

US EPA ARCHIVE DOCUMENT

**ENGINEERING MANAGEMENT SUPPORT, INC.**

**West Lake OU-1**

**STANDARD LEVEL IV  
REPORT OF ANALYSIS**

**WORK ORDER #13-07147-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

**13-07147**

Eberline Services Work Order # \_\_\_\_\_

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

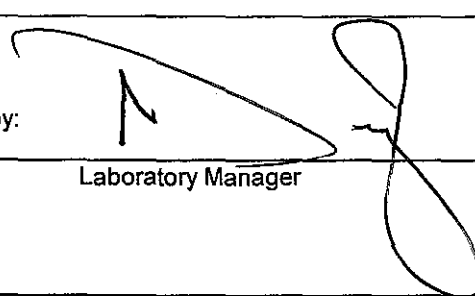
Date for Partial	Initials	Date	Initials	Checklist Items
		7/23/13	KC	Sample Log-In
		8/14/13	KBD	Data Compilation
		8/22/13	MLT	First Technical Data Review
		8/22/13	MSA	Second Technical Data Review
		8/26/13	[Signature]	Data Entry/Electronic Deliverable
		8/26/13	[Signature]	Case Narrative
		8/27/13	KBD	Electronic Deliverable Proof
		8/27/13	MSA	Samples Analyzed within Holding Time Yes? <input checked="" type="checkbox"/> No? <input type="checkbox"/>
		8/27/13	MSA	QA/QC Review
				Client in Possession of Data Electronic or Hard Copy
				Invoiced by Laboratory

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

Date package approved by:

Laboratory Manager

Date

 **8/29/13**

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

Radiochemistry Services

US EPA ARCHIVE DOCUMENT

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

# Chain of Custody Record

No 1604

REC'D JUL 22 2013

13-07147

Eberline Services  
601 Scarboro Road  
Oak Ridge, TN 37830  
(865) 481-0683 Phone • (865) 483-4621 Fax



Project Name: <u>West Lake 0-1</u>	Project Number:
Send Report To: <u>Paul Postico</u>	Sampler (Print Name):
Address: <u>7220 W. Jefferson Ave</u>	Sampler (Print Name):
<u>Suite 406</u>	Shipment Method: <u>Carrier</u>
<u>Lakewood, Co 80035</u>	Airbill Number:
Phone:	Laboratory Receiving:
Fax:	

Analysis Requested  
 D53 U-286 U-285 U-284  
 D53 RA-206 RA-208  
 Tot U-285 232, 230, 228  
 Tot RA-206 235, 237  
 Tot Ther- 232, 230, 228

Page 1 of 3  
 ① samples re-preserved at AWC  
 Purchase Order #:

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested										Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)	
PZ-105-SS	7/12/13	0942	Aqueous	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	①
PZ-114-AS	7/12/13	1056	↑	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↑	
I-66	7/15/13	1044	↑	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↑	
MW-102	↑	1110	↑	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↑	
MW-103	↑	1144	↑	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↑	
PZ-303-AS	↑	1220	↑	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↑	
I-11	↑	1312	↑	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↑	
S-10	↑	1405	↑	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↑	
FB@ D-12	↑	1430	↑	1								✓	✓	✓	✓	↑	
D-12 4.5	↓	1527	↓	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↓	
DJP 05 6.7	7/15/13	N/A	↓	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↓	
PZ-209-SS 8.9	7/16/13	0925	↓	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↓	
PZ-301-AI 10.11	↑	1205	↓	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↓	
PZ-301-AS 12.13	↑	1234	↓	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↓	
MW-104 14.15	↑	1325	↓	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↓	
PZ-204A-SS 16.17	↑	1356	↓	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	↓	
PZ-302-AI 18.19	7/16/13	1510	Aqueous	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	①	

× 3rd container is Total. Eyr 07/23/13

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	Sample Custodian Remarks (Completed By Laboratory):			
	<u>First Capital Courier</u>	<u>7/22/13</u>	<u>0800</u>	QA/QC Level	Turnaround	Sample Receipt	
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	Level I <input type="checkbox"/>	Routine <input type="checkbox"/>	Total # Containers Received?	
	<u>K Bannister</u>	<u>7/22/13</u>	<u>1715</u>	Level II <input type="checkbox"/>	24 Hour <input type="checkbox"/>	COC Seals Present?	
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	Level III <input type="checkbox"/>	1 Week <input type="checkbox"/>	COC Seals Intact?	
				Other <input type="checkbox"/>	Other _____	Received Containers Intact?	
						Temperature?	

0005



# Internal Chain of Custody

Work Order #	<b>13-07147</b>
Lab Deadline	<b>8/13/2013</b>
Analysis	<b>UUISO - 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	46	V1.5
	05	46	V1.5
	06	45	V1.5
	07	45	V1.5
	08	43	V1.5
	09	43	V1.5
	10	46	V1.5
	11	46	V1.5
	12	41	V1.5
	13	41	V1.5
	14	41	V1.5
	15	41	V1.5
	16	40	V1.5
	17	40	V1.5
	18	44	V1.5
	19	44	V1.5

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	7/31/13 1200
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/5/13 1300
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0430 PM	8/5/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0900 PM	8/8/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	D900C	8/8/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	ICB	8/11/13 1232
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		



# Internal Chain of Custody

Work Order #	<b>13-07147</b>
Lab Deadline	<b>See Comments</b>
Analysis	<b>UIISO - Level 4</b>
Sample Matrix	<b>WA</b>

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p>Re-Analysis: 2Fxn <del>04, 06, 08, 10, 12, 14, 16 &amp; 18</del> are TOTAL</p> <p>Fxn <del>05, 07, 09, 11, 13, 15, 17 &amp; 19</del> are DISSOLVED</p> <p><i>G 8/8/13</i></p> <p>Original Lab Deadline: 08/20/13</p> <p>Rerun Lab Deadline: 08/20/13 <del>MUST USE FXN 04 FOR DUP</del></p>	04	46	V1.5
	05	46	V1.5
	06	45	V1.5
	07	45	V1.5
	08	43	V1.5
	09	43	V1.5
	10	46	V1.5
	11	46	V1.5
	12	41	V1.5
	13	41	V1.5
	14	41	V1.5
	15	41	V1.5
	16	40	V1.5
	17	40	V1.5
	18	44	V1.5
	19	44	V1.5

	Location (circle one)					Technician Initials
Received by	<u>Sample Storage</u>	Rough Prep	Prep	Separations	Count Room	<i>WJL 8/9/13 1200</i>
Relinquished by	Sample Storage	Rough Prep	<u>Prep</u>	Separations	Count Room	<i>WJL 8/9/13 1200</i>
Received by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	<i>JPD 8/9/13 1200</i>
Relinquished by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	<i>OSIO TAN 8/13/13</i>
Received by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>	<i>OSW 8/13/13</i>
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>	<i>ICB 8/13/13 1214</i>
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	



# Internal Chain of Custody

Work Order #	<b>13-07147</b>
Lab Deadline	<b>8/13/2013</b>
Analysis	<b>ThISO - Level 4</b>
Sample Matrix	<b>Water</b>

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</p> <p>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</p> <p>MUST USE FXN 04 FOR DUP</p>	04	46	V1.5
	05	46	V1.5
	06	45	V1.5
	07	45	V1.5
	08	43	V1.5
	09	43	V1.5
	10	46	V1.5
	11	46	V1.5
	12	41	V1.5
	13	41	V1.5
	14	41	V1.5
	15	41	V1.5
	16	40	V1.5
	17	40	V1.5
	18	44	V1.5
	19	44	V1.5

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		
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		



# Internal Chain of Custody

Work Order #	<b>13-07147</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	46	V1.5
	05	46	V1.5
	06	45	V1.5
	07	45	V1.5
	08	43	V1.5
	09	43	V1.5
	10	46	V1.5
	11	46	V1.5
	12	41	V1.5
	13	41	V1.5
	14	41	V1.5
	15	41	V1.5
	16	40	V1.5
	17	40	V1.5
	18	44	V1.5
	19	44	V1.5

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	<u>Sample Storage</u>	Rough Prep	Prep	Separations	Count Room	JW	7/31/13 1200
Relinquished by	Sample Storage	Rough Prep	<u>Prep</u>	Separations	Count Room	JW	8/13/13 0500
Received by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	JW	8/2/13 1245
Relinquished by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	JW	8/5/13 1545
Received by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>	KCB	8/5/13 1548
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>		
Received by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		





# Internal Chain of Custody

Work Order #	<b>13-07147</b>
Lab Deadline	<b>8/13/2013</b>
Analysis	<b>Ra228 - Level 4</b>
Sample Matrix	<b>Water</b>

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
<p><b>Fxns 04, 06, 08, 10, 12, 14, 16 &amp; 18 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13, 15, 17 &amp; 19 are DISSOLVED</b></p> <p><b>MUST USE FXN 04 FOR DUP</b></p>	04	46	V1.5
	05	46	V1.5
	06	45	V1.5
	07	45	V1.5
	08	43	V1.5
	09	43	V1.5
	10	46	V1.5
	11	46	V1.5
	12	41	V1.5
	13	41	V1.5
	14	41	V1.5
	15	41	V1.5
	16	40	V1.5
	17	40	V1.5
	18	44	V1.5
	19	44	V1.5

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	7/31/13/200
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/13/13/200
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/2/13 1245
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/5/13 1545
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	ICB	8/5/13 1548
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		8/7/13 0606
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/7/13 1200
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	OTB	8-14-13 1059
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	ICB	8/14/13 1102
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	ICB	8/14/13 1409
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		



**EBERLINE**  
SERVICES

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

Internal Work Order

**13-07147**

Received By

**KCOULSTON**

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
01	LCS	0		WA	V1.5		
02	BLANK	0		WA	V1.5		
03	DUP	0		WA	V1.5		
04	D-12 TOT ✓	3		WA	V1.5	12.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	46
			2	<2	<2	4.0000	35
			3	<2	<2	4.0000	34
05	D-12 DIS ✓	3		WA	V1.5	0.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				46
			2				35
			3				34
06	DUP05 TOT ✓	2		WA	V1.5	8.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	45
			2	<2	<2	4.0000	42
07	DUP05 DIS ✓	2		WA	V1.5	0.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				45
			2				42
08	PZ-208-SS TOT ✓	2		WA	V1.5	8.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	43
			2	<2	<2	4.0000	42
09	PZ-208-SS DIS ✓	2		WA	V1.5	0.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				43
			2				42
10	PZ-304-AI TOT ✓	2		WA	V1.5	8.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	36
			2	<2	<2	4.0000	46
11	PZ-304-AI DIS ✓	2		WA	V1.5	0.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				36
			2				46
12	PZ-304-AS TOT ✓	2		WA	V1.5	8.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	41
			2	<2	<2	4.0000	39
13	PZ-304-AS DIS ✓	2		WA	V1.5	0.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				41
			2				39
14	MW-104 TOT ✓	2		WA	V1.5	8.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	39
			2	<2	<2	4.0000	41
15	MW-104 DIS ✓	2		WA	V1.5	0.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				39
			2				41
16	PZ-204A-SS TOT ✓	2		WA	V1.5	8.00	40
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	35
			2	<2	<2	4.0000	40
17	PZ-204A-SS DIS ✓	2		WA	V1.5	0.00	40
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				35
			2				40
18	PZ-302-AI TOT ✓	2		WA	V1.5	8.00	44
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	44
			2	<2	<2	4.0000	42
19	PZ-302-AI DIS ✓	2		WA	V1.5	0.00	44
			Container Number	pH Orig	pH Final	Volume (L)	CPM

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1625 07/23/13

Received by: Krista Cook

Date: 7/23/13





(Volumes, pH, & CPM)

Received By  
KCOULSTON

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
				1			44
				2			42

*VEY  
07/23/13*

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Received by: *[Signature]* Date: 7/23/13

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





**Eberline Services – Oak Ridge Laboratory**

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

WORK ORDER # 13-07147

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 Coulter DATE: 7/23/13

US EPA ARCHIVE DOCUMENT

**SECTION III  
CASE NARRATIVE**



EBS-OR-36004

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 # 13-07147-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>
D-12 TOT	13-07147-04	PZ-304-AS TOT	13-07147-12
D-12 DIS	13-07147-05	PZ-304-AS DIS	13-07147-13
DUP05 TOT	13-07147-06	MW-104 TOT	13-07147-14
DUP05 DIS	13-07147-07	MW-104 DIS	13-07147-15
PZ-208-SS TOT	13-07147-08	PZ-204A-SS TOT	13-07147-16
PZ-208-SS DIS	13-07147-09	PZ-204A-SS DIS	13-07147-17
PZ-304-AI TOT	13-07147-10	PZ-302-AI TOT	13-07147-18
PZ-304-AI DIS	13-07147-11	PZ-302-AI DIS	13-07147-19

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.

US EPA ARCHIVE DOCUMENT



## ANALYTICAL RESULTS CONTINUED

### 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.

#### *1<sup>st</sup> Analytical Attempt*

Samples demonstrated acceptable results for all Uranium analyses. Chemical recovery was slightly low for sample numbers PZ-304-AS TOT and PZ-304-AS DIS. Results for these samples also demonstrated significant disparity between the dissolved and suspended fractions. Due to this condition and the low analytical recovery, these samples were reanalyzed. 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 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Uranium-235 and 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.

#### *2<sup>nd</sup> Analytical Attempt*

Sample numbers PZ-304-AS TOT and PZ-304-AS DIS were reanalyzed due to a low chemical recovery and disparity between the dissolved and suspend fractions. Samples demonstrated acceptable results for all Uranium analyses. Total versus dissolved results are within reason. Due to limited sample volume for the reanalysis, method detection limits are slightly high. Chemical recovery was acceptable for all samples. The Uranium-234, Uranium-235 and Uranium-238 method blank demonstrated acceptable results. Results for the Uranium-234, Uranium-235 and 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 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Thorium-230 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-228, Thorium-230 and Thorium-232 laboratory control sample demonstrated an acceptable percent recovery.

## ANALYTICAL RESULTS CONTINUED

### 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.

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

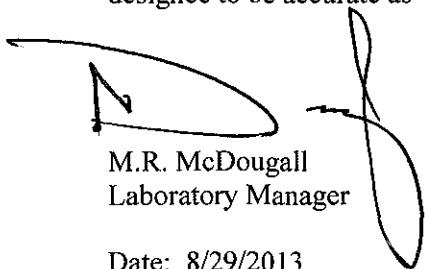
### RADIUM-228

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

Samples demonstrated acceptable results for all Radium-228 analyses. Chemical recovery was acceptable for all samples. The Radium-228 method blank demonstrated acceptable results. Results for the Radium-228 duplicate demonstrated 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**

US EPA ARCHIVE DOCUMENT

<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>
LCS13-07147-01	13-07147-01	08/06/2013 16:35:16	Radium-226	E903.0	11.04	1.39	2.71	0.26		pCi/l
LCS13-07147-01	13-07147-01	08/14/2013 11:08:36	Radium-228	E904.0	8.18	0.91	2.06	1.17		pCi/l
LCS13-07147-01	13-07147-01	08/10/2013 14:55:07	Thorium-228	HASL 300, 4.5.2	4.58	0.72	0.84	0.12		pCi/l
LCS13-07147-01	13-07147-01	08/10/2013 14:55:07	Thorium-230	HASL 300, 4.5.2	5.00	0.77	0.99	0.08		pCi/l
LCS13-07147-01	13-07147-01	08/10/2013 14:55:07	Thorium-232	HASL 300, 4.5.2	4.93	0.76	0.88	0.07		pCi/l
LCS13-07147-01	13-07147-01	08/08/2013 09:06:44	Uranium-234	HASL 300, 4.5.2	9.09	1.32	1.48	0.11		pCi/l
LCS13-07147-01	13-07147-01	08/08/2013 09:06:44	Uranium-235	HASL 300, 4.5.2	1.75	0.46	0.48	0.11		pCi/l
LCS13-07147-01	13-07147-01	08/08/2013 09:06:44	Uranium-238	HASL 300, 4.5.2	9.50	1.37	1.53	0.09		pCi/l
LCS13-07147-01	13-07147-01	08/13/2013 09:05:58	Uranium-234	HASL 300, 4.5.2	7.03	0.99	1.11	0.08		pCi/l
LCS13-07147-01	13-07147-01	08/13/2013 09:05:58	Uranium-235	HASL 300, 4.5.2	0.95	0.27	0.28	0.10		pCi/l
LCS13-07147-01	13-07147-01	08/13/2013 09:05:58	Uranium-238	HASL 300, 4.5.2	8.61	1.16	1.32	0.07		pCi/l
BLANK13-07147-02	13-07147-02	08/06/2013 16:35:17	Radium-226	E903.0	0.04	0.12	0.12	0.24	U	pCi/l
BLANK13-07147-02	13-07147-02	08/14/2013 11:08:36	Radium-228	E904.0	1.01	0.57	0.61	1.08	J	pCi/l
BLANK13-07147-02	13-07147-02	08/10/2013 14:55:08	Thorium-228	HASL 300, 4.5.2	0.00	0.06	0.06	0.13	U	pCi/l
BLANK13-07147-02	13-07147-02	08/10/2013 14:55:08	Thorium-230	HASL 300, 4.5.2	0.45	0.17	0.18	0.10		pCi/l
BLANK13-07147-02	13-07147-02	08/10/2013 14:55:08	Thorium-232	HASL 300, 4.5.2	0.08	0.07	0.07	0.08	J	pCi/l
BLANK13-07147-02	13-07147-02	08/08/2013 09:06:45	Uranium-234	HASL 300, 4.5.2	0.20	0.11	0.11	0.09		pCi/l
BLANK13-07147-02	13-07147-02	08/08/2013 09:06:45	Uranium-235	HASL 300, 4.5.2	0.19	0.12	0.12	0.10	J	pCi/l
BLANK13-07147-02	13-07147-02	08/08/2013 09:06:45	Uranium-238	HASL 300, 4.5.2	0.19	0.11	0.11	0.10	J	pCi/l
BLANK13-07147-02	13-07147-02	08/13/2013 09:05:59	Uranium-234	HASL 300, 4.5.2	0.19	0.11	0.11	0.10	J	pCi/l
BLANK13-07147-02	13-07147-02	08/13/2013 09:05:59	Uranium-235	HASL 300, 4.5.2	0.06	0.08	0.08	0.13	U	pCi/l
BLANK13-07147-02	13-07147-02	08/13/2013 09:05:59	Uranium-238	HASL 300, 4.5.2	0.09	0.07	0.07	0.06	J	pCi/l
D-12 TOT_07_15_2013 DUP	13-07147-03	08/06/2013 16:35:18	Radium-226	E903.0	0.12	0.17	0.17	0.28	U	pCi/l
D-12 TOT_07_15_2013 DUP	13-07147-03	08/14/2013 11:08:36	Radium-228	E904.0	0.38	0.58	0.59	1.21	U	pCi/l
D-12 TOT_07_15_2013 DUP	13-07147-03	08/10/2013 14:55:01	Thorium-228	HASL 300, 4.5.2	0.08	0.19	0.19	0.35	U	pCi/l
D-12 TOT_07_15_2013 DUP	13-07147-03	08/10/2013 14:55:01	Thorium-230	HASL 300, 4.5.2	0.83	0.43	0.44	0.29		pCi/l
D-12 TOT_07_15_2013 DUP	13-07147-03	08/10/2013 14:55:01	Thorium-232	HASL 300, 4.5.2	0.06	0.14	0.14	0.27	U	pCi/l
D-12 TOT_07_15_2013 DUP	13-07147-03	08/08/2013 09:06:37	Uranium-234	HASL 300, 4.5.2	0.67	0.22	0.22	0.12		pCi/l
D-12 TOT_07_15_2013 DUP	13-07147-03	08/08/2013 09:06:37	Uranium-235	HASL 300, 4.5.2	0.22	0.13	0.13	0.10	J	pCi/l
D-12 TOT_07_15_2013 DUP	13-07147-03	08/08/2013 09:06:37	Uranium-238	HASL 300, 4.5.2	0.23	0.12	0.12	0.09		pCi/l
PZ-304-AS TOT_07_16_2013 DUP	13-07147-03	08/13/2013 09:06:00	Uranium-234	HASL 300, 4.5.2	0.59	0.68	0.68	0.89	U	pCi/l
PZ-304-AS TOT_07_16_2013 DUP	13-07147-03	08/13/2013 09:06:00	Uranium-235	HASL 300, 4.5.2	0.49	0.73	0.73	1.18	U	pCi/l
PZ-304-AS TOT_07_16_2013 DUP	13-07147-03	08/13/2013 09:06:00	Uranium-238	HASL 300, 4.5.2	-0.17	0.36	0.36	1.07	U	pCi/l



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Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
D-12 TOT_07_15_2013	13-07147-04	08/06/2013 16:35:19	Radium-226	E903.0	0.29	0.22	0.23	0.23	J	pCi/l
D-12 TOT_07_15_2013	13-07147-04	08/14/2013 11:08:37	Radium-228	E904.0	1.13	0.67	0.72	1.30	J	pCi/l
D-12 TOT_07_15_2013	13-07147-04	08/10/2013 14:55:02	Thorium-228	HASL 300, 4.5.2	0.11	0.10	0.10	0.12	J	pCi/l
D-12 TOT_07_15_2013	13-07147-04	08/10/2013 14:55:02	Thorium-230	HASL 300, 4.5.2	0.54	0.23	0.24	0.08		pCi/l
D-12 TOT_07_15_2013	13-07147-04	08/10/2013 14:55:02	Thorium-232	HASL 300, 4.5.2	0.12	0.10	0.10	0.08	J	pCi/l
D-12 TOT_07_15_2013	13-07147-04	08/08/2013 09:06:38	Uranium-234	HASL 300, 4.5.2	0.58	0.20	0.21	0.07		pCi/l
D-12 TOT_07_15_2013	13-07147-04	08/08/2013 09:06:38	Uranium-235	HASL 300, 4.5.2	0.38	0.18	0.18	0.08		pCi/l
D-12 TOT_07_15_2013	13-07147-04	08/08/2013 09:06:38	Uranium-238	HASL 300, 4.5.2	0.40	0.17	0.17	0.08		pCi/l
D-12 DIS_07_15_2013	13-07147-05	08/06/2013 16:35:20	Radium-226	E903.0	0.47	0.29	0.30	0.29	J	pCi/l
D-12 DIS_07_15_2013	13-07147-05	08/14/2013 11:08:41	Radium-228	E904.0	1.74	0.68	0.79	1.26	J	pCi/l
D-12 DIS_07_15_2013	13-07147-05	08/10/2013 14:55:03	Thorium-228	HASL 300, 4.5.2	-0.03	0.07	0.07	0.19	U	pCi/l
D-12 DIS_07_15_2013	13-07147-05	08/10/2013 14:55:03	Thorium-230	HASL 300, 4.5.2	0.54	0.28	0.29	0.13		pCi/l
D-12 DIS_07_15_2013	13-07147-05	08/10/2013 14:55:03	Thorium-232	HASL 300, 4.5.2	0.10	0.12	0.12	0.18	U	pCi/l
D-12 DIS_07_15_2013	13-07147-05	08/08/2013 09:06:39	Uranium-234	HASL 300, 4.5.2	0.34	0.19	0.19	0.10		pCi/l
D-12 DIS_07_15_2013	13-07147-05	08/08/2013 09:06:39	Uranium-235	HASL 300, 4.5.2	0.22	0.17	0.17	0.17	J	pCi/l
D-12 DIS_07_15_2013	13-07147-05	08/08/2013 09:06:39	Uranium-238	HASL 300, 4.5.2	0.12	0.11	0.11	0.10	J	pCi/l
DUP05 TOT_07_15_2013	13-07147-06	08/06/2013 16:35:21	Radium-226	E903.0	0.36	0.22	0.23	0.16	J	pCi/l
DUP05 TOT_07_15_2013	13-07147-06	08/14/2013 11:08:42	Radium-228	E904.0	0.97	0.70	0.73	1.39	J	pCi/l
DUP05 TOT_07_15_2013	13-07147-06	08/10/2013 14:55:04	Thorium-228	HASL 300, 4.5.2	0.03	0.07	0.07	0.14	U	pCi/l
DUP05 TOT_07_15_2013	13-07147-06	08/10/2013 14:55:04	Thorium-230	HASL 300, 4.5.2	0.54	0.22	0.23	0.09		pCi/l
DUP05 TOT_07_15_2013	13-07147-06	08/10/2013 14:55:04	Thorium-232	HASL 300, 4.5.2	0.17	0.12	0.12	0.08	J	pCi/l
DUP05 TOT_07_15_2013	13-07147-06	08/08/2013 09:06:40	Uranium-234	HASL 300, 4.5.2	0.66	0.25	0.25	0.10		pCi/l
DUP05 TOT_07_15_2013	13-07147-06	08/08/2013 09:06:40	Uranium-235	HASL 300, 4.5.2	0.22	0.16	0.16	0.15	J	pCi/l
DUP05 TOT_07_15_2013	13-07147-06	08/08/2013 09:06:40	Uranium-238	HASL 300, 4.5.2	0.26	0.15	0.15	0.12	J	pCi/l
DUP05 DIS_07_15_2013	13-07147-07	08/06/2013 16:35:22	Radium-226	E903.0	0.44	0.33	0.34	0.39	J	pCi/l
DUP05 DIS_07_15_2013	13-07147-07	08/14/2013 11:08:42	Radium-228	E904.0	1.44	0.72	0.79	1.37	J	pCi/l
DUP05 DIS_07_15_2013	13-07147-07	08/10/2013 14:55:05	Thorium-228	HASL 300, 4.5.2	-0.02	0.06	0.06	0.16	U	pCi/l
DUP05 DIS_07_15_2013	13-07147-07	08/10/2013 14:55:05	Thorium-230	HASL 300, 4.5.2	0.54	0.21	0.22	0.09		pCi/l
DUP05 DIS_07_15_2013	13-07147-07	08/10/2013 14:55:05	Thorium-232	HASL 300, 4.5.2	-0.01	0.03	0.03	0.09	U	pCi/l
DUP05 DIS_07_15_2013	13-07147-07	08/08/2013 09:06:41	Uranium-234	HASL 300, 4.5.2	0.46	0.18	0.18	0.11		pCi/l
DUP05 DIS_07_15_2013	13-07147-07	08/08/2013 09:06:41	Uranium-235	HASL 300, 4.5.2	0.28	0.15	0.15	0.12		pCi/l
DUP05 DIS_07_15_2013	13-07147-07	08/08/2013 09:06:41	Uranium-238	HASL 300, 4.5.2	0.26	0.13	0.13	0.08		pCi/l



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Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
PZ-208-SS TOT_07_16_2013	13-07147-08	08/06/2013 16:35:48	Radium-226	E903.0	0.71	0.32	0.35	0.20		pCi/l
PZ-208-SS TOT_07_16_2013	13-07147-08	08/14/2013 11:08:43	Radium-228	E904.0	2.37	0.80	0.97	1.46		pCi/l
PZ-208-SS TOT_07_16_2013	13-07147-08	08/10/2013 14:55:06	Thorium-228	HASL 300, 4.5.2	0.21	0.14	0.14	0.11	J	pCi/l
PZ-208-SS TOT_07_16_2013	13-07147-08	08/10/2013 14:55:06	Thorium-230	HASL 300, 4.5.2	0.70	0.27	0.28	0.11		pCi/l
PZ-208-SS TOT_07_16_2013	13-07147-08	08/10/2013 14:55:06	Thorium-232	HASL 300, 4.5.2	0.25	0.15	0.15	0.08		pCi/l
PZ-208-SS TOT_07_16_2013	13-07147-08	08/08/2013 09:06:43	Uranium-234	HASL 300, 4.5.2	1.81	0.41	0.43	0.11		pCi/l
PZ-208-SS TOT_07_16_2013	13-07147-08	08/08/2013 09:06:43	Uranium-235	HASL 300, 4.5.2	0.32	0.17	0.17	0.13		pCi/l
PZ-208-SS TOT_07_16_2013	13-07147-08	08/08/2013 09:06:43	Uranium-238	HASL 300, 4.5.2	1.43	0.35	0.37	0.09		pCi/l
PZ-208-SS DIS_07_16_2013	13-07147-09	08/06/2013 16:35:49	Radium-226	E903.0	0.45	0.25	0.26	0.19		pCi/l
PZ-208-SS DIS_07_16_2013	13-07147-09	08/14/2013 11:09:23	Radium-228	E904.0	1.10	0.70	0.74	1.37	J	pCi/l
PZ-208-SS DIS_07_16_2013	13-07147-09	08/10/2013 15:01:59	Thorium-228	HASL 300, 4.5.2	0.09	0.08	0.08	0.08	J	pCi/l
PZ-208-SS DIS_07_16_2013	13-07147-09	08/10/2013 15:01:59	Thorium-230	HASL 300, 4.5.2	0.43	0.18	0.18	0.09		pCi/l
PZ-208-SS DIS_07_16_2013	13-07147-09	08/10/2013 15:01:59	Thorium-232	HASL 300, 4.5.2	0.09	0.07	0.08	0.06	J	pCi/l
PZ-208-SS DIS_07_16_2013	13-07147-09	08/08/2013 09:08:28	Uranium-234	HASL 300, 4.5.2	1.58	0.38	0.39	0.10		pCi/l
PZ-208-SS DIS_07_16_2013	13-07147-09	08/08/2013 09:08:28	Uranium-235	HASL 300, 4.5.2	0.48	0.21	0.21	0.13		pCi/l
PZ-208-SS DIS_07_16_2013	13-07147-09	08/08/2013 09:08:28	Uranium-238	HASL 300, 4.5.2	0.98	0.28	0.29	0.08		pCi/l
PZ-304-AI TOT_07_16_2013	13-07147-10	08/06/2013 16:35:51	Radium-226	E903.0	1.64	0.64	0.73	0.26		pCi/l
PZ-304-AI TOT_07_16_2013	13-07147-10	08/14/2013 11:09:24	Radium-228	E904.0	2.52	0.76	0.95	1.33		pCi/l
PZ-304-AI TOT_07_16_2013	13-07147-10	08/10/2013 15:02:01	Thorium-228	HASL 300, 4.5.2	0.10	0.09	0.09	0.07	J	pCi/l
PZ-304-AI TOT_07_16_2013	13-07147-10	08/10/2013 15:02:01	Thorium-230	HASL 300, 4.5.2	0.62	0.23	0.25	0.10		pCi/l
PZ-304-AI TOT_07_16_2013	13-07147-10	08/10/2013 15:02:01	Thorium-232	HASL 300, 4.5.2	0.05	0.06	0.06	0.07	U	pCi/l
PZ-304-AI TOT_07_16_2013	13-07147-10	08/08/2013 09:08:29	Uranium-234	HASL 300, 4.5.2	0.72	0.36	0.37	0.17		pCi/l
PZ-304-AI TOT_07_16_2013	13-07147-10	08/08/2013 09:08:29	Uranium-235	HASL 300, 4.5.2	0.49	0.32	0.33	0.21	J	pCi/l
PZ-304-AI TOT_07_16_2013	13-07147-10	08/08/2013 09:08:29	Uranium-238	HASL 300, 4.5.2	0.80	0.38	0.39	0.17		pCi/l
PZ-304-AI DIS_07_16_2013	13-07147-11	08/06/2013 16:35:53	Radium-226	E903.0	1.15	0.45	0.51	0.30		pCi/l
PZ-304-AI DIS_07_16_2013	13-07147-11	08/14/2013 11:09:24	Radium-228	E904.0	2.43	0.80	0.97	1.44		pCi/l
PZ-304-AI DIS_07_16_2013	13-07147-11	08/10/2013 15:02:02	Thorium-228	HASL 300, 4.5.2	0.07	0.08	0.08	0.11	U	pCi/l
PZ-304-AI DIS_07_16_2013	13-07147-11	08/10/2013 15:02:02	Thorium-230	HASL 300, 4.5.2	0.25	0.14	0.14	0.08		pCi/l
PZ-304-AI DIS_07_16_2013	13-07147-11	08/10/2013 15:02:02	Thorium-232	HASL 300, 4.5.2	0.06	0.07	0.07	0.07	U	pCi/l
PZ-304-AI DIS_07_16_2013	13-07147-11	08/08/2013 09:08:31	Uranium-234	HASL 300, 4.5.2	0.63	0.35	0.35	0.18		pCi/l
PZ-304-AI DIS_07_16_2013	13-07147-11	08/08/2013 09:08:31	Uranium-235	HASL 300, 4.5.2	0.16	0.21	0.21	0.32	U	pCi/l
PZ-304-AI DIS_07_16_2013	13-07147-11	08/08/2013 09:08:31	Uranium-238	HASL 300, 4.5.2	0.33	0.24	0.25	0.18	J	pCi/l



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Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
PZ-304-AS TOT_07_16_2013	13-07147-12	08/06/2013 16:35:55	Radium-226	E903.0	2.00	0.73	0.84	0.45		pCi/l
PZ-304-AS TOT_07_16_2013	13-07147-12	08/14/2013 11:09:24	Radium-228	E904.0	1.79	0.70	0.81	1.28	J	pCi/l
PZ-304-AS TOT_07_16_2013	13-07147-12	08/10/2013 15:02:04	Thorium-228	HASL 300, 4.5.2	0.03	0.06	0.06	0.12	U	pCi/l
PZ-304-AS TOT_07_16_2013	13-07147-12	08/10/2013 15:02:04	Thorium-230	HASL 300, 4.5.2	0.64	0.26	0.27	0.11		pCi/l
PZ-304-AS TOT_07_16_2013	13-07147-12	08/10/2013 15:02:04	Thorium-232	HASL 300, 4.5.2	0.15	0.12	0.12	0.13	J	pCi/l
PZ-304-AS TOT_07_16_2013	13-07147-12	08/13/2013 09:06:01	Uranium-234	HASL 300, 4.5.2	0.46	0.69	0.69	1.11	U	pCi/l
PZ-304-AS TOT_07_16_2013	13-07147-12	08/13/2013 09:06:01	Uranium-235	HASL 300, 4.5.2	0.72	0.98	0.98	1.53	U	pCi/l
PZ-304-AS TOT_07_16_2013	13-07147-12	08/13/2013 09:06:01	Uranium-238	HASL 300, 4.5.2	0.45	0.68	0.68	1.10	U	pCi/l
PZ-304-AS DIS_07_16_2013	13-07147-13	08/06/2013 16:35:57	Radium-226	E903.0	1.68	0.65	0.74	0.45		pCi/l
PZ-304-AS DIS_07_16_2013	13-07147-13	08/14/2013 11:09:25	Radium-228	E904.0	1.93	0.79	0.91	1.49	J	pCi/l
PZ-304-AS DIS_07_16_2013	13-07147-13	08/10/2013 15:02:06	Thorium-228	HASL 300, 4.5.2	0.09	0.10	0.10	0.12	U	pCi/l
PZ-304-AS DIS_07_16_2013	13-07147-13	08/10/2013 15:02:06	Thorium-230	HASL 300, 4.5.2	0.64	0.26	0.27	0.10		pCi/l
PZ-304-AS DIS_07_16_2013	13-07147-13	08/10/2013 15:02:06	Thorium-232	HASL 300, 4.5.2	0.10	0.09	0.09	0.09	J	pCi/l
PZ-304-AS DIS_07_16_2013	13-07147-13	08/13/2013 09:06:02	Uranium-234	HASL 300, 4.5.2	1.27	0.91	0.91	0.89	J	pCi/l
PZ-304-AS DIS_07_16_2013	13-07147-13	08/13/2013 09:06:02	Uranium-235	HASL 300, 4.5.2	0.35	0.60	0.60	1.05	U	pCi/l
PZ-304-AS DIS_07_16_2013	13-07147-13	08/13/2013 09:06:02	Uranium-238	HASL 300, 4.5.2	0.54	0.56	0.56	0.59	U	pCi/l
MW-104 TOT_07_16_2013	13-07147-14	08/06/2013 16:35:59	Radium-226	E903.0	0.98	0.44	0.49	0.26		pCi/l
MW-104 TOT_07_16_2013	13-07147-14	08/14/2013 11:09:25	Radium-228	E904.0	1.72	0.79	0.88	1.49	J	pCi/l
MW-104 TOT_07_16_2013	13-07147-14	08/10/2013 15:02:07	Thorium-228	HASL 300, 4.5.2	0.71	0.25	0.26	0.09		pCi/l
MW-104 TOT_07_16_2013	13-07147-14	08/10/2013 15:02:07	Thorium-230	HASL 300, 4.5.2	1.15	0.34	0.37	0.10		pCi/l
MW-104 TOT_07_16_2013	13-07147-14	08/10/2013 15:02:07	Thorium-232	HASL 300, 4.5.2	0.60	0.22	0.23	0.07		pCi/l
MW-104 TOT_07_16_2013	13-07147-14	08/08/2013 09:08:37	Uranium-234	HASL 300, 4.5.2	2.89	0.59	0.63	0.12		pCi/l
MW-104 TOT_07_16_2013	13-07147-14	08/08/2013 09:08:37	Uranium-235	HASL 300, 4.5.2	0.74	0.28	0.28	0.12		pCi/l
MW-104 TOT_07_16_2013	13-07147-14	08/08/2013 09:08:37	Uranium-238	HASL 300, 4.5.2	2.39	0.52	0.54	0.08		pCi/l
MW-104 DIS_07_16_2013	13-07147-15	08/06/2013 16:36:02	Radium-226	E903.0	0.24	0.21	0.22	0.28	J	pCi/l
MW-104 DIS_07_16_2013	13-07147-15	08/14/2013 11:09:25	Radium-228	E904.0	0.85	0.72	0.75	1.46	J	pCi/l
MW-104 DIS_07_16_2013	13-07147-15	08/10/2013 15:02:09	Thorium-228	HASL 300, 4.5.2	0.00	0.04	0.04	0.11	U	pCi/l
MW-104 DIS_07_16_2013	13-07147-15	08/10/2013 15:02:09	Thorium-230	HASL 300, 4.5.2	0.46	0.20	0.21	0.10		pCi/l
MW-104 DIS_07_16_2013	13-07147-15	08/10/2013 15:02:09	Thorium-232	HASL 300, 4.5.2	0.05	0.06	0.06	0.09	U	pCi/l
MW-104 DIS_07_16_2013	13-07147-15	08/08/2013 09:08:38	Uranium-234	HASL 300, 4.5.2	2.21	0.50	0.52	0.10		pCi/l
MW-104 DIS_07_16_2013	13-07147-15	08/08/2013 09:08:38	Uranium-235	HASL 300, 4.5.2	0.36	0.19	0.20	0.14		pCi/l
MW-104 DIS_07_16_2013	13-07147-15	08/08/2013 09:08:38	Uranium-238	HASL 300, 4.5.2	1.65	0.41	0.43	0.12		pCi/l



Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
PZ-204A-SS TOT_07_16_2013	13-07147-16	08/06/2013 16:36:04	Radium-226	E903.0	1.82	0.52	0.65	0.23		pCi/l
PZ-204A-SS TOT_07_16_2013	13-07147-16	08/14/2013 11:09:26	Radium-228	E904.0	0.57	0.73	0.74	1.50	U	pCi/l
PZ-204A-SS TOT_07_16_2013	13-07147-16	08/10/2013 15:02:10	Thorium-228	HASL 300, 4.5.2	0.37	0.21	0.21	0.15		pCi/l
PZ-204A-SS TOT_07_16_2013	13-07147-16	08/10/2013 15:02:10	Thorium-230	HASL 300, 4.5.2	0.49	0.24	0.25	0.14		pCi/l
PZ-204A-SS TOT_07_16_2013	13-07147-16	08/10/2013 15:02:10	Thorium-232	HASL 300, 4.5.2	0.18	0.14	0.14	0.11	J	pCi/l
PZ-204A-SS TOT_07_16_2013	13-07147-16	08/08/2013 09:08:40	Uranium-234	HASL 300, 4.5.2	1.98	0.65	0.67	0.21		pCi/l
PZ-204A-SS TOT_07_16_2013	13-07147-16	08/08/2013 09:08:40	Uranium-235	HASL 300, 4.5.2	0.38	0.28	0.28	0.20	J	pCi/l
PZ-204A-SS TOT_07_16_2013	13-07147-16	08/08/2013 09:08:40	Uranium-238	HASL 300, 4.5.2	1.27	0.49	0.50	0.19		pCi/l
PZ-204A-SS DIS_07_16_2013	13-07147-17	08/06/2013 16:36:07	Radium-226	E903.0	1.07	0.39	0.45	0.18		pCi/l
PZ-204A-SS DIS_07_16_2013	13-07147-17	08/14/2013 12:03:03	Radium-228	E904.0	1.59	0.72	0.81	1.37	J	pCi/l
PZ-204A-SS DIS_07_16_2013	13-07147-17	08/10/2013 15:02:13	Thorium-228	HASL 300, 4.5.2	0.04	0.06	0.06	0.10	U	pCi/l
PZ-204A-SS DIS_07_16_2013	13-07147-17	08/10/2013 15:02:13	Thorium-230	HASL 300, 4.5.2	0.42	0.18	0.19	0.08		pCi/l
PZ-204A-SS DIS_07_16_2013	13-07147-17	08/10/2013 15:02:13	Thorium-232	HASL 300, 4.5.2	0.12	0.09	0.09	0.07	J	pCi/l
PZ-204A-SS DIS_07_16_2013	13-07147-17	08/08/2013 09:08:43	Uranium-234	HASL 300, 4.5.2	2.41	0.62	0.64	0.11		pCi/l
PZ-204A-SS DIS_07_16_2013	13-07147-17	08/08/2013 09:08:43	Uranium-235	HASL 300, 4.5.2	0.40	0.24	0.25	0.20	J	pCi/l
PZ-204A-SS DIS_07_16_2013	13-07147-17	08/08/2013 09:08:43	Uranium-238	HASL 300, 4.5.2	1.86	0.52	0.54	0.11		pCi/l
PZ-302-AI TOT_07_16_2013	13-07147-18	08/06/2013 16:36:09	Radium-226	E903.0	0.80	0.34	0.38	0.18		pCi/l
PZ-302-AI TOT_07_16_2013	13-07147-18	08/14/2013 12:03:04	Radium-228	E904.0	0.85	0.76	0.78	1.53	J	pCi/l
PZ-302-AI TOT_07_16_2013	13-07147-18	08/10/2013 15:02:14	Thorium-228	HASL 300, 4.5.2	0.12	0.09	0.09	0.07	J	pCi/l
PZ-302-AI TOT_07_16_2013	13-07147-18	08/10/2013 15:02:14	Thorium-230	HASL 300, 4.5.2	0.59	0.22	0.24	0.10		pCi/l
PZ-302-AI TOT_07_16_2013	13-07147-18	08/10/2013 15:02:14	Thorium-232	HASL 300, 4.5.2	0.15	0.11	0.11	0.10	J	pCi/l
PZ-302-AI TOT_07_16_2013	13-07147-18	08/08/2013 09:08:45	Uranium-234	HASL 300, 4.5.2	3.60	0.60	0.65	0.07		pCi/l
PZ-302-AI TOT_07_16_2013	13-07147-18	08/08/2013 09:08:45	Uranium-235	HASL 300, 4.5.2	0.73	0.24	0.24	0.08		pCi/l
PZ-302-AI TOT_07_16_2013	13-07147-18	08/08/2013 09:08:45	Uranium-238	HASL 300, 4.5.2	3.10	0.53	0.58	0.07		pCi/l
PZ-302-AI DIS_07_16_2013	13-07147-19	08/06/2013 16:36:11	Radium-226	E903.0	0.69	0.34	0.37	0.24		pCi/l
PZ-302-AI DIS_07_16_2013	13-07147-19	08/14/2013 12:03:04	Radium-228	E904.0	1.34	0.88	0.93	1.74	J	pCi/l
PZ-302-AI DIS_07_16_2013	13-07147-19	08/10/2013 15:02:16	Thorium-228	HASL 300, 4.5.2	0.00	0.03	0.03	0.07	U	pCi/l
PZ-302-AI DIS_07_16_2013	13-07147-19	08/10/2013 15:02:16	Thorium-230	HASL 300, 4.5.2	0.57	0.21	0.22	0.06		pCi/l
PZ-302-AI DIS_07_16_2013	13-07147-19	08/10/2013 15:02:16	Thorium-232	HASL 300, 4.5.2	0.07	0.07	0.07	0.07	U	pCi/l
PZ-302-AI DIS_07_16_2013	13-07147-19	08/08/2013 09:08:47	Uranium-234	HASL 300, 4.5.2	5.18	1.25	1.31	0.23		pCi/l
PZ-302-AI DIS_07_16_2013	13-07147-19	08/08/2013 09:08:47	Uranium-235	HASL 300, 4.5.2	0.84	0.42	0.43	0.28		pCi/l
PZ-302-AI DIS_07_16_2013	13-07147-19	08/08/2013 09:08:47	Uranium-238	HASL 300, 4.5.2	4.06	1.04	1.08	0.16		pCi/l



EBERLINE ANALYTICAL CORPORATION

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**SECTION V  
ANALYTICAL STANDARDS**

U-8

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

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

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

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

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

Radioimpurities Refer to attached technical data sheet

Radioactive Daughters Refer to attached technical data sheet

Radionuclide Concentration (Total U) 0.1228 µCi/g.

Method of Calibration

Activity calculations are based upon known specific activity and mass.

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

### NIST Traceability

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

### Leak Test(s)

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

### Notes

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

*[Signature]*  
ERIC ALLAS  
QUALITY CONTROL

29 DECEMBER 1994  
Date Signed



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



# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

SOLUTION REFERENCE # IPL 479-50

CURRENT DATE 9/8/2012 0:00

SOLUTION # U-8

Principal Radionuclide

Half Life, Years

Half Life, Days

234, 235, 238 U

4.468E+09

1.632E+12

Radionuclide 234, 235, 238 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	<u>97.6400</u>	Weight, Grams
Empty Ampoule	<u>32.5020</u>	Weight, Grams
Solution Net	<u>65.1380</u>	Weight, Grams
Total Activity in Ampoule	<u>8.0160</u>	$\mu\text{Ci}$

### Chemical Composition of Standard Solution

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

Dilution Instructions:

Dilution Solvent Used

1M HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 8.0160  $\mu\text{Ci}$

Which Equals

1.780E+07 dpm at the date listed above

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

Expiration Date: September 6, 2013

Verified & Approved By

Date: 9/26/2012 0:00

QC Approval

Date: 9/26/12



QUALITY CONTROL PROGRAM  
MP-009

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

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

Solution Reference # MP-009  
IPL 479-50

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

Principal Radionuclide  
<sup>234, 235, 238</sup>U

Half Life, Years  
4.468E+09

Half Life, Days  
1.632E+12

Radionuclide of Interest <sup>234, 235, 238</sup>U  
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 [Signature]

Date: 9/26/2012 0:00

QC Approval [Signature]

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.

*Radionuclidic 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 HNO<sub>3</sub> 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 radio-active 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

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

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

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

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

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

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

Dilute to a volume of 1000.00 milliliters

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

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

Expiration Date: December 7, 2013

Verified & Approved By [Signature]

Date: 12/13/2012 0:00

QC Approval [Signature]

Date: 12/13/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM  
MP-009

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

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

Solution Reference #		MP-009	Date	12/7/2012 0:00
		AEA/Amersham 92/232/67	Solution #	U-10a
Principal Radionuclide	Half Life, Years		Half Life, Days	
<sup>232</sup> U	7.200E+01		2.630E+04	

Radionuclide of Interest	<sup>232</sup> U	Reference Date	3/1/2000 0:00
Parent Solution Conc.	2.167E+03 dpm/ml		

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

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

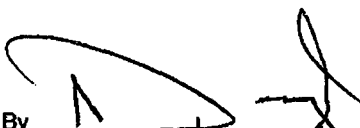
SECONDARY VOLUMETRIC DILUTION

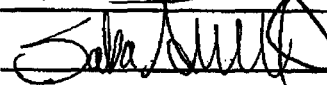
Vol. Parent Solution:	10.0000 ml	Final Activity Concentration:	2.1670E+01 dpm/ml
Total Activity:	2.1670E+04 dpm		
Final Volume:	1000.00 ml		

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 

QC Approval 

Date: 12/13/2012 0:00

Date: 12/13/12

US EPA ARCHIVE DOCUMENT

**Received**  
 OCT 14 1991  
 TMA/Eberline  
 Oak Ridge Lab

**QA/QC REVIEWED**  
 Date 10/14/91 Initials wt  
**CERTIFICATE OF CALIBRATION**  
**ALPHA STANDARD SOLUTION**

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.

**Radiopurities**

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)



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

*[Signature]*  
**QUALITY CONTROL**





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

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

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

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

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

**SECONDARY VOLUMETRIC DILUTION**

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

NOTES:

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

Expiration Date: March 4, 2014

Recertified By: [Signature]  
Verified & Approved By: [Signature]  
QC Approval: [Signature]

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

US EPA ARCHIVE DOCUMENT



# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

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

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

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

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

### Chemical Composition of Standard Solution

<sup>230</sup>Th(NO<sub>3</sub>)<sub>4</sub> in 0.1N HNO<sub>3</sub>

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

Dilute to a volume of 1000.00 milliliters

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

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

Expiration Date: March 4, 2014

Recertified By [Signature]  
QC Approval [Signature]

Date: 3/21/2013 0:00

Date: 3/21/13

US EPA ARCHIVE DOCUMENT

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

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

### Description of Solution

- a. Mass of solution: 11.9712 g (in a 10 ml flame sealed ampoule)
- b. Chemical form: Th(NO<sub>3</sub>)<sub>4</sub> in water
- c. Carrier content: None added
- d. Density: Approx. 1.21 g/ml @ 20°C.

Radioimpurities: None detected (other than daughters).

### Radioactive Daughters

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

### Radionuclide Concentration

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

### Method of Calibration

Activity calculations are based upon known specific activity and mass.

### Uncertainty of Measurement

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

### NIST Traceability

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

### Leak Test(s)

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

### Notes

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



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

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

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



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 Th-232, Th-228 Half Life, Years 1.405E+10 Half Life, Days 5.132E+12

Radionuclide 232 & 228 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 [Signature]

Date: 10/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12

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 STANDARD SOLUTIONS**  
**SECONDARY DILUTION RECERTIFICATION**

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

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

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

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

Dilution Instructions: | Dilution Solvent Used 1% Nitric Acid

**SECONDARY VOLUMETRIC DILUTION**

Vol. Parent Solution: 500.0000 ml | Final Activity Concentration: 1.0355E+02 dpm/ml  
Total Activity: 1.0355E+05 dpm  
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]  
QC Approval [Signature]

Date: 11/9/2012 0:00  
Date: 11/12/12

US EPA ARCHIVE DOCUMENT



**Isotope Products  
Laboratories**

An Eckert & Ziegler Company

24937 Avenue Tibbitts  
Valencia, California 91355

Tel 661-309-1010

Fax 661-257-8303

Th-18

## CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

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

**Physical Description:**

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

**Radioimpurities:**

None detected (daughters in equilibrium)

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

**Method of Calibration:**

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

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

**Uncertainty of Measurement:**

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

**Notes:**

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

*Am U Khan*  
\_\_\_\_\_  
Quality Control

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

IPL Ref. No.:                      867-54

ISO 9001 CERTIFIED

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

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

US EPA ARCHIVE DOCUMENT





# QUALITY CONTROL PROGRAM

MP-009

Rev. 8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

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

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

Principal Radionuclide <sup>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  $\mu$ Ci  
Certified Concentration                       $\mu$ 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  $\mu$ 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  $\mu$ Ci Which Equals 2.249E+06 dpm at the date listed above

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

Expiration Date: October 9, 2013

Verified & Approved By 

Date: 11/9/2012 0:00

QC Approval 

Date: 11/12/12

US EPA ARCHIVE DOCUMENT





QUALITY CONTROL PROGRAM  
MP-009

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

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

Solution Reference # **MP-009**  
**IPL 867-54**

Date **11/9/2012 0:00**  
Solution # **Th-18a**

Principal Radionuclide

Half Life, Years

Half Life, Days

**<sup>228</sup>Th**

**7.340E+03**

**2.681E+06**

Radionuclide of Interest

**<sup>228</sup>Th**

Reference Date

**1/15/2002 0:00**

Parent Solution Conc. **2.25E+03** dpm/ml

Chemical Composition of Standard Solution

**TH(NO<sub>3</sub>)<sub>4</sub> in 0.1M HNO<sub>3</sub>**

Dilution Instructions:

Dilution Solvent Used

**0.1M HNO<sub>3</sub>**

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: **10.0000** ml

Total Activity: **2.2490E+04** dpm

Final Volume: **1000.00** ml

Final Activity Concentration: **2.2490E+01** dpm/ml

NOTES:

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

Expiration Date: **October 9, 2013**

Verified & Approved By

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

QC Approval

Date: **11/12/12**

US EPA ARCHIVE DOCUMENT



Ba-6  
(#6a)

# 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 9/11/1993 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 [Signature]  
QC Approval [Signature]

Date: 7/1/13  
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      Final Activity Concentration: 3.6950E+03 dpm/ml  
Total Activity: 3.6950E+06 dpm  
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>Pc-5</sup>  
QA/QC REVIEWED  
Date 2/8/94 Initials WT

Radionuclide: Ra-226  
Half Life: 1600 ± 7 years  
Catalog No.: 7226  
Source No.: 453-26

Customer: TMA EBERLINE  
P.O.No.: VH1888  
Reference Date: February 1 1994 12:00 PST.  
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(NO<sub>3</sub>)<sub>2</sub> in 1 N HNO<sub>3</sub>
- 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  
1800 North Keystone Street  
Burbank, California 91504  
(818) 843 - 7000

Anna U. Huen  
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

Half Life, Years

Half Life, Days

<sup>226</sup>Radium

1.600E+03

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

[Signature]

Date: 11/9/2012

QC Approval

[Signature]

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM  
MP 009

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

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

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

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

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

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

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

SECONDARY VOLUMETRIC DILUTION

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

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

NOTES:

Expiration Date: November 9, 2013

Verified & Approved By [Signature]  
QC Approval [Signature]

Date: 11/9/2012 0:00  
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 6/11/01 shipment.  
P.S. Different activity level  
8/19/11*



**QUALITY CONTROL PROGRAM**  
MP-009

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

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

**SOLUTION REFERENCE #** Analytics 62680-416 **CURRENT DATE** 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

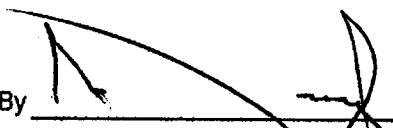
**Chemical Composition of Standard Solution**  
<sup>228</sup>Ra(NO<sub>3</sub>)<sub>2</sub> in 0.5 M HCl

**Dilution Instructions:** **Dilution Solvent Used** 0.5 M HCl  
Dilute to a volume of 1000.00 milliliters

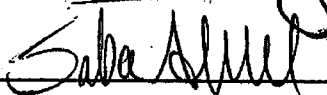
**Certified Total Activity of** 0.0699  $\mu$ Ci **Which Equals** 1.551E+05 dpm at the date listed above

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 

Date: 5/30/13

QC Approval 

Date: 5/30/13

US EPA ARCHIVE DOCUMENT

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

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07147	UUISO	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)
U-234	1.32	112.34%	16.23%	100.00%	3.60%	8.09E+00	2.91E-01	9.09E+00	1.48E+00	U-8a	3.52E+01	3.60E+00	5.10E-01
U-238	2.05	120.39%	16.10%	100.00%	3.60%	7.89E+00	2.84E-01	9.50E+00	1.53E+00	U-8a	3.44E+01	3.60E+00	5.10E-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)

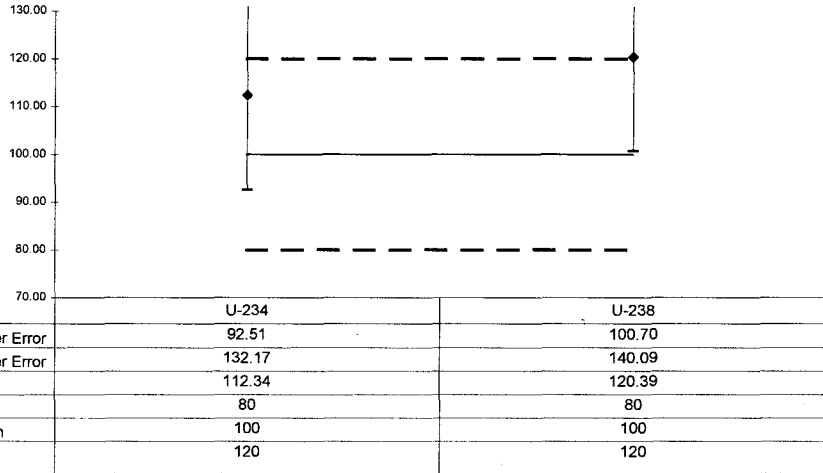
**Replicate Sample**

**QC Summary**

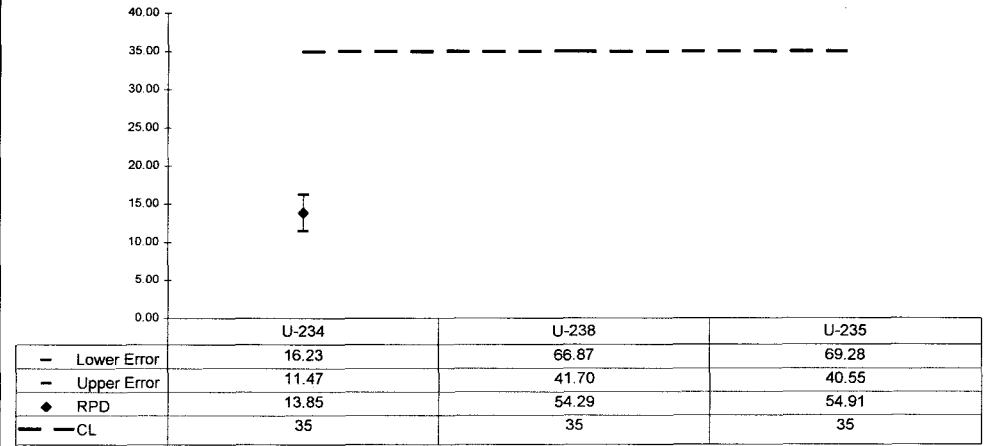
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
U-234	0.56	13.85	5.84E-01	2.08E-01	6.71E-01	2.22E-01	1.12	OK	OK			OK	OK
U-238	1.60	54.29	4.00E-01	1.69E-01	2.29E-01	1.23E-01	1.20	OK	OK			INV	OK
U-235	1.44	54.91	3.78E-01	1.80E-01	2.15E-01	1.31E-01		OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07147</b>	<b>UIISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

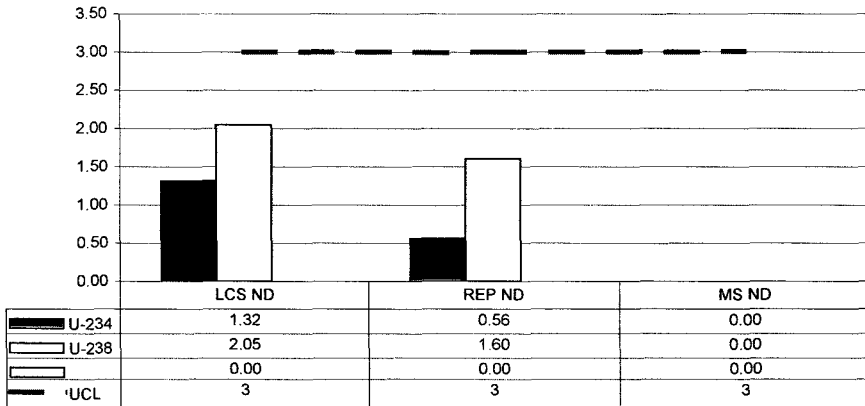
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

0052

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07147	UISO	2	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)
U-234	2.05	85.66%	15.76%	100.00%	3.60%	8.20E+00	2.95E-01	7.03E+00	1.11E+00	U-8a	3.52E+01	3.60E+00	5.17E-01
U-238	0.91	107.70%	15.30%	100.00%	3.60%	7.99E+00	2.88E-01	8.61E+00	1.32E+00	U-8a	3.44E+01	3.60E+00	5.17E-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)

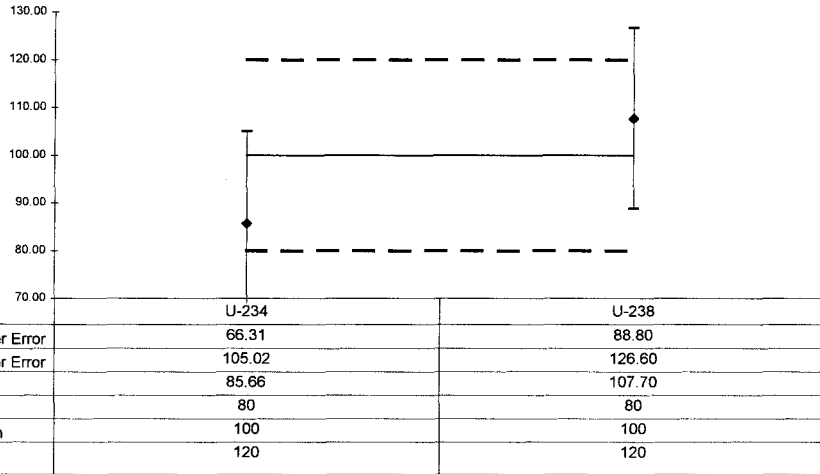
**Replicate Sample**

**QC Summary**

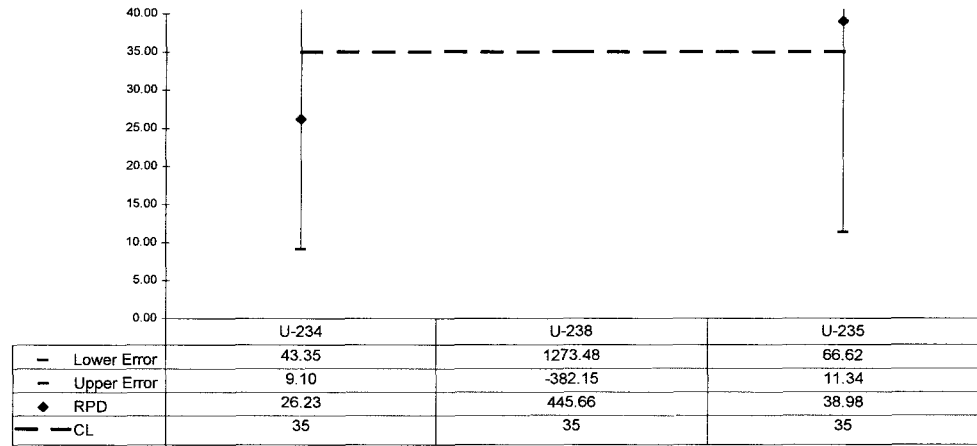
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
U-234	0.28	26.23	4.56E-01	6.87E-01	5.94E-01	6.85E-01	0.86	OK	OK			NA	OK
U-238	1.59	445.66	4.54E-01	6.84E-01	-1.73E-01	3.62E-01	1.08	OK	OK			NA	OK
U-235	0.38	38.98	7.23E-01	9.84E-01	4.87E-01	7.33E-01		OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07147</b>	<b>UUISO</b>	<b>2</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

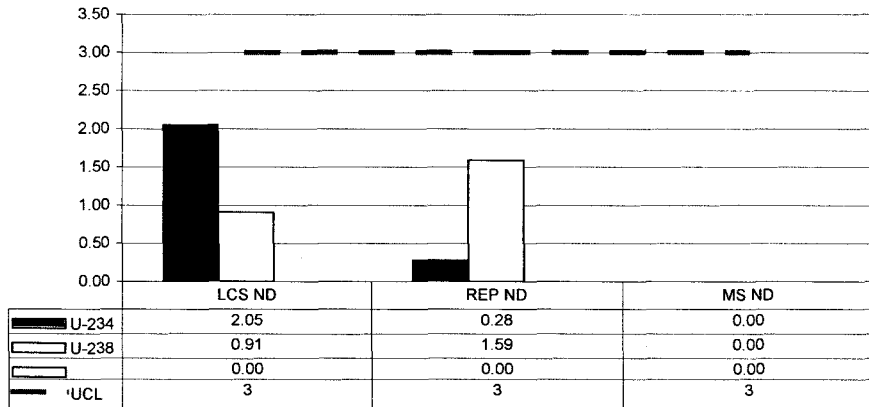
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

0054



WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07147</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	0.73	93.51%	18.37%	100.00%	3.60%	4.89E+00	1.76E-01	4.58E+00	8.41E-01	Th-8b	1.04E+02	3.60E+00	1.05E-01
TH-230	0.89	91.71%	19.79%	100.00%	2.70%	5.46E+00	1.47E-01	5.00E+00	9.91E-01	Th-1b	2.35E+01	2.70E+00	5.15E-01
TH-232	0.07	100.65%	17.82%	100.00%	3.60%	4.89E+00	1.76E-01	4.93E+00	8.78E-01	Th-8b	1.04E+02	3.60E+00	1.05E-01

**Matrix Spike**

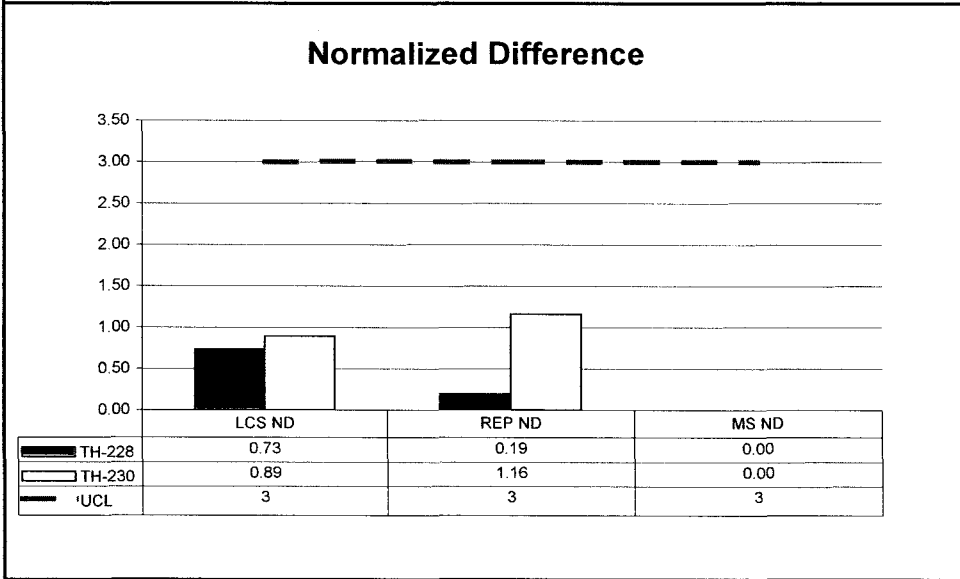
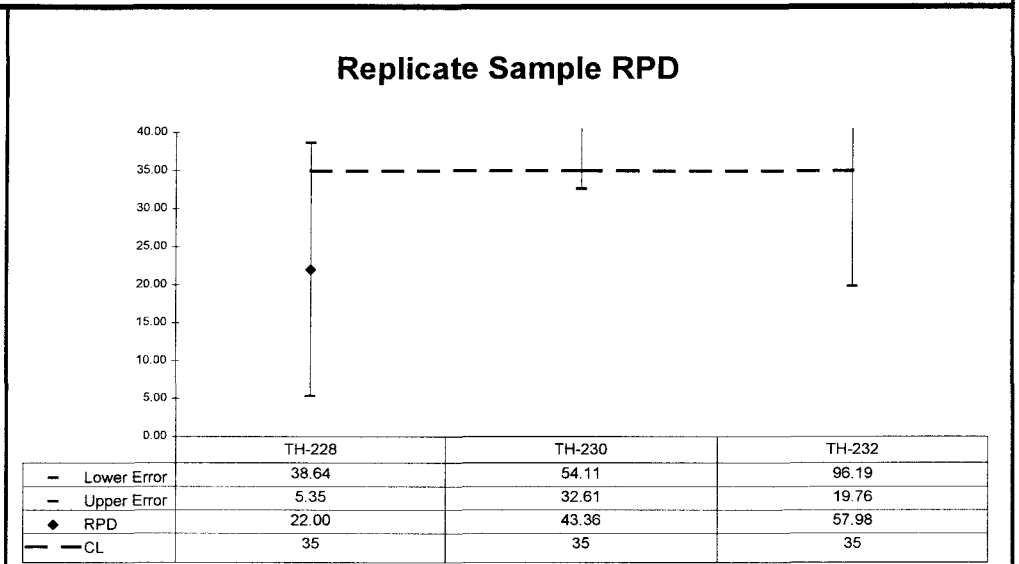
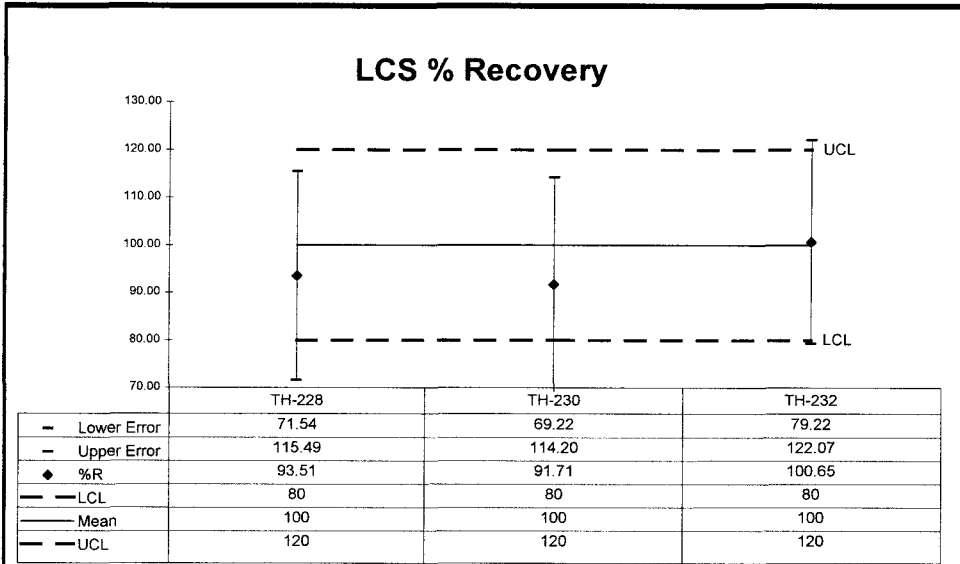
Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS CSU	Sample Result	Sample CSU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

**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	0.19	22.00	1.05E-01	1.02E-01	8.45E-02	1.85E-01	0.94	OK	OK			NA	OK
TH-230	1.16	43.36	5.35E-01	2.37E-01	8.32E-01	4.41E-01	0.92	OK	OK			INV	OK
TH-232	0.60	57.98	1.16E-01	9.88E-02	6.39E-02	1.38E-01	1.01	OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07147</b>	<b>ThISO</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
13-07147	Ra226	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-226	0.54	107.32%	24.59%	100.00%	4.60%	1.03E+01	4.73E-01	1.10E+01	2.71E+00	Ra-5b	4.41E+01	4.60E+00	5.18E-01

**Matrix Spike**

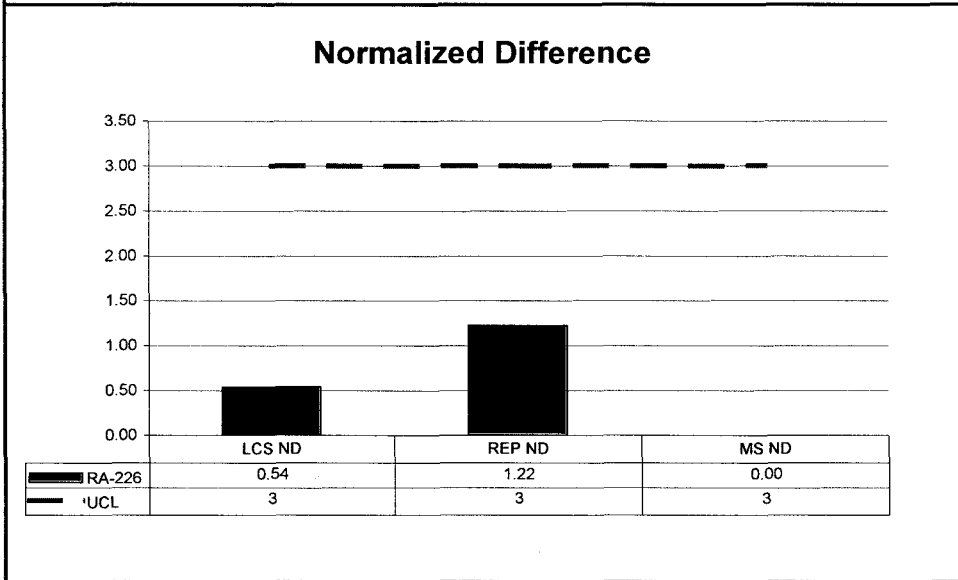
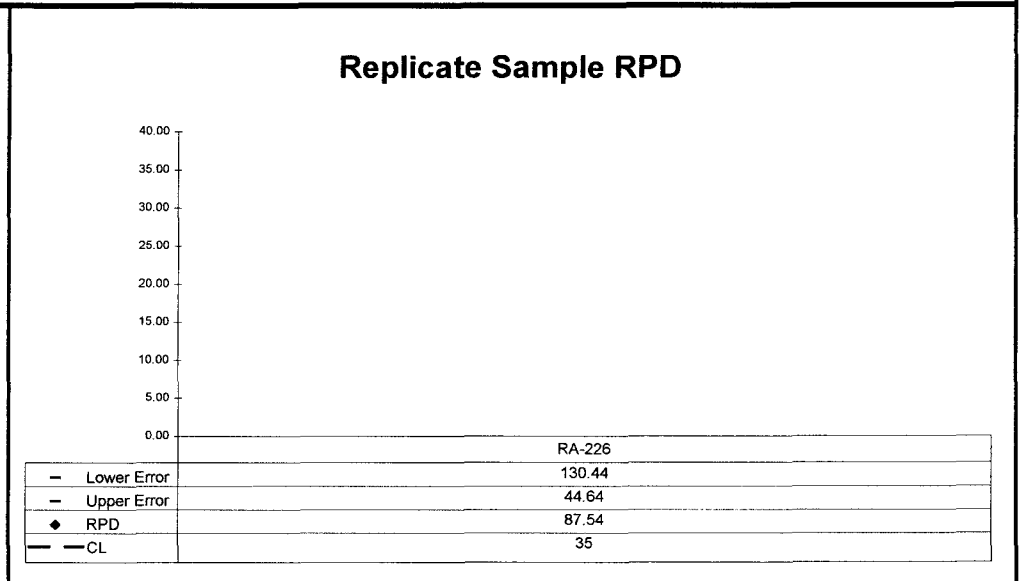
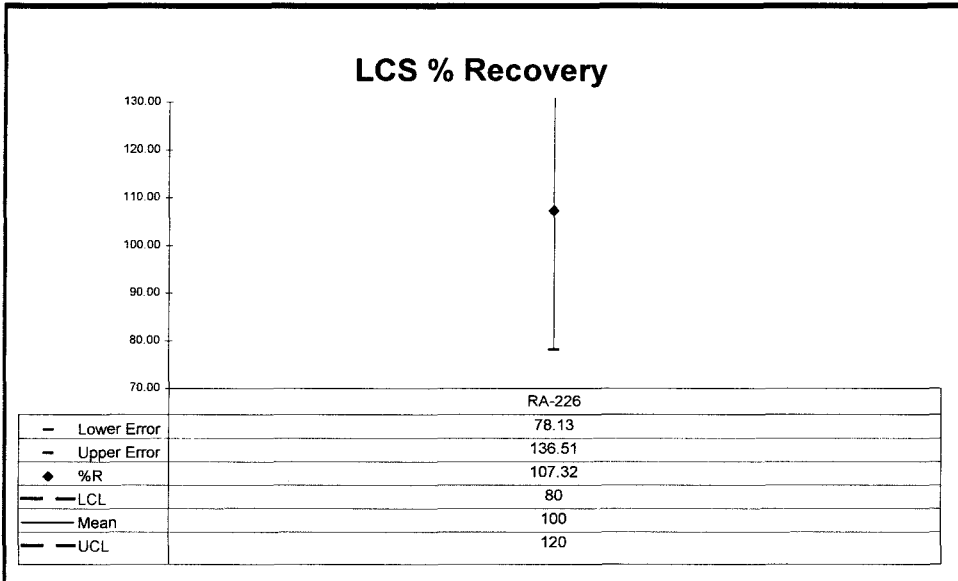
Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS CSU	Sample Result	Sample CSU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

**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	1.22	87.54	2.95E-01	2.33E-01	1.15E-01	1.68E-01	1.07	OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07147	Ra226	1	pCi	I	Engineering Management Support, Inc.



