

US EPA ARCHIVE DOCUMENT

**ENGINEERING MANAGEMENT SUPPORT, INC.**

**West Lake OU-1**

**STANDARD LEVEL IV  
REPORT OF ANALYSIS**

**WORK ORDER #13-07152-OR**

**August 29, 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 # 13-07152

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

Date for Partial	Initials	Date	Initials	Checklist Items
		7/24/13	KC	Sample Log-In
		8-14-13	JG	Data Compilation
		8-23/13	MSA	First Technical Data Review
		8/23/13	MSA	Second Technical Data Review
		8/27/13	[Signature]	Data Entry/Electronic Deliverable
		8/27/13	[Signature]	Case Narrative
		8/28/13	RBS	Electronic Deliverable Proof
		8/28/13	MSA	Samples Analyzed within Holding Time Yes? <input checked="" type="checkbox"/> No? <input type="checkbox"/>
		8/28/13	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: [Signature] 8/29/13  
 Laboratory Manager Date

US EPA ARCHIVE DOCUMENT

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





# Internal Chain of Custody

Work Order #	<b>13-07152</b>
Lab Deadline	<b>8/13/2013</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>	04	38	W1.2	
	05	38	W1.2	
	06	42	W1.2	
	07	42	W1.2	
	08	39	W1.2	
	09	39	W1.2	
	10	43	W1.2	
	11	43	W1.2	
	12	45	W1.2	
	13	45	W1.2	
	14	42	W1.2	
	15	42	W1.2	
	16	41	W1.2	
	17	41	W1.2	
	18	43	W1.2	
	19	43	W1.2	
	<p><b>MUST USE FXN 04 FOR DUP</b></p>			

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	Location (circle one)					Initials	Date
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		
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 #

**13-07152**

Lab Deadline

**8/13/2013**

Analysis

**ThISO - 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> <p><b>MUST USE FXN 04 FOR DUP</b></p>	04	38	W1.2
	05	38	W1.2
	06	42	W1.2
	07	42	W1.2
	08	39	W1.2
	09	39	W1.2
	10	43	W1.2
	11	43	W1.2
	12	45	W1.2
	13	45	W1.2
	14	42	W1.2
	15	42	W1.2
	16	41	W1.2
	17	41	W1.2
	18	43	W1.2
	19	43	W1.2

US EPA ARCHIVE DOCUMENT

	Location (circle one)						Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room			
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/13/2013	
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/7/13 1403	
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JPD	8/7/13 1403	
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0840 PM	8/13/13	
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0842		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	LB	8/13/13 1543	
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			
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room			
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room			



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# Internal Chain of Custody

Work Order #	<b>13-07152</b>
Lab Deadline	<b>8/13/2013</b>
Analysis	<b>Ra226 - 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> <p><b>MUST USE FXN 04 FOR DUP</b></p>	04	38	W1.2
	05	38	W1.2
	06	42	W1.2
	07	42	W1.2
	08	39	W1.2
	09	39	W1.2
	10	43	W1.2
	11	43	W1.2
	12	45	W1.2
	13	45	W1.2
	14	42	W1.2
	15	42	W1.2
	16	41	W1.2
	17	41	W1.2
	18	43	W1.2
	19	43	W1.2

**US EPA ARCHIVE DOCUMENT**

	Location (circle one)					Initials	Date
Received by	<u>Sample Storage</u>	Rough Prep	Prep	Separations	Count Room		8/5/13 0500
Relinquished by	Sample Storage	Rough Prep	<u>Prep</u>	Separations	Count Room		8/13/13 0900
Received by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room		8/6/13 1232
Relinquished by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room		8/7/13 1830
Received by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>		8/8/13 0900
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>		8/8/13 1200
Received by	<u>Sample Storage</u>	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		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		



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SERVICES  
Oak Ridge Laboratory

# Internal Chain of Custody

Work Order #

**13-07152**

Lab Deadline

**8/13/2013**

Analysis

**Ra228 - 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> <p><b>MUST USE FXN 04 FOR DUP</b></p>	04	38	W1.2
	05	38	W1.2
	06	42	W1.2
	07	42	W1.2
	08	39	W1.2
	09	39	W1.2
	10	43	W1.2
	11	43	W1.2
	12	45	W1.2
	13	45	W1.2
	14	42	W1.2
	15	42	W1.2
	16	41	W1.2
	17	41	W1.2
	18	43	W1.2
	19	43	W1.2

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/5/13 0500
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/6/13 0900
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/6/13 1232
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/7/13 1830
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/8/13 0500
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	KB	8/8/13 1800
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/9/13 1233
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/13/13 1835
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/17/13 1200
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	C	8/17/13 1240
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

**13-07152**

Received By

KCOULSTON

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
01	LCS	0		WA	W1.2		
02	BLANK	0		WA	W1.2		
03	DUP	0		WA	W1.2		
04	PZ-203-SS TOT ✓ <i>DUP</i>	3		WA	W1.2	12.00	38
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	33
			2	<2	<2	4.0000	38
			3	<2	<2	4.0000	37
05	PZ-203-SS DIS ✓	3		WA	W1.2	0.00	38
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				33
			2				38
			3				37
06	D-87 TOT ✓	2		WA	W1.2	8.00	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	37
			2	<2	<2	4.0000	42
07	D-87 DIS ✓	2		WA	W1.2	0.00	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				37
			2				42
08	DUP 06 TOT ✓	2		WA	W1.2	8.00	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	35
			2	<2	<2	4.0000	39
09	DUP 06 DIS ✓	2		WA	W1.2	0.00	39
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				35
			2				39
10	S-53 TOT ✓	2		WA	W1.2	8.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	43
			2	<2	<2	4.0000	42
11	S-53 DIS ✓	2		WA	W1.2	0.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				43
			2				42
12	D-14 TOT ✓	2		WA	W1.2	8.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	41
			2	<2	<2	4.0000	45
13	D-14 DIS ✓	2		WA	W1.2	0.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				41
			2				45
14	PZ-205-AS TOT ✓	2		WA	W1.2	8.00	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	40
			2	<2	<2	4.0000	42
15	PZ-205-AS DIS ✓	2		WA	W1.2	0.00	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				40
			2				42
16	I-65 TOT ✓	2		WA	W1.2	8.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	41
			2	<2	<2	4.0000	38
17	I-65 DIS ✓	2		WA	W1.2	0.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				41
			2				38
18	D-13 TOT ✓	2		WA	W1.2	8.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	39
			2	<2	<2	4.0000	43
19	D-13 DIS ✓	2		WA	W1.2	0.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM

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Received by: *Chantal Carlot*

Date: *7/24/13*

MP-001, Rev 5  
Effective: 11/22/02



(Volumes, pH, & CPM)

Received By
KCOULSTON

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
				1			39
				2			43

164T  
07/24/13


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Received by: Charles Coulston Date: 7/24/13

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

Client Name	Contract/PO	Project Type	Date Received	Required Turnaround Days	Eberline Services Work Order
<b>Engineering Management Support, Inc.</b>	<b>West Lake OU-1</b>	<b>Environmental</b>	<b>07/22/2013</b>	<b>28</b>	<b>13-07152</b>
Project Name	Client WO	Sample Disp	Lab Deadline	Internal Deadline	Client Deadline
<b>West Lake OU-1</b>	<b>Westlake OU-1</b>	<b>W</b>	<b>08/13/2013</b>	<b>08/16/2013</b>	<b>08/19/2013</b>

Internal ID	Client ID	Sample Date	Matrix	Storage	P&Z	P&Z	THIO	UISO														TU
01	LCS	07/24/13	WA	W1.2	X	X	X	X														4
02	BLANK	07/24/13	WA	W1.2	X	X	X	X														4
03	DUP	07/24/13	WA	W1.2	X	X	X	X														4
04	PZ-203-SS TOT	07/17/13 13:58	WA	W1.2	X	X	X	X														4
05	PZ-203-SS DIS	07/17/13 13:58	WA	W1.2	X	X	X	X														4
06	D-87 TOT	07/17/13 14:11	WA	W1.2	X	X	X	X														4
07	D-87 DIS	07/17/13 14:11	WA	W1.2	X	X	X	X														4
08	DUP 06 TOT	07/17/13 00:00	WA	W1.2	X	X	X	X														4
09	DUP 06 DIS	07/17/13 00:00	WA	W1.2	X	X	X	X														4
10	S-53 TOT	07/18/13 07:30	WA	W1.2	X	X	X	X														4
11	S-53 DIS	07/18/13 07:30	WA	W1.2	X	X	X	X														4
12	D-14 TOT	07/18/13 09:30	WA	W1.2	X	X	X	X														4
13	D-14 DIS	07/18/13 09:30	WA	W1.2	X	X	X	X														4
14	PZ-205-AS TOT	07/18/13 09:46	WA	W1.2	X	X	X	X														4
15	PZ-205-AS DIS	07/18/13 09:46	WA	W1.2	X	X	X	X														4
16	I-65 TOT	07/18/13 10:59	WA	W1.2	X	X	X	X														4
17	I-65 DIS	07/18/13 10:59	WA	W1.2	X	X	X	X														4
18	D-13 TOT	07/18/13 12:19	WA	W1.2	X	X	X	X														4
19	D-13 DIS	07/18/13 12:19	WA	W1.2	X	X	X	X														4
<b>Totals Per Analysis (non QA samples)</b>					<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

 <p><b>Sample Log In Report</b></p>	<p><b>Oak Ridge Laboratory</b>  <b>601 Scarboro Rd.</b>  <b>Oak Ridge, TN 37830</b></p> <p><b>Voice: (865) 481-0683</b>  <b>Fax: (865) 483-4621</b></p>	<b>Invoice</b>		<b>Report Data</b>	
		Paul V. Rosasco, P.E. Engineering Management Support, Inc. 7220 West Jefferson Avenue, Suite 406 Lakewood, CO 80235		Paul V. Rosasco, P.E. Engineering Management Support, Inc. 7220 West Jefferson Ave, Suite 406 Lakewood, CO 80235	
		Voice 303-640-3426 Fax		Voice 303-940-3426 Fax	
		<b>Contact</b>			
		Lyn Fitzgerald Voice 303-601-4255 Fax			



**Eberline Services – Oak Ridge Laboratory**

**SAMPLE RECEIPT CHECKLIST**  
MP-001-2

WORK ORDER # 13-07152

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 Coulster DATE: 7/24/13

US EPA ARCHIVE DOCUMENT

**SECTION III  
CASE NARRATIVE**



EBS-OR-36007

August 29, 2013

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

CASE NARRATIVE  
Work Order # 13-07152-OR

SAMPLE RECEIPT

This work order contains eight water samples received 07/22/2013. 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>
PZ-203-SS TOT	13-07152-04	D-14 TOT	13-07152-12
PZ-203-SS DIS	13-07152-05	D-14 DIS	13-07152-13
D-87 TOT	13-07152-06	PZ-205-AS TOT	13-07152-14
D-87 DIS	13-07152-07	PZ-205-AS DIS	13-07152-15
DUP 06 TOT	13-07152-08	I-65 TOT	13-07152-16
DUP 06 DIS	13-07152-09	I-65 DIS	13-07152-17
S-53 TOT	13-07152-10	D-13 TOT	13-07152-18
S-53 DIS	13-07152-11	D-13 DIS	13-07152-19

ANALYTICAL METHODS

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

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## ANALYTICAL RESULTS CONTINUED

### SPECIAL CIRCUMSTANCES

Sample numbers S-53 TOT and PZ-205-AS TOT contained high solids. Due to this circumstance, these samples for Radium analyses were prepared with EDTA, Phenolphthalein and hydroxide precipitation.

### ISOTOPIC URANIUM

Samples were prepared by removing representative aliquots followed 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 slightly low sample number PZ-205-AS DIS. Chemical recovery was acceptable for all other samples. The Uranium-234, Uranium-235 and Uranium-238 method blank demonstrated acceptable results. Results for the Uranium-234 and Uranium-235 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Uranium-238 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 prepared by removing representative aliquots followed 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 and Thorium-232 method blank demonstrated acceptable results. The Thorium-230 method blank demonstrated results slightly greater than the detection limit. 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 prepared by removing representative aliquots 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.



ANALYTICAL RESULTS CONTINUED

RADIUM-226 CONTINUED

Samples demonstrated acceptable results for all Radium-226 analyses. Chemical recovery was acceptable for all samples. The Radium-226 method blank demonstrated results slightly greater than the detection limit. 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.

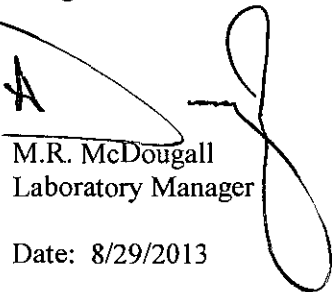
RADIUM-228

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 results slightly greater than the detection limit. Results for the Radium-228 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. 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.

  
M.R. McDougall  
Laboratory Manager

Date: 8/29/2013

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**SECTION IV  
ANALYTICAL RESULTS SUMMARY**

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
LCS13-07152-01	13-07152-01	08/08/2013 12:09:56	Radium-226	E903.0	10.76	1.25	2.59	0.14		pCi/l
LCS13-07152-01	13-07152-01	08/13/2013 10:42:29	Radium-228	E904.0	8.21	1.65	2.48	1.59		pCi/l
LCS13-07152-01	13-07152-01	08/13/2013 12:17:46	Thorium-228	HASL 300, 4.5.2	5.05	0.83	0.95	0.07		pCi/l
LCS13-07152-01	13-07152-01	08/13/2013 12:17:46	Thorium-230	HASL 300, 4.5.2	5.85	0.93	1.18	0.09		pCi/l
LCS13-07152-01	13-07152-01	08/13/2013 12:17:46	Thorium-232	HASL 300, 4.5.2	4.83	0.80	0.91	0.07		pCi/l
LCS13-07152-01	13-07152-01	08/12/2013 09:38:26	Uranium-234	HASL 300, 4.5.2	7.07	1.04	1.16	0.10		pCi/l
LCS13-07152-01	13-07152-01	08/12/2013 09:38:26	Uranium-235	HASL 300, 4.5.2	1.26	0.34	0.35	0.11		pCi/l
LCS13-07152-01	13-07152-01	08/12/2013 09:38:26	Uranium-238	HASL 300, 4.5.2	8.21	1.18	1.31	0.09		pCi/l
BLANK13-07152-02	13-07152-02	08/08/2013 12:09:57	Radium-226	E903.0	0.48	0.27	0.29	0.18		pCi/l
BLANK13-07152-02	13-07152-02	08/13/2013 10:45:40	Radium-228	E904.0	0.41	0.50	0.50	1.01	U	pCi/l
BLANK13-07152-02	13-07152-02	08/13/2013 12:17:47	Thorium-228	HASL 300, 4.5.2	0.08	0.09	0.09	0.15	U	pCi/l
BLANK13-07152-02	13-07152-02	08/13/2013 12:17:47	Thorium-230	HASL 300, 4.5.2	0.45	0.20	0.21	0.14		pCi/l
BLANK13-07152-02	13-07152-02	08/13/2013 12:17:47	Thorium-232	HASL 300, 4.5.2	0.17	0.11	0.11	0.09	J	pCi/l
BLANK13-07152-02	13-07152-02	08/12/2013 09:38:27	Uranium-234	HASL 300, 4.5.2	0.24	0.17	0.17	0.16	J	pCi/l
BLANK13-07152-02	13-07152-02	08/12/2013 09:38:27	Uranium-235	HASL 300, 4.5.2	0.09	0.12	0.12	0.19	U	pCi/l
BLANK13-07152-02	13-07152-02	08/12/2013 09:38:27	Uranium-238	HASL 300, 4.5.2	0.10	0.11	0.11	0.15	U	pCi/l
PZ-203-SS TOT_07_17_2013 DUP	13-07152-03	08/08/2013 12:09:53	Radium-226	E903.0	1.09	0.41	0.47	0.22		pCi/l
PZ-203-SS TOT_07_17_2013 DUP	13-07152-03	08/13/2013 10:45:41	Radium-228	E904.0	0.76	0.63	0.65	1.26	J	pCi/l
PZ-203-SS TOT_07_17_2013 DUP	13-07152-03	08/13/2013 12:17:48	Thorium-228	HASL 300, 4.5.2	0.01	0.03	0.03	0.08	U	pCi/l
PZ-203-SS TOT_07_17_2013 DUP	13-07152-03	08/13/2013 12:17:48	Thorium-230	HASL 300, 4.5.2	0.56	0.21	0.22	0.10		pCi/l
PZ-203-SS TOT_07_17_2013 DUP	13-07152-03	08/13/2013 12:17:48	Thorium-232	HASL 300, 4.5.2	0.06	0.07	0.07	0.09	U	pCi/l
PZ-203-SS TOT_07_17_2013 DUP	13-07152-03	08/12/2013 09:38:28	Uranium-234	HASL 300, 4.5.2	2.76	0.54	0.57	0.10		pCi/l
PZ-203-SS TOT_07_17_2013 DUP	13-07152-03	08/12/2013 09:38:28	Uranium-235	HASL 300, 4.5.2	0.26	0.15	0.15	0.10		pCi/l
PZ-203-SS TOT_07_17_2013 DUP	13-07152-03	08/12/2013 09:38:28	Uranium-238	HASL 300, 4.5.2	0.80	0.25	0.26	0.15		pCi/l
PZ-203-SS TOT_07_17_2013	13-07152-04	08/08/2013 12:09:54	Radium-226	E903.0	2.31	0.60	0.77	0.17		pCi/l
PZ-203-SS TOT_07_17_2013	13-07152-04	08/13/2013 10:45:41	Radium-228	E904.0	1.19	0.55	0.62	1.04	J	pCi/l
PZ-203-SS TOT_07_17_2013	13-07152-04	08/13/2013 12:17:49	Thorium-228	HASL 300, 4.5.2	-0.01	0.05	0.05	0.14	U	pCi/l
PZ-203-SS TOT_07_17_2013	13-07152-04	08/13/2013 12:17:49	Thorium-230	HASL 300, 4.5.2	0.58	0.22	0.23	0.11		pCi/l
PZ-203-SS TOT_07_17_2013	13-07152-04	08/13/2013 12:17:49	Thorium-232	HASL 300, 4.5.2	0.10	0.09	0.09	0.10	J	pCi/l
PZ-203-SS TOT_07_17_2013	13-07152-04	08/12/2013 09:39:37	Uranium-234	HASL 300, 4.5.2	2.86	0.52	0.56	0.06		pCi/l
PZ-203-SS TOT_07_17_2013	13-07152-04	08/12/2013 09:39:37	Uranium-235	HASL 300, 4.5.2	0.22	0.13	0.13	0.09	J	pCi/l
PZ-203-SS TOT_07_17_2013	13-07152-04	08/12/2013 09:39:37	Uranium-238	HASL 300, 4.5.2	0.40	0.16	0.16	0.07		pCi/l



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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>CSU</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
PZ-203-SS DIS_07_17_2013	13-07152-05	08/08/2013 12:51:48	Radium-226	E903.0	1.36	0.47	0.55	0.28		pCi/l
PZ-203-SS DIS_07_17_2013	13-07152-05	08/13/2013 10:45:41	Radium-228	E904.0	0.79	0.60	0.62	1.19	J	pCi/l
PZ-203-SS DIS_07_17_2013	13-07152-05	08/13/2013 12:17:50	Thorium-228	HASL 300, 4.5.2	-0.02	0.05	0.05	0.15	U	pCi/l
PZ-203-SS DIS_07_17_2013	13-07152-05	08/13/2013 12:17:50	Thorium-230	HASL 300, 4.5.2	0.74	0.28	0.29	0.11		pCi/l
PZ-203-SS DIS_07_17_2013	13-07152-05	08/13/2013 12:17:50	Thorium-232	HASL 300, 4.5.2	0.10	0.10	0.10	0.12	U	pCi/l
PZ-203-SS DIS_07_17_2013	13-07152-05	08/12/2013 09:39:39	Uranium-234	HASL 300, 4.5.2	3.03	0.51	0.56	0.08		pCi/l
PZ-203-SS DIS_07_17_2013	13-07152-05	08/12/2013 09:39:39	Uranium-235	HASL 300, 4.5.2	0.31	0.15	0.15	0.10		pCi/l
PZ-203-SS DIS_07_17_2013	13-07152-05	08/12/2013 09:39:39	Uranium-238	HASL 300, 4.5.2	0.88	0.23	0.24	0.06		pCi/l
D-87 TOT_07_17_2013	13-07152-06	08/08/2013 12:51:49	Radium-226	E903.0	2.52	0.76	0.93	0.28		pCi/l
D-87 TOT_07_17_2013	13-07152-06	08/13/2013 10:45:42	Radium-228	E904.0	3.37	0.81	1.11	1.38		pCi/l
D-87 TOT_07_17_2013	13-07152-06	08/13/2013 12:17:51	Thorium-228	HASL 300, 4.5.2	0.55	0.23	0.24	0.16		pCi/l
D-87 TOT_07_17_2013	13-07152-06	08/13/2013 12:17:51	Thorium-230	HASL 300, 4.5.2	1.45	0.41	0.45	0.13		pCi/l
D-87 TOT_07_17_2013	13-07152-06	08/13/2013 12:17:51	Thorium-232	HASL 300, 4.5.2	0.51	0.21	0.22	0.12		pCi/l
D-87 TOT_07_17_2013	13-07152-06	08/12/2013 09:39:40	Uranium-234	HASL 300, 4.5.2	1.05	0.28	0.29	0.06		pCi/l
D-87 TOT_07_17_2013	13-07152-06	08/12/2013 09:39:40	Uranium-235	HASL 300, 4.5.2	0.13	0.11	0.11	0.11	J	pCi/l
D-87 TOT_07_17_2013	13-07152-06	08/12/2013 09:39:40	Uranium-238	HASL 300, 4.5.2	0.47	0.17	0.18	0.06		pCi/l
D-87 DIS_07_17_2013	13-07152-07	08/08/2013 12:51:50	Radium-226	E903.0	2.26	0.76	0.89	0.44		pCi/l
D-87 DIS_07_17_2013	13-07152-07	08/13/2013 10:45:42	Radium-228	E904.0	3.26	0.83	1.11	1.44		pCi/l
D-87 DIS_07_17_2013	13-07152-07	08/13/2013 12:17:52	Thorium-228	HASL 300, 4.5.2	0.06	0.10	0.10	0.17	U	pCi/l
D-87 DIS_07_17_2013	13-07152-07	08/13/2013 12:17:52	Thorium-230	HASL 300, 4.5.2	0.89	0.30	0.32	0.09		pCi/l
D-87 DIS_07_17_2013	13-07152-07	08/13/2013 12:17:52	Thorium-232	HASL 300, 4.5.2	0.09	0.09	0.09	0.12	U	pCi/l
D-87 DIS_07_17_2013	13-07152-07	08/12/2013 09:39:42	Uranium-234	HASL 300, 4.5.2	0.49	0.25	0.25	0.17		pCi/l
D-87 DIS_07_17_2013	13-07152-07	08/12/2013 09:39:42	Uranium-235	HASL 300, 4.5.2	0.31	0.21	0.21	0.15	J	pCi/l
D-87 DIS_07_17_2013	13-07152-07	08/12/2013 09:39:42	Uranium-238	HASL 300, 4.5.2	0.32	0.20	0.20	0.15	J	pCi/l
DUP 06 TOT_07_17_2013	13-07152-08	08/08/2013 12:51:51	Radium-226	E903.0	0.39	0.28	0.29	0.32	J	pCi/l
DUP 06 TOT_07_17_2013	13-07152-08	08/13/2013 10:45:42	Radium-228	E904.0	0.54	0.63	0.64	1.28	U	pCi/l
DUP 06 TOT_07_17_2013	13-07152-08	08/13/2013 12:17:53	Thorium-228	HASL 300, 4.5.2	0.05	0.09	0.09	0.16	U	pCi/l
DUP 06 TOT_07_17_2013	13-07152-08	08/13/2013 12:17:53	Thorium-230	HASL 300, 4.5.2	0.43	0.22	0.23	0.13		pCi/l
DUP 06 TOT_07_17_2013	13-07152-08	08/13/2013 12:17:53	Thorium-232	HASL 300, 4.5.2	0.17	0.14	0.14	0.15	J	pCi/l
DUP 06 TOT_07_17_2013	13-07152-08	08/12/2013 09:39:44	Uranium-234	HASL 300, 4.5.2	1.58	0.35	0.37	0.07		pCi/l
DUP 06 TOT_07_17_2013	13-07152-08	08/12/2013 09:39:44	Uranium-235	HASL 300, 4.5.2	0.25	0.14	0.14	0.11		pCi/l
DUP 06 TOT_07_17_2013	13-07152-08	08/12/2013 09:39:44	Uranium-238	HASL 300, 4.5.2	1.35	0.32	0.33	0.09		pCi/l



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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>CSU</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
DUP 06 DIS_07_17_2013	13-07152-09	08/08/2013 12:51:52	Radium-226	E903.0	0.77	0.39	0.42	0.34		pCi/l
DUP 06 DIS_07_17_2013	13-07152-09	08/13/2013 10:45:43	Radium-228	E904.0	1.44	0.70	0.77	1.34	J	pCi/l
DUP 06 DIS_07_17_2013	13-07152-09	08/13/2013 12:18:11	Thorium-228	HASL 300, 4.5.2	0.10	0.10	0.10	0.12	U	pCi/l
DUP 06 DIS_07_17_2013	13-07152-09	08/13/2013 12:18:11	Thorium-230	HASL 300, 4.5.2	0.53	0.24	0.25	0.13		pCi/l
DUP 06 DIS_07_17_2013	13-07152-09	08/13/2013 12:18:11	Thorium-232	HASL 300, 4.5.2	0.09	0.09	0.09	0.09	U	pCi/l
DUP 06 DIS_07_17_2013	13-07152-09	08/12/2013 09:39:46	Uranium-234	HASL 300, 4.5.2	1.65	0.40	0.42	0.08		pCi/l
DUP 06 DIS_07_17_2013	13-07152-09	08/12/2013 09:39:46	Uranium-235	HASL 300, 4.5.2	0.43	0.21	0.21	0.14		pCi/l
DUP 06 DIS_07_17_2013	13-07152-09	08/12/2013 09:39:46	Uranium-238	HASL 300, 4.5.2	1.45	0.37	0.38	0.09		pCi/l
S-53 TOT_07_18_2013	13-07152-10	08/08/2013 12:51:53	Radium-226	E903.0	4.04	1.06	1.36	0.40		pCi/l
S-53 TOT_07_18_2013	13-07152-10	08/13/2013 10:45:42	Radium-228	E904.0	2.66	0.84	1.03	1.51		pCi/l
S-53 TOT_07_18_2013	13-07152-10	08/13/2013 12:18:13	Thorium-228	HASL 300, 4.5.2	2.02	0.55	0.58	0.08		pCi/l
S-53 TOT_07_18_2013	13-07152-10	08/13/2013 12:18:13	Thorium-230	HASL 300, 4.5.2	2.52	0.64	0.71	0.12		pCi/l
S-53 TOT_07_18_2013	13-07152-10	08/13/2013 12:18:13	Thorium-232	HASL 300, 4.5.2	1.90	0.52	0.55	0.08		pCi/l
S-53 TOT_07_18_2013	13-07152-10	08/12/2013 09:39:49	Uranium-234	HASL 300, 4.5.2	5.90	1.00	1.08	0.11		pCi/l
S-53 TOT_07_18_2013	13-07152-10	08/12/2013 09:39:49	Uranium-235	HASL 300, 4.5.2	1.31	0.38	0.39	0.10		pCi/l
S-53 TOT_07_18_2013	13-07152-10	08/12/2013 09:39:49	Uranium-238	HASL 300, 4.5.2	5.18	0.90	0.97	0.10		pCi/l
S-53 DIS_07_18_2013	13-07152-11	08/08/2013 12:51:54	Radium-226	E903.0	0.22	0.23	0.24	0.33	U	pCi/l
S-53 DIS_07_18_2013	13-07152-11	08/13/2013 10:45:42	Radium-228	E904.0	0.94	0.71	0.74	1.42	J	pCi/l
S-53 DIS_07_18_2013	13-07152-11	08/13/2013 12:18:15	Thorium-228	HASL 300, 4.5.2	0.00	0.05	0.05	0.17	U	pCi/l
S-53 DIS_07_18_2013	13-07152-11	08/13/2013 12:18:15	Thorium-230	HASL 300, 4.5.2	0.51	0.25	0.25	0.12		pCi/l
S-53 DIS_07_18_2013	13-07152-11	08/13/2013 12:18:15	Thorium-232	HASL 300, 4.5.2	0.12	0.11	0.11	0.10	J	pCi/l
S-53 DIS_07_18_2013	13-07152-11	08/12/2013 09:39:50	Uranium-234	HASL 300, 4.5.2	5.19	0.79	0.88	0.07		pCi/l
S-53 DIS_07_18_2013	13-07152-11	08/12/2013 09:39:50	Uranium-235	HASL 300, 4.5.2	0.62	0.22	0.22	0.07		pCi/l
S-53 DIS_07_18_2013	13-07152-11	08/12/2013 09:39:50	Uranium-238	HASL 300, 4.5.2	5.06	0.78	0.86	0.09		pCi/l
D-14 TOT_07_18_2013	13-07152-12	08/08/2013 12:51:55	Radium-226	E903.0	2.22	0.77	0.90	0.32		pCi/l
D-14 TOT_07_18_2013	13-07152-12	08/13/2013 10:45:43	Radium-228	E904.0	3.13	0.86	1.11	1.48		pCi/l
D-14 TOT_07_18_2013	13-07152-12	08/13/2013 12:18:16	Thorium-228	HASL 300, 4.5.2	0.66	0.24	0.25	0.10		pCi/l
D-14 TOT_07_18_2013	13-07152-12	08/13/2013 12:18:16	Thorium-230	HASL 300, 4.5.2	0.97	0.31	0.33	0.09		pCi/l
D-14 TOT_07_18_2013	13-07152-12	08/13/2013 12:18:16	Thorium-232	HASL 300, 4.5.2	0.72	0.25	0.26	0.11		pCi/l
D-14 TOT_07_18_2013	13-07152-12	08/12/2013 09:39:53	Uranium-234	HASL 300, 4.5.2	0.55	0.29	0.29	0.23		pCi/l
D-14 TOT_07_18_2013	13-07152-12	08/12/2013 09:39:53	Uranium-235	HASL 300, 4.5.2	0.30	0.23	0.23	0.23	J	pCi/l
D-14 TOT_07_18_2013	13-07152-12	08/12/2013 09:39:53	Uranium-238	HASL 300, 4.5.2	0.68	0.33	0.33	0.23		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>CSU</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
D-14 DIS_07_18_2013	13-07152-13	08/08/2013 12:51:56	Radium-226	E903.0	1.21	0.52	0.58	0.41		pCi/l
D-14 DIS_07_18_2013	13-07152-13	08/13/2013 10:45:43	Radium-228	E904.0	2.40	0.65	0.85	1.10		pCi/l
D-14 DIS_07_18_2013	13-07152-13	08/13/2013 12:18:19	Thorium-228	HASL 300, 4.5.2	0.08	0.09	0.09	0.11	U	pCi/l
D-14 DIS_07_18_2013	13-07152-13	08/13/2013 12:18:19	Thorium-230	HASL 300, 4.5.2	0.87	0.30	0.32	0.09		pCi/l
D-14 DIS_07_18_2013	13-07152-13	08/13/2013 12:18:19	Thorium-232	HASL 300, 4.5.2	0.09	0.09	0.09	0.08	U	pCi/l
D-14 DIS_07_18_2013	13-07152-13	08/12/2013 09:39:55	Uranium-234	HASL 300, 4.5.2	0.99	0.46	0.47	0.22		pCi/l
D-14 DIS_07_18_2013	13-07152-13	08/12/2013 09:39:55	Uranium-235	HASL 300, 4.5.2	0.34	0.30	0.30	0.34	J	pCi/l
D-14 DIS_07_18_2013	13-07152-13	08/12/2013 09:39:55	Uranium-238	HASL 300, 4.5.2	0.32	0.26	0.26	0.29	J	pCi/l
PZ-205-AS TOT_07_18_2013	13-07152-14	08/08/2013 14:54:37	Radium-226	E903.0	2.94	0.77	0.99	0.28		pCi/l
PZ-205-AS TOT_07_18_2013	13-07152-14	08/13/2013 10:43:36	Radium-228	E904.0	0.92	0.67	0.70	1.33	J	pCi/l
PZ-205-AS TOT_07_18_2013	13-07152-14	08/13/2013 12:18:21	Thorium-228	HASL 300, 4.5.2	0.90	0.31	0.32	0.11		pCi/l
PZ-205-AS TOT_07_18_2013	13-07152-14	08/13/2013 12:18:21	Thorium-230	HASL 300, 4.5.2	1.44	0.42	0.45	0.11		pCi/l
PZ-205-AS TOT_07_18_2013	13-07152-14	08/13/2013 12:18:21	Thorium-232	HASL 300, 4.5.2	0.79	0.28	0.29	0.08		pCi/l
PZ-205-AS TOT_07_18_2013	13-07152-14	08/12/2013 09:39:58	Uranium-234	HASL 300, 4.5.2	0.79	0.33	0.34	0.18		pCi/l
PZ-205-AS TOT_07_18_2013	13-07152-14	08/12/2013 09:39:58	Uranium-235	HASL 300, 4.5.2	0.11	0.15	0.15	0.23	U	pCi/l
PZ-205-AS TOT_07_18_2013	13-07152-14	08/12/2013 09:39:58	Uranium-238	HASL 300, 4.5.2	0.88	0.35	0.36	0.18		pCi/l
PZ-205-AS DIS_07_18_2013	13-07152-15	08/08/2013 14:54:38	Radium-226	E903.0	1.31	0.49	0.56	0.33		pCi/l
PZ-205-AS DIS_07_18_2013	13-07152-15	08/13/2013 10:43:36	Radium-228	E904.0	1.24	0.74	0.79	1.45	J	pCi/l
PZ-205-AS DIS_07_18_2013	13-07152-15	08/13/2013 12:18:24	Thorium-228	HASL 300, 4.5.2	0.02	0.05	0.05	0.10	U	pCi/l
PZ-205-AS DIS_07_18_2013	13-07152-15	08/13/2013 12:18:24	Thorium-230	HASL 300, 4.5.2	0.62	0.23	0.24	0.09		pCi/l
PZ-205-AS DIS_07_18_2013	13-07152-15	08/13/2013 12:18:24	Thorium-232	HASL 300, 4.5.2	0.11	0.09	0.09	0.08	J	pCi/l
PZ-205-AS DIS_07_18_2013	13-07152-15	08/12/2013 09:40:00	Uranium-234	HASL 300, 4.5.2	0.99	0.47	0.47	0.20		pCi/l
PZ-205-AS DIS_07_18_2013	13-07152-15	08/12/2013 09:40:00	Uranium-235	HASL 300, 4.5.2	0.46	0.34	0.34	0.24	J	pCi/l
PZ-205-AS DIS_07_18_2013	13-07152-15	08/12/2013 09:40:00	Uranium-238	HASL 300, 4.5.2	1.08	0.49	0.50	0.20		pCi/l
I-65 TOT_07_18_2013	13-07152-16	08/08/2013 14:54:33	Radium-226	E903.0	1.40	0.58	0.65	0.45		pCi/l
I-65 TOT_07_18_2013	13-07152-16	08/13/2013 10:43:37	Radium-228	E904.0	1.12	0.70	0.74	1.37	J	pCi/l
I-65 TOT_07_18_2013	13-07152-16	08/13/2013 12:18:26	Thorium-228	HASL 300, 4.5.2	0.39	0.19	0.20	0.12		pCi/l
I-65 TOT_07_18_2013	13-07152-16	08/13/2013 12:18:26	Thorium-230	HASL 300, 4.5.2	0.44	0.20	0.21	0.11		pCi/l
I-65 TOT_07_18_2013	13-07152-16	08/13/2013 12:18:26	Thorium-232	HASL 300, 4.5.2	0.15	0.11	0.11	0.09	J	pCi/l
I-65 TOT_07_18_2013	13-07152-16	08/12/2013 09:40:02	Uranium-234	HASL 300, 4.5.2	1.62	0.42	0.44	0.10		pCi/l
I-65 TOT_07_18_2013	13-07152-16	08/12/2013 09:40:02	Uranium-235	HASL 300, 4.5.2	0.60	0.26	0.27	0.16		pCi/l
I-65 TOT_07_18_2013	13-07152-16	08/12/2013 09:40:02	Uranium-238	HASL 300, 4.5.2	1.28	0.36	0.38	0.10		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>CSU</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
I-65 DIS_07_18_2013	13-07152-17	08/08/2013 14:54:34	Radium-226	E903.0	0.29	0.20	0.21	0.15	J	pCi/l
I-65 DIS_07_18_2013	13-07152-17	08/13/2013 10:43:37	Radium-228	E904.0	1.24	0.65	0.71	1.25	J	pCi/l
I-65 DIS_07_18_2013	13-07152-17	08/13/2013 12:18:28	Thorium-228	HASL 300, 4.5.2	0.02	0.04	0.04	0.08	U	pCi/l
I-65 DIS_07_18_2013	13-07152-17	08/13/2013 12:18:28	Thorium-230	HASL 300, 4.5.2	0.49	0.21	0.22	0.13		pCi/l
I-65 DIS_07_18_2013	13-07152-17	08/13/2013 12:18:28	Thorium-232	HASL 300, 4.5.2	0.01	0.07	0.07	0.16	U	pCi/l
I-65 DIS_07_18_2013	13-07152-17	08/12/2013 09:40:04	Uranium-234	HASL 300, 4.5.2	1.09	0.27	0.28	0.06		pCi/l
I-65 DIS_07_18_2013	13-07152-17	08/12/2013 09:40:04	Uranium-235	HASL 300, 4.5.2	0.17	0.11	0.11	0.07	J	pCi/l
I-65 DIS_07_18_2013	13-07152-17	08/12/2013 09:40:04	Uranium-238	HASL 300, 4.5.2	0.93	0.25	0.26	0.08		pCi/l
D-13 TOT_07_18_2013	13-07152-18	08/08/2013 14:54:35	Radium-226	E903.0	0.78	0.34	0.38	0.21		pCi/l
D-13 TOT_07_18_2013	13-07152-18	08/13/2013 10:43:42	Radium-228	E904.0	1.87	0.65	0.77	1.18		pCi/l
D-13 TOT_07_18_2013	13-07152-18	08/13/2013 12:18:31	Thorium-228	HASL 300, 4.5.2	0.24	0.16	0.16	0.13	J	pCi/l
D-13 TOT_07_18_2013	13-07152-18	08/13/2013 12:18:31	Thorium-230	HASL 300, 4.5.2	0.89	0.33	0.35	0.10		pCi/l
D-13 TOT_07_18_2013	13-07152-18	08/13/2013 12:18:31	Thorium-232	HASL 300, 4.5.2	0.09	0.10	0.10	0.14	U	pCi/l
D-13 TOT_07_18_2013	13-07152-18	08/12/2013 09:40:07	Uranium-234	HASL 300, 4.5.2	0.29	0.14	0.14	0.06		pCi/l
D-13 TOT_07_18_2013	13-07152-18	08/12/2013 09:40:07	Uranium-235	HASL 300, 4.5.2	0.15	0.11	0.11	0.11	J	pCi/l
D-13 TOT_07_18_2013	13-07152-18	08/12/2013 09:40:07	Uranium-238	HASL 300, 4.5.2	0.10	0.08	0.08	0.07	J	pCi/l
D-13 DIS_07_18_2013	13-07152-19	08/08/2013 14:54:36	Radium-226	E903.0	1.09	0.40	0.46	0.24		pCi/l
D-13 DIS_07_18_2013	13-07152-19	08/13/2013 10:43:43	Radium-228	E904.0	2.30	0.69	0.86	1.21		pCi/l
D-13 DIS_07_18_2013	13-07152-19	08/13/2013 12:18:34	Thorium-228	HASL 300, 4.5.2	0.17	0.13	0.13	0.13	J	pCi/l
D-13 DIS_07_18_2013	13-07152-19	08/13/2013 12:18:34	Thorium-230	HASL 300, 4.5.2	0.98	0.34	0.36	0.12		pCi/l
D-13 DIS_07_18_2013	13-07152-19	08/13/2013 12:18:34	Thorium-232	HASL 300, 4.5.2	0.22	0.15	0.15	0.12	J	pCi/l
D-13 DIS_07_18_2013	13-07152-19	08/12/2013 12:54:38	Uranium-234	HASL 300, 4.5.2	0.44	0.18	0.19	0.09		pCi/l
D-13 DIS_07_18_2013	13-07152-19	08/12/2013 12:54:38	Uranium-235	HASL 300, 4.5.2	0.27	0.16	0.16	0.12	J	pCi/l
D-13 DIS_07_18_2013	13-07152-19	08/12/2013 12:54:38	Uranium-238	HASL 300, 4.5.2	0.20	0.12	0.12	0.10	J	pCi/l



EBERLINE ANALYTICAL CORPORATION

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



QA/QC REVIEWED

Date 1/16/95 Initials WA

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

U-8

Radionuclide: U-238NAT Customer: TMA EBERLINE  
Half Life:  $(4.468 \pm 0.005) \times 10^9$  years P.O.No.: OR2778  
Catalog No.: 7338 Reference Date: January 1 1995 12:00 PST.  
Source No.: 479-50 Contained Radioactivity: (Total U) 8.016  $\mu$ Ci  
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  $\mu$ 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).

  
ERIC ALLAS  
QUALITY CONTROL

29 DECEMBER 1994  
Date Signed



ISOTOPE PRODUCTS LABORATORIES  
3017 N. SAN FERNANDO BLVD.  
BURBANK, CALIFORNIA 91504  
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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 [Signature]

Date: 9/26/2012 0:00

QC Approval [Signature]

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  
**234, 235, 238 U**

Half Life, Years  
**4.468E+09**

Half Life, Days  
**1.632E+12**

Radionuclide of Interest **234, 235, 238 U**  
Parent Solution Conc. **1.7796E+04 dpm/ml**

Reference Date **1/1/1995 0:00**

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 Volume: **1000.00 ml**

Final Activity Concentration: **7.1182E+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.

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

# RECORD COPY

## Tracer Solution for Environmental Analysis & Disequilibrium Studies

### Product Description & Measurement Certificate

*Description* Principal radionuclide: **uranium 232 (U-232)** Product code: **UDP10050**  
Daughter Nuclide: **Th-228** Batch Number: **92/232/67**

*Measurement* Reference date: **01 March 2000**  
Radioactive concentration U-232 **6.739E+03 becquerels per gram of solution**  
which is equivalent to **1.821E-01 microcuries per gram of solution**  
Mass of solution **5.356 grams**  
Volume of solution **5.035 millilitres**  
Total activity of U-232 **3.61E+04 becquerels**  
which is equivalent to **9.76E-01 microcuries**

*Accuracy* 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.

*Radiometric Purity* 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

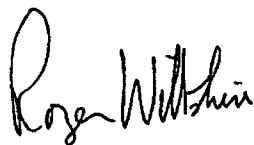
*Isotopic Purity* The isotopic composition, expressed as atom per cent at the reference date .  
  
Not measured

*Chemical Composition* 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'.

*Physical Data* 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.

*Remarks* 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.



# 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

CURRENT DATE 12/13/2012 0:00

SOLUTION REFERENCE # AEA/Amersham 92/232/67

SOLUTION # U-10

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>232</sup>U

7.200E+01

2.630E+04

Radionuclide

<sup>232</sup>U

Reference Date

3/1/2000 0:00

Certified Activity 9.760E-01  $\mu$ Ci

Certified Concentration  $\mu$ Ci per gram

Ampoule /Solution Gross

Weight, Grams

Empty Ampoule

Weight, Grams

Solution Net

Weight, Grams

Total Activity in Ampoule 0.9760  $\mu$ 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  $\mu$ 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

Date: 12/13/2012 0:00

QC Approval

Date: 12/13/12



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 AEA/Amersham 92/232/67 Date 12/7/2012 0:00  
Solution # U-10a

Principal Radionuclide <sup>232</sup>U Half Life, Years 7.200E+01 Half Life, Days 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 Activity Concentration: 2.1670E+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: December 7, 2013

Verified & Approved By [Signature]

Date: 12/13/2012 0:00

QC Approval [Signature]

Date: 12/13/12

US EPA ARCHIVE DOCUMENT

QA/QC REVIEWED

Date 10/14/91 Initials ut

**CERTIFICATE OF CALIBRATION  
ALPHA STANDARD SOLUTION**

Received  
OCT 14 1991  
TMA/Eberline  
Oak Ridge Lab

Radionuclide: Th-230  
Half Life:  $(7.54 \pm 0.03) \times 10^4$  years  
Catalog No.: 7230  
Source No.: 388-116

Customer: TMA EBERLINE  
P.O.No.: TT4944  
Reference Date: November 1 1991 12:00 PST.  
Contained Radioactivity: 1.036  $\mu$ Ci.

**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  $\mu$ Ci/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)



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*[Signature]*  
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**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 Date 3/4/2013 0:00  
IPL 388-116 Solution # Th-1b

Principal Radionuclide	Half Life, Years	Half Life, Days
<sup>230</sup> Th	7.540E+04	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: [Signature]

Date: 3/21/2013 0:00

Verified & Approved By: [Signature]

Date: 3/21/13

QC Approval: [Signature]

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

CURRENT DATE 3/4/2013 0:00

SOLUTION REFERENCE # IPL 388-116

SOLUTION # Th-1

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>230</sup>Th

7.540E+04

2.754E+07

Radionuclide <sup>230</sup>Thorium

Reference Date 11/1/1991 0:00

Certified Activity 1.036E+00  $\mu$ Ci

Certified Concentration  $\mu$ Ci per gram

Ampoule /Solution Gross 9.2660 Weight, Grams

Empty Ampoule 4.6218 Weight, Grams

Solution Net 4.6442 Weight, Grams

Total Activity in Ampoule 1.0360  $\mu$ 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  $\mu$ 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

*Anna U. Khan*  
 \_\_\_\_\_  
 QUALITY CONTROL

*Nov. 8, 1993*  
 \_\_\_\_\_  
 Date Signed

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 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 11/1/1993 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



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

MP-009		Date	11/9/2012 0:00
Solution Reference #	IPL 435-104-2	Solution #	Th-8b
Principal Radionuclide	Half Life, Years	Half Life, Days	
228 & 232 Th	1.405E+10	5.132E+12	
Radionuclide of Interest	Reference Date		
228 & 232 Th	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 Volume: 1000.00 ml  
Final Activity Concentration: 1.0355E+02 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: October 9, 2013

Verified & Approved By 

Date: 11/9/2012 0:00

QC Approval 

Date: 11/12/12

US EPA ARCHIVE DOCUMENT

## 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.

  
Quality Control

9-Jan-02  
Date Signed

IPL Ref. No.: 867-54

ISO 9001 CERTIFIED



**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>229</sup>Th Half Life, Years 7.340E+03 Half Life, Days 2.681E+06

Radionuclide <sup>229</sup>Th Reference Date 1/15/2002 0:00  
Certified Activity 1.013E+00  $\mu\text{Ci}$   
Certified Concentration 1.0130  $\mu\text{Ci per gram}$

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>229</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



**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 Date 11/9/2012 0:00  
IPL 867-54 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: 10.0000 ml  
Total Activity: 2.2490E+04 dpm Final Activity Concentration: 2.2490E+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: October 9, 2013

Verified & Approved By [Signature]

Date: 11/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12





Ba-6  
(f ba)

# National Institute of Standards & Technology Certificate

## Standard Reference Material 4251C Barium-133 Radioactivity Standard

ORIGINAL

ORIGINAL

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





**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

SOLUTION REFERENCE # NIST SRM4251C CURRENT DATE 6/16/2013 0:00  
SOLUTION # Ba-6

Principal Radionuclide <sup>133</sup>Barium Half Life, Years 1.048E+01 Half Life, Days 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: June 16, 2014

Verified & Approved By 

Date: 7/1/13

QC Approval 

Date: 7/2/13



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 6/18/13  
NIST SRM4251C      Solution # Ba-6a

Principal Radionuclide <sup>133</sup>Ba      Half Life, Years 1.048E+01      Half Life, Days 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: June 18, 2014

Verified & Approved By [Signature]

Date: 7/1/13

QC Approval [Signature]

Date: 7/2/13

US EPA ARCHIVE DOCUMENT

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

<sup>Ra-5</sup>  
QA/QC REVIEWED  
Date 2/8/94 Initials WT

Radionuclide:	Ra-226	Customer:	TMA EBERLINE
Half Life:	1600 ± 7 years	P.O.No.:	VH1888
Catalog No.:	7226	Reference Date:	February 1 1994 12:00 PST.
Source No.:	453-26	Contained Radioactivity: (Ra-226)	1.001 μCi.
		Contained Radioactivity: (Ra-226)	37.0 kBq.

### Description of Solution

- a. Mass of solution: 5.1864 g (in a 5 ml Flame Sealed Ampoule)
- b. Chemical form: Ra(NO3)2 in 1 N HNO3
- c. Carrier content: None added
- d. Density: 1.0318 g/ml @ 20°C.

Radioimpurities: None detected (other than daughters)

### Radioactive Daughters

Rn-222, Po-218, At-218, Pb-214, Bi-214, Po-214, Tl-210, Pb-210, Bi-210, Po-210 and Tl-206.

### Radionuclide Concentration

(Ra-226) 0.1929 μCi/g.

### Method of Calibration

Weighed aliquots of the solution were assayed using gamma spectrometry:

Energy peak(s) integrated under: 186 keV.

Branching ratio(s) used: 0.0351 gamma rays per decay.

### Uncertainty of Measurement

- a. Systematic uncertainty in instrument calibration: ±3.4%
- b. Random uncertainty in assay: ±3.1%
- c. Random uncertainty in weighing(s): ±0.2%
- d. Total uncertainty at the 99% confidence level: ±4.6%

### 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  
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Anna H. Kuen  
 QUALITY CONTROL  
Feb. 3, 1994  
 Date Signed



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                      Weight, Grams  
Empty Ampoule                      Weight, Grams  
Solution Net                      Weight, Grams  
Total Activity in Ampoule 1.0010  $\mu\text{Ci}$

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   
QC Approval

Date: 11/9/2012  
Date: 11/12/12



**QUALITY CONTROL PROGRAM**  
MP 009

Rev. 6; 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	Half Life, Years	Half Life, Days
<sup>226</sup> Radium	1.600E+03	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: <u>20.0000</u> ml	Final Activity Concentration: <u>4.4440E+01</u> dpm/ml
Total Activity: <u>4.4440E+04</u> dpm	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.
Final Volume: <u>1000.00</u> ml	

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:

PCW 11/7/01

*New vial from the 4/11/01 shipment.  
P.S. Different activity level 8/19/11*

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  
RECERTIFICATION  
MP 009

SOLUTION REFERENCE # Analytics 62680-416 CURRENT DATE 3/11/2013 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  $\mu$ Ci  
Certified Concentration           $\mu$ 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  $\mu$ 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  $\mu$ 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: March 26, 2014

Recertified By [Signature]

Date: 5/30/13

QC Approval [Signature]

Date: 5/30/13

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



WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07152</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	1.83	86.57%	16.38%	100.00%	3.60%	8.17E+00	2.94E-01	7.07E+00	1.16E+00	U-8a	3.52E+01	3.60E+00	5.15E-01
U-238	0.36	103.08%	16.01%	100.00%	3.60%	7.96E+00	2.87E-01	8.21E+00	1.31E+00	U-8a	3.44E+01	3.60E+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**

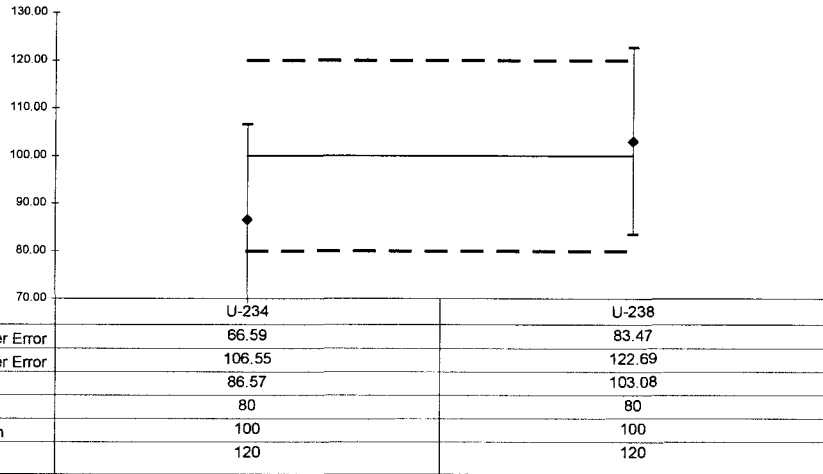
**QC Summary**

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
U-234	0.26	3.75	2.86E+00	5.61E-01	2.76E+00	5.72E-01	0.87	OK	OK			NA	OK
U-238	2.56	66.95	3.98E-01	1.61E-01	7.98E-01	2.60E-01	1.03	OK	OK			NA	OK
U-235	0.46	19.48	2.16E-01	1.29E-01	2.62E-01	1.51E-01		OK	OK			NA	OK

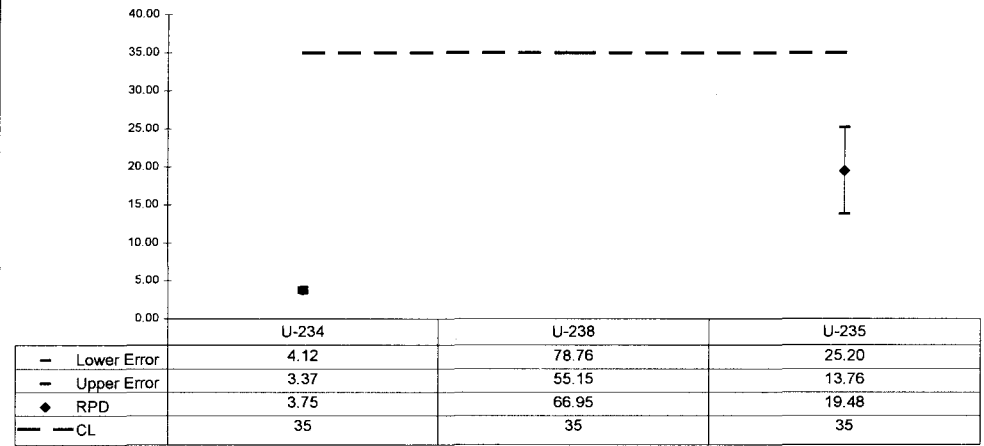


WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07152</b>	<b>UUISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

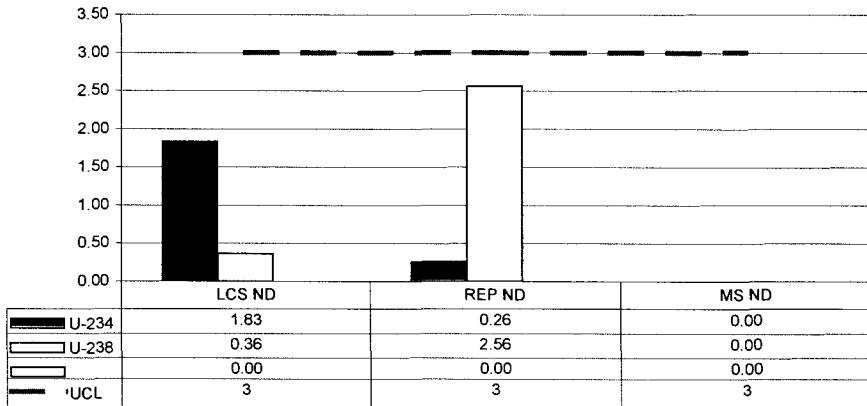
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

0051

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07152</b>	<b>ThISO</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)
TH-228	0.15	101.49%	18.91%	100.00%	3.60%	4.97E+00	1.79E-01	5.05E+00	9.54E-01	Th-8b	1.04E+02	3.60E+00	1.07E-01
TH-230	0.58	106.36%	20.16%	100.00%	2.70%	5.50E+00	1.48E-01	5.85E+00	1.18E+00	Th-1b	2.35E+01	2.70E+00	5.19E-01
TH-232	0.30	97.20%	18.75%	100.00%	3.60%	4.97E+00	1.79E-01	4.83E+00	9.06E-01	Th-8b	1.04E+02	3.60E+00	1.07E-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)

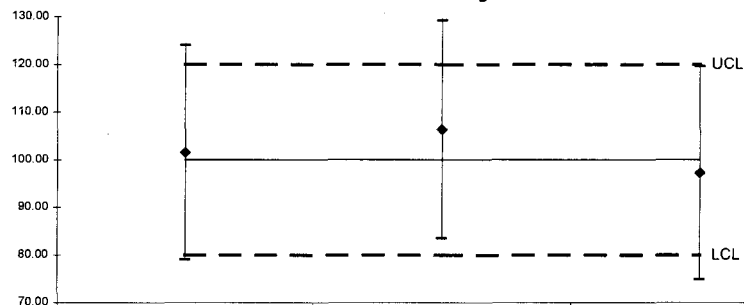
**Replicate Sample**

**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
TH-228	0.55	774.04	-6.51E-03	5.21E-02	1.10E-02	3.38E-02	1.01	OK	OK			NA	OK
TH-230	0.15	4.26	5.81E-01	2.33E-01	5.57E-01	2.24E-01	1.06	OK	OK			OK	OK
TH-232	0.81	57.34	1.03E-01	8.96E-02	5.68E-02	6.55E-02	0.97	OK	OK			NA	OK

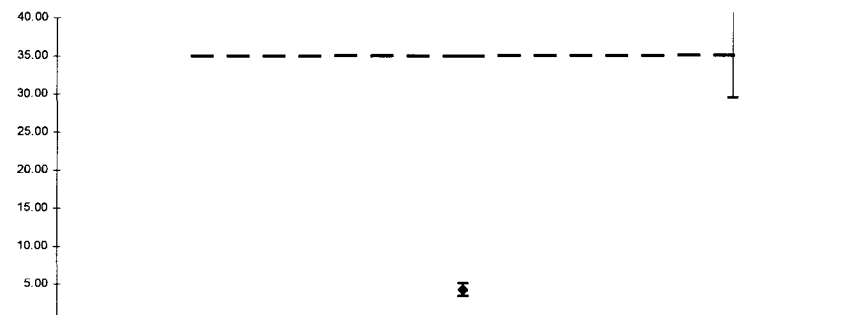
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07152</b>	<b>ThISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

### LCS % Recovery



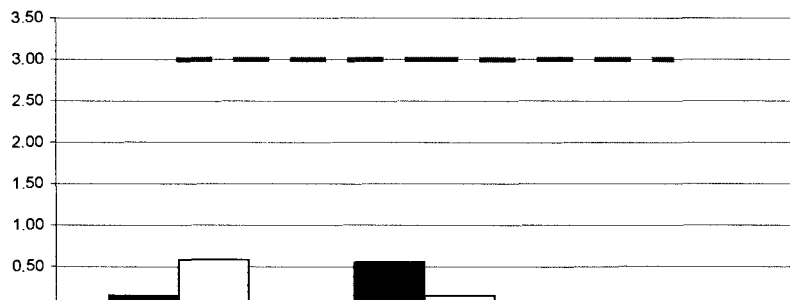
	TH-228	TH-230	TH-232
- Lower Error	78.97	83.50	74.85
- Upper Error	124.00	129.22	119.55
◆ %R	101.49	106.36	97.20
- LCL	80	80	80
- Mean	100	100	100
- UCL	120	120	120

### Replicate Sample RPD



	TH-228	TH-230	TH-232
- Lower Error	8102.71	5.11	85.25
- Upper Error	-6554.62	3.40	29.44
◆ RPD	774.04	4.26	57.34
- CL	35	35	35

### Normalized Difference



	LCS ND	REP ND	MS ND
■ TH-228	0.15	0.55	0.00
□ TH-230	0.58	0.15	0.00
- UCL	3	3	3

### No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07152</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	0.36	104.66%	24.10%	100.00%	4.60%	1.03E+01	4.73E-01	1.08E+01	2.59E+00	Ra-5b	4.41E+01	4.60E+00	5.18E-01

**Matrix Spike**

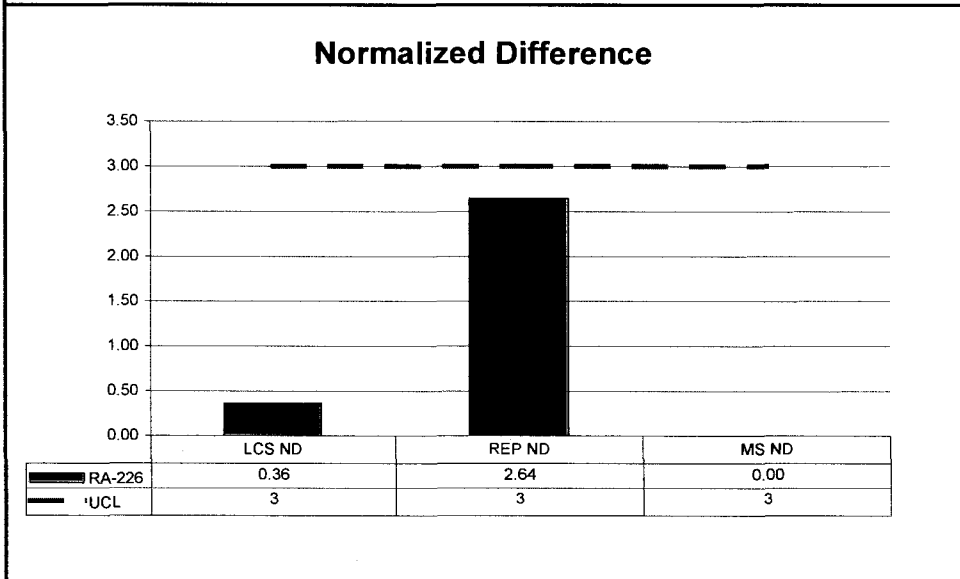
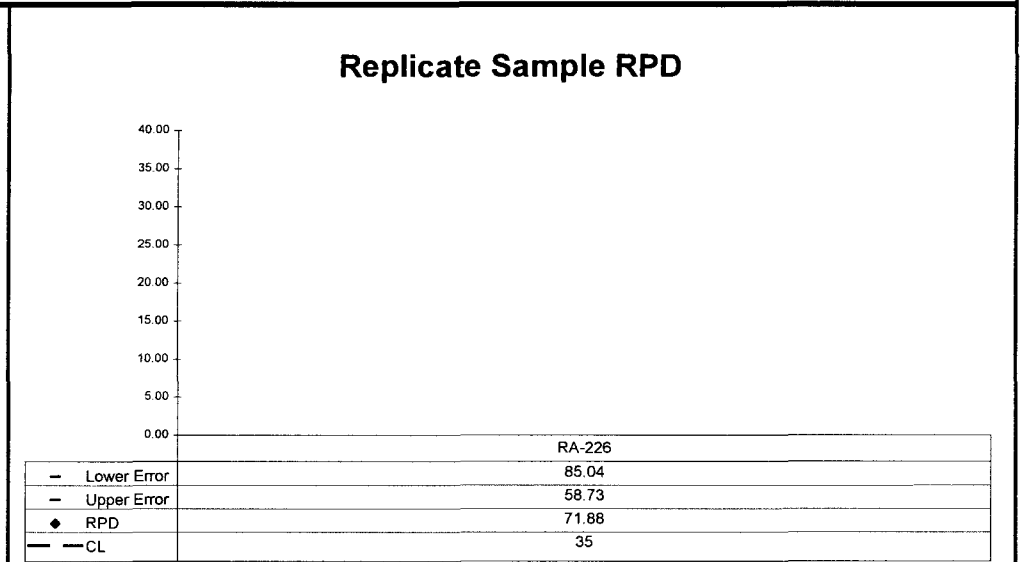
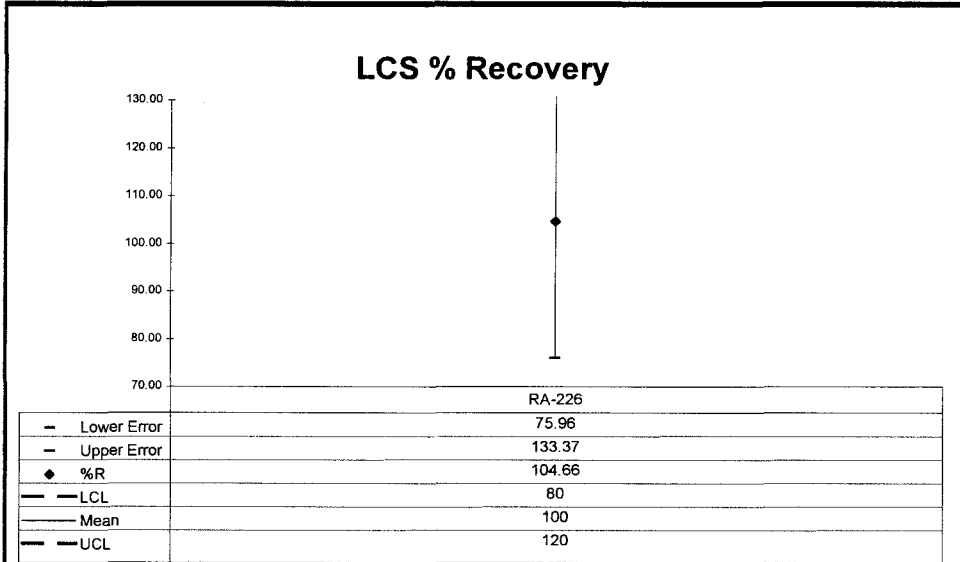
Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS CSU	Sample Result	Sample CSU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

**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	2.64	71.88	2.31E+00	7.74E-01	1.09E+00	4.68E-01	1.05	OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07152</b>	<b>Ra226</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>



## No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07152	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	0.49	92.97%	30.27%	100.00%	5.10%	8.83E+00	4.50E-01	8.21E+00	2.48E+00	Ra-11	3.77E+01	5.10E+00	5.20E-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)

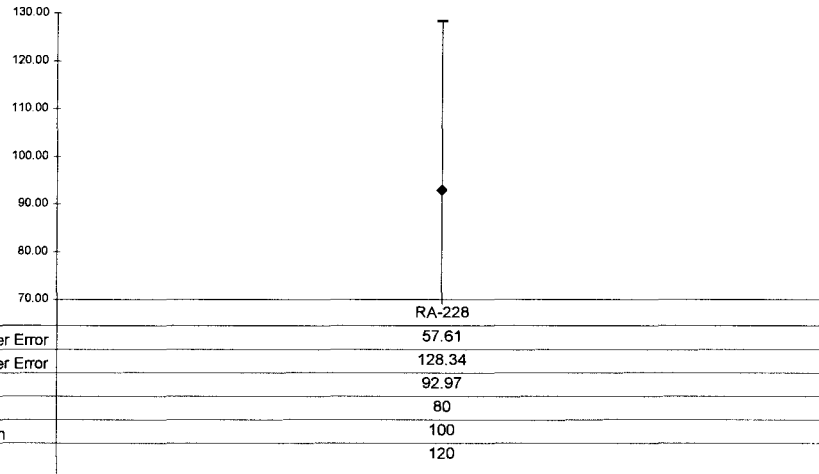
**Replicate Sample**

**QC Summary**

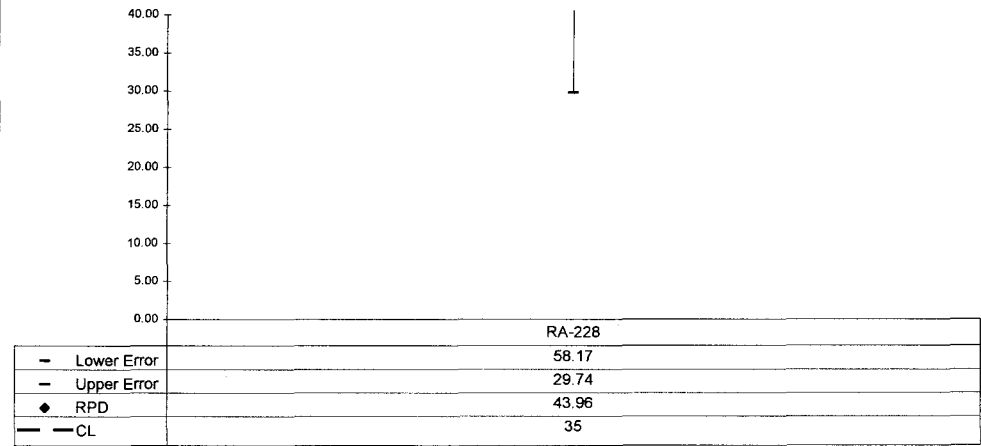
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-228	0.94	43.96	1.19E+00	6.16E-01	7.64E-01	6.51E-01	0.93	OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07152</b>	<b>Ra228</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

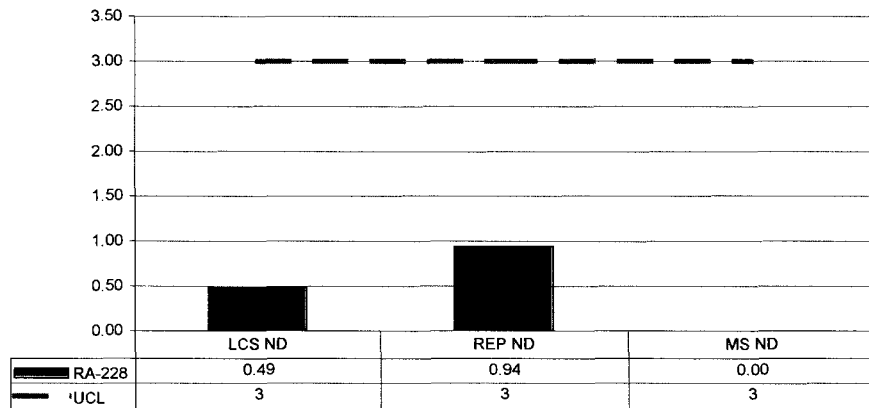
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

0057



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


**ISO U 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	13-07152
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/06/13 12:22	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 6,7,10 AND 12-15 WITH HNO3- DRIED SAMPLES DOWN

*J Wolfe*  
8/6/13


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	13-07152
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/06/13 12:22	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 6,7,10 AND 12-15 WITH HNO3- DRIED SAMPLES DOWN
2	08/09/13 17:21	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.

*John Demelas*  
8/9/13

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	13-07152
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/06/13 12:22	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 6,7,10 AND 12-15 WITH HNO3- DRIED SAMPLES DOWN
2	08/09/13 17:21	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	08/12/13 05:46	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.

*RM*  
*8/12/13*

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

13-07152

Analysis Code

Run

UUISO

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/6/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/9/2013
014230S	HCl - HF	6.5N - 0.04N	JDEMELAS	8/9/2013
014142D01	Hydrochloric Acid	0.5N	JDEMELAS	8/9/2013
014199S	Hydrochloric Acid	6.5N	JDEMELAS	8/9/2013
014237S	Hydrochloric Acid	8N	JDEMELAS	8/9/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/9/2013
014242S	HCl - NH4I	8N - 0.1M	JDEMELAS	8/9/2013
014042S	Carbon substrate	Solution	RMARTZ	8/12/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/12/2013
013191S	Neodymium Carrier	1 mg/ml	RMARTZ	8/12/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/12/2013
014220P	Titanous Chloride	Reagent Grade	RMARTZ	8/12/2013

Date	Jump #	Client	Facility	CTime	Min	Max	Deal
8/6/13	Daily Pulse	LAB	0528	1hr	---	---	
8/6/13	1707171A(4,6)	UWON	0936	2hrs	Amz	---	
8/6/13	1308006A(1-4)	UWON	0977	2hrs	Utz	---	
8/6/13	1307170A(1-7)	United	0978	2hrs	Utz	---	
8/6/13	1307171A(3-4,6)	UWON	1245	2hrs	Amz	KB	
8/6/13	1307144A(1-6)	EMS	1246	2hrs	Th	KB	
8/6/13	1307172A(3-4)	UWON	1434	2hrs	Rob	KB	
8/6/13	1307147A(1-7)	EMS	1635	2hrs	Rob	KB	
8/7/13	Daily Pulse	LAB	0572	1hr	---	---	
8/7/13	1708016A(5)	Limited	0914	2hrs	Utz	---	
8/7/13	1707110B(1-7,10)	EngMan	0915	2hrs	Utz	---	
8/7/13	1307185A(1-4)	Wastren Adv.	0916	2hrs	Phy	---	
8/7/13	1307185A(1-4)	Wastren	1244	2hrs	Amz	KB	
8/7/13	1307172A(1-4)	UWON	1244	2hrs	Amz	KB	
8/7/13	1307146A(1)	EMS	1246	2hrs	Amz	KB	
8/7/13	1307172A(4)	UWON	1605	2hrs	Amz	KB	
8/7/13	1307149A(1-9)	EMS	1606	2hrs	Rob	KB	
8/8/13	Daily Pulse	LAB	0578	1hr	---	---	
8/8/13	1707193B(1-4,7)	UWON	0951	2hrs	Phy	---	
8/8/13	1307109A(1-4)	UWON	0952	2hrs	Phy	---	
8/8/13	1707116B(1-7)	UWON	0953	2hrs	Phy	---	
8/8/13	1307172A(1-13)	EngMan	1252	2hrs	Rob	---	
8/9/13	Daily Pulse	LAB	0506	1hr	---	---	
8/9/13	1707114A(7)	EngMan	0926	2hrs	Rob	---	
8/9/13	1707186A(1-4)	UWON	0927	2hrs	Amz	---	
8/9/13	1707186A(1-4)	UWON	0927	2hrs	Amz	---	
8/9/13	SEC CAL	Lab	1228	2 1/2 hrs	---	KB	
8/9/13	System Bkqd	Lab	1624	16.40 hrs	---	KB	
8/10/13	Daily Pulse	Lab	1123	10min	---	AG	
8/12/13	Daily Pulse	LAB	0515	1hr	---	---	
8/12/13	1707171A(4,6,9)	UWON	0977	2hrs	Phy	---	
8/12/13	1707171A(4,6)	UWON	0978	2hrs	Phy	---	
8/12/13	1707172A(1-7)	EngMan	0978	2hrs	Utz	---	

# Alpha # 3

Date	Sample #	Client	Food Item	OT Item	Analysis	Test
8/9/17	Daily Pulser	VMS	0506	1m	1m	-
8/9/17	SECCAL	VMS	0522	2hr	1m	-
8/9/17	1307149A(1-12)	Eng. Man	0904	2hr	1m	c
8/9/13	1307146A(4)	UWR	1204	2hr	Np	KP
8/9/13	1308003A(1-9)	Access	1209	2hr	1m	KP
8/9/13	System Bkgd	Lab	1624	16.40 hrs	2	KP
8/10/13	Daily Pulser	Lab	1123	10 mn	NA	AG
8/10/13	1307147A(9-19)	Eng. Manage	1502	2hr	150-Th	AG
8/10/17	Daily Pulser	VMS	0519	1m	1m	-
8/12/17	1307149A(1-15)	Eng. Man	0577	2hr	4hr	c
8/12/17	1307152A(4-18)	Eng. Man	0879	2hr	4hr	-
8/12/17	1307148A(4)	Eng. Man	0940	2hr	4hr	-

US EPA ARCHIVE DOCUMENT




# Alpha #1

49


Date	Sample #	Client	Lead Time	CT Time	Analysis	Tech
8/7/13	1708006A(1-4)	Ucon	0917	2hr	Pu 20	-
8/7/13	1308016A(1-4)	Unitech	0914	2hr	Uu 20	-
8/7/13	1308006A(1-4)	Ucon	1243	2hr 50min	Np	KB
8/7/13	1307138A(1-4)	Unitech	1243	2hr 50min	Uu	KB
8/7/13	1307146A(15-20)	EMS	1603	2hr 50min	Uu	KB
8/7/13	1307110B(1-2)	EMS	1607	2hr 50min	Uu	KB
8/8/13	Daily Pulse	Ucon	0578	1hr	---	-
8/8/13	1707147A(1-8)	Eng Man	0906	2hr	Uu 20	-
8/8/13	1307116B(4,6,9)	Ucon	1159	2hr 50min	Pu	KB
8/8/13	1307116B(4,6)	Ucon	1200	2hr 50min	PUNT	KB
8/8/13	1307140A(1-3)	Ucon	1200	2hr 50min	Pu	KB
8/8/13	1307152A(14-19)	EMS	1454	2hr 50min	Re	KB
8/9/13	Daily Pulse	Ucon	0506	1hr	---	-
8/9/13	SEC CAL	Ucon	0800	2hr	---	-
8/9/13	1708071A(1-5)	Ucon	1076	2hr	Uu 20	-
8/9/13	1707186A(1-7)	Ucon	1076	2hr	NP 20	-
8/9/13	1307171A(2-4,6)	Ucon	1729	2hr	Uu 20	-
8/9/13	System Bkgd	Lab	1624	16.40 hrs	-	KB
8/10/13	Daily Pulse	Lab	1123	10 min	NA	AG
8/10/13	1307147A(1-8)	Eng Manage	1455	2hr 50min	iso-Th	AG
8/12/13	Daily Pulse	Ucon	0519	1hr	---	-
8/12/13	1707172A(1-4)	Ucon	0976	2hr	Uu 20	-
8/12/13	1707172A(1-4)	Ucon	0977	2hr	Uu 20	-
8/12/13	1707171A(1-7)	Ucon	0977	2hr 50min	Pu 20	-
8/12/13	1307152A(19)	EMS	1254	2hr 50min	Uu	KB
8/12/13	1307149A(1-7)	EMS	1255	2hr 50min	Th	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	13-07152
		Analysis Code	THISO
		Run Number	1


#	Date	Dept	User	Notes
1	08/06/13 12:22	PREP	JWOLFE	ALICQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 6,7,10 AND 12-15 WITH HNO3- DRIED SAMPLES DOWN

*J Wolfe*  
 8/6/13

 <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	13-07152
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/06/13 12:22	PREP	JWOLFE	ALIQOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 6,7,10 AND 12-15 WITH HNO3- DRIED SAMPLES DOWN
2	08/12/13 17:29	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*  
8/12/13

 <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	13-07152
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/06/13 12:22	PREP	JWOLFE	ALIQOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 6,7,10 AND 12-15 WITH HNO3- DRIED SAMPLES DOWN
2	08/12/13 17:29	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	08/13/13 06:31	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:*  
 [Signature] 8/13/13

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

13-07152

Analysis Code

Run

ThISO

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/6/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/12/2013
014237S	Hydrochloric Acid	8N	JDEMELAS	8/12/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/12/2013
014236S	Nitric Acid	8N	JDEMELAS	8/12/2013
014109P	Nitric Acid	Reagent Grade	JDEMELAS	8/12/2013
014042S	Carbon substrate	Solution	RMARTZ	8/13/2013
014040S	Cerrium Carrier	0.1mg/ml	RMARTZ	8/13/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/13/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/13/2013

# Alpha #2


Date	Sample #	Client	Location	CT Item	Analysis	Tech
9/12/13	1307153A(15-19)	Ems	1648	2hr50-	Rate	UB
8/12/13	1307186A(1-4)	UCOR	1649	2hr50-	Rate	UB
8/12/13	Puicy Puisse	UCOR	0925	1-0	m	-
8/12/13	1707147B(1-2,11,12)	Engl	0905	2Lra	Uhr50	C
8/12/13	1707186A(1-7)	UCOR	0905	2Lra	Uhr50	-
9/13/13	1307152A(1-8)	EMS	1217	2hr50-	Yh	FB

# Alpha # 3

Date	Sample #	Client	Food Item	CT Item	Analysis	Test
8/9/17	Daily Pulse	LAR3	0506	10	---	---
8/9/17	SECCAL	LAR3	0522	2hr	---	---
8/9/17	1707149A(1-2)	Eng. Man	0904	2hr	Rate	C
8/9/13	1307146A(4)	UWOR	1204	2hrs	Np	ICB
8/9/13	1308003A(1-9)	Access	1209	2hrs	Rate	ICB
8/9/13	System Bldg	Lab	1624	16.40 hrs	α	ICB
8/10/13	Daily Pulse	Lab	1123	10 min	NA	AG
8/10/13	1307147A(9-19)	Eng. Manage	1502	2hrs	150-Th	AG
8/10/17	Daily Pulse	LAR3	0515	10	---	---
8/12/17	1707149A(1-15)	Eng. Man	0577	2hr	4hr 30	C
8/12/17	1707152A(4-18)	Eng. Man	0979	2hr	4hr 30	C
8/12/17	1707145A(4)	Eng. Man	0940	2hr	4hr 30	C
8/12/13	1307170A(1-10)	EMS	1256	2hrs	Rate	ICB
8/12/13	1307153A(1-6)	EMS	1256	2hrs	Rate	ICB
8/12/13	1308004A(1-3,5)	UWOR	1649	2hrs	Rate	ICB
8/12/13	1307144A(1-5)	Cal Energy	1650	2hrs	Rate	ICB
8/12/17	Daily Pulse	LAR3	0524	10	---	---
8/12/17	1707186A(4)	UWOR	0906	2hr	4hr 30	C
8/12/17	1707157A(1-18)	Eng. Man	0906	2hr	4hr 30	C
8/13/13	1307152A(9-19)	EMS	1218	2hrs	Th	ICB




**RA-226 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	13-07152
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:36	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 10 AND 14 DOWN AND DIGESTED DUE TO SAMPLES HAVINE A HIGH SOLID CONTENT PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

*J Wolfe*  
 8/5/13

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	13-07152
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:36	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 10 AND 14 DOWN AND DIGESTED DUE TO SAMPLES HAVINE A HIGH SOLID CONTENT PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/06/13 12:42	PREP	LWALKER	ADDED EDTA TO PRECIP-VORTEX-LET SIT OVERNIGHT TO DIGEST.
3	08/07/13 18:25	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.8 IN AP-006 REV 12 FOR RA 226 ANALYSIS-(SYRINGE FILTERED- PRECIP-FILTERED-DRIED-OBTAIN FINAL WEIGHT)-SUBMIT TO COUNT ROOM.

