



July 28, 2016

Mr. Tom Mahler
On-Scene Coordinator
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

**Subject: Data Deliverable Package for June 2016 Sediment Sampling
West Lake Landfill Site, Bridgeton, Missouri
CERCLIS ID: MOD079900932
EPA Region 7, START 4, Contract No. EP-S7-13-06, Task Order No. 0134
Task Monitor: Tom Mahler, On-Scene Coordinator**

Dear Mr. Mahler:

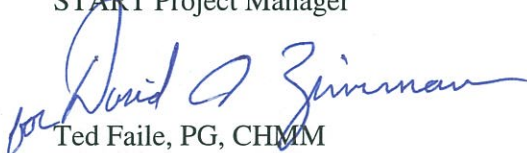
Tetra Tech, Inc. is submitting electronically, on the enclosed CD, the Level 4 analytical laboratory report and corresponding data validation report for the following sediment samples obtained from the West Lake Landfill Site in Bridgeton, Missouri.

<u>Sample Delivery Group</u>	<u>Sample Name</u>	<u>Date of Collection</u>
J17814	AC-SED-4	06/10/2016
J17814	AC-SED-6	06/10/2016
J17814	AC-SED-7	06/10/2016
J17814	AC-SED-8	06/10/2016

If you have any questions or comments, please contact Colin Willits at (816) 412-1785.

Sincerely,

for 
Colin Willits
START Project Manager


Ted Faile, PG, CHMM
START Program Manager

Enclosure

cc: Debra Dorsey, START Project Officer (cover letter only)

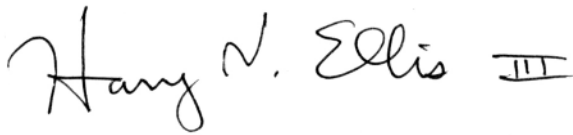
Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL IV

Site: West Lake Landfill Site, Bridgeton, Missouri
Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)
Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)
Review Date: July 26, 2016
Sample Delivery Group (SDG): J17814
Sample Numbers: AC-SED-4, AC-SED-6, AC-SED-7, and AC-SED-8
Matrix / Number of Samples: Four Sediment Samples

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review" (9355.0-131), August 2014. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



26 July 2016

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J17814 included four (4) environmental sediment samples and no QC samples. The samples were analyzed for thorium and uranium isotopes by alpha spectroscopy, using DOE Method A-01-R, and for radium-226 and other isotopes by gamma spectroscopy, using EPA Method GA-01-R. The following summarizes the data validation that was performed.

ALPHA SPECTROSCOPY ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses were not performed in these analyses. No qualifications were applied for this data gap. LCS and duplicate analyses provided adequate confirmation of accuracy and precision.

III. Blanks

The laboratory (method) blanks yielded low activities for thorium-228, thorium 230, and uranium-238. The field sample results for thorium-228 were less than 10 times the blank result, so they were qualified as estimated, possibly biased high, and flagged "J". The activities of the other isotopes were more than 10 times the blank activities, so no further qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries and relative percent differences from the LCS analyses were within established control limits. No qualifications were applied.

V. Tracers

The tracers (thorium-229 and uranium-232) yielded fully satisfactory recoveries from most samples. However the thorium tracer in sample AC-SED-7 yielded a 136 percent recovery, well above the laboratory limits of 30 to 110 percent. The thorium isotope results for sample AC-SED-7 were qualified as estimated and flagged "J".

VI. Calibrations and other Quality Control measures

All calibrations (including initial, annual verification, monthly, and daily) were within their QC limits. Monthly background checks were also within limits.

VI. Comments

None.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

GAMMA SPECTROSCOPY ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. The preferred 21-day ingrowth period was performed before determination of the radium and other isotopes. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses were not performed in these analyses. No qualifications were applied for this data gap. LCS and duplicate analyses provided adequate confirmation of accuracy and precision.

III. Blanks

The laboratory (method) blank yielded a low activity for thallium-208. The field sample results for that isotope were less than 10 times the blank result, so they were qualified as estimated, possibly biased high, and flagged "J".

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Tracers

Tracers are not used in these radioanalytical methods.

VI. Calibrations and other Quality Control measures

All calibrations (including initial, annual verification, and daily) were within their QC limits. Monthly background checks were also within limits.

VI. Comments

None.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications applied. All data are usable as reported for their intended purposes.

ANALYTICAL REPORT

Job Number: 160-17814-1

Job Description: West Lake Landfill

For:

Tetra Tech EM Inc.

415 Oak Street

Kansas City, MO 64106

Attention: Ms. Emily Fisher



Approved for release.
Erika K Gish
Project Manager II
7/13/2016 3:55 PM

Erika K Gish, Project Manager II
13715 Rider Trail North, Earth City, MO, 63045
(314)298-8566
erika.gish@testamericainc.com
07/13/2016

The test results in this report meet NELAP requirements for parameters for which accreditation is required or available. Any exceptions to the NELAP requirements are noted. Results pertain only to samples listed in this report. Pursuant to NELAP, this report shall not be reproduced, except in full, without the written approval of the laboratory. This report is confidential and is intended for the sole use of TestAmerica and its client. All questions regarding this report should be directed to the TestAmerica Project Manager.

Louisiana Lab Certification ID (Non-Potable, Solid/Haz. Material): 106151
Florida Lab Certification ID (Drinking Water): E87689.

TestAmerica Laboratories, Inc.

TestAmerica St. Louis 13715 Rider Trail North, Earth City, MO 63045

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Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
X	Tracer is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	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, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
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
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: Tetra Tech EM Inc.

Project: West Lake Landfill

Report Number: 160-17814-1

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.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

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.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 6/10/2016 9:45 AM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 19.8° C.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples AC-SED-4 (160-17814-1), AC-SED-6 (160-17814-2), AC-SED-7 (160-17814-3) and AC-SED-8 (160-17814-4) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with DOE A01R_Th. The samples were dried on 06/16/2016, prepared on 06/22/2016 and analyzed on 07/02/2016 and 07/07/2016.

The following sample has a Th-229 tracer recovery above the 110% QC limit; (160-17814-A-3-C: 136%). The LCS (laboratory control sample) has an acceptable spike recovery demonstrating acceptable sample preparation and instrument performance. The samples associated with the batch have been truncated to 100% to reduce any potential bias a high carrier recovery may have. The data have been qualified and reported.

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

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Samples AC-SED-4 (160-17814-1), AC-SED-6 (160-17814-2), AC-SED-7 (160-17814-3) and AC-SED-8 (160-17814-4) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with DOE. The samples were dried on 06/16/2016, prepared on 06/22/2016 and analyzed on 07/02/2016.

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

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples AC-SED-4 (160-17814-1), AC-SED-6 (160-17814-2), AC-SED-7 (160-17814-3) and AC-SED-8 (160-17814-4) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 06/16/2016, prepared on 06/20/2016 and analyzed on 07/11/2016.

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

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Client Sample ID: AC-SED-4

Lab Sample ID: 160-17814-1

Date Collected: 06/10/16 06:35

Matrix: Solid

Date Received: 06/10/16 09:45

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

Analyte	Result	Qualifier	Count	Total	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	1.01		0.146	0.169	0.0658	0.0254	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Thorium-230	3.56		0.268	0.401	0.0278	0.00635	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Thorium-232	1.04		0.144	0.169	0.0150	0.00632	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	88.8		30 - 110					06/22/16 10:35	07/02/16 15:17	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-233/234	0.767		0.136	0.151	0.0478	0.0150	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-235/236	0.0517		0.0391	0.0393	0.0222	0.00933	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-238	0.805		0.138	0.154	0.0178	0.00748	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	73.4		30 - 110					06/22/16 10:35	07/02/16 15:31	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium-227	0.349	U	0.741	0.742	1.65	0.782	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Actinium 228	1.17		0.272	0.297	0.179	0.0566	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Bismuth-212	0.743	U	2.03	2.03	3.45	1.62	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Bismuth-214	1.14		0.273	0.298	0.220	0.0951	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Lead-210	0.0417	U	2.66	2.66	3.93	1.87	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Lead-212	0.881		0.157	0.194	0.142	0.0638	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Lead-214	1.17		0.227	0.257	0.230	0.103	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Potassium-40	13.5		2.36	2.74	1.14	0.438	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Protactinium-231	-1.65	U	4.78	4.78	8.03	3.88	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Radium-226	1.14		0.273	0.298	0.220	0.0951	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Radium-228	1.17		0.272	0.297	0.179	0.0566	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Thorium-232	1.17		0.272	0.297	0.179	0.0566	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Thorium-234	2.37		1.73	1.75	2.20	1.03	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Thallium-208	0.365		0.115	0.121	0.0879	0.0362	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Uranium-235	-0.263	U	0.652	0.652	1.09	0.527	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Uranium-238	2.37		1.73	1.75	2.20	1.03	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/g	06/20/16 08:50	07/11/16 07:46	1

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Client Sample ID: AC-SED-6

Lab Sample ID: 160-17814-2

Date Collected: 06/10/16 06:40

Matrix: Solid

Date Received: 06/10/16 09:45

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	1.07		0.150	0.175	0.0545	0.0195	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Thorium-230	2.82		0.241	0.338	0.0339	0.00920	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Thorium-232	1.19		0.156	0.185	0.0154	0.00647	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	82.6		30 - 110					06/22/16 10:35	07/02/16 15:17	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.657		0.123	0.134	0.0314	0.00719	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-235/236	0.0425		0.0347	0.0348	0.0212	0.00894	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-238	0.821		0.137	0.153	0.0314	0.00717	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	79.3		30 - 110					06/22/16 10:35	07/02/16 15:31	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.409	U	0.557	0.559	0.923	0.425	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Actinium 228	0.783		0.229	0.242	0.262	0.110	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Bismuth-212	0.312	U	1.14	1.14	1.96	0.912	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Bismuth-214	0.958		0.195	0.219	0.159	0.0698	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Lead-210	1.13	U	1.68	1.68	2.75	1.30	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Lead-212	0.907		0.145	0.186	0.141	0.0648	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Lead-214	1.21		0.231	0.263	0.191	0.0875	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Potassium-40	17.0		2.11	2.73	1.01	0.420	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Protactinium-231	-0.0000001	U	3.54	3.54	6.02	2.92	pCi/g	06/20/16 08:50	07/11/16 07:46	1
	36									
Radium-226	0.958		0.195	0.219	0.159	0.0698	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Radium-228	0.783		0.229	0.242	0.262	0.110	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Thorium-232	0.783		0.229	0.242	0.262	0.110	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Thorium-234	0.834	U	0.741	0.746	2.12	1.00	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Thallium-208	0.361		0.114	0.120	0.100	0.0447	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Uranium-235	0.102	U	0.190	0.190	0.951	0.460	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Uranium-238	0.834	U	0.741	0.746	2.12	1.00	pCi/g	06/20/16 08:50	07/11/16 07:46	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/g	06/20/16 08:50	07/11/16 07:46	1

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Client Sample ID: AC-SED-7

Lab Sample ID: 160-17814-3

Date Collected: 06/10/16 06:50

Matrix: Solid

Date Received: 06/10/16 09:45

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.728		0.119	0.134	0.0628	0.0245	pCi/g	06/22/16 10:35	07/07/16 13:10	1
Thorium-230	2.45		0.212	0.296	0.0300	0.00817	pCi/g	06/22/16 10:35	07/07/16 13:10	1
Thorium-232	0.656		0.109	0.123	0.0251	0.00575	pCi/g	06/22/16 10:35	07/07/16 13:10	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	136	X	30 - 110					06/22/16 10:35	07/07/16 13:10	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.513		0.114	0.122	0.0410	0.0112	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-235/236	0.0311		0.0311	0.0312	0.0233	0.00982	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-238	0.789		0.140	0.155	0.0344	0.00787	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	67.5		30 - 110					06/22/16 10:35	07/02/16 15:31	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.600	U	1.27	1.27	2.13	1.03	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Actinium 228	0.750		0.243	0.255	0.426	0.188	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Bismuth-212	-0.813	U	1.72	1.73	2.69	1.27	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Bismuth-214	1.07		0.247	0.271	0.194	0.0858	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Lead-210	-1.56	U	1.73	1.74	5.63	2.73	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Lead-212	0.759		0.134	0.166	0.128	0.0582	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Lead-214	1.39		0.188	0.238	0.175	0.0785	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Potassium-40	16.2		2.24	2.79	0.731	0.262	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Protactinium-231	0.568	U	2.29	2.29	7.33	3.56	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Radium-226	1.07		0.247	0.271	0.194	0.0858	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Radium-228	0.750		0.243	0.255	0.426	0.188	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Thorium-232	0.750		0.243	0.255	0.426	0.188	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Thorium-234	0.970	U	0.746	0.752	2.06	0.971	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Thallium-208	0.336		0.0884	0.0950	0.0672	0.0276	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Uranium-235	-0.344	U	0.443	0.444	1.33	0.651	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Uranium-238	0.970	U	0.746	0.752	2.06	0.971	pCi/g	06/20/16 08:50	07/11/16 08:45	1
Other Detected			Count	Total						
Radionuclides	Result	Qualifier	Uncert.	Uncert.	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/g	06/20/16 08:50	07/11/16 08:45	1

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Client Sample ID: AC-SED-8

Lab Sample ID: 160-17814-4

Date Collected: 06/10/16 07:00

Matrix: Solid

Date Received: 06/10/16 09:45

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

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	1.07		0.153	0.177	0.0652	0.0248	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Thorium-230	3.77		0.281	0.423	0.0157	0.00660	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Thorium-232	1.11		0.152	0.178	0.0156	0.00656	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	89.2		30 - 110					06/22/16 10:35	07/02/16 15:17	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.757		0.143	0.157	0.0533	0.0167	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-235/236	0.0330		0.0330	0.0331	0.0247	0.0104	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-238	0.826		0.148	0.163	0.0198	0.00835	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	68.8		30 - 110					06/22/16 10:35	07/02/16 15:31	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	1.14		1.08	1.09	1.48	0.684	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Actinium 228	0.921		0.314	0.327	0.355	0.137	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Bismuth-212	-0.608	U	1.86	1.86	2.86	1.30	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Bismuth-214	1.42		0.310	0.343	0.228	0.0959	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Lead-210	3.66		2.62	2.66	3.47	1.62	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Lead-212	1.04		0.194	0.236	0.183	0.0828	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Lead-214	1.62		0.253	0.305	0.264	0.118	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Potassium-40	17.0		2.95	3.43	1.41	0.541	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Protactinium-231	-1.57	U	4.39	4.39	7.42	3.54	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Radium-226	1.42		0.310	0.343	0.228	0.0959	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Radium-228	0.921		0.314	0.327	0.355	0.137	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Thorium-232	0.921		0.314	0.327	0.355	0.137	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Thorium-234	-1.10	U	1.68	1.68	3.92	1.87	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Thallium-208	0.398		0.105	0.113	0.0522	0.0165	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Uranium-235	0.239	U	0.632	0.632	1.07	0.509	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Uranium-238	-1.10	U	1.68	1.68	3.92	1.87	pCi/g	06/20/16 08:50	07/11/16 08:46	1
Other Detected Radionuclides			Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/g	06/20/16 08:50	07/11/16 08:46	1

Tracer/Carrier Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

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

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Th-229 (30-110)	
160-17814-1	AC-SED-4	88.8	
160-17814-1 DU	AC-SED-4	88.9	
160-17814-2	AC-SED-6	82.6	
160-17814-3	AC-SED-7	136 X	
160-17814-4	AC-SED-8	89.2	
LCS 160-257492/2-A	Lab Control Sample	90.6	
MB 160-257492/1-A	Method Blank	82.6	

Tracer/Carrier Legend

Th-229 = Thorium-229

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		U-232 (30-110)	
160-17814-1	AC-SED-4	73.4	
160-17814-1 DU	AC-SED-4	65.3	
160-17814-2	AC-SED-6	79.3	
160-17814-3	AC-SED-7	67.5	
160-17814-4	AC-SED-8	68.8	
LCS 160-257935/2-A	Lab Control Sample	79.9	
MB 160-257935/1-A	Method Blank	71.3	

Tracer/Carrier Legend

U-232 = Uranium-232

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

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

Lab Sample ID: MB 160-257492/1-A
Matrix: Solid
Analysis Batch: 259078

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 257492

Analyte	MB	MB	Count	Total	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	0.1309		0.0590	0.0600	0.0620	0.0233	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Thorium-230	0.1162		0.0488	0.0497	0.0154	0.00647	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Thorium-232	0.002972	U	0.0110	0.0110	0.0282	0.00644	pCi/g	06/22/16 10:35	07/02/16 15:17	1
Tracer	MB	MB	Limits				Prepared		Analyzed	Dil Fac
Thorium-229	%Yield	Qualifier	30 - 110				06/22/16 10:35		07/02/16 15:17	1

Lab Sample ID: LCS 160-257492/2-A
Matrix: Solid
Analysis Batch: 259080

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 257492

Analyte	Spike Added	LCS Result	LCS Qual	Total	MDC	DLC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Thorium-230	24.5	26.83		2.49	0.0307	0.0129	pCi/g	110	81 - 118
Tracer	LCS	LCS	Limits						
Thorium-229	%Yield	Qualifier	30 - 110						
	90.6								

Lab Sample ID: 160-17814-1 DU
Matrix: Solid
Analysis Batch: 259082

Client Sample ID: AC-SED-4
Prep Type: Total/NA
Prep Batch: 257492

Analyte	Sample	Sample	DU	DU	Total	MDC	DLC	Unit	RER	RER
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					Limit
Thorium-228	1.01		0.9640		0.165	0.0589	0.0217	pCi/g	0.14	1
Thorium-230	3.56		3.480		0.397	0.0286	0.00654	pCi/g	0.10	1
Thorium-232	1.04		0.9194		0.158	0.0285	0.00651	pCi/g	0.37	1
Tracer	DU	DU	Limits							
Thorium-229	%Yield	Qualifier	30 - 110							
	88.9									

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-257935/1-A
Matrix: Solid
Analysis Batch: 259144

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 257935

Analyte	MB	MB	Count	Total	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Uranium-233/234	0.03094		0.0277	0.0278	0.0186	0.00782	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-235/236	-0.006417	U	0.00908	0.00909	0.0506	0.0138	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Uranium-238	0.006176	U	0.0124	0.0124	0.0185	0.00781	pCi/g	06/22/16 10:35	07/02/16 15:31	1
Tracer	MB	MB	Limits				Prepared		Analyzed	Dil Fac
Uranium-232	%Yield	Qualifier	30 - 110				06/22/16 10:35		07/02/16 15:31	1
	71.3									

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

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

Lab Sample ID: LCS 160-257935/2-A
Matrix: Solid
Analysis Batch: 259145

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 257935

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	MDC	DLC	Unit	%Rec	%Rec. Limits	
Uranium-233/234	6.37	6.283		0.651	0.0426	0.0126	pCi/g	99	84 - 120	
Uranium-238	6.51	6.600		0.678	0.0173	0.00728	pCi/g	101	82 - 122	
Tracer	LCS %Yield	LCS Qualifier	Limits							
Uranium-232	79.9		30 - 110							

Lab Sample ID: 160-17814-1 DU
Matrix: Solid
Analysis Batch: 259147

Client Sample ID: AC-SED-4
Prep Type: Total/NA
Prep Batch: 257935

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	MDC	DLC	Unit	RER	RER Limit	
Uranium-233/234	0.767		0.7844		0.161	0.0448	0.0122	pCi/g	0.05	1	
Uranium-235/236	0.0517		0.01978	U	0.0368	0.0683	0.0214	pCi/g	0.42	1	
Uranium-238	0.805		0.8740		0.171	0.0376	0.00859	pCi/g	0.21	1	
Tracer	DU %Yield	DU Qualifier	Limits								
Uranium-232	65.3		30 - 110								

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-257060/1-A
Matrix: Solid
Analysis Batch: 259963

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 257060

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	MDC	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-228	0.08187	U	0.179	0.179	0.246	0.0968	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Bismuth-212	-0.05294	U	0.795	0.795	1.87	0.853	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Bismuth-214	0.08999	U	0.0680	0.0687	0.315	0.146	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Lead-210	-0.6987	U	1.04	1.04	2.36	1.10	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Lead-212	-0.09505	U	0.0534	0.0548	0.208	0.0981	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Lead-214	0.04168	U	0.104	0.104	0.185	0.0834	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Potassium-40	-0.1195	U	0.868	0.868	1.21	0.501	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Protactinium-231	0.5009	U	1.33	1.34	3.17	1.48	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Radium-226	0.08999	U	0.0680	0.0687	0.315	0.146	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Radium-228	0.08187	U	0.179	0.179	0.246	0.0968	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Thorium-232	0.08187	U	0.179	0.179	0.246	0.0968	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Thorium-234	0.3719	U	0.986	0.987	1.46	0.672	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Thallium-208	0.05460		0.0364	0.0368	0.0718	0.0298	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Uranium-235	-0.001966	U	0.252	0.252	0.446	0.207	pCi/g	06/20/16 08:50	07/11/16 07:48	1
Uranium-238	0.3719	U	0.986	0.987	1.46	0.672	pCi/g	06/20/16 08:50	07/11/16 07:48	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

<i>Other Detected Radionuclides</i>	<i>MB Result</i>	<i>MB Qualifier</i>	<i>Count Uncert. (2σ+/-)</i>	<i>Total Uncert. (2σ+/-)</i>	<i>MDC</i>	<i>DLC</i>	<i>Unit</i>	<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
<i>Other Detected Radionuclide</i>	<i>None</i>						<i>pCi/g</i>	<i>06/20/16 08:50</i>	<i>07/11/16 07:48</i>	<i>1</i>

Lab Sample ID: LCS 160-257060/2-A
Matrix: Solid
Analysis Batch: 259965

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 257060

<i>Analyte</i>	<i>Spike Added</i>	<i>LCS Result</i>	<i>LCS Qual</i>	<i>Total Uncert. (2σ+/-)</i>	<i>MDC</i>	<i>DLC</i>	<i>Unit</i>	<i>%Rec</i>	<i>%Rec. Limits</i>
Americium-241	97.1	95.67		10.0	1.02	0.507	pCi/g	99	87 - 116
Cesium-137	29.6	28.64		3.06	0.254	0.122	pCi/g	97	87 - 120
Cobalt-60	16.9	15.99		1.66	0.0831	0.0341	pCi/g	94	87 - 115

Lab Sample ID: 160-17814-1 DU
Matrix: Solid
Analysis Batch: 259965

Client Sample ID: AC-SED-4
Prep Type: Total/NA
Prep Batch: 257060

<i>Analyte</i>	<i>Sample Result</i>	<i>Sample Qual</i>	<i>DU Result</i>	<i>DU Qual</i>	<i>Total Uncert. (2σ+/-)</i>	<i>MDC</i>	<i>DLC</i>	<i>Unit</i>	<i>RER</i>	<i>RER Limit</i>
Actinium-227	0.349	U	-0.4288	U	1.04	1.40	0.667	pCi/g	0.44	1
Actinium 228	1.17		0.8354		0.249	0.201	0.0782	pCi/g	0.61	1
Bismuth-212	0.743	U	0.4704	U	0.805	1.36	0.610	pCi/g	0.1	1
Bismuth-214	1.14		1.230		0.245	0.107	0.0436	pCi/g	0.16	1
Lead-210	0.0417	U	0.05687	U	2.06	3.51	1.68	pCi/g	0	1
Lead-212	0.881		0.8705		0.178	0.147	0.0686	pCi/g	0.03	1
Lead-214	1.17		1.133		0.217	0.165	0.0750	pCi/g	0.07	1
Potassium-40	13.5		14.87		2.64	1.03	0.424	pCi/g	0.26	1
Protactinium-231	-1.65	U	-1.029	U	3.40	5.70	2.77	pCi/g	0.08	1
Radium-226	1.14		1.230		0.245	0.107	0.0436	pCi/g	0.16	1
Radium-228	1.17		0.8354		0.249	0.201	0.0782	pCi/g	0.61	1
Thorium-232	1.17		0.8354		0.249	0.201	0.0782	pCi/g	0.61	1
Thorium-234	2.37		-0.02837	U	1.32	2.26	1.09	pCi/g	0.78	1
Thallium-208	0.365		0.2425		0.0812	0.0715	0.0306	pCi/g	0.61	1
Uranium-235	-0.263	U	-0.1956	U	0.343	1.02	0.495	pCi/g	0.07	1
Uranium-238	2.37		-0.02837	U	1.32	2.26	1.09	pCi/g	0.78	1
<i>Other Detected Radionuclides</i>	<i>Sample Result</i>	<i>Sample Qual</i>	<i>DU Result</i>	<i>DU Qual</i>	<i>Total Uncert. (2σ+/-)</i>	<i>MDC</i>	<i>DLC</i>	<i>Unit</i>	<i>RER</i>	<i>RER Limit</i>
<i>Other Detected Radionuclide</i>	<i>None</i>		<i>None</i>					<i>pCi/g</i>		

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Rad

Leach Batch: 256643

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-17814-1	AC-SED-4	Total/NA	Solid	Dry and Grind	
160-17814-1 DU	AC-SED-4	Total/NA	Solid	Dry and Grind	
160-17814-2	AC-SED-6	Total/NA	Solid	Dry and Grind	
160-17814-3	AC-SED-7	Total/NA	Solid	Dry and Grind	
160-17814-4	AC-SED-8	Total/NA	Solid	Dry and Grind	

Prep Batch: 257060

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-17814-1	AC-SED-4	Total/NA	Solid	Fill_Geo-21	256643
160-17814-1 DU	AC-SED-4	Total/NA	Solid	Fill_Geo-21	256643
160-17814-2	AC-SED-6	Total/NA	Solid	Fill_Geo-21	256643
160-17814-3	AC-SED-7	Total/NA	Solid	Fill_Geo-21	256643
160-17814-4	AC-SED-8	Total/NA	Solid	Fill_Geo-21	256643
LCS 160-257060/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
MB 160-257060/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 257492

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-17814-1	AC-SED-4	Total/NA	Solid	ExtChrom	256643
160-17814-1 DU	AC-SED-4	Total/NA	Solid	ExtChrom	256643
160-17814-2	AC-SED-6	Total/NA	Solid	ExtChrom	256643
160-17814-3	AC-SED-7	Total/NA	Solid	ExtChrom	256643
160-17814-4	AC-SED-8	Total/NA	Solid	ExtChrom	256643
LCS 160-257492/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	
MB 160-257492/1-A	Method Blank	Total/NA	Solid	ExtChrom	

Prep Batch: 257935

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-17814-1	AC-SED-4	Total/NA	Solid	ExtChrom	256643
160-17814-1 DU	AC-SED-4	Total/NA	Solid	ExtChrom	256643
160-17814-2	AC-SED-6	Total/NA	Solid	ExtChrom	256643
160-17814-3	AC-SED-7	Total/NA	Solid	ExtChrom	256643
160-17814-4	AC-SED-8	Total/NA	Solid	ExtChrom	256643
LCS 160-257935/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	
MB 160-257935/1-A	Method Blank	Total/NA	Solid	ExtChrom	

Lab Chronicle

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Client Sample ID: AC-SED-4

Date Collected: 06/10/16 06:35

Date Received: 06/10/16 09:45

Lab Sample ID: 160-17814-1

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	ExtChrom			257492	06/22/16 10:35	SCB	TAL SL
Total/NA	Analysis	A-01-R		1	259081	07/02/16 15:17	ALD	TAL SL
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	ExtChrom			257935	06/22/16 10:35	SCB	TAL SL
Total/NA	Analysis	A-01-R		1	259146	07/02/16 15:31	ALD	TAL SL
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			257060	06/20/16 08:50	R1S	TAL SL
Total/NA	Analysis	GA-01-R		1	259964	07/11/16 07:46	RTM	TAL SL

Client Sample ID: AC-SED-6

Date Collected: 06/10/16 06:40

Date Received: 06/10/16 09:45

Lab Sample ID: 160-17814-2

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	ExtChrom			257492	06/22/16 10:35	SCB	TAL SL
Total/NA	Analysis	A-01-R		1	259083	07/02/16 15:17	ALD	TAL SL
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	ExtChrom			257935	06/22/16 10:35	SCB	TAL SL
Total/NA	Analysis	A-01-R		1	259148	07/02/16 15:31	ALD	TAL SL
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			257060	06/20/16 08:50	R1S	TAL SL
Total/NA	Analysis	GA-01-R		1	259962	07/11/16 07:46	RTM	TAL SL

Client Sample ID: AC-SED-7

Date Collected: 06/10/16 06:50

Date Received: 06/10/16 09:45

Lab Sample ID: 160-17814-3

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	ExtChrom			257935	06/22/16 10:35	SCB	TAL SL
Total/NA	Analysis	A-01-R		1	259149	07/02/16 15:31	ALD	TAL SL
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	ExtChrom			257492	06/22/16 10:35	SCB	TAL SL
Total/NA	Analysis	A-01-R		1	259665	07/07/16 13:10	ALD	TAL SL
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			257060	06/20/16 08:50	R1S	TAL SL
Total/NA	Analysis	GA-01-R		1	259963	07/11/16 08:45	RTM	TAL SL

Lab Chronicle

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Client Sample ID: AC-SED-8

Lab Sample ID: 160-17814-4

Date Collected: 06/10/16 07:00

Matrix: Solid

Date Received: 06/10/16 09:45

<u>Prep Type</u>	<u>Batch Type</u>	<u>Batch Method</u>	<u>Run</u>	<u>Dilution Factor</u>	<u>Batch Number</u>	<u>Prepared or Analyzed</u>	<u>Analyst</u>	<u>Lab</u>
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	ExtChrom			257492	06/22/16 10:35	SCB	TAL SL
Total/NA	Analysis	A-01-R		1	259085	07/02/16 15:17	ALD	TAL SL
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	ExtChrom			257935	06/22/16 10:35	SCB	TAL SL
Total/NA	Analysis	A-01-R		1	259150	07/02/16 15:31	ALD	TAL SL
Total/NA	Leach	Dry and Grind			256643	06/16/16 09:44	DRO	TAL SL
Total/NA	Prep	Fill_Geo-21			257060	06/20/16 08:50	R1S	TAL SL
Total/NA	Analysis	GA-01-R		1	259964	07/11/16 08:46	RTM	TAL SL

Laboratory References:

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

Certification Summary

Client: Tetra Tech EM Inc.
 Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each certification below.

Authority	Program	EPA Region	Certification ID	Expiration Date
Louisiana	NELAP	6	04080	06-30-17

The following analytes are included in this report, but certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
A-01-R	ExtChrom	Solid	Thorium-228
A-01-R	ExtChrom	Solid	Thorium-230
A-01-R	ExtChrom	Solid	Thorium-232
A-01-R	ExtChrom	Solid	Uranium-235/236
GA-01-R	Fill_Geo-21	Solid	Actinium 228
GA-01-R	Fill_Geo-21	Solid	Actinium-227
GA-01-R	Fill_Geo-21	Solid	Bismuth-212
GA-01-R	Fill_Geo-21	Solid	Bismuth-214
GA-01-R	Fill_Geo-21	Solid	Lead-210
GA-01-R	Fill_Geo-21	Solid	Lead-212
GA-01-R	Fill_Geo-21	Solid	Lead-214
GA-01-R	Fill_Geo-21	Solid	Potassium-40
GA-01-R	Fill_Geo-21	Solid	Protactinium-231
GA-01-R	Fill_Geo-21	Solid	Radium-226
GA-01-R	Fill_Geo-21	Solid	Radium-228
GA-01-R	Fill_Geo-21	Solid	Thallium-208
GA-01-R	Fill_Geo-21	Solid	Thorium-232
GA-01-R	Fill_Geo-21	Solid	Thorium-234
GA-01-R	Fill_Geo-21	Solid	Uranium-235
GA-01-R	Fill_Geo-21	Solid	Uranium-238

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

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

Protocol References:

DOE = U.S. Department of Energy

Laboratory References:

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

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill

TestAmerica Job ID: 160-17814-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-17814-1	AC-SED-4	Solid	06/10/16 06:35	06/10/16 09:45
160-17814-2	AC-SED-6	Solid	06/10/16 06:40	06/10/16 09:45
160-17814-3	AC-SED-7	Solid	06/10/16 06:50	06/10/16 09:45
160-17814-4	AC-SED-8	Solid	06/10/16 07:00	06/10/16 09:45

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis

Job No.: 160-17814-1

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	
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	
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	
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	
							Pu-239	5.746 Bq	
							Thorium-230	6.251 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

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis

Job No.: 160-17814-1

SDG No.: _____

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Hg-203	9.6996 Bq
							Sn-113	7.6266 Bq
							Y-88	12.712 Bq
.Gamma Ampuole_00001	04/07/59		Analytix, 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
							Sn-113	7626.6 Bq
							Y-88	12712 Bq
.Gamma Ampuole_00001	04/07/59		Analytix, 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		Analytix, 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

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-17814-1

SDG No.: _____

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Y-88	12712 Bq
Th-229_00020	08/05/16	07/16/15	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	08/05/16	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		Analytix, Lot 97790		(Purchased Reagent)		At-217	740.127 Bq/g
							Thorium-229	740.127 Bq/g
TRM-2_00001	03/20/50		DOE, Lot TRM-2		(Purchased Reagent)		Lead-210	22.1 pCi/g
							Radium-226	25.4 pCi/g
							Thorium-230	24.5 pCi/g
							Uranium-233/234	6.2 pCi/g
							Uranium-238	6 pCi/g
Tuna Can LCS_00005	10/29/16		Analytix, 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
							Cesium-137	465 Bq
							Co-57	357 Bq
							Cobalt-60	742 Bq
							Hg-203	1208 Bq
							Lead-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
							Lead-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

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica St. Louis Job No.: 160-17814-1

SDG No.: _____

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Lead-210	14606 Bq
							Sn-113	961 Bq
							Y-88	1568 Bq
U-232_00034	03/24/17	03/23/16	DI Water, Lot n/a	250 mL	U-232_00009	2 mL	Uranium-232	82.2457 dpm/mL
.U-232_00009	03/24/17	08/29/11	1M HNO3, Lot 0	100 mL	U-232_00003	5.1609 g	Uranium-232	10280.7 dpm/mL
..U-232_00003	08/25/61	Eckert & Ziegler, Lot 85539-334			(Purchased Reagent)		Uranium-232	3320.07 Bq/g
UNAT_00012	05/05/17	04/28/15	1M HNO3, Lot n/a	200 mL	UNAT Parent_00001	20 mL	Uranium-233/234	70.6912 dpm/mL
							Uranium-235	3.37064 dpm/mL
							Uranium-238	72.265 dpm/mL
.UNAT Parent_00001	05/05/17	05/03/13	1M HNO3, Lot n/a	200 mL	UNAT Ampoule_00001	19.2509 g	Uranium-233/234	706.912 dpm/mL
							Uranium-235	33.7064 dpm/mL
							Uranium-238	722.65 dpm/mL
..UNAT Ampoule_00001	03/30/58	New Brunswick Lab, Lot CRM 145			(Purchased Reagent)		Uranium-233/234	7344.2 dpm/g
							Uranium-235	350.18 dpm/g
							Uranium-238	7507.7 dpm/g

Reagent

82232-334_00001

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)

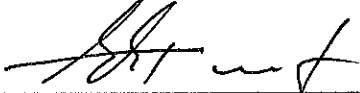


Comments:

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82233-334_00001

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)

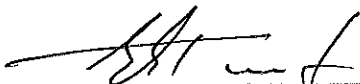


Comments:

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82235-334_00001

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)

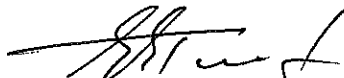


Comments:

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06.24.2010



Reagent

82236-334_00001

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

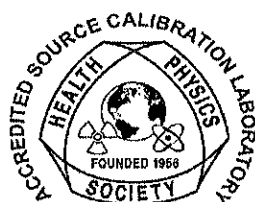
This standard radionuclide source was prepared by electrodeposition onto a stainless steel disk. Total alpha activity was determined with a ZnS scintillation detector. Radionuclide activities and impurities were calculated from the total activity and the fraction of activity for each radionuclide determined 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)

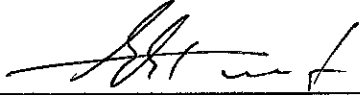


Comments:

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82237-334_00003

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)

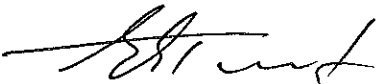


Comments:

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82240-334_00001

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)




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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82241-334_00001

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."

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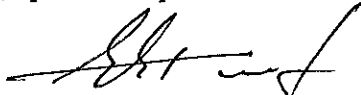


Comments:

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82242-334_00001

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."

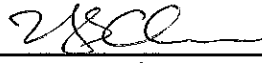
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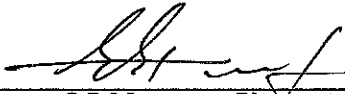


Comments:

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82243-334_00001

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)

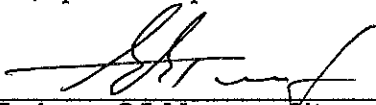


Comments:

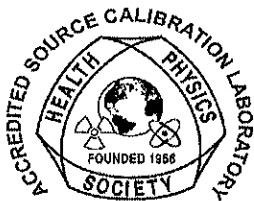
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82244-334_00001

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)

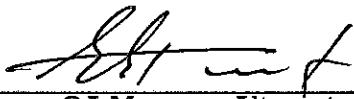


Comments:

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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

82246-334_00001

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)




Comments:

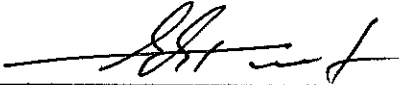
Diameter of active area: 19 mm. Disk mounted on customer supplied disk 31.8 mm diameter x 0.45 mm thick stainless steel disk.

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: _____


E. A. Taskaev, QA Manager Alternate

Date: _____

06.24.2010



Reagent

82247-334_00001

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)



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: 
E. A. Taskaev, QA Manager Alternate

Date: 06-24-2010



Reagent

Gamma Ampuole_00001



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* $\mu\text{ps}/\text{gram}$	This Source μps	Uncertainty, %			Calibration Method
					u_A	u_B	U	
Am-241	59.5	157860	—	3.390E+03	0.1	0.9	1.8	4 π 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: 4 π 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: W. Mao for
 W. Mao, Radiochemist

QA Approved: D. M. Montgomery
 D. M. Montgomery, QA Manager

Date: 5-13-09

End of Certificate

Reagent

Source A_00001



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* $\mu\text{ps}/\text{gram}$	This Source μps	Uncertainty, %			Calibration Method
					u_A	u_B	U	
Am-241	59.5	157860	—	3.390E+03	0.1	0.9	1.8	4 π 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: 4 π 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: W. Mao for
 W. Mao, Radiochemist

QA Approved: D. M. Montgomery
 D. M. Montgomery, QA Manager

Date: 5-13-09

End of Certificate

Reagent

Source C_00001



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* $\mu\text{ps}/\text{gram}$	This Source μps	Uncertainty, %			Calibration Method
					u_A	u_B	U	
Am-241	59.5	157860	—	3.390E+03	0.1	0.9	1.8	4 π 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: 4 π 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: W. Mao for
 W. Mao, Radiochemist

QA Approved: D. M. Montgomery
 D. M. Montgomery, QA Manager

Date: 5-13-09

End of Certificate

Reagent

Source D_00001



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* $\mu\text{ps}/\text{gram}$	This Source μps	Uncertainty, %			Calibration Method
					u_A	u_B	U	
Am-241	59.5	157860	—	3.390E+03	0.1	0.9	1.8	4 π 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: 4 π 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: W. Mao for
 W. Mao, Radiochemist

QA Approved: D. M. Montgomery
 D. M. Montgomery, QA Manager

Date: 5-13-09

End of Certificate

Reagent

Th-229_00016

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

97790

Th-229 5 mL Liquid in Flame Sealed Vial



430569
ID: Th-229_00016
Exp:08/06/14 Pripd: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* , %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
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: 
A. Chen, Spectroscopist

Date: 06 AUG 14





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 NRMAT 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,

A handwritten signature in black ink, appearing to read "Michael P. Unterweger".

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.

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_00020

St. Louis Radiological Standard Reverification Form

Standard ID Number: Th-229_00020
True Value = 66.223 DPM/L or g
Date Analyzed: 8/5/2015

Radionuclide: Th-229

Replicates
#1 66.657 DPM/L or g
#2 65.249 DPM/L or g
#3 68.757 DPM/L or g

Mean = 66.88767

1 sigma = 1.765339

1.96 sigma = 3.460064

True Value minus 5% = 62.91185

(True Value - 5%)

True Value plus 5% = 69.53415

(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

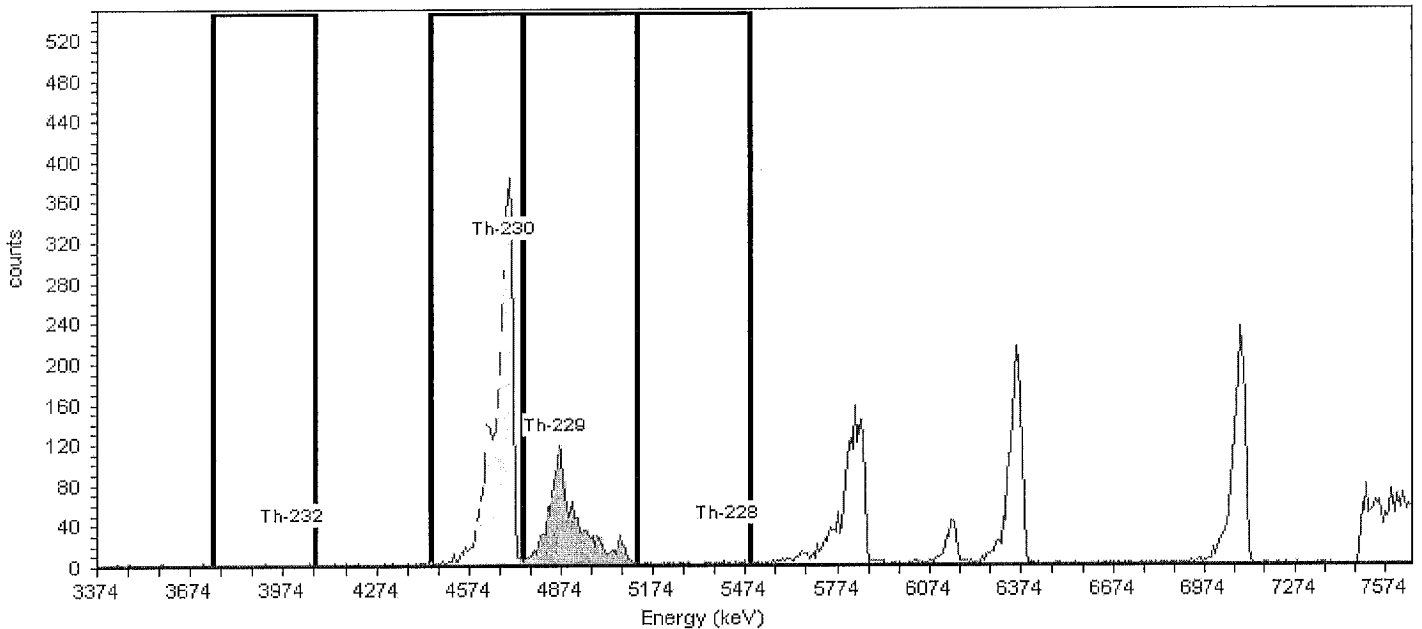
Note: Criteria for reverification of radiological standards is taken from the DOE QSAS and LANL Statements of Work

Reviewed By/Date: Rachel T. Mueller 8/11/2015

SOP Reference: STL-QA-0002, Current Revision

Sample	Spectrum #1 Analysis #1
Sample Name: Verification 1	Sample Volume : 0.1000mL
Sample Type: Sample	Aliquot: N/A Aliquot Fraction: N/A
Sample Collection Date:	
Batch	Analyst: 60040
Batch Name: Th-229_00020	
AnalysisID: 650912	
Tracer	Tracer Nuclide: Th-230
Tracer Name: Th-230_00025	Tracer Recovery: 99.76%
Tracer Activity: 44.56 DPM/mL x (Vol.)0.30 mL = 13.37 DPM	
Tracer Ref. Date: 8/8/2013 12:00:04PM	

Acquisition	Calibration Name: IC-9817;AV115-20150603
Detector: AV115	Calibration Date: 6/4/2015 1:31:22AM
Serial Number: 49-037E4	Gain = 7.4575 keV / Ch
Acquisition Start Date: 8/5/2015 12:04:12PM	Offset = 3,366.95 keV
Live Time: 960.00 min.	Energy Cal: Quadratic = 0.0000 keV / Ch ²
Real Time: 960.02 min.	Efficiency: 25.44% +/- 0.31% TPU(2 sigma)
Background Date: 7/17/2015 12:56:42PM	
Background Info: Sample: ICB;AV115; Det: AV115; Spectrum #1;	
Jul-17-2015 12:56	



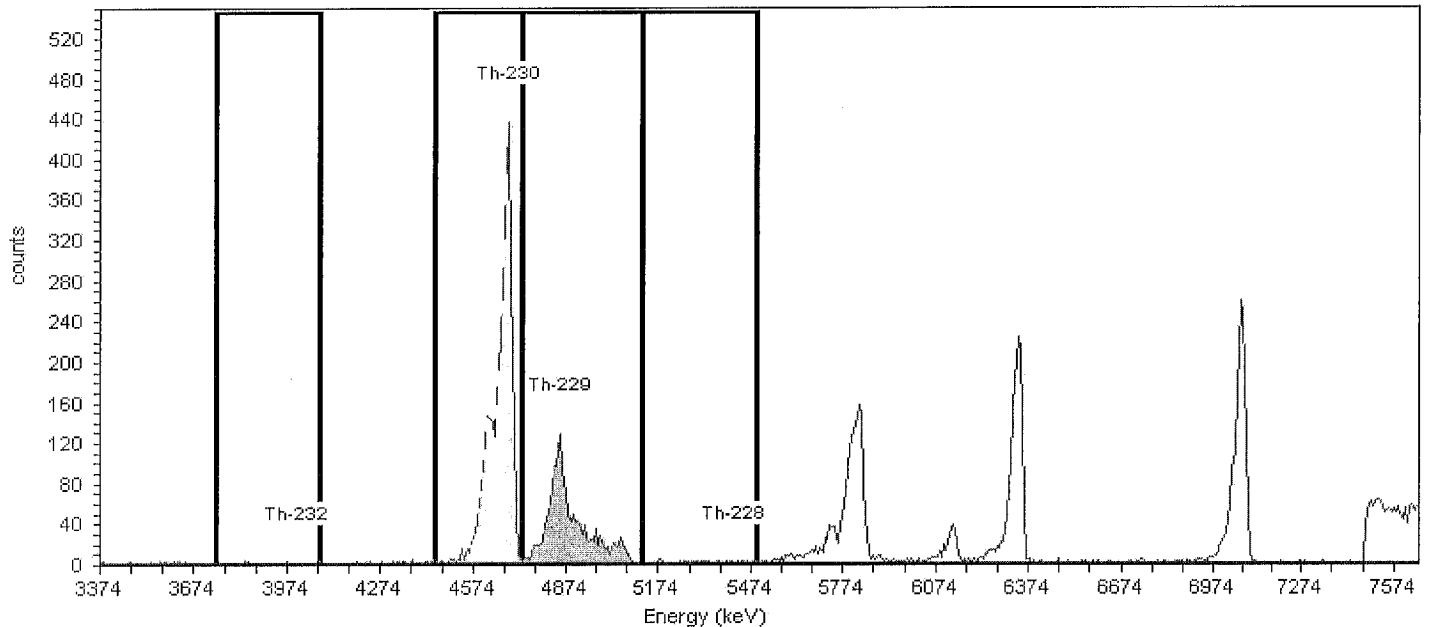
General Analysis	Nuclide Library: Thorium
Analysis Method: Absolute ROI Analysis, Set Name = Th-230_Tracer	MDA Source: Background
Decay Correction: 8/5/2015 12:01:32PM	
MDA Constants: $K\alpha = 1.65$, $K\beta = 1.65$	

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	10.7	100.2	2	3.4586	-1.46	-0.060	DPM/mL
Th-230	4688.0	4,687.5	0.5	4448.3	4746.6	31.9	99.7	3250	2.0000	3248.00	133.370	DPM/mL
Th-229	4848.0	4,845.3	2.7	4746.6	5119.5	75.3	99.8	1624	3.0000	1621.00	66.657	DPM/mL
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	11.0	99.8	28	3.0000	25.15	1.035	DPM/mL

Sample	Sample
Sample Name: Verification 2	Spectrum #1 Analysis #1
Sample Type: Sample	Sample Volume : 0.1000mL
:	Aliquot: N/A Aliquot Fraction: N/A
Sample Collection Date:	
Batch	Batch
Batch Name: Th-229_00020	Analyst: 60040
AnalysisID: 650913	
Tracer	Tracer
Tracer Name: Th-230_00025	Tracer Nuclide: Th-230
Tracer Activity: 44.56 DPM/mL x (Vol.)0.30 mL = 13.37 DPM	Tracer Recovery: 102.76%
Tracer Ref. Date: 8/8/2013 12:00:04PM	

Acquisition	Acquisition
Detector: AV116	Calibration Name: IC-9884;AV116-20150603
Serial Number: 49-034G1	Calibration Date: 6/4/2015 1:31:31AM
Acquisition Start Date: 8/5/2015 12:04:13PM	Gain = 7.4575 keV / Ch
Live Time: 960.00 min.	Offset = 3,366.95 keV
Real Time: 960.02 min.	Energy Cal: Quadratic = 0.0000 keV / Ch ²
Background Date: 7/17/2015 12:56:44PM	Efficiency: 24.86% +/- 0.36% TPU(2 sigma)
Background Info: Sample: ICB;AV116; Det: AV116; Spectrum #1;	
Jul-17-2015 12:56	



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th-230_Tracer	Nuclide Library: Thorium
Decay Correction: 8/5/2015 12:01:32PM	MDA Source: Background
MDA Constants: $K\alpha = 1.65$, $K\beta = 1.65$	

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	44.6	100.2	4	1.0000	2.54	0.103	DPM/mL
Th-230	4688.0	4,687.5	0.5	4448.3	4731.7	40.1	99.7	3272	3.0000	3269.00	137.388	DPM/mL
Th-229	4848.0	4,845.3	2.7	4731.7	5119.5	69.1	99.8	1599	2.0000	1597.00	65.249	DPM/mL
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	.3	99.8	24	4.0000	19.94	0.815	DPM/mL

Sample Name: Verification 3
SampleType: Sample

Sample Collection Date:

Batch Name: Th-229_00020
AnalysisID: 650914

Tracer Name: Th-230_00025
Tracer Activity: 44.56 DPM/mL x (Vol.)0.30 mL = 13.37 DPM
Tracer Ref. Date: 8/8/2013 12:00:04PM

Detector: AV117
Serial Number: 49-037X4
Acquisition Start Date: 8/5/2015 12:04:18PM
Live Time: 960.00 min.
Real Time: 960.02 min.
Background Date: 7/19/2015 5:26:41PM
Background Info: Sample: ICB;AV117; Det: AV117; Spectrum #1;
Jul-19-2015 17:26

Sample

Spectrum #1 Analysis #1
Sample Volume : 0.1000mL
Aliquot: N/A Aliquot Fraction: N/A

Batch

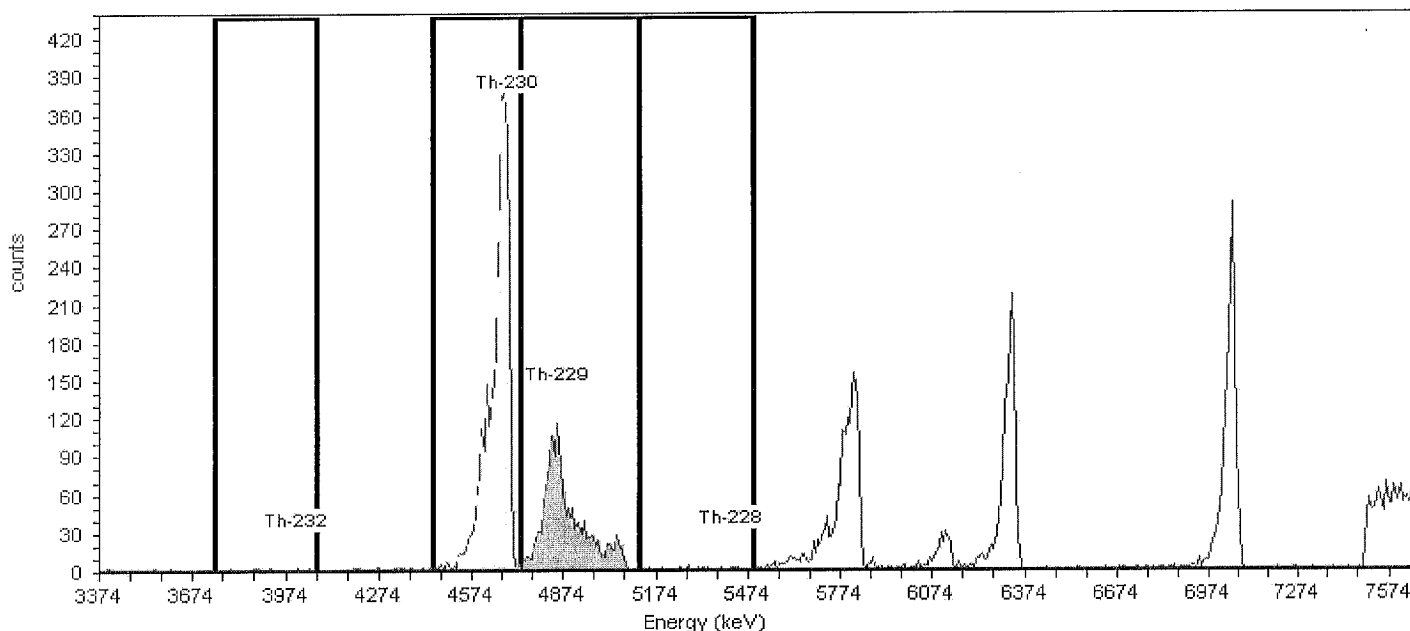
Analyst: 60040

Tracer

Tracer Nuclide: Th-230
Tracer Recovery: 99.73%

Acquisition

Calibration Name: IC-9885;AV117-20150603
Calibration Date: 6/4/2015 1:31:41AM
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Energy Cal: Quadratic = 0.0000 keV / Ch²
Efficiency: 24.89% +/- 0.37% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th-230_Tracer
Decay Correction: 8/5/2015 12:01:32PM
MDA Constants: $K\alpha = 1.65$, $K\beta = 1.65$

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	10.2	100.2	7	1.0000	6.00	0.251	DPM/mL
Th-230	4688.0	4,687.5	0.5	4448.3	4731.7	46.3	99.7	3176	0.0000	3176.00	133.339	DPM/mL
Th-229	4848.0	4,845.3	2.7	4731.7	5119.5	78.5	99.8	1635	0.0000	1635.00	68.757	DPM/mL
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	258.3	99.8	16	2.0866	14.09	0.593	DPM/mL

Th-229 Actinide Prep

Tracer Verification

Batch No.: _____
 Balance ID: _____

Rev. 1: If a sector below is not used, mark the N/A box and initial & date next to the N/A.
 Rev. 2: If a box is not used, mark the N/A box and initial & date next to the N/A.
 Rev. 3: If a box is not used, mark the N/A box and initial & date next to the N/A.

No.	Sample Number	Aliquot (g / mL)	Crucible ID	Dilution
1	VEN 1	0.1	115	
2	VEN 2	1	116	
3	VEN 3	1	117	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				

Tracer N/A _____

Initials / Date: Sub / 8/3/15

Isotope: Th-229

Std Sol'n No.: Th-230-00025

Vol (mL): 0.3

Ref Activity (dpm/mL): _____

Act Ref Date: _____

Verification Signature & Date: NW / 8-3-15

Initials / Date: _____

LCS Standard N/A _____

Initials / Date: _____

Isotope: Th-229-0002 Sub 7/16/15

Std Sol'n ID.: Th-229-00020

Vol (mL): 0.1 Ready to

Ref Activity (dpm/mL): 67.229

Act Ref Date: 08-06-14 66223 Apm

- SOP's applied in preparing these samples. Mark box to left for all that apply:
- ST-RC-0003 Rev.
 - ST-RC-0004 Rev.
 - ST-RC-0014 Rev.
 - ST-RC-0020 Rev.
 - ST-RC-0021 Rev.
 - ST-RC-0040 Rev.
 - ST-RC-0041 Rev.
 - ST-RC-0050 Rev.
 - ST-RC-0090 Rev.
 - ST-RC-0100 Rev.
 - ST-RC-0110 Rev.
 - ST-RC-0120 Rev.
 - ST-RC-0232 Rev.
 - ST-RC-0238 Rev.
 - ST-RC-0240 Rev.
 - ST-RC-0241 Rev.
 - ST-RC-0242 Rev.
 - ST-RC-5016 Rev.

Isotope(s)

<input type="checkbox"/> αβ	<input type="checkbox"/> Iso Pu	<input type="checkbox"/> Tc-99	<input type="checkbox"/> Iso Cm
<input type="checkbox"/> Iso Am	<input type="checkbox"/> Ra	<input checked="" type="checkbox"/> Iso Th	<input type="checkbox"/> Pu-241
<input type="checkbox"/> KPA	<input type="checkbox"/> Sr	<input type="checkbox"/> Iso U	<input type="checkbox"/> Th-229
<input type="checkbox"/> Np	<input type="checkbox"/> TAR	<input type="checkbox"/> C-14	<input type="checkbox"/> Cl-36

Count Time **Matrix**

Long Count Soil

Short Count H₂O

Prepared By: Sub
 Date: 7/16/15

Reviewed by: _____
 Date: _____



Reagent ID: Th-229_00020

Description:	Th-229 Tracer	Expiration Date:	12/24/2015
No. of Bottles:	1	Laboratory:	TestAmerica St. Louis
Storage Location:	RAD Actinide STDs	Prepared By:	Bernsen, Sarah C
Reagent Volume:	500.000 mL	Solvent:	0.1M HNO3
Creation Date:	07/16/2015	Solvent Lot:	n/a
Open Date:			
Container(s):	684059		
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	08/06/2064	2240.98600	dpm/mL	67.22958	dpm/mL
Th-229	Th-229_00017	08/06/2064	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		08/06/64				15.00000	mL

Reagent

TRM-2_00001

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: Minter@aol.com [mailto:Minter@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_00005

St. Louis Radiological Standard Reverification Form

Standard ID Number: Tuna Can LCS_00005 (776670)
True Value = 30.08 pCi/g
Date Analyzed: 10/25/2015

Radionuclide: Gamma LCS Cs-137

	Replicates	
#1	30	pCi/g
#2	29.42	pCi/g
#3	28.95	pCi/g

Mean = 29.45667

1 sigma = 0.525959

1.96 sigma = 1.030881

True Value minus 5% = 28.576
True Value plus 5% = 31.584

(True Value - 5%)
(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 10/29/15

SOP Reference: STL-QA-0002, Current Revision

St. Louis Radiological Standard Reverification Form

Standard ID Number: Tuna Can LCS_00005 (776670)
True Value = 97.23 pCi/g
Date Analyzed: 10/25/2015

Radionuclide:
Gamma LCS Am-241

	Replicates	
#1	96.82	pCi/g
#2	97.14	pCi/g
#3	97.26	pCi/g

Mean = 97.07333

1 sigma = 0.22745

1.96 sigma = 0.445801

True Value minus 5% = 92.3685
True Value plus 5% = 102.0915

(True Value - 5%)
(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 10/29/15

SOP Reference: STL-QA-0002, Current Revision

St. Louis Radiological Standard Reverification Form

Standard ID Number: Tuna Can LCS_00005 (776670)
True Value = 18.6 pCi/g
Date Analyzed: 10/25/2015

Radionuclide: Gamma LCS Co-60

	Replicates	
#1	<u>17.74</u>	pCi/g
#2	<u>18.7</u>	pCi/g
#3	<u>17.74</u>	pCi/g

Mean = 18.06

1 sigma = 0.554256

1.96 sigma = 1.086342

True Value minus 5% = 17.67
True Value plus 5% = 19.53

(True Value - 5%)
(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 10/29/15

SOP Reference: STL-QA-0002, Current Revision

SampID	WRKNO	Aliquot	Sigma	Instrument	Detector	CountDate	Time	CountDuration
LCS 160-217910~2-	LCS	341.90g	1.00	GammaVision	GV01	10 / 25 / 15	16:00	30
Analyte	Compnd#	Activity	TotalUnc	CountUnc	MDA	MLCC	Act/MDA	
AC-228	11136	6.771E-001pCi/g	2.800E-001	2.778E-001	1.003E+000	4.849E-001	0.68	
AG-108M	10982	-6.779E-003pCi/g	1.235E-002	1.235E-002	2.560E-001	1.249E-001	-0.03	
AG-110M	10973	8.663E-003pCi/g	1.112E-001	1.112E-001	3.788E-001	1.830E-001	0.02	
AM-241	10818	9.682E+001pCi/g	5.076E+000	7.243E-001	1.019E+000	5.045E-001	95.00	
BA-133	10469	1.494E-002pCi/g	8.071E-002	8.071E-002	2.729E-001	1.325E-001	0.05	
BA-140	10463	1.374E-001pCi/g	2.240E-001	2.238E-001	7.542E-001	3.638E-001	0.18	
BE-7	10435	0.000E+000pCi/g	3.925E-001	3.925E-001	2.266E+000	1.104E+000	0.00	
BI-207	10195	-2.705E-003pCi/g	5.167E-002	5.167E-002	1.770E-001	8.502E-002	-0.02	
BI-210M	10173	8.461E-002pCi/g	9.172E-002	9.158E-002	3.052E-001	1.486E-001	0.28	
BI-212	10160	5.691E-002pCi/g	6.570E-001	6.570E-001	2.266E+000	1.080E+000	0.03	
BI-214	10154	5.973E-001pCi/g	1.858E-001	1.832E-001	3.511E-001	1.678E-001	1.70	
CD-109	9254	9.357E+000pCi/g	3.288E+000	3.246E+000	3.163E+000	1.546E+000	2.96	
CD-113M	17462	-1.418E+002pCi/g	7.297E+002	7.296E+002	2.462E+003	1.198E+003	-0.06	
CE-139	9241	-3.471E-002pCi/g	4.795E-002	4.783E-002	1.596E-001	7.801E-002	-0.22	
CE-141	9235	1.101E-001pCi/g	6.681E-002	6.657E-002	2.193E-001	1.068E-001	0.50	
CE-144	9221	-1.962E-001pCi/g	3.271E-001	3.269E-001	1.092E+000	5.343E-001	-0.18	
CF-249	9215	-9.471E-002pCi/g	9.312E-002	9.299E-002	3.094E-001	1.508E-001	-0.31	
CF-251	13690	9.783E-002pCi/g	2.187E-001	2.185E-001	7.329E-001	3.576E-001	0.13	
CO-56	8704	-4.255E-002pCi/g	7.343E-002	7.340E-002	2.477E-001	1.193E-001	-0.17	
CO-57	13694	3.299E-002pCi/g	4.336E-002	4.333E-002	1.444E-001	7.069E-002	0.23	
CO-58	8698	-4.234E-003pCi/g	6.516E-002	6.516E-002	2.232E-001	1.072E-001	-0.02	
CO-60	8692	1.774E+001pCi/g	9.138E-001	2.049E-001	6.716E-002	2.728E-002	264.12	
CR-51	8604	3.076E-001pCi/g	4.401E-001	4.398E-001	1.475E+000	7.149E-001	0.21	
CS-134	8553	2.831E-002pCi/g	5.517E-002	5.515E-002	1.867E-001	8.973E-002	0.15	
CS-136	8546	-1.109E-001pCi/g	7.217E-002	7.189E-002	2.373E-001	1.142E-001	-0.47	
CS-137	8539	3.000E+001pCi/g	1.596E+000	3.338E-001	2.346E-001	1.129E-001	127.87	
EU-152	7145	2.877E-001pCi/g	2.421E-001	2.417E-001	6.269E-001	3.045E-001	0.46	
EU-154	7138	1.536E-001pCi/g	1.711E-001	1.709E-001	2.192E+000	1.058E+000	0.07	
EU-155	7131	4.023E-002pCi/g	1.795E-001	1.795E-001	6.019E-001	2.949E-001	0.07	
FE-59	7073	5.086E-002pCi/g	8.161E-002	8.157E-002	4.958E-001	2.382E-001	0.10	
GA-68	18005	-1.209E+000pCi/g	2.759E+000	2.758E+000	9.368E+000	4.493E+000	-0.13	
GD-153	6824	-3.997E-003pCi/g	1.316E-001	1.316E-001	4.420E-001	2.167E-001	-0.01	
HF-181	6495	9.445E-002pCi/g	6.542E-002	6.524E-002	2.322E-001	1.124E-001	0.41	
HG-203	6466	-3.305E-002pCi/g	5.989E-002	5.986E-002	2.006E-001	9.778E-002	-0.16	
I-131	6380	6.854E-002pCi/g	6.647E-002	6.638E-002	2.080E-001	1.010E-001	0.33	
IR-192	6303	-3.750E-002pCi/g	5.981E-002	5.977E-002	2.001E-001	9.748E-002	-0.19	
K-40	6148	-1.766E-002pCi/g	3.281E-001	3.281E-001	1.273E+000	5.734E-001	-0.01	
LA-140	6096	5.379E-002pCi/g	4.255E-002	4.246E-002	1.212E-001	5.304E-002	0.44	
MN-54	5382	3.726E-002pCi/g	6.608E-002	6.605E-002	2.235E-001	1.073E-001	0.17	
NA-22	5201	2.193E-002pCi/g	3.156E-002	3.154E-002	1.109E-001	4.933E-002	0.20	
NB-94	5160	-7.036E-002pCi/g	5.947E-002	5.936E-002	1.977E-001	9.485E-002	-0.36	
NB-95	5154	3.994E-002pCi/g	5.496E-002	5.493E-002	1.856E-001	8.861E-002	0.22	
ND-147	5083	-4.022E-002pCi/g	4.368E-001	4.368E-001	1.486E+000	7.183E-001	-0.03	
NP-237	4757	-4.170E-001pCi/g	3.829E-001	3.821E-001	1.266E+000	6.228E-001	-0.33	
NP-239	4751	-3.998E-004pCi/g	1.579E-001	1.579E-001	5.314E-001	2.601E-001	0.00	
PA-231	4541	1.362E+000pCi/g	8.851E-001	8.820E-001	4.992E+000	2.420E+000	0.27	
PA-233	4535	1.538E-001pCi/g	1.053E-001	1.050E-001	4.596E-001	2.236E-001	0.33	
PA-234	4528	-1.000E-001pCi/g	2.035E-001	2.034E-001	6.804E-001	3.330E-001	-0.15	
PA-234M	19453	-4.676E-001pCi/g	9.603E+000	9.603E+000	3.283E+001	1.580E+001	-0.01	
PB-210	4467	8.549E+002pCi/g	5.089E+001	8.359E+000	1.428E+001	7.079E+000	59.88	

PB-212	4454	3.866E-001pCi/g	1.254E-001	1.229E-001	3.210E-001	1.563E-001	1.20
PB-214	4448	3.785E-001pCi/g	1.361E-001	1.347E-001	4.828E-001	2.350E-001	0.78
PM-144	19585	4.119E-002pCi/g	3.554E-002	3.548E-002	1.884E-001	9.023E-002	0.22
PM-146	2464	3.014E-002pCi/g	1.161E-001	1.161E-001	5.435E-001	2.596E-001	0.06
RH-106	1882	-2.180E-001pCi/g	1.994E-001	1.991E-001	2.012E+000	9.694E-001	-0.11
RU-103	1828	0.000E+000pCi/g	5.216E-002	5.216E-002	2.468E-001	1.200E-001	0.00
SB-124	1784	4.494E-003pCi/g	5.524E-002	5.524E-002	1.889E-001	9.084E-002	0.02
SB-125	1777	2.356E-001pCi/g	2.342E-001	2.338E-001	7.180E-001	3.497E-001	0.33
SC-46	1739	9.344E-002pCi/g	5.627E-002	5.606E-002	2.546E-001	1.226E-001	0.37
SN-113	1570	-5.143E-002pCi/g	9.312E-002	9.309E-002	3.121E-001	1.520E-001	-0.16
SN-126	17459	5.835E-002pCi/g	5.783E-001	5.783E-001	1.938E+000	9.517E-001	0.03
TA-182	1301	1.840E-003pCi/g	2.175E-001	2.175E-001	7.482E-001	3.582E-001	0.00
TC-99M	17412	2.645E-002pCi/g	4.239E-002	4.236E-002	1.415E-001	6.920E-002	0.19
TH-227	1058	2.617E+000pCi/g	1.856E+000	1.850E+000	6.105E+000	3.024E+000	0.43
TH-229	1046	9.577E-002pCi/g	1.073E-001	1.070E-001	3.470E+000	1.699E+000	0.03
TH-234	1027	7.930E-002pCi/g	7.788E-002	7.777E-002	5.067E+000	2.489E+000	0.02
TL-208	929	1.848E-001pCi/g	8.785E-002	8.733E-002	2.310E-001	1.114E-001	0.80
U-235	281	8.439E-002pCi/g	1.008E-001	1.007E-001	9.972E-001	4.863E-001	0.08
Y-88	74	-2.520E-002pCi/g	8.904E-002	8.903E-002	3.017E-001	1.458E-001	-0.08
ZN-65	31	-9.888E-002pCi/g	1.701E-001	1.700E-001	5.742E-001	2.762E-001	-0.17
ZR-95	7	8.948E-002pCi/g	8.129E-002	8.116E-002	3.492E-001	1.669E-001	0.26

Laboratory Control Sample Information

Sample ID	WRKNO	Analyte	Activity	StdAdded	Recovery	ZFactor
LCS 160-217910~2-A	LCS 160-217910~2-A	CS-137	3.000E+001 pCi/g	3.008E+001	99.72%	-0.0379
		CO-60	1.774E+001 pCi/g	1.860E+001	95.37%	-0.6506
		AM-241	9.682E+001 pCi/g	9.723E+001	99.58%	-0.0565

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Samp Activity	Dup Activity	RPD	RER	DER	Flag	ZFactor
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Blanks Information

<u>SampID</u>	<u>WRKNO</u>	<u>Analyte</u>	<u>Activity</u>	<u>UncTotal</u>	<u>ZFactor</u>
MB 160-217910~1-A	MB	AC-228	4.303E-002	4.671E-002	0.9214
MB 160-217910~1-A	MB	AG-108M	5.251E-003	5.684E-003	0.9238
MB 160-217910~1-A	MB	AG-110M	-1.714E-002	2.621E-002	-0.6542
MB 160-217910~1-A	MB	AM-241	-1.074E-002	2.656E-002	-0.4043
MB 160-217910~1-A	MB	BA-133	8.629E-003	1.742E-002	0.4954
MB 160-217910~1-A	MB	BA-140	1.558E-002	5.153E-002	0.3023
MB 160-217910~1-A	MB	BE-7	2.157E-003	9.785E-002	0.0220
MB 160-217910~1-A	MB	BI-207	1.116E-002	1.404E-002	0.7947
MB 160-217910~1-A	MB	BI-210M	1.161E-002	2.003E-002	0.5795
MB 160-217910~1-A	MB	BI-212	-6.519E-004	1.749E-001	-0.0037
MB 160-217910~1-A	MB	BI-214	-3.620E-002	1.629E-001	-0.2222
MB 160-217910~1-A	MB	CD-109	1.434E-001	1.674E-001	0.8566
MB 160-217910~1-A	MB	CD-113M	0.000E+000	1.045E+002	0.0000
MB 160-217910~1-A	MB	CE-139	1.578E-003	8.340E-003	0.1892
MB 160-217910~1-A	MB	CE-141	1.422E-002	1.284E-002	1.1075
MB 160-217910~1-A	MB	CE-144	4.109E-002	5.187E-002	0.7922
MB 160-217910~1-A	MB	CF-249	-5.027E-003	1.126E-002	-0.4467
MB 160-217910~1-A	MB	CF-251	4.859E-003	5.226E-002	0.0930
MB 160-217910~1-A	MB	CO-56	8.053E-003	1.466E-002	0.5492
MB 160-217910~1-A	MB	CO-57	0.000E+000	3.213E-003	0.0000
MB 160-217910~1-A	MB	CO-58	0.000E+000	1.250E-002	0.0000
MB 160-217910~1-A	MB	CO-60	-1.064E-002	2.053E-002	-0.5180
MB 160-217910~1-A	MB	CR-51	1.172E-001	6.390E-002	1.8350
MB 160-217910~1-A	MB	CS-134	9.570E-003	1.221E-002	0.7837
MB 160-217910~1-A	MB	CS-136	3.486E-003	1.564E-002	0.2228
MB 160-217910~1-A	MB	CS-137	9.350E-003	1.111E-002	0.8412
MB 160-217910~1-A	MB	EU-152	2.175E-002	4.360E-002	0.4989
MB 160-217910~1-A	MB	EU-154	4.973E-002	3.892E-002	1.2779
MB 160-217910~1-A	MB	EU-155	1.249E-002	1.540E-002	0.8106
MB 160-217910~1-A	MB	FE-59	1.620E-002	2.388E-002	0.6781
MB 160-217910~1-A	MB	GA-68	0.000E+000	1.259E-001	0.0000
MB 160-217910~1-A	MB	GD-153	-7.436E-003	2.145E-002	-0.3466
MB 160-217910~1-A	MB	HF-181	3.207E-003	4.689E-003	0.6839
MB 160-217910~1-A	MB	HG-203	-1.192E-003	1.116E-002	-0.1067
MB 160-217910~1-A	MB	I-131	2.131E-002	1.517E-002	1.4047
MB 160-217910~1-A	MB	IR-192	1.091E-003	6.973E-003	0.1565
MB 160-217910~1-A	MB	K-40	-4.508E-001	8.911E+000	-0.0506
MB 160-217910~1-A	MB	LA-140	0.000E+000	5.961E-003	0.0000
MB 160-217910~1-A	MB	MN-54	-1.135E-002	1.784E-002	-0.6362
MB 160-217910~1-A	MB	NA-22	0.000E+000	4.741E-003	0.0000
MB 160-217910~1-A	MB	NB-94	2.773E-004	1.092E-002	0.0254
MB 160-217910~1-A	MB	NB-95	7.816E-004	1.302E-002	0.0600
MB 160-217910~1-A	MB	ND-147	4.997E-002	8.625E-002	0.5794
MB 160-217910~1-A	MB	NP-237	1.411E-002	3.697E-002	0.3816
MB 160-217910~1-A	MB	NP-239	1.903E-002	2.441E-002	0.7798
MB 160-217910~1-A	MB	PA-231	5.945E-002	5.603E-002	1.0610
MB 160-217910~1-A	MB	PA-233	2.561E-002	2.422E-002	1.0574
MB 160-217910~1-A	MB	PA-234	2.390E-002	2.381E-002	1.0038
MB 160-217910~1-A	MB	PA-234M	-1.176E+000	2.117E+000	-0.5557
MB 160-217910~1-A	MB	PB-210	0.000E+000	1.332E-001	0.0000
MB 160-217910~1-A	MB	PB-212	0.000E+000	1.627E-002	0.0000
MB 160-217910~1-A	MB	PB-214	5.054E-002	1.994E-002	2.5345

MB 160-217910~1-A	MB	PM-144	7.657E-003	1.530E-002	0.5006
MB 160-217910~1-A	MB	PM-146	-3.061E-002	4.827E-002	-0.6342
MB 160-217910~1-A	MB	RA-226	-8.578E-002	2.376E-001	-0.3610
MB 160-217910~1-A	MB	RH-106	-3.627E-003	1.343E-001	-0.0270
MB 160-217910~1-A	MB	RU-103	-4.735E-003	1.118E-002	-0.4237
MB 160-217910~1-A	MB	SB-124	4.616E-003	1.522E-002	0.3032
MB 160-217910~1-A	MB	SB-125	1.047E-002	2.186E-002	0.4787
MB 160-217910~1-A	MB	SC-46	0.000E+000	7.139E-003	0.0000
MB 160-217910~1-A	MB	SN-113	6.694E-003	1.727E-002	0.3875
MB 160-217910~1-A	MB	SN-126	9.094E-003	7.322E-002	0.1242
MB 160-217910~1-A	MB	TA-182	9.043E-003	1.445E-002	0.6258
MB 160-217910~1-A	MB	TC-99M	-1.255E-003	8.033E-003	-0.1562
MB 160-217910~1-A	MB	TH-227	5.670E-003	1.499E-001	0.0378
MB 160-217910~1-A	MB	TH-229	-7.369E-002	1.885E-001	-0.3910
MB 160-217910~1-A	MB	TH-234	1.446E-002	1.018E-001	0.1420
MB 160-217910~1-A	MB	TL-208	1.346E-002	1.077E-002	1.2495
MB 160-217910~1-A	MB	U-235	7.507E-002	5.910E-002	1.2704
MB 160-217910~1-A	MB	Y-88	0.000E+000	3.838E-003	0.0000
MB 160-217910~1-A	MB	ZN-65	-1.025E-002	3.666E-002	-0.2797
MB 160-217910~1-A	MB	ZR-95	3.371E-003	1.189E-002	0.2836

SampID	WRKNO	Aliquot	Sigma	Instrument	Detector	CountDate	Time	CountDuration
LCS 160-218441~2-	LCS	341.90g	1.00	GammaVision	GV08	10 / 27 / 15	15:25	30
Analyte	Cmpnd#	Activity	TotalUnc	CountUnc	MDA	MLCC	Act/MDA	
AC-228	11136	7.359E-002pCi/g	1.183E-001	1.183E-001	1.351E+000	6.534E-001	0.05	
AG-108M	10982	-1.250E-001pCi/g	9.830E-002	9.810E-002	3.249E-001	1.586E-001	-0.38	
AG-110M	10973	-2.165E-001pCi/g	1.350E-001	1.346E-001	4.435E-001	2.131E-001	-0.49	
AM-241	10818	9.714E+001pCi/g	5.131E+000	9.547E-001	1.461E+000	7.246E-001	66.50	
BA-133	10469	-1.434E-001pCi/g	1.166E-001	1.163E-001	3.856E-001	1.880E-001	-0.37	
BA-140	10463	3.008E-001pCi/g	3.866E-001	3.863E-001	8.898E-001	4.279E-001	0.34	
BE-7	10435	1.764E-001pCi/g	8.364E-001	8.364E-001	2.818E+000	1.373E+000	0.06	
BI-207	10195	-3.983E-002pCi/g	7.303E-002	7.300E-002	2.465E-001	1.188E-001	-0.16	
BI-210M	10173	4.829E-002pCi/g	6.207E-002	6.201E-002	3.950E-001	1.928E-001	0.12	
BI-212	10160	1.191E+000pCi/g	9.269E-001	9.248E-001	3.076E+000	1.467E+000	0.39	
BI-214	10154	1.600E-001pCi/g	1.464E-001	1.462E-001	4.902E-001	2.351E-001	0.33	
CD-109	9254	2.361E+000pCi/g	4.441E+000	4.439E+000	4.063E+000	1.992E+000	0.58	
CD-113M	17462	-3.716E+001pCi/g	9.021E+002	9.021E+002	3.049E+003	1.485E+003	-0.01	
CE-139	9241	3.182E-002pCi/g	5.820E-002	5.812E-002	1.942E-001	9.506E-002	0.16	
CE-141	9235	4.980E-002pCi/g	8.364E-002	8.361E-002	2.795E-001	1.366E-001	0.18	
CE-144	9221	2.569E-002pCi/g	4.004E-001	4.004E-001	1.345E+000	6.591E-001	0.02	
CF-249	9215	5.942E-002pCi/g	1.163E-001	1.162E-001	3.177E-001	1.540E-001	0.19	
CF-251	13690	3.966E-001pCi/g	2.757E-001	2.735E-001	9.033E-001	4.415E-001	0.44	
CO-56	8704	8.557E-002pCi/g	8.063E-002	8.051E-002	2.695E-001	1.287E-001	0.32	
CO-57	13694	3.076E-002pCi/g	5.134E-002	5.131E-002	1.712E-001	8.393E-002	0.18	
CO-58	8698	1.346E-002pCi/g	8.405E-002	8.405E-002	2.875E-001	1.379E-001	0.05	
CO-60	8692	1.870E+001pCi/g	1.007E+000	3.639E-001	1.870E-001	8.459E-002	100.02	
CR-51	8604	-4.740E-001pCi/g	6.167E-001	6.162E-001	2.059E+000	1.002E+000	-0.23	
CS-134	8553	9.391E-002pCi/g	6.368E-002	6.349E-002	1.526E-001	7.164E-002	0.62	
CS-136	8546	3.304E-002pCi/g	3.799E-002	3.794E-002	3.085E-001	1.484E-001	0.11	
CS-137	8539	2.942E+001pCi/g	1.582E+000	3.998E-001	3.497E-001	1.691E-001	84.15	
EU-152	7145	1.912E-001pCi/g	2.554E-001	2.552E-001	8.302E-001	4.042E-001	0.23	
EU-154	7138	6.956E-002pCi/g	1.146E-001	1.146E-001	2.351E+000	1.125E+000	0.03	
EU-155	7131	2.888E-002pCi/g	2.199E-001	2.199E-001	7.370E-001	3.618E-001	0.04	
FE-59	7073	-1.833E-001pCi/g	1.818E-001	1.815E-001	6.083E-001	2.908E-001	-0.30	
GA-68	18005	4.764E+000pCi/g	2.454E+000	2.440E+000	7.914E+000	3.694E+000	0.60	
GD-153	6824	7.978E-002pCi/g	1.552E-001	1.551E-001	5.177E-001	2.540E-001	0.15	
HF-181	6495	2.335E-002pCi/g	1.043E-001	1.043E-001	3.518E-001	1.712E-001	0.07	
HG-203	6466	6.698E-003pCi/g	6.497E-002	6.497E-002	2.197E-001	1.068E-001	0.03	
I-131	6380	-1.610E-002pCi/g	8.500E-002	8.500E-002	2.866E-001	1.396E-001	-0.06	
IR-192	6303	1.018E-001pCi/g	9.042E-002	9.022E-002	2.283E-001	1.111E-001	0.45	
K-40	6148	1.623E-001pCi/g	3.950E-001	3.949E-001	1.502E+000	6.607E-001	0.11	
LA-140	6096	6.191E-003pCi/g	4.179E-002	4.179E-002	5.946E-002	1.880E-002	0.10	
MN-54	5382	1.822E-002pCi/g	9.095E-002	9.094E-002	3.102E-001	1.491E-001	0.06	
NA-22	5201	1.507E-002pCi/g	4.555E-002	4.554E-002	1.637E-001	7.329E-002	0.09	
NB-94	5160	6.019E-002pCi/g	3.912E-002	3.899E-002	2.572E-001	1.233E-001	0.23	
NB-95	5154	2.541E-002pCi/g	7.560E-002	7.559E-002	2.579E-001	1.234E-001	0.10	
ND-147	5083	4.071E-001pCi/g	4.877E-001	4.871E-001	1.636E+000	7.863E-001	0.25	
NP-237	4757	0.000E+000pCi/g	4.510E-001	4.510E-001	1.509E+000	7.430E-001	0.00	
NP-239	4751	-1.622E-002pCi/g	2.061E-001	2.061E-001	6.910E-001	3.393E-001	-0.02	
PA-231	4541	-2.797E-001pCi/g	6.016E-001	6.014E-001	7.388E+000	3.603E+000	-0.04	
PA-233	4535	1.354E-001pCi/g	2.200E-001	2.199E-001	5.917E-001	2.884E-001	0.23	
PA-234	4528	2.370E-002pCi/g	7.301E-002	7.300E-002	8.496E-001	4.166E-001	0.03	
PA-234M	19453	2.685E+000pCi/g	3.731E+000	3.729E+000	3.935E+001	1.884E+001	0.07	
PB-210	4467	8.385E+002pCi/g	5.067E+001	1.196E+001	2.132E+001	1.059E+001	39.34	

PB-212	4454	2.569E-001pCi/g	1.484E-001	1.475E-001	4.865E-001	2.382E-001	0.53
PB-214	4448	-1.187E-001pCi/g	2.062E-001	2.061E-001	4.941E-001	2.392E-001	-0.24
PM-144	19585	-1.104E-002pCi/g	1.584E-002	1.583E-002	2.412E-001	1.154E-001	-0.05
PM-146	2464	1.016E-001pCi/g	1.134E-001	1.133E-001	6.877E-001	3.278E-001	0.15
RH-106	1882	9.849E-001pCi/g	7.318E-001	7.301E-001	1.785E+000	8.453E-001	0.55
RU-103	1828	-7.826E-003pCi/g	8.182E-002	8.182E-002	2.777E-001	1.346E-001	-0.03
SB-124	1784	1.264E-001pCi/g	7.595E-002	7.567E-002	1.582E-001	7.445E-002	0.80
SB-125	1777	2.237E-001pCi/g	1.965E-001	1.962E-001	9.608E-001	4.688E-001	0.23
SC-46	1739	6.651E-002pCi/g	9.525E-002	9.519E-002	3.209E-001	1.541E-001	0.21
SN-113	1570	2.166E-002pCi/g	1.160E-001	1.160E-001	3.912E-001	1.906E-001	0.06
SN-126	17459	-6.991E+000pCi/g	1.044E+000	9.772E-001	3.085E+000	1.523E+000	-2.27
TA-182	1301	2.287E-001pCi/g	2.419E-001	2.416E-001	9.149E-001	4.354E-001	0.25
TC-99M	17412	-3.499E-002pCi/g	5.302E-002	5.298E-002	1.767E-001	8.659E-002	-0.20
TH-227	1058	-3.701E+001pCi/g	4.063E+000	3.522E+000	1.124E+001	5.589E+000	-3.29
TH-229	1046	-1.190E+000pCi/g	1.295E+000	1.291E+000	4.291E+000	2.104E+000	-0.28
TH-234	1027	-5.199E+001pCi/g	5.252E+000	4.493E+000	1.365E+001	6.775E+000	-3.81
TL-208	929	1.496E-001pCi/g	8.481E-002	8.445E-002	2.772E-001	1.334E-001	0.54
U-235	281	-6.184E-002pCi/g	1.918E+001	1.918E+001	1.442E+000	7.072E-001	-0.04
Y-88	74	-1.169E-001pCi/g	1.223E-001	1.221E-001	4.080E-001	1.972E-001	-0.29
ZN-65	31	-6.060E-002pCi/g	2.169E-001	2.169E-001	7.398E-001	3.548E-001	-0.08
ZR-95	7	1.074E-001pCi/g	1.365E-001	1.364E-001	4.600E-001	2.199E-001	0.23

Laboratory Control Sample Information

Sample ID	WRKNO	Analyte	Activity	StdAdded	Recovery	ZFactor
LCS 160-218441~2-A	LCS 160-218441~2-A	CS-137	2.942E+001 pCi/g	3.008E+001	97.82%	-0.2899
		CO-60	1.870E+001 pCi/g	1.859E+001	100.64%	0.0836
		AM-241	9.714E+001 pCi/g	9.723E+001	99.92%	-0.0112

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Samp Activity	Dup Activity	RPD	RER	DER	Flag	ZFactor
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Blanks Information

<u>SampleID</u>	<u>WRKNO</u>	<u>Analyte</u>	<u>Activity</u>	<u>UncTotal</u>	<u>ZFactor</u>
MB 160-218441~1-A	MB	AC-228	3.987E-002	4.560E-002	0.8743
MB 160-218441~1-A	MB	AG-108M	5.451E-003	8.527E-003	0.6393
MB 160-218441~1-A	MB	AG-110M	-1.473E-002	2.625E-002	-0.5612
MB 160-218441~1-A	MB	AM-241	-1.477E-002	2.928E-002	-0.5047
MB 160-218441~1-A	MB	BA-133	3.407E-003	1.959E-002	0.1740
MB 160-218441~1-A	MB	BA-140	6.525E-002	6.139E-002	1.0630
MB 160-218441~1-A	MB	BE-7	0.000E+000	6.035E-002	0.0000
MB 160-218441~1-A	MB	BI-207	8.121E-003	1.544E-002	0.5258
MB 160-218441~1-A	MB	BI-210M	1.934E-002	1.581E-002	1.2233
MB 160-218441~1-A	MB	BI-212	0.000E+000	1.856E-001	0.0000
MB 160-218441~1-A	MB	BI-214	-1.133E-002	5.880E-002	-0.1926
MB 160-218441~1-A	MB	CD-109	9.453E-002	2.288E-001	0.4132
MB 160-218441~1-A	MB	CD-113M	-1.366E+002	2.218E+002	-0.6159
MB 160-218441~1-A	MB	CE-139	-3.140E-003	9.986E-003	-0.3145
MB 160-218441~1-A	MB	CE-141	-6.169E-003	1.570E-002	-0.3929
MB 160-218441~1-A	MB	CE-144	4.904E-003	4.662E-002	0.1052
MB 160-218441~1-A	MB	CF-249	8.754E-003	1.572E-002	0.5569
MB 160-218441~1-A	MB	CF-251	-2.594E-002	5.279E-002	-0.4914
MB 160-218441~1-A	MB	CO-56	-6.736E-003	1.135E-002	-0.5936
MB 160-218441~1-A	MB	CO-57	4.406E-003	9.298E-003	0.4738
MB 160-218441~1-A	MB	CO-58	1.276E-002	1.914E-002	0.6662
MB 160-218441~1-A	MB	CO-60	-3.371E-003	2.082E-002	-0.1619
MB 160-218441~1-A	MB	CR-51	6.564E-002	1.182E-001	0.5552
MB 160-218441~1-A	MB	CS-134	-7.518E-004	1.083E-003	-0.6945
MB 160-218441~1-A	MB	CS-136	0.000E+000	5.399E-003	0.0000
MB 160-218441~1-A	MB	CS-137	1.650E-002	1.844E-002	0.8946
MB 160-218441~1-A	MB	EU-152	-8.619E-004	1.441E-003	-0.5979
MB 160-218441~1-A	MB	EU-154	1.149E-001	1.445E-001	0.7954
MB 160-218441~1-A	MB	EU-155	-2.026E-002	3.719E-002	-0.5447
MB 160-218441~1-A	MB	FE-59	9.255E-003	1.826E-002	0.5070
MB 160-218441~1-A	MB	GA-68	0.000E+000	1.430E-001	0.0000
MB 160-218441~1-A	MB	GD-153	-2.088E-002	3.165E-002	-0.6598
MB 160-218441~1-A	MB	HF-181	-1.476E-003	1.865E-003	-0.7914
MB 160-218441~1-A	MB	HG-203	1.656E-002	9.732E-003	1.7013
MB 160-218441~1-A	MB	I-131	6.142E-003	2.344E-002	0.2620
MB 160-218441~1-A	MB	IR-192	3.418E-003	1.317E-002	0.2595
MB 160-218441~1-A	MB	K-40	-6.451E-001	1.290E+001	-0.0500
MB 160-218441~1-A	MB	LA-140	2.528E-003	2.485E-002	0.1017
MB 160-218441~1-A	MB	MN-54	-2.351E-003	1.657E-002	-0.1419
MB 160-218441~1-A	MB	NA-22	0.000E+000	5.287E-003	0.0000
MB 160-218441~1-A	MB	NB-94	1.400E-003	7.442E-003	0.1881
MB 160-218441~1-A	MB	NB-95	-2.221E-003	1.672E-002	-0.1328
MB 160-218441~1-A	MB	ND-147	2.932E-002	2.819E-002	1.0401
MB 160-218441~1-A	MB	NP-237	-1.201E-002	7.433E-002	-0.1615
MB 160-218441~1-A	MB	NP-239	4.366E-002	2.736E-002	1.5962
MB 160-218441~1-A	MB	PA-231	3.079E-001	2.831E-001	1.0876
MB 160-218441~1-A	MB	PA-233	2.077E-002	3.041E-002	0.6831
MB 160-218441~1-A	MB	PA-234	5.537E-002	5.645E-002	0.9808
MB 160-218441~1-A	MB	PA-234M	-7.028E-001	1.816E+000	-0.3870
MB 160-218441~1-A	MB	PB-210	4.463E-001	4.306E-001	1.0364
MB 160-218441~1-A	MB	PB-212	4.711E-003	2.788E-002	0.1690
MB 160-218441~1-A	MB	PB-214	4.377E-002	3.189E-002	1.3727

MB 160-218441~1-A	MB	PM-144	9.554E-004	6.357E-003	0.1503
MB 160-218441~1-A	MB	PM-146	-3.544E-002	4.841E-002	-0.7319
MB 160-218441~1-A	MB	RH-106	4.655E-002	1.634E-001	0.2849
MB 160-218441~1-A	MB	RU-103	6.210E-003	1.531E-002	0.4057
MB 160-218441~1-A	MB	SB-124	-1.006E-002	1.857E-002	-0.5418
MB 160-218441~1-A	MB	SB-125	1.305E-003	4.143E-003	0.3151
MB 160-218441~1-A	MB	SC-46	-1.594E-004	1.758E-002	-0.0091
MB 160-218441~1-A	MB	SN-113	3.684E-002	1.998E-002	1.8437
MB 160-218441~1-A	MB	SN-126	2.933E-001	1.237E-001	2.3710
MB 160-218441~1-A	MB	TA-182	2.383E-002	4.528E-002	0.5262
MB 160-218441~1-A	MB	TC-99M	3.169E-003	8.389E-003	0.3778
MB 160-218441~1-A	MB	TH-227	2.179E-001	1.503E-001	1.4498
MB 160-218441~1-A	MB	TH-229	-9.602E-002	2.482E-001	-0.3868
MB 160-218441~1-A	MB	TH-234	-6.219E-001	8.472E-001	-0.7341
MB 160-218441~1-A	MB	TL-208	1.433E-002	2.289E-002	0.6260
MB 160-218441~1-A	MB	U-235	1.116E-001	8.413E-002	1.3268
MB 160-218441~1-A	MB	Y-88	0.000E+000	6.164E-003	0.0000
MB 160-218441~1-A	MB	ZN-65	0.000E+000	9.463E-003	0.0000
MB 160-218441~1-A	MB	ZR-95	-8.939E-004	1.210E-003	-0.7385

SampID	WRKNO	Aliquot	Sigma	Instrument	Detector	CountDate	Time	CountDuration
LCS 160-218442~2-	LCS	341.90g	1.00	GammaVision	GV09	10 / 27 / 15	14:09	30
Analyte	Cmpnd#	Activity	TotalUnc	CountUnc	MDA	MLCC	Act/MDA	
AC-228	11136	5.980E-001pCi/g	2.506E-001	2.488E-001	1.014E+000	4.923E-001	0.59	
AG-108M	10982	6.362E-006pCi/g	7.135E-002	7.135E-002	2.404E-001	1.175E-001	0.00	
AG-110M	10973	-4.015E-003pCi/g	1.009E-001	1.009E-001	3.435E-001	1.661E-001	-0.01	
AM-241	10818	9.726E+001pCi/g	5.101E+000	7.368E-001	1.053E+000	5.222E-001	92.32	
BA-133	10469	8.644E-004pCi/g	8.695E-002	8.695E-002	2.932E-001	1.432E-001	0.00	
BA-140	10463	2.814E-001pCi/g	2.308E-001	2.303E-001	7.647E-001	3.708E-001	0.37	
BE-7	10435	5.425E-001pCi/g	6.400E-001	6.394E-001	2.131E+000	1.041E+000	0.25	
BI-207	10195	-2.984E-002pCi/g	5.728E-002	5.726E-002	1.928E-001	9.338E-002	-0.15	
BI-210M	10173	2.463E-002pCi/g	9.686E-002	9.684E-002	3.249E-001	1.590E-001	0.08	
BI-212	10160	4.340E-001pCi/g	7.169E-001	7.165E-001	2.420E+000	1.163E+000	0.18	
BI-214	10154	8.273E-001pCi/g	1.845E-001	1.794E-001	3.533E-001	1.700E-001	2.34	
CD-109	9254	5.485E+000pCi/g	3.401E+000	3.387E+000	3.143E+000	1.540E+000	1.75	
CD-113M	17462	8.114E+000pCi/g	7.905E+002	7.905E+002	2.661E+003	1.302E+003	0.00	
CE-139	9241	-3.089E-002pCi/g	5.178E-002	5.170E-002	1.723E-001	8.460E-002	-0.18	
CE-141	9235	-3.579E-003pCi/g	6.317E-002	6.317E-002	2.129E-001	1.040E-001	-0.02	
CE-144	9221	1.068E-001pCi/g	3.278E-001	3.277E-001	1.096E+000	5.379E-001	0.10	
CF-249	9215	1.007E-001pCi/g	1.004E-001	1.002E-001	2.876E-001	1.404E-001	0.35	
CF-251	13690	-2.639E-001pCi/g	2.511E-001	2.500E-001	8.293E-001	4.069E-001	-0.32	
CO-56	8704	1.134E-001pCi/g	8.881E-002	8.861E-002	2.341E-001	1.131E-001	0.48	
CO-57	13694	5.717E-003pCi/g	4.406E-002	4.406E-002	1.476E-001	7.249E-002	0.04	
CO-58	8698	5.129E-002pCi/g	6.155E-002	6.150E-002	2.064E-001	9.935E-002	0.25	
CO-60	8692	1.774E+001pCi/g	9.122E-001	1.984E-001	9.851E-002	4.359E-002	180.05	
CR-51	8604	-2.572E-002pCi/g	5.332E-001	5.332E-001	1.795E+000	8.779E-001	-0.01	
CS-134	8553	5.920E-002pCi/g	4.059E-002	4.047E-002	2.764E-001	1.350E-001	0.21	
CS-136	8546	4.051E-002pCi/g	4.705E-002	4.700E-002	1.989E-001	9.561E-002	0.20	
CS-137	8539	2.895E+001pCi/g	1.537E+000	3.066E-001	2.184E-001	1.053E-001	132.57	
EU-152	7145	1.210E-001pCi/g	1.140E-001	1.138E-001	6.662E-001	3.254E-001	0.18	
EU-154	7138	1.536E-001pCi/g	2.903E-001	2.902E-001	2.035E+000	9.844E-001	0.08	
EU-155	7131	-2.215E-001pCi/g	1.885E-001	1.881E-001	6.227E-001	3.061E-001	-0.36	
FE-59	7073	-2.347E-001pCi/g	1.656E-001	1.651E-001	5.463E-001	2.646E-001	-0.43	
GA-68	18005	-1.959E+000pCi/g	2.934E+000	2.932E+000	9.861E+000	4.761E+000	-0.20	
GD-153	6824	1.074E-001pCi/g	5.604E-002	5.566E-002	4.253E-001	2.089E-001	0.25	
HF-181	6495	7.655E-003pCi/g	2.864E-002	2.863E-002	2.832E-001	1.384E-001	0.03	
HG-203	6466	-5.635E-002pCi/g	6.273E-002	6.264E-002	2.084E-001	1.020E-001	-0.27	
I-131	6380	7.130E-002pCi/g	8.246E-002	8.238E-002	2.211E-001	1.079E-001	0.32	
IR-192	6303	6.154E-002pCi/g	5.067E-002	5.054E-002	2.010E-001	9.829E-002	0.31	
K-40	6148	-1.447E-001pCi/g	7.481E-001	7.481E-001	1.284E+000	5.849E-001	-0.11	
LA-140	6096	1.563E-002pCi/g	2.812E-002	2.811E-002	1.016E-001	4.393E-002	0.15	
MN-54	5382	-2.832E-002pCi/g	6.926E-002	6.925E-002	2.341E-001	1.131E-001	-0.12	
NA-22	5201	-2.471E-002pCi/g	3.987E-002	3.985E-002	1.381E-001	6.356E-002	-0.18	
NB-94	5160	4.992E-002pCi/g	4.304E-002	4.296E-002	1.435E-001	6.826E-002	0.35	
NB-95	5154	-8.541E-002pCi/g	6.319E-002	6.303E-002	2.089E-001	1.008E-001	-0.41	
ND-147	5083	-5.970E-002pCi/g	4.393E-001	4.392E-001	1.487E+000	7.219E-001	-0.04	
NP-237	4757	-4.152E-001pCi/g	3.778E-001	3.771E-001	1.248E+000	6.152E-001	-0.33	
NP-239	4751	1.422E-001pCi/g	1.425E-001	1.422E-001	4.725E-001	2.313E-001	0.30	
PA-231	4541	7.897E-001pCi/g	5.588E-001	5.571E-001	6.014E+000	2.942E+000	0.13	
PA-233	4535	1.659E-001pCi/g	1.174E-001	1.170E-001	4.817E-001	2.355E-001	0.34	
PA-234	4528	7.379E-003pCi/g	1.848E-001	1.848E-001	6.212E-001	3.043E-001	0.01	
PA-234M	19453	-3.849E+000pCi/g	1.050E+001	1.050E+001	3.544E+001	1.718E+001	-0.11	
PB-210	4467	8.556E+002pCi/g	5.093E+001	8.354E+000	1.399E+001	6.939E+000	61.17	

PB-212	4454	4.747E-001pCi/g	1.198E-001	1.158E-001	2.884E-001	1.405E-001	1.65
PB-214	4448	2.527E-001pCi/g	1.397E-001	1.390E-001	4.865E-001	2.377E-001	0.52
PM-144	19585	5.467E-002pCi/g	5.088E-002	5.080E-002	1.697E-001	8.140E-002	0.32
PM-146	2464	-1.121E-001pCi/g	1.694E-001	1.693E-001	5.705E-001	2.747E-001	-0.20
RH-106	1882	2.453E-001pCi/g	5.500E-001	5.499E-001	1.858E+000	8.973E-001	0.13
RU-103	1828	3.179E-003pCi/g	6.795E-002	6.795E-002	2.296E-001	1.119E-001	0.01
SB-124	1784	6.871E-002pCi/g	5.491E-002	5.479E-002	1.820E-001	8.786E-002	0.38
SB-125	1777	7.725E-002pCi/g	1.204E-001	1.203E-001	7.192E-001	3.515E-001	0.11
SC-46	1739	6.865E-002pCi/g	3.773E-002	3.756E-002	2.744E-001	1.331E-001	0.25
SN-113	1570	-5.988E-002pCi/g	9.283E-002	9.278E-002	3.100E-001	1.515E-001	-0.19
SN-126	17459	4.728E-001pCi/g	6.187E-001	6.182E-001	2.053E+000	1.011E+000	0.23
TA-182	1301	2.190E-001pCi/g	1.744E-001	1.740E-001	6.078E-001	2.897E-001	0.36
TC-99M	17412	4.814E-002pCi/g	4.538E-002	4.530E-002	1.502E-001	7.375E-002	0.32
TH-227	1058	5.812E-001pCi/g	8.496E-001	8.490E-001	7.338E+000	3.643E+000	0.08
TH-229	1046	3.346E-001pCi/g	9.867E-001	9.864E-001	3.300E+000	1.619E+000	0.10
TH-234	1027	-3.012E+001pCi/g	2.825E+000	2.346E+000	7.161E+000	3.541E+000	-4.21
TL-208	929	1.402E-001pCi/g	7.085E-002	7.047E-002	2.180E-001	1.055E-001	0.64
U-235	281	1.225E-001pCi/g	2.509E-001	2.508E-001	1.165E+000	5.718E-001	0.11
Y-88	74	-5.977E-002pCi/g	8.913E-002	8.908E-002	2.987E-001	1.449E-001	-0.20
ZN-65	31	1.053E-001pCi/g	9.011E-002	8.995E-002	3.017E-001	1.411E-001	0.35
ZR-95	7	3.603E-002pCi/g	1.120E-001	1.120E-001	3.799E-001	1.833E-001	0.09

Laboratory Control Sample Information

Sample ID	WRKNO	Analyte	Activity	StdAdded	Recovery	ZFactor
LCS 160-218442~2-A	LCS 160-218442~2-A	CS-137	2.895E+001 pCi/g	3.008E+001	96.24%	-0.5100
		CO-60	1.774E+001 pCi/g	1.859E+001	95.42%	-0.6439
		AM-241	9.726E+001 pCi/g	9.723E+001	100.04%	0.0052

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Samp Activity	Dup Activity	RPD	RER	DER	Flag	ZFactor
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Blanks Information

<u>SamplID</u>	<u>WRKNO</u>	<u>Analyte</u>	<u>Activity</u>	<u>UncTotal</u>	<u>ZFactor</u>
MB 160-218442~1-A	MB	AC-228	4.629E-002	5.406E-002	0.8562
MB 160-218442~1-A	MB	AG-108M	5.830E-003	1.413E-002	0.4125
MB 160-218442~1-A	MB	AG-110M	1.867E-002	2.797E-002	0.6674
MB 160-218442~1-A	MB	AM-241	4.337E-002	3.562E-002	1.2178
MB 160-218442~1-A	MB	BA-133	3.213E-003	1.707E-002	0.1882
MB 160-218442~1-A	MB	BA-140	7.074E-002	6.022E-002	1.1747
MB 160-218442~1-A	MB	BE-7	2.063E-003	1.089E-001	0.0189
MB 160-218442~1-A	MB	BI-207	-8.550E-003	1.554E-002	-0.5500
MB 160-218442~1-A	MB	BI-210M	-5.240E-005	2.134E-002	-0.0025
MB 160-218442~1-A	MB	BI-212	1.891E-001	2.106E-001	0.8980
MB 160-218442~1-A	MB	BI-214	5.878E-002	4.257E-002	1.3807
MB 160-218442~1-A	MB	CD-109	-3.780E-002	2.773E-001	-0.1363
MB 160-218442~1-A	MB	CD-113M	-1.209E+002	2.006E+002	-0.6023
MB 160-218442~1-A	MB	CE-139	-2.638E-003	1.098E-002	-0.2403
MB 160-218442~1-A	MB	CE-141	0.000E+000	1.549E-002	0.0000
MB 160-218442~1-A	MB	CE-144	2.685E-004	7.314E-002	0.0037
MB 160-218442~1-A	MB	CF-249	1.313E-003	1.950E-002	0.0673
MB 160-218442~1-A	MB	CF-251	-3.857E-003	5.706E-002	-0.0676
MB 160-218442~1-A	MB	CO-56	1.232E-004	1.804E-004	0.6833
MB 160-218442~1-A	MB	CO-57	2.443E-003	8.085E-003	0.3022
MB 160-218442~1-A	MB	CO-58	-1.180E-003	2.037E-002	-0.0579
MB 160-218442~1-A	MB	CO-60	6.900E-003	9.579E-003	0.7203
MB 160-218442~1-A	MB	CR-51	1.599E-003	1.074E-001	0.0149
MB 160-218442~1-A	MB	CS-134	3.207E-002	2.395E-002	1.3391
MB 160-218442~1-A	MB	CS-136	5.803E-003	1.781E-002	0.3257
MB 160-218442~1-A	MB	CS-137	0.000E+000	1.138E-002	0.0000
MB 160-218442~1-A	MB	EU-152	-3.093E-005	4.932E-002	-0.0006
MB 160-218442~1-A	MB	EU-154	-1.070E-001	1.707E-001	-0.6272
MB 160-218442~1-A	MB	EU-155	2.380E-002	1.887E-002	1.2612
MB 160-218442~1-A	MB	FE-59	0.000E+000	8.903E-003	0.0000
MB 160-218442~1-A	MB	GA-68	0.000E+000	1.515E-001	0.0000
MB 160-218442~1-A	MB	GD-153	0.000E+000	1.067E-002	0.0000
MB 160-218442~1-A	MB	HF-181	1.261E-002	1.480E-002	0.8522
MB 160-218442~1-A	MB	HG-203	3.510E-003	1.144E-002	0.3067
MB 160-218442~1-A	MB	I-131	0.000E+000	6.680E-003	0.0000
MB 160-218442~1-A	MB	IR-192	1.578E-003	1.452E-002	0.1086
MB 160-218442~1-A	MB	K-40	-2.137E-001	7.006E-001	-0.3050
MB 160-218442~1-A	MB	LA-140	0.000E+000	7.055E-003	0.0000
MB 160-218442~1-A	MB	MN-54	0.000E+000	5.770E-003	0.0000
MB 160-218442~1-A	MB	NA-22	-2.879E-004	1.602E-002	-0.0180
MB 160-218442~1-A	MB	NB-94	1.568E-003	1.741E-002	0.0901
MB 160-218442~1-A	MB	NB-95	2.922E-003	1.554E-002	0.1880
MB 160-218442~1-A	MB	ND-147	7.112E-002	1.032E-001	0.6894
MB 160-218442~1-A	MB	NP-237	5.092E-003	7.332E-002	0.0695
MB 160-218442~1-A	MB	NP-239	1.565E-002	3.200E-002	0.4890
MB 160-218442~1-A	MB	PA-231	-1.854E-001	3.961E-001	-0.4681
MB 160-218442~1-A	MB	PA-233	7.432E-003	1.916E-002	0.3879
MB 160-218442~1-A	MB	PA-234	1.231E-002	3.411E-002	0.3608
MB 160-218442~1-A	MB	PA-234M	0.000E+000	7.911E-001	0.0000
MB 160-218442~1-A	MB	PB-210	3.880E-001	4.487E-001	0.8648
MB 160-218442~1-A	MB	PB-212	-2.440E-002	9.674E-002	-0.2522
MB 160-218442~1-A	MB	PB-214	-2.424E-002	8.010E-002	-0.3026

MB 160-218442~1-A	MB	PM-144	2.715E-003	1.733E-002	0.1567
MB 160-218442~1-A	MB	PM-146	1.519E-002	1.570E-002	0.9676
MB 160-218442~1-A	MB	RH-106	-2.995E-002	1.833E-001	-0.1634
MB 160-218442~1-A	MB	RU-103	-5.540E-003	1.385E-002	-0.4000
MB 160-218442~1-A	MB	SB-124	3.566E-003	1.681E-002	0.2121
MB 160-218442~1-A	MB	SB-125	-3.271E-002	4.871E-002	-0.6716
MB 160-218442~1-A	MB	SC-46	1.794E-002	1.459E-002	1.2302
MB 160-218442~1-A	MB	SN-113	5.033E-004	1.899E-002	0.0265
MB 160-218442~1-A	MB	SN-126	2.542E-002	1.062E-001	0.2393
MB 160-218442~1-A	MB	TA-182	5.091E-002	6.392E-002	0.7965
MB 160-218442~1-A	MB	TC-99M	4.412E-003	8.994E-003	0.4906
MB 160-218442~1-A	MB	TH-227	0.000E+000	6.308E-002	0.0000
MB 160-218442~1-A	MB	TH-229	1.425E-001	1.928E-001	0.7391
MB 160-218442~1-A	MB	TH-234	-5.703E-002	3.530E-001	-0.1616
MB 160-218442~1-A	MB	TL-208	-2.982E-003	2.496E-002	-0.1195
MB 160-218442~1-A	MB	U-235	-6.134E-003	8.135E-003	-0.7541
MB 160-218442~1-A	MB	Y-88	1.099E-002	2.017E-002	0.5449
MB 160-218442~1-A	MB	ZN-65	0.000E+000	1.005E-002	0.0000
MB 160-218442~1-A	MB	ZR-95	-1.630E-002	3.169E-002	-0.5142

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:** 0.01652

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. Analytisc 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* $\mu\text{ps/gram}$	This Source μps	Uncertainty, %			Calibration Method
					u_A	u_B	U	
Pb-210	46.5	8145.9	—	3079.8	0.33	1.46	2.99	4 π LS
Am-241	59.5	157860	—	2034.3	0.33	1.46	2.99	4 π 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 Analytisc's 8-isotope mixture which is calibrated quarterly.

Calibration Methods: 4 π 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: M. I. Taskaeva
M. I. Taskaeva, Radiochemist

QA Approved: D. M. Montgomery, for
D. M. Montgomery, QA Manager

Date: 12-21-06

End of Certificate

Reagent

Tuna Can_00002

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* $\mu\text{ps}/\text{gram}$	This Source μps	Uncertainty, %			Calibration Method
					u_A	u_B	U	
Pb-210	46.5	8.120E+03	—	3.141E+03	0.1	2.1	4.1	4 π LS
Am-241	59.5	1.580E+05	—	2.034E+03	0.1	1.7	3.5	4 π 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: 4 π 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.

This standard will expire one year after the reference date.

Source Prepared by: W. Mao
W. Mao, Radiochemist

QA Approved: J. D. McCorvey
J. D. McCorvey, QA Manager Alternate

Date: 2/1/10

Reagent

Tuna Can_00003

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* yps/gram	This Source yps	Uncertainty*, %			Calibration Method*
					u _A	u _B	U	
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."

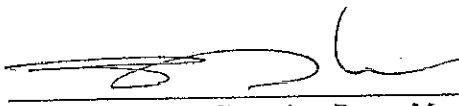
(Certificate continued on reverse side)



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: 
J.D. McCorvey, Counting Room Manager

Date: 30 JAN 12

Reagent

Tuna Can_00006

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* yps/gram	This Source yps	Uncertainty, %			Calibration Method
					u_A	u_B	U	
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.

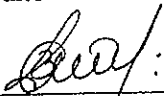
Calibration Methods: 4π LS - 4 pi Liquid Scintillation Counting, HPGe - High Purity Germanium Gamma-Ray Spectrometer, IC - Ionization Chamber. **Uncertainty:** U - Relative expanded uncertainty, k = 2. See NIST Technical Note 1297, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement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

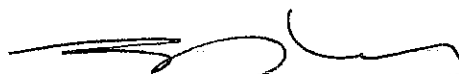
(Certificate continued on reverse side)



Comments:

1850 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: 
J. D. McCorvey, QA Manager Alternate

Date: 2/11/11

Reagent

U-232_00003

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

85539-334

5 mL Liquid in Flame Sealed Vial

Customer: Test America/Earth City, MO
P.O. No.: 2434448, Item 1

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 purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. 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 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.

Isotope	Half-Life, Days	Activity (Bq)	Uncertainty*, %			Reference Date (12:00 PM EST)
			u_A	u_B	U	
U-232	2.517E+04	1.725E+04	0.5	2.4	4.9	08/25/2011

***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: U-232 daughters, γ -impurities (other than decay products) < 0.1 %.

Source Prepared by: _____

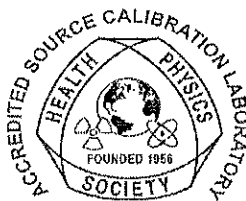
M. I. Taskaeva, Radiochemist

QA Approved: _____

J. D. McCorvey, QA Manager Alternate

Date: _____

8/25/11



Reagent

U-232_00034

St. Louis Radiological Standard Reverification Form

Standard ID Number: U-232_00034
True Value = 78.54115 DPM/L or g
Date Analyzed: 3/24/2016

Radionuclide: U-232

	Replicates	
#1	<u>75.703</u>	DPM/L or g
#2	<u>74.112</u>	DPM/L or g
#3	<u>77.034</u>	DPM/L or g

Mean = 75.61633

1 sigma = 1.462927

1.96 sigma = 2.867336

True Value minus 5% = 74.61409

(True Value - 5%)

True Value plus 5% = 82.4682

(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: Amanda Leigh Dick 03/29/2016

SOP Reference: STL-QA-0002, Current Revision

Sample Name: Verification 1
SampleType: Sample
:
Sample Collection Date:

Sample

Spectrum #1 Analysis #1
Sample Volume : 0.1000mL
Aliquot: N/A Aliquot Fraction: N/A

Batch Name: U-232_00034
AnalysisID: 671238

Batch

Analyst: 60040

Tracer Name: UNAT Spike_00001
Tracer Activity: 72.27 DPM/mL x (Vol.)0.10 mL = 7.23 DPM
Tracer Ref. Date: 3/30/2008 11:00:22AM

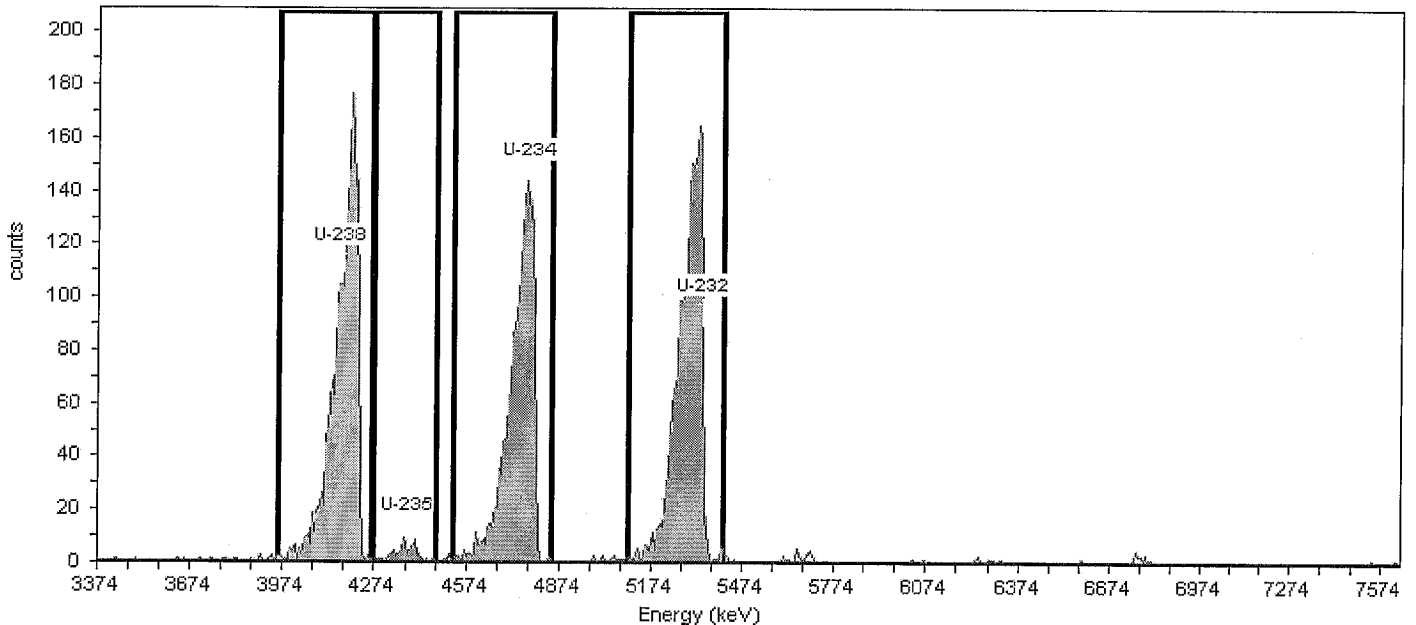
Tracer

Tracer Nuclide: U-238
Tracer Recovery: 104.90%

Detector: AV132
Serial Number: 49-16404
Acquisition Start Date: 3/24/2016 6:16:21PM
Live Time: 960.00 min.
Real Time: 960.02 min.
Background Date: 3/16/2016 3:25:06PM
Background Info: Sample: ICB;AV132; Det: AV132; Spectrum #1;
Mar-16-2016 15:25

Acquisition

Calibration Name: IC-9886;AV132-20150604
Calibration Date: 6/4/2015 6:23:37PM
Gain = 7.4575 keV / Ch
Energy Cal: Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.32% +/- 0.33% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = U_Verify
Decay Correction: 3/24/2016 6:14:58PM
MDA Constants: $K\alpha = 1.65$, $K\beta = 1.65$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	87.0	100.0	1770	0.0000	1770.00	75.809	DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	25.7	91.1	68	0.0000	68.00	3.048	DPM/mL
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	76.4	99.8	1603	0.0000	1603.00	65.578	DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	80.2	100.4	1862	0.0000	1862.00	75.703	DPM/mL

Sample Name: Verification 2
Sample Type: Sample
:
Sample Collection Date:

Sample

Spectrum #1 Analysis #1
Sample Volume : 0.1000mL
Aliquot: N/A Aliquot Fraction: N/A

Batch Name: U-232_00034
AnalysisID: 671239

Batch

Analyst: 60040

Tracer Name: UNAT Spike_00001
Tracer Activity: 72.27 DPM/mL x (Vol.)0.10 mL = 7.23 DPM
Tracer Ref. Date: 3/30/2008 11:00:22AM

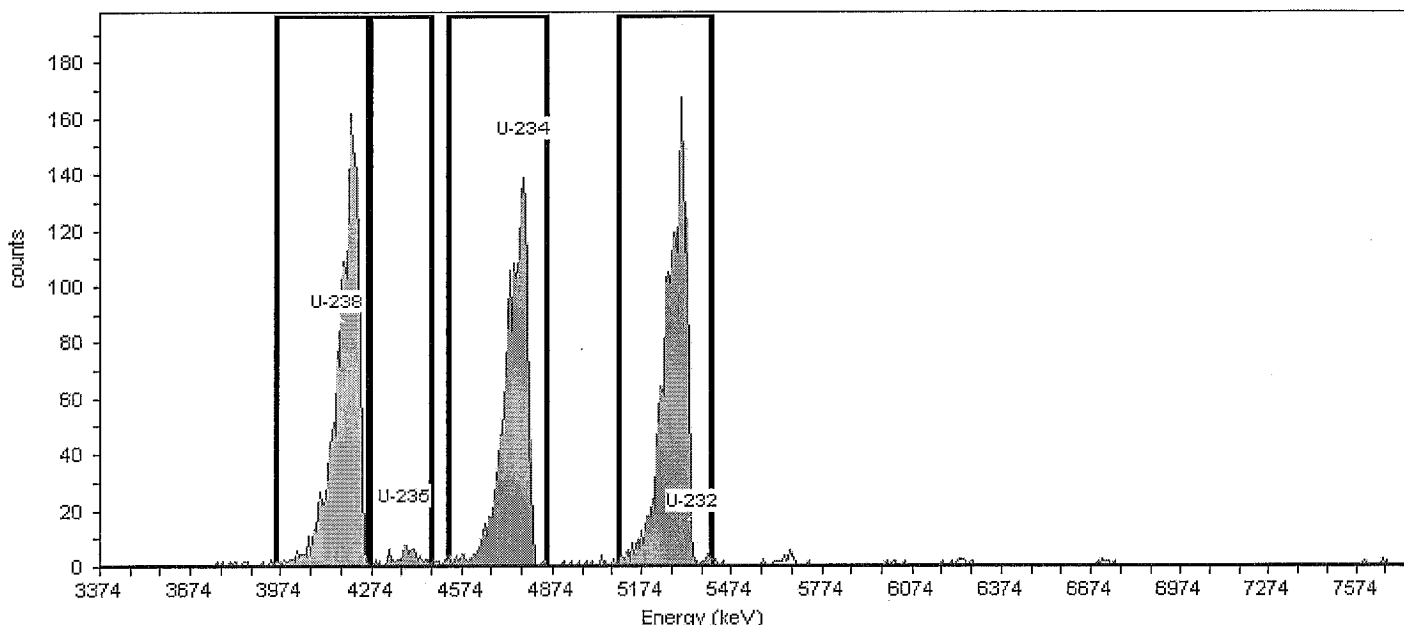
Tracer

Tracer Nuclide: U-238
Tracer Recovery: 93.31%

Detector: AV133
Serial Number: 49-169B4
Acquisition Start Date: 3/24/2016 6:16:23PM
Live Time: 960.00 min.
Real Time: 960.02 min.
Background Date: 3/16/2016 3:25:08PM
Background Info: Sample: ICB;AV133; Det: AV133; Spectrum #1;
Mar-16-2016 15:25

Acquisition

Calibration Name: IC-7107;AV133-20150607
Calibration Date: 6/8/2015 7:46:18PM
Gain = 7.4575 keV / Ch
Energy Cal: Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.35% +/- 0.29% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = U_Verify
Decay Correction: 3/24/2016 6:14:58PM
MDA Constants: $K\alpha = 1.65$, $K\beta = 1.65$

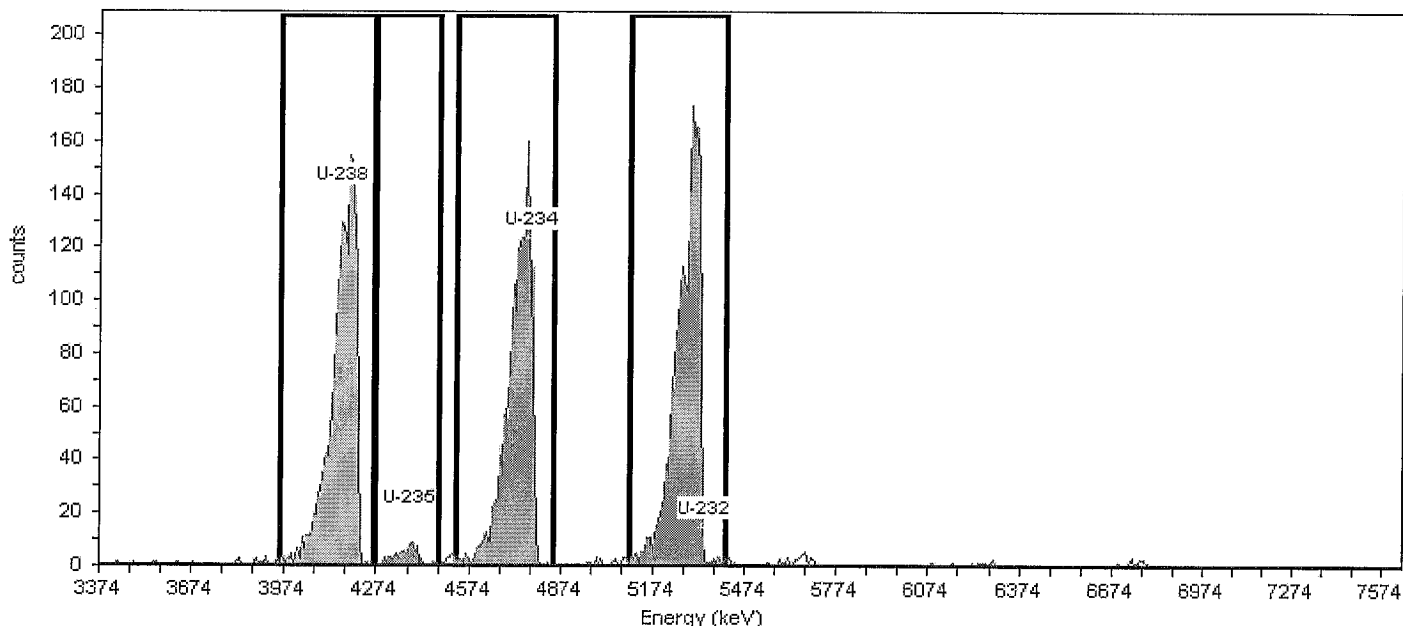
Nuclide Library: Uranium
MDA Source: Background

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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	44.2	100.0	1641	0.0000	1641.00	67.428	DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	93.5	91.1	64	0.0000	64.00	3.094	DPM/mL
U-234	4776.4	4,775.8	0.6	4530.3	4861.0	84.5	99.8	1523	0.0000	1523.00	67.203	DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	87.0	100.4	1690	0.0000	1690.00	74.112	DPM/mL

<p>Sample</p> <p>Sample Name: Verification 3 SampleType: Sample : Sample Collection Date:</p> <hr/> <p>Batch Name: U-232_00034 AnalysisID: 671240</p> <hr/> <p>Tracer Name: UNAT Spike_00001 Tracer Activity: 72.27 DPM/mL x (Vol.)0.10 mL = 7.23 DPM Tracer Ref. Date: 3/30/2008 11:00:22AM</p>	<p>Sample</p> <p>Spectrum #1 Analysis #1 Sample Volume : 0.1000mL Aliquot: N/A Aliquot Fraction: N/A</p> <hr/> <p>Batch</p> <p>Analyst: 60040</p> <hr/> <p>Tracer</p> <p>Tracer Nuclide: U-238 Tracer Recovery: 93.15%</p>
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<p>Acquisition</p> <p>Detector: AV134 Serial Number: 49-169C2 Acquisition Start Date: 3/24/2016 6:16:24PM Live Time: 960.00 min. Real Time: 960.02 min. Background Date: 3/16/2016 3:25:10PM Background Info: Sample: ICB;AV134; Det: AV134; Spectrum #1; Mar-16-2016 15:25</p>	<p>Calibration Name: IC-8874;AV134-20150607a Calibration Date: 6/8/2015 7:46:39PM Gain = 7.4575 keV / Ch Energy Cal: Offset = 3,366.95 keV Quadratic = 0.0000 keV / Ch² Efficiency: 26.35% +/- 0.38% TPU(2 sigma)</p>
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General Analysis	
<p>Analysis Method: Absolute ROI Analysis, Set Name = U_Verify Decay Correction: 3/24/2016 6:14:58PM MDA Constants: $K\alpha = 1.65$, $K\beta = 1.65$</p>	<p>Nuclide Library: Uranium MDA Source: Background</p>

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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	78.5	100.0	1703	0.0000	1703.00	67.317	DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	62.8	91.1	68	0.0000	68.00	3.167	DPM/mL
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	82.9	99.8	1632	0.0000	1632.00	69.391	DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	82.7	100.4	1825	2.0000	1823.00	77.034	DPM/mL

Decay Correction

<u>Uranium-232</u>								
Initial Activity:	82.245	dpm						
Reference Date:	8/25/2011							
Current Date:	3/24/2016							
Elapsed Time:	1673	days						
Half Life:	25165.725	days			603977.4			
Exponential Term:	0.954965614							
Corrected Activity:	78.54114693	dpm			35.37889501	pCi		

U-232 Clean Ver.
 Aliquot Only (coppt)

Batch No. _____

Balance ID: _____

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

Sample Number	Aliquot (g/mL)	Crucible ID	Dilution
1 Ver. 1	0.1	132	
2		133	
3	1	134	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

Tracer N/A Initials / Date

Isotope: U-232

Std Sol'n No.: U-232-00034

Vol (mL): 0.1

Ref Activity (dpm/mL): 234-70.109
235-3.310
238-72.265

Act Ref Date: 03-30-08

Samples Spiked and Traced By: SUB / 3/23/14
 Initials / Date

Verification Signature & Date: SUB / 3-23-16
 Initials / Date

LCS Standard N/A Initials / Date

Isotope: U-232 Clean

Std Sol'n ID.: U-232-00034

Vol (mL): 0.1

Ref Activity (dpm/mL): 82.245

Act Ref Date: 08-25-11

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

<input type="checkbox"/> ST-RC-0003 Rev.	<input type="checkbox"/> ST-RC-0040 Rev.	<input type="checkbox"/> ST-RC-0110 Rev.
<input type="checkbox"/> ST-RC-0004 Rev.	<input type="checkbox"/> ST-RC-0041 Rev.	<input type="checkbox"/> ST-RC-0120 Rev.
<input type="checkbox"/> ST-RC-0014 Rev.	<input type="checkbox"/> ST-RC-0050 Rev.	<input type="checkbox"/> ST-RC-0232 Rev.
<input type="checkbox"/> ST-RC-0020 Rev.	<input type="checkbox"/> ST-RC-0090 Rev.	<input type="checkbox"/> ST-RC-0238 Rev.
<input type="checkbox"/> ST-RC-0021 Rev.	<input type="checkbox"/> ST-RC-0100 Rev.	<input type="checkbox"/> ST-RC-0240 Rev.
		<input type="checkbox"/> ST-RC-0241 Rev.
		<input type="checkbox"/> ST-RC-0242 Rev.
		<input type="checkbox"/> ST-RC-5016 Rev.
		<input type="checkbox"/>
		<input type="checkbox"/>

Isotope(s)

<input type="checkbox"/> αβ	<input type="checkbox"/> Iso Pu	<input type="checkbox"/> Tc-99	<input type="checkbox"/> Iso Cm
<input type="checkbox"/> Iso Am	<input type="checkbox"/> Ra	<input type="checkbox"/> Iso Th	<input type="checkbox"/> Pu-241
<input type="checkbox"/> KPA	<input type="checkbox"/> Sr	<input checked="" type="checkbox"/> Iso U	<input type="checkbox"/> Th-229
<input type="checkbox"/> Np	<input type="checkbox"/> TAR	<input type="checkbox"/> C-14	<input type="checkbox"/> Cl-36

Count Time Matrix

Long Count Soil

Short Count H₂O

Prepared By: SUB / 3/23/14
 Date: _____

Reviewed by: _____
 Date: _____



Reagent ID: U-232_00034

Description: U-232 clean
 No. of Bottles: 1
 Storage Location: RAD Actinide STDs
 Reagent Volume: 250.000 mL
 Creation Date: 03/23/2016
 Open Date:
 Container(s): 875270
 Comment:

Expiration Date: 07/16/2016
 Laboratory: TestAmerica St. Louis
 Prepared By: Bernsen, Sarah C
 Solvent: DI Water
 Solvent Lot: n/a

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
U-232	U-232_00009	08/06/2016	10280.70700	dpm/mL	82.24566	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
U-232_00009	U-232 Parent		08/06/16				2.00000	mL

Reagent

UNAT Ampoule_00001



New Brunswick Laboratory
U.S. Department of Energy

Certificate of Analysis

CRM 145

Uranyl (Normal) Nitrate Assay and Isotopic Solution

Uranium Mass Fraction: 0.0101356 g U/g solution ± 0.0000011 g U/g solution
 [10.1356 mg U/g solution ± 0.0011 mg U/g solution]

	$^{234}\text{U}/^{238}\text{U}$	$^{235}\text{U}/^{238}\text{U}$	
Atom Ratio:	0.000052841	0.0072543	
Atom Ratio Uncertainty:	0.000000082	0.00000040	
	^{234}U	^{235}U	^{238}U
Atom Percent:	0.0052458	0.72017	99.27458
Atom Percent Uncertainty:	0.0000081	0.00039	0.00039
Weight Percent:	0.0051579	0.71114	99.28370
Weight Percent Uncertainty:	0.0000080	0.00038	0.00038
Relative Atomic Weight:	238.028918		
Relative Atomic Weight Uncertainty:	0.000012		

Note: ^{233}U and ^{236}U were not detected. The detection limit of uranium ratios for the technique used is 5×10^{-9} .

This Certified Reference Material (CRM) is a uranium concentration and isotopic solution standard intended for use in calibration of and/or quality control for uranium analysis methods. Each unit of CRM 145 consists of approximately 20-mL of uranyl nitrate solution in 1M nitric acid, contained in a sealed glass ampoule.

NOTE: *The vial should be handled under proper radiologically-controlled conditions at all times.*

The certified uranium content value is based on the mass of high-purity metal dissolved and diluted to a known solution mass. The stated uranium concentration was calculated as the prepared value and verified experimentally by the NBL-modified Davies and Gray titration. The certified uranium isotopic composition and atomic weight is based upon measurements performed on multiple samples by two different measurement techniques on a Thermal Ionization Mass Spectrometer (TIMS), calibrated using CRM U030-A as primary comparator and CRM 129-A as a quality control sample. The isotopic values are shared with CRM 112-A, uranium (normal) metal standard which was the source of uranium used to produce the solutions.

RAD13-0018
 UNAT Spike
 marrss
 None
 Prep/Opened: 5/3/2013
 Exp(1): 5/10/2014
 Exp(2): 5/10/2014

All uncertainties for the certified values are expressed as expanded uncertainties (U) where $U = k \cdot u_c$, where u_c is the

September 30, 2010
 Argonne, Illinois

www.nbl.doe.gov
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Jon Neuhoff, Director
 New Brunswick Laboratory

(Revision of Certificate dated March 30, 2008)



127971
 ID: UNAT_00008
 Exp: 05/10/14 Prpd: SB Cr: 05/03/13
 UNAT spike

combined standard uncertainty and the coverage factor $k = 2$. Uncertainties were determined according to the JCGM 100:2008 *Guide to the Expression of Uncertainty in Measurement*. The coverage factor of 2 was chosen to provide an approximate 95% level of confidence. The input quantities associated with the uranium content included uncertainties due to weighing, CRM 112-A purity, and buoyancy factors. The input quantities associated with the uranium isotopic composition included uncertainties from the certified value for CRM U030-A, measurement precision, and background corrections associated with the analytical techniques.

The CRM was produced by dissolving uranium metal in a single batch and container, with extensive mixing of the resultant solution followed by dispensation into individual bottles. Subsequent measurements of a random sampling of the total lot produced did not indicate any inhomogeneity in uranium concentration or isotopic composition. The minimum sample sizes taken from packaged units and measured were 30 mg U by titration and 1 μg U by TIMS. The NBL makes no recommendation as to the minimum sample size to be used to ensure concentration or isotopic homogeneity.

Users are cautioned that once the vial is opened, the uranium concentration and/or isotopic composition of the material may be affected by evaporative losses or environmental contamination. User's should take appropriate precautions to safeguard the material before, during and after use to ensure valid certificate values.

Recommended Procedure for Ampoule Handling and Dispensing of Solution

1. The ampoule contains a strongly acidic solution of uranium. Appropriate precautions should be taken.
2. Before opening the ampoule, ensure that any dried uranium or condensed liquid in the neck or body of the ampoule is re-dissolved into solution. This can be accomplished by inverting the ampoule repeatedly.
3. The glass ampoules are scored at the neck for ease of opening. However, glass burrs and fragments pose a cut hazard to anyone opening the ampoules. Appropriate precautions should be taken.
4. Lightly moisten the scored line on the neck with distilled water to help ensure a clean break at the score.
5. Because of the narrow neck of the ampoule it may be difficult or impossible to pour the solution out. Here is one possible method:
 - a. Obtain approximately 12-cm length of plastic capillary tubing (e.g. i.d. 0f 0.1", o.d. of 0.16").
 - b. Insert one end of the capillary tubing fully into the ampoule
 - c. Fold the remaining length of tubing along the outside of the ampoule, ensuring that the tube is not crimped and will allow the free flow of air through the tube and into the ampoule.
 - d. Holding the ampoule and tubing in one hand, and a beaker or dispensing bottle in another, invert the ampoule over the container allowing the solution to drain into it.
 - e. The capillary tubing allows air to flow into the ampoule, eliminating the "airlock" created by the narrow neck of the open ampoule.
6. The user should be wary of evaporative losses once the ampoule is opened, and prevent uranium contamination of the sample. It is recommended that the entire solution be accurately weighed and aliquanted as soon as possible after opening the sample. Precautions should be taken (clean glass/plastic ware, air filtration, etc) to prevent uranium contamination of the CRM with subsequent perturbation of the isotopic composition.