## No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07147</b>	<b>Ra228</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-228	0.59	92.87%	25.25%	100.00%	5.10%	8.81E+00	4.49E-01	8.18E+00	2.06E+00	Ra-11	3.77E+01	5.10E+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)

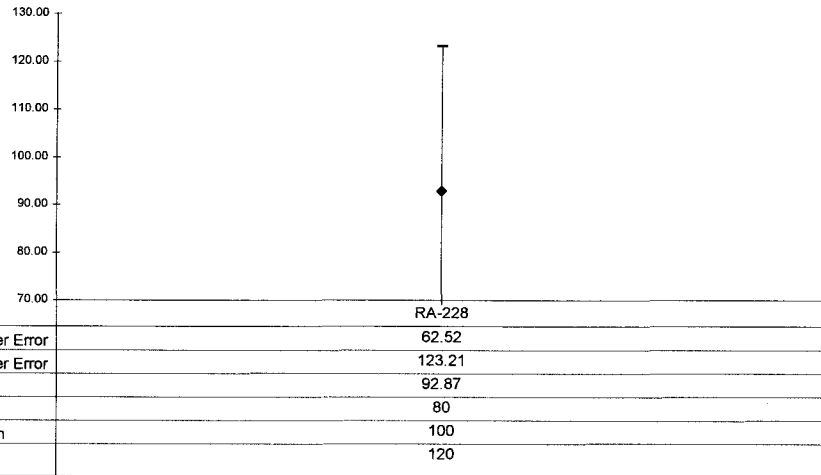
**Replicate Sample**

**QC Summary**

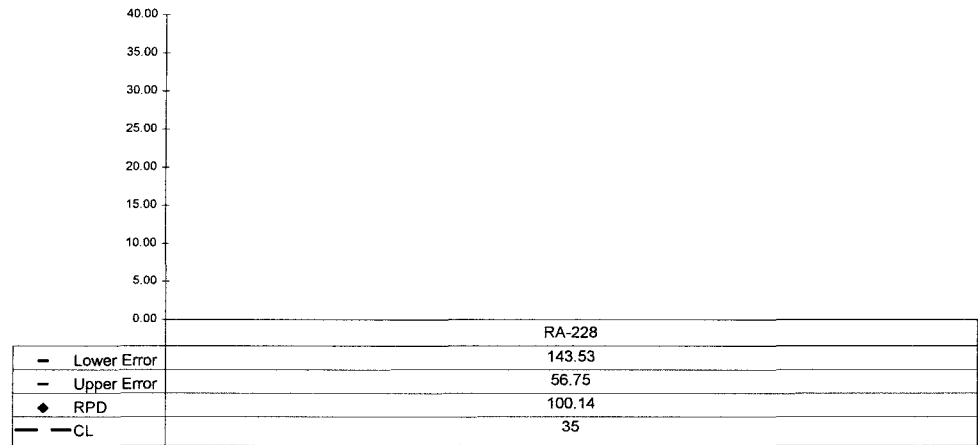
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-228	1.59	100.14	1.13E+00	7.18E-01	3.76E-01	5.89E-01	0.93	OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07147</b>	<b>Ra228</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

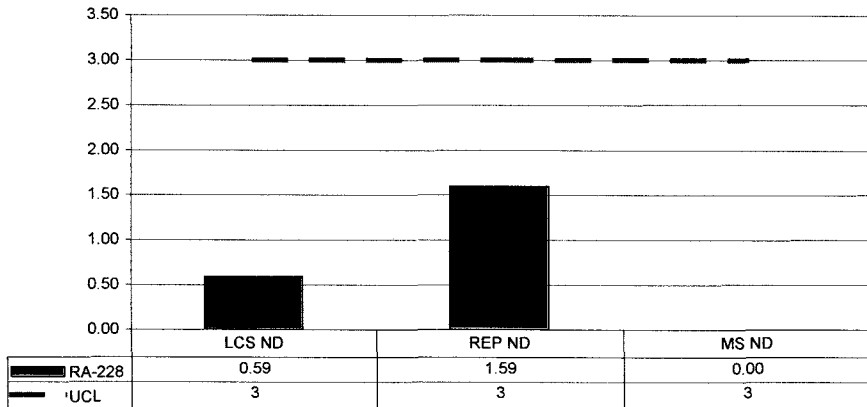
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference




### No Matrix Spike

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




**ISO U NOTES**  
**Run 1**

 <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	13-07147
		Analysis Code	UUIISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:39	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 10-15 AND 18 AND 19 WITH HNO3 AND DRIED SAMPLES DOWN


*J Wolfe*  
*8/2/13*

**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	13-07147
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:39	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 10-15 AND 18 AND 19 WITH HNO3 AND DRIED SAMPLES DOWN
2	08/07/13 18:08	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*  
 8/7/13

 <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	13-07147
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:39	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 10-15 AND 18 AND 19 WITH HNO3 AND DRIED SAMPLES DOWN
2	08/07/13 18:08	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	08/08/13 06:04	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.

*[Handwritten signature]*  
 8/8/13

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

**13-07147**

Analysis Code

Run

**UUISO**

**1**

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/2/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/7/2013
014142D01	Hydrochloric Acid	0.5N	JDEMELAS	8/7/2013
014199S	Hydrochloric Acid	6.5N	JDEMELAS	8/7/2013
014225S	Hydrochloric Acid	8N	JDEMELAS	8/7/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/7/2013
014235S	HCl - NH4I	8N - 0.1M	JDEMELAS	8/7/2013
014217S	HCl - HF	6.5N - 0.04N	JDEMELAS	8/7/2013
014042S	Carbon substrate	Solution	RMARTZ	8/8/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/8/2013
013191S	Neodymium Carrier	1 mg/ml	RMARTZ	8/8/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/8/2013
014220P	Titanous Chloride	Reagent Grade	RMARTZ	8/8/2013

Alpha # 3


Date	Sample #	Client	Facility	CT	Time	Analysis	Other
8/1/13	1307128A(4)	UWOR	0948	2hr	7LN7	C	
8/5/13	1307129A(6)	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	Rate	ICB	
<del>8/5/13</del>	<del>1307128A(4)</del>	<del>EMS</del>		<del>2hr50m</del>	<del>Rate</del>	<del>ICB</del>	
8/5/13	1307146A(13-14)	Ems	1250	2hr50m	Rate	ICB	
8/5/13	1307142A(12-15)	Accudest	1612	2hr50m	Rate	ICB	
8/5/13	1307171A(1-16)	UWOR	1613	2hr50m	Rate	ICB	
8/6/17	Daily Pulse	UWOR	0728	1hr	---	---	
8/6/17	1307179A(4)	TBE	0550	2hr	Rate	C	
8/6/17	1307170A(4)	Unitech	0978	2hr	Unitech	---	
8/6/17	1307178A(1-5)	Unitech	0941	2hr	Pulse	C	
8/6/17	1707179A(1-5)	Mirion Tech	0942	5hr	Unitech	C	
8/6/17	1707170A(1-2)	Unitech	0942	2hr	Pulse	C	
8/6/13	1307146A(7-14)	EMS	1246	2hr50m	Th	ICB	
8/6/13	1307147A(8-19)	EMS	1636	2hr50min	Rate	ICB	
8/7/17	Daily Pulse	UWOR	0972	1hr	---	---	
8/7/17	1707172A(1-4)	UWOR	0916	2hr	Am241	C	
8/7/13	1307172A(1-4)	UWOR	0917	2hr	Am241	C	
8/7/13	1307181A(1-4)	Wastewater	0918	2hr	Am241	C	
8/7/13	1307146A(2-14)	EMS	1247	2hr50m	Unitech	ICB	
8/7/13	1307149A(9-15)	EMS	1606	2hr50m	Rate	ICB	
8/8/17	Daily Pulse	UWOR	0578	1hr	---	---	
8/8/17	1307146A(9)	Engstrom	0920	2hr	Unitech	C	
8/8/17	1707147A(9-11)	Engstrom	0907	2hr	Unitech	C	

# Alpha #1

Date	Sample #	Client	Lead Time	CT Time	Analysis	Fee
8/7/12	1708006A(1-4)	UCOR	0917	2hr	Pit20	-
8/7/12	1308016A(1-4)	Unitech	0914	2hr	Un20	-
8/7/13	1308006A(1-4)	UCOR	1243	2hrs mins	Np	KB
8/7/13	1307138A(1-4)	Unitech	1243	2hrs mins	UU	KB
8/7/13	1307146A(15-20)	EMS	1603	2hrs-	UU	KB
8/7/13	1307110B(1-2)	EMS	1607	2hrs-	UU	KB
8/8/12	Daily Pulse	UM	0578	1hr	uu	-
8/8/12	1707147A(1-8)	Eng Pro	0906	2hr	Un20	-


**ISO U NOTES**  
**Run 2**



 <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	13-07147
		Analysis Code	UUISO
		Run Number	2

#	Date	Dept	User	Notes
1	08/09/13 07:22	PREP	JWOLFE	ALIQUTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS WITH HNO3 AND DRIED SAMPLES DOWN
2	08/12/13 17:28	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.

*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	13-07147
		Analysis Code	UUISO
		Run Number	2

#	Date	Dept	User	Notes
1	08/09/13 07:22	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS WITH HNO3 AND DRIED SAMPLES DOWN
2	08/12/13 17:28	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	08/13/13 06:30	CHEM	RMARTZ	ADDED 0.1 ML NEODYMIUM CARRIER, 0.3 ML TITANOUS CHLORIDE, & 1 ML HF TO C-TUBES; LET SET SIT IN ICE BATH FOR ONE HOUR. SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR, THEN SENT SET TO COUNT ROOM.

*MA*  
*8/13/13*

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

13-07147

Analysis Code

Run

UUISO


2

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/9/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/12/2013
014230S	HCl - HF	6.5N - 0.04N	JDEMELAS	8/12/2013
014142D01	Hydrochloric Acid	0.5N	JDEMELAS	8/12/2013
014199S	Hydrochloric Acid	6.5N	JDEMELAS	8/12/2013
014237S	Hydrochloric Acid	8N	JDEMELAS	8/12/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/12/2013
014248S	HCl - NH4I	8N - 0.1M	JDEMELAS	8/12/2013
014042S	Carbon substrate	Solution	RMARTZ	8/13/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/13/2013
013191S	Neodymium Carrier	1 mg/ml	RMARTZ	8/13/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/13/2013
014220P	Titanous Chloride	Reagent Grade	RMARTZ	8/13/2013

# Alpha #2

Date	Sample #	Client	Serial #	CT	Analysis	Fee
9/12/13	1307153A(15-19)	Ems	1648	2hr 50 -	Rate	148
8/12/13	1307186A(1-4)	UCOR	1649	2hr 50 -	Rate	148
8/10/13	Daily P-18	UCOR	0925	1-0	---	-
8/10/13	1707147B(1-2)(1-2)	Cuyah	0905	2Lr	14750	C
8/10/13	1707186A(1-7)	UCOR	0905	2Lr	14750	C


**ISO TH 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	13-07147
		Analysis Code	THISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:38	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 10-15 AND 18 AND 19 WITH HNO3 AND DRIED SAMPLES DOWN

*J Wolfe*  
8/2/13


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	13-07147
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:38	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 10-15 AND 18 AND 19 WITH HNO3 AND DRIED SAMPLES DOWN
2	08/08/13 18:36	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*  
8/8/13

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	13-07147
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:38	PREP	JWOLFE	ALIQUTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 10-15 AND 18 AND 19 WITH HNO3 AND DRIED SAMPLES DOWN
2	08/08/13 18:36	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	08/09/13 06:54	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.

*RM*  
 8/9/13





Reagents Used in an Analysis

Internal Work Order

**13-07147**

Analysis Code

Run

**ThISO**

**1**

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/2/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/8/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/8/2013
014216S	Nitric Acid	8N	JDEMELAS	8/8/2013
014109P	Nitric Acid	Reagent Grade	JDEMELAS	8/8/2013
014237S	Hydrochloric Acid	8N	JDEMELAS	8/8/2013
014236S	Nitric Acid	8N	JDEMELAS	8/8/2013
014042S	Carbon substrate	Solution	RMARTZ	8/9/2013
014040S	Cerrium Carrier	0.1mg/ml	RMARTZ	8/9/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/9/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/9/2013

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# Alpha #1


Date	Sample #	Client	Lead Time	C70 Time	Analysis	Feed
8/7/17	1708006A(1-4)	UCOR	0917	2hr	Pu 20	-
8/7/17	1308016A(1-4)	Unitech	0914	2hr	Uu 20	-
8/7/13	1308006A(1-4)	UCOR	1243	2hrs 50 mins	Np	KB
8/7/13	1307138A(1-4)	Unitech	1243	2hrs 50 mins	Uu	KB
8/7/13	1307146A(15-20)	EMS	1603	2hrs 50 -	Uu	KB
8/7/13	1307110B(1-2)	EMS	1604	2hrs 50 -	Uu	KB
8/8/17	Daily Pulse	Uu	0578	1hr	Uu	-
8/8/17	1707147A(1-8)	Eng Man	0906	2hr	Uu 20	-
8/8/13	1307116B(4,6,9)	UCOR	1159	2hrs 50 mins	Pu	KB
8/8/13	1307116B(4,6)	UCOR	1200	2hrs 50 mins	PuNT	KB
8/8/13	1307140A(1-3)	UCOR	1200	2hrs 50 -	Pu	KB
8/8/13	1307152A(14-19)	EMS	1454	2hrs 50 -	Pu	KB
8/9/17	Daily Pulse	Uu	0506	1hr	Uu	-
8/9/17	SEC CAL	Uu	0800	2hr 7m	Uu	-
8/9/17	1708071A(4-5)	UCOR	1076	2hr	Uu 20	-
8/9/17	1707186A(4-7)	UCOR	1076	2hr	NA 20	-
8/9/13	1307171A(24,6)	UCOR	1729	2hr	Uu 20	-
8/9/13	System Bkgd	Lab	1624	16:40 hrs	-	KB
8/10/13	Daily Pulser	Lab	1123	10 min	NA	AG
8/10/13	1307147A(1-8)	Eng Manage	1455	2hrs 50 hrs	iso-Th	AG

Alpha # 3

Date	Sample #	Client	Food Item	CT Item	Analysis	Test
8/9/13	Daily Pulser	LAB	0506	1m	nr	-
8/9/13	SECCAL	LAB	0522	2hr	nr	-
8/9/13	(1307147A(1-12))	Eng. Manage	0904	2hr	Rel	c
8/9/13	1307146A(4)	ucon	1207	2hr 50m	Np	KB
8/9/13	1308003A(1-9)	Access	1209	2hr 50m	Rel	KB
8/9/13	System Bkgd	Lab	1624	16.40 hrs	α	KB
8/10/13	Daily Pulser	Lab	1123	10 min	NA	AG
8/10/13	1307147A(9-19)	Eng. Manage	1502	2hr 50m	ISO-Th	AG


US EPA ARCHIVE DOCUMENT

**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	13-07147
		Analysis Code	Ra226
		Run Number	1


#	Date	Dept	User	Notes
1	07/31/13 12:33	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKE S AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

*J Wolfe*  
 7/31/13

 <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	13-07147
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	07/31/13 12:33	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKE S AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/02/13 12:57	PREP	LWALKER	ADDED EDTA TO PRECIP-VORTEX-LET SIT OVERNIGHT TO DIGEST.
3	08/05/13 15:41	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*  
 8/5/13

 <b>Reagents Used in an Analysis</b>		Internal Work Order		
		13-07147		
		Analysis Code		Run
		Ra226		1
Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	7/31/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	7/31/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	7/31/2013
014008D02	Lead Carrier	166 mg/ml	JWOLFE	7/31/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	7/31/2013
014212S	EDTA	0.25M	LWALKER	8/2/2013
011383P	Acetic Acid	Reagent Grade	LWALKER	8/5/2013
013575D05	Ammonium Sulfate	200 mg/ml	LWALKER	8/5/2013

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# Alpha #3


Date	Stamp/ID	Client	Local	Time	CT	Time	Analysis	Tech
8/5/13	1207128A(4)	UWOR	0948	2L	7LNT			C
8/5/13	1307128A(6)	UWOR	1231	2hr50	Th			KB
8/5/13	1307129A(1-7)	MDNR	1231	2hr50	Th			KB
8/5/13	1307144A(1-3)	EMS	1232	2hr50	Rat			KB
<del>8/5/13</del>	<del>1307128A(10-15)</del>	<del>EMS</del>		<del>2hr50</del>	<del>Rat</del>			<del>KB</del>
8/5/13	1307146A(13-14)	EMS	1250	2hr50	Rat			KB
8/5/13	1307142A(12-15)	Accutest	1612	2hr50	Rat			KB
8/5/13	1307171A(1-4,6)	UWOR	1613	2hr50	Rat			KB
8/6/17	Daily Pulse	UW	0728	UW	UW			
8/6/17	1307179A(11)	TBE	0550	2hr	Rat			C
8/6/17	1707170A(4)	Unitelch	0978	2L	UW			
8/6/17	1307178A(1-5)	Unitelch	0941	2L	Pu 20			C
8/6/17	1707179A(1-5)	Mirion Tek	0942	5hr	UW			C
8/6/17	1707170A(12)	Unitelch	0942	2L	Pu 20			C
8/6/13	1307146A(7-14)	EMS	1246	2hr50	Th			KB
8/6/13	1307147A(8-19)	EMS	1636	2hr50 min	Rat			KB



# Alpha #2

Date	Sample #	Client	Time	CT Time	Image	Deal	
8/6/13	Daily Pulm	UAB	0928	1u	run	—	
8/6/13	1307171A(4-6)	UWor	0936	2hrs	Amr	—	
8/6/13	1308006A(1-4)	UWor	0977	2hrs	u230	—	
8/6/13	1307170A(1-7)	United	0978	2hrs	u230	—	
8/6/13	1307171A(3-4,6)	UWor	1245	2hrs	mins	Np	UAB
8/6/13	1307146A(1-6)	EMS	1246	2hrs	son	th	UAB
8/6/13	1307172A(3-4)	UWor	1634	2hrs	son	Raw	UAB
8/6/13	1307147A(1-7)	EMS	1635	2hrs	son	Raw	UAB


**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	13-07147
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	07/31/13 12:33	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKE S AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

*J Wolfe*  
*7/31/13*


**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	13-07147
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	07/31/13 12:33	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKE S AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/07/13 12:18	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	08/09/13 17:46	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)

*L Walker*  
 8/9/13

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	13-07147
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	07/31/13 12:33	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKE S AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/07/13 12:18	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	08/09/13 17:46	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)
4	08/14/13 09:05	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 )

8-14-13  
*[Signature]*

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

13-07147

Analysis Code

Run

Ra228

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	7/31/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	7/31/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	7/31/2013
014008D02	Lead Carrier	166 mg/ml	JWOLFE	7/31/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	7/31/2013
011504D32	Ammonium Sulfide	2%	LWALKER	8/9/2013
014008D03	Lead Carrier	1.5 mg/ml	LWALKER	8/9/2013
014109P	Nitric Acid	Reagent Grade	LWALKER	8/9/2013
013065D06	Sodium Hydroxide	10M	LWALKER	8/9/2013
014060S	Yttrium Carrier	9 mg/ml	LWALKER	8/9/2013
013763D02	Ammonium Oxalate	5%	TSMITH	8/14/2013
013910D07	Nitric Acid	1N	TSMITH	8/14/2013
014110D04	Nitric Acid	6N	TSMITH	8/14/2013
013065D10	Sodium Hydroxide	10M	TSMITH	8/14/2013
013065D09	Sodium Hydroxide	18M	TSMITH	8/14/2013

LB4110REP

Date	Sample #	Client	Analyst	CT/Time	Method	Tab
8/8/13	1307186Ph(1-4)	Udon	CS18112	2h	Pb200	C
8/8/13	330722154(2-9)	Test Ana.	1006	2h	SR504	C
8/8/13	1307186Ph(1-4)	Udon	1217	2hrs	Pb200	KB
8/15/13	EF700	Ums	0702	7am	LAB	C
8/15/13	BLL6000	Ums	0774	6am	Ums	C
8/15/13	1307186RA(1-4)	Udon	0770	2h	RA8	C
8/15/13	1308004RA(1-7)	Udon	0770	2h	RA8	C
8/15/13	1708005RA(1-4)	Udon	0770	2h	RA8	C
8/15/13	1707129RA(1-7)	Miss Rep	0958	2h	RA8	C
8/15/13	1707186NP(1-4)	Udon	1007	1am	NP274	C
8/15/13	1308005Pb(1-4)	Udon	1026	2h	Pb200	C
8/10/13	Weekly Bldg	Lab	1138	12hr	2B	AG
8/12/13	EF700	Ums	0518	3am	LAB	C
8/12/13	BLL6000	Ums	0771	6am	LAB	C
8/12/13	1707142RA(1-7)	Acatest	0747	2h	RA8	C
8/12/13	1707146RA(1-7)	Engman	1116	2h	RA8	C
8/12/13	EF700	Ums	0710	3am	LAB	C
8/12/13	BLL6000	Ums	0744	6am	LAB	C
8/12/13	1707144RA(2-5)	UTAH DIV. OF ENV.	0770	2h	LAB	C
8/12/13	1707144RA(1-5)	UTAH DIV. OF ENV.	0770	3am	LAB	C
8/12/13	1708004NP(1-3)	Udon	0844	10am	NP274	C
8/12/13	1707152RA(1-3)	Engman	1047	2h	RA8	C
8/14/13	EF700	Ums	0712	7am	LAB	C
8/14/13	BLL6000	Ums	0746	6am	LAB	C
8/14/13	1707149RA(1-7)	Engman	0754	2h	RA8	C
8/14/13	130714054(1)	Udon	1002	7am	SR504	C
8/14/13	170717254(1)	Udon	1902	7am	SR504	C
8/14/13	170717154(1-4)	Udon	1002	2h	SR504	C
8/14/13	1307147RA(1-8)	EMS	1107	2hrs	RA8	KB
8/14/13	1307147RA(17-19)	EM	1102	2hrs	RA8	KB

US EPA ARCHIVE DOCUMENT

LBULLO Aqua

Date	Sample #	Client	Facid Thin	CT Time	Analysis	Test
8/13/12	1307118ADK(2-5)	ERK	1119	2h	L1A	C
8/17/12	1707118ABZ(6-7)	ERA	1257	2h	L1B	C
8/14/12	PL600C	UM3	0712	6h	L1B	C
8/14/12	EF76C	UM3	0646	7h	L1B	C
8/14/12	1707149RA(13-15)	Eng Ma	0755	2h	RA8	C
8/14/12	130714054(2-4/6)	U CON	0843	2h	SR904	C
8/14/12	130717234(2-4/6)	U CON	0847	2h	SR904	C
8/14/12	130717154(16)	U CON	1002	2h	SR904	C
8/14/13	1307147RA(9-16)	EMS	1109	2hrs	Raw	ICB



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

**RUN 1**

Work Order	<b>13-07147</b>
Analysis Code	<b>UIISO</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	<b>pCi</b>
Aliquot Units	<b>I</b>
Matrix	<b>WA</b>
Method	<b>HASL 300, 4.5.2</b>
Instrument Type	<b>Alpha Spectroscopy</b>
Radiometric Tracer	<b>U-232</b>
Radiometric Sol#	<b>U-10a</b>
Tracer Act (dpm/g)	19.043
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		07/23/13 00:00	1.0000E+00
02	MBL	BLANK		07/23/13 00:00	1.0000E+00
03	DUP	D-12 TOT	46	07/15/13 15:27	1.0000E+00
04	DO	D-12 TOT	46	07/15/13 15:27	1.0000E+00
05	TRG	D-12 DIS	46	07/15/13 15:27	1.0000E+00
06	TRG	DUP05 TOT	45	07/15/13 00:00	1.0000E+00
07	TRG	DUP05 DIS	45	07/15/13 00:00	1.0000E+00
08	TRG	PZ-208-SS TOT	43	07/16/13 09:25	1.0000E+00
09	TRG	PZ-208-SS DIS	43	07/16/13 09:25	1.0000E+00
10	TRG	PZ-304-AI TOT	46	07/16/13 12:05	1.0000E+00
11	TRG	PZ-304-AI DIS	46	07/16/13 12:05	1.0000E+00
12	TRG	PZ-304-AS TOT	41	07/16/13 12:34	1.0000E+00
13	TRG	PZ-304-AS DIS	41	07/16/13 12:34	1.0000E+00
14	TRG	MW-104 TOT	41	07/16/13 13:25	1.0000E+00
15	TRG	MW-104 DIS	41	07/16/13 13:25	1.0000E+00
16	TRG	PZ-204A-SS TOT	40	07/16/13 13:56	1.0000E+00
17	TRG	PZ-204A-SS DIS	40	07/16/13 13:56	1.0000E+00
18	TRG	PZ-302-AI TOT	44	07/16/13 15:18	1.0000E+00
19	TRG	PZ-302-AI DIS	44	07/16/13 15:18	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	0.9113	17.4		0.00								
02	MBL	0.6093	11.6		0.00								
03	DUP	0.6069	11.6		0.00								
04	DO	0.6056	11.5		0.00								
05	TRG	0.6054	11.5		0.00								
06	TRG	0.6067	11.6		0.00								
07	TRG	0.6048	11.5		0.00								
08	TRG	0.6031	11.5		0.00								
09	TRG	0.6014	11.5		0.00								
10	TRG	0.6035	11.5		0.00								
11	TRG	0.6044	11.5		0.00								
12	TRG	0.6020	11.5		0.00								
13	TRG	0.6030	11.5		0.00								
14	TRG	0.6018	11.5		0.00								
15	TRG	0.6027	11.5		0.00								
16	TRG	0.6018	11.5		0.00								
17	TRG	0.6021	11.5		0.00								
18	TRG	0.6007	11.4		0.00								
19	TRG	0.6019	11.5		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.

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<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			08/02/13 08:15	JWOLFE				
02	MBL			08/02/13 08:15	JWOLFE				
03	DUP			08/02/13 08:15	JWOLFE				
04	DO			08/02/13 08:15	JWOLFE				
05	TRG			08/02/13 08:15	JWOLFE				
06	TRG			08/02/13 08:15	JWOLFE				
07	TRG			08/02/13 08:15	JWOLFE				
08	TRG			08/02/13 08:15	JWOLFE				
09	TRG			08/02/13 08:15	JWOLFE				
10	TRG			08/02/13 08:15	JWOLFE				
11	TRG			08/02/13 08:15	JWOLFE				
12	TRG			08/02/13 08:15	JWOLFE				
13	TRG			08/02/13 08:15	JWOLFE				
14	TRG			08/02/13 08:15	JWOLFE				
15	TRG			08/02/13 08:15	JWOLFE				
16	TRG			08/02/13 08:15	JWOLFE				
17	TRG			08/02/13 08:15	JWOLFE				
18	TRG			08/02/13 08:15	JWOLFE				
19	TRG			08/02/13 08:15	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.

0000

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-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	9.09E+00	1.32E+00	1.10E-01	8.09E+00	112.34	OK		OK	
02	U-234	MBL	BLANK	pCi/l	2.05E-01	1.11E-01	9.10E-02					OK	OK
03	U-234	DUP	D-12 TOT	pCi/l	6.71E-01	2.17E-01	1.15E-01				OK	OK	
04	U-234	DO	D-12 TOT	pCi/l	5.84E-01	2.04E-01	6.80E-02					OK	
05	U-234	TRG	D-12 DIS	pCi/l	3.38E-01	1.86E-01	1.02E-01					OK	
06	U-234	TRG	DUP05 TOT	pCi/l	6.65E-01	2.49E-01	1.00E-01					OK	
07	U-234	TRG	DUP05 DIS	pCi/l	4.55E-01	1.80E-01	1.09E-01					OK	
08	U-234	TRG	PZ-208-SS TOT	pCi/l	1.81E+00	4.13E-01	1.09E-01					OK	
09	U-234	TRG	PZ-208-SS DIS	pCi/l	1.58E+00	3.76E-01	9.63E-02					OK	
10	U-234	TRG	PZ-304-AI TOT	pCi/l	7.25E-01	3.63E-01	1.70E-01					OK	
11	U-234	TRG	PZ-304-AI DIS	pCi/l	6.34E-01	3.45E-01	1.78E-01					OK	
12	U-234	TRG	PZ-304-AS TOT	pCi/l	3.28E-02	2.13E-01	5.79E-01					OK	
13	U-234	TRG	PZ-304-AS DIS	pCi/l	1.60E+00	1.97E+00	2.09E+00					INV	
14	U-234	TRG	MW-104 TOT	pCi/l	2.89E+00	5.92E-01	1.20E-01					OK	
15	U-234	TRG	MW-104 DIS	pCi/l	2.21E+00	4.96E-01	1.02E-01					OK	
16	U-234	TRG	PZ-204A-SS TOT	pCi/l	1.98E+00	6.51E-01	2.05E-01					OK	
17	U-234	TRG	PZ-204A-SS DIS	pCi/l	2.41E+00	6.17E-01	1.13E-01					OK	
18	U-234	TRG	PZ-302-AI TOT	pCi/l	3.60E+00	5.96E-01	6.66E-02					OK	
19	U-234	TRG	PZ-302-AI DIS	pCi/l	5.18E+00	1.25E+00	2.27E-01					OK	

	
Run	1
Analysis Code	UUISO
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-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-234	LCS	07/23/13 00:00	1.00E+00	72.66	0.00	0.00			
02	U-234	MBL	07/23/13 00:00	1.00E+00	99.04	0.00	0.00			
03	U-234	DUP	07/15/13 15:27	1.00E+00	88.83	0.00	0.00			
04	U-234	DO	07/15/13 15:27	1.00E+00	79.47	0.00	0.00			
05	U-234	TRG	07/15/13 15:27	1.00E+00	54.56	0.00	0.00			
06	U-234	TRG	07/15/13 00:00	1.00E+00	67.67	0.00	0.00			
07	U-234	TRG	07/15/13 00:00	1.00E+00	90.44	0.00	0.00			
08	U-234	TRG	07/16/13 09:25	1.00E+00	103.51	0.00	0.00			
09	U-234	TRG	07/16/13 09:25	1.00E+00	84.14	0.00	0.00			
10	U-234	TRG	07/16/13 12:05	1.00E+00	35.19	0.00	0.00			
11	U-234	TRG	07/16/13 12:05	1.00E+00	34.02	0.00	0.00			
12	U-234	TRG	07/16/13 12:34	1.00E+00	13.55	0.00	0.00			
13	U-234	TRG	07/16/13 12:34	1.00E+00	3.53	0.00	0.00			
14	U-234	TRG	07/16/13 13:25	1.00E+00	70.94	0.00	0.00			
15	U-234	TRG	07/16/13 13:25	1.00E+00	71.86	0.00	0.00			
16	U-234	TRG	07/16/13 13:56	1.00E+00	35.51	0.00	0.00			
17	U-234	TRG	07/16/13 13:56	1.00E+00	54.80	0.00	0.00			
18	U-234	TRG	07/16/13 15:18	1.00E+00	104.63	0.00	0.00			
19	U-234	TRG	07/16/13 15:18	1.00E+00	41.84	0.00	0.00			



Run 1

Analysis Code UUISO

Eberline Services Work Order 13-07147

Client Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UIISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-234	LCS	08/08/13 09:06		A_Spec	Alpha_003	170	4.34 E+02	3.00 E-03	17.5
02	U-234	MBL	08/08/13 09:06		A_Spec	Alpha_004	170	1.48 E+01	7.00 E-03	19.4
03	U-234	DUP	08/08/13 09:06		A_Spec	Alpha_010	170	4.41 E+01	1.10 E-02	19.7
04	U-234	DO	08/08/13 09:06		A_Spec	Alpha_011	170	3.58 E+01	1.00 E-03	20.5
05	U-234	TRG	08/08/13 09:06		A_Spec	Alpha_012	170.02	1.38 E+01	1.00 E-03	19.9
06	U-234	TRG	08/08/13 09:06		A_Spec	Alpha_013	170.02	3.17 E+01	2.00 E-03	18.7
07	U-234	TRG	08/08/13 09:06		A_Spec	Alpha_014	170.02	2.86 E+01	8.00 E-03	18.5
08	U-234	TRG	08/08/13 09:06		A_Spec	Alpha_015	170.02	1.04 E+02	6.00 E-03	14.8
09	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_033	170	9.23 E+01	4.00 E-03	18.5
10	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_034	170	1.78 E+01	1.00 E-03	18.6
11	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_035	170	1.48 E+01	1.00 E-03	18.3
12	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_036	170	3.20 E-01	4.00 E-03	19.1
13	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_038	170	3.66 E+00	2.00 E-03	17.2
14	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_039	170	1.52 E+02	6.00 E-03	19.7
15	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_040	170	1.13 E+02	3.00 E-03	19
16	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_045	170	5.05 E+01	3.00 E-03	19.1
17	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_046	170	8.88 E+01	1.00 E-03	17.9
18	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_047	170	2.59 E+02	2.00 E-03	18.2
19	U-234	TRG	08/08/13 09:08		A_Spec	Alpha_048	170	1.37 E+02	0.00 E+00	16.8

	
Run	1
Analysis Code	UIISO
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UIISO-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	9.50E+00	1.37E+00	8.69E-02	7.89E+00	120.39	OK		OK	
02	U-238	MBL	BLANK	pCi/l	1.85E-01	1.07E-01	9.78E-02					OK	OK
03	U-238	DUP	D-12 TOT	pCi/l	2.29E-01	1.22E-01	9.06E-02				INV	OK	
04	U-238	DO	D-12 TOT	pCi/l	4.00E-01	1.66E-01	7.75E-02					OK	
05	U-238	TRG	D-12 DIS	pCi/l	1.18E-01	1.08E-01	1.02E-01					OK	
06	U-238	TRG	DUP05 TOT	pCi/l	2.58E-01	1.52E-01	1.18E-01					OK	
07	U-238	TRG	DUP05 DIS	pCi/l	2.64E-01	1.32E-01	7.57E-02					OK	
08	U-238	TRG	PZ-208-SS TOT	pCi/l	1.43E+00	3.55E-01	9.07E-02					OK	
09	U-238	TRG	PZ-208-SS DIS	pCi/l	9.80E-01	2.81E-01	8.13E-02					OK	
10	U-238	TRG	PZ-304-AI TOT	pCi/l	8.03E-01	3.83E-01	1.69E-01					OK	
11	U-238	TRG	PZ-304-AI DIS	pCi/l	3.33E-01	2.44E-01	1.78E-01					OK	
12	U-238	TRG	PZ-304-AS TOT	pCi/l	-5.41E-02	2.25E-01	7.26E-01					OK	
13	U-238	TRG	PZ-304-AS DIS	pCi/l	1.30E+00	1.88E+00	2.60E+00					INV	
14	U-238	TRG	MW-104 TOT	pCi/l	2.39E+00	5.17E-01	7.91E-02					OK	
15	U-238	TRG	MW-104 DIS	pCi/l	1.65E+00	4.11E-01	1.16E-01					OK	
16	U-238	TRG	PZ-204A-SS TOT	pCi/l	1.27E+00	4.94E-01	1.86E-01					OK	
17	U-238	TRG	PZ-204A-SS DIS	pCi/l	1.86E+00	5.19E-01	1.13E-01					OK	
18	U-238	TRG	PZ-302-AI TOT	pCi/l	3.10E+00	5.34E-01	6.63E-02					OK	
19	U-238	TRG	PZ-302-AI DIS	pCi/l	4.06E+00	1.04E+00	1.57E-01					OK	

Client	Engineering Management Support, Inc.	Eberline Services Work Order	13-07147	Analysis Code	UIISO	Run	1

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-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	07/23/13 00:00	1.00E+00	72.66	0.00	0.00			
02	U-238	MBL	07/23/13 00:00	1.00E+00	99.04	0.00	0.00			
03	U-238	DUP	07/15/13 15:27	1.00E+00	88.83	0.00	0.00			
04	U-238	DO	07/15/13 15:27	1.00E+00	79.47	0.00	0.00			
05	U-238	TRG	07/15/13 15:27	1.00E+00	54.56	0.00	0.00			
06	U-238	TRG	07/15/13 00:00	1.00E+00	67.67	0.00	0.00			
07	U-238	TRG	07/15/13 00:00	1.00E+00	90.44	0.00	0.00			
08	U-238	TRG	07/16/13 09:25	1.00E+00	103.51	0.00	0.00			
09	U-238	TRG	07/16/13 09:25	1.00E+00	84.14	0.00	0.00			
10	U-238	TRG	07/16/13 12:05	1.00E+00	35.19	0.00	0.00			
11	U-238	TRG	07/16/13 12:05	1.00E+00	34.02	0.00	0.00			
12	U-238	TRG	07/16/13 12:34	1.00E+00	13.55	0.00	0.00			
13	U-238	TRG	07/16/13 12:34	1.00E+00	3.53	0.00	0.00			
14	U-238	TRG	07/16/13 13:25	1.00E+00	70.94	0.00	0.00			
15	U-238	TRG	07/16/13 13:25	1.00E+00	71.86	0.00	0.00			
16	U-238	TRG	07/16/13 13:56	1.00E+00	35.51	0.00	0.00			
17	U-238	TRG	07/16/13 13:56	1.00E+00	54.80	0.00	0.00			
18	U-238	TRG	07/16/13 15:18	1.00E+00	104.63	0.00	0.00			
19	U-238	TRG	07/16/13 15:18	1.00E+00	41.84	0.00	0.00			

Run	1	Analysis Code	UUISO	Eberline Services Work Order	13-07147	Client	Engineering Management Support, Inc.

2013

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UIISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-238	LCS	08/08/13 09:06		A_Spec	Alpha_003	170	4.56 E+02	1.00 E-03	17.5
02	U-238	MBL	08/08/13 09:06		A_Spec	Alpha_004	170	1.35 E+01	9.00 E-03	19.4
03	U-238	DUP	08/08/13 09:06		A_Spec	Alpha_010	170	1.52 E+01	5.00 E-03	19.7
04	U-238	DO	08/08/13 09:06		A_Spec	Alpha_011	170	2.47 E+01	2.00 E-03	20.5
05	U-238	TRG	08/08/13 09:06		A_Spec	Alpha_012	170.02	4.83 E+00	1.00 E-03	19.9
06	U-238	TRG	08/08/13 09:06		A_Spec	Alpha_013	170.02	1.23 E+01	4.00 E-03	18.7
07	U-238	TRG	08/08/13 09:06		A_Spec	Alpha_014	170.02	1.67 E+01	2.00 E-03	18.5
08	U-238	TRG	08/08/13 09:06		A_Spec	Alpha_015	170.02	8.25 E+01	3.00 E-03	14.8
09	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_033	170	5.77 E+01	2.00 E-03	18.5
10	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_034	170	1.98 E+01	1.00 E-03	18.6
11	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_035	170	7.83 E+00	1.00 E-03	18.3
12	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_036	170	-5.30 E-01	9.00 E-03	19.1
13	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_038	170	3.00 E+00	0.00 E+00	17.2
14	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_039	170	1.26 E+02	1.00 E-03	19.7
15	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_040	170	8.50 E+01	0.00 E+00	19
16	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_045	170	3.27 E+01	2.00 E-03	19.1
17	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_046	170	6.88 E+01	1.00 E-03	17.9
18	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_047	170	2.24 E+02	2.00 E-03	18.2
19	U-238	TRG	08/08/13 09:08		A_Spec	Alpha_048	170	1.08 E+02	1.00 E-03	16.8

	
Run	1
Analysis Code	UIISO
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

7010

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UIISO-1**

Run	1
Analysis Code	UIISO
Eberline Services Work Order	13-07147
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	U-235	LCS	LCS	pCi/l	1.75E+00	4.61E-01	1.08E-01					OK	
02	U-235	MBL	BLANK	pCi/l	1.93E-01	1.18E-01	9.61E-02					OK	OK
03	U-235	DUP	D-12 TOT	pCi/l	2.15E-01	1.30E-01	9.84E-02				NA	OK	
04	U-235	DO	D-12 TOT	pCi/l	3.78E-01	1.78E-01	8.39E-02					OK	
05	U-235	TRG	D-12 DIS	pCi/l	2.21E-01	1.71E-01	1.70E-01					OK	
06	U-235	TRG	DUP05 TOT	pCi/l	2.15E-01	1.56E-01	1.46E-01					OK	
07	U-235	TRG	DUP05 DIS	pCi/l	2.78E-01	1.53E-01	1.17E-01					OK	
08	U-235	TRG	PZ-208-SS TOT	pCi/l	3.21E-01	1.72E-01	1.28E-01					OK	
09	U-235	TRG	PZ-208-SS DIS	pCi/l	4.84E-01	2.11E-01	1.26E-01					OK	
10	U-235	TRG	PZ-304-AI TOT	pCi/l	4.93E-01	3.24E-01	2.09E-01					OK	
11	U-235	TRG	PZ-304-AI DIS	pCi/l	1.58E-01	2.09E-01	3.16E-01					OK	
12	U-235	TRG	PZ-304-AS TOT	pCi/l	1.46E-01	3.66E-01	7.58E-01					OK	
13	U-235	TRG	PZ-304-AS DIS	pCi/l	1.72E-01	1.12E+00	3.04E+00					INV	
14	U-235	TRG	MW-104 TOT	pCi/l	7.40E-01	2.77E-01	1.23E-01					OK	
15	U-235	TRG	MW-104 DIS	pCi/l	3.60E-01	1.94E-01	1.44E-01					OK	
16	U-235	TRG	PZ-204A-SS TOT	pCi/l	3.78E-01	2.77E-01	2.02E-01					OK	
17	U-235	TRG	PZ-204A-SS DIS	pCi/l	4.01E-01	2.44E-01	2.00E-01					OK	
18	U-235	TRG	PZ-302-AI TOT	pCi/l	7.33E-01	2.36E-01	8.22E-02					OK	
19	U-235	TRG	PZ-302-AI DIS	pCi/l	8.39E-01	4.24E-01	2.79E-01					OK	

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-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	07/23/13 00:00	1.00E+00	72.66	0.00	0.00			
02	U-235	MBL	07/23/13 00:00	1.00E+00	99.04	0.00	0.00			
03	U-235	DUP	07/15/13 15:27	1.00E+00	88.83	0.00	0.00			
04	U-235	DO	07/15/13 15:27	1.00E+00	79.47	0.00	0.00			
05	U-235	TRG	07/15/13 15:27	1.00E+00	54.56	0.00	0.00			
06	U-235	TRG	07/15/13 00:00	1.00E+00	67.67	0.00	0.00			
07	U-235	TRG	07/15/13 00:00	1.00E+00	90.44	0.00	0.00			
08	U-235	TRG	07/16/13 09:25	1.00E+00	103.51	0.00	0.00			
09	U-235	TRG	07/16/13 09:25	1.00E+00	84.14	0.00	0.00			
10	U-235	TRG	07/16/13 12:05	1.00E+00	35.19	0.00	0.00			
11	U-235	TRG	07/16/13 12:05	1.00E+00	34.02	0.00	0.00			
12	U-235	TRG	07/16/13 12:34	1.00E+00	13.55	0.00	0.00			
13	U-235	TRG	07/16/13 12:34	1.00E+00	3.53	0.00	0.00			
14	U-235	TRG	07/16/13 13:25	1.00E+00	70.94	0.00	0.00			
15	U-235	TRG	07/16/13 13:25	1.00E+00	71.86	0.00	0.00			
16	U-235	TRG	07/16/13 13:56	1.00E+00	35.51	0.00	0.00			
17	U-235	TRG	07/16/13 13:56	1.00E+00	54.80	0.00	0.00			
18	U-235	TRG	07/16/13 15:18	1.00E+00	104.63	0.00	0.00			
19	U-235	TRG	07/16/13 15:18	1.00E+00	41.84	0.00	0.00			

Run	1	Analysis Code	UUISO	Eberline Services Work Order	13-07147	Client	Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-235	LCS	08/08/13 09:06		A_Spec	Alpha_003	170	6.78 E+01	1.00 E-03	17.5
02	U-235	MBL	08/08/13 09:06		A_Spec	Alpha_004	170	1.13 E+01	4.00 E-03	19.4
03	U-235	DUP	08/08/13 09:06		A_Spec	Alpha_010	170	1.15 E+01	3.00 E-03	19.7
04	U-235	DO	08/08/13 09:06		A_Spec	Alpha_011	170	1.88 E+01	1.00 E-03	20.5
05	U-235	TRG	08/08/13 09:06		A_Spec	Alpha_012	170.02	7.32 E+00	4.00 E-03	19.9
06	U-235	TRG	08/08/13 09:06		A_Spec	Alpha_013	170.02	8.32 E+00	4.00 E-03	18.7
07	U-235	TRG	08/08/13 09:06		A_Spec	Alpha_014	170.02	1.41 E+01	5.00 E-03	18.5
08	U-235	TRG	08/08/13 09:06		A_Spec	Alpha_015	170.02	1.50 E+01	0.00 E+00	14.8
09	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_033	170	2.30 E+01	0.00 E+00	18.5
10	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_034	170	9.83 E+00	1.00 E-03	18.6
11	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_035	170	3.00 E+00	0.00 E+00	18.3
12	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_036	170	1.15 E+00	5.00 E-03	19.1
13	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_038	170	3.20 E-01	4.00 E-03	17.2
14	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_039	170	3.15 E+01	3.00 E-03	19.7
15	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_040	170	1.50 E+01	0.00 E+00	19
16	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_045	170	7.83 E+00	1.00 E-03	19.1
17	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_046	170	1.20 E+01	0.00 E+00	17.9
18	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_047	170	4.27 E+01	2.00 E-03	18.2
19	U-235	TRG	08/08/13 09:08		A_Spec	Alpha_048	170	1.80 E+01	0.00 E+00	16.8

Run	1
Analysis Code	UISO
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01 ↗	LCS	LCS	07/23/13 00:00	1.0000	0.9113	17.3539		0.00		
02	MBL	BLANK	07/23/13 00:00	1.0000	0.6093	11.6029		0.00		
03	DUP	D-12 TOT	07/15/13 15:27	1.0000	0.6069	11.5572		0.00		
04	DO	D-12 TOT	07/15/13 15:27	1.0000	0.6056	11.5324		0.00		
05	TRG	D-12 DIS	07/15/13 15:27	1.0000	0.6054	11.5286		0.00		
06	TRG	DUP05 TOT	07/15/13 00:00	1.0000	0.6067	11.5534		0.00		
07	TRG	DUP05 DIS	07/15/13 00:00	1.0000	0.6048	11.5172		0.00		
08 15	TRG	PZ-208-SS TOT	07/16/13 09:25	1.0000	0.6031	11.4848		0.00		
09 ↗	TRG	PZ-208-SS DIS	07/16/13 09:25	1.0000	0.6014	11.4525		0.00		
10	TRG	PZ-304-AI TOT	07/16/13 12:05	1.0000	0.6035	11.4925		0.00		
11	TRG	PZ-304-AI DIS	07/16/13 12:05	1.0000	0.6044	11.5096		0.00		
12	TRG	PZ-304-AS TOT	07/16/13 12:34	1.0000	0.6020	11.4639		0.00		
13	TRG	PZ-304-AS DIS	07/16/13 12:34	1.0000	0.6030	11.4829		0.00		
14	TRG	MW-104 TOT	07/16/13 13:25	1.0000	0.6018	11.4601		0.00		
15	TRG	MW-104 DIS	07/16/13 13:25	1.0000	0.6027	11.4772		0.00		
16	TRG	PZ-204A-SS TOT	07/16/13 13:56	1.0000	0.6018	11.4601		0.00		
17	TRG	PZ-204A-SS DIS	07/16/13 13:56	1.0000	0.6021	11.4658		0.00		
18	TRG	PZ-302-AI TOT	07/16/13 15:18	1.0000	0.6007	11.4391		0.00		
19 ✓	TRG	PZ-302-AI DIS	07/16/13 15:18	1.0000	0.6019	11.4620		0.00		

0906

0907

0908

# Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
<b>13-07147</b>	<b>1</b>	<b>UUISO</b>	<b>8/2/2013 8:13</b>	<b>JWOLFE</b>	<i>JW</i>	

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	8/2/2013	0.500	0.5098				8.09	0.291	0.00	0.000	0.00	0.000	0.00	0.000
U-238	U-8a	34.350	8/2/2013	0.500	0.5098				7.89	0.284	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes	
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer	LCS
01	U-232	U-10a	19.043	8/2/2013	0.9113	0.6300	8.0113 g	
02	U-232	U-10a	19.043	8/2/2013	0.6093	0.6300	8.6093 g	
03	U-232	U-10a	19.043	8/2/2013	0.6069	0.6300	8.6069 g	
04	U-232	U-10a	19.043	8/2/2013	0.6056	0.6300	8.6056 g	
05	U-232	U-10a	19.043	8/2/2013	0.6054	0.6300	8.6054 g	
06	U-232	U-10a	19.043	8/2/2013	0.6067	0.6300	8.6067 g	
07	U-232	U-10a	19.043	8/2/2013	0.6048	0.6300	8.6048 g	
08	U-232	U-10a	19.043	8/2/2013	0.6031	0.6300	8.6031 g	
09	U-232	U-10a	19.043	8/2/2013	0.6014	0.6300	8.6014 g	
10	U-232	U-10a	19.043	8/2/2013	0.6035	0.6300	8.6035 g	
11	U-232	U-10a	19.043	8/2/2013	0.6044	0.6300	8.6044 g	
12	U-232	U-10a	19.043	8/2/2013	0.6020	0.6300	8.6020 g	
13	U-232	U-10a	19.043	8/2/2013	0.6030	0.6300	8.6030 g	
14	U-232	U-10a	19.043	8/2/2013	0.6018	0.6300	8.6018 g	
15	U-232	U-10a	19.043	8/2/2013	0.6027	0.6300	8.6027 g	
16	U-232	U-10a	19.043	8/2/2013	0.6018	0.6300	8.6018 g	
17	U-232	U-10a	19.043	8/2/2013	0.6021	0.6300	8.6021 g	
18	U-232	U-10a	19.043	8/2/2013	0.6007	0.6300	8.6007 g	
19	U-232	U-10a	19.043	8/2/2013	0.6019	0.6300	8.6019 g	
								<b>Matrix Spike</b>



# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07147</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 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	D-12 TOT	DUP					1.0000E+00	1.0000E+00				
04	D-12 TOT	DO					1.0000E+00	1.0000E+00				
05	D-12 DIS	TRG					1.0000E+00	1.0000E+00				
06	DUP05 TOT	TRG					1.0000E+00	1.0000E+00				
07	DUP05 DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-208-SS TOT	TRG					1.0000E+00	1.0000E+00				
09	PZ-208-SS DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-304-AI TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-304-AI DIS	TRG					1.0000E+00	1.0000E+00				
12	PZ-304-AS TOT	TRG					1.0000E+00	1.0000E+00				
13	PZ-304-AS DIS	TRG					1.0000E+00	1.0000E+00				
14	MW-104 TOT	TRG					1.0000E+00	1.0000E+00				
15	MW-104 DIS	TRG					1.0000E+00	1.0000E+00				
16	PZ-204A-SS TOT	TRG					1.0000E+00	1.0000E+00				
17	PZ-204A-SS DIS	TRG					1.0000E+00	1.0000E+00				
18	PZ-302-AI TOT	TRG					1.0000E+00	1.0000E+00				
19	PZ-302-AI DIS	TRG					1.0000E+00	1.0000E+00				

Comments
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Technician: J Wolfe Date: 8 2 13



Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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  
 Sample Date/Time: 8/8/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:06:44 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.911 mL  
 Effective Efficiency: 0.1269 +/- 0.0072  
 Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM  
 Chem. Recovery Factor: 0.7266 +/- 0.0434

Control Certificate Name: NatU\_U-8A  
 Chem. Recov. of Control: U-238 1.173603 +/- 0.093290  
 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 5.256	372.15	10.17	0.85	0.00E+000	18.9
U-234	4.735	434.49	9.41	0.51	0.00E+000	28.3
U-235	4.394	67.83	23.83	0.17	0.00E+000	5.2
U-238	4.158	455.83	9.18	0.17	0.00E+000	59.2

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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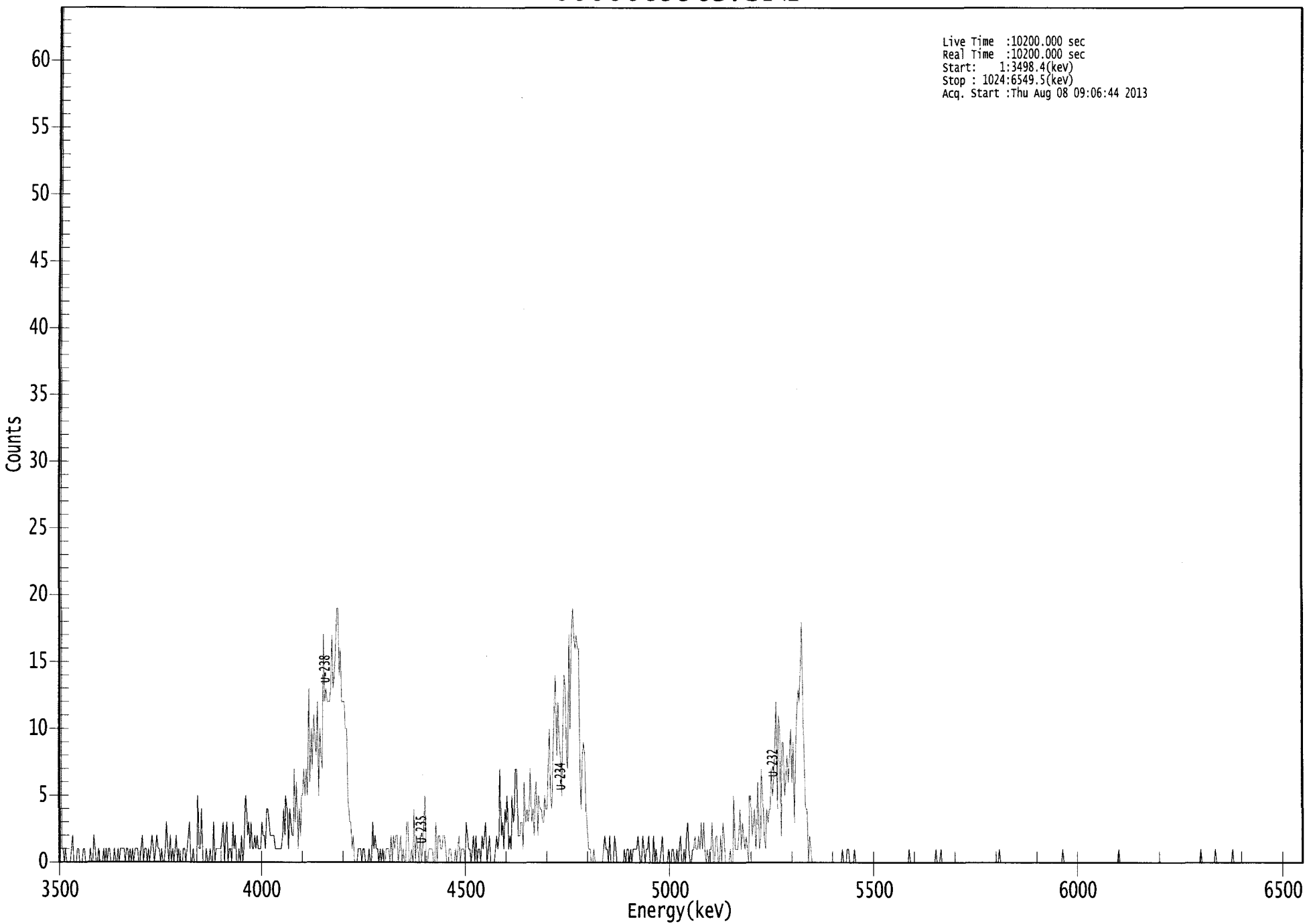
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.985	5302.50*	7.79E+000 +/- 8.67E-001	1.25E-001 +/- 1.39E-002
U-234	0.995	4761.50*	9.09E+000 +/- 1.32E+000	1.10E-001 +/- 1.22E-002
U-235	1.000	4385.50*	1.75E+000 +/- 4.61E-001	1.08E-001 +/- 1.20E-002
U-238	0.995	4184.40*	9.50E+000 +/- 1.37E+000	8.69E-002 +/- 9.68E-003

AG  
 8/8/13

US EPA ARCHIVE DOCUMENT

# 000065563.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 09:06:44 2013



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:	10200	10200	1	1	0	1	0	0
9:	0	0	1	2	0	0	0	1
17:	1	0	0	0	1	1	0	0
25:	0	0	1	0	0	2	1	0
33:	0	1	0	0	0	1	0	1
41:	0	1	1	0	0	0	1	0
49:	0	1	0	1	1	1	1	0
57:	1	1	0	1	0	1	0	1
65:	1	1	0	0	1	2	0	1
73:	1	0	1	0	1	2	1	0
81:	1	2	1	1	0	1	0	0
89:	1	3	1	0	2	0	1	0
97:	1	2	0	1	0	0	0	1
105:	1	0	1	2	3	0	0	1
113:	0	0	0	5	1	1	4	0
121:	0	0	1	0	0	1	0	0
129:	3	0	1	1	1	1	1	2
137:	3	0	2	3	0	1	1	0
145:	3	1	2	0	0	1	0	2
153:	0	1	4	5	2	3	1	3
161:	1	1	2	1	2	1	1	1
169:	3	2	2	1	4	4	3	2
177:	2	2	2	1	1	1	1	1
185:	1	2	4	2	5	4	1	4
193:	3	2	2	7	3	6	1	4
201:	2	5	5	7	5	7	5	13
209:	6	10	7	11	9	8	12	5
217:	10	8	7	17	12	13	12	12
225:	12	13	17	13	14	16	19	19
233:	14	16	12	12	12	10	10	5
241:	3	3	1	2	0	0	0	1
249:	1	1	0	1	1	0	0	0
257:	1	0	0	3	1	2	1	1
265:	0	1	0	1	0	0	1	1
273:	1	0	2	0	2	1	2	2
281:	0	1	2	0	1	0	0	3
289:	3	0	0	1	0	4	0	2
297:	1	0	2	0	1	3	5	0
305:	0	1	1	1	1	0	0	3
313:	0	2	2	1	1	2	2	1
321:	0	0	1	1	0	0	0	1
329:	0	1	2	0	1	1	1	0
337:	3	2	1	1	0	1	2	0
345:	2	0	1	1	0	2	1	2
353:	3	0	1	2	0	0	0	0
361:	1	2	1	2	7	2	3	1

369: 4 3 5 1 2 1 5 3

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
377:	4	7	7	2	2	3	3	1
385:	6	3	4	3	4	7	3	4
393:	2	5	6	2	5	4	4	3
401:	3	5	4	4	7	10	5	4
409:	8	12	14	8	12	9	8	5
417:	10	14	13	8	7	17	10	17
425:	19	17	16	17	16	16	7	4
433:	8	9	8	4	2	1	1	0
441:	0	1	0	0	0	0	0	0
449:	0	1	2	1	1	0	2	0
457:	0	0	2	1	0	0	0	0
465:	0	0	1	0	1	1	0	1
473:	0	1	1	1	1	2	1	0
481:	0	2	1	0	1	1	2	0
489:	0	0	2	0	1	0	0	0
497:	1	2	0	0	0	0	1	0
505:	0	1	1	0	0	1	0	1
513:	2	0	0	1	0	2	3	1
521:	0	0	1	1	2	1	1	2
529:	1	3	1	3	1	0	1	0
537:	1	1	3	0	0	2	2	0
545:	0	2	0	3	2	0	0	0
553:	0	1	0	0	5	1	1	1
561:	2	4	1	3	2	1	2	1
569:	0	5	5	2	3	4	1	3
577:	6	1	2	7	5	2	1	4
585:	3	4	4	7	5	6	9	12
593:	4	11	10	2	9	9	5	6
601:	8	6	8	10	6	9	3	8
609:	11	13	12	15	18	11	8	4
617:	4	0	2	1	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	1	1	0	0	0	0	1
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	1	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	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	1	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: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	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:	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	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	1	0	0	0	0
945:	0	0	0	0	0	0	0	1
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	1	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  
8/8/13