*L. Walker*  
 8/7/13

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

**13-07152**

Analysis Code

Run

**Ra226**

**1**

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	8/5/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	8/5/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	8/5/2013
014008D02	Lead Carrier	166 mg/ml	JWOLFE	8/5/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/5/2013
013416P	Perchloric Acid	Reagent Grade	JWOLFE	8/5/2013
009098P	Sulfuric Acid	Reagent Grade	JWOLFE	8/5/2013
014212S	EDTA	0.25M	LWALKER	8/6/2013
011383P	Acetic Acid	Reagent Grade	LWALKER	8/7/2013
013575D05	Ammonium Sulfate	200 mg/ml	LWALKER	8/7/2013

US EPA ARCHIVE DOCUMENT

# Alpha #2

Date	Sample #	Client	Time	CT Time	Analysis	Test
8/6/13	Daily Pulse	LAB	0928	1hr	---	---
8/6/13	1707171A(4,6)	UWON	0936	2hrs	Am23	---
8/6/13	1308006A(1-4)	UWON	0977	2hrs	UW20	---
8/6/13	1707170A(1-7)	United	0978	2hrs	UW20	---
8/6/13	1307171A(3-4,6)	UWON	1245	2hrs 50mins	NP	ICB
8/6/13	1307146A(1-6)	EMS	1246	2hrs 50-	Th	ICB
8/6/13	1307172A(3-4)	UWON	1434	2hrs 50-	Rob	ICB
8/6/13	1307147A(1-7)	EMS	1635	2hrs 50-	Rob	ICB
8/7/13	Daily Pulse	LAB	0972	1hr	---	---
8/7/13	17080160(5)	United	0914	2hrs	UW20	---
8/7/13	1707110B(1-7,10)	EngMan	0915	2hrs	UW20	---
8/7/13	1307185A(1-4)	Wastren Adv.	0916	2hrs	Pu20	---
8/7/13	1307185A(1-4)	Wastren	1244	2hrs 50mins	UW	ICB
8/7/13	1307172A(1-4)	UWON	1244	2hrs 50-	NP	ICB
8/7/13	1307146A(1)	EMS	1246	2hrs 50-	UW	ICB
8/7/13	1307172A(4)	UWON	1605	2hrs 50-	Am23	ICB
8/7/13	1307149A(1-8)	EMS	1606	2hrs 50-	Rob	ICB
8/8/13	Daily Pulse	LAB	0978	1hr	---	---
8/8/13	1707191B(1-4,7)	UWON	0951	2hrs	Pu20	---
8/8/13	1307109A(1-4)	UWON	0952	2hrs	Pu20	---
8/8/13	1707116B(1-7)	UWON	0953	2hrs	Pu20	---
8/8/13	1307152A(5,13)	EngMan	1252	2hrs	Rob	---

# Alpha #1

Date	Sample #	Client	Lead Time (CT Time)	Analysis	Test
8/7/13	1308006A(1-4)	UCOR	0917	2hrs	Pu230
8/7/13	1308016A(1-4)	Unitech	0914	2hr	Uu230
8/7/13	1308006A(1-4)	UCOR	1243	2hrs	Np
8/7/13	1307138A(1-4)	Unitech	1243	2hrs	Uu
8/7/13	1307146A(15-20)	EMS	1603	2hrs	TUu
8/7/13	1307110B(12)	EMS	1607	2hrs	Uu
8/8/13	Daily Pulse	Uu	0578	1hr	Uu
8/8/13	1307147A(1-8)	Emp. Mm	0906	2hr	Uu230
8/8/13	1307116B(4,6,9)	UCOR	1159	2hrs	Pu
8/8/13	1307116B(4,6)	UCOR	1200	2hrs	PuNT
8/8/13	1307140A(1-3)	UCOR	1200	2hrs	Pu
8/8/13	1307152A(14-19)	EMS	1454	2hrs	Pu


# Alphabet 3

Date	Sample #	Client	Location	CT Time	Analysis	Lab
8/1/13	1307128A(1-3)	UWOR	0948	2hr	TLNT	C
8/5/13	1307129A(1-7)	UWOR	1231	2hr50m	TH	ICB
8/5/13	1307129A(1-7)	MDNR	1231	2hr50m	TH	ICB
8/5/13	1307144A(1-3)	EMS	1232	2hr50m	Rat	ICB
<del>8/5/13</del>	<del>1307128A(1-3)</del>	<del>EMS</del>		<del>2hr50m</del>	<del>Rat</del>	<del>ICB</del>
8/5/13	1307146A(13-14)	EMS	1250	2hr50m	Rat	ICB
8/5/13	1307142A(12-15)	Accutest	1612	2hr50m	Rat	ICB
8/5/13	1307171A(1-4,6)	UWOR	1613	2hr50m	Rat	ICB
8/6/17	DailyPulse	UWR	0928	1hr	---	---
8/6/17	1307179A(1-1)	TBE	0550	2hr	Rat	C
8/6/17	1307170A(4)	Unitech	0978	2hr	Unitech	---
8/6/17	1307178A(1-5)	Unitech	0941	2hr	Phyto	C
8/6/17	1707179A(1-5)	Miriontek	0942	5hr7m	Unitech	C
8/6/17	1707170A(1-2)	Unitech	0942	2hr	Phyto	C
8/6/13	1307146A(7-14)	EMS	1246	2hr50m	TH	ICB
8/6/13	1307147A(8-19)	EMS	1636	2hr50min	Rat	ICB
8/7/17	DailyPulse	UWR	0972	1hr	---	---
8/7/17	1707172A(1-4)	UWOR	0916	2hr	Am241	C
8/7/17	1307172A(1-4)	UWOR	0917	2hr	Am241	C
8/7/17	1307181A(1-4)	Westnuclear	0918	2hr	Am241	C
8/7/13	1307146A(2-14)	EMS	1247	2hr50m	UU	ICB
8/7/13	1307149A(9-15)	EMS	1606	2hr50m	Rat	ICB
<del>8/8/17</del>	<del>DailyPulse</del>	<del>UWR</del>	<del>0578</del>	<del>1hr</del>	<del>---</del>	<del>---</del>
8/8/17	1307146A(9)	Engstrom	0920	2hr	Unitech	C
8/8/17	1707147A(9-11)	Engstrom	0907	2hr	Unitech	C
<del>8/8/13</del>	<del>1307146A(4,6,9)</del>	<del>UWOR</del>		<del>2hr50m</del>	<del>PU</del>	<del>ICB</del>
<del>8/8/13</del>	<del>1307146A(4,6)</del>	<del>UWOR</del>	<del>9/8/13</del>	<del>2hr50m</del>	<del>PUNT</del>	<del>ICB</del>
<del>8/8/13</del>	<del>1307140A(1-3)</del>	<del>UWOR</del>		<del>2hr50m</del>	<del>PU</del>	<del>ICB</del>
8/8/13	1307140A(4,7)	UWOR	1207	2hr50min	PU	ICB
8/8/13	1307140A(4)	UWOR	1207	2hr50m	PUNT	ICB
8/8/13	1307140A(1-4)	UWOR	1208	2hr50m	TH	ICB
8/8/13	1307140A(4)	UWOR	1208	2hr50m	THNT	ICB
8/8/13	1307152A(1-5)	EMS	1210	2hr50m	Rat	ICB

US EPA ARCHIVE DOCUMENT


**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	13-07152
		Analysis Code	Ra228
		Run Number	1


#	Date	Dept	User	Notes
1	08/05/13 09:37	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 10 AND 14 DOWN AND DIGESTED DUE TO SAMPLES HAVINE A HIGH SOLID CONTENT PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

*J Wolfe*  
 8/5/13


 <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	13-07152
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:37	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 10 AND 14 DOWN AND DIGESTED DUE TO SAMPLES HAVINE A HIGH SOLID CONTENT PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/09/13 12:44	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	08/12/13 18:52	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)

*L. Walker*  
 8/12/13

 <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	13-07152
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:37	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 10 AND 14 DOWN AND DIGESTED DUE TO SAMPLES HAVINE A HIGH SOLID CONTENT PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/09/13 12:44	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	08/12/13 18:52	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)
4	08/13/13 09:02	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 )

8-13-13  




Reagents Used in an Analysis

Internal Work Order

13-07152

Analysis Code

Run

Ra228

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	8/5/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	8/5/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	8/5/2013
014008D02	Lead Carrier	166 mg/ml	JWOLFE	8/5/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/5/2013
013416P	Perchloric Acid	Reagent Grade	JWOLFE	8/5/2013
009098P	Sulfuric Acid	Reagent Grade	JWOLFE	8/5/2013
014008D03	Lead Carrier	1.5 mg/ml	LWALKER	8/12/2013
014109P	Nitric Acid	Reagent Grade	LWALKER	8/12/2013
013065D06	Sodium Hydroxide	10M	LWALKER	8/12/2013
014060S	Yttrium Carrier	9 mg/ml	LWALKER	8/12/2013
011504D33	Ammonium Sulfide	2%	LWALKER	8/12/2013
013763D02	Ammonium Oxalate	5%	TSMITH	8/13/2013
013910D07	Nitric Acid	1N	TSMITH	8/13/2013
013910D08	Nitric Acid	6N	TSMITH	8/13/2013
013065D06	Sodium Hydroxide	10M	TSMITH	8/13/2013
014207S	Sodium Hydroxide	18M	TSMITH	8/13/2013

US EPA ARCHIVE DOCUMENT

Date	Sample #	Circle	Location	CTTime	Amount	Test
8/8/17	1307186PB(1-4)	ULOR	091817	2L	Pb200	C
8/8/17	130712154(2-9)	Test Area	1006	2L	Sn200	C
8/8/17	1307186PB(1-4)	ULOR	1217	2hrs	Pb200	KB
8/15/17	EF700	ULOR	0102	70	HP	C
8/15/17	BUC000	ULOR	0174	60	HP	C
8/15/17	1307186N(1-4)	ULOR	0750	2L	PA8	C
8/15/17	1308004N(1-7)	ULOR	0750	2L	PA8	C
8/15/17	1708005N(1-4)	ULOR	0750	2L	PA8	C
8/15/17	1307129N(1-7)	Miss Rept	0918	2L	PA8	C
8/15/17	1307186N(1-4)	ULOR	1005	100	NP274	C
8/15/17	1308005PB(1-4)	ULOR	1026	2L	Pb200	C
8/10/17	Weekly Blog	Lab	1138	12hr	0B	AG
8/12/17	EF700	ULOR	0518	30	HP	C
8/12/17	BUC000	ULOR	0551	60	HP	C
8/12/17	1307142N(1-7)	Acadest	0747	2L	PA8	C
8/12/17	1307146N(1-7)	Engman	1116	2L	PA8	C
8/12/17	EF700	ULOR	0110	30	HP	C
8/12/17	BUC000	ULOR	0544	60	HP	C
8/12/17	1307144N(1-7)	UTAH Div. of P&M	0750	2L	HP	C
8/12/17	1307144N(1-7)	UTAH Div. of P&M	0750	30	HP	C
8/12/17	1308004N(1-3)	ULOR	0814	100	NP274	C
8/12/17	1307152N(1-7)	Engman	1047	2L	PA8	C

US EPA ARCHIVE DOCUMENT

Date	Sample #	Client	Facility	CT Time	Analysis	Fee
8/7/13	1307172CL(1-3,5)	UCOR	1518	30mins	CL36	KB
8/7/13	1307184CL(1-3,5)	UCOR	1519	30mins	CL36	KB
8/7/13	1308004CL(1-3,6)	UCOR	1555	30mins	CL36	KB
8/7/13	1308005CL(1-3,5)	UCOR	1556	30mins	CL36	KB
8/8/17	B/LC/OC	LAB	0117	1hr	L13	C
8/8/17	E/F/OC	LAB	0616	7hr	L13	C
8/8/17	1707111RA(10-9)	EngMan	0786	2L	RT8	C
8/8/17	1707111RA(11)	EngMan	1013	30min	RT8	C
8/8/17	17071254(11-7,8-13)	TestAm.	1017	7L	S/Soly	C
8/8/17	17071154(11)	TestAm.	1048	7hr	S/Soly	C
8/8/17	1308036AB(1-4)	Thermochem	1242	2hrs	2B	KB
8/9/17	B/LC/OC	LAB	0102	1hr	L13	C
8/9/17	E/F/OC	LAB	0606	3hr	2B	C
8/9/17	1708071SN(1-6)	UCOR	0751	2L	S/207	C
8/9/17	1707141RA(11)	Accutest	1002	30min	RT8	C
8/9/17	1707141RA(12-5)	Accutest	1002	2hr	RT8	C
8/9/17	1707105AB(11)	Hudson	0940	30min	L13	C
8/9/17	1707105AB(12-4)	Hudson	0940	2L	L13	C
8/9/17	1708004Pb(11)	UCOR	1028	30min	Ph210	C
8/9/17	1708004Pb(12-3)	UCOR	1106	4hr	Ph210	C
8/10/13	Weekly Blood	Lab	1137	12hr	2B	AG
8/12/17	B/LC/OC	LAB	0111	1hr	L13	C
8/12/17	E/F/OC	LAB	0625	7hr	L13	C
8/12/17	1707142RA(12-15)	Accutest	0747	2L	RT8	C
8/12/17	170712834(1-4,6-8)	UCOR	0848	2L	S/Soly	C
8/12/17	1707146RA(17-20)	EngMan	1117	2L	RT8	C
8/12/13	1307102AB(11)	Accutest	1214	30min	2B	KB
8/12/17	1707108AB(2-11)	Accutest	1724	2L	L13	C
8/17/17	B/LC/OC	LAB	0110	1hr	L13	C
8/17/17	E/F/OC	LAB	0614	7hr	2B	C
8/15/17	1707179RA(1-4)	TBG	0752	2L	RT8	C
8/17/17	1707152RA(11)	EngMan	1045	7hr	RT8	C
8/17/17	1707152RA(14-18)	EngMan	1045	2L	RT8	C

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

UUISO

Run 1

Work Order	13-07152	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	UUISO	01	LCS	LCS		07/24/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/24/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	PZ-203-SS TOT	38	07/17/13 13:58	1.0000E+00
Lab Deadline	8/13/2013	04	DO	PZ-203-SS TOT	38	07/17/13 13:58	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-203-SS DIS	38	07/17/13 13:58	1.0000E+00
Project	West Lake OU-1	06	TRG	D-87 TOT	42	07/17/13 14:11	1.0000E+00
Report Level	4	07	TRG	D-87 DIS	42	07/17/13 14:11	1.0000E+00
Activity Units	pCi	08	TRG	DUP 06 TOT	39	07/17/13 00:00	1.0000E+00
Aliquot Units	I	09	TRG	DUP 06 DIS	39	07/17/13 00:00	1.0000E+00
Matrix	WA	10	TRG	S-53 TOT	43	07/18/13 07:30	1.0000E+00
Method	HASL 300, 4.5.2	11	TRG	S-53 DIS	43	07/18/13 07:30	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	D-14 TOT	45	07/18/13 09:30	1.0000E+00
Radiometric Tracer	U-232	13	TRG	D-14 DIS	45	07/18/13 09:30	1.0000E+00
Radiometric Sol#	U-10a	14	TRG	PZ-205-AS TOT	42	07/18/13 09:46	1.0000E+00
Tracer Act (dpm/g)	19.041	15	TRG	PZ-205-AS DIS	42	07/18/13 09:46	1.0000E+00
Carrier		16	TRG	I-65 TOT	41	07/18/13 10:59	1.0000E+00
Carrier Conc (mg/ml)		17	TRG	I-65 DIS	41	07/18/13 10:59	1.0000E+00
		18	TRG	D-13 TOT	43	07/18/13 12:19	1.0000E+00
		19	TRG	D-13 DIS	43	07/18/13 12:19	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.



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	0.6122	11.7		0.00								
02	MBL	0.6065	11.5		0.00								
03	DUP	0.6057	11.5		0.00								
04	DO	0.6032	11.5		0.00								
05	TRG	0.5975	11.4		0.00								
06	TRG	0.6023	11.5		0.00								
07	TRG	0.6034	11.5		0.00								
08	TRG	0.6022	11.5		0.00								
09	TRG	0.6031	11.5		0.00								
10	TRG	0.6014	11.5		0.00								
11	TRG	0.6025	11.5		0.00								
12	TRG	0.6014	11.5		0.00								
13	TRG	0.6025	11.5		0.00								
14	TRG	0.6017	11.5		0.00								
15	TRG	0.6006	11.4		0.00								
16	TRG	0.5977	11.4		0.00								
17	TRG	0.6036	11.5		0.00								
18	TRG	0.6018	11.5		0.00								
19	TRG	0.5996	11.4		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			08/06/13 12:17	JWOLFE				
02	MBL			08/06/13 12:17	JWOLFE				
03	DUP			08/06/13 12:17	JWOLFE				
04	DO			08/06/13 12:17	JWOLFE				
05	TRG			08/06/13 12:17	JWOLFE				
06	TRG			08/06/13 12:17	JWOLFE				
07	TRG			08/06/13 12:17	JWOLFE				
08	TRG			08/06/13 12:17	JWOLFE				
09	TRG			08/06/13 12:17	JWOLFE				
10	TRG			08/06/13 12:17	JWOLFE				
11	TRG			08/06/13 12:17	JWOLFE				
12	TRG			08/06/13 12:17	JWOLFE				
13	TRG			08/06/13 12:17	JWOLFE				
14	TRG			08/06/13 12:17	JWOLFE				
15	TRG			08/06/13 12:17	JWOLFE				
16	TRG			08/06/13 12:17	JWOLFE				
17	TRG			08/06/13 12:17	JWOLFE				
18	TRG			08/06/13 12:17	JWOLFE				
19	TRG			08/06/13 12:17	JWOLFE				

\* 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.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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-234	LCS	LCS	pCi/l	7.07E+00	1.04E+00	9.69E-02	8.17E+00	86.57	OK		OK	
02	U-234	MBL	BLANK	pCi/l	2.39E-01	1.74E-01	1.62E-01					OK	OK
03	U-234	DUP	PZ-203-SS TOT	pCi/l	2.76E+00	5.38E-01	1.00E-01				NA	OK	
04	U-234	DO	PZ-203-SS TOT	pCi/l	2.86E+00	5.22E-01	6.26E-02					OK	
05	U-234	TRG	PZ-203-SS DIS	pCi/l	3.03E+00	5.11E-01	7.83E-02					OK	
06	U-234	TRG	D-87 TOT	pCi/l	1.05E+00	2.77E-01	6.37E-02					OK	
07	U-234	TRG	D-87 DIS	pCi/l	4.87E-01	2.48E-01	1.70E-01					OK	
08	U-234	TRG	DUP 06 TOT	pCi/l	1.58E+00	3.48E-01	6.96E-02					OK	
09	U-234	TRG	DUP 06 DIS	pCi/l	1.65E+00	4.01E-01	7.74E-02					OK	
10	U-234	TRG	S-53 TOT	pCi/l	5.90E+00	9.99E-01	1.07E-01					OK	
11	U-234	TRG	S-53 DIS	pCi/l	5.19E+00	7.93E-01	6.85E-02					OK	
12	U-234	TRG	D-14 TOT	pCi/l	5.52E-01	2.92E-01	2.28E-01					OK	
13	U-234	TRG	D-14 DIS	pCi/l	9.91E-01	4.62E-01	2.19E-01					OK	
14	U-234	TRG	PZ-205-AS TOT	pCi/l	7.91E-01	3.34E-01	1.82E-01					OK	
15	U-234	TRG	PZ-205-AS DIS	pCi/l	9.90E-01	4.69E-01	1.98E-01					OK	
16	U-234	TRG	I-65 TOT	pCi/l	1.62E+00	4.23E-01	1.01E-01					OK	
17	U-234	TRG	I-65 DIS	pCi/l	1.09E+00	2.73E-01	5.91E-02					OK	
18	U-234	TRG	D-13 TOT	pCi/l	2.91E-01	1.36E-01	6.45E-02					OK	
19	U-234	TRG	D-13 DIS	pCi/l	4.36E-01	1.83E-01	9.34E-02					OK	



**Run**  
1

**Analysis Code**  
UUISO

**Eberline Services Work Order**  
13-07152

**Client**  
Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-UUISO-1**

	
Run	<b>1</b>
Analysis Code	<b>UUISO</b>
Eberline Services Work Order	<b>13-07152</b>
Client	<b>Engineering Management Support, Inc.</b>

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	07/24/13 00:00	1.00E+00	99.94	0.00	0.00			
02	U-234	MBL	07/24/13 00:00	1.00E+00	47.58	0.00	0.00			
03	U-234	DUP	07/17/13 13:58	1.00E+00	111.52	0.00	0.00			
04	U-234	DO	07/17/13 13:58	1.00E+00	95.84	0.00	0.00			
05	U-234	TRG	07/17/13 13:58	1.00E+00	109.58	0.00	0.00			
06	U-234	TRG	07/17/13 14:11	1.00E+00	95.27	0.00	0.00			
07	U-234	TRG	07/17/13 14:11	1.00E+00	48.99	0.00	0.00			
08	U-234	TRG	07/17/13 00:00	1.00E+00	102.31	0.00	0.00			
09	U-234	TRG	07/17/13 00:00	1.00E+00	83.10	0.00	0.00			
10	U-234	TRG	07/18/13 07:30	1.00E+00	71.08	0.00	0.00			
11	U-234	TRG	07/18/13 07:30	1.00E+00	97.58	0.00	0.00			
12	U-234	TRG	07/18/13 09:30	1.00E+00	41.73	0.00	0.00			
13	U-234	TRG	07/18/13 09:30	1.00E+00	31.43	0.00	0.00			
14	U-234	TRG	07/18/13 09:46	1.00E+00	43.58	0.00	0.00			
15	U-234	TRG	07/18/13 09:46	1.00E+00	29.10	0.00	0.00			
16	U-234	TRG	07/18/13 10:59	1.00E+00	65.80	0.00	0.00			
17	U-234	TRG	07/18/13 10:59	1.00E+00	104.73	0.00	0.00			
18	U-234	TRG	07/18/13 12:19	1.00E+00	94.35	0.00	0.00			
19	U-234	TRG	07/18/13 12:19	1.00E+00	85.41	0.00	0.00			

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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	08/12/13 09:38		A_Spec	Alpha_027	170.02	4.60 E+02	6.00 E-03	17.3
02	U-234	MBL	08/12/13 09:38		A_Spec	Alpha_029	170	8.32 E+00	4.00 E-03	19.5
03	U-234	DUP	08/12/13 09:38		A_Spec	Alpha_031	170	1.64 E+02	5.00 E-03	14.2
04	U-234	DO	08/12/13 09:39		A_Spec	Alpha_033	170	1.91 E+02	1.00 E-03	18.5
05	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_034	170	2.32 E+02	0.00 E+00	18.6
06	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_035	170	6.88 E+01	1.00 E-03	18.3
07	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_036	170	1.71 E+01	5.00 E-03	19.1
08	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_037	170	1.09 E+02	2.00 E-03	17.8
09	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_038	170	8.88 E+01	1.00 E-03	17.2
10	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_039	170	3.10 E+02	4.00 E-03	19.7
11	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_040	170	3.63 E+02	2.00 E-03	19
12	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_041	170	1.66 E+01	8.00 E-03	19.2
13	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_042	170	2.17 E+01	2.00 E-03	18.5
14	U-234	TRG	08/12/13 09:39		A_Spec	Alpha_043	170	2.60 E+01	0.00 E+00	20
15	U-234	TRG	08/12/13 09:40		A_Spec	Alpha_044	170	2.08 E+01	1.00 E-03	19.2
16	U-234	TRG	08/12/13 09:40		A_Spec	Alpha_045	170	7.67 E+01	2.00 E-03	19.1
17	U-234	TRG	08/12/13 09:40		A_Spec	Alpha_046	170	7.68 E+01	1.00 E-03	17.9
18	U-234	TRG	08/12/13 09:40		A_Spec	Alpha_047	170	1.88 E+01	1.00 E-03	18.2
19	U-234	TRG	08/12/13 12:54		A_Spec	Alpha_003	170.02	2.45 E+01	3.00 E-03	17.5

Run	1
Analysis Code	UUISO
Eberline Services Work Order	13-07152
Client	Engineering Management Support, Inc.

1308

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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	8.21E+00	1.18E+00	9.17E-02	7.96E+00	103.08	OK		OK	
02	U-238	MBL	BLANK	pCi/l	9.97E-02	1.14E-01	1.50E-01					OK	OK
03	U-238	DUP	PZ-203-SS TOT	pCi/l	7.98E-01	2.54E-01	1.52E-01				NA	OK	
04	U-238	DO	PZ-203-SS TOT	pCi/l	3.98E-01	1.59E-01	7.14E-02					OK	
05	U-238	TRG	PZ-203-SS DIS	pCi/l	8.80E-01	2.31E-01	6.22E-02					OK	
06	U-238	TRG	D-87 TOT	pCi/l	4.69E-01	1.75E-01	6.34E-02					OK	
07	U-238	TRG	D-87 DIS	pCi/l	3.25E-01	1.99E-01	1.48E-01					OK	
08	U-238	TRG	DUP 06 TOT	pCi/l	1.35E+00	3.15E-01	8.69E-02					OK	
09	U-238	TRG	DUP 06 DIS	pCi/l	1.45E+00	3.71E-01	8.83E-02					OK	
10	U-238	TRG	S-53 TOT	pCi/l	5.18E+00	9.02E-01	9.93E-02					OK	
11	U-238	TRG	S-53 DIS	pCi/l	5.06E+00	7.77E-01	8.55E-02					OK	
12	U-238	TRG	D-14 TOT	pCi/l	6.76E-01	3.25E-01	2.35E-01					OK	
13	U-238	TRG	D-14 DIS	pCi/l	3.18E-01	2.62E-01	2.87E-01					OK	
14	U-238	TRG	PZ-205-AS TOT	pCi/l	8.78E-01	3.53E-01	1.82E-01					OK	
15	U-238	TRG	PZ-205-AS DIS	pCi/l	1.08E+00	4.92E-01	1.97E-01					OK	
16	U-238	TRG	I-65 TOT	pCi/l	1.28E+00	3.65E-01	1.01E-01					OK	
17	U-238	TRG	I-65 DIS	pCi/l	9.31E-01	2.49E-01	8.46E-02					OK	
18	U-238	TRG	D-13 TOT	pCi/l	1.02E-01	8.10E-02	7.35E-02					OK	
19	U-238	TRG	D-13 DIS	pCi/l	2.01E-01	1.23E-01	1.00E-01					OK	



Run 1

Analysis Code UUISO

Eberline Services Work Order 13-07152

Client Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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	07/24/13 00:00	1.00E+00	99.94	0.00	0.00			
02	U-238	MBL	07/24/13 00:00	1.00E+00	47.58	0.00	0.00			
03	U-238	DUP	07/17/13 13:58	1.00E+00	111.52	0.00	0.00			
04	U-238	DO	07/17/13 13:58	1.00E+00	95.84	0.00	0.00			
05	U-238	TRG	07/17/13 13:58	1.00E+00	109.58	0.00	0.00			
06	U-238	TRG	07/17/13 14:11	1.00E+00	95.27	0.00	0.00			
07	U-238	TRG	07/17/13 14:11	1.00E+00	48.99	0.00	0.00			
08	U-238	TRG	07/17/13 00:00	1.00E+00	102.31	0.00	0.00			
09	U-238	TRG	07/17/13 00:00	1.00E+00	83.10	0.00	0.00			
10	U-238	TRG	07/18/13 07:30	1.00E+00	71.08	0.00	0.00			
11	U-238	TRG	07/18/13 07:30	1.00E+00	97.58	0.00	0.00			
12	U-238	TRG	07/18/13 09:30	1.00E+00	41.73	0.00	0.00			
13	U-238	TRG	07/18/13 09:30	1.00E+00	31.43	0.00	0.00			
14	U-238	TRG	07/18/13 09:46	1.00E+00	43.58	0.00	0.00			
15	U-238	TRG	07/18/13 09:46	1.00E+00	29.10	0.00	0.00			
16	U-238	TRG	07/18/13 10:59	1.00E+00	65.80	0.00	0.00			
17	U-238	TRG	07/18/13 10:59	1.00E+00	104.73	0.00	0.00			
18	U-238	TRG	07/18/13 12:19	1.00E+00	94.35	0.00	0.00			
19	U-238	TRG	07/18/13 12:19	1.00E+00	85.41	0.00	0.00			

Run	1	UUISO	13-07152	Engineering Management Support, Inc.

9600

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-UISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-238	LCS	08/12/13 09:38		A_Spec	Alpha_027	170.02	5.36 E+02	5.00 E-03	17.3
02	U-238	MBL	08/12/13 09:38		A_Spec	Alpha_029	170	3.49 E+00	3.00 E-03	19.5
03	U-238	DUP	08/12/13 09:38		A_Spec	Alpha_031	170	4.78 E+01	1.90 E-02	14.2
04	U-238	DO	08/12/13 09:39		A_Spec	Alpha_033	170	2.67 E+01	2.00 E-03	18.5
05	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_034	170	6.77 E+01	2.00 E-03	18.6
06	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_035	170	3.08 E+01	1.00 E-03	18.3
07	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_036	170	1.15 E+01	3.00 E-03	19.1
08	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_037	170	9.30 E+01	0.00 E+00	17.8
09	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_038	170	7.87 E+01	2.00 E-03	17.2
10	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_039	170	2.73 E+02	3.00 E-03	19.7
11	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_040	170	3.55 E+02	0.00 E+00	19
12	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_041	170	2.05 E+01	9.00 E-03	19.2
13	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_042	170	6.98 E+00	6.00 E-03	18.5
14	U-238	TRG	08/12/13 09:39		A_Spec	Alpha_043	170	2.90 E+01	0.00 E+00	20
15	U-238	TRG	08/12/13 09:40		A_Spec	Alpha_044	170	2.28 E+01	1.00 E-03	19.2
16	U-238	TRG	08/12/13 09:40		A_Spec	Alpha_045	170	6.07 E+01	2.00 E-03	19.1
17	U-238	TRG	08/12/13 09:40		A_Spec	Alpha_046	170	6.60 E+01	0.00 E+00	17.9
18	U-238	TRG	08/12/13 09:40		A_Spec	Alpha_047	170	6.66 E+00	2.00 E-03	18.2
19	U-238	TRG	08/12/13 12:54		A_Spec	Alpha_003	170.02	1.13 E+01	4.00 E-03	17.5

Run	1	Analysis Code	UISO	Eberline Services Work Order	13-07152	Client	Engineering Management Support, Inc.

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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-235	LCS	LCS	pCi/l	1.26E+00	3.38E-01	1.07E-01					OK	
02	U-235	MBL	BLANK	pCi/l	8.81E-02	1.23E-01	1.86E-01					OK	OK
03	U-235	DUP	PZ-203-SS TOT	pCi/l	2.62E-01	1.50E-01	9.90E-02				NA	OK	
04	U-235	DO	PZ-203-SS TOT	pCi/l	2.16E-01	1.28E-01	8.84E-02					OK	
05	U-235	TRG	PZ-203-SS DIS	pCi/l	3.06E-01	1.45E-01	9.66E-02					OK	
06	U-235	TRG	D-87 TOT	pCi/l	1.32E-01	1.05E-01	1.13E-01					OK	
07	U-235	TRG	D-87 DIS	pCi/l	3.09E-01	2.11E-01	1.46E-01					OK	
08	U-235	TRG	DUP 06 TOT	pCi/l	2.51E-01	1.39E-01	1.08E-01					OK	
09	U-235	TRG	DUP 06 DIS	pCi/l	4.35E-01	2.08E-01	1.37E-01					OK	
10	U-235	TRG	S-53 TOT	pCi/l	1.31E+00	3.82E-01	9.79E-02					OK	
11	U-235	TRG	S-53 DIS	pCi/l	6.15E-01	2.16E-01	7.37E-02					OK	
12	U-235	TRG	D-14 TOT	pCi/l	3.00E-01	2.34E-01	2.31E-01					OK	
13	U-235	TRG	D-14 DIS	pCi/l	3.39E-01	3.00E-01	3.38E-01					OK	
14	U-235	TRG	PZ-205-AS TOT	pCi/l	1.13E-01	1.48E-01	2.25E-01					OK	
15	U-235	TRG	PZ-205-AS DIS	pCi/l	4.59E-01	3.38E-01	2.45E-01					OK	
16	U-235	TRG	I-65 TOT	pCi/l	6.00E-01	2.63E-01	1.56E-01					OK	
17	U-235	TRG	I-65 DIS	pCi/l	1.72E-01	1.10E-01	7.29E-02					OK	
18	U-235	TRG	D-13 TOT	pCi/l	1.52E-01	1.13E-01	1.14E-01					OK	
19	U-235	TRG	D-13 DIS	pCi/l	2.74E-01	1.59E-01	1.15E-01					OK	

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

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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	07/24/13 00:00	1.00E+00	99.94	0.00	0.00			
02	U-235	MBL	07/24/13 00:00	1.00E+00	47.58	0.00	0.00			
03	U-235	DUP	07/17/13 13:58	1.00E+00	111.52	0.00	0.00			
04	U-235	DO	07/17/13 13:58	1.00E+00	95.84	0.00	0.00			
05	U-235	TRG	07/17/13 13:58	1.00E+00	109.58	0.00	0.00			
06	U-235	TRG	07/17/13 14:11	1.00E+00	95.27	0.00	0.00			
07	U-235	TRG	07/17/13 14:11	1.00E+00	48.99	0.00	0.00			
08	U-235	TRG	07/17/13 00:00	1.00E+00	102.31	0.00	0.00			
09	U-235	TRG	07/17/13 00:00	1.00E+00	83.10	0.00	0.00			
10	U-235	TRG	07/18/13 07:30	1.00E+00	71.08	0.00	0.00			
11	U-235	TRG	07/18/13 07:30	1.00E+00	97.58	0.00	0.00			
12	U-235	TRG	07/18/13 09:30	1.00E+00	41.73	0.00	0.00			
13	U-235	TRG	07/18/13 09:30	1.00E+00	31.43	0.00	0.00			
14	U-235	TRG	07/18/13 09:46	1.00E+00	43.58	0.00	0.00			
15	U-235	TRG	07/18/13 09:46	1.00E+00	29.10	0.00	0.00			
16	U-235	TRG	07/18/13 10:59	1.00E+00	65.80	0.00	0.00			
17	U-235	TRG	07/18/13 10:59	1.00E+00	104.73	0.00	0.00			
18	U-235	TRG	07/18/13 12:19	1.00E+00	94.35	0.00	0.00			
19	U-235	TRG	07/18/13 12:19	1.00E+00	85.41	0.00	0.00			

	Run	1
	Analysis Code	UUISO
Eberline Services Work Order	13-07152	
Client	Engineering Management Support, Inc.	

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-UUISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-235	LCS	08/12/13 09:38		A_Spec	Alpha_027	170.02	6.63 E+01	4.00 E-03	17.3
02	U-235	MBL	08/12/13 09:38		A_Spec	Alpha_029	170	2.49 E+00	3.00 E-03	19.5
03	U-235	DUP	08/12/13 09:38		A_Spec	Alpha_031	170	1.27 E+01	2.00 E-03	14.2
04	U-235	DO	08/12/13 09:39		A_Spec	Alpha_033	170	1.17 E+01	2.00 E-03	18.5
05	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_034	170	1.90 E+01	0.00 E+00	18.6
06	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_035	170	7.00 E+00	0.00 E+00	18.3
07	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_036	170	8.83 E+00	1.00 E-03	19.1
08	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_037	170	1.40 E+01	0.00 E+00	17.8
09	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_038	170	1.90 E+01	0.00 E+00	17.2
10	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_039	170	5.58 E+01	1.00 E-03	19.7
11	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_040	170	3.48 E+01	1.00 E-03	19
12	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_041	170	7.32 E+00	4.00 E-03	19.2
13	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_042	170	6.00 E+00	0.00 E+00	18.5
14	U-235	TRG	08/12/13 09:39		A_Spec	Alpha_043	170	3.00 E+00	0.00 E+00	20
15	U-235	TRG	08/12/13 09:40		A_Spec	Alpha_044	170	7.83 E+00	1.00 E-03	19.2
16	U-235	TRG	08/12/13 09:40		A_Spec	Alpha_045	170	2.30 E+01	0.00 E+00	19.1
17	U-235	TRG	08/12/13 09:40		A_Spec	Alpha_046	170	9.83 E+00	1.00 E-03	17.9
18	U-235	TRG	08/12/13 09:40		A_Spec	Alpha_047	170	8.00 E+00	0.00 E+00	18.2
19	U-235	TRG	08/12/13 12:54		A_Spec	Alpha_003	170.02	1.25 E+01	3.00 E-03	17.5

Run	1	Analysis Code	UUISO	Eberline Services Work Order	13-07152	Client	Engineering Management Support, Inc.

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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 <sup>27</sup>	LCS	LCS	07/24/13 00:00	1.0000	0.6122	11.6569		0.00		
02	MBL	BLANK	07/24/13 00:00	1.0000	0.6065	11.5484		0.00		
03 <sup>31</sup>	DUP	PZ-203-SS TOT	07/17/13 13:58	1.0000	0.6057	11.5331		0.00		
04 <sup>37</sup>	DO	PZ-203-SS TOT	07/17/13 13:58	1.0000	0.6032	11.4855		0.00		
05	TRG	PZ-203-SS DIS	07/17/13 13:58	1.0000	0.5975	11.3770		0.00		
06	TRG	D-87 TOT	07/17/13 14:11	1.0000	0.6023	11.4684		0.00		
07	TRG	D-87 DIS	07/17/13 14:11	1.0000	0.6034	11.4893		0.00		
08	TRG	DUP 06 TOT	07/17/13 00:00	1.0000	0.6022	11.4665		0.00		
09	TRG	DUP 06 DIS	07/17/13 00:00	1.0000	0.6031	11.4836		0.00		
10	TRG	S-53 TOT	07/18/13 07:30	1.0000	0.6014	11.4513		0.00		
11	TRG	S-53 DIS	07/18/13 07:30	1.0000	0.6025	11.4722		0.00		
12	TRG	D-14 TOT	07/18/13 09:30	1.0000	0.6014	11.4513		0.00		
13	TRG	D-14 DIS	07/18/13 09:30	1.0000	0.6025	11.4722		0.00		
14	TRG	PZ-205-AS TOT	07/18/13 09:46	1.0000	0.6017	11.4570		0.00		
15	TRG	PZ-205-AS DIS	07/18/13 09:46	1.0000	0.6006	11.4360		0.00		
16	TRG	I-65 TOT	07/18/13 10:59	1.0000	0.5977	11.3808		0.00		
17	TRG	I-65 DIS	07/18/13 10:59	1.0000	0.6036	11.4931		0.00		
18 <sup>47</sup>	TRG	D-13 TOT	07/18/13 12:19	1.0000	0.6018	11.4589		0.00		
19	TRG	D-13 DIS	07/18/13 12:19	1.0000	0.5996	11.4170		0.00		

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# Spike and Tracer Worksheet

Internal Work Order					Run	Analysis Code				Date	Technician				Technician Initials		Witness Initials	
<b>13-07152</b>					<b>1</b>	<b>UIISO</b>				<b>8/6/2013 12:14</b>	<b>JWOLFE</b>				<b>JW</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		
U-234	U-8a	35.240	8/6/2013	0.500	0.5147				8.17	0.294	0.00	0.000	0.00	0.000	0.00	0.000		
U-238	U-8a	34.350	8/6/2013	0.500	0.5147				7.96	0.287	0.00	0.000	0.00	0.000	0.00	0.000		

Tracers						
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition
01	U-232	U-10a	19.041	8/6/2013	0.6122	0.6300
02	U-232	U-10a	19.041	8/6/2013	0.6065	0.6300
03	U-232	U-10a	19.041	8/6/2013	0.6057	0.6300
04	U-232	U-10a	19.041	8/6/2013	0.6032	0.6300
05	U-232	U-10a	19.041	8/6/2013	0.5975	0.6300
06	U-232	U-10a	19.041	8/6/2013	0.6023	0.6300
07	U-232	U-10a	19.041	8/6/2013	0.6034	0.6300
08	U-232	U-10a	19.041	8/6/2013	0.6022	0.6300
09	U-232	U-10a	19.041	8/6/2013	0.6031	0.6300
10	U-232	U-10a	19.041	8/6/2013	0.6014	0.6300
11	U-232	U-10a	19.041	8/6/2013	0.6025	0.6300
12	U-232	U-10a	19.041	8/6/2013	0.6014	0.6300
13	U-232	U-10a	19.041	8/6/2013	0.6025	0.6300
14	U-232	U-10a	19.041	8/6/2013	0.6017	0.6300
15	U-232	U-10a	19.041	8/6/2013	0.6006	0.6300
16	U-232	U-10a	19.041	8/6/2013	0.5977	0.6300
17	U-232	U-10a	19.041	8/6/2013	0.6036	0.6300
18	U-232	U-10a	19.041	8/6/2013	0.6018	0.6300
19	U-232	U-10a	19.041	8/6/2013	0.5996	0.6300

Balance Printer Tapes	
0.6122 g	LCS
0.6065 g	
-0.6037 g	
-0.6002 g	
-0.5975 g	
-0.6023 g	
-0.6034 g	
-0.6022 g	
-0.6031 g	
-0.6014 g	
-0.6025 g	
-0.6014 g	
-0.6025 g	
0.6006 g	
0.6017 g	
-0.6006 g	
-0.5977 g	
-0.6036 g	
-0.6018 g	
-0.5996 g	
	Matrix Spike

0102

# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07152</b>	<b>1</b>	<b>UIISO</b>	<b>liters</b>	<b>8/13/2013</b>	<b>JWOLFE</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 Diis	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	PZ-203-SS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-203-SS TOT	DO					1.0000E+00	1.0000E+00				
05	PZ-203-SS DIS	TRG					1.0000E+00	1.0000E+00				
06	D-87 TOT	TRG					1.0000E+00	1.0000E+00				
07	D-87 DIS	TRG					1.0000E+00	1.0000E+00				
08	DUP 06 TOT	TRG					1.0000E+00	1.0000E+00				
09	DUP 06 DIS	TRG					1.0000E+00	1.0000E+00				
10	S-53 TOT	TRG					1.0000E+00	1.0000E+00				
11	S-53 DIS	TRG					1.0000E+00	1.0000E+00				
12	D-14 TOT	TRG					1.0000E+00	1.0000E+00				
13	D-14 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-205-AS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-205-AS DIS	TRG					1.0000E+00	1.0000E+00				
16	I-65 TOT	TRG					1.0000E+00	1.0000E+00				
17	I-65 DIS	TRG					1.0000E+00	1.0000E+00				
18	D-13 TOT	TRG					1.0000E+00	1.0000E+00				
19	D-13 DIS	TRG					1.0000E+00	1.0000E+00				

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

*J Wolfe* Date: 8/6/13



148  
8/12/13

# Apex-Alpha™

Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307152A-UU  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_027  
 Chamber Serial Number:  
 Detector Serial Number: 27  
 Env. Background: System Bkgd 64778  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 8/12/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:38:26 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: 0.1726 +/- 0.0102  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Chem. Recovery Factor: 0.9994 +/- 0.0618

Control Certificate Name: NatU\_U-8A  
 Chem. Recov. of Control: U-238 1.004805 +/- 0.079416  
 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 5.266	340.15	10.64	0.85	0.00E+000	9.6
U-234	4.716	459.98	9.15	1.02	0.00E+000	22.0
U-235	4.401	66.32	24.21	0.68	0.00E+000	4.8
U-238	4.139	536.15	8.47	0.85	0.00E+000	43.2

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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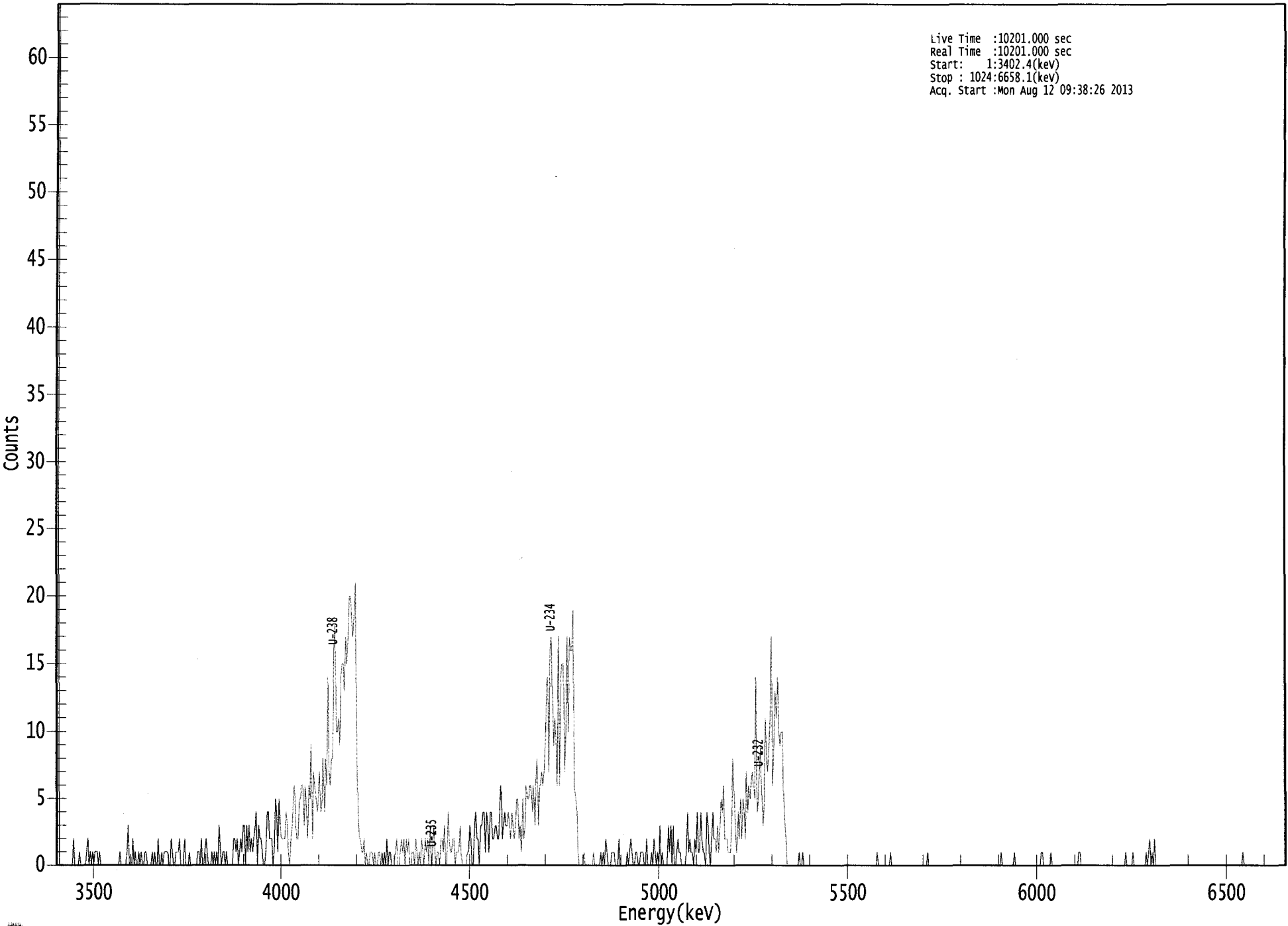
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.991	5302.50*	5.23E+000 +/- 6.05E-001	9.21E-002 +/- 1.06E-002
U-234	0.985	4761.50*	7.07E+000 +/- 1.04E+000	9.69E-002 +/- 1.12E-002
U-235	0.998	4385.50*	1.26E+000 +/- 3.38E-001	1.07E-001 +/- 1.24E-002
U-238	0.986	4184.40*	8.21E+000 +/- 1.18E+000	9.17E-002 +/- 1.06E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065881.CNF

Live Time : 10201.000 sec  
Real Time : 10201.000 sec  
Start : 1:3402.4(kev)  
Stop : 1024:6658.1(kev)  
Acq. Start : Mon Aug 12 09:38:26 2013



ROI Type: 1

ROI Type: 3

5010



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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: 01

Elapsed Live time: 10201  
 Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	0	0	0	2	0
17:	0	0	0	1	0	0	0	0
25:	0	1	2	0	1	0	1	0
33:	1	1	1	0	1	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	1	0	0
57:	0	0	0	1	3	0	0	0
65:	2	0	1	0	0	1	0	1
73:	0	0	1	1	0	0	0	0
81:	1	0	1	0	0	2	0	0
89:	1	0	1	1	1	1	0	0
97:	2	1	0	0	1	1	1	2
105:	0	0	0	2	0	0	0	1
113:	0	0	0	0	0	0	1	1
121:	0	2	0	0	1	2	1	0
129:	0	0	1	0	1	0	1	0
137:	3	1	0	1	1	0	1	0
145:	0	0	0	0	2	2	1	2
153:	0	1	2	1	3	3	0	3
161:	1	3	1	2	1	2	3	4
169:	0	3	2	2	1	0	0	1
177:	4	4	2	2	2	0	1	5
185:	4	1	5	3	2	2	2	2
193:	4	3	1	0	2	3	5	6
201:	3	2	2	5	5	6	6	3
209:	6	4	2	6	5	9	2	7
217:	6	5	4	5	7	4	5	8
225:	4	8	6	14	7	6	8	8
233:	16	18	10	10	11	9	14	15
241:	15	13	17	15	17	20	20	18
249:	17	19	21	9	4	2	2	1
257:	1	2	0	1	0	0	1	1
265:	1	0	1	0	0	1	1	0
273:	1	0	1	0	2	0	1	1
281:	0	0	0	1	2	0	0	1
289:	2	1	2	0	2	1	2	0
297:	0	1	1	0	2	1	0	1
305:	0	2	1	0	2	1	2	0
313:	3	0	1	3	1	0	1	1
321:	0	2	2	1	3	0	0	4
329:	2	1	1	2	2	0	1	1
337:	1	3	1	0	0	0	0	1
345:	1	3	2	0	0	3	4	2
353:	2	0	3	3	4	4	1	4
361:	3	1	4	4	2	2	3	3

369: 2 2 5 6 2 3 4 3

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
377:	3	4	3	2	4	3	2	3
385:	5	5	2	3	1	5	2	3
393:	6	5	5	6	6	4	6	3
401:	6	8	3	6	6	7	6	7
409:	9	13	14	7	16	17	13	9
417:	11	9	6	17	6	14	15	15
425:	7	10	17	10	17	16	16	19
433:	6	5	4	1	0	0	0	0
441:	1	0	0	0	0	0	0	0
449:	1	0	0	0	0	0	1	0
457:	1	0	2	1	0	0	0	1
465:	1	1	0	0	0	2	0	0
473:	0	0	0	0	1	0	1	2
481:	1	0	0	1	1	0	0	1
489:	1	1	0	0	2	0	0	0
497:	1	0	2	1	0	1	0	3
505:	0	1	0	0	0	0	3	1
513:	3	0	3	0	0	1	2	1
521:	1	0	0	0	0	1	4	1
529:	2	1	1	0	2	1	4	1
537:	1	4	2	1	1	0	4	3
545:	1	0	2	4	2	2	1	3
553:	1	3	5	4	6	2	2	2
561:	1	1	1	4	8	5	2	1
569:	4	2	5	2	5	4	2	7
577:	4	6	5	6	7	6	5	14
585:	4	5	7	9	5	3	5	11
593:	8	7	9	11	17	6	9	13
601:	11	14	10	9	10	10	5	3
609:	2	0	0	0	0	0	0	0
617:	0	0	0	1	0	0	1	0
625:	0	0	0	0	0	0	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	1	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	1	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	1	0	0	0	0
793:	0	0	0	0	0	0	1	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	1	1	0	0
825:	0	0	0	0	1	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	1	1	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	1	0	0	0	0	0
897:	1	0	0	0	0	0	0	0
905:	0	0	0	1	0	1	2	0
913:	1	0	2	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	1	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



# Apex-Alpha™

105  
2/12/13

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307152A-UU  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_029  
 Chamber Serial Number:  
 Detector Serial Number: 29  
 Env. Background: System Bkgd 64779  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 8/12/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:38:27 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.607 mL  
 Effective Efficiency: 0.0926 +/- 0.0072  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Chem. Recovery Factor: 0.4758 +/- 0.0382

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 5.283	180.64	14.65	1.36	0.00E+000	19.5
U-234	4.748	8.32	71.13	0.68	0.00E+000	3.1
U-235	4.391	2.49	138.29	0.51	0.00E+000	3.1
U-238	4.117	3.49	113.53	0.51	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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

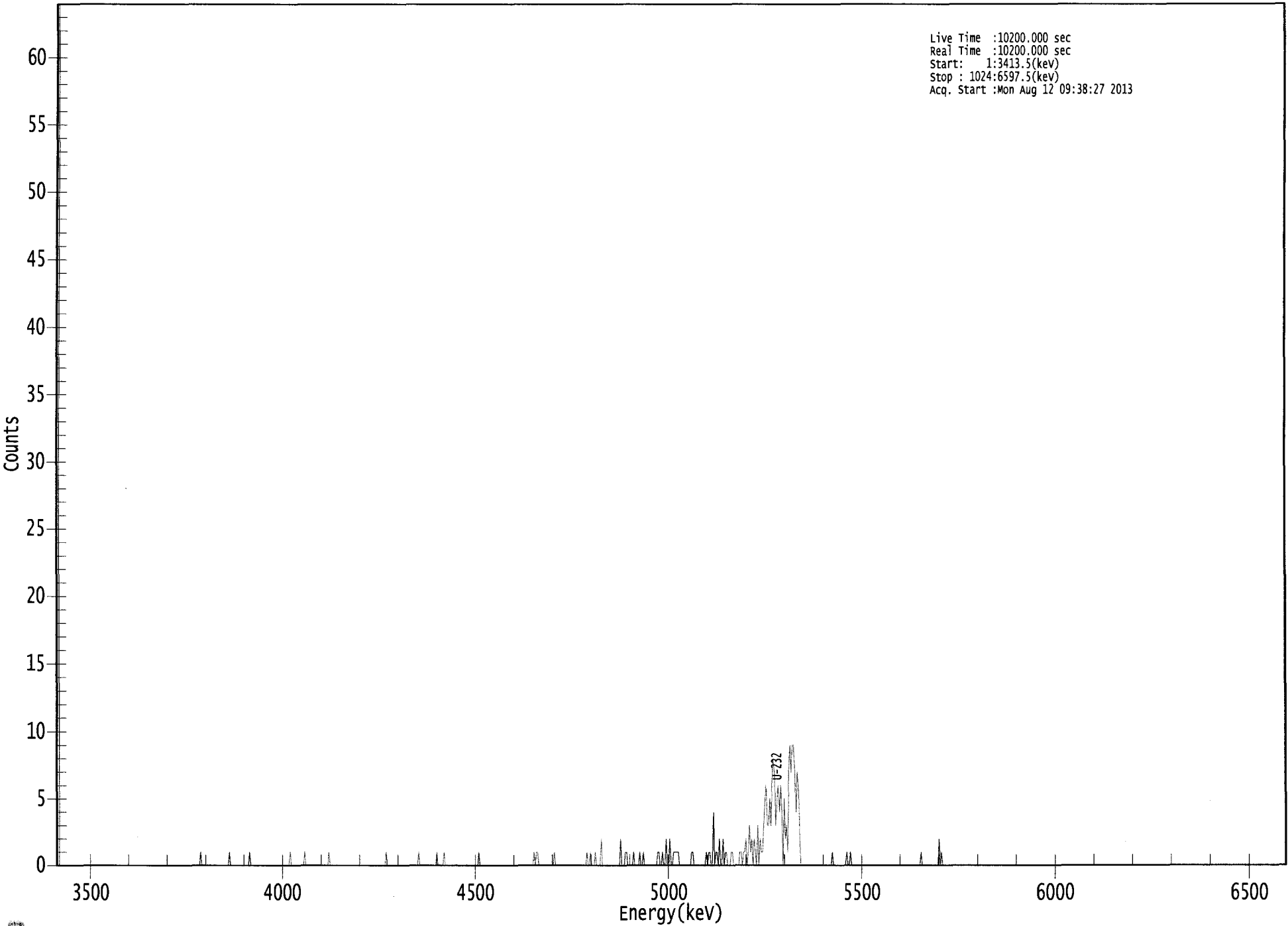
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.18E+000 +/- 7.94E-001	1.97E-001 +/- 3.01E-002
U-234	0.999	4761.50*	2.39E-001 +/- 1.74E-001	1.62E-001 +/- 2.48E-002
U-235	1.000	4385.50*	8.81E-002 +/- 1.23E-001	1.86E-001 +/- 2.85E-002
U-238	0.968	4184.40*	9.97E-002 +/- 1.14E-001	1.50E-001 +/- 2.30E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065882.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3413.5(kev)  
Stop : 1024:6597.5(kev)  
Acq. Start :Mon Aug 12 09:38:27 2013



0110

ROI Type: 1

ROI Type: 3

\*\*\*\*\*  
 \*\*\*\*\* 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:	10200	10200	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	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	1	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	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	1	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	1	0	0	0	0
201:	0	0	0	0	0	0	0	1
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	1	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	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	1	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	1	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	1	0	0
321:	0	0	0	1	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:	1	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: 02

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	1	0
401:	1	1	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	1
417:	0	0	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	1	0	0	1	0	0
449:	0	1	0	0	0	0	2	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	2	0
473:	0	0	1	1	0	0	0	0
481:	0	1	0	0	0	0	1	0
489:	0	1	0	0	0	0	0	0
497:	0	0	0	0	0	1	1	0
505:	0	1	0	0	2	0	0	2
513:	0	0	1	1	1	1	1	0
521:	0	0	0	0	0	0	0	0
529:	0	1	1	0	0	0	0	0
537:	0	0	0	0	0	1	0	1
545:	1	0	0	4	0	1	1	0
553:	2	0	0	2	0	1	1	0
561:	0	0	1	1	0	0	0	0
569:	0	1	1	0	1	1	2	0
577:	1	3	1	2	0	2	1	0
585:	3	0	2	1	1	3	5	6
593:	3	3	5	3	6	8	7	3
601:	5	6	4	6	4	0	5	2
609:	3	1	7	9	7	9	9	7
617:	4	7	6	2	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	1	0
649:	0	0	0	0	0	0	0	0
657:	0	0	1	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:	1	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	2
737:	0	1	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	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



KAS  
8/12/13

# Apex-Alpha™

Sample Description: PZ-203-SS TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307152A-UU  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_031  
 Chamber Serial Number:  
 Detector Serial Number: 31  
 Env. Background: System Bkgd 64780  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:38:28 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.606 mL  
 Effective Efficiency: 0.1582 +/- 0.0097  
 Counting Efficiency: 0.1418 +/- 0.0034 on 6/13/2013 3:23:29 PM  
 Chem. Recovery Factor: 1.1152 +/- 0.0737

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 5.275	308.32	11.18	0.68	0.00E+000	9.4
U-234	4.722	164.15	15.34	0.85	0.00E+000	7.5
U-235	4.382	12.66	55.94	0.34	0.00E+000	3.1
U-238	4.147	47.77	29.46	3.23	0.00E+000	9.4

T = Tracer Peak used for Effective Efficiency

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

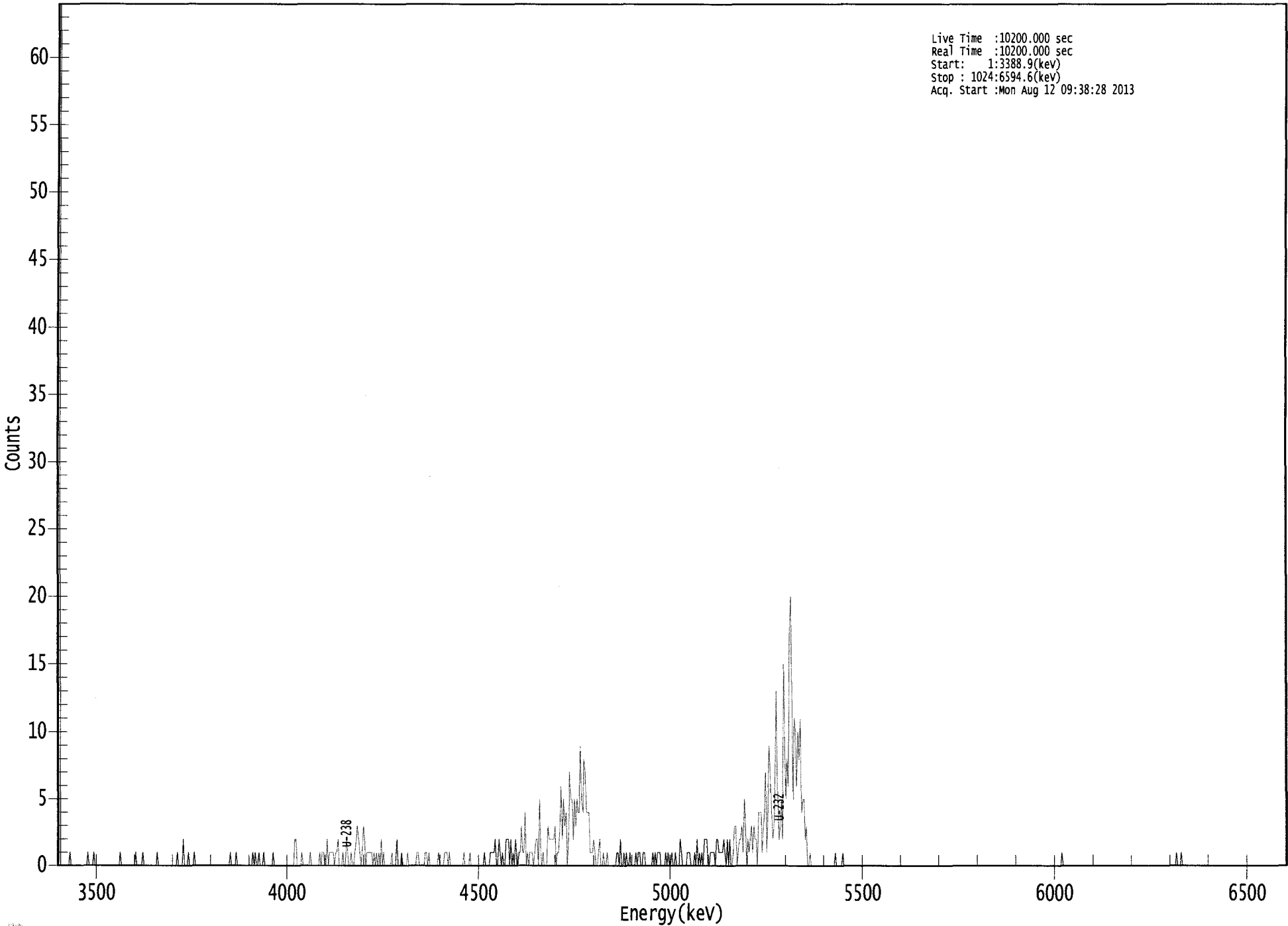
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.995	5302.50*	5.18E+000 +/- 6.24E-001	9.47E-002 +/- 1.14E-002
U-234	0.989	4761.50*	2.76E+000 +/- 5.38E-001	1.00E-001 +/- 1.21E-002
U-235	1.000	4385.50*	2.62E-001 +/- 1.50E-001	9.90E-002 +/- 1.19E-002
U-238	0.990	4184.40*	7.98E-001 +/- 2.54E-001	1.52E-001 +/- 1.83E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065883.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3388.9(kev)  
Stop : 1024:6594.6(kev)  
Acq. Start :Mon Aug 12 09:38:28 2013



ROI Type: 1

ROI Type: 3

0000065883.CNF

\*\*\*\*\*  
 \*\*\*\*\* 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:	10200	10200	0	0	0	0	0	0
9:	0	0	1	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	1	0	0	0	0	1	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	1	0	0	0	0	0	1
73:	0	0	0	0	0	0	0	0
81:	0	0	0	1	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	1	0	0	0
105:	0	2	0	0	0	1	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:	1	0	0	0	0	1	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	1	0	1	0	0
169:	1	0	0	0	1	0	0	0
177:	0	0	0	0	1	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	2	2
201:	0	0	0	0	1	0	0	0
209:	0	0	0	1	0	0	0	0
217:	0	0	0	1	0	1	1	0
225:	0	2	0	1	1	1	1	0
233:	1	1	2	0	0	0	1	0
241:	0	2	1	0	0	1	0	0
249:	1	2	3	2	1	0	1	3
257:	2	0	1	1	1	1	1	0
265:	1	0	1	0	1	0	2	0
273:	1	0	0	0	0	0	0	1
281:	0	0	0	2	0	0	0	1
289:	0	0	0	0	1	0	0	0
297:	0	0	0	0	1	1	0	0
305:	0	0	0	1	1	0	1	0
313:	0	0	0	0	0	0	1	0
321:	0	0	0	1	1	1	0	1
329:	0	0	0	0	0	0	0	0
337:	0	0	0	1	0	0	0	0
345:	1	0	0	0	0	0	0	0
353:	0	0	0	0	1	0	0	0
361:	0	1	1	1	1	2	0	0

369: 2 1 0 1 0 0 2 2

Sample Title: 03

Channel	1	2	3	4	5	6	7	8
377:	2	0	2	0	1	0	2	1
385:	0	1	1	3	1	1	4	0
393:	1	0	1	1	1	0	1	2
401:	2	0	5	1	0	1	0	0
409:	0	3	2	2	2	2	2	3
417:	0	1	1	3	6	2	5	3
425:	4	0	2	7	5	5	2	5
433:	3	5	4	4	9	5	4	8
441:	7	4	4	4	1	1	1	2
449:	1	0	0	1	2	0	0	1
457:	0	0	1	0	0	0	0	0
465:	0	0	1	1	0	2	0	0
473:	1	0	1	0	0	1	0	0
481:	0	0	1	0	1	1	0	0
489:	1	1	0	0	0	0	0	0
497:	1	0	1	0	1	1	1	0
505:	0	0	0	1	0	1	0	0
513:	1	0	0	1	0	0	0	2
521:	1	0	0	0	0	1	1	1
529:	0	0	0	1	0	2	0	1
537:	0	1	0	2	2	2	0	0
545:	1	1	1	1	0	2	2	1
553:	1	1	1	2	1	0	2	0
561:	2	0	0	1	3	3	0	1
569:	2	2	3	1	5	3	0	2
577:	1	2	3	1	3	2	2	0
585:	4	4	4	1	3	4	7	1
593:	5	9	7	4	2	3	7	13
601:	5	2	3	5	2	15	9	5
609:	8	6	17	20	13	5	11	10
617:	6	10	8	11	4	5	5	2
625:	3	0	0	1	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	1	0	0	0	0	0	1	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: 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	1	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	1	0	0	0	1
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  
8/12/13

Sample Description: PZ-203-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_033  
 Chamber Serial Number: 04026479A  
 Detector Serial Number: 91132  
 Env. Background: System Bkgd 64781  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:37 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.603 mL  
 Effective Efficiency: 0.1771 +/- 0.0104  
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM  
 Chem. Recovery Factor: 0.9584 +/- 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 5.287	343.83	10.57	0.17	0.00E+000	19.2
U-234	4.740	190.83	14.20	0.17	0.00E+000	6.3
U-235	4.362	11.66	58.37	0.34	0.00E+000	4.5
U-238	4.157	26.66	38.24	0.34	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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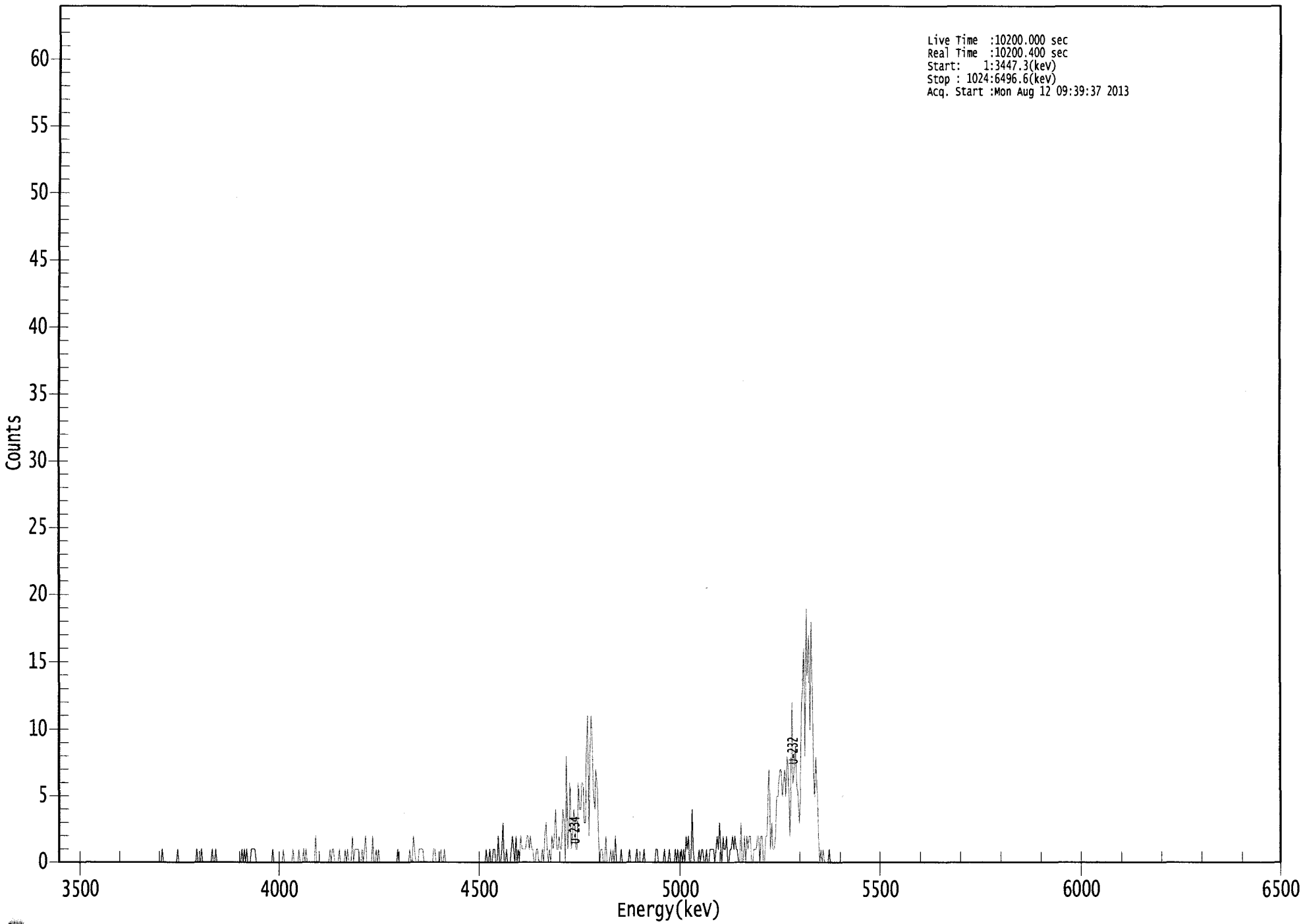
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.998	5302.50*	5.16E+000 +/- 5.93E-001	6.26E-002 +/- 7.20E-003
U-234	0.997	4761.50*	2.86E+000 +/- 5.22E-001	6.26E-002 +/- 7.19E-003
U-235	0.996	4385.50*	2.16E-001 +/- 1.28E-001	8.84E-002 +/- 1.02E-002
U-238	0.995	4184.40*	3.98E-001 +/- 1.59E-001	7.14E-002 +/- 8.20E-003

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065938.CNF

Live Time :10200.000 sec  
Real Time :10200.400 sec  
Start: 1:3447.3(kev)  
Stop : 1024:6496.6(kev)  
Acq. Start :Mon Aug 12 09:39:37 2013



ROI Type: 1

ROI Type: 3

0120

\*\*\*\*\*  
 \*\*\*\*\* 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:	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	1	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	1	0	0	0
121:	1	0	0	0	0	0	0	0
129:	0	1	0	0	1	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	1	0	1	0	1	0
161:	0	0	1	1	1	1	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	1	0	0	0
185:	0	0	0	0	0	1	0	0
193:	0	0	0	0	0	1	0	0
201:	0	0	1	0	0	0	1	0
209:	1	0	0	0	0	0	0	0
217:	2	0	0	0	0	0	0	0
225:	0	0	0	0	1	0	1	1
233:	0	0	0	0	1	0	0	0
241:	0	1	0	1	0	0	0	2
249:	0	1	1	1	1	0	0	1
257:	0	1	2	0	0	0	0	0
265:	2	0	0	1	0	1	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	1	0	0
289:	0	0	0	0	0	0	0	1
297:	0	0	2	1	0	0	0	1
305:	1	1	1	0	0	0	0	0
313:	0	0	0	1	1	0	0	0
321:	0	1	0	0	1	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	1
361:	0	0	1	0	0	1	1	0



369: 0 2 0 0 1 3 0 0

Sample Title: 04

Channel	1	2	3	4	5	6	7	8
377:	1	0	0	0	1	2	1	0
385:	2	0	1	0	2	1	1	1
393:	1	2	2	1	2	1	1	0
401:	0	1	1	0	0	0	1	0
409:	2	3	1	0	1	0	2	1
417:	2	4	1	1	2	1	1	4
425:	3	0	8	1	3	6	1	2
433:	4	3	1	1	6	4	4	6
441:	6	3	3	8	11	2	8	11
449:	9	5	4	7	6	2	0	1
457:	1	0	0	2	0	0	0	1
465:	0	1	0	2	0	0	0	0
473:	1	0	0	0	0	0	0	1
481:	0	0	0	0	0	1	0	0
489:	0	0	0	1	0	0	0	0
497:	0	0	0	0	0	1	1	0
505:	0	0	0	0	1	0	0	0
513:	1	0	0	0	0	1	0	1
521:	0	0	1	0	1	0	2	1
529:	2	0	0	4	1	0	0	0
537:	0	1	0	1	1	0	0	1
545:	0	0	1	1	1	1	0	1
553:	2	1	3	1	0	2	1	1
561:	2	0	0	1	1	2	1	2
569:	1	1	0	0	3	0	0	2
577:	0	2	1	2	2	0	0	1
585:	1	1	2	2	0	2	2	0
593:	0	2	2	5	7	1	3	1
601:	1	2	5	5	6	7	7	5
609:	6	7	5	8	7	2	5	12
617:	6	7	9	6	5	3	5	12
625:	13	16	8	19	14	17	10	18
633:	13	7	5	8	5	2	0	1
641:	0	1	0	0	0	0	1	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: 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	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

KFJ  
8/12/13

# Apex-Alpha™

Sample Description: PZ-203-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_034  
 Chamber Serial Number: 04026479B  
 Detector Serial Number: 91136  
 Env. Background: System Bkgd 64782  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:39 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.598 mL  
 Effective Efficiency: 0.2034 +/- 0.0113  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Chem. Recovery Factor: 1.0958 +/- 0.0639

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	391.00	9.92	0.00	0.00E+000	21.9
U-234	4.733	232.00	12.90	0.00	0.00E+000	5.3
U-235	4.402	19.00	46.13	0.00	0.00E+000	3.5
U-238	4.148	67.66	23.90	0.34	0.00E+000	5.0

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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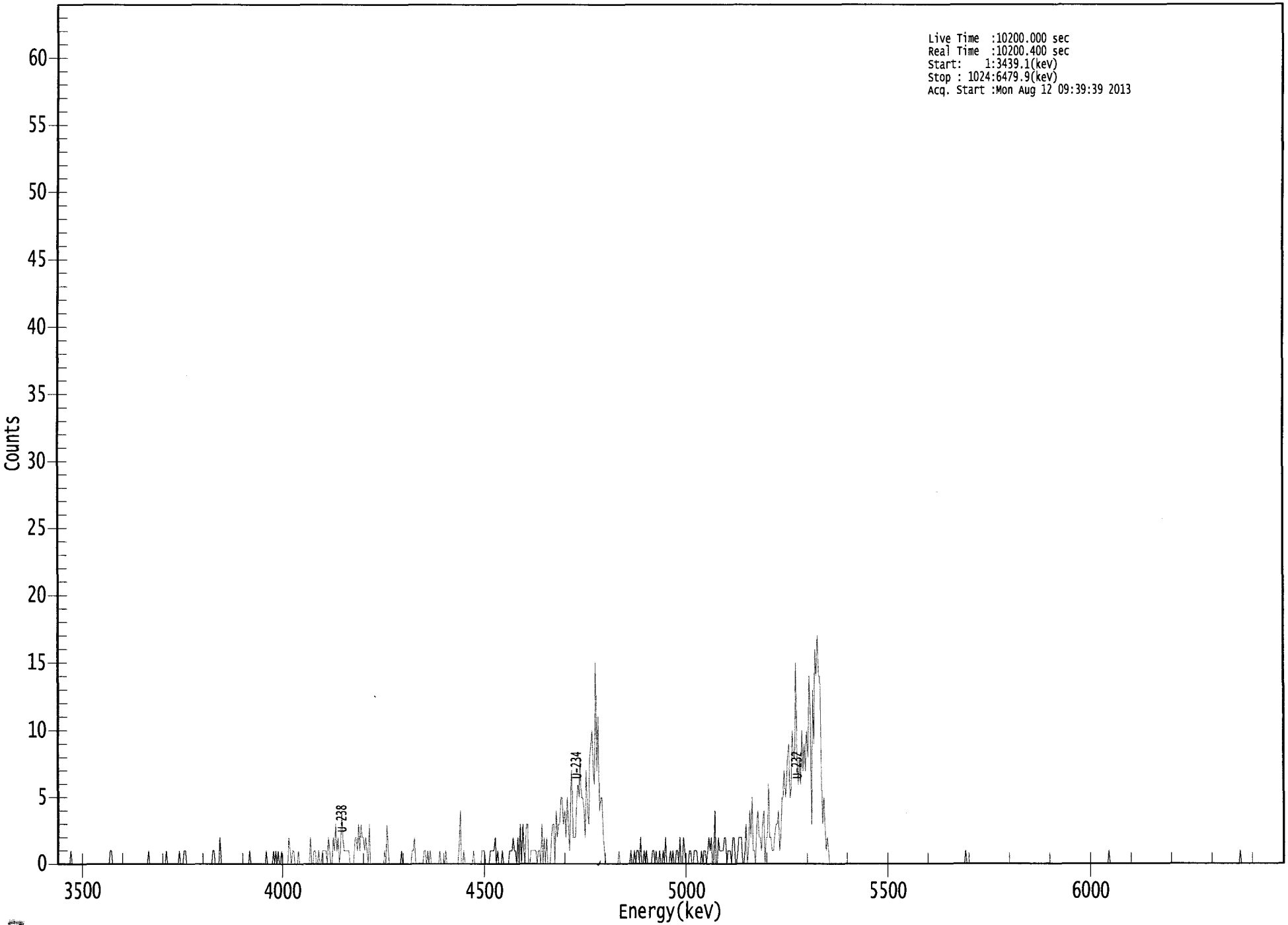
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.996	5302.50*	5.11E+000 +/- 5.57E-001	7.83E-002 +/- 8.54E-003
U-234	0.994	4761.50*	3.03E+000 +/- 5.11E-001	7.83E-002 +/- 8.53E-003
U-235	0.998	4385.50*	3.06E-001 +/- 1.45E-001	9.66E-002 +/- 1.05E-002
U-238	0.991	4184.40*	8.80E-001 +/- 2.31E-001	6.22E-002 +/- 6.78E-003

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US EPA ARCHIVE DOCUMENT

0000065940.CNF

Live Time :10200.000 sec  
Real Time :10200.400 sec  
Start: 1:3439.1(keV)  
Stop : 1024:6479.9(keV)  
Acq. Start :Mon Aug 12 09:39:39 2013



ROI Type: 1

ROI Type: 3

0125

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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: 05

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	1	1	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	1	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	1	0	0	0	0
97:	0	0	0	0	0	0	1	0
105:	0	0	1	1	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	1	1	0	0	0	0
137:	2	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	0	0	0	0	0
169:	0	0	0	0	0	0	0	1
177:	0	0	0	0	0	1	0	1
185:	0	1	0	0	1	0	0	0
193:	0	0	2	1	0	1	1	0
201:	0	0	1	0	0	0	0	0
209:	0	0	0	0	2	0	0	1
217:	1	0	0	1	0	0	1	1
225:	1	1	0	2	1	0	0	2
233:	1	3	1	2	0	1	4	2
241:	1	1	1	1	1	0	0	0
249:	0	2	2	1	3	1	3	2
257:	2	1	2	1	0	3	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	1	0	3	1	0	0
281:	0	0	0	0	0	0	0	0
289:	1	0	0	0	0	0	0	0
297:	0	1	1	2	0	0	0	0
305:	0	0	0	1	1	0	1	0
313:	1	0	0	0	0	0	0	0
321:	1	0	0	0	0	1	0	0
329:	0	0	0	0	0	0	0	0
337:	1	4	0	0	1	0	0	0
345:	0	0	0	0	1	0	0	0
353:	0	0	0	1	1	1	0	0
361:	0	0	1	1	1	1	2	0

369: 1 0 0 0 1 0 0 0

Sample Title: 05

Channel	1	2	3	4	5	6	7	8
377:	0	0	1	1	1	2	1	1
385:	0	2	0	3	0	3	1	0
393:	3	3	0	0	1	1	1	1
401:	1	0	1	1	0	3	0	2
409:	0	2	0	0	0	2	3	3
417:	0	4	2	3	3	5	5	3
425:	4	2	5	3	1	5	7	2
433:	2	2	5	6	5	8	5	5
441:	4	2	7	4	3	8	9	10
449:	7	6	15	7	11	4	5	5
457:	2	1	0	0	0	0	0	0
465:	0	0	0	0	0	1	0	0
473:	0	0	0	0	0	0	0	1
481:	0	0	1	0	1	1	0	2
489:	0	0	1	0	1	0	0	0
497:	0	1	1	0	1	0	0	1
505:	0	0	1	0	2	0	0	0
513:	1	0	1	0	0	1	1	0
521:	2	0	0	2	1	0	0	0
529:	1	1	0	0	1	1	1	0
537:	0	0	1	0	1	1	0	1
545:	2	1	2	0	0	4	0	0
553:	2	1	1	1	1	2	2	0
561:	1	1	1	0	2	2	0	0
569:	1	2	2	2	0	0	1	3
577:	0	1	4	2	5	1	1	0
585:	3	4	2	2	1	3	4	0
593:	2	2	6	2	2	1	1	2
601:	3	3	4	1	2	5	5	7
609:	5	6	8	9	5	6	10	8
617:	8	15	8	6	8	6	10	7
625:	9	7	10	8	14	11	3	13
633:	9	16	14	17	14	14	8	3
641:	5	3	1	2	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	1	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: 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	1	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	1	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

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# Apex-Alpha™

Sample Description: D-87 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 64783  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:40 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.602 mL  
 Effective Efficiency: 0.1740 +/- 0.0103  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 0.9527 +/- 0.0588

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 5.301	337.15	10.69	0.85	0.00E+000	19.3
U-234	4.745	68.83	23.66	0.17	0.00E+000	3.3
U-235	4.413	7.00	79.20	0.00	0.00E+000	2.9
U-238	4.163	30.83	35.41	0.17	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	1.000	5302.50*	5.15E+000 +/- 5.98E-001	9.14E-002 +/- 1.06E-002
U-234	0.998	4761.50*	1.05E+000 +/- 2.77E-001	6.37E-002 +/- 7.39E-003
U-235	0.995	4385.50*	1.32E-001 +/- 1.05E-001	1.13E-001 +/- 1.31E-002
U-238	0.997	4184.40*	4.69E-001 +/- 1.75E-001	6.34E-002 +/- 7.36E-003

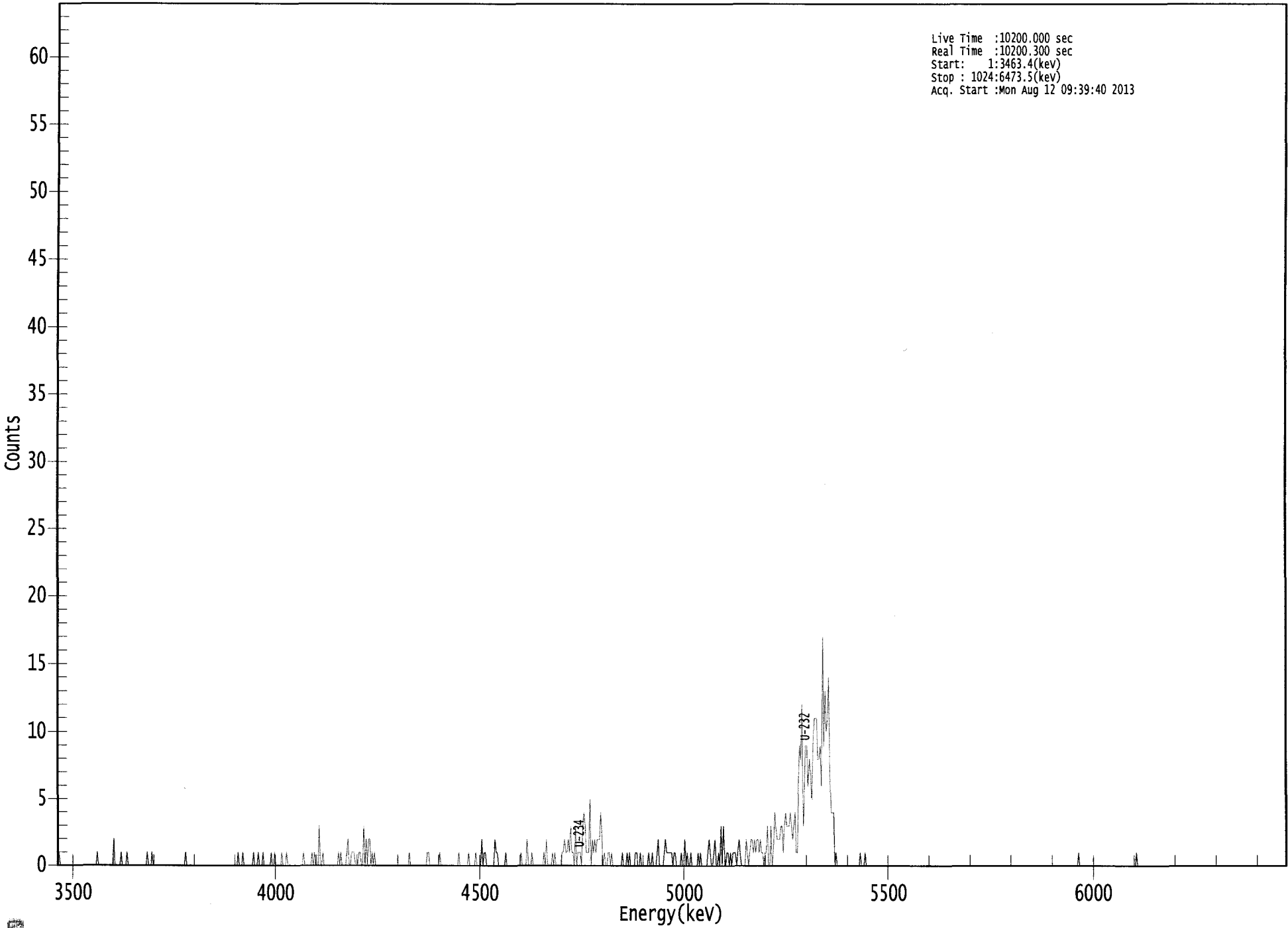
AG  
8/13/13

US EPA ARCHIVE DOCUMENT



0000065941.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :Mon Aug 12 09:39:40 2013



0130

ROI Type: 1

ROI Type: 3

\*\*\*\*\*  
 \*\*\*\*\* 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	1	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	1	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	2
49:	0	0	0	0	0	1	0	0
57:	0	0	1	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	1	0	0	0	1
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	1	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	1
153:	0	0	0	1	0	0	0	0
161:	0	0	0	0	1	0	0	0
169:	1	0	0	0	1	0	0	0
177:	0	0	0	1	0	0	1	0
185:	0	0	0	0	1	0	0	0
193:	1	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	1	0
209:	0	0	0	0	0	1	0	1
217:	0	0	0	3	0	0	1	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	1	0	1	0	0
241:	0	0	1	2	0	0	1	1
249:	1	0	0	0	1	1	0	0
257:	3	0	2	0	2	2	0	1
265:	0	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	0	0	0	0	0
305:	0	0	0	0	0	1	1	0
313:	0	0	0	0	0	0	0	1
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	1
337:	0	0	0	0	0	0	0	1
345:	0	0	0	0	0	1	0	0
353:	0	0	2	0	1	1	0	0
361:	0	0	0	0	0	2	1	1

369: 0 0 0 0 0 0 1 0

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	1	0	0	0	0
393:	2	0	0	0	1	0	0	0
401:	0	0	0	0	0	0	1	0
409:	2	0	0	0	0	1	0	1
417:	0	0	0	0	0	1	1	2
425:	1	1	2	1	3	1	1	0
433:	3	0	1	1	1	0	3	4
441:	3	1	1	1	5	0	2	1
449:	2	1	2	2	2	4	2	0
457:	1	0	0	1	1	0	1	0
465:	0	0	0	0	0	0	0	1
473:	0	0	0	1	0	1	0	0
481:	0	0	1	1	0	0	1	0
489:	0	0	0	0	0	1	0	0
497:	1	0	0	0	1	2	0	0
505:	0	0	1	2	1	1	1	1
513:	1	0	1	1	0	0	0	0
521:	1	0	0	2	0	1	0	0
529:	1	0	0	0	0	0	1	0
537:	1	0	0	0	0	0	1	2
545:	1	0	0	1	2	0	0	1
553:	0	3	0	3	1	0	1	1
561:	0	1	0	1	1	1	0	1
569:	2	1	0	0	0	0	2	1
577:	0	1	2	2	1	2	1	2
585:	2	1	2	1	1	0	1	1
593:	3	0	0	3	0	1	4	3
601:	2	2	2	3	3	1	3	4
609:	3	3	3	4	3	2	3	4
617:	1	1	6	9	8	12	3	6
625:	9	9	6	8	7	5	9	11
633:	11	11	8	8	9	6	17	9
641:	13	10	11	14	7	4	4	4
649:	0	1	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	1	0	0
673:	0	1	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	1	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	1	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

148  
8/12/13

# Apex-Alpha™

Sample Description: D-87 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_036  
 Chamber Serial Number: 04026477B  
 Detector Serial Number: 84167  
 Env. Background: System Bkgd 64784  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:42 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.603 mL  
 Effective Efficiency: 0.0936 +/- 0.0073  
 Counting Efficiency: 0.1910 +/- 0.0033 on 7/20/2013 2:31:37 PM  
 Chem. Recovery Factor: 0.4899 +/- 0.0390

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	5.264	181.66	14.56	0.34	0.00E+000	11.2
U-234	4.759	17.15	48.68	0.85	0.00E+000	3.0
U-235	4.447	8.83	66.70	0.17	0.00E+000	3.0
U-238	4.120	11.49	59.30	0.51	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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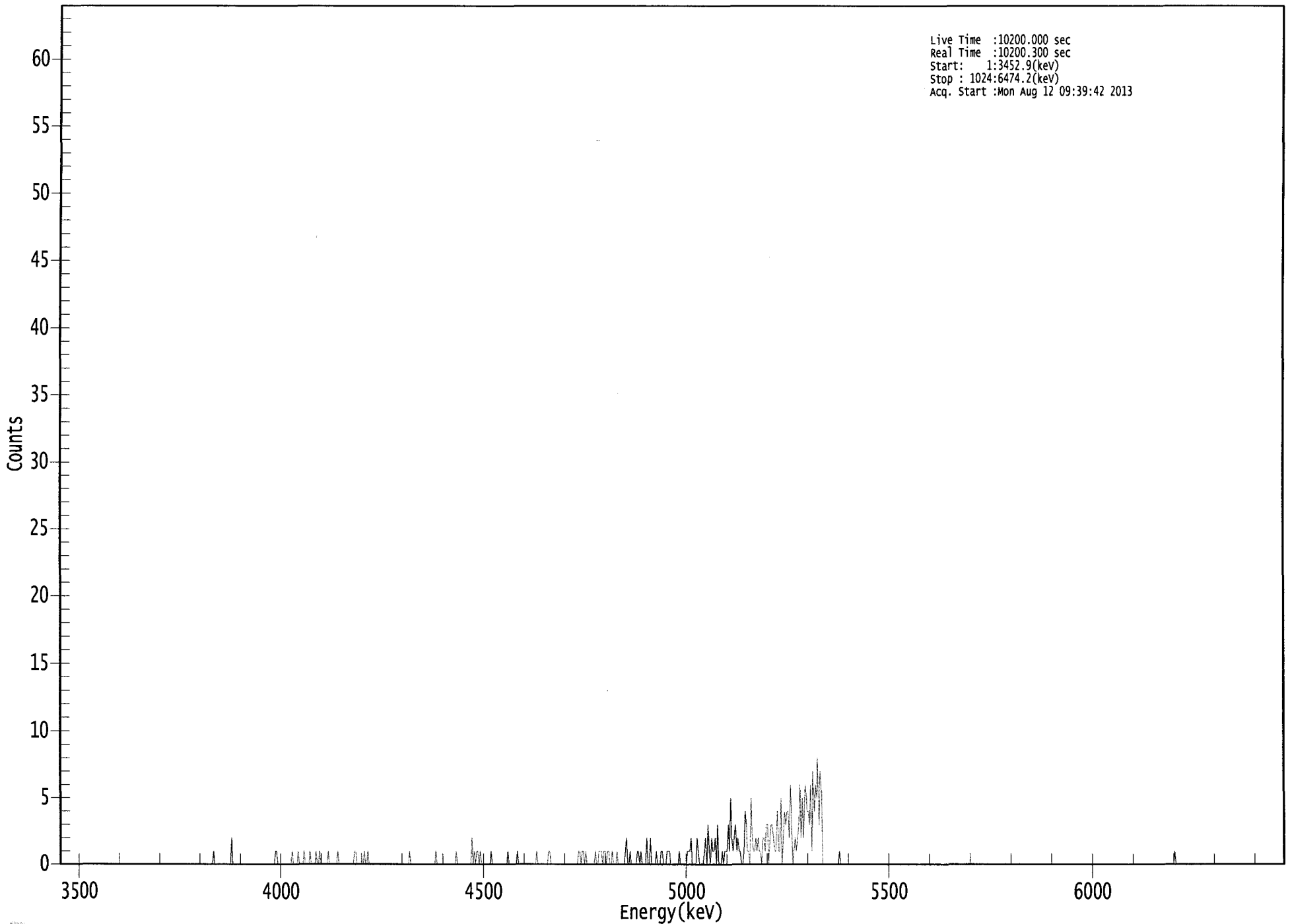
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.990	5302.50*	5.16E+000 +/- 7.86E-001	1.36E-001 +/- 2.07E-002
U-234	1.000	4761.50*	4.87E-001 +/- 2.48E-001	1.70E-001 +/- 2.59E-002
U-235	0.974	4385.50*	3.09E-001 +/- 2.11E-001	1.46E-001 +/- 2.23E-002
U-238	0.971	4184.40*	3.25E-001 +/- 1.99E-001	1.48E-001 +/- 2.26E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065942.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3452.9(kev)  
Stop : 1024:6474.2(kev)  
Acq. Start :Mon Aug 12 09:39:42 2013



