Counting Statistics for Portable and Laboratory Instruments

Minimum Detectable Activity (MDA)

MDA is the minimum detectable (*quantifiable*) activity in dpm at a specified confidence level. Additional conversion factors (C) may be applied to convert dpm to any other activity units that may be desired (e.g., µCi, kBq, etc.). MDA depends on the counting device, counting times (controllable by procedure) and background counting rate. It is not specific to an individual sample. The MDA of a detection system can be prospectively established in the sample collection and counting procedure by specifying sample and background counting times, and by specifying some maximum acceptable background counting rate. Detector efficiency is established during calibration.

$$MDA = \frac{k_1^2 + 2k_1\sqrt{R_b t_s\left(1+\frac{t_s}{t_b}\right)}}{(t_s)(E)(C)}$$

Where:
R_b = background count rate in cpm
t_s = sample count time in minutes
t_b = background count time in minutes
E = detector efficiency in counts per disintegration
A = area wiped
C = conversion factor from dpm to other desired activity unit, if applicable
k_1 = the one-sided confidence factor = 1.645 at 95% confidence

In nuclear counting programs, MDA is usually calculated at the 95% confidence level (k_1 = 1.645).

MARSSIM sets the first term of the numerator equal to 3 instead of 2.71.

$$MDA_{95\%} = \frac{3 + 3.29\sqrt{R_b t_s\left(1+\frac{t_s}{t_b}\right)}}{(t_s)(E)(C)}$$

Where:
R_b = background count rate in cpm
t_s = sample count time in minutes
t_b = background count time in minutes
E = detector efficiency in counts per disintegration
C = conversion factor from dpm to other desired activity unit, if applicable. For these calculations, C = 1.

LLD for Wipe Samples—Liquid Scintillation Analysis

When assaying samples, including wipe samples, the more correct term to use is lower limit of detection (LLD) because sample parameters (e.g., area wiped in this case), in addition to detector and procedural variables, are now part of the equation. For wipe samples, the equation is modified as follows:

$$LLD_{95\%} = \frac{3 + 2k_1\sqrt{R_b t_s\left(1+\frac{t_s}{t_b}\right)}}{(t_s)(E)\left(\frac{A}{100}\right)(C)}$$

This extra term in the denominator accounts for the actual area wiped. A sample area of 100 cm^2 (~4"× 4" or 10 cm×10 cm) was used for these samples.

k_1 = 1.645 at CL=95%

R_b = 50 cpm

t_s = 1 minutes

t_b = 1 minutes

E = 75% (worst case)

A_{Wiped} = 100 cm^2

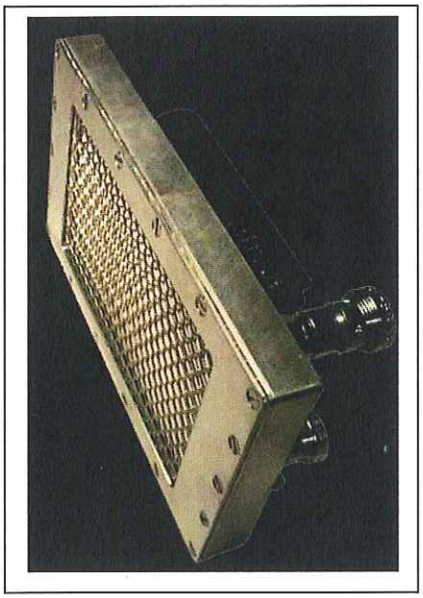
C = 1 (i.e., no unit conversion factor used)

$$\frac{3+3.29\sqrt{50*1\left(1+\frac{1}{1}\right)}}{(1)(0.75)\left(\frac{100}{100}\right)(1)} = \frac{35.9}{0.75} = 47.9\,\text{dpm}/100\,\text{cm}^2$$

An LLD of 47.9 dpm/100cm^2 shows that the DCGL concentration of total contamination can easily be seen with 95% certainty.

LLD for Direct Static Surface Measurements (Ludlum Model 43-68 + Model 2224-1)

Performing direct contamination measurements is the same as counting wipe samples, except the sample is the floor or component being measured. Detector area (A) now comes into play, instead of the area wiped. The area of the Ludlum Model 43-68 is 126 cm^2. The LLD will be in terms of dpm/100 cm^2.



$$LLD = \frac{k_1^2 + 2\ k_1 \sqrt{R_b\ t_s \left(1 + \frac{t_s}{t_b}\right)}}{(t_s)\ (E) \left(\frac{A}{100}\right) (C)}$$

Given:
k_1 = 1.645 at CL=95%

R_b = 546 cpm

t_s = 2 minutes

t_b = 5 minutes

E = 7.2%

A_{Active} = 126 cm^2

C = 1 (i.e., no unit conversion factor used)

At 95% confidence this becomes

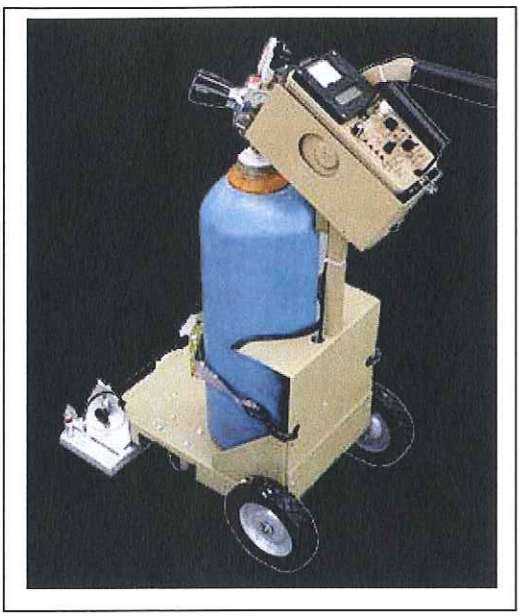
$$LLD_{95\%} = \frac{3 + 3.29\sqrt{546 * 2\left(1 + \frac{2}{5}\right)}}{(2)(0.072)\left(\frac{126}{100}\right)(1)} = \frac{131.64}{0.18} = 726\,\text{dpm}/100\,\text{cm}^2$$

An LLD of 726dpm/100cm^2 shows that we can detect concentrations of total contamination that are far less than even the DCGL for removable contamination, with 95% certainty.