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Jon Neuhoff, Director
New Brunswick Laboratory

(Revision of Certificate dated March 30, 2008)

Reagent

UNAT_00012

St. Louis Radiological Standard Reverification Form

Standard ID Number: UNAT_00011
True Value = 70.69 DPM/L or g
Date Analyzed: 5/5/2016

Radionuclide: U-234

	Replicates	
#1	<u>66.49</u>	DPM/L or g
#2	<u>71.93</u>	DPM/L or g
#3	<u>67.79</u>	DPM/L or g

Mean = 68.73667

1 sigma = 2.840868

1.96 sigma = 5.568102

True Value minus 5% = 67.1555
True Value plus 5% = 74.2245

(True Value - 5%)
(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: Amanda Dick 05/09/2016

SOP Reference: STL-QA-0002, Current Revision

Sample

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

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

Batch

Batch Name: UNAT_00011

Client Name: Undefined
Client Contact:
Analyst: 60040

Description:

Tracer

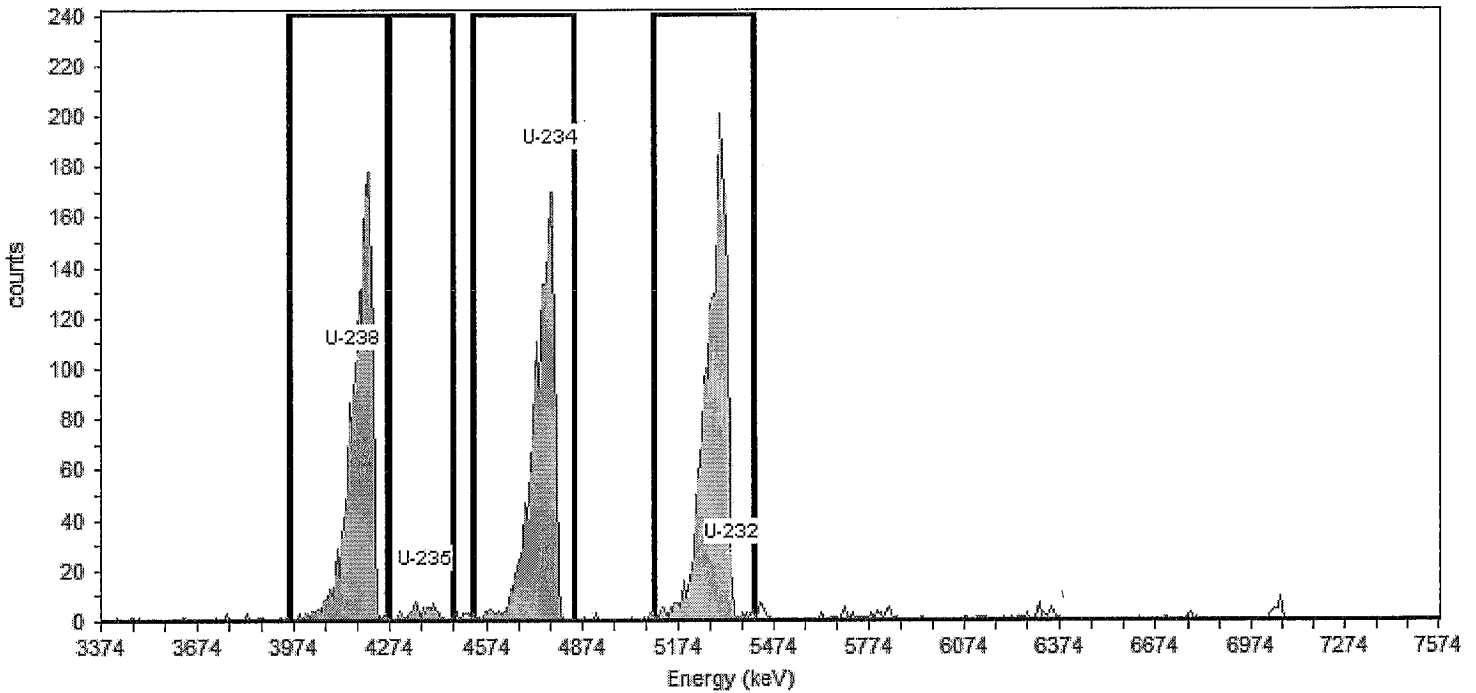
Tracer Name: U-232_00032
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.10 mL = 8.22 DPM
Tracer Ref. Date: 8/25/2011 12:03:08PM

Tracer Nuclide: U-232
Tracer Recovery: 100.46%

Acquisition

Detector: AV194 SN: 50-119J2
Acquisition Start Date: 5/5/2016 10:51:35AM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 4/22/2016 10:41:10AM
Bkgd Info: Sample: ICB;AV194; Det: AV194; Spectrum #1; 4/22/2016 10:41:10 AM

Energy Calibration: IC-9520;AV194-20151017
Efficiency Calibration:IC-9520;AV194-20151017
Calibration Date: 10/18/2015 3:55:14PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.83% +/- 0.35% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 5/5/2016 10:49:41AM
MDA Constants: $K_{\alpha} = 1.64$, $K_{\beta} = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	77.8	100.0	1645	1.0000	1644.00	6.865E+001	DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	22.2	80.2	60	3.0000	57.00	2.968E+000	DPM/mL
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	74.8	99.8	1590	1.0000	1589.00	6.649E+001	DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	76.2	100.1	1892	8.0000	1884.00	8.262E+001	DPM/mL

Sample Name: Verification 2
Spectrum #1 Analysis #1
Type: Sample
Sample Collection Date:
Comment:

Sample

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

Batch Name: UNAT_00011

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Description:

Tracer

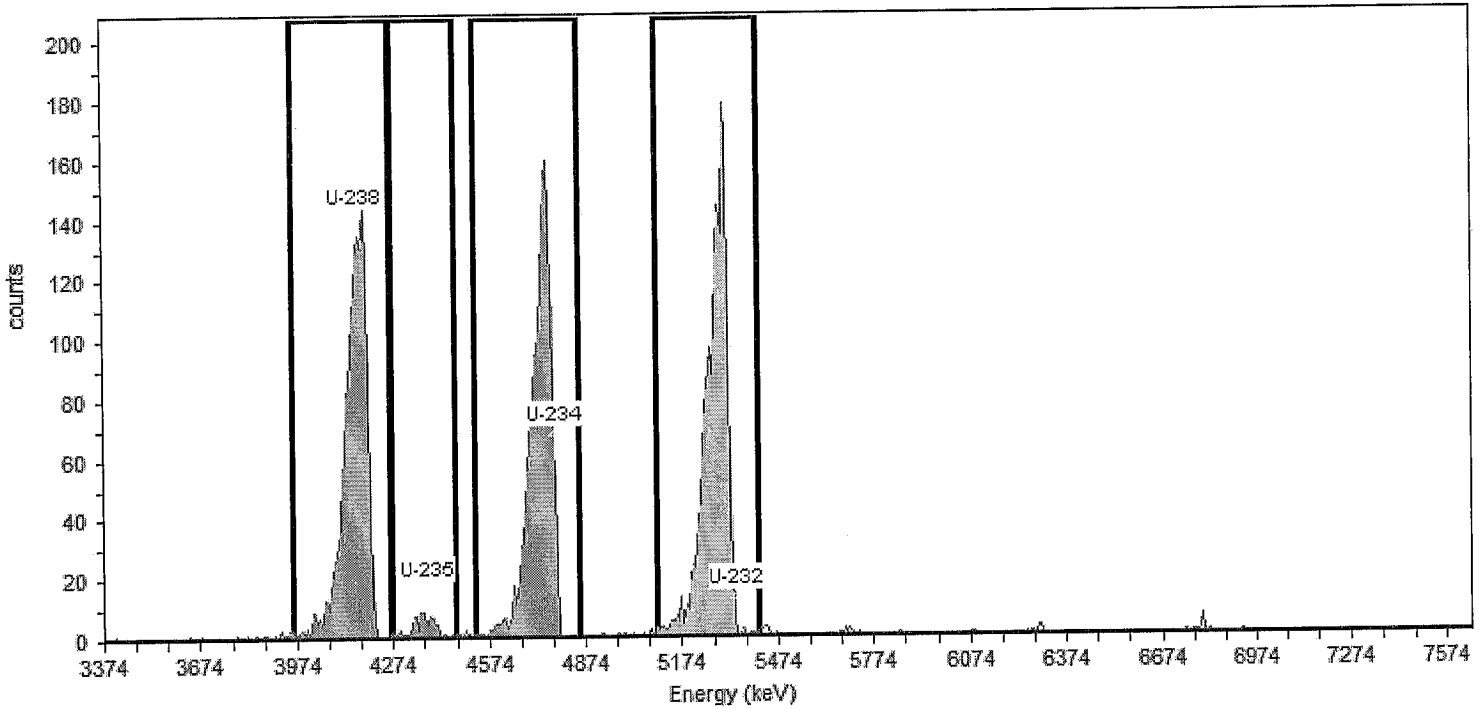
Tracer Name: U-232_00032
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.10 mL = 8.22 DPM
Tracer Ref. Date: 8/25/2011 12:03:08PM

Tracer Nuclide: U-232
Tracer Recovery: 83.14%

Detector: AV195 SN: 50-117AA2
Acquisition Start Date: 5/5/2016 10:51:35AM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 4/22/2016 10:41:10AM
Bkgd Info: Sample: ICB;AV195; Det: AV195; Spectrum #1; 4/22/2016 10:41:10 AM

Acquisition

Energy Calibration: IC-9792;AV195-20151017a
Efficiency Calibration:IC-9792;AV195-20151017a
Calibration Date: 10/18/2015 3:55:41PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.85% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction:5/5/2016 10:49:41AM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
MDA Source: Background

Nuclide Summary (ROI)

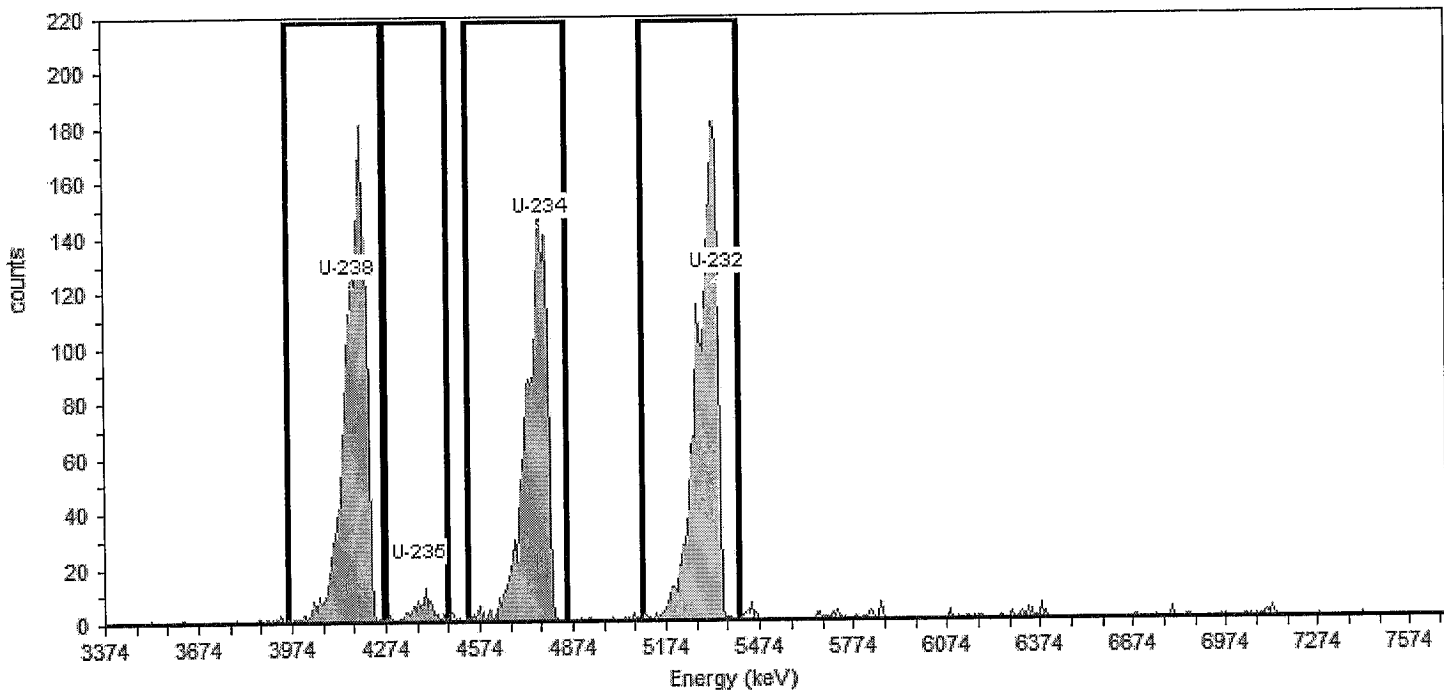
Nuclide	Peak Energy keV	Peak Expected keV	Peak Diff keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity	Units
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	73.6	100.0	1490	0.0000	1490.00	7.223E+001	DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	78.5	80.2	77	0.0000	77.00	4.654E+000	DPM/mL
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	69.4	99.8	1484	3.0000	1481.00	7.193E+001	DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	73.2	100.1	1633	10.0000	1623.00	6.838E+001	DPM/mL

<p>Sample Name: Verification 3 Spectrum #1 Analysis #1 : Sample Collection Date: Comment:</p>	<p>Type: Sample</p>	<p>Sample</p> <p>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:</p>
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<p>Batch Name: UNAT_00011 : Description:</p>	<p>Batch</p> <p>Client Name: Undefined Client Contact: Analyst: 60040</p>
--	--

<p>Tracer Name: U-232_00032 Tracer Activity: 82.25 DPM / mL x (Vol.) 0.10 mL = 8.22 DPM Tracer Ref. Date: 8/25/2011 12:03:08PM</p>	<p>Tracer</p> <p>Tracer Nuclide: U-232 Tracer Recovery: 95.37%</p>
--	---

<p>Acquisition</p> <p>Detector: AV197 SN: 50-117Z5 Acquisition Start Date: 5/5/2016 10:51:35AM Live Time: 960.00 min. Real Time: 960.01 min. Background Date: 4/25/2016 9:56:18AM Bkgd Info: Sample: ICB;AV197; Det: AV197; Spectrum #1; 4/25/2016 9:56:18 AM</p>	<p>Energy Calibration: IC-9794;AV197-20151017 Efficiency Calibration:IC-9794;AV197-20151017 Calibration Date: 10/18/2015 3:55:22PM 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)</p>
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General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 5/5/2016 10:49:41AM
MDA Constants: $K_{\alpha} = 1.64$, $K_{\beta} = 1.64$

Nuclide Library: Uranium
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
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	73.5	99.8	1519	3.0000	1516.00	6.779E+001 DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	78.8	100.1	1769	6.0000	1763.00	7.844E+001 DPM/mL
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	72.8	100.0	1655	0.0000	1655.00	7.385E+001 DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	62.5	80.2	77	0.0000	77.00	4.284E+000 DPM/mL

Batch No.:

Balance ID:

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

Sample Number	Aliquot (g / mL)	Crucible ID	Dilution
15 1	0.1	194	20:199
16 2	1	195	20:200
17 3	1	197	20:201
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

Samples Spiked and Traced By: SJB / 5/21/16
 Date

Verification Signature & Date: JML / 5/21/16
 Date

Tracer N/A

Isotope: U-232

Std Sol'n No.: U-232-00032

Vol (mL): 0.1

Ref Activity (dpm/mL): _____

Act Ref Date: _____

LCS Standard N/A

Isotope: UNWAT

Std Sol'n ID.: UNWAT-00011

Vol (mL): 0.1

Ref Activity (dpm/mL): 234-18:49
235-18:510

Act Ref Date: 03-30-08

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-0004 Rev.
- ST-RC-0041 Rev.
- ST-RC-0014 Rev.
- ST-RC-0050 Rev.
- ST-RC-0020 Rev.
- ST-RC-0090 Rev.
- ST-RC-0021 Rev.
- ST-RC-0100 Rev.
- ST-RC-0110 Rev.
- ST-RC-0120 Rev.
- ST-RC-0232 Rev.
- ST-RC-0238 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 Cf-252

Long Count Matrix
 Short Count Soil
 H₂O

Prepared By: SJB Date: _____

Reviewed by: _____ Date: _____



Reagent ID: UNAT_00011

Description: UNAT spike
 No. of Bottles: 1
 Storage Location: RAD Actinide STDs
 Reagent Volume: 200.000 mL
 Creation Date: 04/28/2015
 Open Date:
 Container(s): 622074
 Comment:

Expiration Date: 05/20/2016
 Laboratory: TestAmerica St. Louis
 Prepared By: Bernsen, Sarah C
 Solvent: 1M HNO3
 Solvent Lot: n/a

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
U-234	UNAT Parent_00001	05/20/2016	706.91200	dpm/mL	70.69123	dpm/mL
U-235	UNAT Parent_00001	05/20/2016	33.70600	dpm/mL	3.37064	dpm/mL
U-238	UNAT Parent_00001	05/20/2016	722.65000	dpm/mL	72.26499	dpm/mL

Source Reagents

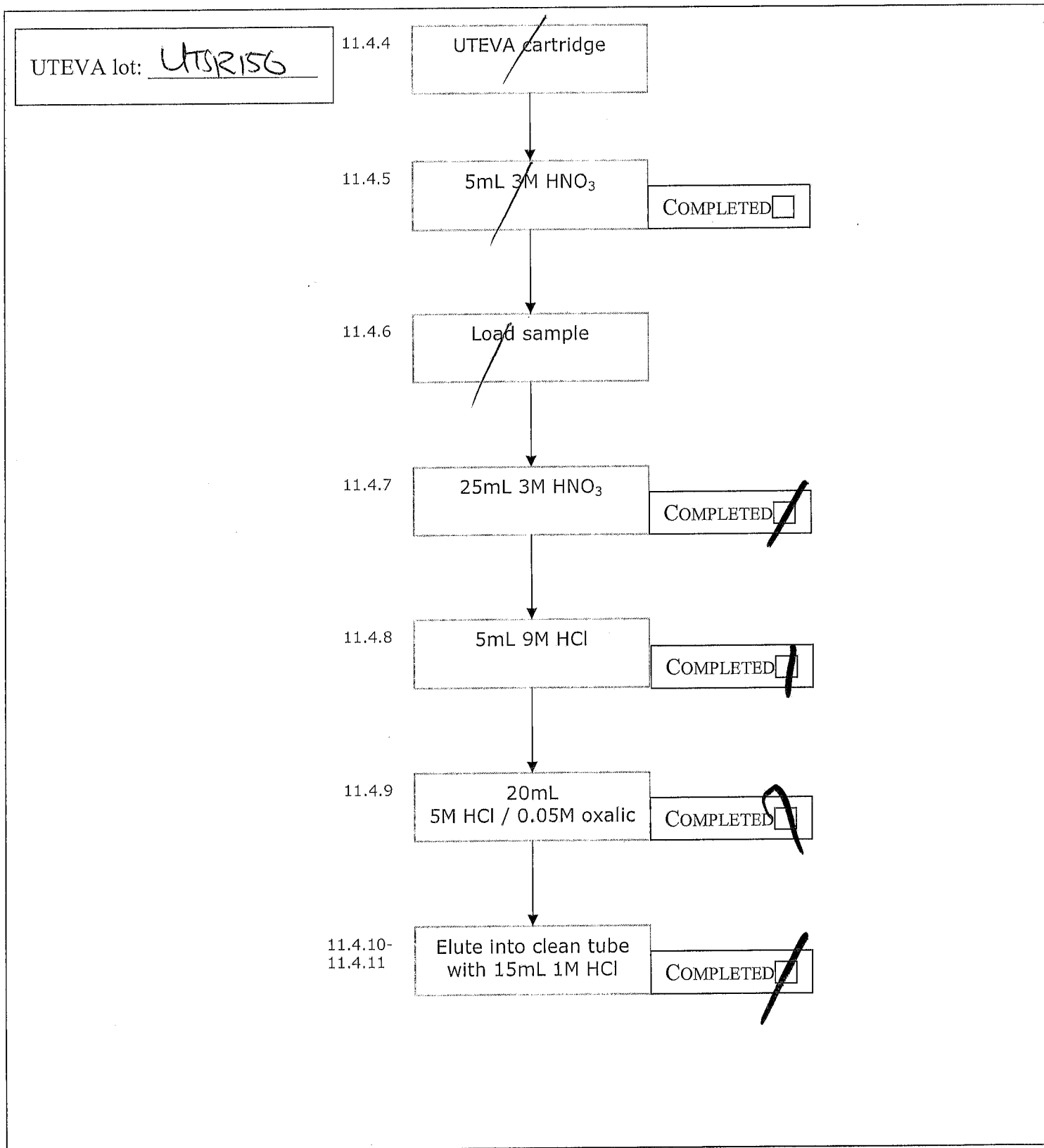
Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
UNAT Parent_00001	UNAT Parent		05/20/16				20.00000	mL

Uranium only via UTEVA

ST-RC-0238

Batch: _____

*All rinses should flow at 1 mL/minute (only 3M HNO₃ may be done at 3 mL/minute)



St. Louis Radiological Standard Reverification Form

Standard ID Number: UNAT_00011
True Value = 72.2649 DPM/L or g
Date Analyzed: 5/5/2016

Radionuclide: U-238

	Replicates	
#1	<u>68.65</u>	DPM/L or g
#2	<u>72.23</u>	DPM/L or g
#3	<u>73.85</u>	DPM/L or g

Mean = 71.57667

1 sigma = 2.660852

1.96 sigma = 5.21527

True Value minus 5% = 68.65166

(True Value - 5%)

True Value plus 5% = 75.87815

(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: Amanda Dick 05/09/2016

SOP Reference: STL-QA-0002, Current Revision

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

Sample

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

Batch Name: UNAT_00011
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: U-232_00032
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.10 mL = 8.22 DPM
Tracer Ref. Date: 8/25/2011 12:03:08PM

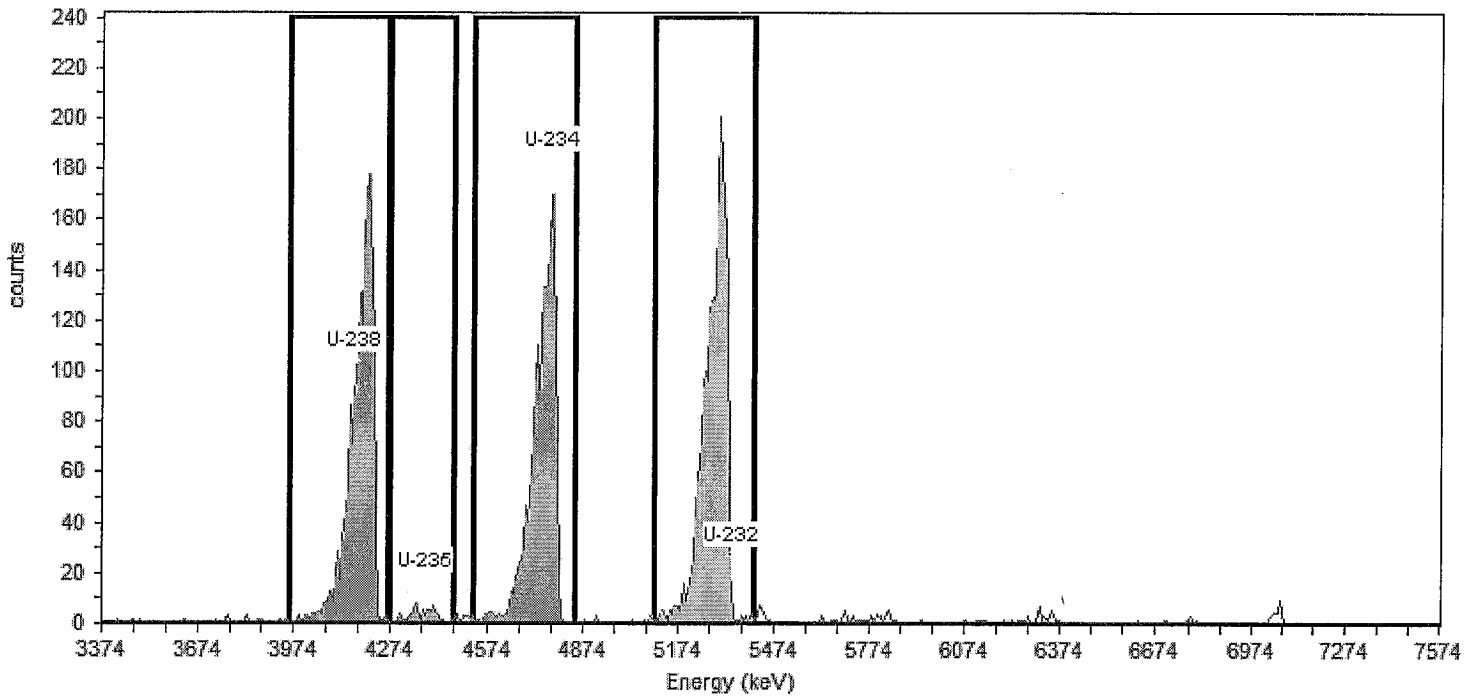
Tracer

Tracer Nuclide: U-232
Tracer Recovery: 100.46%

Detector: AV194 SN: 50-119J2
Acquisition Start Date: 5/5/2016 10:51:35AM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 4/22/2016 10:41:10AM
Bkgd Info: Sample: ICB;AV194; Det: AV194; Spectrum #1; 4/22/2016 10:41:10 AM

Acquisition

Energy Calibration: IC-9520;AV194-20151017
Efficiency Calibration:IC-9520;AV194-20151017
Calibration Date: 10/18/2015 3:55:14PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.83% +/- 0.35% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction:5/5/2016 10:49:41AM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	77.8	100.0	1645	1.0000	1644.00	6.865E+001 DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	22.2	80.2	60	3.0000	57.00	2.968E+000 DPM/mL
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	74.8	99.8	1590	1.0000	1589.00	6.649E+001 DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	76.2	100.1	1892	8.0000	1884.00	8.262E+001 DPM/mL

Sample Name: Verification 2 Type: Sample
Spectrum #1 Analysis #1

Sample Collection Date:
Comment:

Batch Name: UNAT_00011

Description:

Tracer Name: U-232_00032
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.10 mL = 8.22 DPM
Tracer Ref. Date: 8/25/2011 12:03:08PM

Detector: AV195 SN: 50-117AA2
Acquisition Start Date: 5/5/2016 10:51:35AM
Live Time: 960.00 min.
Real Time: 960.00 min.
Background Date: 4/22/2016 10:41:10AM
Bkgd Info: Sample: ICB;AV195; Det: AV195; Spectrum #1; 4/22/2016 10:41:10 AM

Sample

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

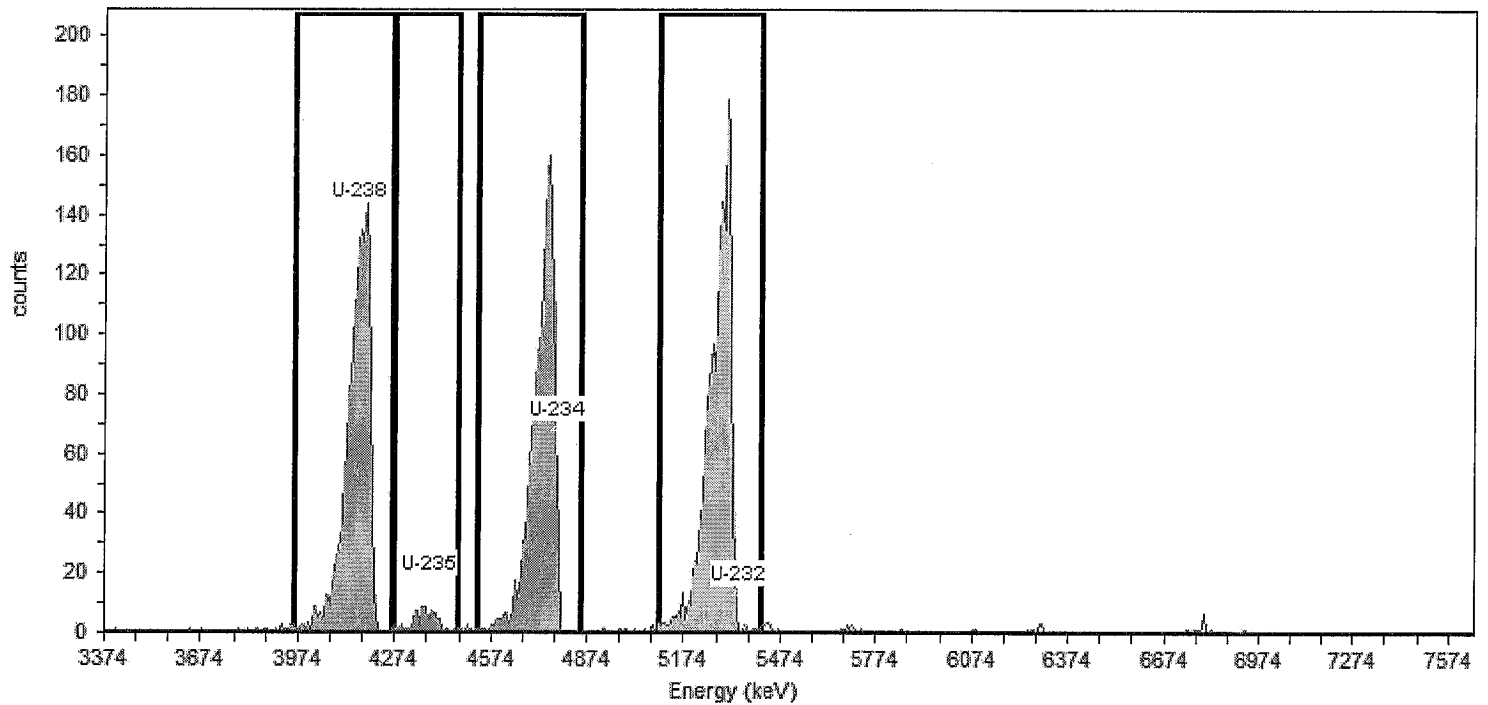
Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer

Tracer Nuclide: U-232
Tracer Recovery: 83.14%

Acquisition

Energy Calibration: IC-9792;AV195-20151017a
Efficiency Calibration: IC-9792;AV195-20151017a
Calibration Date: 10/18/2015 3:55:41PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.85% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 5/5/2016 10:49:41AM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	73.6	100.0	1490	0.0000	1490.00	7.223E+001 DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	78.5	80.2	77	0.0000	77.00	4.654E+000 DPM/mL
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	69.4	99.8	1484	3.0000	1481.00	7.193E+001 DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	73.2	100.1	1633	10.0000	1623.00	6.838E+001 DPM/mL

Sample Name: Verification 3
Spectrum #1 Analysis #1
Type: Sample
Sample Collection Date:
Comment:

Sample

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

Batch Name: UNAT_00011

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Description:

Tracer

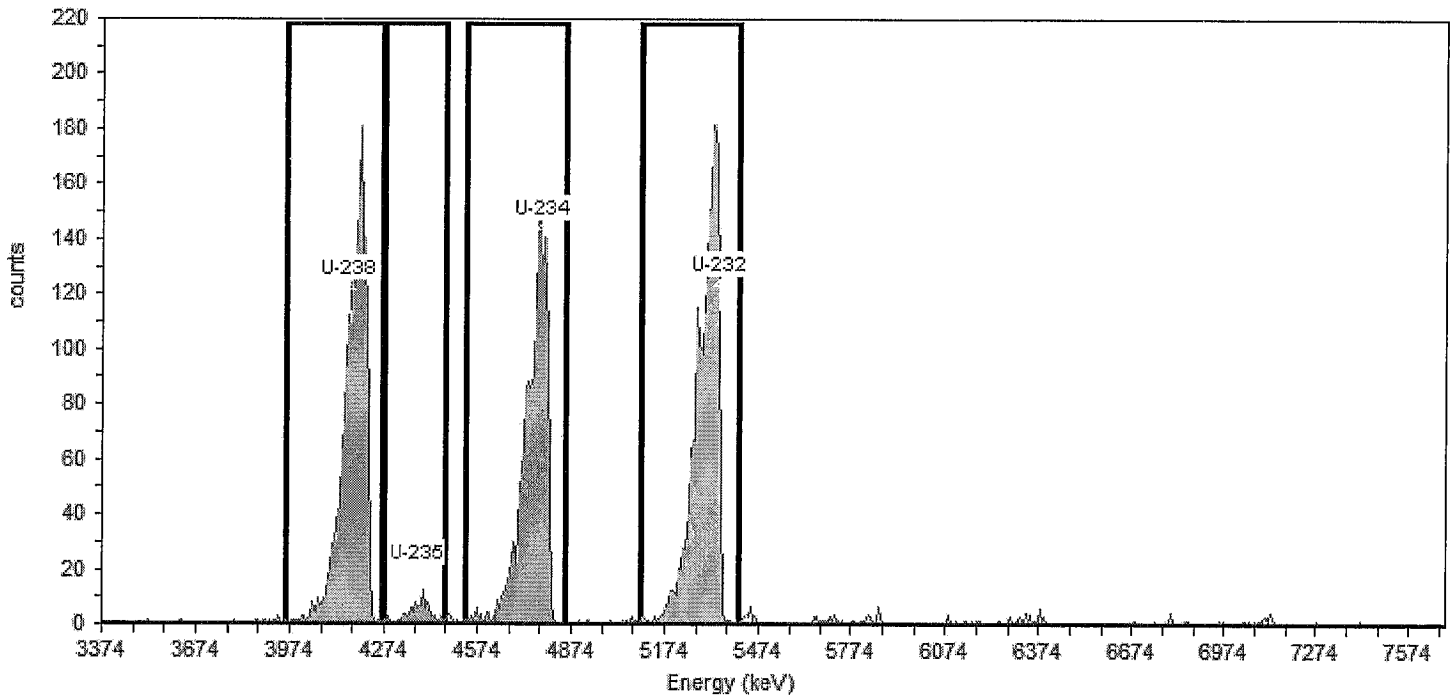
Tracer Name: U-232_00032
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.10 mL = 8.22 DPM
Tracer Ref. Date: 8/25/2011 12:03:08PM

Tracer Nuclide: U-232
Tracer Recovery: 95.37%

Acquisition

Detector: AV197 SN: 50-117Z5
Acquisition Start Date: 5/5/2016 10:51:35AM
Live Time: 960.00 min.
Real Time: 960.01 min.
Background Date: 4/25/2016 9:56:18AM
Bkgd Info: Sample: ICB;AV197; Det: AV197; Spectrum #1; 4/25/2016 9:56:18 AM

Energy Calibration: IC-9794;AV197-20151017
Efficiency Calibration: IC-9794;AV197-20151017
Calibration Date: 10/18/2015 3:55:22PM
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: ROI Analysis, Set Name = UROI
Decay Correction: 5/5/2016 10:49:41AM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	73.5	99.8	1519	3.0000	1516.00	6.779E+001 DPM/mL
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	78.8	100.1	1769	6.0000	1763.00	7.844E+001 DPM/mL
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	72.8	100.0	1655	0.0000	1655.00	7.385E+001 DPM/mL
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	62.5	80.2	77	0.0000	77.00	4.284E+000 DPM/mL

Batch No.:

Balance ID:

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.

Sample Number	Aliquot (g / mL)	Crucible ID	Dilution
151	0.1	194	10:199
152	1	195	10:200
153	1	197	10:201
154			
155			
156			
157			
158			
159			
160			
161			
162			
163			
164			
165			
166			
167			
168			
169			
170			
171			
172			
173			
174			
175			
176			
177			
178			
179			
180			

Samples Spiked and Traced By: SUB / 5/21/16
 Verification Signature & Date: JML / 5/21/16

Tracer: N/A
 Isotope: U-232
 Std Sol'n No.: U-232-00032
 Vol (mL): 0.1
 Ref Activity (dpm/mL):
 Act Ref Date:

LCS Standard: N/A
 Isotope: UNWAT
 Std Sol'n ID.: UNWAT-00011
 Vol (mL): 0.1
 Ref Activity (dpm/mL): 232-12-109
 Act Ref Date: 03-30-08

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

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

Isotope(s):
 αβ
 Iso Am
 KPA
 Np
 Iso Pu
 Ra
 Sr
 TAR
 Tc-99
 Iso Th
 Iso U
 C-14
 Iso Cm
 Pu-241
 Th-229
 Cl-36

Count Time Matrix
 Long Count Soil
 Short Count H₂O

Prepared By: SUB
 Date: _____

Reviewed by: _____
 Date: _____



Reagent ID: UNAT_00011

Description: UNAT spike
 No. of Bottles: 1
 Storage Location: RAD Actinide STDs
 Reagent Volume: 200.000 mL
 Creation Date: 04/28/2015
 Open Date:
 Container(s): 622074
 Comment:

Expiration Date: 05/20/2016
 Laboratory: TestAmerica St. Louis
 Prepared By: Bernsen, Sarah C
 Solvent: 1M HNO3
 Solvent Lot: n/a

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
U-234	UNAT Parent_00001	05/20/2016	706.91200	dpm/mL	70.69123	dpm/mL
U-235	UNAT Parent_00001	05/20/2016	33.70600	dpm/mL	3.37064	dpm/mL
U-238	UNAT Parent_00001	05/20/2016	722.65000	dpm/mL	72.26499	dpm/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
UNAT Parent_00001	UNAT Parent		05/20/16				20.00000	mL

Uranium only via UTEVA

ST-RC-0238

Batch: _____

*All rinses should flow at 1 mL/minute (only 3M HNO₃ may be done at 3 mL/minute)

UTEVA lot: <u>UTSR156</u>	11.4.4	UTEVA cartridge	
	11.4.5	5mL 3M HNO₃	COMPLETED <input type="checkbox"/>
	11.4.6	Load sample	
	11.4.7	25mL 3M HNO₃	COMPLETED <input checked="" type="checkbox"/>
	11.4.8	5mL 9M HCl	COMPLETED <input checked="" type="checkbox"/>
	11.4.9	20mL 5M HCl / 0.05M oxalic	COMPLETED <input checked="" type="checkbox"/>
11.4.10- 11.4.11		Elute into clean tube with 15mL 1M HCl	COMPLETED <input checked="" type="checkbox"/>

ALPHA SPECTROSCOPY

Method A-01-R Th

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

Prep Batch: 257492

Preparation, Extraction
Chromatography Resin Actinide
Separation

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 257492

Lab ID: MB 160-257492/1-A
 Client ID:
 Sigma: 2

Analyzed: 07/02/16 15:17
 Detector: AV148
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: Yes
 Ts: 400

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Thorium-228	0.1309	0.0590	0.0600		pCi/g	0.0620	0.0233	259078	
Thorium-230	0.1162	0.0488	0.0497		pCi/g	0.0154	0.00647	259078	
Thorium-232	0.002972	0.0110	0.0110	U	pCi/g	0.0282	0.00644	259078	
Tracer	MB Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Thorium-229	5.001	0.291	0.511		pCi/g	0.00756	6.06	82.6	30 - 110

Lab ID: LCS 160-257492/2-A
 Client ID:
 Sigma: 2

Analyzed: 07/02/16 15:17
 Detector: AV150
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: Yes
 Ts: 400

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Thorium-230	26.83	1.05	2.49		pCi/g	0.0307	0.0129	259080	
Tracer	LCS Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Thorium-229	10.99	0.639	1.12		pCi/g	0.0203	12.1	90.6	30 - 110

Lab ID: 160-17814-1
 Client ID: AC-SED-4
 Sigma: 2

Analyzed: 07/02/16 15:17
 Detector: AV151
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: Yes
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Thorium-228	1.01	0.146	0.169		pCi/g	0.0658	0.0254	259081	
Thorium-230	3.56	0.268	0.401		pCi/g	0.0278	0.00635	259081	
Thorium-232	1.04	0.144	0.169		pCi/g	0.0150	0.00632	259081	
Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Thorium-229	5.37	0.310	0.547		pCi/g	0.00798	6.05	88.8	30 - 110

Lab ID: 160-17814-1 DU
 Client ID: AC-SED-4
 Sigma: 2

Analyzed: 07/02/16 15:17
 Detector: AV152
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: Yes
 Ts: 400

Analyte	DU Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Thorium-228	0.9640	0.144	0.165		pCi/g	0.0589	0.0217	259082
Thorium-230	3.480	0.269	0.397		pCi/g	0.0286	0.00654	259082
Thorium-232	0.9194	0.138	0.158		pCi/g	0.0285	0.00651	259082

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 257492

Tracer	DU Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Thorium-229	5.378	0.315	0.551		pCi/g	0.0101	6.05	88.9	30 - 110

Lab ID: 160-17814-2
 Client ID: AC-SED-6
 Sigma: 2

Analyzed: 07/02/16 15:17
 Detector: AV153
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: Yes
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Thorium-228	1.07	0.150	0.175		pCi/g	0.0545	0.0195	259083
Thorium-230	2.82	0.241	0.338		pCi/g	0.0339	0.00920	259083
Thorium-232	1.19	0.156	0.185		pCi/g	0.0154	0.00647	259083

Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Thorium-229	5.01	0.292	0.512		pCi/g	0.00760	6.07	82.6	30 - 110

Lab ID: 160-17814-3
 Client ID: AC-SED-7
 Sigma: 2

Analyzed: 07/07/16 13:10
 Detector: AV199
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: Yes
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Thorium-228	0.728	0.119	0.134		pCi/g	0.0628	0.0245	259665
Thorium-230	2.45	0.212	0.296		pCi/g	0.0300	0.00817	259665
Thorium-232	0.656	0.109	0.123		pCi/g	0.0251	0.00575	259665

Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Thorium-229	8.24	0.388	0.793	X	pCi/g	0.00999	6.05	136	30 - 110

Lab ID: 160-17814-4
 Client ID: AC-SED-8
 Sigma: 2

Analyzed: 07/02/16 15:17
 Detector: AV155
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: Yes
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Thorium-228	1.07	0.153	0.177		pCi/g	0.0652	0.0248	259085
Thorium-230	3.77	0.281	0.423		pCi/g	0.0157	0.00660	259085
Thorium-232	1.11	0.152	0.178		pCi/g	0.0156	0.00656	259085

Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Thorium-229	5.39	0.317	0.552		pCi/g	0.00211	6.04	89.2	30 - 110

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 257492

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 160-257492/1-A	Thorium-228			0.1309		pCi/g							4.361193 58
MB 160-257492/1-A	Thorium-230			0.1162		pCi/g							4.671035 8
MB 160-257492/1-A	Thorium-232			0.002972	U	pCi/g							.5383239
Lab Control Sample ID:	Analyte	Parent Result	Spike Added	LCS Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
LCS 160-257492/2-A	Thorium-230		24.5	26.83		pCi/g	110	81 - 118					1.388087 6722
Duplicate ID:	Analyte	Parent Result	Spike Added	DU Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
160-17814-1	Thorium-228	1.01		0.9640		pCi/g			5	0.14	0.40	1	
160-17814-1	Thorium-230	3.56		3.480		pCi/g			2	0.10	0.29	1	
160-17814-1	Thorium-232	1.04		0.9194		pCi/g			12	0.37	1.04	1	

Glossary:

Ts = Count Duration, Sample

ALPHA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-17814-1

SDG No.: _____

Batch Number: 257492 Batch Start Date: 06/22/16 10:35 Batch Analyst: Bernsen, Sarah C

Batch Method: ExtChrom Batch End Date: 07/01/16 16:21

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	Th-229 00020	TRM-2 00001	AnalysisComment		
MB 160-257492/1		ExtChrom, A-01-R		1.0 g	0.2 mL				
LCS 160-257492/2		ExtChrom, A-01-R		0.4989 g	0.2 mL	0.4989 g	TRM		
160-17814-A-1-A	AC-SED-4	ExtChrom, A-01-R	T	1.0018 g	0.2 mL				
160-17814-A-1-A DU	AC-SED-4	ExtChrom, A-01-R	T	1.0008 g	0.2 mL				
160-17814-A-2-A	AC-SED-6	ExtChrom, A-01-R	T	0.9986 g	0.2 mL				
160-17814-A-3-A	AC-SED-7	ExtChrom, A-01-R	T	1.0003 g	0.2 mL				
160-17814-A-4-A	AC-SED-8	ExtChrom, A-01-R	T	1.0033 g	0.2 mL				

Batch Notes	
Balance ID	27050421
Analyst ID - Column	nmn per scb
Column Date	7/1/16
Analyst ID - CoPrecipitation	scb
CoPrecipitation Date	7/1/16
Pipette ID	Rad104
Analyst ID - Reagent Drop Witness	rjs 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.

Sample Name: MB 160-257492/1-A **Type:** Blank
Spectrum #1 Analysis #1
: MB 160-257492/1-A
Sample Collection Date: 7/1/2016 4:42:00PM
Comment:

Sample

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 Name: 257492
AnalysisResultsID: 170136
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

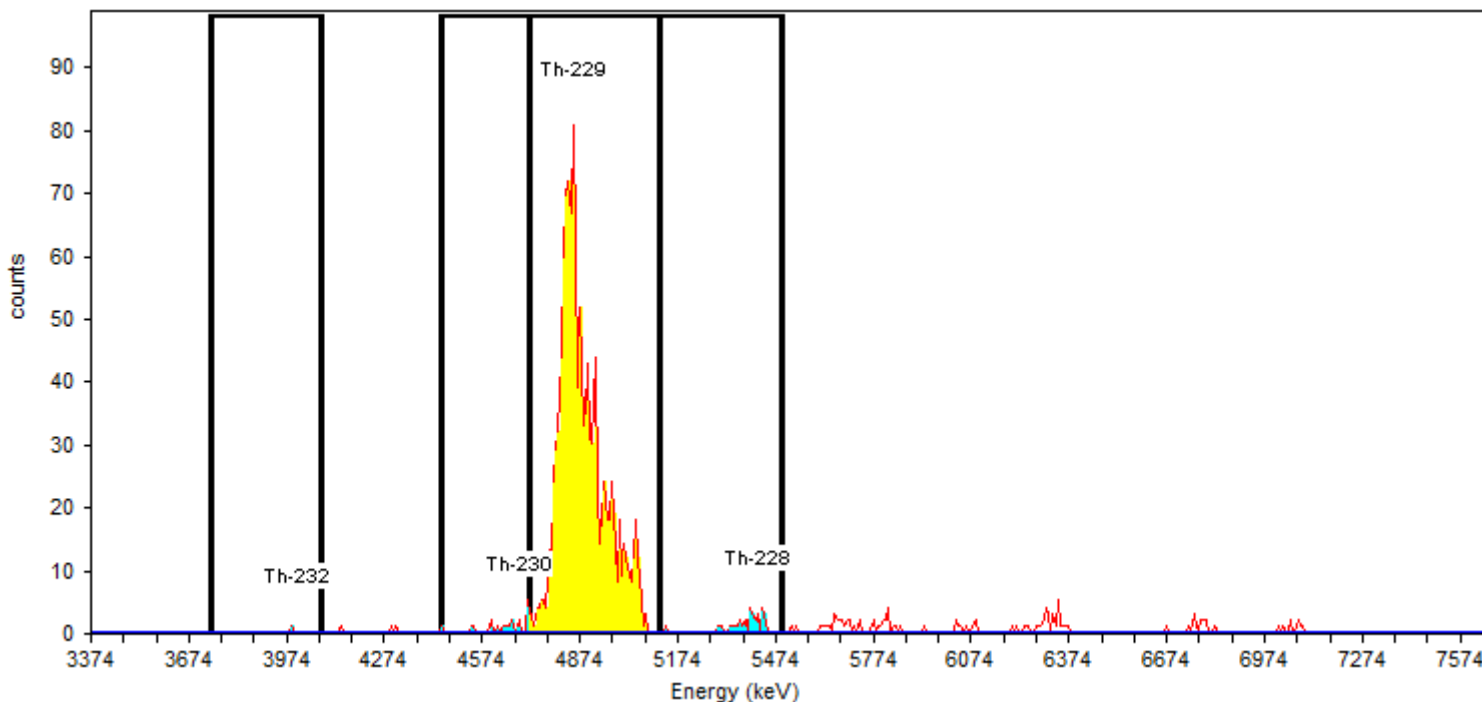
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 82.58%

Detector: AV148 **SN:** 50-05/R2
Acquisition Start Date: 7/2/2016 3:17:11PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 6/24/2016 4:15:34PM
Bkgd Info: Sample: ICB;AV148; Det: AV148; Spectrum #1; 6/24/2016 4:15:34 PM

Acquisition

Energy Calibration: IC-8874;AV148-20151016a
Efficiency Calibration: IC-8874;AV148-20151016a
Calibration Date: 10/16/2015 6:47:19PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 26.72% +/- 0.38% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 7/2/2016 3:14:38PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

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	44.5	100.2	1	0.4167	0.58	2.972E-003	pCi/g
Th-230	4688.0	4,687.5	0.5	4446.0	4717.0	.3	99.7	23	0.0000	22.69	1.162E-001	pCi/g
Th-229	4848.0	4,845.3	2.7	4717.0	5119.0	98.6	99.6	1183	0.8333	1182.17	5.001E+000	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	75.0	99.8	31	5.4167	25.58	1.309E-001	pCi/g

Sample Name: LCS 160-257492/2-A **Type:** Control
Spectrum #1 Analysis #1
: LCS 160-257492/2-A
Sample Collection Date: 7/1/2016 4:42:00PM
Comment:

Sample

Sample Weight : 0.50 **Sample Units:** g
First Stage Dilution: N/A
Aliquot: N/A **Aliquot Fraction:** N/A
Dilution 2: N/A
Lab Preparation:

Batch Name: 257492
AnalysisResultsID: 170138
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

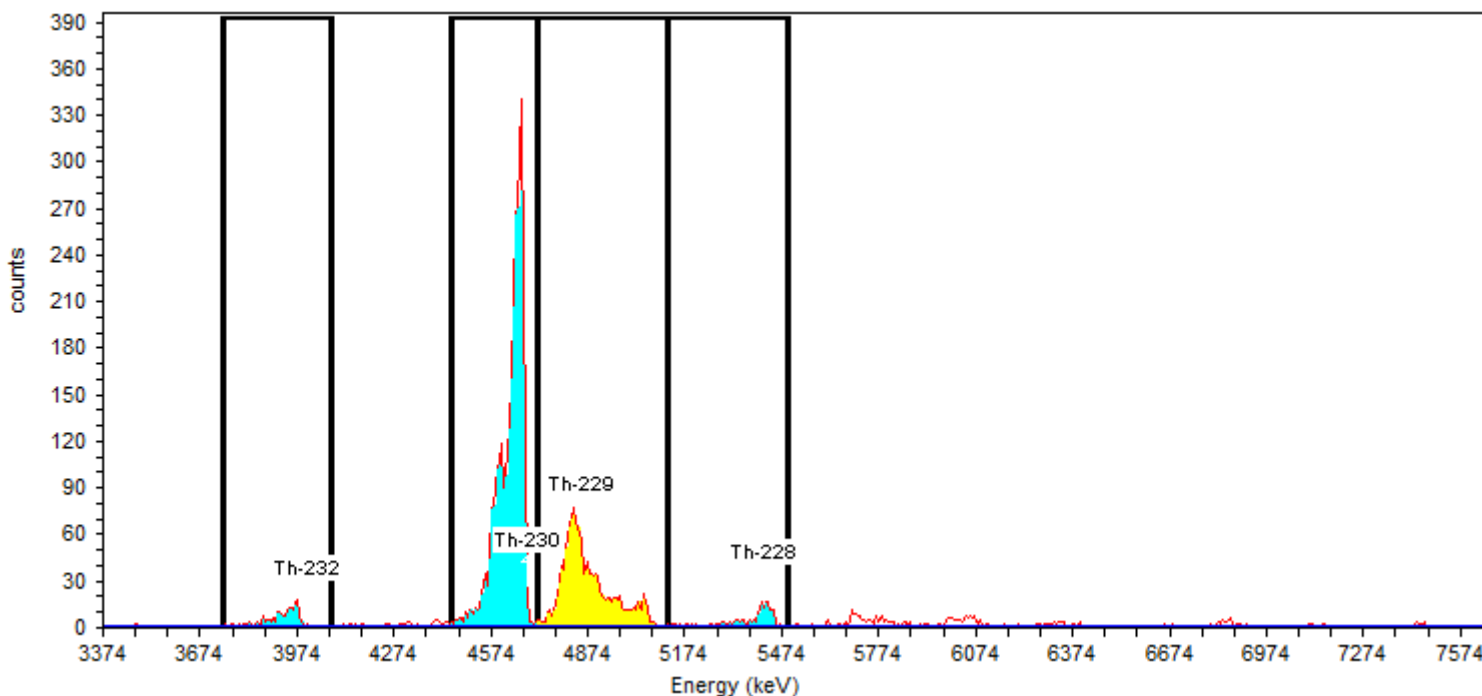
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 90.56%

Detector: AV150 **SN:** 50-05/R4
Acquisition Start Date: 7/2/2016 3:17:11PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 6/24/2016 4:15:33PM
Bkgd Info: Sample: ICB;AV150; Det: AV150; Spectrum #1; 6/24/2016 4:15:33 PM

Acquisition

Energy Calibration: IC-8876;AV150-20151016
Efficiency Calibration: IC-8876;AV150-20151016
Calibration Date: 10/16/2015 6:46:46PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.45% +/- 0.29% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 7/2/2016 3:14:36PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

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	66.1	100.2	136	0.4167	136.01	1.383E+000	pCi/g
Th-230	4688.0	4,687.5	0.5	4446.0	4717.0	40.2	99.7	2625	0.0000	2624.69	2.683E+001	pCi/g
Th-229	4848.0	4,845.3	2.7	4717.0	5119.0	87.0	99.6	1188	1.2500	1186.69	1.099E+001	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	51.6	99.8	135	5.4528	129.48	1.323E+000	pCi/g

Sample Name: 160-17814-A-1-D **Type:** Sample
Spectrum #1 Analysis #1
: 160-17814-A-1-D
Sample Collection Date: 6/10/2016 6:35:00AM
Comment:

Sample

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 Name: 257492
AnalysisResultsID: 170137
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

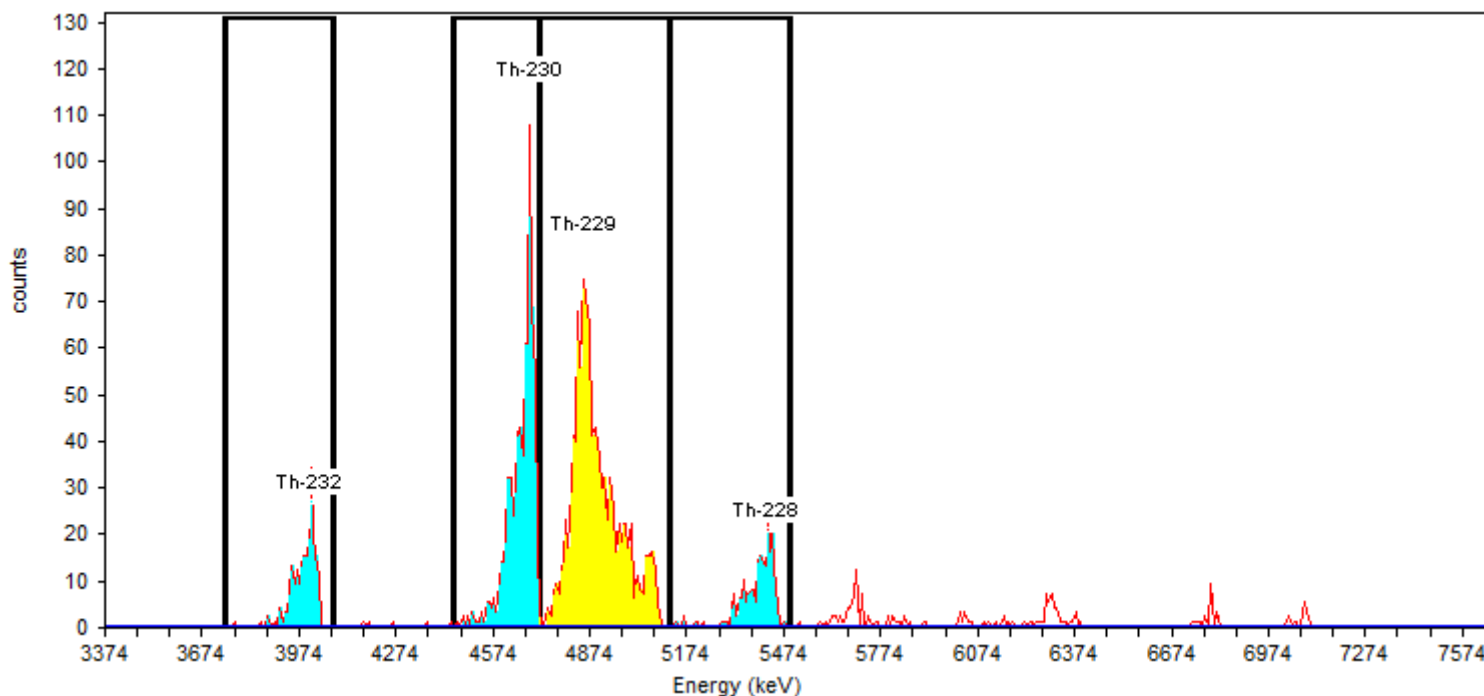
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 89.05%

Detector: AV151 **SN:** 50-05/R5
Acquisition Start Date: 7/2/2016 3:17:11PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:34PM
Bkgd Info: Sample: ICB;AV151; Det: AV151; Spectrum #1; 6/24/2016 4:15:34 PM

Acquisition

Energy Calibration: IC-8877;AV151-20151016
Efficiency Calibration: IC-8877;AV151-20151016
Calibration Date: 10/16/2015 6:46:50PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.28% +/- 0.31% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 7/2/2016 3:14:35PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

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	64.0	100.2	208	0.0000	208.00	1.037E+000	pCi/g
Th-230	4688.0	4,687.5	0.5	4446.0	4717.0	35.1	99.7	705	0.4167	704.77	3.530E+000	pCi/g
Th-229	4848.0	4,845.3	2.7	4717.0	5119.0	84.3	99.6	1207	0.8333	1206.04	5.384E+000	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	65.8	99.8	208	6.6667	201.33	1.008E+000	pCi/g

Sample Name: 160-17814-A-1-D **Type:** Sample
Spectrum #1 Analysis #1
: 160-17814-A-1-D
Sample Collection Date: 6/10/2016 6:35:00AM
Comment:

Sample

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 Name: 257492
AnalysisResultsID: 170218
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

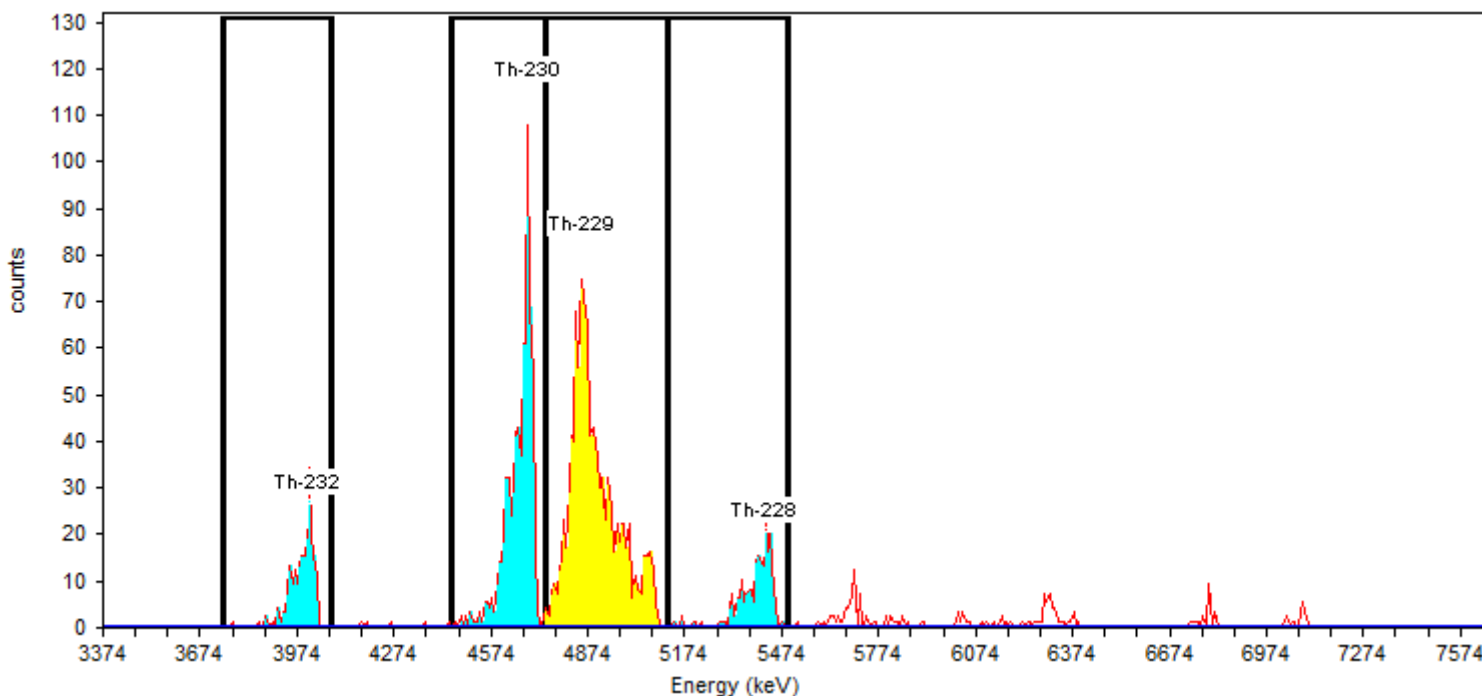
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 88.76%

Detector: AV151 **SN:** 50-05/R5
Acquisition Start Date: 7/2/2016 3:17:11PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:34PM
Bkgd Info: Sample: ICB;AV151; Det: AV151; Spectrum #1; 6/24/2016 4:15:34 PM

Acquisition

Energy Calibration: IC-8877;AV151-20151016
Efficiency Calibration: IC-8877;AV151-20151016
Calibration Date: 10/16/2015 6:46:50PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.28% +/- 0.31% TPU(2 sigma)



General Analysis

Analysis Method: Absolute Interactive ROI Analysis
Decay Correction: 7/2/2016 3:14:35PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for
tailing. 07/05/2016 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-229	4848.0	4,845.3	2.7	4739.1	5119.5	84.3	99.6	1203	0.8333	1202.17	5.366E+000	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	65.8	99.8	208	6.6667	201.33	1.011E+000	pCi/g
Th-232	3999.0	4,010.0	-11.0	3743.0	4072.0	64.0	100.2	208	0.0000	208.00	1.040E+000	pCi/g
Th-230	4688.0	4,687.5	0.5	4448.3	4739.1	44.8	99.7	709	0.4167	708.58	3.561E+000	pCi/g

Sample Name: 160-17814-A-1-E DU Type: Sample
Spectrum #1 Analysis #1
: 160-17814-A-1-E DU
Sample Collection Date: 6/10/2016 6:35:00AM
Comment:

Sample

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 Name: 257492
AnalysisResultsID: 170140
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

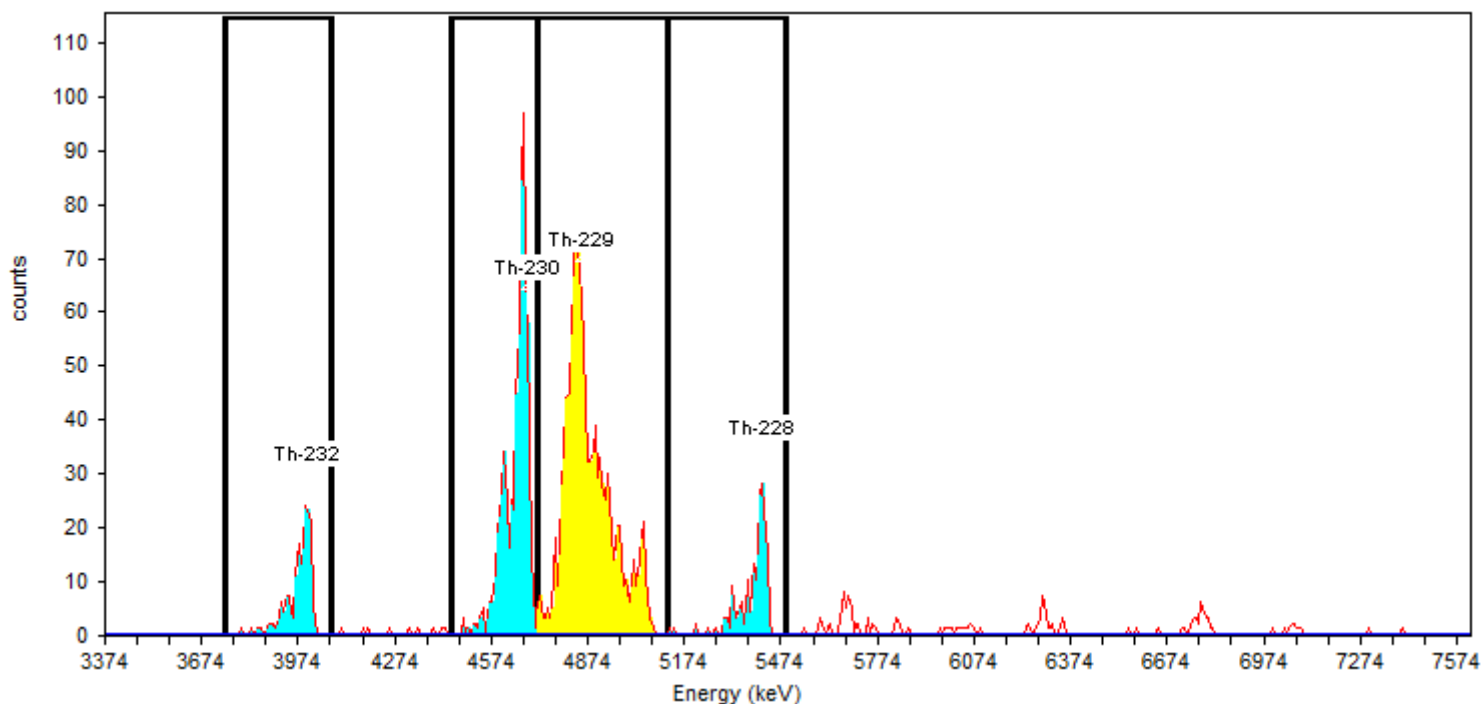
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 88.88%

Detector: AV152 SN: 50-05/R6
Acquisition Start Date: 7/2/2016 3:17:11PM
Live Time: 400.00 min.
Real Time: 400.01 min.
Background Date: 6/26/2016 5:10:10PM
Bkgd Info: Sample: ICB;AV152; Det: AV152; Spectrum #4; 6/26/2016 5:10:10 PM

Acquisition

Energy Calibration: IC-9520;AV152-20151016
Efficiency Calibration: IC-9520;AV152-20151016
Calibration Date: 10/16/2015 6:46:53PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.54% +/- 0.35% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 7/2/2016 3:14:35PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

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	51.9	100.2	179	0.4167	178.58	9.194E-001	pCi/g
Th-230	4688.0	4,687.5	0.5	4446.0	4717.0	23.7	99.7	673	0.4167	672.65	3.480E+000	pCi/g
Th-229	4848.0	4,845.3	2.7	4717.0	5119.0	81.7	99.6	1170	1.2500	1168.81	5.379E+000	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	50.9	99.8	191	4.5833	186.42	9.640E-001	pCi/g

Sample Name: 160-17814-A-2-C **Type:** Sample
Spectrum #1 Analysis #1
: 160-17814-A-2-C
Sample Collection Date: 6/10/2016 6:40:00AM
Comment:

Sample

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 Name: 257492
AnalysisResultsID: 170142
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

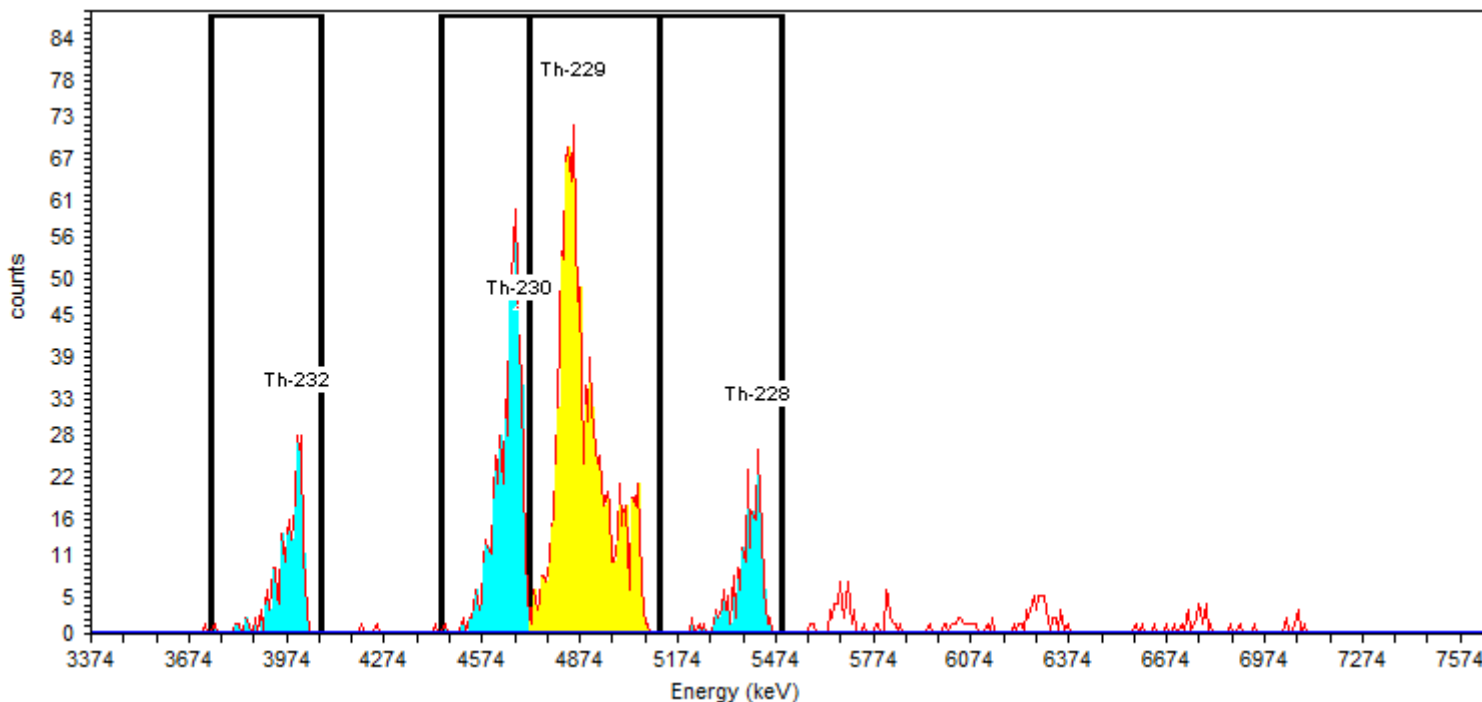
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 82.59%

Detector: AV153 **SN:** 54-011 Y6
Acquisition Start Date: 7/2/2016 3:17:11PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:17PM
Bkgd Info: Sample: ICB;AV153; Det: AV153; Spectrum #1; 6/24/2016 4:15:17 PM

Acquisition

Energy Calibration: IC-9792;AV153-20151016
Efficiency Calibration: IC-9792;AV153-20151016
Calibration Date: 10/16/2015 6:46:57PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 26.60% +/- 0.31% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 7/2/2016 3:14:35PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

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	61.9	100.2	231	0.0000	231.43	1.186E+000	pCi/g
Th-230	4688.0	4,687.5	0.5	4446.0	4717.0	30.2	99.7	549	0.8333	548.14	2.822E+000	pCi/g
Th-229	4848.0	4,845.3	2.7	4717.0	5119.0	83.0	99.6	1178	0.8333	1177.14	5.009E+000	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	70.4	99.8	212	3.7500	208.25	1.072E+000	pCi/g

Sample Name: 160-17814-A-3-C Type: Sample
Spectrum #2 Analysis #1
: 160-17814-A-3-C
Sample Collection Date: 6/10/2016 6:50:00AM
Comment:

Sample

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 Name: 257492
AnalysisResultsID: 170665
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

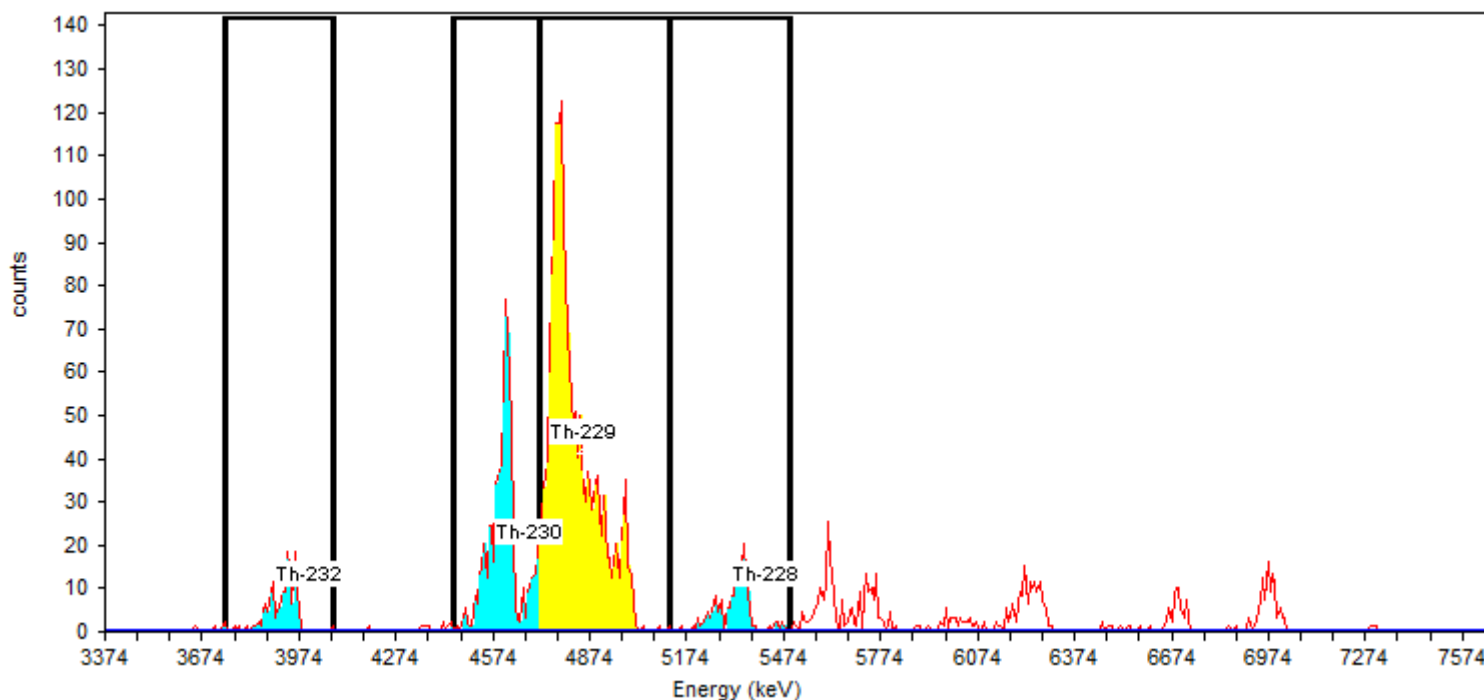
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 128.63%

Detector: AV199 SN: 50-117Z3
Acquisition Start Date: 7/7/2016 1:10:54PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:21PM
Bkgd Info: Sample: ICB;AV199; Det: AV199; Spectrum #1; 6/24/2016 4:15:21 PM

Acquisition

Energy Calibration: IC-9817;AV199-20151017
Efficiency Calibration:IC-9817;AV199-20151017
Calibration Date: 10/18/2015 3:55:29PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.71% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction:7/2/2016 3:14:36PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

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	60.4	100.2	145	0.4167	144.27	5.100E-001	pCi/g
Th-230	4688.0	4,687.5	0.5	4446.0	4717.0	53.9	99.7	637	0.8462	635.83	2.259E+000	pCi/g
Th-229	4848.0	4,845.3	2.7	4717.0	5119.0	71.4	99.6	1704	0.8462	1703.15	7.788E+000	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	52.3	99.8	167	7.5361	159.40	5.687E-001	pCi/g

Sample Name: 160-17814-A-3-C **Type:** Sample
Spectrum #2 Analysis #1
: 160-17814-A-3-C
Sample Collection Date: 6/10/2016 6:50:00AM
Comment:

Sample

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 Name: 257492
AnalysisResultsID: 170687
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

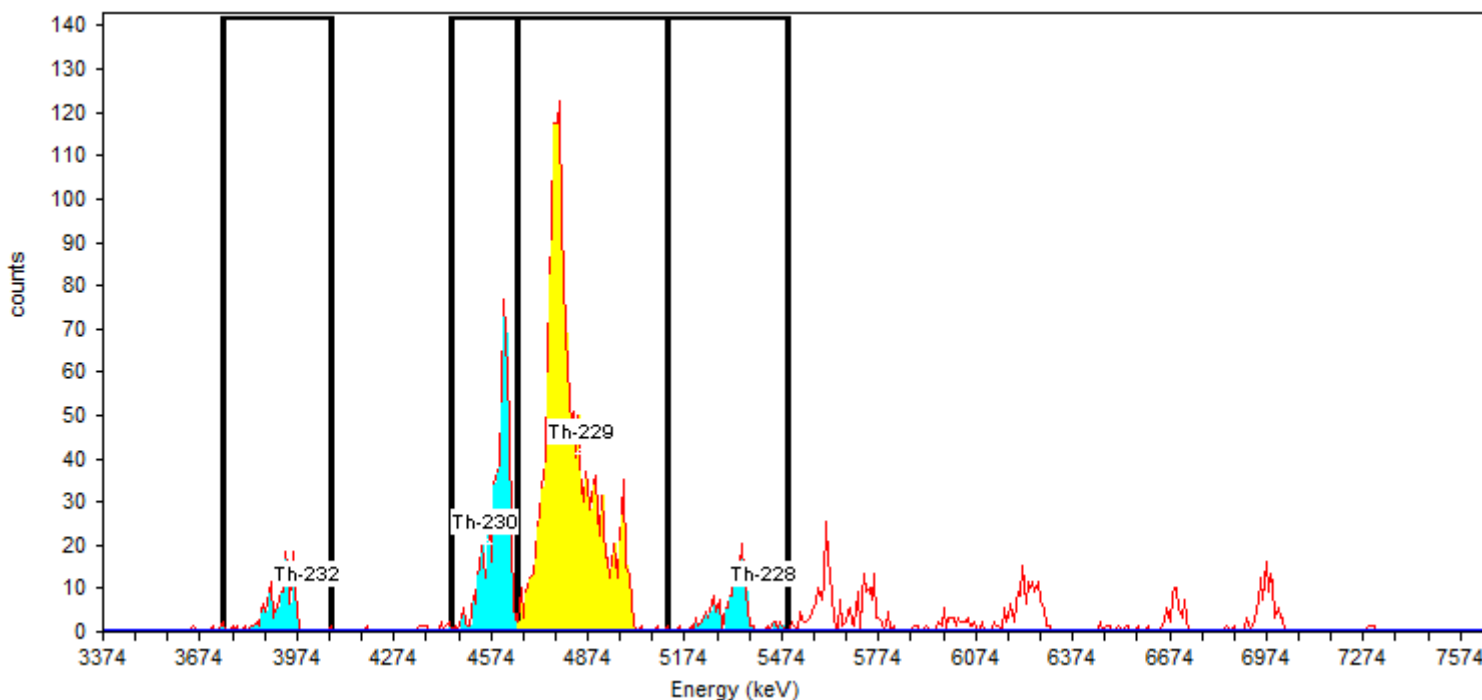
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 136.10%

Detector: AV199 **SN:** 50-117Z3
Acquisition Start Date: 7/7/2016 1:10:54PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:21PM
Bkgd Info: Sample: ICB;AV199; Det: AV199; Spectrum #1; 6/24/2016 4:15:21 PM

Acquisition

Energy Calibration: IC-9817;AV199-20151017
Efficiency Calibration: IC-9817;AV199-20151017
Calibration Date: 10/18/2015 3:55:29PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.71% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: Absolute Interactive ROI Analysis
Decay Correction: 7/2/2016 3:14:36PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Thorium
MDA Source: Background

Manual Integration for
tailing. 07/08/2016 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	60.4	100.2	145	0.4167	144.27	4.820E-001	pCi/g
Th-230	4552.7	4,687.5	-134.8	4448.3	4657.1	39.8	99.7	538	0.8333	537.17	1.804E+000	pCi/g
Th-229	4848.0	4,845.3	2.7	4657.1	5119.5	72.5	99.8	1806	1.2500	1804.75	8.240E+000	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	52.3	99.8	167	7.5361	159.40	5.375E-001	pCi/g

Sample Name: 160-17814-A-4-C **Type:** Sample
Spectrum #1 Analysis #1
: 160-17814-A-4-C
Sample Collection Date: 6/10/2016 7:00:00AM
Comment:

Sample

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 Name: 257492
AnalysisResultsID: 170139
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: Th-229_00020
Tracer Activity: 67.23 DPM / mL x (Vol.) 0.20 mL = 13.45 DPM
Tracer Ref. Date: 8/6/2014 1:28:22PM

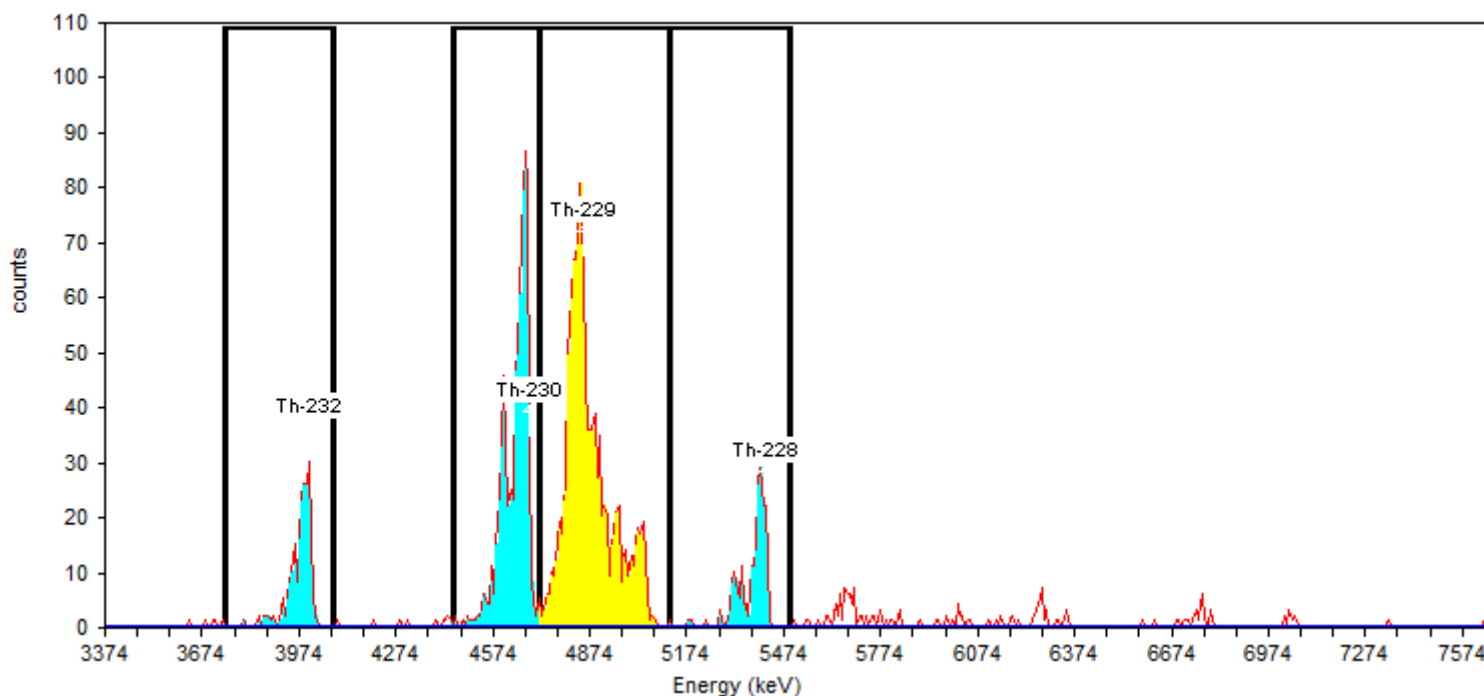
Tracer

Tracer Nuclide: Th-229
Tracer Recovery: 89.24%

Detector: AV155 **SN:** 50-05/II1
Acquisition Start Date: 7/2/2016 3:17:12PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/26/2016 5:10:11PM
Bkgd Info: Sample: ICB;AV155; Det: AV155; Spectrum #4; 6/26/2016 5:10:11 PM

Acquisition

Energy Calibration: IC-9794;AV155-20151016
Efficiency Calibration: IC-9794;AV155-20151016
Calibration Date: 10/16/2015 6:47:03PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.17% +/- 0.31% TPU(2 sigma)



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = Th2007_ROI
Decay Correction: 7/2/2016 3:14:36PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

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	55.9	100.2	213	0.0000	213.00	1.106E+000	pCi/g
Th-230	4688.0	4,687.5	0.5	4446.0	4717.0	20.5	99.7	723	0.0000	723.22	3.775E+000	pCi/g
Th-229	4848.0	4,845.3	2.7	4717.0	5119.0	77.6	99.6	1156	0.0533	1155.79	5.387E+000	pCi/g
Th-228	5420.0	5,423.3	-3.3	5119.0	5493.0	47.9	99.8	212	5.8866	206.05	1.075E+000	pCi/g

Method A-01-R U

Isotopic Uranium (Alpha Spectrometry) by Method A-01-R

Prep Batch: 257935

Preparation, Extraction
Chromatography Resin Actinide
Separation

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 257935

Lab ID: MB 160-257935/1-A
 Client ID:
 Sigma: 2

Analyzed: 07/02/16 15:31
 Detector: AV235
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Uranium-233/234	0.03094	0.0277	0.0278		pCi/g	0.0186	0.00782	259144	
Uranium-235/236	-0.006417	0.00908	0.00909	U	pCi/g	0.0506	0.0138	259144	
Uranium-238	0.006176	0.0124	0.0124	U	pCi/g	0.0185	0.00781	259144	
Tracer	MB Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Uranium-232	5.043	0.298	0.518		pCi/g	0.0124	7.41	71.3	30 - 110

Lab ID: LCS 160-257935/2-A
 Client ID:
 Sigma: 2

Analyzed: 07/02/16 15:31
 Detector: AV236
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Uranium-233/234	6.283	0.381	0.651		pCi/g	0.0426	0.0126	259145	
Uranium-238	6.600	0.390	0.678		pCi/g	0.0173	0.00728	259145	
Tracer	LCS Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Uranium-232	5.650	0.323	0.574		pCi/g	0.0101	7.41	79.9	30 - 110

Lab ID: 160-17814-1
 Client ID: AC-SED-4
 Sigma: 2

Analyzed: 07/02/16 15:31
 Detector: AV237
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Uranium-233/234	0.767	0.136	0.151		pCi/g	0.0478	0.0150	259146	
Uranium-235/236	0.0517	0.0391	0.0393		pCi/g	0.0222	0.00933	259146	
Uranium-238	0.805	0.138	0.154		pCi/g	0.0178	0.00748	259146	
Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Uranium-232	5.18	0.300	0.529		pCi/g	0.0123	7.40	73.4	30 - 110

Lab ID: 160-17814-1 DU
 Client ID: AC-SED-4
 Sigma: 2

Analyzed: 07/02/16 15:31
 Detector: AV238
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	DU Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Uranium-233/234	0.7844	0.147	0.161		pCi/g	0.0448	0.0122	259147
Uranium-235/236	0.01978	0.0367	0.0368	U	pCi/g	0.0683	0.0214	259147
Uranium-238	0.8740	0.155	0.171		pCi/g	0.0376	0.00859	259147

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 257935

Tracer	DU Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Uranium-232	4.617	0.287	0.482		pCi/g	0.0112	7.40	65.3	30 - 110

Lab ID: 160-17814-2
 Client ID: AC-SED-6
 Sigma: 2

Analyzed: 07/02/16 15:31
 Detector: AV239
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Uranium-233/234	0.657	0.123	0.134		pCi/g	0.0314	0.00719	259148	
Uranium-235/236	0.0425	0.0347	0.0348		pCi/g	0.0212	0.00894	259148	
Uranium-238	0.821	0.137	0.153		pCi/g	0.0314	0.00717	259148	
Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Uranium-232	5.62	0.318	0.569		pCi/g	0.00985	7.42	79.3	30 - 110

Lab ID: 160-17814-3
 Client ID: AC-SED-7
 Sigma: 2

Analyzed: 07/02/16 15:31
 Detector: AV240
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Uranium-233/234	0.513	0.114	0.122		pCi/g	0.0410	0.0112	259149	
Uranium-235/236	0.0311	0.0311	0.0312		pCi/g	0.0233	0.00982	259149	
Uranium-238	0.789	0.140	0.155		pCi/g	0.0344	0.00787	259149	
Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Uranium-232	4.77	0.284	0.491		pCi/g	0.00920	7.41	67.5	30 - 110

Lab ID: 160-17814-4
 Client ID: AC-SED-8
 Sigma: 2

Analyzed: 07/02/16 15:31
 Detector: AV241
 Dil Fac: 1

Decay Corrected: No
 Yield Truncated: No
 Ts: 400

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch	
Uranium-233/234	0.757	0.143	0.157		pCi/g	0.0533	0.0167	259150	
Uranium-235/236	0.0330	0.0330	0.0331		pCi/g	0.0247	0.0104	259150	
Uranium-238	0.826	0.148	0.163		pCi/g	0.0198	0.00835	259150	
Tracer	Result	Count Unc	Total Unc	Qualifier	Unit	DLC	Spike Added	% Rec	% Rec Limits
Uranium-232	4.85	0.297	0.504		pCi/g	0.00574	7.39	68.8	30 - 110

Alpha Spectroscopy Analysis Detail Report

Prep Batch: 257935

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 160-257935/1-A	Uranium-233/234			0.03094		pCi/g							2.226271 67
MB 160-257935/1-A	Uranium-235/236			-0.006417	U	pCi/g							-1.411725 45
MB 160-257935/1-A	Uranium-238			0.006176	U	pCi/g							.9991191 7
Lab Control Sample ID:	Analyte	Parent Result	Spike Added	LCS Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
LCS 160-257935/2-A	Uranium-233/234		6.37	6.283		pCi/g	99	84 - 120					-.1840500 64
LCS 160-257935/2-A	Uranium-238		6.51	6.600		pCi/g	101	82 - 122					.1889105 392
Duplicate ID:	Analyte	Parent Result	Spike Added	DU Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
160-17814-1	Uranium-233/234	0.767		0.7844		pCi/g			2	0.05	0.15	1	
160-17814-1	Uranium-235/236	0.0517		0.01978	U	pCi/g			89	0.42	1.19	1	
160-17814-1	Uranium-238	0.805		0.8740		pCi/g			8	0.21	0.60	1	

Glossary:

Ts = Count Duration, Sample

ALPHA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-17814-1

SDG No.: _____

Batch Number: 257935 Batch Start Date: 06/24/16 15:54 Batch Analyst: Bernsen, Sarah C

Batch Method: ExtChrom Batch End Date: 07/01/16 16:21

Lab Sample ID	Client Sample ID	Method Chain	Basis	InitialAmount	U-232 00034	UNAT 00012			
MB 160-257935/1		ExtChrom, A-01-R		1.0 g	0.2 mL				
LCS 160-257935/2		ExtChrom, A-01-R		1.0 g	0.2 mL	0.2 mL			
160-17814-A-1-A	AC-SED-4	ExtChrom, A-01-R	T	1.0018 g	0.2 mL				
160-17814-A-1-A DU	AC-SED-4	ExtChrom, A-01-R	T	1.0008 g	0.2 mL				
160-17814-A-2-A	AC-SED-6	ExtChrom, A-01-R	T	0.9986 g	0.2 mL				
160-17814-A-3-A	AC-SED-7	ExtChrom, A-01-R	T	1.0003 g	0.2 mL				
160-17814-A-4-A	AC-SED-8	ExtChrom, A-01-R	T	1.0033 g	0.2 mL				

Batch Notes	
Balance ID	27050421
Analyst ID - Column	nmn per scb
Column Date	7/1/16
Analyst ID - CoPrecipitation	scb
CoPrecipitation Date	7/1/16
Pipette ID	Rad104
Analyst ID - Reagent Drop Witness	rjs 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.

Sample Name: MB 160-257935/1-A **Type:** Blank
Spectrum #1 Analysis #1
: MB 160-257935/1-A
Sample Collection Date: 7/1/2016 4:42:00PM
Comment:

Sample

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 Name: 257935
AnalysisResultsID: 170198
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: U-232_00034
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.20 mL = 16.45 DPM
Tracer Ref. Date: 8/25/2011 4:14:20PM

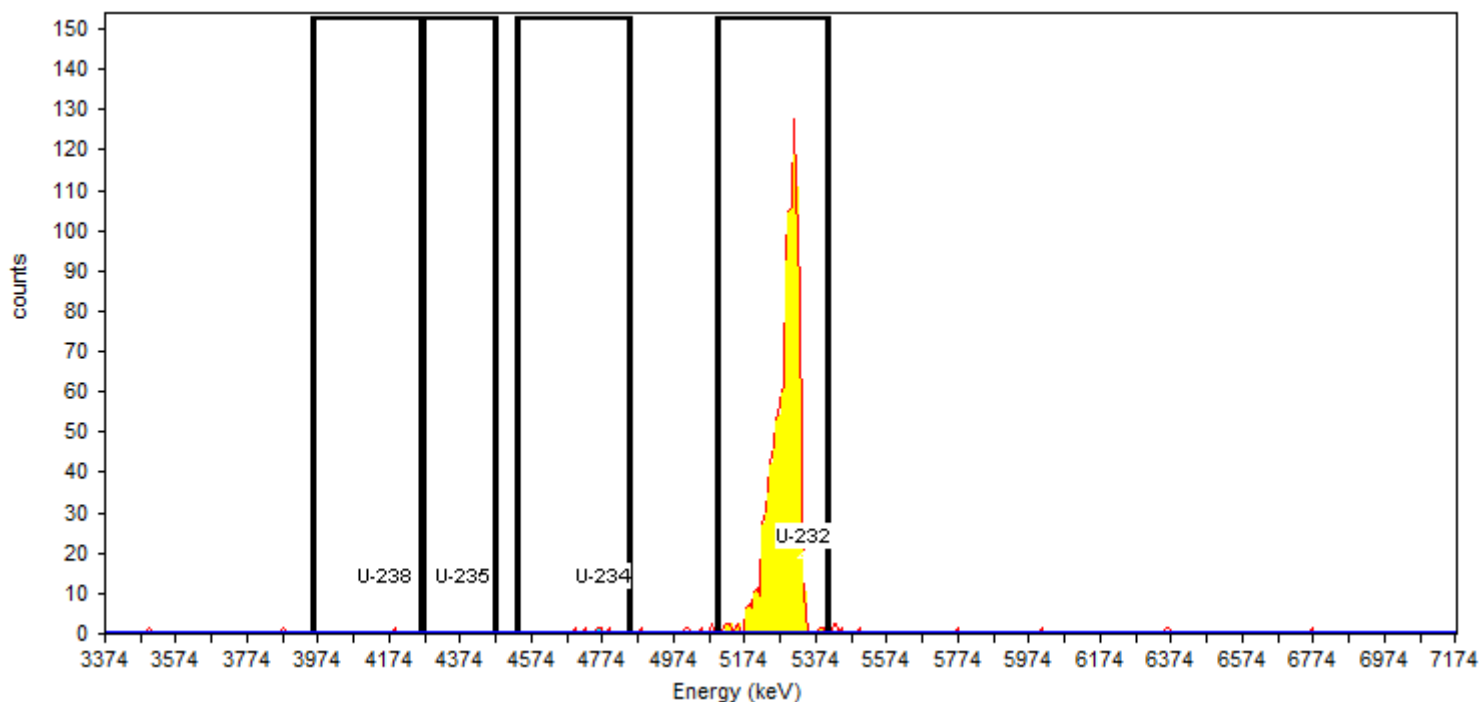
Tracer

Tracer Nuclide: U-232
Tracer Recovery: 71.32%

Detector: AV235 **SN:** 51-005Q5
Acquisition Start Date: 7/2/2016 3:31:33PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:28PM
Bkgd Info: Sample: ICB;AV235; Det: AV235; Spectrum #1; 6/24/2016 4:15:28 PM

Acquisition

Energy Calibration: IC-8877;AV235-20151018
Efficiency Calibration: IC-8877;AV235-20151018
Calibration Date: 10/19/2015 4:11:39PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.57% +/- 0.31% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 7/2/2016 3:29:42PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	44.5	100.0	1	0.0000	1.00	6.176E-003	pCi/g
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	.0	80.2	0	0.8333	-0.83	-6.417E-003	pCi/g
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	96.6	99.8	5	0.0000	5.00	3.094E-002	pCi/g
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	65.2	100.1	1148	2.0833	1145.92	5.285E+000	pCi/g

Sample Name: LCS 160-257935/2-A **Type:** Control
Spectrum #1 Analysis #1
: LCS 160-257935/2-A
Sample Collection Date: 7/1/2016 4:42:00PM
Comment:

Sample

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 Name: 257935
AnalysisResultsID: 170201
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: U-232_00034
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.20 mL = 16.45 DPM
Tracer Ref. Date: 8/25/2011 4:14:20PM

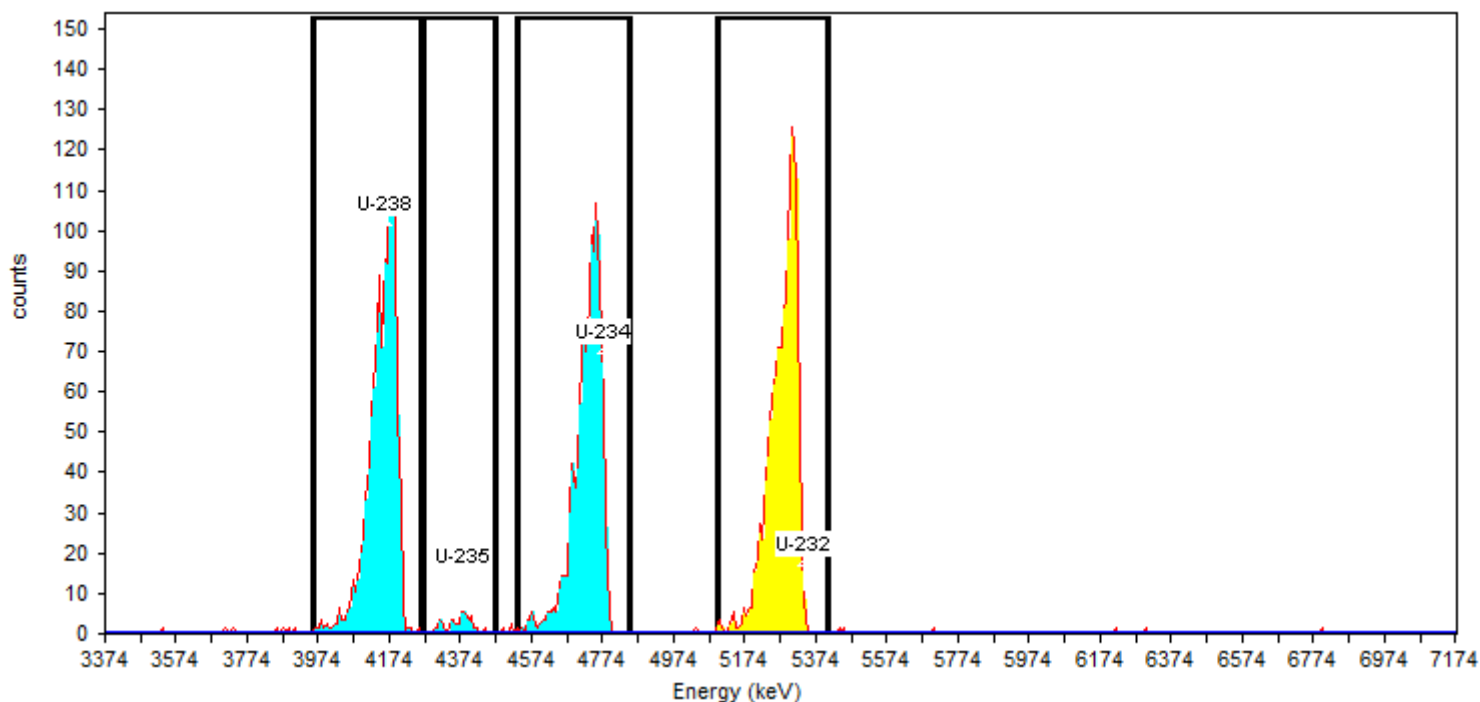
Tracer

Tracer Nuclide: U-232
Tracer Recovery: 79.90%

Detector: AV236 **SN:** 51-005P3
Acquisition Start Date: 7/2/2016 3:31:34PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:30PM
Bkgd Info: Sample: ICB;AV236; Det: AV236; Spectrum #1; 6/24/2016 4:15:30 PM

Acquisition

Energy Calibration: IC-9520;AV236-20151018
Efficiency Calibration: IC-9520;AV236-20151018
Calibration Date: 10/19/2015 4:11:44PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.47% +/- 0.34% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 7/2/2016 3:29:41PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	79.7	100.0	1146	0.0000	1146.00	6.600E+000	pCi/g
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	61.4	80.2	41	0.4167	40.58	2.914E-001	pCi/g
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	75.6	99.8	1090	1.2500	1088.75	6.283E+000	pCi/g
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	81.9	100.1	1230	1.2500	1228.75	5.920E+000	pCi/g

Sample Name: 160-17814-A-1-F **Type:** Sample
Spectrum #1 Analysis #1
: 160-17814-A-1-F
Sample Collection Date: 6/10/2016 6:35:00AM
Comment:

Sample

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 Name: 257935
AnalysisResultsID: 170200
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: U-232_00034
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.20 mL = 16.45 DPM
Tracer Ref. Date: 8/25/2011 4:14:20PM

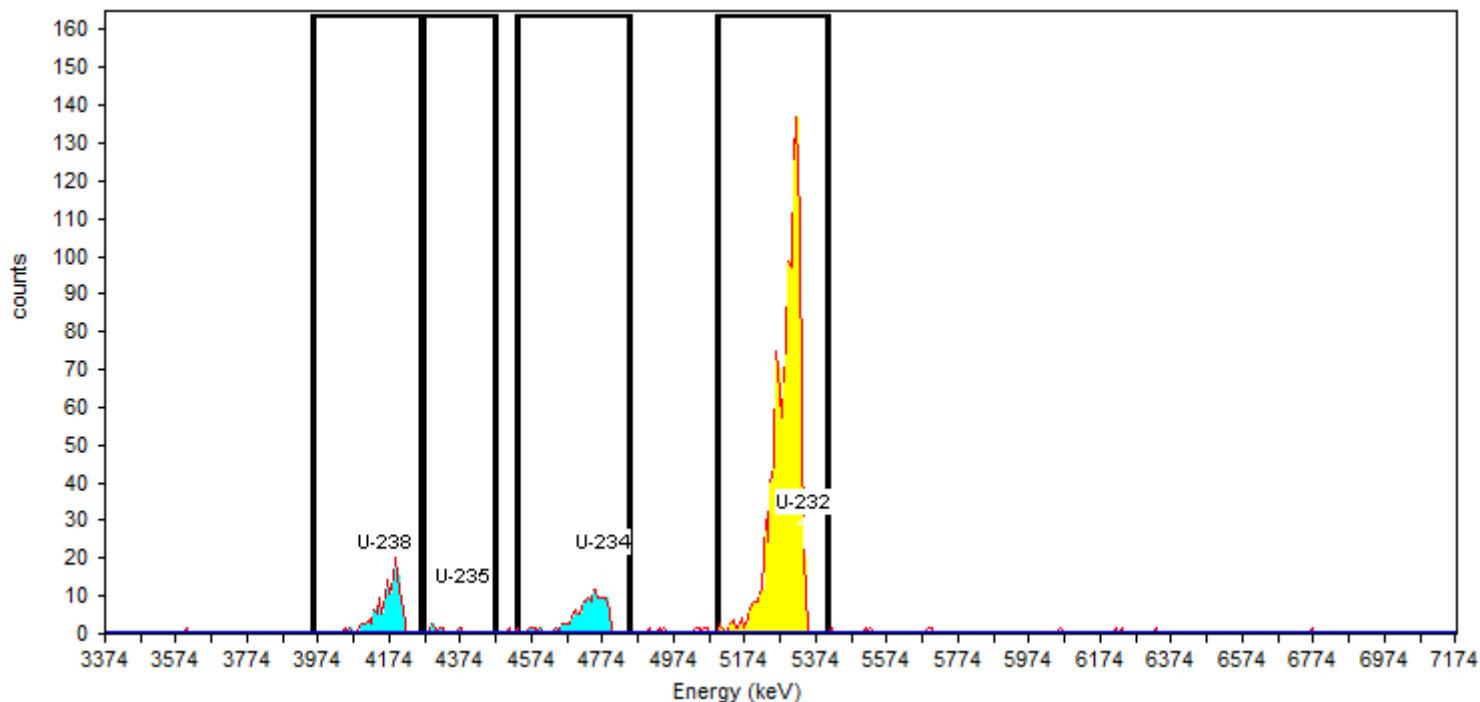
Tracer

Tracer Nuclide: U-232
Tracer Recovery: 73.36%

Detector: AV237 **SN:** 50-120DD7
Acquisition Start Date: 7/2/2016 3:31:34PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:29PM
Bkgd Info: Sample: ICB;AV237; Det: AV237; Spectrum #1; 6/24/2016 4:15:29 PM

Acquisition

Energy Calibration: IC-9792;AV237-20151018
Efficiency Calibration: IC-9792;AV237-20151018
Calibration Date: 10/19/2015 4:11:48PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.87% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 7/2/2016 3:29:41PM
MDA Constants: K α = 1.64 , K β = 1.64

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	60.5	100.0	136	0.0000	136.00	8.054E-001	pCi/g
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	18.3	80.2	7	0.0000	7.00	5.169E-002	pCi/g
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	89.5	99.8	131	1.6667	129.33	7.674E-001	pCi/g
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	74.3	100.1	1195	2.0833	1192.92	5.426E+000	pCi/g

Sample Name: 160-17814-A-1-G DU Type: Sample
Spectrum #1 Analysis #1
: 160-17814-A-1-G DU
Sample Collection Date: 6/10/2016 6:35:00AM
Comment:

Sample

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 Name: 257935
AnalysisResultsID: 170202
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: U-232_00034
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.20 mL = 16.45 DPM
Tracer Ref. Date: 8/25/2011 4:14:20PM

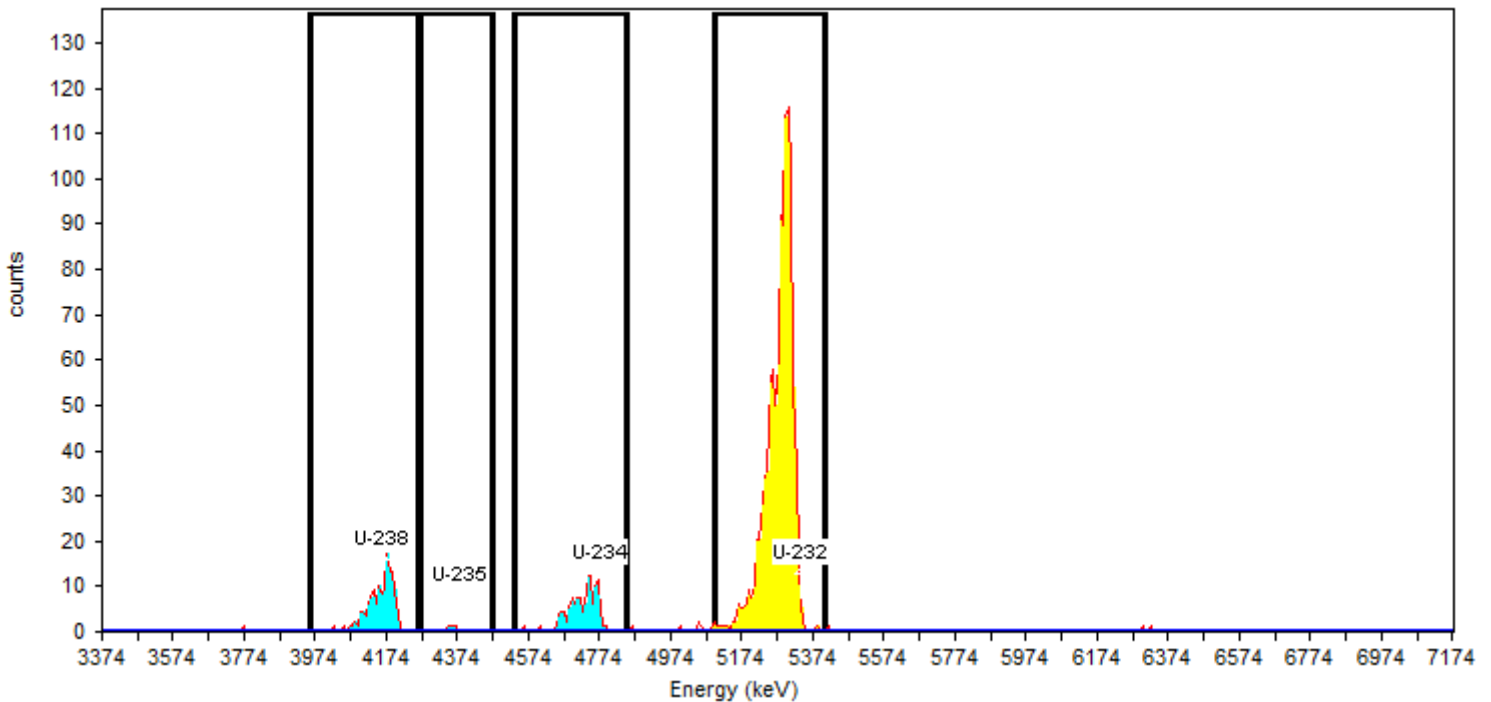
Tracer

Tracer Nuclide: U-232
Tracer Recovery: 65.35%

Detector: AV238 SN: 51-005P7
Acquisition Start Date: 7/2/2016 3:31:34PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:30PM
Bkgd Info: Sample: ICB;AV238; Det: AV238; Spectrum #1; 6/24/2016
4:15:30 PM

Acquisition

Energy Calibration: IC-9793;AV238-20151018
Efficiency Calibration: IC-9793;AV238-20151018
Calibration Date: 10/19/2015 4:11:53PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.33% +/- 0.31% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 7/2/2016 3:29:41PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	77.0	100.0	129	0.4167	128.58	8.740E-001	pCi/g
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	27.9	80.2	4	1.6667	2.33	1.978E-002	pCi/g
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	93.6	99.8	116	0.8333	115.17	7.844E-001	pCi/g
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	65.5	100.1	1042	1.6667	1040.33	4.838E+000	pCi/g

Sample Name: 160-17814-A-2-D **Type:** Sample
Spectrum #1 Analysis #1
: 160-17814-A-2-D
Sample Collection Date: 6/10/2016 6:40:00AM
Comment:

Sample

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 Name: 257935
AnalysisResultsID: 170204
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: U-232_00034
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.20 mL = 16.45 DPM
Tracer Ref. Date: 8/25/2011 4:14:20PM

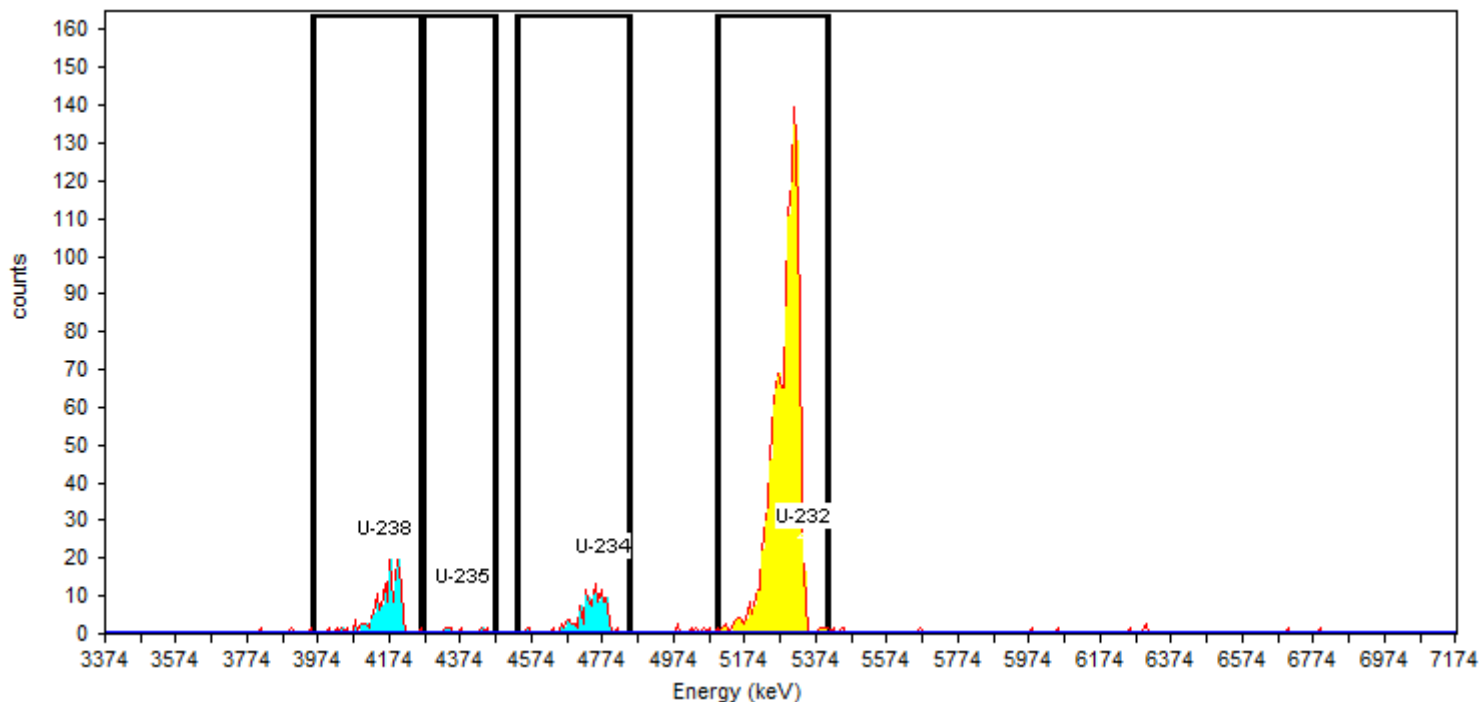
Tracer

Tracer Nuclide: U-232
Tracer Recovery: 79.35%

Detector: AV239 **SN:** 51-005EE1
Acquisition Start Date: 7/2/2016 3:31:34PM
Live Time: 400.00 min.
Real Time: 400.06 min.
Background Date: 6/24/2016 4:15:30PM
Bkgd Info: Sample: ICB;AV239; Det: AV239; Spectrum #1; 6/24/2016 4:15:30 PM

Acquisition

Energy Calibration: IC-9794;AV239-20151018
Efficiency Calibration: IC-9794;AV239-20151018
Calibration Date: 10/19/2015 4:11:57PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.04% +/- 0.32% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 7/2/2016 3:29:41PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	67.4	100.0	145	0.4167	144.58	8.205E-001	pCi/g
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	19.5	80.2	6	0.0000	6.00	4.246E-002	pCi/g
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	69.0	99.8	116	0.4167	115.58	6.573E-001	pCi/g
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	70.7	100.1	1250	1.2500	1248.75	5.887E+000	pCi/g

Sample Name: 160-17814-A-3-D **Type:** Sample
Spectrum #1 Analysis #1
: 160-17814-A-3-D
Sample Collection Date: 6/10/2016 6:50:00AM
Comment:

Sample

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 Name: 257935
AnalysisResultsID: 170197
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: U-232_00034
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.20 mL = 16.45 DPM
Tracer Ref. Date: 8/25/2011 4:14:20PM

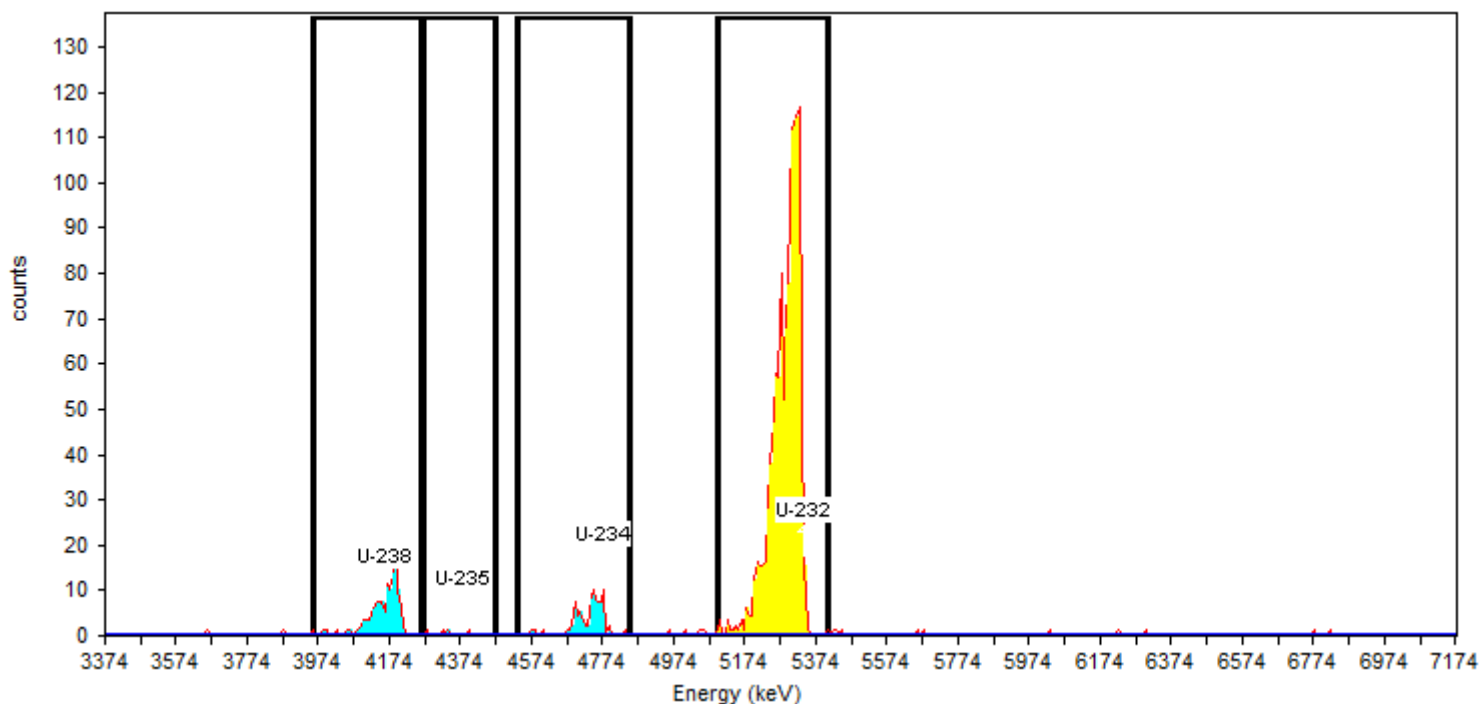
Tracer

Tracer Nuclide: U-232
Tracer Recovery: 67.54%

Detector: AV240 **SN:** 51-005Q1
Acquisition Start Date: 7/2/2016 3:31:35PM
Live Time: 400.00 min.
Real Time: 400.00 min.
Background Date: 6/24/2016 4:15:30PM
Bkgd Info: Sample: ICB;AV240; Det: AV240; Spectrum #1; 6/24/2016 4:15:30 PM

Acquisition

Energy Calibration: IC-9795;AV240-20151018
Efficiency Calibration: IC-9795;AV240-20151018
Calibration Date: 10/19/2015 4:12:02PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 26.76% +/- 0.35% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 7/2/2016 3:29:41PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	63.8	100.0	127	0.4167	126.58	7.885E-001	pCi/g
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	70.8	80.2	4	0.0000	4.00	3.107E-002	pCi/g
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	61.0	99.8	83	0.8333	82.17	5.129E-001	pCi/g
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	78.0	100.1	1137	1.2500	1135.75	5.003E+000	pCi/g

Sample Name: 160-17814-A-4-D **Type:** Sample
Spectrum #1 Analysis #1
: 160-17814-A-4-D
Sample Collection Date: 6/10/2016 7:00:00AM
Comment:

Sample

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 Name: 257935
AnalysisResultsID: 170205
Description:

Batch

Client Name: Undefined
Client Contact:
Analyst: 60040

Tracer Name: U-232_00034
Tracer Activity: 82.25 DPM / mL x (Vol.) 0.20 mL = 16.45 DPM
Tracer Ref. Date: 8/25/2011 4:14:20PM

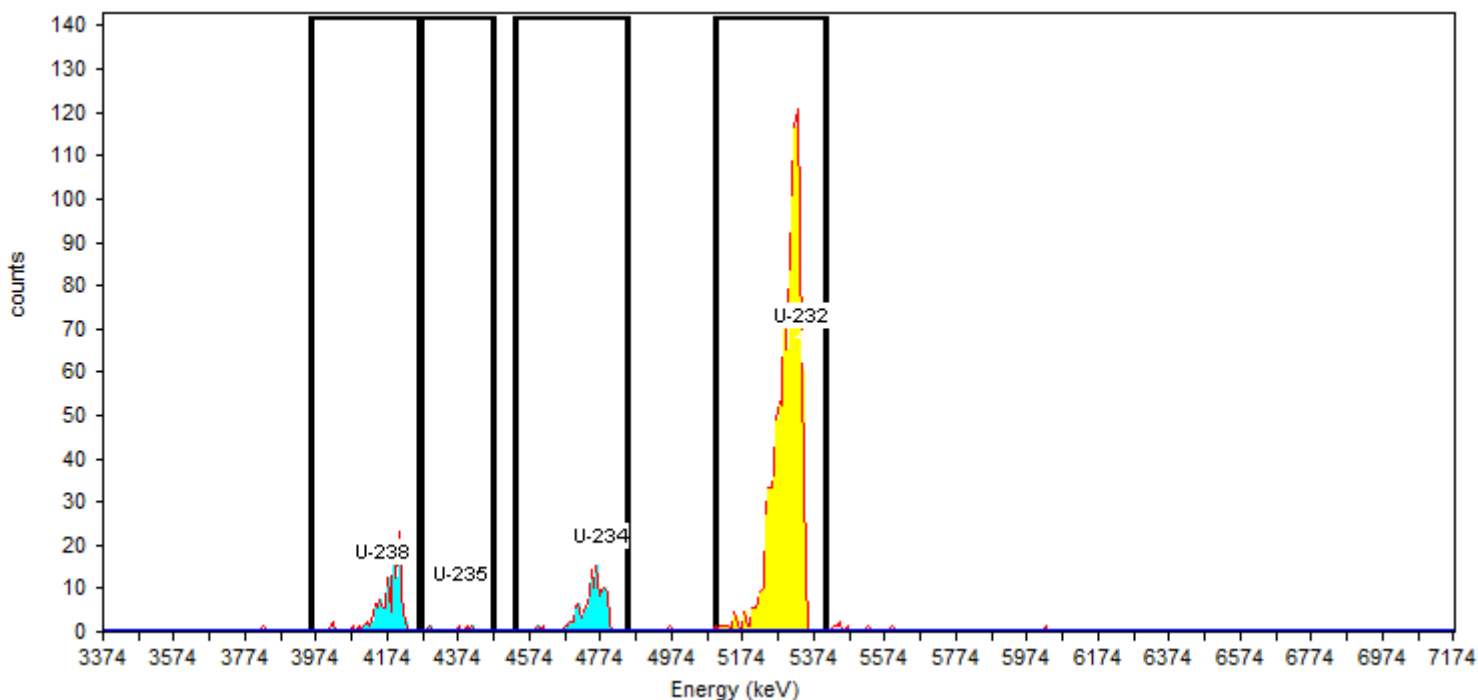
Tracer

Tracer Nuclide: U-232
Tracer Recovery: 68.76%

Detector: AV241 **SN:** 50-005P1
Acquisition Start Date: 7/2/2016 3:31:35PM
Live Time: 400.00 min.
Real Time: 400.05 min.
Background Date: 6/24/2016 4:15:31PM
Bkgd Info: Sample: ICB;AV241; Det: AV241; Spectrum #1; 6/24/2016 4:15:31 PM

Acquisition

Energy Calibration: IC-9817;AV241-20151018
Efficiency Calibration: IC-9817;AV241-20151018
Calibration Date: 10/19/2015 4:12:06PM
Energy Cal: Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.71% +/- 0.30% TPU(2 sigma)



General Analysis

Analysis Method: ROI Analysis, Set Name = UROI
Decay Correction: 7/2/2016 3:29:41PM
MDA Constants: $K\alpha = 1.64$, $K\beta = 1.64$

Nuclide Library: Uranium
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
U-238	4157.5	4,196.0	-38.5	3956.1	4261.9	54.0	100.0	125	0.0000	125.00	8.259E-001	pCi/g
U-235	4381.2	4,396.0	-14.8	4269.3	4470.7	134.2	80.2	4	0.0000	4.00	3.295E-002	pCi/g
U-234	4776.4	4,775.8	0.6	4530.3	4851.0	64.3	99.8	116	1.6667	114.33	7.569E-001	pCi/g
U-232	5343.2	5,320.3	22.9	5097.1	5410.3	64.9	100.1	1068	0.4167	1067.58	5.078E+000	pCi/g

Daily Checks

Alpha Spectroscopy Daily Pulser Check

Analysis Date: 07/02/16

Detector	Analysis Date	Gross Counts			FWHM (keV)			Pulser Center			Energy (keV)		
		Result	Criteria	P/F	Result	Criteria	P/F	Result	Criteria	P/F	Result	Criteria	P/F
AV148	07/02/16 12:40	6013	5686.2-6284.7	Pass	14.4	10-20	Pass	222.0	218.0-228.0	Pass	5023	4990.0-5070.0	Pass
AV150	07/02/16 11:53	6010	5623.0-6214.9	Pass	14.5	10-20	Pass	224.0	219.0-229.0	Pass	5038	4997.7-5077.7	Pass
AV151	07/02/16 11:53	5839	5640.3-6234.1	Pass	12.6	10-20	Pass	222.0	217.0-227.0	Pass	5022	4982.2-5062.2	Pass
AV152	07/02/16 11:53	5816	5683.1-6281.3	Pass	12.7	10-20	Pass	224.0	218.9-228.9	Pass	5038	4996.9-5076.9	Pass
AV153	07/02/16 11:53	5995	5694.3-6293.7	Pass	15.9	10-20	Pass	223.0	218.0-228.0	Pass	5030	4989.9-5069.9	Pass
AV155	07/02/16 11:53	5809	5702.4-6302.6	Pass	12.7	10-20	Pass	222.0	216.5-226.5	Pass	5023	4978.5-5058.5	Pass
AV235	07/02/16 11:53	6028	5703.8-6304.2	Pass	13.4	10-20	Pass	223.0	218.0-228.0	Pass	5030	4990.0-5070.0	Pass
AV236	07/02/16 11:53	6029	5514.1-6094.6	Pass	14.6	10-20	Pass	223.1	217.6-227.6	Pass	5030	4987.2-5067.2	Pass
AV237	07/02/16 11:53	6019	5531.5-6113.7	Pass	14.0	10-20	Pass	221.9	217.1-227.1	Pass	5022	4983.5-5063.5	Pass
AV238	07/02/16 11:53	5977	5718.5-6320.5	Pass	16.3	10-20	Pass	221.9	217.2-227.2	Pass	5022	4984.2-5064.2	Pass
AV239	07/02/16 11:53	5653	5505.4-6084.9	Pass	13.6	10-20	Pass	223.1	217.3-227.3	Pass	5031	4984.8-5064.8	Pass
AV240	07/02/16 11:53	6034	5521.1-6102.2	Pass	13.4	10-20	Pass	223.0	218.1-228.1	Pass	5030	4991.0-5071.0	Pass
AV241	07/02/16 11:53	5641	5544.0-6127.6	Pass	13.4	10-20	Pass	224.1	218.1-228.1	Pass	5038	4990.6-5070.6	Pass

Analysis Date: 07/07/16

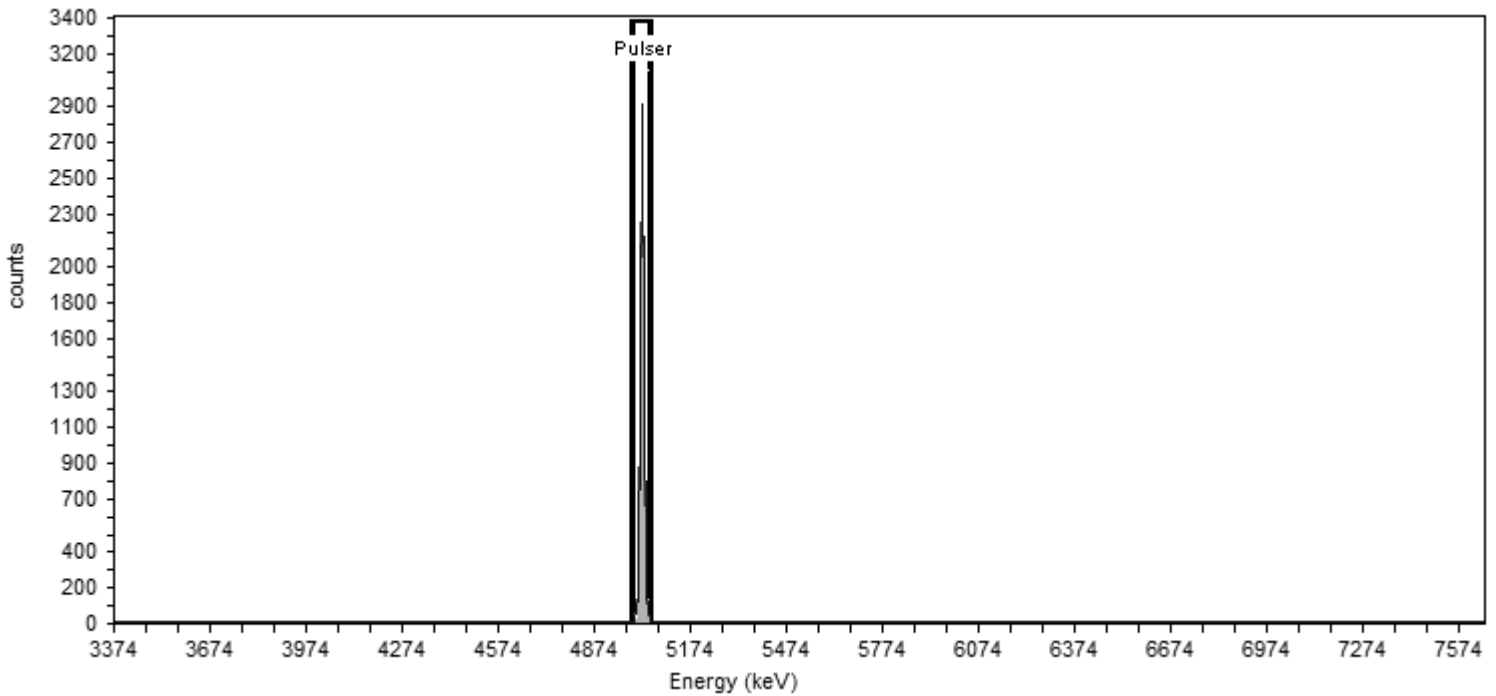
Detector	Analysis Date	Gross Counts			FWHM (keV)			Pulser Center			Energy (keV)		
		Result	Criteria	P/F	Result	Criteria	P/F	Result	Criteria	P/F	Result	Criteria	P/F
AV199	07/07/16 08:33	6003	5584.5-6172.3	Pass	19.0	10-20	Pass	217.9	214.0-224.0	Pass	4992	4959.9-5039.9	Pass

Sample Spectrum #6 Analysis #1
Sample Name: Pulser;AV148
Comment:

Batch
Batch Name: June2016a
Description:

Acquisition
Detector: AV148 , SN: 50-05/R2
Acquisition Start Date: 7/2/2016 12:40:23PM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-8874;AV148-20151016a
Calibration Date: 10/16/2015 6:47:19PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



General Analysis
Analysis Method: Peak Fit Analysis

Nuclide Summary (Peak Search)

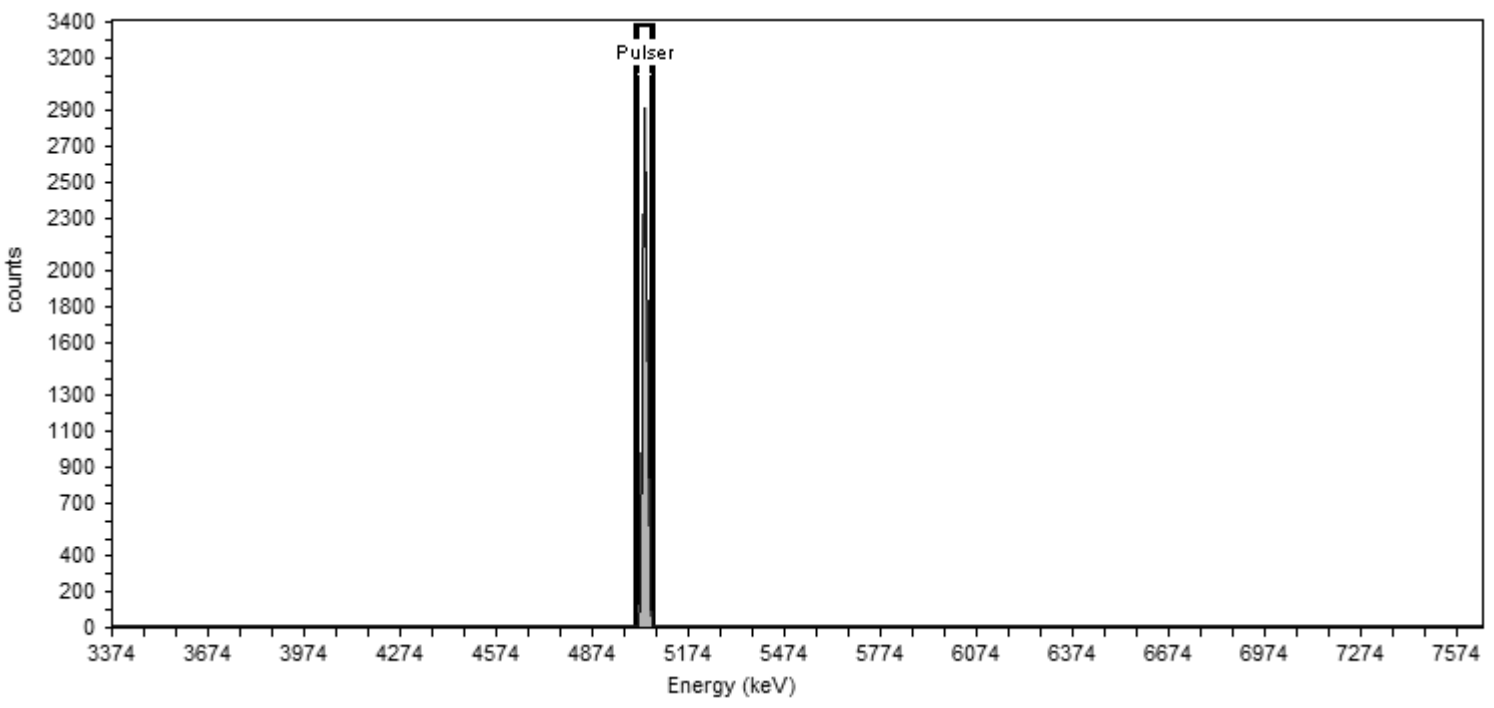
Nuclide	Peak Energy keV	Start Energy keV	End Energy keV	FWHM keV	Fit Area	Gross Counts
Pulser	5022.714	4998.249	5047.180	14.37	6,008.26	6,013.09

Sample Spectrum #5 Analysis #1
 Sample Name: Pulser;AV150
 Comment:

Batch
 Batch Name: June2016a
 Description:

Acquisition

Detector: AV150 , SN: 50-05/R4 Acquisition Start Date: 7/2/2016 11:53:36AM Live Time: 1.00 min. Real Time: 1.00 min. Calibration Name: IC-8876;AV150-20151016 Calibration Date: 10/16/2015 6:46:46PM	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

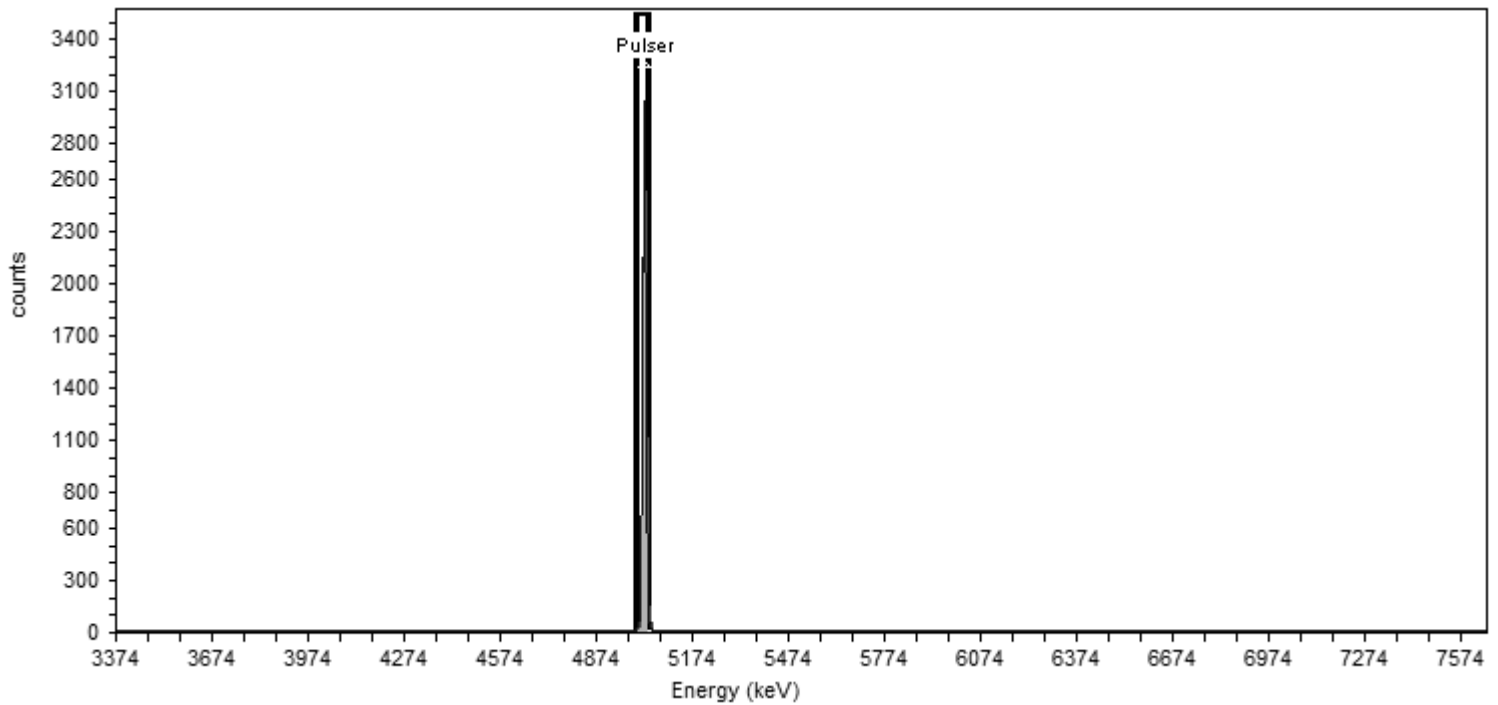
Nuclide Summary (Peak Search)

Nuclide	Peak Energy keV	Start Energy keV	End Energy keV	FWHM keV	Fit Area	Gross Counts
Pulser	5037.715	5013.004	5062.425	14.52	6,072.51	6,009.79

Sample
Sample Name: Pulser;AV151
Comment:
Spectrum #5 Analysis #1

Batch
Batch Name: June2016a
Description:

Acquisition
Detector: AV151 , SN: 50-05/R5
Acquisition Start Date: 7/2/2016 11:53:36AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-8877;AV151-20151016
Calibration Date: 10/16/2015 6:46:50PM
Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



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	5022.238	5000.834	5043.643	12.57	5,499.22	5,839.15

Sample Spectrum #5 Analysis #1

Sample Name: Pulser;AV152
Comment:

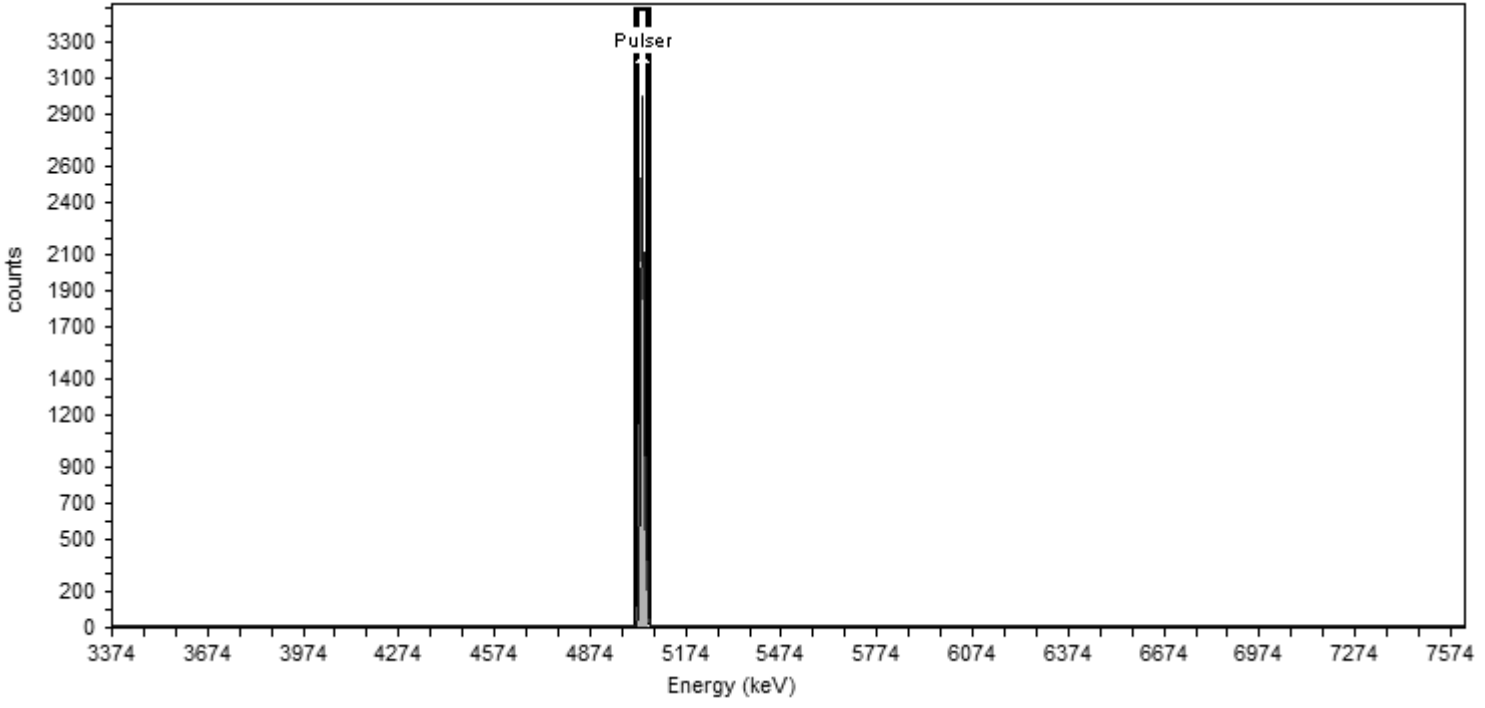
Batch

Batch Name: June2016a
Description:

Acquisition

Detector: AV152 , SN: 50-05/R6
Acquisition Start Date: 7/2/2016 11:53:36AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-9520;AV152-20151016
Calibration Date: 10/16/2015 6:46:53PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



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	5037.761	5016.110	5059.412	12.72	5,466.19	5,815.85

Sample _____ Spectrum #5 Analysis #1

Sample Name: Pulser;AV153
Comment: _____

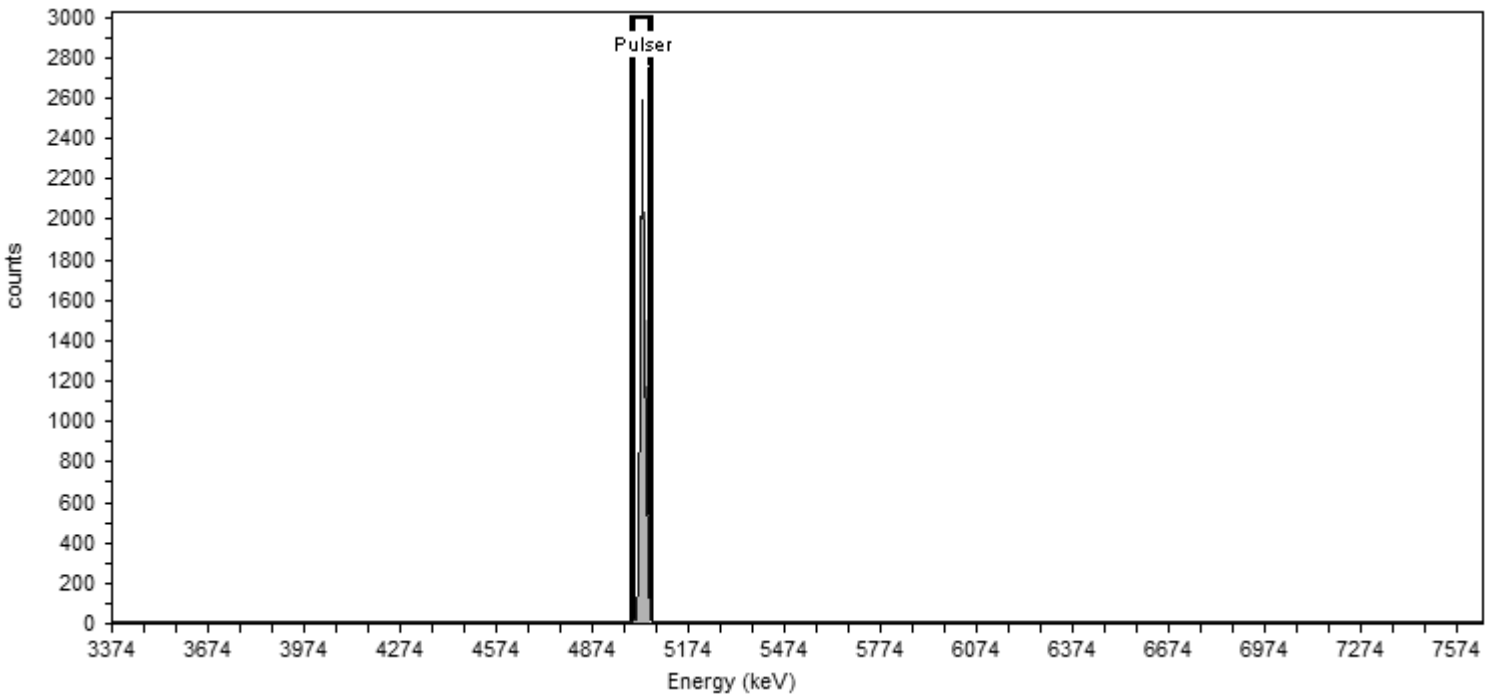
Batch _____

Batch Name: June2016a
Description: _____

Acquisition _____

Detector: AV153 , SN: 54-011 Y6
Acquisition Start Date: 7/2/2016 11:53:36AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-9792;AV153-20151016
Calibration Date: 10/16/2015 6:46:57PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



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	5029.921	5002.799	5057.043	15.93	5,917.83	5,995.02

Sample Spectrum #5 Analysis #1

Sample Name: Pulser;AV155
Comment:

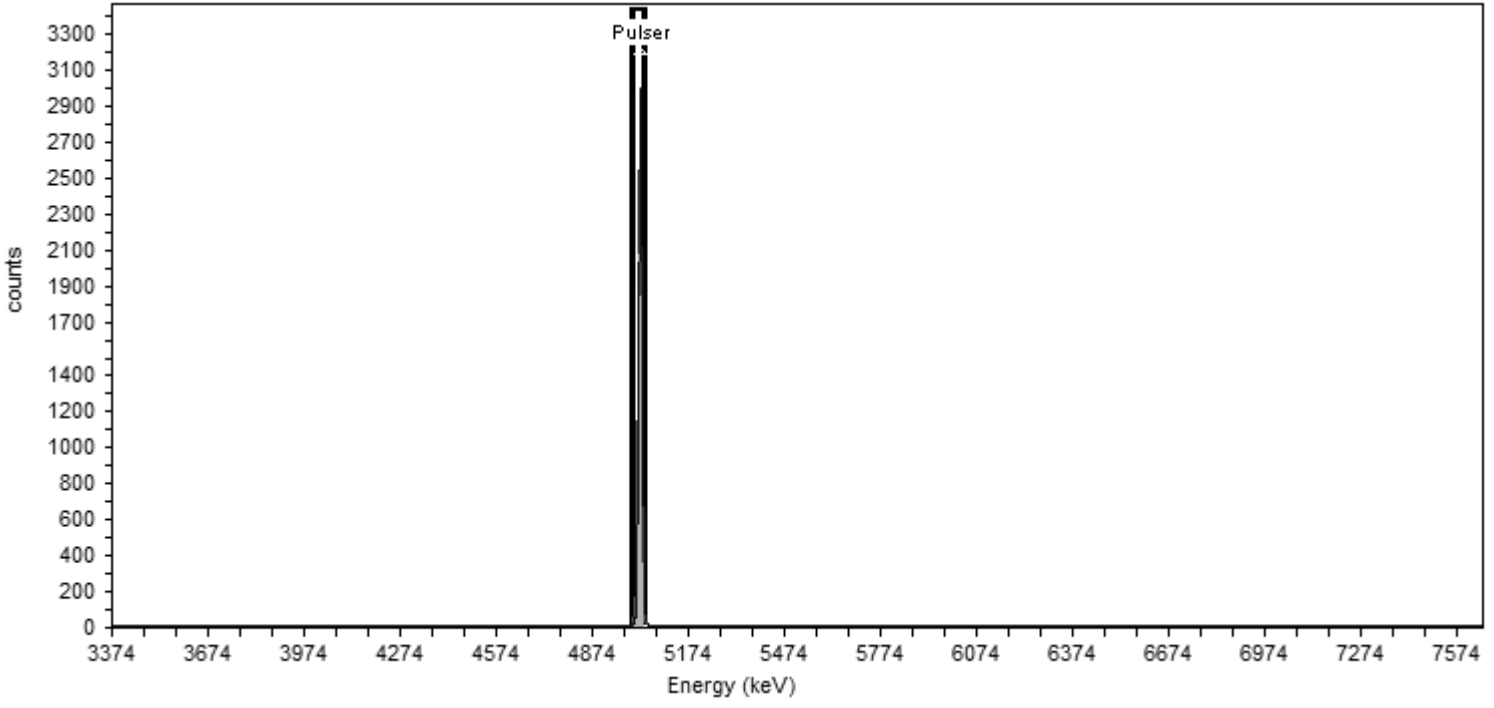
Batch

Batch Name: June2016a
Description:

Acquisition

Detector: AV155 , SN: 50-05/11
Acquisition Start Date: 7/2/2016 11:53:37AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-9794;AV155-20151016
Calibration Date: 10/16/2015 6:47:03PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



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	5022.849	5001.173	5044.524	12.73	5,468.82	5,809.36

Sample _____ Spectrum #8 Analysis #1

Sample Name: Pulser;AV199
Comment: _____

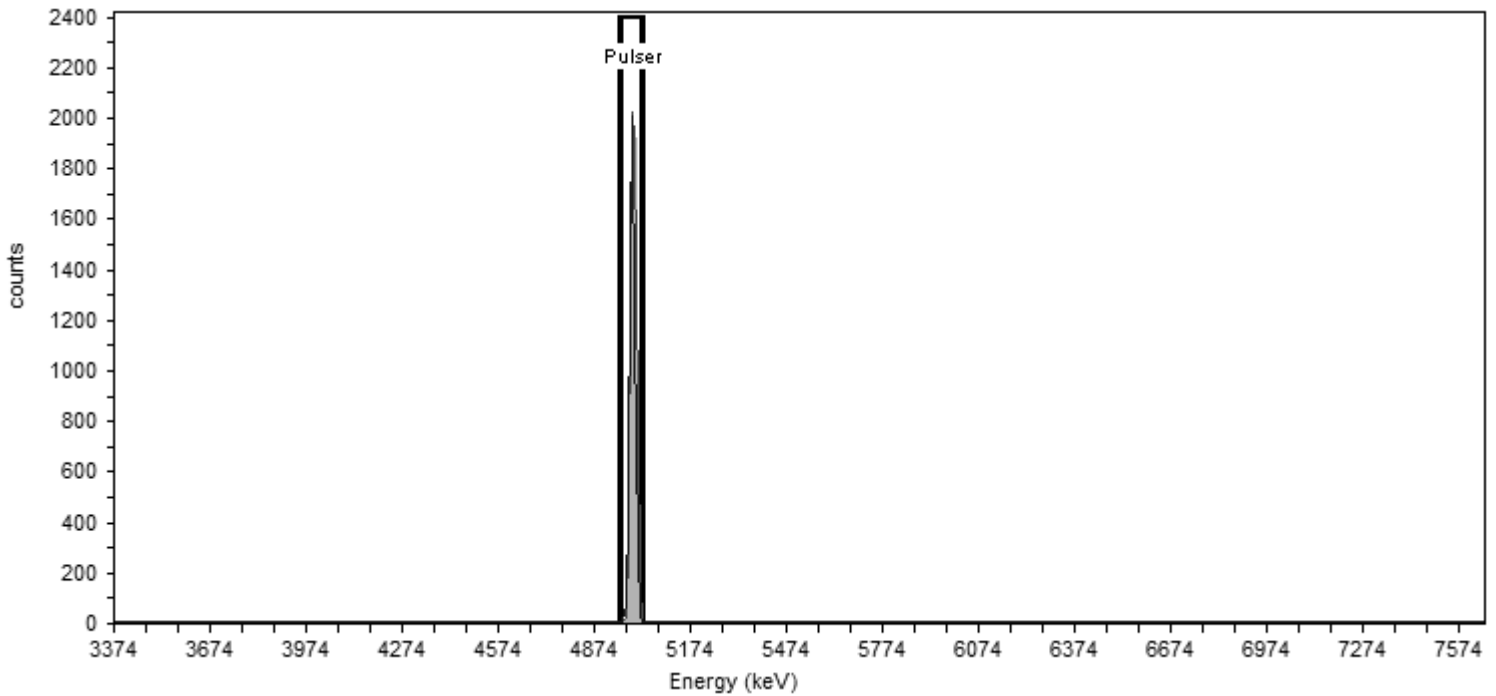
Batch _____

Batch Name: June2016b
Description: _____

Acquisition _____

Detector: AV199 , SN: 50-117Z3
Acquisition Start Date: 7/7/2016 8:33:54AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-9817;AV199-20151017
Calibration Date: 10/18/2015 3:55:29PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



General Analysis _____

Analysis Method: Peak Fit Analysis

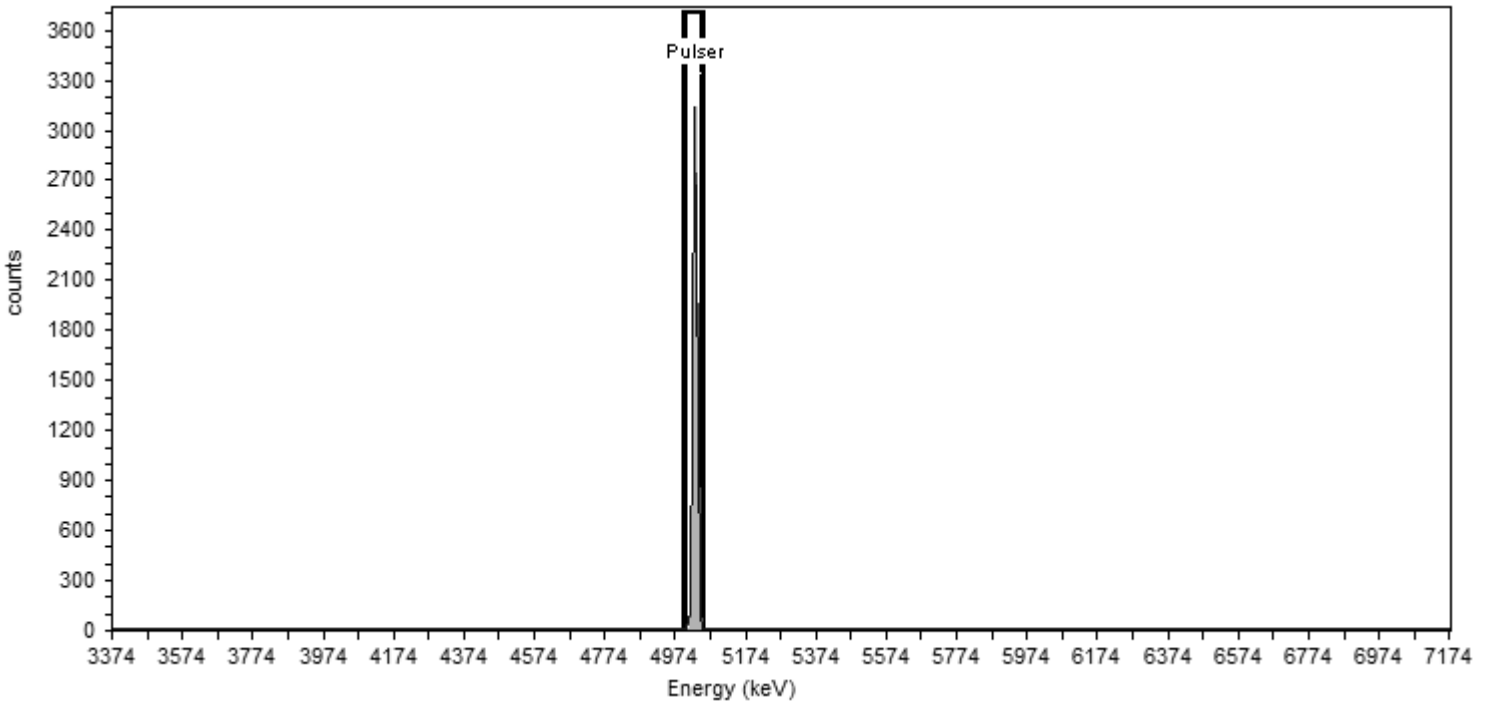
Nuclide Summary (Peak Search) _____

Nuclide	Peak Energy keV	Start Energy keV	End Energy keV	FWHM keV	Fit Area	Gross Counts
Pulser	4991.619	4959.281	5023.956	19.00	5,520.73	6,002.99

Sample
Sample Name: Pulser;AV235 Spectrum #6 Analysis #1
Comment:

Batch
Batch Name: June2016c
Description:

Acquisition
Detector: AV235 , SN: 51-005Q5 Energy Calibration Equation:
Acquisition Start Date: 7/2/2016 11:53:57AM Gain = 7.4575 keV / Ch
Live Time: 1.00 min. Offset = 3,366.95 keV
Real Time: 1.00 min. Quadratic = 0.0000 keV / Ch²
Calibration Name: IC-8877;AV235-20151018
Calibration Date: 10/19/2015 4:11:39PM



General Analysis
Analysis Method: Peak Fit Analysis

Nuclide Summary (Peak Search)

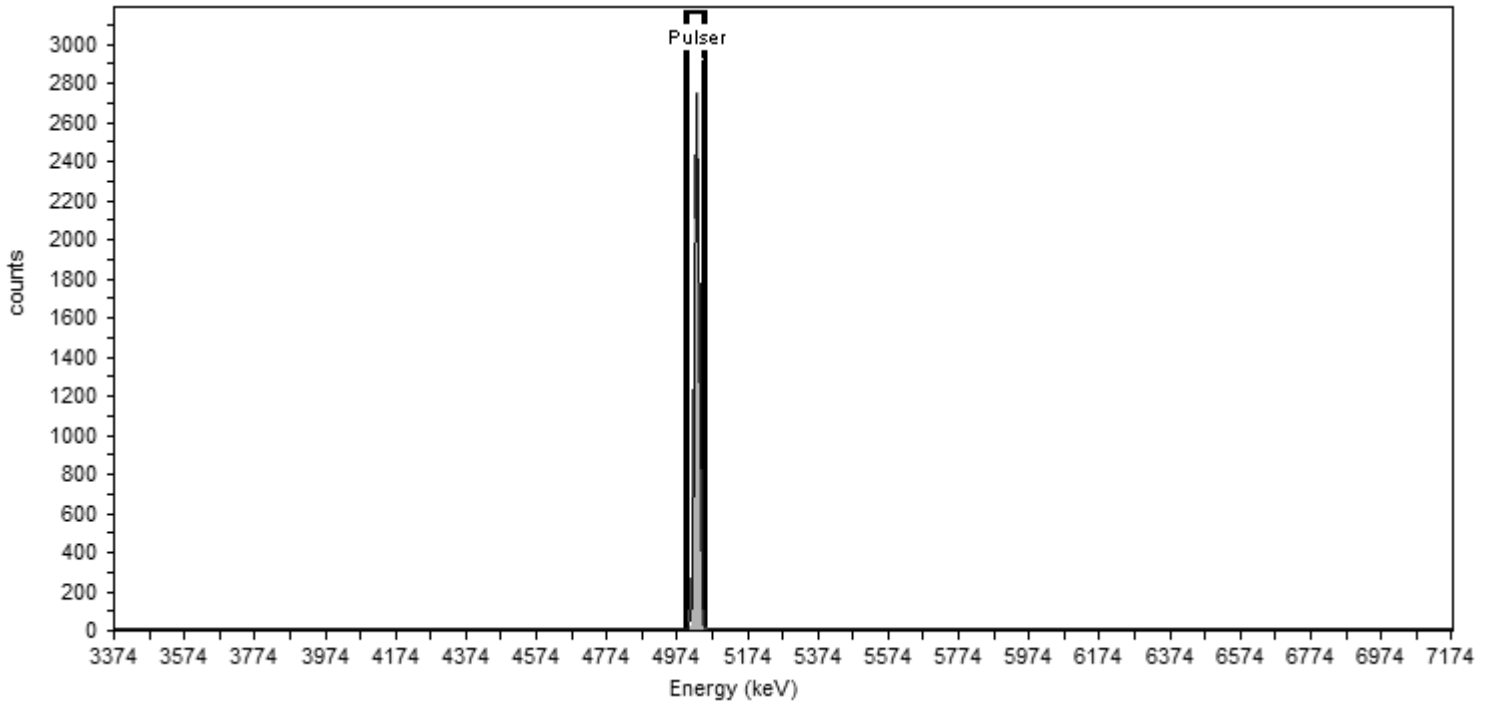
Nuclide	Peak Energy keV	Start Energy keV	End Energy keV	FWHM keV	Fit Area	Gross Counts
Pulser	5029.844	5007.090	5052.597	13.37	6,023.76	6,027.90

Sample Spectrum #6 Analysis #1
Sample Name: Pulser;AV236
Comment:

Batch
Batch Name: June2016c
Description:

Acquisition
Detector: AV236 , SN: 51-005P3
Acquisition Start Date: 7/2/2016 11:53:57AM
Live Time: 1.00 min.
Real Time: 1.01 min.
Calibration Name: IC-9520;AV236-20151018
Calibration Date: 10/19/2015 4:11:44PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



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	5030.458	5005.617	5055.300	14.59	5,745.83	6,029.00

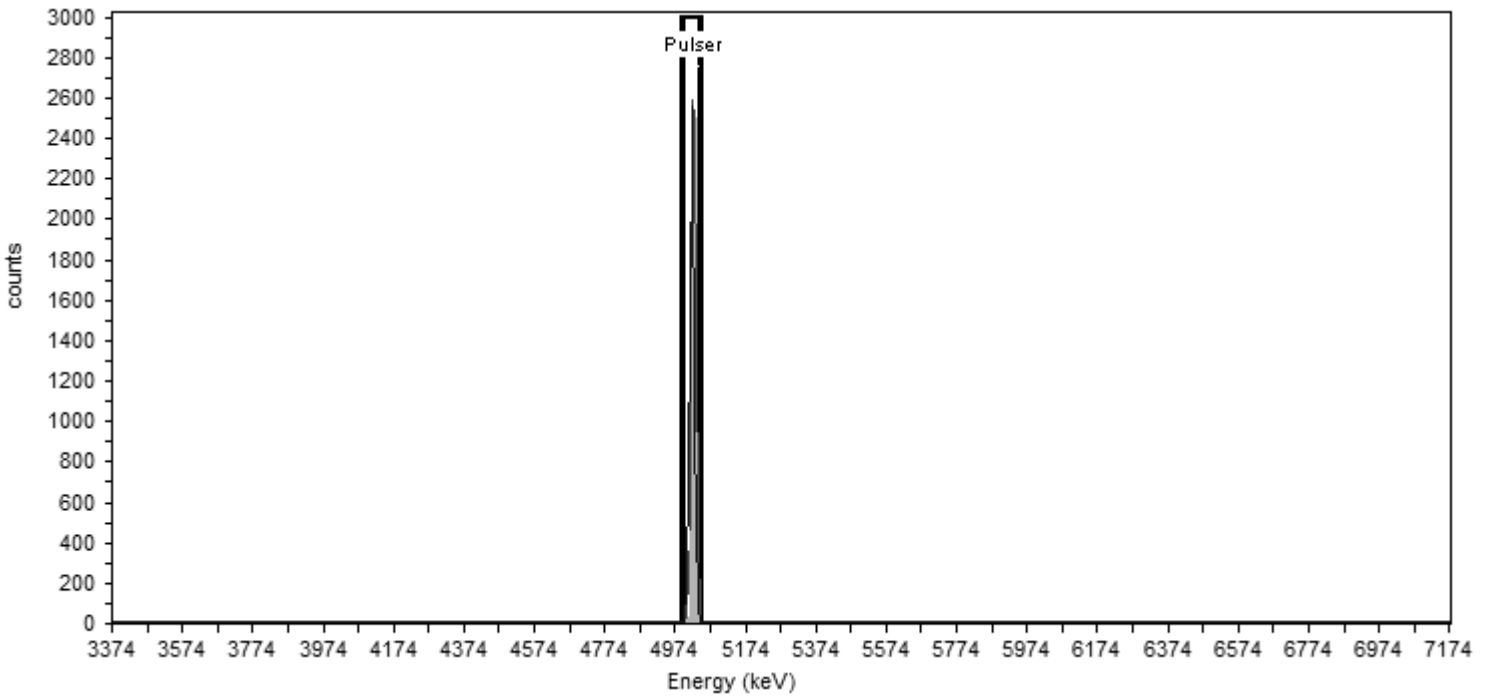
Sample
Sample Name: Pulser;AV237
Comment:

Spectrum #5 Analysis #1

Batch
Batch Name: June2016c
Description:

Acquisition
Detector: AV237 , SN: 50-120DD7
Acquisition Start Date: 7/2/2016 11:53:57AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-9792;AV237-20151018
Calibration Date: 10/19/2015 4:11:48PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



General Analysis
Analysis Method: Peak Fit Analysis

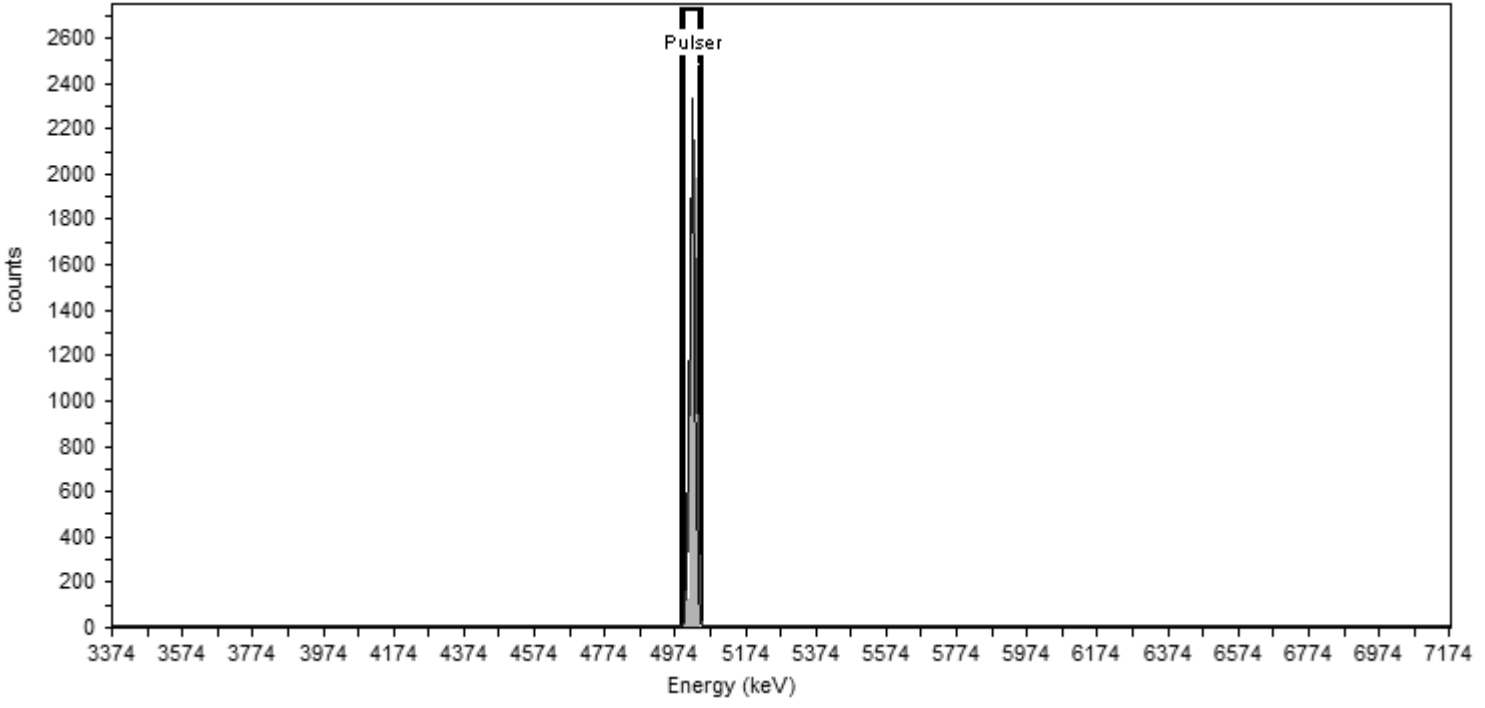
Nuclide Summary (Peak Search)

Nuclide	Peak Energy keV	Start Energy keV	End Energy keV	FWHM keV	Fit Area	Gross Counts
Pulser	5021.625	4997.865	5045.384	13.96	5,180.14	6,019.17

Sample
 Sample Name: Pulser;AV238 Spectrum #5 Analysis #1
 Comment:

Batch
 Batch Name: June2016c
 Description:

Acquisition
 Detector: AV238 , SN: 51-005P7 Energy Calibration Equation:
 Acquisition Start Date: 7/2/2016 11:53:58AM Gain = 7.4575 keV / Ch
 Live Time: 1.00 min. Offset = 3,366.95 keV
 Real Time: 1.00 min. Quadratic = 0.0000 keV / Ch²
 Calibration Name: IC-9793;AV238-20151018
 Calibration Date: 10/19/2015 4:11:53PM



General Analysis

Analysis Method: Peak Fit Analysis

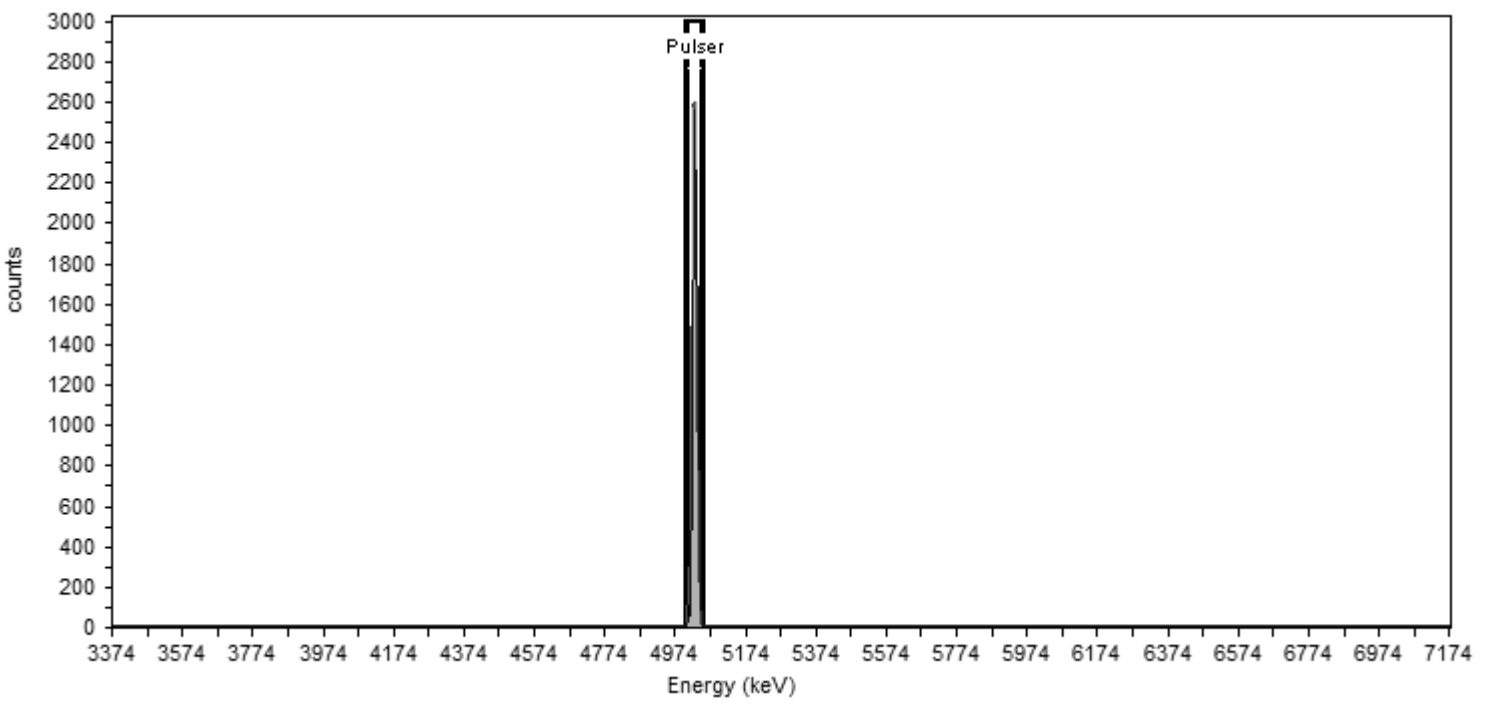
Nuclide Summary (Peak Search)

Nuclide	Peak Energy keV	Start Energy keV	End Energy keV	FWHM keV	Fit Area	Gross Counts
Pulser	5021.743	4994.078	5049.409	16.25	5,445.99	5,977.25

Sample
 Sample Name: Pulser;AV239 Spectrum #5 Analysis #1
 Comment:

Batch
 Batch Name: June2016c
 Description:

Acquisition
 Detector: AV239 , SN: 51-005EE1 Energy Calibration Equation:
 Acquisition Start Date: 7/2/2016 11:53:58AM Gain = 7.4575 keV / Ch
 Live Time: 1.00 min. Offset = 3,366.95 keV
 Real Time: 1.00 min. Quadratic = 0.0000 keV / Ch²
 Calibration Name: IC-9794;AV239-20151018
 Calibration Date: 10/19/2015 4:11:57PM



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	5031.039	5007.929	5054.149	13.58	5,067.67	5,653.49

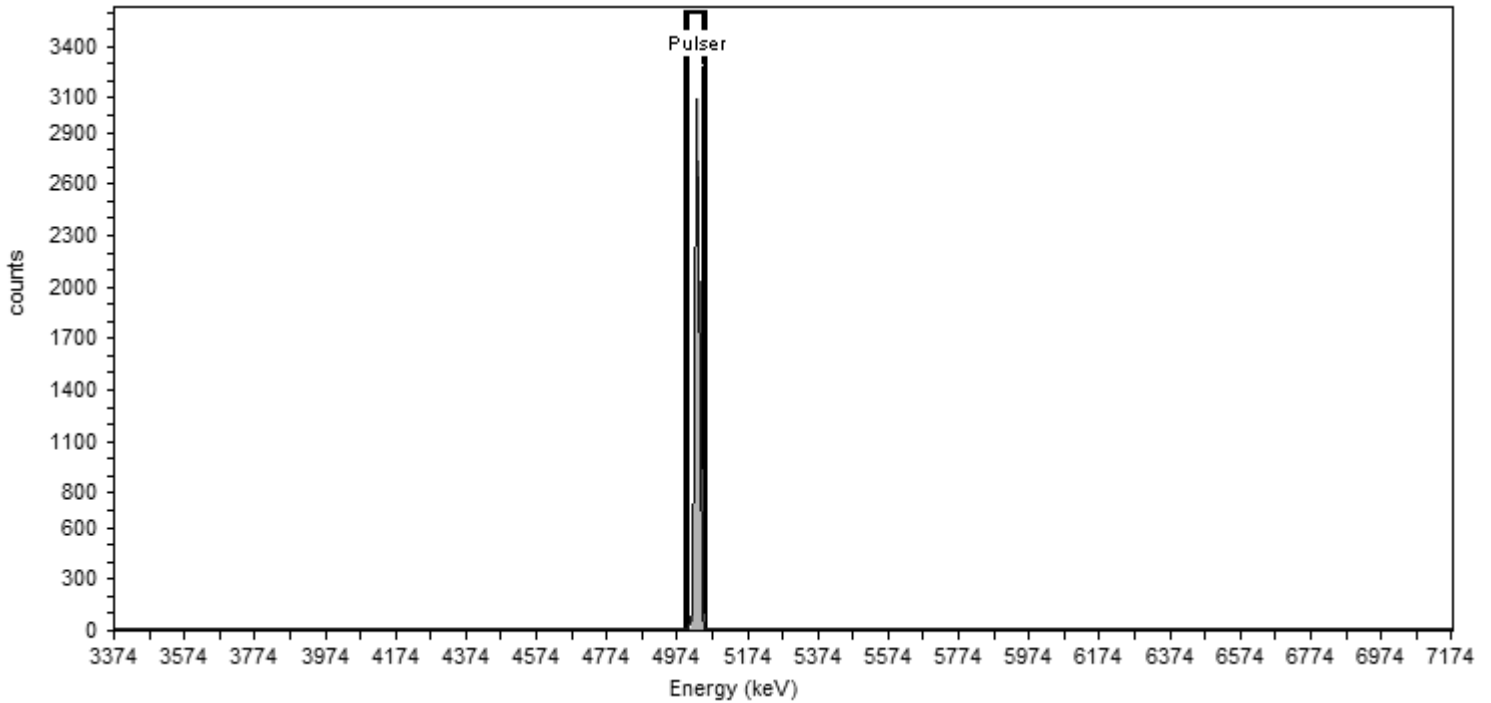
Sample Spectrum #5 Analysis #1
Sample Name: Pulser;AV240
Comment:

Batch
Batch Name: June2016c
Description:

Acquisition

Detector: AV240 , SN: 51-005Q1
Acquisition Start Date: 7/2/2016 11:53:58AM
Live Time: 1.00 min.
Real Time: 1.01 min.
Calibration Name: IC-9795;AV240-20151018
Calibration Date: 10/19/2015 4:12:02PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



General Analysis
Analysis Method: Peak Fit Analysis

Nuclide Summary (Peak Search)

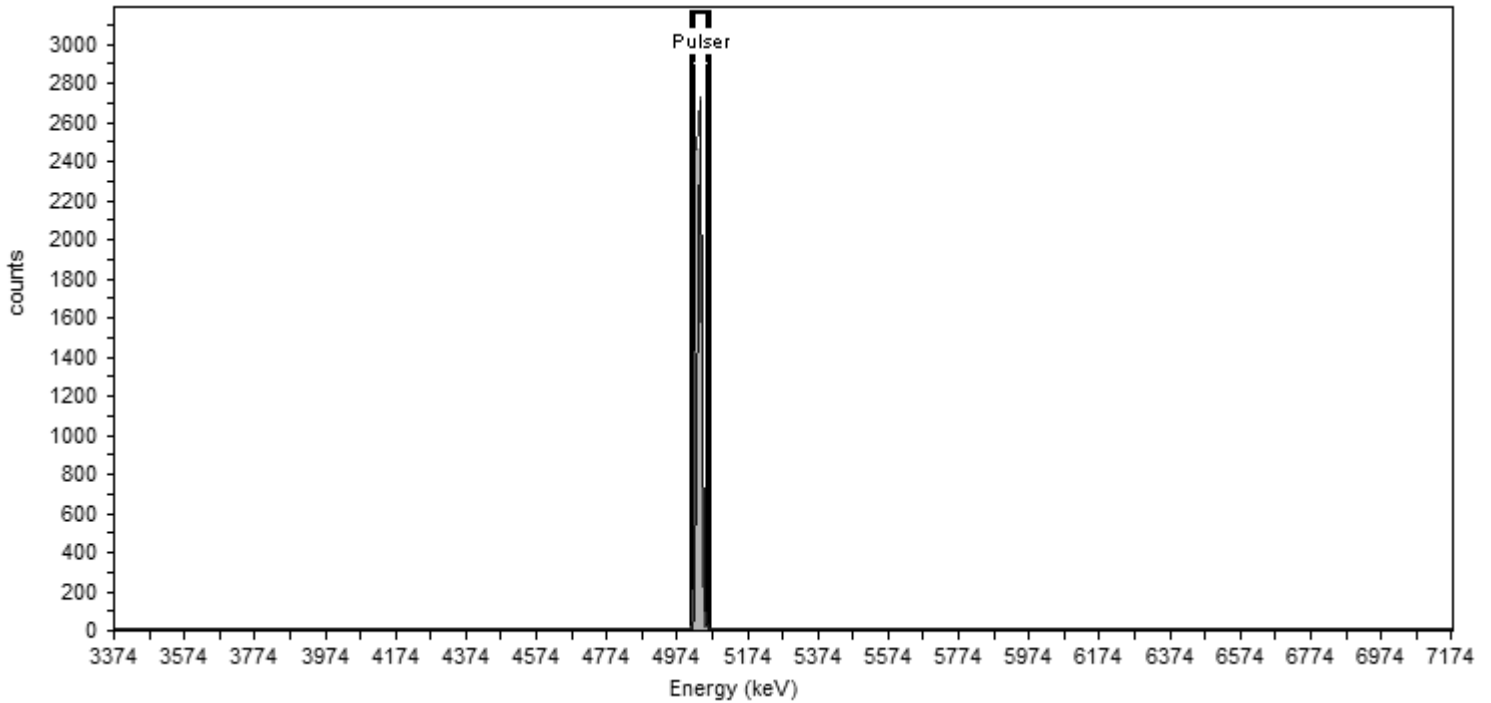
Nuclide	Peak Energy keV	Start Energy keV	End Energy keV	FWHM keV	Fit Area	Gross Counts
Pulser	5029.834	5007.016	5052.652	13.41	5,956.47	6,033.76

Sample Spectrum #5 Analysis #1
Sample Name: Pulser;AV241
Comment:

Batch
Batch Name: June2016c
Description:

Acquisition
Detector: AV241 , SN: 50-005P1
Acquisition Start Date: 7/2/2016 11:53:58AM
Live Time: 1.00 min.
Real Time: 1.00 min.
Calibration Name: IC-9817;AV241-20151018
Calibration Date: 10/19/2015 4:12:06PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



General Analysis
Analysis Method: Peak Fit Analysis

Nuclide Summary (Peak Search)

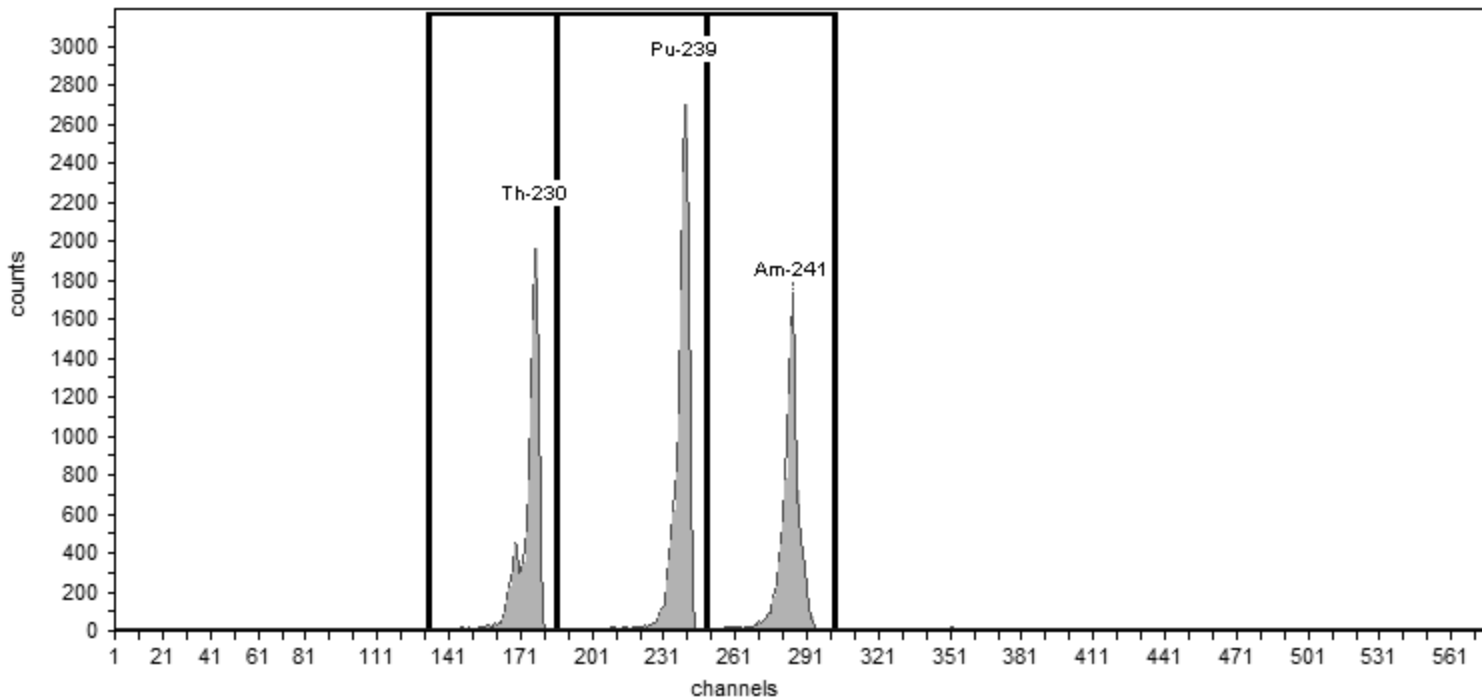
Nuclide	Peak Energy keV	Start Energy keV	End Energy keV	FWHM keV	Fit Area	Gross Counts
Pulser	5038.108	5015.302	5060.914	13.40	5,242.35	5,640.97

Initial Calibrations

Sample Name: IC-8874;AV148-20151016a	Analyst: 60040
Description:	Analysis Date: 10/16/2015 6:47:19PM
Detector: AV148	Calibration Type: Energy And Efficiency

Certificate ID: 82233-334	Certification Date: 6/3/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Detector: AV148 , SN: 50-05/R2	Energy Calibration Equation:
Acquisition Start Date: 10/16/2015 4:27:06PM	Gain = 7.4575 keV / Ch
Live Time: 140.00 min.	Offset = 3,366.95 keV
Real Time: 140.01 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: IC-8874;AV148-20151016i	Efficiency: 26.72% +/- 0.38% TPU(2 sigma)



Method: Manual (ROI)	Initial Calibration: Yes
Algorithm: Linear	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	29.28	10,746.00	76.76
Pu-239	240	5,155.40	186	249	31.36	14,143.00	101.02
Am-241	284	5,485.70	249	303	32.16	11,206.00	80.04

Calibration

Sample Name: IC-8876;AV150-20151016
Description:
Detector: AV150

Analyst: 60040
Analysis Date: 10/16/2015 6:46:46PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82235-334
Prepared by: Analytics
Description:

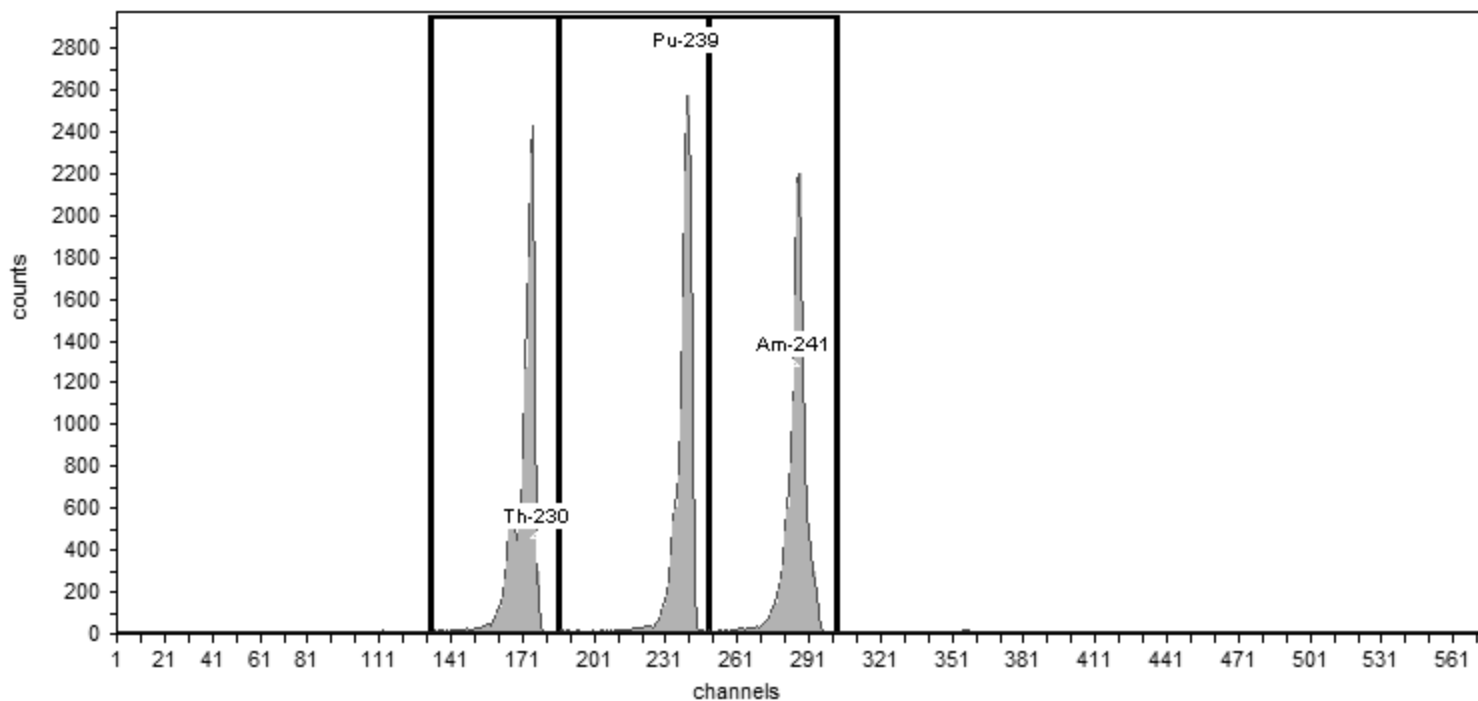
Certification Date: 6/4/2010 12:00:00PM

Acquisition

Detector: AV150 , SN: 50-05/R4
Acquisition Start Date: 10/16/2015 3:51:29PM
Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.45% +/- 0.29% TPU(2 sigma)

Efficiency Calibration Name: IC-8876;AV150-20151016



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	31.57	14,812.00	105.80
Pu-239	240	5,155.40	186	249	32.92	14,414.00	102.96
Am-241	284	5,485.70	249	303	34.04	14,906.00	106.47

Calibration

Sample Name: IC-8877;AV151-20151016
Description:
Detector: AV151

Analyst: 60040
Analysis Date: 10/16/2015 6:46:50PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82236-334
Prepared by: Analytics
Description:

Certification Date: 6/2/2010 12:00:00PM

Acquisition

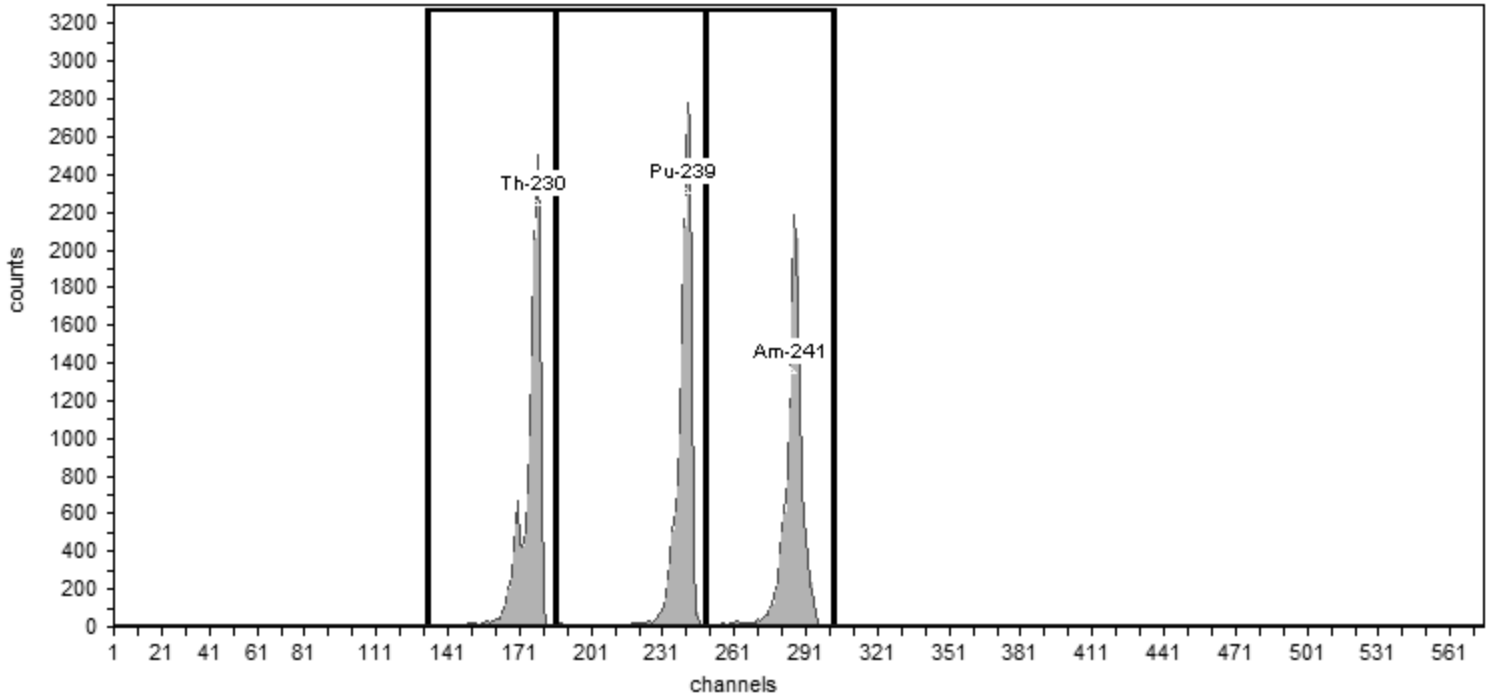
Detector: AV151 , SN: 50-05/R5
Acquisition Start Date: 10/16/2015 3:51:50PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: IC-8877;AV151-20151016

Efficiency: 25.28% +/- 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	30.27	14,588.00	104.20
Pu-239	240	5,155.40	186	249	32.53	15,116.00	107.97
Am-241	284	5,485.70	249	303	33.58	14,215.00	101.54

Calibration

Sample Name: IC-9520;AV152-20151016
Description:
Detector: AV152

Analyst: 60040
Analysis Date: 10/16/2015 6:46:53PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82237-334
Prepared by: Analytics
Description:

Certification Date: 6/1/2010 12:00:00PM

Acquisition

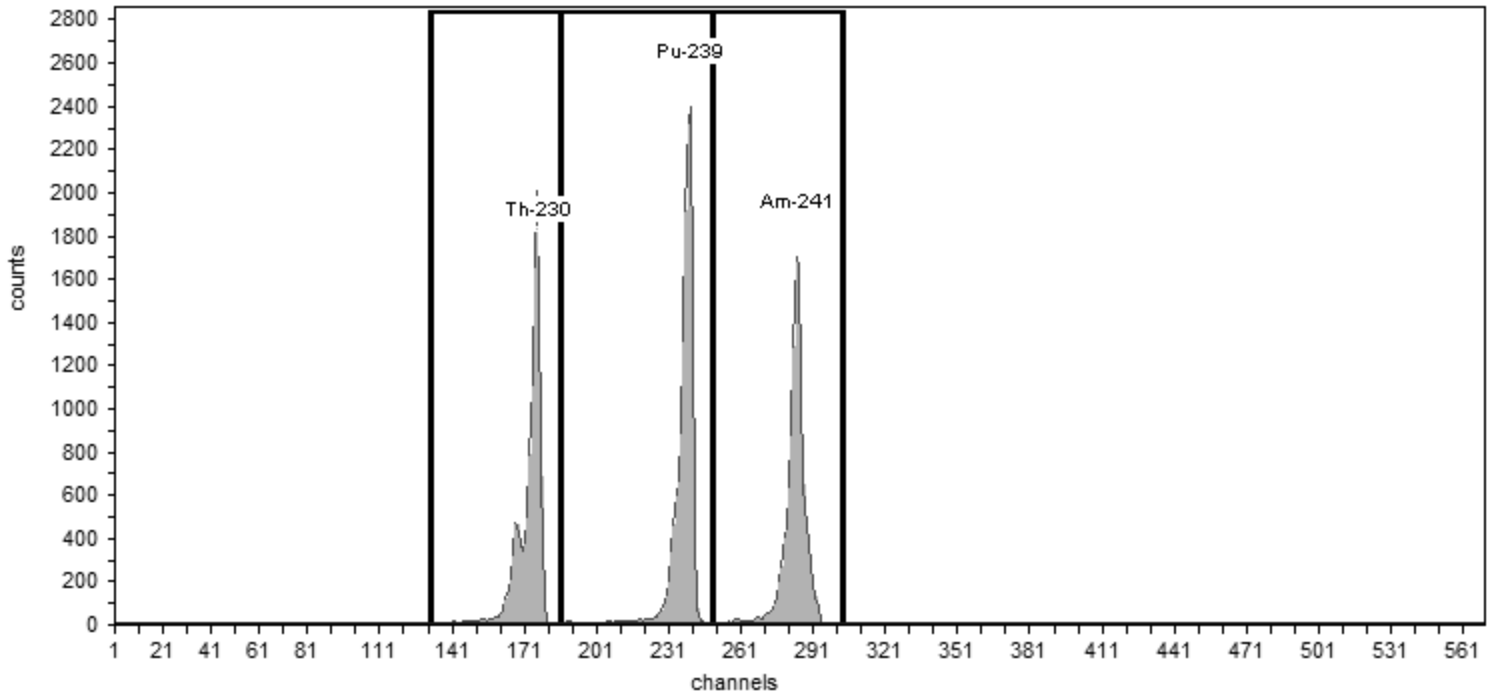
Detector: AV152 , SN: 50-05/R6
Acquisition Start Date: 10/16/2015 3:52:05PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: IC-9520;AV152-20151016

Efficiency: 24.54% +/- 0.35% 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	29.71	11,699.00	83.56
Pu-239	240	5,155.40	186	249	33.73	13,727.00	98.05
Am-241	284	5,485.70	249	303	34.89	11,357.00	81.12

Calibration

Sample Name: IC-9792;AV153-20151016
Description:
Detector: AV153

Analyst: 60040
Analysis Date: 10/16/2015 6:46:57PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82240-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

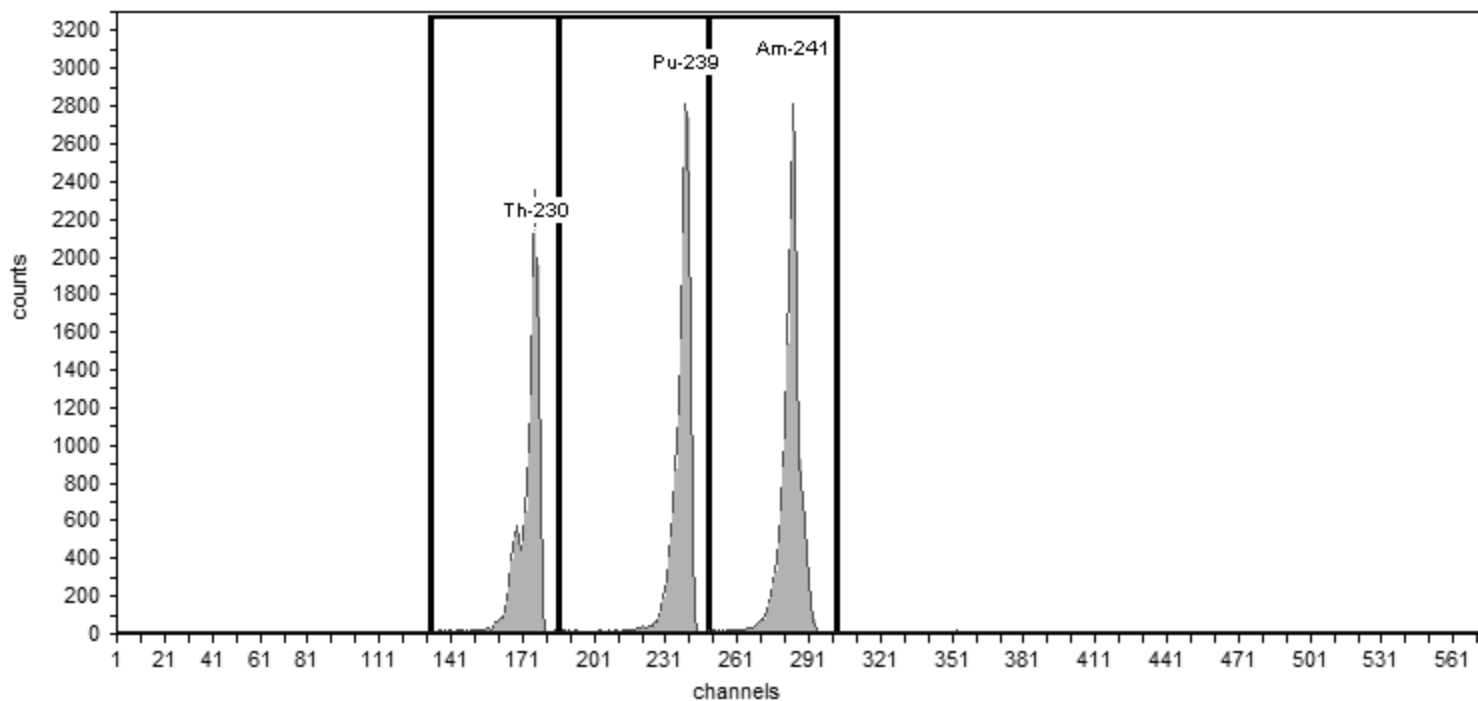
Acquisition

Detector: AV153 , SN: 54-011 Y6
Acquisition Start Date: 10/16/2015 3:52:22PM
Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: IC-9792;AV153-20151016

Efficiency: 26.60% +/- 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	29.79	13,953.00	99.66
Pu-239	240	5,155.40	186	249	34.07	16,216.00	115.83
Am-241	284	5,485.70	249	303	33.42	18,314.00	130.81

Calibration

Sample Name: IC-9794;AV155-20151016
Description:
Detector: AV155

Analyst: 60040
Analysis Date: 10/16/2015 6:47:03PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82242-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

Acquisition

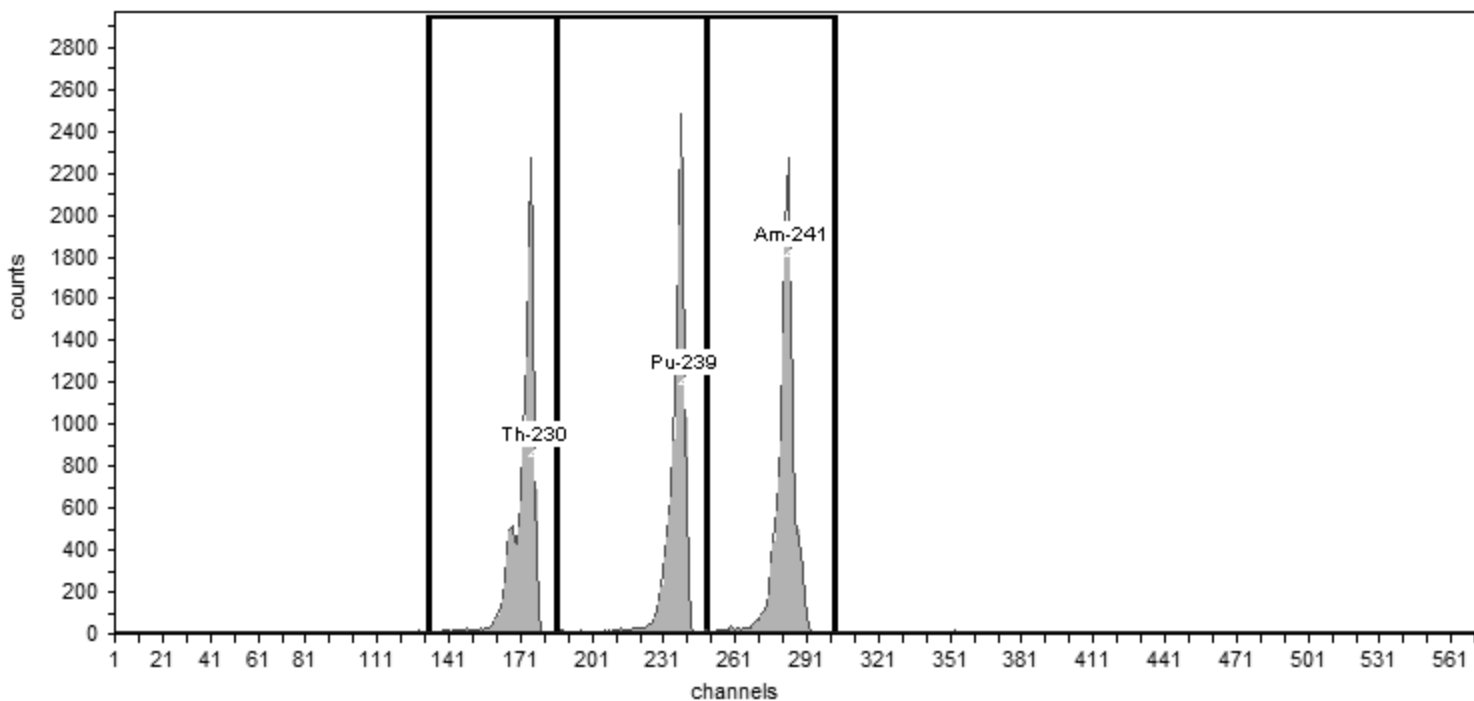
Detector: AV155 , SN: 50-05/II1
Acquisition Start Date: 10/16/2015 3:52:52PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: IC-9794;AV155-20151016

Efficiency: 24.17% +/- 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	30.44	13,390.00	95.64
Pu-239	240	5,155.40	186	249	30.32	13,163.00	94.02
Am-241	284	5,485.70	249	303	32.54	14,240.00	101.71

Calibration

Sample Name: IC-9817;AV199-20151017
Description:
Detector: AV199

Analyst: 60040
Analysis Date: 10/18/2015 3:55:29PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82244-334
Prepared by: Analytics
Description:

Certification Date: 6/9/2010 12:00:00PM

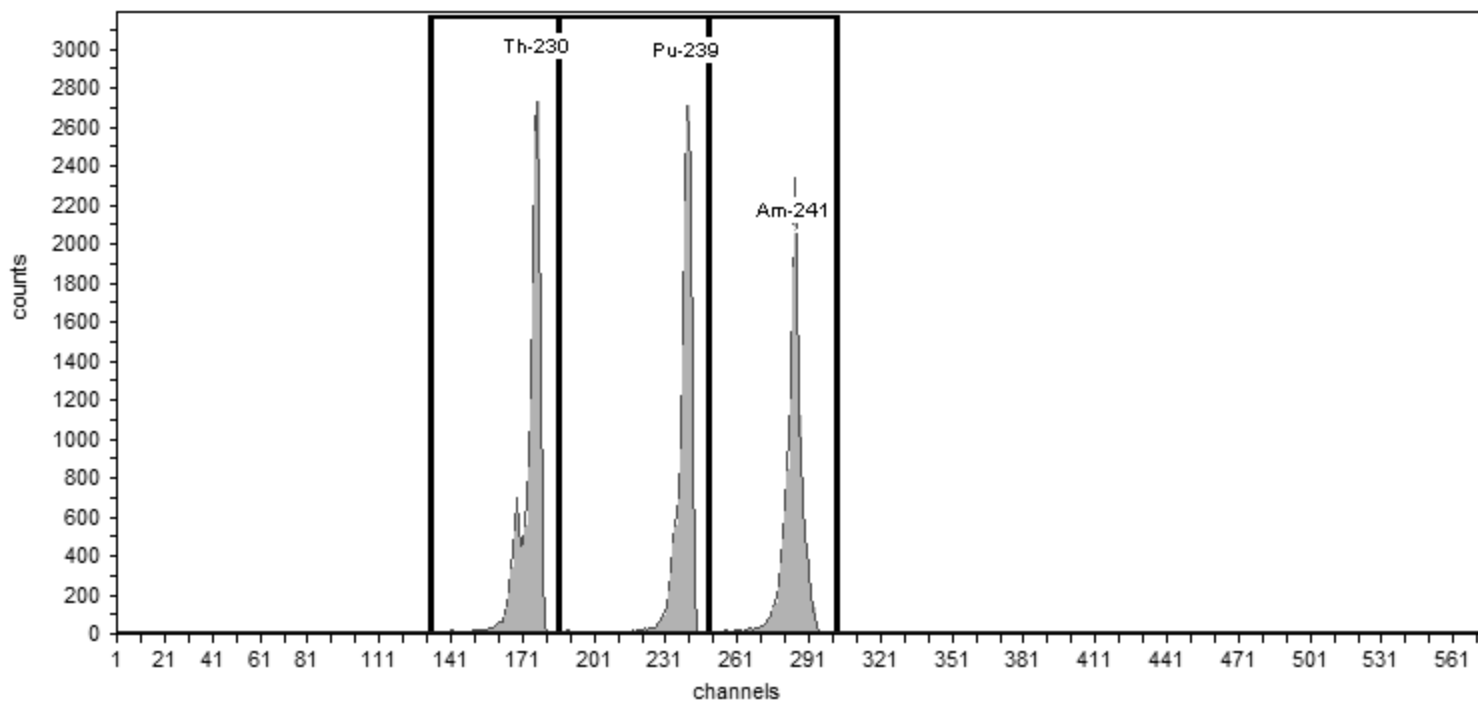
Acquisition

Detector: AV199 , SN: 50-117Z3
Acquisition Start Date: 10/17/2015 6:15:17PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.71% +/- 0.30% TPU(2 sigma)

Efficiency Calibration Name: IC-9817;AV199-20151017



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	28.96	15,446.00	110.33
Pu-239	240	5,155.40	186	249	29.88	13,902.00	99.30
Am-241	284	5,485.70	249	303	29.92	14,059.00	100.42

Calibration

Sample Name: IC-8877;AV235-20151018
Description:
Detector: AV235

Analyst: 60040
Analysis Date: 10/19/2015 4:11:39PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82236-334
Prepared by: Analytics
Description:

Certification Date: 6/2/2010 12:00:00PM

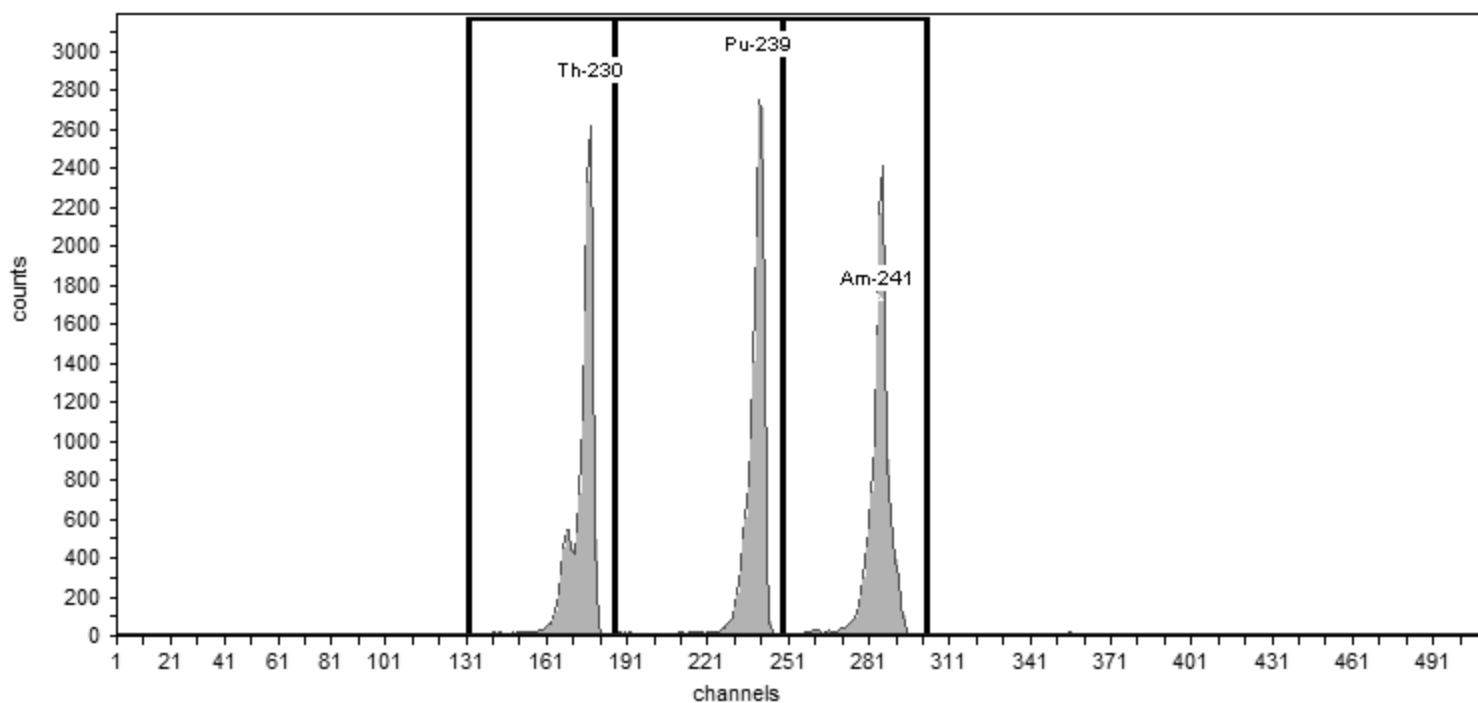
Acquisition

Detector: AV235 , SN: 51-005Q5
Acquisition Start Date: 10/18/2015 9:32:08PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.57% +/- 0.31% TPU(2 sigma)

Efficiency Calibration Name: IC-8877;AV235-20151018



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	29.88	14,697.00	104.98
Pu-239	240	5,155.40	186	249	32.18	15,135.00	108.11
Am-241	284	5,485.70	249	303	30.94	14,563.00	104.02

Calibration

Sample Name: IC-9520;AV236-20151018
Description:
Detector: AV236

Analyst: 60040
Analysis Date: 10/19/2015 4:11:44PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82237-334
Prepared by: Analytics
Description:

Certification Date: 6/1/2010 12:00:00PM

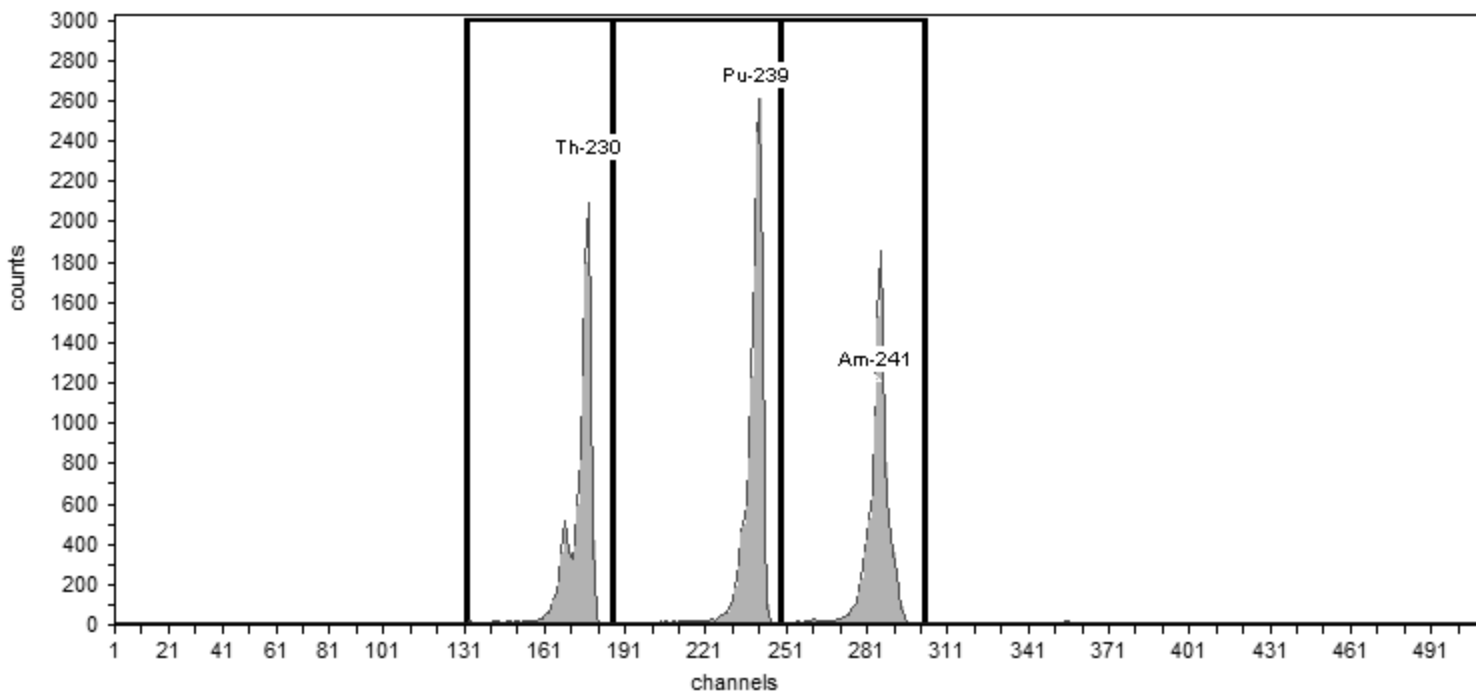
Acquisition

Detector: AV236 , SN: 51-005P3
Acquisition Start Date: 10/18/2015 9:32:19PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.47% +/- 0.34% TPU(2 sigma)

Efficiency Calibration Name: IC-9520;AV236-20151018



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	28.26	11,521.00	82.29
Pu-239	240	5,155.40	186	249	31.34	13,821.00	98.72
Am-241	284	5,485.70	249	303	30.54	11,354.00	81.10

Calibration

Sample Name: IC-9792;AV237-20151018
Description:
Detector: AV237

Analyst: 60040
Analysis Date: 10/19/2015 4:11:48PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82240-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

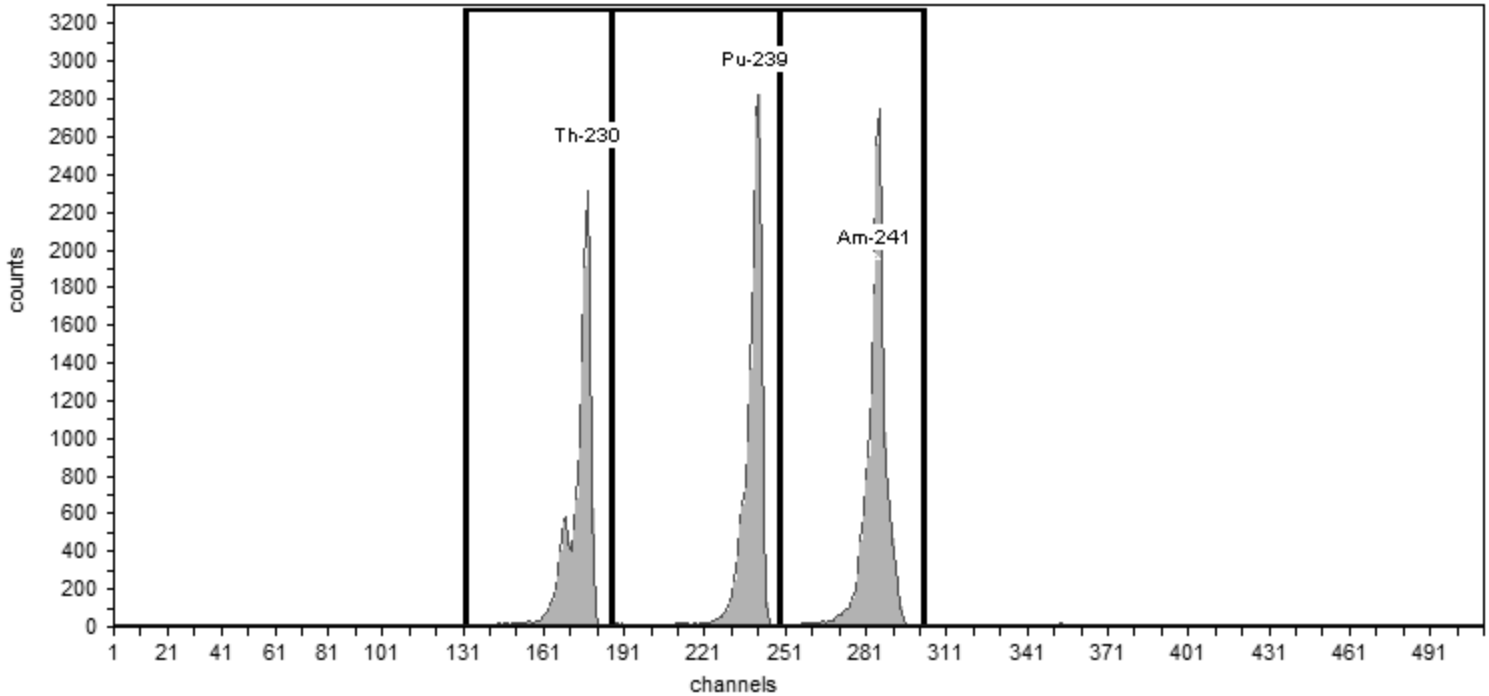
Acquisition

Detector: AV237 , SN: 50-120DD7
Acquisition Start Date: 10/18/2015 9:32:32PM
Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: IC-9792;AV237-20151018

Efficiency: 25.87% +/- 0.30% 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	30.50	13,753.00	98.24
Pu-239	240	5,155.40	186	249	32.16	15,771.00	112.65
Am-241	284	5,485.70	249	303	32.48	17,661.00	126.15

Calibration

Sample Name: IC-9793;AV238-20151018
Description:
Detector: AV238

Analyst: 60040
Analysis Date: 10/19/2015 4:11:53PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82241-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

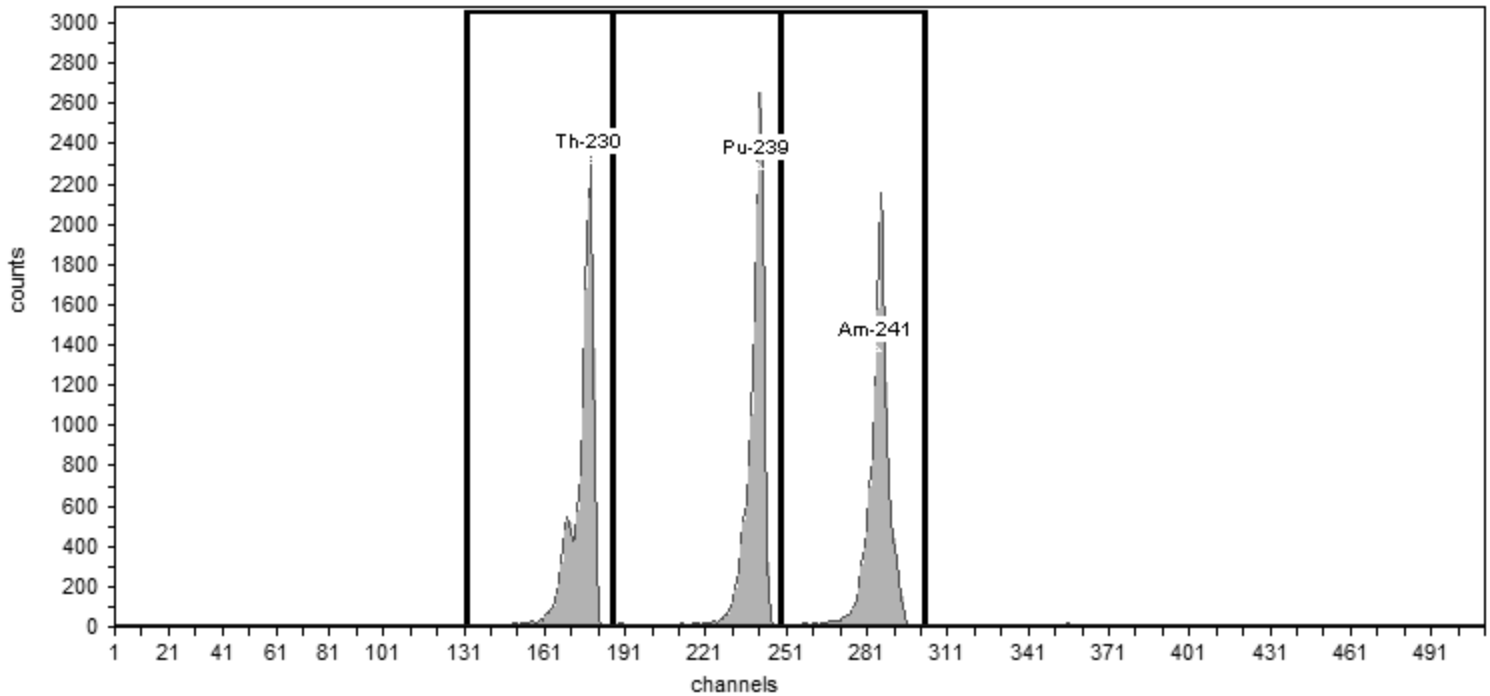
Acquisition

Detector: AV238 , SN: 51-005P7
Acquisition Start Date: 10/18/2015 9:32:47PM
Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: IC-9793;AV238-20151018

Efficiency: 25.33% +/- 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	30.36	13,900.00	99.29
Pu-239	240	5,155.40	186	249	32.15	14,628.00	104.49
Am-241	284	5,485.70	249	303	34.24	14,067.00	100.48

Calibration

Sample Name: IC-9794;AV239-20151018
Description:
Detector: AV239

Analyst: 60040
Analysis Date: 10/19/2015 4:11:57PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82242-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

Acquisition

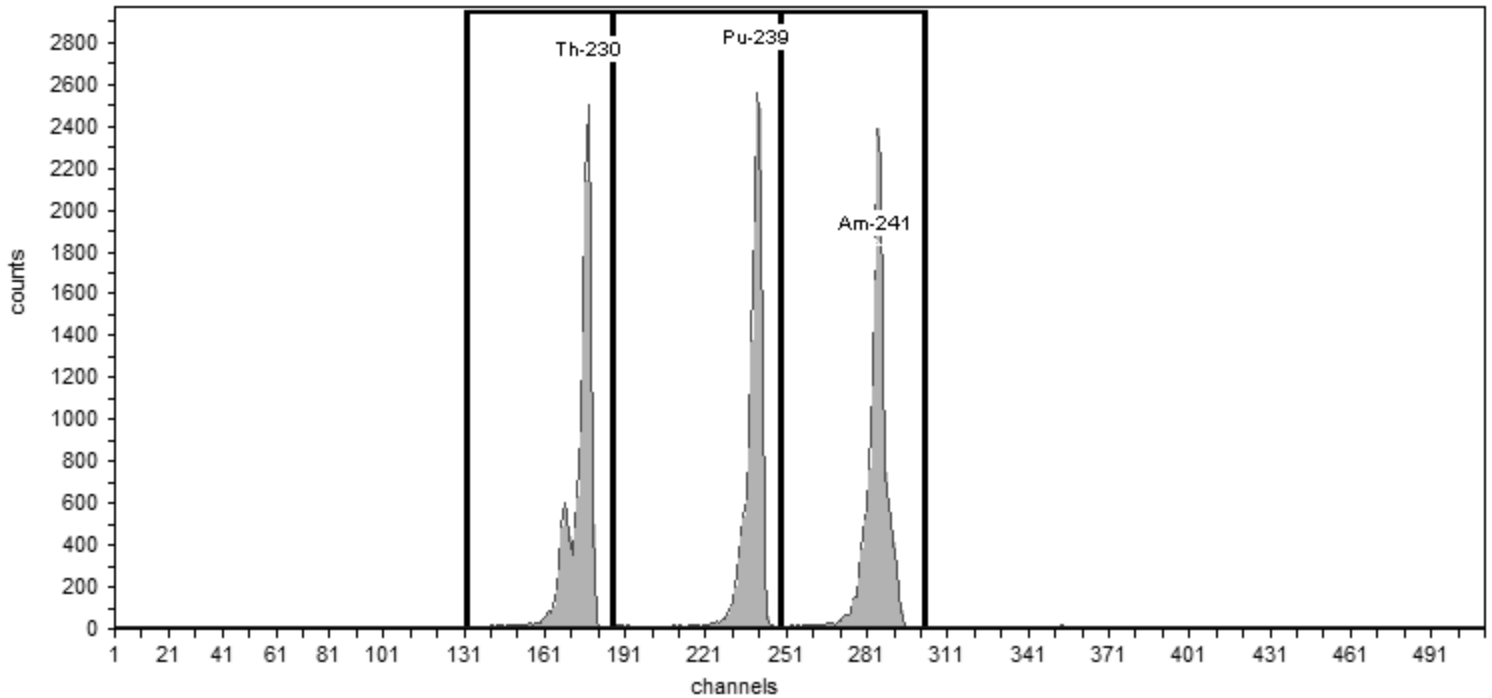
Detector: AV239 , SN: 51-005EE1
Acquisition Start Date: 10/18/2015 9:33:00PM

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Live Time: 140.00 min.
Real Time: 140.01 min.

Efficiency: 25.04% +/- 0.32% TPU(2 sigma)

Efficiency Calibration Name: IC-9794;AV239-20151018



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: Yes
Shelf: 0

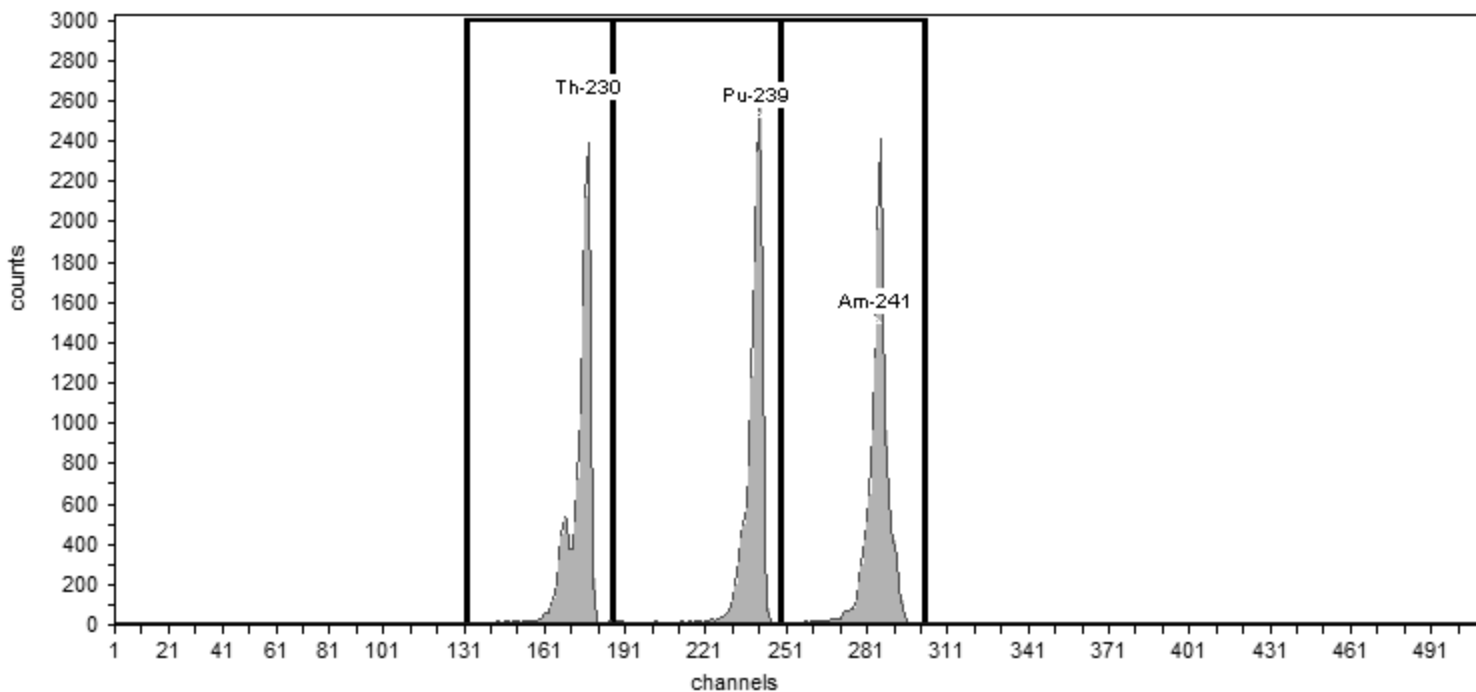
Nuclide Activity Summary

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	28.03	13,815.00	98.68
Pu-239	240	5,155.40	186	249	31.59	13,662.00	97.59
Am-241	284	5,485.70	249	303	31.15	14,789.00	105.64

Sample Name: IC-9795;AV240-20151018	Analyst: 60040
Description:	Analysis Date: 10/19/2015 4:12:02PM
Detector: AV240	Calibration Type: Energy And Efficiency

Certificate ID: 82243-334	Certification Date: 6/9/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Detector: AV240 , SN: 51-005Q1	Energy Calibration Equation:
Acquisition Start Date: 10/18/2015 9:33:12PM	Gain = 7.4575 keV / Ch
Live Time: 140.00 min.	Offset = 3,366.95 keV
Real Time: 140.01 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: IC-9795;AV240-20151018	Efficiency: 26.76% +/- 0.35% TPU(2 sigma)



Method: Manual (ROI)	Initial Calibration: Yes
Algorithm: Linear	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	28.66	13,193.00	94.24
Pu-239	240	5,155.40	186	249	30.85	13,452.00	96.09
Am-241	284	5,485.70	249	303	29.84	14,212.00	101.51

Calibration

Sample Name: IC-9817;AV241-20151018
Description:
Detector: AV241

Analyst: 60040
Analysis Date: 10/19/2015 4:12:06PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82244-334
Prepared by: Analytics
Description:

Certification Date: 6/9/2010 12:00:00PM

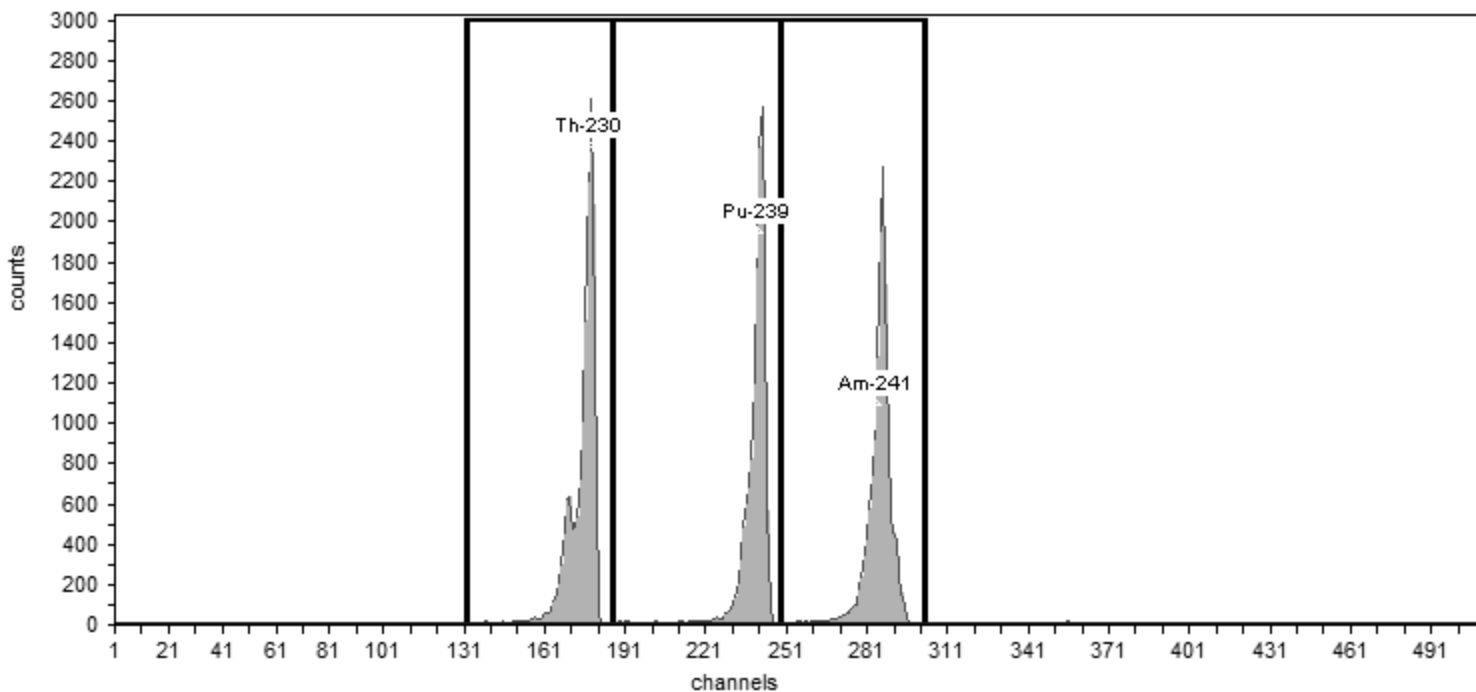
Acquisition

Detector: AV241 , SN: 50-005P1
Acquisition Start Date: 10/18/2015 9:33:21PM

Live Time: 140.00 min.
Real Time: 140.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.71% +/- 0.30% TPU(2 sigma)

Efficiency Calibration Name: IC-9817;AV241-20151018



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	29.42	15,200.00	108.57
Pu-239	240	5,155.40	186	249	31.91	14,189.00	101.35
Am-241	284	5,485.70	249	303	31.06	14,029.00	100.21

Initial Calibration Verifications

Alpha Spectroscopy Calibration Summary

Detector: AV148

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223445/1	10/16/15 16:27	82233-334_00001	0.2672	0.20-0.32		
ICV 160-223563/1	10/26/15 19:10	82232-334_00001	0.2586	0.20-0.32	96.8	95-105
CCV 160-258276/1	06/27/16 10:48	82233-334_00001	0.2679	0.20-0.32	100.3	95-105

Detector: AV150

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223447/1	10/16/15 15:51	82235-334_00001	0.2445	0.20-0.32		
ICV 160-223565/1	10/26/15 19:10	82247-334_00001	0.2449	0.20-0.32	100.1	95-105
CCV 160-258278/1	06/27/16 10:49	82235-334_00001	0.2394	0.20-0.32	97.9	95-105

Detector: AV151

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223448/1	10/16/15 15:51	82236-334_00001	0.2528	0.20-0.32		
ICV 160-223566/1	10/26/15 19:11	82246-334_00001	0.2559	0.20-0.32	101.3	95-105
CCV 160-258279/1	06/27/16 10:49	82236-334_00001	0.2486	0.20-0.32	98.4	95-105

Detector: AV152

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223449/1	10/16/15 15:52	82237-334_00003	0.2454	0.20-0.32		
ICV 160-223567/1	10/26/15 19:11	82242-334_00001	0.2417	0.20-0.32	98.5	95-105
CCV 160-258280/1	06/27/16 10:49	82237-334_00003	0.2372	0.20-0.32	96.7	95-105

Detector: AV153

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223450/1	10/16/15 15:52	82240-334_00001	0.2660	0.20-0.32		
ICV 160-223568/1	10/26/15 19:11	82243-334_00001	0.2646	0.20-0.32	99.5	95-105
CCV 160-258281/1	06/27/16 10:50	82240-334_00001	0.2605	0.20-0.32	97.9	95-105

Detector: AV155

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223452/1	10/16/15 15:52	82242-334_00001	0.2417	0.20-0.32		
ICV 160-223570/1	10/26/15 19:12	82237-334_00003	0.2427	0.20-0.32	100.4	95-105
CCV 160-258283/1	06/27/16 10:50	82242-334_00001	0.2305	0.20-0.32	95.4	95-105

Detector: AV199

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223496/1	10/17/15 18:15	82244-334_00001	0.2471	0.20-0.32		
ICV 160-223614/1	11/01/15 14:25	82241-334_00001	0.2515	0.20-0.32	101.8	95-105
CCV 160-258308/1	06/27/16 13:50	82244-334_00001	0.2420	0.20-0.32	97.9	95-105

Detector: AV235

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223531/1	10/18/15 21:32	82236-334_00001	0.2557	0.20-0.32		
ICV 160-223650/1	11/01/15 20:30	82246-334_00001	0.2578	0.20-0.32	100.8	95-105
CCV 160-258340/1	06/27/16 18:53	82236-334_00001	0.2487	0.20-0.32	97.3	95-105

Alpha Spectroscopy Calibration Summary

Detector: AV236

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223532/1	10/18/15 21:32	82237-334_00003	0.2447	0.20-0.32		
ICV 160-223666/2	11/05/15 18:22	82242-334_00001	0.2437	0.20-0.32	99.6	95-105
CCV 160-258356/1	06/28/16 09:29	82237-334_00003	0.2440	0.20-0.32	99.7	95-105

Detector: AV237

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223533/1	10/18/15 21:32	82240-334_00001	0.2587	0.20-0.32		
ICV 160-223652/1	11/01/15 20:31	82243-334_00001	0.2639	0.20-0.32	102.0	95-105
CCV 160-258342/1	06/27/16 18:53	82240-334_00001	0.2562	0.20-0.32	99.0	95-105

Detector: AV238

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223534/1	10/18/15 21:32	82241-334_00001	0.2533	0.20-0.32		
ICV 160-223653/1	11/01/15 20:31	82244-334_00001	0.2451	0.20-0.32	96.7	95-105
CCV 160-258343/1	06/27/16 18:53	82241-334_00001	0.2456	0.20-0.32	96.9	95-105

Detector: AV239

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223535/1	10/18/15 21:33	82242-334_00001	0.2504	0.20-0.32		
ICV 160-223654/1	11/01/15 20:31	82237-334_00003	0.2501	0.20-0.32	99.9	95-105
CCV 160-258357/1	06/28/16 08:13	82242-334_00001	0.2417	0.20-0.32	96.5	95-105

Detector: AV240

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223536/1	10/18/15 21:33	82243-334_00001	0.2676	0.20-0.32		
ICV 160-223655/1	11/01/15 20:31	82240-334_00001	0.2611	0.20-0.32	97.6	95-105
CCV 160-258358/1	06/28/16 08:13	82243-334_00001	0.2670	0.20-0.32	99.8	95-105

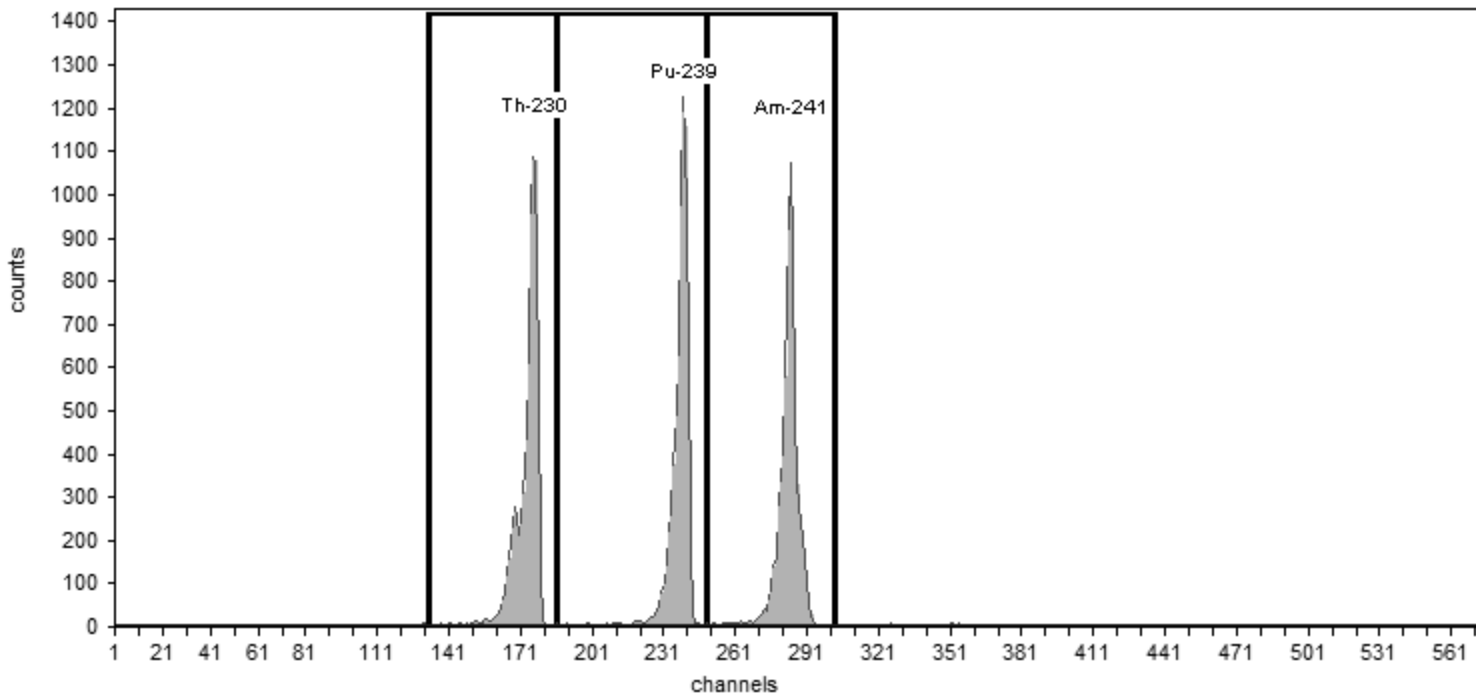
Detector: AV241

Lab Sample ID	Analysis Date	Reagent ID	Efficiency	Efficiency Limits	Efficiency Recovery	Recovery Limits
IC 160-223537/1	10/18/15 21:33	82244-334_00001	0.2471	0.20-0.32		
ICV 160-223656/1	11/01/15 20:32	82241-334_00001	0.2517	0.20-0.32	101.9	95-105
CCV 160-258359/1	06/28/16 08:21	82244-334_00001	0.2417	0.20-0.32	97.8	95-105

<p>Sample Name: ICV-7107;AV148-20151026</p> <p>Description:</p> <p>Detector: AV148</p>	<p>Calibration</p> <p>Analyst: 60040</p> <p>Analysis Date: 10/26/2015 8:20:51PM</p> <p>Calibration Type: Energy And Efficiency</p>
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<p>Certificate ID: 82232-334</p> <p>Prepared by: Analytics</p> <p>Description:</p>	<p>Source Info</p> <p>Certification Date: 6/3/2010 12:00:00PM</p>
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<p>Detector: AV148 , SN: 50-05/R2</p> <p>Acquisition Start Date: 10/26/2015 7:10:27PM</p> <p>Live Time: 60.00 min.</p> <p>Real Time: 60.01 min.</p> <p>Efficiency Calibration Name: ICV-7107;AV148-20151026</p>	<p>Acquisition</p> <p>Energy Calibration Equation:</p> <p style="padding-left: 20px;">Gain = 7.4575 keV / Ch</p> <p style="padding-left: 20px;">Offset = 3,366.95 keV</p> <p style="padding-left: 20px;">Quadratic = 0.0000 keV / Ch²</p> <p>Efficiency: 25.86% +/- 0.40% TPU(2 sigma)</p>
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<p>Method: Manual (ROI)</p> <p>Algorithm: Linear</p>	<p>General Analysis</p> <p>Initial Calibration: No</p> <p>Shelf: 0</p>
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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	33.29	7,000.00	116.67
Pu-239	240	5,155.40	186	249	31.50	6,783.00	113.05
Am-241	284	5,485.70	249	303	30.75	6,700.00	111.67

Calibration

Sample Name: ICV-9886;AV150-20151026
Description:
Detector: AV150

Analyst: 60040
Analysis Date: 10/26/2015 8:20:57PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82247-334
Prepared by: Analytics
Description:

Certification Date: 6/10/2010 12:00:00PM

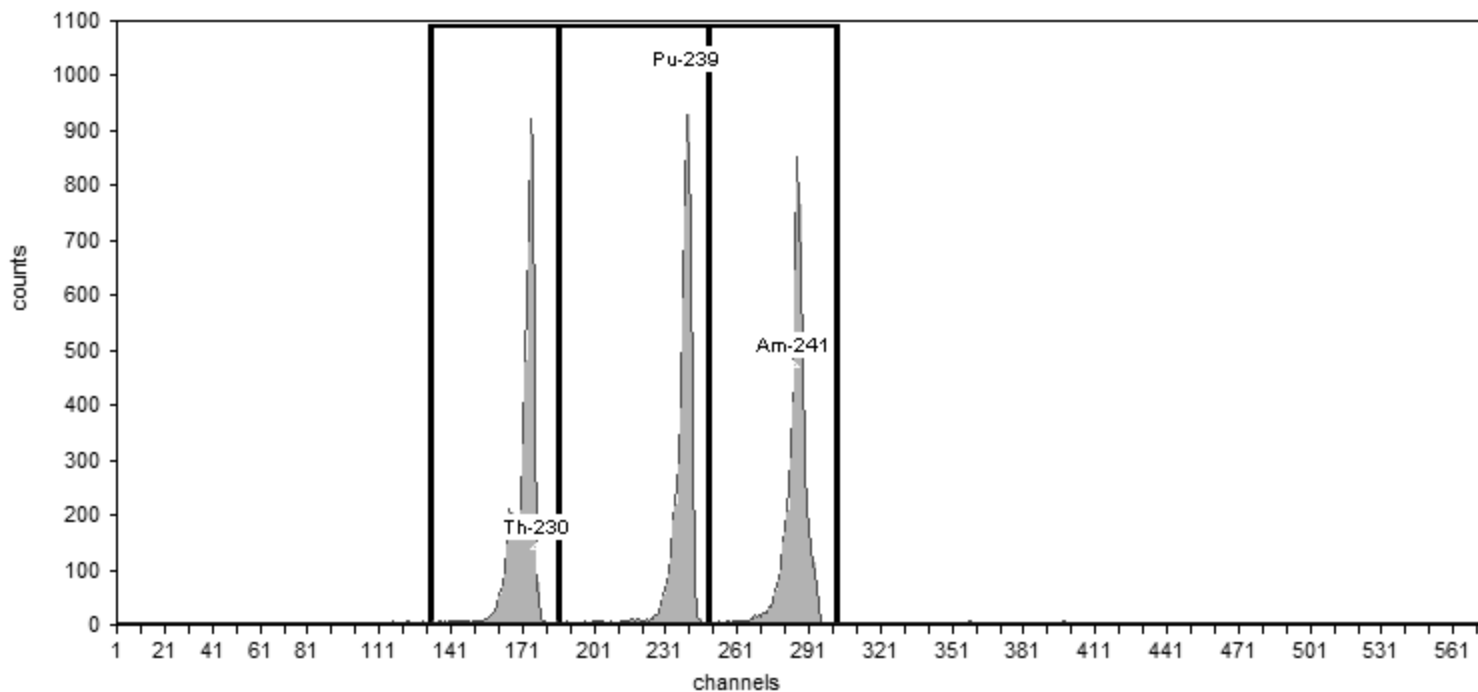
Acquisition

Detector: AV150 , SN: 50-05/R4
Acquisition Start Date: 10/26/2015 7:10:54PM

Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 24.49% +/- 0.44% TPU(2 sigma)

Efficiency Calibration Name: ICV-9886;AV150-20151026



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 0

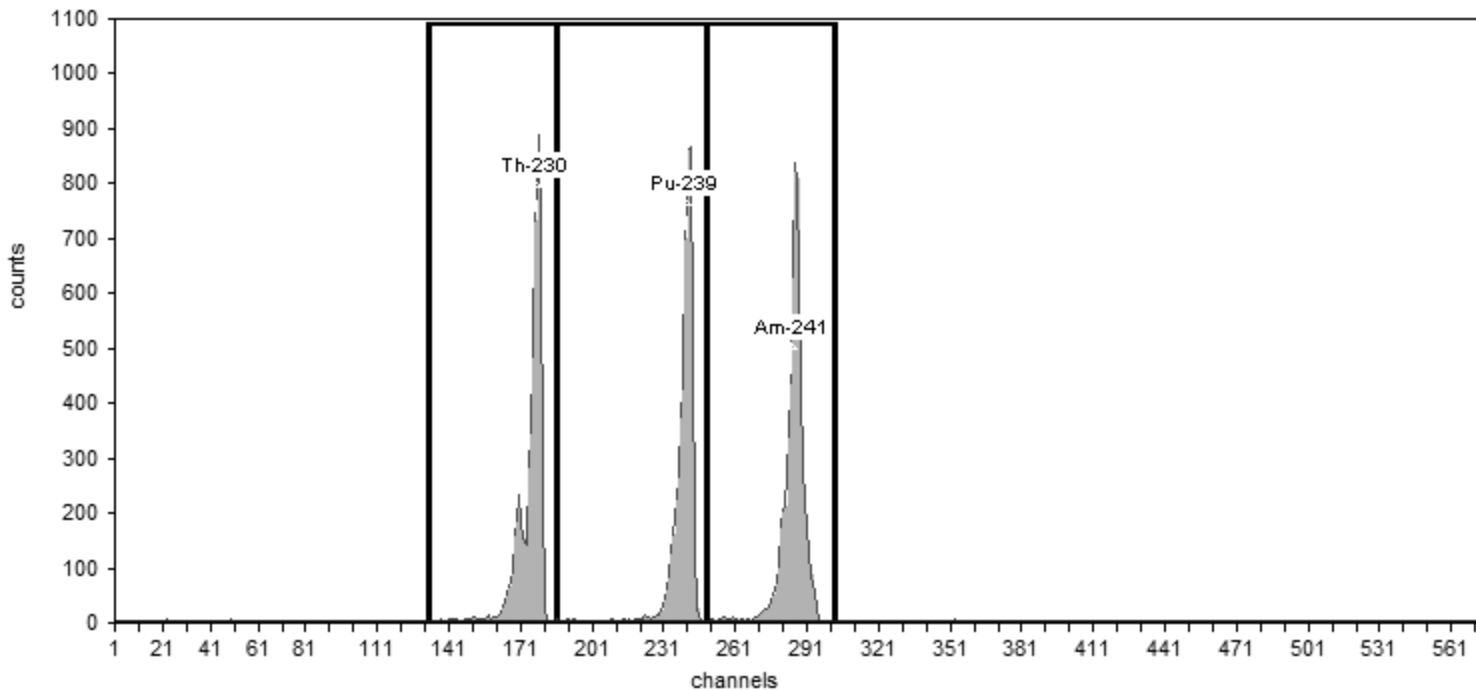
Nuclide Activity Summary

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	30.59	5,506.00	91.77
Pu-239	240	5,155.40	186	249	32.24	5,075.00	84.58
Am-241	284	5,485.70	249	303	31.73	5,498.00	91.63

Sample Name: ICV-9885;AV151-20151026	Analyst: 60040
Description:	Analysis Date: 10/26/2015 8:21:00PM
Detector: AV151	Calibration Type: Energy And Efficiency

Certificate ID: 82246-334	Certification Date: 6/9/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Detector: AV151 , SN: 50-05/R5	Energy Calibration Equation:
Acquisition Start Date: 10/26/2015 7:11:09PM	Gain = 7.4575 keV / Ch
Live Time: 60.00 min.	Offset = 3,366.95 keV
Real Time: 60.00 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: ICV-9885;AV151-20151026	Efficiency: 25.59% +/- 0.49% TPU(2 sigma)



Method: Manual (ROI)	Initial Calibration: No
Algorithm: Linear	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	28.66	5,115.00	85.25
Pu-239	240	5,155.40	186	249	31.32	4,991.00	83.18
Am-241	284	5,485.70	249	303	31.95	5,449.00	90.82

Calibration

Sample Name: ICV-9794;AV152-20151026
Description:
Detector: AV152

Analyst: 60040
Analysis Date: 10/26/2015 8:21:03PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82242-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

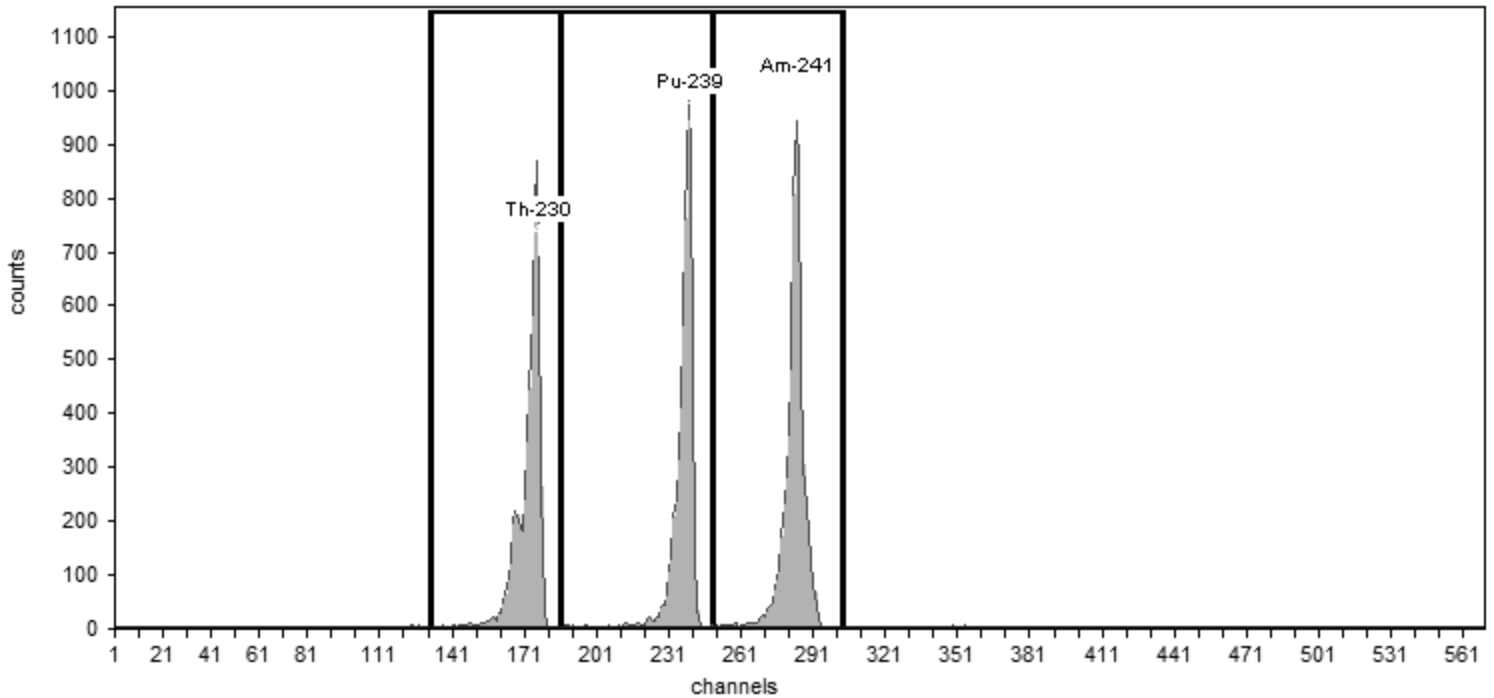
Acquisition

Detector: AV152 , SN: 50-05/R6
Acquisition Start Date: 10/26/2015 7:11:27PM
Live Time: 60.00 min.
Real Time: 60.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: ICV-9794;AV152-20151026

Efficiency: 24.17% +/- 0.41% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
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	34.77	5,721.00	95.35
Pu-239	240	5,155.40	186	249	33.01	5,586.00	93.10
Am-241	284	5,485.70	249	303	31.64	6,169.00	102.82

Sample Name: ICV-9795;AV153-20151026
Description:
Detector: AV153

Calibration

Analyst: 60040
Analysis Date: 10/26/2015 8:21:06PM
Calibration Type: Energy And Efficiency

Certificate ID: 82243-334
Prepared by: Analytics
Description:

Source Info

Certification Date: 6/9/2010 12:00:00PM

Detector: AV153 , SN: 54-011 Y6
Acquisition Start Date: 10/26/2015 7:11:41PM

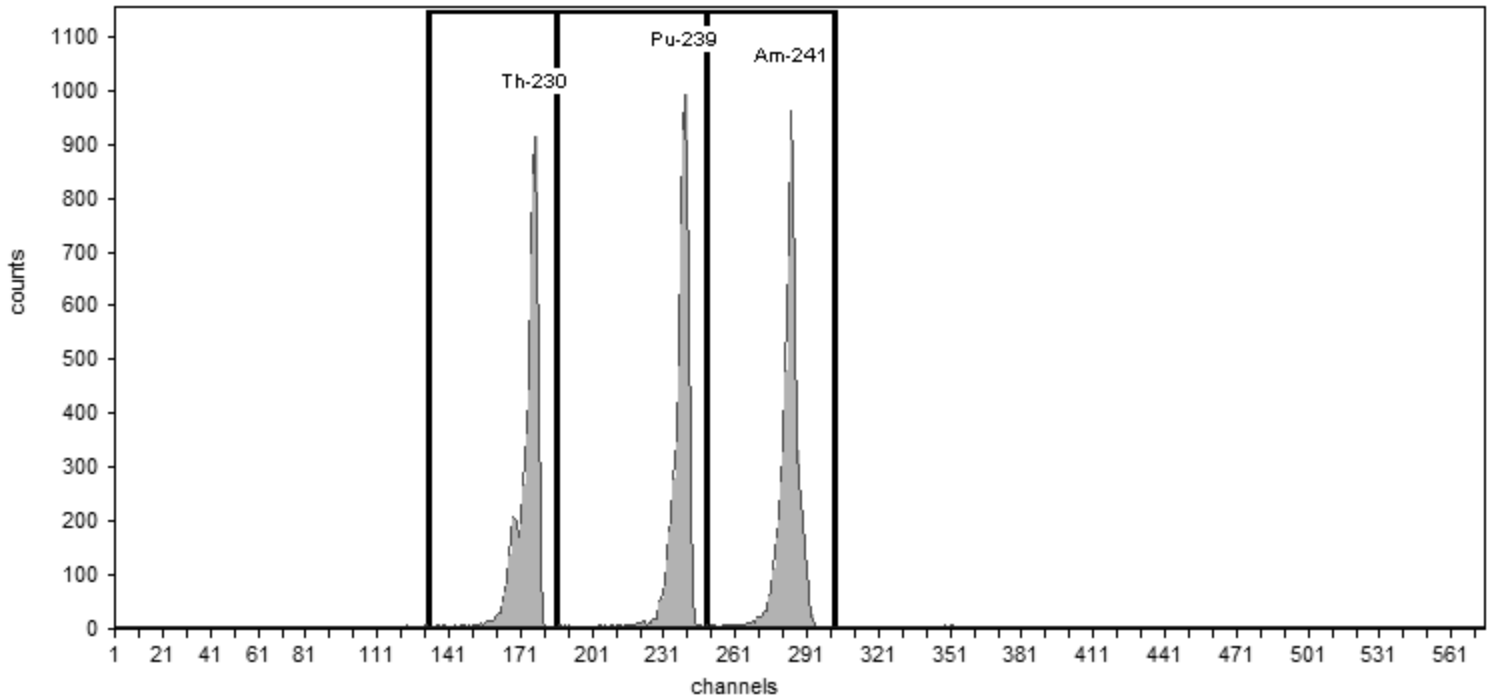
Acquisition

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Live Time: 60.00 min.
Real Time: 60.00 min.

Efficiency Calibration Name: ICV-9795;AV153-20151026

Efficiency: 26.46% +/- 0.46% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
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	30.33	5,618.00	93.63
Pu-239	240	5,155.40	186	249	32.54	5,595.00	93.25
Am-241	284	5,485.70	249	303	32.83	6,103.00	101.72

Calibration

Sample Name: ICV-9520;AV155-20151026
Description:
Detector: AV155

Analyst: 60040
Analysis Date: 10/26/2015 8:21:13PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82237-334
Prepared by: Analytics
Description:

Certification Date: 6/1/2010 12:00:00PM

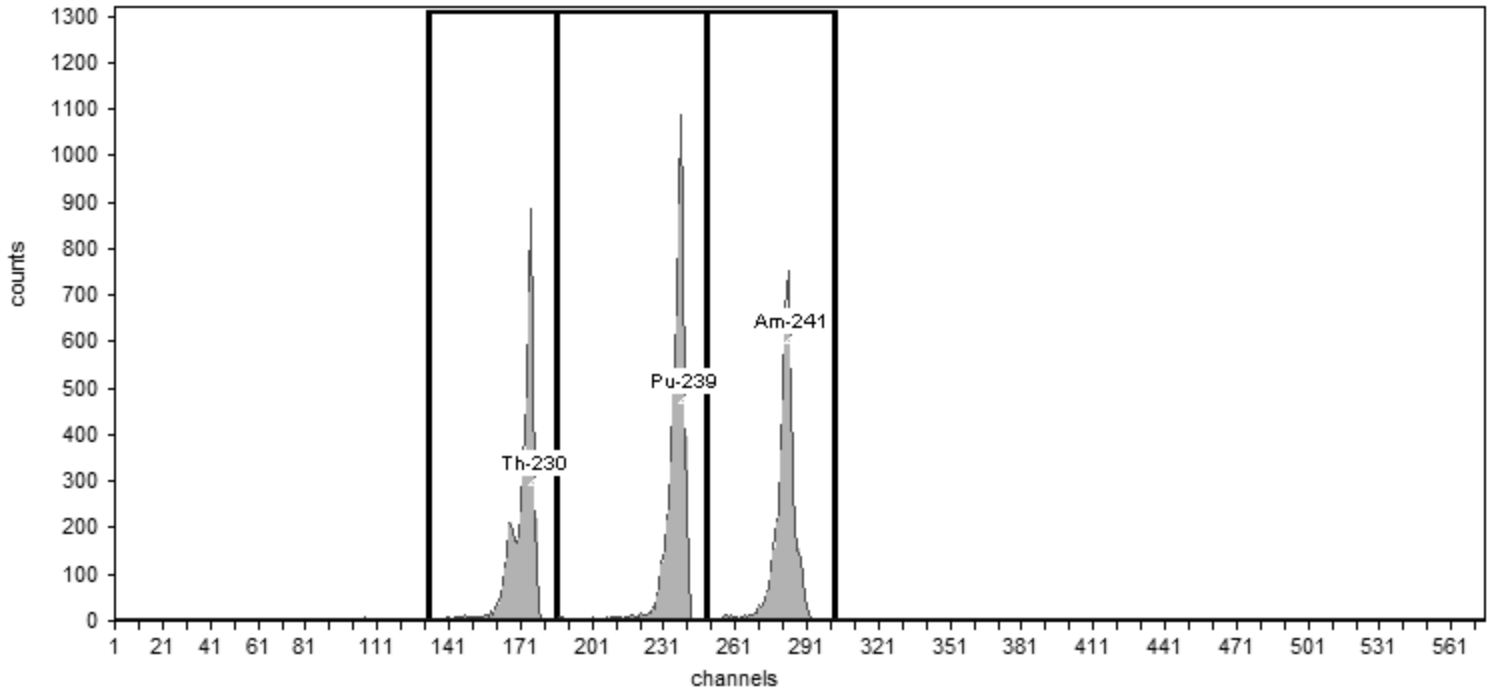
Acquisition

Detector: AV155 , SN: 50-05/II1
Acquisition Start Date: 10/26/2015 7:12:14PM
Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: ICV-9520;AV155-20151026

Efficiency: 24.27% +/- 0.45% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
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	27.23	4,940.00	82.33
Pu-239	240	5,155.40	186	249	32.51	5,892.00	98.20
Am-241	284	5,485.70	249	303	33.96	4,770.00	79.50

Calibration

Sample Name: ICV-9793;AV199-20151101
Description:
Detector: AV199

Analyst: 60040
Analysis Date: 11/1/2015 3:56:07PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82241-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

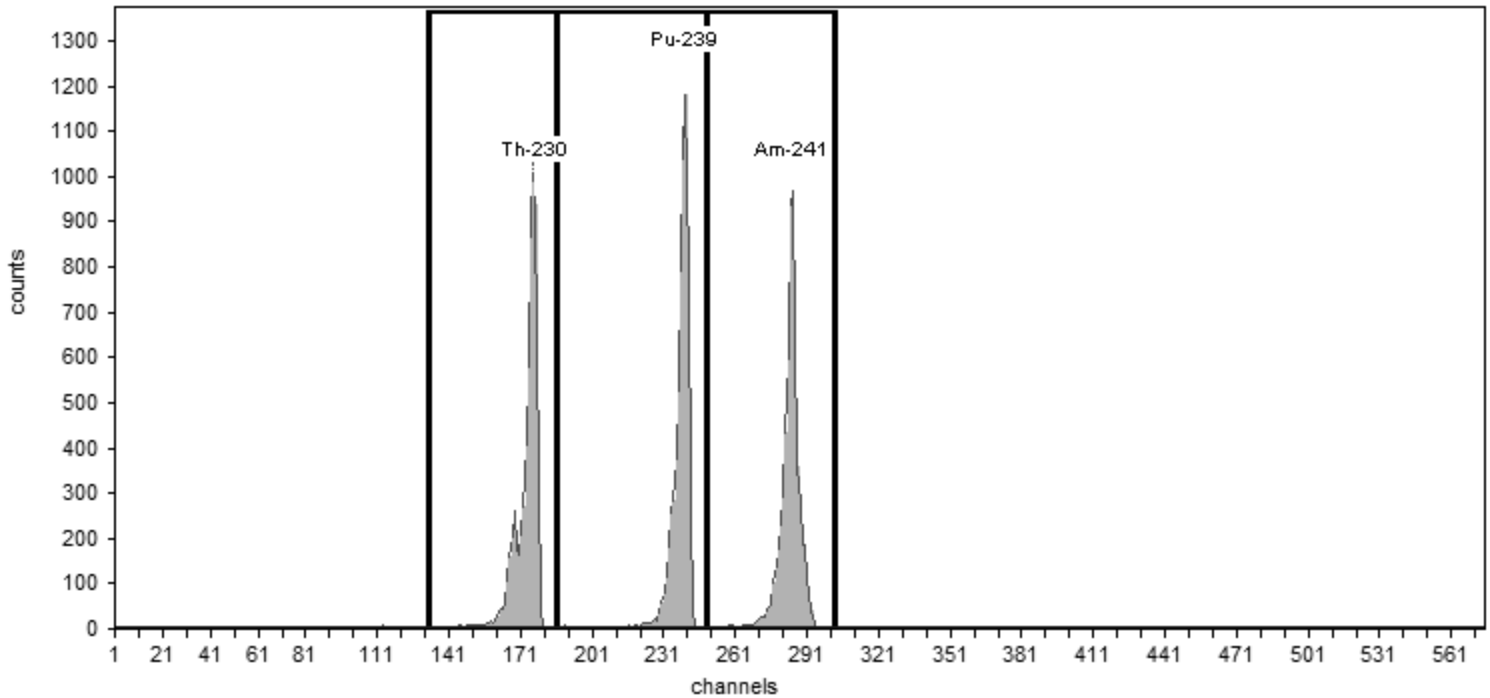
Acquisition

Detector: AV199 , SN: 50-117Z3
Acquisition Start Date: 11/1/2015 2:25:56PM
Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: ICV-9793;AV199-20151101

Efficiency: 25.15% +/- 0.42% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
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	29.93	5,988.00	99.80
Pu-239	240	5,155.40	186	249	30.79	6,118.00	101.97
Am-241	284	5,485.70	249	303	31.69	6,015.00	100.25

Calibration

Sample Name: ICV-9885;AV235-20151101
Description:
Detector: AV235

Analyst: 60040
Analysis Date: 11/1/2015 11:16:20PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82246-334
Prepared by: Analytics
Description:

Certification Date: 6/9/2010 12:00:00PM

Acquisition

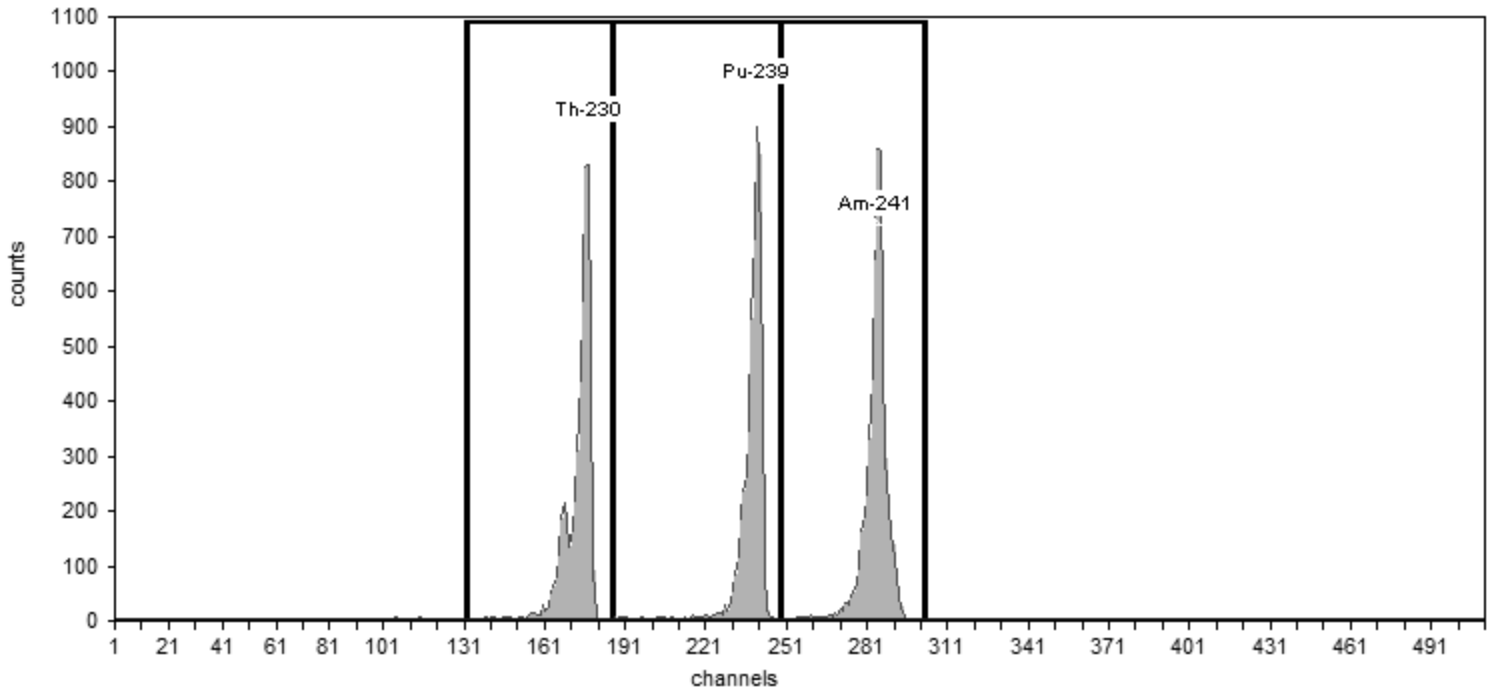
Detector: AV235 , SN: 51-005Q5
Acquisition Start Date: 11/1/2015 8:30:02PM

Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: ICV-9885;AV235-20151101

Efficiency: 25.78% +/- 0.49% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 0

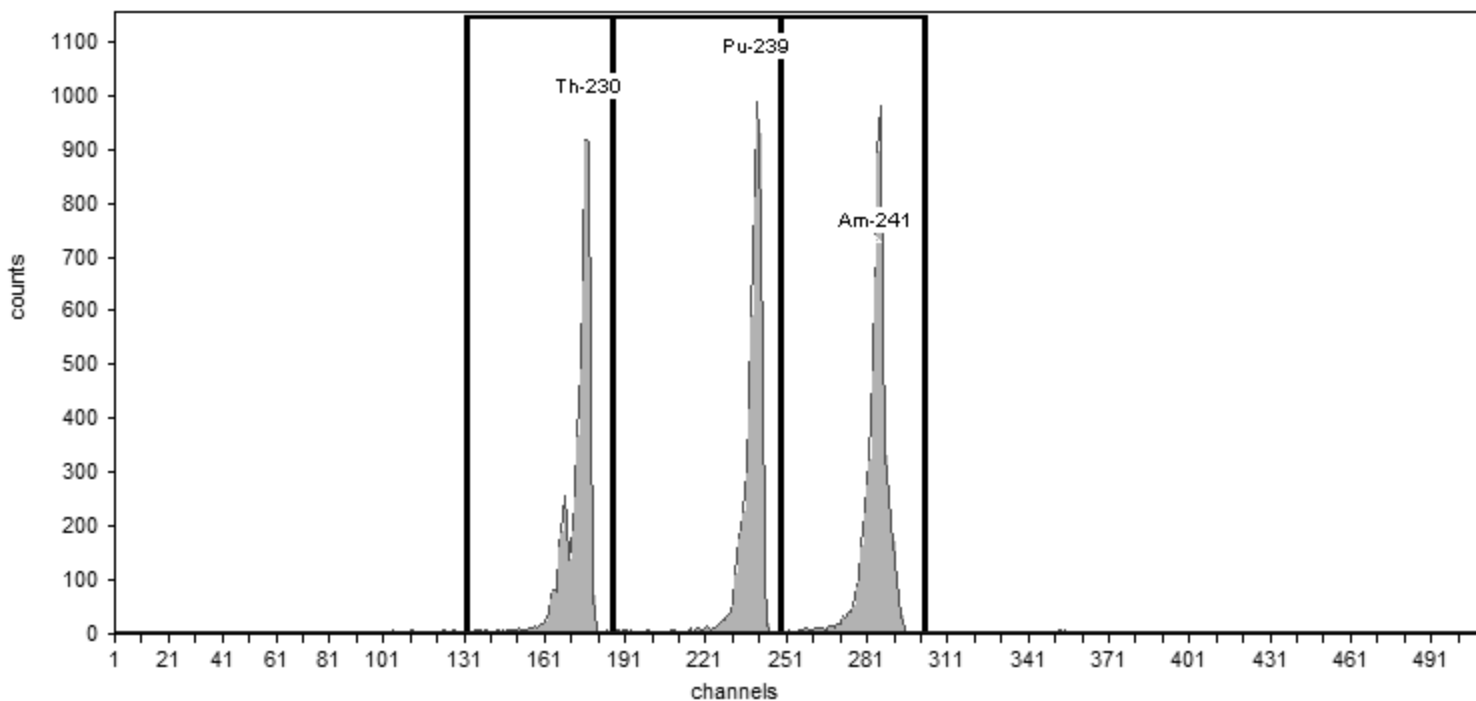
Nuclide Activity Summary

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	32.30	5,105.00	85.08
Pu-239	240	5,155.40	186	249	33.27	4,989.00	83.15
Am-241	284	5,485.70	249	303	32.76	5,571.00	92.85

Calibration	
Sample Name: ICV-9794;AV236-20151105a	Analyst: 60040
Description:	Analysis Date: 11/7/2015 2:05:17PM
Detector: AV236	Calibration Type: Energy And Efficiency

Source Info	
Certificate ID: 82242-334	Certification Date: 6/8/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Acquisition	
Detector: AV236 , SN: 51-005P3	Energy Calibration Equation:
Acquisition Start Date: 11/5/2015 6:22:59PM	Gain = 7.4575 keV / Ch
Live Time: 60.00 min.	Offset = 3,366.95 keV
Real Time: 60.00 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: ICV-9794;AV236-20151105	Efficiency: 24.37% +/- 0.42% TPU(2 sigma)



General Analysis	
Method: Manual (ROI)	Initial Calibration: No
Algorithm: Linear	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	32.30	5,696.00	94.93
Pu-239	240	5,155.40	186	249	34.39	5,670.00	94.50
Am-241	284	5,485.70	249	303	32.72	6,259.00	104.32

Calibration

Sample Name: ICV-9795;AV237-20151101
Description:
Detector: AV237

Analyst: 60040
Analysis Date: 11/1/2015 11:16:28PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82243-334
Prepared by: Analytics
Description:

Certification Date: 6/9/2010 12:00:00PM

Acquisition

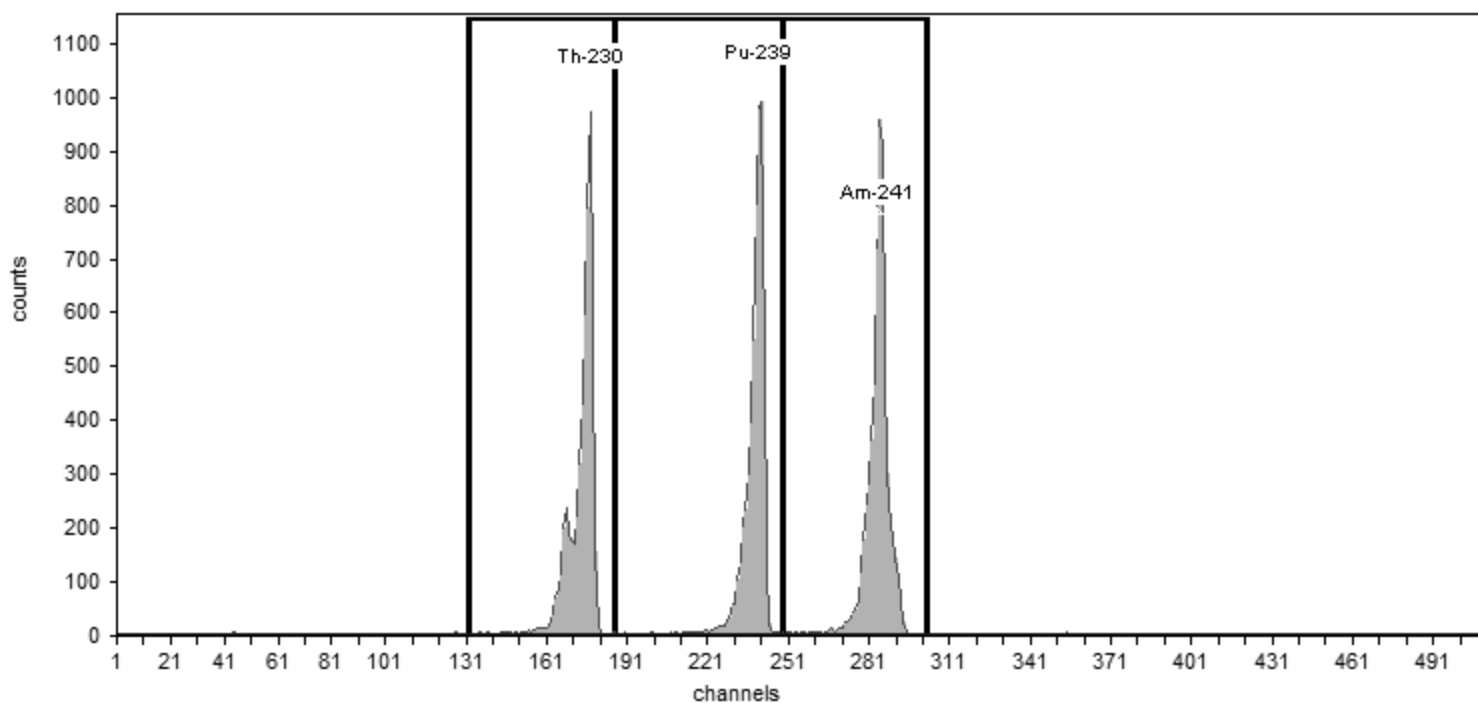
Detector: AV237 , SN: 50-120DD7
Acquisition Start Date: 11/1/2015 8:31:02PM

Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: ICV-9795;AV237-20151101

Efficiency: 26.39% +/- 0.46% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 0

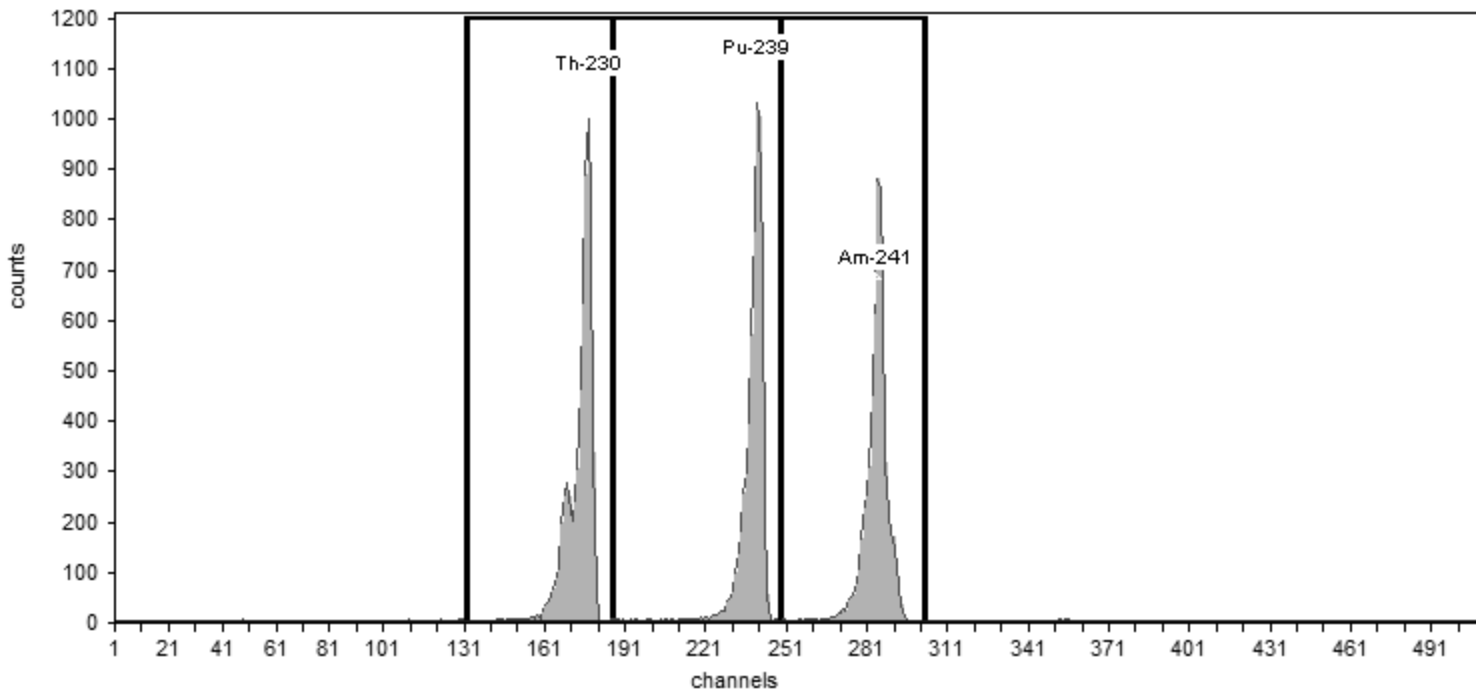
Nuclide Activity Summary

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	29.15	5,513.00	91.88
Pu-239	240	5,155.40	186	249	33.06	5,665.00	94.42
Am-241	284	5,485.70	249	303	30.78	6,092.00	101.53

<p>Sample Name: ICV-9817;AV238-20151101</p> <p>Description:</p> <p>Detector: AV238</p>	<p>Calibration</p> <p>Analyst: 60040</p> <p>Analysis Date: 11/1/2015 11:16:31PM</p> <p>Calibration Type: Energy And Efficiency</p>
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<p>Certificate ID: 82244-334</p> <p>Prepared by: Analytics</p> <p>Description:</p>	<p>Source Info</p> <p>Certification Date: 6/9/2010 12:00:00PM</p>
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<p>Detector: AV238 , SN: 51-005P7</p> <p>Acquisition Start Date: 11/1/2015 8:31:15PM</p> <p>Live Time: 60.00 min.</p> <p>Real Time: 60.00 min.</p> <p>Efficiency Calibration Name: ICV-9817;AV238-20151101</p>	<p>Acquisition</p> <p>Energy Calibration Equation:</p> <p style="padding-left: 20px;">Gain = 7.4575 keV / Ch</p> <p style="padding-left: 20px;">Offset = 3,366.95 keV</p> <p style="padding-left: 20px;">Quadratic = 0.0000 keV / Ch²</p> <p>Efficiency: 24.51% +/- 0.41% TPU(2 sigma)</p>
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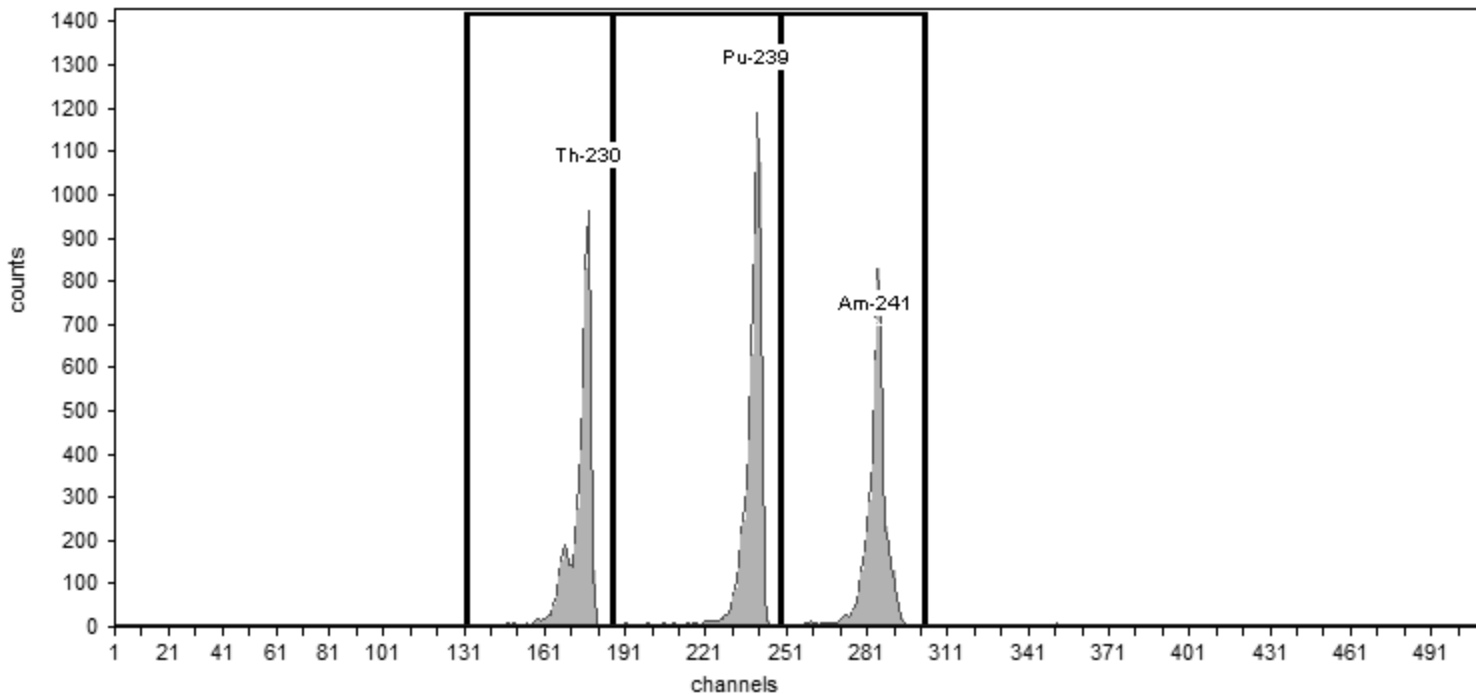
<p>Method: Manual (ROI)</p> <p>Algorithm: Linear</p>	<p>General Analysis</p> <p>Initial Calibration: No</p> <p>Shelf: 0</p>
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Nuclide Activity Summary							
Nuclide	Peak Channel	Peak Energy keV	ROI Start Channel	ROI End Channel	Peak FWHM keV	Gross Counts	Net Count Rate (cpm)
Th-230	177	4,687.50	132	186	33.17	6,400.00	106.67
Pu-239	240	5,155.40	186	249	35.28	6,070.00	101.17
Am-241	284	5,485.70	249	303	35.24	5,990.00	99.83

