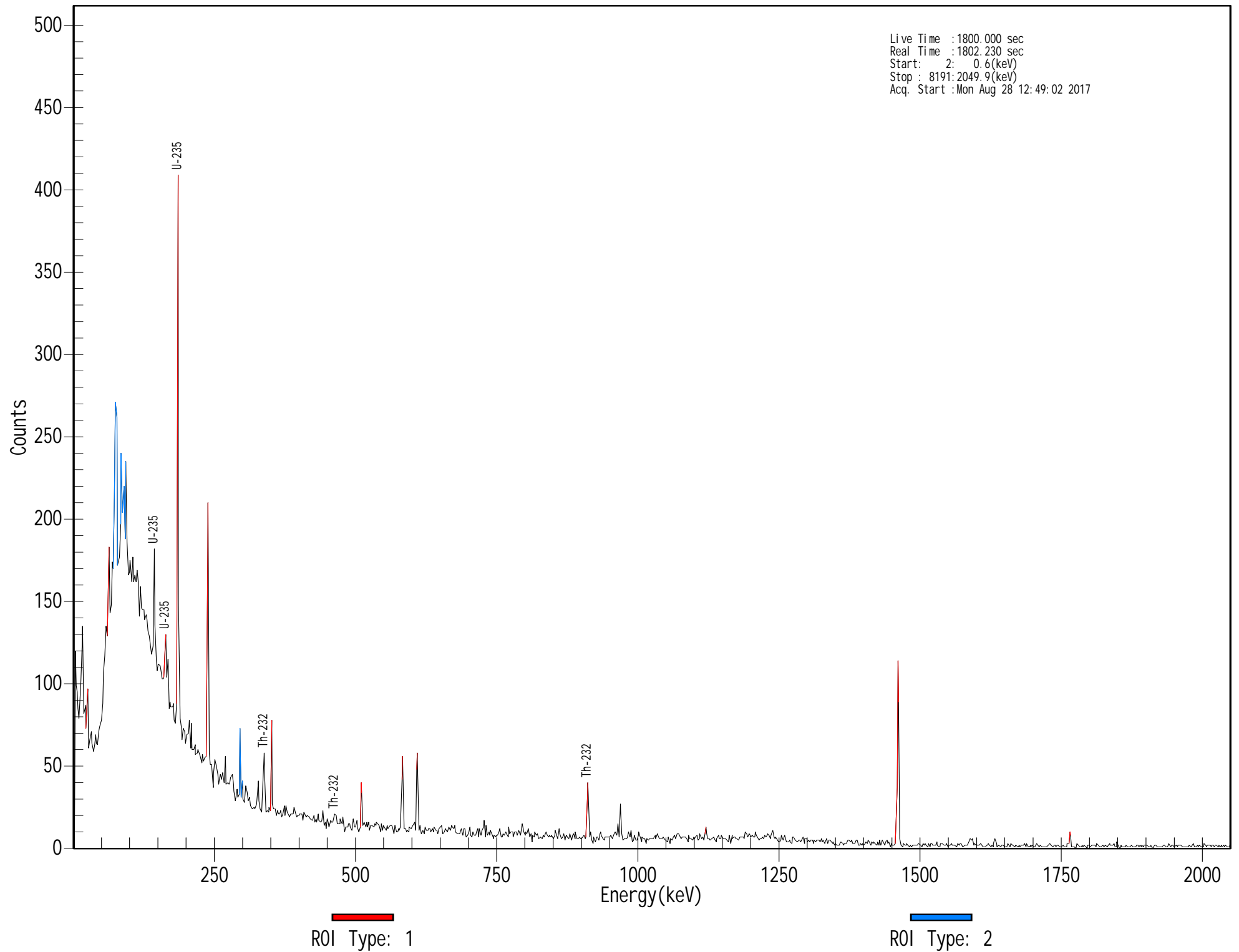


CHEM LAB PIPE.CNF



***** G A M M A S P E C T R U M A N A L Y S I S *****

Filename: C:\GENIE2K\CAMFILES\UNC 2017\INSITU\Chem Lab Pipe.CNF

Report Generated On : 10/4/2017 3:29:24 PM

Sample Title : 6H Chem Lab Pipe
Sample Description :
Sample Identification : 6H Chem Lab Pipe
Sample Type :
Sample Geometry : pipe