LLD for Direct Static Surface Measurements (Ludlum Model 43-37 + Model 2224-1)

Performing direct contamination measurements is the same as counting wipe samples, except the sample is the floor or component being measured. Detector area (A) now comes into play, instead of the area wiped. The area of the Ludlum Model 43-37 is 584 cm^2. The LLD will be in terms of dpm/100 cm^2.

$$LLD = \frac{k_1^2 + 2\ k_1 \sqrt{R_b\ t_s \left(1 + \frac{t_s}{t_b}\right)}}{(t_s)\ (E) \left(\frac{A}{100}\right) (C)}$$



Given:
k_1 = 1.645 at CL=95%

R_b = 521 cpm

t_s = 2 minutes

t_b = 5 minutes

E = 4.7%

A_{active} = 584 cm^2

C = 1 (i.e., no unit conversion factor used)

At 95% confidence this becomes

$$LLD_{95\%} = \frac{3 + 3.29\sqrt{490 \times 2\left(1 + \frac{2}{5}\right)}}{(2)(0.047)\left(\frac{584}{100}\right)(1)} = \frac{124.9}{0.55} = 227\ \text{dpm}/100\,\text{cm}^2$$

An LLD of 227 dpm/100 cm^2 shows that concentrations of total contamination can be detected that are far less than even the DCGL for removable contamination with 95% certainty.

SCANNING MDA FOR COUNT-RATE METERS[1]

At the 95% confidence level, the equation for MDA using a count rate meter is

$$MDA_{95\%} = \frac{4.65\sqrt{\frac{R_b}{2\tau}}}{(E)\left(\frac{A}{100}\right)}$$

where:

MDA = dpm/100 cm^2
R_b = background count rate (cpm)
τ = detector time constant (min)*
(from mfr's tech manual; = 4 sec fast, 22 sec slow)
NOTE: time constant ≠ response time.
E = detector efficiency in counts per disintegration
A = active detector area in cm^2

The detection sensitivity of scanning is dependent on a number of other factors, such as detector scan rate, size of contaminated area, amount of activity present and surface-to-detector distance. A rough estimate of the MDA for a scan survey can be calculated by substituting the audibly discernable increase in count rate for the numerator in the above equation. Therefore,

$$MDA = \frac{D_i \times R_b}{E \times \frac{A}{100}}$$

where:

D_i = Audibly discernable increase in instrument counting rate (multiples of R_b)
E.g., 2 = able to discern 2× background from R_b; 3 = able to discern 3× background from R_b.
R_b = Background counting rate (cpm)
E = Instrument counting efficiency (counts per disintegration)
A = Active detector area in cm^2

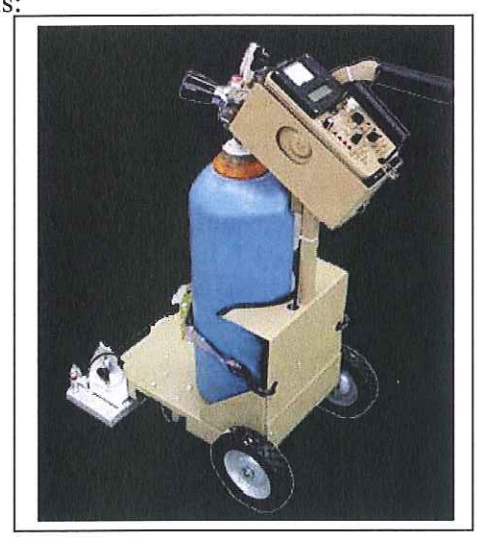
An experienced surveyor may be able to discern an increase of 25% to 50% at background counting rates of several hundred cpm or more. At low background counting rates an increase of two or three times background might be required before an identifiable audible difference can be discerned. The health physicists who performed the scanning surveys at Chemtura are able to discern (conservatively) **twice** background at a minimum.

Standard practice for Radiation Safety Associates, Inc. personnel is to scan at a rate no faster than 1 detector width per second, and maintain a surface-to detector distance of 1 cm.

[1] From Oak Ridge Associated Universities text book (http://www.orau.org/ptp/5849/5849-5.pdf) "Scanning."