0125

ROI Type: 1

ROI Type: 3

\*\*\*\*\*  
 \*\*\*\*\* 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:	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	1	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	2	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	1	1	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	1	0	0	0	0
201:	1	0	0	0	0	1	0	0
209:	0	0	1	0	0	0	0	1
217:	0	0	1	0	0	0	0	0
225:	0	1	0	0	0	0	0	0
233:	0	1	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	1
249:	1	0	0	0	0	0	0	1
257:	0	0	1	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	1	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	1	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	1	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	2	0	1	0	1	1	0
353:	1	0	0	0	0	0	0	0
361:	0	1	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 1

Sample Title: 07

Channel	1	2	3	4	5	6	7	8	9
377:	0	0	0	0	0	0	0	0	1
385:	0	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0	1
401:	0	0	0	0	0	0	0	0	0
409:	0	1	1	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0	0
433:	0	0	1	1	0	1	1	0	0
441:	1	0	0	0	0	0	0	0	0
449:	1	0	0	1	1	1	1	0	1
457:	1	0	1	1	0	0	1	0	0
465:	0	0	1	0	0	0	0	0	0
473:	0	1	2	0	0	1	0	0	0
481:	0	0	0	1	1	0	1	0	0
489:	0	0	0	2	0	0	2	0	0
497:	0	0	0	1	0	0	0	0	1
505:	1	0	0	0	1	1	1	1	0
513:	0	0	0	0	0	0	1	0	0
521:	0	0	0	0	0	1	1	1	1
529:	2	0	0	0	0	2	1	0	0
537:	0	0	0	1	2	0	3	1	1
545:	0	2	1	1	2	0	3	0	0
553:	0	0	1	0	1	1	1	3	3
561:	1	5	2	1	2	3	1	2	2
569:	1	1	0	0	1	4	3	1	1
577:	1	0	5	2	1	1	2	1	1
585:	2	1	1	0	2	2	1	3	3
593:	3	0	2	3	3	2	1	1	1
601:	4	1	1	5	0	2	4	3	3
609:	4	4	2	6	3	0	1	2	2
617:	1	2	3	6	2	5	2	5	5
625:	6	4	4	3	6	1	7	4	4
633:	6	5	8	3	7	6	0	0	0
641:	0	0	0	0	0	0	0	0	0
649:	0	0	0	0	1	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	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	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: 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	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	1	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



# Apex-Alpha™

103  
8/12/13

Sample Description: DUP 06 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_037  
 Chamber Serial Number: 04026478A  
 Detector Serial Number: 91133  
 Env. Background: System Bkgd 62769  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:44 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.602 mL  
 Effective Efficiency: 0.1824 +/- 0.0106  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Chem. Recovery Factor: 1.0231 +/- 0.0623

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 5.284	353.49	10.43	0.51	0.00E+000	10.1
U-234	4.733	108.66	18.84	0.34	0.00E+000	4.9
U-235	4.411	14.00	54.22	0.00	0.00E+000	2.9
U-238	4.162	93.00	20.43	0.00	0.00E+000	5.1

T = Tracer Peak used for Effective Efficiency

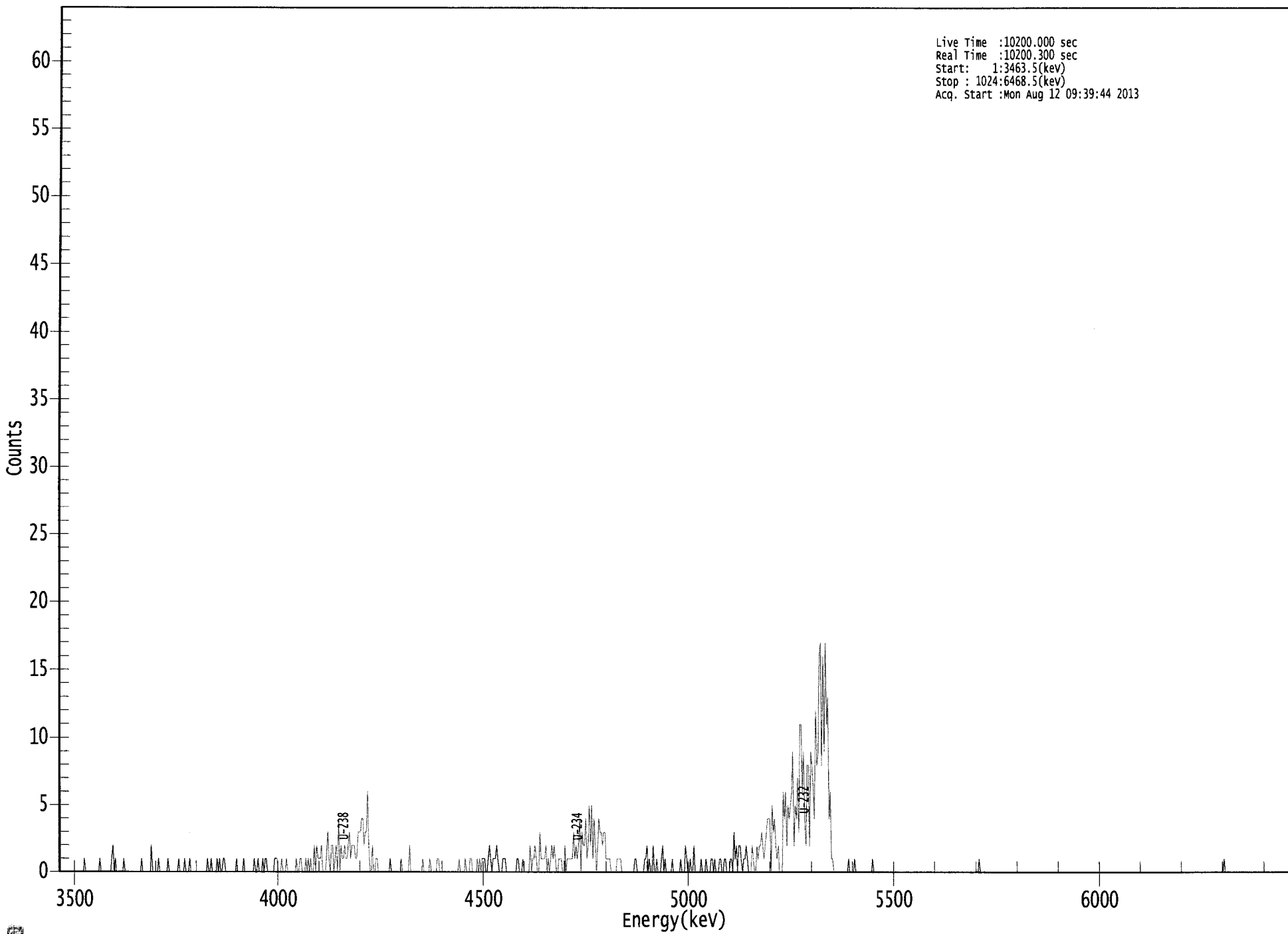
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.998	5302.50*	5.15E+000 +/- 5.85E-001	7.64E-002 +/- 8.69E-003
U-234	0.994	4761.50*	1.58E+000 +/- 3.48E-001	6.96E-002 +/- 7.91E-003
U-235	0.995	4385.50*	2.51E-001 +/- 1.39E-001	1.08E-001 +/- 1.22E-002
U-238	0.996	4184.40*	1.35E+000 +/- 3.15E-001	8.69E-002 +/- 9.88E-003

AG  
8/13/13

0000065943.CNF

Live Time : 10200.000 sec  
Real Time : 10200.300 sec  
Start : 1:3463.5(kev)  
Stop : 1024:6468.5(kev)  
Acq. Start : Mon Aug 12 09:39:44 2013



ROI Type: 1

ROI Type: 3

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

369: 0 1 1 1 0 0 0 0

Sample Title: 08

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	1	1	0
385:	0	0	1	0	0	0	0	0
393:	2	0	1	1	2	1	0	0
401:	3	1	1	1	1	2	0	1
409:	0	1	2	1	2	1	0	0
417:	1	1	1	0	0	2	0	1
425:	1	1	1	1	3	1	2	1
433:	2	4	0	3	2	2	4	1
441:	2	5	2	5	1	4	2	0
449:	2	4	3	3	2	3	3	1
457:	1	1	1	0	0	0	0	0
465:	1	1	1	1	0	0	0	0
473:	0	0	0	0	0	0	0	1
481:	1	0	0	0	0	0	0	1
489:	1	2	0	1	0	0	2	0
497:	0	1	0	0	0	1	2	0
505:	1	0	0	0	0	0	1	0
513:	0	0	0	0	0	1	0	0
521:	0	2	1	0	0	1	0	0
529:	2	0	0	0	0	0	1	0
537:	0	0	1	0	0	0	1	1
545:	0	1	0	0	0	1	1	0
553:	0	1	1	0	0	0	1	1
561:	0	3	1	2	0	2	2	1
569:	0	1	1	2	1	0	0	0
577:	2	1	0	0	2	1	2	2
585:	3	2	1	2	3	4	4	4
593:	0	5	3	4	2	1	2	0
601:	0	0	6	4	6	2	5	4
609:	5	6	9	2	5	4	7	3
617:	11	11	6	9	4	2	8	8
625:	2	9	8	6	4	12	8	9
633:	16	17	8	16	9	17	11	13
641:	4	6	1	1	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	1	0	0	0	0	1	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	1	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	1	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: 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	1
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  
8/12/13

# Apex-Alpha™

Sample Description: DUP 06 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_038  
 Chamber Serial Number: 04026478B  
 Detector Serial Number: 91134  
 Env. Background: System Bkgd 64785  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:46 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.603 mL  
 Effective Efficiency: 0.1431 +/- 0.0092  
 Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM  
 Chem. Recovery Factor: 0.8310 +/- 0.0554

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	5.289	277.66	11.77	0.34	0.00E+000	10.3
U-234	4.743	88.83	20.82	0.17	0.00E+000	3.4
U-235	4.390	19.00	46.13	0.00	0.00E+000	3.0
U-238	4.169	78.66	22.16	0.34	0.00E+000	5.0

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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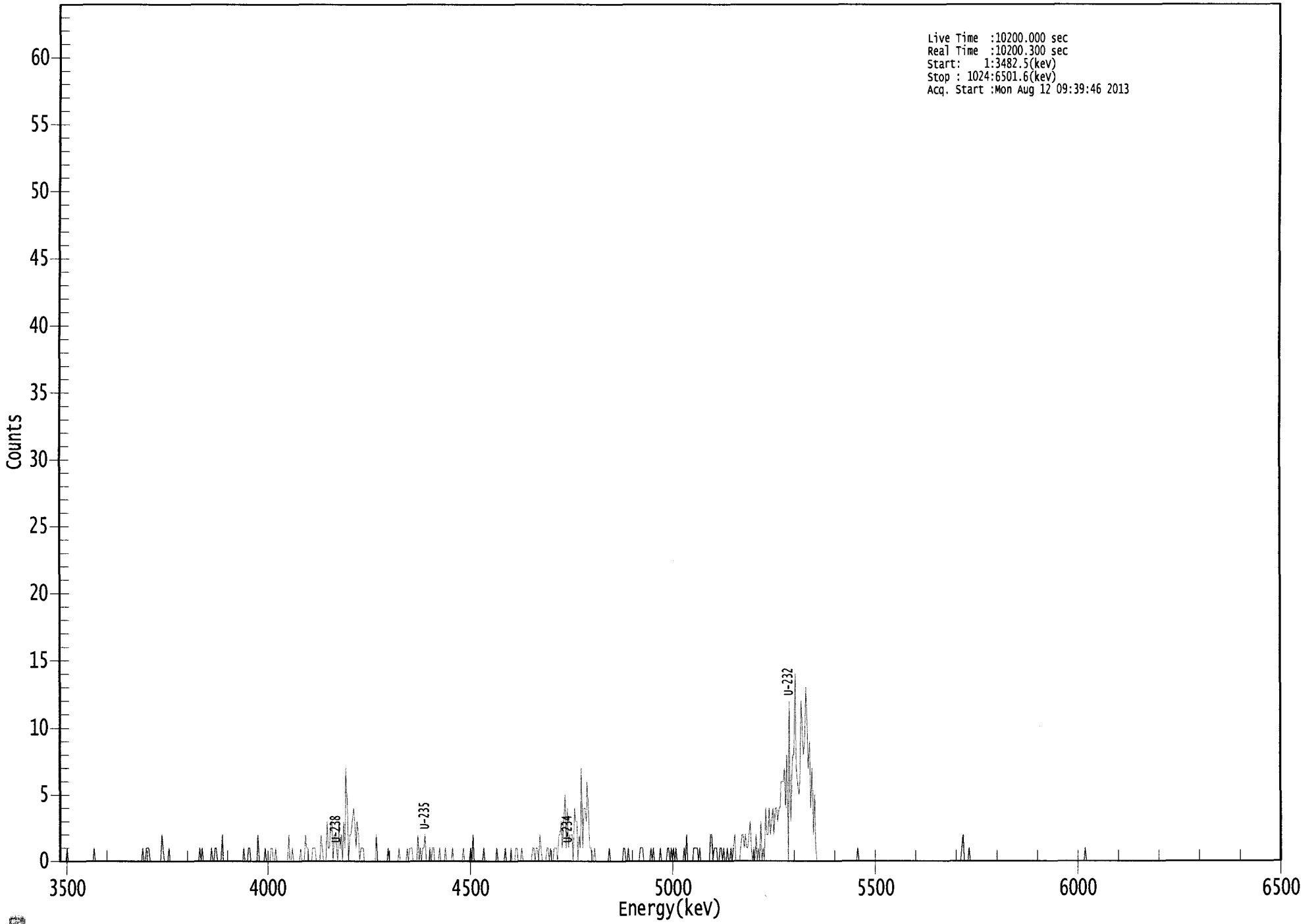
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.999	5302.50*	5.16E+000 +/- 6.50E-001	8.88E-002 +/- 1.12E-002
U-234	0.998	4761.50*	1.65E+000 +/- 4.01E-001	7.74E-002 +/- 9.76E-003
U-235	1.000	4385.50*	4.35E-001 +/- 2.08E-001	1.37E-001 +/- 1.73E-002
U-238	0.998	4184.40*	1.45E+000 +/- 3.71E-001	8.83E-002 +/- 1.11E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

000065944.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3482.5(kev)  
Stop : 1024:6501.6(kev)  
Acq. Start :Mon Aug 12 09:39:46 2013



ROI Type: 1

ROI Type: 3

015



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 \*\*\*\*\* 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	1	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	1	0
73:	0	1	1	1	0	0	0	0
81:	0	0	0	0	0	0	2	1
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	1	0
121:	1	0	0	0	0	0	0	0
129:	1	0	0	1	1	0	0	0
137:	0	2	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	1	0	0	0	1
161:	1	0	0	0	0	0	0	2
169:	0	0	0	0	0	1	0	0
177:	0	0	1	1	0	0	1	0
185:	0	0	0	0	0	0	0	0
193:	0	2	0	0	1	0	0	0
201:	0	0	0	1	0	0	0	2
209:	1	1	0	0	0	1	1	1
217:	0	0	0	0	2	1	0	0
225:	0	3	1	1	3	3	0	2
233:	2	1	0	3	1	2	0	3
241:	1	7	4	0	2	2	3	4
249:	3	1	3	2	0	1	1	1
257:	0	0	0	0	0	0	0	0
265:	0	0	2	0	0	0	0	0
273:	0	0	0	0	1	0	0	0
281:	0	0	0	0	0	1	0	0
289:	0	0	0	0	1	0	1	1
297:	1	0	0	0	0	2	0	1
305:	0	1	1	2	0	0	0	1
313:	0	1	1	0	0	0	0	1
321:	0	0	0	0	1	0	0	0
329:	0	0	1	0	0	0	0	0
337:	0	0	0	1	0	0	0	0
345:	0	1	0	2	0	0	0	0
353:	0	0	0	0	1	0	0	0
361:	0	0	0	0	0	0	0	1

369: 0 0 0 0 0 0 1 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	1	0	0	0	1
385:	1	0	0	0	1	0	0	0
393:	0	0	0	0	0	1	1	0
401:	1	1	0	2	1	0	0	0
409:	0	1	1	0	1	0	0	1
417:	1	1	0	2	2	3	1	3
425:	5	1	4	1	2	2	2	0
433:	4	3	3	0	2	1	7	1
441:	4	4	3	6	3	1	1	0
449:	0	1	0	0	0	0	0	0
457:	0	0	0	0	0	1	0	0
465:	0	0	0	0	0	0	0	0
473:	0	1	1	0	0	1	0	0
481:	0	0	0	0	0	0	0	1
489:	1	1	0	0	0	0	0	0
497:	1	0	1	0	0	0	0	0
505:	1	0	0	0	0	0	1	1
513:	0	1	0	1	0	1	0	0
521:	0	0	0	0	1	0	2	0
529:	0	0	0	0	1	1	1	1
537:	0	1	0	0	0	0	0	0
545:	0	0	2	2	0	1	1	1
553:	0	0	1	1	0	1	0	0
561:	1	0	0	1	0	1	2	0
569:	0	0	0	1	2	2	1	2
577:	1	1	2	3	1	0	1	0
585:	2	0	1	0	3	0	1	0
593:	4	2	2	4	2	3	4	2
601:	4	4	3	4	4	6	6	6
609:	7	4	8	0	12	3	6	8
617:	8	14	7	6	5	6	12	10
625:	8	9	13	10	7	9	4	7
633:	2	5	1	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	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	1	2	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: 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	1	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

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8/12/13

# Apex-Alpha™

Sample Description: S-53 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_039  
 Chamber Serial Number: 06027396A  
 Detector Serial Number: 83109  
 Env. Background: System Bkgd 64786  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:49 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.601 mL  
 Effective Efficiency: 0.1397 +/- 0.0091  
 Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM  
 Chem. Recovery Factor: 0.7108 +/- 0.0479

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	5.269	270.32	11.94	0.68	0.00E+000	14.6
U-234	4.720	310.32	11.14	0.68	0.00E+000	7.5
U-235	4.405	55.83	26.28	0.17	0.00E+000	3.7
U-238	4.140	273.49	11.86	0.51	0.00E+000	17.1

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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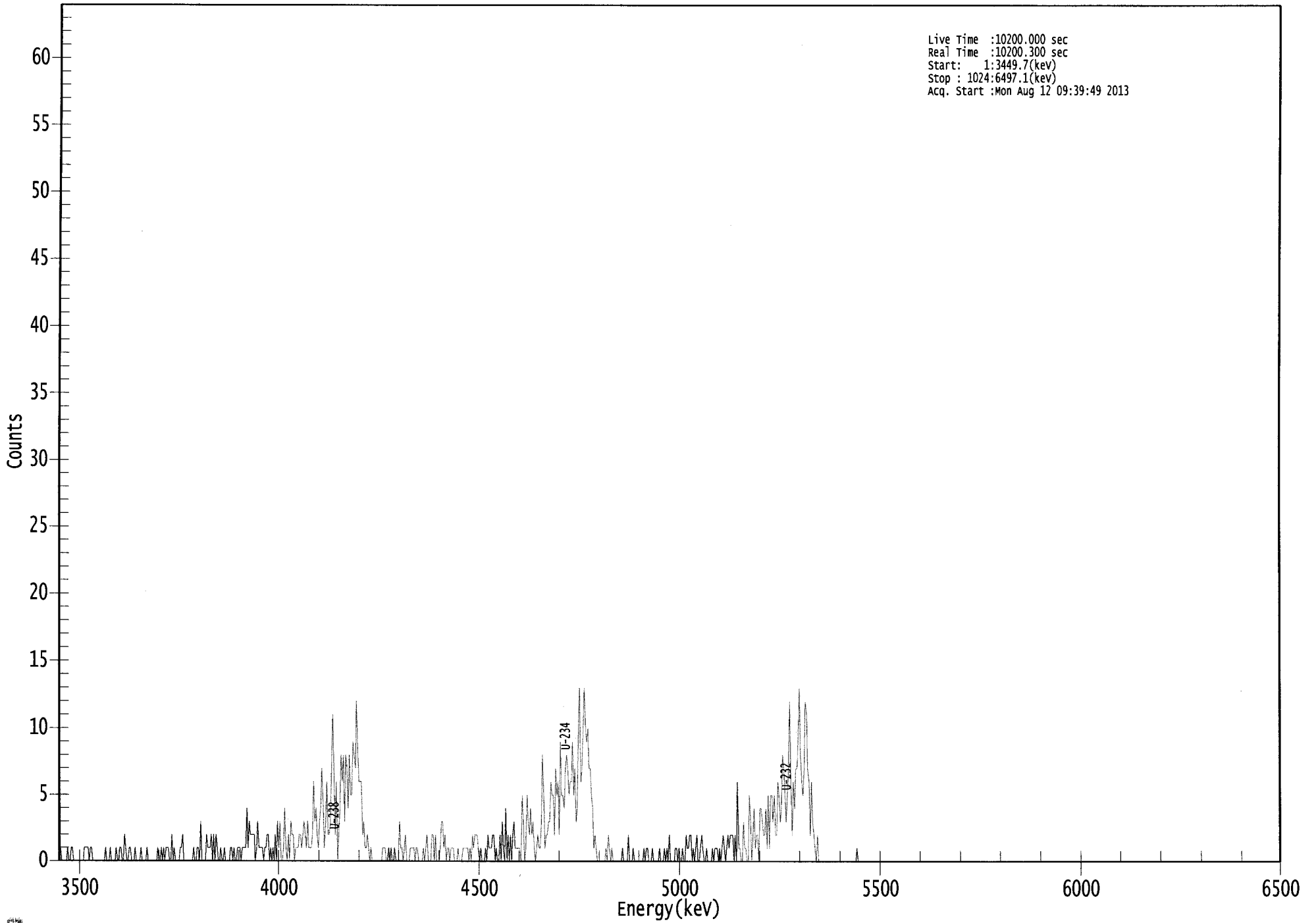
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.992	5302.50*	5.14E+000 +/- 6.56E-001	1.07E-001 +/- 1.37E-002
U-234	0.988	4761.50*	5.90E+000 +/- 9.99E-001	1.07E-001 +/- 1.37E-002
U-235	0.997	4385.50*	1.31E+000 +/- 3.82E-001	9.79E-002 +/- 1.25E-002
U-238	0.986	4184.40*	5.18E+000 +/- 9.02E-001	9.93E-002 +/- 1.27E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065945.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3449.7(keV)  
Stop : 1024:6497.1(keV)  
Acq. Start :Mon Aug 12 09:39:49 2013



ROI Type: 1

ROI Type: 3

0158

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

Sample Title: 10

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 0 2 0 3 1 0 4

Sample Title: 10

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	2	0	2	0	2	3	1
385:	1	1	1	1	0	5	3	0
393:	1	5	3	2	4	2	3	1
401:	0	1	2	1	1	3	8	5
409:	1	2	2	3	3	6	5	5
417:	2	7	5	6	2	9	5	5
425:	4	7	8	7	5	6	6	9
433:	5	7	3	4	10	13	6	7
441:	10	13	10	9	10	7	7	5
449:	4	1	2	1	0	0	0	0
457:	0	0	0	1	0	2	1	0
465:	1	0	0	0	0	0	0	0
473:	0	1	0	0	0	0	2	0
481:	0	0	1	0	0	0	0	0
489:	0	0	0	1	0	1	1	0
497:	0	0	1	0	0	0	0	0
505:	1	0	0	0	1	0	1	0
513:	2	0	0	0	0	1	1	0
521:	1	0	0	1	0	0	2	1
529:	1	2	2	0	1	0	1	2
537:	0	0	1	2	1	0	0	1
545:	0	0	0	0	1	0	1	1
553:	1	0	1	0	1	2	1	0
561:	1	2	1	2	2	2	0	2
569:	0	6	1	1	0	0	3	1
577:	1	0	0	5	3	0	2	4
585:	1	2	2	0	4	4	3	2
593:	2	4	1	5	1	5	5	3
601:	5	2	2	6	5	3	4	8
609:	7	5	3	5	7	12	6	2
617:	6	4	7	7	9	13	8	6
625:	5	7	12	11	7	6	2	6
633:	3	2	1	0	2	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	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

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	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



100  
8/12/13

# Apex-Alpha™

Sample Description: S-53 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 64787  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:50 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.603 mL  
 Effective Efficiency: 0.1854 +/- 0.0107  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 0.9758 +/- 0.0587

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 5.283	359.49	10.35	0.51	0.00E+000	16.4
U-234	4.734	362.66	10.30	0.34	0.00E+000	7.2
U-235	4.401	34.83	33.31	0.17	0.00E+000	3.7
U-238	4.162	355.00	10.42	0.00	0.00E+000	33.2

T = Tracer Peak used for Effective Efficiency

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

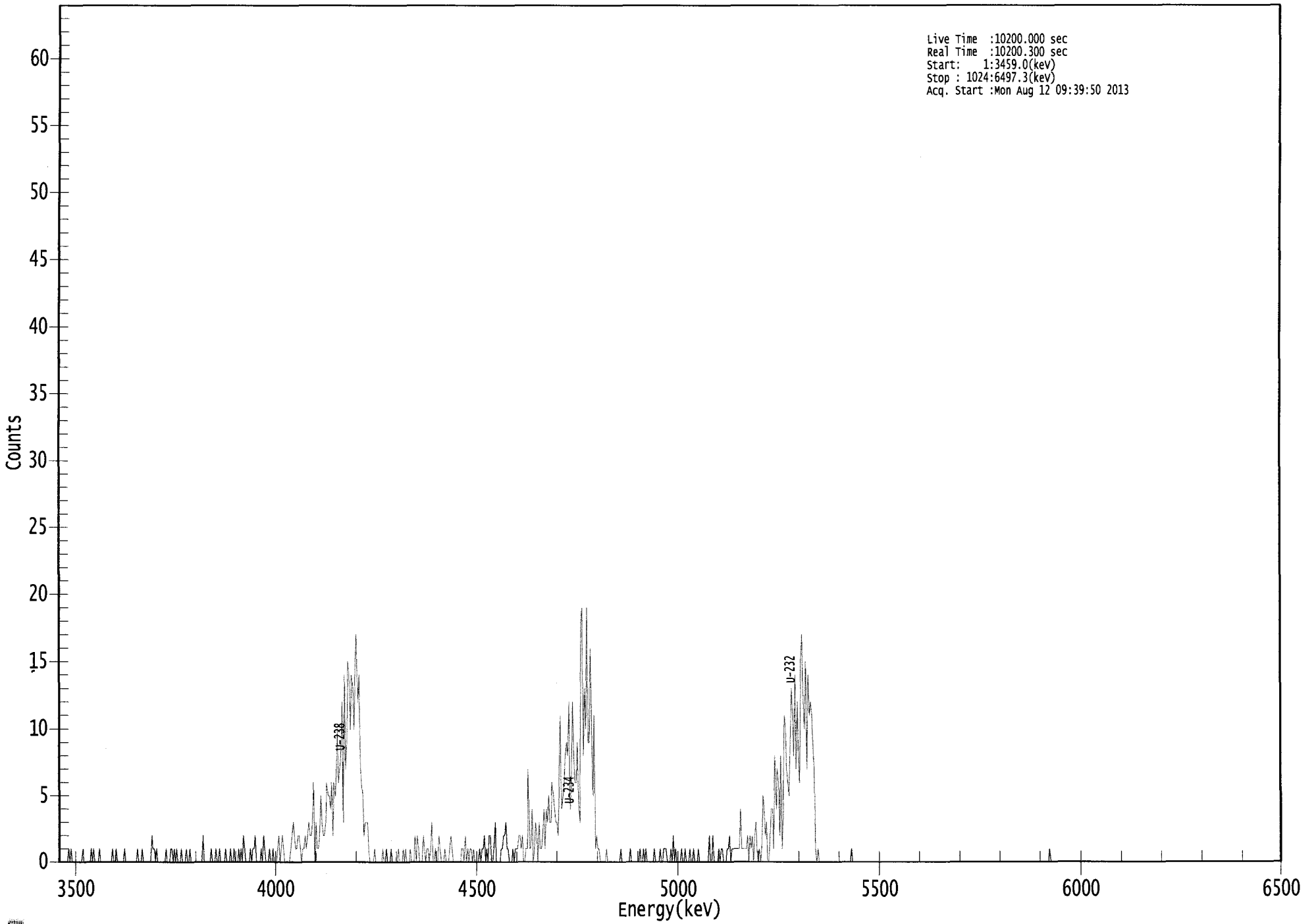
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.997	5302.50*	5.15E+000 +/- 5.81E-001	7.52E-002 +/- 8.49E-003
U-234	0.995	4761.50*	5.19E+000 +/- 7.93E-001	6.85E-002 +/- 7.73E-003
U-235	0.998	4385.50*	6.15E-001 +/- 2.16E-001	7.37E-002 +/- 8.32E-003
U-238	0.996	4184.40*	5.06E+000 +/- 7.77E-001	8.55E-002 +/- 9.65E-003

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065946.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Mon Aug 12 09:39:50 2013



ROI Type: 1

ROI Type: 3

0155



369: 0 0 0 1 1 2 2 3

Sample Title: 11

Channel	1	2	3	4	5	6	7	8
377:	1	1	0	0	0	1	0	1
385:	1	1	2	2	1	2	0	0
393:	1	1	7	1	1	4	0	1
401:	3	2	0	3	1	1	2	4
409:	1	4	3	5	3	3	6	5
417:	4	3	3	2	6	11	4	5
425:	6	8	9	8	12	4	6	12
433:	8	6	6	9	4	3	18	19
441:	8	13	10	19	9	9	16	10
449:	5	11	1	2	1	1	0	0
457:	0	0	0	1	0	0	0	0
465:	0	0	0	0	0	0	0	1
473:	0	0	0	0	0	0	0	1
481:	0	0	0	0	0	0	0	1
489:	0	0	1	0	1	0	0	0
497:	0	0	0	1	0	0	0	0
505:	1	0	0	1	1	1	0	0
513:	0	1	0	2	0	1	0	0
521:	0	0	1	0	0	1	0	0
529:	0	1	0	0	1	0	0	0
537:	1	0	0	0	0	0	0	0
545:	0	2	0	0	2	0	0	0
553:	0	1	0	1	1	0	0	0
561:	1	1	2	0	1	1	1	1
569:	1	1	1	4	1	1	1	1
577:	1	2	0	2	1	2	0	2
585:	3	1	0	1	0	1	5	4
593:	2	3	0	0	2	4	4	1
601:	8	4	7	6	2	8	1	4
609:	11	10	7	6	5	9	13	11
617:	8	14	7	12	8	6	15	17
625:	12	10	15	7	14	11	12	11
633:	9	7	1	0	1	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:	1	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	1	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  
8/12/13

# Apex-Alpha™

Sample Description: D-14 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_041  
 Chamber Serial Number: 05026930A  
 Detector Serial Number: 91087  
 Env. Background: System Bkgd 64058  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:53 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.601 mL  
 Effective Efficiency: 0.0800 +/- 0.0067  
 Counting Efficiency: 0.1917 +/- 0.0033 on 8/10/2013 2:59:03 PM  
 Chem. Recovery Factor: 0.4173 +/- 0.0356

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 5.272	154.83	15.76	0.17	0.00E+000	14.0
U-234	4.709	16.64	50.29	1.36	0.00E+000	3.5
U-235	4.418	7.32	76.28	0.68	0.00E+000	3.0
U-238	4.143	20.47	45.18	1.53	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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

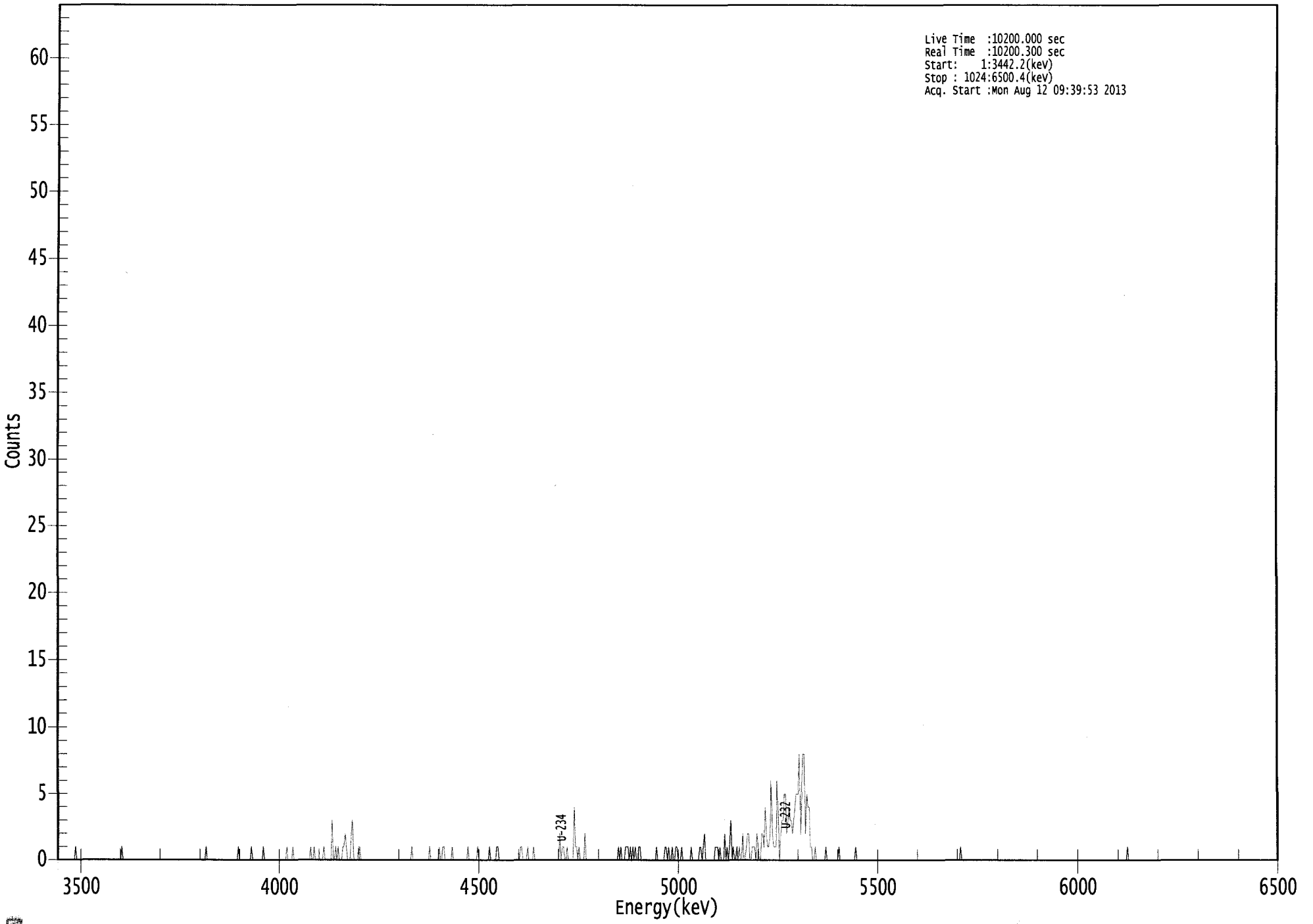
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.993	5302.50*	5.14E+000 +/- 8.43E-001	1.39E-001 +/- 2.27E-002
U-234	0.980	4761.50*	5.52E-001 +/- 2.92E-001	2.28E-001 +/- 3.73E-002
U-235	0.993	4385.50*	3.00E-001 +/- 2.34E-001	2.31E-001 +/- 3.79E-002
U-238	0.988	4184.40*	6.76E-001 +/- 3.25E-001	2.35E-001 +/- 3.85E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065947.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3442.2(keV)  
Stop : 1024:6500.4(keV)  
Acq. Start :Mon Aug 12 09:39:53 2013



ROI Type: 1

ROI Type: 3

010

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

Sample Title: 12

Elapsed Live time: 10200

Elapsed Real Time: 10200

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



369: 0 1 1 0 0 0 0 0

Sample Title: 12

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	1	1	0
393:	0	0	0	1	0	0	0	0
401:	1	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	2	0
425:	1	1	0	0	1	0	0	0
433:	0	0	4	1	1	0	1	0
441:	0	0	0	2	0	0	0	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	1
473:	0	1	0	0	0	1	1	1
481:	0	1	0	1	0	1	0	0
489:	1	1	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	1
505:	0	0	0	0	0	0	1	1
513:	0	1	0	0	1	0	0	1
521:	1	0	0	0	1	0	0	0
529:	0	0	0	0	1	0	0	0
537:	0	0	0	1	1	0	1	2
545:	0	0	0	0	0	0	0	0
553:	1	1	1	0	1	0	0	0
561:	2	0	1	0	1	3	0	1
569:	0	0	1	0	1	0	0	2
577:	0	0	1	2	2	0	0	1
585:	1	1	0	2	1	0	0	2
593:	2	1	4	2	1	1	2	6
601:	2	1	1	1	6	3	0	2
609:	3	3	5	5	2	3	4	3
617:	3	2	3	4	5	5	5	8
625:	2	5	8	8	2	5	4	4
633:	1	1	0	0	1	0	0	0
641:	0	0	0	0	0	1	0	0
649:	0	0	0	0	0	0	0	0
657:	1	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	1	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	1	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: 12

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



# Apex-Alpha™

ICB  
8/12/13

Sample Description: D-14 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_042  
 Chamber Serial Number: 05026930B  
 Detector Serial Number: 84185  
 Env. Background: System Bkgd 64788  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:55 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.603 mL  
 Effective Efficiency: 0.0580 +/- 0.0056  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Chem. Recovery Factor: 0.3143 +/- 0.0311

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	5.272	112.49	18.53	0.51	0.00E+000	6.6
U-234	4.741	21.66	42.50	0.34	0.00E+000	3.0
U-235	4.405	6.00	86.43	0.00	0.00E+000	3.0
U-238	4.191	6.98	80.28	1.02	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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

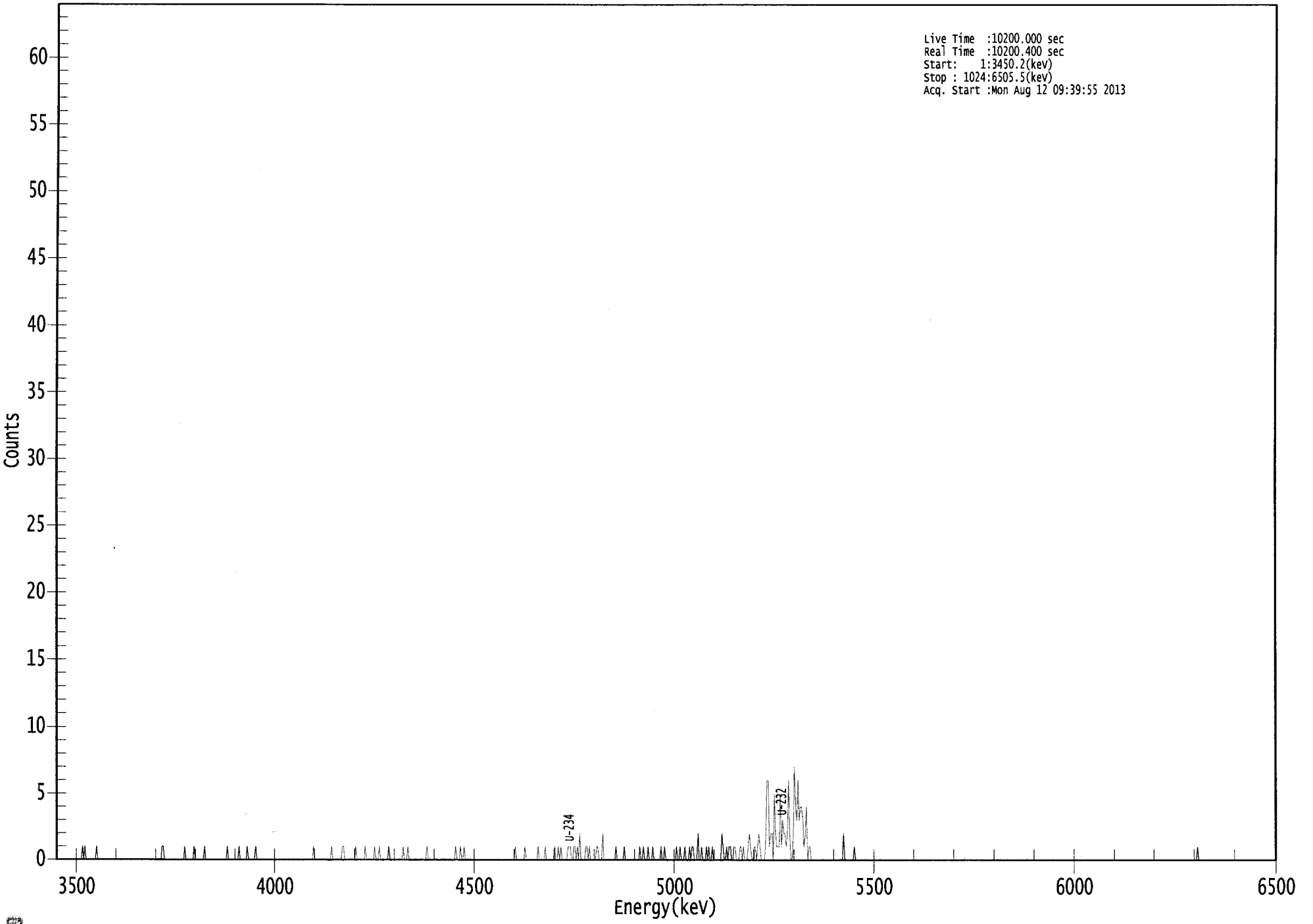
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.993	5302.50*	5.15E+000 +/- 9.82E-001	2.40E-001 +/- 4.58E-002
U-234	0.997	4761.50*	9.91E-001 +/- 4.62E-001	2.19E-001 +/- 4.17E-002
U-235	0.997	4385.50*	3.39E-001 +/- 3.00E-001	3.38E-001 +/- 6.45E-002
U-238	1.000	4184.40*	3.18E-001 +/- 2.62E-001	2.87E-001 +/- 5.47E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065948.CNF

Live Time :10200.000 sec  
Real Time :10200.400 sec  
Start: 1:3450.2(kev)  
Stop : 1024:6505.5(kev)  
Acq. Start :Mon Aug 12 09:39:55 2013



ROI Type: 1

ROI Type: 3

0165

\*\*\*\*\*  
 \*\*\*\*\* 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	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	1	0
25:	1	0	0	0	0	0	0	0
33:	0	0	1	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	1	1	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	1	0	0	0
113:	0	0	0	0	1	0	0	0
121:	0	0	0	0	0	1	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	0	0	0	0
153:	0	0	1	0	0	0	0	0
161:	0	1	0	0	0	0	0	0
169:	1	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	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	1	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	1	0	0	0	0	0	0	0
241:	0	1	1	0	0	0	0	0
249:	0	0	0	0	1	0	0	0
257:	0	0	0	0	1	0	0	0
265:	0	0	0	0	1	0	0	0
273:	1	0	0	0	0	0	0	0
281:	1	0	0	0	0	0	0	0
289:	0	0	0	0	1	0	0	0
297:	1	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
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	0	0
337:	1	0	0	0	1	0	0	1
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: 13

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	1	0	0	0	0	0
393:	0	0	1	0	0	0	0	0
401:	0	0	0	0	0	1	0	0
409:	0	0	0	1	0	0	0	0
417:	0	0	0	1	0	0	1	0
425:	1	0	0	0	0	0	1	1
433:	1	0	0	1	1	0	1	0
441:	2	0	0	0	0	1	1	0
449:	1	0	0	0	0	0	1	1
457:	0	0	0	2	0	0	0	0
465:	0	0	0	0	0	0	1	0
473:	0	0	0	0	0	1	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	1	0	0	1	0	0
497:	0	1	0	0	0	1	0	0
505:	0	0	0	0	1	0	0	1
513:	0	0	0	0	0	0	0	0
521:	0	1	0	0	1	0	0	0
529:	1	0	0	0	1	0	1	1
537:	0	0	0	2	0	0	1	0
545:	0	0	1	0	1	0	0	1
553:	0	0	0	0	0	0	0	2
561:	1	0	0	1	0	1	1	0
569:	0	1	1	0	0	0	1	1
577:	0	1	0	0	0	1	2	1
585:	0	0	1	1	0	1	2	1
593:	0	0	0	0	2	6	6	1
601:	2	2	0	5	2	1	1	1
609:	5	1	3	2	2	1	2	6
617:	2	0	0	2	7	4	3	6
625:	3	4	4	3	1	2	4	0
633:	1	1	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	2	0	0
665:	0	0	0	0	0	0	1	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: 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	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	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

168  
8/12/13

# Apex-Alpha™

Sample Description: PZ-205-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_043  
 Chamber Serial Number: 04026481A  
 Detector Serial Number: 91088  
 Env. Background: System Bkgd 57707  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:39:58 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.602 mL  
 Effective Efficiency: 0.0873 +/- 0.0070  
 Counting Efficiency: 0.2003 +/- 0.0035 on 8/11/2013 2:21:17 PM  
 Chem. Recovery Factor: 0.4358 +/- 0.0359

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 5.269	169.00	15.12	0.00	0.00E+000	9.4
U-234	4.741	26.00	39.17	0.00	0.00E+000	6.0
U-235	4.398	3.00	130.67	0.00	0.00E+000	3.0
U-238	4.143	29.00	37.02	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	0.992	5302.50*	5.14E+000 +/- 8.12E-001	1.83E-001 +/- 2.88E-002
U-234	0.997	4761.50*	7.91E-001 +/- 3.34E-001	1.82E-001 +/- 2.88E-002
U-235	0.999	4385.50*	1.13E-001 +/- 1.48E-001	2.25E-001 +/- 3.55E-002
U-238	0.988	4184.40*	8.78E-001 +/- 3.53E-001	1.82E-001 +/- 2.87E-002

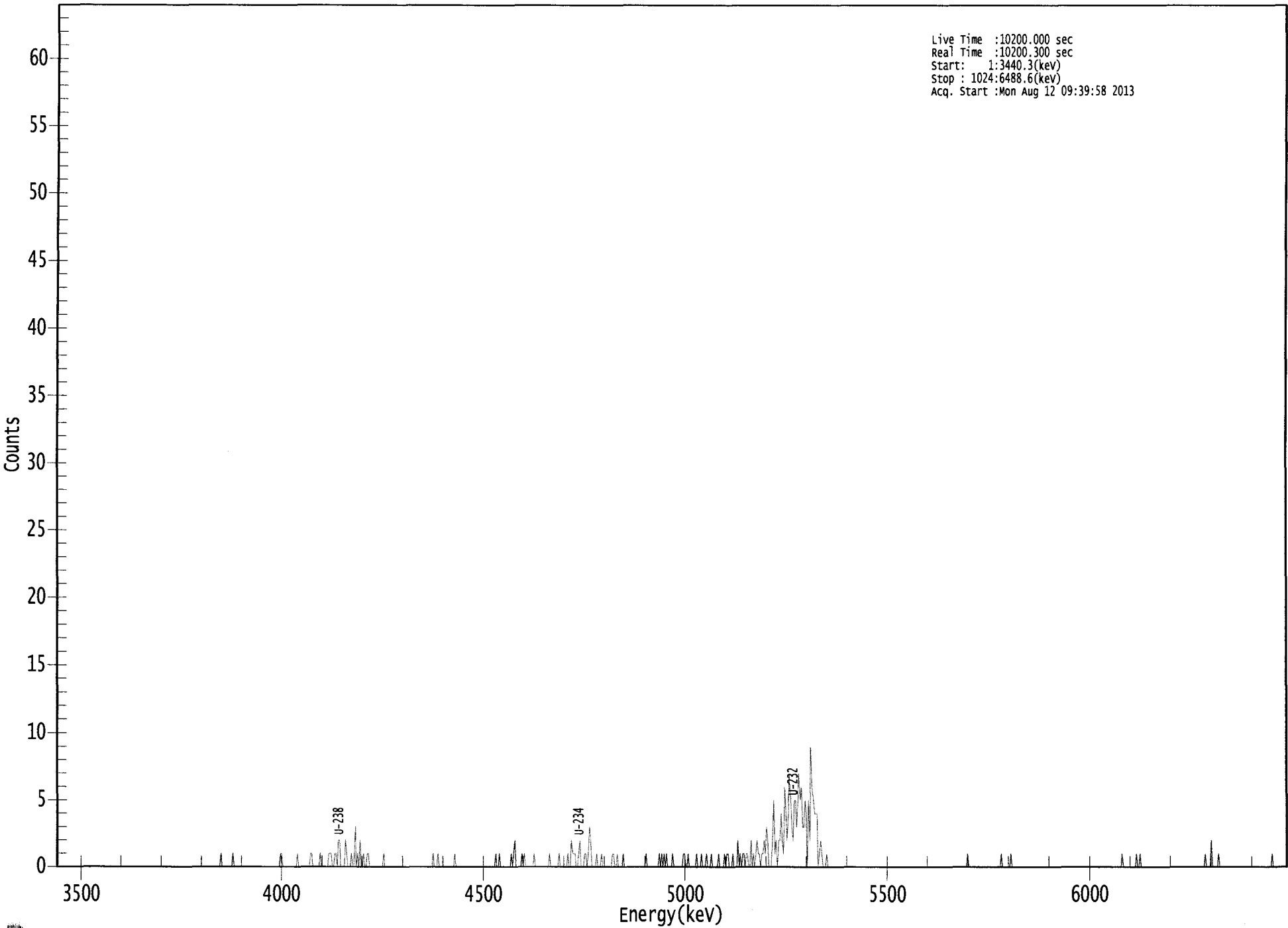
AG  
8/13/13

US EPA ARCHIVE DOCUMENT



0000065949.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3440.3(kev)  
Stop : 1024:6488.6(kev)  
Acq. Start :Mon Aug 12 09:39:58 2013



ROI Type: 1

ROI Type: 3

0170

\*\*\*\*\*  
 \*\*\*\*\* 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	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	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:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	1	1	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	1	0	0	0	0	0	0
209:	0	0	0	0	1	1	0	0
217:	0	0	0	0	1	0	0	0
225:	0	0	0	1	1	1	0	0
233:	1	1	0	2	2	0	0	0
241:	0	2	1	0	0	0	1	0
249:	0	3	0	1	0	2	0	0
257:	1	0	0	1	1	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	1	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	0	0
313:	0	0	1	0	0	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	1	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	1	0

369: 0 1 0 0 0 0 0 0

Sample Title: 14

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	1	0	1	2	0
385:	0	0	0	0	1	0	1	0
393:	0	0	0	0	0	0	1	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	1	0	0	0	0
417:	0	0	0	1	0	0	0	0
425:	0	0	1	0	0	2	1	1
433:	1	0	0	1	2	0	0	0
441:	1	1	0	1	3	2	0	0
449:	0	0	1	0	0	0	1	0
457:	0	0	0	0	0	0	0	1
465:	1	0	0	1	0	0	0	0
473:	1	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	1	0	0	0	0
497:	0	0	0	0	0	0	1	0
505:	1	0	1	0	1	0	0	0
513:	0	1	0	0	0	0	0	0
521:	0	0	1	1	0	0	1	0
529:	0	0	0	0	0	1	0	0
537:	0	1	0	0	0	1	0	0
545:	0	1	0	0	0	0	0	1
553:	0	0	0	0	1	0	1	1
561:	0	0	0	1	0	0	0	2
569:	0	1	0	1	1	0	1	1
577:	0	0	2	0	1	0	1	2
585:	1	1	0	1	1	2	1	3
593:	2	0	0	0	2	5	1	2
601:	0	2	2	4	2	1	6	4
609:	2	4	7	5	3	2	5	5
617:	3	5	7	5	6	3	3	5
625:	4	0	5	2	9	6	5	4
633:	4	4	0	1	2	1	0	0
641:	0	1	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	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	1	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	1	0	0	0	0	0
793:	0	0	1	0	0	0	0	0

801: 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	1	0
889:	0	0	0	0	0	0	0	0
897:	0	0	1	0	0	1	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	1	0	0	0	0
961:	2	0	0	0	0	0	1	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	1	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

1015  
8/12/13

# Apex-Alpha™

Sample Description: PZ-205-AS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_044  
 Chamber Serial Number: 04026481B  
 Detector Serial Number: 84168  
 Env. Background: System Bkgd 60396  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:40:00 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.601 mL  
 Effective Efficiency: 0.0559 +/- 0.0056  
 Counting Efficiency: 0.1920 +/- 0.0033 on 8/11/2013 2:17:37 PM  
 Chem. Recovery Factor: 0.2910 +/- 0.0294

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 5.271	108.00	18.95	0.00	0.00E+000	4.7
U-234	4.730	20.83	43.15	0.17	0.00E+000	3.0
U-235	4.401	7.83	70.93	0.17	0.00E+000	3.0
U-238	4.134	22.83	41.20	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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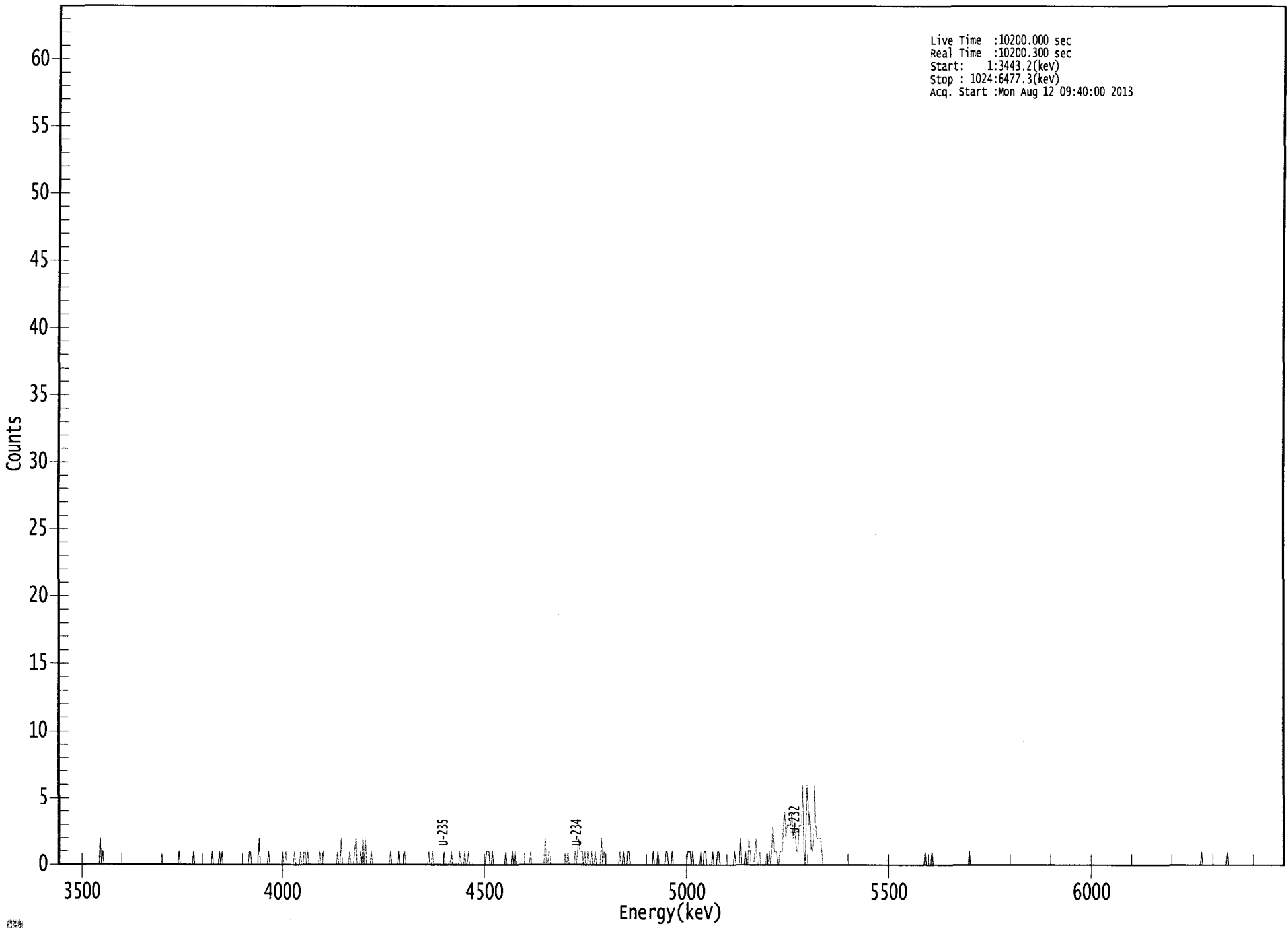
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.993	5302.50*	5.13E+000 +/- 1.00E+000	2.85E-001 +/- 5.55E-002
U-234	0.993	4761.50*	9.90E-001 +/- 4.69E-001	1.98E-001 +/- 3.86E-002
U-235	0.998	4385.50*	4.59E-001 +/- 3.38E-001	2.45E-001 +/- 4.76E-002
U-238	0.982	4184.40*	1.08E+000 +/- 4.92E-001	1.97E-001 +/- 3.85E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065950.CNF

Live Time : 10200.000 sec  
Real Time : 10200.300 sec  
Start : 1:3443.2(keV)  
Stop : 1024:6477.3(keV)  
Acq. Start : Mon Aug 12 09:40:00 2013



ROI Type: 1

ROI Type: 3

0175

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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: 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	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	2	0	1	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	1	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	1	0	0	0	0	0	1
137:	0	1	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:	1	1	0	0	0	0	0	0
169:	2	0	0	0	0	0	0	0
177:	1	0	0	0	0	0	0	0
185:	0	0	0	0	1	0	0	1
193:	0	0	0	0	0	0	1	0
201:	0	0	0	1	0	0	1	1
209:	0	1	0	0	0	0	0	0
217:	0	0	0	1	0	0	1	0
225:	0	0	0	0	0	0	0	0
233:	0	0	1	0	0	2	0	0
241:	0	0	0	0	1	0	0	0
249:	1	2	0	0	0	1	0	2
257:	0	2	0	0	0	0	1	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	1	0	0
289:	0	0	1	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	1	0	0	0	0	0	0
321:	0	0	0	1	0	0	0	0
329:	0	1	0	0	0	0	0	0
337:	1	0	0	0	1	0	0	1
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	1	1
361:	1	0	0	1	0	0	0	0

369: 0 0 0 0 0 0 0 1 0

Sample Title: 15

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	1	0	1	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	1	0	0	0	0
401:	0	0	0	0	0	0	0	2
409:	0	0	1	1	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	1	0	0	0	0	0
433:	1	0	1	2	1	1	1	0
441:	1	0	0	1	0	0	1	0
449:	0	1	0	0	0	0	2	0
457:	1	0	0	0	0	0	0	0
465:	0	0	0	0	0	1	0	0
473:	1	0	0	0	1	1	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	1	0	0	0	1	0	0
505:	0	0	0	0	1	1	0	0
513:	0	1	0	0	0	0	0	0
521:	0	0	0	0	0	0	1	1
529:	1	0	1	0	0	0	0	0
537:	0	1	0	0	1	1	0	0
545:	0	0	0	1	0	0	0	1
553:	1	0	0	0	0	0	0	0
561:	0	0	0	0	0	1	0	0
569:	0	0	2	0	0	0	1	0
577:	0	2	1	0	0	0	1	2
585:	0	0	1	0	0	0	0	0
593:	1	0	1	0	1	3	1	1
601:	1	0	0	1	1	1	3	4
609:	2	3	3	3	3	4	2	3
617:	2	1	1	3	3	3	6	1
625:	0	4	6	3	4	1	1	2
633:	6	3	2	2	2	2	1	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	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	1	0	0	0
729:	0	0	1	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	1	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
817:	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0
953:	0	0	1	0	0	0	0
961:	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	1
977:	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0

103  
8/12/13

# Apex-Alpha™

Sample Description: I-65 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 16  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_045  
 Chamber Serial Number: 04026482A  
 Detector Serial Number: 91131  
 Env. Background: System Bkgd 64789  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:40:02 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.598 mL  
 Effective Efficiency: 0.1256 +/- 0.0086  
 Counting Efficiency: 0.1909 +/- 0.0033 on 7/20/2013 2:31:26 PM  
 Chem. Recovery Factor: 0.6580 +/- 0.0464

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	241.66	12.62	0.34	0.00E+000	18.5
U-234	4.731	76.66	22.44	0.34	0.00E+000	3.0
U-235	4.416	23.00	41.75	0.00	0.00E+000	3.0
U-238	4.145	60.66	25.25	0.34	0.00E+000	4.9

T = Tracer Peak used for Effective Efficiency

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

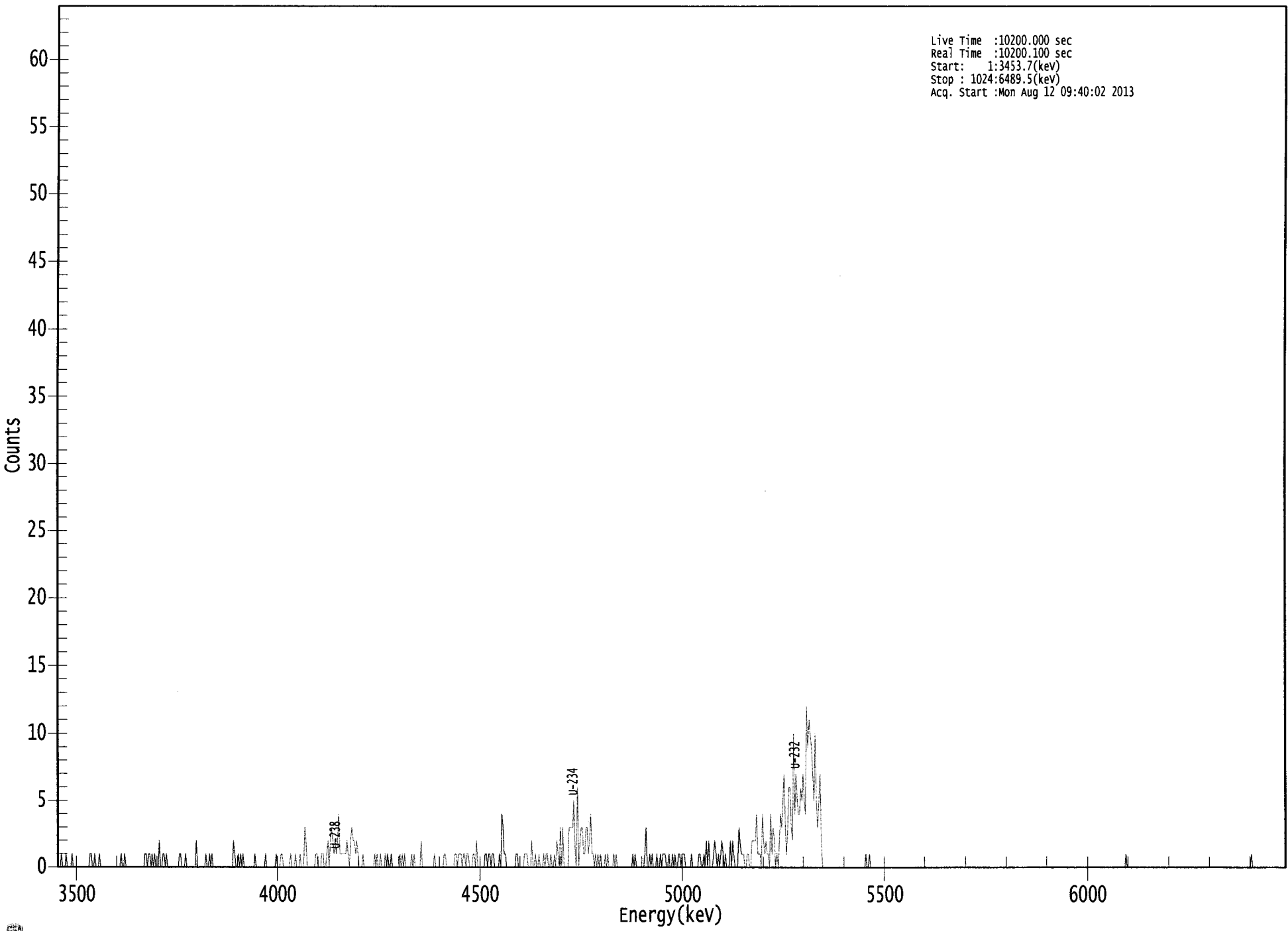
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.997	5302.50*	5.11E+000 +/- 6.85E-001	1.01E-001 +/- 1.35E-002
U-234	0.994	4761.50*	1.62E+000 +/- 4.23E-001	1.01E-001 +/- 1.35E-002
U-235	0.993	4385.50*	6.00E-001 +/- 2.63E-001	1.56E-001 +/- 2.09E-002
U-238	0.989	4184.40*	1.28E+000 +/- 3.65E-001	1.01E-001 +/- 1.35E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

000065951.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6489.5(kev)  
Acq. Start :Mon Aug 12 09:40:02 2013



ROI Type: 1

ROI Type: 3

0180

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

Sample Title: 16

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

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

369: 0 1 0 4 3 1 1 0

Sample Title: 16

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	1
385:	1	0	0	0	0	0	1	1
393:	1	0	0	0	2	0	0	1
401:	0	0	1	0	0	0	1	0
409:	1	1	0	0	1	0	0	1
417:	0	2	1	0	3	0	3	0
425:	0	0	0	3	3	3	3	5
433:	1	0	6	0	2	3	3	1
441:	1	3	3	1	2	4	1	1
449:	0	1	0	1	0	1	0	0
457:	0	1	0	1	0	0	0	0
465:	1	0	1	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	1	0	1	0	0	0	0	0
489:	0	0	1	3	0	0	1	0
497:	1	0	0	0	1	0	0	1
505:	0	1	1	1	0	0	1	0
513:	0	1	0	1	0	0	1	1
521:	0	1	1	1	0	0	0	0
529:	0	1	0	0	0	0	0	1
537:	1	0	0	1	0	2	0	2
545:	0	0	0	1	2	1	0	1
553:	0	1	2	1	0	1	0	0
561:	0	2	0	2	1	0	0	0
569:	3	2	1	1	1	0	0	1
577:	1	0	0	2	2	2	2	4
585:	1	1	1	0	4	2	1	2
593:	1	1	0	4	1	3	2	0
601:	1	0	2	4	3	5	7	3
609:	1	3	6	6	3	2	10	4
617:	7	5	4	4	6	5	7	5
625:	4	12	9	11	10	9	7	5
633:	10	5	3	5	7	2	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	1	0	0	1	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: 16

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

1065  
8/12/13

# Apex-Alpha™

Sample Description: I-65 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 17  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_046  
 Chamber Serial Number: 04026482B  
 Detector Serial Number: 58762  
 Env. Background: System Bkgd 64790  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:40:04 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.604 mL  
 Effective Efficiency: 0.1874 +/- 0.0107  
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM  
 Chem. Recovery Factor: 1.0473 +/- 0.0628

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 5.254	364.00	10.29	0.00	0.00E+000	16.1
U-234	4.713	76.83	22.39	0.17	0.00E+000	6.0
U-235	4.406	9.83	63.14	0.17	0.00E+000	3.0
U-238	4.126	66.00	24.31	0.00	0.00E+000	8.6

T = Tracer Peak used for Effective Efficiency

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

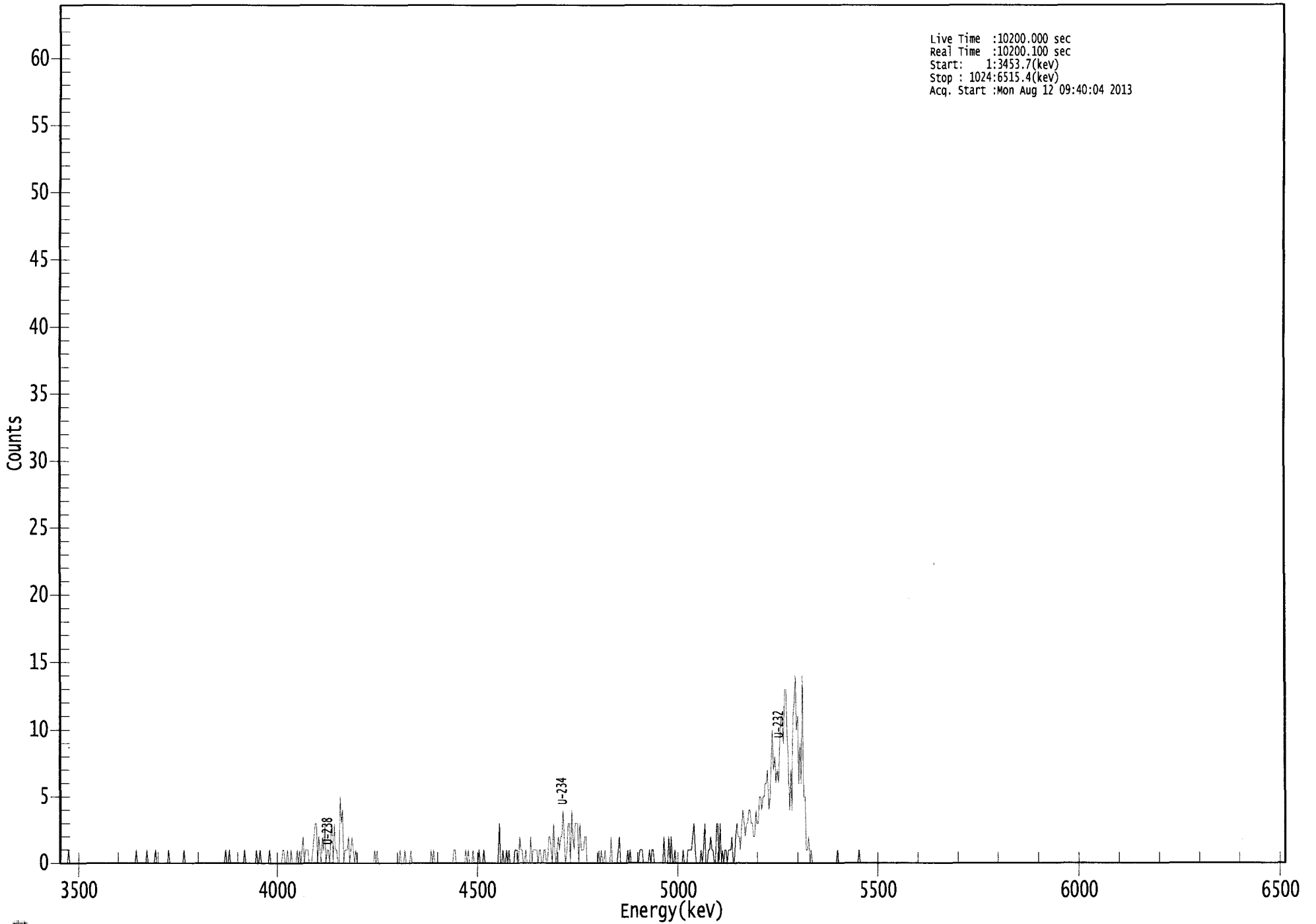
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.983	5302.50*	5.16E+000 +/- 5.80E-001	8.50E-002 +/- 9.55E-003
U-234	0.984	4761.50*	1.09E+000 +/- 2.73E-001	5.91E-002 +/- 6.64E-003
U-235	0.997	4385.50*	1.72E-001 +/- 1.10E-001	7.29E-002 +/- 8.19E-003
U-238	0.976	4184.40*	9.31E-001 +/- 2.49E-001	8.46E-002 +/- 9.50E-003

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065952.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6515.4(kev)  
Acq. Start :Mon Aug 12 09:40:04 2013



ROI Type: 1

ROI Type: 3

5016



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

Sample Title: 17

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	1
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	0	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:	1	0	0	0	0	0	0	0	0
73:	0	1	0	0	0	0	0	0	0
81:	1	0	0	0	0	0	0	0	0
89:	0	0	0	1	0	0	0	0	0
97:	0	0	0	0	0	0	0	0	0
105:	1	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	0	0	0	0	0	0	0
137:	0	0	0	1	0	0	1	0	0
145:	0	0	0	0	0	0	0	0	0
153:	0	0	0	1	0	0	0	0	0
161:	0	0	0	0	0	1	0	0	0
169:	1	0	0	0	0	0	0	0	0
177:	1	0	0	0	0	0	0	0	0
185:	0	0	0	1	1	0	0	0	1
193:	0	0	1	0	0	0	0	0	1
201:	0	1	0	1	2	0	1	1	1
209:	1	0	0	0	1	2	3	3	3
217:	0	2	1	0	2	1	3	0	0
225:	1	1	0	2	3	0	3	1	1
233:	1	0	0	5	3	4	0	1	1
241:	1	1	2	0	1	2	1	0	0
249:	1	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0	0
265:	1	0	1	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	1	0	0	0
289:	0	1	0	0	0	0	1	0	0
297:	0	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0	1
313:	0	1	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0	0
329:	0	0	1	1	0	0	0	0	0
337:	0	0	0	0	1	0	1	0	0
345:	0	0	1	0	0	0	0	0	1
353:	0	0	0	1	0	0	0	0	0
361:	0	0	0	0	0	0	0	0	0

369: 3 0 0 1 0 0 1 0

Sample Title: 17

Channel	1	2	3	4	5	6	7	8	9
377:	1	0	0	0	0	1	1	1	
385:	0	2	1	1	0	0	1	0	
393:	0	0	2	0	1	1	1	1	
401:	0	1	1	0	0	1	1	0	
409:	0	2	2	1	0	3	1	0	
417:	1	2	1	2	2	4	2	0	
425:	1	3	3	0	4	2	1	3	
433:	3	3	0	3	1	1	1	2	
441:	2	0	0	0	0	0	0	0	
449:	0	0	0	1	0	1	0	0	
457:	1	0	0	0	0	2	0	0	
465:	0	0	0	1	2	0	0	0	
473:	0	0	0	1	0	1	0	0	
481:	0	0	0	0	0	1	1	1	
489:	0	0	0	0	0	1	0	1	
497:	1	0	0	0	0	0	0	0	
505:	0	2	0	0	0	2	0	2	
513:	0	0	1	0	0	0	0	0	
521:	0	1	0	0	0	1	1	1	
529:	1	2	3	1	0	0	0	0	
537:	1	0	1	3	0	0	1	1	
545:	2	1	1	0	0	3	3	0	
553:	3	0	1	0	1	1	0	1	
561:	1	1	2	0	0	2	3	2	
569:	2	1	3	4	3	2	3	3	
577:	4	4	3	3	2	2	4	3	
585:	3	5	5	4	5	5	6	6	
593:	7	4	5	7	10	7	8	6	
601:	7	6	9	11	11	9	13	13	
609:	10	8	4	7	4	11	12	14	
617:	10	11	6	9	6	14	5	5	
625:	1	1	2	0	1	0	0	0	
633:	0	0	0	0	0	0	0	0	
641:	0	0	0	0	0	0	0	0	
649:	0	0	1	0	0	0	0	0	
657:	0	0	0	0	0	0	0	0	
665:	0	0	0	0	1	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: 17

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  
8/12/13

# Apex-Alpha™

Sample Description: D-13 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 18  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_047  
 Chamber Serial Number: 02030596A  
 Detector Serial Number: 91086  
 Env. Background: System Bkgd 64791  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 9:40:07 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.602 mL  
 Effective Efficiency: 0.1719 +/- 0.0102  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Chem. Recovery Factor: 0.9435 +/- 0.0585

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 5.262	332.83	10.75	0.17	0.00E+000	5.0
U-234	4.765	18.83	45.41	0.17	0.00E+000	2.9
U-235	4.412	8.00	73.50	0.00	0.00E+000	2.9
U-238	4.182	6.66	78.18	0.34	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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

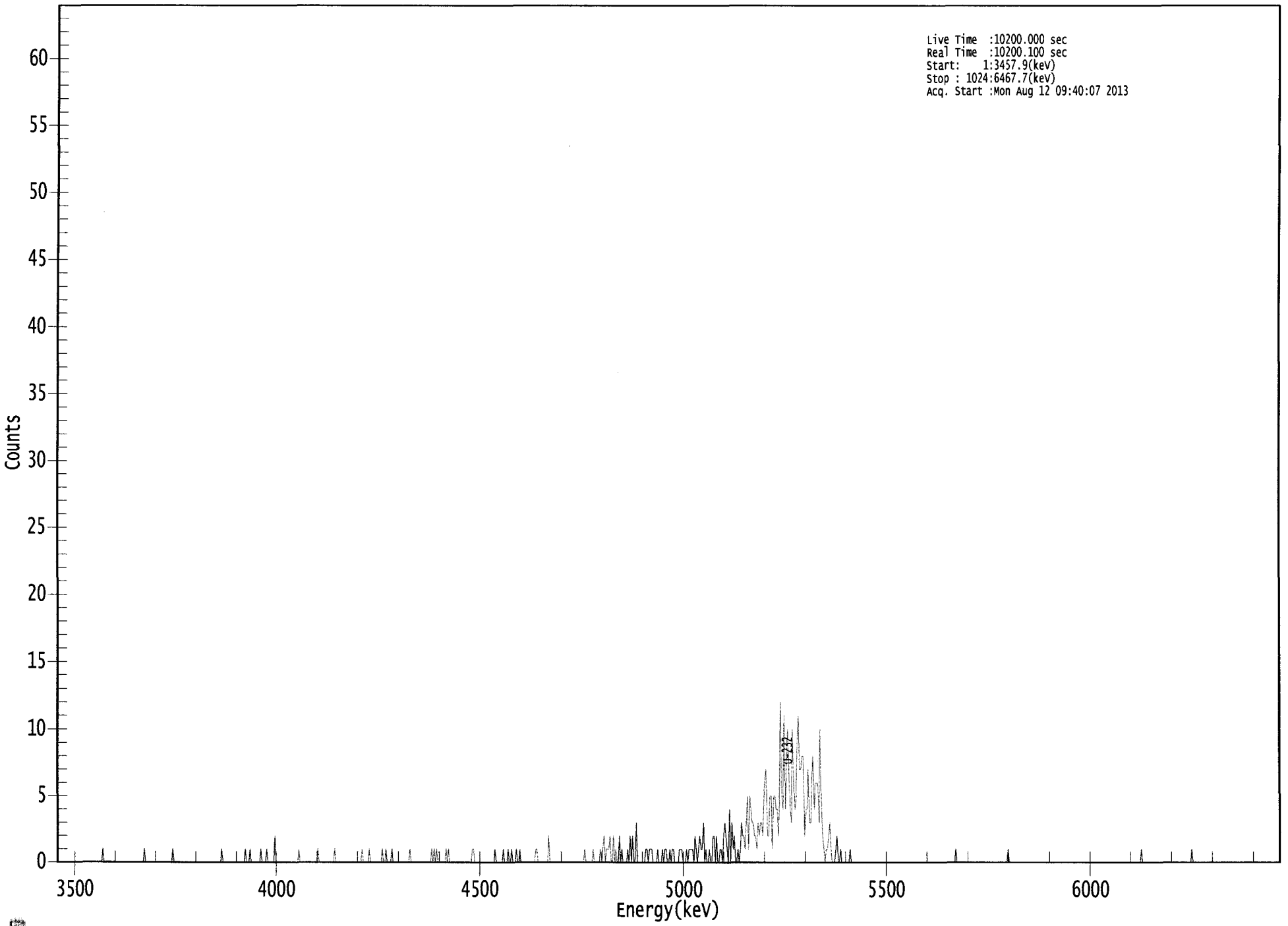
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.988	5302.50*	5.15E+000 +/- 6.00E-001	6.45E-002 +/- 7.52E-003
U-234	1.000	4761.50*	2.91E-001 +/- 1.36E-001	6.45E-002 +/- 7.51E-003
U-235	0.995	4385.50*	1.52E-001 +/- 1.13E-001	1.14E-001 +/- 1.33E-002
U-238	1.000	4184.40*	1.02E-001 +/- 8.10E-002	7.35E-002 +/- 8.57E-003

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065953.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3457.9(kev)  
Stop : 1024:6467.7(kev)  
Acq. Start :Mon Aug 12 09:40:07 2013



ROI Type: 1

ROI Type: 3

0010

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

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	0	0	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:	0	0	0	0	0	0	0	0
73:	0	1	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	1	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	1	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	1	0
161:	0	0	1	0	0	0	0	0
169:	0	0	0	1	0	0	0	0
177:	1	0	0	0	0	0	0	2
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	1	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	1	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	1	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	1	0	0	0	0	0	1	0
265:	0	0	0	0	0	0	0	0
273:	0	1	0	0	1	0	0	0
281:	0	1	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	1	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	1	0	1	0	1	0
321:	0	0	0	0	0	0	1	0
329:	1	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	1	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	1

369: 0 0 0 0 0 0 1 0

Sample Title: 18

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	0	0	1	0	0
385:	0	1	0	0	1	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	1	1	0	0	0	0	0
409:	0	0	0	0	2	0	0	0
417:	0	0	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	1	0	0	0	0	0
449:	0	1	0	0	0	0	0	1
457:	0	1	2	0	1	1	1	2
465:	0	0	2	0	1	0	0	2
473:	0	1	0	0	0	0	1	0
481:	2	0	2	0	0	3	0	0
489:	0	0	0	0	0	1	1	0
497:	1	1	1	0	0	0	0	1
505:	0	0	0	1	0	1	1	0
513:	0	1	0	1	1	0	0	0
521:	0	1	1	1	0	0	0	1
529:	0	1	1	1	1	0	2	1
537:	0	1	2	1	1	3	0	1
545:	0	0	1	0	0	2	2	0
553:	2	0	0	1	1	0	2	3
561:	2	1	0	4	0	3	1	2
569:	0	0	1	0	1	3	2	2
577:	1	3	5	1	5	4	3	3
585:	2	2	1	3	2	3	3	2
593:	5	6	7	2	2	5	5	1
601:	5	5	4	4	2	5	12	5
609:	4	11	4	8	10	7	4	3
617:	10	6	4	5	9	11	7	7
625:	8	8	2	4	4	7	3	3
633:	6	8	4	6	6	6	3	10
641:	4	2	1	0	1	1	2	3
649:	1	0	0	0	1	2	0	0
657:	1	0	0	0	0	0	0	0
665:	1	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:	1	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	1	0	0	0

801: 0 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	1	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	1	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  
8/12/13

# Apex-Alpha™

Sample Description: D-13 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307152A-UU  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_003  
 Chamber Serial Number:  
 Detector Serial Number: 3  
 Env. Background: System Bkgd 64764  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:09:13 AM  
 Acquisition Date/Time: 8/12/2013 12:54:38 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.600 mL  
 Effective Efficiency: 0.1491 +/- 0.0095  
 Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM  
 Chem. Recovery Factor: 0.8541 +/- 0.0565

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 5.278	287.81	11.58	1.19	0.00E+000	5.0
U-234	4.719	24.49	40.09	0.51	0.00E+000	3.0
U-235	4.382	12.49	56.77	0.51	0.00E+000	4.5
U-238	4.130	11.32	60.27	0.68	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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

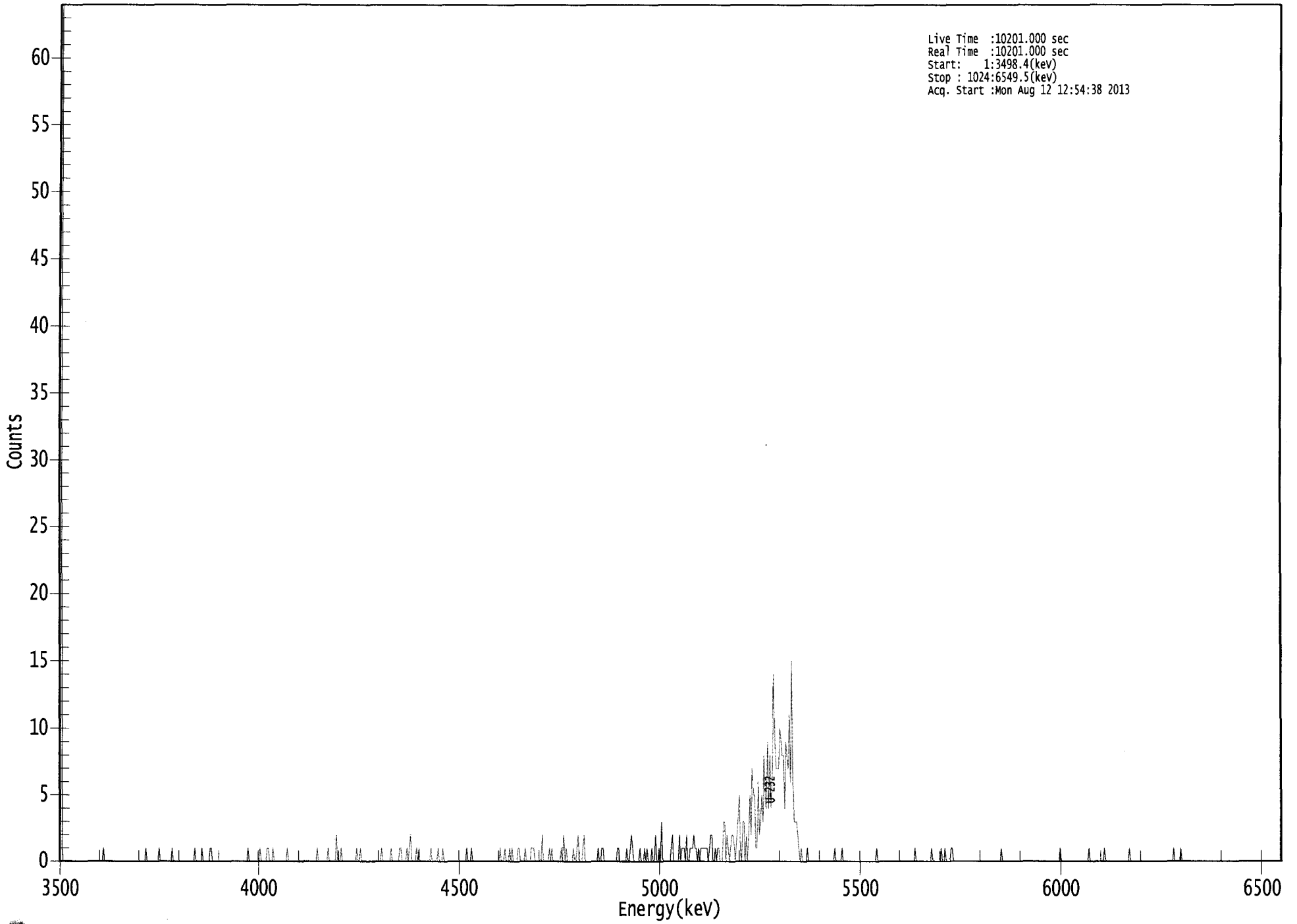
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.996	5302.50*	5.13E+000 +/- 6.37E-001	1.17E-001 +/- 1.46E-002
U-234	0.987	4761.50*	4.36E-001 +/- 1.83E-001	9.34E-002 +/- 1.16E-002
U-235	1.000	4385.50*	2.74E-001 +/- 1.59E-001	1.15E-001 +/- 1.43E-002
U-238	0.979	4184.40*	2.01E-001 +/- 1.23E-001	1.00E-001 +/- 1.24E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065954.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3498.4(kev)  
Stop : 1024:6549.5(kev)  
Acq. Start :Mon Aug 12 12:54:38 2013



ROI Type: 1

ROI Type: 3

0195

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

Sample Title: 19

Elapsed Live time: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	1	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	1	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	1	0	0	0	0	0	0
81:	0	0	0	0	1	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	1	0	0	0	0	0
121:	1	0	0	0	0	0	0	1
129:	1	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	1
161:	0	0	0	0	0	0	0	0
169:	0	1	0	0	0	0	0	1
177:	1	0	0	0	1	0	0	0
185:	0	0	0	0	0	0	0	0
193:	1	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	1	0	0	0	0	0	0
225:	0	0	1	0	0	0	0	0
233:	0	2	0	0	0	1	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	1	0	0	1	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	1
273:	0	0	0	0	0	0	0	1
281:	0	0	0	0	0	0	1	1
289:	0	0	0	0	1	0	1	2
297:	0	0	0	0	1	0	1	0
305:	0	0	0	0	0	0	0	0
313:	1	0	0	0	0	0	1	0
321:	0	0	1	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	1	0
345:	0	0	1	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 1 0 0 0 1 0

Sample Title: 19

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	0	1	0	0	0
385:	0	1	1	0	0	0	0	1
393:	0	0	0	0	1	1	1	0
401:	0	0	0	0	0	2	0	0
409:	0	0	0	1	0	1	0	0
417:	0	0	0	0	0	1	0	2
425:	0	1	0	0	0	0	0	1
433:	0	0	1	2	0	0	0	1
441:	2	0	0	0	0	0	0	0
449:	0	0	0	0	1	0	0	1
457:	1	0	0	0	0	0	0	0
465:	0	0	0	0	1	1	0	0
473:	0	0	0	0	1	0	0	1
481:	2	1	0	0	0	0	0	1
489:	0	0	0	1	0	1	0	0
497:	0	1	0	0	2	0	0	1
505:	0	3	0	0	0	0	0	0
513:	0	1	2	0	0	0	0	0
521:	2	0	1	1	1	0	2	0
529:	0	1	1	1	2	1	1	0
537:	1	0	1	1	1	1	1	1
545:	0	1	2	2	0	0	1	0
553:	1	1	0	0	0	3	3	0
561:	2	1	0	1	2	2	1	0
569:	2	3	5	1	0	3	3	0
577:	2	0	2	5	2	7	5	5
585:	1	1	6	2	3	5	3	8
593:	5	4	9	4	8	4	7	14
601:	9	7	7	7	10	9	8	8
609:	4	9	8	7	11	6	15	6
617:	3	3	3	2	1	0	1	0
625:	0	0	0	1	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	1	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	1	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	1	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	1	0	0	0	0
737:	0	0	0	1	0	0	1	0
745:	0	0	0	1	1	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	1	0	0
793:	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	1	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	1	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	0
897:	1	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	1	0	0
937:	0	0	0	1	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



## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

Date : 8/12/2013  
Time : 6:43:21 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/12/2013 5:20:50 AM
Alpha 004	21f	ALL	Passed	8/12/2013 5:20:50 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	8/12/2013 5:20:51 AM
Alpha 011	21f	ALL	Passed	8/12/2013 5:20:52 AM
Alpha 012	21f	ALL	Passed	8/12/2013 5:20:53 AM
Alpha 013	21f	ALL	Passed	8/12/2013 5:20:53 AM
Alpha 014	21f	ALL	Passed	8/12/2013 5:20:54 AM
Alpha 015	21f	Peak Energy	Action	8/12/2013 5:20:55 AM
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	8/10/2013 11:23:01 AM
Alpha 019	AIM730	ALL	Passed	8/12/2013 5:20:55 AM
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/12/2013 5:20:56 AM
Alpha 023	AIM730	ALL	Passed	8/12/2013 5:20:57 AM
Alpha 024	AIM730	ALL	Passed	8/12/2013 5:20:57 AM
Alpha 025	AIM730	ALL	Passed	8/12/2013 5:20:58 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/12/2013 5:20:59 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/12/2013 5:20:59 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/12/2013 5:21:00 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:01 AM
Alpha 034	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:02 AM
Alpha 035	Alpha Analyst100DC	Peak CPS	Action	8/9/2013 5:06:44 AM
Alpha 036	Alpha Analyst100DC	Peak FWHM	Action	8/12/2013 5:21:05 AM
Alpha 036	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:05 AM
Alpha 037	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:06 AM
Alpha 038	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:09 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:10 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:12 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:22:26 AM

US EPA ARCHIVE DOCUMENT

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:15 AM
Alpha 043	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:22:23 AM
Alpha 044	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:22:22 AM
Alpha 045	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:19 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:21 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:22 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:24 AM

APPROVED BY: \_\_\_\_\_ *e*

APPROVAL DATE: \_\_\_\_\_ *8/12/13*

US EPA ARCHIVE DOCUMENT

\*\*\*\*\*  
 \*\*\*\*\* LIBRARY LISTING REPORT \*\*\*\*\*  
 \*\*\*\*\*

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	13-07152	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	ThISO	01	LCS	LCS		07/24/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/24/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	PZ-203-SS TOT	38	07/17/13 13:58	1.0000E+00
Lab Deadline	8/13/2013	04	DO	PZ-203-SS TOT	38	07/17/13 13:58	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-203-SS DIS	38	07/17/13 13:58	1.0000E+00
Project	West Lake OU-1	06	TRG	D-87 TOT	42	07/17/13 14:11	1.0000E+00
Report Level	4	07	TRG	D-87 DIS	42	07/17/13 14:11	1.0000E+00
Activity Units	pCi	08	TRG	DUP 06 TOT	39	07/17/13 00:00	1.0000E+00
Aliquot Units	I	09	TRG	DUP 06 DIS	39	07/17/13 00:00	1.0000E+00
Matrix	WA	10	TRG	S-53 TOT	43	07/18/13 07:30	1.0000E+00
Method	HASL 300, 4.5.2	11	TRG	S-53 DIS	43	07/18/13 07:30	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	D-14 TOT	45	07/18/13 09:30	1.0000E+00
Radiometric Tracer	Th-229	13	TRG	D-14 DIS	45	07/18/13 09:30	1.0000E+00
Radiometric Sol#	Th-18a	14	TRG	PZ-205-AS TOT	42	07/18/13 09:46	1.0000E+00
Tracer Act (dpm/g)	22.466	15	TRG	PZ-205-AS DIS	42	07/18/13 09:46	1.0000E+00
Carrier		16	TRG	I-65 TOT	41	07/18/13 10:59	1.0000E+00
Carrier Conc (mg/ml)		17	TRG	I-65 DIS	41	07/18/13 10:59	1.0000E+00
		18	TRG	D-13 TOT	43	07/18/13 12:19	1.0000E+00
		19	TRG	D-13 DIS	43	07/18/13 12:19	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.

