 7.036E-01% | 4.71E+00 |
| Y-1836 | 9.3203E+02 | 1.6323E+03 | 6.402E-01% | 6.07E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 82.3 to 1999.4 keV) 3.479E+04 Bq
Total Decayed Activity ( 82.3 to 1999.4 keV) 3.9773562E+04 Bq

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge14 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14422 | 96.6 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1222.5 | 105.1 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 16145 | 98.7 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 349.28 | 96.5 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 538.52 | 98.1 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1205.9 | 103.0 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 971.36 | 100.6 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 465.65 | 99.7 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1570 | 98.8 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 724.16 | 98.6 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 720.6 | 98.1 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1634 | 102.8 |

Reviewed By: Jody Watson

Date: 4/23/2012

Calibration Data from file: 14_Soil_TunaCan.Clb
Energy Calibration Date: 4/23/2012 Time: 11:29:29 AM
Efficiency Calibration Date: 4/23/2012 Time: 11:29:47 AM

Calibration Description:
14_TunaCan_90099_042312

Energy Calibration Fit
Energy = 0.1578 +0.250077*Channel -1.95882e-008*Channel**2
FWHM (ch) = 2.7879 +0.000947*Channel -1.45727e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 186.01 | 46.54 | 46.67 | -0.29% | 0.73 | 0.74 | -2.18% |
| 237.82 | 59.54 | 59.63 | -0.15% | 0.74 | 0.75 | -1.99% |
| 351.26 | 88.03 | 88.00 | 0.04% | 0.78 | 0.78 | -0.25% |
| 487.04 | 122.06 | 121.95 | 0.09% | 0.82 | 0.81 | 0.58% |
| 662.28 | 165.85 | 165.77 | 0.05% | 0.86 | 0.85 | 1.23% |
| 1115.71 | 279.17 | 279.15 | 0.01% | 0.98 | 0.96 | 2.15% |
| 1565.69 | 391.69 | 391.65 | 0.01% | 1.09 | 1.06 | 2.42% |
| 2645.83 | 661.66 | 661.68 | -0.00% | 1.30 | 1.30 | 0.28% |
| 3591.53 | 898.02 | 898.06 | -0.00% | 1.42 | 1.50 | -5.87% |
| 4692.63 | 1173.24 | 1173.24 | -0.00% | 1.76 | 1.73 | 2.11% |
| 5329.97 | 1332.50 | 1332.50 | -0.00% | 1.88 | 1.86 | 1.08% |
| 7345.32 | 1836.01 | 1836.00 | 0.00% | 2.23 | 2.24 | -0.37% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.0212 %
Ln(Eff) = 0.2101 -0.595197*Ln(Eng) -0.0160533*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.2797 %
Ln(Eff) = -23.9149 +8.828985*Ln(Eng) -0.93715*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 2.0990E-002 | 2.1711E-002 | -3.44% |
| 59.54 | 3.2006E-002 | 3.0654E-002 | 4.23% |
| 88.03 | 4.1381E-002 | 4.1960E-002 | -1.40% |
| 122.06 | 4.2230E-002 | 4.3784E-002 | -3.68% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 3.7957E-002 | 3.8722E-002 | -2.02% |
| 279.17 | 2.6754E-002 | 2.5963E-002 | 2.96% |
| 391.69 | 2.0047E-002 | 1.9926E-002 | 0.60% |
| 661.66 | 1.3125E-002 | 1.3132E-002 | -0.05% |
| 898.02 | 1.0136E-002 | 1.0258E-002 | -1.20% |
| 1173.24 | 8.1251E-003 | 8.2437E-003 | -1.46% |
| 1332.50 | 7.2859E-003 | 7.4227E-003 | -1.88% |
| 1836.01 | 5.8454E-003 | 5.6863E-003 | 2.72% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  7/6/2012 11:13:09 AM    Page  1
TestAmerica, Inc.               Spectrum name: 14_TunaCan_20120385.An1

Sample description
     17_TunaCan_90099_032612


Spectrum Filename: C:\User\Cal\Spectra\Det14\14_TunaCan_20120385.An1

Acquisition information
       Start time:                 4/23/2012 9:56:44 AM
       Live time:               3600
       Real time:               3665
       Dead time:                  1.77 %
       Detector ID:                   14

Detector system
     Ge17 SN/11080671


Calibration
       Filename:                   14_Soil_TunaCan.Clb
     14_TunaCan_90099_042312


       Energy Calibration
            Created:               4/23/2012 11:29:29 AM
            Zero offset:           0.158 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.959E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/23/2012 11:29:47 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.02 %
            Log(Eff):              2.101260E-01 + (-5.951973E-01*Log(E) ) +
                                   ( -1.605331E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.28 %
            Log(Eff):             -2.391492E+01 + ( 8.828985E+00*Log(E) ) +
                                   ( -9.371496E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.67keV )
       Stop channel:            8000 (  1999.52keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (1087) Env32  G53W4.25  7/6/2012 11:13:09 AM    Page  2
TestAmerica, Inc.               Spectrum name: 14_TunaCan_20120385.An1
                                      Page 1
```

```
       Random error:                4.0000000E+00
       Systematic error:            4.0000000E+00
       Fraction Limit:              0.000%
       Background width:            average of three points.

       Half lives decay limit:     12.000
       Activity range factor:       2.000
       Min. step backg. energy      0.000
       Multiplet shift channel      2.000

Corrections                           Status          Comments
       Decay correct to date:          YES       1/1/2012 11:00:00 AM
       Decay during acquisition:       YES
       Decay during collection:        NO
       True coincidence correction:    NO
       Peaked background correction:   NO
       Absorption (Internal):          NO
       Geometry correction:            NO
       Random summing:                 NO


total peaks alloc.   12 cutoff: 5.00E+01%
       Energy Calibration
            Normalized diff:       0.0575
```

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.67 | 47449. | 0.64 | 0.73 | 2.181E-02 | 46.54 | 4.250 | 1.442E+04 | Pb210 |
| 59.63 | 48139. | 0.67 | 0.74 | 3.071E-02 | 59.54 | 35.700 | 1.223E+03 | AM241 |
| 72.88 | 1815. | 8.13 | 0.77 | 3.737E-02 | | | | |
| 88.00 | 74331. | 0.47 | 0.79 | 4.195E-02 | 88.03 | 3.610 | 1.614E+04 | CD109 |
| 121.95 | 35331. | 0.76 | 0.82 | 4.379E-02 | 122.06 | 85.600 | 3.493E+02 | CO57 |
| 136.39 | 4314. | 3.84 | 0.82 | 4.244E-02 | | | | |
| 165.77 | 33960. | 0.70 | 0.89 | 3.800E-02 | 165.85 | 79.900 | 5.385E+02 | Ce139 |
| 279.15 | 17136. | 1.05 | 1.00 | 2.596E-02 | 279.17 | 81.500 | 1.206E+03 | Hg203 |
| 391.65 | 22586. | 0.85 | 1.13 | 1.993E-02 | 391.69 | 64.000 | 9.714E+02 | SN113 |
| 661.68 | 18625. | 0.92 | 1.36 | 1.313E-02 | 661.66 | 85.210 | 4.657E+02 | CS137 |
| 898.06 | 26064. | 0.74 | 1.56 | 1.026E-02 | 898.02 | 93.700 | 1.570E+03 | Y898 |
| 1173.24 | 20614. | 0.80 | 1.76 | 8.244E-03 | 1173.24 | 99.900 | 7.242E+02 | Co1173 |
| 1332.50 | 18485. | 0.81 | 1.88 | 7.423E-03 | 1332.50 | 99.982 | 7.206E+02 | Co1332 |
| 1835.98 | 15919. | 0.83 | 2.23 | 5.686E-03 | 1836.01 | 99.200 | 1.634E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 290.81 | 72.88 | 9094. | 1708. | 4.569E+04 | 9.16 | 0.857 | - |
| 544.77 | 136.39 | 6618. | 4314. | 1.017E+05 | 3.84 | 0.819 | - |



s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 186.01 | 46.67 | 13580. | 47449. | 13.180 | 0.64 | 0.728 |
| AM-241 | 237.82 | 59.63 | 14856. | 48139. | 13.372 | 0.67 | 0.736 |
| CD-109 | 351.26 | 88.00 | 13424. | 74331. | 20.647 | 0.47 | 0.793 |
| CO-57 | 487.04 | 121.95 | 9138. | 35331. | 9.814 | 0.76 | 0.820 |
| Ce-139 | 662.28 | 165.77 | 5743. | 33960. | 9.433 | 0.70 | 0.887 |
| Hg-203 | 1115.71 | 279.15 | 3658. | 17136. | 4.760 | 1.05 | 0.998 |
| SN-113 | 1565.69 | 391.65 | 3032. | 22586. | 6.274 | 0.85 | 1.125 |
| CS-137 | 2645.83 | 661.68 | 2231. | 18625. | 5.174 | 0.92 | 1.364 |
| Y-898 | 3591.53 | 898.06 | 1967. | 26064. | 7.240 | 0.74 | 1.562 |
| Co-1173 | 4692.63 | 1173.24 | 1001. | 20614. | 5.726 | 0.80 | 1.765 |
| Co-1332 | 5329.97 | 1332.50 | 650. | 18485. | 5.135 | 0.81 | 1.875 |
| Y-1836 | 7345.28 | 1835.98 | 147. | 15919. | 4.422 | 0.83 | 2.232 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

***** S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E *****

| Nuclide Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4422E+04 | | | | | | 8.15E+03 | |
| | | | 46.54 | 1.442E+04 | ( | 1.659E+02 | 6.42E-01 | 4.25E+00 | G |
| AM-241 | | 1.2225E+03 | | | | | | 1.58E+05 | |
| | | | 59.54 | 1.223E+03 | ( | 1.449E+01 | 6.65E-01 | 3.57E+01 | G |
| CD-109 | | 1.6145E+04 | | | | | | 4.63E+02 | |
| | | | 88.03 | 1.614E+04 | ( | 1.179E+02 | 4.73E-01 | 3.61E+00 | G |
| CO-57 | | 3.4928E+02 | | | | | | 2.72E+02 | |
| | | | 122.06 | 3.493E+02 | ( | 4.431E+00 | 7.59E-01 | 8.56E+01 | G |

ORTEC g v - i (1087) Env32  G53W4.25  7/6/2012 11:13:09 AM  Page 4
TestAmerica, Inc.  Spectrum name: 14_TunaCan_20120385.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | | | Comments |
|---|---|---|---|---|---|---|---|---|
| Ce-139 | 5.3852E+02 | | | | | | 1.38E+02 | |
| | | 165.85 | 5.385E+02 | ( | 5.643E+00 | 6.97E-01 | 7.99E+01 | G |
| Hg-203 | 1.2059E+03 | | | | | | 4.66E+01 | |
| | | 279.17 | 1.206E+03 | ( | 2.002E+01 | 1.05E+00 | 8.15E+01 | G |
| SN-113 | 9.7136E+02 | | | | | | 1.15E+02 | |
| | | 391.69 | 9.714E+02 | ( | 1.115E+01 | 8.54E-01 | 6.40E+01 | G |
| CS-137 | 4.6565E+02 | | | | | | 1.10E+04 | |
| | | 661.66 | 4.657E+02 | ( | 5.571E+00 | 9.21E-01 | 8.52E+01 | G |
| Y-898 | 1.5700E+03 | | | | | | 1.07E+02 | |

```
                          898.02 1.570E+03  (  1.261E+01 7.43E-01 9.37E+01 G

Co-1173      7.2416E+02                                        1.93E+03
                         1173.24 7.242E+02  (  5.275E+00 7.99E-01 9.99E+01 G

Co-1332      7.2060E+02                                        1.93E+03
                         1332.50 7.206E+02  (  4.737E+00 8.09E-01 1.00E+02 G

Y-1836       1.6340E+03                                        1.07E+02
                         1836.01 1.634E+03  (  6.084E+00 8.27E-01 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
```



```
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  1 Sigma %
 ____________________________________________________________________________
   P - Peakbackground subtraction

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  1 Sigma
 Nuclide     Activity       Activity       Counting                   MDA
               Bq             Bq

 ____________________________________________________________________________
 Pb-210       1.4284E+04    1.4422E+04    6.417E-01%                1.66E+02
 AM-241       1.2219E+03    1.2225E+03    6.654E-01%                1.45E+01
 CD-109       1.3631E+04    1.6145E+04    4.729E-01%                1.18E+02
```

| | | | | |
|---|---|---|---|---|
| CO-57 | 2.6186E+02 | 3.4928E+02 | 7.589E-01% | 4.43E+00 |
| Ce-139 | 3.0490E+02 | 5.3852E+02 | 6.967E-01% | 5.64E+00 |
| Hg-203 | 2.2495E+02 | 1.2059E+03 | 1.050E+00% | 2.00E+01 |
| SN-113 | 4.9196E+02 | 9.7136E+02 | 8.544E-01% | 1.12E+01 |
| CS-137 | 4.6235E+02 | 4.6565E+02 | 9.207E-01% | 5.57E+00 |
| Y-898 | 7.5323E+02 | 1.5700E+03 | 7.434E-01% | 1.26E+01 |
| Co-1173 | 6.9530E+02 | 7.2416E+02 | 7.989E-01% | 5.27E+00 |
| Co-1332 | 6.9188E+02 | 7.2060E+02 | 8.094E-01% | 4.74E+00 |
| Y-1836 | 7.8390E+02 | 1.6340E+03 | 8.273E-01% | 6.08E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.7 to 1999.5 keV) 3.381E+04 Bq
Total Decayed Activity ( 37.7 to 1999.5 keV) 3.9968746E+04 Bq

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge15 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14410 | 96.5 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1206.9 | 103.7 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 16069 | 98.2 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 356.06 | 98.4 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 538.81 | 98.2 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1202.4 | 102.7 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 974.62 | 100.9 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 465.43 | 99.7 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1573.7 | 99.0 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 716.44 | 97.6 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 726.55 | 98.9 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1633.2 | 102.8 |

Reviewed By: Jody Watson

Date: 3/22/2012

Calibration Data from file: 15_Soil_TunaCan.Clb
Energy Calibration Date: 3/22/2012 Time: 1:02:46 PM
Efficiency Calibration Date: 3/22/2012 Time: 1:03:01 PM

Calibration Description:
15_TunaCan_90099_032212

Energy Calibration Fit
Energy = 0.0042 +0.250192*Channel -3.10425e-008*Channel**2
FWHM (ch) = 3.5032 +0.001000*Channel -3.73783e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.91 | 46.54 | 46.52 | 0.05% | 0.90 | 0.92 | -2.54% |
| 237.99 | 59.54 | 59.55 | -0.01% | 0.91 | 0.94 | -2.43% |
| 352.01 | 88.03 | 88.07 | -0.05% | 0.95 | 0.96 | -1.92% |
| 487.92 | 122.06 | 122.07 | -0.01% | 1.00 | 1.00 | 0.30% |
| 663.08 | 165.85 | 165.89 | -0.02% | 1.05 | 1.04 | 1.34% |
| 1115.99 | 279.17 | 279.18 | -0.00% | 1.18 | 1.14 | 3.23% |
| 1565.41 | 391.69 | 391.58 | 0.03% | 1.26 | 1.24 | 1.14% |
| 2645.35 | 661.66 | 661.63 | 0.00% | 1.50 | 1.47 | 2.11% |
| 3590.98 | 898.02 | 898.04 | -0.00% | 1.67 | 1.65 | 0.79% |
| 4692.06 | 1173.24 | 1173.24 | -0.00% | 1.80 | 1.84 | -2.06% |
| 5329.66 | 1332.50 | 1332.56 | -0.00% | 1.90 | 1.94 | -2.28% |
| 7344.95 | 1836.01 | 1835.98 | 0.00% | 2.23 | 2.21 | 1.30% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.9975 %
Ln(Eff) = -0.6895 -0.329061*Ln(Eng) -0.0387563*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.1273 %
Ln(Eff) = -23.6268 +8.666669*Ln(Eng) -0.921464*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 1.8904E-002 | 1.9569E-002 | -3.52% |
| 59.54 | 2.8630E-002 | 2.7372E-002 | 4.39% |
| 88.03 | 3.6378E-002 | 3.7061E-002 | -1.88% |
| 122.06 | 3.7201E-002 | 3.8461E-002 | -3.39% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 3.3266E-002 | 3.3919E-002 | -1.96% |
| 279.17 | 2.3641E-002 | 2.3007E-002 | 2.68% |
| 391.69 | 1.7841E-002 | 1.7674E-002 | 0.94% |
| 661.66 | 1.1534E-002 | 1.1545E-002 | -0.10% |
| 898.02 | 8.8355E-003 | 8.9209E-003 | -0.97% |
| 1173.24 | 6.9001E-003 | 7.0763E-003 | -2.55% |
| 1332.50 | 6.2597E-003 | 6.3249E-003 | -1.04% |
| 1836.01 | 4.8716E-003 | 4.7412E-003 | 2.68% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  3/22/2012 1:04:51 PM    Page  1
TestAmerica, Inc.               Spectrum name: 15_TunaCan_20120283.An1

Sample description
     15_TunaCan_90099_032212


Spectrum Filename: C:\User\SPC\Det15\15_TunaCan_20120283.An1

Acquisition information
       Start time:                 3/22/2012 11:06:02 AM
       Live time:               3600
       Real time:               3653
       Dead time:                  1.44 %
       Detector ID:                   15

Detector system
     Ge15 SN/1102216


Calibration
       Filename:                   15_TunaCan.Clb
     15_TunaCan_90099_032212


       Energy Calibration
            Created:               3/22/2012 1:02:46 PM
            Zero offset:           0.004 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.104E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/22/2012 1:03:01 PM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.00 %
            Log(Eff):             -6.894897E-01 + (-3.290613E-01*Log(E) ) +
                                   ( -3.875629E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.13 %
            Log(Eff):             -2.362677E+01 + ( 8.666669E+00*Log(E) ) +
                                   ( -9.214638E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.53keV )
       Stop channel:            8000 (  1999.56keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (1087) Env32  G53W4.25  3/22/2012 1:04:51 PM    Page  2
TestAmerica, Inc.               Spectrum name: 15_TunaCan_20120283.An1
                                      Page 1
```

```
       Random error:                4.0000000E+00
       Systematic error:            4.0000000E+00
       Fraction Limit:              0.000%
       Background width:            average of three points.

       Half lives decay limit:     12.000
       Activity range factor:       2.000
       Min. step backg. energy      0.000
       Multiplet shift channel      2.000

Corrections                          Status          Comments
       Decay correct to date:         YES       1/1/2012 11:00:00 AM
       Decay during acquisition:      NO
       Decay during collection:       NO
       True coincidence correction:   NO
       Peaked background correction:  NO
       Absorption (Internal):         NO
       Geometry correction:           NO
       Random summing:                NO


total peaks alloc.   12 cutoff: 5.00E+01%
       Energy Calibration
            Normalized diff:       0.0249
```

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.52 | 42849. | 0.75 | 0.90 | 1.955E-02 | 46.54 | 4.250 | 1.441E+04 | Pb210 |
| 59.55 | 42443. | 0.72 | 0.91 | 2.738E-02 | 59.54 | 35.700 | 1.207E+03 | AM241 |
| 72.95 | 2606. | 6.34 | 0.95 | 3.318E-02 | | | | |
| 88.07 | 68550. | 0.54 | 0.95 | 3.707E-02 | 88.03 | 3.610 | 1.607E+04 | CD109 |
| 122.10 | 33756. | 0.64 | 1.00 | 3.846E-02 | 122.06 | 85.600 | 3.502E+02 | CO57 |
| 136.52 | 4295. | 2.96 | 1.01 | 3.724E-02 | | | | |
| 165.89 | 34959. | 0.78 | 1.05 | 3.391E-02 | 165.85 | 79.900 | 5.388E+02 | Ce139 |
| 279.18 | 24347. | 0.88 | 1.18 | 2.301E-02 | 279.17 | 81.500 | 1.202E+03 | Hg203 |
| 391.58 | 24366. | 0.82 | 1.26 | 1.768E-02 | 391.69 | 64.000 | 9.746E+02 | SN113 |
| 661.63 | 16400. | 1.16 | 1.50 | 1.155E-02 | 661.66 | 85.210 | 4.654E+02 | CS137 |
| 898.03 | 27965. | 0.74 | 1.67 | 8.921E-03 | 898.02 | 93.700 | 1.574E+03 | Y898 |
| 1173.23 | 17709. | 0.94 | 1.81 | 7.076E-03 | 1173.24 | 99.900 | 7.164E+02 | Co1173 |
| 1332.55 | 16065. | 0.98 | 1.90 | 6.325E-03 | 1332.50 | 99.982 | 7.266E+02 | Co1332 |
| 1835.95 | 16330. | 0.85 | 2.24 | 4.741E-03 | 1836.01 | 99.200 | 1.633E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 291.58 | 72.93 | 12341. | 2606. | 7.854E+04 | 6.34 | 0.949 | - D |
| 545.42 | 136.45 | 8010. | 4524. | 1.215E+05 | 4.23 | 1.054 | - s |



s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: DET_EnergyStandardMix & Pb.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.91 | 46.52 | 15447. | 42849. | 11.903 | 0.75 | 0.900 |
| AM-241 | 237.99 | 59.55 | 14029. | 42443. | 11.790 | 0.72 | 0.913 |
| CD-109 | 352.01 | 88.07 | 16260. | 68550. | 19.042 | 0.54 | 0.945 |
| CO-57 | 487.92 | 122.07 | 9130. | 34324. | 9.535 | 0.78 | 0.999 |
| Ce-139 | 663.08 | 165.89 | 8215. | 34959. | 9.711 | 0.78 | 1.052 |
| Hg-203 | 1115.99 | 279.18 | 4252. | 24347. | 6.763 | 0.88 | 1.182 |
| SN-113 | 1565.41 | 391.58 | 3012. | 24366. | 6.768 | 0.82 | 1.259 |
| CS-137 | 2645.35 | 661.63 | 3077. | 16400. | 4.555 | 1.16 | 1.503 |
| Y-898 | 3590.94 | 898.03 | 2252. | 27965. | 7.768 | 0.74 | 1.667 |
| Co-1173 | 4692.02 | 1173.23 | 1355. | 17709. | 4.919 | 0.94 | 1.807 |
| Co-1332 | 5329.60 | 1332.55 | 1160. | 16065. | 4.463 | 0.98 | 1.900 |
| Y-1836 | 7344.81 | 1835.95 | 345. | 16330. | 4.536 | 0.85 | 2.240 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

***** S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E *****

| Nuclide Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4410E+04 | | | | | 8.15E+03 | |
| | | | 46.54 | 1.441E+04 | ( | 1.957E+02 | 7.55E-01 4.25E+00 | G |
| AM-241 | | 1.2069E+03 | | | | | 1.58E+05 | |
| | | | 59.54 | 1.207E+03 | ( | 1.577E+01 | 7.22E-01 3.57E+01 | G |
| CD-109 | | 1.6069E+04 | | | | | 4.63E+02 | |
| | | | 88.03 | 1.607E+04 | ( | 1.399E+02 | 5.44E-01 3.61E+00 | G |
| CO-57 | | 3.5606E+02 | | | | | 2.72E+02 | |
| | | | 122.06 | 3.561E+02 | ( | 4.647E+00 | 7.84E-01 8.56E+01 | G |



| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | | Comments |
|---|---|---|---|---|---|---|---|
| Ce-139 | 5.3881E+02 | | | | | 1.38E+02 | |
| | | 165.85 | 5.388E+02 | ( | 6.551E+00 | 7.82E-01 7.99E+01 | G |
| Hg-203 | 1.2024E+03 | | | | | 4.66E+01 | |
| | | 279.17 | 1.202E+03 | ( | 1.514E+01 | 8.77E-01 8.15E+01 | G |
| SN-113 | 9.7462E+02 | | | | | 1.15E+02 | |
| | | 391.69 | 9.746E+02 | ( | 1.034E+01 | 8.20E-01 6.40E+01 | G |
| CS-137 | 4.6543E+02 | | | | | 1.10E+04 | |
| | | 661.66 | 4.654E+02 | ( | 7.413E+00 | 1.16E+00 8.52E+01 | G |
| Y-898 | 1.5737E+03 | | | | | 1.07E+02 | |

```
                          898.02 1.574E+03  (  1.260E+01 7.45E-01 9.37E+01 G

Co-1173      7.1644E+02                                        1.93E+03
                         1173.24 7.164E+02  (  7.050E+00 9.39E-01 9.99E+01 G

Co-1332      7.2655E+02                                        1.93E+03
                         1332.50 7.266E+02  (  7.301E+00 9.83E-01 1.00E+02 G

Y-1836       1.6332E+03                                        1.07E+02
                         1836.01 1.633E+03  (  8.923E+00 8.49E-01 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
```



```
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  1 Sigma %
 ____________________________________________________________________________
   P - Peakbackground subtraction

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  1 Sigma
 Nuclide     Activity       Activity       Counting                   MDA
               Bq             Bq

 ____________________________________________________________________________
 Pb-210       1.4311E+04    1.4410E+04    7.549E-01%                1.96E+02
 AM-241       1.2065E+03    1.2069E+03    7.219E-01%                1.58E+01
 CD-109       1.4233E+04    1.6069E+04    5.439E-01%                1.40E+02
```

| | | | | |
|---|---|---|---|---|
| CO-57 | 2.8961E+02 | 3.5606E+02 | 7.837E-01% | 4.65E+00 |
| Ce-139 | 3.5832E+02 | 5.3881E+02 | 7.816E-01% | 6.55E+00 |
| Hg-203 | 3.6068E+02 | 1.2024E+03 | 8.771E-01% | 1.51E+01 |
| SN-113 | 5.9836E+02 | 9.7462E+02 | 8.201E-01% | 1.03E+01 |
| CS-137 | 4.6306E+02 | 4.6543E+02 | 1.155E+00% | 7.41E+00 |
| Y-898 | 9.2933E+02 | 1.5737E+03 | 7.445E-01% | 1.26E+01 |
| Co-1173 | 6.9585E+02 | 7.1644E+02 | 9.390E-01% | 7.05E+00 |
| Co-1332 | 7.0567E+02 | 7.2655E+02 | 9.834E-01% | 7.30E+00 |
| Y-1836 | 9.6449E+02 | 1.6332E+03 | 8.486E-01% | 8.92E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 82.3 to 1999.6 keV) 3.512E+04 Bq
Total Decayed Activity ( 82.3 to 1999.6 keV) 3.9873703E+04 Bq

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge16 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14377 | 96.3 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1228.5 | 105.6 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 16032 | 98.0 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 349.8 | 96.7 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 538.18 | 98.0 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 969.68 | 100.4 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 468.24 | 100.3 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1552.4 | 97.7 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 725.6 | 98.8 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 726.23 | 98.9 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1629.1 | 102.5 |

Reviewed By: Jody Watson

Date: 7/13/2012

Calibration Data from file: 16_Soil_TunaCan.Clb
Energy Calibration Date: 7/13/2012 Time: 9:47:11 AM
Efficiency Calibration Date: 7/13/2012 Time: 9:47:24 AM

Calibration Description:
16_TunaCan_90099_071012

Energy Calibration Fit
Energy = 0.1106 +0.250095*Channel -1.95476e-008*Channel**2
FWHM (ch) = 3.6339 +0.000937*Channel -2.1273e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.57 | 46.54 | 46.52 | 0.04% | 0.97 | 0.95 | 1.52% |
| 237.71 | 59.54 | 59.56 | -0.03% | 0.95 | 0.96 | -1.11% |
| 351.71 | 88.03 | 88.07 | -0.05% | 1.00 | 0.99 | 0.52% |
| 487.80 | 122.06 | 122.10 | -0.04% | 1.03 | 1.02 | 1.07% |
| 662.91 | 165.85 | 165.89 | -0.03% | 1.08 | 1.06 | 1.71% |
| 1115.49 | 279.17 | 279.06 | 0.04% | 1.13 | 1.16 | -3.06% |
| 1565.59 | 391.69 | 391.61 | 0.02% | 1.25 | 1.26 | -0.74% |
| 2645.84 | 661.66 | 661.68 | -0.00% | 1.44 | 1.49 | -3.61% |
| 3591.32 | 898.02 | 898.03 | -0.00% | 1.74 | 1.68 | 3.44% |
| 4692.55 | 1173.24 | 1173.26 | -0.00% | 1.94 | 1.89 | 2.70% |
| 5329.87 | 1332.50 | 1332.53 | -0.00% | 1.95 | 2.01 | -2.97% |
| 7344.93 | 1836.01 | 1835.99 | 0.00% | 2.34 | 2.34 | 0.11% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.0068 %
Ln(Eff) = 0.0148 -0.551427*Ln(Eng) -0.0144348*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.1708 %
Ln(Eff) = -24.0844 +8.948554*Ln(Eng) -0.95136*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 2.2670E-002 | 2.3523E-002 | -3.76% |
| 59.54 | 3.4907E-002 | 3.3268E-002 | 4.69% |
| 88.03 | 4.4561E-002 | 4.5501E-002 | -2.11% |
| 122.06 | 4.5678E-002 | 4.7288E-002 | -3.52% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 4.0710E-002 | 4.1557E-002 | -2.08% |
| 279.17 | 2.9697E-002 | 2.8765E-002 | 3.14% |
| 391.69 | 2.2647E-002 | 2.2549E-002 | 0.43% |
| 661.66 | 1.5445E-002 | 1.5368E-002 | 0.50% |
| 898.02 | 1.1965E-002 | 1.2246E-002 | -2.35% |
| 1173.24 | 9.8925E-003 | 1.0017E-002 | -1.26% |
| 1332.50 | 8.9987E-003 | 9.0965E-003 | -1.09% |
| 1836.01 | 7.2985E-003 | 7.1212E-003 | 2.43% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  7/13/2012 9:50:48 AM
TestAmerica, Inc.                Spectrum name: 16_Soil_TunaCan_90099_20120752.A

Sample description
     16_Soil_TunaCan_90099_071012


Spectrum Filename: C:\User\SPC\Det16\16_Soil_TunaCan_90099_20120752.A

Acquisition information
       Start time:                 7/10/2012 10:35:34 AM
       Live time:               3600
       Real time:               3674
       Dead time:                  2.03 %
       Detector ID:                   16

Detector system
     Ge16 SN/11012217


Calibration
       Filename:                   16_Soil_TunaCan.Clb
     16_TunaCan_90099_071012


       Energy Calibration
            Created:               7/13/2012 9:47:11 AM
            Zero offset:           0.111 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.955E-08 keV/channel^2

       Efficiency Calibration
            Created:               7/13/2012 9:47:24 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.01 %
            Log(Eff):              1.477416E-02 + (-5.514266E-01*Log(E) ) +
                                   ( -1.443482E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.17 %
            Log(Eff):             -2.408438E+01 + ( 8.948554E+00*Log(E) ) +
                                   ( -9.513599E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.62keV )
       Stop channel:            8000 (  1999.62keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (1087) Env32 G53W4.25 7/13/2012 9:50:48 AM
TestAmerica, Inc. Spectrum name: 16_Soil_TunaCan_90099_20120752.A

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2012 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0309

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.52 | 50908. | 0.67 | 0.97 | 2.351E-02 | 46.54 | 4.250 | 1.438E+04 | Pb210 |
| 59.56 | 52484. | 0.66 | 0.95 | 3.328E-02 | 59.54 | 35.700 | 1.229E+03 | AM241 |
| 88.07 | 71211. | 0.52 | 1.00 | 4.551E-02 | 88.03 | 3.610 | 1.603E+04 | CD109 |
| 122.10 | 31320. | 0.80 | 1.03 | 4.728E-02 | 122.06 | 85.600 | 3.498E+02 | CO57 |
| 136.55 | 3896. | 3.92 | 1.12 | 4.572E-02 | | | | |
| 165.89 | 24588. | 0.86 | 1.08 | 4.155E-02 | 165.85 | 79.900 | 5.382E+02 | Ce139 |
| 279.05 | 6035. | 2.82 | 1.13 | 2.877E-02 | 279.17 | 81.500 | 1.223E+03 | Hg203 |
| 391.61 | 15948. | 1.14 | 1.25 | 2.255E-02 | 391.69 | 64.000 | 9.697E+02 | SN113 |
| 661.68 | 21809. | 0.83 | 1.44 | 1.537E-02 | 661.66 | 85.210 | 4.682E+02 | CS137 |
| 898.03 | 18524. | 0.90 | 1.74 | 1.225E-02 | 898.02 | 93.700 | 1.552E+03 | Y898 |
| 1173.26 | 24403. | 0.75 | 1.94 | 1.002E-02 | 1173.24 | 99.900 | 7.256E+02 | Co1173 |
| 1332.53 | 22198. | 0.75 | 1.95 | 9.096E-03 | 1332.50 | 99.982 | 7.262E+02 | Co1332 |
| 1835.98 | 11967. | 0.97 | 2.34 | 7.121E-03 | 1836.01 | 99.200 | 1.629E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 545.57 | 136.55 | 5299. | 3896. | 8.521E+04 | 3.92 | 1.117 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.57 | 46.52 | 16008. | 50908. | 14.141 | 0.67 | 0.967 |
| AM-241 | 237.71 | 59.56 | 16109. | 52484. | 14.579 | 0.66 | 0.954 |
| CD-109 | 351.71 | 88.07 | 14747. | 71211. | 19.781 | 0.52 | 0.996 |
| CO-57 | 487.80 | 122.10 | 7590. | 31320. | 8.700 | 0.80 | 1.033 |
| Ce-139 | 662.91 | 165.89 | 4947. | 24588. | 6.830 | 0.86 | 1.080 |
| Hg-203 | 1115.49 | 279.06 | 4192. | 5963. | 1.656 | 2.79 | 1.129 |
| SN-113 | 1565.60 | 391.61 | 3105. | 15948. | 4.430 | 1.14 | 1.253 |
| CS-137 | 2645.84 | 661.68 | 2129. | 21809. | 6.058 | 0.83 | 1.439 |
| Y-898 | 3591.32 | 898.03 | 1720. | 18524. | 5.145 | 0.90 | 1.741 |
| Co-1173 | 4692.53 | 1173.26 | 1220. | 24403. | 6.779 | 0.75 | 1.944 |
| Co-1332 | 5329.86 | 1332.53 | 680. | 22198. | 6.166 | 0.75 | 1.948 |
| Y-1836 | 7344.92 | 1835.98 | 144. | 11967. | 3.324 | 0.97 | 2.344 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4377E+04 | | | | | | 8.15E+03 | |
| | | | 46.54 | 1.438E+04 | ( | 1.673E+02 | 6.66E-01 | 4.25E+00 | G |
| AM-241 | | 1.2285E+03 | | | | | | 1.58E+05 | |
| | | | 59.54 | 1.229E+03 | ( | 1.391E+01 | 6.59E-01 | 3.57E+01 | G |
| CD-109 | | 1.6032E+04 | | | | | | 4.63E+02 | |
| | | | 88.03 | 1.603E+04 | ( | 1.280E+02 | 5.16E-01 | 3.61E+00 | G |
| CO-57 | | 3.4980E+02 | | | | | | 2.72E+02 | |
| | | | 122.06 | 3.498E+02 | ( | 4.565E+00 | 8.01E-01 | 8.56E+01 | G |

ORTEC g v - i (1087) Env32 G53W4.25 7/13/2012 9:50:48 AM
TestAmerica, Inc. Spectrum name: 16_Soil_TunaCan_90099_20120752.A

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| Ce-139 | 5.3818E+02 | | | | | 1.38E+02 | |
| | | 165.85 | 5.382E+02 | ( | 7.233E+00 | 8.57E-01 | 7.99E+01 G |
| Hg-203 | 1.2081E+03 | | | | | 4.66E+01 | |
| | | 279.17 | 1.208E+03 | ( | 6.167E+01 | 2.79E+00 | 8.15E+01 G |
| SN-113 | 9.6968E+02 | | | | | 1.15E+02 | |
| | | 391.69 | 9.697E+02 | ( | 1.595E+01 | 1.14E+00 | 6.40E+01 G |
| CS-137 | 4.6824E+02 | | | | | 1.10E+04 | |
| | | 661.66 | 4.682E+02 | ( | 4.675E+00 | 8.31E-01 | 8.52E+01 G |
| Y-898 | 1.5524E+03 | | | | | 1.07E+02 | |
| | | 898.02 | 1.552E+03 | ( | 1.643E+01 | 8.98E-01 | 9.37E+01 G |
| Co-1173 | 7.2560E+02 | | | | | 1.93E+03 | |
| | | 1173.24 | 7.256E+02 | ( | 4.920E+00 | 7.53E-01 | 9.99E+01 G |
| Co-1332 | 7.2623E+02 | | | | | 1.93E+03 | |
| | | 1332.50 | 7.262E+02 | ( | 4.064E+00 | 7.46E-01 | 1.00E+02 G |
| Y-1836 | 1.6291E+03 | | | | | 1.07E+02 | |
| | | 1836.01 | 1.629E+03 | ( | 7.981E+00 | 9.68E-01 | 9.92E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape

ORTEC g v - i (1087) Env32 G53W4.25 7/13/2012 9:50:48 AM
TestAmerica, Inc. Spectrum name: 16_Soil_TunaCan_90099_20120752.A

P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq | Time Corrected Activity Bq | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|---|
| Pb-210 | 1.4145E+04 | 1.4377E+04 | 6.660E-01% | 1.67E+02 |
| AM-241 | 1.2275E+03 | 1.2285E+03 | 6.589E-01% | 1.39E+01 |
| CD-109 | 1.2043E+04 | 1.6032E+04 | 5.162E-01% | 1.28E+02 |
| CO-57 | 2.1493E+02 | 3.4980E+02 | 8.011E-01% | 4.56E+00 |
| Ce-139 | 2.0570E+02 | 5.3818E+02 | 8.567E-01% | 7.23E+00 |
| Hg-203 | 7.0659E+01 | 1.2081E+03 | 2.787E+00% | 6.17E+01 |
| SN-113 | 3.0697E+02 | 9.6968E+02 | 1.140E+00% | 1.60E+01 |
| CS-137 | 4.6263E+02 | 4.6824E+02 | 8.306E-01% | 4.67E+00 |
| Y-898 | 4.4842E+02 | 1.5524E+03 | 8.985E-01% | 1.64E+01 |
| Co-1173 | 6.7738E+02 | 7.2560E+02 | 7.529E-01% | 4.92E+00 |
| Co-1332 | 6.7797E+02 | 7.2623E+02 | 7.458E-01% | 4.06E+00 |
| Y-1836 | 4.7056E+02 | 1.6291E+03 | 9.676E-01% | 7.98E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.6 to 1999.6 keV) 3.095E+04 Bq
Total Decayed Activity ( 37.6 to 1999.6 keV) 3.9805016E+04 Bq

Analyzed by: _____
403135

Reviewed by: _____
Supervisor

Laboratory: TestAmerica, Inc.

# Gamma Verification per Geometry

| | |
|---|---|
| Detector: | Ge17 |
| Geometry: | Tunacan |
| Reference date | 1/1/2012 |
| Calibration Standard: | 90099 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 317.8 |
| lab ID# of cal standard | 6699 |

| Isotope | Certified Activity gammas/sec | Geometry Activity gammas/sec | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Pb-210 | 3094 | 634 | 0.0425 | 14926 | 14476 | 97.0 |
| Am-241 | 2037 | 418 | 0.3590 | 1163 | 1217.3 | 104.6 |
| Cd-109 | 2881 | 591 | 0.0361 | 16363 | 16121 | 98.5 |
| Co-57 | 1511 | 310 | 0.8560 | 362 | 351.58 | 97.1 |
| Ce-139 | 2139 | 439 | 0.7990 | 549 | 540.43 | 98.5 |
| Hg-203 | 4651 | 954 | 0.8146 | 1171 | 1200.7 | 102.6 |
| Sn-113 | 3015 | 618 | 0.6400 | 966 | 969.38 | 100.4 |
| Cs-137 | 1938 | 397 | 0.8510 | 467 | 466.08 | 99.8 |
| Y-88 | 7264 | 1489 | 0.9370 | 1589 | 1562.4 | 98.3 |
| Co-60 | 3580 | 734 | 0.9997 | 734 | 724.88 | 98.7 |
| Co-60 | 3581 | 734 | 0.9999 | 734 | 733.12 | 99.8 |
| Y-88 | 7690 | 1577 | 0.9920 | 1589 | 1616.3 | 101.7 |

Reviewed By: Megan McAfee

Date: 4/13/2012

Calibration Data from file: 17_Soil_TunaCan.Clb
Energy Calibration Date: 4/12/2012 Time: 9:28:30 AM
Efficiency Calibration Date: 4/12/2012 Time: 9:28:42 AM

Calibration Description:
17_TunaCan_90099_032612

Energy Calibration Fit
Energy = 0.1178 +0.250077*Channel -2.37566e-008*Channel**2
FWHM (ch) = 2.9772 +0.000994*Channel -3.22638e-008*Channel**2

Energy/FWHM Table

| Channel | Energy(keV) | Fit(keV) | Delta | FWHM(keV) | Fit(keV) | Delta |
|---|---|---|---|---|---|---|
| 185.96 | 46.54 | 46.62 | -0.17% | 0.77 | 0.79 | -3.16% |
| 237.92 | 59.54 | 59.61 | -0.12% | 0.78 | 0.80 | -3.33% |
| 351.79 | 88.03 | 88.09 | -0.07% | 0.82 | 0.83 | -1.16% |
| 487.44 | 122.06 | 122.01 | 0.04% | 0.89 | 0.86 | 3.09% |
| 662.32 | 165.85 | 165.74 | 0.07% | 0.93 | 0.91 | 2.22% |
| 1115.65 | 279.17 | 279.09 | 0.03% | 1.03 | 1.01 | 2.15% |
| 1565.90 | 391.69 | 391.66 | 0.01% | 1.10 | 1.11 | -0.78% |
| 2646.02 | 661.66 | 661.66 | -0.00% | 1.37 | 1.35 | 1.74% |
| 3591.93 | 898.02 | 898.07 | -0.01% | 1.52 | 1.53 | -0.67% |
| 4693.19 | 1173.24 | 1173.25 | -0.00% | 1.72 | 1.73 | -0.81% |
| 5330.69 | 1332.50 | 1332.53 | -0.00% | 1.82 | 1.84 | -0.74% |
| 7346.32 | 1836.01 | 1835.98 | 0.00% | 2.14 | 2.13 | 0.55% |

Efficiency Calibration Fit
Knee Energy = 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.9072 %
Ln(Eff) = -0.5264 -0.402416*Ln(Eng) -0.0260446*(Ln(Eng))**2
Below the Knee: Quadratic Uncertainty = 1.0020 %
Ln(Eff) = -23.4389 +8.582715*Ln(Eng) -0.907543*(Ln(Eng))**2

Efficiency Table

| Energy | Efficiency | Fit | Delta |
|---|---|---|---|
| 46.54 | 2.0383E-002 | 2.1004E-002 | -3.05% |
| 59.54 | 3.0743E-002 | 2.9571E-002 | 3.81% |
| 88.03 | 3.9976E-002 | 4.0594E-002 | -1.55% |
| 122.06 | 4.1510E-002 | 4.2756E-002 | -3.00% |
| 165.85 | ========== Knee ========== | | |
| 165.85 | 3.7629E-002 | 3.8252E-002 | -1.65% |
| 279.17 | 2.7514E-002 | 2.6814E-002 | 2.54% |
| 391.69 | 2.1207E-002 | 2.1122E-002 | 0.40% |
| 661.66 | 1.4433E-002 | 1.4427E-002 | 0.04% |
| 898.02 | 1.1287E-002 | 1.1478E-002 | -1.69% |
| 1173.24 | 9.2333E-003 | 9.3589E-003 | -1.36% |
| 1332.50 | 8.4692E-003 | 8.4809E-003 | -0.14% |
| 1836.01 | 6.7041E-003 | 6.5931E-003 | 1.66% |

Calibration Certificate Table

| Isotope | Energy | Pct | Halflife | Activity | GPS | Error | Date & Time |
|---|---|---|---|---|---|---|---|
| Pb-210 | 46.54 | 4.25 | 8.15E+003 | 14918.00 | 634.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Am-241 | 59.54 | 35.70 | 1.58E+005 | 1170.90 | 418.00 | 3.50% | 1/1/2012 11:00:00 AM |
| Cd-109 | 88.03 | 3.61 | 4.63E+002 | 16371.00 | 591.00 | 4.70% | 1/1/2012 11:00:00 AM |
| Co-57 | 122.06 | 85.60 | 2.72E+002 | 362.15 | 310.00 | 4.10% | 1/1/2012 11:00:00 AM |
| Ce-139 | 165.85 | 79.90 | 1.38E+002 | 549.44 | 439.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Hg-203 | 279.17 | 81.50 | 4.66E+001 | 1170.60 | 954.00 | 3.80% | 1/1/2012 11:00:00 AM |
| Sn-113 | 391.69 | 64.00 | 1.15E+002 | 965.63 | 618.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Cs-137 | 661.66 | 85.21 | 1.10E+004 | 465.91 | 397.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 898.02 | 93.70 | 1.07E+002 | 1589.10 | 1489.00 | 3.90% | 1/1/2012 11:00:00 AM |
| Co-60 | 1173.24 | 99.90 | 1.93E+003 | 734.73 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Co-60 | 1332.50 | 99.98 | 1.93E+003 | 734.15 | 734.00 | 4.00% | 1/1/2012 11:00:00 AM |
| Y-88 | 1836.01 | 99.20 | 1.07E+002 | 1589.70 | 1577.00 | 4.00% | 1/1/2012 11:00:00 AM |

```
     ORTEC g v - i (1087) Env32  G53W4.25  7/6/2012 10:31:21 AM    Page  1
TestAmerica, Inc.               Spectrum name: 17_TunaCan_20120263.An1

Sample description
     17_TunaCan_90099_032612


Spectrum Filename: C:\User\SPC\Det17\17_TunaCan_20120263.An1

Acquisition information
       Start time:                 3/26/2012 6:29:58 AM
       Live time:               3600
       Real time:               3672
       Dead time:                  1.95 %
       Detector ID:                   17

Detector system
     Ge17 SN/11080671


Calibration
       Filename:                   17_Soil_TunaCan.Clb
     17_TunaCan_90099_032612


       Energy Calibration
            Created:               4/12/2012 9:28:30 AM
            Zero offset:           0.118 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.376E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/12/2012 9:28:42 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.91 %
            Log(Eff):             -5.264190E-01 + (-4.024164E-01*Log(E) ) +
                                   ( -2.604461E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.00 %
            Log(Eff):             -2.343889E+01 + ( 8.582715E+00*Log(E) ) +
                                   ( -9.075430E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.63keV )
       Stop channel:            8000 (  1999.21keV )
       Peak rejection level:      10.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (1087) Env32  G53W4.25  7/6/2012 10:31:21 AM    Page  2
TestAmerica, Inc.               Spectrum name: 17_TunaCan_20120263.An1
                                      Page 1
```

```
       Random error:                4.0000000E+00
       Systematic error:            4.0000000E+00
       Fraction Limit:              0.000%
       Background width:            average of three points.

       Half lives decay limit:     12.000
       Activity range factor:       2.000
       Min. step backg. energy      0.000
       Multiplet shift channel      2.000

Corrections                           Status          Comments
       Decay correct to date:          YES       1/1/2012 11:00:00 AM
       Decay during acquisition:       YES
       Decay during collection:        NO
       True coincidence correction:    NO
       Peaked background correction:   NO
       Absorption (Internal):          NO
       Geometry correction:            NO
       Random summing:                 NO


total peaks alloc.   12 cutoff: 5.00E+01%
       Energy Calibration
            Normalized diff:       0.0522
```

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.62 | 46187. | 0.69 | 0.77 | 2.106E-02 | 46.54 | 4.250 | 1.448E+04 | Pb210 |
| 59.61 | 46245. | 0.74 | 0.78 | 2.961E-02 | 59.54 | 35.700 | 1.217E+03 | AM241 |
| 72.97 | 2852. | 5.64 | 0.82 | 3.610E-02 | | | | |
| 88.09 | 74900. | 0.46 | 0.82 | 4.061E-02 | 88.03 | 3.610 | 1.612E+04 | CD109 |
| 122.01 | 37313. | 0.73 | 0.89 | 4.276E-02 | 122.06 | 85.600 | 3.516E+02 | CO57 |
| 136.40 | 4536. | 4.09 | 0.81 | 4.164E-02 | | | | |
| 165.74 | 38793. | 0.66 | 0.93 | 3.765E-02 | 165.85 | 79.900 | 5.404E+02 | Ce139 |
| 255.04 | 1259. | 9.59 | 1.07 | 2.855E-02 | | | | |
| 279.09 | 26776. | 0.82 | 1.03 | 2.682E-02 | 279.17 | 81.500 | 1.201E+03 | Hg203 |
| 391.66 | 28306. | 0.76 | 1.11 | 2.112E-02 | 391.69 | 64.000 | 9.694E+02 | SN113 |
| 661.66 | 20517. | 0.91 | 1.37 | 1.443E-02 | 661.66 | 85.210 | 4.661E+02 | CS137 |
| 898.07 | 34851. | 0.63 | 1.52 | 1.148E-02 | 898.02 | 93.700 | 1.562E+03 | Y898 |
| 1173.25 | 23664. | 0.80 | 1.72 | 9.359E-03 | 1173.24 | 99.900 | 7.249E+02 | Co1173 |
| 1332.52 | 21706. | 0.78 | 1.83 | 8.481E-03 | 1332.50 | 99.982 | 7.331E+02 | Co1332 |
| 1835.97 | 21924. | 0.70 | 2.15 | 6.593E-03 | 1836.01 | 99.200 | 1.616E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 291.30 | 72.97 | 10374. | 2884. | 7.989E+04 | 5.33 | 0.816 | - | D |
| 544.98 | 136.40 | 8136. | 4536. | 1.089E+05 | 4.09 | 0.813 | - | |
| 1019.46 | 255.04 | 3805. | 1259. | 4.410E+04 | 9.59 | 1.072 | - | |



s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.

C - Area < Critical level.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.96 | 46.62 | 15035. | 46187. | 12.830 | 0.69 | 0.766 |
| AM-241 | 237.92 | 59.61 | 17361. | 46245. | 12.846 | 0.74 | 0.777 |
| CD-109 | 351.79 | 88.09 | 12661. | 74900. | 20.806 | 0.46 | 0.821 |
| CO-57 | 487.44 | 122.01 | 9755. | 37313. | 10.365 | 0.73 | 0.891 |
| Ce-139 | 662.32 | 165.74 | 6828. | 38793. | 10.776 | 0.66 | 0.926 |
| Hg-203 | 1115.65 | 279.09 | 4528. | 26776. | 7.438 | 0.82 | 1.034 |
| SN-113 | 1565.90 | 391.66 | 3496. | 28306. | 7.863 | 0.76 | 1.105 |
| CS-137 | 2646.02 | 661.66 | 2816. | 20517. | 5.699 | 0.91 | 1.369 |
| Y-898 | 3591.91 | 898.07 | 2257. | 34851. | 9.681 | 0.63 | 1.523 |
| Co-1173 | 4693.17 | 1173.25 | 1531. | 23664. | 6.573 | 0.80 | 1.720 |
| Co-1332 | 5330.69 | 1332.52 | 1002. | 21706. | 6.029 | 0.78 | 1.825 |
| Y-1836 | 7346.26 | 1835.97 | 205. | 21924. | 6.090 | 0.70 | 2.146 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

***** S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq | Peak Energy keV | Peak Activity Bq | Code | MDA Value Bq | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4476E+04 | | | | 8.15E+03 | |
| | | | 46.54 | 1.448E+04 | ( | 1.799E+02 6.89E-01 4.25E+00 | G |
| AM-241 | | 1.2173E+03 | | | | 1.58E+05 | |
| | | | 59.54 | 1.217E+03 | ( | 1.623E+01 7.35E-01 3.57E+01 | G |
| CD-109 | | 1.6121E+04 | | | | 4.63E+02 | |
| | | | 88.03 | 1.612E+04 | ( | 1.134E+02 4.57E-01 3.61E+00 | G |
| CO-57 | | 3.5158E+02 | | | | 2.72E+02 | |
| | | | 122.06 | 3.516E+02 | ( | 4.362E+00 7.33E-01 8.56E+01 | G |

ORTEC g v - i (1087) Env32  G53W4.25  7/6/2012 10:31:21 AM  Page 4
TestAmerica, Inc.  Spectrum name: 17_TunaCan_20120263.An1

| Nuclide | Ave activity | Energy | Activity | Code | Peak MDA | Comments |
|---|---|---|---|---|---|---|
| Ce-139 | 5.4043E+02 | | | | 1.38E+02 | |
| | | 165.85 | 5.404E+02 | ( | 5.402E+00 6.57E-01 7.99E+01 | G |
| Hg-203 | 1.2007E+03 | | | | 4.66E+01 | |
| | | 279.17 | 1.201E+03 | ( | 1.418E+01 8.17E-01 8.15E+01 | G |
| SN-113 | 9.6938E+02 | | | | 1.15E+02 | |
| | | 391.69 | 9.694E+02 | ( | 9.529E+00 7.56E-01 6.40E+01 | G |
| CS-137 | 4.6608E+02 | | | | 1.10E+04 | |
| | | 661.66 | 4.661E+02 | ( | 5.679E+00 9.07E-01 8.52E+01 | G |

```
Y-898        1.5624E+03                                        1.07E+02
                          898.02 1.562E+03  (  1.005E+01 6.29E-01 9.37E+01 G

Co-1173      7.2488E+02                                        1.93E+03
                         1173.24 7.249E+02  (  5.668E+00 7.98E-01 9.99E+01 G

Co-1332      7.3312E+02                                        1.93E+03
                         1332.50 7.331E+02  (  5.074E+00 7.81E-01 1.00E+02 G

Y-1836       1.6163E+03                                        1.07E+02
                         1836.01 1.616E+03  (  5.123E+00 7.01E-01 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
   N - Naturally Occurring Isotope     S - Single-Escape
```



```
   P - Photon Reaction                 D - Double-Escape
   C - Charged Particle Reaction       K - Key Line
   M - No MDA Calculation              A - Not in Average
   R - Coincidence Corrected           C - Coincidence Peak
   H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


 *************** D I S C A R D E D  I S O T O P E  P E A K S ***************
 Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  1 Sigma %
 ____________________________________________________________________________
   P - Peakbackground subtraction

 *****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  1 Sigma
 Nuclide     Activity       Activity       Counting                   MDA
                Bq             Bq

 ____________________________________________________________________________
 Pb-210       1.4372E+04    1.4476E+04    6.891E-01%                1.80E+02
```

| | | | | |
|---|---|---|---|---|
| AM-241 | 1.2168E+03 | 1.2173E+03 | 7.355E-01% | 1.62E+01 |
| CD-109 | 1.4197E+04 | 1.6121E+04 | 4.569E-01% | 1.13E+02 |
| CO-57 | 2.8320E+02 | 3.5158E+02 | 7.325E-01% | 4.36E+00 |
| Ce-139 | 3.5257E+02 | 5.4043E+02 | 6.571E-01% | 5.40E+00 |
| Hg-203 | 3.4034E+02 | 1.2007E+03 | 8.175E-01% | 1.42E+01 |
| SN-113 | 5.8164E+02 | 9.6938E+02 | 7.559E-01% | 9.53E+00 |
| CS-137 | 4.6359E+02 | 4.6608E+02 | 9.066E-01% | 5.68E+00 |
| Y-898 | 9.0011E+02 | 1.5624E+03 | 6.288E-01% | 1.00E+01 |
| Co-1173 | 7.0308E+02 | 7.2488E+02 | 7.979E-01% | 5.67E+00 |
| Co-1332 | 7.1107E+02 | 7.3312E+02 | 7.808E-01% | 5.07E+00 |
| Y-1836 | 9.3113E+02 | 1.6163E+03 | 7.012E-01% | 5.12E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 77.1 to 1999.2 keV) 3.505E+04 Bq
Total Decayed Activity ( 77.1 to 1999.2 keV) 3.9979633E+04 Bq

# Initial Calibration Verifications

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge3 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | Rad10-0006 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1165 | 100.1 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 443.73 | 95.4 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 700.09 | 94.3 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 704.11 | 94.9 |

Reviewed By: Jody Watson

Date: 3/27/2012

```
     ORTEC g v - i (3263) Env32  G53W4.25  3/28/2012 11:28:58 AM   Page  1
TestAmerica                     Spectrum name: 3_TunaCan2nd_20120999.An1

Sample description
     3_TunaCan_81427-334_2ndsource_032712


Spectrum Filename: C:\User\SPC\Det3\3_TunaCan2nd_20120999.An1

Acquisition information
       Start time:                 3/27/2012 10:50:55 PM
       Live time:               3600
       Real time:               3624
       Dead time:                  0.65 %
       Detector ID:                    3

Detector system
     Ge 3 SN/131


Calibration
       Filename:                   3_Soil_TunaCan.Clb
     3_Soil_TunaCan_90099_032712


       Energy Calibration
            Created:               3/28/2012 11:26:42 AM
            Zero offset:           0.147 keV
            Gain:                  0.250 keV/channel
            Quadratic:             3.682E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/28/2012 11:26:55 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.64 %
            Log(Eff):             -6.102019E-01 + (-3.642282E-01*Log(E) ) +
                                   ( -2.895398E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.29 %
            Log(Eff):             -2.525141E+01 + ( 9.446449E+00*Log(E) ) +
                                   ( -1.005974E+00*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.61keV )
       Stop channel:            8000 (  2000.41keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (3263) Env32  G53W4.25  3/28/2012 11:28:58 AM   Page  2
TestAmerica                     Spectrum name: 3_TunaCan2nd_20120999.An1
                                      Page 1
```

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: average of three points.