Scan Survey Sensitivity—Ludlum 43-37 Floor Monitor

The health physicists who performed the scanning surveys at Chemtura are able to discern (conservatively) **twice** background at a minimum. Therefore the scanning MDA at the 95% confidence level for the Ludlum 43-37 floor monitor is:



$$MDA = \frac{2 \times R_b}{E \times \frac{A}{100}}$$

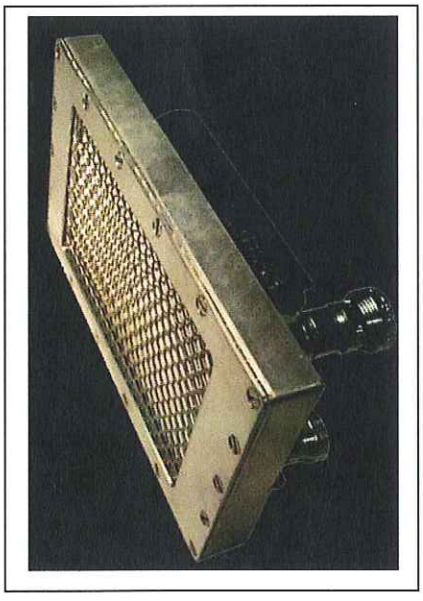
Where:

Rb = 490 cpm
E = 4.7%
A = 584 cm^2

$$MDA = \frac{2 \times 490\,cpm}{0.047 \times \frac{584}{100}} = \frac{980}{0.27} = 3{,}630\,dpm/100\,cm^2$$

Scan Survey Sensitivity—Ludlum 43-68 Hand-Held Detector

The health physicists who performed the scanning surveys at Chemtura are able to discern (conservatively) **twice** background at a minimum. Therefore the scanning MDA at the 95% confidence level for the Ludlum 43-68 hand-held monitor is:



$$MDA = \frac{2 \times R_b}{E \times \frac{A}{100}}$$

Where:

Rb = 546 cpm
E = 7.2%
A = 126 cm^2

$$MDA = \frac{2 \times 546\,cpm}{0.072 \times \frac{126}{100}} = \frac{1092}{0.091} = 12{,}000\,dpm/100\,cm^2$$

Calibration Certificates Attachment AA

CERTIFICATE OF CALIBRATION
(COUNT-RATE INSTRUMENT)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Radiation Safety Associates, Inc. Attn: K. Paul Steinmeyer (860) 228-0487**
Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**
Inst. Mfr. & Model **Ludlum Model 2224-1** Inst. Type **Scaler/Ratemeter** Inst. s/n **129459**
Det. Mfr. & Model **Ludlum Model 43-68** Det. Type **Gas Proportional** Det. s/n **111315**
Cal. Date **29 December 2010** Due Date **29 December 2011** Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **34%** Atmospheric Pressure **29.65** inches Hg

Pre-calibration Checks:
- ☒ Contamination survey
- ☒ Mechanical check
- ☒ Meter zero
- ☒ Geotropism check
- ☒ Battery check
- ☒ Audio check
- ☒ Reset check
- ☐ Fast response check
- ☐ Slow response check
- ☐ Window operation
- ☒ Plateau check
- ☐ Alarm set
- ☒ Det. volts 1550 Vdc
- ☒ Input sens. *See comments

☒ Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☒ Voltmeter s/n 57410002
☒ HV Readout (2 points) Ref./Inst. 900 V/ 900 V Ref./Inst. 1700 V/ 1700 V

Comments: * **Alpha threshold = 140 mV; Beta threshold = 3.6 mV; Beta window = 3.6 mV to 30 mV. Local background ≈ 2 cpm alpha, 614 cpm beta.**

S/N of source used for precision check #6 Isotope **Cs-137** Dedicated Source? ☐Yes ☒No
Reading #1 **23,000** cpm Reading #2 **23,000** cpm Reading #3 **23,000** cpm Mean **23,000** cpm
Precision: ☒± <10% ☐±10-20% ☐Out of tolerance

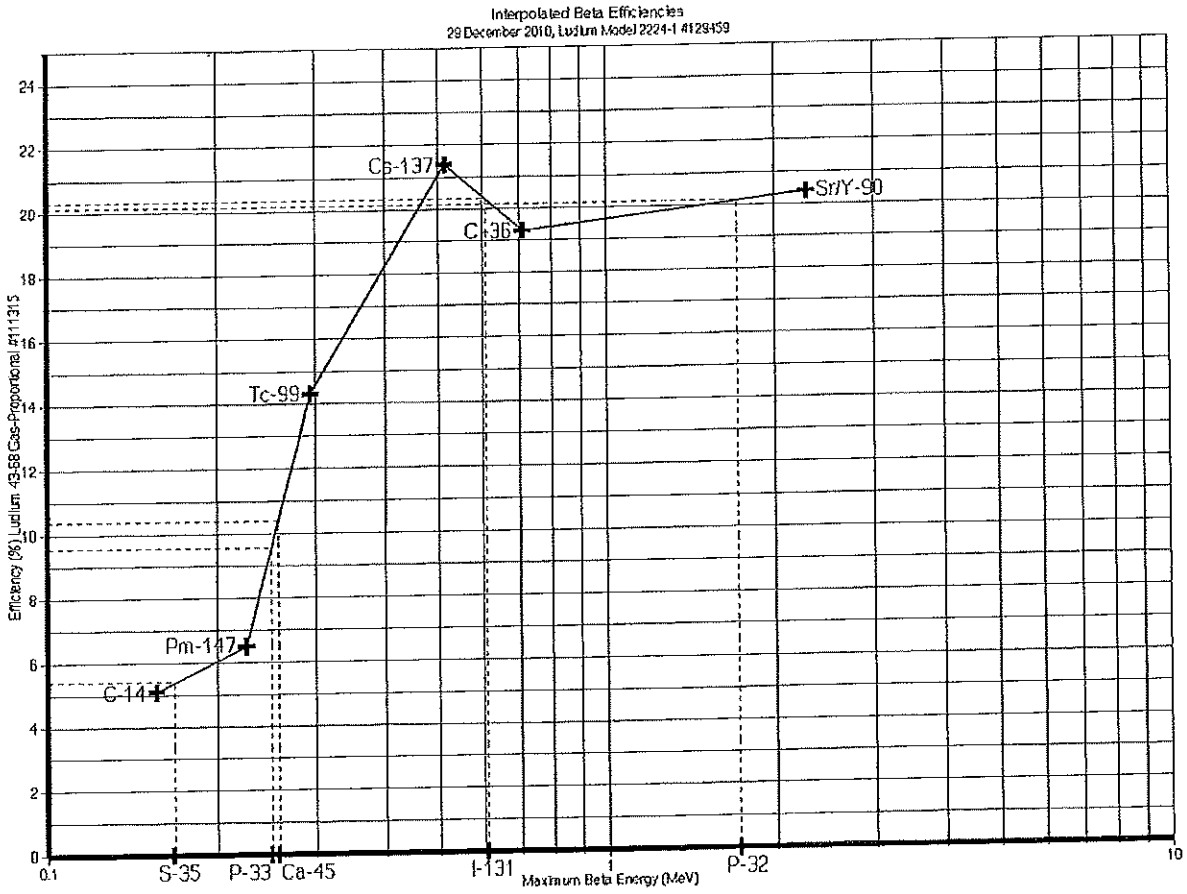
Range Multiplier	Reference Calibration Point	Instrument Indication
x 1000	400,000 cpm	400,000 cpm
x 1000	100,000 cpm	100,000 cpm
x 100	40,000 cpm	40,000 cpm
x 100	10,000 cpm	10,000 cpm
x 10	4000 cpm	4000 cpm
x 10	1000 cpm	1000 cpm
x 1	400 cpm	400 cpm
x 1	100 cpm	100 cpm
1 min count	100,000 cpm	100,001 cpm

