

US EPA ARCHIVE DOCUMENT

**ENGINEERING MANAGEMENT SUPPORT, INC.**

**West Lake OU-1**

**STANDARD LEVEL IV  
REPORT OF ANALYSIS**

**WORK ORDER #13-04052-OR**

**May 6, 2013**

**EBERLINE ANALYTICAL/OAK RIDGE LABORATORY  
OAK RIDGE, TN**

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**Eberline Services – Oak Ridge Laboratory  
LABORATORY DATA SUPPORT CHECKLIST**

MP-001-3

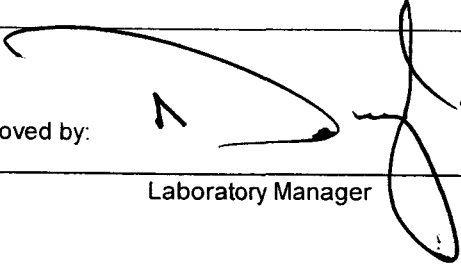
Eberline Services Work Order # 13-04052

The checklist items listed below are to be initialed by appropriate staff upon completion/verification.

Date for Partial	Initials	Date	Initials	Checklist Items
		4/9/13	KC	Sample Log-in
		4/30/13	YBD	Data Compilation
		5-1-13	MLT	First Technical Data Review
		5/1/13	MSA	Second Technical Data Review
		5/2/13	[Signature]	Data Entry/Electronic Deliverable
		5/2/13	[Signature]	Case Narrative
		5/6/13	YBD	Electronic Deliverable Proof
		5/7/13	MSA	Samples Analyzed within Holding Time Yes? <input checked="" type="checkbox"/> No? <input type="checkbox"/>
		5/7/13	MSA	QA/QC Review
				Client in Possession of Data Electronic or Hard Copy
				Invoiced by Laboratory

Technical/Clerical Corrections, Signatures Needed, Problems, Etc	Date/Initials

Date package approved by:

  
Laboratory Manager

5/7/13  
Date

Copy No. \_\_\_\_\_

Radiochemistry Services

US EPA ARCHIVE DOCUMENT

**SECTION I  
CHAIN OF CUSTODY  
&  
pH CHECK SHEET**





# Internal Chain of Custody

Work Order #	<b>13-04052</b>
Lab Deadline	<b>4/30/2013</b>
Analysis	<b>UISO - Level 4</b>
Sample Matrix	<b>Water</b>

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p><b>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</b></p>	<b>04</b>	47	FF1.0
	<b>05</b>	47	FF1.0
	<b>06</b>	43	FF1.0
	<b>07</b>	43	FF1.0
	<b>08</b>	41	FF1.0
	<b>09</b>	41	FF1.0
	<b>10</b>	39	FF1.0
	<b>11</b>	39	FF1.0
	<b>12</b>	39	FF1.0
	<b>13</b>	39	FF1.0
	<b>14</b>	43	FF1.0
	<b>15</b>	43	FF1.0
	<b>16</b>	36	FF1.0
	<b>17</b>	36	FF1.0
	<b>18</b>	35	FF1.0
	<b>19</b>	35	FF1.0

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/17/13 1300
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/19/13 1300
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0500 PM	4/19/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0900 PM	4/24/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	0600
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	105 4/24/13 1754
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		



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Oak Ridge Laboratory

# Internal Chain of Custody

Work Order #	<b>13-04052</b>
Lab Deadline	<b>4/30/2013</b>
Analysis	<b>ThISO - Level 4</b>
Sample Matrix	<b>Water</b>

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p><b>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</b></p>	04	47	FF1.0
	05	47	FF1.0
	06	43	FF1.0
	07	43	FF1.0
	08	41	FF1.0
	09	41	FF1.0
	10	39	FF1.0
	11	39	FF1.0
	12	39	FF1.0
	13	39	FF1.0
	14	43	FF1.0
	15	43	FF1.0
	16	36	FF1.0
	17	36	FF1.0
	18	35	FF1.0
	19	35	FF1.0

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4/17/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4/19/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4/19/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4/23/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4/23/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	<i>[Signature]</i>	4/24/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		





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Oak Ridge Laboratory

# Internal Chain of Custody

Work Order #

**13-04052**

Lab Deadline

**4/30/2013**

Analysis

**Ra226 - Level 4**

Sample Matrix

**Water**

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p><b>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</b></p>	04	47	FF1.0
	05	47	FF1.0
	06	43	FF1.0
	07	43	FF1.0
	08	41	FF1.0
	09	41	FF1.0
	10	39	FF1.0
	11	39	FF1.0
	12	39	FF1.0
	13	39	FF1.0
	14	43	FF1.0
	15	43	FF1.0
	16	36	FF1.0
	17	36	FF1.0
	18	35	FF1.0
	19	35	FF1.0

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JR	4/13/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JR	4/17/13 1910
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JR	4/18/13 0500
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JR	4/19/13 1300
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	VCB	4/19/13 1301
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	VCB	4/22/13 0945
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		



# Internal Chain of Custody

Work Order #	<b>13-04052</b>
Lab Deadline	<b>4/30/2013</b>
Analysis	<b>Ra228 - Level 4</b>
Sample Matrix	<b>Water</b>

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p><b>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</b></p>	04	47	FF1.0
	05	47	FF1.0
	06	43	FF1.0
	07	43	FF1.0
	08	41	FF1.0
	09	41	FF1.0
	10	39	FF1.0
	11	39	FF1.0
	12	39	FF1.0
	13	39	FF1.0
	14	43	FF1.0
	15	43	FF1.0
	16	36	FF1.0
	17	36	FF1.0
	18	35	FF1.0
	19	35	FF1.0

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/13/13 1300
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/17/13 1910
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4-18-13 0500
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4-19-13 1300
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/19/13 1301
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/22/13 0850
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4-20-13 0900
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[Signature]	4/20/13 1325
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		



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**Sample Receiving Report**  
(Volumes, pH, & CPM)

Internal Work Order

**13-04052**

Received By

**KCOULSTON**

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
01	LCS	0		WA	FF1.0		
02	BLANK	0		WA	FF1.0		
03	DUP	0		WA	FF1.0		
04	S-61 TOT ✓	1		WA	FF1.0	9.50	47
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	47
05	S-61 DIS ✓	1		WA	FF1.0	0.00	47
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				47
06	PZ-115-SS TOT ✓	1		WA	FF1.0	9.50	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	43
07	PZ-115-SS DIS ✓	1		WA	FF1.0	0.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				43
08	MW-104 TOT ✓	1		WA	FF1.0	9.50	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	41
09	MW-104 DIS ✓	1		WA	FF1.0	0.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				41
10	PZ-100-SD TOT ✓	1		WA	FF1.0	9.50	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	39
11	PZ-100-SD DIS ✓	1		WA	FF1.0	0.00	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				39
12	I-67 TOT ✓	1		WA	FF1.0	9.50	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	39
13	I-67 DIS ✓	1		WA	FF1.0	0.00	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				39
14	PZ-203-SS TOT ✓	1		WA	FF1.0	9.50	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	43
15	PZ-203-SS DIS ✓	1		WA	FF1.0	0.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				43
16	PZ-100-SS TOT ✓	1		WA	FF1.0	9.50	36
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	36
17	PZ-100-SS DIS ✓	1		WA	FF1.0	0.00	36
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				36
18	I-66 TOT ✓	1		WA	FF1.0	9.50	35
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	7	7	9.5000	35
19	I-66 DIS ✓	1		WA	FF1.0	0.00	35
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				35

*veyr  
04/09/13*

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Received by: Kristen Coulston

Date: 4/9/13

**SECTION II**  
**SAMPLE ACKNOWLEDGEMENT**





**Eberline Services – Oak Ridge Laboratory**

SAMPLE RECEIPT CHECKLIST  
MP-001-2

WORK ORDER # 13-04052

SAMPLE MATRIX/MATRICES:

(CIRCLE ONE OR BOTH)

AQUEOUS NON-AQUEOUS

(CIRCLE EITHER YES, NO, OR N/A)

WERE SAMPLES:

Received in good condition?	<input checked="" type="radio"/> Y	N	
If aqueous, properly preserved	<input checked="" type="radio"/> Y	N	N/A

WERE CHAIN OF CUSTODY SEALS:

Present on outside of package?	<input checked="" type="radio"/> Y	N
Unbroken on outside of package?	<input checked="" type="radio"/> Y	N
Present on samples?	<input checked="" type="radio"/> Y	N
Unbroken on samples?	<input checked="" type="radio"/> Y	N
Was chain of custody present upon sample receipt?	<input checked="" type="radio"/> Y	N

IF THE RESPONSE TO ANY OF THE ABOVE IS **NO**, A DISCREPANT SAMPLE RECEIPT REPORT (DSR) HAS BEEN ISSUED.

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SIGNATURE: Kristen Coulsten DATE: 4/9/13

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**SECTION III  
CASE NARRATIVE**



EBERLINE ANALYTICAL CORPORATION  
 601 SCARBORO ROAD  
 OAK RIDGE, TENNESSEE 37830  
 PHONE (865) 481-0683  
 FAX (865) 483-4621

EBS-OR-35527

May 7, 2013

Paul V. Rosasco, P.E.  
 Engineering Management Support, Inc.  
 7220 West Jefferson Ave, Suite 406  
 Lakewood, CO 80235

CASE NARRATIVE  
 Work Order # 13-04052-OR

SAMPLE RECEIPT

This work order contains eight water samples received 04/09/2013. All samples were analyzed as total and dissolved for Isotopic Uranium, Isotopic Thorium and Radium-226/228.

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
S-61 TOT	13-04052-04	I-67 TOT	13-04052-12
S-61 DIS	13-04052-05	I-67 DIS	13-04052-13
PZ-115-SS TOT	13-04052-06	PZ-203-SS TOT	13-04052-14
PZ-115-SS DIS	13-04052-07	PZ-203-SS DIS	13-04052-15
MW-104 TOT	13-04052-08	PZ-100-SS TOT	13-04052-16
MW-104 DIS	13-04052-09	PZ-100-SS DIS	13-04052-17
PZ-100-SD TOT	13-04052-10	I-66 TOT	13-04052-18
PZ-100-SD DIS	13-04052-11	I-66 DIS	13-04052-19

ANALYTICAL METHODS

Isotopic Uranium and Isotopic Thorium were analyzed using Method HASL 300, 4.5.2. Radium-226 was analyzed using EPA Method 903.0. Radium-228 was analyzed using EPA Method 904.0.

Laboratory qualifiers are as follows:

- J - Indicates a situation where the result minus the error is less than the detection limit but greater than zero.
- U - Indicates a situation where the result minus the error is less than or equal to zero.

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 2-sigma value.

US EPA ARCHIVE DOCUMENT



## ANALYTICAL RESULTS CONTINUED

### ISOTOPIC URANIUM

Samples were filtered to disassociate dissolved and total fractions. Volumetric aliquots from dissolved fractions were acidified with HNO<sub>3</sub>. All samples were prepared by mixed acid digestions as appropriate. Uranium was selectively extracted by ion exchange. Uranium was eluted, micro-precipitated and mounted on micro-porous filter media. Sample activities were then determined by alpha spectroscopy using energy specific regions of interest for Uranium-234, Uranium-235 and Uranium-238. Chemical recovery was determined by the use of a Uranium-232 tracer. Activity of the Uranium-232 tracer was determined by alpha spectroscopy using an energy specific region of interest.

Samples demonstrated acceptable results for all Uranium analyses. Chemical recovery was acceptable for all samples. The Uranium-234, Uranium-235 and Uranium-238 method blank demonstrated acceptable results. Results for the Uranium-234 and Uranium-238 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Uranium-235 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Uranium-234 and Uranium-238 laboratory control sample demonstrated an acceptable percent recovery.

### ISOTOPIC THORIUM

Samples were filtered to disassociate dissolved and total fractions. Volumetric aliquots from dissolved fractions were acidified with HNO<sub>3</sub>. All samples were prepared by mixed acid digestions as appropriate. Thorium was selectively extracted by ion exchange. Thorium was eluted, micro-precipitated and mounted on micro-porous filter media. Sample activities were then determined by alpha spectroscopy using energy specific regions of interest for Thorium-228, Thorium-230 and Thorium-232. Chemical recovery was determined by the use of a Thorium-229 tracer. Activity of the Thorium-229 tracer was determined by alpha spectroscopy using an energy specific region of interest.

Samples demonstrated acceptable results for all Thorium analyses. Chemical recovery was acceptable for all samples. The Thorium-228, Thorium-230 and Thorium-232 method blank demonstrated acceptable results. Results for the Thorium-228 and Thorium-232 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Thorium-230 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Thorium-228, Thorium-230 and Thorium-232 laboratory control sample demonstrated an acceptable percent recovery.

### RADIUM-226

Samples were filtered to disassociate dissolved and total fractions. Volumetric aliquots from dissolved fractions were acidified with HNO<sub>3</sub>. All samples were prepared by mixed acid digestions as appropriate. This was followed by selective sulfate precipitations of the Radium. Samples were then mounted by semi-micro-precipitations onto micro-porous filters. Samples were counted by alpha spectroscopy using an energy specific region of interest for Radium-226. Chemical recovery was calculated by the use of a Barium-133 tracer, which was determined by HPGe gamma spectroscopy.

Samples demonstrated acceptable results for all Radium-226 analyses. Chemical recovery was acceptable for all samples. The Radium-226 method blank demonstrated acceptable results. Results for the Radium-226 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Radium-226 laboratory control sample demonstrated an acceptable percent recovery.

ANALYTICAL RESULTS CONTINUED

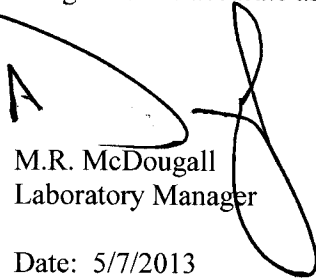
RADIUM-228

Following alpha spectroscopy analysis of Radium-226, Barium/Radium Sulfate precipitates were redissolved and allowed for sufficient ingrowth of the Actinium-228 daughter. After ingrowth, Actinium-228 was selectively precipitated. Precipitates were filtered and beta emissions for Actinium-228 were then counted on a gas proportional counter. Chemical recovery was determined by the use of a Barium-133 tracer, the activity of which was determined by HPGe gamma spectroscopy and an elemental Yttrium carrier by gravimetric measurements. The product of these two recoveries was used to calculate chemical yield.

Samples demonstrated acceptable results for all Radium-228 analyses. Chemical recovery was acceptable for all samples. The Radium-228 method blank demonstrated acceptable results. Results for the Radium-228 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Radium-228 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

I certify that this data report is in compliance with the terms and conditions of the Purchase Order, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the cognizant project manager or his/her designee to be accurate as verified by the following signature.

A 

M.R. McDougall  
Laboratory Manager

Date: 5/7/2013

Eberline Analytical wants and encourages your feedback regarding our performance providing radioanalytical services. Please visit <http://www.eberlineservices.com/client.htm> to provide us with feedback on our services.

**SECTION IV  
ANALYTICAL RESULTS SUMMARY**

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
LCS13-04052-01	13-04052-01	04/22/2013 12:20:08	Radium-226	E903.0	9.98	1.25	0.22		pCi/l
LCS13-04052-01	13-04052-01	04/30/2013 09:00:17	Radium-228	E904.0	8.75	0.86	0.97		pCi/l
LCS13-04052-01	13-04052-01	04/24/2013 05:44:06	Thorium-228	HASL 300, 4.5.2	4.28	0.66	0.07		pCi/l
LCS13-04052-01	13-04052-01	04/24/2013 05:44:06	Thorium-230	HASL 300, 4.5.2	4.68	0.71	0.06		pCi/l
LCS13-04052-01	13-04052-01	04/24/2013 05:44:06	Thorium-232	HASL 300, 4.5.2	4.53	0.69	0.07		pCi/l
LCS13-04052-01	13-04052-01	04/24/2013 11:58:08	Uranium-234	HASL 300, 4.5.2	7.60	1.12	0.08		pCi/l
LCS13-04052-01	13-04052-01	04/24/2013 11:58:08	Uranium-235	HASL 300, 4.5.2	0.90	0.28	0.08		pCi/l
LCS13-04052-01	13-04052-01	04/24/2013 11:58:08	Uranium-238	HASL 300, 4.5.2	7.33	1.09	0.07		pCi/l
BLANK13-04052-02	13-04052-02	04/22/2013 12:20:09	Radium-226	E903.0	-0.03	0.05	0.17	U	pCi/l
BLANK13-04052-02	13-04052-02	04/30/2013 09:00:17	Radium-228	E904.0	0.49	0.39	0.78	J	pCi/l
BLANK13-04052-02	13-04052-02	04/24/2013 05:44:08	Thorium-228	HASL 300, 4.5.2	-0.01	0.03	0.07	U	pCi/l
BLANK13-04052-02	13-04052-02	04/24/2013 05:44:08	Thorium-230	HASL 300, 4.5.2	0.19	0.11	0.07		pCi/l
BLANK13-04052-02	13-04052-02	04/24/2013 05:44:08	Thorium-232	HASL 300, 4.5.2	0.03	0.04	0.06	U	pCi/l
BLANK13-04052-02	13-04052-02	04/24/2013 11:58:09	Uranium-234	HASL 300, 4.5.2	0.05	0.05	0.06	U	pCi/l
BLANK13-04052-02	13-04052-02	04/24/2013 11:58:09	Uranium-235	HASL 300, 4.5.2	0.01	0.03	0.06	U	pCi/l
BLANK13-04052-02	13-04052-02	04/24/2013 11:58:09	Uranium-238	HASL 300, 4.5.2	0.04	0.04	0.05	U	pCi/l
PZ-203-SS TOT DUP	13-04052-03	04/22/2013 12:20:10	Radium-226	E903.0	0.65	0.24	0.14		pCi/l
PZ-203-SS TOT DUP	13-04052-03	04/30/2013 09:00:18	Radium-228	E904.0	0.91	0.39	0.74	J	pCi/l
S-61 TOT DUP	13-04052-03	04/24/2013 05:44:09	Thorium-228	HASL 300, 4.5.2	0.04	0.05	0.06	U	pCi/l
S-61 TOT DUP	13-04052-03	04/24/2013 05:44:09	Thorium-230	HASL 300, 4.5.2	0.25	0.12	0.08		pCi/l
S-61 TOT DUP	13-04052-03	04/24/2013 05:44:09	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.07	U	pCi/l
S-61 TOT DUP	13-04052-03	04/24/2013 11:58:20	Uranium-234	HASL 300, 4.5.2	0.79	0.22	0.08		pCi/l
S-61 TOT DUP	13-04052-03	04/24/2013 11:58:20	Uranium-235	HASL 300, 4.5.2	0.08	0.07	0.07	J	pCi/l
S-61 TOT DUP	13-04052-03	04/24/2013 11:58:20	Uranium-238	HASL 300, 4.5.2	0.65	0.19	0.08		pCi/l
S-61 TOT	13-04052-04	04/22/2013 12:20:11	Radium-226	E903.0	1.93	0.43	0.18		pCi/l
S-61 TOT	13-04052-04	04/30/2013 09:00:18	Radium-228	E904.0	1.21	0.43	0.77		pCi/l
S-61 TOT	13-04052-04	04/24/2013 05:44:11	Thorium-228	HASL 300, 4.5.2	0.08	0.07	0.07	J	pCi/l
S-61 TOT	13-04052-04	04/24/2013 05:44:11	Thorium-230	HASL 300, 4.5.2	0.31	0.14	0.06		pCi/l
S-61 TOT	13-04052-04	04/24/2013 05:44:11	Thorium-232	HASL 300, 4.5.2	0.02	0.04	0.06	U	pCi/l
S-61 TOT	13-04052-04	04/24/2013 11:58:15	Uranium-234	HASL 300, 4.5.2	0.76	0.23	0.09		pCi/l
S-61 TOT	13-04052-04	04/24/2013 11:58:15	Uranium-235	HASL 300, 4.5.2	0.03	0.07	0.12	U	pCi/l
S-61 TOT	13-04052-04	04/24/2013 11:58:15	Uranium-238	HASL 300, 4.5.2	0.74	0.23	0.13		pCi/l



Paul V. Rosasco, P.E.  
 Engineering Management Support, Inc.  
 7220 West Jefferson Ave, Suite 406  
 Lakewood, CO 80235

Project: West Lake OU-1  
 SDG: 1304052  
 Received: 04/09/2013  
 Matrix: Water

Final Report of Analysis  
 Date: 5/7/2013  
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<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
S-61 DIS	13-04052-05	04/22/2013 12:20:12	Radium-226	E903.0	0.37	0.18	0.14		pCi/l
S-61 DIS	13-04052-05	04/30/2013 09:18:28	Radium-228	E904.0	0.89	0.50	0.98	J	pCi/l
S-61 DIS	13-04052-05	04/24/2013 05:44:13	Thorium-228	HASL 300, 4.5.2	0.01	0.03	0.05	U	pCi/l
S-61 DIS	13-04052-05	04/24/2013 05:44:13	Thorium-230	HASL 300, 4.5.2	0.09	0.07	0.06	J	pCi/l
S-61 DIS	13-04052-05	04/24/2013 05:44:13	Thorium-232	HASL 300, 4.5.2	0.03	0.04	0.08	U	pCi/l
S-61 DIS	13-04052-05	04/24/2013 11:58:17	Uranium-234	HASL 300, 4.5.2	0.85	0.24	0.07		pCi/l
S-61 DIS	13-04052-05	04/24/2013 11:58:17	Uranium-235	HASL 300, 4.5.2	0.13	0.10	0.08	J	pCi/l
S-61 DIS	13-04052-05	04/24/2013 11:58:17	Uranium-238	HASL 300, 4.5.2	0.71	0.22	0.07		pCi/l
PZ-115-SS TOT	13-04052-06	04/22/2013 12:20:36	Radium-226	E903.0	7.70	0.91	0.13		pCi/l
PZ-115-SS TOT	13-04052-06	04/30/2013 09:18:29	Radium-228	E904.0	0.85	0.47	0.92	J	pCi/l
PZ-115-SS TOT	13-04052-06	04/24/2013 05:44:16	Thorium-228	HASL 300, 4.5.2	0.02	0.04	0.07	U	pCi/l
PZ-115-SS TOT	13-04052-06	04/24/2013 05:44:16	Thorium-230	HASL 300, 4.5.2	0.01	0.04	0.08	U	pCi/l
PZ-115-SS TOT	13-04052-06	04/24/2013 05:44:16	Thorium-232	HASL 300, 4.5.2	-0.01	0.04	0.11	U	pCi/l
PZ-115-SS TOT	13-04052-06	04/24/2013 11:58:11	Uranium-234	HASL 300, 4.5.2	2.51	0.44	0.05		pCi/l
PZ-115-SS TOT	13-04052-06	04/24/2013 11:58:11	Uranium-235	HASL 300, 4.5.2	0.14	0.10	0.09	J	pCi/l
PZ-115-SS TOT	13-04052-06	04/24/2013 11:58:11	Uranium-238	HASL 300, 4.5.2	1.69	0.34	0.07		pCi/l
PZ-115-SS DIS	13-04052-07	04/22/2013 12:20:38	Radium-226	E903.0	7.35	0.86	0.11		pCi/l
PZ-115-SS DIS	13-04052-07	04/30/2013 09:18:29	Radium-228	E904.0	1.31	0.42	0.75		pCi/l
PZ-115-SS DIS	13-04052-07	04/24/2013 05:44:18	Thorium-228	HASL 300, 4.5.2	0.04	0.06	0.09	U	pCi/l
PZ-115-SS DIS	13-04052-07	04/24/2013 05:44:18	Thorium-230	HASL 300, 4.5.2	0.21	0.11	0.06		pCi/l
PZ-115-SS DIS	13-04052-07	04/24/2013 05:44:18	Thorium-232	HASL 300, 4.5.2	0.07	0.06	0.07	J	pCi/l
PZ-115-SS DIS	13-04052-07	04/24/2013 11:58:13	Uranium-234	HASL 300, 4.5.2	2.30	0.42	0.06		pCi/l
PZ-115-SS DIS	13-04052-07	04/24/2013 11:58:13	Uranium-235	HASL 300, 4.5.2	0.18	0.11	0.10	J	pCi/l
PZ-115-SS DIS	13-04052-07	04/24/2013 11:58:13	Uranium-238	HASL 300, 4.5.2	1.55	0.33	0.08		pCi/l
MW-104 TOT	13-04052-08	04/22/2013 12:20:32	Radium-226	E903.0	0.37	0.21	0.15		pCi/l
MW-104 TOT	13-04052-08	04/30/2013 09:18:34	Radium-228	E904.0	1.33	0.51	0.95	J	pCi/l
MW-104 TOT	13-04052-08	04/24/2013 05:44:21	Thorium-228	HASL 300, 4.5.2	0.21	0.11	0.05		pCi/l
MW-104 TOT	13-04052-08	04/24/2013 05:44:21	Thorium-230	HASL 300, 4.5.2	0.34	0.14	0.08		pCi/l
MW-104 TOT	13-04052-08	04/24/2013 05:44:21	Thorium-232	HASL 300, 4.5.2	0.18	0.10	0.08		pCi/l
MW-104 TOT	13-04052-08	04/24/2013 11:58:05	Uranium-234	HASL 300, 4.5.2	1.45	0.35	0.08		pCi/l
MW-104 TOT	13-04052-08	04/24/2013 11:58:05	Uranium-235	HASL 300, 4.5.2	0.14	0.11	0.09	J	pCi/l
MW-104 TOT	13-04052-08	04/24/2013 11:58:05	Uranium-238	HASL 300, 4.5.2	1.13	0.30	0.07		pCi/l



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0200

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
MW-104 DIS	13-04052-09	04/22/2013 12:20:34	Radium-226	E903.0	0.25	0.16	0.14	J	pCi/l
MW-104 DIS	13-04052-09	04/30/2013 10:00:06	Radium-228	E904.0	1.34	0.53	0.99	J	pCi/l
MW-104 DIS	13-04052-09	04/24/2013 05:44:24	Thorium-228	HASL 300, 4.5.2	0.01	0.03	0.05	U	pCi/l
MW-104 DIS	13-04052-09	04/24/2013 05:44:24	Thorium-230	HASL 300, 4.5.2	0.18	0.10	0.05		pCi/l
MW-104 DIS	13-04052-09	04/24/2013 05:44:24	Thorium-232	HASL 300, 4.5.2	0.02	0.04	0.07	U	pCi/l
MW-104 DIS	13-04052-09	04/24/2013 11:58:06	Uranium-234	HASL 300, 4.5.2	1.42	0.39	0.13		pCi/l
MW-104 DIS	13-04052-09	04/24/2013 11:58:06	Uranium-235	HASL 300, 4.5.2	0.16	0.14	0.16	J	pCi/l
MW-104 DIS	13-04052-09	04/24/2013 11:58:06	Uranium-238	HASL 300, 4.5.2	1.18	0.35	0.13		pCi/l
PZ-100-SD TOT	13-04052-10	04/22/2013 12:45:17	Radium-226	E903.0	2.40	0.48	0.12		pCi/l
PZ-100-SD TOT	13-04052-10	04/30/2013 10:00:06	Radium-228	E904.0	1.20	0.51	0.96	J	pCi/l
PZ-100-SD TOT	13-04052-10	04/24/2013 05:44:26	Thorium-228	HASL 300, 4.5.2	0.02	0.04	0.06	U	pCi/l
PZ-100-SD TOT	13-04052-10	04/24/2013 05:44:26	Thorium-230	HASL 300, 4.5.2	0.15	0.09	0.06	J	pCi/l
PZ-100-SD TOT	13-04052-10	04/24/2013 05:44:26	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.06	U	pCi/l
PZ-100-SD TOT	13-04052-10	04/24/2013 14:51:35	Uranium-234	HASL 300, 4.5.2	0.45	0.15	0.06		pCi/l
PZ-100-SD TOT	13-04052-10	04/24/2013 14:51:35	Uranium-235	HASL 300, 4.5.2	0.01	0.03	0.07	U	pCi/l
PZ-100-SD TOT	13-04052-10	04/24/2013 14:51:35	Uranium-238	HASL 300, 4.5.2	0.27	0.12	0.07		pCi/l
PZ-100-SD DIS	13-04052-11	04/22/2013 12:45:13	Radium-226	E903.0	2.41	0.46	0.17		pCi/l
PZ-100-SD DIS	13-04052-11	04/30/2013 10:00:07	Radium-228	E904.0	0.40	0.44	0.91	U	pCi/l
PZ-100-SD DIS	13-04052-11	04/24/2013 05:44:29	Thorium-228	HASL 300, 4.5.2	0.00	0.03	0.08	U	pCi/l
PZ-100-SD DIS	13-04052-11	04/24/2013 05:44:29	Thorium-230	HASL 300, 4.5.2	0.07	0.06	0.06	J	pCi/l
PZ-100-SD DIS	13-04052-11	04/24/2013 05:44:29	Thorium-232	HASL 300, 4.5.2	0.00	0.03	0.06	U	pCi/l
PZ-100-SD DIS	13-04052-11	04/24/2013 14:51:37	Uranium-234	HASL 300, 4.5.2	0.36	0.13	0.05		pCi/l
PZ-100-SD DIS	13-04052-11	04/24/2013 14:51:37	Uranium-235	HASL 300, 4.5.2	0.01	0.03	0.06	U	pCi/l
PZ-100-SD DIS	13-04052-11	04/24/2013 14:51:37	Uranium-238	HASL 300, 4.5.2	0.36	0.13	0.05		pCi/l
I-67 TOT	13-04052-12	04/22/2013 12:45:15	Radium-226	E903.0	0.69	0.27	0.15		pCi/l
I-67 TOT	13-04052-12	04/30/2013 10:00:07	Radium-228	E904.0	0.55	0.49	0.99	J	pCi/l
I-67 TOT	13-04052-12	04/24/2013 08:55:56	Thorium-228	HASL 300, 4.5.2	0.05	0.07	0.09	U	pCi/l
I-67 TOT	13-04052-12	04/24/2013 08:55:56	Thorium-230	HASL 300, 4.5.2	0.61	0.22	0.08		pCi/l
I-67 TOT	13-04052-12	04/24/2013 08:55:56	Thorium-232	HASL 300, 4.5.2	0.00	0.04	0.10	U	pCi/l
I-67 TOT	13-04052-12	04/24/2013 14:51:38	Uranium-234	HASL 300, 4.5.2	0.86	0.24	0.08		pCi/l
I-67 TOT	13-04052-12	04/24/2013 14:51:38	Uranium-235	HASL 300, 4.5.2	0.05	0.06	0.08	U	pCi/l
I-67 TOT	13-04052-12	04/24/2013 14:51:38	Uranium-238	HASL 300, 4.5.2	0.60	0.20	0.06		pCi/l



<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
I-67 DIS	13-04052-13	04/22/2013 12:45:10	Radium-226	E903.0	0.46	0.21	0.10		pCi/l
I-67 DIS	13-04052-13	04/30/2013 09:59:54	Radium-228	E904.0	0.60	0.45	0.89	J	pCi/l
I-67 DIS	13-04052-13	04/24/2013 08:55:58	Thorium-228	HASL 300, 4.5.2	0.02	0.04	0.07	U	pCi/l
I-67 DIS	13-04052-13	04/24/2013 08:55:58	Thorium-230	HASL 300, 4.5.2	0.13	0.09	0.07	J	pCi/l
I-67 DIS	13-04052-13	04/24/2013 08:55:58	Thorium-232	HASL 300, 4.5.2	0.00	0.03	0.06	U	pCi/l
I-67 DIS	13-04052-13	04/24/2013 14:51:40	Uranium-234	HASL 300, 4.5.2	0.51	0.18	0.08		pCi/l
I-67 DIS	13-04052-13	04/24/2013 14:51:40	Uranium-235	HASL 300, 4.5.2	0.16	0.11	0.08	J	pCi/l
I-67 DIS	13-04052-13	04/24/2013 14:51:40	Uranium-238	HASL 300, 4.5.2	0.43	0.16	0.07		pCi/l
PZ-203-SS TOT	13-04052-14	04/22/2013 12:45:11	Radium-226	E903.0	1.22	0.36	0.11		pCi/l
PZ-203-SS TOT	13-04052-14	04/30/2013 09:59:54	Radium-228	E904.0	1.08	0.60	1.17	J	pCi/l
PZ-203-SS TOT	13-04052-14	04/24/2013 08:55:52	Thorium-228	HASL 300, 4.5.2	0.02	0.03	0.05	U	pCi/l
PZ-203-SS TOT	13-04052-14	04/24/2013 08:55:52	Thorium-230	HASL 300, 4.5.2	0.09	0.07	0.07	J	pCi/l
PZ-203-SS TOT	13-04052-14	04/24/2013 08:55:52	Thorium-232	HASL 300, 4.5.2	0.03	0.04	0.05	U	pCi/l
PZ-203-SS TOT	13-04052-14	04/24/2013 14:51:42	Uranium-234	HASL 300, 4.5.2	3.29	0.50	0.07		pCi/l
PZ-203-SS TOT	13-04052-14	04/24/2013 14:51:42	Uranium-235	HASL 300, 4.5.2	0.13	0.09	0.06	J	pCi/l
PZ-203-SS TOT	13-04052-14	04/24/2013 14:51:42	Uranium-238	HASL 300, 4.5.2	0.47	0.15	0.07		pCi/l
PZ-203-SS DIS	13-04052-15	04/22/2013 12:45:07	Radium-226	E903.0	1.44	0.36	0.13		pCi/l
PZ-203-SS DIS	13-04052-15	04/30/2013 09:59:54	Radium-228	E904.0	0.37	0.55	1.14	U	pCi/l
PZ-203-SS DIS	13-04052-15	04/24/2013 08:55:54	Thorium-228	HASL 300, 4.5.2	0.02	0.04	0.07	U	pCi/l
PZ-203-SS DIS	13-04052-15	04/24/2013 08:55:54	Thorium-230	HASL 300, 4.5.2	0.22	0.11	0.06		pCi/l
PZ-203-SS DIS	13-04052-15	04/24/2013 08:55:54	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.07	U	pCi/l
PZ-203-SS DIS	13-04052-15	04/24/2013 14:51:43	Uranium-234	HASL 300, 4.5.2	3.16	0.53	0.08		pCi/l
PZ-203-SS DIS	13-04052-15	04/24/2013 14:51:43	Uranium-235	HASL 300, 4.5.2	0.13	0.10	0.11	J	pCi/l
PZ-203-SS DIS	13-04052-15	04/24/2013 14:51:43	Uranium-238	HASL 300, 4.5.2	0.43	0.16	0.11		pCi/l
PZ-100-SS TOT	13-04052-16	04/22/2013 12:45:08	Radium-226	E903.0	4.60	0.72	0.12		pCi/l
PZ-100-SS TOT	13-04052-16	04/30/2013 09:59:55	Radium-228	E904.0	1.37	0.58	1.10	J	pCi/l
PZ-100-SS TOT	13-04052-16	04/24/2013 08:56:09	Thorium-228	HASL 300, 4.5.2	0.02	0.04	0.09	U	pCi/l
PZ-100-SS TOT	13-04052-16	04/24/2013 08:56:09	Thorium-230	HASL 300, 4.5.2	0.10	0.09	0.10	J	pCi/l
PZ-100-SS TOT	13-04052-16	04/24/2013 08:56:09	Thorium-232	HASL 300, 4.5.2	0.02	0.06	0.12	U	pCi/l
PZ-100-SS TOT	13-04052-16	04/24/2013 14:51:45	Uranium-234	HASL 300, 4.5.2	5.70	0.80	0.06		pCi/l
PZ-100-SS TOT	13-04052-16	04/24/2013 14:51:45	Uranium-235	HASL 300, 4.5.2	0.32	0.14	0.06		pCi/l
PZ-100-SS TOT	13-04052-16	04/24/2013 14:51:45	Uranium-238	HASL 300, 4.5.2	2.30	0.41	0.06		pCi/l



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0022

Paul V. Rosasco, P.E.  
 Engineering Management Support, Inc.  
 7220 West Jefferson Ave, Suite 406  
 Lakewood, CO 80235

Project: West Lake OU-1  
 SDG: 1304052  
 Received: 04/09/2013  
 Matrix: Water

Final Report of Analysis  
 Date: 5/7/2013  
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<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
PZ-100-SS DIS	13-04052-17	04/22/2013 16:36:46	Radium-226	E903.0	3.80	0.59	0.12		pCi/l
PZ-100-SS DIS	13-04052-17	04/30/2013 11:21:23	Radium-228	E904.0	1.08	0.54	1.04	J	pCi/l
PZ-100-SS DIS	13-04052-17	04/24/2013 08:56:04	Thorium-228	HASL 300, 4.5.2	-0.01	0.03	0.07	U	pCi/l
PZ-100-SS DIS	13-04052-17	04/24/2013 08:56:04	Thorium-230	HASL 300, 4.5.2	0.10	0.08	0.09	J	pCi/l
PZ-100-SS DIS	13-04052-17	04/24/2013 08:56:04	Thorium-232	HASL 300, 4.5.2	-0.02	0.03	0.12	U	pCi/l
PZ-100-SS DIS	13-04052-17	04/24/2013 14:51:47	Uranium-234	HASL 300, 4.5.2	6.01	0.80	0.05		pCi/l
PZ-100-SS DIS	13-04052-17	04/24/2013 14:51:47	Uranium-235	HASL 300, 4.5.2	0.21	0.11	0.08		pCi/l
PZ-100-SS DIS	13-04052-17	04/24/2013 14:51:47	Uranium-238	HASL 300, 4.5.2	2.35	0.40	0.07		pCi/l
I-66 TOT	13-04052-18	04/22/2013 16:36:48	Radium-226	E903.0	0.23	0.16	0.13	J	pCi/l
I-66 TOT	13-04052-18	04/30/2013 11:21:23	Radium-228	E904.0	0.27	0.64	1.33	U	pCi/l
I-66 TOT	13-04052-18	04/24/2013 08:56:06	Thorium-228	HASL 300, 4.5.2	0.04	0.06	0.11	U	pCi/l
I-66 TOT	13-04052-18	04/24/2013 08:56:06	Thorium-230	HASL 300, 4.5.2	0.12	0.10	0.07	J	pCi/l
I-66 TOT	13-04052-18	04/24/2013 08:56:06	Thorium-232	HASL 300, 4.5.2	-0.01	0.04	0.09	U	pCi/l
I-66 TOT	13-04052-18	04/24/2013 14:51:49	Uranium-234	HASL 300, 4.5.2	0.76	0.21	0.06		pCi/l
I-66 TOT	13-04052-18	04/24/2013 14:51:49	Uranium-235	HASL 300, 4.5.2	0.26	0.14	0.10		pCi/l
I-66 TOT	13-04052-18	04/24/2013 14:51:49	Uranium-238	HASL 300, 4.5.2	0.58	0.19	0.08		pCi/l
I-66 DIS	13-04052-19	04/22/2013 16:36:44	Radium-226	E903.0	0.20	0.15	0.14	J	pCi/l
I-66 DIS	13-04052-19	04/30/2013 11:21:23	Radium-228	E904.0	1.42	0.54	0.98	J	pCi/l
I-66 DIS	13-04052-19	04/24/2013 08:56:01	Thorium-228	HASL 300, 4.5.2	0.04	0.04	0.05	U	pCi/l
I-66 DIS	13-04052-19	04/24/2013 08:56:01	Thorium-230	HASL 300, 4.5.2	0.16	0.10	0.08	J	pCi/l
I-66 DIS	13-04052-19	04/24/2013 08:56:01	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.08	U	pCi/l
I-66 DIS	13-04052-19	04/24/2013 14:51:50	Uranium-234	HASL 300, 4.5.2	0.76	0.22	0.07		pCi/l
I-66 DIS	13-04052-19	04/24/2013 14:51:50	Uranium-235	HASL 300, 4.5.2	0.10	0.09	0.07	J	pCi/l
I-66 DIS	13-04052-19	04/24/2013 14:51:50	Uranium-238	HASL 300, 4.5.2	0.60	0.20	0.06		pCi/l



EBERLINE ANALYTICAL CORPORATION

601 SCARBORO ROAD OAK RIDGE, TN 37830 865/481-0683 FAX 865/483-4621

5223



**SECTION V**  
**ANALYTICAL STANDARDS**

U-8

QA/QC REVIEWED  
Date 1/16/95 Initials [initials]

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide: U-238NAT  
Half Life: (4.468 ± 0.005) x 10<sup>9</sup> years  
Catalog No.: 7338  
Source No.: 479-50

Customer: TMA EBERLINE  
P.O.No.: OR2778  
Reference Date: January 1 1995 12:00 PST.  
Contained Radioactivity: (Total U) 8.016 µCi  
Contained Radioactivity: (Total U) 297 kBq

**Description of Solution**

- a. Mass of solution: 65.2896 g in a 50 ml flame sealed ampoule
- b. Chemical form: Uranyl Nitrate in H<sub>2</sub>O
- c. Carrier content: None
- d. Density: Approximately 1.3202 g/ml @ 20°C.