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	0.4811	10.8		0.00								
02	MBL	0.2380	5.3		0.00								
03	DUP	0.2360	5.3		0.00								
04	DO	0.2355	5.3		0.00								
05	TRG	0.2374	5.3		0.00								
06	TRG	0.2360	5.3		0.00								
07	TRG	0.2364	5.3		0.00								
08	TRG	0.2347	5.3		0.00								
09	TRG	0.2340	5.3		0.00								
10	TRG	0.2341	5.3		0.00								
11	TRG	0.2346	5.3		0.00								
12	TRG	0.2350	5.3		0.00								
13	TRG	0.2342	5.3		0.00								
14	TRG	0.2342	5.3		0.00								
15	TRG	0.2347	5.3		0.00								
16	TRG	0.2340	5.3		0.00								
17	TRG	0.2343	5.3		0.00								
18	TRG	0.2336	5.2		0.00								
19	TRG	0.2340	5.3		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.

0204

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

\* 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.

0205


Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-THISO-1**

	
Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07152
Client	Engineering Management Support, Inc.

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	5.05E+00	8.28E-01	7.15E-02	4.97E+00	101.49	OK		OK	
02	TH-228	MBL	BLANK	pCi/l	7.76E-02	9.43E-02	1.46E-01					OK	OK
03	TH-228	DUP	PZ-203-SS TOT	pCi/l	1.10E-02	3.38E-02	8.00E-02				NA	OK	
04	TH-228	DO	PZ-203-SS TOT	pCi/l	-6.51E-03	5.21E-02	1.40E-01					OK	
05	TH-228	TRG	PZ-203-SS DIS	pCi/l	-1.77E-02	4.59E-02	1.54E-01					OK	
06	TH-228	TRG	D-87 TOT	pCi/l	5.51E-01	2.30E-01	1.60E-01					OK	
07	TH-228	TRG	D-87 DIS	pCi/l	6.39E-02	9.79E-02	1.67E-01					OK	
08	TH-228	TRG	DUP 06 TOT	pCi/l	4.98E-02	8.84E-02	1.58E-01					OK	
09	TH-228	TRG	DUP 06 DIS	pCi/l	1.03E-01	1.03E-01	1.20E-01					OK	
10	TH-228	TRG	S-53 TOT	pCi/l	2.02E+00	5.47E-01	8.35E-02					OK	
11	TH-228	TRG	S-53 DIS	pCi/l	-4.80E-03	5.43E-02	1.66E-01					OK	—
12	TH-228	TRG	D-14 TOT	pCi/l	6.56E-01	2.42E-01	9.91E-02					OK	
13	TH-228	TRG	D-14 DIS	pCi/l	8.41E-02	8.77E-02	1.10E-01					OK	
14	TH-228	TRG	PZ-205-AS TOT	pCi/l	8.95E-01	3.05E-01	1.07E-01					OK	
15	TH-228	TRG	PZ-205-AS DIS	pCi/l	1.92E-02	4.80E-02	9.99E-02					OK	
16	TH-228	TRG	I-65 TOT	pCi/l	3.89E-01	1.93E-01	1.21E-01					OK	
17	TH-228	TRG	I-65 DIS	pCi/l	1.59E-02	3.81E-02	7.98E-02					OK	
18	TH-228	TRG	D-13 TOT	pCi/l	2.42E-01	1.61E-01	1.33E-01					OK	
19	TH-228	TRG	D-13 DIS	pCi/l	1.68E-01	1.27E-01	1.26E-01					OK	

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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	07/24/13 00:00	1.00E+00	106.92	0.00	0.00			
02	TH-228	MBL	07/24/13 00:00	1.00E+00	99.22	0.00	0.00			
03	TH-228	DUP	07/17/13 13:58	1.00E+00	95.16	0.00	0.00			
04	TH-228	DO	07/17/13 13:58	1.00E+00	92.94	0.00	0.00			
05	TH-228	TRG	07/17/13 13:58	1.00E+00	77.10	0.00	0.00			
06	TH-228	TRG	07/17/13 14:11	1.00E+00	86.15	0.00	0.00			
07	TH-228	TRG	07/17/13 14:11	1.00E+00	71.83	0.00	0.00			
08	TH-228	TRG	07/17/13 00:00	1.00E+00	76.42	0.00	0.00			
09	TH-228	TRG	07/17/13 00:00	1.00E+00	64.47	0.00	0.00			
10	TH-228	TRG	07/18/13 07:30	1.00E+00	73.33	0.00	0.00			
11	TH-228	TRG	07/18/13 07:30	1.00E+00	58.98	0.00	0.00			
12	TH-228	TRG	07/18/13 09:30	1.00E+00	81.09	0.00	0.00			
13	TH-228	TRG	07/18/13 09:30	1.00E+00	78.39	0.00	0.00			
14	TH-228	TRG	07/18/13 09:46	1.00E+00	83.55	0.00	0.00			
15	TH-228	TRG	07/18/13 09:46	1.00E+00	82.98	0.00	0.00			
16	TH-228	TRG	07/18/13 10:59	1.00E+00	70.57	0.00	0.00			
17	TH-228	TRG	07/18/13 10:59	1.00E+00	74.22	0.00	0.00			
18	TH-228	TRG	07/18/13 12:19	1.00E+00	62.73	0.00	0.00			
19	TH-228	TRG	07/18/13 12:19	1.00E+00	64.81	0.00	0.00			

	
Run	1
Analysis Code	ThISO
Eberline Services Work Order	13-07152
Client	Engineering Management Support, Inc.

2020

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-THISO-1**

	
Run	<b>1</b>
Analysis Code	<b>THISO</b>
Eberline Services Work Order	<b>13-07152</b>
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-228	LCS	08/13/13 12:17		A_Spec	Alpha_019	170.02	3.38 E+02	2.00 E-03	16.6
02	TH-228	MBL	08/13/13 12:17		A_Spec	Alpha_022	170.02	4.45 E+00	1.50 E-02	15.3
03	TH-228	DUP	08/13/13 12:17		A_Spec	Alpha_023	170	6.60 E-01	2.00 E-03	17.1
04	TH-228	DO	08/13/13 12:17		A_Spec	Alpha_024	170	-3.80 E-01	1.40 E-02	17.1
05	TH-228	TRG	08/13/13 12:17		A_Spec	Alpha_025	170	-8.70 E-01	1.10 E-02	17.4
06	TH-228	TRG	08/13/13 12:17		A_Spec	Alpha_027	170.02	3.01 E+01	1.70 E-02	17.3
07	TH-228	TRG	08/13/13 12:17		A_Spec	Alpha_029	170	3.28 E+00	1.60 E-02	19.5
08	TH-228	TRG	08/13/13 12:17		A_Spec	Alpha_031	170	1.98 E+00	6.00 E-03	14.2
09	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_033	170	4.49 E+00	3.00 E-03	18.5
10	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_034	170	1.01 E+02	1.00 E-03	18.6
11	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_035	170	-1.90 E-01	7.00 E-03	18.3
12	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_036	170	3.73 E+01	4.00 E-03	19.1
13	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_037	170	4.32 E+00	4.00 E-03	17.8
14	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_038	170	4.73 E+01	4.00 E-03	17.2
15	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_039	170	1.15 E+00	5.00 E-03	19.7
16	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_040	170	1.91 E+01	5.00 E-03	19
17	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_041	170	8.30 E-01	1.00 E-03	19.2
18	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_042	170	1.03 E+01	4.00 E-03	18.5
19	TH-228	TRG	08/13/13 12:18		A_Spec	Alpha_043	170	8.00 E+00	0.00 E+00	20

5208

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-THISO-1**

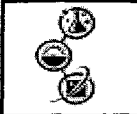
Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	TH-230	LCS	LCS	pCi/l	5.85E+00	9.32E-01	8.97E-02	5.50E+00	106.36	OK		OK	
02	TH-230	MBL	BLANK	pCi/l	4.53E-01	1.99E-01	1.36E-01					OK	OK
03	TH-230	DUP	PZ-203-SS TOT	pCi/l	5.57E-01	2.13E-01	9.77E-02				OK	OK	
04	TH-230	DO	PZ-203-SS TOT	pCi/l	5.81E-01	2.22E-01	1.10E-01					OK	
05	TH-230	TRG	PZ-203-SS DIS	pCi/l	7.40E-01	2.78E-01	1.12E-01					OK	
06	TH-230	TRG	D-87 TOT	pCi/l	1.45E+00	4.13E-01	1.31E-01					OK	
07	TH-230	TRG	D-87 DIS	pCi/l	8.86E-01	3.04E-01	9.08E-02					OK	
08	TH-230	TRG	DUP 06 TOT	pCi/l	4.28E-01	2.23E-01	1.29E-01					OK	
09	TH-230	TRG	DUP 06 DIS	pCi/l	5.35E-01	2.43E-01	1.34E-01					OK	
10	TH-230	TRG	S-53 TOT	pCi/l	2.52E+00	6.43E-01	1.17E-01					OK	
11	TH-230	TRG	S-53 DIS	pCi/l	5.09E-01	2.46E-01	1.18E-01					OK	
12	TH-230	TRG	D-14 TOT	pCi/l	9.68E-01	3.07E-01	8.99E-02					OK	
13	TH-230	TRG	D-14 DIS	pCi/l	8.67E-01	3.00E-01	9.08E-02					OK	
14	TH-230	TRG	PZ-205-AS TOT	pCi/l	1.44E+00	4.16E-01	1.11E-01					OK	
15	TH-230	TRG	PZ-205-AS DIS	pCi/l	6.24E-01	2.27E-01	9.18E-02					OK	
16	TH-230	TRG	I-65 TOT	pCi/l	4.42E-01	2.04E-01	1.12E-01					OK	
17	TH-230	TRG	I-65 DIS	pCi/l	4.94E-01	2.15E-01	1.33E-01					OK	
18	TH-230	TRG	D-13 TOT	pCi/l	8.90E-01	3.34E-01	9.57E-02					OK	
19	TH-230	TRG	D-13 DIS	pCi/l	9.82E-01	3.38E-01	1.23E-01					OK	

Client: Engineering Management Support, Inc.  
 Eberline Services Work Order: 13-07152  
 Analysis Code: THISO  
 Run: 1



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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-230	LCS	07/24/13 00:00	1.00E+00	106.92	0.00	0.00			
02	TH-230	MBL	07/24/13 00:00	1.00E+00	99.22	0.00	0.00			
03	TH-230	DUP	07/17/13 13:58	1.00E+00	95.16	0.00	0.00			
04	TH-230	DO	07/17/13 13:58	1.00E+00	92.94	0.00	0.00			
05	TH-230	TRG	07/17/13 13:58	1.00E+00	77.10	0.00	0.00			
06	TH-230	TRG	07/17/13 14:11	1.00E+00	86.15	0.00	0.00			
07	TH-230	TRG	07/17/13 14:11	1.00E+00	71.83	0.00	0.00			
08	TH-230	TRG	07/17/13 00:00	1.00E+00	76.42	0.00	0.00			
09	TH-230	TRG	07/17/13 00:00	1.00E+00	64.47	0.00	0.00			
10	TH-230	TRG	07/18/13 07:30	1.00E+00	73.33	0.00	0.00			
11	TH-230	TRG	07/18/13 07:30	1.00E+00	58.98	0.00	0.00			
12	TH-230	TRG	07/18/13 09:30	1.00E+00	81.09	0.00	0.00			
13	TH-230	TRG	07/18/13 09:30	1.00E+00	78.39	0.00	0.00			
14	TH-230	TRG	07/18/13 09:46	1.00E+00	83.55	0.00	0.00			
15	TH-230	TRG	07/18/13 09:46	1.00E+00	82.98	0.00	0.00			
16	TH-230	TRG	07/18/13 10:59	1.00E+00	70.57	0.00	0.00			
17	TH-230	TRG	07/18/13 10:59	1.00E+00	74.22	0.00	0.00			
18	TH-230	TRG	07/18/13 12:19	1.00E+00	62.73	0.00	0.00			
19	TH-230	TRG	07/18/13 12:19	1.00E+00	64.81	0.00	0.00			



Run 1

Analysis Code THISO

Eberline Services Work Order 13-07152

Client Engineering Management Support, Inc.

0120

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-THISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-230	LCS	08/13/13 12:17		A_Spec	Alpha_019	170.02	3.91 E+02	0.00 E+00	16.6
02	TH-230	MBL	08/13/13 12:17		A_Spec	Alpha_022	170.02	2.60 E+01	1.20 E-02	15.3
03	TH-230	DUP	08/13/13 12:17		A_Spec	Alpha_023	170	3.42 E+01	5.00 E-03	17.1
04	TH-230	DO	08/13/13 12:17		A_Spec	Alpha_024	170	3.48 E+01	7.00 E-03	17.1
05	TH-230	TRG	08/13/13 12:17		A_Spec	Alpha_025	170	3.73 E+01	4.00 E-03	17.4
06	TH-230	TRG	08/13/13 12:17		A_Spec	Alpha_027	170.02	8.13 E+01	1.00 E-02	17.3
07	TH-230	TRG	08/13/13 12:17		A_Spec	Alpha_029	170	4.67 E+01	2.00 E-03	19.5
08	TH-230	TRG	08/13/13 12:17		A_Spec	Alpha_031	170	1.75 E+01	3.00 E-03	14.2
09	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_033	170	2.40 E+01	0.00 E+00	18.5
10	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_034	170	1.29 E+02	0.00 E+00	18.6
11	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_035	170	2.07 E+01	2.00 E-03	18.3
12	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_036	170	5.65 E+01	3.00 E-03	19.1
13	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_037	170	4.57 E+01	2.00 E-03	17.8
14	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_038	170	7.80 E+01	0.00 E+00	17.2
15	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_039	170	3.83 E+01	4.00 E-03	19.7
16	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_040	170	2.23 E+01	4.00 E-03	19
17	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_041	170	2.65 E+01	9.00 E-03	19.2
18	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_042	170	3.88 E+01	1.00 E-03	18.5
19	TH-230	TRG	08/13/13 12:18		A_Spec	Alpha_043	170	4.80 E+01	0.00 E+00	20

Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07152
Client	Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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	4.83E+00	8.00E-01	7.14E-02	4.97E+00	97.20	OK		OK	
02	TH-232	MBL	BLANK	pCi/l	1.65E-01	1.12E-01	9.15E-02					OK	OK
03	TH-232	DUP	PZ-203-SS TOT	pCi/l	5.68E-02	6.53E-02	8.54E-02				NA	OK	
04	TH-232	DO	PZ-203-SS TOT	pCi/l	1.03E-01	8.92E-02	9.98E-02					OK	
05	TH-232	TRG	PZ-203-SS DIS	pCi/l	9.90E-02	9.69E-02	1.19E-01					OK	
06	TH-232	TRG	D-87 TOT	pCi/l	5.13E-01	2.13E-01	1.17E-01					OK	
07	TH-232	TRG	D-87 DIS	pCi/l	9.12E-02	9.41E-02	1.25E-01					OK	
08	TH-232	TRG	DUP 06 TOT	pCi/l	1.75E-01	1.42E-01	1.46E-01					OK	
09	TH-232	TRG	DUP 06 DIS	pCi/l	8.52E-02	8.91E-02	9.28E-02					OK	
10	TH-232	TRG	S-53 TOT	pCi/l	1.90E+00	5.21E-01	8.13E-02					OK	
11	TH-232	TRG	S-53 DIS	pCi/l	1.19E-01	1.11E-01	1.03E-01					OK	
12	TH-232	TRG	D-14 TOT	pCi/l	7.18E-01	2.55E-01	1.08E-01					OK	
13	TH-232	TRG	D-14 DIS	pCi/l	9.16E-02	8.51E-02	7.91E-02					OK	
14	TH-232	TRG	PZ-205-AS TOT	pCi/l	7.89E-01	2.78E-01	7.69E-02					OK	
15	TH-232	TRG	PZ-205-AS DIS	pCi/l	1.08E-01	8.67E-02	7.77E-02					OK	
16	TH-232	TRG	I-65 TOT	pCi/l	1.51E-01	1.14E-01	9.45E-02					OK	
17	TH-232	TRG	I-65 DIS	pCi/l	8.38E-03	6.77E-02	1.56E-01					OK	
18	TH-232	TRG	D-13 TOT	pCi/l	9.11E-02	1.04E-01	1.44E-01					OK	
19	TH-232	TRG	D-13 DIS	pCi/l	2.25E-01	1.45E-01	1.22E-01					OK	



Run 1

Analysis Code THISO

Eberline Services Work Order 13-07152

Client Engineering Management Support, Inc.

2120

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-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-232	LCS	07/24/13 00:00	1.00E+00	106.92	0.00	0.00			
02	TH-232	MBL	07/24/13 00:00	1.00E+00	99.22	0.00	0.00			
03	TH-232	DUP	07/17/13 13:58	1.00E+00	95.16	0.00	0.00			
04	TH-232	DO	07/17/13 13:58	1.00E+00	92.94	0.00	0.00			
05	TH-232	TRG	07/17/13 13:58	1.00E+00	77.10	0.00	0.00			
06	TH-232	TRG	07/17/13 14:11	1.00E+00	86.15	0.00	0.00			
07	TH-232	TRG	07/17/13 14:11	1.00E+00	71.83	0.00	0.00			
08	TH-232	TRG	07/17/13 00:00	1.00E+00	76.42	0.00	0.00			
09	TH-232	TRG	07/17/13 00:00	1.00E+00	64.47	0.00	0.00			
10	TH-232	TRG	07/18/13 07:30	1.00E+00	73.33	0.00	0.00			
11	TH-232	TRG	07/18/13 07:30	1.00E+00	58.98	0.00	0.00			
12	TH-232	TRG	07/18/13 09:30	1.00E+00	81.09	0.00	0.00			
13	TH-232	TRG	07/18/13 09:30	1.00E+00	78.39	0.00	0.00			
14	TH-232	TRG	07/18/13 09:46	1.00E+00	83.55	0.00	0.00			
15	TH-232	TRG	07/18/13 09:46	1.00E+00	82.98	0.00	0.00			
16	TH-232	TRG	07/18/13 10:59	1.00E+00	70.57	0.00	0.00			
17	TH-232	TRG	07/18/13 10:59	1.00E+00	74.22	0.00	0.00			
18	TH-232	TRG	07/18/13 12:19	1.00E+00	62.73	0.00	0.00			
19	TH-232	TRG	07/18/13 12:19	1.00E+00	64.81	0.00	0.00			

	
Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07152
Client	Engineering Management Support, Inc.

0170

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-THISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-232	LCS	08/13/13 12:17		A_Spec	Alpha_019	170.02	3.24 E+02	2.00 E-03	16.6
02	TH-232	MBL	08/13/13 12:17		A_Spec	Alpha_022	170.02	9.49 E+00	3.00 E-03	15.3
03	TH-232	DUP	08/13/13 12:17		A_Spec	Alpha_023	170	3.49 E+00	3.00 E-03	17.1
04	TH-232	DO	08/13/13 12:17		A_Spec	Alpha_024	170	6.15 E+00	5.00 E-03	17.1
05	TH-232	TRG	08/13/13 12:17		A_Spec	Alpha_025	170	5.00 E+00	0.00 E+00	17.4
06	TH-232	TRG	08/13/13 12:17		A_Spec	Alpha_027	170.02	2.88 E+01	7.00 E-03	17.3
07	TH-232	TRG	08/13/13 12:17		A_Spec	Alpha_029	170	4.81 E+00	7.00 E-03	19.5
08	TH-232	TRG	08/13/13 12:17		A_Spec	Alpha_031	170	7.15 E+00	5.00 E-03	14.2
09	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_033	170	3.83 E+00	1.00 E-03	18.5
10	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_034	170	9.78 E+01	1.00 E-03	18.6
11	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_035	170	4.83 E+00	1.00 E-03	18.3
12	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_036	170	4.20 E+01	6.00 E-03	19.1
13	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_037	170	4.83 E+00	1.00 E-03	17.8
14	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_038	170	4.28 E+01	1.00 E-03	17.2
15	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_039	170	6.66 E+00	2.00 E-03	19.7
16	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_040	170	7.66 E+00	2.00 E-03	19
17	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_041	170	4.50 E-01	1.50 E-02	19.2
18	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_042	170	3.98 E+00	6.00 E-03	18.5
19	TH-232	TRG	08/13/13 12:18		A_Spec	Alpha_043	170	1.10 E+01	0.00 E+00	20



Run  
**1**

Analysis Code  
**THISO**

Eberline Services Work Order  
**13-07152**


Client  
Engineering Management Support, Inc.

193

343

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	07/24/13 00:00	1.0000	0.4811	10.8084		0.00		
02	MBL	BLANK	07/24/13 00:00	1.0000	0.2380	5.3469		0.00		
03	DUP	PZ-203-SS TOT	07/17/13 13:58	1.0000	0.2360	5.3020		0.00		
04	DO	PZ-203-SS TOT	07/17/13 13:58	1.0000	0.2355	5.2907		0.00		
05	TRG	PZ-203-SS DIS	07/17/13 13:58	1.0000	0.2374	5.3334		0.00		
06	TRG	D-87 TOT	07/17/13 14:11	1.0000	0.2360	5.3020		0.00		
07	TRG	D-87 DIS	07/17/13 14:11	1.0000	0.2364	5.3110		0.00		
08	TRG	DUP 06 TOT	07/17/13 00:00	1.0000	0.2347	5.2728		0.00		
09	TRG	DUP 06 DIS	07/17/13 00:00	1.0000	0.2340	5.2570		0.00		
10	TRG	S-53 TOT	07/18/13 07:30	1.0000	0.2341	5.2593		0.00		
11	TRG	S-53 DIS	07/18/13 07:30	1.0000	0.2346	5.2705		0.00		
12	TRG	D-14 TOT	07/18/13 09:30	1.0000	0.2350	5.2795		0.00		
13	TRG	D-14 DIS	07/18/13 09:30	1.0000	0.2342	5.2615		0.00		
14	TRG	PZ-205-AS TOT	07/18/13 09:46	1.0000	0.2342	5.2615		0.00		
15	TRG	PZ-205-AS DIS	07/18/13 09:46	1.0000	0.2347	5.2728		0.00		
16	TRG	I-65 TOT	07/18/13 10:59	1.0000	0.2340	5.2570		0.00		
17	TRG	I-65 DIS	07/18/13 10:59	1.0000	0.2343	5.2638		0.00		
18	TRG	D-13 TOT	07/18/13 12:19	1.0000	0.2336	5.2481		0.00		
19	TRG	D-13 DIS	07/18/13 12:19	1.0000	0.2340	5.2570		0.00		

# Spike and Tracer Worksheet

Internal Work Order		Run	Analysis Code		Date	Technician		Technician Initials		Witness Initials	
13-07152		1	ThISO		8/6/2013 11:59	JWOLFE					

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	8/6/2013	0.100	0.1066				4.97	0.179	0.00	0.000	0.00	0.000	0.00	0.000
Th-230	Th-1b	23.525	8/6/2013	0.500	0.5190				5.50	0.148	0.00	0.000	0.00	0.000	0.00	0.000
Th-232	Th-8b	103.560	8/6/2013	0.100	0.1066				4.97	0.179	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	22.466	8/6/2013	0.4811	0.2200	0.4811 g					0.5190 g				
02	Th-229	Th-18a	22.466	8/6/2013	0.2380	0.2200	0.2380 g					0.1066 g				
03	Th-229	Th-18a	22.466	8/6/2013	0.2360	0.2200	-0.2386 g									
04	Th-229	Th-18a	22.466	8/6/2013	0.2355	0.2200	-0.2395 g									
05	Th-229	Th-18a	22.466	8/6/2013	0.2374	0.2200	-0.2374 g									
06	Th-229	Th-18a	22.466	8/6/2013	0.2360	0.2200	-0.2360 g									
07	Th-229	Th-18a	22.466	8/6/2013	0.2364	0.2200	-0.2364 g									
08	Th-229	Th-18a	22.466	8/6/2013	0.2347	0.2200	-0.2347 g									
09	Th-229	Th-18a	22.466	8/6/2013	0.2340	0.2200										
10	Th-229	Th-18a	22.466	8/6/2013	0.2341	0.2200	-0.2340 g									
11	Th-229	Th-18a	22.466	8/6/2013	0.2346	0.2200	-0.2341 g									
12	Th-229	Th-18a	22.466	8/6/2013	0.2350	0.2200	-0.2346 g									
13	Th-229	Th-18a	22.466	8/6/2013	0.2342	0.2200	-0.2342 g									
14	Th-229	Th-18a	22.466	8/6/2013	0.2342	0.2200	-0.2342 g									
15	Th-229	Th-18a	22.466	8/6/2013	0.2347	0.2200	-0.2342 g									
16	Th-229	Th-18a	22.466	8/6/2013	0.2340	0.2200										
17	Th-229	Th-18a	22.466	8/6/2013	0.2343	0.2200	-0.2341 g									
18	Th-229	Th-18a	22.466	8/6/2013	0.2336	0.2200	-0.2340 g									
19	Th-229	Th-18a	22.466	8/6/2013	0.2340	0.2200	-0.2343 g									
							-0.2336 g									
							-0.2340 g									

# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07152</b>	<b>1</b>	<b>ThISO</b>	<b>liters</b>	<b>8/13/2013</b>	<b>JWOLFE</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	PZ-203-SS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-203-SS TOT	DO					1.0000E+00	1.0000E+00				
05	PZ-203-SS DIS	TRG					1.0000E+00	1.0000E+00				
06	D-87 TOT	TRG					1.0000E+00	1.0000E+00				
07	D-87 DIS	TRG					1.0000E+00	1.0000E+00				
08	DUP 06 TOT	TRG					1.0000E+00	1.0000E+00				
09	DUP 06 DIS	TRG					1.0000E+00	1.0000E+00				
10	S-53 TOT	TRG					1.0000E+00	1.0000E+00				
11	S-53 DIS	TRG					1.0000E+00	1.0000E+00				
12	D-14 TOT	TRG					1.0000E+00	1.0000E+00				
13	D-14 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-205-AS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-205-AS DIS	TRG					1.0000E+00	1.0000E+00				
16	I-65 TOT	TRG					1.0000E+00	1.0000E+00				
17	I-65 DIS	TRG					1.0000E+00	1.0000E+00				
18	D-13 TOT	TRG					1.0000E+00	1.0000E+00				
19	D-13 DIS	TRG					1.0000E+00	1.0000E+00				

Comments
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Technician: J Wolfe Date: 8/6/13



105  
8/13/13



Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_019  
 Chamber Serial Number:  
 Detector Serial Number: 19  
 Env. Background: System Bkgd 64773  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 8/13/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:17:46 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.481 mL  
 Effective Efficiency: 0.1774 +/- 0.0113  
 Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM  
 Chem. Recovery Factor: 1.0692 +/- 0.0705

Control Certificate Name: NatTh\_Th-8  
 Chem. Recov. of Control: TH-232 0.971999 +/- 0.087108  
 Peak Match Tolerance: 0.175 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)
TH-227	5.973	6.64	84.69	1.36	0.00E+000	3.3
TH-228	5.338	337.66	10.67	0.34	0.00E+000	13.7
TH-229 T	4.875	326.00	10.87	0.00	0.00E+000	13.9
TH-230	4.609	391.00	9.92	0.00	0.00E+000	34.6
TH-232	3.957	323.66	10.90	0.34	0.00E+000	6.0

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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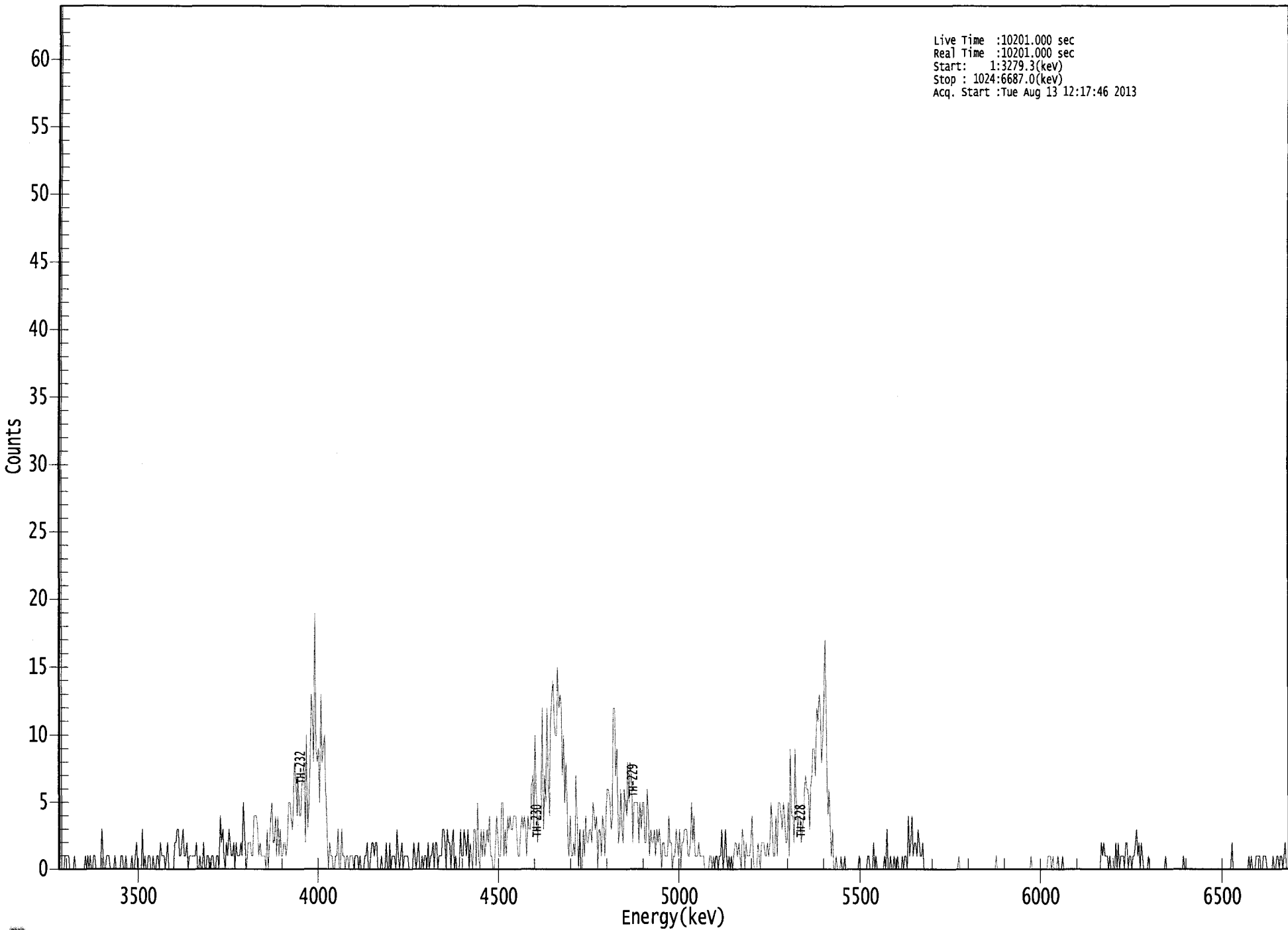
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.925	5850.00*	1.02E-001 +/- 8.71E-002	1.05E-001 +/- 1.31E-002
TH-228	0.980	5400.00*	5.05E+000 +/- 8.28E-001	7.15E-002 +/- 8.90E-003
TH-229	1.000	4872.00*	4.89E+000 +/- 6.09E-001	9.00E-002 +/- 1.12E-002
TH-230	0.979	4672.00*	5.85E+000 +/- 9.32E-001	8.97E-002 +/- 1.12E-002
TH-232	0.992	3997.00*	4.83E+000 +/- 8.00E-001	7.14E-002 +/- 8.89E-003

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

000066060.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3279.3(kev)  
Stop : 1024:6687.0(kev)  
Acq. Start :Tue Aug 13 12:17:46 2013



ROI Type: 1

ROI Type: 3

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

Sample Title: 01

Elapsed Live time: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	0	0	0	1	1	1
9:	1	0	0	0	0	1	0	0
17:	0	0	0	0	0	0	1	0
25:	1	0	1	0	0	1	1	0
33:	0	0	0	0	3	1	0	0
41:	1	1	1	0	0	0	0	1
49:	0	0	0	0	1	1	0	0
57:	1	0	0	0	0	1	0	0
65:	1	2	0	0	0	0	3	0
73:	1	0	0	1	1	0	0	1
81:	0	0	1	1	0	2	1	1
89:	1	0	1	2	0	0	0	0
97:	0	2	2	3	3	1	1	2
105:	3	1	1	2	0	1	1	1
113:	1	1	1	2	0	0	1	0
121:	0	2	0	0	1	1	0	0
129:	1	1	0	0	1	1	0	4
137:	2	3	1	0	2	1	3	2
145:	1	1	2	0	2	1	1	1
153:	2	1	5	3	1	0	2	2
161:	2	1	1	4	4	4	3	1
169:	2	1	1	1	1	0	3	0
177:	2	4	5	2	2	4	1	4
185:	1	3	1	1	2	2	1	2
193:	5	5	4	3	5	8	7	4
201:	7	4	4	6	7	8	2	10
209:	3	5	7	13	11	8	19	9
217:	8	9	5	13	8	9	10	6
225:	2	0	2	1	1	0	0	1
233:	1	3	0	0	3	1	1	0
241:	1	1	0	1	1	1	0	1
249:	1	1	0	1	0	0	0	1
257:	1	2	0	0	1	2	2	1
265:	2	2	0	0	0	1	0	0
273:	0	2	0	0	2	0	1	1
281:	1	0	3	1	0	1	2	0
289:	1	1	1	1	0	0	0	0
297:	2	1	0	1	2	0	0	1
305:	0	1	1	0	2	0	1	1
313:	2	0	2	2	0	1	1	1
321:	3	3	2	0	3	2	2	0
329:	2	3	0	1	0	0	0	3
337:	1	1	3	2	1	3	0	2
345:	1	0	3	3	0	5	1	0
353:	3	1	3	1	2	3	2	4
361:	1	1	0	0	2	4	2	1

369: 1 5 5 1 3 1 4 3

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
377:	4	3	3	4	4	4	2	1
385:	1	3	4	3	4	3	1	4
393:	3	3	6	7	3	10	6	2
401:	4	4	4	12	3	7	5	12
409:	7	4	11	13	14	11	10	10
417:	15	12	13	12	7	10	5	8
425:	2	1	4	1	1	2	1	7
433:	3	0	3	0	0	3	1	4
441:	2	2	3	3	2	5	4	3
449:	4	0	3	3	1	4	3	1
457:	5	6	6	5	3	4	12	12
465:	7	9	2	3	6	3	2	6
473:	5	4	8	5	8	7	2	5
481:	5	5	5	2	5	3	5	5
489:	2	2	6	4	1	3	2	2
497:	3	1	3	2	3	2	0	2
505:	2	1	1	1	4	2	2	0
513:	1	1	3	2	1	3	0	2
521:	2	3	3	3	1	1	2	5
529:	2	4	1	1	1	2	1	1
537:	1	1	0	0	0	0	1	1
545:	0	1	0	1	1	0	1	1
553:	3	0	1	3	1	0	1	0
561:	1	0	1	2	2	1	2	1
569:	0	3	2	0	2	1	1	1
577:	2	4	1	0	0	0	2	1
585:	0	2	2	2	1	1	2	1
593:	2	5	3	1	1	4	1	5
601:	5	4	3	5	4	2	2	5
609:	1	9	4	4	2	9	5	3
617:	4	4	2	3	4	6	7	6
625:	6	3	6	7	9	9	7	12
633:	11	13	12	8	10	13	17	11
641:	4	6	3	1	3	0	0	1
649:	0	0	0	1	0	0	1	0
657:	0	0	0	0	0	0	0	0
665:	0	0	1	0	0	0	0	0
673:	0	1	1	0	0	0	2	0
681:	1	0	0	0	0	0	0	1
689:	0	3	0	0	1	0	0	1
697:	0	0	1	0	0	0	1	0
705:	1	1	0	4	1	2	4	1
713:	2	2	1	3	2	1	1	2
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	1	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	1	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: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	1	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	1
825:	1	1	0	1	0	0	0	1
833:	0	0	0	1	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	2	1	2	1	1
873:	1	0	1	0	0	0	0	2
881:	0	2	0	1	1	1	0	2
889:	2	0	1	1	0	1	1	2
897:	3	1	2	0	2	1	0	0
905:	0	0	1	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	1	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	1
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	2
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	1	0	1
993:	0	0	0	1	1	1	1	0
1001:	0	1	1	1	0	0	0	0
1009:	0	1	0	0	1	1	0	1
1017:	1	0	1	2	0	0	0	0

106  
8/13/13

# Apex-Alpha™

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_022  
 Chamber Serial Number:  
 Detector Serial Number: 22  
 Env. Background: System Bkgd 64774  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 8/13/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:17:47 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.238 mL  
 Effective Efficiency: 0.1520 +/- 0.0139  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Chem. Recovery Factor: 0.9922 +/- 0.0924

Peak Match Tolerance: 0.175 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.800	2.64	152.72	1.36	0.00E+000	3.1
TH-228	5.369	4.45	120.09	2.55	0.00E+000	3.1
TH-229 T	4.883	138.13	16.81	1.87	0.00E+000	8.0
TH-230	4.627	25.96	40.20	2.04	0.00E+000	3.1
TH-232	3.979	9.49	65.59	0.51	0.00E+000	4.7

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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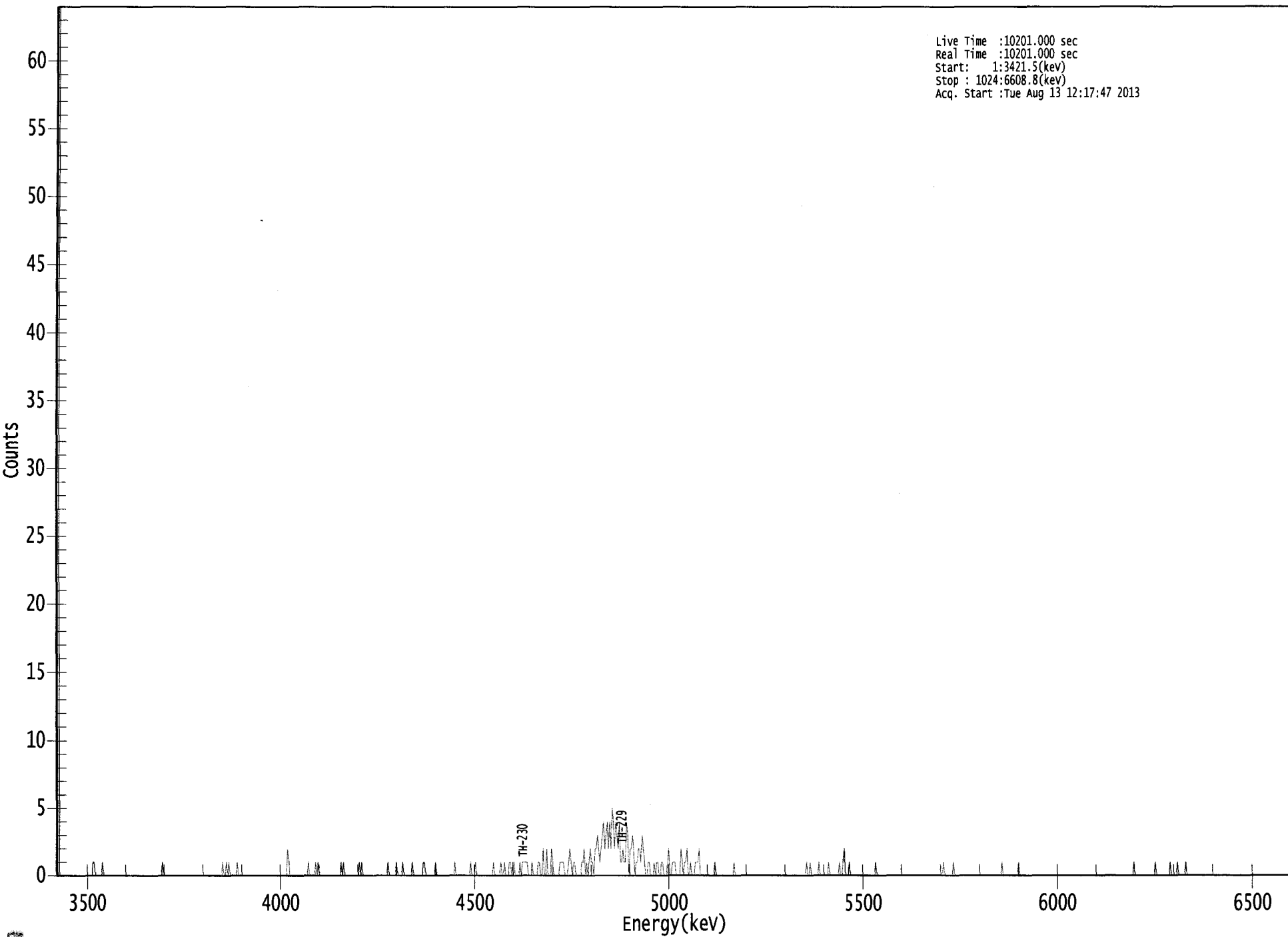
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.987	5850.00*	4.72E-002 +/- 7.26E-002	1.23E-001 +/- 2.19E-002
TH-228	0.995	5400.00*	7.76E-002 +/- 9.43E-002	1.46E-001 +/- 2.62E-002
TH-229	0.999	4872.00*	2.42E+000 +/- 4.33E-001	1.33E-001 +/- 2.37E-002
TH-230	0.989	4672.00*	4.53E-001 +/- 1.99E-001	1.36E-001 +/- 2.43E-002
TH-232	0.998	3997.00*	1.65E-001 +/- 1.12E-001	9.15E-002 +/- 1.64E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

000066061.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3421.5(kev)  
Stop : 1024:6608.8(kev)  
Acq. Start :Tue Aug 13 12:17:47 2013



ROI Type: 1

ROI Type: 3

0224

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

Sample Title: 02

Elapsed Live time: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	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	1	1
33:	0	0	0	0	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:	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:	0	0	0	0	0	0	0	0
137:	0	0	1	0	0	1	0	1
145:	0	0	0	0	0	0	1	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:	2	1	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	1	0	0	0	0	0	1
217:	0	1	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	1	0	1	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	1	0	1	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	1	0	0	0	0
281:	0	0	1	0	0	0	0	1
289:	0	0	0	0	0	0	0	1
297:	0	0	0	0	0	0	0	0
305:	1	1	0	0	0	0	0	0
313:	0	0	1	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	1	0	0	0	0	0
337:	0	0	0	0	0	0	0	1
345:	0	0	0	1	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	1	0	0	0	0	0



369: 1 0 0 1 0 0 0 1

Sample Title: 02

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	0	1	1	0	0	0	0
385:	1	0	1	1	1	1	1	0
393:	0	0	1	0	0	0	0	1
401:	1	0	0	2	0	0	2	0
409:	0	0	2	1	0	0	0	0
417:	0	1	1	1	1	0	0	0
425:	1	2	1	0	1	1	0	0
433:	0	0	0	1	1	2	0	1
441:	0	1	2	1	1	0	2	2
449:	3	2	1	2	3	4	2	3
457:	4	2	4	2	5	4	2	4
465:	3	2	4	1	1	2	1	1
473:	4	3	0	2	2	3	2	0
481:	1	1	2	2	1	3	2	1
489:	0	0	1	1	0	0	0	1
497:	0	1	1	0	0	1	1	0
505:	0	0	1	2	0	0	1	1
513:	1	0	0	0	0	2	1	0
521:	1	1	2	0	0	1	0	0
529:	0	1	1	1	2	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	1	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	1	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	1	0	0
625:	1	0	0	0	0	0	0	1
633:	0	0	0	0	0	0	0	1
641:	0	0	0	0	0	0	0	0
649:	1	0	0	1	2	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	1	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	1	0
737:	0	0	0	0	0	0	1	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	1	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	1	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	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	1	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	1	0	0	0	0	0	1
929:	0	0	0	0	0	0	1	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  
8/13/13

# Apex-Alpha™

Sample Description: PZ-203-SS TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_023  
 Chamber Serial Number:  
 Detector Serial Number: 23  
 Env. Background: System Bkgd 64775  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:17:48 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.236 mL  
 Effective Efficiency: 0.1627 +/- 0.0144  
 Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM  
 Chem. Recovery Factor: 0.9516 +/- 0.0857

Peak Match Tolerance: 0.175 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.921	3.15	126.67	0.85	0.00E+000	3.1
TH-228	5.446	0.66	305.43	0.34	0.00E+000	3.1
TH-229 T	4.876	146.66	16.21	0.34	0.00E+000	5.4
TH-230	4.608	34.15	34.02	0.85	0.00E+000	3.1
TH-232	3.981	3.49	113.53	0.51	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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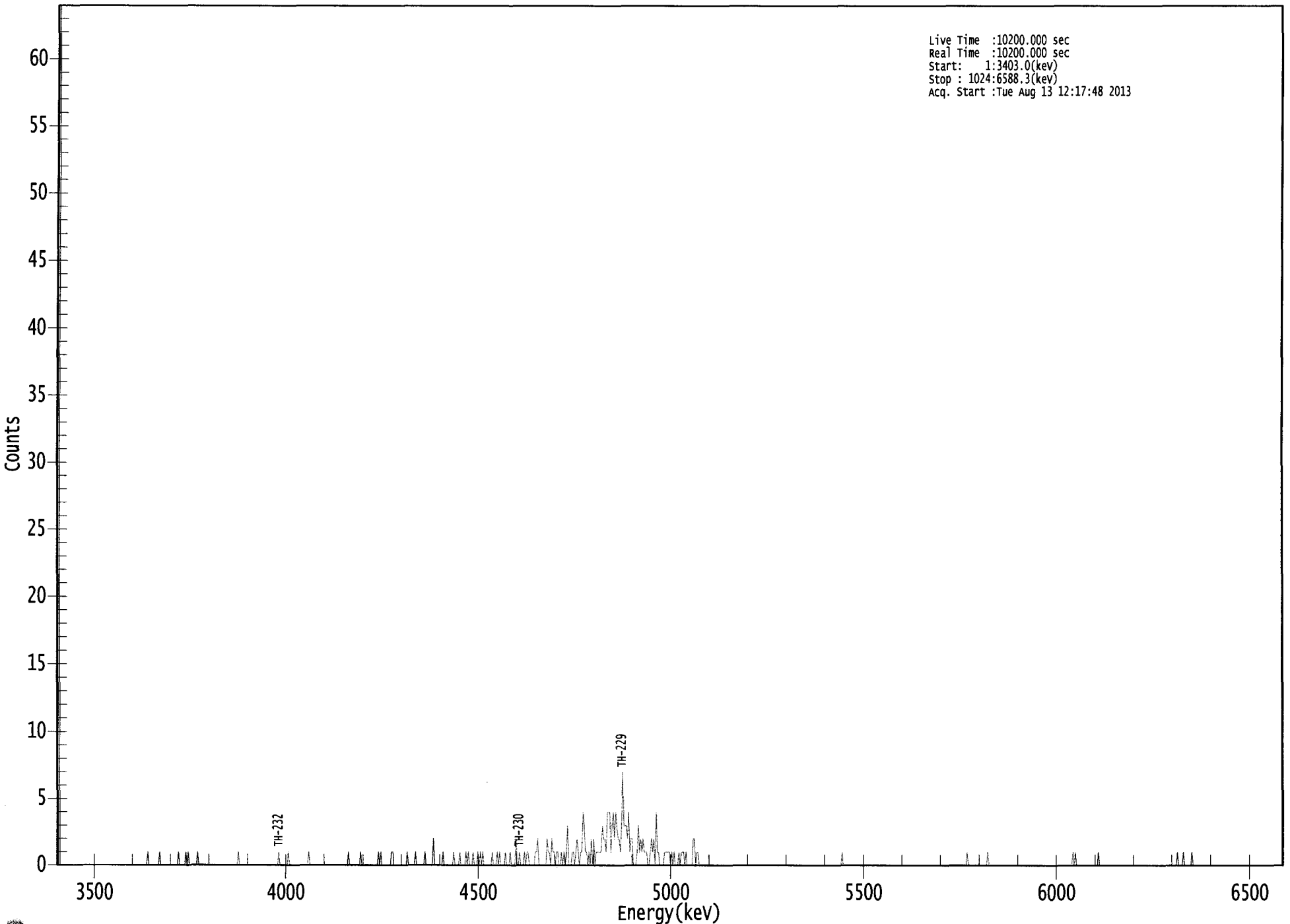
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.974	5850.00*	5.27E-002 +/- 6.74E-002	1.00E-001 +/- 1.73E-002
TH-228	0.989	5400.00*	1.10E-002 +/- 3.38E-002	8.00E-002 +/- 1.39E-002
TH-229	1.000	4872.00*	2.40E+000 +/- 4.15E-001	7.82E-002 +/- 1.35E-002
TH-230	0.979	4672.00*	5.57E-001 +/- 2.13E-001	9.77E-002 +/- 1.69E-002
TH-232	0.999	3997.00*	5.68E-002 +/- 6.53E-002	8.54E-002 +/- 1.48E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

0000066062.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3403.0(kev)  
Stop : 1024:6588.3(kev)  
Acq. Start :Tue Aug 13 12:17:48 2013



ROI Type: 1

ROI Type: 3

6229

\*\*\*\*\*  
 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 03

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	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	1	0	0	0
81:	0	0	0	0	0	0	1	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	1	0
105:	0	0	0	0	1	0	1	0
113:	0	0	0	0	0	0	1	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:	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	1	0	0	0	0	0
193:	0	0	1	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	1	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	1	0	0	0
249:	0	0	0	0	0	0	1	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	1	0	1
273:	0	0	0	0	0	0	0	0
281:	1	1	0	0	0	0	0	0
289:	0	0	0	0	0	1	0	0
297:	0	0	0	0	1	0	0	0
305:	0	0	0	0	1	0	0	0
313:	0	0	0	2	0	0	0	0
321:	0	0	0	1	0	0	0	0
329:	0	0	0	0	1	0	0	0
337:	0	1	0	0	0	0	1	0
345:	1	0	0	0	1	0	0	0
353:	1	0	1	0	1	0	0	0
361:	0	0	0	0	1	0	0	0

369: 1 0 1 0 0 0 0 1

Sample Title: 03

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	1	0	0	0	0
385:	2	0	0	1	0	0	0	1
393:	0	1	1	0	0	0	0	0
401:	1	1	2	0	0	0	0	0
409:	0	0	2	1	1	0	2	1
417:	1	0	1	1	0	0	1	0
425:	1	0	1	3	0	0	0	1
433:	1	0	1	2	1	0	1	1
441:	4	3	1	1	0	1	0	2
449:	0	2	0	1	1	1	1	1
457:	3	2	2	1	4	4	4	1
465:	3	4	2	4	3	2	2	1
473:	3	7	3	3	3	2	4	1
481:	2	2	0	0	0	1	3	1
489:	2	1	2	1	1	1	0	0
497:	1	2	1	2	0	4	1	1
505:	0	0	0	0	1	1	1	1
513:	1	0	1	0	1	0	0	0
521:	1	0	1	1	1	0	1	0
529:	0	0	0	0	2	2	0	1
537:	1	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	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:	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:	1	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	1	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:	1	0	1	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	1	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	1
937:	0	0	0	0	1	0	0	0
945:	0	0	0	1	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



# Apex-Alpha™

105  
2/13/13

Sample Description: PZ-203-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_024  
 Chamber Serial Number:  
 Detector Serial Number: 24  
 Env. Background: System Bkgd 64776  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:17:49 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.1590 +/- 0.0143  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Chem. Recovery Factor: 0.9294 +/- 0.0853

Peak Match Tolerance: 0.175 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.790	1.28	323.46	2.72	0.00E+000	3.1
TH-228	5.394	-0.38	799.90	2.38	0.00E+000	3.1
TH-229 T	4.848	142.96	16.53	2.04	0.00E+000	4.7
TH-230	4.589	34.81	33.88	1.19	0.00E+000	3.1
TH-232	3.947	6.15	85.19	0.85	0.00E+000	3.1

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)
TH-227	0.981	5850.00*	2.19E-002 +/- 7.11E-002	1.47E-001 +/- 2.59E-002
TH-228	1.000	5400.00*	-6.51E-003 +/- 5.21E-002	1.40E-001 +/- 2.47E-002
TH-229	0.997	4872.00*	2.39E+000 +/- 4.22E-001	1.30E-001 +/- 2.30E-002
TH-230	0.964	4672.00*	5.81E-001 +/- 2.22E-001	1.10E-001 +/- 1.94E-002
TH-232	0.987	3997.00*	1.03E-001 +/- 8.92E-002	9.98E-002 +/- 1.76E-002

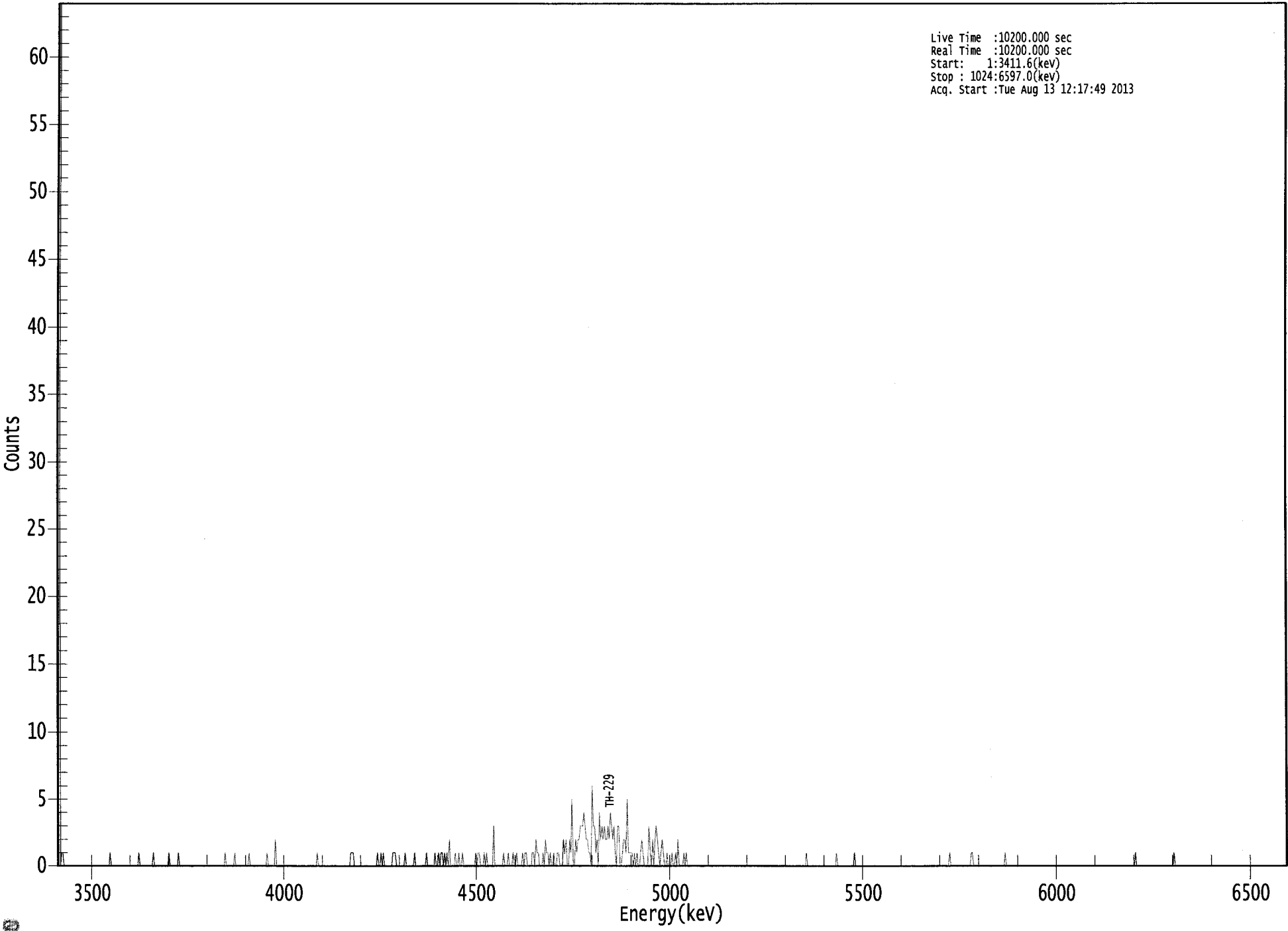
AG  
8/14/13

US EPA ARCHIVE DOCUMENT



000066063.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3411.6(kev)  
Stop : 1024:6597.0(kev)  
Acq. Start :Tue Aug 13 12:17:49 2013



ROI Type: 1

ROI Type: 3

0234

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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:	10200	10200	0	1	1	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	1	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	1	0	0	0
73:	0	0	0	0	0	0	0	0
81:	1	0	0	0	0	0	0	0
89:	0	0	0	0	0	1	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	1	0	0	0
145:	0	0	0	0	1	0	0	0
153:	0	0	0	0	0	0	0	0
161:	1	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	1
177:	0	0	0	0	0	0	2	0
185:	0	0	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	0	0	0	0	0	0	0
217:	0	1	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	1	1	1
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	1	0	0	1	0
273:	1	0	0	0	0	0	0	0
281:	1	1	1	0	0	0	0	0
289:	0	0	1	0	0	0	0	0
297:	0	0	1	0	0	0	0	0
305:	0	0	0	0	1	0	0	0
313:	0	0	0	1	0	0	1	0
321:	1	1	0	1	0	1	0	2
329:	0	0	0	0	1	0	0	1
337:	0	0	1	0	0	0	0	0
345:	0	0	0	0	0	1	0	1
353:	1	0	0	0	1	0	1	0
361:	0	0	0	0	3	0	0	0

369: 0 0 0 0 1 0 0 0

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	0	0	0	1	0	0	1
385:	0	0	0	0	1	0	1	1
393:	0	0	0	0	1	1	0	2
401:	1	1	0	0	0	1	0	2
409:	1	1	0	1	0	0	1	0
417:	0	1	1	0	0	0	2	1
425:	2	0	0	2	1	5	0	0
433:	2	1	2	2	3	3	3	4
441:	3	2	2	1	1	0	6	3
449:	3	1	2	0	4	2	3	2
457:	3	2	2	3	2	4	3	2
465:	3	1	0	3	3	0	0	1
473:	2	2	1	5	1	1	1	1
481:	0	1	0	1	0	0	1	2
489:	1	0	0	0	0	3	1	0
497:	2	0	2	3	2	1	0	1
505:	2	1	0	0	1	0	0	0
513:	1	0	0	1	0	2	0	0
521:	0	0	1	0	1	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	1	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	1	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	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	1
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	1	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	1	0	0
793:	0	0	0	0	0	0	0	0

801: 0 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	1	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	1	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



148  
8/13/13

Sample Description: PZ-203-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_025  
 Chamber Serial Number:  
 Detector Serial Number: 25  
 Env. Background: System Bkgd 64777  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:17:50 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.237 mL  
 Effective Efficiency: 0.1338 +/- 0.0129  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Chem. Recovery Factor: 0.7710 +/- 0.0756

Peak Match Tolerance: 0.175 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)
TH-227	5.877	4.81	101.48	1.19	0.00E+000	3.1
TH-228	5.427	-0.87	258.63	1.87	0.00E+000	3.1
TH-229 T	4.857	121.32	17.85	0.68	0.00E+000	6.9
TH-230	4.600	37.32	32.42	0.68	0.00E+000	4.7
TH-232	3.900	5.00	96.02	0.00	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
 -----  
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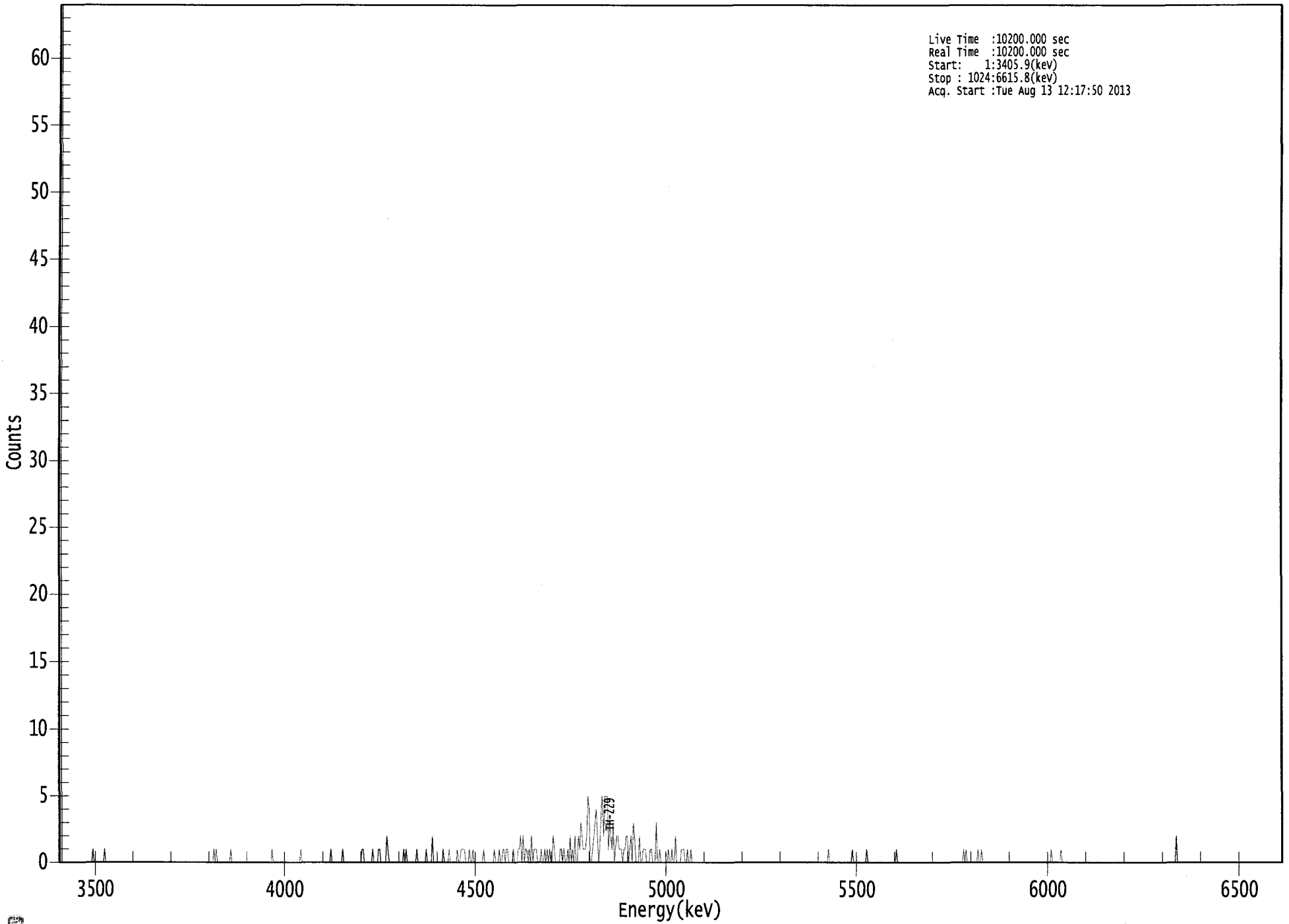
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.996	5850.00*	9.79E-002 +/- 1.01E-001	1.34E-001 +/- 2.53E-002
TH-228	0.996	5400.00*	-1.77E-002 +/- 4.59E-002	1.54E-001 +/- 2.91E-002
TH-229	0.999	4872.00*	2.41E+000 +/- 4.55E-001	1.12E-001 +/- 2.12E-002
TH-230	0.973	4672.00*	7.40E-001 +/- 2.78E-001	1.12E-001 +/- 2.11E-002
TH-232	0.952	3997.00*	9.90E-002 +/- 9.69E-002	1.19E-001 +/- 2.24E-002

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8/14/13

US EPA ARCHIVE DOCUMENT

000066064.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3405.9(kev)  
Stop : 1024:6615.8(kev)  
Acq. Start :Tue Aug 13 12:17:50 2013



ROI Type: 1

ROI Type: 3

0239

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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: 05

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	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	1	0	0	0
33:	0	0	0	0	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:	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	1	0	1	0	0	0
137:	0	0	0	0	0	0	0	0
145:	1	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	1	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	1	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	1	0	0	0
233:	0	0	0	0	0	0	1	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	1	1
257:	0	0	0	0	0	0	0	1
265:	0	0	0	0	1	1	0	0
273:	0	0	0	2	1	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	1	0	1	0	0	0	0
297:	0	0	0	0	1	0	0	0
305:	0	0	0	0	1	0	0	0
313:	0	2	0	0	0	0	0	0
321:	0	0	1	0	0	0	0	1
329:	0	0	0	0	0	0	1	0
337:	0	1	1	1	1	0	0	0
345:	1	0	0	1	0	0	0	0
353:	0	0	0	0	1	0	0	0
361:	0	0	0	0	0	1	0	0

369: 0 1 0 0 1 1 0 1

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	0	0	0	0	1	0	0
385:	0	1	1	2	0	2	0	1
393:	1	0	1	0	2	0	1	1
401:	1	0	0	0	1	0	0	1
409:	0	1	0	1	0	0	2	1
417:	0	0	0	0	1	1	0	1
425:	0	0	1	0	2	0	1	0
433:	2	0	0	2	1	3	2	1
441:	1	1	2	5	4	0	0	1
449:	2	3	4	2	0	1	4	5
457:	2	5	5	5	1	3	2	1
465:	3	0	1	2	2	1	1	1
473:	0	1	1	2	2	0	1	2
481:	0	3	2	0	0	0	2	0
489:	0	1	1	1	0	0	0	1
497:	1	0	0	0	3	0	0	1
505:	0	0	0	0	0	0	1	0
513:	0	1	0	0	2	0	0	0
521:	0	1	1	1	0	0	1	0
529:	0	1	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
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:	1	0	0	0	0	0	0	0
673:	0	0	0	0	1	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	1	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	1	0	1
761:	0	0	0	0	0	0	0	0
769:	0	1	0	0	1	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	1	0
833:	0	0	0	0	0	0	1	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	2	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  
8/13/13

# Apex-Alpha™

Sample Description: D-87 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_027  
 Chamber Serial Number:  
 Detector Serial Number: 27  
 Env. Background: System Bkgd 64778  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:17:51 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.236 mL  
 Effective Efficiency: 0.1488 +/- 0.0137  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Chem. Recovery Factor: 0.8615 +/- 0.0809

Peak Match Tolerance: 0.175 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.895	2.30	176.50	1.70	0.00E+000	3.2
TH-228	5.365	30.11	37.67	2.89	0.00E+000	9.5
TH-229 T	4.859	134.15	16.98	0.85	0.00E+000	8.0
TH-230	4.610	81.30	22.00	1.70	0.00E+000	4.8
TH-232	3.957	28.81	37.39	1.19	0.00E+000	4.8

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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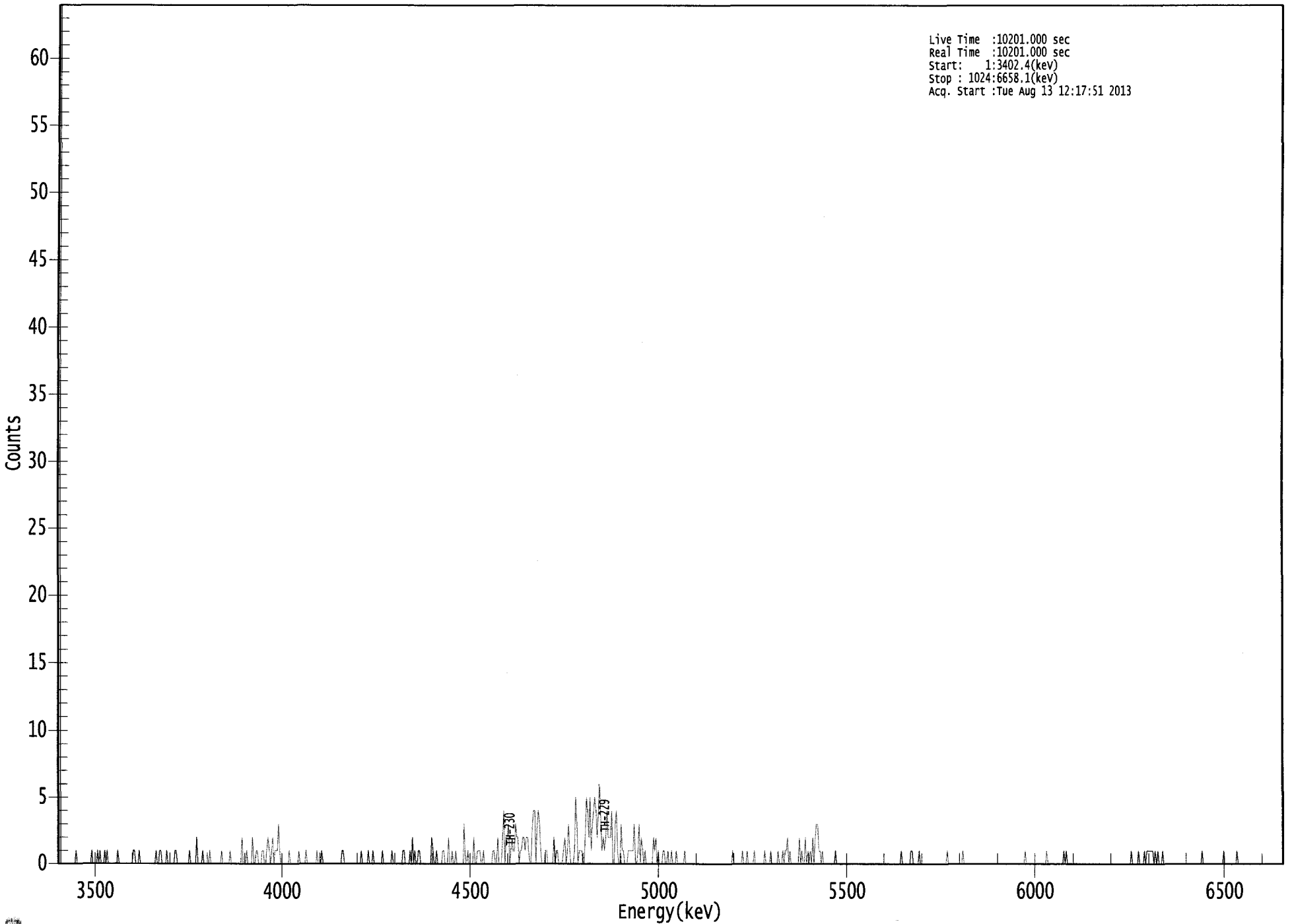
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.989	5850.00*	4.21E-002 +/- 7.47E-002	1.34E-001 +/- 2.43E-002
TH-228	0.994	5400.00*	5.51E-001 +/- 2.30E-001	1.60E-001 +/- 2.89E-002
TH-229	0.999	4872.00*	2.40E+000 +/- 4.33E-001	1.07E-001 +/- 1.93E-002
TH-230	0.980	4672.00*	1.45E+000 +/- 4.13E-001	1.31E-001 +/- 2.36E-002
TH-232	0.992	3997.00*	5.13E-001 +/- 2.13E-001	1.17E-001 +/- 2.12E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

0000066065.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3402.4(kev)  
Stop : 1024:6658.1(kev)  
Acq. Start :Tue Aug 13 12:17:51 2013



ROI Type: 1

ROI Type: 3

0244

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

Sample Title: 06

Elapsed Live time: 10201  
Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	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	1	0	0	0
33:	0	1	0	1	0	0	0	1
41:	0	1	0	0	0	0	0	0
49:	0	0	1	0	0	0	0	0
57:	0	0	0	0	0	0	0	1
65:	1	0	0	0	1	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	1	0	0	1	1	0
89:	0	0	0	1	0	0	0	0
97:	0	0	1	1	0	0	0	0
105:	0	0	0	0	0	0	1	0
113:	0	0	0	0	2	0	0	0
121:	0	1	0	0	0	0	0	1
129:	0	0	0	0	0	0	0	0
137:	0	1	0	0	0	0	0	0
145:	1	0	0	0	0	0	0	0
153:	0	0	2	0	0	0	1	0
161:	0	0	0	2	0	0	1	1
169:	0	0	0	1	1	0	0	1
177:	2	1	0	1	2	0	1	1
185:	1	3	1	0	0	0	0	0
193:	0	0	1	0	0	0	0	0
201:	0	0	1	0	0	0	0	0
209:	1	0	0	0	0	0	0	0
217:	0	1	0	0	0	1	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	1	1
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	1	0
257:	0	0	0	0	1	0	0	0
265:	1	0	0	0	0	0	0	0
273:	1	0	0	0	0	0	0	0
281:	1	0	0	0	0	0	0	0
289:	0	1	1	0	0	0	0	1
297:	0	2	0	1	0	0	1	1
305:	0	0	0	0	0	0	0	0
313:	0	2	1	0	0	1	0	0
321:	0	0	1	1	0	0	0	2
329:	0	0	1	0	0	1	0	0
337:	0	0	0	0	3	0	0	1
345:	0	0	0	0	2	0	0	1
353:	1	1	0	0	1	0	0	0
361:	0	0	0	0	1	1	0	0

369: 2 0 0 0 2 4 0 2

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	2	3	0	1	2	1	1	3
385:	2	2	0	1	1	2	2	1
393:	2	2	1	0	0	3	4	4
401:	0	3	4	3	1	0	0	0
409:	1	1	0	0	0	0	0	2
417:	0	1	1	0	0	0	0	1
425:	2	0	1	3	1	0	0	0
433:	1	5	3	0	1	1	1	0
441:	0	2	5	4	2	5	1	3
449:	4	5	4	2	4	6	3	1
457:	2	1	2	4	2	2	2	4
465:	0	0	3	4	1	0	0	3
473:	1	1	0	0	0	1	1	1
481:	1	1	3	0	0	1	3	0
489:	2	1	0	1	0	0	0	0
497:	0	0	2	1	2	0	1	0
505:	0	0	1	1	0	0	1	0
513:	0	1	0	0	0	1	0	0
521:	0	0	0	0	1	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	1	0	0	0
569:	0	0	0	0	1	0	0	0
577:	1	0	0	0	0	0	1	0
585:	0	0	0	0	0	0	0	1
593:	0	0	0	0	1	0	0	0
601:	0	0	1	0	0	0	1	0
609:	1	1	2	0	1	0	0	0
617:	0	0	0	0	2	0	1	0
625:	0	2	0	1	0	1	0	2
633:	0	2	3	3	1	1	0	1
641:	0	0	0	0	0	0	0	0
649:	0	0	1	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	1	1	0	0	0	0	0
721:	1	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	1
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	1	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	1	2	3	4	5	6	7	8
809:	1	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	1	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	1	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	0	0
889:	0	0	0	0	0	0	0	0
897:	1	0	0	0	0	0	1	0
905:	0	0	0	1	0	1	1	1
913:	1	1	1	0	1	0	1	0
921:	0	0	1	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	1	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	1	0	0
977:	0	0	0	0	0	0	0	0
985:	1	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

104  
8/13/13

# Apex-Alpha™

Sample Description: D-87 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_029  
 Chamber Serial Number:  
 Detector Serial Number: 29  
 Env. Background: System Bkgd 64779  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:17:52 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.236 mL  
 Effective Efficiency: 0.1397 +/- 0.0132  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Chem. Recovery Factor: 0.7183 +/- 0.0692

Peak Match Tolerance: 0.175 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.714	1.32	215.97	0.68	0.00E+000	3.1
TH-228	5.343	3.28	151.91	2.72	0.00E+000	3.1
TH-229 T	4.860	126.15	17.52	0.85	0.00E+000	4.0
TH-230	4.614	46.66	28.82	0.34	0.00E+000	4.7
TH-232	4.019	4.81	101.48	1.19	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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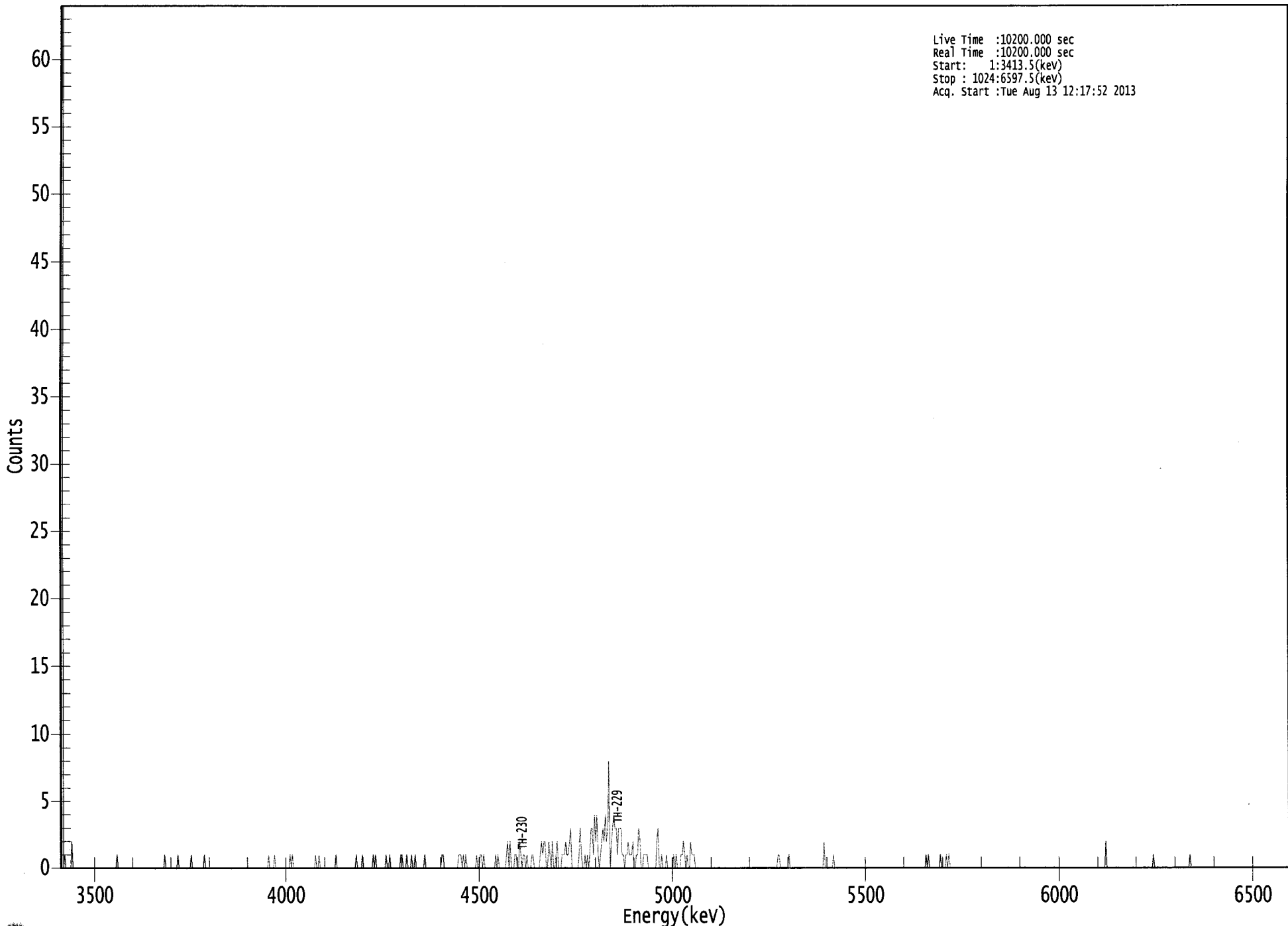
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.907	5850.00*	2.57E-002 +/- 5.58E-002	1.10E-001 +/- 2.04E-002
TH-228	0.983	5400.00*	6.39E-002 +/- 9.79E-002	1.67E-001 +/- 3.10E-002
TH-229	0.999	4872.00*	2.40E+000 +/- 4.46E-001	1.14E-001 +/- 2.12E-002
TH-230	0.983	4672.00*	8.86E-001 +/- 3.04E-001	9.08E-002 +/- 1.68E-002
TH-232	0.997	3997.00*	9.12E-002 +/- 9.41E-002	1.25E-001 +/- 2.32E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

000066066.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3413.5(kev)  
Stop : 1024:6597.5(kev)  
Acq. Start :Tue Aug 13 12:17:52 2013



ROI Type: 1

ROI Type: 3

0219



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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: 07

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	1	0	0	0	0
9:	0	2	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	1
89:	0	0	0	0	0	0	0	0
97:	0	0	1	0	0	0	0	0
105:	0	0	0	0	0	1	0	0
113:	0	0	0	0	0	0	0	0
121:	1	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	0	1	0
177:	0	0	0	1	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	1	0	1	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	1	0	0
217:	1	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	1	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	1
249:	0	0	0	0	1	0	0	0
257:	0	0	0	0	0	1	0	1
265:	0	0	0	0	0	0	0	0
273:	1	0	0	1	0	0	0	0
281:	0	0	0	0	1	1	0	0
289:	0	1	0	0	0	1	0	0
297:	1	0	0	0	0	0	0	0
305:	1	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	1	1
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	1	1	1	0
337:	1	0	1	0	0	0	0	0
345:	0	0	0	1	0	0	1	1
353:	0	1	0	0	0	0	0	0
361:	0	0	0	1	0	1	0	0

369: 0 0 0 0 1 2 0 2

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	1	1	0	0	2
385:	1	0	1	1	0	1	0	0
393:	0	1	1	0	0	0	0	0
401:	1	2	1	2	2	0	0	2
409:	1	0	2	0	0	1	2	0
417:	0	0	1	1	1	2	1	1
425:	2	3	0	0	0	0	0	0
433:	1	3	1	0	0	1	0	1
441:	0	1	3	3	1	4	2	4
449:	1	0	1	2	3	2	4	2
457:	3	8	0	2	3	4	3	3
465:	1	3	3	3	1	1	0	1
473:	1	2	1	1	1	2	0	0
481:	1	1	3	2	0	0	1	1
489:	1	1	0	0	0	0	0	0
497:	0	2	3	0	0	1	0	0
505:	0	1	0	0	0	0	0	1
513:	0	1	0	0	0	1	1	2
521:	1	0	1	0	0	2	1	1
529:	1	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	1	1
601:	0	0	0	0	0	0	0	1
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	2	0	0	0
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	1	0	1	0	0	0	0
729:	0	0	0	0	0	1	0	0
737:	0	0	1	0	1	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	0
865:	0	0	0	0	0	0	2	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	1	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	1	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

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8/13/13

# Apex-Alpha™

Sample Description: DUP 06 TOT  
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
Batch Identification: 1307152A-TH  
Sample Identification: 08  
Sample Geometry: Shelf 2  
Procedure Description: Th iso

Detector Name: Alpha\_031  
Chamber Serial Number:  
Detector Serial Number: 31  
Env. Background: System Bkgd 64780  
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
Sample Date/Time: 7/17/2013 7:15:31 AM  
Acquisition Date/Time: 8/13/2013 12:17:53 PM  
Acquisition Live Time: 170.0 minutes  
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
Tracer Quantity: 0.235 mL  
Effective Efficiency: 0.1084 +/- 0.0116  
Counting Efficiency: 0.1418 +/- 0.0034 on 6/13/2013 3:23:29 PM  
Chem. Recovery Factor: 0.7642 +/- 0.0835

Peak Match Tolerance: 0.175 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.789	0.32	646.93	0.68	0.00E+000	3.1
TH-228	5.337	1.98	176.34	1.02	0.00E+000	3.1
TH-229 T	4.871	97.15	19.99	0.85	0.00E+000	5.2
TH-230	4.594	17.49	47.66	0.51	0.00E+000	4.7
TH-232	3.984	7.15	78.23	0.85	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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