Sample Name: ICV-9520;AV239-20151101	Analyst: 60040
Description:	Analysis Date: 11/1/2015 11:16:35PM
Detector: AV239	Calibration Type: Energy And Efficiency

Certificate ID: 82237-334	Certification Date: 6/1/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Detector: AV239 , SN: 51-005EE1	Energy Calibration Equation:
Acquisition Start Date: 11/1/2015 8:31:32PM	Gain = 7.4575 keV / Ch
Live Time: 60.00 min.	Offset = 3,366.95 keV
Real Time: 60.00 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: ICV-9520;AV239-20151101	Efficiency: 25.01% +/- 0.46% TPU(2 sigma)



Method: Manual (ROI)	Initial Calibration: No
Algorithm: Linear	Shelf: 0

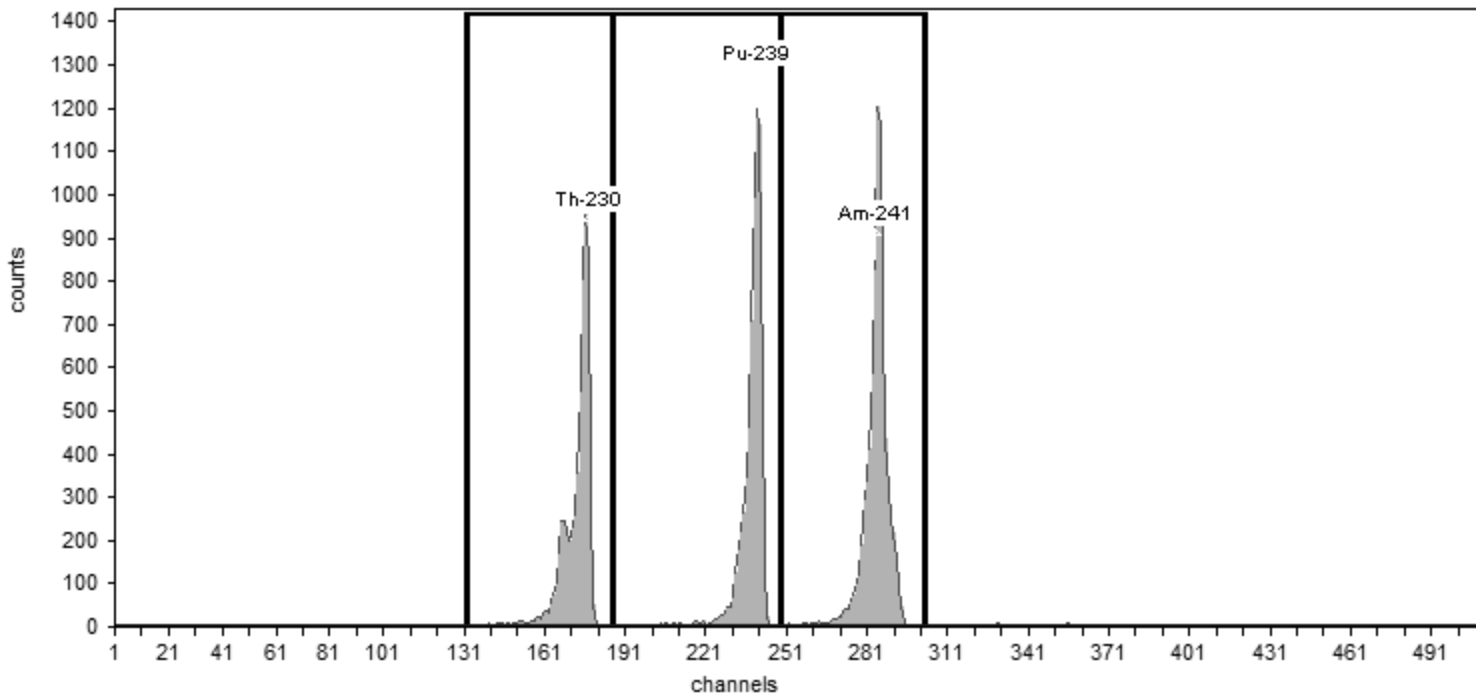
Nuclide Activity Summary

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	27.94	5,117.00	85.28
Pu-239	240	5,155.40	186	249	29.59	6,071.00	101.18
Am-241	284	5,485.70	249	303	27.94	4,887.00	81.45

Sample Name: ICV-9792;AV240-20151101	Analyst: 60040
Description:	Analysis Date: 11/1/2015 11:16:39PM
Detector: AV240	Calibration Type: Energy And Efficiency

Certificate ID: 82240-334	Certification Date: 6/8/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Detector: AV240 , SN: 51-005Q1	Energy Calibration Equation:
Acquisition Start Date: 11/1/2015 8:31:50PM	Gain = 7.4575 keV / Ch
Live Time: 60.00 min.	Offset = 3,366.95 keV
Real Time: 60.00 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: ICV-9792;AV240-20151101	Efficiency: 26.11% +/- 0.41% TPU(2 sigma)



Method: Manual (ROI)	Initial Calibration: No
Algorithm: Linear	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	30.15	5,861.00	97.68
Pu-239	240	5,155.40	186	249	32.46	6,691.00	111.52
Am-241	284	5,485.70	249	303	32.67	7,840.00	130.67

Calibration

Sample Name: ICV-9793;AV241-20151101
Description:
Detector: AV241

Analyst: 60040
Analysis Date: 11/1/2015 11:16:43PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82241-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

Acquisition

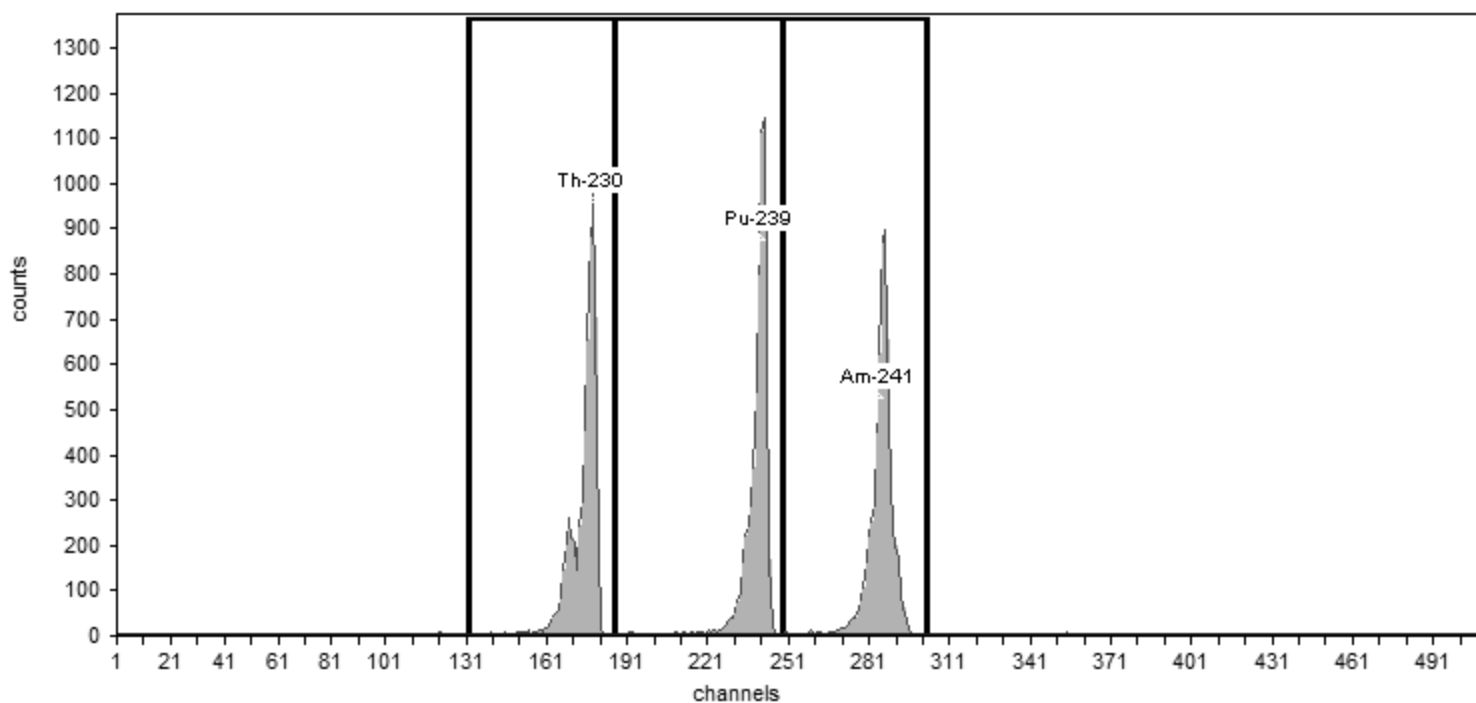
Detector: AV241 , SN: 50-005P1
Acquisition Start Date: 11/1/2015 8:32:05PM

Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: ICV-9793;AV241-20151101

Efficiency: 25.17% +/- 0.42% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
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	30.18	5,997.00	99.95
Pu-239	240	5,155.40	186	249	30.06	6,143.00	102.38
Am-241	284	5,485.70	249	303	34.64	5,997.00	99.95

Monthly Calibration Verifications

Calibration

Sample Name: CCV-8874;AV148-20160627
Description:
Detector: AV148

Analyst: 60040
Analysis Date: 6/27/2016 11:52:50AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82233-334
Prepared by: Analytics
Description:

Certification Date: 6/3/2010 12:00:00PM

Acquisition

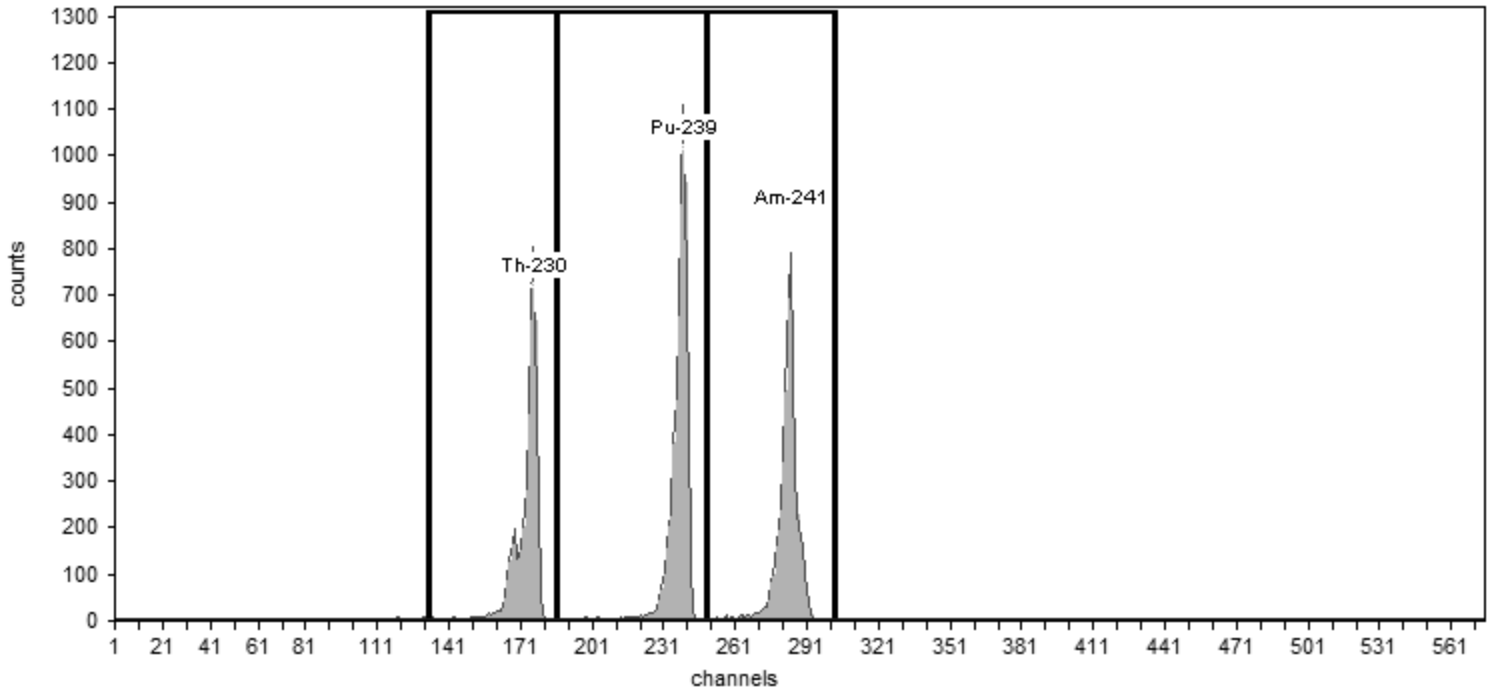
Detector: AV148 , SN: 50-05/R2
Acquisition Start Date: 6/27/2016 10:48:12AM

Live Time: 60.00 min.
Real Time: 60.02 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: CCV-8874;AV148-201606:

Efficiency: 26.79% +/- 0.50% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

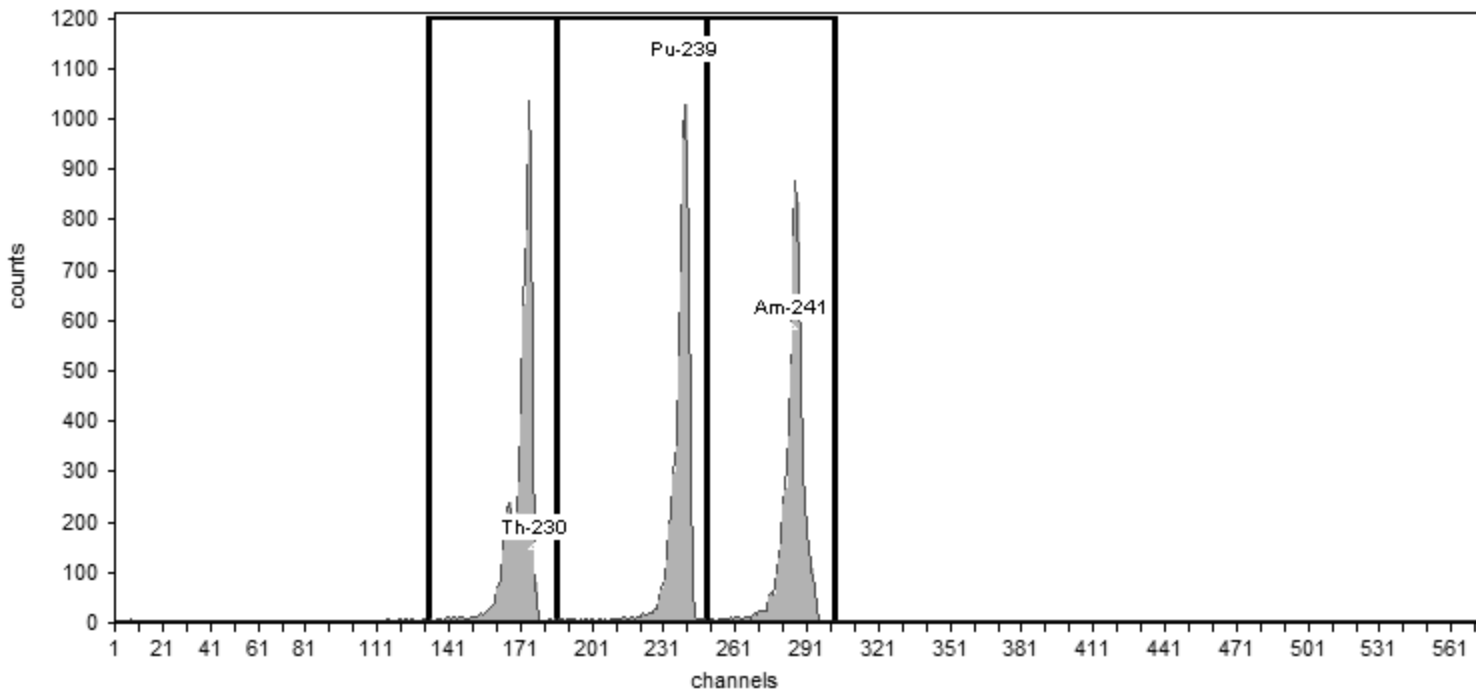
Nuclide Activity Summary

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	29.04	4,552.00	75.87
Pu-239	240	5,155.40	186	249	32.45	6,017.00	100.28
Am-241	284	5,485.70	249	303	32.21	4,950.00	82.50

Calibration	
Sample Name: CCV-8876;AV150-20160627	Analyst: 60040
Description:	Analysis Date: 6/27/2016 11:53:17AM
Detector: AV150	Calibration Type: Energy And Efficiency

Source Info	
Certificate ID: 82235-334	Certification Date: 6/4/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Acquisition	
Detector: AV150 , SN: 50-05/R4	Energy Calibration Equation:
Acquisition Start Date: 6/27/2016 10:49:05AM	Gain = 7.4575 keV / Ch
Live Time: 60.00 min.	Offset = 3,366.95 keV
Real Time: 60.00 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: CCV-8876;AV150-201606:	Efficiency: 23.94% +/- 0.39% TPU(2 sigma)



General Analysis	
Method: Manual (ROI)	Initial Calibration: No
Algorithm: Linear	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	32.32	6,372.00	106.20
Pu-239	240	5,155.40	186	249	34.61	5,965.00	99.42
Am-241	284	5,485.70	249	303	36.46	6,178.00	102.97

Calibration

Sample Name: CCV-8877;AV151-20160627
Description:
Detector: AV151

Analyst: 60040
Analysis Date: 6/27/2016 11:53:30AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82236-334
Prepared by: Analytics
Description:

Certification Date: 6/2/2010 12:00:00PM

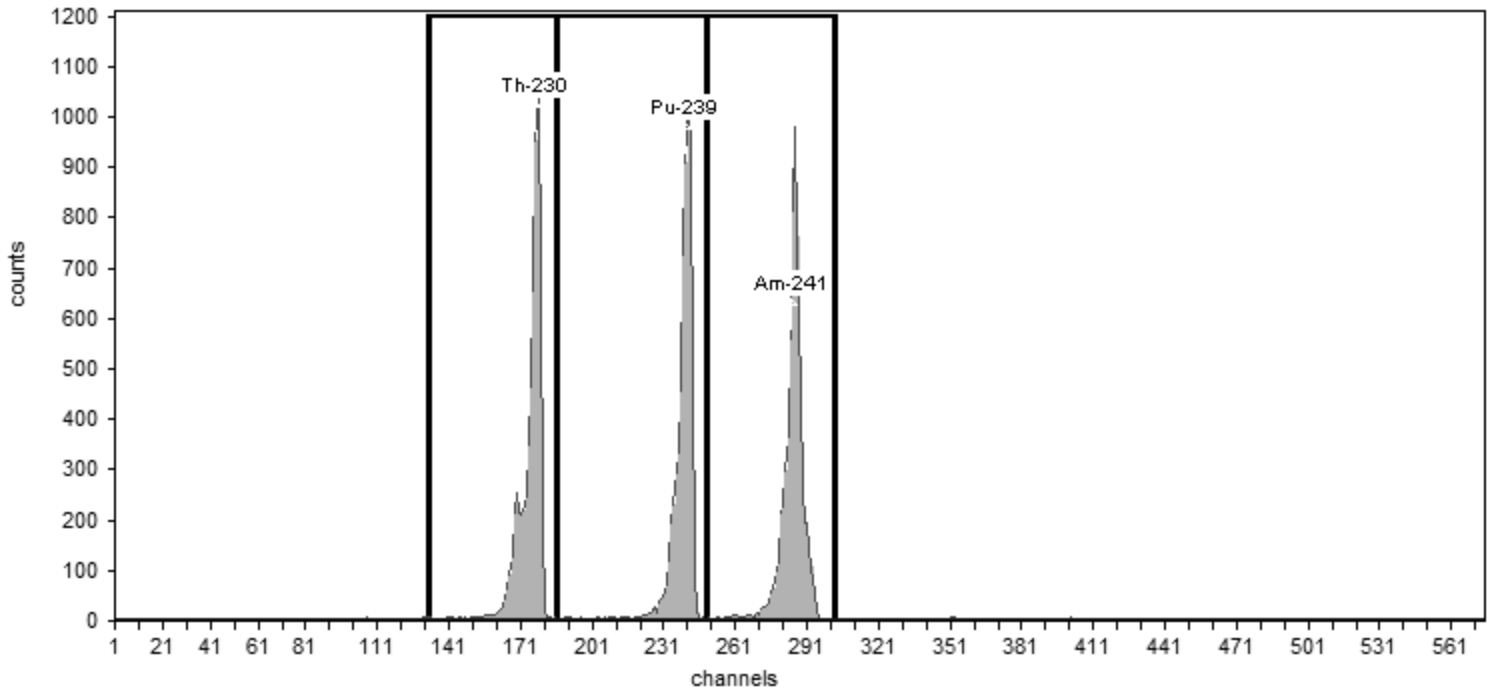
Acquisition

Detector: AV151 , SN: 50-05/R5
Acquisition Start Date: 6/27/2016 10:49:25AM
Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: CCV-8877;AV151-201606:

Efficiency: 24.86% +/- 0.41% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

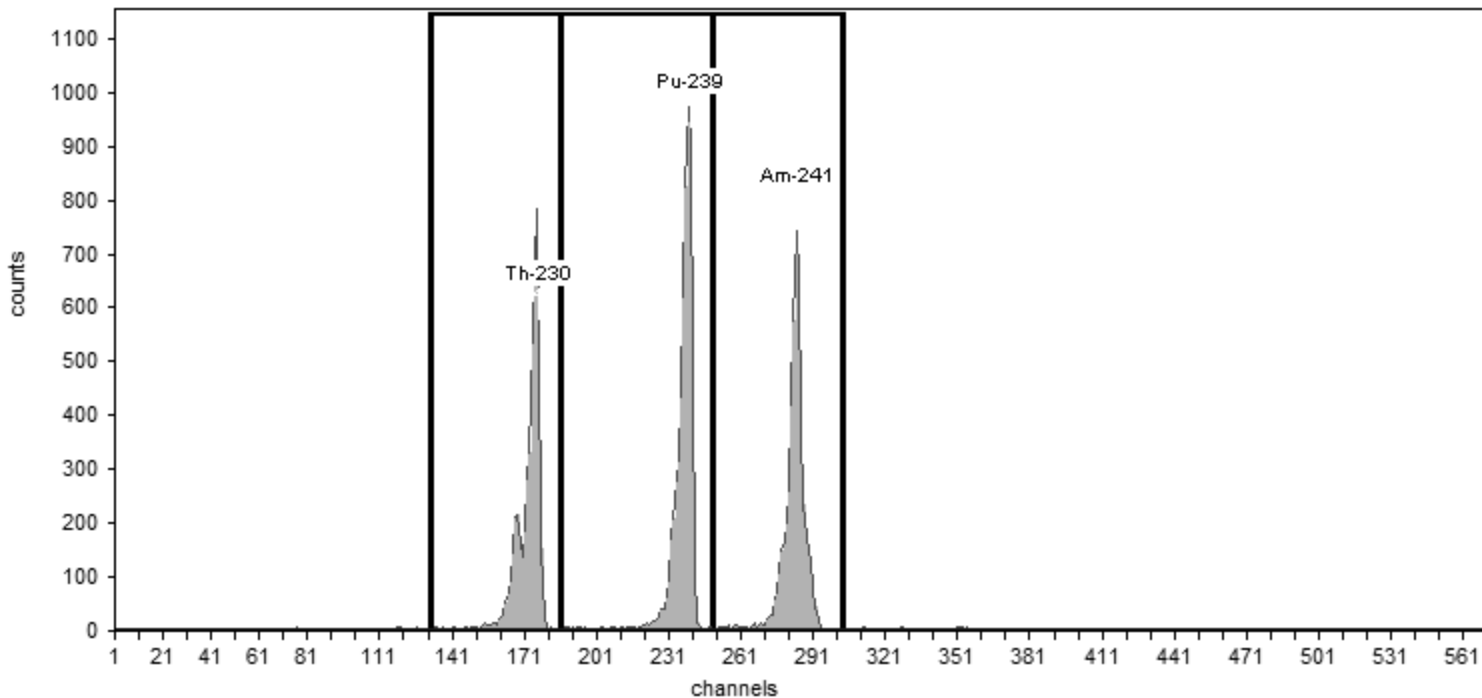
Nuclide Activity Summary

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	30.02	6,181.00	103.02
Pu-239	240	5,155.40	186	249	35.02	6,152.00	102.53
Am-241	284	5,485.70	249	303	31.25	6,123.00	102.05

<p>Sample Name: CCV-9520;AV152-20160627</p> <p>Description:</p> <p>Detector: AV152</p>	<p>Calibration</p> <p>Analyst: 60040</p> <p>Analysis Date: 6/27/2016 11:53:54AM</p> <p>Calibration Type: Energy And Efficiency</p>
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<p>Certificate ID: 82237-334</p> <p>Prepared by: Analytics</p> <p>Description:</p>	<p>Source Info</p> <p>Certification Date: 6/1/2010 12:00:00PM</p>
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<p>Detector: AV152 , SN: 50-05/R6</p> <p>Acquisition Start Date: 6/27/2016 10:49:44AM</p> <p>Live Time: 60.00 min.</p> <p>Real Time: 60.00 min.</p> <p>Efficiency Calibration Name: CCV-9520;AV152-201606:</p>	<p>Acquisition</p> <p>Energy Calibration Equation:</p> <p style="padding-left: 20px;">Gain = 7.4575 keV / Ch</p> <p style="padding-left: 20px;">Offset = 3,366.95 keV</p> <p style="padding-left: 20px;">Quadratic = 0.0000 keV / Ch²</p> <p>Efficiency: 23.72% +/- 0.44% TPU(2 sigma)</p>
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<p>Method: Manual (ROI)</p> <p>Algorithm: Linear</p>	<p>General Analysis</p> <p>Initial Calibration: No</p> <p>Shelf: 1</p>
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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	30.54	4,771.00	79.52
Pu-239	240	5,155.40	186	249	34.92	5,725.00	95.42
Am-241	284	5,485.70	249	303	32.75	4,753.00	79.22

Calibration

Sample Name: CCV-9792;AV153-20160627
Description:
Detector: AV153

Analyst: 60040
Analysis Date: 6/27/2016 11:54:07AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82240-334
Prepared by: Analytics
Description:

Certification Date: 6/8/2010 12:00:00PM

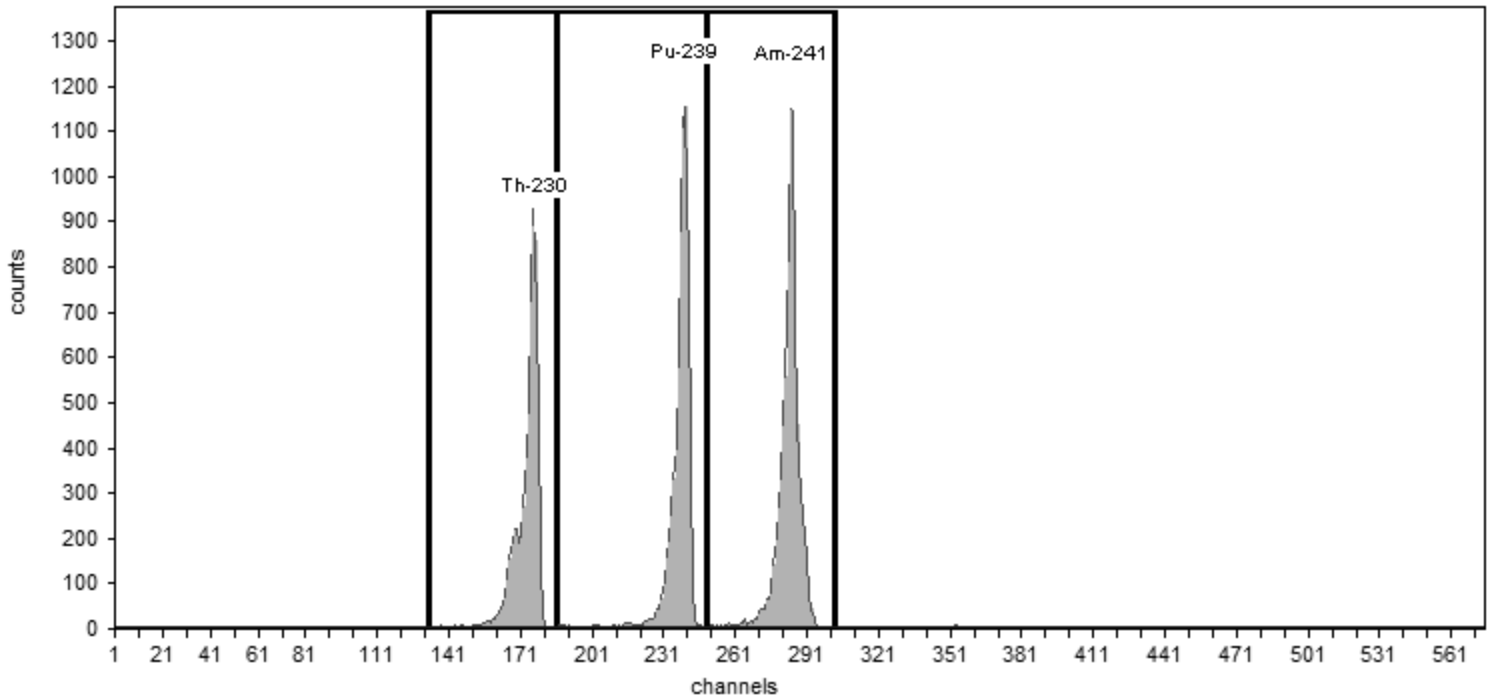
Acquisition

Detector: AV153 , SN: 54-011 Y6
Acquisition Start Date: 6/27/2016 10:50:05AM
Live Time: 60.00 min.
Real Time: 60.01 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: CCV-9792;AV153-20160627

Efficiency: 26.05% +/- 0.41% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

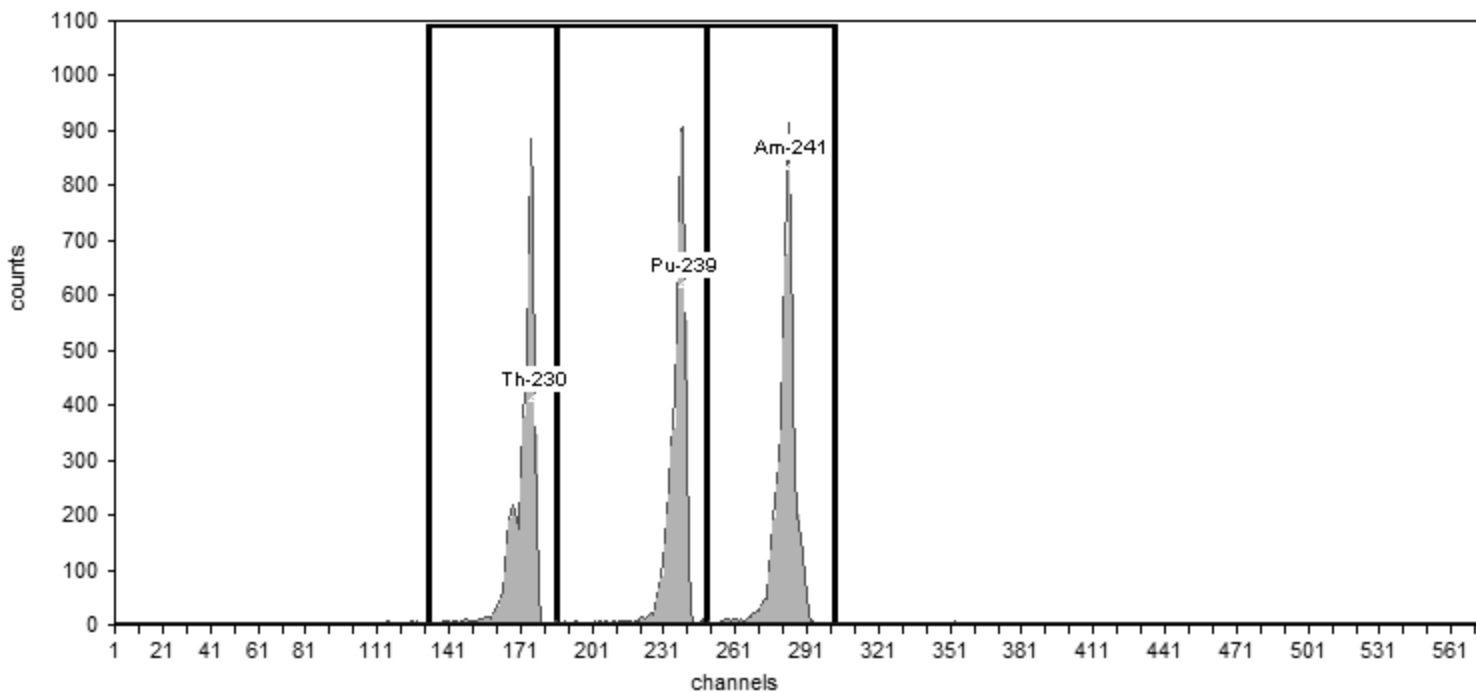
Nuclide Activity Summary

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	31.30	5,884.00	98.07
Pu-239	240	5,155.40	186	249	33.65	6,740.00	112.33
Am-241	284	5,485.70	249	303	33.08	7,716.00	128.60

Calibration	
Sample Name: CCV-9794;AV155-20160627	Analyst: 60040
Description:	Analysis Date: 6/27/2016 11:54:30AM
Detector: AV155	Calibration Type: Energy And Efficiency

Source Info	
Certificate ID: 82242-334	Certification Date: 6/8/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Acquisition	
Detector: AV155 , SN: 50-05/II1	Energy Calibration Equation:
Acquisition Start Date: 6/27/2016 10:50:52AM	Gain = 7.4575 keV / Ch
Live Time: 60.00 min.	Offset = 3,366.95 keV
Real Time: 60.00 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: CCV-9794;AV155-20160627	Efficiency: 23.05% +/- 0.40% TPU(2 sigma)



General Analysis	
Method: Manual (ROI)	Initial Calibration: No
Algorithm: Linear	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	30.46	5,389.00	89.82
Pu-239	240	5,155.40	186	249	34.35	5,412.00	90.20
Am-241	284	5,485.70	249	303	32.27	5,863.00	97.72

Calibration

Sample Name: CCV-9817;AV199-20160627
Description:
Detector: AV199

Analyst: 60040
Analysis Date: 6/27/2016 2:55:17PM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82244-334
Prepared by: Analytics
Description:

Certification Date: 6/9/2010 12:00:00PM

Acquisition

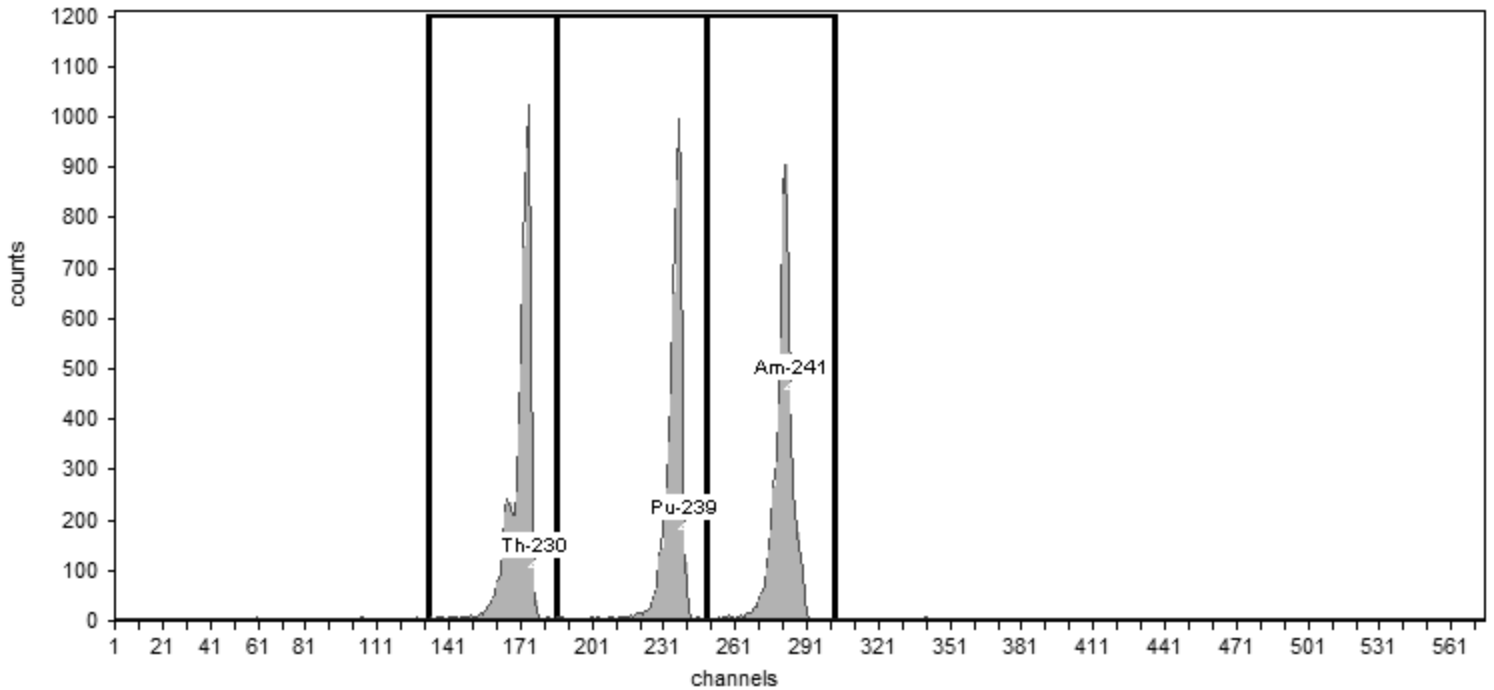
Detector: AV199 , SN: 50-117Z3
Acquisition Start Date: 6/27/2016 1:50:21PM

Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Efficiency Calibration Name: CCV-9817;AV199-201606:

Efficiency: 24.20% +/- 0.40% 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	6,410.00	106.83
Pu-239	240	5,155.40	186	249	33.57	5,773.00	96.22
Am-241	284	5,485.70	249	303	34.41	6,034.00	100.57

Sample Name: CCV-8877;AV235-20160627
Description:
Detector: AV235

Calibration

Analyst: 60040
Analysis Date: 6/28/2016 7:40:39AM
Calibration Type: Energy And Efficiency

Certificate ID: 82236-334
Prepared by: Analytics
Description:

Source Info

Certification Date: 6/2/2010 12:00:00PM

Detector: AV235 , SN: 51-005Q5
Acquisition Start Date: 6/27/2016 6:53:04PM

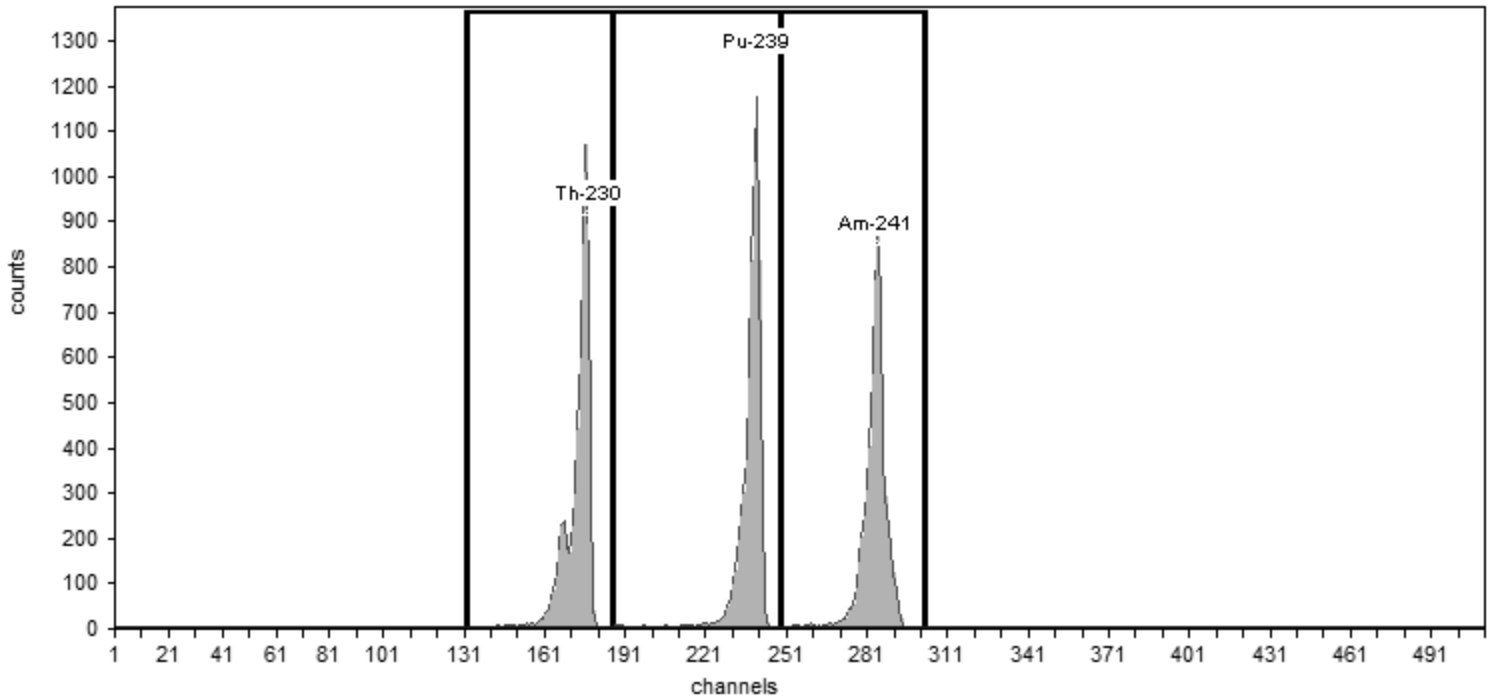
Acquisition

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²

Live Time: 60.00 min.
Real Time: 60.00 min.

Efficiency Calibration Name: CCV-8877;AV235-201606:

Efficiency: 24.87% +/- 0.41% TPU(2 sigma)



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

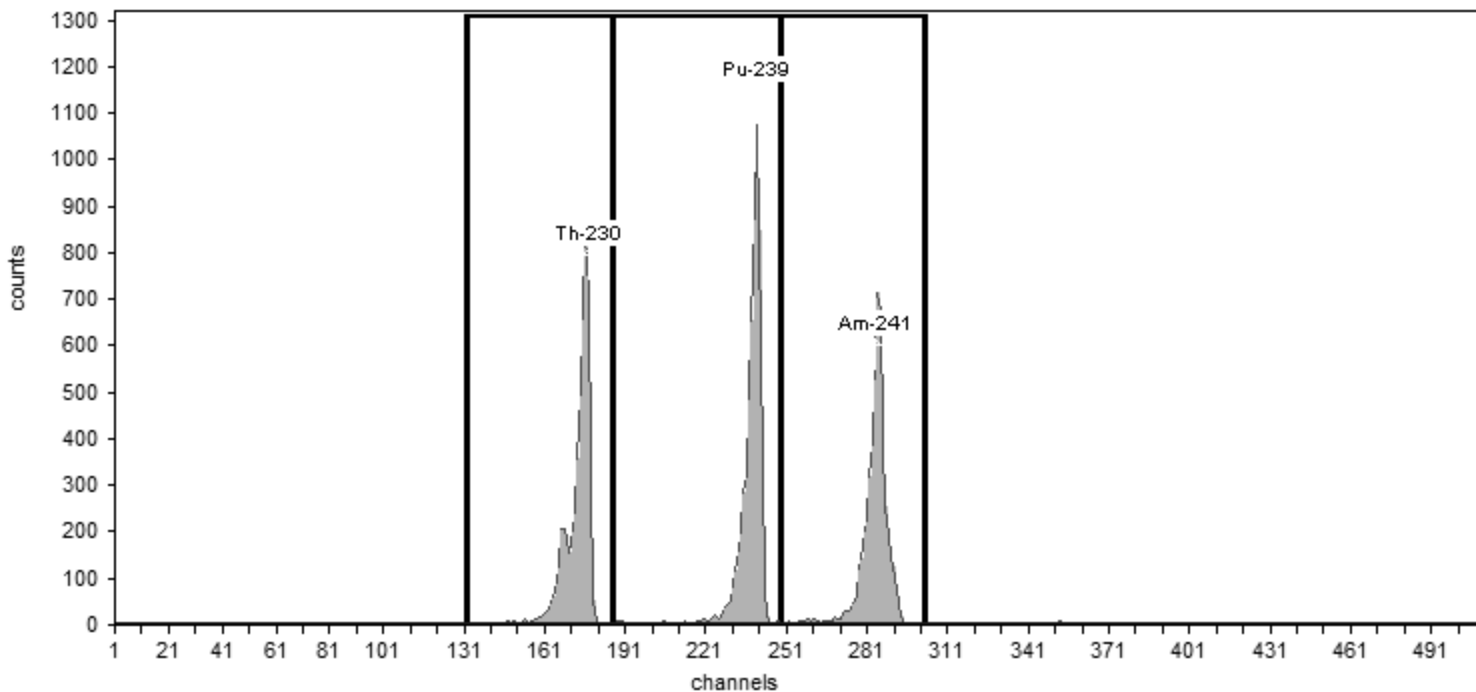
Nuclide Activity Summary

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	29.94	6,157.00	102.62
Pu-239	240	5,155.40	186	249	32.06	6,396.00	106.60
Am-241	284	5,485.70	249	303	33.98	5,953.00	99.22

Calibration	
Sample Name: CCV-9520;AV236-20160628a	Analyst: 60040
Description:	Analysis Date: 6/28/2016 10:30:00AM
Detector: AV236	Calibration Type: Energy And Efficiency

Source Info	
Certificate ID: 82237-334	Certification Date: 6/1/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Acquisition	
Detector: AV236 , SN: 51-005P3	Energy Calibration Equation:
Acquisition Start Date: 6/28/2016 9:29:55AM	Gain = 7.4575 keV / Ch
Live Time: 60.00 min.	Offset = 3,366.95 keV
Real Time: 60.00 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: CCV-9520;AV236-201606:	Efficiency: 24.40% +/- 0.45% TPU(2 sigma)



General Analysis	
Method: Manual (ROI)	Initial Calibration: No
Algorithm: Linear	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	31.76	5,069.00	84.48
Pu-239	240	5,155.40	186	249	31.90	5,772.00	96.20
Am-241	284	5,485.70	249	303	35.09	4,829.00	80.48

Calibration

Sample Name: CCV-9792;AV237-20160627
Description:
Detector: AV237

Analyst: 60040
Analysis Date: 6/28/2016 7:40:49AM
Calibration Type: Energy And Efficiency

Source Info

Certificate ID: 82240-334
Prepared by: Analytics
Description:

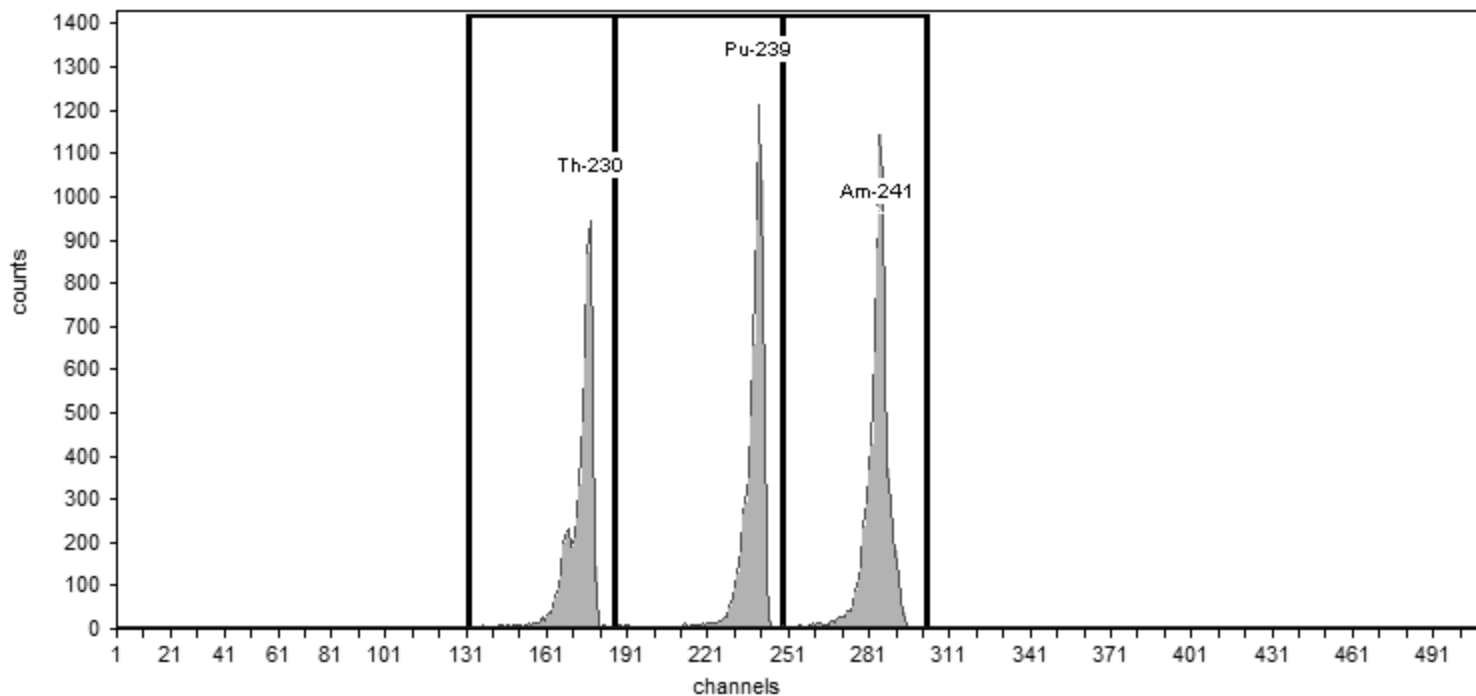
Certification Date: 6/8/2010 12:00:00PM

Acquisition

Detector: AV237 , SN: 50-120DD7
Acquisition Start Date: 6/27/2016 6:53:27PM
Live Time: 60.00 min.
Real Time: 60.00 min.

Energy Calibration Equation:
Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²
Efficiency: 25.62% +/- 0.41% TPU(2 sigma)

Efficiency Calibration Name: CCV-9792;AV237-20160627



General Analysis

Method: Manual (ROI)
Algorithm: Linear

Initial Calibration: No
Shelf: 1

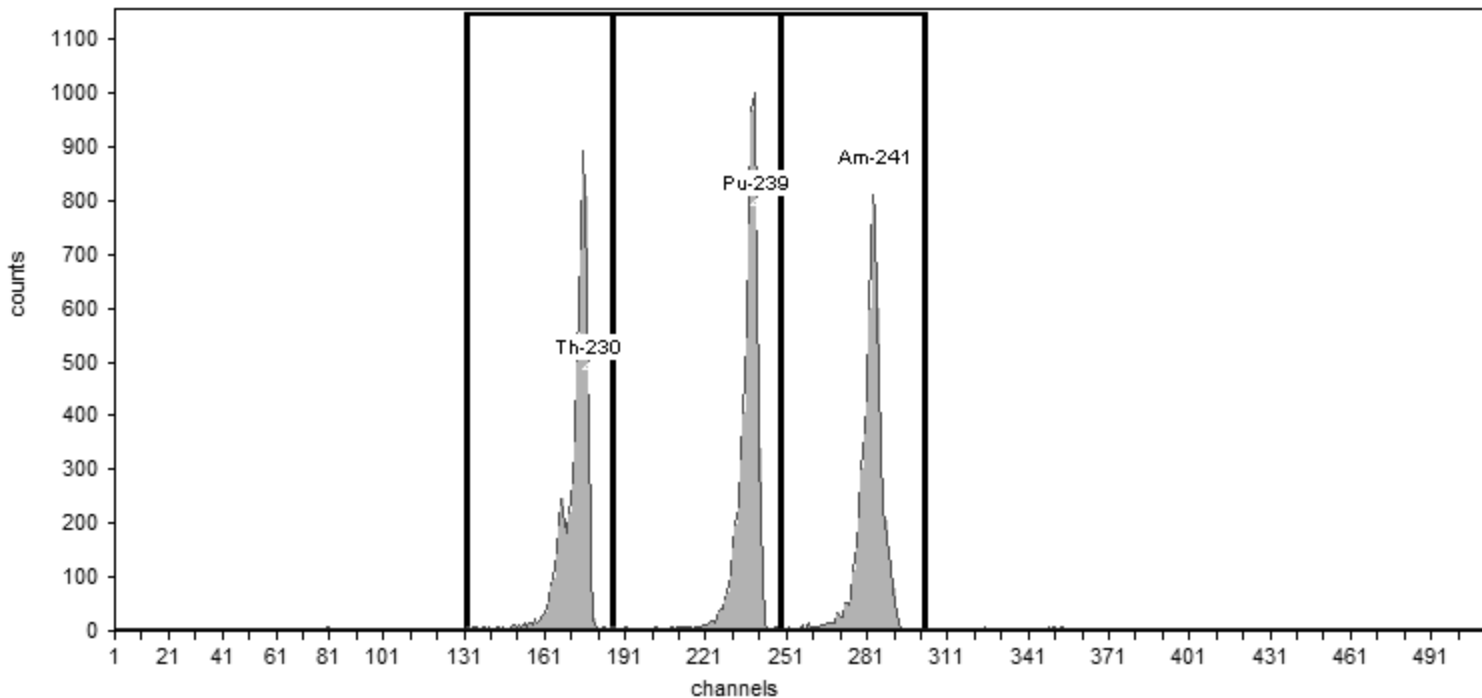
Nuclide Activity Summary

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	31.73	5,783.00	96.38
Pu-239	240	5,155.40	186	249	31.02	6,637.00	110.62
Am-241	284	5,485.70	249	303	33.88	7,586.00	126.43

<p>Sample Name: CCV-9793;AV238-20160627</p> <p>Description:</p> <p>Detector: AV238</p>	<p>Calibration</p> <p>Analyst: 60040</p> <p>Analysis Date: 6/28/2016 7:40:54AM</p> <p>Calibration Type: Energy And Efficiency</p>
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<p>Certificate ID: 82241-334</p> <p>Prepared by: Analytics</p> <p>Description:</p>	<p>Source Info</p> <p>Certification Date: 6/8/2010 12:00:00PM</p>
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<p>Detector: AV238 , SN: 51-005P7</p> <p>Acquisition Start Date: 6/27/2016 6:53:44PM</p> <p>Live Time: 60.00 min.</p> <p>Real Time: 60.00 min.</p> <p>Efficiency Calibration Name: CCV-9793;AV238-201606:</p>	<p>Acquisition</p> <p>Energy Calibration Equation:</p> <p style="padding-left: 20px;">Gain = 7.4575 keV / Ch</p> <p style="padding-left: 20px;">Offset = 3,366.95 keV</p> <p style="padding-left: 20px;">Quadratic = 0.0000 keV / Ch²</p> <p>Efficiency: 24.56% +/- 0.42% TPU(2 sigma)</p>
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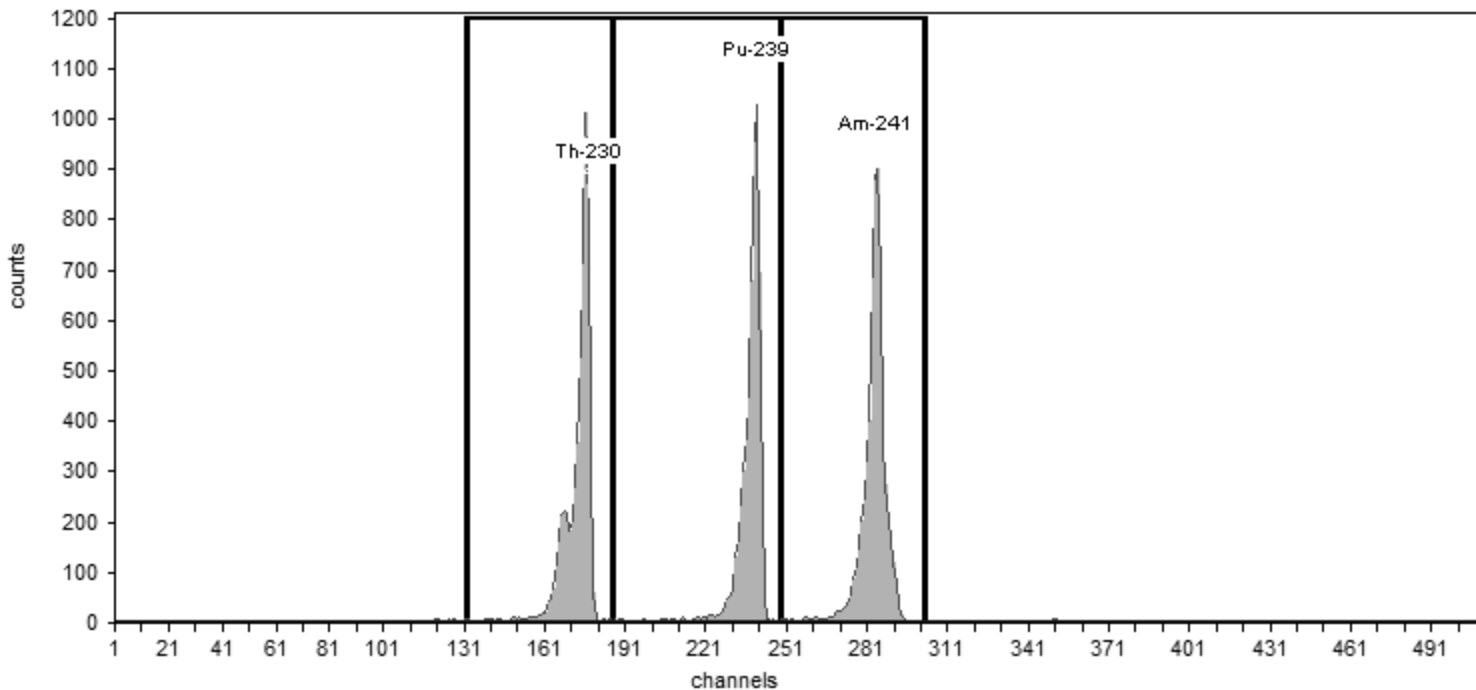
<p>Method: Manual (ROI)</p> <p>Algorithm: Linear</p>	<p>General Analysis</p> <p>Initial Calibration: No</p> <p>Shelf: 1</p>
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Nuclide Activity Summary							
Nuclide	Peak Channel	Peak Energy keV	ROI Start Channel	ROI End Channel	Peak FWHM keV	Gross Counts	Net Count Rate (cpm)
Th-230	177	4,687.50	132	186	32.03	5,702.00	95.03
Pu-239	240	5,155.40	186	249	36.54	6,170.00	102.83
Am-241	284	5,485.70	249	303	37.88	5,823.00	97.05

<p>Sample Name: CCV-9794;AV239-20160628a</p> <p>Description:</p> <p>Detector: AV239</p>	<p>Calibration</p> <p>Analyst: 60040</p> <p>Analysis Date: 6/28/2016 9:16:47AM</p> <p>Calibration Type: Energy And Efficiency</p>
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<p>Certificate ID: 82242-334</p> <p>Prepared by: Analytics</p> <p>Description:</p>	<p>Source Info</p> <p>Certification Date: 6/8/2010 12:00:00PM</p>
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<p>Detector: AV239 , SN: 51-005EE1</p> <p>Acquisition Start Date: 6/28/2016 8:13:35AM</p> <p>Live Time: 60.00 min.</p> <p>Real Time: 60.00 min.</p> <p>Efficiency Calibration Name: CCV-9794;AV239-201606;</p>	<p>Acquisition</p> <p>Energy Calibration Equation:</p> <p style="padding-left: 20px;">Gain = 7.4575 keV / Ch</p> <p style="padding-left: 20px;">Offset = 3,366.95 keV</p> <p style="padding-left: 20px;">Quadratic = 0.0000 keV / Ch²</p> <p>Efficiency: 24.17% +/- 0.41% TPU(2 sigma)</p>
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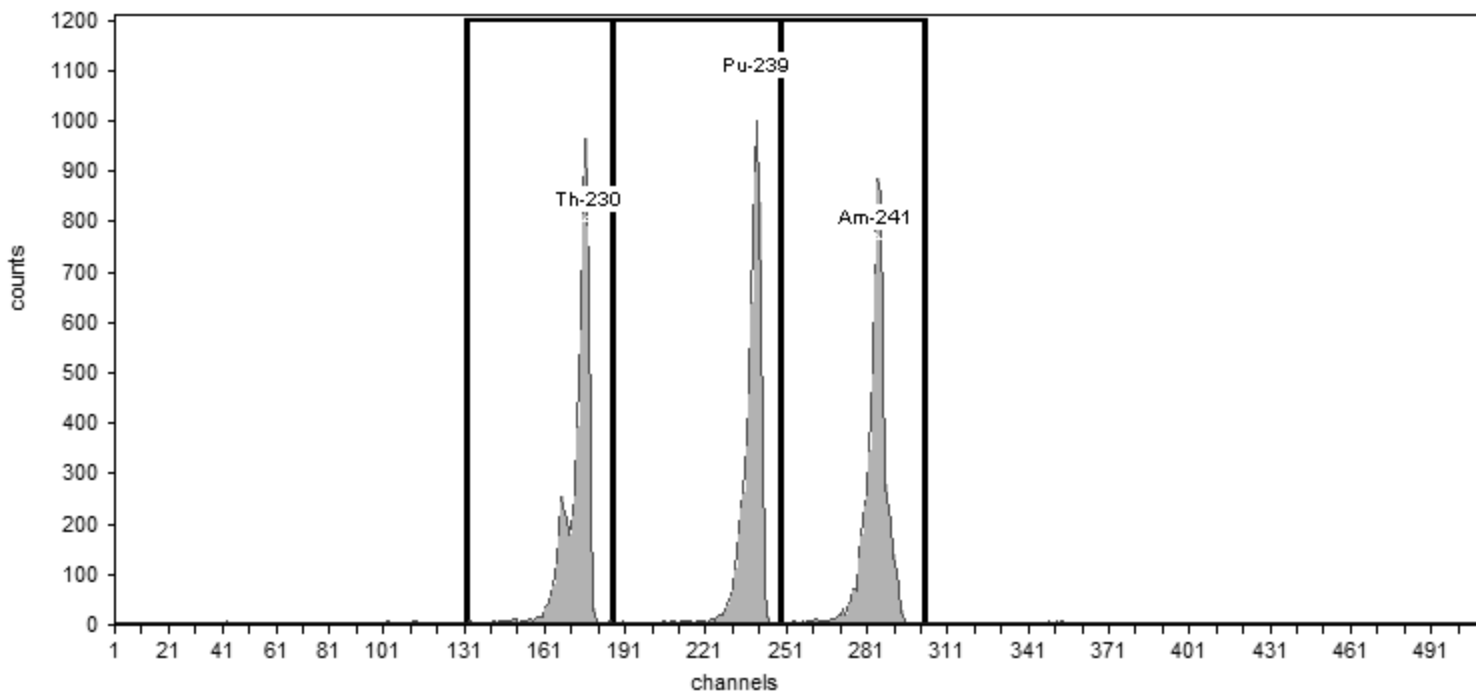
<p>Method: Manual (ROI)</p> <p>Algorithm: Linear</p>	<p>General Analysis</p> <p>Initial Calibration: No</p> <p>Shelf: 1</p>
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Nuclide Activity Summary							
Nuclide	Peak Channel	Peak Energy keV	ROI Start Channel	ROI End Channel	Peak FWHM keV	Gross Counts	Net Count Rate (cpm)
Th-230	177	4,687.50	132	186	28.30	5,694.00	94.90
Pu-239	240	5,155.40	186	249	30.59	5,613.00	93.55
Am-241	284	5,485.70	249	303	34.03	6,166.00	102.77

Calibration	
Sample Name: CCV-9795;AV240-20160628a	Analyst: 60040
Description:	Analysis Date: 6/28/2016 9:16:53AM
Detector: AV240	Calibration Type: Energy And Efficiency

Source Info	
Certificate ID: 82243-334	Certification Date: 6/9/2010 12:00:00PM
Prepared by: Analytics	
Description:	

Acquisition	
Detector: AV240 , SN: 51-005Q1	Energy Calibration Equation:
Acquisition Start Date: 6/28/2016 8:13:56AM	Gain = 7.4575 keV / Ch
Live Time: 60.00 min.	Offset = 3,366.95 keV
Real Time: 60.00 min.	Quadratic = 0.0000 keV / Ch ²
Efficiency Calibration Name: CCV-9795;AV240-201606:	Efficiency: 26.70% +/- 0.46% TPU(2 sigma)



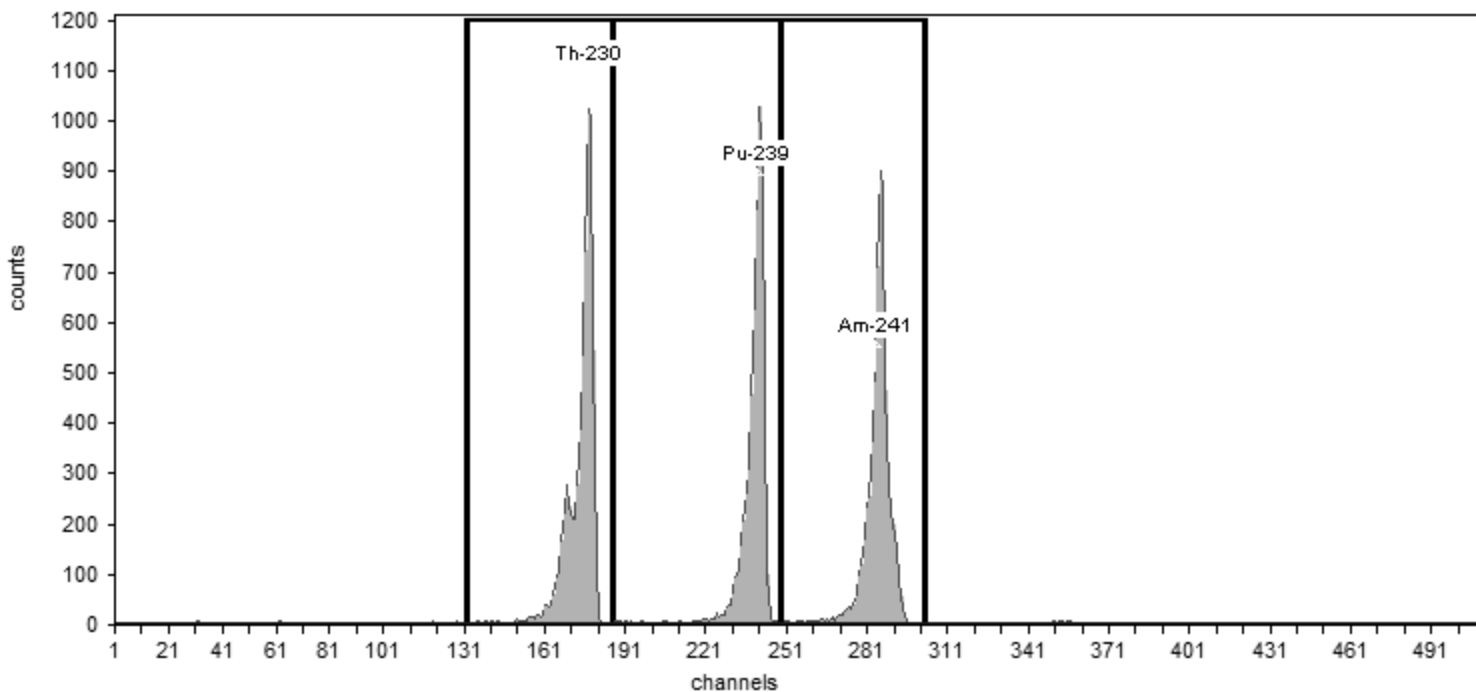
General Analysis	
Method: Manual (ROI)	Initial Calibration: No
Algorithm: Linear	Shelf: 1

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	30.29	5,715.00	95.25
Pu-239	240	5,155.40	186	249	33.62	5,731.00	95.52
Am-241	284	5,485.70	249	303	35.41	6,024.00	100.40

<p>Sample Name: CCV-9817;AV241-20160628a</p> <p>Description:</p> <p>Detector: AV241</p>	<p>Calibration</p> <p>Analyst: 60040</p> <p>Analysis Date: 6/28/2016 9:22:00AM</p> <p>Calibration Type: Energy And Efficiency</p>
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<p>Certificate ID: 82244-334</p> <p>Prepared by: Analytics</p> <p>Description:</p>	<p>Source Info</p> <p>Certification Date: 6/9/2010 12:00:00PM</p>
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<p>Detector: AV241 , SN: 50-005P1</p> <p>Acquisition Start Date: 6/28/2016 8:21:27AM</p> <p>Live Time: 60.00 min.</p> <p>Real Time: 60.00 min.</p> <p>Efficiency Calibration Name: CCV-9817;AV241-201606;</p>	<p>Acquisition</p> <p>Energy Calibration Equation:</p> <p style="padding-left: 20px;">Gain = 7.4575 keV / Ch</p> <p style="padding-left: 20px;">Offset = 3,366.95 keV</p> <p style="padding-left: 20px;">Quadratic = 0.0000 keV / Ch²</p> <p>Efficiency: 24.17% +/- 0.40% TPU(2 sigma)</p>
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<p>Method: Manual (ROI)</p> <p>Algorithm: Linear</p>	<p>General Analysis</p> <p>Initial Calibration: No</p> <p>Shelf: 1</p>
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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	31.44	6,421.00	107.02
Pu-239	240	5,155.40	186	249	33.75	5,817.00	96.95
Am-241	284	5,485.70	249	303	32.40	5,951.00	99.18

Monthly Backgrounds

Sample Name: **ICB;AV148**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV148**, SN: **50-05/R2**

Acquisition Start Date: **6/24/2016 4:15:34PM**

Live Time: **960.00 min.**

Real Time: **960.49 min.**

Calibration Name: **IC-8874;AV148-20151016a**

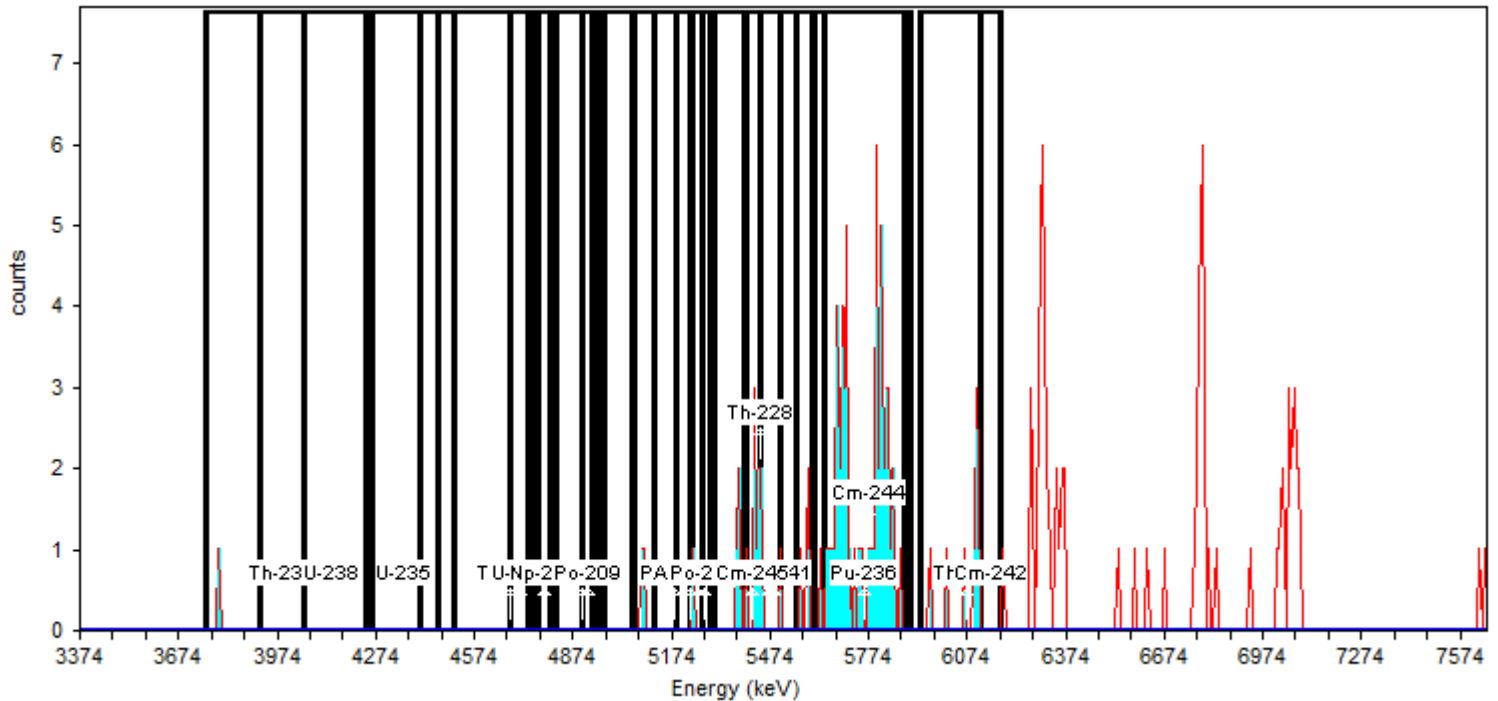
Calibration Date: **10/16/2015 6:47:19PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **162.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	1.00	1.042E-003	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	0.00	0.000E+000	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	0.00	0.000E+000	1.473E-003
U-234	4,709.31	4,507.96	4,821.17	0.00	0.000E+000	1.473E-003
Pu-242	4,903.21	4,679.48	4,947.95	0.00	0.000E+000	1.473E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-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	3.00	3.125E-003	2.083E-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	7.00	7.292E-003	2.946E-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	1.00	1.042E-003	1.473E-003
Pu-238	5,469.98	5,268.63	5,552.01	13.00	1.354E-002	3.898E-003
Am-241	5,484.90	5,298.46	5,604.22	16.00	1.667E-002	4.295E-003
Cm-245	5,417.78	5,395.41	5,447.61	9.00	9.375E-003	3.294E-003
Pu-236	5,760.83	5,611.67	5,887.60	55.00	5.729E-002	7.795E-003
Cm-244	5,775.74	5,641.51	5,902.52	54.00	5.625E-002	7.725E-003
Th-227	6,074.04	5,932.35	6,178.45	9.00	9.375E-003	3.294E-003
Cm-242	6,148.62	6,118.79	6,178.45	0.00	0.000E+000	1.473E-003

Sample Name: **ICB;AV150**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV150**, SN: **50-05/R4**

Acquisition Start Date: **6/24/2016 4:15:33PM**

Live Time: **960.00 min.**

Real Time: **960.01 min.**

Calibration Name: **IC-8876;AV150-20151016**

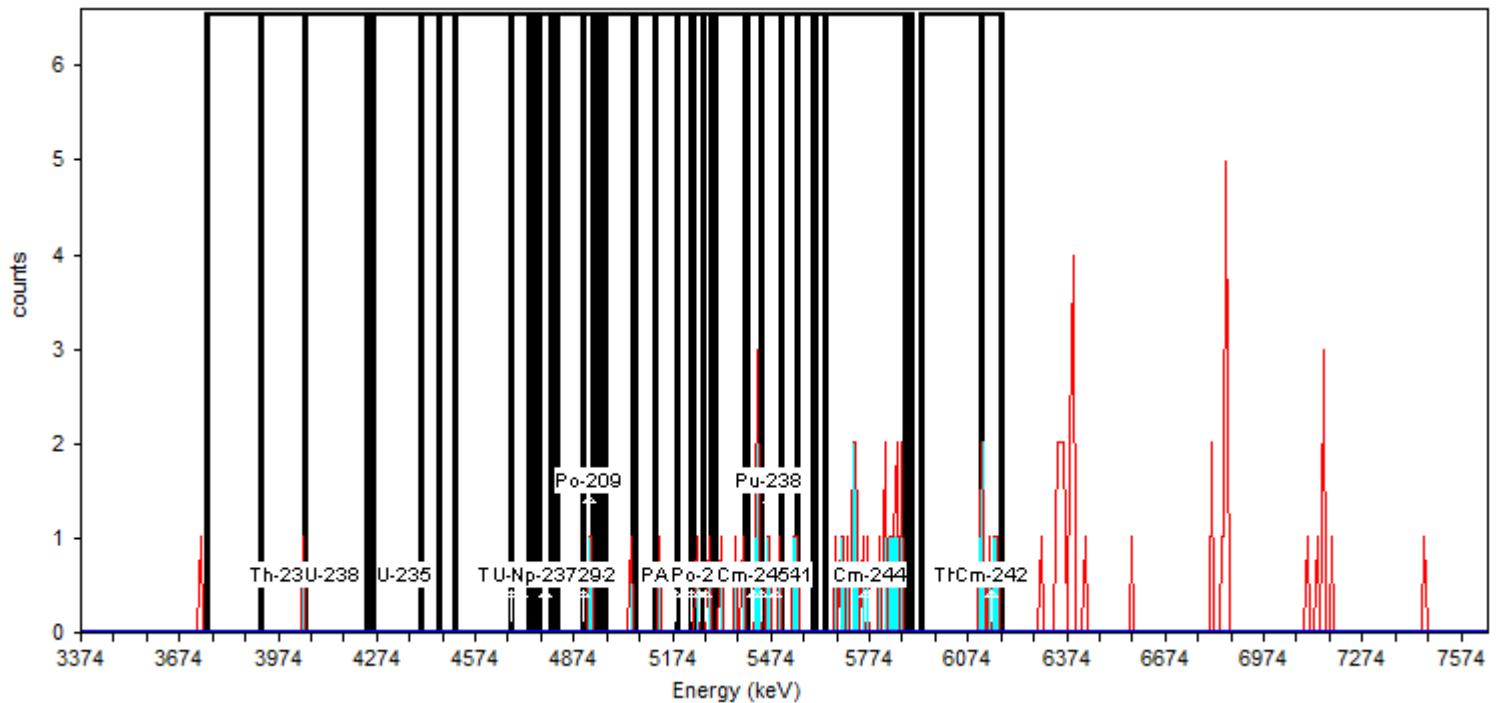
Calibration Date: **10/16/2015 6:46:46PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **82.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	1.00	1.042E-003	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	1.00	1.042E-003	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	0.00	0.000E+000	1.473E-003
U-234	4,709.31	4,507.96	4,821.17	0.00	0.000E+000	1.473E-003
Pu-242	4,903.21	4,679.48	4,947.95	2.00	2.083E-003	1.804E-003
Th-229	4,858.46	4,739.14	5,119.48	3.00	3.125E-003	2.083E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-003
Po-209	4,918.12	4,903.21	4,933.04	2.00	2.083E-003	1.804E-003
Pu-239	5,179.14	4,970.33	5,238.80	2.00	2.083E-003	1.804E-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	6.00	6.250E-003	2.756E-003
Th-228	5,447.61	5,186.59	5,507.27	13.00	1.354E-002	3.898E-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	13.00	1.354E-002	3.898E-003
Cm-245	5,417.78	5,395.41	5,447.61	5.00	5.208E-003	2.552E-003
Pu-236	5,760.83	5,611.67	5,887.60	21.00	2.188E-002	4.886E-003
Cm-244	5,775.74	5,641.51	5,902.52	21.00	2.188E-002	4.886E-003
Th-227	6,074.04	5,932.35	6,178.45	6.00	6.250E-003	2.756E-003
Cm-242	6,148.62	6,118.79	6,178.45	5.00	5.208E-003	2.552E-003

Sample Name: **ICB;AV151**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV151**, SN: **50-05/R5**

Acquisition Start Date: **6/24/2016 4:15:34PM**

Live Time: **960.00 min.**

Real Time: **960.00 min.**

Calibration Name: **IC-8877;AV151-20151016**

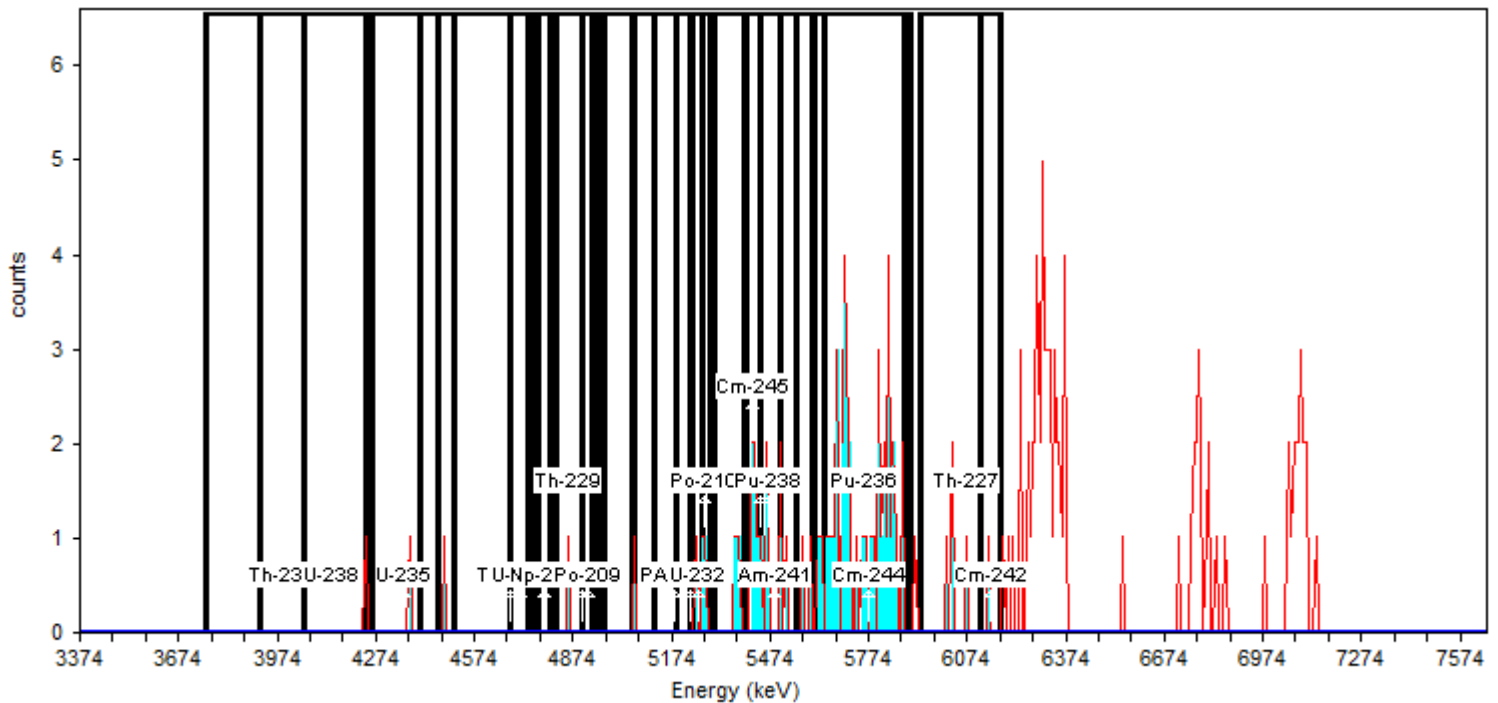
Calibration Date: **10/16/2015 6:46:50PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **159.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	1.00	1.042E-003	1.473E-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	1.00	1.042E-003	1.473E-003
U-234	4,709.31	4,507.96	4,821.17	0.00	0.000E+000	1.473E-003
Pu-242	4,903.21	4,679.48	4,947.95	1.00	1.042E-003	1.473E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-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	4.00	4.167E-003	2.329E-003
U-232	5,253.71	5,059.82	5,402.86	7.00	7.292E-003	2.946E-003
Th-228	5,447.61	5,186.59	5,507.27	18.00	1.875E-002	4.541E-003
Po-210	5,276.09	5,231.34	5,291.00	3.00	3.125E-003	2.083E-003
Pu-238	5,469.98	5,268.63	5,552.01	18.00	1.875E-002	4.541E-003
Am-241	5,484.90	5,298.46	5,604.22	18.00	1.875E-002	4.541E-003
Cm-245	5,417.78	5,395.41	5,447.61	7.00	7.292E-003	2.946E-003
Pu-236	5,760.83	5,611.67	5,887.60	44.00	4.583E-002	6.988E-003
Cm-244	5,775.74	5,641.51	5,902.52	41.00	4.271E-002	6.751E-003
Th-227	6,074.04	5,932.35	6,178.45	5.00	5.208E-003	2.552E-003
Cm-242	6,148.62	6,118.79	6,178.45	1.00	1.042E-003	1.473E-003

Sample Name: **ICB;AV152**

Comment:

Sample

Spectrum #4 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016a**

Description:

Acquisition

Detector: **AV152**, SN: **50-05/R6**

Acquisition Start Date: **6/26/2016 5:10:10PM**

Live Time: **960.00 min.**

Real Time: **960.03 min.**

Calibration Name: **IC-9520;AV152-20151016**

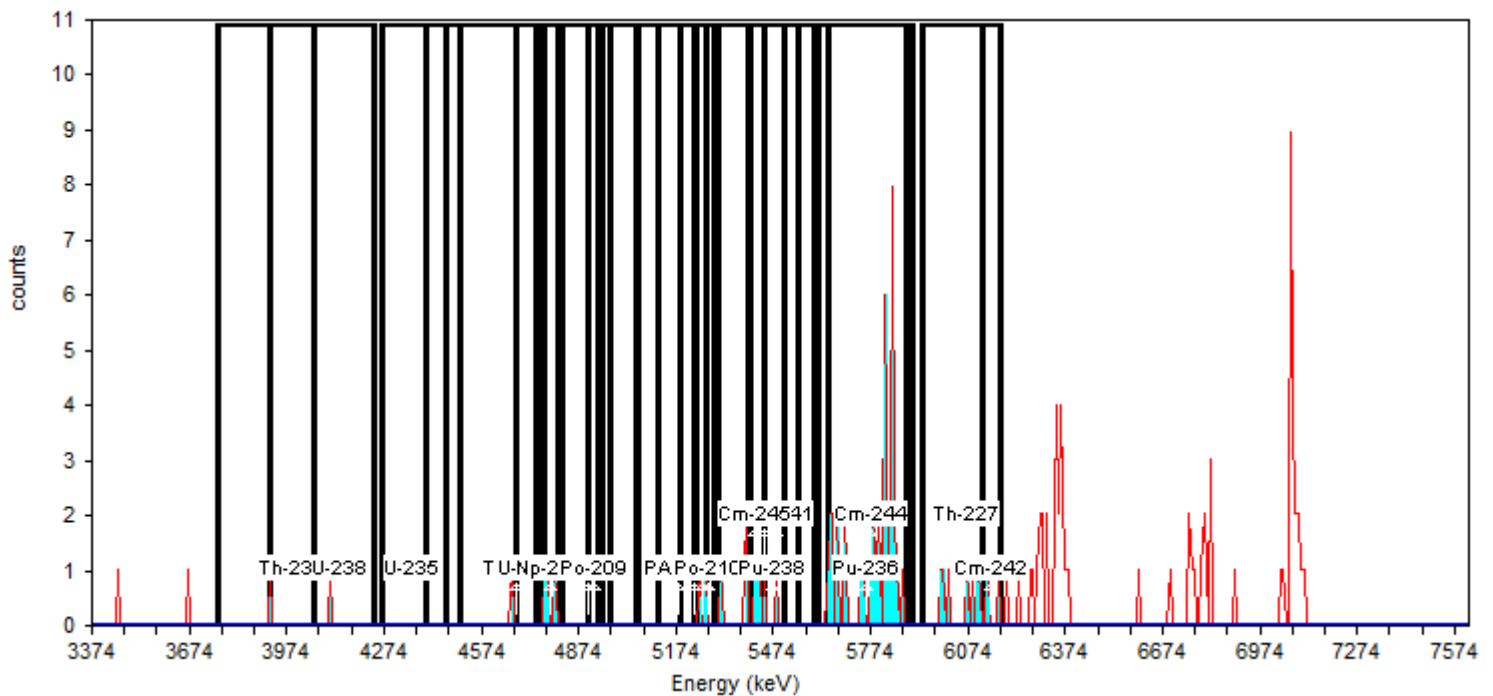
Calibration Date: **10/16/2015 6:46:53PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **131.00**

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	1.00	1.042E-003	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	2.00	2.083E-003	1.804E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	1.00	1.042E-003	1.473E-003
U-234	4,709.31	4,507.96	4,821.17	4.00	4.167E-003	2.329E-003
Pu-242	4,903.21	4,679.48	4,947.95	3.00	3.125E-003	2.083E-003
Th-229	4,858.46	4,739.14	5,119.48	3.00	3.125E-003	2.083E-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	0.00	0.000E+000	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	6.00	6.250E-003	2.756E-003
Th-228	5,447.61	5,186.59	5,507.27	11.00	1.146E-002	3.608E-003
Po-210	5,276.09	5,231.34	5,291.00	3.00	3.125E-003	2.083E-003
Pu-238	5,469.98	5,268.63	5,552.01	9.00	9.375E-003	3.294E-003
Am-241	5,484.90	5,298.46	5,604.22	8.00	8.333E-003	3.125E-003
Cm-245	5,417.78	5,395.41	5,447.61	4.00	4.167E-003	2.329E-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	40.00	4.167E-002	6.670E-003
Th-227	6,074.04	5,932.35	6,178.45	10.00	1.042E-002	3.455E-003
Cm-242	6,148.62	6,118.79	6,178.45	3.00	3.125E-003	2.083E-003

Sample Name: **ICB;AV153**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV153**, SN: **54-011 Y6**

Acquisition Start Date: **6/24/2016 4:15:17PM**

Live Time: **960.00 min.**

Real Time: **960.01 min.**

Calibration Name: **IC-9792;AV153-20151016**

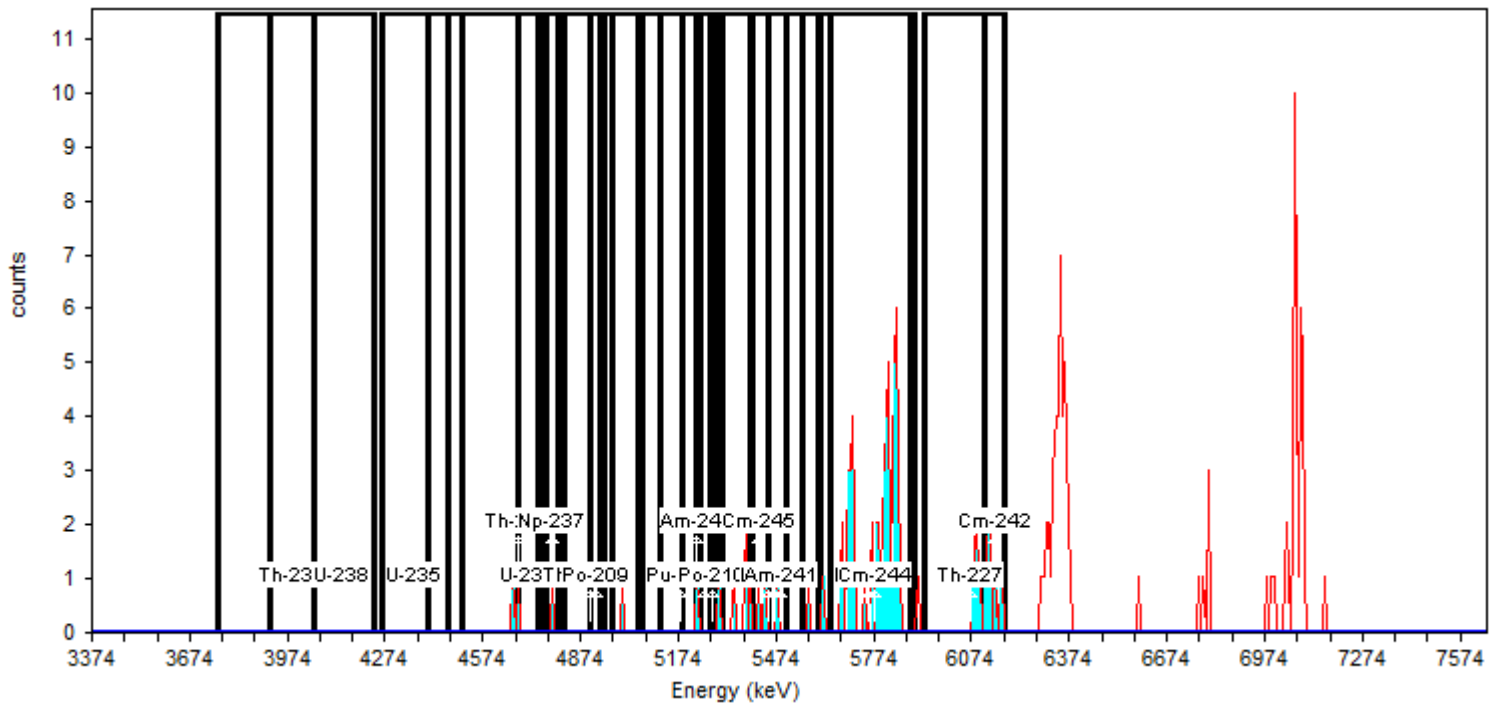
Calibration Date: **10/16/2015 6:46:57PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



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 (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	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	0.00	0.000E+000	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	2.00	2.083E-003	1.804E-003
U-234	4,709.31	4,507.96	4,821.17	3.00	3.125E-003	2.083E-003
Pu-242	4,903.21	4,679.48	4,947.95	2.00	2.083E-003	1.804E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	1.00	1.042E-003	1.473E-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	2.00	2.083E-003	1.804E-003
Am-243	5,231.34	5,052.36	5,305.92	2.00	2.083E-003	1.804E-003
U-232	5,253.71	5,059.82	5,402.86	6.00	6.250E-003	2.756E-003
Th-228	5,447.61	5,186.59	5,507.27	9.00	9.375E-003	3.294E-003
Po-210	5,276.09	5,231.34	5,291.00	1.00	1.042E-003	1.473E-003
Pu-238	5,469.98	5,268.63	5,552.01	8.00	8.333E-003	3.125E-003
Am-241	5,484.90	5,298.46	5,604.22	9.00	9.375E-003	3.294E-003
Cm-245	5,417.78	5,395.41	5,447.61	3.00	3.125E-003	2.083E-003
Pu-236	5,760.83	5,611.67	5,887.60	52.00	5.417E-002	7.583E-003
Cm-244	5,775.74	5,641.51	5,902.52	51.00	5.313E-002	7.512E-003
Th-227	6,074.04	5,932.35	6,178.45	13.00	1.354E-002	3.898E-003
Cm-242	6,148.62	6,118.79	6,178.45	8.00	8.333E-003	3.125E-003

Sample Name: **ICB;AV155**

Comment:

Sample

Spectrum #4 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016a**

Description:

Acquisition

Detector: **AV155**, SN: 50-05/11

Acquisition Start Date: **6/26/2016 5:10:11PM**

Live Time: **960.00 min.**

Real Time: **960.00 min.**

Calibration Name: **IC-9794;AV155-20151016**

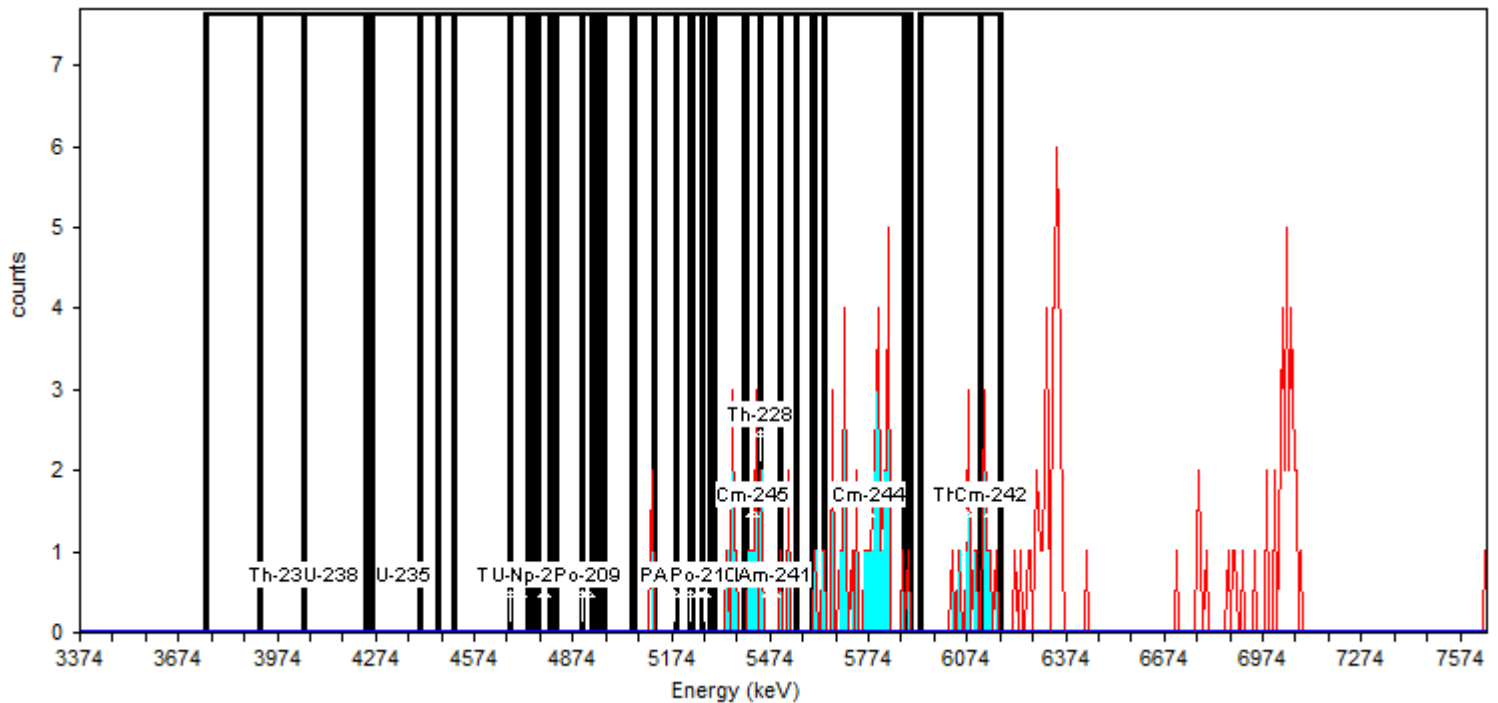
Calibration Date: **10/16/2015 6:47:03PM**

Energy Calibration Equation:

Gain = 7.4575 keV / Ch

Offset = 3,366.95 keV

Quadratic = 0.0000 keV / Ch²



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = 11/05_BackgroundROI, Nuclide Library: Background ROI Library

Total Background Counts: **150.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	0.00	0.000E+000	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	0.00	0.000E+000	1.473E-003
U-234	4,709.31	4,507.96	4,821.17	0.00	0.000E+000	1.473E-003
Pu-242	4,903.21	4,679.48	4,947.95	0.00	0.000E+000	1.473E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-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	2.00	2.083E-003	1.804E-003
Am-243	5,231.34	5,052.36	5,305.92	2.00	2.083E-003	1.804E-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	15.00	1.563E-002	4.167E-003
Po-210	5,276.09	5,231.34	5,291.00	0.00	0.000E+000	1.473E-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	17.00	1.771E-002	4.419E-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	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	15.00	1.563E-002	4.167E-003
Cm-242	6,148.62	6,118.79	6,178.45	7.00	7.292E-003	2.946E-003

Sample Name: **ICB;AV199**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV199**, SN: **50-117Z3**

Acquisition Start Date: **6/24/2016 4:15:21PM**

Live Time: **960.00 min.**

Real Time: **960.00 min.**

Calibration Name: **IC-9817;AV199-20151017**

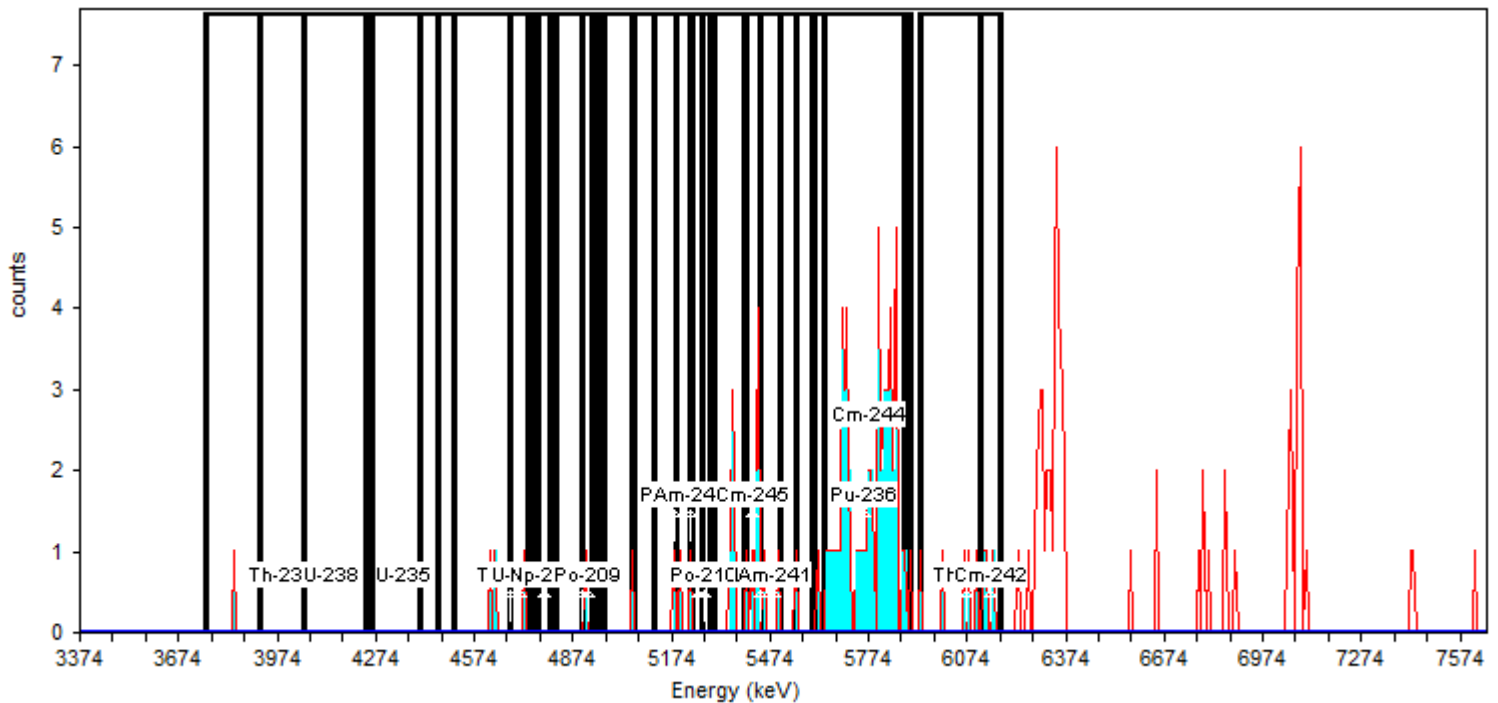
Calibration Date: **10/18/2015 3:55:29PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **165.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	1.00	1.042E-003	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	0.00	0.000E+000	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	3.00	3.125E-003	2.083E-003
U-234	4,709.31	4,507.96	4,821.17	3.00	3.125E-003	2.083E-003
Pu-242	4,903.21	4,679.48	4,947.95	2.00	2.083E-003	1.804E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-003
Po-209	4,918.12	4,903.21	4,933.04	1.00	1.042E-003	1.473E-003
Pu-239	5,179.14	4,970.33	5,238.80	4.00	4.167E-003	2.329E-003
Am-243	5,231.34	5,052.36	5,305.92	4.00	4.167E-003	2.329E-003
U-232	5,253.71	5,059.82	5,402.86	10.00	1.042E-002	3.455E-003
Th-228	5,447.61	5,186.59	5,507.27	18.00	1.875E-002	4.541E-003
Po-210	5,276.09	5,231.34	5,291.00	1.00	1.042E-003	1.473E-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	17.00	1.771E-002	4.419E-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	59.00	6.146E-002	8.069E-003
Cm-244	5,775.74	5,641.51	5,902.52	59.00	6.146E-002	8.069E-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	3.00	3.125E-003	2.083E-003

Sample Name: **ICB;AV235**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV235**, SN: **51-005Q5**

Acquisition Start Date: **6/24/2016 4:15:28PM**

Live Time: **960.00 min.**

Real Time: **960.00 min.**

Calibration Name: **IC-8877;AV235-20151018**

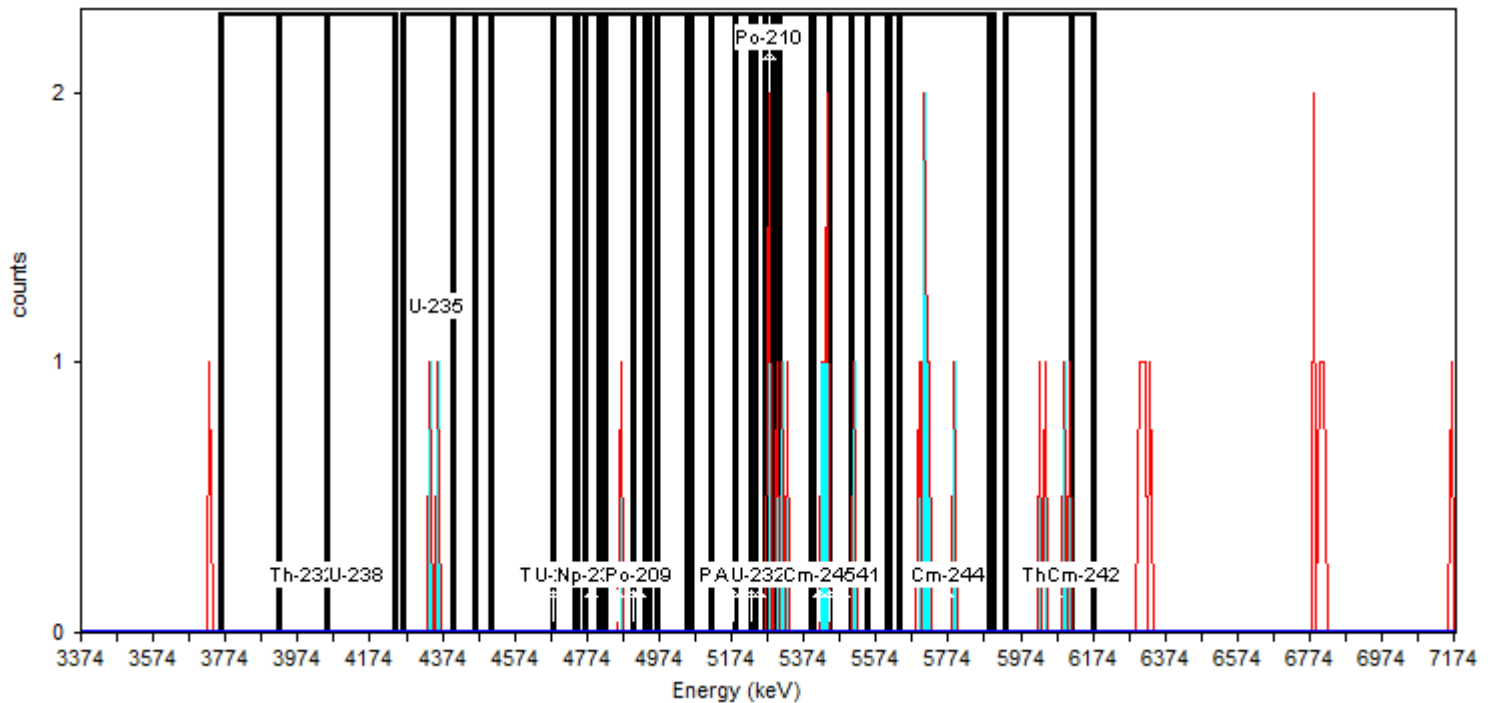
Calibration Date: **10/19/2015 4:11:39PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **34.00**

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	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	0.00	0.000E+000	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	2.00	2.083E-003	1.804E-003
Th-230	4,679.48	4,403.55	4,746.60	0.00	0.000E+000	1.473E-003
U-234	4,709.31	4,507.96	4,821.17	0.00	0.000E+000	1.473E-003
Pu-242	4,903.21	4,679.48	4,947.95	1.00	1.042E-003	1.473E-003
Th-229	4,858.46	4,739.14	5,119.48	1.00	1.042E-003	1.473E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-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	0.00	0.000E+000	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	5.00	5.208E-003	2.552E-003
Th-228	5,447.61	5,186.59	5,507.27	9.00	9.375E-003	3.294E-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	10.00	1.042E-002	3.455E-003
Am-241	5,484.90	5,298.46	5,604.22	8.00	8.333E-003	3.125E-003
Cm-245	5,417.78	5,395.41	5,447.61	4.00	4.167E-003	2.329E-003
Pu-236	5,760.83	5,611.67	5,887.60	6.00	6.250E-003	2.756E-003
Cm-244	5,775.74	5,641.51	5,902.52	6.00	6.250E-003	2.756E-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	0.00	0.000E+000	1.473E-003

Sample Name: ICB;AV236

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: June2016

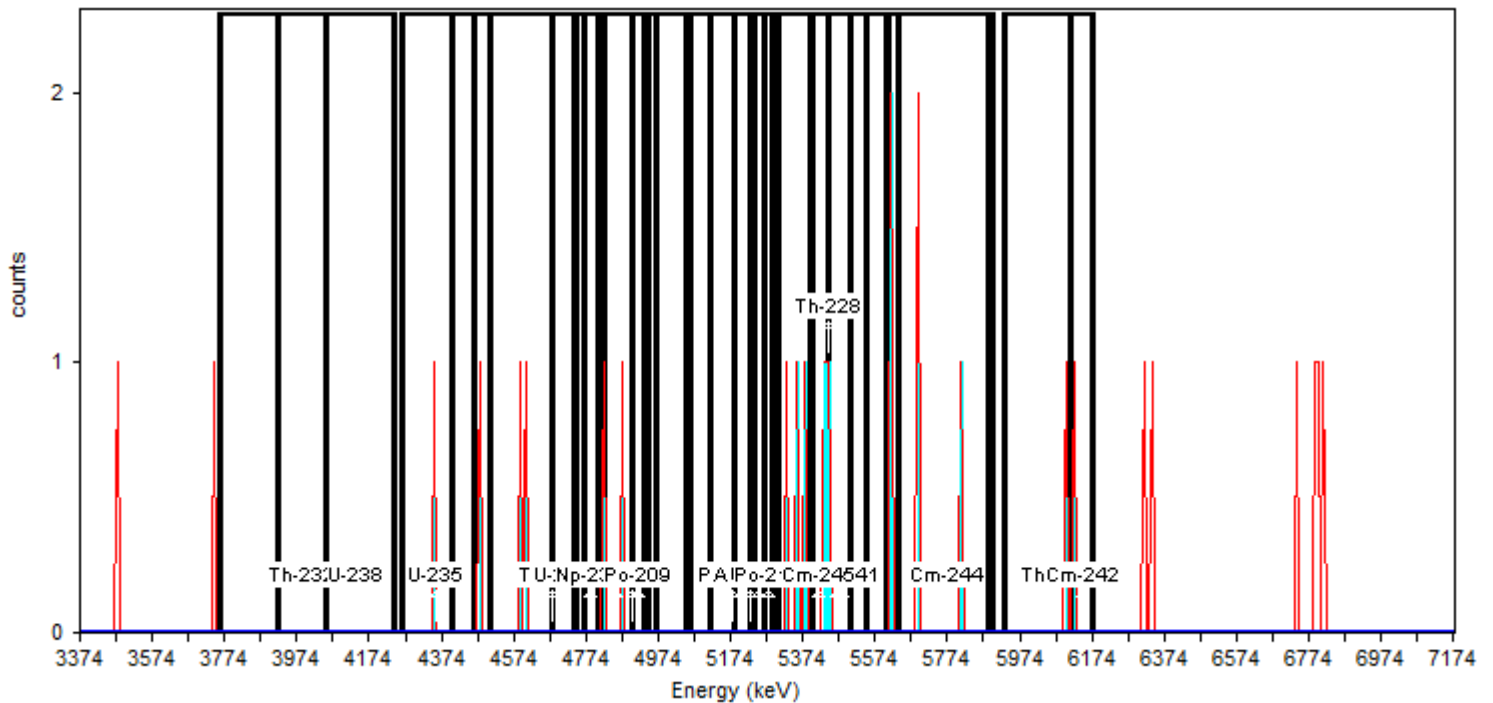
Description:

Acquisition

Detector: AV236 , SN: 51-005P3
Acquisition Start Date: 6/24/2016 4:15:30PM
Live Time: 960.00 min.
Real Time: 960.00 min.
Calibration Name: IC-9520;AV236-20151018
Calibration Date: 10/19/2015 4:11:44PM

Energy Calibration Equation:

Gain = 7.4575 keV / Ch
Offset = 3,366.95 keV
Quadratic = 0.0000 keV / Ch²



General Analysis

Analysis Method: Absolute ROI Analysis, Set Name = 11/05_BackgroundROI, Nuclide Library: Background ROI Library
Total Background Counts: 27.00

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	0.00	0.000E+000	1.473E-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	3.00	3.125E-003	2.083E-003
U-234	4,709.31	4,507.96	4,821.17	3.00	3.125E-003	2.083E-003
Pu-242	4,903.21	4,679.48	4,947.95	2.00	2.083E-003	1.804E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-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	0.00	0.000E+000	1.473E-003
Am-243	5,231.34	5,052.36	5,305.92	0.00	0.000E+000	1.473E-003
U-232	5,253.71	5,059.82	5,402.86	3.00	3.125E-003	2.083E-003
Th-228	5,447.61	5,186.59	5,507.27	6.00	6.250E-003	2.756E-003
Po-210	5,276.09	5,231.34	5,291.00	0.00	0.000E+000	1.473E-003
Pu-238	5,469.98	5,268.63	5,552.01	6.00	6.250E-003	2.756E-003
Am-241	5,484.90	5,298.46	5,604.22	6.00	6.250E-003	2.756E-003
Cm-245	5,417.78	5,395.41	5,447.61	3.00	3.125E-003	2.083E-003
Pu-236	5,760.83	5,611.67	5,887.60	5.00	5.208E-003	2.552E-003
Cm-244	5,775.74	5,641.51	5,902.52	3.00	3.125E-003	2.083E-003
Th-227	6,074.04	5,932.35	6,178.45	2.00	2.083E-003	1.804E-003
Cm-242	6,148.62	6,118.79	6,178.45	1.00	1.042E-003	1.473E-003

Sample Name: **ICB;AV237**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV237**, SN: **50-120DD7**

Acquisition Start Date: **6/24/2016 4:15:29PM**

Live Time: **960.00 min.**

Real Time: **960.00 min.**

Calibration Name: **IC-9792;AV237-20151018**

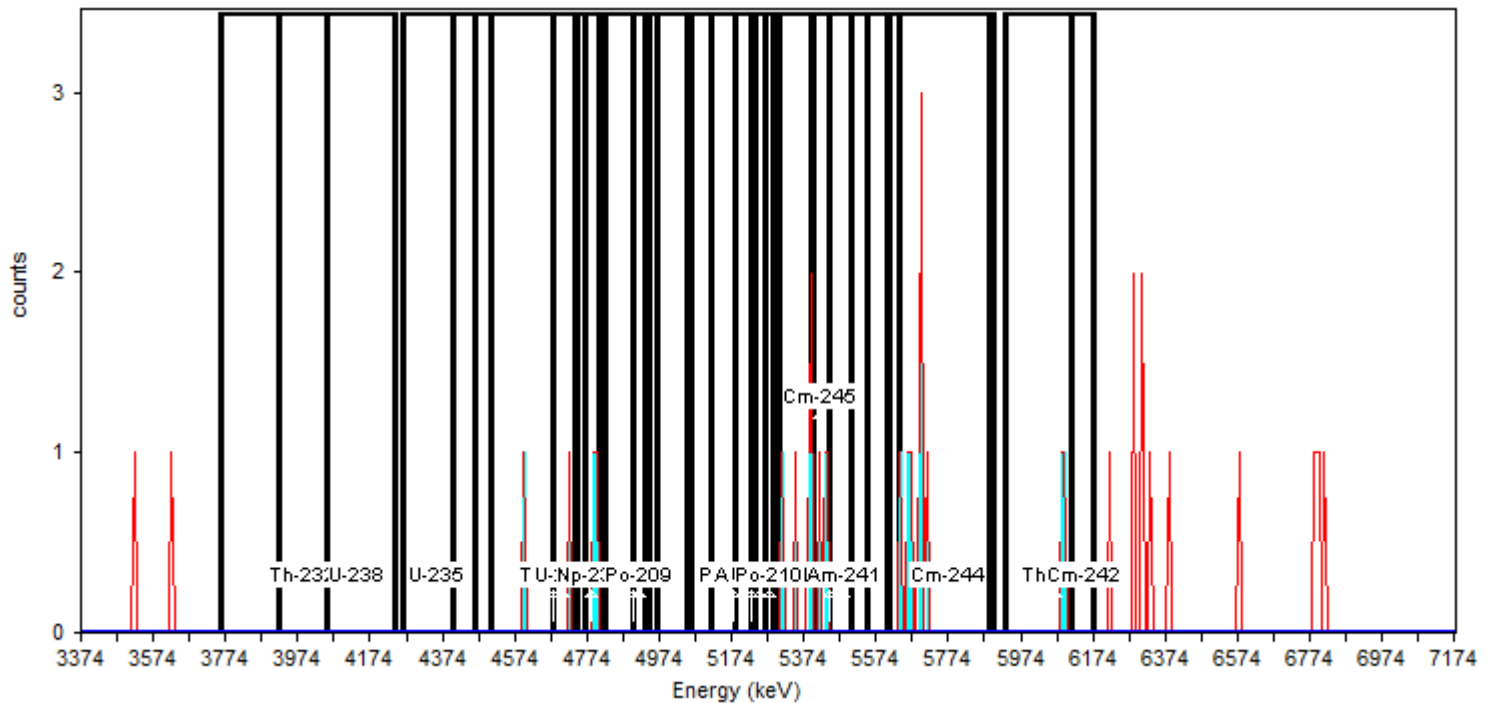
Calibration Date: **10/19/2015 4:11:48PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **36.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	0.00	0.000E+000	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	2.00	2.083E-003	1.804E-003
U-234	4,709.31	4,507.96	4,821.17	4.00	4.167E-003	2.329E-003
Pu-242	4,903.21	4,679.48	4,947.95	3.00	3.125E-003	2.083E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	2.00	2.083E-003	1.804E-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	0.00	0.000E+000	1.473E-003
Am-243	5,231.34	5,052.36	5,305.92	0.00	0.000E+000	1.473E-003
U-232	5,253.71	5,059.82	5,402.86	5.00	5.208E-003	2.552E-003
Th-228	5,447.61	5,186.59	5,507.27	8.00	8.333E-003	3.125E-003
Po-210	5,276.09	5,231.34	5,291.00	0.00	0.000E+000	1.473E-003
Pu-238	5,469.98	5,268.63	5,552.01	8.00	8.333E-003	3.125E-003
Am-241	5,484.90	5,298.46	5,604.22	8.00	8.333E-003	3.125E-003
Cm-245	5,417.78	5,395.41	5,447.61	5.00	5.208E-003	2.552E-003
Pu-236	5,760.83	5,611.67	5,887.60	8.00	8.333E-003	3.125E-003
Cm-244	5,775.74	5,641.51	5,902.52	8.00	8.333E-003	3.125E-003
Th-227	6,074.04	5,932.35	6,178.45	2.00	2.083E-003	1.804E-003
Cm-242	6,148.62	6,118.79	6,178.45	0.00	0.000E+000	1.473E-003

Sample Name: **ICB;AV238**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV238**, SN: **51-005P7**

Acquisition Start Date: **6/24/2016 4:15:30PM**

Live Time: **960.00 min.**

Real Time: **960.22 min.**

Calibration Name: **IC-9793;AV238-20151018**

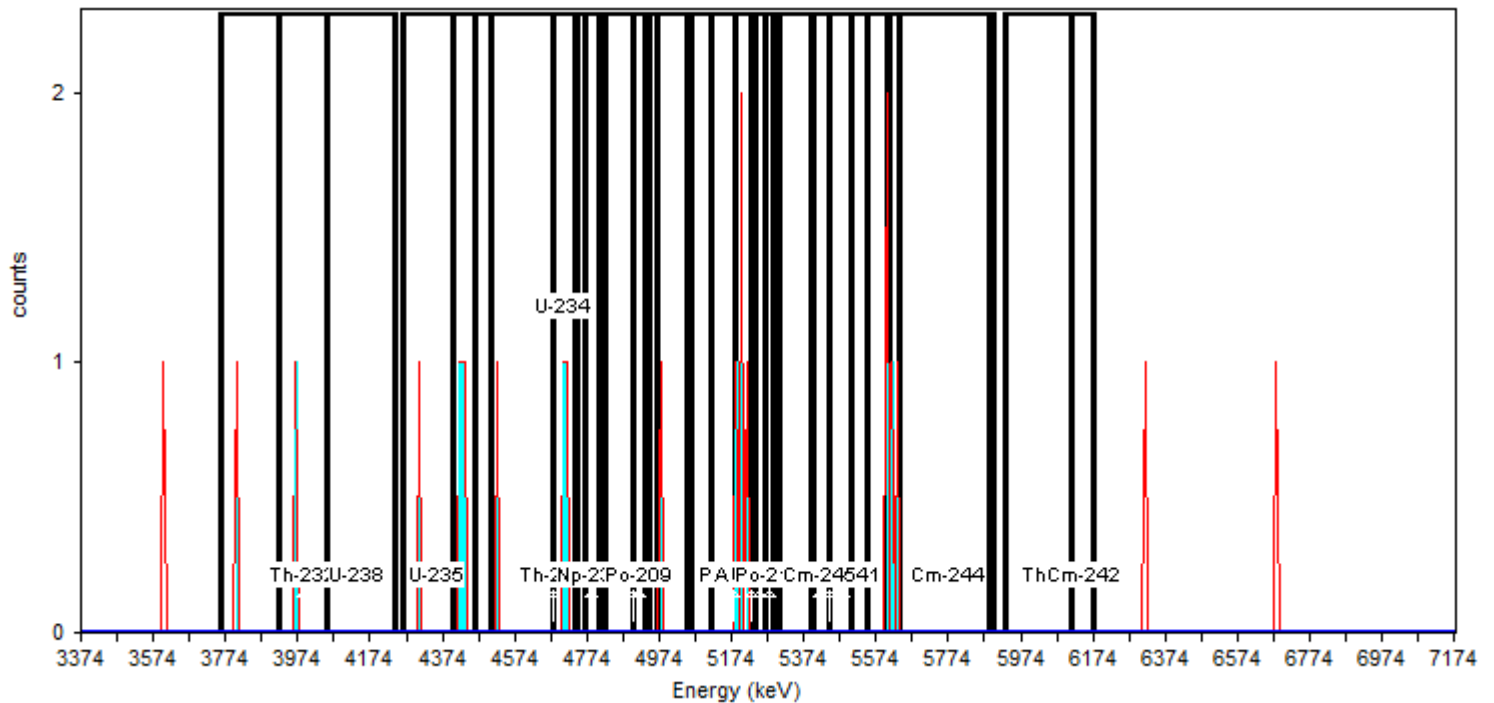
Calibration Date: **10/19/2015 4:11:53PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **21.00**

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	2.00	2.083E-003	1.804E-003
U-238	4,135.08	3,918.81	4,239.49	1.00	1.042E-003	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	4.00	4.167E-003	2.329E-003
Th-230	4,679.48	4,403.55	4,746.60	6.00	6.250E-003	2.756E-003
U-234	4,709.31	4,507.96	4,821.17	3.00	3.125E-003	2.083E-003
Pu-242	4,903.21	4,679.48	4,947.95	2.00	2.083E-003	1.804E-003
Th-229	4,858.46	4,739.14	5,119.48	1.00	1.042E-003	1.473E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-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	5.00	5.208E-003	2.552E-003
Am-243	5,231.34	5,052.36	5,305.92	4.00	4.167E-003	2.329E-003
U-232	5,253.71	5,059.82	5,402.86	4.00	4.167E-003	2.329E-003
Th-228	5,447.61	5,186.59	5,507.27	4.00	4.167E-003	2.329E-003
Po-210	5,276.09	5,231.34	5,291.00	0.00	0.000E+000	1.473E-003
Pu-238	5,469.98	5,268.63	5,552.01	0.00	0.000E+000	1.473E-003
Am-241	5,484.90	5,298.46	5,604.22	2.00	2.083E-003	1.804E-003
Cm-245	5,417.78	5,395.41	5,447.61	0.00	0.000E+000	1.473E-003
Pu-236	5,760.83	5,611.67	5,887.60	2.00	2.083E-003	1.804E-003
Cm-244	5,775.74	5,641.51	5,902.52	0.00	0.000E+000	1.473E-003
Th-227	6,074.04	5,932.35	6,178.45	0.00	0.000E+000	1.473E-003
Cm-242	6,148.62	6,118.79	6,178.45	0.00	0.000E+000	1.473E-003

Sample Name: **ICB;AV239**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV239**, SN: **51-005EE1**

Acquisition Start Date: **6/24/2016 4:15:30PM**

Live Time: **960.00 min.**

Real Time: **960.01 min.**

Calibration Name: **IC-9794;AV239-20151018**

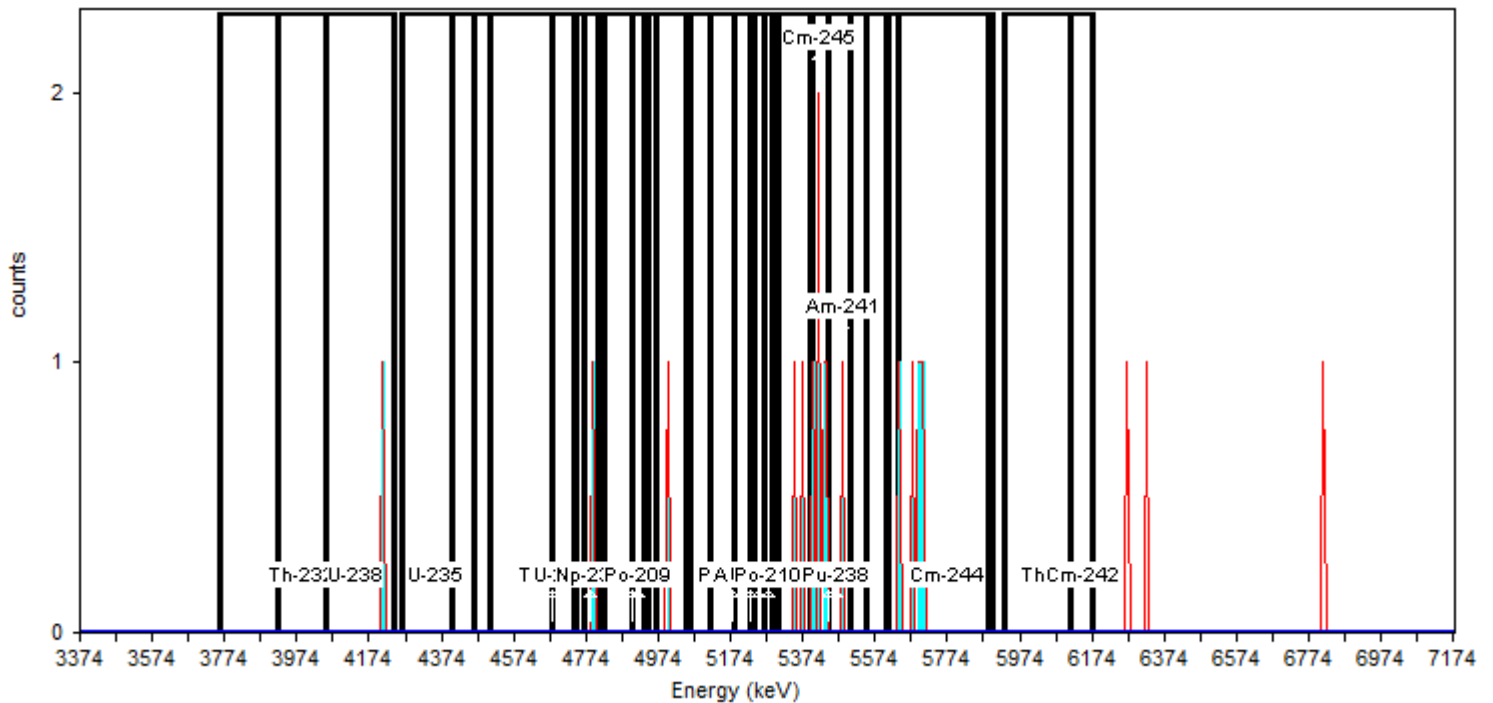
Calibration Date: **10/19/2015 4:11:57PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **19.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	1.00	1.042E-003	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	0.00	0.000E+000	1.473E-003
U-234	4,709.31	4,507.96	4,821.17	1.00	1.042E-003	1.473E-003
Pu-242	4,903.21	4,679.48	4,947.95	1.00	1.042E-003	1.473E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	1.00	1.042E-003	1.473E-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	0.00	0.000E+000	1.473E-003
U-232	5,253.71	5,059.82	5,402.86	3.00	3.125E-003	2.083E-003
Th-228	5,447.61	5,186.59	5,507.27	8.00	8.333E-003	3.125E-003
Po-210	5,276.09	5,231.34	5,291.00	0.00	0.000E+000	1.473E-003
Pu-238	5,469.98	5,268.63	5,552.01	8.00	8.333E-003	3.125E-003
Am-241	5,484.90	5,298.46	5,604.22	8.00	8.333E-003	3.125E-003
Cm-245	5,417.78	5,395.41	5,447.61	5.00	5.208E-003	2.552E-003
Pu-236	5,760.83	5,611.67	5,887.60	5.00	5.208E-003	2.552E-003
Cm-244	5,775.74	5,641.51	5,902.52	5.00	5.208E-003	2.552E-003
Th-227	6,074.04	5,932.35	6,178.45	0.00	0.000E+000	1.473E-003
Cm-242	6,148.62	6,118.79	6,178.45	0.00	0.000E+000	1.473E-003

Sample Name: **ICB;AV240**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV240**, SN: **51-005Q1**

Acquisition Start Date: **6/24/2016 4:15:30PM**

Live Time: **960.00 min.**

Real Time: **960.00 min.**

Calibration Name: **IC-9795;AV240-20151018**

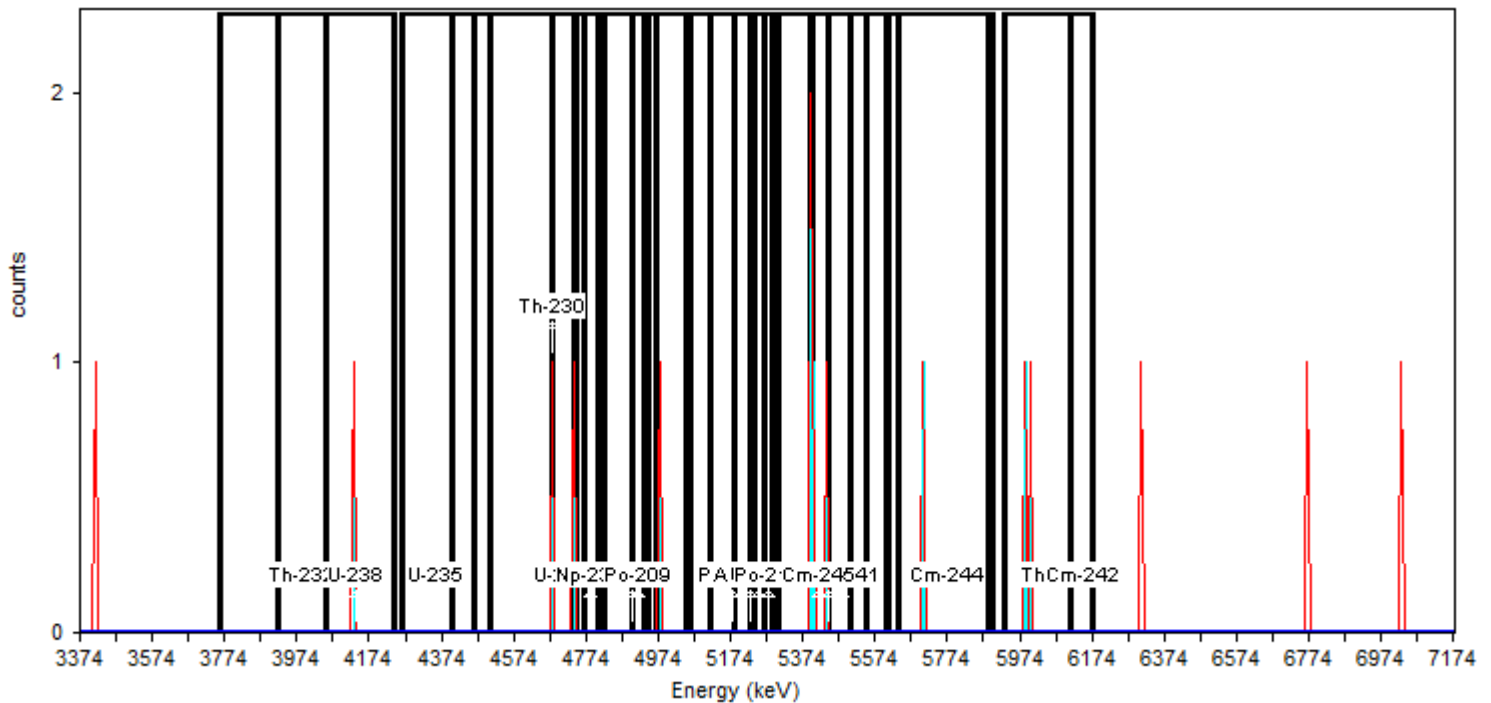
Calibration Date: **10/19/2015 4:12:02PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **15.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	1.00	1.042E-003	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	2.00	2.083E-003	1.804E-003
U-234	4,709.31	4,507.96	4,821.17	2.00	2.083E-003	1.804E-003
Pu-242	4,903.21	4,679.48	4,947.95	2.00	2.083E-003	1.804E-003
Th-229	4,858.46	4,739.14	5,119.48	2.00	2.083E-003	1.804E-003
Np-237	4,783.89	4,768.97	4,806.26	0.00	0.000E+000	1.473E-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	0.00	0.000E+000	1.473E-003
U-232	5,253.71	5,059.82	5,402.86	3.00	3.125E-003	2.083E-003
Th-228	5,447.61	5,186.59	5,507.27	4.00	4.167E-003	2.329E-003
Po-210	5,276.09	5,231.34	5,291.00	0.00	0.000E+000	1.473E-003
Pu-238	5,469.98	5,268.63	5,552.01	4.00	4.167E-003	2.329E-003
Am-241	5,484.90	5,298.46	5,604.22	4.00	4.167E-003	2.329E-003
Cm-245	5,417.78	5,395.41	5,447.61	4.00	4.167E-003	2.329E-003
Pu-236	5,760.83	5,611.67	5,887.60	1.00	1.042E-003	1.473E-003
Cm-244	5,775.74	5,641.51	5,902.52	1.00	1.042E-003	1.473E-003
Th-227	6,074.04	5,932.35	6,178.45	2.00	2.083E-003	1.804E-003
Cm-242	6,148.62	6,118.79	6,178.45	0.00	0.000E+000	1.473E-003

Sample Name: **ICB;AV241**

Comment:

Sample

Spectrum #1 Analysis #1

Analyst: 60040

Batch

Batch Name: **June2016**

Description:

Acquisition

Detector: **AV241**, SN: **50-005P1**

Acquisition Start Date: **6/24/2016 4:15:31PM**

Live Time: **960.00 min.**

Real Time: **960.00 min.**

Calibration Name: **IC-9817;AV241-20151018**

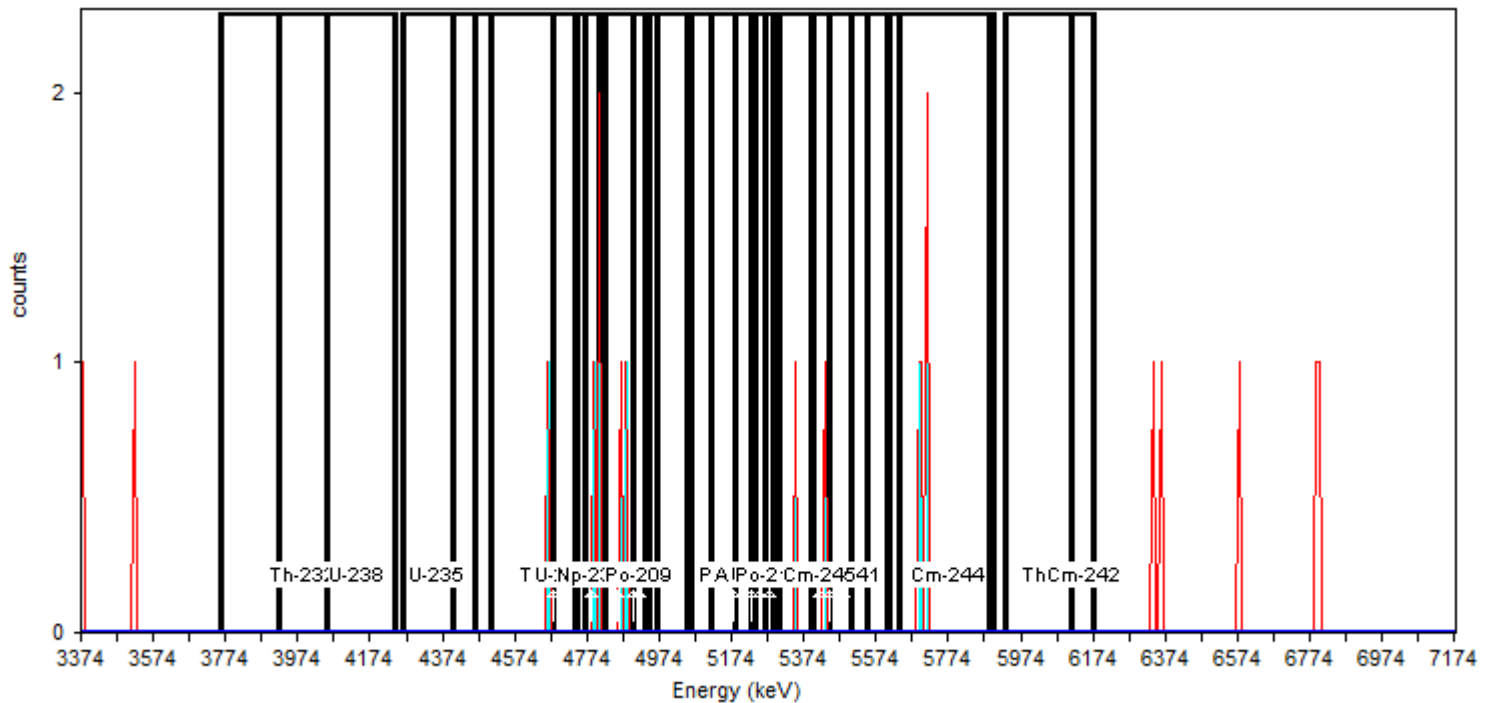
Calibration Date: **10/19/2015 4:12:06PM**

Energy Calibration Equation:

Gain = **7.4575 keV / Ch**

Offset = **3,366.95 keV**

Quadratic = **0.0000 keV / Ch²**



General Analysis

Analysis Method: **Absolute ROI Analysis**, Set Name = **11/05_BackgroundROI**, Nuclide Library: **Background ROI Library**

Total Background Counts: **19.00**

Nuclide Summary (ROI)

<u>RegionName</u>	<u>Peak Energy</u> (keV)	<u>Start Energy</u> (keV)	<u>End Energy</u> (keV)	<u>GrossCounts</u>	<u>Count Rate</u> (CPM)	<u>CR Uncertainty</u> (CPM)
Th-232	3,985.93	3,754.75	4,053.05	0.00	0.000E+000	1.473E-003
U-238	4,135.08	3,918.81	4,239.49	0.00	0.000E+000	1.473E-003
U-235	4,358.81	4,261.86	4,463.21	0.00	0.000E+000	1.473E-003
Th-230	4,679.48	4,403.55	4,746.60	1.00	1.042E-003	1.473E-003
U-234	4,709.31	4,507.96	4,821.17	4.00	4.167E-003	2.329E-003
Pu-242	4,903.21	4,679.48	4,947.95	5.00	5.208E-003	2.552E-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	0.00	0.000E+000	1.473E-003
Am-243	5,231.34	5,052.36	5,305.92	0.00	0.000E+000	1.473E-003
U-232	5,253.71	5,059.82	5,402.86	1.00	1.042E-003	1.473E-003
Th-228	5,447.61	5,186.59	5,507.27	2.00	2.083E-003	1.804E-003
Po-210	5,276.09	5,231.34	5,291.00	0.00	0.000E+000	1.473E-003
Pu-238	5,469.98	5,268.63	5,552.01	2.00	2.083E-003	1.804E-003
Am-241	5,484.90	5,298.46	5,604.22	2.00	2.083E-003	1.804E-003
Cm-245	5,417.78	5,395.41	5,447.61	1.00	1.042E-003	1.473E-003
Pu-236	5,760.83	5,611.67	5,887.60	4.00	4.167E-003	2.329E-003
Cm-244	5,775.74	5,641.51	5,902.52	4.00	4.167E-003	2.329E-003
Th-227	6,074.04	5,932.35	6,178.45	0.00	0.000E+000	1.473E-003
Cm-242	6,148.62	6,118.79	6,178.45	0.00	0.000E+000	1.473E-003