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 40 - 8192
Peak Area Range (in channels) : 40 - 8192
Identification Energy Tolerance : 1.000 keV

Sample Size : 1.000E+000 g

Sample Taken On : 8/28/2017 2:00:00 PM
Acquisition Started : 8/28/2017 12:49:02 PM

Live Time : 1800.0 seconds
Real Time : 1802.2 seconds

Dead Time : 0.12 %

Energy Calibration Used Done On : 4/13/2017
Efficiency Calibration Used Done On : 10/4/2017
Efficiency ID : UNC-2017-001

***** P E A K A N A L Y S I S R E P O R T *****

Detector Name: 8566

Sample Title: 6H Chem Lab Pipe

Peak Analysis Performed on: 10/4/2017 3:29:19 PM

Peak Analysis From Channel: 40

Peak Analysis To Channel: 8192

	Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	FWHM (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
F	1	93-	107	103.58	26.03	0.19	1.15E+002	13.74	8.48E+002
F	2	248-	258	254.43	63.78	0.22	1.68E+002	20.32	1.34E+003
m	3	288-	320	308.17	77.23	0.69	3.11E+002	30.99	1.91E+003
m	4	334-	378	349.15	87.48	0.93	1.66E+002	30.76	2.89E+003
m	5	334-	378	359.98	90.19	0.94	1.64E+002	30.73	2.89E+003
m	6	334-	378	371.85	93.16	0.95	3.49E+002	35.21	2.88E+003
F	7	569-	580	574.50	143.88	0.82	2.79E+002	29.23	1.32E+003
F	8	648-	657	653.65	163.68	0.59	1.94E+002	115.30	8.38E+002
F	9	734-	748	742.15	185.83	0.94	1.51E+003	42.15	1.06E+003
F	10	944-	960	953.35	238.68	0.96	6.95E+002	32.11	8.67E+002
M	11	1173-	1205	1179.15	295.19	0.85	1.51E+002	18.82	3.22E+002
m	12	1173-	1205	1198.25	299.97	0.86	4.76E+001	13.99	2.95E+002
F	13	1305-	1315	1310.79	328.13	1.12	6.91E+001	15.02	2.00E+002
F	14	1346-	1359	1351.43	338.30	1.14	1.73E+002	18.54	2.72E+002
F	15	1397-	1410	1405.45	351.82	1.01	2.86E+002	61.05	2.41E+002
F	16	1843-	1853	1848.59	462.71	0.99	4.46E+001	12.05	1.15E+002
F	17	2030-	2055	2040.57	510.75	2.09	2.21E+002	18.30	2.67E+002
F	18	2321-	2337	2329.84	583.14	1.42	3.04E+002	20.63	1.54E+002
F	19	2426-	2442	2433.86	609.17	1.39	2.81E+002	19.82	1.37E+002
F	20	3630-	3651	3640.63	911.16	1.80	2.18E+002	17.07	8.96E+001
F	21	4469-	4483	4475.39	1120.05	1.83	5.66E+001	10.76	5.81E+001
F	22	5821-	5854	5838.32	1461.12	2.46	1.15E+003	34.54	3.40E+001
F	23	7047-	7066	7054.69	1765.51	2.04	4.82E+001	8.09	1.40E+001