Radioimpurities Refer to attached technical data sheet

Radioactive Daughters Refer to attached technical data sheet

**Radionuclide Concentration**

(Total U) 0.1228 µCi/g.

**Method of Calibration**

Activity calculations are based upon known specific activity and mass.

**Uncertainty of Measurement**

- a. Systematic uncertainty in instrument calibration: ±3.0%
- b. Random uncertainty in assay: ±0.0%
- c. Random uncertainty in weighing(s): ±2.0%
- d. Total uncertainty at the 99% confidence level: ±3.6%

**NIST Traceability**

This calibration is implicitly traceable to the National Institute of Standards and Technology.

**Leak Test(s)**

See reverse side for Leak Test(s) applied to this source.

**Notes**

1. Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).

*[Signature]*  
ERIC ALLAS  
QUALITY CONTROL

29 DECEMBER 1994  
Date Signed



ISOTOPE PRODUCTS LABORATORIES  
3017 N. SAN FERNANDO BLVD.  
BURBANK, CALIFORNIA 91504  
818-843-7000 FAX 818-843-6168



# QUALITY CONTROL PROGRAM

MP-009

Rev.8: 11/01/03

Title: Radioactive Reference Standards Solutions & Records

## EBERLINE SERVICES - OAK RIDGE LABORATORY RADIOACTIVE REFERENCE SOLUTIONS PRIMARY DILUTION RECERTIFICATION MP 009

SOLUTION REFERENCE # IPL 479-50 CURRENT DATE 9/6/2012 0:00  
SOLUTION # U-8

Principal Radionuclide <sup>234, 235, 238</sup>U Half Life, Years 4.468E+09 Half Life, Days 1.632E+12

Radionuclide <sup>234, 235, 238</sup>U Reference Date 1/1/1995 0:00  
Certified Activity 8.016E+00  $\mu\text{Ci}$   
Certified Concentration                       $\mu\text{Ci per gram}$

Ampoule /Solution Gross 97.6400 Weight, Grams  
Empty Ampoule 32.5020 Weight, Grams  
Solution Net 65.1380 Weight, Grams  
Total Activity in Ampoule 8.0160  $\mu\text{Ci}$

### Chemical Composition of Standard Solution

Uranyl nitrate in dilute HNO<sub>3</sub>

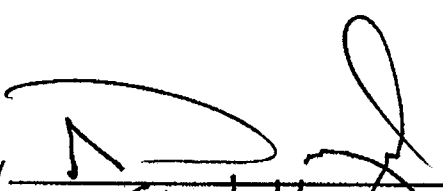
Dilution Instructions: Dilution Solvent Used 1M HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 8.0160  $\mu\text{Ci}$  Which Equals 1.780E+07 dpm at the date listed above

And after dilution the activity of this solution is 1.77955E+04 dpm/ml  
This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: September 6, 2013

Verified & Approved By 

Date: 9/26/2012 0:00

QC Approval 

Date: 9/26/12



QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY  
RADIOACTIVE REFERENCE STANDARD SOLUTIONS  
SECONDARY DILUTION RECERTIFICATION

Solution Reference # **MP-009**  
**IPL 479-50**

Date **9/6/2012 0:00**  
Solution # **U-8a**

Principal Radionuclide **<sup>234, 235, 238</sup>U** Half Life, Years **4.468E+09** Half Life, Days **1.632E+12**

Radionuclide of Interest **<sup>234, 235, 238</sup>U** Reference Date **1/1/1995 0:00**  
Parent Solution Conc. **1.7796E+04** dpm/ml

Chemical Composition of Standard Solution  
**Uranly Nitrate in 1M HNO<sub>3</sub>**

Dilution Instructions: Dilution Solvent Used **1M HNO<sub>3</sub>**

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: **4.0000** ml  
Total Activity: **7.1182E+04** dpm Final Activity Concentration: **7.1182E+01** dpm/ml  
Final Volume: **1000.00** ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Isotopic Distribution as:  
U-238 Atom % = 48.239 U-238 = 71.182 dpm/ml X 0.48249 = 34.345 dpm/ml  
U-235 Atom % = 2.25 U-235 = 71.182 dpm/ml X 0.0225 = 1.602 dpm/ml  
U-234 Atom % = 49.501 U-238 = 71.182 dpm/ml X 0.49501 = 35.236 dpm/ml  
All values +/- 3.6%  
Isotopic ratios from manufacturer's data sheet

Expiration Date: **September 6, 2013**

Verified & Approved By 

Date: **9/26/2012 0:00**

QC Approval 

Date: **9/26/12**

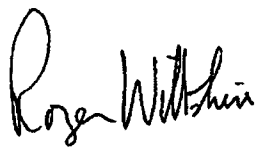
US EPA ARCHIVE DOCUMENT

**Tracer Solution for Environmental Analysis & Disequilibrium Studies**

**Product Description & Measurement Certificate**

<i>Description</i>	Principal radionuclide: <b>uranium 232 (U-232)</b> Daughter Nuclide: <b>Th-228</b>	Product code: <b>UDP10050</b> Batch Number: <b>92/232/67</b>
<i>Measurement</i>	Reference date: Radioactive concentration U-232 which is equivalent to Mass of solution Volume of solution Total activity of U-232 which is equivalent to	<b>01 March 2000</b> <b>6.739E+03 becquerels per gram of solution</b> <b>1.821E-01 microcuries per gram of solution</b> <b>5.356 grams</b> <b>5.035 millilitres</b> <b>3.61E+04 becquerels</b> <b>9.76E-01 microcuries</b>
<i>Accuracy</i>	Method of measurement (see reverse of this certificate) Random uncertainty is: $\pm 0.7\%$ Systematic uncertainty: $\pm 0.5\%$ Overall uncertainty in the radioactive concentration quoted above: $\pm 1.7\%$ Overall uncertainty is defined on the reverse of this certificate.	
<i>Radionuclidic Purity</i>	Any radioactive impurities measured are listed below, expressed as percentages of the activity of the principle radionuclide at the reference date .  Th-228 and daughter activity removed 2 Feb 2000 U-232 daughters activity will increase with time. By alpha 88% U-232, 12% daughters on 1/3/00	
<i>Isotopic Purity</i>	The isotopic composition, expressed as atom per cent at the reference date .  Not measured	
<i>Chemical Composition</i>	Calculated weight of U-232, 4.42E-08 grams, as 2M HNO3 solution in a flame sealed glass vial. This Tracer solution has been produced 'carrier free'.	
<i>Physical Data</i>	Recommended half life of uranium 232: 6.980E+01 years Principle energies of alpha emissions (MeV): 5.263 31.7%, 5.320 68.0% Branching ratio for alpha emission: 100% Calculated specific activity of uranium 232: 8.167E+05 Bq per microgram U-232.	
<i>Remarks</i>	For safety information and notes to ensure correct usage by all persons handling this radioactive Tracer solution please read the instructions accompanying the package.  AEA Technology operates a quality management system which has been independently audited and approved to ISO 9001.	

Approved Signatory



Roger Wiltshire

Project Ref. AE2315

Prepared and characterised in the UK, for world wide distribution by **Isotrak, AEA Technology, QSA.**

US EPA ARCHIVE DOCUMENT



# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

## EBERLINE SERVICES - OAK RIDGE LABORATORY RADIOACTIVE REFERENCE SOLUTIONS PRIMARY DILUTION RECERTIFICATION MP 009

SOLUTION REFERENCE # AEA/Amersham 92/232/67 CURRENT DATE 12/13/2012 0:00  
SOLUTION # U-10

Principal Radionuclide <sup>232</sup>U Half Life, Years 7.200E+01 Half Life, Days 2.630E+04

Radionuclide <sup>232</sup>U Reference Date 3/1/2000 0:00  
Certified Activity 9.760E-01  $\mu\text{Ci}$   
Certified Concentration                       $\mu\text{Ci per gram}$

Ampoule /Solution Gross		Weight, Grams
Empty Ampoule		Weight, Grams
Solution Net		Weight, Grams
Total Activity in Ampoule	<u>0.9760</u>	$\mu\text{Ci}$

Chemical Composition of Standard Solution  
<sup>232</sup>U(NO<sub>3</sub>)<sub>6</sub> in 2M HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 2M HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.9760  $\mu\text{Ci}$  Which Equals 2.167E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.167E+03 dpm/ml  
This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: December 7, 2013

Verified & Approved By [Signature]

Date: 12/13/2012 0:00

QC Approval [Signature]

Date: 12/13/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY  
RADIOACTIVE REFERENCE STANDARD SOLUTIONS  
SECONDARY DILUTION RECERTIFICATION

MP-009

Date: 12/7/2012 0:00

Solution Reference # AEA/Amersham 92/232/67

Solution # U-10a

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>232</sup>U

7.200E+01

2.630E+04

Radionuclide of Interest

<sup>232</sup>U

Reference Date

3/1/2000 0:00

Parent Solution Conc. 2.167E+03 dpm/ml

Chemical Composition of Standard Solution

<sup>232</sup>U(NO<sub>3</sub>)<sub>6</sub> in 2M HNO<sub>3</sub>

Dilution Instructions:

Dilution Solvent Used

2M HNO<sub>3</sub>

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 10.0000 ml

Total Activity: 2.1670E+04 dpm

Final Volume: 1000.00 ml

Final Activity Concentration: 2.1670E+01 dpm/ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: December 7, 2013

Verified & Approved By

Date: 12/13/2012 0:00

QC Approval

Date: 12/13/12

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QA/QC REVIEWED

Date 10/14/91 Initials wt

CERTIFICATE OF CALIBRATION  
ALPHA STANDARD SOLUTION

Received  
OCT 14 1991  
TMA/Eberline  
Oak Ridge Lab

Radionuclide Th-230 Customer: TMA EBERLINE  
Half Life:  $(7.54 \pm 0.03) \times 10^4$  years P.O.No.: TT4944  
Catalog No.: 7230 Reference Date: November 1 1991 12:00 PST.  
Source No.: 388-116 Contained Radioactivity: 1.036  $\mu$ Cl.

Description of Solution  
a. Mass of solution: 5.0042 grams.  
b. Chemical form: Th(NO<sub>3</sub>)<sub>4</sub> in 0.1N HNO<sub>3</sub>  
c. Carrier content: None added  
d. Density: 1.0016 gram/ml @ 20°C.

Radioimpurities See attached technical data sheet

Radioactive Daughters See attached technical data sheet

Radionuclide Concentration 0.207  $\mu$ Cl/gram.

Method of Calibration  
Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement  
a. Systematic uncertainty in instrument calibration:  $\pm 2.0\%$   
b. Random uncertainty in assay:  $\pm 0.5\%$   
c. Random uncertainty in weighing(s):  $\pm 0.2\%$   
d. Total uncertainty at the 99% confidence level:  $\pm 2.7\%$

NIST Traceability  
This calibration is implicitly traceable to the National Institute of Standards and Technology.

- Notes
1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
  2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



ISOTOPE PRODUCTS LABORATORIES  
1800 No. Keystone Street.,  
Burbank, California 91504  
(818) 843 - 7000

*[Signature]*  
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MP-009

Rev.8; 11/01/03  
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY  
RADIOACTIVE REFERENCE STANDARD SOLUTIONS  
SECONDARY DILUTION RECERTIFICATION

Solution Reference # **MP-009** **IPL 388-116** Date **3/4/2013 0:00**  
Solution # **Th-1b**

Principal Radionuclide **<sup>230</sup>Th** Half Life, Years **7.540E+04** Half Life, Days **2.754E+07**

Radionuclide of Interest **<sup>230</sup>Thorium** Reference Date **11/1/1991 0:00**  
Parent Solution Conc. **2.30E+03** dpm/ml

Chemical Composition of Standard Solution  
**<sup>230</sup>Th(NO<sub>3</sub>)<sub>4</sub> in 0.1N HNO<sub>3</sub>**

Dilution Instructions: Dilution Solvent Used **0.1N HNO<sub>3</sub>**



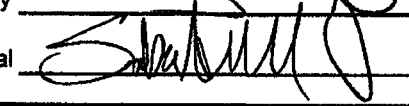
SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: **10.0000** ml  
Total Activity: **2.2999E+04** dpm Final Activity Concentration: **2.2999E+01** dpm/ml  
Final Volume: **1000.00** ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: **March 4, 2014**

Recertified By:   
Verified & Approved By:   
QC Approval: 

Date: **3/21/2013 0:00**  
Date: **3/21/13**  
Date: **3/21/13**

US EPA ARCHIVE DOCUMENT



**QUALITY CONTROL PROGRAM**  
MP-009

Rev.8; 11/01/03  
Title: Radioactive Reference Standards Solutions & Records

**EBERLINE SERVICES - OAK RIDGE LABORATORY**  
**RADIOACTIVE REFERENCE SOLUTIONS**  
**PRIMARY DILUTION RECERTIFICATION**  
MP 009

SOLUTION REFERENCE # IPL 388-116 CURRENT DATE 3/4/2013 0:00  
SOLUTION # Th-1

Principal Radionuclide <sup>230</sup>Th Half Life, Years 7.540E+04 Half Life, Days 2.754E+07

Radionuclide <sup>230</sup>Thorium Reference Date 11/1/1991 0:00  
Certified Activity 1.036E+00  $\mu\text{Ci}$   
Certified Concentration                       $\mu\text{Ci per gram}$

Ampoule /Solution Gross	<u>9.2660</u>	Weight, Grams
Empty Ampoule	<u>4.6218</u>	Weight, Grams
Solution Net	<u>4.6442</u>	Weight, Grams
Total Activity in Ampoule	<u>1.0360</u>	$\mu\text{Ci}$

Chemical Composition of Standard Solution  
<sup>230</sup>Th(NO<sub>3</sub>)<sub>4</sub> in 0.1N HNO<sub>3</sub>


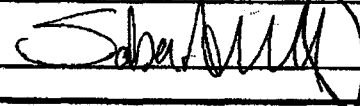
Dilution Instructions: Dilution Solvent Used 0.1N HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0360  $\mu\text{Ci}$  Which Equals 2.300E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.300E+03 dpm/ml  
This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: March 4, 2014

Recertified By  Date: 3/21/2013 0:00  
QC Approval  Date: 3/21/13

US EPA ARCHIVE DOCUMENT

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Th-232	Customer:	TMA EBERLINE
Half Life:	$(1.405 \pm 0.006) \times 10^{10}$ years	P.O.No.:	VH1632
Catalog No.:	7232	Reference Date:	November 1 1993 12:00 PST.
Source No.:	435-104-2	Contained Radioactivity:	(Th-232) 0.0933 $\mu$ Ci.
		Contained Radioactivity:	(Th-232) 3.45 kBq.

**Description of Solution**

a. Mass of solution: 11.9712 g (in a 10 ml flame sealed ampoule)

b. Chemical form: Th(NO<sub>3</sub>)<sub>4</sub> in water

c. Carrier content: None added

d. Density: Approx. 1.21 g/ml @ 20°C.

**Radioimpurities** None detected (other than daughters).

**Radioactive Daughters**  
Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Po-212, Tl-208

**Radionuclide Concentration**  
(Th-232) 0.00779  $\mu$ Ci/g.

**Method of Calibration**  
Activity calculations are based upon known specific activity and mass.

**Uncertainty of Measurement**

a. Systematic uncertainty in instrument calibration:	$\pm 3.0\%$
b. Random uncertainty in assay:	$\pm 0.0\%$
c. Random uncertainty in weighing(s):	$\pm 2.0\%$
d. Total uncertainty at the 99% confidence level:	$\pm 3.6\%$

**NIST Traceability**  
This calibration is implicitly traceable to the National Institute of Standards and Technology.

**Leak Test(s)**  
See reverse side for Leak Test(s) applied to this source.

**Notes**

1. Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).



**ISOTOPE PRODUCTS LABORATORIES**  
1800 North Keystone Street  
Burbank, California 91504  
(818) 843 - 7000

*Arma U. Khan*  
QUALITY CONTROL  
*Nov. 8, 1993*  
Date Signed

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QUALITY CONTROL PROGRAM  
MP-009

Rev.8; 1/10/03  
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY  
RADIOACTIVE REFERENCE SOLUTIONS  
PRIMARY DILUTION RECERTIFICATION  
MP 009

SOLUTION REFERENCE # IPL 435-104-2 CURRENT DATE 10/9/2012 0:00  
SOLUTION # Th-8

Principal Radionuclide <sup>232</sup>Th, <sup>228</sup>Th Half Life, Years 1.405E+10 Half Life, Days 5.132E+12

Radionuclide <sup>232</sup> & <sup>228</sup>Th Reference Date 11/11/1993 0:00  
Certified Activity 9.330E-02  $\mu\text{Ci}$   
Certified Concentration                       $\mu\text{Ci per gram}$

Ampoule /Solution Gross 18.8415 Weight, Grams  
Empty Ampoule 6.9296 Weight, Grams  
Solution Net 11.9119 Weight, Grams  
Total Activity in Ampoule 0.0933  $\mu\text{Ci}$

Chemical Composition of Standard Solution  
Th(NO<sub>3</sub>)<sub>4</sub> in H<sub>2</sub>O

Dilution Instructions: Dilution Solvent Used 1% Nitric Acid

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.0933  $\mu\text{Ci}$  Which Equals 2.071E+05 dpm at the date listed above

And after dilution the activity of this solution is 2.071E+02 dpm/ml This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: October 9, 2013

Verified & Approved By

Date: 10/9/2012 0:00

QC Approval

Date: 11/12/12

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**QUALITY CONTROL PROGRAM**  
MP-009

Rev.8; 1/10/03  
Title: Radioactive Reference Standards Solutions & Records

**EBERLINE SERVICES - OAK RIDGE LABORATORY**  
**RADIOACTIVE REFERENCE STANDARD SOLUTIONS**  
**SECONDARY DILUTION RECERTIFICATION**

Solution Reference # **MP-009** **IPL 435-104-2** Date **11/9/2012 0:00**  
Solution # **Th-8b**

Principal Radionuclide **228 & 232 Th** Half Life, Years **1.405E+10** Half Life, Days **5.132E+12**

Radionuclide of Interest **228 & 232 Th** Reference Date **11/1/1993 0:00**  
Parent Solution Conc. **2.07E+02** dpm/ml

**Chemical Composition of Standard Solution**  
**Th(NO<sub>3</sub>)<sub>4</sub> in 1% HNO<sub>3</sub>**

Dilution Instructions: Dilution Solvent Used **1% Nitric Acid**

**SECONDARY VOLUMETRIC DILUTION**

Vol. Parent Solution: **500.0000** ml  
Total Activity: **1.0355E+05** dpm Final Activity Concentration: **1.0355E+02** dpm/ml  
Final Volume: **1000.00** ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: **October 9, 2013**

Verified & Approved By 

Date: **11/9/2012 0:00**

QC Approval 

Date: **11/12/12**

US EPA ARCHIVE DOCUMENT



**Isotope Products  
Laboratories**

An Eckert & Ziegler Company

24937 Avenue Tibbitts  
Valencia, California 91355

Tel 661-309-1010  
Fax 661-257-8303

Th-18

## CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

<b>Radionuclide:</b> Th-229	<b>Customer:</b> EBERLINE SERVICES
<b>Half-life:</b> 7340 ± 160 years	<b>P.O. No.:</b> 00009633
<b>Catalog No.:</b> 7229	<b>Reference Date:</b> 15-Jan-02 12:00 PST
<b>Source No.:</b> 867-54	<b>Contained Radioactivity:</b> 1.013 μCi 37.48 kBq (Th-229 only)

**Physical Description:**

A. Mass of solution:	5.0147 g in 5 mL flame-sealed ampoule
B. Chemical form:	Th(NO <sub>3</sub> ) <sub>4</sub> in 0.1M HNO <sub>3</sub>
C. Carrier content:	10μg Th/mL
D. Density:	1.0016 g/mL @ 20°C.

**Radioimpurities:**

None detected (daughters in equilibrium)

**Radionuclide Concentration:** 0.2020 μCi/g, 7.474 kBq/g

**Method of Calibration:**

This source was prepared from a weighed aliquot of solution whose activity in μCi/g was determined using gamma ray spectrometry.

Peak energy used for integration:	193.5 keV
Branching ratio used:	0.0441 gammas per decay

**Uncertainty of Measurement:**

A. Type A (random) uncertainty:	± 0.7 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

**Notes:**

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from IAEA Technical Report Series No. 261.
- This solution has a working life of 5 years.

*Ann U Khan*  
\_\_\_\_\_  
Quality Control

9-Jan-02  
\_\_\_\_\_  
Date Signed

IPL Ref. No.: 867-54

ISO 9001 CERTIFIED

**Medical Imaging Laboratory**  
24937 Avenue Tibbitts Valencia, California 91355

**Industrial Gauging Laboratory**  
1800 North Keystone Street Burbank, California 91504

US EPA ARCHIVE DOCUMENT





# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

## EBERLINE SERVICES - OAK RIDGE LABORATORY RADIOACTIVE REFERENCE SOLUTIONS PRIMARY DILUTION RECERTIFICATION MP 009

SOLUTION REFERENCE # IPL 867-54 CURRENT DATE 11/9/2012 0:00  
SOLUTION # Th-18

Principal Radionuclide <sup>228</sup>Th Half Life, Years 7.340E+03 Half Life, Days 2.681E+06

Radionuclide <sup>228</sup>Th Reference Date 1/15/2002 0:00  
Certified Activity 1.013E+00  $\mu\text{Ci}$   
Certified Concentration                       $\mu\text{Ci per gram}$

Ampoule /Solution Gross 8.7752 Weight, Grams  
Empty Ampoule 3.7591 Weight, Grams  
Solution Net 5.0161 Weight, Grams  
Total Activity in Ampoule 1.0130  $\mu\text{Ci}$

Chemical Composition of Standard Solution  
<sup>228</sup>Th(NO<sub>3</sub>)<sub>4</sub> in 0.1M HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 0.1 M HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0130  $\mu\text{Ci}$  Which Equals 2.249E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.249E+03 dpm/ml  
This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: October 9, 2013

Verified & Approved By 

Date: 11/9/2012 0:00

QC Approval 

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



**QUALITY CONTROL PROGRAM**  
MP-009

Rev.7; 9/29/99  
Title: Radioactive Reference Standards Solutions & Records

**EBERLINE SERVICES - OAK RIDGE LABORATORY**  
**RADIOACTIVE REFERENCE STANDARD SOLUTIONS**  
**SECONDARY DILUTION RECERTIFICATION**

Solution Reference # MP-009 IPL 867-54 Date 11/9/2012 0:00  
Solution # Th-18a

Principal Radionuclide	Half Life, Years	Half Life, Days
<sup>228</sup> Th	7.340E+03	2.681E+06

Radionuclide of Interest <sup>228</sup>Th Reference Date 1/15/2002 0:00  
Parent Solution Conc. 2.25E+03 dpm/ml

**Chemical Composition of Standard Solution**  
TH(NO<sub>3</sub>)<sub>4</sub> in 0.1M HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 0.1M HNO<sub>3</sub>

**SECONDARY VOLUMETRIC DILUTION**

Vol. Parent Solution:	<u>10.0000</u> ml	Final Activity Concentration:	<u>2.2490E+01</u> dpm/ml
Total Activity:	<u>2.2490E+04</u> dpm		
Final Volume:	<u>1000.00</u> ml		

**NOTES:**

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: October 9, 2013

Verified & Approved By 

Date: 11/9/2012 0:00

QC Approval 

Date: 11/12/12





National Institute of Standards & Technology  
**Certificate**

Ba-6  
(f 6a)

ORIGINAL

ORIGINAL

Standard Reference Material 4251C  
Barium-133 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive barium-133 chloride, non-radioactive barium chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

**Radiological Hazard**

The SRM ampoule contains barium-133 with a total activity of approximately 2.5 MBq. Barium-133 decays by electron capture and during the decay process X-rays and gamma rays with energies from 4 to 400 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]\*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

**Chemical Hazard**

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

**Storage and Handling**

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least June 2004.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

**Preparation**

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899  
October 1994

Thomas E. Gills, Chief  
Standard Reference Materials Program

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM  
QCP-009

Rev.8; 11/10/03  
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY  
RADIOACTIVE REFERENCE SOLUTIONS  
PRIMARY DILUTION RECERTIFICATION  
QCP 009-1

CURRENT DATE 9/20/2012 0:00

SOLUTION REFERENCE # NIST SRM4251C

SOLUTION # Ba-6

Principal Radionuclide	Half Life, Years	Half Life, Days
<sup>133</sup> Barium	1.048E+01	3.828E+03

Radionuclide <sup>133</sup>Barium

Reference Date 9/1/1993 0:00

Certified Activity  $\mu\text{Ci}$   
Certified Concentration 1.318E+01  $\mu\text{Ci per gram}$

Ampoule /Solution Gross	9.3081	Weight, Grams
Empty Ampoule	4.2582	Weight, Grams
Solution Net	5.0499	Weight, Grams
Total Activity in Ampoule	66.5577	$\mu\text{Ci}$

Chemical Composition of Standard Solution

<sup>133</sup>BaCl<sub>2</sub> in 1M HCl

Dilution Instructions: Dilution Solvent Used 1M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 66.5577  $\mu\text{Ci}$  Which Equals 1.478E+08 dpm at the date listed above

And after dilution the activity of this solution is 1.478E+05 dpm/ml This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: September 20, 2013

Verified & Approved By 

Date: 9/27/12

QC Approval 

Date: 9/27/12

US EPA ARCHIVE DOCUMENT



**QUALITY CONTROL PROGRAM**  
QCP-009

Rev. 8: 11/10/03  
Title: Radioactive Reference Standards Solutions & Records

**EBERLINE SERVICES - OAK RIDGE LABORATORY**  
**RADIOACTIVE REFERENCE STANDARD SOLUTIONS**  
**SECONDARY DILUTION RECERTIFICATION**

Solution Reference # QCP-009-1-A      Date 9/20/12  
NIST-SRM4251C      Solution # Ba-6a

Principal Radionuclide	Half Life, Years	Half Life, Days
<sup>133</sup> Ba	1.048E+01	3.828E+03

Radionuclide of Interest <sup>133</sup>Ba      Reference Date 9/1/1993 0:00  
Parent Solution Conc. 1.48E+05 dpm/ml

**Chemical Composition of Standard Solution**  
<sup>133</sup>BaCl<sub>2</sub> in 1M HCl

Dilution Instructions:      Dilution Solvent Used 1M HCl

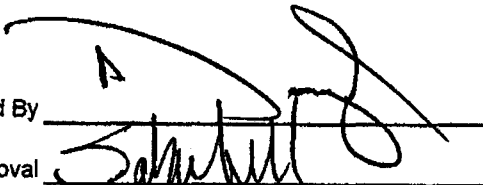

**SECONDARY VOLUMETRIC DILUTION**

Vol. Parent Solution: 25.0000 ml  
Total Activity: 3.6950E+06 dpm      Final Activity Concentration: 3.6950E+03 dpm/ml  
Final Volume: 1000.00 ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: September 20, 2013

Verified & Approved By   
QC Approval 

Date: 9/27/12  
Date: 9/27/12

US EPA ARCHIVE DOCUMENT





**QUALITY CONTROL PROGRAM**  
MP 009

Rev.8; 11/01/03  
Title: Radioactive Reference Standards Solutions & Records

**EBERLINE SERVICES - OAK RIDGE LABORATORY**  
**RADIOACTIVE REFERENCE SOLUTIONS**  
**PRIMARY DILUTION RECERTIFICATION**  
MP 009

SOLUTION REFERENCE # IPL 453-26 CURRENT DATE 11/9/2012 0:00  
SOLUTION # Ra-5

Principal Radionuclide <sup>226</sup>Radium Half Life, Years 1.600E+03 Half Life, Days 5.844E+05

Radionuclide <sup>226</sup>Radium Reference Date 2/1/1994 0:00  
Certified Activity 1.001E+00  $\mu\text{Ci}$   
Certified Concentration                       $\mu\text{Ci per gram}$

Ampoule /Solution Gross	<u>                    </u>	Weight, Grams
Empty Ampoule	<u>                    </u>	Weight, Grams
Solution Net	<u>                    </u>	Weight, Grams
Total Activity in Ampoule	<u>1.0010</u>	$\mu\text{Ci}$

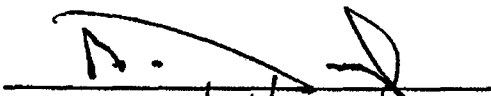
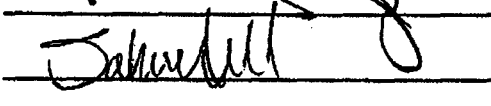
Chemical Composition of Standard Solution  
<sup>226</sup>Ra(NO<sub>3</sub>)<sub>2</sub> in 1M HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 1M HNO<sub>3</sub>  
Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0010  $\mu\text{Ci}$  Which Equals 2.222E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.222E+03 dpm/ml  
This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: November 9, 2013

Verified & Approved By  Date: 11/9/2012  
QC Approval  Date: 11/12/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM

MP 009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY  
RADIOACTIVE REFERENCE STANDARD SOLUTIONS  
SECONDARY DILUTION RECERTIFICATION

Solution Reference # MP 009 IPL-453-26 Date 11/9/2012 0:00  
Solution # Ra-5b

Principal Radionuclide <sup>226</sup>Radium Half Life, Years 1.600E+03 Half Life, Days 5.844E+05

Radionuclide of Interest <sup>226</sup>Radium Reference Date 2/1/1994 0:00  
Parent Solution Conc. 2.22E+03 dpm/ml

Chemical Composition of Standard Solution

<sup>226</sup>Ra(NO<sub>3</sub>)<sub>2</sub> in 1M HNO<sub>3</sub>

Dilution Instructions: Dilution Solvent Used 1M HNO<sub>3</sub>

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 20.0000 ml  
Total Activity: 4.4440E+04 dpm  
Final Volume: 1000.00 ml  
Final Activity Concentration: 4.4440E+01 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

NOTES:

Expiration Date: November 9, 2013

Verified & Approved By [Signature]

Date: 11/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12

US EPA ARCHIVE DOCUMENT





ANALYTICS

RA-11

1380 Seaboard Industrial Blvd.  
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677  
Fax (404) 352-2837

# CERTIFICATE OF CALIBRATION

## Standard Radionuclide Source

62680-416

Ra-228 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated using a germanium gamma spectrometer system.

Radionuclide purity and calibration were checked using a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	Ra-228
ACTIVITY (dps):	2.585 E3
HALF-LIFE:	5.75 years
CALIBRATION DATE:	November 7, 2001 12:00 EST
TOTAL UNCERTAINTY*:	4.0%
SYSTEMATIC:	3.0%
RANDOM:	1.0%

\*99% Confidence Level

Impurities:  $\gamma$ -impurities (other than decay products) <0.1%

5.07198 grams 0.1M HCl solution with 50  $\mu$ g/g Ba carrier.

P O NUMBER 9508, Item 1 (Part #4339A)

SOURCE PREPARED BY: M. D. Currie  
M. D. Currie, Radiochemist

Q A APPROVED: [Signature] 11/7/01

*New vial from the 6/11/01 shipment.  
P.S. Different activity level 8/19/11*



# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

## EBERLINE SERVICES - OAK RIDGE LABORATORY RADIOACTIVE REFERENCE SOLUTIONS RECERTIFICATION MP 009

SOLUTION REFERENCE # Analytics 62680-416 CURRENT DATE 4/16/2012 0:00  
SOLUTION # Ra-11

Principal Radionuclide <sup>228</sup>Ra Half Life, Years 5.750E+00 Half Life, Days 2.100E+03

Radionuclide <sup>228</sup>Ra Reference Date 11/7/2001 0:00  
Certified Activity 6.986E-02  $\mu\text{Ci}$   
Certified Concentration           $\mu\text{Ci per gram}$

Ampoule /Solution Gross 9.4982 Weight, Grams  
Empty Ampoule 4.4895 Weight, Grams  
Solution Net 5.0087 Weight, Grams  
Total Activity in Ampoule 0.0699  $\mu\text{Ci}$

Chemical Composition of Standard Solution  
<sup>228</sup>Ra(NO<sub>3</sub>)<sub>2</sub> in 0.5 M HCl


Dilution Instructions: Dilution Solvent Used 0.5 M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.0699  $\mu\text{Ci}$  Which Equals 1.551E+05 dpm at the date listed above

And after dilution the activity of this solution is 1.551E+02 dpm/ml This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.