Run Logs

Alpha Spectroscopy Run Log

Detector: AV148

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/16/15 16:27	140	IC 160-223445/1		223445			PS
10/26/15 19:10	60	ICV 160-223563/1		223563			PS
06/24/16 16:15	960	ICB 160-258037/1		258037			PS
06/27/16 10:48	60	CCV 160-258276/1		258276			PS
07/02/16 11:53	1	PULSER 160-259078/1		259078			
07/02/16 12:40	1	PULSER 160-259078/2		259078			ALD
07/02/16 15:17	400	MB 160-257492/1-A		259078	257492	A-01-R	ALD

Detector: AV150

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/16/15 15:51	140	IC 160-223447/1		223447			PS
10/26/15 19:10	60	ICV 160-223565/1		223565			PS
06/24/16 16:15	960	ICB 160-258039/1		258039			PS
06/27/16 10:49	60	CCV 160-258278/1		258278			PS
07/02/16 11:53	1	PULSER 160-259080/1		259080			ALD
07/02/16 15:17	400	LCS 160-257492/2-A		259080	257492	A-01-R	ALD

Detector: AV151

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/16/15 15:51	140	IC 160-223448/1		223448			PS
10/26/15 19:11	60	ICV 160-223566/1		223566			PS
06/24/16 16:15	960	ICB 160-258040/1		258040			PS
06/27/16 10:49	60	CCV 160-258279/1		258279			PS
07/02/16 11:53	1	PULSER 160-259081/1		259081			ALD
07/02/16 15:17	400	160-17814-1	AC-SED-4	259081	257492	A-01-R	ALD

Detector: AV152

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/16/15 15:52	140	IC 160-223449/1		223449			PS
10/26/15 19:11	60	ICV 160-223567/1		223567			PS
06/26/16 17:10	960	ICB 160-258131/1		258131			PS
06/27/16 10:49	60	CCV 160-258280/1		258280			PS
07/02/16 11:53	1	PULSER 160-259082/1		259082			ALD
07/02/16 15:17	400	160-17814-1 DU	AC-SED-4 DU	259082	257492	A-01-R	ALD

Detector: AV153

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/16/15 15:52	140	IC 160-223450/1		223450			PS
10/26/15 19:11	60	ICV 160-223568/1		223568			PS
06/24/16 16:15	960	ICB 160-258042/1		258042			PS
06/27/16 10:50	60	CCV 160-258281/1		258281			PS
07/02/16 11:53	1	PULSER 160-259083/1		259083			ALD
07/02/16 15:17	400	160-17814-2	AC-SED-6	259083	257492	A-01-R	ALD

Detector: AV155

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/16/15 15:52	140	IC 160-223452/1		223452			PS

Alpha Spectroscopy Run Log

Detector: AV155 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/26/15 19:12	60	ICV 160-223570/1		223570			PS
06/26/16 17:10	960	ICB 160-258132/1		258132			PS
06/27/16 10:50	60	CCV 160-258283/1		258283			PS
07/02/16 11:53	1	PULSER 160-259085/1		259085			ALD
07/02/16 15:17	400	160-17814-4	AC-SED-8	259085	257492	A-01-R	ALD

Detector: AV199

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/17/15 18:15	140	IC 160-223496/1		223496			PS
11/01/15 14:25	60	ICV 160-223614/1		223614			PS
06/24/16 16:15	960	ICB 160-258079/1		258079			PS
06/27/16 13:50	60	CCV 160-258308/1		258308			PS
07/07/16 08:33	1	PULSER 160-259665/1		259665			ALD
07/07/16 13:10	400	160-17814-3	AC-SED-7	259665	257492	A-01-R	ALD

Detector: AV235

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 21:32	140	IC 160-223531/1		223531			PS
11/01/15 20:30	60	ICV 160-223650/1		223650			PS
06/24/16 16:15	960	ICB 160-258114/1		258114			PS
06/27/16 18:53	60	CCV 160-258340/1		258340			PS
07/02/16 11:53	1	PULSER 160-259144/1		259144			ALD
07/02/16 15:31	400	MB 160-257935/1-A		259144	257935	A-01-R	ALD

Detector: AV236

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 21:32	140	IC 160-223532/1		223532			PS
11/05/15 16:56	60	ICV 160-223666/1		223666			
11/05/15 18:22	60	ICV 160-223666/2		223666			PS
06/24/16 16:15	960	ICB 160-258115/1		258115			PS
06/28/16 09:29	60	CCV 160-258356/1		258356			PS
07/02/16 11:53	1	PULSER 160-259145/1		259145			ALD
07/02/16 15:31	400	LCS 160-257935/2-A		259145	257935	A-01-R	ALD

Detector: AV237

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 21:32	140	IC 160-223533/1		223533			PS
11/01/15 20:31	60	ICV 160-223652/1		223652			PS
06/24/16 16:15	960	ICB 160-258116/1		258116			PS
06/27/16 18:53	60	CCV 160-258342/1		258342			PS
07/02/16 11:53	1	PULSER 160-259146/1		259146			ALD
07/02/16 15:31	400	160-17814-1	AC-SED-4	259146	257935	A-01-R	ALD

Detector: AV238

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 21:32	140	IC 160-223534/1		223534			PS
11/01/15 20:31	60	ICV 160-223653/1		223653			PS

Alpha Spectroscopy Run Log

Detector: AV238 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
06/24/16 16:15	960	ICB 160-258117/1		258117			PS
06/27/16 18:53	60	CCV 160-258343/1		258343			PS
07/02/16 11:53	1	PULSER 160-259147/1		259147			ALD
07/02/16 15:31	400	160-17814-1 DU	AC-SED-4 DU	259147	257935	A-01-R	ALD

Detector: AV239

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 21:33	140	IC 160-223535/1		223535			PS
11/01/15 20:31	60	ICV 160-223654/1		223654			PS
06/24/16 16:15	960	ICB 160-258118/1		258118			PS
06/28/16 08:13	60	CCV 160-258357/1		258357			PS
07/02/16 11:53	1	PULSER 160-259148/1		259148			ALD
07/02/16 15:31	400	160-17814-2	AC-SED-6	259148	257935	A-01-R	ALD

Detector: AV240

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 21:33	140	IC 160-223536/1		223536			PS
11/01/15 20:31	60	ICV 160-223655/1		223655			PS
06/24/16 16:15	960	ICB 160-258119/1		258119			PS
06/28/16 08:13	60	CCV 160-258358/1		258358			PS
07/02/16 11:53	1	PULSER 160-259149/1		259149			ALD
07/02/16 15:31	400	160-17814-3	AC-SED-7	259149	257935	A-01-R	ALD

Detector: AV241

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
10/18/15 21:33	140	IC 160-223537/1		223537			PS
11/01/15 20:32	60	ICV 160-223656/1		223656			PS
06/24/16 16:15	960	ICB 160-258120/1		258120			PS
06/28/16 08:21	60	CCV 160-258359/1		258359			PS
07/02/16 11:53	1	PULSER 160-259150/1		259150			ALD
07/02/16 15:31	400	160-17814-4	AC-SED-8	259150	257935	A-01-R	ALD

GAMMA SPECTROSCOPY

Method GA-01-R

Ra-226

Radium-226 & Other Gamma Emitters
(GS) by Method GA-01-R

Prep Batch: 257060

Fill Geometry, 21-Day In-Growth

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 257060

Lab ID: MB 160-257060/1-A
 Client ID:

Analyzed: 07/11/16 07:48
 Detector: GV8

Ts: 30
 Decay Corrected: No

Sigma: 2

Analyte	MB Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Actinium-227	0.2838	0.646	0.647	U	pCi/g	1.10	0.511	259963
Radium-226	0.08999	0.0680	0.0687	U	pCi/g	0.315	0.146	259963
Radium-228	0.08187	0.179	0.179	U	pCi/g	0.246	0.0968	259963
Thorium-232	0.08187	0.179	0.179	U	pCi/g	0.246	0.0968	259963
Thorium-234	0.3719	0.986	0.987	U	pCi/g	1.46	0.672	259963
Thallium-208	0.05460	0.0364	0.0368		pCi/g	0.0718	0.0298	259963
Uranium-235	-0.001966	0.252	0.252	U	pCi/g	0.446	0.207	259963
Uranium-238	0.3719	0.986	0.987	U	pCi/g	1.46	0.672	259963
Actinium 228	0.08187	0.179	0.179	U	pCi/g	0.246	0.0968	259963
Bismuth-212	-0.05294	0.795	0.795	U	pCi/g	1.87	0.853	259963
Bismuth-214	0.08999	0.0680	0.0687	U	pCi/g	0.315	0.146	259963
Lead-210	-0.6987	1.04	1.04	U	pCi/g	2.36	1.10	259963
Lead-212	-0.09505	0.0534	0.0548	U	pCi/g	0.208	0.0981	259963
Lead-214	0.04168	0.104	0.104	U	pCi/g	0.185	0.0834	259963
Potassium-40	-0.1195	0.868	0.868	U	pCi/g	1.21	0.501	259963
Protactinium-231	0.5009	1.33	1.34	U	pCi/g	3.17	1.48	259963
Other Detected Radionuclides	MB Result	Count Unc	Total Unc	Qualifier	Unit	DLC		
Other Detected Radionuclide	None				pCi/g			

Lab ID: LCS 160-257060/2-A
 Client ID:

Analyzed: 07/11/16 07:47
 Detector: GV7

Ts: 30
 Decay Corrected: No

Sigma: 2

Analyte	LCS Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Americium-241	95.67	1.42	10.0		pCi/g	1.02	0.507	259965
Cesium-137	28.64	0.682	3.06		pCi/g	0.254	0.122	259965
Cobalt-60	15.99	0.423	1.66		pCi/g	0.0831	0.0341	259965

Lab ID: 160-17814-1
 Client ID: AC-SED-4

Analyzed: 07/11/16 07:46
 Detector: GV5

Ts: 30
 Decay Corrected: No

Sigma: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Actinium-227	0.349	0.741	0.742	U	pCi/g	1.65	0.782	259964
Radium-226	1.14	0.273	0.298		pCi/g	0.220	0.0951	259964
Radium-228	1.17	0.272	0.297		pCi/g	0.179	0.0566	259964
Thorium-232	1.17	0.272	0.297		pCi/g	0.179	0.0566	259964
Thorium-234	2.37	1.73	1.75		pCi/g	2.20	1.03	259964

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 257060

Lab ID: 160-17814-1
Client ID: AC-SED-4

Analyzed: 07/11/16 07:46
Detector: GV5

Ts: 30
Decay Corrected: No

Sigma: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Thallium-208	0.365	0.115	0.121		pCi/g	0.0879	0.0362	259964
Uranium-235	-0.263	0.652	0.652	U	pCi/g	1.09	0.527	259964
Uranium-238	2.37	1.73	1.75		pCi/g	2.20	1.03	259964
Actinium 228	1.17	0.272	0.297		pCi/g	0.179	0.0566	259964
Bismuth-212	0.743	2.03	2.03	U	pCi/g	3.45	1.62	259964
Bismuth-214	1.14	0.273	0.298		pCi/g	0.220	0.0951	259964
Lead-210	0.0417	2.66	2.66	U	pCi/g	3.93	1.87	259964
Lead-212	0.881	0.157	0.194		pCi/g	0.142	0.0638	259964
Lead-214	1.17	0.227	0.257		pCi/g	0.230	0.103	259964
Potassium-40	13.5	2.36	2.74		pCi/g	1.14	0.438	259964
Protactinium-231	-1.65	4.78	4.78	U	pCi/g	8.03	3.88	259964
Other Detected Radionuclides	Result	Count Unc	Total Unc	Qualifier	Unit		DLC	
Other Detected Radionuclide	None				pCi/g			

Lab ID: 160-17814-1 DU
Client ID: AC-SED-4

Analyzed: 07/11/16 08:47
Detector: GV7

Ts: 30
Decay Corrected: No

Sigma: 2

Analyte	DU Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Actinium-227	-0.4288	1.04	1.04	U	pCi/g	1.40	0.667	259965
Radium-226	1.230	0.209	0.245		pCi/g	0.107	0.0436	259965
Radium-228	0.8354	0.233	0.249		pCi/g	0.201	0.0782	259965
Thorium-232	0.8354	0.233	0.249		pCi/g	0.201	0.0782	259965
Thorium-234	-0.02837	1.32	1.32	U	pCi/g	2.26	1.09	259965
Thallium-208	0.2425	0.0773	0.0812		pCi/g	0.0715	0.0306	259965
Uranium-235	-0.1956	0.342	0.343	U	pCi/g	1.02	0.495	259965
Uranium-238	-0.02837	1.32	1.32	U	pCi/g	2.26	1.09	259965
Actinium 228	0.8354	0.233	0.249		pCi/g	0.201	0.0782	259965
Bismuth-212	0.4704	0.803	0.805	U	pCi/g	1.36	0.610	259965
Bismuth-214	1.230	0.209	0.245		pCi/g	0.107	0.0436	259965
Lead-210	0.05687	2.06	2.06	U	pCi/g	3.51	1.68	259965
Lead-212	0.8705	0.138	0.178		pCi/g	0.147	0.0686	259965
Lead-214	1.133	0.182	0.217		pCi/g	0.165	0.0750	259965
Potassium-40	14.87	2.15	2.64		pCi/g	1.03	0.424	259965
Protactinium-231	-1.029	3.40	3.40	U	pCi/g	5.70	2.77	259965
Other Detected Radionuclides	DU Result	Count Unc	Total Unc	Qualifier	Unit		DLC	
Other Detected Radionuclide	None				pCi/g			

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 257060

Lab ID: 160-17814-2
Client ID: AC-SED-6

Analyzed: 07/11/16 07:46
Detector: GV3

Ts: 30
Decay Corrected: No

Sigma: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Actinium-227	0.409	0.557	0.559	U	pCi/g	0.923	0.425	259962
Radium-226	0.958	0.195	0.219		pCi/g	0.159	0.0698	259962
Radium-228	0.783	0.229	0.242		pCi/g	0.262	0.110	259962
Thorium-232	0.783	0.229	0.242		pCi/g	0.262	0.110	259962
Thorium-234	0.834	0.741	0.746	U	pCi/g	2.12	1.00	259962
Thallium-208	0.361	0.114	0.120		pCi/g	0.100	0.0447	259962
Uranium-235	0.102	0.190	0.190	U	pCi/g	0.951	0.460	259962
Uranium-238	0.834	0.741	0.746	U	pCi/g	2.12	1.00	259962
Actinium 228	0.783	0.229	0.242		pCi/g	0.262	0.110	259962
Bismuth-212	0.312	1.14	1.14	U	pCi/g	1.96	0.912	259962
Bismuth-214	0.958	0.195	0.219		pCi/g	0.159	0.0698	259962
Lead-210	1.13	1.68	1.68	U	pCi/g	2.75	1.30	259962
Lead-212	0.907	0.145	0.186		pCi/g	0.141	0.0648	259962
Lead-214	1.21	0.231	0.263		pCi/g	0.191	0.0875	259962
Potassium-40	17.0	2.11	2.73		pCi/g	1.01	0.420	259962
Protactinium-231	-0.00000013	3.54	3.54	U	pCi/g	6.02	2.92	259962
	6							
Other Detected Radionuclides	Result	Count Unc	Total Unc	Qualifier	Unit	DLC		
Other Detected Radionuclide	None				pCi/g			

Lab ID: 160-17814-3
Client ID: AC-SED-7

Analyzed: 07/11/16 08:45
Detector: GV8

Ts: 30
Decay Corrected: No

Sigma: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Actinium-227	0.600	1.27	1.27	U	pCi/g	2.13	1.03	259963
Radium-226	1.07	0.247	0.271		pCi/g	0.194	0.0858	259963
Radium-228	0.750	0.243	0.255		pCi/g	0.426	0.188	259963
Thorium-232	0.750	0.243	0.255		pCi/g	0.426	0.188	259963
Thorium-234	0.970	0.746	0.752	U	pCi/g	2.06	0.971	259963
Thallium-208	0.336	0.0884	0.0950		pCi/g	0.0672	0.0276	259963
Uranium-235	-0.344	0.443	0.444	U	pCi/g	1.33	0.651	259963
Uranium-238	0.970	0.746	0.752	U	pCi/g	2.06	0.971	259963
Actinium 228	0.750	0.243	0.255		pCi/g	0.426	0.188	259963
Bismuth-212	-0.813	1.72	1.73	U	pCi/g	2.69	1.27	259963
Bismuth-214	1.07	0.247	0.271		pCi/g	0.194	0.0858	259963
Lead-210	-1.56	1.73	1.74	U	pCi/g	5.63	2.73	259963
Lead-212	0.759	0.134	0.166		pCi/g	0.128	0.0582	259963

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 257060

Lab ID: 160-17814-3
Client ID: AC-SED-7

Analyzed: 07/11/16 08:45
Detector: GV8

Ts: 30
Decay Corrected: No

Sigma: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Lead-214	1.39	0.188	0.238		pCi/g	0.175	0.0785	259963
Potassium-40	16.2	2.24	2.79		pCi/g	0.731	0.262	259963
Protactinium-231	0.568	2.29	2.29	U	pCi/g	7.33	3.56	259963
Other Detected Radionuclides	Result	Count Unc	Total Unc	Qualifier	Unit		DLC	
Other Detected Radionuclide	None				pCi/g			

Lab ID: 160-17814-4
Client ID: AC-SED-8

Analyzed: 07/11/16 08:46
Detector: GV5

Ts: 30
Decay Corrected: No

Sigma: 2

Analyte	Result	Count Unc	Total Unc	Qualifier	Unit	MDC	DLC	Anly Batch
Actinium-227	1.14	1.08	1.09		pCi/g	1.48	0.684	259964
Radium-226	1.42	0.310	0.343		pCi/g	0.228	0.0959	259964
Radium-228	0.921	0.314	0.327		pCi/g	0.355	0.137	259964
Thorium-232	0.921	0.314	0.327		pCi/g	0.355	0.137	259964
Thorium-234	-1.10	1.68	1.68	U	pCi/g	3.92	1.87	259964
Thallium-208	0.398	0.105	0.113		pCi/g	0.0522	0.0165	259964
Uranium-235	0.239	0.632	0.632	U	pCi/g	1.07	0.509	259964
Uranium-238	-1.10	1.68	1.68	U	pCi/g	3.92	1.87	259964
Actinium 228	0.921	0.314	0.327		pCi/g	0.355	0.137	259964
Bismuth-212	-0.608	1.86	1.86	U	pCi/g	2.86	1.30	259964
Bismuth-214	1.42	0.310	0.343		pCi/g	0.228	0.0959	259964
Lead-210	3.66	2.62	2.66		pCi/g	3.47	1.62	259964
Lead-212	1.04	0.194	0.236		pCi/g	0.183	0.0828	259964
Lead-214	1.62	0.253	0.305		pCi/g	0.264	0.118	259964
Potassium-40	17.0	2.95	3.43		pCi/g	1.41	0.541	259964
Protactinium-231	-1.57	4.39	4.39	U	pCi/g	7.42	3.54	259964
Other Detected Radionuclides	Result	Count Unc	Total Unc	Qualifier	Unit		DLC	
Other Detected Radionuclide	None				pCi/g			

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 257060

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 160-257060/1-A	Actinium-227			0.2838	U	pCi/g							.8776796 1
MB 160-257060/1-A	Radium-226			0.08999	U	pCi/g							2.621098 74
MB 160-257060/1-A	Radium-228			0.08187	U	pCi/g							.9162139 1
MB 160-257060/1-A	Thorium-232			0.08187	U	pCi/g							.9162139 1
MB 160-257060/1-A	Thorium-234			0.3719	U	pCi/g							.7536209 7
MB 160-257060/1-A	Thallium-208			0.05460		pCi/g							2.964314 69
MB 160-257060/1-A	Uranium-235			-0.001966	U	pCi/g							-.0156251 8
MB 160-257060/1-A	Uranium-238			0.3719	U	pCi/g							.7536209 7
MB 160-257060/1-A	Actinium 228			0.08187	U	pCi/g							.9162139 1
MB 160-257060/1-A	Bismuth-212			-0.05294	U	pCi/g							-.1332121 1
MB 160-257060/1-A	Bismuth-214			0.08999	U	pCi/g							2.621098 74
MB 160-257060/1-A	Lead-210			-0.6987	U	pCi/g							-1.340117 96
MB 160-257060/1-A	Lead-212			-0.09505	U	pCi/g							-3.466679 77
MB 160-257060/1-A	Lead-214			0.04168	U	pCi/g							.8046230 5
MB 160-257060/1-A	Potassium-40			-0.1195	U	pCi/g							-.2753985
MB 160-257060/1-A	Protactinium-231			0.5009	U	pCi/g							.7499269 4

Lab Control Sample ID:	Analyte	Parent Result	Spike Added	LCS Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
LCS 160-257060/2-A	Americium-241		97.1	95.67		pCi/g	99	87 - 116					-.2029023 205
LCS 160-257060/2-A	Cesium-137		29.6	28.64		pCi/g	97	87 - 120					-.4349387 734
LCS 160-257060/2-A	Cobalt-60		16.9	15.99		pCi/g	94	87 - 115					-.7816121 071

Duplicate ID:	Analyte	Parent Result	Spike Added	DU Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
160-17814-1	Actinium-227	0.349		-0.4288	U	pCi/g			1944	0.44	1.22	1	
160-17814-1	Radium-226	1.14		1.230		pCi/g			7	0.16	0.44	1	
160-17814-1	Radium-228	1.17		0.8354		pCi/g			33	0.61	1.71	1	
160-17814-1	Thorium-232	1.17		0.8354		pCi/g			33	0.61	1.71	1	
160-17814-1	Thorium-234	2.37		-0.02837	U	pCi/g			205	0.78	2.19	1	
160-17814-1	Thallium-208	0.365		0.2425		pCi/g			40	0.61	1.69	1	

Gamma Spectroscopy Analysis Detail Report

Prep Batch: 257060

Duplicate ID:	Analyte	Parent Result	Spike Added	DU Result	Qualifier	Unit	% Rec	% Rec Limits	RPD	RER	DER	RER Limit	Z Factor
160-17814-1	Uranium-235	-0.263		-0.1956	U	pCi/g			29	0.07	0.18	1	
160-17814-1	Uranium-238	2.37		-0.02837	U	pCi/g			205	0.78	2.19	1	
160-17814-1	Actinium 228	1.17		0.8354		pCi/g			33	0.61	1.71	1	
160-17814-1	Bismuth-212	0.743		0.4704	U	pCi/g			45	0.1	0.25	1	
160-17814-1	Bismuth-214	1.14		1.230		pCi/g			7	0.16	0.44	1	
160-17814-1	Lead-210	0.0417		0.05687	U	pCi/g			31	0	0.01	1	
160-17814-1	Lead-212	0.881		0.8705		pCi/g			1	0.03	0.08	1	
160-17814-1	Lead-214	1.17		1.133		pCi/g			3	0.07	0.20	1	
160-17814-1	Potassium-40	13.5		14.87		pCi/g			10	0.26	0.73	1	
160-17814-1	Protactinium-231	-1.65		-1.029	U	pCi/g			47	0.08	0.21	1	

Glossary:

Ts = Count Duration, Sample

GAMMA SPECTROSCOPY BATCH WORKSHEET

Lab Name: TestAmerica St. Louis Job No.: 160-17814-1

SDG No.: _____

Batch Number: 257060 Batch Start Date: 06/20/16 08:50 Batch Analyst: Sloan, Robert 1

Batch Method: Fill_Geo-21 Batch End Date: 06/20/16 10:00

Lab Sample ID	Client Sample ID	Method Chain	Basis	TareWeight	GrossWeight	InitialAmount	IngDecDate1	IngDecDate3	Geometry
MB 160-257060/1		Fill_Geo-21, GA-01-R				291.18 g	6/20/2016	7/11/2016	Tuna Can
LCS 160-257060/2		Fill_Geo-21, GA-01-R				341.9 g	6/20/2016	7/11/2016	Tuna Can
160-17814-A-1-A	AC-SED-4	Fill_Geo-21, GA-01-R	T	46.3 g	327.3 g	281 g	6/20/2016	7/11/2016	Tuna Can
160-17814-A-1-A DU	AC-SED-4	Fill_Geo-21, GA-01-R	T	46.3 g	327.3 g	281 g	6/20/2016	7/11/2016	Tuna Can
160-17814-A-2-A	AC-SED-6	Fill_Geo-21, GA-01-R	T	46.8 g	325.0 g	278.2 g	6/20/2016	7/11/2016	Tuna Can
160-17814-A-3-A	AC-SED-7	Fill_Geo-21, GA-01-R	T	46.2 g	346.2 g	300 g	6/20/2016	7/11/2016	Tuna Can
160-17814-A-4-A	AC-SED-8	Fill_Geo-21, GA-01-R	T	46.3 g	273.7 g	227.4000 g	6/20/2016	7/11/2016	Tuna Can

Lab Sample ID	Client Sample ID	Method Chain	Basis	Tuna Can LCS 00005					
MB 160-257060/1		Fill_Geo-21, GA-01-R							
LCS 160-257060/2		Fill_Geo-21, GA-01-R		# g					
160-17814-A-1-A	AC-SED-4	Fill_Geo-21, GA-01-R	T						
160-17814-A-1-A DU	AC-SED-4	Fill_Geo-21, GA-01-R	T						
160-17814-A-2-A	AC-SED-6	Fill_Geo-21, GA-01-R	T						
160-17814-A-3-A	AC-SED-7	Fill_Geo-21, GA-01-R	T						
160-17814-A-4-A	AC-SED-8	Fill_Geo-21, GA-01-R	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.

Sample Description: 257060_Gamma_MB 160-257060~1-A
 Detector: Detector # 8
 Batch ID: 257060
 Work Order Number: Gamma
 Lot Number: MB 160-257060~1-A

Decay to Time: 7/11/2016 07:48 Live Time: 1800 sec
 Acquisition Time: 7/11/2016 07:48:49 Real Time: 1854 sec
 Analysis Time: 7/11/2016 08:19 Dead Time: 2.89 %
 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_2016-07-10_1451.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	5.569E-01	399.5	2.225E+00	2.225E+00	8.098E+00
NA-22	0.000E+00	1.#INF	8.011E-02	8.011E-02	5.904E-01
K-40	-1.288E+00	363.1	4.676E+00	4.677E+00	1.308E+01
Sc-46	7.089E-03	8385.0	5.944E-01	5.944E-01	2.116E+00
CR-51	-2.164E+00	75.8	1.639E+00	1.644E+00	7.776E+00
MN-54	1.302E-01	207.0	2.696E-01	2.697E-01	7.132E-01
FE-59	-6.863E-01	123.2	8.456E-01	8.463E-01	2.222E+00
Co-56	2.306E-01	124.1	2.863E-01	2.866E-01	7.373E-01
CO-57	0.000E+00	1.#INF	4.951E-02	4.951E-02	5.372E-01
CO-58	6.570E-01	28.9	1.897E-01	1.927E-01	4.035E-01
CO-60	-2.444E-01	133.3	3.258E-01	3.260E-01	8.901E-01
ZN-65	0.000E+00	1.#INF	1.411E-01	1.411E-01	2.355E+00
NB-94	6.932E-02	39.5	2.735E-02	2.759E-02	8.362E-01
ZR-95	-9.970E-01	92.0	9.177E-01	9.191E-01	2.156E+00
NB-95	0.000E+00	1.#INF	5.202E-02	5.202E-02	1.069E+00
RU-103	-3.862E-01	103.4	3.994E-01	3.999E-01	9.749E-01
RH-106	0.000E+00	1.#INF	4.396E-01	4.396E-01	1.553E+01
AG-108M	1.531E-01	149.8	2.293E-01	2.294E-01	5.927E-01
AG-110M	1.955E-01	80.5	1.574E-01	1.577E-01	2.902E+00
SN-113	2.068E-01	143.8	2.975E-01	2.977E-01	1.052E+00
SB-124	3.687E-01	114.6	4.226E-01	4.230E-01	1.429E+00
SB-125	9.499E-01	61.2	5.813E-01	5.833E-01	1.307E+00
I-131	9.822E-02	103.0	1.012E-01	1.013E-01	7.388E-01
Gd-153	0.000E+00	1.#INF	8.961E-02	8.962E-02	3.365E+00
Ga-68	-7.408E+00	238.8	1.769E+01	1.770E+01	4.308E+01
Tc-99m	-1.527E-02	1994.6	3.045E-01	3.045E-01	1.046E+00
BA-133	-1.547E-02	131.6	2.036E-02	2.038E-02	1.450E+00
CS-134	1.220E-01	112.1	1.368E-01	1.369E-01	1.544E+00
CS-137	-1.067E-01	324.9	3.467E-01	3.467E-01	1.303E+00
CE-139	1.274E-01	130.2	1.659E-01	1.664E-01	5.738E-01
Ba-140	7.947E-01	177.8	1.413E+00	1.413E+00	2.621E+00
La-140	1.138E-01	138.9	1.580E-01	1.581E-01	7.522E-01
CE-141	-3.561E-01	106.0	3.776E-01	3.780E-01	9.856E-01

CE-144	-8.692E-01	247.8	2.154E+00	2.154E+00	7.351E+00
PM-144	-1.938E-01	204.6	3.965E-01	3.966E-01	9.759E-01
EU-152	1.649E+00	33.3	5.496E-01	5.563E-01	3.837E+00
EU-154	-2.553E+00	51.9	1.326E+00	1.332E+00	9.340E+00
EU-155	0.000E+00	1.#INF	1.534E-01	1.534E-01	4.703E+00
HF-181	0.000E+00	1.#INF	1.078E-01	1.078E-01	1.103E+00
Ta-182	0.000E+00	1.#INF	2.055E-01	2.055E-01	3.429E+00
Hg-203	0.000E+00	1.#INF	1.686E-01	1.686E-01	8.726E-01
TL-208	5.882E-01	33.3	1.961E-01	1.984E-01	7.739E-01
pm-146	7.430E-01	40.8	3.033E-01	3.058E-01	1.911E+00
y-88	-8.479E-02	755.1	6.403E-01	6.403E-01	1.074E+00
Cd-113m	7.295E+02	393.7	2.872E+03	2.872E+03	1.030E+04
Cd-109	-3.062E+00	261.2	7.997E+00	7.999E+00	2.711E+01
Cf-251	-3.778E-01	225.0	8.501E-01	8.507E-01	2.320E+00
Cf-249	2.844E-01	149.9	4.264E-01	4.266E-01	1.183E+00
Sn-126	-1.948E+00	139.7	2.722E+00	2.724E+00	9.246E+00
PB-210	-7.528E+00	74.4	5.600E+00	5.617E+00	2.540E+01
PB-212	-1.024E+00	28.1	2.879E-01	2.954E-01	2.241E+00
PB-214	4.490E-01	124.2	5.575E-01	5.580E-01	1.996E+00
BI-207	-1.122E-01	249.2	2.795E-01	2.796E-01	9.498E-01
BI-212	-5.704E-01	750.7	4.282E+00	4.282E+00	2.016E+01
BI-214	9.695E-01	37.8	3.664E-01	3.699E-01	3.395E+00
BI-210M	-2.202E-01	170.9	3.763E-01	3.766E-01	1.316E+00
AC-228	8.820E-01	109.0	9.617E-01	9.627E-01	2.647E+00
TH-227	3.057E+00	113.8	3.479E+00	3.483E+00	1.184E+01
TH-229	3.000E+00	110.5	3.317E+00	3.326E+00	8.869E+00
TH-234	4.007E+00	132.6	5.313E+00	5.317E+00	1.576E+01
PA-231	5.396E+00	133.2	7.190E+00	7.196E+00	3.419E+01
PA-233	3.147E-01	188.5	5.933E-01	5.936E-01	3.142E+00
PA-234	-2.923E-01	143.5	4.194E-01	4.197E-01	4.158E+00
PA-234M	-3.424E+00	1387.0	4.749E+01	4.749E+01	1.767E+02
U-235	-2.119E-02	6399.9	1.356E+00	1.356E+00	4.806E+00
AM-241	-1.646E-01	426.3	7.019E-01	7.019E-01	2.471E+00
Np-237	-1.401E+00	182.6	2.558E+00	2.559E+00	8.622E+00
Ir-192	5.413E-02	116.5	6.304E-02	6.312E-02	1.221E+00
Cs-136	-9.186E-02	106.8	9.806E-02	9.820E-02	1.344E+00
Np-239	-8.605E-01	143.1	1.231E+00	1.232E+00	4.147E+00
Nd-147	3.833E+00	27.7	1.063E+00	1.086E+00	2.173E+00

Total	7.595E+02				

Analyst: Amanda Dick

Sample description
257060_Gamma_MB 160-257060~1-A

Spectrum Filename: C:\User\SPC\Det8\8_Gamma_20160992.An1

Acquisition information

Start time: 7/11/2016 7:48:49 AM
Live time: 1800
Real time: 1854
Dead time: 2.89 %
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): $-1.098764E-01 + (-4.958544E-01 * \text{Log}(E)) + (-2.572270E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.71 %
Log(Eff): $-2.525301E+01 + (9.398253E+00 * \text{Log}(E)) + (-1.000034E+00 * \text{Log}(E)^2)$

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 +/- 0.0000E+00%
Activity scaling factor: $1.0000E+00 / (1.0000E+00 * 1.0000E+00) = 1.0000E+00$
Detection limit method: Reg. Guide 4.16 Method

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	7/11/2016 7:48:00 AM
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	8_2016-07-10_1451.PBC 7/10/2016 2:51:27 PM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 3 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.0957

***** 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/Samp1	Nuc
50.14	10. 113.81	1.01	2.267E-02	50.14	8.000	PBC<MDA	TH227	
59.54	-3. 426.34	1.02	2.881E-02	59.54	35.900	PBC<MDA	AM241	
63.40	9. 132.59	0.62	3.099E-02	63.29	3.810	PBC<MDA	TH234	
				64.28	9.700	1.547E+00	Sn126	
121.78	2. 474.34	1.07	4.148E-02	121.78	28.580	PBC<MDA	EU152	
				122.06	85.600	3.131E-02	CO57	
123.10	8. 90.89	1.07	4.138E-02	123.10	40.790	PBC<MDA	EU154	
165.85	7. 130.22	1.10	3.629E-02	165.85	79.900	PBC<MDA	CE139	
185.53	7. 114.31	0.67	3.332E-02					
193.51	8. 110.55	1.13	3.226E-02	193.51	4.400	PBC<MDA	TH229	
205.33	-3. 367.79	1.13	3.083E-02	205.33	5.010	PBC<MDA	U235	
263.70	2. 393.70	1.18	2.539E-02	263.70	0.006	PBC<MDA	Cd113m	
295.09	6. 163.52	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	

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
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.	218.51	1.21	2.265E-02	304.85	4.290	PBC<MDA	Ba140
					304.90	28.000	5.075E-01	BI210M
328.76	6.	138.85	1.23	2.133E-02	328.76	20.300	PBC<MDA	La140
333.44	6.	149.92	1.23	2.110E-02	333.44	15.510	PBC<MDA	Cf249
338.32	6.	160.14	1.23	2.085E-02	338.32	12.010	PBC<MDA	AC228
340.57	6.	169.92	1.23	2.074E-02	340.57	46.900	PBC<MDA	Cs136
344.29	6.	178.97	1.24	2.057E-02	344.29	26.500	PBC<MDA	EU152
351.93	4.	186.91	1.24	2.021E-02	351.93	37.600	PBC<MDA	PB214
383.84	6.	113.06	1.27	1.885E-02	383.84	8.940	PBC<MDA	BA133
387.95	2.	299.38	1.27	1.869E-02	387.95	66.000	PBC<MDA	Cf249
391.69	4.	143.85	1.27	1.855E-02	391.69	64.000	PBC<MDA	SN113
427.88	5.	98.79	1.30	1.728E-02	427.88	29.600	PBC<MDA	SB125
433.94	4.	149.80	1.30	1.708E-02	433.94	90.480	PBC<MDA	AG108M
463.37	5.	100.56	1.32	1.620E-02	463.37	10.470	PBC<MDA	SB125
468.06	5.	116.47	1.33	1.606E-02	468.06	51.750	PBC<MDA	Ir192
477.60	2.	399.50	1.33	1.580E-02	477.60	10.520	PBC<MDA	BE7
511.86	24.	45.58	2.61	1.494E-02	511.86	20.000	4.464E+00	RH106
531.00	13.	27.74	1.37	1.449E-02	531.00	13.000	3.833E+00	Nd147
537.26	2.	280.50	1.37	1.436E-02	537.26	24.390	PBC<MDA	Ba140
583.02	1.	394.86	1.40	1.342E-02	583.02	84.500	PBC<MDA	TL208
600.50	5.	133.56	1.42	1.310E-02	600.50	17.860	PBC<MDA	SB125
602.73	7.	141.69	1.42	1.306E-02	602.73	98.260	PBC<MDA	SB124
635.89	3.	149.00	1.44	1.250E-02	635.89	11.310	PBC<MDA	SB125
636.97	4.	103.04	1.44	1.248E-02	636.97	7.170	PBC<MDA	I131
657.76	7.	80.50	1.45	1.215E-02	657.76	94.640	PBC<MDA	AG110M
661.66	-2.	324.88	1.46	1.209E-02	661.66	85.210	PBC<MDA	CS137
722.79	2.	180.14	1.50	1.123E-02	722.79	10.810	PBC<MDA	SB124
					722.94	90.840	1.271E-01	AG108M
					723.36	20.220	5.711E-01	EU154
735.72	6.	40.82	1.51	1.107E-02	735.72	22.500	PBC<MDA	pm146
747.16	2.	207.02	1.51	1.093E-02	747.16	34.000	PBC<MDA	pm146
778.92	1.	354.44	1.53	1.055E-02	778.92	12.940	PBC<MDA	EU152
795.87	4.	112.14	1.54	1.036E-02	795.87	85.530	PBC<MDA	CS134
810.78	12.	28.87	1.55	1.020E-02	810.78	99.460	6.570E-01	CO58
834.85	2.	207.02	1.57	9.955E-03	834.85	99.980	PBC<MDA	MN54
846.77	4.	124.14	1.58	9.836E-03	846.77	99.935	PBC<MDA	Co56
860.56	9.	33.33	1.59	9.703E-03	860.56	12.420	4.149E+00	TL208
871.10	7.	39.46	1.59	9.604E-03	871.10	99.890	PBC<MDA	NB94
911.07	3.	147.99	1.62	9.247E-03	911.07	29.000	PBC<MDA	AC228
946.02	1.	501.66	1.64	8.957E-03	946.02	13.400	PBC<MDA	PA234
964.11	0.	734.85	1.65	8.814E-03	964.11	14.605	PBC<MDA	EU152
996.33	6.	89.27	1.67	8.571E-03	996.33	10.600	PBC<MDA	EU154
1004.77	2.	397.46	1.67	8.509E-03	1004.77	18.010	PBC<MDA	EU154
1048.07	2.	173.21	1.70	8.209E-03	1048.07	80.000	PBC<MDA	Cs136

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1063.66	-3.	217.33	1.71	8.106E-03	1063.66	74.500	PBC<MDA	BI207
1112.07	9.	33.33	1.74	7.803E-03	1112.07	13.644	4.696E+00	EU152
1173.24	1.	198.61	1.77	7.453E-03	1173.24	99.900	PBC<MDA	CO60
1460.83	-2.	363.07	1.92	6.165E-03	1460.83	10.670	PBC<MDA	K40
1764.49	7.	37.80	2.07	5.226E-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 Centroid Background Net Area Efficiency Uncert FWHM Suspected
 Channel Energy Counts Counts * Area 1 Sigma % keV Nuclide

Channel	Energy	Counts	Counts	* Area	1 Sigma	%	keV	Nuclide
741.97	185.53	30.	7.	2.244E+02	114.31	0.675	-	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 Centroid Background Net Area Intensity Uncert FWHM
 Channel Energy Counts Counts Cts/Sec 1 Sigma % keV

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 1 Sigma	%	keV
PB-210	185.96	46.54	61.	-12.	-0.006	74.39	1.012s	
TH-227	200.37	50.14	60.	10.	0.006	113.81	1.015s	
AM-241	237.95	59.54	86.	-3.	-0.002	426.34	1.022	
TH-234	253.39	63.40	43.	9.	0.005	132.59	0.623s	
Sn-126	256.93	64.28	106.	-11.	-0.006	139.74	1.026s	
BA-133	323.77	80.99	44.	-12.	-0.007	107.37	1.039	
Np-237	345.77	86.49	279.	-13.	-0.007	182.62	1.043s	
EU-155	345.98	86.54	266.	-13.	-0.007	178.38	1.043s	
Sn-126	347.57	86.94	253.	-13.	-0.007	173.98	1.044s	
Sn-126	350.09	87.57	239.	-13.	-0.007	169.47	1.044s	
Cd-109	351.97	88.04	233.	-8.	-0.005	261.18	1.044s	
TH-234	370.17	92.59	280.	-62.	-0.034	23.01	1.048	
AC-228	373.21	93.35	241.	0.	0.000	1000.00	1.049s	
Gd-153	389.81	97.50	241.	0.	0.000	1000.00	1.052s	
Np-239	397.81	99.50	241.	0.	0.000	1000.00	1.053s	
Gd-153	412.62	103.20	241.	0.	0.000	1000.00	1.056s	
Np-239	414.62	103.70	241.	0.	0.000	1000.00	1.057s	
EU-155	421.07	105.31	241.	0.	0.000	1000.00	1.058s	
Np-239	424.34	106.13	214.	-15.	-0.008	143.06	1.058s	
EU-152	486.92	121.78	44.	2.	0.001	474.34	1.071s	
CO-57	488.06	122.06	46.	0.	0.000	1000.00	1.071s	
EU-154	492.22	123.10	24.	8.	0.005	90.89	1.072s	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
PA-234	525.00	131.29	124.	-11.	-0.006	143.49	1.078s
HF-181	531.92	133.02	136.	-11.	-0.006	149.38	1.079s
CE-144	533.98	133.54	147.	-7.	-0.004	247.81	1.080s
HF-181	545.02	136.30	154.	0.	0.000	1000.00	1.082s
CO-57	545.72	136.47	163.	-12.	-0.007	154.46	1.082s
CE-141	581.59	145.44	43.	-12.	-0.007	106.03	1.089s
Ba-140	650.47	162.66	67.	-12.	-0.007	99.56	1.102s
U-235	653.35	163.38	82.	-8.	-0.004	139.10	1.102s
CE-139	663.24	165.85	34.	7.	0.004	130.22	1.104
Cf-251	706.23	176.60	22.	-4.	-0.002	225.00	1.112s
TH-229	773.87	193.51	18.	8.	0.004	110.55	1.125s
U-235	821.17	205.33	29.	-3.	-0.001	367.79	1.134
TH-229	843.24	210.85	40.	-7.	-0.004	180.89	1.138s
Cf-251	907.84	227.00	28.	-4.	-0.002	263.79	1.151s
PB-212	954.37	238.63	94.	-22.	-0.012	28.11	1.159s
PB-214	967.84	242.00	98.	-13.	-0.007	112.99	1.162s
EU-152	978.62	244.69	107.	-7.	-0.004	208.15	1.164s
TH-227	1024.81	256.24	20.	-2.	-0.001	443.47	1.172s
Cd-113m	1054.65	263.70	30.	2.	0.001	393.70	1.178s
BI-210M	1063.18	265.83	34.	-5.	-0.003	170.88	1.179
TL-208	1108.99	277.28	32.	-5.	-0.003	114.12	1.188s
Hg-203	1116.66	279.20	37.	0.	0.000	1000.00	1.189s
I-131	1137.05	284.30	24.	-8.	-0.004	125.00	1.193s
PB-214	1180.22	295.09	44.	6.	0.003	163.52	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	1.205s
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	218.51	1.208s
Ir-192	1233.62	308.44	83.	0.	0.000	1000.00	1.211s
Ir-192	1265.82	316.49	71.	-3.	-0.002	362.49	1.217s
CR-51	1280.20	320.08	35.	-8.	-0.005	75.77	1.219s
La-140	1314.91	328.76	32.	6.	0.003	138.85	1.226s
Cf-249	1333.63	333.44	38.	6.	0.003	149.92	1.229s
AC-228	1353.15	338.32	44.	6.	0.003	160.14	1.233s
Cs-136	1362.15	340.57	50.	6.	0.003	169.92	1.234s
EU-152	1377.01	344.29	56.	6.	0.003	178.97	1.237s
HF-181	1383.19	345.83	138.	-11.	-0.006	148.66	1.238s
PB-214	1407.60	351.93	28.	4.	0.002	186.91	1.243s
BA-133	1423.87	356.00	41.	-6.	-0.003	164.60	1.245s
I-131	1457.81	364.48	16.	-4.	-0.002	202.07	1.252
BA-133	1535.24	383.84	20.	6.	0.003	113.06	1.266s
Cf-249	1551.68	387.95	26.	2.	0.001	299.38	1.269s
SN-113	1566.64	391.69	18.	4.	0.002	143.85	1.271s
SB-125	1711.39	427.88	4.	5.	0.003	98.79	1.297s
AG-108M	1735.64	433.94	9.	4.	0.002	149.80	1.301s
pm-146	1815.41	453.88	14.	-5.	-0.003	135.31	1.315s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
SB-125	1853.36	463.37	8.	5.	0.003	100.56	1.322s
Ir-192	1872.14	468.06	12.	5.	0.003	116.47	1.325s
BE-7	1910.28	477.60	21.	2.	0.001	399.50	1.332s
HF-181	1927.89	482.00	23.	0.	0.000	1000.00	1.335s
La-140	1947.98	487.02	23.	0.	0.000	1000.00	1.339s
RU-103	1988.12	497.05	22.	-10.	-0.005	103.42	1.346s
RH-106	2047.36	511.86	14.	24.	0.013	45.58	2.606s
Nd-147	2123.91	531.00	0.	13.	0.007	27.74	1.369s
Ba-140	2148.95	537.26	9.	2.	0.001	280.50	1.373s
CS-134	2252.86	563.24	18.	-4.	-0.002	161.84	1.391s
CS-134	2277.20	569.32	13.	-2.	-0.001	264.58	1.395s
BI-207	2278.73	569.70	19.	-3.	-0.002	249.21	1.396s
TL-208	2332.01	583.02	8.	1.	0.001	394.86	1.405s
SB-125	2401.92	600.50	19.	5.	0.003	133.56	1.416s
SB-124	2410.85	602.73	42.	7.	0.004	141.69	1.418s
CS-134	2418.76	604.71	49.	0.	0.000	1000.00	1.419s
BI-214	2437.17	609.31	52.	-3.	-0.002	173.68	1.422s
RU-103	2441.12	610.30	49.	0.	0.000	1000.00	1.423s
AG-108M	2457.05	614.28	49.	0.	0.000	1000.00	1.426s
PM-144	2472.18	618.06	49.	0.	0.000	1000.00	1.428s
RH-106	2487.60	621.92	49.	0.	0.000	1000.00	1.431s
SB-125	2543.49	635.89	11.	3.	0.002	149.00	1.440s
I-131	2547.83	636.97	8.	4.	0.002	103.04	1.441s
AG-110M	2630.98	657.76	13.	7.	0.004	80.50	1.455s
CS-137	2646.58	661.66	21.	-2.	-0.001	324.88	1.457s
PM-144	2786.11	696.54	14.	-4.	-0.002	204.63	1.480s
NB-94	2810.46	702.63	9.	-5.	-0.003	129.00	1.484s
SB-124	2891.09	722.79	8.	2.	0.001	180.14	1.497s
AG-108M	2891.70	722.94	10.	0.	0.000	1000.00	1.498s
EU-154	2893.37	723.36	25.	-9.	-0.005	84.94	1.498s
ZR-95	2896.74	724.20	29.	-6.	-0.003	137.80	1.498s
BI-212	2908.63	727.17	36.	-1.	0.000	750.66	1.500
pm-146	2942.83	735.72	0.	6.	0.003	40.82	1.506s
pm-146	2988.59	747.16	5.	2.	0.001	207.02	1.513s
ZR-95	3026.87	756.73	19.	-11.	-0.006	92.04	1.519s
AG-110M	3055.73	763.94	12.	-2.	-0.001	222.69	1.524s
NB-95	3063.11	765.79	15.	0.	0.000	1000.00	1.525s
PA-234M	3065.60	766.41	21.	-7.	-0.004	96.38	1.526s
EU-152	3115.64	778.92	5.	1.	0.001	354.44	1.534s
CS-134	3183.43	795.87	9.	4.	0.002	112.14	1.544s
CS-134	3207.77	801.95	4.	0.	0.000	1000.00	1.548s
CO-58	3243.06	810.78	0.	12.	0.007	28.87	1.554
La-140	3263.04	815.77	12.	0.	0.000	1000.00	1.557s
Cs-136	3273.97	818.50	22.	-5.	-0.003	129.28	1.559s
MN-54	3339.36	834.85	5.	2.	0.001	207.02	1.569s
Co-56	3387.05	846.77	5.	4.	0.002	124.14	1.577s
TL-208	3442.23	860.56	0.	9.	0.005	33.33	1.585
NB-94	3484.36	871.10	0.	7.	0.004	39.46	1.592s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-154	3492.89	873.23	13.	-5.	-0.003	51.93	1.593s
PA-234	3522.10	880.53	32.	-10.	-0.005	89.19	1.598s
PA-234	3532.94	883.24	42.	-9.	-0.005	102.60	1.599s
AG-110M	3538.71	884.68	51.	0.	0.000	1000.00	1.600s
y-88	3592.14	898.04	9.	-1.	-0.001	755.14	1.608s
AC-228	3644.26	911.07	5.	3.	0.002	147.99	1.616s
AG-110M	3749.96	937.49	10.	-5.	-0.003	146.06	1.633s
PA-234	3784.07	946.02	5.	1.	0.001	501.66	1.638s
EU-152	3856.43	964.11	6.	0.	0.000	734.85	1.649s
AC-228	3875.88	968.97	0.	0.	0.000	1000.00	1.652s
EU-154	3985.31	996.33	10.	6.	0.003	89.27	1.668s
EU-154	4019.10	1004.77	8.	2.	0.001	397.46	1.673s
Cs-136	4192.29	1048.07	5.	2.	0.001	173.21	1.698s
RH-106	4201.45	1050.36	2.	0.	0.000	1000.00	1.700s
BI-207	4254.65	1063.66	3.	-3.	-0.002	217.33	1.708s
Ga-68	4309.61	1077.40	10.	-3.	-0.002	238.82	1.716
FE-59	4397.02	1099.25	11.	-6.	-0.003	123.22	1.728s
EU-152	4448.32	1112.07	0.	9.	0.005	33.33	1.736s
ZN-65	4462.20	1115.55	9.	0.	0.000	1000.00	1.738s
Ta-182	4485.22	1121.30	9.	0.	0.000	1000.00	1.741s
CO-60	4692.97	1173.24	4.	1.	0.001	198.61	1.770s
Ta-182	4756.23	1189.05	0.	0.	0.000	1000.00	1.779s
Ta-182	4885.67	1221.41	0.	0.	0.000	1000.00	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.	0.	0.000	1000.00	1.835s
CO-60	5330.06	1332.50	3.	-3.	-0.002	133.26	1.857s
AG-110M	5537.25	1384.30	11.	-5.	-0.003	165.68	1.884
EU-152	5632.07	1408.00	0.	0.	0.000	1000.00	1.896s
K-40	5843.40	1460.83	8.	-2.	-0.001	363.07	1.923s
SB-124	6764.03	1690.98	0.	0.	0.000	1000.00	2.034s
BI-214	7058.07	1764.49	0.	7.	0.004	37.80	2.067s
Co-56	7085.51	1771.35	7.	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 *****

Name	Code	Average Activity Bq/Sample	Energy keV	Peak Activity Bq/Sample	Code	MDA Value Bq/Sample	COMMENTS
BE-7	C	5.5694E-01	477.60	5.569E-01	?(	8.098E+00	5.31E+01 3.99E+02 1.05E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
K-40	N	-1.2879E+00					4.66E+11	
			1460.83	-1.288E+00	?(P	1.308E+01	3.63E+02	1.07E+01 G
Sc-46	F	7.0894E-03					8.38E+01	
			889.28	7.089E-03	%(P	2.116E+00	8.39E+03	1.00E+02 G
			1120.55	-3.493E-02	% P	1.223E+00	1.43E+03	1.00E+02 G
CR-51	F	-2.1636E+00					2.77E+01	
			320.08	-2.164E+00	?(P	7.776E+00	7.58E+01	9.94E+00 G
MN-54	C	1.3025E-01					3.12E+02	
			834.85	1.302E-01	?(	7.132E-01	2.07E+02	1.00E+02 G
FE-59	F	-6.8625E-01					4.45E+01	
			1099.25	-6.863E-01	?(P	2.222E+00	1.23E+02	5.65E+01 G
			1291.60	0.000E+00	+	1.382E+00	1.00E+03	4.32E+01 G
Co-56	C	2.3064E-01					7.73E+01	
			846.77	2.306E-01	?(P	7.373E-01	1.24E+02	9.99E+01 G
			1238.28	0.000E+00	-	8.711E-01	1.00E+03	6.61E+01 G
			1037.84	-7.401E-02	% P	6.313E+00	3.95E+03	1.41E+01 G
			1771.35	0.000E+00	-	1.036E+01	1.00E+03	1.55E+01 A
CO-58	C	6.5697E-01					7.09E+01	
			810.78	6.570E-01	?(	4.035E-01	2.89E+01	9.95E+01 G
CO-60	F	-2.4444E-01					1.93E+03	
			1332.50	-2.444E-01	?(P	8.901E-01	1.33E+02	1.00E+02 G
			1173.24	1.113E-01	+ P	8.535E-01	1.99E+02	9.99E+01 G
NB-94	I	6.9317E-02					7.41E+06	
			702.63	-2.632E-01	?(	8.362E-01	1.29E+02	9.79E+01 G
			871.10	3.952E-01	?(P	4.268E-01	3.95E+01	9.99E+01 G
ZR-95	I	-9.9699E-01					6.40E+01	
			756.73	-9.970E-01	?(	2.156E+00	9.20E+01	5.45E+01 G
			724.20	-6.524E-01	+	3.129E+00	1.38E+02	4.42E+01 G
RU-103	I	-3.8620E-01					3.93E+01	
			497.05	-3.862E-01	?(	9.749E-01	1.03E+02	9.09E+01 G
			610.30	0.000E+00	+	2.641E+01	1.00E+03	5.75E+00 GA
AG-108M	C	1.5307E-01					1.53E+05	
			433.94	1.531E-01	?(P	5.927E-01	1.50E+02	9.05E+01 G
			722.94	0.000E+00	-	9.500E-01	1.00E+03	9.08E+01 G
			614.28	0.000E+00	-	1.699E+00	1.00E+03	8.98E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
AG-110M	F	1.9547E-01				2.50E+02	
		884.68	0.000E+00	?(	2.902E+00	1.00E+03	7.27E+01 G
		657.76	3.456E-01	?(	9.427E-01	8.05E+01	9.46E+01 G
		937.49	-8.957E-01	+	3.125E+00	1.46E+02	3.44E+01 G
		1384.30	-1.652E+00	&	6.348E+00	1.66E+02	2.43E+01 G
		763.94	-5.425E-01	+	4.435E+00	2.23E+02	2.23E+01 G
SN-113	F	2.0682E-01				1.15E+02	
		391.69	2.068E-01	?(	1.052E+00	1.44E+02	6.40E+01 G
SB-124	F	3.6875E-01				6.02E+01	
		602.73	2.919E-01	&(	1.429E+00	1.42E+02	9.83E+01 G
		1690.98	0.000E+00	-	1.579E+00	1.00E+03	4.78E+01 G
		722.79	1.068E+00	?(	7.143E+00	1.80E+02	1.08E+01 G
SB-125	I	9.4994E-01				1.01E+03	
		427.88	4.899E-01	?(	1.307E+00	9.88E+01	2.96E+01 G
		600.50	1.169E+00	?(	5.488E+00	1.34E+02	1.79E+01 G
		635.89	1.310E+00	?(	7.048E+00	1.49E+02	1.13E+01 G
		463.37	1.487E+00	&(P	5.221E+00	1.01E+02	1.05E+01 G
I-131	I	9.8216E-02				8.02E+00	
		364.48	-1.384E-01	?(	7.388E-01	2.02E+02	8.17E+01 G
		284.30	-3.025E+00	+	9.657E+00	1.25E+02	6.14E+00 G
		636.97	2.795E+00	?(	1.012E+01	1.03E+02	7.17E+00 G
Ga-68	C	-7.4080E+00				4.71E-02	
		1077.40	-7.408E+00	?(	4.308E+01	2.39E+02	3.30E+00 G
Tc-99m	I	-1.5265E-02				2.51E-01	
		140.51	-1.527E-02	&(	1.046E+00	1.99E+03	8.93E+01 G
BA-133	F	-1.5475E-02				3.85E+03	
		356.00	-2.534E-01	?(	1.450E+00	1.65E+02	6.20E+01 G
		302.85	7.898E-01	&(	5.598E+00	2.05E+02	1.83E+01 G
		383.84	1.964E+00	? P	7.693E+00	1.13E+02	8.94E+00 GA
		80.99	-5.123E-01	+	1.435E+00	1.07E+02	3.41E+01 GA
CS-134	I	1.2196E-01				7.54E+02	
		604.71	0.000E+00	?(	1.544E+00	1.00E+03	9.76E+01 G
		795.87	2.612E-01	?(	1.038E+00	1.12E+02	8.55E+01 G
		569.32	-5.278E-01	+	5.149E+00	2.65E+02	1.54E+01 G
		801.95	0.000E+00	-	7.588E+00	1.00E+03	8.69E+00 G
		563.24	-1.886E+00	+ P	1.081E+01	1.62E+02	8.35E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
CS-137	I	-1.0672E-01					1.10E+04
		661.66	-1.067E-01	&(P	1.303E+00	3.25E+02	8.52E+01 G
CE-139	F	1.2741E-01					1.38E+02
		165.85	1.274E-01	?{(	5.738E-01	1.30E+02	7.99E+01 G
Ba-140	I	7.9471E-01					1.28E+01
		537.26	3.519E-01	?(P	2.621E+00	2.81E+02	2.44E+01 G
		162.66	-3.011E+00	+	1.013E+01	9.96E+01	6.22E+00 G
		304.85	3.312E+00	?{(	2.496E+01	2.19E+02	4.29E+00 G
La-140	I	1.1375E-01					1.28E+01
		1596.21	-2.655E-02	%(P	7.522E-01	2.15E+03	9.54E+01 G
		487.02	0.000E+00	+	1.967E+00	1.00E+03	4.55E+01 G
		328.76	7.731E-01	?{(	3.729E+00	1.39E+02	2.03E+01 G
		815.77	0.000E+00	-	4.433E+00	1.00E+03	2.33E+01 G
CE-141	I	-3.5614E-01					3.25E+01
		145.44	-3.561E-01	?{(	9.856E-01	1.06E+02	4.82E+01 G
CE-144	I	-8.6920E-01					2.85E+02
		133.54	-8.692E-01	&{(	7.351E+00	2.48E+02	1.11E+01 G
PM-144	C	-1.9376E-01					3.63E+02
		696.54	-1.938E-01	?{(	9.759E-01	2.05E+02	9.90E+01 G
		618.06	0.000E+00	+	1.548E+00	1.00E+03	9.91E+01 G
EU-152	F	1.6488E+00					4.94E+03
		344.29	6.200E-01	?{(	3.837E+00	1.79E+02	2.65E+01 G
		1112.07	4.696E+00	?{(	3.846E+00	3.33E+01	1.36E+01 G
		121.78	9.373E-02	-	1.576E+00	4.74E+02	2.86E+01 G
		778.92	5.425E-01	?{(	5.199E+00	3.54E+02	1.29E+01 G
		964.11	2.158E-01	-	6.297E+00	7.35E+02	1.46E+01 G
		244.69	-1.947E+00	+	1.388E+01	2.08E+02	7.58E+00 G
		1408.00	0.000E+00	-	3.062E+00	1.00E+03	2.10E+01 GA
EU-154	I	-2.5534E+00					3.14E+03
		873.23	-2.553E+00	?(P	9.340E+00	5.19E+01	1.23E+01 G
		123.10	2.742E-01	+	8.484E-01	9.09E+01	4.08E+01 G
		1274.54	0.000E+00	+	1.677E+00	1.00E+03	3.52E+01 G
		723.36	-2.208E+00	+	6.347E+00	8.49E+01	2.02E+01 G
		1004.77	5.916E-01	+	5.869E+00	3.97E+02	1.80E+01 G
		996.33	3.546E+00	&	1.089E+01	8.93E+01	1.06E+01 G
TL-208	N	5.8824E-01					6.98E+02
		583.02	6.490E-02	?(P	7.739E-01	3.95E+02	8.45E+01 G
		277.28	-1.980E+00	+ P	1.056E+01	1.14E+02	6.31E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		860.56	4.149E+00	?(	3.397E+00	3.33E+01	1.24E+01 G
pm-146	C 7.4303E-01					2.02E+03	
		747.16	3.489E-01	?(	1.911E+00	2.07E+02	3.40E+01 G
		735.72	1.339E+00	?(	1.644E+00	4.08E+01	2.25E+01 G
		453.88	-2.507E-01	+ P	1.040E+00	1.35E+02	6.50E+01 G
y-88	F -8.4788E-02					1.07E+02	
		898.04	-8.479E-02	?(P	1.074E+00	7.55E+02	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	(	1.030E+04	3.94E+02	6.00E-03 K
Cd-109	F -3.0620E+00					4.53E+02	
		88.04	-3.062E+00	?(	2.711E+01	2.61E+02	3.79E+00 G
Cf-251	T -3.7782E-01					3.28E+05	
		176.60	-3.778E-01	?(	2.320E+00	2.25E+02	1.70E+01 G
		227.00	-1.236E+00	+	8.460E+00	2.64E+02	6.30E+00 GA
Cf-249	T 2.8438E-01					1.28E+05	
		387.95	1.101E-01	?(	1.183E+00	2.99E+02	6.60E+01 G
		333.44	1.026E+00	&(	5.339E+00	1.50E+02	1.55E+01 G
Sn-126	-1.9480E+00					3.65E+07	
		87.57	-4.869E-01	+	2.783E+00	1.69E+02	3.75E+01 GA
		64.28	-1.948E+00	?(	9.246E+00	1.40E+02	9.70E+00 G
		86.94	-2.026E+00	+	1.188E+01	1.74E+02	9.04E+00 GA
PB-210	N -7.5278E+00					8.14E+03	
		46.54	-7.528E+00	?(P	2.540E+01	7.44E+01	4.25E+00 G
PB-212	N -1.0240E+00					6.98E+02	
		238.63	-1.024E+00	?(P	2.241E+00	2.81E+01	4.33E+01 G
		300.03	4.374E+00	+	2.574E+01	1.70E+02	3.28E+00 GA
PB-214	N 4.4901E-01					5.84E+05	
		351.93	3.040E-01	?(P	1.996E+00	1.87E+02	3.76E+01 G
		295.09	7.315E-01	&(	4.150E+00	1.64E+02	1.93E+01 G
		242.00	-3.518E+00	&	1.344E+01	1.13E+02	7.43E+00 GA
BI-207	C -1.1218E-01					1.18E+04	
		569.70	-1.122E-01	?(P	9.498E-01	2.49E+02	9.77E+01 G
		1063.66	-2.833E-01	+ P	1.002E+00	2.17E+02	7.45E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
BI-212	N	-5.7036E-01					6.98E+02	
			727.17-5.704E-01	&(P	2.016E+01	7.51E+02	7.55E+00	G
			785.42-1.381E+00	%	7.019E+01	1.95E+03	1.28E+00	GA
BI-214	N	9.6949E-01					5.84E+05	
			609.31-3.213E-01	?(P	3.395E+00	1.74E+02	4.61E+01	G
			1120.29-2.312E-01	% P	8.096E+00	1.41E+03	1.51E+01	G
			1764.49 4.833E+00	?(	5.088E+00	3.78E+01	1.54E+01	G
BI-210M	T	-2.2024E-01					1.10E+09	
			265.83-2.202E-01	&(	1.316E+00	1.71E+02	5.00E+01	G
			304.90-3.342E-07	%	3.957E+00	3.38E+08	2.80E+01	G
AC-228	N	8.8204E-01					2.10E+03	
			911.07 6.906E-01	?(	2.647E+00	1.48E+02	2.90E+01	G
			968.97 0.000E+00	-	2.672E+00	1.00E+03	1.75E+01	G
			338.32 1.344E+00	?(	7.463E+00	1.60E+02	1.20E+01	G
			93.35 0.000E+00	-	1.838E+01	1.00E+03	5.56E+00	XA
TH-227	N	3.0574E+00					7.95E+03	
			50.14 3.057E+00	&(	1.184E+01	1.14E+02	8.00E+00	G
			256.24-6.114E-01	-	7.199E+00	4.43E+02	7.00E+00	G
TH-229	N	3.0004E+00					2.68E+06	
			193.51 3.000E+00	?(	8.869E+00	1.11E+02	4.40E+00	G
			210.85-4.306E+00	&	1.980E+01	1.81E+02	2.99E+00	G
TH-234	N	4.0068E+00					1.63E+12	
			63.29 4.007E+00	(P	1.576E+01	1.33E+02	3.81E+00	G
			92.59-1.515E+01	+ P	1.972E+01	2.30E+01	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	3.1469E-01					7.82E+08	
			312.01-2.986E-02	%(P	3.142E+00	1.48E+03	3.60E+01	G
			300.18 2.315E+00	?(	1.510E+01	1.89E+02	6.20E+00	G
PA-234	N	-2.9231E-01					1.63E+12	
			131.29-8.545E-01	?(	4.158E+00	1.43E+02	1.80E+01	G
			946.02 4.629E-01	?(	6.078E+00	5.02E+02	1.34E+01	G
			569.47-2.475E-01	%	1.042E+01	1.12E+03	8.20E+00	G
			883.24-5.718E+00	+	1.998E+01	1.03E+02	9.60E+00	G
			880.53-9.359E+00	+	2.828E+01	8.92E+01	6.00E+00	GA

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
PA-234M	N -3.4240E+00						1.63E+12
		1001.00-3.424E+00	%(P 1.767E+02		1.39E+03	8.37E-01	G
		766.41-1.198E+02	+ P 4.292E+02		9.64E+01	2.94E-01	G
U-235	N -2.1186E-02						2.57E+11
		143.79-2.119E-02	%(P 4.806E+00		6.40E+03	1.10E+01	G
		205.33-9.518E-01	+ P 9.947E+00		3.68E+02	5.01E+00	G
		163.38-2.387E+00	+ P 1.372E+01		1.39E+02	5.08E+00	G
AM-241	T -1.6463E-01						1.58E+05
		59.54-1.646E-01	?(P 2.471E+00		4.26E+02	3.59E+01	G
Np-237	F -1.4008E+00						2.14E+06
		86.49-1.401E+00	?(	8.622E+00	1.83E+02	1.31E+01	G
Ir-192	F 5.4126E-02						7.40E+01
		316.49-9.676E-02	?(	1.221E+00	3.62E+02	8.70E+01	G
		468.06 3.079E-01	* (	1.264E+00	1.16E+02	5.18E+01	G
		308.44 0.000E+00	-	3.522E+00	1.00E+03	3.18E+01	G
Cs-136	F -9.1859E-02						1.30E+01
		818.50-2.975E-01	?(	1.344E+00	1.29E+02	1.00E+02	G
		1048.07 1.692E-01	+	1.111E+00	1.73E+02	8.00E+01	G
		340.57 3.465E-01	?(	2.039E+00	1.70E+02	4.69E+01	G
Np-239	T -8.6048E-01						2.36E+00
		103.70 0.000E+00	+	4.161E+00	1.00E+03	2.40E+01	X
		106.13-8.605E-01	?(	4.147E+00	1.43E+02	2.27E+01	G
		99.50 0.000E+00	+	6.702E+00	1.00E+03	1.50E+01	X
Nd-147	3.8331E+00						1.11E+01
		531.00 3.833E+00	?(	2.173E+00	2.77E+01	1.30E+01	G
		91.10-4.625E-08	%	3.642E+00	2.30E+09	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	61.	-12.	-0.006	74.39	-7.528E+00	P
TH-227	50.14	60.	10.	0.006	113.81	3.057E+00	
AM-241	59.54	86.	-3.	-0.002	426.34	-1.646E-01	P
Sn-126	64.28	106.	-11.	-0.006	139.74	-1.948E+00	
BA-133	80.99	44.	-12.	-0.007	107.37	-5.123E-01	
Np-237	86.49	279.	-13.	-0.007	182.62	-1.401E+00	
EU-155	86.54	266.	-13.	-0.007	178.38	-5.976E-01	
Sn-126	86.94	253.	-13.	-0.007	173.98	-2.026E+00	
Sn-126	87.57	239.	-13.	-0.007	169.47	-4.869E-01	
Cd-109	88.04	233.	-8.	-0.005	261.18	-3.062E+00	
Np-239	106.13	214.	-15.	-0.008	143.06	-8.605E-01	
EU-152	121.78	44.	2.	0.001	474.34	9.373E-02	
EU-154	123.10	24.	8.	0.005	90.89	2.742E-01	
PA-234	131.29	124.	-11.	-0.006	143.49	-8.545E-01	
HF-181	133.02	136.	-11.	-0.006	149.38	-3.574E-01	
CE-144	133.54	147.	-7.	-0.004	247.81	-8.692E-01	
CO-57	136.47	163.	-12.	-0.007	154.46	-1.547E+00	
CE-141	145.44	43.	-12.	-0.007	106.03	-3.561E-01	
Ba-140	162.66	67.	-12.	-0.007	99.56	-3.011E+00	
U-235	163.38	82.	-8.	-0.004	139.10	-2.387E+00	P
CE-139	165.85	34.	7.	0.004	130.22	1.274E-01	
Cf-251	176.60	22.	-4.	-0.002	225.00	-3.778E-01	
TH-229	193.51	18.	8.	0.004	110.55	3.000E+00	
U-235	205.33	29.	-3.	-0.001	367.79	-9.518E-01	P
TH-229	210.85	40.	-7.	-0.004	180.89	-4.306E+00	
Cf-251	227.00	28.	-4.	-0.002	263.79	-1.236E+00	
PB-214	242.00	98.	-13.	-0.007	112.99	-3.518E+00	
EU-152	244.69	107.	-7.	-0.004	208.15	-1.947E+00	
TH-227	256.24	20.	-2.	-0.001	443.47	-6.114E-01	
Cd-113m	263.70	30.	2.	0.001	393.70	7.295E+02	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
BI-210M	265.83	34.	-5.	-0.003	170.88	-2.202E-01	
TL-208	277.28	32.	-5.	-0.003	114.12	-1.980E+00	P
I-131	284.30	24.	-8.	-0.004	125.00	-3.025E+00	
PB-214	295.09	44.	6.	0.003	163.52	7.315E-01	
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	
Ba-140	304.85	77.	6.	0.003	218.51	3.312E+00	
Ir-192	316.49	71.	-3.	-0.002	362.49	-9.676E-02	
CR-51	320.08	35.	-8.	-0.005	75.77	-2.164E+00	P
La-140	328.76	32.	6.	0.003	138.85	7.731E-01	
Cf-249	333.44	38.	6.	0.003	149.92	1.026E+00	
AC-228	338.32	44.	6.	0.003	160.14	1.344E+00	
Cs-136	340.57	50.	6.	0.003	169.92	3.465E-01	
EU-152	344.29	56.	6.	0.003	178.97	6.200E-01	
HF-181	345.83	138.	-11.	-0.006	148.66	-2.049E+00	
PB-214	351.93	28.	4.	0.002	186.91	3.040E-01	P
BA-133	356.00	41.	-6.	-0.003	164.60	-2.534E-01	
I-131	364.48	16.	-4.	-0.002	202.07	-1.384E-01	
BA-133	383.84	20.	6.	0.003	113.06	1.964E+00	P
Cf-249	387.95	26.	2.	0.001	299.38	1.101E-01	
SN-113	391.69	18.	4.	0.002	143.85	2.068E-01	
SB-125	427.88	4.	5.	0.003	98.79	4.899E-01	
AG-108M	433.94	9.	4.	0.002	149.80	1.531E-01	P
pm-146	453.88	14.	-5.	-0.003	135.31	-2.507E-01	P
SB-125	463.37	8.	5.	0.003	100.56	1.487E+00	P
Ir-192	468.06	12.	5.	0.003	116.47	3.079E-01	
BE-7	477.60	21.	2.	0.001	399.50	5.569E-01	
RU-103	497.05	22.	-10.	-0.005	103.42	-3.862E-01	
RH-106	511.86	14.	24.	0.013	45.58	4.464E+00	
Ba-140	537.26	9.	2.	0.001	280.50	3.519E-01	P
CS-134	563.24	18.	-4.	-0.002	161.84	-1.886E+00	P
CS-134	569.32	13.	-2.	-0.001	264.58	-5.278E-01	
BI-207	569.70	19.	-3.	-0.002	249.21	-1.122E-01	P
TL-208	583.02	8.	1.	0.001	394.86	6.490E-02	P
SB-125	600.50	19.	5.	0.003	133.56	1.169E+00	
SB-124	602.73	42.	7.	0.004	141.69	2.919E-01	
BI-214	609.31	52.	-3.	-0.002	173.68	-3.213E-01	P
SB-125	635.89	11.	3.	0.002	149.00	1.310E+00	
I-131	636.97	8.	4.	0.002	103.04	2.795E+00	
AG-110M	657.76	13.	7.	0.004	80.50	3.456E-01	
CS-137	661.66	21.	-2.	-0.001	324.88	-1.067E-01	P
PM-144	696.54	14.	-4.	-0.002	204.63	-1.938E-01	
NB-94	702.63	9.	-5.	-0.003	129.00	-2.632E-01	
SB-124	722.79	8.	2.	0.001	180.14	1.068E+00	
EU-154	723.36	25.	-9.	-0.005	84.94	-2.208E+00	
ZR-95	724.20	29.	-6.	-0.003	137.80	-6.524E-01	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
BI-212	727.17	36.	-1.	0.000	750.66	-5.704E-01	P
pm-146	735.72	0.	6.	0.003	40.82	1.339E+00	
pm-146	747.16	5.	2.	0.001	207.02	3.489E-01	
ZR-95	756.73	19.	-11.	-0.006	92.04	-9.970E-01	
AG-110M	763.94	12.	-2.	-0.001	222.69	-5.425E-01	
PA-234M	766.41	21.	-7.	-0.004	96.38	-1.198E+02	P
EU-152	778.92	5.	1.	0.001	354.44	5.425E-01	
CS-134	795.87	9.	4.	0.002	112.14	2.612E-01	
Cs-136	818.50	22.	-5.	-0.003	129.28	-2.975E-01	
MN-54	834.85	5.	2.	0.001	207.02	1.302E-01	
Co-56	846.77	5.	4.	0.002	124.14	2.306E-01	P
TL-208	860.56	0.	9.	0.005	33.33	4.149E+00	
NB-94	871.10	0.	7.	0.004	39.46	3.952E-01	P
EU-154	873.23	13.	-5.	-0.003	51.93	-2.553E+00	P
PA-234	880.53	32.	-10.	-0.005	89.19	-9.359E+00	
PA-234	883.24	42.	-9.	-0.005	102.60	-5.718E+00	
y-88	898.04	9.	-1.	-0.001	755.14	-8.479E-02	P
AC-228	911.07	5.	3.	0.002	147.99	6.906E-01	
AG-110M	937.49	10.	-5.	-0.003	146.06	-8.957E-01	
PA-234	946.02	5.	1.	0.001	501.66	4.629E-01	
EU-152	964.11	6.	0.	0.000	734.85	2.158E-01	
EU-154	996.33	10.	6.	0.003	89.27	3.546E+00	
EU-154	1004.77	8.	2.	0.001	397.46	5.916E-01	
Cs-136	1048.07	5.	2.	0.001	173.21	1.692E-01	
BI-207	1063.66	3.	-3.	-0.002	217.33	-2.833E-01	P
Ga-68	1077.40	10.	-3.	-0.002	238.82	-7.408E+00	
FE-59	1099.25	11.	-6.	-0.003	123.22	-6.863E-01	P
EU-152	1112.07	0.	9.	0.005	33.33	4.696E+00	
CO-60	1173.24	4.	1.	0.001	198.61	1.113E-01	P
CO-60	1332.50	3.	-3.	-0.002	133.26	-2.444E-01	P
AG-110M	1384.30	11.	-5.	-0.003	165.68	-1.652E+00	
K-40	1460.83	8.	-2.	-0.001	363.07	-1.288E+00	P
BI-214	1764.49	0.	7.	0.004	37.80	4.833E+00	

P - Peakbackground subtraction

***** SUMMARY OF NUCLIDES IN SAMPLE *****					
Nuclide	Time of Count	Time Corrected	Uncertainty	1 Sigma	
	Activity	Activity	Counting	MDA	
	Bq/Sample	Bq/Sample		Bq/Sample	
BE-7	#A	5.5694E-01	5.5694E-01	3.995E+02%	8.10E+00
NA-22	#A	0.0000E+00	0.0000E+00	1.000E+03%	5.90E-01
K-40	#A	-1.2879E+00	-1.2879E+00	3.631E+02%	1.31E+01
Sc-46	#A	7.0894E-03	7.0894E-03	8.385E+03%	2.12E+00
CR-51	#A	-2.1636E+00	-2.1636E+00	7.577E+01%	7.78E+00
MN-54	#A	1.3025E-01	1.3025E-01	2.070E+02%	7.13E-01
FE-59	#A	-6.8624E-01	-6.8625E-01	1.232E+02%	2.22E+00

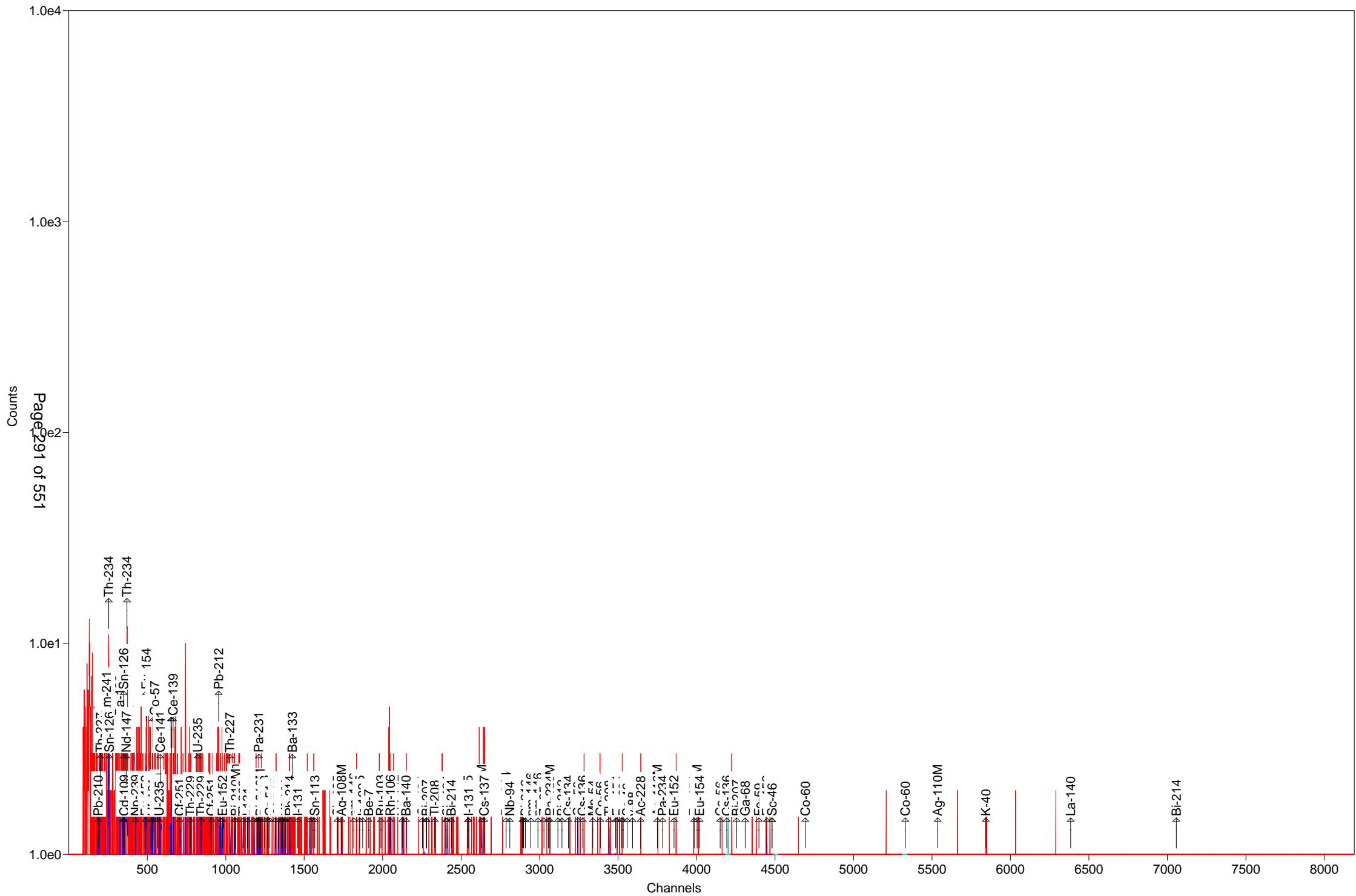
Co-56 #A	2.3064E-01	2.3064E-01	1.241E+02%	7.37E-01
CO-57 #A	0.0000E+00	0.0000E+00	1.000E+03%	5.37E-01
CO-58 #	6.5697E-01	6.5697E-01	2.887E+01%	4.03E-01
CO-60 #A	-2.4444E-01	-2.4444E-01	1.333E+02%	8.90E-01
ZN-65 #A	0.0000E+00	0.0000E+00	1.000E+03%	2.35E+00
NB-94 #A	6.9317E-02	6.9317E-02	3.946E+01%	8.36E-01
ZR-95 #A	-9.9698E-01	-9.9699E-01	9.204E+01%	2.16E+00
NB-95 #A	0.0000E+00	0.0000E+00	1.000E+03%	1.07E+00
RU-103 #A	-3.8620E-01	-3.8620E-01	1.034E+02%	9.75E-01
RH-106 #A	0.0000E+00	0.0000E+00	7.071E+02%	1.55E+01
AG-108M#A	1.5307E-01	1.5307E-01	1.498E+02%	5.93E-01
AG-110M#A	1.9547E-01	1.9547E-01	8.050E+01%	2.90E+00
SN-113 #A	2.0682E-01	2.0682E-01	1.438E+02%	1.05E+00
SB-124 #A	3.6875E-01	3.6875E-01	1.146E+02%	1.43E+00
SB-125 #A	9.4994E-01	9.4994E-01	6.119E+01%	1.31E+00
I-131 #A	9.8211E-02	9.8216E-02	1.030E+02%	7.39E-01
Gd-153 #A	0.0000E+00	0.0000E+00	7.071E+02%	3.37E+00
Ga-68 #A	-7.3464E+00	-7.4080E+00	2.388E+02%	4.31E+01
Tc-99m #A	-1.5241E-02	-1.5265E-02	1.995E+03%	1.05E+00
BA-133 #A	-1.5475E-02	-1.5475E-02	1.316E+02%	1.45E+00
CS-134 #A	1.2196E-01	1.2196E-01	1.121E+02%	1.54E+00
CS-137 #A	-1.0672E-01	-1.0672E-01	3.249E+02%	1.30E+00
CE-139 #A	1.2741E-01	1.2741E-01	1.302E+02%	5.74E-01
Ba-140 #A	7.9468E-01	7.9471E-01	1.778E+02%	2.62E+00
La-140 #A	1.1375E-01	1.1375E-01	1.389E+02%	7.52E-01
CE-141 #A	-3.5613E-01	-3.5614E-01	1.060E+02%	9.86E-01
CE-144 #A	-8.6920E-01	-8.6920E-01	2.478E+02%	7.35E+00
PM-144 #A	-1.9376E-01	-1.9376E-01	2.046E+02%	9.76E-01
EU-152 #A	1.6488E+00	1.6488E+00	3.333E+01%	3.84E+00
EU-154 #A	-2.5534E+00	-2.5534E+00	5.193E+01%	9.34E+00
EU-155 #A	0.0000E+00	0.0000E+00	1.000E+03%	4.70E+00
HF-181 #A	0.0000E+00	0.0000E+00	7.071E+02%	1.10E+00
Ta-182 #A	0.0000E+00	0.0000E+00	5.774E+02%	3.43E+00
Hg-203 #A	0.0000E+00	0.0000E+00	1.000E+03%	8.73E-01
TL-208 #A	5.8824E-01	5.8824E-01	3.333E+01%	7.74E-01
pm-146 #A	7.4303E-01	7.4303E-01	4.082E+01%	1.91E+00
y-88 #A	-8.4788E-02	-8.4788E-02	7.551E+02%	1.07E+00
Cd-113m#A	7.2951E+02	7.2951E+02	3.937E+02%	1.03E+04
Cd-109 #A	-3.0620E+00	-3.0620E+00	2.612E+02%	2.71E+01
Cf-251 #A	-3.7782E-01	-3.7782E-01	2.250E+02%	2.32E+00
Cf-249 #A	2.8438E-01	2.8438E-01	1.499E+02%	1.18E+00
Sn-126 #A	-1.9480E+00	-1.9480E+00	1.397E+02%	9.25E+00
PB-210 #A	-7.5278E+00	-7.5278E+00	7.439E+01%	2.54E+01
PB-212 #A	-1.0240E+00	-1.0240E+00	2.811E+01%	2.24E+00
PB-214 #A	4.4901E-01	4.4901E-01	1.242E+02%	2.00E+00
BI-207 #A	-1.1218E-01	-1.1218E-01	2.492E+02%	9.50E-01
BI-212 #A	-5.7036E-01	-5.7036E-01	7.507E+02%	2.02E+01
BI-214 #A	9.6949E-01	9.6949E-01	3.780E+01%	3.40E+00
BI-210M#A	-2.2024E-01	-2.2024E-01	1.709E+02%	1.32E+00

AC-228 #A	8.8204E-01	8.8204E-01	1.090E+02%	2.65E+00
TH-227 #A	3.0574E+00	3.0574E+00	1.138E+02%	1.18E+01
TH-229 #A	3.0004E+00	3.0004E+00	1.105E+02%	8.87E+00
TH-234 A	4.0068E+00	4.0068E+00	1.326E+02%	1.58E+01
PA-231 #A	5.3963E+00	5.3963E+00	1.332E+02%	3.42E+01
PA-233 #A	3.1469E-01	3.1469E-01	1.885E+02%	3.14E+00
PA-234 #A	-2.9231E-01	-2.9231E-01	1.435E+02%	4.16E+00
PA-234M#A	-3.4240E+00	-3.4240E+00	1.387E+03%	1.77E+02
U-235 #A	-2.1186E-02	-2.1186E-02	6.400E+03%	4.81E+00
AM-241 #A	-1.6463E-01	-1.6463E-01	4.263E+02%	2.47E+00
Np-237 #A	-1.4008E+00	-1.4008E+00	1.826E+02%	8.62E+00
Ir-192 #A	5.4126E-02	5.4126E-02	1.165E+02%	1.22E+00
Cs-136 #A	-9.1856E-02	-9.1859E-02	1.068E+02%	1.34E+00
Np-239 #A	-8.6034E-01	-8.6048E-01	1.431E+02%	4.15E+00
Nd-147 #	3.8330E+00	3.8331E+00	2.774E+01%	2.17E+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



Sample Description: 257060_Gamma_LCS 160-257060~2-A

Detector: Detector # 7

Batch ID: 257060

Work Order Number: Gamma

Lot Number: LCS 160-257060~2-A

Decay to Time: 7/11/2016 07:47 Live Time: 1800 sec
 Acquisition Time: 7/11/2016 07:47:36 Real Time: 1838 sec
 Analysis Time: 7/11/2016 08:18 Dead Time: 2.07 %
 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_2016-07-10_0612.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	-1.345E+01	103.0	1.385E+01	1.387E+01	4.594E+01
NA-22	8.951E-02	673.6	6.030E-01	6.030E-01	2.152E+00
K-40	8.870E+00	33.9	3.009E+00	3.043E+00	7.230E+00
Sc-46	5.393E-01	318.4	1.717E+00	1.718E+00	5.765E+00
CR-51	-2.573E+00	599.0	1.541E+01	1.541E+01	5.128E+01
MN-54	1.715E+00	83.7	1.436E+00	1.438E+00	3.217E+00
FE-59	6.920E-01	535.4	3.706E+00	3.706E+00	7.858E+00
Co-56	4.986E-01	177.1	8.832E-01	8.836E-01	3.774E+00
CO-57	0.000E+00	1.#INF	3.960E-01	3.960E-01	2.164E+00
CO-58	1.698E+00	83.9	1.425E+00	1.427E+00	4.727E+00
CO-60	2.023E+02	1.3	2.674E+00	1.050E+01	1.051E+00
ZN-65	0.000E+00	1.#INF	1.448E+00	1.448E+00	1.187E+01
NB-94	-1.203E-01	1026.3	1.235E+00	1.235E+00	2.817E+00
ZR-95	2.441E+00	87.3	2.132E+00	2.136E+00	4.795E+00
NB-95	8.424E-01	122.8	1.035E+00	1.036E+00	3.467E+00
RU-103	1.327E+00	95.3	1.264E+00	1.266E+00	2.935E+00
RH-106	2.976E+01	50.7	1.509E+01	1.517E+01	3.186E+01
AG-108M	1.055E-01	1276.7	1.346E+00	1.346E+00	3.279E+00
AG-110M	1.666E+00	32.9	5.473E-01	5.539E-01	7.419E+00
SN-113	2.393E-01	793.8	1.900E+00	1.900E+00	6.352E+00
SB-124	-7.880E-01	139.7	1.101E+00	1.102E+00	5.735E+00
SB-125	4.121E+00	95.5	3.936E+00	3.942E+00	9.494E+00
I-131	1.524E+00	105.6	1.610E+00	1.612E+00	2.962E+00
Gd-153	-1.998E+00	143.6	2.870E+00	2.872E+00	9.508E+00
Ga-68	3.000E+01	227.9	6.835E+01	6.837E+01	1.448E+02
Tc-99m	-6.605E-01	121.5	8.026E-01	8.035E-01	2.661E+00
BA-133	1.584E+00	95.1	1.506E+00	1.508E+00	4.997E+00
CS-134	1.979E+00	83.6	1.653E+00	1.656E+00	5.736E+00
CS-137	3.623E+02	1.2	4.313E+00	1.933E+01	3.208E+00
CE-139	7.294E-01	101.9	7.436E-01	7.469E-01	2.466E+00
Ba-140	-5.921E+00	101.7	6.020E+00	6.028E+00	1.261E+01
La-140	1.058E+00	33.3	3.528E-01	3.572E-01	6.371E-01
CE-141	1.152E+00	157.5	1.815E+00	1.816E+00	6.016E+00

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CE-144	3.020E+00	189.5	5.723E+00	5.725E+00	1.903E+01
PM-144	-3.956E-01	134.3	5.312E-01	5.316E-01	3.073E+00
EU-152	3.963E+00	74.2	2.940E+00	2.947E+00	1.230E+01
EU-154	5.438E+00	182.4	9.919E+00	9.923E+00	3.338E+01
EU-155	9.627E-01	174.6	1.681E+00	1.681E+00	1.356E+01
HF-181	4.705E-01	114.0	5.362E-01	5.368E-01	6.163E+00
Ta-182	-7.201E+00	79.1	5.693E+00	5.705E+00	1.886E+01
Hg-203	7.744E-02	1123.5	8.700E-01	8.700E-01	2.922E+00
TL-208	5.187E+00	23.9	1.241E+00	1.270E+00	2.517E+00
pm-146	1.310E+00	139.5	1.828E+00	1.829E+00	8.566E+00
y-88	2.069E+00	86.4	1.788E+00	1.792E+00	3.868E+00
Cd-113m	-1.427E+04	107.1	1.529E+04	1.532E+04	5.070E+04
Cd-109	1.717E+01	130.7	2.244E+01	2.246E+01	7.433E+01
Cf-251	-3.709E+00	90.4	3.353E+00	3.369E+00	1.111E+01
Cf-249	1.801E+00	96.9	1.746E+00	1.748E+00	5.564E+00
Sn-126	-1.860E+00	478.2	8.894E+00	8.894E+00	2.964E+01
PB-210	1.033E+04	1.0	1.049E+02	6.156E+02	1.831E+02
PB-212	6.940E+00	26.6	1.846E+00	1.900E+00	4.250E+00
PB-214	2.346E+00	94.7	2.221E+00	2.225E+00	7.444E+00
BI-207	1.303E-02	88.6	1.154E-02	1.156E-02	3.052E+00
BI-212	-1.510E+01	104.6	1.579E+01	1.581E+01	5.264E+01
BI-214	6.942E+00	23.6	1.639E+00	1.678E+00	3.965E+00
BI-210M	-1.736E+00	43.3	7.523E-01	7.593E-01	5.969E+00
AC-228	8.558E-01	40.8	3.493E-01	3.520E-01	1.482E+01
TH-227	-3.273E+01	190.9	6.248E+01	6.251E+01	2.063E+02
TH-229	3.647E+00	96.1	3.505E+00	3.517E+00	4.319E+01
TH-234	-3.097E+01	234.4	7.260E+01	7.262E+01	7.253E+01
PA-231	-3.327E+01	157.1	5.225E+01	5.228E+01	1.733E+02
PA-233	2.683E+00	155.3	4.167E+00	4.170E+00	1.382E+01
PA-234	7.870E+00	68.8	5.414E+00	5.429E+00	1.132E+01
PA-234M	-6.157E+01	358.1	2.205E+02	2.205E+02	8.350E+02
U-235	5.056E+00	160.5	8.116E+00	8.120E+00	2.691E+01
AM-241	1.210E+03	0.7	8.995E+00	6.345E+01	1.294E+01
Np-237	0.000E+00	1.#INF	7.012E+00	7.012E+00	2.330E+01
Ir-192	1.061E+00	147.1	1.560E+00	1.561E+00	5.747E+00
Cs-136	1.617E+00	86.2	1.394E+00	1.397E+00	4.629E+00
Np-239	2.531E+00	139.9	3.541E+00	3.544E+00	1.173E+01
Nd-147	1.557E+00	131.4	2.045E+00	2.047E+00	2.124E+01

Total	1.228E+04				

Analyst: Amanda Dick

Sample description
257060_Gamma_LCS 160-257060~2-A

Spectrum Filename: C:\User\SPC\Det7\7_Gamma_20161686.An1

Acquisition information

Start time: 7/11/2016 7:47:36 AM
Live time: 1800
Real time: 1838
Dead time: 2.07 %
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): $6.716580E-01 + (-6.166540E-01 * \text{Log}(E)) + (-2.065917E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.48 %
Log(Eff): $-2.689695E+01 + (1.019544E+01 * \text{Log}(E)) + (-1.081671E+00 * \text{Log}(E)^2)$

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	7/11/2016 7:47:00 AM
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	7_2016-07-10_0612.PBC 7/10/2016 6:12:03 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 25 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.1233

***** 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
46.57	19620.	1.02	0.94	2.486E-02	46.54	4.250	1.033E+04	PB210
59.56	28945.	0.74	0.95	3.703E-02	59.54	35.900	1.210E+03	AM241
77.04	217.	21.29	1.21	4.884E-02				
86.55	0.	539.99	0.88	5.279E-02	86.49	13.100	PBC<MDA	Np237
					86.54	30.700	PBC<MDA	EU155
					86.94	9.040	PBC<MDA	Sn126
87.94	279.	20.25	0.91	5.326E-02	87.57	37.500	7.783E+00	Sn126
					88.04	3.790	7.679E+01	Cd109
91.10	63.	131.39	0.88	5.415E-02	91.10	28.300	PBC<MDA	Nd147
92.59	35.	233.10	0.89	5.452E-02	92.59	5.584	PBC<MDA	TH234
93.35	63.	133.40	0.89	5.470E-02	93.35	5.561	PBC<MDA	AC228
106.13	58.	139.89	0.90	5.643E-02	106.13	22.700	PBC<MDA	Np239
121.53	48.	115.58	0.92	5.608E-02	121.78	28.580	PBC<MDA	EU152
131.29	54.	112.57	0.93	5.493E-02	131.29	18.000	PBC<MDA	PA234
133.02	54.	113.97	0.93	5.467E-02	133.02	43.300	PBC<MDA	HF181
133.54	33.	189.51	0.93	5.459E-02	133.54	11.090	PBC<MDA	CE144
144.39	53.	160.54	0.94	5.271E-02	143.79	10.960	PBC<MDA	U235
145.44	52.	157.48	0.94	5.237E-02	145.44	48.200	PBC<MDA	CE141
165.85	51.	101.95	0.96	4.881E-02	165.85	79.900	PBC<MDA	CE139
178.67	64.	42.69	0.56	4.589E-02				
210.85	52.	96.48	1.01	3.997E-02	210.85	2.990	PBC<MDA	TH229
214.78	32.	76.11	0.43	3.935E-02				

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
227.00	6.	798.92	1.03	3.757E-02	227.00	6.300	PBC<MDA	Cf251
238.60	195.	26.60	0.92	3.602E-02	238.63	43.300	6.940E+00	PB212
242.00	7.	782.07	1.04	3.560E-02	242.00	7.430	PBC<MDA	PB214
256.24	9.	533.46	1.06	3.392E-02	256.24	7.000	PBC<MDA	TH227
269.97	77.	35.06	0.56	3.245E-02				
277.80	52.	50.24	0.48	3.167E-02	277.28	6.310	1.434E+01	TL208
295.09	24.	195.83	1.10	3.009E-02	295.09	19.300	PBC<MDA	PB214
306.93	69.	33.44	1.11	2.910E-02				
310.53	70.	38.25	1.12	2.882E-02				
312.01	50.	155.31	1.12	2.869E-02	312.01	36.000	PBC<MDA	PA233
316.32	28.	270.59	1.12	2.834E-02	316.49	87.040	PBC<MDA	Ir192
317.33	50.	50.70	1.12	2.826E-02	316.49	87.040	1.132E+00	Ir192
318.58	8.	318.20	1.12	2.816E-02				
333.44	47.	96.92	1.14	2.711E-02	333.44	15.510	PBC<MDA	Cf249
338.74	62.	40.81	1.45	2.677E-02	338.32	12.010	PBC<MDA	AC228
345.83	15.	331.17	1.15	2.627E-02	345.83	15.070	PBC<MDA	HF181
351.93	42.	94.67	1.16	2.588E-02	351.93	37.600	PBC<MDA	PB214
356.00	45.	95.10	1.16	2.562E-02	356.00	62.050	PBC<MDA	BA133
364.48	36.	125.61	1.17	2.511E-02	364.48	81.700	PBC<MDA	I131
375.44	16.	97.63	0.44	2.448E-02				
387.95	22.	218.04	1.19	2.380E-02	387.95	66.000	PBC<MDA	Cf249
390.58	7.	793.82	1.20	2.360E-02	391.69	64.000	PBC<MDA	SN113
427.88	48.	95.53	1.23	2.186E-02	427.88	29.600	PBC<MDA	SB125
453.88	33.	139.47	1.26	2.077E-02	453.88	65.000	PBC<MDA	pm146
468.64	33.	147.09	1.27	2.022E-02	468.06	51.750	PBC<MDA	Ir192
487.02	44.	119.49	1.29	1.954E-02	487.02	45.500	PBC<MDA	La140
497.05	42.	95.29	1.30	1.919E-02	497.05	90.900	PBC<MDA	RU103
511.86	84.	74.63	2.56	1.870E-02	511.86	20.000	PBC<MDA	RH106
563.24	18.	187.55	1.36	1.720E-02	563.24	8.350	PBC<MDA	CS134
569.47	40.	69.06	1.37	1.704E-02	569.32	15.380	PBC<MDA	CS134
					569.47	8.200	1.573E+01	PA234
					569.70	97.740	1.320E+00	BI207
583.62	132.	23.93	2.10	1.669E-02	583.02	84.500	5.187E+00	TL208
609.55	92.	23.61	1.23	1.605E-02	609.31	46.090	6.942E+00	BI214
618.06	21.	134.27	1.42	1.585E-02	618.06	99.100	PBC<MDA	PM144
621.92	34.	79.19	1.42	1.576E-02	621.92	9.930	PBC<MDA	RH106
636.97	16.	169.86	1.43	1.543E-02	636.97	7.170	PBC<MDA	I131
661.79	8293.	1.19	1.49	1.492E-02	661.66	85.210	3.623E+02	CS137
747.16	10.	309.03	1.53	1.340E-02	747.16	34.000	PBC<MDA	pm146
756.73	32.	87.34	1.54	1.325E-02	756.73	54.460	PBC<MDA	ZR95
765.79	20.	122.83	1.55	1.311E-02	765.79	99.790	PBC<MDA	NB95
					766.41	0.294	2.861E+02	PA234M
778.92	15.	199.67	1.56	1.291E-02	778.92	12.940	PBC<MDA	EU152
785.42	14.	216.40	1.57	1.281E-02	785.42	1.280	PBC<MDA	BI212
801.95	38.	83.55	1.58	1.258E-02	801.95	8.690	PBC<MDA	CS134
810.78	38.	83.88	1.59	1.246E-02	810.78	99.460	PBC<MDA	CO58
815.77	11.	283.87	1.59	1.239E-02	815.77	23.280	PBC<MDA	La140
818.50	36.	86.21	1.60	1.235E-02	818.50	100.000	PBC<MDA	Cs136

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
834.85	37.	83.69	1.61	1.213E-02	834.85	99.980	PBC<MDA	MN54
860.56	7.	530.87	1.63	1.181E-02	860.56	12.420	PBC<MDA	TL208
873.23	14.	182.39	1.64	1.166E-02	873.23	12.270	PBC<MDA	EU154
886.42	22.	47.64	0.64	1.150E-02	884.68	72.680	PBC<MDA	AG110M
889.27	11.	318.45	1.66	1.147E-02	889.28	99.984	PBC<MDA	Sc46
898.04	40.	86.44	1.66	1.137E-02	898.04	93.700	PBC<MDA	y88
946.02	25.	158.58	1.70	1.085E-02	946.02	13.400	PBC<MDA	PA234
964.11	37.	92.01	1.72	1.066E-02	964.11	14.605	PBC<MDA	EU152
970.00	48.	42.47	0.72	1.061E-02	968.97	17.460	PBC<MDA	AC228
989.81	32.	44.72	0.46	1.041E-02				
1037.84	17.	187.32	1.78	9.978E-03	1037.84	14.130	PBC<MDA	Co56
1050.36	39.	63.41	1.79	9.871E-03	1050.36	1.560	PBC<MDA	RH106
1063.66	18.	184.19	1.80	9.759E-03	1063.66	74.500	PBC<MDA	BI207
1077.40	15.	227.86	1.81	9.646E-03	1077.40	3.300	PBC<MDA	Ga68
1099.25	7.	535.44	1.83	9.472E-03	1099.25	56.500	PBC<MDA	FE59
1112.07	20.	146.01	1.84	9.373E-03	1112.07	13.644	PBC<MDA	EU152
1120.19	9.	318.46	1.85	9.309E-03	1120.29	15.100	PBC<MDA	BI214
					1120.55	99.987	5.393E-01	Sc46
1173.44	3255.	1.86	1.92	8.927E-03	1173.24	99.900	2.028E+02	CO60
1189.05	5.	426.18	1.90	8.821E-03	1189.05	16.200	PBC<MDA	Ta182
1238.28	6.	275.00	1.94	8.501E-03	1238.28	66.070	PBC<MDA	Co56
1274.53	1.	673.61	1.96	8.280E-03	1274.53	99.940	PBC<MDA	NA22
					1274.54	35.190	2.542E-01	EU154
1332.68	2889.	1.88	2.15	7.950E-03	1332.50	99.980	2.019E+02	CO60
1384.30	10.	32.86	2.04	7.678E-03	1384.30	24.290	2.909E+00	AG110M
1460.83	12.	33.92	2.10	7.309E-03	1460.83	10.670	8.870E+00	K40
1596.21	9.	33.33	2.19	6.737E-03	1596.21	95.400	7.780E-01	La140
1764.60	27.	19.60	2.29	6.141E-03	1764.49	15.400	1.607E+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 *****

Channel	Peak Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 1 Sigma	FWHM % keV	Suspected Nuclide
307.74	77.04	722.	217.	4.450E+03	21.29	1.209	- s
714.29	178.67	268.	64.	1.384E+03	42.69	0.556	- sM
858.74	214.78	259.	32.	8.132E+02	76.11	0.429	- sc
1079.98	269.97	341.	45.	1.375E+03	60.40	1.074	- sD
1110.85	277.80	233.	52.	1.631E+03	50.24	0.484	- sM
1227.35	306.82	338.	54.	1.846E+03	50.26	1.112	- sD
1241.72	310.41	328.	63.	2.176E+03	42.76	1.115	- sD
1269.45	317.62	340.	45.	1.583E+03	60.19	1.122	- D
1274.44	318.86	396.	16.	5.643E+02	178.94	1.124	- c
1501.44	375.44	114.	16.	6.536E+02	97.63	0.439	- c
3545.41	886.42	95.	18.	1.554E+03	80.72	1.654	- c
3879.75	970.00	218.	30.	2.853E+03	71.39	1.724	- c
3958.96	989.81	63.	32.	3.041E+03	44.72	0.459	- 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	185.84	46.57	5484.	19620.	10.900	1.02	0.941s
TH-227	200.12	50.14	32600.	-134.	-0.074	190.89	0.840
AM-241	237.80	59.56	4335.	28945.	16.081	0.74	0.947
TH-234	252.71	63.29	1778.	-85.	-0.047	234.44	0.854s
Sn-126	256.68	64.28	2001.	-13.	-0.007	478.20	0.856s
BA-133	323.52	80.99	1474.	-58.	-0.032	342.73	0.874s
Np-237	345.53	86.49	3801.	0.	0.000	539.99	0.880A
EU-155	345.74	86.54	3511.	48.	0.027	174.57	0.880s
Sn-126	347.33	86.94	3559.	0.	0.000	1000.00	0.880
Sn-126	349.85	87.57	3548.	11.	0.006	425.92	0.881D
Cd-109	351.73	88.04	3295.	62.	0.035	130.66	0.881A
Nd-147	363.97	91.10	3358.	63.	0.035	131.39	0.885s
TH-234	369.93	92.59	3327.	35.	0.019	233.10	0.886s
AC-228	372.97	93.35	3482.	63.	0.035	133.40	0.887
Gd-153	389.57	97.50	3668.	-60.	-0.033	143.62	0.892
Np-239	397.57	99.50	3728.	-60.	-0.033	144.43	0.894s
Gd-153	412.38	103.20	3788.	-59.	-0.033	148.26	0.898s
Np-239	414.38	103.70	3847.	0.	0.000	1000.00	0.898s
Np-239	424.10	106.13	3302.	58.	0.032	139.89	0.901s
EU-152	486.69	121.78	1515.	48.	0.027	115.58	0.918s
CO-57	487.83	122.06	1563.	0.	0.000	1000.00	0.918s
PA-234	524.77	131.29	1820.	54.	0.030	112.57	0.928s
HF-181	531.68	133.02	1874.	54.	0.030	113.97	0.930
CE-144	533.74	133.54	1928.	33.	0.018	189.51	0.930s
CO-57	545.48	136.47	1998.	0.	0.000	1000.00	0.933s
Tc-99m	561.63	140.51	2202.	-55.	-0.031	121.51	0.938
U-235	574.73	143.79	3535.	53.	0.029	160.54	0.941
CE-141	581.35	145.44	3373.	52.	0.029	157.48	0.943s
Ba-140	650.24	162.66	1498.	-53.	-0.030	103.44	0.961s
U-235	653.11	163.38	1541.	-2.	-0.001	916.93	0.962s
CE-139	663.01	165.85	1337.	51.	0.028	101.95	0.965s
Cf-251	706.00	176.60	1104.	-53.	-0.029	90.40	0.976
TH-229	773.64	193.51	957.	-35.	-0.019	166.22	0.994s
U-235	820.94	205.33	816.	-29.	-0.016	73.32	1.007
TH-229	843.01	210.85	1231.	52.	0.029	96.48	1.012

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Cf-251	907.62	227.00	730.	6.	0.004	798.92	1.029s
PB-212	954.03	238.60	626.	195.	0.108	26.60	0.924
PB-214	967.61	242.00	1495.	7.	0.004	782.07	1.045s
EU-152	978.39	244.69	1898.	-37.	-0.021	167.33	1.048
TH-227	1024.59	256.24	627.	9.	0.005	533.46	1.060
Cd-113m	1054.43	263.70	1468.	-51.	-0.028	107.14	1.067s
BI-210M	1062.96	265.83	1393.	-51.	-0.029	43.33	1.070s
TL-208	1108.77	277.28	737.	-51.	-0.029	75.98	1.081
I-131	1136.83	284.30	628.	-19.	-0.010	118.95	1.089s
PB-214	1180.00	295.09	628.	24.	0.013	195.83	1.100s
PB-212	1199.76	300.03	3308.	-51.	-0.028	29.44	1.105s
PA-231	1199.92	300.07	3257.	-51.	-0.028	159.91	1.105
PA-233	1200.36	300.18	3206.	-51.	-0.028	158.67	1.105
PA-231	1210.24	302.65	3155.	-51.	-0.028	157.06	1.107s
BA-133	1211.05	302.85	3104.	-51.	-0.028	155.76	1.108s
Ba-140	1219.04	304.85	3054.	-51.	-0.028	154.21	1.110
BI-210M	1219.23	304.90	3109.	-51.	-0.028	155.59	1.110
Ir-192	1233.41	308.44	3193.	-51.	-0.028	157.15	1.113s
PA-233	1247.69	312.01	2976.	50.	0.028	155.31	1.117s
Ir-192	1265.61	316.49	2935.	28.	0.016	270.59	1.122
CR-51	1279.99	320.08	2990.	-13.	-0.007	598.95	1.125s
La-140	1314.69	328.76	962.	-51.	-0.028	87.76	1.134s
Cf-249	1333.41	333.44	1014.	47.	0.026	96.92	1.139s
AC-228	1354.61	338.74	216.	62.	0.034	40.81	1.452s
Cs-136	1361.93	340.57	1032.	-10.	-0.005	471.00	1.146s
EU-152	1376.80	344.29	1064.	-20.	-0.011	233.65	1.150s
HF-181	1382.97	345.83	1185.	15.	0.008	331.17	1.151s
PB-214	1407.39	351.93	751.	42.	0.023	94.67	1.157s
BA-133	1423.66	356.00	907.	45.	0.025	95.10	1.162s
I-131	1457.59	364.48	524.	36.	0.020	125.61	1.170s
BA-133	1535.03	383.84	1416.	-50.	-0.028	108.18	1.189s
Cf-249	1551.47	387.95	1100.	22.	0.012	218.04	1.193
SN-113	1566.43	391.69	1330.	7.	0.004	793.82	1.197s
SB-125	1711.18	427.88	536.	48.	0.027	95.53	1.233s
pm-146	1815.20	453.88	544.	33.	0.018	139.47	1.258s
SB-125	1853.15	463.37	1087.	-25.	-0.014	191.28	1.268s
Ir-192	1871.93	468.06	1185.	33.	0.019	147.09	1.272s
BE-7	1910.07	477.60	1333.	-51.	-0.028	102.99	1.282s
HF-181	1927.68	482.00	1384.	-7.	-0.004	712.71	1.286s
La-140	1947.77	487.02	1339.	44.	0.024	119.49	1.291s
RU-103	1987.91	497.05	368.	42.	0.023	95.29	1.301s
RH-106	2047.15	511.86	587.	84.	0.046	74.63	2.565s
Nd-147	2123.70	531.00	351.	0.	0.000	1000.00	1.333s
Ba-140	2148.74	537.26	429.	-47.	-0.026	101.68	1.339s
CS-134	2252.65	563.24	278.	18.	0.010	187.55	1.364s
CS-134	2276.99	569.32	351.	-43.	-0.024	63.69	1.369s
PA-234	2277.59	569.47	353.	40.	0.022	69.06	1.370s
BI-207	2278.51	569.70	363.	-31.	-0.017	88.60	1.370s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
TL-208	2334.19	583.62	172.	132.	0.073	23.93	2.096s
SB-125	2401.71	600.50	1241.	-38.	-0.021	82.23	1.399s
SB-124	2410.64	602.73	1204.	-23.	-0.013	139.74	1.401
CS-134	2418.55	604.71	1181.	0.	0.000	1000.00	1.403s
BI-214	2437.91	609.55	116.	92.	0.051	23.61	1.228
PM-144	2471.96	618.06	387.	21.	0.012	134.27	1.415s
RH-106	2487.38	621.92	349.	34.	0.019	79.19	1.419s
SB-125	2543.28	635.89	332.	-25.	-0.014	88.70	1.432s
I-131	2547.62	636.97	339.	16.	0.009	169.86	1.433s
AG-110M	2630.77	657.76	8686.	-13.	-0.007	170.40	1.452
CS-137	2646.87	661.79	230.	8293.	4.607	1.19	1.488
PM-144	2785.90	696.54	262.	-39.	-0.022	253.10	1.487s
SB-124	2890.87	722.79	360.	-16.	-0.009	169.56	1.511s
AG-108M	2891.48	722.94	376.	0.	0.000	1000.00	1.511s
EU-154	2893.15	723.36	375.	-6.	-0.004	434.43	1.511s
ZR-95	2896.52	724.20	382.	0.	0.000	1000.00	1.512s
BI-212	2908.41	727.17	420.	-28.	-0.016	104.59	1.515
pm-146	2988.37	747.16	210.	10.	0.006	309.03	1.533s
ZR-95	3026.65	756.73	163.	32.	0.018	87.34	1.541s
AG-110M	3055.51	763.94	262.	-25.	-0.014	392.89	1.548
NB-95	3062.89	765.79	287.	20.	0.011	122.83	1.549s
PA-234M	3065.38	766.41	325.	-37.	-0.021	70.55	1.550s
EU-152	3115.41	778.92	196.	15.	0.008	199.67	1.561
BI-212	3141.41	785.42	191.	14.	0.008	216.40	1.567s
CS-134	3183.20	795.87	468.	-34.	-0.019	90.25	1.576s
CS-134	3207.54	801.95	485.	38.	0.021	83.55	1.581s
CO-58	3242.84	810.78	486.	38.	0.021	83.88	1.589
La-140	3262.82	815.77	524.	11.	0.006	283.87	1.593s
Cs-136	3273.74	818.50	462.	36.	0.020	86.21	1.596s
MN-54	3339.13	834.85	210.	37.	0.021	83.69	1.610s
Co-56	3386.82	846.77	285.	-9.	-0.005	414.37	1.620s
TL-208	3442.00	860.56	275.	7.	0.004	530.87	1.632
NB-94	3484.13	871.10	306.	-7.	-0.004	355.42	1.641
EU-154	3492.66	873.23	319.	14.	0.008	182.39	1.643s
PA-234	3521.86	880.53	626.	-43.	-0.024	83.14	1.649s
PA-234	3532.70	883.24	595.	-10.	-0.005	356.64	1.652s
AG-110M	3538.47	884.68	548.	19.	0.010	177.26	1.653
Sc-46	3556.86	889.28	622.	11.	0.006	318.45	1.657s
y-88	3591.90	898.04	235.	40.	0.022	86.44	1.664s
AC-228	3644.02	911.07	326.	-19.	-0.010	99.65	1.675s
AG-110M	3749.71	937.49	385.	-52.	-0.029	36.24	1.697
PA-234	3783.82	946.02	320.	25.	0.014	158.58	1.704s
EU-152	3856.18	964.11	553.	37.	0.020	92.01	1.719
AC-228	3875.62	968.97	581.	9.	0.005	387.71	1.724
EU-154	3985.06	996.33	761.	-45.	-0.025	88.71	1.746s
PA-234M	4003.73	1001.00	742.	-10.	-0.005	358.08	1.750s
EU-154	4018.84	1004.77	932.	-49.	-0.027	89.02	1.753s
Co-56	4151.10	1037.84	195.	17.	0.009	187.32	1.780s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Cs-136	4192.02	1048.07	261.	-18.	-0.010	126.87	1.788s
RH-106	4201.18	1050.36	292.	39.	0.022	63.41	1.790s
BI-207	4254.38	1063.66	214.	18.	0.010	184.19	1.801s
Ga-68	4309.34	1077.40	213.	15.	0.008	227.86	1.812s
FE-59	4396.74	1099.25	245.	7.	0.004	535.44	1.829s
EU-152	4448.04	1112.07	425.	20.	0.011	146.01	1.839
ZN-65	4461.92	1115.55	445.	0.	0.000	1000.00	1.842s
Sc-46	4481.94	1120.55	445.	9.	0.005	318.46	1.846A
Ta-182	4484.94	1121.30	532.	-42.	-0.023	79.06	1.846
CO-60	4693.50	1173.44	65.	3255.	1.809	1.86	1.918
Ta-182	4755.93	1189.05	80.	5.	0.003	426.18	1.899s
Co-56	4952.84	1238.28	48.	6.	0.003	275.00	1.936s
NA-22	5097.84	1274.53	40.	1.	0.001	673.61	1.963s
EU-154	5097.89	1274.54	41.	0.	0.000	1000.00	1.963s
FE-59	5166.10	1291.60	28.	-2.	-0.001	538.99	1.975s
CO-60	5330.42	1332.68	7.	2889.	1.605	1.88	2.145
AG-110M	5536.89	1384.30	0.	10.	0.005	32.86	2.042
EU-152	5631.70	1408.00	28.	-16.	-0.009	81.91	2.059s
K-40	5843.01	1460.83	3.	12.	0.007	33.92	2.095s
La-140	6384.49	1596.21	0.	9.	0.005	33.33	2.185s
SB-124	6763.55	1690.98	18.	-8.	-0.004	132.88	2.245s
BI-214	7057.56	1764.49	1.	27.	0.015	19.60	2.290s
Co-56	7084.99	1771.35	39.	-8.	-0.004	116.06	2.294s
y-88	7343.81	1836.06	19.	-8.	-0.004	139.85	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 *****

Name	Code	Average Activity Bq/Sample	Energy keV	Peak Activity Bq/Sample	Code	MDA Value Bq/Sample	COMMENTS
BE-7	C	-1.3450E+01	477.60	-1.345E+01	(	4.594E+01	5.31E+01 1.03E+02 1.05E+01 G
NA-22	C	8.9511E-02	1274.53	8.951E-02	?(	2.152E+00	9.50E+02 6.74E+02 9.99E+01 G
K-40	N	8.8704E+00	1460.83	8.870E+00	?(P	7.230E+00	4.66E+11 3.39E+01 1.07E+01 G
Sc-46	F	5.3927E-01	889.28	5.393E-01	?(	5.765E+00	8.38E+01 3.18E+02 1.00E+02 G
			1120.55	5.393E-01	}	6.029E+00	3.18E+02 1.00E+02 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
CR-51	F	-2.5735E+00					2.77E+01
		320.08-2.573E+00	&(	5.128E+01	5.99E+02	9.94E+00	G
MN-54	C	1.7152E+00					3.12E+02
		834.85 1.715E+00	&(P	3.217E+00	8.37E+01	1.00E+02	G
FE-59	F	6.9204E-01					4.45E+01
		1099.25 6.920E-01	?(	7.858E+00	5.35E+02	5.65E+01	G
		1291.60-3.668E-01	+	4.325E+00	5.39E+02	4.32E+01	G
Co-56	C	4.9858E-01					7.73E+01
		846.77-4.021E-01	(	3.774E+00	4.14E+02	9.99E+01	G
		1238.28 5.736E-01	&(P	3.468E+00	2.75E+02	6.61E+01	G
		1037.84 6.518E+00	?(P	2.674E+01	1.87E+02	1.41E+01	G
		1771.35-4.676E+00	+	1.862E+01	1.16E+02	1.55E+01	A
CO-58	C	1.6983E+00					7.09E+01
		810.78 1.698E+00	(	4.727E+00	8.39E+01	9.95E+01	G
CO-60	F	2.0233E+02					1.93E+03
		1332.50 2.019E+02	(	1.051E+00	1.88E+00	1.00E+02	G
		1173.24 2.028E+02	(P	2.502E+00	1.86E+00	9.99E+01	G
NB-94	I	-1.2031E-01					7.41E+06
		702.63-1.203E-01	%(	2.817E+00	1.03E+03	9.79E+01	G
		871.10-3.333E-01	+	4.010E+00	3.55E+02	9.99E+01	G
ZR-95	I	2.4414E+00					6.40E+01
		756.73 2.441E+00	?(	4.795E+00	8.73E+01	5.45E+01	G
		724.20 0.000E+00	-	8.564E+00	1.00E+03	4.42E+01	G
NB-95	I	8.4241E-01					6.40E+01
		765.79 8.424E-01	&(	3.467E+00	1.23E+02	9.98E+01	G
RU-103	I	1.3270E+00					3.93E+01
		497.05 1.327E+00	(	2.935E+00	9.53E+01	9.09E+01	G
		610.30 2.300E-06	&	9.817E+01	1.27E+09	5.75E+00	GA
RH-106	I	2.9759E+01					3.74E+02
		621.92 1.213E+01	(	3.186E+01	7.92E+01	9.93E+00	G
		1050.36 1.420E+02	?(	2.969E+02	6.34E+01	1.56E+00	G
		511.86 1.242E+01		1.716E+01	7.46E+01	2.00E+01	GA
AG-108M	C	1.0546E-01					1.53E+05
		433.94 1.055E-01	%(P	3.279E+00	1.28E+03	9.05E+01	G
		722.94 0.000E+00	-	4.126E+00	1.00E+03	9.08E+01	G
		614.28-1.480E-07	%	6.319E+00	1.27E+09	8.98E+01	G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
AG-110M	F	1.6657E+00					2.50E+02
		884.68	1.250E+00	(P	7.419E+00	1.77E+02	7.27E+01 G
		657.76	-5.027E-01	+ P	1.710E+01	1.70E+02	9.46E+01 G
		937.49	-7.666E+00	+ P	1.392E+01	3.62E+01	3.44E+01 G
		1384.30	2.909E+00	(P	2.195E+00	3.29E+01	2.43E+01 G
		763.94	-4.771E+00	+ P	1.484E+01	3.93E+02	2.23E+01 G
SN-113	F	2.3932E-01					1.15E+02
		391.69	2.393E-01	&(P	6.352E+00	7.94E+02	6.40E+01 G
SB-124	F	-7.8802E-01					6.02E+01
		602.73	-7.880E-01	?(P	5.735E+00	1.40E+02	9.83E+01 G
		1690.98	-1.456E+00	+ P	4.091E+00	1.33E+02	4.78E+01 G
		722.79	-5.959E+00	+ P	3.394E+01	1.70E+02	1.08E+01 G
SB-125	I	4.1206E+00					1.01E+03
		427.88	4.121E+00	&(	9.494E+00	9.55E+01	2.96E+01 G
		600.50	-7.333E+00	& P	3.192E+01	8.22E+01	1.79E+01 G
		635.89	-7.838E+00	+ P	2.783E+01	8.87E+01	1.13E+01 G
		463.37	-6.442E+00	+ P	4.066E+01	1.91E+02	1.05E+01 G
I-131	I	1.5241E+00					8.02E+00
		364.48	9.749E-01	?(	2.962E+00	1.26E+02	8.17E+01 G
		284.30	-5.463E+00	+ P	3.481E+01	1.19E+02	6.14E+00 G
		636.97	7.782E+00	?(	4.443E+01	1.70E+02	7.17E+00 G
Gd-153	F	-1.9980E+00					2.42E+02
		97.50	-1.998E+00	(	9.508E+00	1.44E+02	3.00E+01 G
		103.20	-2.672E+00	+ P	1.312E+01	1.48E+02	2.18E+01 G
Ga-68	C	2.9998E+01					4.71E-02
		1077.40	3.000E+01	?(	1.448E+02	2.28E+02	3.30E+00 G
Tc-99m	I	-6.6055E-01					2.51E-01
		140.51	-6.605E-01	&(	2.661E+00	1.22E+02	8.93E+01 G
BA-133	F	1.5839E+00					3.85E+03
		356.00	1.584E+00	?(	4.997E+00	9.51E+01	6.20E+01 G
		302.85	-5.231E+00	&	2.702E+01	1.56E+02	1.83E+01 G
		383.84	-1.284E+01	+ P	4.607E+01	1.08E+02	8.94E+00 GA
		80.99	-1.872E+00	& P	5.845E+00	3.43E+02	3.41E+01 GA
CS-134	I	1.9785E+00					7.54E+02
		604.71	0.000E+00	?(	5.736E+00	1.00E+03	9.76E+01 G
		795.87	-1.769E+00	+ P	5.307E+00	9.03E+01	8.55E+01 G
		569.32	-9.084E+00	+ P	1.908E+01	6.37E+01	1.54E+01 G
		801.95	1.931E+01	?(	5.354E+01	8.36E+01	8.69E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		563.24	7.069E+00	?(P	3.109E+01	1.88E+02	8.35E+00 G
CS-137	I 3.6229E+02						1.10E+04
		661.66	3.623E+02	(P	3.208E+00	1.19E+00	8.52E+01 G
CE-139	F 7.2943E-01						1.38E+02
		165.85	7.294E-01	?(	2.466E+00	1.02E+02	7.99E+01 G
Ba-140	I -5.9209E+00						1.28E+01
		537.26-5.921E+00		&(P	1.261E+01	1.02E+02	2.44E+01 G
		162.66-9.843E+00		+	3.375E+01	1.03E+02	6.22E+00 G
		304.85-2.252E+01		+	1.152E+02	1.54E+02	4.29E+00 G
La-140	I 1.0585E+00						1.28E+01
		1596.21	7.780E-01	?(	6.371E-01	3.33E+01	9.54E+01 G
		487.02	2.729E+00	&	1.083E+01	1.19E+02	4.55E+01 G
		328.76-5.052E+00		-	1.469E+01	8.78E+01	2.03E+01 G
		815.77	2.208E+00	?(	2.106E+01	2.84E+02	2.33E+01 G
CE-141	I 1.1523E+00						3.25E+01
		145.44	1.152E+00	?(	6.016E+00	1.57E+02	4.82E+01 G
CE-144	I 3.0200E+00						2.85E+02
		133.54	3.020E+00	?(	1.903E+01	1.90E+02	1.11E+01 G
PM-144	C -3.9565E-01						3.63E+02
		696.54-1.535E+00		&(P	3.073E+00	2.53E+02	9.90E+01 G
		618.06	7.427E-01	?(	3.338E+00	1.34E+02	9.91E+01 G
EU-152	F 3.9627E+00						4.94E+03
		344.29-1.577E+00		?(	1.230E+01	2.34E+02	2.65E+01 G
		1112.07	8.774E+00	(	4.290E+01	1.46E+02	1.36E+01 G
		121.78	1.664E+00	?(	6.381E+00	1.16E+02	2.86E+01 G
		778.92	4.988E+00	(	2.260E+01	2.00E+02	1.29E+01 G
		964.11	1.311E+01	&(	4.006E+01	9.20E+01	1.46E+01 G
		244.69-7.690E+00		+	4.276E+01	1.67E+02	7.58E+00 G
		1408.00-5.599E+00		+	9.626E+00	8.19E+01	2.10E+01 GA
EU-154	I 5.4383E+00						3.14E+03
		873.23	5.438E+00	?(	3.338E+01	1.82E+02	1.23E+01 G
		123.10-6.218E-02		% P	4.172E+00	3.20E+03	4.08E+01 G
		1274.54	0.000E+00	-	6.206E+00	1.00E+03	3.52E+01 G
		723.36-1.262E+00		-	1.853E+01	4.34E+02	2.02E+01 G
		1004.77-1.475E+01		+	4.353E+01	8.90E+01	1.80E+01 G
		996.33-2.258E+01		&	6.644E+01	8.87E+01	1.06E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments		
EU-155	I	9.6270E-01				1.81E+03			
			105.31-3.343E-02	%(P	1.356E+01	1.14E+04	2.12E+01	G	
			86.54	1.651E+00	&(	9.555E+00	1.75E+02 3.07E+01	G
HF-181	F	4.7049E-01				4.24E+01			
			482.00-2.587E-01	?(	6.163E+00	7.13E+02	8.05E+01	G
			133.02	1.270E+00	?(4.798E+00	1.14E+02	4.33E+01	G
			345.83	2.070E+00	?(P	2.289E+01	3.31E+02	1.51E+01	G
			136.30	6.434E-01	%	3.699E+01	1.72E+03 5.85E+00	G	
Ta-182	F	-7.2014E+00				1.14E+02			
			1121.30-7.201E+00	?(	1.886E+01	7.91E+01	3.49E+01	G
			1221.41	4.974E-02	% P	9.189E+00	8.37E+03	2.70E+01	G
			1189.05	1.867E+00	+ P	1.728E+01	4.26E+02 1.62E+01	G	
Hg-203	F	7.7437E-02				4.66E+01			
			279.20	7.744E-02	%(2.922E+00	1.12E+03	8.15E+01	G
TL-208	N	5.1870E+00				6.98E+02			
			583.02	5.187E+00	*(P	2.517E+00	2.39E+01	8.45E+01	G
			277.28-1.427E+01	-	3.587E+01	7.60E+01	6.31E+00	G	
			860.56	2.608E+00	- P	3.030E+01	5.31E+02 1.24E+01	G	
pm-146	C	1.3104E+00				2.02E+03			
			747.16	1.220E+00	&(8.566E+00	3.09E+02	3.40E+01	G
			735.72	3.030E-01	%	1.263E+01	1.83E+03	2.25E+01	G
			453.88	1.358E+00	&(	4.584E+00	1.39E+02 6.50E+01	G
y-88	F	2.0689E+00				1.07E+02			
			898.04	2.069E+00	*(3.868E+00	8.64E+01	9.37E+01	G
			1836.06-7.569E-01	-	2.178E+00	1.40E+02	9.92E+01	G	
Cd-113m		-1.4268E+04				5.33E+03			
			263.70-1.427E+04	?(	5.070E+04	1.07E+02	6.00E-03	K
Cd-109	F	1.7173E+01				4.53E+02			
			88.04	1.717E+01	}(7.433E+01	1.31E+02	3.79E+00	G
						Derived Ave Activity			
Cf-251	T	-3.7086E+00				3.28E+05			
			176.60-3.709E+00	?(	1.111E+01	9.04E+01	1.70E+01	G
			227.00	1.487E+00	+	3.019E+01	7.99E+02 6.30E+00	GA	
Cf-249	T	1.8012E+00				1.28E+05			
			387.95	7.648E-01	&(5.564E+00	2.18E+02	6.60E+01	G
			333.44	6.212E+00	&(	1.997E+01	9.69E+01 1.55E+01	G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Sn-126	-1.8599E+00						3.65E+07
		87.57	3.115E-01	}	7.814E+00	4.26E+02	3.75E+01 GA
		64.28	-1.860E+00	&(	2.964E+01	4.78E+02	9.70E+00 G
		86.94	0.000E+00	}	3.259E+01	1.00E+03	9.04E+00 GA
PB-210	N 1.0330E+04						8.14E+03
		46.54	1.033E+04	@(P	1.831E+02	1.02E+00	4.25E+00 G
PB-212	N 6.9398E+00						6.98E+02
		238.63	6.940E+00	(P	4.250E+00	2.66E+01	4.33E+01 G
		300.03	-2.927E+01	- P	1.546E+02	2.94E+01	3.28E+00 GA
PB-214	N 2.3462E+00						5.84E+05
		351.93	2.370E+00	(P	7.444E+00	9.47E+01	3.76E+01 G
		295.09	2.300E+00	(P	1.143E+01	1.96E+02	1.93E+01 G
		242.00	1.470E+00	?	3.842E+01	7.82E+02	7.43E+00 GA
BI-207	C 1.3029E-02						1.18E+04
		569.70	-1.036E+00	?(	3.052E+00	8.86E+01	9.77E+01 G
		1063.66	1.389E+00	&(P	5.414E+00	1.84E+02	7.45E+01 G
BI-212	N -1.5101E+01						6.98E+02
		727.17	-1.510E+01	(	5.264E+01	1.05E+02	7.55E+00 G
		785.42	4.629E+01	?	2.275E+02	2.16E+02	1.28E+00 GA
BI-214	N 6.9422E+00						5.84E+05
		609.31	6.942E+00	(P	3.965E+00	2.36E+01	4.61E+01 G
		1120.29	0.000E+00	}	3.913E+01	1.60E+03	1.51E+01 G
		1764.49	1.607E+01	+ P	4.329E+00	1.96E+01	1.54E+01 G
BI-210M	T -1.7361E+00						1.10E+09
		265.83	-1.736E+00	?(P	5.969E+00	4.33E+01	5.00E+01 G
		304.90	-3.451E+00	+	1.780E+01	1.56E+02	2.80E+01 G
AC-228	N 8.5576E-01						2.10E+03
		911.07	-3.218E+00	?(P	1.482E+01	9.97E+01	2.90E+01 G
		968.97	2.646E+00	& P	3.448E+01	3.88E+02	1.75E+01 G
		338.32	1.069E+01	(P	1.231E+01	4.08E+01	1.20E+01 G
		93.35	1.148E+01		5.072E+01	1.33E+02	5.56E+00 XA
TH-227	N -3.2733E+01						7.95E+03
		50.14	-3.273E+01	(	2.063E+02	1.91E+02	8.00E+00 G
		256.24	2.059E+00	+ P	2.794E+01	5.33E+02	7.00E+00 G
TH-229	N 3.6472E+00						2.68E+06
		193.51	-1.029E+01	(	4.319E+01	1.66E+02	4.40E+00 G
		210.85	2.416E+01	&(	7.727E+01	9.65E+01	2.99E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments		
TH-234	N	-3.0966E+01				1.63E+12			
			63.29	3.097E+01	(P	7.253E+01	2.34E+02	3.81E+00	G
			92.59	6.404E+00	+ P	4.954E+01	2.33E+02	5.58E+00	G
PA-231	N	-3.3268E+01				1.20E+07			
			302.65	3.327E+01	&(	1.733E+02	1.57E+02	2.88E+00	G
			300.07	3.858E+01	+	2.045E+02	1.60E+02	2.46E+00	G
PA-233	C	2.6832E+00				7.82E+08			
			312.01	2.683E+00	&(	1.382E+01	1.55E+02	3.60E+01	G
			300.18	1.531E+01	+	8.055E+01	1.59E+02	6.20E+00	G
PA-234	N	7.8698E+00				1.63E+12			
			131.29	3.033E+00	(	1.132E+01	1.13E+02	1.80E+01	G
			946.02	9.555E+00	? (	3.290E+01	1.59E+02	1.34E+01	G
			569.47	1.573E+01	? (	3.592E+01	6.91E+01	8.20E+00	G
			883.24	4.873E+00	&	5.839E+01	3.57E+02	9.60E+00	G
			880.53	3.464E+01	+	9.548E+01	8.31E+01	6.00E+00	GA
PA-234M	N	-6.1574E+01				1.63E+12			
			1001.00	6.157E+01	&(P	8.350E+02	3.58E+02	8.37E-01	G
			766.41	5.362E+02	&	1.251E+03	7.05E+01	2.94E-01	G
U-235	N	5.0557E+00				2.57E+11			
			143.79	5.056E+00	&(P	2.691E+01	1.61E+02	1.10E+01	G
			205.33	7.754E+00	+ P	3.685E+01	7.33E+01	5.01E+00	G
			163.38	5.155E-01	& P	4.207E+01	9.17E+02	5.08E+00	G
AM-241	T	1.2102E+03				1.58E+05			
			59.54	1.210E+03	(	1.294E+01	7.43E-01	3.59E+01	G
Ir-192	F	1.0607E+00				7.40E+01			
			316.49	6.392E-01	&(	5.747E+00	2.71E+02	8.70E+01	G
			468.06	1.769E+00	? (	8.661E+00	1.47E+02	5.18E+01	G
			308.44	3.083E+00	&	1.607E+01	1.57E+02	3.18E+01	G
Cs-136	F	1.6172E+00				1.30E+01			
			818.50	1.617E+00	&(	4.629E+00	8.62E+01	1.00E+02	G
			1048.07	1.287E+00	-	5.480E+00	1.27E+02	8.00E+01	G
			340.57	4.302E-01	&	6.782E+00	4.71E+02	4.69E+01	G
Np-239	T	2.5310E+00				2.36E+00			
			103.70	0.000E+00	-	1.201E+01	1.00E+03	2.40E+01	X
			106.13	2.531E+00	? (	1.173E+01	1.40E+02	2.27E+01	G
			99.50	3.985E+00	+	1.907E+01	1.44E+02	1.50E+01	X