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000 sigma

***** P E A K L O C A T E R E P O R T *****

Detector Name: 8566

Sample Title: 6H Chem Lab Pipe

Peak Locate Performed on: 10/4/2017 3:29:19 PM

Peak Locate From Channel: 40

Peak Locate To Channel: 8192

Peak Search Sensitivity: 3.00

Peak No.	Centroid Channel	Centroid Uncertainty	Energy (keV)	Peak Significance
1	103.01	0.4289	26.03	3.00
2	253.69	0.3945	63.78	3.04
3	308.13	0.2565	77.23	7.11
4	348.83	0.3750	87.48	3.07
5	359.96	0.3614	90.19	3.40
6	371.82	0.3470	93.16	3.13
7	574.34	0.2491	143.88	5.92
8	653.04	0.2837	163.68	3.95
9	742.12	0.1250	185.83	20.68
10	953.39	0.1463	238.68	14.08
11	1179.15	0.2152	295.19	6.61
12	1198.23	0.3099	299.97	3.49
13	1310.74	0.2856	328.13	3.25
14	1351.59	0.2057	338.30	6.14
15	1405.45	0.1653	351.82	10.02
16	1848.53	0.2664	462.71	3.60
17	2039.44	0.2129	510.75	4.94
18	2330.08	0.1467	583.14	9.52
19	2433.89	0.1462	609.17	9.76
20	3640.46	0.1509	911.16	7.85
21	4475.60	0.2091	1120.05	3.63
22	5838.19	0.0892	1461.12	17.28
23	7054.79	0.1735	1765.51	4.57

? = Adjacent peak noted

Errors quoted at 1.960 sigma

 ***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****

Sample Title: 6H Chem Lab Pipe
 Nuclide Library Used: C:\GENIE2K\CAMFILES\UNC 2017 NLB 0328201

..... IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/g)	Activity Uncertainty
K-40	0.986	1460.82*	10.66	5.92423E+003	7.11352E+002
Pb-212	0.999	74.82	10.28		
		77.11*	17.10	1.81374E+003	4.28600E+002
		86.83	2.07		
		87.35*	3.97	3.59962E+003	1.38472E+003
		89.78*	1.46	9.40069E+003	3.63983E+003
		115.18	0.60		
		238.63*	43.60	6.64266E+002	1.15207E+002
		300.09*	3.30	6.27918E+002	3.66182E+002
PB-214	0.835	74.82	5.80		
		77.11*	9.70	3.19742E+003	8.08551E+002
		86.83	1.70		
		87.35*	2.24	6.37968E+003	2.51389E+003
		89.78*	0.82	1.67378E+004	6.64121E+003
		241.99	7.25		
		258.76	0.53		
		295.22*	18.42	3.59580E+002	9.36335E+001
		351.93*	35.60	1.63878E+002	1.47639E+002
		785.96	1.06		
		839.07	0.58		
Ra-226	0.980	81.07	0.20		
		83.79	0.32		
		186.21*	3.64	2.31453E+004	2.76136E+003
TH-234	0.977	63.29*	3.70	6.39382E+003	2.19224E+003
		92.38	2.13		
		92.80*	2.10	1.35045E+004	3.98403E+003
		112.81	0.21		
U-235	0.747	89.96*	3.43	4.00146E+003	1.55459E+003
		93.35*	5.54	5.11902E+003	1.19662E+003
		104.82	0.69		
		105.60	1.31		
		108.58	0.50		
		109.19	1.66		
		143.76*	10.96	1.60410E+003	3.70341E+002
		163.36*	5.08	2.27160E+003	2.65345E+003
		194.94	0.63		
		202.12	1.08		
		205.32	5.02		

* = Energy line found in the spectrum.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.60

Errors quoted at 1.960 sigma

 ***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****

	Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/g)	Wt mean Activity Uncertainty
	K-40	0.986	5.924235E+003	7.113525E+002
	Pb-212	0.999	7.413625E+002	1.052457E+002
	PB-214	0.835	3.273706E+002	7.860588E+001
	Ra-226	0.980	2.314533E+004	2.761358E+003
X	TH-232	1.000		
	TH-234	0.977	6.964370E+003	1.519946E+003
	U-235	0.747	1.786108E+003	3.430370E+002

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.960 sigma

***** U N I D E N T I F I E D P E A K S *****

Peak Locate Performed on: 10/4/2017 3:29:19 PM
Peak Locate From Channel: 40
Peak Locate To Channel: 8192