Expiration Date: April 12, 2013

Recertified By 

Date: 4/16/12

Verified & Approved By         

Date:         

QC Approval 

Date: 4/16/12

US EPA ARCHIVE DOCUMENT



**SECTION VI**  
**QUALITY CONTROL SAMPLE RESULTS SUMMARY**

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-04052</b>	<b>UUISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

**Laboratory Control Sample**

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
U-234	0.83	93.41%	16.42%	100.00%	3.60%	8.14E+00	2.93E-01	7.60E+00	1.25E+00	U-8a	3.52E+01	3.60E+00	5.13E-01
U-238	0.96	92.47%	16.50%	100.00%	3.60%	7.93E+00	2.86E-01	7.33E+00	1.21E+00	U-8a	3.44E+01	3.60E+00	5.13E-01

**Matrix Spike**

Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS CSU	Sample Result	Sample CSU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

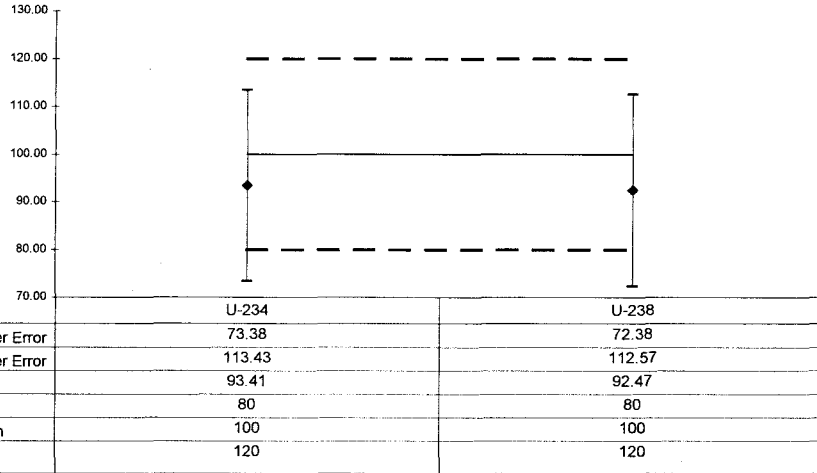
**Replicate Sample**

**QC Summary**

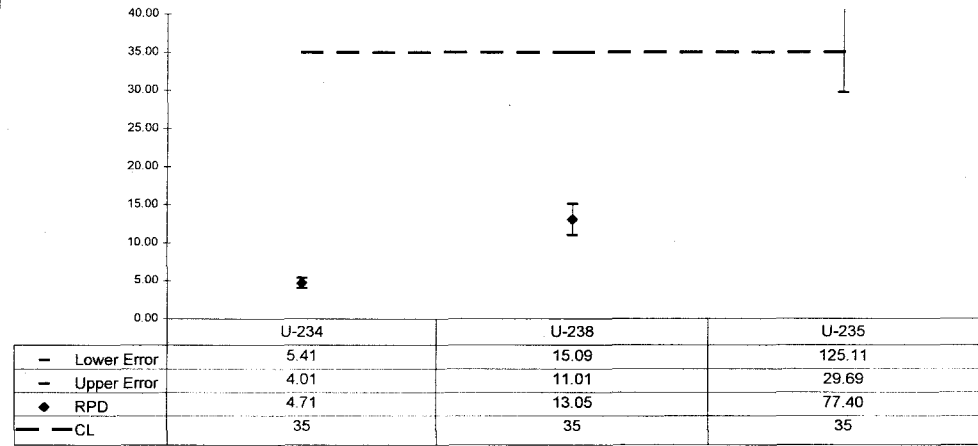
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
U-234	0.22	4.71	7.58E-01	2.35E-01	7.95E-01	2.24E-01	0.93	OK	OK			OK	OK
U-238	0.58	13.05	7.42E-01	2.36E-01	6.51E-01	1.99E-01	0.92	OK	OK			OK	OK
U-235	0.87	77.40	3.38E-02	6.56E-02	7.64E-02	7.02E-02		OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-04052</b>	<b>UISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

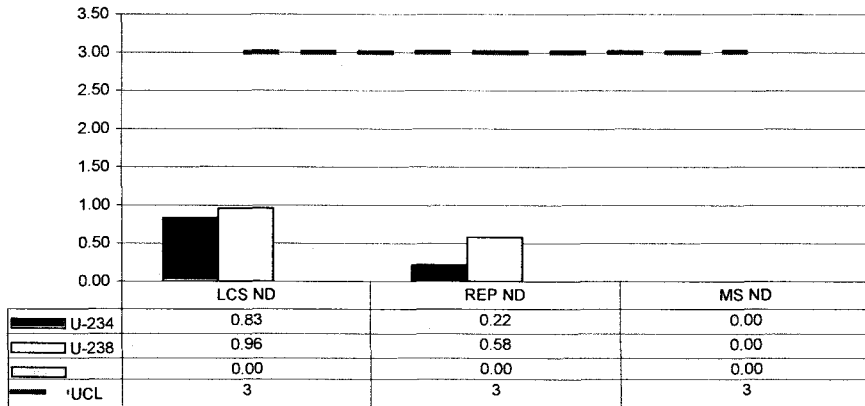
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference

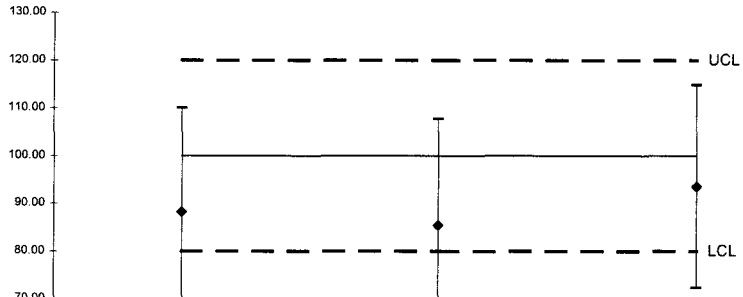


### No Matrix Spike



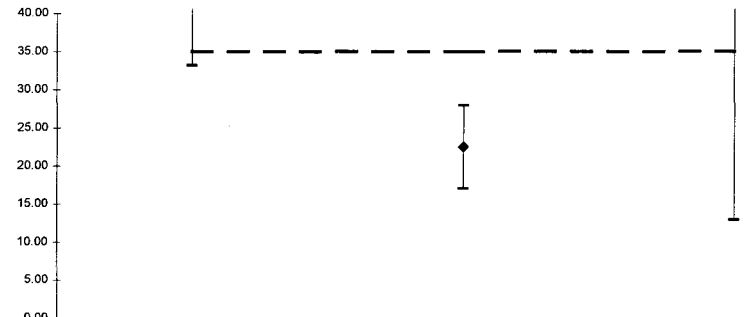
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-04052</b>	<b>ThISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

### LCS % Recovery



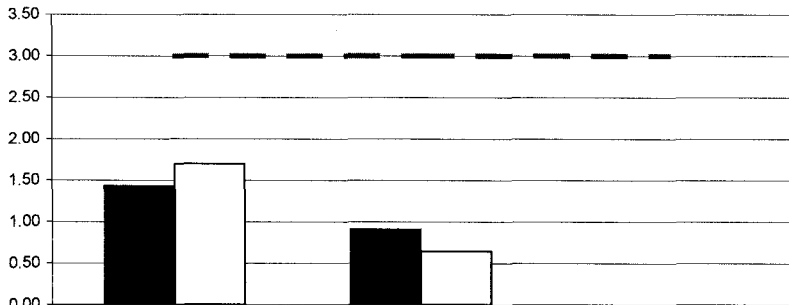
	TH-228	TH-230	TH-232
Lower Error	66.48	63.14	72.28
Upper Error	109.93	107.71	114.77
%R	88.21	85.42	93.53
LCL	80	80	80
Mean	100	100	100
UCL	120	120	120

### Replicate Sample RPD



	TH-228	TH-230	TH-232
Lower Error	98.08	27.95	81.91
Upper Error	33.16	17.04	12.92
RPD	65.62	22.50	47.41
CL	35	35	35

### Normalized Difference



	LCS ND	REP ND	MS ND
TH-228	1.43	0.91	0.00
TH-230	1.70	0.64	0.00
UCL	3	3	3

### No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-04052</b>	<b>Ra226</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

**Laboratory Control Sample**

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
RA-226	0.30	96.40%	24.54%	100.00%	4.60%	1.04E+01	4.76E-01	9.98E+00	2.45E+00	Ra-5b	4.41E+01	4.60E+00	5.22E-01

**Matrix Spike**

Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS CSU	Sample Result	Sample CSU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

**Replicate Sample**

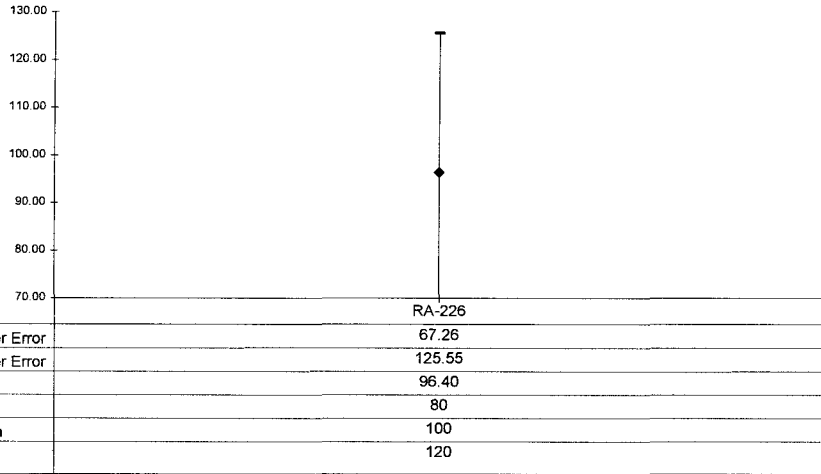
**QC Summary**

Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-226	2.13	60.60	1.22E+00	4.44E-01	6.53E-01	2.74E-01	0.96	OK	OK			NA	OK

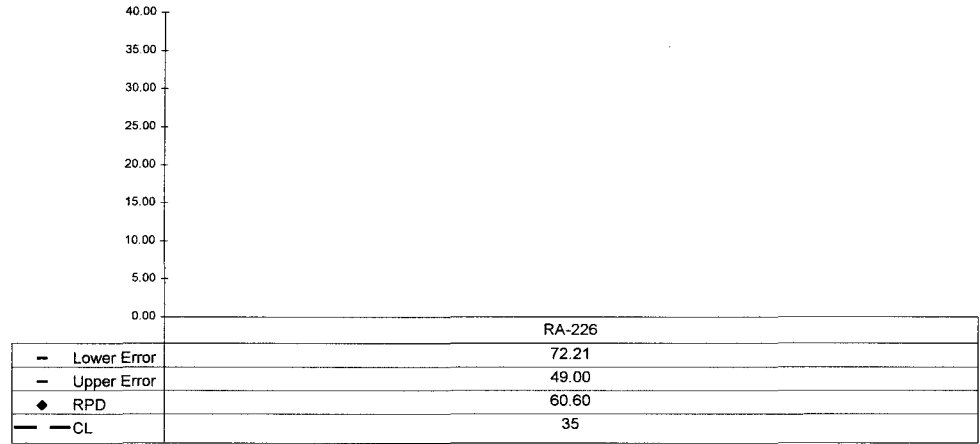
5053

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-04052</b>	<b>Ra226</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

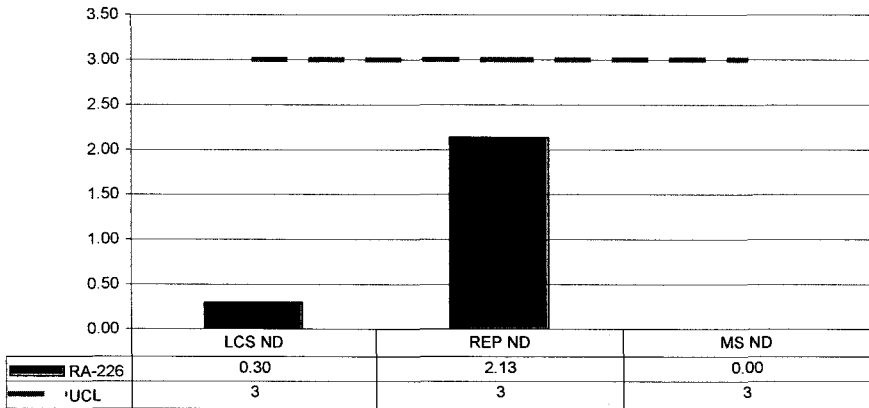
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-04052	Ra228	1	pCi	I	Engineering Management Support, Inc.

**Laboratory Control Sample**

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
RA-228	0.28	96.60%	24.68%	100.00%	5.10%	9.05E+00	4.62E-01	8.75E+00	2.16E+00	Ra-11	3.90E+01	5.10E+00	5.15E-01

**Matrix Spike**

Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS CSU	Sample Result	Sample CSU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

**Replicate Sample**

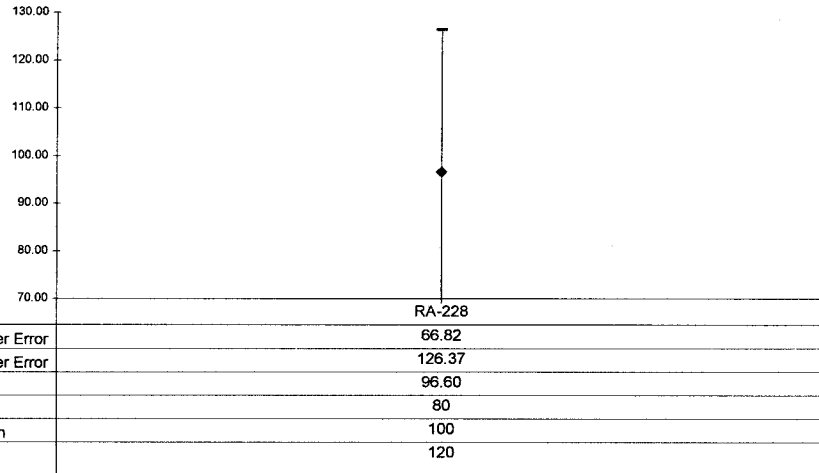
**QC Summary**

Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-228	0.42	16.91	1.08E+00	6.48E-01	9.08E-01	4.45E-01	0.97	OK	OK			NA	OK

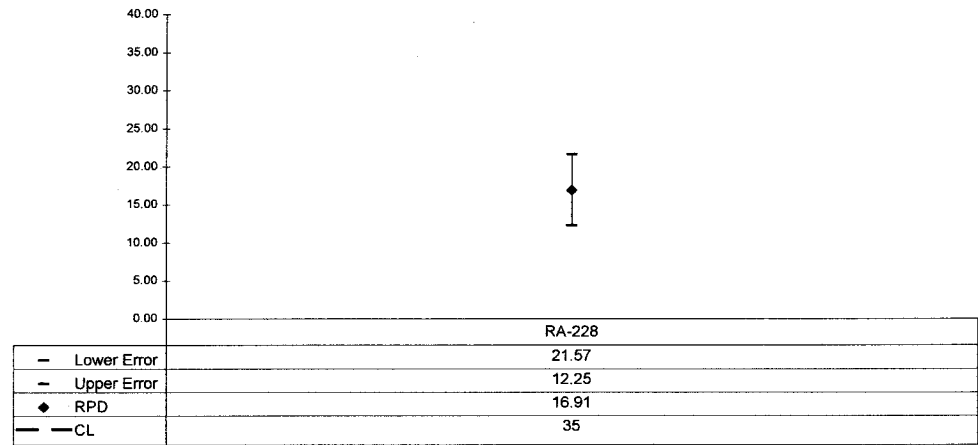


WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-04052</b>	<b>Ra228</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

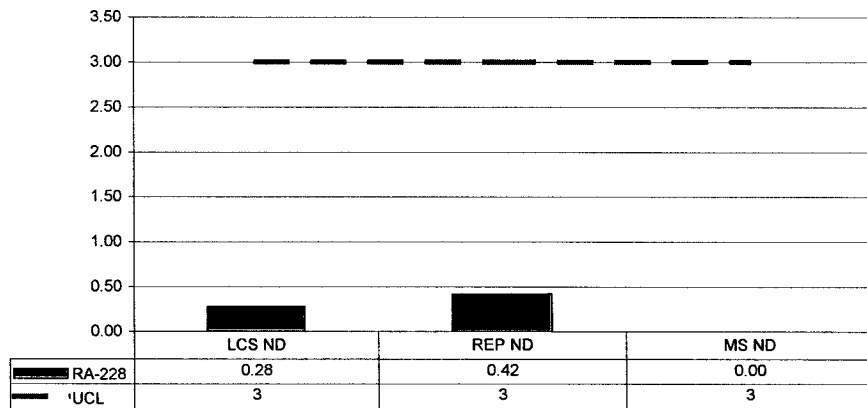
### LCS % Recovery



### Replicate Sample RPD




### Normalized Difference



### No Matrix Spike

**SECTION VII**  
**LABORATORY TECHNICIAN'S NOTES**


**ISO U NOTES**

 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:19	PREP	JBARNARD	ALIQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

*JB*  
*4/18/13*

**US EPA ARCHIVE DOCUMENT**

 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	UISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:19	PREP	JBARNARD	ALIUQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	04/23/13 16:48	CHEM	JDEMELAS	Added concentrated HCl to sample beakers and heated to dryness; Added 20 ml 8N HCL to samples and transferred to new, labeled C-Tubes, rinsing with 8N HCl to bring volume to 35 ml; Preconditioned resin columns with 35 ml 8N HCl; Centrifuged samples and loaded onto columns; Rinsed C-Tubes with 20 ml 8N HCl, centrifuged as needed and loaded onto columns; Rinsed columns with 35 ml 8N HCl – 0.1N NH4I, 35 ml of 6.5N HCl – 0.04N HF, and 10 ml of 6.5N HCl; Eluted Uranium with 50 ml of 0.5N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with DI H2O. Set samples aside for later precipitation and filtering.

*J. Demelas*  
4/23/13

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**EBERLINE**  
SERVICES

**Work Order Analysis Notes**

**Oak Ridge Laboratory**

601 Scarboro Rd.  
Oak Ridge, TN 37830  
Voice: 865.481.0683  
www.eberlineservices.com

Internal Work Order

13-04052

Analysis Code

UUISO

Run Number

1

#	Date	Dept	User	Notes
1	04/18/13 08:19	PREP	JBARNARD	ALIUQUOTED AND FILTERED DISSOLVED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	04/23/13 16:48	CHEM	JDEMELAS	Added concentrated HCl to sample beakers and heated to dryness; Added 20 ml 8N HCL to samples and transferred to new, labeled C-Tubes, rinsing with 8N HCl to bring volume to 35 ml; Preconditioned resin columns with 35 ml 8N HCl; Centrifuged samples and loaded onto columns; Rinsed C-Tubes with 20 ml 8N HCl, centrifuged as needed and loaded onto columns; Rinsed columns with 35 ml 8N HCl - 0.1N NH4I, 35 ml of 6.5N HCl - 0.04N HF, and 10 ml of 6.5N HCl; Eluted Uranium with 50 ml of 0.5N HCl into clean, labeled 100 ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with DI H2O. Set samples aside for later precipitation and filtering.
3	04/24/13 05:30	CHEM	RMARTZ	ADDED 0.1 ML NEODYMIUM CARRIER, 0.3 ML TITANOUS CHLORIDE, & 1 ML HF TO C-TUBES; LET SET SIT IN ICE BATH FOR ONE HOUR. SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR, THEN SENT SET TO COUNT ROOM.

US EPA ARCHIVE DOCUMENT

RA  
4/24/13



Reagents Used in an Analysis

Internal Work Order

13-04052

Analysis Code

Run

UUISO

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/18/2013
013666P	Anion Exchange Resin	Reagent Grade	JDEMELAS	4/23/2013
013774S	HCl - HF	6.5N - 0.04N	JDEMELAS	4/23/2013
013790S	HCl - NH4I	8N - 0.1M	JDEMELAS	4/23/2013
013675D01	Hydrochloric Acid	0.5N	JDEMELAS	4/23/2013
013712S	Hydrochloric Acid	6.5N	JDEMELAS	4/23/2013
013779S	Hydrochloric Acid	8N	JDEMELAS	4/23/2013
013675P	Hydrochloric Acid	Reagent Grade	JDEMELAS	4/23/2013
013246S	Carbon substrate	Solution	RMARTZ	4/24/2013
012809P	Ethyl Alcohol	Reagent Grade	RMARTZ	4/24/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	4/24/2013
013191S	Neodymium Carrier	1 mg/ml	RMARTZ	4/24/2013
013434P	Titanous Chloride	Reagent Grade	RMARTZ	4/24/2013


US EPA ARCHIVE DOCUMENT

# Alphabet

Date	Sample #	Client	Invoice #	CTO/Title	Value	Stat
4/21/13	Daily Pulsar	Lab	1359	10 min	NA	AC
4/22/13	Daily Pulsar	Lab	0827	1 hr	NA	C
4/22/13	1704112A(12-4)	Ucon	0914	2 hr	TH 50	C
4/22/13	1704112A(17-4)	Ucon	0914	2 hr	TH 117	C
4/22/13	1704086A(1-4)	Account	0948	2 hr	NA	C
4/22/13	1304052A(6-9)	Eng. Manag. Su	1220	2 hr 50 min	Rate	KB
4/22/13	1304052A(10-16)	Eng. Manag. Su	1245	2 hr 50 min	Rate	KB
4/22/13	1304052A(17-19)	Eng. Manag. Su	1636	2 hr 50 min	Rate	KB
4/22/13	1304134A(1-4)	Ucon	1637	2 hr 50 min	Rate	KB
4/27/13	Daily Pulsar	Lab	0509	1 hr	NA	C
4/29/13	1704053A(4-11)	7N Dept.	0526	16 hr	4420	C
4/24/13	Daily Pulsar	Lab	0507	1 hr	NA	C
4/24/13	1704082A(1-11)	Comp Man	0544	2 hr	TH 50	C
4/24/13	1704082A(12-3)	TYPE	0886	2 hr	4420	C
4/24/13	1704082A(12-19)	Eng Man	0888	2 hr	TH 50	C
4/24/13	1704082A(14-19)	Eng Man	1157	2 hr	TH 50	C
4/24/13	1704082A(16-19)	Eng Man	1158	2 hr	4420	C
4/24/13	1304052A(10-19)	Eng. Manag. Su	1451	2 hr 50 min	Rate	KB



**ISO TH NOTES**


 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:19	PREP	JBARNARD	<del>DISSOLVED</del> <b>DISSOLVED</b> SUSPENDED FRACTIONS- ADDED SPIKES AND TRACERS- PRESEVED ALIQUOTED AND FILTERED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN

4/19/13 JB


JB  
4/18/13

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 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:19	PREP	JBARNARD	ALIQUOTED AND FILTERED SUSPENDED FRACTIONS- ADDED SPIKES AND TRACERS- PRESEVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN
2	04/22/13 15:29	CHEM	JDEMELAS	Added concentrated HNO3 to sample beakers and heated to dryness; Added 20 ml 8N HNO3 to samples and transferred to new, labeled C-Tubes, adding 8N HNO3 to bring volume to 35 ml; Preconditioned resin columns with 50 ml 8N HNO3; Centrifuged samples as needed, and passed through columns; Rinsed C-Tubes with 20 ml 8N HNO3; Centrifuged rinsates and loaded onto columns; Rinsed columns with 40 ml 8N HNO3; Eluted Thorium with 50 ml of 8N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with deionized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering.

*JDEMELAS*  
 4/22/13

 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:19	PREP	JBARNARD	ALIUQUOTED AND FILTERED SUSPENDED FRACTIONS- ADDED SPIKES AND TRACERS- PRESEVED SAMPLES WITH HNO3 AND DRIED SAMPLES DOWN
2	04/22/13 15:29	CHEM	JDEMELAS	Added concentrated HNO3 to sample beakers and heated to dryness; Added 20 ml 8N HNO3 to samples and transferred to new, labeled C-Tubes, adding 8N HNO3 to bring volume to 35 ml; Preconditioned resin columns with 50 ml 8N HNO3; Centrifuged samples as needed, and passed through columns; Rinsed C-Tubes with 20 ml 8N HNO3; Centrifuged rinsates and loaded onto columns; Rinsed columns with 40 ml 8N HNO3; Eluted Thorium with 50 ml of 8N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with deionized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering.
3	04/23/13 06:26	CHEM	RMARTZ	ADDED 0.75 ML 0.1MG/ML CERIUM CARRIER & 1 ML HF TO C-TUBES & LET SET SIT IN ICE BATH FOR ONE HOUR; SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR, THEN SENT SET TO COUNT ROOM.

*Handwritten signature and date: 4/23/13*

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Reagents Used in an Analysis

Internal Work Order

13-04052

Analysis Code

Run

ThISO

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/18/2013
013666P	Anion Exchange Resin	Reagent Grade	JDEMELAS	4/22/2013
013779S	Hydrochloric Acid	8N	JDEMELAS	4/22/2013
013675P	Hydrochloric Acid	Reagent Grade	JDEMELAS	4/22/2013
013773S	Nitric Acid	8N	JDEMELAS	4/22/2013
013624P	Nitric Acid	Reagent Grade	JDEMELAS	4/22/2013
013246S	Carbon substrate	Solution	RMARTZ	4/23/2013
013017S	Cerrium Carrier	0.1mg/ml	RMARTZ	4/23/2013
012809P	Ethyl Alcohol	Reagent Grade	RMARTZ	4/23/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	4/23/2013


US EPA ARCHIVE DOCUMENT

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Date	Sample #	Client	Location	CT Time	Analysis	Notes
4/21/13	Daily Pulsar	Lab	1359	10min	NA	AC
4/22/13	Daily Pulsar	Lab	0827	10min	NA	C
4/22/13	1704112A(12-4)	UConn	0914	2hr	TL350	C
4/22/13	1704112A(17-4)	UConn	0914	2hr	TL417	C
4/22/13	1704086A(1-6)	Acoust	0948	2hr	NA	C
4/22/13	1304052A(6-9)	Eng. Manag. Sui	1220	2hr 50min	Rate	KB
4/22/13	1304052A(10-16)	Eng. Manag. Sui	1245	2hr 50min	Rate	KB
4/22/13	1304052A(17-19)	Eng. Manag. Sui	1636	2hr 50min	Rate	KB
4/22/13	1304134A(1-4)	UConn	1637	2hr 50min	Rate	KB
4/27/13	Daily Pulsar	Lab	0509	10min	NA	C
4/29/13	1704053A(4-11)	TN Dept.	0526	16hr	4hr 30min	C
4/24/13	Daily Pulsar	Lab	0507	10min	NA	C
4/24/13	1704052A(1-11)	Eng. Manag.	0544	2hr	TL350	C
4/24/13	1704052A(12-13)	TYPE	0856	2hr	TL350	C
4/24/13	1704052A(12-13)	Eng. Manag.	0855	2hr	TL350	C

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**RA-226 NOTES**


 <b>EBERLINE</b> SERVICES <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:17	PREP	JBARNARD	<p style="text-align: center;"><b>DISSOLVED</b></p> <p>ALIQUOTED AND <del>FILTERED</del> SUSPENDED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS</p>

  
 4/18/13

US EPA ARCHIVE DOCUMENT



 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:17	PREP	JBARNARD	ALIQUOTED AND FILTERED SUSPENDED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	04/18/13 20:03	PREP	LWALKER	ADDED EDTA TO PRECIP-VORTEX-LET SIT OVERNIGHT TO DIGEST.
3	04/19/13 12:36	CHEM	TSMITH	Followed steps 12.1 to 12.8 in AP-006 rev. 12 . ( Sringe filtered samples. Precipitated and filtered samples, obtained final weights, and took to count room )

4-19-13  
 Jm

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Reagents Used in an Analysis

Internal Work Order

13-04052

Analysis Code

Run

Ra226

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JBARNARD	4/18/2013
013575D01	Ammonium Sulfate	200 mg/ml	JBARNARD	4/18/2013
012766D14	Barium Carrier	1 mg/ml	JBARNARD	4/18/2013
012729D07	Lead Carrier	166 mg/ml	JBARNARD	4/18/2013
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/18/2013
013754S	EDTA	0.25M	LWALKER	4/18/2013
011383P	Acetic Acid	Reagent Grade	TSMITH	4/19/2013
013377D01	Ammonium Sulfate	200 mg/ml	TSMITH	4/19/2013

US EPA ARCHIVE DOCUMENT

Alpha #2


Date	Sample #	Client	Instrument	CT Time	Analysis Tech	Spec
4/17/13	1704075A (2-5)	Westwood	1021	2hr	Aur243	C
4/17/13	1704085A (1-2)	Udon	1022	2hr	Aur243	C
4/17/13	1704089A (1-4)	Udon	1725	2hr	NR277	C
4/18/13	Daily Pulse	Udon	0516	1hr	NR	-
4/18/13	1704094A (7)	Westwood	0970	2hr	UR230	C
4/18/13	1304085A (1-5)	Westwood	0931	2hr	UR230	C
4/18/13	1304085A (1-6)	Weston	1229	2hr 50m	Th	KB
4/18/13	1304048A (2-7)	PCC	1524	2hr 50m	Th	KB
4/18/13	1304050A (18-19)	Eng. Manag. Su	1929	2hr 50m	Rob	KB
4/18/13	1304050A (1-4)	Eng. Manag. Su.	1829	2hr 50m	Th	KB
4/19/13	Daily Pulse	Lab	0525	1hr	NR	-
4/19/13	1704112A (7-11)	Udon	0559	2hr	NR	C
4/19/13	SBCAL	Udon	0900	2hr	NR	C
4/19/13	1304051A (1-6)	Eng. Manag.	1176	2hr	UR230	-
4/19/13	1304051A (1-6)	Eng. Manag. Su	1439	2hr 50m	Rob	KB
4/19/13	System Bkgd	Lab	1755	16.40 hrs	-	KB
4/20/13	Daily Pulse	Lab	1022	10 mins	NA	KB
4/21/13	1304051A (5-10)	Eng. Manag. S.	1350	2hr 50m	iso-Th	AG
4/21/13	Daily Pulse	Lab	1359	10 min.	NA	AG
4/22/13	Daily Pulse	Lab	0522	1hr	NR	-
4/22/13	1704089A (1-4)	Udon	0917	2hr	UR230	C
4/22/13	1704089A (1-4)	Udon	0917	2hr	UR230	C
4/22/13	1704112A (1)	Udon	0917	2hr	UR230	C
4/22/13	1304057A (7)	Accutest	1219	2hr 50m	Rob	KB
4/22/13	1304052A (1-5)	Eng. Manag. Su	1220	2hr 50m	Rob	KB



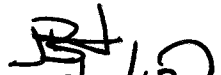
# Alphat 7


Date	Sample #	Client	Invoice	CT Time	Analysis	Total
4/21/13	Daily Pulsar	Lab	1359	10min	NA	AC
4/22/13	Daily Pulsar	Lab	0527	1hr	NA	C
4/22/13	1704112A(2-4)	Udon	0914	2hr	TL 50	C
4/22/13	1704112A(7-4)	Udon	0914	2hr	TL 117	C
4/22/13	1704106A(1-4)	Acoustic	0948	2hr	Rule	C
4/22/13	1304052A(6-9)	Eng. Manag. Sur	1220	2hr 50m	Rule	KB
4/22/13	1304052A(10-16)	Eng. Manag. Sur	1245	2hr 50m	Rule	KB
4/22/13	1304052A(17-19)	Eng. Manag. Sur	1636	2hr 50m	Rule	KB
4/22/13	1304134A(1-4)	Udon	1637	2hr 50m	Rule	KB

**RA-228 NOTES**

 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:18	PREP	JBARNARD	<p style="text-align: center;"><b>DISSOLVED</b></p> <p>ALIQOTED AND <del>FILTERED</del> SUSPENDE FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS</p>

  
 4/18/13


 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:18	PREP	JBARNARD	ALIUQUOTED AND FILTERED SUSPENDED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	04/23/13 12:21	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	04/29/13 18:58	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 17 (CHEMICAL CLEANUP FOR RA 228)


*J. Walker*  
 4/29/13

US EPA ARCHIVE DOCUMENT



 <b>EBERLINE</b> SERVICES <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-04052
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	04/18/13 08:18	PREP	JBARNARD	ALIQUOTED AND FILTERED SUSPENDED FRACTIONS- ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	04/23/13 12:21	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	04/29/13 18:58	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 17 (CHEMICAL CLEANUP FOR RA 228)
4	04/30/13 08:01	CHEM	TSMITH	Followed steps 12.7 to 12.15 in AP-007 rev. 17 . ( Precipitated samples, hot bathed, centrifuged, and discarded supernate. Dissolved precip, precipitated samples, hot bathed, centrifuged, and discarded supernate. Dissolved precip, precipitated and filtered samples, obtained final weights, covered with aluminum foil, and took to count room )

4-30-13  


US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

**13-04052**

Analysis Code

Run

**Ra228**

**1**

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JBARNARD	4/18/2013
013575D01	Ammonium Sulfate	200 mg/ml	JBARNARD	4/18/2013
012766D14	Barium Carrier	1 mg/ml	JBARNARD	4/18/2013
012729D07	Lead Carrier	166 mg/ml	JBARNARD	4/18/2013
013624P	Nitric Acid	Reagent Grade	JBARNARD	4/18/2013
012729D08	Lead Carrier	1.5 mg/ml	LWALKER	4/29/2013
013624P	Nitric Acid	Reagent Grade	LWALKER	4/29/2013
013322D01	Sodium Hydroxide	10M	LWALKER	4/29/2013
013587S	Yttrium Carrier	9 mg/ml	LWALKER	4/29/2013
011504D21	Ammonium Sulfide	2%	LWALKER	4/29/2013
013624D03	Nitric Acid	1N	TSMITH	4/30/2013
013290D18	Nitric Acid	6N	TSMITH	4/30/2013
013065D03	Sodium Hydroxide	18M	TSMITH	4/30/2013
013690S	Sodium Hydroxide	10M	TSMITH	4/30/2013
012717D04	Ammonium Oxalate	5%	TSMITH	4/30/2013

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Date	Sample #	Client	Location	CT	Time	Message	Par
4/25/13	1304139PB(1-8)	USA	1432	2 hrs	Pb210	KB	
4/25/13	ETAC	WV	0717	70m	LN	C	
4/25/13	NUCPORE	WV	0746	60m	LB	C	
4/25/13	170406254(1-4)	Dairyland	0751	70m	SN904	C	
4/25/13	170406254(1-4)	Dairyland	0751	70m	SN904	C	
4/26/13	170408952(1-3)	Ulor	0802	70m	SB707	C	
4/26/13	170408952(1-3)	Ulor	0877	70m	SN707	C	
4/26/13	1704080RA(1-4)	Engman	1006	70m	RA8	C	
4/26/13	1704080RA(1-4)	Engman	1078	70m	RA8	C	
4/26/13	1304147PB(2-5)	USA	1210	2 hrs	Pb210	KB	
4/26/13	1304050RAA(18-19)	Eng. Manag. Su.	1212	2 hrs	RA8	KB	
4/27/13	Weekly Bldg	Lab	1632	12 hrs	αp	KB	
4/29/13	ETAC	WV	0717	70m	LN	C	
4/29/13	NUCPORE	WV	0746	60m	LN	C	
4/29/13	17041078AD(1-6)	Accutest	0746	70m	LN	C	
4/29/13	1704051RA(1-4)	Engman	0789	70m	RA8	C	
4/29/13	1704051RA(1-4)	Engman	0910	70m	RA8	C	
4/29/13	1704051RA(1-4)	Engman	1102	70m	RA8	C	
4/29/13	1304051RAA(17-19)	Eng. Manag. Su.	1153	2 hrs	RA8	KB	
4/29/13	1304080AB(1-4)	ND	1155	2 hrs	αp	KB	
4/29/13	1704090DAS(1-4)	Ulor	1306	70m	αp	C	
4/29/13	1304113AB(2-3,6-7)	Ulor	1517	2 hrs	αp	KB	
4/29/13	1304057AB(1-7)	Accutest	1521	2 hrs	αp	KB	
4/29/13	1304113AB1(1)	Ulor	1720	30 mins	αp	KB	
4/29/13	1304056AB1(1)	Accutest	1723	30 mins	αp	KB	
4/29/13	1304056AB(2-6)	Accutest	1752	2 hrs	αp	KB	
4/29/13	ETAC	WV	0717	70m	LN	C	
4/29/13	NUCPORE	WV	0746	60m	LN	C	
4/29/13	17041175AD(1-4)	Ulor	0757	70m	LN	C	
4/29/13	170411754C(4-8)	Ulor	0757	70m	SN904	C	
4/29/13	130411754C(4-8)	Ulor	0757	70m	SN904	C	
4/29/13	1304051RA(1-4)	Engman	0907	70m	RA8	C	
4/29/13	1304052RA(1-10)	Engman	1007	70m	RA8	C	

Date	Sample #	Client	Lead	CT	Analysis	Dist
4/12/17	ALCAGE	WS	0714	Low	AD	C
4/12/17	ET760	AS	0619	70	AD	C
4/12/17	BIGDOR	WS	0710	Low	AD	C
4/12/17	ET760	WS	0618	70	AD	C
4/12/17	13041173411)	Union	0717	70	SMSdy	C
4/12/17	17041715411)	Union	0717	70	SMSdy	C
4/12/17	13041166NPL14)	Union	0717	100	KP27	C
4/12/17	1704121NPL14)	Union	0706	100	KP27	C
4/12/17	1304052RA15-8)	Eng Man	092	2L	RAS	C
4/12/17	1304052RA2	17-19) Eng Man	1121	2L	RAS	C
4/12/17	1704147Pb4)	USA	1125	300	Pb210	C

US EPA ARCHIVE DOCUMENT

**SECTION VIII**  
**ANALYTICAL DATA (ISOTOPIC URANIUM)**

Work Order	13-04052	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	UUISO	01	LCS	LCS		04/09/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		04/09/13 00:00	1.0000E+00
Date Received	4/9/2013	03	DUP	S-61 TOT	47	04/05/13 11:18	1.0000E+00
Lab Deadline	4/30/2013	04	DO	S-61 TOT	47	04/05/13 11:18	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	S-61 DIS	47	04/05/13 11:18	1.0000E+00
Project	West Lake OU-1	06	TRG	PZ-115-SS TOT	43	04/05/13 12:23	1.0000E+00
Report Level	4	07	TRG	PZ-115-SS DIS	43	04/05/13 12:23	1.0000E+00
Activity Units	pCi	08	TRG	MW-104 TOT	41	04/05/13 12:56	1.0000E+00
Aliquot Units	I	09	TRG	MW-104 DIS	41	04/05/13 12:56	1.0000E+00
Matrix	WA	10	TRG	PZ-100-SD TOT	39	04/05/13 14:03	1.0000E+00
Method	NAS NS-3050 Mod	11	TRG	PZ-100-SD DIS	39	04/05/13 14:03	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	I-67 TOT	39	04/05/13 14:09	1.0000E+00
Radiometric Tracer	U-232	13	TRG	I-67 DIS	39	04/05/13 14:09	1.0000E+00
Radiometric Sol#	U-10a	14	TRG	PZ-203-SS TOT	43	04/05/13 14:58	1.0000E+00
Tracer Act (dpm/g)	19.097	15	TRG	PZ-203-SS DIS	43	04/05/13 14:58	1.0000E+00
Carrier		16	TRG	PZ-100-SS TOT	36	04/05/13 14:58	1.0000E+00
Carrier Conc (mg/ml)		17	TRG	PZ-100-SS DIS	36	04/05/13 14:58	1.0000E+00
		18	TRG	I-66 TOT	35	04/05/13 14:59	1.0000E+00
		19	TRG	I-66 DIS	35	04/05/13 14:59	1.0000E+00

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.6118	11.7		0.00								
02	MBL	0.6089	11.6		0.00								
03	DUP	0.6103	11.7		0.00								
04	DO	0.6098	11.6		0.00								
05	TRG	0.6099	11.6		0.00								
06	TRG	0.6096	11.6		0.00								
07	TRG	0.6095	11.6		0.00								
08	TRG	0.6093	11.6		0.00								
09	TRG	0.6095	11.6		0.00								
10	TRG	0.6092	11.6		0.00								
11	TRG	0.6088	11.6		0.00								
12	TRG	0.6083	11.6		0.00								
13	TRG	0.6080	11.6		0.00								
14	TRG	0.6083	11.6		0.00								
15	TRG	0.6092	11.6		0.00								
16	TRG	0.6053	11.6		0.00								
17	TRG	0.6067	11.6		0.00								
18	TRG	0.6060	11.6		0.00								
19	TRG	0.6057	11.6		0.00								

\* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. \*\* Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

0000

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			04/17/13 19:06	LWALKER				
02	MBL			04/17/13 19:06	LWALKER				
03	DUP			04/17/13 19:06	LWALKER				
04	DO			04/17/13 19:06	LWALKER				
05	TRG			04/17/13 19:06	LWALKER				
06	TRG			04/17/13 19:06	LWALKER				
07	TRG			04/17/13 19:06	LWALKER				
08	TRG			04/17/13 19:06	LWALKER				
09	TRG			04/17/13 19:06	LWALKER				
10	TRG			04/17/13 19:06	LWALKER				
11	TRG			04/17/13 19:06	LWALKER				
12	TRG			04/17/13 19:06	LWALKER				
13	TRG			04/17/13 19:06	LWALKER				
14	TRG			04/17/13 19:06	LWALKER				
15	TRG			04/17/13 19:06	LWALKER				
16	TRG			04/17/13 19:06	LWALKER				
17	TRG			04/17/13 19:06	LWALKER				
18	TRG			04/17/13 19:06	LWALKER				
19	TRG			04/17/13 19:06	LWALKER				

\* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. \*\* Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

0007



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-UISO-1**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-234	LCS	LCS	pCi/l	7.60E+00	1.12E+00	8.39E-02	8.14E+00	93.41	OK		OK	
02	U-234	MBL	BLANK	pCi/l	5.26E-02	5.08E-02	6.31E-02					OK	OK
03	U-234	DUP	S-61 TOT	pCi/l	7.95E-01	2.17E-01	7.69E-02				OK	OK	
04	U-234	DO	S-61 TOT	pCi/l	7.58E-01	2.29E-01	9.05E-02					OK	
05	U-234	TRG	S-61 DIS	pCi/l	8.50E-01	2.45E-01	7.30E-02					OK	
06	U-234	TRG	PZ-115-SS TOT	pCi/l	2.51E+00	4.36E-01	5.17E-02					OK	
07	U-234	TRG	PZ-115-SS DIS	pCi/l	2.30E+00	4.24E-01	5.55E-02					OK	
08	U-234	TRG	MW-104 TOT	pCi/l	1.45E+00	3.55E-01	8.11E-02					OK	
09	U-234	TRG	MW-104 DIS	pCi/l	1.42E+00	3.94E-01	1.29E-01					OK	
10	U-234	TRG	PZ-100-SD TOT	pCi/l	4.46E-01	1.55E-01	5.98E-02					OK	
11	U-234	TRG	PZ-100-SD DIS	pCi/l	3.59E-01	1.31E-01	4.71E-02					OK	
12	U-234	TRG	I-67 TOT	pCi/l	8.59E-01	2.42E-01	7.71E-02					OK	
13	U-234	TRG	I-67 DIS	pCi/l	5.10E-01	1.76E-01	8.27E-02					OK	
14	U-234	TRG	PZ-203-SS TOT	pCi/l	3.29E+00	5.00E-01	6.62E-02					OK	
15	U-234	TRG	PZ-203-SS DIS	pCi/l	3.16E+00	5.28E-01	7.94E-02					OK	
16	U-234	TRG	PZ-100-SS TOT	pCi/l	5.70E+00	7.99E-01	5.95E-02					OK	
17	U-234	TRG	PZ-100-SS DIS	pCi/l	6.01E+00	7.95E-01	4.69E-02					OK	
18	U-234	TRG	I-66 TOT	pCi/l	7.57E-01	2.14E-01	5.56E-02					OK	
19	U-234	TRG	I-66 DIS	pCi/l	7.64E-01	2.24E-01	6.94E-02					OK	

Run	1
Analysis Code	UISO
Eberline Services Work Order	13-04052
Client	Engineering Management Support, Inc.