# Apex-Alpha™

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UJ  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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  
 Sample Date/Time: 8/8/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:06:45 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UJ-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.1922 +/- 0.0109  
 Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM  
 Chem. Recovery Factor: 0.9904 +/- 0.0588

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	5.275	376.81	10.12	1.19	0.00E+000	10.2
U-234		4.719	14.81	53.27	1.19	0.00E+000	2.9
U-235		4.413	11.32	60.27	0.68	0.00E+000	2.9
U-238		4.127	13.47	56.84	1.53	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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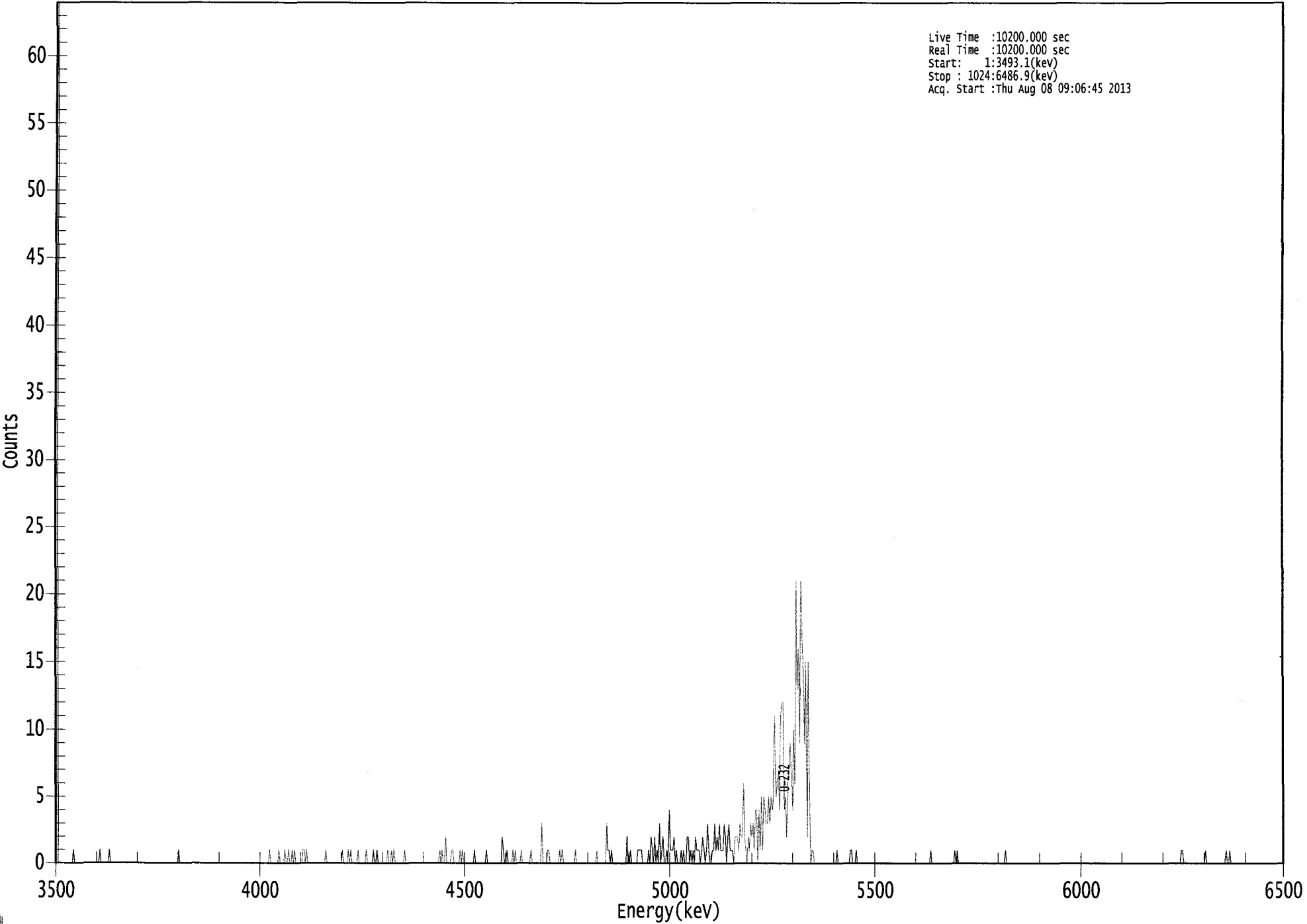
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.995	5302.50*	5.21E+000 +/- 5.77E-001	9.10E-002 +/- 1.01E-002
U-234	0.987	4761.50*	2.05E-001 +/- 1.11E-001	9.10E-002 +/- 1.01E-002
U-235	0.995	4385.50*	1.93E-001 +/- 1.18E-001	9.61E-002 +/- 1.06E-002
U-238	0.977	4184.40*	1.85E-001 +/- 1.07E-001	9.78E-002 +/- 1.08E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

000065508.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 09:06:45 2013



ROI Type: 1

ROI Type: 3



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

Sample Title: 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	1
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	1	0	0
41:	0	0	0	0	0	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	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	1
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:	0	0	0	1	0	0	0	0
185:	0	0	0	1	0	0	0	0
193:	1	0	0	1	0	0	1	0
201:	1	0	0	0	0	0	0	1
209:	1	0	1	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	0	0	0
241:	1	0	0	0	0	1	0	1
249:	0	0	0	0	0	1	0	0
257:	0	0	0	0	1	0	0	0
265:	0	0	1	0	0	1	0	0
273:	0	0	0	0	0	0	1	0
281:	0	1	0	1	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	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	1	0	1	0	0	2	0
329:	0	0	0	1	1	0	0	0
337:	0	0	1	0	1	0	0	0
345:	0	0	0	0	0	0	1	0
353:	0	0	0	0	0	0	0	0
361:	1	0	0	0	0	0	0	0

369: 0 0 0 0 0 2 1 0

Sample Title: 02

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	0	1	0
385:	1	0	0	0	0	1	0	0
393:	0	0	0	0	0	1	0	0
401:	0	0	0	0	0	0	3	0
409:	0	0	0	1	1	0	0	0
417:	0	0	0	0	0	1	0	1
425:	0	0	0	0	0	0	0	0
433:	0	0	1	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	0	1	0	0	0
457:	0	0	0	0	3	1	1	0
465:	1	0	0	0	0	0	0	0
473:	0	0	0	0	0	2	0	0
481:	1	0	0	0	0	0	1	1
489:	1	1	0	0	0	0	0	1
497:	0	2	1	0	2	0	1	0
505:	3	0	1	2	0	0	1	0
513:	4	1	1	1	2	0	1	0
521:	0	0	1	0	1	0	0	2
529:	2	0	1	0	1	0	2	1
537:	1	1	0	1	2	1	0	1
545:	3	1	0	0	1	1	3	1
553:	2	1	3	1	1	1	3	2
561:	0	2	3	1	1	1	0	2
569:	2	2	1	3	2	2	6	2
577:	1	0	2	1	3	2	3	1
585:	4	4	0	4	1	5	1	5
593:	4	3	3	5	3	5	4	5
601:	11	5	6	7	4	11	12	12
609:	4	5	2	6	7	9	7	4
617:	10	6	21	13	16	9	21	17
625:	15	9	15	2	15	4	0	1
633:	1	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	1	0	0	0
657:	0	0	0	0	0	0	0	1
665:	1	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	1	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	1	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:	1	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	1	1	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	0	0	0	0
969:	0	0	0	0	0	0	0	1
977:	0	0	1	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KB  
8/8/13

# Apex-Alpha™

Sample Description: D-12 TOT-DUP  
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
Batch Identification: 1307147A-UU  
Sample Identification: 03  
Sample Geometry: Shelf 2  
Procedure Description: U iso

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  
Sample Date/Time: 7/15/2013 7:05:56 AM  
Acquisition Date/Time: 8/8/2013 9:06:37 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: 0.1747 +/- 0.0103  
Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM  
Chem. Recovery Factor: 0.8883 +/- 0.0548

Peak Match Tolerance: 0.150 MeV

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----- PEAK AREA REPORT -----  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.280	341.30	10.64	1.70	0.00E+000	11.8
U-234	4.729	44.13	30.23	1.87	0.00E+000	2.9
U-235	4.403	11.49	59.30	0.51	0.00E+000	4.4
U-238	4.176	15.15	51.98	0.85	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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----- NUCLIDE ANALYSIS RESULTS -----  
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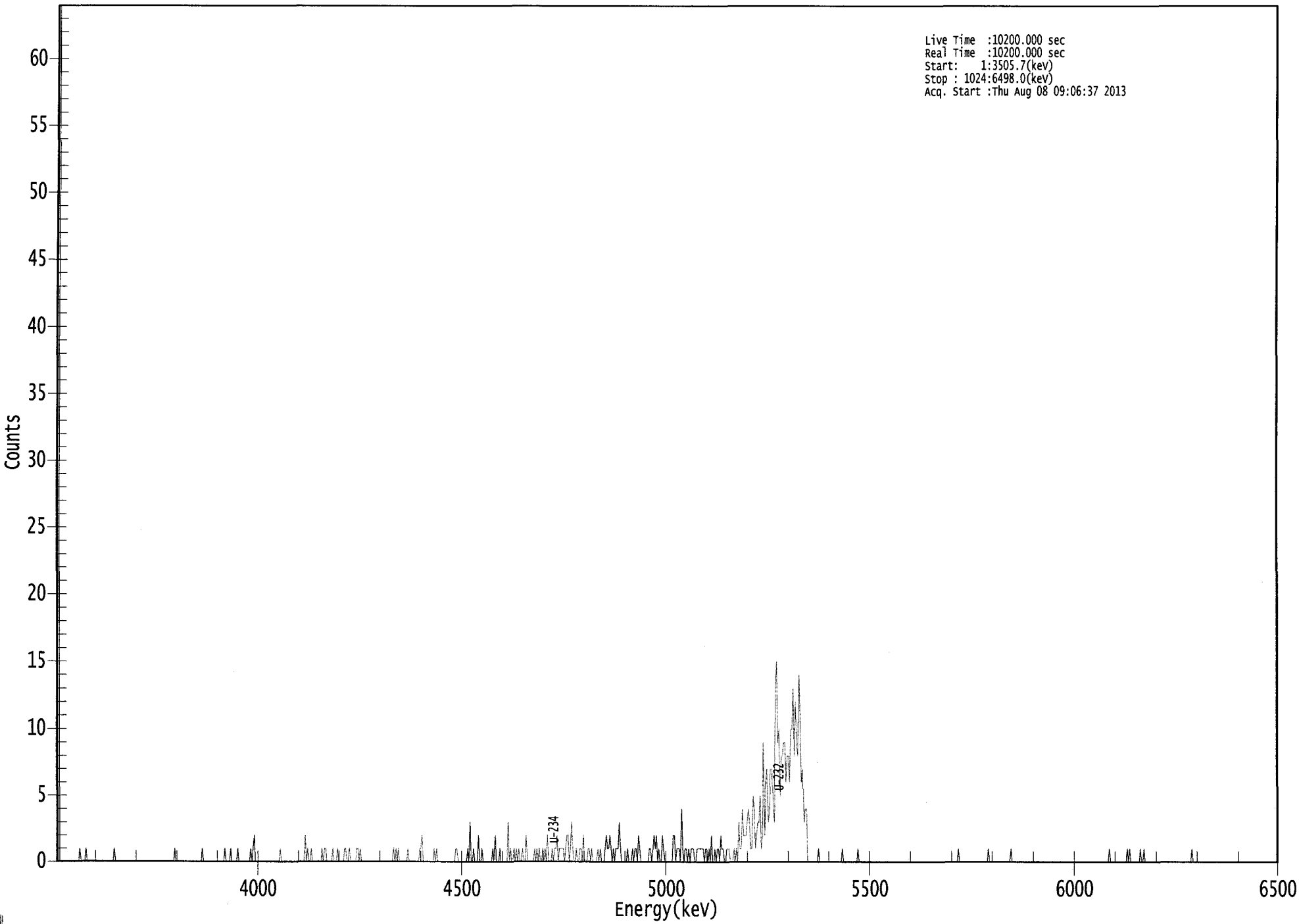
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.996	5302.50*	5.19E+000 +/- 6.00E-001	1.12E-001 +/- 1.29E-002
U-234	0.993	4761.50*	6.71E-001 +/- 2.17E-001	1.15E-001 +/- 1.33E-002
U-235	0.998	4385.50*	2.15E-001 +/- 1.30E-001	9.84E-002 +/- 1.14E-002
U-238	0.999	4184.40*	2.29E-001 +/- 1.22E-001	9.06E-002 +/- 1.05E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065501.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 09:06:37 2013



ROI Type: 1

ROI Type: 3

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

Sample Title: 03

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	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:	1	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:	1	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	1	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	1	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	1	0	0
145:	0	0	1	0	0	0	0	0
153:	1	0	0	0	0	0	0	0
161:	0	0	0	1	0	1	2	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	1	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	2	0	1	0	0	1	0
217:	0	0	0	0	0	0	0	1
225:	0	1	1	0	0	0	0	0
233:	1	0	0	0	1	0	0	0
241:	0	0	1	1	0	0	1	0
249:	0	0	0	0	1	1	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:	0	0	0	1	0	1	0	1
289:	0	0	0	0	0	0	0	1
297:	0	0	0	0	0	0	0	0
305:	0	1	1	2	0	0	0	0
313:	0	0	0	0	0	1	0	1
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	1
337:	1	0	0	0	0	0	0	0
345:	0	1	0	3	0	0	1	0
353:	0	0	2	0	0	1	0	0
361:	0	0	0	0	0	0	1	0

369: 2 0 0 0 1 0 0 0

Sample Title: 03

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	3	0	1	0	0
385:	1	0	1	0	1	0	0	1
393:	0	0	2	0	0	0	0	0
401:	0	1	0	1	0	1	0	0
409:	1	0	1	0	2	0	0	0
417:	1	0	1	1	2	0	1	1
425:	1	1	0	1	2	2	0	1
433:	3	1	0	0	1	0	0	1
441:	1	0	2	0	0	0	1	1
449:	0	1	0	0	0	0	1	0
457:	1	0	0	0	1	2	1	1
465:	2	1	0	1	0	1	1	1
473:	3	1	0	0	0	0	0	1
481:	0	0	0	1	0	1	1	0
489:	2	1	0	0	0	0	0	0
497:	0	1	1	0	1	2	1	2
505:	0	1	0	0	2	1	0	0
513:	0	0	0	0	0	2	2	0
521:	1	1	1	0	4	1	0	1
529:	1	0	1	0	1	1	1	0
537:	0	1	1	1	1	1	1	0
545:	1	1	0	1	0	2	0	0
553:	1	0	1	1	0	2	1	1
561:	0	0	1	1	1	0	0	0
569:	1	0	1	0	3	1	1	4
577:	2	2	2	3	4	3	1	1
585:	5	4	1	2	3	3	5	1
593:	2	9	2	6	7	3	4	7
601:	7	4	3	13	15	9	10	5
609:	8	8	9	9	6	8	8	6
617:	10	10	13	8	12	9	8	14
625:	11	6	7	3	4	4	0	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:	0	0	0	1	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	1	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	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	1	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: 03

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	1	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	1	0	1	0	0	0	0
905:	0	0	0	0	1	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	1
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  
8/8/13

# Apex-Alpha™

Sample Description: D-12 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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  
 Sample Date/Time: 7/15/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:06:38 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: 0.1630 +/- 0.0099  
 Counting Efficiency: 0.2051 +/- 0.0035 on 7/20/2013 2:50:46 PM  
 Chem. Recovery Factor: 0.7947 +/- 0.0501

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	317.66	11.00	0.34	0.00E+000	3.9
U-234	4.724	35.83	32.83	0.17	0.00E+000	3.1
U-235	4.419	18.83	45.41	0.17	0.00E+000	3.9
U-238	4.126	24.66	39.79	0.34	0.00E+000	3.3

T = Tracer Peak used for Effective Efficiency

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

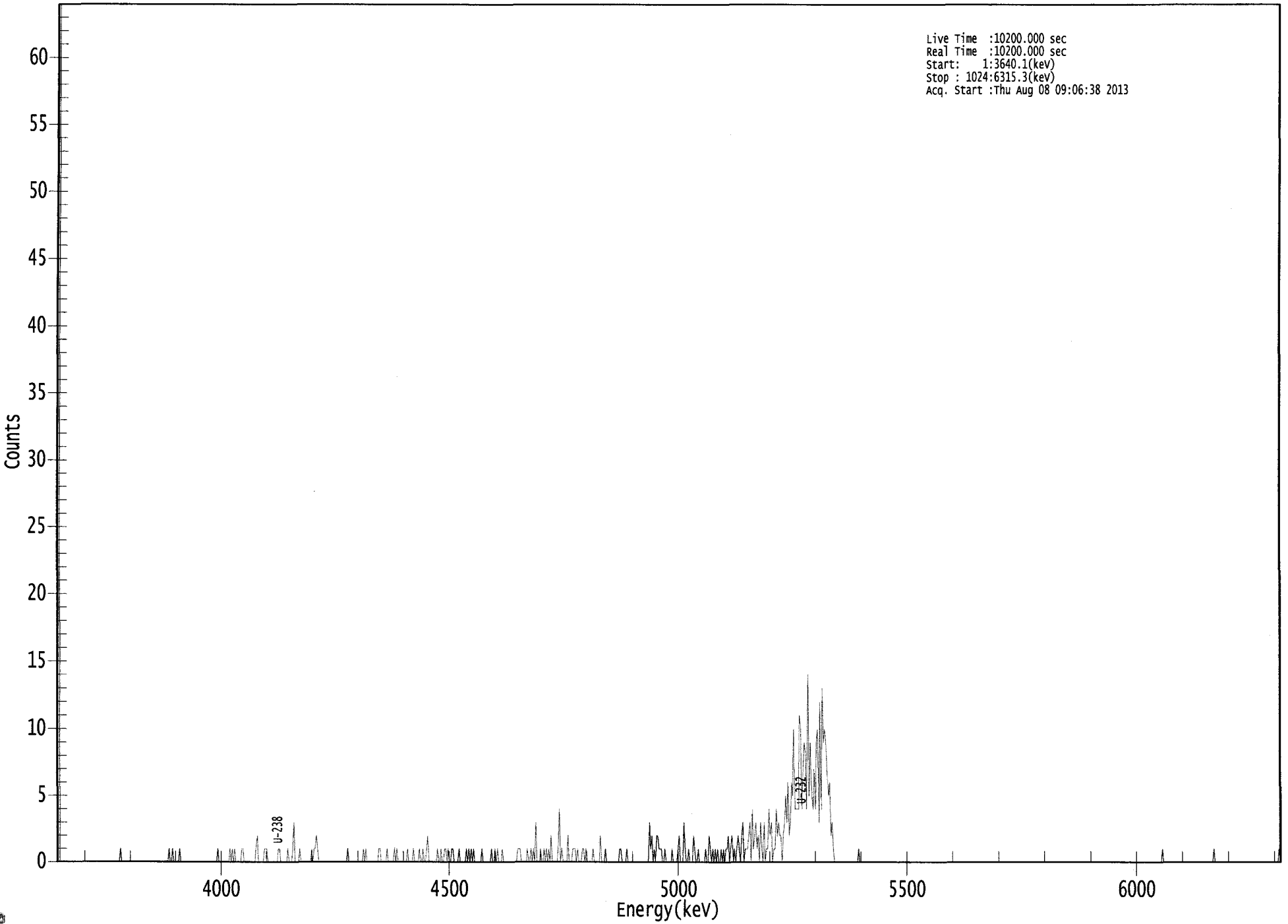
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.993	5302.50*	5.18E+000 +/- 6.16E-001	7.79E-002 +/- 9.27E-003
U-234	0.990	4761.50*	5.84E-001 +/- 2.04E-001	6.80E-002 +/- 8.08E-003
U-235	0.992	4385.50*	3.78E-001 +/- 1.78E-001	8.39E-002 +/- 9.97E-003
U-238	0.976	4184.40*	4.00E-001 +/- 1.66E-001	7.75E-002 +/- 9.22E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

000065538.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 09:06:38 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: 04

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	1	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	1	0
97:	0	1	0	0	0	0	0	1
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:	0	1	0	1	0	1	0	0
153:	0	0	0	1	1	0	0	0
161:	0	0	0	0	0	0	0	1
169:	2	0	0	0	0	0	1	1
177:	1	0	0	0	0	0	0	0
185:	0	0	1	1	0	0	0	0
193:	0	0	1	0	0	0	1	3
201:	0	0	0	0	1	0	0	0
209:	0	0	0	0	0	0	1	0
217:	1	1	2	1	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	0	0
257:	0	1	0	1	0	0	0	0
265:	0	0	0	0	0	0	1	1
273:	0	0	0	0	0	1	0	0
281:	0	0	0	1	0	1	0	0
289:	0	0	0	0	0	0	1	0
297:	0	0	0	1	0	0	0	0
305:	1	0	0	1	0	0	1	2
313:	0	0	0	0	0	0	0	1
321:	0	0	1	0	0	1	1	0
329:	1	0	0	1	1	0	0	0
337:	0	1	0	0	0	0	0	1
345:	0	1	0	1	0	1	0	0
353:	0	0	0	0	1	0	0	0
361:	0	0	0	0	1	0	0	1

369: 0 1 0 0 0 1 0 0

Sample Title: 04

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

KCS  
8/8/13



Sample Description: D-12 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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  
 Sample Date/Time: 7/15/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:06:39 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.605 mL  
 Effective Efficiency: 0.1085 +/- 0.0079  
 Counting Efficiency: 0.1989 +/- 0.0034 on 12/11/2011 2:21:56 PM  
 Chem. Recovery Factor: 0.5456 +/- 0.0407

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 5.268	211.49	13.50	0.51	0.00E+000	8.6
U-234	4.716	13.83	53.08	0.17	0.00E+000	4.4
U-235	4.408	7.32	76.28	0.68	0.00E+000	3.0
U-238	4.170	4.83	91.00	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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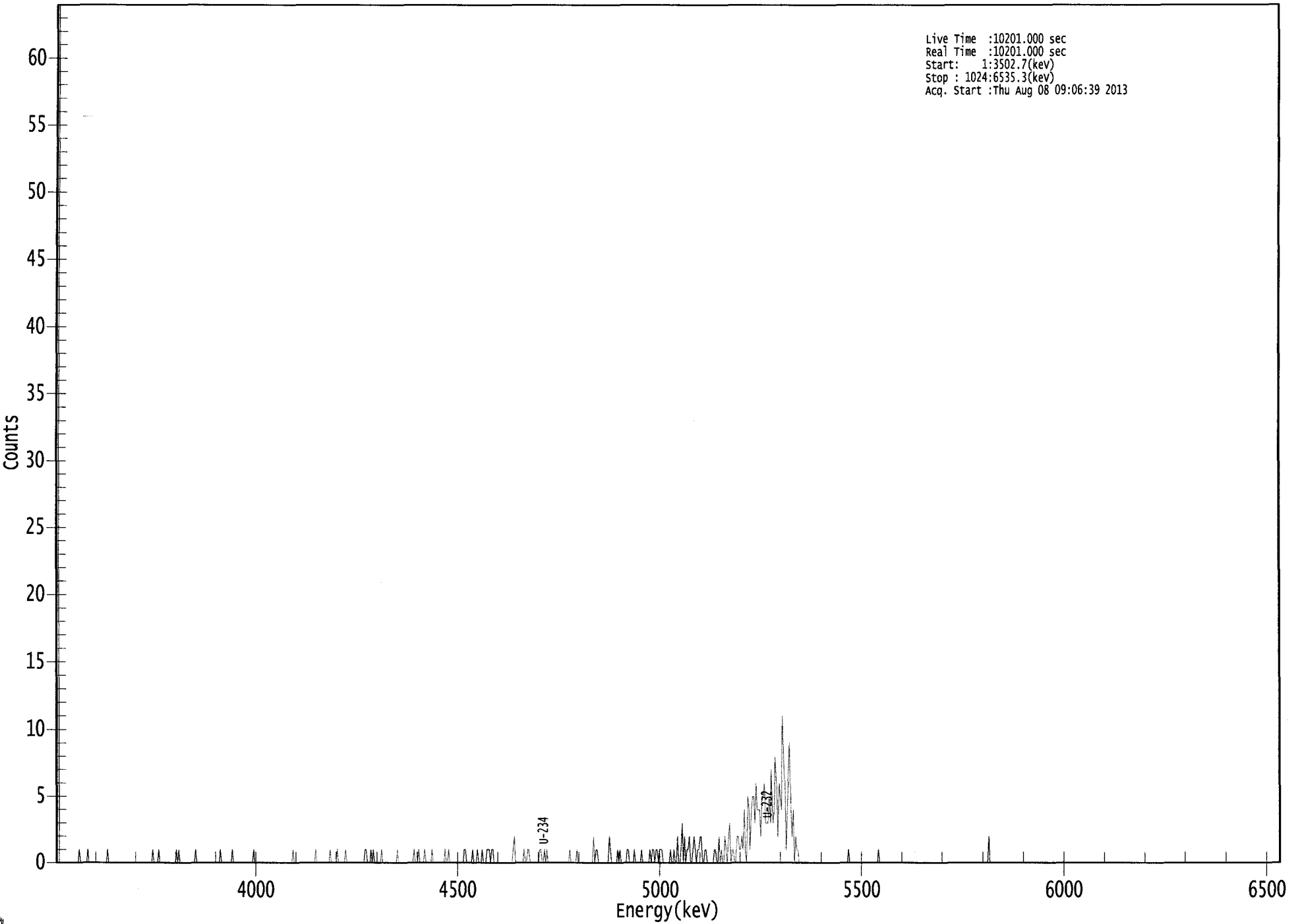
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.992	5302.50*	5.18E+000 +/- 7.37E-001	1.28E-001 +/- 1.83E-002
U-234	0.986	4761.50*	3.38E-001 +/- 1.86E-001	1.02E-001 +/- 1.45E-002
U-235	0.997	4385.50*	2.21E-001 +/- 1.71E-001	1.70E-001 +/- 2.42E-002
U-238	0.999	4184.40*	1.18E-001 +/- 1.08E-001	1.02E-001 +/- 1.45E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065539.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3502.7(kev)  
Stop : 1024:6535.3(kev)  
Acq. Start :Thu Aug 08 09:06:39 2013



ROI Type: 1

ROI Type: 3

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

Sample Title: 05

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	0	0
25:	0	0	1	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	0	1	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	1	0	1
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	1	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	1	0	0	0	0	0
145:	0	0	0	0	1	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	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	1
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	0	0	0	0	0	1	0
233:	0	0	0	0	1	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	0	0
265:	1	0	1	0	0	0	0	0
273:	0	1	0	0	0	0	0	0
281:	0	0	0	0	0	0	1	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	1	0	0	0
305:	1	0	0	0	0	1	0	0
313:	0	0	0	1	0	0	0	0
321:	0	0	0	0	0	0	1	0
329:	0	1	0	0	0	0	0	0
337:	0	0	0	0	0	0	1	1
345:	0	0	0	0	0	1	0	0
353:	0	1	0	0	0	1	0	0
361:	0	1	1	1	0	1	1	0



369: 0 0 0 0 0 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	1
385:	2	0	0	0	0	0	0	0
393:	1	0	0	1	1	0	0	0
401:	0	0	0	0	0	1	1	0
409:	0	1	0	1	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	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	2	0	1	1	0	0
457:	0	0	0	0	0	0	0	2
465:	1	0	0	0	0	0	1	0
473:	1	0	0	0	0	0	1	1
481:	0	0	0	0	1	0	0	0
489:	0	0	1	0	0	0	0	0
497:	0	1	0	1	1	0	1	1
505:	0	1	1	1	0	0	0	0
513:	0	0	1	0	0	1	0	0
521:	2	0	0	1	3	0	2	0
529:	1	1	2	0	0	1	2	1
537:	0	1	1	2	2	0	0	1
545:	1	0	0	0	0	0	0	1
553:	1	0	0	2	0	1	0	0
561:	2	1	0	2	3	0	1	1
569:	0	0	2	2	1	1	2	1
577:	4	1	0	5	4	1	4	5
585:	5	3	6	4	4	4	2	5
593:	5	6	3	3	3	5	3	7
601:	3	4	8	6	2	6	5	4
609:	11	8	6	1	4	7	9	4
617:	2	4	0	2	1	1	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	1
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:	1	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	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	2	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 05

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

KS  
8/8/13

# Apex-Alpha™

Sample Description: DUP05 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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  
 Sample Date/Time: 7/15/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:06:40 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: 0.1265 +/- 0.0086  
 Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM  
 Chem. Recovery Factor: 0.6767 +/- 0.0477

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 5.272	246.96	12.53	2.04	0.00E+000	8.2
U-234	4.733	31.66	35.05	0.34	0.00E+000	2.8
U-235	4.406	8.32	71.13	0.68	0.00E+000	2.8
U-238	4.106	12.32	57.62	0.68	0.00E+000	2.8

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
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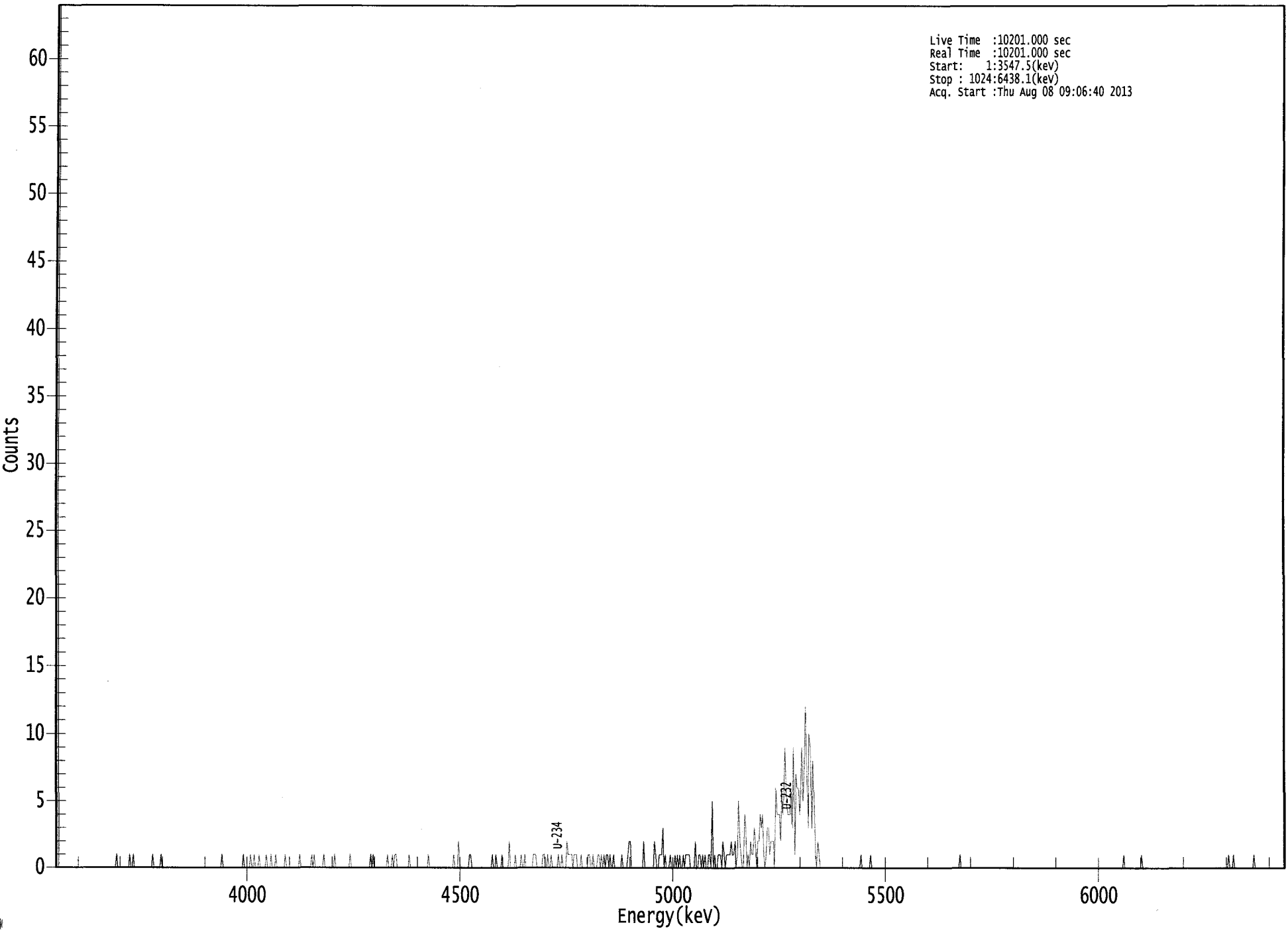
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.993	5302.50*	5.19E+000 +/- 6.91E-001	1.64E-001 +/- 2.18E-002
U-234	0.994	4761.50*	6.65E-001 +/- 2.49E-001	1.00E-001 +/- 1.34E-002
U-235	0.997	4385.50*	2.15E-001 +/- 1.56E-001	1.46E-001 +/- 1.95E-002
U-238	0.957	4184.40*	2.58E-001 +/- 1.52E-001	1.18E-001 +/- 1.57E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065540.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3547.5(kev)  
Stop : 1024:6438.1(kev)  
Acq. Start :Thu Aug 08 09:06:40 2013



ROI Type: 1

ROI Type: 3

0127

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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	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	1	0	0	0	0
57:	0	0	0	0	0	0	1	0
65:	0	1	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	1	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	1	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	1	0	0
161:	0	0	0	1	0	0	1	0
169:	0	0	1	0	0	0	0	0
177:	1	0	0	0	1	0	0	0
185:	1	0	0	0	0	0	0	0
193:	1	0	0	0	0	0	0	0
201:	0	0	0	0	1	0	0	0
209:	0	0	0	0	0	0	1	0
217:	1	0	0	0	0	0	0	0
225:	1	0	0	0	0	0	0	0
233:	0	1	0	0	0	0	0	0
241:	0	0	0	0	0	0	1	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	1
265:	0	1	0	0	0	0	0	0
273:	0	0	0	0	0	1	0	0
281:	0	1	0	1	1	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	1
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	1	0	0	0
337:	2	0	0	0	0	0	0	0
345:	0	1	1	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	1	0	0	1

369: 0 0 0 0 1 0 0 0

Sample Title: 06

Channel	1	2	3	4	5	6	7	8
377:	0	0	2	0	0	0	0	1
385:	0	0	0	0	1	0	0	1
393:	0	0	0	0	0	0	1	1
401:	1	0	0	0	0	0	1	1
409:	0	0	1	0	0	1	0	0
417:	0	0	0	1	0	0	1	0
425:	0	0	2	1	1	1	1	0
433:	1	1	1	0	0	0	1	0
441:	0	0	0	0	1	1	0	0
449:	1	0	0	0	1	1	0	1
457:	0	1	0	1	1	0	1	0
465:	0	1	0	0	0	0	0	0
473:	1	0	0	0	0	1	2	2
481:	0	0	0	0	0	0	0	0
489:	0	0	2	0	0	0	0	0
497:	0	0	0	2	1	0	0	1
505:	1	1	3	0	1	0	0	0
513:	1	0	0	0	1	0	1	0
521:	1	0	0	1	0	1	1	1
529:	1	0	0	0	0	2	0	0
537:	1	1	0	1	0	1	0	0
545:	1	1	0	5	0	1	0	0
553:	1	1	1	0	2	1	0	1
561:	1	1	1	2	1	1	2	0
569:	1	5	2	1	0	0	4	3
577:	0	1	0	2	1	1	3	2
585:	0	2	2	4	3	4	1	0
593:	1	3	3	1	2	2	2	0
601:	6	4	4	4	2	6	4	6
609:	9	5	4	4	4	6	3	9
617:	1	7	6	6	4	6	9	5
625:	7	12	8	3	10	9	3	8
633:	5	1	0	2	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:	0	0	0	0	0	0	0	1
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	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	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	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	1	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	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:	1	0	0	0	1	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	1	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  
9/8/13

Sample Description: DUP05 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_014  
 Chamber Serial Number:  
 Detector Serial Number: 14  
 Env. Background: System Bkgd 64040  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/15/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:06:41 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.605 mL  
 Effective Efficiency: 0.1669 +/- 0.0101  
 Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM  
 Chem. Recovery Factor: 0.9044 +/- 0.0571

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	324.94	10.93	3.06	0.00E+000	8.8
U-234		4.720	28.64	37.63	1.36	0.00E+000	2.9
U-235		4.401	14.15	53.91	0.85	0.00E+000	8.8
U-238		4.113	16.66	48.59	0.34	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.992	5302.50*	5.17E+000 +/- 6.12E-001	1.42E-001 +/- 1.68E-002
U-234	0.988	4761.50*	4.55E-001 +/- 1.80E-001	1.09E-001 +/- 1.29E-002
U-235	0.998	4385.50*	2.78E-001 +/- 1.53E-001	1.17E-001 +/- 1.39E-002
U-238	0.964	4184.40*	2.64E-001 +/- 1.32E-001	7.57E-002 +/- 8.95E-003

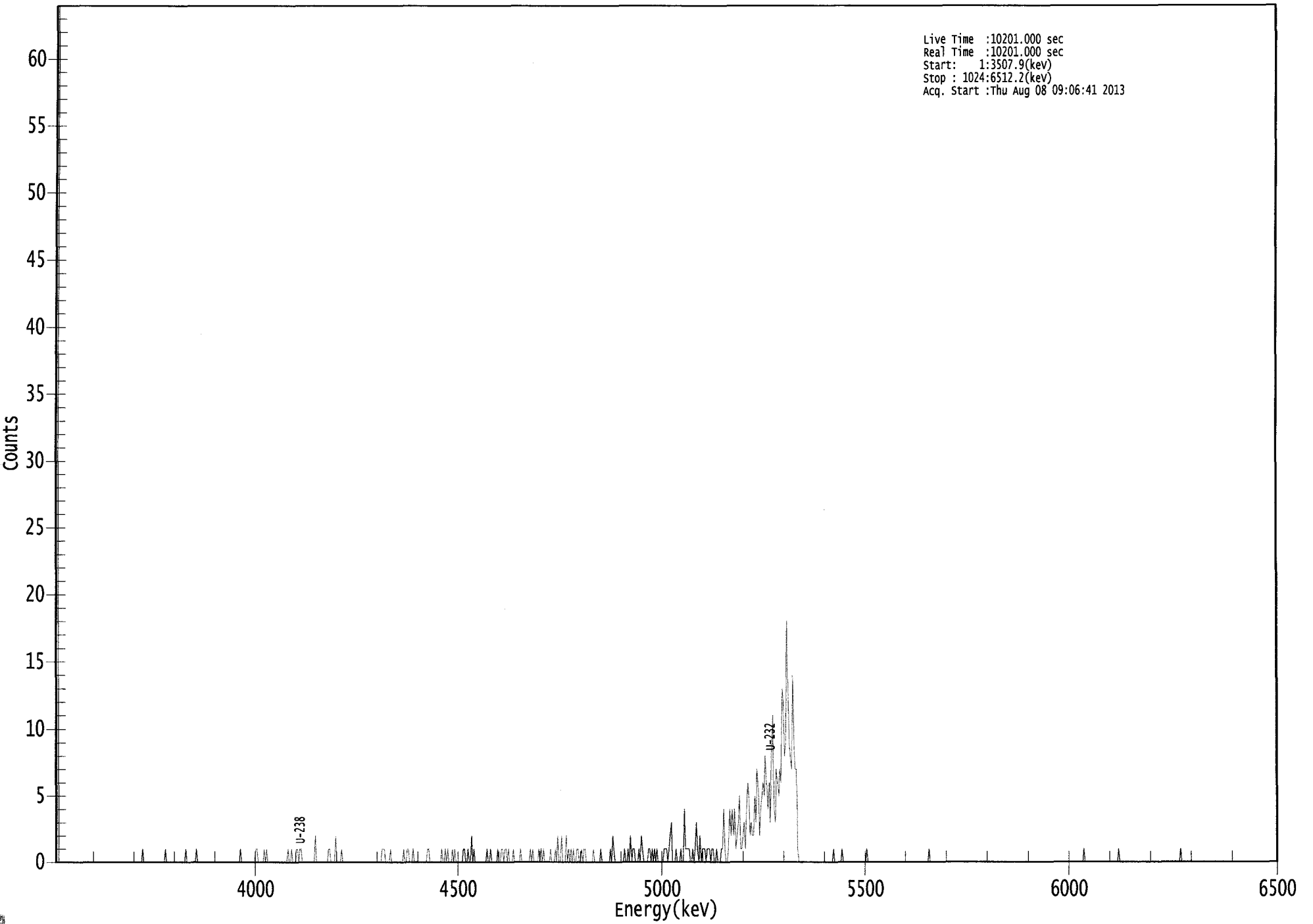
AG  
8/8/13

US EPA ARCHIVE DOCUMENT



0000065541.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3507.9(kev)  
Stop : 1024:6512.2(kev)  
Acq. Start :Thu Aug 08 09:06:41 2013



ROI Type: 1

ROI Type: 3

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

Sample Title: 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	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	1	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	1	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	1	0	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:	0	0	0	1	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	1	1	0	0	0	0	0	1
177:	0	1	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	1	0	0	1	0
201:	0	0	1	1	0	1	1	0
209:	0	0	0	0	0	0	0	0
217:	0	0	2	0	0	0	0	0
225:	0	0	0	0	0	1	1	0
233:	0	0	0	2	0	0	0	0
241:	1	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	1	1	1	0	0	0
281:	0	1	0	0	0	0	0	0
289:	0	0	0	0	1	0	0	1
297:	1	0	0	0	1	0	0	0
305:	0	0	0	0	0	0	0	0
313:	1	1	0	0	0	0	0	0
321:	0	0	0	0	1	0	0	1
329:	0	1	0	0	0	1	0	1
337:	0	0	0	0	0	0	1	1
345:	0	0	1	0	0	2	0	1
353:	0	0	0	0	0	0	0	0
361:	0	0	1	0	0	1	0	0

369: 0 0 0 1 0 0 1 1

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	1	0	1	0	0	0
385:	1	0	0	0	0	0	1	0
393:	0	0	0	0	0	0	1	0
401:	1	0	0	0	0	1	0	1
409:	0	1	0	0	0	0	0	1
417:	0	0	0	1	0	2	0	0
425:	2	0	0	0	2	0	1	0
433:	1	0	1	0	0	1	1	0
441:	0	1	0	1	1	0	0	0
449:	0	0	0	1	0	0	0	0
457:	0	1	0	0	0	0	0	0
465:	0	1	0	2	1	0	0	0
473:	0	0	0	0	0	1	0	0
481:	1	0	2	0	1	1	0	0
489:	0	1	0	2	1	0	0	0
497:	0	1	1	0	1	0	1	0
505:	1	0	0	0	0	0	1	1
513:	1	0	1	2	3	0	0	0
521:	1	0	0	0	1	0	0	4
529:	1	1	1	1	0	0	1	0
537:	1	3	1	0	2	0	1	1
545:	1	0	1	1	1	0	1	1
553:	0	0	1	0	0	0	1	1
561:	4	1	0	0	1	4	2	4
569:	2	4	1	2	3	5	1	1
577:	2	3	1	4	6	5	2	3
585:	2	2	5	3	7	6	2	4
593:	5	6	5	8	6	4	6	3
601:	8	11	4	3	7	6	5	7
609:	6	13	12	8	9	18	13	9
617:	8	7	14	9	7	7	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	1	0	0	0
657:	0	0	0	1	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	1	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	1	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	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	1	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	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

108  
2/21/13

# Apex-Alpha™

Sample Description: PZ-208-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_015  
 Chamber Serial Number:  
 Detector Serial Number: 15  
 Env. Background: System Bkgd 64041  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:06:43 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: 0.1529 +/- 0.0096  
 Counting Efficiency: 0.1477 +/- 0.0027 on 7/20/2013 6:27:27 PM  
 Chem. Recovery Factor: 1.0351 +/- 0.0673

Peak Match Tolerance: 0.150 MeV

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 ----- PEAK AREA REPORT -----  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232 T	5.279	296.83	11.38	0.17	0.00E+000	18.5
U-234	4.732	103.98	19.33	1.02	0.00E+000	4.1
U-235	4.409	15.00	52.27	0.00	0.00E+000	3.0
U-238	4.147	82.49	21.66	0.51	0.00E+000	6.0

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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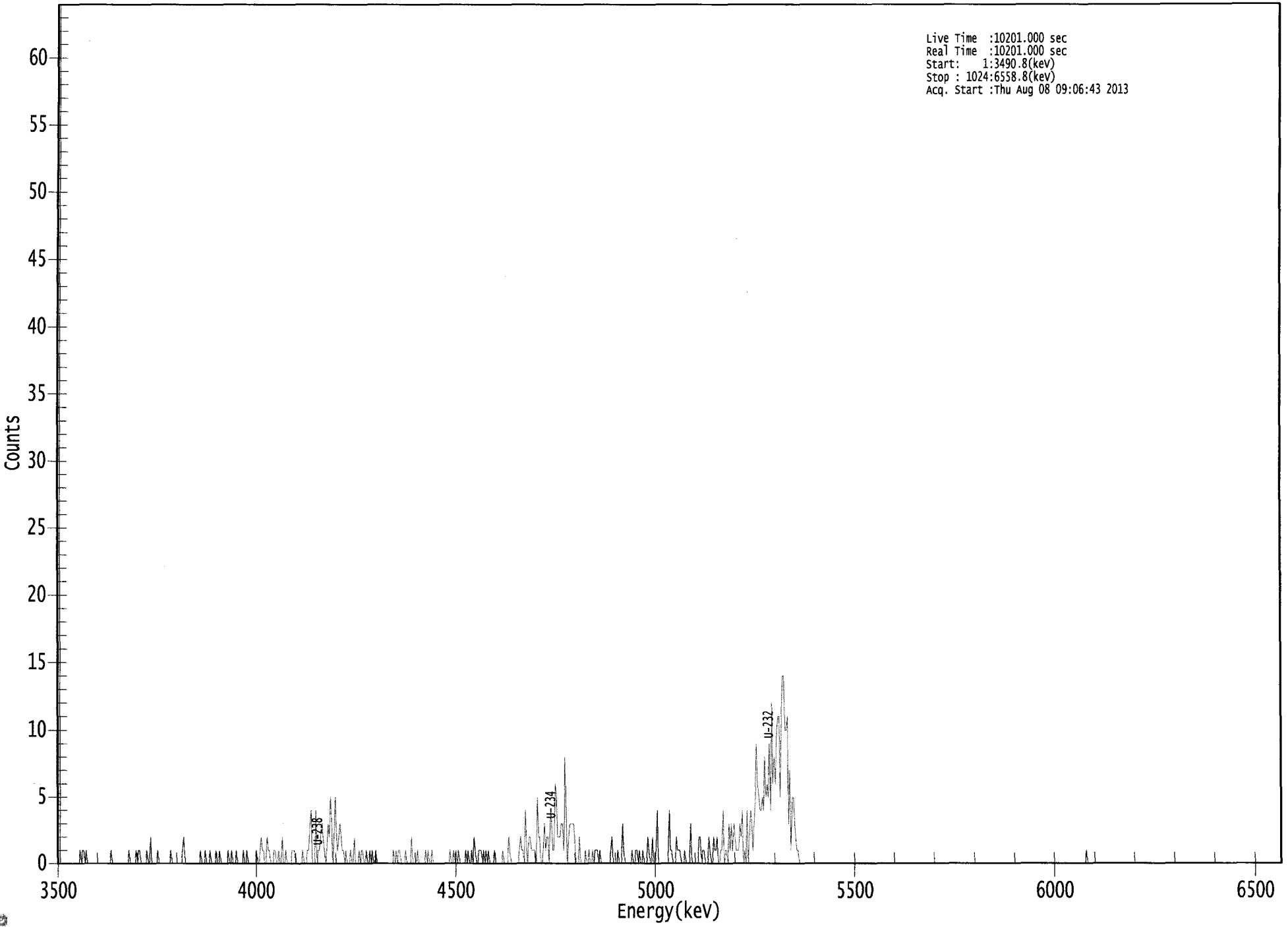
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.16E+000 +/- 6.31E-001	7.25E-002 +/- 8.88E-003
U-234	0.994	4761.50*	1.81E+000 +/- 4.13E-001	1.09E-001 +/- 1.34E-002
U-235	0.996	4385.50*	3.21E-001 +/- 1.72E-001	1.28E-001 +/- 1.57E-002
U-238	0.990	4184.40*	1.43E+000 +/- 3.55E-001	9.07E-002 +/- 1.11E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

000065542.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3490.8(kev)  
Stop : 1024:6558.8(kev)  
Acq. Start :Thu Aug 08 09:06:43 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: 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	1	1	0
25:	1	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	1	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	1	0	0	0
65:	0	0	1	0	1	1	0	0
73:	0	0	0	1	0	0	2	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	1	2	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	1	0	0	0	1	0	0	0
129:	1	0	0	0	0	1	0	0
137:	1	0	0	0	0	0	0	1
145:	0	0	1	0	0	0	1	0
153:	0	0	0	0	1	0	0	1
161:	0	0	0	0	0	0	0	1
169:	0	0	1	2	1	1	0	0
177:	2	1	1	0	0	0	1	1
185:	0	0	1	0	0	2	0	0
193:	1	0	0	0	0	1	1	1
201:	0	0	0	0	0	0	1	0
209:	0	0	1	1	3	4	0	0
217:	0	4	0	1	1	2	3	2
225:	1	0	1	3	2	5	3	0
233:	2	5	2	1	2	3	2	1
241:	1	0	1	0	0	0	1	0
249:	0	2	0	0	0	1	0	1
257:	1	0	0	1	0	0	1	0
265:	1	0	0	1	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	1	0	1	0	1	1
289:	0	0	0	0	1	0	0	0
297:	0	2	0	0	0	0	1	0
305:	0	0	0	0	0	1	0	1
313:	0	0	1	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	1	0	0	1	0	1	0
337:	1	0	0	0	0	0	1	0
345:	1	0	0	1	0	2	1	0
353:	0	1	1	1	0	1	0	1
361:	0	1	0	0	0	0	1	0

369: 0 0 0 0 0 1 0 0

Sample Title: 08

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

145  
9/2/13

# Apex-Alpha™

Sample Description: PZ-208-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_033  
 Chamber Serial Number: 04026479A  
 Detector Serial Number: 91132  
 Env. Background: System Bkgd 64051  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:28 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: 0.1555 +/- 0.0097  
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM  
 Chem. Recovery Factor: 0.8414 +/- 0.0543

Peak Match Tolerance: 0.150 MeV

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 -----  
 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.278	301.00	11.32	0.00	0.00E+000	38.3
U-234	4.733	92.32	20.49	0.68	0.00E+000	9.9
U-235	4.396	23.00	41.75	0.00	0.00E+000	3.0
U-238	4.151	57.66	25.90	0.34	0.00E+000	3.7

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
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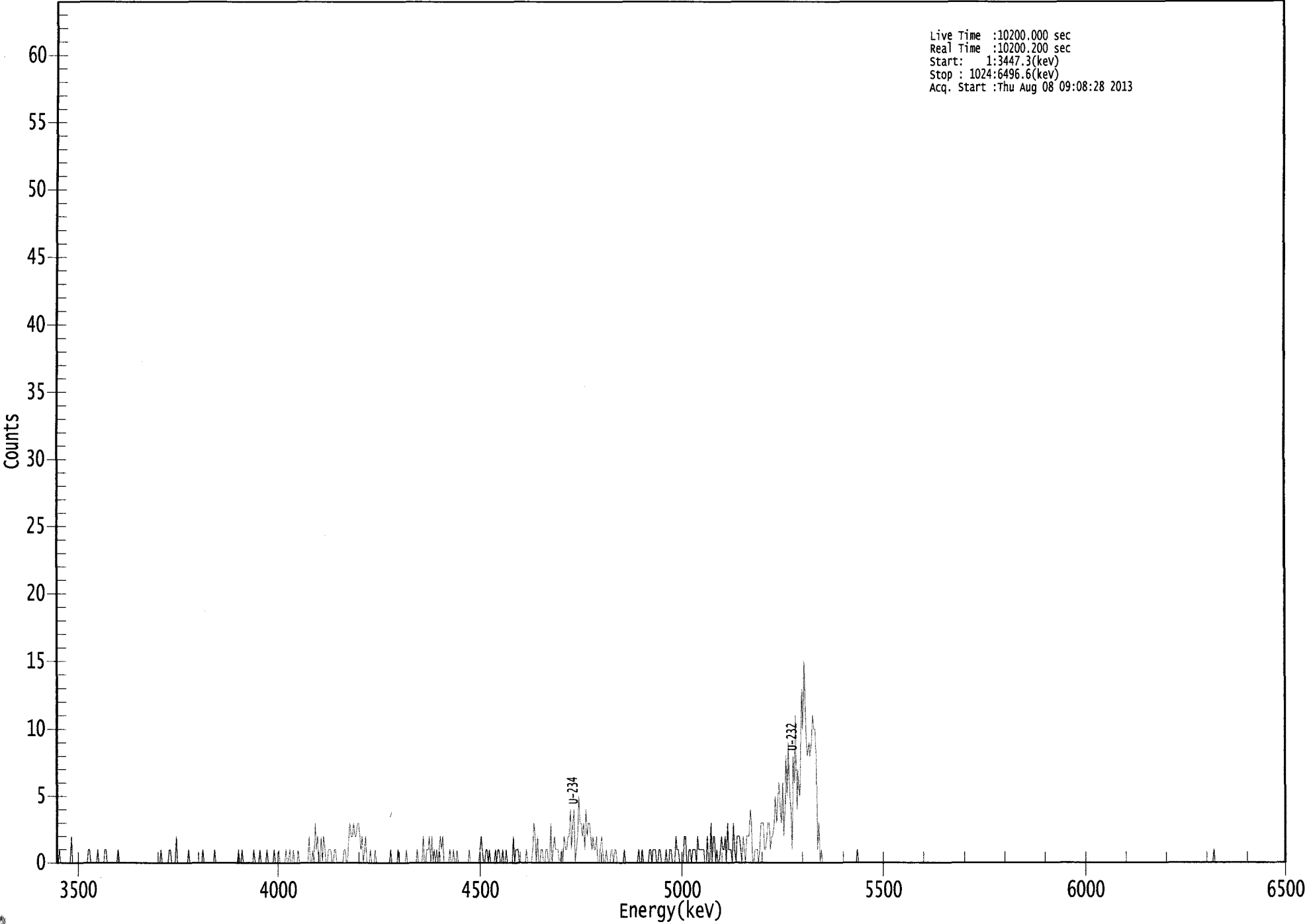
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.14E+000 +/- 6.26E-001	1.02E-001 +/- 1.25E-002
U-234	0.994	4761.50*	1.58E+000 +/- 3.76E-001	9.63E-002 +/- 1.17E-002
U-235	0.999	4385.50*	4.84E-001 +/- 2.11E-001	1.26E-001 +/- 1.54E-002
U-238	0.992	4184.40*	9.80E-001 +/- 2.81E-001	8.13E-002 +/- 9.90E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

000065543.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3447.3(kev)  
Stop : 1024:6496.6(kev)  
Acq. Start :Thu Aug 08 09:08:28 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: 09

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 1 0 0 1 0 0 1

Sample Title: 09

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	2	0	1
385:	1	1	0	0	0	0	0	0
393:	1	0	0	0	0	1	3	2
401:	0	2	0	0	1	1	0	0
409:	1	1	0	0	3	0	1	2
417:	1	1	1	0	0	1	0	2
425:	1	1	2	2	4	1	3	4
433:	0	1	2	5	3	3	2	3
441:	1	4	2	3	3	2	1	2
449:	1	1	2	0	0	1	2	1
457:	0	0	1	0	0	0	1	1
465:	0	1	1	0	0	0	0	0
473:	0	1	0	0	0	0	0	0
481:	0	0	0	0	0	1	0	0
489:	1	0	0	0	0	0	1	1
497:	0	1	1	1	0	0	1	1
505:	0	0	0	0	1	0	0	1
513:	1	0	0	0	2	1	1	0
521:	0	0	0	2	2	0	0	1
529:	1	0	1	1	1	0	2	1
537:	1	1	1	1	0	0	2	0
545:	0	3	0	2	2	0	1	0
553:	0	1	2	1	1	2	0	3
561:	1	1	1	0	3	1	0	2
569:	2	2	1	0	2	1	0	2
577:	2	2	4	3	0	0	1	1
585:	1	0	1	3	3	3	1	1
593:	2	3	3	1	2	2	3	5
601:	3	5	6	4	3	6	2	4
609:	8	5	9	5	4	1	8	6
617:	11	4	7	5	6	13	10	15
625:	12	9	8	9	8	9	11	10
633:	10	8	1	3	0	1	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	1	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: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	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	1	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

143  
8/8/13

# Apex-Alpha™

Sample Description: PZ-304-AI TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_034  
 Chamber Serial Number: 04026479B  
 Detector Serial Number: 91136  
 Env. Background: System Bkgd 64052  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:29 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: 0.0653 +/- 0.0060  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Chem. Recovery Factor: 0.3519 +/- 0.0329

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	126.83	17.42	0.17	0.00E+000	6.1
U-234	4.705	17.83	46.68	0.17	0.00E+000	3.0
U-235	4.374	9.83	63.14	0.17	0.00E+000	3.0
U-238	4.139	19.83	44.23	0.17	0.00E+000	4.5

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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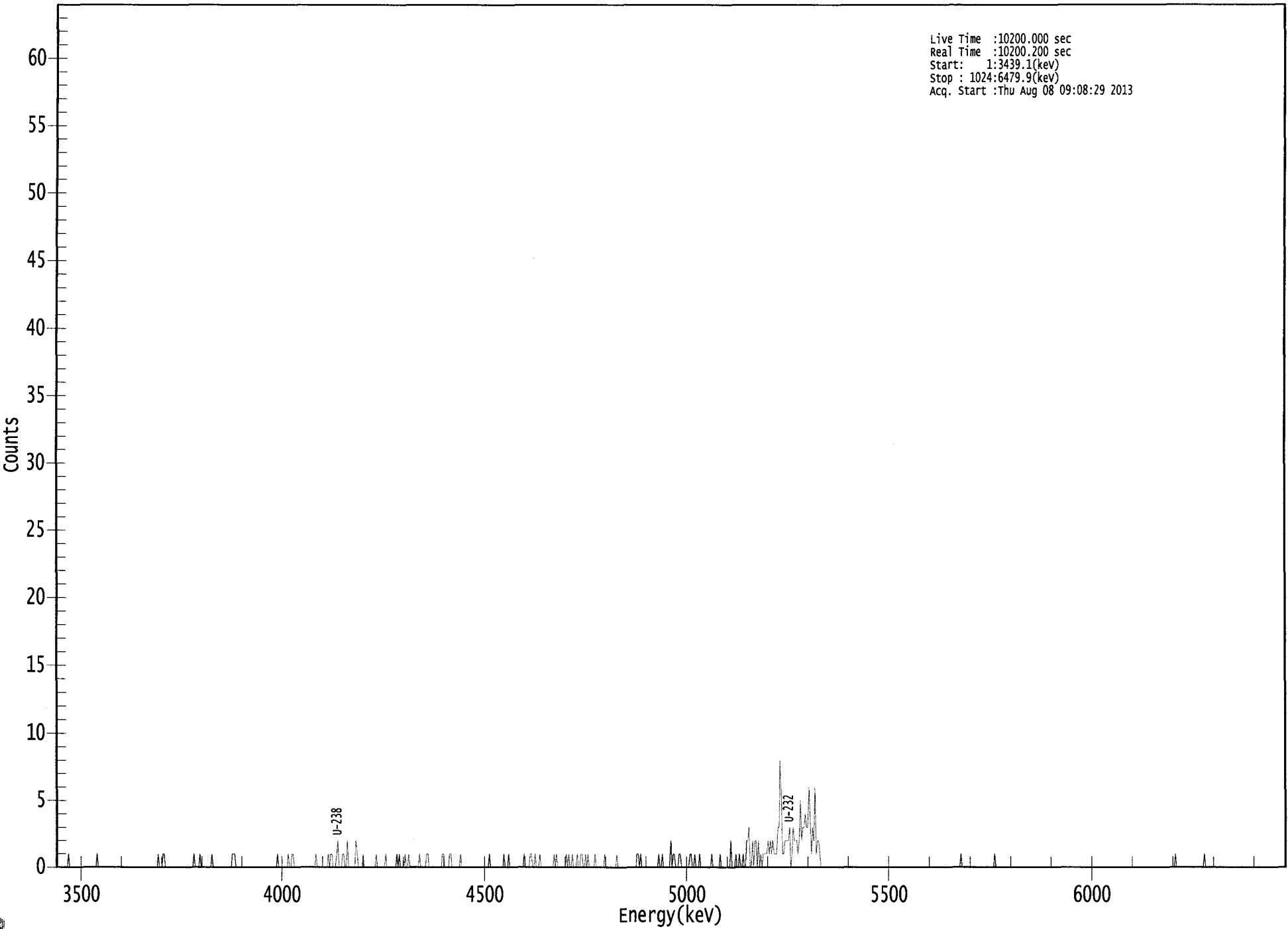
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.984	5302.50*	5.16E+000 +/- 9.28E-001	1.70E-001 +/- 3.05E-002
U-234	0.977	4761.50*	7.25E-001 +/- 3.63E-001	1.70E-001 +/- 3.05E-002
U-235	0.999	4385.50*	4.93E-001 +/- 3.24E-001	2.09E-001 +/- 3.77E-002
U-238	0.986	4184.40*	8.03E-001 +/- 3.83E-001	1.69E-001 +/- 3.04E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

000065544.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3439.1(kev)  
Stop : 1024:6479.9(kev)  
Acq. Start :Thu Aug 08 09:08:29 2013



ROI Type: 1

ROI Type: 3

057



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

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	1	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	1	0	0	0	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	1	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	0	0	0	0
113:	0	0	0	1	0	0	0	0
121:	1	0	0	0	0	0	0	0
129:	0	0	1	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	1	1	1	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	1	0	0	0	0	0	0
193:	0	0	1	0	0	1	1	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	1	0	1	1	0
233:	0	0	1	2	0	0	0	1
241:	1	0	0	2	0	0	0	0
249:	0	0	2	1	0	0	0	0
257:	1	0	0	0	0	0	0	0
265:	0	0	0	1	0	0	0	0
273:	0	0	0	1	0	0	0	0
281:	0	0	0	0	1	0	1	0
289:	0	0	0	1	0	0	1	0
297:	0	0	0	0	0	0	0	1
305:	0	0	0	0	0	1	1	0
313:	0	0	0	0	0	0	0	0
321:	0	0	1	1	0	0	0	0
329:	1	1	0	0	0	0	0	0
337:	0	1	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	1	0	0	0	0	0	0

369: 0 0 0 0 0 1 0 0

Sample Title: 10

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

# Apex-Alpha™

Sample Description: PZ-304-AI DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 64053  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:31 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: 0.0621 +/- 0.0059  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 0.3402 +/- 0.0326

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 5.294	120.81	17.93	1.19	0.00E+000	4.4
U-234	4.738	14.83	51.24	0.17	0.00E+000	2.9
U-235	4.420	3.00	130.67	0.00	0.00E+000	2.9
U-238	4.165	7.83	70.93	0.17	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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

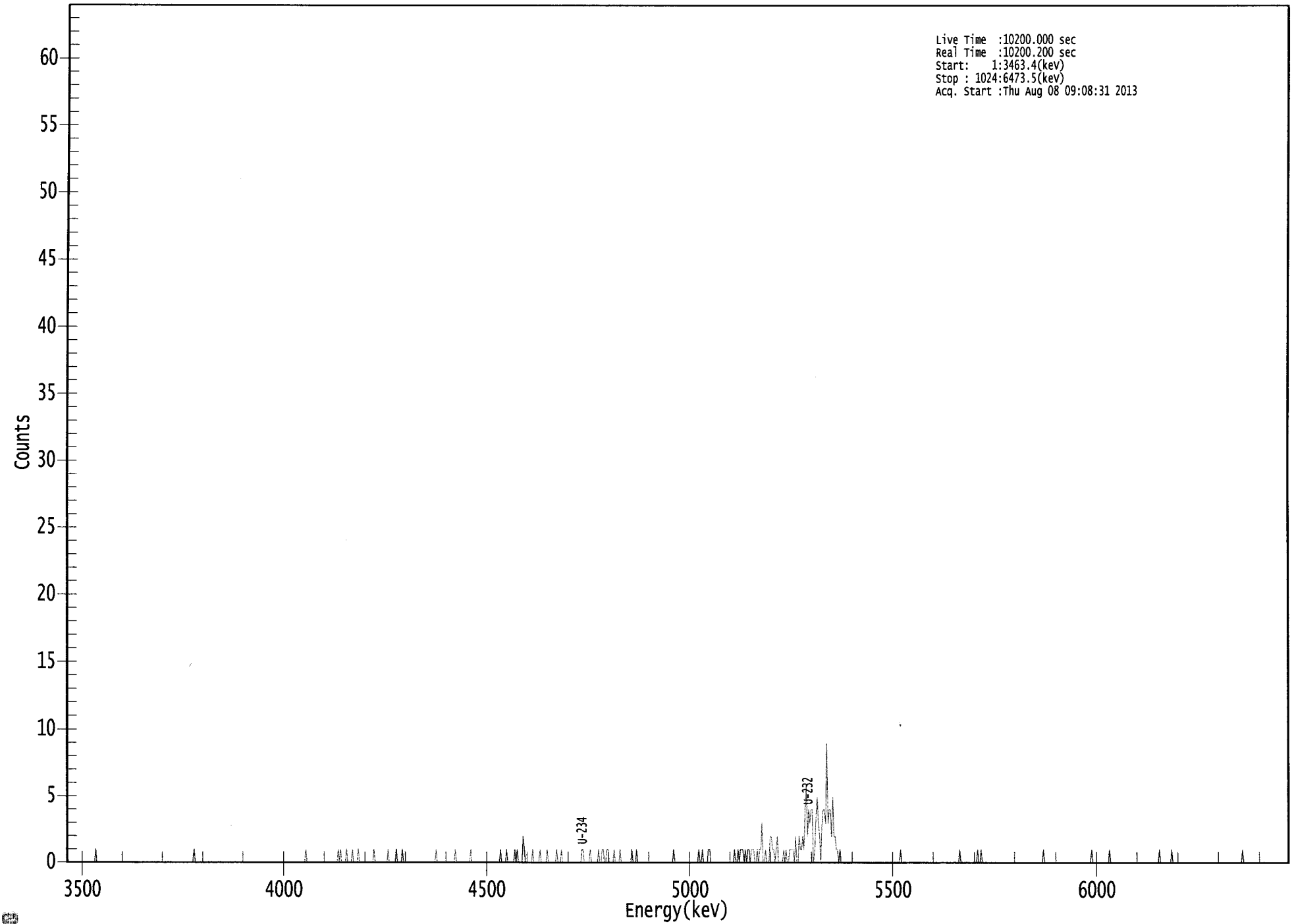
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.999	5302.50*	5.17E+000 +/- 9.56E-001	2.82E-001 +/- 5.21E-002
U-234	0.996	4761.50*	6.34E-001 +/- 3.45E-001	1.78E-001 +/- 3.30E-002
U-235	0.992	4385.50*	1.58E-001 +/- 2.09E-001	3.16E-001 +/- 5.85E-002
U-238	0.997	4184.40*	3.33E-001 +/- 2.44E-001	1.78E-001 +/- 3.29E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065545.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :Thu Aug 08 09:08:31 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: 11

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	0	0
17:	0	0	0	0	0	0	0	0
25:	1	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	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	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	1	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	1	0	1	0
233:	0	0	0	1	0	0	0	0
241:	1	0	0	0	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	1	0
273:	0	0	0	0	0	1	0	0
281:	0	0	1	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	1	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	1	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	1	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	1	0	0	0