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty	Peak Type	Tol. Nuclide
F 1	26.03	6.3871E-002	23.43		
F 13	328.13	3.8384E-002	42.62	Sum	
F 14	338.30	9.5896E-002	21.05		
F 16	462.71	2.4756E-002	52.99	Sum	
F 17	510.75	1.2253E-001	16.27		
F 18	583.14	1.6870E-001	13.32		
F 19	609.17	1.5622E-001	13.82		
F 20	911.16	1.2137E-001	15.32		
F 21	1120.05	3.1455E-002	37.26		
F 23	1765.51	2.6761E-002	32.91		

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.960 sigma

 ***** N U C L I D E M D A R E P O R T *****

Detector Name: 8566
 Sample Geometry: pipe
 Sample Title: 6H Chem Lab Pipe
 Nuclide Library Used: C:\GENIE2K\CAMFILES\UNC 2017 NLB 0328201

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/g)	Nuclide MDA (pCi/g)	Activity (pCi/g)	Dec. Leve (pCi/g
+	K-40	1460.82*	10.66	7.250E+002	7.25E+002	5.924E+003	3.536E+00
	Pb-210	46.54	4.25	1.423E+004	1.42E+004	3.918E+002	6.983E+00
	BI-212	727.33	6.67	5.401E+002	5.40E+002	7.207E+002	2.622E+00
		785.37	1.10	2.851E+003		-4.471E+002	1.376E+00
		1078.62	0.56	6.458E+003		-4.508E+003	3.105E+00
		1620.50	1.47	1.874E+003		1.579E+001	8.656E+00
+	Pb-212	74.82	10.28	2.891E+003	2.25E+002	5.194E+002	1.432E+00
		77.11*	17.10	1.200E+003		1.814E+003	5.921E+00
		86.83	2.07	1.152E+004		8.935E+003	5.703E+00
		87.35*	3.97	5.488E+003		3.600E+003	2.715E+00
		89.78*	1.46	1.447E+004		9.401E+003	7.159E+00
		115.18	0.60	3.175E+004		6.258E+003	1.572E+00
		238.63*	43.60	2.250E+002		6.643E+002	1.110E+00
		300.09*	3.30	1.090E+003		6.279E+002	5.272E+00
	BI-214	76.86	0.55	5.280E+004	9.82E+001	1.319E+005	2.615E+00
		79.29	0.91	2.863E+004		9.905E+002	1.417E+00
		609.32	45.49	9.820E+001		2.929E+002	4.801E+00
		665.45	1.53	2.140E+003		-8.738E+000	1.037E+00
		768.36	4.89	6.595E+002		5.003E+001	3.187E+00
		806.18	1.26	2.477E+003		5.789E+002	1.195E+00
		934.06	3.11	1.070E+003		2.181E+002	5.150E+00
		1120.29	14.92	2.929E+002		1.340E+002	1.416E+00
		1155.21	1.63	2.403E+003		7.937E+002	1.156E+00
		1238.11	5.83	7.913E+002		1.919E+002	3.819E+00
		1280.98	1.43	2.814E+003		1.655E+003	1.349E+00
		1377.67	3.99	8.616E+002		1.749E+002	4.083E+00
		1385.31	0.79	4.337E+003		2.681E+003	2.055E+00
		1401.52	1.33	2.252E+003		1.228E+003	1.057E+00
		1407.99	2.39	1.286E+003		-3.624E+002	6.047E+00
		1509.21	2.13	1.321E+003		3.466E+002	6.143E+00
		1583.20	0.70	5.244E+003		-5.156E+003	2.476E+00
		1661.27	1.05	2.582E+003		1.816E+003	1.189E+00
		1729.59	2.88	9.279E+002		1.553E+002	4.257E+00
		1764.49	15.30	2.587E+002		4.132E+002	1.221E+00
		1847.43	2.03	1.567E+003		1.052E+003	7.269E+00
>		2118.51	1.16	0.000E+000		0.000E+000	0.000E+00
>		2204.06	4.92	0.000E+000		0.000E+000	0.000E+00
>		2447.70	1.55	0.000E+000		0.000E+000	0.000E+00
+	PB-214	74.82	5.80	5.124E+003	1.41E+002	9.205E+002	2.538E+00
		77.11*	9.70	2.115E+003		3.197E+003	1.044E+00
		86.83	1.70	1.403E+004		1.088E+004	6.945E+00
		87.35*	2.24	9.727E+003		6.380E+003	4.812E+00