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Nd-147	1.5565E+00						1.11E+01
		531.00	0.000E+00	*	2.124E+01	1.00E+03	1.30E+01 G
		91.10	2.272E+00	?	9.887E+00	1.31E+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	32600.	-134.	-0.074	190.89	-3.273E+01	
TH-234	63.29	1778.	-85.	-0.047	234.44	-3.097E+01	P
BA-133	80.99	1474.	-58.	-0.032	342.73	-1.872E+00	P
EU-155	86.54	3511.	48.	0.027	174.57	1.651E+00	
Nd-147	91.10	3358.	63.	0.035	131.39	2.272E+00	
TH-234	92.59	3327.	35.	0.019	233.10	6.404E+00	P
Gd-153	97.50	3668.	-60.	-0.033	143.62	-1.998E+00	
Np-239	99.50	3728.	-60.	-0.033	144.43	-3.985E+00	
Gd-153	103.20	3788.	-59.	-0.033	148.26	-2.672E+00	
Np-239	106.13	3302.	58.	0.032	139.89	2.531E+00	
PA-234	131.29	1820.	54.	0.030	112.57	3.033E+00	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
HF-181	133.02	1874.	54.	0.030	113.97	1.270E+00	
CE-144	133.54	1928.	33.	0.018	189.51	3.020E+00	
Tc-99m	140.51	2202.	-55.	-0.031	121.51	-6.605E-01	
CE-141	145.44	3373.	52.	0.029	157.48	1.152E+00	
Ba-140	162.66	1498.	-53.	-0.030	103.44	-9.843E+00	
CE-139	165.85	1337.	51.	0.028	101.95	7.294E-01	
Cf-251	176.60	1104.	-53.	-0.029	90.40	-3.709E+00	
TH-229	193.51	957.	-35.	-0.019	166.22	-1.029E+01	
TH-229	210.85	1231.	52.	0.029	96.48	2.416E+01	
Cf-251	227.00	730.	6.	0.004	798.92	1.487E+00	
PB-214	242.00	1495.	7.	0.004	782.07	1.470E+00	
TH-227	256.24	627.	9.	0.005	533.46	2.059E+00	P
Cd-113m	263.70	1468.	-51.	-0.028	107.14	-1.427E+04	
BI-210M	265.83	1393.	-51.	-0.029	43.33	-1.736E+00	P
I-131	284.30	628.	-19.	-0.010	118.95	-5.463E+00	P
PB-214	295.09	628.	24.	0.013	195.83	2.300E+00	P
PA-231	300.07	3257.	-51.	-0.028	159.91	-3.858E+01	
PA-233	300.18	3206.	-51.	-0.028	158.67	-1.531E+01	
PA-231	302.65	3155.	-51.	-0.028	157.06	-3.327E+01	
BA-133	302.85	3104.	-51.	-0.028	155.76	-5.231E+00	
Ba-140	304.85	3054.	-51.	-0.028	154.21	-2.252E+01	
BI-210M	304.90	3109.	-51.	-0.028	155.59	-3.451E+00	
PA-233	312.01	2976.	50.	0.028	155.31	2.683E+00	
CR-51	320.08	2990.	-13.	-0.007	598.95	-2.573E+00	
Cf-249	333.44	1014.	47.	0.026	96.92	6.212E+00	
Cs-136	340.57	1032.	-10.	-0.005	471.00	-4.302E-01	
HF-181	345.83	1185.	15.	0.008	331.17	2.070E+00	P
PB-214	351.93	751.	42.	0.023	94.67	2.370E+00	P
BA-133	356.00	907.	45.	0.025	95.10	1.584E+00	
I-131	364.48	524.	36.	0.020	125.61	9.749E-01	
BA-133	383.84	1416.	-50.	-0.028	108.18	-1.284E+01	
Cf-249	387.95	1100.	22.	0.012	218.04	7.648E-01	
SB-125	427.88	536.	48.	0.027	95.53	4.121E+00	
pm-146	453.88	544.	33.	0.018	139.47	1.358E+00	
SB-125	463.37	1087.	-25.	-0.014	191.28	-6.442E+00	P
BE-7	477.60	1333.	-51.	-0.028	102.99	-1.345E+01	
HF-181	482.00	1384.	-7.	-0.004	712.71	-2.587E-01	
RU-103	497.05	368.	42.	0.023	95.29	1.327E+00	
RH-106	511.86	587.	84.	0.046	74.63	1.242E+01	
Ba-140	537.26	429.	-47.	-0.026	101.68	-5.921E+00	P
CS-134	563.24	278.	18.	0.010	187.55	7.069E+00	P
CS-134	569.32	351.	-43.	-0.024	63.69	-9.084E+00	
PA-234	569.47	353.	40.	0.022	69.06	1.573E+01	
BI-207	569.70	363.	-31.	-0.017	88.60	-1.036E+00	
SB-125	600.50	1241.	-38.	-0.021	82.23	-7.333E+00	P
SB-124	602.73	1204.	-23.	-0.013	139.74	-7.880E-01	P
PM-144	618.06	387.	21.	0.012	134.27	7.427E-01	
RH-106	621.92	349.	34.	0.019	79.19	1.213E+01	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
SB-125	635.89	332.	-25.	-0.014	88.70	-7.838E+00	P
I-131	636.97	339.	16.	0.009	169.86	7.782E+00	
AG-110M	657.76	8686.	-13.	-0.007	170.40	-5.027E-01	P
PM-144	696.54	262.	-39.	-0.022	253.10	-1.535E+00	P
SB-124	722.79	360.	-16.	-0.009	169.56	-5.959E+00	
EU-154	723.36	375.	-6.	-0.004	434.43	-1.262E+00	
BI-212	727.17	420.	-28.	-0.016	104.59	-1.510E+01	
pm-146	747.16	210.	10.	0.006	309.03	1.220E+00	
ZR-95	756.73	163.	32.	0.018	87.34	2.441E+00	
AG-110M	763.94	262.	-25.	-0.014	392.89	-4.771E+00	P
NB-95	765.79	287.	20.	0.011	122.83	8.424E-01	
PA-234M	766.41	325.	-37.	-0.021	70.55	-5.362E+02	
BI-212	785.42	191.	14.	0.008	216.40	4.629E+01	
CS-134	795.87	468.	-34.	-0.019	90.25	-1.769E+00	
CS-134	801.95	485.	38.	0.021	83.55	1.931E+01	
CO-58	810.78	486.	38.	0.021	83.88	1.698E+00	
Cs-136	818.50	462.	36.	0.020	86.21	1.617E+00	
MN-54	834.85	210.	37.	0.021	83.69	1.715E+00	P
Co-56	846.77	285.	-9.	-0.005	414.37	-4.021E-01	
NB-94	871.10	306.	-7.	-0.004	355.42	-3.333E-01	
EU-154	873.23	319.	14.	0.008	182.39	5.438E+00	
PA-234	880.53	626.	-43.	-0.024	83.14	-3.464E+01	
PA-234	883.24	595.	-10.	-0.005	356.64	-4.873E+00	
AG-110M	884.68	548.	19.	0.010	177.26	1.250E+00	P
y-88	898.04	235.	40.	0.022	86.44	2.069E+00	
AG-110M	937.49	385.	-52.	-0.029	36.24	-7.666E+00	P
PA-234	946.02	320.	25.	0.014	158.58	9.555E+00	
EU-154	996.33	761.	-45.	-0.025	88.71	-2.258E+01	
PA-234M	1001.00	742.	-10.	-0.005	358.08	-6.157E+01	P
EU-154	1004.77	932.	-49.	-0.027	89.02	-1.475E+01	
Co-56	1037.84	195.	17.	0.009	187.32	6.518E+00	P
Cs-136	1048.07	261.	-18.	-0.010	126.87	-1.287E+00	
RH-106	1050.36	292.	39.	0.022	63.41	1.420E+02	
BI-207	1063.66	214.	18.	0.010	184.19	1.389E+00	P
Ga-68	1077.40	213.	15.	0.008	227.86	3.000E+01	
FE-59	1099.25	245.	7.	0.004	535.44	6.920E-01	
Ta-182	1121.30	532.	-42.	-0.023	79.06	-7.201E+00	
Ta-182	1189.05	80.	5.	0.003	426.18	1.867E+00	P
Co-56	1238.28	48.	6.	0.003	275.00	5.736E-01	P
NA-22	1274.53	40.	1.	0.001	673.61	8.951E-02	
FE-59	1291.60	28.	-2.	-0.001	538.99	-3.668E-01	
AG-110M	1384.30	0.	10.	0.005	32.86	2.909E+00	P
SB-124	1690.98	18.	-8.	-0.004	132.88	-1.456E+00	
Co-56	1771.35	39.	-8.	-0.004	116.06	-4.676E+00	
y-88	1836.06	19.	-8.	-0.004	139.85	-7.569E-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	-1.3450E+01	-1.3450E+01	1.030E+02%		4.59E+01
NA-22	#A	8.9511E-02	8.9511E-02	6.736E+02%		2.15E+00
K-40	#	8.8704E+00	8.8704E+00	3.392E+01%		7.23E+00
Sc-46	#A	5.3927E-01	5.3927E-01	3.184E+02%		5.76E+00
CR-51	#A	-2.5735E+00	-2.5735E+00	5.990E+02%		5.13E+01
MN-54	#A	1.7152E+00	1.7152E+00	8.369E+01%		3.22E+00
FE-59	#A	6.9204E-01	6.9204E-01	5.354E+02%		7.86E+00
Co-56	#A	4.9858E-01	4.9858E-01	1.771E+02%		3.77E+00
CO-57	#A	0.0000E+00	0.0000E+00	7.071E+02%		2.16E+00
CO-58	#A	1.6983E+00	1.6983E+00	8.388E+01%		4.73E+00
CO-60		2.0233E+02	2.0233E+02	1.321E+00%		1.05E+00
ZN-65	#A	0.0000E+00	0.0000E+00	1.000E+03%		1.19E+01
NB-94	#A	-1.2031E-01	-1.2031E-01	1.026E+03%		2.82E+00
ZR-95	#A	2.4414E+00	2.4414E+00	8.734E+01%		4.79E+00
NB-95	#A	8.4241E-01	8.4241E-01	1.228E+02%		3.47E+00
RU-103	#A	1.3270E+00	1.3270E+00	9.529E+01%		2.93E+00
RH-106	#A	2.9759E+01	2.9759E+01	5.072E+01%		3.19E+01
AG-108M	#A	1.0546E-01	1.0546E-01	1.277E+03%		3.28E+00
AG-110M	#A	1.6657E+00	1.6657E+00	3.286E+01%		7.42E+00
SN-113	A	2.3932E-01	2.3932E-01	7.938E+02%		6.35E+00
SB-124	#A	-7.8802E-01	-7.8802E-01	1.397E+02%		5.74E+00
SB-125	#A	4.1206E+00	4.1206E+00	9.553E+01%		9.49E+00
I-131	#A	1.5240E+00	1.5241E+00	1.056E+02%		2.96E+00
Gd-153	#A	-1.9980E+00	-1.9980E+00	1.436E+02%		9.51E+00
Ga-68	#A	2.9814E+01	2.9998E+01	2.279E+02%		1.45E+02
Tc-99m	#A	-6.5979E-01	-6.6055E-01	1.215E+02%		2.66E+00
BA-133	#A	1.5839E+00	1.5839E+00	9.510E+01%		5.00E+00
CS-134	#A	1.9785E+00	1.9785E+00	8.355E+01%		5.74E+00
CS-137		3.6229E+02	3.6229E+02	1.191E+00%		3.21E+00
CE-139	#A	7.2943E-01	7.2943E-01	1.019E+02%		2.47E+00
Ba-140	#A	-5.9207E+00	-5.9209E+00	1.017E+02%		1.26E+01
La-140	#	1.0585E+00	1.0585E+00	3.333E+01%		6.37E-01
CE-141	#A	1.1523E+00	1.1523E+00	1.575E+02%		6.02E+00
CE-144	#A	3.0199E+00	3.0200E+00	1.895E+02%		1.90E+01
PM-144	#A	-3.9564E-01	-3.9565E-01	1.343E+02%		3.07E+00
EU-152	A	3.9627E+00	3.9627E+00	7.419E+01%		1.23E+01
EU-154	#A	5.4383E+00	5.4383E+00	1.824E+02%		3.34E+01
EU-155	#A	9.6270E-01	9.6270E-01	1.746E+02%		1.36E+01
HF-181	#A	4.7049E-01	4.7049E-01	1.140E+02%		6.16E+00
Ta-182	#A	-7.2014E+00	-7.2014E+00	7.906E+01%		1.89E+01
Hg-203	#A	7.7436E-02	7.7437E-02	1.123E+03%		2.92E+00
TL-208		5.1870E+00	5.1870E+00	2.393E+01%		2.52E+00
pm-146	#A	1.3104E+00	1.3104E+00	1.395E+02%		8.57E+00

y-88 #A	2.0688E+00	2.0689E+00	8.644E+01%	3.87E+00
Cd-113m#A	-1.4268E+04	-1.4268E+04	1.071E+02%	5.07E+04
Cd-109 #A	1.7173E+01	1.7173E+01	1.307E+02%	7.43E+01
Cf-251 #A	-3.7086E+00	-3.7086E+00	9.040E+01%	1.11E+01
Cf-249 #A	1.8012E+00	1.8012E+00	9.692E+01%	5.56E+00
Sn-126 A	-1.8599E+00	-1.8599E+00	4.782E+02%	2.96E+01
PB-210 #	1.0330E+04	1.0330E+04	1.016E+00%	1.83E+02
PB-212	6.9398E+00	6.9398E+00	2.660E+01%	4.25E+00
PB-214 #A	2.3462E+00	2.3462E+00	9.467E+01%	7.44E+00
BI-207 #A	1.3029E-02	1.3029E-02	8.860E+01%	3.05E+00
BI-212 #A	-1.5101E+01	-1.5101E+01	1.046E+02%	5.26E+01
BI-214	6.9422E+00	6.9422E+00	2.361E+01%	3.97E+00
BI-210M#A	-1.7361E+00	-1.7361E+00	4.333E+01%	5.97E+00
AC-228 A	8.5576E-01	8.5576E-01	4.081E+01%	1.48E+01
TH-227 #A	-3.2733E+01	-3.2733E+01	1.909E+02%	2.06E+02
TH-229 #A	3.6472E+00	3.6472E+00	9.610E+01%	4.32E+01
TH-234 #A	-3.0966E+01	-3.0966E+01	2.344E+02%	7.25E+01
PA-231 #A	-3.3268E+01	-3.3268E+01	1.571E+02%	1.73E+02
PA-233 #A	2.6832E+00	2.6832E+00	1.553E+02%	1.38E+01
PA-234 #A	7.8698E+00	7.8698E+00	6.879E+01%	1.13E+01
PA-234M#A	-6.1574E+01	-6.1574E+01	3.581E+02%	8.35E+02
U-235 #A	5.0557E+00	5.0557E+00	1.605E+02%	2.69E+01
AM-241	1.2102E+03	1.2102E+03	7.433E-01%	1.29E+01
Np-237 #A	0.0000E+00	0.0000E+00	1.000E+03%	2.33E+01
Ir-192 A	1.0607E+00	1.0607E+00	1.471E+02%	5.75E+00
Cs-136 #A	1.6172E+00	1.6172E+00	8.621E+01%	4.63E+00
Np-239 #A	2.5306E+00	2.5310E+00	1.399E+02%	1.17E+01
Nd-147 #A	1.5565E+00	1.5565E+00	1.314E+02%	2.12E+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 (37.6 to 2000.1 keV) 1.212E+04 Bq/Sample
 Total Decayed Activity (37.6 to 2000.1 keV) 1.2123812E+04 Bq/Sample

Sample Description: 257060_Gamma_160-17814-A-1-B
 Detector: Detector # 5
 Batch ID: 257060
 Work Order Number: Gamma
 Lot Number: 160-17814-A-1-B

Decay to Time: 7/11/2016 07:46 Live Time: 1800 sec
 Acquisition Time: 7/11/2016 07:46:20 Real Time: 1807 sec
 Analysis Time: 7/11/2016 08:17 Dead Time: 0.38 %
 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_2016-07-10_0601.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	3.377E+00	132.4	4.470E+00	4.474E+00	1.532E+01
NA-22	3.237E-02	1396.4	4.520E-01	4.520E-01	1.741E+00
K-40	1.401E+02	8.8	1.229E+01	1.423E+01	1.187E+01
Sc-46	-6.455E-01	110.6	7.136E-01	7.144E-01	2.436E+00
CR-51	3.783E+00	126.3	4.779E+00	4.783E+00	1.617E+01
MN-54	-3.511E-01	172.7	6.065E-01	6.068E-01	1.572E+00
FE-59	8.193E-01	91.7	7.513E-01	7.524E-01	3.216E+00
Co-56	1.286E+00	37.8	4.864E-01	4.908E-01	1.167E+00
CO-57	2.878E-01	142.4	4.097E-01	4.100E-01	9.817E-01
CO-58	1.257E-01	469.7	5.902E-01	5.903E-01	2.101E+00
CO-60	6.530E-01	48.7	3.181E-01	3.197E-01	1.387E+00
ZN-65	-1.528E+00	142.3	2.174E+00	2.175E+00	7.426E+00
NB-94	6.013E-02	742.7	4.466E-01	4.466E-01	1.173E+00
ZR-95	-6.895E-01	220.8	1.523E+00	1.523E+00	2.825E+00
NB-95	-1.198E+00	77.9	9.331E-01	9.352E-01	3.109E+00
RU-103	-1.455E-01	297.5	4.328E-01	4.329E-01	1.142E+00
RH-106	-5.542E+00	195.0	1.080E+01	1.081E+01	3.659E+01
AG-108M	3.915E-01	102.8	4.027E-01	4.032E-01	1.025E+00
AG-110M	6.240E-01	35.4	2.206E-01	2.229E-01	2.936E+00
SN-113	4.207E-01	151.0	6.354E-01	6.358E-01	2.182E+00
SB-124	5.060E-01	40.8	2.066E-01	2.082E-01	3.437E+00
SB-125	8.418E-01	72.2	6.075E-01	6.090E-01	3.621E+00
I-131	1.089E+00	47.8	5.207E-01	5.237E-01	8.566E-01
Gd-153	3.511E-01	146.0	5.127E-01	5.132E-01	2.693E+00
Ga-68	2.679E+01	33.3	8.929E+00	9.054E+00	2.194E+01
Tc-99m	-3.253E-01	126.0	4.098E-01	4.102E-01	1.376E+00
BA-133	-4.483E-02	2365.3	1.060E+00	1.060E+00	3.636E+00
CS-134	1.878E-01	184.3	3.462E-01	3.463E-01	3.469E+00
CS-137	-2.638E-01	224.0	5.909E-01	5.911E-01	2.162E+00
CE-139	0.000E+00	1.#INF	2.034E-01	2.034E-01	1.150E+00
Ba-140	1.547E+00	105.1	1.625E+00	1.627E+00	4.198E+00
La-140	1.930E-02	104.1	2.009E-02	2.012E-02	1.697E+00
CE-141	-6.945E-01	127.7	8.867E-01	8.874E-01	2.970E+00

CE-144	-2.653E+00	136.4	3.620E+00	3.622E+00	1.214E+01
PM-144	-5.130E-01	103.8	5.326E-01	5.333E-01	1.441E+00
EU-152	-1.051E-01	97.7	1.026E-01	1.028E-01	7.571E+00
EU-154	4.971E+00	84.6	4.204E+00	4.212E+00	1.422E+01
EU-155	2.124E-01	735.5	1.562E+00	1.563E+00	5.326E+00
HF-181	3.698E-01	135.2	4.999E-01	5.003E-01	2.245E+00
Ta-182	1.785E+00	77.4	1.381E+00	1.384E+00	6.415E+00
Hg-203	3.349E-02	1126.9	3.774E-01	3.774E-01	1.330E+00
TL-208	3.797E+00	15.7	5.964E-01	6.281E-01	9.136E-01
pm-146	1.153E-02	104.0	1.199E-02	1.200E-02	4.040E+00
y-88	-5.104E-01	112.0	5.717E-01	5.723E-01	1.584E+00
Cd-113m	2.747E+03	175.6	4.823E+03	4.826E+03	1.665E+04
Cd-109	-8.434E+00	148.5	1.253E+01	1.254E+01	4.195E+01
Cf-251	9.887E-01	168.8	1.668E+00	1.671E+00	4.581E+00
Cf-249	2.307E-03	508.1	1.172E-02	1.172E-02	2.770E+00
Sn-126	-3.845E+00	123.6	4.751E+00	4.755E+00	1.594E+01
PB-210	4.340E-01	3187.8	1.383E+01	1.384E+01	4.085E+01
PB-212	9.155E+00	8.9	8.178E-01	1.010E+00	1.477E+00
PB-214	1.214E+01	9.7	1.178E+00	1.336E+00	2.388E+00
BI-207	3.871E-01	93.8	3.632E-01	3.637E-01	1.164E+00
BI-212	7.727E+00	136.4	1.054E+01	1.055E+01	3.590E+01
BI-214	1.190E+01	11.9	1.419E+00	1.548E+00	2.284E+00
BI-210M	-7.091E-01	99.5	7.052E-01	7.065E-01	2.377E+00
AC-228	1.212E+01	11.7	1.412E+00	1.542E+00	1.860E+00
TH-227	3.627E+00	106.3	3.854E+00	3.859E+00	1.720E+01
TH-229	2.910E+00	105.0	3.057E+00	3.066E+00	1.682E+01
TH-234	2.467E+01	36.5	9.010E+00	9.102E+00	2.288E+01
PA-231	-1.719E+01	144.5	2.485E+01	2.486E+01	8.345E+01
PA-233	-1.035E+00	205.2	2.125E+00	2.125E+00	7.159E+00
PA-234	2.739E-01	104.6	2.863E-01	2.867E-01	6.990E+00
PA-234M	8.482E+01	92.6	7.857E+01	7.869E+01	2.751E+02
U-235	-2.733E+00	124.0	3.388E+00	3.391E+00	1.137E+01
AM-241	-1.490E+00	73.3	1.092E+00	1.095E+00	3.441E+00
Np-237	-2.350E+00	165.4	3.887E+00	3.890E+00	1.302E+01
Ir-192	1.292E-01	81.3	1.051E-01	1.053E-01	1.872E+00
Cs-136	1.791E-01	128.1	2.294E-01	2.296E-01	2.185E+00
Np-239	9.352E-01	152.0	1.422E+00	1.423E+00	4.794E+00
Nd-147	-2.150E+00	177.4	3.814E+00	3.816E+00	9.806E+00

Total	3.114E+03				

Analyst: Amanda Dick

Sample description
257060_Gamma_160-17814-A-1-B

Spectrum Filename: C:\User\SPC\Det5\5_Gamma_20161261.An1

Acquisition information

Start time: 7/11/2016 7:46:20 AM
Live time: 1800
Real time: 1807
Dead time: 0.38 %
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): $6.466115E-01 + (-7.830454E-01 * \text{Log}(E)) + (-4.117504E-03 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.43 %
Log(Eff): $-2.462251E+01 + (9.075211E+00 * \text{Log}(E)) + (-9.664422E-01 * \text{Log}(E)^2)$

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 +/- 0.0000E+00%
Activity scaling factor: $1.0000E+00 / (1.0000E+00 * 1.0000E+00) = 1.0000E+00$
Detection limit method: Reg. Guide 4.16 Method

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	7/11/2016 7:46:00 AM
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	5_2016-07-10_0601.PBC 7/10/2016 6:01:50 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 24 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.1321

***** 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
46.57	13.	82.93	0.60	1.790E-02	46.54	4.250	PBC<MDA	PB210
50.14	13.	135.53	0.79	2.012E-02	50.14	8.000	PBC<MDA	TH227
63.11	62.	26.36	0.77	2.704E-02	63.29	3.810	2.467E+01	TH234
74.77	103.	14.88	0.81	3.150E-02				
77.08	159.	11.45	0.81	3.219E-02				
87.06	70.	19.17	0.83	3.443E-02	86.49	13.100	8.641E+00	Np237
					86.54	30.700	3.686E+00	EU155
					86.94	9.040	1.249E+01	Sn126
					87.57	37.500	3.002E+00	Sn126
89.84	36.	30.61	0.83	3.488E-02				
92.86	25.	56.42	0.83	3.529E-02	92.59	5.584	PBC<MDA	TH234
					93.35	5.561	7.186E+00	AC228
99.50	7.	231.90	0.84	3.592E-02	99.50	15.000	PBC<MDA	Np239
103.20	13.	146.02	0.84	3.612E-02	103.20	21.800	PBC<MDA	Gd153
105.31	3.	735.50	0.84	3.618E-02	105.31	21.200	PBC<MDA	EU155
106.13	14.	152.01	0.84	3.620E-02	106.13	22.700	PBC<MDA	Np239
121.78	6.	257.12	0.86	3.584E-02	121.78	28.580	PBC<MDA	EU152
					122.06	85.600	1.087E-01	CO57
136.47	17.	142.38	0.88	3.457E-02	136.30	5.850	PBC<MDA	HF181
					136.47	10.680	2.594E+00	CO57
176.60	9.	168.75	0.92	2.975E-02	176.60	17.000	PBC<MDA	Cf251
210.85	14.	105.03	0.95	2.569E-02	210.85	2.990	PBC<MDA	TH229

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
238.70	157.	10.98	0.84	2.319E-02	238.63	43.300	8.685E+00	PB212
242.03	45.	24.62	0.98	2.293E-02	242.00	7.430	1.481E+01	PB214
256.24	7.	163.70	1.00	2.186E-02	256.24	7.000	PBC<MDA	TH227
263.70	6.	175.59	1.00	2.135E-02	263.70	0.006	PBC<MDA	Cd113m
277.28	3.	375.65	1.02	2.048E-02	277.28	6.310	PBC<MDA	TL208
284.30	12.	105.96	1.02	2.006E-02	284.30	6.140	PBC<MDA	I131
295.31	79.	14.79	0.99	1.944E-02	295.09	19.300	1.103E+01	PB214
300.31	9.	100.36	1.82	1.918E-02	300.03	3.280	PBC<MDA	PB212
					300.07	2.460	1.079E+01	PA231
					300.18	6.200	4.284E+00	PA233
308.44	14.	163.90	1.05	1.875E-02	308.44	31.750	PBC<MDA	Ir192
320.08	12.	126.32	1.06	1.818E-02	320.08	9.940	PBC<MDA	CR51
328.76	4.	328.22	1.07	1.778E-02	328.76	20.300	PBC<MDA	La140
333.44	2.	541.99	1.07	1.757E-02	333.44	15.510	PBC<MDA	Cf249
338.55	58.	19.15	1.45	1.736E-02	338.32	12.010	1.550E+01	AC228
345.83	11.	135.17	1.08	1.705E-02	345.83	15.070	PBC<MDA	HF181
351.90	144.	11.06	0.92	1.680E-02	351.93	37.600	1.271E+01	PB214
364.48	17.	47.81	1.10	1.632E-02	364.48	81.700	PBC<MDA	I131
391.69	7.	151.02	1.12	1.537E-02	391.69	64.000	PBC<MDA	SN113
433.94	9.	102.84	1.16	1.411E-02	433.94	90.480	PBC<MDA	AG108M
453.88	7.	104.00	1.18	1.360E-02	453.88	65.000	PBC<MDA	pm146
468.06	7.	150.39	1.20	1.325E-02	468.06	51.750	PBC<MDA	Ir192
477.43	8.	132.36	1.20	1.303E-02	477.60	10.520	PBC<MDA	BE7
487.02	8.	104.08	1.21	1.282E-02	487.02	45.500	PBC<MDA	La140
511.86	36.	50.72	2.48	1.230E-02	511.86	20.000	8.207E+00	RH106
537.26	8.	105.07	1.26	1.181E-02	537.26	24.390	PBC<MDA	Ba140
569.32	3.	197.20	1.29	1.125E-02	569.32	15.380	PBC<MDA	CS134
					569.47	8.200	1.807E+00	PA234
					569.70	97.740	1.516E-01	BI207
583.30	63.	15.71	1.17	1.103E-02	583.02	84.500	3.735E+00	TL208
609.43	105.	11.92	0.81	1.063E-02	609.31	46.090	1.190E+01	BI214
					610.30	5.750	9.554E+01	RU103
635.89	8.	72.16	1.34	1.026E-02	635.89	11.310	PBC<MDA	SB125
636.97	2.	344.84	1.34	1.025E-02	636.97	7.170	PBC<MDA	I131
657.76	9.	82.76	1.36	9.974E-03	657.76	94.640	PBC<MDA	AG110M
661.66	-4.	224.00	1.37	9.924E-03	661.66	85.210	PBC<MDA	CS137
702.63	1.	742.74	1.40	9.438E-03	702.63	97.900	PBC<MDA	NB94
727.17	10.	136.40	1.42	9.170E-03	727.17	7.550	PBC<MDA	BI212
766.41	15.	92.63	1.45	8.776E-03	765.79	99.790	PBC<MDA	NB95
					766.41	0.294	3.263E+02	PA234M
801.95	4.	184.30	1.48	8.448E-03	801.95	8.690	PBC<MDA	CS134
810.78	2.	469.67	1.49	8.371E-03	810.78	99.460	PBC<MDA	CO58
846.57	7.	104.64	1.52	8.072E-03	846.77	99.935	PBC<MDA	Co56
861.37	8.	93.64	1.53	7.963E-03	860.56	12.420	PBC<MDA	TL208
873.23	9.	84.56	1.54	7.866E-03	873.23	12.270	PBC<MDA	EU154
911.12	46.	15.01	1.60	7.591E-03	911.07	29.000	1.165E+01	AC228
937.49	1.	979.80	1.59	7.411E-03	937.49	34.360	PBC<MDA	AG110M
946.02	5.	164.92	1.60	7.355E-03	946.02	13.400	PBC<MDA	PA234

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
964.11	6.	149.20	1.61	7.239E-03	964.11	14.605	PBC<MDA	EU152
969.54	24.	25.11	3.18	7.209E-03	968.97	17.460	1.057E+01	AC228
1037.37	2.	408.26	1.66	6.805E-03	1037.84	14.130	PBC<MDA	Co56
1048.07	5.	128.06	1.67	6.749E-03	1048.07	80.000	PBC<MDA	Cs136
1063.66	8.	93.82	1.68	6.666E-03	1063.66	74.500	PBC<MDA	BI207
1077.40	9.	33.33	1.69	6.594E-03	1077.40	3.300	2.679E+01	Ga68
1099.25	2.	389.82	1.71	6.484E-03	1099.25	56.500	PBC<MDA	FE59
1120.33	32.	20.65	1.72	6.381E-03	1120.29	15.100	1.869E+01	BI214
					1120.55	99.987	PBC<MDA	Sc46
1121.56	6.	123.42	1.72	6.376E-03	1121.30	34.900	PBC<MDA	Ta182
1173.24	13.	48.70	1.76	6.138E-03	1173.24	99.900	PBC<MDA	CO60
1221.21	6.	93.30	1.79	5.934E-03	1221.41	27.000	PBC<MDA	Ta182
1238.28	18.	37.82	1.80	5.866E-03	1238.28	66.070	2.596E+00	Co56
1291.60	6.	91.70	1.84	5.661E-03	1291.60	43.200	PBC<MDA	FE59
1332.50	1.	397.16	1.87	5.514E-03	1332.50	99.980	PBC<MDA	CO60
1384.30	8.	35.36	1.90	5.340E-03	1384.30	24.290	3.426E+00	AG110M
1460.95	137.	8.77	2.19	5.103E-03	1460.83	10.670	1.401E+02	K40
1690.98	6.	40.82	2.08	4.511E-03	1690.98	47.790	PBC<MDA	SB124
1764.49	1.	672.51	2.11	4.351E-03	1764.49	15.400	PBC<MDA	BI214
1770.73	7.	79.73	2.12	4.337E-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
298.72	74.78	65.	103.	3.266E+03	14.88	0.813	- D
307.97	77.09	86.	159.	4.946E+03	11.45	0.815	- D
347.95	86.96	65.	60.	1.749E+03	22.87	0.825	- sD
359.07	89.73	60.	31.	8.817E+02	39.93	0.828	- 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	200.11	50.14	102.	13.	0.007	135.53	0.787s
AM-241	237.72	59.54	132.	-24.	-0.014	73.32	0.797s
TH-234	252.02	63.11	73.	46.	0.025	36.52	0.768s
Sn-126	256.71	64.28	252.	-19.	-0.010	123.56	0.802

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Np-237	345.63	86.49	486.	-19.	-0.011	165.42	0.825
EU-155	345.84	86.54	467.	-19.	-0.011	162.21	0.825
Sn-126	347.43	86.94	448.	-19.	-0.011	158.89	0.825
Sn-126	349.95	87.57	429.	-16.	-0.009	183.45	0.826
Cd-109	351.83	88.04	428.	-20.	-0.011	148.53	0.826s
Nd-147	364.08	91.10	408.	-10.	-0.005	294.70	0.829
TH-234	370.05	92.59	93.	28.	0.016	52.58	0.831D
AC-228	373.09	93.35	334.	18.	0.010	148.78	0.832s
Np-239	397.71	99.50	81.	7.	0.004	231.90	0.838s
Gd-153	412.52	103.20	169.	13.	0.007	146.02	0.842s
Np-239	414.52	103.70	182.	0.	0.000	1000.00	0.842
EU-155	420.98	105.31	231.	3.	0.002	735.50	0.844s
Np-239	424.25	106.13	214.	14.	0.008	152.01	0.845s
EU-152	486.88	121.78	116.	6.	0.003	257.12	0.861
CO-57	488.03	122.06	122.	0.	0.000	1000.00	0.861s
EU-154	492.18	123.10	120.	-11.	-0.006	202.41	0.862s
PA-234	524.99	131.29	271.	-18.	-0.010	128.57	0.871s
HF-181	531.91	133.02	290.	-18.	-0.010	132.46	0.872s
CE-144	533.97	133.54	308.	-18.	-0.010	136.41	0.873
HF-181	545.02	136.30	327.	-19.	-0.010	139.89	0.876s
CO-57	545.72	136.47	293.	17.	0.010	142.38	0.876s
Tc-99m	561.88	140.51	229.	-17.	-0.010	125.98	0.880s
U-235	574.99	143.79	245.	-18.	-0.010	123.96	0.883
CE-141	581.61	145.44	322.	-20.	-0.011	127.68	0.885s
U-235	653.42	163.38	122.	0.	0.000	1000.00	0.903s
CE-139	663.32	165.85	111.	0.	0.000	1000.00	0.905s
Cf-251	706.34	176.60	70.	9.	0.005	168.75	0.916s
TH-229	774.03	193.51	53.	-4.	-0.002	303.72	0.933s
U-235	821.35	205.33	65.	-6.	-0.003	389.36	0.945s
TH-229	843.44	210.85	64.	14.	0.008	105.03	0.950s
PB-212	954.64	238.63	27.	165.	0.092	8.93	0.978D
PB-214	968.10	242.00	40.	45.	0.025	24.62	0.981D
EU-152	978.89	244.69	365.	-15.	-0.009	178.34	0.984s
TH-227	1025.11	256.24	41.	7.	0.004	163.70	0.995s
Cd-113m	1054.97	263.70	59.	6.	0.004	175.59	1.002
BI-210M	1063.50	265.83	84.	-14.	-0.008	99.46	1.005s
TL-208	1109.33	277.28	62.	3.	0.002	375.65	1.016
I-131	1137.41	284.30	40.	12.	0.006	105.96	1.022s
PB-214	1181.48	295.31	24.	75.	0.041	15.96	0.988
PB-212	1201.48	300.31	24.	9.	0.005	100.36	1.824s
PA-231	1200.53	300.07	277.	-17.	-0.009	141.08	1.038s
PA-233	1200.97	300.18	275.	-17.	-0.009	140.74	1.038s
PA-231	1210.86	302.65	292.	-17.	-0.009	144.54	1.040s
BA-133	1211.66	302.85	309.	-17.	-0.009	148.53	1.040s
Ba-140	1219.66	304.85	326.	-17.	-0.009	152.17	1.042s
BI-210M	1219.85	304.90	343.	-17.	-0.009	155.98	1.042s
Ir-192	1234.03	308.44	242.	14.	0.008	163.90	1.046s
PA-233	1248.32	312.01	321.	-12.	-0.007	205.21	1.049s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ir-192	1266.25	316.49	120.	-16.	-0.009	100.31	1.053s
CR-51	1280.63	320.08	115.	12.	0.007	126.32	1.057s
La-140	1315.35	328.76	40.	4.	0.002	328.22	1.065s
Cf-249	1334.08	333.44	33.	2.	0.001	541.99	1.070
AC-228	1354.53	338.55	16.	58.	0.032	19.15	1.448s
Cs-136	1362.62	340.57	159.	-12.	-0.007	146.37	1.077s
EU-152	1377.49	344.29	161.	-15.	-0.008	126.02	1.080s
HF-181	1383.66	345.83	111.	11.	0.006	135.17	1.082s
PB-214	1407.97	351.90	28.	144.	0.080	11.06	0.920
I-131	1458.32	364.48	15.	17.	0.010	47.81	1.099s
BA-133	1535.78	383.84	95.	-12.	-0.007	115.74	1.117
Cf-249	1552.22	387.95	107.	-2.	-0.001	859.56	1.121s
SN-113	1567.19	391.69	59.	7.	0.004	151.02	1.125
SB-125	1711.99	427.88	28.	-2.	-0.001	469.00	1.158s
AG-108M	1736.25	433.94	20.	9.	0.005	102.84	1.164s
pm-146	1816.05	453.88	12.	7.	0.004	104.00	1.182s
SB-125	1854.01	463.37	57.	-4.	-0.002	251.74	1.191s
Ir-192	1872.79	468.06	55.	7.	0.004	150.39	1.195s
BE-7	1910.94	477.59	57.	8.	0.005	132.36	1.204s
La-140	1948.65	487.02	16.	8.	0.004	104.08	1.212s
RU-103	1988.80	497.05	20.	-3.	-0.002	297.52	1.221s
RH-106	2048.06	511.86	47.	36.	0.020	50.72	2.485s
Nd-147	2124.62	531.00	28.	-6.	-0.003	177.43	1.252s
Ba-140	2149.67	537.26	17.	8.	0.004	105.07	1.258
CS-134	2253.60	563.24	20.	-3.	-0.002	297.52	1.280s
CS-134	2277.94	569.32	16.	3.	0.002	197.20	1.286s
PA-234	2278.54	569.47	20.	-1.	0.000	948.68	1.286s
BI-207	2279.47	569.70	19.	0.	0.000	1000.00	1.286s
TL-208	2333.87	583.30	7.	63.	0.035	15.71	1.170
SB-125	2402.69	600.50	185.	-5.	-0.003	363.58	1.313s
SB-124	2411.61	602.73	180.	0.	0.000	1000.00	1.315s
CS-134	2419.53	604.71	180.	0.	0.000	1000.00	1.317s
BI-214	2438.42	609.43	14.	105.	0.058	11.92	0.811s
RU-103	2441.89	610.30	180.	0.	0.000	1000.00	1.322s
AG-108M	2457.82	614.28	180.	0.	0.000	1000.00	1.325s
PM-144	2472.94	618.06	180.	0.	0.000	1000.00	1.328s
RH-106	2488.37	621.92	198.	-10.	-0.006	194.95	1.332s
SB-125	2544.26	635.89	13.	8.	0.004	72.16	1.344s
I-131	2548.61	636.97	29.	2.	0.001	344.84	1.345s
AG-110M	2631.76	657.76	26.	9.	0.005	82.76	1.362s
CS-137	2647.36	661.66	42.	-4.	-0.002	224.00	1.366s
PM-144	2786.90	696.54	22.	-9.	-0.005	103.82	1.395s
NB-94	2811.25	702.63	13.	1.	0.001	742.74	1.400s
SB-124	2891.88	722.79	50.	-13.	-0.007	81.68	1.417s
AG-108M	2892.48	722.94	63.	-8.	-0.005	142.64	1.417s
EU-154	2894.16	723.36	71.	0.	0.000	1000.00	1.418s
ZR-95	2897.53	724.20	72.	-10.	-0.005	126.27	1.418s
BI-212	2909.41	727.17	81.	10.	0.005	136.40	1.421s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
pm-146	2943.61	735.72	13.	-3.	-0.002	378.74	1.428s
pm-146	2989.37	747.16	17.	-4.	-0.002	297.94	1.437s
ZR-95	3027.65	756.73	22.	-6.	-0.003	220.85	1.445s
AG-110M	3056.50	763.94	80.	-20.	-0.011	68.58	1.451s
NB-95	3063.89	765.79	99.	-19.	-0.010	77.90	1.453s
PA-234M	3066.38	766.41	91.	15.	0.008	92.63	1.453s
EU-152	3116.41	778.92	28.	-12.	-0.007	94.44	1.463s
BI-212	3142.41	785.42	19.	-3.	-0.001	349.11	1.468s
CS-134	3184.19	795.87	14.	0.	0.000	1000.00	1.477s
CS-134	3208.53	801.95	9.	4.	0.002	184.30	1.482s
CO-58	3243.82	810.78	38.	2.	0.001	469.67	1.489s
La-140	3263.80	815.77	40.	0.	0.000	1000.00	1.493s
Cs-136	3274.72	818.50	41.	-1.	-0.001	687.39	1.495s
MN-54	3340.10	834.85	19.	-5.	-0.003	172.74	1.508s
Co-56	3387.78	846.77	9.	7.	0.004	104.64	1.518s
TL-208	3442.95	860.56	9.	8.	0.004	93.64	1.529s
NB-94	3485.08	871.10	30.	-4.	-0.002	254.12	1.537s
EU-154	3493.61	873.23	22.	9.	0.005	84.56	1.539s
PA-234	3522.80	880.53	31.	-3.	-0.002	268.74	1.544s
PA-234	3533.64	883.24	34.	0.	0.000	1000.00	1.547s
AG-110M	3539.41	884.68	34.	0.	0.000	1000.00	1.547s
Sc-46	3557.79	889.28	45.	-9.	-0.005	110.55	1.551s
y-88	3592.83	898.04	15.	-7.	-0.004	112.01	1.558s
AC-228	3645.15	911.12	1.	46.	0.026	15.01	1.604
AG-110M	3750.60	937.49	9.	1.	0.000	979.80	1.589s
PA-234	3784.70	946.02	14.	5.	0.003	164.92	1.595s
EU-152	3857.05	964.11	32.	6.	0.003	149.20	1.609
AC-228	3878.75	969.54	3.	24.	0.013	25.11	3.183s
EU-154	3985.88	996.33	30.	-2.	-0.001	527.05	1.633s
PA-234M	4004.55	1001.00	32.	0.	0.000	1000.00	1.636s
EU-154	4019.65	1004.77	55.	-13.	-0.007	86.85	1.639s
Co-56	4151.87	1037.84	10.	2.	0.001	408.26	1.664s
Cs-136	4192.77	1048.07	18.	5.	0.003	128.06	1.671s
RH-106	4201.93	1050.36	31.	-5.	-0.003	163.71	1.673s
BI-207	4255.11	1063.66	10.	8.	0.004	93.82	1.682s
Ga-68	4310.04	1077.40	0.	9.	0.005	33.33	1.692s
FE-59	4397.41	1099.25	16.	2.	0.001	389.82	1.708s
EU-152	4448.68	1112.07	89.	-13.	-0.007	103.81	1.717s
ZN-65	4462.56	1115.55	76.	-9.	-0.005	142.28	1.720s
BI-214	4481.51	1120.29	6.	32.	0.018	20.65	1.723D
Sc-46	4482.57	1120.55	67.	0.	0.000	1000.00	1.723s
Ta-182	4485.56	1121.30	24.	6.	0.003	123.42	1.724s
CO-60	4693.21	1173.24	6.	13.	0.007	48.70	1.760s
Ta-182	4756.42	1189.05	30.	-10.	-0.006	124.50	1.771s
Ta-182	4885.79	1221.41	5.	6.	0.003	93.30	1.793s
Co-56	4953.23	1238.28	6.	18.	0.010	37.82	1.804
EU-154	5098.19	1274.54	11.	0.	0.000	1000.00	1.828s
FE-59	5166.35	1291.60	5.	6.	0.004	91.70	1.840s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
CO-60	5329.85	1332.50	6.	1.	0.001	397.16	1.866s
AG-110M	5536.88	1384.30	0.	8.	0.004	35.36	1.899s
K-40	5843.24	1460.95	4.	137.	0.076	8.77	2.185
La-140	6383.73	1596.21	6.	-4.	-0.002	160.96	2.024s
SB-124	6762.39	1690.98	0.	6.	0.003	40.82	2.076s
BI-214	7056.06	1764.49	27.	1.	0.001	672.51	2.114s
Co-56	7083.46	1771.35	14.	7.	0.004	79.73	2.117s

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	- Average Code	Activity Bq/Sample	Energy keV	Peak Activity Bq/Sample	Code	MDA Value Bq/Sample	COMMENTS
BE-7	C	3.3774E+00	477.60	3.377E+00	?(	1.532E+01 1.32E+02	5.31E+01 1.05E+01 G
NA-22	C	3.2367E-02	1274.53	3.237E-02	%(	1.741E+00 1.40E+03	9.50E+02 9.99E+01 G
K-40	N	1.4012E+02	1460.83	1.401E+02	(P	1.187E+01 8.77E+00	4.66E+11 1.07E+01 G
Sc-46	F	-6.4551E-01	889.28-1120.55	-6.455E-01 0.000E+00	?(+	2.436E+00 1.11E+02 3.558E+00 1.00E+03	8.38E+01 1.00E+02 G 1.00E+02 G
CR-51	F	3.7828E+00	320.08	3.783E+00	&(	1.617E+01 1.26E+02	2.77E+01 9.94E+00 G
MN-54	C	-3.5111E-01	834.85	-3.511E-01	?(P	1.572E+00 1.73E+02	3.12E+02 1.00E+02 G
FE-59	F	8.1932E-01	1099.25-1291.60	3.400E-01 1.446E+00	?(P ?(P	3.216E+00 3.90E+02 3.066E+00 9.17E+01	4.45E+01 5.65E+01 G 4.32E+01 G
Co-56	C	1.2859E+00	846.77-1238.28-1037.84-1771.35	4.591E-01 2.596E+00 1.007E+00 6.083E+00	?((P ?(P ?	1.167E+00 1.05E+02 2.010E+00 3.78E+01 1.019E+01 4.08E+02 1.641E+01 7.97E+01	7.73E+01 9.99E+01 G 6.61E+01 G 1.41E+01 G 1.55E+01 A

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
CO-57	C	2.8776E-01					2.72E+02	
			122.06	0.000E+00	?(9.817E-01	1.00E+03	8.56E+01 G
			136.47	2.594E+00	?(	1.240E+01	1.42E+02 1.07E+01 G
CO-58	C	1.2567E-01					7.09E+01	
			810.78	1.257E-01	?(P	2.101E+00	4.70E+02	9.95E+01 G
CO-60	F	6.5304E-01					1.93E+03	
			1332.50	1.381E-01	?(P	1.387E+00	3.97E+02	1.00E+02 G
			1173.24	1.168E+00	?(P	1.289E+00	4.87E+01 9.99E+01 G	
ZN-65	F	-1.5277E+00					2.44E+02	
			1115.55	-1.528E+00	?(7.426E+00	1.42E+02	5.06E+01 G
NB-94	I	6.0127E-02					7.41E+06	
			702.63	6.013E-02	&(1.173E+00	7.43E+02	9.79E+01 G
			871.10	-2.491E-01	& P	1.978E+00	2.54E+02 9.99E+01 G	
ZR-95	I	-6.8951E-01					6.40E+01	
			756.73	-6.895E-01	?(P	2.825E+00	2.21E+02	5.45E+01 G
			724.20	-1.345E+00	+	5.784E+00	1.26E+02 4.42E+01 G	
NB-95	I	-1.1979E+00					6.40E+01	
			765.79	-1.198E+00	?(3.109E+00	7.79E+01	9.98E+01 G
RU-103	I	-1.4548E-01					3.93E+01	
			497.05	-1.455E-01	?(1.142E+00	2.98E+02	9.09E+01 G
			610.30	0.000E+00	+	5.936E+01	1.00E+03 5.75E+00 GA	
RH-106	I	-5.5415E+00					3.74E+02	
			621.92	-5.542E+00	?(3.659E+01	1.95E+02	9.93E+00 G
			1050.36	-2.643E+01	+	1.515E+02	1.64E+02	1.56E+00 G
			511.86	8.207E+00	?	7.802E+00	5.07E+01 2.00E+01 GA	
AG-108M	C	3.9154E-01					1.53E+05	
			433.94	3.915E-01	&(1.025E+00	1.03E+02	9.05E+01 G
			722.94	-5.396E-01	+	2.638E+00	1.43E+02	9.08E+01 G
			614.28	0.000E+00	-	3.819E+00	1.00E+03 8.98E+01 G	
AG-110M	F	6.2397E-01					2.50E+02	
			884.68	0.000E+00	?(2.936E+00	1.00E+03	7.27E+01 G
			657.76	5.576E-01	?(1.558E+00	8.28E+01	9.46E+01 G
			937.49	1.454E-01	?(3.697E+00	9.80E+02	3.44E+01 G
			1384.30	3.426E+00	&(3.157E+00	3.54E+01	2.43E+01 G
			763.94	-5.537E+00	+	1.258E+01	6.86E+01 2.23E+01 G	

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
SN-113	F	4.2075E-01					1.15E+02
		391.69	4.207E-01	&(P	2.182E+00	1.51E+02	6.40E+01 G
SB-124	F	5.0598E-01					6.02E+01
		602.73	0.000E+00	?(	3.437E+00	1.00E+03	9.83E+01 G
		1690.98	1.546E+00	?(	1.899E+00	4.08E+01	4.78E+01 G
		722.79-7.268E+00		+	1.991E+01	8.17E+01	1.08E+01 G
SB-125	I	8.4183E-01					1.01E+03
		427.88-3.168E-01		&(P	3.621E+00	4.69E+02	2.96E+01 G
		600.50-1.541E+00		+	1.912E+01	3.64E+02	1.79E+01 G
		635.89	3.874E+00	(	9.342E+00	7.22E+01	1.13E+01 G
		463.37-1.721E+00		+	1.509E+01	2.52E+02	1.05E+01 G
I-131	I	1.0891E+00					8.02E+00
		364.48	7.223E-01	?(	8.566E-01	4.78E+01	8.17E+01 G
		284.30	5.263E+00	&(	1.457E+01	1.06E+02	6.14E+00 G
		636.97	1.695E+00	?(	2.095E+01	3.45E+02	7.17E+00 G
Gd-153	F	3.5112E-01					2.42E+02
		97.50-5.177E-02		%(<	2.693E+00	1.50E+03	3.00E+01 G
		103.20	9.055E-01	&(	4.468E+00	1.46E+02	2.18E+01 G
Ga-68	C	2.6787E+01					4.71E-02
		1077.40	2.679E+01	(	2.194E+01	3.33E+01	3.30E+00 G
Tc-99m	I	-3.2527E-01					2.51E-01
		140.51-3.253E-01		(	1.376E+00	1.26E+02	8.93E+01 G
BA-133	F	-4.4833E-02					3.85E+03
		356.00-4.483E-02		%(<	3.636E+00	2.37E+03	6.20E+01 G
		302.85-2.703E+00		+	1.348E+01	1.49E+02	1.83E+01 G
		383.84-4.885E+00		&	1.913E+01	1.16E+02	8.94E+00 GA
		80.99	8.188E-02	%	2.874E+00	1.28E+03	3.41E+01 GA
CS-134	I	1.8783E-01					7.54E+02
		604.71	0.000E+00	?(	3.469E+00	1.00E+03	9.76E+01 G
		795.87	0.000E+00	&(	1.539E+00	1.00E+03	8.55E+01 G
		569.32	9.630E-01	?(	6.853E+00	1.97E+02	1.54E+01 G
		801.95	2.775E+00	?(	1.282E+01	1.84E+02	8.69E+00 G
		563.24-1.758E+00		+	1.380E+01	2.98E+02	8.35E+00 G
CS-137	I	-2.6381E-01					1.10E+04
		661.66-2.638E-01		?(P	2.162E+00	2.24E+02	8.52E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
Ba-140	I	1.5466E+00				1.28E+01		
			537.26	1.547E+00	?(P	4.198E+00	1.05E+02	2.44E+01 G
			162.66	-2.869E-01	&	1.549E+01	1.56E+03	6.22E+00 G
			304.85	-1.163E+01	&	5.944E+01	1.52E+02	4.29E+00 G
La-140	I	1.9305E-02				1.28E+01		
			1596.21	-4.509E-01	?(	1.697E+00	1.61E+02	9.54E+01 G
			487.02	7.620E-01	?(	2.034E+00	1.04E+02	4.55E+01 G
			328.76	5.644E-01	?(	4.973E+00	3.28E+02	2.03E+01 G
			815.77	0.000E+00	-	9.222E+00	1.00E+03	2.33E+01 G
CE-141	I	-6.9450E-01				3.25E+01		
			145.44	-6.945E-01	&(	2.970E+00	1.28E+02	4.82E+01 G
CE-144	I	-2.6535E+00				2.85E+02		
			133.54	-2.653E+00	(	1.214E+01	1.36E+02	1.11E+01 G
PM-144	C	-5.1301E-01				3.63E+02		
			696.54	-5.130E-01	?(P	1.441E+00	1.04E+02	9.90E+01 G
			618.06	0.000E+00	+	3.481E+00	1.00E+03	9.91E+01 G
EU-152	F	-1.0511E-01				4.94E+03		
			344.29	-1.782E+00	&(	7.571E+00	1.26E+02	2.65E+01 G
			1112.07	-8.462E+00	+	2.964E+01	1.04E+02	1.36E+01 G
			121.78	3.255E-01	+	2.869E+00	2.57E+02	2.86E+01 G
			778.92	-6.179E+00	+	1.357E+01	9.44E+01	1.29E+01 G
			964.11	2.938E+00	?(	1.528E+01	1.49E+02	1.46E+01 G
			244.69	-4.938E+00	+	2.959E+01	1.78E+02	7.58E+00 G
			1408.00	1.675E-01	%	9.008E+00	2.23E+03	2.10E+01 GA
EU-154	I	4.9714E+00				3.14E+03		
			873.23	4.971E+00	?(P	1.422E+01	8.46E+01	1.23E+01 G
			123.10	-4.074E-01	- P	2.045E+00	2.02E+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	&	1.255E+01	1.00E+03	2.02E+01 G
			1004.77	-5.620E+00	-	1.642E+01	8.68E+01	1.80E+01 G
			996.33	-1.116E+00	-	2.117E+01	5.27E+02	1.06E+01 G
EU-155	I	2.1244E-01				1.81E+03		
			105.31	2.124E-01	?(P	5.326E+00	7.36E+02	2.12E+01 G
			86.54	-1.003E+00	+	5.448E+00	1.62E+02	3.07E+01 G
HF-181	F	3.6982E-01				4.24E+01		
			482.00	-1.779E-02	%(	2.245E+00	3.59E+03	8.05E+01 G
			133.02	-6.782E-01	&	3.014E+00	1.32E+02	4.33E+01 G
			345.83	2.440E+00	?(	1.119E+01	1.35E+02	1.51E+01 G
			136.30	-5.088E+00	+	2.387E+01	1.40E+02	5.85E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
Ta-182	F	1.7854E+00					1.14E+02	
			1121.30	1.495E+00	?(6.415E+00	1.23E+02	3.49E+01 G
			1221.41	2.160E+00	?(4.672E+00	9.33E+01	2.70E+01 G
			1189.05-5.650E+00	+	1.595E+01	1.24E+02	1.62E+01 G	
Hg-203	F	3.3492E-02					4.66E+01	
			279.20	3.349E-02	%	1.330E+00	1.13E+03	8.15E+01 G
TL-208	N	3.7971E+00					6.98E+02	
			583.02	3.735E+00	(9.136E-01	1.57E+01	8.45E+01 G
			277.28	1.290E+00	-	1.694E+01	3.76E+02	6.31E+00 G
			860.56	4.221E+00	&	9.519E+00	9.36E+01	1.24E+01 G
pm-146	C	1.1528E-02					2.02E+03	
			747.16-8.078E-01	?(P	4.040E+00	2.98E+02	3.40E+01 G	
			735.72-9.466E-01	+ P	5.389E+00	3.79E+02	2.25E+01 G	
			453.88	4.401E-01	&	1.185E+00	1.04E+02	6.50E+01 G
y-88	F	-5.1039E-01					1.07E+02	
			898.04-5.104E-01	?(P	1.584E+00	1.12E+02	9.37E+01 G	
			1836.06-4.150E-02	% P	9.809E-01	2.40E+03	9.92E+01 G	
Cd-113m		2.7466E+03					5.33E+03	
			263.70	2.747E+03	&	1.665E+04	1.76E+02	6.00E-03 K
Cd-109	F	-8.4343E+00					4.53E+02	
			88.04-8.434E+00	?(	4.195E+01	1.49E+02	3.79E+00 G
Cf-251	T	9.8870E-01					3.28E+05	
			176.60	9.887E-01	(4.581E+00	1.69E+02	1.70E+01 G
			227.00-1.216E-01	%	1.340E+01	3.90E+03	6.30E+00 GA	
Cf-249	T	2.3066E-03					1.28E+05	
			387.95-9.296E-02	?(	2.770E+00	8.60E+02	6.60E+01 G
			333.44	4.077E-01	&	6.009E+00	5.42E+02	1.55E+01 G
Sn-126		-3.8447E+00					3.65E+07	
			87.57-6.914E-01	+	4.257E+00	1.83E+02	3.75E+01 GA	
			64.28-3.845E+00	(	1.594E+01	1.24E+02	9.70E+00 G
			86.94-3.399E+00	+	1.809E+01	1.59E+02	9.04E+00 GA	
PB-210	N	4.3400E-01					8.14E+03	
			46.54	4.340E-01	%(P	4.085E+01	3.19E+03	4.25E+00 G
PB-212	N	9.1551E+00					6.98E+02	
			238.63	9.155E+00	(1.477E+00	8.93E+00	4.33E+01 G
			300.03	8.094E+00		2.248E+01	1.00E+02	3.28E+00 GA

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
PB-214	N	1.2137E+01				5.84E+05		
			351.93	1.271E+01	(P	2.388E+00	1.11E+01	3.76E+01 G
			295.09	1.103E+01	(P	3.814E+00	1.60E+01	1.93E+01 G
			242.00	1.481E+01	P	1.045E+01	2.46E+01	7.43E+00 GA
BI-207	C	3.8712E-01				1.18E+04		
			569.70	0.000E+00	&(	1.164E+00	1.00E+03	9.77E+01 G
			1063.66	8.950E-01	?(	1.952E+00	9.38E+01	7.45E+01 G
BI-212	N	7.7269E+00				6.98E+02		
			727.17	7.727E+00	?(P	3.590E+01	1.36E+02	7.55E+00 G
			785.42	-1.346E+01	+	1.153E+02	3.49E+02	1.28E+00 GA
BI-214	N	1.1903E+01				5.84E+05		
			609.31	1.190E+01	(P	2.284E+00	1.19E+01	4.61E+01 G
			1120.29	1.869E+01	+ P	8.052E+00	2.07E+01	1.51E+01 G
			1764.49	9.154E-01	- P	2.228E+01	6.73E+02	1.54E+01 G
BI-210M	T	-7.0906E-01				1.10E+09		
			265.83	-7.091E-01	?(	2.377E+00	9.95E+01	5.00E+01 G
			304.90	-1.783E+00	&	9.335E+00	1.56E+02	2.80E+01 G
AC-228	N	1.2118E+01				2.10E+03		
			911.07	1.165E+01	(P	1.860E+00	1.50E+01	2.90E+01 G
			968.97	1.057E+01	(P	4.790E+00	2.51E+01	1.75E+01 G
			338.32	1.550E+01	(	5.663E+00	1.92E+01	1.20E+01 G
			93.35	4.973E+00	-	2.483E+01	1.49E+02	5.56E+00 XA
TH-227	N	3.6268E+00				7.95E+03		
			50.14	4.429E+00	?(P	1.720E+01	1.36E+02	8.00E+00 G
			256.24	2.710E+00	?(P	1.175E+01	1.64E+02	7.00E+00 G
TH-229	N	2.9102E+00				2.68E+06		
			193.51	-1.984E+00	?(	1.682E+01	3.04E+02	4.40E+00 G
			210.85	1.011E+01	?(P	2.887E+01	1.05E+02	2.99E+00 G
TH-234	N	2.4674E+01				1.63E+12		
			63.29	2.467E+01	(P	2.288E+01	3.65E+01	3.81E+00 G
			92.59	7.920E+00	- P	1.346E+01	5.26E+01	5.58E+00 G
PA-231	N	-1.7189E+01				1.20E+07		
			302.65	-1.719E+01	?(	8.345E+01	1.45E+02	2.88E+00 G
			300.07	-1.994E+01	+	9.448E+01	1.41E+02	2.46E+00 G
PA-233	C	-1.0353E+00				7.82E+08		
			312.01	-1.035E+00	&(	7.159E+00	2.05E+02	3.60E+01 G
			300.18	-7.912E+00	+	3.741E+01	1.41E+02	6.20E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
PA-234	N	2.7385E-01				1.63E+12		
			131.29	-1.620E+00	?(	6.990E+00	1.29E+02	1.80E+01 G
			946.02	2.818E+00	?(	1.136E+01	1.65E+02	1.34E+01 G
			569.47	-4.015E-01	&	1.408E+01	9.49E+02	8.20E+00 G
			883.24	0.000E+00	-	2.219E+01	1.00E+03	9.60E+00 G
			880.53	-3.556E+00	+	3.397E+01	2.69E+02	6.00E+00 GA
PA-234M	N	8.4823E+01				1.63E+12		
			1001.00	0.000E+00	?(	2.751E+02	1.00E+03	8.37E-01 G
			766.41	3.263E+02	?(	1.015E+03	9.26E+01	2.94E-01 G
U-235	N	-2.7331E+00				2.57E+11		
			143.79	-2.733E+00	(	1.137E+01	1.24E+02	1.10E+01 G
			205.33	-2.356E+00	+ P	1.696E+01	3.89E+02	5.01E+00 G
			163.38	0.000E+00	+	1.910E+01	1.00E+03	5.08E+00 G
AM-241	T	-1.4896E+00				1.58E+05		
			59.54	-1.490E+00	?(P	3.441E+00	7.33E+01	3.59E+01 G
Np-237	F	-2.3501E+00				2.14E+06		
			86.49	-2.350E+00	?(	1.302E+01	1.65E+02	1.31E+01 G
Ir-192	F	1.2915E-01				7.40E+01		
			316.49	-5.555E-01	?(	1.872E+00	1.00E+02	8.70E+01 G
			468.06	5.806E-01	?(	3.007E+00	1.50E+02	5.18E+01 G
			308.44	1.270E+00	&(	7.019E+00	1.64E+02	3.18E+01 G
Cs-136	F	1.7912E-01				1.30E+01		
			818.50	-8.919E-02	?(	2.185E+00	6.87E+02	1.00E+02 G
			1048.07	5.145E-01	&(	2.313E+00	1.28E+02	8.00E+01 G
			340.57	-8.520E-01	+	4.217E+00	1.46E+02	4.69E+01 G
Np-239	T	9.3521E-01				2.36E+00		
			103.70	0.000E+00	&	4.201E+00	1.00E+03	2.40E+01 X
			106.13	9.352E-01	(	4.794E+00	1.52E+02	2.27E+01 G
			99.50	7.218E-01	&	4.604E+00	2.32E+02	1.50E+01 X
Nd-147		-2.1498E+00				1.11E+01		
			531.00	-2.150E+00	?(	9.806E+00	1.77E+02	1.30E+01 G
			91.10	-5.455E-01	+	5.418E+00	2.95E+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	102.	13.	0.007	135.53	4.429E+00	P
AM-241	59.54	132.	-24.	-0.014	73.32	-1.490E+00	P
Sn-126	64.28	252.	-19.	-0.010	123.56	-3.845E+00	
Np-237	86.49	486.	-19.	-0.011	165.42	-2.350E+00	
EU-155	86.54	467.	-19.	-0.011	162.21	-1.003E+00	
Sn-126	86.94	448.	-19.	-0.011	158.89	-3.399E+00	
Sn-126	87.57	429.	-16.	-0.009	183.45	-6.914E-01	
Cd-109	88.04	428.	-20.	-0.011	148.53	-8.434E+00	
Nd-147	91.10	408.	-10.	-0.005	294.70	-5.455E-01	
Np-239	99.50	81.	7.	0.004	231.90	7.218E-01	
Gd-153	103.20	169.	13.	0.007	146.02	9.055E-01	
EU-155	105.31	231.	3.	0.002	735.50	2.124E-01	P
Np-239	106.13	214.	14.	0.008	152.01	9.352E-01	
EU-152	121.78	116.	6.	0.003	257.12	3.255E-01	
EU-154	123.10	120.	-11.	-0.006	202.41	-4.074E-01	P
PA-234	131.29	271.	-18.	-0.010	128.57	-1.620E+00	
HF-181	133.02	290.	-18.	-0.010	132.46	-6.782E-01	
CE-144	133.54	308.	-18.	-0.010	136.41	-2.653E+00	
HF-181	136.30	327.	-19.	-0.010	139.89	-5.088E+00	
CO-57	136.47	293.	17.	0.010	142.38	2.594E+00	
Tc-99m	140.51	229.	-17.	-0.010	125.98	-3.253E-01	
U-235	143.79	245.	-18.	-0.010	123.96	-2.733E+00	
CE-141	145.44	322.	-20.	-0.011	127.68	-6.945E-01	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Cf-251	176.60	70.	9.	0.005	168.75	9.887E-01	
TH-229	193.51	53.	-4.	-0.002	303.72	-1.984E+00	
U-235	205.33	65.	-6.	-0.003	389.36	-2.356E+00	P
TH-229	210.85	64.	14.	0.008	105.03	1.011E+01	P
EU-152	244.69	365.	-15.	-0.009	178.34	-4.938E+00	
TH-227	256.24	41.	7.	0.004	163.70	2.710E+00	P
Cd-113m	263.70	59.	6.	0.004	175.59	2.747E+03	
BI-210M	265.83	84.	-14.	-0.008	99.46	-7.091E-01	
PA-231	300.07	277.	-17.	-0.009	141.08	-1.994E+01	
PA-233	300.18	275.	-17.	-0.009	140.74	-7.912E+00	
PA-231	302.65	292.	-17.	-0.009	144.54	-1.719E+01	
BA-133	302.85	309.	-17.	-0.009	148.53	-2.703E+00	
Ba-140	304.85	326.	-17.	-0.009	152.17	-1.163E+01	
BI-210M	304.90	343.	-17.	-0.009	155.98	-1.783E+00	
Ir-192	308.44	242.	14.	0.008	163.90	1.270E+00	
PA-233	312.01	321.	-12.	-0.007	205.21	-1.035E+00	
Ir-192	316.49	120.	-16.	-0.009	100.31	-5.555E-01	
CR-51	320.08	115.	12.	0.007	126.32	3.783E+00	
La-140	328.76	40.	4.	0.002	328.22	5.644E-01	
Cf-249	333.44	33.	2.	0.001	541.99	4.077E-01	
Cs-136	340.57	159.	-12.	-0.007	146.37	-8.520E-01	
EU-152	344.29	161.	-15.	-0.008	126.02	-1.782E+00	
HF-181	345.83	111.	11.	0.006	135.17	2.440E+00	
BA-133	383.84	95.	-12.	-0.007	115.74	-4.885E+00	
Cf-249	387.95	107.	-2.	-0.001	859.56	-9.296E-02	
SN-113	391.69	59.	7.	0.004	151.02	4.207E-01	P
SB-125	427.88	28.	-2.	-0.001	469.00	-3.168E-01	P
AG-108M	433.94	20.	9.	0.005	102.84	3.915E-01	
pm-146	453.88	12.	7.	0.004	104.00	4.401E-01	
SB-125	463.37	57.	-4.	-0.002	251.74	-1.721E+00	
Ir-192	468.06	55.	7.	0.004	150.39	5.806E-01	
La-140	487.02	16.	8.	0.004	104.08	7.620E-01	
RU-103	497.05	20.	-3.	-0.002	297.52	-1.455E-01	
RH-106	511.86	47.	36.	0.020	50.72	8.207E+00	
Nd-147	531.00	28.	-6.	-0.003	177.43	-2.150E+00	
Ba-140	537.26	17.	8.	0.004	105.07	1.547E+00	P
CS-134	563.24	20.	-3.	-0.002	297.52	-1.758E+00	
CS-134	569.32	16.	3.	0.002	197.20	9.630E-01	
PA-234	569.47	20.	-1.	0.000	948.68	-4.015E-01	
SB-125	600.50	185.	-5.	-0.003	363.58	-1.541E+00	
RH-106	621.92	198.	-10.	-0.006	194.95	-5.542E+00	
SB-125	635.89	13.	8.	0.004	72.16	3.874E+00	
AG-110M	657.76	26.	9.	0.005	82.76	5.576E-01	
CS-137	661.66	42.	-4.	-0.002	224.00	-2.638E-01	P
PM-144	696.54	22.	-9.	-0.005	103.82	-5.130E-01	P
NB-94	702.63	13.	1.	0.001	742.74	6.013E-02	
SB-124	722.79	50.	-13.	-0.007	81.68	-7.268E+00	
AG-108M	722.94	63.	-8.	-0.005	142.64	-5.396E-01	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
ZR-95	724.20	72.	-10.	-0.005	126.27	-1.345E+00	
BI-212	727.17	81.	10.	0.005	136.40	7.727E+00	P
pm-146	735.72	13.	-3.	-0.002	378.74	-9.466E-01	P
pm-146	747.16	17.	-4.	-0.002	297.94	-8.078E-01	P
ZR-95	756.73	22.	-6.	-0.003	220.85	-6.895E-01	P
AG-110M	763.94	80.	-20.	-0.011	68.58	-5.537E+00	
NB-95	765.79	99.	-19.	-0.010	77.90	-1.198E+00	
PA-234M	766.41	91.	15.	0.008	92.63	3.263E+02	
EU-152	778.92	28.	-12.	-0.007	94.44	-6.179E+00	
BI-212	785.42	19.	-3.	-0.001	349.11	-1.346E+01	
CS-134	801.95	9.	4.	0.002	184.30	2.775E+00	
CO-58	810.78	38.	2.	0.001	469.67	1.257E-01	P
Cs-136	818.50	41.	-1.	-0.001	687.39	-8.919E-02	
MN-54	834.85	19.	-5.	-0.003	172.74	-3.511E-01	P
NB-94	871.10	30.	-4.	-0.002	254.12	-2.491E-01	P
EU-154	873.23	22.	9.	0.005	84.56	4.971E+00	P
PA-234	880.53	31.	-3.	-0.002	268.74	-3.556E+00	
Sc-46	889.28	45.	-9.	-0.005	110.55	-6.455E-01	
y-88	898.04	15.	-7.	-0.004	112.01	-5.104E-01	P
AG-110M	937.49	9.	1.	0.000	979.80	1.454E-01	
PA-234	946.02	14.	5.	0.003	164.92	2.818E+00	
EU-152	964.11	32.	6.	0.003	149.20	2.938E+00	
EU-154	996.33	30.	-2.	-0.001	527.05	-1.116E+00	
EU-154	1004.77	55.	-13.	-0.007	86.85	-5.620E+00	
Cs-136	1048.07	18.	5.	0.003	128.06	5.145E-01	
RH-106	1050.36	31.	-5.	-0.003	163.71	-2.643E+01	
BI-207	1063.66	10.	8.	0.004	93.82	8.950E-01	
FE-59	1099.25	16.	2.	0.001	389.82	3.400E-01	P
EU-152	1112.07	89.	-13.	-0.007	103.81	-8.462E+00	
ZN-65	1115.55	76.	-9.	-0.005	142.28	-1.528E+00	
CO-60	1173.24	6.	13.	0.007	48.70	1.168E+00	P
FE-59	1291.60	5.	6.	0.004	91.70	1.446E+00	P
CO-60	1332.50	6.	1.	0.001	397.16	1.381E-01	P
AG-110M	1384.30	0.	8.	0.004	35.36	3.426E+00	
La-140	1596.21	6.	-4.	-0.002	160.96	-4.509E-01	
SB-124	1690.98	0.	6.	0.003	40.82	1.546E+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	Time Corrected	Uncertainty	1 Sigma
	Activity	Activity	Counting	MDA
	Bq/Sample	Bq/Sample		Bq/Sample
BE-7 #A	3.3774E+00	3.3774E+00	1.324E+02%	1.53E+01
NA-22 #A	3.2367E-02	3.2367E-02	1.396E+03%	1.74E+00
K-40	1.4012E+02	1.4012E+02	8.769E+00%	1.19E+01
Sc-46 #A	-6.4551E-01	-6.4551E-01	1.106E+02%	2.44E+00

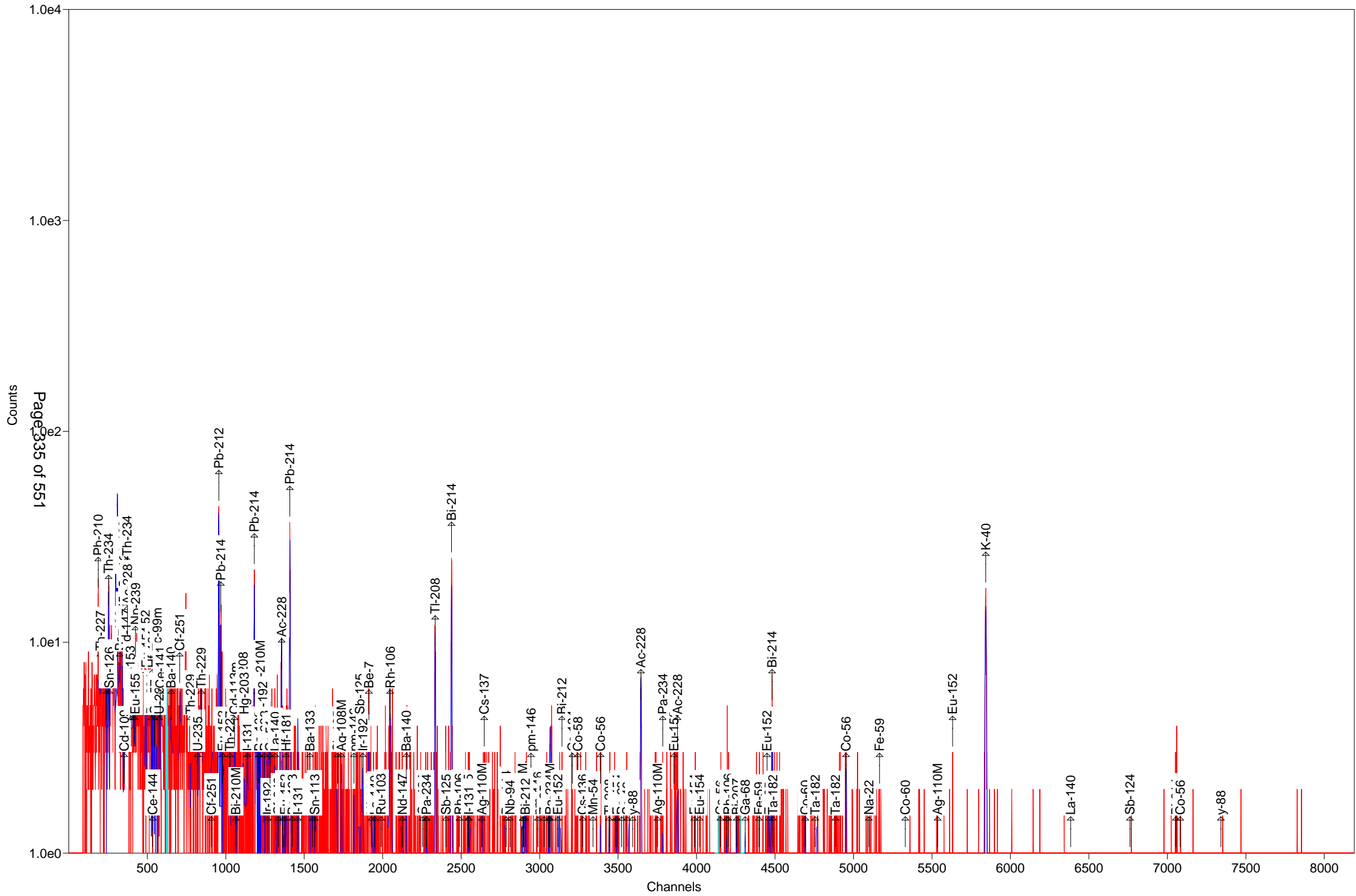
CR-51	#A	3.7828E+00	3.7828E+00	1.263E+02%	1.62E+01
MN-54	#A	-3.5111E-01	-3.5111E-01	1.727E+02%	1.57E+00
FE-59	#A	8.1932E-01	8.1932E-01	9.170E+01%	3.22E+00
Co-56	C	1.2859E+00	1.2859E+00	3.782E+01%	1.17E+00
CO-57	#A	2.8776E-01	2.8776E-01	1.424E+02%	9.82E-01
CO-58	#A	1.2567E-01	1.2567E-01	4.697E+02%	2.10E+00
CO-60	#A	6.5304E-01	6.5304E-01	4.870E+01%	1.39E+00
ZN-65	#A	-1.5277E+00	-1.5277E+00	1.423E+02%	7.43E+00
NB-94	#A	6.0127E-02	6.0127E-02	7.427E+02%	1.17E+00
ZR-95	#A	-6.8951E-01	-6.8951E-01	2.208E+02%	2.83E+00
NB-95	#A	-1.1979E+00	-1.1979E+00	7.790E+01%	3.11E+00
RU-103	#A	-1.4548E-01	-1.4548E-01	2.975E+02%	1.14E+00
RH-106	#A	-5.5415E+00	-5.5415E+00	1.950E+02%	3.66E+01
AG-108M	#A	3.9154E-01	3.9154E-01	1.028E+02%	1.02E+00
AG-110M	#A	6.2397E-01	6.2397E-01	3.536E+01%	2.94E+00
SN-113	#A	4.2075E-01	4.2075E-01	1.510E+02%	2.18E+00
SB-124	#A	5.0598E-01	5.0598E-01	4.082E+01%	3.44E+00
SB-125	#A	8.4183E-01	8.4183E-01	7.216E+01%	3.62E+00
I-131	#	1.0891E+00	1.0891E+00	4.781E+01%	8.57E-01
Gd-153	#A	3.5112E-01	3.5112E-01	1.460E+02%	2.69E+00
Ga-68	#	2.6696E+01	2.6787E+01	3.333E+01%	2.19E+01
Tc-99m	#A	-3.2507E-01	-3.2527E-01	1.260E+02%	1.38E+00
BA-133	#A	-4.4833E-02	-4.4833E-02	2.365E+03%	3.64E+00
CS-134	#A	1.8783E-01	1.8783E-01	1.843E+02%	3.47E+00
CS-137	#A	-2.6381E-01	-2.6381E-01	2.240E+02%	2.16E+00
CE-139	#A	0.0000E+00	0.0000E+00	1.000E+03%	1.15E+00
Ba-140	#A	1.5465E+00	1.5466E+00	1.051E+02%	4.20E+00
La-140	#A	1.9305E-02	1.9305E-02	1.041E+02%	1.70E+00
CE-141	#A	-6.9450E-01	-6.9450E-01	1.277E+02%	2.97E+00
CE-144	#A	-2.6535E+00	-2.6535E+00	1.364E+02%	1.21E+01
PM-144	#A	-5.1301E-01	-5.1301E-01	1.038E+02%	1.44E+00
EU-152	#A	-1.0511E-01	-1.0511E-01	9.765E+01%	7.57E+00
EU-154	#A	4.9714E+00	4.9714E+00	8.456E+01%	1.42E+01
EU-155	#A	2.1244E-01	2.1244E-01	7.355E+02%	5.33E+00
HF-181	#A	3.6982E-01	3.6982E-01	1.352E+02%	2.25E+00
Ta-182	#A	1.7854E+00	1.7854E+00	7.736E+01%	6.42E+00
Hg-203	#A	3.3492E-02	3.3492E-02	1.127E+03%	1.33E+00
TL-208		3.7971E+00	3.7971E+00	1.571E+01%	9.14E-01
pm-146	#A	1.1528E-02	1.1528E-02	1.040E+02%	4.04E+00
y-88	#A	-5.1039E-01	-5.1039E-01	1.120E+02%	1.58E+00
Cd-113m	#A	2.7466E+03	2.7466E+03	1.756E+02%	1.67E+04
Cd-109	#A	-8.4343E+00	-8.4343E+00	1.485E+02%	4.20E+01
Cf-251	#A	9.8870E-01	9.8870E-01	1.688E+02%	4.58E+00
Cf-249	#A	2.3066E-03	2.3066E-03	5.081E+02%	2.77E+00
Sn-126	#A	-3.8447E+00	-3.8447E+00	1.236E+02%	1.59E+01
PB-210	#A	4.3400E-01	4.3400E-01	3.188E+03%	4.09E+01
PB-212	#	9.1551E+00	9.1551E+00	8.932E+00%	1.48E+00
PB-214		1.2137E+01	1.2137E+01	9.708E+00%	2.39E+00
BI-207	#A	3.8712E-01	3.8712E-01	9.382E+01%	1.16E+00

BI-212 #A	7.7269E+00	7.7269E+00	1.364E+02%	3.59E+01
BI-214	1.1903E+01	1.1903E+01	1.192E+01%	2.28E+00
BI-210M#A	-7.0906E-01	-7.0906E-01	9.946E+01%	2.38E+00
AC-228	1.2118E+01	1.2118E+01	1.166E+01%	1.86E+00
TH-227 #A	3.6268E+00	3.6268E+00	1.063E+02%	1.72E+01
TH-229 #A	2.9102E+00	2.9102E+00	1.050E+02%	1.68E+01
TH-234 #	2.4674E+01	2.4674E+01	3.652E+01%	2.29E+01
PA-231 #A	-1.7189E+01	-1.7189E+01	1.445E+02%	8.35E+01
PA-233 #A	-1.0353E+00	-1.0353E+00	2.052E+02%	7.16E+00
PA-234 #A	2.7385E-01	2.7385E-01	1.046E+02%	6.99E+00
PA-234M#A	8.4823E+01	8.4823E+01	9.263E+01%	2.75E+02
U-235 #A	-2.7331E+00	-2.7331E+00	1.240E+02%	1.14E+01
AM-241 #A	-1.4896E+00	-1.4896E+00	7.332E+01%	3.44E+00
Np-237 #A	-2.3501E+00	-2.3501E+00	1.654E+02%	1.30E+01
Ir-192 #A	1.2915E-01	1.2915E-01	8.134E+01%	1.87E+00
Cs-136 #A	1.7911E-01	1.7912E-01	1.281E+02%	2.19E+00
Np-239 #A	9.3515E-01	9.3521E-01	1.520E+02%	4.79E+00
Nd-147 #A	-2.1498E+00	-2.1498E+00	1.774E+02%	9.81E+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 - Half-life limit exceeded

----- S U M M A R Y -----

Total Activity (37.6 to 2000.8 keV) 2.139E+02 Bq/Sample
 Total Decayed Activity (37.6 to 2000.8 keV) 2.1390179E+02 Bq/Sample



Sample Description: 257060_Gamma_160-17814-A-1-C DU
 Detector: Detector # 7
 Batch ID: 257060
 Work Order Number: Gamma
 Lot Number: 160-17814-A-1-C DU

Decay to Time: 7/11/2016 08:47 Live Time: 1800 sec
 Acquisition Time: 7/11/2016 08:47:27 Real Time: 1832 sec
 Analysis Time: 7/11/2016 09:18 Dead Time: 1.73 %
 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_2016-07-10_0612.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	-3.928E+00	105.3	4.135E+00	4.140E+00	1.392E+01
NA-22	4.252E-01	66.4	2.822E-01	2.830E-01	9.266E-01
K-40	1.546E+02	7.2	1.120E+01	1.371E+01	1.074E+01
Sc-46	-4.834E-01	105.0	5.074E-01	5.080E-01	1.725E+00
CR-51	0.000E+00	1.#INF	7.964E-01	7.964E-01	1.910E+01
MN-54	-1.924E-02	3509.6	6.753E-01	6.753E-01	1.157E+00
FE-59	1.038E-01	914.7	9.495E-01	9.495E-01	2.216E+00
Co-56	2.461E-01	83.8	2.063E-01	2.067E-01	1.170E+00
CO-57	1.107E-01	121.2	1.341E-01	1.342E-01	8.414E-01
CO-58	-6.068E-01	84.1	5.104E-01	5.113E-01	1.713E+00
CO-60	4.426E-01	96.7	4.280E-01	4.286E-01	9.647E-01
ZN-65	7.521E-01	160.1	1.204E+00	1.205E+00	4.164E+00
NB-94	-6.581E-01	91.7	6.034E-01	6.044E-01	1.385E+00
ZR-95	-4.107E-01	196.9	8.089E-01	8.092E-01	1.942E+00
NB-95	6.451E-01	88.2	5.692E-01	5.701E-01	1.909E+00
RU-103	-1.062E-02	3377.1	3.585E-01	3.585E-01	9.037E-01
RH-106	-5.536E+00	156.2	8.649E+00	8.654E+00	2.908E+01
AG-108M	3.038E-01	69.3	2.106E-01	2.111E-01	5.415E-01
AG-110M	3.484E-01	134.9	4.701E-01	4.705E-01	1.644E+00
SN-113	-3.247E-01	222.2	7.215E-01	7.217E-01	1.742E+00
SB-124	-1.864E-01	51.0	9.515E-02	9.564E-02	3.103E+00
SB-125	1.017E+00	94.5	9.611E-01	9.625E-01	2.763E+00
I-131	7.357E-01	51.7	3.803E-01	3.822E-01	7.411E-01
Gd-153	-4.115E-01	162.7	6.698E-01	6.702E-01	1.817E+00
Ga-68	6.804E+00	229.3	1.560E+01	1.561E+01	3.660E+01
Tc-99m	-1.562E-01	180.9	2.825E-01	2.827E-01	9.526E-01
BA-133	-3.727E-01	224.6	8.371E-01	8.373E-01	2.827E+00
CS-134	-3.250E-01	112.7	3.664E-01	3.668E-01	3.058E+00
CS-137	-3.108E-01	205.7	6.392E-01	6.394E-01	1.465E+00
CE-139	-6.762E-02	382.3	2.585E-01	2.586E-01	8.842E-01
Ba-140	6.333E-01	109.6	6.939E-01	6.947E-01	3.379E+00
La-140	-4.025E-01	77.8	3.133E-01	3.140E-01	1.943E+00
CE-141	3.886E-01	163.5	6.354E-01	6.357E-01	2.131E+00

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CE-144	0.000E+00	1.#INF	5.027E-01	5.027E-01	7.388E+00
PM-144	6.299E-02	160.1	1.008E-01	1.009E-01	1.232E+00
EU-152	6.391E-01	89.6	5.725E-01	5.734E-01	5.278E+00
EU-154	1.481E+00	81.8	1.211E+00	1.213E+00	9.361E+00
EU-155	7.894E-01	108.4	8.556E-01	8.567E-01	2.872E+00
HF-181	3.500E-01	113.8	3.985E-01	3.989E-01	1.356E+00
Ta-182	8.091E-02	86.3	6.981E-02	6.993E-02	7.212E+00
Hg-203	2.821E-01	96.4	2.720E-01	2.725E-01	9.171E-01
TL-208	2.521E+00	15.9	4.016E-01	4.224E-01	7.433E-01
pm-146	1.095E+00	66.2	7.254E-01	7.276E-01	2.067E+00
y-88	1.565E-01	289.6	4.532E-01	4.533E-01	1.083E+00
Cd-113m	3.595E+03	93.6	3.366E+03	3.374E+03	1.135E+04
Cd-109	0.000E+00	1.#INF	9.450E+00	9.450E+00	3.189E+01
Cf-251	-1.551E+00	107.7	1.671E+00	1.676E+00	4.270E+00
Cf-249	2.379E-01	187.6	4.464E-01	4.466E-01	1.535E+00
Sn-126	1.383E+00	248.5	3.436E+00	3.437E+00	9.305E+00
PB-210	5.913E-01	1807.7	1.069E+01	1.069E+01	3.646E+01
PB-212	9.051E+00	7.9	7.162E-01	9.251E-01	1.524E+00
PB-214	1.178E+01	8.0	9.451E-01	1.126E+00	1.714E+00
BI-207	2.765E-01	96.1	2.657E-01	2.661E-01	9.703E-01
BI-212	4.890E+00	85.4	4.177E+00	4.185E+00	1.414E+01
BI-214	1.279E+01	8.5	1.085E+00	1.272E+00	1.111E+00
BI-210M	3.344E-01	128.0	4.279E-01	4.284E-01	1.456E+00
AC-228	8.685E+00	14.0	1.214E+00	1.292E+00	2.089E+00
TH-227	-4.459E+00	121.1	5.401E+00	5.406E+00	1.454E+01
TH-229	1.677E+00	276.6	4.640E+00	4.642E+00	1.282E+01
TH-234	-2.949E-01	2330.7	6.874E+00	6.874E+00	2.355E+01
PA-231	-1.070E+01	165.0	1.765E+01	1.766E+01	5.929E+01
PA-233	0.000E+00	1.#INF	3.100E-01	3.100E-01	5.159E+00
PA-234	2.826E-01	79.4	2.243E-01	2.247E-01	4.315E+00
PA-234M	-9.082E+01	56.3	5.115E+01	5.135E+01	2.364E+02
U-235	-2.034E+00	87.4	1.778E+00	1.781E+00	1.056E+01
AM-241	8.293E-01	112.2	9.301E-01	9.311E-01	2.500E+00
Np-237	0.000E+00	1.#INF	2.982E+00	2.982E+00	9.982E+00
Ir-192	2.145E-01	101.2	2.170E-01	2.173E-01	2.160E+00
Cs-136	4.423E-01	126.3	5.585E-01	5.591E-01	1.903E+00
Np-239	-8.375E-01	111.9	9.371E-01	9.384E-01	3.141E+00
Nd-147	-1.189E-01	192.1	2.284E-01	2.285E-01	8.230E+00

Total	3.824E+03				

Analyst: Amanda Dick

Sample description
257060_Gamma_160-17814-A-1-C DU

Spectrum Filename: C:\User\SPC\Det7\7_Gamma_20161687.An1

Acquisition information

Start time: 7/11/2016 8:47:27 AM
Live time: 1800
Real time: 1832
Dead time: 1.73 %
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): $6.716580E-01 + (-6.166540E-01 * \text{Log}(E)) + (-2.065917E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.48 %
Log(Eff): $-2.689695E+01 + (1.019544E+01 * \text{Log}(E)) + (-1.081671E+00 * \text{Log}(E)^2)$

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	7/11/2016 8:47:00 AM
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	7_2016-07-10_0612.PBC 7/10/2016 6:12:03 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 20 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.1722

***** 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	20.	112.15	0.85	3.701E-02	59.54	35.900	PBC<MDA	AM241
64.48	10.	248.50	0.86	4.080E-02	64.28	9.700	PBC<MDA	Sn126
74.80	126.	14.49	0.87	4.767E-02				
77.14	238.	9.48	0.87	4.890E-02				
87.07	91.	18.76	0.88	5.298E-02	86.49	13.100	PBC<MDA	Np237
					86.54	30.700	3.126E+00	EU155
					86.94	9.040	1.059E+01	Sn126
					87.57	37.500	2.543E+00	Sn126
89.75	70.	21.04	0.88	5.379E-02				
91.10	12.	289.72	0.88	5.415E-02	91.10	28.300	PBC<MDA	Nd147
92.59	-26.	75.91	0.89	5.452E-02	92.59	5.584	PBC<MDA	TH234
93.32	24.	143.80	0.89	5.470E-02	93.35	5.561	PBC<MDA	AC228
103.14	16.	134.05	0.90	5.626E-02	103.20	21.800	PBC<MDA	Gd153
					103.70	24.000	6.584E-01	Np239
105.31	17.	108.38	0.90	5.638E-02	105.31	21.200	PBC<MDA	EU155
136.47	19.	121.17	0.93	5.410E-02	136.30	5.850	PBC<MDA	HF181
					136.47	10.680	1.793E+00	CO57
145.44	18.	163.52	0.94	5.237E-02	145.44	48.200	PBC<MDA	CE141
162.66	15.	109.57	0.96	4.843E-02	162.66	6.220	PBC<MDA	Ba140
193.51	6.	276.64	0.99	4.294E-02	193.51	4.400	PBC<MDA	TH229
210.85	3.	540.14	1.01	3.997E-02	210.85	2.990	PBC<MDA	TH229
238.64	250.	8.83	1.03	3.602E-02	238.63	43.300	8.923E+00	PB212

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
242.06	51.	26.94	1.04	3.560E-02	242.00	7.430	1.067E+01	PB214
244.69	17.	185.43	1.05	3.526E-02	244.69	7.580		PBC<MDA EU152
263.88	13.	93.64	1.07	3.310E-02	263.70	0.006		PBC<MDA Cd113m
265.83	10.	127.96	1.07	3.288E-02	265.83	50.000		PBC<MDA BI210M
276.98	15.	79.85	1.08	3.172E-02	277.28	6.310		PBC<MDA TL208
279.20	13.	96.41	1.08	3.154E-02	279.20	81.460		PBC<MDA Hg203
284.30	9.	154.72	1.09	3.106E-02	284.30	6.140		PBC<MDA I131
295.26	117.	13.11	0.99	3.009E-02	295.09	19.300	1.120E+01	PB214
300.06	0.	883.18	1.10	2.966E-02	300.03	3.280		PBC<MDA PB212
					300.07	2.460		PBC<MDA PA231
					300.18	6.200		PBC<MDA PA233
328.76	14.	100.83	1.13	2.744E-02	328.76	20.300		PBC<MDA La140
338.55	58.	22.37	1.08	2.677E-02	338.32	12.010	9.943E+00	AC228
352.04	212.	9.24	1.45	2.587E-02	351.93	37.600	1.208E+01	PB214
364.48	22.	51.69	1.17	2.511E-02	364.48	81.700		PBC<MDA I131
383.84	11.	108.77	1.19	2.402E-02	383.84	8.940		PBC<MDA BA133
387.95	7.	187.63	1.19	2.380E-02	387.95	66.000		PBC<MDA Cf249
427.88	4.	313.58	1.23	2.186E-02	427.88	29.600		PBC<MDA SB125
433.94	7.	102.41	1.24	2.160E-02	433.94	90.480		PBC<MDA AG108M
463.37	11.	94.53	1.27	2.040E-02	463.37	10.470		PBC<MDA SB125
468.06	11.	101.16	1.27	2.022E-02	468.06	51.750		PBC<MDA Ir192
482.00	10.	113.85	1.29	1.971E-02	482.00	80.500		PBC<MDA HF181
487.02	6.	220.04	1.29	1.954E-02	487.02	45.500		PBC<MDA La140
511.86	27.	76.31	2.56	1.870E-02	511.86	20.000		PBC<MDA RH106
569.32	5.	151.00	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
583.37	64.	15.93	1.44	1.669E-02	583.02	84.500	2.521E+00	TL208
609.48	170.	8.49	1.61	1.605E-02	609.31	46.090	1.279E+01	BI214
618.06	10.	187.32	1.42	1.585E-02	618.06	99.100		PBC<MDA PM144
722.79	9.	80.84	1.51	1.380E-02	722.79	10.810		PBC<MDA SB124
					722.94	90.840	4.033E-01	AG108M
					723.36	20.220	1.813E+00	EU154
722.94	9.	93.45	1.51	1.380E-02	722.79	10.810	3.389E+00	SB124
					722.94	90.840	4.033E-01	AG108M
					723.36	20.220	1.813E+00	EU154
723.36	3.	278.64	1.51	1.379E-02	722.79	10.810		PBC<MDA SB124
					722.94	90.840	1.464E-01	AG108M
					723.36	20.220	6.581E-01	EU154
727.17	9.	85.41	1.51	1.373E-02	727.17	7.550		PBC<MDA BI212
735.72	7.	93.97	1.52	1.358E-02	735.72	22.500		PBC<MDA pm146
747.16	8.	93.40	1.53	1.340E-02	747.16	34.000		PBC<MDA pm146
765.79	15.	88.23	1.55	1.311E-02	765.79	99.790		PBC<MDA NB95
					766.41	0.294	2.191E+02	PA234M
785.42	6.	92.71	1.57	1.281E-02	785.42	1.280		PBC<MDA BI212
795.87	2.	418.33	1.58	1.266E-02	795.87	85.530		PBC<MDA CS134
818.50	10.	126.27	1.60	1.235E-02	818.50	100.000		PBC<MDA Cs136
860.89	4.	258.49	1.63	1.181E-02	860.56	12.420		PBC<MDA TL208

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
871.10	8.	70.18	1.64	1.168E-02	871.10	99.890	PBC<MDA	NB94
873.23	1.	704.60	1.64	1.166E-02	873.23	12.270	PBC<MDA	EU154
880.53	6.	88.00	1.65	1.157E-02	880.53	6.000	PBC<MDA	PA234
883.24	6.	107.52	1.65	1.154E-02	883.24	9.600	PBC<MDA	PA234
884.68	5.	134.93	1.65	1.152E-02	884.68	72.680	PBC<MDA	AG110M
898.04	3.	289.64	1.66	1.137E-02	898.04	93.700	PBC<MDA	y88
911.37	48.	16.76	0.91	1.122E-02	911.07	29.000	8.164E+00	AC228
969.09	9.	85.28	1.72	1.062E-02	968.97	17.460	PBC<MDA	AC228
996.33	9.	81.75	1.75	1.035E-02	996.33	10.600	PBC<MDA	EU154
1048.07	1.	563.47	1.79	9.890E-03	1048.07	80.000	PBC<MDA	Cs136
1063.66	8.	96.07	1.80	9.759E-03	1063.66	74.500	PBC<MDA	BI207
1077.40	3.	229.35	1.81	9.646E-03	1077.40	3.300	PBC<MDA	Ga68
1099.25	1.	914.69	1.83	9.472E-03	1099.25	56.500	PBC<MDA	FE59
1112.07	6.	150.27	1.84	9.373E-03	1112.07	13.644	PBC<MDA	EU152
1115.55	6.	160.11	1.84	9.347E-03	1115.55	50.600	PBC<MDA	ZN65
1120.22	6.	132.40	1.85	9.311E-03	1120.29	15.100	PBC<MDA	BI214
					1120.55	99.987	3.829E-01	Sc46
1120.55	6.	143.68	1.85	9.309E-03	1120.29	15.100	2.535E+00	BI214
					1120.55	99.987	3.830E-01	Sc46
					1121.30	34.900	1.098E+00	Ta182
1187.41	2.	431.15	1.90	8.821E-03	1189.05	16.200	PBC<MDA	Ta182
1221.07	9.	86.28	1.92	8.608E-03	1221.41	27.000	PBC<MDA	Ta182
1238.28	11.	84.92	1.94	8.501E-03	1238.28	66.070	PBC<MDA	Co56
1274.53	6.	66.37	1.96	8.280E-03	1274.53	99.940	PBC<MDA	NA22
					1274.54	35.190	1.208E+00	EU154
1332.50	6.	96.69	2.01	7.951E-03	1332.50	99.980	PBC<MDA	CO60
1408.00	11.	30.15	2.06	7.560E-03	1408.00	21.005	3.848E+00	EU152
1461.01	217.	7.25	1.91	7.309E-03	1460.83	10.670	1.546E+02	K40
1764.60	7.	73.30	2.29	6.141E-03	1764.49	15.400	PBC<MDA	BI214
1771.35	8.	84.65	2.29	6.119E-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 *****

Channel	Peak Energy	Centroid	Background	Net Area	Efficiency	Uncert	FWHM	Suspected	Nuclide
			Counts	Counts	* Area	1 Sigma	% keV		
298.76	74.81		104.	126.	2.645E+03	14.49	0.867	-	D
308.13	77.15		136.	238.	4.869E+03	9.48	0.869	-	sD
358.44	89.75		82.	64.	1.198E+03	23.49	0.883	-	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	200.12	50.14	148.	-18.	-0.010	121.13	0.840s
AM-241	237.70	59.54	150.	20.	0.011	112.15	0.850
Sn-126	256.68	64.28	186.	10.	0.005	248.50	0.856
BA-133	323.52	80.99	208.	-25.	-0.014	76.50	0.874s
Np-237	345.53	86.49	680.	0.	0.000	213.98	0.880A
EU-155	345.74	86.54	675.	-24.	-0.013	156.39	0.880s
Sn-126	347.33	86.94	576.	12.	0.007	157.97	0.880D
Sn-126	349.85	87.57	576.	31.	0.017	61.60	0.881D
Cd-109	351.73	88.04	590.	0.	0.000	1000.00	0.881A
Nd-147	363.97	91.10	614.	12.	0.007	289.72	0.885s
TH-234	369.93	92.59	652.	-26.	-0.014	75.91	0.886s
AC-228	372.97	93.35	578.	24.	0.013	143.80	0.887s
Gd-153	389.57	97.50	123.	-12.	-0.007	162.75	0.892s
Np-239	397.57	99.50	362.	-17.	-0.009	161.66	0.894
Np-239	414.38	103.70	222.	16.	0.009	134.05	0.898s
EU-155	420.83	105.31	161.	17.	0.009	108.38	0.900
Np-239	424.10	106.13	224.	-19.	-0.011	111.89	0.901
EU-152	486.69	121.78	205.	-20.	-0.011	101.53	0.918s
CO-57	487.83	122.06	225.	-9.	-0.005	250.21	0.918s
EU-154	491.98	123.10	221.	-14.	-0.008	134.31	0.919s
PA-234	524.77	131.29	253.	-20.	-0.011	116.78	0.928s
HF-181	531.68	133.02	272.	-6.	-0.003	378.25	0.930s
CE-144	533.74	133.54	279.	0.	0.000	1000.00	0.930s
HF-181	544.79	136.30	279.	0.	0.000	1000.00	0.933s
CO-57	545.48	136.47	246.	19.	0.010	121.17	0.933s
Tc-99m	561.63	140.51	270.	-13.	-0.007	180.89	0.938
U-235	574.73	143.79	528.	-21.	-0.012	87.43	0.941s
CE-141	581.35	145.44	408.	18.	0.010	163.52	0.943s
Ba-140	650.24	162.66	127.	15.	0.008	109.57	0.961s
U-235	653.11	163.38	141.	-18.	-0.010	103.72	0.962s
CE-139	663.01	165.85	162.	-5.	-0.003	382.28	0.965s
Cf-251	706.00	176.60	154.	-22.	-0.012	107.68	0.976s
TH-229	773.64	193.51	77.	6.	0.003	276.64	0.994s
TH-229	843.01	210.85	92.	3.	0.002	540.14	1.012s
Cf-251	907.62	227.00	81.	-8.	-0.004	222.12	1.029s
PB-212	954.15	238.63	74.	254.	0.141	7.91	1.041D
PB-214	967.61	242.00	68.	51.	0.028	26.94	1.045D
EU-152	978.39	244.69	471.	17.	0.009	185.43	1.048s
TH-227	1024.59	256.24	77.	-8.	-0.005	245.49	1.060s
Cd-113m	1054.43	263.70	66.	13.	0.007	93.64	1.067s
BI-210M	1062.96	265.83	75.	10.	0.005	127.96	1.070s
TL-208	1108.77	277.28	60.	15.	0.008	79.85	1.081s
Hg-203	1116.44	279.20	73.	13.	0.007	96.41	1.083
I-131	1136.83	284.30	52.	9.	0.005	154.72	1.089s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
PB-214	1180.66	295.26	34.	117.	0.065	13.11	0.992s
PB-212	1199.76	300.03	314.	0.	0.000	883.18	1.105D
PA-231	1199.92	300.07	315.	-16.	-0.009	155.96	1.105
PA-233	1200.36	300.18	339.	-16.	-0.009	161.60	1.105
PA-231	1210.24	302.65	355.	-16.	-0.009	164.98	1.107s
BA-133	1211.05	302.85	371.	-16.	-0.009	168.61	1.108s
Ba-140	1219.04	304.85	388.	-12.	-0.007	225.54	1.110s
BI-210M	1219.23	304.90	400.	0.	0.000	1000.00	1.110s
Ir-192	1233.41	308.44	400.	0.	0.000	1000.00	1.113s
PA-233	1247.69	312.01	400.	0.	0.000	1000.00	1.117s
Ir-192	1265.61	316.49	400.	0.	0.000	1000.00	1.122s
CR-51	1279.99	320.08	400.	0.	0.000	1000.00	1.125
La-140	1314.69	328.76	88.	14.	0.008	100.83	1.134
Cf-249	1333.41	333.44	130.	-16.	-0.009	101.78	1.139s
AC-228	1353.87	338.55	26.	58.	0.032	22.37	1.083
Cs-136	1361.93	340.57	203.	-16.	-0.009	128.79	1.146s
EU-152	1376.80	344.29	187.	-16.	-0.009	123.43	1.150s
HF-181	1382.97	345.83	164.	-16.	-0.009	81.92	1.151s
PB-214	1407.80	352.04	34.	212.	0.118	9.24	1.451s
BA-133	1423.66	356.00	282.	-11.	-0.006	224.61	1.162s
I-131	1457.59	364.48	28.	22.	0.012	51.69	1.170s
BA-133	1535.03	383.84	65.	11.	0.006	108.77	1.189s
Cf-249	1551.47	387.95	76.	7.	0.004	187.63	1.193s
SN-113	1566.43	391.69	92.	-9.	-0.005	222.24	1.197s
SB-125	1711.18	427.88	40.	4.	0.002	313.58	1.233s
AG-108M	1735.43	433.94	12.	7.	0.004	102.41	1.239s
pm-146	1815.20	453.88	32.	0.	0.000	1000.00	1.258
SB-125	1853.15	463.37	51.	11.	0.006	94.53	1.268s
Ir-192	1871.93	468.06	55.	11.	0.006	101.16	1.272s
BE-7	1910.07	477.60	114.	-15.	-0.008	105.29	1.282
HF-181	1927.68	482.00	60.	10.	0.006	113.85	1.286s
La-140	1947.77	487.02	87.	6.	0.003	220.04	1.291s
RH-106	2047.15	511.86	60.	27.	0.015	76.31	2.565
Nd-147	2123.70	531.00	48.	-6.	-0.003	252.22	1.333s
CS-134	2252.65	563.24	39.	-5.	-0.003	195.40	1.364s
CS-134	2276.99	569.32	26.	5.	0.003	151.00	1.369s
PA-234	2277.59	569.47	32.	-1.	-0.001	806.23	1.370
BI-207	2278.51	569.70	32.	0.	0.000	1000.00	1.370
TL-208	2333.20	583.37	12.	64.	0.036	15.93	1.440
SB-125	2401.71	600.50	357.	-15.	-0.009	66.32	1.399s
SB-124	2410.64	602.73	342.	-17.	-0.009	62.36	1.401s
CS-134	2418.55	604.71	326.	-15.	-0.009	167.44	1.403s
BI-214	2437.63	609.48	7.	170.	0.095	8.49	1.610
RU-103	2440.91	610.30	310.	-15.	-0.009	162.93	1.408s
AG-108M	2456.84	614.28	295.	-16.	-0.009	158.50	1.412s
PM-144	2471.96	618.06	165.	10.	0.005	187.32	1.415s
RH-106	2487.38	621.92	289.	-16.	-0.009	156.25	1.419s
SB-125	2543.28	635.89	37.	-11.	-0.006	130.14	1.432s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
I-131	2547.62	636.97	62.	-14.	-0.007	86.75	1.433s
AG-110M	2630.77	657.76	36.	-2.	-0.001	722.48	1.452s
CS-137	2646.36	661.66	44.	-7.	-0.004	205.67	1.455s
PM-144	2785.90	696.54	38.	-6.	-0.003	259.61	1.487
NB-94	2810.25	702.63	47.	-16.	-0.009	91.69	1.493s
SB-124	2890.87	722.79	22.	9.	0.005	80.84	1.511s
AG-108M	2891.48	722.94	32.	9.	0.005	93.45	1.511s
EU-154	2893.15	723.36	41.	3.	0.002	278.64	1.511s
ZR-95	2896.52	724.20	92.	-18.	-0.010	77.88	1.512s
BI-212	2908.41	727.17	26.	9.	0.005	85.41	1.515s
pm-146	2942.61	735.72	9.	7.	0.004	93.97	1.523s
pm-146	2988.37	747.16	9.	8.	0.004	93.40	1.533s
ZR-95	3026.65	756.73	23.	-5.	-0.003	196.95	1.541s
AG-110M	3055.51	763.94	97.	-23.	-0.013	64.09	1.548s
NB-95	3062.89	765.79	82.	15.	0.008	88.23	1.549s
PA-234M	3065.38	766.41	69.	-2.	-0.001	707.39	1.550s
EU-152	3115.41	778.92	14.	0.	0.000	1000.00	1.561s
BI-212	3141.41	785.42	5.	6.	0.003	92.71	1.567s
CS-134	3183.20	795.87	34.	2.	0.001	418.33	1.576s
CO-58	3242.84	810.78	58.	-14.	-0.008	84.11	1.589s
La-140	3262.82	815.77	72.	-9.	-0.005	130.44	1.593s
Cs-136	3273.74	818.50	72.	10.	0.005	126.27	1.596s
Co-56	3386.82	846.77	23.	-7.	-0.004	144.53	1.620s
TL-208	3442.00	860.56	20.	4.	0.002	258.49	1.632s
NB-94	3484.13	871.10	12.	8.	0.004	70.18	1.641s
EU-154	3492.66	873.23	21.	1.	0.001	704.60	1.643s
PA-234	3521.86	880.53	10.	6.	0.003	88.00	1.649s
PA-234	3532.70	883.24	16.	6.	0.003	107.52	1.652s
AG-110M	3538.47	884.68	22.	5.	0.003	134.93	1.653s
Sc-46	3556.86	889.28	50.	-10.	-0.006	104.97	1.657s
y-88	3591.90	898.04	15.	3.	0.002	289.64	1.664s
AC-228	3645.22	911.37	4.	48.	0.027	16.76	0.906s
AG-110M	3749.71	937.49	40.	-17.	-0.009	47.95	1.697
PA-234	3783.82	946.02	30.	-4.	-0.002	305.16	1.704s
EU-152	3856.18	964.11	50.	0.	0.000	1000.00	1.719s
AC-228	3875.62	968.97	26.	9.	0.005	85.28	1.724s
EU-154	3985.06	996.33	20.	9.	0.005	81.75	1.746s
PA-234M	4003.73	1001.00	53.	-14.	-0.008	56.31	1.750s
EU-154	4018.84	1004.77	58.	-5.	-0.003	207.86	1.753s
Co-56	4151.10	1037.84	25.	-7.	-0.004	107.52	1.780s
Cs-136	4192.02	1048.07	11.	1.	0.001	563.47	1.788s
RH-106	4201.18	1050.36	15.	-2.	-0.001	282.84	1.790
BI-207	4254.38	1063.66	11.	8.	0.005	96.07	1.801s
Ga-68	4309.34	1077.40	11.	3.	0.002	229.35	1.812s
FE-59	4396.74	1099.25	16.	1.	0.001	914.69	1.829s
EU-152	4448.04	1112.07	43.	6.	0.004	150.27	1.839s
ZN-65	4461.92	1115.55	49.	6.	0.004	160.11	1.842s
BI-214	4480.88	1120.29	33.	6.	0.004	132.40	1.845

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Sc-46	4481.94	1120.55	39.	6.	0.004	143.68	1.846
Ta-182	4484.94	1121.30	72.	-12.	-0.006	107.03	1.846s
CO-60	4692.68	1173.24	27.	-2.	-0.001	355.65	1.886s
Ta-182	4755.93	1189.05	22.	2.	0.001	431.15	1.899s
Ta-182	4885.37	1221.41	11.	9.	0.005	86.28	1.923s
Co-56	4952.84	1238.28	16.	11.	0.006	84.92	1.936s
NA-22	5097.84	1274.53	6.	6.	0.004	66.37	1.963s
EU-154	5097.89	1274.54	12.	0.	0.000	1000.00	1.963s
FE-59	5166.10	1291.60	23.	-8.	-0.004	150.05	1.975s
CO-60	5329.71	1332.50	6.	6.	0.004	96.69	2.005s
AG-110M	5536.89	1384.30	12.	-5.	-0.003	213.71	2.042s
EU-152	5631.70	1408.00	0.	11.	0.006	30.15	2.059s
K-40	5843.72	1461.01	7.	217.	0.121	7.25	1.911
La-140	6384.49	1596.21	18.	-9.	-0.005	118.63	2.185s
SB-124	6763.55	1690.98	0.	0.	0.000	1000.00	2.245s
BI-214	7057.56	1764.49	11.	7.	0.004	73.30	2.290s
Co-56	7084.99	1771.35	19.	8.	0.004	84.65	2.294s
y-88	7343.81	1836.06	6.	-5.	-0.003	124.92	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 *****

Name	Code	Average Activity Bq/Sample	Energy keV	Peak Activity Bq/Sample	Code	MDA Value Bq/Sample	COMMENTS
BE-7	C	-3.9276E+00	477.60	-3.928E+00	(	1.392E+01 1.05E+02	5.31E+01 1.05E+01 G
NA-22	C	4.2518E-01	1274.53	4.252E-01	?(	9.266E-01 6.64E+01	9.50E+02 9.99E+01 G
K-40	N	1.5456E+02	1460.83	1.546E+02	(P	1.074E+01 7.25E+00	4.66E+11 1.07E+01 G
Sc-46	F	-4.8338E-01	889.28	-4.834E-01	?(	1.725E+00 1.05E+02	8.38E+01 1.00E+02 G
			1120.55	3.830E-01	+	1.905E+00 1.44E+02	1.00E+02 G
MN-54	C	-1.9242E-02	834.85	-1.924E-02	%(P	1.157E+00 3.51E+03	3.12E+02 1.00E+02 G
FE-59	F	1.0381E-01	1099.25	1.038E-01	?(	2.216E+00 9.15E+02	4.45E+01 5.65E+01 G
			1291.60	-1.205E+00	+	3.914E+00 1.50E+02	4.32E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
Co-56	C	2.4614E-01					7.73E+01	
			846.77-3.402E-01	?(1.170E+00	1.45E+02	9.99E+01	G
			1238.28 1.133E+00	?(P	2.123E+00	8.49E+01	6.61E+01	G
			1037.84-2.939E+00	+ P	1.033E+01	1.08E+02	1.41E+01	G
		1771.35	4.676E+00	?	1.344E+01	8.47E+01	1.55E+01	A
CO-57	C	1.1068E-01					2.72E+02	
			122.06-9.918E-02	* (8.414E-01	2.50E+02	8.56E+01	G
		136.47	1.793E+00	(7.287E+00	1.21E+02	1.07E+01	G
CO-58	C	-6.0678E-01					7.09E+01	
			810.78-6.068E-01	?(1.713E+00	8.41E+01	9.95E+01	G
CO-60	F	4.4262E-01					1.93E+03	
			1332.50 4.426E-01	?(9.647E-01	9.67E+01	1.00E+02	G
		1173.24-1.424E-01	- P	1.685E+00	3.56E+02	9.99E+01	G	
ZN-65	F	7.5209E-01					2.44E+02	
			1115.55 7.521E-01	?(4.164E+00	1.60E+02	5.06E+01	G
NB-94	I	-6.5814E-01					7.41E+06	
			702.63-6.581E-01	?(1.385E+00	9.17E+01	9.79E+01	G
		871.10 3.841E-01	+	8.976E-01	7.02E+01	9.99E+01	G	
ZR-95	I	-4.1071E-01					6.40E+01	
			756.73-4.107E-01	?(1.942E+00	1.97E+02	5.45E+01	G
		724.20-1.664E+00	+	4.319E+00	7.79E+01	4.42E+01	G	
NB-95	I	6.4506E-01					6.40E+01	
			765.79 6.451E-01	&(1.909E+00	8.82E+01	9.98E+01	G
RU-103	I	-1.0616E-02					3.93E+01	
			497.05-1.062E-02	% (9.037E-01	3.38E+03	9.09E+01	G
		610.30-9.331E+00	+	5.112E+01	1.63E+02	5.75E+00	GA	
RH-106	I	-5.5356E+00					3.74E+02	
			621.92-5.536E+00	&(2.908E+01	1.56E+02	9.93E+00	G
			1050.36-7.216E+00	+	7.489E+01	2.83E+02	1.56E+00	G
		511.86 3.973E+00		5.763E+00	7.63E+01	2.00E+01	GA	
AG-108M	C	3.0378E-01					1.53E+05	
			433.94 2.038E-01	?(P	5.415E-01	1.02E+02	9.05E+01	G
			722.94 4.033E-01	?(1.281E+00	9.35E+01	9.08E+01	G
		614.28-6.022E-01	+	3.210E+00	1.59E+02	8.98E+01	G	

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
AG-110M	F	3.4844E-01					2.50E+02
		884.68	3.484E-01	?(P	1.644E+00	1.35E+02	7.27E+01 G
		657.76	-7.882E-02	- P	1.200E+00	7.22E+02	9.46E+01 G
		937.49	-2.478E+00	+ P	4.762E+00	4.80E+01	3.44E+01 G
		1384.30	-1.360E+00	+ P	5.528E+00	2.14E+02	2.43E+01 G
		763.94	-4.363E+00	+ P	9.233E+00	6.41E+01	2.23E+01 G
SN-113	F	-3.2466E-01					1.15E+02
		391.69	-3.247E-01	?(P	1.742E+00	2.22E+02	6.40E+01 G
SB-124	F	-1.8640E-01					6.02E+01
		602.73	-5.797E-01	?(P	3.103E+00	6.24E+01	9.83E+01 G
		1690.98	0.000E+00	+	1.341E+00	1.00E+03	4.78E+01 G
		722.79	3.389E+00	?(	9.242E+00	8.08E+01	1.08E+01 G
SB-125	I	1.0167E+00					1.01E+03
		427.88	3.434E-01	?(	2.763E+00	3.14E+02	2.96E+01 G
		600.50	-2.949E+00	+ P	1.735E+01	6.63E+01	1.79E+01 G
		635.89	-3.548E+00	+ P	9.889E+00	1.30E+02	1.13E+01 G
		463.37	2.920E+00	(P	9.326E+00	9.45E+01	1.05E+01 G
I-131	I	7.3570E-01					8.02E+00
		364.48	5.958E-01	&(	7.411E-01	5.17E+01	8.17E+01 G
		284.30	2.598E+00	(P	1.059E+01	1.55E+02	6.14E+00 G
		636.97	-6.778E+00	&	1.976E+01	8.68E+01	7.17E+00 G
Gd-153	F	-4.1154E-01					2.42E+02
		97.50	-4.115E-01	?(	1.817E+00	1.63E+02	3.00E+01 G
		103.20	-4.323E-08	%	4.155E+00	2.83E+09	2.18E+01 G
Ga-68	C	6.8037E+00					4.71E-02
		1077.40	6.804E+00	?(	3.660E+01	2.29E+02	3.30E+00 G
Tc-99m	I	-1.5619E-01					2.51E-01
		140.51	-1.562E-01	&(	9.526E-01	1.81E+02	8.93E+01 G
BA-133	F	-3.7269E-01					3.85E+03
		356.00	-3.727E-01	?(	2.827E+00	2.25E+02	6.20E+01 G
		302.85	-1.683E+00	+	9.526E+00	1.69E+02	1.83E+01 G
		383.84	2.831E+00	?	1.045E+01	1.09E+02	8.94E+00 GA
		80.99	-7.968E-01	+ P	2.247E+00	7.65E+01	3.41E+01 GA
CS-134	I	-3.2499E-01					7.54E+02
		604.71	-5.432E-01	?(	3.058E+00	1.67E+02	9.76E+01 G
		795.87	1.026E-01	+	1.533E+00	4.18E+02	8.55E+01 G
		569.32	1.060E+00	?(	5.612E+00	1.51E+02	1.54E+01 G
		801.95	3.388E-01	%	1.585E+01	1.30E+03	8.69E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		563.24	-2.085E+00	+ P	1.236E+01	1.95E+02	8.35E+00 G
CS-137	I -3.1079E-01					1.10E+04	
		661.66	-3.108E-01	?(P	1.465E+00	2.06E+02	8.52E+01 G
CE-139	F -6.7616E-02					1.38E+02	
		165.85	-6.762E-02	?(	8.842E-01	3.82E+02	7.99E+01 G
Ba-140	I 6.3331E-01					1.28E+01	
		537.26	9.181E-02	&(P	3.379E+00	1.45E+03	2.44E+01 G
		162.66	2.757E+00	?(	1.017E+01	1.10E+02	6.22E+00 G
		304.85	-5.506E+00	&	4.180E+01	2.26E+02	4.29E+00 G
La-140	I -4.0246E-01					1.28E+01	
		1596.21	-7.780E-01	?(	1.943E+00	1.19E+02	9.54E+01 G
		487.02	3.822E-01	+	2.893E+00	2.20E+02	4.55E+01 G
		328.76	1.362E+00	&(	4.631E+00	1.01E+02	2.03E+01 G
		815.77	-1.824E+00	+	8.114E+00	1.30E+02	2.33E+01 G
CE-141	I 3.8858E-01					3.25E+01	
		145.44	3.886E-01	&(	2.131E+00	1.64E+02	4.82E+01 G
PM-144	C 6.2990E-02					3.63E+02	
		696.54	-2.223E-01	?(P	1.232E+00	2.60E+02	9.90E+01 G
		618.06	3.480E-01	?(	2.213E+00	1.87E+02	9.91E+01 G
EU-152	F 6.3915E-01					4.94E+03	
		344.29	-1.271E+00	&(	5.278E+00	1.23E+02	2.65E+01 G
		1112.07	2.777E+00	?(	1.444E+01	1.50E+02	1.36E+01 G
		121.78	-7.082E-01	&	2.407E+00	1.02E+02	2.86E+01 G
		778.92	0.000E+00	-	6.700E+00	1.00E+03	1.29E+01 G
		964.11	0.000E+00	&	1.272E+01	1.00E+03	1.46E+01 G
		244.69	3.469E+00	?(	2.157E+01	1.85E+02	7.58E+00 G
		1408.00	3.848E+00	?	2.578E+00	3.02E+01	2.10E+01 GA
EU-154	I 1.4809E+00					3.14E+03	
		873.23	3.618E-01	?(	9.361E+00	7.05E+02	1.23E+01 G
		123.10	-3.340E-01	+ P	1.751E+00	1.34E+02	4.08E+01 G
		1274.54	0.000E+00	-	3.594E+00	1.00E+03	3.52E+01 G
		723.36	6.581E-01	?(	6.463E+00	2.79E+02	2.02E+01 G
		1004.77	-1.596E+00	+	1.150E+01	2.08E+02	1.80E+01 G
		996.33	4.346E+00	?(	1.201E+01	8.18E+01	1.06E+01 G
EU-155	I 7.8942E-01					1.81E+03	
		105.31	7.894E-01	(P	2.872E+00	1.08E+02	2.12E+01 G
		86.54	-8.119E-01	&	4.241E+00	1.56E+02	3.07E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
HF-181	F	3.5001E-01				4.24E+01		
			482.00	3.500E-01	?(1.356E+00	1.14E+02	8.05E+01 G
			133.02	-1.457E-01	-	1.869E+00	3.78E+02	4.33E+01 G
			345.83	-2.211E+00	+ P	8.767E+00	8.19E+01	1.51E+01 G
		136.30	0.000E+00	-	1.412E+01	1.00E+03	5.85E+00 G	
Ta-182	F	8.0910E-02				1.14E+02		
			1121.30	-1.990E+00	?(7.212E+00	1.07E+02	3.49E+01 G
			1221.41	2.230E+00	?(P	4.307E+00	8.63E+01	2.70E+01 G
		1189.05	9.593E-01	&(P	9.461E+00	4.31E+02	1.62E+01 G	
Hg-203	F	2.8212E-01				4.66E+01		
			279.20	2.821E-01	(9.171E-01	9.64E+01	8.15E+01 G
TL-208	N	2.5208E+00				6.98E+02		
			583.02	2.521E+00	(P	7.433E-01	1.59E+01	8.45E+01 G
			277.28	4.047E+00	+	1.081E+01	7.99E+01	6.31E+00 G
		860.56	1.472E+00	- P	8.942E+00	2.58E+02	1.24E+01 G	
pm-146	C	1.0950E+00				2.02E+03		
			747.16	9.190E-01	?(2.067E+00	9.34E+01	3.40E+01 G
			735.72	1.361E+00	?(3.081E+00	9.40E+01	2.25E+01 G
		453.88	0.000E+00	-	1.196E+00	1.00E+03	6.50E+01 G	
y-88	F	1.5649E-01				1.07E+02		
			898.04	1.565E-01	?(1.083E+00	2.90E+02	9.37E+01 G
		1836.06	-5.046E-01	+	1.366E+00	1.25E+02	9.92E+01 G	
Cd-113m		3.5953E+03				5.33E+03		
			263.70	3.595E+03	?(1.135E+04	9.36E+01	6.00E-03 K
Cf-251	T	-1.5514E+00				3.28E+05		
			176.60	-1.551E+00	&(4.270E+00	1.08E+02	1.70E+01 G
		227.00	-1.800E+00	+	1.046E+01	2.22E+02	6.30E+00 GA	
Cf-249	T	2.3793E-01				1.28E+05		
			387.95	2.379E-01	?(1.535E+00	1.88E+02	6.60E+01 G
		333.44	-2.157E+00	+	7.375E+00	1.02E+02	1.55E+01 G	
Sn-126		1.3828E+00				3.65E+07		
			87.57	8.714E-01	}	3.195E+00	6.16E+01	3.75E+01 GA
			64.28	1.383E+00	?(9.305E+00	2.48E+02	9.70E+00 G
		86.94	1.383E+00	}	1.329E+01	1.58E+02	9.04E+00 GA	
PB-210	N	5.9127E-01				8.14E+03		
			46.54	5.913E-01	%(P	3.646E+01	1.81E+03	4.25E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments		
PB-212	N	9.0507E+00					6.98E+02		
			238.63	9.051E+00	(P	1.524E+00	7.91E+00	4.33E+01	G
			300.03	0.000E+00	} P	4.870E+01	8.83E+02	3.28E+00	GA
PB-214	N	1.1783E+01					5.84E+05		
			351.93	1.208E+01	*(P	1.714E+00	9.24E+00	3.76E+01	G
			295.09	1.120E+01	(P	2.857E+00	1.31E+01	1.93E+01	G
			242.00	1.067E+01		8.654E+00	2.69E+01	7.43E+00	GA
BI-207	C	2.7654E-01					1.18E+04		
			569.70	0.000E+00	&(	9.703E-01	1.00E+03	9.77E+01	G
			1063.66	6.394E-01	?(P	1.396E+00	9.61E+01	7.45E+01	G
BI-212	N	4.8903E+00					6.98E+02		
			727.17	4.890E+00	?(	1.414E+01	8.54E+01	7.55E+00	G
			785.42	1.883E+01	?	4.327E+01	9.27E+01	1.28E+00	GA
BI-214	N	1.2787E+01					5.84E+05		
			609.31	1.279E+01	(P	1.111E+00	8.49E+00	4.61E+01	G
			1120.29	2.535E+00	-	1.163E+01	1.32E+02	1.51E+01	G
			1764.49	4.293E+00	- P	1.053E+01	7.33E+01	1.54E+01	G
BI-210M	T	3.3443E-01					1.10E+09		
			265.83	3.344E-01	*(P	1.456E+00	1.28E+02	5.00E+01	G
			304.90	0.000E+00	&	6.504E+00	1.00E+03	2.80E+01	G
AC-228	N	8.6852E+00					2.10E+03		
			911.07	8.164E+00	(P	2.089E+00	1.68E+01	2.90E+01	G
			968.97	2.761E+00	- P	7.957E+00	8.53E+01	1.75E+01	G
			338.32	9.943E+00	(P	4.610E+00	2.24E+01	1.20E+01	G
			93.35	4.364E+00	&	2.096E+01	1.44E+02	5.56E+00	XA
TH-227	N	-4.4586E+00					7.95E+03		
			50.14	-4.459E+00	&(	1.454E+01	1.21E+02	8.00E+00	G
			256.24	-1.919E+00	+ P	1.022E+01	2.45E+02	7.00E+00	G
TH-229	N	1.6775E+00					2.68E+06		
			193.51	1.764E+00	?(	1.282E+01	2.77E+02	4.40E+00	G
			210.85	1.550E+00	?(	2.200E+01	5.40E+02	2.99E+00	G
TH-234	N	-2.9493E-01					1.63E+12		
			63.29	-2.949E-01	%(P	2.355E+01	2.33E+03	3.81E+00	G
			92.59	-4.714E+00	+ P	2.221E+01	7.59E+01	5.58E+00	G
PA-231	N	-1.0700E+01					1.20E+07		
			302.65	-1.070E+01	?(	5.929E+01	1.65E+02	2.88E+00	G
			300.07	-1.241E+01	&	6.501E+01	1.56E+02	2.46E+00	G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
PA-234	N	2.8257E-01					1.63E+12	
			131.29	-1.103E+00	?(4.315E+00	1.17E+02	1.80E+01 G
			946.02	-1.529E+00	+	1.079E+01	3.05E+02	1.34E+01 G
			569.47	-3.977E-01	&	1.156E+01	8.06E+02	8.20E+00 G
			883.24	2.880E+00	?(1.076E+01	1.08E+02	9.60E+00 G
		880.53	4.683E+00	?	1.416E+01	8.80E+01	6.00E+00 GA	
PA-234M	N	-9.0823E+01					1.63E+12	
			1001.00	-9.082E+01	?(P	2.364E+02	5.63E+01	8.37E-01 G
		766.41	-2.405E+01	&	5.962E+02	7.07E+02	2.94E-01 G	
U-235	N	-2.0338E+00					2.57E+11	
			143.79	-2.034E+00	?(P	1.056E+01	8.74E+01	1.10E+01 G
			205.33	-4.269E-01	% P	1.270E+01	1.18E+03	5.01E+00 G
		163.38	-4.046E+00	+ P	1.316E+01	1.04E+02	5.08E+00 G	
AM-241	T	8.2927E-01					1.58E+05	
			59.54	8.293E-01	(2.500E+00	1.12E+02	3.59E+01 G
Ir-192	F	2.1448E-01					7.40E+01	
			316.49	0.000E+00	&(2.160E+00	1.00E+03	8.70E+01 G
			468.06	5.752E-01	?(1.973E+00	1.01E+02	5.18E+01 G
		308.44	0.000E+00	-	5.792E+00	1.00E+03	3.18E+01 G	
Cs-136	F	4.4231E-01					1.30E+01	
			818.50	4.423E-01	?(1.903E+00	1.26E+02	1.00E+02 G
			1048.07	9.362E-02	-	1.259E+00	5.63E+02	8.00E+01 G
		340.57	-7.092E-01	+	3.073E+00	1.29E+02	4.69E+01 G	
Np-239	T	-8.3753E-01					2.36E+00	
			103.70	6.584E-01	&	2.969E+00	1.34E+02	2.40E+01 X
			106.13	-8.375E-01	(3.141E+00	1.12E+02	2.27E+01 G
		99.50	-1.117E+00	+	6.064E+00	1.62E+02	1.50E+01 X	
Nd-147		-1.1893E-01					1.11E+01	
			531.00	-1.337E+00	?(8.230E+00	2.52E+02	1.30E+01 G
		91.10	4.406E-01	?(	4.284E+00	2.90E+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	148.	-18.	-0.010	121.13	-4.459E+00	
AM-241	59.54	150.	20.	0.011	112.15	8.293E-01	
BA-133	80.99	208.	-25.	-0.014	76.50	-7.968E-01	P
EU-155	86.54	675.	-24.	-0.013	156.39	-8.119E-01	
Nd-147	91.10	614.	12.	0.007	289.72	4.406E-01	
TH-234	92.59	652.	-26.	-0.014	75.91	-4.714E+00	P
Gd-153	97.50	123.	-12.	-0.007	162.75	-4.115E-01	
EU-155	105.31	161.	17.	0.009	108.38	7.894E-01	P
EU-152	121.78	205.	-20.	-0.011	101.53	-7.082E-01	
CO-57	122.06	225.	-9.	-0.005	250.21	-9.918E-02	
EU-154	123.10	221.	-14.	-0.008	134.31	-3.340E-01	P
PA-234	131.29	253.	-20.	-0.011	116.78	-1.103E+00	
HF-181	133.02	272.	-6.	-0.003	378.25	-1.457E-01	
CO-57	136.47	246.	19.	0.010	121.17	1.793E+00	
Tc-99m	140.51	270.	-13.	-0.007	180.89	-1.562E-01	
U-235	143.79	528.	-21.	-0.012	87.43	-2.034E+00	P
CE-141	145.44	408.	18.	0.010	163.52	3.886E-01	
Ba-140	162.66	127.	15.	0.008	109.57	2.757E+00	
U-235	163.38	141.	-18.	-0.010	103.72	-4.046E+00	P
CE-139	165.85	162.	-5.	-0.003	382.28	-6.762E-02	
Cf-251	176.60	154.	-22.	-0.012	107.68	-1.551E+00	
TH-229	193.51	77.	6.	0.003	276.64	1.764E+00	
TH-229	210.85	92.	3.	0.002	540.14	1.550E+00	
Cf-251	227.00	81.	-8.	-0.004	222.12	-1.800E+00	
EU-152	244.69	471.	17.	0.009	185.43	3.469E+00	
TH-227	256.24	77.	-8.	-0.005	245.49	-1.919E+00	P

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
BI-210M	265.83	75.	10.	0.005	127.96	3.344E-01	P
Hg-203	279.20	73.	13.	0.007	96.41	2.821E-01	
I-131	284.30	52.	9.	0.005	154.72	2.598E+00	P
PA-231	300.07	315.	-16.	-0.009	155.96	-1.241E+01	
PA-233	300.18	339.	-16.	-0.009	161.60	-4.924E+00	
PA-231	302.65	355.	-16.	-0.009	164.98	-1.070E+01	
BA-133	302.85	371.	-16.	-0.009	168.61	-1.683E+00	
Ba-140	304.85	388.	-12.	-0.007	225.54	-5.506E+00	
La-140	328.76	88.	14.	0.008	100.83	1.362E+00	
Cf-249	333.44	130.	-16.	-0.009	101.78	-2.157E+00	
Cs-136	340.57	203.	-16.	-0.009	128.79	-7.092E-01	
EU-152	344.29	187.	-16.	-0.009	123.43	-1.271E+00	
HF-181	345.83	164.	-16.	-0.009	81.92	-2.211E+00	P
BA-133	356.00	282.	-11.	-0.006	224.61	-3.727E-01	
I-131	364.48	28.	22.	0.012	51.69	5.958E-01	
BA-133	383.84	65.	11.	0.006	108.77	2.831E+00	
Cf-249	387.95	76.	7.	0.004	187.63	2.379E-01	
SN-113	391.69	92.	-9.	-0.005	222.24	-3.247E-01	P
SB-125	427.88	40.	4.	0.002	313.58	3.434E-01	
AG-108M	433.94	12.	7.	0.004	102.41	2.038E-01	P
SB-125	463.37	51.	11.	0.006	94.53	2.920E+00	P
Ir-192	468.06	55.	11.	0.006	101.16	5.752E-01	
BE-7	477.60	114.	-15.	-0.008	105.29	-3.928E+00	
HF-181	482.00	60.	10.	0.006	113.85	3.500E-01	
La-140	487.02	87.	6.	0.003	220.04	3.822E-01	
RH-106	511.86	60.	27.	0.015	76.31	3.973E+00	
Nd-147	531.00	48.	-6.	-0.003	252.22	-1.337E+00	
CS-134	563.24	39.	-5.	-0.003	195.40	-2.085E+00	P
CS-134	569.32	26.	5.	0.003	151.00	1.060E+00	
PA-234	569.47	32.	-1.	-0.001	806.23	-3.977E-01	
SB-125	600.50	357.	-15.	-0.009	66.32	-2.949E+00	P
SB-124	602.73	342.	-17.	-0.009	62.36	-5.797E-01	P
CS-134	604.71	326.	-15.	-0.009	167.44	-5.432E-01	
RU-103	610.30	310.	-15.	-0.009	162.93	-9.331E+00	
AG-108M	614.28	295.	-16.	-0.009	158.50	-6.022E-01	
PM-144	618.06	165.	10.	0.005	187.32	3.480E-01	
RH-106	621.92	289.	-16.	-0.009	156.25	-5.536E+00	
SB-125	635.89	37.	-11.	-0.006	130.14	-3.548E+00	P
I-131	636.97	62.	-14.	-0.007	86.75	-6.778E+00	
AG-110M	657.76	36.	-2.	-0.001	722.48	-7.882E-02	P
CS-137	661.66	44.	-7.	-0.004	205.67	-3.108E-01	P
PM-144	696.54	38.	-6.	-0.003	259.61	-2.223E-01	P
NB-94	702.63	47.	-16.	-0.009	91.69	-6.581E-01	
SB-124	722.79	22.	9.	0.005	80.84	3.389E+00	
AG-108M	722.94	32.	9.	0.005	93.45	4.033E-01	
EU-154	723.36	41.	3.	0.002	278.64	6.581E-01	
ZR-95	724.20	92.	-18.	-0.010	77.88	-1.664E+00	
BI-212	727.17	26.	9.	0.005	85.41	4.890E+00	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
pm-146	735.72	9.	7.	0.004	93.97	1.361E+00	
pm-146	747.16	9.	8.	0.004	93.40	9.190E-01	
ZR-95	756.73	23.	-5.	-0.003	196.95	-4.107E-01	
AG-110M	763.94	97.	-23.	-0.013	64.09	-4.363E+00	P
NB-95	765.79	82.	15.	0.008	88.23	6.451E-01	
PA-234M	766.41	69.	-2.	-0.001	707.39	-2.405E+01	
BI-212	785.42	5.	6.	0.003	92.71	1.883E+01	
CS-134	795.87	34.	2.	0.001	418.33	1.026E-01	
CO-58	810.78	58.	-14.	-0.008	84.11	-6.068E-01	
La-140	815.77	72.	-9.	-0.005	130.44	-1.824E+00	
Cs-136	818.50	72.	10.	0.005	126.27	4.423E-01	
Co-56	846.77	23.	-7.	-0.004	144.53	-3.402E-01	
NB-94	871.10	12.	8.	0.004	70.18	3.841E-01	
EU-154	873.23	21.	1.	0.001	704.60	3.618E-01	
PA-234	880.53	10.	6.	0.003	88.00	4.683E+00	
PA-234	883.24	16.	6.	0.003	107.52	2.880E+00	
AG-110M	884.68	22.	5.	0.003	134.93	3.484E-01	P
Sc-46	889.28	50.	-10.	-0.006	104.97	-4.834E-01	
y-88	898.04	15.	3.	0.002	289.64	1.565E-01	
AG-110M	937.49	40.	-17.	-0.009	47.95	-2.478E+00	P
PA-234	946.02	30.	-4.	-0.002	305.16	-1.529E+00	
EU-154	996.33	20.	9.	0.005	81.75	4.346E+00	
PA-234M	1001.00	53.	-14.	-0.008	56.31	-9.082E+01	P
EU-154	1004.77	58.	-5.	-0.003	207.86	-1.596E+00	
Co-56	1037.84	25.	-7.	-0.004	107.52	-2.939E+00	P
Cs-136	1048.07	11.	1.	0.001	563.47	9.362E-02	
RH-106	1050.36	15.	-2.	-0.001	282.84	-7.216E+00	
BI-207	1063.66	11.	8.	0.005	96.07	6.394E-01	P
Ga-68	1077.40	11.	3.	0.002	229.35	6.804E+00	
FE-59	1099.25	16.	1.	0.001	914.69	1.038E-01	
EU-152	1112.07	43.	6.	0.004	150.27	2.777E+00	
ZN-65	1115.55	49.	6.	0.004	160.11	7.521E-01	
Sc-46	1120.55	39.	6.	0.004	143.68	3.830E-01	
CO-60	1173.24	27.	-2.	-0.001	355.65	-1.424E-01	P
Co-56	1238.28	16.	11.	0.006	84.92	1.133E+00	P
NA-22	1274.53	6.	6.	0.004	66.37	4.252E-01	
FE-59	1291.60	23.	-8.	-0.004	150.05	-1.205E+00	
CO-60	1332.50	6.	6.	0.004	96.69	4.426E-01	
AG-110M	1384.30	12.	-5.	-0.003	213.71	-1.360E+00	P
EU-152	1408.00	0.	11.	0.006	30.15	3.848E+00	
La-140	1596.21	18.	-9.	-0.005	118.63	-7.780E-01	
Co-56	1771.35	19.	8.	0.004	84.65	4.676E+00	
y-88	1836.06	6.	-5.	-0.003	124.92	-5.046E-01	

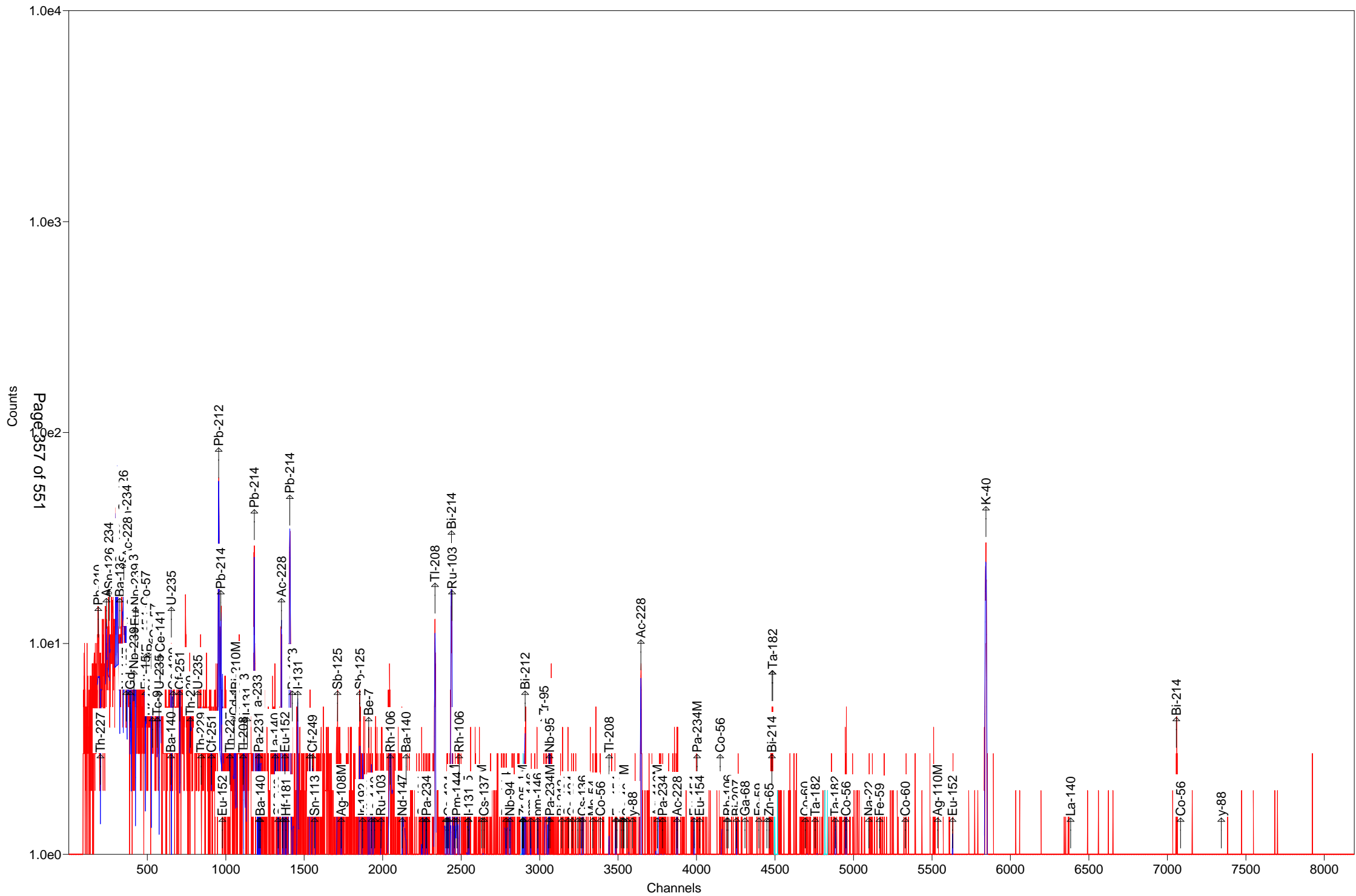
P - Peakbackground subtraction

***** 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	-3.9276E+00	-3.9276E+00	1.053E+02%		1.39E+01
NA-22	#A	4.2518E-01	4.2518E-01	6.637E+01%		9.27E-01
K-40		1.5456E+02	1.5456E+02	7.245E+00%		1.07E+01
Sc-46	#A	-4.8338E-01	-4.8338E-01	1.050E+02%		1.73E+00
CR-51	#A	0.0000E+00	0.0000E+00	1.000E+03%		1.91E+01
MN-54	#A	-1.9242E-02	-1.9242E-02	3.510E+03%		1.16E+00
FE-59	#A	1.0381E-01	1.0381E-01	9.147E+02%		2.22E+00
Co-56	#A	2.4614E-01	2.4614E-01	8.381E+01%		1.17E+00
CO-57	#A	1.1068E-01	1.1068E-01	1.212E+02%		8.41E-01
CO-58	#A	-6.0678E-01	-6.0678E-01	8.411E+01%		1.71E+00
CO-60	#A	4.4262E-01	4.4262E-01	9.669E+01%		9.65E-01
ZN-65	#A	7.5209E-01	7.5209E-01	1.601E+02%		4.16E+00
NB-94	#A	-6.5814E-01	-6.5814E-01	9.169E+01%		1.39E+00
ZR-95	#A	-4.1071E-01	-4.1071E-01	1.969E+02%		1.94E+00
NB-95	#A	6.4506E-01	6.4506E-01	8.823E+01%		1.91E+00
RU-103	#A	-1.0616E-02	-1.0616E-02	3.377E+03%		9.04E-01
RH-106	#A	-5.5355E+00	-5.5356E+00	1.562E+02%		2.91E+01
AG-108M	#A	3.0378E-01	3.0378E-01	6.932E+01%		5.41E-01
AG-110M	#A	3.4844E-01	3.4844E-01	1.349E+02%		1.64E+00
SN-113	#A	-3.2466E-01	-3.2466E-01	2.222E+02%		1.74E+00
SB-124	#A	-1.8640E-01	-1.8640E-01	5.105E+01%		3.10E+00
SB-125	#A	1.0167E+00	1.0167E+00	9.453E+01%		2.76E+00
I-131	#A	7.3568E-01	7.3570E-01	5.169E+01%		7.41E-01
Gd-153	#A	-4.1154E-01	-4.1154E-01	1.627E+02%		1.82E+00
Ga-68	#A	6.7725E+00	6.8037E+00	2.293E+02%		3.66E+01
Tc-99m	#A	-1.5606E-01	-1.5619E-01	1.809E+02%		9.53E-01
BA-133	#A	-3.7269E-01	-3.7269E-01	2.246E+02%		2.83E+00
CS-134	#A	-3.2499E-01	-3.2499E-01	1.127E+02%		3.06E+00
CS-137	#A	-3.1079E-01	-3.1079E-01	2.057E+02%		1.47E+00
CE-139	#A	-6.7616E-02	-6.7616E-02	3.823E+02%		8.84E-01
Ba-140	#A	6.3330E-01	6.3331E-01	1.096E+02%		3.38E+00
La-140	#A	-4.0246E-01	-4.0246E-01	7.785E+01%		1.94E+00
CE-141	#A	3.8858E-01	3.8858E-01	1.635E+02%		2.13E+00
CE-144	#A	0.0000E+00	0.0000E+00	1.000E+03%		7.39E+00
PM-144	#A	6.2990E-02	6.2990E-02	1.601E+02%		1.23E+00
EU-152	#A	6.3915E-01	6.3915E-01	8.957E+01%		5.28E+00
EU-154	#A	1.4809E+00	1.4809E+00	8.175E+01%		9.36E+00
EU-155	#A	7.8942E-01	7.8942E-01	1.084E+02%		2.87E+00
HF-181	#A	3.5001E-01	3.5001E-01	1.138E+02%		1.36E+00
Ta-182	#A	8.0910E-02	8.0910E-02	8.628E+01%		7.21E+00
Hg-203	#A	2.8212E-01	2.8212E-01	9.641E+01%		9.17E-01
TL-208		2.5208E+00	2.5208E+00	1.593E+01%		7.43E-01
pm-146	#A	1.0950E+00	1.0950E+00	6.624E+01%		2.07E+00

y-88 #A	1.5648E-01	1.5649E-01	2.896E+02%	1.08E+00
Cd-113m#A	3.5953E+03	3.5953E+03	9.364E+01%	1.13E+04
Cd-109 #A	0.0000E+00	0.0000E+00	1.000E+03%	3.19E+01
Cf-251 #A	-1.5514E+00	-1.5514E+00	1.077E+02%	4.27E+00
Cf-249 #A	2.3793E-01	2.3793E-01	1.876E+02%	1.54E+00
Sn-126 #A	1.3828E+00	1.3828E+00	2.485E+02%	9.30E+00
PB-210 #A	5.9127E-01	5.9127E-01	1.808E+03%	3.65E+01
PB-212	9.0507E+00	9.0507E+00	7.913E+00%	1.52E+00
PB-214	1.1783E+01	1.1783E+01	8.021E+00%	1.71E+00
BI-207 #A	2.7654E-01	2.7654E-01	9.607E+01%	9.70E-01
BI-212 #A	4.8903E+00	4.8903E+00	8.541E+01%	1.41E+01
BI-214	1.2787E+01	1.2787E+01	8.486E+00%	1.11E+00
BI-210M#A	3.3443E-01	3.3443E-01	1.280E+02%	1.46E+00
AC-228	8.6852E+00	8.6852E+00	1.397E+01%	2.09E+00
TH-227 #A	-4.4586E+00	-4.4586E+00	1.211E+02%	1.45E+01
TH-229 #A	1.6775E+00	1.6775E+00	2.766E+02%	1.28E+01
TH-234 #A	-2.9493E-01	-2.9493E-01	2.331E+03%	2.35E+01
PA-231 #A	-1.0700E+01	-1.0700E+01	1.650E+02%	5.93E+01
PA-233 #A	0.0000E+00	0.0000E+00	1.000E+03%	5.16E+00
PA-234 #A	2.8257E-01	2.8257E-01	7.937E+01%	4.32E+00
PA-234M#A	-9.0823E+01	-9.0823E+01	5.631E+01%	2.36E+02
U-235 #A	-2.0338E+00	-2.0338E+00	8.743E+01%	1.06E+01
AM-241 #A	8.2927E-01	8.2927E-01	1.122E+02%	2.50E+00
Np-237 #A	0.0000E+00	0.0000E+00	1.000E+03%	9.98E+00
Ir-192 #A	2.1448E-01	2.1448E-01	1.012E+02%	2.16E+00
Cs-136 #A	4.4230E-01	4.4231E-01	1.263E+02%	1.90E+00
Np-239 A	-8.3745E-01	-8.3753E-01	1.119E+02%	3.14E+00
Nd-147 #A	-1.1893E-01	-1.1893E-01	1.921E+02%	8.23E+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 - Half-life limit exceeded