All ranges calibrated electronically.

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	4π Instrument Efficiency (%)
1 min. count	C-14 #4456	202,100	1 (α) 10,838 (ß)	0.0% 5.1%
1 min. count	Pm-147 #5381	1,653	1 (α) 721 (ß)	0.0% 6.5%
1 min. count	Tc-99 #D702	23,064	3 (α) 3,917 (ß)	0.0% 14.3%
1 min. count	Cs-137 #2886	15,425	3 (α) 3,921 (ß)	0.0% 21.4%
1 min. count	Cl-36 #D700	23,598	1 (α) 5,162 (ß)	0.0% 19.3%
1 min. count	Sr/Y-90 #D711	38,312	2 (α) 8,431 (ß)	0.0% 20.4%
1 min. count	Th-230 #91TH2200210	38,980	310 (α) 1,593 (ß)	0.8% 2.5%

RSA Laboratories ID# **13901.** Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: **Kurt D. Newton** Date: **29 December 2010**



RSA Laboratories ID# 13901.

Calibrated by: Kurt D. Newton Date: 29 December 2010

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Customer and Contact: **Radiation Safety Associates, Inc. Attn: K. Paul Steinmeyer (860) 228-0487**
Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Ludlum Model 2224-1**	Inst. Type **Scaler/Ratemeter**	Inst. s/n **129459**
Det. Mfr. & Model **Ludlum Model 43-68**	Det. Type **Gas Proportional**	Det. s/n **111315**
Cal. Date **29 December 2010**	Due Date **29 December 2011**	Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **34%** Atmospheric Pressure **29.65** inches Hg

Pre-calibration Checks:

☒ Contamination survey	☒ Battery check	☐ Slow response check	
☒ Mechanical check	☒ Audio check	☐ Window operation	☒ Det. volts 1550 Vdc
☒ Meter zero	☒ Reset check	☒ Plateau check	
☒ Geotropism check	☐ Fast response check	☐ Alarm set	☒ Input sens. *See comments

☒ Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☒ Voltmeter s/n 57410002
☒ HV Readout (2 points) Ref./Inst. 900 V/ 900 V Ref./Inst. 1700 V/ 1700 V

Comments: * Alpha threshold = 140 mV; Beta threshold = 3.6 mV; Beta window = 3.6 mV to 30 mV.
Local background ≈ 2 cpm alpha, 614 cpm beta. All efficiences measured on contact.

S/N of source used for precision check #6 Isotope Cs-137 Dedicated Source? ☐Yes ☒No
Reading #1 **28,000** cpm Reading #2 **28,000** cpm Reading #3 **28,000** cpm Mean **28,000** cpm
Precision: ☒± <10% ☐± 10-20% ☐Out of tolerance