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Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	U-234	LCS	04/09/13 00:00	1.00E+00	90.97	0.00	0.00			
02	U-234	MBL	04/09/13 00:00	1.00E+00	141.50	0.00	0.00			
03	U-234	DUP	04/05/13 11:18	1.00E+00	109.01	0.00	0.00			
04	U-234	DO	04/05/13 11:18	1.00E+00	88.76	0.00	0.00			
05	U-234	TRG	04/05/13 11:18	1.00E+00	94.14	0.00	0.00			
06	U-234	TRG	04/05/13 12:23	1.00E+00	112.74	0.00	0.00			
07	U-234	TRG	04/05/13 12:23	1.00E+00	111.59	0.00	0.00			
08	U-234	TRG	04/05/13 12:56	1.00E+00	85.92	0.00	0.00			
09	U-234	TRG	04/05/13 12:56	1.00E+00	73.43	0.00	0.00			
10	U-234	TRG	04/05/13 14:03	1.00E+00	116.40	0.00	0.00			
11	U-234	TRG	04/05/13 14:03	1.00E+00	126.70	0.00	0.00			
12	U-234	TRG	04/05/13 14:09	1.00E+00	99.03	0.00	0.00			
13	U-234	TRG	04/05/13 14:09	1.00E+00	107.99	0.00	0.00			
14	U-234	TRG	04/05/13 14:58	1.00E+00	126.52	0.00	0.00			
15	U-234	TRG	04/05/13 14:58	1.00E+00	101.19	0.00	0.00			
16	U-234	TRG	04/05/13 14:58	1.00E+00	115.65	0.00	0.00			
17	U-234	TRG	04/05/13 14:58	1.00E+00	124.29	0.00	0.00			
18	U-234	TRG	04/05/13 14:59	1.00E+00	111.38	0.00	0.00			
19	U-234	TRG	04/05/13 14:59	1.00E+00	100.47	0.00	0.00			

Client	Engineering Management Support, Inc.	Eberline Services Work Order	13-04052	Analysis Code	UIISO	Run	1

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-UUISO-1**


Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-234	LCS	04/24/13 11:58		A_Spec	Alpha_035	170	4.75 E+02	3.00 E-03	18.3
02	U-234	MBL	04/24/13 11:58		A_Spec	Alpha_037	170	5.00 E+00	0.00 E+00	17.8
03	U-234	DUP	04/24/13 11:58		A_Spec	Alpha_040	170	6.20 E+01	0.00 E+00	19
04	U-234	DO	04/24/13 11:58		A_Spec	Alpha_041	170	5.02 E+01	5.00 E-03	19.8
05	U-234	TRG	04/24/13 11:58		A_Spec	Alpha_042	170	5.57 E+01	2.00 E-03	18.5
06	U-234	TRG	04/24/13 11:58		A_Spec	Alpha_044	170	2.03 E+02	1.00 E-03	19
07	U-234	TRG	04/24/13 11:58		A_Spec	Alpha_046	170	1.73 E+02	1.00 E-03	17.9
08	U-234	TRG	04/24/13 11:58		A_Spec	Alpha_047	170	8.57 E+01	2.00 E-03	18.2
09	U-234	TRG	04/24/13 11:58		A_Spec	Alpha_048	170	6.60 E+01	0.00 E+00	16.8
10	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_033	170	3.57 E+01	2.00 E-03	18.2
11	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_034	170	3.18 E+01	1.00 E-03	18.6
12	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_035	170	5.85 E+01	3.00 E-03	18.3
13	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_037	170	3.70 E+01	0.00 E+00	17.8
14	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_040	170	2.98 E+02	0.00 E+00	19
15	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_041	170	2.38 E+02	5.00 E-03	19.8
16	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_042	170	4.59 E+02	2.00 E-03	18.5
17	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_044	170	5.35 E+02	1.00 E-03	19
18	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_046	170	5.68 E+01	1.00 E-03	17.9
19	U-234	TRG	04/24/13 14:51		A_Spec	Alpha_047	170	5.27 E+01	2.00 E-03	18.2

	Run	1
	Analysis Code	UUISO
Eberline Services Work Order	13-04052	
Client	Engineering Management Support, Inc.	

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-UUISO-1**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-238	LCS	LCS	pCi/l	7.33E+00	1.09E+00	6.64E-02	7.93E+00	92.47	OK		OK	
02	U-238	MBL	BLANK	pCi/l	3.84E-02	4.15E-02	5.01E-02					OK	OK
03	U-238	DUP	S-61 TOT	pCi/l	6.51E-01	1.93E-01	7.65E-02				OK	OK	
04	U-238	DO	S-61 TOT	pCi/l	7.42E-01	2.30E-01	1.29E-01					OK	
05	U-238	TRG	S-61 DIS	pCi/l	7.10E-01	2.20E-01	7.27E-02					OK	
06	U-238	TRG	PZ-115-SS TOT	pCi/l	1.69E+00	3.35E-01	7.39E-02					OK	
07	U-238	TRG	PZ-115-SS DIS	pCi/l	1.55E+00	3.28E-01	7.94E-02					OK	
08	U-238	TRG	MW-104 TOT	pCi/l	1.13E+00	3.03E-01	7.05E-02					OK	
09	U-238	TRG	MW-104 DIS	pCi/l	1.18E+00	3.52E-01	1.29E-01					OK	
10	U-238	TRG	PZ-100-SD TOT	pCi/l	2.74E-01	1.21E-01	7.46E-02					OK	
11	U-238	TRG	PZ-100-SD DIS	pCi/l	3.58E-01	1.30E-01	4.69E-02					OK	
12	U-238	TRG	I-67 TOT	pCi/l	5.97E-01	1.96E-01	6.10E-02					OK	
13	U-238	TRG	I-67 DIS	pCi/l	4.35E-01	1.60E-01	6.56E-02					OK	
14	U-238	TRG	PZ-203-SS TOT	pCi/l	4.73E-01	1.51E-01	6.59E-02					OK	
15	U-238	TRG	PZ-203-SS DIS	pCi/l	4.26E-01	1.61E-01	1.13E-01					OK	
16	U-238	TRG	PZ-100-SS TOT	pCi/l	2.30E+00	4.11E-01	5.92E-02					OK	
17	U-238	TRG	PZ-100-SS DIS	pCi/l	2.35E+00	3.98E-01	6.71E-02					OK	
18	U-238	TRG	I-66 TOT	pCi/l	5.84E-01	1.86E-01	7.95E-02					OK	
19	U-238	TRG	I-66 DIS	pCi/l	6.04E-01	1.96E-01	6.03E-02					OK	



**Run**  
1

**Analysis Code**  
UUISO

**Eberline Services Work Order**  
13-04052

**Client**  
Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-UUISO-1**

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	U-238	LCS	04/09/13 00:00	1.00E+00	90.97	0.00	0.00			
02	U-238	MBL	04/09/13 00:00	1.00E+00	141.50	0.00	0.00			
03	U-238	DUP	04/05/13 11:18	1.00E+00	109.01	0.00	0.00			
04	U-238	DO	04/05/13 11:18	1.00E+00	88.76	0.00	0.00			
05	U-238	TRG	04/05/13 11:18	1.00E+00	94.14	0.00	0.00			
06	U-238	TRG	04/05/13 12:23	1.00E+00	112.74	0.00	0.00			
07	U-238	TRG	04/05/13 12:23	1.00E+00	111.59	0.00	0.00			
08	U-238	TRG	04/05/13 12:56	1.00E+00	85.92	0.00	0.00			
09	U-238	TRG	04/05/13 12:56	1.00E+00	73.43	0.00	0.00			
10	U-238	TRG	04/05/13 14:03	1.00E+00	116.40	0.00	0.00			
11	U-238	TRG	04/05/13 14:03	1.00E+00	126.70	0.00	0.00			
12	U-238	TRG	04/05/13 14:09	1.00E+00	99.03	0.00	0.00			
13	U-238	TRG	04/05/13 14:09	1.00E+00	107.99	0.00	0.00			
14	U-238	TRG	04/05/13 14:58	1.00E+00	126.52	0.00	0.00			
15	U-238	TRG	04/05/13 14:58	1.00E+00	101.19	0.00	0.00			
16	U-238	TRG	04/05/13 14:58	1.00E+00	115.65	0.00	0.00			
17	U-238	TRG	04/05/13 14:58	1.00E+00	124.29	0.00	0.00			
18	U-238	TRG	04/05/13 14:59	1.00E+00	111.38	0.00	0.00			
19	U-238	TRG	04/05/13 14:59	1.00E+00	100.47	0.00	0.00			

	Run	1
	Analysis Code	UUISO
Eberline Services Work Order	13-04052	
Client	Engineering Management Support, Inc.	

2500

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-238	LCS	04/24/13 11:58		A_Spec	Alpha_035	170	4.61 E+02	1.00 E-03	18.3
02	U-238	MBL	04/24/13 11:58		A_Spec	Alpha_037	170	3.66 E+00	2.00 E-03	17.8
03	U-238	DUP	04/24/13 11:58		A_Spec	Alpha_040	170	5.10 E+01	0.00 E+00	19
04	U-238	DO	04/24/13 11:58		A_Spec	Alpha_041	170	4.93 E+01	1.60 E-02	19.8
05	U-238	TRG	04/24/13 11:58		A_Spec	Alpha_042	170	4.67 E+01	2.00 E-03	18.5
06	U-238	TRG	04/24/13 11:58		A_Spec	Alpha_044	170	1.37 E+02	0.00 E+00	19
07	U-238	TRG	04/24/13 11:58		A_Spec	Alpha_046	170	1.17 E+02	0.00 E+00	17.9
08	U-238	TRG	04/24/13 11:58		A_Spec	Alpha_047	170	6.68 E+01	1.00 E-03	18.2
09	U-238	TRG	04/24/13 11:58		A_Spec	Alpha_048	170	5.50 E+01	0.00 E+00	16.8
10	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_033	170	2.20 E+01	0.00 E+00	18.2
11	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_034	170	3.18 E+01	1.00 E-03	18.6
12	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_035	170	4.08 E+01	1.00 E-03	18.3
13	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_037	170	3.17 E+01	2.00 E-03	17.8
14	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_040	170	4.30 E+01	0.00 E+00	19
15	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_041	170	3.23 E+01	1.60 E-02	19.8
16	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_042	170	1.86 E+02	2.00 E-03	18.5
17	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_044	170	2.10 E+02	0.00 E+00	19
18	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_046	170	4.40 E+01	0.00 E+00	17.9
19	U-238	TRG	04/24/13 14:51		A_Spec	Alpha_047	170	4.18 E+01	1.00 E-03	18.2



Run 1

Analysis Code UUISO

Eberline Services Work Order 13-04052

Client Engineering Management Support, Inc.

5500

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-UISO-1**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-235	LCS	LCS	pCi/l	9.04E-01	2.83E-01	8.23E-02					OK	
02	U-235	MBL	BLANK	pCi/l	8.57E-03	2.62E-02	6.21E-02					OK	OK
03	U-235	DUP	S-61 TOT	pCi/l	7.64E-02	7.00E-02	6.60E-02				NA	OK	
04	U-235	DO	S-61 TOT	pCi/l	3.38E-02	6.55E-02	1.23E-01					OK	
05	U-235	TRG	S-61 DIS	pCi/l	1.29E-01	9.90E-02	7.86E-02					OK	
06	U-235	TRG	PZ-115-SS TOT	pCi/l	1.37E-01	9.58E-02	9.16E-02					OK	
07	U-235	TRG	PZ-115-SS DIS	pCi/l	1.80E-01	1.13E-01	9.84E-02					OK	
08	U-235	TRG	MW-104 TOT	pCi/l	1.43E-01	1.10E-01	8.73E-02					OK	
09	U-235	TRG	MW-104 DIS	pCi/l	1.59E-01	1.39E-01	1.59E-01					OK	
10	U-235	TRG	PZ-100-SD TOT	pCi/l	1.02E-02	3.11E-02	7.37E-02					OK	
11	U-235	TRG	PZ-100-SD DIS	pCi/l	1.16E-02	2.77E-02	5.81E-02					OK	
12	U-235	TRG	I-67 TOT	pCi/l	5.13E-02	6.21E-02	7.56E-02					OK	
13	U-235	TRG	I-67 DIS	pCi/l	1.64E-01	1.07E-01	8.13E-02					OK	
14	U-235	TRG	PZ-203-SS TOT	pCi/l	1.34E-01	8.56E-02	5.69E-02					OK	
15	U-235	TRG	PZ-203-SS DIS	pCi/l	1.28E-01	9.83E-02	1.08E-01					OK	
16	U-235	TRG	PZ-100-SS TOT	pCi/l	3.20E-01	1.42E-01	6.40E-02					OK	
17	U-235	TRG	PZ-100-SS DIS	pCi/l	2.08E-01	1.11E-01	8.31E-02					OK	
18	U-235	TRG	I-66 TOT	pCi/l	2.63E-01	1.36E-01	9.85E-02					OK	
19	U-235	TRG	I-66 DIS	pCi/l	1.04E-01	8.69E-02	7.47E-02					OK	

  
 Run **1**  
 Analysis Code **UISO**  
 Eberline Services Work Order **13-04052**  
 Client **Engineering Management Support, Inc.**

7500

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-UUISO-1**

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	U-235	LCS	04/09/13 00:00	1.00E+00	90.97	0.00	0.00			
02	U-235	MBL	04/09/13 00:00	1.00E+00	141.50	0.00	0.00			
03	U-235	DUP	04/05/13 11:18	1.00E+00	109.01	0.00	0.00			
04	U-235	DO	04/05/13 11:18	1.00E+00	88.76	0.00	0.00			
05	U-235	TRG	04/05/13 11:18	1.00E+00	94.14	0.00	0.00			
06	U-235	TRG	04/05/13 12:23	1.00E+00	112.74	0.00	0.00			
07	U-235	TRG	04/05/13 12:23	1.00E+00	111.59	0.00	0.00			
08	U-235	TRG	04/05/13 12:56	1.00E+00	85.92	0.00	0.00			
09	U-235	TRG	04/05/13 12:56	1.00E+00	73.43	0.00	0.00			
10	U-235	TRG	04/05/13 14:03	1.00E+00	116.40	0.00	0.00			
11	U-235	TRG	04/05/13 14:03	1.00E+00	126.70	0.00	0.00			
12	U-235	TRG	04/05/13 14:09	1.00E+00	99.03	0.00	0.00			
13	U-235	TRG	04/05/13 14:09	1.00E+00	107.99	0.00	0.00			
14	U-235	TRG	04/05/13 14:58	1.00E+00	126.52	0.00	0.00			
15	U-235	TRG	04/05/13 14:58	1.00E+00	101.19	0.00	0.00			
16	U-235	TRG	04/05/13 14:58	1.00E+00	115.65	0.00	0.00			
17	U-235	TRG	04/05/13 14:58	1.00E+00	124.29	0.00	0.00			
18	U-235	TRG	04/05/13 14:59	1.00E+00	111.38	0.00	0.00			
19	U-235	TRG	04/05/13 14:59	1.00E+00	100.47	0.00	0.00			

	Run	1
	Analysis Code	UUISO
Eberline Services Work Order	13-04052	
Client	Engineering Management Support, Inc.	

0000



Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-235	LCS	04/24/13 11:58		A_Spec	Alpha_035	170	4.58 E+01	1.00 E-03	18.3
02	U-235	MBL	04/24/13 11:58		A_Spec	Alpha_037	170	6.60 E-01	2.00 E-03	17.8
03	U-235	DUP	04/24/13 11:58		A_Spec	Alpha_040	170	4.83 E+00	1.00 E-03	19
04	U-235	DO	04/24/13 11:58		A_Spec	Alpha_041	170	1.81 E+00	7.00 E-03	19.8
05	U-235	TRG	04/24/13 11:58		A_Spec	Alpha_042	170	6.83 E+00	1.00 E-03	18.5
06	U-235	TRG	04/24/13 11:58		A_Spec	Alpha_044	170	9.00 E+00	0.00 E+00	19
07	U-235	TRG	04/24/13 11:58		A_Spec	Alpha_046	170	1.10 E+01	0.00 E+00	17.9
08	U-235	TRG	04/24/13 11:58		A_Spec	Alpha_047	170	6.83 E+00	1.00 E-03	18.2
09	U-235	TRG	04/24/13 11:58		A_Spec	Alpha_048	170	6.00 E+00	0.00 E+00	16.8
10	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_033	170	6.60 E-01	2.00 E-03	18.2
11	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_034	170	8.30 E-01	1.00 E-03	18.6
12	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_035	170	2.83 E+00	1.00 E-03	18.3
13	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_037	170	9.66 E+00	2.00 E-03	17.8
14	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_040	170	9.83 E+00	1.00 E-03	19
15	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_041	170	7.81 E+00	7.00 E-03	19.8
16	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_042	170	2.08 E+01	1.00 E-03	18.5
17	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_044	170	1.50 E+01	0.00 E+00	19
18	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_046	170	1.60 E+01	0.00 E+00	17.9
19	U-235	TRG	04/24/13 14:51		A_Spec	Alpha_047	170	5.83 E+00	1.00 E-03	18.2

	Run	1
	Analysis Code	UIISO
Eberline Services Work Order	13-04052	
Client	Engineering Management Support, Inc.	

9500

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Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	04/09/13 00:00	1.0000	0.6118	11.6835		0.00		
02	MBL	BLANK	04/09/13 00:00	1.0000	0.6089	11.6282		0.00		
03	DUP	S-61 TOT	04/05/13 11:18	1.0000	0.6103	11.6549		0.00		
04	DO	S-61 TOT	04/05/13 11:18	1.0000	0.6098	11.6454		0.00		
05	TRG	S-61 DIS	04/05/13 11:18	1.0000	0.6099	11.6473		0.00		
06	TRG	PZ-115-SS TOT	04/05/13 12:23	1.0000	0.6096	11.6415		0.00		
07	TRG	PZ-115-SS DIS	04/05/13 12:23	1.0000	0.6095	11.6396		0.00		
08	TRG	MW-104 TOT	04/05/13 12:56	1.0000	0.6093	11.6358		0.00		
09	TRG	MW-104 DIS	04/05/13 12:56	1.0000	0.6095	11.6396		0.00		
10	TRG	PZ-100-SD TOT	04/05/13 14:03	1.0000	0.6092	11.6339		0.00		
11	TRG	PZ-100-SD DIS	04/05/13 14:03	1.0000	0.6088	11.6263		0.00		
12	TRG	I-67 TOT	04/05/13 14:09	1.0000	0.6083	11.6167		0.00		
13	TRG	I-67 DIS	04/05/13 14:09	1.0000	0.6080	11.6110		0.00		
14	TRG	PZ-203-SS TOT	04/05/13 14:58	1.0000	0.6083	11.6167		0.00		
15	TRG	PZ-203-SS DIS	04/05/13 14:58	1.0000	0.6092	11.6339		0.00		
16	TRG	PZ-100-SS TOT	04/05/13 14:58	1.0000	0.6053	11.5594		0.00		
17	TRG	PZ-100-SS DIS	04/05/13 14:58	1.0000	0.6067	11.5861		0.00		
18	TRG	I-66 TOT	04/05/13 14:59	1.0000	0.6060	11.5728		0.00		
19	TRG	I-66 DIS	04/05/13 14:59	1.0000	0.6057	11.5671		0.00		

*Handwritten: 1158*

*Handwritten: 3247*

*Handwritten: 6697*

### Spike and Tracer Worksheet

Internal Work Order					Run	Analysis Code			Date	Technician			Technician Initials	Witness Initials		
<b>13-04052</b>					<b>1</b>	<b>UIISO</b>			<b>4/17/2013 18:48</b>	<b>LWALKER</b>			<i>[Signature]</i>			
<b>LCS &amp; Matrix Spikes</b>					<b>LCS</b>	<b>MS</b>	<b>LCSD</b>	<b>MSD</b>	<b>LCS</b>		<b>MS</b>		<b>LCSD</b>		<b>MSD</b>	
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	Volume Used (g)	Volume Used (g)	Volume Used (g)	Volume Used (g)	Known pCi	Error Estimate	Added pCi	Error Estimate	Known pCi	Error Estimate	Added pCi	Error Estimate
U-234	U-8a	35.240	4/17/2013	0.500	0.5126				8.14	0.293	0.00	0.000	0.00	0.000	0.00	0.000
U-238	U-8a	34.350	4/17/2013	0.500	0.5126				7.93	0.286	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes														
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer					LCS									
01	U-232	U-10a	19.097	4/17/2013	0.6118	0.6300															
02	U-232	U-10a	19.097	4/17/2013	0.6089	0.6300															
03	U-232	U-10a	19.097	4/17/2013	0.6103	0.6300															
04	U-232	U-10a	19.097	4/17/2013	0.6098	0.6300															
05	U-232	U-10a	19.097	4/17/2013	0.6099	0.6300															
06	U-232	U-10a	19.097	4/17/2013	0.6096	0.6300															
07	U-232	U-10a	19.097	4/17/2013	0.6095	0.6300															
08	U-232	U-10a	19.097	4/17/2013	0.6093	0.6300															
09	U-232	U-10a	19.097	4/17/2013	0.6095	0.6300															
10	U-232	U-10a	19.097	4/17/2013	0.6092	0.6300															
11	U-232	U-10a	19.097	4/17/2013	0.6088	0.6300															
12	U-232	U-10a	19.097	4/17/2013	0.6083	0.6300															
13	U-232	U-10a	19.097	4/17/2013	0.6080	0.6300															
14	U-232	U-10a	19.097	4/17/2013	0.6083	0.6300															
15	U-232	U-10a	19.097	4/17/2013	0.6092	0.6300															
16	U-232	U-10a	19.097	4/17/2013	0.6053	0.6300															
17	U-232	U-10a	19.097	4/17/2013	0.6067	0.6300															
18	U-232	U-10a	19.097	4/17/2013	0.6060	0.6300															
19	U-232	U-10a	19.097	4/17/2013	0.6057	0.6300															

0.6118 g  
0.6089 g  
-0.6103 g  
-0.6098 g  
-0.6099 g  
-0.6096 g  
-0.6095 g  
-0.6093 g  
-0.6095 g  
-0.6092 g  
-0.6088 g  
-0.6083 g  
-0.6080 g  
-0.6083 g  
-0.6092 g  
-0.6053 g  
-0.6067 g  
-0.6060 g  
-0.6057 g

0.5126 g

Matrix Spike


# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-04052</b>	<b>1</b>	<b>UUISO</b>	<b>liters</b>	<b>4/30/2013</b>	<b>JBARNARD</b>

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data		Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq	
01	LCS	LCS						1.0000E+00	1.0000E+00				
02	BLANK	MBL						1.0000E+00	1.0000E+00				
03	S-61 TOT	DUP						1.0000E+00	1.0000E+00				
04	S-61 TOT	DO						1.0000E+00	1.0000E+00				
05	S-61 DIS	TRG						1.0000E+00	1.0000E+00				
06	PZ-115-SS TOT	TRG						1.0000E+00	1.0000E+00				
07	PZ-115-SS DIS	TRG						1.0000E+00	1.0000E+00				
08	MW-104 TOT	TRG						1.0000E+00	1.0000E+00				
09	MW-104 DIS	TRG						1.0000E+00	1.0000E+00				
10	PZ-100-SD TOT	TRG						1.0000E+00	1.0000E+00				
11	PZ-100-SD DIS	TRG						1.0000E+00	1.0000E+00				
12	I-67 TOT	TRG						1.0000E+00	1.0000E+00				
13	I-67 DIS	TRG						1.0000E+00	1.0000E+00				
14	PZ-203-SS TOT	TRG						1.0000E+00	1.0000E+00				
15	PZ-203-SS DIS	TRG						1.0000E+00	1.0000E+00				
16	PZ-100-SS TOT	TRG						1.0000E+00	1.0000E+00				
17	PZ-100-SS DIS	TRG						1.0000E+00	1.0000E+00				
18	I-66 TOT	TRG						1.0000E+00	1.0000E+00				
19	I-66 DIS	TRG						1.0000E+00	1.0000E+00				

Comments	
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Technician: \_\_\_\_\_

 Date: 4, 18, 13

10/5  
4/24/13

# Apex-Alpha™

Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 55205  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/24/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:08 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232 UU-10A  
 Tracer Quantity: 0.612 mL  
 Effective Efficiency: 0.1661 +/- 0.0099  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 0.9097 +/- 0.0568

Control Certificate Name: NatU\_U-8A  
 Chem. Recov. of Control: U-238 0.901445 +/- 0.073558  
 Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.280	328.00	10.84	0.00	0.00E+000	7.6
U-234	4.726	475.49	8.99	0.51	0.00E+000	9.6
U-235	4.420	45.83	29.01	0.17	0.00E+000	3.3
U-238	4.150	460.83	9.13	0.17	0.00E+000	36.3

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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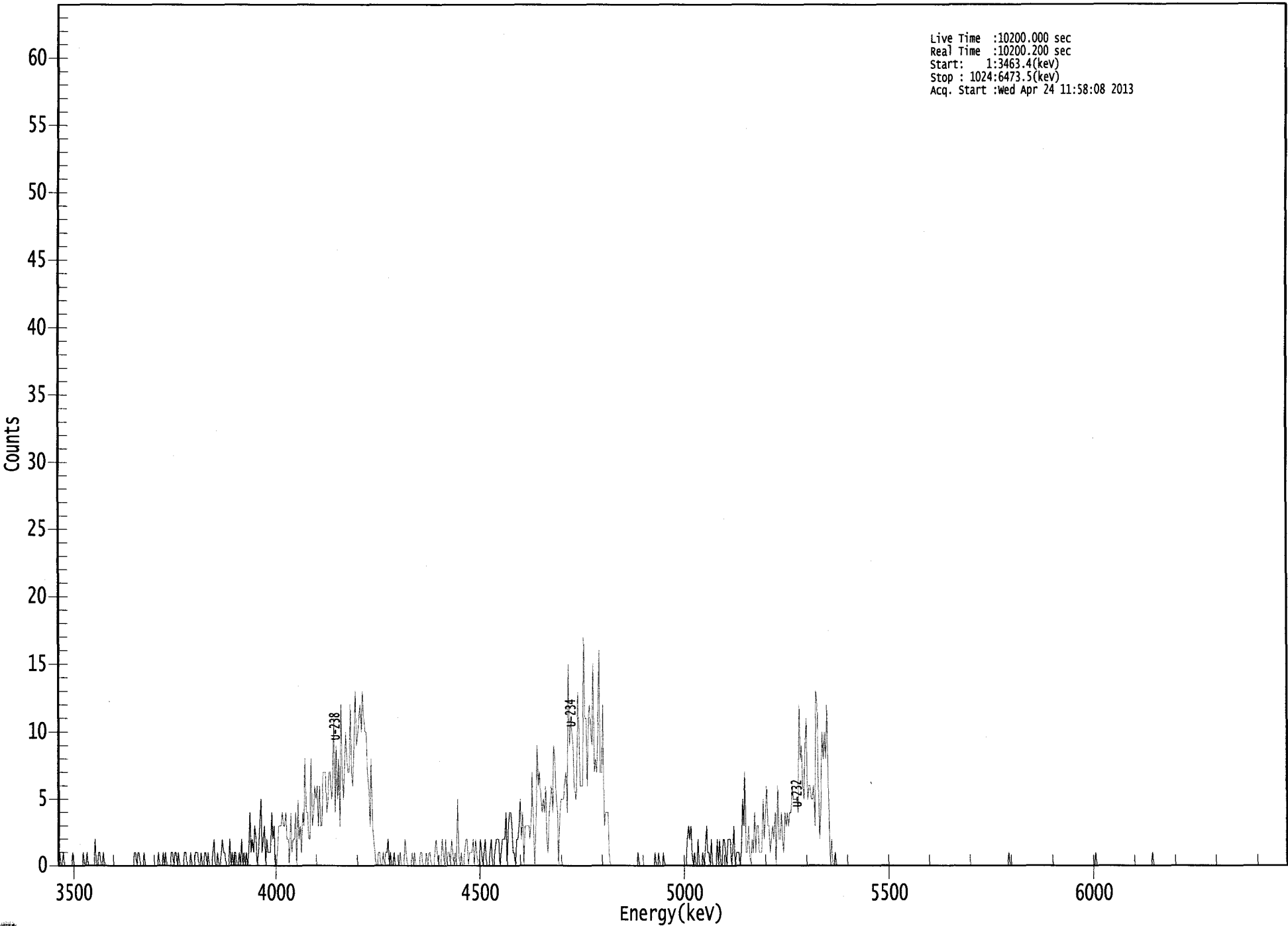
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.24E+000 +/- 6.16E-001	9.58E-002 +/- 1.13E-002
U-234	0.991	4761.50*	7.60E+000 +/- 1.12E+000	8.39E-002 +/- 9.85E-003
U-235	0.991	4385.50*	9.04E-001 +/- 2.83E-001	8.23E-002 +/- 9.66E-003
U-238	0.992	4184.40*	7.33E+000 +/- 1.09E+000	6.64E-002 +/- 7.80E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

000056322.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :wed Apr 24 11:58:08 2013



ROI Type: 1

ROI Type: 3

1010

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 01

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	1	0	0	1	0	0	0
9:	0	0	0	0	1	0	0	0
17:	0	0	0	0	0	1	0	0
25:	1	0	0	0	0	0	0	2
33:	0	0	1	1	0	0	1	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	1	1	0	1	1	0	0	0
73:	1	0	0	0	0	0	0	0
81:	0	0	0	0	1	0	0	0
89:	1	0	1	0	0	0	0	1
97:	1	0	1	1	0	1	0	0
105:	0	0	1	1	0	0	0	1
113:	0	0	0	1	1	1	0	0
121:	1	0	0	1	1	0	1	0
129:	0	0	1	2	0	0	1	0
137:	0	1	2	1	1	0	0	0
145:	2	0	1	0	1	1	0	0
153:	1	0	2	0	1	0	1	0
161:	1	4	1	2	1	3	2	0
169:	1	3	5	1	2	3	0	2
177:	1	1	1	4	2	3	0	0
185:	1	3	3	3	4	3	3	4
193:	2	2	0	4	1	2	2	4
201:	0	5	2	3	1	4	3	8
209:	4	4	2	2	8	3	4	6
217:	5	6	3	6	3	3	7	7
225:	7	4	5	7	7	5	6	11
233:	4	9	5	8	3	12	7	5
241:	7	10	8	7	7	12	7	6
249:	9	13	9	10	11	12	10	13
257:	11	10	10	7	6	3	8	3
265:	2	1	0	0	1	1	0	0
273:	1	0	1	1	2	0	1	0
281:	0	1	0	0	0	0	1	0
289:	0	0	2	1	0	0	0	0
297:	1	0	1	0	0	0	0	1
305:	1	0	0	0	1	0	1	1
313:	0	0	0	1	2	1	0	0
321:	0	2	1	0	2	0	1	1
329:	0	2	1	0	1	0	5	1
337:	0	1	0	0	1	2	2	0
345:	1	1	1	2	0	2	1	0
353:	0	2	1	0	1	2	0	0
361:	0	1	2	0	0	1	2	2

369: 2 0 1 2 2 2 4 0

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
377:	3	4	4	3	1	1	0	2
385:	2	3	5	2	4	0	3	3
393:	3	3	2	4	7	2	0	4
401:	9	6	7	5	4	5	4	6
409:	2	1	4	5	6	4	9	8
417:	5	4	0	4	5	5	5	6
425:	7	4	15	9	11	10	9	6
433:	5	6	13	10	6	6	6	17
441:	11	11	6	11	12	10	9	15
449:	7	8	7	10	16	7	7	12
457:	3	4	4	4	1	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	1	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	1	0	0	1	0	0
505:	0	1	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	2	3	2
529:	3	1	0	1	0	0	2	0
537:	0	0	1	0	1	3	1	1
545:	0	2	0	0	0	0	2	0
553:	2	0	0	2	2	1	0	2
561:	2	2	0	1	3	0	1	1
569:	1	0	1	5	3	7	1	1
577:	3	1	0	2	1	4	1	3
585:	3	1	1	1	5	2	4	6
593:	3	3	1	2	3	2	4	0
601:	6	2	2	4	2	1	4	3
609:	4	3	4	4	6	5	5	5
617:	5	4	12	8	9	6	5	9
625:	11	5	6	6	5	5	6	3
633:	13	12	6	2	5	10	8	10
641:	8	12	7	3	0	2	0	0
649:	1	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	1	0	0	0	0	0	0	0



801: 0 0 0 0 0 0 0 0

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	1	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	1
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



105  
4/24/13

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_037  
 Chamber Serial Number: 04026478A  
 Detector Serial Number: 91133  
 Env. Background: System Bkgd 55207  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/24/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:09 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.2523 +/- 0.0127  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Chem. Recovery Factor: 1.4150 +/- 0.0761

Peak Match Tolerance: 0.150 MeV

-----  
 PEAK AREA REPORT  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.271	495.83	8.80	0.17	0.00E+000	4.4
U-234	4.719	5.00	96.02	0.00	0.00E+000	2.9
U-235	4.409	0.66	305.43	0.34	0.00E+000	2.9
U-238	4.134	3.66	107.87	0.34	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
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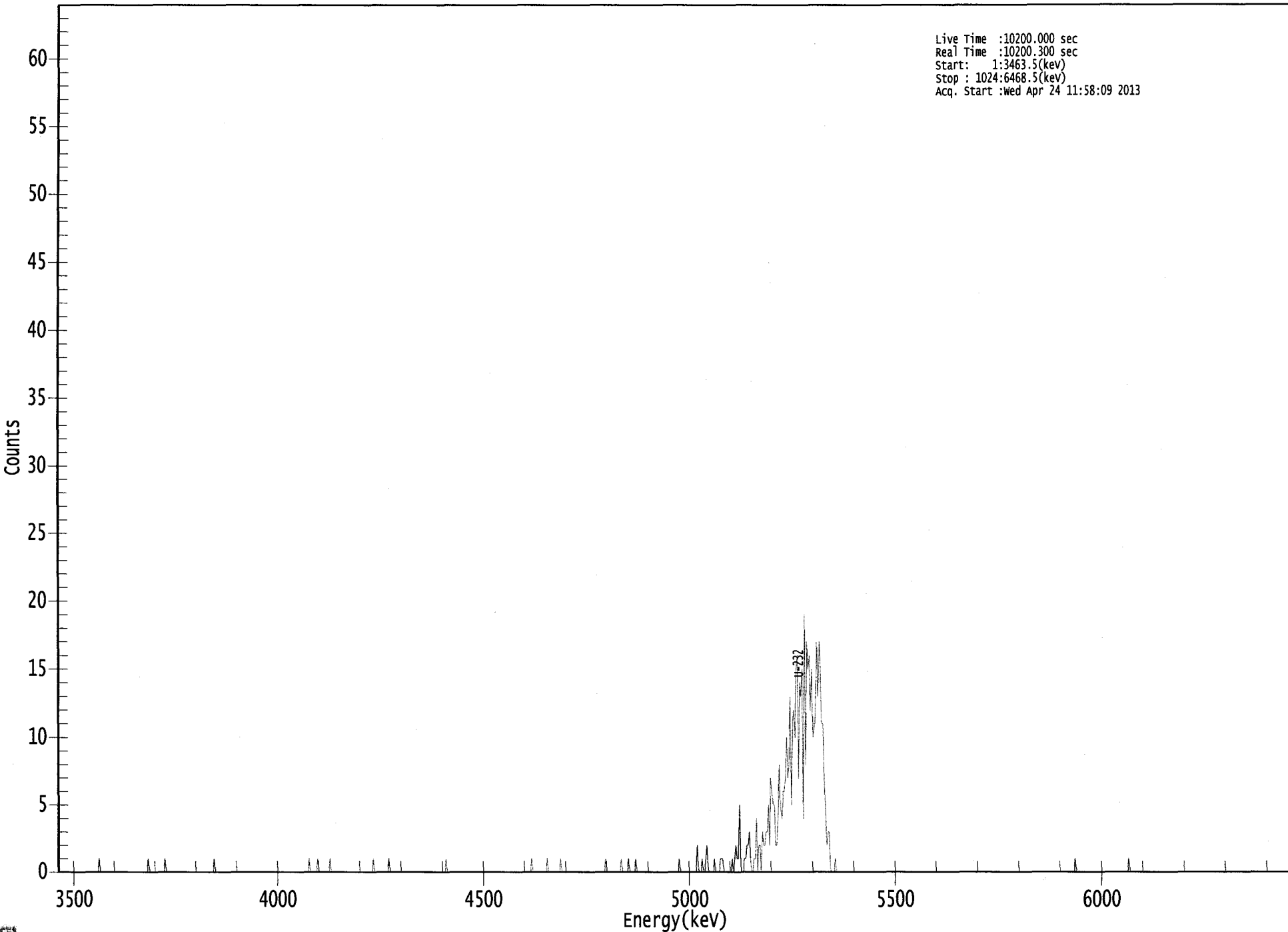
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.993	5302.50*	5.22E+000 +/- 5.16E-001	4.39E-002 +/- 4.34E-003
U-234	0.987	4761.50*	5.26E-002 +/- 5.08E-002	6.31E-002 +/- 6.24E-003
U-235	0.996	4385.50*	8.57E-003 +/- 2.62E-002	6.21E-002 +/- 6.14E-003
U-238	0.982	4184.40*	3.84E-002 +/- 4.15E-002	5.01E-002 +/- 4.96E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

000056321.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3463.5(kev)  
Stop : 1024:6468.5(kev)  
Acq. Start :wed Apr 24 11:58:09 2013



ROI Type: 1

ROI Type: 3

0100

\*\*\*\*\*  
\*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
\*\*\*\*\*

Sample Title: 02

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	1	2	3	4	5	6	7	8	9
1:	0	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0	0
33:	0	0	1	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0	0
73:	0	0	0	1	0	0	0	0	0
81:	0	0	0	0	0	0	0	0	0
89:	0	1	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0	0
129:	0	0	1	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0	0
209:	0	1	0	0	0	0	0	0	0
217:	1	0	0	0	0	0	0	0	0
225:	0	0	1	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	1	0
265:	0	0	0	0	0	0	0	0	0
273:	0	0	0	1	0	0	0	0	0
281:	0	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0	0
321:	0	0	1	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 02

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	1	0
409:	0	0	0	0	0	0	0	0
417:	0	1	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	1	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	1	0	0	0	0
473:	0	1	0	0	0	0	0	1
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	1	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	2	0	0	0	1	0
537:	0	1	2	0	0	0	0	0
545:	1	0	0	0	0	1	1	1
553:	0	0	0	0	0	0	0	1
561:	0	1	2	1	1	5	0	0
569:	0	1	1	2	2	3	1	0
577:	0	1	1	4	0	2	2	0
585:	3	2	2	3	3	5	2	7
593:	6	5	5	2	2	4	8	5
601:	4	6	6	7	10	7	8	13
609:	5	11	12	10	15	16	7	14
617:	13	15	4	19	8	17	15	16
625:	12	15	10	11	11	17	13	17
633:	15	11	11	7	4	2	3	3
641:	0	0	0	0	1	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 02

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	1	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	1	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

105  
4/24/13

# Apex-Alpha™

Sample Description: S-61 TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 55210  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:20 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.610 mL  
 Effective Efficiency: 0.2071 +/- 0.0113  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 1.0901 +/- 0.0625

Peak Match Tolerance: 0.150 MeV

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 -----  
 PEAK AREA REPORT  
 -----  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.281	408.00	9.72	0.00	0.00E+000	23.8
U-234	4.735	62.00	25.09	0.00	0.00E+000	3.0
U-235	4.432	4.83	91.00	0.17	0.00E+000	3.0
U-238	4.155	51.00	27.71	0.00	0.00E+000	7.9