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 3_2012-02-26_0244.PBC 2/26/2012 2:44:46 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0561

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.57 | 684. | 13.49 | 0.86 | 1.380E-02 | | | | |
| 46.58 | 46359. | 0.64 | 0.82 | 2.218E-02 | 46.54 | 4.250 | 1.465E+04 | Pb210 |
| 49.41 | 474. | 26.39 | 0.62 | 2.446E-02 | | | | |
| 55.13 | 148. | 69.87 | 0.50 | 2.879E-02 | | | | |
| 59.56 | 47477. | 0.63 | 0.80 | 3.183E-02 | 59.54 | 35.700 | 1.165E+03 | AM241 |
| 63.23 | 116. | 55.13 | 0.52 | 3.413E-02 | | | | |
| 74.81 | 347. | 24.83 | 0.85 | 3.992E-02 | | | | |
| 77.26 | 173. | 50.89 | 0.85 | 4.088E-02 | | | | |
| 87.94 | 26078. | 0.87 | 0.86 | 4.402E-02 | 88.03 | 3.610 | 1.549E+04 | CD109 |
| 121.96 | 6006. | 2.27 | 0.93 | 4.564E-02 | 122.06 | 85.600 | 3.426E+02 | CO57 |
| 136.40 | 688. | 9.11 | 0.98 | 4.398E-02 | | | | |
| 157.37 | 39. | 92.20 | 0.44 | 4.044E-02 | | | | |
| 165.86 | 1056. | 7.85 | 0.99 | 3.963E-02 | 165.85 | 79.900 | 5.658E+02 | Ce139 |
| 210.61 | 83. | 58.19 | 0.66 | 3.379E-02 | | | | |
| 272.61 | 73. | 46.14 | 0.59 | 2.834E-02 | | | | |
| 332.61 | 124. | 44.81 | 0.91 | 2.468E-02 | | | | |
| 391.78 | 370. | 17.84 | 1.12 | 2.199E-02 | 391.69 | 64.000 | 9.986E+02 | SN113 |
| 621.40 | 108. | 40.97 | 0.41 | 1.575E-02 | | | | |
| 661.73 | 19442. | 0.81 | 1.44 | 1.504E-02 | 661.66 | 85.210 | 4.437E+02 | CS137 |
| 719.67 | 90. | 45.03 | 0.66 | 1.413E-02 | | | | |
| 813.20 | 114. | 49.57 | 0.70 | 1.289E-02 | | | | |
| 898.03 | 310. | 14.07 | 1.64 | 1.196E-02 | 898.02 | 93.700 | 1.553E+03 | Y898 |
| 901.05 | 12. | 303.83 | 1.64 | 1.193E-02 | | | | |
| 974.92 | 130. | 55.88 | 0.66 | 1.124E-02 | | | | |
| 1145.48 | 114. | 31.99 | 0.24 | 9.931E-03 | | | | |
| 1173.20 | 18293. | 0.84 | 1.86 | 9.749E-03 | 1173.24 | 99.900 | 7.001E+02 | Co1173 |
| 1332.46 | 16679. | 0.82 | 1.95 | 8.830E-03 | 1332.50 | 99.982 | 7.041E+02 | Co1332 |
| 1836.29 | 148. | 9.58 | 2.45 | 6.855E-03 | 1836.01 | 99.200 | 1.225E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

3_TunaCan2nd_20120999

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 145.86 | 36.57 | 2766. | 684. | 4.960E+04 | 13.49 | 0.858 | - s |
| 197.25 | 49.41 | 5697. | 474. | 1.939E+04 | 26.39 | 0.620 | - sM |
| 220.16 | 55.13 | 4834. | 148. | 5.123E+03 | 69.87 | 0.497 | - sc |
| 252.57 | 63.23 | 1834. | 116. | 3.399E+03 | 55.13 | 0.521 | - s |

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 11:28:58 AM Page 3
TestAmerica Spectrum name: 3_TunaCan2nd_20120999.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 298.78 | 74.77 | 3800. | 394. | 9.858E+03 | 26.85 | 0.961 | - |
| 308.61 | 77.22 | 3690. | 220. | 5.394E+03 | 46.86 | 0.670 | - |
| 545.54 | 136.40 | 1213. | 688. | 1.563E+04 | 9.11 | 0.979 | - |
| 629.48 | 157.37 | 627. | 39. | 9.644E+02 | 92.20 | 0.441 | - c |
| 842.63 | 210.61 | 900. | 83. | 2.456E+03 | 58.19 | 0.661 | - s |
| 1090.83 | 272.61 | 495. | 73. | 2.587E+03 | 46.14 | 0.594 | - s |
| 1330.98 | 332.61 | 884. | 124. | 5.010E+03 | 44.81 | 0.910 | - |
| 2486.71 | 621.40 | 501. | 108. | 6.835E+03 | 40.97 | 0.412 | - s |
| 2879.89 | 719.67 | 427. | 90. | 6.393E+03 | 45.03 | 0.665 | - s |
| 3254.07 | 813.20 | 660. | 114. | 8.842E+03 | 49.57 | 0.696 | - s |
| 3605.81 | 901.13 | 695. | 12. | 1.042E+03 | 301.14 | 1.640 | - sc |
| 3900.95 | 974.92 | 936. | 130. | 1.157E+04 | 55.88 | 0.655 | - s |
| 4583.05 | 1145.48 | 294. | 114. | 1.153E+04 | 31.99 | 0.244 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.92 | 46.58 | 11142. | 46316. | 12.866 | 0.64 | 0.818 |
| AM-241 | 237.87 | 59.56 | 10162. | 47477. | 13.188 | 0.63 | 0.799 |
| CD-109 | 351.53 | 87.94 | 5716. | 26078. | 7.244 | 0.87 | 0.855 |
| CO-57 | 487.71 | 121.96 | 2782. | 6006. | 1.668 | 2.27 | 0.932 |
| Ce-139 | 663.45 | 165.85 | 1658. | 1078. | 0.300 | 7.99 | 0.995s |
| SN-113 | 1567.82 | 391.78 | 1043. | 370. | 0.103 | 17.84 | 1.118 |
| CS-137 | 2648.06 | 661.73 | 971. | 19442. | 5.401 | 0.81 | 1.437 |
| Y-898 | 3593.36 | 898.02 | 795. | 310. | 0.086 | 14.06 | 1.637D |
| Co-1173 | 4693.90 | 1173.20 | 663. | 18293. | 5.081 | 0.84 | 1.858 |
| Co-1332 | 5330.66 | 1332.46 | 231. | 16679. | 4.633 | 0.82 | 1.949 |
| Y-1836 | 7344.33 | 1836.29 | 27. | 148. | 0.041 | 9.58 | 2.454 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 11:28:58 AM Page 4
TestAmerica Spectrum name: 3_TunaCan2nd_20120999.An1

```
 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             Bq/Sample     keV     Bq/Sample     Bq/Sample      COMMENTS
 ____________________________________________________________________________

Pb-210   N   1.4654E+04                                      8.15E+03
                            46.54 1.465E+04  (P 1.565E+02 6.36E-01 4.25E+00 G

AM-241       1.1650E+03                                      1.58E+05
                            59.54 1.165E+03  (  1.159E+01 6.31E-01 3.57E+01 G

CD-109       1.5485E+04                                      4.63E+02
                            88.03 1.549E+04  (  2.108E+02 8.73E-01 3.61E+00 G

CO-57        3.4265E+02                                      2.72E+02
                           122.06 3.426E+02  (  1.418E+01 2.27E+00 8.56E+01 G

Ce-139       5.7768E+02                                      1.38E+02
                           165.85 5.777E+02 *(  1.031E+02 7.99E+00 7.99E+01 G

Hg-203       1.3708E-02                                      4.66E+01
                           279.17 1.371E-02 %(  2.387E+00 5.21E+03 8.15E+01 G

SN-113       9.9863E+02                                      1.15E+02
                           391.69 9.986E+02  (  4.131E+02 1.78E+01 6.40E+01 G

CS-137       4.4373E+02                                      1.10E+04
                           661.66 4.437E+02  (  3.375E+00 8.12E-01 8.52E+01 G

Y-898        1.5527E+03                                      1.07E+02
                           898.02 1.553E+03  (  6.719E+02 1.41E+01 9.37E+01 G

Co-1173      7.0009E+02                                      1.93E+03
                          1173.24 7.001E+02  (  4.695E+00 8.38E-01 9.99E+01 G

Co-1332      7.0411E+02                                      1.93E+03
                          1332.50 7.041E+02  (  3.104E+00 8.16E-01 1.00E+02 G

Y-1836       1.2247E+03                                      1.07E+02
                          1836.01 1.225E+03 ?(  2.214E+02 9.58E+00 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
```



```
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
```

to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting | 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | 1.3671E+04 | 1.4654E+04 | 6.370E-01% | | 1.56E+02 |
| AM-241 | 1.1608E+03 | 1.1650E+03 | 6.312E-01% | | 1.16E+01 |
| CD-109 | 4.5562E+03 | 1.5485E+04 | 8.727E-01% | | 2.11E+02 |
| CO-57 | 4.2711E+01 | 3.4265E+02 | 2.266E+00% | | 1.42E+01 |
| Ce-139 # | 9.4613E+00 | 5.7768E+02 | 7.994E+00% | | 1.03E+02 |
| Hg-203 #A | 1.3708E-02 | >12 Halflives | 5.2116E+03% | 2.3868E+00 | |
| SN-113 | 7.3077E+00 | 9.9863E+02 | 1.784E+01% | | 4.13E+02 |
| CS-137 | 4.2144E+02 | 4.4373E+02 | 8.123E-01% | | 3.38E+00 |
| Y-898 | 7.6802E+00 | 1.5527E+03 | 1.406E+01% | | 6.72E+02 |
| Co-1173 | 5.2177E+02 | 7.0009E+02 | 8.377E-01% | | 4.70E+00 |
| Co-1332 | 5.2477E+02 | 7.0411E+02 | 8.161E-01% | | 3.10E+00 |
| Y-1836 # | 6.0578E+00 | 1.2247E+03 | 9.579E+00% | | 2.21E+02 |

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 11:28:58 AM Page 6
TestAmerica Spectrum name: 3_TunaCan2nd_20120999.An1

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 974.7 to 2000.4 keV) 2.093E+04 Bq/Sample
Total Decayed Activity ( 974.7 to 2000.4 keV) 3.7848984E+04 Bq/Sample

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge5 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1160.9 | 99.7 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 442.36 | 95.1 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 700.21 | 94.3 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 701.86 | 94.6 |

Reviewed By: Jody Watson

Date: 3/27/2012

```
     ORTEC g v - i (3263) Env32  G53W4.25  3/28/2012 7:35:49 AM    Page  1
TestAmerica                     Spectrum name: 5_TunaCan2nd_20120813.An1

Sample description
     5_TunaCan2nd_Rad10_032712


Spectrum Filename: C:\User\SPC\Det5\5_TunaCan2nd_20120813.An1

Acquisition information
       Start time:                 3/27/2012 10:12:05 AM
       Live time:               7200
       Real time:               7250
       Dead time:                  0.69 %
       Detector ID:                    5

Detector system
     Ge 5 SN/157


Calibration
       Filename:                   5_Soil_TunaCan.Clb
     5_Soil_TunaCan_90099_032612


       Energy Calibration
            Created:               3/27/2012 5:20:02 PM
            Zero offset:           0.135 keV
            Gain:                  0.250 keV/channel
            Quadratic:             2.720E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/27/2012 5:20:37 PM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.87 %
            Log(Eff):              6.466115E-01 + (-7.830454E-01*Log(E) ) +
                                   ( -4.117504E-03*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.43 %
            Log(Eff):             -2.462251E+01 + ( 9.075211E+00*Log(E) ) +
                                   ( -9.664422E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.61keV )
       Stop channel:            8000 (  2000.53keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (3263) Env32  G53W4.25  3/28/2012 7:35:49 AM    Page  2
TestAmerica                     Spectrum name: 5_TunaCan2nd_20120813.An1
                                      Page 1
```

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: average of three points.

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 5_2012-02-26_0305.PBC 2/26/2012 3:05:30 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 33.1557

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.81 | 1005. | 12.08 | 0.62 | 1.151E-02 | | | | |
| 46.61 | 72616. | 0.49 | 0.73 | 1.792E-02 | 46.54 | 4.250 | 1.421E+04 | Pb210 |
| 49.73 | 1326. | 15.18 | 0.68 | 1.987E-02 | | | | |
| 59.57 | 75329. | 0.49 | 0.74 | 2.535E-02 | 59.54 | 35.700 | 1.161E+03 | AM241 |
| 87.94 | 40851. | 0.68 | 0.80 | 3.460E-02 | 88.03 | 3.610 | 1.542E+04 | CD109 |
| 96.44 | 148. | 47.31 | 0.80 | 3.568E-02 | | | | |
| 99.01 | 160. | 48.52 | 0.81 | 3.589E-02 | | | | |
| 105.59 | 109. | 69.79 | 0.52 | 3.619E-02 | | | | |
| 121.94 | 9225. | 1.66 | 0.84 | 3.583E-02 | 122.06 | 85.600 | 3.348E+02 | CO57 |
| 129.89 | 126. | 62.97 | 0.30 | 3.522E-02 | | | | |
| 136.43 | 1263. | 7.42 | 0.90 | 3.457E-02 | | | | |
| 165.86 | 1574. | 6.14 | 0.84 | 3.133E-02 | 165.85 | 79.900 | 5.319E+02 | Ce139 |
| 238.72 | 327. | 27.04 | 0.86 | 2.319E-02 | | | | |
| 247.25 | 57. | 84.47 | 0.31 | 2.252E-02 | | | | |
| 259.02 | 93. | 60.17 | 0.97 | 2.167E-02 | | | | |
| 260.46 | 98. | 58.62 | 0.97 | 2.157E-02 | | | | |
| 322.65 | 45. | 91.14 | 0.46 | 1.806E-02 | | | | |
| 351.63 | 256. | 27.79 | 1.06 | 1.681E-02 | | | | |
| 391.95 | 494. | 16.33 | 1.15 | 1.536E-02 | 391.69 | 64.000 | 9.501E+02 | SN113 |
| 407.02 | 43. | 90.43 | 0.56 | 1.489E-02 | | | | |
| 412.80 | 202. | 35.90 | 0.77 | 1.471E-02 | | | | |
| 420.83 | 123. | 52.91 | 0.72 | 1.448E-02 | | | | |
| 510.72 | 188. | 44.32 | 0.50 | 1.232E-02 | | | | |
| 542.81 | 148. | 28.69 | 0.36 | 1.171E-02 | | | | |
| 583.30 | 161. | 33.50 | 0.69 | 1.103E-02 | | | | |
| 661.70 | 25605. | 0.71 | 1.39 | 9.924E-03 | 661.66 | 85.210 | 4.424E+02 | CS137 |
| 762.61 | 129. | 36.06 | 0.79 | 8.812E-03 | | | | |
| 796.90 | 151. | 38.71 | 0.30 | 8.493E-03 | | | | |
| 886.67 | 129. | 46.77 | 0.30 | 7.766E-03 | | | | |
| 897.77 | 428. | 19.21 | 1.38 | 7.686E-03 | 898.02 | 93.700 | 1.665E+03 | Y898 |
| 932.49 | 230. | 35.52 | 0.82 | 7.445E-03 | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1008.65 | 104. | 56.29 | 0.28 | 6.970E-03 | | | | |
| 1173.15 | 23044. | 0.73 | 1.79 | 6.138E-03 | 1173.24 | 99.900 | 7.002E+02 | Co1173 |
| 1332.39 | 20769. | 0.71 | 1.87 | 5.515E-03 | 1332.50 | 99.982 | 7.019E+02 | Co1332 |
| 1836.05 | 245. | 7.47 | 1.56 | 4.208E-03 | 1836.01 | 99.200 | 1.642E+03 | Y1836 |

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 146.78 | 36.81 | 4847. | 1005. | 8.731E+04 | 12.08 | 0.625 | - |
| 198.52 | 49.73 | 12365. | 1326. | 6.673E+04 | 15.18 | 0.681 | - s |
| 385.40 | 96.42 | 1874. | 90. | 2.532E+03 | 71.31 | 0.588 | - sc |
| 395.68 | 98.99 | 2103. | 121. | 3.381E+03 | 58.44 | 0.394 | - s |

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 7:35:49 AM Page 3
TestAmerica Spectrum name: 5_TunaCan2nd_20120813.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 422.09 | 105.59 | 2271. | 109. | 3.012E+03 | 69.79 | 0.518 | - sc |
| 519.32 | 129.89 | 2194. | 126. | 3.592E+03 | 62.97 | 0.298 | - s |
| 545.51 | 136.43 | 2377. | 1263. | 3.654E+04 | 7.42 | 0.900 | - s |
| 954.90 | 238.72 | 2247. | 327. | 1.410E+04 | 27.04 | 0.863 | - sM |
| 989.00 | 247.25 | 1031. | 57. | 2.516E+03 | 84.47 | 0.312 | - sc |
| 1036.13 | 259.01 | 1532. | 93. | 4.309E+03 | 60.17 | 0.968 | - D |
| 1041.90 | 260.46 | 1588. | 98. | 4.525E+03 | 58.62 | 0.970 | - D |
| 1290.76 | 322.65 | 744. | 45. | 2.473E+03 | 91.14 | 0.455 | - c |
| 1406.70 | 351.63 | 1442. | 256. | 1.523E+04 | 27.79 | 1.058 | - s |
| 1628.36 | 407.02 | 667. | 43. | 2.866E+03 | 90.43 | 0.562 | - sc |
| 1651.47 | 412.80 | 1438. | 202. | 1.370E+04 | 35.90 | 0.775 | - s |
| 1683.60 | 420.83 | 1291. | 123. | 8.472E+03 | 52.91 | 0.720 | - s |
| 2043.25 | 510.72 | 1553. | 188. | 1.523E+04 | 44.32 | 0.503 | - s |
| 2171.67 | 542.81 | 587. | 148. | 1.267E+04 | 28.69 | 0.362 | - s |
| 2333.63 | 583.30 | 785. | 161. | 1.460E+04 | 33.50 | 0.694 | - s |
| 3050.97 | 762.61 | 614. | 129. | 1.468E+04 | 36.06 | 0.794 | - s |
| 3188.11 | 796.90 | 856. | 151. | 1.782E+04 | 38.71 | 0.295 | - s |
| 3547.15 | 886.67 | 963. | 129. | 1.665E+04 | 46.77 | 0.296 | - s |
| 3730.41 | 932.49 | 1438. | 230. | 3.096E+04 | 35.52 | 0.818 | - s |
| 4035.01 | 1008.65 | 864. | 104. | 1.490E+04 | 56.29 | 0.275 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 186.01 | 46.61 | 16470. | 72552. | 10.077 | 0.49 | 0.733 |
| AM-241 | 237.88 | 59.57 | 15419. | 75329. | 10.462 | 0.49 | 0.735 |
| CD-109 | 351.46 | 87.94 | 8772. | 40851. | 5.674 | 0.68 | 0.804 |
| CO-57 | 487.54 | 121.94 | 3880. | 9225. | 1.281 | 1.66 | 0.838 |
| Ce-139 | 663.30 | 165.86 | 2329. | 1574. | 0.219 | 6.14 | 0.840 |
| SN-113 | 1568.04 | 391.95 | 1640. | 494. | 0.069 | 16.33 | 1.153 |
| CS-137 | 2647.28 | 661.70 | 1362. | 25582. | 3.553 | 0.71 | 1.394 |
| Y-898 | 3591.55 | 897.77 | 1410. | 428. | 0.060 | 19.21 | 1.376 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Co-1173 | 4692.83 | 1173.15 | 788. | 23044. | 3.201 | 0.73 | 1.786 |
| Co-1332 | 5329.55 | 1332.39 | 98. | 20769. | 2.885 | 0.71 | 1.870 |
| Y-1836 | 7342.76 | 1836.05 | 15. | 245. | 0.034 | 7.47 | 1.556s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 7:35:49 AM Page 4
TestAmerica Spectrum name: 5_TunaCan2nd_20120813.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4212E+04 | | | | 8.15E+03 | |
| | | | 46.54 | 1.421E+04 | (P | 1.177E+02 4.91E-01 4.25E+00 | G |
| AM-241 | | 1.1609E+03 | | | | 1.58E+05 | |
| | | | 59.54 | 1.161E+03 | ( | 8.959E+00 4.87E-01 3.57E+01 | G |
| CD-109 | | 1.5419E+04 | | | | 4.63E+02 | |
| | | | 88.03 | 1.542E+04 | ( | 1.658E+02 6.81E-01 3.61E+00 | G |
| CO-57 | | 3.3478E+02 | | | | 2.72E+02 | |
| | | | 122.06 | 3.348E+02 | ( | 1.063E+01 1.66E+00 8.56E+01 | G |
| Ce-139 | | 5.3191E+02 | | | | 1.38E+02 | |
| | | | 165.85 | 5.319E+02 | ( | 7.689E+01 6.14E+00 7.99E+01 | G |
| Hg-203 | | -6.5193E-03 | | | | 4.66E+01 | |
| | | | 279.17 | -6.519E-03 | %( | 1.788E+00 8.22E+03 8.15E+01 | G |
| SN-113 | | 9.5011E+02 | | | | 1.15E+02 | |
| | | | 391.69 | 9.501E+02 | ( | 3.682E+02 1.63E+01 6.40E+01 | G |
| CS-137 | | 4.4236E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 4.424E+02 | (P | 3.020E+00 7.12E-01 8.52E+01 | G |
| Y-898 | | 1.6655E+03 | | | | 1.07E+02 | |
| | | | 898.02 | 1.665E+03 | ( | 6.908E+02 1.92E+01 9.37E+01 | G |
| Co-1173 | | 7.0021E+02 | | | | 1.93E+03 | |
| | | | 1173.24 | 7.002E+02 | ( | 4.056E+00 7.32E-01 9.99E+01 | G |
| Co-1332 | | 7.0186E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.019E+02 | ( | 1.651E+00 7.07E-01 1.00E+02 | G |
| Y-1836 | | 1.6424E+03 | | | | 1.07E+02 | |
| | | | 1836.01 | 1.642E+03 | ( | 1.392E+02 7.47E+00 9.92E+01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.

@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|
| Pb-210 | 1.3259E+04 | 1.4212E+04 | 4.918E-01% | 1.18E+02 |
| AM-241 | 1.1568E+03 | 1.1609E+03 | 4.867E-01% | 8.96E+00 |
| CD-109 | 4.5403E+03 | 1.5419E+04 | 6.810E-01% | 1.66E+02 |
| CO-57 | 4.1787E+01 | 3.3478E+02 | 1.660E+00% | 1.06E+01 |
| Ce-139 | 8.7347E+00 | 5.3191E+02 | 6.138E+00% | 7.69E+01 |
| Hg-203 #A | -6.5193E-03 | >12 Halflives | 8.2197E+03% | 1.7882E+00 |
| SN-113 | 6.9747E+00 | 9.5011E+02 | 1.633E+01% | 3.68E+02 |
| CS-137 | 4.2015E+02 | 4.4236E+02 | 7.122E-01% | 3.02E+00 |
| Y-898 | 8.2662E+00 | 1.6655E+03 | 1.921E+01% | 6.91E+02 |
| Co-1173 | 5.2196E+02 | 7.0021E+02 | 7.316E-01% | 4.06E+00 |
| Co-1332 | 5.2320E+02 | 7.0186E+02 | 7.069E-01% | 1.65E+00 |
| Y-1836 | 8.1520E+00 | 1.6424E+03 | 7.471E+00% | 1.39E+02 |



# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.

```
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (  279.0 to  2000.5 keV)     2.050E+04  Bq/Sample
Total Decayed Activity (  279.0 to  2000.5 keV) 3.7761527E+04  Bq/Sample
```

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge7 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1150.4 | 98.8 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 440.47 | 94.7 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 681.72 | 91.9 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 692.1 | 93.2 |

Reviewed By: Jody Watson

Date: 3/27/2012

```
     ORTEC g v - i (3263) Env32  G53W4.25  3/28/2012 8:52:25 AM
TestAmerica                      Spectrum name: 7_TunaCan2ndSource_20120479.An1

Sample description
     7_TunaCan2ndSource_81427-334_032712


Spectrum Filename: C:\User\SPC\Det7\7_TunaCan2ndSource_20120479.An1

Acquisition information
       Start time:                 3/27/2012 3:25:25 PM
       Live time:               3600
       Real time:               3684
       Dead time:                  2.28 %
       Detector ID:                   7

Detector system
     Ge 7 SN/154


Calibration
       Filename:                   7_Soil_TunaCan.Clb
     7_TunaCan_90099_032712


       Energy Calibration
            Created:               3/16/2012 11:44:50 AM
            Zero offset:           0.153 keV
            Gain:                  0.250 keV/channel
            Quadratic:             6.716E-09 keV/channel^2

       Efficiency Calibration
            Created:               3/16/2012 11:45:14 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.87 %
            Log(Eff):              6.716580E-01 + (-6.166540E-01*Log(E) ) +
                                   ( -2.065917E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.48 %
            Log(Eff):             -2.689695E+01 + ( 1.019544E+01*Log(E) ) +
                                   ( -1.081671E+00*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.65keV )
       Stop channel:            8000 (  2000.21keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 8:52:25 AM
TestAmerica Spectrum name: 7_TunaCan2ndSource_20120479.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 7_2012-02-26_0327.PBC 2/26/2012 3:27:47 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0270

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.65 | 788. | 12.78 | 0.82 | 1.487E-02 | | | | |
| 40.49 | 109. | 96.90 | 0.59 | 1.869E-02 | | | | |
| 46.62 | 49142. | 0.63 | 0.84 | 2.491E-02 | 46.54 | 4.250 | 1.386E+04 | Pb210 |
| 49.64 | 876. | 18.72 | 0.86 | 2.792E-02 | | | | |
| 59.61 | 54530. | 0.58 | 0.87 | 3.707E-02 | 59.54 | 35.700 | 1.150E+03 | AM241 |
| 76.99 | 260. | 38.90 | 1.03 | 4.881E-02 | | | | |
| 88.06 | 31019. | 0.77 | 0.89 | 5.329E-02 | 88.03 | 3.610 | 1.522E+04 | CD109 |
| 122.04 | 6834. | 2.04 | 0.94 | 5.606E-02 | 122.06 | 85.600 | 3.171E+02 | CO57 |
| 136.41 | 810. | 9.51 | 1.00 | 5.411E-02 | | | | |
| 165.84 | 1193. | 6.45 | 0.96 | 4.765E-02 | 165.85 | 79.900 | 5.180E+02 | Ce139 |
| 185.66 | 92. | 57.01 | 0.73 | 4.445E-02 | | | | |
| 213.19 | 122. | 50.56 | 0.75 | 3.960E-02 | | | | |
| 272.80 | 146. | 47.29 | 0.28 | 3.217E-02 | | | | |
| 391.67 | 372. | 19.60 | 1.11 | 2.360E-02 | 391.69 | 64.000 | 9.332E+02 | SN113 |
| 442.91 | 47. | 93.72 | 0.45 | 2.122E-02 | | | | |
| 483.77 | 95. | 38.10 | 0.62 | 1.965E-02 | | | | |
| 524.63 | 67. | 65.12 | 0.73 | 1.831E-02 | | | | |
| 604.78 | 31. | 59.37 | 0.27 | 1.616E-02 | | | | |
| 628.99 | 32. | 94.37 | 0.58 | 1.561E-02 | | | | |
| 661.67 | 19152. | 0.86 | 1.47 | 1.492E-02 | 661.66 | 85.210 | 4.405E+02 | CS137 |
| 898.03 | 322. | 23.53 | 1.90 | 1.137E-02 | 898.02 | 93.700 | 1.694E+03 | Y898 |
| 910.18 | 180. | 33.99 | 0.85 | 1.123E-02 | | | | |
| 963.79 | 49. | 71.39 | 0.69 | 1.067E-02 | | | | |
| 1173.23 | 16317. | 0.86 | 1.89 | 8.929E-03 | 1173.24 | 99.900 | 6.817E+02 | Co1173 |
| 1332.49 | 14763. | 0.85 | 2.04 | 7.951E-03 | 1332.50 | 99.982 | 6.921E+02 | Co1332 |
| 1836.09 | 186. | 9.19 | 1.40 | 5.919E-03 | 1836.01 | 99.200 | 1.780E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 146.00 | 36.65 | 3116. | 788. | 5.300E+04 | 12.78 | 0.819 | - | |
| 161.37 | 40.49 | 4419. | 109. | 5.831E+03 | 96.90 | 0.587 | - | c |
| 197.99 | 49.64 | 8222. | 876. | [illegible] | 18.72 | 0.855 | - | sM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 307.39 | 76.99 | 3728. | 260. | 5.319E+03 | 38.90 | 1.033 | - |

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 8:52:25 AM
TestAmerica Spectrum name: 7_TunaCan2ndSource_20120479.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 545.11 | 136.41 | 1706. | 810. | 1.497E+04 | 9.51 | 1.002 | - | |
| 742.15 | 185.66 | 1076. | 92. | 2.081E+03 | 57.01 | 0.725 | - | s |
| 852.30 | 213.19 | 1296. | 122. | 3.077E+03 | 50.56 | 0.748 | - | s |
| 1090.74 | 272.80 | 1320. | 146. | 4.539E+03 | 47.29 | 0.283 | - | s |
| 1771.26 | 442.91 | 710. | 47. | 2.215E+03 | 93.72 | 0.453 | - | sc |
| 1934.71 | 483.77 | 486. | 95. | 4.835E+03 | 38.10 | 0.616 | - | s |
| 2098.18 | 524.63 | 583. | 67. | 3.669E+03 | 65.12 | 0.732 | - | s |
| 2418.80 | 604.78 | 172. | 31. | 1.939E+03 | 59.37 | 0.268 | - | s |
| 2515.62 | 628.99 | 330. | 32. | 2.050E+03 | 94.37 | 0.581 | - | sc |
| 3640.41 | 910.18 | 855. | 180. | 1.603E+04 | 33.99 | 0.852 | - | s |
| 3854.87 | 963.79 | 447. | 49. | 4.625E+03 | 71.39 | 0.695 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.90 | 46.62 | 12530. | 49107. | 13.641 | 0.63 | 0.840 |
| AM-241 | 237.87 | 59.61 | 10985. | 54530. | 15.147 | 0.58 | 0.871 |
| CD-109 | 351.70 | 88.06 | 6100. | 31019. | 8.616 | 0.77 | 0.892 |
| CO-57 | 487.62 | 122.04 | 3040. | 6834. | 1.898 | 2.04 | 0.937 |
| Ce-139 | 662.88 | 165.84 | 1495. | 1193. | 0.331 | 6.45 | 0.956 |
| Hg-203 | 1114.79 | 278.81 | 2119. | -42. | -0.012 | 155.58 | 1.105s |
| SN-113 | 1566.31 | 391.67 | 1236. | 372. | 0.103 | 19.60 | 1.107 |
| CS-137 | 2646.35 | 661.67 | 1156. | 19152. | 5.320 | 0.86 | 1.474 |
| Y-898 | 3591.81 | 898.03 | 1084. | 322. | 0.089 | 23.53 | 1.897 |
| Co-1173 | 4692.59 | 1173.23 | 493. | 16317. | 4.532 | 0.86 | 1.893 |
| Co-1332 | 5329.55 | 1332.49 | 127. | 14763. | 4.101 | 0.85 | 2.038 |
| Y-1836 | 7343.66 | 1836.09 | 16. | 186. | 0.052 | 9.19 | 1.399s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 8:52:25 AM
TestAmerica Spectrum name: 7_TunaCan2ndSource_20120479.An1

```
*****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average      ------------- Peak -------------
Name   Code  Activity     Energy   Activity Code MDA Value
             Bq/Sample     keV     Bq/Sample     Bq/Sample      COMMENTS
_____________________________________________________________________________

Pb-210   N   1.3857E+04                                        8.15E+03
                            46.54 1.386E+04  (P 1.480E+02 6.34E-01 4.25E+00 G

AM-241       1.1504E+03                                        1.58E+05
                            59.54 1.150E+03  (  1.036E+01 5.81E-01 3.57E+01 G

CD-109       1.5217E+04                                        4.63E+02
                            88.03 1.522E+04  (  1.799E+02 7.73E-01 3.61E+00 G

CO-57        3.1712E+02                                        2.72E+02
                           122.06 3.171E+02  (  1.205E+01 2.04E+00 8.56E+01 G

Ce-139       5.1801E+02                                        1.38E+02
                           165.85 5.180E+02  (  7.941E+01 6.45E+00 7.99E+01 G

Hg-203      -4.5441E-01                                        4.66E+01
                           279.17-4.544E-01 ?(  2.347E+00 1.56E+02 8.15E+01 G

SN-113       9.3315E+02                                        1.15E+02
                           391.69 9.332E+02  (  4.178E+02 1.96E+01 6.40E+01 G

CS-137       4.4047E+02                                        1.10E+04
                           661.66 4.405E+02  (  3.706E+00 8.56E-01 8.52E+01 G

Y-898        1.6944E+03                                        1.07E+02
                           898.02 1.694E+03  (  8.216E+02 2.35E+01 9.37E+01 G

Co-1173      6.8172E+02                                        1.93E+03
                          1173.24 6.817E+02  (  4.436E+00 8.58E-01 9.99E+01 G

Co-1332      6.9210E+02                                        1.93E+03
                          1332.50 6.921E+02  (  2.586E+00 8.49E-01 1.00E+02 G

Y-1836       1.7801E+03                                        1.07E+02
                          1836.01 1.780E+03  (  2.065E+02 9.19E+00 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
```

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 8:52:25 AM
TestAmerica Spectrum name: 7_TunaCan2ndSource_20120479.An1

@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| Hg-203 | 278.81 | 2119. | -42. | -0.012 | 155.58 | 0.000E+00 |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting | 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | 1.2927E+04 | 1.3857E+04 | 6.344E-01% | | 1.48E+02 |
| AM-241 | 1.1462E+03 | 1.1504E+03 | 5.808E-01% | | 1.04E+01 |
| CD-109 | 4.4794E+03 | 1.5217E+04 | 7.727E-01% | | 1.80E+02 |
| CO-57 | 3.9561E+01 | 3.1712E+02 | 2.043E+00% | | 1.20E+01 |
| Ce-139 | 8.4971E+00 | 5.1801E+02 | 6.453E+00% | | 7.94E+01 |
| Hg-203 #A | -4.5441E-01 | >12 Halflives | 1.5558E+02% | 2.3474E+00 | |
| SN-113 | 6.8413E+00 | 9.3315E+02 | 1.960E+01% | | 4.18E+02 |
| CS-137 | 4.1835E+02 | 4.4047E+02 | 8.557E-01% | | 3.71E+00 |
| Y-898 | 8.3979E+00 | 1.6944E+03 | 2.353E+01% | | 8.22E+02 |
| Co-1173 | 5.0814E+02 | 6.8172E+02 | 8.581E-01% | | 4.44E+00 |
| Co-1332 | 5.1588E+02 | 6.9210E+02 | 8.485E-01% | | 2.59E+00 |
| Y-1836 | 8.8227E+00 | 1.7801E+03 | 9.190E+00% | | 2.07E+02 |

ORTEC g v - i (3263) Env32 G53W4.25 3/28/2012 8:52:25 AM
TestAmerica Spectrum name: 7_TunaCan2ndSource_20120479.An1

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.6 to 2000.2 keV) 2.007E+04 Bq/Sample
Total Decayed Activity ( 37.6 to 2000.2 keV) 3.7281199E+04 Bq/Sample

Analyzed by: _____
Admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge8 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1175.4 | 101.0 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 446.61 | 96.0 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 697.22 | 93.9 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 691.92 | 93.2 |

Reviewed By: Jody Watson

Date: 3/29/2012

```
     ORTEC g v - i (3263) Env32  G53W4.25  3/29/2012 7:45:38 AM    Page  1
TestAmerica                     Spectrum name: 8_TunaCan2nd_20120697.An1

Sample description
     8_TunaCan_81427-334_2ndsource_032912


Spectrum Filename: C:\User\SPC\Det8\8_TunaCan2nd_20120697.An1

Acquisition information
       Start time:                 3/29/2012 1:58:04 AM
       Live time:               3600
       Real time:               3622
       Dead time:                  0.61 %
       Detector ID:                    8

Detector system
     Ge 8 SN/174


Calibration
       Filename:                   8_Soil_TunaCan.Clb
     8_Soil_TunaCan_90099_032712


       Energy Calibration
            Created:               3/28/2012 10:35:07 AM
            Zero offset:           0.050 keV
            Gain:                  0.250 keV/channel
            Quadratic:             8.067E-10 keV/channel^2

       Efficiency Calibration
            Created:               3/28/2012 10:35:20 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.39 %
            Log(Eff):             -1.098764E-01 + (-4.958544E-01*Log(E) ) +
                                   ( -2.572270E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.71 %
            Log(Eff):             -2.525301E+01 + ( 9.398253E+00*Log(E) ) +
                                   ( -1.000034E+00*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.55keV )
       Stop channel:            8000 (  2000.30keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (3263) Env32  G53W4.25  3/29/2012 7:45:38 AM    Page  2
TestAmerica                     Spectrum name: 8_TunaCan2nd_20120697.An1
                                      Page 1
```

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: average of three points.

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 8_2012-03-02_0402.PBC 3/2/2012 4:02:11 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 27.9595

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.61 | 594. | 17.47 | 1.15 | 1.254E-02 | | | | |
| 46.53 | 38495. | 0.62 | 0.95 | 2.001E-02 | 46.54 | 4.250 | 1.345E+04 | Pb210 |
| 49.81 | 542. | 25.92 | 1.04 | 2.243E-02 | | | | |
| 59.48 | 43371. | 0.71 | 0.98 | 2.878E-02 | 59.54 | 35.700 | 1.175E+03 | AM241 |
| 84.86 | 327. | 26.82 | 0.98 | 3.922E-02 | | | | |
| 88.03 | 22911. | 0.76 | 0.98 | 3.992E-02 | 88.03 | 3.610 | 1.504E+04 | CD109 |
| 122.06 | 5318. | 2.55 | 1.03 | 4.146E-02 | 122.06 | 85.600 | 3.349E+02 | CO57 |
| 136.54 | 691. | 14.03 | 0.89 | 3.998E-02 | | | | |
| 165.93 | 1033. | 8.62 | 1.19 | 3.628E-02 | 165.85 | 79.900 | 6.077E+02 | Ce139 |
| 177.05 | 71. | 70.08 | 0.69 | 3.453E-02 | | | | |
| 185.74 | 128. | 40.98 | 0.85 | 3.329E-02 | | | | |
| 227.93 | 52. | 65.04 | 0.45 | 2.844E-02 | | | | |
| 270.79 | 87. | 50.41 | 0.41 | 2.486E-02 | | | | |
| 278.94 | 44. | 131.33 | 1.13 | 2.428E-02 | 279.17 | 81.500 | HL>Cutoff | Hg203 |
| 302.52 | 63. | 54.81 | 0.69 | 2.279E-02 | | | | |
| 370.09 | 35. | 84.23 | 0.41 | 1.941E-02 | | | | |
| 391.61 | 316. | 17.91 | 0.81 | 1.855E-02 | 391.69 | 64.000 | 1.016E+03 | SN113 |
| 409.22 | 93. | 50.95 | 0.41 | 1.791E-02 | | | | |
| 428.24 | 88. | 46.51 | 0.39 | 1.726E-02 | | | | |
| 564.57 | 72. | 45.26 | 0.57 | 1.378E-02 | | | | |
| 591.73 | 73. | 42.60 | 0.61 | 1.326E-02 | | | | |
| 661.62 | 15734. | 0.88 | 1.38 | 1.209E-02 | 661.66 | 85.210 | 4.466E+02 | CS137 |
| 720.39 | 41. | 72.89 | 0.46 | 1.126E-02 | | | | |
| 831.73 | 36. | 50.61 | 0.44 | 9.986E-03 | | | | |
| 897.91 | 396. | 17.93 | 1.52 | 9.360E-03 | 898.02 | 93.700 | 2.554E+03 | Y898 |
| 1092.31 | 69. | 44.41 | 0.50 | 7.924E-03 | | | | |
| 1173.30 | 13922. | 0.92 | 1.73 | 7.452E-03 | 1173.24 | 99.900 | 6.972E+02 | Co1173 |
| 1332.56 | 12390. | 0.92 | 1.75 | 6.677E-03 | 1332.50 | 99.982 | 6.919E+02 | Co1332 |
| 1836.18 | 152. | 9.00 | 1.63 | 5.046E-03 | 1836.01 | 99.200 | 1.724E+03 | Y1836 |

8_TunaCan2nd_20120697

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 146.23 | 36.61 | 3218. | 594. | 4.742E+04 | 17.47 | 1.147 | - s |
| 199.01 | 49.81 | 6400. | 542. | 2.416E+04 | 25.92 | 1.039 | - sM |
| 339.16 | 84.85 | 3491. | 236. | 6.026E+03 | 42.58 | 0.697 | - sM |

ORTEC g v - i (3263) Env32 G53W4.25 3/29/2012 7:45:38 AM Page 3
TestAmerica Spectrum name: 8_TunaCan2nd_20120697.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 545.91 | 136.54 | 2178. | 691. | 1.728E+04 | 14.03 | 0.888 | - |
| 707.94 | 177.05 | 893. | 71. | 2.046E+03 | 70.08 | 0.693 | - sM |
| 742.68 | 185.74 | 978. | 128. | 3.835E+03 | 40.98 | 0.847 | - sM |
| 911.43 | 227.93 | 546. | 52. | 1.829E+03 | 65.04 | 0.445 | - sc |
| 1082.86 | 270.79 | 683. | 87. | 3.486E+03 | 50.41 | 0.413 | - sM |
| 1209.76 | 302.52 | 484. | 63. | 2.765E+03 | 54.81 | 0.692 | - s |
| 1480.00 | 370.09 | 385. | 35. | 1.803E+03 | 84.23 | 0.412 | - sc |
| 1636.49 | 409.22 | 685. | 93. | 5.212E+03 | 50.95 | 0.407 | - s |
| 1712.56 | 428.24 | 565. | 88. | 5.117E+03 | 46.51 | 0.393 | - s |
| 2257.86 | 564.57 | 330. | 72. | 5.224E+03 | 45.26 | 0.565 | - s |
| 2366.45 | 591.73 | 298. | 73. | 5.505E+03 | 42.60 | 0.613 | - s |
| 2881.06 | 720.39 | 284. | 41. | 3.640E+03 | 72.89 | 0.464 | - s |
| 3326.37 | 831.73 | 148. | 36. | 3.605E+03 | 50.61 | 0.439 | - s |
| 4368.55 | 1092.31 | 290. | 69. | 8.708E+03 | 44.41 | 0.495 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.71 | 46.48 | 12173. | 40702. | 11.306 | 0.74 | 0.992 |
| AM-241 | 237.70 | 59.48 | 10649. | 43371. | 12.047 | 0.71 | 0.984 |
| CD-109 | 351.85 | 88.02 | 4506. | 23196. | 6.443 | 0.88 | 1.056 |
| CO-57 | 487.99 | 122.06 | 2908. | 5318. | 1.477 | 2.55 | 1.026 |
| Ce-139 | 663.47 | 165.93 | 1722. | 1033. | 0.287 | 8.62 | 1.189s |
| Hg-203 | 1115.46 | 278.94 | 1642. | 44. | 0.012 | 131.33 | 1.133 |
| SN-113 | 1566.07 | 391.61 | 822. | 316. | 0.088 | 17.91 | 0.806s |
| CS-137 | 2646.01 | 661.62 | 665. | 15731. | 4.370 | 0.88 | 1.379 |
| Y-898 | 3591.03 | 897.91 | 871. | 396. | 0.110 | 17.93 | 1.524 |
| Co-1173 | 4692.46 | 1173.30 | 374. | 13922. | 3.867 | 0.92 | 1.726 |
| Co-1332 | 5329.42 | 1332.56 | 82. | 12390. | 3.442 | 0.92 | 1.753 |
| Y-1836 | 7343.62 | 1836.18 | 6. | 152. | 0.042 | 9.00 | 1.626s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.25 3/29/2012 7:45:38 AM Page 4
TestAmerica Spectrum name: 8_TunaCan2nd_20120697.An1
Page 3

```
 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             Bq/Sample     keV     Bq/Sample     Bq/Sample      COMMENTS
 ____________________________________________________________________________

Pb-210   N   1.4221E+04                                      8.15E+03
                            46.54 1.422E+04  (  1.806E+02 7.43E-01 4.25E+00 G

AM-241       1.1754E+03                                      1.58E+05
                            59.54 1.175E+03  (  1.311E+01 7.10E-01 3.57E+01 G

CD-109       1.5223E+04                                      4.63E+02
                            88.03 1.522E+04  (  2.071E+02 8.83E-01 3.61E+00 G

CO-57        3.3494E+02                                      2.72E+02
                           122.06 3.349E+02  (  1.600E+01 2.55E+00 8.56E+01 G

Ce-139       6.0766E+02                                      1.38E+02
                           165.85 6.077E+02 *(  1.153E+02 8.62E+00 7.99E+01 G

Hg-203       6.1671E-01                                      4.66E+01
                           279.17 6.167E-01  (  2.689E+00 1.31E+02 8.15E+01 G

SN-113       1.0157E+03                                      1.15E+02
                           391.69 1.016E+03  (  4.390E+02 1.79E+01 6.40E+01 G

CS-137       4.4661E+02                                      1.10E+04
                           661.66 4.466E+02  (P 3.489E+00 8.85E-01 8.52E+01 G

Y-898        2.5543E+03                                      1.07E+02
                           898.02 2.554E+03  (  9.046E+02 1.79E+01 9.37E+01 G

Co-1173      6.9722E+02                                      1.93E+03
                          1173.24 6.972E+02  (  4.649E+00 9.19E-01 9.99E+01 G

Co-1332      6.9192E+02                                      1.93E+03
                          1332.50 6.919E+02  (  2.515E+00 9.18E-01 1.00E+02 G

Y-1836       1.7236E+03                                      1.07E+02
                          1836.01 1.724E+03  (  1.542E+02 9.00E+00 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
```



```
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
```

P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting | 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | 1.3265E+04 | 1.4221E+04 | 7.429E-01% | | 1.81E+02 |
| AM-241 | 1.1712E+03 | 1.1754E+03 | 7.101E-01% | | 1.31E+01 |
| CD-109 | 4.4713E+03 | 1.5223E+04 | 8.832E-01% | | 2.07E+02 |
| CO-57 | 4.1631E+01 | 3.3494E+02 | 2.551E+00% | | 1.60E+01 |
| Ce-139 # | 9.8959E+00 | 6.0766E+02 | 8.616E+00% | | 1.15E+02 |
| Hg-203 A | 6.1671E-01 | >12 Halflives | 1.3133E+02% | 2.6892E+00 | |
| SN-113 | 7.3819E+00 | 1.0157E+03 | 1.791E+01% | | 4.39E+02 |
| CS-137 | 4.2415E+02 | 4.4661E+02 | 8.848E-01% | | 3.49E+00 |
| Y-898 | 1.2542E+01 | 2.5543E+03 | 1.793E+01% | | 9.05E+02 |
| Co-1173 | 5.1942E+02 | 6.9722E+02 | 9.185E-01% | | 4.65E+00 |
| Co-1332 | 5.1548E+02 | 6.9192E+02 | 9.176E-01% | | 2.52E+00 |
| Y-1836 | 8.4633E+00 | 1.7236E+03 | 8.997E+00% | | 1.54E+02 |

ORTEC g v - i (3263) Env32 G53W4.25 3/29/2012 7:45:38 AM Page 6
TestAmerica Spectrum name: 8_TunaCan2nd_20120697.An1

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.6 to 2000.3 keV) 2.045E+04 Bq/Sample
Total Decayed Activity ( 37.6 to 2000.3 keV) 3.8690848E+04 Bq/Sample

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge9 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1169.4 | 100.4 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 444.52 | 95.6 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 687.72 | 92.7 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 692.56 | 93.3 |

Reviewed By: Jody Watson

Date: 6/14/2012

```
     ORTEC g v - i (3263) Env32  G53W4.25  6/14/2012 1:20:45 PM    Page  1
TestAmerica, Inc                Spectrum name: 9_TunaCan_20120371.An1

Sample description
     9_TunaCan_90099_061412


Spectrum Filename: C:\User\SPC\Det9\9_TunaCan_20120371.An1

Acquisition information
       Start time:                 6/14/2012 10:54:15 AM
       Live time:               3600
       Real time:               3629
       Dead time:                  0.81 %
       Detector ID:                    9

Detector system
     Ge 9 SN/100113


Calibration
       Filename:                   9_Soil_TunaCan.Clb
     9_Soil_TunaCan_90099_050312


       Energy Calibration
            Created:               6/14/2012 10:19:40 AM
            Zero offset:           0.088 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.039E-08 keV/channel^2