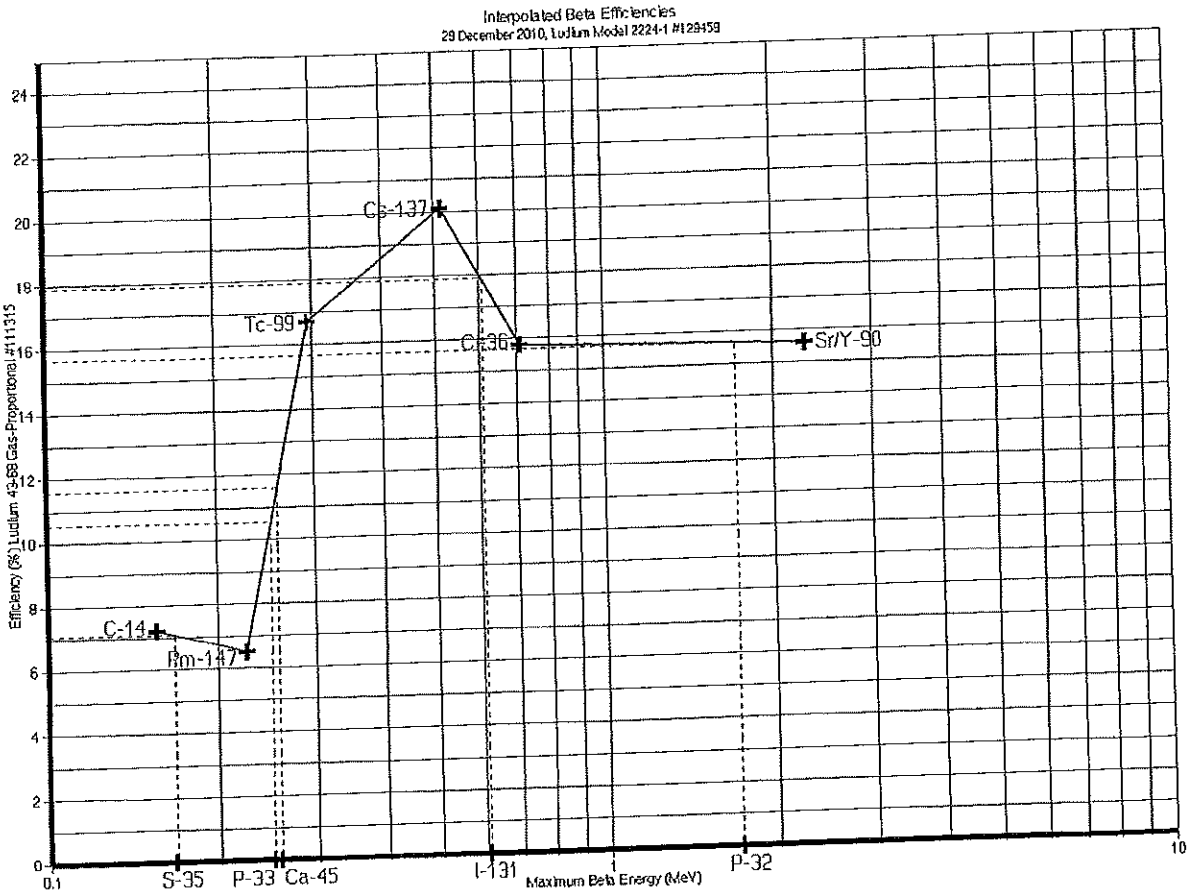
Range Multiplier	Reference Calibration Point	Instrument Indication
x 1000	400,000 cpm	400,000 cpm
x 1000	100,000 cpm	100,000 cpm
x 100	40,000 cpm	40,000 cpm
x 100	10,000 cpm	10,000 cpm
x 10	4000 cpm	4000 cpm
x 10	1000 cpm	1000 cpm
x 1	400 cpm	400 cpm
x 1	100 cpm	100 cpm
1 min count	100,000 cpm	100,001 cpm

All ranges calibrated electronically.

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	4π Instrument Efficiency (%)
1 min. count	C-14 #4456	202,100	0 (α) 15,158 (β)	0.0% 7.2%
1 min. count	Pm-147 #5381	1,653	1 (α) 720 (β)	0.0% 6.5%
1 min. count	Tc-99 #D702	23,064	0 (α) 4,467 (β)	0.0% 16.7%
1 min. count	Cs-137 #2886	15,425	0 (α) 3,714 (β)	0.0% 20.1%
1 min. count	Cl-36 #D700	23,598	2 (α) 4,342 (β)	0.0% 15.8%
1 min. count	Sr/Y-90 #D711	38,312	0 (α) 6,603 (β)	0.0% 15.6%
1 min. count	Th-230 #91TH2200210	38,900	3,895 (α) 2,186 (β)	8.4% 4.0%

RSA Laboratories ID# 13901. Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: Kurt D. Newton Date: 29 December 2010



RSA Laboratories ID# 13901.

Calibrated by: Kurt D. Newton Date: 29 December 2010

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Customer and Contact: **Radiation Safety Associates, Inc. Attn: K. Paul Steinmeyer (860) 228-0487**
Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Ludlum Model 2224**	Inst. Type **Scaler/Ratemeter**	Inst. s/n **119815**
Det. Mfr. & Model **Ludlum 43-37**	Det. Type **Gas-Proportional**	Det. s/n **160827**
Cal. Date **30 December 2010**	Due Date **30 December 2011**	Cal. Interval **1 year**

Environmental conditions: Temperature: **70°F** Relative Humidity **36%** Atmospheric Pressure **29.85** inches Hg

Pre-calibration Checks:

☒ Contamination survey	☒ Battery check	☐ Slow response check	
☒ Mechanical check	☒ Audio check	☐ Window operation	☒ Det. volts 1580 Vdc
☒ Meter zero	☒ Reset check	☒ Plateau check	
☒ Geotropism check	☐ Fast response check	☐ Alarm set	☒ Input sens. *See comments

☒ Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☒ Voltmeter s/n 57410002
☒ HV Readout (2 points) Ref./Inst. 900 V/ 900 V Ref./Inst. 1700 V/ 1700 V

Comments: * Alpha threshold = 140 mV; Beta threshold = 3.6 mV; Beta window = 3.6 mV to 30 mV.
Local background ≈ 1 cpm alpha, 617 cpm beta. Th-230 efficiency measured on contact.