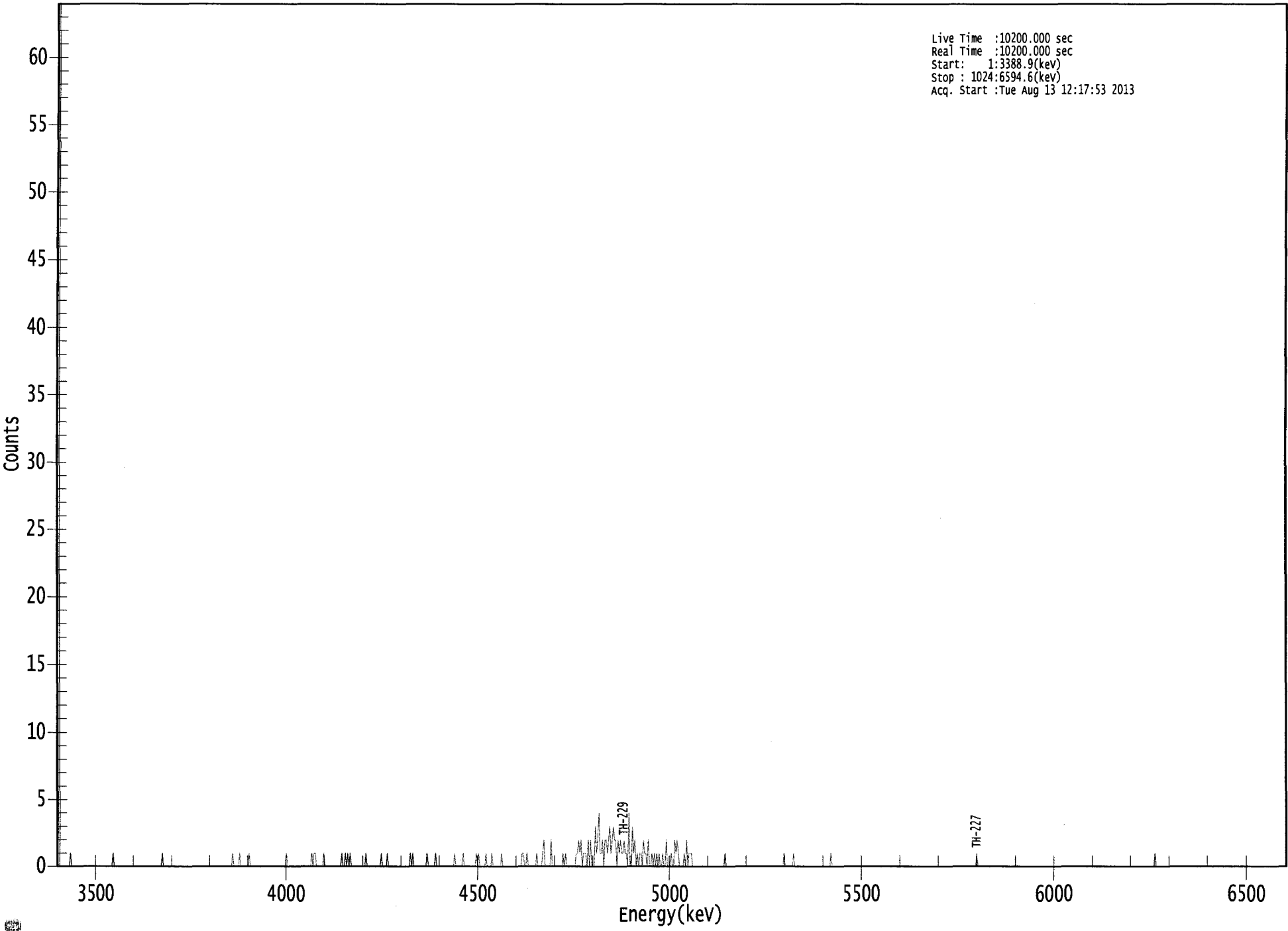
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.981	5850.00*	8.04E-003 +/- 5.21E-002	1.42E-001 +/- 2.96E-002
TH-228	0.979	5400.00*	4.98E-002 +/- 8.84E-002	1.58E-001 +/- 3.31E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 4.99E-001	1.47E-001 +/- 3.07E-002
TH-230	0.969	4672.00*	4.28E-001 +/- 2.23E-001	1.29E-001 +/- 2.68E-002
TH-232	0.999	3997.00*	1.75E-001 +/- 1.42E-001	1.46E-001 +/- 3.06E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

0000066067.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3388.9(kev)  
Stop : 1024:6594.6(kev)  
Acq. Start :Tue Aug 13 12:17:53 2013



ROI Type: 1

ROI Type: 3

\*\*\*\*\*  
 \*\*\*\*\* 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:	10200	10200	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	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:	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:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	1	0	0	0	0
153:	0	1	0	0	0	0	0	0
161:	0	1	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:	1	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	1	0	1
217:	1	0	0	0	0	0	0	1
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	1	0
241:	0	1	0	1	0	1	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	1	0	0	0	0	0
265:	0	0	0	0	0	0	0	1
273:	0	0	0	0	1	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	1
297:	0	1	0	0	0	0	0	0
305:	0	0	0	0	0	1	0	0
313:	0	0	0	0	1	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	1	0	0	0
337:	0	0	0	1	0	0	0	0
345:	0	0	0	0	0	0	1	0
353:	1	0	0	0	0	0	1	0
361:	0	0	0	1	0	0	0	0

369: 0 0 0 1 0 0 0 0

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	1	1	0	0
393:	1	0	0	0	0	0	0	0
401:	1	0	0	0	0	1	2	0
409:	0	0	0	0	2	0	0	0
417:	0	0	0	0	0	0	1	0
425:	1	0	0	0	0	0	0	0
433:	0	1	1	2	1	2	0	1
441:	1	1	0	2	0	2	0	0
449:	0	3	1	2	4	1	1	2
457:	0	2	2	1	2	3	1	2
465:	3	2	2	0	2	1	2	1
473:	1	2	1	1	0	4	0	0
481:	3	1	2	0	1	0	1	1
489:	0	2	1	1	0	2	0	0
497:	1	0	1	0	1	0	1	0
505:	0	1	0	0	2	0	0	0
513:	1	0	0	2	1	2	1	0
521:	0	0	0	1	0	2	0	1
529:	1	1	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	1	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	1	0
609:	0	0	0	0	0	0	1	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	1	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	1	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: 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	1	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





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Sample Description: DUP 06 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_033  
 Chamber Serial Number: 04026479A  
 Detector Serial Number: 91132  
 Env. Background: System Bkgd 64781  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:11 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1192 +/- 0.0122  
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM  
 Chem. Recovery Factor: 0.6447 +/- 0.0667

Peak Match Tolerance: 0.175 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.764	2.15	161.66	0.85	0.00E+000	3.0
TH-228	5.362	4.49	98.45	0.51	0.00E+000	3.0
TH-229 T	4.871	106.49	19.05	0.51	0.00E+000	5.0
TH-230	4.615	24.00	40.83	0.00	0.00E+000	3.7
TH-232	3.949	3.83	102.72	0.17	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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

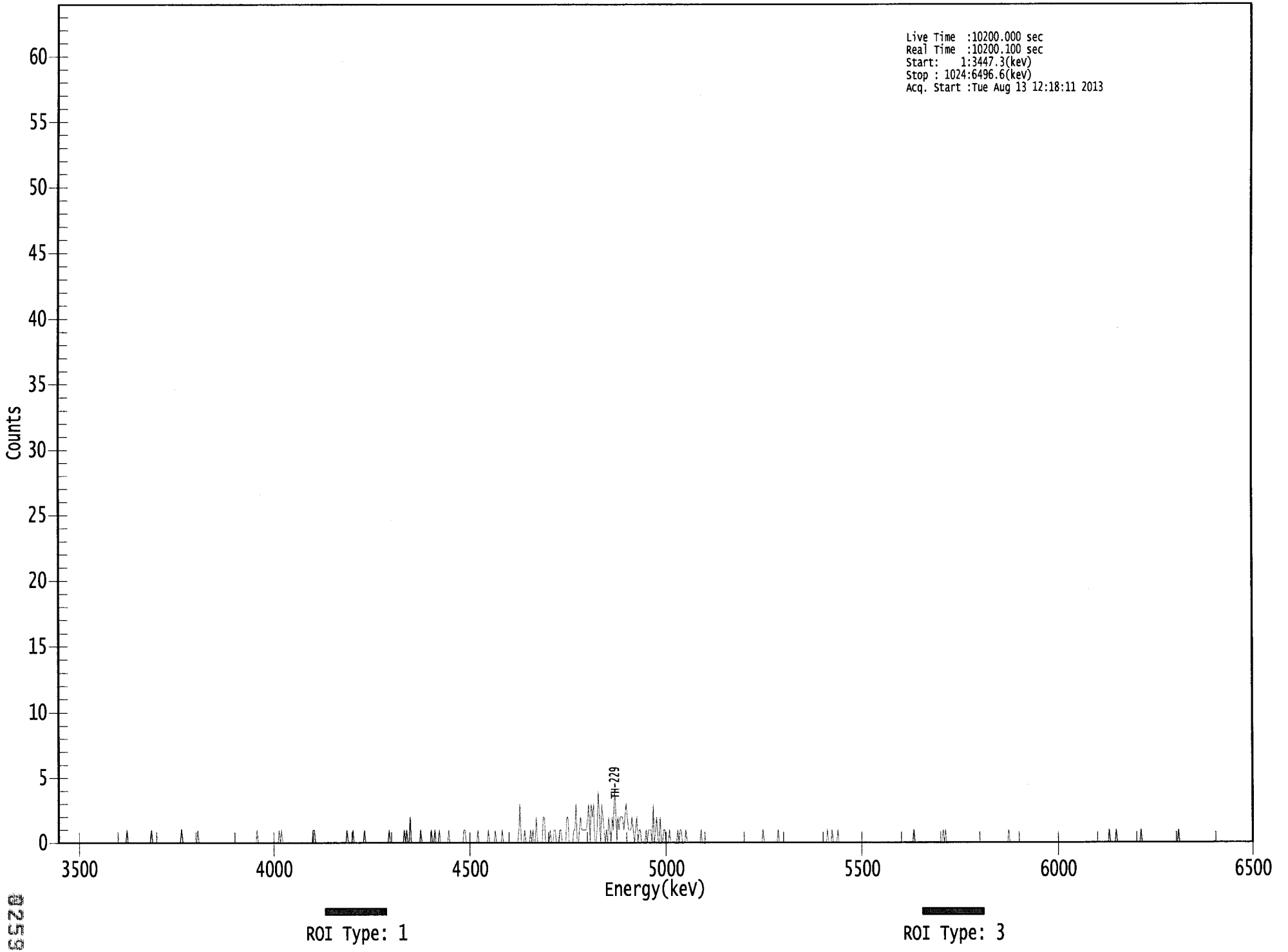
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.962	5850.00*	4.92E-002 +/- 8.01E-002	1.37E-001 +/- 2.74E-002
TH-228	0.992	5400.00*	1.03E-001 +/- 1.03E-001	1.20E-001 +/- 2.40E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.76E-001	1.17E-001 +/- 2.34E-002
TH-230	0.983	4672.00*	5.35E-001 +/- 2.43E-001	1.34E-001 +/- 2.67E-002
TH-232	0.988	3997.00*	8.52E-002 +/- 8.91E-002	9.28E-002 +/- 1.86E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

000066071.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3447.3(kev)  
Stop : 1024:6496.6(kev)  
Acq. Start :Tue Aug 13 12:18:11 2013



0259

ROI Type: 1

ROI Type: 3

\*\*\*\*\*  
 \*\*\*\*\* 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	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	1	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	1	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:	1	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	1	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	1	0
193:	1	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	1	1	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	1	0	0	0	0	1	0	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	0	0	1	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	1	0	1	0	0	2	0
305:	0	0	0	0	0	0	0	1
313:	0	0	0	0	0	0	0	0
321:	1	0	0	1	0	0	0	1
329:	0	0	0	0	0	0	0	1
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	1	1	0	0
353:	0	0	0	0	0	0	0	0
361:	1	0	0	0	0	0	0	0

369: 0 1 0 0 0 0 0 1

Sample Title: 09

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	1	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	1	3	0	0	0
401:	1	0	0	0	0	1	0	1
409:	0	0	2	0	0	0	0	0
417:	2	2	0	0	0	0	1	0
425:	0	1	1	0	0	0	1	1
433:	0	0	0	0	2	2	0	0
441:	0	0	1	1	3	0	0	1
449:	2	1	1	1	1	1	2	3
457:	0	3	2	3	0	0	1	4
465:	2	0	3	2	1	0	1	0
473:	2	1	0	2	1	4	3	0
481:	2	1	2	2	2	1	2	3
489:	2	1	1	1	2	1	0	1
497:	2	0	1	1	0	0	0	0
505:	1	0	1	1	1	0	3	0
513:	1	2	0	0	2	0	0	1
521:	1	0	0	0	1	0	0	0
529:	0	0	0	1	0	1	1	0
537:	0	0	1	0	0	0	0	0
545:	0	0	0	0	0	0	0	1
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	1	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	1	0	0	0	0	0	0
625:	0	0	0	0	0	0	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	1	0	0	0	1
665:	0	0	0	0	1	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	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	1	0
761:	1	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: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	1	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	1	0	0	0
905:	0	0	1	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	1
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	1
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

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8/13/13

# Apex-Alpha™

Sample Description: S-53 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_034  
 Chamber Serial Number: 04026479B  
 Detector Serial Number: 91136  
 Env. Background: System Bkgd 64782  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:13 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1361 +/- 0.0131  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Chem. Recovery Factor: 0.7333 +/- 0.0715

Peak Match Tolerance: 0.175 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)
TH-227	5.867	11.83	57.46	0.17	0.00E+000	3.0
TH-228	5.353	100.83	19.54	0.17	0.00E+000	4.3
TH-229 T	4.888	121.66	17.80	0.34	0.00E+000	4.0
TH-230	4.612	129.00	17.32	0.00	0.00E+000	6.2
TH-232	3.962	97.83	19.84	0.17	0.00E+000	7.4

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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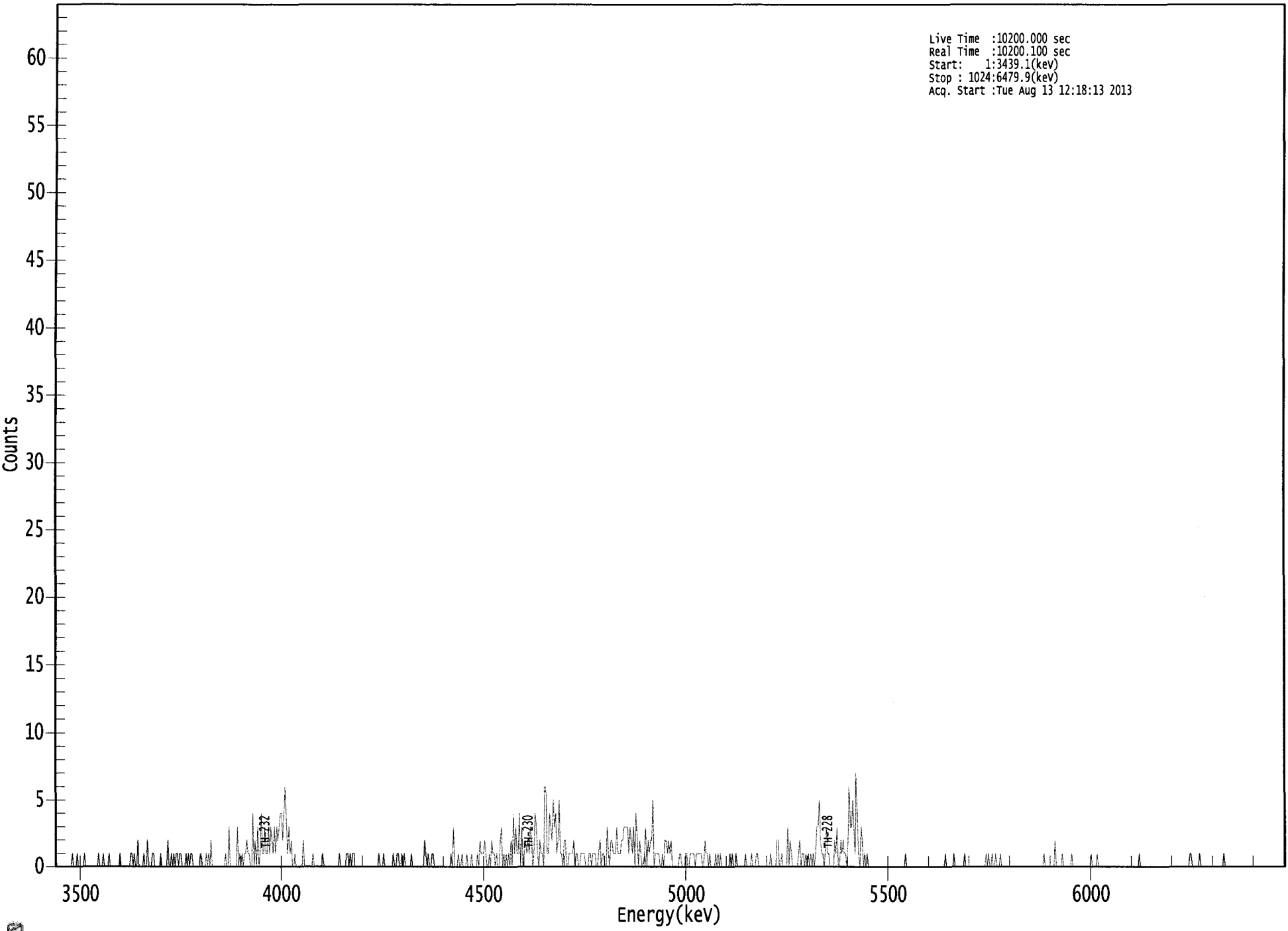
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.998	5850.00*	2.37E-001 +/- 1.43E-001	8.35E-002 +/- 1.57E-002
TH-228	0.988	5400.00*	2.02E+000 +/- 5.47E-001	8.35E-002 +/- 1.57E-002
TH-229	0.999	4872.00*	2.38E+000 +/- 4.48E-001	9.35E-002 +/- 1.76E-002
TH-230	0.982	4672.00*	2.52E+000 +/- 6.43E-001	1.17E-001 +/- 2.20E-002
TH-232	0.994	3997.00*	1.90E+000 +/- 5.21E-001	8.13E-002 +/- 1.53E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

0000066072.CNF

Live Time : 10200.000 sec  
Real Time : 10200.100 sec  
Start : 1:3439.1(kev)  
Stop : 1024:6479.9(kev)  
Acq. Start : Tue Aug 13 12:18:13 2013



0928

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: 10

Elapsed Live time: 10200

Elapsed Real Time: 10200

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



369: 1 0 0 2 3 0 1 0

Sample Title: 10

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

801: 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	1
825:	0	0	0	0	0	0	0	0
833:	2	0	0	0	0	0	1	0
841:	0	0	0	0	0	0	1	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	1	0
865:	0	0	0	1	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	1	0	0	0	0	0	0
953:	1	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	1	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

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8/12/13

# Apex-Alpha™

Sample Description: S-53 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 64783  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:15 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.1077 +/- 0.0115  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 0.5898 +/- 0.0638

Peak Match Tolerance: 0.175 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)
TH-227	5.876	2.32	149.12	0.68	0.00E+000	2.9
TH-228	5.423	-0.19	1131.1	1.19	0.00E+000	2.9
TH-229 T	4.868	96.49	20.01	0.51	0.00E+000	4.3
TH-230	4.591	20.66	43.53	0.34	0.00E+000	2.9
TH-232	3.939	4.83	91.00	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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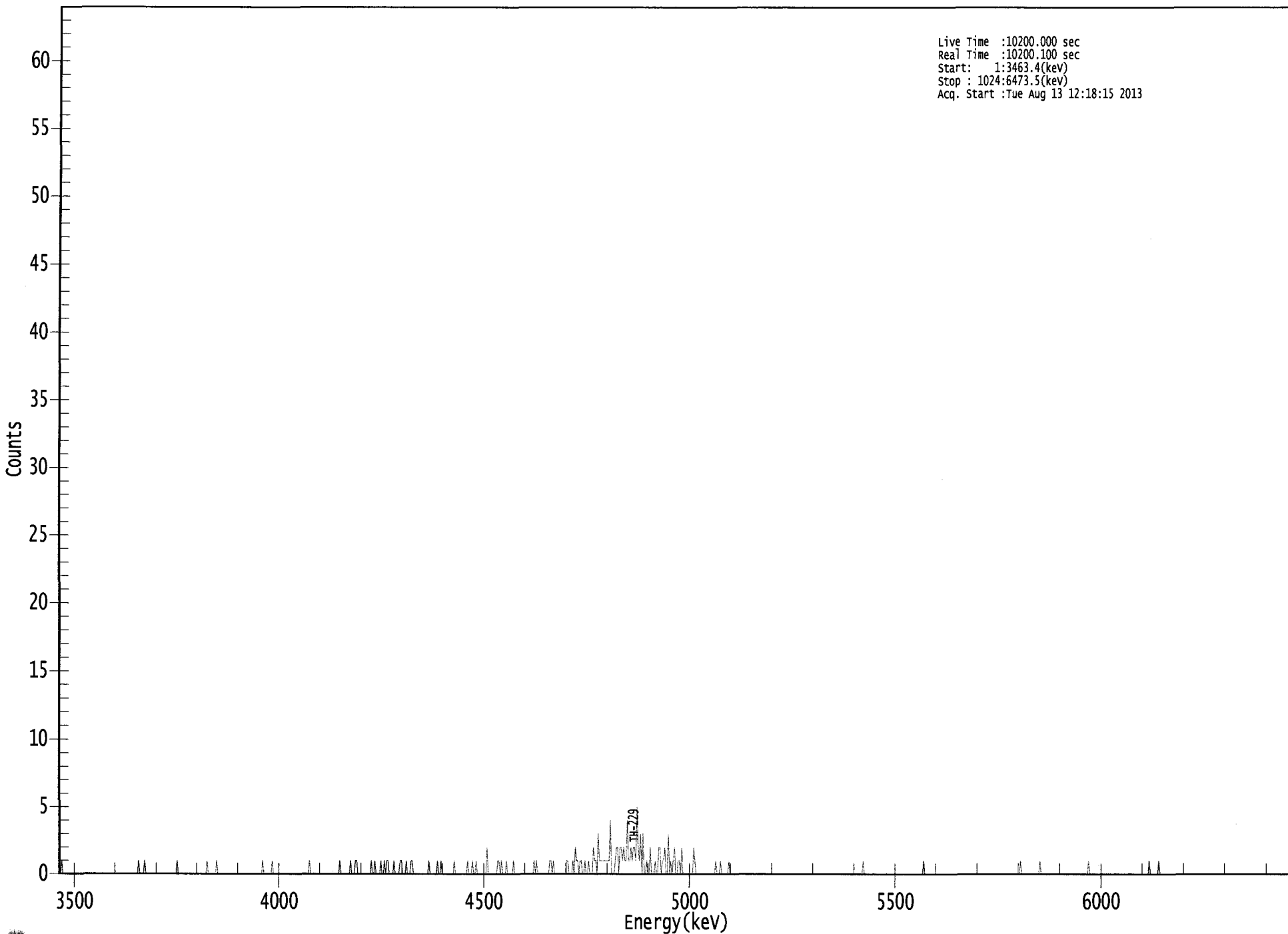
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.996	5850.00*	5.87E-002 +/- 8.84E-002	1.43E-001 +/- 2.98E-002
TH-228	0.997	5400.00*	-4.80E-003 +/- 5.43E-002	1.66E-001 +/- 3.48E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 4.99E-001	1.30E-001 +/- 2.71E-002
TH-230	0.967	4672.00*	5.09E-001 +/- 2.46E-001	1.18E-001 +/- 2.46E-002
TH-232	0.983	3997.00*	1.19E-001 +/- 1.11E-001	1.03E-001 +/- 2.15E-002

AG  
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US EPA ARCHIVE DOCUMENT

0000066073.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3463.4(keV)  
Stop : 1024:6473.5(keV)  
Acq. Start :Tue Aug 13 12:18:15 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: 11

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	1	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	1	0	0	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	1	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	1	0	0	0	0
129:	0	0	0	1	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	1	0	0	0	0	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	0	0	0
201:	0	0	0	0	0	0	0	0
209:	1	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	1	0	0	0	0	0	0
241:	0	0	1	0	0	0	1	1
249:	0	0	0	0	0	0	0	0
257:	0	0	0	1	0	0	1	0
265:	0	0	0	1	0	0	1	0
273:	1	1	0	0	0	0	1	0
281:	0	0	0	1	1	0	0	0
289:	1	0	0	0	1	1	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	1	0	0	0	0
313:	0	0	1	0	0	1	0	0
321:	0	0	0	0	0	0	0	0
329:	1	0	0	0	0	0	0	0
337:	0	0	0	1	0	0	0	1
345:	0	0	1	0	0	0	0	0
353:	0	0	0	2	0	0	0	0
361:	0	0	0	0	1	1	0	1

369: 0 0 0 1 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	1	0	1	0	0	0
401:	0	0	0	0	0	0	0	1
409:	1	0	1	0	0	0	0	0
417:	0	0	0	0	0	1	1	0
425:	0	0	1	0	2	1	1	0
433:	1	1	0	0	1	0	0	1
441:	0	0	0	2	1	1	0	3
449:	1	1	1	1	1	1	1	1
457:	1	4	0	0	0	1	2	2
465:	0	2	2	1	2	1	1	4
473:	1	1	2	1	2	2	1	5
481:	2	1	3	0	3	0	0	1
489:	0	0	2	0	0	0	1	0
497:	0	2	2	0	1	1	2	0
505:	0	3	0	1	0	1	2	0
513:	0	1	1	0	2	0	0	0
521:	0	0	0	0	0	0	2	1
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	1	0	0	0	1	0	0	0
553:	0	0	0	1	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	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	1	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	1	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	1	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	1	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	1	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	1	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

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8/13/13



Sample Description: D-14 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_036  
 Chamber Serial Number: 04026477B  
 Detector Serial Number: 84167  
 Env. Background: System Bkgd 64784  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:16 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.1549 +/- 0.0140  
 Counting Efficiency: 0.1910 +/- 0.0033 on 7/20/2013 2:31:37 PM  
 Chem. Recovery Factor: 0.8109 +/- 0.0748

Peak Match Tolerance: 0.175 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)
TH-227	5.802	3.49	113.53	0.51	0.00E+000	3.0
TH-228	5.355	37.32	32.42	0.68	0.00E+000	5.9
TH-229 T	4.879	138.98	16.70	1.02	0.00E+000	6.9
TH-230	4.593	56.49	26.22	0.51	0.00E+000	4.4
TH-232	3.954	41.98	30.68	1.02	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)
TH-227	0.988	5850.00*	6.14E-002 +/- 7.05E-002	9.23E-002 +/- 1.64E-002
TH-228	0.989	5400.00*	6.56E-001 +/- 2.42E-001	9.91E-002 +/- 1.76E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 4.25E-001	1.08E-001 +/- 1.92E-002
TH-230	0.968	4672.00*	9.68E-001 +/- 3.07E-001	8.99E-002 +/- 1.60E-002
TH-232	0.990	3997.00*	7.18E-001 +/- 2.55E-001	1.08E-001 +/- 1.92E-002

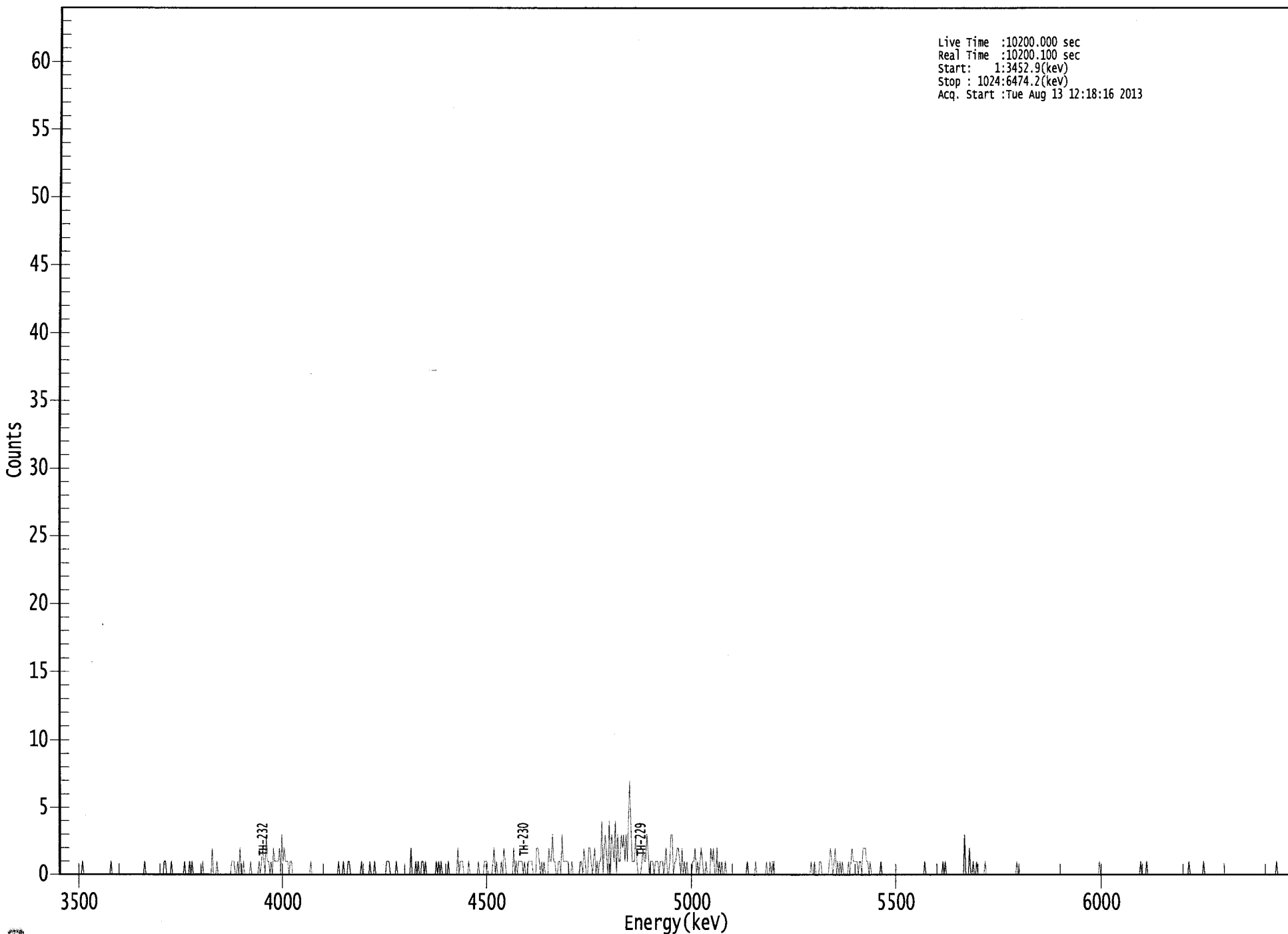
AG  
8/14/13

US EPA ARCHIVE DOCUMENT



000066074.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3452.9(keV)  
Stop : 1024:6474.2(keV)  
Acq. Start :Tue Aug 13 12:18:16 2013



ROI Type: 1

ROI Type: 3

0274

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

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

369: 0 2 1 0 0 0 0 0

Sample Title: 12

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

801: 0 0 0 0 0 0 0 0

Sample Title: 12

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	1	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	1
897:	0	0	0	0	1	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	1
937:	0	0	0	0	0	0	0	0
945:	0	0	0	1	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	1
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



KCS  
8/13/13

Sample Description: D-14 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_037  
 Chamber Serial Number: 04026478A  
 Detector Serial Number: 91133  
 Env. Background: System Bkgd 62769  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:19 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1398 +/- 0.0133  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Chem. Recovery Factor: 0.7839 +/- 0.0759

Peak Match Tolerance: 0.175 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)
TH-227	5.996	0.83	239.53	0.17	0.00E+000	2.9
TH-228	5.342	4.32	102.62	0.68	0.00E+000	2.9
TH-229 T	4.879	125.00	17.60	0.00	0.00E+000	5.1
TH-230	4.608	45.66	29.13	0.34	0.00E+000	3.7
TH-232	3.945	4.83	91.00	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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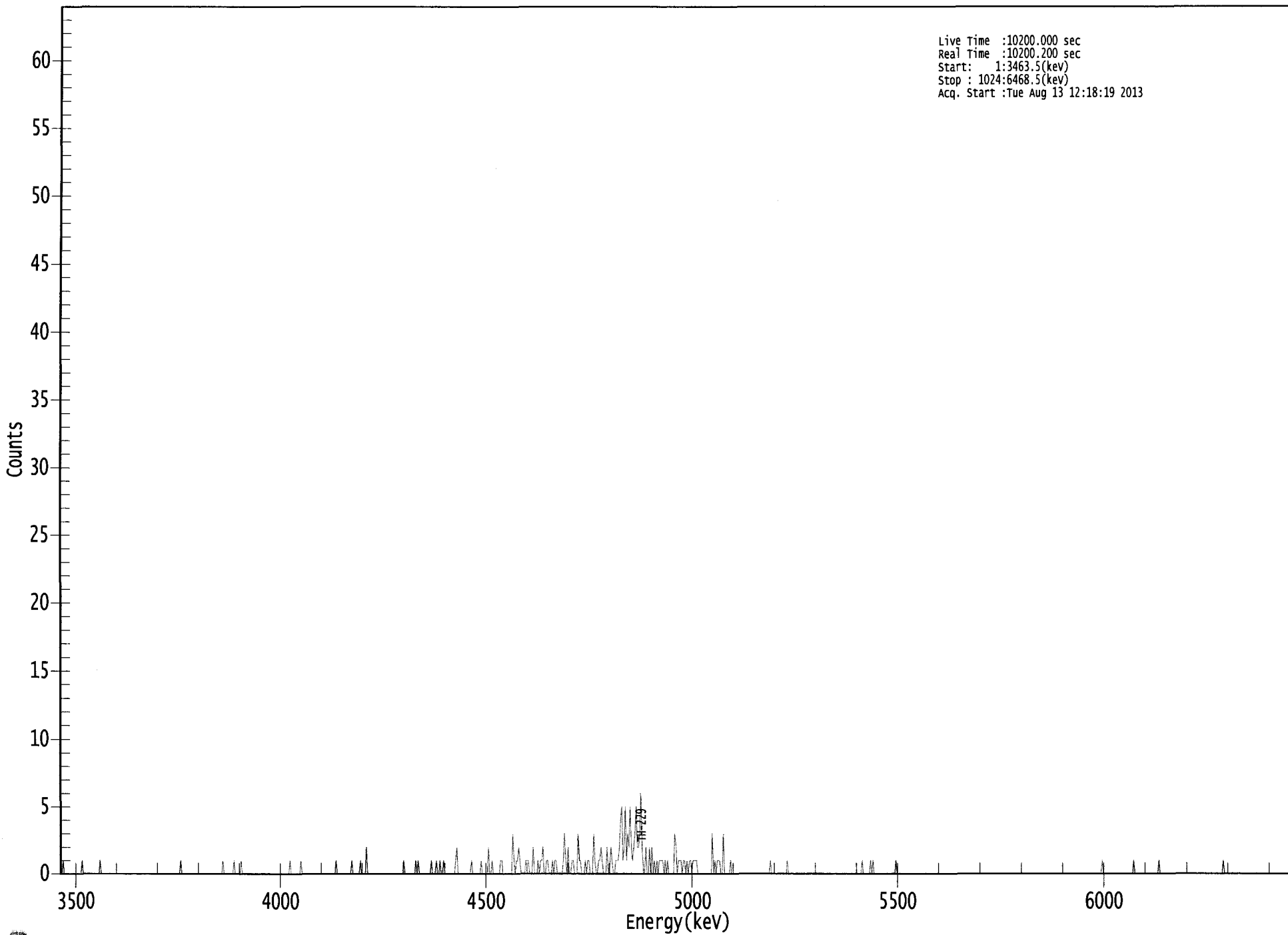
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.895	5850.00*	1.62E-002 +/- 3.89E-002	8.13E-002 +/- 1.51E-002
TH-228	0.983	5400.00*	8.41E-002 +/- 8.77E-002	1.10E-001 +/- 2.05E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.43E-001	1.14E-001 +/- 2.13E-002
TH-230	0.979	4672.00*	8.67E-001 +/- 3.00E-001	9.08E-002 +/- 1.69E-002
TH-232	0.986	3997.00*	9.16E-002 +/- 8.51E-002	7.91E-002 +/- 1.47E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

0000066070.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3463.5(kev)  
Stop : 1024:6468.5(kev)  
Acq. Start :Tue Aug 13 12:18:19 2013



ROI Type: 1

ROI Type: 3

6279

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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: 13

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	1	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	1	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	1	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	1
137:	0	0	0	0	0	0	0	0
145:	1	0	0	0	0	0	1	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	1
193:	0	0	0	0	0	0	0	0
201:	1	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	1	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	1	0	0	0	0	0
249:	0	1	0	0	0	0	2	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	1	0	0
289:	0	0	0	0	0	0	0	1
297:	0	1	0	0	0	0	0	0
305:	0	0	0	0	1	0	0	0
313:	1	0	0	1	0	0	1	0
321:	0	0	0	0	0	0	0	0
329:	1	2	0	0	0	0	0	0
337:	0	0	0	0	0	1	0	0
345:	0	0	0	0	0	1	0	0
353:	0	0	0	2	0	0	1	0
361:	0	0	0	0	0	1	1	0

369: 0 0 0 0 0 0 0 0 3

Sample Title: 13

Channel	1	2	3	4	5	6	7	8	9
377:	1	0	1	1	2	1	0	0	
385:	0	0	1	1	1	0	0	0	
393:	2	0	0	0	1	0	1	1	
401:	2	0	0	1	1	0	0	0	
409:	1	0	1	1	0	0	0	0	
417:	0	1	3	1	0	2	0	0	
425:	1	1	0	0	0	3	1	1	
433:	0	0	0	1	0	1	1	0	
441:	0	0	3	1	0	0	1	1	
449:	2	1	0	0	0	2	0	0	
457:	2	1	0	0	1	1	1	2	
465:	4	5	1	2	5	1	3	2	
473:	5	2	1	2	3	5	2	2	
481:	3	6	2	0	0	2	0	0	
489:	2	0	2	0	1	0	1	0	
497:	1	1	1	1	0	1	0	1	
505:	0	0	0	0	0	3	2	0	
513:	1	1	1	0	1	1	0	1	
521:	0	1	1	0	1	1	1	1	
529:	0	0	0	0	0	0	0	0	
537:	0	0	0	0	3	0	1	0	
545:	1	1	1	0	0	3	0	0	
553:	0	0	0	1	0	0	0	0	
561:	0	0	0	0	0	0	0	0	
569:	0	0	0	0	0	0	0	0	
577:	0	0	0	0	0	0	0	0	
585:	0	0	0	0	1	0	0	0	
593:	0	0	0	0	0	0	0	0	
601:	0	0	1	0	0	0	0	0	
609:	0	0	0	0	0	0	0	0	
617:	0	0	0	0	0	0	0	0	
625:	0	0	0	0	0	0	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:	1	0	0	0	0	0	0	1	
673:	0	1	0	0	0	0	0	0	
681:	0	0	0	0	0	0	0	0	
689:	0	0	0	0	1	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: 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	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	1	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:	1	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	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	1	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  
8/13/13



Sample Description: PZ-205-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_038  
 Chamber Serial Number: 04026478B  
 Detector Serial Number: 91134  
 Env. Background: System Bkgd 64785  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:21 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1438 +/- 0.0135  
 Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM  
 Chem. Recovery Factor: 0.8355 +/- 0.0796

Peak Match Tolerance: 0.175 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)
TH-227	5.810	4.00	109.57	0.00	0.00E+000	5.9
TH-228	5.349	47.32	28.73	0.68	0.00E+000	3.7
TH-229	T 4.891	128.66	17.31	0.34	0.00E+000	6.4
TH-230	4.614	78.00	22.33	0.00	0.00E+000	3.7
TH-232	3.980	42.83	30.02	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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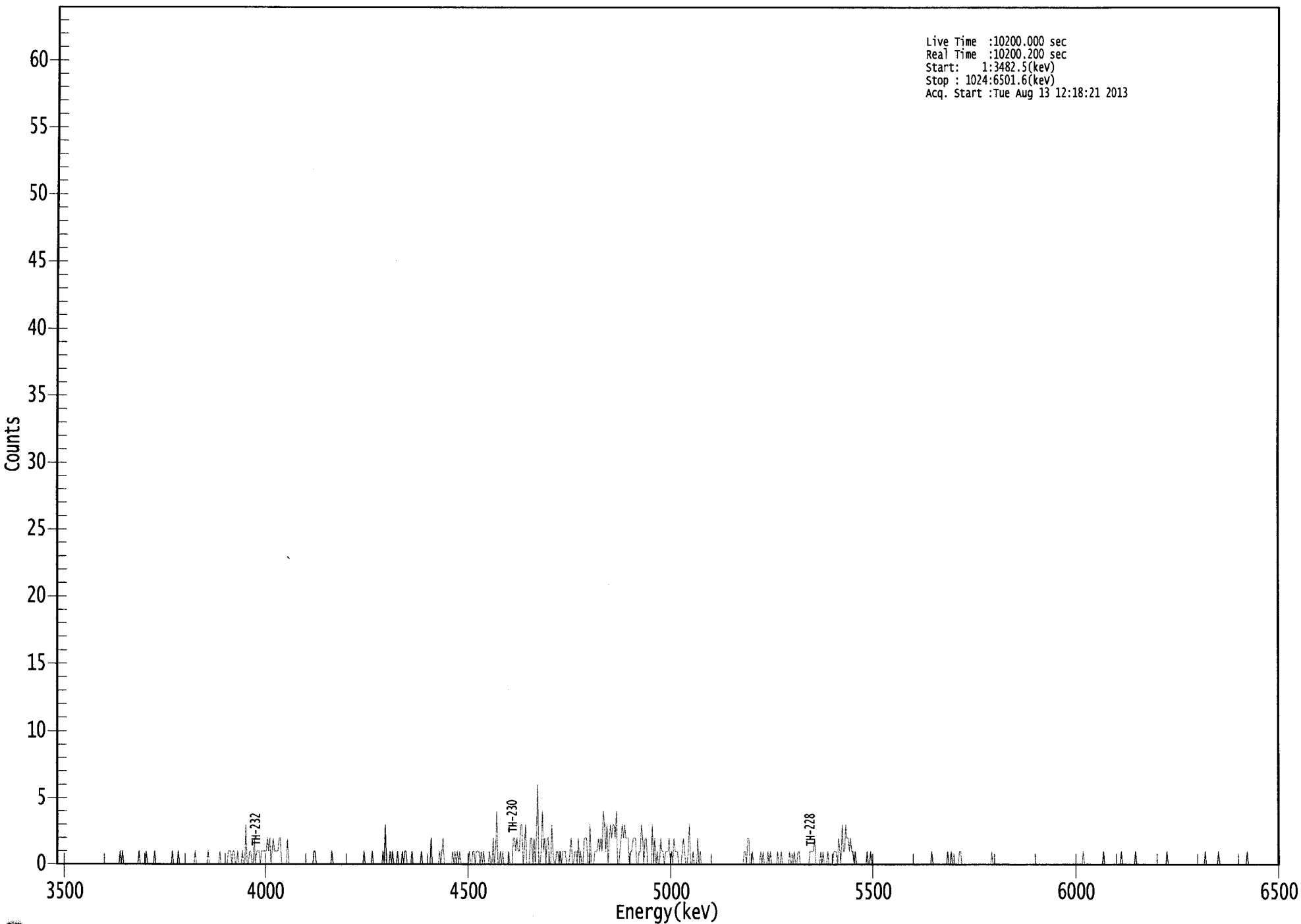
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.992	5850.00*	7.57E-002 +/- 8.41E-002	1.14E-001 +/- 2.08E-002
TH-228	0.986	5400.00*	8.95E-001 +/- 3.05E-001	1.07E-001 +/- 1.96E-002
TH-229	0.998	4872.00*	2.38E+000 +/- 4.37E-001	8.85E-002 +/- 1.62E-002
TH-230	0.983	4672.00*	1.44E+000 +/- 4.16E-001	1.11E-001 +/- 2.03E-002
TH-232	0.998	3997.00*	7.89E-001 +/- 2.78E-001	7.69E-002 +/- 1.41E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

000066075.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3482.5(kev)  
Stop : 1024:6501.6(kev)  
Acq. Start :Tue Aug 13 12:18:21 2013



0284

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

369: 1 4 0 0 1 0 1 0

Sample Title: 14

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	1	0	0	0	2
385:	2	1	2	1	1	3	3	0
393:	1	3	0	0	0	2	2	0
401:	2	0	2	6	0	0	1	4
409:	1	2	0	2	2	0	0	3
417:	1	0	0	1	1	0	1	0
425:	1	1	1	0	0	0	1	2
433:	0	0	1	1	0	2	0	1
441:	0	0	2	2	2	0	0	3
449:	0	0	0	1	1	1	2	1
457:	2	1	4	3	1	3	0	2
465:	3	2	3	3	2	4	0	0
473:	1	2	3	2	3	2	2	2
481:	0	1	1	2	2	2	0	0
489:	1	1	3	2	0	2	2	0
497:	0	0	0	3	0	2	0	1
505:	0	0	2	1	1	0	1	1
513:	1	2	0	1	0	2	1	1
521:	1	0	0	0	1	2	1	0
529:	0	1	3	0	0	1	0	0
537:	0	2	0	1	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	1	1	0	2	2	0	0	1
585:	0	0	0	0	0	0	1	0
593:	1	0	0	0	1	0	1	0
601:	0	0	0	0	1	0	0	1
609:	0	0	0	0	0	0	1	0
617:	0	0	1	0	0	1	1	0
625:	0	0	0	0	0	0	0	1
633:	1	1	1	2	0	0	0	0
641:	1	0	1	0	0	0	1	0
649:	0	0	0	1	1	1	0	2
657:	1	0	3	1	1	3	2	2
665:	1	2	1	1	0	1	0	0
673:	0	0	0	0	0	0	0	1
681:	0	0	1	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	1	0	0	1	0	0
753:	0	0	0	0	1	1	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	1
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: 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	1	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	1	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	1	0	0	0	0
897:	0	0	0	0	0	0	0	1
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	1	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	1	0	0	0	0	0	0
969:	0	0	0	0	1	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	1	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  
8/13/13

# Apex-Alpha™

Sample Description: PZ-205-AS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_039  
 Chamber Serial Number: 06027396A  
 Detector Serial Number: 83109  
 Env. Background: System Bkgd 64786  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:24 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.1631 +/- 0.0144  
 Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM  
 Chem. Recovery Factor: 0.8298 +/- 0.0749

Peak Match Tolerance: 0.175 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)
TH-227	5.746	0.49	416.98	0.51	0.00E+000	3.0
TH-228	5.310	1.15	249.59	0.85	0.00E+000	3.0
TH-229	T 4.839	146.15	16.27	0.85	0.00E+000	3.0
TH-230	4.619	38.32	31.99	0.68	0.00E+000	3.5
TH-232	3.967	6.66	78.18	0.34	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
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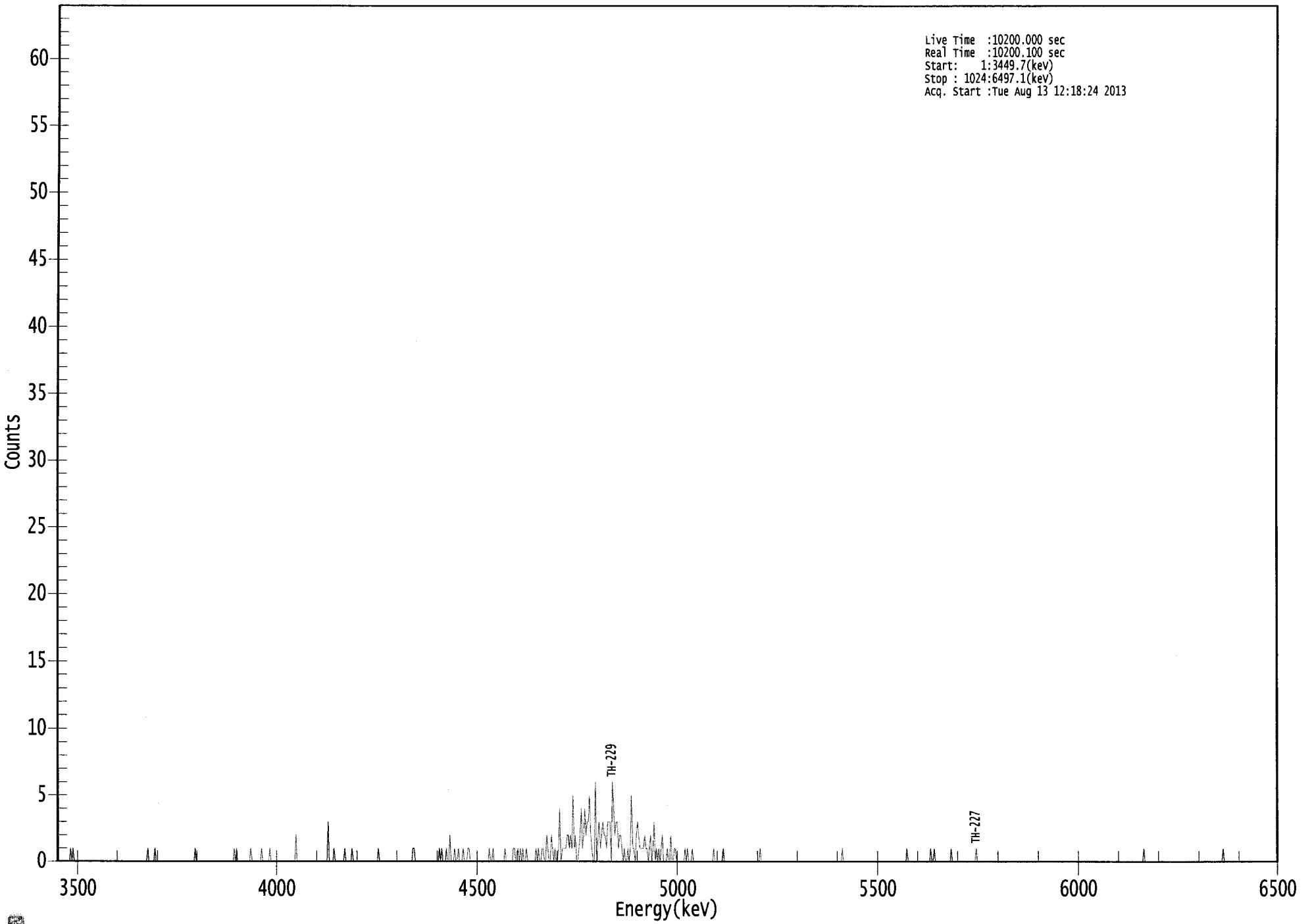
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.945	5850.00*	8.19E-003 +/- 3.42E-002	8.77E-002 +/- 1.52E-002
TH-228	0.959	5400.00*	1.92E-002 +/- 4.80E-002	9.99E-002 +/- 1.74E-002
TH-229	0.994	4872.00*	2.39E+000 +/- 4.14E-001	9.78E-002 +/- 1.70E-002
TH-230	0.985	4672.00*	6.24E-001 +/- 2.27E-001	9.18E-002 +/- 1.59E-002
TH-232	0.995	3997.00*	1.08E-001 +/- 8.67E-002	7.77E-002 +/- 1.35E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

000066076.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3449.7(kev)  
Stop : 1024:6497.1(kev)  
Acq. Start :Tue Aug 13 12:18:24 2013



0289

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: 15

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	1	0	1	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	1	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	0	0
113:	0	0	0	0	1	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	1
153:	0	0	0	0	0	0	0	0
161:	0	0	0	1	0	0	0	0
169:	0	0	0	0	1	0	0	0
177:	0	0	0	1	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	2	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	3	0	0	0
233:	0	1	0	0	0	0	0	0
241:	0	0	1	0	0	0	0	0
249:	1	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	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	0	0
297:	0	0	0	1	1	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	1	0	1	0	0	0	1
329:	0	0	2	0	0	0	1	0
337:	0	1	0	0	0	1	0	0
345:	0	1	1	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	1	0	0	1	0

369: 0 0 0 0 0 0 0 0

Sample Title: 15

Channel	1	2	3	4	5	6	7	8	9
377:	1	0	0	0	0	0	0	0	1
385:	1	0	0	1	0	1	0	0	1
393:	0	0	1	0	0	0	0	0	0
401:	0	0	1	0	1	0	0	0	1
409:	1	0	0	2	1	0	0	0	2
417:	1	0	1	0	0	1	4	0	0
425:	1	1	1	1	2	2	1	2	2
433:	1	5	1	2	0	0	1	2	2
441:	4	1	2	4	2	3	3	5	3
449:	2	1	0	0	6	0	2	3	3
457:	1	2	3	2	2	1	3	3	3
465:	3	0	6	4	2	3	3	1	1
473:	2	2	1	0	1	0	0	1	1
481:	0	1	5	1	1	0	2	3	3
489:	2	1	1	1	1	2	1	1	1
497:	0	1	2	0	1	3	0	1	1
505:	0	1	0	1	2	0	0	0	0
513:	1	0	0	2	0	0	1	1	1
521:	0	0	0	0	0	0	0	1	1
529:	0	1	0	0	0	1	0	0	0
537:	0	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	1	1
553:	0	0	0	0	0	0	0	1	1
561:	0	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	1	0	0
593:	0	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0	0
657:	0	0	0	1	0	0	0	0	0
665:	0	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	1	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	1	0	0	0
737:	1	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	1	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	1	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: 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	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	1	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



YLS  
8/13/13

Sample Description: I-65 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 16  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 64787  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:26 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1341 +/- 0.0129  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 0.7057 +/- 0.0692

Peak Match Tolerance: 0.175 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)
TH-227	5.843	2.66	128.85	0.34	0.00E+000	3.0
TH-228	5.342	19.15	45.94	0.85	0.00E+000	3.0
TH-229 T	4.875	119.83	17.92	0.17	0.00E+000	3.5
TH-230	4.615	22.32	42.22	0.68	0.00E+000	3.0
TH-232	3.972	7.66	72.63	0.34	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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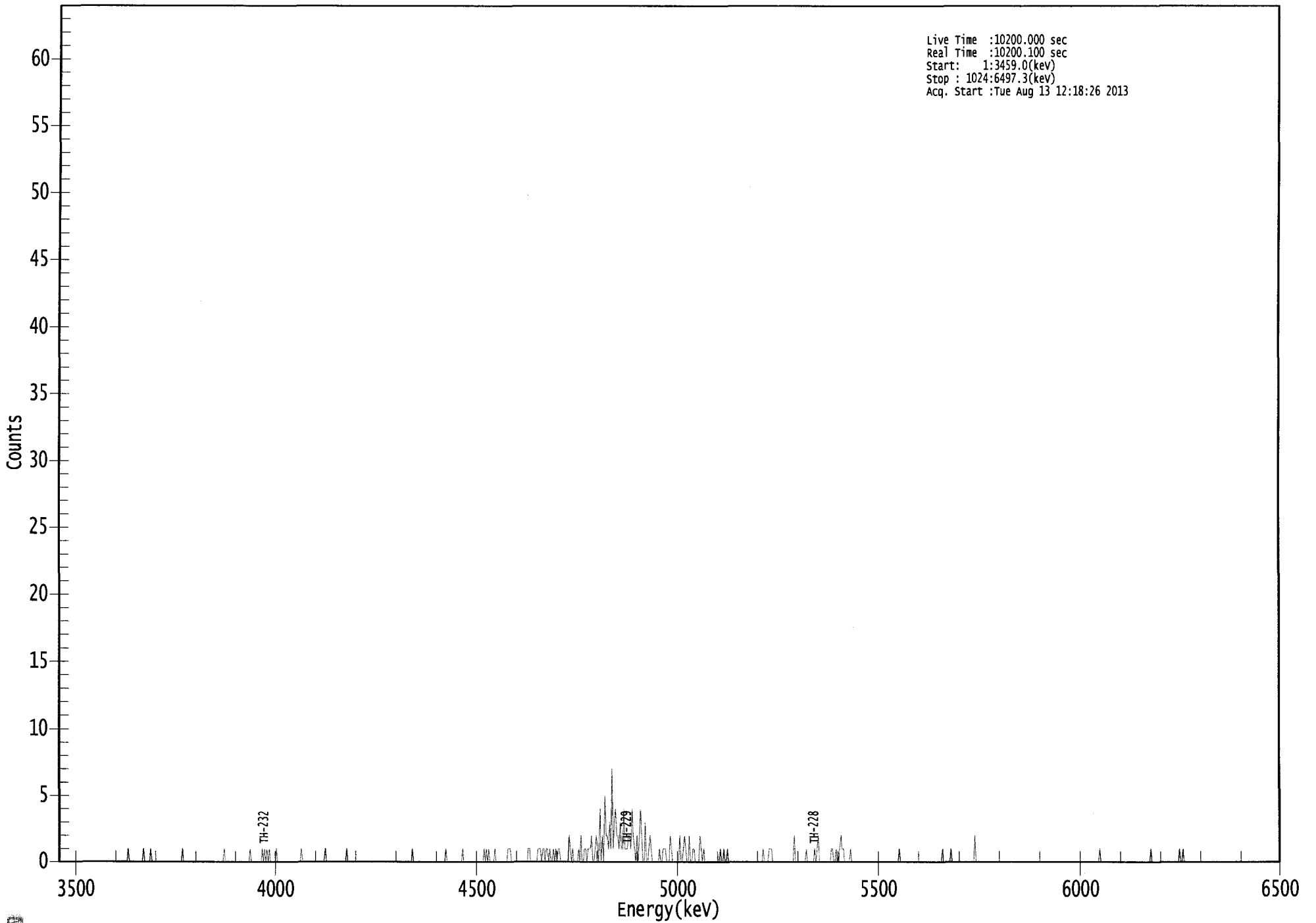
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	1.000	5850.00*	5.40E-002 +/- 7.04E-002	9.71E-002 +/- 1.84E-002
TH-228	0.983	5400.00*	3.89E-001 +/- 1.93E-001	1.21E-001 +/- 2.30E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.50E-001	8.29E-002 +/- 1.57E-002
TH-230	0.983	4672.00*	4.42E-001 +/- 2.04E-001	1.12E-001 +/- 2.11E-002
TH-232	0.997	3997.00*	1.51E-001 +/- 1.14E-001	9.45E-002 +/- 1.79E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

0000066077.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Tue Aug 13 12:18:26 2013



ROI Type: 1

ROI Type: 3

0294

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

Sample Title: 16

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	1	0	0	0	0	0
65:	0	0	0	0	0	0	0	1
73:	0	0	0	0	0	1	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:	1	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	1	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	0	0	0	0	0
169:	0	0	0	1	0	1	0	1
177:	0	1	0	0	0	0	0	1
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	1	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	1	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	1	0	0	0	0	0
249:	0	0	0	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	0
297:	0	1	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	1	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	1	0	1
361:	0	1	0	0	0	0	1	0

369: 0 0 0 0 0 0 0 0

Sample Title: 16

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	1	1	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	1	1	0	0	0	0
401:	0	0	1	1	1	0	1	1
409:	0	1	1	0	1	0	0	1
417:	0	1	0	1	1	0	0	0
425:	0	0	0	0	2	1	0	1
433:	0	0	0	0	1	0	2	0
441:	0	1	1	0	1	1	1	2
449:	0	0	1	2	1	0	4	0
457:	2	0	5	2	2	1	3	1
465:	7	1	3	4	2	2	1	3
473:	1	1	4	1	1	1	2	2
481:	1	4	2	1	0	2	0	2
489:	4	2	0	0	3	0	0	1
497:	2	1	0	0	0	0	0	0
505:	1	0	0	1	1	1	0	0
513:	0	2	1	0	0	0	0	0
521:	0	2	0	0	1	2	1	0
529:	0	2	0	0	1	1	0	0
537:	0	0	2	1	0	1	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	1	0	0	1	0
561:	0	1	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	1
593:	0	0	0	0	1	1	1	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	2	0	0	0	0	0	0
625:	0	0	0	1	0	0	0	0
633:	0	0	1	0	1	2	0	0
641:	0	0	0	0	0	0	0	0
649:	1	1	0	0	1	0	0	1
657:	2	1	1	0	0	0	0	0
665:	1	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	1	0	0
745:	0	0	0	0	1	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	2	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:	1	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	1	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	1	0	0	1	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



10/8  
9/13/13

# Apex-Alpha™

Sample Description: I-65 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 17  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_041  
 Chamber Serial Number: 05026930A  
 Detector Serial Number: 91087  
 Env. Background: System Bkgd 64058  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:28 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1423 +/- 0.0134  
 Counting Efficiency: 0.1917 +/- 0.0033 on 8/10/2013 2:59:03 PM  
 Chem. Recovery Factor: 0.7422 +/- 0.0711

Peak Match Tolerance: 0.175 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)
TH-227	5.707	1.15	249.59	0.85	0.00E+000	3.0
TH-228	5.385	0.83	239.53	0.17	0.00E+000	3.0
TH-229	T 4.846	127.32	17.42	0.68	0.00E+000	4.0
TH-230	4.606	26.47	39.36	1.53	0.00E+000	3.0
TH-232	3.989	0.45	807.07	2.55	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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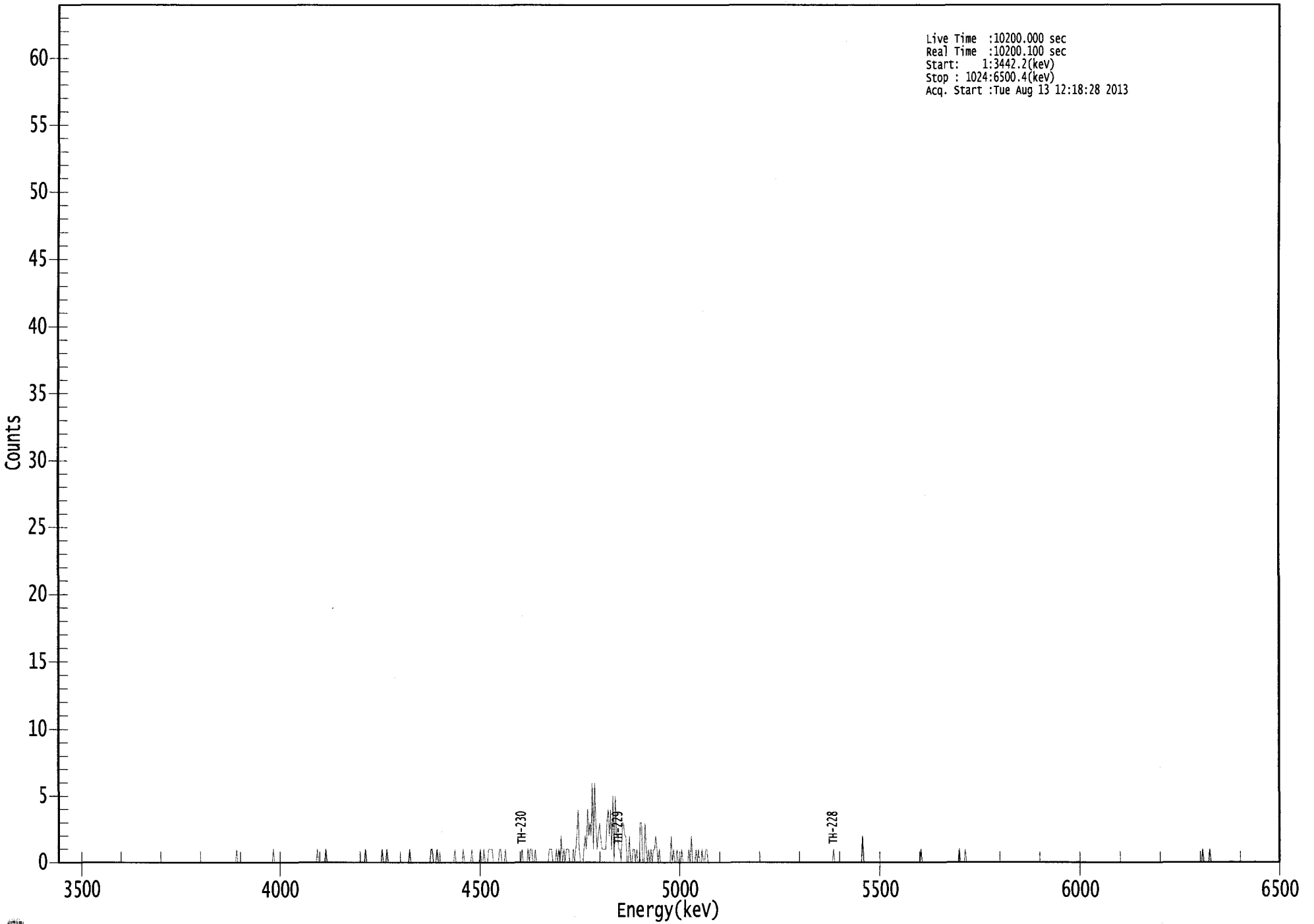
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.898	5850.00*	2.20E-002 +/- 5.51E-002	1.15E-001 +/- 2.11E-002
TH-228	0.999	5400.00*	1.59E-002 +/- 3.81E-002	7.98E-002 +/- 1.47E-002
TH-229	0.996	4872.00*	2.38E+000 +/- 4.40E-001	1.06E-001 +/- 1.95E-002
TH-230	0.977	4672.00*	4.94E-001 +/- 2.15E-001	1.33E-001 +/- 2.45E-002
TH-232	1.000	3997.00*	8.38E-003 +/- 6.77E-002	1.56E-001 +/- 2.88E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

0000066068.CNF

Live Time : 10200.000 sec  
Real Time : 10200.100 sec  
Start : 1:3442.2(keV)  
Stop : 1024:6500.4(keV)  
Acq. Start : Tue Aug 13 12:18:28 2013



6620

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: 17

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	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	1	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	1	0	0
185:	0	0	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	0	0	0	0	0	0	0
217:	0	0	1	0	0	0	0	0
225:	0	1	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	1	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	1	0	0	0	1	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	1	1	0	0	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	1	0	0
337:	0	0	0	0	1	0	0	0
345:	0	0	0	1	0	0	0	0
353:	0	0	1	0	0	1	0	0
361:	0	1	1	1	1	0	0	0

369: 0 0 1 1 0 0 0 1

Sample Title: 17

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	1	0	0
393:	0	0	1	0	1	1	0	0
401:	1	0	0	0	0	0	0	0
409:	0	0	0	0	1	1	1	0
417:	0	0	1	0	1	0	2	0
425:	1	0	1	1	1	0	0	0
433:	1	0	1	2	4	1	0	0
441:	0	1	2	1	4	2	3	2
449:	6	1	6	3	1	2	3	2
457:	1	1	1	1	3	4	2	4
465:	1	5	0	5	2	2	1	1
473:	0	3	3	2	2	0	0	2
481:	0	0	1	1	0	1	0	0
489:	3	3	0	0	3	1	0	1
497:	0	1	0	1	1	2	1	0
505:	1	0	0	0	0	0	0	0
513:	0	0	2	0	1	0	0	1
521:	0	0	0	1	0	0	0	0
529:	0	1	0	2	0	0	0	1
537:	0	1	0	0	1	0	0	1
545:	1	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	1	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	2	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	1	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	1	0	0	0	0
761:	1	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: 17

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	1	0
961:	0	0	0	0	1	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  
8/13/13



Sample Description: D-13 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 18  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_042  
 Chamber Serial Number: 05026930B  
 Detector Serial Number: 84185  
 Env. Background: System Bkgd 64788  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:31 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1158 +/- 0.0120  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Chem. Recovery Factor: 0.6273 +/- 0.0658

Peak Match Tolerance: 0.175 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)
TH-227	5.839	1.49	190.02	0.51	0.00E+000	3.0
TH-228	5.329	10.32	63.32	0.68	0.00E+000	3.0
TH-229 T	4.876	103.32	19.36	0.68	0.00E+000	3.5
TH-230	4.591	38.83	31.53	0.17	0.00E+000	3.0
TH-232	3.953	3.98	112.01	1.02	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
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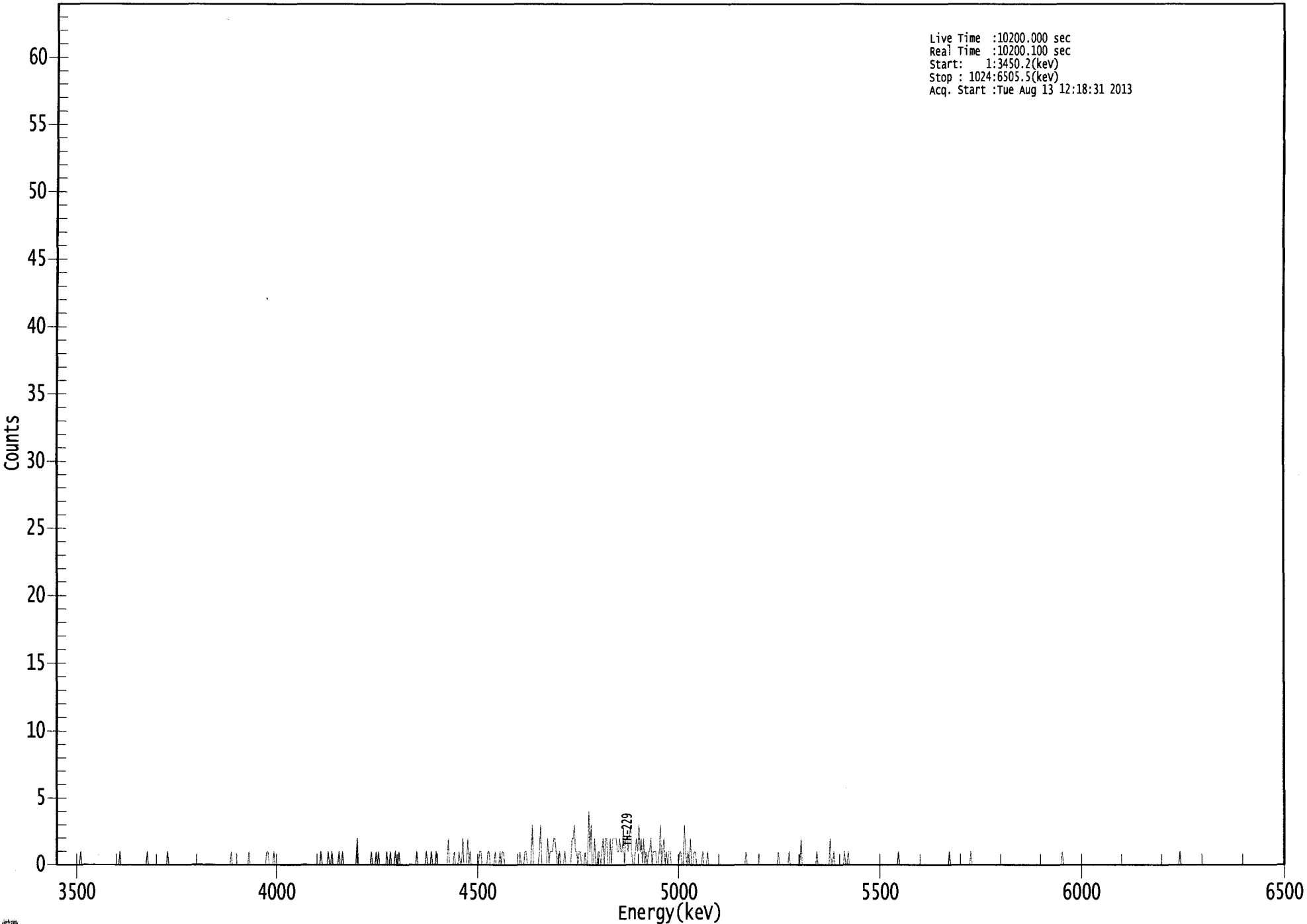
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.999	5850.00*	3.50E-002 +/- 6.70E-002	1.23E-001 +/- 2.50E-002
TH-228	0.974	5400.00*	2.42E-001 +/- 1.61E-001	1.33E-001 +/- 2.69E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.82E-001	1.30E-001 +/- 2.63E-002
TH-230	0.966	4672.00*	8.90E-001 +/- 3.34E-001	9.57E-002 +/- 1.94E-002
TH-232	0.990	3997.00*	9.11E-002 +/- 1.04E-001	1.44E-001 +/- 2.92E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

000066069.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3450.2(kev)  
Stop : 1024:6505.5(kev)  
Acq. Start :Tue Aug 13 12:18:31 2013



ROI Type: 1

ROI Type: 3

0309

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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	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	1	0	0	0	0
25:	0	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	1	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	0	1	0	0	0	0
81:	0	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	1	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	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0	0
145:	0	0	1	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0	0
161:	0	1	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0	0
177:	1	1	0	0	0	0	1	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	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	1	0	0	0
225:	0	0	0	1	0	0	1	0	0
233:	0	0	0	0	1	0	0	1	0
241:	0	0	0	0	0	0	0	0	0
249:	0	0	0	2	0	0	0	0	0
257:	0	0	0	0	0	0	0	0	1
265:	0	0	0	1	0	1	0	0	0
273:	0	0	0	0	1	0	0	0	1
281:	0	0	0	1	0	0	1	0	0
289:	0	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	1	0	0	0
305:	0	0	0	0	0	1	0	0	0
313:	0	1	0	0	0	1	0	0	0
321:	0	0	0	0	0	0	0	0	2
329:	0	0	0	0	1	0	0	0	0
337:	1	0	0	2	0	0	0	0	2
345:	0	1	0	0	0	0	0	0	0
353:	0	1	1	0	0	0	0	0	0
361:	1	1	0	0	0	0	1	0	0



369: 0 0 1 0 1 1 0 0

Sample Title: 18

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	1	0	0	0	1
393:	1	0	0	0	0	3	0	0
401:	0	0	0	1	3	0	0	0
409:	0	0	2	0	1	1	1	2
417:	2	1	0	0	1	0	0	0
425:	1	0	0	0	0	0	2	2
433:	3	1	1	0	1	1	0	0
441:	0	1	0	0	4	1	3	0
449:	0	2	0	0	1	1	0	1
457:	2	0	2	2	0	0	2	0
465:	2	2	2	2	1	1	2	1
473:	1	3	0	2	2	1	2	3
481:	1	0	0	1	2	1	3	1
489:	2	0	2	0	1	0	1	1
497:	2	0	1	1	1	0	0	1
505:	3	0	1	2	0	1	0	1
513:	1	0	0	0	0	0	0	0
521:	1	1	0	0	3	1	0	1
529:	0	2	0	0	1	1	0	0
537:	0	0	0	1	0	0	0	1
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	1
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	1	0	0	0	0	0
609:	0	0	0	1	0	0	0	0
617:	0	0	0	0	0	2	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	1	0	0	0	0	0
641:	0	0	0	0	0	2	0	0
649:	1	0	0	0	0	0	0	0
657:	0	1	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	1	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:	1	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: 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	1	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:	1	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



# Apex-Alpha™

KVS  
8/13/10

Sample Description: D-13 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307152A-TH  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_043  
 Chamber Serial Number: 04026481A  
 Detector Serial Number: 91088  
 Env. Background: System Bkgd 57707  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/18/2013 7:15:31 AM  
 Acquisition Date/Time: 8/13/2013 12:18:34 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1298 +/- 0.0128  
 Counting Efficiency: 0.2003 +/- 0.0035 on 8/11/2013 2:21:17 PM  
 Chem. Recovery Factor: 0.6481 +/- 0.0647

Peak Match Tolerance: 0.175 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)
TH-227	5.937	3.00	130.67	0.00	0.00E+000	3.0
TH-228	5.306	8.00	73.50	0.00	0.00E+000	3.0
TH-229 T	4.870	116.00	18.28	0.00	0.00E+000	5.2
TH-230	4.592	48.00	28.58	0.00	0.00E+000	3.0
TH-232	3.998	11.00	61.72	0.00	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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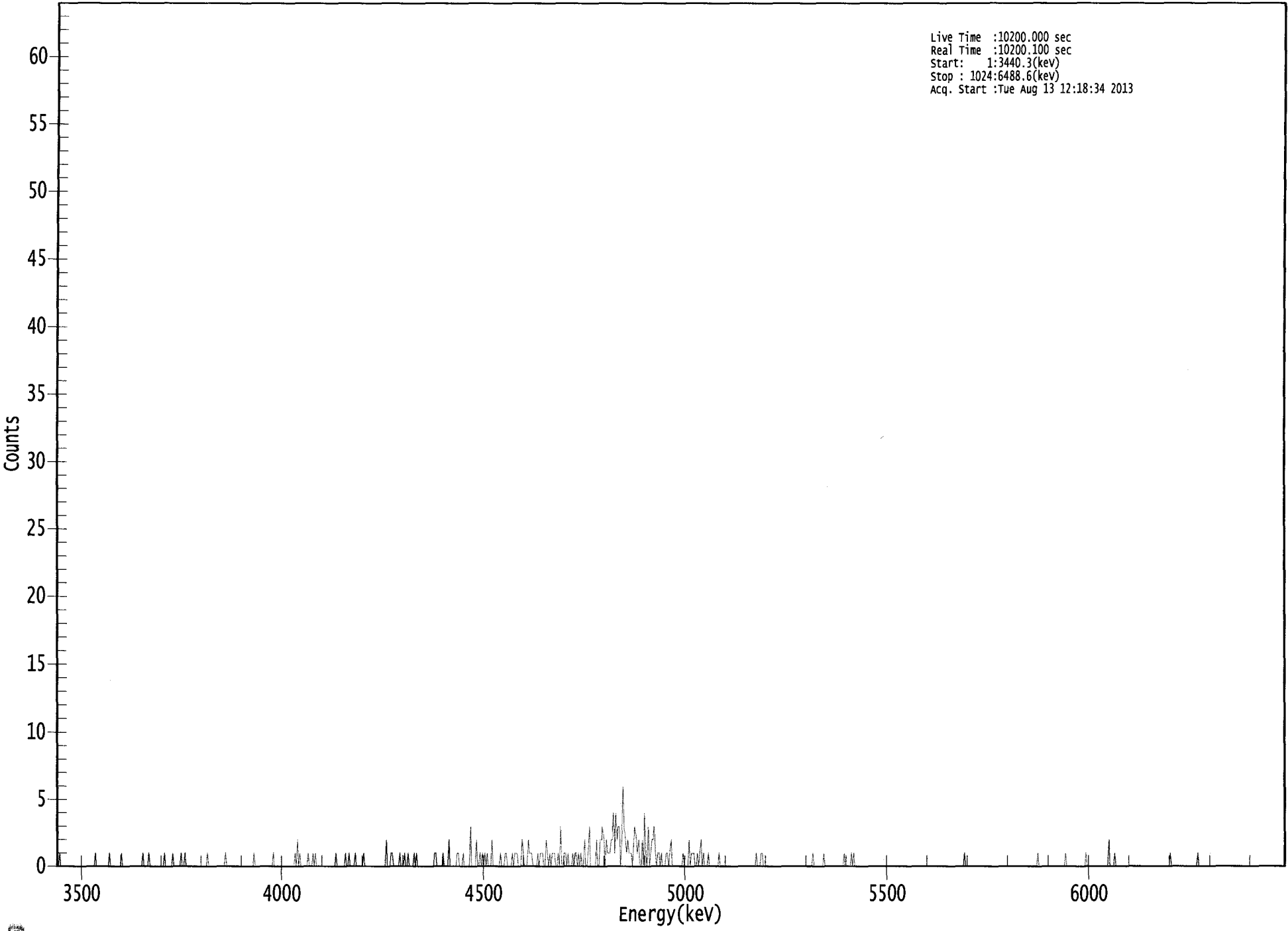
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.961	5850.00*	6.30E-002 +/- 8.31E-002	1.26E-001 +/- 2.42E-002
TH-228	0.955	5400.00*	1.68E-001 +/- 1.27E-001	1.26E-001 +/- 2.42E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.58E-001	1.23E-001 +/- 2.37E-002
TH-230	0.967	4672.00*	9.82E-001 +/- 3.38E-001	1.23E-001 +/- 2.36E-002
TH-232	1.000	3997.00*	2.25E-001 +/- 1.45E-001	1.22E-001 +/- 2.36E-002

AG  
8/14/13

US EPA ARCHIVE DOCUMENT

000066078.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3440.3(kev)  
Stop : 1024:6488.6(kev)  
Acq. Start :Tue Aug 13 12:18:34 2013



ROI Type: 1

ROI Type: 3

0000

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

369: 0 0 1 0 0 0 1 1

Sample Title: 19

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	1	0	1	1
385:	1	0	0	0	2	1	0	0
393:	0	2	1	1	1	0	0	0
401:	0	1	0	1	1	1	0	0
409:	2	1	0	1	0	1	1	1
417:	0	0	1	0	3	0	0	1
425:	1	0	1	0	0	0	1	0
433:	1	1	0	1	0	1	0	0
441:	2	0	0	1	3	0	0	0
449:	0	0	2	0	0	2	2	3
457:	2	0	2	1	1	1	2	2
465:	4	1	4	2	3	3	0	2
473:	6	3	2	1	2	1	1	1
481:	0	2	3	2	1	2	0	0
489:	2	0	4	1	0	3	0	1
497:	2	2	3	1	0	1	1	0
505:	1	0	0	0	1	1	0	1
513:	2	0	0	0	0	0	0	0
521:	0	0	1	0	0	0	0	2
529:	0	1	1	1	0	0	1	0
537:	1	2	0	1	0	0	0	1
545:	0	0	0	0	0	0	0	0
553:	1	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	1
585:	0	0	0	1	1	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	1	0
633:	0	0	0	0	0	0	0	1
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	1	0	0	0	0	0	1	0
665:	1	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	1	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: 19

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	1	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:	1	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	1	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	2	0	0	0
881:	0	1	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	1
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	1	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



## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

Date : 8/13/2013  
Time : 5:41:01 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/13/2013 5:25:16 AM
Alpha 004	21f	ALL	Passed	8/13/2013 5:25:17 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	8/13/2013 5:25:18 AM
Alpha 011	21f	ALL	Passed	8/13/2013 5:25:18 AM
Alpha 012	21f	ALL	Passed	8/13/2013 5:25:19 AM
Alpha 013	21f	ALL	Passed	8/13/2013 5:25:20 AM
Alpha 014	21f	ALL	Passed	8/13/2013 5:25:21 AM
Alpha 015	21f	Peak Energy	Action	8/13/2013 5:25:22 AM
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	8/10/2013 11:23:01 AM
Alpha 019	AIM730	ALL	Passed	8/13/2013 5:25:22 AM
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/13/2013 5:25:23 AM
Alpha 023	AIM730	ALL	Passed	8/13/2013 5:25:24 AM
Alpha 024	AIM730	ALL	Passed	8/13/2013 5:25:25 AM
Alpha 025	AIM730	ALL	Passed	8/13/2013 5:25:26 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/13/2013 5:25:26 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/13/2013 5:25:27 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/13/2013 5:25:28 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:29 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:30 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:31 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:33 AM
Alpha 037	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:34 AM
Alpha 038	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:35 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:37 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:38 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:40 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:41 AM





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

Nuclide Library Description: Th-227,-228,-229,-230,-232

Nuclide Name	Half-Life (Seconds)	Energy (keV )	Energy Uncert. (keV )	Yield (%)	Yield Uncert. (Abs.+)
TH-227	6.873E+008	5850.000*	0.000	97.5000	0.0000
TH-228	6.034E+007	5400.000*	0.000	99.9400	0.0000
TH-229	2.487E+011	4872.000*	0.000	99.5200	0.0000
TH-230	2.379E+012	4672.000*	0.000	99.8200	0.0000
TH-232	4.434E+017	3997.000*	0.000	100.0000	0.0000

\* = key line

TOTALS:           5   Nuclides           5   Energy Lines

**SECTION X**  
**ANALYTICAL DATA (RADIUM-226)**

Work Order	13-07152	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	Ra226	01	LCS	LCS		07/24/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/24/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	PZ-203-SS TOT	38	07/17/13 13:58	1.0000E+00
Lab Deadline	8/13/2013	04	DO	PZ-203-SS TOT	38	07/17/13 13:58	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-203-SS DIS	38	07/17/13 13:58	1.0000E+00
Project	West Lake OU-1	06	TRG	D-87 TOT	42	07/17/13 14:11	1.0000E+00
Report Level	4	07	TRG	D-87 DIS	42	07/17/13 14:11	1.0000E+00
Activity Units	pCi	08	TRG	DUP 06 TOT	39	07/17/13 00:00	1.0000E+00
Aliquot Units	I	09	TRG	DUP 06 DIS	39	07/17/13 00:00	1.0000E+00
Matrix	WA	10	TRG	S-53 TOT	43	07/18/13 07:30	1.0000E+00
Method	E903.0	11	TRG	S-53 DIS	43	07/18/13 07:30	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	D-14 TOT	45	07/18/13 09:30	1.0000E+00
Radiometric Tracer	Ba-133	13	TRG	D-14 DIS	45	07/18/13 09:30	1.0000E+00
Radiometric Sol#	Ba-6a	14	TRG	PZ-205-AS TOT	42	07/18/13 09:46	1.0000E+00
Tracer Act (dpm/g)	990.581	15	TRG	PZ-205-AS DIS	42	07/18/13 09:46	1.0000E+00
Carrier		16	TRG	I-65 TOT	41	07/18/13 10:59	1.0000E+00
Carrier Conc (mg/ml)		17	TRG	I-65 DIS	41	07/18/13 10:59	1.0000E+00
		18	TRG	D-13 TOT	43	07/18/13 12:19	1.0000E+00
		19	TRG	D-13 DIS	43	07/18/13 12:19	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.

537

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	0.9265	917.8	469.4	113.54		0.0228	0.0297	0.0069		110.00	2.47	1.00
02	MBL	0.9144	905.8	417.4	102.30		0.0227	0.0299	0.0072		102.30	2.55	1.00
03	DUP	0.9161	907.5	377.8	92.42		0.0226	0.0294	0.0068		92.42	2.44	1.00
04	DO	0.9103	901.7	412.1	101.46		0.0226	0.0297	0.0071		101.46	2.53	1.00
05	TRG	0.9140	905.4	402.4	98.67		0.0226	0.0300	0.0074		98.67	2.61	1.00
06	TRG	0.9103	901.7	350.2	86.22		0.0226	0.0320	0.0094		86.22	3.12	1.00
07	TRG	0.9094	900.8	359.0	88.47		0.0224	0.0320	0.0096		88.47	3.17	1.00
08	TRG	0.9112	902.6	379.4	93.31		0.0225	0.0297	0.0072		93.31	2.55	1.00
09	TRG	0.9099	901.3	355.7	87.61		0.0223	0.0295	0.0072		87.61	2.55	1.00
10	TRG	0.9084	899.8	339.0	83.63		0.0225	0.0341	0.0116		83.63	3.86	1.00
11	TRG	0.9082	899.6	383.6	94.66		0.0225	0.0302	0.0077		94.66	2.69	1.00
12	TRG	0.9077	899.2	303.2	74.86		0.0225	0.0338	0.0113		74.86	3.73	1.00
13	TRG	0.9079	899.3	406.3	100.29		0.0223	0.0305	0.0082		100.29	2.82	1.00
14	TRG	0.9113	902.7	368.5	90.62		0.0226	0.0316	0.0090		90.62	3.01	1.00
15	TRG	0.9114	902.8	375.4	92.31		0.0222	0.0309	0.0087		92.31	2.94	1.00
16	TRG	0.9231	914.4	392.5	95.29		0.0223	0.0351	0.0128		95.29	4.52	1.00
17	TRG	0.9112	902.6	361.2	88.84		0.0224	0.0295	0.0071		88.84	2.53	1.00
18	TRG	0.9161	907.5	409.2	100.10		0.0226	0.0305	0.0079		100.10	2.74	1.00
19	TRG	0.9078	899.2	412.4	101.81		0.0228	0.0301	0.0073		101.81	2.58	1.00

\* 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.

5218

<i>Internal Fraction</i>	<i>Sample Desc</i>	<i>Rough Prep Date</i>	<i>Rough Prep By</i>	<i>Prep Date</i>	<i>Prep By</i>	<i>Sep t0 Date/Time</i>	<i>Sep t0 By</i>	<i>Sep t1 Date/Time</i>	<i>Sep t1 By</i>
01	LCS			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
02	MBL			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
03	DUP			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
04	DO			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
05	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
06	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
07	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
08	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
09	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
10	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
11	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
12	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
13	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
14	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
15	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
16	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
17	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
18	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	LWALKER		
19	TRG			08/05/13 09:30	JWOLFE	08/07/13 16:49	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.