369: 0 1 0 0 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	0	1	0	0	0	0	2
385:	1	0	0	0	0	0	0	1
393:	0	0	0	0	0	1	0	0
401:	0	0	0	1	0	0	0	0
409:	0	0	0	1	0	0	0	1
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	1	1	0	0	0	0	0	1
441:	0	0	0	0	0	0	1	0
449:	0	1	1	0	0	1	1	0
457:	0	0	0	1	0	0	0	0
465:	1	0	0	0	0	0	0	0
473:	0	0	1	0	0	0	1	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:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	1	0	0	1	0	0
537:	0	0	1	1	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	1	0	1	1	1
569:	0	1	0	1	1	0	1	1
577:	1	0	0	1	0	1	1	3
585:	0	0	1	0	0	0	2	2
593:	1	1	0	1	2	0	0	0
601:	0	1	0	1	0	0	1	1
609:	1	1	0	2	0	0	2	1
617:	1	2	1	4	6	2	4	3
625:	4	4	0	1	3	5	3	2
633:	0	3	4	4	3	9	3	4
641:	4	2	5	2	2	1	1	0
649:	1	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	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:	0	0	0	0	1	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	1	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 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	1	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	1	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	1	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	1	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:	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





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8/8/13

Sample Description: MW-104 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_039  
 Chamber Serial Number: 06027396A  
 Detector Serial Number: 83109  
 Env. Background: System Bkgd 64056  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:37 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: 0.1394 +/- 0.0091  
 Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM  
 Chem. Recovery Factor: 0.7094 +/- 0.0478

Peak Match Tolerance: 0.150 MeV

-----  
 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 5.276	270.00	11.95	0.00	0.00E+000	42.0
U-234	4.728	151.98	15.96	1.02	0.00E+000	14.3
U-235	4.421	31.49	35.26	0.51	0.00E+000	3.0
U-238	4.152	125.83	17.49	0.17	0.00E+000	6.3

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
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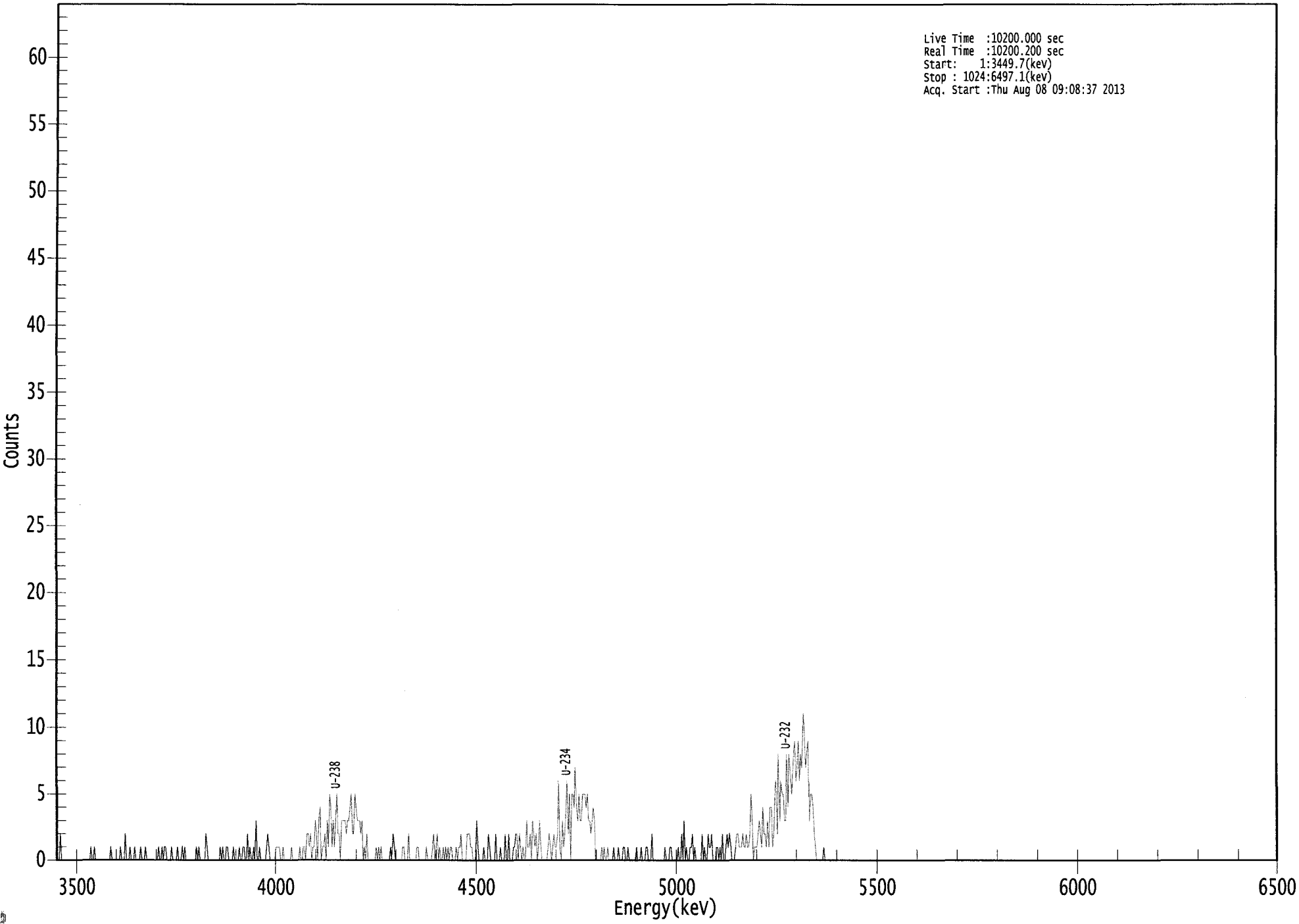
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.995	5302.50*	5.15E+000 +/- 6.57E-001	1.14E-001 +/- 1.46E-002
U-234	0.992	4761.50*	2.89E+000 +/- 5.92E-001	1.20E-001 +/- 1.53E-002
U-235	0.991	4385.50*	7.40E-001 +/- 2.77E-001	1.23E-001 +/- 1.57E-002
U-238	0.993	4184.40*	2.39E+000 +/- 5.17E-001	7.91E-002 +/- 1.01E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065548.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3449.7(kev)  
Stop : 1024:6497.1(kev)  
Acq. Start :Thu Aug 08 09:08:37 2013



ROI Type: 1

ROI Type: 3

916

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

369: 0 2 0 0 0 1 0 0

Sample Title: 14

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

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

143  
8/13/13

# Apex-Alpha™

Sample Description: MW-104 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 64057  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:38 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: 0.1365 +/- 0.0090  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 0.7186 +/- 0.0488

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	5.272	264.83	12.05	0.17	0.00E+000	6.9
U-234		4.737	113.49	18.45	0.51	0.00E+000	4.1
U-235		4.402	15.00	52.27	0.00	0.00E+000	3.0
U-238		4.158	85.00	21.38	0.00	0.00E+000	4.0

T = Tracer Peak used for Effective Efficiency

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 -----  
 NUCLIDE ANALYSIS RESULTS  
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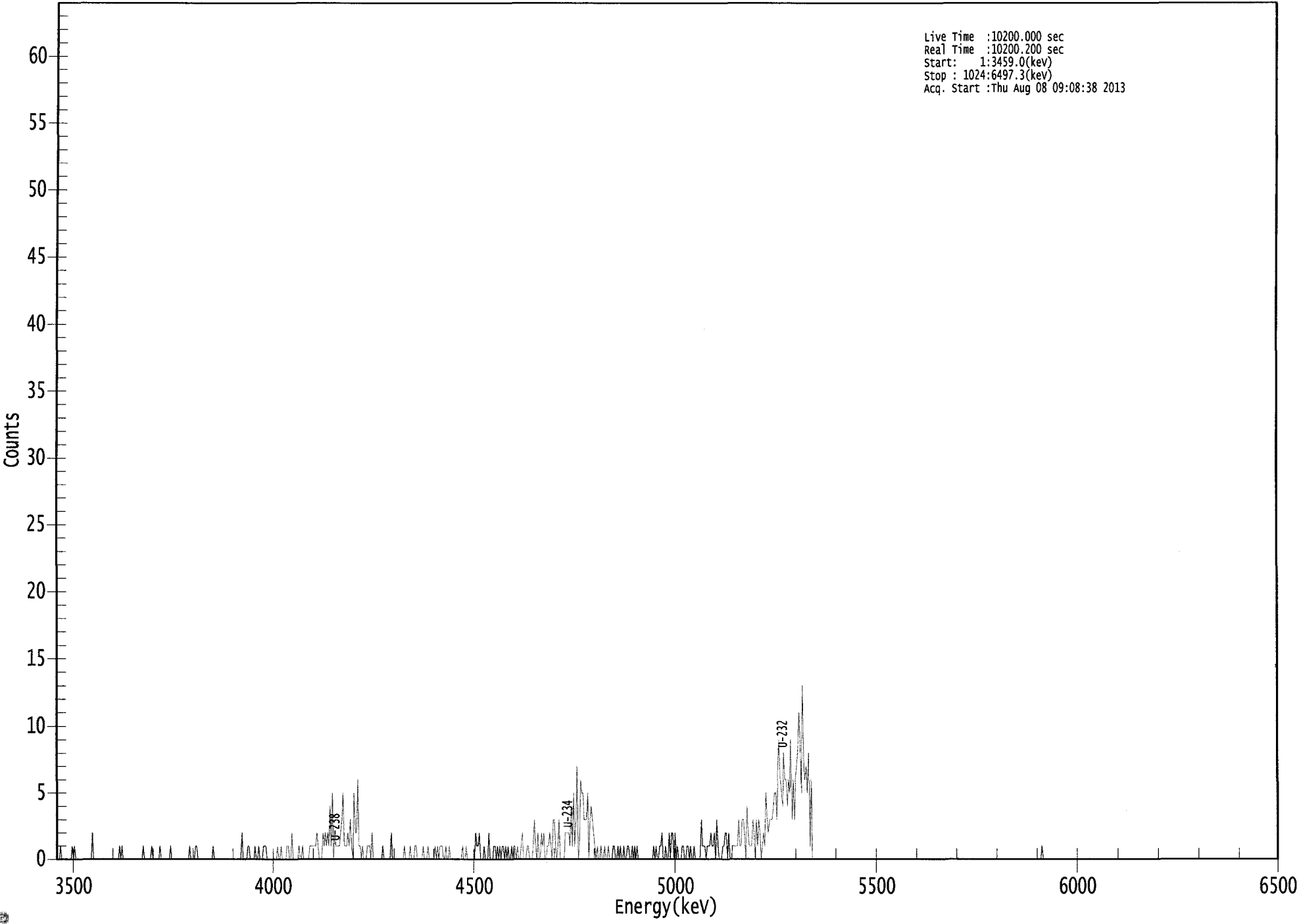
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.993	5302.50*	5.15E+000 +/- 6.63E-001	8.12E-002 +/- 1.04E-002
U-234	0.996	4761.50*	2.21E+000 +/- 4.96E-001	1.02E-001 +/- 1.31E-002
U-235	0.998	4385.50*	3.60E-001 +/- 1.94E-001	1.44E-001 +/- 1.85E-002
U-238	0.995	4184.40*	1.65E+000 +/- 4.11E-001	1.16E-001 +/- 1.49E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

000065549.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Thu Aug 08 09:08:38 2013



ROI Type: 1

ROI Type: 3

0172

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

Sample Title: 15

Elapsed Live time: 10200

Elapsed Real Time: 10200

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



369: 1 0 1 0 1 0 1 1

Sample Title: 15

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

801: 0 0 0 0 0 0 0 0

Sample Title: 15

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	1	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

107  
8/8/13

# Apex-Alpha™

Sample Description: PZ-204A-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-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 64060  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:40 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: 0.0678 +/- 0.0061  
 Counting Efficiency: 0.1909 +/- 0.0033 on 7/20/2013 2:31:26 PM  
 Chem. Recovery Factor: 0.3551 +/- 0.0327

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 5.272	131.32	17.16	0.68	0.00E+000	6.8
U-234	4.738	50.49	27.75	0.51	0.00E+000	3.7
U-235	4.397	7.83	70.93	0.17	0.00E+000	3.0
U-238	4.135	32.66	34.50	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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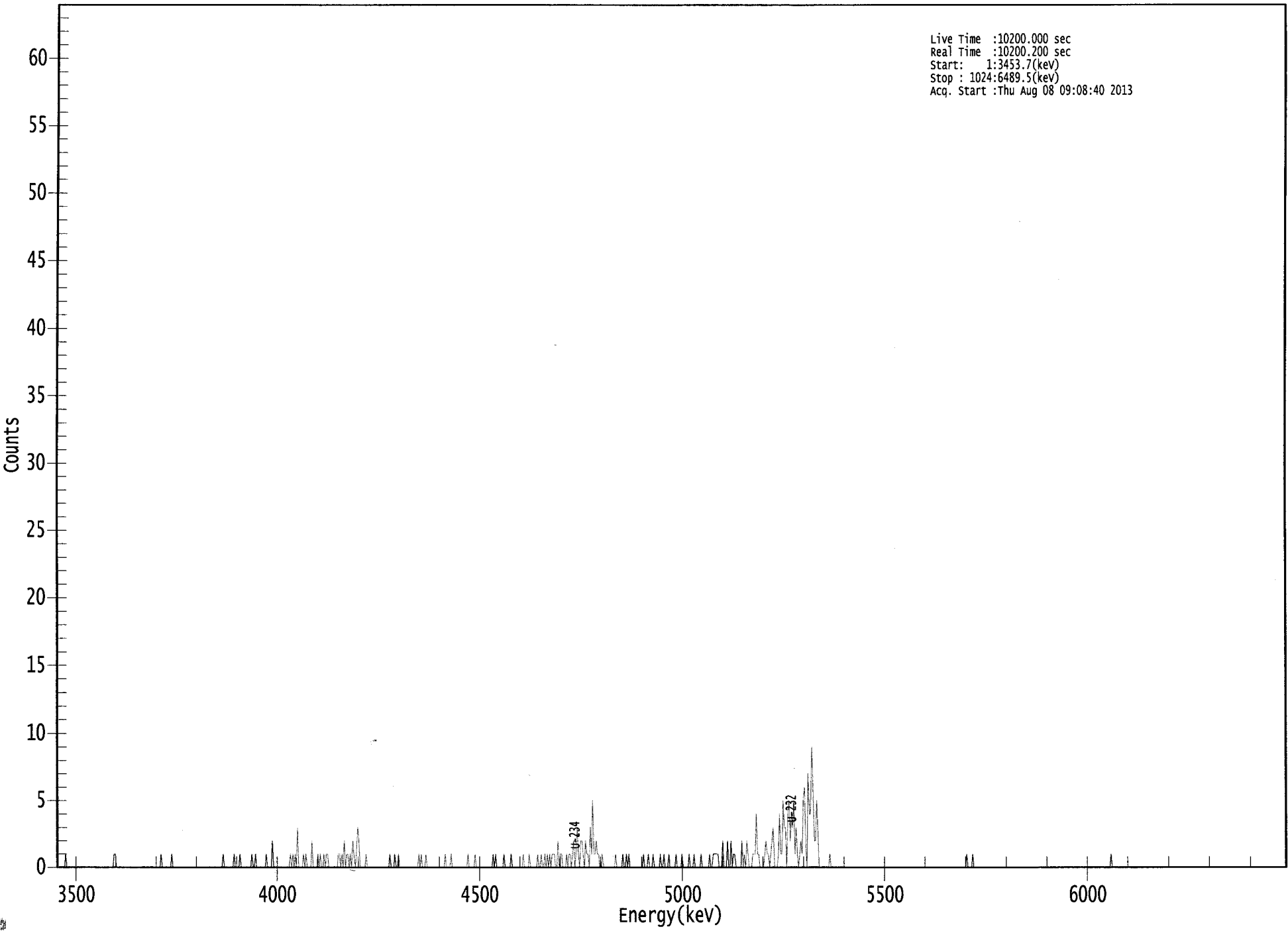
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.994	5302.50*	5.15E+000 +/- 9.13E-001	2.21E-001 +/- 3.92E-002
U-234	0.996	4761.50*	1.98E+000 +/- 6.51E-001	2.05E-001 +/- 3.64E-002
U-235	0.999	4385.50*	3.78E-001 +/- 2.77E-001	2.02E-001 +/- 3.58E-002
U-238	0.983	4184.40*	1.27E+000 +/- 4.94E-001	1.86E-001 +/- 3.31E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065550.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6489.5(kev)  
Acq. Start :Thu Aug 08 09:08:40 2013



ROI Type: 1

ROI Type: 3

617

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

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	1
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	1	1	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:	1	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	1	0	0	0	0
145:	0	0	0	0	1	0	0	0
153:	0	1	0	0	0	0	0	0
161:	0	0	0	1	0	0	1	0
169:	0	0	0	0	0	0	0	1
177:	0	0	0	0	2	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	1	0	1	0	1
201:	0	3	0	0	0	0	1	0
209:	1	0	0	0	0	2	0	0
217:	0	0	1	0	1	0	0	1
225:	0	1	1	0	0	0	0	0
233:	0	0	0	1	1	0	1	0
241:	2	0	1	1	0	1	0	2
249:	1	0	1	3	2	0	0	0
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	1	0
281:	0	0	1	0	0	1	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	1	0
305:	1	0	0	0	1	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	1	0	0	0
329:	0	1	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	1
345:	0	0	0	0	0	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	1	0	1	0

369: 0 0 0 0 0 1 0 0

Sample Title: 16

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

10/8  
8/18/13

# Apex-Alpha™

Sample Description: PZ-204A-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-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 64061  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:43 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: 0.0981 +/- 0.0075  
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM  
 Chem. Recovery Factor: 0.5480 +/- 0.0429

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	5.268	190.00	14.26	0.00	0.00E+000	7.8
U-234		4.729	88.83	20.82	0.17	0.00E+000	4.4
U-235		4.418	12.00	58.89	0.00	0.00E+000	3.0
U-238		4.141	68.83	23.66	0.17	0.00E+000	4.4

T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.992	5302.50*	5.15E+000 +/- 7.70E-001	1.62E-001 +/- 2.43E-002
U-234	0.992	4761.50*	2.41E+000 +/- 6.17E-001	1.13E-001 +/- 1.69E-002
U-235	0.993	4385.50*	4.01E-001 +/- 2.44E-001	2.00E-001 +/- 2.99E-002
U-238	0.986	4184.40*	1.86E+000 +/- 5.19E-001	1.13E-001 +/- 1.68E-002

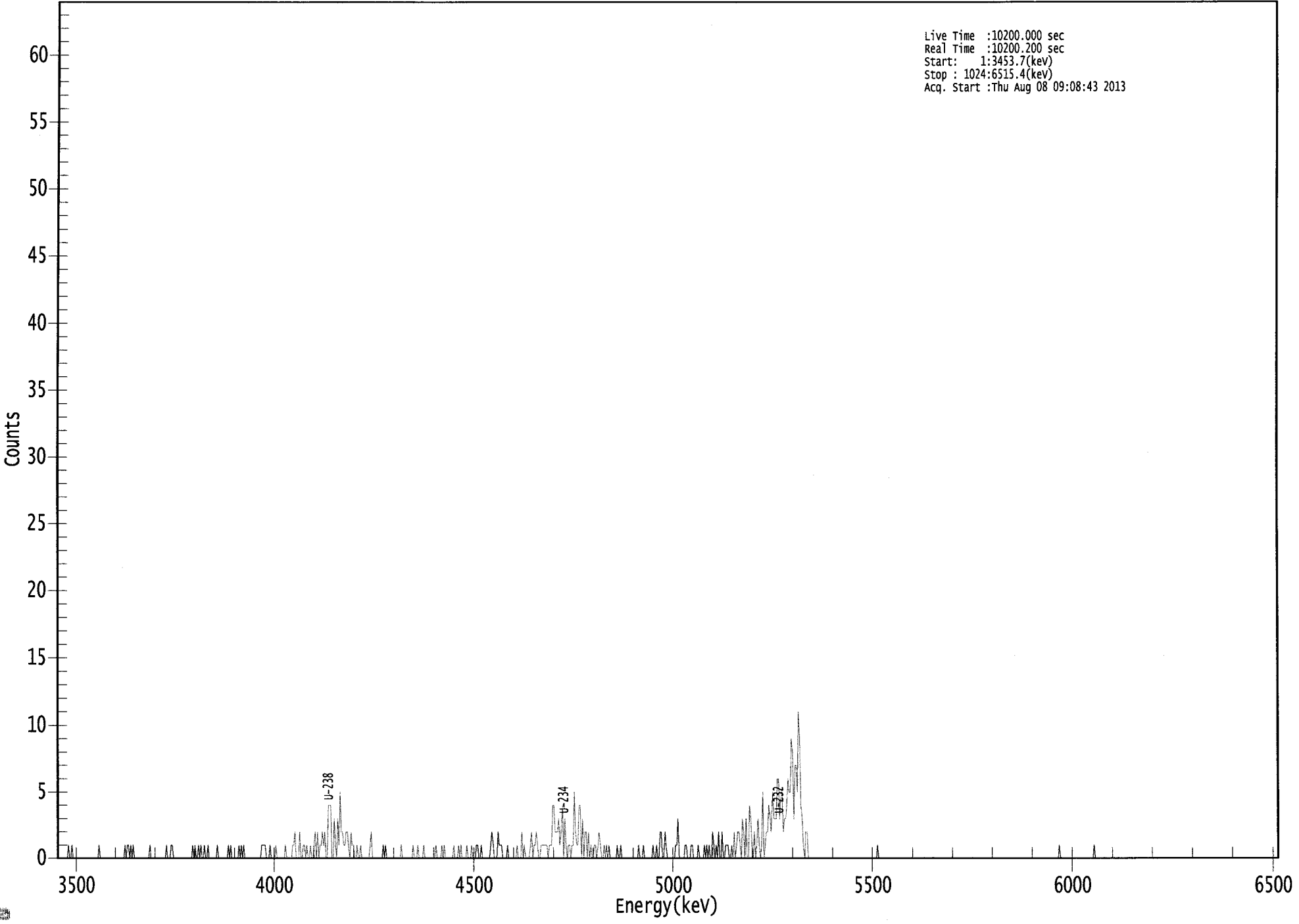
AG  
8/8/13

US EPA ARCHIVE DOCUMENT



000065551.CNF

Live Time :10200.000 sec  
Real Time :10200.200 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6515.4(kev)  
Acq. Start :Thu Aug 08 09:08:43 2013



ROI Type: 1

ROI Type: 3

0187

\*\*\*\*\*  
 \*\*\*\*\* 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	1	0	0	1	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	1	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	1	1	0	1	0
65:	1	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	1	0	0	0
97:	1	1	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	1	0	1	0	0	1
121:	0	1	0	0	1	0	0	1
129:	0	0	0	0	0	0	0	1
137:	0	0	0	0	0	0	0	0
145:	1	0	1	0	0	0	0	0
153:	0	1	0	1	0	1	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	1	1	1	1
177:	0	0	0	1	0	0	0	0
185:	1	0	0	0	0	0	0	0
193:	1	0	0	0	0	0	1	1
201:	2	0	0	0	2	0	0	1
209:	1	0	1	0	0	1	0	0
217:	1	2	0	2	0	1	1	2
225:	1	2	0	0	4	4	4	0
233:	0	3	1	0	3	1	5	2
241:	2	1	1	2	2	1	0	2
249:	1	1	0	0	1	0	0	1
257:	0	0	0	0	0	0	0	1
265:	2	0	0	0	0	0	0	0
273:	0	0	1	0	1	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	1	0	0	0	0	0	0
297:	0	0	0	1	0	0	0	1
305:	0	0	0	0	1	0	0	0
313:	0	0	0	0	0	0	1	0
321:	0	0	0	1	0	1	0	0
329:	0	0	0	0	0	1	0	0
337:	0	1	0	1	0	0	0	0
345:	1	0	0	0	1	0	0	0
353:	1	1	0	0	1	0	0	0
361:	0	0	0	0	1	2	1	0

369: 0 0 2 1 1 1 0 0

Sample Title: 17

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	0	0	0	0	0
385:	0	0	1	0	0	0	2	0
393:	1	0	0	0	0	1	2	0
401:	1	1	2	1	0	0	1	1
409:	1	1	1	1	0	1	1	1
417:	4	4	2	2	2	3	1	2
425:	4	0	3	1	0	1	1	0
433:	1	1	5	2	1	1	4	4
441:	0	3	0	2	2	0	2	0
449:	1	0	0	1	1	0	1	2
457:	1	0	0	1	0	1	0	1
465:	0	0	0	0	0	0	1	0
473:	0	1	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	1	0	0	0	1	0	0	0
497:	0	0	0	0	1	0	0	1
505:	0	0	2	2	0	0	2	1
513:	0	0	0	0	0	0	0	1
521:	1	3	0	0	0	0	0	1
529:	1	0	0	0	1	1	0	0
537:	0	0	1	0	0	0	0	1
545:	0	1	0	1	0	0	2	1
553:	0	1	0	2	0	0	2	0
561:	0	1	1	1	0	0	1	0
569:	2	0	1	2	2	1	0	3
577:	2	0	3	0	0	4	3	1
585:	0	2	0	1	3	1	0	1
593:	5	0	1	2	2	4	3	2
601:	5	3	3	3	6	6	3	5
609:	5	2	3	3	4	6	5	5
617:	9	8	3	7	7	5	11	9
625:	4	3	1	0	2	2	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:	1	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	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:	1	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	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	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

145  
8/8/13



Sample Description: PZ-302-AI TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-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 64062  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:45 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: 0.1906 +/- 0.0109  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Chem. Recovery Factor: 1.0463 +/- 0.0624

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 5.270	368.49	10.22	0.51	0.00E+000	16.8
U-234	4.720	258.66	12.20	0.34	0.00E+000	16.3
U-235	4.417	42.66	30.15	0.34	0.00E+000	3.4
U-238	4.140	223.66	13.12	0.34	0.00E+000	16.1

T = Tracer Peak used for Effective Efficiency

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

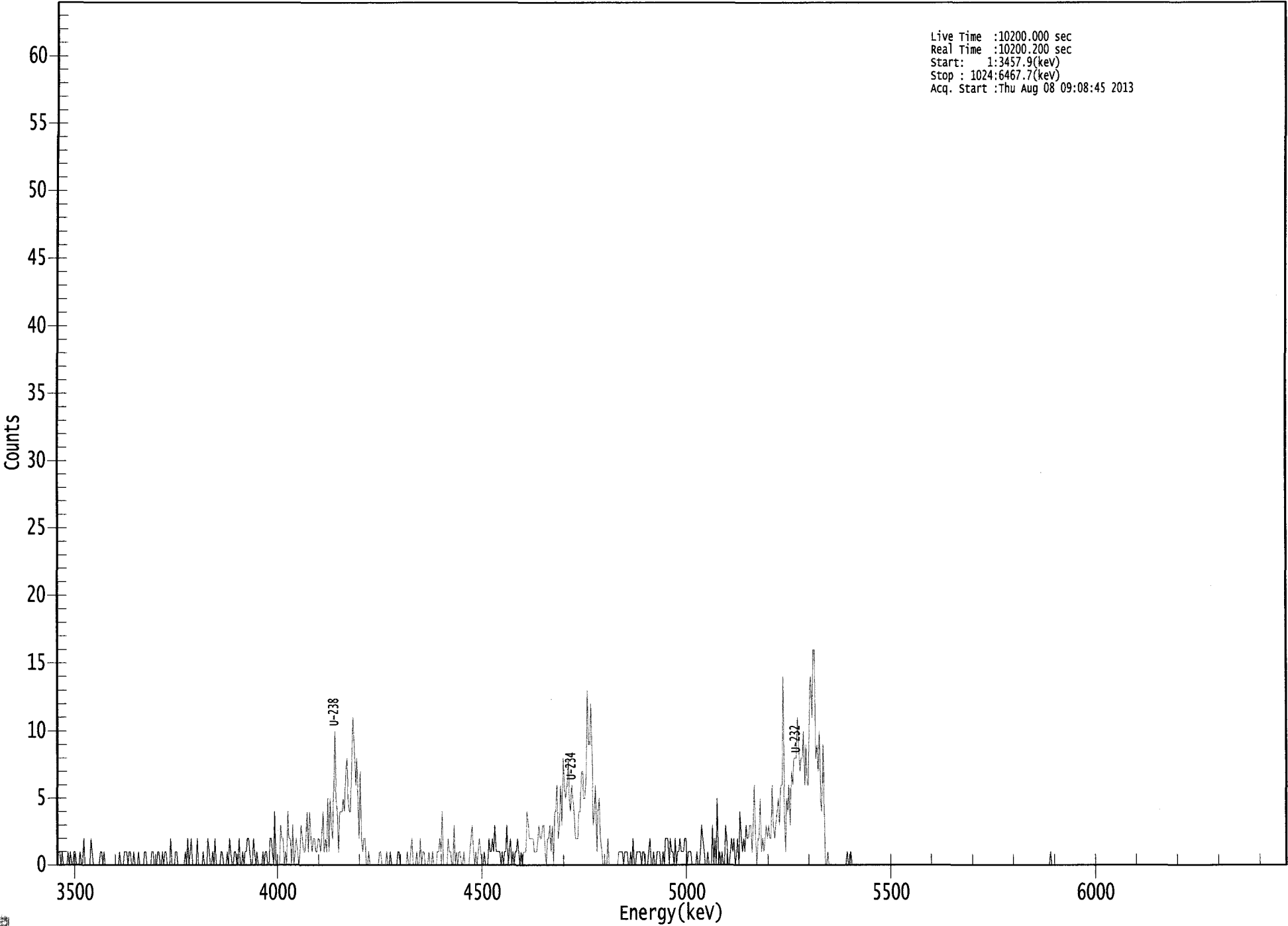
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.992	5302.50*	5.14E+000 +/- 5.74E-001	7.31E-002 +/- 8.17E-003
U-234	0.988	4761.50*	3.60E+000 +/- 5.96E-001	6.66E-002 +/- 7.44E-003
U-235	0.993	4385.50*	7.33E-001 +/- 2.36E-001	8.22E-002 +/- 9.18E-003
U-238	0.986	4184.40*	3.10E+000 +/- 5.34E-001	6.63E-002 +/- 7.41E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

000065552.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 09:08:45 2013



ROI Type: 1

ROI Type: 3

0107

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

369: 1 1 0 1 0 1 1 3

Sample Title: 18

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



801: 0 0 0 0 0 0 0 0

Sample Title: 18

Channel								
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	1	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

158  
8/8/13

# Apex-Alpha™

Sample Description: PZ-302-AI DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000655  
 Batch Identification: 1307147A-UU  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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  
 Sample Date/Time: 7/16/2013 7:05:56 AM  
 Acquisition Date/Time: 8/8/2013 9:08:47 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: 0.0703 +/- 0.0063  
 Counting Efficiency: 0.1680 +/- 0.0030 on 12/16/2012 5:49:20 PM  
 Chem. Recovery Factor: 0.4184 +/- 0.0380

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 5.283	136.15	16.86	0.85	0.00E+000	19.2
U-234	4.730	137.00	16.81	0.00	0.00E+000	4.6
U-235	4.421	18.00	47.46	0.00	0.00E+000	3.0
U-238	4.147	107.83	18.89	0.17	0.00E+000	3.9

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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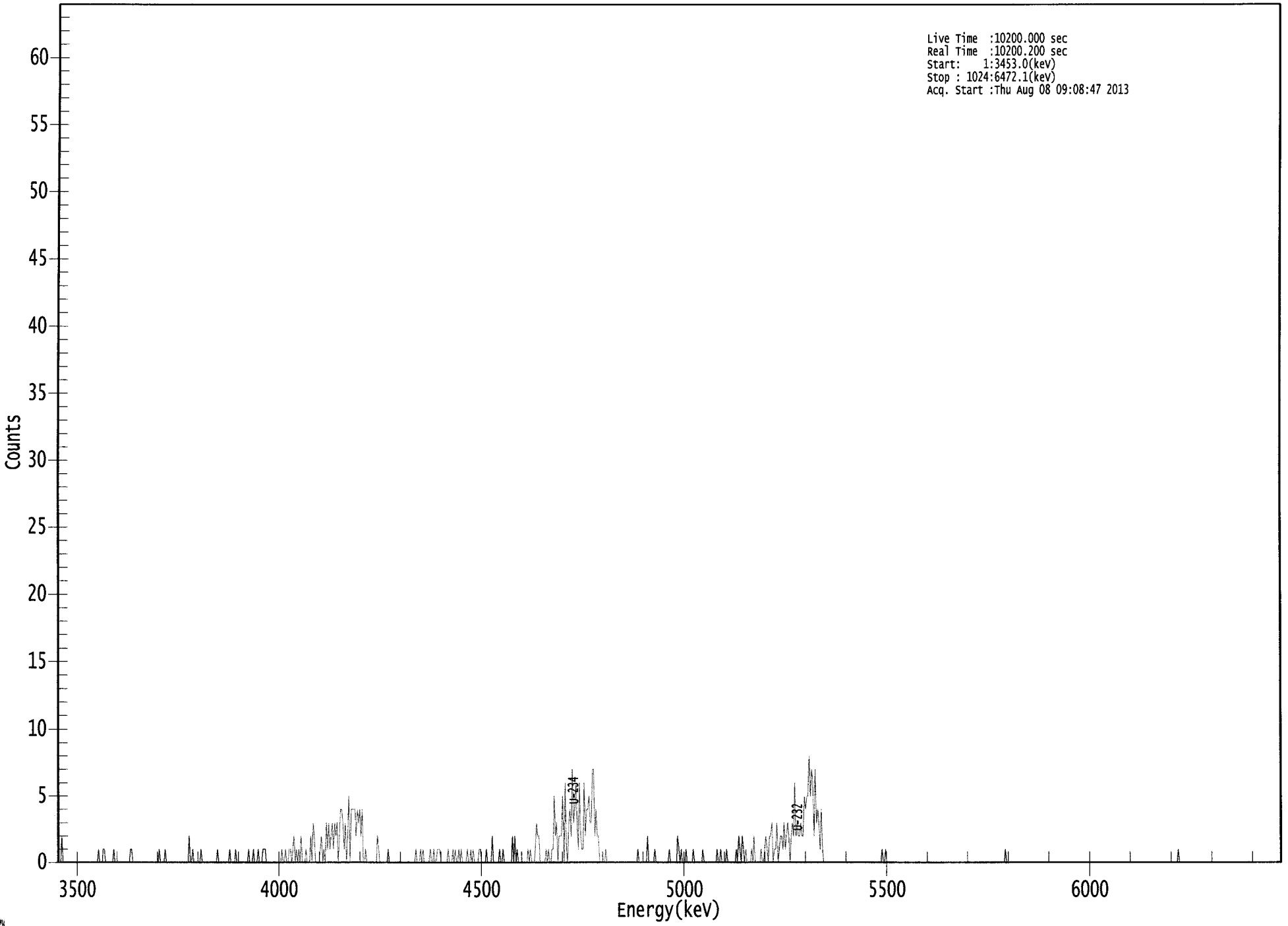
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.997	5302.50*	5.15E+000 +/- 8.98E-001	2.26E-001 +/- 3.95E-002
U-234	0.993	4761.50*	5.18E+000 +/- 1.25E+000	2.27E-001 +/- 3.95E-002
U-235	0.991	4385.50*	8.39E-001 +/- 4.24E-001	2.79E-001 +/- 4.88E-002
U-238	0.990	4184.40*	4.06E+000 +/- 1.04E+000	1.57E-001 +/- 2.74E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

00006553.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 09:08:47 2013



ROI Type: 1

ROI Type: 3

0192

\*\*\*\*\*  
 \*\*\*\*\* 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:	0	0	0	2	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	1	0	0	0	1	1
41:	0	0	0	0	0	0	0	1
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	1	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	1	0	0
89:	0	0	1	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	2	0
113:	0	1	0	0	0	0	0	0
121:	1	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	1	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:	1	0	0	0	1	0	0	0
169:	1	0	0	0	1	1	1	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	1	0	0	1
193:	0	0	1	1	0	1	2	0
201:	1	0	1	0	2	0	0	0
209:	1	0	0	0	2	0	3	2
217:	0	0	0	0	1	2	0	1
225:	0	3	1	3	1	2	3	1
233:	3	2	3	0	2	4	4	3
241:	1	3	0	2	5	0	4	4
249:	4	4	2	4	3	4	2	4
257:	0	0	1	0	0	0	0	0
265:	0	0	0	0	2	1	0	0
273:	0	0	0	0	0	1	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	1	0	0	0
305:	1	0	1	0	0	0	0	0
313:	1	0	0	1	0	0	1	1
321:	1	0	0	0	0	0	0	1
329:	0	0	0	1	0	1	0	0
337:	1	0	1	0	0	0	0	1
345:	0	0	1	0	1	0	0	0
353:	0	1	1	0	0	0	0	1
361:	0	0	0	0	2	0	0	0

369: 0 0 1 0 0 1 0 0

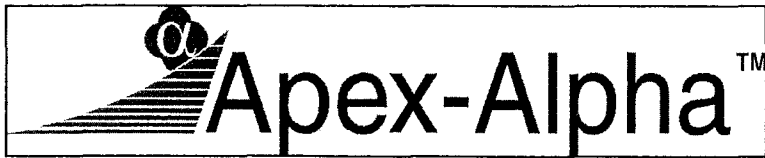
Sample Title: 19

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

801: 0 0 0 0 0 0 0 0

Sample Title: 19

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	1	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



## 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

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: 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

**RUN 2**

Work Order	13-07147
Analysis Code	UIISO
Run	2
Date Received	7/22/2013
Lab Deadline	8/13/2013
Client	Engineering Management Support, Inc.
Project	West Lake OU-1
Report Level	4
Activity Units	pCi
Aliquot Units	I
Matrix	WA
Method	HASL 300, 4.5.2
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	U-232
Radiometric Sol#	U-10a
Tracer Act (dpm/g)	19.04
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		07/23/13 00:00	1.0000E+00
02	MBL	BLANK		07/23/13 00:00	1.0000E+00
03	DUP	PZ-304-AS TOT	41	07/16/13 12:34	2.5000E-01
12	DO	PZ-304-AS TOT	41	07/16/13 12:34	2.5000E-01
13	TRG	PZ-304-AS DIS	41	07/16/13 12:34	2.5000E-01

\* 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.

0200

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	0.6134	11.7		0.00								
02	MBL	0.6087	11.6		0.00								
03	DUP	0.6070	11.6		0.00								
12	DO	0.6034	11.5		0.00								
13	TRG	0.6099	11.6		0.00								

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

0201

<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			08/09/13 07:17	JWOLFE				
02	MBL			08/09/13 07:17	JWOLFE				
03	DUP			08/09/13 07:17	JWOLFE				
12	DO			08/09/13 07:17	JWOLFE				
13	TRG			08/09/13 07:17	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: 13-07147-UUISO-2**

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	7.03E+00	9.87E-01	8.28E-02	8.20E+00	85.66	OK		OK	
02	U-234	MBL	BLANK	pCi/l	1.92E-01	1.13E-01	9.87E-02					OK	OK
03	U-234	DUP	PZ-304-AS TOT	pCi/l	5.94E-01	6.83E-01	8.93E-01				NA	OK	
12	U-234	DO	PZ-304-AS TOT	pCi/l	4.56E-01	6.87E-01	1.11E+00					INV	
13	U-234	TRG	PZ-304-AS DIS	pCi/l	1.27E+00	9.10E-01	8.91E-01					OK	



**Run 2**

**Analysis Code UUISO**

**Eberline Services Work Order 13-07147**

**Client Engineering Management Support, Inc.**

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UUISO-2**

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	07/23/13 00:00	1.00E+00	115.92	0.00	0.00			
02	U-234	MBL	07/23/13 00:00	1.00E+00	115.72	0.00	0.00			
03	U-234	DUP	07/16/13 12:34	2.50E-01	36.47	0.00	0.00			
12	U-234	DO	07/16/13 12:34	2.50E-01	31.56	0.00	0.00			
13	U-234	TRG	07/16/13 12:34	2.50E-01	43.25	0.00	0.00			



Run **2**  
Analysis Code **UUISO**

Eberline Services Work Order  
**13-07147**

Client  
Engineering Management Support, Inc.

### Preliminary Data Report & Analytical Calculations

## Work Order: 13-07147-UUISO-2

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-234	LCS	08/13/13 09:05		A_Spec	Alpha_019	170	5.09 E+02	0.00 E+00	16.6
02	U-234	MBL	08/13/13 09:05		A_Spec	Alpha_022	170	1.28 E+01	7.00 E-03	15.3
03	U-234	DUP	08/13/13 09:06		A_Spec	Alpha_023	170	3.49 E+00	3.00 E-03	17.1
12	U-234	DO	08/13/13 09:06		A_Spec	Alpha_024	170	2.32 E+00	4.00 E-03	17.1
13	U-234	TRG	08/13/13 09:06		A_Spec	Alpha_025	170	8.98 E+00	6.00 E-03	17.4

	Run	2
	Analysis Code	UUISO
	Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.	



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UUISO-2**

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	8.61E+00	1.16E+00	7.21E-02	7.99E+00	107.70	OK		OK	
02	U-238	MBL	BLANK	pCi/l	8.70E-02	7.25E-02	6.23E-02					OK	OK
03	U-238	DUP	PZ-304-AS TOT	pCi/l	-1.73E-01	3.61E-01	1.07E+00				NA	INV	
12	U-238	DO	PZ-304-AS TOT	pCi/l	4.54E-01	6.84E-01	1.10E+00					INV	
13	U-238	TRG	PZ-304-AS DIS	pCi/l	5.40E-01	5.62E-01	5.88E-01					OK	

	Run	2
	Analysis Code	
Eberline Services Work Order	13-07147	
Client	Engineering Management Support, Inc.	

9029

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UUIISO-2**

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep 10 Date/Time	Sep 11 Date/Time
01	U-238	LCS	07/23/13 00:00	1.00E+00	115.92	0.00	0.00			
02	U-238	MBL	07/23/13 00:00	1.00E+00	115.72	0.00	0.00			
03	U-238	DUP	07/16/13 12:34	2.50E-01	36.47	0.00	0.00			
12	U-238	DO	07/16/13 12:34	2.50E-01	31.56	0.00	0.00			
13	U-238	TRG	07/16/13 12:34	2.50E-01	43.25	0.00	0.00			



Run **2**

Analysis Code **UUIISO**

Eberline Services Work Order **13-07147**

Client **Engineering Management Support, Inc.**

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UUISO-2**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-238	LCS	08/13/13 09:05		A_Spec	Alpha_019	170	6.26 E+02	3.00 E-03	16.6
02	U-238	MBL	08/13/13 09:05		A_Spec	Alpha_022	170	5.83 E+00	1.00 E-03	15.3
03	U-238	DUP	08/13/13 09:06		A_Spec	Alpha_023	170	-1.02 E+00	6.00 E-03	17.1
12	U-238	DO	08/13/13 09:06		A_Spec	Alpha_024	170	2.32 E+00	4.00 E-03	17.1
13	U-238	TRG	08/13/13 09:06		A_Spec	Alpha_025	170	3.83 E+00	1.00 E-03	17.4

	Run	2
	Analysis Code	UUISO
Eberline Services Work Order	13-07147	
Client	Engineering Management Support, Inc.	

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UUISO-2**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-235	LCS	LCS	pCi/l	9.54E-01	2.73E-01	1.02E-01					OK	
02	U-235	MBL	BLANK	pCi/l	6.41E-02	8.34E-02	1.31E-01					OK	OK
03	U-235	DUP	PZ-304-AS TOT	pCi/l	4.87E-01	7.32E-01	1.18E+00				NA	INV	
12	U-235	DO	PZ-304-AS TOT	pCi/l	7.23E-01	9.82E-01	1.53E+00					INV	
13	U-235	TRG	PZ-304-AS DIS	pCi/l	3.49E-01	5.95E-01	1.05E+00					INV	

Run	2
Analysis Code	UUISO
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UUISO-2**



Run	2
Analysis Code	UUISO
Eberline Services Work Order	13-07147
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	U-235	LCS	07/23/13 00:00	1.00E+00	115.92	0.00	0.00			
02	U-235	MBL	07/23/13 00:00	1.00E+00	115.72	0.00	0.00			
03	U-235	DUP	07/16/13 12:34	2.50E-01	36.47	0.00	0.00			
12	U-235	DO	07/16/13 12:34	2.50E-01	31.56	0.00	0.00			
13	U-235	TRG	07/16/13 12:34	2.50E-01	43.25	0.00	0.00			

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-UUISO-2**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-235	LCS	08/13/13 09:05		A_Spec	Alpha_019	170	5.60 E+01	0.00 E+00	16.6
02	U-235	MBL	08/13/13 09:05		A_Spec	Alpha_022	170	3.47 E+00	9.00 E-03	15.3
03	U-235	DUP	08/13/13 09:06		A_Spec	Alpha_023	170	2.32 E+00	4.00 E-03	17.1
12	U-235	DO	08/13/13 09:06		A_Spec	Alpha_024	170	2.98 E+00	6.00 E-03	17.1
13	U-235	TRG	08/13/13 09:06		A_Spec	Alpha_025	170	2.00 E+00	0.00 E+00	17.4



Run	2
Analysis Code	UUISO
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

0501  
 219

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	07/23/13 00:00	1.0000	0.6134	11.6791		0.00		
02	MBL	BLANK	07/23/13 00:00	1.0000	0.6087	11.5896		0.00		
03	DUP	PZ-304-AS TOT	07/16/13 12:34	0.2500	0.6070	11.5573		0.00		
12	DO	PZ-304-AS TOT	07/16/13 12:34	0.2500	0.6034	11.4887		0.00		
13	TRG	PZ-304-AS DIS	07/16/13 12:34	0.2500	0.6099	11.6125		0.00		





# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07147</b>	<b>2</b>	<b>UUISO</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-304-AS TOT	DUP					2.5000E-01	2.5000E-01				
12	PZ-304-AS TOT	DO					2.5000E-01	2.5000E-01				
13	PZ-304-AS DIS	TRG					2.5000E-01	2.5000E-01				

Comments	
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Technician: J Wolfe Date: 8.9.13

10/13  
8/13/13



Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307147B-UU  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: U 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 7:05:52 AM  
 Acquisition Date/Time: 8/13/2013 9:05:58 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.613 mL  
 Effective Efficiency: 0.1923 +/- 0.0108  
 Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM  
 Chem. Recovery Factor: 1.1592 +/- 0.0684

Control Certificate Name: NatU\_U-8A  
 Chem. Recov. of Control: U-238 1.049880 +/- 0.079014  
 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 5.256	379.66	10.06	0.34	0.00E+000	6.1
U-234	4.722	509.00	8.70	0.00	0.00E+000	36.8
U-235	4.414	56.00	26.42	0.00	0.00E+000	3.3
U-238	4.153	626.49	7.83	0.51	0.00E+000	33.7

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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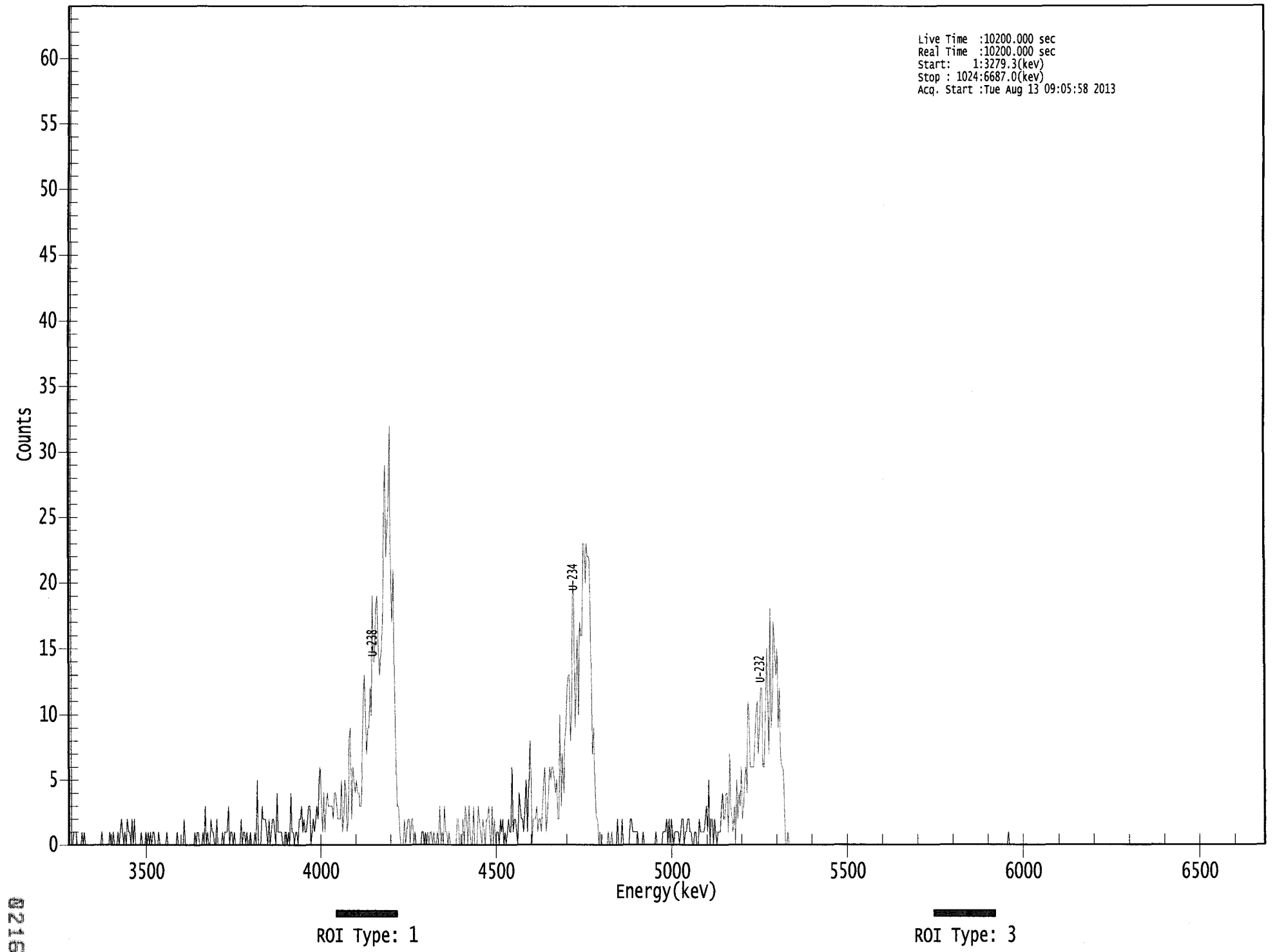
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.985	5302.50*	5.24E+000 +/- 5.78E-001	6.60E-002 +/- 7.28E-003
U-234	0.989	4761.50*	7.03E+000 +/- 9.87E-001	8.28E-002 +/- 9.13E-003
U-235	0.994	4385.50*	9.54E-001 +/- 2.73E-001	1.02E-001 +/- 1.13E-002
U-238	0.993	4184.40*	8.61E+000 +/- 1.16E+000	7.21E-002 +/- 7.95E-003

AG  
 8/13/13

US EPA ARCHIVE DOCUMENT

000066026.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3279.3(kev)  
Stop : 1024:6687.0(kev)  
Acq. Start :Tue Aug 13 09:05:58 2013



ROI Type: 1

ROI Type: 3

9120

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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: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	1	1	1	0
9:	0	0	0	1	0	1	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	1	0	0	0
33:	0	0	0	1	0	0	1	0
41:	0	0	1	0	1	2	1	0
49:	1	0	2	1	1	0	2	0
57:	2	0	0	0	0	0	1	0
65:	0	0	1	0	1	0	1	0
73:	1	1	0	0	0	1	0	0
81:	0	0	0	0	1	0	0	0
89:	0	0	0	0	0	1	0	0
97:	0	0	0	2	0	0	0	0
105:	0	0	0	0	1	0	1	1
113:	0	0	0	1	0	3	0	1
121:	0	0	2	1	1	0	0	2
129:	0	0	0	0	1	0	1	1
137:	1	3	0	1	1	0	1	0
145:	0	0	0	0	2	0	1	1
153:	0	1	0	0	1	0	0	0
161:	1	0	5	0	0	0	3	2
169:	2	2	1	0	2	0	1	2
177:	2	1	0	4	1	1	1	1
185:	0	0	1	1	0	1	0	4
193:	1	1	0	1	1	0	2	2
201:	3	1	2	1	1	2	3	3
209:	0	1	2	1	2	3	2	5
217:	6	3	1	4	1	3	4	3
225:	3	3	3	2	4	4	3	2
233:	2	2	5	1	2	5	4	1
241:	2	8	9	2	6	5	4	5
249:	4	4	3	3	6	11	13	10
257:	7	9	9	12	10	19	14	14
265:	18	19	16	13	14	15	17	25
273:	29	22	24	26	32	20	17	21
281:	13	7	3	3	1	0	0	0
289:	2	0	1	2	2	0	2	2
297:	0	1	0	0	0	0	0	1
305:	1	0	1	0	1	0	1	1
313:	0	1	0	0	1	0	3	0
321:	1	0	3	1	1	0	1	0
329:	0	0	0	0	0	2	2	0
337:	0	0	2	0	3	2	0	3
345:	1	0	0	3	0	0	0	3
353:	2	1	0	2	1	0	2	2
361:	3	1	0	3	0	2	0	1

369: 1 0 2 1 2 0 1 0

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
377:	1	2	1	1	6	1	2	2
385:	1	0	4	3	2	2	1	3
393:	5	1	4	6	8	0	2	2
401:	2	3	1	2	2	1	3	5
409:	6	1	2	4	6	5	6	6
417:	5	4	5	2	2	10	3	7
425:	4	8	9	12	13	13	8	10
433:	20	19	9	12	16	10	17	16
441:	16	23	23	20	23	22	22	19
449:	13	7	9	4	2	2	0	1
457:	0	0	0	0	0	0	1	0
465:	0	1	0	0	0	0	2	0
473:	0	0	2	0	0	0	0	0
481:	0	2	2	1	1	1	1	1
489:	0	0	0	0	1	0	0	0
497:	0	0	0	0	0	0	0	1
505:	0	0	0	0	0	1	1	1
513:	2	0	2	0	2	1	0	1
521:	1	1	1	0	1	2	2	0
529:	1	1	2	2	1	1	0	0
537:	1	1	0	0	2	1	1	1
545:	1	2	3	1	5	0	2	2
553:	0	2	1	0	1	1	1	3
561:	4	2	2	4	4	1	7	3
569:	2	1	3	0	5	2	4	3
577:	6	2	3	5	6	4	11	10
585:	6	6	6	6	8	10	11	7
593:	9	12	12	6	6	9	15	12
601:	7	18	9	11	17	15	13	15
609:	9	12	7	6	6	3	0	0
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	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 1 0 0 0

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	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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8/13/13

# Apex-Alpha™

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307147B-UU  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: U 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 7:05:52 AM  
 Acquisition Date/Time: 8/13/2013 9:05:59 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.609 mL  
 Effective Efficiency: 0.1772 +/- 0.0104  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Chem. Recovery Factor: 1.1572 +/- 0.0713

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 5.302	347.13	10.55	1.87	0.00E+000	25.3
U-234	4.687	12.81	57.66	1.19	0.00E+000	0.0
U-235	4.446	3.47	129.55	1.53	0.00E+000	3.1
U-238	4.106	5.83	82.55	0.17	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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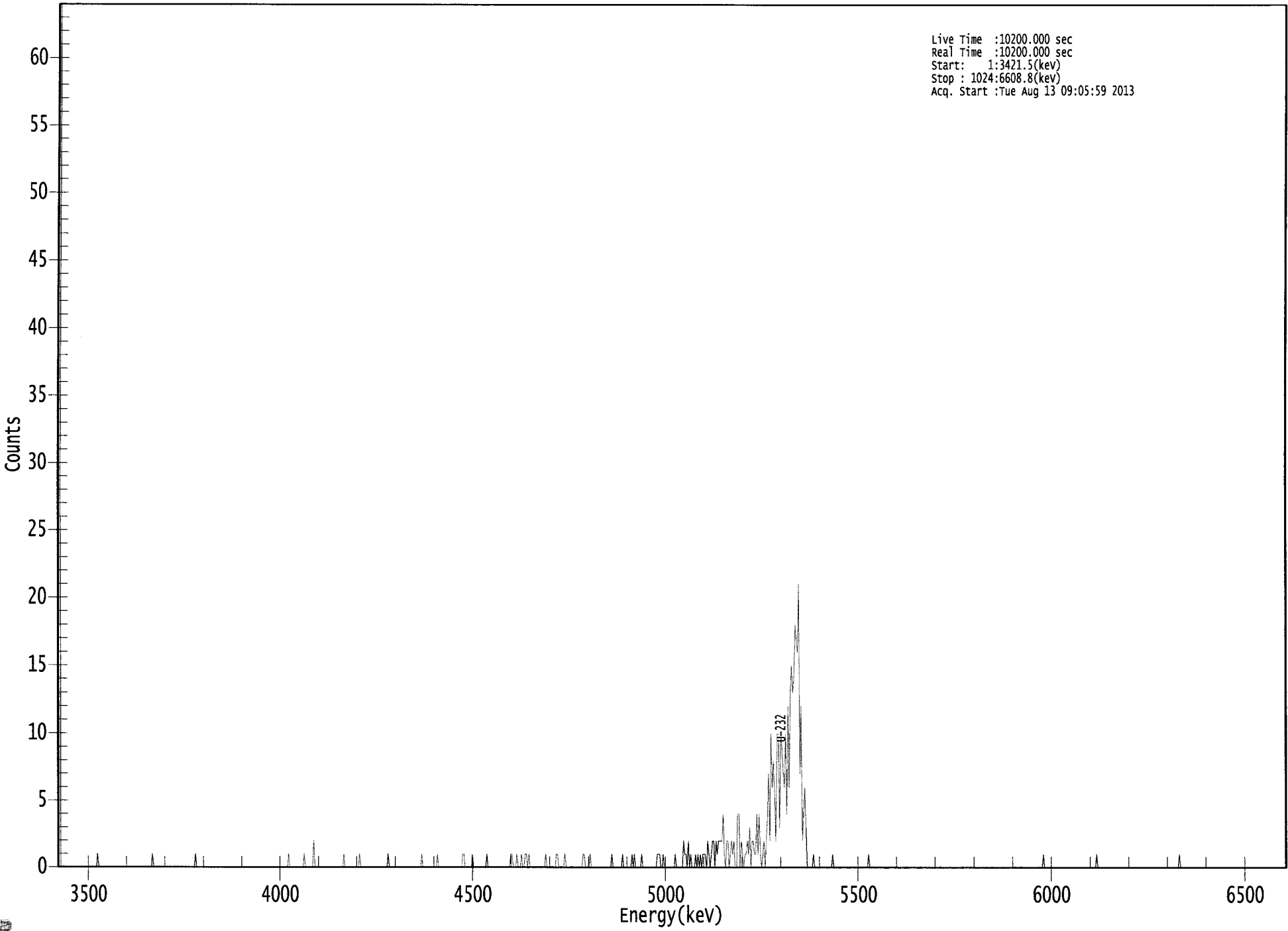
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	1.000	5302.50*	5.20E+000 +/- 5.97E-001	1.13E-001 +/- 1.30E-002
U-234	0.961	4761.50*	1.92E-001 +/- 1.13E-001	9.87E-002 +/- 1.13E-002
U-235	0.974	4385.50*	6.41E-002 +/- 8.34E-002	1.31E-001 +/- 1.51E-002
U-238	0.957	4184.40*	8.70E-002 +/- 7.25E-002	6.23E-002 +/- 7.14E-003

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000066027.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3421.5(kev)  
Stop : 1024:6608.8(kev)  
Acq. Start :Tue Aug 13 09:05:59 2013



ROI Type: 1

ROI Type: 3

0221



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 \*\*\*\*\* 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	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	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	0	0	0	0	0
113:	0	0	0	1	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	1	0	0	0	0	0	0
201:	0	0	0	0	0	0	1	0
209:	0	0	0	0	0	0	2	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	1
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	1	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	1	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:	1	0	0	0	0	0	0	0
313:	0	0	0	0	0	1	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	1	1	0	0	0	0
345:	0	0	1	0	0	0	0	0
353:	0	0	0	0	0	0	1	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	1	1	0	0	0	1
385:	0	0	0	1	0	0	1	1
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	1
409:	0	0	0	0	0	0	0	0
417:	1	1	0	0	0	0	0	1
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	1	1
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	1	0
465:	0	0	0	0	0	0	0	1
473:	0	0	0	0	0	0	0	1
481:	0	1	0	0	0	0	0	1
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	1	1	1	0
505:	0	1	0	0	0	0	0	0
513:	0	0	0	1	0	0	0	0
521:	0	0	2	1	1	0	2	0
529:	1	0	0	0	1	0	1	0
537:	1	0	1	1	1	0	2	1
545:	0	1	2	2	0	2	1	2
553:	2	2	2	4	1	0	2	2
561:	0	1	2	1	2	0	0	4
569:	4	0	2	1	0	1	1	2
577:	1	3	0	2	2	1	1	4
585:	1	4	1	0	1	2	0	2
593:	4	7	2	10	6	8	5	2
601:	10	10	3	10	9	7	6	10
609:	4	12	6	13	15	13	14	18
617:	17	16	21	7	12	2	4	6
625:	3	0	0	0	0	0	1	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	0	0	0	0	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	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: 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	1	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	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

WJ  
8/13/13

# Apex-Alpha™

Sample Description: PZ-304-AS TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307147B-UU  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 2.500E-001 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:52 AM  
 Acquisition Date/Time: 8/13/2013 9:06:00 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: 0.0624 +/- 0.0058  
 Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM  
 Chem. Recovery Factor: 0.3647 +/- 0.0347

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	121.83	17.77	0.17	0.00E+000	13.9
U-234	4.782	3.49	113.53	0.51	0.00E+000	3.1
U-235	4.430	2.32	149.12	0.68	0.00E+000	3.1
U-238	4.132	-1.02	208.15	1.02	0.00E+000	0.0

T = Tracer Peak used for Effective Efficiency

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

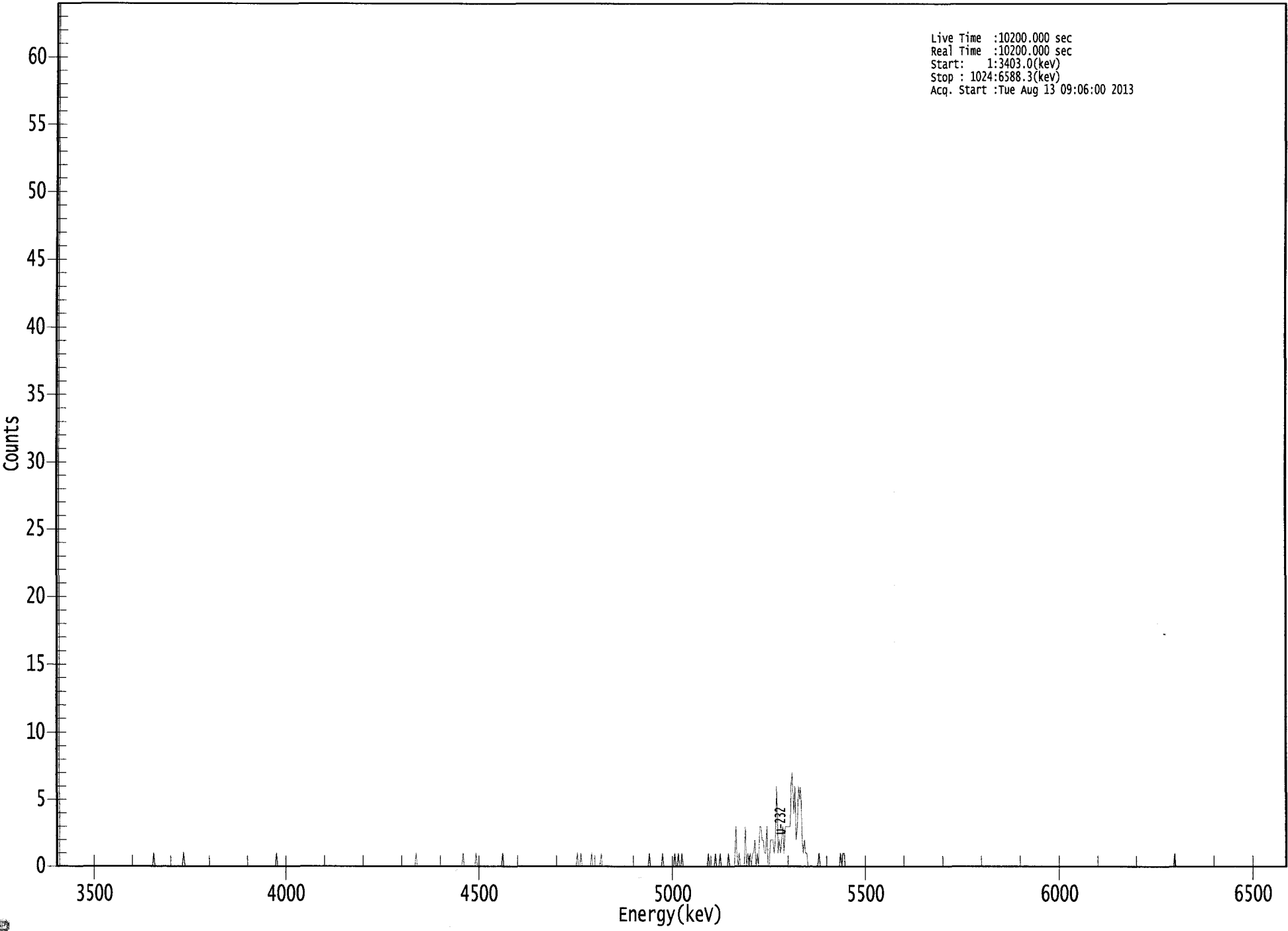
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.997	5302.50*	2.08E+001 +/- 3.81E+000	7.11E-001 +/- 1.30E-001
U-234	0.997	4761.50*	5.94E-001 +/- 6.83E-001	8.93E-001 +/- 1.64E-001
U-235	0.986	4385.50*	4.87E-001 +/- 7.32E-001	1.18E+000 +/- 2.17E-001
U-238	0.980	4184.40*	-1.73E-001 +/- 3.61E-001	1.07E+000 +/- 1.96E-001

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

000066028.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 09:06:00 2013



ROI Type: 1

ROI Type: 3

0226

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

Sample Title: 03

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	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	1	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	1	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	1	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	0	0	0	0	0	0
297:	0	0	0	0	1	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	1	0	0	0	0
345:	0	0	0	0	0	0	1	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 1 0 0 0

Sample Title: 03

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	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	1	0	0	1	0	0
441:	0	0	0	0	0	0	1	0
449:	0	0	0	0	0	0	1	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	1	0
497:	0	0	0	0	0	0	0	0
505:	0	1	0	0	0	0	0	0
513:	0	0	0	1	0	0	1	0
521:	0	1	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	1
545:	0	0	0	0	0	1	0	0
553:	0	1	0	0	0	0	0	0
561:	1	0	0	0	0	0	3	1
569:	0	1	0	0	0	0	3	0
577:	1	0	1	0	1	1	2	0
585:	1	0	3	3	2	2	1	1
593:	3	0	0	2	2	2	1	2
601:	6	1	2	1	2	3	1	3
609:	3	3	3	3	6	7	4	6
617:	2	3	6	5	6	2	1	2
625:	1	1	0	0	0	0	0	0
633:	0	0	0	1	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	1	0	1
657:	1	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0 0

Sample Title: 03

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



105  
8/13/13

# Apex-Alpha™

Sample Description: PZ-304-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307147B-UU  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 2.500E-001 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:52 AM  
 Acquisition Date/Time: 8/13/2013 9:06:01 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: 0.0540 +/- 0.0055  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Chem. Recovery Factor: 0.3156 +/- 0.0324

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 5.283	104.81	19.27	1.19	0.00E+000	5.4
U-234	4.685	2.32	149.12	0.68	0.00E+000	3.1
U-235	4.418	2.98	134.36	1.02	0.00E+000	3.1
U-238	4.098	2.32	149.12	0.68	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
 -----