       Efficiency Calibration
            Created:               6/14/2012 10:19:51 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.30 %
            Log(Eff):             -8.079856E-01 + (-2.367265E-01*Log(E) ) +
                                   ( -3.950640E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.42 %
            Log(Eff):             -2.387916E+01 + ( 8.875647E+00*Log(E) ) +
                                   ( -9.401100E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.60keV )
       Stop channel:            8000 (  1999.66keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (3263) Env32  G53W4.25  6/14/2012 1:20:45 PM    Page  2
TestAmerica, Inc                Spectrum name: 9_TunaCan_20120371.An1
                                      Page 1
```

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: average of three points.

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 9_2012-05-27_0502.PBC 5/27/2012 5:02:59 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0390

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.54 | 860. | 12.66 | 1.34 | 1.634E-02 | | | | |
| 46.62 | 48876. | 0.54 | 1.09 | 2.580E-02 | 46.54 | 4.250 | 1.338E+04 | Pb210 |
| 50.03 | 116. | 122.12 | 1.09 | 2.886E-02 | | | | |
| 59.57 | 54776. | 0.62 | 1.11 | 3.661E-02 | 59.54 | 35.700 | 1.169E+03 | AM241 |
| 63.90 | 47. | 193.18 | 0.35 | 3.962E-02 | | | | |
| 88.09 | 26880. | 0.87 | 1.14 | 5.052E-02 | 88.03 | 3.610 | 1.566E+04 | CD109 |
| 122.10 | 5522. | 2.86 | 1.15 | 5.303E-02 | 122.06 | 85.600 | 3.312E+02 | CO57 |
| 136.38 | 729. | 11.64 | 1.25 | 5.151E-02 | | | | |
| 165.67 | 814. | 10.74 | 1.30 | 4.629E-02 | 165.85 | 79.900 | 5.417E+02 | Ce139 |
| 295.46 | 252. | 33.13 | 0.56 | 3.229E-02 | | | | |
| 316.16 | 66. | 75.82 | 0.25 | 3.082E-02 | | | | |
| 356.41 | 45. | 97.50 | 1.36 | 2.835E-02 | | | | |
| 358.68 | 42. | 110.02 | 1.37 | 2.822E-02 | | | | |
| 379.76 | 37. | 75.05 | 0.46 | 2.711E-02 | | | | |
| 391.75 | 310. | 24.80 | 1.08 | 2.652E-02 | 391.69 | 64.000 | 1.113E+03 | SN113 |
| 454.98 | 83. | 53.05 | 0.37 | 2.383E-02 | | | | |
| 568.66 | 103. | 37.41 | 0.47 | 2.026E-02 | | | | |
| 626.42 | 84. | 49.00 | 0.45 | 1.885E-02 | | | | |
| 661.66 | 23324. | 0.76 | 1.61 | 1.810E-02 | 661.66 | 85.210 | 4.445E+02 | CS137 |
| 821.54 | 239. | 27.43 | 0.39 | 1.536E-02 | | | | |
| 876.16 | 66. | 52.19 | 0.61 | 1.462E-02 | | | | |
| 898.25 | 346. | 23.61 | 1.52 | 1.434E-02 | 898.02 | 93.700 | 2.406E+03 | Y898 |
| 937.90 | 34. | 79.64 | 0.44 | 1.387E-02 | | | | |
| 1071.41 | 38. | 61.01 | 0.57 | 1.249E-02 | | | | |
| 1085.31 | 68. | 35.74 | 1.00 | 1.237E-02 | | | | |
| 1098.64 | 14. | 140.33 | 0.47 | 1.225E-02 | | | | |
| 1173.23 | 20836. | 0.81 | 2.05 | 1.163E-02 | 1173.24 | 99.900 | 6.877E+02 | Co1173 |
| 1332.49 | 18966. | 0.75 | 2.11 | 1.050E-02 | 1332.50 | 99.982 | 6.926E+02 | Co1332 |
| 1835.90 | 150. | 10.23 | 1.72 | 8.080E-03 | 1836.01 | 99.200 | 1.745E+03 | Y1836 |

9_TunaCan_20120371

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 145.76 | 36.54 | 3297. | 860. | 5.262E+04 | 12.66 | 1.336 | - s |
| 199.48 | 49.98 | 8660. | 956. | 3.313E+04 | 18.50 | 0.958 | - sM |
| 255.13 | 63.90 | 2893. | 47. | 1.186E+03 | 193.18 | 0.347 | - sc |
| 544.97 | 136.38 | 1941. | 729. | 1.415E+04 | 11.64 | 1.247 | - |

ORTEC g v - i (3263) Env32 G53W4.25 6/14/2012 1:20:45 PM Page 3

TestAmerica, Inc Spectrum name: 9_TunaCan_20120371.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 1181.07 | 295.46 | 1550. | 252. | 7.804E+03 | 33.13 | 0.562 | - s |
| 1263.87 | 316.16 | 856. | 66. | 2.136E+03 | 75.82 | 0.245 | - sc |
| 1424.84 | 356.47 | 930. | 45. | 1.579E+03 | 97.50 | 1.363 | - sc |
| 1433.89 | 358.73 | 1025. | 42. | 1.473E+03 | 110.02 | 1.365 | - sc |
| 1518.22 | 379.76 | 367. | 37. | 1.365E+03 | 75.05 | 0.460 | - sc |
| 1819.03 | 454.98 | 702. | 83. | 3.496E+03 | 53.05 | 0.375 | - s |
| 2273.73 | 568.66 | 433. | 103. | 5.068E+03 | 37.41 | 0.468 | - s |
| 2504.73 | 626.42 | 460. | 84. | 4.455E+03 | 49.00 | 0.451 | - s |
| 3285.25 | 821.54 | 812. | 239. | 1.556E+04 | 27.43 | 0.391 | - s |
| 3503.76 | 876.16 | 400. | 66. | 4.538E+03 | 52.19 | 0.608 | - s |
| 3750.76 | 937.90 | 332. | 34. | 2.488E+03 | 79.64 | 0.436 | - sc |
| 4284.91 | 1071.41 | 226. | 38. | 3.015E+03 | 61.01 | 0.571 | - s |
| 4340.51 | 1085.31 | 224. | 68. | 5.498E+03 | 35.74 | 1.000 | - s |
| 4393.86 | 1098.64 | 186. | 14. | 1.143E+03 | 140.33 | 0.472 | - sc |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.86 | 46.57 | 13300. | 51041. | 14.178 | 0.65 | 1.116 |
| AM-241 | 237.82 | 59.57 | 11784. | 54776. | 15.216 | 0.62 | 1.111 |
| CD-109 | 351.87 | 88.09 | 5995. | 26880. | 7.467 | 0.87 | 1.137 |
| CO-57 | 487.85 | 122.10 | 3767. | 5522. | 1.534 | 2.86 | 1.155 |
| Ce-139 | 662.09 | 165.67 | 1864. | 814. | 0.226 | 10.74 | 1.299 |
| Hg-203 | 1120.44 | 280.29 | 2362. | -52. | -0.014 | 133.84 | 1.296s |
| SN-113 | 1565.85 | 391.67 | 1962. | 266. | 0.074 | 24.38 | 1.393 |
| CS-137 | 2645.72 | 661.66 | 1258. | 23324. | 6.479 | 0.76 | 1.614 |
| Y-898 | 3592.12 | 898.25 | 1148. | 346. | 0.096 | 23.61 | 1.524s |
| Co-1173 | 4692.30 | 1173.23 | 840. | 20836. | 5.788 | 0.81 | 2.049 |
| Co-1332 | 5329.58 | 1332.49 | 131. | 18966. | 5.268 | 0.75 | 2.109 |
| Y-1836 | 7344.43 | 1835.90 | 14. | 150. | 0.042 | 10.23 | 1.719s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.25 6/14/2012 1:20:45 PM Page 4

Page 3

```
 *****   S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide -  Average     ------------- Peak --------------
Name   Code  Activity     Energy   Activity Code MDA Value
             Bq/Sample     keV     Bq/Sample     Bq/Sample      COMMENTS
 ____________________________________________________________________________

Pb-210   N   1.3971E+04                                     8.15E+03
                            46.54 1.397E+04  (  1.478E+02 6.46E-01 4.25E+00 G

AM-241       1.1694E+03                                     1.58E+05
                            59.54 1.169E+03  (  1.086E+01 6.16E-01 3.57E+01 G

CD-109       1.5657E+04                                     4.63E+02
                            88.03 1.566E+04  (  2.117E+02 8.71E-01 3.61E+00 G

CO-57        3.3118E+02                                     2.72E+02
                           122.06 3.312E+02  (  1.731E+01 2.86E+00 8.56E+01 G

Ce-139       5.4173E+02                                     1.38E+02
                           165.85 5.417E+02  (  1.357E+02 1.07E+01 7.99E+01 G

Hg-203      -5.2429E-01                                     4.66E+01
                           279.17-5.243E-01 ?(  2.327E+00 1.34E+02 8.15E+01 G

SN-113       9.5260E+02                                     1.15E+02
                           391.69 9.526E+02 ?(  7.503E+02 2.44E+01 6.40E+01 G

CS-137       4.4452E+02                                     1.10E+04
                           661.66 4.445E+02  (  3.202E+00 7.63E-01 8.52E+01 G

Y-898        2.4057E+03                                     1.07E+02
                           898.02 2.406E+03 @(  1.118E+03 2.36E+01 9.37E+01 G

Co-1173      6.8772E+02                                     1.93E+03
                          1173.24 6.877E+02  (  4.547E+00 8.09E-01 9.99E+01 G

Co-1332      6.9256E+02                                     1.93E+03
                          1332.50 6.926E+02  (  2.044E+00 7.49E-01 1.00E+02 G

Y-1836       1.7452E+03                                     1.07E+02
                          1836.01 1.745E+03  (  2.388E+02 1.02E+01 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
```



```
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
```

```
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                        Peak Codes:
  T - Thermal Neutron Activation        G - Gamma Ray
  F - Fast Neutron Activation           X - X-Ray
  I - Fission Product                   P - Positron Decay
  N - Naturally Occurring Isotope       S - Single-Escape
  P - Photon Reaction                   D - Double-Escape
  C - Charged Particle Reaction         K - Key Line
  M - No MDA Calculation                A - Not in Average
  R - Coincidence Corrected             C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
          Energy   Counts     Counts     Cts/Sec  1 Sigma %
_____________________________________________________________________________
Hg-203     280.29      2362.       -52.    -0.014   133.84   0.000E+00
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
        Time of Count  Time Corrected  Uncertainty  1 Sigma
Nuclide     Activity       Activity       Counting                    MDA
               Bq/Sample     Bq/Sample                                Bq/Sample

_____________________________________________________________________________
Pb-210       1.2947E+04    1.3971E+04    6.459E-01%                 1.48E+02
AM-241       1.1648E+03    1.1694E+03    6.156E-01%                 1.09E+01
CD-109       4.0954E+03    1.5657E+04    8.713E-01%                 2.12E+02
CO-57        3.3792E+01    3.3118E+02    2.862E+00%                 1.73E+01
Ce-139       5.9752E+00    5.4173E+02    1.074E+01%                 1.36E+02
Hg-203 #A   -5.2429E-01 >12 Halflives   1.3384E+02%   2.3272E+00
SN-113 #     4.3447E+00    9.5260E+02    2.438E+01%                 7.50E+02
CS-137       4.2011E+02    4.4452E+02    7.635E-01%                 3.20E+00
Y-898  #     7.1422E+00    2.4057E+03    2.361E+01%                 1.12E+03
Co-1173      4.9827E+02    6.8772E+02    8.087E-01%                 4.55E+00
Co-1332      5.0178E+02    6.9256E+02    7.487E-01%                 2.04E+00
Y-1836       5.1813E+00    1.7452E+03    1.023E+01%                 2.39E+02
```



```
  # - All peaks for activity calculation had bad shape.
  * - Activity omitted from total
  & - Activity omitted from total and all peaks had bad shape.
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
----------------------------   S U M M A R Y   ---------------------------
Total Activity (  379.7 to  1999.7 keV)     1.968E+04  Bq/Sample
Total Decayed Activity (  379.7 to  1999.7 keV) 3.8598309E+04  Bq/Sample
```

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge10 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1237.3 | 106.3 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 485.68 | 104.4 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 746.05 | 100.5 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 769.35 | 103.6 |

Reviewed By: Megan McAfee

Date: 04/10/12

```
     ORTEC g v - i (3263) Env32  G53W4.25  4/2/2012 3:47:54 PM
TestAmerica, Inc                Spectrum name: 10_TunaCan2nd_20120704.An1

Sample description
     10_TunaCan2nd_81427-334_032912


Spectrum Filename: C:\User\SPC\Det10\10_TunaCan2nd_20120704.An1

Acquisition information
       Start time:                 3/29/2012 3:37:46 AM
       Live time:               3600
       Real time:               3624
       Dead time:                  0.66 %
       Detector ID:                   10

Detector system
     Ge10 S/N08316756


Calibration
       Filename:                   10_TunaCan2nd_20120704.An1
     10_Soil_TunaCan_83814-334_032211


       Energy Calibration
            Created:               2/23/2012 9:27:47 AM
            Zero offset:           0.044 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.974E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/26/2011 9:31:38 AM
            Knee Energy:         122.06 keV
            Above the Knee:        Quadratic        Uncertainty =   1.54 %
            Log(Eff):             -1.946516E+00 + (-1.617316E-03*Log(E) ) +
                                   ( -5.658918E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.50 %
            Log(Eff):             -2.948487E+01 + ( 1.133679E+01*Log(E) ) +
                                   ( -1.224020E+00*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.56keV )
       Stop channel:            8000 (  1999.70keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (3263) Env32 G53W4.25 4/2/2012 3:47:54 PM
TestAmerica, Inc Spectrum name: 10_TunaCan2nd_20120704.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 10_2012-02-26_0405.PBC 2/26/2012 4:05:25 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0354

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.55 | 674. | 13.79 | 0.75 | 1.068E-02 | | | | |
| 46.50 | 41280. | 0.67 | 0.83 | 1.829E-02 | 46.54 | 4.250 | 1.576E+04 | Pb210 |
| 49.73 | 766. | 19.54 | 1.53 | 2.072E-02 | | | | |
| 59.54 | 43408. | 0.63 | 0.83 | 2.740E-02 | 59.54 | 35.700 | 1.237E+03 | AM241 |
| 76.73 | 171. | 71.48 | 0.34 | 3.550E-02 | | | | |
| 88.03 | 23771. | 0.88 | 0.86 | 3.825E-02 | 88.03 | 3.610 | 1.628E+04 | CD109 |
| 96.14 | 172. | 39.52 | 0.30 | 3.917E-02 | | | | |
| 112.82 | 72. | 70.33 | 0.37 | 3.894E-02 | | | | |
| 122.05 | 5313. | 2.29 | 0.91 | 3.795E-02 | 122.06 | 85.600 | 3.616E+02 | CO57 |
| 136.47 | 816. | 10.81 | 1.20 | 3.608E-02 | | | | |
| 165.84 | 1036. | 7.69 | 0.94 | 3.229E-02 | 165.85 | 79.900 | 6.854E+02 | Ce139 |
| 170.38 | 64. | 64.94 | 0.36 | 3.179E-02 | | | | |
| 238.61 | 163. | 31.22 | 0.50 | 2.595E-02 | | | | |
| 281.24 | 13. | 395.54 | 1.06 | 2.351E-02 | 279.17 | 81.500 | HL>Cutoff | Hg203 |
| 391.54 | 438. | 17.09 | 1.10 | 1.881E-02 | 391.69 | 64.000 | 1.390E+03 | SN113 |
| 529.57 | 52. | 55.97 | 0.42 | 1.526E-02 | | | | |
| 595.35 | 29. | 65.15 | 0.31 | 1.403E-02 | | | | |
| 634.94 | 71. | 51.83 | 0.34 | 1.338E-02 | | | | |
| 641.62 | 72. | 50.62 | 0.30 | 1.328E-02 | | | | |
| 661.62 | 18371. | 0.85 | 1.40 | 1.298E-02 | 661.66 | 85.210 | 4.857E+02 | CS137 |
| 794.14 | 60. | 68.77 | 0.45 | 1.133E-02 | | | | |
| 879.92 | 61. | 45.15 | 0.51 | 1.048E-02 | | | | |
| 897.95 | 377. | 21.47 | 1.57 | 1.031E-02 | 898.02 | 93.700 | 2.206E+03 | Y898 |
| 1059.51 | 83. | 58.76 | 0.57 | 9.064E-03 | | | | |
| 1086.17 | 110. | 36.10 | 0.68 | 8.888E-03 | | | | |
| 1173.21 | 16706. | 0.85 | 1.83 | 8.358E-03 | 1173.24 | 99.900 | 7.460E+02 | Co1173 |
| 1332.49 | 15555. | 0.82 | 1.98 | 7.540E-03 | 1332.50 | 99.982 | 7.693E+02 | Co1332 |
| 1835.95 | 199. | 7.72 | 1.85 | 5.771E-03 | 1836.01 | 99.200 | 1.971E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 145.97 | 36.55 | 2654. | 674. | 6.308E-04 | 13.79 | 0.750 | - s |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 198.67 | 49.73 | 6829. | 766. | 3.696E+04 | 19.54 | 1.531 | - | sM |
| 306.62 | 76.73 | 4431. | 171. | 4.816E+03 | 71.48 | 0.340 | - | s |

ORTEC g v - i (3263) Env32 G53W4.25 4/2/2012 3:47:54 PM
TestAmerica, Inc Spectrum name: 10_TunaCan2nd_20120704.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 384.23 | 96.14 | 1577. | 172. | 4.400E+03 | 39.52 | 0.297 | - | s |
| 450.93 | 112.82 | 1068. | 72. | 1.849E+03 | 70.33 | 0.366 | - | sc |
| 545.48 | 136.47 | 1816. | 816. | 2.261E+04 | 10.81 | 1.203 | - | s |
| 681.08 | 170.38 | 705. | 64. | 2.003E+03 | 64.94 | 0.355 | - | s |
| 953.89 | 238.61 | 910. | 163. | 6.281E+03 | 31.22 | 0.503 | - | s |
| 2117.47 | 529.57 | 318. | 52. | 3.409E+03 | 55.97 | 0.417 | - | s |
| 2380.56 | 595.35 | 164. | 29. | 2.068E+03 | 65.15 | 0.313 | - | sc |
| 2538.92 | 634.94 | 385. | 71. | 5.305E+03 | 51.83 | 0.337 | - | s |
| 2565.63 | 641.62 | 373. | 72. | 5.396E+03 | 50.62 | 0.304 | - | s |
| 3175.73 | 794.14 | 448. | 60. | 5.296E+03 | 68.77 | 0.449 | - | s |
| 3518.87 | 879.92 | 279. | 61. | 5.823E+03 | 45.15 | 0.512 | - | s |
| 4237.32 | 1059.51 | 551. | 83. | 9.157E+03 | 58.76 | 0.571 | - | s |
| 4344.00 | 1086.17 | 400. | 110. | 1.238E+04 | 36.10 | 0.675 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.76 | 46.50 | 9968. | 41200. | 11.444 | 0.67 | 0.827 |
| AM-241 | 237.88 | 59.54 | 8038. | 43408. | 12.058 | 0.63 | 0.835 |
| CD-109 | 351.78 | 88.03 | 4717. | 23771. | 6.603 | 0.88 | 0.861 |
| CO-57 | 487.81 | 122.05 | 2370. | 5313. | 1.476 | 2.29 | 0.915 |
| Ce-139 | 662.93 | 165.84 | 1451. | 1036. | 0.288 | 7.69 | 0.936 |
| Hg-203 | 1124.36 | 281.24 | 1217. | 13. | 0.003 | 395.54 | 1.062s |
| SN-113 | 1565.64 | 391.59 | 1093. | 443. | 0.123 | 16.26 | 1.097s |
| CS-137 | 2645.64 | 661.62 | 902. | 18371. | 5.103 | 0.85 | 1.404 |
| Y-898 | 3592.06 | 898.22 | 944. | 347. | 0.096 | 20.51 | 1.571 |
| Co-1173 | 4692.26 | 1173.21 | 493. | 16706. | 4.640 | 0.85 | 1.829 |
| Co-1332 | 5329.55 | 1332.49 | 85. | 15555. | 4.321 | 0.82 | 1.976 |
| Y-1836 | 7344.49 | 1835.95 | 6. | 199. | 0.055 | 7.72 | 1.855 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.25 4/2/2012 3:47:54 PM
TestAmerica, Inc Spectrum name: 10_TunaCan2nd_20120704.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.5760E+04 | | | | | 8.15E+03 |
| | | | 46.54 | 1.576E+04 | (P | 1.790E+02 | 6.75E-01 4.25E+00 G |
| AM-241 | | 1.2373E+03 | | | | | 1.58E+05 |
| | | | 59.54 | 1.237E+03 | ( | 1.199E+01 | 6.28E-01 3.57E+01 G |
| CD-109 | | 1.6280E+04 | | | | | 4.63E+02 |
| | | | 88.03 | 1.628E+04 | ( | 2.210E+02 | 8.85E-01 3.61E+00 G |
| CO-57 | | 3.6160E+02 | | | | | 2.72E+02 |
| | | | 122.06 | 3.616E+02 | ( | 1.562E+01 | 2.29E+00 8.56E+01 G |
| Ce-139 | | 6.8545E+02 | | | | | 1.38E+02 |
| | | | 165.85 | 6.854E+02 | ( | 1.192E+02 | 7.69E+00 7.99E+01 G |
| Hg-203 | | 1.8128E-01 | | | | | 4.66E+01 |
| | | | 279.17 | 1.813E-01 | ?( | 2.396E+00 | 3.96E+02 8.15E+01 G |
| SN-113 | | 1.4060E+03 | | | | | 1.15E+02 |
| | | | 391.69 | 1.406E+03 | @( | 4.980E+02 | 1.63E+01 6.40E+01 G |
| CS-137 | | 4.8568E+02 | | | | | 1.10E+04 |
| | | | 661.66 | 4.857E+02 | ( | 3.772E+00 | 8.47E-01 8.52E+01 G |
| Y-898 | | 2.0324E+03 | | | | | 1.07E+02 |
| | | | 898.02 | 2.032E+03 | ( | 8.545E+02 | 2.05E+01 9.37E+01 G |
| Co-1173 | | 7.4605E+02 | | | | | 1.93E+03 |
| | | | 1173.24 | 7.460E+02 | ( | 4.743E+00 | 8.52E-01 9.99E+01 G |
| Co-1332 | | 7.6935E+02 | | | | | 1.93E+03 |
| | | | 1332.50 | 7.693E+02 | ( | 2.259E+00 | 8.16E-01 1.00E+02 G |
| Y-1836 | | 1.9706E+03 | | | | | 1.07E+02 |
| | | | 1836.01 | 1.971E+03 | ( | 1.365E+02 | 7.72E+00 9.92E+01 G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.

ORTEC g v - i (3263) Env32 G53W4.25 4/2/2012 3:47:54 PM
TestAmerica, Inc Spectrum name: 10_TunaCan2nd_20120704.An1

@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| Hg-203 | 281.24 | 1217. | 13. | 0.003 | 395.54 | 0.000E+00 |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting | 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | 1.4701E+04 | 1.5760E+04 | 6.759E-01% | | 1.79E+02 |
| AM-241 | 1.2329E+03 | 1.2373E+03 | 6.276E-01% | | 1.20E+01 |
| CD-109 | 4.7814E+03 | 1.6280E+04 | 8.845E-01% | | 2.21E+02 |
| CO-57 | 4.4937E+01 | 3.6160E+02 | 2.289E+00% | | 1.56E+01 |
| Ce-139 | 1.1159E+01 | 6.8545E+02 | 7.693E+00% | | 1.19E+02 |
| Hg-203 #A | 1.8128E-01 | >12 Halflives | 3.9554E+02% | 2.3960E+00 | |
| SN-113 # | 1.0214E+01 | 1.4060E+03 | 1.626E+01% | | 4.98E+02 |
| CS-137 | 4.6125E+02 | 4.8568E+02 | 8.474E-01% | | 3.77E+00 |
| Y-898 | 9.9747E+00 | 2.0324E+03 | 2.051E+01% | | 8.54E+02 |
| Co-1173 | 5.5579E+02 | 7.4605E+02 | 8.516E-01% | | 4.74E+00 |
| Co-1332 | 5.7314E+02 | 7.6935E+02 | 8.163E-01% | | 2.26E+00 |
| Y-1836 | 9.6714E+00 | 1.9706E+03 | 7.725E+00% | | 1.36E+02 |

ORTEC g v - i (3263) Env32 G53W4.25 4/2/2012 3:47:54 PM
TestAmerica, Inc Spectrum name: 10_TunaCan2nd_20120704.An1

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.6 to 1999.7 keV) 2.239E+04 Bq/Sample
Total Decayed Activity ( 37.6 to 1999.7 keV) 4.1734531E+04 Bq/Sample

Analyzed by: _____
admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica, Inc

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge13 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1139.6 | 97.9 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 445.47 | 95.8 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 679.75 | 91.6 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 691.64 | 93.2 |

Reviewed By: Jody Watson

Date: 3/27/2012

```
     ORTEC g v - i (3263) Env32  G53W4.25  3/29/2012 7:52:27 AM
TestAmerica, Inc                Spectrum name: 13_TunaCan2nd_20120188.An1

Sample description
     13_TunaCan2nd_Rad10_32712


Spectrum Filename: C:\User\SPC\Det13\13_TunaCan2nd_20120188.An1

Acquisition information
       Start time:                 3/27/2012 6:51:58 PM
       Live time:               3600
       Real time:               3628
       Dead time:                  0.78 %
       Detector ID:                   13

Detector system
     Ge13 SN/10064006


Calibration
       Filename:                   13_Soil_TunaCan.Clb
     13_Soil_TunaCan_90099_032712


       Energy Calibration
            Created:               3/29/2012 7:50:00 AM
            Zero offset:           0.072 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.129E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/29/2012 7:50:26 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.91 %
            Log(Eff):             -5.308398E-01 + (-3.057754E-01*Log(E) ) +
                                   ( -3.437570E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.60 %
            Log(Eff):             -2.292218E+01 + ( 8.455931E+00*Log(E) ) +
                                   ( -8.924057E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.58keV )
       Stop channel:            8000 (  1999.40keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method
```

ORTEC g v - i (3263) Env32 G53W4.25 3/29/2012 7:52:27 AM
TestAmerica, Inc Spectrum name: 13_TunaCan2nd_20120188.An1

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | average of three points. |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 12:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 13_2012-02-26_0417.PBC 2/26/2012 4:17:38 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 28.2216

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.63 | 804. | 13.85 | 1.08 | 1.752E-02 | | | | |
| 40.21 | 60. | 185.44 | 0.67 | 2.100E-02 | | | | |
| 46.59 | 52644. | 0.64 | 1.03 | 2.710E-02 | 46.54 | 4.250 | 1.363E+04 | Pb210 |
| 59.58 | 55490. | 0.64 | 1.04 | 3.805E-02 | 59.54 | 35.700 | 1.140E+03 | AM241 |
| 88.11 | 30251. | 0.82 | 1.05 | 5.228E-02 | 88.03 | 3.610 | 1.515E+04 | CD109 |
| 122.15 | 7057. | 2.19 | 1.12 | 5.528E-02 | 122.06 | 85.600 | 3.326E+02 | CO57 |
| 136.58 | 848. | 11.42 | 1.04 | 5.394E-02 | | | | |
| 165.89 | 1296. | 7.65 | 1.22 | 5.020E-02 | 165.85 | 79.900 | 5.488E+02 | Ce139 |
| 172.07 | 64. | 73.90 | 0.46 | 4.900E-02 | | | | |
| 256.08 | 52. | 107.49 | 0.43 | 3.749E-02 | | | | |
| 391.55 | 506. | 16.69 | 1.67 | 2.782E-02 | 391.69 | 64.000 | 1.081E+03 | SN113 |
| 505.51 | 54. | 53.76 | 0.71 | 2.313E-02 | | | | |
| 606.29 | 68. | 54.54 | 1.51 | 2.022E-02 | | | | |
| 609.47 | 156. | 25.34 | 1.52 | 2.014E-02 | | | | |
| 661.70 | 24573. | 0.73 | 1.57 | 1.893E-02 | 661.66 | 85.210 | 4.455E+02 | CS137 |
| 712.45 | 48. | 87.48 | 0.52 | 1.791E-02 | | | | |
| 788.55 | 57. | 45.24 | 0.72 | 1.658E-02 | | | | |
| 865.90 | 201. | 31.02 | 0.76 | 1.543E-02 | | | | |
| 875.22 | 53. | 53.16 | 0.57 | 1.530E-02 | | | | |
| 892.03 | 70. | 57.17 | 0.30 | 1.508E-02 | | | | |
| 898.14 | 349. | 18.02 | 1.75 | 1.500E-02 | 898.02 | 93.700 | 1.399E+03 | Y898 |
| 936.66 | 183. | 26.42 | 0.66 | 1.452E-02 | | | | |
| 1000.19 | 143. | 40.81 | 0.58 | 1.379E-02 | | | | |
| 1173.33 | 22167. | 0.77 | 1.99 | 1.217E-02 | 1173.24 | 99.900 | 6.798E+02 | Co1173 |
| 1332.59 | 20398. | 0.72 | 2.09 | 1.099E-02 | 1332.50 | 99.982 | 6.916E+02 | Co1332 |
| 1836.09 | 255. | 7.25 | 1.84 | 8.477E-03 | 1836.01 | 99.200 | 1.707E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 146.20 | 36.63 | 3474. | 804. | 4.587E+04 | 13.85 | 1.080 | - | |
| 160.50 | 40.21 | 4620. | 60. | 2.857E+03 | 185.44 | 0.671 | - | c |
| 545.87 | 136.58 | 2328. | 848. | 1.572E+04 | 11.42 | 1.036 | - | s |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 687.79 | 172.07 | 921. | 64. | 1.299E+03 | 73.90 | 0.462 | - | sc |

ORTEC g v - i (3263) Env32 G53W4.25 3/29/2012 7:52:27 AM
TestAmerica, Inc Spectrum name: 13_TunaCan2nd_20120188.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 1023.76 | 256.08 | 1106. | 52. | 1.400E+03 | 107.49 | 0.433 - | sc |
| 2021.40 | 505.51 | 369. | 54. | 2.349E+03 | 53.76 | 0.707 - | s |
| 2424.54 | 605.96 | 659. | 68. | 3.375E+03 | 54.54 | 1.514 - | D |
| 2437.27 | 609.15 | 707. | 156. | 7.762E+03 | 25.34 | 1.517 - | D |
| 2849.24 | 712.45 | 490. | 48. | 2.681E+03 | 87.48 | 0.517 - | c |
| 3153.66 | 788.55 | 257. | 57. | 3.419E+03 | 45.24 | 0.717 - | s |
| 3463.13 | 865.90 | 819. | 201. | 1.303E+04 | 31.02 | 0.758 - | s |
| 3500.42 | 875.22 | 313. | 53. | 3.442E+03 | 53.16 | 0.568 - | s |
| 3567.71 | 892.03 | 535. | 70. | 4.621E+03 | 57.17 | 0.300 - | sM |
| 3746.27 | 936.66 | 649. | 183. | 1.263E+04 | 26.42 | 0.655 - | s |
| 4000.44 | 1000.19 | 757. | 143. | 1.039E+04 | 40.81 | 0.580 - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 186.01 | 46.59 | 14100. | 52644. | 14.623 | 0.64 | 1.035 |
| AM-241 | 237.95 | 59.58 | 13492. | 55490. | 15.414 | 0.64 | 1.040 |
| CD-109 | 352.05 | 88.11 | 6670. | 30251. | 8.403 | 0.82 | 1.051 |
| CO-57 | 488.16 | 122.15 | 3586. | 7057. | 1.960 | 2.19 | 1.121 |
| Ce-139 | 663.07 | 165.89 | 2133. | 1296. | 0.360 | 7.65 | 1.221 |
| SN-113 | 1565.60 | 391.55 | 1530. | 506. | 0.141 | 16.69 | 1.674s |
| CS-137 | 2646.19 | 661.70 | 1216. | 24573. | 6.826 | 0.73 | 1.574 |
| Y-898 | 3592.12 | 898.14 | 1808. | 349. | 0.097 | 18.02 | 1.748 |
| Co-1173 | 4693.29 | 1173.33 | 884. | 22167. | 6.157 | 0.77 | 1.991 |
| Co-1332 | 5330.68 | 1332.59 | 172. | 20398. | 5.666 | 0.72 | 2.087 |
| Y-1836 | 7346.16 | 1836.09 | 9. | 255. | 0.071 | 7.25 | 1.837s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.25 3/29/2012 7:52:27 AM
TestAmerica, Inc Spectrum name: 13_TunaCan2nd_20120188.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.3634E+04 | | | | | 8.15E+03 |
| | | | 46.54 | 1.363E+04 | ( | 1.440E+02 6.41E-01 4.25E+00 | G |
| AM-241 | | 1.1396E+03 | | | | | 1.58E+05 |
| | | | 59.54 | 1.140E+03 | ( | 1.117E+01 6.38E-01 3.57E+01 | G |
| CD-109 | | 1.5147E+04 | | | | | 4.63E+02 |
| | | | 88.03 | 1.515E+04 | ( | 1.919E+02 8.19E-01 3.61E+00 | G |
| CO-57 | | 3.3255E+02 | | | | | 2.72E+02 |
| | | | 122.06 | 3.326E+02 | ( | 1.328E+01 2.19E+00 8.56E+01 | G |
| Ce-139 | | 5.4879E+02 | | | | | 1.38E+02 |
| | | | 165.85 | 5.488E+02 | ( | 9.228E+01 7.65E+00 7.99E+01 | G |
| Hg-203 | | -4.5053E-03 | | | | | 4.66E+01 |
| | | | 279.17 | -4.505E-03 | %( | 2.170E+00 1.44E+04 8.15E+01 | G |
| SN-113 | | 1.0805E+03 | | | | | 1.15E+02 |
| | | | 391.69 | 1.081E+03 | ( | 3.950E+02 1.67E+01 6.40E+01 | G |
| CS-137 | | 4.4547E+02 | | | | | 1.10E+04 |
| | | | 661.66 | 4.455E+02 | ( | 2.995E+00 7.31E-01 8.52E+01 | G |
| Y-898 | | 1.3989E+03 | | | | | 1.07E+02 |
| | | | 898.02 | 1.399E+03 | ?( | 8.041E+02 1.80E+01 9.37E+01 | G |
| Co-1173 | | 6.7975E+02 | | | | | 1.93E+03 |
| | | | 1173.24 | 6.798E+02 | ( | 4.332E+00 7.66E-01 9.99E+01 | G |
| Co-1332 | | 6.9164E+02 | | | | | 1.93E+03 |
| | | | 1332.50 | 6.916E+02 | ( | 2.164E+00 7.24E-01 1.00E+02 | G |
| Y-1836 | | 1.7073E+03 | | | | | 1.07E+02 |
| | | | 1836.01 | 1.707E+03 | ( | 1.108E+02 7.25E+00 9.92E+01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.

ORTEC g v - i (3263) Env32 G53W4.25 3/29/2012 7:52:27 AM
TestAmerica, Inc Spectrum name: 13_TunaCan2nd_20120188.An1

@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting | 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | 1.2719E+04 | 1.3634E+04 | 6.406E-01% | | 1.44E+02 |
| AM-241 | 1.1355E+03 | 1.1396E+03 | 6.376E-01% | | 1.12E+01 |
| CD-109 | 4.4546E+03 | 1.5147E+04 | 8.189E-01% | | 1.92E+02 |
| CO-57 | 4.1423E+01 | 3.3255E+02 | 2.186E+00% | | 1.33E+01 |
| Ce-139 | 8.9749E+00 | 5.4879E+02 | 7.649E+00% | | 9.23E+01 |
| Hg-203 #A | -4.5053E-03 | >12 Halflives | 1.4441E+04% | 2.1699E+00 | |
| SN-113 # | 7.8929E+00 | 1.0805E+03 | 1.669E+01% | | 3.95E+02 |
| CS-137 | 4.2308E+02 | 4.4547E+02 | 7.311E-01% | | 2.99E+00 |
| Y-898 # | 6.9065E+00 | 1.3989E+03 | 1.802E+01% | | 8.04E+02 |
| Co-1173 | 5.0656E+02 | 6.7975E+02 | 7.655E-01% | | 4.33E+00 |
| Co-1332 | 5.1542E+02 | 6.9164E+02 | 7.239E-01% | | 2.16E+00 |
| Y-1836 | 8.4289E+00 | 1.7073E+03 | 7.248E+00% | | 1.11E+02 |

ORTEC g v - i (3263) Env32 G53W4.25 3/29/2012 7:52:27 AM
TestAmerica, Inc Spectrum name: 13_TunaCan2nd_20120188.An1

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 661.7 to 1999.4 keV) 1.983E+04 Bq/Sample
Total Decayed Activity ( 661.7 to 1999.4 keV) 3.6805410E+04 Bq/Sample

Analyzed by: _____
admin

Reviewed by: _____
Supervisor

Laboratory: TestAmerica, Inc

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge14 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1140.8 | 98.0 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 447.55 | 96.2 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 690.01 | 93.0 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 699.61 | 94.2 |

Reviewed By: Jody Watson

Date: 4/24/2012

14_TunaCan2nd_20120390

```
     ORTEC g v - i (3263) Env32  G53W4.25  7/6/2012 9:20:28 AM     Page  1
TestAmerica, Inc.               Spectrum name: 14_TunaCan2nd_20120390.An1

Sample description
     14_TunaCan2nd_rad10_042412


Spectrum Filename: C:\User\SPC\Det14\14_TunaCan2nd_20120390.An1

Acquisition information
       Start time:                 4/24/2012 8:12:45 AM
       Live time:               3600
       Real time:               3635
       Dead time:                  0.95 %
       Detector ID:                   14

Detector system
     Ge14 SN/11080670


Calibration
       Filename:                   14_Soil_TunaCan.Clb
     14_TunaCan_90099_042312


       Energy Calibration
            Created:               4/23/2012 11:29:29 AM
            Zero offset:           0.158 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.959E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/23/2012 11:29:47 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.02 %
            Log(Eff):              2.101260E-01 + (-5.951973E-01*Log(E) ) +
                                   ( -1.605331E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.28 %
            Log(Eff):             -2.391492E+01 + ( 8.828985E+00*Log(E) ) +
                                   ( -9.371496E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.67keV )
       Stop channel:            8000 (  1999.52keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (3263) Env32  G53W4.25  7/6/2012 9:20:28 AM     Page  2
TestAmerica, Inc.               Spectrum name: 14_TunaCan2nd_20120390.An1
                                      Page 1
```

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: average of three points.

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 14_2012-04-01_0328.PBC 4/1/2012 3:28:19 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0804

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.65 | 636. | 14.35 | 0.68 | 1.394E-02 | | | | |
| 46.70 | 42844. | 0.65 | 0.73 | 2.183E-02 | 46.54 | 4.250 | 1.384E+04 | Pb210 |
| 49.57 | 579. | 23.20 | 1.08 | 2.397E-02 | | | | |
| 59.66 | 44776. | 0.62 | 0.73 | 3.072E-02 | 59.54 | 35.700 | 1.141E+03 | AM241 |
| 88.02 | 24143. | 0.88 | 0.79 | 4.196E-02 | 88.03 | 3.610 | 1.568E+04 | CD109 |
| 121.97 | 5150. | 2.07 | 0.81 | 4.379E-02 | 122.06 | 85.600 | 3.284E+02 | CO57 |
| 136.39 | 594. | 12.74 | 0.84 | 4.244E-02 | | | | |
| 165.76 | 922. | 8.50 | 0.93 | 3.800E-02 | 165.85 | 79.900 | 5.802E+02 | Ce139 |
| 238.43 | 269. | 23.37 | 0.71 | 2.933E-02 | | | | |
| 315.48 | 114. | 42.70 | 0.42 | 2.361E-02 | | | | |
| 327.51 | 51. | 61.93 | 0.45 | 2.293E-02 | | | | |
| 351.90 | 216. | 23.90 | 0.91 | 2.167E-02 | | | | |
| 364.95 | 52. | 64.29 | 0.48 | 2.106E-02 | | | | |
| 374.52 | 129. | 45.68 | 0.49 | 2.064E-02 | | | | |
| 391.67 | 297. | 17.91 | 1.16 | 1.993E-02 | 391.69 | 64.000 | 1.044E+03 | SN113 |
| 510.55 | 153. | 33.44 | 0.60 | 1.616E-02 | | | | |
| 661.74 | 16713. | 0.81 | 1.30 | 1.313E-02 | 661.66 | 85.210 | 4.376E+02 | CS137 |
| 665.93 | 55. | 47.01 | 1.30 | 1.306E-02 | | | | |
| 682.98 | 51. | 73.33 | 0.31 | 1.280E-02 | | | | |
| 802.77 | 123. | 33.88 | 0.65 | 1.124E-02 | | | | |
| 897.96 | 328. | 20.32 | 1.77 | 1.026E-02 | 898.02 | 93.700 | 2.290E+03 | Y898 |
| 978.13 | 53. | 59.31 | 0.31 | 9.568E-03 | | | | |
| 1173.32 | 15097. | 0.91 | 1.81 | 8.243E-03 | 1173.24 | 99.900 | 6.900E+02 | Co1173 |
| 1332.58 | 13794. | 0.88 | 1.91 | 7.422E-03 | 1332.50 | 99.982 | 6.996E+02 | Co1332 |
| 1836.21 | 153. | 8.94 | 1.16 | 5.686E-03 | 1836.01 | 99.200 | 1.816E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 145.93 | 36.65 | 2712. | 636. | 4.559E+04 | 14.35 | 0.681 | - | s |
| 197.59 | 49.57 | 6158. | 579. | 2.414E+04 | 23.20 | 1.078 | - | s |
| 544.79 | 136.39 | 1623. | 594. | 1.400E+04 | 12.74 | 0.836 | - | |
| 952.87 | 238.43 | 1166. | 269. | 9.182E+03 | 23.37 | 0.709 | - | |



| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 1261.02 | 315.48 | 752. | 114. | 4.829E+03 | 42.70 | 0.415 | - | s |
| 1309.15 | 327.51 | 440. | 51. | 2.232E+03 | 61.93 | 0.449 | - | s |
| 1406.69 | 351.90 | 776. | 216. | 9.981E+03 | 23.90 | 0.914 | - | |
| 1458.89 | 364.95 | 463. | 52. | 2.484E+03 | 64.29 | 0.475 | - | s |
| 1497.18 | 374.52 | 912. | 129. | 6.250E+03 | 45.68 | 0.487 | - | s |
| 2041.26 | 510.55 | 669. | 153. | 9.449E+03 | 33.44 | 0.603 | - | s |
| 2662.75 | 665.91 | 160. | 40. | 3.074E+03 | 48.94 | 0.586 | - | sM |
| 2731.03 | 682.98 | 385. | 51. | 3.984E+03 | 73.33 | 0.306 | - | s |
| 3210.25 | 802.77 | 443. | 123. | 1.098E+04 | 33.88 | 0.654 | - | s |
| 3911.87 | 978.13 | 330. | 53. | 5.539E+03 | 59.31 | 0.307 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 186.10 | 46.70 | 10276. | 42803. | 11.890 | 0.65 | 0.733 |
| AM-241 | 237.93 | 59.66 | 8589. | 44776. | 12.438 | 0.62 | 0.733 |
| CD-109 | 351.36 | 88.02 | 4956. | 24143. | 6.706 | 0.88 | 0.785 |
| CO-57 | 487.12 | 121.97 | 1860. | 5150. | 1.431 | 2.07 | 0.805 |
| Ce-139 | 662.24 | 165.76 | 1490. | 922. | 0.256 | 8.50 | 0.930s |
| Hg-203 | 1114.33 | 278.80 | 1377. | -40. | -0.011 | 133.76 | 0.957s |
| SN-113 | 1565.78 | 391.67 | 802. | 297. | 0.083 | 17.91 | 1.165 |
| CS-137 | 2645.99 | 661.72 | 749. | 17094. | 4.748 | 0.86 | 1.367 |
| Y-898 | 3591.10 | 897.96 | 851. | 328. | 0.091 | 20.32 | 1.769s |
| Co-1173 | 4692.93 | 1173.32 | 513. | 15097. | 4.194 | 0.91 | 1.810 |
| Co-1332 | 5330.26 | 1332.58 | 105. | 13794. | 3.832 | 0.88 | 1.907 |
| Y-1836 | 7346.17 | 1836.21 | 5. | 153. | 0.042 | 8.94 | 1.165s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.



***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|

```
Pb-210   N   1.3845E+04                                        8.15E+03
                            46.54 1.384E+04  (P 1.537E+02 6.55E-01 4.25E+00 G

AM-241       1.1408E+03                                        1.58E+05
                            59.54 1.141E+03  (  1.107E+01 6.17E-01 3.57E+01 G

CD-109       1.5678E+04                                        4.63E+02
                            88.03 1.568E+04  (  2.148E+02 8.77E-01 3.61E+00 G

CO-57        3.2838E+02                                        2.72E+02
                           122.06 3.284E+02  (  1.299E+01 2.07E+00 8.56E+01 G

Ce-139       5.8018E+02                                        1.38E+02
                           165.85 5.802E+02 *(  1.149E+02 8.50E+00 7.99E+01 G

Hg-203      -5.1862E-01                                        4.66E+01
                           279.17-5.186E-01 ?(  2.305E+00 1.34E+02 8.15E+01 G

SN-113       1.0438E+03                                        1.15E+02
                           391.69 1.044E+03  (  4.727E+02 1.79E+01 6.40E+01 G

CS-137       4.4755E+02                                        1.10E+04
                           661.66 4.475E+02  (  3.410E+00 8.57E-01 8.52E+01 G

Y-898        2.2899E+03                                        1.07E+02
                           898.02 2.290E+03 *(  9.680E+02 2.03E+01 9.37E+01 G

Co-1173      6.9001E+02                                        1.93E+03
                          1173.24 6.900E+02  (  4.948E+00 9.10E-01 9.99E+01 G

Co-1332      6.9961E+02                                        1.93E+03
                          1332.50 6.996E+02  (  2.559E+00 8.77E-01 1.00E+02 G

Y-1836       1.8162E+03                                        1.07E+02
                          1836.01 1.816E+03  (  1.603E+02 8.94E+00 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
```



```
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
                                       Page 4
```

I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| Hg-203 | 278.80 | 1377. | -40. | -0.011 | 133.76 | 0.000E+00 |

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting | 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | 1.2885E+04 | 1.3845E+04 | 6.553E-01% | | 1.54E+02 |
| AM-241 | 1.1366E+03 | 1.1408E+03 | 6.168E-01% | | 1.11E+01 |
| CD-109 | 4.4274E+03 | 1.5678E+04 | 8.766E-01% | | 2.15E+02 |
| CO-57 | 3.8172E+01 | 3.2838E+02 | 2.068E+00% | | 1.30E+01 |
| Ce-139 # | 8.2779E+00 | 5.8018E+02 | 8.497E+00% | | 1.15E+02 |
| Hg-203 #A | -5.1862E-01 | >12 Halflives | 1.3376E+02% | 2.3053E+00 | |
| SN-113 | 6.4765E+00 | 1.0438E+03 | 1.791E+01% | | 4.73E+02 |
| CS-137 | 4.2434E+02 | 4.4755E+02 | 8.571E-01% | | 3.41E+00 |
| Y-898 # | 9.4790E+00 | 2.2899E+03 | 2.032E+01% | | 9.68E+02 |
| Co-1173 | 5.0921E+02 | 6.9001E+02 | 9.096E-01% | | 4.95E+00 |
| Co-1332 | 5.1630E+02 | 6.9961E+02 | 8.770E-01% | | 2.56E+00 |
| Y-1836 | 7.5179E+00 | 1.8162E+03 | 8.944E+00% | | 1.60E+02 |

ORTEC g v - i (3263) Env32 G53W4.25 7/6/2012 9:20:28 AM Page 6
TestAmerica, Inc. Spectrum name: 14_TunaCan2nd_20120390.An1

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.7 to 1999.5 keV) 1.997E+04 Bq/Sample
Total Decayed Activity ( 37.7 to 1999.5 keV) 3.8559289E+04 Bq/Sample

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge 15 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1151 | 98.9 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 435.18 | 93.6 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 687.16 | 92.6 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 696.46 | 93.8 |

Reviewed By: Jody Watson

Date: 3/23/2012

15_TunaCan2nd_20120288

```
     ORTEC g v - i (3263) Env32  G53W4.25  7/5/2012 1:14:04 PM     Page  1
TestAmerica, Inc.               Spectrum name: 15_TunaCan2nd_20120288.An1

Sample description
     15_TunaCan2nd_rad10_032312


Spectrum Filename: C:\User\SPC\Det15\15_TunaCan2nd_20120288.An1

Acquisition information
       Start time:                 3/23/2012 6:10:28 AM
       Live time:               7200
       Real time:               7248
       Dead time:                  0.66 %
       Detector ID:                   15

Detector system
     Ge15 SN/1102216


Calibration
       Filename:                   15_Soil_TunaCan.Clb
     15_TunaCan_90099_032212


       Energy Calibration
            Created:               3/22/2012 1:02:46 PM
            Zero offset:           0.004 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -3.104E-08 keV/channel^2

       Efficiency Calibration
            Created:               3/22/2012 1:03:01 PM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.00 %
            Log(Eff):             -6.894897E-01 + (-3.290613E-01*Log(E) ) +
                                   ( -3.875629E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.13 %
            Log(Eff):             -2.362677E+01 + ( 8.666669E+00*Log(E) ) +
                                   ( -9.214638E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.53keV )
       Stop channel:            8000 (  1999.56keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (3263) Env32  G53W4.25  7/5/2012 1:14:04 PM     Page  2
TestAmerica, Inc.               Spectrum name: 15_TunaCan2nd_20120288.An1
                                      Page 1
```

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: average of three points.

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 15_2012-02-26_0425.PBC 2/26/2012 4:25:10 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 12 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 26.5953

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.48 | 1231. | 11.17 | 1.20 | 1.258E-02 | | | | |
| 46.44 | 76440. | 0.51 | 0.91 | 1.950E-02 | 46.54 | 4.250 | 1.366E+04 | Pb210 |
| 49.65 | 1514. | 14.37 | 1.25 | 2.160E-02 | | | | |
| 59.44 | 80694. | 0.48 | 0.94 | 2.732E-02 | 59.54 | 35.700 | 1.151E+03 | AM241 |
| 87.99 | 43578. | 0.68 | 0.97 | 3.705E-02 | 88.03 | 3.610 | 1.527E+04 | CD109 |
| 92.63 | 219. | 44.56 | 0.42 | 3.776E-02 | | | | |
| 122.00 | 10133. | 1.58 | 1.01 | 3.846E-02 | 122.06 | 85.600 | 3.389E+02 | CO57 |
| 136.33 | 1390. | 8.77 | 1.13 | 3.725E-02 | | | | |
| 165.85 | 1699. | 7.29 | 1.05 | 3.392E-02 | 165.85 | 79.900 | 5.192E+02 | Ce139 |
| 238.39 | 480. | 20.10 | 1.42 | 2.594E-02 | | | | |
| 260.67 | 81. | 57.86 | 0.33 | 2.424E-02 | | | | |
| 279.32 | 56. | 141.32 | 1.14 | 2.301E-02 | 279.17 | 81.500 | HL>Cutoff | Hg203 |
| 352.13 | 110. | 54.66 | 0.68 | 1.922E-02 | | | | |
| 368.26 | 125. | 49.84 | 0.46 | 1.856E-02 | | | | |
| 391.56 | 581. | 13.59 | 1.28 | 1.768E-02 | 391.69 | 64.000 | 9.477E+02 | SN113 |
| 400.57 | 73. | 61.58 | 0.54 | 1.736E-02 | | | | |
| 661.57 | 29285. | 0.71 | 1.46 | 1.155E-02 | 661.66 | 85.210 | 4.352E+02 | CS137 |
| 754.74 | 100. | 52.53 | 0.39 | 1.034E-02 | | | | |
| 898.10 | 516. | 14.74 | 1.96 | 8.921E-03 | 898.02 | 93.700 | 1.681E+03 | Y898 |
| 904.89 | 86. | 54.53 | 0.36 | 8.863E-03 | | | | |
| 1000.75 | 82. | 43.22 | 0.58 | 8.127E-03 | | | | |
| 1096.51 | 181. | 26.16 | 0.80 | 7.507E-03 | | | | |
| 1173.15 | 26111. | 0.71 | 1.80 | 7.077E-03 | 1173.24 | 99.900 | 6.872E+02 | Co1173 |
| 1226.66 | 98. | 36.87 | 0.74 | 6.805E-03 | | | | |
| 1332.45 | 23674. | 0.68 | 1.95 | 6.325E-03 | 1332.50 | 99.982 | 6.965E+02 | Co1332 |
| 1835.96 | 284. | 9.76 | 1.20 | 4.741E-03 | 1836.01 | 99.200 | 1.642E+03 | Y1836 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 145.78 | 36.48 | 5577. | 1231. | 9.786E+04 | 11.17 | 1.202 | - | s |
| 198.43 | 49.65 | 13746. | 1514. | 7.010E+04 | 14.37 | 1.248 | - | sM |
| 370.24 | 92.63 | 3274. | 219. | 5.791E+03 | 44.56 | 0.421 | - | s |

ORTEC g v - i (3263) Env32 G53W4.25 7/5/2012 1:14:04 PM Page 3
TestAmerica, Inc. Spectrum name: 15_TunaCan2nd_20120288.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 544.93 | 136.33 | 3516. | 1390. | 3.731E+04 | 8.77 | 1.130 | - | s |
| 952.92 | 238.39 | 2518. | 480. | 1.849E+04 | 20.10 | 1.422 | - | sM |
| 1042.01 | 260.67 | 968. | 81. | 3.328E+03 | 57.86 | 0.332 | - | sM |
| 1407.66 | 352.13 | 1248. | 110. | 5.749E+03 | 54.66 | 0.679 | - | s |
| 1472.16 | 368.26 | 1252. | 125. | 6.736E+03 | 49.84 | 0.459 | - | s |
| 1601.36 | 400.57 | 843. | 73. | 4.224E+03 | 61.58 | 0.543 | - | s |
| 3017.75 | 754.74 | 768. | 100. | 9.719E+03 | 52.53 | 0.393 | - | s |
| 3618.39 | 904.89 | 752. | 86. | 9.741E+03 | 54.53 | 0.363 | - | s |
| 4001.87 | 1000.75 | 476. | 82. | 1.015E+04 | 43.22 | 0.582 | - | s |
| 4385.05 | 1096.51 | 621. | 181. | 2.415E+04 | 26.16 | 0.796 | - | s |
| 4905.82 | 1226.66 | 215. | 98. | 1.445E+04 | 36.87 | 0.740 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.62 | 46.44 | 19930. | 76355. | 10.605 | 0.51 | 0.907 |
| AM-241 | 237.58 | 59.44 | 16824. | 80694. | 11.208 | 0.48 | 0.935 |
| CD-109 | 351.67 | 87.99 | 9695. | 43578. | 6.052 | 0.68 | 0.972 |
| CO-57 | 487.63 | 122.00 | 4069. | 10133. | 1.407 | 1.58 | 1.014 |
| Ce-139 | 662.95 | 165.85 | 3411. | 1699. | 0.236 | 7.29 | 1.054 |
| Hg-203 | 1116.56 | 279.32 | 3139. | 56. | 0.008 | 141.32 | 1.144 |
| SN-113 | 1565.32 | 391.56 | 1615. | 581. | 0.081 | 13.59 | 1.282 |
| CS-137 | 2645.11 | 661.57 | 2071. | 29285. | 4.067 | 0.71 | 1.459 |
| Y-898 | 3591.24 | 898.10 | 1317. | 516. | 0.072 | 14.74 | 1.959 |
| Co-1173 | 4691.69 | 1173.15 | 1159. | 26111. | 3.627 | 0.71 | 1.803 |
| Co-1332 | 5329.20 | 1332.45 | 323. | 23674. | 3.288 | 0.68 | 1.945 |
| Y-1836 | 7345.58 | 1836.14 | 48. | 260. | 0.036 | 8.96 | 1.181s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

ORTEC g v - i (3263) Env32 G53W4.25 7/5/2012 1:14:04 PM Page 4
TestAmerica, Inc. Spectrum name: 15_TunaCan2nd_20120288.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|

```
Pb-210    N   1.3663E+04                                        8.15E+03
                              46.54 1.366E+04  (P 1.182E+02 5.11E-01 4.25E+00 G

AM-241        1.1510E+03                                        1.58E+05
                              59.54 1.151E+03  (  8.660E+00 4.81E-01 3.57E+01 G

CD-109        1.5268E+04                                        4.63E+02
                              88.03 1.527E+04  (  1.617E+02 6.78E-01 3.61E+00 G

CO-57         3.3887E+02                                        2.72E+02
                             122.06 3.389E+02  (  1.003E+01 1.58E+00 8.56E+01 G

Ce-139        5.1921E+02                                        1.38E+02
                             165.85 5.192E+02  (  8.400E+01 7.29E+00 7.99E+01 G

Hg-203        4.1717E-01                                        4.66E+01
                             279.17 4.172E-01  (  1.954E+00 1.41E+02 8.15E+01 G

SN-113        9.4771E+02                                        1.15E+02
                             391.69 9.477E+02  (  3.099E+02 1.36E+01 6.40E+01 G

CS-137        4.3518E+02                                        1.10E+04
                             661.66 4.352E+02  (  3.191E+00 7.12E-01 8.52E+01 G

Y-898         1.6812E+03                                        1.07E+02
                             898.02 1.681E+03  (  5.598E+02 1.47E+01 9.37E+01 G

Co-1173       6.8716E+02                                        1.93E+03
                            1173.24 6.872E+02  (  4.246E+00 7.12E-01 9.99E+01 G

Co-1332       6.9646E+02                                        1.93E+03
                            1332.50 6.965E+02  (  2.544E+00 6.82E-01 1.00E+02 G

Y-1836        1.5036E+03                                        1.07E+02
                            1836.01 1.504E+03  (  2.033E+02 8.96E+00 9.92E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
```



```
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
                                       Page 4
```

F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | | 1.2751E+04 | 1.3663E+04 | 5.115E-01% | 1.18E+02 |
| AM-241 | | 1.1469E+03 | 1.1510E+03 | 4.812E-01% | 8.66E+00 |
| CD-109 | | 4.5239E+03 | 1.5268E+04 | 6.776E-01% | 1.62E+02 |
| CO-57 | | 4.2749E+01 | 3.3887E+02 | 1.583E+00% | 1.00E+01 |
| Ce-139 | | 8.7071E+00 | 5.1921E+02 | 7.291E+00% | 8.40E+01 |
| Hg-203 | A | 4.1717E-01 | >12 Halflives | 1.4132E+02% | 1.9540E+00 |
| SN-113 | | 7.1340E+00 | 9.4771E+02 | 1.359E+01% | 3.10E+02 |
| CS-137 | | 4.1344E+02 | 4.3518E+02 | 7.117E-01% | 3.19E+00 |
| Y-898 | | 8.5738E+00 | 1.6812E+03 | 1.474E+01% | 5.60E+02 |
| Co-1173 | | 5.1301E+02 | 6.8716E+02 | 7.125E-01% | 4.25E+00 |
| Co-1332 | | 5.1995E+02 | 6.9646E+02 | 6.817E-01% | 2.54E+00 |
| Y-1836 | | 7.6681E+00 | 1.5036E+03 | 8.962E+00% | 2.03E+02 |

ORTEC g v - i (3263) Env32 G53W4.25 7/5/2012 1:14:04 PM Page 6
TestAmerica, Inc. Spectrum name: 15_TunaCan2nd_20120288.An1

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.5 to 1999.6 keV) 1.994E+04 Bq/Sample
Total Decayed Activity ( 37.5 to 1999.6 keV) 3.6891324E+04 Bq/Sample

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge16 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1175.5 | 101.0 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 456.26 | 98.1 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 696.55 | 93.8 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 694.91 | 93.6 |

Reviewed By: Jody Watson

Date: 7/17/2012

16_TunaCan2nd_81427_071712

```
     ORTEC g v - i (3263) Env32  G53W4.25  7/17/2012 12:43:11 PM   Page  1
TestAmerica, Inc.               Spectrum name: 16_TunaCan2nd_81427_071712.An1

Sample description
     16_Soil_TunaCan2nd_81427


Spectrum Filename: C:\User\SPC\Det16\16_TunaCan2nd_81427_071712.An1

Acquisition information
       Start time:                 7/17/2012 11:27:38 AM
       Live time:               3600
       Real time:               3637
       Dead time:                  1.01 %
       Detector ID:                   16

Detector system
     Ge16 SN/11012217


Calibration
       Filename:                   16_Soil_TunaCan.Clb
     16_TunaCan_90099_071012


       Energy Calibration
            Created:               7/13/2012 9:47:11 AM
            Zero offset:           0.111 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -1.955E-08 keV/channel^2

       Efficiency Calibration
            Created:               7/13/2012 9:47:24 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   1.01 %
            Log(Eff):              1.477416E-02 + (-5.514266E-01*Log(E) ) +
                                   ( -1.443482E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.17 %
            Log(Eff):             -2.408438E+01 + ( 8.948554E+00*Log(E) ) +
                                   ( -9.513599E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.62keV )
       Stop channel:            8000 (  1999.62keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (3263) Env32  G53W4.25  7/17/2012 12:43:11 PM   Page  2
TestAmerica, Inc.               Spectrum name: 16_TunaCan2nd_81427_071712.An1
                                      Page 1
```

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: average of three points.