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/g)	Nuclide MDA (pCi/g)	Activity (pCi/g)	Dec. Leve (pCi/g)
+	PB-214	89.78*	0.82	2.577E+004	1.41E+002	1.674E+004	1.275E+00
		241.99	7.25	1.443E+003		7.978E+002	7.125E+00
		258.76	0.53	1.362E+004		-8.861E+001	6.689E+00
		295.22*	18.42	2.053E+002		3.596E+002	9.945E+00
		351.93*	35.60	1.414E+002		1.639E+002	6.918E+00
		785.96	1.06	2.966E+003		-4.652E+002	1.431E+00
		839.07	0.58	5.447E+003		1.118E+003	2.626E+00
+	Ra-226	81.07	0.20	1.238E+005	2.83E+003	2.819E+004	6.123E+00
		83.79	0.32	7.606E+004		-1.744E+004	3.765E+00
		186.21*	3.64	2.830E+003		2.315E+004	1.394E+00
	AC-228	89.96	1.90	1.126E+004	1.57E+002	-2.216E+004	5.577E+00
		93.35	3.10	6.756E+003		9.582E+002	3.346E+00
		99.51	1.26	1.463E+004		3.860E+003	7.239E+00
		105.60	0.74	2.463E+004		-2.509E+003	1.219E+00
		129.07	2.42	6.224E+003		-1.398E+003	3.078E+00
		153.98	0.72	1.766E+004		7.304E+003	8.725E+00
		209.25	3.89	2.340E+003		-6.701E+002	1.153E+00
		214.85	0.76	1.126E+004		-1.484E+003	5.546E+00
		270.24	3.46	1.866E+003		1.977E+003	9.167E+00
		328.00	2.95	1.624E+003		8.256E+001	7.950E+00
		338.32	11.27	4.531E+002		4.997E+002	2.221E+00
		409.46	1.92	1.986E+003		-4.170E+002	9.688E+00
		463.00	4.40	7.792E+002		6.903E+000	3.794E+00
		562.50	0.87	3.671E+003		3.972E+003	1.784E+00
		674.75	2.10	1.419E+003		3.294E+002	6.876E+00
		726.86	0.62	5.211E+003		4.841E+003	2.529E+00
		755.32	1.00	2.854E+003		1.206E+003	1.379E+00
		772.29	1.49	1.958E+003		5.241E+002	9.463E+00
		794.95	4.25	6.944E+002		2.864E+002	3.355E+00
		830.49	0.54	5.142E+003		1.327E+003	2.477E+00
		835.71	1.61	1.795E+003		1.040E+003	8.657E+00
		840.38	0.91	3.119E+003		-1.644E+003	1.503E+00
		904.20	0.77	4.251E+003		-4.365E+003	2.055E+00
		911.20	25.80	1.568E+002		4.269E+002	7.627E+00
		964.77	4.99	7.925E+002		1.407E+003	3.848E+00
		968.97	15.80	2.534E+002		5.029E+002	1.231E+00
		1247.08	0.50	7.554E+003		-8.043E+003	3.631E+00
		1459.14	0.83	1.258E+004		8.870E+004	6.185E+00
		1495.91	0.86	2.733E+003		-1.692E+003	1.265E+00
		1588.20	3.22	1.150E+003		1.922E+003	5.461E+00
		1630.63	1.51	1.739E+003		-3.706E+001	8.066E+00
	TH-230	67.67	0.38	7.945E+004	7.94E+004	-1.033E+003	3.928E+00
	PA-234	742.81	0.11	2.902E+004	4.12E+003	-1.091E+004	1.401E+00
		766.42	0.32	1.018E+004		5.469E+003	4.921E+00
		1001.03	0.84	4.117E+003		1.586E+003	1.981E+00
+	TH-234	63.29*	3.70	7.808E+003	7.81E+003	6.394E+003	3.852E+00
		92.38	2.13	1.117E+004		1.872E+004	5.531E+00
		92.80*	2.10	9.763E+003		1.350E+004	4.829E+00
		112.81	0.21	9.238E+004		-6.042E+004	4.573E+00
	U-234	53.20	0.12	3.442E+005	3.44E+005	-6.399E+004	1.695E+00
		120.90	0.04	5.015E+005		1.048E+005	2.481E+00