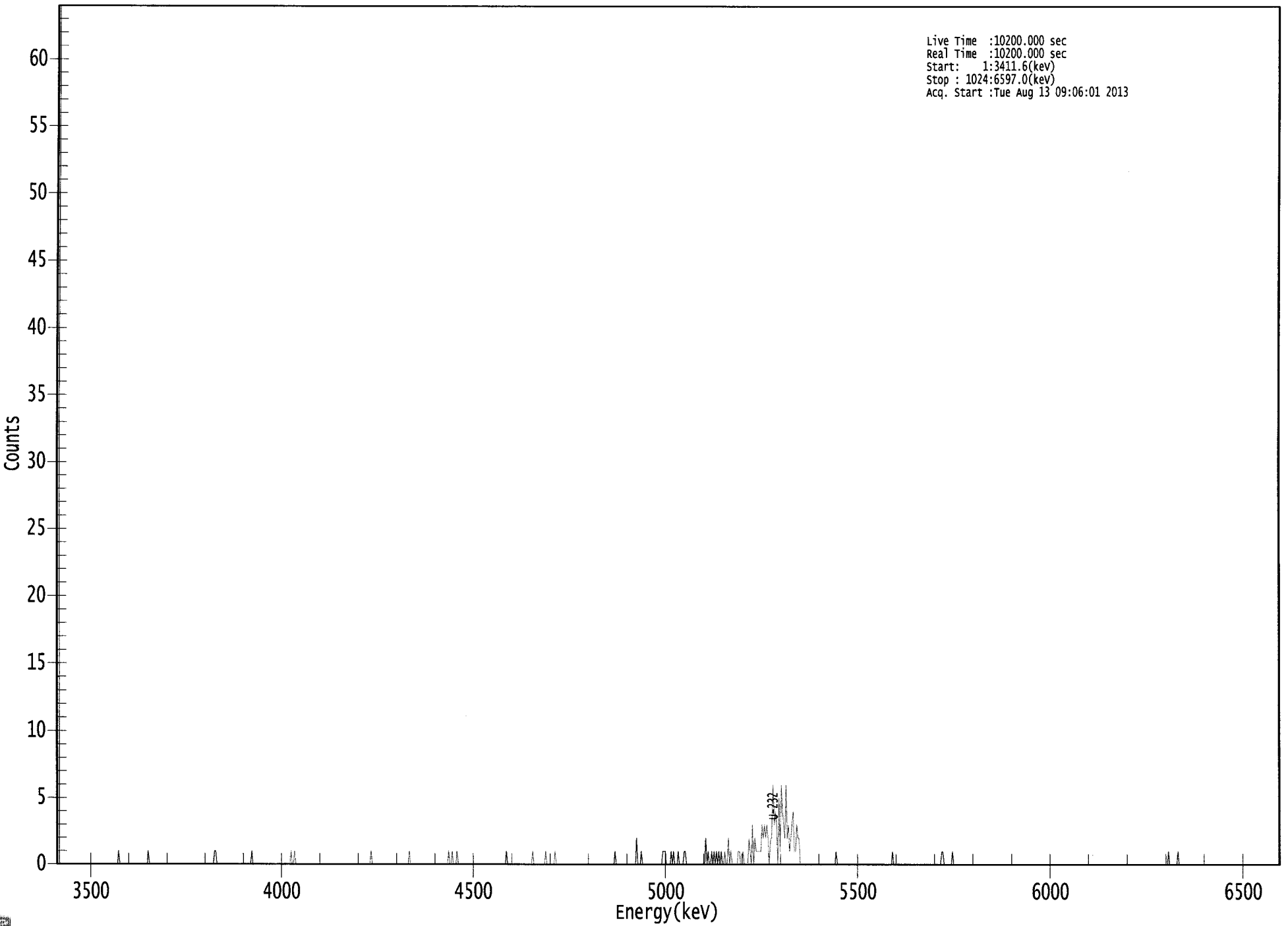
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.997	5302.50*	2.06E+001 +/- 4.08E+000	1.30E+000 +/- 2.57E-001
U-234	0.959	4761.50*	4.56E-001 +/- 6.87E-001	1.11E+000 +/- 2.20E-001
U-235	0.992	4385.50*	7.23E-001 +/- 9.82E-001	1.53E+000 +/- 3.03E-001
U-238	0.948	4184.40*	4.54E-001 +/- 6.84E-001	1.10E+000 +/- 2.19E-001

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

000066029.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 09:06:01 2013



ROI Type: 1

ROI Type: 3

021

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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	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	1	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	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:	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	1	1	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	1	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	1	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	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:	1	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	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	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	1	0	0	1	0	0	0
337:	1	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: 12

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	0	1
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:	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	1	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	2	0
489:	0	0	1	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	1	1	1	0
513:	0	0	0	1	0	1	0	0
521:	0	1	0	0	0	0	1	1
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	2	0	1	0	0	1	0	1
553:	0	1	0	1	0	1	0	0
561:	1	0	0	2	0	1	0	0
569:	0	0	0	1	1	0	0	1
577:	0	0	0	0	2	1	0	3
585:	0	2	1	1	1	1	1	3
593:	2	3	2	3	2	0	2	2
601:	6	3	4	3	0	5	1	6
609:	4	3	2	6	2	3	1	2
617:	3	4	1	1	3	2	2	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	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	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	1	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	1	1	0
745:	0	0	0	0	0	0	1	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 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	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	1	0	0	0	0	0
937:	0	0	1	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

KP  
8/13/13



Sample Description: PZ-304-AS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307147B-UU  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 2.500E-001 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:05:52 AM  
 Acquisition Date/Time: 8/13/2013 9:06:02 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.610 mL  
 Effective Efficiency: 0.0751 +/- 0.0064  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Chem. Recovery Factor: 0.4325 +/- 0.0380

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 5.266	147.32	16.19	0.68	0.00E+000	11.8
U-234	4.740	8.98	69.62	1.02	0.00E+000	4.7
U-235	4.438	2.00	169.74	0.00	0.00E+000	3.1
U-238	4.167	3.83	102.72	0.17	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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

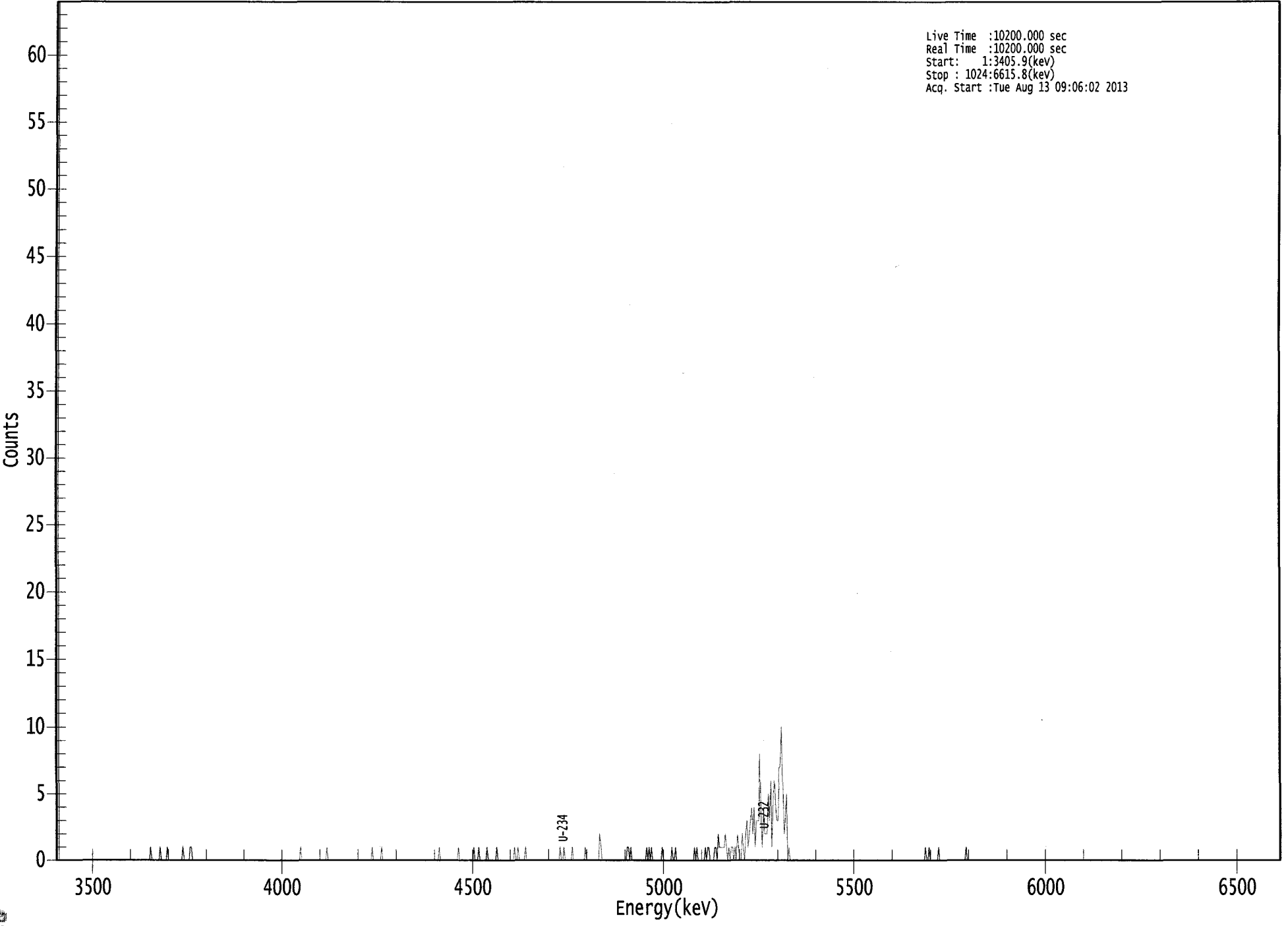
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.991	5302.50*	2.09E+001 +/- 3.51E+000	7.99E-001 +/- 1.34E-001
U-234	0.997	4761.50*	1.27E+000 +/- 9.10E-001	8.91E-001 +/- 1.50E-001
U-235	0.980	4385.50*	3.49E-001 +/- 5.95E-001	1.05E+000 +/- 1.76E-001
U-238	0.998	4184.40*	5.40E-001 +/- 5.62E-001	5.88E-001 +/- 9.88E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

000066030.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 09:06:02 2013



ROI Type: 1

ROI Type: 3

0235  
9920

\*\*\*\*\*  
 \*\*\*\*\* 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:	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	1
81:	0	0	0	0	0	0	0	1
89:	0	0	0	0	0	1	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	1	0	0	0	0	0
113:	1	1	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:	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	1	0	0
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	1	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	0	0	0	0	0	0
321:	0	1	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	1	0	0	0	0	0	0
345:	0	0	0	0	0	0	1	0
353:	0	0	1	0	0	0	0	0
361:	0	1	0	0	0	0	0	0



369: 0 1 0 0 0 0 0 0

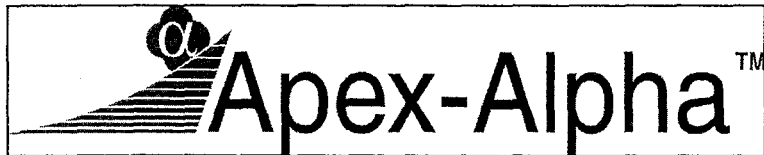
Sample Title: 13

Channel	1	2	3	4	5	6	7	8	9
377:	0	0	0	0	0	0	0	0	0
385:	1	0	0	1	0	0	0	0	0
393:	0	1	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	1	0
425:	0	1	0	0	0	0	0	0	0
433:	1	0	0	0	0	0	0	0	0
441:	0	0	0	1	0	0	0	0	0
449:	0	0	0	0	0	0	0	0	2
457:	1	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	1	1
481:	0	1	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	1	0
497:	1	0	1	0	0	0	0	0	0
505:	0	0	0	1	0	0	0	0	0
513:	0	0	0	1	0	0	0	1	0
521:	0	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	1	0
537:	1	0	0	0	0	0	0	0	1
545:	0	1	1	0	0	0	0	0	1
553:	1	0	2	1	1	1	1	1	1
561:	2	1	0	1	0	1	1	1	0
569:	1	0	2	1	0	0	2	2	1
577:	0	2	3	1	2	3	4	4	2
585:	4	1	3	3	3	8	3	3	1
593:	4	2	2	2	5	3	6	6	1
601:	5	6	4	3	3	7	7	7	10
609:	6	2	3	5	0	1	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	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	1
729:	0	0	1	0	0	0	0	0	0
737:	0	0	1	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	1	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 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	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

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 043	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:42 AM
Alpha 044	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:44 AM
Alpha 045	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:46 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:47 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:49 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:50 AM

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

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

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)**

Work Order	<b>13-07147</b>
Analysis Code	<b>ThISO</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	I
Matrix	WA
Method	HASL 300, 4.5.2
Instrument Type	Alpha Spectroscopy
Radiometric Tracer	Th-229
Radiometric Sol#	Th-18a
Tracer Act (dpm/g)	22.466
Carrier	
Carrier Conc (mg/ml)	

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		07/23/13 00:00	1.0000E+00
02	MBL	BLANK		07/23/13 00:00	1.0000E+00
03	DUP	D-12 TOT	46	07/15/13 15:27	1.0000E+00
04	DO	D-12 TOT	46	07/15/13 15:27	1.0000E+00
05	TRG	D-12 DIS	46	07/15/13 15:27	1.0000E+00
06	TRG	DUP05 TOT	45	07/15/13 00:00	1.0000E+00
07	TRG	DUP05 DIS	45	07/15/13 00:00	1.0000E+00
08	TRG	PZ-208-SS TOT	43	07/16/13 09:25	1.0000E+00
09	TRG	PZ-208-SS DIS	43	07/16/13 09:25	1.0000E+00
10	TRG	PZ-304-AI TOT	46	07/16/13 12:05	1.0000E+00
11	TRG	PZ-304-AI DIS	46	07/16/13 12:05	1.0000E+00
12	TRG	PZ-304-AS TOT	41	07/16/13 12:34	1.0000E+00
13	TRG	PZ-304-AS DIS	41	07/16/13 12:34	1.0000E+00
14	TRG	MW-104 TOT	41	07/16/13 13:25	1.0000E+00
15	TRG	MW-104 DIS	41	07/16/13 13:25	1.0000E+00
16	TRG	PZ-204A-SS TOT	40	07/16/13 13:56	1.0000E+00
17	TRG	PZ-204A-SS DIS	40	07/16/13 13:56	1.0000E+00
18	TRG	PZ-302-AI TOT	44	07/16/13 15:18	1.0000E+00
19	TRG	PZ-302-AI DIS	44	07/16/13 15:18	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	0.4801	10.8		0.00								
02	MBL	0.2401	5.4		0.00								
03	DUP	0.2373	5.3		0.00								
04	DO	0.2358	5.3		0.00								
05	TRG	0.2356	5.3		0.00								
06	TRG	0.2368	5.3		0.00								
07	TRG	0.2341	5.3		0.00								
08	TRG	0.2345	5.3		0.00								
09	TRG	0.2353	5.3		0.00								
10	TRG	0.2354	5.3		0.00								
11	TRG	0.2351	5.3		0.00								
12	TRG	0.2332	5.2		0.00								
13	TRG	0.2350	5.3		0.00								
14	TRG	0.2339	5.3		0.00								
15	TRG	0.2331	5.2		0.00								
16	TRG	0.2340	5.3		0.00								
17	TRG	0.2345	5.3		0.00								
18	TRG	0.2352	5.3		0.00								
19	TRG	0.2356	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.



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			08/02/13 08:16	JWOLFE				
02	MBL			08/02/13 08:16	JWOLFE				
03	DUP			08/02/13 08:16	JWOLFE				
04	DO			08/02/13 08:16	JWOLFE				
05	TRG			08/02/13 08:16	JWOLFE				
06	TRG			08/02/13 08:16	JWOLFE				
07	TRG			08/02/13 08:16	JWOLFE				
08	TRG			08/02/13 08:16	JWOLFE				
09	TRG			08/02/13 08:16	JWOLFE				
10	TRG			08/02/13 08:16	JWOLFE				
11	TRG			08/02/13 08:16	JWOLFE				
12	TRG			08/02/13 08:16	JWOLFE				
13	TRG			08/02/13 08:16	JWOLFE				
14	TRG			08/02/13 08:16	JWOLFE				
15	TRG			08/02/13 08:16	JWOLFE				
16	TRG			08/02/13 08:16	JWOLFE				
17	TRG			08/02/13 08:16	JWOLFE				
18	TRG			08/02/13 08:16	JWOLFE				
19	TRG			08/02/13 08:16	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: 13-07147-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-228	LCS	LCS	pCi/l	4.58E+00	7.22E-01	1.18E-01	4.89E+00	93.51	OK		OK	
02	TH-228	MBL	BLANK	pCi/l	1.19E-03	5.61E-02	1.29E-01					OK	OK
03	TH-228	DUP	D-12 TOT	pCi/l	8.45E-02	1.85E-01	3.50E-01				NA	OK	
04	TH-228	DO	D-12 TOT	pCi/l	1.05E-01	1.01E-01	1.22E-01					OK	
05	TH-228	TRG	D-12 DIS	pCi/l	-2.64E-02	6.54E-02	1.86E-01					OK	
06	TH-228	TRG	DUP05 TOT	pCi/l	2.92E-02	7.05E-02	1.41E-01					OK	
07	TH-228	TRG	DUP05 DIS	pCi/l	-1.75E-02	6.13E-02	1.61E-01					OK	
08	TH-228	TRG	PZ-208-SS TOT	pCi/l	2.09E-01	1.38E-01	1.14E-01					OK	
09	TH-228	TRG	PZ-208-SS DIS	pCi/l	8.57E-02	7.69E-02	8.19E-02					OK	
10	TH-228	TRG	PZ-304-AI TOT	pCi/l	1.03E-01	8.68E-02	7.36E-02					OK	
11	TH-228	TRG	PZ-304-AI DIS	pCi/l	6.57E-02	7.80E-02	1.14E-01					OK	
12	TH-228	TRG	PZ-304-AS TOT	pCi/l	2.85E-02	6.19E-02	1.22E-01					OK	
13	TH-228	TRG	PZ-304-AS DIS	pCi/l	9.25E-02	9.66E-02	1.21E-01					OK	
14	TH-228	TRG	MW-104 TOT	pCi/l	7.10E-01	2.49E-01	9.47E-02					OK	
15	TH-228	TRG	MW-104 DIS	pCi/l	2.81E-03	3.93E-02	1.12E-01					OK	
16	TH-228	TRG	PZ-204A-SS TOT	pCi/l	3.72E-01	2.08E-01	1.47E-01					OK	
17	TH-228	TRG	PZ-204A-SS DIS	pCi/l	4.02E-02	6.04E-02	9.78E-02					OK	
18	TH-228	TRG	PZ-302-AI TOT	pCi/l	1.18E-01	9.25E-02	7.24E-02					OK	
19	TH-228	TRG	PZ-302-AI DIS	pCi/l	-2.69E-03	3.15E-02	6.62E-02					OK	

Run	1
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

4720

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-THISO-1**



Run **1**

Analysis Code **THISO**

Eberline Services Work Order **13-07147**

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	TH-228	LCS	07/23/13 00:00	1.00E+00	117.53	0.00	0.00			
02	TH-228	MBL	07/23/13 00:00	1.00E+00	103.21	0.00	0.00			
03	TH-228	DUP	07/15/13 15:27	1.00E+00	34.56	0.00	0.00			
04	TH-228	DO	07/15/13 15:27	1.00E+00	64.88	0.00	0.00			
05	TH-228	TRG	07/15/13 15:27	1.00E+00	44.04	0.00	0.00			
06	TH-228	TRG	07/15/13 00:00	1.00E+00	73.35	0.00	0.00			
07	TH-228	TRG	07/15/13 00:00	1.00E+00	90.78	0.00	0.00			
08	TH-228	TRG	07/16/13 09:25	1.00E+00	90.94	0.00	0.00			
09	TH-228	TRG	07/16/13 09:25	1.00E+00	94.22	0.00	0.00			
10	TH-228	TRG	07/16/13 12:05	1.00E+00	83.12	0.00	0.00			
11	TH-228	TRG	07/16/13 12:05	1.00E+00	86.31	0.00	0.00			
12	TH-228	TRG	07/16/13 12:34	1.00E+00	65.84	0.00	0.00			
13	TH-228	TRG	07/16/13 12:34	1.00E+00	71.24	0.00	0.00			
14	TH-228	TRG	07/16/13 13:25	1.00E+00	94.06	0.00	0.00			
15	TH-228	TRG	07/16/13 13:25	1.00E+00	73.83	0.00	0.00			
16	TH-228	TRG	07/16/13 13:56	1.00E+00	58.20	0.00	0.00			
17	TH-228	TRG	07/16/13 13:56	1.00E+00	82.16	0.00	0.00			
18	TH-228	TRG	07/16/13 15:18	1.00E+00	87.62	0.00	0.00			
19	TH-228	TRG	07/16/13 15:18	1.00E+00	94.15	0.00	0.00			

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-THISO-1**

	
Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07147
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	08/10/13 14:55		A_Spec	Alpha_003	170	3.54 E+02	1.90 E-02	17.5
02	TH-228	MBL	08/10/13 14:55		A_Spec	Alpha_004	170.02	8.97 E-02	2.30 E-02	19.4
03	TH-228	DUP	08/10/13 14:55		A_Spec	Alpha_010	170	2.11 E+00	1.70 E-02	19.7
04	TH-228	DO	08/10/13 14:55		A_Spec	Alpha_011	170	5.15 E+00	5.00 E-03	20.5
05	TH-228	TRG	08/10/13 14:55		A_Spec	Alpha_012	170	-8.50 E-01	5.00 E-03	19.9
06	TH-228	TRG	08/10/13 14:55		A_Spec	Alpha_013	170	1.47 E+00	9.00 E-03	18.7
07	TH-228	TRG	08/10/13 14:55		A_Spec	Alpha_014	170.02	-1.08 E+00	2.40 E-02	18.5
08	TH-228	TRG	08/10/13 14:55		A_Spec	Alpha_015	170	1.03 E+01	4.00 E-03	14.8
09	TH-228	TRG	08/10/13 15:01		A_Spec	Alpha_033	170	5.49 E+00	3.00 E-03	18.5
10	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_034	170	5.83 E+00	1.00 E-03	18.6
11	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_035	170	3.81 E+00	7.00 E-03	18.3
12	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_036	170	1.32 E+00	4.00 E-03	19.1
13	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_037	170	4.32 E+00	4.00 E-03	17.8
14	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_038	170	4.23 E+01	4.00 E-03	17.2
15	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_039	170	1.50 E-01	5.00 E-03	19.7
16	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_040	170	1.51 E+01	5.00 E-03	19
17	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_045	170	2.32 E+00	4.00 E-03	19.1
18	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_046	170	6.83 E+00	1.00 E-03	17.9
19	TH-228	TRG	08/10/13 15:02		A_Spec	Alpha_047	170	-1.70 E-01	1.00 E-03	18.2

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-THISO-1**

	<b>Run</b>	<b>1</b>
<b>Analysis Code</b>	<b>THISO</b>	
<b>Eberline Services Work Order</b>	<b>13-07147</b>	
<b>Client</b>	<b>Engineering Management Support, Inc.</b>	

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	5.00E+00	7.73E-01	8.15E-02	5.46E+00	91.71	OK		OK	
02	TH-230	MBL	BLANK	pCi/l	4.55E-01	1.72E-01	9.74E-02					OK	OK
03	TH-230	DUP	D-12 TOT	pCi/l	8.32E-01	4.29E-01	2.87E-01				INV	OK	
04	TH-230	DO	D-12 TOT	pCi/l	5.35E-01	2.27E-01	8.33E-02					OK	
05	TH-230	TRG	D-12 DIS	pCi/l	5.40E-01	2.81E-01	1.26E-01					OK	
06	TH-230	TRG	DUP05 TOT	pCi/l	5.36E-01	2.25E-01	9.26E-02					OK	
07	TH-230	TRG	DUP05 DIS	pCi/l	5.44E-01	2.06E-01	8.94E-02					OK	
08	TH-230	TRG	PZ-208-SS TOT	pCi/l	6.98E-01	2.68E-01	1.11E-01					OK	
09	TH-230	TRG	PZ-208-SS DIS	pCi/l	4.27E-01	1.76E-01	9.14E-02					OK	
10	TH-230	TRG	PZ-304-AI TOT	pCi/l	6.20E-01	2.33E-01	1.03E-01					OK	
11	TH-230	TRG	PZ-304-AI DIS	pCi/l	2.47E-01	1.35E-01	8.05E-02					OK	
12	TH-230	TRG	PZ-304-AS TOT	pCi/l	6.44E-01	2.63E-01	1.11E-01					OK	
13	TH-230	TRG	PZ-304-AS DIS	pCi/l	6.41E-01	2.60E-01	9.99E-02					OK	
14	TH-230	TRG	MW-104 TOT	pCi/l	1.15E+00	3.36E-01	9.83E-02					OK	
15	TH-230	TRG	MW-104 DIS	pCi/l	4.63E-01	2.02E-01	1.03E-01					OK	
16	TH-230	TRG	PZ-204A-SS TOT	pCi/l	4.88E-01	2.38E-01	1.35E-01					OK	
17	TH-230	TRG	PZ-204A-SS DIS	pCi/l	4.17E-01	1.82E-01	8.09E-02					OK	
18	TH-230	TRG	PZ-302-AI TOT	pCi/l	5.93E-01	2.25E-01	1.02E-01					OK	
19	TH-230	TRG	PZ-302-AI DIS	pCi/l	5.70E-01	2.08E-01	6.46E-02					OK	

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-THISO-1**



Run **1**

Analysis Code **THISO**

Eberline Services Work Order **13-07147**

Client **Engineering Management Support, Inc.**

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep 10 Date/Time	Sep 11 Date/Time
01	TH-230	LCS	07/23/13 00:00	1.00E+00	117.53	0.00	0.00			
02	TH-230	MBL	07/23/13 00:00	1.00E+00	103.21	0.00	0.00			
03	TH-230	DUP	07/15/13 15:27	1.00E+00	34.56	0.00	0.00			
04	TH-230	DO	07/15/13 15:27	1.00E+00	64.88	0.00	0.00			
05	TH-230	TRG	07/15/13 15:27	1.00E+00	44.04	0.00	0.00			
06	TH-230	TRG	07/15/13 00:00	1.00E+00	73.35	0.00	0.00			
07	TH-230	TRG	07/15/13 00:00	1.00E+00	90.78	0.00	0.00			
08	TH-230	TRG	07/16/13 09:25	1.00E+00	90.94	0.00	0.00			
09	TH-230	TRG	07/16/13 09:25	1.00E+00	94.22	0.00	0.00			
10	TH-230	TRG	07/16/13 12:05	1.00E+00	83.12	0.00	0.00			
11	TH-230	TRG	07/16/13 12:05	1.00E+00	86.31	0.00	0.00			
12	TH-230	TRG	07/16/13 12:34	1.00E+00	65.84	0.00	0.00			
13	TH-230	TRG	07/16/13 12:34	1.00E+00	71.24	0.00	0.00			
14	TH-230	TRG	07/16/13 13:25	1.00E+00	94.06	0.00	0.00			
15	TH-230	TRG	07/16/13 13:25	1.00E+00	73.83	0.00	0.00			
16	TH-230	TRG	07/16/13 13:56	1.00E+00	58.20	0.00	0.00			
17	TH-230	TRG	07/16/13 13:56	1.00E+00	82.16	0.00	0.00			
18	TH-230	TRG	07/16/13 15:18	1.00E+00	87.62	0.00	0.00			
19	TH-230	TRG	07/16/13 15:18	1.00E+00	94.15	0.00	0.00			

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-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	08/10/13 14:55		A_Spec	Alpha_003	170	3.87 E+02	6.00 E-03	17.5
02	TH-230	MBL	08/10/13 14:55		A_Spec	Alpha_004	170.02	3.43 E+01	1.00 E-02	19.4
03	TH-230	DUP	08/10/13 14:55		A_Spec	Alpha_010	170	2.13 E+01	1.00 E-02	19.7
04	TH-230	DO	08/10/13 14:55		A_Spec	Alpha_011	170	2.68 E+01	1.00 E-03	20.5
05	TH-230	TRG	08/10/13 14:55		A_Spec	Alpha_012	170	1.78 E+01	1.00 E-03	19.9
06	TH-230	TRG	08/10/13 14:55		A_Spec	Alpha_013	170	2.77 E+01	2.00 E-03	18.7
07	TH-230	TRG	08/10/13 14:55		A_Spec	Alpha_014	170.02	3.43 E+01	4.00 E-03	18.5
08	TH-230	TRG	08/10/13 14:55		A_Spec	Alpha_015	170	3.53 E+01	4.00 E-03	14.8
09	TH-230	TRG	08/10/13 15:01		A_Spec	Alpha_033	170	2.80 E+01	0.00 E+00	18.5
10	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_034	170	3.60 E+01	0.00 E+00	18.6
11	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_035	170	1.47 E+01	2.00 E-03	18.3
12	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_036	170	3.05 E+01	3.00 E-03	19.1
13	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_037	170	3.07 E+01	2.00 E-03	17.8
14	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_038	170	7.00 E+01	0.00 E+00	17.2
15	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_039	170	2.53 E+01	4.00 E-03	19.7
16	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_040	170	2.03 E+01	4.00 E-03	19
17	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_045	170	2.47 E+01	2.00 E-03	19.1
18	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_046	170	3.50 E+01	0.00 E+00	17.9
19	TH-230	TRG	08/10/13 15:02		A_Spec	Alpha_047	170	3.68 E+01	1.00 E-03	18.2

Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-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	4.93E+00	7.63E-01	6.77E-02	4.89E+00	100.65	OK		OK	
02	TH-232	MBL	BLANK	pCi/l	8.14E-02	7.05E-02	7.92E-02					OK	OK
03	TH-232	DUP	D-12 TOT	pCi/l	6.39E-02	1.38E-01	2.67E-01				NA	OK	
04	TH-232	DO	D-12 TOT	pCi/l	1.16E-01	9.83E-02	8.31E-02					OK	
05	TH-232	TRG	D-12 DIS	pCi/l	9.53E-02	1.23E-01	1.81E-01					OK	
06	TH-232	TRG	DUP05 TOT	pCi/l	1.71E-01	1.18E-01	8.07E-02					OK	
07	TH-232	TRG	DUP05 DIS	pCi/l	-1.08E-02	3.28E-02	8.92E-02					OK	
08	TH-232	TRG	PZ-208-SS TOT	pCi/l	2.53E-01	1.48E-01	8.23E-02					OK	
09	TH-232	TRG	PZ-208-SS DIS	pCi/l	8.87E-02	7.47E-02	6.35E-02					OK	
10	TH-232	TRG	PZ-304-AI TOT	pCi/l	4.86E-02	5.92E-02	7.17E-02					OK	
11	TH-232	TRG	PZ-304-AI DIS	pCi/l	6.44E-02	6.71E-02	7.02E-02					OK	
12	TH-232	TRG	PZ-304-AS TOT	pCi/l	1.47E-01	1.22E-01	1.33E-01					OK	
13	TH-232	TRG	PZ-304-AS DIS	pCi/l	1.01E-01	9.38E-02	8.71E-02					OK	
14	TH-232	TRG	MW-104 TOT	pCi/l	6.03E-01	2.22E-01	6.83E-02					OK	
15	TH-232	TRG	MW-104 DIS	pCi/l	4.86E-02	6.32E-02	8.73E-02					OK	
16	TH-232	TRG	PZ-204A-SS TOT	pCi/l	1.84E-01	1.39E-01	1.15E-01					OK	
17	TH-232	TRG	PZ-204A-SS DIS	pCi/l	1.15E-01	9.01E-02	7.05E-02					OK	
18	TH-232	TRG	PZ-302-AI TOT	pCi/l	1.52E-01	1.08E-01	1.01E-01					OK	
19	TH-232	TRG	PZ-302-AI DIS	pCi/l	7.20E-02	6.92E-02	7.39E-02					OK	

Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-THISO-1**



Run **1**

Analysis Code **THISO**

Eberline Services Work Order **13-07147**

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	TH-232	LCS	07/23/13 00:00	1.00E+00	117.53	0.00	0.00			
02	TH-232	MBL	07/23/13 00:00	1.00E+00	103.21	0.00	0.00			
03	TH-232	DUP	07/15/13 15:27	1.00E+00	34.56	0.00	0.00			
04	TH-232	DO	07/15/13 15:27	1.00E+00	64.88	0.00	0.00			
05	TH-232	TRG	07/15/13 15:27	1.00E+00	44.04	0.00	0.00			
06	TH-232	TRG	07/15/13 00:00	1.00E+00	73.35	0.00	0.00			
07	TH-232	TRG	07/15/13 00:00	1.00E+00	90.78	0.00	0.00			
08	TH-232	TRG	07/16/13 09:25	1.00E+00	90.94	0.00	0.00			
09	TH-232	TRG	07/16/13 09:25	1.00E+00	94.22	0.00	0.00			
10	TH-232	TRG	07/16/13 12:05	1.00E+00	83.12	0.00	0.00			
11	TH-232	TRG	07/16/13 12:05	1.00E+00	86.31	0.00	0.00			
12	TH-232	TRG	07/16/13 12:34	1.00E+00	65.84	0.00	0.00			
13	TH-232	TRG	07/16/13 12:34	1.00E+00	71.24	0.00	0.00			
14	TH-232	TRG	07/16/13 13:25	1.00E+00	94.06	0.00	0.00			
15	TH-232	TRG	07/16/13 13:25	1.00E+00	73.83	0.00	0.00			
16	TH-232	TRG	07/16/13 13:56	1.00E+00	58.20	0.00	0.00			
17	TH-232	TRG	07/16/13 13:56	1.00E+00	82.16	0.00	0.00			
18	TH-232	TRG	07/16/13 15:18	1.00E+00	87.62	0.00	0.00			
19	TH-232	TRG	07/16/13 15:18	1.00E+00	94.15	0.00	0.00			

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-THISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-232	LCS	08/10/13 14:55		A_Spec	Alpha_003	170	3.81 E+02	3.00 E-03	17.5
02	TH-232	MBL	08/10/13 14:55		A_Spec	Alpha_004	170.02	6.15 E+00	5.00 E-03	19.4
03	TH-232	DUP	08/10/13 14:55		A_Spec	Alpha_010	170	1.64 E+00	8.00 E-03	19.7
04	TH-232	DO	08/10/13 14:55		A_Spec	Alpha_011	170	5.83 E+00	1.00 E-03	20.5
05	TH-232	TRG	08/10/13 14:55		A_Spec	Alpha_012	170	3.15 E+00	5.00 E-03	19.9
06	TH-232	TRG	08/10/13 14:55		A_Spec	Alpha_013	170	8.83 E+00	1.00 E-03	18.7
07	TH-232	TRG	08/10/13 14:55		A_Spec	Alpha_014	170.02	-6.80 E-01	4.00 E-03	18.5
08	TH-232	TRG	08/10/13 14:55		A_Spec	Alpha_015	170	1.28 E+01	1.00 E-03	14.8
09	TH-232	TRG	08/10/13 15:01		A_Spec	Alpha_033	170	5.83 E+00	1.00 E-03	18.5
10	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_034	170	2.83 E+00	1.00 E-03	18.6
11	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_035	170	3.83 E+00	1.00 E-03	18.3
12	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_036	170	6.98 E+00	6.00 E-03	19.1
13	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_037	170	4.83 E+00	1.00 E-03	17.8
14	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_038	170	3.68 E+01	1.00 E-03	17.2
15	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_039	170	2.66 E+00	2.00 E-03	19.7
16	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_040	170	7.66 E+00	2.00 E-03	19
17	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_045	170	6.83 E+00	1.00 E-03	19.1
18	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_046	170	9.00 E+00	0.00 E+00	17.9
19	TH-232	TRG	08/10/13 15:02		A_Spec	Alpha_047	170	4.66 E+00	2.00 E-03	18.2

Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07147
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	07/23/13 00:00	1.0000	0.4801	10.7859		0.00		
02	MBL	BLANK	07/23/13 00:00	1.0000	0.2401	5.3941		0.00		
03	DUP	D-12 TOT	07/15/13 15:27	1.0000	0.2373	5.3312		0.00		
04	DO	D-12 TOT	07/15/13 15:27	1.0000	0.2358	5.2975		0.00		
05	TRG	D-12 DIS	07/15/13 15:27	1.0000	0.2356	5.2930		0.00		
06	TRG	DUP05 TOT	07/15/13 00:00	1.0000	0.2368	5.3199		0.00		
07	TRG	DUP05 DIS	07/15/13 00:00	1.0000	0.2341	5.2593		0.00		
08	TRG	PZ-208-SS TOT	07/16/13 09:25	1.0000	0.2345	5.2683		0.00		
09	TRG	PZ-208-SS DIS	07/16/13 09:25	1.0000	0.2353	5.2862		0.00		
10	TRG	PZ-304-AI TOT	07/16/13 12:05	1.0000	0.2354	5.2885		0.00		
11	TRG	PZ-304-AI DIS	07/16/13 12:05	1.0000	0.2351	5.2818		0.00		
12	TRG	PZ-304-AS TOT	07/16/13 12:34	1.0000	0.2332	5.2391		0.00		
13	TRG	PZ-304-AS DIS	07/16/13 12:34	1.0000	0.2350	5.2795		0.00		
14	TRG	MW-104 TOT	07/16/13 13:25	1.0000	0.2339	5.2548		0.00		
15	TRG	MW-104 DIS	07/16/13 13:25	1.0000	0.2331	5.2368		0.00		
16	TRG	PZ-204A-SS TOT	07/16/13 13:56	1.0000	0.2340	5.2570		0.00		
17	TRG	PZ-204A-SS DIS	07/16/13 13:56	1.0000	0.2345	5.2683		0.00		
18	TRG	PZ-302-AI TOT	07/16/13 15:18	1.0000	0.2352	5.2840		0.00		
19	TRG	PZ-302-AI DIS	07/16/13 15:18	1.0000	0.2356	5.2930		0.00		

*0-15*

*53-40*

*15-47*

*0255*

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
<b>13-07147</b>	<b>1</b>	<b>ThISO</b>	<b>8/2/2013 8:15</b>	<b>JWOLFE</b>	<i>JW</i>	

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	8/2/2013	0.100	0.1049				4.89	0.176	0.00	0.000	0.00	0.000	0.00	0.000
Th-230	Th-1b	23.525	8/2/2013	0.500	0.5150				5.46	0.147	0.00	0.000	0.00	0.000	0.00	0.000
Th-232	Th-8b	103.560	8/2/2013	0.100	0.1049				4.89	0.176	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	8/2/2013	0.4801	0.2200										
02	Th-229	Th-18a	22.466	8/2/2013	0.2401	0.2200										
03	Th-229	Th-18a	22.466	8/2/2013	0.2373	0.2200										
04	Th-229	Th-18a	22.466	8/2/2013	0.2358	0.2200										
05	Th-229	Th-18a	22.466	8/2/2013	0.2356	0.2200										
06	Th-229	Th-18a	22.466	8/2/2013	0.2368	0.2200										
07	Th-229	Th-18a	22.466	8/2/2013	0.2341	0.2200										
08	Th-229	Th-18a	22.466	8/2/2013	0.2345	0.2200										
09	Th-229	Th-18a	22.466	8/2/2013	0.2353	0.2200										
10	Th-229	Th-18a	22.466	8/2/2013	0.2354	0.2200										
11	Th-229	Th-18a	22.466	8/2/2013	0.2351	0.2200										
12	Th-229	Th-18a	22.466	8/2/2013	0.2332	0.2200										
13	Th-229	Th-18a	22.466	8/2/2013	0.2350	0.2200										
14	Th-229	Th-18a	22.466	8/2/2013	0.2339	0.2200										
15	Th-229	Th-18a	22.466	8/2/2013	0.2331	0.2200										
16	Th-229	Th-18a	22.466	8/2/2013	0.2340	0.2200										
17	Th-229	Th-18a	22.466	8/2/2013	0.2345	0.2200										
18	Th-229	Th-18a	22.466	8/2/2013	0.2352	0.2200										
19	Th-229	Th-18a	22.466	8/2/2013	0.2356	0.2200										
							Matrix Spike									

0257

# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07147</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	D-12 TOT	DUP					1.0000E+00	1.0000E+00				
04	D-12 TOT	DO					1.0000E+00	1.0000E+00				
05	D-12 DIS	TRG					1.0000E+00	1.0000E+00				
06	DUP05 TOT	TRG					1.0000E+00	1.0000E+00				
07	DUP05 DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-208-SS TOT	TRG					1.0000E+00	1.0000E+00				
09	PZ-208-SS DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-304-AI TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-304-AI DIS	TRG					1.0000E+00	1.0000E+00				
12	PZ-304-AS TOT	TRG					1.0000E+00	1.0000E+00				
13	PZ-304-AS DIS	TRG					1.0000E+00	1.0000E+00				
14	MW-104 TOT	TRG					1.0000E+00	1.0000E+00				
15	MW-104 DIS	TRG					1.0000E+00	1.0000E+00				
16	PZ-204A-SS TOT	TRG					1.0000E+00	1.0000E+00				
17	PZ-204A-SS DIS	TRG					1.0000E+00	1.0000E+00				
18	PZ-302-AI TOT	TRG					1.0000E+00	1.0000E+00				
19	PZ-302-AI DIS	TRG					1.0000E+00	1.0000E+00				

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

*J Wolfe* Date: 8.2.13

0258



Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: Th 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: 8/9/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 2:55:07 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.480 mL  
 Effective Efficiency: 0.2052 +/- 0.0124  
 Counting Efficiency: 0.1746 +/- 0.0033 on 12/15/2012 11:26:47 AM  
 Chem. Recovery Factor: 1.1753 +/- 0.0741

Control Certificate Name: NatTh\_Th-8  
 Chem. Recov. of Control: TH-232 1.006466 +/- 0.085100  
 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	5.855	34.79	34.44	2.21	0.00E+000	3.0
TH-228	5.347	353.77	10.48	3.23	0.00E+000	20.7
TH-229 T	4.883	376.32	10.11	0.68	0.00E+000	5.1
TH-230	4.610	386.98	9.98	1.02	0.00E+000	36.0
TH-232	3.948	381.49	10.04	0.51	0.00E+000	13.6

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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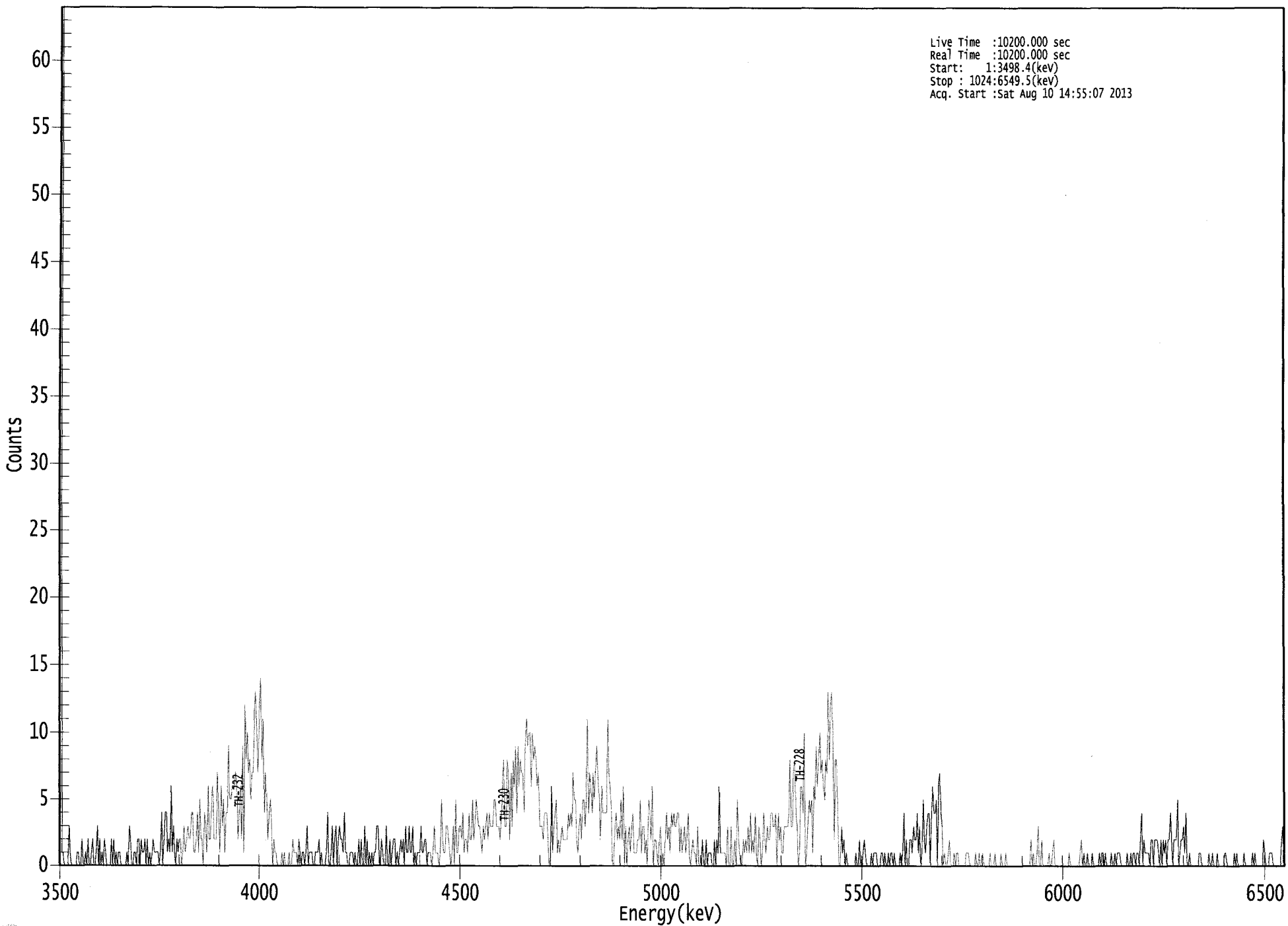
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	1.000	5850.00*	4.61E-001 +/- 1.68E-001	1.06E-001 +/- 1.25E-002
TH-228	0.985	5400.00*	4.58E+000 +/- 7.22E-001	1.18E-001 +/- 1.39E-002
TH-229	0.999	4872.00*	4.88E+000 +/- 5.76E-001	7.32E-002 +/- 8.63E-003
TH-230	0.980	4672.00*	5.00E+000 +/- 7.73E-001	8.15E-002 +/- 9.61E-003
TH-232	0.987	3997.00*	4.93E+000 +/- 7.63E-001	6.77E-002 +/- 7.99E-003

AG  
 8/12/13

US EPA ARCHIVE DOCUMENT

0000065790.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3498.4(kev)  
Stop : 1024:6549.5(kev)  
Acq. Start :Sat Aug 10 14:55:07 2013



ROI Type: 1

ROI Type: 3

0260

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

Sample Title: 01

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	1	1	0	0	0	0
9:	3	1	0	0	0	0	0	1
17:	1	0	0	2	0	0	1	0
25:	2	0	0	1	2	0	0	1
33:	3	0	2	0	1	0	2	1
41:	0	0	0	0	2	0	2	0
49:	1	0	1	1	0	0	0	0
57:	0	1	0	3	2	0	0	1
65:	1	0	2	2	0	2	1	1
73:	2	0	2	0	1	0	1	2
81:	1	1	1	1	0	1	4	0
89:	2	4	4	1	2	1	6	1
97:	3	1	0	2	1	2	2	0
105:	1	3	1	2	3	2	2	4
113:	4	1	1	2	4	1	5	2
121:	2	0	4	3	1	6	2	2
129:	5	6	2	2	2	7	4	1
137:	6	3	5	1	4	4	9	5
145:	5	6	6	6	7	6	2	4
153:	6	2	9	1	12	8	10	7
161:	8	5	7	7	12	13	9	7
169:	12	14	8	11	4	7	5	2
177:	4	5	3	0	2	1	1	0
185:	0	0	0	1	0	1	0	0
193:	0	1	0	0	2	1	1	1
201:	0	2	1	0	1	1	0	1
209:	3	0	1	1	1	0	0	1
217:	1	1	2	0	1	0	0	0
225:	1	4	0	0	1	3	0	2
233:	3	0	2	3	2	2	1	4
241:	1	1	0	0	1	1	1	0
249:	1	0	0	2	0	2	0	0
257:	3	0	2	0	1	0	1	0
265:	1	1	3	3	1	0	2	1
273:	0	0	3	0	0	2	0	1
281:	2	2	0	1	0	1	2	1
289:	2	0	3	1	1	3	1	1
297:	3	0	1	0	1	1	1	3
305:	1	1	2	2	0	1	1	1
313:	0	1	3	1	1	1	0	1
321:	5	2	1	1	3	3	2	1
329:	0	1	3	0	5	1	1	3
337:	3	2	4	1	2	2	1	4
345:	2	2	5	2	3	5	4	3
353:	3	2	1	3	2	3	4	2
361:	4	3	3	3	5	5	3	3



369: 3 2 4 6 8 3 3 8

Sample Title: 01

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 01

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



Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_004  
 Chamber Serial Number:  
 Detector Serial Number: 4  
 Env. Background: System Bkgd 64765  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 8/9/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 2:55:08 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.240 mL  
 Effective Efficiency: 0.2003 +/- 0.0161  
 Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM  
 Chem. Recovery Factor: 1.0321 +/- 0.0851

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	5.747	1.15	249.60	0.85	0.00E+000	2.9
TH-228	5.318	0.09	4720.2	3.91	0.00E+000	2.9
TH-229 T	4.870	183.64	14.53	1.36	0.00E+000	6.8
TH-230	4.625	34.30	34.42	1.70	0.00E+000	3.7
TH-232	3.973	6.15	85.19	0.85	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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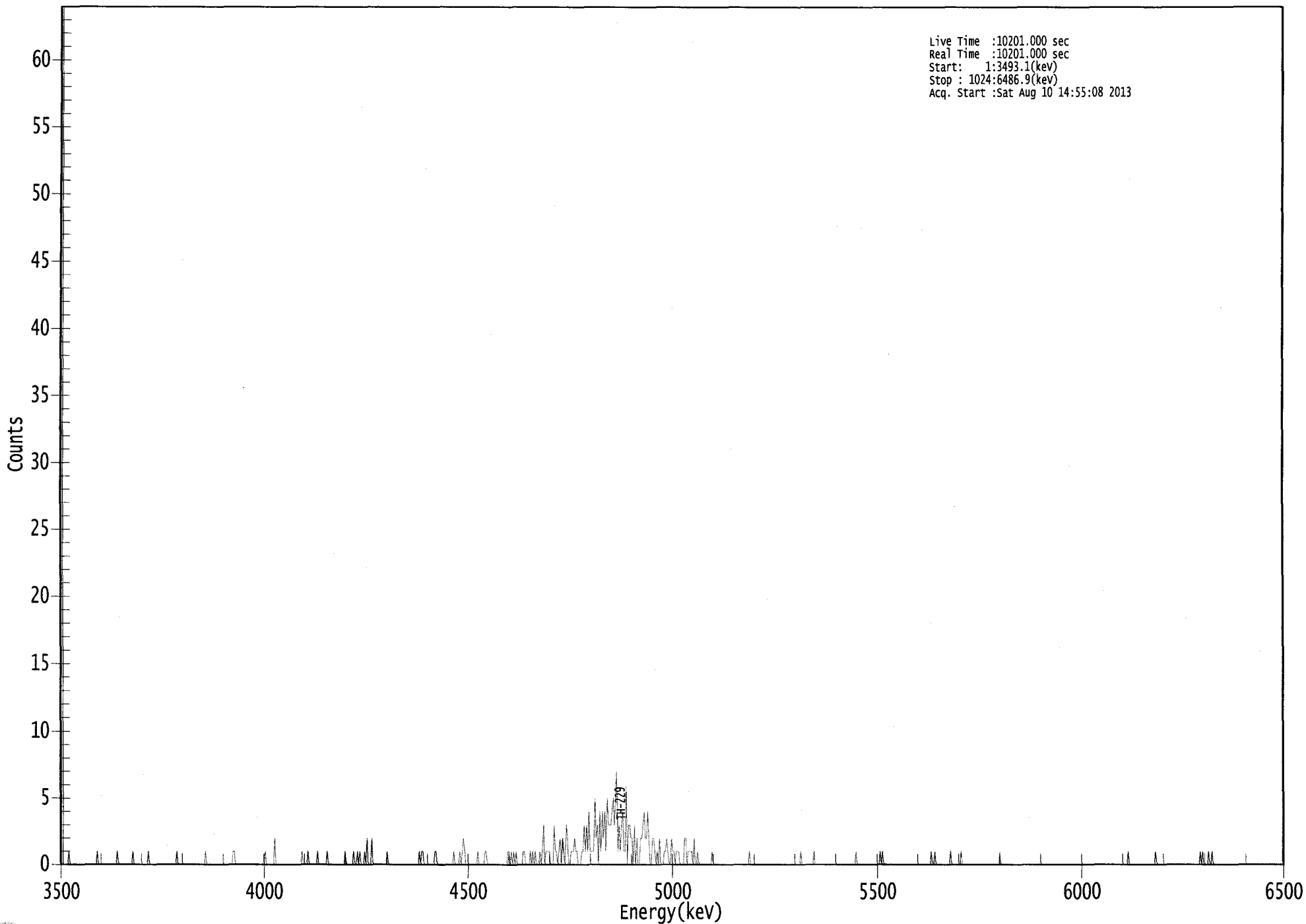
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.946	5850.00*	1.56E-002 +/- 3.90E-002	8.13E-002 +/- 1.28E-002
TH-228	0.965	5400.00*	1.19E-003 +/- 5.61E-002	1.29E-001 +/- 2.03E-002
TH-229	1.000	4872.00*	2.44E+000 +/- 3.84E-001	9.12E-002 +/- 1.44E-002
TH-230	0.988	4672.00*	4.55E-001 +/- 1.72E-001	9.74E-002 +/- 1.53E-002
TH-232	0.997	3997.00*	8.14E-002 +/- 7.05E-002	7.92E-002 +/- 1.25E-002

AG  
 8/10/13

US EPA ARCHIVE DOCUMENT

0000065791.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3493.1(kev)  
Stop : 1024:6486.9(kev)  
Acq. Start :Sat Aug 10 14:55:08 2013



ROI Type: 1

ROI Type: 3

0265

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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: 02

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 0 0 0 0 1

Sample Title: 02

Channel	1	2	3	4	5	6	7	8
377:	1	0	1	0	1	0	1	0
385:	0	0	0	0	1	1	0	0
393:	0	0	1	0	1	0	1	0
401:	0	0	1	0	1	3	0	1
409:	1	1	1	0	0	0	3	1
417:	1	0	1	2	0	2	1	0
425:	3	2	0	0	1	1	1	2
433:	1	1	0	0	0	1	1	3
441:	1	3	1	4	1	1	1	1
449:	5	2	3	0	4	1	4	2
457:	4	1	5	3	3	3	4	5
465:	3	5	7	1	3	1	3	4
473:	1	1	6	0	3	3	2	2
481:	0	3	0	2	0	0	2	2
489:	3	4	2	2	4	2	0	0
497:	2	2	1	0	1	0	2	0
505:	0	0	1	1	2	1	0	0
513:	2	1	1	0	1	1	1	0
521:	0	0	0	2	2	0	1	1
529:	1	1	0	2	0	0	1	0
537:	0	0	0	0	0	0	0	0
545:	0	0	1	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	1	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	1	0	0	0
625:	0	0	0	0	0	0	0	1
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	1	0
689:	1	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	1	0	0	1	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	1	0	0	0	0	0	0
753:	0	0	1	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	1	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	1	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	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	1	0	1	0	0	0	0
961:	1	0	0	1	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



Sample Description: D-12 TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_010  
 Chamber Serial Number:  
 Detector Serial Number: 10  
 Env. Background: System Bkgd 64766  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/15/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 2:55:01 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: 0.0680 +/- 0.0091  
 Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM  
 Chem. Recovery Factor: 0.3456 +/- 0.0467

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	5.824	0.28	1302.3	2.72	0.00E+000	2.9
TH-228	5.387	2.11	217.67	2.89	0.00E+000	2.9
TH-229 T	4.854	61.62	25.53	2.38	0.00E+000	3.4
TH-230	4.554	21.30	44.41	1.70	0.00E+000	5.9
TH-232	3.959	1.64	214.83	1.36	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	0.997	5850.00*	1.12E-002 +/- 1.46E-001	3.44E-001 +/- 9.01E-002
TH-228	0.999	5400.00*	8.45E-002 +/- 1.85E-001	3.50E-001 +/- 9.20E-002
TH-229	0.998	4872.00*	2.41E+000 +/- 6.33E-001	3.21E-001 +/- 8.42E-002
TH-230	0.930	4672.00*	8.32E-001 +/- 4.29E-001	2.87E-001 +/- 7.53E-002
TH-232	0.993	3997.00*	6.39E-002 +/- 1.38E-001	2.67E-001 +/- 7.01E-002

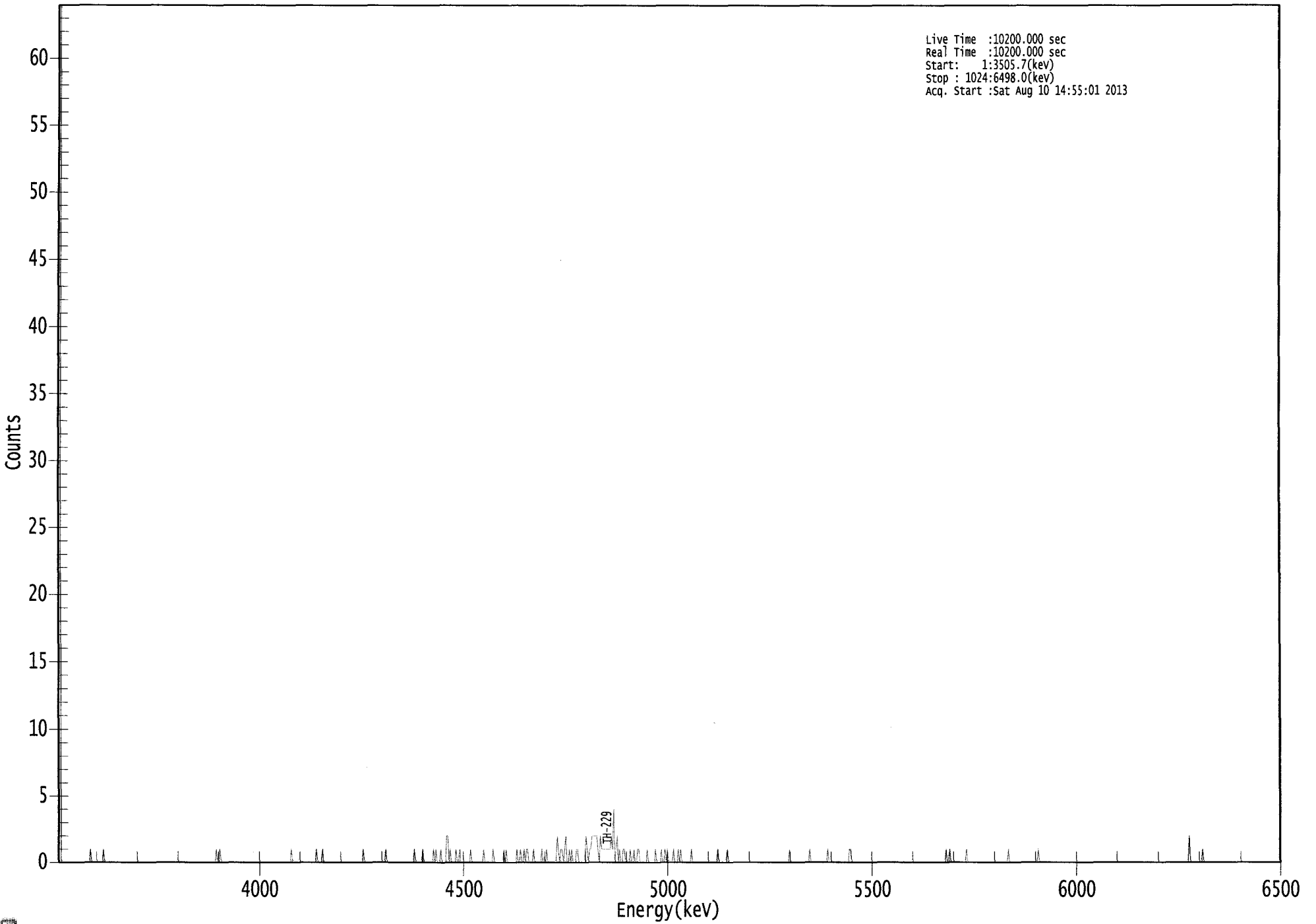
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US EPA ARCHIVE DOCUMENT



000065784.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3505.7(kev)  
Stop : 1024:6498.0(kev)  
Acq. Start :Sat Aug 10 14:55:01 2013



ROI Type: 1

ROI Type: 3

0270

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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: 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	1	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	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	1	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	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	1	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	1	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:	1	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	1	0	0	0	0
305:	0	0	1	0	0	0	0	0
313:	0	0	0	1	0	1	0	0
321:	0	1	0	0	0	0	2	2
329:	0	1	0	0	0	0	1	0
337:	0	1	0	0	0	0	0	0
345:	0	0	1	0	0	0	0	0
353:	0	0	0	0	0	1	0	0
361:	0	0	0	0	0	1	0	0

369: 0 0 0 0 0 0 0 1 0

Sample Title: 03

Channel	1	2	3	4	5	6	7	8	9
377:	1	0	0	0	0	0	0	0	0
385:	0	1	0	0	0	1	0	0	1
393:	0	1	1	0	0	0	0	0	1
401:	0	0	0	0	0	0	0	1	0
409:	0	0	1	0	0	0	0	0	0
417:	0	0	0	2	1	0	0	1	1
425:	0	1	2	0	0	1	1	0	1
433:	0	0	0	1	1	0	0	0	0
441:	0	0	0	2	1	0	1	1	1
449:	2	2	2	2	2	1	1	0	2
457:	1	1	1	1	1	1	1	1	1
465:	2	1	4	0	1	2	0	0	1
473:	0	0	1	1	0	0	0	0	0
481:	1	0	0	1	0	0	0	1	1
489:	0	0	0	0	0	0	0	1	0
497:	0	0	0	0	0	0	1	0	0
505:	0	0	1	0	0	0	1	0	1
513:	0	0	0	0	0	1	0	0	0
521:	1	0	1	0	0	0	0	0	0
529:	0	0	0	1	0	0	0	0	0
537:	0	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0	0
553:	0	1	0	0	0	0	0	0	0
561:	0	1	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	0	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	1	0	0
617:	0	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	1	0
633:	0	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	1	0	0
649:	0	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0	1
665:	1	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	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:	1	0	0	1	0	0	0	0	0
753:	0	0	0	0	0	0	0	0	0
761:	0	1	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	1	0	0	0	0

801: 0 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	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	2	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	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



Sample Description: D-12 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_011  
 Chamber Serial Number:  
 Detector Serial Number: 11  
 Env. Background: System Bkgd 64767  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/15/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 2:55:02 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: 0.1331 +/- 0.0128  
 Counting Efficiency: 0.2051 +/- 0.0035 on 7/20/2013 2:50:46 PM  
 Chem. Recovery Factor: 0.6488 +/- 0.0636

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	5.855	3.15	126.67	0.85	0.00E+000	2.6
TH-228	5.390	5.15	94.34	0.85	0.00E+000	2.6
TH-229 T	4.860	119.83	17.92	0.17	0.00E+000	4.7
TH-230	4.591	26.83	37.98	0.17	0.00E+000	2.6
TH-232	3.960	5.83	82.55	0.17	0.00E+000	2.6

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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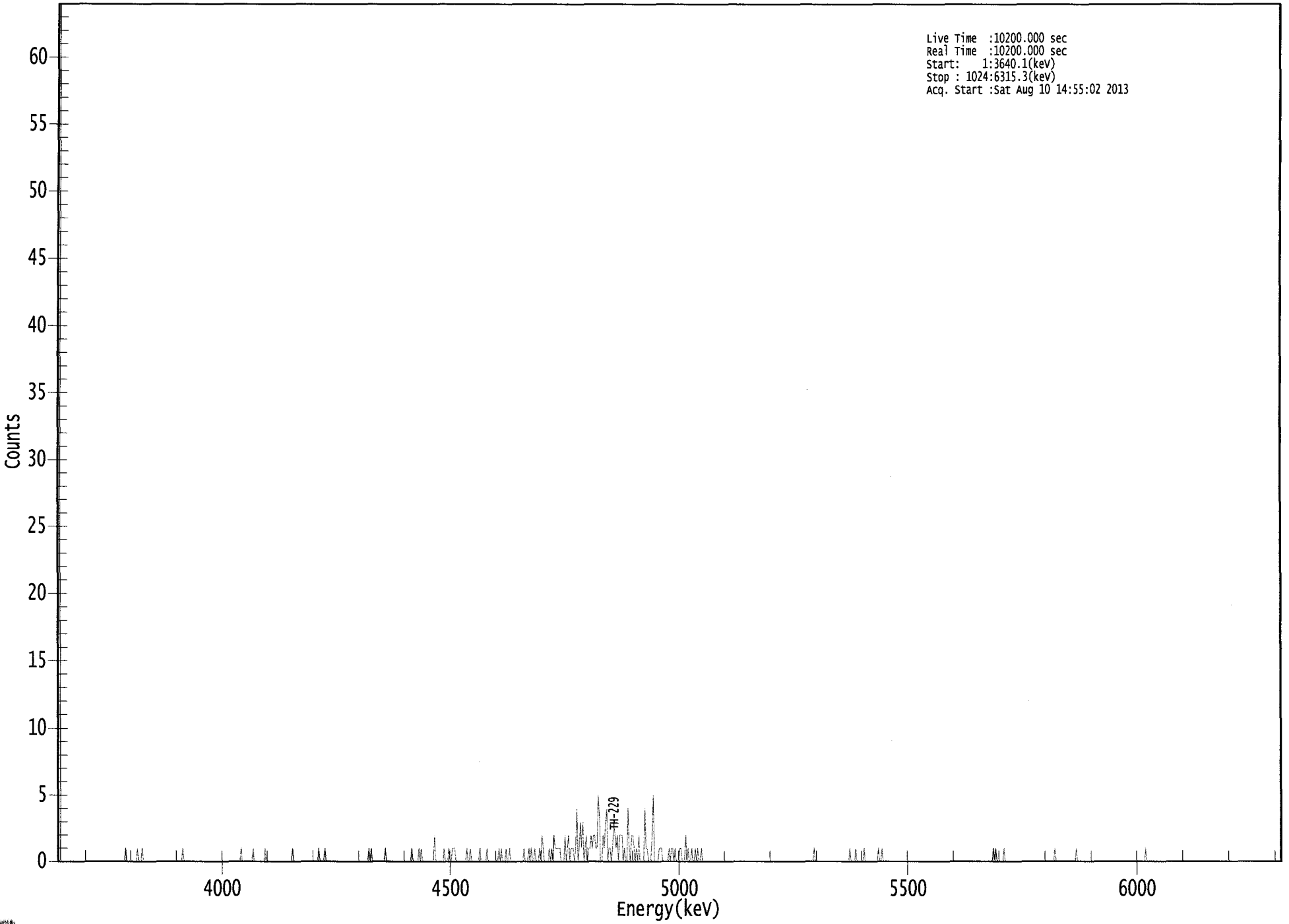
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	1.000	5850.00*	6.45E-002 +/- 8.26E-002	1.23E-001 +/- 2.32E-002
TH-228	1.000	5400.00*	1.05E-001 +/- 1.01E-001	1.22E-001 +/- 2.32E-002
TH-229	0.999	4872.00*	2.40E+000 +/- 4.54E-001	8.35E-002 +/- 1.58E-002
TH-230	0.966	4672.00*	5.35E-001 +/- 2.27E-001	8.33E-002 +/- 1.58E-002
TH-232	0.993	3997.00*	1.16E-001 +/- 9.83E-002	8.31E-002 +/- 1.57E-002

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 8/14/13

US EPA ARCHIVE DOCUMENT

000065785.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3640.1(kev)  
Stop : 1024:6315.3(kev)  
Acq. Start :Sat Aug 10 14:55:02 2013