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 16_2012-07-01_0410.PBC 7/1/2012 4:10:46 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0735

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.61 | 662. | 16.00 | 0.95 | 1.502E-02 | | | | |
| 46.61 | 44788. | 0.57 | 0.95 | 2.354E-02 | 46.54 | 4.250 | 1.344E+04 | Pb210 |
| 49.73 | 846. | 14.98 | 0.96 | 2.615E-02 | | | | |
| 51.93 | 67. | 175.93 | 0.96 | 2.781E-02 | | | | |
| 59.60 | 50058. | 0.62 | 0.95 | 3.331E-02 | 59.54 | 35.700 | 1.176E+03 | AM241 |
| 67.02 | 327. | 40.04 | 0.43 | 3.772E-02 | | | | |
| 77.05 | 248. | 35.16 | 0.66 | 4.226E-02 | | | | |
| 88.11 | 23229. | 0.97 | 1.00 | 4.552E-02 | 88.03 | 3.610 | 1.578E+04 | CD109 |
| 92.72 | 154. | 41.19 | 0.62 | 4.641E-02 | | | | |
| 102.49 | 234. | 36.86 | 0.72 | 4.751E-02 | | | | |
| 122.18 | 4603. | 2.65 | 1.08 | 4.728E-02 | 122.06 | 85.600 | 3.368E+02 | CO57 |
| 136.63 | 690. | 11.63 | 1.03 | 4.571E-02 | | | | |
| 165.89 | 573. | 14.69 | 0.88 | 4.155E-02 | 165.85 | 79.900 | 5.132E+02 | Ce139 |
| 279.05 | 48. | 131.87 | 1.16 | 2.876E-02 | 279.17 | 81.500 | HL>Cutoff | Hg203 |
| 383.49 | 28. | 109.64 | 0.60 | 2.290E-02 | | | | |
| 391.47 | 391. | 21.81 | 0.93 | 2.256E-02 | 391.69 | 64.000 | 2.012E+03 | SN113 |
| 416.76 | 115. | 47.52 | 0.73 | 2.156E-02 | | | | |
| 454.44 | 148. | 42.64 | 0.71 | 2.024E-02 | | | | |
| 470.03 | 138. | 36.11 | 1.33 | 1.974E-02 | | | | |
| 471.50 | 87. | 46.19 | 1.33 | 1.970E-02 | | | | |
| 609.23 | 184. | 25.35 | 0.44 | 1.633E-02 | | | | |
| 661.72 | 20285. | 0.80 | 1.52 | 1.537E-02 | 661.66 | 85.210 | 4.563E+02 | CS137 |
| 688.53 | 70. | 44.77 | 0.67 | 1.492E-02 | | | | |
| 756.44 | 34. | 63.94 | 0.34 | 1.392E-02 | | | | |
| 891.54 | 148. | 42.73 | 0.38 | 1.231E-02 | | | | |
| 898.03 | 342. | 24.68 | 0.43 | 1.225E-02 | 898.02 | 93.700 | 3.456E+03 | Y898 |
| 1092.88 | 180. | 35.97 | 0.46 | 1.057E-02 | | | | |
| 1173.34 | 17966. | 0.81 | 1.90 | 1.002E-02 | 1173.24 | 99.900 | 6.965E+02 | Co1173 |
| 1332.62 | 16290. | 0.80 | 2.05 | 9.096E-03 | 1332.50 | 99.982 | 6.949E+02 | Co1332 |
| 1836.30 | 109. | 12.59 | 1.70 | 7.121E-03 | 1836.01 | 99.200 | 1.789E+03 | Y1836 |

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 145.94 | 36.61 | 3330. | 662. | 4.407E+04 | 16.00 | 0.954 | - |
| 198.40 | 49.77 | 7608. | 846. | 3.236E+04 | 14.98 | 0.955 | - D |
| 206.87 | 51.89 | 6455. | 301. | 1.081E+04 | 38.23 | 0.957 | - D |

ORTEC g v - i (3263) Env32 G53W4.25 7/17/2012 12:43:11 PM Page 3
TestAmerica, Inc. Spectrum name: 16_TunaCan2nd_81427_071712.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 267.54 | 67.02 | 4805. | 327. | 8.670E+03 | 40.04 | 0.431 | - s |
| 307.65 | 77.05 | 2954. | 248. | 5.881E+03 | 35.16 | 0.659 | - s |
| 370.31 | 92.72 | 1548. | 154. | 3.319E+03 | 41.19 | 0.623 | - s |
| 409.40 | 102.49 | 2168. | 234. | 4.932E+03 | 36.86 | 0.719 | - s |
| 545.90 | 136.63 | 1724. | 690. | 1.509E+04 | 11.63 | 1.033 | - |
| 1533.12 | 383.49 | 438. | 28. | 1.245E+03 | 109.64 | 0.596 | - c |
| 1666.20 | 416.76 | 856. | 115. | 5.319E+03 | 47.52 | 0.732 | - s |
| 1816.90 | 454.44 | 1051. | 148. | 7.328E+03 | 42.64 | 0.711 | - s |
| 1879.23 | 470.27 | 1171. | 138. | 6.985E+03 | 36.11 | 1.330 | - D |
| 1885.13 | 471.75 | 760. | 87. | 4.406E+03 | 46.19 | 1.331 | - D |
| 2436.00 | 609.23 | 541. | 184. | 1.125E+04 | 25.35 | 0.437 | - s |
| 2753.21 | 688.53 | 304. | 70. | 4.691E+03 | 44.77 | 0.673 | - s |
| 3024.88 | 756.44 | 198. | 34. | 2.419E+03 | 63.94 | 0.336 | - s |
| 3565.37 | 891.54 | 821. | 148. | 1.199E+04 | 42.73 | 0.382 | - sM |
| 4370.93 | 1092.88 | 734. | 180. | 1.708E+04 | 35.97 | 0.458 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.74 | 46.56 | 12987. | 46638. | 12.955 | 0.67 | 0.934 |
| AM-241 | 237.89 | 59.60 | 10773. | 50058. | 13.905 | 0.62 | 0.952 |
| CD-109 | 351.86 | 88.11 | 5903. | 23229. | 6.452 | 0.97 | 0.996 |
| CO-57 | 488.11 | 122.18 | 2577. | 4603. | 1.279 | 2.65 | 1.080 |
| Ce-139 | 662.88 | 165.89 | 1776. | 573. | 0.159 | 14.69 | 0.876 |
| Hg-203 | 1115.44 | 279.05 | 1953. | 48. | 0.013 | 131.87 | 1.164s |
| SN-113 | 1566.59 | 391.86 | 1251. | 282. | 0.078 | 26.27 | 0.890s |
| CS-137 | 2645.99 | 661.72 | 1025. | 20285. | 5.635 | 0.80 | 1.515 |
| Y-898 | 3591.33 | 898.03 | 1130. | 342. | 0.095 | 24.68 | 0.434s |
| Co-1173 | 4692.85 | 1173.34 | 496. | 17966. | 4.991 | 0.81 | 1.896 |
| Co-1332 | 5330.25 | 1332.62 | 94. | 16290. | 4.525 | 0.80 | 2.052 |
| Y-1836 | 7346.21 | 1836.30 | 14. | 109. | 0.030 | 12.59 | 1.698s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.4024E+04 | | | | 8.15E+03 | |
| | | | 46.54 | 1.402E+04 | (P | 1.605E+02 6.71E-01 4.25E+00 | G |
| AM-241 | | 1.1755E+03 | | | | 1.58E+05 | |
| | | | 59.54 | 1.176E+03 | ( | 1.142E+01 6.21E-01 3.57E+01 | G |
| CD-109 | | 1.5779E+04 | | | | 4.63E+02 | |
| | | | 88.03 | 1.578E+04 | ( | 2.451E+02 9.70E-01 3.61E+00 | G |
| CO-57 | | 3.3677E+02 | | | | 2.72E+02 | |
| | | | 122.06 | 3.368E+02 | ( | 1.751E+01 2.65E+00 8.56E+01 | G |
| Ce-139 | | 5.1324E+02 | | | | 1.38E+02 | |
| | | | 165.85 | 5.132E+02 | ( | 1.783E+02 1.47E+01 7.99E+01 | G |
| Hg-203 | | 5.6505E-01 | | | | 4.66E+01 | |
| | | | 279.17 | 5.651E-01 | *( | 2.473E+00 1.32E+02 8.15E+01 | G |
| SN-113 | | 1.4529E+03 | | | | 1.15E+02 | |
| | | | 391.69 | 1.453E+03 | ( | 8.626E+02 2.63E+01 6.40E+01 | G |
| CS-137 | | 4.5626E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 4.563E+02 | ( | 3.417E+00 8.02E-01 8.52E+01 | G |
| Y-898 | | 3.4565E+03 | | | | 1.07E+02 | |
| | | | 898.02 | 3.456E+03 | *( | 1.611E+03 2.47E+01 9.37E+01 | G |
| Co-1173 | | 6.9655E+02 | | | | 1.93E+03 | |
| | | | 1173.24 | 6.965E+02 | ( | 4.129E+00 8.09E-01 9.99E+01 | G |
| Co-1332 | | 6.9491E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 6.949E+02 | ( | 2.043E+00 8.03E-01 1.00E+02 | G |
| Y-1836 | | 1.7894E+03 | | | | 1.07E+02 | |
| | | | 1836.01 | 1.789E+03 | ( | 3.307E+02 1.26E+01 9.92E+01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.



@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| Hg-203 | 279.05 | 1953. | 48. | 0.013 | 131.87 | 0.000E+00 |

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting | 1 Sigma | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | 1.2959E+04 | 1.4024E+04 | 6.724E-01% | | 1.60E+02 |
| AM-241 | 1.1708E+03 | 1.1755E+03 | 6.214E-01% | | 1.14E+01 |
| CD-109 | 3.9282E+03 | 1.5779E+04 | 9.701E-01% | | 2.45E+02 |
| CO-57 | 3.1587E+01 | 3.3677E+02 | 2.653E+00% | | 1.75E+01 |
| Ce-139 | 4.7936E+00 | 5.1324E+02 | 1.469E+01% | | 1.78E+02 |
| Hg-203 #A | 5.6505E-01 | >12 Halflives | 1.3187E+02% | 2.4725E+00 | |
| SN-113 | 5.4311E+00 | 1.4529E+03 | 2.627E+01% | | 8.63E+02 |
| CS-137 | 4.3030E+02 | 4.5626E+02 | 8.015E-01% | | 3.42E+00 |
| Y-898 # | 8.2791E+00 | 3.4565E+03 | 2.468E+01% | | 1.61E+03 |
| Co-1173 | 4.9870E+02 | 6.9655E+02 | 8.087E-01% | | 4.13E+00 |
| Co-1332 | 4.9753E+02 | 6.9491E+02 | 8.032E-01% | | 2.04E+00 |
| Y-1836 | 4.2861E+00 | 1.7894E+03 | 1.259E+01% | | 3.31E+02 |

ORTEC g v - i (3263) Env32 G53W4.25 7/17/2012 12:43:11 PM Page 6
TestAmerica, Inc. Spectrum name: 16_TunaCan2nd_81427_071712.An1

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 609.2 to 1999.6 keV) 1.954E+04 Bq/Sample
Total Decayed Activity ( 609.2 to 1999.6 keV) 4.0374930E+04 Bq/Sample

# 2nd Source Verification

| | |
|---|---|
| Detector: | Ge17 |
| Geometry: | Tunacan |
| Reference date | 1/1/2010 |
| Source: | 81427-334 |
| Standard volume g / vial | 1550 |
| Standard volume transferred in g / geometry | 318.5 |
| lab ID# of cal standard | 6665 |

| Isotope | Certified Activity gammas/sec | Geometry Activity | γ abundance | Bq/sample | Count Results | %recovery |
|---|---|---|---|---|---|---|
| Am-241 | 2034 | 418 | 0.359 | 1164 | 1140.2 | 97.9 |
| Cs-137 | 1926 | 396 | 0.851 | 465 | 440.98 | 94.8 |
| Co-60 | 3611 | 742 | 0.99974 | 742 | 682.05 | 91.9 |
| Co-60 | 3612 | 742 | 0.999856 | 742 | 689.63 | 92.9 |

Reviewed By: Megan McAfee

Date: 4/13/2012

```
     ORTEC g v - i (3263) Env32  G53W4.25  7/6/2012 9:25:36 AM     Page  1
TestAmerica, Inc.               Spectrum name: 17_Tuna2nd_20120265.An1

Sample description
     17_Tuna2nd_81427_032612


Spectrum Filename: C:\User\SPC\Det17\17_Tuna2nd_20120265.An1

Acquisition information
       Start time:                 3/26/2012 9:29:21 AM
       Live time:               3600
       Real time:               3637
       Dead time:                  1.02 %
       Detector ID:                   17

Detector system
     Ge17 SN/11080671


Calibration
       Filename:                   17_Soil_TunaCan.Clb
     17_TunaCan_90099_032612


       Energy Calibration
            Created:               4/12/2012 9:28:30 AM
            Zero offset:           0.118 keV
            Gain:                  0.250 keV/channel
            Quadratic:            -2.376E-08 keV/channel^2

       Efficiency Calibration
            Created:               4/12/2012 9:28:42 AM
            Knee Energy:         165.85 keV
            Above the Knee:        Quadratic        Uncertainty =   0.91 %
            Log(Eff):             -5.264190E-01 + (-4.024164E-01*Log(E) ) +
                                   ( -2.604461E-02*Log(E)^2 )
            Below the Knee:        Quadratic        Uncertainty =   1.00 %
            Log(Eff):             -2.343889E+01 + ( 8.582715E+00*Log(E) ) +
                                   ( -9.075430E-01*Log(E)^2 )

Library Files
       Main analysis library:      DET_EnergyStandardMix & Pb.Lib
       Library Match Width:        0.500
       Peak stripping:             Library based

Analysis parameters
       Analysis engine:            Env32   G53W4.25
       Start channel:            150 (    37.63keV )
       Stop channel:            8000 (  1999.21keV )
       Peak rejection level:    1000.000%
       Peak search sensitivity:    3
       Sample Size:                1.0000E+00
       Activity scaling factor:    1.0000E+00/(  1.0000E+00*  1.0000E+00) =
                                   1.0000E+00
       Detection limit method:     Reg. Guide 4.16 Method

     ORTEC g v - i (3263) Env32  G53W4.25  7/6/2012 9:25:36 AM     Page  2
TestAmerica, Inc.               Spectrum name: 17_Tuna2nd_20120265.An1
                                      Page 1
```

Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: average of three points.

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 1/1/2010 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 17_2012-02-26_0520.PBC 2/26/2012 5:20:29 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 11 cutoff: 5.00E+01%
Energy Calibration
Normalized diff: 0.0590

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 36.64 | 681. | 13.12 | 0.69 | 1.356E-02 | | | | |
| 40.87 | 116. | 86.09 | 0.16 | 1.677E-02 | | | | |
| 46.62 | 41004. | 0.69 | 0.76 | 2.106E-02 | 46.54 | 4.250 | 1.365E+04 | Pb210 |
| 49.59 | 775. | 17.97 | 0.63 | 2.318E-02 | | | | |
| 59.61 | 43179. | 0.65 | 0.77 | 2.961E-02 | 59.54 | 35.700 | 1.140E+03 | AM241 |
| 77.20 | 214. | 40.60 | 1.02 | 3.765E-02 | | | | |
| 88.08 | 23344. | 0.86 | 0.81 | 4.060E-02 | 88.03 | 3.610 | 1.500E+04 | CD109 |
| 121.99 | 5536. | 2.31 | 0.89 | 4.276E-02 | 122.06 | 85.600 | 3.357E+02 | CO57 |
| 136.39 | 771. | 11.84 | 0.71 | 4.164E-02 | | | | |
| 162.22 | 87. | 50.79 | 0.72 | 3.820E-02 | | | | |
| 165.73 | 964. | 7.35 | 1.09 | 3.765E-02 | 165.85 | 79.900 | 5.310E+02 | Ce139 |
| 216.43 | 116. | 39.82 | 0.95 | 3.196E-02 | | | | |
| 217.94 | 83. | 57.15 | 0.95 | 3.181E-02 | | | | |
| 238.21 | 247. | 27.84 | 0.94 | 2.992E-02 | | | | |
| 265.99 | 94. | 61.67 | 0.61 | 2.773E-02 | | | | |
| 301.12 | 44. | 67.34 | 0.41 | 2.544E-02 | | | | |
| 340.53 | 91. | 61.26 | 0.55 | 2.333E-02 | | | | |
| 351.73 | 148. | 32.96 | 0.62 | 2.280E-02 | | | | |
| 391.54 | 336. | 18.56 | 0.91 | 2.113E-02 | 391.69 | 64.000 | 9.356E+02 | SN113 |
| 464.58 | 72. | 65.99 | 1.18 | 1.868E-02 | | | | |
| 466.04 | 44. | 93.25 | 1.18 | 1.864E-02 | | | | |
| 582.96 | 167. | 29.62 | 0.45 | 1.584E-02 | | | | |
| 661.66 | 18538. | 0.82 | 1.37 | 1.443E-02 | 661.66 | 85.210 | 4.410E+02 | CS137 |
| 738.88 | 57. | 57.41 | 0.44 | 1.329E-02 | | | | |
| 833.91 | 110. | 41.26 | 0.51 | 1.214E-02 | | | | |
| 856.69 | 111. | 46.51 | 0.75 | 1.189E-02 | | | | |
| 898.10 | 352. | 17.10 | 1.23 | 1.148E-02 | 898.02 | 93.700 | 1.818E+03 | Y898 |
| 1026.09 | 89. | 47.19 | 0.52 | 1.037E-02 | | | | |
| 1173.27 | 17119. | 0.83 | 1.74 | 9.359E-03 | 1173.24 | 99.900 | 6.820E+02 | Co1173 |
| 1332.53 | 15698. | 0.82 | 1.79 | 8.481E-03 | 1332.50 | 99.982 | 6.896E+02 | Co1332 |
| 1835.81 | 220. | 7.55 | 1.96 | 6.593E-03 | 1836.01 | 99.200 | 1.873E+03 | Y1836 |

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 146.04 | 36.64 | 2578. | 681. | 5.025E+04 | 13.12 | 0.695 | - |
| 162.95 | 40.87 | 4224. | 116. | 6.916E+03 | 86.09 | 0.161 | - c |
| 197.82 | 49.59 | 6204. | 775. | 3.343E+04 | 17.97 | 0.635 | - sM |
| 308.25 | 77.20 | 2934. | 214. | 5.685E+03 | 40.60 | 1.020 | - s |

ORTEC g v - i (3263) Env32 G53W4.25 7/6/2012 9:25:36 AM Page 3
TestAmerica, Inc. Spectrum name: 17_Tuna2nd_20120265.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 544.96 | 136.39 | 1975. | 771. | 1.852E+04 | 11.84 | 0.713 | - |
| 648.26 | 162.22 | 793. | 87. | 2.269E+03 | 50.79 | 0.719 | - s |
| 865.04 | 216.40 | 1003. | 116. | 3.620E+03 | 39.82 | 0.953 | - D |
| 871.09 | 217.91 | 1078. | 83. | 2.603E+03 | 57.15 | 0.955 | - D |
| 952.16 | 238.21 | 1349. | 247. | 8.265E+03 | 27.84 | 0.937 | - s |
| 1063.26 | 265.99 | 1020. | 94. | 3.372E+03 | 61.67 | 0.615 | - s |
| 1203.77 | 301.12 | 417. | 44. | 1.730E+03 | 67.34 | 0.412 | - sc |
| 1361.41 | 340.53 | 898. | 91. | 3.887E+03 | 61.26 | 0.553 | - s |
| 1406.20 | 351.73 | 744. | 148. | 6.491E+03 | 32.96 | 0.618 | - s |
| 1857.60 | 464.69 | 1086. | 72. | 3.842E+03 | 65.99 | 1.178 | - sc |
| 1863.46 | 466.15 | 839. | 44. | 2.387E+03 | 93.25 | 1.179 | - sc |
| 2331.15 | 582.96 | 570. | 167. | 1.054E+04 | 29.62 | 0.448 | - s |
| 2954.96 | 738.88 | 338. | 57. | 4.289E+03 | 57.41 | 0.442 | - s |
| 3335.20 | 833.91 | 507. | 110. | 9.049E+03 | 41.26 | 0.506 | - s |
| 3426.35 | 856.69 | 611. | 111. | 9.318E+03 | 46.51 | 0.755 | - s |
| 4104.24 | 1026.09 | 453. | 89. | 8.549E+03 | 47.19 | 0.517 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: DET_EnergyStandardMix & Pb.Lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| Pb-210 | 185.95 | 46.62 | 10512. | 40927. | 11.369 | 0.69 | 0.761 |
| AM-241 | 237.89 | 59.61 | 9192. | 43179. | 11.994 | 0.65 | 0.771 |
| CD-109 | 351.75 | 88.08 | 4394. | 23344. | 6.484 | 0.86 | 0.812 |
| CO-57 | 487.38 | 121.99 | 2606. | 5536. | 1.538 | 2.31 | 0.891 |
| Ce-139 | 662.30 | 165.73 | 1283. | 964. | 0.268 | 7.35 | 1.085 |
| Hg-203 | 1119.82 | 280.13 | 1632. | -52. | -0.015 | 109.81 | 1.012s |
| SN-113 | 1565.42 | 391.54 | 971. | 336. | 0.093 | 18.56 | 0.910s |
| CS-137 | 2646.04 | 661.66 | 840. | 18538. | 5.149 | 0.82 | 1.373 |
| Y-898 | 3592.05 | 898.10 | 753. | 352. | 0.098 | 17.10 | 1.228 |
| Co-1173 | 4693.24 | 1173.27 | 496. | 17119. | 4.755 | 0.83 | 1.743 |
| Co-1332 | 5330.69 | 1332.53 | 136. | 15698. | 4.361 | 0.82 | 1.789 |
| Y-1836 | 7345.64 | 1835.81 | 10. | 220. | 0.061 | 7.55 | 1.956s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| Pb-210 | N | 1.3650E+04 | | | | 8.15E+03 | |
| | | | 46.54 | 1.365E+04 | (P | 1.603E+02 6.87E-01 4.25E+00 | G |
| AM-241 | | 1.1402E+03 | | | | 1.58E+05 | |
| | | | 59.54 | 1.140E+03 | ( | 1.187E+01 6.55E-01 3.57E+01 | G |
| CD-109 | | 1.5004E+04 | | | | 4.63E+02 | |
| | | | 88.03 | 1.500E+04 | ( | 2.003E+02 8.59E-01 3.61E+00 | G |
| CO-57 | | 3.3573E+02 | | | | 2.72E+02 | |
| | | | 122.06 | 3.357E+02 | ( | 1.459E+01 2.31E+00 8.56E+01 | G |
| Ce-139 | | 5.3096E+02 | | | | 1.38E+02 | |
| | | | 165.85 | 5.310E+02 | ( | 9.338E+01 7.35E+00 7.99E+01 | G |
| Hg-203 | | -6.6653E-01 | | | | 4.66E+01 | |
| | | | 279.17 | -6.665E-01 | ?( | 2.427E+00 1.10E+02 8.15E+01 | G |
| SN-113 | | 9.3563E+02 | | | | 1.15E+02 | |
| | | | 391.69 | 9.356E+02 | @( | 4.114E+02 1.86E+01 6.40E+01 | G |
| CS-137 | | 4.4098E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 4.410E+02 | ( | 3.277E+00 8.23E-01 8.52E+01 | G |
| Y-898 | | 1.8177E+03 | | | | 1.07E+02 | |
| | | | 898.02 | 1.818E+03 | ( | 6.751E+02 1.71E+01 9.37E+01 | G |
| Co-1173 | | 6.8205E+02 | | | | 1.93E+03 | |
| | | | 1173.24 | 6.820E+02 | ( | 4.243E+00 8.31E-01 9.99E+01 | G |
| Co-1332 | | 6.8963E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 6.896E+02 | ( | 2.503E+00 8.22E-01 1.00E+02 | G |
| Y-1836 | | 1.8728E+03 | | | | 1.07E+02 | |
| | | | 1836.01 | 1.873E+03 | ( | 1.462E+02 7.55E+00 9.92E+01 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.



@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|
| Hg-203 | 280.13 | 1632. | -52. | -0.015 | 109.81 | 0.000E+00 |

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty Counting 1 Sigma | | MDA Bq/Sample |
|---|---|---|---|---|---|
| Pb-210 | 1.2735E+04 | 1.3650E+04 | 6.879E-01% | | 1.60E+02 |
| AM-241 | 1.1361E+03 | 1.1402E+03 | 6.548E-01% | | 1.19E+01 |
| CD-109 | 4.4248E+03 | 1.5004E+04 | 8.588E-01% | | 2.00E+02 |
| CO-57 | 4.2016E+01 | 3.3573E+02 | 2.313E+00% | | 1.46E+01 |
| Ce-139 | 8.7645E+00 | 5.3096E+02 | 7.352E+00% | | 9.34E+01 |
| Hg-203 #A | -6.6653E-01 | >12 Halflives | 1.0981E+02% | 2.4271E+00 | |
| SN-113 # | 6.9111E+00 | 9.3563E+02 | 1.856E+01% | | 4.11E+02 |
| CS-137 | 4.1887E+02 | 4.4098E+02 | 8.234E-01% | | 3.28E+00 |
| Y-898 | 9.0827E+00 | 1.8177E+03 | 1.710E+01% | | 6.75E+02 |
| Co-1173 | 5.0861E+02 | 6.8205E+02 | 8.315E-01% | | 4.24E+00 |
| Co-1332 | 5.1427E+02 | 6.8963E+02 | 8.225E-01% | | 2.50E+00 |
| Y-1836 # | 9.3579E+00 | 1.8728E+03 | 7.550E+00% | | 1.46E+02 |



# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

17_Tuna2nd_20120265

---------- S U M M A R Y ----------

Total Activity ( 582.9 to 1999.2 keV) 1.981E+04 Bq/Sample

Total Decayed Activity ( 582.9 to 1999.2 keV) 3.7099195E+04 Bq/Sample

# Annual Calibration Verifications

## ACV TOP 2016 Gamma Detector 3

| | Cs-137 | Co-60 | Am-241 |
|---|---|---|---|
| Detector | Recovery | Recovery | Recovery |
| | | | |
| 3 | 100.52% | 98.64% | 104.79% |

**Standard ID**
Tuna Can LCS
Tuna can LCS_00006 #1012459
Cert# 74139-334 Ref. date 10/1/2006

**Known Activity:**

| | |
|---|---|
| Cs-137 | 29.31 pCi/g |
| Co-60 | 16.04 pCi/g |
| Am-241 | 97.05 pCi/g |

**Recovered Activity:**

| | |
|---|---|
| Cs-137 | 29.46 pCi/g |
| Co-60 | 15.82 pCi/g |
| Am-241 | 101.7 pCi/g |

Original count ID: LCS 160-279184

1st review: Jody Watson 12/9/16

2nd review: Amanda Joseph Deel 12/9/16

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## Analysis Report for Gamma Spectroscopy

**Batch:** 279184 **Operator:**

| SampID | WRKNO | Aliquot | Sigma | Instrument | Detector | CountDateTime | CountDuration |
|---|---|---|---|---|---|---|---|
| LCS 160-279184~2- | LCS | 341.90g | 1.00 | GammaVision | GV03 | 12 / 9 / 16 8:29 | 120 |

| Analyte | Cmpnd# | Activity | TotalUnc | CountUnc | MDA | MLCC | Act/MDA | |
|---|---|---|---|---|---|---|---|---|
| AC-228 | 11136 | 7.439E-001pCi/g | 1.485E-001 | 1.435E-001 | 3.504E-001 | 1.709E-001 | 2.12 | 0.1485 |
| AG-108M | 10982 | 1.821E-002pCi/g | 1.125E-002 | 1.121E-002 | 1.307E-001 | 6.456E-002 | 0.14 | 0.0112 |
| AG-110M | 10973 | -1.049E-001pCi/g | 8.778E-002 | 8.762E-002 | 2.896E-001 | 1.431E-001 | -0.36 | 0.0878 |
| AM-241 | 10818 | 1.017E+002pCi/g | 5.293E+000 | 3.900E-001 | 5.576E-001 | 2.775E-001 | 182.41 | 5.2925 |
| BA-133 | 10469 | -3.095E-002pCi/g | 6.391E-002 | 6.389E-002 | 2.119E-001 | 1.050E-001 | -0.15 | 0.0639 |
| BA-140 | 10463 | 8.513E-002pCi/g | 1.498E-001 | 1.498E-001 | 4.103E-001 | 2.017E-001 | 0.21 | 0.1498 |
| BE-7 | 10435 | -5.121E-001pCi/g | 4.161E-001 | 4.153E-001 | 1.886E+000 | 9.358E-001 | -0.27 | 0.4161 |
| BI-207 | 10195 | 3.392E-002pCi/g | 4.043E-002 | 4.040E-002 | 1.076E-001 | 5.288E-002 | 0.32 | 0.0404 |
| BI-210M | 10173 | -4.896E-002pCi/g | 6.191E-002 | 6.185E-002 | 2.049E-001 | 1.014E-001 | -0.24 | 0.0619 |
| BI-212 | 10160 | 6.366E-001pCi/g | 5.119E-001 | 5.109E-001 | 1.690E+000 | 8.310E-001 | 0.38 | 0.5119 |
| BI-214 | 10154 | 4.983E-001pCi/g | 8.203E-002 | 7.784E-002 | 1.751E-001 | 8.552E-002 | 2.85 | 0.0820 |
| CD-109 | 9254 | 5.576E+000pCi/g | 5.990E-001 | 5.121E-001 | 1.583E+000 | 7.825E-001 | 3.52 | 0.5990 |
| CD-113M | 17462 | 5.604E+002pCi/g | 5.178E+002 | 5.165E+002 | 1.708E+003 | 8.453E+002 | 0.33 | 517.7885 |
| CE-139 | 9241 | -3.329E-002pCi/g | 3.372E-002 | 3.357E-002 | 1.110E-001 | 5.503E-002 | -0.30 | 0.0337 |
| CE-141 | 9235 | -4.470E-002pCi/g | 3.992E-002 | 3.985E-002 | 2.195E-001 | 1.090E-001 | -0.20 | 0.0399 |
| CE-144 | 9221 | 1.335E-001pCi/g | 2.429E-001 | 2.428E-001 | 8.039E-001 | 3.990E-001 | 0.17 | 0.2429 |
| CF-249 | 9215 | 3.096E-002pCi/g | 6.951E-002 | 6.949E-002 | 2.305E-001 | 1.142E-001 | 0.13 | 0.0695 |
| CF-251 | 13690 | 6.795E-002pCi/g | 1.552E-001 | 1.551E-001 | 4.098E-001 | 2.026E-001 | 0.17 | 0.1552 |
| CO-56 | 8704 | 7.882E-002pCi/g | 5.069E-002 | 5.053E-002 | 1.196E-001 | 5.860E-002 | 0.66 | 0.0507 |
| CO-57 | 13694 | 2.575E-002pCi/g | 3.047E-002 | 3.044E-002 | 8.099E-002 | 4.011E-002 | 0.32 | 0.0305 |
| CO-58 | 8698 | -4.015E-002pCi/g | 4.993E-002 | 4.989E-002 | 1.656E-001 | 8.163E-002 | -0.24 | 0.0499 |
| CO-60 | 8692 | 1.582E+001pCi/g | 8.015E-001 | 1.063E-001 | 8.313E-002 | 3.988E-002 | 190.36 | 0.8015 |
| CR-51 | 8604 | -2.170E-001pCi/g | 3.195E-001 | 3.193E-001 | 2.141E+000 | 1.064E+000 | -0.10 | 0.3195 |
| CS-134 | 8553 | 5.832E-002pCi/g | 4.599E-002 | 4.589E-002 | 2.088E-001 | 1.035E-001 | 0.28 | 0.0460 |
| CS-136 | 8546 | 1.377E-002pCi/g | 8.180E-003 | 8.141E-003 | 1.728E-001 | 8.522E-002 | 0.08 | 0.0082 |
| CS-137 | 8539 | 2.946E+001pCi/g | 1.543E+000 | 1.732E-001 | 1.283E-001 | 6.298E-002 | 229.67 | 1.5426 |
| EU-152 | 7145 | 4.748E-002pCi/g | 1.072E-001 | 1.072E-001 | 5.552E-001 | 2.753E-001 | 0.09 | 0.1072 |
| EU-154 | 7138 | -5.975E-001pCi/g | 3.547E-001 | 3.534E-001 | 1.287E+000 | 6.335E-001 | -0.46 | 0.3547 |
| EU-155 | 7131 | 0.000E+000pCi/g | 6.459E-002 | 6.458E-002 | 5.669E-001 | 2.819E-001 | 0.00 | 0.0646 |
| FE-59 | 7073 | 2.643E-002pCi/g | 9.024E-002 | 9.023E-002 | 2.608E-001 | 1.278E-001 | 0.10 | 0.0902 |
| GA-68 | 18005 | 8.596E+000pCi/g | 3.357E+000 | 3.323E+000 | 6.813E+000 | 3.331E+000 | 1.26 | 3.3573 |
| GD-153 | 6824 | -8.384E-002pCi/g | 1.220E-001 | 1.219E-001 | 4.029E-001 | 2.003E-001 | -0.21 | 0.1220 |
| HF-181 | 6495 | -6.828E-002pCi/g | 5.481E-002 | 5.470E-002 | 2.461E-001 | 1.221E-001 | -0.28 | 0.0548 |
| HG-203 | 6466 | 4.202E-002pCi/g | 3.706E-002 | 3.698E-002 | 1.223E-001 | 6.047E-002 | 0.34 | 0.0371 |
| I-131 | 6380 | 3.628E-002pCi/g | 1.901E-002 | 1.892E-002 | 1.246E-001 | 6.152E-002 | 0.29 | 0.0190 |
| IR-192 | 6303 | -2.168E-002pCi/g | 7.180E-002 | 7.179E-002 | 2.377E-001 | 1.182E-001 | -0.09 | 0.0718 |
| K-40 | 6148 | 6.639E-001pCi/g | 2.328E-001 | 2.304E-001 | 4.971E-001 | 2.316E-001 | 1.34 | 0.2328 |
| LA-140 | 6096 | -4.506E-003pCi/g | 2.822E-002 | 2.822E-002 | 5.829E-002 | 2.711E-002 | -0.08 | 0.0282 |
| MN-54 | 5382 | -6.745E-002pCi/g | 5.650E-002 | 5.640E-002 | 1.251E-001 | 6.137E-002 | -0.54 | 0.0565 |
| NA-22 | 5201 | -2.403E-002pCi/g | 2.173E-002 | 2.170E-002 | 7.252E-002 | 3.463E-002 | -0.33 | 0.0217 |
| NB-94 | 5160 | -3.407E-004pCi/g | 3.069E-004 | 3.063E-004 | 1.048E-001 | 5.135E-002 | 0.00 | 0.0003 |
| NB-95 | 5154 | 3.914E-002pCi/g | 3.649E-002 | 3.643E-002 | 1.208E-001 | 5.929E-002 | 0.32 | 0.0365 |
| ND-147 | 5083 | 7.805E-002pCi/g | 3.391E-001 | 3.391E-001 | 7.858E-001 | 3.864E-001 | 0.10 | 0.3391 |
| NP-237 | 4757 | -2.837E-001pCi/g | 1.395E-001 | 1.386E-001 | 1.219E+000 | 6.069E-001 | -0.23 | 0.1395 |
| NP-239 | 4751 | 1.084E-001pCi/g | 1.518E-001 | 1.517E-001 | 5.014E-001 | 2.492E-001 | 0.22 | 0.1518 |
| PA-231 | 4541 | -1.320E+000pCi/g | 2.103E+000 | 2.101E+000 | 6.948E+000 | 3.455E+000 | -0.19 | 2.1026 |
| PA-233 | 4535 | -1.093E-001pCi/g | 1.714E-001 | 1.713E-001 | 5.664E-001 | 2.816E-001 | -0.19 | 0.1714 |
| PA-234 | 4528 | -1.363E-001pCi/g | 1.644E-001 | 1.643E-001 | 5.432E-001 | 2.697E-001 | -0.25 | 0.1644 |
| PA-234M | 19453 | 6.684E+000pCi/g | 7.479E+000 | 7.471E+000 | 2.474E+001 | 1.221E+001 | 0.27 | 7.4790 |
| PB-210 | 4467 | 8.653E+002pCi/g | 5.095E+001 | 3.757E+000 | 6.636E+000 | 3.302E+000 | 130.39 | 50.9455 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PB-212 | 4454 | 5.224E-001pCi/g | 5.823E-002 | 4.742E-002 | 1.424E-001 | 7.008E-002 | 3.67 | 0.0582 |
| PB-214 | 4448 | 4.392E-001pCi/g | 9.032E-002 | 8.739E-002 | 2.205E-001 | 1.086E-001 | 1.99 | 0.0903 |
| PM-144 | 19585 | -5.417E-002pCi/g | 3.958E-002 | 3.948E-002 | 1.040E-001 | 5.098E-002 | -0.52 | 0.0396 |
| PM-146 | 2464 | 1.226E-001pCi/g | 1.108E-001 | 1.106E-001 | 3.016E-001 | 1.476E-001 | 0.41 | 0.1108 |
| RH-106 | 1882 | 2.599E-002pCi/g | 2.105E-002 | 2.100E-002 | 2.156E+000 | 1.068E+000 | 0.01 | 0.0210 |
| RU-103 | 1828 | -5.867E-002pCi/g | 2.349E-002 | 2.330E-002 | 1.241E-001 | 6.118E-002 | -0.47 | 0.0235 |
| SB-124 | 1784 | 0.000E+000pCi/g | 1.688E-002 | 1.688E-002 | 2.070E-001 | 1.025E-001 | 0.00 | 0.0169 |
| SB-125 | 1777 | -1.078E-002pCi/g | 1.601E-001 | 1.601E-001 | 3.858E-001 | 1.905E-001 | -0.03 | 0.1601 |
| SC-46 | 1739 | -7.883E-002pCi/g | 6.814E-002 | 6.802E-002 | 2.249E-001 | 1.112E-001 | -0.35 | 0.0681 |
| SN-113 | 1570 | -3.132E-002pCi/g | 5.919E-002 | 5.917E-002 | 2.463E-001 | 1.221E-001 | -0.13 | 0.0592 |
| SN-126 | 17459 | 1.194E-001pCi/g | 3.683E-001 | 3.682E-001 | 1.220E+000 | 6.058E-001 | 0.10 | 0.3683 |
| TA-182 | 1301 | -2.417E-001pCi/g | 1.927E-001 | 1.923E-001 | 6.357E-001 | 3.136E-001 | -0.38 | 0.1927 |
| TC-99M | 17412 | -3.094E-002pCi/g | 3.986E-002 | 3.982E-002 | 1.317E-001 | 6.540E-002 | -0.23 | 0.0399 |
| TH-227 | 1058 | 1.356E+000pCi/g | 9.182E-001 | 9.151E-001 | 3.017E+000 | 1.501E+000 | 0.45 | 0.9182 |
| TH-229 | 1046 | 6.952E-001pCi/g | 6.285E-001 | 6.260E-001 | 1.750E+000 | 8.657E-001 | 0.40 | 0.6285 |
| TH-234 | 1027 | -6.254E-001pCi/g | 2.719E+000 | 2.719E+000 | 3.056E+000 | 1.517E+000 | -0.20 | 2.7194 |
| TL-208 | 929 | 2.501E-001pCi/g | 5.393E-002 | 5.235E-002 | 1.079E-001 | 5.290E-002 | 2.32 | 0.0539 |
| U-235 | 281 | -2.285E-001pCi/g | 2.914E-001 | 2.911E-001 | 9.626E-001 | 4.781E-001 | -0.24 | 0.2914 |
| Y-88 | 74 | 4.069E-003pCi/g | 4.933E-003 | 4.928E-003 | 1.477E-001 | 7.253E-002 | 0.03 | 0.0049 |
| ZN-65 | 31 | 1.536E-001pCi/g | 1.219E-001 | 1.216E-001 | 4.021E-001 | 1.982E-001 | 0.38 | 0.1219 |
| ZR-95 | 7 | -1.042E-001pCi/g | 8.528E-002 | 8.511E-002 | 1.981E-001 | 9.703E-002 | -0.53 | 0.0853 |

## *Laboratory Control Sample Information*

| Sample ID | WRKNO | Analyte | Activity | StdAdded | Recovery | ZFactor |
|---|---|---|---|---|---|---|
| LCS 160-279184~2-A | LCS 160-279184~2-A | CS-137 | 2.946E+001 pCi/g | 2.931E+001 | 100.52% | 0.0694 |
| | | CO-60 | 1.582E+001 pCi/g | 1.604E+001 | 98.64% | -0.1915 |
| | | AM-241 | 1.017E+002 pCi/g | 9.705E+001 | 104.79% | 0.6358 |

## *Sample Duplicate Information*

| Sample ID | Dup Sample ID | Analyte | Samp Activity | Dup Activity | RPD | RER | DER | Flag | ZFactor |
|---|---|---|---|---|---|---|---|---|---|

Test America St. Louis  Spectrum ID: 3_Gamma_20161824

Sample Description: ACVTop-1012459;TunaCan2006
Detector: Detector # 3
Batch ID: 279184
Work Order Number: Gamma
Lot Number: LCS 160-279184~2-A

Decay to Time: 12/9/2016 08:29  Live Time: 7200 sec
Acquisition Time: 12/9/2016 08:29:24  Real Time: 7231 sec
Analysis Time: 12/9/2016 13:09  Dead Time: 0.43 %
Analysis Quantity: 1.000E+00 Sample

Efficiency Cal File: 3_Soil_TunaCan.Clb
Efficiency Cal Desc: 3_Soil_TunaCan_90099_032712
Efficiency Cal Date: 3/28/2012 11:26
Energy Cal Date: 2/28/2012 19:25
Library: Client_Long_Rev11.lib
Bkgd Correction File: 3_2016-11-06_1105.PBC

| Nuclide | Activity Bq/Sample | 1-Sigma Counting Uncert % | 1-Sigma Counting Uncert Bq/Sample | 1-Sigma Total Uncert Bq/Sample | Minimum Detectable Activity Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | -6.479E+00 | 81.1 | 5.253E+00 | 5.264E+00 | 2.386E+01 |
| NA-22 | -3.040E-01 | 90.3 | 2.745E-01 | 2.749E-01 | 9.174E-01 |
| K-40 | 8.399E+00 | 34.7 | 2.914E+00 | 2.946E+00 | 6.288E+00 |
| Sc-46 | -9.972E-01 | 86.3 | 8.605E-01 | 8.620E-01 | 2.845E+00 |
| CR-51 | -2.746E+00 | 147.1 | 4.039E+00 | 4.042E+00 | 2.708E+01 |
| MN-54 | -8.533E-01 | 83.6 | 7.134E-01 | 7.148E-01 | 1.582E+00 |
| FE-59 | 3.343E-01 | 341.4 | 1.141E+00 | 1.142E+00 | 3.299E+00 |
| Co-56 | 9.971E-01 | 64.1 | 6.392E-01 | 6.413E-01 | 1.513E+00 |
| CO-57 | 3.257E-01 | 118.2 | 3.851E-01 | 3.855E-01 | 1.025E+00 |
| CO-58 | -5.079E-01 | 124.3 | 6.311E-01 | 6.317E-01 | 2.094E+00 |
| CO-60 | 2.002E+02 | 0.7 | 1.344E+00 | 1.014E+01 | 1.052E+00 |
| ZN-65 | 1.943E+00 | 79.2 | 1.539E+00 | 1.542E+00 | 5.087E+00 |
| NB-94 | -4.310E-03 | 89.9 | 3.875E-03 | 3.882E-03 | 1.326E+00 |
| ZR-95 | -1.318E+00 | 81.7 | 1.077E+00 | 1.079E+00 | 2.506E+00 |
| NB-95 | 4.951E-01 | 93.1 | 4.608E-01 | 4.616E-01 | 1.528E+00 |
| RU-103 | -7.422E-01 | 39.7 | 2.947E-01 | 2.972E-01 | 1.570E+00 |
| RH-106 | 3.288E-01 | 80.8 | 2.657E-01 | 2.662E-01 | 2.727E+01 |
| AG-108M | 2.303E-01 | 61.6 | 1.418E-01 | 1.423E-01 | 1.654E+00 |
| AG-110M | -1.327E+00 | 83.5 | 1.108E+00 | 1.110E+00 | 3.664E+00 |
| SN-113 | -3.962E-01 | 188.9 | 7.485E-01 | 7.487E-01 | 3.116E+00 |
| SB-124 | 0.000E+00 | 1.#INF | 2.135E-01 | 2.135E-01 | 2.618E+00 |
| SB-125 | -1.363E-01 | 1485.9 | 2.026E+00 | 2.026E+00 | 4.881E+00 |
| I-131 | 4.589E-01 | 52.1 | 2.393E-01 | 2.405E-01 | 1.577E+00 |
| Gd-153 | -1.061E+00 | 145.4 | 1.542E+00 | 1.543E+00 | 5.096E+00 |
| Ga-68 | 1.087E+02 | 38.7 | 4.203E+01 | 4.247E+01 | 8.619E+01 |
| Tc-99m | -3.914E-01 | 128.7 | 5.037E-01 | 5.042E-01 | 1.666E+00 |
| BA-133 | -3.916E-01 | 206.4 | 8.082E-01 | 8.084E-01 | 2.681E+00 |
| CS-134 | 7.377E-01 | 78.7 | 5.805E-01 | 5.818E-01 | 2.642E+00 |
| CS-137 | 3.727E+02 | 0.6 | 2.191E+00 | 1.951E+01 | 1.623E+00 |
| CE-139 | -4.212E-01 | 100.8 | 4.247E-01 | 4.266E-01 | 1.404E+00 |
| Ba-140 | 1.077E+00 | 175.9 | 1.895E+00 | 1.896E+00 | 5.190E+00 |
| La-140 | -5.701E-02 | 626.3 | 3.570E-01 | 3.570E-01 | 7.374E-01 |
| CE-141 | -5.654E-01 | 89.2 | 5.041E-01 | 5.049E-01 | 2.777E+00 |

| | | | | | |
|---|---|---|---|---|---|
| CE-144 | 1.688E+00 | 181.9 | 3.071E+00 | 3.072E+00 | 1.017E+01 |
| PM-144 | -6.853E-01 | 72.9 | 4.994E-01 | 5.007E-01 | 1.316E+00 |
| EU-152 | 6.007E-01 | 225.8 | 1.356E+00 | 1.357E+00 | 7.023E+00 |
| EU-154 | -7.558E+00 | 59.1 | 4.470E+00 | 4.487E+00 | 1.628E+01 |
| EU-155 | 0.000E+00 | 1.#INF | 8.170E-01 | 8.170E-01 | 7.171E+00 |
| HF-181 | -8.638E-01 | 80.1 | 6.919E-01 | 6.933E-01 | 3.113E+00 |
| Ta-182 | -3.058E+00 | 79.6 | 2.433E+00 | 2.438E+00 | 8.042E+00 |
| Hg-203 | 5.316E-01 | 88.0 | 4.678E-01 | 4.688E-01 | 1.547E+00 |
| TL-208 | 3.164E+00 | 20.9 | 6.622E-01 | 6.823E-01 | 1.365E+00 |
| pm-146 | 1.551E+00 | 90.2 | 1.399E+00 | 1.401E+00 | 3.815E+00 |
| y-88 | 5.148E-02 | 121.1 | 6.234E-02 | 6.240E-02 | 1.869E+00 |
| Cd-113m | 7.089E+03 | 92.2 | 6.534E+03 | 6.550E+03 | 2.160E+04 |
| Cd-109 | 7.054E+01 | 9.2 | 6.478E+00 | 7.577E+00 | 2.002E+01 |
| Cf-251 | 8.596E-01 | 228.3 | 1.962E+00 | 1.964E+00 | 5.184E+00 |
| Cf-249 | 3.916E-01 | 224.5 | 8.791E-01 | 8.793E-01 | 2.915E+00 |
| Sn-126 | 1.511E+00 | 308.3 | 4.658E+00 | 4.659E+00 | 1.544E+01 |
| PB-210 | 1.095E+04 | 0.4 | 4.753E+01 | 6.445E+02 | 8.395E+01 |
| PB-212 | 6.608E+00 | 9.1 | 5.999E-01 | 7.366E-01 | 1.801E+00 |
| PB-214 | 5.556E+00 | 19.9 | 1.106E+00 | 1.143E+00 | 2.789E+00 |
| BI-207 | 4.291E-01 | 119.1 | 5.110E-01 | 5.115E-01 | 1.361E+00 |
| BI-212 | 8.053E+00 | 80.3 | 6.463E+00 | 6.476E+00 | 2.138E+01 |
| BI-214 | 6.303E+00 | 15.6 | 9.847E-01 | 1.038E+00 | 2.215E+00 |
| BI-210M | -6.194E-01 | 126.3 | 7.824E-01 | 7.832E-01 | 2.592E+00 |
| AC-228 | 9.411E+00 | 19.3 | 1.816E+00 | 1.878E+00 | 4.433E+00 |
| TH-227 | 1.716E+01 | 67.5 | 1.158E+01 | 1.161E+01 | 3.817E+01 |
| TH-229 | 8.795E+00 | 90.0 | 7.920E+00 | 7.951E+00 | 2.214E+01 |
| TH-234 | -7.912E+00 | 434.8 | 3.440E+01 | 3.440E+01 | 3.866E+01 |
| PA-231 | -1.670E+01 | 159.2 | 2.658E+01 | 2.660E+01 | 8.790E+01 |
| PA-233 | -1.382E+00 | 156.8 | 2.167E+00 | 2.168E+00 | 7.166E+00 |
| PA-234 | -1.725E+00 | 120.5 | 2.078E+00 | 2.080E+00 | 6.871E+00 |
| PA-234M | 8.455E+01 | 111.8 | 9.452E+01 | 9.461E+01 | 3.130E+02 |
| U-235 | -2.890E+00 | 127.4 | 3.683E+00 | 3.686E+00 | 1.218E+01 |
| AM-241 | 1.287E+03 | 0.4 | 4.934E+00 | 6.695E+01 | 7.053E+00 |
| Np-237 | -3.589E+00 | 48.8 | 1.753E+00 | 1.764E+00 | 1.542E+01 |
| Ir-192 | -2.743E-01 | 331.1 | 9.082E-01 | 9.083E-01 | 3.006E+00 |
| Cs-136 | 1.742E-01 | 59.1 | 1.030E-01 | 1.035E-01 | 2.185E+00 |
| Np-239 | 1.371E+00 | 139.9 | 1.919E+00 | 1.920E+00 | 6.343E+00 |
| Nd-147 | 9.873E-01 | 434.5 | 4.290E+00 | 4.290E+00 | 9.941E+00 |
| Total | 2.025E+04 | | | | |