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-Ra226-1**

Run	1
Analysis Code	Ra226
Eberline Services Work Order	13-07152
Client	Engineering Management Support, Inc.

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	RA-226	LCS	LCS	pCi/l	1.08E+01	1.25E+00	1.43E-01	1.03E+01	104.66	OK		OK	
02	RA-226	MBL	BLANK	pCi/l	4.78E-01	2.68E-01	1.81E-01					OK	OK
03	RA-226	DUP	PZ-203-SS TOT	pCi/l	1.09E+00	4.08E-01	2.17E-01				NA	OK	
04	RA-226	DO	PZ-203-SS TOT	pCi/l	2.31E+00	6.01E-01	1.67E-01					OK	
05	RA-226	TRG	PZ-203-SS DIS	pCi/l	1.36E+00	4.68E-01	2.80E-01					OK	
06	RA-226	TRG	D-87 TOT	pCi/l	2.52E+00	7.57E-01	2.76E-01					OK	
07	RA-226	TRG	D-87 DIS	pCi/l	2.26E+00	7.56E-01	4.41E-01					OK	
08	RA-226	TRG	DUP 06 TOT	pCi/l	3.87E-01	2.80E-01	3.21E-01					OK	
09	RA-226	TRG	DUP 06 DIS	pCi/l	7.72E-01	3.90E-01	3.41E-01					OK	
10	RA-226	TRG	S-53 TOT	pCi/l	4.04E+00	1.06E+00	3.97E-01					OK	
11	RA-226	TRG	S-53 DIS	pCi/l	2.24E-01	2.31E-01	3.30E-01					OK	
12	RA-226	TRG	D-14 TOT	pCi/l	2.22E+00	7.69E-01	3.24E-01					OK	
13	RA-226	TRG	D-14 DIS	pCi/l	1.21E+00	5.23E-01	4.10E-01					OK	
14	RA-226	TRG	PZ-205-AS TOT	pCi/l	2.94E+00	7.67E-01	2.84E-01					OK	
15	RA-226	TRG	PZ-205-AS DIS	pCi/l	1.31E+00	4.87E-01	3.29E-01					OK	
16	RA-226	TRG	I-65 TOT	pCi/l	1.40E+00	5.82E-01	4.52E-01					OK	
17	RA-226	TRG	I-65 DIS	pCi/l	2.88E-01	2.05E-01	1.54E-01					OK	
18	RA-226	TRG	D-13 TOT	pCi/l	7.78E-01	3.37E-01	2.06E-01					OK	
19	RA-226	TRG	D-13 DIS	pCi/l	1.09E+00	4.02E-01	2.41E-01					OK	

0220

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-Ra226-1**

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	RA-226	LCS	07/24/13 00:00	1.00E+00	100.00	0.00	110.00		8/7/2013 16:49	
02	RA-226	MBL	07/24/13 00:00	1.00E+00	100.00	0.00	102.30		8/7/2013 16:49	
03	RA-226	DUP	07/17/13 13:58	1.00E+00	92.42	0.00	92.42		8/7/2013 16:49	
04	RA-226	DO	07/17/13 13:58	1.00E+00	100.00	0.00	101.46		8/7/2013 16:49	
05	RA-226	TRG	07/17/13 13:58	1.00E+00	98.67	0.00	98.67		8/7/2013 16:49	
06	RA-226	TRG	07/17/13 14:11	1.00E+00	86.22	0.00	86.22		8/7/2013 16:49	
07	RA-226	TRG	07/17/13 14:11	1.00E+00	88.47	0.00	88.47		8/7/2013 16:49	
08	RA-226	TRG	07/17/13 00:00	1.00E+00	93.31	0.00	93.31		8/7/2013 16:49	
09	RA-226	TRG	07/17/13 00:00	1.00E+00	87.61	0.00	87.61		8/7/2013 16:49	
10	RA-226	TRG	07/18/13 07:30	1.00E+00	83.63	0.00	83.63		8/7/2013 16:49	
11	RA-226	TRG	07/18/13 07:30	1.00E+00	94.66	0.00	94.66		8/7/2013 16:49	
12	RA-226	TRG	07/18/13 09:30	1.00E+00	74.86	0.00	74.86		8/7/2013 16:49	
13	RA-226	TRG	07/18/13 09:30	1.00E+00	100.00	0.00	100.29		8/7/2013 16:49	
14	RA-226	TRG	07/18/13 09:46	1.00E+00	90.62	0.00	90.62		8/7/2013 16:49	
15	RA-226	TRG	07/18/13 09:46	1.00E+00	92.31	0.00	92.31		8/7/2013 16:49	
16	RA-226	TRG	07/18/13 10:59	1.00E+00	95.29	0.00	95.29		8/7/2013 16:49	
17	RA-226	TRG	07/18/13 10:59	1.00E+00	88.84	0.00	88.84		8/7/2013 16:49	
18	RA-226	TRG	07/18/13 12:19	1.00E+00	100.00	0.00	100.10		8/7/2013 16:49	
19	RA-226	TRG	07/18/13 12:19	1.00E+00	100.00	0.00	101.81		8/7/2013 16:49	

	
Run	1
Analysis Code	Ra226
Eberline Services Work Order	13-07152
Client	Engineering Management Support, Inc.



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-Ra226-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-226	LCS	08/08/13 12:09		A_Spec	Alpha_045	170	3.14 E+02	1.00 E-03	19.1
02	RA-226	MBL	08/08/13 12:09		A_Spec	Alpha_046	170	1.27 E+01	2.00 E-03	17.9
03	RA-226	DUP	08/08/13 12:09		A_Spec	Alpha_047	170	2.83 E+01	4.00 E-03	18.2
04	RA-226	DO	08/08/13 12:09		A_Spec	Alpha_048	170	5.78 E+01	1.00 E-03	16.8
05	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_018	170	3.45 E+01	9.00 E-03	17.8
06	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_019	170.02	4.37 E+01	2.00 E-03	16.6
07	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_022	170.02	3.65 E+01	9.00 E-03	15.3
08	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_023	170	9.13 E+00	1.10 E-02	17.1
09	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_024	170	1.71 E+01	1.10 E-02	17.1
10	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_025	170	5.73 E+01	4.00 E-03	17.4
11	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_027	170	5.13 E+00	1.10 E-02	17.3
12	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_029	170	3.27 E+01	2.00 E-03	19.5
13	RA-226	TRG	08/08/13 12:51		A_Spec	Alpha_031	170	2.30 E+01	1.20 E-02	14.2
14	RA-226	TRG	08/08/13 14:54		A_Spec	Alpha_003	170	5.83 E+01	4.00 E-03	17.5
15	RA-226	TRG	08/08/13 14:54		A_Spec	Alpha_004	170	3.01 E+01	1.10 E-02	19.4
16	RA-226	TRG	08/08/13 14:54		A_Spec	Alpha_010	170	2.48 E+01	1.30 E-02	19.7
17	RA-226	TRG	08/08/13 14:54		A_Spec	Alpha_011	170	7.83 E+00	1.00 E-03	20.5
18	RA-226	TRG	08/08/13 14:54		A_Spec	Alpha_012	170	2.13 E+01	4.00 E-03	19.9
19	RA-226	TRG	08/08/13 14:54		A_Spec	Alpha_013	170	2.98 E+01	7.00 E-03	18.7

Run	1
Analysis Code	Ra226
Eberline Services Work Order	13-07152
Client	Engineering Management Support, Inc.

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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	07/24/13 00:00	1.0000	0.9265	917.7733	469.4000	113.54	2.47	1.00
02	MBL	BLANK	07/24/13 00:00	1.0000	0.9144	905.7873	417.4000	102.30	2.55	1.00
03	DUP	PZ-203-SS TOT	07/17/13 13:58	1.0000	0.9161	907.4713	377.8000	92.42	2.44	1.00
04	DO	PZ-203-SS TOT	07/17/13 13:58	1.0000	0.9103	901.7259	412.1000	101.46	2.53	1.00
05	TRG	PZ-203-SS DIS	07/17/13 13:58	1.0000	0.9140	905.3910	402.4000	98.67	2.61	1.00
06	TRG	D-87 TOT	07/17/13 14:11	1.0000	0.9103	901.7259	350.2000	86.22	3.12	1.00
07	TRG	D-87 DIS	07/17/13 14:11	1.0000	0.9094	900.8344	359.0000	88.47	3.17	1.00
08	TRG	DUP 06 TOT	07/17/13 00:00	1.0000	0.9112	902.6174	379.4000	93.31	2.55	1.00
09	TRG	DUP 06 DIS	07/17/13 00:00	1.0000	0.9099	901.3297	355.7000	87.61	2.55	1.00
10	TRG	S-53 TOT	07/18/13 07:30	1.0000	0.9084	899.8438	339.0000	83.63	3.86	1.00
11	TRG	S-53 DIS	07/18/13 07:30	1.0000	0.9082	899.6457	383.6000	94.66	2.69	1.00
12	TRG	D-14 TOT	07/18/13 09:30	1.0000	0.9077	899.1504	303.2000	74.86	3.73	1.00
13	TRG	D-14 DIS	07/18/13 09:30	1.0000	0.9079	899.3485	406.3000	100.29	2.82	1.00
14	TRG	PZ-205-AS TOT	07/18/13 09:46	1.0000	0.9113	902.7165	368.5000	90.62	3.01	1.00
15	TRG	PZ-205-AS DIS	07/18/13 09:46	1.0000	0.9114	902.8155	375.4000	92.31	2.94	1.00
16	TRG	I-65 TOT	07/18/13 10:59	1.0000	0.9231	914.4053	392.5000	95.29	4.52	1.00
17	TRG	I-65 DIS	07/18/13 10:59	1.0000	0.9112	902.6174	361.2000	88.84	2.53	1.00
18	TRG	D-13 TOT	07/18/13 12:19	1.0000	0.9161	907.4713	409.2000	100.10	2.74	1.00
19	TRG	D-13 DIS	07/18/13 12:19	1.0000	0.9078	899.2494	412.4000	101.81	2.58	1.00

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18-31  
12/2

0323



# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07152</b>	<b>1</b>	<b>Ra226</b>	<b>liters</b>	<b>8/13/2013</b>	<b>JWOLFE</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	PZ-203-SS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-203-SS TOT	DO					1.0000E+00	1.0000E+00				
05	PZ-203-SS DIS	TRG					1.0000E+00	1.0000E+00				
06	D-87 TOT	TRG					1.0000E+00	1.0000E+00				
07	D-87 DIS	TRG					1.0000E+00	1.0000E+00				
08	DUP 06 TOT	TRG					1.0000E+00	1.0000E+00				
09	DUP 06 DIS	TRG					1.0000E+00	1.0000E+00				
10	S-53 TOT	TRG					1.0000E+00	1.0000E+00				
11	S-53 DIS	TRG					1.0000E+00	1.0000E+00				
12	D-14 TOT	TRG					1.0000E+00	1.0000E+00				
13	D-14 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-205-AS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-205-AS DIS	TRG					1.0000E+00	1.0000E+00				
16	I-65 TOT	TRG					1.0000E+00	1.0000E+00				
17	I-65 DIS	TRG					1.0000E+00	1.0000E+00				
18	D-13 TOT	TRG					1.0000E+00	1.0000E+00				
19	D-13 DIS	TRG					1.0000E+00	1.0000E+00				

Comments	
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Technician: J Wolfe Date: 8/5/13

# Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
<b>13-07152</b>	<b>1</b>	<b>Ra226</b>			<b>LWALKER</b>

TRetec Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Carrier Data	Filter Data			Gravimetric % Recovery
			Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)	
01	LCS	LCS		0.0228	0.0297	0.0069	
02	BLANK	MBL		0.0227	0.0299	0.0072	
03	DUP	DUP		0.0226	0.0294	0.0068	
04	PZ-203-SS TOT	DO		0.0226	0.0297	0.0071	
05	PZ-203-SS DIS	TRG		0.0226	0.0300	0.0074	
06	D-87 TOT	TRG		0.0226	0.0320	0.0094	
07	D-87 DIS	TRG		0.0224	0.0320	0.0096	
08	DUP 06 TOT	TRG		0.0225	0.0297	0.0072	
09	DUP 06 DIS	TRG		0.0223	0.0295	0.0072	
10	S-53 TOT	TRG		0.0225	0.0341	0.0116	
11	S-53 DIS	TRG		0.0225	0.0302	0.0077	
12	D-14 TOT	TRG		0.0225	0.0338	0.0113	
13	D-14 DIS	TRG		0.0223	0.0305	0.0082	
14	PZ-205-AS TOT	TRG		0.0226	0.0316	0.0090	
15	PZ-205-AS DIS	TRG		0.0222	0.0309	0.0087	
16	I-65 TOT	TRG		0.0223	0.0351	0.0128	
17	I-65 DIS	TRG		0.0224	0.0295	0.0071	
18	D-13 TOT	TRG		0.0226	0.0305	0.0079	
19	D-13 DIS	TRG		0.0228	0.0301	0.0073	

Technician: *L Walker*

Date: 8, 7, 13

0326

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8/9/13

# Apex-Alpha™

Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656  
 Batch Identification: 1307152A-RA  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_045  
 Chamber Serial Number: 04026482A  
 Detector Serial Number: 91131  
 Env. Background: System Bkgd 64060  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.470E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 8/8/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:09:56 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1909 +/- 0.0033 on 7/20/2013 2:31:26 PM  
 Effective Efficiency: 0.1909 +/- 0.0033

Control Certificate Name: Ra226\_Ra-5b  
 Chem. Recov. of Control: RA-226 0.423722 +/- 0.028078  
 Peak Match Tolerance: 0.350 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)
RA-224	5.535	541.49	8.43	0.51	0.00E+000	6.1
RA-226	4.573	313.83	11.07	0.17	0.00E+000	7.7

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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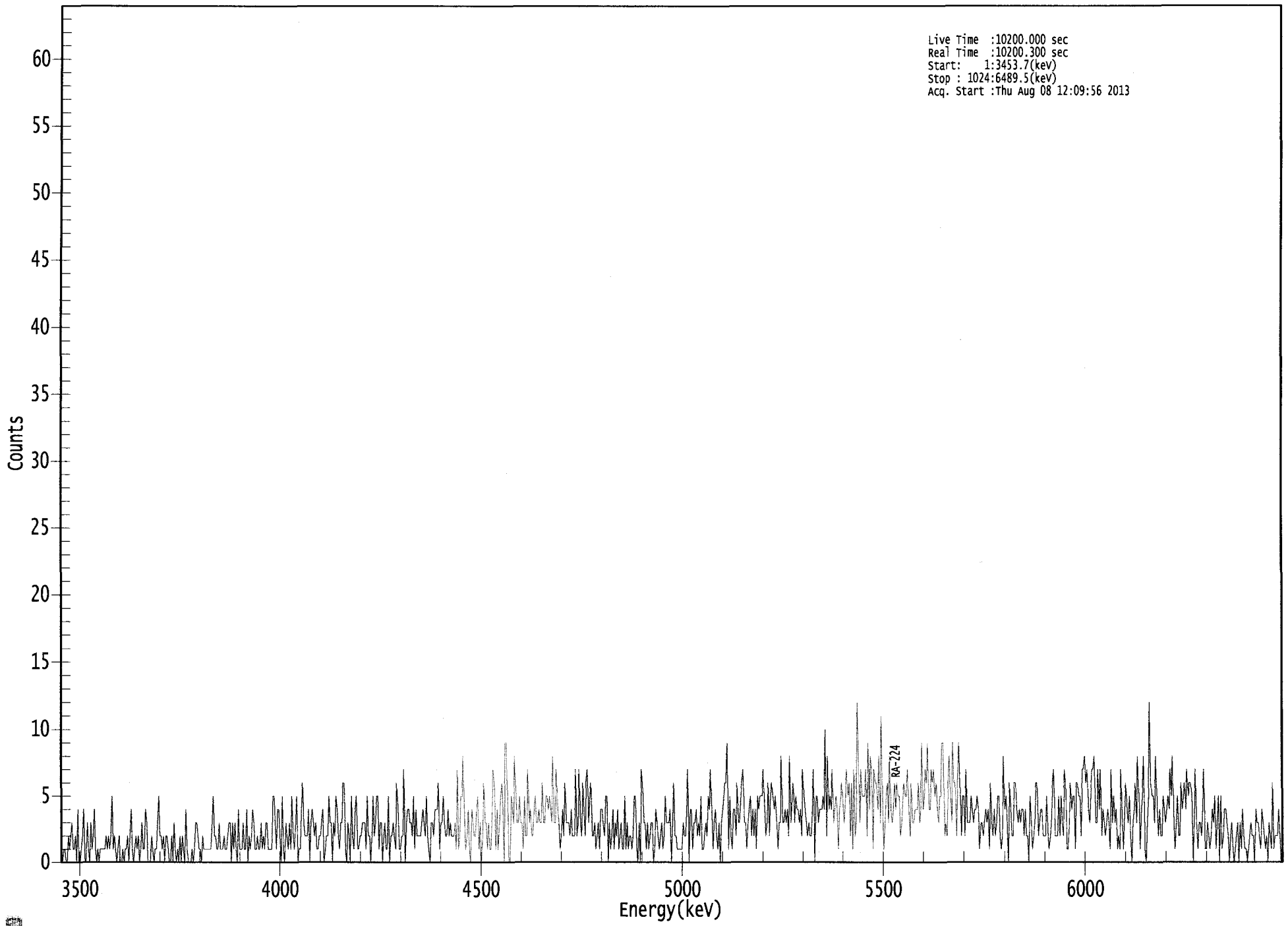
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.971	5685.50*	1.95E+001 +/- 1.77E+000	1.89E-001 +/- 6.45E-003
RA-226	0.943	4785.00*	1.08E+001 +/- 1.25E+000	1.43E-001 +/- 4.88E-003

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8/9/13

US EPA ARCHIVE DOCUMENT

000065602.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3453.7(keV)  
Stop : 1024:6489.5(keV)  
Acq. Start :Thu Aug 08 12:09:56 2013



0328

ROI Type: 1

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



369: 3 5 6 4 0 9 9 5

Sample Title: 01

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

801: 6 4 3 4 3 4 4 2

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	4	2	2	0	5	3	1	2
817:	3	6	6	2	3	4	4	2
825:	2	2	5	2	1	2	3	6
833:	7	2	2	2	5	2	5	3
841:	2	7	6	1	1	3	6	4
849:	5	5	1	6	6	5	5	2
857:	7	7	8	6	7	4	3	5
865:	7	7	8	3	3	7	4	7
873:	2	4	3	2	3	4	3	1
881:	7	3	5	3	4	1	2	1
889:	7	3	1	4	6	4	3	5
897:	2	0	3	4	6	3	8	5
905:	1	4	5	8	1	0	3	5
913:	12	6	5	5	3	8	4	2
921:	4	2	2	5	4	3	4	5
929:	4	7	5	8	3	1	3	5
937:	2	2	6	4	5	6	4	7
945:	5	6	6	5	0	3	7	3
953:	1	3	3	2	4	7	1	1
961:	3	2	1	2	4	3	5	1
969:	3	5	0	5	1	2	4	4
977:	3	2	0	2	3	1	0	1
985:	2	3	0	3	1	4	2	1
993:	1	0	1	2	3	2	2	0
1001:	4	3	3	2	1	4	3	2
1009:	1	2	0	3	2	1	6	1
1017:	2	2	2	4	2	0	1	1

168  
8/8/13

# Apex-Alpha™

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_046  
 Chamber Serial Number: 04026482B  
 Detector Serial Number: 58762  
 Env. Background: System Bkgd 64061  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.550E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 8/8/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:09:57 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM  
 Effective Efficiency: 0.1789 +/- 0.0031

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.624	0.83	239.53	0.17	0.00E+000	3.0
RA-226	4.616	12.66	55.94	0.34	0.00E+000	3.0

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

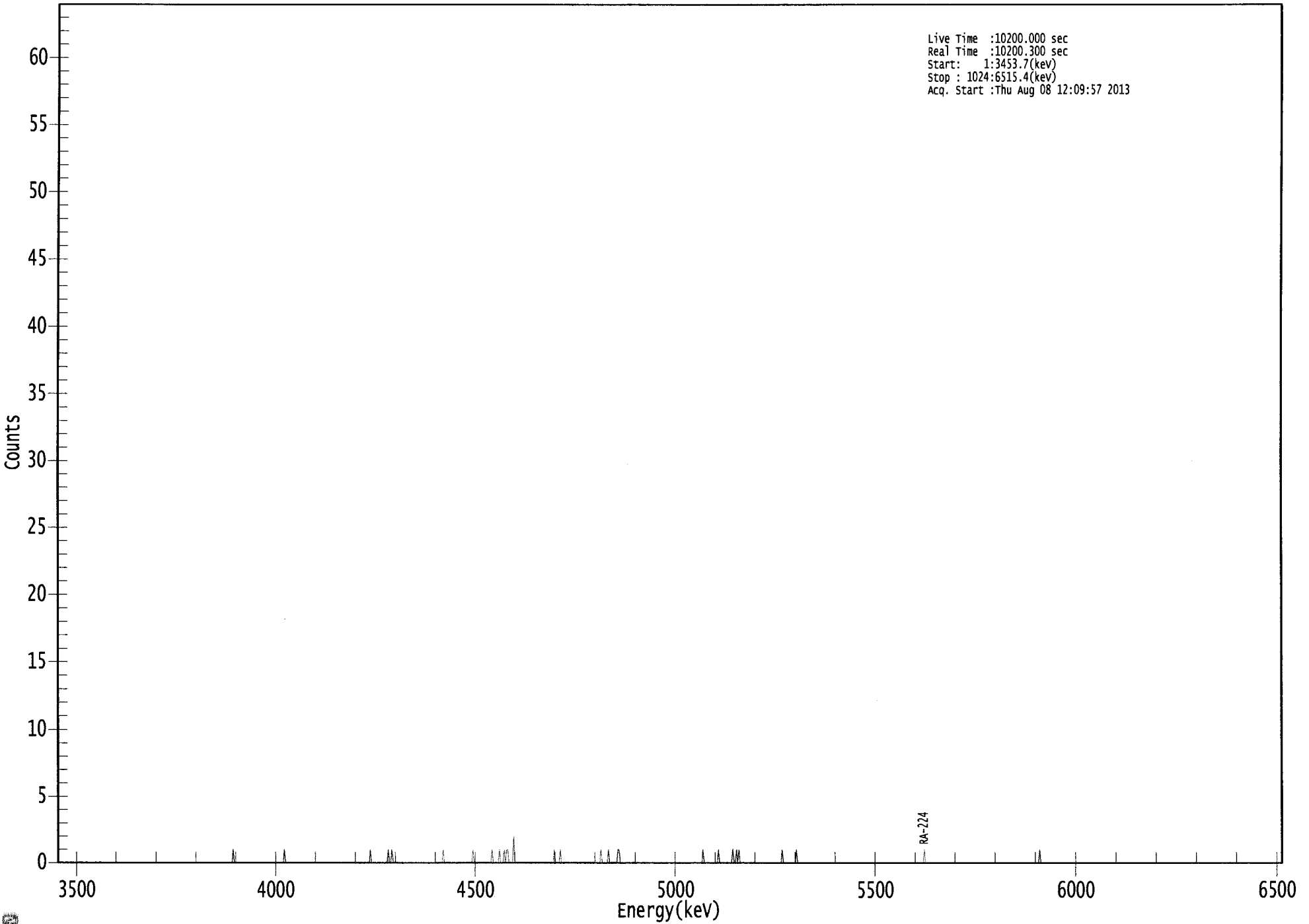
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.995	5685.50*	3.30E-002 +/- 7.90E-002	1.66E-001 +/- 5.70E-003
RA-226	0.963	4785.00*	4.78E-001 +/- 2.68E-001	1.81E-001 +/- 6.21E-003

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

000065581.CNF

Live Time :10200.000 sec  
Real Time :10200.300 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6515.4(kev)  
Acq. Start :Thu Aug 08 12:09:57 2013



ROI Type: 1

\*\*\*\*\*  
\*\*\*\*\* 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:	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	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	1	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	1	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	1	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	1	0	0
281:	1	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:	0	0	0	1	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	1	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	1	0	0	0

369: 0 0 1 0 0 0 1 0

Sample Title: 02

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	1	0	0	0	0	2	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	1	0	0	0	0	1	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	0	1
457:	0	0	0	0	0	1	0	0
465:	0	0	0	0	0	1	1	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	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	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	0	0
553:	0	1	0	0	0	0	0	0
561:	0	0	0	0	0	1	0	0
569:	1	0	1	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	1	0
609:	0	0	0	0	0	0	0	0
617:	0	0	1	0	0	0	0	0
625:	0	0	0	0	0	0	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	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	1	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	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



KCB  
8/8/13

Sample Description: PZ-203-SS TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_047  
 Chamber Serial Number: 02030596A  
 Detector Serial Number: 91086  
 Env. Background: System Bkgd 64062  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.440E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:09:53 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9242 +/- 0.0000  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Effective Efficiency: 0.1684 +/- 0.0029

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.459	3.83	102.72	0.17	0.00E+000	2.9
RA-226	4.576	28.32	37.34	0.68	0.00E+000	4.4

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.935	5685.50*	1.56E-001 +/- 1.60E-001	1.70E-001 +/- 5.84E-003
RA-226	0.944	4785.00*	1.09E+000 +/- 4.08E-001	2.17E-001 +/- 7.43E-003

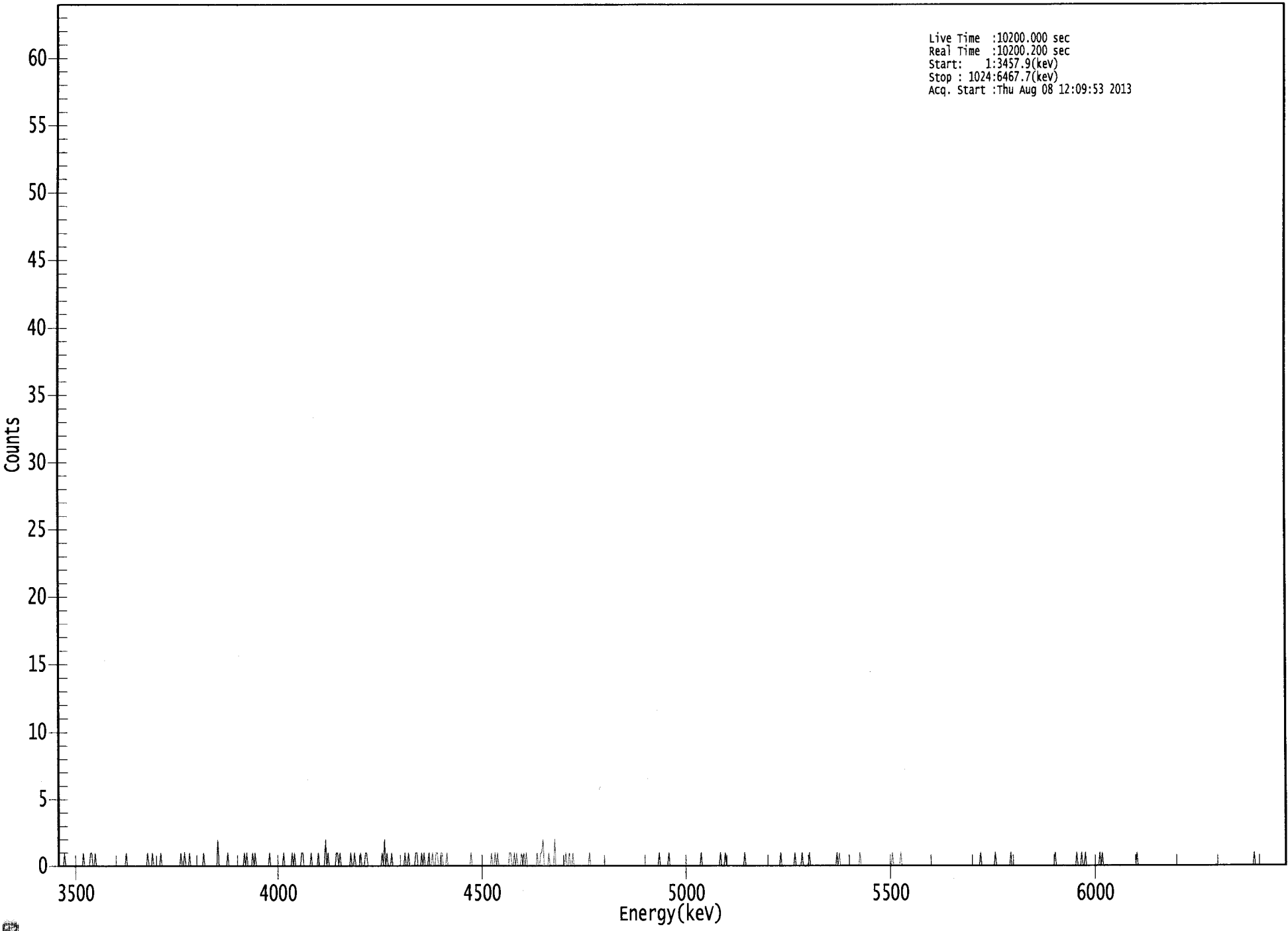
AG  
8/9/13

US EPA ARCHIVE DOCUMENT



0000065583.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3457.9(kev)  
Stop : 1024:6467.7(kev)  
Acq. Start :Thu Aug 08 12:09:53 2013



0338

ROI Type: 1

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

369: 0 0 0 0 0 0 0 0

Sample Title: 03

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	1	0	0	1	0	1
385:	0	0	0	1	0	1	0	1
393:	0	0	0	0	0	0	0	0
401:	1	0	0	1	1	2	0	0
409:	0	0	1	0	0	0	0	2
417:	0	0	0	0	0	0	0	0
425:	1	0	0	1	0	0	1	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	1	0	0	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	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	1	0
505:	0	0	0	0	0	0	1	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	1	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	1	0	0	0	1	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	1	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	1	0	0	0	0
609:	0	0	0	0	0	0	0	1
617:	0	0	0	0	0	1	0	0
625:	0	0	0	1	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	1	0	1	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	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:	1	0	0	0	0	0	0	1
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	1	0	0	0	0	0	0
777:	0	0	0	0	0	1	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	1	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	1
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	1	0	0	0	1	0	0
857:	1	0	0	0	0	0	0	0
865:	0	0	0	0	1	0	1	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	1	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	1	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

LCS  
8/8/13

# Apex-Alpha™

Sample Description: PZ-203-SS TOT  
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
Batch Identification: 1307152A-RA  
Sample Identification: 04  
Sample Geometry: Shelf 2  
Procedure Description: Ra

Detector Name: Alpha\_048  
Chamber Serial Number: 02030596B  
Detector Serial Number: 83111  
Env. Background: System Bkgd 64063  
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
Generic Mult. Factor: 2.530E+000 Generic Div. Factor: 1.000E+000  
Sample Date/Time: 7/17/2013 10:28:54 AM  
Acquisition Date/Time: 8/8/2013 12:09:54 PM  
Acquisition Live Time: 170.0 minutes  
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
Counting Efficiency: 0.1680 +/- 0.0030 on 12/16/2012 5:49:20 PM  
Effective Efficiency: 0.1680 +/- 0.0030

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.488	5.32	91.11	0.68	0.00E+000	3.0
RA-226	4.582	57.83	25.82	0.17	0.00E+000	3.7

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----- NUCLIDE ANALYSIS RESULTS -----  
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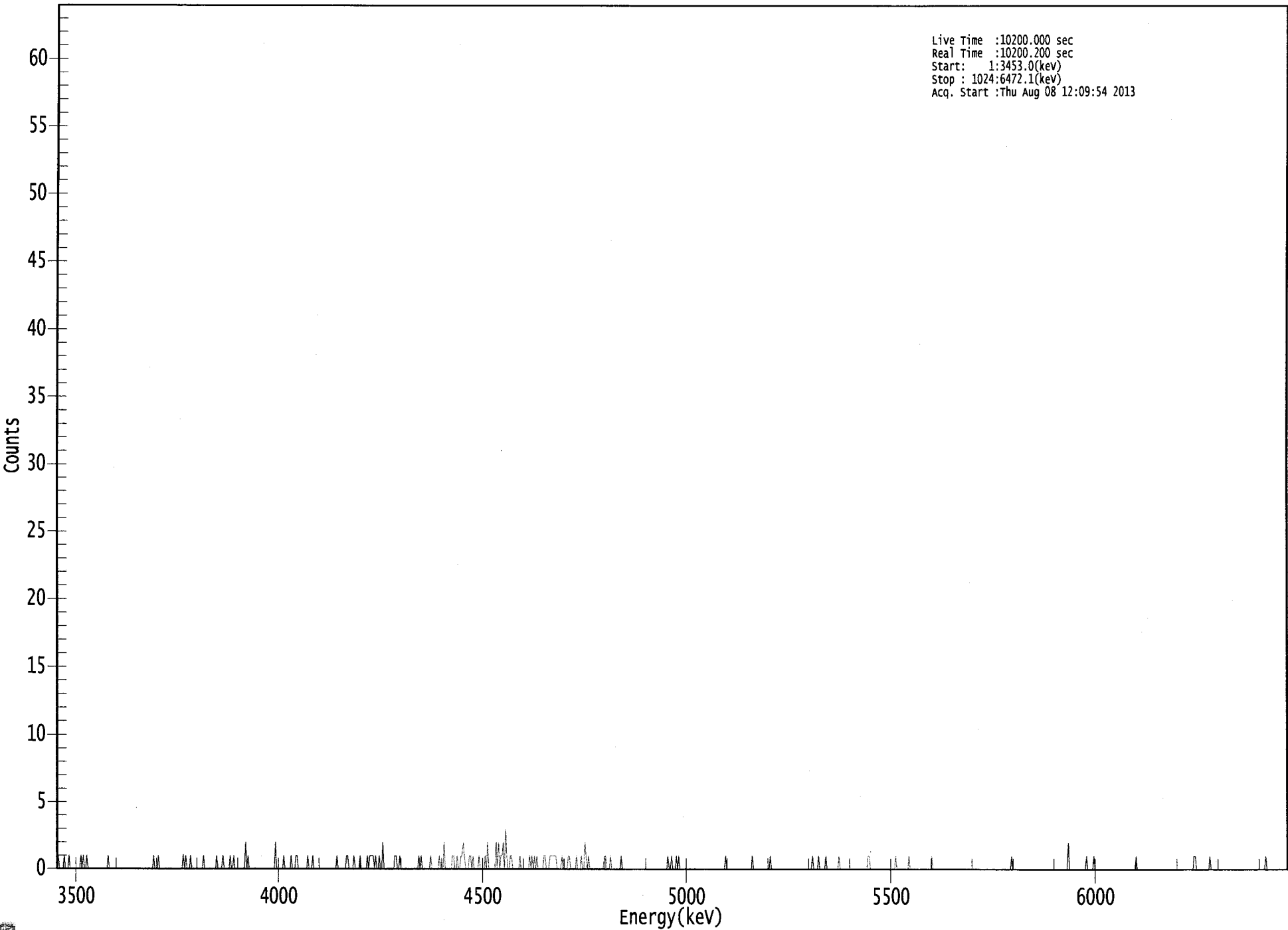
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.950	5685.50*	2.25E-001 +/- 2.05E-001	2.38E-001 +/- 8.28E-003
RA-226	0.948	4785.00*	2.31E+000 +/- 6.01E-001	1.67E-001 +/- 5.77E-003

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065584.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3453.0(kev)  
Stop : 1024:6472.1(kev)  
Acq. Start :Thu Aug 08 12:09:54 2013



ROI Type: 1

2420

\*\*\*\*\*  
 \*\*\*\*\* 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	1	0	0	0	0	1	0
9:	0	0	1	0	0	0	0	0
17:	0	0	0	0	1	0	1	0
25:	0	1	0	0	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	0	0	0	0	0	0
81:	0	1	0	0	0	1	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	1	0	0	0
113:	1	0	0	0	0	0	0	0
121:	0	0	0	1	0	0	0	0
129:	0	0	0	0	0	0	1	0
137:	0	0	0	1	0	0	0	0
145:	0	1	0	0	1	0	0	0
153:	0	0	0	0	0	0	2	0
161:	1	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	2
185:	0	0	0	0	0	0	1	0
193:	0	0	0	0	1	0	0	0
201:	1	1	0	0	0	0	0	0
209:	0	0	1	0	0	0	1	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	1	0	0	0	0	0
241:	0	0	1	1	0	0	0	0
249:	1	0	0	0	0	1	0	0
257:	0	0	0	1	0	1	1	1
265:	1	0	1	0	0	1	0	0
273:	2	0	0	0	0	0	0	0
281:	0	0	1	1	0	0	1	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	1	0
305:	1	0	0	0	0	0	0	0
313:	1	0	0	0	0	0	0	1
321:	0	0	0	2	0	0	0	0
329:	0	0	1	1	0	0	1	0
337:	0	1	1	2	1	0	0	0
345:	1	1	0	1	0	0	0	0
353:	1	0	0	0	0	1	0	2
361:	0	0	0	0	0	0	2	0

369: 2 0 1 1 2 0 3 1

Sample Title: 04

Channel	1	2	3	4	5	6	7	8
377:	0	0	1	1	0	0	0	0
385:	0	0	1	0	0	0	0	0
393:	0	0	1	0	1	0	1	0
401:	1	0	0	0	0	0	1	1
409:	0	0	0	1	1	1	1	1
417:	1	0	0	0	0	1	0	0
425:	0	0	1	1	0	0	0	0
433:	0	1	0	0	0	1	0	0
441:	2	1	0	1	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	1	1	0	0	0	1	0	0
465:	0	0	0	0	0	0	1	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	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	1	0	0
513:	1	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	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	1	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	1	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	1	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	1	0	0
633:	0	0	1	0	0	0	0	0
641:	1	0	0	0	0	0	0	0
649:	0	0	0	1	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	1	1	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	1	0	0	0	0	0
705:	0	0	0	0	0	1	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	1	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	1	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	2	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	1	0	0	0	0	0	1	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	1	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	1	1	0	0	0	0	0
953:	0	0	0	0	0	0	1	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	1	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KS  
8/2/13

# Apex-Alpha™

Sample Description: PZ-203-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_018  
 Chamber Serial Number:  
 Detector Serial Number: 18  
 Env. Background: System Bkgd 64042  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.610E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:48 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9867 +/- 0.0000  
 Counting Efficiency: 0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM  
 Effective Efficiency: 0.1753 +/- 0.0033

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.482	4.26	135.21	3.74	0.00E+000	3.1
RA-226	4.591	34.47	34.24	1.53	0.00E+000	3.1

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

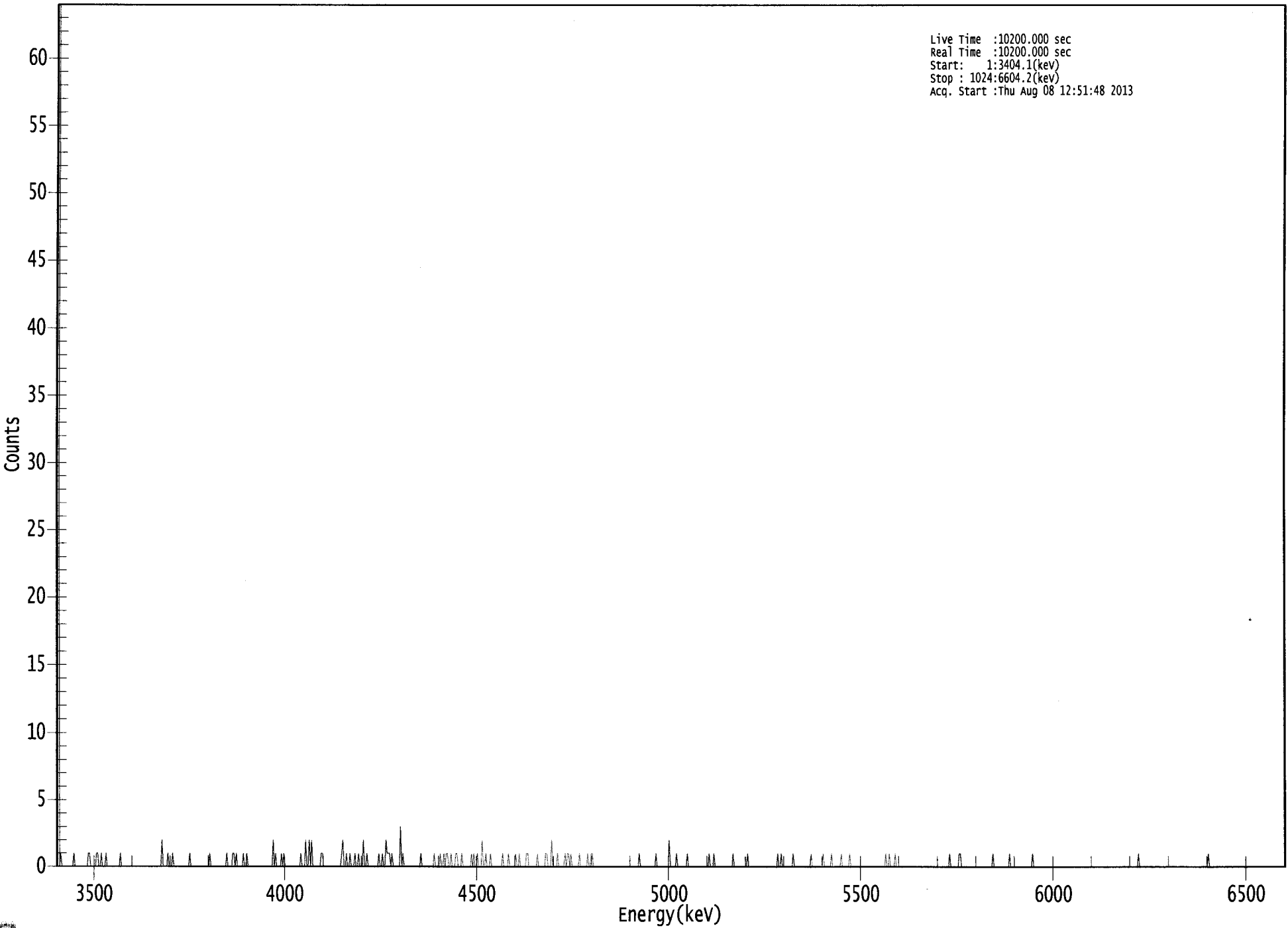
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.947	5685.50*	1.78E-001 +/- 2.41E-001	4.01E-001 +/- 1.46E-002
RA-226	0.952	4785.00*	1.36E+000 +/- 4.68E-001	2.80E-001 +/- 1.02E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065585.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3404.1(kev)  
Stop : 1024:6604.2(kev)  
Acq. Start :Thu Aug 08 12:51:48 2013



ROI Type: 1

0318  
0920

\*\*\*\*\*  
 \*\*\*\*\* 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:	10200	10200	0	1	0	0	0	0
9:	0	0	0	0	0	0	1	0
17:	0	0	0	0	0	0	0	0
25:	0	0	1	1	0	0	0	0
33:	0	1	1	0	0	1	0	0
41:	0	1	0	0	0	0	0	0
49:	0	0	0	0	0	1	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:	2	0	0	0	0	1	0	0
97:	0	1	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	1
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	0	0	0	0	0	1	0
145:	0	0	0	1	1	0	1	0
153:	0	0	0	0	1	0	0	1
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	2	0	1
185:	0	0	0	0	1	0	1	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	1	0	0	0
209:	2	0	0	2	0	2	0	0
217:	0	0	0	0	0	1	1	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	1	2
241:	0	0	1	0	0	1	0	0
249:	0	1	0	0	1	0	0	0
257:	2	0	0	1	0	0	0	0
265:	0	0	0	0	0	1	0	0
273:	1	0	0	2	1	1	1	0
281:	1	0	0	0	0	0	0	3
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	1	0	0	0	0	0	0	0
313:	0	0	0	1	0	0	0	0
321:	1	0	0	1	0	1	1	0
329:	0	1	0	0	0	1	1	0
337:	0	0	1	0	0	0	0	0
345:	0	0	1	0	1	0	0	1
353:	0	0	0	2	0	0	1	0
361:	0	0	1	0	0	0	0	0

369: 0 0 0 0 1 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	0	0	1
385:	0	0	1	0	0	0	0	0
393:	1	1	0	0	0	0	0	0
401:	0	1	0	0	0	0	0	0
409:	1	1	0	0	0	2	0	0
417:	0	0	1	0	0	0	0	0
425:	1	0	1	1	0	1	0	0
433:	0	0	0	0	1	0	0	0
441:	0	0	0	1	0	0	1	1
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	0	0	0	0	1	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	1	0	0	0
505:	0	0	0	0	0	0	0	2
513:	0	0	0	0	0	1	0	0
521:	0	0	0	0	0	0	1	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	1	0	0	0	1	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	1	0	0	0
569:	0	0	0	0	0	0	0	0
577:	1	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	1	0	0	1	0	0	0
609:	0	0	0	0	0	0	1	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	1	0	0
633:	0	0	0	0	0	0	0	1
641:	0	0	0	0	0	0	1	0
649:	0	0	0	0	0	0	1	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	1	0	0	1	0
697:	0	0	0	1	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:	1	0	0	0	0	0	0	0
753:	1	1	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	1	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	1	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	1	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	1	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	1
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  
8/18/13

# Apex-Alpha™

Sample Description: D-87 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_019  
 Chamber Serial Number:  
 Detector Serial Number: 19  
 Env. Background: System Bkgd 64043  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.120E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:49 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8622 +/- 0.0000  
 Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM  
 Effective Efficiency: 0.1431 +/- 0.0025

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.532	15.15	51.98	0.85	0.00E+000	3.3
RA-226	4.610	43.66	29.80	0.34	0.00E+000	3.3

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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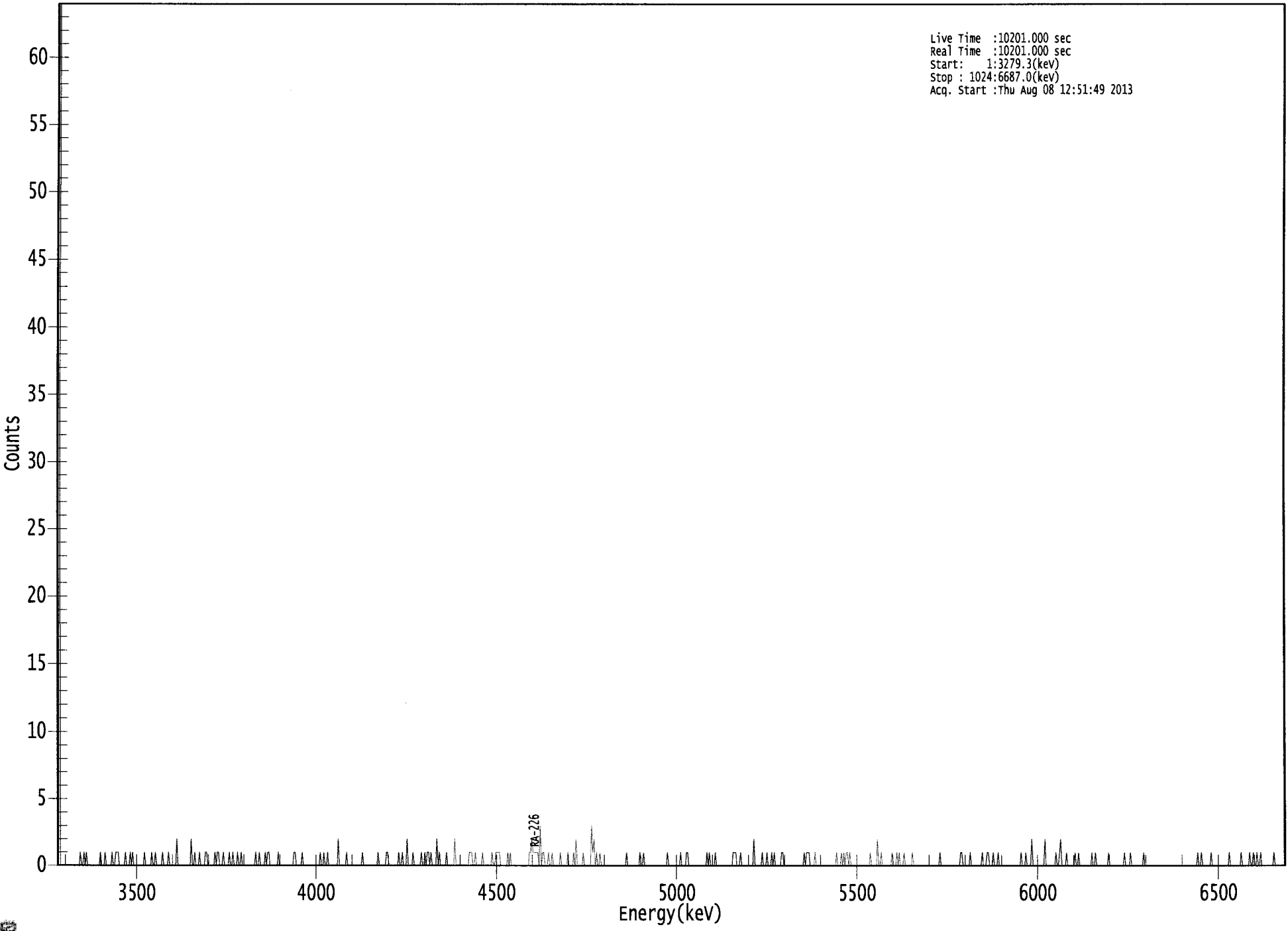
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.970	5685.50*	9.27E-001 +/- 4.83E-001	3.66E-001 +/- 1.27E-002
RA-226	0.961	4785.00*	2.52E+000 +/- 7.57E-001	2.76E-001 +/- 9.58E-003

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

000065586.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3279.3(kev)  
Stop : 1024:6687.0(kev)  
Acq. Start :Thu Aug 08 12:51:49 2013



0253

ROI Type: 1



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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: 06

Elapsed Live time: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	1	0	0	1	0
25:	1	0	0	0	0	0	0	0
33:	0	0	0	0	1	0	0	0
41:	1	0	0	0	0	0	1	0
49:	0	1	1	1	0	0	0	0
57:	0	1	0	0	0	1	0	1
65:	0	0	0	0	0	0	0	0
73:	0	1	0	0	0	0	0	1
81:	0	0	1	0	0	0	0	0
89:	1	0	0	0	0	1	0	0
97:	0	0	0	0	2	0	0	0
105:	0	0	0	0	0	0	0	0
113:	2	0	0	1	0	0	0	1
121:	0	0	0	0	1	1	0	0
129:	0	0	0	0	1	0	1	1
137:	0	0	0	1	0	0	0	0
145:	1	0	0	1	0	0	0	1
153:	0	0	1	0	0	0	0	0
161:	0	0	0	0	0	0	1	0
169:	0	1	0	0	0	0	1	0
177:	1	1	0	0	0	0	0	0
185:	0	1	0	0	0	0	0	0
193:	0	0	0	0	0	0	1	1
201:	0	0	0	0	0	1	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	1	0	0	1
225:	0	0	1	0	0	0	0	0
233:	0	0	0	2	0	0	0	0
241:	0	0	1	0	0	0	0	0
249:	0	0	0	0	0	0	0	1
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	1	0	0	0
273:	0	0	0	1	1	0	0	0
281:	0	0	0	0	0	1	0	0
289:	1	0	0	0	2	0	0	0
297:	0	1	0	0	0	0	0	0
305:	1	0	0	1	0	1	1	0
313:	1	0	0	0	0	2	0	1
321:	0	0	0	0	0	1	0	0
329:	0	0	0	0	2	0	0	0
337:	0	0	0	0	0	0	0	0
345:	1	1	1	0	0	1	0	0
353:	0	0	0	1	0	0	0	0
361:	0	0	0	1	0	0	1	1

369: 1 1 0 0 0 0 0 0

Sample Title: 06

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

801: 0 0 0 1 0 0 0 1

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	2	0	0	0
817:	0	0	0	0	0	0	0	2
825:	0	0	0	0	0	0	0	0
833:	1	0	0	1	2	0	0	0
841:	0	1	0	0	0	0	0	0
849:	1	0	0	1	0	0	0	0
857:	0	0	0	0	0	0	1	0
865:	0	1	0	0	0	0	0	0
873:	0	0	0	0	1	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	1	0	0	0	0	1	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	1	0
953:	0	1	0	0	0	0	0	0
961:	0	1	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	1	0	0	0	0	0	0	0
985:	0	0	1	0	0	0	0	0
993:	0	1	0	0	1	0	0	1
1001:	0	0	1	0	0	0	0	0
1009:	0	0	0	0	0	1	0	0
1017:	0	0	0	0	0	0	0	0

ICB  
8/8/13

# Apex-Alpha™

Sample Description: D-87 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_022  
 Chamber Serial Number:  
 Detector Serial Number: 22  
 Env. Background: System Bkgd 64044  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.170E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:50 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8847 +/- 0.0000  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Effective Efficiency: 0.1355 +/- 0.0026

Peak Match Tolerance: 0.350 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)
RA-224	5.520	5.45	104.44	2.55	0.00E+000	3.1
RA-226	4.576	36.47	33.24	1.53	0.00E+000	3.1

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 NUCLIDE ANALYSIS RESULTS  
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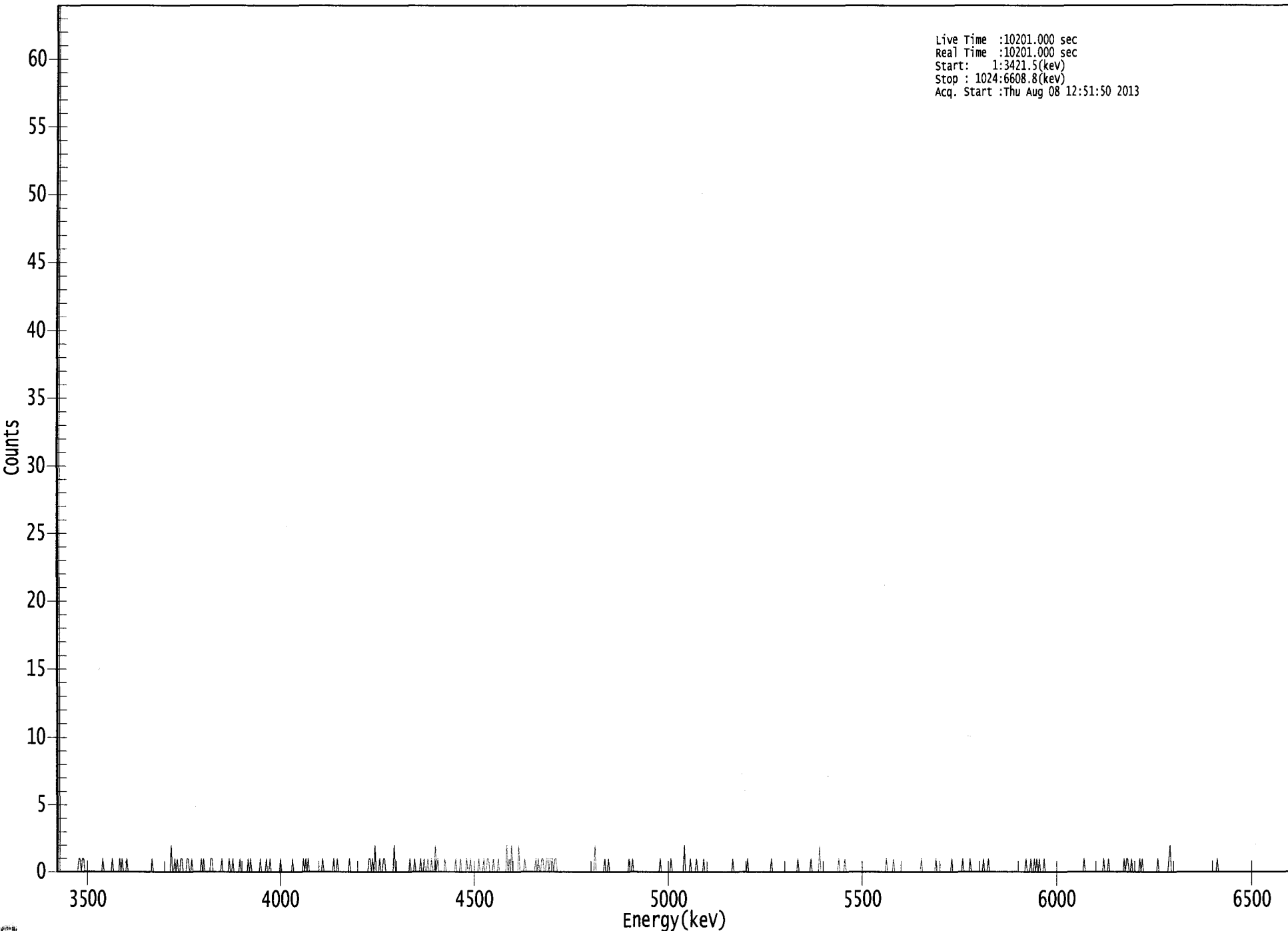
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.965	5685.50*	3.58E-001 +/- 3.74E-001	5.51E-001 +/- 2.06E-002
RA-226	0.944	4785.00*	2.26E+000 +/- 7.56E-001	4.41E-001 +/- 1.65E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065587.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3421.5(kev)  
Stop : 1024:6608.8(kev)  
Acq. Start :Thu Aug 08 12:51:50 2013



0358

ROI Type: 1

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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: 07

Elapsed Live time: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	1	1	0	1	1	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	1	0
41:	0	0	0	0	0	0	1	0
49:	0	0	0	0	1	0	1	0
57:	0	0	1	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	1
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	2
97:	0	0	1	0	1	0	0	1
105:	1	0	0	0	1	1	0	0
113:	1	0	0	0	0	0	0	0
121:	1	0	1	0	0	0	0	0
129:	1	1	0	0	0	0	0	0
137:	0	1	0	0	0	0	0	1
145:	0	0	1	0	0	0	0	0
153:	1	0	0	0	0	0	0	1
161:	0	1	0	0	0	0	0	0
169:	0	1	0	0	0	0	1	0
177:	0	1	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	1
209:	0	1	0	0	0	0	0	0
217:	0	0	0	0	0	1	0	0
225:	0	0	0	0	0	0	1	0
233:	0	1	0	0	0	0	0	0
241:	0	0	0	1	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	1	1	0	1	0
265:	2	0	0	0	1	0	0	1
273:	1	0	0	0	0	0	0	0
281:	2	0	0	0	0	0	0	0
289:	0	0	0	0	0	1	0	0
297:	0	1	0	0	0	0	1	0
305:	0	1	0	0	1	0	0	1
313:	0	0	2	0	1	0	0	0
321:	0	0	1	0	0	0	0	0
329:	0	0	0	1	0	0	0	1
337:	0	0	0	0	1	0	0	1
345:	0	0	0	0	0	0	1	0
353:	0	0	1	0	0	1	1	0
361:	0	0	1	0	0	0	1	0

369: 0 0 0 0 0 2 0 1

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	2	0	0	0	0	0	2
385:	0	0	0	0	1	0	0	0
393:	0	0	0	0	0	1	0	1
401:	0	0	1	1	0	0	1	1
409:	0	1	1	1	0	1	1	0
417:	0	0	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	2	0
449:	0	0	0	0	0	0	1	0
457:	0	1	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	1	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	1	0	0	0
505:	0	0	0	0	0	1	0	0
513:	0	0	0	0	0	0	0	0
521:	2	0	0	0	0	1	0	0
529:	0	0	1	0	0	0	0	0
537:	1	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	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	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	1	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	1	0
617:	0	0	0	0	0	0	0	0
625:	0	1	0	0	0	0	0	0
633:	2	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	1	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	0	0	0	0	1
689:	0	0	0	0	0	1	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	1	0	0	0
721:	0	0	0	0	0	0	0	0
729:	1	0	0	0	0	0	0	0
737:	0	0	0	0	0	1	0	0
745:	0	0	0	0	0	0	1	0
753:	0	0	0	0	1	0	0	0
761:	0	0	0	0	0	0	0	1
769:	0	0	0	1	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 1 0 0 0 1 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	1	0	1	0	1	0	0
817:	0	1	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	1	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	1	0	0	0	1	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	1	0	1	1	0
889:	0	1	0	0	0	0	0	0
897:	1	0	1	0	0	0	0	0
905:	0	0	0	0	0	0	0	1
913:	0	0	0	0	0	0	0	0
921:	1	2	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:	1	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	1	0	0



KCS  
8/8/13

# Apex-Alpha™

Sample Description: DUP 06 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_023  
 Chamber Serial Number:  
 Detector Serial Number: 23  
 Env. Background: System Bkgd 64045  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.550E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:51 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9331 +/- 0.0000  
 Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM  
 Effective Efficiency: 0.1596 +/- 0.0028

Peak Match Tolerance: 0.350 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)
RA-224	5.583	0.45	806.99	2.55	0.00E+000	3.1
RA-226	4.566	9.13	72.22	1.87	0.00E+000	3.1

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 NUCLIDE ANALYSIS RESULTS  
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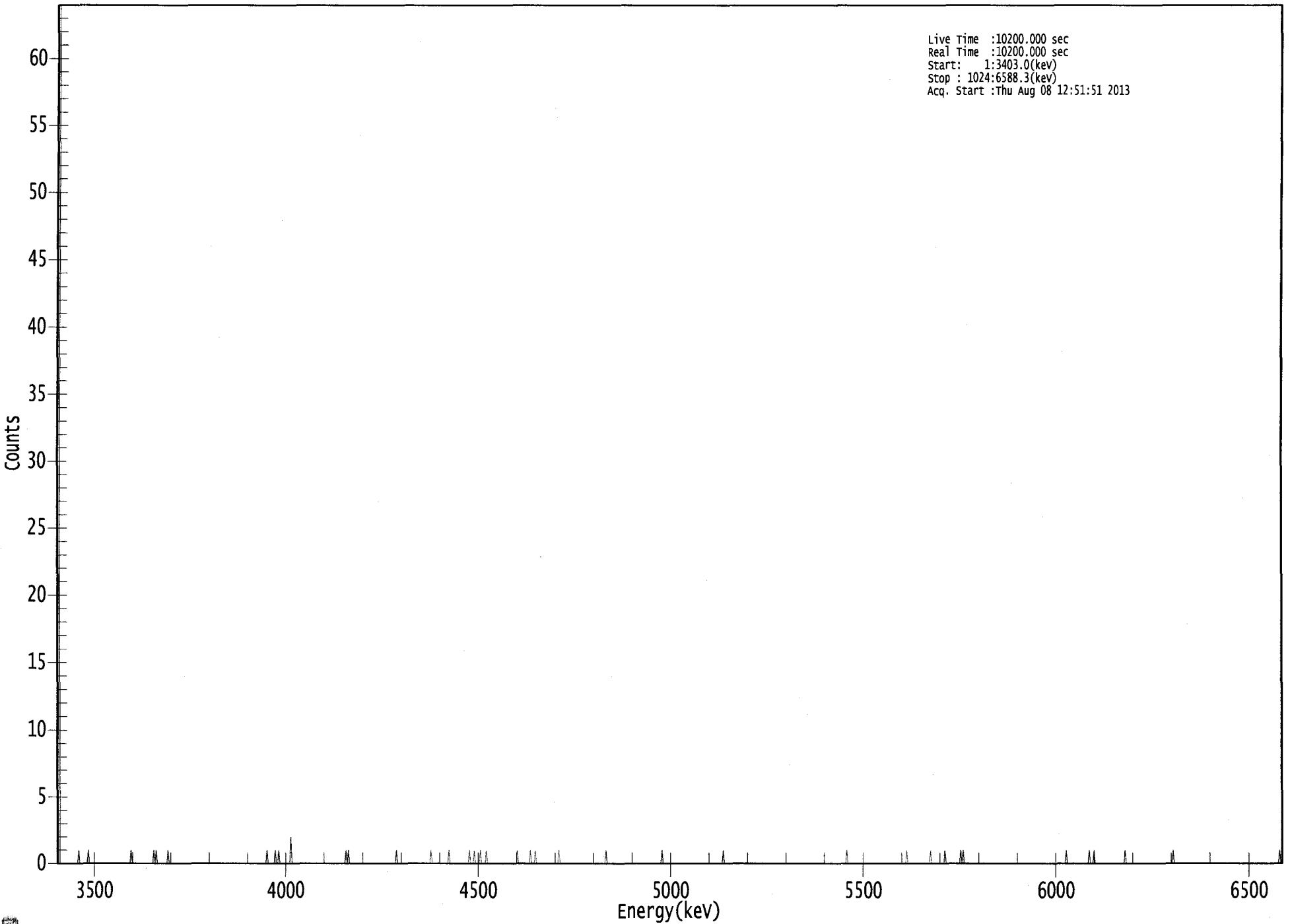
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.986	5685.50*	2.02E-002 +/- 1.63E-001	3.76E-001 +/- 1.30E-002
RA-226	0.939	4785.00*	3.87E-001 +/- 2.80E-001	3.21E-001 +/- 1.11E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065589.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3403.0(kev)  
Stop : 1024:6588.3(kev)  
Acq. Start :Thu Aug 08 12:51:51 2013



0303  
ROI Type: 1

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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:    08

Elapsed Live time:        10200

Elapsed Real Time:       10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	1	0	0	0	0	0
25:	0	0	1	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	1	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	1	0	1	0	0	0	0
89:	0	0	0	0	0	1	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	0	0
169:	0	0	0	0	0	0	0	0
177:	1	0	0	0	0	0	0	1
185:	0	0	1	0	0	0	0	0
193:	0	0	0	0	2	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	1	0	1	0	0	0
249:	0	0	0	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	1	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	1	0	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	0	0	0	0
345:	0	1	0	0	0	1	0	0
353:	0	0	1	0	0	0	0	1
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	1	0	0	0	0	0	0
393:	0	0	0	0	1	0	0	0
401:	1	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	1	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	0	0
457:	0	0	0	1	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	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	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	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	1	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	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	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	1	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	1	0	0	0	0	0
737:	0	0	0	0	0	0	1	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	1	0	1	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: 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	1	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	1	0
865:	0	0	1	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	1	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	1	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	1	0	0	0

10/8  
8/15/13



Sample Description: DUP 06 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_024  
 Chamber Serial Number:  
 Detector Serial Number: 24  
 Env. Background: System Bkgd 64046  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.550E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:52 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8761 +/- 0.0000  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Effective Efficiency: 0.1498 +/- 0.0028

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.566	8.64	72.56	1.36	0.00E+000	3.1
RA-226	4.521	17.13	50.29	1.87	0.00E+000	3.1

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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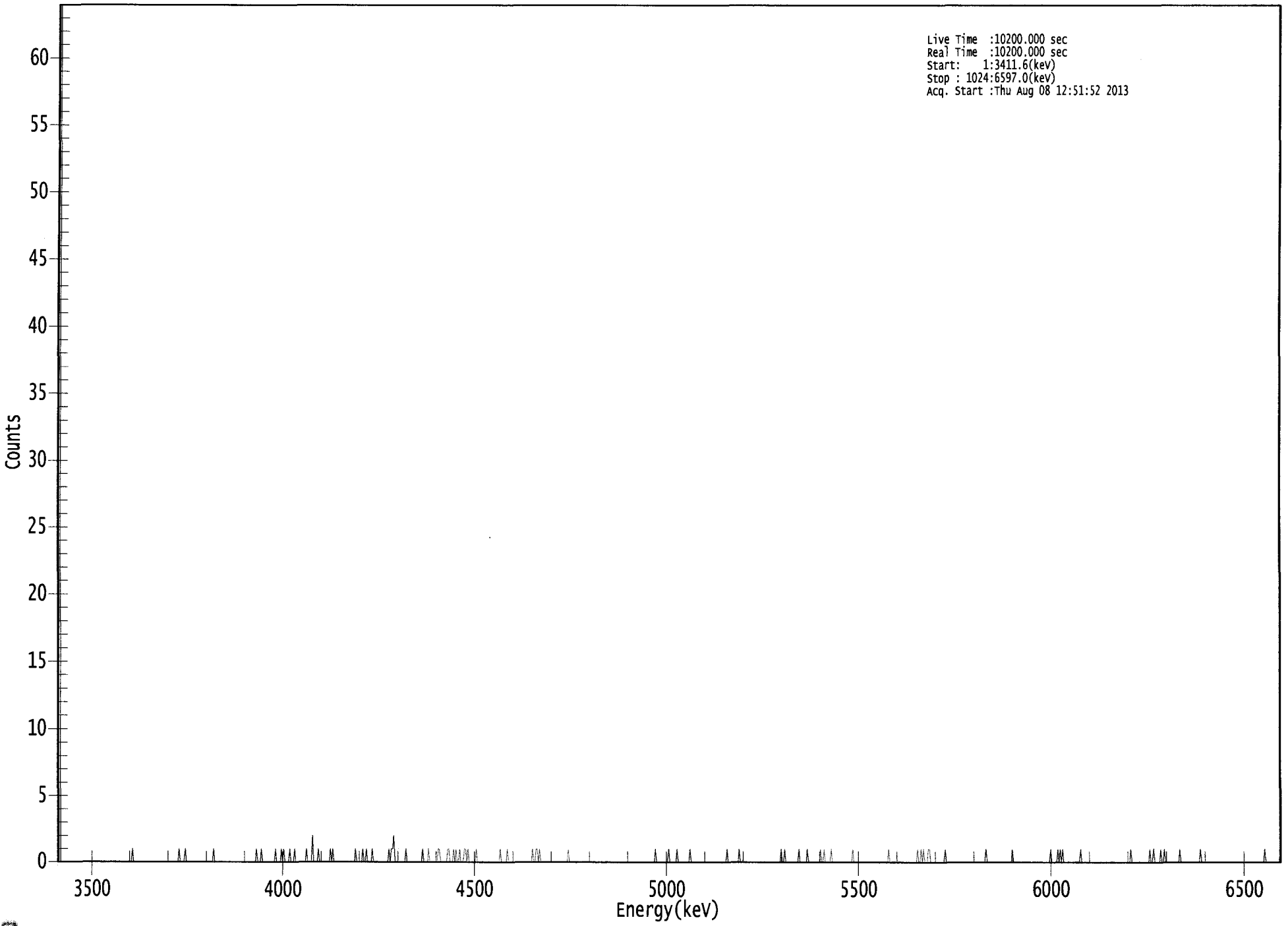
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.981	5685.50*	4.13E-001 +/- 3.00E-001	3.27E-001 +/- 1.20E-002
RA-226	0.913	4785.00*	7.72E-001 +/- 3.90E-001	3.41E-001 +/- 1.25E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065588.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3411.6(kev)  
Stop : 1024:6597.0(kev)  
Acq. Start :Thu Aug 08 12:51:52 2013



0368  
ROI Type: 1

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 \*\*\*\*\* 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:	10200	10200	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	1
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	1	0
105:	0	0	0	1	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	1	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	1
169:	0	0	0	1	0	0	0	0
177:	0	0	0	0	0	0	0	1
185:	0	0	0	0	1	0	1	0
193:	0	0	0	1	0	0	0	1
201:	0	0	0	0	0	0	0	0
209:	0	1	0	0	0	0	2	0
217:	0	0	0	1	0	0	0	0
225:	0	0	0	0	0	1	0	1
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	1	0	0	0	0	0
257:	1	0	0	1	0	0	0	0
265:	1	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	1	0
281:	1	1	2	0	0	0	0	0
289:	0	0	0	0	1	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	1	0	0	0	0	1
313:	0	0	0	0	0	0	0	1
321:	1	0	0	0	0	0	0	1
329:	1	0	0	0	1	0	1	0
337:	0	1	0	0	0	1	1	0
345:	1	0	0	0	0	0	0	1
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0



369: 0 0 0 1 0 0 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	1	0
401:	0	1	1	0	1	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	1	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	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	0	0	0
497:	0	0	0	0	0	1	0	0
505:	0	0	0	0	0	0	0	0
513:	1	0	0	0	0	0	0	1
521:	0	0	0	0	0	0	0	0
529:	0	0	1	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	1	0	0	0	0	0	0
569:	0	0	0	1	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	1	0
609:	0	1	0	0	0	0	0	0
617:	0	0	0	0	0	1	0	0
625:	0	0	0	0	1	0	0	0
633:	0	0	0	0	0	0	0	1
641:	0	0	1	0	0	0	0	0
649:	1	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	1	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:	1	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:	1	0	0	1	0	1	0	0
729:	0	1	1	0	0	0	0	0
737:	0	0	0	0	0	0	0	1
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	1	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	1

801: 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	1
833:	0	0	0	0	0	1	0	1
841:	0	1	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	1	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	1	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	1	0	0	1	0	0
921:	0	0	0	1	0	0	1	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	1	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	1	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	1	0	0	0	0	0	0
1017:	0	0	0	0	0	0	1	0

KBS  
8/8/13

# Apex-Alpha™

Sample Description: S-53 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_025  
 Chamber Serial Number:  
 Detector Serial Number: 25  
 Env. Background: System Bkgd 64047  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.860E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:53 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8363 +/- 0.0000  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Effective Efficiency: 0.1451 +/- 0.0027

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.539	42.13	30.97	1.87	0.00E+000	3.1
RA-226	4.594	57.32	26.07	0.68	0.00E+000	6.3

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

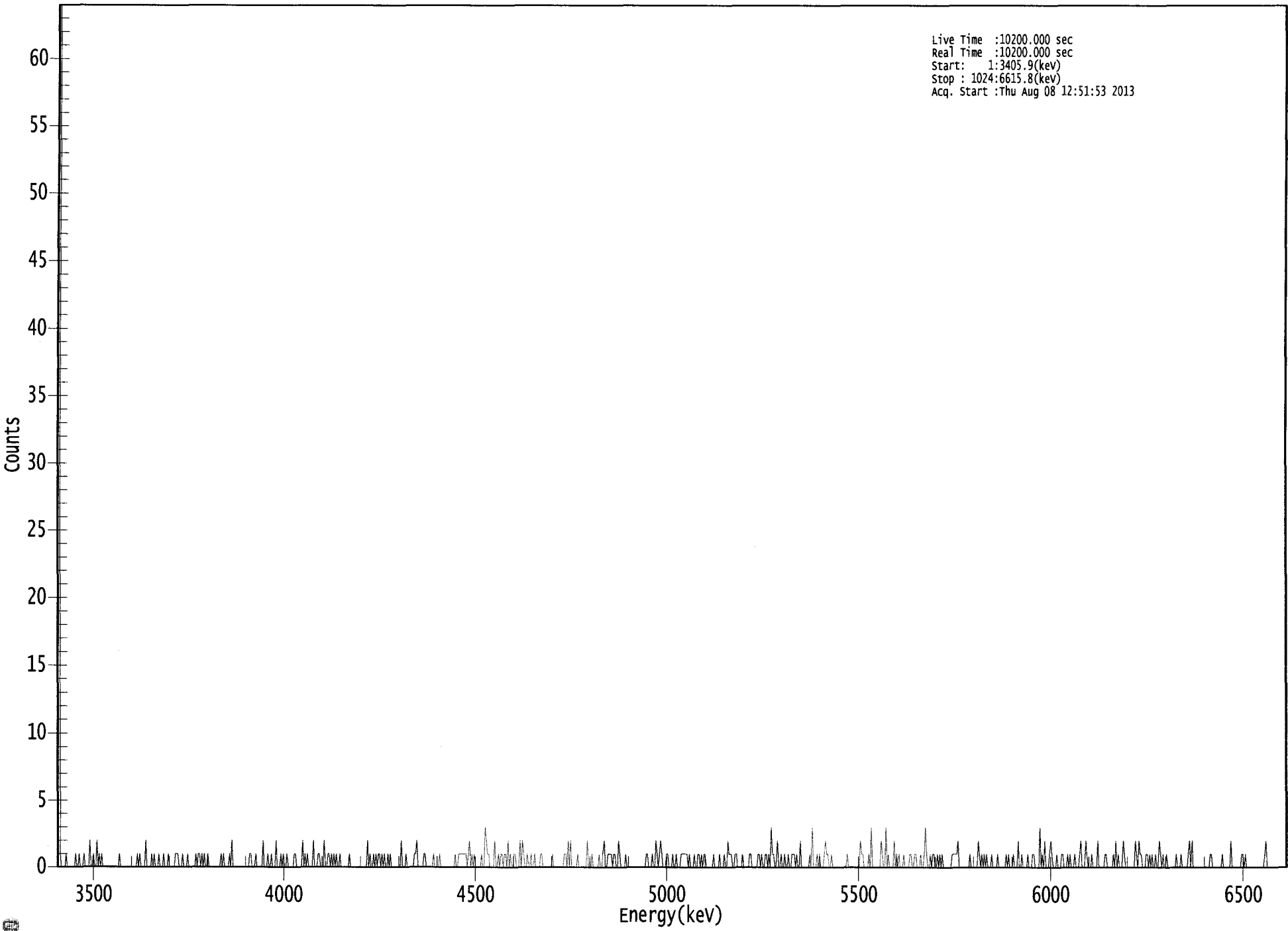
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.972	5685.50*	3.14E+000 +/- 9.80E-001	5.65E-001 +/- 2.07E-002
RA-226	0.953	4785.00*	4.04E+000 +/- 1.06E+000	3.97E-001 +/- 1.45E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065590.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3405.9(kev)  
Stop : 1024:6615.8(kev)  
Acq. Start :Thu Aug 08 12:51:53 2013



0373

ROI Type: 1

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

Sample Title:    10

Elapsed Live time:        10200

Elapsed Real Time:        10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	1	0	0	0	0	1
9:	0	0	0	0	0	0	0	1
17:	0	0	1	0	0	0	1	0
25:	0	0	0	2	0	0	1	0
33:	0	2	0	1	0	1	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	1	0	1	0	0
73:	0	0	2	0	0	0	0	1
81:	0	1	0	0	0	1	0	0
89:	0	1	0	0	0	1	0	0
97:	0	0	0	1	1	1	0	0
105:	0	1	0	0	0	1	0	0
113:	0	0	0	0	1	0	1	1
121:	0	1	0	1	0	0	1	0
129:	0	0	0	0	0	0	0	0
137:	0	1	0	1	0	0	0	0
145:	1	0	2	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	1	1	0	0	0	1	0
169:	0	0	0	0	2	0	0	0
177:	1	0	0	1	0	0	0	2
185:	0	0	0	1	0	1	0	0
193:	1	0	0	0	0	0	1	1
201:	0	0	0	0	0	2	0	1
209:	0	1	0	0	0	0	2	0
217:	0	0	1	1	0	0	0	2
225:	0	0	1	1	0	1	0	1
233:	0	1	0	0	1	0	0	0
241:	0	0	0	0	1	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	2	0	1	0	0
265:	1	0	1	0	1	1	0	1
273:	0	1	0	0	1	0	1	0
281:	0	0	0	0	0	0	0	2
289:	0	0	0	1	0	0	0	0
297:	0	0	1	1	2	0	0	0
305:	0	0	1	1	0	0	0	0
313:	0	0	1	0	0	0	0	1
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	1	0	0	1
337:	1	1	1	1	1	1	0	1
345:	2	0	1	0	1	0	0	0
353:	0	0	1	0	0	3	2	1
361:	1	0	0	0	0	2	0	0

369: 1 0 1 1 0 1 1 0

Sample Title: 10

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

801: 2 0 0 1 0 0 0 0

Sample Title: 10

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	1	0	0	0	1	1	0	0
817:	0	0	3	0	1	0	2	0
825:	0	0	1	2	1	0	0	0
833:	1	0	0	0	1	1	0	0
841:	0	1	0	1	0	0	0	1
849:	0	0	0	1	2	0	0	0
857:	2	1	0	0	0	1	0	0
865:	0	0	2	0	0	0	0	0
873:	1	1	0	0	0	0	0	1
881:	0	2	0	1	0	0	0	2
889:	1	0	0	0	0	0	0	0
897:	0	2	1	0	2	1	1	0
905:	0	0	1	1	0	1	0	1
913:	0	0	1	0	0	2	1	0
921:	1	0	0	1	0	0	0	0
929:	0	0	0	1	0	0	0	1
937:	0	0	0	0	0	1	2	0
945:	2	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	1
961:	1	0	0	0	0	0	0	0
969:	0	1	0	0	0	0	0	0
977:	2	0	0	0	0	0	0	0
985:	0	1	1	0	1	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	1	2	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	1

108  
8/9/13

# Apex-Alpha™

Sample Description: S-53 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_027  
 Chamber Serial Number:  
 Detector Serial Number: 27  
 Env. Background: System Bkgd 64048  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.690E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:54 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9466 +/- 0.0000  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Effective Efficiency: 0.1635 +/- 0.0031

Peak Match Tolerance: 0.350 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)
RA-224	5.568	-0.04	7506.4	2.04	0.00E+000	3.2
RA-226	4.578	5.13	103.36	1.87	0.00E+000	3.2

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 -----  
 NUCLIDE ANALYSIS RESULTS  
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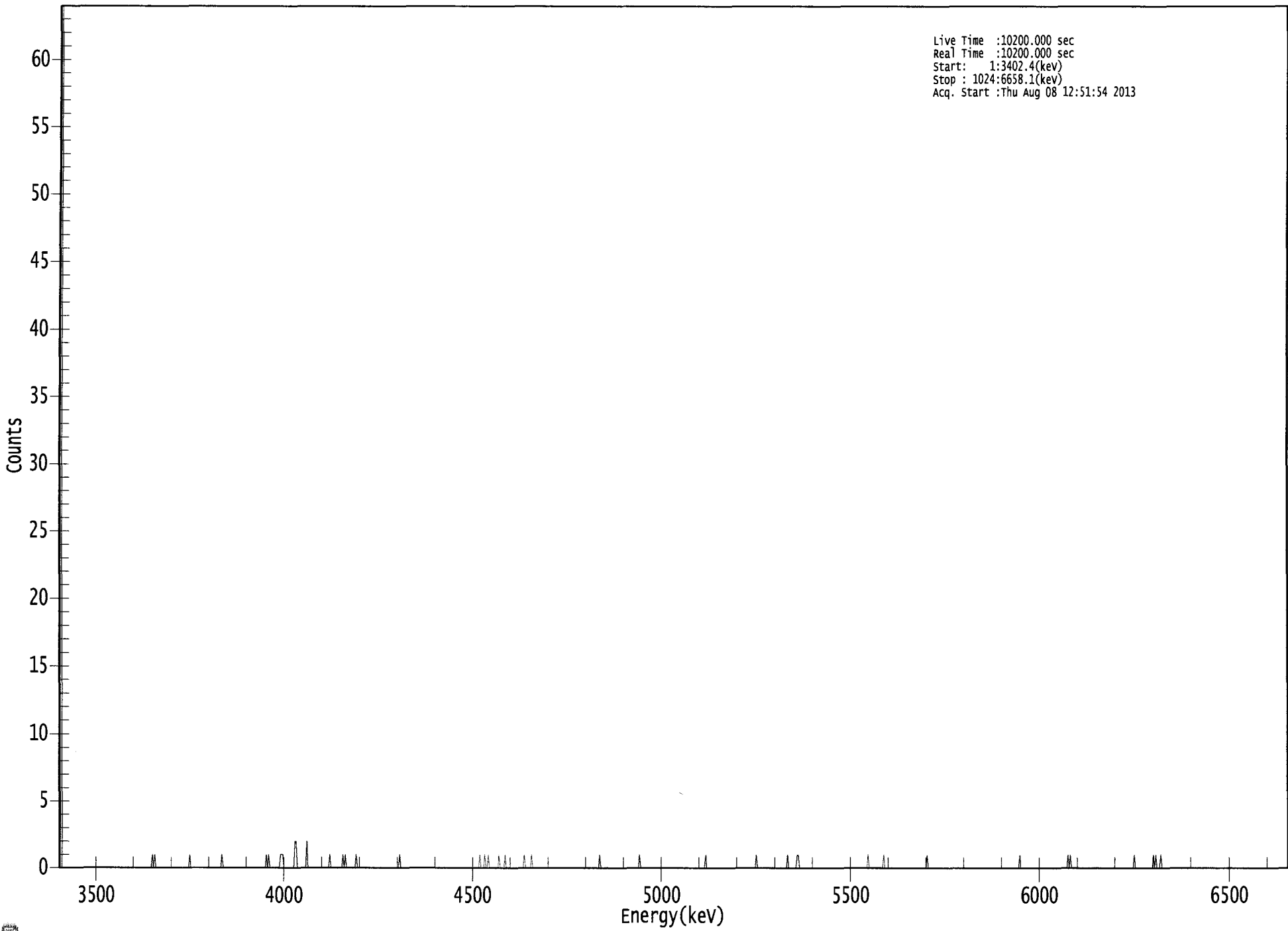
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.982	5685.50*	-1.85E-003 +/- 1.39E-001	3.59E-001 +/- 1.32E-002
RA-226	0.945	4785.00*	2.24E-001 +/- 2.31E-001	3.30E-001 +/- 1.21E-002

AG  
8/9/13



0000065591.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3402.4(kev)  
Stop : 1024:6658.1(kev)  
Acq. Start :Thu Aug 08 12:51:54 2013



0378

ROI Type: 1

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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:	10200	10200	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	1	0
81:	1	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	1	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	0	1	0	1
177:	0	0	0	0	0	0	0	0
185:	0	1	1	1	0	0	0	0
193:	0	0	0	0	0	2	2	0
201:	0	0	0	0	0	0	0	2
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	1	0	0	0	0	0
233:	0	0	0	0	0	1	0	1
241:	0	0	0	0	0	0	0	0
249:	1	0	0	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	1	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:	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	1
353:	0	0	0	1	0	0	1	0
361:	0	0	0	0	0	0	0	1

369: 0 0 0 0 1 0 0 0

Sample Title: 11

Channel								
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	1	0	0	0
393:	0	0	1	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	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	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	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	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	1	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	1	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	1
609:	0	0	0	0	0	0	0	1
617:	1	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	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	1	0	0	0	0	0
681:	0	0	0	0	0	0	0	1
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	1	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: 1 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:	1	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	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	1
913:	0	1	0	0	0	1	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  
8/18/13



Sample Description: D-14 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_029  
 Chamber Serial Number:  
 Detector Serial Number: 29  
 Env. Background: System Bkgd 64049  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.730E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:55 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.7486 +/- 0.0000  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Effective Efficiency: 0.1456 +/- 0.0027

Peak Match Tolerance: 0.350 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)
RA-224	5.494	12.96	59.25	2.04	0.00E+000	3.1
RA-226	4.587	32.66	34.50	0.34	0.00E+000	3.1

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 NUCLIDE ANALYSIS RESULTS  
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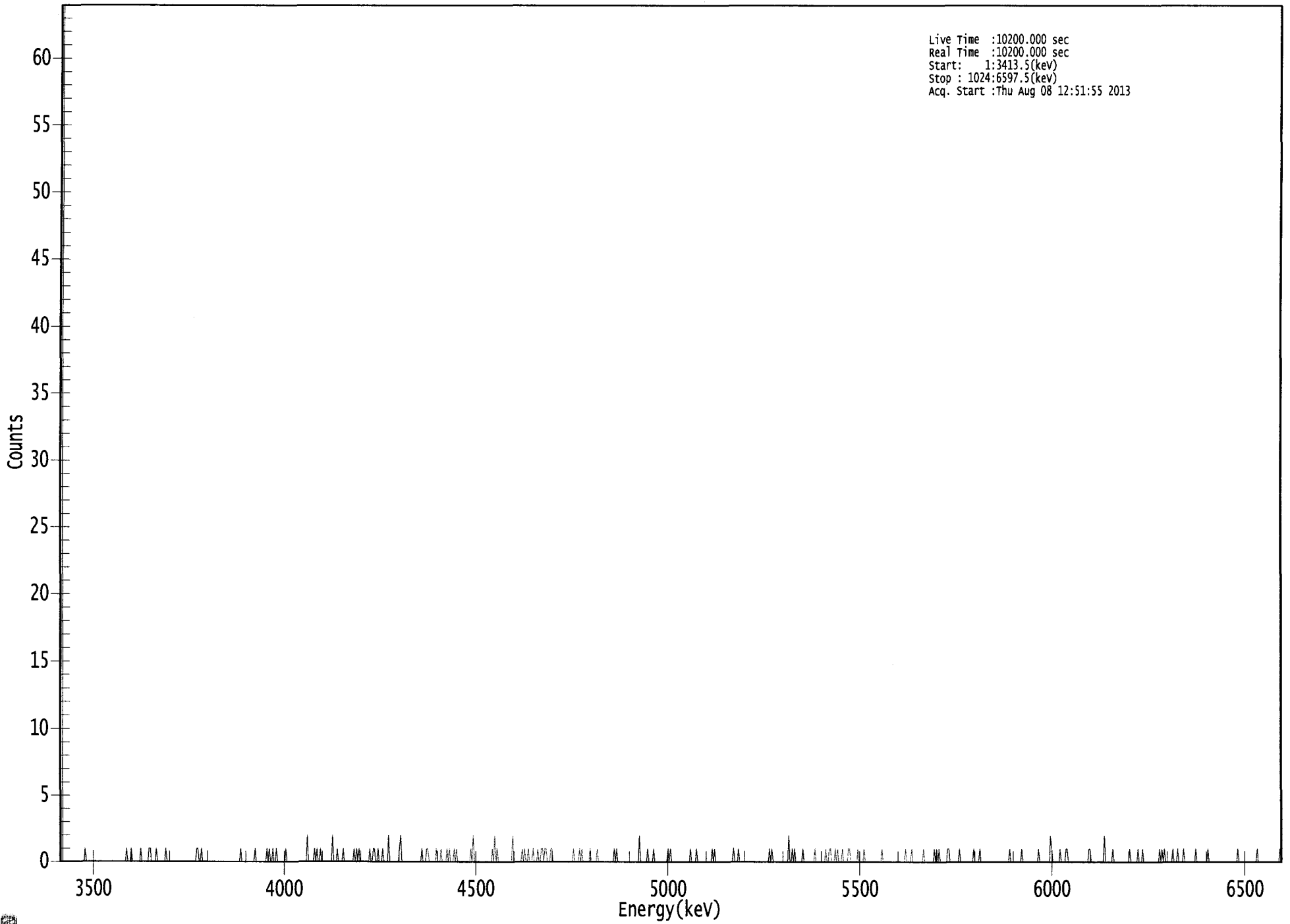
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.953	5685.50*	9.31E-001 +/- 5.53E-001	5.60E-001 +/- 2.02E-002
RA-226	0.950	4785.00*	2.22E+000 +/- 7.69E-001	3.24E-001 +/- 1.17E-002