ROI Type: 1

ROI Type: 3

5275

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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: 04

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	1	0	0	0	0	0	0
65:	0	0	0	1	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	0	0	0	0	0	0
105:	0	1	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	1	0	0	0	0	0
161:	0	0	0	0	1	0	0	0
169:	0	0	0	0	0	0	1	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	1	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	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	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	1	0	1
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	1	0	0	0	0	0	1
305:	0	1	0	0	0	0	0	0
313:	0	0	0	0	2	0	0	0
321:	0	0	0	0	1	0	0	0
329:	1	0	0	1	1	1	0	0
337:	0	0	0	0	0	0	0	1
345:	0	0	1	0	0	0	0	0
353:	0	0	1	0	0	0	0	0
361:	1	0	0	0	0	0	0	0

369: 0 0 1 0 1 0 0 0

Sample Title: 04

Channel	1	2	3	4	5	6	7	8
377:	1	0	0	1	0	0	0	0
385:	0	0	0	0	0	0	0	1
393:	0	0	0	1	0	1	0	0
401:	1	0	0	0	1	0	2	1
409:	0	0	0	0	1	0	1	0
417:	2	1	1	1	1	1	0	0
425:	0	2	0	1	2	0	1	1
433:	1	0	1	4	0	1	3	1
441:	3	0	1	2	0	1	1	2
449:	1	2	2	1	1	5	3	0
457:	0	2	1	3	4	0	1	1
465:	0	1	3	2	1	2	0	2
473:	2	2	0	1	0	0	4	1
481:	0	2	2	1	0	1	0	2
489:	0	0	0	0	4	1	1	0
497:	0	0	2	5	0	0	0	0
505:	1	1	1	0	0	0	0	0
513:	1	0	1	1	0	1	0	0
521:	0	1	1	0	0	0	2	0
529:	1	0	0	1	0	0	1	0
537:	1	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	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	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	0	0	1
665:	0	0	0	0	1	0	0	0
673:	0	0	0	1	0	0	0	0
681:	0	0	0	0	0	0	0	1
689:	0	0	1	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	1
785:	0	1	0	0	0	0	0	0
793:	1	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	1	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	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	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



Sample Description: D-12 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307147A-TH  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_012  
 Chamber Serial Number:  
 Detector Serial Number: 12  
 Env. Background: System Bkgd 64768  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/15/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 2:55:03 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: 0.0876 +/- 0.0102  
 Counting Efficiency: 0.1989 +/- 0.0034 on 12/11/2011 2:21:56 PM  
 Chem. Recovery Factor: 0.4404 +/- 0.0521

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	5.702	0.83	239.53	0.17	0.00E+000	3.0
TH-228	5.314	-0.85	246.69	0.85	0.00E+000	0.0
TH-229 T	4.859	78.83	22.10	0.17	0.00E+000	5.9
TH-230	4.613	17.83	46.68	0.17	0.00E+000	5.2
TH-232	3.983	3.15	126.67	0.85	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

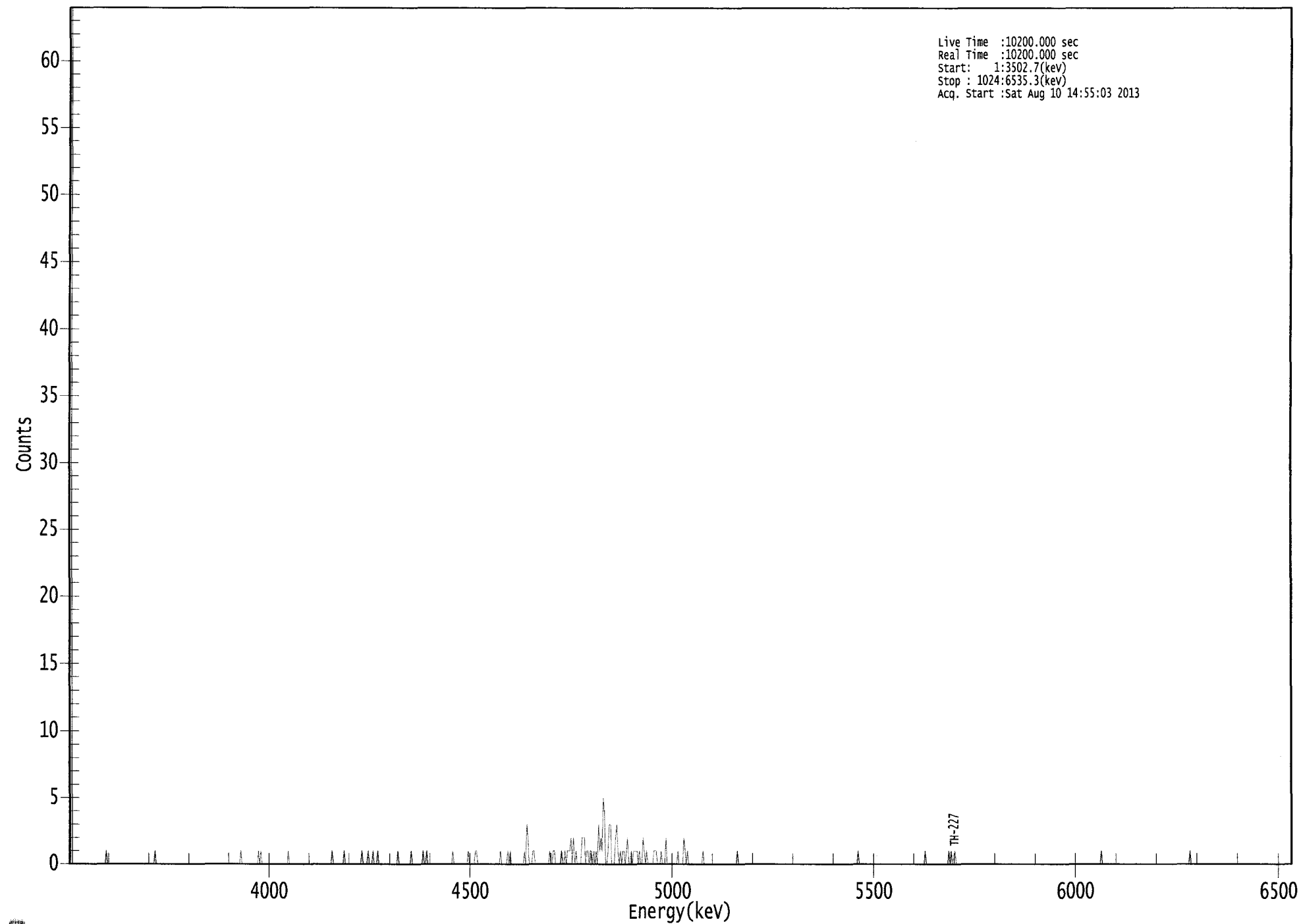
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.892	5850.00*	2.58E-002 +/- 6.21E-002	1.30E-001 +/- 2.97E-002
TH-228	0.962	5400.00*	-2.64E-002 +/- 6.54E-002	1.86E-001 +/- 4.26E-002
TH-229	0.999	4872.00*	2.40E+000 +/- 5.49E-001	1.27E-001 +/- 2.91E-002
TH-230	0.982	4672.00*	5.40E-001 +/- 2.81E-001	1.26E-001 +/- 2.90E-002
TH-232	0.999	3997.00*	9.53E-002 +/- 1.23E-001	1.81E-001 +/- 4.15E-002

AG  
 8/10/13

0000065804.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3502.7(kev)  
Stop : 1024:6535.3(kev)  
Acq. Start :Sat Aug 10 14:55:03 2013



ROI Type: 1

ROI Type: 3

0280

\*\*\*\*\*  
 \*\*\*\*\* 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	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	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	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	1	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:	1	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	1
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:	1	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	1	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	1	0
249:	0	0	0	1	0	0	0	1
257:	0	0	0	1	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	1	0	0	0
281:	0	0	0	0	0	0	0	1
289:	0	0	0	0	0	0	0	0
297:	0	1	0	0	1	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	1	0	0	0	0	0
329:	0	0	0	0	0	0	0	1
337:	0	0	0	0	0	1	1	0
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: 1 0 1 0 0 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	1	0
385:	3	2	0	0	0	1	1	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	1	0	0	1	1
409:	0	0	0	0	0	1	0	0
417:	1	0	1	1	1	2	0	2
425:	0	1	0	0	0	0	2	2
433:	2	0	1	1	0	1	1	0
441:	1	0	1	0	3	1	2	1
449:	5	4	0	0	1	3	3	0
457:	0	0	2	3	1	0	1	0
465:	1	1	0	1	2	0	0	1
473:	0	1	1	1	1	0	1	0
481:	0	2	1	0	1	0	0	0
489:	0	0	1	1	1	0	0	0
497:	1	0	0	0	2	0	0	0
505:	0	0	0	0	0	0	1	0
513:	0	0	0	2	1	0	1	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	1	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:	1	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	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	1	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	1	0	1	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	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:	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	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	1	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



Sample Description: DUP05 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_013  
 Chamber Serial Number:  
 Detector Serial Number: 13  
 Env. Background: System Bkgd 64769  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/15/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 2:55:04 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: 0.1371 +/- 0.0131  
 Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM  
 Chem. Recovery Factor: 0.7335 +/- 0.0713

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	5.816	4.30	114.31	1.70	0.00E+000	2.8
TH-228	5.327	1.47	240.74	1.53	0.00E+000	2.8
TH-229 T	4.870	123.98	17.69	1.02	0.00E+000	4.1
TH-230	4.609	27.66	37.53	0.34	0.00E+000	2.8
TH-232	3.969	8.83	66.70	0.17	0.00E+000	2.8

T = Tracer Peak used for Effective Efficiency

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

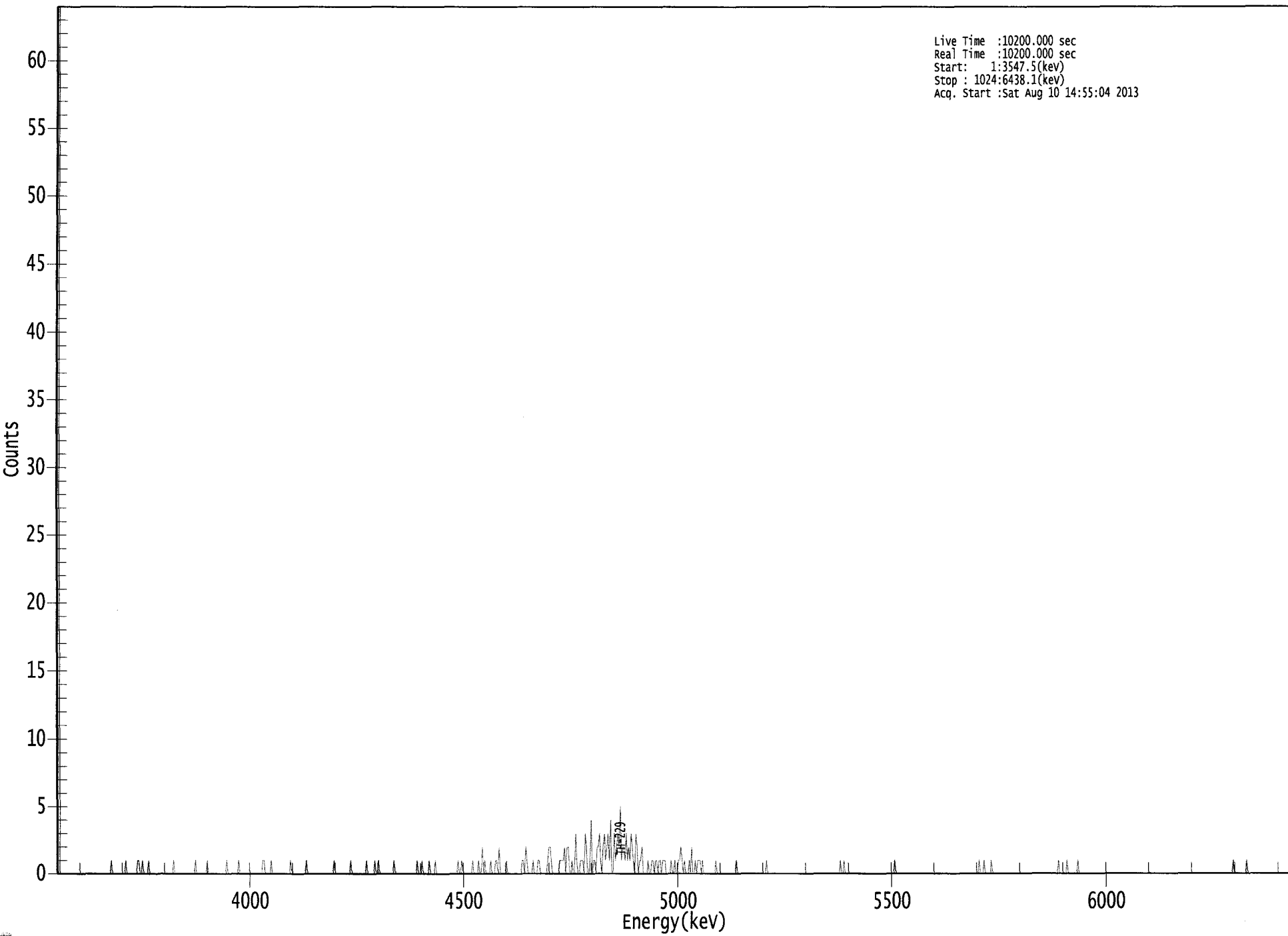
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.994	5850.00*	8.54E-002 +/- 9.90E-002	1.46E-001 +/- 2.73E-002
TH-228	0.972	5400.00*	2.92E-002 +/- 7.05E-002	1.41E-001 +/- 2.64E-002
TH-229	1.000	4872.00*	2.41E+000 +/- 4.50E-001	1.22E-001 +/- 2.29E-002
TH-230	0.980	4672.00*	5.36E-001 +/- 2.25E-001	9.26E-002 +/- 1.73E-002
TH-232	0.996	3997.00*	1.71E-001 +/- 1.18E-001	8.07E-002 +/- 1.51E-002

AG  
 8/12/13

US EPA ARCHIVE DOCUMENT

0000065787.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3547.5(kev)  
Stop : 1024:6438.1(kev)  
Acq. Start :Sat Aug 10 14:55:04 2013



ROI Type: 1

ROI Type: 3

0285



\*\*\*\*\*  
 \*\*\*\*\* 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:	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	1	0	0
49:	0	0	0	0	0	0	0	0
57:	0	1	0	0	0	0	0	0
65:	0	0	0	1	1	0	0	1
73:	0	0	0	0	1	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	1	0	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	1	0	0
145:	0	0	0	0	0	0	0	1
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	1	1	0	0	0
177:	0	0	1	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	1	0	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	0	0	0	1	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	0	0
257:	0	1	0	0	0	0	0	0
265:	1	0	0	1	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	1	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	1	0	0	0	1
305:	0	0	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	0	0	0	1	0	0
337:	1	0	0	0	0	0	0	0
345:	0	1	0	0	0	0	1	0
353:	0	2	0	1	0	0	0	0
361:	1	0	0	0	1	1	0	2

369: 0 0 0 0 0 1 0 0

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	1	1	0	2	1	0
393:	0	0	0	1	0	0	0	1
401:	1	0	0	0	0	0	0	1
409:	2	2	1	0	0	0	0	0
417:	0	1	1	1	1	2	0	2
425:	2	0	0	1	0	0	3	1
433:	0	0	1	1	1	0	3	2
441:	0	0	1	4	0	1	1	0
449:	2	2	3	1	0	2	3	1
457:	2	3	1	4	0	0	3	1
465:	2	3	2	5	1	2	2	1
473:	3	1	2	1	3	2	1	0
481:	3	2	0	1	1	2	0	0
489:	0	0	1	0	0	1	1	0
497:	1	1	0	1	1	0	1	1
505:	1	0	0	0	0	1	0	0
513:	1	0	0	1	1	2	1	0
521:	1	0	0	0	1	0	2	0
529:	0	1	0	1	1	1	0	1
537:	0	0	0	0	0	0	0	0
545:	0	0	1	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	1	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	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	1	0	0	1	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	1	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:	1	0	0	0	0	0	1	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	1	0	0
833:	0	0	0	0	1	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	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	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



Sample Description: DUP05 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307147A-TH  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_014  
 Chamber Serial Number:  
 Detector Serial Number: 14  
 Env. Background: System Bkgd 64770  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/15/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 2:55:05 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: 0.1675 +/- 0.0147  
 Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM  
 Chem. Recovery Factor: 0.9078 +/- 0.0814

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	5.797	1.28	323.53	2.72	0.00E+000	2.9
TH-228	5.390	-1.08	348.68	4.08	0.00E+000	2.9
TH-229 T	4.862	149.81	16.09	1.19	0.00E+000	5.1
TH-230	4.630	34.32	33.84	0.68	0.00E+000	3.4
TH-232	3.969	-0.68	304.42	0.68	0.00E+000	0.0

T = Tracer Peak used for Effective Efficiency

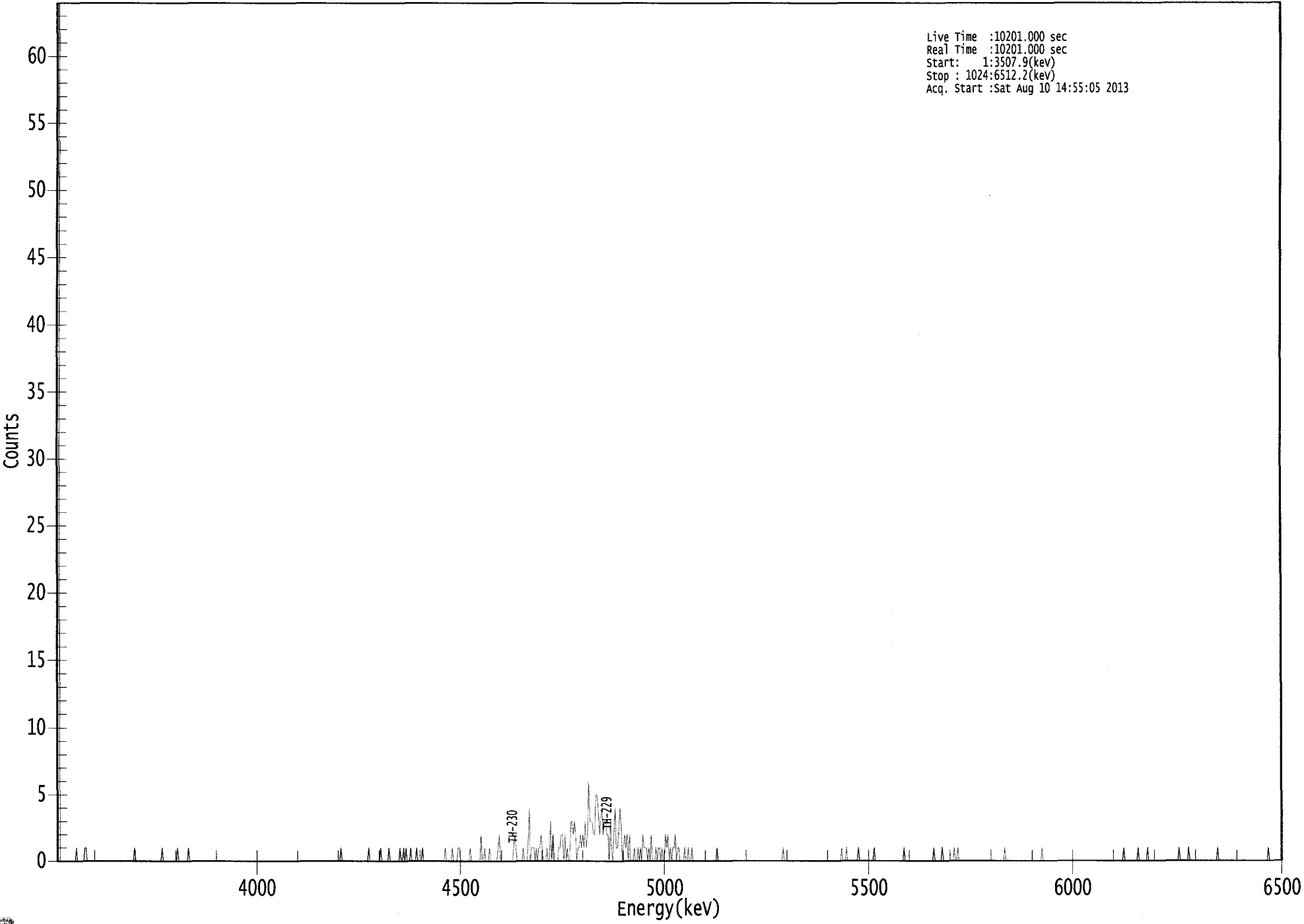
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.985	5850.00*	2.08E-002 +/- 6.74E-002	1.39E-001 +/- 2.40E-002
TH-228	1.000	5400.00*	-1.75E-002 +/- 6.13E-002	1.61E-001 +/- 2.76E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.09E-001	1.05E-001 +/- 1.80E-002
TH-230	0.991	4672.00*	5.44E-001 +/- 2.06E-001	8.94E-002 +/- 1.54E-002
TH-232	0.996	3997.00*	-1.08E-002 +/- 3.28E-002	8.92E-002 +/- 1.53E-002

AG  
 8/12/13

0000065803.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3507.9(keV)  
Stop : 1024:6512.2(keV)  
Acq. Start :Sat Aug 10 14:55:05 2013



ROI Type: 1

ROI Type: 3

0290

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

Sample Title: 07

Elapsed Live time: 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:	1	0	0	0	0	0	0	1
25:	1	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	1	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	1	0	0
105:	0	0	0	0	0	0	1	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	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:	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	1	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	1	0	0
265:	0	0	0	0	0	0	0	1
273:	0	0	0	0	0	0	1	0
281:	0	0	0	0	0	0	0	1
289:	0	0	1	0	1	0	0	0
297:	1	0	0	0	0	1	0	0
305:	0	0	1	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	1	0	0	0	0
337:	1	1	0	0	0	0	0	0
345:	0	0	1	0	0	0	0	0
353:	0	0	0	2	0	0	1	0
361:	0	0	1	0	0	0	0	0

369: 0 1 2 0 0 0 0 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	1	2
385:	1	0	0	0	0	0	1	0
393:	0	0	1	4	0	1	1	1
401:	0	1	0	1	1	2	1	0
409:	0	0	1	0	0	3	0	2
417:	0	0	0	0	1	1	2	2
425:	0	2	0	1	0	0	3	3
433:	2	3	2	0	1	1	2	1
441:	2	1	3	1	2	6	3	3
449:	3	2	2	5	5	4	2	3
457:	4	2	3	3	2	2	0	3
465:	1	0	2	4	1	1	2	4
473:	3	0	1	2	1	2	0	2
481:	0	0	0	1	0	0	1	0
489:	1	0	2	1	1	1	0	1
497:	0	2	0	0	0	1	0	1
505:	1	0	1	0	0	2	1	2
513:	0	1	0	1	1	2	0	1
521:	1	0	0	0	0	1	0	0
529:	1	0	0	1	0	0	0	0
537:	0	0	0	0	0	0	0	0
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	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	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	1	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	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	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	1	0	0
737:	0	0	0	0	1	0	0	0
745:	0	0	0	0	0	0	1	0
753:	0	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	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	1	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0 0

Sample Title: 07

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:	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	1
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	1	0	0	0	0	0	0
945:	0	1	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	1	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	1	0	0	0	0
1017:	0	0	0	0	0	0	0	0





Sample Description: PZ-208-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

Detector Name: Alpha\_015  
 Chamber Serial Number:  
 Detector Serial Number: 15  
 Env. Background: System Bkgd 64771  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 2:55:06 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: 0.1343 +/- 0.0130  
 Counting Efficiency: 0.1477 +/- 0.0027 on 7/20/2013 6:27:27 PM  
 Chem. Recovery Factor: 0.9094 +/- 0.0893

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	5.739	2.15	161.66	0.85	0.00E+000	3.0
TH-228	5.305	10.32	63.32	0.68	0.00E+000	3.0
TH-229 T	4.864	120.32	17.93	0.68	0.00E+000	6.2
TH-230	4.611	35.32	33.35	0.68	0.00E+000	4.5
TH-232	3.943	12.83	55.14	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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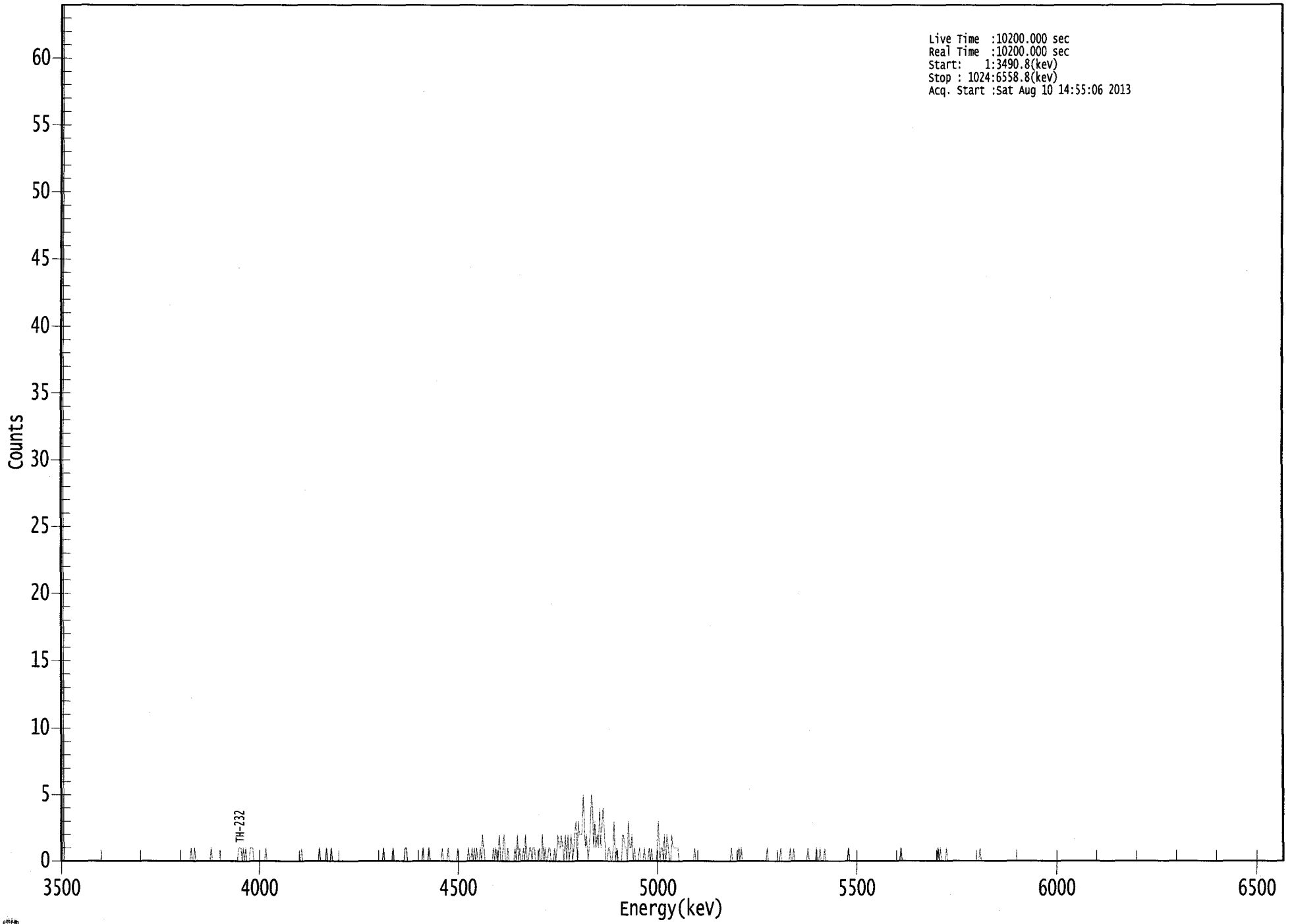
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.938	5850.00*	4.36E-002 +/- 7.09E-002	1.21E-001 +/- 2.30E-002
TH-228	0.954	5400.00*	2.09E-001 +/- 1.38E-001	1.14E-001 +/- 2.16E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.51E-001	1.12E-001 +/- 2.12E-002
TH-230	0.981	4672.00*	6.98E-001 +/- 2.68E-001	1.11E-001 +/- 2.11E-002
TH-232	0.985	3997.00*	2.53E-001 +/- 1.48E-001	8.23E-002 +/- 1.56E-002

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 8/12/13

US EPA ARCHIVE DOCUMENT

000065789.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3490.8(kev)  
Stop : 1024:6558.8(kev)  
Acq. Start :Sat Aug 10 14:55:06 2013



ROI Type: 1

ROI Type: 3

6295

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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	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	1	0	0
113:	1	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	0	0	0
145:	0	0	0	0	0	1	1	1
153:	0	1	0	1	0	0	0	1
161:	1	1	0	0	0	0	0	0
169:	0	0	0	0	1	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	1	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	1	0	0	0	0	0	1
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	1
273:	0	0	0	0	0	0	0	1
281:	0	0	0	0	0	0	0	0
289:	0	1	1	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	1	0	0	0	0	1	0	0
313:	0	0	0	0	0	0	0	0
321:	1	0	0	0	0	1	0	0
329:	0	0	0	0	0	1	0	0
337:	0	0	0	0	0	0	1	0
345:	0	1	0	1	0	1	0	0
353:	1	0	2	1	0	0	0	0
361:	0	0	0	1	0	1	0	0

369: 2 0 0 1 2 0 0 1

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	1	0	2
385:	0	1	0	0	1	0	2	0
393:	0	1	1	0	1	1	0	0
401:	0	1	0	0	2	0	1	0
409:	0	1	1	0	0	0	1	0
417:	1	2	1	1	2	1	0	2
425:	0	2	0	1	2	0	1	2
433:	3	0	3	2	2	2	5	3
441:	1	2	0	1	2	5	4	1
449:	3	1	2	1	4	1	3	4
457:	2	0	0	1	1	0	0	1
465:	3	0	1	0	0	0	0	2
473:	2	1	1	0	3	1	1	2
481:	0	1	0	0	0	1	0	0
489:	0	1	0	0	0	1	0	1
497:	0	0	0	0	2	3	0	1
505:	1	0	2	0	2	1	0	0
513:	2	1	1	1	1	1	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	1	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	1	0	0	0	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:	1	0	0	0	0	0	0	0
601:	0	0	0	1	0	0	0	0
609:	0	0	0	1	0	0	1	0
617:	0	0	0	0	0	0	0	0
625:	0	0	1	0	0	0	0	0
633:	0	1	0	0	1	0	0	0
641:	1	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:	1	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	1
737:	0	1	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	1	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	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™

Sample Description: PZ-208-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:01:59 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 173.6 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.1741 +/- 0.0150  
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM  
 Chem. Recovery Factor: 0.9422 +/- 0.0826

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	5.874	-0.85	246.69	0.85	0.00E+000	0.0
TH-228	5.343	5.49	88.08	0.51	0.00E+000	3.0
TH-229 T	4.876	156.49	15.70	0.51	0.00E+000	6.3
TH-230	4.604	28.00	37.70	0.00	0.00E+000	4.5
TH-232	3.960	5.83	82.55	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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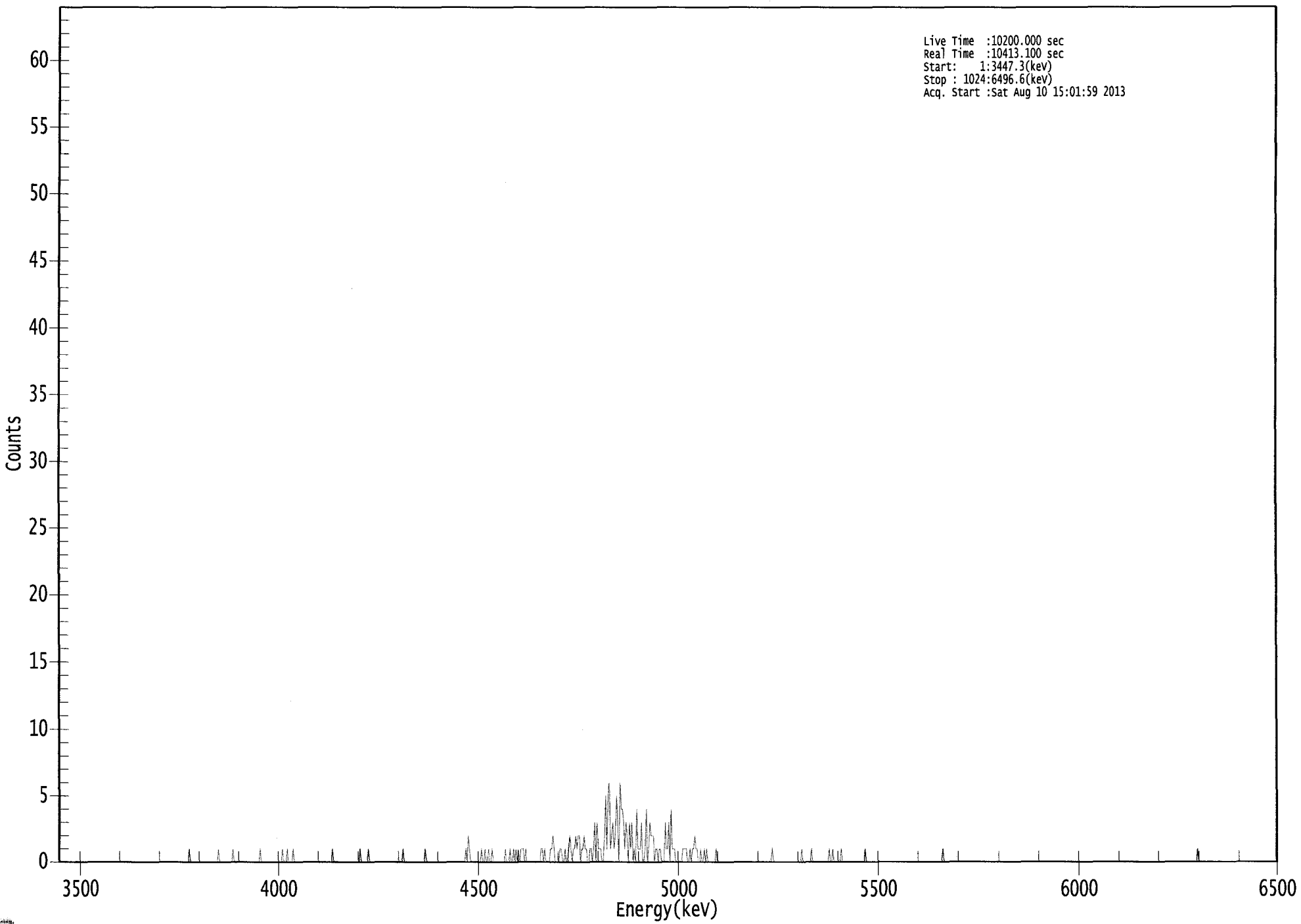
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.997	5850.00*	-1.33E-002 +/- 3.29E-002	9.36E-002 +/- 1.58E-002
TH-228	0.983	5400.00*	8.57E-002 +/- 7.69E-002	8.19E-002 +/- 1.38E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 4.03E-001	8.02E-002 +/- 1.35E-002
TH-230	0.976	4672.00*	4.27E-001 +/- 1.76E-001	9.14E-002 +/- 1.54E-002
TH-232	0.993	3997.00*	8.87E-002 +/- 7.47E-002	6.35E-002 +/- 1.07E-002

AG  
 8/12/13

US EPA ARCHIVE DOCUMENT

0000065795.CNF

Live Time :10200.000 sec  
Real Time :10413.100 sec  
Start: 1:3447.3(kev)  
Stop : 1024:6496.6(kev)  
Acq. Start :Sat Aug 10 15:01:59 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:    09

Elapsed Live time:    10200

Elapsed Real Time:    10413

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	1	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:	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	1	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	1	0	0
193:	0	1	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:	0	0	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	1	0
257:	0	0	0	0	0	1	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	1	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	1
345:	0	2	1	0	0	0	0	0
353:	0	0	0	0	1	0	0	1
361:	0	0	1	0	0	1	0	0



369: 0 0 0 0 0 0 0 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	0	0	0	1	0	0	1
385:	0	1	0	1	0	1	1	1
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	1	1
409:	0	1	0	0	0	0	1	1
417:	2	1	0	0	0	0	1	1
425:	0	0	1	0	0	1	2	1
433:	0	1	1	2	1	2	2	0
441:	1	1	2	1	1	0	0	1
449:	1	0	1	3	0	3	1	1
457:	1	0	0	2	5	1	5	6
465:	1	2	3	1	2	5	3	0
473:	6	4	4	3	1	3	2	0
481:	3	1	3	0	1	0	4	1
489:	1	1	3	0	0	1	4	0
497:	1	3	2	2	2	0	1	1
505:	0	1	1	0	0	0	3	1
513:	1	3	0	4	1	1	1	0
521:	0	0	0	0	0	1	1	1
529:	1	0	0	1	0	1	1	2
537:	1	1	0	0	1	0	0	1
545:	0	1	0	0	0	0	0	0
553:	0	1	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:	1	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	1	0	0	0	0	0	0
633:	0	1	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	1	0	0	1	0	0	0	0
657:	0	0	1	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	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	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	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	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	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	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



Sample Description: PZ-304-AI TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:01 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 173.6 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.1542 +/- 0.0140  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Chem. Recovery Factor: 0.8312 +/- 0.0766

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	5.771	1.83	152.56	0.17	0.00E+000	3.0
TH-228	5.351	5.83	82.55	0.17	0.00E+000	3.0
TH-229 T	4.853	138.66	16.67	0.34	0.00E+000	5.0
TH-230	4.612	36.00	33.12	0.00	0.00E+000	3.0
TH-232	3.945	2.83	120.53	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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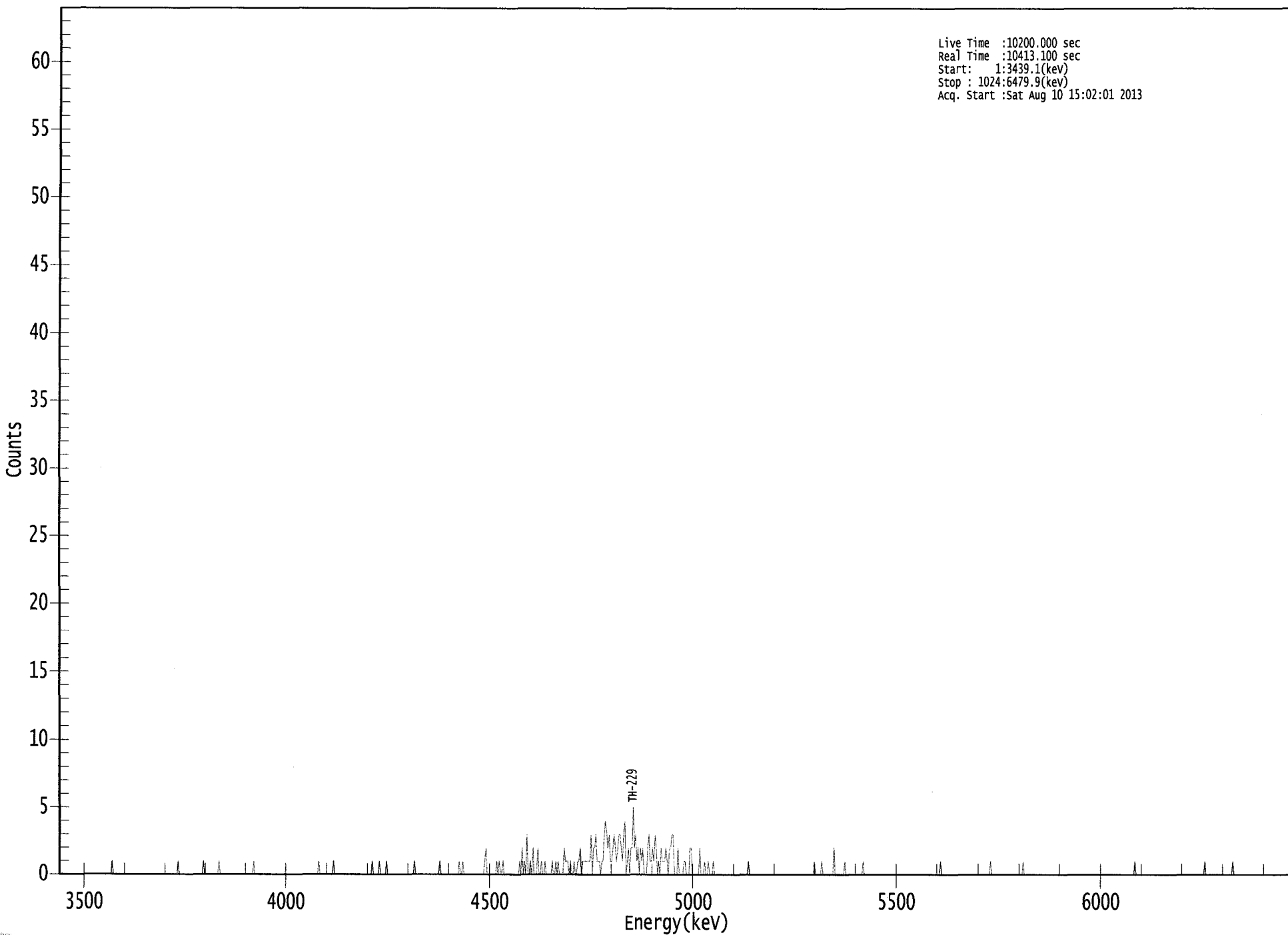
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.968	5850.00*	3.23E-002 +/- 4.96E-002	7.37E-002 +/- 1.31E-002
TH-228	0.987	5400.00*	1.03E-001 +/- 8.68E-002	7.36E-002 +/- 1.31E-002
TH-229	0.998	4872.00*	2.39E+000 +/- 4.25E-001	8.25E-002 +/- 1.46E-002
TH-230	0.982	4672.00*	6.20E-001 +/- 2.33E-001	1.03E-001 +/- 1.83E-002
TH-232	0.986	3997.00*	4.86E-002 +/- 5.92E-002	7.17E-002 +/- 1.27E-002

AG  
 8/12/13

US EPA ARCHIVE DOCUMENT

0000065796.CNF

Live Time :10200.000 sec  
Real Time :10413.100 sec  
Start: 1:3439.1(kev)  
Stop : 1024:6479.9(kev)  
Acq. Start :Sat Aug 10 15:02:01 2013



ROI Type: 1

ROI Type: 3

5020

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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: 10413

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	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	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	1	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	1	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	1	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	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	1	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	0	0	0
265:	0	0	1	0	0	0	0	0
273:	1	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	1
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	1	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	1	0	0	1
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	1	2	0	0	0	0	0
361:	0	0	0	1	0	1	0	0

369: 1 0 0 0 0 0 0 0

Sample Title: 10

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	1	0
385:	2	0	1	0	3	0	0	1
393:	0	2	0	0	0	2	0	0
401:	1	0	0	1	0	0	0	0
409:	0	1	0	0	1	0	1	0
417:	0	0	0	2	1	1	1	0
425:	1	0	0	1	0	0	1	1
433:	2	0	1	1	1	1	1	1
441:	1	3	0	2	2	3	1	1
449:	1	0	1	1	3	4	3	2
457:	3	1	1	2	3	2	1	2
465:	3	3	2	1	3	4	0	1
473:	2	0	2	2	5	2	3	1
481:	2	0	2	1	2	0	0	0
489:	2	3	1	1	2	1	3	2
497:	0	1	0	2	1	1	1	2
505:	1	0	2	2	3	3	0	0
513:	0	2	0	0	0	0	1	1
521:	0	0	0	2	2	0	0	0
529:	0	0	0	2	0	0	0	1
537:	0	0	1	0	0	0	1	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	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	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	1	0	0	0	0	0
633:	1	0	0	0	0	0	0	0
641:	0	0	2	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	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	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	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	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	1	0

801: 0 0 0 0 0 0 0 0

Sample Title: 10

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	1	0	0
953:	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0
969:	0	0	0	1	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



Sample Description: PZ-304-AI DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:02 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 173.6 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.1576 +/- 0.0141  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 0.8631 +/- 0.0789

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	5.754	1.32	215.97	0.68	0.00E+000	2.9
TH-228	5.378	3.81	117.34	1.19	0.00E+000	2.9
TH-229 T	4.883	141.49	16.51	0.51	0.00E+000	3.9
TH-230	4.644	14.66	51.88	0.34	0.00E+000	2.9
TH-232	3.935	3.83	102.72	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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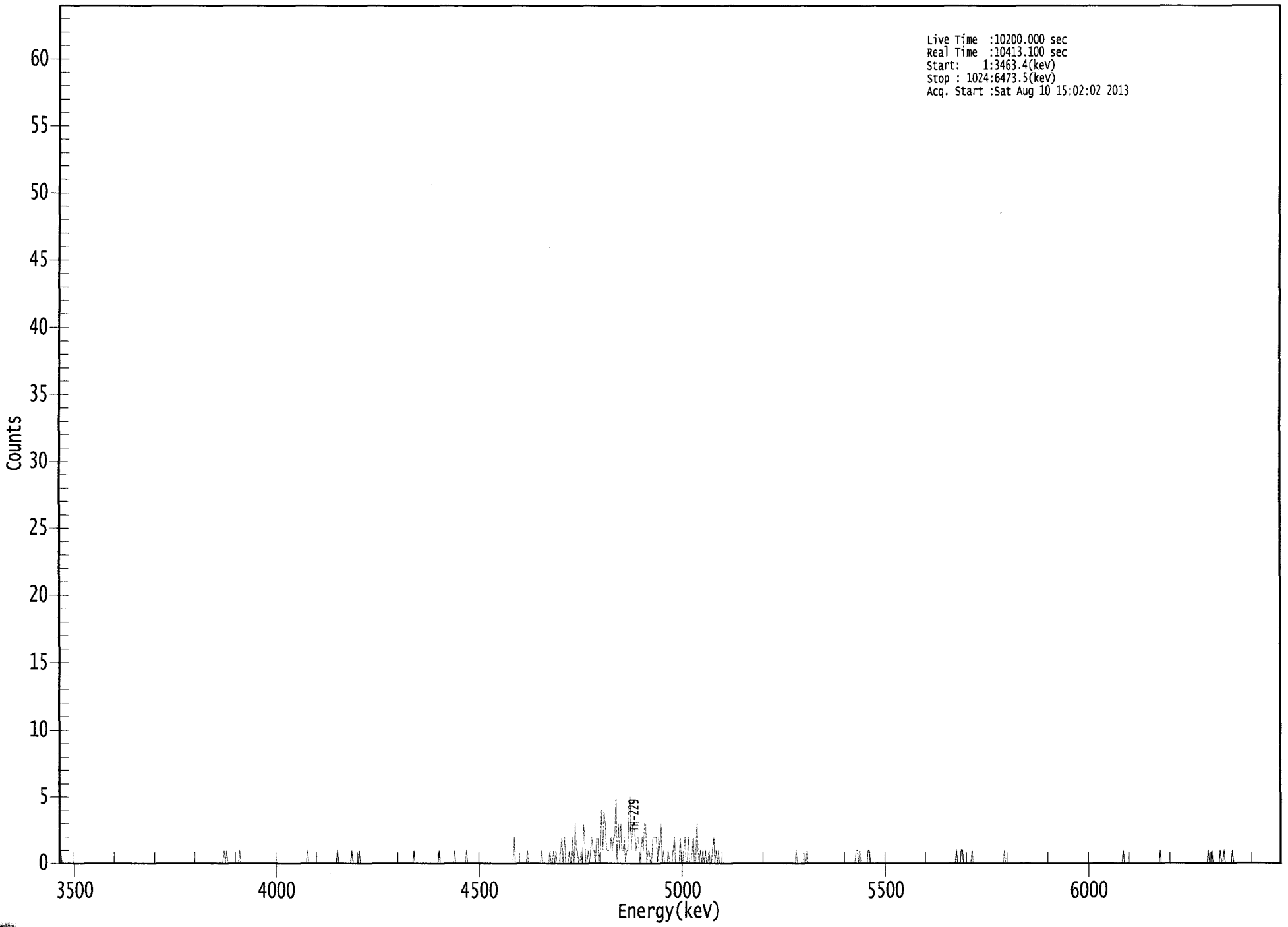
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.953	5850.00*	2.28E-002 +/- 4.94E-002	9.75E-002 +/- 1.72E-002
TH-228	0.997	5400.00*	6.57E-002 +/- 7.80E-002	1.14E-001 +/- 2.00E-002
TH-229	0.999	4872.00*	2.39E+000 +/- 4.21E-001	8.87E-002 +/- 1.56E-002
TH-230	0.996	4672.00*	2.47E-001 +/- 1.35E-001	8.05E-002 +/- 1.42E-002
TH-232	0.980	3997.00*	6.44E-002 +/- 6.71E-002	7.02E-002 +/- 1.23E-002

AG  
8/12/13



0000065797.CNF

Live Time :10200.000 sec  
Real Time :10413.100 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :Sat Aug 10 15:02:02 2013



ROI Type: 1

ROI Type: 3

0150

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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: 10413

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

369: 0 0 0 0 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	2	0
385:	0	0	0	0	0	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	1	0	0
409:	0	0	0	0	1	0	0	1
417:	0	1	0	0	0	1	2	0
425:	2	0	0	0	1	0	0	2
433:	0	3	1	1	0	0	1	0
441:	3	2	0	0	1	0	1	2
449:	1	1	0	2	2	0	1	4
457:	1	4	3	1	1	1	1	2
465:	1	2	2	5	0	3	1	3
473:	1	1	2	0	1	1	4	5
481:	1	3	3	2	1	2	2	0
489:	1	2	1	3	3	0	1	1
497:	0	0	2	2	2	2	0	2
505:	1	3	0	1	0	0	0	1
513:	0	0	0	1	2	0	0	0
521:	0	2	0	0	1	2	0	0
529:	2	0	0	1	2	0	0	3
537:	1	0	1	0	1	0	1	0
545:	0	1	0	0	1	2	0	1
553:	0	1	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	1	0	0	0	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	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	1	1	0	1
673:	0	0	0	0	0	0	1	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	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	1	1	0	0
761:	0	0	0	0	0	1	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	1	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 11

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	1	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	1	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	1	0	0	1	0
969:	0	0	0	0	1	0	1
977:	0	0	0	0	0	0	1
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



Sample Description: PZ-304-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:04 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 173.6 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.233 mL  
 Effective Efficiency: 0.1257 +/- 0.0126  
 Counting Efficiency: 0.1910 +/- 0.0033 on 7/20/2013 2:31:37 PM  
 Chem. Recovery Factor: 0.6584 +/- 0.0668

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	5.827	0.49	416.98	0.51	0.00E+000	3.0
TH-228	5.226	1.32	215.97	0.68	0.00E+000	3.0
TH-229 T	4.835	111.98	18.62	1.02	0.00E+000	4.4
TH-230	4.621	30.49	35.84	0.51	0.00E+000	3.0
TH-232	3.932	6.98	80.28	1.02	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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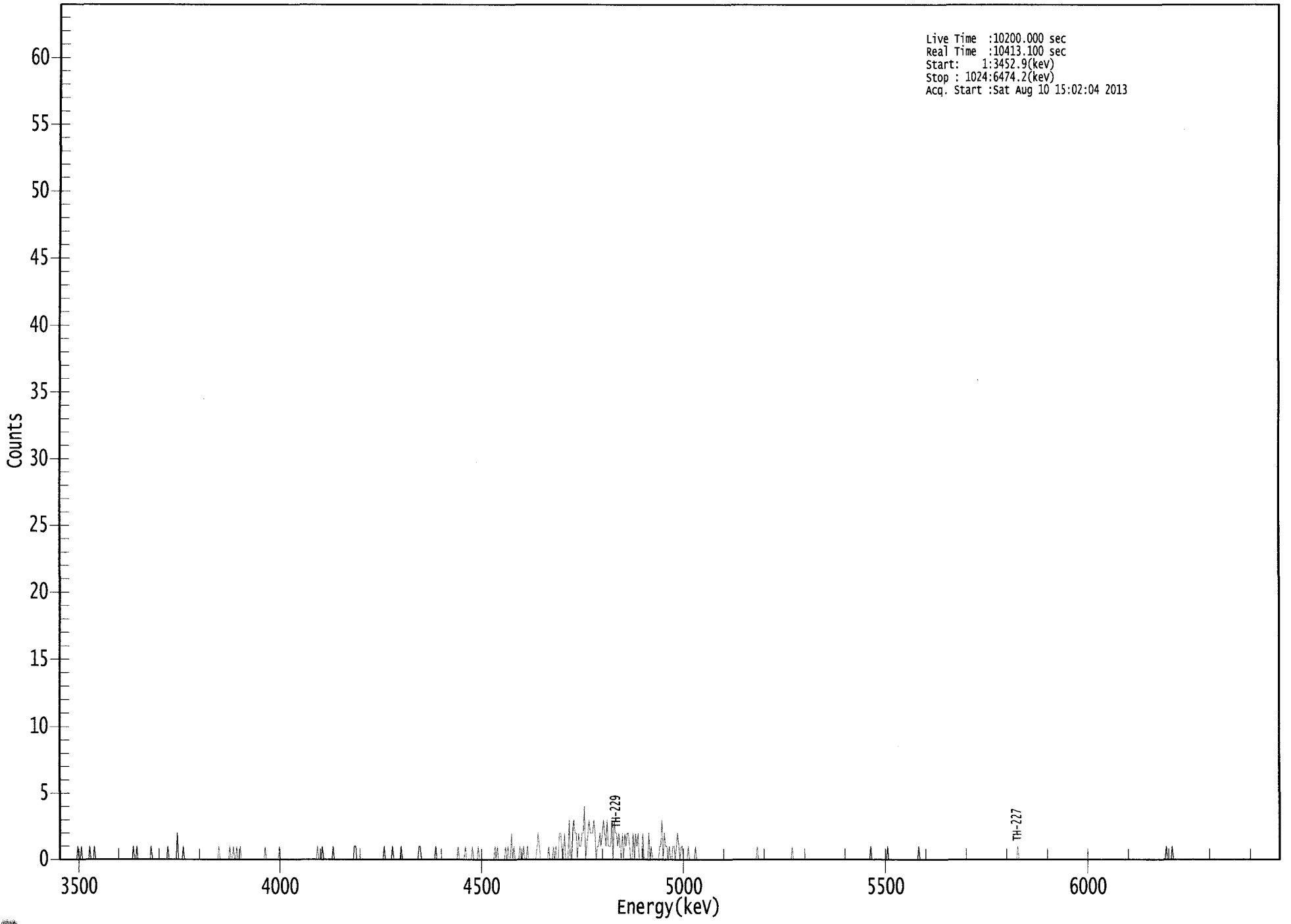
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.997	5850.00*	1.06E-002 +/- 4.43E-002	1.14E-001 +/- 2.23E-002
TH-228	0.854	5400.00*	2.85E-002 +/- 6.19E-002	1.22E-001 +/- 2.39E-002
TH-229	0.993	4872.00*	2.37E+000 +/- 4.64E-001	1.33E-001 +/- 2.61E-002
TH-230	0.986	4672.00*	6.44E-001 +/- 2.63E-001	1.11E-001 +/- 2.17E-002
TH-232	0.978	3997.00*	1.47E-001 +/- 1.22E-001	1.33E-001 +/- 2.60E-002

AG  
8/10/13

US EPA ARCHIVE DOCUMENT

000065798.CNF

Live Time :10200.000 sec  
Real Time :10413.100 sec  
Start: 1:3452.9(keV)  
Stop : 1024:6474.2(keV)  
Acq. Start :Sat Aug 10 15:02:04 2013



ROI Type: 1

ROI Type: 3

65798

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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: 10413

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	1
17:	0	0	1	0	0	0	0	0
25:	0	1	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	1	0
65:	0	1	0	0	0	0	0	0
73:	0	0	0	0	0	1	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	1	0	0	0	0
97:	0	0	0	2	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	1	0
137:	0	0	0	0	0	0	0	1
145:	0	0	1	0	0	1	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	1	0	0
177:	0	0	0	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	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	1	0	0	0	1	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	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	0	0
273:	0	1	0	0	0	0	0	0
281:	1	0	0	0	0	0	0	1
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	1	1
305:	0	0	0	0	0	0	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	0	0	0	1
337:	0	0	0	0	0	1	0	0
345:	0	0	0	1	0	0	0	0
353:	1	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	1	0

369: 1 0 0 0 0 0 0 0 1

Sample Title: 12

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	2	0	1	0
385:	0	0	0	1	0	0	1	0
393:	0	1	0	0	0	0	0	0
401:	0	1	2	1	0	0	0	0
409:	0	0	0	1	0	0	0	1
417:	0	1	0	0	2	2	1	0
425:	2	0	0	0	3	0	0	2
433:	3	2	2	0	2	1	1	2
441:	2	4	0	1	2	3	2	2
449:	2	3	2	0	1	1	2	1
457:	2	3	2	1	3	1	1	1
465:	3	0	3	2	2	1	2	1
473:	0	2	0	2	1	2	2	1
481:	0	0	2	0	2	1	2	0
489:	0	0	2	0	0	0	0	2
497:	0	1	0	0	0	0	0	0
505:	1	1	3	0	2	1	1	0
513:	1	0	0	1	1	0	1	2
521:	1	0	1	1	0	0	0	0
529:	1	0	0	0	0	0	1	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	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	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	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	1	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	1
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	1	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 1 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	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:	1	0	0	0	0	1	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



Sample Description: PZ-304-AS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:06 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 173.6 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.235 mL  
 Effective Efficiency: 0.1270 +/- 0.0126  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Chem. Recovery Factor: 0.7124 +/- 0.0718

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	5.813	2.83	120.53	0.17	0.00E+000	2.9
TH-228	5.360	4.32	102.62	0.68	0.00E+000	2.9
TH-229 T	4.877	114.00	18.44	0.00	0.00E+000	3.2
TH-230	4.581	30.66	35.63	0.34	0.00E+000	5.9
TH-232	3.927	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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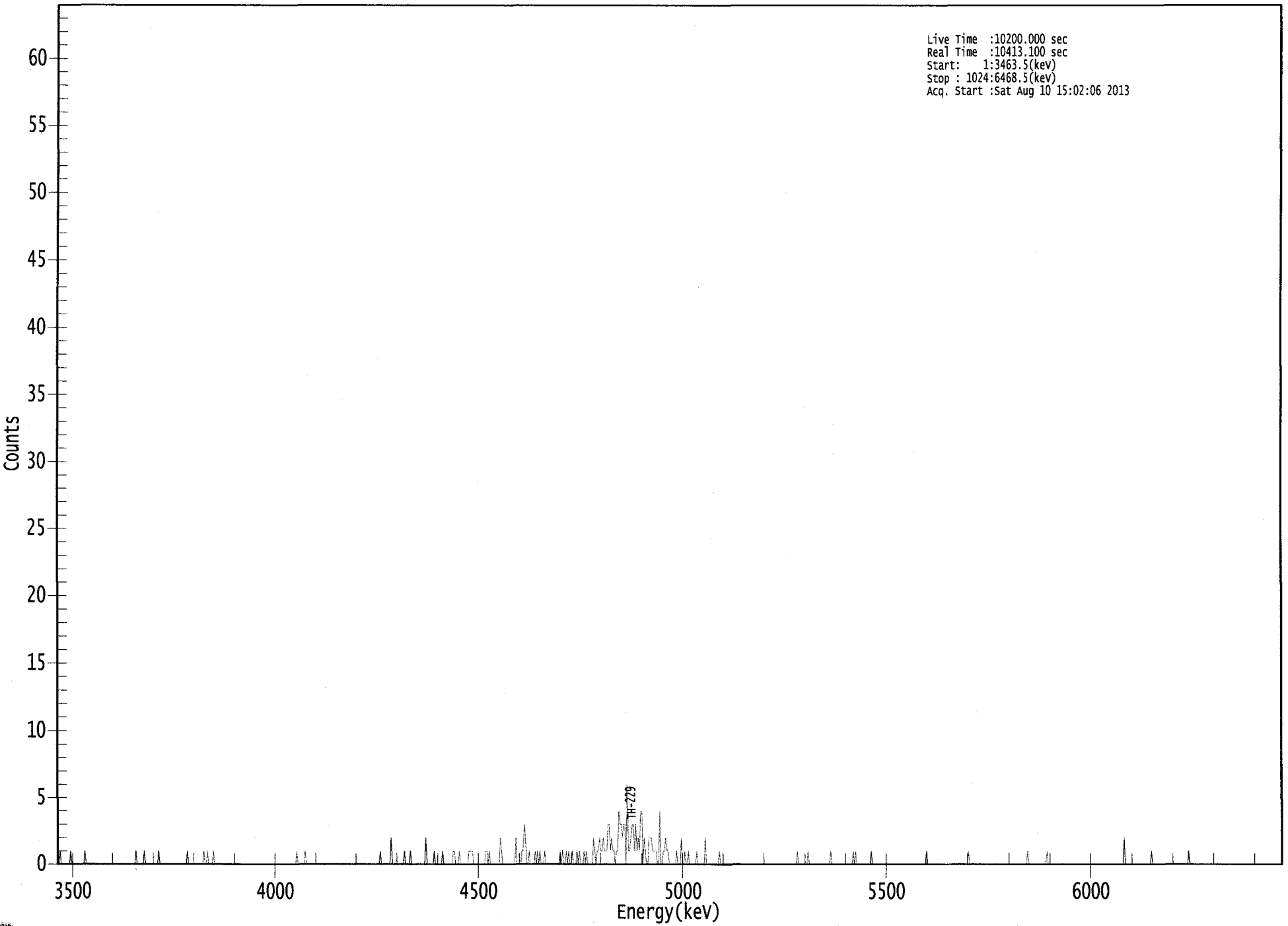
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.993	5850.00*	6.07E-002 +/- 7.41E-002	8.95E-002 +/- 1.74E-002
TH-228	0.992	5400.00*	9.25E-002 +/- 9.66E-002	1.21E-001 +/- 2.34E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 4.64E-001	1.26E-001 +/- 2.44E-002
TH-230	0.958	4672.00*	6.41E-001 +/- 2.60E-001	9.99E-002 +/- 1.94E-002
TH-232	0.975	3997.00*	1.01E-001 +/- 9.38E-002	8.71E-002 +/- 1.69E-002

AG  
 8/16/13

US EPA ARCHIVE DOCUMENT

000065799.CNF

Live Time :10200.000 sec  
Real Time :10413.100 sec  
Start: 1:3463.5(kev)  
Stop : 1024:6468.5(kev)  
Acq. Start :Sat Aug 10 15:02:06 2013



ROI Type: 1

ROI Type: 3

0250

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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: 10413

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	1	0	0	0	0	0
9:	0	0	0	1	0	0	0	0
17:	0	0	0	0	0	0	0	1
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	1	0	0	0	0	0
73:	0	1	0	0	0	0	0	0
81:	0	0	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	0	0	0	1	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	1	0	0	1	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	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	1	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	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	1
273:	0	0	0	0	0	0	0	0
281:	2	0	0	0	0	0	0	0
289:	0	0	0	1	0	0	0	0
297:	1	0	0	0	0	0	0	0
305:	0	0	0	0	0	2	0	0
313:	0	0	0	0	1	0	0	0
321:	0	0	0	1	0	0	0	0
329:	0	0	0	0	1	1	0	0
337:	0	1	0	0	0	0	0	0
345:	0	1	1	1	1	0	0	0
353:	0	0	0	0	0	0	0	1
361:	1	0	1	0	0	0	0	0

369: 0 0 0 2 1 0 0 0

Sample Title: 13

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	2	0	0	0	0	1	1	3
393:	2	0	0	1	0	0	0	0
401:	1	0	1	0	1	0	0	0
409:	1	0	0	0	0	0	0	0
417:	0	0	0	0	0	1	0	1
425:	0	0	1	0	1	0	0	1
433:	0	0	0	1	0	1	0	0
441:	0	1	0	1	0	0	0	0
449:	0	2	1	0	1	1	2	1
457:	1	2	1	1	1	3	3	1
465:	2	1	1	0	1	1	4	3
473:	3	2	3	3	0	6	1	1
481:	2	3	3	1	3	1	2	1
489:	4	4	0	2	1	0	0	2
497:	2	2	1	1	1	1	0	0
505:	4	0	0	1	1	2	1	1
513:	0	0	0	0	0	0	1	0
521:	0	0	2	0	0	1	0	0
529:	1	0	0	0	0	0	0	1
537:	0	0	0	0	0	0	2	0
545:	0	0	0	0	0	0	0	0
553:	0	0	1	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	1	0	0	0	0
625:	0	0	0	0	1	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	1
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	1	0	1	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	1	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	1
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	1	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 13

Channel	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	1	0	0	0
817:	0	0	0	0	0	0	0
825:	0	0	0	1	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	2	0	0	0
897:	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0
913:	0	0	1	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	1	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



Sample Description: MW-104 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307147A-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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:07 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 173.6 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1619 +/- 0.0144  
 Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM  
 Chem. Recovery Factor: 0.9406 +/- 0.0852

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	5.888	5.00	96.02	0.00	0.00E+000	3.0
TH-228	5.381	42.32	30.41	0.68	0.00E+000	3.0
TH-229 T	4.889	144.66	16.32	0.34	0.00E+000	5.5
TH-230	4.628	70.00	23.59	0.00	0.00E+000	4.4
TH-232	3.951	36.83	32.38	0.17	0.00E+000	4.9

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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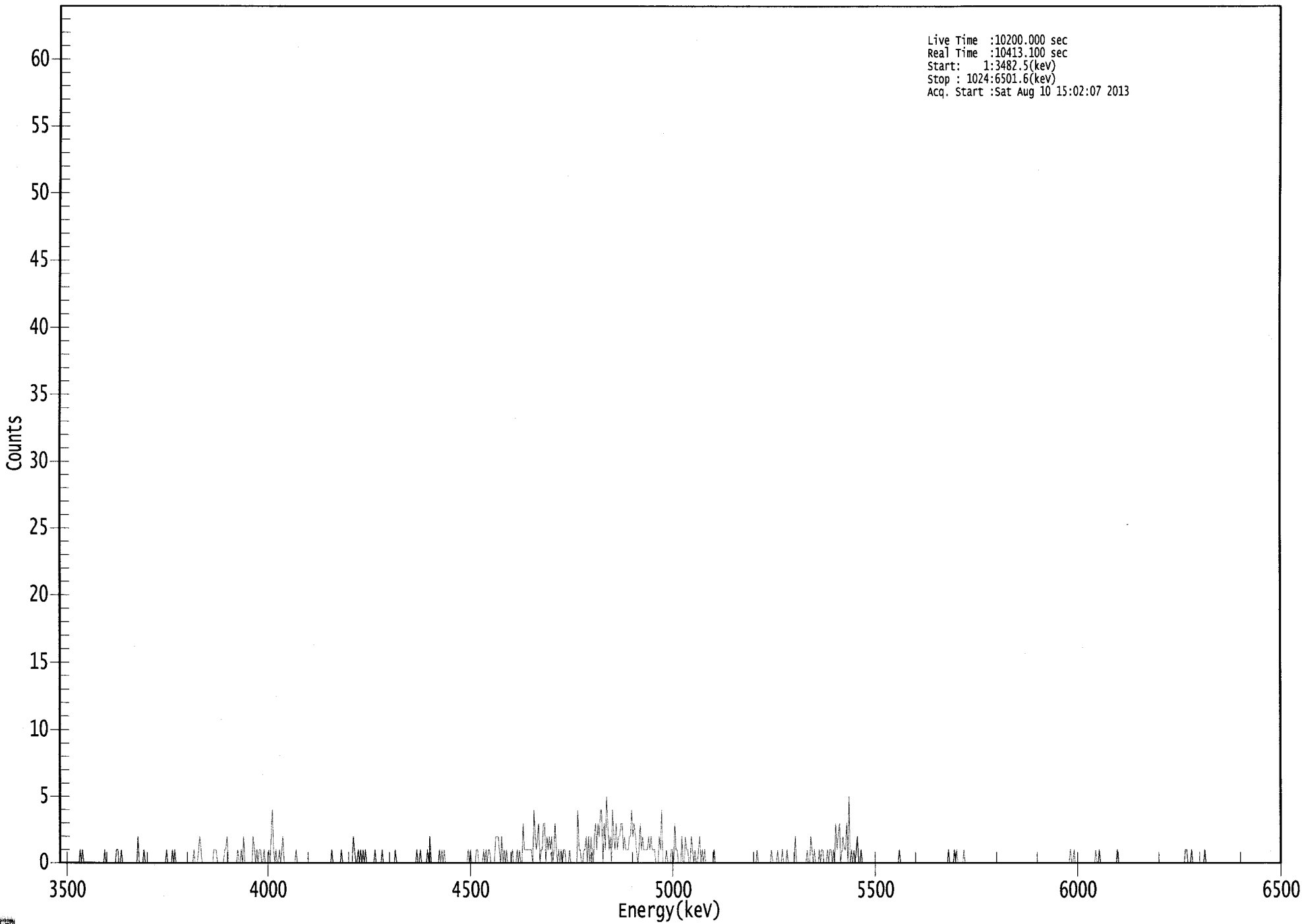
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.993	5850.00*	8.41E-002 +/- 8.21E-002	1.01E-001 +/- 1.76E-002
TH-228	0.998	5400.00*	7.10E-001 +/- 2.49E-001	9.47E-002 +/- 1.65E-002
TH-229	0.998	4872.00*	2.38E+000 +/- 4.14E-001	7.86E-002 +/- 1.37E-002
TH-230	0.990	4672.00*	1.15E+000 +/- 3.36E-001	9.83E-002 +/- 1.71E-002
TH-232	0.989	3997.00*	6.03E-001 +/- 2.22E-001	6.83E-002 +/- 1.19E-002