S/N of source used for precision check #6 Isotope Cs-137 Dedicated Source? ☐Yes ☒No
Reading #1 20,000 cpm Reading #2 20,000 cpm Reading #3 20,000 cpm Mean 20,000 cpm
Precision: ☒± < 10% ☐± 10-20% ☐Out of tolerance

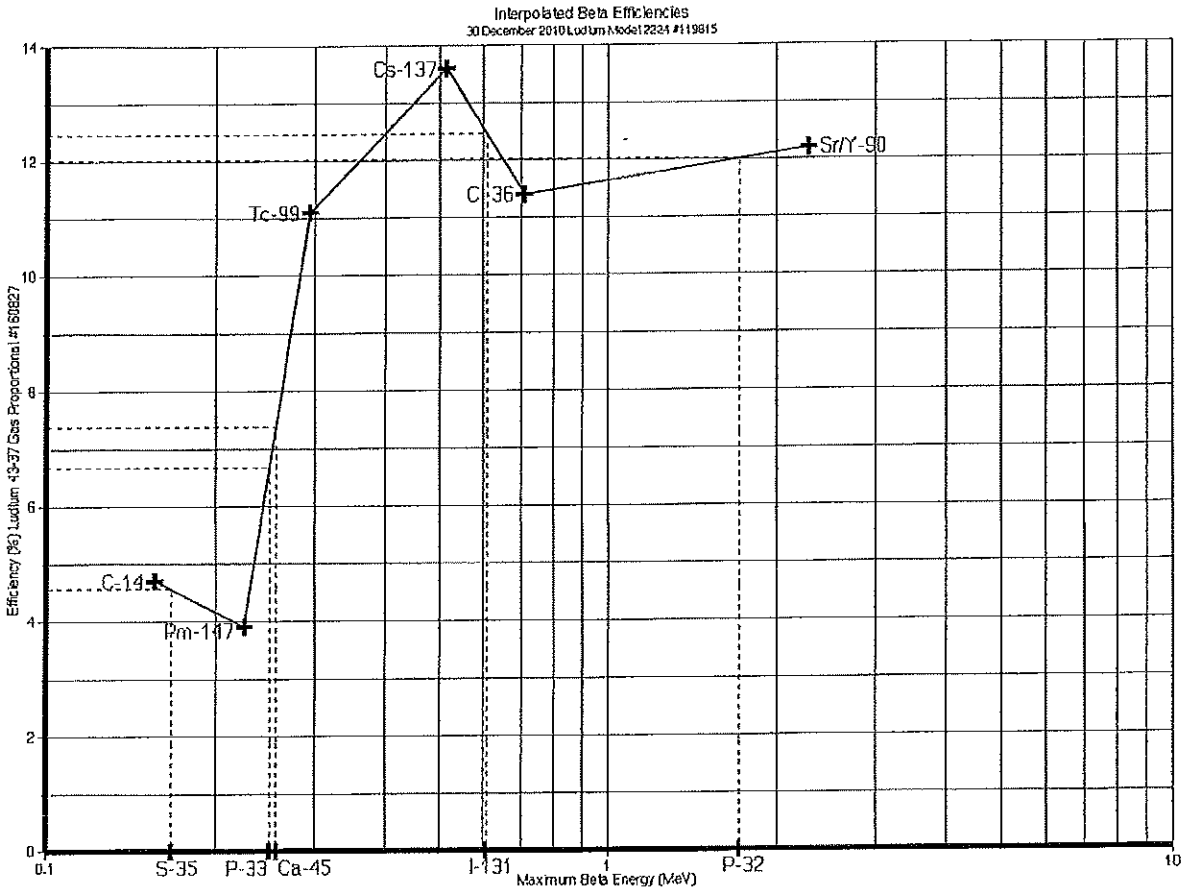
Range Multiplier	Reference Calibration Point	Instrument Indication
x 1000	400,000 cpm	400,000 cpm
x 1000	100,000 cpm	100,000 cpm
x 100	40,000 cpm	40,000 cpm
x 100	10,000 cpm	10,000 cpm
x 10	4000 cpm	4000 cpm
x 10	1000 cpm	1000 cpm
x 1	400 cpm	400 cpm
x 1	100 cpm	100 cpm
1 min. count	99,999 cpm	99,999 cpm

All ranges calibrated electronically.

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	4π Instrument Efficiency (%)
1 min. count	C-14 #4456	202,100	0 (α) 10,135 (β)	0.0% 4.7%
1 min. count	Pm-147 #5381	1,653	0 (α) 682 (β)	0.0% 3.9%
1 min. count	Tc-99 #D702	23,064	2 (α) 3,179 (β)	0.0% 11.1%
1 min. count	Cs-137 #2886	15,425	2 (α) 2,708 (β)	0.0% 13.6%
1 min. count	Cl-36 #D700	23,598	3 (α) 3,311 (β)	0.0% 11.4%
1 min. count	Sr/Y-90 #D711	38,312	1 (α) 5,301 (β)	0.0% 12.2%
1 min. count	Th-230 #91TH2200210	38,900	1,895 (α) 1,954 (β)	4.9% 3.4%

RSA Laboratories ID# 13902. Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: Kurt D. Newton _____ Date: 30 December 2010



RSA Laboratories ID# **13902.**

Calibrated by: **Kurt D. Newton** Date: **30 December 2010**

To: Licensed Project Designers, Licensed Asbestos Abatement Contractors and Connecticut Approved Asbestos Training Providers

From: Ronald Skomro, Supervising Environmental Sanitarian Asbestos Program
Date: April 7, 2003

Subject: Regulatory Interpretation Regarding Intact Removal of Non-Friable Asbestos-Containing Materials