AG  
 8/9/13

US EPA ARCHIVE DOCUMENT

0000065592.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3413.5(kev)  
Stop : 1024:6597.5(kev)  
Acq. Start :Thu Aug 08 12:51:55 2013



0303

ROI Type: 1

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

Sample Title: 12

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0	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	0	0	0	0	0	0
57:	1	0	0	0	1	0	0	0
65:	0	0	0	0	1	0	0	0
73:	0	0	0	1	1	0	0	0
81:	0	1	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	1	1	0	0	1
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:	1	0	0	0	0	0	0	0
161:	0	0	0	0	1	0	0	0
169:	0	0	0	0	0	0	1	0
177:	1	0	0	1	0	0	1	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	0
209:	2	0	0	0	0	0	1	0
217:	1	0	0	1	0	0	0	0
225:	0	0	0	0	0	2	0	0
233:	0	1	0	0	0	0	1	0
241:	0	0	0	0	0	0	0	1
249:	0	1	0	1	0	0	0	0
257:	0	0	0	0	1	0	0	1
265:	1	0	0	1	0	0	0	1
273:	0	0	0	0	2	0	0	0
281:	0	0	0	0	0	1	2	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	1	0	0	0	1	1	0	0
313:	0	0	0	0	1	0	0	0
321:	1	0	0	0	0	1	0	1
329:	0	0	0	1	0	1	0	0
337:	0	0	0	0	0	0	0	0
345:	0	1	0	2	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	1	0	2	0	1

369: 0 0 0 0 0 0 0 0 0

Sample Title: 12

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



801: 0 0 0 0 0 0 0 1 0

Sample Title: 12

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	1	0	0	0
825:	0	0	0	0	0	0	2	1
833:	0	0	0	0	0	0	1	0
841:	0	0	0	1	1	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	1	1
865:	0	0	0	0	0	0	0	0
873:	0	0	0	2	0	0	0	0
881:	0	0	1	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	1	0	0	0	0	0	0	1
905:	0	0	0	1	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	1	0	1	0	1	0	0
929:	0	0	0	0	1	0	0	0
937:	1	0	0	0	0	1	0	0
945:	0	0	0	0	0	0	0	1
953:	0	0	0	0	0	0	0	0
961:	0	1	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	1	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	1	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	1	0	0

193  
8/13/13

# Apex-Alpha™

Sample Description: D-14 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_031  
 Chamber Serial Number:  
 Detector Serial Number: 31  
 Env. Background: System Bkgd 64050  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.820E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 12:51:56 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1418 +/- 0.0034 on 6/13/2013 3:23:29 PM  
 Effective Efficiency: 0.1418 +/- 0.0034

Peak Match Tolerance: 0.350 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)
RA-224	5.497	9.32	66.89	0.68	0.00E+000	3.1
RA-226	4.563	22.96	42.98	2.04	0.00E+000	3.1

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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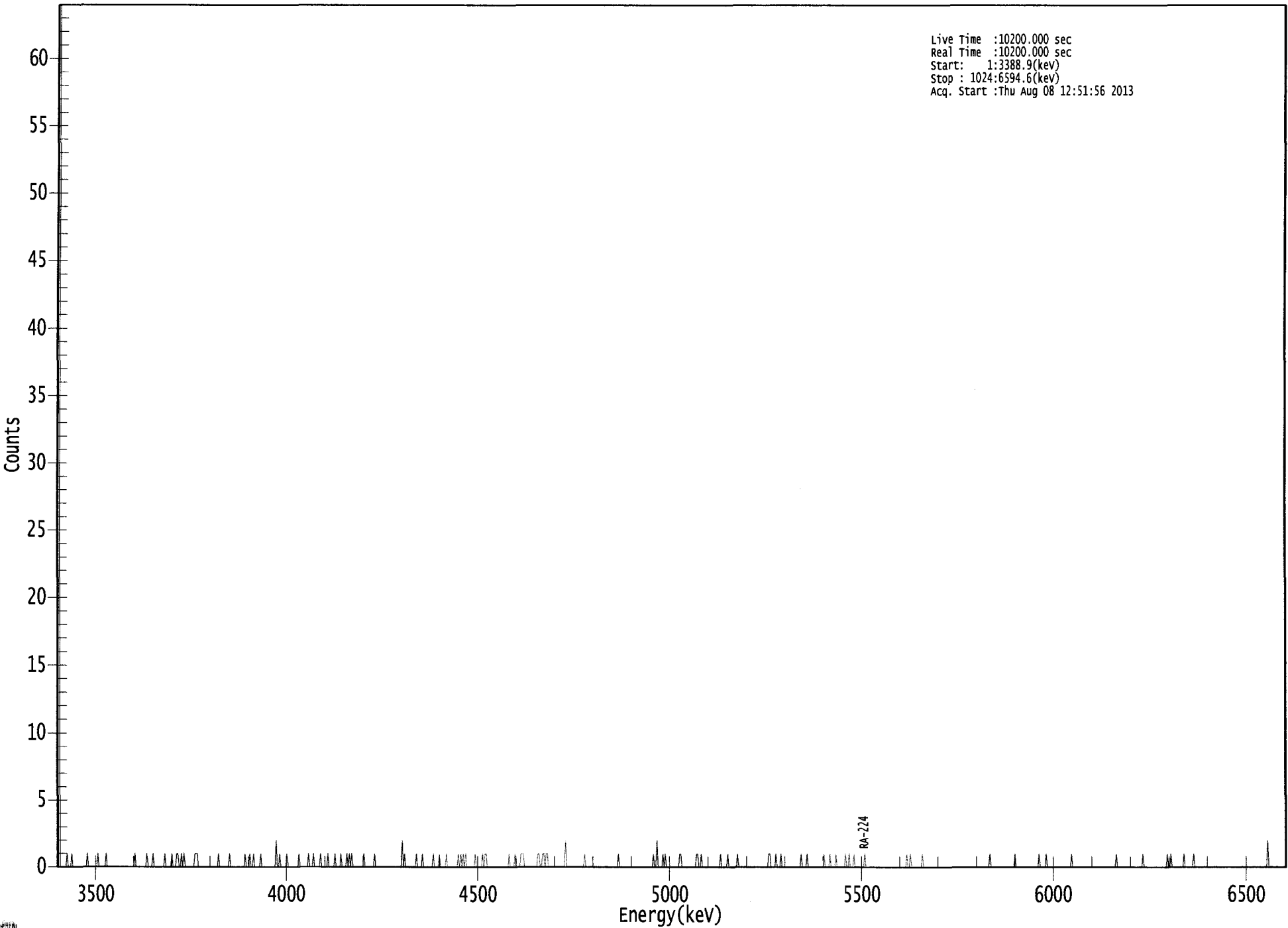
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.954	5685.50*	5.20E-001 +/- 3.49E-001	3.15E-001 +/- 1.50E-002
RA-226	0.938	4785.00*	1.21E+000 +/- 5.23E-001	4.10E-001 +/- 1.95E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065593.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3388.9(kev)  
Stop : 1024:6594.6(kev)  
Acq. Start :Thu Aug 08 12:51:56 2013



03388

ROI Type: 1

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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: 13

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0	0
9:	1	0	0	0	1	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	1	0	0	0	0	0	0
33:	0	0	1	0	0	0	0	0
41:	0	1	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	1	0	0	0	0	0	0
73:	0	0	0	1	0	0	0	0
81:	1	0	0	0	0	0	0	0
89:	0	0	1	0	0	0	0	0
97:	1	0	0	0	1	1	0	0
105:	1	0	1	0	0	0	0	0
113:	0	0	0	1	1	1	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	1
137:	0	0	0	0	0	0	0	0
145:	1	0	0	0	0	0	0	0
153:	0	0	0	0	0	1	0	0
161:	0	1	0	0	1	0	0	0
169:	0	0	1	0	0	0	0	0
177:	0	0	0	0	0	0	0	2
185:	0	0	1	0	0	0	0	0
193:	1	0	0	0	0	0	0	0
201:	0	0	1	0	0	0	0	0
209:	0	0	1	0	0	0	1	0
217:	0	0	0	0	1	0	0	0
225:	0	0	1	0	0	0	0	0
233:	1	0	0	0	0	1	0	0
241:	0	0	1	0	1	0	1	0
249:	0	0	0	0	0	0	0	0
257:	1	0	0	0	0	0	0	0
265:	0	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:	2	0	1	0	0	0	0	0
297:	0	0	0	0	1	0	0	0
305:	0	1	0	0	0	0	0	0
313:	0	0	1	0	0	0	0	1
321:	0	0	0	0	0	1	0	0
329:	0	0	0	0	0	0	0	1
337:	0	1	0	1	0	1	0	0
345:	0	0	0	0	0	1	0	0
353:	0	0	0	1	0	1	1	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 13

Channel	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	1	0
385:	0	0	0	1	1	0	0
393:	0	0	0	0	0	0	0
401:	0	1	1	0	0	1	0
409:	1	1	0	0	0	0	0
417:	0	0	0	0	0	0	0
425:	2	0	0	0	0	0	0
433:	0	0	0	0	0	0	0
441:	1	0	0	0	0	0	0
449:	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0
465:	0	0	0	0	1	0	0
473:	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0
497:	0	1	0	0	2	0	0
505:	0	1	0	1	0	0	0
513:	0	0	0	0	0	0	1
521:	1	0	0	0	0	0	0
529:	0	0	0	0	0	1	0
537:	0	1	0	0	0	0	0
545:	0	0	0	0	0	0	0
553:	0	1	0	0	0	0	1
561:	0	0	0	0	0	0	1
569:	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0
593:	0	1	1	0	0	0	1
601:	0	0	0	1	0	0	0
609:	0	0	0	0	0	0	0
617:	0	0	0	0	1	0	0
625:	0	1	0	0	0	0	0
633:	0	0	0	0	0	0	1
641:	0	0	0	0	1	0	0
649:	0	1	0	0	0	0	0
657:	0	1	0	0	1	0	0
665:	1	0	0	0	0	0	0
673:	0	1	0	0	0	0	0
681:	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0
705:	0	0	0	0	1	0	1
713:	0	0	0	0	0	0	0
721:	0	1	0	0	0	0	0
729:	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0
777:	0	1	0	0	0	0	0
785:	0	0	0	0	0	0	0
793:	0	0	0	0	0	1	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	1	0	0	0	0	0
825:	1	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	1	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	1	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	1	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	1	0	0	1
929:	0	0	0	0	0	0	0	0
937:	0	0	1	0	0	0	0	0
945:	0	0	1	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	2
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

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9/9/13

# Apex-Alpha™

Sample Description: PZ-205-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_003  
 Chamber Serial Number:  
 Detector Serial Number: 3  
 Env. Background: System Bkgd 64034  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.010E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 2:54:37 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9062 +/- 0.0000  
 Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM  
 Effective Efficiency: 0.1583 +/- 0.0030

Peak Match Tolerance: 0.350 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)
RA-224	5.536	34.58	35.74	4.42	0.00E+000	3.0
RA-226	4.601	58.32	25.84	0.68	0.00E+000	3.0

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.971	5685.50*	1.85E+000 +/- 6.63E-001	5.44E-001 +/- 2.00E-002
RA-226	0.957	4785.00*	2.94E+000 +/- 7.67E-001	2.84E-001 +/- 1.04E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065599.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3498.4(keV)  
Stop : 1024:6549.5(keV)  
Acq. Start :Thu Aug 08 14:54:37 2013



ROI Type: 1



\*\*\*\*\*  
 \*\*\*\*\* S P E C T R A L   D A T A   R E P O R T   \*\*\*\*\*  
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Sample Title: 14

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	1	0	1	0	0
9:	1	0	0	1	0	0	2	0
17:	1	0	0	1	0	0	0	0
25:	0	0	0	1	0	0	0	0
33:	0	0	0	0	1	0	0	0
41:	0	0	0	0	0	1	1	0
49:	0	0	2	0	0	0	0	0
57:	0	0	0	0	1	0	0	0
65:	0	0	1	0	1	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	2	0	0	0	1	1	1
89:	0	1	0	0	0	1	0	0
97:	0	0	1	0	1	0	1	0
105:	1	0	0	0	1	1	0	0
113:	0	0	1	0	0	0	0	0
121:	0	0	0	1	0	0	0	1
129:	0	0	1	0	2	0	0	1
137:	0	1	0	0	1	2	0	0
145:	1	0	0	0	0	0	0	0
153:	1	1	1	0	0	1	0	0
161:	1	1	0	0	0	0	0	0
169:	0	0	0	0	0	1	0	0
177:	0	0	0	0	0	1	0	0
185:	1	1	0	0	0	0	0	0
193:	0	1	0	0	1	0	0	1
201:	0	0	0	0	0	0	0	0
209:	0	0	0	1	2	0	0	0
217:	1	0	1	0	1	0	0	1
225:	0	0	1	0	3	0	0	1
233:	0	0	1	2	0	0	1	0
241:	0	0	1	0	0	1	1	1
249:	0	0	0	0	0	1	0	0
257:	0	0	1	1	1	1	0	0
265:	0	1	0	0	1	0	0	0
273:	1	0	0	1	0	0	1	0
281:	1	0	0	0	1	0	0	0
289:	0	1	1	1	0	0	0	0
297:	2	0	0	0	0	0	1	1
305:	1	2	1	0	0	0	0	0
313:	0	0	1	1	1	0	1	1
321:	1	0	0	0	0	0	0	0
329:	1	1	0	1	1	0	0	0
337:	0	0	0	0	0	0	0	0
345:	1	1	1	0	0	0	0	0
353:	1	0	1	0	1	1	0	0
361:	0	0	0	0	0	1	0	1

369: 0 1 0 0 0 0 0 1

Sample Title: 14

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

801: 0 0 0 0 0 0 0 1 0

Sample Title: 14

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	1	0	0
817:	0	0	0	2	0	0	0	0
825:	0	0	0	0	0	1	0	0
833:	0	0	0	0	0	0	0	0
841:	1	0	0	1	0	0	1	0
849:	0	1	0	0	0	0	0	0
857:	1	0	0	1	0	0	0	0
865:	1	0	0	0	1	0	1	1
873:	2	0	0	1	0	0	0	0
881:	1	1	0	1	0	0	0	0
889:	0	0	1	1	0	0	0	0
897:	0	0	0	0	1	0	1	0
905:	0	0	1	0	0	0	0	0
913:	0	0	0	0	1	0	0	1
921:	0	0	0	0	1	0	0	0
929:	0	0	0	0	0	1	1	1
937:	0	1	0	1	0	1	0	0
945:	1	0	0	0	0	0	0	0
953:	1	0	1	1	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	1	0	0	0	0
1001:	0	0	0	1	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

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8/9/13

# Apex-Alpha™

Sample Description: PZ-205-AS DIS  
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
Batch Identification: 1307152A-RA  
Sample Identification: 15  
Sample Geometry: Shelf 2  
Procedure Description: Ra

Detector Name: Alpha\_004  
Chamber Serial Number:  
Detector Serial Number: 4  
Env. Background: System Bkgd 64035  
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
Generic Mult. Factor: 2.940E+000 Generic Div. Factor: 1.000E+000  
Sample Date/Time: 7/18/2013 10:28:54 AM  
Acquisition Date/Time: 8/8/2013 2:54:38 PM  
Acquisition Live Time: 170.0 minutes  
Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9231 +/- 0.0000  
Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM  
Effective Efficiency: 0.1791 +/- 0.0033

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.504	5.28	107.99	2.72	0.00E+000	2.9
RA-226	4.578	30.13	36.98	1.87	0.00E+000	2.9

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----- NUCLIDE ANALYSIS RESULTS -----  
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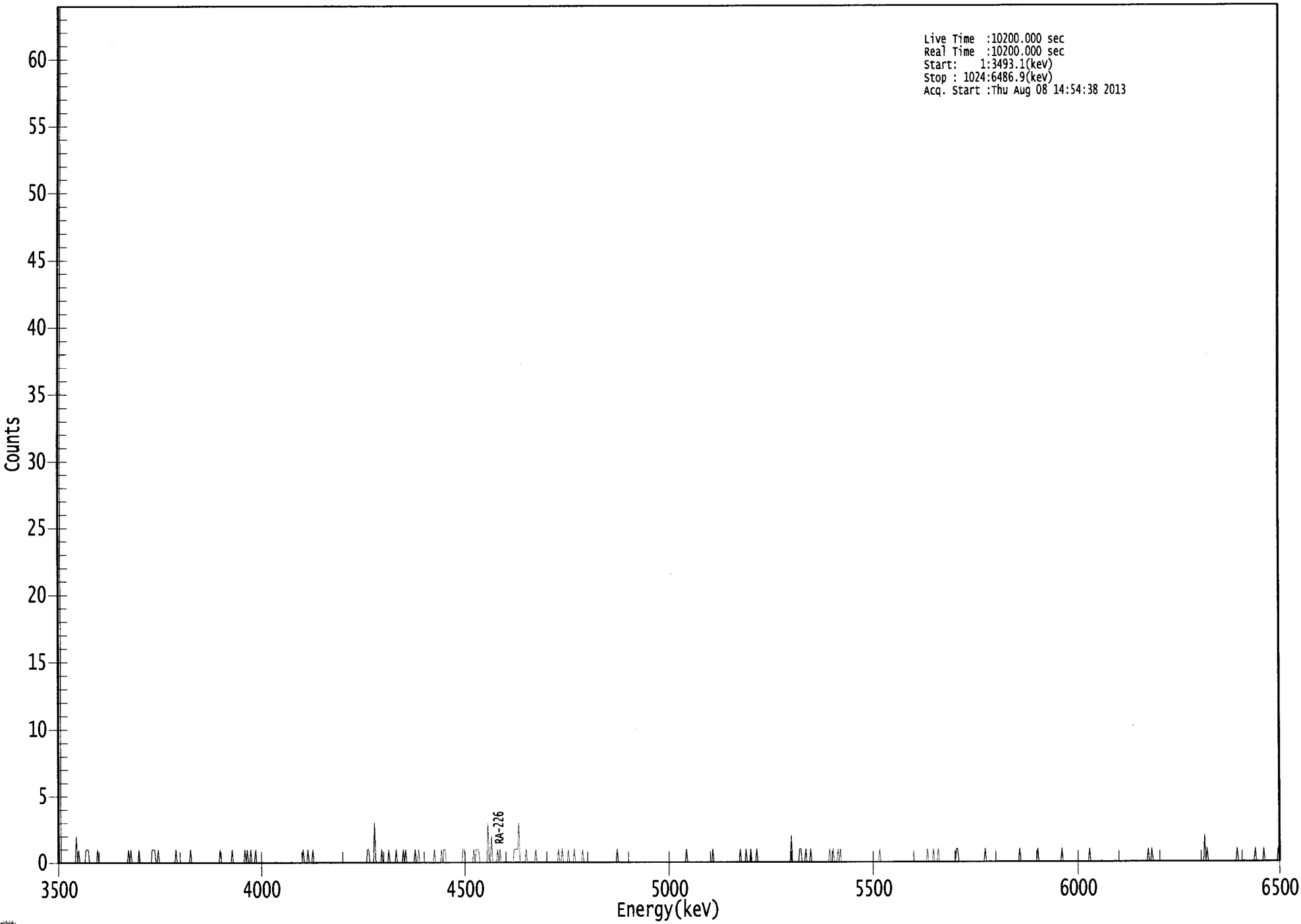
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.958	5685.50*	2.43E-001 +/- 2.63E-001	3.95E-001 +/- 1.42E-002
RA-226	0.946	4785.00*	1.31E+000 +/- 4.87E-001	3.29E-001 +/- 1.19E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

000065598.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3493.1(keV)  
Stop : 1024:6486.9(keV)  
Acq. Start :Thu Aug 08 14:54:38 2013



ROI Type: 1

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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: 15

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	2
17:	0	1	0	0	0	0	0	1
25:	1	1	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	1	0	1	0	0
65:	0	0	0	0	1	0	0	0
73:	0	0	0	0	0	0	0	1
81:	1	1	0	0	1	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	1
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	1	0	0	0	0	0
153:	0	0	0	0	0	1	0	1
161:	0	0	1	0	0	0	1	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	0	0	0	0	0	1	0
209:	0	0	1	0	0	0	1	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	1	1	0	0
265:	0	0	3	0	0	0	0	0
273:	1	0	0	0	0	0	1	0
281:	0	0	0	0	1	0	0	0
289:	0	0	1	0	1	0	0	0
297:	0	0	0	0	1	0	0	1
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	1	0	0	0
321:	0	0	1	0	1	1	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	1	1	0	0
345:	0	0	0	0	0	1	0	1
353:	1	1	0	0	0	0	0	0
361:	0	3	0	0	2	0	0	0

369: 0 1 0 1 0 0 0 0

Sample Title: 15

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	1
385:	1	1	1	3	0	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	1	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	1	0	0	1
425:	0	0	0	0	1	0	0	0
433:	0	1	0	0	0	0	0	0
441:	1	0	0	0	0	0	0	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	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	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	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	1	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	1	0	0	0
577:	0	1	0	0	0	1	0	0
585:	0	0	1	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	2
617:	0	0	0	0	0	0	1	1
625:	0	0	0	1	0	0	0	1
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	1
649:	0	0	1	0	0	0	1	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	1	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	1	0	0	0	0	1	0
737:	0	0	1	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	1	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	1	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 1 0

Sample Title: 15

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	1	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	0
913:	0	1	0	0	1	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:	2	0	1	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	1	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	1	0	0	0	0	0
1009:	0	1	0	0	0	0	0	0
1017:	0	0	0	0	0	1	0	0



10/5  
8/2/13

# Apex-Alpha™

Sample Description: I-65 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 16  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_010  
 Chamber Serial Number:  
 Detector Serial Number: 10  
 Env. Background: System Bkgd 64036  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 4.000E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 2:54:33 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9529 +/- 0.0000  
 Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM  
 Effective Efficiency: 0.1875 +/- 0.0034

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.513	14.88	61.84	6.12	0.00E+000	4.4
RA-226	4.555	24.79	41.37	2.21	0.00E+000	4.4

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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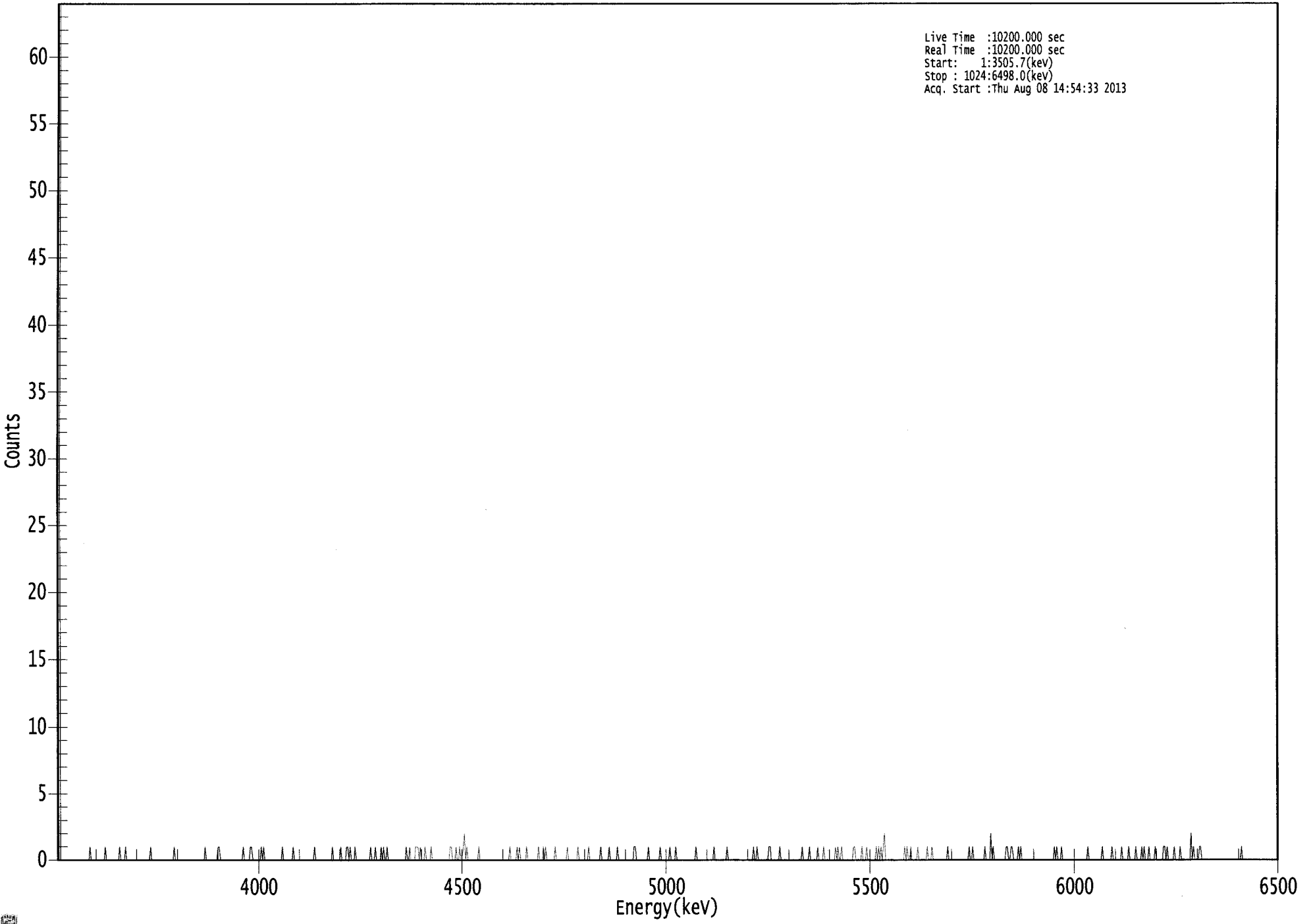
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.962	5685.50*	8.91E-001 +/- 5.52E-001	6.89E-001 +/- 2.47E-002
RA-226	0.933	4785.00*	1.40E+000 +/- 5.82E-001	4.52E-001 +/- 1.62E-002

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

000065594.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3505.7(keV)  
Stop : 1024:6498.0(keV)  
Acq. Start :Thu Aug 08 14:54:33 2013



ROI Type: 1

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

Sample Title: 16

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	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:	1	0	0	0	0	0	0	0
49:	0	0	0	0	1	0	0	0
57:	0	1	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	1	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	1	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	1	0	0	0
129:	0	0	0	0	0	0	0	1
137:	1	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	1	0	0	0
161:	0	0	1	1	0	0	0	0
169:	0	0	0	1	0	1	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	1	0	0
193:	0	0	0	0	0	0	1	0
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	0
225:	0	0	0	0	0	0	0	1
233:	0	0	0	0	0	0	1	0
241:	0	0	0	1	1	0	1	0
249:	0	0	1	0	0	0	0	0
257:	0	0	0	0	0	0	0	1
265:	0	0	0	1	0	0	0	0
273:	1	0	1	0	0	1	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	1	0	0
297:	1	0	0	0	0	1	1	1
305:	0	1	0	0	0	1	0	0
313:	0	0	1	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	1	1	0	0	0	1
337:	0	0	1	0	0	1	2	0
345:	1	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 0

Sample Title: 16

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

801: 1 1 0 0 0 0 1 0

Sample Title: 16

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	1	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	1	0	1	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:	1	0	0	0	0	0	0	0
873:	0	0	0	0	1	0	0	0
881:	0	0	0	0	1	0	0	0
889:	0	0	0	0	1	0	0	0
897:	0	0	1	0	0	0	0	0
905:	1	0	0	0	0	1	0	1
913:	0	0	0	1	0	0	0	0
921:	1	0	0	0	0	0	0	1
929:	1	0	1	0	0	0	0	0
937:	1	0	0	0	0	1	0	0
945:	0	0	0	0	0	0	2	0
953:	1	0	0	0	0	1	1	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:	1	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  
7/18/13

Sample Description: I-65 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 17  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_011  
 Chamber Serial Number:  
 Detector Serial Number: 11  
 Env. Background: System Bkgd 64037  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.530E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 2:54:34 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8884 +/- 0.0000  
 Counting Efficiency: 0.2051 +/- 0.0035 on 7/20/2013 2:50:46 PM  
 Effective Efficiency: 0.1822 +/- 0.0031

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.569	5.32	91.11	0.68	0.00E+000	2.6
RA-226	4.686	7.83	70.93	0.17	0.00E+000	2.6

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

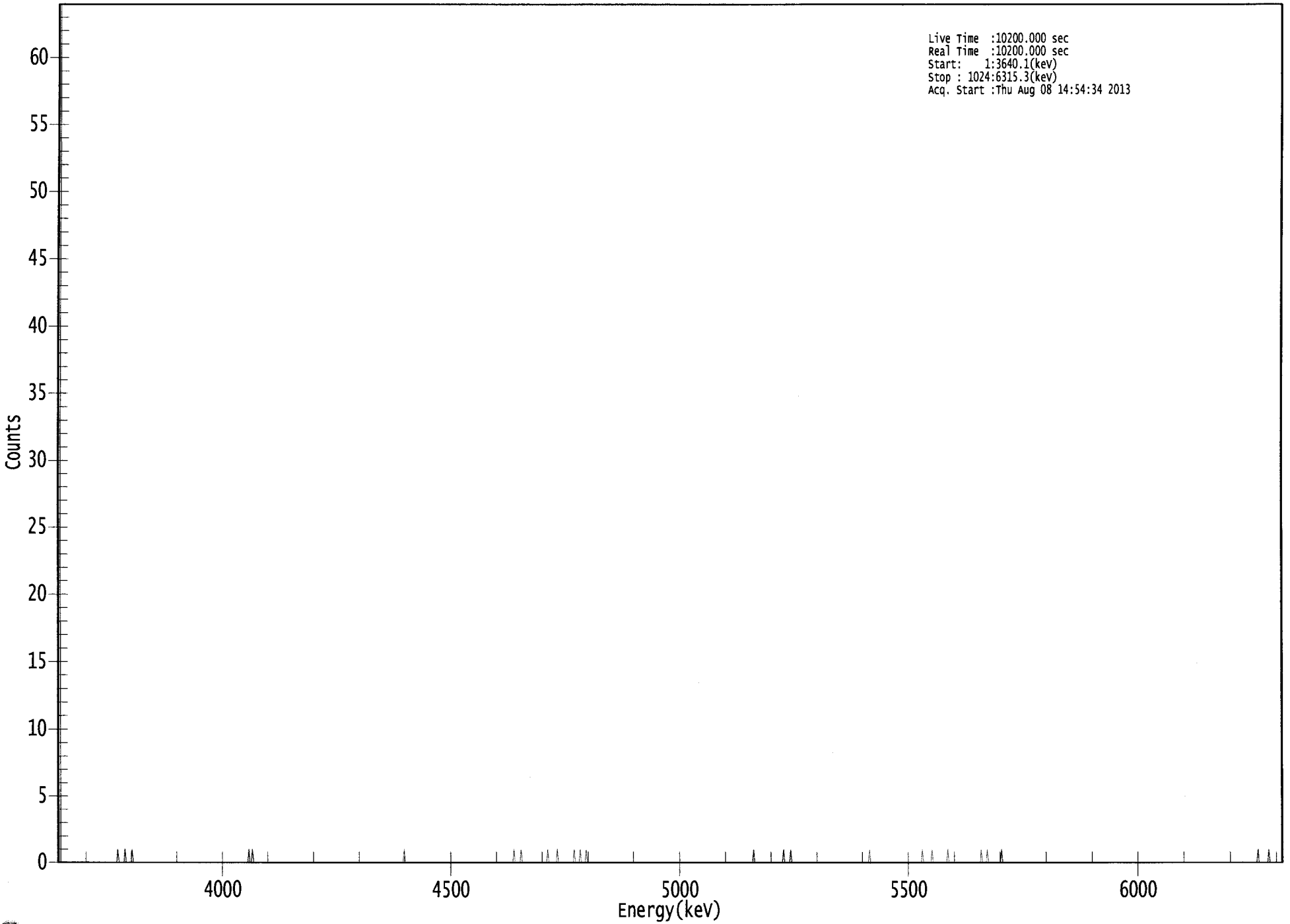
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.982	5685.50*	2.07E-001 +/- 1.89E-001	2.20E-001 +/- 7.45E-003
RA-226	0.987	4785.00*	2.88E-001 +/- 2.05E-001	1.54E-001 +/- 5.19E-003

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

0000065595.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3640.1(kev)  
Stop : 1024:6315.3(kev)  
Acq. Start :Thu Aug 08 14:54:34 2013



0000

ROI Type: 1

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

Sample Title: 17

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	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	1	0	0	0	0	0
57:	1	0	0	0	0	0	1	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:	1	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	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	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	1	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:	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	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: 17

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	1	0
385:	0	0	0	0	1	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	1	0	0	0	0	0
417:	0	0	1	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	1	0	0	0	0	1	0	0
441:	0	0	1	0	0	0	0	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	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	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	1	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	1
609:	0	0	0	0	0	1	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	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	1
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	1	0	0	0	0
729:	0	0	0	1	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	1	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	1	0	0	0
777:	0	1	0	0	0	0	0	0
785:	0	0	0	0	0	1	0	0
793:	0	0	0	0	0	0	0	0

801: 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	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	1	0	0	0	0	0
1009:	0	0	0	1	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KP  
8/9/13

# Apex-Alpha™

Sample Description: D-13 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 18  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_012  
 Chamber Serial Number:  
 Detector Serial Number: 12  
 Env. Background: System Bkgd 64038  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.740E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 2:54:35 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1989 +/- 0.0034 on 12/11/2011 2:21:56 PM  
 Effective Efficiency: 0.1989 +/- 0.0034

Peak Match Tolerance: 0.350 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)
RA-224	5.569	10.32	63.32	0.68	0.00E+000	3.0
RA-226	4.624	21.32	43.23	0.68	0.00E+000	3.0

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 -----  
 NUCLIDE ANALYSIS RESULTS  
 -----  
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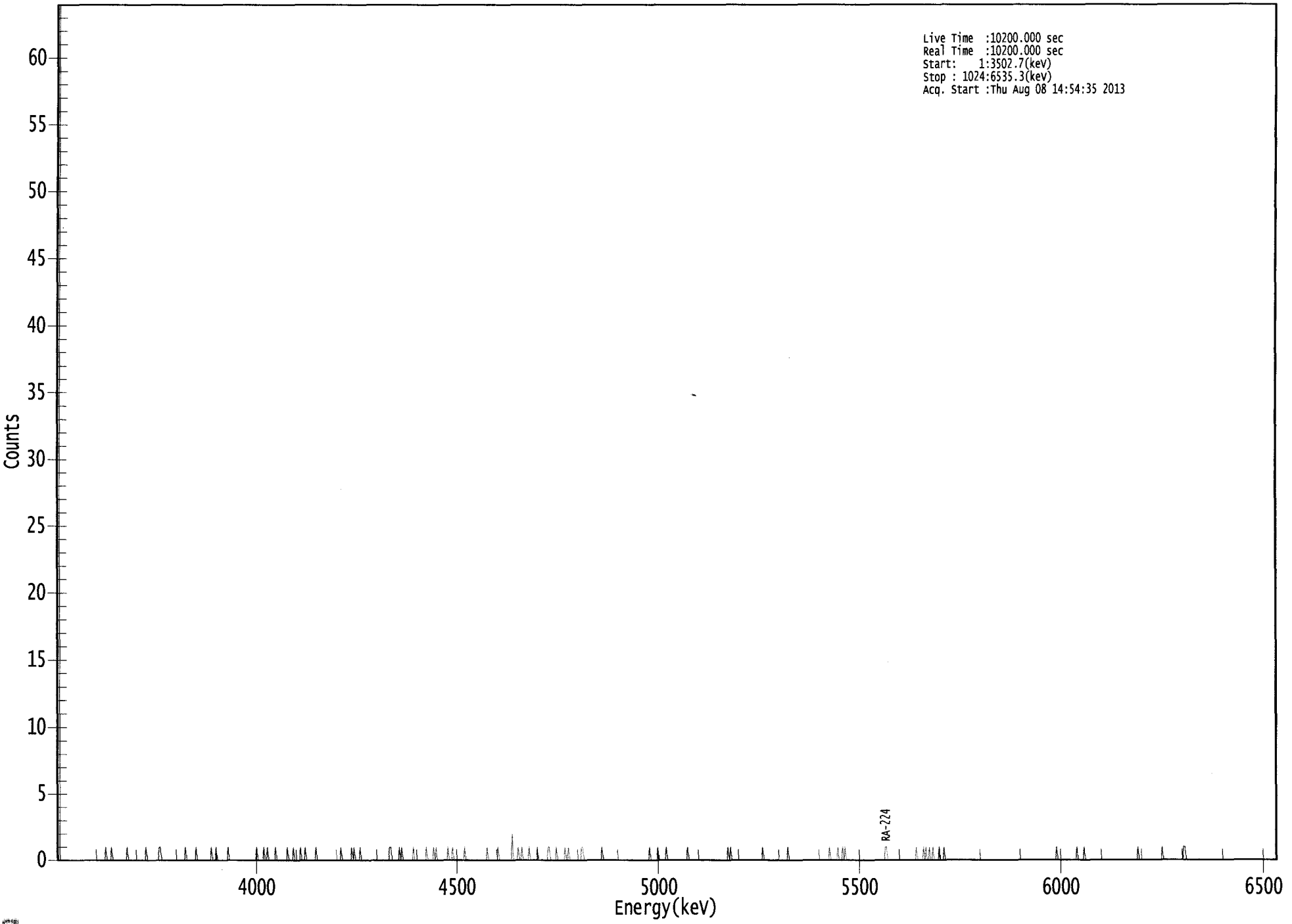
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.983	5685.50*	3.99E-001 +/- 2.53E-001	2.18E-001 +/- 7.42E-003
RA-226	0.967	4785.00*	7.78E-001 +/- 3.37E-001	2.06E-001 +/- 6.99E-003

AG  
8/9/13

US EPA ARCHIVE DOCUMENT

000065596.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3502.7(kev)  
Stop : 1024:6535.3(kev)  
Acq. Start :Thu Aug 08 14:54:35 2013



ROI Type: 1

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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:	10200	10200	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	1	0	0	0	0	1	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	1	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	1	0	0	0	0
81:	0	0	0	0	0	0	1	1
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	1	0	0	0
113:	0	0	0	0	0	1	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	1	0	0	0	1	0
137:	0	0	0	0	0	0	0	0
145:	1	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:	1	0	0	0	0	0	1	0
177:	0	1	0	0	0	0	0	0
185:	1	0	0	0	0	0	0	0
193:	0	0	1	0	0	0	0	1
201:	0	0	0	0	0	1	0	0
209:	0	1	0	0	0	0	0	0
217:	0	0	1	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	1
241:	0	0	0	0	0	0	0	0
249:	1	0	1	0	0	0	0	1
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:	1	1	0	0	0	0	0	0
289:	1	0	1	0	0	0	0	0
297:	0	0	0	0	1	0	0	0
305:	0	0	0	0	0	0	0	1
313:	0	0	0	0	0	1	0	1
321:	0	0	0	0	0	0	0	0
329:	0	1	0	0	0	1	0	0
337:	0	0	0	0	0	0	0	1
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	1	0	0	0	0	0

369: 0 0 0 1 0 0 0 0

Sample Title: 18

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	2
385:	0	0	0	0	1	0	0	1
393:	0	0	0	0	0	1	0	0
401:	0	0	0	0	1	0	0	0
409:	0	0	0	0	0	1	1	0
417:	0	0	0	0	1	0	0	0
425:	0	0	0	1	0	0	1	0
433:	0	0	0	0	0	0	0	0
441:	0	1	1	0	0	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	1	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	0	0	0
497:	0	0	1	0	0	0	0	0
505:	0	1	0	0	0	0	0	0
513:	1	0	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:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	1	0	1	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	1	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	1	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	1	0	0	0	0	0	0
657:	1	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	0
697:	1	1	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	1	0	0	0	0	0
729:	1	0	1	0	0	1	0	0
737:	1	0	0	0	0	1	0	0
745:	0	1	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	1
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	1	0	0	0	0	0	1	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	1	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	1
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	1	1	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  
8/8/13



Sample Description: D-13 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307152A-RA  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_013  
 Chamber Serial Number:  
 Detector Serial Number: 13  
 Env. Background: System Bkgd 64039  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.580E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/18/2013 10:28:54 AM  
 Acquisition Date/Time: 8/8/2013 2:54:36 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM  
 Effective Efficiency: 0.1869 +/- 0.0035

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.508	7.92	88.17	4.08	0.00E+000	2.8
RA-226	4.587	29.81	36.73	1.19	0.00E+000	5.7

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.960	5685.50*	3.07E-001 +/- 2.71E-001	3.83E-001 +/- 1.39E-002
RA-226	0.950	4785.00*	1.09E+000 +/- 4.02E-001	2.41E-001 +/- 8.73E-003

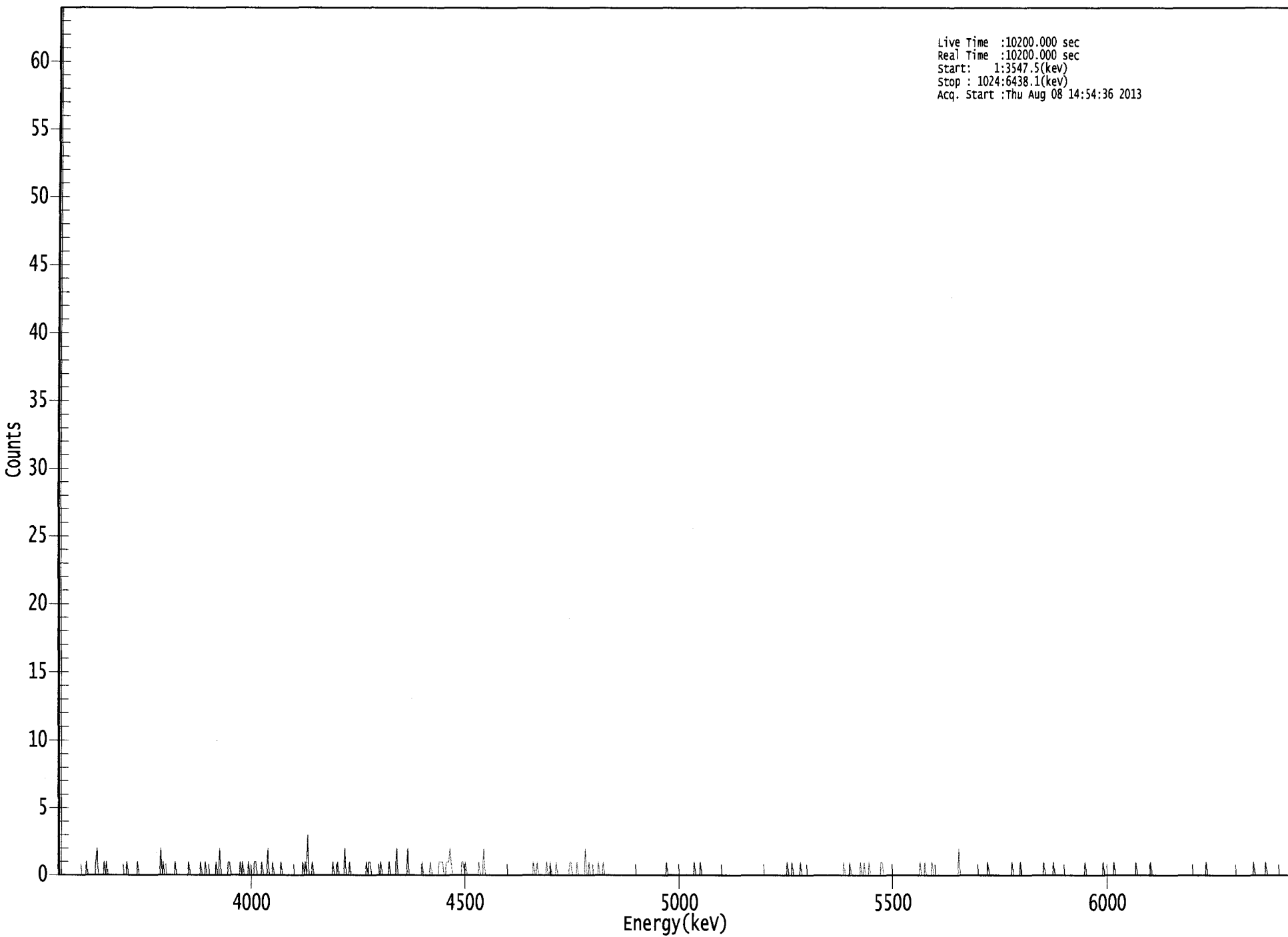
AG  
8/9/13

US EPA ARCHIVE DOCUMENT



000065597.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3547.5(kev)  
Stop : 1024:6438.1(kev)  
Acq. Start :Thu Aug 08 14:54:36 2013



0170

ROI Type: 1

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

Sample Title: 19

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	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	1
33:	2	0	0	0	0	0	1	0
41:	1	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	1	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	2	0	1
89:	0	0	0	0	0	0	0	0
97:	0	1	0	0	0	0	0	0
105:	0	0	0	0	1	0	0	0
113:	0	0	0	0	0	0	1	0
121:	0	0	1	0	0	0	0	0
129:	0	0	0	1	0	0	2	0
137:	0	0	0	0	0	1	1	0
145:	0	0	0	0	0	0	0	1
153:	0	1	0	0	0	0	1	0
161:	0	0	0	1	1	0	0	0
169:	0	1	0	0	0	0	2	0
177:	0	0	1	0	0	0	0	0
185:	0	1	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	1	0	1	0	3
209:	0	0	0	1	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	1	0	0	0
233:	1	0	0	0	0	0	2	0
241:	0	0	1	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	1	0	1	1	0	0	0	0
265:	0	0	0	0	1	0	0	0
273:	0	0	0	1	0	0	0	0
281:	0	2	0	0	0	0	0	0
289:	0	0	2	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	1	1	1	1
321:	0	0	1	1	1	2	1	0
329:	0	0	0	0	0	0	0	1
337:	1	0	1	0	0	0	0	0
345:	0	0	0	0	0	1	0	0
353:	0	2	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 19

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	1	0	0	1	0	0
401:	0	0	0	0	0	1	0	0
409:	1	0	0	0	0	1	0	0
417:	0	0	0	0	0	0	0	0
425:	1	1	0	0	0	0	1	0
433:	0	0	0	0	0	2	0	0
441:	1	0	0	0	0	0	0	0
449:	1	0	0	0	1	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	0	0	0
497:	0	0	0	0	0	0	0	0
505:	1	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	0	0	0	1	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	1	0	0	0
609:	1	0	0	0	0	0	0	1
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	1	0	0	0	0
657:	1	0	0	0	0	0	0	0
665:	0	1	0	0	1	0	0	0
673:	1	0	0	0	0	0	0	0
681:	0	0	1	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	1	0	0	0	1	0
721:	0	0	0	0	1	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	2	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	1	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	1	0
793:	0	0	0	0	0	1	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:	1	0	0	0	0	0	0	0
825:	1	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	1	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	1	0	0	0	0	0	0
873:	0	0	1	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	1	0	0	0
897:	0	0	0	0	0	0	0	0
905:	1	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	1	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	1	0	0
993:	0	0	0	0	0	0	0	1
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	1	0	0	0	0



## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

Date : 8/8/2013

Time : 7:55:58 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/8/2013 5:38:35 AM
Alpha 004	21f	ALL	Passed	8/8/2013 5:38:36 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	8/8/2013 5:38:37 AM
Alpha 011	21f	ALL	Passed	8/8/2013 5:38:38 AM
Alpha 012	21f	ALL	Passed	8/8/2013 5:38:39 AM
Alpha 013	21f	ALL	Passed	8/8/2013 5:38:40 AM
Alpha 014	21f	ALL	Passed	8/8/2013 5:38:40 AM
Alpha 015	21f	Peak Energy	Action	8/8/2013 5:38:41 AM
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	8/8/2013 5:38:42 AM
Alpha 019	AIM730	ALL	Passed	8/8/2013 5:38:43 AM
Alpha 020	AIM730	ALL	Passed	8/2/2013 5:14:08 AM
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/8/2013 5:38:44 AM
Alpha 023	AIM730	ALL	Passed	8/8/2013 5:38:45 AM
Alpha 024	AIM730	ALL	Passed	8/8/2013 5:38:45 AM
Alpha 025	AIM730	ALL	Passed	8/8/2013 5:38:46 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/8/2013 5:38:47 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/8/2013 5:38:48 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/8/2013 5:38:49 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:38:50 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:38:51 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:38:52 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:38:54 AM
Alpha 037	Alpha Analyst100DC	ALL	Not Done	
Alpha 038	Alpha Analyst100DC	Peak FWHM	Action	8/8/2013 5:38:55 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:38:57 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:38:58 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:39:00 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:39:02 AM

US EPA ARCHIVE DOCUMENT

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 043	Alpha Analyst100DC	ALL	Not Done	
Alpha 044	Alpha Analyst100DC	ALL	Not Done	
Alpha 045	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:39:03 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:39:05 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:39:06 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:39:08 AM

APPROVED BY: \_\_\_\_\_ ✓

APPROVAL DATE: \_\_\_\_\_ 8/8/13

US EPA ARCHIVE DOCUMENT

\*\*\*\*\*  
\*\*\*\*\* LIBRARY LISTING REPORT \*\*\*\*\*  
\*\*\*\*\*

Nuclide Library Title: Radium

Nuclide Library Description: Ra-226, Po-218, Rn-222

Nuclide Name	Half-Life (Seconds)	Energy (keV )	Energy Uncert. (keV )	Yield (%)	Yield Uncert. (Abs.+)
PO-218	5.049E+010	6003.000*	0.000	99.9800	0.0000
RN-222	5.049E+010	5490.000*	0.000	99.9200	0.0000
RA-226	5.049E+010	4785.000*	0.000	100.0000	0.0000

\* = key line

TOTALS:            3    Nuclides            3    Energy Lines

**SECTION XI  
ANALYTICAL DATA (RADIUM-228)**



Work Order	<b>13-07152</b>
Analysis Code	<b>Ra228</b>
Run	<b>1</b>
Date Received	<b>7/22/2013</b>
Lab Deadline	<b>8/13/2013</b>
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	<b>4</b>
Activity Units	pCi
Aliquot Units	<b>1</b>
Matrix	WA
Method	E904.0
Instrument Type	Alpha/Beta GPC
Radiometric Tracer	Ba-133
Radiometric Sol#	Ba-6a
Tracer Act (dpm/g)	990.581
Carrier	Yttrium
Carrier Conc (mg/ml)	34

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		07/24/13 00:00	1.0000E+00
02	MBL	BLANK		07/24/13 00:00	1.0000E+00
03	DUP	PZ-203-SS TOT	38	07/17/13 13:58	1.0000E+00
04	DO	PZ-203-SS TOT	38	07/17/13 13:58	1.0000E+00
05	TRG	PZ-203-SS DIS	38	07/17/13 13:58	1.0000E+00
06	TRG	D-87 TOT	42	07/17/13 14:11	1.0000E+00
07	TRG	D-87 DIS	42	07/17/13 14:11	1.0000E+00
08	TRG	DUP 06 TOT	39	07/17/13 00:00	1.0000E+00
09	TRG	DUP 06 DIS	39	07/17/13 00:00	1.0000E+00
10	TRG	S-53 TOT	43	07/18/13 07:30	1.0000E+00
11	TRG	S-53 DIS	43	07/18/13 07:30	1.0000E+00
12	TRG	D-14 TOT	45	07/18/13 09:30	1.0000E+00
13	TRG	D-14 DIS	45	07/18/13 09:30	1.0000E+00
14	TRG	PZ-205-AS TOT	42	07/18/13 09:46	1.0000E+00
15	TRG	PZ-205-AS DIS	42	07/18/13 09:46	1.0000E+00
16	TRG	I-65 TOT	41	07/18/13 10:59	1.0000E+00
17	TRG	I-65 DIS	41	07/18/13 10:59	1.0000E+00
18	TRG	D-13 TOT	43	07/18/13 12:19	1.0000E+00
19	TRG	D-13 DIS	43	07/18/13 12:19	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.

0425

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	0.9265	917.8	469.4	113.54	2.000	0.0951	0.1527	0.0576	84.71	93.18	1.00	1.00
02	MBL	0.9144	905.8	417.4	102.30	2.000	0.0951	0.1523	0.0572	84.12	86.05	1.00	1.00
03	DUP	0.9161	907.5	377.8	92.42	2.000	0.0927	0.1503	0.0576	84.71	78.29	1.00	1.00
04	DO	0.9103	901.7	412.1	101.46	2.000	0.0925	0.1495	0.0570	83.82	85.04	1.00	1.00
05	TRG	0.9140	905.4	402.4	98.67	2.000	0.0931	0.1498	0.0567	83.38	82.27	1.00	1.00
06	TRG	0.9103	901.7	350.2	86.22	2.000	0.0925	0.1532	0.0607	89.26	76.96	1.00	1.00
07	TRG	0.9094	900.8	359.0	88.47	2.000	0.0924	0.1510	0.0586	86.18	76.24	1.00	1.00
08	TRG	0.9112	902.6	379.4	93.31	2.000	0.0928	0.1517	0.0589	86.62	80.83	1.00	1.00
09	TRG	0.9099	901.3	355.7	87.61	2.000	0.0933	0.1517	0.0584	85.88	75.24	1.00	1.00
10	TRG	0.9084	899.8	339.0	83.63	2.000	0.0927	0.1514	0.0587	86.32	72.20	1.00	1.00
11	TRG	0.9082	899.6	383.6	94.66	2.000	0.0925	0.1514	0.0589	86.62	81.99	1.00	1.00
12	TRG	0.9077	899.2	303.2	74.86	2.000	0.0932	0.1521	0.0589	86.62	64.84	1.00	1.00
13	TRG	0.9079	899.3	406.3	100.29	2.000	0.0926	0.1492	0.0566	83.24	83.48	1.00	1.00
14	TRG	0.9113	902.7	368.5	90.62	2.000	0.0926	0.1507	0.0581	85.44	77.43	1.00	1.00
15	TRG	0.9114	902.8	375.4	92.31	2.000	0.0912	0.1465	0.0553	81.32	75.07	1.00	1.00
16	TRG	0.9231	914.4	392.5	95.29	2.000	0.0907	0.1485	0.0578	85.00	81.00	1.00	1.00
17	TRG	0.9112	902.6	361.2	88.84	2.000	0.0904	0.1534	0.0630	92.65	82.31	1.00	1.00
18	TRG	0.9161	907.5	409.2	100.10	2.000	0.0912	0.1534	0.0622	91.47	91.57	1.00	1.00
19	TRG	0.9078	899.2	412.4	101.81	2.000	0.0908	0.1440	0.0532	78.24	79.65	1.00	1.00

\* 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.

0427

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			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
02	MBL			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
03	DUP			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
04	DO			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
05	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
06	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
07	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
08	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
09	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
10	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
11	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
12	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
13	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
14	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
15	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
16	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
17	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
18	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH
19	TRG			08/05/13 09:31	JWOLFE	08/07/13 16:49	LWALKER	08/13/13 06:39	TSMITH

\* 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.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-Ra228-1**

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	RA-228	LCS	LCS	pCi/l	8.21E+00	1.65E+00	1.59E+00	8.83E+00	92.97	OK		OK	
02	RA-228	MBL	BLANK	pCi/l	4.07E-01	4.96E-01	1.01E+00					OK	OK
03	RA-228	DUP	PZ-203-SS TOT	pCi/l	7.64E-01	6.28E-01	1.26E+00				NA	OK	
04	RA-228	DO	PZ-203-SS TOT	pCi/l	1.19E+00	5.53E-01	1.04E+00					OK	
05	RA-228	TRG	PZ-203-SS DIS	pCi/l	7.91E-01	5.97E-01	1.19E+00					OK	
06	RA-228	TRG	D-87 TOT	pCi/l	3.37E+00	8.08E-01	1.38E+00					OK	
07	RA-228	TRG	D-87 DIS	pCi/l	3.26E+00	8.30E-01	1.44E+00					OK	
08	RA-228	TRG	DUP 06 TOT	pCi/l	5.45E-01	6.27E-01	1.28E+00					OK	
09	RA-228	TRG	DUP 06 DIS	pCi/l	1.44E+00	7.02E-01	1.34E+00					OK	
10	RA-228	TRG	S-53 TOT	pCi/l	2.66E+00	8.38E-01	1.51E+00					OK	
11	RA-228	TRG	S-53 DIS	pCi/l	9.43E-01	7.10E-01	1.42E+00					OK	
12	RA-228	TRG	D-14 TOT	pCi/l	3.13E+00	8.59E-01	1.48E+00					OK	
13	RA-228	TRG	D-14 DIS	pCi/l	2.40E+00	6.47E-01	1.10E+00					OK	
14	RA-228	TRG	PZ-205-AS TOT	pCi/l	9.23E-01	6.73E-01	1.33E+00					OK	
15	RA-228	TRG	PZ-205-AS DIS	pCi/l	1.24E+00	7.42E-01	1.45E+00					OK	
16	RA-228	TRG	I-65 TOT	pCi/l	1.12E+00	6.97E-01	1.37E+00					OK	
17	RA-228	TRG	I-65 DIS	pCi/l	1.24E+00	6.49E-01	1.25E+00					OK	
18	RA-228	TRG	D-13 TOT	pCi/l	1.87E+00	6.45E-01	1.18E+00					OK	
19	RA-228	TRG	D-13 DIS	pCi/l	2.30E+00	6.87E-01	1.21E+00					OK	

Run	1	Analysis Code	Ra228	Eberline Services Work Order	13-07152	Client	Engineering Management Support, Inc.

6276

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-Ra228-1**



**Run** 1

**Analysis Code** Ra228

**Eberline Services Work Order** 13-07152

**Client** Engineering Management Support, Inc.

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	RA-228	LCS	07/24/13 00:00	1.00E+00	113.54	84.71	93.18	1.00	8/7/2013 16:49	8/13/2013 6:39
02	RA-228	MBL	07/24/13 00:00	1.00E+00	102.30	84.12	86.05	1.00	8/7/2013 16:49	8/13/2013 6:39
03	RA-228	DUP	07/17/13 13:58	1.00E+00	92.42	84.71	78.29	1.00	8/7/2013 16:49	8/13/2013 6:39
04	RA-228	DO	07/17/13 13:58	1.00E+00	101.46	83.82	85.04	1.00	8/7/2013 16:49	8/13/2013 6:39
05	RA-228	TRG	07/17/13 13:58	1.00E+00	98.67	83.38	82.27	1.00	8/7/2013 16:49	8/13/2013 6:39
06	RA-228	TRG	07/17/13 14:11	1.00E+00	86.22	89.26	76.96	1.00	8/7/2013 16:49	8/13/2013 6:39
07	RA-228	TRG	07/17/13 14:11	1.00E+00	88.47	86.18	76.24	1.00	8/7/2013 16:49	8/13/2013 6:39
08	RA-228	TRG	07/17/13 00:00	1.00E+00	93.31	86.62	80.83	1.00	8/7/2013 16:49	8/13/2013 6:39
09	RA-228	TRG	07/17/13 00:00	1.00E+00	87.61	85.88	75.24	1.00	8/7/2013 16:49	8/13/2013 6:39
10	RA-228	TRG	07/18/13 07:30	1.00E+00	83.63	86.32	72.20	1.00	8/7/2013 16:49	8/13/2013 6:39
11	RA-228	TRG	07/18/13 07:30	1.00E+00	94.66	86.62	81.99	1.00	8/7/2013 16:49	8/13/2013 6:39
12	RA-228	TRG	07/18/13 09:30	1.00E+00	74.86	86.62	64.84	1.00	8/7/2013 16:49	8/13/2013 6:39
13	RA-228	TRG	07/18/13 09:30	1.00E+00	100.29	83.24	83.48	1.00	8/7/2013 16:49	8/13/2013 6:39
14	RA-228	TRG	07/18/13 09:46	1.00E+00	90.62	85.44	77.43	1.00	8/7/2013 16:49	8/13/2013 6:39
15	RA-228	TRG	07/18/13 09:46	1.00E+00	92.31	81.32	75.07	1.00	8/7/2013 16:49	8/13/2013 6:39
16	RA-228	TRG	07/18/13 10:59	1.00E+00	95.29	85.00	81.00	1.00	8/7/2013 16:49	8/13/2013 6:39
17	RA-228	TRG	07/18/13 10:59	1.00E+00	88.84	92.65	82.31	1.00	8/7/2013 16:49	8/13/2013 6:39
18	RA-228	TRG	07/18/13 12:19	1.00E+00	100.10	91.47	91.57	1.00	8/7/2013 16:49	8/13/2013 6:39
19	RA-228	TRG	07/18/13 12:19	1.00E+00	101.81	78.24	79.65	1.00	8/7/2013 16:49	8/13/2013 6:39

0070

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07152-Ra228-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-228	LCS	08/13/13 10:42		LB4110A	A3	30	188	1.35	0.4719
02	RA-228	MBL	08/13/13 10:45		LB4110R	A1	120	133	0.9	0.4776
03	RA-228	DUP	08/13/13 10:45		LB4110R	A2	120	176	1.116666667	0.4699
04	RA-228	DO	08/13/13 10:45		LB4110R	A3	120	185	0.933333333	0.4809
05	RA-228	TRG	08/13/13 10:45		LB4110R	A4	120	180	1.116666667	0.4732
06	RA-228	TRG	08/13/13 10:45		LB4110R	B1	120	346	1.35	0.4754
07	RA-228	TRG	08/13/13 10:45		LB4110R	B2	120	339	1.383333333	0.4658
08	RA-228	TRG	08/13/13 10:45		LB4110R	B3	120	181	1.25	0.4713
09	RA-228	TRG	08/13/13 10:45		LB4110R	B4	120	223	1.216666667	0.4773
10	RA-228	TRG	08/13/13 10:45		LB4110R	C1	120	303	1.4	0.4705
11	RA-228	TRG	08/13/13 10:45		LB4110R	C2	120	242	1.566666667	0.4676
12	RA-228	TRG	08/13/13 10:45		LB4110R	C3	120	262	1.016666667	0.4614
13	RA-228	TRG	08/13/13 10:45		LB4110R	C4	120	259	0.983333333	0.4714
14	RA-228	TRG	08/13/13 10:43		LB4110A	C1	120	198	1.233333333	0.4667
15	RA-228	TRG	08/13/13 10:43		LB4110A	C2	120	222	1.316666667	0.4578
16	RA-228	TRG	08/13/13 10:43		LB4110A	C3	120	238	1.45	0.4699
17	RA-228	TRG	08/13/13 10:43		LB4110A	C4	120	220	1.233333333	0.4692
18	RA-228	TRG	08/13/13 10:43		LB4110A	D2	120	284	1.366666667	0.4682
19	RA-228	TRG	08/13/13 10:43		LB4110A	D4	120	262	1.1	0.4741


Run	1
	1
Analysis Code	Ra228
	Ra228
Eberline Services Work Order	13-07152
	13-07152
Client	Engineering Management Support, Inc.
	Engineering Management Support, Inc.

0470

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	07/24/13 00:00	1.0000	0.9265	917.7733	469.4000	113.54	1.00	1.00
02	MBL	BLANK	07/24/13 00:00	1.0000	0.9144	905.7873	417.4000	102.30	1.00	1.00
03	DUP	PZ-203-SS TOT	07/17/13 13:58	1.0000	0.9161	907.4713	377.8000	92.42	1.00	1.00
04	DO	PZ-203-SS TOT	07/17/13 13:58	1.0000	0.9103	901.7259	412.1000	101.46	1.00	1.00
05	TRG	PZ-203-SS DIS	07/17/13 13:58	1.0000	0.9140	905.3910	402.4000	98.67	1.00	1.00
06	TRG	D-87 TOT	07/17/13 14:11	1.0000	0.9103	901.7259	350.2000	86.22	1.00	1.00
07	TRG	D-87 DIS	07/17/13 14:11	1.0000	0.9094	900.8344	359.0000	88.47	1.00	1.00
08	TRG	DUP 06 TOT	07/17/13 00:00	1.0000	0.9112	902.6174	379.4000	93.31	1.00	1.00
09	TRG	DUP 06 DIS	07/17/13 00:00	1.0000	0.9099	901.3297	355.7000	87.61	1.00	1.00
10	TRG	S-53 TOT	07/18/13 07:30	1.0000	0.9084	899.8438	339.0000	83.63	1.00	1.00
11	TRG	S-53 DIS	07/18/13 07:30	1.0000	0.9082	899.6457	383.6000	94.66	1.00	1.00
12	TRG	D-14 TOT	07/18/13 09:30	1.0000	0.9077	899.1504	303.2000	74.86	1.00	1.00
13	TRG	D-14 DIS	07/18/13 09:30	1.0000	0.9079	899.3485	406.3000	100.29	1.00	1.00
14	TRG	PZ-205-AS TOT	07/18/13 09:46	1.0000	0.9113	902.7165	368.5000	90.62	1.00	1.00
15	TRG	PZ-205-AS DIS	07/18/13 09:46	1.0000	0.9114	902.8155	375.4000	92.31	1.00	1.00
16	TRG	I-65 TOT	07/18/13 10:59	1.0000	0.9231	914.4053	392.5000	95.29	1.00	1.00
17	TRG	I-65 DIS	07/18/13 10:59	1.0000	0.9112	902.6174	361.2000	88.84	1.00	1.00
18	TRG	D-13 TOT	07/18/13 12:19	1.0000	0.9161	907.4713	409.2000	100.10	1.00	1.00
19	TRG	D-13 DIS	07/18/13 12:19	1.0000	0.9078	899.2494	412.4000	101.81	1.00	1.00

0432

### Spike and Tracer Worksheet

Internal Work Order		Run	Analysis Code		Date	Technician		Technician Initials		Witness Initials	
<b>13-07152</b>		<b>1</b>	<b>Ra228</b>		<b>8/5/2013 9:31</b>	<b>JWOLFE</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
Ra-228	Ra-11	37.653	8/5/2013	0.530	0.5204				8.83	0.450	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	
01	Ba-133	Ba-6a	990.581	8/5/2013	0.9265	1.0200		
02	Ba-133	Ba-6a	990.581	8/5/2013	0.9144	1.0200		
03	Ba-133	Ba-6a	990.581	8/5/2013	0.9161	1.0200		
04	Ba-133	Ba-6a	990.581	8/5/2013	0.9103	1.0200		
05	Ba-133	Ba-6a	990.581	8/5/2013	0.9140	1.0200		
06	Ba-133	Ba-6a	990.581	8/5/2013	0.9103	1.0200		
07	Ba-133	Ba-6a	990.581	8/5/2013	0.9094	1.0200		
08	Ba-133	Ba-6a	990.581	8/5/2013	0.9112	1.0200		
09	Ba-133	Ba-6a	990.581	8/5/2013	0.9099	1.0200		
10	Ba-133	Ba-6a	990.581	8/5/2013	0.9084	1.0200		
11	Ba-133	Ba-6a	990.581	8/5/2013	0.9082	1.0200		
12	Ba-133	Ba-6a	990.581	8/5/2013	0.9077	1.0200		
13	Ba-133	Ba-6a	990.581	8/5/2013	0.9079	1.0200		
14	Ba-133	Ba-6a	990.581	8/5/2013	0.9113	1.0200		
15	Ba-133	Ba-6a	990.581	8/5/2013	0.9114	1.0200		
16	Ba-133	Ba-6a	990.581	8/5/2013	0.9231	1.0200		
17	Ba-133	Ba-6a	990.581	8/5/2013	0.9112	1.0200		
18	Ba-133	Ba-6a	990.581	8/5/2013	0.9161	1.0200		
19	Ba-133	Ba-6a	990.581	8/5/2013	0.9078	1.0200		
							LCS	
							Matrix Spike	

08/05/13



# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07152</b>	<b>1</b>	<b>Ra228</b>	<b>liters</b>	<b>8/13/2013</b>	<b>JWOLFE</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	PZ-203-SS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-203-SS TOT	DO					1.0000E+00	1.0000E+00				
05	PZ-203-SS DIS	TRG					1.0000E+00	1.0000E+00				
06	D-87 TOT	TRG					1.0000E+00	1.0000E+00				
07	D-87 DIS	TRG					1.0000E+00	1.0000E+00				
08	DUP 06 TOT	TRG					1.0000E+00	1.0000E+00				
09	DUP 06 DIS	TRG					1.0000E+00	1.0000E+00				
10	S-53 TOT	TRG					1.0000E+00	1.0000E+00				
11	S-53 DIS	TRG					1.0000E+00	1.0000E+00				
12	D-14 TOT	TRG					1.0000E+00	1.0000E+00				
13	D-14 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-205-AS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-205-AS DIS	TRG					1.0000E+00	1.0000E+00				
16	I-65 TOT	TRG					1.0000E+00	1.0000E+00				
17	I-65 DIS	TRG					1.0000E+00	1.0000E+00				
18	D-13 TOT	TRG					1.0000E+00	1.0000E+00				
19	D-13 DIS	TRG					1.0000E+00	1.0000E+00				

Comments
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Technician: Wolfe Date: 8/5/13

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# Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
<b>13-07152</b>	<b>1</b>	<b>Ra228</b>	<b>Yttirum</b>	<b>34.0000</b>	<b>TSMITH</b>

TRetec Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Carrier Data	Filter Data			Gravimetric % Recovery
			Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)	
01	LCS	LCS	2.0000	0.0951	0.1527	0.0576	84.71
02	BLANK	MBL	2.0000	0.0951	0.1523	0.0572	84.12
03	DUP	DUP	2.0000	0.0927	0.1503	0.0576	84.71
04	PZ-203-SS TOT	DO	2.0000	0.0925	0.1495	0.0570	83.82
05	PZ-203-SS DIS	TRG	2.0000	0.0931	0.1498	0.0567	83.38
06	D-87 TOT	TRG	2.0000	0.0925	0.1532	0.0607	89.26
07	D-87 DIS	TRG	2.0000	0.0924	0.1510	0.0586	86.18
08	DUP 06 TOT	TRG	2.0000	0.0928	0.1517	0.0589	86.62
09	DUP 06 DIS	TRG	2.0000	0.0933	0.1517	0.0584	85.88
10	S-53 TOT	TRG	2.0000	0.0927	0.1514	0.0587	86.32
11	S-53 DIS	TRG	2.0000	0.0925	0.1514	0.0589	86.62
12	D-14 TOT	TRG	2.0000	0.0932	0.1521	0.0589	86.62
13	D-14 DIS	TRG	2.0000	0.0926	0.1492	0.0566	83.24
14	PZ-205-AS TOT	TRG	2.0000	0.0926	0.1507	0.0581	85.44
15	PZ-205-AS DIS	TRG	2.0000	0.0912	0.1465	0.0553	81.32
16	I-65 TOT	TRG	2.0000	0.0907	0.1485	0.0578	85.00
17	I-65 DIS	TRG	2.0000	0.0904	0.1534	0.0630	92.65
18	D-13 TOT	TRG	2.0000	0.0912	0.1534	0.0622	91.47
19	D-13 DIS	TRG	2.0000	0.0908	0.1440	0.0532	78.24

Technician: *T Smith*

Date: 8 / 13 / 13

8/13/13  
A

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
A3	1307152-01	3	188	30	1400	8/13/13 11:12

8/13/13

(A)

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
C1	1307152-14	15	198	120	1400	8/13/13 12:43
C2	1307152-15	13	222	120	1400	8/13/13 12:43
C3	1307152-16	20	238	120	1400	8/13/13 12:43
C4	1307152-17	18	220	120	1400	8/13/13 12:43
D2	1307152-18	12	284	120	1400	8/13/13 12:43
D4	1307152-19	8	262	120	1400	8/13/13 12:43

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Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
A1	1307152-02	10	133	120	1400	8/13/13 12:45
A2	1307152-03	12	176	120	1400	8/13/13 12:45
A3	1307152-04	16	185	120	1400	8/13/13 12:45
A4	1307152-05	8	180	120	1400	8/13/13 12:45
B1	1307152-06	20	346	120	1400	8/13/13 12:45
B2	1307152-07	8	339	120	1400	8/13/13 12:45
C1	1307152-10	9	303	120	1400	8/13/13 12:45
B3	1307152-08	10	181	120	1400	8/13/13 12:45
C2	1307152-11	8	242	120	1400	8/13/13 12:45
B4	1307152-09	14	223	120	1400	8/13/13 12:45
C3	1307152-12	8	262	120	1400	8/13/13 12:45
C4	1307152-13	14	259	120	1400	8/13/13 12:45

C  
8/13/13

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	8/13/2013	0.00E+00	P	-2.13E+01	2.82E-01	2.19E+01
LB4110A - A2	Alpha	11/18/2007	8/13/2013	8.33E-02	P	-1.81E+01	2.54E-01	1.86E+01
LB4110A - A3	Alpha	11/18/2007	8/13/2013	5.00E-02	P	-1.76E+01	2.16E-01	1.81E+01
LB4110A - A4	Alpha	11/18/2007	8/13/2013	3.33E-02	P	-1.87E+01	2.36E-01	1.92E+01
LB4110A - B1	Alpha	11/18/2007	8/13/2013	6.67E-02	P	-9.68E-02	7.51E-02	2.47E-01
LB4110A - B2	Alpha	11/18/2007	8/13/2013	0.00E+00	P	-7.82E-02	7.22E-02	2.22E-01
LB4110A - B3	Alpha	11/18/2007	8/13/2013	3.33E-02	P	-6.30E-02	5.34E-02	1.70E-01
LB4110A - B4	Alpha	11/18/2007	8/13/2013	8.33E-02	P	-1.40E-01	7.88E-02	2.98E-01
LB4110A - C1	Alpha	11/18/2007	8/13/2013	1.17E-01	P	-1.49E-01	8.87E-02	3.26E-01
LB4110A - C2	Alpha	11/18/2007	8/13/2013	1.17E-01	P	-1.77E-01	8.67E-02	3.50E-01
LB4110A - C3	Alpha	11/18/2007	8/13/2013	5.00E-02	P	-1.72E-01	1.00E-01	3.72E-01
LB4110A - C4	Alpha	11/18/2007	8/13/2013	3.33E-02	P	-6.27E-02	6.83E-02	1.99E-01
LB4110A - D1	Alpha	11/18/2007	8/13/2013	6.67E-02	P	-5.36E-02	8.33E-02	2.20E-01
LB4110A - D2	Alpha	11/18/2007	8/13/2013	3.33E-02	P	-6.99E-02	6.06E-02	1.91E-01
LB4110A - D3	Alpha	11/18/2007	8/13/2013	1.67E-02	P	-4.85E-02	7.07E-02	1.90E-01
LB4110A - D4	Alpha	11/18/2007	8/13/2013	1.17E-01	P	-5.72E-02	7.03E-02	1.98E-01
LB4110R - A1	Alpha	11/24/2006	8/13/2013	5.00E-02	P	-9.81E-02	1.01E-01	3.00E-01
LB4110R - A2	Alpha	11/24/2006	8/13/2013	1.67E-02	P	-8.92E-02	7.64E-02	2.42E-01
LB4110R - A3	Alpha	11/24/2006	8/13/2013	5.00E-02	P	-7.32E-02	7.73E-02	2.28E-01
LB4110R - A4	Alpha	11/24/2006	8/13/2013	3.33E-02	P	-5.27E-02	7.08E-02	1.94E-01
LB4110R - B1	Alpha	11/24/2006	8/13/2013	8.33E-02	P	-9.42E-02	6.16E-02	2.17E-01
LB4110R - B2	Alpha	11/24/2006	8/13/2013	5.00E-02	P	-6.94E-02	6.33E-02	1.96E-01
LB4110R - B3	Alpha	11/24/2006	8/13/2013	0.00E+00	P	-6.49E-02	6.99E-02	2.05E-01
LB4110R - B4	Alpha	11/24/2006	8/13/2013	1.67E-02	P	-6.39E-02	7.02E-02	2.04E-01
LB4110R - C1	Alpha	11/24/2006	8/13/2013	6.67E-02	P	-7.68E-02	7.36E-02	2.24E-01
LB4110R - C2	Alpha	11/24/2006	8/13/2013	6.67E-02	P	-7.55E-02	7.10E-02	2.17E-01
LB4110R - C3	Alpha	11/24/2006	8/13/2013	1.67E-02	P	-8.78E-02	8.44E-02	2.57E-01
LB4110R - C4	Alpha	11/24/2006	8/13/2013	5.00E-02	P	-6.18E-02	8.12E-02	2.24E-01
LB4110R - D1	Alpha	11/24/2006	8/13/2013	0.00E+00	P	-1.03E-01	7.02E-02	2.43E-01
LB4110R - D2	Alpha	11/24/2006	8/13/2013	0.00E+00	P	-7.79E-02	6.96E-02	2.17E-01
LB4110R - D3	Alpha	11/24/2006	8/13/2013	0.00E+00	P	-8.29E-02	6.94E-02	2.22E-01
LB4110R - D4	Alpha	11/24/2006	8/13/2013	0.00E+00	P	-7.53E-02	7.41E-02	2.24E-01
LB5100 - 1	Alpha	7/10/2006	10/26/2007	5.00E-02	P	-1.56E-02	9.58E-02	2.07E-01

GPC Detector Report  
(ALL Backgrounds)

*8/17/13*

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	8/13/2013	6.87E+00	P	-2.89E+02	7.63E+00	3.04E+02
LB4110A - A2	Beta	11/18/2007	8/13/2013	4.48E+00	P	-3.03E+01	2.59E+00	3.55E+01
LB4110A - A3	Beta	11/18/2007	8/13/2013	1.35E+00	P	-5.02E+01	2.63E+00	5.54E+01
LB4110A - A4	Beta	11/18/2007	8/13/2013	6.78E+00	P	-3.24E+01	3.21E+00	3.88E+01
LB4110A - B1	Beta	11/18/2007	8/13/2013	1.50E+00	P	-1.04E+01	3.23E+00	1.68E+01
LB4110A - B2	Beta	11/18/2007	8/13/2013	1.52E+00	P	-7.63E+00	2.00E+00	1.16E+01
LB4110A - B3	Beta	11/18/2007	8/13/2013	1.12E+00	P	1.16E-01	1.36E+00	2.60E+00
LB4110A - B4	Beta	11/18/2007	8/13/2013	1.38E+00	P	-7.61E+00	1.97E+00	1.16E+01
LB4110A - C1	Beta	11/18/2007	8/13/2013	1.23E+00	P	-5.39E+00	2.12E+00	9.62E+00
LB4110A - C2	Beta	11/18/2007	8/13/2013	1.32E+00	P	3.81E-01	1.27E+00	2.15E+00
LB4110A - C3	Beta	11/18/2007	8/13/2013	1.45E+00	P	4.71E-01	1.46E+00	2.45E+00
LB4110A - C4	Beta	11/18/2007	8/13/2013	1.23E+00	P	-1.75E+00	2.10E+00	5.95E+00
LB4110A - D1	Beta	11/18/2007	8/13/2013	2.08E+00	P	-2.31E+00	2.56E+00	7.43E+00
LB4110A - D2	Beta	11/18/2007	8/13/2013	1.37E+00	P	-6.40E-01	1.56E+00	3.76E+00
LB4110A - D3	Beta	11/18/2007	8/13/2013	4.37E+00	P	1.29E+00	4.47E+00	7.66E+00
LB4110A - D4	Beta	11/18/2007	8/13/2013	1.10E+00	P	-4.24E-01	1.37E+00	3.16E+00
LB4110R - A1	Beta	11/24/2006	8/13/2013	9.00E-01	P	-6.08E+01	3.67E+00	6.81E+01
LB4110R - A2	Beta	11/24/2006	8/13/2013	1.12E+00	P	-4.83E+01	2.01E+00	5.23E+01
LB4110R - A3	Beta	11/24/2006	8/13/2013	9.33E-01	P	-4.47E+01	2.73E+00	5.02E+01
LB4110R - A4	Beta	11/24/2006	8/13/2013	1.12E+00	P	-4.46E+01	1.99E+00	4.86E+01
LB4110R - B1	Beta	11/24/2006	8/13/2013	1.35E+00	P	-4.69E+01	2.02E+00	5.10E+01
LB4110R - B2	Beta	11/24/2006	8/13/2013	1.38E+00	P	-4.69E+01	2.05E+00	5.10E+01
LB4110R - B3	Beta	11/24/2006	8/13/2013	1.25E+00	P	-4.67E+01	2.65E+00	5.20E+01
LB4110R - B4	Beta	11/24/2006	8/13/2013	1.22E+00	P	-4.70E+01	1.92E+00	5.09E+01
LB4110R - C1	Beta	11/24/2006	8/13/2013	1.40E+00	P	-4.68E+01	2.96E+00	5.27E+01
LB4110R - C2	Beta	11/24/2006	8/13/2013	1.57E+00	P	-4.68E+01	2.71E+00	5.22E+01
LB4110R - C3	Beta	11/24/2006	8/13/2013	1.02E+00	P	-4.73E+01	2.52E+00	5.23E+01
LB4110R - C4	Beta	11/24/2006	8/13/2013	9.83E-01	P	-5.33E+01	2.95E+00	5.92E+01
LB4110R - D1	Beta	11/24/2006	8/13/2013	0.00E+00	P	-4.44E+01	5.55E+00	5.55E+01
LB4110R - D2	Beta	11/24/2006	8/13/2013	0.00E+00	P	-4.78E+01	1.87E+00	5.15E+01
LB4110R - D3	Beta	11/24/2006	8/13/2013	0.00E+00	P	-5.11E+01	5.53E+00	6.22E+01
LB4110R - D4	Beta	11/24/2006	8/13/2013	0.00E+00	P	-4.74E+01	2.23E+00	5.19E+01
LB5100 - 1	Beta	7/10/2006	10/26/2007	4.52E+00	F	-3.19E-01	1.58E+00	3.48E+00

GPC Detector Report  
(ALL Efficiencies)

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	8/13/2013	0.2462	P	-0.0129	0.2159	0.4447
LB4110A - A2	Alpha	11/18/2007	8/13/2013	0.2074	P	-0.0504	0.1741	0.3986
LB4110A - A3	Alpha	11/18/2007	8/13/2013	0.2050	P	-0.0737	0.1633	0.4004
LB4110A - A4	Alpha	11/18/2007	8/13/2013	0.2194	P	-0.0522	0.1820	0.4163
LB4110A - B1	Alpha	11/18/2007	8/13/2013	0.2144	P	0.1943	0.2243	0.2543
LB4110A - B2	Alpha	11/18/2007	8/13/2013	0.2197	P	0.1924	0.2213	0.2502
LB4110A - B3	Alpha	11/18/2007	8/13/2013	0.2290	P	0.1279	0.2323	0.3367
LB4110A - B4	Alpha	11/18/2007	8/13/2013	0.2337	P	0.2089	0.2364	0.2639
LB4110A - C1	Alpha	11/18/2007	8/13/2013	0.2184	P	0.1976	0.2208	0.2439
LB4110A - C2	Alpha	11/18/2007	8/13/2013	0.2129	P	0.1971	0.2252	0.2532
LB4110A - C3	Alpha	11/18/2007	8/13/2013	0.2467	P	0.2234	0.2494	0.2755
LB4110A - C4	Alpha	11/18/2007	8/13/2013	0.2139	P	0.1969	0.2256	0.2544
LB4110A - D1	Alpha	11/18/2007	8/13/2013	0.2126	P	0.2028	0.2328	0.2628
LB4110A - D2	Alpha	11/18/2007	8/13/2013	0.2386	P	0.2276	0.2580	0.2884
LB4110A - D3	Alpha	11/18/2007	8/13/2013	0.2424	P	0.2309	0.2634	0.2958
LB4110A - D4	Alpha	11/18/2007	8/13/2013	0.1865	P	0.1642	0.1992	0.2342
LB4110R - A1	Alpha	11/24/2006	8/13/2013	0.2319	P	0.1983	0.2385	0.2787
LB4110R - A2	Alpha	11/24/2006	8/13/2013	0.2148	P	0.1851	0.2201	0.2551
LB4110R - A3	Alpha	11/24/2006	8/13/2013	0.2117	P	0.1924	0.2243	0.2563
LB4110R - A4	Alpha	11/24/2006	8/13/2013	0.2419	P	0.2118	0.2454	0.2789
LB4110R - B1	Alpha	11/24/2006	8/13/2013	0.2224	P	0.1832	0.2257	0.2682
LB4110R - B2	Alpha	11/24/2006	8/13/2013	0.2032	P	0.1754	0.2169	0.2585
LB4110R - B3	Alpha	11/24/2006	8/13/2013	0.2471	P	0.2015	0.2438	0.2861
LB4110R - B4	Alpha	11/24/2006	8/13/2013	0.2181	P	0.1883	0.2313	0.2742
LB4110R - C1	Alpha	11/24/2006	8/13/2013	0.2088	P	0.1833	0.2150	0.2466
LB4110R - C2	Alpha	11/24/2006	8/13/2013	0.2219	P	0.1932	0.2245	0.2558
LB4110R - C3	Alpha	11/24/2006	8/13/2013	0.2329	P	0.2034	0.2394	0.2754
LB4110R - C4	Alpha	11/24/2006	8/13/2013	0.2095	P	0.1826	0.2222	0.2618
LB4110R - D1	Alpha	11/24/2006	8/13/2013	0.0000	F	0.0040	0.1993	0.3946
LB4110R - D2	Alpha	11/24/2006	8/13/2013	0.0000	F	0.0052	0.2266	0.4481
LB4110R - D3	Alpha	11/24/2006	8/13/2013	0.0000	F	0.0051	0.2226	0.4402
LB4110R - D4	Alpha	11/24/2006	8/13/2013	0.0000	F	0.0027	0.1794	0.3562
LB5100 - 1	Alpha	7/10/2006	10/26/2007	0.3368	P	0.3332	0.3455	0.3578

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GPC Detector Report  
(ALL Efficiencies)