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (pCi/g)	Nuclide MDA (pCi/g)	Activity (pCi/g)	Dec. Leve (pCi/g
+	U-235	89.96*	3.43	6.161E+003	1.10E+003	4.001E+003	3.047E+00
		93.35*	5.54	3.701E+003		5.119E+003	1.830E+00
		104.82	0.69	2.974E+004		2.120E+003	1.472E+00
		105.60	1.31	1.546E+004		-1.575E+003	7.652E+00
		108.58	0.50	4.029E+004		1.573E+004	1.995E+00
		109.19	1.66	1.205E+004		-1.487E+003	5.965E+00
		143.76*	10.96	1.102E+003		1.604E+003	5.430E+00
		163.36*	5.08	1.702E+003		2.272E+003	8.350E+00
		194.94	0.63	1.716E+004		-3.346E+003	8.462E+00
		202.12	1.08	9.768E+003		2.928E+003	4.817E+00
		205.32	5.02	2.076E+003		-8.010E+002	1.024E+00

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

 *** LINE ACTIVITY CONSISTENCY EVALUATOR ***

=====
 Analysis using Key Line Activities
 =====

Filename: C:\GENIE2K\CAMFILES\UNC 2017\INSITU\Chem Lab Pipe.CNF

Equation used to calculate plot: $\ln(\text{Ratio}) = A + B \cdot \ln(\text{Energy})$
 where: Ratio = Activity/KL Activity

Notes:

'^' Denotes Key Line energy

* All uncertainties quoted at 1.96 sigma

Nuclide	Energy (keV)	Activity (pCi/g)	Activity %Uncert*	Ratio[%Uncert]	A	B [uncert]
-----	-----	-----	-----	-----	-----	-----
K-40	1460.8	^ 5.92E+003	12.007			
Pb-212	77.1	1.81E+003	23.631	2.730[29.312]	7.45	-1.344
	87.3	3.60E+003	38.469	5.419[42.197]		[0.280]
	89.8	9.40E+003	38.719	14.152[42.426]		
	238.6	^ 6.64E+002	17.344	1.000[24.527]		
	300.1	6.28E+002	58.317	0.945[60.841]		
PB-214	77.1	3.20E+003	25.288	19.511[93.573]	14.22	-2.373
	87.3	6.38E+003	39.405	38.929[98.331]		[0.709]
	89.8	1.67E+004	39.678	102.13[98.441]		
	295.2	3.60E+002	26.040	2.194[93.779]		
	351.9	^ 1.64E+002	90.091	1.000[127.40]		
Ra-226	186.2	^ 2.31E+004	11.931			
TH-234	63.3	^ 6.39E+003	34.287	1.000[48.489]	-8.10	1.954
	92.8	1.35E+004	29.502	2.112[45.232]		[1.733]
U-235	90.0	4.00E+003	38.851	2.495[45.193]	11.20	-2.241
	93.3	5.12E+003	23.376	3.191[32.855]		[0.903]
	143.8	^ 1.60E+003	23.087	1.000[32.650]		
	163.4	2.27E+003	116.81	1.416[119.07]		