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
 -----  
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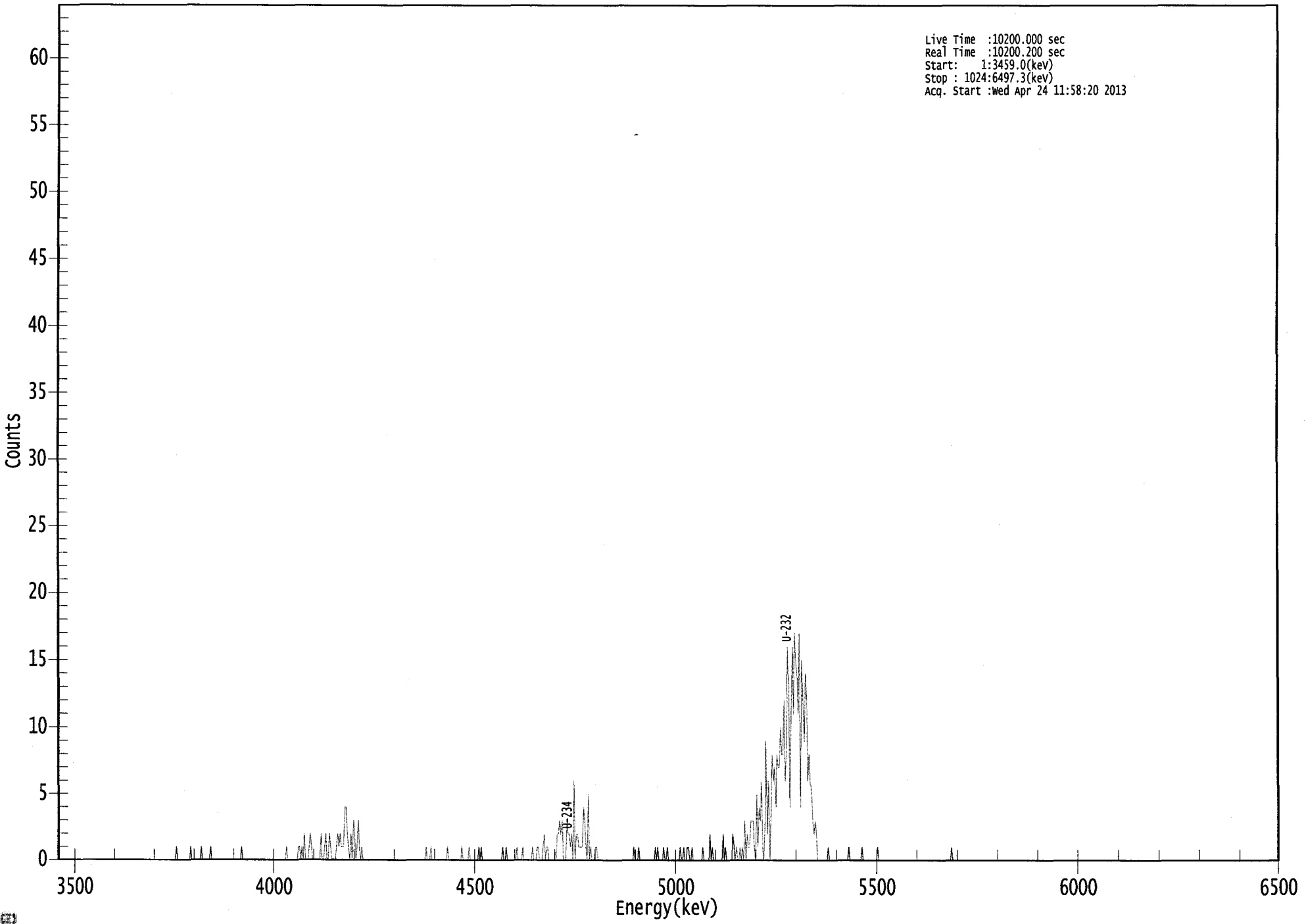
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.23E+000 +/- 5.61E-001	7.69E-002 +/- 8.24E-003
U-234	0.995	4761.50*	7.95E-001 +/- 2.17E-001	7.69E-002 +/- 8.23E-003
U-235	0.985	4385.50*	7.64E-002 +/- 7.00E-002	6.60E-002 +/- 7.07E-003
U-238	0.994	4184.40*	6.51E-001 +/- 1.93E-001	7.65E-002 +/- 8.20E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

000056320.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Wed Apr 24 11:58:20 2013



ROI Type: 1

ROI Type: 3



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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 03

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	1	0	0	0
105:	0	0	0	0	0	0	0	0
113:	1	0	0	0	0	0	0	0
121:	0	1	0	0	0	0	0	0
129:	0	1	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	1	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	1	0	0	0	0	0	0
201:	0	0	0	1	1	0	1	0
209:	2	0	0	0	1	2	1	0
217:	0	0	0	0	0	0	2	0
225:	0	1	2	0	0	2	1	0
233:	0	0	0	1	2	1	2	1
241:	1	1	4	4	2	1	0	2
249:	0	3	2	0	1	3	1	0
257:	1	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	1	0
313:	0	0	1	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	1	0	0	0	0	0	0	0
337:	0	0	0	0	1	0	0	0
345:	0	0	1	0	0	0	0	0
353:	0	0	1	0	1	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 1 0

Sample Title: 03

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	0	0	0
385:	0	0	1	0	0	0	0	1
393:	0	0	0	0	0	0	0	1
401:	0	0	0	1	1	0	0	0
409:	1	2	0	1	1	0	0	0
417:	0	0	0	0	2	2	3	2
425:	3	0	0	0	3	2	2	1
433:	2	0	6	0	2	2	1	1
441:	1	1	4	3	1	0	5	0
449:	1	0	0	0	1	1	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	1	0	0	0
489:	1	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	1	0
505:	1	0	0	0	0	1	0	0
513:	1	0	0	0	0	0	0	0
521:	0	0	0	1	0	0	1	0
529:	0	1	1	0	0	1	0	0
537:	0	0	0	0	0	0	1	0
545:	0	0	0	0	2	0	1	0
553:	0	0	0	0	0	0	0	2
561:	0	1	0	0	0	0	0	2
569:	1	0	1	0	0	1	0	1
577:	0	3	0	2	1	1	3	3
585:	3	1	0	5	1	4	3	6
593:	1	0	3	9	2	6	0	3
601:	8	6	7	4	8	7	7	10
609:	8	8	12	6	8	16	13	4
617:	11	16	11	17	15	14	11	17
625:	4	15	12	9	14	12	6	8
633:	6	5	3	2	3	2	0	0
641:	0	0	0	0	0	0	0	1
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	1	0	0	0	0	0	0	0
673:	0	0	0	1	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	1	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	1	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 03

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

168  
4/24/13

Sample Description: S-61 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_041  
 Chamber Serial Number: 05026930A  
 Detector Serial Number: 91087  
 Env. Background: System Bkgd 55211  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:15 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.610 mL  
 Effective Efficiency: 0.1756 +/- 0.0103  
 Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM  
 Chem. Recovery Factor: 0.8876 +/- 0.0542

Peak Match Tolerance: 0.150 MeV

-----  
 PEAK AREA REPORT  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.279	345.66	10.55	0.34	0.00E+000	19.6
U-234	4.726	50.15	27.95	0.85	0.00E+000	3.0
U-235	4.422	1.81	193.78	1.19	0.00E+000	3.0
U-238	4.155	49.28	28.81	2.72	0.00E+000	3.4

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
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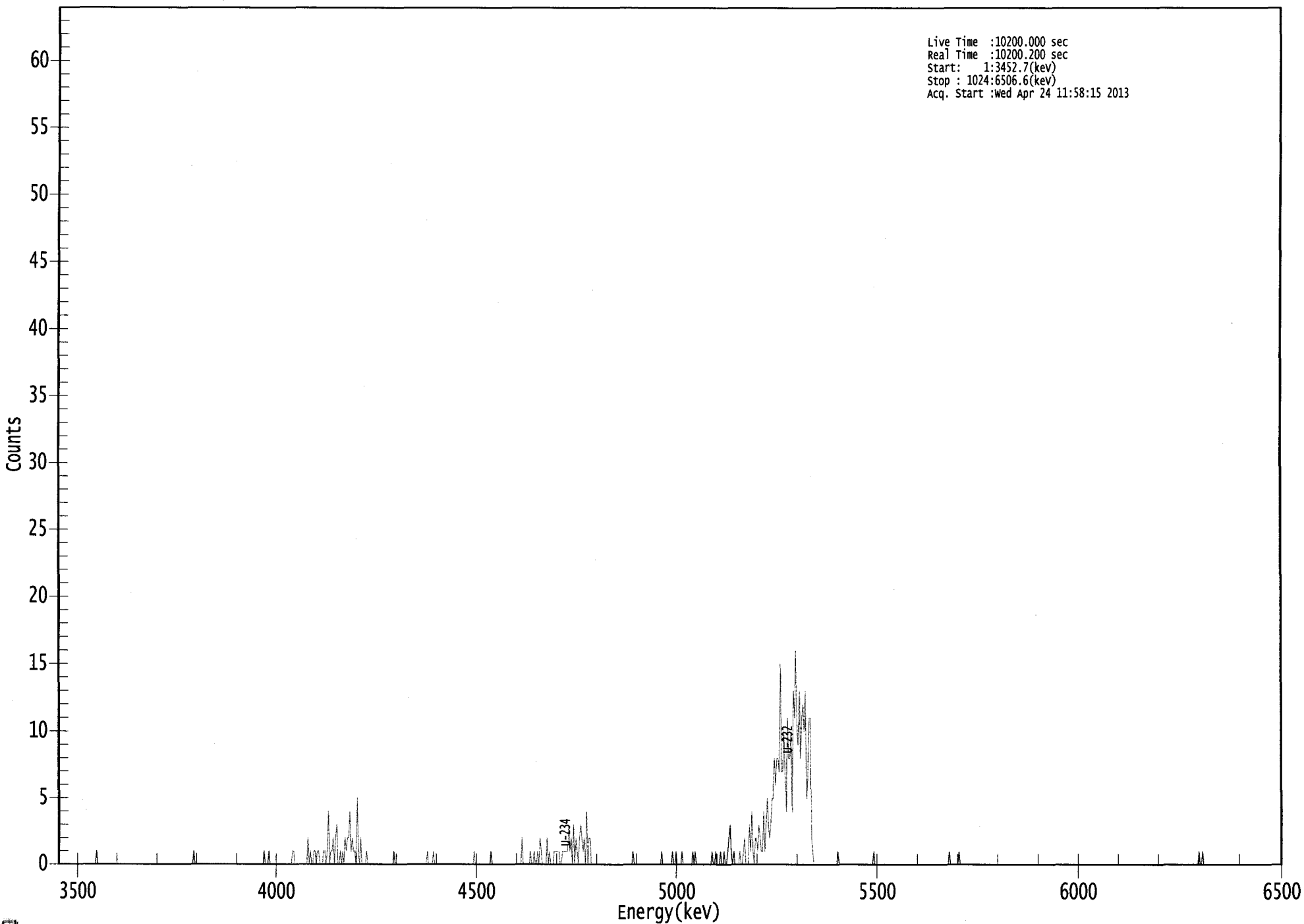
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.23E+000 +/- 6.00E-001	7.23E-002 +/- 8.30E-003
U-234	0.991	4761.50*	7.58E-001 +/- 2.29E-001	9.05E-002 +/- 1.04E-002
U-235	0.991	4385.50*	3.38E-002 +/- 6.55E-002	1.23E-001 +/- 1.41E-002
U-238	0.994	4184.40*	7.42E-001 +/- 2.30E-001	1.29E-001 +/- 1.48E-002

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

0000056323.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3452.7(keV)  
Stop : 1024:6506.6(keV)  
Acq. Start :Wed Apr 24 11:58:15 2013



ROI Type: 1

ROI Type: 3

0116

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 04

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	1	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	1	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	1	0	0
177:	0	1	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	1	1	0
201:	0	0	0	0	0	0	0	0
209:	0	0	2	0	1	0	0	1
217:	1	0	1	1	0	0	0	1
225:	1	0	1	4	0	1	1	2
233:	0	2	3	0	0	1	0	1
241:	0	2	1	2	2	4	1	2
249:	1	1	0	5	1	0	2	0
257:	0	0	0	1	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	1	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	1	0
313:	0	0	0	1	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	1	0	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	2	0	0
393:	0	0	0	0	1	0	0	1
401:	0	0	1	0	2	1	0	0
409:	0	0	2	0	1	0	0	0
417:	1	1	1	1	1	0	0	1
425:	1	1	1	1	3	1	2	0
433:	3	0	2	1	0	2	3	2
441:	1	2	0	4	0	2	2	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	1	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	1	0	0	0	0	0
513:	0	0	0	1	0	0	1	0
521:	0	0	0	1	0	0	0	0
529:	0	0	0	0	1	0	1	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	1	0	0	1
553:	0	0	0	1	0	0	1	0
561:	0	1	2	3	1	0	1	0
569:	0	0	0	1	0	0	1	2
577:	0	0	0	3	1	4	1	0
585:	2	2	1	3	2	1	1	4
593:	1	3	5	3	2	3	5	5
601:	8	6	8	8	7	15	7	7
609:	10	7	4	11	8	8	10	4
617:	13	11	16	10	9	13	8	11
625:	12	10	13	5	6	11	11	2
633:	1	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	1	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	1	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	1	0	0	0	0	0
753:	0	0	1	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	1	0	0	1	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



KB  
4/24/13

# Apex-Alpha™

Sample Description: S-61 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UJ  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_042  
 Chamber Serial Number: 05026930B  
 Detector Serial Number: 84185  
 Env. Background: System Bkgd 55212  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:17 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UJ-10A  
 Tracer Quantity: 0.610 mL  
 Effective Efficiency: 0.1738 +/- 0.0102  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Chem. Recovery Factor: 0.9414 +/- 0.0578

Peak Match Tolerance: 0.150 MeV

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 -----  
 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.282	342.15	10.61	0.85	0.00E+000	23.4
U-234	4.721	55.66	26.37	0.34	0.00E+000	9.0
U-235	4.394	6.83	76.08	0.17	0.00E+000	3.0
U-238	4.162	46.66	28.82	0.34	0.00E+000	4.0

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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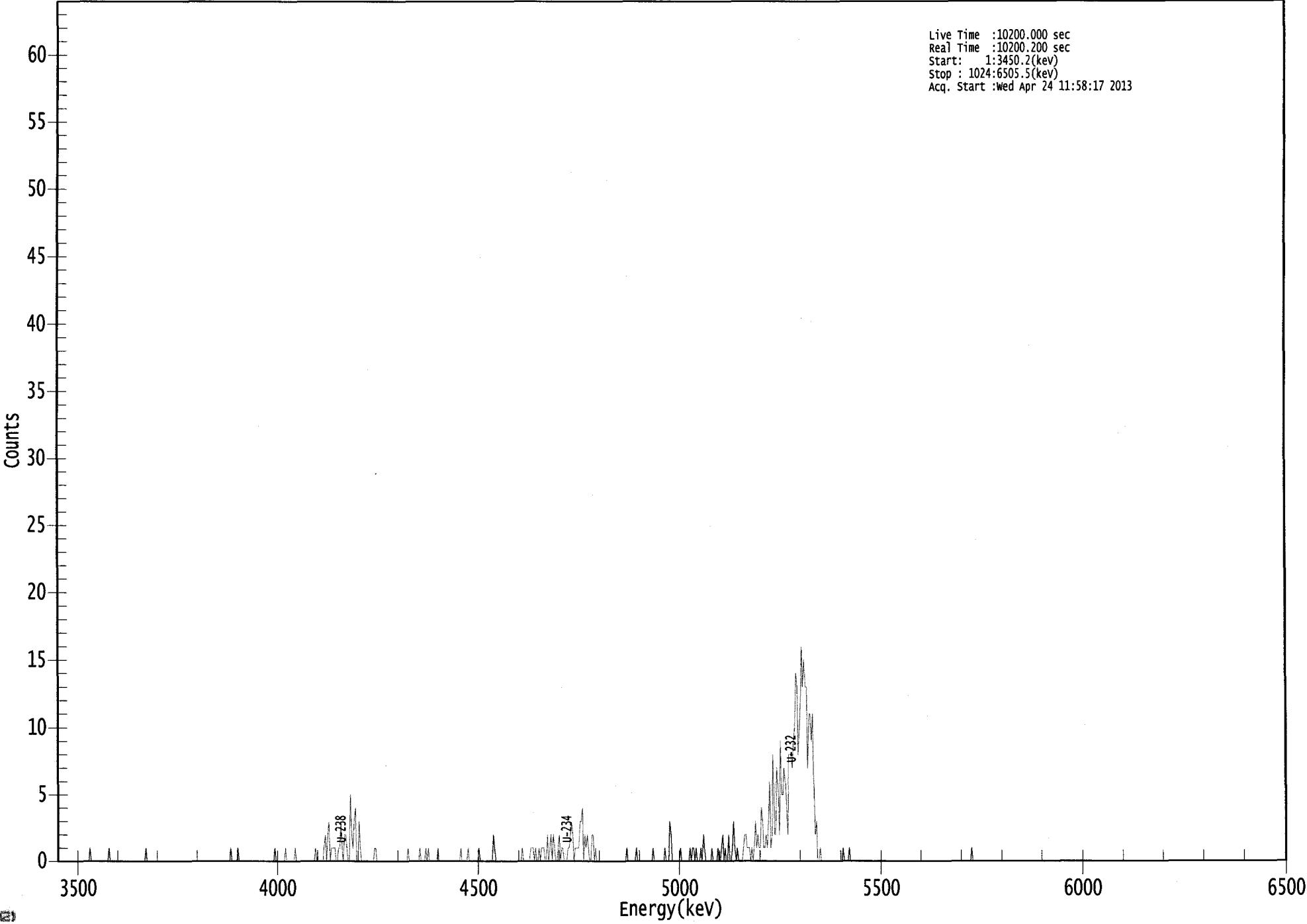
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.23E+000 +/- 6.03E-001	9.15E-002 +/- 1.06E-002
U-234	0.988	4761.50*	8.50E-001 +/- 2.45E-001	7.30E-002 +/- 8.42E-003
U-235	0.999	4385.50*	1.29E-001 +/- 9.90E-002	7.86E-002 +/- 9.07E-003
U-238	0.996	4184.40*	7.10E-001 +/- 2.20E-001	7.27E-002 +/- 8.39E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

0000056324.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3450.2(kev)  
Stop : 1024:6505.5(kev)  
Acq. Start :wed Apr 24 11:58:17 2013



ROI Type: 1

ROI Type: 3

1210

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 05

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	1	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	1	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	1	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	1	0	0	0	0	0	1
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	1	0
185:	0	0	0	0	0	0	0	1
193:	0	0	0	0	0	0	0	1
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	1	0	0	0	0	0	0	1
225:	2	0	2	3	0	1	1	1
233:	1	0	0	1	1	3	1	0
241:	2	2	1	0	0	5	2	1
249:	3	4	0	0	3	1	0	0
257:	0	0	0	0	0	0	0	0
265:	0	1	1	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	1	0	0
297:	0	0	0	0	0	0	0	1
305:	0	0	0	0	1	0	1	0
313:	0	0	0	0	0	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	1	0	0	0	0	0	1
345:	0	0	0	0	0	0	0	0
353:	1	0	0	0	0	0	0	0
361:	0	0	0	0	2	1	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	1	0	0	0
393:	0	0	0	1	1	1	0	1
401:	0	0	1	0	1	1	1	0
409:	0	2	0	1	2	0	2	1
417:	0	0	1	2	0	1	1	0
425:	0	0	1	1	2	3	2	0
433:	1	1	1	1	3	3	4	0
441:	2	1	2	1	0	0	2	2
449:	0	1	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	1	0	0	0	0
481:	0	0	0	1	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	1	0	0	0	0	0	0
505:	0	0	0	1	0	0	0	3
513:	2	0	0	0	0	0	0	0
521:	1	0	0	0	0	0	0	0
529:	1	0	1	1	0	1	0	0
537:	0	1	0	2	1	0	0	0
545:	0	0	1	0	0	0	0	1
553:	0	0	1	2	0	1	0	0
561:	2	0	0	1	3	1	0	1
569:	0	0	0	0	1	2	2	1
577:	1	1	0	1	0	1	3	1
585:	2	1	1	4	3	1	1	2
593:	1	3	6	1	2	8	2	2
601:	7	5	2	9	5	5	7	6
609:	4	2	8	8	8	7	9	10
617:	14	13	8	10	12	16	13	15
625:	13	13	7	11	11	9	11	5
633:	2	3	0	0	1	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	1
657:	0	0	0	0	1	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	1	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

ICB  
4/24/13

# Apex-Alpha™

Sample Description: PZ-115-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_044  
 Chamber Serial Number: 04026481B  
 Detector Serial Number: 84168  
 Env. Background: System Bkgd 55214  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:11 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.610 mL  
 Effective Efficiency: 0.2144 +/- 0.0115  
 Counting Efficiency: 0.1902 +/- 0.0033 on 12/16/2012 5:49:26 PM  
 Chem. Recovery Factor: 1.1274 +/- 0.0638

Peak Match Tolerance: 0.150 MeV

-----  
 ----- PEAK AREA REPORT -----  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.284	421.83	9.55	0.17	0.00E+000	23.1
U-234	4.738	202.83	13.77	0.17	0.00E+000	12.5
U-235	4.389	9.00	68.87	0.00	0.00E+000	3.0
U-238	4.165	137.00	16.81	0.00	0.00E+000	8.9

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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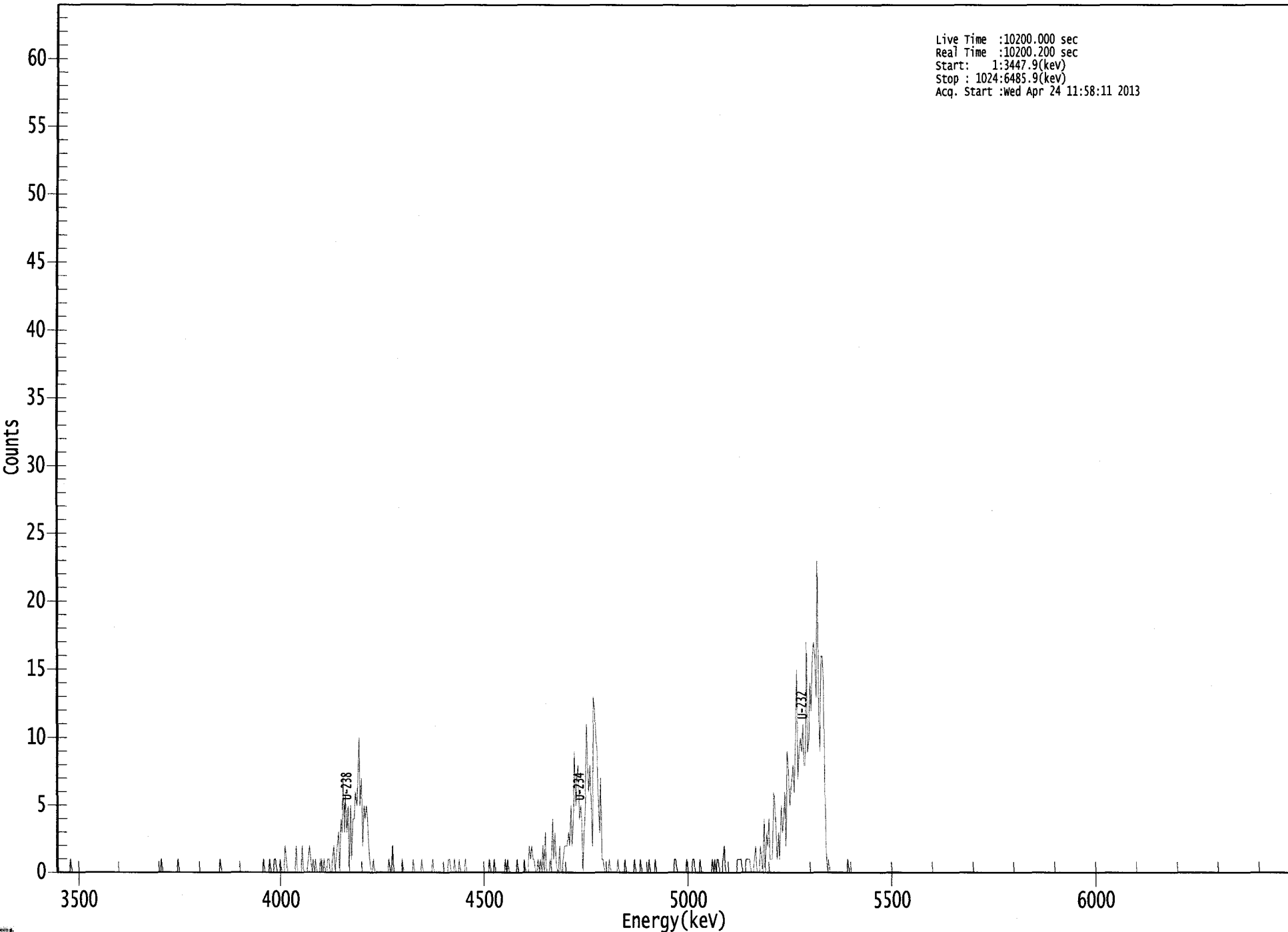
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.998	5302.50*	5.23E+000 +/- 5.52E-001	5.17E-002 +/- 5.46E-003
U-234	0.996	4761.50*	2.51E+000 +/- 4.36E-001	5.17E-002 +/- 5.46E-003
U-235	1.000	4385.50*	1.37E-001 +/- 9.58E-002	9.16E-002 +/- 9.67E-003
U-238	0.997	4184.40*	1.69E+000 +/- 3.35E-001	7.39E-002 +/- 7.81E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

0000056325.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3447.9(kev)  
Stop : 1024:6485.9(kev)  
Acq. Start :wed Apr 24 11:58:11 2013



ROI Type: 1

ROI Type: 3

9210

\*\*\*\*\*  
 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 06

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	1	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	1
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	1	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	1	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	1	0	0	0
177:	0	1	0	0	0	1	1	0
185:	0	0	1	0	0	0	2	1
193:	0	0	0	0	0	0	0	2
201:	0	0	0	0	2	0	0	0
209:	0	1	2	1	0	1	0	1
217:	0	0	0	1	1	0	1	0
225:	0	1	1	0	0	1	2	0
233:	1	2	3	0	4	3	7	3
241:	6	3	5	0	5	1	4	4
249:	6	5	6	10	5	7	2	5
257:	4	5	4	2	1	0	0	1
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	1	0	0	2
281:	0	0	0	0	0	0	0	1
289:	0	0	0	0	0	0	0	0
297:	1	0	0	0	0	0	0	1
305:	0	0	0	0	0	0	0	0
313:	1	0	0	0	0	0	0	0
321:	0	0	0	0	0	1	1	0
329:	0	0	1	0	0	0	1	0
337:	0	0	0	1	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	1
361:	0	0	0	1	0	0	0	0



369: 0 0 0 0 1 0 1 0

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	1	0
385:	0	0	0	0	1	0	0	0
393:	2	1	2	1	1	0	0	1
401:	0	1	0	2	0	3	0	0
409:	0	1	0	4	1	3	1	0
417:	0	2	0	0	1	2	2	2
425:	3	2	5	2	4	9	5	7
433:	8	4	5	4	0	3	5	11
441:	8	6	8	5	2	13	12	10
449:	9	5	3	7	1	1	0	0
457:	0	0	1	0	0	0	0	0
465:	0	1	0	0	0	0	0	1
473:	0	0	0	0	0	0	0	1
481:	0	0	0	0	1	0	0	0
489:	0	0	0	1	0	0	0	0
497:	1	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	1	1	0	0	0	0	0	0
521:	0	0	1	0	0	0	0	1
529:	1	0	0	0	0	1	0	0
537:	0	0	0	0	0	0	0	1
545:	0	1	0	1	1	0	0	0
553:	1	2	0	0	0	0	0	0
561:	0	0	0	0	1	1	1	1
569:	0	0	0	1	1	1	1	0
577:	0	0	1	2	0	0	0	2
585:	1	0	4	0	3	2	4	1
593:	1	1	6	5	3	1	3	1
601:	5	3	4	6	2	9	8	5
609:	6	7	8	6	10	15	7	9
617:	10	9	11	8	8	17	9	10
625:	14	12	16	17	16	13	23	12
633:	9	16	16	14	6	2	0	1
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	1
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 06

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KCS  
4/24/13

# Apex-Alpha™

Sample Description: PZ-115-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_046  
 Chamber Serial Number: 04026482B  
 Detector Serial Number: 58762  
 Env. Background: System Bkgd 55215  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:13 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.1997 +/- 0.0111  
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM  
 Chem. Recovery Factor: 1.1159 +/- 0.0649

Peak Match Tolerance: 0.150 MeV

-----  
 PEAK AREA REPORT  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.271	392.83	9.89	0.17	0.00E+000	47.3
U-234	4.722	172.83	14.92	0.17	0.00E+000	4.9
U-235	4.383	11.00	61.72	0.00	0.00E+000	3.0
U-238	4.140	117.00	18.20	0.00	0.00E+000	17.0

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

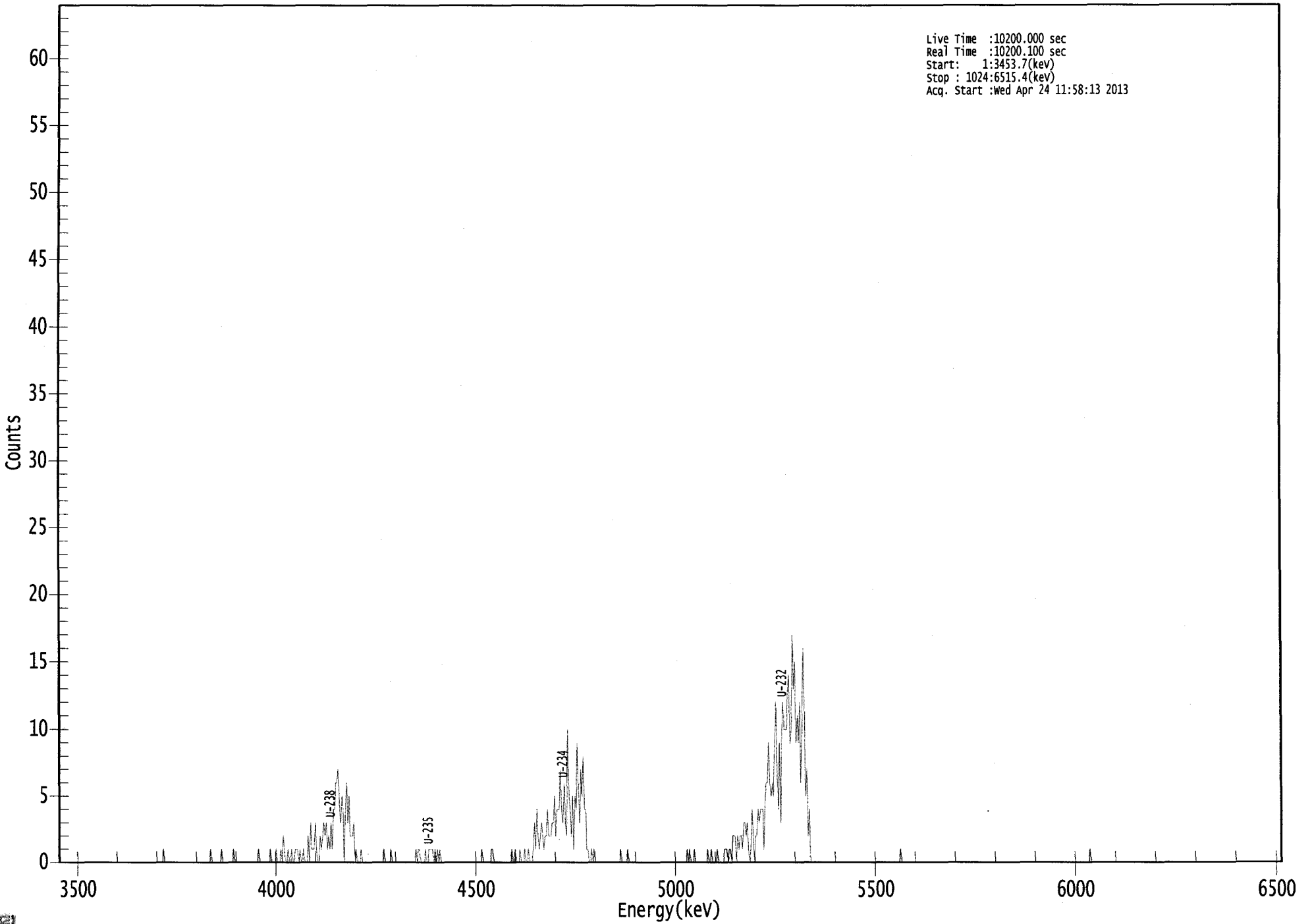
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.993	5302.50*	5.23E+000 +/- 5.68E-001	5.55E-002 +/- 6.04E-003
U-234	0.989	4761.50*	2.30E+000 +/- 4.24E-001	5.55E-002 +/- 6.03E-003
U-235	1.000	4385.50*	1.80E-001 +/- 1.13E-001	9.84E-002 +/- 1.07E-002
U-238	0.986	4184.40*	1.55E+000 +/- 3.28E-001	7.94E-002 +/- 8.63E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

000056319.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6515.4(kev)  
Acq. Start :wed Apr 24 11:58:13 2013



ROI Type: 1

ROI Type: 3

1512

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 07

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	1	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	1	0	0	0	0	0	0	0
137:	0	1	0	0	0	0	0	0
145:	0	0	0	1	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	1	0	0	0	0	0	0	0
177:	0	0	1	0	0	0	0	1
185:	0	0	0	1	0	2	1	0
193:	0	1	0	0	1	0	0	1
201:	1	1	0	1	0	0	1	0
209:	0	0	2	0	3	1	1	1
217:	3	1	0	0	2	1	2	3
225:	2	3	1	2	1	3	1	4
233:	4	6	6	7	4	3	5	4
241:	0	4	6	3	5	2	2	2
249:	3	0	1	0	0	0	1	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	1	0	0	0	0	0	1
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	1	0	1	1
305:	0	0	0	0	1	0	0	1
313:	1	1	1	0	1	0	1	0
321:	1	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	1	0	0	0	0
361:	0	0	0	1	1	0	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 07

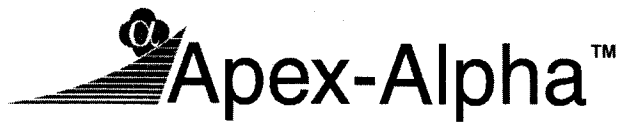
Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	1	0	0	1
385:	0	0	0	1	0	0	0	1
393:	0	0	1	0	0	0	1	3
401:	1	4	2	1	2	3	2	1
409:	2	2	4	2	2	2	3	3
417:	5	2	4	4	4	7	4	3
425:	6	3	2	10	5	4	2	5
433:	1	5	4	9	5	3	7	5
441:	8	4	4	1	1	0	0	1
449:	0	1	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	1
473:	0	0	0	0	0	1	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	1
529:	0	1	0	0	0	1	0	0
537:	0	0	0	0	0	0	0	0
545:	1	0	0	1	0	0	0	0
553:	1	0	0	0	0	0	1	1
561:	1	0	1	1	0	2	2	2
569:	0	2	1	2	2	1	3	3
577:	2	3	1	0	1	4	2	0
585:	2	2	4	3	4	4	4	1
593:	5	6	6	9	6	5	6	5
601:	9	12	7	4	9	3	10	12
609:	10	10	10	13	14	9	10	17
617:	13	15	9	11	9	12	6	10
625:	16	12	5	7	2	4	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	1	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 07

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	1
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KCS  
4/25/13



Sample Description: MW-104 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_047  
 Chamber Serial Number: 02030596A  
 Detector Serial Number: 91086  
 Env. Background: System Bkgd 55216  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:05 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.1565 +/- 0.0096  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Chem. Recovery Factor: 0.8592 +/- 0.0549

Peak Match Tolerance: 0.150 MeV

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 -----  
 PEAK AREA REPORT  
 -----  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.278	307.83	11.17	0.17	0.00E+000	25.4
U-234	4.732	85.66	21.23	0.34	0.00E+000	3.9
U-235	4.380	6.83	76.08	0.17	0.00E+000	2.9
U-238	4.147	66.83	24.01	0.17	0.00E+000	4.0

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
 -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.22E+000 +/- 6.30E-001	7.08E-002 +/- 8.54E-003
U-234	0.994	4761.50*	1.45E+000 +/- 3.55E-001	8.11E-002 +/- 9.77E-003
U-235	1.000	4385.50*	1.43E-001 +/- 1.10E-001	8.73E-002 +/- 1.05E-002
U-238	0.990	4184.40*	1.13E+000 +/- 3.03E-001	7.05E-002 +/- 8.49E-003

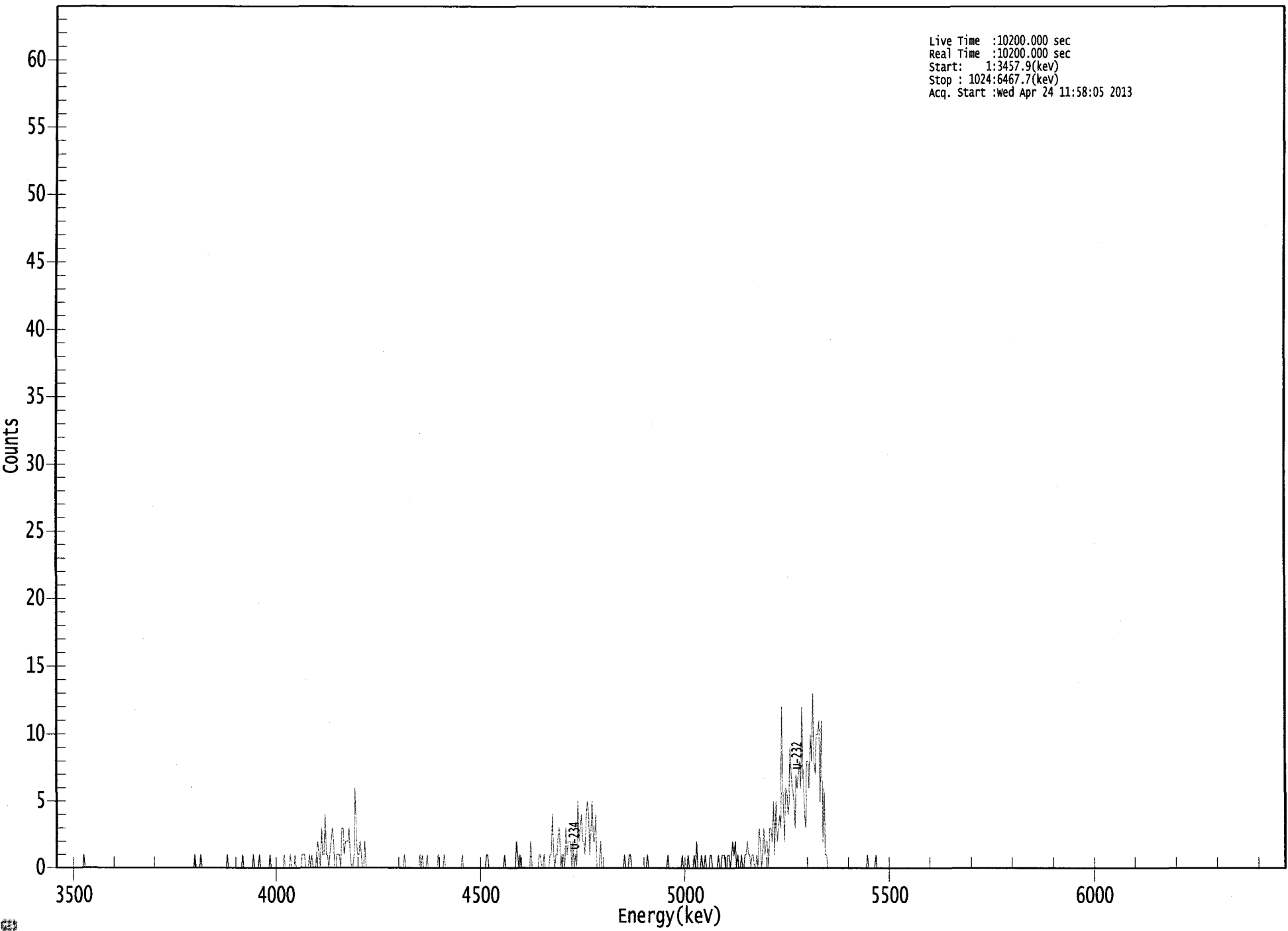
AG  
4/25/13

US EPA ARCHIVE DOCUMENT



0000056327.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3457.9(kev)  
Stop : 1024:6467.7(kev)  
Acq. Start :wed Apr 24 11:58:05 2013