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	8/13/2013	0.5598	P	0.2110	0.5625	0.9139
LB4110A - A2	Beta	11/18/2007	8/13/2013	0.4836	P	0.1620	0.4648	0.7677
LB4110A - A3	Beta	11/18/2007	8/13/2013	0.4614	P	0.0900	0.4572	0.8244
LB4110A - A4	Beta	11/18/2007	8/13/2013	0.5201	P	0.1427	0.4892	0.8356
LB4110A - B1	Beta	11/18/2007	8/13/2013	0.5087	P	0.4634	0.5297	0.5961
LB4110A - B2	Beta	11/18/2007	8/13/2013	0.5274	P	0.4632	0.5268	0.5904
LB4110A - B3	Beta	11/18/2007	8/13/2013	0.5258	P	0.3168	0.5314	0.7460
LB4110A - B4	Beta	11/18/2007	8/13/2013	0.5528	P	0.4918	0.5538	0.6159
LB4110A - C1	Beta	11/18/2007	8/13/2013	0.4883	P	0.4511	0.5026	0.5542
LB4110A - C2	Beta	11/18/2007	8/13/2013	0.4888	P	0.4292	0.5010	0.5728
LB4110A - C3	Beta	11/18/2007	8/13/2013	0.5811	P	0.5291	0.5907	0.6523
LB4110A - C4	Beta	11/18/2007	8/13/2013	0.4896	P	0.4577	0.5248	0.5918
LB4110A - D1	Beta	11/18/2007	8/13/2013	0.5167	P	0.4784	0.5530	0.6276
LB4110A - D2	Beta	11/18/2007	8/13/2013	0.5409	P	0.4887	0.5871	0.6855
LB4110A - D3	Beta	11/18/2007	8/13/2013	0.5991	P	0.5374	0.6149	0.6924
LB4110A - D4	Beta	11/18/2007	8/13/2013	0.4294	P	0.3846	0.4719	0.5592
LB4110R - A1	Beta	11/24/2006	8/13/2013	0.5649	P	0.4743	0.5672	0.6601
LB4110R - A2	Beta	11/24/2006	8/13/2013	0.5099	P	0.4157	0.5085	0.6013
LB4110R - A3	Beta	11/24/2006	8/13/2013	0.5118	P	0.4503	0.5384	0.6265
LB4110R - A4	Beta	11/24/2006	8/13/2013	0.5906	P	0.5032	0.5914	0.6797
LB4110R - B1	Beta	11/24/2006	8/13/2013	0.5396	P	0.4463	0.5422	0.6380
LB4110R - B2	Beta	11/24/2006	8/13/2013	0.5136	P	0.4246	0.5195	0.6144
LB4110R - B3	Beta	11/24/2006	8/13/2013	0.6047	P	0.4939	0.5917	0.6895
LB4110R - B4	Beta	11/24/2006	8/13/2013	0.5238	P	0.4540	0.5489	0.6438
LB4110R - C1	Beta	11/24/2006	8/13/2013	0.4659	P	0.4160	0.5016	0.5872
LB4110R - C2	Beta	11/24/2006	8/13/2013	0.5118	P	0.4440	0.5283	0.6126
LB4110R - C3	Beta	11/24/2006	8/13/2013	0.5519	P	0.4755	0.5706	0.6656
LB4110R - C4	Beta	11/24/2006	8/13/2013	0.4917	P	0.4258	0.5249	0.6241
LB4110R - D1	Beta	11/24/2006	8/13/2013	0.0000	F	0.0087	0.4766	0.9445
LB4110R - D2	Beta	11/24/2006	8/13/2013	0.0000	F	0.0104	0.5355	1.0607
LB4110R - D3	Beta	11/24/2006	8/13/2013	0.0000	F	0.0100	0.5201	1.0302
LB4110R - D4	Beta	11/24/2006	8/13/2013	0.0000	F	0.0054	0.4282	0.8509
LB5100 - 1	Beta	7/10/2006	10/26/2007	0.4428	F	0.4555	0.4731	0.4906

*C*  
*8/13/13*

0552

**SECTION XII**  
**BARIUM-133 ANALYTICAL TRACER DATA**

C  
8/8/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715201\_GE5\_BAFIL\_194455.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : SPIKE  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 07:49:32.  
 Sample ID : 1307152-01 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.27 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	21.18	80	60	0.43	208.58	199	18	8.84E-02	25.9	
2	0	25.40	9	8	0.32	249.11	244	9	9.64E-03	70.3	
3	0	30.97	2187	139	0.74	302.59	289	25	2.43E+00	2.6	
4	3	35.03	387	35	0.63	341.52	332	27	4.31E-01	6.6	2.13E+00
5	3	35.89	119	25	0.74	349.80	332	27	1.32E-01	21.5	
6	0	53.25	38	38	0.79	516.40	507	18	4.21E-02	36.7	
7	0	61.74	259	21	0.63	597.80	586	25	2.88E-01	7.4	
8	5	65.90	101	27	1.06	637.79	627	25	1.12E-01	15.8	1.69E+00
9	5	67.08	17	5	0.43	649.06	627	25	1.93E-02	26.3	
10	1	79.60	46	8	0.76	769.20	758	36	5.16E-02	32.0	9.71E-01
11	1	80.99	930	10	0.66	782.54	758	36	1.03E+00	3.4	
12	0	111.80	223	34	0.88	1078.20	1063	31	2.48E-01	9.5	
13	0	275.84	48	6	0.75	2652.26	2639	23	5.36E-02	17.4	
14	1	301.55	14	7	1.06	2899.00	2887	29	1.57E-02	75.9	1.73E+00
15	1	302.18	123	3	1.06	2905.00	2887	29	1.36E-01	8.7	
16	0	332.94	65	3	1.00	3200.16	3186	25	7.25E-02	13.2	
17	0	355.10	429	17	0.78	3412.83	3396	31	4.76E-01	5.2	
18	0	382.90	80	3	0.99	3679.54	3665	25	8.91E-02	11.8	
19	2	385.43	43	4	1.15	3703.89	3693	26	4.82E-02	30.2	5.89E+00
20	2	386.07	179	7	1.16	3710.00	3693	26	1.99E-01	7.4	
21	0	390.02	36	4	1.00	3747.89	3731	26	4.03E-02	20.2	

Summary of Nuclide Activity

Sample ID : 1307152-01

Acquisition date : 8-AUG-2013 07:49:32

Total number of lines in spectrum 21  
 Number of unidentified lines 16  
 Number of lines tentatively identified by NID 5 23.81%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	4.693E+02	4.694E+02	0.783E+02	16.67	
Total Activity :			4.693E+02	4.694E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
TH-234	4.47E+09Y	1.00	2.339E+02	2.339E+02	0.360E+02	15.38	
Total Activity :			2.339E+02	2.339E+02			

Grand Total Activity : 7.032E+02 7.032E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	4.693E+02	4.694E+02	16.67	OK
	302.84	17.80	2.575E+00	8.042E+02	8.043E+02	31.57	OK
	356.01	60.00	4.312E+00	4.974E+02	4.974E+02	17.86	OK

Final Mean for 3 Valid Peaks = 4.694E+02 +/- 7.825E+01 ( 16.67%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.339E+02	2.339E+02	15.38	OK

Final Mean for 1 Valid Peaks = 2.339E+02 +/- 3.596E+01 ( 15.38%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.694E+02	7.825E+01	1.312E+01	1.932E+00	35.765
TH-234	2.339E+02	3.596E+01	3.178E+01	4.088E-01	7.360

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	7.687E+00		1.661E+01	3.166E+01	1.073E+01	0.243
CD-109	1.986E+01		1.058E+02	1.960E+02	1.886E+01	0.101
PA-231	-9.647E-01		8.864E-01	1.334E+00	1.501E-02	-0.723
PA-234	3.683E+00	+	1.911E+00	2.191E+00	2.466E-02	1.681
NP-237	-1.289E+01		2.809E+01	4.799E+01	4.233E+00	-0.269
AM-241	1.148E+00		1.416E+00	2.495E+00	2.809E-02	0.460

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Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715202\_GE5\_BAFIL\_194460.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : BLANK  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:08:27.  
 Sample ID : 1307152-02 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.29 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	1	9.86	19	7	0.44	100.00	96	15	2.13E-02	27.2	3.30E+00
2	1	10.49	12	3	0.45	106.00	96	15	1.39E-02	47.5	
3	0	12.45	8	4	0.10	124.87	120	8	8.89E-03	55.9	
4	0	16.91	9	8	0.31	167.66	162	10	1.03E-02	70.2	
5	0	21.28	85	52	0.69	209.60	198	20	9.41E-02	24.0	
6	0	30.98	2072	118	0.72	302.71	291	24	2.30E+00	2.6	
7	0	35.22	552	13	0.71	343.30	330	29	6.13E-01	4.7	
8	0	53.45	37	32	0.45	518.25	506	18	4.16E-02	38.8	
9	0	61.70	236	50	0.94	597.46	587	27	2.62E-01	9.6	
10	0	65.99	115	33	0.59	638.64	628	26	1.28E-01	15.0	
11	1	79.51	31	21	0.76	768.33	760	37	3.49E-02	33.4	5.06E-01
12	1	80.98	827	21	0.63	782.41	760	37	9.19E-01	3.7	
13	0	84.11	34	10	0.54	812.46	803	19	3.83E-02	25.0	
14	0	111.78	212	30	0.90	1077.95	1066	23	2.36E-01	8.9	
15	0	115.98	52	29	1.07	1118.25	1106	22	5.76E-02	26.5	
16	0	275.65	44	8	1.36	2650.47	2636	25	4.92E-02	20.4	
17	0	302.10	110	15	0.59	2904.23	2888	26	1.22E-01	11.9	
18	0	332.83	48	9	0.55	3199.11	3183	26	5.29E-02	19.2	
19	1	355.10	293	11	1.01	3412.83	3397	27	3.26E-01	7.1	2.31E+00
20	1	355.54	116	8	1.13	3417.00	3397	27	1.29E-01	15.8	
21	1	382.42	12	7	1.16	3675.00	3664	28	1.31E-02	75.3	2.38E+00
22	1	383.15	91	6	1.16	3682.00	3664	28	1.01E-01	10.0	
23	0	385.91	120	13	0.98	3708.42	3693	26	1.33E-01	10.8	

Total number of lines in spectrum 23  
 Number of unidentified lines 17  
 Number of lines tentatively identified by NID 6 26.09%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	4.173E+02	4.174E+02	0.706E+02	16.93		
Total Activity :			4.173E+02	4.174E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
PA-231	3.28E+04Y	1.00	1.369E+00	1.369E+00	0.747E+00	54.57		
PA-234	4.47E+09Y	1.00	3.920E+00	3.920E+00	1.885E+00	48.09		
TH-234	4.47E+09Y	1.00	2.128E+02	2.128E+02	0.417E+02	19.60		
Total Activity :			2.181E+02	2.181E+02				

Grand Total Activity : 6.354E+02 6.355E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	4.173E+02	4.174E+02	16.93	OK
	302.84	17.80	2.575E+00	7.198E+02	7.198E+02	35.61	OK
	356.01	60.00	4.312E+00	1.345E+02	1.345E+02	34.69	OK

Final Mean for 3 Valid Peaks = 4.174E+02+/- 7.064E+01 ( 16.93%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
PA-231	9.28	42.00*	1.000E+02	1.369E+00	1.369E+00	54.57	OK
	10.11	20.20	1.000E+02	2.846E+00	2.846E+00	54.57	OK
	283.67	1.60	2.191E+00	-----	Line Not Found	-----	Absent
	302.67	2.30	2.572E+00	5.579E+03	5.579E+03	34.18	OK

Final Mean for 3 Valid Peaks = 1.369E+00+/- 7.469E-01 ( 54.57%)

PA-234	9.89	89.00	1.000E+02	6.460E-01	6.460E-01	54.57	OK
	21.72	64.90*	1.000E+02	3.920E+00	3.920E+00	48.09	OK
	37.93	23.75	1.000E+02	-----	Line Not Found	-----	Absent
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 2 Valid Peaks = 3.920E+00+/- 1.885E+00 ( 48.09%)

TH-234	63.29	3.80*	8.750E+01	2.128E+02	2.128E+02	19.60	OK
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Final Mean for 1 Valid Peaks = 2.128E+02+/- 4.171E+01 ( 19.60%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.174E+02	7.064E+01	1.283E+01	1.888E+00	32.541
PA-231	1.369E+00	7.469E-01	1.533E+00	1.726E-02	0.893
PA-234	3.920E+00	1.885E+00	1.134E+00	1.276E-02	3.458
TH-234	2.128E+02	4.171E+01	3.121E+01	4.015E-01	6.819

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.114E+00	1.434E+01	2.682E+01	9.090E+00	0.042
CD-109	4.435E+01	9.924E+01	1.910E+02	1.838E+01	0.232
NP-237	1.614E+00	2.963E+01	4.852E+01	4.280E+00	0.033
AM-241	1.033E+00	1.503E+00	2.571E+00	2.895E-02	0.402

8816

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715203\_GE5\_BAFIL\_194463.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-203-SS TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:28:56.  
 Sample ID : 1307152-03 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.24 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	13.97	8	7	0.19	139.44	134	9	8.81E-03	74.8	
2	0	21.33	61	59	0.38	210.10	200	20	6.82E-02	33.4	
3	0	27.88	22	12	0.27	272.93	265	13	2.42E-02	40.0	
4	0	30.98	1902	118	0.73	302.70	292	23	2.11E+00	2.8	
5	1	35.10	339	0	0.62	342.24	333	27	3.77E-01	5.9	2.51E+00
6	1	35.96	105	0	0.62	350.46	333	27	1.16E-01	18.5	
7	0	48.74	8	9	0.71	473.09	463	13	8.89E-03	87.2	
8	0	53.33	45	16	0.89	517.15	508	15	5.05E-02	23.8	
9	0	61.74	242	32	0.93	597.84	586	24	2.69E-01	8.3	
10	0	66.00	122	37	0.23	638.67	626	28	1.35E-01	15.0	
11	0	81.00	748	73	0.62	782.65	771	24	8.31E-01	4.5	
12	1	111.75	169	28	0.84	1077.73	1066	22	1.88E-01	10.3	2.26E+00
13	1	112.30	31	4	0.77	1083.00	1066	22	3.44E-02	35.8	
14	0	116.10	39	54	0.17	1119.41	1105	23	4.37E-02	43.9	
15	0	160.27	26	17	0.57	1543.29	1529	21	2.87E-02	38.4	
16	0	275.77	51	4	1.10	2651.64	2634	29	5.64E-02	16.3	
17	0	302.07	108	2	0.70	2903.99	2888	28	1.20E-01	10.1	
18	0	332.94	56	7	0.57	3200.18	3183	26	6.21E-02	16.3	
19	0	355.14	385	9	0.87	3413.24	3396	30	4.28E-01	5.3	
20	0	382.91	63	18	0.50	3679.67	3665	27	7.01E-02	18.2	
21	0	385.87	109	33	0.79	3708.07	3692	27	1.21E-01	13.9	
22	3	389.23	17	2	1.55	3740.30	3731	27	1.84E-02	35.6	2.25E+00
23	3	390.24	48	6	1.16	3750.00	3731	27	5.37E-02	13.4	

Summary of Nuclide Activity

Sample ID : 1307152-03

Acquisition date : 8-AUG-2013 08:28:56

Total number of lines in spectrum 23  
 Number of unidentified lines 17  
 Number of lines tentatively identified by NID 6 26.09%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.777E+02	3.778E+02	0.669E+02	17.70	
Total Activity :			3.777E+02	3.778E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	2.188E+02	2.188E+02	0.374E+02	17.08	
Total Activity :			2.188E+02	2.188E+02			

Grand Total Activity : 5.966E+02 5.966E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	3.777E+02	3.778E+02	17.70	OK
	302.84	17.80	2.575E+00	7.049E+02	7.050E+02	33.23	OK
	356.01	60.00	4.312E+00	4.474E+02	4.474E+02	17.96	OK

Final Mean for 3 Valid Peaks = 3.778E+02 +/- 6.685E+01 ( 17.70%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.188E+02	2.188E+02	17.08	OK

Final Mean for 1 Valid Peaks = 2.188E+02 +/- 3.737E+01 ( 17.08%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.778E+02	6.685E+01	1.528E+01	2.249E+00	24.726
TH-234	2.188E+02	3.737E+01	2.973E+01	3.825E-01	7.361

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-3.299E+00		1.324E+01	2.366E+01	8.019E+00	-0.139
CD-109	6.755E+01		8.519E+01	1.751E+02	1.686E+01	0.386
PA-231	-6.128E-01		8.677E-01	1.416E+00	1.594E-02	-0.433
PA-234	2.840E+00	+	1.900E+00	2.221E+00	2.501E-02	1.278
NP-237	-9.310E+00		2.216E+01	3.854E+01	3.399E+00	-0.242
AM-241	1.285E+00		1.625E+00	2.779E+00	3.128E-02	0.462

C  
8(8)

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715204\_GE5\_BAFIL\_194467.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-203-SS TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:50:39.  
 Sample ID : 1307152-04 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.35 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	1	20.70	21	20	0.50	204.00	198	21	2.36E-02	55.7	2.71E+00
2	1	21.32	73	15	0.51	210.00	198	21	8.08E-02	17.8	
3	0	30.99	2075	77	0.69	302.79	292	29	2.31E+00	2.6	
4	1	35.10	409	34	0.62	342.22	332	26	4.54E-01	6.2	1.10E+00
5	1	35.91	93	14	0.57	350.00	332	26	1.03E-01	23.0	
6	0	46.06	3	7	0.29	447.33	439	10	3.50E-03	170.2	
7	0	53.24	46	22	0.58	516.25	504	22	5.13E-02	29.8	
8	3	61.72	241	32	0.86	597.65	586	36	2.68E-01	8.3	2.44E+00
9	3	63.95	42	3	0.65	619.00	586	36	4.67E-02	10.0	
10	3	65.73	103	19	0.88	636.09	626	25	1.15E-01	13.3	2.64E+00
11	3	66.96	24	7	0.59	647.95	626	25	2.72E-02	22.5	
12	1	79.51	56	17	0.76	768.33	759	38	6.24E-02	18.3	7.53E-01
13	1	80.97	816	10	0.70	782.30	759	38	9.07E-01	3.6	
14	0	111.68	206	36	0.60	1077.06	1063	27	2.29E-01	9.7	
15	0	160.41	40	11	0.13	1544.66	1532	23	4.42E-02	23.1	
16	0	275.78	48	3	0.39	2651.67	2638	24	5.30E-02	16.2	
17	0	302.08	114	2	0.60	2904.08	2888	26	1.27E-01	9.7	
18	0	332.90	47	10	0.60	3199.78	3185	24	5.27E-02	18.9	
19	0	355.16	416	0	0.83	3413.40	3397	31	4.62E-01	4.9	
20	3	382.75	51	9	1.27	3678.11	3663	28	5.62E-02	19.8	6.12E-01
21	3	383.78	19	5	0.84	3687.99	3663	28	2.07E-02	18.9	
22	8	385.14	78	12	1.36	3701.09	3693	29	8.71E-02	12.3	4.65E+00
23	8	385.55	12	14	1.16	3705.00	3693	29	1.31E-02	107.8	
24	8	386.21	57	6	0.50	3711.35	3693	29	6.29E-02	19.7	
25	0	390.15	34	6	0.81	3749.19	3734	28	3.82E-02	21.7	

Total number of lines in spectrum 25  
 Number of unidentified lines 20  
 Number of lines tentatively identified by NID 5 20.00%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	4.121E+02	4.121E+02	0.696E+02	16.88		
Total Activity :			4.121E+02	4.121E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
TH-234	4.47E+09Y	1.00	3.798E+01	3.798E+01	0.774E+01	20.37		
Total Activity :			3.798E+01	3.798E+01				

Grand Total Activity : 4.501E+02 4.501E+02

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	4.121E+02	4.121E+02	16.88	OK
	302.84	17.80	2.575E+00	7.469E+02	7.469E+02	32.78	OK
	356.01	60.00	4.312E+00	4.829E+02	4.829E+02	17.47	OK

Final Mean for 3 Valid Peaks = 4.121E+02 +/- 6.956E+01 ( 16.88%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	3.798E+01	3.798E+01	20.37	OK

Final Mean for 1 Valid Peaks = 3.798E+01 +/- 7.735E+00 ( 20.37%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.121E+02	6.956E+01	1.264E+01	1.862E+00	32.595
TH-234	3.798E+01	7.735E+00	2.278E+01	2.931E-01	1.667

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-9.891E+00		1.562E+01	2.536E+01	8.595E+00	-0.390
CD-109	4.148E+01		8.788E+01	1.730E+02	1.664E+01	0.240
PA-231	-6.203E-01		9.161E-01	1.503E+00	1.692E-02	-0.413
PA-234	3.365E+00	+	1.209E+00	1.995E+00	2.246E-02	1.686
NP-237	-1.549E+01		2.721E+01	4.577E+01	4.037E+00	-0.338
AM-241	2.549E+00		1.376E+00	2.788E+00	3.139E-02	0.914

*88u*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715205\_GE5\_BAFIL\_194471.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-203-SS DIS  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 09:14:54.  
 Sample ID : 1307152-05 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE5 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.31 0.1%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	12.64	15	6	0.13	126.69	119	13	1.63E-02	44.1	
2	0	17.17	10	1	0.20	170.12	167	8	1.07E-02	40.4	
3	0	20.98	133	30	0.66	206.71	191	30	1.48E-01	14.8	
4	0	28.49	41	23	0.84	278.80	271	15	4.50E-02	30.0	
5	0	30.96	2048	110	0.74	302.46	291	22	2.28E+00	2.6	
6	3	35.09	436	30	0.65	342.10	330	28	4.84E-01	5.8	1.23E+00
7	3	36.14	64	7	0.52	352.13	330	28	7.09E-02	19.2	
8	0	39.71	9	5	0.16	386.39	381	10	1.00E-02	57.2	
9	0	53.47	24	42	0.25	518.45	506	19	2.67E-02	68.3	
10	0	61.70	274	26	0.70	597.45	586	22	3.05E-01	7.2	
11	1	65.72	105	16	0.66	636.00	623	28	1.17E-01	12.5	2.82E+00
12	1	66.34	35	12	0.66	642.00	623	28	3.88E-02	37.7	
13	2	79.62	78	35	0.77	769.40	757	36	8.71E-02	21.0	2.36E+00
14	2	80.99	797	16	0.70	782.53	757	36	8.86E-01	3.7	
15	0	84.09	21	7	0.23	812.26	805	15	2.31E-02	32.9	
16	0	111.64	238	30	0.69	1076.65	1060	27	2.64E-01	8.3	
17	0	160.35	18	17	0.70	1544.06	1536	15	2.00E-02	45.3	
18	1	275.40	19	2	1.03	2648.00	2636	23	2.09E-02	35.0	1.04E+00
19	1	276.12	28	2	0.92	2654.95	2636	23	3.08E-02	13.9	
20	1	301.45	63	1	1.06	2898.00	2888	26	6.96E-02	16.2	5.96E+00
21	1	302.02	74	2	1.17	2903.52	2888	26	8.24E-02	14.7	
22	0	332.74	44	9	1.06	3198.25	3185	22	4.86E-02	19.5	
23	0	355.14	386	9	1.02	3413.20	3397	31	4.29E-01	5.3	
24	3	382.32	49	1	1.16	3674.00	3663	27	5.45E-02	17.8	5.58E-01
25	3	383.12	46	2	0.84	3681.68	3663	27	5.11E-02	19.2	
26	4	385.23	20	11	1.70	3701.91	3692	28	2.21E-02	61.1	1.20E+00
27	4	385.91	137	13	0.96	3708.43	3692	28	1.52E-01	10.2	
28	0	389.98	36	6	1.09	3747.57	3732	25	4.03E-02	21.5	
29	0	413.69	28	5	0.48	3975.01	3959	27	3.07E-02	25.0	

Summary of Nuclide Activity

Sample ID : 1307152-05

Acquisition date : 8-AUG-2013 09:14:54

Total number of lines in spectrum 29  
 Number of unidentified lines 23  
 Number of lines tentatively identified by NID 6 20.69%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
			pCi/filter	pCi/filter	2-Sigma Error	%Error	
BA-133	10.50Y	1.00	4.024E+02	4.024E+02	0.683E+02	16.98	
Total Activity :			4.024E+02	4.024E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
			pCi/filter	pCi/filter	2-Sigma Error	%Error	
TH-234	4.47E+09Y	1.00	2.479E+02	2.479E+02	0.373E+02	15.07	
Total Activity :			2.479E+02	2.479E+02			

Grand Total Activity : 6.502E+02 6.503E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	4.024E+02	4.024E+02	16.98	OK
	302.84	17.80	2.575E+00	4.857E+02	4.857E+02	39.54	OK
	356.01	60.00	4.312E+00	4.479E+02	4.479E+02	17.97	OK

Final Mean for 3 Valid Peaks = 4.024E+02+/- 6.832E+01 ( 16.98%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.479E+02	2.479E+02	15.07	OK

Final Mean for 1 Valid Peaks = 2.479E+02+/- 3.734E+01 ( 15.07%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.024E+02	6.832E+01	1.365E+01	2.009E+00	29.486
TH-234	2.479E+02	3.734E+01	2.472E+01	3.181E-01	10.026

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-5.502E+00		1.377E+01	2.376E+01	8.055E+00	-0.232
CD-109	2.048E+01		8.910E+01	1.697E+02	1.633E+01	0.121
PA-231	1.141E-01		1.107E+00	2.015E+00	2.268E-02	0.057
PA-234	6.154E+00	+	1.841E+00	2.247E+00	2.529E-02	2.739
NP-237	4.824E+00		2.694E+01	4.722E+01	4.165E+00	0.102
AM-241	5.661E-01		1.548E+00	2.510E+00	2.825E-02	0.226

*C*  
*8/8/13*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715206\_GE1\_BAFIL\_194456.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-87 TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 07:50:05.  
 Sample ID : 1307152-06 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE1 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.27 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.95	1908	80	1.51	31.18	27	13	2.12E+00	2.4	1.11E+01
2	3	35.21	449	49	1.77	35.45	27	13	4.99E-01	5.5	
3	0	52.67	44	84	1.96	52.90	50	6	4.85E-02	36.5	
4	3	61.98	234	65	1.91	62.21	58	17	2.60E-01	8.7	1.09E+00
5	3	65.99	125	69	1.91	66.22	58	17	1.39E-01	15.7	
6	4	81.33	755	56	1.64	81.56	78	11	8.39E-01	3.9	6.96E+00
7	4	84.98	23	74	1.95	85.21	78	11	2.61E-02	104.1	
8	0	93.26	54	65	2.02	93.48	90	7	6.02E-02	28.3	
9	0	103.06	16	56	1.79	103.28	100	6	1.79E-02	78.4	
10	2	112.09	177	45	1.81	112.31	108	13	1.97E-01	9.6	3.08E+00
11	2	116.58	41	47	1.82	116.81	108	13	4.60E-02	29.7	
12	0	164.17	56	121	8.56	164.40	158	13	6.18E-02	43.2	
13	1	185.93	20	48	1.72	186.16	183	18	2.26E-02	55.0	1.25E+00
14	1	191.86	18	46	1.73	192.08	183	18	2.00E-02	61.9	
15	0	228.05	21	74	7.65	228.27	218	13	2.33E-02	90.3	
16	0	245.89	13	33	2.97	246.11	241	8	1.47E-02	80.9	
17	0	277.21	40	34	1.23	277.42	275	7	4.42E-02	28.6	
18	0	302.93	112	65	1.86	303.15	300	8	1.24E-01	15.5	
19	0	308.36	14	30	1.26	308.58	307	5	1.61E-02	64.8	
20	3	333.94	76	16	1.78	334.16	330	20	8.40E-02	14.1	2.84E+00
21	3	338.09	18	19	2.23	338.30	330	20	1.97E-02	55.5	
22	0	356.46	573	7	1.72	356.67	352	10	6.37E-01	4.3	
23	2	384.15	107	14	2.06	384.36	381	18	1.19E-01	11.7	5.14E+00
24	2	387.44	205	11	2.07	387.65	381	18	2.28E-01	8.3	
25	2	391.81	50	10	1.93	392.02	381	18	5.55E-02	19.8	
26	0	417.47	84	20	4.99	417.68	411	14	9.30E-02	15.9	
27	0	437.71	102	11	1.77	437.92	433	9	1.13E-01	11.5	
28	0	455.20	6	9	2.55	455.41	451	9	6.19E-03	106.7	
29	0	463.09	9	5	1.71	463.29	459	7	9.76E-03	54.8	
30	0	469.30	29	2	1.78	469.51	466	9	3.26E-02	20.5	
31	0	511.38	27	7	2.53	511.58	507	12	2.99E-02	26.8	
32	0	520.42	8	2	2.04	520.62	518	5	8.67E-03	46.4	

Summary of Nuclide Activity

Sample ID : 1307152-06

Acquisition date : 8-AUG-2013 07:50:05

Total number of lines in spectrum 32  
 Number of unidentified lines 27  
 Number of lines tentatively identified by NID 5 15.63%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	3.501E+02	3.502E+02	0.651E+02	18.61	
NP-237	2.14E+06Y	1.00	3.651E+01	3.651E+01	7.616E+01	208.58	
Total Activity :			3.867E+02	3.867E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
TH-234	4.47E+09Y	1.00	3.158E+02	3.158E+02	0.574E+02	18.17	
Total Activity :			3.158E+02	3.158E+02			

Grand Total Activity : 7.025E+02 7.025E+02

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.501E+02	3.502E+02	18.61	OK
	302.84	17.80	4.915E+00	3.845E+02	3.845E+02	42.60	OK
	356.01	60.00	6.963E+00	4.119E+02	4.119E+02	17.39	OK

Final Mean for 3 Valid Peaks = 3.502E+02+/- 6.515E+01 ( 18.61%)

NP-237	86.50	12.60*	1.532E+01	3.651E+01	3.651E+01	208.58	OK
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Final Mean for 1 Valid Peaks = 3.651E+01+/- 7.616E+01 (208.58%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.158E+02	3.158E+02	18.17	OK

Final Mean for 1 Valid Peaks = 3.158E+02+/- 5.738E+01 ( 18.17%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.502E+02	6.515E+01	1.813E+01	2.976E+00	19.312
TH-234	3.158E+02	5.738E+01	5.271E+01	1.689E+00	5.992
NP-237	3.651E+01	7.616E+01	5.450E+01	6.635E+00	0.670

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.077E+00	1.302E+01	2.137E+01	6.673E+00	0.144
CD-109	-1.014E+01	1.452E+02	2.016E+02	2.607E+01	-0.050
PA-231	0.000E+00	0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	1.160E+01	1.885E+00	3.955E+00	7.432E-02	2.932
AM-241	8.402E+00	3.030E+00	6.059E+00	1.422E-01	1.387

88117

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715207\_GE1\_BAFIL\_194457.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-87 DIS  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:06:42.  
 Sample ID : 1307152-07 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE1 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.27 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.91	2052	70	1.64	31.15	27	13	2.28E+00	2.3	1.77E+01
2	3	35.20	469	48	1.75	35.44	27	13	5.21E-01	5.3	
3	0	52.55	34	93	1.85	52.78	50	7	3.78E-02	49.8	
4	2	61.92	234	96	1.67	62.15	58	13	2.61E-01	9.0	3.14E+00
5	2	65.81	66	98	1.74	66.04	58	13	7.29E-02	28.1	
6	0	81.37	774	153	1.76	81.60	77	10	8.60E-01	4.7	
7	0	93.42	38	64	1.16	93.65	90	6	4.18E-02	37.7	
8	0	103.07	42	56	2.53	103.30	100	8	4.67E-02	34.8	
9	3	111.90	209	44	1.99	112.13	107	14	2.32E-01	8.6	2.62E+00
10	3	116.27	53	42	2.00	116.50	107	14	5.88E-02	25.8	
11	0	162.62	45	102	1.98	162.85	157	12	4.95E-02	47.8	
12	0	276.93	79	37	1.44	277.14	272	10	8.73E-02	18.4	
13	3	303.19	168	24	1.66	303.40	300	11	1.87E-01	8.7	6.94E+00
14	3	307.27	17	41	2.20	307.48	300	11	1.93E-02	78.7	
15	0	334.18	72	29	1.74	334.39	331	7	8.04E-02	16.9	
16	3	352.35	12	6	2.24	352.56	351	10	1.37E-02	33.0	6.96E+00
17	3	356.52	551	12	1.55	356.73	351	10	6.12E-01	4.4	
18	0	365.72	14	21	2.98	365.93	362	7	1.56E-02	60.5	
19	3	384.26	112	31	2.23	384.47	381	10	1.25E-01	15.6	8.76E+00
20	3	387.37	191	39	1.76	387.58	381	10	2.12E-01	9.2	
21	0	391.90	42	19	1.92	392.11	391	6	4.65E-02	25.6	
22	3	415.18	54	14	2.10	415.39	410	16	6.02E-02	17.5	1.74E+00
23	3	418.87	30	15	2.30	419.08	410	16	3.33E-02	33.3	
24	0	437.52	99	13	1.89	437.73	432	9	1.10E-01	11.9	
25	0	468.29	24	5	1.33	468.49	465	7	2.62E-02	26.2	
26	0	511.86	36	4	1.97	512.05	508	9	4.02E-02	19.6	

Total number of lines in spectrum 26  
 Number of unidentified lines 22  
 Number of lines tentatively identified by NID 4 15.38%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	3.590E+02	3.590E+02	0.693E+02	19.31		
Total Activity :			3.590E+02	3.590E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
TH-234	4.47E+09Y	1.00	3.160E+02	3.160E+02	0.593E+02	18.77		
Total Activity :			3.160E+02	3.160E+02				

Grand Total Activity : 6.750E+02 6.750E+02

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected		Decay Corr		2-Sigma	Status
				pCi/filter	pCi/filter	pCi/filter	pCi/filter		
BA-133	81.00	33.00*	1.963E+01	3.590E+02	3.590E+02	19.31	OK		
	302.84	17.80	4.915E+00	5.771E+02	5.771E+02	34.01	OK		
	356.01	60.00	6.963E+00	3.962E+02	3.962E+02	17.48	OK		

Final Mean for 3 Valid Peaks = 3.590E+02+/- 6.932E+01 ( 19.31%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected		Decay Corr		2-Sigma	Status
				pCi/filter	pCi/filter	pCi/filter	pCi/filter		
TH-234	63.29	3.80*	5.865E+01	3.160E+02	3.160E+02	18.77	OK		

Final Mean for 1 Valid Peaks = 3.160E+02+/- 5.931E+01 ( 18.77%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.590E+02	6.932E+01	1.828E+01	3.001E+00	19.640
TH-234	3.160E+02	5.931E+01	5.980E+01	1.916E+00	5.284

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-3.887E+00		1.165E+01	1.774E+01	5.538E+00	-0.219
CD-109	1.308E+01		1.586E+02	2.239E+02	2.896E+01	0.058
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	9.277E+00		1.751E+00	3.652E+00	6.863E-02	2.540
NP-237	3.378E+01		4.236E+01	6.569E+01	7.998E+00	0.514
AM-241	8.449E+00		3.487E+00	6.442E+00	1.511E-01	1.311

818117

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715208\_GE1\_BAFIL\_194461.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : DUP 06 TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:27:52.  
 Sample ID : 1307152-08 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE1 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.95	2041	66	1.63	31.18	27	13	2.27E+00	2.3	1.83E+01
2	3	35.23	502	43	1.78	35.46	27	13	5.57E-01	5.1	
3	0	53.01	58	78	1.99	53.24	50	6	6.44E-02	27.4	
4	4	62.13	259	92	1.86	62.36	58	17	2.87E-01	8.6	1.17E+00
5	4	66.18	109	87	2.11	66.41	58	17	1.21E-01	19.1	
6	0	81.37	818	133	1.85	81.60	76	12	9.09E-01	4.5	
7	0	92.73	59	93	1.83	92.96	89	9	6.52E-02	32.3	
8	2	112.08	195	63	1.65	112.31	108	15	2.17E-01	9.2	1.88E+00
9	2	116.57	47	48	1.82	116.80	108	15	5.20E-02	28.9	
10	0	161.48	48	39	3.11	161.71	159	6	5.33E-02	25.1	
11	0	277.36	51	40	1.45	277.58	274	6	5.70E-02	21.4	
12	4	303.20	176	22	1.75	303.41	299	22	1.95E-01	8.3	2.44E+00
13	4	307.55	30	23	2.14	307.76	299	22	3.31E-02	34.1	
14	4	312.40	16	26	2.43	312.61	299	22	1.75E-02	62.1	
15	3	333.89	91	12	1.80	334.11	330	13	1.02E-01	12.5	3.08E+00
16	3	338.34	21	23	2.23	338.55	330	13	2.32E-02	52.9	
17	1	352.86	14	4	1.85	353.07	351	13	1.60E-02	34.6	2.03E+00
18	1	356.62	528	7	1.56	356.83	351	13	5.87E-01	4.4	
19	0	386.33	368	56	3.87	386.54	382	9	4.08E-01	6.4	
20	0	391.94	40	26	1.45	392.14	391	6	4.48E-02	27.1	
21	0	417.44	66	27	5.00	417.65	411	14	7.30E-02	21.0	
22	0	437.89	109	25	1.73	438.10	433	9	1.21E-01	12.6	
23	0	468.41	21	7	1.98	468.61	466	7	2.28E-02	29.3	
24	2	510.06	11	0	2.15	510.26	508	9	1.24E-02	32.3	6.79E-01
25	2	512.50	14	2	2.15	512.70	508	9	1.55E-02	38.7	
26	0	547.86	9	5	2.65	548.06	543	9	9.44E-03	56.6	
27	0	609.71	11	5	2.25	609.90	606	9	1.17E-02	47.7	
28	0	721.19	7	4	1.35	721.37	717	8	7.88E-03	61.5	

Summary of Nuclide Activity

Sample ID : 1307152-08

Acquisition date : 8-AUG-2013 08:27:52

Total number of lines in spectrum 28  
 Number of unidentified lines 24  
 Number of lines tentatively identified by NID 4 14.29%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.794E+02	3.794E+02	0.726E+02	19.14	
Total Activity :			3.794E+02	3.794E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	3.485E+02	3.485E+02	0.626E+02	17.97	
Total Activity :			3.485E+02	3.485E+02			

Grand Total Activity : 7.279E+02 7.280E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.794E+02	3.794E+02	19.14	OK
	302.84	17.80	4.915E+00	6.038E+02	6.038E+02	33.65	OK
	356.01	60.00	6.963E+00	3.797E+02	3.797E+02	17.56	OK

Final Mean for 3 Valid Peaks = 3.794E+02 +/- 7.263E+01 ( 19.14%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.485E+02	3.485E+02	17.97	OK

Final Mean for 1 Valid Peaks = 3.485E+02 +/- 6.262E+01 ( 17.97%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.794E+02	7.263E+01	1.720E+01	2.824E+00	22.057
TH-234	3.485E+02	6.262E+01	5.617E+01	1.800E+00	6.205

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.036E+00		1.139E+01	1.815E+01	5.665E+00	-0.057
CD-109	1.326E+01		1.204E+02	1.751E+02	2.266E+01	0.076
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	9.613E+00		1.767E+00	3.693E+00	6.940E-02	2.603
NP-237	1.235E+01		3.418E+01	5.169E+01	6.293E+00	0.239
AM-241	7.704E+00		3.281E+00	6.105E+00	1.432E-01	1.262

*c*  
*BBm*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715209\_GE1\_BAFIL\_194465.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : DUP 06 DIS  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:49:21.  
 Sample ID : 1307152-09 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE1 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	27.90	42	56	1.51	28.14	27	13	4.64E-02	27.3	2.50E+01
2	4	30.96	2025	63	1.47	31.20	27	13	2.25E+00	2.3	
3	4	35.08	549	67	2.03	35.31	27	13	6.10E-01	6.5	
4	0	53.15	51	90	2.19	53.39	50	7	5.70E-02	33.6	
5	4	61.88	291	83	2.10	62.11	57	16	3.23E-01	7.8	3.78E+00
6	4	65.99	125	85	2.11	66.22	57	16	1.39E-01	16.4	
7	0	81.32	767	165	1.87	81.55	77	10	8.52E-01	4.8	
8	0	92.77	59	92	1.14	93.00	89	8	6.56E-02	31.0	
9	3	112.10	206	65	1.99	112.33	108	12	2.28E-01	9.6	3.38E+00
10	3	116.27	45	56	2.00	116.50	108	12	4.95E-02	33.0	
11	0	143.82	36	49	2.69	144.05	140	7	3.99E-02	36.7	
12	1	160.62	31	53	1.70	160.85	157	10	3.40E-02	38.7	4.18E+00
13	1	163.93	18	45	1.70	164.15	157	10	1.98E-02	62.9	
14	0	277.07	86	36	1.45	277.29	273	9	9.52E-02	16.6	
15	1	307.78	34	14	1.82	307.99	299	17	3.77E-02	25.4	1.46E+01
16	1	312.62	10	15	1.83	312.83	299	17	1.16E-02	61.3	
17	0	334.30	58	50	1.37	334.51	331	7	6.46E-02	23.9	
18	0	339.06	24	24	2.16	339.28	337	6	2.65E-02	39.5	
19	2	352.79	19	13	1.69	353.00	351	13	2.10E-02	29.2	1.42E+00
20	2	356.53	532	15	1.49	356.74	351	13	5.91E-01	4.5	
21	3	377.23	20	4	2.26	377.44	374	22	2.23E-02	32.4	1.81E+01
22	3	384.79	111	3	1.71	385.00	374	22	1.23E-01	10.8	
23	3	391.62	47	6	1.88	391.83	374	22	5.18E-02	19.1	
24	3	415.36	35	7	2.29	415.57	411	19	3.94E-02	24.2	2.65E+00
25	3	419.36	25	7	2.30	419.57	411	19	2.76E-02	35.2	
26	0	437.66	101	14	1.65	437.86	433	9	1.13E-01	11.9	
27	0	511.98	14	8	2.30	512.18	508	7	1.52E-02	44.7	
28	0	610.89	10	2	2.21	611.08	607	9	1.13E-02	40.6	
29	0	671.97	8	2	1.85	672.16	669	6	8.33E-03	44.7	
30	0	705.48	9	0	2.00	705.67	702	7	1.00E-02	33.3	

Summary of Nuclide Activity

Sample ID : 1307152-09

Acquisition date : 8-AUG-2013 08:49:21

Total number of lines in spectrum 30  
 Number of unidentified lines 27  
 Number of lines tentatively identified by NID 3 10.00%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	3.557E+02	3.557E+02	0.691E+02	19.43		
Total Activity :			3.557E+02	3.557E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
TH-234	4.47E+09Y	1.00	3.917E+02	3.917E+02	0.640E+02	16.35		
Total Activity :			3.917E+02	3.917E+02				

Grand Total Activity : 7.474E+02 7.474E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.557E+02	3.557E+02	19.43	OK
	302.84	17.80	4.915E+00	-----	Line Not Found	-----	Absent
	356.01	60.00	6.963E+00	3.825E+02	3.826E+02	17.58	OK

Final Mean for 2 Valid Peaks = 3.557E+02 +/- 6.913E+01 ( 19.43%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.917E+02	3.917E+02	16.35	OK

Final Mean for 1 Valid Peaks = 3.917E+02 +/- 6.403E+01 ( 16.35%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.557E+02	6.913E+01	1.972E+01	3.236E+00	18.043
TH-234	3.917E+02	6.403E+01	5.285E+01	1.694E+00	7.411

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.228E+01		1.266E+01	2.197E+01	6.858E+00	0.559
CD-109	-4.560E+00		1.573E+02	2.187E+02	2.829E+01	-0.021
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	8.916E+00		1.812E+00	3.714E+00	6.980E-02	2.401
NP-237	-1.067E+01		4.291E+01	5.769E+01	7.024E+00	-0.185
AM-241	1.239E+01		3.467E+00	6.799E+00	1.595E-01	1.822

*818w*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715210\_GE1\_BAFIL\_194469.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : S-53 TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 09:13:43.  
 Sample ID : 1307152-10 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE1 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.25 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.94	1715	87	1.51	31.18	27	13	1.91E+00	2.5	7.75E+00
2	3	35.13	465	59	1.72	35.36	27	13	5.16E-01	5.5	
3	4	53.11	45	80	2.08	53.34	48	26	5.05E-02	34.0	2.72E+00
4	4	62.07	263	67	1.85	62.30	48	26	2.92E-01	7.9	
5	4	65.97	91	60	2.11	66.21	48	26	1.01E-01	20.4	
6	4	69.64	17	56	1.92	69.87	48	26	1.94E-02	85.7	
7	0	81.33	731	110	1.88	81.56	76	11	8.12E-01	4.6	
8	0	92.28	43	69	1.14	92.51	90	6	4.73E-02	34.5	
9	4	108.77	16	64	2.18	109.00	106	14	1.79E-02	104.2	1.85E+00
10	4	112.22	189	51	2.00	112.45	106	14	2.10E-01	9.4	
11	4	116.26	58	52	2.20	116.49	106	14	6.48E-02	29.6	
12	0	135.07	31	54	1.64	135.29	131	8	3.42E-02	45.6	
13	1	143.77	18	29	1.53	144.00	139	26	2.00E-02	58.4	2.93E+00
14	1	158.78	17	33	1.54	159.00	139	26	1.88E-02	62.9	
15	0	277.06	63	14	1.30	277.28	274	7	7.04E-02	15.9	
16	1	302.95	157	6	1.82	303.17	299	16	1.74E-01	8.4	8.00E+00
17	1	307.88	36	7	1.82	308.09	299	16	3.97E-02	19.5	
18	2	333.92	70	12	1.87	334.13	330	16	7.80E-02	14.5	1.16E+00
19	2	338.52	24	12	2.03	338.73	330	16	2.71E-02	32.8	
20	0	356.55	451	30	1.70	356.76	352	10	5.01E-01	5.2	
21	4	378.42	15	7	2.49	378.63	373	28	1.69E-02	40.0	1.04E+01
22	4	384.56	122	7	2.28	384.77	373	28	1.36E-01	12.2	
23	4	387.23	206	6	1.91	387.44	373	28	2.29E-01	7.9	
24	4	391.34	54	7	2.42	391.54	373	28	5.97E-02	24.3	
25	3	415.02	45	8	2.29	415.23	411	17	4.96E-02	19.7	1.82E+00
26	3	418.30	30	8	2.01	418.50	411	17	3.28E-02	31.6	
27	3	421.79	10	7	1.73	422.00	411	17	1.13E-02	70.2	
28	0	437.45	76	20	1.72	437.65	434	9	8.47E-02	15.6	
29	0	468.16	29	2	1.68	468.36	464	9	3.19E-02	20.9	
30	3	507.97	7	1	2.36	508.17	507	11	7.24E-03	36.2	1.39E+00
31	3	511.39	14	2	2.36	511.59	507	11	1.58E-02	37.3	
32	0	671.44	8	0	2.50	671.62	668	7	8.89E-03	35.4	
33	0	686.37	6	1	1.73	686.56	685	4	6.98E-03	45.0	
34	0	693.94	8	0	2.59	694.12	691	6	8.89E-03	35.4	

Summary of Nuclide Activity

Sample ID : 1307152-10

Acquisition date : 8-AUG-2013 09:13:43

Total number of lines in spectrum 34  
 Number of unidentified lines 29  
 Number of lines tentatively identified by NID 5 14.71%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	3.390E+02	3.390E+02	0.653E+02	19.26		
Total Activity :			3.390E+02	3.390E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
TH-234	4.47E+09Y	1.00	3.541E+02	3.541E+02	0.589E+02	16.64		
Total Activity :			3.541E+02	3.541E+02				

Grand Total Activity : 6.931E+02 6.931E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.390E+02	3.390E+02	19.26	OK
	302.84	17.80	4.915E+00	5.373E+02	5.374E+02	33.74	OK
	356.01	60.00	6.963E+00	3.244E+02	3.244E+02	18.41	OK

Final Mean for 3 Valid Peaks = 3.390E+02 +/- 6.530E+01 ( 19.26%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.541E+02	3.541E+02	16.64	OK

Final Mean for 1 Valid Peaks = 3.541E+02 +/- 5.891E+01 ( 16.64%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.390E+02	6.530E+01	1.704E+01	2.797E+00	19.893
TH-234	3.541E+02	5.891E+01	4.960E+01	1.589E+00	7.139

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.546E+00		1.051E+01	1.771E+01	5.529E+00	0.144
CD-109	4.581E+01		1.339E+02	1.997E+02	2.583E+01	0.229
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	7.731E+00		1.603E+00	3.361E+00	6.316E-02	2.300
NP-237	2.083E+01		3.781E+01	5.792E+01	7.052E+00	0.360
AM-241	8.470E+00		2.922E+00	5.918E+00	1.388E-01	1.431

*8184*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715211\_GE1\_BAFIL\_194474.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : S-53 DIS  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 09:31:53.  
 Sample ID : 1307152-11 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE1 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	27.90	41	60	1.51	28.14	27	12	4.51E-02	30.0	2.07E+01
2	4	30.96	2057	74	1.48	31.19	27	12	2.29E+00	2.3	
3	4	35.11	467	99	2.03	35.35	27	12	5.19E-01	7.7	
4	0	53.28	62	94	2.26	53.51	50	8	6.94E-02	29.5	
5	3	61.87	283	85	1.91	62.11	58	12	3.14E-01	8.0	3.36E+00
6	3	66.33	141	68	1.82	66.56	58	12	1.57E-01	12.3	
7	0	81.35	827	159	1.87	81.58	77	11	9.19E-01	4.6	
8	0	92.90	28	84	1.48	93.12	90	7	3.06E-02	58.4	
9	0	112.17	172	96	1.93	112.40	109	6	1.91E-01	11.8	
10	0	116.85	35	66	1.30	117.08	116	5	3.85E-02	41.2	
11	0	239.19	47	51	5.41	239.40	234	13	5.22E-02	34.8	
12	0	277.23	66	35	1.70	277.45	273	9	7.34E-02	20.4	
13	5	303.16	146	15	1.72	303.37	300	15	1.63E-01	8.8	6.45E+00
14	5	307.85	26	16	2.67	308.07	300	15	2.84E-02	48.8	
15	5	311.53	11	10	2.67	311.74	300	15	1.20E-02	67.9	
16	3	333.86	71	19	1.79	334.07	330	15	7.91E-02	15.7	2.10E+00
17	3	338.50	28	25	2.23	338.71	330	15	3.15E-02	40.4	
18	0	356.53	595	22	1.69	356.74	352	10	6.61E-01	4.4	
19	0	365.59	9	26	2.86	365.80	362	7	1.04E-02	94.5	
20	0	377.11	10	17	1.39	377.32	375	5	1.14E-02	68.1	
21	0	386.04	326	83	4.14	386.25	381	10	3.62E-01	7.7	
22	0	391.83	31	28	1.54	392.04	391	6	3.48E-02	36.2	
23	2	415.16	25	11	2.08	415.36	411	18	2.81E-02	30.3	1.37E+00
24	2	418.43	24	10	2.09	418.64	411	18	2.66E-02	32.6	
25	0	437.65	109	13	1.70	437.85	433	8	1.21E-01	11.1	
26	4	464.92	9	0	2.33	465.12	464	11	9.71E-03	30.6	4.37E+00
27	4	468.19	14	4	2.57	468.39	464	11	1.53E-02	44.7	
28	4	472.24	7	5	2.10	472.44	464	11	8.17E-03	64.5	
29	0	511.71	20	7	2.13	511.91	507	9	2.26E-02	31.9	
30	0	582.14	12	0	1.20	582.33	579	7	1.33E-02	28.9	
31	0	598.93	8	4	3.16	599.13	595	8	8.80E-03	56.5	
32	0	766.71	9	0	2.75	766.89	763	8	1.00E-02	33.3	

Summary of Nuclide Activity

Sample ID : 1307152-11

Acquisition date : 8-AUG-2013 09:31:53

Total number of lines in spectrum 32  
 Number of unidentified lines 28  
 Number of lines tentatively identified by NID 4 12.50%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	%Error	Flags
			Uncorrected	Decay Corr					
BA-133	10.50Y	1.00	3.836E+02	3.836E+02	0.736E+02	19.19			
Total Activity :			3.836E+02	3.836E+02					

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	%Error	Flags
			Uncorrected	Decay Corr					
TH-234	4.47E+09Y	1.00	3.813E+02	3.813E+02	0.637E+02	16.72			
Total Activity :			3.813E+02	3.813E+02					

Grand Total Activity : 7.649E+02 7.649E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.963E+01	3.836E+02	3.836E+02	19.19	OK
	302.84	17.80	4.915E+00	5.028E+02	5.028E+02	34.16	OK
	356.01	60.00	6.963E+00	4.274E+02	4.274E+02	17.49	OK

Final Mean for 3 Valid Peaks = 3.836E+02+/- 7.361E+01 ( 19.19%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	5.865E+01	3.813E+02	3.813E+02	16.72	OK

Final Mean for 1 Valid Peaks = 3.813E+02+/- 6.375E+01 ( 16.72%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.836E+02	7.361E+01	1.688E+01	2.771E+00	22.724
TH-234	3.813E+02	6.375E+01	6.177E+01	1.979E+00	6.173

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	4.814E+00		1.324E+01	2.196E+01	6.855E+00	0.219
CD-109	3.660E+01		1.489E+02	2.162E+02	2.797E+01	0.169
PA-231	0.000E+00		0.000E+00	1.933E-01	3.632E-03	0.000
PA-234	9.869E+00		1.832E+00	3.794E+00	7.129E-02	2.602
NP-237	3.239E+01		4.059E+01	6.340E+01	7.719E+00	0.511
AM-241	9.752E+00		3.656E+00	6.781E+00	1.591E-01	1.438

*C*  
88110

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715212\_GE2\_BAFIL\_194458.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-14 TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:07:21.  
 Sample ID : 1307152-12 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	30.92	1824	86	1.53	31.03	26	18	2.03E+00	2.4	8.57E+00
2	4	35.27	463	55	1.65	35.38	26	18	5.14E-01	5.4	
3	0	52.19	55	64	3.72	52.31	49	7	6.16E-02	27.3	
4	0	61.33	180	136	1.59	61.44	57	8	2.00E-01	13.5	
5	0	65.70	54	95	1.63	65.81	65	6	6.00E-02	32.4	
6	1	81.02	599	30	1.50	81.14	77	11	6.66E-01	4.6	7.78E+00
7	1	83.89	24	37	1.37	84.00	77	11	2.68E-02	71.1	
8	0	94.21	10	93	1.71	94.32	89	8	1.11E-02	171.9	
9	0	111.58	206	83	1.48	111.69	107	8	2.29E-01	10.4	
10	0	186.24	27	61	1.20	186.35	183	7	2.95E-02	52.6	
11	0	276.91	53	37	2.12	277.02	273	7	5.93E-02	23.5	
12	1	302.92	135	16	1.59	303.02	298	14	1.50E-01	9.7	1.80E+00
13	1	307.73	28	17	1.79	307.84	298	14	3.13E-02	29.3	
14	3	333.84	64	23	1.74	333.94	330	13	7.15E-02	16.9	1.84E+00
15	3	338.23	14	32	2.20	338.33	330	13	1.60E-02	70.3	
16	1	352.04	12	3	1.83	352.14	350	11	1.35E-02	30.0	2.40E+00
17	1	356.05	514	8	1.58	356.16	350	11	5.71E-01	4.5	
18	1	383.79	112	10	1.86	383.89	380	18	1.25E-01	11.7	4.99E+00
19	1	387.00	220	7	1.86	387.11	380	18	2.45E-01	7.9	
20	1	391.05	33	4	1.86	391.16	380	18	3.63E-02	30.9	
21	2	414.53	32	7	2.07	414.64	410	15	3.51E-02	24.2	1.68E+00
22	2	418.25	24	8	2.08	418.36	410	15	2.70E-02	32.8	
23	0	437.07	85	11	1.50	437.17	433	9	9.44E-02	13.0	
24	0	467.84	19	6	1.62	467.95	465	6	2.11E-02	30.7	
25	0	510.74	33	5	1.90	510.84	505	10	3.63E-02	21.8	

Total number of lines in spectrum 25  
 Number of unidentified lines 21  
 Number of lines tentatively identified by NID 4 16.00%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	%Error	Flags
			Uncorrected	Decay Corr					
BA-133	10.50Y	1.00	3.031E+02	3.032E+02		0.598E+02		19.74	
Total Activity :			3.031E+02	3.032E+02					

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	%Error	Flags
			Uncorrected	Decay Corr					
TH-234	4.47E+09Y	1.00	6.164E+02	6.164E+02		1.762E+02		28.58	
AM-241	432.20Y	1.00	6.111E+01	6.111E+01		1.738E+01		28.44	
Total Activity :			6.776E+02	6.776E+02					

Grand Total Activity : 9.807E+02 9.807E+02

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.031E+02	3.032E+02	19.74	OK
	302.84	17.80	7.560E+00	3.007E+02	3.007E+02	35.63	OK
	356.01	60.00	7.170E+00	3.588E+02	3.588E+02	17.60	OK

Final Mean for 3 Valid Peaks = 3.032E+02+/- 5.985E+01 ( 19.74%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	6.164E+02	6.164E+02	28.58	OK

Final Mean for 1 Valid Peaks = 6.164E+02+/- 1.762E+02 ( 28.58%)

AM-241	59.54	35.90*	2.461E+01	6.111E+01	6.111E+01	28.44	OK
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Final Mean for 1 Valid Peaks = 6.111E+01+/- 1.738E+01 ( 28.44%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.032E+02	5.985E+01	1.806E+01	3.075E+00	16.787
TH-234	6.164E+02	1.762E+02	1.568E+02	1.296E+01	3.931
AM-241	6.111E+01	1.738E+01	1.408E+01	1.090E+00	4.341

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.865E-01		4.791E+00	8.575E+00	1.317E+00	0.045
CD-109	-5.993E+01		1.245E+02	1.650E+02	1.894E+01	-0.363
PA-231	2.523E+01		3.918E+00	7.860E+00	1.497E-01	3.209
PA-234	2.592E+00		1.675E+00	3.022E+00	6.233E-02	0.858
NP-237	-1.295E+01		3.640E+01	4.937E+01	5.574E+00	-0.262

884

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715213\_GE2\_BAFIL\_194462.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-14 DIS  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:28:24.  
 Sample ID : 1307152-13 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.29 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	2	30.94	2070	89	1.42	31.06	26	14	2.30E+00	2.3	8.74E+00
2	2	35.15	490	94	1.53	35.27	26	14	5.44E-01	5.5	
3	0	53.11	70	98	2.52	53.23	50	8	7.74E-02	27.4	
4	2	61.94	202	64	1.60	62.06	58	19	2.25E-01	9.5	2.82E+00
5	2	65.84	77	66	1.61	65.95	58	19	8.56E-02	20.3	
6	2	72.60	15	67	1.63	72.72	58	19	1.64E-02	90.6	
7	0	81.12	803	131	1.49	81.24	77	9	8.92E-01	4.4	
8	0	93.40	65	77	1.41	93.51	89	9	7.17E-02	27.4	
9	0	111.58	188	90	1.47	111.69	107	8	2.08E-01	11.5	
10	0	116.19	46	43	1.28	116.30	115	4	5.11E-02	25.5	
11	0	277.03	54	42	1.51	277.14	273	9	6.02E-02	25.6	
12	3	302.96	150	12	1.70	303.07	299	16	1.67E-01	8.7	2.86E+00
13	3	307.35	25	9	2.16	307.46	299	16	2.77E-02	38.5	
14	1	333.85	80	13	1.81	333.96	328	14	8.93E-02	12.6	1.13E+00
15	1	337.94	22	13	1.82	338.05	328	14	2.44E-02	37.1	
16	0	356.07	542	32	1.49	356.17	351	10	6.02E-01	4.7	
17	1	383.77	97	26	1.86	383.88	381	9	1.07E-01	14.4	3.84E+00
18	1	386.98	198	25	1.55	387.08	381	9	2.20E-01	8.3	
19	0	392.12	37	25	2.70	392.23	391	9	4.15E-02	39.6	
20	4	415.12	41	13	2.51	415.23	411	15	4.60E-02	24.0	2.29E+00
21	4	418.89	13	9	1.72	419.00	411	15	1.43E-02	53.2	
22	0	437.10	86	17	1.95	437.20	431	11	9.50E-02	14.2	
23	0	459.77	14	3	2.88	459.87	456	7	1.52E-02	35.2	
24	1	465.07	6	1	1.92	465.17	464	7	6.94E-03	38.4	9.19E-01
25	1	467.93	15	5	1.93	468.04	464	7	1.67E-02	37.5	
26	0	511.75	18	5	2.09	511.85	509	6	2.01E-02	31.2	
27	0	951.32	6	2	2.55	951.41	947	7	6.87E-03	53.8	

Summary of Nuclide Activity

Sample ID : 1307152-13

Acquisition date : 8-AUG-2013 08:28:24

Total number of lines in spectrum 27  
 Number of unidentified lines 23  
 Number of lines tentatively identified by NID 4 14.81%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	4.063E+02	4.063E+02	0.794E+02	19.55	
Total Activity :			4.063E+02	4.063E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	6.931E+02	6.931E+02	1.457E+02	21.02	
Total Activity :			6.931E+02	6.931E+02			

Grand Total Activity : 1.099E+03 1.099E+03

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	4.063E+02	4.063E+02	19.55	OK
	302.84	17.80	7.560E+00	3.356E+02	3.356E+02	34.62	OK
	356.01	60.00	7.170E+00	3.783E+02	3.783E+02	17.85	OK

Final Mean for 3 Valid Peaks = 4.063E+02 +/- 7.942E+01 ( 19.55%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	6.931E+02	6.931E+02	21.02	OK

Final Mean for 1 Valid Peaks = 6.931E+02 +/- 1.457E+02 ( 21.02%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.063E+02	7.942E+01	1.760E+01	2.997E+00	23.083
TH-234	6.931E+02	1.457E+02	1.218E+02	1.006E+01	5.692

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.182E+00		5.405E+00	9.272E+00	1.424E+00	0.235
CD-109	-9.786E+01		1.194E+02	1.474E+02	1.692E+01	-0.664
PA-231	2.977E+01		4.119E+00	8.275E+00	1.576E-01	3.597
PA-234	3.159E+00		1.711E+00	3.127E+00	6.449E-02	1.011
NP-237	1.477E+00		3.324E+01	4.837E+01	5.461E+00	0.031
AM-241	2.248E+01		1.013E+01	1.792E+01	1.387E+00	1.255

*C*  
*8800*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715214\_GE2\_BAFIL\_194466.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-205-AS TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:50:00.  
 Sample ID : 1307152-14 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.26 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	28.30	39	81	1.66	28.41	27	18	4.38E-02	32.2	1.15E+01
2	3	30.99	1710	88	1.44	31.11	27	18	1.90E+00	2.5	
3	3	35.05	402	75	1.68	35.17	27	18	4.47E-01	6.4	
4	0	52.52	72	87	1.64	52.64	49	8	7.98E-02	25.3	
5	3	59.32	29	25	1.76	59.44	58	12	3.24E-02	29.2	3.69E+00
6	3	61.82	179	50	1.76	61.94	58	12	1.99E-01	10.1	
7	3	65.86	70	65	1.77	65.97	58	12	7.77E-02	22.1	
8	0	81.12	728	108	1.50	81.23	77	9	8.09E-01	4.5	
9	0	91.83	49	89	3.60	91.95	89	10	5.49E-02	37.9	
10	0	111.78	169	63	1.33	111.89	108	7	1.88E-01	11.0	
11	0	116.06	27	55	1.59	116.17	115	5	3.04E-02	44.2	
12	0	186.45	56	65	1.43	186.56	182	9	6.18E-02	29.4	
13	0	276.75	47	24	1.70	276.86	273	6	5.23E-02	22.0	
14	1	302.94	127	17	1.57	303.05	297	19	1.41E-01	10.1	5.24E-01
15	1	307.05	24	11	1.79	307.16	297	19	2.64E-02	38.9	
16	1	310.73	13	9	1.79	310.84	297	19	1.39E-02	57.7	
17	0	333.84	56	26	1.64	333.95	330	7	6.21E-02	19.0	
18	0	356.15	476	28	1.60	356.26	351	10	5.29E-01	5.0	
19	0	365.27	25	11	5.29	365.38	361	9	2.78E-02	31.3	
20	3	383.81	79	21	2.25	383.91	381	9	8.80E-02	20.7	7.61E+00
21	3	386.94	148	26	1.65	387.05	381	9	1.64E-01	9.9	
22	0	391.23	41	10	1.89	391.33	390	5	4.59E-02	20.7	
23	3	414.78	26	8	2.28	414.89	409	16	2.91E-02	30.1	1.65E+00
24	3	417.91	15	5	2.08	418.02	409	16	1.64E-02	50.8	
25	0	437.08	85	9	1.48	437.18	433	9	9.42E-02	12.6	
26	0	468.64	16	7	2.40	468.74	465	9	1.76E-02	39.0	
27	0	510.66	24	6	2.79	510.77	505	11	2.61E-02	28.3	
28	0	649.10	10	2	1.13	649.20	645	8	1.12E-02	39.8	

Summary of Nuclide Activity

Sample ID : 1307152-14

Acquisition date : 8-AUG-2013 08:50:00

Total number of lines in spectrum 28  
 Number of unidentified lines 23  
 Number of lines tentatively identified by NID 5 17.86%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	3.685E+02	3.685E+02	0.725E+02	19.68		
Total Activity :			3.685E+02	3.685E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
TH-234	4.47E+09Y	1.00	6.139E+02	6.139E+02	1.364E+02	22.23		
AM-241	432.20Y	1.00	9.909E+00	9.909E+00	5.845E+00	58.99		
Total Activity :			6.238E+02	6.238E+02				

Grand Total Activity : 9.923E+02 9.923E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.685E+02	3.685E+02	19.68	OK
	302.84	17.80	7.560E+00	2.831E+02	2.831E+02	36.06	OK
	356.01	60.00	7.170E+00	3.324E+02	3.324E+02	18.18	OK

Final Mean for 3 Valid Peaks = 3.685E+02+/- 7.252E+01 ( 19.68%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	6.139E+02	6.139E+02	22.23	OK

Final Mean for 1 Valid Peaks = 6.139E+02+/- 1.364E+02 ( 22.23%)

AM-241	59.54	35.90*	2.461E+01	9.909E+00	9.909E+00	58.99	OK
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Final Mean for 1 Valid Peaks = 9.909E+00+/- 5.845E+00 ( 58.99%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.685E+02	7.252E+01	1.800E+01	3.065E+00	20.471
TH-234	6.139E+02	1.364E+02	1.240E+02	1.025E+01	4.951
AM-241	9.909E+00	5.845E+00	1.226E+01	9.489E-01	0.808

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	8.844E-01		5.652E+00	9.372E+00	1.439E+00	0.094
CD-109	-3.983E+01		1.135E+02	1.543E+02	1.771E+01	-0.258
PA-231	2.600E+01		3.951E+00	7.931E+00	1.510E-01	3.278
PA-234	9.845E-01		1.593E+00	2.902E+00	5.986E-02	0.339
NP-237	1.986E+01		2.856E+01	4.671E+01	5.274E+00	0.425

C  
08/12

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715215\_GE2\_BAFIL\_194470.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-205-AS DIS  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 09:14:15.  
 Sample ID : 1307152-15 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	2	30.95	1793	98	1.43	31.07	26	15	1.99E+00	2.5	5.78E+00
2	2	35.15	457	93	1.53	35.27	26	15	5.08E-01	5.9	
3	0	52.41	38	114	2.43	52.52	50	9	4.23E-02	53.6	
4	0	61.53	193	123	1.28	61.65	58	7	2.14E-01	12.0	
5	0	65.60	53	116	1.67	65.72	65	6	5.89E-02	35.8	
6	0	81.09	742	100	1.45	81.20	76	9	8.24E-01	4.4	
7	0	91.88	15	67	2.53	91.99	91	6	1.65E-02	90.3	
8	0	111.40	129	144	1.20	111.52	108	8	1.43E-01	18.3	
9	0	160.89	42	90	1.41	161.00	156	10	4.67E-02	45.0	
10	2	182.20	13	52	1.81	182.31	180	9	1.48E-02	81.8	2.43E+00
11	2	185.70	36	39	1.82	185.81	180	9	3.96E-02	33.4	
12	0	277.38	42	44	1.71	277.49	273	9	4.62E-02	32.5	
13	1	302.93	129	14	1.47	303.04	299	16	1.43E-01	9.5	1.79E+00
14	1	307.04	28	13	1.79	307.14	299	16	3.13E-02	33.4	
15	1	311.78	14	11	1.79	311.89	299	16	1.51E-02	48.4	
16	0	333.69	46	17	1.77	333.80	331	6	5.09E-02	20.5	
17	2	351.57	10	6	2.01	351.67	350	10	1.06E-02	43.1	7.51E-01
18	2	356.06	512	3	1.43	356.17	350	10	5.69E-01	4.4	
19	1	383.72	113	14	1.86	383.83	380	15	1.25E-01	11.6	7.05E+00
20	1	386.93	156	13	1.86	387.04	380	15	1.73E-01	10.4	
21	1	391.06	48	12	1.86	391.17	380	15	5.33E-02	21.9	
22	4	414.65	33	18	2.51	414.75	410	12	3.68E-02	29.4	1.36E+00
23	4	418.69	21	17	2.29	418.80	410	12	2.28E-02	43.7	
24	0	437.14	75	12	1.36	437.25	433	8	8.33E-02	14.0	
25	0	468.05	13	12	1.34	468.16	465	7	1.46E-02	51.9	
26	0	512.56	29	6	2.54	512.67	506	14	3.22E-02	26.7	

Total number of lines in spectrum 26  
 Number of unidentified lines 22  
 Number of lines tentatively identified by NID 4 15.38%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	3.754E+02	3.754E+02	0.735E+02	19.58		
Total Activity :			3.754E+02	3.754E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
TH-234	4.47E+09Y	1.00	6.604E+02	6.604E+02	1.700E+02	25.75		
AM-241	432.20Y	1.00	6.546E+01	6.546E+01	1.675E+01	25.58		
Total Activity :			7.258E+02	7.258E+02				

Grand Total Activity : 1.101E+03 1.101E+03

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.754E+02	3.754E+02	19.58	OK
	302.84	17.80	7.560E+00	2.879E+02	2.880E+02	35.45	OK
	356.01	60.00	7.170E+00	3.573E+02	3.573E+02	17.54	OK

Final Mean for 3 Valid Peaks = 3.754E+02+/- 7.350E+01 ( 19.58%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	6.604E+02	6.604E+02	25.75	OK

Final Mean for 1 Valid Peaks = 6.604E+02+/- 1.700E+02 ( 25.75%)

AM-241	59.54	35.90*	2.461E+01	6.546E+01	6.546E+01	25.58	OK
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Final Mean for 1 Valid Peaks = 6.546E+01+/- 1.675E+01 ( 25.58%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.754E+02	7.350E+01	1.800E+01	3.065E+00	20.855
TH-234	6.604E+02	1.700E+02	1.715E+02	1.417E+01	3.850
AM-241	6.546E+01	1.675E+01	1.567E+01	1.213E+00	4.177

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.890E+00		5.133E+00	8.457E+00	1.299E+00	-0.342
CD-109	7.994E+01		1.162E+02	1.844E+02	2.118E+01	0.433
PA-231	2.611E+01		3.957E+00	7.943E+00	1.513E-01	3.288
PA-234	4.148E+00		1.693E+00	3.194E+00	6.587E-02	1.299
NP-237	2.803E+01		3.188E+01	5.233E+01	5.908E+00	0.536

*C*  
*8815*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715216\_GE3\_BAFIL\_194464.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : I-65 TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:29:37.  
 Sample ID : 1307152-16 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:06.20 0.7%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	30.83	2113	105	1.57	31.14	26	13	2.35E+00	2.3	1.36E+01
2	4	35.14	527	67	1.70	35.46	26	13	5.85E-01	5.1	
3	0	53.62	49	128	1.86	53.94	50	8	5.44E-02	42.5	
4	2	61.76	260	71	1.66	62.08	58	18	2.88E-01	8.0	4.29E+00
5	2	65.71	113	62	1.67	66.03	58	18	1.26E-01	14.5	
6	0	81.06	819	118	1.87	81.38	76	11	9.10E-01	4.3	
7	4	111.81	256	62	1.92	112.12	107	14	2.85E-01	7.9	1.64E+00
8	4	116.01	44	67	2.13	116.33	107	14	4.87E-02	39.1	
9	0	276.64	52	40	1.34	276.95	273	8	5.75E-02	25.3	
10	0	289.63	22	24	3.25	289.93	285	10	2.45E-02	47.3	
11	2	302.99	138	18	1.68	303.29	299	16	1.53E-01	9.4	2.80E+00
12	2	307.60	26	21	1.99	307.90	299	16	2.94E-02	34.3	
13	3	333.68	82	9	1.78	333.98	330	15	9.09E-02	12.5	1.34E+00
14	3	338.25	35	11	2.22	338.55	330	15	3.88E-02	28.1	
15	0	356.21	506	23	1.98	356.52	351	12	5.62E-01	4.8	
16	0	377.39	10	15	2.45	377.70	375	6	1.15E-02	64.9	
17	3	384.70	96	6	1.70	385.00	380	16	1.06E-01	12.7	2.12E+01
18	3	391.44	41	1	2.27	391.75	380	16	4.51E-02	28.8	
19	1	414.86	51	12	1.89	415.17	409	22	5.63E-02	17.5	9.32E-01
20	1	418.60	28	9	1.90	418.90	409	22	3.10E-02	30.4	
21	1	421.87	14	8	1.90	422.17	409	22	1.57E-02	53.4	
22	0	437.29	120	5	1.96	437.59	434	9	1.33E-01	9.7	
23	0	468.35	25	18	1.64	468.65	464	9	2.75E-02	36.9	
24	0	511.31	22	14	4.40	511.61	506	9	2.48E-02	36.5	
25	0	523.20	6	0	1.88	523.50	521	5	6.67E-03	40.8	
26	0	706.59	6	2	1.42	706.88	703	7	7.08E-03	52.2	

Total number of lines in spectrum 26  
 Number of unidentified lines 22  
 Number of lines tentatively identified by NID 4 15.38%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	3.924E+02	3.925E+02	0.708E+02	18.03	
Total Activity :			3.924E+02	3.925E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
TH-234	4.47E+09Y	1.00	7.748E+02	7.748E+02	1.340E+02	17.29	
Total Activity :			7.748E+02	7.748E+02			

Grand Total Activity : 1.167E+03 1.167E+03

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.899E+01	3.924E+02	3.925E+02	18.03	OK
	302.84	17.80	6.222E+00	3.731E+02	3.731E+02	27.91	OK
	356.01	60.00	5.860E+00	4.318E+02	4.318E+02	16.74	OK

Final Mean for 3 Valid Peaks = 3.925E+02+/- 7.077E+01 ( 18.03%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	7.748E+02	7.748E+02	17.29	OK

Final Mean for 1 Valid Peaks = 7.748E+02+/- 1.340E+02 ( 17.29%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.925E+02	7.077E+01	1.735E+01	2.654E+00	22.618
TH-234	7.748E+02	1.340E+02	1.242E+02	6.671E+00	6.238

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.903E+00		6.747E+00	1.022E+01	1.167E+00	-0.284
CD-109	2.933E+01		1.058E+02	1.764E+02	1.455E+01	0.166
PA-231	2.808E+00		1.713E+00	3.400E+00	4.836E-02	0.826
PA-234	3.164E+00		1.485E+00	2.763E+00	3.930E-02	1.145
NP-237	7.630E+00		3.166E+01	5.244E+01	4.239E+00	0.145
AM-241	3.027E+01		1.048E+01	1.854E+01	9.115E-01	1.633

*88100*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130715217\_GE3\_BAFIL\_194468.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : I-65 DIS  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 08:51:16.  
 Sample ID : 1307152-17 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:06.57 0.7%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	27.81	21	45	1.43	28.13	27	13	2.38E-02	40.5	1.48E+01
2	4	30.87	2012	89	1.50	31.19	27	13	2.24E+00	2.3	
3	4	35.00	497	80	1.93	35.32	27	13	5.52E-01	7.2	
4	0	52.90	65	132	1.82	53.22	49	9	7.27E-02	33.9	
5	2	61.79	214	83	1.66	62.11	58	13	2.37E-01	9.7	3.02E+00
6	2	65.91	132	84	1.67	66.22	58	13	1.47E-01	13.7	
7	0	81.13	754	89	1.92	81.45	78	9	8.37E-01	4.3	
8	1	92.54	41	58	1.56	92.86	89	10	4.56E-02	31.5	2.09E+00
9	1	95.68	17	52	1.57	96.00	89	10	1.93E-02	67.8	
10	1	111.79	210	47	1.59	112.10	107	13	2.33E-01	8.7	5.85E+00
11	1	115.83	41	42	1.60	116.15	107	13	4.52E-02	31.6	
12	0	161.21	41	80	1.24	161.52	158	8	4.53E-02	42.3	
13	0	238.34	32	46	1.33	238.65	235	8	3.58E-02	40.4	
14	1	273.53	9	3	1.78	273.84	273	8	1.05E-02	25.6	6.20E+00
15	1	276.85	69	16	1.78	277.16	273	8	7.71E-02	14.8	
16	0	303.00	129	41	1.49	303.31	300	7	1.43E-01	12.0	
17	0	307.76	20	30	1.26	308.07	307	5	2.17E-02	48.7	
18	0	333.27	71	68	1.42	333.58	330	9	7.89E-02	24.0	
19	0	356.24	466	30	1.91	356.54	351	12	5.18E-01	5.2	
20	3	376.96	13	17	2.26	377.26	373	23	1.47E-02	55.8	2.91E+00
21	3	384.26	119	15	2.26	384.56	373	23	1.32E-01	14.1	
22	3	386.97	223	8	1.69	387.27	373	23	2.48E-01	7.5	
23	3	391.13	55	7	2.10	391.44	373	23	6.07E-02	23.3	
24	0	416.28	70	23	2.27	416.58	412	10	7.74E-02	17.5	
25	0	437.52	99	15	1.74	437.82	433	8	1.10E-01	12.0	
26	1	467.88	20	1	1.93	468.18	466	9	2.21E-02	21.9	1.97E-01
27	1	471.80	7	2	1.94	472.09	466	9	7.29E-03	66.9	
28	0	511.37	18	0	4.07	511.67	509	7	2.00E-02	23.6	
29	0	718.65	7	4	4.48	718.94	714	7	8.28E-03	55.5	

Summary of Nuclide Activity

Sample ID : 1307152-17

Acquisition date : 8-AUG-2013 08:51:16

Total number of lines in spectrum 29  
 Number of unidentified lines 25  
 Number of lines tentatively identified by NID 4 13.79%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter				
BA-133	10.50Y	1.00	3.612E+02	3.612E+02	0.649E+02	17.97		
Total Activity :			3.612E+02	3.612E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter				
TH-234	4.47E+09Y	1.00	6.378E+02	6.378E+02	1.308E+02	20.50		
Total Activity :			6.378E+02	6.378E+02				

Grand Total Activity : 9.990E+02 9.990E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.899E+01	3.612E+02	3.612E+02	17.97	OK
	302.84	17.80	6.222E+00	3.495E+02	3.495E+02	31.67	OK
	356.01	60.00	5.860E+00	3.980E+02	3.980E+02	17.15	OK

Final Mean for 3 Valid Peaks = 3.612E+02 +/- 6.490E+01 ( 17.97%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	6.378E+02	6.378E+02	20.50	OK

Final Mean for 1 Valid Peaks = 6.378E+02 +/- 1.308E+02 ( 20.50%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.612E+02	6.490E+01	1.697E+01	2.595E+00	21.291
TH-234	6.378E+02	1.308E+02	1.265E+02	6.793E+00	5.043

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.934E+00		5.467E+00	9.545E+00	1.090E+00	0.307
CD-109	1.286E+01		1.199E+02	1.734E+02	1.429E+01	0.074
PA-231	3.769E+00		1.835E+00	3.683E+00	5.238E-02	1.023
PA-234	3.550E+00		1.525E+00	2.969E+00	4.223E-02	1.196
NP-237	1.345E+01		3.537E+01	5.304E+01	4.287E+00	0.254
AM-241	2.781E+01		9.624E+00	1.824E+01	8.969E-01	1.524

818(1)

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715218\_GE3\_BAFIL\_194472.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-13 TOT  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 09:15:28.  
 Sample ID : 1307152-18 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:06.20 0.7%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	28.27	52	142	1.90	28.59	26	13	5.78E-02	82.7	1.30E+01
2	4	30.86	1979	88	1.42	31.18	26	13	2.20E+00	2.4	
3	4	34.96	499	113	1.93	35.28	26	13	5.55E-01	7.2	
4	0	52.95	49	116	2.17	53.27	50	8	5.44E-02	40.5	
5	3	61.72	231	67	1.47	62.04	58	12	2.57E-01	8.2	7.19E-01
6	3	66.01	123	99	1.83	66.33	58	12	1.37E-01	15.7	
7	0	81.08	854	137	1.87	81.40	77	10	9.49E-01	4.3	
8	0	92.45	30	56	1.02	92.77	90	5	3.30E-02	42.3	
9	0	102.27	12	84	1.76	102.58	99	7	1.33E-02	129.9	
10	2	111.94	195	61	1.75	112.26	107	14	2.16E-01	9.3	2.33E+00
11	2	115.99	44	60	1.76	116.30	107	14	4.85E-02	31.9	
12	0	140.17	12	45	1.61	140.48	138	4	1.36E-02	82.2	
13	0	161.07	25	43	1.25	161.38	158	6	2.74E-02	47.2	
14	0	276.88	39	28	1.25	277.18	275	6	4.35E-02	26.5	
15	2	303.03	143	21	1.89	303.34	297	14	1.59E-01	9.7	2.32E+00
16	2	307.45	29	21	1.99	307.75	297	14	3.19E-02	32.4	
17	0	335.04	99	35	1.94	335.34	330	11	1.09E-01	15.5	
18	0	356.20	476	25	1.95	356.51	351	10	5.29E-01	5.0	
19	0	386.03	290	38	1.89	386.33	381	9	3.22E-01	7.1	
20	2	415.06	38	17	2.08	415.36	410	20	4.26E-02	22.5	1.67E+00
21	2	419.70	13	9	1.73	420.00	410	20	1.50E-02	52.5	
22	0	437.06	89	12	1.89	437.36	431	9	9.89E-02	12.6	
23	4	467.98	23	4	2.05	468.28	465	11	2.56E-02	25.8	1.48E+00
24	4	472.52	8	1	2.58	472.82	465	11	8.84E-03	47.9	
25	0	511.42	13	5	2.76	511.72	507	9	1.39E-02	41.7	
26	0	848.88	6	0	1.98	849.17	846	6	6.67E-03	40.8	

Total number of lines in spectrum 26  
 Number of unidentified lines 22  
 Number of lines tentatively identified by NID 4 15.38%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	4.092E+02	4.092E+02	0.736E+02	17.98	
Total Activity :			4.092E+02	4.092E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	6.894E+02	6.894E+02	1.224E+02	17.76	
Total Activity :			6.894E+02	6.894E+02			

Grand Total Activity : 1.099E+03 1.099E+03

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit



Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.899E+01	4.092E+02	4.092E+02	17.98	OK
	302.84	17.80	6.222E+00	3.869E+02	3.869E+02	28.29	OK
	356.01	60.00	5.860E+00	4.065E+02	4.066E+02	16.90	OK

Final Mean for 3 Valid Peaks = 4.092E+02+/- 7.356E+01 ( 17.98%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	6.894E+02	6.894E+02	17.76	OK

Final Mean for 1 Valid Peaks = 6.894E+02+/- 1.224E+02 ( 17.76%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.092E+02	7.356E+01	2.015E+01	3.081E+00	20.312
TH-234	6.894E+02	1.224E+02	1.287E+02	6.912E+00	5.358

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.535E+00	6.495E+00	9.901E+00	1.131E+00	-0.256
CD-109	3.738E+00	1.287E+02	1.829E+02	1.508E+01	0.020
PA-231	2.211E+00	1.715E+00	3.335E+00	4.743E-02	0.663
PA-234	2.733E+00	1.490E+00	2.726E+00	3.878E-02	1.002
NP-237	1.826E+01	3.710E+01	5.610E+01	4.535E+00	0.326
AM-241	2.534E+01	9.560E+00	1.794E+01	8.820E-01	1.412

2  
8817

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130715219\_GE3\_BAFIL\_194475.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-13 DIS  
 Deposition Date :  
 Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 09:32:27.  
 Sample ID : 1307152-19 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE3 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:06.02 0.7%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	27.81	26	54	1.43	28.13	27	14	2.92E-02	36.7	2.16E+01
2	4	30.86	1872	92	1.43	31.18	27	14	2.08E+00	2.4	
3	4	34.96	472	107	1.93	35.28	27	14	5.24E-01	7.5	
4	0	46.98	40	66	1.29	47.30	44	6	4.42E-02	36.4	
5	0	52.57	61	77	2.52	52.88	50	7	6.77E-02	26.9	
6	3	59.13	18	64	1.82	59.45	57	13	2.02E-02	77.8	8.59E+00
7	3	61.90	280	62	1.82	62.22	57	13	3.11E-01	7.3	
8	3	65.63	125	68	1.83	65.95	57	13	1.39E-01	15.6	
9	3	81.08	860	55	1.52	81.40	77	13	9.56E-01	3.6	1.65E+00
10	3	84.84	15	57	1.70	85.16	77	13	1.72E-02	82.4	
11	3	111.97	230	59	1.77	112.28	108	19	2.55E-01	8.2	8.70E-01
12	3	115.89	43	55	1.93	116.21	108	19	4.81E-02	39.2	
13	0	143.33	25	66	2.31	143.64	141	7	2.78E-02	57.0	
14	0	164.96	11	150	6.16	165.27	154	14	1.23E-02	2235.9	
15	0	276.72	45	43	2.05	277.03	271	11	5.02E-02	32.0	
16	0	304.40	126	44	1.84	304.71	299	11	1.40E-01	13.7	
17	3	333.86	59	20	1.83	334.16	330	17	6.60E-02	17.7	1.72E+00
18	3	338.25	26	28	2.22	338.55	330	17	2.86E-02	44.5	
19	0	356.18	513	30	2.00	356.49	351	11	5.70E-01	4.9	
20	3	383.80	87	26	2.09	384.10	381	10	9.72E-02	16.0	1.05E+01
21	3	386.90	204	46	1.85	387.21	381	10	2.27E-01	9.5	
22	0	391.65	32	20	1.46	391.95	391	4	3.56E-02	27.2	
23	3	414.84	32	7	2.29	415.14	409	17	3.54E-02	25.9	2.17E+00
24	3	418.70	36	6	1.95	419.00	409	17	4.00E-02	22.8	
25	3	422.06	13	6	2.09	422.36	409	17	1.39E-02	56.9	
26	3	433.70	5	0	1.73	434.00	433	8	6.07E-03	6.5	3.43E+00
27	3	437.13	90	3	2.05	437.43	433	8	1.00E-01	11.6	
28	0	468.11	20	7	2.51	468.41	465	7	2.17E-02	32.0	
29	0	500.19	6	5	1.24	500.49	496	7	6.52E-03	76.6	
30	1	507.70	5	2	1.78	508.00	505	10	5.57E-03	58.4	2.40E+00
31	1	511.70	9	1	1.79	512.00	505	10	1.05E-02	44.5	

Total number of lines in spectrum 31  
 Number of unidentified lines 25  
 Number of lines tentatively identified by NID 6 19.35%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	4.123E+02	4.124E+02	0.718E+02	17.40	
NP-237	2.14E+06Y	1.00	2.103E+01	2.103E+01	3.471E+01	165.03	
Total Activity :			4.334E+02	4.334E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
TH-234	4.47E+09Y	1.00	8.365E+02	8.365E+02	1.347E+02	16.10	
AM-241	432.20Y	1.00	5.244E+00	5.244E+00	8.165E+00	155.70	
Total Activity :			8.418E+02	8.418E+02			

Grand Total Activity : 1.275E+03 1.275E+03

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.899E+01	4.123E+02	4.124E+02	17.40	OK
	302.84	17.80	6.222E+00	3.415E+02	3.415E+02	34.31	OK
	356.01	60.00	5.860E+00	4.379E+02	4.380E+02	16.78	OK

Final Mean for 3 Valid Peaks = 4.124E+02+/- 7.176E+01 ( 17.40%)

NP-237	86.50	12.60*	1.749E+01	2.103E+01	2.103E+01	165.03	OK
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Final Mean for 1 Valid Peaks = 2.103E+01+/- 3.471E+01 (165.03%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	8.365E+02	8.365E+02	16.10	OK

Final Mean for 1 Valid Peaks = 8.365E+02+/- 1.347E+02 ( 16.10%)

AM-241	59.54	35.90*	2.893E+01	5.244E+00	5.244E+00	155.70	OK
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Final Mean for 1 Valid Peaks = 5.244E+00+/- 8.165E+00 (155.70%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.124E+02	7.176E+01	1.713E+01	2.620E+00	24.067
TH-234	8.365E+02	1.347E+02	1.159E+02	6.228E+00	7.215
NP-237	2.103E+01	3.471E+01	4.884E+01	3.948E+00	0.431
AM-241	5.244E+00	8.165E+00	1.121E+01	5.511E-01	0.468

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.652E-01	5.916E+00	1.027E+01	1.173E+00	-0.016
CD-109	-9.281E+00	1.080E+02	1.727E+02	1.424E+01	-0.054
PA-231	5.689E+00	2.103E+00	4.253E+00	6.048E-02	1.338
PA-234	2.963E+00	1.426E+00	2.773E+00	3.944E-02	1.069