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 8/12/13

US EPA ARCHIVE DOCUMENT

000065800.CNF

Live Time :10200.000 sec  
Real Time :10413.100 sec  
Start: 1:3482.5(keV)  
Stop : 1024:6501.6(keV)  
Acq. Start :Sat Aug 10 15:02:07 2013



ROI Type: 1

ROI Type: 3

0325



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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: 10413

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

369: 2 1 0 2 0 1 0 1

Sample Title: 14

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	1	0	0	0
385:	1	0	1	0	0	3	1	1
393:	1	1	1	1	1	0	4	2
401:	1	2	3	0	1	1	3	3
409:	0	2	1	2	1	2	0	1
417:	3	1	0	1	0	1	0	1
425:	1	0	0	0	1	0	0	0
433:	0	0	0	4	1	1	0	0
441:	1	1	2	0	2	0	2	1
449:	0	2	3	1	3	2	4	4
457:	0	3	1	5	3	1	2	0
465:	4	2	1	3	1	2	2	3
473:	3	1	2	1	1	1	2	2
481:	4	2	3	2	1	0	1	3
489:	1	2	1	1	1	1	2	1
497:	2	1	1	1	0	0	0	2
505:	1	4	0	0	0	1	0	0
513:	0	1	1	0	3	1	1	0
521:	0	0	2	0	0	2	1	1
529:	0	0	2	1	0	1	0	0
537:	1	2	0	1	0	1	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	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	1	0	0	0	0	0	0
593:	0	0	0	0	0	1	0	0
601:	0	0	1	0	0	0	1	0
609:	0	0	1	0	0	0	0	0
617:	0	2	0	0	0	0	0	0
625:	0	0	0	1	0	0	2	1
633:	0	1	0	0	0	1	0	1
641:	1	0	0	0	1	0	1	1
649:	0	1	0	3	1	2	3	0
657:	1	2	1	1	3	0	5	0
665:	1	0	1	0	1	2	0	0
673:	1	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	1	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	1	0	0	0	0	1	0
753:	1	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: 14

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	1
849:	0	0	1	0	0	0	0
857:	0	0	0	0	0	0	0
865:	0	0	0	0	1	0	1
873:	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	1
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	1
945:	1	0	0	0	1	0	0
953:	0	0	0	0	0	0	1
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



Sample Description: MW-104 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307147A-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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:09 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 173.6 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.233 mL  
 Effective Efficiency: 0.1451 +/- 0.0136  
 Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM  
 Chem. Recovery Factor: 0.7383 +/- 0.0703

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	5.842	0.49	416.98	0.51	0.00E+000	3.0
TH-228	5.347	0.15	1397.8	0.85	0.00E+000	3.0
TH-229 T	4.851	129.15	17.31	0.85	0.00E+000	4.5
TH-230	4.602	25.32	39.56	0.68	0.00E+000	3.7
TH-232	4.035	2.66	128.85	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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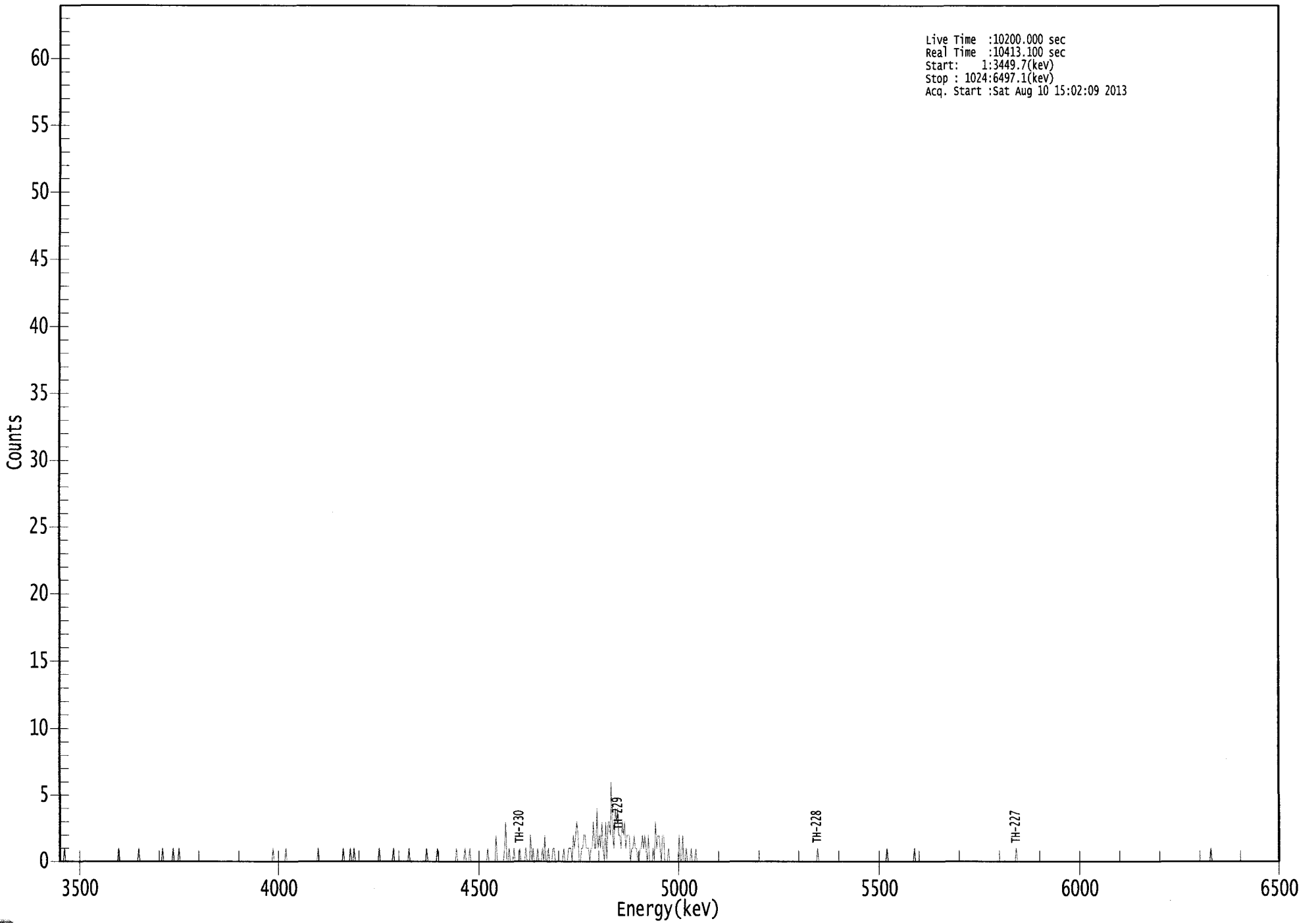
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	1.000	5850.00*	9.20E-003 +/- 3.84E-002	9.85E-002 +/- 1.81E-002
TH-228	0.986	5400.00*	2.81E-003 +/- 3.93E-002	1.12E-001 +/- 2.06E-002
TH-229	0.998	4872.00*	2.37E+000 +/- 4.35E-001	1.10E-001 +/- 2.02E-002
TH-230	0.975	4672.00*	4.63E-001 +/- 2.02E-001	1.03E-001 +/- 1.89E-002
TH-232	0.993	3997.00*	4.86E-002 +/- 6.32E-002	8.73E-002 +/- 1.60E-002

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US EPA ARCHIVE DOCUMENT

0000065801.CNF

Live Time :10200.000 sec  
Real Time :10413.100 sec  
Start: 1:3449.7(kev)  
Stop : 1024:6497.1(kev)  
Acq. Start :Sat Aug 10 15:02:09 2013



ROI Type: 1

ROI Type: 3

0250

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

Sample Title: 15

Elapsed Live time: 10200

Elapsed Real Time: 10413

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	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	0	0	0	0
49:	0	0	1	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	1	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:	1	0	0	0	0	1	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	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	1	0	0	0
185:	0	0	0	0	0	0	0	1
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	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	1	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	1	0	0
273:	0	0	0	0	0	0	0	0
281:	0	1	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	0	0
313:	0	0	0	0	0	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	1	0
337:	0	0	0	0	0	1	0	0
345:	0	1	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	1	0	0	0	0	0	0	2

369: 0 0 0 0 0 0 0 1 3

Sample Title: 15

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	0	0	0	1	0
385:	0	0	0	1	0	0	0	0
393:	1	0	0	0	2	0	1	0
401:	0	0	1	0	0	0	1	0
409:	2	0	0	1	0	0	0	1
417:	1	0	0	0	0	0	0	0
425:	1	0	0	0	1	1	1	0
433:	2	1	2	3	2	0	0	1
441:	1	2	2	1	1	1	0	1
449:	1	3	1	1	4	1	2	1
457:	3	1	0	3	0	3	3	2
465:	6	2	1	4	3	4	2	2
473:	1	3	2	3	1	2	2	2
481:	0	1	1	2	1	1	0	0
489:	1	1	2	1	2	1	0	2
497:	0	0	0	1	0	3	1	2
505:	2	1	0	2	2	0	0	0
513:	1	0	0	0	0	0	0	0
521:	0	2	0	0	2	0	0	1
529:	0	0	0	1	0	0	0	1
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	1	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	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	1	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 1 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	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	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	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0





Sample Description: PZ-204A-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307147A-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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:10 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 173.6 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.234 mL  
 Effective Efficiency: 0.1106 +/- 0.0117  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 0.5820 +/- 0.0621

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	5.839	2.66	128.85	0.34	0.00E+000	3.0
TH-228	5.345	15.15	51.98	0.85	0.00E+000	3.0
TH-229 T	4.867	98.83	19.74	0.17	0.00E+000	7.9
TH-230	4.619	20.32	44.32	0.68	0.00E+000	3.7
TH-232	3.910	7.66	72.63	0.34	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

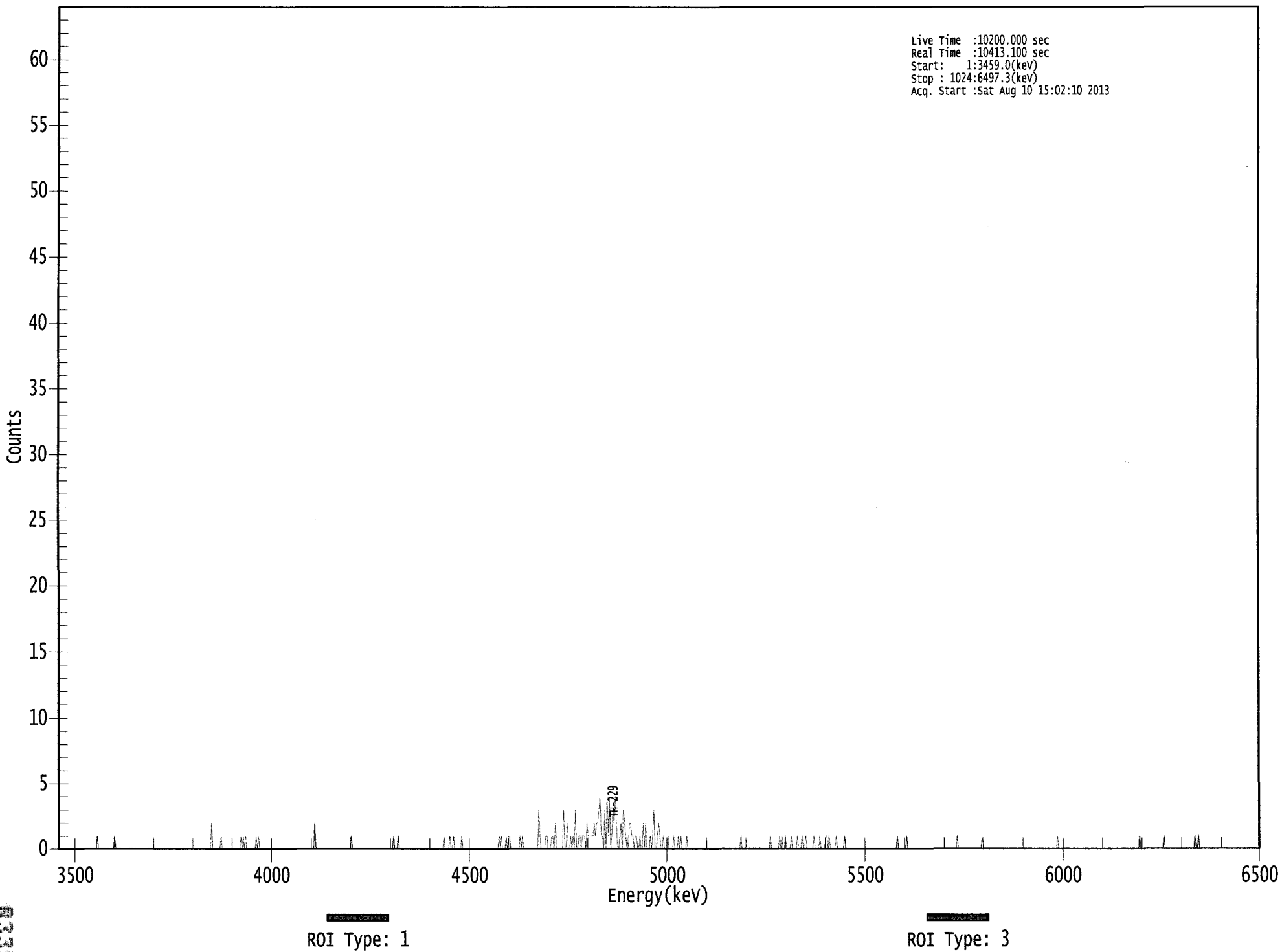
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.999	5850.00*	6.55E-002 +/- 8.55E-002	1.18E-001 +/- 2.43E-002
TH-228	0.984	5400.00*	3.72E-001 +/- 2.08E-001	1.47E-001 +/- 3.04E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.91E-001	1.00E-001 +/- 2.07E-002
TH-230	0.986	4672.00*	4.88E-001 +/- 2.38E-001	1.35E-001 +/- 2.80E-002
TH-232	0.961	3997.00*	1.84E-001 +/- 1.39E-001	1.15E-001 +/- 2.37E-002

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 8/12/13

0000065802.CNF

Live Time :10200.000 sec  
Real Time :10413.100 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Sat Aug 10 15:02:10 2013



0000065802

\*\*\*\*\*  
\*\*\*\*\* 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: 10413

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	1	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	1	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	2	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	1	0	1	0
161:	1	0	0	0	0	0	0	0
169:	0	1	0	1	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	2	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	1	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	1	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	1	0	0	0	0	1	0
337:	0	1	0	0	0	0	0	0
345:	1	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

Sample Title: 16

Channel	1	2	3	4	5	6	7	8
377:	1	0	1	0	0	0	1	0
385:	1	1	0	0	0	0	0	0
393:	0	0	1	0	1	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	3	1	0	0	0	0
417:	1	1	0	0	0	1	1	0
425:	2	0	0	0	0	0	0	3
433:	0	0	2	0	0	1	0	1
441:	0	3	0	0	1	1	0	1
449:	1	1	0	2	1	1	1	1
457:	1	2	1	2	2	3	4	1
465:	1	0	3	0	4	1	4	0
473:	1	3	2	4	2	0	0	1
481:	2	0	3	2	1	0	0	2
489:	2	1	1	0	1	1	0	0
497:	1	0	0	2	0	2	0	0
505:	0	1	0	1	3	0	0	1
513:	2	1	0	0	1	0	0	0
521:	1	0	0	0	0	1	0	0
529:	0	1	0	1	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:	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	0	0	1
617:	0	1	0	0	1	0	0	0
625:	0	1	0	0	0	0	1	0
633:	0	0	1	0	0	1	0	0
641:	0	0	0	0	1	0	0	0
649:	0	1	0	0	0	0	1	1
657:	0	1	0	0	0	0	0	1
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	1	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	1	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	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	1	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	1	0	0	0	0	0
929:	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	1
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:	1	0	0	1	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



Sample Description: PZ-204A-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 17  
 Sample Geometry: Shelf 2  
 Procedure Description: Th 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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:13 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: 0.1569 +/- 0.0141  
 Counting Efficiency: 0.1909 +/- 0.0033 on 7/20/2013 2:31:26 PM  
 Chem. Recovery Factor: 0.8216 +/- 0.0754

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	5.838	2.66	128.85	0.34	0.00E+000	3.0
TH-228	5.346	2.32	149.12	0.68	0.00E+000	3.0
TH-229 T	4.885	140.49	16.57	0.51	0.00E+000	4.5
TH-230	4.604	24.66	39.79	0.34	0.00E+000	5.9
TH-232	3.968	6.83	76.08	0.17	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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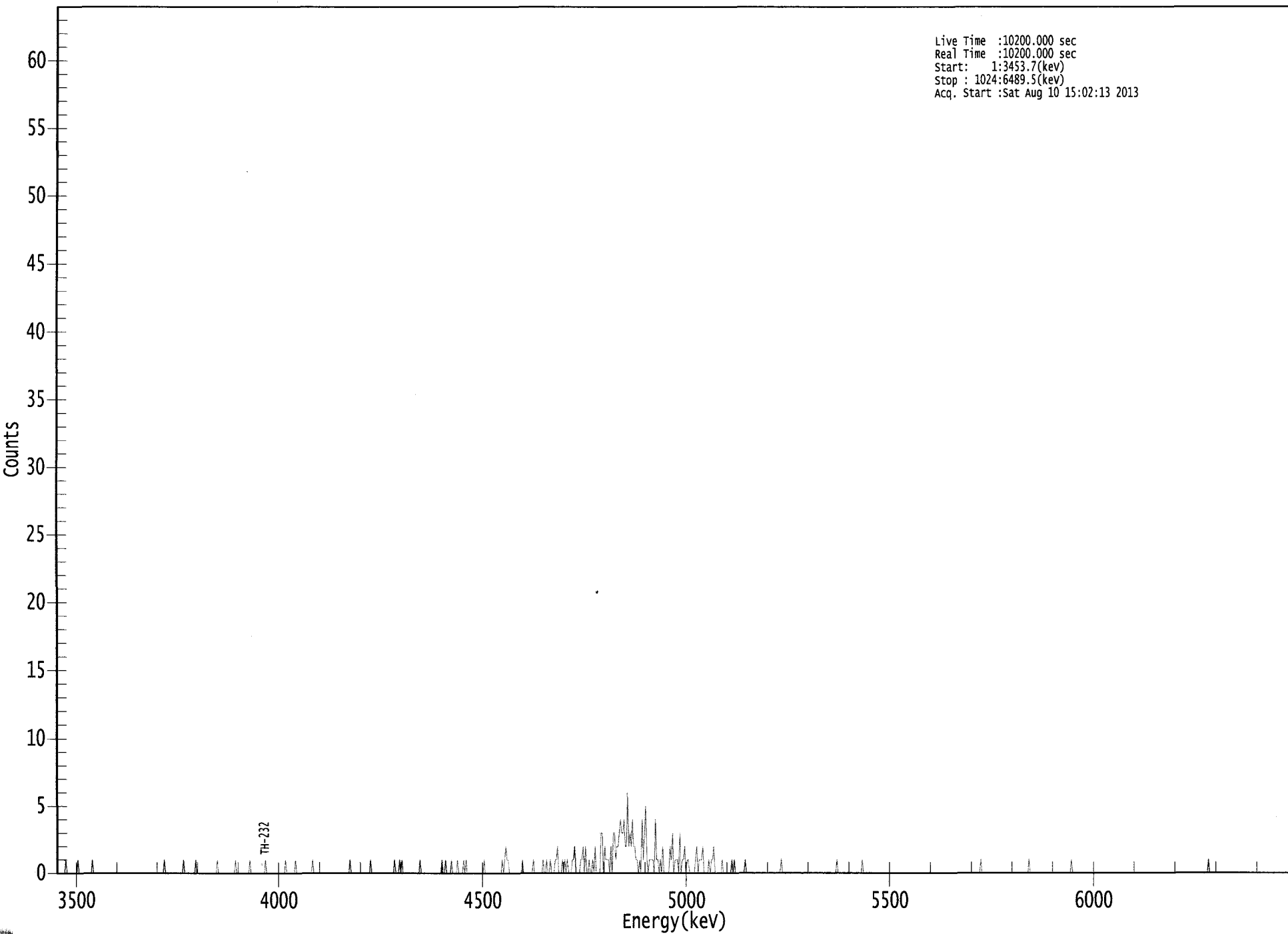
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.999	5850.00*	4.62E-002 +/- 6.01E-002	8.30E-002 +/- 1.47E-002
TH-228	0.985	5400.00*	4.02E-002 +/- 6.04E-002	9.78E-002 +/- 1.73E-002
TH-229	0.999	4872.00*	2.38E+000 +/- 4.21E-001	8.91E-002 +/- 1.57E-002
TH-230	0.976	4672.00*	4.17E-001 +/- 1.82E-001	8.09E-002 +/- 1.43E-002
TH-232	0.996	3997.00*	1.15E-001 +/- 9.01E-002	7.05E-002 +/- 1.24E-002

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 8/12/13

US EPA ARCHIVE DOCUMENT

000065792.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6489.5(kev)  
Acq. Start :Sat Aug 10 15:02:13 2013



ROI Type: 1

ROI Type: 3

000065792

\*\*\*\*\*  
\*\*\*\*\* 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	1
9:	0	0	0	0	0	0	0	0
17:	0	1	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	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	1	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	1	0	0	0	0	0	0
113:	0	0	0	1	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	1	0	0
137:	0	0	0	0	0	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	1	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	1	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	1	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	1	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	1	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	1	0	0	0	1	0	1	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	1	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	1
321:	0	0	1	0	0	0	0	1
329:	0	0	0	0	1	0	0	0
337:	0	1	0	1	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	1	0	0	0	0	0
361:	0	0	0	0	0	0	0	0



369: 0 1 0 1 2 1 1 0

Sample Title: 17

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	1	0	0	0	0	0
393:	0	0	0	1	0	0	0	0
401:	0	0	0	1	0	0	1	0
409:	0	1	0	0	0	1	1	2
417:	0	0	0	1	0	1	0	1
425:	0	0	0	1	1	2	0	0
433:	0	0	1	1	2	0	2	0
441:	0	1	0	0	1	0	2	0
449:	0	0	0	3	3	0	2	1
457:	1	1	0	2	0	3	3	1
465:	2	2	3	4	3	3	4	2
473:	2	6	2	3	2	4	2	2
481:	1	1	0	1	0	4	1	3
489:	5	1	0	1	1	1	1	0
497:	4	1	1	0	1	0	2	0
505:	0	0	0	0	2	1	3	0
513:	1	1	1	0	3	0	1	1
521:	2	0	1	1	0	0	0	0
529:	0	1	2	0	1	1	1	2
537:	0	0	0	0	1	0	1	1
545:	2	0	0	0	0	0	0	1
553:	0	0	0	0	0	0	0	1
561:	0	1	0	0	0	0	0	0
569:	0	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:	1	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	1	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	1	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	1	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 1 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:	1	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	1	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



Sample Description: PZ-302-AI TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 18  
 Sample Geometry: Shelf 2  
 Procedure Description: Th 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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:14 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: 0.1568 +/- 0.0141  
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM  
 Chem. Recovery Factor: 0.8762 +/- 0.0802

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	5.882	5.83	82.55	0.17	0.00E+000	3.0
TH-228	5.350	6.83	76.08	0.17	0.00E+000	3.0
TH-229 T	4.859	140.83	16.53	0.17	0.00E+000	8.2
TH-230	4.608	35.00	33.60	0.00	0.00E+000	3.7
TH-232	3.939	9.00	68.87	0.00	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

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

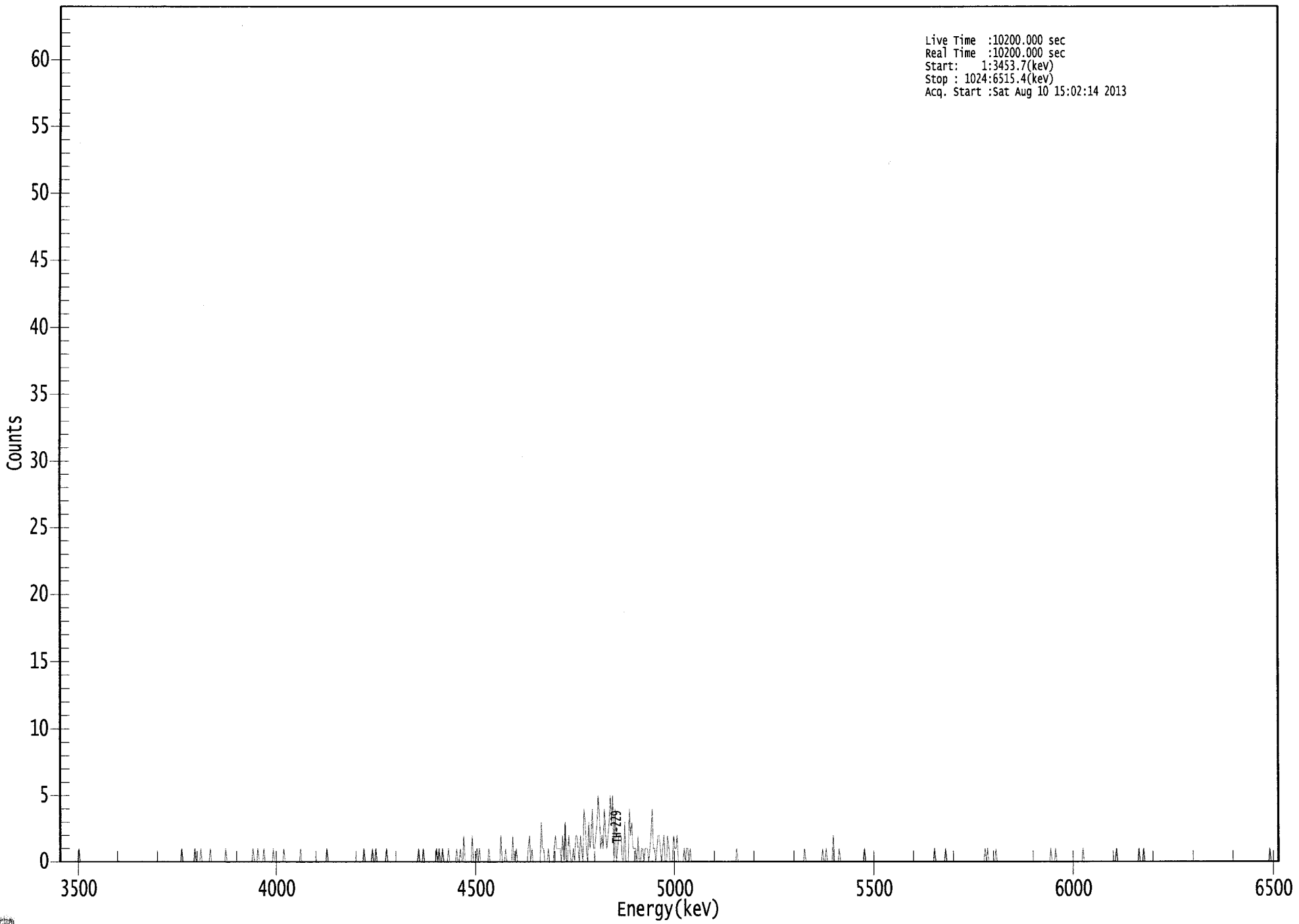
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.995	5850.00*	1.01E-001 +/- 8.55E-002	7.25E-002 +/- 1.28E-002
TH-228	0.987	5400.00*	1.18E-001 +/- 9.25E-002	7.24E-002 +/- 1.27E-002
TH-229	0.999	4872.00*	2.39E+000 +/- 4.21E-001	7.09E-002 +/- 1.25E-002
TH-230	0.979	4672.00*	5.93E-001 +/- 2.25E-001	1.02E-001 +/- 1.79E-002
TH-232	0.983	3997.00*	1.52E-001 +/- 1.08E-001	1.01E-001 +/- 1.78E-002

AG  
 8/12/13

US EPA ARCHIVE DOCUMENT

0000065793.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3453.7(keV)  
Stop : 1024:6515.4(keV)  
Acq. Start :Sat Aug 10 15:02:14 2013



ROI Type: 1

ROI Type: 3

0345

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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:	1	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	1
105:	0	0	0	0	0	0	0	0
113:	0	0	1	0	0	0	0	1
121:	0	0	0	0	0	0	0	1
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	1	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	1	0	0	0	1
169:	0	0	0	0	1	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	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	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:	1	0	0	0	0	0	0	1
265:	0	0	1	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	1	0	0	0	0	0
313:	0	0	0	0	0	1	0	1
321:	0	0	1	0	0	0	0	1
329:	0	0	0	0	0	0	1	0
337:	0	1	0	0	2	0	0	0
345:	0	0	0	2	0	0	0	1
353:	0	1	0	0	0	0	0	0
361:	0	1	0	0	0	0	0	0

369: 0 0 0 2 0 0 0 1

Sample Title: 18

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	2	0	0
385:	1	0	0	0	0	0	0	0
393:	0	0	1	2	0	1	0	0
401:	0	0	0	0	0	3	1	1
409:	0	0	0	1	0	0	0	0
417:	1	2	1	1	1	1	0	2
425:	0	3	0	0	2	1	0	0
433:	1	0	2	2	1	0	2	1
441:	0	4	3	1	0	3	1	2
449:	4	1	1	2	3	5	3	1
457:	2	1	4	2	1	2	3	5
465:	3	5	0	4	0	1	2	2
473:	2	0	0	3	0	0	0	4
481:	2	3	1	1	1	0	2	0
489:	0	1	1	0	1	1	1	0
497:	1	2	4	1	1	0	1	2
505:	2	1	0	1	2	0	0	2
513:	1	0	0	0	2	1	1	2
521:	0	0	0	0	0	1	0	1
529:	1	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	0	0	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	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	1	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	1	0	0	1	0	0	0
649:	0	0	2	0	0	0	0	1
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	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	1
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	0	0	0	0
777:	0	1	0	1	0	0	0	0
785:	0	0	1	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
817:	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0
833:	1	0	0	0	1	0	0
841:	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0
857:	0	0	0	1	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	1
889:	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0
905:	0	0	1	0	0	0	1
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	1
1017:	0	0	0	0	0	0	0



# Apex-Alpha™

Sample Description: PZ-302-AI DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000657  
 Batch Identification: 1307147A-TH  
 Sample Identification: 19  
 Sample Geometry: Shelf 2  
 Procedure Description: Th 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: 7/16/2013 7:27:05 AM  
 Acquisition Date/Time: 8/10/2013 3:02:16 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: 0.1715 +/- 0.0148  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Chem. Recovery Factor: 0.9415 +/- 0.0831

Peak Match Tolerance: 0.175 MeV

-----  
 ----- PEAK AREA REPORT -----  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
TH-227	5.709	0.66	305.43	0.34	0.00E+000	2.9
TH-228	5.300	-0.17	1169.4	0.17	0.00E+000	0.0
TH-229 T	4.856	154.32	15.82	0.68	0.00E+000	8.1
TH-230	4.639	36.83	32.38	0.17	0.00E+000	2.9
TH-232	3.971	4.66	94.59	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)
TH-227	0.901	5850.00*	1.05E-002 +/- 3.21E-002	7.59E-002 +/- 1.29E-002
TH-228	0.949	5400.00*	-2.69E-003 +/- 3.15E-002	6.62E-002 +/- 1.12E-002
TH-229	0.999	4872.00*	2.40E+000 +/- 4.06E-001	8.76E-002 +/- 1.48E-002
TH-230	0.994	4672.00*	5.70E-001 +/- 2.08E-001	6.46E-002 +/- 1.09E-002
TH-232	0.996	3997.00*	7.20E-002 +/- 6.92E-002	7.39E-002 +/- 1.25E-002

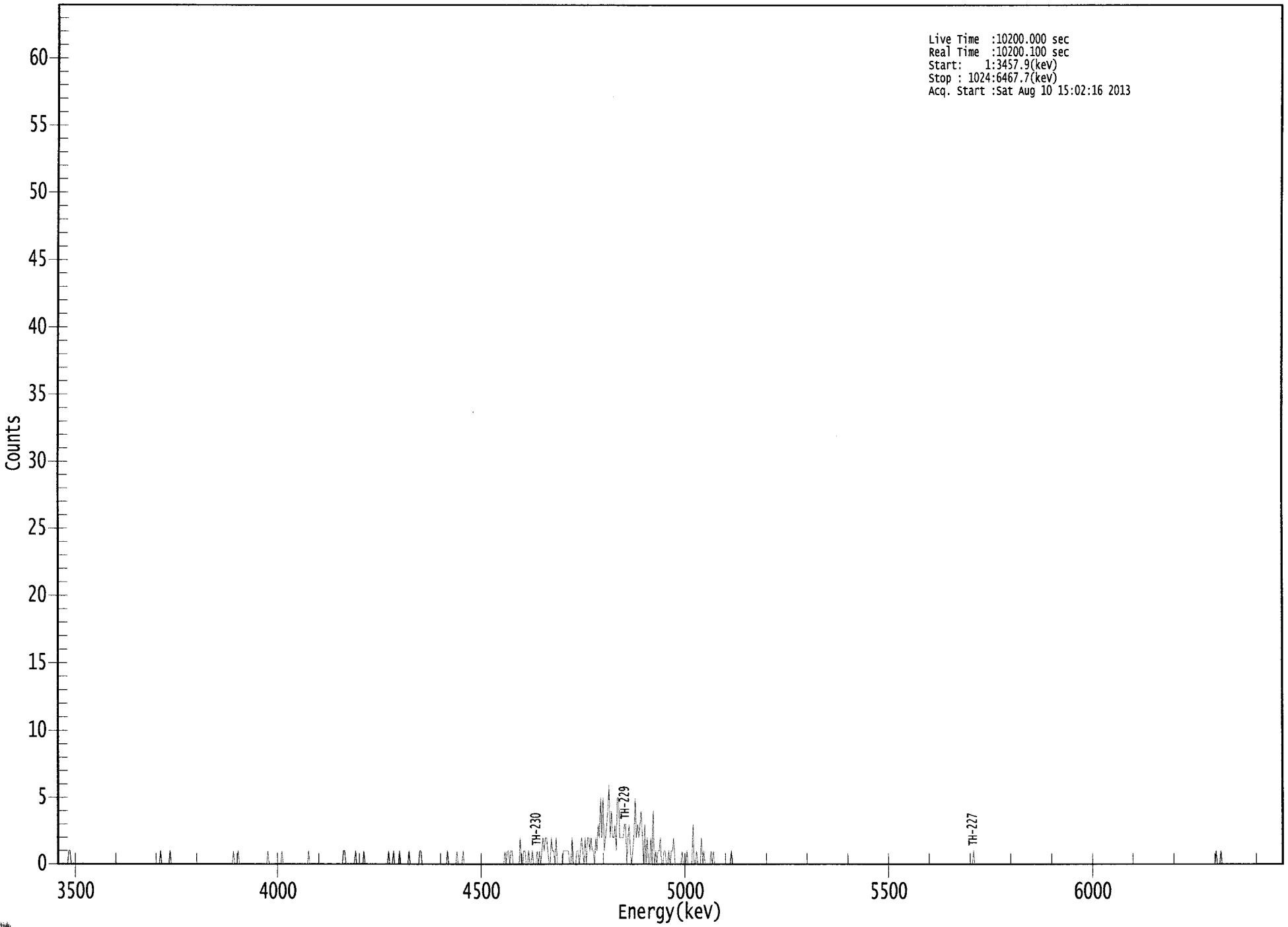
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 8/12/13

US EPA ARCHIVE DOCUMENT



0000065794.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3457.9(kev)  
Stop : 1024:6467.7(kev)  
Acq. Start :Sat Aug 10 15:02:16 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   \*\*\*\*\*  
 \*\*\*\*\*

Sample Title: 19

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	1	1	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	1	0
89:	0	0	0	0	0	0	1	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	1
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	1	0	0	0	0	0	0	0
185:	0	0	0	0	1	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	1	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	1
241:	1	0	0	0	0	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	0	0	1	0	0
281:	0	1	0	0	0	0	1	0
289:	0	0	0	0	0	0	1	0
297:	0	0	0	0	0	0	0	1
305:	1	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	1	0
329:	0	0	0	0	0	0	1	0
337:	0	0	0	1	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 1 0

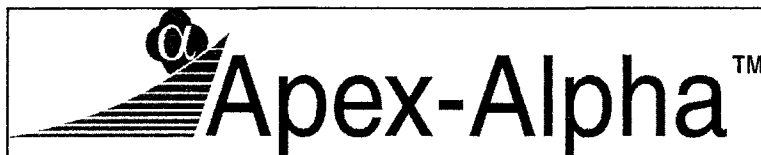
Sample Title: 19

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	1	0	1	1	0	0	0
385:	0	0	0	2	0	0	1	1
393:	0	0	1	0	0	1	0	0
401:	0	1	0	1	0	1	2	1
409:	2	2	1	0	0	2	1	1
417:	0	2	0	0	0	0	0	1
425:	1	1	1	1	0	0	2	0
433:	0	0	1	1	0	1	2	1
441:	0	2	0	2	2	1	2	1
449:	1	0	2	1	3	2	5	2
457:	5	1	2	3	4	6	2	4
465:	2	2	3	1	5	5	2	2
473:	2	2	3	3	0	2	3	1
481:	0	1	2	5	2	3	2	3
489:	4	2	0	3	0	2	0	0
497:	2	0	4	0	1	0	1	1
505:	2	0	0	1	1	0	0	1
513:	0	1	1	2	0	0	0	0
521:	0	0	1	0	0	0	1	0
529:	0	0	0	3	0	0	1	0
537:	0	0	2	0	1	0	0	0
545:	0	0	1	0	1	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	1	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	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	1	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	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	1	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 : 8/10/2013  
Time : 11:44:26 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/10/2013 11:22:54 AM
Alpha 004	21f	ALL	Passed	8/10/2013 11:22:55 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	8/10/2013 11:22:55 AM
Alpha 011	21f	ALL	Passed	8/10/2013 11:22:56 AM
Alpha 012	21f	ALL	Passed	8/10/2013 11:22:57 AM
Alpha 013	21f	ALL	Passed	8/10/2013 11:22:58 AM
Alpha 014	21f	ALL	Passed	8/10/2013 11:22:59 AM
Alpha 015	21f	ALL	Passed	8/10/2013 11:25:06 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	8/10/2013 11:23:01 AM
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/10/2013 11:23:02 AM
Alpha 023	AIM730	ALL	Passed	8/10/2013 11:23:03 AM
Alpha 024	AIM730	ALL	Passed	8/10/2013 11:23:04 AM
Alpha 025	AIM730	ALL	Passed	8/10/2013 11:23:05 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/10/2013 11:23:06 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/10/2013 11:23:06 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/10/2013 11:23:07 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:08 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:10 AM
Alpha 035	Alpha Analyst100DC	Peak CPS	Action	8/9/2013 5:06:44 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:12 AM
Alpha 037	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:14 AM
Alpha 038	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:16 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:17 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:19 AM
Alpha 041	Alpha Analyst100DC	Peak FWHM	Action	8/10/2013 11:23:20 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:22 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	8/10/2013 11:23:24 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:25 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:27 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	8/10/2013 11:23:28 AM

APPROVED BY: AG

APPROVAL DATE: 8/10/13

US EPA ARCHIVE DOCUMENT

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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	13-07147	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	Ra226	01	LCS	LCS		07/23/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/23/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	D-12 TOT	46	07/15/13 15:27	1.0000E+00
Lab Deadline	8/13/2013	04	DO	D-12 TOT	46	07/15/13 15:27	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	D-12 DIS	46	07/15/13 15:27	1.0000E+00
Project	West Lake OU-1	06	TRG	DUP05 TOT	45	07/15/13 00:00	1.0000E+00
Report Level	4	07	TRG	DUP05 DIS	45	07/15/13 00:00	1.0000E+00
Activity Units	pCi	08	TRG	PZ-208-SS TOT	43	07/16/13 09:25	1.0000E+00
Aliquot Units	I	09	TRG	PZ-208-SS DIS	43	07/16/13 09:25	1.0000E+00
Matrix	WA	10	TRG	PZ-304-AI TOT	46	07/16/13 12:05	1.0000E+00
Method	E903.0	11	TRG	PZ-304-AI DIS	46	07/16/13 12:05	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	PZ-304-AS TOT	41	07/16/13 12:34	1.0000E+00
Radiometric Tracer	Ba-133	13	TRG	PZ-304-AS DIS	41	07/16/13 12:34	1.0000E+00
Radiometric Sol#	Ba-6a	14	TRG	MW-104 TOT	41	07/16/13 13:25	1.0000E+00
Tracer Act (dpm/g)	991.479	15	TRG	MW-104 DIS	41	07/16/13 13:25	1.0000E+00
Carrier		16	TRG	PZ-204A-SS TOT	40	07/16/13 13:56	1.0000E+00
Carrier Conc (mg/ml)		17	TRG	PZ-204A-SS DIS	40	07/16/13 13:56	1.0000E+00
		18	TRG	PZ-302-AI TOT	44	07/16/13 15:18	1.0000E+00
		19	TRG	PZ-302-AI DIS	44	07/16/13 15:18	1.0000E+00

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.9234	915.5	386.3	93.67		0.0230	0.0292	0.0062		93.67	2.23	1.00
02	MBL	0.9145	906.7	383.0	93.77		0.0231	0.0286	0.0055		93.77	1.95	1.00
03	DUP	0.9149	907.1	402.4	98.48		0.0232	0.0297	0.0065		98.48	2.34	1.00
04	DO	0.9109	903.1	361.1	88.76		0.0229	0.0294	0.0065		88.76	2.34	1.00
05	TRG	0.9102	902.4	389.0	95.69		0.0224	0.0291	0.0067		95.69	2.40	1.00
06	TRG	0.9138	906.0	380.7	93.28		0.0230	0.0294	0.0064		93.28	2.31	1.00
07	TRG	0.9128	905.0	385.0	94.44		0.0224	0.0294	0.0070		94.44	2.50	1.00
08	TRG	0.9113	903.5	366.7	90.10		0.0226	0.0287	0.0061		90.10	2.20	1.00
09	TRG	0.9122	904.4	406.4	99.75		0.0228	0.0293	0.0065		99.75	2.34	1.00
10	TRG	0.9115	903.7	372.5	91.50		0.0223	0.0358	0.0135		91.50	5.02	1.00
11	TRG	0.9100	902.2	395.5	97.31		0.0226	0.0317	0.0091		97.31	3.04	1.00
12	TRG	0.9079	900.2	383.4	94.55		0.0232	0.0351	0.0119		94.55	4.00	1.00
13	TRG	0.9121	904.3	357.3	87.71		0.0223	0.0352	0.0129		87.71	4.58	1.00
14	TRG	0.9090	901.3	356.2	87.74		0.0225	0.0321	0.0096		87.74	3.17	1.00
15	TRG	0.9091	901.4	394.5	97.16		0.0225	0.0298	0.0073		97.16	2.58	1.00
16	TRG	0.9109	903.1	377.2	92.72		0.0228	0.0296	0.0068		92.72	2.44	1.00
17	TRG	0.9061	898.4	406.4	100.43		0.0226	0.0297	0.0071		100.43	2.53	1.00
18	TRG	0.9064	898.7	436.4	107.80		0.0225	0.0295	0.0070		107.80	2.50	1.00
19	TRG	0.9104	902.6	351.8	86.52		0.0226	0.0296	0.0070		86.52	2.50	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.

<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			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
02	MBL			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
03	DUP			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
04	DO			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
05	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
06	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
07	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
08	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
09	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
10	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
11	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
12	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
13	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
14	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
15	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
16	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
17	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
18	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	LWALKER		
19	TRG			07/31/13 12:40	JWOLFE	08/05/13 13:55	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.

0300

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-Ra226-1**

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-226	LCS	LCS	pCi/l	1.10E+01	1.39E+00	2.59E-01	1.03E+01	107.32	OK		OK	
02	RA-226	MBL	BLANK	pCi/l	3.64E-02	1.15E-01	2.44E-01					OK	OK
03	RA-226	DUP	D-12 TOT	pCi/l	1.15E-01	1.66E-01	2.79E-01				NA	OK	
04	RA-226	DO	D-12 TOT	pCi/l	2.95E-01	2.25E-01	2.27E-01					OK	
05	RA-226	TRG	D-12 DIS	pCi/l	4.67E-01	2.86E-01	2.91E-01					OK	
06	RA-226	TRG	DUP05 TOT	pCi/l	3.60E-01	2.20E-01	1.61E-01					OK	
07	RA-226	TRG	DUP05 DIS	pCi/l	4.43E-01	3.27E-01	3.85E-01					OK	
08	RA-226	TRG	PZ-208-SS TOT	pCi/l	7.11E-01	3.16E-01	1.97E-01					OK	
09	RA-226	TRG	PZ-208-SS DIS	pCi/l	4.46E-01	2.47E-01	1.89E-01					OK	
10	RA-226	TRG	PZ-304-AI TOT	pCi/l	1.64E+00	6.37E-01	2.65E-01					OK	
11	RA-226	TRG	PZ-304-AI DIS	pCi/l	1.15E+00	4.53E-01	2.97E-01					OK	
12	RA-226	TRG	PZ-304-AS TOT	pCi/l	2.00E+00	7.28E-01	4.46E-01					OK	
13	RA-226	TRG	PZ-304-AS DIS	pCi/l	1.68E+00	6.55E-01	4.52E-01					OK	
14	RA-226	TRG	MW-104 TOT	pCi/l	9.82E-01	4.44E-01	2.64E-01					OK	
15	RA-226	TRG	MW-104 DIS	pCi/l	2.41E-01	2.14E-01	2.84E-01					OK	
16	RA-226	TRG	PZ-204A-SS TOT	pCi/l	1.82E+00	5.23E-01	2.26E-01					OK	
17	RA-226	TRG	PZ-204A-SS DIS	pCi/l	1.07E+00	3.85E-01	1.84E-01					OK	
18	RA-226	TRG	PZ-302-AI TOT	pCi/l	8.02E-01	3.42E-01	1.77E-01					OK	
19	RA-226	TRG	PZ-302-AI DIS	pCi/l	6.86E-01	3.42E-01	2.37E-01					OK	

Client	Engineering Management Support, Inc.	Eberline Services Work Order	13-07147	Analysis Code	Ra226	Run	1

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-Ra226-1**



Run 1

Analysis Code Ra226

Eberline Services Work Order 13-07147

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-226	LCS	07/23/13 00:00	1.00E+00	93.67	0.00	93.67		8/5/2013 13:55	
02	RA-226	MBL	07/23/13 00:00	1.00E+00	93.77	0.00	93.77		8/5/2013 13:55	
03	RA-226	DUP	07/15/13 15:27	1.00E+00	98.48	0.00	98.48		8/5/2013 13:55	
04	RA-226	DO	07/15/13 15:27	1.00E+00	88.76	0.00	88.76		8/5/2013 13:55	
05	RA-226	TRG	07/15/13 15:27	1.00E+00	95.69	0.00	95.69		8/5/2013 13:55	
06	RA-226	TRG	07/15/13 00:00	1.00E+00	93.28	0.00	93.28		8/5/2013 13:55	
07	RA-226	TRG	07/15/13 00:00	1.00E+00	94.44	0.00	94.44		8/5/2013 13:55	
08	RA-226	TRG	07/16/13 09:25	1.00E+00	90.10	0.00	90.10		8/5/2013 13:55	
09	RA-226	TRG	07/16/13 09:25	1.00E+00	99.75	0.00	99.75		8/5/2013 13:55	
10	RA-226	TRG	07/16/13 12:05	1.00E+00	91.50	0.00	91.50		8/5/2013 13:55	
11	RA-226	TRG	07/16/13 12:05	1.00E+00	97.31	0.00	97.31		8/5/2013 13:55	
12	RA-226	TRG	07/16/13 12:34	1.00E+00	94.55	0.00	94.55		8/5/2013 13:55	
13	RA-226	TRG	07/16/13 12:34	1.00E+00	87.71	0.00	87.71		8/5/2013 13:55	
14	RA-226	TRG	07/16/13 13:25	1.00E+00	87.74	0.00	87.74		8/5/2013 13:55	
15	RA-226	TRG	07/16/13 13:25	1.00E+00	97.16	0.00	97.16		8/5/2013 13:55	
16	RA-226	TRG	07/16/13 13:56	1.00E+00	92.72	0.00	92.72		8/5/2013 13:55	
17	RA-226	TRG	07/16/13 13:56	1.00E+00	100.00	0.00	100.43		8/5/2013 13:55	
18	RA-226	TRG	07/16/13 15:18	1.00E+00	100.00	0.00	107.80		8/5/2013 13:55	
19	RA-226	TRG	07/16/13 15:18	1.00E+00	86.52	0.00	86.52		8/5/2013 13:55	

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-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	08/06/13 16:35		A_Spec	Alpha_022	170.02	2.68 E+02	6.00 E-03	15.3
02	RA-226	MBL	08/06/13 16:35		A_Spec	Alpha_023	170	1.13 E+00	1.10 E-02	17.1
03	RA-226	DUP	08/06/13 16:35		A_Spec	Alpha_024	170	3.13 E+00	1.10 E-02	17.1
04	RA-226	DO	08/06/13 16:35		A_Spec	Alpha_025	170	7.32 E+00	4.00 E-03	17.4
05	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_027	170.02	1.21 E+01	1.10 E-02	17.3
06	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_029	170	1.07 E+01	2.00 E-03	19.5
07	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_031	170	8.96 E+00	1.20 E-02	14.2
08	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_033	170	2.03 E+01	4.00 E-03	18.5
09	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_034	170	1.33 E+01	4.00 E-03	18.6
10	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_035	170	2.58 E+01	1.00 E-03	18.3
11	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_036	170	2.66 E+01	8.00 E-03	19.1
12	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_038	170	3.06 E+01	8.00 E-03	17.2
13	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_039	170	2.73 E+01	1.00 E-02	19.7
14	RA-226	TRG	08/06/13 16:35		A_Spec	Alpha_040	170	1.95 E+01	3.00 E-03	19
15	RA-226	TRG	08/06/13 16:36		A_Spec	Alpha_041	170	6.79 E+00	1.30 E-02	19.8
16	RA-226	TRG	08/06/13 16:36		A_Spec	Alpha_042	170	4.82 E+01	5.00 E-03	18.5
17	RA-226	TRG	08/06/13 16:36		A_Spec	Alpha_045	170	3.05 E+01	3.00 E-03	19.1
18	RA-226	TRG	08/06/13 16:36		A_Spec	Alpha_046	170	2.17 E+01	2.00 E-03	17.9
19	RA-226	TRG	08/06/13 16:36		A_Spec	Alpha_047	170	1.63 E+01	4.00 E-03	18.2



Run  
1

Analysis Code  
Ra226

Eberline Services Work Order  
13-07147

Client  
Engineering Management Support, Inc.

25

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	07/23/13 00:00	1.0000	0.9234	915.5317	386.3000	93.67	2.23	1.00
02	MBL	BLANK	07/23/13 00:00	1.0000	0.9145	906.7075	383.0000	93.77	1.95	1.00
03	DUP	D-12 TOT	07/15/13 15:27	1.0000	0.9149	907.1041	402.4000	98.48	2.34	1.00
04	DO	D-12 TOT	07/15/13 15:27	1.0000	0.9109	903.1382	361.1000	88.76	2.34	1.00
05	TRG	D-12 DIS	07/15/13 15:27	1.0000	0.9102	902.4442	389.0000	95.69	2.40	1.00
06	TRG	DUP05 TOT	07/15/13 00:00	1.0000	0.9138	906.0135	380.7000	93.28	2.31	1.00
07	TRG	DUP05 DIS	07/15/13 00:00	1.0000	0.9128	905.0220	385.0000	94.44	2.50	1.00
08	TRG	PZ-208-SS TOT	07/16/13 09:25	1.0000	0.9113	903.5348	366.7000	90.10	2.20	1.00
09	TRG	PZ-208-SS DIS	07/16/13 09:25	1.0000	0.9122	904.4271	406.4000	99.75	2.34	1.00
10	TRG	PZ-304-AI TOT	07/16/13 12:05	1.0000	0.9115	903.7331	372.5000	91.50	5.02	1.00
11	TRG	PZ-304-AI DIS	07/16/13 12:05	1.0000	0.9100	902.2459	395.5000	97.31	3.04	1.00
12	TRG	PZ-304-AS TOT	07/16/13 12:34	1.0000	0.9079	900.1638	383.4000	94.55	4.00	1.00
13	TRG	PZ-304-AS DIS	07/16/13 12:34	1.0000	0.9121	904.3280	357.3000	87.71	4.58	1.00
14	TRG	MW-104 TOT	07/16/13 13:25	1.0000	0.9090	901.2544	356.2000	87.74	3.17	1.00
15	TRG	MW-104 DIS	07/16/13 13:25	1.0000	0.9091	901.3536	394.5000	97.16	2.58	1.00
16	TRG	PZ-204A-SS TOT	07/16/13 13:56	1.0000	0.9109	903.1382	377.2000	92.72	2.44	1.00
17	TRG	PZ-204A-SS DIS	07/16/13 13:56	1.0000	0.9061	898.3791	406.4000	100.43	2.53	1.00
18	TRG	PZ-302-AI TOT	07/16/13 15:18	1.0000	0.9064	898.6766	436.4000	107.80	2.50	1.00
19	TRG	PZ-302-AI DIS	07/16/13 15:18	1.0000	0.9104	902.6425	351.8000	86.52	2.50	1.00

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0364

Internal Work Order		Run	Analysis Code		Date	Technician		Technician Initials		Witness Initials	
13-07147		1	Ra226		7/31/2013 12:38	JWOLFE		JW			

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-226	Ra-5b	44.066	7/31/2013	0.500	0.5181				10.28	0.473	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	Ba-133	Ba-6a	991.479	7/31/2013	0.9234	1.0200				
02	Ba-133	Ba-6a	991.479	7/31/2013	0.9145	1.0200				
03	Ba-133	Ba-6a	991.479	7/31/2013	0.9149	1.0200				
04	Ba-133	Ba-6a	991.479	7/31/2013	0.9109	1.0200				
05	Ba-133	Ba-6a	991.479	7/31/2013	0.9102	1.0200				
06	Ba-133	Ba-6a	991.479	7/31/2013	0.9138	1.0200				
07	Ba-133	Ba-6a	991.479	7/31/2013	0.9128	1.0200				
08	Ba-133	Ba-6a	991.479	7/31/2013	0.9113	1.0200				
09	Ba-133	Ba-6a	991.479	7/31/2013	0.9122	1.0200				
10	Ba-133	Ba-6a	991.479	7/31/2013	0.9115	1.0200				
11	Ba-133	Ba-6a	991.479	7/31/2013	0.9100	1.0200				
12	Ba-133	Ba-6a	991.479	7/31/2013	0.9079	1.0200				
13	Ba-133	Ba-6a	991.479	7/31/2013	0.9121	1.0200				
14	Ba-133	Ba-6a	991.479	7/31/2013	0.9090	1.0200				
15	Ba-133	Ba-6a	991.479	7/31/2013	0.9091	1.0200				
16	Ba-133	Ba-6a	991.479	7/31/2013	0.9109	1.0200				
17	Ba-133	Ba-6a	991.479	7/31/2013	0.9061	1.0200				
18	Ba-133	Ba-6a	991.479	7/31/2013	0.9064	1.0200				
19	Ba-133	Ba-6a	991.479	7/31/2013	0.9104	1.0200				



# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07147</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	D-12 TOT	DUP					1.0000E+00	1.0000E+00				
04	D-12 TOT	DO					1.0000E+00	1.0000E+00				
05	D-12 DIS	TRG					1.0000E+00	1.0000E+00				
06	DUP05 TOT	TRG					1.0000E+00	1.0000E+00				
07	DUP05 DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-208-SS TOT	TRG					1.0000E+00	1.0000E+00				
09	PZ-208-SS DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-304-AI TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-304-AI DIS	TRG					1.0000E+00	1.0000E+00				
12	PZ-304-AS TOT	TRG					1.0000E+00	1.0000E+00				
13	PZ-304-AS DIS	TRG					1.0000E+00	1.0000E+00				
14	MW-104 TOT	TRG					1.0000E+00	1.0000E+00				
15	MW-104 DIS	TRG					1.0000E+00	1.0000E+00				
16	PZ-204A-SS TOT	TRG					1.0000E+00	1.0000E+00				
17	PZ-204A-SS DIS	TRG					1.0000E+00	1.0000E+00				
18	PZ-302-AI TOT	TRG					1.0000E+00	1.0000E+00				
19	PZ-302-AI DIS	TRG					1.0000E+00	1.0000E+00				

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

*J Wolfe* Date: 7.31.13

0366

# Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
<b>13-07147</b>	<b>1</b>	<b>Ra226</b>			<b>LWALKER</b>

TRetek Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Carrier Data	Filter Data			Gravimetric
			Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)	% Recovery
01	LCS	LCS		0.0230	0.0292	0.0062	
02	BLANK	MBL		0.0231	0.0286	0.0055	
03	DUP	DUP		0.0232	0.0297	0.0065	
04	D-12 TOT	DO		0.0229	0.0294	0.0065	
05	D-12 DIS	TRG		0.0224	0.0291	0.0067	
06	DUP05 TOT	TRG		0.0230	0.0294	0.0064	
07	DUP05 DIS	TRG		0.0224	0.0294	0.0070	
08	PZ-208-SS TOT	TRG		0.0226	0.0287	0.0061	
09	PZ-208-SS DIS	TRG		0.0228	0.0293	0.0065	
10	PZ-304-AI TOT	TRG		0.0223	0.0358	0.0135	
11	PZ-304-AI DIS	TRG		0.0226	0.0317	0.0091	
12	PZ-304-AS TOT	TRG		0.0232	0.0351	0.0119	
13	PZ-304-AS DIS	TRG		0.0223	0.0352	0.0129	
14	MW-104 TOT	TRG		0.0225	0.0321	0.0096	
15	MW-104 DIS	TRG		0.0225	0.0298	0.0073	
16	PZ-204A-SS TOT	TRG		0.0228	0.0296	0.0068	
17	PZ-204A-SS DIS	TRG		0.0226	0.0297	0.0071	
18	PZ-302-AI TOT	TRG		0.0225	0.0295	0.0070	
19	PZ-302-AI DIS	TRG		0.0226	0.0296	0.0070	

Technician: J. Walker

Date: 8, 5, 13

0367



Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 01  
 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: 2.230E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 8/6/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:16 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9367 +/- 0.0000  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Effective Efficiency: 0.1435 +/- 0.0027

Control Certificate Name: Ra226\_Ra-5b  
 Chem. Recov. of Control: RA-226 0.481241 +/- 0.034067  
 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	5.526	484.45	8.93	2.55	0.00E+000	10.9
RA-226	4.712	267.98	12.00	1.02	0.00E+000	11.4

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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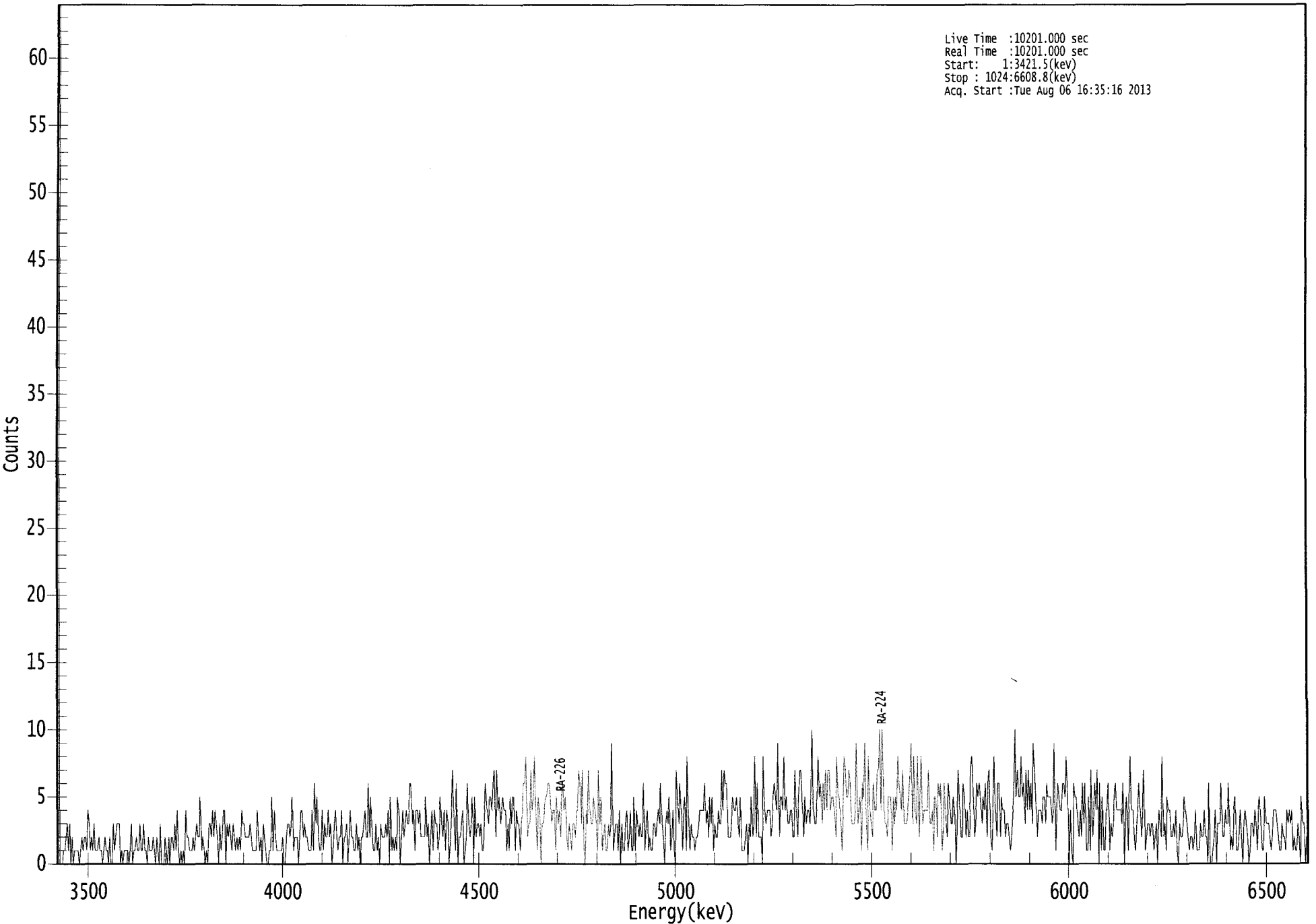
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.967	5685.50*	2.10E+001 +/- 2.03E+000	3.63E-001 +/- 1.36E-002
RA-226	0.993	4785.00*	1.10E+001 +/- 1.39E+000	2.59E-001 +/- 9.69E-003

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

000065373.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 06 16:35:16 2013



6959  
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: 10201

Elapsed Real Time: 10201

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

369: 4 1 3 1 5 3 5 . 5

Sample Title: 01

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

801: 7 5 2 4 4 4 3 5

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	5	3	6	5	5	5	3	4
817:	9	1	4	6	5	4	4	6
825:	6	5	8	5	0	4	1	0
833:	6	5	5	3	2	4	2	6
841:	3	6	1	1	5	1	7	2
849:	4	6	4	7	0	6	1	5
857:	1	1	4	4	6	1	3	2
865:	3	5	6	4	4	4	4	3
873:	6	0	4	5	1	5	8	4
881:	4	2	1	3	4	6	4	2
889:	4	7	1	2	3	3	2	3
897:	3	1	2	3	0	4	3	2
905:	8	2	3	1	5	4	4	2
913:	2	3	2	4	1	0	3	2
921:	2	3	5	4	3	2	1	2
929:	2	1	2	4	1	1	1	3
937:	2	2	4	2	2	0	6	0
945:	0	1	2	4	0	3	3	3
953:	6	2	2	4	3	3	6	1
961:	2	1	4	5	1	1	2	4
969:	2	0	3	4	3	2	0	1
977:	3	3	2	4	3	1	4	5
985:	3	1	1	5	3	3	3	2
993:	1	2	4	4	4	3	2	1
1001:	1	3	2	2	1	4	3	4
1009:	3	4	1	2	1	1	3	2
1017:	0	5	3	3	0	2	2	2



C  
8/7/13

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 02  
 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: 1.950E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:17 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9377 +/- 0.0000  
 Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM  
 Effective Efficiency: 0.1603 +/- 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	5.533	0.45	806.99	2.55	0.00E+000	3.1
RA-226	4.654	1.13	315.93	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	0.970	5685.50*	1.54E-002 +/- 1.24E-001	2.86E-001 +/- 9.91E-003
RA-226	0.978	4785.00*	3.64E-002 +/- 1.15E-001	2.44E-001 +/- 8.43E-003

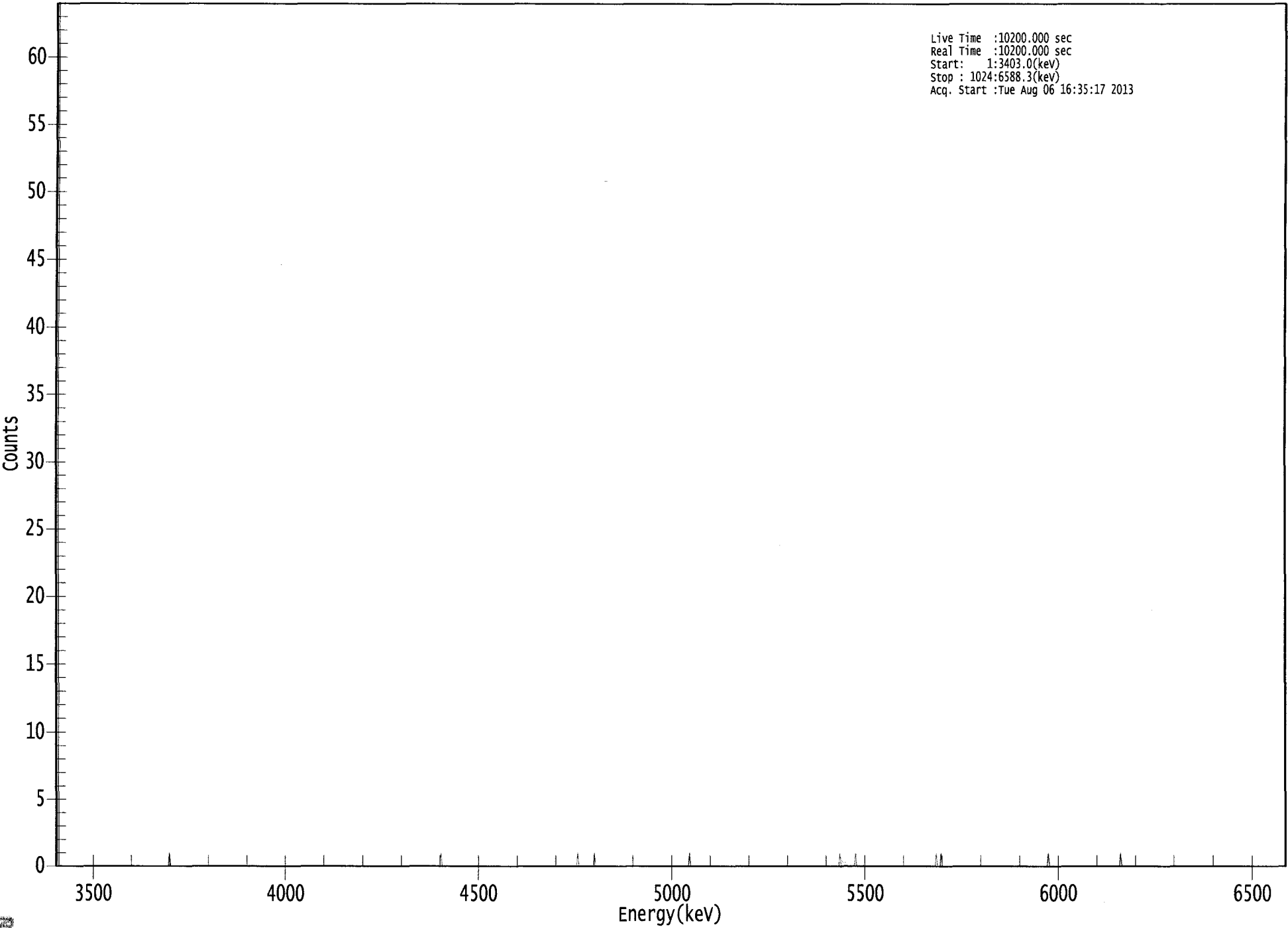
AG  
8/7/13

US EPA ARCHIVE DOCUMENT



0000065322.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 06 16:35:17 2013