----- S U M M A R Y -----
 Total Activity (37.6 to 2000.1 keV) 1.994E+02 Bq/Sample
 Total Decayed Activity (37.6 to 2000.1 keV) 1.9938333E+02 Bq/Sample



Sample Description: 257060_Gamma_160-17814-A-2-B
 Detector: Detector # 3
 Batch ID: 257060
 Work Order Number: Gamma
 Lot Number: 160-17814-A-2-B

Decay to Time: 7/11/2016 07:46 Live Time: 1800 sec
 Acquisition Time: 7/11/2016 07:46:36 Real Time: 1802 sec
 Analysis Time: 7/11/2016 08:16 Dead Time: 0.11 %
 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_2016-07-10_0602.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	-4.672E+00	104.6	4.887E+00	4.893E+00	1.641E+01
NA-22	-2.230E-01	190.9	4.256E-01	4.258E-01	1.514E+00
K-40	1.745E+02	6.2	1.085E+01	1.405E+01	1.037E+01
Sc-46	3.720E-01	110.0	4.091E-01	4.095E-01	1.402E+00
CR-51	-3.933E+00	26.3	1.036E+00	1.057E+00	1.930E+01
MN-54	-3.595E-01	138.0	4.961E-01	4.964E-01	1.126E+00
FE-59	-6.267E-02	85.8	5.379E-02	5.388E-02	2.789E+00
Co-56	1.744E-01	108.0	1.883E-01	1.885E-01	1.122E+00
CO-57	1.798E-01	141.0	2.536E-01	2.537E-01	9.321E-01
CO-58	3.458E-01	129.9	4.492E-01	4.496E-01	1.541E+00
CO-60	3.129E-01	86.9	2.720E-01	2.725E-01	1.162E+00
ZN-65	-1.835E+00	89.7	1.646E+00	1.648E+00	5.513E+00
NB-94	6.087E-01	29.3	1.784E-01	1.811E-01	7.948E-01
ZR-95	-1.249E-01	731.6	9.140E-01	9.140E-01	2.200E+00
NB-95	-2.559E-02	2099.0	5.372E-01	5.372E-01	1.879E+00
RU-103	-1.454E-01	255.9	3.721E-01	3.722E-01	9.080E-01
RH-106	3.963E+00	97.8	3.875E+00	3.881E+00	1.310E+01
AG-108M	1.402E-01	91.9	1.289E-01	1.291E-01	1.014E+00
AG-110M	4.030E-02	408.8	1.647E-01	1.648E-01	2.355E+00
SN-113	4.940E-01	117.1	5.785E-01	5.790E-01	1.955E+00
SB-124	-6.179E-02	64.0	3.953E-02	3.966E-02	2.975E+00
SB-125	3.355E+00	29.3	9.816E-01	9.965E-01	2.140E+00
I-131	4.917E-01	111.5	5.481E-01	5.487E-01	9.127E-01
Gd-153	-7.983E-01	146.8	1.172E+00	1.173E+00	3.926E+00
Ga-68	1.386E+01	107.8	1.493E+01	1.495E+01	3.388E+01
Tc-99m	-2.902E-01	121.0	3.511E-01	3.515E-01	1.177E+00
BA-133	-4.744E-01	192.4	9.130E-01	9.133E-01	3.079E+00
CS-134	4.228E-01	61.3	2.593E-01	2.602E-01	2.929E+00
CS-137	2.168E-01	175.5	3.804E-01	3.806E-01	1.330E+00
CE-139	-5.848E-02	521.3	3.049E-01	3.050E-01	1.047E+00
Ba-140	-3.100E-01	629.0	1.950E+00	1.950E+00	3.464E+00
La-140	7.570E-01	32.1	2.427E-01	2.460E-01	5.602E-01
CE-141	4.907E-01	123.3	6.051E-01	6.056E-01	2.031E+00

CE-144	-2.257E+00	131.1	2.958E+00	2.960E+00	9.908E+00
PM-144	3.758E-01	100.6	3.779E-01	3.784E-01	8.954E-01
EU-152	2.046E+00	31.7	6.481E-01	6.569E-01	5.713E+00
EU-154	9.565E-01	88.4	8.454E-01	8.468E-01	9.724E+00
EU-155	-7.669E-02	1294.6	9.929E-01	9.929E-01	5.742E+00
HF-181	-1.655E-01	81.6	1.350E-01	1.353E-01	2.274E+00
Ta-182	-1.577E-01	1220.7	1.925E+00	1.925E+00	6.748E+00
Hg-203	1.797E-02	2353.3	4.230E-01	4.230E-01	1.119E+00
TL-208	3.719E+00	15.8	5.890E-01	6.198E-01	1.029E+00
pm-146	-1.905E+00	69.8	1.331E+00	1.334E+00	3.925E+00
y-88	4.018E-01	92.7	3.723E-01	3.729E-01	8.647E-01
Cd-113m	-1.437E+03	324.7	4.666E+03	4.667E+03	1.608E+04
Cd-109	0.000E+00	1.#INF	3.014E+00	3.014E+00	3.576E+01
Cf-251	2.865E-01	470.6	1.349E+00	1.349E+00	3.740E+00
Cf-249	0.000E+00	1.#INF	1.075E-01	1.075E-01	2.067E+00
Sn-126	-4.015E+00	104.9	4.213E+00	4.219E+00	1.407E+01
PB-210	1.163E+01	74.2	8.635E+00	8.662E+00	2.831E+01
PB-212	9.337E+00	8.0	7.455E-01	9.595E-01	1.447E+00
PB-214	1.242E+01	9.6	1.188E+00	1.352E+00	1.971E+00
BI-207	-2.497E-01	207.9	5.191E-01	5.193E-01	1.056E+00
BI-212	3.210E+00	182.2	5.849E+00	5.851E+00	2.019E+01
BI-214	9.864E+00	10.2	1.005E+00	1.128E+00	1.641E+00
BI-210M	5.292E-01	100.0	5.293E-01	5.302E-01	1.782E+00
AC-228	8.058E+00	14.6	1.178E+00	1.247E+00	2.699E+00
TH-227	4.206E+00	68.2	2.868E+00	2.877E+00	9.505E+00
TH-229	9.649E+00	56.5	5.451E+00	5.505E+00	1.439E+01
TH-234	8.589E+00	44.4	3.815E+00	3.841E+00	2.180E+01
PA-231	-1.396E-06	1305466607.6	1.822E+01	1.822E+01	6.202E+01
PA-233	-1.014E+00	151.5	1.536E+00	1.537E+00	5.157E+00
PA-234	-5.144E-01	123.5	6.353E-01	6.359E-01	5.702E+00
PA-234M	4.330E+01	89.5	3.877E+01	3.883E+01	1.939E+02
U-235	1.049E+00	93.0	9.757E-01	9.772E-01	9.785E+00
AM-241	-1.005E+00	122.7	1.234E+00	1.235E+00	3.310E+00
Np-237	2.094E+00	151.4	3.171E+00	3.173E+00	1.061E+01
Ir-192	3.682E-01	155.9	5.740E-01	5.744E-01	1.932E+00
Cs-136	2.435E-01	39.1	9.518E-02	9.620E-02	1.868E+00
Np-239	7.957E-01	152.4	1.213E+00	1.214E+00	4.083E+00
Nd-147	1.048E+00	281.5	2.949E+00	2.950E+00	7.290E+00

Total	3.349E+02				

Analyst: Amanda Dick

Sample description
257060_Gamma_160-17814-A-2-B

Spectrum Filename: C:\User\SPC\Det3\3_Gamma_20161196.An1

Acquisition information

Start time: 7/11/2016 7:46:36 AM
Live time: 1800
Real time: 1802
Dead time: 0.11 %
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): $-6.102019E-01 + (-3.642282E-01 * \text{Log}(E)) + (-2.895398E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.29 %
Log(Eff): $-2.525141E+01 + (9.446449E+00 * \text{Log}(E)) + (-1.005974E+00 * \text{Log}(E)^2)$

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	7/11/2016 7:46:00 AM
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	3_2016-07-10_0602.PBC 7/10/2016 6:02:16 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 26 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.1355

***** 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
46.55	20.	74.25	0.82	2.214E-02	46.54	4.250	PBC<MDA	PB210
50.16	15.	68.18	0.82	2.503E-02	50.14	8.000	PBC<MDA	TH227
63.35	28.	63.73	0.48	3.420E-02	63.29	3.810	PBC<MDA	TH234
74.83	134.	15.59	0.85	3.994E-02				
77.09	195.	10.23	0.85	4.082E-02				
80.99	4.	647.35	0.85	4.217E-02	80.99	34.060	PBC<MDA	BA133
87.04	22.	151.42	0.86	4.369E-02	86.49	13.100	PBC<MDA	Np237
					86.94	9.040	3.028E+00	Sn126
92.47	28.	61.88	0.87	4.491E-02	92.59	5.584	PBC<MDA	TH234
93.23	21.	140.54	0.87	4.503E-02	93.35	5.561	PBC<MDA	AC228
106.13	15.	152.45	0.88	4.614E-02	106.13	22.700	PBC<MDA	Np239
123.10	17.	103.49	0.90	4.555E-02	123.10	40.790	PBC<MDA	EU154
136.47	16.	141.03	0.91	4.397E-02	136.30	5.850	PBC<MDA	HF181
					136.47	10.680	1.949E+00	CO57
145.44	18.	123.31	0.92	4.257E-02	145.44	48.200	PBC<MDA	CE141
163.38	15.	118.52	0.94	3.929E-02	163.38	5.080	PBC<MDA	U235
176.60	3.	470.64	0.95	3.802E-02	176.60	17.000	PBC<MDA	Cf251
193.51	27.	56.49	0.97	3.577E-02	193.51	4.400	PBC<MDA	TH229
205.33	9.	187.78	0.98	3.437E-02	205.33	5.010	PBC<MDA	U235
238.73	220.	9.55	1.07	3.104E-02	238.63	43.300	9.098E+00	PB212
242.12	50.	25.00	1.02	3.075E-02	242.00	7.430	1.221E+01	PB214
265.83	14.	100.02	1.04	2.884E-02	265.83	50.000	PBC<MDA	BI210M

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
295.09	85.	18.65	0.77	2.683E-02	295.09	19.300	9.142E+00	PB214
316.49	15.	155.89	1.09	2.556E-02	316.49	87.040		PBC<MDA Ir192
338.39	56.	21.43	0.84	2.439E-02	338.32	12.010	1.070E+01	AC228
345.83	15.	120.72	1.12	2.402E-02	345.83	15.070		PBC<MDA HF181
352.03	199.	9.56	1.38	2.372E-02	351.93	37.600	1.242E+01	PB214
364.48	9.	136.11	1.14	2.315E-02	364.48	81.700		PBC<MDA I131
391.69	13.	117.10	1.17	2.200E-02	391.69	64.000		PBC<MDA SN113
427.88	9.	98.99	1.20	2.065E-02	427.88	29.600		PBC<MDA SB125
463.37	38.	29.26	1.24	1.951E-02	463.37	10.470	1.043E+01	SB125
511.66	-48.	30.93	1.34	1.816E-02	511.86	20.000	-7.400E+00	RH106
511.86	28.	50.85	2.54	1.815E-02	511.86	20.000		PBC<MDA RH106
531.00	4.	281.48	1.31	1.767E-02	531.00	13.000		PBC<MDA Nd147
563.24	11.	96.11	1.34	1.693E-02	563.24	8.350		PBC<MDA CS134
569.32	6.	129.21	1.34	1.680E-02	569.32	15.380		PBC<MDA CS134
					569.47	8.200	2.219E+00	PA234
					569.70	97.740		PBC<MDA BI207
583.38	99.	14.74	1.28	1.650E-02	583.02	84.500	3.719E+00	TL208
609.53	130.	10.18	1.45	1.598E-02	609.31	46.090	9.827E+00	BI214
					610.30	5.750	7.886E+01	RU103
621.92	11.	97.80	1.39	1.574E-02	621.92	9.930		PBC<MDA RH106
636.97	6.	176.53	1.41	1.547E-02	636.97	7.170		PBC<MDA I131
657.76	2.	408.79	1.43	1.510E-02	657.76	94.640		PBC<MDA AG110M
661.29	5.	175.50	1.43	1.504E-02	661.66	85.210		PBC<MDA CS137
696.54	10.	100.56	1.46	1.448E-02	696.54	99.000		PBC<MDA PM144
702.63	9.	95.83	1.47	1.438E-02	702.63	97.900		PBC<MDA NB94
722.79	12.	81.98	1.49	1.408E-02	722.79	10.810		PBC<MDA SB124
					722.94	90.840	5.023E-01	AG108M
					723.36	20.220	2.258E+00	EU154
722.94	12.	91.91	1.49	1.408E-02	722.79	10.810	4.221E+00	SB124
					722.94	90.840	5.024E-01	AG108M
					723.36	20.220	2.258E+00	EU154
723.36	4.	306.18	1.49	1.408E-02	722.79	10.810		PBC<MDA SB124
					722.94	90.840	1.607E-01	AG108M
					723.36	20.220	7.222E-01	EU154
727.17	6.	182.22	1.49	1.402E-02	727.17	7.550		PBC<MDA BI212
766.41	12.	89.55	1.53	1.348E-02	765.79	99.790		PBC<MDA NB95
					766.41	0.294	1.666E+02	PA234M
778.92	4.	216.89	1.54	1.332E-02	778.92	12.940		PBC<MDA EU152
785.42	19.	22.94	1.55	1.323E-02	785.42	1.280	6.231E+01	BI212
801.95	12.	88.54	1.56	1.303E-02	801.95	8.690		PBC<MDA CS134
810.78	8.	129.90	1.57	1.292E-02	810.78	99.460		PBC<MDA CO58
871.10	19.	29.30	1.62	1.224E-02	871.10	99.890	8.632E-01	NB94
880.53	11.	85.40	1.63	1.214E-02	880.53	6.000		PBC<MDA PA234
883.24	2.	448.82	1.64	1.211E-02	883.24	9.600		PBC<MDA PA234
889.28	8.	109.98	1.64	1.205E-02	889.28	99.984		PBC<MDA Sc46
898.04	8.	92.67	1.65	1.196E-02	898.04	93.700		PBC<MDA y88
911.37	43.	19.87	1.96	1.183E-02	911.07	29.000	6.966E+00	AC228
964.11	27.	31.67	1.71	1.133E-02	964.11	14.605	8.949E+00	EU152

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
969.38	-4.	250.07	1.71	1.129E-02	968.97	17.460	PBC<MDA	AC228
996.33	10.	88.38	1.74	1.105E-02	996.33	10.600	PBC<MDA	EU154
1037.84	5.	108.01	1.77	1.071E-02	1037.84	14.130	PBC<MDA	Co56
1048.07	12.	39.09	1.78	1.063E-02	1048.07	80.000	PBC<MDA	Cs136
1077.40	7.	107.76	1.81	1.041E-02	1077.40	3.300	PBC<MDA	Ga68
1120.33	47.	14.88	1.44	1.010E-02	1120.29	15.100	1.717E+01	BI214
					1120.55	99.987	PBC<MDA	Sc46
1173.24	9.	86.92	1.89	9.749E-03	1173.24	99.900	PBC<MDA	CO60
1291.60	7.	89.11	1.99	9.048E-03	1291.60	43.200	PBC<MDA	FE59
1332.50	2.	512.62	2.03	8.830E-03	1332.50	99.980	PBC<MDA	CO60
1461.00	275.	6.22	2.28	8.216E-03	1460.83	10.670	1.745E+02	K40
1596.21	10.	32.06	2.24	7.662E-03	1596.21	95.400	7.570E-01	La140
1765.15	20.	35.01	2.37	7.075E-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
299.09	74.83	149.	134.	3.353E+03	15.59	0.848	- D
308.13	77.08	101.	195.	4.771E+03	10.23	0.850	- 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	185.82	46.54	94.	20.	0.011	74.25	0.818D
TH-227	200.24	50.14	46.	15.	0.008	68.18	0.822D
AM-241	237.85	59.54	197.	-21.	-0.011	122.74	0.832
TH-234	253.12	63.35	108.	28.	0.016	63.73	0.476s
Sn-126	256.84	64.28	314.	-24.	-0.014	104.93	0.837
BA-133	323.73	80.99	164.	4.	0.002	647.35	0.854s
Np-237	345.75	86.49	523.	22.	0.012	151.42	0.860s
EU-155	345.96	86.54	540.	-23.	-0.013	142.10	0.860s
Sn-126	347.55	86.94	516.	-11.	-0.006	287.53	0.860
Sn-126	350.08	87.57	505.	0.	0.000	1000.00	0.861
Cd-109	351.96	88.04	505.	0.	0.000	1000.00	0.862s
Nd-147	364.21	91.10	505.	0.	0.000	1000.00	0.865s
TH-234	370.17	92.59	134.	28.	0.016	61.88	0.866D

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
AC-228	373.21	93.35	421.	21.	0.012	140.54	0.867s
Gd-153	389.83	97.50	406.	-20.	-0.011	146.78	0.871
Np-239	397.83	99.50	426.	-18.	-0.010	160.68	0.873s
Gd-153	412.64	103.20	444.	0.	0.000	1000.00	0.877s
Np-239	414.64	103.70	444.	0.	0.000	1000.00	0.878s
Np-239	424.37	106.13	254.	15.	0.008	152.45	0.880s
EU-152	487.00	121.78	163.	-18.	-0.010	100.69	0.896s
CO-57	488.14	122.06	182.	-3.	-0.002	664.08	0.897s
EU-154	492.30	123.10	138.	17.	0.009	103.49	0.898s
PA-234	525.11	131.29	293.	-20.	-0.011	123.52	0.906s
HF-181	532.03	133.02	313.	-20.	-0.011	127.26	0.908s
CE-144	534.09	133.54	333.	-20.	-0.011	131.06	0.909s
HF-181	545.14	136.30	353.	-17.	-0.010	154.43	0.911s
CO-57	545.83	136.47	262.	16.	0.009	141.03	0.912s
Tc-99m	561.99	140.51	272.	-20.	-0.011	120.96	0.916
U-235	575.10	143.79	295.	-10.	-0.006	169.03	0.919s
CE-141	581.73	145.44	241.	18.	0.010	123.31	0.921s
Ba-140	650.65	162.66	190.	-17.	-0.009	117.21	0.939s
U-235	653.53	163.38	145.	15.	0.008	118.52	0.939s
CE-139	663.43	165.85	149.	-3.	-0.002	521.34	0.942s
Cf-251	706.45	176.60	77.	3.	0.002	470.64	0.953s
TH-229	774.13	193.51	67.	27.	0.015	56.49	0.970s
U-235	821.46	205.33	82.	9.	0.005	187.78	0.982s
TH-229	843.54	210.85	103.	-5.	-0.003	408.83	0.988s
Cf-251	908.18	227.00	88.	-9.	-0.005	197.83	1.004s
PB-212	954.74	238.63	48.	226.	0.126	7.98	1.016D
PB-214	968.20	242.00	54.	50.	0.028	25.00	1.020D
TH-227	1025.21	256.24	99.	-18.	-0.010	106.07	1.034
Cd-113m	1055.07	263.70	104.	-4.	-0.002	324.70	1.041s
BI-210M	1063.60	265.83	87.	14.	0.008	100.02	1.044s
I-131	1137.51	284.30	95.	-19.	-0.010	99.65	1.062s
PB-214	1180.71	295.09	42.	85.	0.047	18.65	0.770s
PB-212	1200.47	300.03	305.	-15.	-0.009	161.70	1.078
PA-231	1200.63	300.07	306.	-4.	-0.002	589.58	1.078
Ba-140	1219.75	304.85	282.	-17.	-0.009	143.20	1.083s
BI-210M	1219.94	304.90	288.	-17.	-0.009	144.47	1.083s
Ir-192	1234.12	308.44	305.	-17.	-0.009	148.05	1.086s
PA-233	1248.42	312.01	321.	-17.	-0.009	151.51	1.090s
Ir-192	1266.34	316.49	257.	15.	0.008	155.89	1.094s
CR-51	1280.73	320.08	332.	-18.	-0.010	26.34	1.098s
Cf-249	1334.18	333.44	66.	-4.	-0.002	383.24	1.111s
AC-228	1353.97	338.39	25.	56.	0.031	21.43	0.841s
Cs-136	1362.71	340.57	180.	-16.	-0.009	124.42	1.119s
EU-152	1377.58	344.29	182.	-17.	-0.009	117.93	1.122s
HF-181	1383.75	345.83	149.	15.	0.008	120.72	1.124s
PB-214	1408.59	352.03	39.	199.	0.111	9.56	1.384s
BA-133	1424.46	356.00	282.	-12.	-0.007	192.43	1.134
I-131	1458.41	364.48	37.	9.	0.005	136.11	1.142s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
BA-133	1535.87	383.84	114.	-9.	-0.005	171.05	1.162s
Cf-249	1552.32	387.95	123.	0.	0.000	1000.00	1.165s
SN-113	1567.28	391.69	101.	13.	0.007	117.10	1.169s
SB-125	1712.08	427.88	20.	9.	0.005	98.99	1.205s
AG-108M	1736.34	433.94	44.	-7.	-0.004	197.75	1.211s
SB-125	1854.10	463.37	44.	38.	0.021	29.26	1.240s
Ir-192	1872.88	468.06	96.	-12.	-0.007	116.95	1.244s
BE-7	1911.04	477.60	148.	-17.	-0.009	104.59	1.254s
HF-181	1928.65	482.00	164.	-17.	-0.009	109.74	1.258
La-140	1948.75	487.02	189.	-17.	-0.009	116.80	1.263s
RU-103	1988.90	497.05	28.	-4.	-0.002	255.92	1.273s
RH-106	2048.16	511.86	87.	28.	0.015	50.85	2.537
Nd-147	2124.72	531.00	35.	4.	0.002	281.48	1.306
Ba-140	2149.77	537.26	26.	-2.	-0.001	628.98	1.312s
CS-134	2253.70	563.24	26.	11.	0.006	96.11	1.337s
CS-134	2278.04	569.32	22.	6.	0.003	129.21	1.342s
PA-234	2278.64	569.47	28.	0.	0.000	1000.00	1.343s
BI-207	2279.57	569.70	37.	-7.	-0.004	207.91	1.343s
TL-208	2334.29	583.38	25.	93.	0.052	15.84	1.277
SB-125	2402.79	600.50	326.	-16.	-0.009	93.50	1.372s
SB-124	2411.71	602.73	310.	-15.	-0.008	98.24	1.374s
CS-134	2419.63	604.71	295.	-15.	-0.008	162.50	1.376s
BI-214	2438.90	609.53	17.	130.	0.072	10.18	1.448
RU-103	2441.99	610.30	280.	-14.	-0.008	175.17	1.382s
PM-144	2473.05	618.06	61.	-13.	-0.007	103.04	1.389s
RH-106	2488.47	621.92	54.	11.	0.006	97.80	1.392s
SB-125	2544.37	635.89	48.	-10.	-0.005	106.00	1.406s
I-131	2548.71	636.97	56.	6.	0.003	176.53	1.407s
AG-110M	2631.87	657.76	27.	2.	0.001	408.79	1.427s
CS-137	2647.47	661.66	36.	5.	0.003	175.50	1.430s
PM-144	2787.02	696.54	19.	10.	0.005	100.56	1.463s
NB-94	2811.37	702.63	14.	9.	0.005	95.83	1.469
SB-124	2892.00	722.79	39.	12.	0.006	81.98	1.488s
AG-108M	2892.61	722.94	51.	12.	0.006	91.91	1.488s
EU-154	2894.28	723.36	62.	4.	0.002	306.18	1.488s
BI-212	2909.54	727.17	59.	6.	0.003	182.22	1.492s
pm-146	2989.50	747.16	42.	-16.	-0.009	69.84	1.510
ZR-95	3027.78	756.73	33.	-2.	-0.001	731.57	1.519s
AG-110M	3056.63	763.94	70.	-18.	-0.010	68.47	1.526s
PA-234M	3066.51	766.41	51.	12.	0.007	89.55	1.528s
EU-152	3116.54	778.92	19.	4.	0.002	216.89	1.540s
BI-212	3142.54	785.42	0.	19.	0.011	22.94	1.546s
CS-134	3184.33	795.87	60.	-8.	-0.004	149.96	1.556s
CS-134	3208.67	801.95	52.	12.	0.007	88.54	1.561s
CO-58	3243.96	810.78	50.	8.	0.004	129.90	1.569s
La-140	3263.94	815.77	77.	-14.	-0.008	89.57	1.574s
Cs-136	3274.86	818.50	75.	-4.	-0.002	285.77	1.576s
MN-54	3340.25	834.85	24.	-8.	-0.005	137.98	1.591s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Co-56	3387.93	846.77	23.	-1.	-0.001	832.06	1.602
TL-208	3443.11	860.56	29.	-1.	0.000	680.15	1.615s
NB-94	3485.23	871.10	6.	19.	0.011	29.30	1.625
PA-234	3522.96	880.53	41.	11.	0.006	85.40	1.633s
PA-234	3533.80	883.24	53.	2.	0.001	448.82	1.636s
AG-110M	3539.58	884.68	55.	0.	0.000	1000.00	1.637s
Sc-46	3557.96	889.28	35.	8.	0.004	109.98	1.641s
y-88	3593.00	898.04	10.	8.	0.005	92.67	1.649s
AC-228	3646.33	911.37	9.	43.	0.024	19.87	1.959
AG-110M	3750.78	937.49	35.	-5.	-0.003	263.94	1.685s
PA-234	3784.89	946.02	25.	-5.	-0.003	224.35	1.692s
EU-152	3857.23	964.11	22.	27.	0.015	31.67	1.709s
AC-228	3876.67	968.97	56.	-4.	-0.002	250.07	1.713
EU-154	3986.08	996.33	30.	10.	0.005	88.38	1.737s
PA-234M	4004.75	1001.00	40.	0.	0.000	1000.00	1.742s
EU-154	4019.86	1004.77	52.	-9.	-0.005	116.22	1.745s
Co-56	4152.08	1037.84	5.	5.	0.003	108.01	1.774s
Cs-136	4192.99	1048.07	5.	12.	0.007	39.09	1.783s
RH-106	4202.15	1050.36	44.	-14.	-0.008	73.11	1.785s
BI-207	4255.33	1063.66	22.	-3.	-0.002	352.86	1.797s
Ga-68	4310.28	1077.40	11.	7.	0.004	107.76	1.809s
FE-59	4397.65	1099.25	32.	-9.	-0.005	146.71	1.828s
EU-152	4448.93	1112.07	124.	-17.	-0.009	96.18	1.839s
ZN-65	4462.81	1115.55	107.	-17.	-0.009	89.67	1.842s
BI-214	4481.94	1120.33	1.	47.	0.026	14.88	1.438
Sc-46	4482.82	1120.55	80.	-9.	-0.005	142.32	1.847s
CO-60	4693.48	1173.24	11.	9.	0.005	86.92	1.892s
Ta-182	4756.71	1189.05	27.	-2.	-0.001	708.52	1.906
Ta-182	4886.09	1221.41	32.	-6.	-0.003	218.16	1.934
Co-56	4953.53	1238.28	37.	-3.	-0.002	420.24	1.948s
NA-22	5098.46	1274.53	23.	-4.	-0.002	190.91	1.979s
FE-59	5166.69	1291.60	6.	7.	0.004	89.11	1.993s
CO-60	5330.21	1332.50	11.	2.	0.001	512.62	2.028s
AG-110M	5537.27	1384.30	17.	-4.	-0.002	246.86	2.071s
EU-152	5632.02	1408.00	17.	-6.	-0.003	166.25	2.090s
K-40	5843.87	1461.00	9.	275.	0.153	6.22	2.284
La-140	6384.26	1596.21	0.	10.	0.006	32.06	2.242s
SB-124	6763.00	1690.98	13.	-5.	-0.003	194.96	2.317s
BI-214	7056.73	1764.49	13.	20.	0.011	35.01	2.373
Co-56	7084.14	1771.35	46.	-9.	-0.005	111.67	2.379s
y-88	7342.69	1836.06	6.	-1.	-0.001	490.41	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 -	Average	----- Peak -----				
Name	Code	Activity	Energy	Activity	Code	MDA Value
		Bq/Sample	keV	Bq/Sample		Bq/Sample
COMMENTS						
BE-7	C	-4.6721E+00				5.31E+01
			477.60-4.672E+00	&(	1.641E+01	1.05E+02 1.05E+01 G
NA-22	C	-2.2296E-01				9.50E+02
			1274.53-2.230E-01	? (	1.514E+00	1.91E+02 9.99E+01 G
K-40	N	1.7453E+02				4.66E+11
			1460.83 1.745E+02	(P	1.037E+01	6.22E+00 1.07E+01 G
Sc-46	F	3.7196E-01				8.38E+01
			889.28 3.720E-01	? (	1.402E+00	1.10E+02 1.00E+02 G
			1120.55-5.031E-01	+	2.444E+00	1.42E+02 1.00E+02 G
CR-51	F	-3.9334E+00				2.77E+01
			320.08-3.933E+00	? (P	1.930E+01	2.63E+01 9.94E+00 G
MN-54	C	-3.5953E-01				3.12E+02
			834.85-3.595E-01	? (P	1.126E+00	1.38E+02 1.00E+02 G
FE-59	F	-6.2670E-02				4.45E+01
			1099.25-8.633E-01	? (	2.789E+00	1.47E+02 5.65E+01 G
			1291.60 9.844E-01	? (	1.962E+00	8.91E+01 4.32E+01 G
Co-56	C	1.7437E-01				7.73E+01
			846.77-6.042E-02	? (P	1.122E+00	8.32E+02 9.99E+01 G
			1238.28-2.998E-01	+	2.805E+00	4.20E+02 6.61E+01 G
			1037.84 1.835E+00	? (	4.819E+00	1.08E+02 1.41E+01 G
			1771.35-4.579E+00	&	1.746E+01	1.12E+02 1.55E+01 A
CO-57	C	1.7980E-01				2.72E+02
			122.06-4.100E-02	&(	9.321E-01	6.64E+02 8.56E+01 G
			136.47 1.949E+00	&(	9.240E+00	1.41E+02 1.07E+01 G
CO-58	C	3.4579E-01				7.09E+01
			810.78 3.458E-01	? (	1.541E+00	1.30E+02 9.95E+01 G
CO-60	F	3.1295E-01				1.93E+03
			1332.50 9.840E-02	? (P	1.162E+00	5.13E+02 1.00E+02 G
			1173.24 5.277E-01	? (P	1.025E+00	8.69E+01 9.99E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
ZN-65	F -1.8351E+00	1115.55	-1.835E+00	?(	5.513E+00	8.97E+01	2.44E+02 5.06E+01 G
NB-94	I 6.0867E-01	702.63	3.490E-01	?(	7.948E-01	9.58E+01	7.41E+06 9.79E+01 G
		871.10	8.632E-01	(	6.417E-01	2.93E+01	9.99E+01 G
ZR-95	I -1.2493E-01	756.73	-1.249E-01	?(	2.200E+00	7.32E+02	6.40E+01 5.45E+01 G
		724.20	-2.460E-02	% P	3.637E+00	3.57E+03	4.42E+01 G
NB-95	I -2.5591E-02	765.79	-2.559E-02	%(	1.879E+00	2.10E+03	6.40E+01 9.98E+01 G
RU-103	I -1.4541E-01	497.05	-1.454E-01	?(P	9.080E-01	2.56E+02	3.93E+01 9.09E+01 G
		610.30	-8.271E+00	+	4.881E+01	1.75E+02	5.75E+00 GA
RH-106	I 3.9625E+00	621.92	3.963E+00	?(P	1.310E+01	9.78E+01	3.74E+02 9.93E+00 G
		1050.36	-4.654E+01	&	1.134E+02	7.31E+01	1.56E+00 G
		511.86	4.269E+00		7.053E+00	5.08E+01	2.00E+01 GA
AG-108M	C 1.4023E-01	433.94	-2.234E-01	&(P	1.014E+00	1.98E+02	1.53E+05 9.05E+01 G
		722.94	5.024E-01	?(	1.559E+00	9.19E+01	9.08E+01 G
		614.28	2.969E-07	%	3.063E+00	3.02E+08	8.98E+01 G
AG-110M	F 4.0300E-02	884.68	0.000E+00	?(	2.355E+00	1.00E+03	2.50E+02 7.27E+01 G
		657.76	7.125E-02	&(	1.049E+00	4.09E+02	9.46E+01 G
		937.49	-6.982E-01	+	4.228E+00	2.64E+02	3.44E+01 G
		1384.30	-1.067E+00	+	5.850E+00	2.47E+02	2.43E+01 G
		763.94	-3.392E+00	+	7.695E+00	6.85E+01	2.23E+01 G
SN-113	F 4.9399E-01	391.69	4.940E-01	?(P	1.955E+00	1.17E+02	1.15E+02 6.40E+01 G
SB-124	F -6.1789E-02	602.73	-5.329E-01	(P	2.975E+00	9.82E+01	6.02E+01 9.83E+01 G
		1690.98	-7.412E-01	+	3.065E+00	1.95E+02	4.78E+01 G
		722.79	4.221E+00	?(	1.163E+01	8.20E+01	1.08E+01 G
SB-125	I 3.3553E+00	427.88	8.515E-01	?(	2.140E+00	9.90E+01	1.01E+03 2.96E+01 G
		600.50	-3.064E+00	+ P	1.672E+01	9.35E+01	1.79E+01 G
		635.89	-3.066E+00	&	1.106E+01	1.06E+02	1.13E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		463.37	1.043E+01	(P	9.112E+00	2.93E+01	1.05E+01 G
I-131	I 4.9175E-01					8.02E+00	
		364.48	2.638E-01	@(P	9.127E-01	1.36E+02	8.17E+01 G
		284.30	-6.192E+00	+	1.584E+01	9.97E+01	6.14E+00 G
		636.97	3.089E+00	?(	1.885E+01	1.77E+02	7.17E+00 G
Gd-153	F -7.9834E-01					2.42E+02	
		97.50	-7.983E-01	&(	3.926E+00	1.47E+02	3.00E+01 G
		103.20	0.000E+00	+	5.587E+00	1.00E+03	2.18E+01 G
Ga-68	C 1.3857E+01					4.71E-02	
		1077.40	1.386E+01	?(	3.388E+01	1.08E+02	3.30E+00 G
Tc-99m	I -2.9024E-01					2.51E-01	
		140.51	-2.902E-01	(	1.177E+00	1.21E+02	8.93E+01 G
BA-133	F -4.7443E-01					3.85E+03	
		356.00	-4.744E-01	&(	3.079E+00	1.92E+02	6.20E+01 G
		302.85	-1.534E-01	%	9.662E+00	1.85E+03	1.83E+01 G
		383.84	-2.506E+00	&	1.461E+01	1.71E+02	8.94E+00 GA
		80.99	1.368E-01	+ P	2.416E+00	6.47E+02	3.41E+01 GA
CS-134	I 4.2282E-01					7.54E+02	
		604.71	-5.359E-01	?(	2.929E+00	1.62E+02	9.76E+01 G
		795.87	-3.718E-01	+	1.916E+00	1.50E+02	8.55E+01 G
		569.32	1.183E+00	?(	5.336E+00	1.29E+02	1.54E+01 G
		801.95	5.955E+00	?(	1.776E+01	8.85E+01	8.69E+00 G
		563.24	4.474E+00	?(	1.040E+01	9.61E+01	8.35E+00 G
CS-137	I 2.1676E-01					1.10E+04	
		661.66	2.168E-01	?(	1.330E+00	1.75E+02	8.52E+01 G
CE-139	F -5.8485E-02					1.38E+02	
		165.85	-5.848E-02	?(	1.047E+00	5.21E+02	7.99E+01 G
Ba-140	I -3.1002E-01					1.28E+01	
		537.26	-3.100E-01	?(P	3.464E+00	6.29E+02	2.44E+01 G
		162.66	-3.851E+00	+	1.516E+01	1.17E+02	6.22E+00 G
		304.85	-8.316E+00	&	4.001E+01	1.43E+02	4.29E+00 G
La-140	I 7.5699E-01					1.28E+01	
		1596.21	7.570E-01	?(P	5.602E-01	3.21E+01	9.54E+01 G
		487.02	-1.104E+00	-	4.331E+00	1.17E+02	4.55E+01 G
		328.76	3.953E-02	% P	4.289E+00	4.03E+03	2.03E+01 G
		815.77	-2.686E+00	-	8.081E+00	8.96E+01	2.33E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
CE-141	I 4.9066E-01	145.44	4.907E-01	?(	2.031E+00	1.23E+02	3.25E+01 4.82E+01 G
CE-144	I -2.2566E+00	133.54	-2.257E+00	?(	9.908E+00	1.31E+02	2.85E+02 1.11E+01 G
PM-144	C 3.7582E-01	696.54 618.06	3.758E-01 -4.599E-01	?(P + P	8.954E-01 1.386E+00	1.01E+02 1.03E+02	3.63E+02 9.90E+01 G 9.91E+01 G
EU-152	F 2.0463E+00	344.29 1112.07 121.78 778.92 964.11 244.69 1408.00	-1.441E+00 -6.778E+00 -7.855E-01 1.397E+00 8.949E+00 5.582E-01 -1.876E+00	?( + & ?( &(	5.713E+00 2.187E+01 2.651E+00 7.364E+00 8.300E+00 2.433E+01 6.856E+00	1.18E+02 9.62E+01 1.01E+02 2.17E+02 3.17E+01 1.29E+03 1.66E+02	4.94E+03 2.65E+01 G 1.36E+01 G 2.86E+01 G 1.29E+01 G 1.46E+01 G 7.58E+00 G 2.10E+01 GA
EU-154	I 9.5653E-01	873.23 123.10 1274.54 723.36 1004.77 996.33	-1.853E-01 4.942E-01 -1.151E-01 7.222E-01 -2.575E+00 4.504E+00	%( ?( % ?( + ?(	9.724E+00 1.718E+00 4.650E+00 7.709E+00 1.021E+01 1.349E+01	1.44E+03 1.03E+02 1.11E+03 3.06E+02 1.16E+02 8.84E+01	3.14E+03 1.23E+01 G 4.08E+01 G 3.52E+01 G 2.02E+01 G 1.80E+01 G 1.06E+01 G
EU-155	I -7.6692E-02	105.31 86.54	-7.669E-02 -9.677E-01	%(P +	5.742E+00 4.595E+00	1.29E+03 1.42E+02	1.81E+03 2.12E+01 G 3.07E+01 G
HF-181	F -1.6553E-01	482.00 133.02 345.83 136.30	-6.168E-01 -5.767E-01 2.245E+00 -3.761E+00	(+ ?(+	2.274E+00 2.459E+00 9.134E+00 1.949E+01	1.10E+02 1.27E+02 1.21E+02 1.54E+02	4.24E+01 8.05E+01 G 4.33E+01 G 1.51E+01 G 5.85E+00 G
Ta-182	F -1.5768E-01	1121.30 1221.41 1189.05	-1.577E-01 -1.307E+00 -5.924E-01	%(+ +	6.748E+00 6.330E+00 9.517E+00	1.22E+03 2.18E+02 7.09E+02	1.14E+02 3.49E+01 G 2.70E+01 G 1.62E+01 G
Hg-203	F 1.7973E-02	279.20	1.797E-02	%(P	1.119E+00	2.35E+03	4.66E+01 8.15E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
TL-208	N	3.7188E+00					6.98E+02
		583.02	3.719E+00	(P	1.029E+00	1.58E+01	8.45E+01 G
		277.28	-3.919E-01	% P	1.664E+01	1.11E+03	6.31E+00 G
		860.56	-2.867E-01	- P	1.003E+01	6.80E+02	1.24E+01 G
pm-146	C	-1.9054E+00					2.02E+03
		747.16	-1.905E+00	?(P	3.925E+00	6.98E+01	3.40E+01 G
		735.72	-1.777E-01	%	4.862E+00	1.13E+03	2.25E+01 G
		453.88	-4.317E-02	%	1.451E+00	1.30E+03	6.50E+01 G
y-88	F	4.0180E-01					1.07E+02
		898.04	4.018E-01	&(	8.647E-01	9.27E+01	9.37E+01 G
		1836.06	-1.145E-01	- P	1.185E+00	4.90E+02	9.92E+01 G
Cd-113m		-1.4369E+03					5.33E+03
		263.70	-1.437E+03	?(	1.608E+04	3.25E+02	6.00E-03 K
Cf-251	T	2.8654E-01					3.28E+05
		176.60	2.865E-01	?(	3.740E+00	4.71E+02	1.70E+01 G
		227.00	-2.471E+00	+	1.275E+01	1.98E+02	6.30E+00 GA
Sn-126		-4.0153E+00					3.65E+07
		87.57	0.000E+00	+	3.622E+00	1.00E+03	3.75E+01 GA
		64.28	-4.015E+00	(	1.407E+01	1.05E+02	9.70E+00 G
		86.94	-1.577E+00	+	1.524E+01	2.88E+02	9.04E+00 GA
PB-210	N	1.1629E+01					8.14E+03
		46.54	1.163E+01	(P	2.831E+01	7.42E+01	4.25E+00 G
PB-212	N	9.3366E+00					6.98E+02
		238.63	9.337E+00	(P	1.447E+00	7.98E+00	4.33E+01 G
		300.03	-9.871E+00	-	5.367E+01	1.62E+02	3.28E+00 GA
PB-214	N	1.2421E+01					5.84E+05
		351.93	1.242E+01	(P	1.971E+00	9.56E+00	3.76E+01 G
		295.09	9.142E+00	- P	3.522E+00	1.87E+01	1.93E+01 G
		242.00	1.221E+01		8.966E+00	2.50E+01	7.43E+00 GA
BI-207	C	-2.4967E-01					1.18E+04
		569.70	-2.497E-01	(P	1.056E+00	2.08E+02	9.77E+01 G
		1063.66	-2.119E-01	+ P	1.742E+00	3.53E+02	7.45E+01 G
BI-212	N	3.2098E+00					6.98E+02
		727.17	3.210E+00	(P	2.019E+01	1.82E+02	7.55E+00 G
		785.42	6.231E+01	&	2.417E+01	2.29E+01	1.28E+00 GA

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
BI-214	N	9.8644E+00					5.84E+05	
			609.31	9.827E+00	(P	1.641E+00	1.02E+01	4.61E+01 G
			1120.29	1.717E+01	+ P	2.684E+00	1.49E+01	1.51E+01 G
			1764.49	9.978E+00	?(P	1.009E+01	3.50E+01	1.54E+01 G
BI-210M	T	5.2919E-01					1.10E+09	
			265.83	5.292E-01	&(P	1.782E+00	1.00E+02	5.00E+01 G
			304.90	-1.274E+00	&	6.184E+00	1.44E+02	2.80E+01 G
AC-228	N	8.0581E+00					2.10E+03	
			911.07	6.966E+00	(P	2.699E+00	1.99E+01	2.90E+01 G
			968.97	-1.178E+00	- P	1.061E+01	2.50E+02	1.75E+01 G
			338.32	1.070E+01	(P	4.898E+00	2.14E+01	1.20E+01 G
			93.35	4.636E+00	-	2.181E+01	1.41E+02	5.56E+00 XA
TH-227	N	4.2060E+00					7.95E+03	
			50.14	4.206E+00	(	9.505E+00	6.82E+01	8.00E+00 G
			256.24	-4.831E+00	-	1.317E+01	1.06E+02	7.00E+00 G
TH-229	N	9.6487E+00					2.68E+06	
			193.51	9.649E+00	*(	1.439E+01	5.65E+01	4.40E+00 G
			210.85	-2.568E+00	&	2.747E+01	4.09E+02	2.99E+00 G
TH-234	N	8.5889E+00					1.63E+12	
			63.29	1.207E+01	(P	2.180E+01	6.37E+01	3.81E+00 G
			92.59	6.214E+00	(P	1.256E+01	6.19E+01	5.58E+00 G
PA-231	N	-1.3956E-06					1.20E+07	
			302.65	-1.396E-06	%(<	6.202E+01	1.31E+09	2.88E+00 G
			300.07	-3.584E+00	+	7.170E+01	5.90E+02	2.46E+00 G
PA-233	C	-1.0136E+00					7.82E+08	
			312.01	-1.014E+00	&(	5.157E+00	1.52E+02	3.60E+01 G
			300.18	6.446E-07	%	2.864E+01	1.31E+09	6.20E+00 G
PA-234	N	-5.1436E-01					1.63E+12	
			131.29	-1.378E+00	?(	5.702E+00	1.24E+02	1.80E+01 G
			946.02	-1.803E+00	+	9.378E+00	2.24E+02	1.34E+01 G
			569.47	0.000E+00	+	1.104E+01	1.00E+03	8.20E+00 G
			883.24	1.105E+00	&(	1.745E+01	4.49E+02	9.60E+00 G
			880.53	8.658E+00	?	2.491E+01	8.54E+01	6.00E+00 GA
PA-234M	N	4.3298E+01					1.63E+12	
			1001.00	0.000E+00	?(	1.939E+02	1.00E+03	8.37E-01 G
			766.41	1.666E+02	?(	5.030E+02	8.95E+01	2.94E-01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
U-235	N	1.0489E+00					2.57E+11	
			143.79	-1.237E+00	(P	9.785E+00	1.69E+02	1.10E+01 G
			205.33	2.948E+00	?(P	1.448E+01	1.88E+02	5.01E+00 G
		163.38	4.107E+00	&(P	1.639E+01	1.19E+02	5.08E+00 G	
AM-241	T	-1.0051E+00					1.58E+05	
			59.54	-1.005E+00	?(3.310E+00	1.23E+02	3.59E+01 G
Np-237	F	2.0943E+00					2.14E+06	
			86.49	2.094E+00	&(1.061E+01	1.51E+02	1.31E+01 G
Ir-192	F	3.6821E-01					7.40E+01	
			316.49	3.682E-01	&(1.932E+00	1.56E+02	8.70E+01 G
			468.06	-6.786E-01	+	2.686E+00	1.17E+02	5.18E+01 G
		308.44	-1.136E+00	+	5.651E+00	1.48E+02	3.18E+01 G	
Cs-136	F	2.4352E-01					1.30E+01	
			818.50	-1.886E-01	&(1.868E+00	2.86E+02	1.00E+02 G
			1048.07	7.837E-01	?(8.575E-01	3.91E+01	8.00E+01 G
		340.57	-7.593E-01	+	3.180E+00	1.24E+02	4.69E+01 G	
Np-239	T	7.9575E-01					2.36E+00	
			103.70	0.000E+00	-	5.072E+00	1.00E+03	2.40E+01 X
			106.13	7.957E-01	*(&	4.083E+00	1.52E+02	2.27E+01 G
		99.50	-1.485E+00	+	8.000E+00	1.61E+02	1.50E+01 X	
Nd-147		1.0478E+00					1.11E+01	
			531.00	1.048E+00	?(7.290E+00	2.81E+02	1.30E+01 G
		91.10	0.000E+00	-	4.723E+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	
AM-241	59.54	197.	-21.	-0.011	122.74	-1.005E+00	
Sn-126	64.28	314.	-24.	-0.014	104.93	-4.015E+00	
BA-133	80.99	164.	4.	0.002	647.35	1.368E-01	P
EU-155	86.54	540.	-23.	-0.013	142.10	-9.677E-01	
Sn-126	86.94	516.	-11.	-0.006	287.53	-1.577E+00	
Gd-153	97.50	406.	-20.	-0.011	146.78	-7.983E-01	
Np-239	99.50	426.	-18.	-0.010	160.68	-1.485E+00	
Np-239	106.13	254.	15.	0.008	152.45	7.957E-01	
EU-152	121.78	163.	-18.	-0.010	100.69	-7.855E-01	
CO-57	122.06	182.	-3.	-0.002	664.08	-4.100E-02	
EU-154	123.10	138.	17.	0.009	103.49	4.942E-01	
PA-234	131.29	293.	-20.	-0.011	123.52	-1.378E+00	
HF-181	133.02	313.	-20.	-0.011	127.26	-5.767E-01	
CE-144	133.54	333.	-20.	-0.011	131.06	-2.257E+00	
HF-181	136.30	353.	-17.	-0.010	154.43	-3.761E+00	
CO-57	136.47	262.	16.	0.009	141.03	1.949E+00	
Tc-99m	140.51	272.	-20.	-0.011	120.96	-2.902E-01	
U-235	143.79	295.	-10.	-0.006	169.03	-1.237E+00	P
CE-141	145.44	241.	18.	0.010	123.31	4.907E-01	
Ba-140	162.66	190.	-17.	-0.009	117.21	-3.851E+00	
U-235	163.38	145.	15.	0.008	118.52	4.107E+00	P
CE-139	165.85	149.	-3.	-0.002	521.34	-5.848E-02	
Cf-251	176.60	77.	3.	0.002	470.64	2.865E-01	
TH-229	193.51	67.	27.	0.015	56.49	9.649E+00	
U-235	205.33	82.	9.	0.005	187.78	2.948E+00	P
TH-229	210.85	103.	-5.	-0.003	408.83	-2.568E+00	
Cf-251	227.00	88.	-9.	-0.005	197.83	-2.471E+00	
Cd-113m	263.70	104.	-4.	-0.002	324.70	-1.437E+03	
BI-210M	265.83	87.	14.	0.008	100.02	5.292E-01	P
I-131	284.30	95.	-19.	-0.010	99.65	-6.192E+00	
PA-231	300.07	306.	-4.	-0.002	589.58	-3.584E+00	
Ba-140	304.85	282.	-17.	-0.009	143.20	-8.316E+00	
BI-210M	304.90	288.	-17.	-0.009	144.47	-1.274E+00	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ir-192	308.44	305.	-17.	-0.009	148.05	-1.136E+00	
PA-233	312.01	321.	-17.	-0.009	151.51	-1.014E+00	
Ir-192	316.49	257.	15.	0.008	155.89	3.682E-01	
CR-51	320.08	332.	-18.	-0.010	26.34	-3.933E+00	P
Cf-249	333.44	66.	-4.	-0.002	383.24	-5.815E-01	
Cs-136	340.57	180.	-16.	-0.009	124.42	-7.593E-01	
EU-152	344.29	182.	-17.	-0.009	117.93	-1.441E+00	
HF-181	345.83	149.	15.	0.008	120.72	2.245E+00	
BA-133	356.00	282.	-12.	-0.007	192.43	-4.744E-01	
I-131	364.48	37.	9.	0.005	136.11	2.638E-01	P
BA-133	383.84	114.	-9.	-0.005	171.05	-2.506E+00	
SN-113	391.69	101.	13.	0.007	117.10	4.940E-01	P
AG-108M	433.94	44.	-7.	-0.004	197.75	-2.234E-01	P
Ir-192	468.06	96.	-12.	-0.007	116.95	-6.786E-01	
BE-7	477.60	148.	-17.	-0.009	104.59	-4.672E+00	
HF-181	482.00	164.	-17.	-0.009	109.74	-6.168E-01	
RU-103	497.05	28.	-4.	-0.002	255.92	-1.454E-01	P
RH-106	511.86	87.	28.	0.015	50.85	4.269E+00	
Nd-147	531.00	35.	4.	0.002	281.48	1.048E+00	
Ba-140	537.26	26.	-2.	-0.001	628.98	-3.100E-01	P
CS-134	563.24	26.	11.	0.006	96.11	4.474E+00	
CS-134	569.32	22.	6.	0.003	129.21	1.183E+00	
BI-207	569.70	37.	-7.	-0.004	207.91	-2.497E-01	P
SB-124	602.73	310.	-15.	-0.008	98.24	-5.329E-01	P
CS-134	604.71	295.	-15.	-0.008	162.50	-5.359E-01	
RU-103	610.30	280.	-14.	-0.008	175.17	-8.271E+00	
PM-144	618.06	61.	-13.	-0.007	103.04	-4.599E-01	P
RH-106	621.92	54.	11.	0.006	97.80	3.963E+00	P
I-131	636.97	56.	6.	0.003	176.53	3.089E+00	
AG-110M	657.76	27.	2.	0.001	408.79	7.125E-02	
PM-144	696.54	19.	10.	0.005	100.56	3.758E-01	P
NB-94	702.63	14.	9.	0.005	95.83	3.490E-01	
SB-124	722.79	39.	12.	0.006	81.98	4.221E+00	
AG-108M	722.94	51.	12.	0.006	91.91	5.024E-01	
EU-154	723.36	62.	4.	0.002	306.18	7.222E-01	
BI-212	727.17	59.	6.	0.003	182.22	3.210E+00	P
pm-146	747.16	42.	-16.	-0.009	69.84	-1.905E+00	P
ZR-95	756.73	33.	-2.	-0.001	731.57	-1.249E-01	
AG-110M	763.94	70.	-18.	-0.010	68.47	-3.392E+00	
PA-234M	766.41	51.	12.	0.007	89.55	1.666E+02	
EU-152	778.92	19.	4.	0.002	216.89	1.397E+00	
BI-212	785.42	0.	19.	0.011	22.94	6.231E+01	
CS-134	795.87	60.	-8.	-0.004	149.96	-3.718E-01	
CS-134	801.95	52.	12.	0.007	88.54	5.955E+00	
CO-58	810.78	50.	8.	0.004	129.90	3.458E-01	
Cs-136	818.50	75.	-4.	-0.002	285.77	-1.886E-01	
MN-54	834.85	24.	-8.	-0.005	137.98	-3.595E-01	P
Co-56	846.77	23.	-1.	-0.001	832.06	-6.042E-02	P

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
NB-94	871.10	6.	19.	0.011	29.30	8.632E-01	
PA-234	880.53	41.	11.	0.006	85.40	8.658E+00	
PA-234	883.24	53.	2.	0.001	448.82	1.105E+00	
Sc-46	889.28	35.	8.	0.004	109.98	3.720E-01	
y-88	898.04	10.	8.	0.005	92.67	4.018E-01	
AG-110M	937.49	35.	-5.	-0.003	263.94	-6.982E-01	
PA-234	946.02	25.	-5.	-0.003	224.35	-1.803E+00	
EU-152	964.11	22.	27.	0.015	31.67	8.949E+00	
EU-154	996.33	30.	10.	0.005	88.38	4.504E+00	
EU-154	1004.77	52.	-9.	-0.005	116.22	-2.575E+00	
Co-56	1037.84	5.	5.	0.003	108.01	1.835E+00	
Cs-136	1048.07	5.	12.	0.007	39.09	7.837E-01	
RH-106	1050.36	44.	-14.	-0.008	73.11	-4.654E+01	
BI-207	1063.66	22.	-3.	-0.002	352.86	-2.119E-01	P
Ga-68	1077.40	11.	7.	0.004	107.76	1.386E+01	
FE-59	1099.25	32.	-9.	-0.005	146.71	-8.633E-01	
EU-152	1112.07	124.	-17.	-0.009	96.18	-6.778E+00	
ZN-65	1115.55	107.	-17.	-0.009	89.67	-1.835E+00	
Sc-46	1120.55	80.	-9.	-0.005	142.32	-5.031E-01	
CO-60	1173.24	11.	9.	0.005	86.92	5.277E-01	P
Ta-182	1189.05	27.	-2.	-0.001	708.52	-5.924E-01	
Ta-182	1221.41	32.	-6.	-0.003	218.16	-1.307E+00	
Co-56	1238.28	37.	-3.	-0.002	420.24	-2.998E-01	
NA-22	1274.53	23.	-4.	-0.002	190.91	-2.230E-01	
FE-59	1291.60	6.	7.	0.004	89.11	9.844E-01	
CO-60	1332.50	11.	2.	0.001	512.62	9.840E-02	P
AG-110M	1384.30	17.	-4.	-0.002	246.86	-1.067E+00	
EU-152	1408.00	17.	-6.	-0.003	166.25	-1.876E+00	
SB-124	1690.98	13.	-5.	-0.003	194.96	-7.412E-01	
Co-56	1771.35	46.	-9.	-0.005	111.67	-4.579E+00	
y-88	1836.06	6.	-1.	-0.001	490.41	-1.145E-01	P

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	Time Corrected	Uncertainty		
	Activity	Activity	Counting		
	Bq/Sample	Bq/Sample			
			1 Sigma		
			MDA		
			Bq/Sample		
BE-7	#A	-4.6720E+00	-4.6721E+00	1.046E+02%	1.64E+01
NA-22	#A	-2.2296E-01	-2.2296E-01	1.909E+02%	1.51E+00
K-40		1.7453E+02	1.7453E+02	6.218E+00%	1.04E+01
Sc-46	#A	3.7196E-01	3.7196E-01	1.100E+02%	1.40E+00
CR-51	#A	-3.9334E+00	-3.9334E+00	2.634E+01%	1.93E+01
MN-54	#A	-3.5953E-01	-3.5953E-01	1.380E+02%	1.13E+00
FE-59	#A	-6.2669E-02	-6.2670E-02	8.583E+01%	2.79E+00
Co-56	#A	1.7437E-01	1.7437E-01	1.080E+02%	1.12E+00
CO-57	#A	1.7980E-01	1.7980E-01	1.410E+02%	9.32E-01

CO-58	#A	3.4579E-01	3.4579E-01	1.299E+02%	1.54E+00
CO-60	#A	3.1295E-01	3.1295E-01	8.692E+01%	1.16E+00
ZN-65	#A	-1.8351E+00	-1.8351E+00	8.967E+01%	5.51E+00
NB-94	#A	6.0867E-01	6.0867E-01	2.930E+01%	7.95E-01
ZR-95	#A	-1.2493E-01	-1.2493E-01	7.316E+02%	2.20E+00
NB-95	#A	-2.5591E-02	-2.5591E-02	2.099E+03%	1.88E+00
RU-103	#A	-1.4541E-01	-1.4541E-01	2.559E+02%	9.08E-01
RH-106	#A	3.9625E+00	3.9625E+00	9.780E+01%	1.31E+01
AG-108M	#A	1.4023E-01	1.4023E-01	9.191E+01%	1.01E+00
AG-110M	#A	4.0300E-02	4.0300E-02	4.088E+02%	2.35E+00
SN-113	#A	4.9399E-01	4.9399E-01	1.171E+02%	1.96E+00
SB-124	#A	-6.1789E-02	-6.1789E-02	6.397E+01%	2.97E+00
SB-125	#C	3.3553E+00	3.3553E+00	2.926E+01%	2.14E+00
I-131	#A	4.9173E-01	4.9175E-01	1.115E+02%	9.13E-01
Gd-153	#A	-7.9834E-01	-7.9834E-01	1.468E+02%	3.93E+00
Ga-68	#A	1.3772E+01	1.3857E+01	1.078E+02%	3.39E+01
Tc-99m	#A	-2.8991E-01	-2.9024E-01	1.210E+02%	1.18E+00
BA-133	#A	-4.7443E-01	-4.7443E-01	1.924E+02%	3.08E+00
CS-134	#A	4.2282E-01	4.2282E-01	6.133E+01%	2.93E+00
CS-137	#A	2.1676E-01	2.1676E-01	1.755E+02%	1.33E+00
CE-139	#A	-5.8485E-02	-5.8485E-02	5.213E+02%	1.05E+00
Ba-140	#A	-3.1001E-01	-3.1002E-01	6.290E+02%	3.46E+00
La-140	#	7.5697E-01	7.5699E-01	3.206E+01%	5.60E-01
CE-141	#A	4.9066E-01	4.9066E-01	1.233E+02%	2.03E+00
CE-144	#A	-2.2565E+00	-2.2566E+00	1.311E+02%	9.91E+00
PM-144	#A	3.7582E-01	3.7582E-01	1.006E+02%	8.95E-01
EU-152	#A	2.0463E+00	2.0463E+00	3.167E+01%	5.71E+00
EU-154	#A	9.5653E-01	9.5653E-01	8.838E+01%	9.72E+00
EU-155	#A	-7.6692E-02	-7.6692E-02	1.295E+03%	5.74E+00
HF-181	#A	-1.6553E-01	-1.6553E-01	8.157E+01%	2.27E+00
Ta-182	#A	-1.5768E-01	-1.5768E-01	1.221E+03%	6.75E+00
Hg-203	#A	1.7973E-02	1.7973E-02	2.353E+03%	1.12E+00
TL-208		3.7188E+00	3.7188E+00	1.584E+01%	1.03E+00
pm-146	#A	-1.9054E+00	-1.9054E+00	6.984E+01%	3.93E+00
y-88	#A	4.0179E-01	4.0180E-01	9.267E+01%	8.65E-01
Cd-113m	#A	-1.4369E+03	-1.4369E+03	3.247E+02%	1.61E+04
Cd-109	#A	0.0000E+00	0.0000E+00	1.000E+03%	3.58E+01
Cf-251	#A	2.8654E-01	2.8654E-01	4.706E+02%	3.74E+00
Cf-249	#A	0.0000E+00	0.0000E+00	1.000E+03%	2.07E+00
Sn-126	#A	-4.0153E+00	-4.0153E+00	1.049E+02%	1.41E+01
PB-210	A	1.1629E+01	1.1629E+01	7.425E+01%	2.83E+01
PB-212		9.3366E+00	9.3366E+00	7.985E+00%	1.45E+00
PB-214		1.2421E+01	1.2421E+01	9.565E+00%	1.97E+00
BI-207	#A	-2.4967E-01	-2.4967E-01	2.079E+02%	1.06E+00
BI-212	#A	3.2098E+00	3.2098E+00	1.822E+02%	2.02E+01
BI-214		9.8644E+00	9.8644E+00	1.018E+01%	1.64E+00
BI-210M	#A	5.2919E-01	5.2919E-01	1.000E+02%	1.78E+00
AC-228		8.0581E+00	8.0581E+00	1.461E+01%	2.70E+00
TH-227	A	4.2060E+00	4.2060E+00	6.818E+01%	9.50E+00

TH-229 #A	9.6487E+00	9.6487E+00	5.649E+01%	1.44E+01
TH-234 A	8.5889E+00	8.5889E+00	4.442E+01%	2.18E+01
PA-231 #A	-1.3956E-06	-1.3956E-06	1.305E+09%	6.20E+01
PA-233 #A	-1.0136E+00	-1.0136E+00	1.515E+02%	5.16E+00
PA-234 #A	-5.1436E-01	-5.1436E-01	1.235E+02%	5.70E+00
PA-234M#A	4.3298E+01	4.3298E+01	8.955E+01%	1.94E+02
U-235 #A	1.0489E+00	1.0489E+00	9.302E+01%	9.78E+00
AM-241 #A	-1.0051E+00	-1.0051E+00	1.227E+02%	3.31E+00
Np-237 #A	2.0943E+00	2.0943E+00	1.514E+02%	1.06E+01
Ir-192 #A	3.6820E-01	3.6821E-01	1.559E+02%	1.93E+00
Cs-136 #A	2.4351E-01	2.4352E-01	3.909E+01%	1.87E+00
Np-239 #A	7.9565E-01	7.9575E-01	1.524E+02%	4.08E+00
Nd-147 #A	1.0478E+00	1.0478E+00	2.815E+02%	7.29E+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 - Half-life limit exceeded

----- S U M M A R Y -----

Total Activity (37.6 to 2000.6 keV) 2.265E+02 Bq/Sample
 Total Decayed Activity (37.6 to 2000.6 keV) 2.2651714E+02 Bq/Sample

Sample Description: 257060_Gamma_160-17814-A-3-B
 Detector: Detector # 8
 Batch ID: 257060
 Work Order Number: Gamma
 Lot Number: 160-17814-A-3-B

Decay to Time: 7/11/2016 08:45 Live Time: 1800 sec
 Acquisition Time: 7/11/2016 08:45:21 Real Time: 1854 sec
 Analysis Time: 7/11/2016 09:17 Dead Time: 2.92 %
 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_2016-07-10_1451.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	9.476E-01	288.3	2.732E+00	2.732E+00	9.714E+00
NA-22	5.085E-01	65.0	3.304E-01	3.314E-01	1.079E+00
K-40	1.797E+02	6.9	1.245E+01	1.548E+01	8.115E+00
Sc-46	3.967E-01	126.9	5.035E-01	5.039E-01	2.204E+00
CR-51	3.577E+00	104.3	3.732E+00	3.737E+00	1.258E+01
MN-54	3.045E-01	94.3	2.871E-01	2.875E-01	7.132E-01
FE-59	5.614E-01	196.4	1.102E+00	1.103E+00	2.627E+00
Co-56	1.011E+00	44.6	4.510E-01	4.540E-01	1.147E+00
CO-57	-2.736E-02	94.9	2.595E-02	2.599E-02	1.167E+00
CO-58	-5.915E-01	87.5	5.179E-01	5.188E-01	1.748E+00
CO-60	1.152E-01	220.7	2.541E-01	2.542E-01	1.656E+00
ZN-65	-5.123E-01	305.3	1.564E+00	1.564E+00	5.459E+00
NB-94	1.623E-01	192.1	3.118E-01	3.119E-01	1.244E+00
ZR-95	3.145E-02	2755.0	8.666E-01	8.666E-01	2.156E+00
NB-95	0.000E+00	1.#INF	2.326E-01	2.326E-01	1.595E+00
RU-103	1.864E-01	245.3	4.574E-01	4.575E-01	1.134E+00
RH-106	3.487E+00	101.0	3.522E+00	3.526E+00	3.239E+01
AG-108M	-5.421E-01	120.7	6.544E-01	6.549E-01	1.255E+00
AG-110M	1.496E-01	43.2	6.455E-02	6.500E-02	2.842E+00
SN-113	5.850E-01	118.1	6.907E-01	6.913E-01	2.336E+00
SB-124	0.000E+00	1.#INF	1.500E-01	1.500E-01	3.210E+00
SB-125	1.065E+00	92.6	9.859E-01	9.874E-01	3.332E+00
I-131	3.012E-01	96.2	2.896E-01	2.900E-01	7.388E-01
Gd-153	-1.226E+00	162.5	1.992E+00	1.993E+00	6.639E+00
Ga-68	4.915E+00	354.7	1.744E+01	1.744E+01	4.288E+01
Tc-99m	2.875E-01	157.8	4.538E-01	4.541E-01	1.522E+00
BA-133	-6.707E-01	164.5	1.103E+00	1.104E+00	3.712E+00
CS-134	5.061E-01	79.3	4.013E-01	4.022E-01	3.240E+00
CS-137	-9.384E-01	83.3	7.821E-01	7.836E-01	1.983E+00
CE-139	-3.822E-01	92.6	3.540E-01	3.558E-01	1.184E+00
Ba-140	9.039E-01	132.1	1.194E+00	1.195E+00	3.108E+00
La-140	1.864E-01	120.2	2.239E-01	2.241E-01	7.522E-01
CE-141	-7.033E-01	146.1	1.027E+00	1.028E+00	3.432E+00

CE-144	2.186E+00	147.4	3.222E+00	3.224E+00	1.082E+01
PM-144	1.130E-01	398.2	4.501E-01	4.501E-01	1.107E+00
EU-152	2.180E+00	92.0	2.006E+00	2.009E+00	6.278E+00
EU-154	8.582E-01	82.2	7.054E-01	7.068E-01	1.301E+01
EU-155	-1.723E+00	170.3	2.935E+00	2.936E+00	9.779E+00
HF-181	7.882E-01	68.1	5.370E-01	5.385E-01	1.329E+00
Ta-182	2.918E+00	47.0	1.371E+00	1.379E+00	6.447E+00
Hg-203	-4.929E-01	83.6	4.122E-01	4.131E-01	1.378E+00
TL-208	3.731E+00	13.1	4.906E-01	5.274E-01	7.462E-01
pm-146	-4.985E-02	3079.0	1.535E+00	1.535E+00	3.772E+00
y-88	1.052E-01	398.2	4.191E-01	4.191E-01	1.074E+00
Cd-113m	-6.511E+03	87.8	5.719E+03	5.735E+03	1.914E+04
Cd-109	-9.978E+00	168.7	1.683E+01	1.684E+01	5.611E+01
Cf-251	1.322E+00	111.8	1.478E+00	1.483E+00	3.832E+00
Cf-249	-5.745E-01	130.0	7.471E-01	7.476E-01	2.526E+00
Sn-126	1.828E+00	270.6	4.945E+00	4.946E+00	1.668E+01
PB-210	-1.735E+01	55.5	9.629E+00	9.682E+00	6.244E+01
PB-212	8.427E+00	8.8	7.429E-01	9.214E-01	1.419E+00
PB-214	1.548E+01	6.7	1.044E+00	1.318E+00	1.941E+00
BI-207	-1.191E-01	347.9	4.144E-01	4.144E-01	1.223E+00
BI-212	-9.020E+00	106.1	9.570E+00	9.581E+00	2.991E+01
BI-214	1.186E+01	11.6	1.369E+00	1.501E+00	2.158E+00
BI-210M	-8.471E-01	88.5	7.496E-01	7.513E-01	2.506E+00
AC-228	8.324E+00	16.2	1.350E+00	1.416E+00	4.733E+00
TH-227	6.663E+00	105.9	7.059E+00	7.069E+00	2.361E+01
TH-229	2.539E+00	102.4	2.601E+00	2.608E+00	1.887E+01
TH-234	1.076E+01	38.4	4.138E+00	4.176E+00	2.284E+01
PA-231	6.302E+00	201.4	1.269E+01	1.269E+01	8.142E+01
PA-233	1.955E-01	735.0	1.437E+00	1.437E+00	6.676E+00
PA-234	1.815E+00	90.1	1.636E+00	1.638E+00	6.385E+00
PA-234M	-8.245E+01	68.7	5.667E+01	5.683E+01	3.472E+02
U-235	-3.823E+00	64.3	2.458E+00	2.466E+00	1.481E+01
AM-241	-1.981E+00	42.2	8.364E-01	8.427E-01	4.833E+00
Np-237	-2.577E+00	184.0	4.742E+00	4.745E+00	1.582E+01
Ir-192	-4.756E-01	120.0	5.706E-01	5.713E-01	1.919E+00
Cs-136	6.516E-01	62.3	4.058E-01	4.076E-01	1.861E+00
Np-239	1.506E+00	172.7	2.600E+00	2.602E+00	8.670E+00
Nd-147	0.000E+00	1.#INF	1.319E+00	1.319E+00	7.805E+00

Total	2.905E+02				

Analyst: Amanda Dick

Sample description
257060_Gamma_160-17814-A-3-B

Spectrum Filename: C:\User\SPC\Det8\8_Gamma_20160993.An1

Acquisition information

Start time: 7/11/2016 8:45:21 AM
Live time: 1800
Real time: 1854
Dead time: 2.92 %
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): $-1.098764E-01 + (-4.958544E-01 * \text{Log}(E)) + (-2.572270E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.71 %
Log(Eff): $-2.525301E+01 + (9.398253E+00 * \text{Log}(E)) + (-1.000034E+00 * \text{Log}(E)^2)$

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 +/- 0.0000E+00%
Activity scaling factor: $1.0000E+00 / (1.0000E+00 * 1.0000E+00) = 1.0000E+00$
Detection limit method: Reg. Guide 4.16 Method

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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	7/11/2016 8:45:00 AM
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	8_2016-07-10_1451.PBC 7/10/2016 2:51:27 PM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 22 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.0881

***** 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.	105.94	1.01	2.267E-02	50.14	8.000	PBC<MDA	TH227
63.23	20.	83.61	0.71	3.093E-02	63.29	3.810	PBC<MDA	TH234
64.28	10.	270.55	1.03	3.146E-02	64.28	9.700	PBC<MDA	Sn126
74.65	141.	13.51	1.03	3.610E-02				
77.27	201.	9.70	1.04	3.703E-02				
87.02	76.	19.65	1.18	3.971E-02	86.49	13.100	8.104E+00	Np237
					86.54	30.700	3.457E+00	EU155
					86.94	9.040	1.172E+01	Sn126
					87.57	37.500	2.815E+00	Sn126
92.74	76.	26.10	1.06	4.074E-02	92.59	5.584	1.849E+01	TH234
					93.35	5.561	1.851E+01	AC228
106.13	26.	172.69	1.06	4.187E-02	106.13	22.700	PBC<MDA	Np239
123.10	10.	207.36	1.07	4.138E-02	123.10	40.790	PBC<MDA	EU154
131.29	6.	405.17	1.08	4.061E-02	131.29	18.000	PBC<MDA	PA234
133.02	18.	143.58	1.08	4.041E-02	133.02	43.300	PBC<MDA	HF181
					133.54	11.090	2.185E+00	CE144
133.54	18.	147.43	1.08	4.035E-02	133.02	43.300	PBC<MDA	HF181
					133.54	11.090	2.186E+00	CE144
136.30	18.	150.94	1.08	4.001E-02	136.30	5.850	PBC<MDA	HF181
					136.47	10.680	2.295E+00	CO57
136.47	18.	154.63	1.08	3.999E-02	136.30	5.850	PBC<MDA	HF181
					136.47	10.680	2.295E+00	CO57

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
140.51	18.	157.81	1.08	3.945E-02	140.51	89.300	PBC<MDA	Tc99m
162.66	3.	534.83	1.10	3.593E-02	162.66	6.220	PBC<MDA	Ba140
163.38	-3.	587.07	1.10	3.580E-02	163.38	5.080	PBC<MDA	U235
176.60	14.	111.80	1.11	3.460E-02	176.60	17.000	PBC<MDA	Cf251
210.85	18.	102.44	1.14	3.020E-02	210.85	2.990	PBC<MDA	TH229
227.00	5.	344.29	1.15	2.853E-02	227.00	6.300	PBC<MDA	Cf251
238.69	180.	8.82	1.16	2.744E-02	238.63	43.300	8.426E+00	PB212
242.13	56.	20.44	1.16	2.713E-02	242.00	7.430	1.538E+01	PB214
277.68	17.	38.45	1.09	2.440E-02	277.28	6.310	6.257E+00	TL208
295.08	133.	11.08	1.15	2.324E-02	295.09	19.300	1.647E+01	PB214
300.07	14.	201.36	1.20	2.293E-02	300.03	3.280	PBC<MDA	PB212
					300.07	2.460	1.368E+01	PA231
					300.18	6.200	5.429E+00	PA233
300.17	27.	33.52	1.20	2.294E-02	300.03	3.280	PBC<MDA	PB212
					300.07	2.460	2.618E+01	PA231
					300.18	6.200	1.039E+01	PA233
300.18	4.	734.96	1.20	2.293E-02	300.03	3.280	PBC<MDA	PB212
					300.07	2.460	3.790E+00	PA231
					300.18	6.200	1.504E+00	PA233
320.08	14.	104.32	1.22	2.179E-02	320.08	9.940	PBC<MDA	CR51
338.11	15.	142.25	1.23	2.085E-02	338.32	12.010	PBC<MDA	AC228
340.57	15.	137.26	1.23	2.074E-02	340.57	46.900	PBC<MDA	Cs136
344.29	14.	128.04	1.24	2.057E-02	344.29	26.500	PBC<MDA	EU152
345.83	14.	137.26	1.24	2.049E-02	345.83	15.070	PBC<MDA	HF181
351.99	212.	8.57	1.24	2.021E-02	351.93	37.600	1.549E+01	PB214
364.48	9.	96.16	1.25	1.965E-02	364.48	81.700	PBC<MDA	I131
391.69	13.	118.07	1.27	1.855E-02	391.69	64.000	PBC<MDA	SN113
463.37	11.	92.56	1.32	1.620E-02	463.37	10.470	PBC<MDA	SB125
477.60	3.	288.30	1.33	1.580E-02	477.60	10.520	PBC<MDA	BE7
482.00	8.	109.65	1.34	1.569E-02	482.00	80.500	PBC<MDA	HF181
487.02	8.	120.16	1.34	1.555E-02	487.02	45.500	PBC<MDA	La140
497.05	5.	245.31	1.35	1.530E-02	497.05	90.900	PBC<MDA	RU103
511.86	16.	138.96	2.61	1.494E-02	511.86	20.000	PBC<MDA	RH106
537.26	6.	132.10	1.37	1.436E-02	537.26	24.390	PBC<MDA	Ba140
563.24	3.	352.79	1.39	1.381E-02	563.24	8.350	PBC<MDA	CS134
569.32	4.	187.08	1.40	1.369E-02	569.32	15.380	PBC<MDA	CS134
					569.47	8.200	1.980E+00	PA234
					569.70	97.740	PBC<MDA	BI207
569.47	8.	90.14	1.40	1.369E-02	569.32	15.380	PBC<MDA	CS134
					569.47	8.200	3.960E+00	PA234
					569.70	97.740	PBC<MDA	BI207
583.02	77.	13.15	0.96	1.342E-02	583.02	84.500	3.760E+00	TL208
609.31	121.	11.55	1.39	1.294E-02	609.31	46.090	1.124E+01	BI214
635.89	4.	168.86	1.44	1.250E-02	635.89	11.310	PBC<MDA	SB125
657.76	11.	43.16	1.45	1.215E-02	657.76	94.640	PBC<MDA	AG110M
696.54	2.	398.21	1.48	1.158E-02	696.54	99.000	PBC<MDA	PM144
702.63	3.	389.11	1.48	1.150E-02	702.63	97.900	PBC<MDA	NB94
763.94	5.	158.23	1.52	1.072E-02	763.94	22.280	PBC<MDA	AG110M

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
766.41	7.	89.20	1.53	1.070E-02	765.79	99.790	PBC<MDA	NB95
					766.41	0.294	PBC<MDA	PA234M
795.87	8.	79.30	1.54	1.036E-02	795.87	85.530	PBC<MDA	CS134
801.95	8.	100.15	1.55	1.030E-02	801.95	8.690	PBC<MDA	CS134
818.50	9.	106.03	1.56	1.012E-02	818.50	100.000	PBC<MDA	Cs136
834.85	5.	94.29	1.57	9.955E-03	834.85	99.980	PBC<MDA	MN54
860.51	8.	91.92	1.59	9.703E-03	860.56	12.420	PBC<MDA	TL208
871.10	3.	192.05	1.59	9.604E-03	871.10	99.890	PBC<MDA	NB94
880.53	8.	90.49	1.60	9.517E-03	880.53	6.000	PBC<MDA	PA234
889.28	4.	283.11	1.60	9.438E-03	889.28	99.984	PBC<MDA	Sc46
898.04	2.	398.22	1.61	9.360E-03	898.04	93.700	PBC<MDA	y88
911.48	24.	42.77	1.62	9.247E-03	911.07	29.000	5.041E+00	AC228
946.02	5.	176.07	1.64	8.957E-03	946.02	13.400	PBC<MDA	PA234
964.11	8.	132.17	1.65	8.814E-03	964.11	14.605	PBC<MDA	EU152
968.86	38.	16.22	1.33	8.776E-03	968.97	17.460	1.378E+01	AC228
1004.77	10.	130.17	1.67	8.509E-03	1004.77	18.010	PBC<MDA	EU154
1037.84	5.	111.96	1.69	8.278E-03	1037.84	14.130	PBC<MDA	Co56
1048.07	8.	69.50	1.70	8.209E-03	1048.07	80.000	PBC<MDA	Cs136
1050.36	6.	100.98	1.70	8.193E-03	1050.36	1.560	PBC<MDA	RH106
1077.40	2.	354.73	1.72	8.017E-03	1077.40	3.300	PBC<MDA	Ga68
1099.25	4.	196.36	1.73	7.881E-03	1099.25	56.500	PBC<MDA	FE59
1120.21	10.	93.98	1.74	7.754E-03	1120.29	15.100	PBC<MDA	BI214
					1120.55	99.987	PBC<MDA	Sc46
1120.55	8.	126.94	1.74	7.752E-03	1120.29	15.100	PBC<MDA	BI214
					1120.55	99.987	5.704E-01	Sc46
					1121.30	34.900	1.635E+00	Ta182
1121.22	10.	88.56	1.74	7.748E-03	1120.55	99.987	PBC<MDA	Sc46
					1121.30	34.900	2.154E+00	Ta182
1172.81	3.	220.66	1.77	7.453E-03	1173.24	99.900	PBC<MDA	CO60
1187.24	1.	857.32	1.78	7.367E-03	1189.05	16.200	PBC<MDA	Ta182
1220.99	14.	46.98	1.80	7.199E-03	1221.41	27.000	3.906E+00	Ta182
1238.28	19.	44.63	1.81	7.114E-03	1238.28	66.070	2.285E+00	Co56
1274.53	6.	64.98	1.83	6.939E-03	1274.53	99.940	PBC<MDA	NA22
					1274.54	35.190	1.444E+00	EU154
1408.00	2.	324.35	1.90	6.366E-03	1408.00	21.005	PBC<MDA	EU152
1461.09	213.	6.93	1.36	6.164E-03	1460.83	10.670	1.797E+02	K40
1764.75	20.	30.32	2.07	5.226E-03	1764.49	15.400	1.369E+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
298.41	74.61	111.	141.	3.906E+03	13.51	1.034	- D
308.88	77.23	90.	201.	5.437E+03	9.70	1.036	- D
348.39	87.02	72.	66.	1.666E+03	21.87	1.044	- 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	185.96	46.54	399.	-27.	-0.015	55.50	1.012s
TH-227	200.37	50.14	255.	22.	0.012	105.94	1.015
AM-241	237.95	59.54	351.	-37.	-0.020	42.22	1.022s
TH-234	252.71	63.23	96.	20.	0.011	83.61	0.708s
Sn-126	256.93	64.28	364.	10.	0.006	270.55	1.026
BA-133	323.77	80.99	741.	-22.	-0.012	176.13	1.039s
Np-237	345.77	86.49	968.	-24.	-0.013	184.02	1.043
EU-155	345.98	86.54	1119.	-27.	-0.015	175.32	1.043
Sn-126	347.57	86.94	1092.	-27.	-0.015	173.14	1.044
Sn-126	350.09	87.57	1065.	-27.	-0.015	170.94	1.044
Cd-109	351.97	88.04	1037.	-27.	-0.015	168.71	1.044
Nd-147	364.21	91.10	1010.	-27.	-0.015	166.15	1.047s
TH-234	370.17	92.59	146.	48.	0.027	38.45	1.048D
AC-228	373.21	93.35	957.	-27.	-0.015	161.49	1.049s
Gd-153	389.81	97.50	975.	-27.	-0.015	162.45	1.052s
Np-239	397.81	99.50	1002.	-27.	-0.015	164.45	1.053s
Gd-153	412.62	103.20	1029.	-27.	-0.015	166.19	1.056s
Np-239	414.62	103.70	1057.	-27.	-0.015	168.31	1.057s
EU-155	421.07	105.31	1084.	-28.	-0.015	170.27	1.058
Np-239	424.34	106.13	976.	26.	0.014	172.69	1.058s
EU-152	486.92	121.78	214.	-23.	-0.013	91.49	1.071s
CO-57	488.06	122.06	238.	-20.	-0.011	109.92	1.071s
EU-154	492.22	123.10	210.	10.	0.006	207.36	1.072s
PA-234	525.00	131.29	304.	6.	0.003	405.17	1.078
HF-181	531.92	133.02	310.	18.	0.010	143.58	1.079s
CE-144	533.98	133.54	328.	18.	0.010	147.43	1.080s
HF-181	545.02	136.30	346.	18.	0.010	150.94	1.082s
CO-57	545.72	136.47	363.	18.	0.010	154.63	1.082s
Tc-99m	561.86	140.51	381.	18.	0.010	157.81	1.085s
U-235	574.97	143.79	569.	-29.	-0.016	64.29	1.087
CE-141	581.59	145.44	584.	-24.	-0.013	146.08	1.089s
Ba-140	650.47	162.66	142.	3.	0.002	534.83	1.102s
U-235	653.35	163.38	148.	-3.	-0.002	587.07	1.102s
CE-139	663.24	165.85	161.	-20.	-0.011	92.60	1.104s
Cf-251	706.23	176.60	66.	14.	0.008	111.80	1.112s
TH-229	773.87	193.51	95.	-8.	-0.005	221.92	1.125s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
TH-229	843.24	210.85	84.	18.	0.010	102.44	1.138s
Cf-251	907.84	227.00	76.	5.	0.003	344.29	1.151s
PB-212	954.37	238.63	35.	180.	0.100	8.81	1.159D
PB-214	967.84	242.00	36.	57.	0.032	19.94	1.162D
TH-227	1024.81	256.24	68.	-14.	-0.008	118.38	1.172s
Cd-113m	1054.65	263.70	114.	-18.	-0.010	87.84	1.178s
BI-210M	1063.18	265.83	135.	-19.	-0.011	88.48	1.179s
TL-208	1110.57	277.68	10.	17.	0.010	38.45	1.095
Hg-203	1116.66	279.20	99.	-18.	-0.010	83.62	1.189s
I-131	1137.05	284.30	60.	-9.	-0.005	171.77	1.193s
PB-214	1180.22	295.09	22.	125.	0.069	10.42	1.201D
PB-212	1199.98	300.03	26.	27.	0.015	33.52	1.205D
PA-231	1200.14	300.07	384.	14.	0.008	201.36	1.205s
PA-233	1200.58	300.18	398.	4.	0.002	734.96	1.205s
PA-231	1210.46	302.65	402.	0.	0.000	1000.00	1.207s
BA-133	1211.27	302.85	402.	0.	0.000	1000.00	1.207
Ba-140	1219.26	304.85	402.	0.	0.000	1000.00	1.208s
BI-210M	1219.45	304.90	402.	0.	0.000	1000.00	1.208s
Ir-192	1233.62	308.44	402.	0.	0.000	1000.00	1.211
Ir-192	1265.82	316.49	185.	-16.	-0.009	119.97	1.217s
CR-51	1280.20	320.08	99.	14.	0.008	104.32	1.219s
La-140	1314.91	328.76	240.	-15.	-0.008	150.53	1.226s
Cf-249	1333.63	333.44	225.	-15.	-0.008	145.55	1.229s
AC-228	1353.15	338.32	216.	15.	0.008	142.25	1.233
Cs-136	1362.15	340.57	201.	15.	0.008	137.26	1.234s
EU-152	1377.01	344.29	160.	14.	0.008	128.04	1.237s
HF-181	1383.19	345.83	168.	14.	0.008	137.26	1.238s
PB-214	1407.85	351.99	26.	212.	0.118	8.57	1.243
BA-133	1423.87	356.00	297.	-15.	-0.008	164.51	1.245s
I-131	1457.81	364.48	16.	9.	0.005	96.16	1.252s
BA-133	1535.24	383.84	116.	-16.	-0.009	117.31	1.266s
Cf-249	1551.68	387.95	131.	-13.	-0.007	130.03	1.269s
SN-113	1566.64	391.69	103.	13.	0.007	118.07	1.271s
SB-125	1711.39	427.88	36.	0.	0.000	1000.00	1.297s
AG-108M	1735.64	433.94	48.	-15.	-0.008	120.70	1.301s
SB-125	1853.36	463.37	48.	11.	0.006	92.56	1.322s
Ir-192	1872.14	468.06	64.	-3.	-0.002	413.86	1.325s
BE-7	1910.28	477.60	32.	3.	0.002	288.30	1.332s
HF-181	1927.89	482.00	35.	8.	0.004	109.65	1.335
La-140	1947.98	487.02	43.	8.	0.004	120.16	1.339s
RU-103	1988.12	497.05	30.	5.	0.003	245.31	1.346s
RH-106	2047.36	511.86	70.	16.	0.009	138.96	2.606
Nd-147	2123.91	531.00	26.	0.	0.000	1000.00	1.369s
Ba-140	2148.95	537.26	13.	6.	0.003	132.10	1.373s
CS-134	2252.86	563.24	22.	3.	0.002	352.79	1.391s
CS-134	2277.20	569.32	26.	4.	0.002	187.08	1.395s
PA-234	2277.80	569.47	22.	8.	0.004	90.14	1.395s
BI-207	2278.73	569.70	33.	-3.	-0.002	347.91	1.396s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
TL-208	2332.00	583.02	7.	77.	0.043	13.15	0.958s
SB-125	2401.92	600.50	239.	-4.	-0.002	527.18	1.416s
SB-124	2410.85	602.73	235.	0.	0.000	1000.00	1.418s
CS-134	2418.76	604.71	235.	0.	0.000	1000.00	1.419s
BI-214	2437.16	609.31	19.	121.	0.067	11.55	1.394
RU-103	2441.12	610.30	235.	0.	0.000	1000.00	1.423s
AG-108M	2457.05	614.28	235.	0.	0.000	1000.00	1.426s
PM-144	2472.18	618.06	235.	0.	0.000	1000.00	1.428s
RH-106	2487.60	621.92	232.	0.	0.000	1000.00	1.431s
SB-125	2543.49	635.89	17.	4.	0.002	168.86	1.440
AG-110M	2630.98	657.76	6.	11.	0.006	43.16	1.455s
CS-137	2646.58	661.66	53.	-17.	-0.010	83.34	1.457s
PM-144	2786.11	696.54	19.	2.	0.001	398.21	1.480s
NB-94	2810.46	702.63	23.	3.	0.001	389.11	1.484s
SB-124	2891.09	722.79	54.	-14.	-0.008	79.90	1.497s
EU-154	2893.37	723.36	68.	0.	0.000	1000.00	1.498s
ZR-95	2896.74	724.20	68.	0.	0.000	1000.00	1.498s
BI-212	2908.63	727.17	84.	-14.	-0.008	106.10	1.500
pm-146	2942.83	735.72	37.	-12.	-0.007	108.88	1.506s
AG-110M	3055.73	763.94	31.	5.	0.003	158.23	1.524s
NB-95	3063.11	765.79	36.	0.	0.000	1000.00	1.525
PA-234M	3065.60	766.41	18.	7.	0.004	89.20	1.526s
EU-152	3115.64	778.92	23.	-7.	-0.004	144.53	1.534
BI-212	3141.64	785.42	28.	-6.	-0.003	191.49	1.538s
CS-134	3183.43	795.87	14.	8.	0.004	79.30	1.544
CS-134	3207.77	801.95	25.	8.	0.004	100.15	1.548s
CO-58	3243.06	810.78	39.	-11.	-0.006	87.54	1.554s
La-140	3263.04	815.77	50.	-5.	-0.003	226.07	1.557s
Cs-136	3273.97	818.50	45.	9.	0.005	106.03	1.559s
MN-54	3339.36	834.85	5.	5.	0.003	94.29	1.569s
TL-208	3442.23	860.56	9.	8.	0.004	91.92	1.585s
NB-94	3484.36	871.10	19.	3.	0.002	192.05	1.592s
EU-154	3492.89	873.23	28.	-6.	-0.004	100.43	1.593s
PA-234	3522.10	880.53	21.	8.	0.004	90.49	1.598s
PA-234	3532.94	883.24	52.	-12.	-0.007	86.81	1.599s
AG-110M	3538.71	884.68	49.	-9.	-0.005	119.92	1.600s
Sc-46	3557.10	889.28	56.	4.	0.002	283.11	1.603s
y-88	3592.14	898.04	9.	2.	0.001	398.22	1.608s
AC-228	3644.26	911.07	19.	24.	0.014	42.77	1.616s
AG-110M	3749.96	937.49	25.	-7.	-0.004	161.52	1.633s
PA-234	3784.07	946.02	15.	5.	0.003	176.07	1.638s
EU-152	3856.43	964.11	53.	8.	0.005	132.17	1.649s
AC-228	3875.45	968.86	0.	38.	0.021	16.22	1.333
EU-154	3985.31	996.33	63.	-14.	-0.008	83.36	1.668s
PA-234M	4003.99	1001.00	81.	-11.	-0.006	68.73	1.671s
EU-154	4019.10	1004.77	74.	10.	0.005	130.17	1.673
Co-56	4151.36	1037.84	5.	5.	0.003	111.96	1.693s
Cs-136	4192.29	1048.07	13.	8.	0.005	69.50	1.698s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
RH-106	4201.45	1050.36	15.	6.	0.003	100.98	1.700s
BI-207	4254.65	1063.66	18.	-7.	-0.004	85.22	1.708s
Ga-68	4309.61	1077.40	10.	2.	0.001	354.73	1.716s
FE-59	4397.02	1099.25	16.	4.	0.002	196.36	1.728s
EU-152	4448.32	1112.07	70.	-10.	-0.006	117.43	1.736s
ZN-65	4462.20	1115.55	60.	-4.	-0.002	305.28	1.738s
BI-214	4481.17	1120.29	39.	10.	0.006	93.98	1.740s
Sc-46	4482.22	1120.55	47.	8.	0.004	126.94	1.740s
Ta-182	4485.22	1121.30	38.	10.	0.006	88.56	1.741s
CO-60	4692.97	1173.24	9.	3.	0.001	220.66	1.770s
Ta-182	4756.23	1189.05	15.	1.	0.001	857.32	1.779s
Ta-182	4885.67	1221.41	5.	14.	0.008	46.98	1.797s
Co-56	4953.16	1238.28	11.	19.	0.011	44.63	1.806s
NA-22	5098.16	1274.53	5.	6.	0.004	64.98	1.826s
AG-110M	5537.25	1384.30	16.	-7.	-0.004	135.27	1.884s
EU-152	5632.07	1408.00	5.	2.	0.001	324.35	1.896s
K-40	5844.43	1461.09	2.	213.	0.118	6.93	1.357s
SB-124	6764.03	1690.98	11.	-6.	-0.004	130.84	2.034s
BI-214	7058.07	1764.49	8.	20.	0.011	30.32	2.067
Co-56	7085.51	1771.35	20.	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 *****

Name	Code	Average Activity Bq/Sample	Energy keV	Peak Activity Bq/Sample	Code	MDA Value Bq/Sample	COMMENTS
BE-7	C	9.4760E-01	477.60	9.476E-01	?(	9.714E+00 2.88E+02	5.31E+01 1.05E+01 G
NA-22	C	5.0854E-01	1274.53	5.085E-01	?(	1.079E+00 6.50E+01	9.50E+02 9.99E+01 G
K-40	N	1.7973E+02	1460.83	1.797E+02	(P	8.115E+00 6.93E+00	4.66E+11 1.07E+01 G
Sc-46	F	3.9666E-01	889.28	2.230E-01	?(P	2.204E+00 2.83E+02	8.38E+01 1.00E+02 G
			1120.55	5.704E-01	?(	2.485E+00 1.27E+02	1.00E+02 G
CR-51	F	3.5774E+00	320.08	3.577E+00	&(P	1.258E+01 1.04E+02	2.77E+01 9.94E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
MN-54	C	3.0450E-01					3.12E+02
		834.85	3.045E-01	?(	7.132E-01	9.43E+01	1.00E+02 G
FE-59	F	5.6143E-01					4.45E+01
		1099.25	5.614E-01	&(P	2.627E+00	1.96E+02	5.65E+01 G
		1291.60	-1.250E-01	%	3.361E+00	1.12E+03	4.32E+01 G
Co-56	C	1.0107E+00					7.73E+01
		846.77	-1.427E-02	&(P	1.147E+00	2.63E+03	9.99E+01 G
		1238.28	2.285E+00	?(	2.119E+00	4.46E+01	6.61E+01 G
		1037.84	2.301E+00	?(P	6.313E+00	1.12E+02	1.41E+01 G
		1771.35	0.000E+00	-	1.617E+01	1.00E+03	1.55E+01 A
CO-57	C	-2.7359E-02					2.72E+02
		122.06	-3.171E-01	?(	1.167E+00	1.10E+02	8.56E+01 G
		136.47	2.295E+00	?(	1.191E+01	1.55E+02	1.07E+01 G
CO-58	C	-5.9154E-01					7.09E+01
		810.78	-5.915E-01	?(	1.748E+00	8.75E+01	9.95E+01 G
CO-60	F	1.1517E-01					1.93E+03
		1332.50	3.294E-02	%(P	1.656E+00	1.98E+03	1.00E+02 G
		1173.24	1.975E-01	?(P	1.216E+00	2.21E+02	9.99E+01 G
ZN-65	F	-5.1232E-01					2.44E+02
		1115.55	-5.123E-01	?(	5.459E+00	3.05E+02	5.06E+01 G
NB-94	I	1.6233E-01					7.41E+06
		702.63	1.316E-01	?(	1.244E+00	3.89E+02	9.79E+01 G
		871.10	1.925E-01	&(P	1.323E+00	1.92E+02	9.99E+01 G
ZR-95	I	3.1455E-02					6.40E+01
		756.73	3.145E-02	%(	2.156E+00	2.75E+03	5.45E+01 G
		724.20	0.000E+00	&	4.626E+00	1.00E+03	4.42E+01 G
RU-103	I	1.8644E-01					3.93E+01
		497.05	1.864E-01	?(	1.134E+00	2.45E+02	9.09E+01 G
		610.30	0.000E+00	-	5.542E+01	1.00E+03	5.75E+00 GA
RH-106	I	3.4873E+00					3.74E+02
		621.92	0.000E+00	?(	3.239E+01	1.00E+03	9.93E+00 G
		1050.36	2.569E+01	?(	8.983E+01	1.01E+02	1.56E+00 G
		511.86	2.976E+00		7.755E+00	1.39E+02	2.00E+01 GA
AG-108M	C	-5.4211E-01					1.53E+05
		433.94	-5.421E-01	?(P	1.255E+00	1.21E+02	9.05E+01 G
		722.94	-4.860E-02	%	2.231E+00	1.31E+03	9.08E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		614.28	0.000E+00	+	3.566E+00	1.00E+03	8.98E+01 G
AG-110M	F	1.4956E-01					2.50E+02
		884.68	-6.925E-01	?(	2.842E+00	1.20E+02	7.27E+01 G
		657.76	5.487E-01	&(	6.976E-01	4.32E+01	9.46E+01 G
		937.49	-1.254E+00	+	4.660E+00	1.62E+02	3.44E+01 G
		1384.30	-2.478E+00	+	7.559E+00	1.35E+02	2.43E+01 G
		763.94	1.201E+00	?(	6.646E+00	1.58E+02	2.23E+01 G
SN-113	F	5.8498E-01					1.15E+02
		391.69	5.850E-01	&(	2.336E+00	1.18E+02	6.40E+01 G
SB-125	I	1.0651E+00					1.01E+03
		427.88	0.000E+00	(	3.332E+00	1.00E+03	2.96E+01 G
		600.50	-9.893E-01	+	1.776E+01	5.27E+02	1.79E+01 G
		635.89	1.441E+00	&(	8.692E+00	1.69E+02	1.13E+01 G
		463.37	3.670E+00	&(P	1.147E+01	9.26E+01	1.05E+01 G
I-131	I	3.0116E-01					8.02E+00
		364.48	3.012E-01	&(	7.388E-01	9.62E+01	8.17E+01 G
		284.30	-3.403E+00	+	1.467E+01	1.72E+02	6.14E+00 G
		636.97	4.140E-01	%	1.596E+01	1.05E+03	7.17E+00 G
Gd-153	F	-1.2262E+00					2.42E+02
		97.50	-1.226E+00	&(	6.639E+00	1.62E+02	3.00E+01 G
		103.20	-1.677E+00	+	9.289E+00	1.66E+02	2.18E+01 G
Ga-68	C	4.9154E+00					4.71E-02
		1077.40	4.915E+00	?(	4.288E+01	3.55E+02	3.30E+00 G
Tc-99m	I	2.8754E-01					2.51E-01
		140.51	2.875E-01	?(	1.522E+00	1.58E+02	8.93E+01 G
BA-133	F	-6.7070E-01					3.85E+03
		356.00	-6.707E-01	?(	3.712E+00	1.65E+02	6.20E+01 G
		302.85	0.000E+00	+	1.280E+01	1.00E+03	1.83E+01 G
		383.84	-5.111E+00	+	1.745E+01	1.17E+02	8.94E+00 GA
		80.99	-9.401E-01	+	5.531E+00	1.76E+02	3.41E+01 GA
CS-134	I	5.0606E-01					7.54E+02
		604.71	0.000E+00	?(	3.240E+00	1.00E+03	9.76E+01 G
		795.87	4.760E-01	&(	1.276E+00	7.93E+01	8.55E+01 G
		569.32	1.056E+00	(	6.985E+00	1.87E+02	1.54E+01 G
		801.95	4.727E+00	?(	1.622E+01	1.00E+02	8.69E+00 G
		563.24	1.326E+00	?(P	1.189E+01	3.53E+02	8.35E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
CS-137	I	-9.3844E-01					1.10E+04	
			661.66	-9.384E-01	?(P	1.983E+00	8.33E+01	8.52E+01 G
CE-139	F	-3.8222E-01					1.38E+02	
			165.85	-3.822E-01	?(	1.184E+00	9.26E+01	7.99E+01 G
Ba-140	I	9.0395E-01					1.28E+01	
			537.26	9.337E-01	&(P	3.108E+00	1.32E+02	2.44E+01 G
			162.66	7.872E-01	?(	1.447E+01	5.35E+02	6.22E+00 G
			304.85	0.000E+00	-	5.497E+01	1.00E+03	4.29E+00 G
La-140	I	1.8636E-01					1.28E+01	
			1596.21	-2.655E-02	%(P	7.522E-01	5.68E+03	9.54E+01 G
			487.02	6.328E-01	?(	2.608E+00	1.20E+02	4.55E+01 G
			328.76	-1.894E+00	&	9.599E+00	1.51E+02	2.03E+01 G
			815.77	-1.065E+00	+	8.395E+00	2.26E+02	2.33E+01 G
CE-141	I	-7.0331E-01				3.25E+01		
			145.44	-7.033E-01	?(	3.432E+00	1.46E+02	4.82E+01 G
CE-144	I	2.1857E+00				2.85E+02		
			133.54	2.186E+00	?(	1.082E+01	1.47E+02	1.11E+01 G
PM-144	C	1.1303E-01					3.63E+02	
			696.54	1.130E-01	?(	1.107E+00	3.98E+02	9.90E+01 G
			618.06	0.000E+00	&	3.249E+00	1.00E+03	9.91E+01 G
EU-152	F	2.1804E+00					4.94E+03	
			344.29	1.454E+00	?(	6.278E+00	1.28E+02	2.65E+01 G
			1112.07	-5.454E+00	+	2.177E+01	1.17E+02	1.36E+01 G
			121.78	-1.089E+00	+	3.326E+00	9.15E+01	2.86E+01 G
			778.92	-2.984E+00	+	1.026E+01	1.45E+02	1.29E+01 G
			964.11	3.498E+00	?(	1.586E+01	1.32E+02	1.46E+01 G
			244.69	2.167E-01	%	2.442E+01	3.32E+03	7.58E+00 G
			1408.00	6.925E-01	?	5.597E+00	3.24E+02	2.10E+01 GA
EU-154	I	8.5815E-01					3.14E+03	
			873.23	-3.026E+00	?(P	1.301E+01	1.00E+02	1.23E+01 G
			123.10	3.291E-01	+	2.312E+00	2.07E+02	4.08E+01 G
			1274.54	7.240E-02	%	4.240E+00	1.53E+03	3.52E+01 G
			723.36	0.000E+00	+	1.009E+01	1.00E+03	2.02E+01 G
			1004.77	3.504E+00	&(	1.555E+01	1.30E+02	1.80E+01 G
			996.33	-8.686E+00	+	2.428E+01	8.34E+01	1.06E+01 G
EU-155	I	-1.7235E+00					1.81E+03	
			105.31	-1.723E+00	?(	9.779E+00	1.70E+02	2.12E+01 G
			86.54	-1.240E+00	+	7.246E+00	1.75E+02	3.07E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
HF-181	F	7.8817E-01					4.24E+01	
			482.00	3.537E-01	?(1.329E+00	1.10E+02	8.05E+01 G
			133.02	5.588E-01	?(2.693E+00	1.44E+02	4.33E+01 G
			345.83	2.449E+00	&(1.134E+01	1.37E+02	1.51E+01 G
		136.30	4.187E+00	?(	2.121E+01	1.51E+02	5.85E+00 G
Ta-182	F	2.9181E+00					1.14E+02	
			1121.30	2.154E+00	?(6.447E+00	8.86E+01	3.49E+01 G
			1221.41	3.906E+00	?(3.850E+00	4.70E+01	2.70E+01 G
		1189.05	4.655E-01	&	9.662E+00	8.57E+02	1.62E+01 G	
Hg-203	F	-4.9293E-01					4.66E+01	
			279.20	-4.929E-01	?(1.378E+00	8.36E+01	8.15E+01 G
TL-208	N	3.7314E+00					6.98E+02	
			583.02	3.760E+00	(P	7.462E-01	1.31E+01	8.45E+01 G
			277.28	6.257E+00	+ P	6.201E+00	3.84E+01	6.31E+00 G
		860.56	3.534E+00	?(	7.812E+00	9.19E+01	1.24E+01 G
pm-146	C	-4.9850E-02					2.02E+03	
			747.16	-4.985E-02	%(3.772E+00	3.08E+03	3.40E+01 G
			735.72	-2.751E+00	+	6.957E+00	1.09E+02	2.25E+01 G
		453.88	4.338E-02	& P	1.491E+00	1.36E+03	6.50E+01 G	
y-88	F	1.0524E-01					1.07E+02	
			898.04	1.052E-01	?(P	1.074E+00	3.98E+02	9.37E+01 G
		1836.06	0.000E+00	-	8.180E-01	1.00E+03	9.92E+01 G	
Cd-113m		-6.5112E+03					5.33E+03	
			263.70	-6.511E+03	?(1.914E+04	8.78E+01	6.00E-03 K
Cd-109	F	-9.9784E+00					4.53E+02	
			88.04	-9.978E+00	?(5.611E+01	1.69E+02	3.79E+00 G
Cf-251	T	1.3224E+00					3.28E+05	
			176.60	1.322E+00	?(3.832E+00	1.12E+02	1.70E+01 G
		227.00	1.546E+00	&	1.340E+01	3.44E+02	6.30E+00 GA	
Cf-249	T	-5.7452E-01					1.28E+05	
			387.95	-5.745E-01	?(2.526E+00	1.30E+02	6.60E+01 G
		333.44	-2.514E+00	+	1.232E+01	1.46E+02	1.55E+01 G	
Sn-126		1.8278E+00					3.65E+07	
			87.57	-1.011E+00	+	5.757E+00	1.71E+02	3.75E+01 GA
			64.28	1.828E+00	(1.668E+01	2.71E+02	9.70E+00 G
		86.94	-4.204E+00	+	2.426E+01	1.73E+02	9.04E+00 GA	

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
PB-210	N -1.7348E+01	46.54	-1.735E+01	(P	6.244E+01	5.55E+01	8.14E+03 4.25E+00 G
PB-212	N 8.4274E+00	238.63 300.03	8.427E+00 1.963E+01	(P +	1.419E+00 1.969E+01	8.81E+00 3.35E+01	6.98E+02 4.33E+01 G 3.28E+00 GA
PB-214	N 1.5479E+01	351.93 295.09 242.00	1.549E+01 1.546E+01 1.569E+01	(P ( (	1.941E+00 3.053E+00 8.452E+00	8.57E+00 1.04E+01 1.99E+01	5.84E+05 3.76E+01 G 1.93E+01 G 7.43E+00 GA
BI-207	C -1.1910E-01	569.70 1063.66	-1.191E-01 -6.513E-01	&(P + P	1.223E+00 2.072E+00	3.48E+02 8.52E+01	1.18E+04 9.77E+01 G 7.45E+01 G
BI-212	N -9.0196E+00	727.17 785.42	-9.020E+00 -2.485E+01	?(P +	2.991E+01 1.134E+02	1.06E+02 1.91E+02	6.98E+02 7.55E+00 G 1.28E+00 GA
BI-214	N 1.1855E+01	609.31 1120.29 1764.49	1.124E+01 4.741E+00 1.369E+01	(P - P ?(	2.158E+00 1.510E+01 1.106E+01	1.16E+01 9.40E+01 3.03E+01	5.84E+05 4.61E+01 G 1.51E+01 G 1.54E+01 G
BI-210M	T -8.4715E-01	265.83 304.90	-8.471E-01 0.000E+00	?(+	2.506E+00 8.423E+00	8.85E+01 1.00E+03	1.10E+09 5.00E+01 G 2.80E+01 G
AC-228	N 8.3243E+00	911.07 968.97 338.32 93.35	5.041E+00 1.378E+01 3.293E+00 -6.675E+00	?((- -	4.733E+00 2.672E+00 1.578E+01 3.593E+01	4.28E+01 1.62E+01 1.42E+02 1.61E+02	2.10E+03 2.90E+01 G 1.75E+01 G 1.20E+01 G 5.56E+00 XA
TH-227	N 6.6634E+00	50.14 256.24	6.663E+00 -4.280E+00	&(-	2.361E+01 1.258E+01	1.06E+02 1.18E+02	7.95E+03 8.00E+00 G 7.00E+00 G
TH-229	N 2.5386E+00	193.51 210.85	-3.261E+00 1.107E+01	&( &(	1.887E+01 2.794E+01	2.22E+02 1.02E+02	2.68E+06 4.40E+00 G 2.99E+00 G
TH-234	N 1.0762E+01	63.29 92.59	9.270E+00 1.178E+01	(P (P	2.284E+01 1.441E+01	8.36E+01 3.84E+01	1.63E+12 3.81E+00 G 5.58E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
PA-231	N	6.3015E+00					1.20E+07	
			302.65	0.000E+00	?(8.142E+01	1.00E+03	2.88E+00 G
			300.07	1.368E+01	@(9.262E+01	2.01E+02	2.46E+00 G
PA-233	C	1.9553E-01					7.82E+08	
			312.01-2.986E-02	% (P	6.676E+00	1.57E+03	3.60E+01 G	
			300.18	1.504E+00	@(3.740E+01	7.35E+02	6.20E+00 G
PA-234	N	1.8147E+00					1.63E+12	
			131.29	4.651E-01	&(6.385E+00	4.05E+02	1.80E+01 G
			946.02	2.314E+00	?(9.609E+00	1.76E+02	1.34E+01 G
			569.47	3.960E+00	(1.216E+01	9.01E+01	8.20E+00 G
			883.24-7.580E+00	+	2.214E+01	8.68E+01	9.60E+00 G	
			880.53	7.642E+00	?	2.358E+01	9.05E+01	6.00E+00 GA
PA-234M	N	-8.2452E+01					1.63E+12	
			1001.00-8.245E+01	&(P	3.472E+02	6.87E+01	8.37E-01 G	
			766.41	1.305E+02	+ P	3.967E+02	8.92E+01	2.94E-01 G
U-235	N	-3.8235E+00					2.57E+11	
			143.79-3.823E+00	(P	1.481E+01	6.43E+01	1.10E+01 G	
			205.33	6.070E-01	% P	1.664E+01	1.03E+03	5.01E+00 G
			163.38-9.965E-01	+ P	1.816E+01	5.87E+02	5.08E+00 G	
AM-241	T	-1.9812E+00					1.58E+05	
			59.54-1.981E+00	?(P	4.833E+00	4.22E+01	3.59E+01 G	
Np-237	F	-2.5771E+00					2.14E+06	
			86.49-2.577E+00	&(	1.582E+01	1.84E+02	1.31E+01 G
Ir-192	F	-4.7561E-01					7.40E+01	
			316.49-4.756E-01	?(	1.919E+00	1.20E+02	8.70E+01 G
			468.06-1.843E-01	+	2.668E+00	4.14E+02	5.18E+01 G	
			308.44	0.000E+00	+	7.497E+00	1.00E+03	3.18E+01 G
Cs-136	F	6.5162E-01					1.30E+01	
			818.50	5.152E-01	?(1.861E+00	1.06E+02	1.00E+02 G
			1048.07	7.065E-01	?(1.632E+00	6.95E+01	8.00E+01 G
			340.57	8.488E-01	?(3.925E+00	1.37E+02	4.69E+01 G
Np-239	T	1.5057E+00					2.36E+00	
			103.70-1.523E+00	+	8.543E+00	1.68E+02	2.40E+01 X	
			106.13	1.506E+00	?(8.670E+00	1.73E+02	2.27E+01 G
			99.50-2.445E+00	+	1.340E+01	1.64E+02	1.50E+01 X	

(- 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 - Half-life 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	399.	-27.	-0.015	55.50	-1.735E+01	P
TH-227	50.14	255.	22.	0.012	105.94	6.663E+00	
AM-241	59.54	351.	-37.	-0.020	42.22	-1.981E+00	P
BA-133	80.99	741.	-22.	-0.012	176.13	-9.401E-01	
Np-237	86.49	968.	-24.	-0.013	184.02	-2.577E+00	
EU-155	86.54	1119.	-27.	-0.015	175.32	-1.240E+00	
Cd-109	88.04	1037.	-27.	-0.015	168.71	-9.978E+00	
Nd-147	91.10	1010.	-27.	-0.015	166.15	-1.321E+00	
Gd-153	97.50	975.	-27.	-0.015	162.45	-1.226E+00	
Np-239	99.50	1002.	-27.	-0.015	164.45	-2.445E+00	
Gd-153	103.20	1029.	-27.	-0.015	166.19	-1.677E+00	
Np-239	103.70	1057.	-27.	-0.015	168.31	-1.523E+00	
EU-155	105.31	1084.	-28.	-0.015	170.27	-1.723E+00	
Np-239	106.13	976.	26.	0.014	172.69	1.506E+00	
EU-152	121.78	214.	-23.	-0.013	91.49	-1.089E+00	
CO-57	122.06	238.	-20.	-0.011	109.92	-3.171E-01	
EU-154	123.10	210.	10.	0.006	207.36	3.291E-01	
PA-234	131.29	304.	6.	0.003	405.17	4.651E-01	
HF-181	133.02	310.	18.	0.010	143.58	5.588E-01	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
CE-144	133.54	328.	18.	0.010	147.43	2.186E+00	
HF-181	136.30	346.	18.	0.010	150.94	4.187E+00	
CO-57	136.47	363.	18.	0.010	154.63	2.295E+00	
Tc-99m	140.51	381.	18.	0.010	157.81	2.875E-01	
U-235	143.79	569.	-29.	-0.016	64.29	-3.823E+00	P
CE-141	145.44	584.	-24.	-0.013	146.08	-7.033E-01	
Ba-140	162.66	142.	3.	0.002	534.83	7.872E-01	
U-235	163.38	148.	-3.	-0.002	587.07	-9.965E-01	P
CE-139	165.85	161.	-20.	-0.011	92.60	-3.822E-01	
Cf-251	176.60	66.	14.	0.008	111.80	1.322E+00	
TH-229	193.51	95.	-8.	-0.005	221.92	-3.261E+00	
TH-229	210.85	84.	18.	0.010	102.44	1.107E+01	
Cf-251	227.00	76.	5.	0.003	344.29	1.546E+00	
TH-227	256.24	68.	-14.	-0.008	118.38	-4.280E+00	
Cd-113m	263.70	114.	-18.	-0.010	87.84	-6.511E+03	
BI-210M	265.83	135.	-19.	-0.011	88.48	-8.471E-01	
Hg-203	279.20	99.	-18.	-0.010	83.62	-4.929E-01	
I-131	284.30	60.	-9.	-0.005	171.77	-3.403E+00	
PA-231	300.07	384.	14.	0.008	201.36	1.368E+01	
PA-233	300.18	398.	4.	0.002	734.96	1.504E+00	
Ir-192	316.49	185.	-16.	-0.009	119.97	-4.756E-01	
CR-51	320.08	99.	14.	0.008	104.32	3.577E+00	P
La-140	328.76	240.	-15.	-0.008	150.53	-1.894E+00	
Cf-249	333.44	225.	-15.	-0.008	145.55	-2.514E+00	
Cs-136	340.57	201.	15.	0.008	137.26	8.488E-01	
EU-152	344.29	160.	14.	0.008	128.04	1.454E+00	
HF-181	345.83	168.	14.	0.008	137.26	2.449E+00	
BA-133	356.00	297.	-15.	-0.008	164.51	-6.707E-01	
I-131	364.48	16.	9.	0.005	96.16	3.012E-01	
BA-133	383.84	116.	-16.	-0.009	117.31	-5.111E+00	P
Cf-249	387.95	131.	-13.	-0.007	130.03	-5.745E-01	
SN-113	391.69	103.	13.	0.007	118.07	5.850E-01	
AG-108M	433.94	48.	-15.	-0.008	120.70	-5.421E-01	P
SB-125	463.37	48.	11.	0.006	92.56	3.670E+00	P
Ir-192	468.06	64.	-3.	-0.002	413.86	-1.843E-01	
BE-7	477.60	32.	3.	0.002	288.30	9.476E-01	
HF-181	482.00	35.	8.	0.004	109.65	3.537E-01	
La-140	487.02	43.	8.	0.004	120.16	6.328E-01	
RU-103	497.05	30.	5.	0.003	245.31	1.864E-01	
RH-106	511.86	70.	16.	0.009	138.96	2.976E+00	
Ba-140	537.26	13.	6.	0.003	132.10	9.337E-01	P
CS-134	563.24	22.	3.	0.002	352.79	1.326E+00	P
CS-134	569.32	26.	4.	0.002	187.08	1.056E+00	
PA-234	569.47	22.	8.	0.004	90.14	3.960E+00	
BI-207	569.70	33.	-3.	-0.002	347.91	-1.191E-01	P
SB-125	600.50	239.	-4.	-0.002	527.18	-9.893E-01	
SB-125	635.89	17.	4.	0.002	168.86	1.441E+00	
AG-110M	657.76	6.	11.	0.006	43.16	5.487E-01	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
CS-137	661.66	53.	-17.	-0.010	83.34	-9.384E-01	P
PM-144	696.54	19.	2.	0.001	398.21	1.130E-01	
NB-94	702.63	23.	3.	0.001	389.11	1.316E-01	
SB-124	722.79	54.	-14.	-0.008	79.90	-6.302E+00	
BI-212	727.17	84.	-14.	-0.008	106.10	-9.020E+00	P
pm-146	735.72	37.	-12.	-0.007	108.88	-2.751E+00	
AG-110M	763.94	31.	5.	0.003	158.23	1.201E+00	
PA-234M	766.41	18.	7.	0.004	89.20	1.305E+02	P
EU-152	778.92	23.	-7.	-0.004	144.53	-2.984E+00	
BI-212	785.42	28.	-6.	-0.003	191.49	-2.485E+01	
CS-134	795.87	14.	8.	0.004	79.30	4.760E-01	
CS-134	801.95	25.	8.	0.004	100.15	4.727E+00	
CO-58	810.78	39.	-11.	-0.006	87.54	-5.915E-01	
La-140	815.77	50.	-5.	-0.003	226.07	-1.065E+00	
Cs-136	818.50	45.	9.	0.005	106.03	5.152E-01	
MN-54	834.85	5.	5.	0.003	94.29	3.045E-01	
NB-94	871.10	19.	3.	0.002	192.05	1.925E-01	P
EU-154	873.23	28.	-6.	-0.004	100.43	-3.026E+00	P
PA-234	880.53	21.	8.	0.004	90.49	7.642E+00	
PA-234	883.24	52.	-12.	-0.007	86.81	-7.580E+00	
AG-110M	884.68	49.	-9.	-0.005	119.92	-6.925E-01	
Sc-46	889.28	56.	4.	0.002	283.11	2.230E-01	P
y-88	898.04	9.	2.	0.001	398.22	1.052E-01	P
AG-110M	937.49	25.	-7.	-0.004	161.52	-1.254E+00	
PA-234	946.02	15.	5.	0.003	176.07	2.314E+00	
EU-152	964.11	53.	8.	0.005	132.17	3.498E+00	
EU-154	996.33	63.	-14.	-0.008	83.36	-8.686E+00	
PA-234M	1001.00	81.	-11.	-0.006	68.73	-8.245E+01	P
EU-154	1004.77	74.	10.	0.005	130.17	3.504E+00	
Co-56	1037.84	5.	5.	0.003	111.96	2.301E+00	P
Cs-136	1048.07	13.	8.	0.005	69.50	7.065E-01	
RH-106	1050.36	15.	6.	0.003	100.98	2.569E+01	
BI-207	1063.66	18.	-7.	-0.004	85.22	-6.513E-01	P
Ga-68	1077.40	10.	2.	0.001	354.73	4.915E+00	
FE-59	1099.25	16.	4.	0.002	196.36	5.614E-01	P
EU-152	1112.07	70.	-10.	-0.006	117.43	-5.454E+00	
ZN-65	1115.55	60.	-4.	-0.002	305.28	-5.123E-01	
Sc-46	1120.55	47.	8.	0.004	126.94	5.704E-01	
Co-56	1238.28	11.	19.	0.011	44.63	2.285E+00	
NA-22	1274.53	5.	6.	0.004	64.98	5.085E-01	
AG-110M	1384.30	16.	-7.	-0.004	135.27	-2.478E+00	
EU-152	1408.00	5.	2.	0.001	324.35	6.925E-01	
SB-124	1690.98	11.	-6.	-0.004	130.84	-1.357E+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	9.4760E-01	9.4760E-01	2.883E+02%		9.71E+00
NA-22	#A	5.0854E-01	5.0854E-01	6.498E+01%		1.08E+00
K-40		1.7973E+02	1.7973E+02	6.929E+00%		8.12E+00
Sc-46	#A	3.9666E-01	3.9666E-01	1.269E+02%		2.20E+00
CR-51	#A	3.5774E+00	3.5774E+00	1.043E+02%		1.26E+01
MN-54	#A	3.0450E-01	3.0450E-01	9.429E+01%		7.13E-01
FE-59	#A	5.6143E-01	5.6143E-01	1.964E+02%		2.63E+00
Co-56	#A	1.0107E+00	1.0107E+00	4.463E+01%		1.15E+00
CO-57	#A	-2.7359E-02	-2.7359E-02	9.486E+01%		1.17E+00
CO-58	#A	-5.9154E-01	-5.9154E-01	8.754E+01%		1.75E+00
CO-60	#A	1.1517E-01	1.1517E-01	2.207E+02%		1.66E+00
ZN-65	#A	-5.1232E-01	-5.1232E-01	3.053E+02%		5.46E+00
NB-94	#A	1.6233E-01	1.6233E-01	1.921E+02%		1.24E+00
ZR-95	#A	3.1455E-02	3.1455E-02	2.755E+03%		2.16E+00
NB-95	#A	0.0000E+00	0.0000E+00	1.000E+03%		1.60E+00
RU-103	#A	1.8644E-01	1.8644E-01	2.453E+02%		1.13E+00
RH-106	#A	3.4873E+00	3.4873E+00	1.010E+02%		3.24E+01
AG-108M	#A	-5.4211E-01	-5.4211E-01	1.207E+02%		1.25E+00
AG-110M	#A	1.4956E-01	1.4956E-01	4.316E+01%		2.84E+00
SN-113	#A	5.8498E-01	5.8498E-01	1.181E+02%		2.34E+00
SB-124	#A	0.0000E+00	0.0000E+00	1.000E+03%		3.21E+00
SB-125	#A	1.0651E+00	1.0651E+00	9.256E+01%		3.33E+00
I-131	#A	3.0116E-01	3.0116E-01	9.616E+01%		7.39E-01
Gd-153	#A	-1.2262E+00	-1.2262E+00	1.625E+02%		6.64E+00
Ga-68	#A	4.8978E+00	4.9154E+00	3.547E+02%		4.29E+01
Tc-99m	#A	2.8735E-01	2.8754E-01	1.578E+02%		1.52E+00
BA-133	#A	-6.7070E-01	-6.7070E-01	1.645E+02%		3.71E+00
CS-134	#A	5.0606E-01	5.0606E-01	7.930E+01%		3.24E+00
CS-137	#A	-9.3844E-01	-9.3844E-01	8.334E+01%		1.98E+00
CE-139	#A	-3.8222E-01	-3.8222E-01	9.260E+01%		1.18E+00
Ba-140	#A	9.0393E-01	9.0395E-01	1.321E+02%		3.11E+00
La-140	#A	1.8636E-01	1.8636E-01	1.202E+02%		7.52E-01
CE-141	#A	-7.0331E-01	-7.0331E-01	1.461E+02%		3.43E+00
CE-144	#A	2.1857E+00	2.1857E+00	1.474E+02%		1.08E+01
PM-144	#A	1.1303E-01	1.1303E-01	3.982E+02%		1.11E+00
EU-152	#A	2.1804E+00	2.1804E+00	9.201E+01%		6.28E+00
EU-154	#A	8.5815E-01	8.5815E-01	8.220E+01%		1.30E+01
EU-155	#A	-1.7235E+00	-1.7235E+00	1.703E+02%		9.78E+00
HF-181	#A	7.8817E-01	7.8817E-01	6.813E+01%		1.33E+00
Ta-182	#A	2.9181E+00	2.9181E+00	4.698E+01%		6.45E+00
Hg-203	#A	-4.9293E-01	-4.9293E-01	8.362E+01%		1.38E+00
TL-208		3.7314E+00	3.7314E+00	1.315E+01%		7.46E-01
pm-146	#A	-4.9850E-02	-4.9850E-02	3.079E+03%		3.77E+00

y-88 #A	1.0524E-01	1.0524E-01	3.982E+02%	1.07E+00
Cd-113m#A	-6.5112E+03	-6.5112E+03	8.784E+01%	1.91E+04
Cd-109 #A	-9.9784E+00	-9.9784E+00	1.687E+02%	5.61E+01
Cf-251 #A	1.3224E+00	1.3224E+00	1.118E+02%	3.83E+00
Cf-249 #A	-5.7452E-01	-5.7452E-01	1.300E+02%	2.53E+00
Sn-126 A	1.8278E+00	1.8278E+00	2.706E+02%	1.67E+01
PB-210 #A	-1.7348E+01	-1.7348E+01	5.550E+01%	6.24E+01
PB-212	8.4274E+00	8.4274E+00	8.815E+00%	1.42E+00
PB-214	1.5479E+01	1.5479E+01	6.747E+00%	1.94E+00
BI-207 #A	-1.1910E-01	-1.1910E-01	3.479E+02%	1.22E+00
BI-212 #A	-9.0195E+00	-9.0196E+00	1.061E+02%	2.99E+01
BI-214	1.1855E+01	1.1855E+01	1.155E+01%	2.16E+00
BI-210M#A	-8.4715E-01	-8.4715E-01	8.848E+01%	2.51E+00
AC-228	8.3243E+00	8.3243E+00	1.622E+01%	4.73E+00
TH-227 #A	6.6634E+00	6.6634E+00	1.059E+02%	2.36E+01
TH-229 #A	2.5386E+00	2.5386E+00	1.024E+02%	1.89E+01
TH-234 A	1.0762E+01	1.0762E+01	3.845E+01%	2.28E+01
PA-231 #A	6.3015E+00	6.3015E+00	2.014E+02%	8.14E+01
PA-233 #A	1.9553E-01	1.9553E-01	7.350E+02%	6.68E+00
PA-234 #A	1.8147E+00	1.8147E+00	9.014E+01%	6.38E+00
PA-234M#A	-8.2452E+01	-8.2452E+01	6.873E+01%	3.47E+02
U-235 #A	-3.8235E+00	-3.8235E+00	6.429E+01%	1.48E+01
AM-241 #A	-1.9812E+00	-1.9812E+00	4.222E+01%	4.83E+00
Np-237 #A	-2.5771E+00	-2.5771E+00	1.840E+02%	1.58E+01
Ir-192 #A	-4.7561E-01	-4.7561E-01	1.200E+02%	1.92E+00
Cs-136 #A	6.5161E-01	6.5162E-01	6.228E+01%	1.86E+00
Np-239 #A	1.5056E+00	1.5057E+00	1.727E+02%	8.67E+00
Nd-147 #A	0.0000E+00	0.0000E+00	1.000E+03%	7.81E+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 - Half-life limit exceeded

----- S U M M A R Y -----
 Total Activity (37.5 to 2000.0 keV) 2.275E+02 Bq/Sample
 Total Decayed Activity (37.5 to 2000.0 keV) 2.2754265E+02 Bq/Sample

Sample Description: 257060_Gamma_160-17814-A-4-B
 Detector: Detector # 5
 Batch ID: 257060
 Work Order Number: Gamma
 Lot Number: 160-17814-A-4-B

Decay to Time: 7/11/2016 08:45 Live Time: 1800 sec
 Acquisition Time: 7/11/2016 08:46:11 Real Time: 1808 sec
 Analysis Time: 7/11/2016 09:17 Dead Time: 0.44 %
 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_2016-07-10_0601.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	1.162E+01	25.5	2.960E+00	3.019E+00	7.731E+00
NA-22	-3.884E-01	150.0	5.826E-01	5.829E-01	2.073E+00
K-40	1.432E+02	8.7	1.241E+01	1.441E+01	1.187E+01
Sc-46	-6.797E-02	87.4	5.939E-02	5.950E-02	2.886E+00
CR-51	-4.521E+00	105.0	4.748E+00	4.754E+00	1.599E+01
MN-54	2.611E-01	132.7	3.466E-01	3.468E-01	9.045E-01
FE-59	7.809E-01	41.5	3.237E-01	3.261E-01	2.107E+00
Co-56	8.457E-01	68.6	5.798E-01	5.814E-01	1.167E+00
CO-57	2.046E-01	128.5	2.630E-01	2.632E-01	8.922E-01
CO-58	-7.801E-01	41.4	3.228E-01	3.253E-01	2.345E+00
CO-60	-4.329E-01	61.4	2.659E-01	2.668E-01	2.169E+00
ZN-65	0.000E+00	1.#INF	5.422E-01	5.422E-01	5.942E+00
NB-94	-6.013E-02	742.7	4.466E-01	4.466E-01	1.173E+00
ZR-95	-1.035E+00	53.2	5.506E-01	5.533E-01	3.482E+00
NB-95	4.620E-01	149.4	6.902E-01	6.906E-01	2.375E+00
RU-103	-9.699E-02	443.5	4.301E-01	4.301E-01	1.142E+00
RH-106	2.057E+00	115.4	2.374E+00	2.376E+00	3.239E+01
AG-108M	3.387E-01	140.1	4.747E-01	4.750E-01	8.202E-01
AG-110M	4.753E-01	40.8	1.940E-01	1.956E-01	3.620E+00
SN-113	3.094E-01	172.7	5.345E-01	5.347E-01	1.857E+00
SB-124	6.799E-01	126.6	8.610E-01	8.617E-01	3.395E+00
SB-125	1.355E+00	75.9	1.029E+00	1.031E+00	3.621E+00
I-131	8.692E-01	47.1	4.097E-01	4.122E-01	1.024E+00
Gd-153	-8.248E-01	100.4	8.282E-01	8.297E-01	2.783E+00
Ga-68	3.003E+00	702.4	2.109E+01	2.109E+01	5.238E+01
Tc-99m	2.511E-01	138.1	3.467E-01	3.470E-01	1.171E+00
BA-133	-6.125E-01	184.3	1.129E+00	1.129E+00	3.818E+00
CS-134	7.685E-01	35.7	2.745E-01	2.774E-01	3.500E+00
CS-137	2.817E-01	225.5	6.351E-01	6.353E-01	2.212E+00
CE-139	2.882E-01	113.2	3.264E-01	3.276E-01	1.103E+00
Ba-140	5.276E-02	2907.2	1.534E+00	1.534E+00	4.198E+00
La-140	-3.123E-01	78.9	2.465E-01	2.471E-01	2.262E+00
CE-141	4.367E-01	134.8	5.887E-01	5.891E-01	1.990E+00

CE-144	1.833E+00	132.8	2.435E+00	2.436E+00	8.232E+00
PM-144	-3.359E-01	170.3	5.722E-01	5.725E-01	1.441E+00
EU-152	1.077E+00	107.5	1.158E+00	1.159E+00	5.813E+00
EU-154	-8.245E-02	100.8	8.310E-02	8.321E-02	1.680E+01
EU-155	-1.218E+00	88.7	1.080E+00	1.082E+00	5.958E+00
HF-181	3.202E-01	122.3	3.915E-01	3.918E-01	1.630E+00
Ta-182	1.776E+00	88.3	1.568E+00	1.570E+00	6.605E+00
Hg-203	-4.742E-01	93.8	4.445E-01	4.454E-01	1.495E+00
TL-208	3.346E+00	13.2	4.431E-01	4.759E-01	4.392E-01
pm-146	6.322E-01	89.4	5.655E-01	5.664E-01	2.282E+00
y-88	4.049E-03	12561.2	5.086E-01	5.086E-01	1.343E+00
Cd-113m	0.000E+00	1.#INF	3.187E+03	3.187E+03	1.518E+04
Cd-109	0.000E+00	1.#INF	1.115E+01	1.115E+01	3.788E+01
Cf-251	2.527E+00	53.2	1.344E+00	1.363E+00	3.535E+00
Cf-249	4.237E-01	124.2	5.262E-01	5.267E-01	1.808E+00
Sn-126	1.714E+00	221.5	3.798E+00	3.799E+00	1.292E+01
PB-210	3.079E+01	35.8	1.103E+01	1.118E+01	2.921E+01
PB-212	8.762E+00	9.3	8.146E-01	9.924E-01	1.543E+00
PB-214	1.366E+01	7.8	1.066E+00	1.281E+00	2.218E+00
BI-207	3.196E-01	80.1	2.560E-01	2.565E-01	8.692E-01
BI-212	-5.111E+00	152.8	7.809E+00	7.813E+00	2.410E+01
BI-214	1.198E+01	10.9	1.303E+00	1.444E+00	1.921E+00
BI-210M	-2.881E-01	230.3	6.637E-01	6.639E-01	2.291E+00
AC-228	7.746E+00	17.0	1.319E+00	1.377E+00	2.988E+00
TH-227	9.607E+00	47.2	4.539E+00	4.569E+00	1.244E+01
TH-229	3.528E+00	159.3	5.618E+00	5.625E+00	1.822E+01
TH-234	-9.241E+00	76.3	7.050E+00	7.067E+00	3.297E+01
PA-231	-1.321E+01	139.8	1.847E+01	1.848E+01	6.239E+01
PA-233	9.098E-01	150.2	1.366E+00	1.367E+00	4.635E+00
PA-234	-1.573E-01	129.6	2.039E-01	2.041E-01	5.676E+00
PA-234M	6.322E+01	82.6	5.220E+01	5.230E+01	2.865E+02
U-235	2.014E+00	132.0	2.657E+00	2.659E+00	8.974E+00
AM-241	-1.064E+00	79.2	8.423E-01	8.441E-01	3.289E+00
Np-237	0.000E+00	1.#INF	3.895E+00	3.895E+00	1.304E+01
Ir-192	-4.595E-01	102.2	4.695E-01	4.703E-01	1.584E+00
Cs-136	5.575E-01	63.5	3.541E-01	3.556E-01	1.705E+00
Np-239	-1.033E+00	146.7	1.515E+00	1.516E+00	5.099E+00
Nd-147	-3.583E+00	108.3	3.881E+00	3.887E+00	9.807E+00

Total	3.353E+02				

Analyst: Amanda Dick

Sample description
257060_Gamma_160-17814-A-4-B

Spectrum Filename: C:\User\SPC\Det5\5_Gamma_20161262.An1

Acquisition information

Start time: 7/11/2016 8:46:11 AM
Live time: 1800
Real time: 1808
Dead time: 0.44 %
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): $6.466115E-01 + (-7.830454E-01 * \text{Log}(E)) + (-4.117504E-03 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.43 %
Log(Eff): $-2.462251E+01 + (9.075211E+00 * \text{Log}(E)) + (-9.664422E-01 * \text{Log}(E)^2)$

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 +/- 0.0000E+00%
Activity scaling factor: $1.0000E+00 / (1.0000E+00 * 1.0000E+00) = 1.0000E+00$
Detection limit method: Reg. Guide 4.16 Method

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	7/11/2016 8:45:00 AM
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	5_2016-07-10_0601.PBC 7/10/2016 6:01:50 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 22 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.1816

***** 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
46.75	58.	24.80	0.76	1.801E-02	46.54	4.250	3.079E+01	PB210
50.14	28.	47.24	0.79	2.012E-02	50.14	8.000	PBC<MDA	TH227
64.42	8.	221.53	0.80	2.757E-02	64.28	9.700	PBC<MDA	Sn126
74.81	113.	15.41	0.81	3.150E-02				
77.08	163.	10.80	0.81	3.218E-02				
87.29	45.	33.77	0.47	3.449E-02	86.54	30.700	2.370E+00	EU155
					86.94	9.040	8.032E+00	Sn126
					87.57	37.500	1.930E+00	Sn126
					88.04	3.790	1.905E+01	Cd109
91.10	15.	180.25	0.83	3.508E-02	91.10	28.300	PBC<MDA	Nd147
92.94	76.	24.48	0.77	3.532E-02	92.59	5.584	1.529E+01	TH234
					93.35	5.561	2.152E+01	AC228
99.50	14.	115.41	0.84	3.592E-02	99.50	15.000	PBC<MDA	Np239
103.20	6.	243.98	0.84	3.612E-02	103.20	21.800	PBC<MDA	Gd153
103.70	11.	134.87	0.84	3.614E-02	103.70	24.000	PBC<MDA	Np239
121.78	13.	107.53	0.86	3.584E-02	121.78	28.580	PBC<MDA	EU152
					122.06	85.600	2.302E-01	CO57
122.06	11.	128.54	0.86	3.582E-02	121.78	28.580	PBC<MDA	EU152
					122.06	85.600	2.046E-01	CO57
133.02	14.	130.33	0.87	3.492E-02	133.02	43.300	PBC<MDA	HF181
133.54	13.	132.81	0.87	3.487E-02	133.54	11.090	PBC<MDA	CE144
140.51	13.	138.12	0.88	3.411E-02	140.51	89.300	PBC<MDA	Tc99m

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
143.70	13.	131.97	0.88	3.371E-02	143.79	10.960	PBC<MDA	U235
145.44	13.	134.80	0.88	3.351E-02	145.44	48.200	PBC<MDA	CE141
165.85	13.	113.25	0.91	3.133E-02	165.85	79.900	PBC<MDA	CE139
176.60	23.	53.19	0.92	2.975E-02	176.60	17.000	PBC<MDA	Cf251
193.51	3.	534.59	0.93	2.758E-02	193.51	4.400	PBC<MDA	TH229
210.85	10.	159.25	0.95	2.569E-02	210.85	2.990	PBC<MDA	TH229
238.71	147.	11.23	0.87	2.319E-02	238.63	43.300	8.114E+00	PB212
242.12	46.	25.34	0.98	2.293E-02	242.00	7.430	1.493E+01	PB214
256.24	5.	263.21	1.00	2.186E-02	256.24	7.000	PBC<MDA	TH227
295.47	106.	11.14	0.89	1.943E-02	295.09	19.300	1.497E+01	PB214
300.41	24.	27.41	1.87	1.918E-02	300.03	3.280	2.163E+01	PB212
					300.07	2.460	2.885E+01	PA231
					300.18	6.200	1.145E+01	PA233
312.01	11.	150.18	1.05	1.857E-02	312.01	36.000	PBC<MDA	PA233
338.35	28.	26.41	1.06	1.736E-02	338.32	12.010	7.460E+00	AC228
340.57	9.	144.30	1.08	1.727E-02	340.57	46.900	PBC<MDA	Cs136
344.29	9.	151.22	1.08	1.711E-02	344.29	26.500	PBC<MDA	EU152
352.00	148.	10.18	1.08	1.680E-02	351.93	37.600	1.298E+01	PB214
364.48	21.	47.14	1.10	1.632E-02	364.48	81.700	PBC<MDA	I131
383.84	6.	140.66	1.12	1.563E-02	383.84	8.940	PBC<MDA	BA133
387.95	8.	124.21	1.12	1.549E-02	387.95	66.000	PBC<MDA	Cf249
391.69	5.	172.75	1.12	1.537E-02	391.69	64.000	PBC<MDA	SN113
433.94	5.	142.83	1.16	1.411E-02	433.94	90.480	PBC<MDA	AG108M
453.88	7.	102.35	1.18	1.360E-02	453.88	65.000	PBC<MDA	pm146
463.37	10.	96.66	1.19	1.336E-02	463.37	10.470	PBC<MDA	SB125
477.60	29.	25.48	1.20	1.303E-02	477.60	10.520	1.162E+01	BE7
482.00	4.	206.90	1.21	1.293E-02	482.00	80.500	PBC<MDA	HF181
511.86	56.	29.65	2.48	1.230E-02	511.86	20.000	1.257E+01	RH106
569.47	3.	213.54	1.29	1.125E-02	569.32	15.380	PBC<MDA	CS134
					569.47	8.200	2.007E+00	PA234
					569.70	97.740	1.685E-01	BI207
569.70	6.	80.09	1.29	1.125E-02	569.32	15.380	2.030E+00	CS134
					569.47	8.200	3.808E+00	PA234
					569.70	97.740	3.196E-01	BI207
583.34	57.	13.25	0.79	1.103E-02	583.02	84.500	3.397E+00	TL208
600.50	8.	234.15	1.31	1.076E-02	600.50	17.860	PBC<MDA	SB125
602.73	8.	239.14	1.32	1.073E-02	602.73	98.260	PBC<MDA	SB124
609.43	106.	10.88	1.54	1.063E-02	609.31	46.090	1.198E+01	BI214
610.30	8.	233.13	1.32	1.062E-02	610.30	5.750	PBC<MDA	RU103
614.28	8.	241.15	1.33	1.056E-02	614.28	89.850	PBC<MDA	AG108M
635.89	7.	77.09	1.34	1.026E-02	635.89	11.310	PBC<MDA	SB125
636.97	1.	557.69	1.34	1.025E-02	636.97	7.170	PBC<MDA	I131
661.16	4.	225.48	1.37	9.924E-03	661.66	85.210	PBC<MDA	CS137
722.79	6.	126.62	1.42	9.217E-03	722.79	10.810	PBC<MDA	SB124
					722.94	90.840	3.650E-01	AG108M
					723.36	20.220	1.641E+00	EU154
735.72	4.	210.42	1.43	9.081E-03	735.72	22.500	PBC<MDA	pm146
747.16	4.	131.31	1.44	8.965E-03	747.16	34.000	PBC<MDA	pm146