A request for regulatory interpretation was made by a licensed asbestos consultant to the Department of Public Health (DPH) concerning the applicability of the DPH regulations to activities involving intact non-friable asbestos-containing materials within a facility.This memorandum addresses the DPH response to the scenarios presented. The following is a list of those activities detailed by the consultant:

- Removal of transite panels by unbolting or unscrewing and removing the panels intact;
- Removal of transite lab-type desk tops by either unbolting or unscrewing and removing the desk top intact, or complete component removal of the entire desk;

- Removal of flexible duct connectors by either unbolting or unscrewing and removing the connector intact, or complete component removal of the entire connector and small portions of the surrounding ductwork;

- Removal of countertops, backsplashes, etc., with linoleum, panel glue, or similar materials by completely removing the entire unit intact;

- Removal of sinks with pan sealant by removing the sink intact;
- Removal of window sashes with window glazing (interior or exterior) by removing the window stops and removing the entire window sash unit intact;

- Picking up loose floor tiles that have become completely disassociated with the floor and are either whole or are slightly broken but are still not considered to be Regulated Asbestos-Containing Material (RACM);

- Picking up loose miscellaneous non-friable items such as rolls of linoleum, loose gaskets, loose shingles, etc.;
- Removal of fire doors containing insulation from their hinges intact for complete component disposal;

- Attaching framing, brackets, etc., to structures by using power actuated tools to shoot/screw/bolt fasteners through the framing, brackets, etc., and through category I non-friable ACM (e.g., floor tile or mastic, cove base, waterproofing tar-like coating, asphalt roofing, gasketing, etc.). (The use of drills or similar tools to drill pilot holes or holes through the materials is not allowed.)

(860) 509-7367 / Fax (860) 509-7378

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It is the interpretation of the DPH that the activities that are detailed above do not constitute asbestos abatement as defined by Section 19a-332 of the Connecticut General Statutes. Given this interpretation, such activities are not subject to DPH regulation. This interpretation is provided based upon the following understandings:

1. The asbestos-containing material is undamaged and non-friable and remains undamaged and non-friable during the removal or collection of the material. In the case of floor tile characterized as "slightly broken", a case-by-case assessment should be made to determine whether the removal of the tile constitutes asbestos abatement. The DPH shall be contacted directly when such activities are contemplated.
2. The asbestos-containing material is removed intact and without breakage or other disturbance of the material. The material is removed without the creation of a visible residue.
3. The asbestos-containing material is not subject to sanding, cutting, grinding, or abrading during the removal or collection process.
4. The asbestos-containing material does not become a RACM as defined by the asbestos National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61, Subpart M).

It should be noted that asbestos-containing waste generated as a result of these activities must be disposed of as asbestos waste at an authorized waste disposal facility. Questions regarding the disposal of asbestos-containing material within the State of Connecticut should be directed to the Connecticut Department of Environmental Protections at (860) 424-3366.

This interpretation does not relieve the owner of the facility in which these activities are performed, or the operator of these activities from complying with the provisions of all other applicable federal, state, or local regulations.

Miscellaneous Objects Scoping Survey

Contents

NOTE

In addition to a number of objects identified for survey in various labs[1] by Chemtura, other objects were found in the laboratory wing that also needed survey to establish whether or not they could be released. This attachment contains survey results for the objects in the latter category.

Page

2-4 Wipe test data

[1] Room 1205 (Attachment E), Room 1206 (Attachment F), Room 1207 (Attachment G), Room 1208 (Attachment H), Room 1210 (Attachment J), Room 1215 (Attachment K), Room 1216 (Attachment L), Room 1218 (Attachment N), Room 1219 (Attachment O), Room 1220 (Attachment P) and Room 1221 (Attachment Q).

RSA Laboratories

A Division of Radiation Safety Associates

Radiochemistry Analysis Data Sheet

Report No. **N/A**

Customer: **Chemtura**

Customer Samp No. **N/A**

Location: **Misc Object Wipes**

RSA Lab Sample No. **N/A**

Project: **Lab Decommissioning**

Date Collected: **2/28/2011**

Samp. Description: **Survey Wip**

Date Counted: **2/28/2011**

Matrix: **Wipes**

C-14 LLD dpm= 40.47

RSA ID#	CUST. ID#	Location			C-14 CPM	dpm/100 cm sq
BG		BACKGROUND			35.30	
1		Room 1205 Desk 325			19.30	21.70
2		Room 1205 Weigh Table 326			27.40	30.70
3		Room 1205 Desk 327			26.10	29.30
4		Room 1206 Bookcase 328			29.40	34.30
5		Room 1206 Padded Chair 329			23.50	26.50
6		Room 1206 Metal Chair 330			18.30	20.60
7		Room 1206 Stool 331			27.10	30.60
8		Room 1207 Weigh Table 332			34.10	38.30
9		Room 1207 Padded Chair 333			210.30	236.60
10		Room 1207 Stool 334			62.00	69.80
11		Room 1207 Shelves (Metal) 335			78.60	93.20
12		Room 1208 Bookcase 336			6.30	7.10
13		Room 1208 Metal Table 337			25.90	29.60
14		Room 1208 Chair 942			21.80	24.40
15		Room 1208 Chair 943			20.80	23.30
16		Room 1208 Chair 944			19.10	21.30
17		Room 1208 Chair 945			28.30	31.70
18		Room 1208 Cork Boards 946			26.80	30.10
19		Room 1208 Desk 947			20.00	22.40
20		Room 1208 Chair 948			11.60	19.90
21		Room 1208 Chair 949			25.90	29.10
22		Room 1208 Chair 950			27.10	30.70
23		Room 1208 Desk 951			26.20	29.40
C-14		QC C-14			118475.90	134448.40
24		Room 1210 Chair/Stool 952			42.80	48.10
25		Room 1210 Chair/Stool 953			24.30	27.40
26		Room 1210 Dewar 954			18.80	21.40
27		Room 1215 Stool 955			58.10	65.30
28		Room 1215 Desk 956			24.70	27.60
29		Room 1215 Chair 957			32.40	36.30
30		Room 1215 Chair 958			32.00	35.80
31		Room 1215 Chair 959			22.10	24.70
32		Room 1215 Chair 960			23.80	26.60
33		Room 1215 Haz. Waste Can 961			15.90	17.80
34		Room 1216 Desk 962			27.80	31.20