Analyst: Jody Watson

TestAmerica Inc  Spectrum name: 3_Gamma_20161824.An1

Sample description
ACVTop-1012459;TunaCan2006

Spectrum Filename: C:\User\SPC\Det3\3_Gamma_20161824.An1

Acquisition information

| | |
|---|---|
| Start time: | 12/9/2016 8:29:24 AM |
| Live time: | 7200 |
| Real time: | 7231 |
| Dead time: | 0.43 % |
| Detector ID: | 3 |

Detector system
Ge 3 SN/131

Calibration

| | |
|---|---|
| Filename: | 3_Soil_TunaCan.Clb |

3_Soil_TunaCan_90099_032712

Energy Calibration

| | |
|---|---|
| Created: | 2/28/2012 7:25:37 PM |
| Zero offset: | 0.122 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | 3.421E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 3/28/2012 11:26:55 AM |
| Knee Energy: | 165.85 keV |
| Above the Knee: | Quadratic  Uncertainty =  0.64 % |
| Log(Eff): | -6.102019E-01 + (-3.642282E-01*Log(E) ) + ( -2.895398E-02*Log(E)^2 ) |
| Below the Knee: | Quadratic  Uncertainty =  1.29 % |
| Log(Eff): | -2.525141E+01 + ( 9.446449E+00*Log(E) ) + ( -1.005974E+00*Log(E)^2 ) |

Library Files

| | |
|---|---|
| Main analysis library: | Client_Long_Rev11.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 150 (  37.59keV ) |
| Stop channel: | 8000 (  2000.59keV ) |
| Peak rejection level: | 1000.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Reg. Guide 4.16 Method |

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 12/9/2016 8:29:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | YES | 3_2016-11-06_1105.PBC 11/6/2016 11:05:57 AM |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 32 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.1381

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. Bq/Sampl | Nuc |
|---|---|---|---|---|---|---|---|---|
| 43.56 | 1159. | 14.72 | 0.82 | 1.961E-02 | | | | |
| 46.60 | 74156. | 0.43 | 0.82 | 2.213E-02 | 46.54 | 4.250 | 1.094E+04 | PB210 |
| 49.64 | 763. | 21.69 | 0.82 | 2.458E-02 | 50.14 | 8.000 | 5.291E+01 | TH227 |
| 59.51 | 105820. | 0.38 | 0.82 | 3.180E-02 | 59.54 | 35.900 | 1.287E+03 | AM241 |
| 65.07 | 24. | 203.33 | 0.84 | 3.520E-02 | 64.28 | 9.700 | 9.684E-01 | Sn126 |
| 72.72 | 216. | 36.52 | 0.85 | 3.905E-02 | | | | |
| 74.86 | 523. | 15.42 | 0.85 | 3.996E-02 | | | | |
| 76.97 | 494. | 16.02 | 0.85 | 4.078E-02 | | | | |
| 84.66 | 153. | 48.83 | 0.86 | 4.320E-02 | | | | |
| 87.85 | 848. | 9.18 | 0.86 | 4.397E-02 | 87.57 | 37.500 | 7.150E+00 | Sn126 |
| | | | | | 88.04 | 3.790 | 7.058E+01 | Cd109 |
| 92.61 | 226. | 42.74 | 0.77 | 4.491E-02 | 92.59 | 5.584 | PBC<MDA | TH234 |
| | | | | | 93.35 | 5.561 | 1.256E+01 | AC228 |
| 106.13 | 102. | 139.90 | 0.88 | 4.614E-02 | 106.13 | 22.700 | PBC<MDA | Np239 |
| 113.87 | 75. | 77.18 | 0.36 | 4.611E-02 | | | | |
| 121.82 | 30. | 285.00 | 0.90 | 4.566E-02 | 121.78 | 28.580 | PBC<MDA | EU152 |
| | | | | | 122.06 | 85.600 | 1.078E-01 | CO57 |
| 123.10 | 14. | 644.79 | 0.90 | 4.555E-02 | 123.10 | 40.790 | PBC<MDA | EU154 |
| 133.54 | 60. | 181.88 | 0.91 | 4.438E-02 | 133.54 | 11.090 | PBC<MDA | CE144 |
| 136.47 | 99. | 118.24 | 0.91 | 4.397E-02 | 136.30 | 5.850 | PBC<MDA | HF181 |
| | | | | | 136.47 | 10.680 | 2.936E+00 | CO57 |
| 148.51 | 174. | 35.01 | 1.40 | 4.205E-02 | | | | |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| 162.66 | 58. | 175.94 | 0.94 | 3.943E-02 | 162.66 | 6.220 | PBC<MDA | Ba140 |
| 176.60 | 40. | 228.26 | 0.95 | 3.802E-02 | 176.60 | 17.000 | PBC<MDA | Cf251 |
| 193.51 | 65. | 145.59 | 0.97 | 3.577E-02 | 193.51 | 4.400 | PBC<MDA | TH229 |
| 210.85 | 96. | 106.00 | 0.99 | 3.376E-02 | 210.85 | 2.990 | PBC<MDA | TH229 |
| 227.00 | 81. | 120.97 | 1.00 | 3.212E-02 | 227.00 | 6.300 | PBC<MDA | Cf251 |
| 238.65 | 587. | 12.92 | 1.01 | 3.105E-02 | 238.63 | 43.300 | 6.064E+00 | PB212 |
| 242.01 | 163. | 31.88 | 1.02 | 3.075E-02 | 242.00 | 7.430 | PBC<MDA | PB214 |
| 255.11 | 62. | 58.11 | 0.62 | 2.966E-02 | | | | |
| 263.70 | 89. | 92.17 | 1.04 | 2.900E-02 | 263.70 | 0.006 | PBC<MDA | Cd113m |
| 278.84 | 85. | 93.98 | 1.05 | 2.801E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| | | | | | 279.20 | 81.460 | PBC<MDA | Hg203 |
| 279.20 | 87. | 88.00 | 1.06 | 2.788E-02 | 277.28 | 6.310 | PBC<MDA | TL208 |
| | | | | | 279.20 | 81.460 | 5.316E-01 | Hg203 |
| 284.30 | 76. | 112.23 | 1.06 | 2.753E-02 | 284.30 | 6.140 | PBC<MDA | I131 |
| 295.39 | 262. | 27.77 | 0.82 | 2.681E-02 | 295.09 | 19.300 | 5.906E+00 | PB214 |
| 310.22 | 84. | 42.76 | 0.70 | 2.591E-02 | | | | |
| 338.43 | 215. | 32.60 | 0.53 | 2.439E-02 | 338.32 | 12.010 | 1.018E+01 | AC228 |
| 344.22 | 29. | 332.23 | 1.12 | 2.409E-02 | 344.29 | 26.500 | PBC<MDA | EU152 |
| 352.04 | 345. | 21.93 | 1.06 | 2.372E-02 | 351.93 | 37.600 | 5.377E+00 | PB214 |
| 370.67 | 60. | 57.16 | 0.63 | 2.287E-02 | | | | |
| 387.95 | 41. | 224.47 | 1.17 | 2.215E-02 | 387.95 | 66.000 | PBC<MDA | Cf249 |
| 488.39 | 47. | 76.79 | 1.26 | 1.878E-02 | | | | |
| 490.85 | 66. | 60.36 | 1.27 | 1.871E-02 | | | | |
| 511.86 | 337. | 36.39 | 2.54 | 1.815E-02 | 511.86 | 20.000 | 1.291E+01 | RH106 |
| 531.00 | 16. | 434.47 | 1.31 | 1.767E-02 | 531.00 | 13.000 | PBC<MDA | Nd147 |
| 537.26 | 16. | 439.74 | 1.31 | 1.752E-02 | 537.26 | 24.390 | PBC<MDA | Ba140 |
| 569.70 | 35. | 138.30 | 1.34 | 1.679E-02 | 569.32 | 15.380 | 1.886E+00 | CS134 |
| | | | | | 569.47 | 8.200 | 3.538E+00 | PA234 |
| | | | | | 569.70 | 97.740 | PBC<MDA | BI207 |
| 582.98 | 318. | 20.93 | 2.04 | 1.651E-02 | 583.02 | 84.500 | 3.164E+00 | TL208 |
| 592.01 | 24. | 70.37 | 0.25 | 1.632E-02 | | | | |
| 609.29 | 329. | 15.62 | 1.13 | 1.598E-02 | 609.31 | 46.090 | 6.196E+00 | BI214 |
| | | | | | 610.30 | 5.750 | 4.972E+01 | RU103 |
| 614.28 | 67. | 131.67 | 1.39 | 1.589E-02 | 614.28 | 89.850 | PBC<MDA | AG108M |
| 618.06 | 67. | 133.48 | 1.39 | 1.582E-02 | 618.06 | 99.100 | PBC<MDA | PM144 |
| 636.97 | 65. | 68.20 | 1.41 | 1.547E-02 | 636.97 | 7.170 | PBC<MDA | I131 |
| 657.76 | 40. | 674.83 | 1.43 | 1.510E-02 | 657.76 | 94.640 | PBC<MDA | AG110M |
| 661.69 | 34392. | 0.59 | 1.41 | 1.504E-02 | 661.66 | 85.210 | 3.727E+02 | CS137 |
| 722.94 | 65. | 76.61 | 1.49 | 1.408E-02 | 722.79 | 10.810 | 5.895E+00 | SB124 |
| | | | | | 722.94 | 90.840 | 7.016E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 3.153E+00 | EU154 |
| 723.36 | 64. | 76.41 | 1.49 | 1.408E-02 | 722.79 | 10.810 | PBC<MDA | SB124 |
| | | | | | 722.94 | 90.840 | 6.949E-01 | AG108M |
| | | | | | 723.36 | 20.220 | 3.123E+00 | EU154 |
| 727.17 | 61. | 80.25 | 1.49 | 1.402E-02 | 727.17 | 7.550 | PBC<MDA | BI212 |
| 735.72 | 58. | 90.19 | 1.50 | 1.390E-02 | 735.72 | 22.500 | PBC<MDA | pm146 |
| 747.16 | 29. | 195.04 | 1.51 | 1.374E-02 | 747.16 | 34.000 | PBC<MDA | pm146 |
| 765.49 | 49. | 50.70 | 1.53 | 1.349E-02 | 765.79 | 99.790 | 5.039E-01 | NB95 |

| pk energy | area | uncert | fwhm | corr | nuclide | brnch. | act. | nuc |
|---|---|---|---|---|---|---|---|---|
| | | | | | 766.41 | 0.294 | 1.712E+02 | PA234M |
| 768.01 | 39. | 68.54 | 1.53 | 1.346E-02 | | | | |
| 785.42 | 20. | 294.09 | 1.55 | 1.323E-02 | 785.42 | 1.280 | PBC<MDA | BI212 |
| 795.87 | 66. | 78.69 | 1.56 | 1.310E-02 | 795.87 | 85.530 | PBC<MDA | CS134 |
| 801.95 | 67. | 80.28 | 1.56 | 1.303E-02 | 801.95 | 8.690 | PBC<MDA | CS134 |
| 846.20 | 71. | 86.67 | 1.60 | 1.251E-02 | 846.77 | 99.935 | PBC<MDA | Co56 |
| 862.17 | 43. | 65.37 | 0.68 | 1.234E-02 | | | | |
| 871.10 | 36. | 134.13 | 1.62 | 1.224E-02 | 871.10 | 99.890 | PBC<MDA | NB94 |
| 911.30 | 225. | 20.64 | 2.15 | 1.183E-02 | 911.07 | 29.000 | 9.093E+00 | AC228 |
| 931.93 | 182. | 37.22 | 2.82 | 1.164E-02 | | | | |
| 945.08 | 186. | 29.15 | 0.66 | 1.151E-02 | 946.02 | 13.400 | 1.660E+01 | PA234 |
| 969.20 | 64. | 99.74 | 1.71 | 1.129E-02 | 968.97 | 17.460 | PBC<MDA | AC228 |
| 996.33 | 77. | 79.66 | 1.74 | 1.105E-02 | 996.33 | 10.600 | PBC<MDA | EU154 |
| 1001.00 | 56. | 111.79 | 1.74 | 1.101E-02 | 1001.00 | 0.837 | PBC<MDA | PA234M |
| 1037.84 | 46. | 134.73 | 1.77 | 1.071E-02 | 1037.84 | 14.130 | PBC<MDA | Co56 |
| 1048.07 | 74. | 60.06 | 1.78 | 1.063E-02 | 1048.07 | 80.000 | PBC<MDA | Cs136 |
| 1050.36 | 49. | 89.71 | 1.79 | 1.062E-02 | 1050.36 | 1.560 | PBC<MDA | RH106 |
| 1063.66 | 34. | 193.93 | 1.80 | 1.051E-02 | 1063.66 | 74.500 | PBC<MDA | BI207 |
| 1077.12 | 42. | 51.62 | 0.29 | 1.041E-02 | 1077.40 | 3.300 | 3.001E+01 | Ga68 |
| 1099.25 | 19. | 341.40 | 1.83 | 1.025E-02 | 1099.25 | 56.500 | PBC<MDA | FE59 |
| 1112.07 | 11. | 516.98 | 1.84 | 1.016E-02 | 1112.07 | 13.644 | PBC<MDA | EU152 |
| 1115.63 | 72. | 79.21 | 1.84 | 1.014E-02 | 1115.55 | 50.600 | PBC<MDA | ZN65 |
| 1120.37 | 80. | 40.20 | 1.85 | 1.010E-02 | 1120.29 | 15.100 | PBC<MDA | BI214 |
| | | | | | 1120.55 | 99.987 | PBC<MDA | Sc46 |
| 1173.18 | 13926. | 0.96 | 1.84 | 9.749E-03 | 1173.24 | 99.900 | 1.986E+02 | CO60 |
| 1189.05 | 48. | 80.56 | 1.91 | 9.648E-03 | 1189.05 | 16.200 | PBC<MDA | Ta182 |
| 1238.28 | 28. | 106.42 | 1.95 | 9.349E-03 | 1238.28 | 66.070 | PBC<MDA | Co56 |
| 1291.60 | 5. | 611.75 | 1.99 | 9.048E-03 | 1291.60 | 43.200 | PBC<MDA | FE59 |
| 1332.44 | 12825. | 0.94 | 1.95 | 8.831E-03 | 1332.50 | 99.980 | 2.018E+02 | CO60 |
| 1384.30 | 22. | 80.54 | 2.07 | 8.571E-03 | 1384.30 | 24.290 | PBC<MDA | AG110M |
| 1402.11 | 8. | 244.02 | 2.09 | 8.458E-03 | 1408.00 | 21.005 | PBC<MDA | EU152 |
| 1460.65 | 53. | 34.70 | 2.40 | 8.216E-03 | 1460.83 | 10.670 | 8.399E+00 | K40 |
| 1764.69 | 44. | 29.59 | 2.66 | 7.075E-03 | 1764.49 | 15.400 | 5.653E+00 | BI214 |
| 1836.06 | 11. | 121.11 | 2.43 | 6.854E-03 | 1836.06 | 99.200 | PBC<MDA | y88 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 173.84 | 43.49 | 13967. | 1159. | 5.908E+04 | 14.72 | 0.815 | - sD |
| 198.20 | 49.57 | 13443. | 647. | 2.630E+04 | 25.66 | 0.822 | - sD |
| 260.00 | 65.07 | 1232. | 24. | 6.677E+02 | 203.33 | 0.000 | - sc |
| 290.64 | 72.72 | 3002. | 216. | 5.544E+03 | 36.52 | 0.846 | - D |
| 299.18 | 74.86 | 2974. | 523. | 1.309E+04 | 15.42 | 0.848 | - D |
| 307.62 | 76.97 | 2871. | 494. | 1.211E+04 | 16.02 | 0.850 | - D |
| 337.26 | 84.54 | 2471. | 134. | 3.091E+03 | 53.51 | 0.858 | - D |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 369.64 | 92.61 | 2511. | 227. | 5.055E+03 | 31.91 | 0.866 | - sD |
| 455.34 | 113.87 | 1404. | 75. | 1.626E+03 | 77.18 | 0.359 | - sc |
| 594.02 | 148.51 | 1332. | 174. | 4.146E+03 | 35.01 | 1.396 | - s |
| 1021.33 | 255.11 | 963. | 69. | 2.329E+03 | 64.67 | 1.033 | - sc |
| 1241.24 | 310.22 | 564. | 84. | 3.261E+03 | 42.76 | 0.702 | - s |
| 1483.18 | 370.67 | 512. | 60. | 2.616E+03 | 57.16 | 0.632 | - s |
| 1954.22 | 488.32 | 616. | 47. | 2.480E+03 | 76.79 | 1.264 | - sc |
| 1964.06 | 490.78 | 754. | 66. | 3.512E+03 | 60.36 | 1.267 | - sD |
| 2368.84 | 592.01 | 147. | 24. | 1.491E+03 | 70.37 | 0.252 | - sc |
| 3072.15 | 768.01 | 369. | 39. | 2.894E+03 | 71.59 | 1.530 | - sc |
| 3449.55 | 862.17 | 266. | 43. | 3.499E+03 | 65.37 | 0.676 | - sM |
| 3728.54 | 930.98 | 823. | 182. | 1.561E+04 | 37.22 | 2.825 | - s |
| 3781.13 | 945.08 | 633. | 186. | 1.613E+04 | 29.15 | 0.658 | - s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.
M - Peak is close to a library peak.

---

This section based on library: Client_Long_Rev11.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| PB-210 | 185.82 | 46.54 | 14758. | 74166. | 10.301 | 0.43 | 0.818D |
| TH-227 | 200.24 | 50.14 | 13807. | 247. | 0.034 | 67.47 | 0.822D |
| AM-241 | 237.74 | 59.51 | 15354. | 105820. | 14.697 | 0.38 | 0.815 |
| TH-234 | 252.87 | 63.29 | 5955. | -74. | -0.010 | 434.77 | 0.836s |
| Sn-126 | 256.84 | 64.28 | 6370. | 37. | 0.005 | 308.28 | 0.837 |
| BA-133 | 323.73 | 80.99 | 18517. | -114. | -0.016 | 169.02 | 0.854s |
| Np-237 | 345.75 | 86.49 | 18436. | -148. | -0.021 | 48.84 | 0.860s |
| EU-155 | 345.96 | 86.54 | 18288. | -115. | -0.016 | 166.87 | 0.860s |
| Sn-126 | 347.55 | 86.94 | 18173. | -115. | -0.016 | 166.24 | 0.860 |
| Sn-126 | 350.08 | 87.57 | 18059. | -115. | -0.016 | 165.62 | 0.861 |
| Cd-109 | 351.96 | 88.04 | 2607. | 848. | 0.118 | 9.18 | 0.861D |
| Nd-147 | 364.21 | 91.10 | 17944. | -115. | -0.016 | 164.40 | 0.865s |
| TH-234 | 370.17 | 92.59 | 17381. | -226. | -0.031 | 32.89 | 0.866s |
| AC-228 | 373.21 | 93.35 | 17263. | 115. | 0.016 | 161.44 | 0.867s |
| Gd-153 | 389.83 | 97.50 | 11465. | -104. | -0.015 | 145.37 | 0.871s |
| Np-239 | 397.83 | 99.50 | 11569. | -40. | -0.006 | 378.12 | 0.873s |
| Gd-153 | 412.64 | 103.20 | 11609. | 0. | 0.000 | 1000.00 | 0.877s |
| Np-239 | 414.64 | 103.70 | 11609. | 0. | 0.000 | 1000.00 | 0.878s |
| EU-155 | 421.10 | 105.31 | 11609. | 0. | 0.000 | 1000.00 | 0.879s |
| Np-239 | 424.37 | 106.13 | 10162. | 102. | 0.014 | 139.90 | 0.880s |
| EU-152 | 487.00 | 121.78 | 3722. | 30. | 0.004 | 285.00 | 0.896 |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| CO-57 | 488.14 | 122.06 | 3752. | 0. | 0.000 | 1000.00 | 0.897 |
| EU-154 | 492.30 | 123.10 | 4264. | 14. | 0.002 | 644.79 | 0.898s |
| PA-234 | 525.11 | 131.29 | 7188. | -100. | -0.014 | 120.50 | 0.906s |
| HF-181 | 532.03 | 133.02 | 7288. | -28. | -0.004 | 426.77 | 0.908s |
| CE-144 | 534.09 | 133.54 | 5891. | 60. | 0.008 | 181.88 | 0.909 |
| HF-181 | 545.14 | 136.30 | 6742. | -76. | -0.011 | 153.22 | 0.911s |
| CO-57 | 545.83 | 136.47 | 6841. | 99. | 0.014 | 118.24 | 0.912s |
| Tc-99m | 561.99 | 140.51 | 7802. | -97. | -0.014 | 128.70 | 0.916 |
| U-235 | 575.10 | 143.79 | 7705. | -98. | -0.014 | 127.43 | 0.919s |
| CE-141 | 581.73 | 145.44 | 7651. | -84. | -0.012 | 89.16 | 0.921s |
| Ba-140 | 650.65 | 162.66 | 5238. | 58. | 0.008 | 175.94 | 0.939s |
| CE-139 | 663.43 | 165.85 | 4640. | -96. | -0.013 | 100.84 | 0.942s |
| Cf-251 | 706.45 | 176.60 | 2620. | 40. | 0.006 | 228.26 | 0.953s |
| TH-229 | 774.13 | 193.51 | 2837. | 65. | 0.009 | 145.59 | 0.970s |
| U-235 | 821.46 | 205.33 | 3069. | -46. | -0.006 | 225.79 | 0.982s |
| TH-229 | 843.54 | 210.85 | 2952. | 96. | 0.013 | 106.00 | 0.988 |
| Cf-251 | 908.18 | 227.00 | 2743. | 81. | 0.011 | 120.97 | 1.004 |
| PB-212 | 954.74 | 238.63 | 1356. | 640. | 0.089 | 9.08 | 1.016D |
| PB-214 | 968.20 | 242.00 | 1266. | 163. | 0.023 | 31.88 | 1.019D |
| EU-152 | 978.99 | 244.69 | 6192. | -96. | -0.013 | 116.77 | 1.022 |
| TH-227 | 1025.21 | 256.24 | 2595. | -94. | -0.013 | 77.02 | 1.034 |
| Cd-113m | 1055.07 | 263.70 | 3306. | 89. | 0.012 | 92.17 | 1.041s |
| BI-210M | 1063.60 | 265.83 | 3266. | -64. | -0.009 | 126.31 | 1.044s |
| TL-208 | 1109.43 | 277.28 | 3110. | 85. | 0.012 | 93.98 | 1.055s |
| Hg-203 | 1117.10 | 279.20 | 2882. | 87. | 0.012 | 88.00 | 1.057s |
| I-131 | 1137.51 | 284.30 | 2057. | 76. | 0.011 | 112.23 | 1.062s |
| PB-214 | 1181.91 | 295.39 | 1474. | 220. | 0.031 | 33.21 | 0.824 |
| PB-212 | 1200.47 | 300.03 | 10438. | -91. | -0.013 | 159.01 | 1.078 |
| PA-231 | 1200.63 | 300.07 | 10347. | -91. | -0.013 | 158.28 | 1.078 |
| PA-233 | 1201.07 | 300.18 | 10394. | -91. | -0.013 | 158.64 | 1.078 |
| PA-231 | 1210.95 | 302.65 | 10514. | -91. | -0.013 | 159.18 | 1.081 |
| BA-133 | 1211.76 | 302.85 | 10605. | -91. | -0.013 | 159.83 | 1.081s |
| Ba-140 | 1219.75 | 304.85 | 10696. | -91. | -0.013 | 160.21 | 1.083s |
| BI-210M | 1219.94 | 304.90 | 10790. | -93. | -0.013 | 78.53 | 1.083s |
| Ir-192 | 1234.12 | 308.44 | 10879. | -92. | -0.013 | 161.05 | 1.086s |
| PA-233 | 1248.42 | 312.01 | 10464. | -92. | -0.013 | 156.79 | 1.090s |
| Ir-192 | 1266.34 | 316.49 | 10556. | -44. | -0.006 | 331.14 | 1.094s |
| CR-51 | 1280.73 | 320.08 | 10999. | -50. | -0.007 | 147.11 | 1.098s |
| La-140 | 1315.45 | 328.76 | 1951. | -23. | -0.003 | 365.14 | 1.107s |
| Cf-249 | 1334.18 | 333.44 | 1984. | -77. | -0.011 | 109.28 | 1.111s |
| AC-228 | 1354.15 | 338.43 | 1277. | 215. | 0.030 | 32.60 | 0.528s |
| Cs-136 | 1362.71 | 340.57 | 4865. | -88. | -0.012 | 112.77 | 1.119s |
| EU-152 | 1377.58 | 344.29 | 4720. | 29. | 0.004 | 332.23 | 1.122s |
| HF-181 | 1383.75 | 345.83 | 4703. | -34. | -0.005 | 283.75 | 1.124s |
| PB-214 | 1408.60 | 352.04 | 1434. | 345. | 0.048 | 21.93 | 1.065s |
| BA-133 | 1424.46 | 356.00 | 3589. | -41. | -0.006 | 206.40 | 1.134 |
| I-131 | 1458.41 | 364.48 | 2053. | -89. | -0.012 | 84.99 | 1.142s |
| BA-133 | 1535.87 | 383.84 | 4702. | -90. | -0.012 | 108.41 | 1.162s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| Cf-249 | 1552.32 | 387.95 | 4259. | 41. | 0.006 | 224.47 | 1.165s |
| SN-113 | 1567.28 | 391.69 | 4515. | -40. | -0.006 | 188.93 | 1.169s |
| AG-108M | 1736.34 | 433.94 | 2180. | -88. | -0.012 | 104.43 | 1.211s |
| pm-146 | 1816.14 | 453.88 | 2260. | -26. | -0.004 | 358.53 | 1.230s |
| SB-125 | 1854.10 | 463.37 | 4171. | -44. | -0.006 | 208.13 | 1.240s |
| Ir-192 | 1872.88 | 468.06 | 4265. | -36. | -0.005 | 255.91 | 1.244s |
| BE-7 | 1911.04 | 477.60 | 5395. | -94. | -0.013 | 81.09 | 1.254s |
| HF-181 | 1928.65 | 482.00 | 5304. | -95. | -0.013 | 80.10 | 1.258s |
| La-140 | 1948.75 | 487.02 | 5351. | -64. | -0.009 | 161.90 | 1.263 |
| RU-103 | 1988.90 | 497.05 | 1625. | -90. | -0.013 | 39.71 | 1.273 |
| RH-106 | 2048.16 | 511.86 | 2267. | 337. | 0.047 | 36.39 | 2.537 |
| Nd-147 | 2124.72 | 531.00 | 1205. | 16. | 0.002 | 434.47 | 1.306 |
| Ba-140 | 2149.77 | 537.26 | 1135. | 16. | 0.002 | 439.74 | 1.312s |
| CS-134 | 2253.70 | 563.24 | 1015. | -52. | -0.007 | 68.70 | 1.337s |
| CS-134 | 2278.04 | 569.32 | 1146. | -72. | -0.010 | 67.65 | 1.342 |
| PA-234 | 2278.64 | 569.47 | 1217. | -13. | -0.002 | 391.33 | 1.343 |
| BI-207 | 2279.57 | 569.70 | 1151. | 35. | 0.005 | 138.30 | 1.343 |
| TL-208 | 2332.68 | 582.98 | 832. | 318. | 0.044 | 20.93 | 2.037s |
| SB-125 | 2402.79 | 600.50 | 4058. | -32. | -0.005 | 277.77 | 1.372s |
| SB-124 | 2411.71 | 602.73 | 4026. | 0. | 0.000 | 1000.00 | 1.374s |
| CS-134 | 2419.63 | 604.71 | 4026. | 0. | 0.000 | 1000.00 | 1.376s |
| BI-214 | 2437.96 | 609.29 | 606. | 329. | 0.046 | 15.62 | 1.130s |
| RU-103 | 2441.99 | 610.30 | 4026. | 0. | 0.000 | 1000.00 | 1.382 |
| AG-108M | 2457.92 | 614.28 | 3848. | 67. | 0.009 | 131.67 | 1.385s |
| PM-144 | 2473.05 | 618.06 | 3915. | 67. | 0.009 | 133.48 | 1.389s |
| RH-106 | 2488.47 | 621.92 | 4264. | -69. | -0.010 | 134.40 | 1.392s |
| SB-125 | 2544.37 | 635.89 | 1150. | -39. | -0.005 | 132.55 | 1.406s |
| I-131 | 2548.71 | 636.97 | 958. | 65. | 0.009 | 68.20 | 1.407s |
| AG-110M | 2631.87 | 657.76 | 35809. | 40. | 0.006 | 674.83 | 1.427s |
| CS-137 | 2647.59 | 661.69 | 996. | 34392. | 4.777 | 0.59 | 1.415 |
| PM-144 | 2787.02 | 696.54 | 816. | -71. | -0.010 | 72.88 | 1.463 |
| NB-94 | 2811.37 | 702.63 | 799. | -43. | -0.006 | 119.80 | 1.469s |
| SB-124 | 2892.00 | 722.79 | 1311. | -23. | -0.003 | 223.61 | 1.488s |
| AG-108M | 2892.61 | 722.94 | 1193. | 65. | 0.009 | 76.61 | 1.488s |
| EU-154 | 2894.28 | 723.36 | 1164. | 64. | 0.009 | 76.41 | 1.488s |
| BI-212 | 2909.54 | 727.17 | 1182. | 61. | 0.009 | 80.25 | 1.492s |
| pm-146 | 2943.74 | 735.72 | 594. | 58. | 0.008 | 90.19 | 1.500s |
| pm-146 | 2989.50 | 747.16 | 727. | 29. | 0.004 | 195.04 | 1.510s |
| ZR-95 | 3027.78 | 756.73 | 790. | -70. | -0.010 | 81.67 | 1.519s |
| AG-110M | 3056.63 | 763.94 | 1037. | -63. | -0.009 | 73.83 | 1.526s |
| NB-95 | 3064.02 | 765.79 | 973. | 48. | 0.007 | 93.08 | 1.528s |
| EU-152 | 3116.54 | 778.92 | 742. | -10. | -0.001 | 578.71 | 1.540s |
| BI-212 | 3142.54 | 785.42 | 732. | 20. | 0.003 | 294.09 | 1.546s |
| CS-134 | 3184.33 | 795.87 | 1334. | 66. | 0.009 | 78.69 | 1.556s |
| CS-134 | 3208.67 | 801.95 | 1400. | 67. | 0.009 | 80.28 | 1.561s |
| CO-58 | 3243.96 | 810.78 | 1682. | -47. | -0.007 | 124.26 | 1.569s |
| La-140 | 3263.94 | 815.77 | 1729. | 0. | 0.000 | 1000.00 | 1.574s |
| Cs-136 | 3274.86 | 818.50 | 1827. | -60. | -0.008 | 101.85 | 1.576s |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| MN-54 | 3340.25 | 834.85 | 919. | -78. | -0.011 | 83.61 | 1.591s |
| Co-56 | 3387.93 | 846.77 | 820. | 71. | 0.010 | 86.67 | 1.602s |
| TL-208 | 3443.11 | 860.56 | 1018. | -81. | -0.011 | 56.71 | 1.615s |
| NB-94 | 3485.23 | 871.10 | 1142. | 36. | 0.005 | 134.13 | 1.625s |
| EU-154 | 3493.77 | 873.23 | 1379. | -82. | -0.011 | 59.14 | 1.627s |
| PA-234 | 3522.96 | 880.53 | 2253. | -84. | -0.012 | 80.82 | 1.633s |
| PA-234 | 3533.80 | 883.24 | 2336. | -84. | -0.012 | 82.15 | 1.636s |
| AG-110M | 3539.58 | 884.68 | 2420. | -84. | -0.012 | 83.52 | 1.637s |
| Sc-46 | 3557.96 | 889.28 | 2743. | -87. | -0.012 | 86.29 | 1.641 |
| y-88 | 3593.00 | 898.04 | 1010. | -10. | -0.001 | 480.02 | 1.649s |
| AC-228 | 3646.03 | 911.30 | 525. | 225. | 0.031 | 20.64 | 2.148s |
| AG-110M | 3750.78 | 937.49 | 2290. | -89. | -0.012 | 76.94 | 1.685 |
| PA-234 | 3784.89 | 946.02 | 1472. | -93. | -0.013 | 52.15 | 1.692s |
| EU-152 | 3857.23 | 964.11 | 1912. | -89. | -0.012 | 70.06 | 1.709s |
| AC-228 | 3876.67 | 968.97 | 1981. | 64. | 0.009 | 99.74 | 1.713s |
| EU-154 | 3986.08 | 996.33 | 1847. | 77. | 0.011 | 79.66 | 1.737s |
| PA-234M | 4004.75 | 1001.00 | 1936. | 56. | 0.008 | 111.79 | 1.742 |
| EU-154 | 4019.86 | 1004.77 | 1937. | -49. | -0.007 | 128.68 | 1.745s |
| Co-56 | 4152.08 | 1037.84 | 796. | 46. | 0.006 | 134.73 | 1.774 |
| Cs-136 | 4192.99 | 1048.07 | 940. | 74. | 0.010 | 60.06 | 1.783 |
| RH-106 | 4202.15 | 1050.36 | 958. | 49. | 0.007 | 89.71 | 1.785s |
| BI-207 | 4255.33 | 1063.66 | 835. | 34. | 0.005 | 193.93 | 1.797s |
| Ga-68 | 4310.28 | 1077.40 | 656. | 154. | 0.021 | 38.65 | 1.809s |
| FE-59 | 4397.65 | 1099.25 | 838. | 19. | 0.003 | 341.40 | 1.828s |
| EU-152 | 4448.93 | 1112.07 | 1639. | 11. | 0.002 | 516.98 | 1.839 |
| ZN-65 | 4462.81 | 1115.55 | 1578. | 72. | 0.010 | 79.21 | 1.842s |
| BI-214 | 4481.77 | 1120.29 | 469. | 80. | 0.011 | 40.20 | 1.847D |
| Sc-46 | 4482.82 | 1120.55 | 1650. | 0. | 0.000 | 1000.00 | 1.847s |
| Ta-182 | 4485.82 | 1121.30 | 1866. | -78. | -0.011 | 79.56 | 1.847s |
| CO-60 | 4693.25 | 1173.18 | 556. | 13926. | 1.934 | 0.96 | 1.836 |
| Ta-182 | 4756.71 | 1189.05 | 277. | 48. | 0.007 | 80.56 | 1.906s |
| Ta-182 | 4886.09 | 1221.41 | 229. | -13. | -0.002 | 259.61 | 1.934s |
| Co-56 | 4953.53 | 1238.28 | 164. | 28. | 0.004 | 106.42 | 1.948 |
| NA-22 | 5098.46 | 1274.53 | 153. | -20. | -0.003 | 90.28 | 1.979s |
| FE-59 | 5166.69 | 1291.60 | 147. | 5. | 0.001 | 611.75 | 1.993s |
| CO-60 | 5329.97 | 1332.44 | 189. | 12825. | 1.781 | 0.94 | 1.949 |
| AG-110M | 5537.27 | 1384.30 | 51. | 22. | 0.003 | 80.54 | 2.071s |
| EU-152 | 5632.02 | 1408.00 | 74. | 8. | 0.001 | 244.02 | 2.090 |
| K-40 | 5842.47 | 1460.65 | 63. | 53. | 0.007 | 34.70 | 2.398 |
| La-140 | 6384.26 | 1596.21 | 60. | -3. | 0.000 | 626.28 | 2.242 |
| SB-124 | 6763.00 | 1690.98 | 63. | -17. | -0.002 | 116.52 | 2.317s |
| BI-214 | 7057.54 | 1764.69 | 39. | 44. | 0.006 | 29.59 | 2.656 |
| Co-56 | 7084.14 | 1771.35 | 180. | -27. | -0.004 | 71.93 | 2.379 |
| y-88 | 7342.69 | 1836.06 | 25. | 11. | 0.001 | 121.11 | 2.428 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity Bq/Sample | Peak Energy keV | Peak Activity Bq/Sample | Code | MDA Value Bq/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| BE-7 | C | -6.4785E+00 | | | | 5.31E+01 | |
| | | | 477.60 | -6.479E+00 | &(P | 2.386E+01 8.11E+01 1.05E+01 | G |
| NA-22 | C | -3.0404E-01 | | | | 9.50E+02 | |
| | | | 1274.53 | -3.040E-01 | ?( | 9.174E-01 9.03E+01 9.99E+01 | G |
| K-40 | N | 8.3990E+00 | | | | 4.66E+11 | |
| | | | 1460.83 | 8.399E+00 | (P | 6.288E+00 3.47E+01 1.07E+01 | G |
| Sc-46 | F | -9.9721E-01 | | | | 8.38E+01 | |
| | | | 889.28 | -9.972E-01 | ?( | 2.845E+00 8.63E+01 1.00E+02 | G |
| | | | 1120.55 | 0.000E+00 | + | 2.640E+00 1.00E+03 1.00E+02 | G |
| CR-51 | F | -2.7456E+00 | | | | 2.77E+01 | |
| | | | 320.08 | -2.746E+00 | &(P | 2.708E+01 1.47E+02 9.94E+00 | G |
| MN-54 | C | -8.5331E-01 | | | | 3.12E+02 | |
| | | | 834.85 | -8.533E-01 | ?( | 1.582E+00 8.36E+01 1.00E+02 | G |
| FE-59 | F | 3.3434E-01 | | | | 4.45E+01 | |
| | | | 1099.25 | 4.632E-01 | &(P | 3.299E+00 3.41E+02 5.65E+01 | G |
| | | | 1291.60 | 1.658E-01 | &( | 2.106E+00 6.12E+02 4.32E+01 | G |
| Co-56 | C | 9.9706E-01 | | | | 7.73E+01 | |
| | | | 846.77 | 7.856E-01 | ?(P | 1.513E+00 8.67E+01 9.99E+01 | G |
| | | | 1238.28 | 6.216E-01 | (P | 1.404E+00 1.06E+02 6.61E+01 | G |
| | | | 1037.84 | 4.248E+00 | (P | 1.231E+01 1.35E+02 1.41E+01 | G |
| | | | 1771.35 | -3.485E+00 | + | 8.308E+00 7.19E+01 1.55E+01 | A |
| CO-57 | C | 3.2571E-01 | | | | 2.72E+02 | |
| | | | 122.06 | 0.000E+00 | ?( | 1.025E+00 1.00E+03 8.56E+01 | G |
| | | | 136.47 | 2.936E+00 | &( | 1.148E+01 1.18E+02 1.07E+01 | G |
| CO-58 | C | -5.0788E-01 | | | | 7.09E+01 | |
| | | | 810.78 | -5.079E-01 | ?( | 2.094E+00 1.24E+02 9.95E+01 | G |
| CO-60 | F | 2.0018E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 2.018E+02 | (P | 1.052E+00 9.36E-01 1.00E+02 | G |
| | | | 1173.24 | 1.986E+02 | (P | 1.605E+00 9.63E-01 9.99E+01 | G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| ZN-65 | F | 1.9425E+00 | | | | | 2.44E+02 | |
| | | | 1115.55 | 1.943E+00 | ?( | 5.087E+00 | 7.92E+01 | 5.06E+01 G |
| NB-94 | I | -4.3098E-03 | | | | | 7.41E+06 | |
| | | | 702.63 | -4.250E-01 | &(P | 1.326E+00 | 1.20E+02 | 9.79E+01 G |
| | | | 871.10 | 4.080E-01 | &(P | 1.819E+00 | 1.34E+02 | 9.99E+01 G |
| ZR-95 | I | -1.3183E+00 | | | | | 6.40E+01 | |
| | | | 756.73 | -1.318E+00 | &(P | 2.506E+00 | 8.17E+01 | 5.45E+01 G |
| | | | 724.20 | 7.573E-02 | % | 3.713E+00 | 1.46E+03 | 4.42E+01 G |
| NB-95 | I | 4.9510E-01 | | | | | 6.40E+01 | |
| | | | 765.79 | 4.951E-01 | ?( | 1.528E+00 | 9.31E+01 | 9.98E+01 G |
| RU-103 | I | -7.4216E-01 | | | | | 3.93E+01 | |
| | | | 497.05 | -7.422E-01 | ?(P | 1.570E+00 | 3.97E+01 | 9.09E+01 G |
| | | | 610.30 | 0.000E+00 | + | 4.515E+01 | 1.00E+03 | 5.75E+00 GA |
| RH-106 | I | 3.2883E-01 | | | | | 3.74E+02 | |
| | | | 621.92 | -6.129E+00 | ?( | 2.727E+01 | 1.34E+02 | 9.93E+00 G |
| | | | 1050.36 | 4.144E+01 | ?( | 1.232E+02 | 8.97E+01 | 1.56E+00 G |
| | | | 511.86 | 1.291E+01 | | 8.591E+00 | 3.64E+01 | 2.00E+01 GA |
| AG-108M | C | 2.3033E-01 | | | | | 1.53E+05 | |
| | | | 433.94 | -6.607E-01 | ?( | 1.654E+00 | 1.04E+02 | 9.05E+01 G |
| | | | 722.94 | 7.016E-01 | *( | 1.777E+00 | 7.66E+01 | 9.08E+01 G |
| | | | 614.28 | 6.511E-01 | &( | 2.839E+00 | 1.32E+02 | 8.98E+01 G |
| AG-110M | F | -1.3270E+00 | | | | | 2.50E+02 | |
| | | | 884.68 | -1.327E+00 | ?( | 3.664E+00 | 8.35E+01 | 7.27E+01 G |
| | | | 657.76 | 3.854E-01 | + | 8.594E+00 | 6.75E+02 | 9.46E+01 G |
| | | | 937.49 | -3.101E+00 | + | 7.880E+00 | 7.69E+01 | 3.44E+01 G |
| | | | 1384.30 | 1.440E+00 | & | 2.401E+00 | 8.05E+01 | 2.43E+01 G |
| | | | 763.94 | -2.888E+00 | & | 7.046E+00 | 7.38E+01 | 2.23E+01 G |
| SN-113 | F | -3.9616E-01 | | | | | 1.15E+02 | |
| | | | 391.69 | -3.962E-01 | &(P | 3.116E+00 | 1.89E+02 | 6.40E+01 G |
| SB-125 | I | -1.3631E-01 | | | | | 1.01E+03 | |
| | | | 427.88 | -1.363E-01 | &( | 4.881E+00 | 1.49E+03 | 2.96E+01 G |
| | | | 600.50 | -1.565E+00 | & | 1.442E+01 | 2.78E+02 | 1.79E+01 G |
| | | | 635.89 | -3.074E+00 | + P | 1.274E+01 | 1.33E+02 | 1.13E+01 G |
| | | | 463.37 | -2.992E+00 | + | 2.065E+01 | 2.08E+02 | 1.05E+01 G |
| I-131 | I | 4.5889E-01 | | | | | 8.02E+00 | |
| | | | 364.48 | -6.573E-01 | &(P | 1.577E+00 | 8.50E+01 | 8.17E+01 G |
| | | | 284.30 | 6.267E+00 | ?( | 1.765E+01 | 1.12E+02 | 6.14E+00 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| | | 636.97 | 8.204E+00 | &( | 1.847E+01 | 6.82E+01 | 7.17E+00 G |
| Gd-153 | F -1.0606E+00 | | | | | 2.42E+02 | |
| | | 97.50 | -1.061E+00 | ?( | 5.096E+00 | 1.45E+02 | 3.00E+01 G |
| | | 103.20 | 0.000E+00 | + | 6.987E+00 | 1.00E+03 | 2.18E+01 G |
| Ga-68 | C 1.0874E+02 | | | | | 4.71E-02 | |
| | | 1077.40 | 1.087E+02 | ?( | 8.619E+01 | 3.87E+01 | 3.30E+00 G |
| Tc-99m | I -3.9140E-01 | | | | | 2.51E-01 | |
| | | 140.51 | -3.914E-01 | &( | 1.666E+00 | 1.29E+02 | 8.93E+01 G |
| BA-133 | F -3.9156E-01 | | | | | 3.85E+03 | |
| | | 356.00 | -3.916E-01 | ?( | 2.681E+00 | 2.06E+02 | 6.20E+01 G |
| | | 302.85 | -2.626E+00 | + | 1.388E+01 | 1.60E+02 | 1.83E+01 G |
| | | 383.84 | -6.258E+00 | & | 2.244E+01 | 1.08E+02 | 8.94E+00 GA |
| | | 80.99 | -1.103E+00 | & | 6.158E+00 | 1.69E+02 | 3.41E+01 GA |
| CS-134 | I 7.3774E-01 | | | | | 7.54E+02 | |
| | | 604.71 | 0.000E+00 | ?( | 2.642E+00 | 1.00E+03 | 9.76E+01 G |
| | | 795.87 | 8.235E-01 | ( | 2.143E+00 | 7.87E+01 | 8.55E+01 G |
| | | 569.32 | -3.863E+00 | + | 8.624E+00 | 6.76E+01 | 1.54E+01 G |
| | | 801.95 | 8.182E+00 | &( | 2.172E+01 | 8.03E+01 | 8.69E+00 G |
| | | 563.24 | -5.132E+00 | + P | 1.485E+01 | 6.87E+01 | 8.35E+00 G |
| CS-137 | I 3.7274E+02 | | | | | 1.10E+04 | |
| | | 661.66 | 3.727E+02 | ( | 1.623E+00 | 5.88E-01 | 8.52E+01 G |
| CE-139 | F -4.2116E-01 | | | | | 1.38E+02 | |
| | | 165.85 | -4.212E-01 | &( | 1.404E+00 | 1.01E+02 | 7.99E+01 G |
| Ba-140 | I 1.0769E+00 | | | | | 1.28E+01 | |
| | | 537.26 | 5.091E-01 | ?( | 5.190E+00 | 4.40E+02 | 2.44E+01 G |
| | | 162.66 | 3.303E+00 | ?( | 1.925E+01 | 1.76E+02 | 6.22E+00 G |
| | | 304.85 | -1.129E+01 | & | 5.982E+01 | 1.60E+02 | 4.29E+00 G |
| La-140 | I -5.7006E-02 | | | | | 1.28E+01 | |
| | | 1596.21 | -5.701E-02 | ?( | 7.374E-01 | 6.26E+02 | 9.54E+01 G |
| | | 487.02 | -1.040E+00 | & | 5.574E+00 | 1.62E+02 | 4.55E+01 G |
| | | 328.76 | -6.232E-01 | + | 5.733E+00 | 3.65E+02 | 2.03E+01 G |
| | | 815.77 | 0.000E+00 | + | 9.113E+00 | 1.00E+03 | 2.33E+01 G |
| CE-141 | I -5.6541E-01 | | | | | 3.25E+01 | |
| | | 145.44 | -5.654E-01 | &(P | 2.777E+00 | 8.92E+01 | 4.82E+01 G |
| CE-144 | I 1.6885E+00 | | | | | 2.85E+02 | |
| | | 133.54 | 1.688E+00 | ?( | 1.017E+01 | 1.82E+02 | 1.11E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| PM-144 | C -6.8525E-01 | | | | | 3.63E+02 | |
| | | 696.54 | -6.853E-01 | ?(P | 1.316E+00 | 7.29E+01 | 9.90E+01 G |
| | | 618.06 | 5.900E-01 | + | 2.608E+00 | 1.33E+02 | 9.91E+01 G |
| EU-152 | F 6.0065E-01 | | | | | 4.94E+03 | |
| | | 344.29 | 6.373E-01 | ?(P | 7.023E+00 | 3.32E+02 | 2.65E+01 G |
| | | 1112.07 | 1.111E+00 | ( | 1.917E+01 | 5.17E+02 | 1.36E+01 G |
| | | 121.78 | 3.229E-01 | ?( | 3.055E+00 | 2.85E+02 | 2.86E+01 G |
| | | 778.92 | -8.059E-01 | & | 1.045E+01 | 5.79E+02 | 1.29E+01 G |
| | | 964.11 | -7.491E+00 | + | 1.732E+01 | 7.01E+01 | 1.46E+01 G |
| | | 244.69 | -5.743E+00 | + | 2.218E+01 | 1.17E+02 | 7.58E+00 G |
| | | 1408.00 | 6.515E-01 | & | 3.339E+00 | 2.44E+02 | 2.10E+01 GA |
| EU-154 | I -7.5584E+00 | | | | | 3.14E+03 | |
| | | 873.23 | -7.558E+00 | &(P | 1.628E+01 | 5.91E+01 | 1.23E+01 G |
| | | 123.10 | 1.072E-01 | + | 2.295E+00 | 6.45E+02 | 4.08E+01 G |
| | | 1274.54 | -2.159E-02 | % | 2.797E+00 | 3.77E+03 | 3.52E+01 G |
| | | 723.36 | 3.123E+00 | & | 7.890E+00 | 7.64E+01 | 2.02E+01 G |
| | | 1004.77 | -3.417E+00 | & | 1.459E+01 | 1.29E+02 | 1.80E+01 G |
| | | 996.33 | 9.139E+00 | & | 2.406E+01 | 7.97E+01 | 1.06E+01 G |
| HF-181 | F -8.6380E-01 | | | | | 4.24E+01 | |
| | | 482.00 | -8.638E-01 | ?(P | 3.113E+00 | 8.01E+01 | 8.05E+01 G |
| | | 133.02 | -2.044E-01 | + | 2.890E+00 | 4.27E+02 | 4.33E+01 G |
| | | 345.83 | -1.317E+00 | & P | 1.237E+01 | 2.84E+02 | 1.51E+01 G |
| | | 136.30 | -4.101E+00 | & | 2.079E+01 | 1.53E+02 | 5.85E+00 G |
| Ta-182 | F -3.0581E+00 | | | | | 1.14E+02 | |
| | | 1121.30 | -3.058E+00 | &( | 8.042E+00 | 7.96E+01 | 3.49E+01 G |
| | | 1221.41 | -7.258E-01 | + | 3.989E+00 | 2.60E+02 | 2.70E+01 G |
| | | 1189.05 | 4.244E+00 | & | 7.137E+00 | 8.06E+01 | 1.62E+01 G |
| Hg-203 | F 5.3162E-01 | | | | | 4.66E+01 | |
| | | 279.20 | 5.316E-01 | ?( | 1.547E+00 | 8.80E+01 | 8.15E+01 G |
| TL-208 | N 3.1640E+00 | | | | | 6.98E+02 | |
| | | 583.02 | 3.164E+00 | @(P | 1.365E+00 | 2.09E+01 | 8.45E+01 G |
| | | 277.28 | 6.641E+00 | & P | 2.063E+01 | 9.40E+01 | 6.31E+00 G |
| | | 860.56 | -7.346E+00 | & | 1.371E+01 | 5.67E+01 | 1.24E+01 G |
| pm-146 | C 1.5509E+00 | | | | | 2.02E+03 | |
| | | 747.16 | 8.748E-01 | (P | 3.815E+00 | 1.95E+02 | 3.40E+01 G |
| | | 735.72 | 2.573E+00 | &(P | 5.163E+00 | 9.02E+01 | 2.25E+01 G |
| | | 453.88 | -2.806E-01 | - | 2.420E+00 | 3.59E+02 | 6.50E+01 G |