ROI Type: 1

ROI Type: 3

0139

\*\*\*\*\*  
 \*\*\*\*\* S P E C T R A L   D A T A   R E P O R T   \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 08

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	1
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	1	0	0	0
121:	0	1	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	1
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	1	0	0	0
161:	0	0	0	0	0	1	0	0
169:	0	0	1	0	0	0	0	0
177:	0	0	0	1	0	0	0	0
185:	0	0	0	0	0	0	0	1
193:	0	0	0	0	1	0	0	0
201:	1	0	0	0	0	0	1	1
209:	1	0	0	0	1	0	1	0
217:	0	0	1	2	1	0	3	1
225:	1	4	1	1	0	1	2	3
233:	2	0	0	1	1	1	0	3
241:	3	1	2	2	2	3	1	0
249:	0	1	6	2	1	1	2	1
257:	0	0	2	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	1	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	1	0	1	0	0	0	1	0
313:	0	0	0	0	0	0	0	1
321:	0	0	0	0	1	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	1	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	1
361:	1	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 1 0

Sample Title: 08

Channel	1	2	3	4	5	6	7	8	9
377:	0	0	0	0	0	0	0	0	0
385:	2	1	0	1	0	0	0	0	0
393:	0	0	0	0	2	0	0	0	0
401:	0	0	0	1	1	0	0	0	1
409:	0	0	0	0	1	1	4	1	1
417:	0	1	1	3	3	0	1	1	1
425:	0	3	1	2	2	2	0	2	2
433:	0	1	0	5	2	3	4	2	2
441:	2	1	4	5	4	1	3	5	5
449:	2	2	4	0	0	0	2	0	0
457:	0	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0	0
473:	0	0	1	0	0	0	1	1	1
481:	0	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	1	0	0	0
497:	0	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	1	0	0
513:	0	0	0	0	0	0	0	0	0
521:	0	0	1	0	0	0	0	1	1
529:	0	0	0	0	1	0	2	0	0
537:	0	0	1	0	0	1	0	0	0
545:	0	1	1	0	0	0	0	0	0
553:	1	0	0	1	1	1	0	0	0
561:	1	1	0	1	2	1	2	0	0
569:	1	0	0	1	0	0	1	1	1
577:	2	1	1	0	1	1	0	0	0
585:	1	0	3	2	0	1	3	1	1
593:	2	2	0	3	3	2	5	1	1
601:	5	2	3	4	3	12	5	2	2
609:	6	6	4	5	9	7	6	5	5
617:	3	7	6	7	8	6	12	7	7
625:	4	3	8	8	6	10	8	13	13
633:	8	7	10	10	11	5	11	2	2
641:	6	1	1	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0	0
673:	0	0	0	0	1	0	0	0	0
681:	0	0	0	1	0	0	0	0	0
689:	0	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

1015  
4/25/13

# Apex-Alpha™

Sample Description: MW-104 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_048  
 Chamber Serial Number: 02030596B  
 Detector Serial Number: 83111  
 Env. Background: System Bkgd 55217  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 11:58:06 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.1233 +/- 0.0084  
 Counting Efficiency: 0.1680 +/- 0.0030 on 12/16/2012 5:49:20 PM  
 Chem. Recovery Factor: 0.7343 +/- 0.0518

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.280	242.66	12.59	0.34	0.00E+000	14.8
U-234	4.735	66.00	24.31	0.00	0.00E+000	6.6
U-235	4.382	6.00	86.43	0.00	0.00E+000	3.0
U-238	4.152	55.00	26.67	0.00	0.00E+000	3.7

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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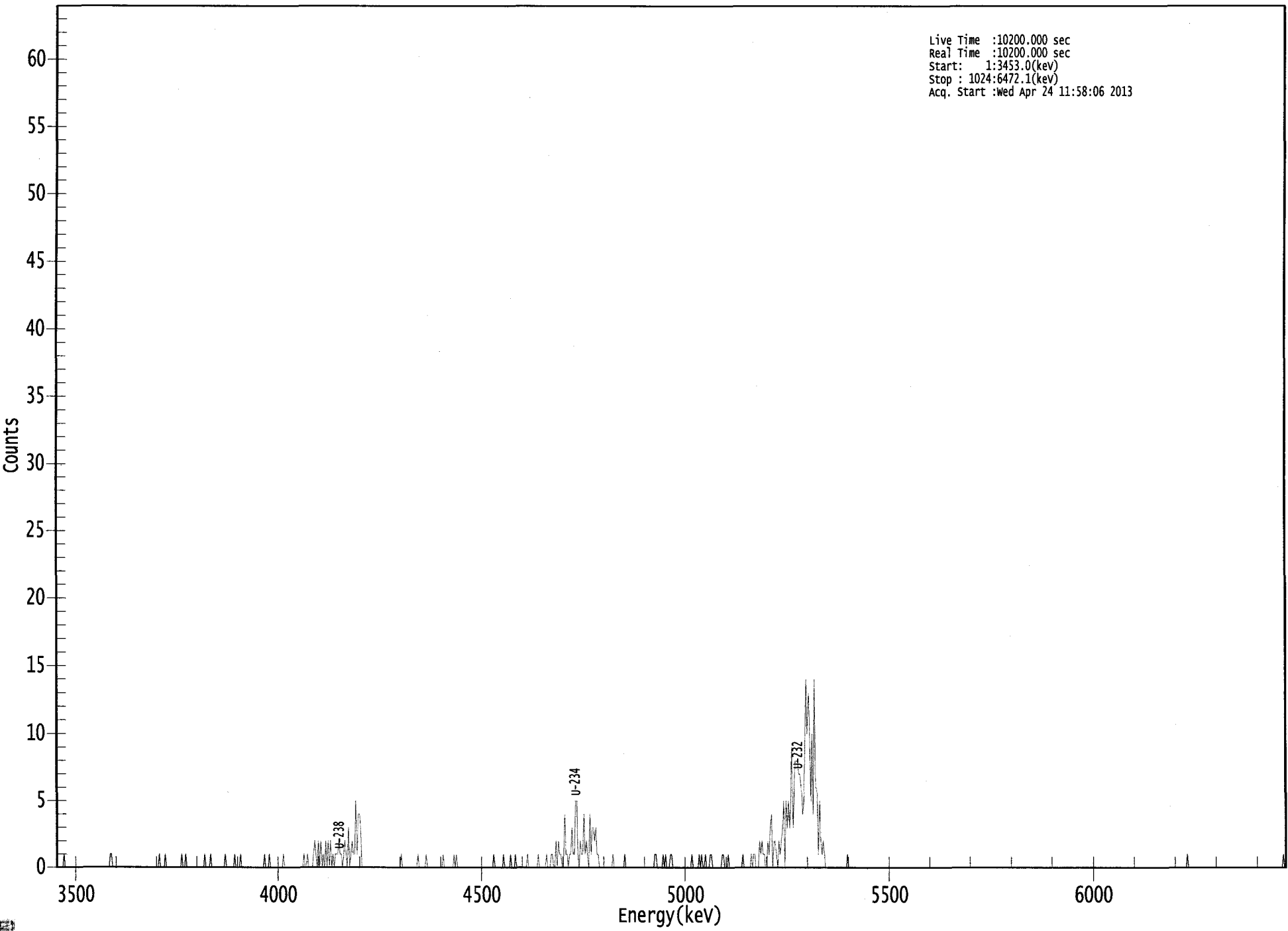
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.23E+000 +/- 6.99E-001	1.03E-001 +/- 1.38E-002
U-234	0.995	4761.50*	1.42E+000 +/- 3.94E-001	1.29E-001 +/- 1.73E-002
U-235	1.000	4385.50*	1.59E-001 +/- 1.39E-001	1.59E-001 +/- 2.13E-002
U-238	0.993	4184.40*	1.18E+000 +/- 3.52E-001	1.29E-001 +/- 1.72E-002

AG  
 4/25/13

US EPA ARCHIVE DOCUMENT

0000056326.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3453.0(kev)  
Stop : 1024:6472.1(kev)  
Acq. Start :wed Apr 24 11:58:06 2013



ROI Type: 1

ROI Type: 3

1110

\*\*\*\*\*  
 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 09

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	1	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	1	1	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	1	0
89:	0	0	0	1	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	1	0	0	1	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	1	0	0	0
129:	0	1	0	0	0	0	0	0
137:	0	0	0	0	0	1	0	0
145:	0	0	0	0	0	1	0	0
153:	0	0	1	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	1	0
177:	0	0	1	0	0	0	0	0
185:	0	0	0	0	0	0	1	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	1
209:	0	0	1	0	0	0	0	1
217:	2	1	0	2	0	2	0	1
225:	0	2	0	2	0	2	0	1
233:	0	1	1	1	2	1	1	0
241:	1	2	1	0	3	0	1	2
249:	1	1	5	1	4	4	3	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	1	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	1	0
305:	0	0	0	0	0	1	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	1	0	0	0	0
329:	0	0	0	0	1	0	1	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	1	0	0

369: 0 0 0 0 0 1 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	1	0	0	0	1
385:	0	0	0	0	0	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	0	1	0	0	0	0	0
409:	0	1	0	0	0	1	1	0
417:	0	2	0	2	1	1	0	0
425:	4	1	1	0	1	1	3	1
433:	1	5	5	1	0	2	1	1
441:	4	1	2	1	0	4	1	3
449:	3	2	3	1	1	0	0	0
457:	0	0	0	0	0	0	0	0
465:	1	0	0	0	0	0	0	0
473:	0	0	1	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	1	1	0	0	0
505:	0	0	1	0	1	0	0	0
513:	1	1	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	1	0	0	0	0	0
537:	1	0	1	0	0	1	0	0
545:	0	1	1	0	0	0	0	0
553:	0	0	0	1	1	0	0	0
561:	1	0	0	0	0	0	0	0
569:	0	0	0	0	1	0	0	0
577:	0	0	0	1	0	1	1	0
585:	0	0	2	1	2	1	1	0
593:	0	2	1	3	4	0	2	2
601:	1	0	2	1	2	3	5	0
609:	5	3	5	3	5	9	3	6
617:	8	8	8	7	7	6	4	5
625:	8	14	10	13	11	5	10	4
633:	14	6	6	1	5	2	1	2
641:	1	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	1	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0



801: 0 0 0 0 0 0 0 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	1	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	1	0	0	0

108  
4/25/13

# Apex-Alpha™

Sample Description: PZ-100-SD TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_033  
 Chamber Serial Number: 04026479A  
 Detector Serial Number: 91132  
 Env. Background: System Bkgd 55203  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:35 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.2124 +/- 0.0115  
 Counting Efficiency: 0.1825 +/- 0.0032 on 12/16/2012 5:49:18 PM  
 Chem. Recovery Factor: 1.1640 +/- 0.0662

Peak Match Tolerance: 0.150 MeV

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 ----- PEAK AREA REPORT -----  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.278	417.66	9.60	0.34	0.00E+000	24.5
U-234	4.723	35.66	33.00	0.34	0.00E+000	3.7
U-235	4.342	0.66	305.43	0.34	0.00E+000	3.0
U-238	4.144	22.00	42.73	0.00	0.00E+000	4.5

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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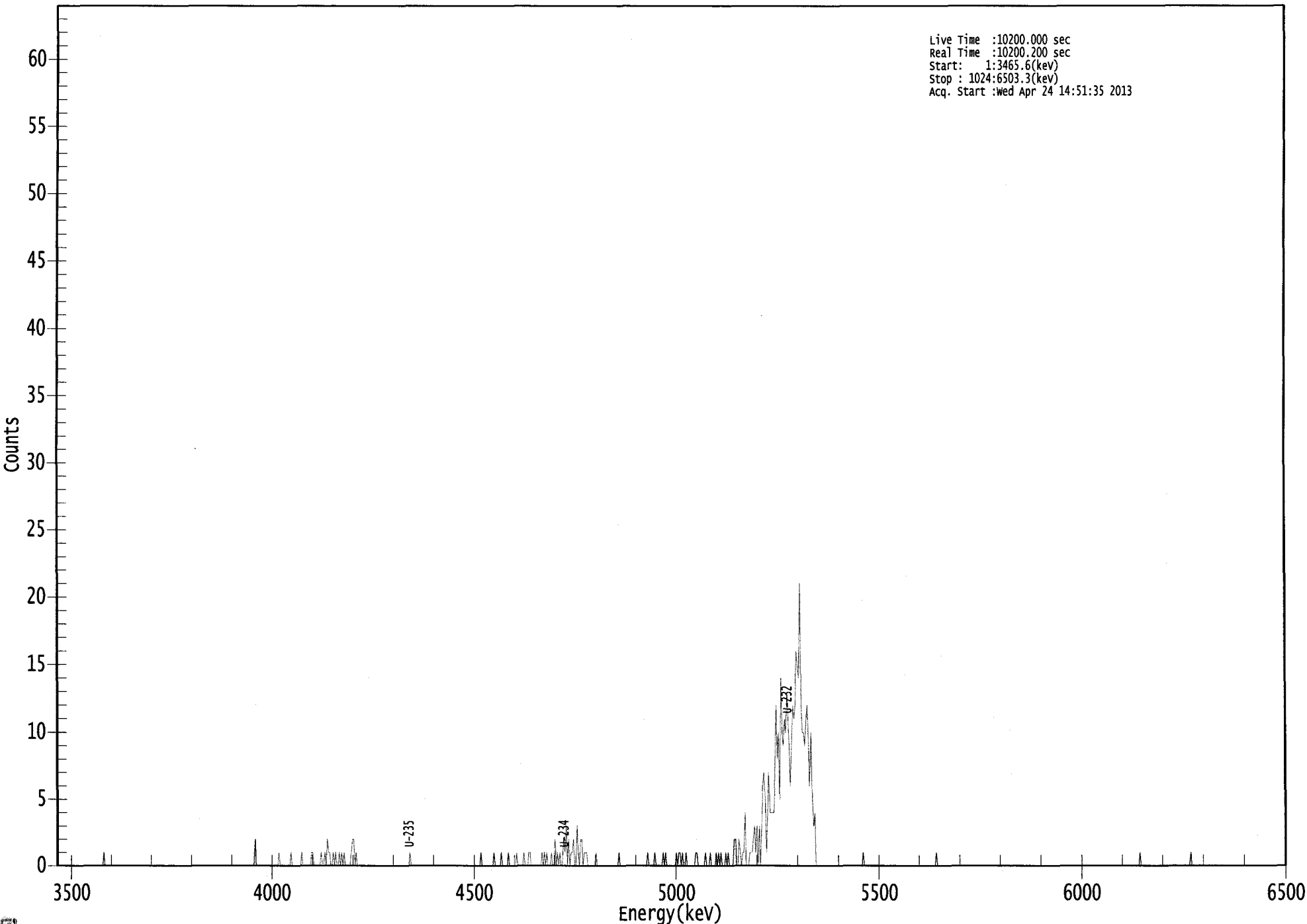
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.996	5302.50*	5.22E+000 +/- 5.54E-001	5.98E-002 +/- 6.34E-003
U-234	0.990	4761.50*	4.46E-001 +/- 1.55E-001	5.98E-002 +/- 6.34E-003
U-235	0.986	4385.50*	1.02E-002 +/- 3.11E-002	7.37E-002 +/- 7.82E-003
U-238	0.989	4184.40*	2.74E-001 +/- 1.21E-001	7.46E-002 +/- 7.91E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

000056331.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3465.6(kev)  
Stop : 1024:6503.3(kev)  
Acq. Start :wed Apr 24 14:51:35 2013



ROI Type: 1

ROI Type: 3

0149

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 10

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	1
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	2	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	1	0	0	0	0	0
193:	0	0	0	0	1	0	0	0
201:	0	0	0	0	0	1	0	0
209:	0	0	0	0	0	1	1	0
217:	0	0	0	0	0	1	0	0
225:	1	0	2	1	1	0	0	1
233:	0	1	0	0	1	0	1	0
241:	1	0	0	0	0	0	1	2
249:	2	0	1	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	1
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	1	0	0	0	0	0
361:	0	0	0	0	0	1	0	0

369: 0 0 0 1 0 0 0 0

Sample Title: 10

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	0	0	0
385:	1	0	0	0	0	0	1	0
393:	0	0	1	1	0	0	0	0
401:	0	0	0	0	0	1	0	1
409:	0	1	0	0	0	1	0	0
417:	2	0	1	0	1	0	0	2
425:	1	3	0	2	0	1	1	2
433:	0	0	3	1	0	2	2	0
441:	1	1	1	0	0	0	0	0
449:	0	0	1	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	1	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	1	0	0
497:	0	0	0	1	0	0	0	0
505:	0	0	1	0	1	0	0	0
513:	0	0	0	0	0	1	0	1
521:	1	0	1	0	0	1	0	0
529:	0	0	0	0	0	1	1	0
537:	0	0	0	0	0	1	0	0
545:	0	1	0	0	0	0	1	0
553:	1	0	1	0	0	0	1	0
561:	1	0	0	0	0	2	2	0
569:	0	2	1	0	1	1	4	0
577:	0	0	1	1	1	2	3	1
585:	3	0	3	0	3	6	7	5
593:	1	4	7	4	4	4	4	6
601:	12	8	10	5	14	10	9	11
609:	10	13	11	9	6	9	12	11
617:	12	16	15	14	21	12	10	10
625:	9	11	12	9	6	10	5	3
633:	4	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	1	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	1	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0 0

Sample Title: 10

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	1	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	1	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

IGS  
4/25/13

# Apex-Alpha™

Sample Description: PZ-100-SD DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_034  
 Chamber Serial Number: 04026479B  
 Detector Serial Number: 91136  
 Env. Background: System Bkgd 55204  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:37 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.2351 +/- 0.0122  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Chem. Recovery Factor: 1.2670 +/- 0.0694

Peak Match Tolerance: 0.150 MeV

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 -----  
 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.279	462.00	9.13	0.00	0.00E+000	59.1
U-234	4.727	31.83	34.85	0.17	0.00E+000	3.0
U-235	4.390	0.83	239.53	0.17	0.00E+000	3.0
U-238	4.137	31.83	34.85	0.17	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
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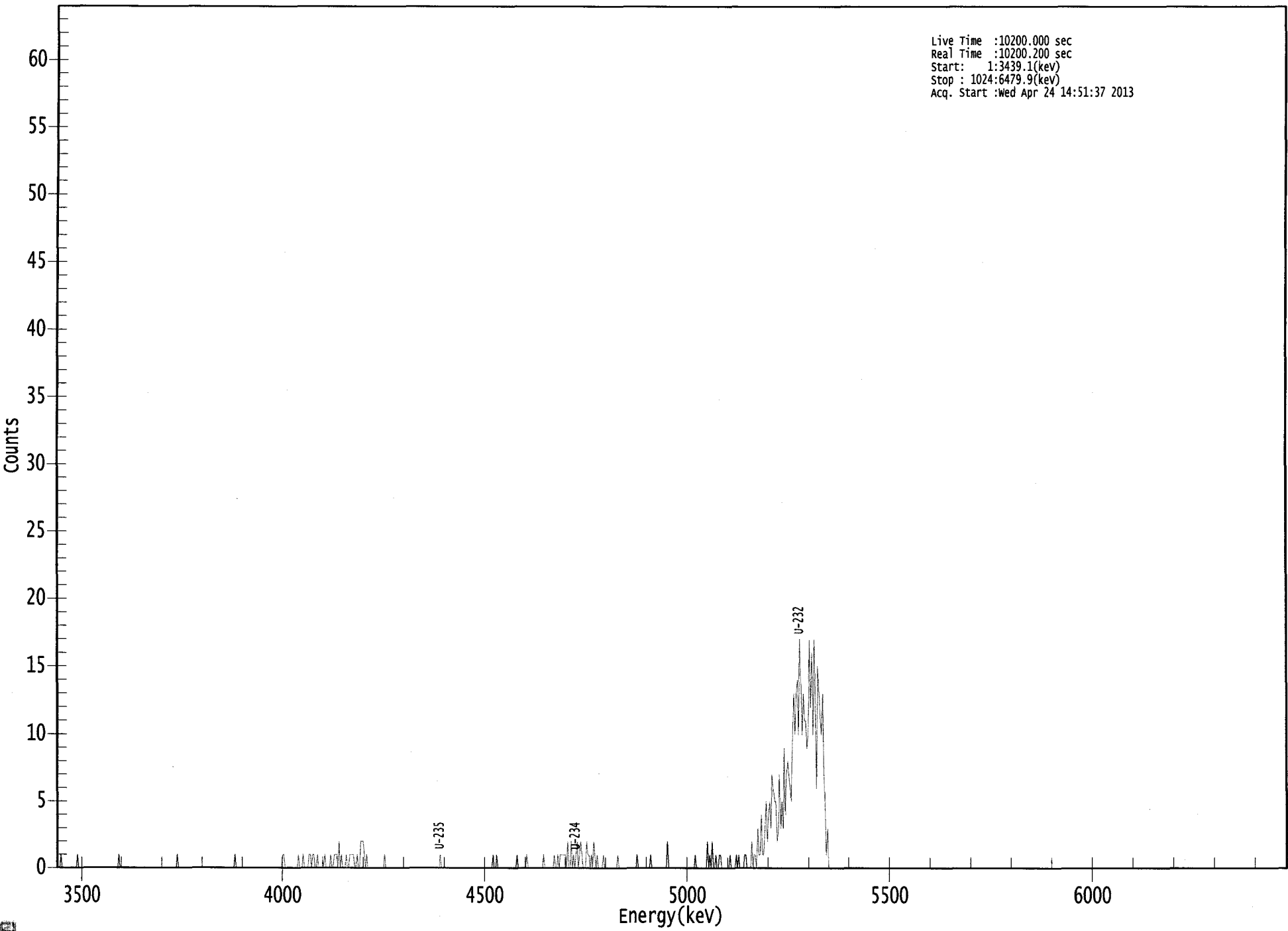
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.22E+000 +/- 5.32E-001	6.77E-002 +/- 6.90E-003
U-234	0.992	4761.50*	3.59E-001 +/- 1.31E-001	4.71E-002 +/- 4.80E-003
U-235	1.000	4385.50*	1.16E-002 +/- 2.77E-002	5.81E-002 +/- 5.92E-003
U-238	0.984	4184.40*	3.58E-001 +/- 1.30E-001	4.69E-002 +/- 4.78E-003

AG  
 4/25/13

US EPA ARCHIVE DOCUMENT

0000056330.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3439.1(kev)  
Stop : 1024:6479.9(kev)  
Acq. Start :Wed Apr 24 14:51:37 2013



ROI Type: 1

ROI Type: 3

1510



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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 11

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	1	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	1	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	1	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	1	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	1	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	1	1	0
193:	0	0	0	0	0	0	0	0
201:	0	0	1	0	0	0	1	0
209:	0	0	0	1	1	0	1	1
217:	0	0	1	0	0	0	0	0
225:	1	0	0	0	0	1	0	0
233:	1	1	1	0	2	0	1	0
241:	0	0	1	0	0	1	1	1
249:	1	0	0	1	0	0	2	2
257:	2	1	0	1	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	1	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	1	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	1	0	0	1

369: 0 0 0 0 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	1	0	0	0	0	0	0	0
393:	1	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	1	0
409:	0	0	0	0	0	0	0	1
417:	0	0	1	0	1	1	1	1
425:	1	0	2	0	0	2	0	1
433:	0	1	2	0	1	2	1	0
441:	0	0	2	1	1	0	1	0
449:	2	1	0	1	0	0	0	0
457:	1	0	0	0	0	0	0	0
465:	0	0	0	0	1	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	1	0	0	0
489:	0	0	0	0	0	0	0	1
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	2	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	1	0	0	0
537:	0	0	0	0	0	0	2	0
545:	1	0	2	0	0	1	0	0
553:	1	1	0	0	0	0	0	0
561:	0	1	0	0	0	0	1	0
569:	1	0	0	0	0	1	1	0
577:	0	0	0	2	0	1	1	0
585:	3	1	1	4	1	1	3	5
593:	2	4	5	3	7	6	5	5
601:	2	3	7	3	5	3	9	4
609:	7	8	7	6	5	10	13	10
617:	13	14	10	17	14	10	13	11
625:	11	9	10	17	12	16	10	17
633:	12	6	15	13	11	10	13	8
641:	4	1	3	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

163  
4/25/13

# Apex-Alpha™

Sample Description: I-67 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 55205  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:38 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.608 mL  
 Effective Efficiency: 0.1808 +/- 0.0105  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 0.9903 +/- 0.0599

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.305	355.00	10.42	0.00	0.00E+000	33.2
U-234	4.759	58.49	25.76	0.51	0.00E+000	4.4
U-235	4.365	2.83	120.53	0.17	0.00E+000	2.9
U-238	4.170	40.83	30.75	0.17	0.00E+000	3.4

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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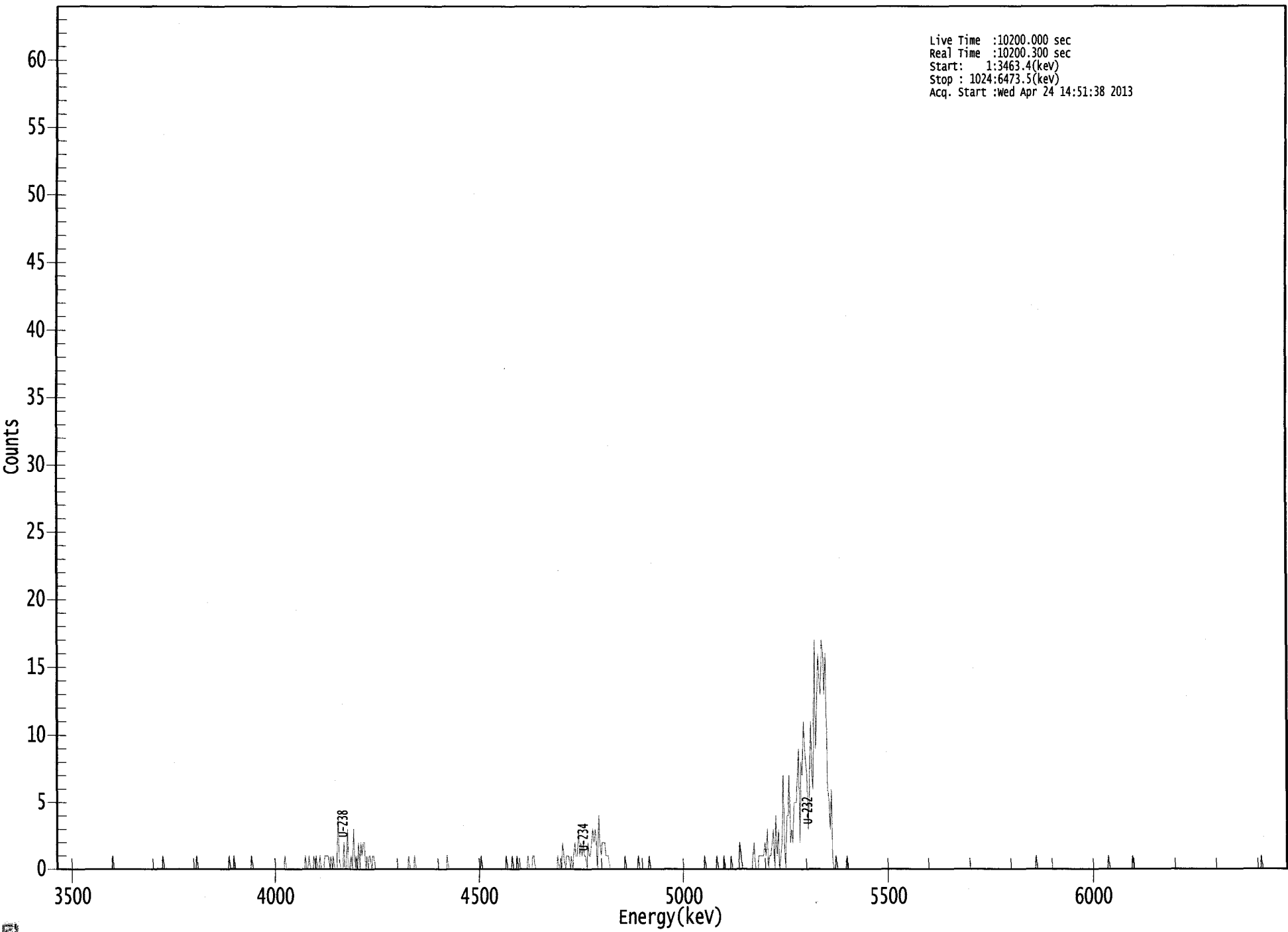
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	1.000	5302.50*	5.22E+000 +/- 5.92E-001	8.81E-002 +/- 1.00E-002
U-234	1.000	4761.50*	8.59E-001 +/- 2.42E-001	7.71E-002 +/- 8.75E-003
U-235	0.997	4385.50*	5.13E-002 +/- 6.21E-002	7.56E-002 +/- 8.58E-003
U-238	0.999	4184.40*	5.97E-001 +/- 1.96E-001	6.10E-002 +/- 6.93E-003

AG  
 4/25/13

US EPA ARCHIVE DOCUMENT

0000056336.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :wed Apr 24 14:51:38 2013



ROI Type: 1

ROI Type: 3

0156

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 \*\*\*\*\* S P E C T R A L   D A T A   R E P O R T   \*\*\*\*\*  
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Sample Title: 12

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	1
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	1	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	1	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	1	0	0	0	1	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	1	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	1
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	1	0	0	1	0	0	0	1
217:	0	1	0	0	1	0	0	0
225:	1	1	1	1	0	1	0	1
233:	0	0	0	4	1	0	0	0
241:	2	0	0	3	0	0	1	0
249:	3	0	1	0	2	0	2	1
257:	2	2	0	1	0	1	1	0
265:	1	1	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	1	0
297:	0	0	0	1	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	1	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	1	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 1

Sample Title: 12

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	1	0	0	0
385:	1	0	0	0	0	0	0	0
393:	0	1	0	0	0	1	1	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	1	0	0	0	2	1
425:	0	1	1	1	0	1	0	1
433:	2	1	1	3	1	2	1	2
441:	1	1	0	2	1	1	2	3
449:	2	3	2	0	4	2	1	2
457:	2	2	1	1	1	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	1	0	0	0	0	0
481:	0	0	0	0	0	1	0	0
489:	0	0	0	0	0	0	1	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	1	0	0	0
545:	0	0	0	0	0	0	1	0
553:	0	0	0	0	1	0	0	0
561:	0	0	1	0	0	0	0	0
569:	0	2	1	0	0	0	0	0
577:	0	0	0	0	1	2	0	0
585:	0	1	1	1	1	1	2	1
593:	3	0	1	1	2	3	0	4
601:	1	3	0	1	2	7	2	0
609:	4	4	7	2	3	2	5	5
617:	5	7	9	2	8	7	11	9
625:	8	7	3	7	11	7	6	17
633:	9	12	16	14	13	17	16	13
641:	16	11	6	5	3	6	1	0
649:	0	1	0	0	0	0	0	0
657:	0	0	1	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0 0

Sample Title: 12

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	1
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	1	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	1
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	1	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



UCB  
4/2-113

# Apex-Alpha™

Sample Description: I-67 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_037  
 Chamber Serial Number: 04026478A  
 Detector Serial Number: 91133  
 Env. Background: System Bkgd 55207  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:40 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.608 mL  
 Effective Efficiency: 0.1925 +/- 0.0109  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Chem. Recovery Factor: 1.0799 +/- 0.0641

Peak Match Tolerance: 0.150 MeV

-----  
 PEAK AREA REPORT  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.265	377.83	10.09	0.17	0.00E+000	15.1
U-234	4.708	37.00	32.65	0.00	0.00E+000	2.9
U-235	4.384	9.66	64.35	0.34	0.00E+000	8.8
U-238	4.140	31.66	35.05	0.34	0.00E+000	3.4

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

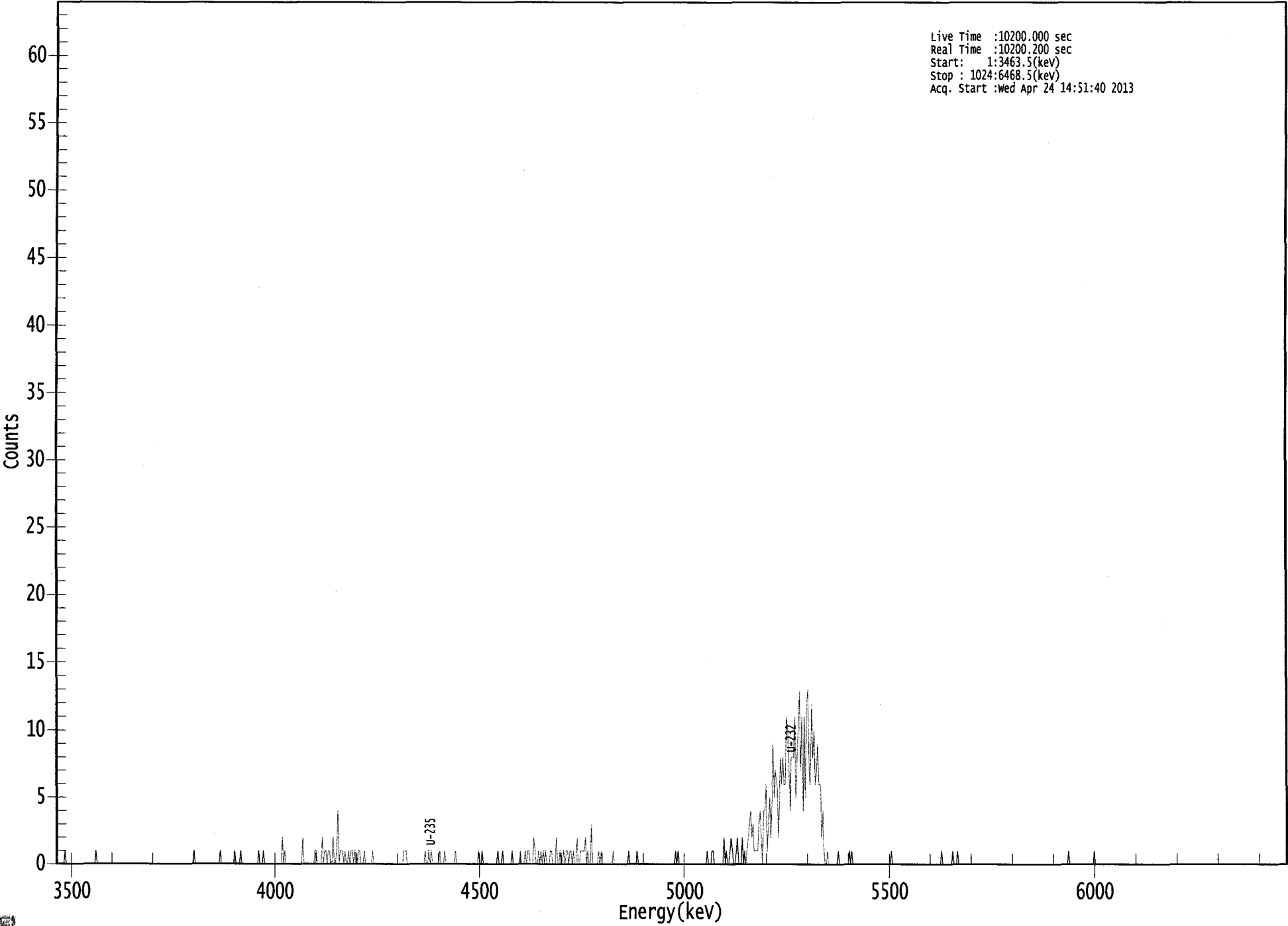
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.990	5302.50*	5.21E+000 +/- 5.76E-001	5.76E-002 +/- 6.36E-003
U-234	0.980	4761.50*	5.10E-001 +/- 1.76E-001	8.27E-002 +/- 9.14E-003
U-235	1.000	4385.50*	1.64E-001 +/- 1.07E-001	8.13E-002 +/- 8.99E-003
U-238	0.986	4184.40*	4.35E-001 +/- 1.60E-001	6.56E-002 +/- 7.25E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

000056329.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3463.5(kev)  
Stop : 1024:6468.5(kev)  
Acq. Start :Wed Apr 24 14:51:40 2013



ROI Type: 1

ROI Type: 3

1910

\*\*\*\*\*  
 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 13

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	1
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	1	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	1	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	1	0	0	0	0	0	0
145:	0	0	0	0	0	1	0	0
153:	0	0	1	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	1	0	0	0	1	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	2	0	1
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	2	0
209:	0	0	0	0	0	0	0	0
217:	1	1	0	0	0	0	2	0
225:	1	1	0	1	1	0	0	2
233:	0	0	1	4	0	1	1	1
241:	0	1	0	0	1	0	1	1
249:	0	1	0	0	1	1	0	0
257:	0	1	0	0	0	0	0	0
265:	1	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	1	1	1	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	1	0	0	1
313:	0	1	0	0	0	0	0	0
321:	1	0	0	0	1	0	0	0
329:	0	0	0	0	0	1	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	1	0	0	1	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 1 0 0 0 1 0 0 0

Sample Title: 13

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	1	0	0	0
385:	0	0	0	1	0	0	0	1
393:	0	1	1	0	0	0	2	1
401:	0	0	1	0	1	0	1	0
409:	1	0	0	0	1	1	0	0
417:	0	2	0	0	1	0	0	1
425:	0	1	1	0	1	1	0	1
433:	0	0	2	0	0	1	1	1
441:	1	2	0	1	0	0	3	0
449:	0	0	0	0	1	0	1	0
457:	0	0	0	0	0	0	0	0
465:	1	0	0	0	0	0	0	0
473:	0	0	0	0	0	1	0	0
481:	0	0	0	0	1	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	1	0	1	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	1	0
545:	0	0	1	1	0	0	0	0
553:	0	0	0	0	2	0	1	0
561:	0	1	2	1	0	0	1	2
569:	0	0	0	2	0	1	0	1
577:	2	3	4	2	3	1	1	1
585:	1	3	4	2	0	4	4	6
593:	1	3	5	2	5	9	5	7
601:	6	2	5	8	6	8	6	6
609:	11	10	8	4	8	8	8	11
617:	5	8	10	13	7	11	4	11
625:	5	12	13	7	6	12	8	10
633:	6	7	9	6	6	2	4	1
641:	0	0	1	0	0	0	0	0
649:	0	0	0	1	0	0	0	0
657:	0	0	0	0	1	0	1	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	1
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	1	0	0	0	0	0	0
745:	0	0	1	0	0	0	1	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 13

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	1	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	1
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

103  
4/25/13

# Apex-Alpha™

Sample Description: PZ-203-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 55210  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:42 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.608 mL  
 Effective Efficiency: 0.2404 +/- 0.0124  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 1.2652 +/- 0.0688

Peak Match Tolerance: 0.150 MeV

-----  
 PEAK AREA REPORT  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.280	472.00	9.03	0.00	0.00E+000	36.0
U-234	4.733	298.00	11.37	0.00	0.00E+000	17.4
U-235	4.407	9.83	63.14	0.17	0.00E+000	3.0
U-238	4.156	43.00	30.24	0.00	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