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Radiochemistry Analysis Data Sheet

RSA ID#	CUST. ID#	LOCATION			C-14 CPM	dpm/100 cm sq
35		Room 1216 Chair 963			18.40	20.60
36		Room 1216 Chair 964			25.00	27.90
37		Room 1216 Desk 965			26.70	29.90
38		Room 1217 Desk 966			22.50	25.30
39		Room 1217 Chair 967			2.80	3.20
40		Room 1217 Chair 968			17.60	19.70
41		Room 1217 Desk 969			16.10	18.20
42		Room 1219 Table Marked Rad 970			17.30	20.10
43		Room 1219 UPS 971			35.60	40.20
44		Room 1219 UPS 972			21.00	23.70
45		Room 1219 Plastic Tray 973			6.90	7.70
46		Room 1219 Chair 974			22.10	24.70
BL		QC Blank			9.90	10.70
47		Room 1219 Chair 975			8.00	9.00
48		Room 1219 Table 976			24.60	27.60
49		Room 1219 Table 977			5.00	5.70
50		Room 1219 Chair 978			30.30	33.80
51		Room 1219 Chair 979			25.10	28.00
52		Room 1219 Chair 980			11.50	12.90
53		Room 1222 Object 1002 Water Bath			13.20	14.30
54		Room 1222 Object 1003 Pump			6.70	7.40
55		Room 1222 Object 1004 Hot Plate			27.00	29.30
56		Room 1222 Object 1005 Transformer			12.10	13.10
57		Room 1222 Object 1006 Balance			19.20	20.90
58		Room 1222 Object 1007 Pump			29.50	32.10
59		Room 1206 Object 1008 Corner Desk Left			10.50	11.40
60		Room 1206 Object 1008 Middle			9.50	10.30
61		Room 1206 Object 1008 Right			18.10	20.20
62		Room 1206 Object 1009 Desk			11.90	13.00
63		Room 1220 Object 1010 Cabinet			0.00	0.00
64		Room 1220 Object 1011 Cabinet			14.10	15.40
65		Room 1219 Object 1012 H^2 Generator			18.30	19.90
66		Room 1219 Object 1013 Liquid Nitrogen Tank			0.00	0.00
67		Room 1206 Object 1014 Tray			150.90	167.30
68		Room 1206 Object 1014 White Container			18.60	20.30
69		Room 1206 Object 1014 Red Container			23.70	25.90
70		Room 1206 Object 1014 Tray			17.40	18.90
71		Room 1207 Object 1016 Tray			27.00	29.70
72		Room 1207 Object 1016 White Container			15.30	16.70
73		Room 1207 Object 1016 Red Container			25.80	28.10
74		Room 1207 Object 1016 Flucked Container			12.70	13.90
C-14		QC C-14			125148.10	13571.00
BL		QC Blank			21.70	23.60

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Radiochemistry Analysis Data Sheet

Report No. **N/A**

Customer: **Chemtura**

Customer Samp No. **N/A**

Location: **Floor Mats**

RSA Lab Sample No. **N/A**

Project: **Lab Decommissioning**

Date Collected: **3/8/2011**

Samp. Description: **Survey Wip**

Date Counted: **3/8/2011**

Matrix: **Wipes**

C-14 LLD dpm= 39.35

RSA ID#	CUST. ID#	Location			C-14 CPM	dpm/100 cm sq
BG		BACKGROUND			33.20	
1		Room 1201 402			13.60	15.00
2		Room 1201 403			11.80	13.00
3		Room 1201 404			18.70	20.70
4		Room 1201 405			16.90	18.70
5		Room 1201 406			11.30	12.50
6		Room 1201 407			6.60	7.40
7		Room 1201 408			2.50	2.80
8		Room 1201 409			25.40	28.30
9		Room 1205 410			17.80	19.70
10		Room 1205 411			22.30	24.50
11		Room 1209 412			14.70	16.20
12		Room 1210 413			14.40	15.80
13		Room 1210 414			15.70	17.30
14		Room 1210 415			16.30	18.00
15		Room 1215 416			24.30	26.80
16		Room 1215 417			19.10	21.10
17		Room 1215 418			19.30	21.20
18		Room 1215 419			12.80	14.10
19		Room 1215 420			17.60	19.40
20		Room 1216 421			18.60	20.50
21		Room 1217 422			0.00	0.00
22		Room 1217 423			13.80	15.20
23		Room 1221 424			24.70	27.20
C-14		QC C-14			115236.90	134890.40
24		Room 1221 425			10.20	11.30
25		Room 1221 426			13.60	14.90
26		Room 1221 427			2.80	3.00
27		Room 1221 428			14.00	15.40
BL		QC Blank			0.20	0.20