| Nuclide | | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|---|
| y-88 | F | 5.1477E-02 | | | | | 1.07E+02 | |
| | | | 898.04 | -1.247E-01 | (P | 1.869E+00 | 4.80E+02 | 9.37E+01 G |
| | | | 1836.06 | 2.179E-01 | &( | 5.344E-01 | 1.21E+02 | 9.92E+01 G |
| Cd-113m | | 7.0890E+03 | | | | | 5.33E+03 | |
| | | | 263.70 | 7.089E+03 | ?( | 2.160E+04 | 9.22E+01 | 6.00E-03 K |
| Cd-109 | F | 7.0542E+01 | | | | | 4.53E+02 | |
| | | | 88.04 | 7.054E+01 | ( | 2.002E+01 | 9.18E+00 | 3.79E+00 G |
| Cf-251 | T | 8.5963E-01 | | | | | 3.28E+05 | |
| | | | 176.60 | 8.596E-01 | &( | 5.184E+00 | 2.28E+02 | 1.70E+01 G |
| | | | 227.00 | 5.582E+00 | & | 1.694E+01 | 1.21E+02 | 6.30E+00 GA |
| Cf-249 | T | 3.9163E-01 | | | | | 1.28E+05 | |
| | | | 387.95 | 3.916E-01 | ( | 2.915E+00 | 2.24E+02 | 6.60E+01 G |
| | | | 333.44 | -2.786E+00 | + | 7.641E+00 | 1.09E+02 | 1.55E+01 G |
| Sn-126 | | 1.5110E+00 | | | | | 3.65E+07 | |
| | | | 87.57 | -9.688E-01 | + | 5.301E+00 | 1.66E+02 | 3.75E+01 GA |
| | | | 64.28 | 1.511E+00 | ( | 1.544E+01 | 3.08E+02 | 9.70E+00 G |
| | | | 86.94 | -4.029E+00 | + | 2.213E+01 | 1.66E+02 | 9.04E+00 GA |
| PB-210 | N | 1.0946E+04 | | | | | 8.14E+03 | |
| | | | 46.54 | 1.095E+04 | (P | 8.395E+01 | 4.34E-01 | 4.25E+00 G |
| PB-212 | N | 6.6084E+00 | | | | | 6.98E+02 | |
| | | | 238.63 | 6.608E+00 | (P | 1.801E+00 | 9.08E+00 | 4.33E+01 G |
| | | | 300.03 | -1.454E+01 | - | 7.644E+01 | 1.59E+02 | 3.28E+00 GA |
| PB-214 | N | 5.5563E+00 | | | | | 5.84E+05 | |
| | | | 351.93 | 5.377E+00 | @(P | 2.789E+00 | 2.19E+01 | 3.76E+01 G |
| | | | 295.09 | 5.906E+00 | (P | 4.871E+00 | 3.32E+01 | 1.93E+01 G |
| | | | 242.00 | 9.925E+00 | P | 1.024E+01 | 3.19E+01 | 7.43E+00 GA |
| BI-207 | C | 4.2908E-01 | | | | | 1.18E+04 | |
| | | | 569.70 | 2.969E-01 | (P | 1.361E+00 | 1.38E+02 | 9.77E+01 G |
| | | | 1063.66 | 6.025E-01 | ?(P | 2.436E+00 | 1.94E+02 | 7.45E+01 G |
| BI-212 | N | 8.0529E+00 | | | | | 6.98E+02 | |
| | | | 727.17 | 8.053E+00 | ( | 2.138E+01 | 8.03E+01 | 7.55E+00 G |
| | | | 785.42 | 1.603E+01 | ? P | 1.056E+02 | 2.94E+02 | 1.28E+00 GA |
| BI-214 | N | 6.3031E+00 | | | | | 5.84E+05 | |
| | | | 609.31 | 6.196E+00 | (P | 2.215E+00 | 1.56E+01 | 4.61E+01 G |
| | | | 1120.29 | 7.294E+00 | (P | 9.434E+00 | 4.02E+01 | 1.51E+01 G |
| | | | 1764.49 | 5.653E+00 | (P | 4.038E+00 | 2.96E+01 | 1.54E+01 G |

| Nuclide | Ave activity | Energy | Activity | Code | Peak | MDA | Comments |
|---|---|---|---|---|---|---|---|
| BI-210M | T -6.1940E-01 | | | | | 1.10E+09 | |
| | | 265.83 | -6.194E-01 | *( | 2.592E+00 | 1.26E+02 | 5.00E+01 G |
| | | 304.90 | -1.763E+00 | & P | 9.205E+00 | 7.85E+01 | 2.80E+01 G |
| AC-228 | N 9.4109E+00 | | | | | 2.10E+03 | |
| | | 911.07 | 9.093E+00 | ( | 4.433E+00 | 2.06E+01 | 2.90E+01 G |
| | | 968.97 | 4.482E+00 | - | 1.480E+01 | 9.97E+01 | 1.75E+01 G |
| | | 338.32 | 1.018E+01 | *( | 8.025E+00 | 3.26E+01 | 1.20E+01 G |
| | | 93.35 | 6.395E+00 | & | 3.411E+01 | 1.61E+02 | 5.56E+00 XA |
| TH-227 | N 1.7159E+01 | | | | | 7.95E+03 | |
| | | 50.14 | 1.716E+01 | ( | 3.817E+01 | 6.75E+01 | 8.00E+00 G |
| | | 256.24 | -6.333E+00 | - | 1.611E+01 | 7.70E+01 | 7.00E+00 G |
| TH-229 | N 8.7950E+00 | | | | | 2.68E+06 | |
| | | 193.51 | 5.766E+00 | &( | 2.214E+01 | 1.46E+02 | 4.40E+00 G |
| | | 210.85 | 1.325E+01 | ?( | 3.520E+01 | 1.06E+02 | 2.99E+00 G |
| TH-234 | N -7.9119E+00 | | | | | 1.63E+12 | |
| | | 63.29 | -7.912E+00 | (P | 3.866E+01 | 4.35E+02 | 3.81E+00 G |
| | | 92.59 | -1.252E+01 | + P | 3.418E+01 | 3.29E+01 | 5.58E+00 G |
| PA-231 | N -1.6700E+01 | | | | | 1.20E+07 | |
| | | 302.65 | -1.670E+01 | &( | 8.790E+01 | 1.59E+02 | 2.88E+00 G |
| | | 300.07 | -1.939E+01 | + | 1.015E+02 | 1.58E+02 | 2.46E+00 G |
| PA-233 | C -1.3821E+00 | | | | | 7.82E+08 | |
| | | 312.01 | -1.382E+00 | &( | 7.166E+00 | 1.57E+02 | 3.60E+01 G |
| | | 300.18 | -7.696E+00 | + | 4.037E+01 | 1.59E+02 | 6.20E+00 G |
| PA-234 | N -1.7248E+00 | | | | | 1.63E+12 | |
| | | 131.29 | -1.725E+00 | *( | 6.871E+00 | 1.20E+02 | 1.80E+01 G |
| | | 946.02 | -8.364E+00 | & P | 1.636E+01 | 5.21E+01 | 1.34E+01 G |
| | | 569.47 | -1.275E+00 | + | 1.667E+01 | 3.91E+02 | 8.20E+00 G |
| | | 883.24 | -1.003E+01 | & | 2.722E+01 | 8.22E+01 | 9.60E+00 G |
| | | 880.53 | -1.598E+01 | + | 4.268E+01 | 8.08E+01 | 6.00E+00 GA |
| PA-234M | N 8.4548E+01 | | | | | 1.63E+12 | |
| | | 1001.00 | 8.455E+01 | (P | 3.130E+02 | 1.12E+02 | 8.37E-01 G |
| | | 766.41 | -1.051E+01 | & | 5.275E+02 | 1.50E+03 | 2.94E-01 G |
| U-235 | N -2.8901E+00 | | | | | 2.57E+11 | |
| | | 143.79 | -2.890E+00 | *( | 1.218E+01 | 1.27E+02 | 1.10E+01 G |
| | | 205.33 | -3.710E+00 | + | 2.104E+01 | 2.26E+02 | 5.01E+00 G |
| | | 163.38 | -4.389E-01 | & P | 2.380E+01 | 1.18E+03 | 5.08E+00 G |

```
 Nuclide  Ave activity   Energy    Activity  Code Peak MDA  Comments

AM-241   T   1.2866E+03                                     1.58E+05
                           59.54 1.287E+03  (  7.053E+00 3.83E-01 3.59E+01 G

Np-237   F  -3.5893E+00                                     2.14E+06
                           86.49-3.589E+00 ?(P 1.542E+01 4.88E+01 1.31E+01 G

Ir-192   F  -2.7427E-01                                     7.40E+01
                          316.49-2.743E-01 &(  3.006E+00 3.31E+02 8.70E+01 G
                          468.06-5.013E-01 +   4.256E+00 2.56E+02 5.18E+01 G
                          308.44-1.543E+00 &   8.217E+00 1.61E+02 3.18E+01 G

Cs-136   F   1.7421E-01                                     1.30E+01
                          818.50-6.477E-01 &(  2.185E+00 1.02E+02 1.00E+02 G
                         1048.07 1.202E+00 ?(  2.377E+00 6.01E+01 8.00E+01 G
                          340.57-1.072E+00 +   3.998E+00 1.13E+02 4.69E+01 G

Np-239   T   1.3714E+00                                     2.36E+00
                          103.70 0.000E+00 &   6.422E+00 1.00E+03 2.40E+01 X
                          106.13 1.371E+00 ?(  6.343E+00 1.40E+02 2.27E+01 G
                           99.50-8.247E-01 &   1.032E+01 3.78E+02 1.50E+01 X

Nd-147       9.8733E-01                                     1.11E+01
                          531.00 9.873E-01 ?(  9.941E+00 4.34E+02 1.30E+01 G
                           91.10-1.268E+00 +   6.891E+00 1.64E+02 2.83E+01 G
   ( - This peak used in the nuclide activity average.

   * - Peak is too wide, but only one peak in library.
   ! - Peak is part of a multiplet and this area went
       negative during deconvolution.
   ? - Peak is too narrow.
   @ - Peak is too wide at FW25M, but ok at FWHM.
   % - Peak fails sensitivity test.
   $ - Peak identified, but first peak of this nuclide
       failed one or more qualification tests.
   + - Peak activity higher than counting uncertainty range.
   - - Peak activity lower than counting uncertainty range.
   = - Peak outside analysis energy range.
   & - Calculated peak centroid is not close enough to the
       library energy centroid for positive identification.
   P - Peakbackground subtraction
   } - Peak is too close to another for the activity
       to be found directly.

   Nuclide Codes:                      Peak Codes:
   T - Thermal Neutron Activation      G - Gamma Ray
   F - Fast Neutron Activation         X - X-Ray
   I - Fission Product                 P - Positron Decay
```

N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity | |
|---|---|---|---|---|---|---|---|
| TH-234 | 63.29 | 5955. | -74. | -0.010 | 434.77 | -7.912E+00 | P |
| BA-133 | 80.99 | 18517. | -114. | -0.016 | 169.02 | -1.103E+00 | |
| Np-237 | 86.49 | 18436. | -148. | -0.021 | 48.84 | -3.589E+00 | P |
| EU-155 | 86.54 | 18288. | -115. | -0.016 | 166.87 | -1.188E+00 | |
| Nd-147 | 91.10 | 17944. | -115. | -0.016 | 164.40 | -1.268E+00 | |
| TH-234 | 92.59 | 17381. | -226. | -0.031 | 32.89 | -1.252E+01 | P |
| Gd-153 | 97.50 | 11465. | -104. | -0.015 | 145.37 | -1.061E+00 | |
| Np-239 | 99.50 | 11569. | -40. | -0.006 | 378.12 | -8.247E-01 | |
| Np-239 | 106.13 | 10162. | 102. | 0.014 | 139.90 | 1.371E+00 | |
| EU-154 | 123.10 | 4264. | 14. | 0.002 | 644.79 | 1.072E-01 | |
| PA-234 | 131.29 | 7188. | -100. | -0.014 | 120.50 | -1.725E+00 | |
| HF-181 | 133.02 | 7288. | -28. | -0.004 | 426.77 | -2.044E-01 | |
| CE-144 | 133.54 | 5891. | 60. | 0.008 | 181.88 | 1.688E+00 | |
| HF-181 | 136.30 | 6742. | -76. | -0.011 | 153.22 | -4.101E+00 | |
| CO-57 | 136.47 | 6841. | 99. | 0.014 | 118.24 | 2.936E+00 | |
| Tc-99m | 140.51 | 7802. | -97. | -0.014 | 128.70 | -3.914E-01 | |
| U-235 | 143.79 | 7705. | -98. | -0.014 | 127.43 | -2.890E+00 | |
| CE-141 | 145.44 | 7651. | -84. | -0.012 | 89.16 | -5.654E-01 | P |
| Ba-140 | 162.66 | 5238. | 58. | 0.008 | 175.94 | 3.303E+00 | |
| CE-139 | 165.85 | 4640. | -96. | -0.013 | 100.84 | -4.212E-01 | |
| Cf-251 | 176.60 | 2620. | 40. | 0.006 | 228.26 | 8.596E-01 | |
| TH-229 | 193.51 | 2837. | 65. | 0.009 | 145.59 | 5.766E+00 | |
| U-235 | 205.33 | 3069. | -46. | -0.006 | 225.79 | -3.710E+00 | |
| TH-229 | 210.85 | 2952. | 96. | 0.013 | 106.00 | 1.325E+01 | |
| Cf-251 | 227.00 | 2743. | 81. | 0.011 | 120.97 | 5.582E+00 | |
| Cd-113m | 263.70 | 3306. | 89. | 0.012 | 92.17 | 7.089E+03 | |
| BI-210M | 265.83 | 3266. | -64. | -0.009 | 126.31 | -6.194E-01 | |
| Hg-203 | 279.20 | 2882. | 87. | 0.012 | 88.00 | 5.316E-01 | |
| I-131 | 284.30 | 2057. | 76. | 0.011 | 112.23 | 6.267E+00 | |
| PA-231 | 300.07 | 10347. | -91. | -0.013 | 158.28 | -1.939E+01 | |
| PA-233 | 300.18 | 10394. | -91. | -0.013 | 158.64 | -7.696E+00 | |
| PA-231 | 302.65 | 10514. | -91. | -0.013 | 159.18 | -1.670E+01 | |
| BA-133 | 302.85 | 10605. | -91. | -0.013 | 159.83 | -2.626E+00 | |
| Ba-140 | 304.85 | 10696. | -91. | -0.013 | 160.21 | -1.129E+01 | |
| BI-210M | 304.90 | 10790. | -93. | -0.013 | 78.53 | -1.763E+00 | P |
| Ir-192 | 308.44 | 10879. | -92. | -0.013 | 161.05 | -1.543E+00 | |
| PA-233 | 312.01 | 10464. | -92. | -0.013 | 156.79 | -1.382E+00 | |
| Ir-192 | 316.49 | 10556. | -44. | -0.006 | 331.14 | -2.743E-01 | |
| CR-51 | 320.08 | 10999. | -50. | -0.007 | 147.11 | -2.746E+00 | P |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM |
|---|---|---|---|---|---|---|---|
| La-140 | 328.76 | 1951. | -23. | -0.003 | 365.14 | -6.232E-01 | |
| Cf-249 | 333.44 | 1984. | -77. | -0.011 | 109.28 | -2.786E+00 | |
| Cs-136 | 340.57 | 4865. | -88. | -0.012 | 112.77 | -1.072E+00 | |
| HF-181 | 345.83 | 4703. | -34. | -0.005 | 283.75 | -1.317E+00 | P |
| BA-133 | 356.00 | 3589. | -41. | -0.006 | 206.40 | -3.916E-01 | |
| I-131 | 364.48 | 2053. | -89. | -0.012 | 84.99 | -6.573E-01 | P |
| BA-133 | 383.84 | 4702. | -90. | -0.012 | 108.41 | -6.258E+00 | |
| Cf-249 | 387.95 | 4259. | 41. | 0.006 | 224.47 | 3.916E-01 | |
| SN-113 | 391.69 | 4515. | -40. | -0.006 | 188.93 | -3.962E-01 | P |
| AG-108M | 433.94 | 2180. | -88. | -0.012 | 104.43 | -6.607E-01 | |
| pm-146 | 453.88 | 2260. | -26. | -0.004 | 358.53 | -2.806E-01 | |
| SB-125 | 463.37 | 4171. | -44. | -0.006 | 208.13 | -2.992E+00 | |
| Ir-192 | 468.06 | 4265. | -36. | -0.005 | 255.91 | -5.013E-01 | |
| BE-7 | 477.60 | 5395. | -94. | -0.013 | 81.09 | -6.479E+00 | P |
| HF-181 | 482.00 | 5304. | -95. | -0.013 | 80.10 | -8.638E-01 | P |
| La-140 | 487.02 | 5351. | -64. | -0.009 | 161.90 | -1.040E+00 | |
| RU-103 | 497.05 | 1625. | -90. | -0.013 | 39.71 | -7.422E-01 | P |
| RH-106 | 511.86 | 2267. | 337. | 0.047 | 36.39 | 1.291E+01 | |
| Nd-147 | 531.00 | 1205. | 16. | 0.002 | 434.47 | 9.873E-01 | |
| Ba-140 | 537.26 | 1135. | 16. | 0.002 | 439.74 | 5.091E-01 | |
| CS-134 | 563.24 | 1015. | -52. | -0.007 | 68.70 | -5.132E+00 | P |
| CS-134 | 569.32 | 1146. | -72. | -0.010 | 67.65 | -3.863E+00 | |
| PA-234 | 569.47 | 1217. | -13. | -0.002 | 391.33 | -1.275E+00 | |
| BI-207 | 569.70 | 1151. | 35. | 0.005 | 138.30 | 2.969E-01 | P |
| SB-125 | 600.50 | 4058. | -32. | -0.005 | 277.77 | -1.565E+00 | |
| AG-108M | 614.28 | 3848. | 67. | 0.009 | 131.67 | 6.511E-01 | |
| PM-144 | 618.06 | 3915. | 67. | 0.009 | 133.48 | 5.900E-01 | |
| RH-106 | 621.92 | 4264. | -69. | -0.010 | 134.40 | -6.129E+00 | |
| SB-125 | 635.89 | 1150. | -39. | -0.005 | 132.55 | -3.074E+00 | P |
| I-131 | 636.97 | 958. | 65. | 0.009 | 68.20 | 8.204E+00 | |
| AG-110M | 657.76 | 35809. | 40. | 0.006 | 674.83 | 3.854E-01 | |
| PM-144 | 696.54 | 816. | -71. | -0.010 | 72.88 | -6.853E-01 | P |
| NB-94 | 702.63 | 799. | -43. | -0.006 | 119.80 | -4.250E-01 | P |
| SB-124 | 722.79 | 1311. | -23. | -0.003 | 223.61 | -2.098E+00 | |
| AG-108M | 722.94 | 1193. | 65. | 0.009 | 76.61 | 7.016E-01 | |
| EU-154 | 723.36 | 1164. | 64. | 0.009 | 76.41 | 3.123E+00 | |
| BI-212 | 727.17 | 1182. | 61. | 0.009 | 80.25 | 8.053E+00 | |
| pm-146 | 735.72 | 594. | 58. | 0.008 | 90.19 | 2.573E+00 | P |
| pm-146 | 747.16 | 727. | 29. | 0.004 | 195.04 | 8.748E-01 | P |
| ZR-95 | 756.73 | 790. | -70. | -0.010 | 81.67 | -1.318E+00 | P |
| AG-110M | 763.94 | 1037. | -63. | -0.009 | 73.83 | -2.888E+00 | |
| BI-212 | 785.42 | 732. | 20. | 0.003 | 294.09 | 1.603E+01 | P |
| CS-134 | 795.87 | 1334. | 66. | 0.009 | 78.69 | 8.235E-01 | |
| CS-134 | 801.95 | 1400. | 67. | 0.009 | 80.28 | 8.182E+00 | |
| CO-58 | 810.78 | 1682. | -47. | -0.007 | 124.26 | -5.079E-01 | |
| Cs-136 | 818.50 | 1827. | -60. | -0.008 | 101.85 | -6.477E-01 | |
| MN-54 | 834.85 | 919. | -78. | -0.011 | 83.61 | -8.533E-01 | |
| NB-94 | 871.10 | 1142. | 36. | 0.005 | 134.13 | 4.080E-01 | P |

| Nuclide | Channel | Energy | Background | Net area | Cnts/sec | Uncert | FWHM | |
|---|---|---|---|---|---|---|---|---|
| EU-154 | 873.23 | 1379. | -82. | -0.011 | 59.14 | -7.558E+00 | | P |
| PA-234 | 880.53 | 2253. | -84. | -0.012 | 80.82 | -1.598E+01 | | |
| PA-234 | 883.24 | 2336. | -84. | -0.012 | 82.15 | -1.003E+01 | | |
| AG-110M | 884.68 | 2420. | -84. | -0.012 | 83.52 | -1.327E+00 | | |
| Sc-46 | 889.28 | 2743. | -87. | -0.012 | 86.29 | -9.972E-01 | | |
| y-88 | 898.04 | 1010. | -10. | -0.001 | 480.02 | -1.247E-01 | | P |
| AG-110M | 937.49 | 2290. | -89. | -0.012 | 76.94 | -3.101E+00 | | |
| PA-234 | 946.02 | 1472. | -93. | -0.013 | 52.15 | -8.364E+00 | | P |
| EU-154 | 996.33 | 1847. | 77. | 0.011 | 79.66 | 9.139E+00 | | |
| PA-234M | 1001.00 | 1936. | 56. | 0.008 | 111.79 | 8.455E+01 | | P |
| EU-154 | 1004.77 | 1937. | -49. | -0.007 | 128.68 | -3.417E+00 | | |
| Cs-136 | 1048.07 | 940. | 74. | 0.010 | 60.06 | 1.202E+00 | | |
| RH-106 | 1050.36 | 958. | 49. | 0.007 | 89.71 | 4.144E+01 | | |
| BI-207 | 1063.66 | 835. | 34. | 0.005 | 193.93 | 6.025E-01 | | P |
| FE-59 | 1099.25 | 838. | 19. | 0.003 | 341.40 | 4.632E-01 | | P |
| Ta-182 | 1121.30 | 1866. | -78. | -0.011 | 79.56 | -3.058E+00 | | |
| Ta-182 | 1189.05 | 277. | 48. | 0.007 | 80.56 | 4.244E+00 | | |
| Ta-182 | 1221.41 | 229. | -13. | -0.002 | 259.61 | -7.258E-01 | | |
| NA-22 | 1274.53 | 153. | -20. | -0.003 | 90.28 | -3.040E-01 | | |
| FE-59 | 1291.60 | 147. | 5. | 0.001 | 611.75 | 1.658E-01 | | |
| AG-110M | 1384.30 | 51. | 22. | 0.003 | 80.54 | 1.440E+00 | | |
| La-140 | 1596.21 | 60. | -3. | 0.000 | 626.28 | -5.701E-02 | | |
| SB-124 | 1690.98 | 63. | -17. | -0.002 | 116.52 | -6.883E-01 | | |
| y-88 | 1836.06 | 25. | 11. | 0.001 | 121.11 | 2.179E-01 | | |

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | | Time of Count Activity Bq/Sample | Time Corrected Activity Bq/Sample | Uncertainty 1 Sigma Counting | MDA Bq/Sample |
|---|---|---|---|---|---|
| BE-7 | #A | -6.4785E+00 | -6.4785E+00 | 8.109E+01% | 2.39E+01 |
| NA-22 | #A | -3.0404E-01 | -3.0404E-01 | 9.028E+01% | 9.17E-01 |
| K-40 | | 8.3990E+00 | 8.3990E+00 | 3.470E+01% | 6.29E+00 |
| Sc-46 | #A | -9.9720E-01 | -9.9721E-01 | 8.629E+01% | 2.84E+00 |
| CR-51 | #A | -2.7456E+00 | -2.7456E+00 | 1.471E+02% | 2.71E+01 |
| MN-54 | #A | -8.5331E-01 | -8.5331E-01 | 8.361E+01% | 1.58E+00 |
| FE-59 | #A | 3.3433E-01 | 3.3434E-01 | 3.414E+02% | 3.30E+00 |
| Co-56 | A | 9.9705E-01 | 9.9706E-01 | 6.411E+01% | 1.51E+00 |
| CO-57 | #A | 3.2571E-01 | 3.2571E-01 | 1.182E+02% | 1.02E+00 |
| CO-58 | #A | -5.0788E-01 | -5.0788E-01 | 1.243E+02% | 2.09E+00 |
| CO-60 | | 2.0018E+02 | 2.0018E+02 | 6.716E-01% | 1.05E+00 |
| ZN-65 | #A | 1.9425E+00 | 1.9425E+00 | 7.921E+01% | 5.09E+00 |
| NB-94 | #A | -4.3098E-03 | -4.3098E-03 | 8.992E+01% | 1.33E+00 |
| ZR-95 | #A | -1.3183E+00 | -1.3183E+00 | 8.167E+01% | 2.51E+00 |
| NB-95 | #A | 4.9510E-01 | 4.9510E-01 | 9.308E+01% | 1.53E+00 |
| RU-103 | #A | -7.4216E-01 | -7.4216E-01 | 3.971E+01% | 1.57E+00 |

| | | | | |
|---|---|---|---|---|
| RH-106 #A | 3.2883E-01 | 3.2883E-01 | 8.079E+01% | 2.73E+01 |
| AG-108M#A | 2.3033E-01 | 2.3033E-01 | 6.156E+01% | 1.65E+00 |
| AG-110M#A | -1.3270E+00 | -1.3270E+00 | 8.352E+01% | 3.66E+00 |
| SN-113 #A | -3.9616E-01 | -3.9616E-01 | 1.889E+02% | 3.12E+00 |
| SB-124 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 2.62E+00 |
| SB-125 #A | -1.3631E-01 | -1.3631E-01 | 1.486E+03% | 4.88E+00 |
| I-131 #A | 4.5888E-01 | 4.5889E-01 | 5.214E+01% | 1.58E+00 |
| Gd-153 #A | -1.0606E+00 | -1.0606E+00 | 1.454E+02% | 5.10E+00 |
| Ga-68 # | 1.0830E+02 | 1.0874E+02 | 3.865E+01% | 8.62E+01 |
| Tc-99m #A | -3.9110E-01 | -3.9140E-01 | 1.287E+02% | 1.67E+00 |
| BA-133 #A | -3.9156E-01 | -3.9156E-01 | 2.064E+02% | 2.68E+00 |
| CS-134 #A | 7.3774E-01 | 7.3774E-01 | 7.869E+01% | 2.64E+00 |
| CS-137 | 3.7274E+02 | 3.7274E+02 | 5.878E-01% | 1.62E+00 |
| CE-139 #A | -4.2116E-01 | -4.2116E-01 | 1.008E+02% | 1.40E+00 |
| Ba-140 #A | 1.0769E+00 | 1.0769E+00 | 1.759E+02% | 5.19E+00 |
| La-140 #A | -5.7005E-02 | -5.7006E-02 | 6.263E+02% | 7.37E-01 |
| CE-141 #A | -5.6540E-01 | -5.6541E-01 | 8.916E+01% | 2.78E+00 |
| CE-144 #A | 1.6885E+00 | 1.6885E+00 | 1.819E+02% | 1.02E+01 |
| PM-144 #A | -6.8525E-01 | -6.8525E-01 | 7.288E+01% | 1.32E+00 |
| EU-152 A | 6.0065E-01 | 6.0065E-01 | 2.258E+02% | 7.02E+00 |
| EU-154 #A | -7.5584E+00 | -7.5584E+00 | 5.914E+01% | 1.63E+01 |
| EU-155 #A | 0.0000E+00 | 0.0000E+00 | 1.000E+03% | 7.17E+00 |
| HF-181 #A | -8.6379E-01 | -8.6380E-01 | 8.010E+01% | 3.11E+00 |
| Ta-182 #A | -3.0581E+00 | -3.0581E+00 | 7.956E+01% | 8.04E+00 |
| Hg-203 #A | 5.3162E-01 | 5.3162E-01 | 8.800E+01% | 1.55E+00 |
| TL-208 # | 3.1640E+00 | 3.1640E+00 | 2.093E+01% | 1.37E+00 |
| pm-146 #A | 1.5509E+00 | 1.5509E+00 | 9.019E+01% | 3.82E+00 |
| y-88 #A | 5.1477E-02 | 5.1477E-02 | 1.211E+02% | 1.87E+00 |
| Cd-113m#A | 7.0890E+03 | 7.0890E+03 | 9.217E+01% | 2.16E+04 |
| Cd-109 # | 7.0542E+01 | 7.0542E+01 | 9.184E+00% | 2.00E+01 |
| Cf-251 #A | 8.5963E-01 | 8.5963E-01 | 2.283E+02% | 5.18E+00 |
| Cf-249 #A | 3.9163E-01 | 3.9163E-01 | 2.245E+02% | 2.92E+00 |
| Sn-126 A | 1.5110E+00 | 1.5110E+00 | 3.083E+02% | 1.54E+01 |
| PB-210 # | 1.0946E+04 | 1.0946E+04 | 4.342E-01% | 8.39E+01 |
| PB-212 | 6.6084E+00 | 6.6084E+00 | 9.077E+00% | 1.80E+00 |
| PB-214 | 5.5563E+00 | 5.5563E+00 | 1.990E+01% | 2.79E+00 |
| BI-207 #A | 4.2908E-01 | 4.2908E-01 | 1.191E+02% | 1.36E+00 |
| BI-212 #A | 8.0529E+00 | 8.0529E+00 | 8.025E+01% | 2.14E+01 |
| BI-214 | 6.3031E+00 | 6.3031E+00 | 1.562E+01% | 2.21E+00 |
| BI-210M#A | -6.1940E-01 | -6.1940E-01 | 1.263E+02% | 2.59E+00 |
| AC-228 | 9.4109E+00 | 9.4109E+00 | 1.929E+01% | 4.43E+00 |
| TH-227 #A | 1.7159E+01 | 1.7159E+01 | 6.747E+01% | 3.82E+01 |
| TH-229 #A | 8.7950E+00 | 8.7950E+00 | 9.005E+01% | 2.21E+01 |
| TH-234 #A | -7.9119E+00 | -7.9119E+00 | 4.348E+02% | 3.87E+01 |
| PA-231 #A | -1.6700E+01 | -1.6700E+01 | 1.592E+02% | 8.79E+01 |
| PA-233 #A | -1.3821E+00 | -1.3821E+00 | 1.568E+02% | 7.17E+00 |
| PA-234 #A | -1.7248E+00 | -1.7248E+00 | 1.205E+02% | 6.87E+00 |
| PA-234M#A | 8.4548E+01 | 8.4548E+01 | 1.118E+02% | 3.13E+02 |
| U-235 #A | -2.8901E+00 | -2.8901E+00 | 1.274E+02% | 1.22E+01 |

| | | | | |
|---|---|---|---|---|
| AM-241 | 1.2866E+03 | 1.2866E+03 | 3.835E-01% | 7.05E+00 |
| Np-237 #A | -3.5893E+00 | -3.5893E+00 | 4.884E+01% | 1.54E+01 |
| Ir-192 #A | -2.7427E-01 | -2.7427E-01 | 3.311E+02% | 3.01E+00 |
| Cs-136 #A | 1.7421E-01 | 1.7421E-01 | 5.912E+01% | 2.19E+00 |
| Np-239 #A | 1.3713E+00 | 1.3714E+00 | 1.399E+02% | 6.34E+00 |
| Nd-147 #A | 9.8732E-01 | 9.8733E-01 | 4.345E+02% | 9.94E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  2000.6 keV)  1.302E+04  Bq/Sample
Total Decayed Activity (  37.6 to  2000.6 keV) 1.3025129E+04  Bq/Sample

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: Detector # 5
SpectrumID: 5__20162316
Analysis Description: ACVTop-1012459;TunaCan2006
Calibration: 5_Soil_TunaCan_90099_032612
Detector: Detector # 5

Verification Date: 2016-12-07 09:33
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.70E+02 | -4.6% |
| Cs-137 | 661.66 | 400 | 4.03E+02 | -0.7% |
| Co-1332 | 1332.5 | 777 | 7.80E+02 | -0.4% |

Comments:

Perform ____Jody Watson 12/7/16_____

Reviev __Rachel Mueller__12/7/16_____

C:\User\CRpt\5__20162316.xls

Sample Description: ACVTop-1012459;TunaCan2006
Detector: Detector # 5
Source Date: 10/1/2006 11:00
Acquired: 12/7/2016 09:33:08
Analyzed: 12/7/2016 13:06

Analyst: Jody Watson

Efficiency: 5_Soil_TunaCan_90099_032612
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity uCi/Sample | Uncertainty % |
|---|---|---|
| AM-241 | 4.699E+02 | 0.44 |
| CS-137 | 4.030E+02 | 0.71 |
| Co-1332 | 7.800E+02 | 1.14 |
| Total | 1.653E+03 | |

(Page 1 of 5)

Sample description
ACVTop-1012459;TunaCan2006

Spectrum Filename: C:\User\SPC\Det5\5__20162316.An1

Acquisition information
Start time: 12/7/2016 9:33:08 AM
Live time: 7200
Real time: 7243
Dead time: 0.59 %
Detector ID: 5

Detector system
Ge 5 SN/157

Calibration
Filename: 5_Soil_TunaCan.Clb
5_Soil_TunaCan_90099_032612

Energy Calibration
Created: 2/28/2012 7:35:48 PM
Zero offset: 0.158 keV
Gain: 0.250 keV/channel
Quadratic: 3.911E-08 keV/channel^2

Efficiency Calibration
Created: 3/27/2012 5:20:37 PM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.87 %
Log(Eff): 6.466115E-01 + (-7.830454E-01*Log(E) ) + ( -4.117504E-03*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.43 %
Log(Eff): -2.462251E+01 + ( 9.075211E+00*Log(E) ) + ( -9.664422E-01*Log(E)^2 )

Library Files
Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32 G800W064
Start channel: 120 ( 30.13keV )
Stop channel: 8000 ( 2000.81keV )
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/( 1.0000E+00* 1.0000E+00) = 1.0000E+00
Detection limit method: Traditional ORTEC method

```
       Random error:                4.0000000E+00
       Systematic error:            4.0000000E+00
       Fraction Limit:              0.000%
       Background width:            3
       Half lives decay limit:     12.000
       Activity range factor:       2.000
       Min. step backg. energy      0.000
       Multiplet shift channel      2.000

Corrections                          Status          Comments
       Decay correct to date:         YES       10/1/2006 11:00:00 AM
       Decay during acquisition:      YES
       Decay during collection:       NO
       True coincidence correction:   NO
       Peaked background correction:  NO
       Absorption (Internal):         NO
       Geometry correction:           NO
       Random summing:                NO


total peaks alloc.    3 cutoff: 5.00E+01 %
       Energy Calibration
            Normalized diff:       0.0548
```

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. uCi/Samp | Nuc |
|---|---|---|---|---|---|---|---|---|
| 32.18 | 496. | 15.67 | 0.61 | 8.524E-03 | | | | |
| 36.67 | 944. | 11.09 | 0.80 | 1.141E-02 | | | | |
| 46.60 | 62589. | 0.55 | 0.74 | 1.792E-02 | | | | |
| 59.57 | 84323. | 0.44 | 0.75 | 2.535E-02 | 59.54 | 100.000 | 4.699E+02 | AM241 |
| 77.03 | 510. | 14.86 | 0.78 | 3.217E-02 | | | | |
| 87.79 | 672. | 12.91 | 0.84 | 3.458E-02 | | | | |
| 238.69 | 548. | 12.32 | 1.11 | 2.319E-02 | | | | |
| 661.59 | 22770. | 0.71 | 1.33 | 9.925E-03 | 661.66 | 100.000 | 4.030E+02 | CS137 |
| 1173.02 | 8977. | 1.15 | 1.73 | 6.139E-03 | | | | |
| 1332.35 | 8114. | 1.14 | 1.91 | 5.515E-03 | 1332.50 | 100.000 | 7.800E+02 | Co1332 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 128.22 | 32.18 | 1958. | 496. | 5.819E+04 | 15.67 | 0.614 | - | |
| 146.17 | 36.67 | 3535. | 944. | 8.273E+04 | 11.09 | 0.805 | - | s |
| 185.94 | 46.60 | 15385. | 62589. | 3.493E+06 | 0.55 | 0.740 | - | |
| 307.75 | 77.03 | 1967. | 510. | 1.586E+04 | 14.86 | 0.780 | - | |
| 350.84 | 87.79 | 2286. | 672. | 1.944E+04 | 12.91 | 0.836 | - | |
| 954.87 | 238.69 | 1265. | 548. | 2.362E+04 | 12.32 | 1.111 | - | |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 4692.35 | 1173.02 | 245. | 8977. | 1.462E+06 | 1.15 | 1.727 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.84 | 59.57 | 13512. | 84323. | 11.712 | 0.44 | 0.745 |
| CS-137 | 2647.08 | 661.59 | 590. | 22770. | 3.162 | 0.71 | 1.327 |
| Co-1332 | 5329.25 | 1332.35 | 60. | 8114. | 1.127 | 1.14 | 1.909 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity uCi/Sample | Peak Energy keV | Peak Activity uCi/Sample | Code | MDA Value uCi/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.6987E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.699E+02 | ( | 4.650E+00 4.41E-01 1.00E+02 G | |
| CS-137 | | 4.0297E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 4.030E+02 | ( | 3.268E+00 7.08E-01 1.00E+02 G | |
| Co-1332 | | 7.8001E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.800E+02 | ( | 6.623E+00 1.14E+00 1.00E+02 G | |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.

= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity uCi/Sample | Time Corrected Activity uCi/Sample | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|---|
| AM-241 | 4.6227E+02 | 4.6987E+02 | 4.411E-01% | 4.65E+00 |
| CS-137 | 3.1865E+02 | 4.0297E+02 | 7.083E-01% | 3.27E+00 |
| Co-1332 | 2.0438E+02 | 7.8001E+02 | 1.137E+00% | 6.62E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 30.1 to 2000.8 keV) 9.853E+02 uCi/Sample
Total Decayed Activity ( 30.1 to 2000.8 keV) 1.6528577E+03 uCi/Sample

(Page 5 of 5)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: Detector # 7
SpectrumID: 7_2016120600_fVerif
Analysis Description: ACVTop-1012459
Calibration: 7_TunaCan_90099_032712
Detector: Detector # 7

Verification Date: 2016-12-06 16:15
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.30E+02 | 4.3% |
| Cs-137 | 661.66 | 400 | 3.83E+02 | 4.2% |
| Co-1332 | 1332.5 | 777 | 7.17E+02 | 7.7% |

Comments:

Perform ___Jody Watson 12/7/16_____

Reviev ____Rachel Mueller 12/7/16_____

C:\User\CRpt\7_20161206005_EffVerif.xls

Sample Description: ACVTop-1012459
Detector: Detector # 7
Source Date: 10/1/2006 11:00
Acquired: 12/6/2016 16:15:04
Analyzed: 12/6/2016 18:17

Analyst: conrad.reuscher

Efficiency: 7_TunaCan_90099_032712
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity GPS/Source | Uncertainty % |
|---|---|---|
| AM-241 | 4.298E+02 | 0.33 |
| CS-137 | 3.831E+02 | 0.59 |
| Co-1332 | 7.170E+02 | 1.00 |
| Total | 1.530E+03 | |

TestAmerica Inc  Spectrum name: 7_20161206005_EffVerif.An1

Sample description
ACVTop-1012459

Spectrum Filename: C:\User\SPC\Det7\7_20161206005_EffVerif.An1

Acquisition information

| | |
|---|---|
| Start time: | 12/6/2016 4:15:04 PM |
| Live time: | 7200 |
| Real time: | 7334 |
| Dead time: | 1.83 % |
| Detector ID: | 7 |

Detector system
Ge 7 SN/154

Calibration

| | |
|---|---|
| Filename: | 7_Soil_TunaCan.Clb |

7_TunaCan_90099_032712

Energy Calibration

| | |
|---|---|
| Created: | 2/23/2012 8:40:56 AM |
| Zero offset: | 0.117 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | 3.508E-09 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 3/16/2012 11:45:14 AM |
| Knee Energy: | 165.85 keV |
| Above the Knee: | Quadratic  Uncertainty =  0.87 % |
| Log(Eff): | 6.716580E-01 + (-6.166540E-01*Log(E) ) + ( -2.065917E-02*Log(E)^2 ) |
| Below the Knee: | Quadratic  Uncertainty =  1.48 % |
| Log(Eff): | -2.689695E+01 + ( 1.019544E+01*Log(E) ) + ( -1.081671E+00*Log(E)^2 ) |

Library Files

| | |
|---|---|
| Main analysis library: | DET_EfficiencyVerification.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 120 (  30.11keV ) |
| Stop channel: | 8000 (  2000.13keV ) |
| Peak rejection level: | 20.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Traditional ORTEC method |

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0928

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. GPS/Sour | Nuc |
|---|---|---|---|---|---|---|---|---|
| 32.17 | 506. | 19.31 | 1.12 | 1.067E-02 | | | | |
| 36.55 | 1365. | 9.32 | 1.06 | 1.477E-02 | | | | |
| 46.61 | 80070. | 0.49 | 0.89 | 2.489E-02 | | | | |
| 57.28 | 1723. | 9.65 | 0.85 | 3.504E-02 | | | | |
| 59.64 | 112697. | 0.33 | 0.85 | 3.707E-02 | 59.54 | 100.000 | 4.298E+02 | AM241 |
| 77.11 | 570. | 15.94 | 1.12 | 4.888E-02 | | | | |
| 87.86 | 837. | 13.18 | 0.72 | 5.323E-02 | | | | |
| 238.60 | 923. | 11.11 | 1.06 | 3.602E-02 | | | | |
| 609.49 | 312. | 14.49 | 1.45 | 1.605E-02 | | | | |
| 661.81 | 32550. | 0.59 | 1.44 | 1.492E-02 | 661.66 | 100.000 | 3.831E+02 | CS137 |
| 1173.45 | 12301. | 1.02 | 1.85 | 8.927E-03 | | | | |
| 1332.71 | 10758. | 1.00 | 2.03 | 7.950E-03 | 1332.50 | 100.000 | 7.170E+02 | Co1332 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 128.22 | 32.17 | 2851. | 506. | 4.739E+04 | 19.31 | 1.115 | - | s |
| 145.74 | 36.55 | 4682. | 1365. | 9.241E+04 | 9.32 | 1.063 | - | s |
| 185.98 | 46.61 | 20339. | 80070. | 3.216E+06 | 0.49 | 0.894 | - | |
| 228.91 | 57.24 | 15661. | 1815. | 5.182E+04 | 10.03 | 0.848 | - | sD |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 308.00 | 77.11 | 2887. | 570. | 1.167E+04 | 15.94 | 1.123 | - s |
| 351.01 | 87.86 | 3577. | 837. | 1.572E+04 | 13.18 | 0.716 | - s |
| 954.04 | 238.60 | 2400. | 923. | 2.562E+04 | 11.11 | 1.058 | - s |
| 2437.67 | 609.49 | 495. | 312. | 1.944E+04 | 14.49 | 1.452 | - |
| 4693.52 | 1173.45 | 467. | 12301. | 1.378E+06 | 1.02 | 1.850 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.72 | 59.54 | 12405. | 112700. | 15.653 | 0.33 | 0.850D |
| CS-137 | 2646.96 | 661.81 | 776. | 32550. | 4.521 | 0.59 | 1.439 |
| Co-1332 | 5330.54 | 1332.71 | 98. | 10758. | 1.494 | 1.00 | 2.029 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

***** S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E *****

| - Nuclide - Name | Code | Average Activity GPS/Source | Peak Energy keV | Peak Activity GPS/Source | Peak Code | Peak MDA Value GPS/Source | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.2982E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.298E+02 | ( | 3.052E+00 3.29E-01 1.00E+02 | G |
| CS-137 | | 3.8308E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.831E+02 | ( | 2.469E+00 5.88E-01 1.00E+02 | G |
| Co-1332 | | 7.1700E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.170E+02 | ( | 5.561E+00 9.96E-01 1.00E+02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.

$ - Peak identified, but first peak of this nuclide
failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the
library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Time of Count Activity GPS/Source | Time Corrected Activity GPS/Source | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|---|
| AM-241 | 4.2287E+02 | 4.2982E+02 | 3.290E-01% | 3.05E+00 |
| CS-137 | 3.0293E+02 | 3.8308E+02 | 5.884E-01% | 2.47E+00 |
| Co-1332 | 1.8792E+02 | 7.1700E+02 | 9.964E-01% | 5.56E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  30.1 to  2000.1 keV)  9.137E+02  GPS/Source
Total Decayed Activity (  30.1 to  2000.1 keV) 1.5299009E+03  GPS/Source

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: Detector # 8
SpectrumID: 8__20162079
Analysis Description: ACVTop-1012459;TunaCan2006
Calibration: 8_Soil_TunaCan_90099_032712
Detector: Detector # 8

Verification Date: 2016-12-06 10:28
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.74E+02 | -5.6% |
| Cs-137 | 661.66 | 400 | 3.94E+02 | 1.5% |
| Co-1332 | 1332.5 | 777 | 7.46E+02 | 4.0% |

Comments:

Perform Jody Watson 12/6/16_____ Reviev _Rachel Mueller 12/6/16_____

C:\User\CRpt\8__20162079.xls

Sample Description: ACVTop-1012459;TunaCan2006
Detector: Detector # 8
Source Date: 10/1/2006 11:00
Acquired: 12/6/2016 10:28:22
Analyzed: 12/6/2016 14:38

Analyst: Jody Watson

Efficiency: 8_Soil_TunaCan_90099_032712
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity uCi/Sample | Uncertainty % |
|---|---|---|
| AM-241 | 4.743E+02 | 0.43 |
| CS-137 | 3.938E+02 | 0.66 |
| Co-1332 | 7.463E+02 | 1.05 |
| Total | 1.614E+03 | |

(Page 1 of 5)

Sample description
ACVTop-1012459;TunaCan2006

Spectrum Filename: C:\User\SPC\Det8\8__20162079.An1

Acquisition information
Start time: 12/6/2016 10:28:22 AM
Live time: 7200
Real time: 7401
Dead time: 2.71 %
Detector ID: 8

Detector system
Ge 8 SN/174

Calibration
Filename: 8_Soil_TunaCan.Clb
8_Soil_TunaCan_90099_032712

Energy Calibration
Created: 2/28/2012 10:34:41 AM
Zero offset: 0.052 keV
Gain: 0.250 keV/channel
Quadratic: 5.282E-10 keV/channel^2

Efficiency Calibration
Created: 3/28/2012 10:35:20 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.39 %
Log(Eff): -1.098764E-01 + (-4.958544E-01*Log(E) ) + ( -2.572270E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.71 %
Log(Eff): -2.525301E+01 + ( 9.398253E+00*Log(E) ) + ( -1.000034E+00*Log(E)^2 )

Library Files
Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 120 (  30.05keV )
Stop channel: 8000 (  1999.97keV )
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Traditional ORTEC method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0641

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. uCi/Samp | Nuc |
|---|---|---|---|---|---|---|---|---|
| 32.09 | 707. | 14.15 | 1.02 | 9.221E-03 | | | | |
| 36.58 | 980. | 12.10 | 0.75 | 1.251E-02 | | | | |
| 46.52 | 70815. | 0.54 | 0.82 | 2.004E-02 | | | | |
| 59.52 | 96810. | 0.43 | 0.83 | 2.880E-02 | 59.54 | 100.000 | 4.743E+02 | AM241 |
| 77.07 | 604. | 14.42 | 0.91 | 3.704E-02 | | | | |
| 87.85 | 746. | 13.66 | 0.82 | 3.988E-02 | | | | |
| 238.63 | 632. | 10.73 | 0.95 | 2.744E-02 | | | | |
| 582.93 | 290. | 16.79 | 1.17 | 1.343E-02 | | | | |
| 609.09 | 274. | 15.38 | 1.27 | 1.295E-02 | | | | |
| 661.53 | 27112. | 0.66 | 1.30 | 1.209E-02 | 661.66 | 100.000 | 3.938E+02 | CS137 |
| 1173.08 | 10600. | 1.06 | 1.62 | 7.454E-03 | | | | |
| 1332.34 | 9404. | 1.05 | 1.73 | 6.678E-03 | 1332.50 | 100.000 | 7.463E+02 | Co1332 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 128.14 | 32.09 | 2938. | 707. | 7.668E+04 | 14.15 | 1.023 | - | |
| 146.11 | 36.58 | 4362. | 980. | 7.832E+04 | 12.10 | 0.745 | - | s |
| 185.87 | 46.52 | 18921. | 70815. | 3.534E+06 | 0.54 | 0.818 | - | |
| 308.09 | 77.24 | 2470. | 604. | 1.632E+04 | 14.42 | 0.907 | - | |

(Page 3 of 5)

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 351.20 | 87.85 | 2891. | 746. | 1.871E+04 | 13.66 | 0.815 | - |
| 954.37 | 238.63 | 1322. | 632. | 2.303E+04 | 10.73 | 0.954 | - s |
| 2331.64 | 582.93 | 480. | 290. | 2.160E+04 | 16.79 | 1.168 | - |
| 2436.28 | 609.09 | 411. | 274. | 2.119E+04 | 15.38 | 1.268 | - |
| 4692.33 | 1173.08 | 306. | 10600. | 1.422E+06 | 1.06 | 1.623 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.89 | 59.52 | 16889. | 96810. | 13.446 | 0.43 | 0.828 |
| CS-137 | 2646.07 | 661.53 | 760. | 27112. | 3.765 | 0.66 | 1.301 |
| Co-1332 | 5329.41 | 1332.34 | 56. | 9404. | 1.306 | 1.05 | 1.731 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity uCi/Sample | Peak Energy keV | Peak Activity uCi/Sample | Code | MDA Value uCi/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.7433E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.743E+02 | ( | 4.564E+00 4.33E-01 1.00E+02 G | |
| CS-137 | | 3.9384E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.938E+02 | ( | 3.018E+00 6.58E-01 1.00E+02 G | |
| Co-1332 | | 7.4628E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.463E+02 | ( | 5.288E+00 1.05E+00 1.00E+02 G | |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.

```
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
          Energy   Counts     Counts     Cts/Sec  1 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  1 Sigma
Nuclide     Activity       Activity       Counting                   MDA
              uCi/Sample    uCi/Sample
_____________________________________________________________________________
AM-241       4.6665E+02    4.7433E+02    4.329E-01%                4.56E+00
CS-137       3.1145E+02    3.9384E+02    6.577E-01%                3.02E+00
Co-1332      1.9561E+02    7.4628E+02    1.053E+00%                5.29E+00
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   30.1 to  2000.0 keV)     9.737E+02  uCi/Sample
Total Decayed Activity (   30.1 to  2000.0 keV) 1.6144471E+03  uCi/Sample
```

(Page 5 of 5)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: Detector # 9
SpectrumID: 9__20162258
Analysis Description: ACVTop-1012459;Tunacan2006
Calibration: 9_Soil_TunaCan_90099_050312
Detector: Detector # 9

Verification Date: 2016-12-05 11:08
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.57E+02 | -1.8% |
| Cs-137 | 661.66 | 400 | 3.76E+02 | 5.9% |
| Co-1332 | 1332.5 | 777 | 7.17E+02 | 7.8% |

Comments:

Perform ___Jody Watson 12/6/16_____

Reviev ___Rachel Mueller 12/6/16_____

C:\User\CRpt\9__20162258.xls

Sample Description: ACVTop-1012459;Tunacan2006
Detector: Detector # 9
Source Date: 10/1/2006 11:00
Acquired: 12/5/2016 11:08:33
Analyzed: 12/6/2016 14:13

Analyst: Jody Watson

Efficiency: 9_Soil_TunaCan_90099_050312
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity uCi/Sample | Uncertainty % |
|---|---|---|
| AM-241 | 4.571E+02 | 0.31 |
| CS-137 | 3.765E+02 | 0.55 |
| Co-1332 | 7.166E+02 | 0.87 |
| Total | 1.550E+03 | |

(Page 1 of 6)

Sample description
ACVTop-1012459;Tunacan2006

Spectrum Filename: C:\User\SPC\Det9\9__20162258.An1

Acquisition information

| | |
|---|---|
| Start time: | 12/5/2016 11:08:33 AM |
| Live time: | 7200 |
| Real time: | 7238 |
| Dead time: | 0.52 % |
| Detector ID: | 9 |

Detector system
Ge9 S/N100228730

Calibration

| | |
|---|---|
| Filename: | 9_Soil_TunaCan.Clb |

9_Soil_TunaCan_90099_050312

Energy Calibration

| | |
|---|---|
| Created: | 3/1/2012 1:57:17 PM |
| Zero offset: | 0.074 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | -2.269E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 6/14/2012 10:19:51 AM |
| Knee Energy: | 165.85 keV |
| Above the Knee: | Quadratic  Uncertainty =  1.30 % |
| Log(Eff): | -8.079856E-01 + (-2.367265E-01*Log(E) ) + ( -3.950640E-02*Log(E)^2 ) |
| Below the Knee: | Quadratic  Uncertainty =  1.42 % |
| Log(Eff): | -2.387916E+01 + ( 8.875647E+00*Log(E) ) + ( -9.401100E-01*Log(E)^2 ) |

Library Files

| | |
|---|---|
| Main analysis library: | DET_EfficiencyVerification.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 120 (  30.08keV ) |
| Stop channel: | 8000 (  1999.34keV ) |
| Peak rejection level: | 20.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Traditional ORTEC method |

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0314

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. uCi/Samp | Nuc |
|---|---|---|---|---|---|---|---|---|
| 32.12 | 578. | 16.42 | 0.93 | 1.226E-02 | | | | |
| 36.59 | 1367. | 9.68 | 0.96 | 1.639E-02 | | | | |
| 42.63 | 1354. | 12.81 | 0.99 | 2.208E-02 | | | | |
| 46.57 | 84264. | 0.40 | 1.00 | 2.576E-02 | | | | |
| 49.67 | 972. | 18.11 | 1.00 | 2.855E-02 | | | | |
| 55.63 | 1287. | 12.48 | 1.01 | 3.357E-02 | | | | |
| 59.58 | 118469. | 0.31 | 1.01 | 3.659E-02 | 59.54 | 100.000 | 4.571E+02 | AM241 |
| 87.95 | 870. | 12.40 | 1.19 | 5.048E-02 | | | | |
| 238.35 | 828. | 11.31 | 1.18 | 3.735E-02 | | | | |
| 351.91 | 409. | 19.37 | 1.42 | 2.860E-02 | | | | |
| 609.54 | 463. | 13.11 | 1.42 | 1.924E-02 | | | | |
| 661.61 | 38796. | 0.55 | 1.45 | 1.810E-02 | 661.66 | 100.000 | 3.765E+02 | CS137 |
| 1173.16 | 15809. | 0.90 | 1.93 | 1.163E-02 | | | | |
| 1332.39 | 14207. | 0.87 | 2.02 | 1.050E-02 | 1332.50 | 100.000 | 7.166E+02 | Co1332 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 128.15 | 32.12 | 2658. | 578. | 4.711E+04 | 16.42 | 0.934 | - |
| 146.03 | 36.59 | 4849. | 1367. | 8.341E+04 | 9.68 | 0.960 | - |

(Page 3 of 6)

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 170.15 | 42.59 | 14363. | 1354. | 6.131E+04 | 12.81 | 0.994 | - sD |
| 185.94 | 46.54 | 14030. | 84264. | 3.271E+06 | 0.40 | 0.998 | - D |
| 198.32 | 49.63 | 15015. | 972. | 3.406E+04 | 18.11 | 1.001 | - sD |
| 222.16 | 55.59 | 12253. | 1291. | 3.846E+04 | 12.44 | 1.007 | - sD |
| 351.38 | 87.95 | 3229. | 870. | 1.723E+04 | 12.40 | 1.192 | - |
| 952.83 | 238.35 | 2165. | 828. | 2.216E+04 | 11.31 | 1.177 | - |
| 1407.00 | 351.91 | 1530. | 409. | 1.430E+04 | 19.37 | 1.422 | - |
| 2437.55 | 609.54 | 689. | 463. | 2.404E+04 | 13.11 | 1.419 | - s |
| 4692.65 | 1173.16 | 580. | 15809. | 1.360E+06 | 0.90 | 1.927 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.78 | 59.54 | 8677. | 118469. | 16.454 | 0.31 | 1.010D |
| CS-137 | 2645.81 | 661.61 | 1056. | 38796. | 5.388 | 0.55 | 1.448 |
| Co-1332 | 5329.91 | 1332.39 | 138. | 14207. | 1.973 | 0.87 | 2.023 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity uCi/Sample | Peak Energy keV | Peak Activity uCi/Sample | Code | MDA Value uCi/Sample | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.5709E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.571E+02 | ( | 2.590E+00 3.11E-01 1.00E+02 G | |
| CS-137 | | 3.7646E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.765E+02 | ( | 2.354E+00 5.54E-01 1.00E+02 G | |
| Co-1332 | | 7.1662E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.166E+02 | ( | 4.868E+00 8.74E-01 1.00E+02 G | |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went

```
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  1 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  1 Sigma
Nuclide     Activity       Activity       Counting                  MDA
               uCi/Sample    uCi/Sample
_____________________________________________________________________________
AM-241       4.4970E+02    4.5709E+02    3.111E-01%                2.59E+00
CS-137       2.9772E+02    3.7646E+02    5.540E-01%                2.35E+00
Co-1332      1.8790E+02    7.1662E+02    8.736E-01%                4.87E+00
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   30.1 to  1999.3 keV)     9.353E+02  uCi/Sample
Total Decayed Activity (   30.1 to  1999.3 keV) 1.5501667E+03  uCi/Sample
```

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: Detector #10
SpectrumID: 10_20161205009_EffVerif
Analysis Description: ACVTop-1012459;TunaCan2006
Calibration: 10_Soil_TunaCan_90099_032812
Detector: Detector #10

Verification Date: 2016-12-05 14:53
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.61E+02 | -2.6% |
| Cs-137 | 661.66 | 400 | 3.99E+02 | 0.3% |
| Co-1332 | 1332.5 | 777 | 7.55E+02 | 2.8% |

Comments:

Perform___Jody Watson 12/6/16_____ Reviev _Rachel mueller 12/6/16_____

C:\User\CRpt\10_20161205009_EffVerif.xls

Sample Description: ACVTop-1012459;TunaCan2006
Detector: Detector #10
Source Date: 10/1/2006 11:00
Acquired: 12/5/2016 14:53:22
Analyzed: 12/5/2016 16:54

Analyst: conrad.reuscher

Efficiency: 10_Soil_TunaCan_90099_032812
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity GPS/Source | Uncertainty % |
|---|---|---|
| AM-241 | 4.606E+02 | 0.40 |
| CS-137 | 3.988E+02 | 0.60 |
| Co-1332 | 7.553E+02 | 0.96 |
| Total | 1.615E+03 | |

Sample description
ACVTop-1012459;TunaCan2006

Spectrum Filename: C:\User\SPC\Det10\10_20161205009_EffVerif.An1

Acquisition information
Start time: 12/5/2016 2:53:22 PM
Live time: 7200
Real time: 7232
Dead time: 0.45 %
Detector ID: 10

Detector system
Ge10 S/N08316756

Calibration
Filename: 10_Soil_TunaCan.Clb
10_Soil_TunaCan_90099_032812

Energy Calibration
Created: 2/23/2012 9:27:47 AM
Zero offset: 0.044 keV
Gain: 0.250 keV/channel
Quadratic: -1.974E-08 keV/channel^2

Efficiency Calibration
Created: 4/2/2012 3:35:54 PM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.76 %
Log(Eff): -5.833467E-01 + (-3.986081E-01*Log(E) ) + ( -2.634340E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.87 %
Log(Eff): -2.530844E+01 + ( 9.416612E+00*Log(E) ) + ( -1.001096E+00*Log(E)^2 )

Library Files
Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 120 (  30.06keV )
Stop channel: 8000 (  1999.70keV )
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Traditional ORTEC method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0474

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. GPS/Sour | Nuc |
|---|---|---|---|---|---|---|---|---|
| 32.03 | 590. | 15.33 | 0.78 | 9.142E-03 | | | | |
| 36.43 | 1026. | 10.56 | 0.75 | 1.237E-02 | | | | |
| 46.45 | 68434. | 0.52 | 0.86 | 1.997E-02 | | | | |
| 59.48 | 94190. | 0.40 | 0.86 | 2.883E-02 | 59.54 | 100.000 | 4.606E+02 | AM241 |
| 76.99 | 519. | 15.47 | 0.81 | 3.711E-02 | | | | |
| 87.85 | 730. | 13.51 | 0.95 | 4.010E-02 | | | | |
| 238.53 | 677. | 11.34 | 1.04 | 2.858E-02 | | | | |
| 583.36 | 378. | 17.50 | 1.33 | 1.514E-02 | | | | |
| 609.30 | 390. | 15.75 | 1.50 | 1.466E-02 | | | | |
| 661.59 | 31329. | 0.60 | 1.46 | 1.380E-02 | 661.66 | 100.000 | 3.988E+02 | CS137 |
| 1173.19 | 12697. | 0.98 | 1.83 | 8.948E-03 | | | | |
| 1332.45 | 11561. | 0.96 | 2.00 | 8.108E-03 | 1332.50 | 100.000 | 7.553E+02 | Co1332 |
| 1531.19 | 29. | 18.57 | 0.75 | 7.273E-03 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 127.90 | 32.03 | 2401. | 590. | 6.458E+04 | 15.33 | 0.775 | - s |
| 145.50 | 36.43 | 3784. | 1026. | 8.296E+04 | 10.56 | 0.745 | - |
| 185.53 | 46.45 | 16728. | 68434. | 3.426E+06 | 0.52 | 0.856 | - |

(Page 3 of 5)

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 307.67 | 76.99 | 2218. | 519. | 1.398E+04 | 15.47 | 0.808 | - | |
| 351.08 | 87.85 | 2838. | 730. | 1.820E+04 | 13.51 | 0.950 | - | |
| 953.57 | 238.53 | 1563. | 677. | 2.368E+04 | 11.34 | 1.036 | - | s |
| 2332.62 | 583.36 | 724. | 378. | 2.494E+04 | 17.50 | 1.328 | - | |
| 2436.39 | 609.30 | 654. | 390. | 2.659E+04 | 15.75 | 1.495 | - | s |
| 4692.16 | 1173.19 | 351. | 12697. | 1.419E+06 | 0.98 | 1.832 | - | |
| 6124.73 | 1531.19 | 0. | 29. | 3.987E+03 | 18.57 | 0.750 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.66 | 59.48 | 13376. | 94190. | 13.082 | 0.40 | 0.864 |
| CS-137 | 2645.51 | 661.59 | 702. | 31329. | 4.351 | 0.60 | 1.463 |
| Co-1332 | 5329.42 | 1332.45 | 84. | 11561. | 1.606 | 0.96 | 1.995 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity GPS/Source | Peak Energy keV | Peak Activity GPS/Source | Code | MDA Value GPS/Source | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.6063E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.606E+02 | ( | 4.061E+00 4.05E-01 1.00E+02 G | |
| CS-137 | | 3.9883E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.988E+02 | ( | 2.549E+00 5.99E-01 1.00E+02 G | |
| Co-1332 | | 7.5533E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.553E+02 | ( | 5.137E+00 9.59E-01 1.00E+02 G | |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.