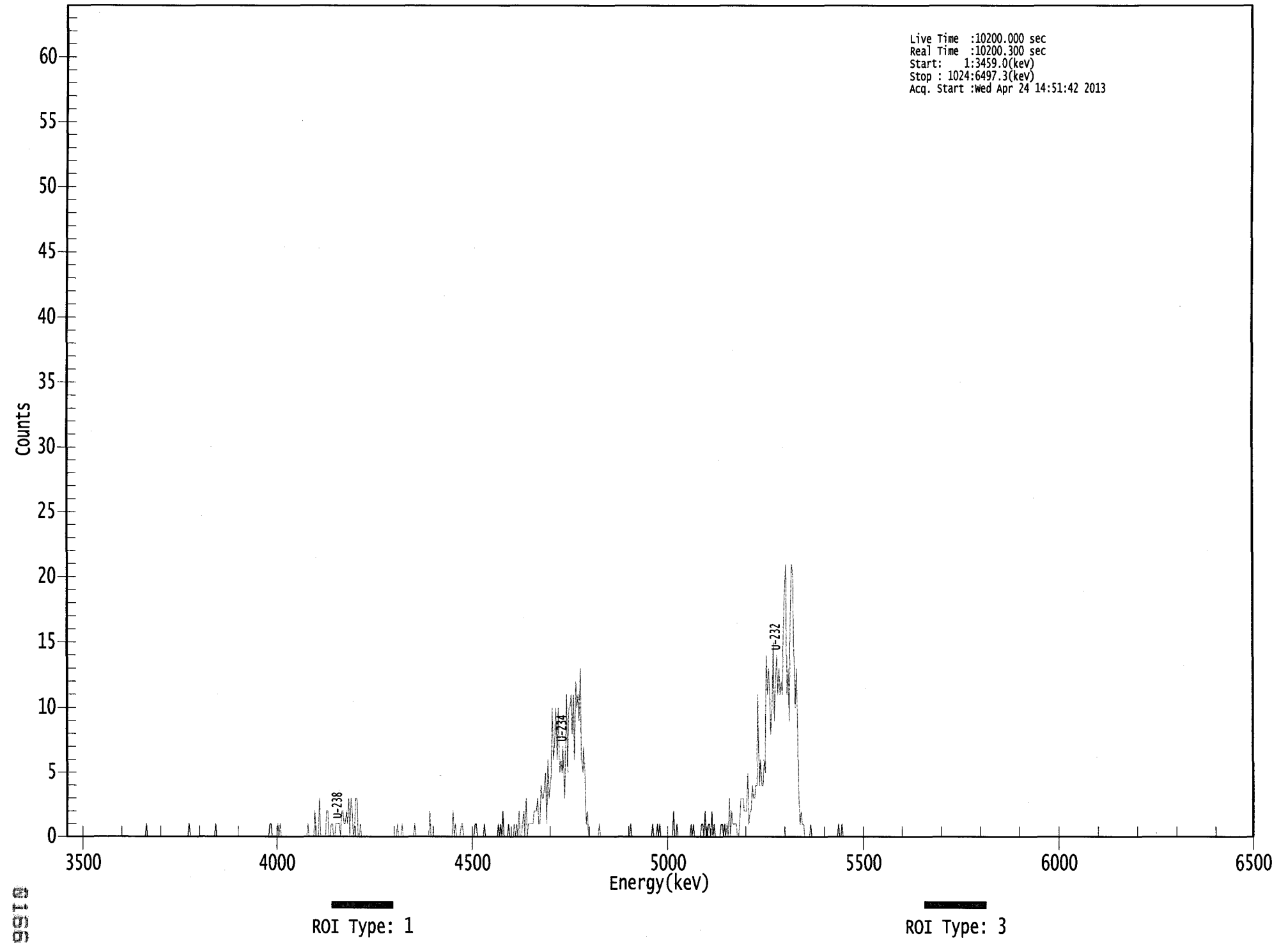
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.22E+000 +/- 5.27E-001	6.63E-002 +/- 6.69E-003
U-234	0.994	4761.50*	3.29E+000 +/- 5.00E-001	6.62E-002 +/- 6.69E-003
U-235	0.997	4385.50*	1.34E-001 +/- 8.56E-002	5.69E-002 +/- 5.74E-003
U-238	0.994	4184.40*	4.73E-001 +/- 1.51E-001	6.59E-002 +/- 6.66E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

0000056332.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Wed Apr 24 14:51:42 2013



\*\*\*\*\*  
 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 14

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	1	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	1	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	1	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	1	1	0	0	0	0	0	1
185:	0	1	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	1	0	0	0	0	0	2
217:	0	0	0	3	0	0	0	0
225:	0	2	2	0	0	1	1	0
233:	0	1	1	1	1	0	2	2
241:	1	1	2	1	3	0	3	2
249:	0	1	3	3	0	0	1	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	1	0
289:	0	0	1	0	0	0	0	0
297:	0	0	0	0	0	1	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	2	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	2	0
337:	1	0	0	0	0	1	1	0
345:	0	0	0	0	0	0	0	0
353:	0	1	1	0	0	0	0	0
361:	0	1	0	0	0	0	0	0



369: 0 0 0 0 0 1 0 1

Sample Title: 14

Channel	1	2	3	4	5	6	7	8
377:	0	2	0	0	0	0	1	0
385:	0	0	0	1	0	1	0	2
393:	0	0	1	2	0	3	0	1
401:	1	1	1	1	2	2	2	3
409:	1	1	4	3	3	4	5	1
417:	6	3	4	5	10	6	7	10
425:	6	10	5	6	5	7	3	6
433:	11	5	10	10	11	8	11	6
441:	12	10	11	9	13	6	5	7
449:	4	1	2	0	0	0	0	0
457:	0	0	0	0	1	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	1
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	1	0	0	0	1	0
513:	1	0	0	0	0	0	0	0
521:	0	0	0	0	2	0	0	1
529:	0	0	0	0	0	0	0	0
537:	0	0	0	1	0	1	0	0
545:	0	0	0	0	1	1	0	2
553:	0	0	1	1	0	2	0	1
561:	0	0	0	0	0	1	1	0
569:	1	0	1	0	3	0	2	1
577:	1	1	1	0	0	1	3	3
585:	3	2	2	2	5	1	2	2
593:	4	3	3	4	4	11	4	6
601:	4	4	6	5	14	11	13	11
609:	8	10	15	9	12	14	11	13
617:	11	12	11	16	19	21	11	13
625:	9	17	21	20	15	10	13	9
633:	3	1	2	1	1	0	0	0
641:	0	0	1	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	1	0	0	1	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0 0

Sample Title: 14

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

105  
4/12/13

# Apex-Alpha™

Sample Description: PZ-203-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_041  
 Chamber Serial Number: 05026930A  
 Detector Serial Number: 91087  
 Env. Background: System Bkgd 55211  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:43 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.2002 +/- 0.0111  
 Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM  
 Chem. Recovery Factor: 1.0119 +/- 0.0587

Peak Match Tolerance: 0.150 MeV

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 ----- PEAK AREA REPORT -----  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.269	393.66	9.88	0.34	0.00E+000	26.1
U-234	4.725	238.15	12.73	0.85	0.00E+000	17.0
U-235	4.417	7.81	76.13	1.19	0.00E+000	3.0
U-238	4.141	32.28	36.16	2.72	0.00E+000	6.0

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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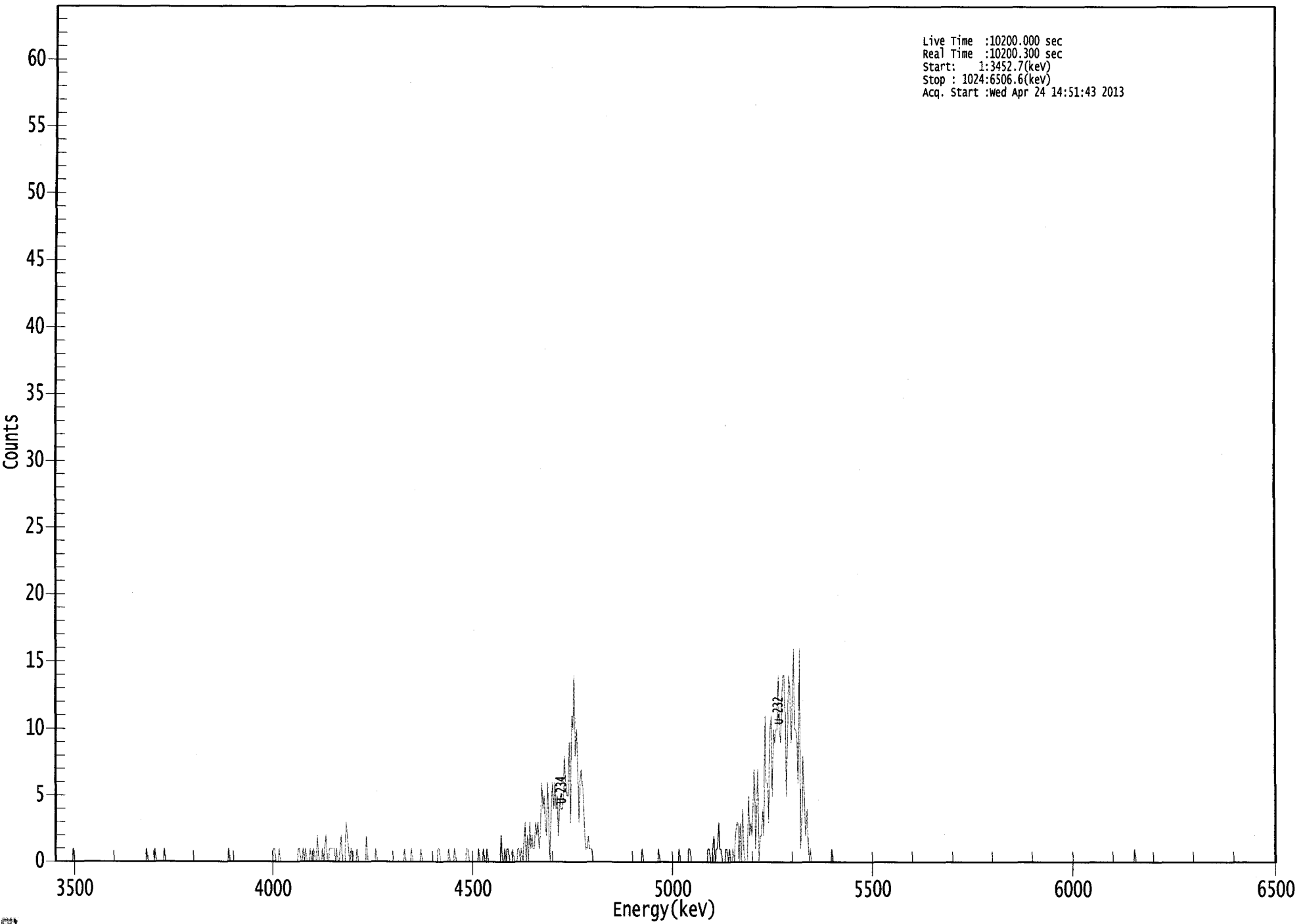
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.992	5302.50*	5.22E+000 +/- 5.67E-001	6.34E-002 +/- 6.89E-003
U-234	0.990	4761.50*	3.16E+000 +/- 5.28E-001	7.94E-002 +/- 8.63E-003
U-235	0.993	4385.50*	1.28E-001 +/- 9.83E-002	1.08E-001 +/- 1.17E-002
U-238	0.987	4184.40*	4.26E-001 +/- 1.61E-001	1.13E-001 +/- 1.23E-002

AG  
 4/25/13

US EPA ARCHIVE DOCUMENT

000056335.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3452.7(kev)  
Stop : 1024:6506.6(kev)  
Acq. Start :Wed Apr 24 14:51:43 2013



ROI Type: 1

ROI Type: 3

0171

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 15

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	1
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	1	0	0
81:	0	0	0	0	1	0	0	0
89:	0	0	0	0	1	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	1	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	1	1	0	0	0	1	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	1	1	0
209:	0	1	0	1	0	0	0	1
217:	0	0	1	0	0	2	0	0
225:	0	1	0	1	2	0	0	1
233:	1	1	1	1	0	1	0	0
241:	1	2	0	0	0	3	2	1
249:	0	1	0	0	0	0	1	0
257:	0	0	0	0	0	0	2	0
265:	0	0	0	0	0	0	1	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	1	0
297:	0	0	0	0	1	0	0	0
305:	0	0	0	0	1	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	1	1	0	0	0	0
329:	0	0	0	1	0	0	0	0
337:	1	0	0	0	0	0	0	0
345:	0	0	1	1	0	0	0	0
353:	0	0	0	0	1	0	0	0
361:	1	0	0	1	0	0	0	0

369: 0 0 0 0 0 0 0 0 2

Sample Title: 15

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	0	1	1	0	0
385:	0	1	0	0	0	1	1	0
393:	1	0	1	3	0	2	0	3
401:	1	2	1	1	3	2	3	1
409:	2	6	4	5	3	2	6	3
417:	0	4	6	4	6	4	5	2
425:	5	4	4	5	8	6	5	5
433:	9	3	11	10	14	8	10	8
441:	3	6	7	6	4	2	1	1
449:	2	1	1	1	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	1	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	1	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	1	0	0	0
529:	0	0	0	0	1	1	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	1	1	0	0
553:	1	2	0	1	1	3	1	1
561:	0	0	0	1	1	0	1	0
569:	0	1	0	2	3	3	0	3
577:	0	4	1	0	0	0	5	2
585:	3	2	5	7	1	4	7	0
593:	2	2	4	2	11	6	6	3
601:	10	11	5	10	9	10	10	14
609:	10	9	12	14	14	11	5	10
617:	14	13	9	12	16	10	10	9
625:	6	16	1	4	8	4	2	4
633:	2	0	1	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	1	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 15

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	1	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

LCB  
4/24/13

# Apex-Alpha™

Sample Description: PZ-100-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 16  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_042  
 Chamber Serial Number: 05026930B  
 Detector Serial Number: 84185  
 Env. Background: System Bkgd 55212  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:45 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.605 mL  
 Effective Efficiency: 0.2135 +/- 0.0116  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Chem. Recovery Factor: 1.1565 +/- 0.0658

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.277	417.15	9.61	0.85	0.00E+000	45.4
U-234	4.729	458.66	9.16	0.34	0.00E+000	28.0
U-235	4.398	20.83	43.15	0.17	0.00E+000	3.7
U-238	4.157	185.66	14.40	0.34	0.00E+000	13.7

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.995	5302.50*	5.19E+000 +/- 5.51E-001	7.45E-002 +/- 7.91E-003
U-234	0.992	4761.50*	5.70E+000 +/- 7.99E-001	5.95E-002 +/- 6.31E-003
U-235	0.999	4385.50*	3.20E-001 +/- 1.42E-001	6.40E-002 +/- 6.79E-003
U-238	0.995	4184.40*	2.30E+000 +/- 4.11E-001	5.92E-002 +/- 6.28E-003

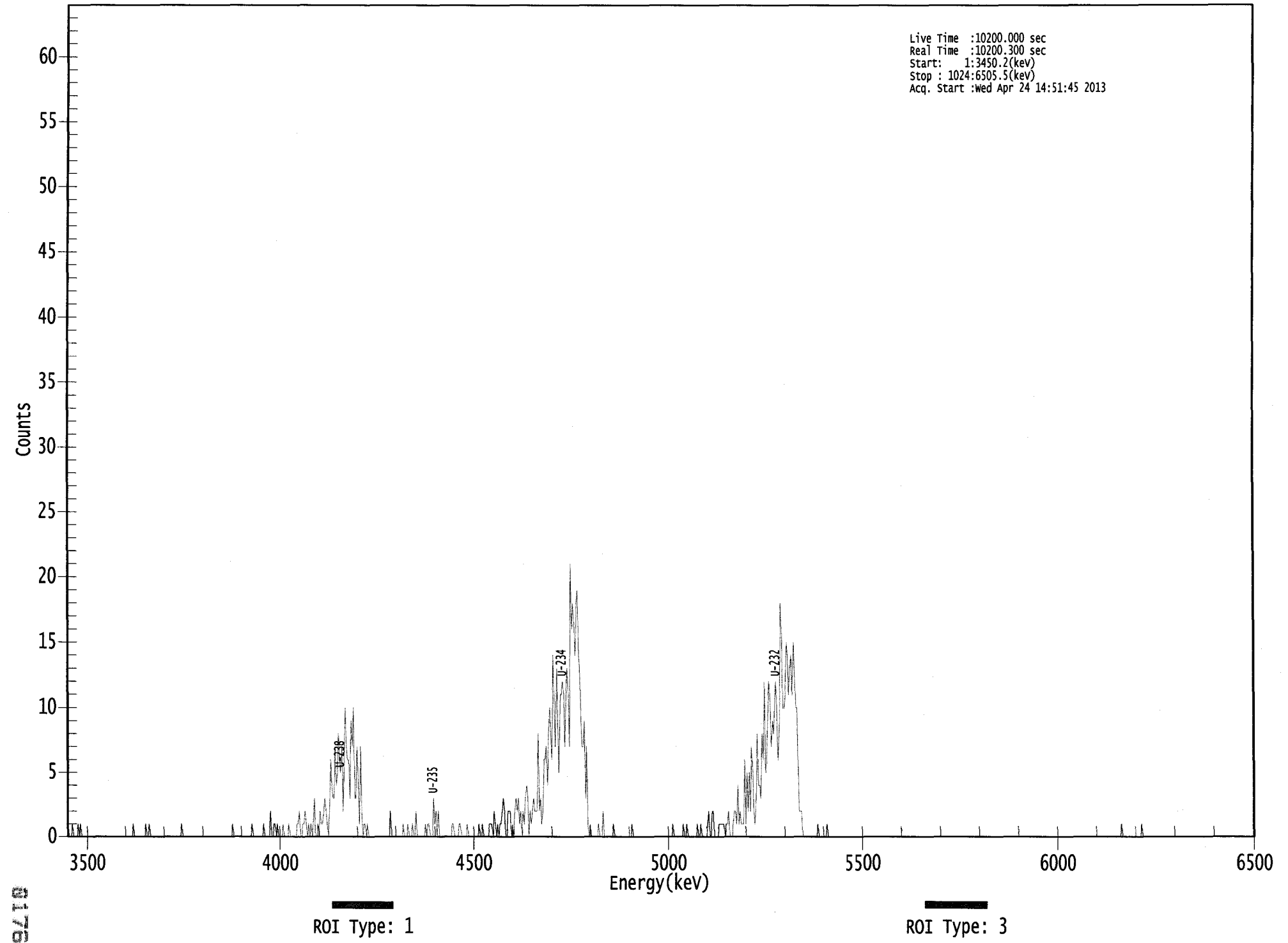
AG  
4/25/13

US EPA ARCHIVE DOCUMENT



0000056334.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3450.2(kev)  
Stop : 1024:6505.5(kev)  
Acq. Start :wed Apr 24 14:51:45 2013



0178

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 16

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	1	0	0	0	1	0	0	0
1:	1	0	0	0	1	0	0	0
9:	0	1	0	1	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	1	0	0	0	0	0	0
65:	0	0	0	0	1	0	0	1
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	1	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	1
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	1	0	0	0	0	0	0	0
169:	0	0	1	0	0	0	0	0
177:	2	0	0	1	1	0	1	0
185:	0	0	0	1	0	0	0	0
193:	1	0	0	0	0	0	0	1
201:	1	2	0	0	1	1	2	1
209:	0	1	0	1	0	1	3	0
217:	0	1	0	2	1	1	2	3
225:	2	1	0	2	6	4	3	3
233:	7	4	5	8	6	5	7	2
241:	6	10	7	6	6	3	9	7
249:	10	3	3	7	4	1	7	2
257:	0	1	1	0	1	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	2	0	0	0	0	0	0	0
289:	0	0	0	1	0	0	0	1
297:	0	0	0	1	0	0	2	0
305:	0	0	0	0	0	0	1	0
313:	1	1	0	0	0	3	1	2
321:	0	2	0	0	0	0	0	0
329:	0	0	0	0	0	1	1	0
337:	0	0	0	1	1	0	0	0
345:	0	0	1	0	0	0	0	0
353:	0	0	0	0	1	0	0	1
361:	0	0	0	0	0	1	1	1

369: 0 2 1 0 1 0 1 1

Sample Title: 16

Channel	1	2	3	4	5	6	7	8
377:	2	3	2	0	0	2	2	2
385:	0	1	0	2	3	2	3	1
393:	2	0	2	1	3	4	3	0
401:	2	1	2	3	2	2	2	8
409:	2	3	1	2	6	6	7	4
417:	8	10	8	6	14	10	7	13
425:	8	5	11	11	12	11	7	11
433:	13	11	7	21	16	18	16	14
441:	18	19	14	13	9	7	7	9
449:	3	7	1	0	1	0	0	0
457:	0	0	0	1	0	0	0	2
465:	0	0	0	0	0	0	0	0
473:	1	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	1	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	1	0	0	0	0
529:	0	0	0	0	1	0	0	1
537:	0	0	0	0	0	0	0	0
545:	1	0	0	1	0	0	0	0
553:	0	1	2	0	0	2	2	0
561:	0	0	0	1	1	1	1	1
569:	0	1	1	2	0	0	0	1
577:	2	2	1	4	1	2	1	1
585:	1	6	1	5	2	5	2	7
593:	5	2	1	3	8	4	4	3
601:	8	6	12	5	6	10	12	10
609:	7	9	8	11	12	8	6	9
617:	18	15	10	10	11	15	14	11
625:	13	14	11	15	13	10	10	5
633:	2	2	2	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	1	0	0	0	0	0	0	0
657:	1	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0 0

Sample Title: 16

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	1	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	1	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

10/13  
412-110

# Apex-Alpha™

Sample Description: PZ-100-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 17  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_044  
 Chamber Serial Number: 04026481B  
 Detector Serial Number: 84168  
 Env. Background: System Bkgd 55214  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:47 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.607 mL  
 Effective Efficiency: 0.2363 +/- 0.0123  
 Counting Efficiency: 0.1902 +/- 0.0033 on 12/16/2012 5:49:26 PM  
 Chem. Recovery Factor: 1.2429 +/- 0.0680

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.283	462.83	9.11	0.17	0.00E+000	21.3
U-234	4.738	534.83	8.48	0.17	0.00E+000	8.5
U-235	4.396	15.00	52.27	0.00	0.00E+000	3.0
U-238	4.151	210.00	13.56	0.00	0.00E+000	11.5

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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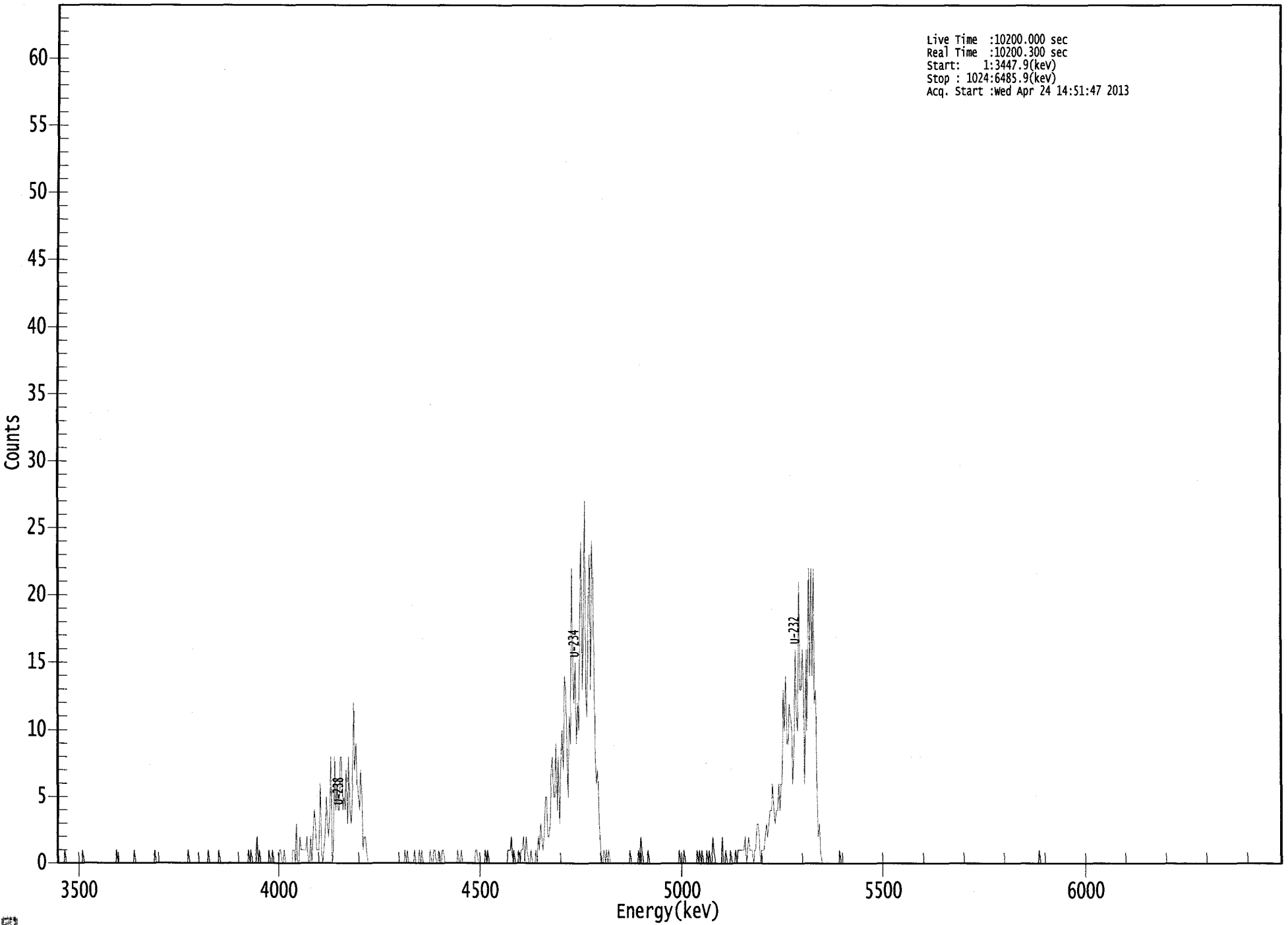
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.20E+000 +/- 5.29E-001	4.69E-002 +/- 4.77E-003
U-234	0.996	4761.50*	6.01E+000 +/- 7.95E-001	4.69E-002 +/- 4.77E-003
U-235	0.999	4385.50*	2.08E-001 +/- 1.11E-001	8.31E-002 +/- 8.45E-003
U-238	0.992	4184.40*	2.35E+000 +/- 3.98E-001	6.71E-002 +/- 6.82E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

000056333.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3447.9(kev)  
Stop : 1024:6485.9(kev)  
Acq. Start :Wed Apr 24 14:51:47 2013



ROI Type: 1

ROI Type: 3

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 17

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	1	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	1	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	1	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	1	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	1	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	1	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	1
129:	0	0	0	0	0	0	0	0
137:	1	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	1	0	1	0	0	0	0
169:	2	0	1	0	0	0	0	0
177:	0	0	1	0	0	1	0	0
185:	0	0	0	1	1	0	0	1
193:	0	0	0	0	0	0	1	1
201:	0	3	0	0	2	1	1	1
209:	1	1	2	0	0	2	0	2
217:	4	3	1	1	1	6	1	0
225:	1	2	5	3	2	4	8	0
233:	1	8	4	6	4	4	8	8
241:	4	5	4	7	3	8	4	3
249:	5	12	7	9	6	5	4	7
257:	5	1	2	2	1	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	1	0	1	0
297:	0	0	0	0	1	0	0	0
305:	1	0	1	0	0	0	0	0
313:	0	1	0	0	1	1	0	0
321:	1	0	0	1	1	0	0	0
329:	0	0	0	0	0	0	0	0
337:	1	0	0	1	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	1	0	0	0	0	0	0	1
361:	0	1	0	0	0	0	0	1

369: 0 0 0 0 0 0 0 0 0

Sample Title: 17

Channel	1	2	3	4	5	6	7	8
377:	0	0	1	1	1	2	0	1
385:	0	0	0	1	0	1	1	2
393:	0	2	1	0	0	1	0	0
401:	0	1	0	2	1	3	2	1
409:	2	5	5	2	2	3	7	8
417:	5	5	9	4	8	3	7	10
425:	7	14	13	9	5	11	9	22
433:	15	12	15	9	12	10	19	24
441:	13	18	27	13	11	19	23	13
449:	24	21	14	8	6	7	3	2
457:	0	0	1	0	1	0	1	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	1	0	0	0	0	0	0	1
489:	0	2	1	0	0	0	0	1
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	1	0	0	0	1	0	0
529:	0	0	0	0	0	0	0	0
537:	1	0	1	0	1	0	0	0
545:	1	0	1	0	0	2	1	0
553:	0	0	0	0	0	2	0	0
561:	1	0	0	0	1	0	0	0
569:	1	0	1	1	1	1	1	1
577:	2	0	1	2	1	1	1	0
585:	1	1	3	3	2	0	1	1
593:	1	2	3	2	3	4	4	6
601:	4	3	4	4	6	4	6	6
609:	13	10	14	9	9	12	11	10
617:	6	9	16	11	10	21	13	13
625:	16	13	6	16	10	22	14	22
633:	14	22	12	13	5	2	3	1
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	1
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0



801: 0 0 0 0 0 0 0 0 0

Sample Title: 17

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	1	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

108  
4/25/13

# Apex-Alpha™

Sample Description: I-66 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 18  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_046  
 Chamber Serial Number: 04026482B  
 Detector Serial Number: 58762  
 Env. Background: System Bkgd 55215  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:49 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.606 mL  
 Effective Efficiency: 0.1993 +/- 0.0111  
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM  
 Chem. Recovery Factor: 1.1138 +/- 0.0650

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.288	389.83	9.93	0.17	0.00E+000	28.7
U-234	4.730	56.83	26.05	0.17	0.00E+000	4.5
U-235	4.393	16.00	50.51	0.00	0.00E+000	3.0
U-238	4.156	44.00	29.88	0.00	0.00E+000	9.5

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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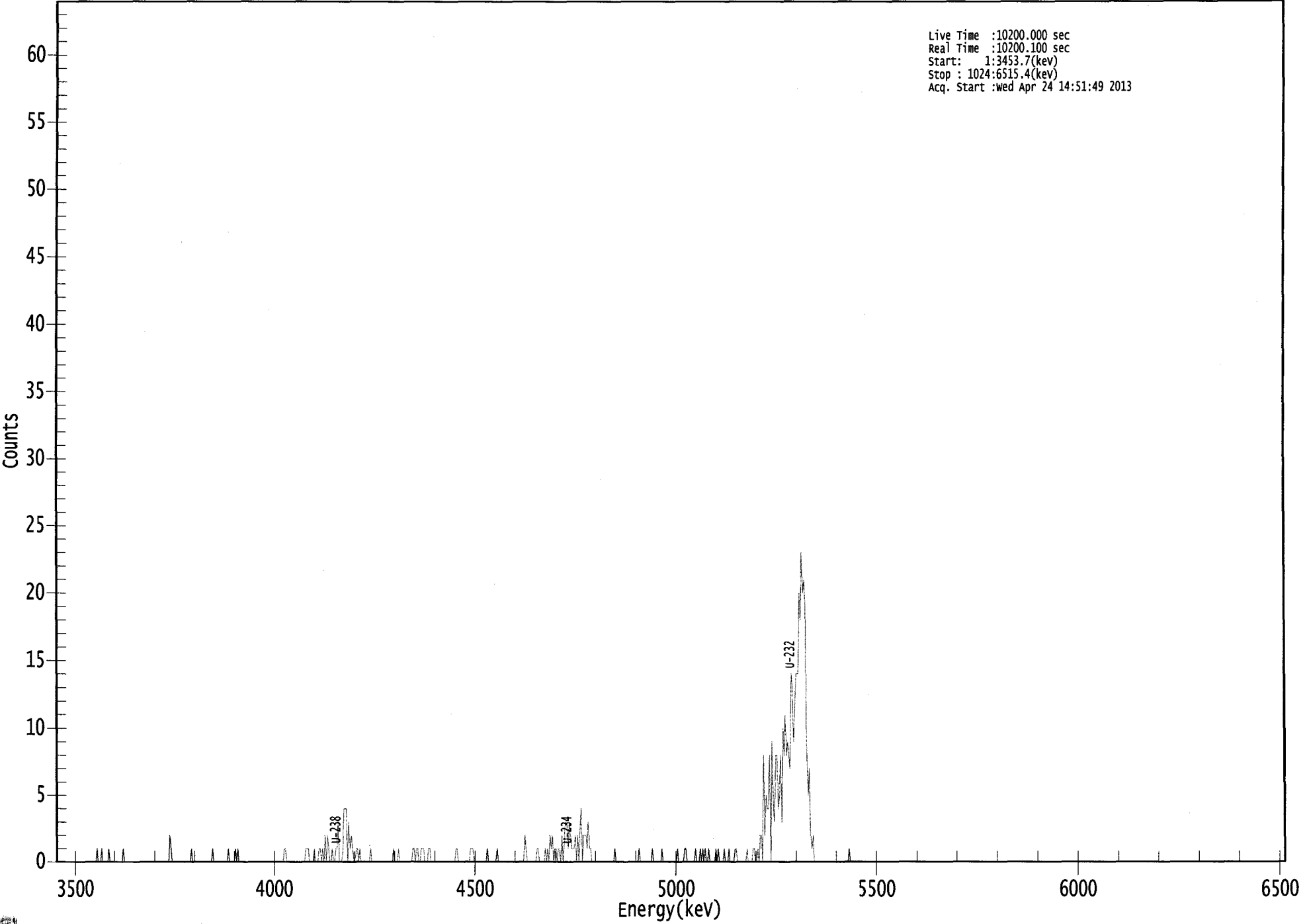
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.999	5302.50*	5.20E+000 +/- 5.67E-001	5.56E-002 +/- 6.07E-003
U-234	0.993	4761.50*	7.57E-001 +/- 2.14E-001	5.56E-002 +/- 6.06E-003
U-235	1.000	4385.50*	2.63E-001 +/- 1.36E-001	9.85E-002 +/- 1.07E-002
U-238	0.994	4184.40*	5.84E-001 +/- 1.86E-001	7.95E-002 +/- 8.67E-003

AG  
 4/25/13

US EPA ARCHIVE DOCUMENT

0000056328.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6515.4(kev)  
Acq. Start :wed Apr 24 14:51:49 2013



ROI Type: 1

ROI Type: 3

0185

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 18

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	1	0	0	0	1	0
41:	0	0	0	0	1	0	0	0
49:	0	0	0	0	0	0	0	0
57:	1	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	2
97:	1	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	1	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	1	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	1	0	0	0	0	0	1	0
153:	1	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	1
193:	1	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	1	1	1	0	0	0	0
217:	1	0	0	0	1	1	0	1
225:	0	2	0	2	1	0	0	1
233:	0	0	1	1	3	0	0	0
241:	1	4	4	4	0	3	1	2
249:	1	0	0	1	1	0	1	0
257:	0	0	0	0	0	0	0	1
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	1	0	0	0	1	0
289:	0	0	0	0	0	0	0	0
297:	0	0	1	1	0	1	1	0
305:	0	1	1	1	0	0	0	1
313:	1	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	1	1
337:	0	0	0	0	0	0	0	0
345:	0	0	1	1	1	0	0	0
353:	0	0	0	0	0	0	0	0
361:	1	0	0	0	0	0	0	0

369: 1 0 0 0 0 0 0 0 0

Sample Title: 18

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	2
393:	1	0	0	0	0	0	0	0
401:	0	1	1	0	0	0	0	0
409:	1	0	1	0	2	1	2	0
417:	1	1	0	1	1	0	2	0
425:	2	3	3	1	3	2	1	1
433:	1	2	0	2	0	2	4	0
441:	2	2	2	1	3	1	1	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	1	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	1	0
489:	0	0	0	0	0	0	0	0
497:	0	1	0	0	0	0	0	0
505:	0	1	0	0	0	0	0	0
513:	0	0	0	0	0	0	1	0
521:	0	0	0	0	1	1	0	0
529:	0	0	0	0	0	1	0	0
537:	0	1	0	1	0	1	0	0
545:	1	0	0	0	0	0	1	0
553:	1	0	0	0	0	1	0	0
561:	0	1	0	0	0	0	1	1
569:	0	0	0	0	0	0	0	0
577:	1	0	0	0	0	1	1	0
585:	0	1	0	2	2	0	8	2
593:	5	4	4	8	0	9	4	3
601:	8	8	4	5	8	3	10	8
609:	11	8	9	8	7	14	13	9
617:	11	14	14	14	20	18	23	20
625:	21	19	9	5	7	2	1	2
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	1	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 18

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KCS  
4/25/13



Sample Description: I-66 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000563  
 Batch Identification: 1304052A-UU  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_047  
 Chamber Serial Number: 02030596A  
 Detector Serial Number: 91086  
 Env. Background: System Bkgd 55216  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 4/5/2013 7:57:06 AM  
 Acquisition Date/Time: 4/24/2013 2:51:50 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.606 mL  
 Effective Efficiency: 0.1830 +/- 0.0106  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Chem. Recovery Factor: 1.0047 +/- 0.0606

Peak Match Tolerance: 0.150 MeV

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 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.280	357.83	10.36	0.17	0.00E+000	5.3
U-234	4.715	52.66	27.11	0.34	0.00E+000	5.9
U-235	4.358	5.83	82.55	0.17	0.00E+000	2.9
U-238	4.148	41.83	30.38	0.17	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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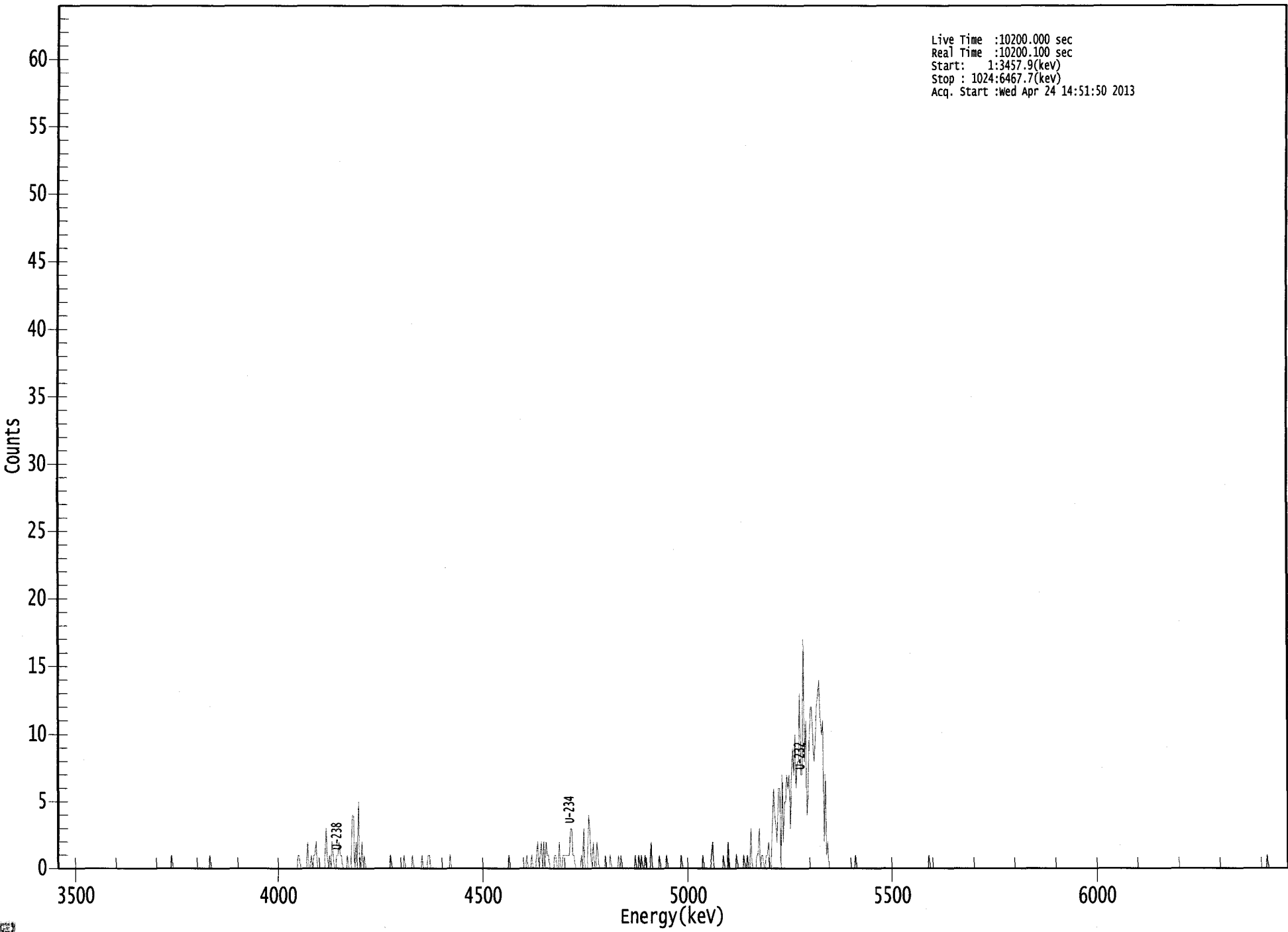
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.19E+000 +/- 5.87E-001	6.06E-002 +/- 6.85E-003
U-234	0.985	4761.50*	7.64E-001 +/- 2.24E-001	6.94E-002 +/- 7.84E-003
U-235	0.995	4385.50*	1.04E-001 +/- 8.69E-002	7.47E-002 +/- 8.44E-003
U-238	0.990	4184.40*	6.04E-001 +/- 1.96E-001	6.03E-002 +/- 6.81E-003