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
765.79	7.	149.41	1.45	8.781E-03	765.79	99.790	PBC<MDA	NB95
					766.41	0.294	1.569E+02	PA234M
766.41	11.	82.56	1.45	8.776E-03	765.79	99.790	PBC<MDA	NB95
					766.41	0.294	2.432E+02	PA234M
795.87	17.	35.72	1.48	8.503E-03	795.87	85.530	1.324E+00	CS134
801.95	5.	146.39	1.48	8.448E-03	801.95	8.690	PBC<MDA	CS134
815.77	7.	109.40	1.49	8.328E-03	815.77	23.280	PBC<MDA	La140
818.50	7.	101.03	1.50	8.305E-03	818.50	100.000	PBC<MDA	Cs136
834.85	4.	132.73	1.51	8.168E-03	834.85	99.980	PBC<MDA	MN54
846.77	7.	94.25	1.52	8.072E-03	846.77	99.935	PBC<MDA	Co56
858.74	5.	177.22	1.53	7.963E-03	860.56	12.420	PBC<MDA	TL208
911.21	31.	21.53	1.05	7.591E-03	911.07	29.000	7.864E+00	AC228
968.56	11.	88.23	1.61	7.209E-03	968.97	17.460	PBC<MDA	AC228
996.33	4.	179.85	1.63	7.042E-03	996.33	10.600	PBC<MDA	EU154
1037.84	6.	99.59	1.66	6.805E-03	1037.84	14.130	PBC<MDA	Co56
1048.07	6.	72.66	1.67	6.749E-03	1048.07	80.000	PBC<MDA	Cs136
1050.36	5.	115.37	1.67	6.736E-03	1050.36	1.560	PBC<MDA	RH106
1077.40	1.	702.38	1.69	6.594E-03	1077.40	3.300	PBC<MDA	Ga68
1099.25	2.	236.19	1.71	6.484E-03	1099.25	56.500	PBC<MDA	FE59
1112.07	3.	337.94	1.72	6.421E-03	1112.07	13.644	PBC<MDA	EU152
1120.26	3.	217.07	1.72	6.381E-03	1120.29	15.100	PBC<MDA	BI214
					1120.55	99.987	PBC<MDA	Sc46
1120.55	6.	118.42	1.72	6.380E-03	1120.29	15.100	PBC<MDA	BI214
					1120.55	99.987	5.215E-01	Sc46
					1121.30	34.900	1.495E+00	Ta182
1121.16	6.	127.06	1.72	6.376E-03	1120.55	99.987	PBC<MDA	Sc46
					1121.30	34.900	1.495E+00	Ta182
1173.24	5.	182.44	1.76	6.138E-03	1173.24	99.900	PBC<MDA	CO60
1188.69	4.	180.85	1.77	6.069E-03	1189.05	16.200	PBC<MDA	Ta182
1221.41	5.	145.77	1.79	5.934E-03	1221.41	27.000	PBC<MDA	Ta182
1291.60	6.	41.45	1.84	5.661E-03	1291.60	43.200	PBC<MDA	FE59
1384.30	6.	40.82	1.90	5.340E-03	1384.30	24.290	PBC<MDA	AG110M
1408.00	3.	206.16	1.91	5.264E-03	1408.00	21.005	PBC<MDA	EU152
1461.07	140.	8.67	1.50	5.103E-03	1460.83	10.670	1.432E+02	K40
1764.81	20.	24.44	2.11	4.351E-03	1764.49	15.400	1.667E+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 *****

Channel	Peak Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 1 Sigma	FWHM % keV	Suspected Nuclide
298.88	74.79	95.	113.	3.593E+03	15.41	0.813	- D
307.98	77.06	72.	163.	5.057E+03	10.80	0.815	- 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	186.53	46.75	64.	42.	0.023	35.82	0.761
TH-227	200.11	50.14	51.	28.	0.015	47.24	0.787s
AM-241	237.72	59.54	120.	-17.	-0.010	79.17	0.797s
TH-234	252.74	63.29	158.	-17.	-0.010	76.30	0.801
Sn-126	256.71	64.28	163.	8.	0.005	221.53	0.802s
BA-133	323.61	80.99	187.	-21.	-0.012	116.04	0.819s
Np-237	345.63	86.49	488.	0.	0.000	165.72	0.825A
EU-155	345.84	86.54	371.	8.	0.004	341.89	0.825
Sn-126	347.43	86.94	379.	10.	0.005	151.03	0.825D
Sn-126	349.95	87.57	329.	27.	0.015	49.53	0.826D
Cd-109	351.83	88.04	347.	0.	0.000	1000.00	0.826A
Nd-147	364.08	91.10	364.	15.	0.008	180.25	0.829s
TH-234	370.05	92.59	98.	21.	0.011	72.29	0.831D
AC-228	373.09	93.35	402.	-15.	-0.008	187.96	0.832
Gd-153	389.70	97.50	120.	-16.	-0.009	100.41	0.836s
Np-239	397.71	99.50	123.	14.	0.008	115.41	0.838s
Gd-153	412.52	103.20	122.	6.	0.004	243.98	0.842
Np-239	414.52	103.70	108.	11.	0.006	134.87	0.842s
EU-155	420.98	105.31	291.	-17.	-0.009	88.67	0.844s
Np-239	424.25	106.13	243.	-15.	-0.008	146.70	0.845s
EU-152	486.88	121.78	87.	13.	0.007	107.53	0.861s
CO-57	488.03	122.06	100.	11.	0.006	128.54	0.861s
EU-154	492.18	123.10	125.	-16.	-0.009	94.52	0.862s
PA-234	524.99	131.29	176.	-13.	-0.007	146.96	0.871
HF-181	531.91	133.02	150.	14.	0.008	130.33	0.872s
CE-144	533.97	133.54	137.	13.	0.007	132.81	0.873s
Tc-99m	561.88	140.51	163.	13.	0.007	138.12	0.880s
U-235	574.99	143.79	150.	13.	0.007	131.97	0.883
CE-141	581.61	145.44	140.	13.	0.007	134.80	0.885s
Ba-140	650.54	162.66	132.	-11.	-0.006	150.76	0.902s
U-235	653.42	163.38	143.	0.	0.000	1000.00	0.903
CE-139	663.32	165.85	102.	13.	0.007	113.25	0.905s
Cf-251	706.34	176.60	40.	23.	0.013	53.19	0.916s
TH-229	774.03	193.51	63.	3.	0.001	534.59	0.933s
U-235	821.35	205.33	71.	-9.	-0.005	163.62	0.945
TH-229	843.44	210.85	70.	10.	0.005	159.25	0.950s
Cf-251	908.08	227.00	57.	-8.	-0.004	178.42	0.966s
PB-212	954.64	238.63	29.	158.	0.088	9.30	0.978D
PB-214	968.10	242.00	44.	46.	0.025	25.34	0.981D
EU-152	978.89	244.69	338.	-14.	-0.008	186.16	0.984s
TH-227	1025.11	256.24	44.	5.	0.003	263.21	0.995s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Cd-113m	1054.97	263.70	48.	0.	0.000	1000.00	1.002s
BI-210M	1063.50	265.83	78.	-6.	-0.003	230.34	1.005s
TL-208	1109.33	277.28	46.	-1.	-0.001	964.37	1.016s
Hg-203	1117.00	279.20	81.	-14.	-0.008	93.75	1.017s
PB-214	1182.11	295.47	13.	101.	0.056	11.84	0.893s
PB-212	1201.88	300.41	6.	24.	0.014	27.41	1.867s
PA-231	1200.53	300.07	183.	-13.	-0.007	149.45	1.038s
PA-233	1200.97	300.18	170.	-13.	-0.007	144.22	1.038s
PA-231	1210.86	302.65	160.	-13.	-0.007	139.77	1.040
BA-133	1211.66	302.85	173.	-12.	-0.006	163.02	1.040
Ba-140	1219.66	304.85	184.	0.	0.000	1000.00	1.042s
BI-210M	1219.85	304.90	184.	0.	0.000	1000.00	1.042s
Ir-192	1234.03	308.44	184.	0.	0.000	1000.00	1.046s
PA-233	1248.32	312.01	130.	11.	0.006	150.18	1.049s
Ir-192	1266.25	316.49	84.	-13.	-0.007	102.18	1.053s
CR-51	1280.63	320.08	112.	-15.	-0.008	105.01	1.057s
Cf-249	1334.08	333.44	40.	-1.	-0.001	895.30	1.070s
AC-228	1353.75	338.35	10.	28.	0.016	26.41	1.062
Cs-136	1362.62	340.57	83.	9.	0.005	144.30	1.077s
EU-152	1377.49	344.29	92.	9.	0.005	151.22	1.080s
HF-181	1383.66	345.83	121.	-11.	-0.006	141.23	1.082s
PB-214	1408.36	352.00	23.	148.	0.082	10.18	1.083
BA-133	1424.36	356.00	214.	-11.	-0.006	184.34	1.091s
I-131	1458.32	364.48	22.	21.	0.012	47.14	1.099s
BA-133	1535.78	383.84	37.	6.	0.004	140.66	1.117s
Cf-249	1552.22	387.95	43.	8.	0.004	124.21	1.121s
SN-113	1567.19	391.69	42.	5.	0.003	172.75	1.125s
SB-125	1711.99	427.88	28.	-6.	-0.004	148.61	1.158s
AG-108M	1736.25	433.94	12.	5.	0.003	142.83	1.164s
pm-146	1816.05	453.88	12.	7.	0.004	102.35	1.182s
SB-125	1854.01	463.37	43.	10.	0.006	96.66	1.191
Ir-192	1872.79	468.06	67.	-10.	-0.006	115.10	1.195s
BE-7	1910.94	477.59	12.	29.	0.016	25.48	1.204s
HF-181	1928.56	482.00	36.	4.	0.002	206.90	1.208s
La-140	1948.65	487.02	32.	-12.	-0.007	97.28	1.212s
RU-103	1988.80	497.05	20.	-2.	-0.001	443.47	1.221s
RH-106	2048.06	511.86	33.	56.	0.031	29.65	2.485s
Nd-147	2124.62	531.00	28.	-10.	-0.006	108.32	1.252s
CS-134	2253.60	563.24	20.	-2.	-0.001	443.47	1.280s
CS-134	2277.94	569.32	25.	-2.	-0.001	360.56	1.286s
PA-234	2278.54	569.47	24.	3.	0.002	213.54	1.286s
BI-207	2279.47	569.70	10.	6.	0.004	80.09	1.286s
TL-208	2334.02	583.34	0.	57.	0.032	13.25	0.791s
SB-125	2402.69	600.50	168.	8.	0.004	234.15	1.313s
SB-124	2411.61	602.73	175.	8.	0.004	239.14	1.315s
BI-214	2438.42	609.43	9.	106.	0.059	10.88	1.544
RU-103	2441.89	610.30	168.	8.	0.004	233.13	1.322s
AG-108M	2457.82	614.28	176.	8.	0.004	241.15	1.325s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
PM-144	2472.94	618.06	184.	0.	0.000	1000.00	1.328s
RH-106	2488.37	621.92	154.	-3.	-0.002	621.92	1.332s
SB-125	2544.26	635.89	10.	7.	0.004	77.09	1.344s
I-131	2548.61	636.97	17.	1.	0.001	557.69	1.345s
AG-110M	2631.76	657.76	50.	-12.	-0.006	90.77	1.362s
CS-137	2647.36	661.66	44.	4.	0.002	225.48	1.366
PM-144	2786.90	696.54	22.	-6.	-0.003	170.34	1.395s
NB-94	2811.25	702.63	13.	-1.	-0.001	742.74	1.400s
SB-124	2891.88	722.79	22.	6.	0.003	126.62	1.417
AG-108M	2892.48	722.94	27.	0.	0.000	1000.00	1.417
EU-154	2894.16	723.36	27.	0.	0.000	1000.00	1.418
ZR-95	2897.53	724.20	27.	0.	0.000	1000.00	1.418s
BI-212	2909.41	727.17	34.	-6.	-0.004	152.77	1.421s
pm-146	2943.61	735.72	18.	4.	0.002	210.42	1.428s
pm-146	2989.37	747.16	4.	4.	0.002	131.31	1.437s
ZR-95	3027.65	756.73	35.	-9.	-0.005	53.23	1.445s
AG-110M	3056.50	763.94	53.	-16.	-0.009	69.41	1.451s
NB-95	3063.89	765.79	56.	7.	0.004	149.41	1.453s
PA-234M	3066.38	766.41	38.	11.	0.006	82.56	1.453s
BI-212	3142.41	785.42	33.	-14.	-0.008	93.80	1.468s
CS-134	3184.19	795.87	5.	17.	0.010	35.72	1.477s
CS-134	3208.53	801.95	9.	5.	0.003	146.39	1.482s
CO-58	3243.82	810.78	48.	-12.	-0.006	41.38	1.489s
La-140	3263.80	815.77	29.	7.	0.004	109.40	1.493s
Cs-136	3274.72	818.50	24.	7.	0.004	101.03	1.495s
MN-54	3340.10	834.85	5.	4.	0.002	132.73	1.508s
Co-56	3387.78	846.77	9.	7.	0.004	94.25	1.518s
TL-208	3442.95	860.56	19.	5.	0.003	177.22	1.529s
NB-94	3485.08	871.10	14.	-7.	-0.004	70.52	1.537s
EU-154	3493.61	873.23	32.	-5.	-0.003	100.80	1.539s
PA-234	3522.80	880.53	41.	-11.	-0.006	90.01	1.544s
PA-234	3533.64	883.24	52.	-2.	-0.001	644.06	1.547s
AG-110M	3539.41	884.68	54.	0.	0.000	1000.00	1.547s
Sc-46	3557.79	889.28	65.	-9.	-0.005	128.54	1.551s
AC-228	3645.50	911.21	4.	31.	0.017	21.53	1.051s
AG-110M	3750.60	937.49	14.	0.	0.000	1000.00	1.589s
PA-234	3784.70	946.02	9.	-1.	-0.001	493.71	1.595s
AC-228	3876.48	968.97	19.	11.	0.006	88.23	1.612s
EU-154	3985.88	996.33	30.	4.	0.002	179.85	1.633s
PA-234M	4004.55	1001.00	35.	0.	0.000	1000.00	1.636s
Co-56	4151.87	1037.84	5.	6.	0.003	99.59	1.664s
Cs-136	4192.77	1048.07	6.	6.	0.003	72.66	1.671s
RH-106	4201.93	1050.36	12.	5.	0.003	115.37	1.673s
BI-207	4255.11	1063.66	15.	-2.	-0.001	431.57	1.682s
Ga-68	4310.04	1077.40	10.	1.	0.001	702.38	1.692s
FE-59	4397.41	1099.25	6.	2.	0.001	236.19	1.708s
EU-152	4448.68	1112.07	44.	3.	0.002	337.94	1.717s
ZN-65	4462.56	1115.55	47.	0.	0.000	1000.00	1.720s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
BI-214	4481.51	1120.29	19.	3.	0.002	217.07	1.723s
Sc-46	4482.57	1120.55	22.	6.	0.003	118.42	1.723s
Ta-182	4485.56	1121.30	26.	6.	0.003	127.06	1.724s
CO-60	4693.21	1173.24	16.	5.	0.003	182.44	1.760s
Ta-182	4756.42	1189.05	10.	4.	0.002	180.85	1.771s
Ta-182	4885.79	1221.41	11.	5.	0.003	145.77	1.793
Co-56	4953.23	1238.28	22.	-3.	-0.002	311.56	1.804s
NA-22	5098.13	1274.53	16.	-4.	-0.002	150.00	1.828s
EU-154	5098.19	1274.54	20.	0.	0.000	1000.00	1.828s
FE-59	5166.35	1291.60	0.	6.	0.003	41.45	1.840s
CO-60	5329.85	1332.50	16.	-4.	-0.002	61.42	1.866s
AG-110M	5536.88	1384.30	0.	6.	0.003	40.82	1.899s
EU-152	5631.62	1408.00	5.	3.	0.001	206.16	1.914s
K-40	5843.70	1461.07	4.	140.	0.078	8.67	1.501s
La-140	6383.73	1596.21	11.	-7.	-0.004	113.82	2.024s
SB-124	6762.39	1690.98	0.	0.	0.000	1000.00	2.076s
BI-214	7056.06	1764.49	2.	20.	0.011	24.44	2.114s
Co-56	7083.46	1771.35	32.	-7.	-0.004	115.70	2.117s

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	- Average Code	Activity Bq/Sample	Energy keV	Peak Activity Bq/Sample	Code	MDA Value Bq/Sample	COMMENTS
BE-7	C	1.1618E+01	477.60	1.162E+01	?(	7.731E+00 2.55E+01	5.31E+01 1.05E+01 G
NA-22	C	-3.8841E-01	1274.53	-3.884E-01	?(	2.073E+00 1.50E+02	9.50E+02 9.99E+01 G
K-40	N	1.4318E+02	1460.83	1.432E+02	(P	1.187E+01 8.67E+00	4.66E+11 1.07E+01 G
Sc-46	F	-6.7969E-02	889.28	-6.575E-01	?(	2.886E+00 1.29E+02	8.38E+01 1.00E+02 G
			1120.55	5.215E-01	?(	2.146E+00 1.18E+02	1.00E+02 G
CR-51	F	-4.5213E+00	320.08	-4.521E+00	?(	1.599E+01 1.05E+02	2.77E+01 9.94E+00 G
MN-54	C	2.6112E-01	834.85	2.611E-01	(P	9.045E-01 1.33E+02	3.12E+02 1.00E+02 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
FE-59	F	7.8085E-01					4.45E+01	
			1099.25	3.400E-01	?(P	2.107E+00	2.36E+02	5.65E+01 G
			1291.60	1.357E+00	?(P	1.674E+00	4.15E+01 4.32E+01 G	
Co-56	C	8.4569E-01					7.73E+01	
			846.77	5.139E-01	&(1.167E+00	9.43E+01	9.99E+01 G
			1238.28	4.145E-01	- P	3.514E+00	3.12E+02	6.61E+01 G
			1037.84	3.192E+00	?(P	7.739E+00	9.96E+01	1.41E+01 G
			1771.35	6.083E+00	+	2.422E+01	1.16E+02 1.55E+01 A	
CO-57	C	2.0461E-01					2.72E+02	
			122.06	2.046E-01	(8.922E-01	1.29E+02	8.56E+01 G
			136.47	1.435E-07	%	8.997E+00	1.82E+09 1.07E+01 G	
CO-58	C	-7.8012E-01	810.78	7.801E-01	?(P	2.345E+00	4.14E+01 9.95E+01 G	
CO-60	F	-4.3290E-01					1.93E+03	
			1332.50	4.329E-01	?(P	2.169E+00	6.14E+01	1.00E+02 G
			1173.24	4.436E-01	+ P	1.940E+00	1.82E+02 9.99E+01 G	
NB-94	I	-6.0127E-02					7.41E+06	
			702.63	6.013E-02	?(1.173E+00	7.43E+02	9.79E+01 G
			871.10	5.196E-01	+ P	1.437E+00	7.05E+01 9.99E+01 G	
ZR-95	I	-1.0346E+00					6.40E+01	
			756.73	1.035E+00	?(P	3.482E+00	5.32E+01	5.45E+01 G
			724.20	0.000E+00	+	3.682E+00	1.00E+03 4.42E+01 G	
NB-95	I	4.6196E-01	765.79	4.620E-01	?(	2.375E+00	1.49E+02 9.98E+01 G
RU-103	I	-9.6988E-02					3.93E+01	
			497.05	9.699E-02	?(1.142E+00	4.43E+02	9.09E+01 G
			610.30	7.243E+00	?	5.746E+01	2.33E+02 5.75E+00 GA	
RH-106	I	2.0574E+00					3.74E+02	
			621.92	1.517E+00	?(3.239E+01	6.22E+02	9.93E+00 G
			1050.36	2.481E+01	?(1.008E+02	1.15E+02	1.56E+00 G
			511.86	1.257E+01	?	6.689E+00	2.96E+01 2.00E+01 GA	
AG-108M	C	3.3871E-01					1.53E+05	
			433.94	2.175E-01	?(8.202E-01	1.43E+02	9.05E+01 G
			722.94	0.000E+00	-	1.787E+00	1.00E+03	9.08E+01 G
			614.28	4.607E-01	?(	3.780E+00	2.41E+02 8.98E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
AG-110M	F	4.7531E-01					2.50E+02
		884.68	0.000E+00	?(	3.620E+00	1.00E+03	7.27E+01 G
		657.76	-6.829E-01	+	2.092E+00	9.08E+01	9.46E+01 G
		937.49	0.000E+00	?(	4.395E+00	1.00E+03	3.44E+01 G
		1384.30	2.570E+00	?(	3.157E+00	4.08E+01	2.43E+01 G
		763.94	-4.521E+00	+	1.041E+01	6.94E+01	2.23E+01 G
SN-113	F	3.0942E-01					1.15E+02
		391.69	3.094E-01	&(P	1.857E+00	1.73E+02	6.40E+01 G
SB-124	F	6.7995E-01					6.02E+01
		602.73	4.174E-01	?(	3.395E+00	2.39E+02	9.83E+01 G
		1690.98	0.000E+00	-	1.899E+00	1.00E+03	4.78E+01 G
		722.79	3.067E+00	?(	1.356E+01	1.27E+02	1.08E+01 G
SB-125	I	1.3552E+00					1.01E+03
		427.88	-8.425E-01	?(P	3.621E+00	1.49E+02	2.96E+01 G
		600.50	2.286E+00	?(	1.821E+01	2.34E+02	1.79E+01 G
		635.89	3.163E+00	?(	8.234E+00	7.71E+01	1.13E+01 G
		463.37	4.028E+00	(	1.321E+01	9.67E+01	1.05E+01 G
I-131	I	8.6918E-01					8.02E+00
		364.48	8.751E-01	?(	1.024E+00	4.71E+01	8.17E+01 G
		284.30	4.511E-01	&	1.330E+01	1.08E+03	6.14E+00 G
		636.97	8.017E-01	?(	1.656E+01	5.58E+02	7.17E+00 G
Gd-153	F	-8.2480E-01					2.42E+02
		97.50	-8.248E-01	?(	2.783E+00	1.00E+02	3.00E+01 G
		103.20	4.587E-01	&	3.831E+00	2.44E+02	2.18E+01 G
Ga-68	C	3.0026E+00					4.71E-02
		1077.40	3.003E+00	?(	5.238E+01	7.02E+02	3.30E+00 G
Tc-99m	I	2.5105E-01					2.51E-01
		140.51	2.511E-01	*(	1.171E+00	1.38E+02	8.93E+01 G
BA-133	F	-6.1245E-01					3.85E+03
		356.00	-6.125E-01	?(	3.818E+00	1.84E+02	6.20E+01 G
		302.85	-1.846E+00	+	1.018E+01	1.63E+02	1.83E+01 G
		383.84	2.523E+00	&	1.230E+01	1.41E+02	8.94E+00 GA
		80.99	-1.048E+00	+	3.261E+00	1.16E+02	3.41E+01 GA
CS-134	I	7.6850E-01					7.54E+02
		604.71	3.570E-02	%(<	3.500E+00	2.86E+03	9.76E+01 G
		795.87	1.324E+00	?(	9.761E-01	3.57E+01	8.55E+01 G
		569.32	-6.420E-01	+	8.349E+00	3.61E+02	1.54E+01 G
		801.95	3.531E+00	&(	1.282E+01	1.46E+02	8.69E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		563.24	-1.172E+00	+	1.380E+01	4.43E+02	8.35E+00 G
CS-137	I 2.8169E-01	661.66	2.817E-01	?(P	2.212E+00	2.25E+02	1.10E+04 8.52E+01 G
CE-139	F 2.8823E-01	165.85	2.882E-01	@(	1.103E+00	1.13E+02	1.38E+02 7.99E+01 G
Ba-140	I 5.2763E-02	537.26	5.276E-02	%(P	4.198E+00	2.91E+03	1.28E+01 2.44E+01 G
		162.66	-3.156E+00	+	1.614E+01	1.51E+02	6.22E+00 G
		304.85	0.000E+00	&	4.514E+01	1.00E+03	4.29E+00 G
La-140	I -3.1232E-01	1596.21	-9.018E-01	?(	2.262E+00	1.14E+02	1.28E+01 9.54E+01 G
		487.02	-1.136E+00	+	2.769E+00	9.73E+01	4.55E+01 G
		328.76	5.131E-02	%	5.370E+00	3.88E+03	2.03E+01 G
		815.77	2.103E+00	?(	7.915E+00	1.09E+02	2.33E+01 G
CE-141	I 4.3669E-01	145.44	4.367E-01	&(	1.990E+00	1.35E+02	3.25E+01 4.82E+01 G
CE-144	I 1.8331E+00	133.54	1.833E+00	&(	8.232E+00	1.33E+02	2.85E+02 1.11E+01 G
PM-144	C -3.3592E-01	696.54	-3.359E-01	?(P	1.441E+00	1.70E+02	3.63E+02 9.90E+01 G
		618.06	0.000E+00	+	3.517E+00	1.00E+03	9.91E+01 G
EU-152	F 1.0770E+00	344.29	1.127E+00	?(	5.813E+00	1.51E+02	4.94E+03 2.65E+01 G
		1112.07	1.792E+00	?(	2.136E+01	3.38E+02	1.36E+01 G
		121.78	6.893E-01	?(	2.505E+00	1.08E+02	2.86E+01 G
		778.92	-3.306E-01	%	1.133E+01	1.38E+03	1.29E+01 G
		964.11	1.752E-01	%	1.868E+01	3.00E+03	1.46E+01 G
		244.69	-4.553E+00	+	2.852E+01	1.86E+02	7.58E+00 G
		1408.00	1.340E+00	?	6.769E+00	2.06E+02	2.10E+01 GA
EU-154	I -8.2445E-02	873.23	-3.047E+00	?(P	1.680E+01	1.01E+02	3.14E+03 1.23E+01 G
		123.10	-6.053E-01	+ P	2.090E+00	9.45E+01	4.08E+01 G
		1274.54	0.000E+00	+	6.494E+00	1.00E+03	3.52E+01 G
		723.36	0.000E+00	+	8.031E+00	1.00E+03	2.02E+01 G
		1004.77	2.206E-01	%	1.362E+01	1.71E+03	1.80E+01 G
		996.33	3.349E+00	&(	2.117E+01	1.80E+02	1.06E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
EU-155	I	-1.2180E+00					1.81E+03
			105.31-1.218E+00	@(P	5.958E+00	8.87E+01	2.12E+01 G
			86.54	4.219E-01	&	4.870E+00	3.42E+02 3.07E+01 G
HF-181	F	3.2019E-01					4.24E+01
			482.00	2.242E-01	?(	1.630E+00	2.07E+02 8.05E+01 G
			133.02	4.986E-01	&(	2.194E+00	1.30E+02 4.33E+01 G
			345.83-2.440E+00	+	1.169E+01	1.41E+02 1.51E+01 G	
			136.30	2.619E-07	%	1.642E+01	1.82E+09 5.85E+00 G
Ta-182	F	1.7764E+00					1.14E+02
			1121.30	1.495E+00	?(	6.605E+00	1.27E+02 3.49E+01 G
			1221.41	1.849E+00	(	6.217E+00	1.46E+02 2.70E+01 G
			1189.05	2.260E+00	?(	9.858E+00	1.81E+02 1.62E+01 G
Hg-203	F	-4.7416E-01					4.66E+01
			279.20-4.742E-01	?(	1.495E+00	9.38E+01	8.15E+01 G
TL-208	N	3.3456E+00					6.98E+02
			583.02	3.397E+00	(	4.392E-01	1.32E+01 8.45E+01 G
			277.28-4.299E-01	-	1.475E+01	9.64E+02 6.31E+00 G	
			860.56	2.996E+00	&(	1.283E+01	1.77E+02 1.24E+01 G
pm-146	C	6.3224E-01					2.02E+03
			747.16	6.504E-01	?(P	2.282E+00	1.31E+02 3.40E+01 G
			735.72	1.138E+00	?(P	6.085E+00	2.10E+02 2.25E+01 G
			453.88	4.477E-01	?(	1.185E+00	1.02E+02 6.50E+01 G
y-88	F	4.0488E-03					1.07E+02
			898.04	4.049E-03	%(P	1.343E+00	1.26E+04 9.37E+01 G
			1836.06-4.150E-02	% P	9.809E-01	1.60E+03 9.92E+01 G	
Cf-251	T	2.5267E+00					3.28E+05
			176.60	2.527E+00	(	3.535E+00	5.32E+01 1.70E+01 G
			227.00-2.797E+00	-	1.379E+01	1.78E+02 6.30E+00 GA	
Cf-249	T	4.2367E-01					1.28E+05
			387.95	4.237E-01	?(	1.808E+00	1.24E+02 6.60E+01 G
			333.44-2.718E-01	&	6.585E+00	8.95E+02 1.55E+01 G	
Sn-126		1.7143E+00					3.65E+07
			87.57	1.165E+00	}	3.744E+00	4.95E+01 3.75E+01 GA
			64.28	1.714E+00	?(	1.292E+01	2.22E+02 9.70E+00 G
			86.94	1.714E+00	}	1.668E+01	1.51E+02 9.04E+00 GA

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
PB-210	N 3.0795E+01	46.54	3.079E+01	(P	2.921E+01	3.58E+01	8.14E+03 4.25E+00 G
PB-212	N 8.7621E+00	238.63 300.03	8.762E+00 2.163E+01	(+	1.543E+00 1.288E+01	9.30E+00 2.74E+01	6.98E+02 4.33E+01 G 3.28E+00 GA
PB-214	N 1.3660E+01	351.93 295.09 242.00	1.298E+01 1.497E+01 1.493E+01	(P @P P	2.218E+00 2.871E+00 1.099E+01	1.02E+01 1.18E+01 2.53E+01	5.84E+05 3.76E+01 G 1.93E+01 G 7.43E+00 GA
BI-207	C 3.1962E-01	569.70 1063.66	3.196E-01 -2.238E-01	?(-	8.692E-01 2.322E+00	8.01E+01 4.32E+02	1.18E+04 9.77E+01 G 7.45E+01 G
BI-212	N -5.1114E+00	727.17 785.42	-5.111E+00 -6.819E+01	?(P +	2.410E+01 1.481E+02	1.53E+02 9.38E+01	6.98E+02 7.55E+00 G 1.28E+00 GA
BI-214	N 1.1979E+01	609.31 1120.29 1764.49	1.198E+01 1.723E+00 1.667E+01	(P - P + P	1.921E+00 1.332E+01 7.566E+00	1.09E+01 2.17E+02 2.44E+01	5.84E+05 4.61E+01 G 1.51E+01 G 1.54E+01 G
BI-210M	T -2.8815E-01	265.83 304.90	-2.881E-01 0.000E+00	&(&	2.291E+00 6.916E+00	2.30E+02 1.00E+03	1.10E+09 5.00E+01 G 2.80E+01 G
AC-228	N 7.7456E+00	911.07 968.97 338.32 93.35	7.864E+00 4.924E+00 7.460E+00 -4.303E+00	(P - P (-	2.988E+00 1.017E+01 4.648E+00 2.717E+01	2.15E+01 8.82E+01 2.64E+01 1.88E+02	2.10E+03 2.90E+01 G 1.75E+01 G 1.20E+01 G 5.56E+00 XA
TH-227	N 9.6073E+00	50.14 256.24	9.607E+00 1.742E+00	*(P - P	1.244E+01 1.223E+01	4.72E+01 2.63E+02	7.95E+03 8.00E+00 G 7.00E+00 G
TH-229	N 3.5277E+00	193.51 210.85	1.221E+00 6.923E+00	?(?(P	1.822E+01 3.024E+01	5.35E+02 1.59E+02	2.68E+06 4.40E+00 G 2.99E+00 G
TH-234	N -9.2407E+00	63.29 92.59	-9.241E+00 5.788E+00	?(P + P	3.297E+01 1.378E+01	7.63E+01 7.23E+01	1.63E+12 3.81E+00 G 5.58E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments		
PA-231	N	-1.3213E+01					1.20E+07		
			302.65-1.321E+01	?(	6.239E+01	1.40E+02	2.88E+00	G	
			300.07-1.532E+01	+	7.735E+01	1.49E+02	2.46E+00	G	
PA-233	C	9.0976E-01					7.82E+08		
			312.01	9.098E-01	?(	4.635E+00	1.50E+02	3.60E+01	G
			300.18-6.082E+00	+	2.963E+01	1.44E+02	6.20E+00	G	
PA-234	N	-1.5731E-01					1.63E+12		
			131.29-1.143E+00	?(	5.676E+00	1.47E+02	1.80E+01	G	
			946.02-7.516E-01	+	9.552E+00	4.94E+02	1.34E+01	G	
			569.47	2.007E+00	?(	1.528E+01	2.14E+02	8.20E+00	G
			883.24-1.186E+00	&	2.699E+01	6.44E+02	9.60E+00	G	
			880.53-1.273E+01	+	3.872E+01	9.00E+01	6.00E+00	GA	
PA-234M	N	6.3224E+01					1.63E+12		
			1001.00	0.000E+00	?(	2.865E+02	1.00E+03	8.37E-01	G
			766.41	2.432E+02	?(	6.756E+02	8.26E+01	2.94E-01	G
U-235	N	2.0137E+00					2.57E+11		
			143.79	2.014E+00	?(	8.974E+00	1.32E+02	1.10E+01	G
			205.33-3.904E+00	+	P	1.775E+01	1.64E+02	5.01E+00	G
			163.38	0.000E+00	-	2.060E+01	1.00E+03	5.08E+00	G
AM-241	T	-1.0639E+00					1.58E+05		
			59.54-1.064E+00	?(P	3.289E+00	7.92E+01	3.59E+01	G	
Ir-192	F	-4.5950E-01					7.40E+01		
			316.49-4.595E-01	?(	1.584E+00	1.02E+02	8.70E+01	G	
			468.06-8.489E-01	+	3.321E+00	1.15E+02	5.18E+01	G	
			308.44	0.000E+00	&	6.158E+00	1.00E+03	3.18E+01	G
Cs-136	F	5.5751E-01					1.30E+01		
			818.50	4.918E-01	?(	1.705E+00	1.01E+02	1.00E+02	G
			1048.07	5.976E-01	&(	1.453E+00	7.27E+01	8.00E+01	G
			340.57	6.293E-01	?(	3.099E+00	1.44E+02	4.69E+01	G
Np-239	T	-1.0327E+00					2.36E+00		
			103.70	7.155E-01	?	3.274E+00	1.35E+02	2.40E+01	X
			106.13-1.033E+00	&(	5.099E+00	1.47E+02	2.27E+01	G	
			99.50	1.442E+00	?	5.615E+00	1.15E+02	1.50E+01	X
Nd-147		-3.5832E+00					1.11E+01		
			531.00-3.583E+00	&(	9.807E+00	1.08E+02	1.30E+01	G	
			91.10	8.462E-01	+	5.126E+00	1.80E+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	51.	28.	0.015	47.24	9.607E+00	P
AM-241	59.54	120.	-17.	-0.010	79.17	-1.064E+00	P
BA-133	80.99	187.	-21.	-0.012	116.04	-1.048E+00	
EU-155	86.54	371.	8.	0.004	341.89	4.219E-01	
Nd-147	91.10	364.	15.	0.008	180.25	8.462E-01	
Gd-153	97.50	120.	-16.	-0.009	100.41	-8.248E-01	
Np-239	99.50	123.	14.	0.008	115.41	1.442E+00	
Gd-153	103.20	122.	6.	0.004	243.98	4.587E-01	
Np-239	103.70	108.	11.	0.006	134.87	7.155E-01	
EU-155	105.31	291.	-17.	-0.009	88.67	-1.218E+00	P
Np-239	106.13	243.	-15.	-0.008	146.70	-1.033E+00	
EU-152	121.78	87.	13.	0.007	107.53	6.893E-01	
CO-57	122.06	100.	11.	0.006	128.54	2.046E-01	
EU-154	123.10	125.	-16.	-0.009	94.52	-6.053E-01	P
PA-234	131.29	176.	-13.	-0.007	146.96	-1.143E+00	
HF-181	133.02	150.	14.	0.008	130.33	4.986E-01	
CE-144	133.54	137.	13.	0.007	132.81	1.833E+00	
Tc-99m	140.51	163.	13.	0.007	138.12	2.511E-01	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
CE-141	145.44	140.	13.	0.007	134.80	4.367E-01	
Ba-140	162.66	132.	-11.	-0.006	150.76	-3.156E+00	
CE-139	165.85	102.	13.	0.007	113.25	2.882E-01	
Cf-251	176.60	40.	23.	0.013	53.19	2.527E+00	
TH-229	193.51	63.	3.	0.001	534.59	1.221E+00	
TH-229	210.85	70.	10.	0.005	159.25	6.923E+00	P
Cf-251	227.00	57.	-8.	-0.004	178.42	-2.797E+00	
EU-152	244.69	338.	-14.	-0.008	186.16	-4.553E+00	
TH-227	256.24	44.	5.	0.003	263.21	1.742E+00	P
BI-210M	265.83	78.	-6.	-0.003	230.34	-2.881E-01	
Hg-203	279.20	81.	-14.	-0.008	93.75	-4.742E-01	
PA-231	300.07	183.	-13.	-0.007	149.45	-1.532E+01	
PA-233	300.18	170.	-13.	-0.007	144.22	-6.082E+00	
PA-231	302.65	160.	-13.	-0.007	139.77	-1.321E+01	
BA-133	302.85	173.	-12.	-0.006	163.02	-1.846E+00	
PA-233	312.01	130.	11.	0.006	150.18	9.098E-01	
Ir-192	316.49	84.	-13.	-0.007	102.18	-4.595E-01	
CR-51	320.08	112.	-15.	-0.008	105.01	-4.521E+00	
Cf-249	333.44	40.	-1.	-0.001	895.30	-2.718E-01	
Cs-136	340.57	83.	9.	0.005	144.30	6.293E-01	
EU-152	344.29	92.	9.	0.005	151.22	1.127E+00	
HF-181	345.83	121.	-11.	-0.006	141.23	-2.440E+00	
BA-133	356.00	214.	-11.	-0.006	184.34	-6.125E-01	
I-131	364.48	22.	21.	0.012	47.14	8.751E-01	
BA-133	383.84	37.	6.	0.004	140.66	2.523E+00	
Cf-249	387.95	43.	8.	0.004	124.21	4.237E-01	
SN-113	391.69	42.	5.	0.003	172.75	3.094E-01	P
SB-125	427.88	28.	-6.	-0.004	148.61	-8.425E-01	P
AG-108M	433.94	12.	5.	0.003	142.83	2.175E-01	
pm-146	453.88	12.	7.	0.004	102.35	4.477E-01	
SB-125	463.37	43.	10.	0.006	96.66	4.028E+00	
Ir-192	468.06	67.	-10.	-0.006	115.10	-8.489E-01	
HF-181	482.00	36.	4.	0.002	206.90	2.242E-01	
La-140	487.02	32.	-12.	-0.007	97.28	-1.136E+00	
RU-103	497.05	20.	-2.	-0.001	443.47	-9.699E-02	
RH-106	511.86	33.	56.	0.031	29.65	1.257E+01	
Nd-147	531.00	28.	-10.	-0.006	108.32	-3.583E+00	
CS-134	563.24	20.	-2.	-0.001	443.47	-1.172E+00	
CS-134	569.32	25.	-2.	-0.001	360.56	-6.420E-01	
PA-234	569.47	24.	3.	0.002	213.54	2.007E+00	
BI-207	569.70	10.	6.	0.004	80.09	3.196E-01	
SB-125	600.50	168.	8.	0.004	234.15	2.286E+00	
SB-124	602.73	175.	8.	0.004	239.14	4.174E-01	
RU-103	610.30	168.	8.	0.004	233.13	7.243E+00	
AG-108M	614.28	176.	8.	0.004	241.15	4.607E-01	
RH-106	621.92	154.	-3.	-0.002	621.92	-1.517E+00	
SB-125	635.89	10.	7.	0.004	77.09	3.163E+00	
I-131	636.97	17.	1.	0.001	557.69	8.017E-01	

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
AG-110M	657.76	50.	-12.	-0.006	90.77	-6.829E-01	
PM-144	696.54	22.	-6.	-0.003	170.34	-3.359E-01	P
NB-94	702.63	13.	-1.	-0.001	742.74	-6.013E-02	
SB-124	722.79	22.	6.	0.003	126.62	3.067E+00	
BI-212	727.17	34.	-6.	-0.004	152.77	-5.111E+00	P
pm-146	735.72	18.	4.	0.002	210.42	1.138E+00	P
pm-146	747.16	4.	4.	0.002	131.31	6.504E-01	P
ZR-95	756.73	35.	-9.	-0.005	53.23	-1.035E+00	P
AG-110M	763.94	53.	-16.	-0.009	69.41	-4.521E+00	
NB-95	765.79	56.	7.	0.004	149.41	4.620E-01	
PA-234M	766.41	38.	11.	0.006	82.56	2.432E+02	
BI-212	785.42	33.	-14.	-0.008	93.80	-6.819E+01	
CS-134	795.87	5.	17.	0.010	35.72	1.324E+00	
CS-134	801.95	9.	5.	0.003	146.39	3.531E+00	
CO-58	810.78	48.	-12.	-0.006	41.38	-7.801E-01	P
La-140	815.77	29.	7.	0.004	109.40	2.103E+00	
Cs-136	818.50	24.	7.	0.004	101.03	4.918E-01	
MN-54	834.85	5.	4.	0.002	132.73	2.611E-01	P
Co-56	846.77	9.	7.	0.004	94.25	5.139E-01	
NB-94	871.10	14.	-7.	-0.004	70.52	-5.196E-01	P
EU-154	873.23	32.	-5.	-0.003	100.80	-3.047E+00	P
PA-234	880.53	41.	-11.	-0.006	90.01	-1.273E+01	
PA-234	883.24	52.	-2.	-0.001	644.06	-1.186E+00	
Sc-46	889.28	65.	-9.	-0.005	128.54	-6.575E-01	
PA-234	946.02	9.	-1.	-0.001	493.71	-7.516E-01	
EU-154	996.33	30.	4.	0.002	179.85	3.349E+00	
Co-56	1037.84	5.	6.	0.003	99.59	3.192E+00	P
Cs-136	1048.07	6.	6.	0.003	72.66	5.976E-01	
RH-106	1050.36	12.	5.	0.003	115.37	2.481E+01	
BI-207	1063.66	15.	-2.	-0.001	431.57	-2.238E-01	
Ga-68	1077.40	10.	1.	0.001	702.38	3.003E+00	
FE-59	1099.25	6.	2.	0.001	236.19	3.400E-01	P
EU-152	1112.07	44.	3.	0.002	337.94	1.792E+00	
Sc-46	1120.55	22.	6.	0.003	118.42	5.215E-01	
CO-60	1173.24	16.	5.	0.003	182.44	4.436E-01	P
Co-56	1238.28	22.	-3.	-0.002	311.56	-4.145E-01	P
NA-22	1274.53	16.	-4.	-0.002	150.00	-3.884E-01	
FE-59	1291.60	0.	6.	0.003	41.45	1.357E+00	P
CO-60	1332.50	16.	-4.	-0.002	61.42	-4.329E-01	P
AG-110M	1384.30	0.	6.	0.003	40.82	2.570E+00	
EU-152	1408.00	5.	3.	0.001	206.16	1.340E+00	
La-140	1596.21	11.	-7.	-0.004	113.82	-9.018E-01	
Co-56	1771.35	32.	-7.	-0.004	115.70	-6.083E+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	Time Corrected	Uncertainty	1 Sigma	MDA
	Activity	Activity	Counting		Bq/Sample
	Bq/Sample	Bq/Sample			
BE-7	#	1.1618E+01	1.1618E+01	2.548E+01%	7.73E+00
NA-22	#A	-3.8840E-01	-3.8841E-01	1.500E+02%	2.07E+00
K-40		1.4318E+02	1.4318E+02	8.670E+00%	1.19E+01
Sc-46	#A	-6.7968E-02	-6.7969E-02	8.738E+01%	2.89E+00
CR-51	#A	-4.5212E+00	-4.5213E+00	1.050E+02%	1.60E+01
MN-54	#A	2.6112E-01	2.6112E-01	1.327E+02%	9.05E-01
FE-59	#A	7.8084E-01	7.8085E-01	4.145E+01%	2.11E+00
Co-56	#A	8.4568E-01	8.4569E-01	6.856E+01%	1.17E+00
CO-57	#A	2.0461E-01	2.0461E-01	1.285E+02%	8.92E-01
CO-58	#A	-7.8012E-01	-7.8012E-01	4.138E+01%	2.35E+00
CO-60	#A	-4.3290E-01	-4.3290E-01	6.142E+01%	2.17E+00
ZN-65	#A	0.0000E+00	0.0000E+00	1.000E+03%	5.94E+00
NB-94	#A	-6.0127E-02	-6.0127E-02	7.427E+02%	1.17E+00
ZR-95	#A	-1.0346E+00	-1.0346E+00	5.323E+01%	3.48E+00
NB-95	#A	4.6196E-01	4.6196E-01	1.494E+02%	2.38E+00
RU-103	#A	-9.6987E-02	-9.6988E-02	4.435E+02%	1.14E+00
RH-106	#A	2.0573E+00	2.0574E+00	1.154E+02%	3.24E+01
AG-108M	#A	3.3871E-01	3.3871E-01	1.401E+02%	8.20E-01
AG-110M	#A	4.7530E-01	4.7531E-01	4.082E+01%	3.62E+00
SN-113	#A	3.0941E-01	3.0942E-01	1.727E+02%	1.86E+00
SB-124	#A	6.7994E-01	6.7995E-01	1.266E+02%	3.40E+00
SB-125	#A	1.3552E+00	1.3552E+00	7.591E+01%	3.62E+00
I-131	#A	8.6912E-01	8.6918E-01	4.714E+01%	1.02E+00
Gd-153	#A	-8.2480E-01	-8.2480E-01	1.004E+02%	2.78E+00
Ga-68	#A	2.9665E+00	3.0026E+00	7.024E+02%	5.24E+01
Tc-99m	#A	2.5048E-01	2.5105E-01	1.381E+02%	1.17E+00
BA-133	#A	-6.1245E-01	-6.1245E-01	1.843E+02%	3.82E+00
CS-134	#A	7.6850E-01	7.6850E-01	3.572E+01%	3.50E+00
CS-137	#A	2.8169E-01	2.8169E-01	2.255E+02%	2.21E+00
CE-139	#A	2.8823E-01	2.8823E-01	1.132E+02%	1.10E+00
Ba-140	#A	5.2760E-02	5.2763E-02	2.907E+03%	4.20E+00
La-140	#A	-3.1230E-01	-3.1232E-01	7.894E+01%	2.26E+00
CE-141	#A	4.3668E-01	4.3669E-01	1.348E+02%	1.99E+00
CE-144	#A	1.8331E+00	1.8331E+00	1.328E+02%	8.23E+00
PM-144	#A	-3.3592E-01	-3.3592E-01	1.703E+02%	1.44E+00
EU-152	#A	1.0770E+00	1.0770E+00	1.075E+02%	5.81E+00
EU-154	#A	-8.2445E-02	-8.2445E-02	1.008E+02%	1.68E+01
EU-155	#A	-1.2180E+00	-1.2180E+00	8.867E+01%	5.96E+00
HF-181	#A	3.2018E-01	3.2019E-01	1.223E+02%	1.63E+00
Ta-182	A	1.7764E+00	1.7764E+00	8.826E+01%	6.60E+00
Hg-203	#A	-4.7415E-01	-4.7416E-01	9.375E+01%	1.50E+00
TL-208		3.3456E+00	3.3456E+00	1.325E+01%	4.39E-01
pm-146	#A	6.3224E-01	6.3224E-01	8.944E+01%	2.28E+00

y-88 #A	4.0488E-03	4.0488E-03	1.256E+04%	1.34E+00
Cd-113m#A	0.0000E+00	0.0000E+00	1.000E+03%	1.52E+04
Cd-109 #A	0.0000E+00	0.0000E+00	1.000E+03%	3.79E+01
Cf-251 #A	2.5267E+00	2.5267E+00	5.319E+01%	3.54E+00
Cf-249 #A	4.2367E-01	4.2367E-01	1.242E+02%	1.81E+00
Sn-126 #A	1.7143E+00	1.7143E+00	2.215E+02%	1.29E+01
PB-210	3.0795E+01	3.0795E+01	3.582E+01%	2.92E+01
PB-212	8.7621E+00	8.7621E+00	9.297E+00%	1.54E+00
PB-214	1.3660E+01	1.3660E+01	7.807E+00%	2.22E+00
BI-207 #A	3.1962E-01	3.1962E-01	8.009E+01%	8.69E-01
BI-212 #A	-5.1114E+00	-5.1114E+00	1.528E+02%	2.41E+01
BI-214	1.1979E+01	1.1979E+01	1.088E+01%	1.92E+00
BI-210M#A	-2.8815E-01	-2.8815E-01	2.303E+02%	2.29E+00
AC-228	7.7456E+00	7.7456E+00	1.703E+01%	2.99E+00
TH-227 #A	9.6073E+00	9.6073E+00	4.724E+01%	1.24E+01
TH-229 #A	3.5277E+00	3.5277E+00	1.593E+02%	1.82E+01
TH-234 #A	-9.2407E+00	-9.2407E+00	7.630E+01%	3.30E+01
PA-231 #A	-1.3213E+01	-1.3213E+01	1.398E+02%	6.24E+01
PA-233 #A	9.0976E-01	9.0976E-01	1.502E+02%	4.64E+00
PA-234 #A	-1.5731E-01	-1.5731E-01	1.296E+02%	5.68E+00
PA-234M#A	6.3224E+01	6.3224E+01	8.256E+01%	2.87E+02
U-235 #A	2.0137E+00	2.0137E+00	1.320E+02%	8.97E+00
AM-241 #A	-1.0639E+00	-1.0639E+00	7.917E+01%	3.29E+00
Np-237 #A	0.0000E+00	0.0000E+00	1.000E+03%	1.30E+01
Ir-192 #A	-4.5949E-01	-4.5950E-01	1.022E+02%	1.58E+00
Cs-136 #A	5.5748E-01	5.5751E-01	6.352E+01%	1.71E+00
Np-239 #A	-1.0325E+00	-1.0327E+00	1.467E+02%	5.10E+00
Nd-147 #A	-3.5830E+00	-3.5832E+00	1.083E+02%	9.81E+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 - Half-life limit exceeded

----- S U M M A R Y -----
 Total Activity (37.6 to 2000.8 keV) 2.195E+02 Bq/Sample
 Total Decayed Activity (37.6 to 2000.8 keV) 2.1946523E+02 Bq/Sample

Daily Checks

Test America
St. Louis
Quality Control Check

Spectrum: 3_20160711001_QCAsLeft
 Description: Quality control Check (QC Source 'C') Post Stabilization
 Acquired: 7/11/2016 12:40:31 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	238.00	239.00	240.00	PASS
Energy	59.54	59.04	59.29	59.57	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	-1.67	4.00	5.00	PASS

QA-662							
FWHM	1.46	0.00	0.00	1.44	3.16	3.26	PASS
ActivityDiff	606.50	-5.00	-4.00	-3.12	4.00	5.00	PASS

QA-1332							
Channel	5330.00	5327.00	5328.00	5331.10	5332.00	5333.00	PASS
Energy	1332.51	1331.76	1332.01	1332.72	1333.01	1333.26	PASS
FWHM	2.07	0.00	0.00	1.98	4.27	4.37	PASS
ActivityDiff	1183.00	-5.00	-4.00	-2.27	4.00	5.00	PASS

Analyst: Aaron Schroder

Reviewer: Amanda Dick

Test America
St. Louis
Background Check

Spectrum: 3_20160711002_BG

Description: Background Contamination Check

Acquired: 7/11/2016 6:34:49 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	2.34	2.18	2.23	2.40	2.44	2.49	PASS

Analyst: Amanda Dick

Reviewer: Amanda Dick

Test America
St. Louis
Background Check

Spectrum: 5_20160711001_BG

Description: Background Contamination Check

Acquired: 7/11/2016 12:15:17 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	1.40	1.55	1.60	PASS

Analyst: Aaron Schroder

Reviewer: Amanda Dick

Test America
St. Louis
Quality Control Check

Spectrum: 5_20160711002_QCAsLeft
 Description: Quality control Check (QC Source 'A') Post Stabilization
 Acquired: 7/11/2016 6:58:06 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	0.01	4.00	5.00	PASS

QA-662							
FWHM	1.36	0.00	0.00	1.38	3.06	3.16	PASS
ActivityDiff	596.80	-5.00	-4.00	-1.77	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	1332.73	1333.01	1333.26	PASS
FWHM	1.90	0.00	0.00	1.83	4.10	4.20	PASS
ActivityDiff	1164.20	-5.00	-4.00	-3.19	4.00	5.00	PASS

Analyst: Amanda Dick

Reviewer: Amanda Dick

Test America
St. Louis
Background Check

Spectrum: 7_20160711001_BG

Description: Background Contamination Check

Acquired: 7/11/2016 12:16:14 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	1.28	1.40	1.45	PASS

Analyst: Aaron Schroder

Reviewer: Amanda Dick

Test America
St. Louis
Quality Control Check

Spectrum: 7_20160711002_QCAsLeft
 Description: Quality control Check (QC Source 'C') Post Stabilization
 Acquired: 7/11/2016 6:57:05 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	59.59	59.79	60.04	PASS
FWHM	0.84	0.00	0.00	0.96	1.94	2.04	PASS
ActivityDiff	647.00	-5.00	-4.00	0.47	4.00	5.00	PASS

QA-662							
FWHM	1.45	0.00	0.00	1.49	3.15	3.25	PASS
ActivityDiff	606.50	-5.00	-4.00	-0.33	4.00	5.00	PASS

QA-1332							
Channel	5330.00	5327.00	5328.00	5330.60	5332.00	5333.00	PASS
Energy	1332.51	1331.76	1332.01	1332.72	1333.01	1333.26	PASS
FWHM	1.98	0.00	0.00	2.02	4.18	4.28	PASS
ActivityDiff	1183.00	-5.00	-4.00	-1.07	4.00	5.00	PASS

Analyst: Amanda Dick

Reviewer: Amanda Dick

Test America
St. Louis
Background Check

Spectrum: 8_20160711001_BG

Description: Background Contamination Check

Acquired: 7/11/2016 12:17:39 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	1.61	1.68	1.74	PASS

Analyst: Aaron Schroder

Reviewer: Amanda Dick

Test America
St. Louis
Quality Control Check

Spectrum: 8_20160711002_QCAsLeft
 Description: Quality control Check (QC Source 'D') Post Stabilization
 Acquired: 7/11/2016 6:56:31 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	237.80	239.00	240.00	PASS
Energy	59.54	59.04	59.29	59.52	59.79	60.04	PASS
FWHM	1.10	0.00	0.00	0.86	2.20	2.30	PASS
ActivityDiff	650.60	-5.00	-4.00	-1.48	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	0.47	4.00	5.00	PASS

QA-1332							
Channel	5330.00	5327.00	5328.00	5331.30	5332.00	5333.00	PASS
Energy	1332.51	1331.76	1332.01	1332.82	1333.01	1333.26	PASS
FWHM	1.90	0.00	0.00	1.79	4.10	4.20	PASS
ActivityDiff	1189.70	-5.00	-4.00	-0.43	4.00	5.00	PASS

Analyst: Amanda Dick

Reviewer: Amanda Dick

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	Half-life	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): $-6.102019E-01 + (-3.642282E-01 * \text{Log}(E)) + (-2.895398E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.29 %
Log(Eff): $-2.525141E+01 + (9.446449E+00 * \text{Log}(E)) + (-1.005974E+00 * \text{Log}(E)^2)$

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

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	Corrcrtn 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 Channel	Centroid 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	-

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 %
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 *****

Name	Code	Average Activity Bq	Energy keV	Peak Activity Bq	Code	MDA Value Bq	COMMENTS
Pb-210	N	1.5038E+04	46.54	1.504E+04	(	1.745E+02 6.50E-01	8.15E+03 4.25E+00 G
AM-241		1.2311E+03	59.54	1.231E+03	(	1.493E+01 6.75E-01	1.58E+05 3.57E+01 G
CD-109		1.6045E+04	88.03	1.605E+04	(	1.271E+02 4.98E-01	4.63E+02 3.61E+00 G
CO-57		3.4866E+02	122.06	3.487E+02	(	4.295E+00 7.36E-01	2.72E+02 8.56E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Ce-139	5.4218E+02	165.85	5.422E+02	(	5.592E+00	6.78E-01	1.38E+02 7.99E+01 G
Hg-203	1.1909E+03	279.17	1.191E+03	(	1.478E+01	8.48E-01	4.66E+01 8.15E+01 G
SN-113	9.7414E+02	391.69	9.741E+02	(	8.908E+00	7.23E-01	1.15E+02 6.40E+01 G
CS-137	4.6573E+02	661.66	4.657E+02	(	5.618E+00	8.92E-01	1.10E+04 8.52E+01 G
Y-898	1.5629E+03	898.02	1.563E+03	(	1.082E+01	6.55E-01	1.07E+02 9.37E+01 G
Co-1173	7.3225E+02	1173.24	7.323E+02	(	5.778E+00	7.93E-01	1.93E+03 9.99E+01 G
Co-1332	7.2640E+02	1332.50	7.264E+02	(	5.541E+00	8.01E-01	1.93E+03 1.00E+02 G
Y-1836	1.6163E+03	1836.01	1.616E+03	(	6.976E+00	7.29E-01	1.07E+02 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

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 - Half-life 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 *****

Nuclide	Activity Bq	Activity Bq	Uncertainty Counting	1 Sigma	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 - Half-life 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): $6.466115E-01 + (-7.830454E-01 * \text{Log}(E)) + (-4.117504E-03 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.43 %
Log(Eff): $-2.462251E+01 + (9.075211E+00 * \text{Log}(E)) + (-9.664422E-01 * \text{Log}(E)^2)$

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

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 *****

Channel	Peak 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	-

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	- Average Code	Activity Bq	Energy keV	Peak Activity Bq	Code	MDA Value Bq	COMMENTS
Pb-210	N	1.4353E+04	46.54	1.435E+04	(	1.958E+02	8.15E+03 7.44E-01 4.25E+00 G
AM-241		1.2302E+03	59.54	1.230E+03	(	1.659E+01	1.58E+05 7.44E-01 3.57E+01 G
CD-109		1.6101E+04	88.03	1.610E+04	(	1.343E+02	4.63E+02 5.28E-01 3.61E+00 G
CO-57		3.4772E+02	122.06	3.477E+02	(	4.399E+00	2.72E+02 7.60E-01 8.56E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Ce-139	5.3840E+02	165.85	5.384E+02	(	5.997E+00	7.36E-01	1.38E+02 7.99E+01 G
Hg-203	1.2084E+03	279.17	1.208E+03	(	1.492E+01	8.69E-01	4.66E+01 8.15E+01 G
SN-113	9.7207E+02	391.69	9.721E+02	(	1.226E+01	9.31E-01	1.15E+02 6.40E+01 G
CS-137	4.6235E+02	661.66	4.623E+02	(	6.941E+00	1.10E+00	1.10E+04 8.52E+01 G
Y-898	1.5593E+03	898.02	1.559E+03	(	1.397E+01	8.19E-01	1.07E+02 9.37E+01 G
Co-1173	7.2251E+02	1173.24	7.225E+02	(	6.463E+00	9.30E-01	1.93E+03 9.99E+01 G
Co-1332	7.3967E+02	1332.50	7.397E+02	(	6.515E+00	9.82E-01	1.93E+03 1.00E+02 G
Y-1836	1.6138E+03	1836.01	1.614E+03	(	5.776E+00	8.71E-01	1.07E+02 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 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
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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
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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): $6.716580E-01 + (-6.166540E-01 * \text{Log}(E)) + (-2.065917E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.48 %
Log(Eff): $-2.689695E+01 + (1.019544E+01 * \text{Log}(E)) + (-1.081671E+00 * \text{Log}(E)^2)$

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

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 *****

Channel	Peak Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 1 Sigma	FWHM %	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	-

- 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	Energy keV	Peak Activity Bq	Code	MDA Value Bq	Value	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

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Ce-139	5.3948E+02	165.85	5.395E+02	(	4.586E+00	5.65E-01	1.38E+02 7.99E+01 G
Hg-203	1.1992E+03	279.17	1.199E+03	(	9.415E+00	5.92E-01	4.66E+01 8.15E+01 G
SN-113	9.7676E+02	391.69	9.768E+02	(	8.153E+00	6.55E-01	1.15E+02 6.40E+01 G
CS-137	4.6766E+02	661.66	4.677E+02	(	5.584E+00	7.73E-01	1.10E+04 8.52E+01 G
Y-898	1.5673E+03	898.02	1.567E+03	(	1.056E+01	6.29E-01	1.07E+02 9.37E+01 G
Co-1173	7.2623E+02	1173.24	7.262E+02	(	6.394E+00	8.53E-01	1.93E+03 9.99E+01 G
Co-1332	7.1964E+02	1332.50	7.196E+02	(	6.072E+00	8.54E-01	1.93E+03 1.00E+02 G
Y-1836	1.6357E+03	1836.01	1.636E+03	(	5.819E+00	7.02E-01	1.07E+02 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

- 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 - Half-life limit exceeded

***** DISCARDED ISOTOPE PEAKS *****
Nuclide Centroid Background Net Area Intensity Uncert Activity
 Energy Counts Counts Cts/Sec 1 Sigma %

P - Peakbackground subtraction

***** SUMMARY OF NUCLIDES IN SAMPLE *****

Nuclide	Time of Count	Time Corrected	Uncertainty	1 Sigma	MDA
	Activity	Activity	Counting		
	Bq	Bq			
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 - Half-life limit exceeded

----- SUMMARY -----
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 WatsonDate: 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: $8.067E-10 \text{ keV/channel}^2$

Efficiency Calibration

Created: 3/28/2012 10:35:20 AM
Knee Energy: 165.85 keV
Above the Knee: Quadratic Uncertainty = 1.39 %
Log(Eff): $-1.098764E-01 + (-4.958544E-01 * \text{Log}(E)) + (-2.572270E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.71 %
Log(Eff): $-2.525301E+01 + (9.398253E+00 * \text{Log}(E)) + (-1.000034E+00 * \text{Log}(E)^2)$

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

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 Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 1 Sigma	FWHM %	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	-

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 *****

Name	Code	Average Activity Bq	Energy keV	Peak Activity Bq	Code	MDA Value Bq	Comments
Pb-210	N	1.4960E+04	46.54	1.496E+04	(	2.033E+02	8.15E+03 7.55E-01 4.25E+00 G
AM-241		1.2405E+03	59.54	1.240E+03	(	1.715E+01	1.58E+05 7.72E-01 3.57E+01 G
CD-109		1.6066E+04	88.03	1.607E+04	(	1.353E+02	4.63E+02 5.26E-01 3.61E+00 G
CO-57		3.4512E+02	122.06	3.451E+02	(	4.486E+00	2.72E+02 7.68E-01 8.56E+01 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Ce-139	5.3634E+02	165.85	5.363E+02	(	6.333E+00	7.56E-01	1.38E+02 7.99E+01 G
Hg-203	1.2182E+03	279.17	1.218E+03	(	1.569E+01	8.81E-01	4.66E+01 8.15E+01 G
SN-113	9.6715E+02	391.69	9.671E+02	(	9.575E+00	7.73E-01	1.15E+02 6.40E+01 G
CS-137	4.6586E+02	661.66	4.659E+02	(	7.158E+00	1.10E+00	1.10E+04 8.52E+01 G
Y-898	1.5521E+03	898.02	1.552E+03	(	1.135E+01	7.10E-01	1.07E+02 9.37E+01 G
Co-1173	7.2448E+02	1173.24	7.245E+02	(	4.676E+00	7.93E-01	1.93E+03 9.99E+01 G
Co-1332	7.2998E+02	1332.50	7.300E+02	(	4.916E+00	8.45E-01	1.93E+03 1.00E+02 G
Y-1836	1.6272E+03	1836.01	1.627E+03	(	5.029E+00	7.91E-01	1.07E+02 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

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 *****

Nuclide	Time of Count Activity Bq	Time Corrected Activity Bq	Uncertainty Counting	1 Sigma	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

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

3_TunaCan2nd_20120999

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): $-6.102019E-01 + (-3.642282E-01 * \text{Log}(E)) + (-2.895398E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.29 %
Log(Eff): $-2.525141E+01 + (9.446449E+00 * \text{Log}(E)) + (-1.005974E+00 * \text{Log}(E)^2)$

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

3_TunaCan2nd_20120999

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/Samp	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 *****
 Page 2

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

3_TunaCan2nd_20120999

***** 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	46.54	1.465E+04	(P	1.565E+02	8.15E+03	6.36E-01	4.25E+00 G
AM-241		1.1650E+03	59.54	1.165E+03	(	1.159E+01	1.58E+05	6.31E-01	3.57E+01 G
CD-109		1.5485E+04	88.03	1.549E+04	(	2.108E+02	4.63E+02	8.73E-01	3.61E+00 G
CO-57		3.4265E+02	122.06	3.426E+02	(	1.418E+01	2.72E+02	2.27E+00	8.56E+01 G
Ce-139		5.7768E+02	165.85	5.777E+02	*(	1.031E+02	1.38E+02	7.99E+00	7.99E+01 G
Hg-203		1.3708E-02	279.17	1.371E-02	%(	2.387E+00	4.66E+01	5.21E+03	8.15E+01 G
SN-113		9.9863E+02	391.69	9.986E+02	(	4.131E+02	1.15E+02	1.78E+01	6.40E+01 G
CS-137		4.4373E+02	661.66	4.437E+02	(	3.375E+00	1.10E+04	8.12E-01	8.52E+01 G
Y-898		1.5527E+03	898.02	1.553E+03	(	6.719E+02	1.07E+02	1.41E+01	9.37E+01 G
Co-1173		7.0009E+02	1173.24	7.001E+02	(	4.695E+00	1.93E+03	8.38E-01	9.99E+01 G
Co-1332		7.0411E+02	1332.50	7.041E+02	(	3.104E+00	1.93E+03	8.16E-01	1.00E+02 G
Y-1836		1.2247E+03	1836.01	1.225E+03	?(	2.214E+02	1.07E+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
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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

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 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

5_TunaCan2nd_20120813

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

5_TunaCan2nd_20120813

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/Samp	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				

5_TunaCan2nd_20120813

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 Channel	Centroid 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

5_TunaCan2nd_20120813

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.

□

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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	Energy keV	Peak Activity Bq/Sample	Code	MDA Value Bq/Sample	COMMENTS
Pb-210	N	1.4212E+04	46.54	1.421E+04	(P	1.177E+02 4.91E-01	8.15E+03 4.25E+00 G
AM-241		1.1609E+03	59.54	1.161E+03	(	8.959E+00 4.87E-01	1.58E+05 3.57E+01 G
CD-109		1.5419E+04	88.03	1.542E+04	(	1.658E+02 6.81E-01	4.63E+02 3.61E+00 G
CO-57		3.3478E+02	122.06	3.348E+02	(	1.063E+01 1.66E+00	2.72E+02 8.56E+01 G
Ce-139		5.3191E+02	165.85	5.319E+02	(	7.689E+01 6.14E+00	1.38E+02 7.99E+01 G
Hg-203		-6.5193E-03	279.17	-6.519E-03	%(	1.788E+00 8.22E+03	4.66E+01 8.15E+01 G
SN-113		9.5011E+02	391.69	9.501E+02	(	3.682E+02 1.63E+01	1.15E+02 6.40E+01 G
CS-137		4.4236E+02	661.66	4.424E+02	(P	3.020E+00 7.12E-01	1.10E+04 8.52E+01 G
Y-898		1.6655E+03	898.02	1.665E+03	(	6.908E+02 1.92E+01	1.07E+02 9.37E+01 G
Co-1173		7.0021E+02	1173.24	7.002E+02	(	4.056E+00 7.32E-01	1.93E+03 9.99E+01 G
Co-1332		7.0186E+02	1332.50	7.019E+02	(	1.651E+00 7.07E-01	1.93E+03 1.00E+02 G
Y-1836		1.6424E+03	1836.01	1.642E+03	(	1.392E+02 7.47E+00	1.07E+02 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	Time Corrected	Activity	Uncertainty	MDA
	Bq/Sample	Bq/Sample	Bq/Sample	Bq/Sample	1 Sigma	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.
- Page 5

5_TunaCan2nd_20120813

- < - 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): $6.716580E-01 + (-6.166540E-01 * \text{Log}(E)) + (-2.065917E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.48 %
Log(Eff): $-2.689695E+01 + (1.019544E+01 * \text{Log}(E)) + (-1.081671E+00 * \text{Log}(E)^2)$

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

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 Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 1 Sigma	FWHM %	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.	2.792E+02	18.72	0.855	- sM

307.39 76.99 3728. 260. 5.319E+03 38.90 1.033 -

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.

***** 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 *****

Name	Code	Average Activity Bq/Sample	Energy keV	Peak Activity Bq/Sample	Code	MDA Value Bq/Sample	COMMENTS
Pb-210	N	1.3857E+04	46.54	1.386E+04	(P	1.480E+02 6.34E-01 4.25E+00	8.15E+03 G
AM-241		1.1504E+03	59.54	1.150E+03	(	1.036E+01 5.81E-01 3.57E+01	1.58E+05 G
CD-109		1.5217E+04	88.03	1.522E+04	(	1.799E+02 7.73E-01 3.61E+00	4.63E+02 G
CO-57		3.1712E+02	122.06	3.171E+02	(	1.205E+01 2.04E+00 8.56E+01	2.72E+02 G
Ce-139		5.1801E+02	165.85	5.180E+02	(	7.941E+01 6.45E+00 7.99E+01	1.38E+02 G
Hg-203	-4.5441E-01		279.17	-4.544E-01	? (	2.347E+00 1.56E+02 8.15E+01	4.66E+01 G
SN-113		9.3315E+02	391.69	9.332E+02	(	4.178E+02 1.96E+01 6.40E+01	1.15E+02 G
CS-137		4.4047E+02	661.66	4.405E+02	(	3.706E+00 8.56E-01 8.52E+01	1.10E+04 G
Y-898		1.6944E+03	898.02	1.694E+03	(	8.216E+02 2.35E+01 9.37E+01	1.07E+02 G
Co-1173		6.8172E+02	1173.24	6.817E+02	(	4.436E+00 8.58E-01 9.99E+01	1.93E+03 G
Co-1332		6.9210E+02	1332.50	6.921E+02	(	2.586E+00 8.49E-01 1.00E+02	1.93E+03 G
Y-1836		1.7801E+03	1836.01	1.780E+03	(	2.065E+02 9.19E+00 9.92E+01	1.07E+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 %
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

- # - 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

8_TunaCan2nd_20120697

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): $-1.098764E-01 + (-4.958544E-01 * \text{Log}(E)) + (-2.572270E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.71 %
Log(Eff): $-2.525301E+01 + (9.398253E+00 * \text{Log}(E)) + (-1.000034E+00 * \text{Log}(E)^2)$

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

8_TunaCan2nd_20120697

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/Samp	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

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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.

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***** 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 -----		Code	MDA Value	*****			
Name	Activity	Energy	Activity		Bq/Sample				COMMENTS
Code	Bq/Sample	keV	Bq/Sample		Bq/Sample				
Pb-210	N 1.4221E+04	46.54	1.422E+04	(	1.806E+02	7.43E-01	8.15E+03	4.25E+00	G
AM-241	1.1754E+03	59.54	1.175E+03	(	1.311E+01	7.10E-01	1.58E+05	3.57E+01	G
CD-109	1.5223E+04	88.03	1.522E+04	(	2.071E+02	8.83E-01	4.63E+02	3.61E+00	G
CO-57	3.3494E+02	122.06	3.349E+02	(	1.600E+01	2.55E+00	2.72E+02	8.56E+01	G
Ce-139	6.0766E+02	165.85	6.077E+02	*(	1.153E+02	8.62E+00	1.38E+02	7.99E+01	G
Hg-203	6.1671E-01	279.17	6.167E-01	(	2.689E+00	1.31E+02	4.66E+01	8.15E+01	G
SN-113	1.0157E+03	391.69	1.016E+03	(	4.390E+02	1.79E+01	1.15E+02	6.40E+01	G
CS-137	4.4661E+02	661.66	4.466E+02	(P	3.489E+00	8.85E-01	1.10E+04	8.52E+01	G
Y-898	2.5543E+03	898.02	2.554E+03	(	9.046E+02	1.79E+01	1.07E+02	9.37E+01	G
Co-1173	6.9722E+02	1173.24	6.972E+02	(	4.649E+00	9.19E-01	1.93E+03	9.99E+01	G
Co-1332	6.9192E+02	1332.50	6.919E+02	(	2.515E+00	9.18E-01	1.93E+03	1.00E+02	G
Y-1836	1.7236E+03	1836.01	1.724E+03	(	1.542E+02	9.00E+00	1.07E+02	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.

□

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@ - 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 Halfives		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

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- 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

Annual Calibration Verifications

SampID	WRKNO	Aliquot	Sigma	Instrument	Detector	CountDate	Time	CountDuration
LCS 160-229576~2-	LCS 160-229576	341.90g	1.00	GammaVision	GV03	1/19/16	7:22	30
Analyte	Cmpnd#	Activity	TotalUnc	CountUnc	MDA	MLCC	Act/MDA	
AC-228	11136	4.965E-001pCi/g	2.941E-001	2.930E-001	1.062E+000	5.136E-001	0.47	0.2941
AG-108M	10982	-4.175E-002pCi/g	6.792E-002	6.789E-002	2.277E-001	1.106E-001	-0.18	0.0679
AG-110M	10973	-3.575E-003pCi/g	2.188E-002	2.188E-002	4.448E-001	2.156E-001	-0.01	0.0219
AM-241	10818	9.980E+001pCi/g	5.238E+000	7.784E-001	1.133E+000	5.611E-001	88.11	5.2375
BA-133	10469	5.873E-002pCi/g	9.186E-002	9.180E-002	3.075E-001	1.497E-001	0.19	0.0919
BA-140	10463	4.018E-003pCi/g	3.844E-003	3.839E-003	7.823E-001	3.772E-001	0.01	0.0038
BE-7	10435	-8.382E-002pCi/g	6.487E-001	6.487E-001	2.192E+000	1.066E+000	-0.04	0.6487
BI-207	10195	7.936E-002pCi/g	5.743E-002	5.729E-002	1.898E-001	9.128E-002	0.42	0.0574
BI-210M	10173	6.234E-002pCi/g	1.031E-001	1.031E-001	3.449E-001	1.683E-001	0.18	0.1031
BI-212	10160	1.346E+000pCi/g	8.174E-001	8.144E-001	2.681E+000	1.284E+000	0.50	0.8174
BI-214	10154	3.248E-001pCi/g	1.433E-001	1.423E-001	4.660E-001	2.249E-001	0.70	0.1433
CD-109	9254	2.731E+000pCi/g	2.382E+000	2.378E+000	3.514E+000	1.721E+000	0.78	2.3824
CD-113M	17462	8.379E-001pCi/g	8.360E+002	8.360E+002	2.823E+003	1.377E+003	0.00	835.9792
CE-139	9241	3.194E-002pCi/g	4.967E-002	4.958E-002	1.656E-001	8.094E-002	0.19	0.0497
CE-141	9235	-9.276E-002pCi/g	8.336E-002	8.322E-002	2.761E-001	1.351E-001	-0.34	0.0834
CE-144	9221	4.148E-001pCi/g	3.518E-001	3.512E-001	1.164E+000	5.698E-001	0.36	0.3518
CF-249	9215	3.609E-002pCi/g	7.851E-002	7.848E-002	3.006E-001	1.462E-001	0.12	0.0785
CF-251	13690	-9.337E-002pCi/g	2.422E-001	2.421E-001	8.119E-001	3.967E-001	-0.12	0.2422
CO-56	8704	5.712E-003pCi/g	1.869E-002	1.869E-002	2.580E-001	1.242E-001	0.02	0.0187
CO-57	13694	1.046E-002pCi/g	4.413E-002	4.413E-002	1.564E-001	7.667E-002	0.07	0.0441
CO-58	8698	2.582E-002pCi/g	6.995E-002	6.994E-002	2.376E-001	1.142E-001	0.11	0.0700
CO-60	8692	1.791E+001pCi/g	9.248E-001	2.166E-001	3.666E-002	1.159E-002	488.51	0.9248
CR-51	8604	-5.434E-002pCi/g	5.663E-001	5.663E-001	1.911E+000	9.317E-001	-0.03	0.5663
CS-134	8553	8.527E-002pCi/g	5.497E-002	5.479E-002	2.246E-001	1.085E-001	0.38	0.0550
CS-136	8546	6.970E-002pCi/g	6.544E-002	6.532E-002	2.257E-001	1.082E-001	0.31	0.0654
CS-137	8539	2.987E+001pCi/g	1.592E+000	3.439E-001	2.525E-001	1.216E-001	118.28	1.5915
EU-152	7145	4.783E-001pCi/g	2.253E-001	2.239E-001	5.623E-001	2.718E-001	0.85	0.2253
EU-154	7138	1.944E-001pCi/g	3.227E-001	3.226E-001	2.414E+000	1.167E+000	0.08	0.3227
EU-155	7131	4.818E-002pCi/g	1.507E-001	1.507E-001	5.063E-001	2.471E-001	0.10	0.1507
FE-59	7073	1.976E-001pCi/g	1.432E-001	1.428E-001	4.736E-001	2.265E-001	0.42	0.1432
GA-68	18005	5.250E+000pCi/g	2.726E+000	2.710E+000	8.844E+000	4.219E+000	0.59	2.7260
GD-153	6824	1.212E-001pCi/g	8.816E-002	8.785E-002	4.318E-001	2.115E-001	0.28	0.0882
HF-181	6495	8.831E-002pCi/g	8.376E-002	8.363E-002	2.320E-001	1.121E-001	0.38	0.0838
HG-203	6466	7.767E-002pCi/g	5.465E-002	5.447E-002	1.522E-001	7.346E-002	0.51	0.0546
I-131	6380	3.072E-003pCi/g	6.170E-002	6.170E-002	2.094E-001	1.016E-001	0.01	0.0617
IR-192	6303	3.665E-002pCi/g	6.296E-002	6.292E-002	2.108E-001	1.027E-001	0.17	0.0630
K-40	6148	-2.504E-001pCi/g	9.590E-001	9.589E-001	1.437E+000	6.508E-001	-0.17	0.9590
LA-140	6096	7.503E-002pCi/g	7.767E-002	7.757E-002	1.900E-001	8.688E-002	0.39	0.0777
MN-54	5382	-6.356E-002pCi/g	7.748E-002	7.741E-002	2.597E-001	1.252E-001	-0.24	0.0775
NA-22	5201	2.684E-003pCi/g	3.144E-002	3.144E-002	1.160E-001	5.146E-002	0.02	0.0314
NB-94	5160	7.491E-003pCi/g	1.036E-002	1.035E-002	1.803E-001	8.592E-002	0.04	0.0104
NB-95	5154	5.861E-003pCi/g	6.671E-002	6.671E-002	2.282E-001	1.097E-001	0.03	0.0667
ND-147	5083	-5.976E-001pCi/g	5.313E-001	5.302E-001	1.763E+000	8.557E-001	-0.34	0.5313
NP-237	4757	-6.326E-001pCi/g	3.879E-001	3.863E-001	1.273E+000	6.261E-001	-0.50	0.3879
NP-239	4751	1.659E-001pCi/g	1.170E-001	1.165E-001	3.854E-001	1.870E-001	0.43	0.1170
PA-231	4541	2.101E-001pCi/g	1.792E+000	1.792E+000	6.049E+000	2.946E+000	0.03	1.7916
PA-233	4535	8.968E-002pCi/g	1.522E-001	1.521E-001	5.093E-001	2.482E-001	0.18	0.1522
PA-234	4528	2.653E-001pCi/g	1.500E-001	1.494E-001	7.114E-001	3.483E-001	0.37	0.1500
PA-234M	19453	-2.813E-001pCi/g	1.067E+001	1.067E+001	3.643E+001	1.757E+001	-0.01	10.6698
PB-210	4467	9.199E+002pCi/g	5.477E+001	9.060E+000	1.538E+001	7.626E+000	59.82	54.7700

PB-212	4454	6.332E-001pCi/g	1.510E-001	1.453E-001	3.483E-001	1.697E-001	1.82	0.1510
PB-214	4448	5.128E-001pCi/g	1.570E-001	1.547E-001	4.982E-001	2.424E-001	1.03	0.1570
PM-144	19585	2.182E-002pCi/g	2.495E-002	2.492E-002	1.999E-001	9.579E-002	0.11	0.0249
PM-146	2464	2.659E-002pCi/g	2.213E-002	2.209E-002	5.997E-001	2.871E-001	0.04	0.0221
RH-106	1882	8.705E-003pCi/g	4.824E-001	4.824E-001	1.665E+000	7.944E-001	0.01	0.4824
RU-103	1828	-2.228E-002pCi/g	7.147E-002	7.146E-002	2.412E-001	1.171E-001	-0.09	0.0715
SB-124	1784	1.479E-002pCi/g	6.348E-002	6.347E-002	2.156E-001	1.040E-001	0.07	0.0635
SB-125	1777	6.246E-002pCi/g	8.163E-002	8.157E-002	8.005E-001	3.905E-001	0.08	0.0816
SC-46	1739	4.902E-002pCi/g	5.829E-002	5.824E-002	2.659E-001	1.280E-001	0.18	0.0583
SN-113	1570	-6.202E-002pCi/g	9.565E-002	9.560E-002	3.201E-001	1.558E-001	-0.19	0.0956
SN-126	17459	2.876E-001pCi/g	5.839E-001	5.837E-001	1.948E+000	9.564E-001	0.15	0.5839
TA-182	1301	9.507E-002pCi/g	7.136E-002	7.120E-002	7.354E-001	3.508E-001	0.13	0.0714
TC-99M	17412	-4.559E-004pCi/g	4.481E-002	4.481E-002	1.508E-001	7.382E-002	0.00	0.0448
TH-227	1058	3.043E+000pCi/g	1.854E+000	1.846E+000	6.083E+000	3.012E+000	0.50	1.8537
TH-229	1046	4.315E-002pCi/g	8.927E-002	8.920E-002	3.602E+000	1.763E+000	0.01	0.0893
TH-234	1027	4.427E-001pCi/g	8.093E-001	8.090E-001	5.471E+000	2.690E+000	0.08	0.8093
TL-208	929	2.014E-001pCi/g	1.080E-001	1.075E-001	2.276E-001	1.095E-001	0.88	0.1080
U-235	281	7.771E-002pCi/g	2.597E-001	2.597E-001	1.183E+000	5.786E-001	0.07	0.2597
Y-88	74	7.631E-003pCi/g	1.276E-002	1.276E-002	2.917E-001	1.406E-001	0.03	0.0128
ZN-65	31	2.900E-001pCi/g	1.832E-001	1.827E-001	6.023E-001	2.895E-001	0.48	0.1832
ZR-95	7	5.699E-002pCi/g	8.566E-002	8.560E-002	2.916E-001	1.378E-001	0.20	0.0857

Laboratory Control Sample Information

Sample ID	WRKNO	Analyte	Activity	StdAdded	Recovery	ZFactor
LCS 160-229576~2-A	LCS 160-229576~2-A	CS-137	2.987E+001 pCi/g	2.992E+001	99.83%	-0.0229
		CO-60	1.791E+001 pCi/g	1.803E+001	99.31%	-0.0954
		AM-241	9.980E+001 pCi/g	9.719E+001	102.69%	0.3571

Sample Duplicate Information

Sample ID	Dup Sample ID	Analyte	Samp Activity	Dup Activity	RPD	RER	DER Flag	ZFactor
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ACV TOP 2016	Gamma Detector 3
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	Cs-137	Co-60	Am-241
Detector	Recovery	Recovery	Recovery
3	99.83%	99.31%	102.69%

Standard ID

Tuna Can LCS

Tuna Can LCS_00005 #776670

Cert # 74139-334 Ref. date 10/1/2006

Known Activity:

Cs-137	29.92 pCi/g
Co-60	18.03 pCi/g
Am-241	97.19 pCi/g

Recovered Activity:

Cs-137	29.87 pCi/g
Co-60	17.91 pCi/g
Am-241	99.8 pCi/g

Original count ID: LCS 160-229576-2-A

1st review: *Walter 2/29/16*

2nd review: *Amanda Singh Dey 3/1/16*

Sample Description: 229576_Gamma_LCS 160-229576~2-A
 Detector: Ge 3 SN/131
 Batch ID: 229576
 Work Order Number: Gamma
 Lot Number: LCS 160-229576~2-A

Decay to Time: 1/19/2016 07:22 Live Time: 1800 sec
 Acquisition Time: 1/19/2016 07:22:44 Real Time: 1808 sec
 Analysis Time: 1/19/2016 07:53 Dead Time: 0.44 %
 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_2016-01-10_0555.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	-1.060E+00	773.9	8.206E+00	8.206E+00	2.773E+01
NA-22	3.395E-02	1172.0	3.978E-01	3.978E-01	1.467E+00
K-40	-3.167E+00	383.0	1.213E+01	1.213E+01	1.818E+01
Sc-46	6.201E-01	118.8	7.368E-01	7.374E-01	3.363E+00
CR-51	-6.874E-01	1042.0	7.164E+00	7.164E+00	2.417E+01
MN-54	-8.041E-01	121.8	9.793E-01	9.801E-01	3.286E+00
FE-59	2.500E+00	72.3	1.807E+00	1.811E+00	5.991E+00
Co-56	7.226E-02	327.2	2.365E-01	2.365E-01	3.263E+00
CO-57	1.323E-01	422.0	5.583E-01	5.583E-01	1.978E+00
CO-58	3.266E-01	270.9	8.848E-01	8.849E-01	3.006E+00
CO-60	2.266E+02	1.2	2.740E+00	1.170E+01	4.638E-01
ZN-65	3.668E+00	63.0	2.311E+00	2.318E+00	7.619E+00
NB-94	9.476E-02	138.2	1.310E-01	1.310E-01	2.281E+00
ZR-95	7.209E-01	150.2	1.083E+00	1.084E+00	3.688E+00
NB-95	7.414E-02	1138.0	8.439E-01	8.439E-01	2.887E+00
RU-103	-2.818E-01	320.7	9.040E-01	9.041E-01	3.051E+00
RH-106	1.101E-01	5542.0	6.103E+00	6.103E+00	2.106E+01
AG-108M	-5.281E-01	162.6	8.588E-01	8.592E-01	2.881E+00
AG-110M	-4.523E-02	612.0	2.768E-01	2.768E-01	5.626E+00
SN-113	-7.845E-01	154.1	1.209E+00	1.210E+00	4.049E+00
SB-124	1.872E-01	429.0	8.029E-01	8.030E-01	2.727E+00
SB-125	7.901E-01	130.6	1.032E+00	1.033E+00	1.013E+01
I-131	3.887E-02	2008.0	7.805E-01	7.805E-01	2.649E+00
Gd-153	1.534E+00	72.5	1.111E+00	1.115E+00	5.462E+00
Ga-68	6.641E+01	51.6	3.428E+01	3.448E+01	1.119E+02
Tc-99m	-5.768E-03	9829.0	5.669E-01	5.669E-01	1.908E+00
BA-133	7.429E-01	156.3	1.161E+00	1.162E+00	3.890E+00
CS-134	1.079E+00	64.3	6.931E-01	6.954E-01	2.841E+00
CS-137	3.779E+02	1.2	4.350E+00	2.013E+01	3.195E+00
CE-139	4.041E-01	155.2	6.272E-01	6.283E-01	2.095E+00
Ba-140	5.082E-02	95.5	4.856E-02	4.863E-02	9.896E+00
La-140	9.492E-01	103.4	9.813E-01	9.826E-01	2.404E+00
CE-141	-1.174E+00	89.7	1.053E+00	1.055E+00	3.492E+00
CE-144	5.247E+00	84.7	4.442E+00	4.451E+00	1.472E+01
PM-144	2.760E-01	114.2	3.152E-01	3.156E-01	2.529E+00
EU-152	6.050E+00	46.8	2.832E+00	2.850E+00	7.114E+00
EU-154	2.459E+00	166.0	4.081E+00	4.082E+00	3.054E+01
EU-155	6.095E-01	312.7	1.906E+00	1.906E+00	6.405E+00
HF-181	1.117E+00	94.7	1.058E+00	1.060E+00	2.935E+00
Ta-182	1.203E+00	74.9	9.007E-01	9.027E-01	9.303E+00
Hg-203	9.826E-01	70.1	6.890E-01	6.913E-01	1.925E+00
TL-208	2.547E+00	53.4	1.360E+00	1.366E+00	2.879E+00
pm-146	3.364E-01	83.0	1.351E-01	2.800E-01	7.587E+00

y-88	9.654E-02	167.2	1.614E-01	1.615E-01	3.691E+00
Cd-113m	1.060E+01	99770.0	1.058E+04	1.058E+04	3.571E+04
Cd-109	3.455E+01	87.1	3.008E+01	3.014E+01	4.445E+01
Cf-251	-1.181E+00	259.3	3.063E+00	3.065E+00	1.027E+01
Cf-249	4.565E-01	217.5	9.928E-01	9.931E-01	3.803E+00
Sn-126	3.638E+00	203.0	7.384E+00	7.387E+00	2.464E+01
PB-210	1.164E+04	1.0	1.146E+02	6.929E+02	1.945E+02
PB-212	8.010E+00	23.0	1.838E+00	1.910E+00	4.406E+00
PB-214	6.487E+00	30.2	1.957E+00	1.986E+00	6.302E+00
BI-207	1.004E+00	72.2	7.247E-01	7.266E-01	2.401E+00
BI-212	1.703E+01	60.5	1.030E+01	1.034E+01	3.391E+01
BI-214	4.109E+00	43.8	1.800E+00	1.813E+00	5.895E+00
BI-210M	7.886E-01	165.4	1.304E+00	1.305E+00	4.363E+00
AC-228	6.281E+00	59.0	3.707E+00	3.721E+00	1.343E+01
TH-227	3.850E+01	60.7	2.336E+01	2.345E+01	7.695E+01
TH-229	5.458E-01	206.7	1.128E+00	1.129E+00	4.557E+01
TH-234	5.601E+00	182.7	1.023E+01	1.024E+01	6.921E+01
PA-231	2.657E+00	852.9	2.266E+01	2.266E+01	7.652E+01
PA-233	1.135E+00	169.6	1.924E+00	1.925E+00	6.443E+00
PA-234	3.357E+00	56.3	1.890E+00	1.898E+00	8.999E+00
PA-234M	-3.559E+00	3793.0	1.350E+02	1.350E+02	4.608E+02
U-235	9.830E-01	334.2	3.285E+00	3.285E+00	1.496E+01
AM-241	1.263E+03	0.8	9.848E+00	6.626E+01	1.433E+01
Np-237	-8.003E+00	61.1	4.887E+00	4.908E+00	1.610E+01
Ir-192	4.636E-01	171.7	7.960E-01	7.964E-01	2.666E+00
Cs-136	8.817E-01	93.7	8.263E-01	8.278E-01	2.856E+00
Np-239	2.099E+00	70.2	1.474E+00	1.480E+00	4.876E+00
Nd-147	-7.560E+00	88.7	6.708E+00	6.722E+00	2.230E+01

Total 1.375E+04

Analyst: kody Saulters

ANNUAL CALIBRATION VERIFICATION

Detector ID: **Detector # 5**
 SpectrumID: 5_20160128006_EffVerif
 Analysis Description: ACVTop-776670;TunaCan2006
 Calibration: 5_Soil_TunaCan_90099_032612
 Detector: Ge 5 SN/157

Verification Date: 2016-01-28 10:21
 Source Assay Date/Time: 2006-10-01 11:00

Isotope	Gamma Energy (keV)	Source Emission Rate (GPS) (Assay)	Observed Activity (GPS)	Percent Difference (%)
			(Actual)	<u>Assay-Actual</u> Assay
Am-241	59.54	449	4.57E+02	-1.7%
Cs-137	661.66	400	3.97E+02	0.7%
Co-1332	1332.5	777	7.71E+02	0.8%

Comments:

Perform ___Jody Watson 1/28/16_____

Review ___Rachel Mueller 1/28/16_____

C:\User\CRpt\5_20160128006_EffVerif.xls

Sample Description: ACVTop-776670;TunaCan2006

Detector: Ge 5 SN/157

Source Date: 10/1/2006 11:00

Acquired: 1/28/2016 10:21:33

Analyzed: 2/4/2016 10:52

Analyst: Jody Watson

Efficiency: 5_Soil_TunaCan_90099_032612

Library: DET_EfficiencyVerification.lib

Nuclide	Activity uCi/Source	Uncertainty %
AM-241	4.566E+02	0.45
CS-137	3.974E+02	0.71
Co-1332	7.707E+02	1.09
Total	1.625E+03	

Sample description
ACVTop-776670;TunaCan2006

Spectrum Filename: C:\User\SPC\Det5\5_20160128006_EffVerif.An1

Acquisition information

Start time: 1/28/2016 10:21:33 AM
Live time: 7200
Real time: 7242
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): $6.466115E-01 + (-7.830454E-01 * \text{Log}(E)) + (-4.117504E-03 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.43 %
Log(Eff): $-2.462251E+01 + (9.075211E+00 * \text{Log}(E)) + (-9.664422E-01 * \text{Log}(E)^2)$

Library Files

Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G53W4.25
Start channel: 150 (37.62keV)
Stop channel: 8000 (2000.81keV)
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

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	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: 0.0281

***** 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	62614.	0.54	0.73	1.791E-02				
59.55	82059.	0.45	0.73	2.534E-02	59.54	100.000	4.566E+02	AM241
87.79	1068.	8.88	0.81	3.458E-02				
661.63	22901.	0.71	1.29	9.925E-03	661.66	100.000	3.973E+02	CS137
1173.12	9966.	1.10	1.75	6.139E-03				
1332.41	8977.	1.09	1.90	5.515E-03	1332.50	100.000	7.707E+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
185.88	46.59	15162.	62614.	3.496E+06	0.54	0.733	-
350.82	87.79	2502.	1068.	3.087E+04	8.88	0.809	- s
4692.76	1173.12	266.	9966.	1.624E+06	1.10	1.754	-

- 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 %
AM-241	237.79	59.55	13086.	82059.	11.397	0.45	0.731
CS-137	2647.26	661.63	612.	22901.	3.181	0.71	1.293
Co-1332	5329.50	1332.41	77.	8977.	1.247	1.09	1.898

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	Energy keV	Peak Activity uCi/Source	Code	MDA Value uCi/Source	COMMENTS
------------------	------	-----------------------------	------------	--------------------------	------	----------------------	----------

AM-241		4.5663E+02				1.58E+05	
			59.54	4.566E+02	(	2.981E+00	4.47E-01 1.00E+02 G
CS-137		3.9735E+02				1.10E+04	
			661.66	3.973E+02	(	2.047E+00	7.08E-01 1.00E+02 G
Co-1332		7.7068E+02				1.93E+03	
			1332.50	7.707E+02	(	3.743E+00	1.09E+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	Time Corrected	Uncertainty Counting	1 Sigma	MDA
	Activity uCi/Source	Activity uCi/Source			
AM-241	4.4986E+02	4.5663E+02	4.468E-01%		2.98E+00
CS-137	3.2049E+02	3.9735E+02	7.077E-01%		2.05E+00
Co-1332	2.2610E+02	7.7068E+02	1.091E+00%		3.74E+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 2000.8 keV) 9.965E+02 uCi/Source
 Total Decayed Activity (37.6 to 2000.8 keV) 1.6246621E+03 uCi/Source

ANNUAL CALIBRATION VERIFICATION

Detector ID: **Detector # 7**
 SpectrumID: 7_20160123003_EffVerif
 Analysis Description: ACVTop-776670;TunaCan2006
 Calibration: 7_TunaCan_90099_032712
 Detector: Ge 7 SN/154

Verification Date: 2016-01-23 19:25
 Source Assay Date/Time: 2006-10-01 11:00

Isotope	Gamma Energy (keV)	Source Emission Rate (GPS)	Observed Activity (GPS)	Percent Difference (%)
		(Assay)	(Actual)	<u>Assay-Actual</u> Assay
Am-241	59.54	449	4.38E+02	2.5%
Cs-137	661.66	400	3.86E+02	3.6%
Co-1332	1332.5	777	7.19E+02	7.5%

Comments:

Perform ____ Kody Saulters 2/4/16 _____

Review ____ Jody Watson 2/4/16 _____

C:\User\CRpt\7_20160123003_EffVerif.xls

Sample Description: ACVTop-776670;TunaCan2006

Detector: Ge 7 SN/154

Source Date: 10/1/2006 11:00

Acquired: 1/23/2016 19:25:53

Analyzed: 2/4/2016 10:49

Analyst: Jody Watson

Efficiency: 7_TunaCan_90099_032712

Library: DET_EfficiencyVerification.lib

Nuclide	Activity uCi/Source	Uncertainty %
AM-241	4.380E+02	0.38
CS-137	3.857E+02	0.59
Co-1332	7.189E+02	0.94
Total	1.543E+03	

Sample description
ACVTop-776670;TunaCan2006

Spectrum Filename: C:\User\SPC\Det7\7_20160123003_EffVerif.An1

Acquisition information

Start time: 1/23/2016 7:25:53 PM
Live time: 7200
Real time: 7361
Dead time: 2.18 %
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): $6.716580E-01 + (-6.166540E-01 * \text{Log}(E)) + (-2.065917E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.48 %
Log(Eff): $-2.689695E+01 + (1.019544E+01 * \text{Log}(E)) + (-1.081671E+00 * \text{Log}(E)^2)$

Library Files

Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G53W4.25
Start channel: 150 (37.61keV)
Stop channel: 8000 (2000.12keV)
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

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	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: 0.0434

***** 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
36.52	1402.	9.33	1.11	1.474E-02				
46.60	75982.	0.45	0.84	2.485E-02				
59.55	114994.	0.38	0.89	3.702E-02	59.54	100.000	4.380E+02	AM241
87.94	1428.	8.44	0.97	5.326E-02				
661.74	33440.	0.59	1.49	1.492E-02	661.66	100.000	3.857E+02	CS137
1173.38	13650.	0.99	1.95	8.928E-03				
1332.63	12093.	0.94	1.99	7.950E-03	1332.50	100.000	7.189E+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
145.62	36.52	4964.	1402.	9.512E+04	9.33	1.111	- s
185.78	46.56	20640.	82430.	3.318E+06	0.48	0.912	-
351.31	87.94	3932.	1428.	2.682E+04	8.44	0.972	- s
4693.26	1173.38	567.	13650.	1.529E+06	0.99	1.950	-

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 %
AM-241	237.75	59.55	18759.	114994.	15.971	0.38	0.895
CS-137	2646.69	661.74	882.	33440.	4.644	0.59	1.494
Co-1332	5330.24	1332.63	117.	12093.	1.680	0.94	1.990

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 *****

Name	Code	Average Activity uCi/Source	Energy keV	Peak Activity uCi/Source	Code	MDA Value uCi/Source	COMMENTS
AM-241		4.3796E+02	59.54	4.380E+02	(	2.441E+00 3.82E-01	1.58E+05 1.00E+02 G
CS-137		3.8573E+02	661.66	3.857E+02	(	1.628E+00 5.85E-01	1.10E+04 1.00E+02 G
Co-1332		7.1885E+02	1332.50	7.189E+02	(	3.157E+00 9.42E-01	1.93E+03 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	4.3147E+02	4.3796E+02	3.822E-01%	2.44E+00
CS-137	3.1121E+02	3.8573E+02	5.852E-01%	1.63E+00
Co-1332	2.1125E+02	7.1885E+02	9.418E-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 2000.1 keV) 9.539E+02 uCi/Source
 Total Decayed Activity (37.6 to 2000.1 keV) 1.5425436E+03 uCi/Source

ANNUAL CALIBRATION VERIFICATION

Detector ID: **Detector # 8**
 SpectrumID: 8_20160128004_EffVerif
 Analysis Description: ACVTop-776670;TunaCan2006
 Calibration: 8_Soil_TunaCan_90099_032712
 Detector: Ge 8 SN/174

Verification Date: 2016-01-28 18:34
 Source Assay Date/Time: 2006-10-01 11:00

Isotope	Gamma Energy (keV)	Source Emission Rate (GPS) (Assay)	Observed Activity (GPS)	Percent Difference (%)
			(Actual)	<u>Assay-Actual</u> Assay
Am-241	59.54	449	4.79E+02	-6.7%
Cs-137	661.66	400	3.90E+02	2.5%
Co-1332	1332.5	777	7.56E+02	2.7%

Comments:

Perform Aaron Schroder 1/28/16

Review __Jody Watson____1/29/16_____

C:\User\CRpt\8_20160128004_EffVerif.xls

Sample Description: ACVTop-776670;TunaCan2006

Detector: Ge 8 SN/174

Source Date: 10/1/2006 11:00

Acquired: 1/28/2016 18:34:05

Analyzed: 2/4/2016 10:51

Analyst: Jody Watson

Efficiency: 8_Soil_TunaCan_90099_032712

Library: DET_EfficiencyVerification.lib

Nuclide	Activity uCi/Source	Uncertainty %
AM-241	4.789E+02	0.41
CS-137	3.899E+02	0.64
Co-1332	7.564E+02	0.99
Total	1.625E+03	

Sample description
ACVTop-776670;TunaCan2006

Spectrum Filename: C:\User\SPC\Det8\8_20160128004_EffVerif.An1

Acquisition information

Start time: 1/28/2016 6:34:05 PM
Live time: 7200
Real time: 7434
Dead time: 3.15 %
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): $-1.098764E-01 + (-4.958544E-01 * \text{Log}(E)) + (-2.572270E-02 * \text{Log}(E)^2)$
Below the Knee: Quadratic Uncertainty = 1.71 %
Log(Eff): $-2.525301E+01 + (9.398253E+00 * \text{Log}(E)) + (-1.000034E+00 * \text{Log}(E)^2)$

Library Files

Main analysis library: DET_EfficiencyVerification.lib
Library Match Width: 0.500
Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G53W4.25
Start channel: 150 (37.55keV)
Stop channel: 8000 (1999.96keV)
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

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	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: 0.0632

***** 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
46.57	74004.	0.44	1.01	2.005E-02				
59.58	102880.	0.35	1.02	2.881E-02	59.54	100.000	5.034E+02	AM241
88.09	1218.	9.96	0.76	3.993E-02				
661.54	27378.	0.64	1.34	1.209E-02	661.66	100.000	3.899E+02	CS137
1173.07	11810.	1.00	1.56	7.454E-03				
1332.31	10667.	0.99	1.75	6.678E-03	1332.50	100.000	7.564E+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
185.94	46.53	19029.	71370.	3.560E+06	0.54	0.847	-
352.16	88.09	3683.	1218.	3.051E+04	9.96	0.764	- s
4692.32	1173.07	306.	11810.	1.584E+06	1.00	1.561	-

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	237.97	59.54	15110.	97876.	13.594	0.41	0.867D
CS-137	2646.10	661.54	638.	27378.	3.802	0.64	1.335
Co-1332	5329.28	1332.31	68.	10667.	1.482	0.99	1.753

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 *****

Name	Code	Average Activity uCi/Source	Energy keV	Peak Activity uCi/Source	Code	MDA Value uCi/Source	COMMENTS
------	------	-----------------------------	------------	--------------------------	------	----------------------	----------

AM-241		4.7889E+02	59.54	4.789E+02	(	2.816E+00 4.13E-01	1.58E+05 1.00E+02 G
CS-137		3.8993E+02	661.66	3.899E+02	(	1.714E+00 6.40E-01	1.10E+04 1.00E+02 G
Co-1332		7.5635E+02	1332.50	7.564E+02	(	2.913E+00 9.90E-01	1.93E+03 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	Time Corrected	Uncertainty Counting	1 Sigma	MDA
	Activity uCi/Source	Activity uCi/Source			
AM-241	4.7179E+02	4.7889E+02	4.129E-01%		2.82E+00
CS-137	3.1450E+02	3.8993E+02	6.397E-01%		1.71E+00
Co-1332	2.2187E+02	7.5635E+02	9.900E-01%		2.91E+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 (37.5 to 2000.0 keV) 1.008E+03 uCi/Source
 Total Decayed Activity (37.5 to 2000.0 keV) 1.6251797E+03 uCi/Source

Monthly Backgrounds

Test America
St. Louis
Background Check

Spectrum: 3_20160709004_BGLong
Description: Background Long PBC Count
Acquired: 7/9/2016 5:59:54 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	2.34	2.18	2.23	2.41	2.44	2.49	PASS

Analyst: Aaron Schroder Reviewer:

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det3\3_20160709004_BGLong.An1

Acquisition information

Start time: 7/9/2016 5:59:54 PM
Live time: 43200
Real time: 43267
Dead time: 0.15 %
Detector ID: 3

Detector system

Ge 3 SN/131

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: DET_Long Background PBC.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 8)

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	

total peaks alloc. 20 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.1910

***** 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
46.38	479.	10.48	0.75	6.660E-02	46.54	4.250	3.910E+00	PB210
63.27	429.	13.93	0.93	9.450E-02	63.29	3.810	2.759E+00	TH234
72.78	270.	15.78	0.85	1.103E-01				
74.90	671.	6.93	0.85	1.138E-01				
84.64	352.	11.44	0.86	1.299E-01				
87.41	149.	23.22	0.86	1.345E-01	86.54	30.700	8.454E-02	EU155
92.55	716.	7.38	1.15	1.357E-01	92.59	5.584	2.186E+00	TH234
					93.35	5.561	2.194E+00	AC228
185.82	443.	12.25	1.33	1.149E-01	185.72	54.000	1.654E-01	U235
					185.99	3.280	2.724E+00	Ra226
198.40	113.	27.70	1.07	1.116E-01				
238.78	276.	16.02	0.85	1.010E-01	238.63	43.300	1.460E-01	PB212
351.90	253.	17.34	0.82	7.143E-02	351.93	37.600	2.184E-01	PB214
511.23	1640.	4.45	2.38	5.106E-02	511.86	20.000	3.723E+00	RH106
569.77	93.	27.84	1.21	4.619E-02	569.70	97.740	4.769E-02	BI207
					569.32	15.380	3.029E-01	CS134
					569.47	8.200	5.682E-01	PA234
583.29	127.	26.74	1.48	4.508E-02	583.02	84.500	7.718E-02	TL208
609.64	273.	16.41	1.26	4.286E-02	609.31	46.090	3.197E-01	BI214
					610.30	5.750	2.568E+00	RU103
802.76	113.	25.23	0.96	3.217E-02	801.95	8.690	9.374E-01	CS134
911.97	123.	21.82	2.12	2.760E-02	911.16	29.000	3.567E-01	AC228
969.92	108.	23.35	1.96	2.638E-02	968.97	17.460	5.445E-01	AC228
1461.25	206.	9.85	2.00	1.865E-02	1460.83	10.670	2.397E+00	K40
1764.82	114.	14.92	1.29	1.571E-02	1764.49	15.400	1.094E+00	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 Background Net Area Efficiency Uncert FWHM Suspected
 Channel Energy Counts Counts * Area 1 Sigma % keV Nuclide

Channel	Energy	Counts	Counts	* Area	1 Sigma	%	keV	Nuclide
290.86	72.77	772.	270.	2.447E+03	15.78	0.846	-	D
299.35	74.89	746.	671.	5.895E+03	6.93	0.848	-	D
338.35	84.61	636.	352.	2.711E+03	11.44	0.858	-	sD
349.42	87.37	526.	149.	1.110E+03	23.22	0.861	-	sD
793.71	198.40	325.	113.	1.013E+03	27.70	1.072	-	M
2045.62	511.23	472.	1640.	3.213E+04	4.45	2.383	-	s
3211.90	802.76	146.	113.	3.523E+03	25.23	0.960	-	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: DET_Long Background PBC.lib

***** I D E N T I F I E D P E A K S U M M A R Y *****
 Nuclide Peak Centroid Background Net Area Intensity Uncert FWHM
 Channel Energy Counts Counts Cts/Sec 1 Sigma % keV

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	1 Sigma	%	keV
PB-210	185.41	46.44	720.	488.	0.011	11.67	0.747s	
TH-234	252.78	63.27	822.	429.	0.010	13.93	0.934	
TH-234	370.02	92.55	592.	716.	0.017	7.38	1.154s	
Ra-226	743.36	185.82	602.	443.	0.010	12.25	1.333s	
PB-212	955.34	238.78	480.	276.	0.006	16.02	0.847s	
PB-214	1408.04	351.90	387.	253.	0.006	17.34	0.818s	
BI-207	2279.86	569.77	165.	93.	0.002	27.84	1.207	
TL-208	2333.95	583.29	220.	127.	0.003	26.74	1.482	
BI-214	2439.37	609.64	325.	273.	0.006	16.41	1.262s	
AC-228	3648.70	911.97	113.	123.	0.003	21.82	2.125s	
AC-228	3880.48	969.92	100.	108.	0.003	23.35	1.965s	
K-40	5844.86	1461.25	44.	206.	0.005	9.85	2.001	
BI-214	7058.06	1764.82	25.	114.	0.003	14.92	1.292s	

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 -	Average	----- Peak -----							
Name	Code	Activity	Energy	Activity	Code	MDA	Value	COMMENTS	
		DPS	keV	DPS		DPS			
K-40	N	2.3967E+00					4.66E+11		
			1460.83	2.397E+00	(	3.912E-01	9.85E+00	1.07E+01	G
TL-208	N	7.7183E-02					6.98E+02		
			583.02	7.718E-02	?(	4.365E-02	2.67E+01	8.45E+01	G
			277.28	0.000E+00	%	2.333E-01	9.24E+01	6.31E+00	G
			860.56	0.000E+00	%	2.202E-01	5.83E+01	1.24E+01	G
PB-210	N	3.9836E+00					8.14E+03		
			46.54	3.984E+00	*(	1.042E+00	1.17E+01	4.25E+00	G
PB-212	N	1.4598E-01					6.98E+02		
			238.63	1.460E-01	(	5.543E-02	1.60E+01	4.33E+01	G
			300.03	0.000E+00	%	4.884E-01	1.00E+03	3.28E+00	GA
PB-214	N	2.1836E-01					5.84E+05		
			351.93	2.184E-01	@(	8.132E-02	1.73E+01	3.76E+01	G
			295.09	0.000E+00	%	8.175E-02	3.30E+01	1.93E+01	G
			242.00	0.000E+00		3.034E-01	0.00E+00	7.43E+00	GA
BI-207	C	4.7689E-02					1.18E+04		
			569.70	4.769E-02	(	3.208E-02	2.78E+01	9.77E+01	G
			1063.66	0.000E+00	%	4.771E-02	7.91E+01	7.45E+01	G
BI-214	N	3.1972E-01					5.84E+05		
			609.31	3.197E-01	*(	1.016E-01	1.64E+01	4.61E+01	G
			1120.29	0.000E+00	%	2.655E-01	6.54E+01	1.51E+01	G
			1764.49	1.094E+00	+	2.474E-01	1.49E+01	1.54E+01	G
AC-228	N	4.2724E-01					2.10E+03		
			911.16	3.567E-01	(	1.509E-01	2.18E+01	2.90E+01	G
			968.97	5.445E-01	&(	2.474E-01	2.34E+01	1.75E+01	G
			338.32	0.000E+00	%	1.508E-01	1.15E+02	1.20E+01	G
			93.35	0.000E+00	?	4.656E-01	0.00E+00	5.56E+00	XA
TH-234	N	2.4183E+00					1.63E+12		
			63.29	2.759E+00	(	8.759E-01	1.39E+01	3.81E+00	G
			92.59	2.186E+00	*(	3.548E-01	7.38E+00	5.58E+00	G
Ra-226		2.7242E+00					5.84E+05		
			185.99	2.724E+00	*(	7.190E-01	1.23E+01	3.28E+00	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 - Half-life 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 %
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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	Uncertainty Counting	1 Sigma	MDA
BE-7	<	1.2370E-01			
NA-22	<	4.4140E-02			
K-40		2.3967E+00	9.8453E+00%		3.912E-01
Sc-46	<	1.4285E-02			
CR-51	<	1.5062E-01			
MN-54	<	2.7766E-02			
FE-59	<	6.3268E-02			
Co-56	<	3.1237E-02			
CO-57	<	1.9432E-02			
CO-58	<	1.6041E-02			

CO-60	<	3.4318E-02		
ZN-65	<	6.7449E-02		
NB-94	<	3.2012E-02		
ZR-95	<	5.1760E-02		
NB-95	<	4.1117E-02		
RU-103	<	2.3130E-02		
RH-106	<	2.5637E-01		
AG-108M	<	2.1504E-02		
AG-110M	<	4.5685E-02		
SN-113	<	2.8881E-02		
SB-124	<	3.0233E-02		
SB-125	<	6.0431E-02		
I-131	<	1.9339E-02		
BA-133	<	3.1899E-02		
CS-134	<	3.4978E-02		
CS-137	<	3.1819E-02		
CE-139	<	2.5584E-02		
Ba-140	<	8.7595E-02		
La-140	<	4.0205E-02		
CE-141	<	3.4373E-02		
CE-144	<	1.3285E-01		
PM-144	<	3.1250E-02		
EU-152	<	4.5080E-02		
EU-154	<	3.6596E-01		
EU-155	<	5.3244E-02		
HF-181	<	3.2442E-02		
Ta-182	<	1.4126E-01		
Hg-203	<	1.7435E-02		
TL-208 #		7.7183E-02	2.6745E+01%	4.365E-02
pm-146	<	7.6590E-02		
y-88	<	3.9449E-02		
PB-210 #		3.9836E+00	1.1669E+01%	1.042E+00
PB-212 #		1.4598E-01	1.6024E+01%	5.543E-02
PB-214 #		2.1836E-01	1.7336E+01%	8.132E-02
BI-207		4.7689E-02	2.7843E+01%	3.208E-02
BI-212 <		3.4799E-01		
BI-214 #		3.1972E-01	1.6407E+01%	1.016E-01
BI-210M <		2.8015E-02		
RA-224 <		5.7204E-01		
AC-228		4.2724E-01	1.5979E+01%	1.509E-01
TH-227 <		1.1264E-01		
TH-229 <		3.0603E-01		
TH-234		2.4183E+00	7.3813E+00%	8.759E-01
PA-231 <		3.9748E-01		
PA-233 <		4.4257E-02		
PA-234 <		1.0423E-01		
PA-234M <		5.2049E+00		
Ra-226 #		2.7242E+00	1.2252E+01%	7.190E-01
U-235 <		1.1006E-01		

AM-241 < 7.1454E-02
Np-237 < 1.8030E-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 (37.6 to 2000.6 keV) 1.276E+01 DPS

Test America
St. Louis
Background Check

Spectrum: 5_20160709002_BGLong
Description: Background Long PBC Count
Acquired: 7/9/2016 5:58:11 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	1.41	1.55	1.60	PASS

Analyst: Aaron Schroder Reviewer:

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det5\5_20160709002_BGLong.An1

Acquisition information

Start time: 7/9/2016 5:58:11 PM
Live time: 43200
Real time: 43365
Dead time: 0.38 %
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: DET_Long Background PBC.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 7)

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	

total peaks alloc. 13 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.1104

***** 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
46.59	389.	9.06	0.82	5.682E-02	46.54	4.250	3.733E+00	PB210
59.44	154.	23.18	0.81	7.407E-02	59.54	35.900	1.338E-01	AM241
63.28	374.	10.23	0.79	7.922E-02	63.29	3.810	2.872E+00	TH234
74.89	115.	24.92	0.81	9.469E-02				
77.28	124.	21.97	0.82	9.789E-02				
92.54	527.	8.35	1.05	1.129E-01	92.59	5.584	1.935E+00	TH234
					93.35	5.561	1.941E+00	AC228
185.89	267.	10.95	1.03	9.603E-02	185.72	54.000	1.191E-01	U235
					185.99	3.280	1.961E+00	Ra226
295.22	104.	23.54	0.82	6.950E-02	295.09	19.300	1.791E-01	PB214
351.67	200.	15.51	1.32	5.580E-02	351.93	37.600	2.213E-01	PB214
511.09	1010.	6.10	2.45	3.835E-02	511.86	20.000	3.052E+00	RH106
609.20	152.	21.54	1.14	3.200E-02	609.31	46.090	2.386E-01	BI214
					610.30	5.750	1.916E+00	RU103
662.36	125.	18.15	1.06	2.860E-02	661.66	85.210	1.187E-01	CS137
1120.29	72.	28.87	0.51	1.646E-02	1120.29	15.100	6.704E-01	BI214
					1120.55	99.987	1.013E-01	Sc46
1460.97	88.	16.39	1.90	1.300E-02	1460.83	10.670	1.469E+00	K40
1764.21	46.	26.11	5.54	1.105E-02	1764.49	15.400	6.188E-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 %	Suspected Nuclide
299.19	74.80	354.	115.	1.216E+03	24.92	0.813	- sD

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
308.75	77.19	306.	124.	1.262E+03	21.97	0.815	- sD
2044.98	511.09	322.	1010.	2.633E+04	6.10	2.452	-

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_Long Background PBC.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 %
PB-210	185.89	46.59	284.	389.	0.009	9.06	0.820
AM-241	237.34	59.44	336.	154.	0.004	23.18	0.811s
TH-234	252.71	63.28	312.	374.	0.009	10.23	0.794s
TH-234	369.85	92.54	384.	527.	0.012	8.35	1.046s
Ra-226	743.51	185.89	207.	267.	0.006	10.95	1.033
PB-214	1181.13	295.22	174.	104.	0.002	23.54	0.822
PB-214	1407.02	351.67	184.	200.	0.005	15.51	1.317s
BI-214	2437.50	609.20	184.	152.	0.004	21.54	1.137s
CS-137	2650.15	662.36	90.	125.	0.003	18.15	1.060
BI-214	4481.54	1120.29	60.	72.	0.002	28.87	0.506s
K-40	5843.30	1460.97	24.	88.	0.002	16.39	1.897
BI-214	7054.95	1764.21	16.	46.	0.001	26.11	5.540s

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 *****

Name	Code	Average Activity DPS	Energy keV	Activity DPS	Code	MDA Value DPS	COMMENTS
K-40	N	1.4688E+00	1460.83	1.469E+00	(	4.263E-01	4.66E+11 1.64E+01 1.07E+01 G
CS-137	I	1.1872E-01	661.66	1.187E-01	&(	4.456E-02	1.10E+04 1.82E+01 8.52E+01 G
PB-210	N	3.7332E+00	46.54	3.733E+00	(	7.797E-01	8.14E+03 9.06E+00 4.25E+00 G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments	
PB-214	N	2.0698E-01				5.84E+05		
			351.93	2.213E-01	*(	7.275E-02	1.55E+01	3.76E+01 G
			295.09	1.791E-01	(	1.108E-01	2.35E+01	1.93E+01 G
			242.00	0.000E+00	%	1.915E-01	9.52E+01	7.43E+00 GA
BI-214	N	2.3861E-01				5.84E+05		
			609.31	2.386E-01	@(	1.035E-01	2.15E+01	4.61E+01 G
			1120.29	6.704E-01	+	3.613E-01	2.89E+01	1.51E+01 G
			1764.49	6.188E-01	+	2.864E-01	2.61E+01	1.54E+01 G
TH-234	N	2.8717E+00				1.63E+12		
			63.29	2.872E+00	*(	6.525E-01	1.02E+01	3.81E+00 G
			92.59	1.935E+00	-	3.452E-01	8.35E+00	5.58E+00 G
Ra-226		1.9614E+00				5.84E+05		
		185.99	1.961E+00	(	5.130E-01	1.10E+01	3.28E+00 G	
AM-241	T	1.3383E-01				1.58E+05		
			59.54	1.338E-01	*(	7.659E-02	2.32E+01	3.59E+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 Uncertainty 1 Sigma
 Nuclide Activity Counting MDA
 DPS

BE-7	<	2.3676E-01			
NA-22	<	2.4128E-02			
K-40		1.4688E+00	1.6389E+01%		4.263E-01
Sc-46	<	4.9825E-02			
CR-51	<	1.6048E-01			
MN-54	<	2.8526E-02			
FE-59	<	5.4692E-02			
Co-56	<	3.2515E-02			
CO-57	<	1.0937E-02			
CO-58	<	2.9115E-02			
CO-60	<	4.2786E-02			
ZN-65	<	1.1980E-01			
NB-94	<	3.2682E-02			
ZR-95	<	5.2342E-02			
NB-95	<	3.8417E-02			
RU-103	<	2.2589E-02			
RH-106	<	2.7272E-01			
AG-108M	<	2.1208E-02			
AG-110M	<	8.1898E-02			
SN-113	<	2.8203E-02			
SB-124	<	3.6502E-02			
SB-125	<	6.3264E-02			
I-131	<	2.2298E-02			
BA-133	<	4.1125E-02			
CS-134	<	3.2597E-02			
CS-137		1.1872E-01	1.8155E+01%		4.456E-02
CE-139	<	2.2437E-02			
Ba-140	<	8.7346E-02			
La-140	<	4.3283E-02			
CE-141	<	3.5837E-02			
CE-144	<	1.6512E-01			
PM-144	<	3.2987E-02			
EU-152	<	7.1907E-02			
EU-154	<	2.3309E-01			
EU-155	<	5.0521E-02			

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HF-181	<	2.0479E-02		
Ta-182	<	2.2686E-01		
Hg-203	<	2.0146E-02		
TL-208	<	3.0257E-02		
pm-146	<	8.0361E-02		
y-88	<	3.6587E-02		
PB-210		3.7332E+00	9.0560E+00%	7.797E-01
PB-212	<	3.1920E-02		
PB-214		2.0698E-01	1.4094E+01%	7.275E-02
BI-207	<	4.3497E-02		
BI-212	<	3.7812E-01		
BI-214 #		2.3861E-01	2.1540E+01%	1.035E-01
BI-210M	<	2.8222E-02		
RA-224	<	5.3272E-01		
AC-228	<	1.1590E-01		
TH-227	<	1.7073E-01		
TH-229	<	3.0616E-01		
TH-234 #		2.8717E+00	1.0232E+01%	6.525E-01
PA-231	<	5.2395E-01		
PA-233	<	4.8273E-02		
PA-234	<	7.6306E-02		
PA-234M	<	3.9131E+00		
Ra-226		1.9614E+00	1.0951E+01%	5.130E-01
U-235	<	9.8216E-02		
AM-241 #		1.3383E-01	2.3177E+01%	7.659E-02
Np-237	<	1.3313E-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 - Half-life limit exceeded

----- S U M M A R Y -----
 Total Activity (37.6 to 2000.8 keV) 1.073E+01 DPS

Test America
St. Louis
Background Check

Spectrum: 7_20160709002_BGLong
Description: Background Long PBC Count
Acquired: 7/9/2016 5:58:58 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: Aaron Schroder Reviewer:

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det7\7_20160709002_BGLong.An1

Acquisition information

Start time: 7/9/2016 5:58:58 PM
Live time: 43200
Real time: 43957
Dead time: 1.72 %
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: DET_Long Background PBC.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

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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	

total peaks alloc. 10 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.0864

***** 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	414.	10.25	1.08	8.101E-02	46.54	4.250	2.782E+00	PB210
63.39	487.	9.34	0.88	1.231E-01	63.29	3.810	2.408E+00	TH234
92.66	620.	7.31	1.12	1.861E-01	92.59	5.584	1.381E+00	TH234
					93.35	5.561	1.385E+00	AC228
185.53	293.	13.08	1.00	1.634E-01	185.72	54.000	7.691E-02	U235
					185.99	3.280	1.267E+00	Ra226
238.69	196.	18.55	1.10	1.417E-01	238.63	43.300	7.407E-02	PB212
294.98	111.	27.43	2.76	1.186E-01	295.09	19.300	1.122E-01	PB214
351.83	96.	28.46	0.65	9.546E-02	351.93	37.600	6.215E-02	PB214
511.07	989.	6.78	2.38	6.487E-02	511.86	20.000	1.767E+00	RH106
1460.76	61.	21.24	1.84	1.997E-02	1460.83	10.670	6.646E-01	K40

***** 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
2043.99	511.07	351.	989.	1.525E+04	6.78	2.379	- 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_Long Background PBC.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 %
PB-210	185.53	46.50	363.	414.	0.010	10.25	1.078s
TH-234	253.12	63.39	396.	487.	0.011	9.34	0.883s
TH-234	370.20	92.66	374.	620.	0.014	7.31	1.119s
Ra-226	741.72	185.53	294.	293.	0.007	13.08	0.998s
PB-212	954.40	238.69	295.	196.	0.005	18.55	1.098s
PB-214	1179.55	294.98	204.	111.	0.003	27.43	2.762s
PB-214	1406.99	351.83	179.	96.	0.002	28.46	0.653s
K-40	5842.73	1460.76	21.	61.	0.001	21.24	1.842

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	- Average Code	- Activity DPS	- Peak Energy keV	- Activity DPS	- Code	- MDA Value DPS	- COMMENTS
K-40	N	6.6461E-01	1460.83	6.646E-01	?(	2.606E-01 2.12E+01	4.66E+11 1.07E+01 G
PB-210	N	2.7819E+00	46.54	2.782E+00	*(	6.140E-01 1.03E+01	8.14E+03 4.25E+00 G
PB-212	N	7.4073E-02	238.63	7.407E-02	*(	3.120E-02 1.85E+01	6.98E+02 4.33E+01 G
			300.03	0.000E+00	%	2.660E-01 8.80E+01	3.28E+00 GA
PB-214	N	7.9136E-02	351.93	6.215E-02	(	4.194E-02 2.85E+01	5.84E+05 3.76E+01 G
			295.09	1.122E-01	*(	7.003E-02 2.74E+01	1.93E+01 G
			242.00	0.000E+00	?	1.404E-01 0.00E+00	7.43E+00 GA
TH-234	N	2.4085E+00	63.29	2.408E+00	*(	4.720E-01 9.34E+00	1.63E+12 3.81E+00 G
			92.59	1.381E+00	-	2.068E-01 7.31E+00	5.58E+00 G
Ra-226		1.2670E+00	185.99	1.267E+00	*(	3.572E-01 1.31E+01	5.84E+05 3.28E+00 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 - Half-life 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 %
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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	Uncertainty Counting	1 Sigma	MDA
BE-7	<	1.6047E-01			
NA-22	<	3.1555E-02			
K-40	#	6.6461E-01	2.1241E+01%		2.606E-01
Sc-46	<	2.0866E-02			
CR-51	<	8.7029E-02			
MN-54	<	2.0301E-02			
FE-59	<	4.3559E-02			
Co-56	<	2.0763E-02			
CO-57	<	8.3165E-03			
CO-58	<	2.4327E-02			
CO-60	<	2.7031E-02			
ZN-65	<	5.2883E-02			
NB-94	<	1.6936E-02			

ZR-95	<	3.1670E-02		
NB-95	<	2.7458E-02		
RU-103	<	1.5059E-02		
RH-106	<	1.8400E-01		
AG-108M	<	1.1924E-02		
AG-110M	<	2.5931E-02		
SN-113	<	1.6662E-02		
SB-124	<	1.5448E-02		
SB-125	<	3.5797E-02		
I-131	<	1.2488E-02		
BA-133	<	2.6024E-02		
CS-134	<	1.8576E-02		
CS-137	<	1.8852E-02		
CE-139	<	8.6236E-03		
Ba-140	<	5.4914E-02		
La-140	<	3.4319E-02		
CE-141	<	1.6035E-02		
CE-144	<	6.3422E-02		
PM-144	<	1.9340E-02		
EU-152	<	3.6340E-02		
EU-154	<	1.6467E-01		
EU-155	<	2.9252E-02		
HF-181	<	7.9311E-03		
Ta-182	<	1.1886E-01		
Hg-203	<	7.3087E-03		
TL-208	<	2.1832E-02		
pm-146	<	4.7400E-02		
Y-88	<	2.5513E-02		
PB-210	#	2.7819E+00	1.0253E+01%	6.140E-01
PB-212	#	7.4073E-02	1.8546E+01%	3.120E-02
PB-214		7.9136E-02	1.9762E+01%	4.194E-02
BI-207	<	2.6280E-02		
BI-212	<	2.8809E-01		
BI-214	<	4.0953E-02		
BI-210M	<	1.5268E-02		
RA-224	<	2.4955E-01		
AC-228	<	8.9822E-02		
TH-227	<	7.8294E-02		
TH-229	<	1.7009E-01		
TH-234	#	2.4085E+00	9.3446E+00%	4.720E-01
PA-231	<	2.8418E-01		
PA-233	<	2.4264E-02		
PA-234	<	4.3918E-02		
PA-234M	<	3.0174E+00		
Ra-226	#	1.2670E+00	1.3081E+01%	3.572E-01
U-235	<	6.4124E-02		
AM-241	<	5.4748E-02		
Np-237	<	7.8646E-02		

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- # - 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) 7.275E+00 DPS

Test America
St. Louis
Background Check

Spectrum: 8_20160709002_BGLong
Description: Background Long PBC Count
Acquired: 7/9/2016 6:00:08 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: Aaron Schroder Reviewer:

Sample description
Background Long PBC Count

Spectrum Filename: C:\User\SPC\Det8\8_20160709002_BGLong.An1

Acquisition information

Start time: 7/9/2016 6:00:08 PM
Live time: 72000
Real time: 74127
Dead time: 2.87 %
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: DET_Long Background PBC.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 8)

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	

total peaks alloc. 19 cutoff: 5.00E+01 %
 Energy Calibration
 Normalized diff: 0.1316

***** 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	444.	9.34	1.02	8.677E-02	59.54	35.900	1.974E-01	AM241
63.31	1140.	4.34	1.03	9.238E-02	63.29	3.810	4.496E+00	TH234
76.96	162.	26.05	0.81	1.126E-01				
84.23	215.	28.15	1.11	1.233E-01				
92.62	2014.	3.79	1.02	1.295E-01	92.59	5.584	3.868E+00	TH234
					93.35	5.561	3.881E+00	AC228
140.03	112.	29.81	1.08	1.263E-01				
143.80	244.	15.05	1.09	1.248E-01	143.79	10.960	2.477E-01	U235
185.76	1060.	6.27	0.99	1.108E-01	185.72	54.000	2.462E-01	U235
					185.99	3.280	4.056E+00	Ra226
238.45	366.	14.63	1.21	9.644E-02	238.63	43.300	1.219E-01	PB212
351.72	127.	23.79	1.53	6.558E-02	351.93	37.600	7.154E-02	PB214
569.68	88.	27.87	1.24	4.064E-02	569.70	97.740	3.077E-02	BI207
					569.32	15.380	1.954E-01	CS134
					569.47	8.200	3.666E-01	PA234
583.38	142.	26.31	1.13	3.958E-02	583.02	84.500	5.910E-02	TL208
608.95	138.	26.16	1.08	3.750E-02	609.31	46.090	1.109E-01	BI214
					610.30	5.750	8.908E-01	RU103
661.82	282.	13.58	1.35	3.333E-02	661.66	85.210	1.378E-01	CS137
1000.87	152.	24.47	0.97	2.158E-02	1001.00	0.837	1.172E+01	PA234M
1063.06	123.	20.84	0.86	2.040E-02	1063.66	74.500	1.126E-01	BI207
1173.32	140.	14.76	1.88	1.834E-02	1173.24	99.900	1.064E-01	CO60
1332.46	118.	19.74	1.09	1.637E-02	1332.50	99.980	9.969E-02	CO60
1461.49	88.	22.50	1.95	1.543E-02	1460.83	10.670	7.397E-01	K40

***** 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
307.63	76.96	570.	162.	1.437E+03	26.05	0.806	-
336.73	84.23	898.	215.	1.742E+03	28.15	1.109	-
559.61	139.92	498.	116.	9.201E+02	28.70	1.085	- 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: DET_Long Background PBC.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	237.95	59.54	684.	440.	0.006	9.66	1.022D
TH-234	252.96	63.29	653.	1140.	0.016	4.34	1.025D
TH-234	370.31	92.62	954.	2014.	0.028	3.79	1.022
U-235	574.97	143.79	551.	244.	0.003	15.03	1.087D
U-235	742.71	185.72	777.	1068.	0.015	4.30	0.993D
PB-212	953.63	238.45	602.	366.	0.005	14.63	1.213
PB-214	1406.73	351.72	262.	127.	0.002	23.79	1.525s
BI-207	2278.64	569.68	154.	88.	0.001	27.87	1.235
TL-208	2333.44	583.38	261.	142.	0.002	26.31	1.130
BI-214	2435.72	608.95	259.	138.	0.002	26.16	1.082s
CS-137	2647.23	661.82	229.	282.	0.004	13.58	1.349
PA-234M	4003.48	1000.87	173.	152.	0.002	24.47	0.972s
BI-207	4252.26	1063.06	92.	123.	0.002	20.84	0.859s
CO-60	4693.32	1173.32	67.	140.	0.002	14.76	1.877
CO-60	5329.89	1332.46	76.	118.	0.002	19.74	1.094s
K-40	5846.04	1461.49	58.	88.	0.001	22.50	1.954

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 -	Average	----- Peak -----							
Name	Code	Activity	Energy	Activity	Code	MDA	Value	COMMENTS	
		DPS	keV	DPS		DPS			
K-40	N	7.3972E-01					4.66E+11		
			1460.83	7.397E-01	(	3.232E-01	2.25E+01	1.07E+01	G
CO-60	F	1.0304E-01					1.93E+03		
			1332.50	9.969E-02	?(	3.688E-02	1.97E+01	1.00E+02	G
			1173.24	1.064E-01	(	3.090E-02	1.48E+01	9.99E+01	G
CS-137	I	1.3778E-01					1.10E+04		
			661.66	1.378E-01	(	3.581E-02	1.36E+01	8.52E+01	G
TL-208	N	5.9103E-02					6.98E+02		
			583.02	5.910E-02	(	3.237E-02	2.63E+01	8.45E+01	G
			277.28	0.000E+00	&	1.491E-01	8.55E+01	6.31E+00	G
			860.56	0.000E+00	&	1.972E-01	1.00E+03	1.24E+01	G
PB-212	N	1.2191E-01					6.98E+02		
			238.63	1.219E-01	(	3.894E-02	1.46E+01	4.33E+01	G
			300.03	0.000E+00	%	4.687E-01	0.00E+00	3.28E+00	GA
PB-214	N	7.1536E-02					5.84E+05		
			351.93	7.154E-02	(	4.401E-02	2.38E+01	3.76E+01	G
			295.09	0.000E+00	?	7.784E-02	0.00E+00	1.93E+01	G
			242.00	0.000E+00		1.969E-01	0.00E+00	7.43E+00	GA
BI-207	C	3.0770E-02					1.18E+04		
			569.70	3.077E-02	?(	2.117E-02	2.79E+01	9.77E+01	G
			1063.66	1.126E-01	+	4.329E-02	2.08E+01	7.45E+01	G
BI-214	N	1.1091E-01					5.84E+05		
			609.31	1.109E-01	*(	6.245E-02	2.62E+01	4.61E+01	G
			1120.29	0.000E+00	&	1.712E-01	6.22E+01	1.51E+01	G
			1764.49	0.000E+00	&	2.098E-01	1.00E+03	1.54E+01	G
TH-234	N	4.4954E+00					1.63E+12		
			63.29	4.495E+00	(	4.802E-01	4.34E+00	3.81E+00	G
			92.59	3.868E+00	-	2.817E-01	3.79E+00	5.58E+00	G
PA-234M	N	1.1715E+01					1.63E+12		
			1001.00	1.172E+01	(	4.918E+00	2.45E+01	8.37E-01	G
			766.41	0.000E+00	&	7.156E+00	2.83E+02	2.94E-01	G

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
U-235	N	2.4788E-01					2.57E+11
		185.72	2.479E-01	}	3.078E-02	4.30E+00	5.40E+01 GA
		143.79	2.479E-01	?(	1.138E-01	1.50E+01	1.10E+01 G
		205.33	0.000E+00	%	1.808E-01	4.18E+01	5.01E+00 G
		163.38	0.000E+00	%	1.676E-01	3.70E+01	5.08E+00 G

AM-241	T	1.9608E-01					1.58E+05
		59.54	1.961E-01	(	5.547E-02	9.66E+00	3.59E+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 - Half-life 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
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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
BE-7	< 2.2101E-01			
NA-22	< 2.3975E-02			
K-40	7.3972E-01	2.2499E+01%		3.232E-01
Sc-46	< 2.0326E-02			
CR-51	< 9.9497E-02			
MN-54	< 2.1634E-02			
FE-59	< 4.0328E-02			
Co-56	< 2.0169E-02			
CO-57	< 1.3309E-02			
CO-58	< 2.1116E-02			
CO-60	1.0304E-01	1.2327E+01%		3.688E-02
ZN-65	< 8.6349E-02			
NB-94	< 1.9827E-02			
ZR-95	< 3.3544E-02			
NB-95	< 3.6005E-02			
RU-103	< 1.6960E-02			
RH-106	< 1.1141E-01			
AG-108M	< 1.6134E-02			
AG-110M	< 3.0125E-02			
SN-113	< 2.3283E-02			
SB-124	< 2.5934E-02			
SB-125	< 5.1466E-02			
I-131	< 1.6253E-02			
BA-133	< 3.4489E-02			
CS-134	< 1.1525E-02			
CS-137	1.3778E-01	1.3585E+01%		3.581E-02
CE-139	< 1.0629E-02			
Ba-140	< 6.6494E-02			
La-140	< 2.3499E-02			
CE-141	< 1.6675E-02			
CE-144	< 5.3313E-02			
PM-144	< 2.1845E-02			
EU-152	< 4.3126E-02			
EU-154	< 1.6647E-01			
EU-155	< 3.9910E-02			
HF-181	< 2.3894E-02			
Ta-182	< 1.1464E-01			
Hg-203	< 1.9366E-02			
TL-208	5.9103E-02	2.6309E+01%		3.237E-02
pm-146	< 6.0638E-02			
y-88	< 2.7289E-02			
PB-210	< 3.9808E-01			
PB-212	1.2191E-01	1.4632E+01%		3.894E-02

PB-214	7.1536E-02	2.3792E+01%	4.401E-02
BI-207 #	3.0770E-02	2.7866E+01%	2.117E-02
BI-212 <	2.6010E-01		
BI-214 #	1.1091E-01	2.6162E+01%	6.245E-02
BI-210M <	1.8412E-02		
RA-224 <	3.8410E-01		
AC-228 <	9.4185E-02		
TH-227 <	7.6651E-02		
TH-229 <	2.1018E-01		
TH-234	4.4954E+00	4.3383E+00%	4.802E-01
PA-231 <	4.7624E-01		
PA-233 <	2.6774E-02		
PA-234 <	7.3572E-02		
PA-234M	1.1715E+01	2.4472E+01%	4.918E+00
U-235	2.4788E-01	1.5032E+01%	1.138E-01
AM-241	1.9608E-01	9.6560E+00%	5.547E-02
Np-237 <	1.0103E-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 - Half-life limit exceeded

----- S U M M A R Y -----
 Total Activity (37.5 to 2000.0 keV) 1.803E+01 DPS

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
01/19/16 07:22		ACVTOP 160-238517/1		238517			JLW
07/09/16 17:59		ICB 160-259819/1		259819			RTM
07/11/16 00:16		CCV 160-259962/1		259962			
07/11/16 00:40		CCV 160-259962/2		259962			RTM
07/11/16 06:34		CCB 160-259962/3		259962			RTM
07/11/16 07:46	30	160-17814-2	AC-SED-6	259962	257060	GA-01-R	RTM
07/11/16 08:44	30	ZZZZZ		259962			
07/11/16 09:25	30	ZZZZZ		259962			
07/11/16 18:56	30	ZZZZZ		259962			
07/11/16 19:29	30	ZZZZZ		259962			

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
01/28/16 10:21		ACVTOP 160-236240/1		236240			PS
07/09/16 17:58		ICB 160-259822/1		259822			RTM
07/11/16 00:15		CCB 160-259964/1		259964			RTM
07/11/16 06:36		CCV 160-259964/2		259964			
07/11/16 06:58		CCV 160-259964/3		259964			RTM
07/11/16 07:46	30	160-17814-1	AC-SED-4	259964	257060	GA-01-R	RTM
07/11/16 08:46	30	160-17814-4	AC-SED-8	259964	257060	GA-01-R	RTM
07/11/16 09:27	30	ZZZZZ		259964			
07/11/16 18:56	30	ZZZZZ		259964			

Detector: GV7

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
03/27/12 08:10		IC 160-12302/1		12302			JLW
03/27/12 15:25		ICV 160-12302/2		12302			JLW
01/23/16 19:25		ACVTOP 160-236241/1		236241			PS
07/09/16 17:58		ICB 160-259823/1		259823			RTM
07/11/16 00:16		CCB 160-259965/1		259965			RTM
07/11/16 06:34		CCV 160-259965/2		259965			
07/11/16 06:57		CCV 160-259965/3		259965			RTM
07/11/16 07:47	30	LCS 160-257060/2-A		259965	257060	GA-01-R	RTM
07/11/16 08:47	30	160-17814-1 DU	AC-SED-4 DU	259965	257060	GA-01-R	RTM
07/11/16 09:26	30	ZZZZZ		259965			
07/11/16 10:25	60	ZZZZZ		259965			
07/11/16 13:38	30	ZZZZZ		259965			
07/11/16 18:57	30	ZZZZZ		259965			
07/11/16 23:28	60	ZZZZZ		259965			

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
01/28/16 18:34		ACVTOP 160-236248/1		236248			PS
07/09/16 18:00		ICB 160-259824/1		259824			RTM

Gamma Spectroscopy Run Log

Detector: GV8 (Continued)

Analysis Date	Count Minutes	Lab Sample ID	Client Sample ID	Analysis Batch	Prep Batch	Method	Analyst Initials
07/11/16 00:17		CCB 160-259963/1		259963			RTM
07/11/16 06:34		CCV 160-259963/2		259963			
07/11/16 06:56		CCV 160-259963/3		259963			RTM
07/11/16 07:48	30	MB 160-257060/1-A		259963	257060	GA-01-R	RTM
07/11/16 08:45	30	160-17814-3	AC-SED-7	259963	257060	GA-01-R	RTM
07/11/16 09:28	30	ZZZZZ		259963			
07/11/16 13:39	30	ZZZZZ		259963			
07/11/16 18:59		ZZZZZ		259963			
07/11/16 19:31	30	ZZZZZ		259963			

Radiological Pre-Preparation Data

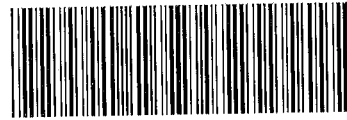
Shipping and Receiving Documents

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print) RANDY BROWN/EPA	NAME OF SURVEY OR ACTIVITY WLL SEDIMENT SAMPLING	DATE OF COLLECTION 10 DAY 06 MONTH 2016 YEAR	SHEET 1 of 1
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CONTENTS OF SHIPMENT **4 BAGS FOR GAMMA SPEC (INCLUDING Ra-226), Isotopic U, Isotopic Th**

SAMPLE NUMBER	TYPE OF CONTAINERS				SAMPLED MEDIA				RECEIVING LABORATORY REMARKS: OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)		
	CUBITAINER	BOTTLE	BOTTLE	BOTTLE	VOA SET (2 VIALS EA)	water	soil	sediment		dust	other
	NUMBERS OF CONTAINERS PER SAMPLE NUMBER										
AC-SED-4	1	BAG						X			TIME 0635
AC-SED-6	1	BAG						X			TIME 0640
AC-SED-7	1	BAG						X			TIME 0650
AC-SED-8	1	BAG						X			TIME 0700
										ALL SAMPLES! GAMMA SPEC (INCLUDING Ra-226) ISOTOPIC U ISOTOPIC Th	



160-17814 Chain of Custody

DESCRIPTION OF SHIPMENT ____ PIECE(S) CONSISTING OF ____ BOX(ES) 1 ICE CHEST(S); OTHER _____	MODE OF SHIPMENT ____ COMMERCIAL CARRIER: _____ ____ COURIER <input checked="" type="checkbox"/> SAMPLER CONVEYED (SHIPPING DOCUMENT NUMBER) _____
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PERSONNEL CUSTODY RECORD						
RELINQUISHED BY (SAMPLER) <i>[Signature]</i>	DATE 06/10/16	TIME 0945	RECEIVED BY <i>[Signature]</i>	DATE 6.10.16	TIME 0945	REASON FOR CHANGE OF CUSTODY Delivered to Lab
<input type="checkbox"/> SEALED <input checked="" type="checkbox"/> UNSEALED			<input type="checkbox"/> SEALED <input checked="" type="checkbox"/> UNSEALED			
RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME	REASON FOR CHANGE OF CUSTODY
<input type="checkbox"/> SEALED <input type="checkbox"/> UNSEALED			<input type="checkbox"/> SEALED <input type="checkbox"/> UNSEALED			
RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME	REASON FOR CHANGE OF CUSTODY
<input type="checkbox"/> SEALED <input type="checkbox"/> UNSEALED			<input type="checkbox"/> SEALED <input type="checkbox"/> UNSEALED			

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-17814-1

Login Number: 17814
List Number: 1
Creator: Daniels, Brian J

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
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.	True	
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?	True	
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 $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	