@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity GPS/Source | Time Corrected Activity GPS/Source | Uncertainty Counting 1 Sigma | MDA |
|---|---|---|---|---|
| AM-241 | 4.5318E+02 | 4.6063E+02 | 4.049E-01% | 4.06E+00 |
| CS-137 | 3.1541E+02 | 3.9883E+02 | 5.988E-01% | 2.55E+00 |
| Co-1332 | 1.9804E+02 | 7.5533E+02 | 9.590E-01% | 5.14E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 30.1 to 1999.7 keV) 9.666E+02 GPS/Source
Total Decayed Activity ( 30.1 to 1999.7 keV) 1.6147915E+03 GPS/Source

(Page 5 of 5)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: **Detector #13**
SpectrumID: 13_20161205012_EffVerif
Analysis Description: ACVTop-1012459;TunaCan2006
Calibration: 13_Soil_TunaCan_90099_032712
Detector: Detector #13

Verification Date: 2016-12-05 22:06
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.40E+02 | 2.0% |
| Cs-137 | 661.66 | 400 | 3.77E+02 | 5.7% |
| Co-1332 | 1332.5 | 777 | 7.23E+02 | 7.0% |

Comments:

Perform __Jody Watson 12/6/16_____ Reviev Rachel Mueller 12/6/16_____

C:\User\CRpt\13_20161205012_EffVerif.xls

Sample Description: ACVTop-1012459;TunaCan2006
Detector: Detector #13
Source Date: 10/1/2006 11:00
Acquired: 12/5/2016 22:06:02
Analyzed: 12/6/2016 14:22

Analyst: Jody Watson

Efficiency: 13_Soil_TunaCan_90099_032712
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity uCi/Source | Uncertainty % |
|---|---|---|
| AM-241 | 4.402E+02 | 0.40 |
| CS-137 | 3.774E+02 | 0.53 |
| Co-1332 | 7.229E+02 | 0.86 |
| Total | 1.541E+03 | |

Sample description
ACVTop-1012459;TunaCan2006

Spectrum Filename: C:\User\SPC\Det13\13_20161205012_EffVerif.An1

Acquisition information
Start time: 12/5/2016 10:06:02 PM
Live time: 7200
Real time: 7277
Dead time: 1.05 %
Detector ID: 13

Detector system
Ge13 SN/10064006

Calibration
Filename: 13_Soil_TunaCan.Clb
13_Soil_TunaCan_90099_032712

Energy Calibration
Created: 2/23/2012 9:31:24 AM
Zero offset: 0.036 keV
Gain: 0.250 keV/channel
Quadratic: -2.347E-08 keV/channel^2

Efficiency Calibration
Created: 3/29/2012 7:50:26 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.91 %
Log(Eff): -5.308398E-01 + (-3.057754E-01*Log(E) ) + ( -3.437570E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.60 %
Log(Eff): -2.292218E+01 + ( 8.455931E+00*Log(E) ) + ( -8.924057E-01*Log(E)^2 )

Library Files
Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 120 (  30.05keV )
Stop channel: 8000 (  1999.54keV )
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Traditional ORTEC method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0352

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. uCi/Sour | Nuc |
|---|---|---|---|---|---|---|---|---|
| 32.00 | 820. | 12.15 | 0.87 | 1.310E-02 | | | | |
| 36.46 | 1633. | 8.27 | 0.86 | 1.735E-02 | | | | |
| 46.49 | 87482. | 0.49 | 0.82 | 2.701E-02 | | | | |
| 59.46 | 118574. | 0.40 | 0.84 | 3.796E-02 | 59.54 | 100.000 | 4.402E+02 | AM241 |
| 74.64 | 457. | 18.36 | 1.04 | 4.727E-02 | | | | |
| 77.00 | 582. | 15.97 | 1.05 | 4.835E-02 | | | | |
| 87.62 | 1084. | 11.33 | 0.90 | 5.220E-02 | | | | |
| 238.36 | 812. | 12.45 | 1.19 | 3.938E-02 | | | | |
| 351.78 | 547. | 15.91 | 1.48 | 3.004E-02 | | | | |
| 583.22 | 287. | 16.34 | 1.29 | 2.081E-02 | | | | |
| 609.52 | 365. | 17.77 | 1.32 | 2.014E-02 | | | | |
| 661.70 | 40685. | 0.53 | 1.44 | 1.893E-02 | 661.66 | 100.000 | 3.774E+02 | CS137 |
| 1173.25 | 16368. | 0.88 | 1.93 | 1.217E-02 | | | | |
| 1332.50 | 15003. | 0.86 | 2.06 | 1.100E-02 | 1332.50 | 100.000 | 7.229E+02 | Co1332 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 127.78 | 32.00 | 2735. | 820. | 6.264E+04 | 12.15 | 0.874 | - | s |
| 145.63 | 36.46 | 4979. | 1633. | 9.409E+04 | 8.27 | 0.864 | - | s |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 185.74 | 46.49 | 22334. | 87482. | 3.239E+06 | 0.49 | 0.824 | - |
| 298.28 | 74.69 | 3292. | 457. | 9.669E+03 | 18.36 | 1.045 | - D |
| 307.72 | 77.06 | 4028. | 582. | 1.203E+04 | 15.97 | 1.047 | - sD |
| 350.18 | 87.84 | 3819. | 1084. | 2.077E+04 | 11.33 | 0.903 | - |
| 952.92 | 238.36 | 2456. | 812. | 2.063E+04 | 12.45 | 1.190 | - |
| 1406.47 | 351.78 | 1688. | 547. | 1.822E+04 | 15.91 | 1.476 | - |
| 2332.07 | 583.22 | 574. | 287. | 1.379E+04 | 16.34 | 1.288 | - s |
| 2437.28 | 609.52 | 821. | 365. | 1.811E+04 | 17.77 | 1.322 | - |
| 4692.55 | 1173.25 | 629. | 16368. | 1.345E+06 | 0.88 | 1.932 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.58 | 59.46 | 21512. | 118574. | 16.469 | 0.40 | 0.835 |
| CS-137 | 2645.98 | 661.70 | 1059. | 40685. | 5.651 | 0.53 | 1.445 |
| Co-1332 | 5329.84 | 1332.50 | 192. | 15003. | 2.084 | 0.86 | 2.062 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity uCi/Source | Peak Energy keV | Peak Activity uCi/Source | Code | MDA Value uCi/Source | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.4024E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.402E+02 | ( | 3.897E+00 4.01E-01 1.00E+02 G | |
| CS-137 | | 3.7738E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.774E+02 | ( | 2.254E+00 5.34E-01 1.00E+02 G | |
| Co-1332 | | 7.2292E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.229E+02 | ( | 5.358E+00 8.60E-01 1.00E+02 G | |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went

```
      negative during deconvolution.
  ? - Peak is too narrow.
  @ - Peak is too wide at FW25M, but ok at FWHM.
  % - Peak fails sensitivity test.
  $ - Peak identified, but first peak of this nuclide
      failed one or more qualification tests.
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
           Energy   Counts     Counts     Cts/Sec  1 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count  Time Corrected  Uncertainty  1 Sigma
Nuclide     Activity       Activity       Counting                  MDA
               uCi/Source    uCi/Source
_____________________________________________________________________________
AM-241       4.3312E+02    4.4024E+02    4.010E-01%                3.90E+00
CS-137       2.9844E+02    3.7738E+02    5.341E-01%                2.25E+00
Co-1332      1.8952E+02    7.2292E+02    8.604E-01%                5.36E+00
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   30.1 to  1999.5 keV)     9.211E+02  uCi/Source
Total Decayed Activity (   30.1 to  1999.5 keV) 1.5405464E+03  uCi/Source
```

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: Detector #14
SpectrumID: 14_20161206009_EffVerif
Analysis Description: ACVTop-1012459;TunaCan2006
Calibration: 14_TunaCan_90099_042312
Detector: Detector #14

Verification Date: 2016-12-06 19:00
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.52E+02 | -0.8% |
| Cs-137 | 661.66 | 400 | 3.93E+02 | 1.9% |
| Co-1332 | 1332.5 | 777 | 7.42E+02 | 4.5% |

Comments:

Perform __Jody Watson 12/7/16_____

Reviev __Rachel Mueller 12/7/16_____

C:\User\CRpt\14_20161206009_EffVerif.xls

Sample Description: ACVTop-1012459;TunaCan2006
Detector: Detector #14
Source Date: 10/1/2006 11:00
Acquired: 12/6/2016 19:00:44
Analyzed: 12/6/2016 21:01

Analyst: conrad.reuscher

Efficiency: 14_TunaCan_90099_042312
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity GPS/Source | Uncertainty % |
|---|---|---|
| AM-241 | 4.525E+02 | 0.40 |
| CS-137 | 3.926E+02 | 0.62 |
| Co-1332 | 7.422E+02 | 1.00 |
| Total | 1.587E+03 | |

Sample description
ACVTop-1012459;TunaCan2006

Spectrum Filename: C:\User\SPC\Det14\14_20161206009_EffVerif.An1

Acquisition information

| | |
|---|---|
| Start time: | 12/6/2016 7:00:44 PM |
| Live time: | 7200 |
| Real time: | 7262 |
| Dead time: | 0.85 % |
| Detector ID: | 14 |

Detector system
Ge14 SN/11080670

Calibration

| | |
|---|---|
| Filename: | 14_Soil_TunaCan.Clb |

14_TunaCan_90099_042312

Energy Calibration

| | |
|---|---|
| Created: | 2/28/2012 10:48:23 AM |
| Zero offset: | 0.130 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | -2.050E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 4/23/2012 11:29:47 AM |
| Knee Energy: | 165.85 keV |
| Above the Knee: | Quadratic  Uncertainty =  1.02 % |
| Log(Eff): | 2.101260E-01 + (-5.951973E-01*Log(E) ) + ( -1.605331E-02*Log(E)^2 ) |
| Below the Knee: | Quadratic  Uncertainty =  1.28 % |
| Log(Eff): | -2.391492E+01 + ( 8.828985E+00*Log(E) ) + ( -9.371496E-01*Log(E)^2 ) |

Library Files

| | |
|---|---|
| Main analysis library: | DET_EfficiencyVerification.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 150 (  37.64keV ) |
| Stop channel: | 8000 (  1999.51keV ) |
| Peak rejection level: | 20.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Reg. Guide 4.16 Method |

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.1435

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. GPS/Sour | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.61 | 71619. | 0.51 | 0.89 | 2.176E-02 | | | | |
| 59.60 | 98251. | 0.40 | 0.90 | 3.069E-02 | 59.54 | 100.000 | 4.525E+02 | AM241 |
| 74.82 | 386. | 19.16 | 0.78 | 3.813E-02 | | | | |
| 77.13 | 518. | 14.38 | 0.78 | 3.896E-02 | | | | |
| 87.90 | 913. | 11.04 | 0.93 | 4.193E-02 | | | | |
| 238.14 | 634. | 13.98 | 1.02 | 2.936E-02 | | | | |
| 351.44 | 458. | 15.59 | 1.46 | 2.170E-02 | | | | |
| 661.37 | 29354. | 0.62 | 1.41 | 1.314E-02 | 661.66 | 100.000 | 3.926E+02 | CS137 |
| 1173.04 | 11448. | 1.03 | 1.82 | 8.245E-03 | | | | |
| 1332.36 | 10396. | 1.00 | 1.92 | 7.423E-03 | 1332.50 | 100.000 | 7.422E+02 | Co1332 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 185.86 | 46.61 | 17790. | 71619. | 3.291E+06 | 0.51 | 0.889 | - s |
| 298.68 | 74.82 | 2547. | 386. | 1.013E+04 | 19.16 | 0.777 | - sD |
| 307.90 | 77.13 | 2511. | 518. | 1.328E+04 | 14.38 | 0.780 | - D |
| 350.97 | 87.90 | 2923. | 913. | 2.178E+04 | 11.04 | 0.933 | - s |
| 951.78 | 238.14 | 1971. | 634. | 2.161E+04 | 13.98 | 1.023 | - s |
| 1404.91 | 351.44 | 1213. | 458. | 2.112E+04 | 15.59 | 1.456 | - s |

TestAmerica Inc  Spectrum name: 14_20161206009_EffVerif.An1

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 4691.83 | 1173.04 | 379. | 11448. | 1.389E+06 | 1.03 | 1.815 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.80 | 59.60 | 14512. | 98251. | 13.646 | 0.40 | 0.903s |
| CS-137 | 2644.63 | 661.37 | 630. | 29354. | 4.077 | 0.62 | 1.405 |
| Co-1332 | 5329.40 | 1332.36 | 70. | 10396. | 1.444 | 1.00 | 1.924 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

***** S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E *****

| - Nuclide - Name | Code | Average Activity GPS/Source | Peak Energy keV | Peak Activity GPS/Source | Code | MDA Value GPS/Source | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.5249E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.525E+02 | *( | 2.598E+00 3.99E-01 1.00E+02 | G |
| CS-137 | | 3.9259E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.926E+02 | ( | 1.601E+00 6.17E-01 1.00E+02 | G |
| Co-1332 | | 7.4224E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.422E+02 | ( | 2.977E+00 1.00E+00 1.00E+02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.

= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Time of Count Activity GPS/Source | Time Corrected Activity GPS/Source | Uncertainty Counting 1 Sigma | MDA |
|---|---|---|---|---|
| AM-241 # | 4.4517E+02 | 4.5249E+02 | 3.993E-01% | 2.60E+00 |
| CS-137 | 3.1045E+02 | 3.9259E+02 | 6.172E-01% | 1.60E+00 |
| Co-1332 | 1.9452E+02 | 7.4224E+02 | 1.003E+00% | 2.98E+00 |

# - All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  1999.5 keV)  9.501E+02  GPS/Source
Total Decayed Activity (  37.6 to  1999.5 keV) 1.5873201E+03  GPS/Source

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: **Detector #15**
SpectrumID: 15_20161202008_EffVerif
Analysis Description: ACVTOP-1012459;TUNACAN2006
Calibration: 15_TunaCan_90099_032212
Detector: Detector #15

Verification Date: 2016-12-02 13:12
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.47E+02 | 0.4% |
| Cs-137 | 661.66 | 400 | 3.83E+02 | 4.2% |
| Co-1332 | 1332.5 | 777 | 7.53E+02 | 3.1% |

Comments:

Perform ___Jody Watson 12/6/16_____ Reviev __Rachel Mueller 12/6/16_____

C:\User\CRpt\15_20161202008_EffVerif.xls

Sample Description: ACVTOP-1012459;TUNACAN2006
Detector: Detector #15
Source Date: 10/1/2006 11:00
Acquired: 12/2/2016 13:12:16
Analyzed: 12/6/2016 09:50

Analyst: Jody Watson

Efficiency: 15_TunaCan_90099_032212
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity uCi/Source | Uncertainty % |
|---|---|---|
| AM-241 | 4.473E+02 | 0.47 |
| CS-137 | 3.833E+02 | 0.68 |
| Co-1332 | 7.527E+02 | 1.10 |
| Total | 1.583E+03 | |

Sample description
ACVTOP-1012459;TUNACAN2006

Spectrum Filename: C:\User\SPC\Det15\15_20161202008_EffVerif.An1

Acquisition information
Start time: 12/2/2016 1:12:16 PM
Live time: 7200
Real time: 7225
Dead time: 0.34 %
Detector ID: 15

Detector system
Ge15 SN/11012216

Calibration
Filename: 15_Soil_TunaCan.Clb
15_TunaCan_90099_032212

Energy Calibration
Created: 2/28/2012 4:29:17 PM
Zero offset: 0.044 keV
Gain: 0.250 keV/channel
Quadratic: -3.267E-08 keV/channel^2

Efficiency Calibration
Created: 3/22/2012 1:03:01 PM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.00 %
Log(Eff): -6.894897E-01 + (-3.290613E-01*Log(E) ) + ( -3.875629E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.13 %
Log(Eff): -2.362677E+01 + ( 8.666669E+00*Log(E) ) + ( -9.214638E-01*Log(E)^2 )

Library Files
Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.57keV )
Stop channel: 8000 (  1999.52keV )
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc.  3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff:  0.0311

***** S U M M A R Y  O F  P E A K S  I N  R A N G E  *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. uCi/Sour | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.59 | 64818. | 0.57 | 0.91 | 1.960E-02 | | | | |
| 59.59 | 86736. | 0.47 | 0.94 | 2.740E-02 | 59.54 | 100.000 | 4.473E+02 | AM241 |
| 87.94 | 670. | 14.07 | 0.96 | 3.704E-02 | | | | |
| 238.68 | 654. | 13.05 | 0.89 | 2.591E-02 | | | | |
| 609.36 | 320. | 18.13 | 1.05 | 1.236E-02 | | | | |
| 661.64 | 25204. | 0.68 | 1.51 | 1.155E-02 | 661.66 | 100.000 | 3.833E+02 | CS137 |
| 1173.17 | 9850. | 1.12 | 1.80 | 7.077E-03 | | | | |
| 1332.45 | 8997. | 1.10 | 1.98 | 6.325E-03 | 1332.50 | 100.000 | 7.527E+02 | Co1332 |

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 186.03 | 46.59 | 18144. | 64818. | 3.307E+06 | 0.57 | 0.915 | - | |
| 351.32 | 87.94 | 2591. | 670. | 1.808E+04 | 14.07 | 0.960 | - | s |
| 953.91 | 238.68 | 1726. | 654. | 2.522E+04 | 13.05 | 0.885 | - | s |
| 2436.14 | 609.36 | 588. | 320. | 2.585E+04 | 18.13 | 1.052 | - | s |
| 4691.70 | 1173.17 | 330. | 9850. | 1.392E+06 | 1.12 | 1.803 | - | |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 238.00 | 59.59 | 16940. | 86736. | 12.047 | 0.47 | 0.943 |
| CS-137 | 2645.22 | 661.64 | 720. | 25204. | 3.501 | 0.68 | 1.512 |
| Co-1332 | 5329.15 | 1332.45 | 96. | 8997. | 1.250 | 1.10 | 1.980 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity uCi/Source | Peak Energy keV | Peak Activity uCi/Source | Code | MDA Value uCi/Source | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.4733E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.473E+02 | ( | 3.142E+00 4.73E-01 1.00E+02 | G |
| CS-137 | | 3.8332E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.833E+02 | ( | 1.943E+00 6.85E-01 1.00E+02 | G |
| Co-1332 | | 7.5272E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.527E+02 | ( | 4.040E+00 1.10E+00 1.00E+02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

*****  S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E  *****

| Nuclide | Time of Count Activity uCi/Source | Time Corrected Activity uCi/Source | Uncertainty Counting 1 Sigma | MDA |
|---|---|---|---|---|
| AM-241 | 4.4010E+02 | 4.4733E+02 | 4.734E-01% | 3.14E+00 |
| CS-137 | 3.0320E+02 | 3.8332E+02 | 6.845E-01% | 1.94E+00 |
| Co-1332 | 1.9757E+02 | 7.5272E+02 | 1.097E+00% | 4.04E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

----------  S U M M A R Y  ----------

Total Activity (  37.6 to  1999.5 keV)  9.409E+02  uCi/Source
Total Decayed Activity (  37.6 to  1999.5 keV) 1.5833716E+03  uCi/Source

(Page 5 of 5)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: **Detector #16**
SpectrumID: 16_20161206003_EffVerif
Analysis Description: ACVTop-1012459;TunaCan2006
Calibration: 16_TunaCan_90099_071012
Detector: Detector #16

Verification Date: 2016-12-06 03:13
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.48E+02 | 0.3% |
| Cs-137 | 661.66 | 400 | 3.93E+02 | 1.7% |
| Co-1332 | 1332.5 | 777 | 7.63E+02 | 1.8% |

Comments:

Perform __Jody Watson__12/6/16_____ Reviev ___Rachel Mueller 12/6/16_____

C:\User\CRpt\16_20161206003_EffVerif.xls

Sample Description: ACVTop-1012459;TunaCan2006
Detector: Detector #16
Source Date: 10/1/2006 11:00
Acquired: 12/6/2016 03:13:51
Analyzed: 12/6/2016 10:08

Analyst: Jody Watson

Efficiency: 16_TunaCan_90099_071012
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity uCi/Source | Uncertainty % |
|---|---|---|
| AM-241 | 4.478E+02 | 0.41 |
| CS-137 | 3.932E+02 | 0.59 |
| Co-1332 | 7.634E+02 | 0.91 |
| Total | 1.604E+03 | |

Sample description
ACVTop-1012459;TunaCan2006

Spectrum Filename: C:\User\SPC\Det16\16_20161206003_EffVerif.An1

Acquisition information
Start time: 12/6/2016 3:13:51 AM
Live time: 7200
Real time: 7282
Dead time: 1.13 %
Detector ID: 16

Detector system
Ge16 SN/11012217

Calibration
Filename: 16_Soil_TunaCan.Clb
16_TunaCan_90099_071012

Energy Calibration
Created: 2/28/2012 9:35:31 AM
Zero offset: 0.050 keV
Gain: 0.250 keV/channel
Quadratic: -2.285E-08 keV/channel^2

Efficiency Calibration
Created: 7/13/2012 9:47:24 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.01 %
Log(Eff): 1.477416E-02 + (-5.514266E-01*Log(E) ) + ( -1.443482E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.17 %
Log(Eff): -2.408438E+01 + ( 8.948554E+00*Log(E) ) + ( -9.513599E-01*Log(E)^2 )

Library Files
Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.57keV )
Stop channel: 8000 (  1999.64keV )
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc.  3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff:  0.0520

***** S U M M A R Y  O F  P E A K S  I N  R A N G E  *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. uCi/Sour | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.45 | 73429. | 0.54 | 1.00 | 2.345E-02 | | | | |
| 59.47 | 105531. | 0.41 | 0.99 | 3.322E-02 | 59.54 | 100.000 | 4.478E+02 | AM241 |
| 74.73 | 396. | 19.10 | 0.99 | 4.134E-02 | | | | |
| 77.08 | 572. | 14.81 | 0.99 | 4.226E-02 | | | | |
| 87.85 | 972. | 11.86 | 1.05 | 4.546E-02 | | | | |
| 238.32 | 838. | 11.96 | 0.98 | 3.219E-02 | | | | |
| 295.04 | 415. | 17.81 | 1.60 | 2.765E-02 | | | | |
| 609.07 | 375. | 19.64 | 1.61 | 1.634E-02 | | | | |
| 661.70 | 34408. | 0.59 | 1.47 | 1.537E-02 | 661.66 | 100.000 | 3.932E+02 | CS137 |
| 911.55 | 378. | 19.71 | 1.60 | 1.211E-02 | | | | |
| 1173.34 | 14248. | 0.90 | 1.88 | 1.002E-02 | | | | |
| 1332.63 | 13106. | 0.91 | 2.00 | 9.096E-03 | 1332.50 | 100.000 | 7.634E+02 | Co1332 |

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 185.51 | 46.45 | 21384. | 73429. | 3.131E+06 | 0.54 | 0.998 | - | |
| 298.59 | 74.73 | 2662. | 396. | 9.579E+03 | 19.10 | 0.985 | - | sD |
| 307.97 | 77.07 | 3303. | 572. | 1.353E+04 | 14.81 | 0.988 | - | D |
| 351.02 | 87.85 | 3512. | 972. | 2.137E+04 | 11.86 | 1.048 | - | s |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 952.65 | 238.32 | 2301. | 838. | 2.603E+04 | 11.96 | 0.975 | - s |
| 1179.46 | 295.04 | 1376. | 415. | 1.501E+04 | 17.81 | 1.597 | - s |
| 2435.35 | 609.07 | 918. | 375. | 2.296E+04 | 19.64 | 1.606 | - s |
| 3645.29 | 911.55 | 884. | 378. | 3.117E+04 | 19.71 | 1.604 | - s |
| 4692.71 | 1173.34 | 356. | 14248. | 1.423E+06 | 0.90 | 1.883 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.56 | 59.47 | 18088. | 105531. | 14.657 | 0.41 | 0.994 |
| CS-137 | 2645.83 | 661.70 | 974. | 34408. | 4.779 | 0.59 | 1.475 |
| Co-1332 | 5330.11 | 1332.63 | 123. | 13106. | 1.820 | 0.91 | 1.999 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity uCi/Source | Peak Energy keV | Peak Activity uCi/Source | Code | MDA Value uCi/Source | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.4782E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.478E+02 | ( | 2.671E+00 4.10E-01 1.00E+02 G | |
| CS-137 | | 3.9324E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.932E+02 | ( | 1.693E+00 5.87E-01 1.00E+02 G | |
| Co-1332 | | 7.6338E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.634E+02 | ( | 3.164E+00 9.08E-01 1.00E+02 G | |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.

$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

| Nuclide | Time of Count Activity uCi/Source | Time Corrected Activity uCi/Source | Uncertainty Counting 1 Sigma | MDA |
|---|---|---|---|---|
| AM-241 | 4.4057E+02 | 4.4782E+02 | 4.097E-01% | 2.67E+00 |
| CS-137 | 3.1098E+02 | 3.9324E+02 | 5.866E-01% | 1.69E+00 |
| Co-1332 | 2.0011E+02 | 7.6338E+02 | 9.082E-01% | 3.16E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity ( 37.6 to 1999.6 keV) 9.517E+02 uCi/Source
Total Decayed Activity ( 37.6 to 1999.6 keV) 1.6044343E+03 uCi/Source

(Page 5 of 5)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

# ANNUAL CALIBRATION VERIFICATION

Detector ID: **Detector #17**
SpectrumID: 17_20161130004_EffVerif
Analysis Description: ACVTop-1012459;TunaCan2006
Calibration: 17_TunaCan_90099_032612
Detector: Detector #17

Verification Date: 2016-11-30 17:05
Source Assay Date/Time: 2006-10-01 11:00

| Isotope | Gamma Energy (kev) | Source Emission Rate (GPS) (Assay) | Observed Activity (GPS) (Actual) | Percent Difference (%) Assay-Actual / Assay |
|---|---|---|---|---|
| Am-241 | 59.54 | 449 | 4.38E+02 | 2.5% |
| Cs-137 | 661.66 | 400 | 3.91E+02 | 2.2% |
| Co-1332 | 1332.5 | 777 | 7.64E+02 | 1.6% |

Comments:

Perform __Jody Watson 12/6/16_____

Reviev __Rachel Mueller 12/6/16_____

C:\User\CRpt\17_20161130004_EffVerif.xls

Sample Description: ACVTop-1012459;TunaCan2006
Detector: Detector #17
Source Date: 10/1/2006 11:00
Acquired: 11/30/2016 17:05:22
Analyzed: 12/6/2016 10:38

Analyst: Jody Watson

Efficiency: 17_TunaCan_90099_032612
Library: DET_EfficiencyVerification.lib

| Nuclide | Activity uCi/Source | Uncertainty % |
|---|---|---|
| AM-241 | 4.379E+02 | 0.42 |
| CS-137 | 3.912E+02 | 0.59 |
| Co-1332 | 7.643E+02 | 0.93 |
| Total | 1.593E+03 | |

Sample description
ACVTop-1012459;TunaCan2006

Spectrum Filename: C:\User\SPC\Det17\17_20161130004_EffVerif.An1

Acquisition information
Start time: 11/30/2016 5:05:22 PM
Live time: 7200
Real time: 7372
Dead time: 2.34 %
Detector ID: 17

Detector system
Ge17 SN/11080671

Calibration
Filename: 17_Soil_TunaCan.Clb
17_TunaCan_90099_032612

Energy Calibration
Created: 2/29/2012 10:33:23 AM
Zero offset: 0.108 keV
Gain: 0.250 keV/channel
Quadratic: -2.584E-08 keV/channel^2

Efficiency Calibration
Created: 4/12/2012 9:28:42 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 0.91 %
Log(Eff): -5.264190E-01 + (-4.024164E-01*Log(E) ) + ( -2.604461E-02*Log(E)^2 )
Below the Knee: Quadratic Uncertainty = 1.00 %
Log(Eff): -2.343889E+01 + ( 8.582715E+00*Log(E) ) + ( -9.075430E-01*Log(E)^2 )

Library Files
Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.63keV )
Stop channel: 8000 (  1999.54keV )
Peak rejection level: 20.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00
Detection limit method: Reg. Guide 4.16 Method

| | |
|---|---|
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | YES | 10/1/2006 11:00:00 AM |
| Decay during acquisition: | YES | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

total peaks alloc. 3 cutoff: 5.00E+01 %

Energy Calibration

Normalized diff: 0.0587

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. uCi/Sour | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.60 | 67262. | 0.53 | 0.78 | 2.104E-02 | | | | |
| 59.58 | 91724. | 0.42 | 0.79 | 2.960E-02 | 59.54 | 100.000 | 4.379E+02 | AM241 |
| 77.16 | 472. | 16.23 | 0.77 | 3.763E-02 | | | | |
| 87.91 | 711. | 13.20 | 0.93 | 4.057E-02 | | | | |
| 238.53 | 674. | 11.15 | 0.96 | 2.990E-02 | | | | |
| 351.84 | 424. | 16.13 | 0.92 | 2.280E-02 | | | | |
| 511.74 | 648. | 16.19 | 1.92 | 1.742E-02 | | | | |
| 583.50 | 308. | 17.06 | 0.92 | 1.583E-02 | | | | |
| 609.36 | 338. | 16.77 | 0.96 | 1.533E-02 | | | | |
| 661.72 | 32151. | 0.59 | 1.35 | 1.443E-02 | 661.66 | 100.000 | 3.912E+02 | CS137 |
| 1173.36 | 13329. | 0.93 | 1.78 | 9.358E-03 | | | | |
| 1332.64 | 12257. | 0.93 | 1.77 | 8.480E-03 | 1332.50 | 100.000 | 7.643E+02 | Co1332 |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 185.85 | 46.60 | 16872. | 67262. | 3.196E+06 | 0.53 | 0.779 | - |
| 308.04 | 77.16 | 2164. | 472. | 1.256E+04 | 16.23 | 0.766 | - |
| 351.03 | 87.91 | 2700. | 711. | 1.753E+04 | 13.20 | 0.932 | - |
| 953.28 | 238.53 | 1571. | 674. | 2.255E+04 | 11.15 | 0.956 | - |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 1406.37 | 351.84 | 1160. | 424. | 1.860E+04 | 16.13 | 0.919 | - | s |
| 2045.85 | 511.74 | 1517. | 648. | 3.721E+04 | 16.19 | 1.921 | - | s |
| 2332.88 | 583.50 | 589. | 308. | 1.946E+04 | 17.06 | 0.920 | - | s |
| 2436.30 | 609.36 | 640. | 338. | 2.208E+04 | 16.77 | 0.959 | - | s |
| 4692.75 | 1173.36 | 330. | 13329. | 1.424E+06 | 0.93 | 1.785 | - | |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: DET_EfficiencyVerification.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|
| AM-241 | 237.78 | 59.58 | 14835. | 91724. | 12.739 | 0.42 | 0.787 |
| CS-137 | 2645.74 | 661.72 | 728. | 32151. | 4.465 | 0.59 | 1.355 |
| Co-1332 | 5330.17 | 1332.64 | 111. | 12257. | 1.702 | 0.93 | 1.772 |

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

***** S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E *****

| - Nuclide - Name | Code | Average Activity uCi/Source | Peak Energy keV | Peak Activity uCi/Source | Code | MDA Value uCi/Source | COMMENTS |
|---|---|---|---|---|---|---|---|
| AM-241 | | 4.3788E+02 | | | | 1.58E+05 | |
| | | | 59.54 | 4.379E+02 | ( | 2.722E+00 4.24E-01 1.00E+02 | G |
| CS-137 | | 3.9125E+02 | | | | 1.10E+04 | |
| | | | 661.66 | 3.912E+02 | ( | 1.563E+00 5.88E-01 1.00E+02 | G |
| Co-1332 | | 7.6425E+02 | | | | 1.93E+03 | |
| | | | 1332.50 | 7.643E+02 | ( | 3.228E+00 9.31E-01 1.00E+02 | G |

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.

$ - Peak identified, but first peak of this nuclide
failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the
library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity
to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

*****  S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E  *****

| Nuclide | Time of Count Activity uCi/Source | Time Corrected Activity uCi/Source | Uncertainty Counting 1 Sigma | MDA |
|---|---|---|---|---|
| AM-241 | 4.3080E+02 | 4.3788E+02 | 4.237E-01% | 2.72E+00 |
| CS-137 | 3.0951E+02 | 3.9125E+02 | 5.884E-01% | 1.56E+00 |
| Co-1332 | 2.0073E+02 | 7.6425E+02 | 9.307E-01% | 3.23E+00 |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

----------  S U M M A R Y  ----------

Total Activity (  37.6 to  1999.5 keV)  9.410E+02  uCi/Source
Total Decayed Activity (  37.6 to  1999.5 keV) 1.5933748E+03  uCi/Source

(Page 5 of 5)

# Monthly Backgrounds

Test America
St. Louis
Background Check

Spectrum: 3_20170603003_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 2:18:40 PM
Detector: Detector # 3
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 2.39 | 2.13 | 2.22 | 2.40 | 2.56 | 2.65 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det3\3_20170603003_BGLong.An1

Acquisition information
Start time: 6/3/2017 2:18:40 PM
Live time: 72000
Real time: 72044
Dead time: 0.06 %
Detector ID: 3

Detector system
Ge 3 SN/242

Calibration
Filename: 3_QC.Clb
Ge3_QC

Energy Calibration
Created: 2/28/2012 7:25:37 PM
Zero offset: 0.122 keV
Gain: 0.250 keV/channel
Quadratic: 3.421E-08 keV/channel^2

Efficiency Calibration
Created: 1/6/2011 8:38:10 AM
Knee Energy: 0.00 keV
Above the Knee: Interpolative  Uncertainty =  0.00 %
Below the Knee: Interpolative  Uncertainty =  0.00 %

Library Files
Main analysis library: Null.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.59keV )
Stop channel: 8000 (  2000.59keV )
Peak rejection level: 30.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) =
1.0000E+00
Detection limit method: Reg. Guide 4.16 Method
Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3

(Page 2 of 5)

Half lives decay limit: 12.000
Activity range factor: 2.000
Min. step backg. energy 0.000
Multiplet shift channel 2.000

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.50 | 728. | 9.16 | 0.71 | 6.670E-02 | | | | |
| 63.23 | 695. | 10.59 | 0.91 | 9.444E-02 | | | | |
| 72.80 | 580. | 9.74 | 0.85 | 1.103E-01 | | | | |
| 74.94 | 1277. | 4.72 | 0.85 | 1.138E-01 | | | | |
| 77.12 | 486. | 10.43 | 0.85 | 1.174E-01 | | | | |
| 84.71 | 605. | 8.86 | 0.86 | 1.299E-01 | | | | |
| 87.35 | 317. | 15.31 | 0.86 | 1.343E-01 | | | | |
| 92.59 | 1121. | 6.51 | 1.13 | 1.357E-01 | | | | |
| 185.53 | 612. | 10.76 | 1.12 | 1.150E-01 | | | | |
| 198.29 | 222. | 23.99 | 0.96 | 1.116E-01 | | | | |
| 238.54 | 470. | 13.03 | 1.01 | 1.011E-01 | | | | |
| 295.03 | 371. | 11.49 | 1.33 | 8.631E-02 | | | | |
| 338.35 | 183. | 29.77 | 1.40 | 7.498E-02 | | | | |
| 351.65 | 668. | 9.00 | 1.30 | 7.150E-02 | | | | |
| 510.63 | 2800. | 4.37 | 2.51 | 5.116E-02 | | | | |
| 582.59 | 310. | 16.30 | 0.98 | 4.511E-02 | | | | |
| 608.93 | 632. | 9.11 | 1.10 | 4.292E-02 | | | | |
| 1460.82 | 439. | 9.62 | 2.27 | 1.865E-02 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 185.65 | 46.50 | 1118. | 728. | 1.092E+04 | 9.16 | 0.715 | - | |
| 252.64 | 63.23 | 1288. | 695. | 7.359E+03 | 10.59 | 0.912 | - | |
| 290.94 | 72.79 | 1306. | 580. | 5.258E+03 | 9.74 | 0.846 | - | D |

(Page 3 of 5)

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 299.53 | 74.93 | 1178. | 1277. | 1.122E+04 | 4.72 | 0.848 | - D |
| 308.22 | 77.11 | 1044. | 486. | 4.142E+03 | 10.43 | 0.850 | - D |
| 338.62 | 84.64 | 1135. | 605. | 4.657E+03 | 8.86 | 0.858 | - sD |
| 349.21 | 87.28 | 1023. | 317. | 2.363E+03 | 15.31 | 0.861 | - D |
| 370.17 | 92.59 | 1147. | 1121. | 8.263E+03 | 6.51 | 1.134 | - s |
| 742.20 | 185.53 | 1016. | 612. | 5.323E+03 | 10.76 | 1.123 | - |
| 793.28 | 198.29 | 784. | 222. | 1.989E+03 | 23.99 | 0.962 | - s |
| 954.36 | 238.54 | 893. | 470. | 4.646E+03 | 13.03 | 1.007 | - |
| 1180.47 | 295.03 | 482. | 371. | 4.298E+03 | 11.49 | 1.331 | - s |
| 1353.81 | 338.35 | 696. | 183. | 2.441E+03 | 29.77 | 1.402 | - s |
| 1407.05 | 351.65 | 680. | 668. | 9.343E+03 | 9.00 | 1.296 | - |
| 2043.22 | 510.05 | 1141. | 2800. | 5.474E+04 | 4.37 | 2.508 | - s |
| 2331.11 | 582.59 | 433. | 310. | 6.864E+03 | 16.30 | 0.983 | - s |
| 2436.53 | 608.93 | 556. | 632. | 1.473E+04 | 9.11 | 1.099 | - |
| 5843.13 | 1460.82 | 165. | 439. | 2.355E+04 | 9.62 | 2.271 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | Peak MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

(Page 4 of 5)

```
  + - Peak activity higher than counting uncertainty range.
  - - Peak activity lower than counting uncertainty range.
  = - Peak outside analysis energy range.
  & - Calculated peak centroid is not close enough to the
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
          Energy   Counts     Counts     Cts/Sec  1 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count   Uncertainty  1 Sigma
Nuclide    Activity        Counting                  MDA
               DPS
_____________________________________________________________________________
DUMMY    No in-range peaks
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   37.6 to  2000.6 keV)     0.000E+00  DPS
```

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 5_20170603003_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 2:18:06 PM
Detector: Detector # 5
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.45 | 1.30 | 1.35 | 1.44 | 1.55 | 1.60 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det5\5_20170603003_BGLong.An1

Acquisition information

| | |
|---|---|
| Start time: | 6/3/2017 2:18:06 PM |
| Live time: | 72000 |
| Real time: | 72333 |
| Dead time: | 0.46 % |
| Detector ID: | 5 |

Detector system
Ge 5 SN/157

Calibration

| | |
|---|---|
| Filename: | 5_QC.Clb |

Ge5_QC

Energy Calibration

| | |
|---|---|
| Created: | 2/28/2012 7:35:48 PM |
| Zero offset: | 0.158 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | 3.911E-08 keV/channel^2 |

Efficiency Calibration

| | | | |
|---|---|---|---|
| Created: | 1/6/2011 8:03:22 AM | | |
| Knee Energy: | 0.00 keV | | |
| Above the Knee: | Interpolative | Uncertainty = | 0.00 % |
| Below the Knee: | Interpolative | Uncertainty = | 0.00 % |

Library Files

| | |
|---|---|
| Main analysis library: | Null.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 150 (  37.62keV ) |
| Stop channel: | 8000 (  2000.81keV ) |
| Peak rejection level: | 30.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Reg. Guide 4.16 Method |
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.63 | 572. | 10.07 | 0.80 | 5.688E-02 | | | | |
| 59.56 | 180. | 21.03 | 0.85 | 7.423E-02 | | | | |
| 63.38 | 631. | 8.51 | 0.85 | 7.936E-02 | | | | |
| 74.77 | 204. | 16.46 | 0.81 | 9.469E-02 | | | | |
| 77.11 | 235. | 14.61 | 0.81 | 9.784E-02 | | | | |
| 87.42 | 146. | 29.42 | 0.52 | 1.116E-01 | | | | |
| 92.55 | 753. | 6.49 | 1.18 | 1.129E-01 | | | | |
| 185.94 | 428. | 11.38 | 0.79 | 9.602E-02 | | | | |
| 238.79 | 217. | 18.13 | 1.11 | 8.319E-02 | | | | |
| 295.19 | 256. | 14.76 | 1.09 | 6.951E-02 | | | | |
| 352.04 | 287. | 12.45 | 0.96 | 5.571E-02 | | | | |
| 511.29 | 1626. | 5.26 | 2.12 | 3.834E-02 | | | | |
| 609.62 | 305. | 12.97 | 1.35 | 3.197E-02 | | | | |
| 782.66 | 85. | 24.14 | 0.48 | 2.443E-02 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 186.06 | 46.63 | 717. | 572. | 1.006E+04 | 10.07 | 0.796 | - | s |
| 237.81 | 59.56 | 470. | 180. | 2.425E+03 | 21.03 | 0.851 | - | |
| 253.11 | 63.38 | 613. | 631. | 7.947E+03 | 8.51 | 0.854 | - | |
| 298.70 | 74.80 | 464. | 204. | 2.159E+03 | 16.46 | 0.813 | - | D |
| 308.09 | 77.15 | 474. | 235. | 2.405E+03 | 14.61 | 0.815 | - | D |
| 349.37 | 87.42 | 535. | 146. | 1.306E+03 | 29.42 | 0.523 | - | s |
| 369.91 | 92.55 | 544. | 753. | 6.669E+03 | 6.49 | 1.177 | - | s |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 743.72 | 185.94 | 555. | 428. | 4.457E+03 | 11.38 | 0.788 | - | s |
| 955.25 | 238.79 | 399. | 217. | 2.608E+03 | 18.13 | 1.107 | - | s |
| 1180.99 | 295.19 | 335. | 256. | 3.683E+03 | 14.76 | 1.086 | - | s |
| 1408.53 | 352.04 | 296. | 287. | 5.146E+03 | 12.45 | 0.955 | - | |
| 2045.75 | 511.29 | 621. | 1626. | 4.242E+04 | 5.26 | 2.122 | - | s |
| 2439.16 | 609.62 | 280. | 305. | 9.539E+03 | 12.97 | 1.348 | - | s |
| 3131.36 | 782.66 | 84. | 85. | 3.480E+03 | 24.14 | 0.479 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

*****  S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E  *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | Peak MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity

to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

*****  S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E  *****

| Nuclide | Time of Count Activity DPS | Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|
| DUMMY | No in-range peaks | | |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

----------  S U M M A R Y  ----------

Total Activity (  37.6 to  2000.8 keV)  0.000E+00  DPS

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 7_20170603002_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 2:16:27 PM
Detector: Detector # 7
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.30 | 1.16 | 1.21 | 1.29 | 1.40 | 1.45 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det7\7_20170603002_BGLong.An1

Acquisition information
Start time: 6/3/2017 2:16:27 PM
Live time: 43200
Real time: 44002
Dead time: 1.82 %
Detector ID: 7

Detector system
Ge 7 SN/154

Calibration
Filename: 7_QC.Clb
Ge7_QC

Energy Calibration
Created: 2/23/2012 8:40:56 AM
Zero offset: 0.117 keV
Gain: 0.250 keV/channel
Quadratic: 3.508E-09 keV/channel^2

Efficiency Calibration
Created: 1/6/2011 8:06:10 AM
Knee Energy: 0.00 keV
Above the Knee: Interpolative  Uncertainty =  0.00 %
Below the Knee: Interpolative  Uncertainty =  0.00 %

Library Files
Main analysis library: Null.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.61keV )
Stop channel: 8000 (  2000.13keV )
Peak rejection level: 30.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) =
1.0000E+00
Detection limit method: Reg. Guide 4.16 Method
Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.62 | 427. | 10.91 | 1.25 | 8.133E-02 | | | | |
| 63.25 | 447. | 11.53 | 1.42 | 1.228E-01 | | | | |
| 92.61 | 522. | 10.48 | 1.46 | 1.861E-01 | | | | |
| 185.60 | 315. | 11.97 | 1.37 | 1.634E-01 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 186.05 | 46.62 | 418. | 427. | 5.250E+03 | 10.91 | 1.251 | - | s |
| 252.58 | 63.25 | 510. | 447. | 3.641E+03 | 11.53 | 1.424 | - | s |
| 370.02 | 92.61 | 570. | 522. | 2.805E+03 | 10.48 | 1.458 | - | s |
| 742.00 | 185.60 | 289. | 315. | 1.928E+03 | 11.97 | 1.365 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

(Page 3 of 5)

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Activity DPS | Time of Count Uncertainty 1 Sigma Counting | MDA |
|---|---|---|---|

DUMMY  No in-range peaks
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  2000.1 keV)  0.000E+00  DPS

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 8_20170603002_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 2:15:40 PM
Detector: Detector # 8
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.56 | 1.39 | 1.45 | 1.59 | 1.68 | 1.74 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det8\8_20170603002_BGLong.An1

Acquisition information
Start time: 6/3/2017 2:15:40 PM
Live time: 72000
Real time: 73905
Dead time: 2.58 %
Detector ID: 8

Detector system
Ge 8 SN/174

Calibration
Filename: 8_QC.Clb
Ge8_QC

Energy Calibration
Created: 2/28/2012 10:34:41 AM
Zero offset: 0.052 keV
Gain: 0.250 keV/channel
Quadratic: 5.282E-10 keV/channel^2

Efficiency Calibration
Created: 1/6/2011 8:07:20 AM
Knee Energy: 0.00 keV
Above the Knee: Interpolative  Uncertainty =  0.00 %
Below the Knee: Interpolative  Uncertainty =  0.00 %

Library Files
Main analysis library: Null.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.55keV )
Stop channel: 8000 (  1999.97keV )
Peak rejection level: 30.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) =
1.0000E+00
Detection limit method: Reg. Guide 4.16 Method
Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y  O F  P E A K S  I N  R A N G E  *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 59.50 | 570. | 7.41 | 1.02 | 8.685E-02 | | | | |
| 63.25 | 1163. | 4.19 | 1.03 | 9.239E-02 | | | | |
| 83.97 | 206. | 26.30 | 1.27 | 1.229E-01 | | | | |
| 92.64 | 1930. | 4.11 | 0.99 | 1.295E-01 | | | | |
| 143.99 | 209. | 24.88 | 0.96 | 1.247E-01 | | | | |
| 185.69 | 1091. | 7.20 | 1.00 | 1.108E-01 | | | | |
| 238.63 | 301. | 13.19 | 1.17 | 9.636E-02 | | | | |
| 661.69 | 282. | 12.40 | 1.30 | 3.334E-02 | | | | |

********** U N I D E N T I F I E D  P E A K  S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 237.80 | 59.50 | 608. | 570. | 6.565E+03 | 7.41 | 1.022 | - | sD |
| 252.82 | 63.25 | 607. | 1163. | 1.258E+04 | 4.19 | 1.025 | - | D |
| 335.70 | 83.97 | 780. | 206. | 1.676E+03 | 26.30 | 1.274 | - | s |
| 370.36 | 92.64 | 1045. | 1930. | 1.490E+04 | 4.11 | 0.993 | - | |
| 575.79 | 143.99 | 683. | 209. | 1.679E+03 | 24.88 | 0.959 | - | |
| 742.60 | 185.69 | 983. | 1091. | 9.845E+03 | 7.20 | 1.000 | - | |
| 954.35 | 238.74 | 403. | 301. | 3.124E+03 | 13.19 | 1.173 | - | s |
| 2646.70 | 661.69 | 196. | 282. | 8.473E+03 | 12.40 | 1.304 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