AG  
4/25/13

US EPA ARCHIVE DOCUMENT

000056337.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3457.9(kev)  
Stop : 1024:6467.7(kev)  
Acq. Start :Wed Apr 24 14:51:50 2013



ROI Type: 1

ROI Type: 3

100  
100  
100



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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 19

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	1
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	1
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	1	1	0	0	0	0	0
209:	0	2	0	0	1	0	1	1
217:	2	0	0	0	0	0	0	0
225:	3	1	0	1	0	2	1	0
233:	0	1	1	2	1	1	0	0
241:	0	0	1	0	0	0	4	4
249:	0	2	0	5	0	0	2	0
257:	1	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	1	0
281:	0	0	0	0	0	0	0	0
289:	0	1	0	0	0	0	0	0
297:	1	0	0	0	0	0	0	0
305:	1	0	0	0	0	1	1	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	1
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 19

Channel	1	2	3	4	5	6	7	8	9
377:	1	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0	1
393:	0	0	0	1	0	0	0	0	1
401:	2	0	1	2	0	2	0	2	2
409:	1	1	0	0	0	0	1	1	1
417:	0	0	2	0	0	1	1	1	1
425:	1	1	1	3	3	1	1	0	0
433:	0	0	0	0	1	0	3	0	0
441:	0	0	4	3	1	0	2	0	0
449:	0	2	1	0	0	0	0	0	0
457:	1	0	0	0	1	0	0	0	0
465:	0	0	0	1	0	1	0	0	0
473:	0	0	0	0	0	0	0	0	0
481:	0	1	0	0	1	0	1	0	0
489:	0	1	0	0	0	0	2	0	0
497:	0	0	0	0	0	1	0	0	0
505:	0	0	0	1	0	0	0	0	0
513:	0	0	0	0	0	0	0	0	1
521:	0	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0	0
537:	0	1	0	0	0	0	0	0	0
545:	1	2	0	0	0	0	0	0	0
553:	0	0	1	0	0	0	2	0	0
561:	0	0	0	0	0	1	0	0	0
569:	0	0	0	1	0	0	1	0	0
577:	0	3	0	0	0	0	1	1	1
585:	3	0	1	1	0	0	1	1	1
593:	2	0	0	3	6	4	3	2	2
601:	6	6	0	7	2	5	5	7	7
609:	6	7	3	7	9	7	10	6	6
617:	8	8	13	7	7	17	8	11	11
625:	4	6	10	12	12	9	8	10	10
633:	12	13	14	11	10	11	2	7	7
641:	1	2	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0	0
665:	1	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	1	0	0	0
729:	0	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 19

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	1	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

Date : 4/24/2013  
Time : 5:32:06 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	4/24/2013 5:07:46 AM
Alpha 004	21f	ALL	Passed	4/24/2013 5:07:47 AM
Alpha 005	21f	ALL	Not Done	
Alpha 006	21f	ALL	Not Done	
Alpha 007	21f	ALL	Not Done	
Alpha 008	21f	ALL	Not Done	
Alpha 009	21f	ALL	Not Done	
Alpha 010	21f	ALL	Passed	4/24/2013 5:07:48 AM
Alpha 011	21f	ALL	Passed	4/24/2013 5:07:48 AM
Alpha 012	21f	ALL	Not Done	
Alpha 013	21f	ALL	Passed	4/24/2013 5:07:49 AM
Alpha 014	21f	ALL	Passed	4/24/2013 5:07:50 AM
Alpha 015	21f	ALL	Not Done	
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	4/24/2013 5:07:51 AM
Alpha 019	AIM730	ALL	Not Done	
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	4/24/2013 5:07:52 AM
Alpha 023	AIM730	ALL	Not Done	
Alpha 024	AIM730	ALL	Passed	4/24/2013 5:07:53 AM
Alpha 025	AIM730	ALL	Passed	4/24/2013 5:07:54 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	4/24/2013 5:07:54 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	4/24/2013 5:07:55 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Not Done	
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:07:56 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:07:58 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:00 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	4/20/2013 10:41:48 AM
Alpha 037	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:02 AM
Alpha 038	Alpha Analyst100DC	ALL	Passed	4/20/2013 10:41:52 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	4/20/2013 10:41:54 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:04 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:06 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:09 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 043	Alpha Analyst100DC	ALL	Passed	4/20/2013 10:42:02 AM
Alpha 044	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:11 AM
Alpha 045	Alpha Analyst100DC	ALL	Not Done	
Alpha 046	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:14 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:17 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	4/24/2013 5:08:19 AM

APPROVED BY: \_\_\_\_\_

APPROVAL DATE: 4/24/13

US EPA ARCHIVE DOCUMENT

\*\*\*\*\*  
\*\*\*\*\* LIBRARY LISTING REPORT \*\*\*\*\*  
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Nuclide Library Title: Uranium

Nuclide Library Description: U-232,-234,-235,-238

Nuclide Name	Half-Life (Seconds)	Energy (keV )	Energy Uncert. (keV )	Yield (%)	Yield Uncert. (Abs.+)
U-232	2.174E+009	5302.500*	0.000	99.8000	0.0000
U-234	7.731E+012	4761.500*	0.000	99.8000	0.0000
U-235	2.221E+016	4385.500*	0.000	80.9000	0.0000
U-238	1.410E+017	4184.400*	0.000	100.2300	0.0000

\* = key line

TOTALS: 4 Nuclides 4 Energy Lines

**SECTION IX**  
**ANALYTICAL DATA (ISOTOPIC THORIUM)**

ThISO

Run 1

Work Order	13-04052	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	ThISO	01	LCS	LCS		04/09/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		04/09/13 00:00	1.0000E+00
Date Received	4/9/2013	03	DUP	S-61 TOT	47	04/05/13 11:18	1.0000E+00
Lab Deadline	4/30/2013	04	DO	S-61 TOT	47	04/05/13 11:18	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	S-61 DIS	47	04/05/13 11:18	1.0000E+00
Project	West Lake OU-1	06	TRG	PZ-115-SS TOT	43	04/05/13 12:23	1.0000E+00
Report Level	4	07	TRG	PZ-115-SS DIS	43	04/05/13 12:23	1.0000E+00
Activity Units	pCi	08	TRG	MW-104 TOT	41	04/05/13 12:56	1.0000E+00
Aliquot Units	I	09	TRG	MW-104 DIS	41	04/05/13 12:56	1.0000E+00
Matrix	WA	10	TRG	PZ-100-SD TOT	39	04/05/13 14:03	1.0000E+00
Method	NAS NS-3004 Mod	11	TRG	PZ-100-SD DIS	39	04/05/13 14:03	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	I-67 TOT	39	04/05/13 14:09	1.0000E+00
Radiometric Tracer	Th-229	13	TRG	I-67 DIS	39	04/05/13 14:09	1.0000E+00
Radiometric Sol#	Th-18a	14	TRG	PZ-203-SS TOT	43	04/05/13 14:58	1.0000E+00
Tracer Act (dpm/g)	22.467	15	TRG	PZ-203-SS DIS	43	04/05/13 14:58	1.0000E+00
Carrier		16	TRG	PZ-100-SS TOT	36	04/05/13 14:58	1.0000E+00
Carrier Conc (mg/ml)		17	TRG	PZ-100-SS DIS	36	04/05/13 14:58	1.0000E+00
		18	TRG	I-66 TOT	35	04/05/13 14:59	1.0000E+00
		19	TRG	I-66 DIS	35	04/05/13 14:59	1.0000E+00

\* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. \*\* Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.



ThISO  
Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.4537	10.2		0.00								
02	MBL	0.2269	5.1		0.00								
03	DUP	0.2258	5.1		0.00								
04	DO	0.2265	5.1		0.00								
05	TRG	0.2269	5.1		0.00								
06	TRG	0.2269	5.1		0.00								
07	TRG	0.2267	5.1		0.00								
08	TRG	0.2261	5.1		0.00								
09	TRG	0.2269	5.1		0.00								
10	TRG	0.2268	5.1		0.00								
11	TRG	0.2261	5.1		0.00								
12	TRG	0.2259	5.1		0.00								
13	TRG	0.2258	5.1		0.00								
14	TRG	0.2262	5.1		0.00								
15	TRG	0.2258	5.1		0.00								
16	TRG	0.2255	5.1		0.00								
17	TRG	0.2249	5.1		0.00								
18	TRG	0.2254	5.1		0.00								
19	TRG	0.2251	5.1		0.00								

\* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. \*\* Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

0020

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			04/17/13 18:25	LWALKER				
02	MBL			04/17/13 18:25	LWALKER				
03	DUP			04/17/13 18:25	LWALKER				
04	DO			04/17/13 18:25	LWALKER				
05	TRG			04/17/13 18:25	LWALKER				
06	TRG			04/17/13 18:25	LWALKER				
07	TRG			04/17/13 18:25	LWALKER				
08	TRG			04/17/13 18:25	LWALKER				
09	TRG			04/17/13 18:25	LWALKER				
10	TRG			04/17/13 18:25	LWALKER				
11	TRG			04/17/13 18:25	LWALKER				
12	TRG			04/17/13 18:25	LWALKER				
13	TRG			04/17/13 18:25	LWALKER				
14	TRG			04/17/13 18:25	LWALKER				
15	TRG			04/17/13 18:25	LWALKER				
16	TRG			04/17/13 18:25	LWALKER				
17	TRG			04/17/13 18:25	LWALKER				
18	TRG			04/17/13 18:25	LWALKER				
19	TRG			04/17/13 18:25	LWALKER				

\* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. \*\* Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

6291

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	TH-228	LCS	LCS	pCi/l	4.28E+00	6.62E-01	6.58E-02	4.85E+00	88.21	OK		OK	
02	TH-228	MBL	BLANK	pCi/l	-5.05E-03	3.00E-02	7.10E-02					OK	OK
03	TH-228	DUP	S-61 TOT	pCi/l	3.94E-02	4.79E-02	5.81E-02				NA	OK	
04	TH-228	DO	S-61 TOT	pCi/l	7.79E-02	6.76E-02	6.58E-02					OK	
05	TH-228	TRG	S-61 DIS	pCi/l	1.09E-02	2.61E-02	5.47E-02					OK	
06	TH-228	TRG	PZ-115-SS TOT	pCi/l	1.89E-02	3.60E-02	6.66E-02					OK	
07	TH-228	TRG	PZ-115-SS DIS	pCi/l	4.32E-02	5.84E-02	9.13E-02					OK	
08	TH-228	TRG	MW-104 TOT	pCi/l	2.05E-01	1.07E-01	5.41E-02					OK	
09	TH-228	TRG	MW-104 DIS	pCi/l	1.09E-02	2.61E-02	5.46E-02					OK	
10	TH-228	TRG	PZ-100-SD TOT	pCi/l	2.46E-02	3.78E-02	5.62E-02					OK	
11	TH-228	TRG	PZ-100-SD DIS	pCi/l	2.11E-03	2.95E-02	8.42E-02					OK	
12	TH-228	TRG	I-67 TOT	pCi/l	5.37E-02	6.50E-02	9.13E-02					OK	
13	TH-228	TRG	I-67 DIS	pCi/l	2.32E-02	3.95E-02	6.68E-02					OK	
14	TH-228	TRG	PZ-203-SS TOT	pCi/l	2.02E-02	3.10E-02	4.61E-02					OK	
15	TH-228	TRG	PZ-203-SS DIS	pCi/l	2.35E-02	3.99E-02	6.76E-02					OK	
16	TH-228	TRG	PZ-100-SS TOT	pCi/l	1.73E-02	4.16E-02	8.70E-02					OK	
17	TH-228	TRG	PZ-100-SS DIS	pCi/l	-6.86E-03	2.75E-02	7.06E-02					OK	
18	TH-228	TRG	I-66 TOT	pCi/l	3.61E-02	6.40E-02	1.15E-01					OK	
19	TH-228	TRG	I-66 DIS	pCi/l	3.62E-02	4.39E-02	5.33E-02					OK	

Client	Engineering Management Support, Inc.	Eberline Services Work Order	13-04052	Analysis Code	THISO	Run	1

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-ThISO-1**

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-228	LCS	04/09/13 00:00	1.00E+00	124.61	0.00	0.00			
02	TH-228	MBL	04/09/13 00:00	1.00E+00	96.28	0.00	0.00			
03	TH-228	DUP	04/05/13 11:18	1.00E+00	106.27	0.00	0.00			
04	TH-228	DO	04/05/13 11:18	1.00E+00	110.12	0.00	0.00			
05	TH-228	TRG	04/05/13 11:18	1.00E+00	108.51	0.00	0.00			
06	TH-228	TRG	04/05/13 12:23	1.00E+00	107.61	0.00	0.00			
07	TH-228	TRG	04/05/13 12:23	1.00E+00	101.03	0.00	0.00			
08	TH-228	TRG	04/05/13 12:56	1.00E+00	109.51	0.00	0.00			
09	TH-228	TRG	04/05/13 12:56	1.00E+00	115.44	0.00	0.00			
10	TH-228	TRG	04/05/13 14:03	1.00E+00	110.17	0.00	0.00			
11	TH-228	TRG	04/05/13 14:03	1.00E+00	114.33	0.00	0.00			
12	TH-228	TRG	04/05/13 14:09	1.00E+00	91.47	0.00	0.00			
13	TH-228	TRG	04/05/13 14:09	1.00E+00	104.25	0.00	0.00			
14	TH-228	TRG	04/05/13 14:58	1.00E+00	133.97	0.00	0.00			
15	TH-228	TRG	04/05/13 14:58	1.00E+00	107.20	0.00	0.00			
16	TH-228	TRG	04/05/13 14:58	1.00E+00	68.24	0.00	0.00			
17	TH-228	TRG	04/05/13 14:58	1.00E+00	101.50	0.00	0.00			
18	TH-228	TRG	04/05/13 14:59	1.00E+00	80.22	0.00	0.00			
19	TH-228	TRG	04/05/13 14:59	1.00E+00	111.22	0.00	0.00			

 Run <b>1</b>	Analysis Code <b>ThISO</b>	Eberline Services Work Order <b>13-04052</b>	Client Engineering Management Support, Inc.

5020



**Run** 1

**Analysis Code** THISO

**Eberline Services Work Order** 13-04052

**Client** Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-228	LCS	04/24/13 05:44		A_Spec	Alpha_033	170	3.66 E+02	4.00 E-03	18.2
02	TH-228	MBL	04/24/13 05:44		A_Spec	Alpha_034	170	-3.40 E-01	2.00 E-03	18.6
03	TH-228	DUP	04/24/13 05:44		A_Spec	Alpha_035	170	2.83 E+00	1.00 E-03	18.3
04	TH-228	DO	04/24/13 05:44		A_Spec	Alpha_037	170	5.66 E+00	2.00 E-03	17.8
05	TH-228	TRG	04/24/13 05:44		A_Spec	Alpha_040	170	8.30 E-01	1.00 E-03	19
06	TH-228	TRG	04/24/13 05:44		A_Spec	Alpha_041	170	1.49 E+00	3.00 E-03	19.8
07	TH-228	TRG	04/24/13 05:44		A_Spec	Alpha_042	170	2.98 E+00	6.00 E-03	18.5
08	TH-228	TRG	04/24/13 05:44		A_Spec	Alpha_044	170	1.58 E+01	1.00 E-03	19
09	TH-228	TRG	04/24/13 05:44		A_Spec	Alpha_046	170	8.30 E-01	1.00 E-03	17.9
10	TH-228	TRG	04/24/13 05:44		A_Spec	Alpha_047	170	1.83 E+00	1.00 E-03	18.2
11	TH-228	TRG	04/24/13 05:44		A_Spec	Alpha_048	170	1.50 E-01	5.00 E-03	16.8
12	TH-228	TRG	04/24/13 08:55		A_Spec	Alpha_033	170	3.32 E+00	4.00 E-03	18.2
13	TH-228	TRG	04/24/13 08:55		A_Spec	Alpha_034	170	1.66 E+00	2.00 E-03	18.6
14	TH-228	TRG	04/24/13 08:55		A_Spec	Alpha_035	170	1.83 E+00	1.00 E-03	18.3
15	TH-228	TRG	04/24/13 08:55		A_Spec	Alpha_037	170	1.66 E+00	2.00 E-03	17.8
16	TH-228	TRG	04/24/13 08:56		A_Spec	Alpha_040	170	8.30 E-01	1.00 E-03	19
17	TH-228	TRG	04/24/13 08:56		A_Spec	Alpha_041	170	-5.10 E-01	3.00 E-03	19.8
18	TH-228	TRG	04/24/13 08:56		A_Spec	Alpha_042	170	1.98 E+00	6.00 E-03	18.5
19	TH-228	TRG	04/24/13 08:56		A_Spec	Alpha_044	170	2.83 E+00	1.00 E-03	19

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-THISO-1**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	TH-230	LCS	LCS	pCi/l	4.68E+00	7.10E-01	6.13E-02	5.47E+00	85.42	OK		OK	
02	TH-230	MBL	BLANK	pCi/l	1.88E-01	1.10E-01	7.10E-02					OK	OK
03	TH-230	DUP	S-61 TOT	pCi/l	2.46E-01	1.24E-01	8.20E-02				NA	OK	
04	TH-230	DO	S-61 TOT	pCi/l	3.09E-01	1.37E-01	5.64E-02					OK	
05	TH-230	TRG	S-61 DIS	pCi/l	8.57E-02	6.84E-02	6.16E-02					OK	
06	TH-230	TRG	PZ-115-SS TOT	pCi/l	1.01E-02	3.63E-02	8.21E-02					OK	
07	TH-230	TRG	PZ-115-SS DIS	pCi/l	2.11E-01	1.14E-01	5.94E-02					OK	
08	TH-230	TRG	MW-104 TOT	pCi/l	3.44E-01	1.43E-01	7.64E-02					OK	
09	TH-230	TRG	MW-104 DIS	pCi/l	1.78E-01	9.85E-02	5.36E-02					OK	
10	TH-230	TRG	PZ-100-SD TOT	pCi/l	1.54E-01	9.34E-02	6.32E-02					OK	
11	TH-230	TRG	PZ-100-SD DIS	pCi/l	6.68E-02	6.17E-02	5.77E-02					OK	
12	TH-230	TRG	I-67 TOT	pCi/l	6.12E-01	2.22E-01	8.35E-02					OK	
13	TH-230	TRG	I-67 DIS	pCi/l	1.33E-01	8.80E-02	6.56E-02					OK	
14	TH-230	TRG	PZ-203-SS TOT	pCi/l	8.68E-02	6.51E-02	6.51E-02					OK	
15	TH-230	TRG	PZ-203-SS DIS	pCi/l	2.20E-01	1.15E-01	5.80E-02					OK	
16	TH-230	TRG	PZ-100-SS TOT	pCi/l	9.54E-02	9.22E-02	9.79E-02					OK	
17	TH-230	TRG	PZ-100-SS DIS	pCi/l	1.03E-01	8.03E-02	8.71E-02					OK	
18	TH-230	TRG	I-66 TOT	pCi/l	1.22E-01	9.58E-02	7.48E-02					OK	
19	TH-230	TRG	I-66 DIS	pCi/l	1.63E-01	9.56E-02	7.53E-02					OK	



Run 1


Analysis Code THISO

Eberline Services Work Order 13-04052

Client Engineering Management Support, Inc.

5020

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-230	LCS	04/09/13 00:00	1.00E+00	124.61	0.00	0.00			
02	TH-230	MBL	04/09/13 00:00	1.00E+00	96.28	0.00	0.00			
03	TH-230	DUP	04/05/13 11:18	1.00E+00	106.27	0.00	0.00			
04	TH-230	DO	04/05/13 11:18	1.00E+00	110.12	0.00	0.00			
05	TH-230	TRG	04/05/13 11:18	1.00E+00	108.51	0.00	0.00			
06	TH-230	TRG	04/05/13 12:23	1.00E+00	107.61	0.00	0.00			
07	TH-230	TRG	04/05/13 12:23	1.00E+00	101.03	0.00	0.00			
08	TH-230	TRG	04/05/13 12:56	1.00E+00	109.51	0.00	0.00			
09	TH-230	TRG	04/05/13 12:56	1.00E+00	115.44	0.00	0.00			
10	TH-230	TRG	04/05/13 14:03	1.00E+00	110.17	0.00	0.00			
11	TH-230	TRG	04/05/13 14:03	1.00E+00	114.33	0.00	0.00			
12	TH-230	TRG	04/05/13 14:09	1.00E+00	91.47	0.00	0.00			
13	TH-230	TRG	04/05/13 14:09	1.00E+00	104.25	0.00	0.00			
14	TH-230	TRG	04/05/13 14:58	1.00E+00	133.97	0.00	0.00			
15	TH-230	TRG	04/05/13 14:58	1.00E+00	107.20	0.00	0.00			
16	TH-230	TRG	04/05/13 14:58	1.00E+00	68.24	0.00	0.00			
17	TH-230	TRG	04/05/13 14:58	1.00E+00	101.50	0.00	0.00			
18	TH-230	TRG	04/05/13 14:59	1.00E+00	80.22	0.00	0.00			
19	TH-230	TRG	04/05/13 14:59	1.00E+00	111.22	0.00	0.00			



Run 1

Analysis Code THISO

Eberline Services Work Order 13-04052

Client Engineering Management Support, Inc.

9020

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-230	LCS	04/24/13 05:44		A_Spec	Alpha_033	170	4.00 E+02	3.00 E-03	18.2
02	TH-230	MBL	04/24/13 05:44		A_Spec	Alpha_034	170	1.27 E+01	2.00 E-03	18.6
03	TH-230	DUP	04/24/13 05:44		A_Spec	Alpha_035	170	1.80 E+01	0.00 E+00	18.3
04	TH-230	DO	04/24/13 05:44		A_Spec	Alpha_037	170	2.28 E+01	1.00 E-03	17.8
05	TH-230	TRG	04/24/13 05:44		A_Spec	Alpha_040	170	6.66 E+00	2.00 E-03	19
06	TH-230	TRG	04/24/13 05:44		A_Spec	Alpha_041	170	8.10 E-01	7.00 E-03	19.8
07	TH-230	TRG	04/24/13 05:44		A_Spec	Alpha_042	170	1.48 E+01	1.00 E-03	18.5
08	TH-230	TRG	04/24/13 05:44		A_Spec	Alpha_044	170	2.70 E+01	0.00 E+00	19
09	TH-230	TRG	04/24/13 05:44		A_Spec	Alpha_046	170	1.38 E+01	1.00 E-03	17.9
10	TH-230	TRG	04/24/13 05:44		A_Spec	Alpha_047	170	1.17 E+01	2.00 E-03	18.2
11	TH-230	TRG	04/24/13 05:44		A_Spec	Alpha_048	170	4.83 E+00	1.00 E-03	16.8
12	TH-230	TRG	04/24/13 08:55		A_Spec	Alpha_033	170	3.85 E+01	3.00 E-03	18.2
13	TH-230	TRG	04/24/13 08:55		A_Spec	Alpha_034	170	9.66 E+00	2.00 E-03	18.6
14	TH-230	TRG	04/24/13 08:55		A_Spec	Alpha_035	170	8.00 E+00	0.00 E+00	18.3
15	TH-230	TRG	04/24/13 08:55		A_Spec	Alpha_037	170	1.58 E+01	1.00 E-03	17.8
16	TH-230	TRG	04/24/13 08:56		A_Spec	Alpha_040	170	4.66 E+00	2.00 E-03	19
17	TH-230	TRG	04/24/13 08:56		A_Spec	Alpha_041	170	7.81 E+00	7.00 E-03	19.8
18	TH-230	TRG	04/24/13 08:56		A_Spec	Alpha_042	170	6.83 E+00	1.00 E-03	18.5
19	TH-230	TRG	04/24/13 08:56		A_Spec	Alpha_044	170	1.30 E+01	0.00 E+00	19

	Run	1
Analysis Code	THISO	
Eberline Services Work Order	13-04052	
Client	Engineering Management Support, Inc.	

2020



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-04052-THISO-1**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	TH-232	LCS	LCS	pCi/l	4.53E+00	6.93E-01	6.99E-02	4.85E+00	93.53	OK		OK	
02	TH-232	MBL	BLANK	pCi/l	2.71E-02	4.17E-02	6.19E-02					OK	OK
03	TH-232	DUP	S-61 TOT	pCi/l	3.63E-02	4.72E-02	6.53E-02				NA	OK	
04	TH-232	DO	S-61 TOT	pCi/l	2.24E-02	3.81E-02	6.45E-02					OK	
05	TH-232	TRG	S-61 DIS	pCi/l	2.57E-02	4.38E-02	7.71E-02					OK	
06	TH-232	TRG	PZ-115-SS TOT	pCi/l	-1.11E-02	3.85E-02	1.09E-01					OK	
07	TH-232	TRG	PZ-115-SS DIS	pCi/l	6.62E-02	6.36E-02	6.79E-02					OK	
08	TH-232	TRG	MW-104 TOT	pCi/l	1.78E-01	1.01E-01	7.63E-02					OK	
09	TH-232	TRG	MW-104 DIS	pCi/l	1.91E-02	3.64E-02	6.73E-02					OK	
10	TH-232	TRG	PZ-100-SD TOT	pCi/l	3.51E-02	4.56E-02	6.31E-02					OK	
11	TH-232	TRG	PZ-100-SD DIS	pCi/l	-2.35E-03	2.74E-02	5.76E-02					OK	
12	TH-232	TRG	I-67 TOT	pCi/l	0.00E+00	4.40E-02	9.52E-02					OK	
13	TH-232	TRG	I-67 DIS	pCi/l	-2.33E-03	2.72E-02	5.72E-02					OK	
14	TH-232	TRG	PZ-203-SS TOT	pCi/l	2.88E-02	3.74E-02	5.18E-02					OK	
15	TH-232	TRG	PZ-203-SS DIS	pCi/l	3.69E-02	4.79E-02	6.63E-02					OK	
16	TH-232	TRG	PZ-100-SS TOT	pCi/l	2.04E-02	5.68E-02	1.23E-01					OK	
17	TH-232	TRG	PZ-100-SS DIS	pCi/l	-2.49E-02	3.18E-02	1.16E-01					OK	
18	TH-232	TRG	I-66 TOT	pCi/l	-6.08E-03	3.61E-02	8.55E-02					OK	
19	TH-232	TRG	I-66 DIS	pCi/l	3.76E-02	4.95E-02	7.51E-02					OK	



**Run**  
1

**Analysis Code**  
THISO

**Eberline Services Work Order**  
13-04052

**Client**  
Engineering Management Support, Inc.

9020

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-232	LCS	04/09/13 00:00	1.00E+00	124.61	0.00	0.00			
02	TH-232	MBL	04/09/13 00:00	1.00E+00	96.28	0.00	0.00			
03	TH-232	DUP	04/05/13 11:18	1.00E+00	106.27	0.00	0.00			
04	TH-232	DO	04/05/13 11:18	1.00E+00	110.12	0.00	0.00			
05	TH-232	TRG	04/05/13 11:18	1.00E+00	108.51	0.00	0.00			
06	TH-232	TRG	04/05/13 12:23	1.00E+00	107.61	0.00	0.00			
07	TH-232	TRG	04/05/13 12:23	1.00E+00	101.03	0.00	0.00			
08	TH-232	TRG	04/05/13 12:56	1.00E+00	109.51	0.00	0.00			
09	TH-232	TRG	04/05/13 12:56	1.00E+00	115.44	0.00	0.00			
10	TH-232	TRG	04/05/13 14:03	1.00E+00	110.17	0.00	0.00			
11	TH-232	TRG	04/05/13 14:03	1.00E+00	114.33	0.00	0.00			
12	TH-232	TRG	04/05/13 14:09	1.00E+00	91.47	0.00	0.00			
13	TH-232	TRG	04/05/13 14:09	1.00E+00	104.25	0.00	0.00			
14	TH-232	TRG	04/05/13 14:58	1.00E+00	133.97	0.00	0.00			
15	TH-232	TRG	04/05/13 14:58	1.00E+00	107.20	0.00	0.00			
16	TH-232	TRG	04/05/13 14:58	1.00E+00	68.24	0.00	0.00			
17	TH-232	TRG	04/05/13 14:58	1.00E+00	101.50	0.00	0.00			
18	TH-232	TRG	04/05/13 14:59	1.00E+00	80.22	0.00	0.00			
19	TH-232	TRG	04/05/13 14:59	1.00E+00	111.22	0.00	0.00			

	
Run	1
Analysis Code	THISO
Eberline Services Work Order	13-04052
Client	Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-232	LCS	04/24/13 05:44		A_Spec	Alpha_033	170	3.89 E+02	0.00 E+00	18.2
02	TH-232	MBL	04/24/13 05:44		A_Spec	Alpha_034	170	1.83 E+00	1.00 E-03	18.6
03	TH-232	DUP	04/24/13 05:44		A_Spec	Alpha_035	170	2.66 E+00	2.00 E-03	18.3
04	TH-232	DO	04/24/13 05:44		A_Spec	Alpha_037	170	1.66 E+00	2.00 E-03	17.8
05	TH-232	TRG	04/24/13 05:44		A_Spec	Alpha_040	170	2.00 E+00	0.00 E+00	19
06	TH-232	TRG	04/24/13 05:44		A_Spec	Alpha_041	170	-8.90 E-01	1.70 E-02	19.8
07	TH-232	TRG	04/24/13 05:44		A_Spec	Alpha_042	170	4.66 E+00	2.00 E-03	18.5
08	TH-232	TRG	04/24/13 05:44		A_Spec	Alpha_044	170	1.40 E+01	0.00 E+00	19
09	TH-232	TRG	04/24/13 05:44		A_Spec	Alpha_046	170	1.49 E+00	3.00 E-03	17.9
10	TH-232	TRG	04/24/13 05:44		A_Spec	Alpha_047	170	2.66 E+00	2.00 E-03	18.2
11	TH-232	TRG	04/24/13 05:44		A_Spec	Alpha_048	170	-1.70 E-01	1.00 E-03	16.8
12	TH-232	TRG	04/24/13 08:55		A_Spec	Alpha_033	170	1.00 E+00	0.00 E+00	18.2
13	TH-232	TRG	04/24/13 08:55		A_Spec	Alpha_034	170	-1.70 E-01	1.00 E-03	18.6
14	TH-232	TRG	04/24/13 08:55		A_Spec	Alpha_035	170	2.66 E+00	2.00 E-03	18.3
15	TH-232	TRG	04/24/13 08:55		A_Spec	Alpha_037	170	2.66 E+00	2.00 E-03	17.8
16	TH-232	TRG	04/24/13 08:56		A_Spec	Alpha_040	170	1.00 E+00	0.00 E+00	19
17	TH-232	TRG	04/24/13 08:56		A_Spec	Alpha_041	170	-1.89 E+00	1.70 E-02	19.8
18	TH-232	TRG	04/24/13 08:56		A_Spec	Alpha_042	170	-3.40 E-01	2.00 E-03	18.5
19	TH-232	TRG	04/24/13 08:56		A_Spec	Alpha_044	170	3.00 E+00	0.00 E+00	19

	
Run	1
Analysis Code	THISO
Eberline Services Work Order	13-04052
Client	Engineering Management Support, Inc.

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	04/09/13 00:00	1.0000	0.4537	10.1933		0.00		
02	MBL	BLANK	04/09/13 00:00	1.0000	0.2269	5.0978		0.00		
03	DUP	S-61 TOT	04/05/13 11:18	1.0000	0.2258	5.0730		0.00		
04	DO	S-61 TOT	04/05/13 11:18	1.0000	0.2265	5.0888		0.00		
05	TRG	S-61 DIS	04/05/13 11:18	1.0000	0.2269	5.0978		0.00		
06	TRG	PZ-115-SS TOT	04/05/13 12:23	1.0000	0.2269	5.0978		0.00		
07	TRG	PZ-115-SS DIS	04/05/13 12:23	1.0000	0.2267	5.0933		0.00		
08	TRG	MW-104 TOT	04/05/13 12:56	1.0000	0.2261	5.0798		0.00		
09	TRG	MW-104 DIS	04/05/13 12:56	1.0000	0.2269	5.0978		0.00		
10	TRG	PZ-100-SD TOT	04/05/13 14:03	1.0000	0.2268	5.0955		0.00		
11	TRG	PZ-100-SD DIS	04/05/13 14:03	1.0000	0.2261	5.0798		0.00		
12	TRG	I-67 TOT	04/05/13 14:09	1.0000	0.2259	5.0753		0.00		
13	TRG	I-67 DIS	04/05/13 14:09	1.0000	0.2258	5.0730		0.00		
14	TRG	PZ-203-SS TOT	04/05/13 14:58	1.0000	0.2262	5.0820		0.00		
15	TRG	PZ-203-SS DIS	04/05/13 14:58	1.0000	0.2258	5.0730		0.00		
16	TRG	PZ-100-SS TOT	04/05/13 14:58	1.0000	0.2255	5.0663		0.00		
17	TRG	PZ-100-SS DIS	04/05/13 14:58	1.0000	0.2249	5.0528		0.00		
18	TRG	I-66 TOT	04/05/13 14:59	1.0000	0.2254	5.0641		0.00		
19	TRG	I-66 DIS	04/05/13 14:59	1.0000	0.2251	5.0573		0.00		

01/44

01/22

0211

### Spike and Tracer Worksheet

*JA*

Internal Work Order					Run	Analysis Code				Date	Technician				Technician Initials	Witness Initials
<b>13-04052</b>					<b>1</b>	<b>ThISO</b>				<b>4/17/2013 18:06</b>	<b>LWALKER</b>					
LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	Volume Used (g)	Volume Used (g)	Volume Used (g)	Volume Used (g)	Known pCi	Error Estimate	Added pCi	Error Estimate	Known pCi	Error Estimate	Added pCi	Error Estimate
Th-228	Th-8b	103.560	4/17/2013	0.100	0.1039				4.85	0.174	0.00	0.000	0.00	0.000	0.00	0.000
Th-230	Th-1b	23.525	4/17/2013	0.500	0.5165				5.47	0.148	0.00	0.000	0.00	0.000	0.00	0.000
Th-232	Th-8b	103.560	4/17/2013	0.100	0.1039				4.85	0.174	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes														
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer					LCS									
01	Th-229	Th-18a	22.467	4/17/2013	0.4537	0.2200															
02	Th-229	Th-18a	22.467	4/17/2013	0.2269	0.2200															
03	Th-229	Th-18a	22.467	4/17/2013	0.2258	0.2200															
04	Th-229	Th-18a	22.467	4/17/2013	0.2265	0.2200															
05	Th-229	Th-18a	22.467	4/17/2013	0.2269	0.2200															
06	Th-229	Th-18a	22.467	4/17/2013	0.2269	0.2200															
07	Th-229	Th-18a	22.467	4/17/2013	0.2267	0.2200															
08	Th-229	Th-18a	22.467	4/17/2013	0.2261	0.2200															
09	Th-229	Th-18a	22.467	4/17/2013	0.2269	0.2200															
10	Th-229	Th-18a	22.467	4/17/2013	0.2268	0.2200															
11	Th-229	Th-18a	22.467	4/17/2013	0.2261	0.2200															
12	Th-229	Th-18a	22.467	4/17/2013	0.2259	0.2200															
13	Th-229	Th-18a	22.467	4/17/2013	0.2258	0.2200															
14	Th-229	Th-18a	22.467	4/17/2013	0.2262	0.2200															
15	Th-229	Th-18a	22.467	4/17/2013	0.2258	0.2200															
16	Th-229	Th-18a	22.467	4/17/2013	0.2255	0.2200															
17	Th-229	Th-18a	22.467	4/17/2013	0.2249	0.2200															
18	Th-229	Th-18a	22.467	4/17/2013	0.2254	0.2200															
19	Th-229	Th-18a	22.467	4/17/2013	0.2251	0.2200															

0.4537 g  
0.2269 g  
-0.2258 g  
-0.2265 g  
-0.2269 g  
-0.2269 g  
-0.2267 g  
-0.2261 g  
-0.2269 g  
-0.2268 g  
-0.2261 g  
-0.2259 g  
-0.2258 g  
-0.2262 g  
-0.2258 g  
-0.2255 g  
-0.2249 g  
-0.2254 g  
-0.2251 g

0.5165 g  
0.1039 g

Matrix Spike


# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-04052</b>	<b>1</b>	<b>ThISO</b>	<b>liters</b>	<b>4/30/2013</b>	<b>JBARNARD</b>

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	S-61 TOT	DUP					1.0000E+00	1.0000E+00				
04	S-61 TOT	DO					1.0000E+00	1.0000E+00				
05	S-61 DIS	TRG					1.0000E+00	1.0000E+00				
06	PZ-115-SS TOT	TRG					1.0000E+00	1.0000E+00				
07	PZ-115-SS DIS	TRG					1.0000E+00	1.0000E+00				
08	MW-104 TOT	TRG					1.0000E+00	1.0000E+00				
09	MW-104 DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-100-SD TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-100-SD DIS	TRG					1.0000E+00	1.0000E+00				
12	I-67 TOT	TRG					1.0000E+00	1.0000E+00				
13	I-67 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-203-SS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-203-SS DIS	TRG					1.0000E+00	1.0000E+00				
16	PZ-100-SS TOT	TRG					1.0000E+00	1.0000E+00				
17	PZ-100-SS DIS	TRG					1.0000E+00	1.0000E+00				
18	I-66 TOT	TRG					1.0000E+00	1.0000E+00				
19	I-66 DIS	TRG					1.0000E+00	1.0000E+00				

Comments
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Technician: \_\_\_\_\_

 Date: 4, 18, 13