***** S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

(Page 4 of 5)

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Activity DPS | Time of Count Uncertainty Counting 1 Sigma | MDA |
|---|---|---|---|

DUMMY  No in-range peaks
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.5 to  2000.0 keV)  0.000E+00  DPS

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 9_20170603004_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 2:40:10 PM
Detector: Detector # 9
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.89 | 1.53 | 1.65 | 1.80 | 2.14 | 2.26 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det9\9_20170603004_BGLong.An1

Acquisition information

| | |
|---|---|
| Start time: | 6/3/2017 2:40:10 PM |
| Live time: | 43200 |
| Real time: | 43243 |
| Dead time: | 0.10 % |
| Detector ID: | 9 |

Detector system
Ge9 S/N100228730

Calibration

| | |
|---|---|
| Filename: | 9_QC.Clb |

9_QC-E_79670-334_060211

Energy Calibration

| | |
|---|---|
| Created: | 3/1/2012 1:57:17 PM |
| Zero offset: | 0.074 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | -2.269E-08 keV/channel^2 |

Efficiency Calibration

| | | | |
|---|---|---|---|
| Created: | 6/3/2011 12:03:10 PM | | |
| Knee Energy: | 0.00 keV | | |
| Above the Knee: | Interpolative | Uncertainty = | 0.00 % |
| Below the Knee: | Interpolative | Uncertainty = | 0.00 % |

Library Files

| | |
|---|---|
| Main analysis library: | Null.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 150 (  37.59keV ) |
| Stop channel: | 8000 (  1999.34keV ) |
| Peak rejection level: | 30.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Reg. Guide 4.16 Method |
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 238.45 | 157. | 24.72 | 1.15 | 1.229E-01 | | | | |
| 351.93 | 230. | 14.87 | 0.87 | 8.640E-02 | | | | |
| 510.90 | 1422. | 5.58 | 2.60 | 6.209E-02 | | | | |
| 583.16 | 116. | 28.19 | 1.07 | 5.511E-02 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 953.26 | 238.45 | 368. | 157. | 1.277E+03 | 24.72 | 1.149 | - | |
| 1407.09 | 351.93 | 246. | 230. | 2.668E+03 | 14.87 | 0.870 | - | s |
| 2042.96 | 510.90 | 466. | 1422. | 2.291E+04 | 5.58 | 2.596 | - | |
| 2332.00 | 583.16 | 183. | 116. | 2.099E+03 | 28.19 | 1.073 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

(Page 3 of 5)

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Activity DPS | Time of Count Counting | Uncertainty 1 Sigma | MDA |
|---|---|---|---|---|

DUMMY  No in-range peaks
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  1999.3 keV)  0.000E+00  DPS

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 10_20170603003_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 2:20:41 PM
Detector: Detector #10
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 2.34 | 1.91 | 2.05 | 2.27 | 2.63 | 2.78 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det10\10_20170603003_BGLong.An1

Acquisition information

| | |
|---|---|
| Start time: | 6/3/2017 2:20:41 PM |
| Live time: | 43200 |
| Real time: | 43234 |
| Dead time: | 0.08 % |
| Detector ID: | 10 |

Detector system
Ge10 S/N08316756

Calibration

| | |
|---|---|
| Filename: | 10_QC.Clb |

10_QC-F_062111

Energy Calibration

| | |
|---|---|
| Created: | 2/23/2012 9:27:47 AM |
| Zero offset: | 0.044 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | -1.974E-08 keV/channel^2 |

Efficiency Calibration

| | | | |
|---|---|---|---|
| Created: | 7/6/2011 9:01:12 AM | | |
| Knee Energy: | 0.00 keV | | |
| Above the Knee: | Interpolative | Uncertainty = | 0.00 % |
| Below the Knee: | Interpolative | Uncertainty = | 0.00 % |

Library Files

| | |
|---|---|
| Main analysis library: | Null.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 150 (  37.56keV ) |
| Stop channel: | 8000 (  1999.70keV ) |
| Peak rejection level: | 30.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Reg. Guide 4.16 Method |
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.47 | 863. | 7.18 | 0.97 | 6.242E-02 | | | | |
| 54.60 | 786. | 9.18 | 1.37 | 7.317E-02 | | | | |
| 63.31 | 727. | 7.77 | 0.85 | 8.470E-02 | | | | |
| 74.90 | 164. | 21.29 | 0.86 | 9.998E-02 | | | | |
| 77.10 | 148. | 24.37 | 0.86 | 1.029E-01 | | | | |
| 92.57 | 1102. | 5.09 | 1.14 | 1.178E-01 | | | | |
| 143.77 | 159. | 24.99 | 1.47 | 1.140E-01 | | | | |
| 185.58 | 607. | 9.64 | 1.00 | 1.026E-01 | | | | |
| 238.50 | 311. | 15.63 | 0.90 | 9.002E-02 | | | | |
| 295.00 | 115. | 28.04 | 0.78 | 7.663E-02 | | | | |
| 351.74 | 250. | 16.05 | 1.45 | 6.319E-02 | | | | |
| 511.08 | 1388. | 5.08 | 2.20 | 4.528E-02 | | | | |
| 583.21 | 133. | 22.11 | 1.11 | 4.018E-02 | | | | |
| 609.28 | 268. | 15.65 | 1.26 | 3.833E-02 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 185.61 | 46.47 | 776. | 863. | 1.382E+04 | 7.18 | 0.968 | - | s |
| 218.13 | 54.60 | 1205. | 786. | 1.074E+04 | 9.18 | 1.370 | - | s |
| 252.95 | 63.31 | 740. | 727. | 8.588E+03 | 7.77 | 0.851 | - | |
| 299.28 | 74.87 | 531. | 164. | 1.644E+03 | 21.29 | 0.856 | - | D |
| 308.10 | 77.07 | 575. | 148. | 1.437E+03 | 24.37 | 0.859 | - | D |
| 369.94 | 92.57 | 611. | 1102. | 9.349E+03 | 5.09 | 1.143 | - | s |
| 574.67 | 143.77 | 446. | 159. | 1.391E+03 | 24.99 | 1.474 | - | s |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 741.86 | 185.58 | 678. | 607. | 5.922E+03 | 9.64 | 1.001 | - | |
| 953.46 | 238.50 | 513. | 311. | 3.455E+03 | 15.63 | 0.901 | - | |
| 1179.39 | 295.00 | 290. | 115. | 1.496E+03 | 28.04 | 0.785 | - | s |
| 1406.28 | 351.74 | 326. | 250. | 3.954E+03 | 16.05 | 1.449 | - | s |
| 2043.55 | 511.08 | 414. | 1388. | 3.066E+04 | 5.08 | 2.204 | - | s |
| 2332.01 | 583.21 | 183. | 133. | 3.310E+03 | 22.11 | 1.107 | - | |
| 2436.31 | 609.28 | 288. | 268. | 6.979E+03 | 15.65 | 1.261 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | Peak MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity

to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

*****  S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E  *****

| Nuclide | Time of Count Activity DPS | Uncertainty Counting | 1 Sigma | MDA |
|---|---|---|---|---|
| DUMMY | No in-range peaks | | | |

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

----------  S U M M A R Y  ----------

Total Activity (  37.6 to  1999.7 keV)  0.000E+00  DPS

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 13_20170603003_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 3:31:21 PM
Detector: Detector #13
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.91 | 1.71 | 1.77 | 1.87 | 2.04 | 2.10 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det13\13_20170603003_BGLong.An1

Acquisition information
Start time: 6/3/2017 3:31:21 PM
Live time: 43200
Real time: 43266
Dead time: 0.15 %
Detector ID: 13

Detector system
Ge13 SN/10064006

Calibration
Filename: 13_QC.Clb
13_QC-I_83725-334_060211

Energy Calibration
Created: 2/23/2012 9:31:24 AM
Zero offset: 0.036 keV
Gain: 0.250 keV/channel
Quadratic: -2.347E-08 keV/channel^2

Efficiency Calibration
Created: 6/5/2011 10:21:36 AM
Knee Energy: 0.00 keV
Above the Knee: Interpolative  Uncertainty =  0.00 %
Below the Knee: Interpolative  Uncertainty =  0.00 %

Library Files
Main analysis library: Null.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.55keV )
Stop channel: 8000 (  1999.54keV )
Peak rejection level: 30.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) =
1.0000E+00
Detection limit method: Reg. Guide 4.16 Method
Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3

(Page 2 of 5)

```
       Half lives decay limit:    12.000
       Activity range factor:      2.000
       Min. step backg. energy     0.000
       Multiplet shift channel     2.000

Corrections                          Status          Comments
       Decay correct to date:         NO
       Decay during acquisition:      NO
       Decay during collection:       NO
       True coincidence correction:   NO
       Peaked background correction:  NO
       Absorption (Internal):         NO
       Geometry correction:           NO
       Random summing:                NO
```

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 139.82 | 157. | 28.93 | 1.00 | 1.677E-01 | | | | |
| 198.07 | 145. | 25.05 | 1.07 | 1.468E-01 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 558.90 | 139.82 | 520. | 157. | 9.363E+02 | 28.93 | 1.004 | - |
| 791.80 | 198.07 | 373. | 145. | 9.901E+02 | 25.05 | 1.065 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

(Page 3 of 5)

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

| Nuclide Codes: | Peak Codes: |
|---|---|
| T - Thermal Neutron Activation | G - Gamma Ray |
| F - Fast Neutron Activation | X - X-Ray |
| I - Fission Product | P - Positron Decay |
| N - Naturally Occurring Isotope | S - Single-Escape |
| P - Photon Reaction | D - Double-Escape |
| C - Charged Particle Reaction | K - Key Line |
| M - No MDA Calculation | A - Not in Average |
| R - Coincidence Corrected | C - Coincidence Peak |
| H - Halflife limit exceeded | |

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D I S O T O P E P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

(Page 4 of 5)

```
*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count   Uncertainty  1 Sigma
Nuclide    Activity        Counting                  MDA
               DPS
_____________________________________________________________________________
DUMMY    No in-range peaks
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   37.6 to  1999.5 keV)     0.000E+00  DPS
```

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 14_20170603006_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 5:00:09 PM
Detector: Detector #14
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.80 | 1.66 | 1.71 | 1.79 | 1.90 | 1.94 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det14\14_20170603006_BGLong.An1

Acquisition information
Start time: 6/3/2017 5:00:09 PM
Live time: 43200
Real time: 43254
Dead time: 0.12 %
Detector ID: 14

Detector system
Ge14 SN/11080670

Calibration
Filename: 14_QC.Clb
14_QC_79670-334_SOURCE E_042211

Energy Calibration
Created: 2/28/2012 10:48:23 AM
Zero offset: 0.130 keV
Gain: 0.250 keV/channel
Quadratic: -2.050E-08 keV/channel^2

Efficiency Calibration
Created: 5/1/2011 8:43:09 AM
Knee Energy: 0.00 keV
Above the Knee: Interpolative  Uncertainty =  0.00 %
Below the Knee: Interpolative  Uncertainty =  0.00 %

Library Files
Main analysis library: Null.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.64keV )
Stop channel: 8000 (  1999.51keV )
Peak rejection level: 30.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) =
1.0000E+00
Detection limit method: Reg. Guide 4.16 Method
Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.67 | 460. | 10.33 | 0.78 | 6.139E-02 | | | | |
| 63.40 | 354. | 11.56 | 0.80 | 8.553E-02 | | | | |
| 92.63 | 492. | 9.47 | 0.93 | 1.215E-01 | | | | |
| 185.51 | 264. | 17.51 | 1.02 | 1.072E-01 | | | | |
| 238.27 | 197. | 20.34 | 1.21 | 9.398E-02 | | | | |
| 510.59 | 1058. | 4.87 | 2.40 | 4.543E-02 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 186.08 | 46.67 | 539. | 460. | 7.493E+03 | 10.33 | 0.785 | - | |
| 253.02 | 63.40 | 468. | 354. | 4.145E+03 | 11.56 | 0.803 | - | |
| 369.87 | 92.63 | 531. | 492. | 4.052E+03 | 9.47 | 0.926 | - | s |
| 741.30 | 185.51 | 509. | 264. | 2.459E+03 | 17.51 | 1.022 | - | s |
| 952.31 | 238.27 | 384. | 197. | 2.096E+03 | 20.34 | 1.210 | - | s |
| 2041.48 | 510.59 | 228. | 1058. | 2.329E+04 | 4.87 | 2.398 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

(Page 3 of 5)

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

*****  S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E  *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

(Page 4 of 5)

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Activity DPS | Time of Count Counting | Uncertainty 1 Sigma | MDA |
|---|---|---|---|---|

DUMMY  No in-range peaks
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  1999.5 keV)  0.000E+00  DPS

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 15_20170603003_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 4:58:03 PM
Detector: Detector #15
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 1.68 | 1.59 | 1.62 | 1.68 | 1.74 | 1.77 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det15\15_20170603003_BGLong.An1

Acquisition information

| | |
|---|---|
| Start time: | 6/3/2017 4:58:03 PM |
| Live time: | 43200 |
| Real time: | 43220 |
| Dead time: | 0.05 % |
| Detector ID: | 15 |

Detector system
Ge15 SN/11012216

Calibration

| | |
|---|---|
| Filename: | 15_QC.Clb |

15_QC_83725-334_SOURCE F_2011

Energy Calibration

| | |
|---|---|
| Created: | 2/28/2012 4:29:17 PM |
| Zero offset: | 0.044 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | -3.267E-08 keV/channel^2 |

Efficiency Calibration

| | | |
|---|---|---|
| Created: | 8/2/2011 8:55:45 AM | |
| Knee Energy: | 0.00 keV | |
| Above the Knee: | Interpolative | Uncertainty = 0.00 % |
| Below the Knee: | Interpolative | Uncertainty = 0.00 % |

Library Files

| | |
|---|---|
| Main analysis library: | Null.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 150 (  37.57keV ) |
| Stop channel: | 8000 (  1999.52keV ) |
| Peak rejection level: | 30.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Reg. Guide 4.16 Method |
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.58 | 475. | 9.85 | 0.80 | 6.060E-02 | | | | |
| 63.39 | 417. | 12.59 | 0.96 | 8.213E-02 | | | | |
| 74.94 | 144. | 23.81 | 0.94 | 9.692E-02 | | | | |
| 92.69 | 640. | 9.68 | 1.09 | 1.142E-01 | | | | |
| 185.82 | 353. | 12.92 | 0.96 | 9.778E-02 | | | | |
| 238.69 | 204. | 19.79 | 1.11 | 8.500E-02 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 185.99 | 46.58 | 516. | 475. | 7.844E+03 | 9.85 | 0.799 | - | |
| 253.20 | 63.39 | 637. | 417. | 5.073E+03 | 12.59 | 0.956 | - | |
| 299.37 | 74.94 | 410. | 144. | 1.481E+03 | 23.81 | 0.936 | - | |
| 370.33 | 92.69 | 766. | 640. | 5.603E+03 | 9.68 | 1.090 | - | s |
| 742.59 | 185.82 | 432. | 353. | 3.610E+03 | 12.92 | 0.963 | - | s |
| 953.94 | 238.69 | 371. | 204. | 2.398E+03 | 19.79 | 1.107 | - | |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

(Page 3 of 5)

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

*****  S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E  *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation
R - Coincidence Corrected
H - Halflife limit exceeded

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average
C - Coincidence Peak

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

********** D I S C A R D E D  I S O T O P E  P E A K S **********

| Nuclide | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | Activity |
|---|---|---|---|---|---|---|

P - Peakbackground subtraction

***** S U M M A R Y  O F  N U C L I D E S  I N  S A M P L E *****

| Nuclide | Activity DPS | Time of Count Counting | Uncertainty 1 Sigma | MDA |
|---|---|---|---|---|

DUMMY  No in-range peaks
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

---------- S U M M A R Y ----------

Total Activity (  37.6 to  1999.5 keV)  0.000E+00  DPS

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 16_20170603006_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 4:56:55 PM
Detector: Detector #16
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 2.68 | 2.51 | 2.56 | 2.69 | 2.80 | 2.86 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det16\16_20170603006_BGLong.An1

Acquisition information

| | |
|---|---|
| Start time: | 6/3/2017 4:56:55 PM |
| Live time: | 43200 |
| Real time: | 43809 |
| Dead time: | 1.39 % |
| Detector ID: | 16 |

Detector system
Ge16 SN/11012217

Calibration

| | |
|---|---|
| Filename: | 16_QC.Clb |

16_QC-G_081311

Energy Calibration

| | |
|---|---|
| Created: | 2/28/2012 9:35:31 AM |
| Zero offset: | 0.050 keV |
| Gain: | 0.250 keV/channel |
| Quadratic: | -2.285E-08 keV/channel^2 |

Efficiency Calibration

| | |
|---|---|
| Created: | 8/14/2011 1:15:14 PM |
| Knee Energy: | 0.00 keV |
| Above the Knee: | Interpolative  Uncertainty =  0.00 % |
| Below the Knee: | Interpolative  Uncertainty =  0.00 % |

Library Files

| | |
|---|---|
| Main analysis library: | Null.lib |
| Library Match Width: | 0.500 |
| Peak stripping: | Library based |

Analysis parameters

| | |
|---|---|
| Analysis engine: | Env32  G800W064 |
| Start channel: | 150 (  37.57keV ) |
| Stop channel: | 8000 (  1999.64keV ) |
| Peak rejection level: | 30.000% |
| Peak search sensitivity: | 3 |
| Sample Size: | 1.0000E+00 +/- 0.000E+00% |
| Activity scaling factor: | 1.0000E+00/(  1.0000E+00*  1.0000E+00) = 1.0000E+00 |
| Detection limit method: | Reg. Guide 4.16 Method |
| Random error: | 4.0000000E+00 |
| Systematic error: | 4.0000000E+00 |
| Fraction Limit: | 0.000% |
| Background width: | 3 |

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.43 | 948. | 6.56 | 0.98 | 7.057E-02 | | | | |
| 59.58 | 242. | 15.89 | 0.97 | 8.956E-02 | | | | |
| 63.31 | 656. | 6.82 | 0.97 | 9.496E-02 | | | | |
| 74.93 | 268. | 15.52 | 0.99 | 1.118E-01 | | | | |
| 77.37 | 173. | 24.76 | 0.99 | 1.153E-01 | | | | |
| 84.60 | 216. | 22.60 | 0.82 | 1.258E-01 | | | | |
| 92.74 | 952. | 7.72 | 1.20 | 1.312E-01 | | | | |
| 185.72 | 429. | 12.74 | 1.17 | 1.130E-01 | | | | |
| 238.57 | 360. | 12.03 | 1.09 | 9.903E-02 | | | | |
| 295.36 | 133. | 23.84 | 1.29 | 8.402E-02 | | | | |
| 351.54 | 265. | 17.13 | 1.15 | 6.916E-02 | | | | |
| 609.39 | 262. | 18.20 | 1.28 | 4.174E-02 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide |
|---|---|---|---|---|---|---|---|
| 185.44 | 46.43 | 762. | 948. | 1.343E+04 | 6.56 | 0.980 | - |
| 238.01 | 59.55 | 616. | 242. | 2.697E+03 | 15.89 | 0.971 | - D |
| 252.92 | 63.28 | 672. | 656. | 6.904E+03 | 6.82 | 0.975 | - sD |
| 299.36 | 74.91 | 732. | 268. | 2.399E+03 | 15.52 | 0.986 | - sD |
| 309.14 | 77.36 | 831. | 173. | 1.500E+03 | 24.76 | 0.988 | - sD |
| 338.04 | 84.60 | 722. | 216. | 1.717E+03 | 22.60 | 0.816 | - s |
| 370.58 | 92.74 | 1113. | 952. | 7.255E+03 | 7.72 | 1.197 | - s |
| 742.34 | 185.72 | 699. | 429. | 3.799E+03 | 12.74 | 1.169 | - |
| 953.67 | 238.57 | 455. | 360. | 3.635E+03 | 12.03 | 1.089 | - |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected |
|---|---|---|---|---|---|---|---|
| 1180.73 | 295.36 | 308. | 133. | 1.583E+03 | 23.84 | 1.287 | - |
| 1405.40 | 351.54 | 413. | 265. | 3.827E+03 | 17.13 | 1.152 | - s |
| 2436.63 | 609.39 | 377. | 262. | 6.278E+03 | 18.20 | 1.282 | - |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

********** I D E N T I F I E D  P E A K  S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A  Derived peak area.

*****  S U M M A R Y  O F  L I B R A R Y  P E A K  U S A G E  *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | Peak MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction
} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay

(Page 4 of 5)

```
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
          Energy   Counts     Counts     Cts/Sec  1 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
        Time of Count   Uncertainty  1 Sigma
Nuclide    Activity        Counting                  MDA
              DPS
_____________________________________________________________________________
DUMMY    No in-range peaks
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
-----------------------------   S U M M A R Y   ----------------------------
Total Activity (   37.6 to  1999.6 keV)     0.000E+00  DPS
```

(Page 5 of 5)

Test America
St. Louis
Background Check

Spectrum: 17_20170603006_BGLong
Description: Background Long PBC Count
Acquired: 6/3/2017 4:56:04 PM
Detector: Detector #17
Background Evaluation Criteria:
1) Place instrument out of service if Countrate exceeds Control Limits.
2) Investigate high countrate and take corrective action as necessary if Countrate exceeds Tolerance Limits.

| | Target | L_Ctrl | L_Tol | Measured | H_Tol | H_Ctrl | Results |
|---|---|---|---|---|---|---|---|
| Bkgd Countrate | 2.32 | 2.18 | 2.23 | 2.32 | 2.42 | 2.46 | PASS |

Analyst: conrad.reuscher Reviewer:

(Page 1 of 5)

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det17\17_20170603006_BGLong.An1

Acquisition information
Start time: 6/3/2017 4:56:04 PM
Live time: 72000
Real time: 75220
Dead time: 4.28 %
Detector ID: 17

Detector system
Ge17 SN/11080671

Calibration
Filename: 17_QC.Clb
17_QC_83725-334_SOURCE H_042211

Energy Calibration
Created: 2/29/2012 10:33:23 AM
Zero offset: 0.108 keV
Gain: 0.250 keV/channel
Quadratic: -2.584E-08 keV/channel^2

Efficiency Calibration
Created: 5/1/2011 11:17:56 AM
Knee Energy: 0.00 keV
Above the Knee: Interpolative  Uncertainty =  0.00 %
Below the Knee: Interpolative  Uncertainty =  0.00 %

Library Files
Main analysis library: Null.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters
Analysis engine: Env32  G800W064
Start channel: 150 (  37.63keV )
Stop channel: 8000 (  1999.54keV )
Peak rejection level: 30.000%
Peak search sensitivity: 3
Sample Size: 1.0000E+00 +/- 0.000E+00%
Activity scaling factor: 1.0000E+00/(  1.0000E+00*  1.0000E+00) =
1.0000E+00
Detection limit method: Reg. Guide 4.16 Method
Random error: 4.0000000E+00
Systematic error: 4.0000000E+00
Fraction Limit: 0.000%
Background width: 3

(Page 2 of 5)

| | |
|---|---|
| Half lives decay limit: | 12.000 |
| Activity range factor: | 2.000 |
| Min. step backg. energy | 0.000 |
| Multiplet shift channel | 2.000 |

| Corrections | Status | Comments |
|---|---|---|
| Decay correct to date: | NO | |
| Decay during acquisition: | NO | |
| Decay during collection: | NO | |
| True coincidence correction: | NO | |
| Peaked background correction: | NO | |
| Absorption (Internal): | NO | |
| Geometry correction: | NO | |
| Random summing: | NO | |

***** S U M M A R Y O F P E A K S I N R A N G E *****

| Peak Energy | Area | Uncert | FWHM | Corrctn Factor | Nuclide Energy | Brnch. Ratio | Act. DPS | Nuc |
|---|---|---|---|---|---|---|---|---|
| 46.67 | 1261. | 5.69 | 0.74 | 5.957E-02 | | | | |
| 63.30 | 1134. | 6.71 | 0.73 | 8.038E-02 | | | | |
| 74.97 | 335. | 15.02 | 0.80 | 9.503E-02 | | | | |
| 77.23 | 224. | 21.13 | 0.80 | 9.786E-02 | | | | |
| 84.60 | 295. | 21.85 | 0.85 | 1.070E-01 | | | | |
| 92.64 | 1686. | 4.60 | 1.04 | 1.119E-01 | | | | |
| 143.75 | 210. | 28.02 | 0.76 | 1.093E-01 | | | | |
| 185.61 | 921. | 8.14 | 0.87 | 9.859E-02 | | | | |
| 198.26 | 218. | 26.62 | 0.84 | 9.571E-02 | | | | |
| 238.50 | 440. | 11.89 | 0.75 | 8.657E-02 | | | | |
| 295.01 | 192. | 27.58 | 1.04 | 7.373E-02 | | | | |
| 351.91 | 320. | 15.48 | 1.03 | 6.081E-02 | | | | |
| 511.08 | 2473. | 3.61 | 2.62 | 4.372E-02 | | | | |
| 583.10 | 200. | 18.20 | 1.13 | 3.887E-02 | | | | |
| 609.48 | 307. | 17.46 | 1.25 | 3.709E-02 | | | | |
| 1120.38 | 122. | 22.84 | 1.00 | 1.989E-02 | | | | |

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

| Peak Centroid Channel | Energy | Background Counts | Net Area Counts | Efficiency * Area | Uncert 1 Sigma % | FWHM keV | Suspected Nuclide | |
|---|---|---|---|---|---|---|---|---|
| 186.15 | 46.67 | 1061. | 1261. | 2.116E+04 | 5.69 | 0.738 | - | |
| 252.65 | 63.30 | 1330. | 1134. | 1.411E+04 | 6.71 | 0.731 | - | |
| 299.28 | 75.00 | 1099. | 335. | 3.527E+03 | 15.02 | 0.802 | - | sD |
| 308.33 | 77.27 | 1005. | 224. | 2.286E+03 | 21.13 | 0.804 | - | D |
| 337.80 | 84.60 | 1220. | 295. | 2.758E+03 | 21.85 | 0.847 | - | s |

| Channel | Energy | Background | Net area | Eff*Area | Uncert | FWHM | Suspected | |
|---|---|---|---|---|---|---|---|---|
| 369.95 | 92.64 | 1295. | 1686. | 1.507E+04 | 4.60 | 1.040 | - | s |
| 574.29 | 143.75 | 1027. | 210. | 1.921E+03 | 28.02 | 0.757 | - | |
| 741.68 | 185.61 | 1127. | 921. | 9.339E+03 | 8.14 | 0.870 | - | |
| 792.24 | 198.26 | 900. | 218. | 2.278E+03 | 26.62 | 0.843 | - | s |
| 953.16 | 238.50 | 691. | 440. | 5.086E+03 | 11.89 | 0.748 | - | |
| 1179.12 | 295.01 | 683. | 192. | 2.606E+03 | 27.58 | 1.039 | - | s |
| 1406.66 | 351.91 | 555. | 320. | 5.257E+03 | 15.48 | 1.034 | - | s |
| 2043.23 | 511.08 | 704. | 2473. | 5.657E+04 | 3.61 | 2.617 | - | s |
| 2331.27 | 583.10 | 295. | 200. | 5.154E+03 | 18.20 | 1.129 | - | |
| 2436.79 | 609.48 | 550. | 307. | 8.278E+03 | 17.46 | 1.250 | - | |
| 4480.72 | 1120.38 | 139. | 122. | 6.117E+03 | 22.84 | 1.001 | - | s |

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

---

This section based on library: Null.lib

********** I D E N T I F I E D P E A K S U M M A R Y **********

| Nuclide | Peak Channel | Centroid Energy | Background Counts | Net Area Counts | Intensity Cts/Sec | Uncert 1 Sigma % | FWHM keV |
|---|---|---|---|---|---|---|---|

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

| - Nuclide - Name | Code | Average Activity DPS | Peak Energy keV | Peak Activity DPS | Peak Code | Peak MDA Value DPS | COMMENTS |
|---|---|---|---|---|---|---|---|

( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

```
      library energy centroid for positive identification.
  P - Peakbackground subtraction
  } - Peak is too close to another for the activity
      to be found directly.

  Nuclide Codes:                      Peak Codes:
  T - Thermal Neutron Activation      G - Gamma Ray
  F - Fast Neutron Activation         X - X-Ray
  I - Fission Product                 P - Positron Decay
  N - Naturally Occurring Isotope     S - Single-Escape
  P - Photon Reaction                 D - Double-Escape
  C - Charged Particle Reaction       K - Key Line
  M - No MDA Calculation              A - Not in Average
  R - Coincidence Corrected           C - Coincidence Peak
  H - Halflife limit exceeded

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


*************** D I S C A R D E D  I S O T O P E  P E A K S ***************
Nuclide Centroid  Background  Net Area   Intensity   Uncert   Activity
          Energy   Counts     Counts     Cts/Sec  1 Sigma %
_____________________________________________________________________________
  P - Peakbackground subtraction

*****   S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E   *****
         Time of Count   Uncertainty  1 Sigma
Nuclide    Activity        Counting                  MDA
               DPS
_____________________________________________________________________________
DUMMY    No in-range peaks
  < - MDA value printed.
  A - Activity printed, but activity < MDA.
  B - Activity < MDA and failed test.
  C - Area < Critical level.
  F - Failed fraction or key line test.
  H - Halflife limit exceeded
----------------------------   S U M M A R Y   ----------------------------
Total Activity (   37.6 to  1999.5 keV)     0.000E+00  DPS
```

(Page 5 of 5)

# Run Logs

# Gamma Spectroscopy Run Log

## Detector: GV3

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/27/12 18:49 | | IC 160-11762/1 | | 11762 | | | JLW |
| 03/27/12 22:50 | | ICV 160-11762/2 | | 11762 | | | JLW |
| 12/09/16 08:29 | | ACVTOP 160-283293/1 | | 283293 | | | PS |
| 06/03/17 14:18 | | ICB 160-311828/1 | | 311828 | | | RTM |
| 06/07/17 00:08 | | CCB 160-312293/1 | | 312293 | | | CDR |
| 06/07/17 01:05 | | CCV 160-312293/2 | | 312293 | | | |
| 06/07/17 01:27 | | CCV 160-312293/3 | | 312293 | | | CDR |
| 06/07/17 06:40 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 07:36 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 08:23 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 09:03 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 09:55 | 30 | 160-22327-9 | SU03-S-087-SS-P-00 | 312293 | 309155 | 901.1 | CDR |
| 06/07/17 11:19 | | ZZZZZ | | 312293 | | | |
| 06/07/17 11:19 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 12:13 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 12:54 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 13:32 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 14:05 | | ZZZZZ | | 312293 | | | |
| 06/07/17 16:25 | | TCCLBA<br>160-312307/1-A | | 312293 | | | |
| 06/07/17 16:40 | | TCCLBC<br>160-312307/3-A | | 312293 | | | |
| 06/07/17 16:55 | | TCCLBB<br>160-312307/2-A | | 312293 | | | |
| 06/07/17 17:30 | 30 | ZZZZZ | | 312293 | | | |
| 06/07/17 20:00 | | ZZZZZ | | 312293 | | | |
| 06/07/17 20:31 | | ZZZZZ | | 312293 | | | |
| 06/07/17 20:57 | | ZZZZZ | | 312293 | | | |
| 06/07/17 21:26 | | ZZZZZ | | 312293 | | | |
| 06/07/17 21:42 | | ZZZZZ | | 312293 | | | |
| 06/07/17 21:56 | | ZZZZZ | | 312293 | | | |

## Detector: GV5

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/26/12 15:05 | | IC 160-12297/1 | | 12297 | | | JLW |
| 03/27/12 10:12 | | ICV 160-12297/2 | | 12297 | | | JLW |
| 12/07/16 01:00 | | CCB 160-282801/1 | | 282801 | | | |
| 12/07/16 01:42 | | CCV 160-282801/2 | | 282801 | | | |
| 12/07/16 02:04 | | CCV 160-282801/3 | | 282801 | | | |
| 12/07/16 07:35 | 30 | ZZZZZ | | 282801 | | | |
| 12/07/16 08:34 | 30 | ZZZZZ | | 282801 | | | |
| 12/07/16 09:33 | | ACVTOP 160-282801/6 | | 282801 | | | KLS |
| 12/07/16 09:33 | | ACVTOP 160-282835/1 | | 282835 | | | PS |
| 06/03/17 14:18 | | ICB 160-311830/1 | | 311830 | | | RTM |
| 06/07/17 00:08 | | CCV 160-312291/1 | | 312291 | | | |
| 06/07/17 00:30 | | CCV 160-312291/2 | | 312291 | | | CDR |
| 06/07/17 01:05 | | CCB 160-312291/3 | | 312291 | | | CDR |
| 06/07/17 06:40 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 07:30 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 08:27 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 09:08 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 09:57 | 30 | 160-22327-1 | SU01-EXB-026-SS-P-01 | 312291 | 309155 | 901.1 | CDR |

# Gamma Spectroscopy Run Log

## Detector: GV5 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 06/07/17 11:19 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 12:07 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 12:56 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 13:31 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 14:05 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 14:38 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 16:25 | | TCCLBB 160-312307/2-A | | 312291 | | | |
| 06/07/17 16:40 | | TCCLBA 160-312307/1-A | | 312291 | | | |
| 06/07/17 16:54 | | TCCLBC 160-312307/3-A | | 312291 | | | |
| 06/07/17 17:30 | 30 | ZZZZZ | | 312291 | | | |
| 06/07/17 19:57 | | ZZZZZ | | 312291 | | | |
| 06/07/17 20:32 | | ZZZZZ | | 312291 | | | |
| 06/07/17 20:56 | | ZZZZZ | | 312291 | | | |
| 06/07/17 21:23 | | ZZZZZ | | 312291 | | | |
| 06/07/17 21:41 | | ZZZZZ | | 312291 | | | |
| 06/07/17 21:56 | | ZZZZZ | | 312291 | | | |

## Detector: GV7

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/05/12 14:07 | | IC 160-12302/1 | | 12302 | | | JLW |
| 03/27/12 15:25 | | ICV 160-12302/2 | | 12302 | | | JLW |
| 12/06/16 16:15 | | ACVTOP 160-282836/1 | | 282836 | | | PS |
| 06/03/17 14:16 | | ICB 160-311831/1 | | 311831 | | | RTM |
| 06/07/17 00:09 | | CCV 160-312290/1 | | 312290 | | | |
| 06/07/17 00:32 | | CCV 160-312290/2 | | 312290 | | | CDR |
| 06/07/17 01:07 | | CCB 160-312290/3 | | 312290 | | | CDR |
| 06/07/17 06:38 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 07:32 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 08:23 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 09:07 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 09:56 | 30 | 160-22327-8 | SU01-EXB-086-SS-P-00 | 312290 | 309155 | 901.1 | CDR |
| 06/07/17 11:24 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 12:12 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 12:55 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 13:30 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 14:06 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 14:45 | 120 | ZZZZZ | | 312290 | | | |
| 06/07/17 16:52 | 30 | ZZZZZ | | 312290 | | | |
| 06/07/17 17:29 | 120 | ZZZZZ | | 312290 | | | |

## Detector: GV8

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/27/12 10:58 | | IC 160-12311/1 | | 12311 | | | JLW |
| 03/29/12 01:58 | | ICV 160-12311/2 | | 12311 | | | JLW |
| 12/06/16 10:28 | | ACVTOP 160-282755/1 | | 282755 | | | PS |
| 06/03/17 14:15 | | ICB 160-311829/1 | | 311829 | | | RTM |
| 06/07/17 00:11 | | CCV 160-312292/1 | | 312292 | | | |
| 06/07/17 00:34 | | CCV 160-312292/2 | | 312292 | | | CDR |

# Gamma Spectroscopy Run Log

## Detector: GV8 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 06/07/17 01:22 | | CCB 160-312292/3 | | 312292 | | | CDR |
| 06/07/17 06:37 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 07:33 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 08:22 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 09:06 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 09:55 | 30 | MB 160-309155/1-A | | 312292 | 309155 | 901.1 | CDR |
| 06/07/17 11:16 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 12:04 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 12:54 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 13:29 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 14:07 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 16:26 | | TCCLBC 160-312307/3-A | | 312292 | | | |
| 06/07/17 16:42 | | TCCLBB 160-312307/2-A | | 312292 | | | |
| 06/07/17 16:55 | | TCCLBA 160-312307/1-A | | 312292 | | | |
| 06/07/17 19:26 | 30 | ZZZZZ | | 312292 | | | |
| 06/07/17 19:59 | | ZZZZZ | | 312292 | | | |
| 06/07/17 20:31 | | ZZZZZ | | 312292 | | | |
| 06/07/17 20:57 | | ZZZZZ | | 312292 | | | |
| 06/07/17 21:25 | | ZZZZZ | | 312292 | | | |
| 06/07/17 21:43 | | ZZZZZ | | 312292 | | | |
| 06/07/17 21:57 | | ZZZZZ | | 312292 | | | |

## Detector: GV9

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 05/03/12 13:37 | | IC 160-12326/1 | | 12326 | | | JLW |
| 06/14/12 10:54 | | ICV 160-12326/2 | | 12326 | | | JLW |
| 12/05/16 11:08 | | ACVTOP 160-282744/1 | | 282744 | | | PS |
| 06/03/17 14:40 | | ICB 160-311834/1 | | 311834 | | | RTM |
| 06/07/17 00:07 | | CCV 160-312296/1 | | 312296 | | | |
| 06/07/17 00:30 | | CCV 160-312296/2 | | 312296 | | | CDR |
| 06/07/17 01:04 | | CCB 160-312296/3 | | 312296 | | | CDR |
| 06/07/17 06:39 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 07:23 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 08:22 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 09:00 | | ZZZZZ | | 312296 | | | |
| 06/07/17 09:17 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 09:54 | 30 | 160-22327-2 | SU01-EXB-023-SS-P-01 | 312296 | 309155 | 901.1 | CDR |
| 06/07/17 11:15 | 30 | 160-22327-10 | SU03-S-088-SS-P-00 | 312296 | 309155 | 901.1 | CDR |
| 06/07/17 12:17 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 12:56 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 13:31 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 16:49 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 17:34 | 30 | ZZZZZ | | 312296 | | | |
| 06/07/17 19:39 | 30 | ZZZZZ | | 312296 | | | |

## Detector: GV10

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/28/12 22:11 | | IC 160-12330/1 | | 12330 | | | JLW |

# Gamma Spectroscopy Run Log

## Detector: GV10 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/29/12 03:37 | | ICV 160-12330/2 | | 12330 | | | JLW |
| 12/05/16 14:53 | | ACVTOP 160-282745/1 | | 282745 | | | PS |
| 06/03/17 14:20 | | ICB 160-311832/1 | | 311832 | | | RTM |
| 06/07/17 00:09 | | CCV 160-312295/1 | | 312295 | | | |
| 06/07/17 00:32 | | CCV 160-312295/2 | | 312295 | | | CDR |
| 06/07/17 01:07 | | CCB 160-312295/3 | | 312295 | | | CDR |
| 06/07/17 06:41 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 07:24 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 08:24 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 09:03 | | ZZZZZ | | 312295 | | | |
| 06/07/17 09:24 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 10:00 | 30 | LCS 160-309155/2-A | | 312295 | 309155 | 901.1 | CDR |
| 06/07/17 11:20 | 30 | 160-22327-1 DU | SU01-EXB-026-SS-P-01 DU | 312295 | 309155 | 901.1 | CDR |
| 06/07/17 12:13 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 12:51 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 13:28 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 15:51 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 16:45 | 30 | ZZZZZ | | 312295 | | | |
| 06/07/17 17:27 | 120 | ZZZZZ | | 312295 | | | |

## Detector: GV13

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/27/12 15:23 | | IC 160-12348/1 | | 12348 | | | JLW |
| 03/27/12 18:51 | | ICV 160-12348/2 | | 12348 | | | JLW |
| 12/05/16 22:06 | | ACVTOP 160-282749/1 | | 282749 | | | PS |
| 06/03/17 15:31 | | ICB 160-311833/1 | | 311833 | | | RTM |
| 06/07/17 01:01 | | CCV 160-312294/1 | | 312294 | | | |
| 06/07/17 01:23 | | CCV 160-312294/2 | | 312294 | | | CDR |
| 06/07/17 01:43 | | CCB 160-312294/3 | | 312294 | | | CDR |
| 06/07/17 06:46 | 30 | ZZZZZ | | 312294 | | | |
| 06/07/17 07:28 | 30 | ZZZZZ | | 312294 | | | |
| 06/07/17 08:26 | 30 | ZZZZZ | | 312294 | | | |
| 06/07/17 09:14 | 30 | ZZZZZ | | 312294 | | | |
| 06/07/17 09:58 | 30 | 160-22327-3 | SU01-EXB-076-SS-P-01 | 312294 | 309155 | 901.1 | CDR |
| 06/07/17 11:23 | 30 | 160-22327-11 | SU03-S-089-SS-P-00 | 312294 | 309155 | 901.1 | CDR |
| 06/07/17 12:10 | 30 | ZZZZZ | | 312294 | | | |
| 06/07/17 12:49 | 30 | ZZZZZ | | 312294 | | | |
| 06/07/17 13:26 | 30 | ZZZZZ | | 312294 | | | |
| 06/07/17 16:43 | 30 | ZZZZZ | | 312294 | | | |
| 06/07/17 17:32 | 120 | ZZZZZ | | 312294 | | | |

## Detector: GV14

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 04/23/12 09:56 | | IC 160-12359/1 | | 12359 | | | JLW |
| 04/24/12 08:12 | | ICV 160-12359/2 | | 12359 | | | JLW |
| 12/06/16 19:00 | | ACVTOP 160-282843/1 | | 282843 | | | PS |
| 06/03/17 17:00 | | ICB 160-311835/1 | | 311835 | | | RTM |
| 06/07/17 00:07 | | CCB 160-312301/1 | | 312301 | | | CDR |
| 06/07/17 01:04 | | CCV 160-312301/2 | | 312301 | | | |
| 06/07/17 01:28 | | CCV 160-312301/3 | | 312301 | | | CDR |

# Gamma Spectroscopy Run Log

## Detector: GV14 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 06/07/17 06:36 | 30 | ZZZZZ | | 312301 | | | |
| 06/07/17 07:25 | 30 | ZZZZZ | | 312301 | | | |
| 06/07/17 08:24 | 30 | ZZZZZ | | 312301 | | | |
| 06/07/17 09:08 | 30 | ZZZZZ | | 312301 | | | |
| 06/07/17 09:53 | 30 | 160-22327-4 | SU02-EXB-051-SS-P-01 | 312301 | 309155 | 901.1 | CDR |
| 06/07/17 11:16 | 30 | ZZZZZ | | 312301 | | | |
| 06/07/17 12:14 | 30 | ZZZZZ | | 312301 | | | |
| 06/07/17 12:49 | 30 | ZZZZZ | | 312301 | | | |
| 06/07/17 13:28 | 30 | ZZZZZ | | 312301 | | | |
| 06/07/17 14:04 | 120 | ZZZZZ | | 312301 | | | |
| 06/07/17 16:18 | 120 | ZZZZZ | | 312301 | | | |
| 06/07/17 18:59 | 120 | ZZZZZ | | 312301 | | | |

## Detector: GV15

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/22/12 11:06 | | IC 160-12362/1 | | 12362 | | | JLW |
| 03/23/12 06:10 | | ICV 160-12362/2 | | 12362 | | | JLW |
| 12/02/16 13:12 | | ACVTOP 160-282704/1 | | 282704 | | | PS |
| 06/03/17 16:58 | | ICB 160-311836/1 | | 311836 | | | RTM |
| 06/07/17 00:08 | | CCB 160-312302/1 | | 312302 | | | CDR |
| 06/07/17 01:06 | | CCV 160-312302/2 | | 312302 | | | |
| 06/07/17 01:30 | | CCV 160-312302/3 | | 312302 | | | CDR |
| 06/07/17 06:39 | 30 | ZZZZZ | | 312302 | | | |
| 06/07/17 07:27 | 30 | ZZZZZ | | 312302 | | | |
| 06/07/17 08:25 | 30 | ZZZZZ | | 312302 | | | |
| 06/07/17 09:09 | 30 | ZZZZZ | | 312302 | | | |
| 06/07/17 09:54 | 30 | 160-22327-5 | SU01-EXB-083-SS-P-00 | 312302 | 309155 | 901.1 | CDR |
| 06/07/17 11:21 | 30 | ZZZZZ | | 312302 | | | |
| 06/07/17 12:14 | 30 | ZZZZZ | | 312302 | | | |
| 06/07/17 12:51 | 30 | ZZZZZ | | 312302 | | | |
| 06/07/17 13:25 | 30 | ZZZZZ | | 312302 | | | |
| 06/07/17 14:02 | 120 | ZZZZZ | | 312302 | | | |
| 06/07/17 16:14 | 120 | ZZZZZ | | 312302 | | | |
| 06/07/17 19:00 | 120 | ZZZZZ | | 312302 | | | |

## Detector: GV16

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 07/10/12 10:35 | | IC 160-12382/1 | | 12382 | | | JLW |
| 07/17/12 11:27 | | ICV 160-12382/2 | | 12382 | | | JLW |
| 12/06/16 03:13 | | ACVTOP 160-282705/1 | | 282705 | | | PS |
| 06/03/17 16:56 | | ICB 160-311837/1 | | 311837 | | | RTM |
| 06/07/17 00:10 | | CCB 160-312299/1 | | 312299 | | | CDR |
| 06/07/17 01:06 | | CCV 160-312299/2 | | 312299 | | | |
| 06/07/17 01:32 | | CCV 160-312299/3 | | 312299 | | | CDR |
| 06/07/17 06:41 | 30 | ZZZZZ | | 312299 | | | |
| 06/07/17 07:29 | 30 | ZZZZZ | | 312299 | | | |
| 06/07/17 08:26 | 30 | ZZZZZ | | 312299 | | | |
| 06/07/17 09:13 | 30 | ZZZZZ | | 312299 | | | |
| 06/07/17 09:59 | 30 | 160-22327-6 | SU01-EXB-084-SS-P-00 | 312299 | 309155 | 901.1 | CDR |
| 06/07/17 11:24 | 30 | ZZZZZ | | 312299 | | | |
| 06/07/17 12:19 | 30 | ZZZZZ | | 312299 | | | |

# Gamma Spectroscopy Run Log

## Detector: GV16 (Continued)

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 06/07/17 12:52 | 30 | ZZZZZ | | 312299 | | | |
| 06/07/17 13:24 | 30 | ZZZZZ | | 312299 | | | |
| 06/07/17 14:01 | 30 | ZZZZZ | | 312299 | | | |
| 06/07/17 14:41 | 120 | ZZZZZ | | 312299 | | | |
| 06/07/17 16:52 | 120 | ZZZZZ | | 312299 | | | |
| 06/07/17 21:21 | 120 | ZZZZZ | | 312299 | | | |

## Detector: GV17

| Analysis Date | Count Minutes | Lab Sample ID | Client Sample ID | Analysis Batch | Prep Batch | Method | Analyst Initials |
|---|---|---|---|---|---|---|---|
| 03/26/12 06:29 | | IC 160-12390/1 | | 12390 | | | JLW |
| 03/26/12 09:29 | | ICV 160-12390/2 | | 12390 | | | JLW |
| 11/30/16 17:05 | | ACVTOP 160-282698/1 | | 282698 | | | PS |
| 06/03/17 16:56 | | ICB 160-311943/1 | | 311943 | | | RTM |
| 06/07/17 00:12 | | CCB 160-312300/1 | | 312300 | | | CDR |
| 06/07/17 01:22 | | CCV 160-312300/2 | | 312300 | | | |
| 06/07/17 01:47 | | CCV 160-312300/3 | | 312300 | | | CDR |
| 06/07/17 06:47 | 30 | ZZZZZ | | 312300 | | | |
| 06/07/17 07:34 | 30 | ZZZZZ | | 312300 | | | |
| 06/07/17 08:28 | 30 | ZZZZZ | | 312300 | | | |
| 06/07/17 09:15 | 30 | ZZZZZ | | 312300 | | | |
| 06/07/17 10:01 | 30 | 160-22327-7 | SU01-EXB-085-SS-P-00 | 312300 | 309155 | 901.1 | CDR |
| 06/07/17 11:26 | 30 | ZZZZZ | | 312300 | | | |
| 06/07/17 12:22 | 30 | ZZZZZ | | 312300 | | | |
| 06/07/17 13:22 | 30 | ZZZZZ | | 312300 | | | |
| 06/07/17 14:00 | 30 | ZZZZZ | | 312300 | | | |
| 06/07/17 14:44 | 120 | ZZZZZ | | 312300 | | | |
| 06/07/17 16:49 | 120 | ZZZZZ | | 312300 | | | |

# Radiological
## Pre-Preparation Data

# Shipping and Receiving Documents

**TestAmerica St. Louis**
13715 Rider Trail North
Earth City, MO 63045
phone 314.298.8566 fax 314.298.8757

160-22327 Chain of Custody

# Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

**TestAmerica Laboratories, Inc.**

**Regulatory Program:** ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

| Client Contact | Project Manager: Greg Bright | Site Contact: Bachir Badaoui | Date: 7/29/2016 | COC No: 001 |
|---|---|---|---|---|
| Cabrera Services, Inc | Tel/Fax: 508-315-6246 | Lab Contact: Jessica DeHerrera | Carrier: | 1 of 1 COCs |
| 50 Founder Plaza Suite 207 | Analysis Turnaround Time | | | Sampler: |
| East Hartford, CT 06108 | ☐ CALENDAR DAYS ☑ WORKING DAYS | | | For Lab Use Only: |
| 508-315-6246 | TAT if different from Below 20 | | | Walk-in Client: |
| 781-264-4445 (Gbright cell) | ☐ 2 weeks | | | Lab Sampling: |
| Project Name: WR 111 - Little Mountain Test Annex | ☐ 1 week | | | |
| Site: Hill Air Force Base, Utah | ☐ 2 days | | | Job / SDG No.: |
| PO #:11460 | ☐ 1 day | | | |

| Sample Identification | Sample Date | Sample Time | Sample Type (C=Comp, G=Grab) | Matrix | # of Cont. | Filtered Sample (Y / N) | Perform MS / MSD (Y / N) | Radium 226- by Gamma spec | Isotopic Thorium (Th-230, Th-232) | Sample Specific Notes: |
|---|---|---|---|---|---|---|---|---|---|---|
| SU01-EXB-026-SS-P-01 | 5/10/2017 | 14:30 | G | S | 1 | | | X | X | |
| SU01-EXB-023-SS-P-01 | 5/10/2017 | 14:35 | G | S | 1 | | | X | X | |
| SU01-EXB-076-SS-P-01 | 5/10/2017 | 14:40 | G | S | 1 | | | X | X | |
| SU02-EXB-051-SS-P-01 | 5/10/2017 | 14:35 | G | S | 1 | | | X | X | |
| SU01-EXB-083-SS-P-00 | 5/11/2017 | 12:15 | G | S | 1 | | | X | X | |
| SU01-EXB-084-SS-P-00 | 5/11/2017 | 12:20 | G | S | 1 | | | X | X | |
| SU01-EXB-085-SS-P-00 | 5/11/2017 | 13:05 | G | S | 1 | | | X | X | |
| SU01-EXB-086-SS-P-00 | 5/11/2017 | 13:10 | G | S | 1 | | | X | X | |
| SU03-S-087-SS-P-00 | 5/11/2017 | 13:15 | G | S | 1 | | | X | X | |
| SU03-S-088-SS-P-00 | 5/11/2017 | 13:20 | G | S | 1 | | | X | X | |
| SU03-S-089-SS-P-00 | 5/11/2017 | 13:25 | G | S | 1 | | | X | X | |

**Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other** _____

**Possible Hazard Identification:**
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

**Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)**

☐ Return to Client ☐ Disposal by Lab ☑ Archive for_____ Months

**Special Instructions/QC Requirements & Comments:** Gamma spec analysis for Ra-226 which includes 21 day ingrowth. Alpha Spec/ST-RD-0210 (Th-230 and Th-232). Gamma Spec/ST-RD-0102 for (Ra-226)

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

| Relinquished by: | Company: | Date/Time: | Received by: | Company: | Date/Time: |
|---|---|---|---|---|---|
| Greg Bright | Cabrera Services | 5/11/17 1737 | Keisha Taylor | TASL | 5-15-17 0930 |
| Relinquished by: | Company: | Date/Time: | Received by: | Company: | Date/Time: |
| Relinquished by: | Company: | Date/Time: | Received in Laboratory by: | Company: | Date/Time: |

Form No. CA-C-WI-002, Rev. 4.2, dated 04/02/2013

# Login Sample Receipt Checklist

Client: EA Engineering, Science, and Technology

Job Number: 160-22327-1

**Login Number: 22327**
**List Number: 1**
**Creator: Taylor, Kristene N**

**List Source: TestAmerica St. Louis**

| Question | Answer | Comment |
|---|---|---|
| Radioactivity wasn't checked or is </= background as measured by a survey meter. | True | |
| The cooler's custody seal, if present, is intact. | True | |
| Sample custody seals, if present, are intact. | N/A | |
| The cooler or samples do not appear to have been compromised or tampered with. | True | |
| Samples were received on ice. | N/A | |
| Cooler Temperature is acceptable. | True | |
| Cooler Temperature is recorded. | True | |
| COC is present. | True | |
| COC is filled out in ink and legible. | True | |
| COC is filled out with all pertinent information. | True | |
| Is the Field Sampler's name present on COC? | False | |
| There are no discrepancies between the containers received and the COC. | True | |
| Samples are received within Holding Time (excluding tests with immediate HTs) | True | |
| Sample containers have legible labels. | True | |
| Containers are not broken or leaking. | True | |
| Sample collection date/times are provided. | True | |
| Appropriate sample containers are used. | True | |
| Sample bottles are completely filled. | True | |
| Sample Preservation Verified. | True | |
| There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs | True | |
| Containers requiring zero headspace have no headspace or bubble is <6mm (1/4"). | N/A | |
| Multiphasic samples are not present. | True | |
| Samples do not require splitting or compositing. | True | |
| Residual Chlorine Checked. | N/A | |