0374

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:	10200	10200	0	0	0	0	0
9:	0	0	0	0	0	0	0
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	0	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	1
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	0	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:	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0
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	0	0	0	0	0
305:	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0
321:	0	1	0	0	0	0	0
329:	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 02

Channel	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0
393:	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0
433:	0	0	0	1	0	0	0
441:	0	0	0	0	0	0	0
449:	0	1	0	0	0	0	0
457:	0	0	0	0	0	0	0
465:	0	0	0	0	0	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	0	0	0	0	0	0
505:	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0
529:	1	0	0	0	0	0	0
537:	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0
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	0	0	0	0	0	0
601:	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0
649:	0	0	0	0	0	1	0
657:	0	0	0	0	0	0	0
665:	0	0	1	0	0	0	0
673:	0	0	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	0	0	0
713:	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0
729:	0	0	0	0	0	1	0
737:	0	1	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	0	0	0	0	0	0
785:	0	0	0	0	0	0	0
793:	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
817:	0	0	0	0	0	0	0
825:	0	0	1	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	1
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	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



C  
B(7/11)

Sample Description: D-12 TOT DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 03  
 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: 2.340E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/15/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:18 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9848 +/- 0.0000  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Effective Efficiency: 0.1684 +/- 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	5.491	3.64	123.16	1.36	0.00E+000	3.1
RA-226	4.628	3.13	144.40	1.87	0.00E+000	3.1

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

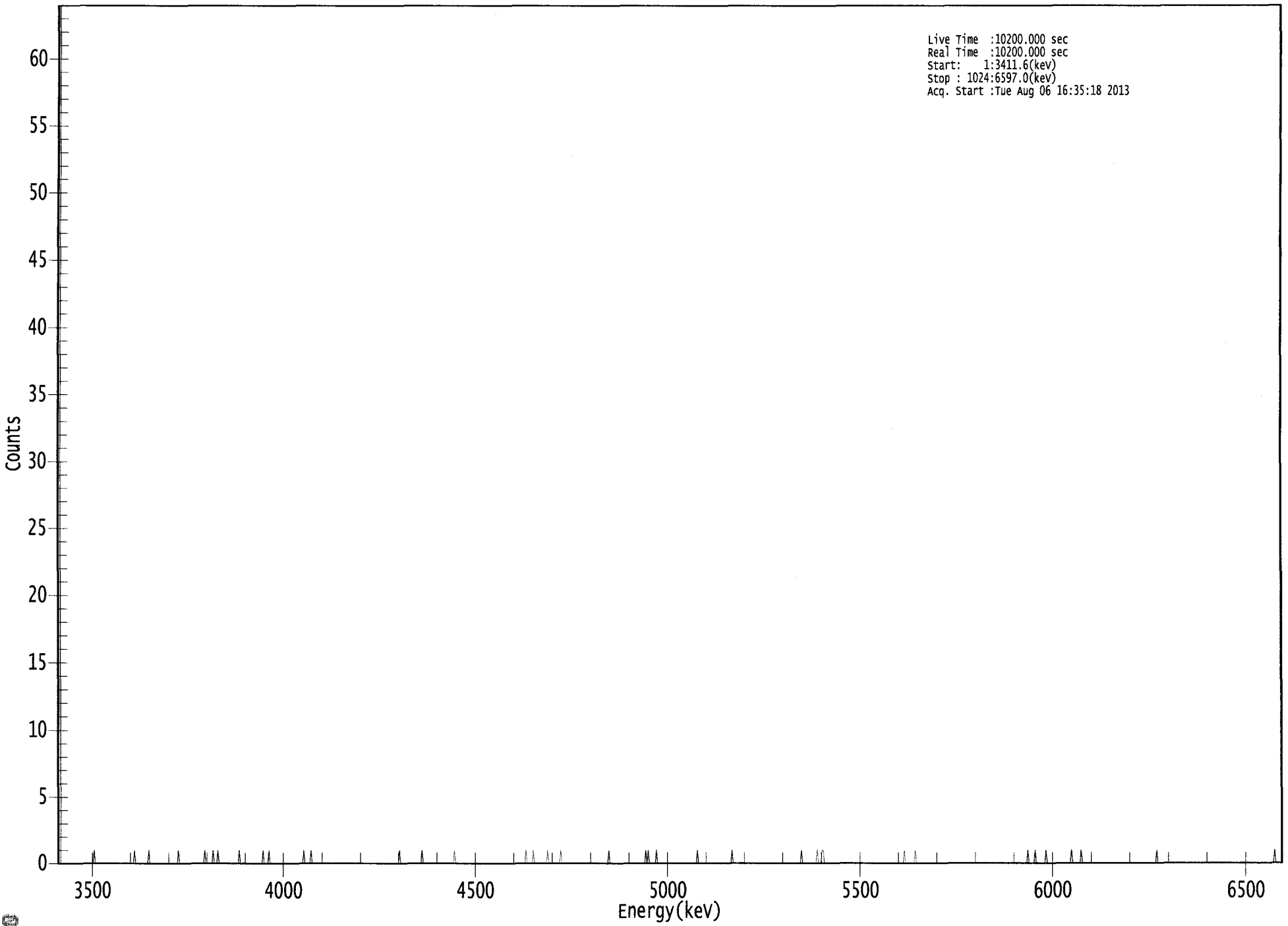
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.952	5685.50*	1.42E-001 +/- 1.75E-001	2.67E-001 +/- 9.81E-003
RA-226	0.968	4785.00*	1.15E-001 +/- 1.66E-001	2.79E-001 +/- 1.02E-002

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065323.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 06 16:35:18 2013



6279

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:	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	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	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	1	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	0	0	0	0	0
97:	0	0	0	0	0	1	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	1	0	0	0	0
129:	0	0	1	0	0	0	1	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	1	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	1	0
209:	0	0	0	0	1	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	1	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	1	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	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	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 03

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	1	0	0	0	0	0	1	0
401:	0	0	0	0	0	0	0	0
409:	0	0	1	0	0	0	0	0
417:	0	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	0
457:	0	0	0	0	0	1	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	1	0	1	0
497:	0	0	0	0	0	1	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	1
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	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	1	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	1	0	0	0	1
641:	1	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	1	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	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	1	0	0	0	0
817:	0	1	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:	0	0	0	0	0	0	0	1
849:	0	0	0	0	0	0	0	1
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	1	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:	1	0	0	0	0	0	0	0



C  
D/7/13

Sample Description: D-12 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 04  
 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: 2.340E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/15/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:19 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8876 +/- 0.0000  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Effective Efficiency: 0.1541 +/- 0.0029

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	5.540	2.13	191.21	1.87	0.00E+000	3.1
RA-226	4.583	7.32	76.28	0.68	0.00E+000	6.3

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

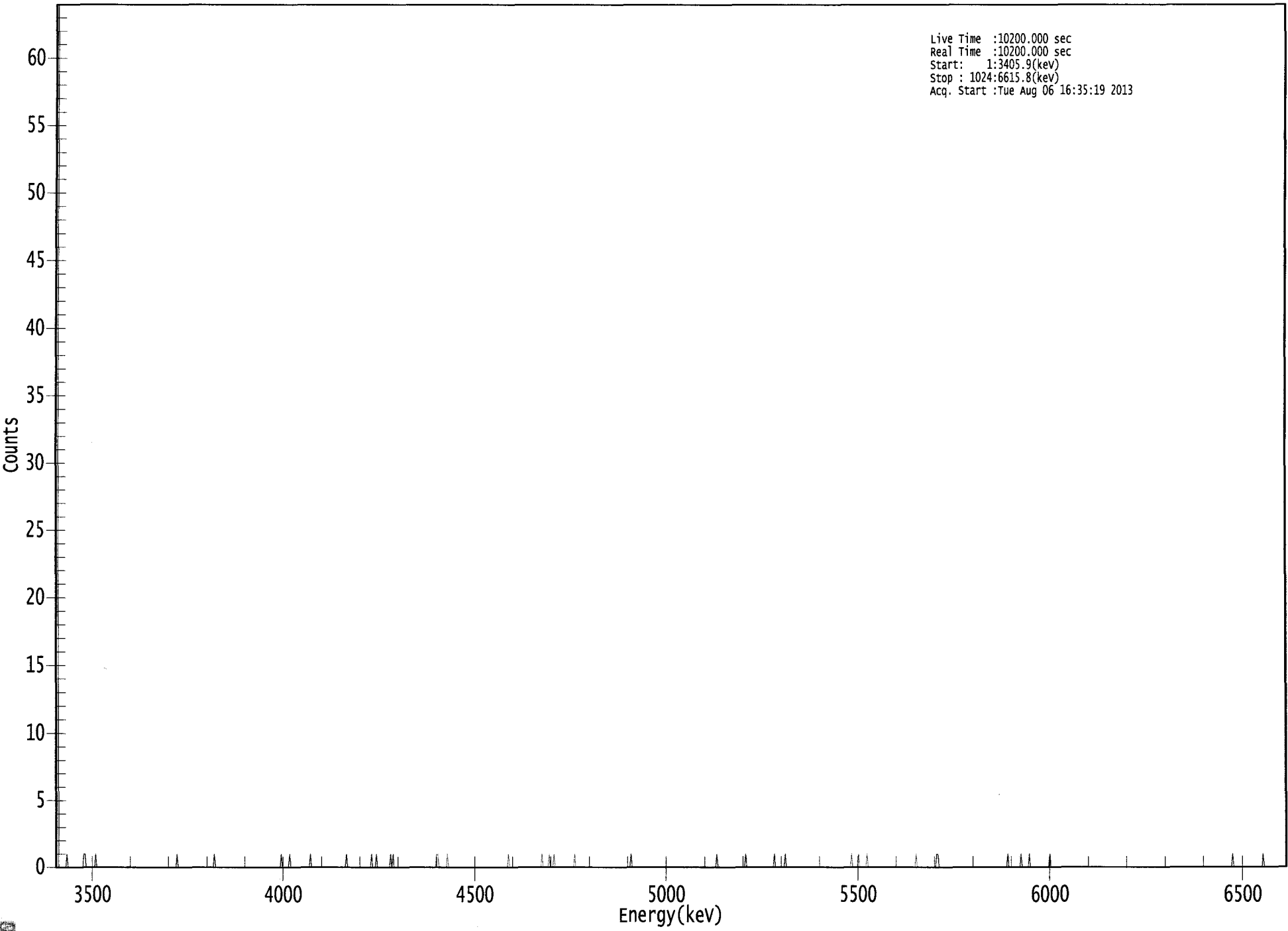
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.973	5685.50*	9.08E-002 +/- 1.74E-001	3.23E-001 +/- 1.18E-002
RA-226	0.948	4785.00*	2.95E-001 +/- 2.25E-001	2.27E-001 +/- 8.29E-003

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065324.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 06 16:35:19 2013



0304  
0804

ROI Type: 1

\*\*\*\*\*  
 \*\*\*\*\* 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	0	0	0	0	0
9:	0	1	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	1
25:	1	0	0	0	0	0	0	0
33:	0	1	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	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	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	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	1	0	0	0
193:	0	0	0	1	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	1	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	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	1
265:	0	0	0	1	0	0	0	0
273:	0	0	0	0	0	0	0	1
281:	0	1	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	1	1	0
321:	0	0	0	0	0	0	1	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	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: 04

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	0	0
401:	0	0	0	0	0	1	0	0
409:	0	0	0	1	0	0	0	1
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	1	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	1
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	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	1	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	1	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	0
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	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	1	0
665:	0	0	0	0	1	0	0	0
673:	0	0	0	1	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	1	1	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	1	0	0	0	0	0	0	0

801: 0 0 0 1 0 0 0 0

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	1	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	1	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	1	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	1	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



C  
8/7/13

Sample Description: D-12 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 05  
 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: 2.400E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/15/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:20 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9569 +/- 0.0000  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Effective Efficiency: 0.1653 +/- 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	5.501	6.96	86.10	2.04	0.00E+000	3.2
RA-226	4.595	12.13	61.14	1.87	0.00E+000	6.4

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

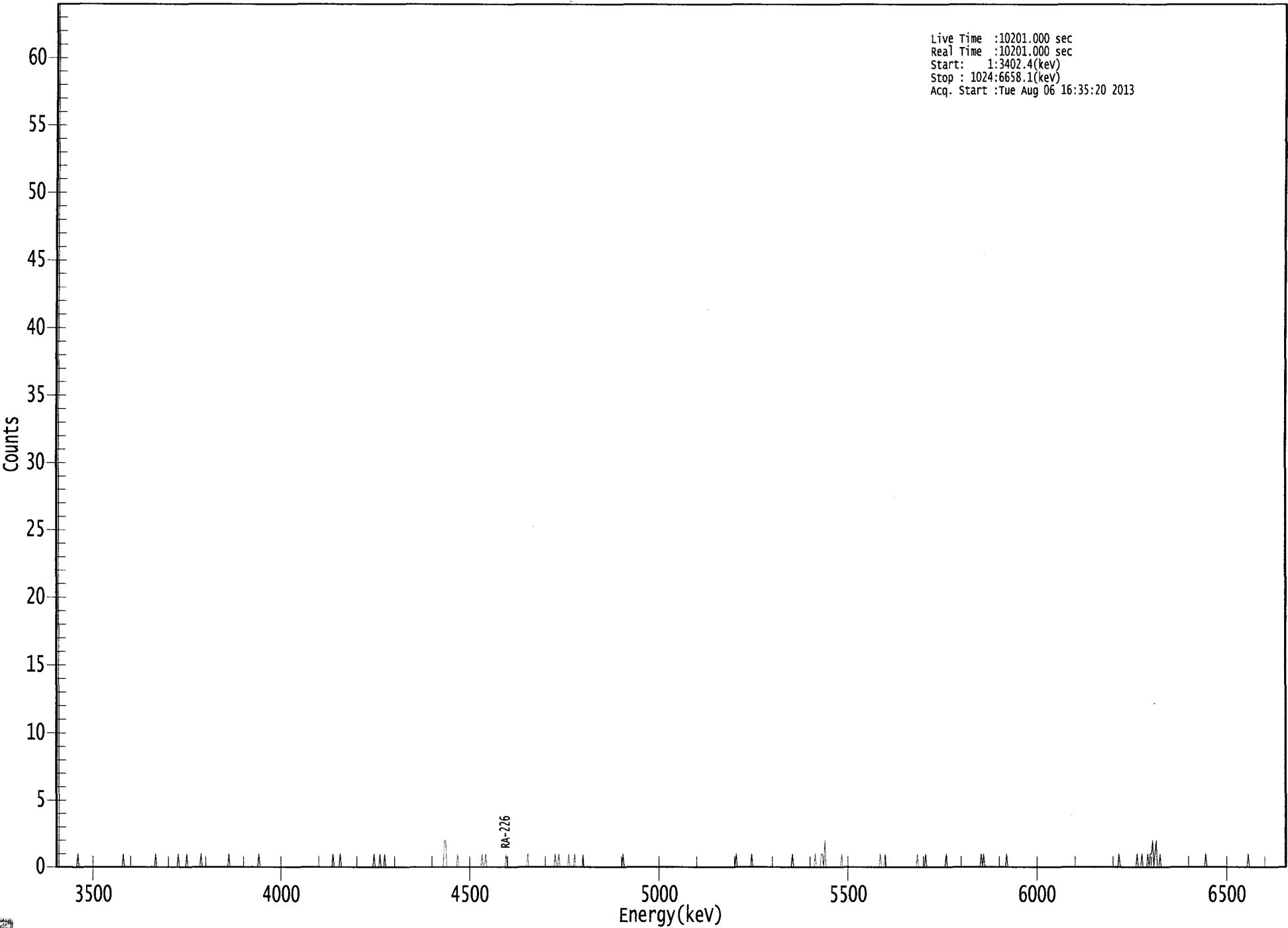
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.956	5685.50*	2.84E-001 +/- 2.44E-001	3.17E-001 +/- 1.17E-002
RA-226	0.954	4785.00*	4.67E-001 +/- 2.86E-001	2.91E-001 +/- 1.07E-002

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065325.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 06 16:35:20 2013



6839

ROI Type: 1



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

Sample Title: 05

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	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:	1	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	1	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	0	0	1	0	0
113:	0	0	0	0	0	0	0	0
121:	0	1	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	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	1	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	1
233:	0	0	0	0	0	1	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	1	0	0	0	0	1	0
273:	0	0	1	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	2	2	0	0
329:	0	0	0	0	0	0	0	1
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	1	0	0	1	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 1

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	1	0	0	1	0	0	0	0
425:	0	0	0	1	0	0	0	0
433:	1	0	0	0	0	0	0	1
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:	1	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	1	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	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
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:	1	0	0	0	0	1	1	0
641:	2	0	0	0	0	0	0	0
649:	0	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	1	0
689:	0	0	1	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	1	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	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	1	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	1
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	1	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	1	0	0	0	1
905:	0	0	0	0	1	0	1	1
913:	2	0	1	2	0	0	1	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	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	1
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	1



C  
Ed/7u

Sample Description: DUP05 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 06  
 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: 2.310E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/15/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:21 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9328 +/- 0.0000  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Effective Efficiency: 0.1815 +/- 0.0033

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	5.534	3.96	124.69	2.04	0.00E+000	3.1
RA-226	4.536	10.66	61.14	0.34	0.00E+000	3.1

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 -----  
 NUCLIDE ANALYSIS RESULTS  
 -----  
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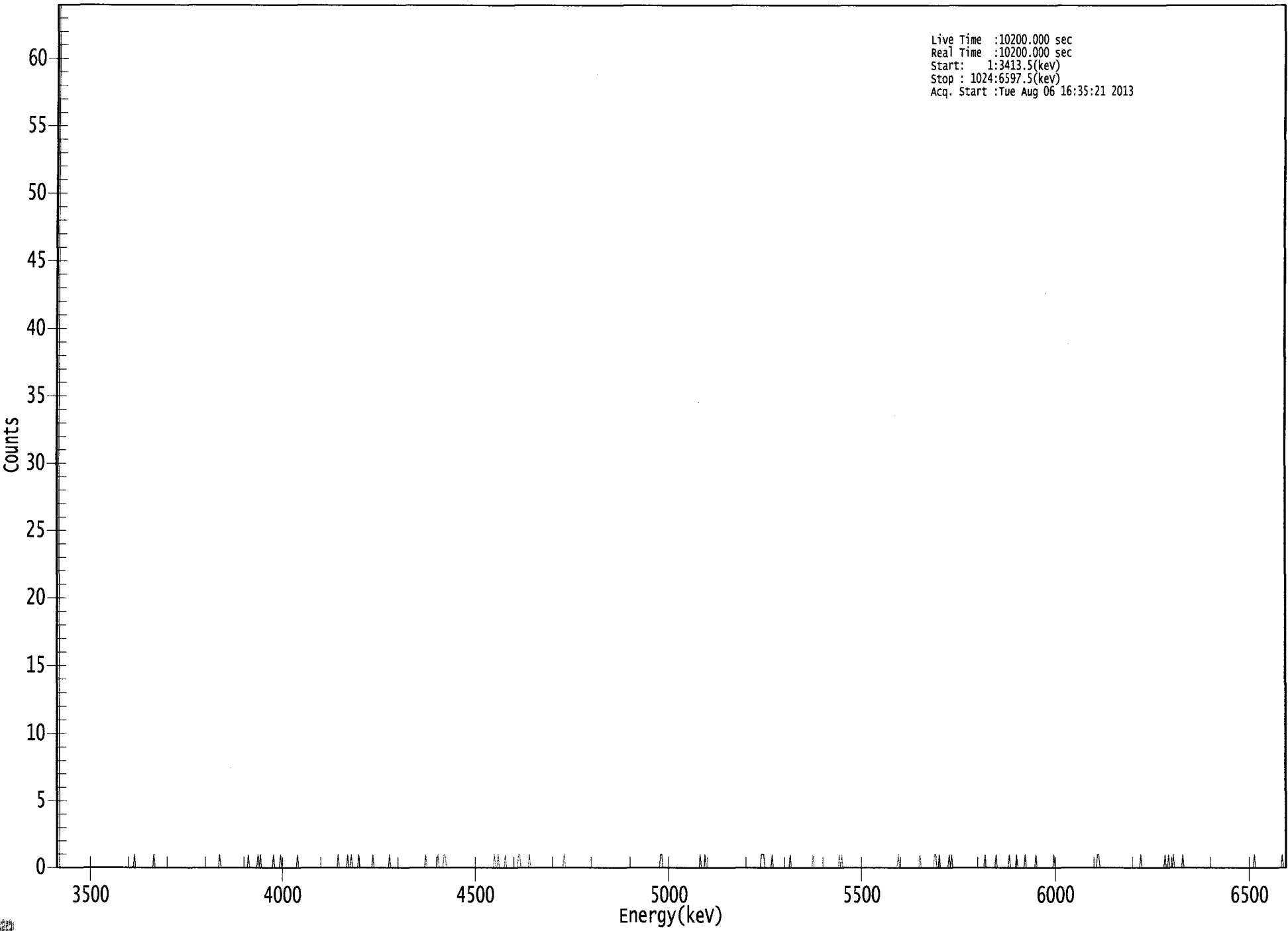
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.970	5685.50*	1.41E-001 +/- 1.76E-001	2.78E-001 +/- 1.00E-002
RA-226	0.922	4785.00*	3.60E-001 +/- 2.20E-001	1.61E-001 +/- 5.81E-003

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065326.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 06 16:35:21 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: 06

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	1	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	1	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:	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:	1	0	0	0	0	0	0	0
169:	1	0	1	0	0	0	0	0
177:	0	0	0	0	0	1	0	0
185:	0	0	0	1	0	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	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	1	0	0	0	0
241:	0	0	0	1	0	0	1	0
249:	0	0	0	0	1	0	0	0
257:	0	0	0	0	0	0	0	0
265:	1	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	1	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	1	0	0	0
313:	0	0	0	0	0	0	1	0
321:	0	0	0	1	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	0
361:	0	0	0	0	0	1	0	0

369: 1 0 0 0 0 0 1 0

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	1	1	0	0	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	1
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	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	1
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	0
529:	0	0	0	0	0	0	0	0
537:	1	0	0	0	1	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	1	1	1	0	0
593:	0	0	0	0	1	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	1	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	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	1	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	1	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	1
721:	0	0	0	0	0	0	0	0
729:	0	0	0	1	1	0	0	1
737:	0	0	0	0	0	0	0	1
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	1	0	0
777:	0	0	0	0	0	0	1	0
785:	0	0	0	0	0	0	0	0
793:	0	1	0	0	0	0	0	1

801: 0 0 0 0 0 0 1 0

Sample Title: 06

Channel								
809:	0	0	0	0	0	0	0	1
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	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	1	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	1	0	0	1	0	0
929:	0	1	0	0	0	0	0	0
937:	0	1	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	1	0	0	0	0





*C*  
*D/A*

Sample Description: DUP05 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 07  
 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: 2.500E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/15/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:22 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9444 +/- 0.0000  
 Counting Efficiency: 0.1418 +/- 0.0034 on 6/13/2013 3:23:29 PM  
 Effective Efficiency: 0.1340 +/- 0.0032

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	5.444	4.32	102.62	0.68	0.00E+000	3.1
RA-226	4.665	8.96	73.69	2.04	0.00E+000	4.7

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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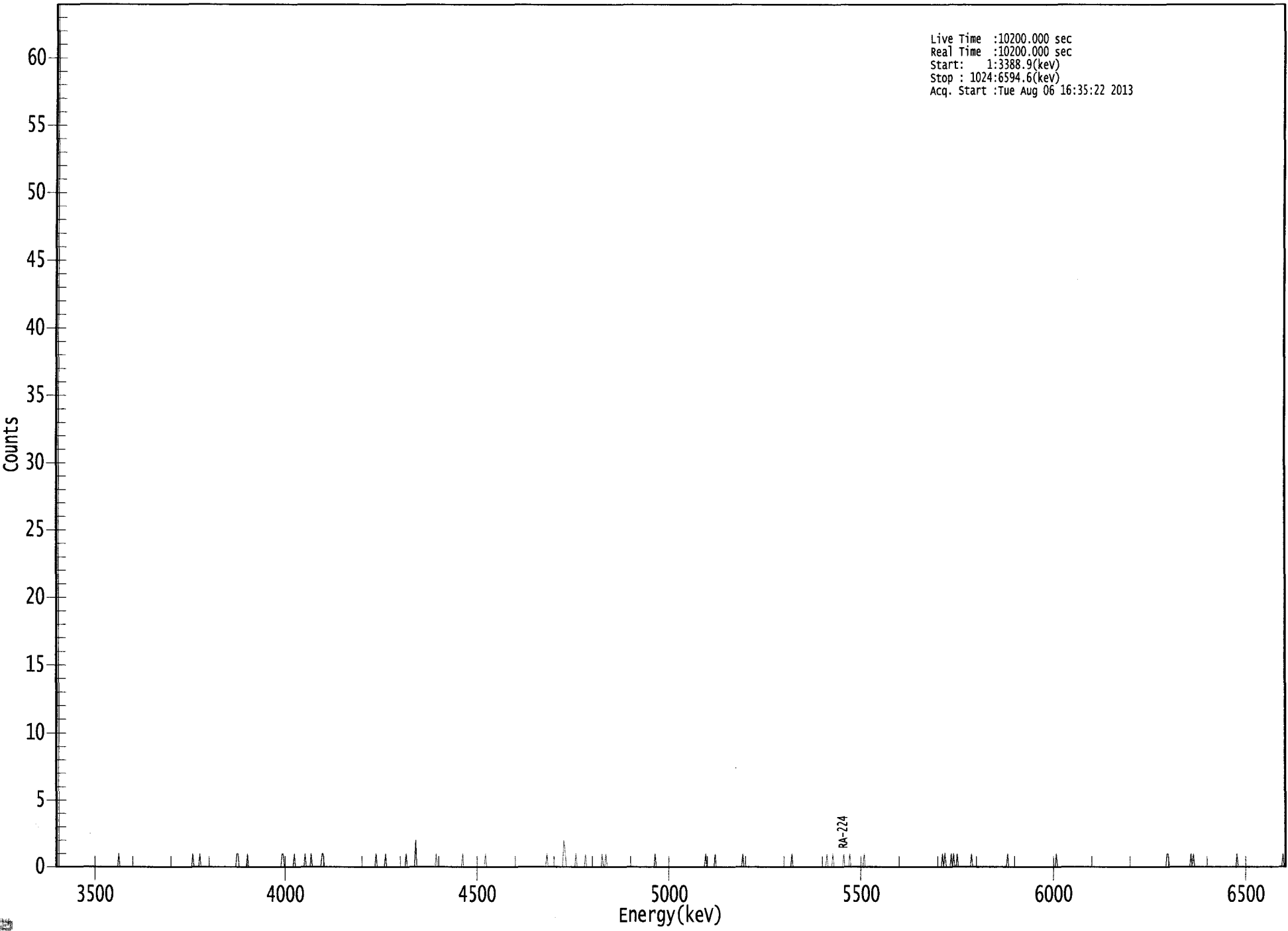
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.927	5685.50*	2.26E-001 +/- 2.32E-001	2.95E-001 +/- 1.41E-002
RA-226	0.981	4785.00*	4.43E-001 +/- 3.27E-001	3.85E-001 +/- 1.83E-002

*AG*  
*8/7/13*

US EPA ARCHIVE DOCUMENT

0000065327.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 06 16:35:22 2013



0339

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:        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	1	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	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	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:	1	0	0	0	0	0	0	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	0
185:	0	0	0	0	0	1	1	0
193:	0	0	0	0	0	0	0	1
201:	0	0	0	0	0	0	0	0
209:	1	0	0	0	0	1	0	0
217:	0	0	0	0	0	0	1	1
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	1	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	1	0	0	0
297:	0	0	0	0	2	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	1	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	1	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	1	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 07

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	0	0
401:	0	0	0	0	0	0	0	0
409:	0	1	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	2
425:	1	0	0	0	0	0	0	0
433:	0	1	0	0	0	0	0	0
441:	0	1	0	0	0	0	0	0
449:	0	0	0	0	0	0	0	1
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	0	1	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	1	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	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	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	1	0	0	0	0	1
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	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	1	0	1	0	0	0
745:	0	1	0	1	0	0	1	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:	1	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:	1	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	1	1	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	1	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	1	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



C  
B7h

Sample Description: PZ-208-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_033  
 Chamber Serial Number: 04026479A  
 Detector Serial Number: 91132  
 Env. Background: System Bkgd 64051  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.200E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:48 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9010 +/- 0.0000  
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM  
 Effective Efficiency: 0.1665 +/- 0.0029

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	5.522	11.15	61.26	0.85	0.00E+000	4.5
RA-226	4.557	20.32	44.32	0.68	0.00E+000	3.0

-----  
 NUCLIDE ANALYSIS RESULTS  
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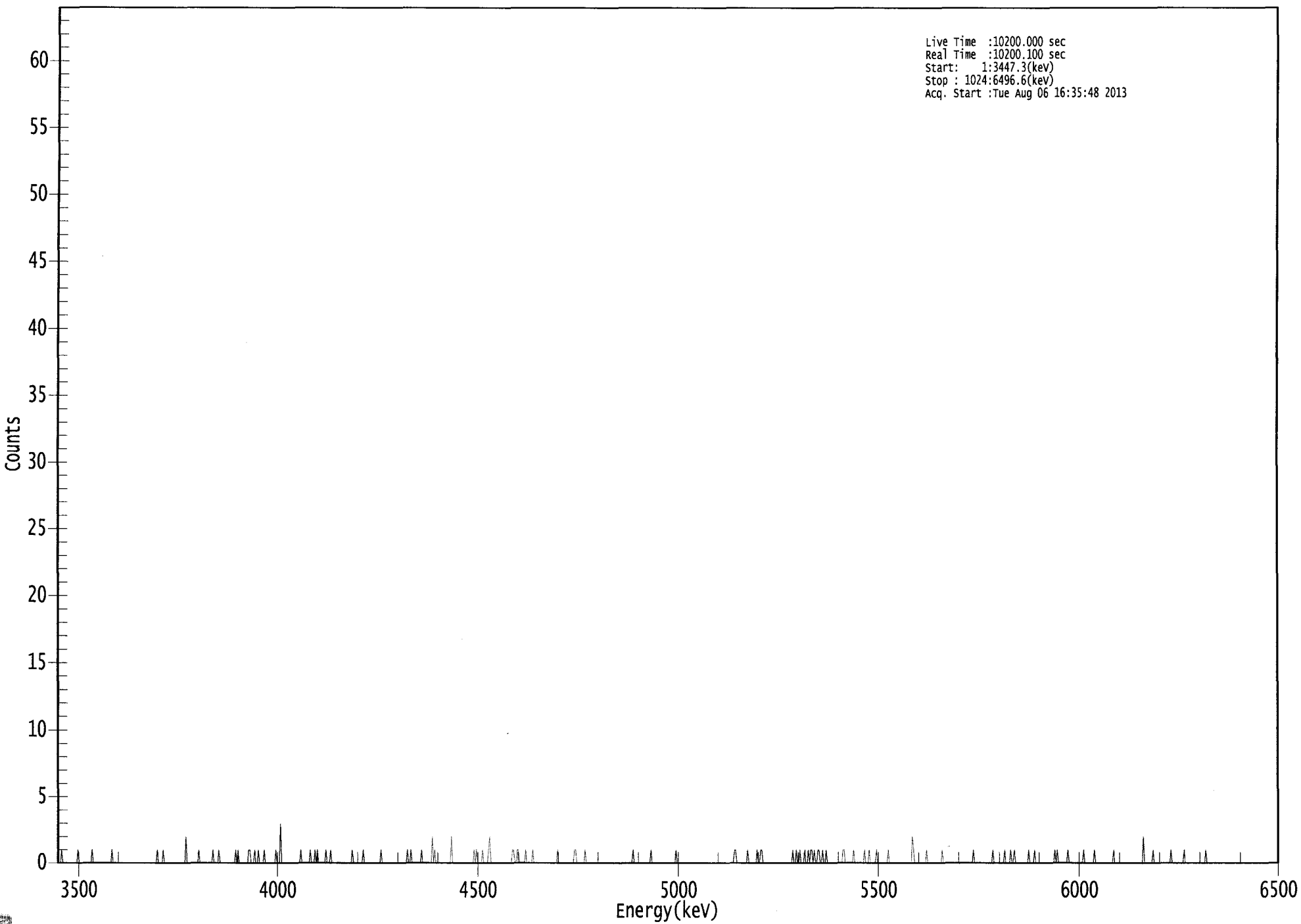
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.966	5685.50*	4.13E-001 +/- 2.54E-001	2.22E-001 +/- 7.65E-003
RA-226	0.934	4785.00*	7.11E-001 +/- 3.16E-001	1.97E-001 +/- 6.79E-003

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065330.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 06 16:35:48 2013



ROI Type: 1

\*\*\*\*\*  
 \*\*\*\*\* 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	1	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	1	0	0	0	0	0	0
25:	0	0	0	0	0	1	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	1	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	1	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	2	0	0	0
113:	0	0	0	0	0	0	0	1
121:	0	0	0	0	0	0	0	0
129:	0	0	0	1	0	0	0	0
137:	1	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	1	0
153:	1	0	0	0	0	0	0	0
161:	0	1	1	0	0	0	1	0
169:	0	1	0	0	0	0	1	0
177:	0	0	0	0	0	0	0	0
185:	1	0	0	0	3	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	1	0	0
209:	0	0	0	0	0	1	0	0
217:	0	1	0	1	0	0	0	0
225:	0	0	1	0	0	0	1	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	0	0	0
257:	0	1	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	1	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	1	0	0	0	0	0	0
305:	0	0	1	0	0	0	0	0
313:	0	0	0	2	0	1	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	2	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	1	0
353:	1	0	0	0	0	1	0	0
361:	0	0	1	2	0	0	0	0



369: 0 0 0 0 0 0 0 0

Sample Title: 08

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

801: 0 0 1 0 0 0 0 0

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	1	0
817:	0	0	0	1	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	0	0	0	0	0	1
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	1	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	1	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	2	0
913:	0	0	0	0	0	0	1	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	1	0	0
937:	0	0	0	0	0	0	0	0
945:	1	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	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



C  
B/m

Sample Description: PZ-208-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_034  
 Chamber Serial Number: 04026479B  
 Detector Serial Number: 91136  
 Env. Background: System Bkgd 64052  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.340E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:49 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9975 +/- 0.0000  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Effective Efficiency: 0.1851 +/- 0.0032

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	5.493	7.83	70.93	0.17	0.00E+000	3.0
RA-226	4.567	13.32	55.28	0.68	0.00E+000	3.0

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

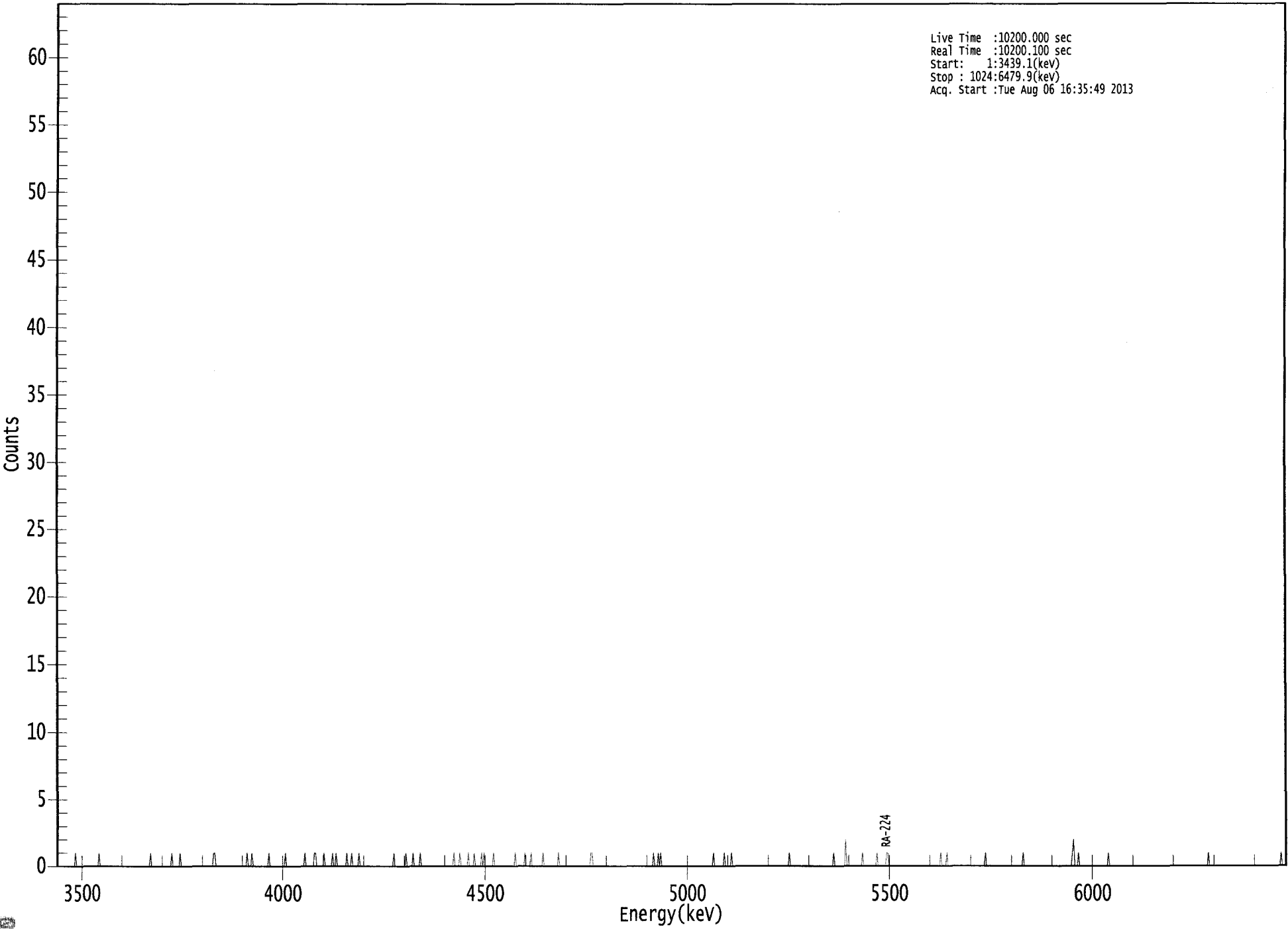
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.953	5685.50*	2.78E-001 +/- 1.97E-001	1.48E-001 +/- 5.06E-003
RA-226	0.940	4785.00*	4.46E-001 +/- 2.47E-001	1.89E-001 +/- 6.45E-003

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065331.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 06 16:35:49 2013



6090

ROI Type: 1

\*\*\*\*\*  
 \*\*\*\*\* 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	1
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	1	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:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	1	0	0	0	0	0	0	1
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	1	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	0	0	0	0	0	1
161:	0	0	0	1	0	0	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	0	0	1
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	1
209:	0	0	0	0	0	0	0	1
217:	1	0	0	0	0	0	0	1
225:	0	0	0	0	0	0	1	0
233:	0	1	0	0	0	0	0	0
241:	0	0	1	0	0	0	1	0
249:	0	0	0	0	1	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	1	0	0	0	0	0	0
289:	0	0	0	1	0	0	0	0
297:	0	1	0	0	0	0	0	1
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	1	0	0	0	0
337:	1	0	0	0	0	0	0	1
345:	0	0	0	0	1	0	0	0
353:	0	0	1	0	1	0	0	0
361:	0	0	0	0	1	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	1	0
385:	0	0	0	0	0	0	1	0
393:	0	0	0	1	0	0	0	0
401:	0	0	0	0	0	1	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	1	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	1	1	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	1	0	0	0	1	0	1
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	1	0	0	0	0
553:	0	0	0	0	1	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:	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	1	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	1
649:	0	0	0	0	0	0	0	0
657:	0	2	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	1
673:	0	0	0	0	0	0	0	0
681:	0	0	0	1	0	0	0	0
689:	0	0	0	1	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:	1	0	0	0	0	1	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	1	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 1 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	1	2	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	1	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	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	1	0	0	0	0	0



*Handwritten signature*

Sample Description: PZ-304-AI TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_035  
 Chamber Serial Number: 04026477A  
 Detector Serial Number: 58771  
 Env. Background: System Bkgd 64053  
 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: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:51 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9150 +/- 0.0000  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Effective Efficiency: 0.1671 +/- 0.0029

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	5.517	5.66	85.23	0.34	0.00E+000	2.9
RA-226	4.604	25.83	38.71	0.17	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	0.963	5685.50*	3.80E-001 +/- 3.24E-001	3.21E-001 +/- 1.10E-002
RA-226	0.958	4785.00*	1.64E+000 +/- 6.37E-001	2.65E-001 +/- 9.07E-003

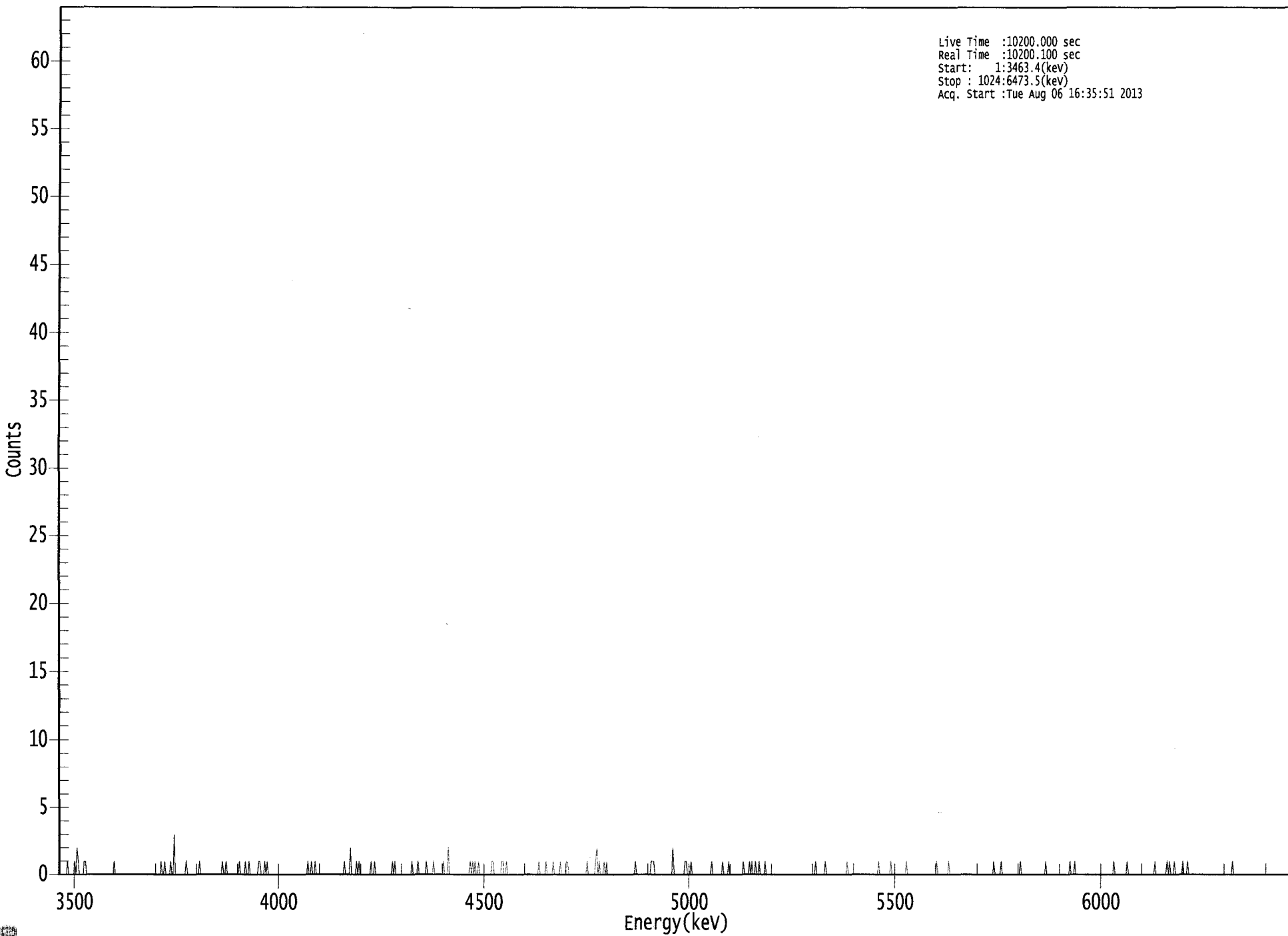
*AG*  
*8/7/13*

US EPA ARCHIVE DOCUMENT



0000065332.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 06 16:35:51 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: 10

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 0 0 1 0 0 0 0

Sample Title: 10

Channel	1	2	3	4	5	6	7	8
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:	0	0	0	0	1	0	0	0
409:	0	0	1	0	0	0	0	0
417:	1	0	0	0	0	1	1	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	1	0
441:	0	0	0	0	0	1	2	0
449:	1	0	0	0	1	0	1	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	1	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	1	1	1	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	2	0	0
513:	0	0	0	0	0	0	0	1
521:	1	0	0	0	1	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	1	0	0
545:	0	0	0	0	0	0	1	0
553:	0	0	0	1	0	0	0	0
561:	0	0	0	0	0	0	0	1
569:	0	0	0	0	1	0	1	0
577:	0	1	0	0	1	0	0	0
585:	0	1	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	1	0	0	0	0
633:	0	0	0	1	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	1	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	1
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	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	1
729:	0	0	0	0	0	0	0	0
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	1	0
777:	0	0	0	0	1	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: 10

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	1	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:	0	0	0	0	0	0	0	0
873:	0	1	0	0	0	0	0	0
881:	0	0	0	0	1	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	1	0	1
921:	0	0	0	1	0	0	0	0
929:	0	0	1	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	1	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	1	0	0	0	0	0



8/7/13

Sample Description: PZ-304-AI DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_036  
 Chamber Serial Number: 04026477B  
 Detector Serial Number: 84167  
 Env. Background: System Bkgd 64054  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 3.040E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:53 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9731 +/- 0.0000  
 Counting Efficiency: 0.1910 +/- 0.0033 on 7/20/2013 2:31:37 PM  
 Effective Efficiency: 0.1858 +/- 0.0032

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	5.575	9.32	66.89	0.68	0.00E+000	3.0
RA-226	4.596	26.64	39.09	1.36	0.00E+000	3.0

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 NUCLIDE ANALYSIS RESULTS  
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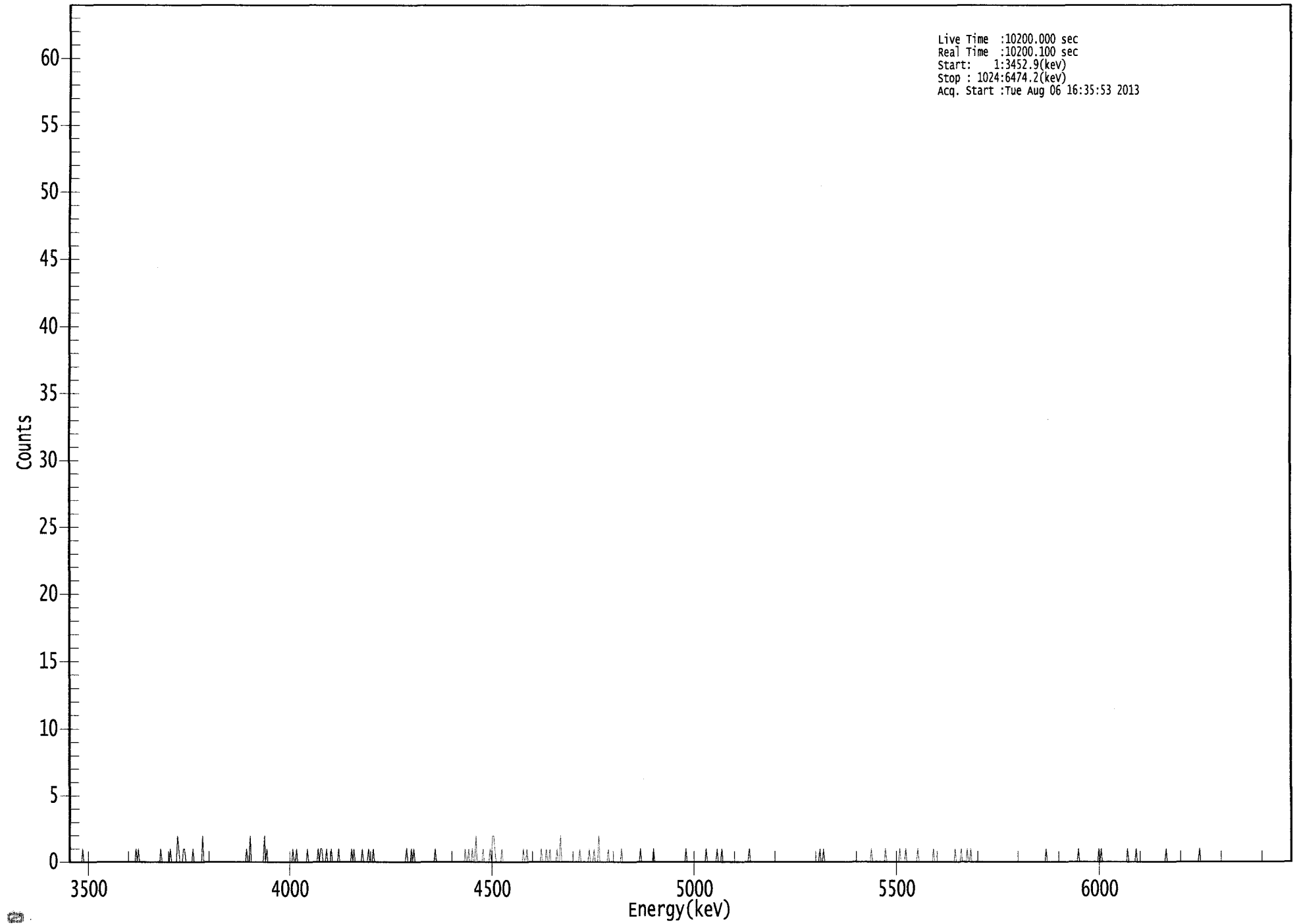
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.984	5685.50*	4.28E-001 +/- 2.86E-001	2.59E-001 +/- 8.84E-003
RA-226	0.954	4785.00*	1.15E+000 +/- 4.53E-001	2.97E-001 +/- 1.01E-002

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065333.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 06 16:35:53 2013



ROI Type: 1

0119

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

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	1	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	1	0	1	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	1	0	0
81:	0	0	0	0	0	1	0	0
89:	0	0	0	2	1	0	0	0
97:	1	1	0	0	0	0	0	0
105:	1	0	0	0	0	0	0	0
113:	2	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	1	0	0
153:	2	0	0	0	0	0	0	0
161:	0	0	0	0	2	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	1	0	0	1
193:	0	0	0	0	0	0	0	0
201:	1	0	0	0	0	0	0	0
209:	0	1	0	1	1	0	0	0
217:	1	0	0	0	1	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	1	0
249:	0	0	0	1	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:	0	0	0	1	0	0	0	1
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	1	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	1	0	0	1
337:	0	0	1	0	0	2	0	0
345:	0	0	0	1	0	0	0	0
353:	0	1	0	2	2	1	0	0
361:	0	0	0	1	0	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	1	0	0
385:	1	0	0	0	0	0	0	0
393:	0	0	0	0	1	0	0	0
401:	1	0	0	1	0	0	0	0
409:	0	1	0	0	2	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	1	0	0	0
441:	1	0	0	0	2	0	0	0
449:	0	0	0	0	1	0	0	0
457:	0	0	0	0	0	0	0	1
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	1
481:	0	0	0	0	0	0	0	0
489:	0	0	1	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	1	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	1	0
537:	0	0	0	0	0	0	0	1
545:	0	0	0	1	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	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	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:	1	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	1	0	0	0	0	0	0	0
681:	0	0	0	0	1	0	0	0
689:	0	0	0	0	0	0	0	0
697:	1	0	0	0	0	1	0	0
705:	0	0	0	0	0	0	0	1
713:	0	0	0	0	0	0	0	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	1	0
745:	0	0	0	1	0	0	0	0
753:	1	0	0	1	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	1	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	1	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	1	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	1	0
889:	0	0	0	0	0	1	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	1	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	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



*C*  
*8/7/13*

Sample Description: PZ-304-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_038  
 Chamber Serial Number: 04026478B  
 Detector Serial Number: 91134  
 Env. Background: System Bkgd 64055  
 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: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:55 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9455 +/- 0.0000  
 Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM  
 Effective Efficiency: 0.1628 +/- 0.0029

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	5.479	10.15	64.46	0.85	0.00E+000	5.9
RA-226	4.601	30.64	36.32	1.36	0.00E+000	3.0

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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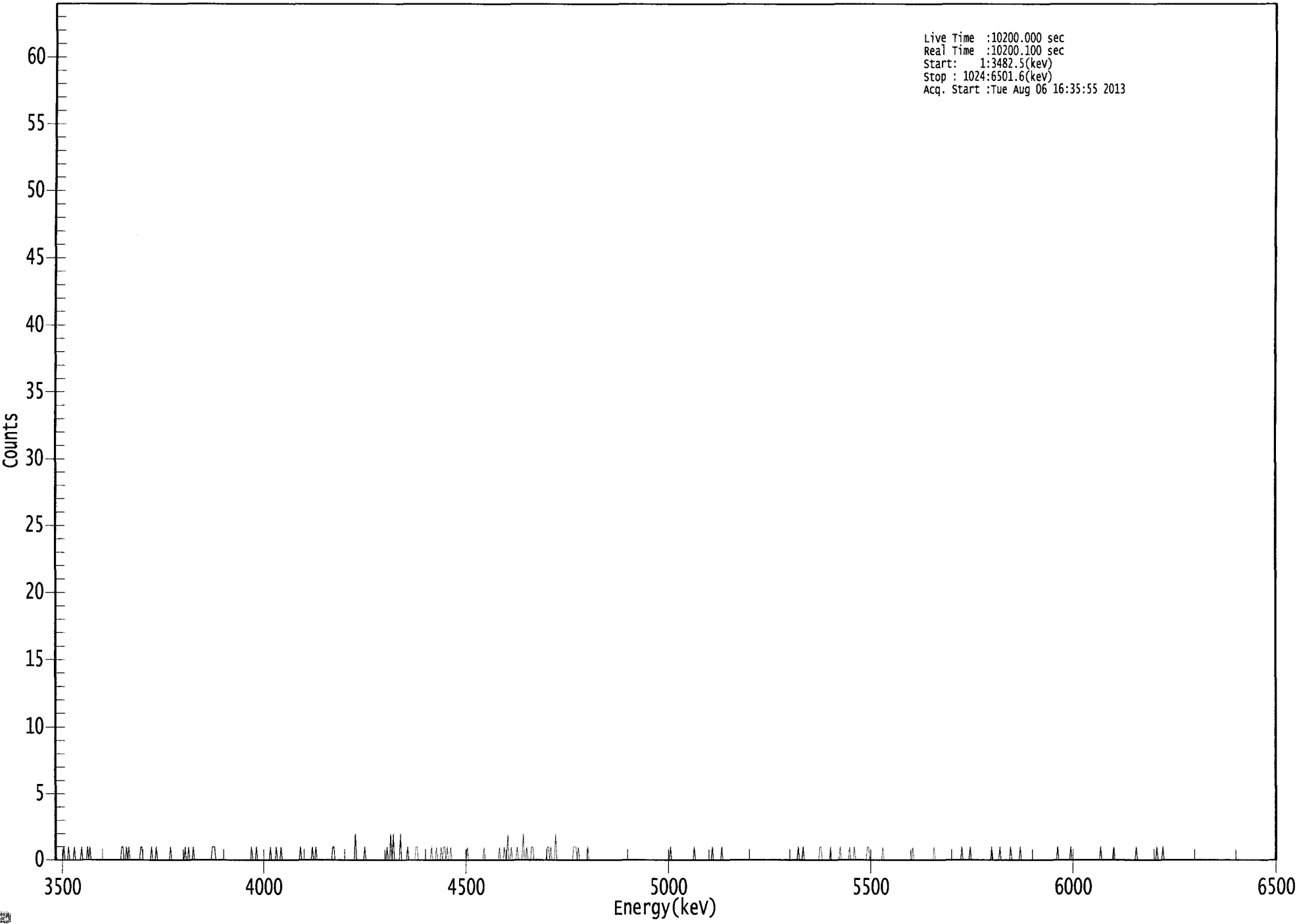
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.946	5685.50*	7.00E-001 +/- 4.52E-001	4.13E-001 +/- 1.42E-002
RA-226	0.957	4785.00*	2.00E+000 +/- 7.28E-001	4.46E-001 +/- 1.54E-002

*AG*  
*8/7/13*

US EPA ARCHIVE DOCUMENT

0000065334.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3482.5(kev)  
Stop : 1024:6501.6(kev)  
Acq. Start :Tue Aug 06 16:35:55 2013



ROI Type: 1

0424

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

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	2	0	0	0	0	0	0	1
9:	0	0	0	1	0	0	0	0
17:	1	0	0	0	0	0	1	0
25:	0	0	0	1	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:	1	1	0	0	1	0	1	0
65:	0	0	0	0	0	0	0	0
73:	1	1	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	1	0	0	0	0	0	0
105:	0	0	0	0	0	1	0	0
113:	1	0	0	0	1	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	1	1	1	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	1	0	0
169:	0	1	0	0	0	0	0	0
177:	0	0	0	0	0	1	0	0
185:	0	0	1	0	0	0	1	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	1	0
209:	0	0	0	0	0	0	0	0
217:	1	0	0	1	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	1	1	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	2	0	0	0
257:	0	0	0	0	1	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	1
281:	0	0	2	0	2	0	0	0
289:	0	0	2	0	0	0	0	0
297:	1	0	0	0	0	0	0	1
305:	1	0	0	0	0	0	0	0
313:	0	0	0	0	1	0	0	0
321:	1	0	0	0	1	0	1	1
329:	0	1	0	0	1	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	1	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	1	0	0	0	0	0	0	0

369: 0 0 0 0 0 1 0 0

Sample Title: 12

Channel	1	2	3	4	5	6	7	8
377:	0	1	0	0	2	0	0	1
385:	0	0	0	0	1	0	0	0
393:	0	2	0	0	1	0	0	0
401:	1	1	0	0	0	0	0	0
409:	0	0	0	0	0	1	1	0
417:	1	0	0	0	2	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	1	1	1	0	1
441:	0	0	0	0	0	0	0	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	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	1	0	0	0
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	1
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	1
625:	0	0	0	1	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	1	1	0	0	0	0	0
649:	0	0	1	0	0	0	0	0
657:	0	0	1	0	0	0	0	0
665:	0	0	1	0	0	0	1	0
673:	0	0	0	0	0	0	0	0
681:	0	1	1	0	0	0	0	0
689:	0	0	0	0	0	0	1	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	1
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	1	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	1	0	0	0	0	0	0	1
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	1	0	0	0	0	0	0
793:	1	0	0	0	0	0	0	0

801: 0 1 0 0 0 0 0 0

Sample Title: 12

Channel	1	2	3	4	5	6	7	8
809:	0	1	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	0	0	0	0	0	0
849:	0	0	0	1	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	1	0	0	0
881:	0	0	0	0	0	0	0	1
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	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	1	0	0	0	0
929:	1	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	1	0



*C*  
*8/13*

Sample Description: PZ-304-AS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_039  
 Chamber Serial Number: 06027396A  
 Detector Serial Number: 83109  
 Env. Background: System Bkgd 64056  
 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: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:57 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8771 +/- 0.0000  
 Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM  
 Effective Efficiency: 0.1724 +/- 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	5.530	6.66	78.18	0.34	0.00E+000	3.0
RA-226	4.611	27.30	38.85	1.70	0.00E+000	3.0

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

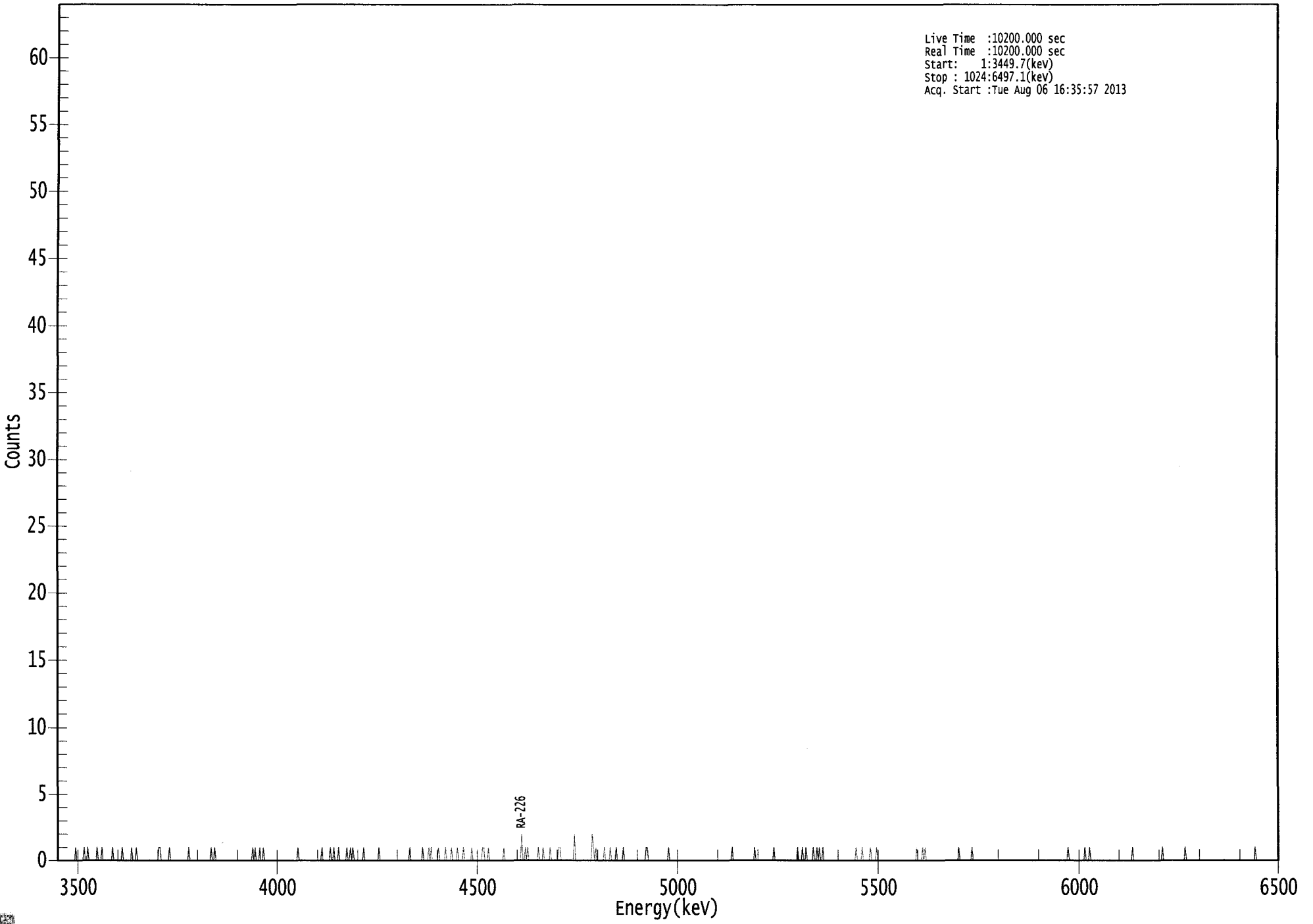
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.969	5685.50*	4.34E-001 +/- 3.39E-001	3.11E-001 +/- 1.06E-002
RA-226	0.961	4785.00*	1.68E+000 +/- 6.55E-001	4.52E-001 +/- 1.53E-002

*AG*  
*8/7/13*

US EPA ARCHIVE DOCUMENT

0000065335.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3449.7(kev)  
Stop : 1024:6497.1(kev)  
Acq. Start :Tue Aug 06 16:35:57 2013



6279

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:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	1
17:	0	0	0	0	0	0	1	0
25:	0	1	0	0	0	0	0	0
33:	0	1	0	0	0	1	0	0
41:	0	0	0	0	0	0	1	0
49:	0	0	0	0	0	0	1	0
57:	0	0	0	0	0	0	1	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	1	1	0
89:	0	0	0	0	0	0	1	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	1	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	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	0	0	0	0	0	0
161:	0	0	0	0	1	0	1	0
169:	0	0	1	0	0	1	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	1	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	1	0
225:	0	0	0	0	0	1	0	0
233:	1	0	0	0	1	0	0	0
241:	0	0	0	1	0	0	1	0
249:	1	0	0	0	0	0	0	0
257:	0	1	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:	1	0	0	0	0	0	0	0
305:	0	0	0	1	0	0	0	0
313:	1	0	1	0	0	0	0	0
321:	1	0	0	0	0	0	1	0
329:	0	0	0	1	0	0	0	0
337:	1	0	0	0	0	1	0	0
345:	0	0	0	0	1	0	0	0
353:	0	0	0	0	0	1	1	0
361:	0	0	1	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 1

Sample Title: 13

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	2	0
393:	0	1	0	1	0	0	0	0
401:	0	0	0	0	1	0	0	0
409:	1	0	0	0	0	0	1	0
417:	0	0	0	0	0	1	1	0
425:	0	0	0	0	0	0	0	0
433:	0	0	2	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	2	1	0	1	0	0	0
457:	0	0	0	1	0	0	0	0
465:	1	0	0	0	0	1	0	0
473:	0	0	0	1	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	1	1
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	1	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	1	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	1	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	1	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:	0	1	0	0	1	0	0	0
633:	0	0	1	0	0	1	0	1
641:	0	0	1	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	1	0
673:	0	0	0	1	0	0	0	0
681:	0	0	1	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	1	0	0	0	0	1	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	1	0	0	0
761:	0	0	0	0	0	0	0	1
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	1
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	1	0	0
865:	0	1	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	1	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	1	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	1	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



C  
8/7/13

Sample Description: MW-104 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_040  
 Chamber Serial Number: 06027396B  
 Detector Serial Number: 91135  
 Env. Background: System Bkgd 64057  
 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: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:35:59 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8774 +/- 0.0000  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Effective Efficiency: 0.1667 +/- 0.0029

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	5.488	11.15	61.26	0.85	0.00E+000	3.0
RA-226	4.608	19.49	45.07	0.51	0.00E+000	3.0

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 -----  
 NUCLIDE ANALYSIS RESULTS  
 -----  
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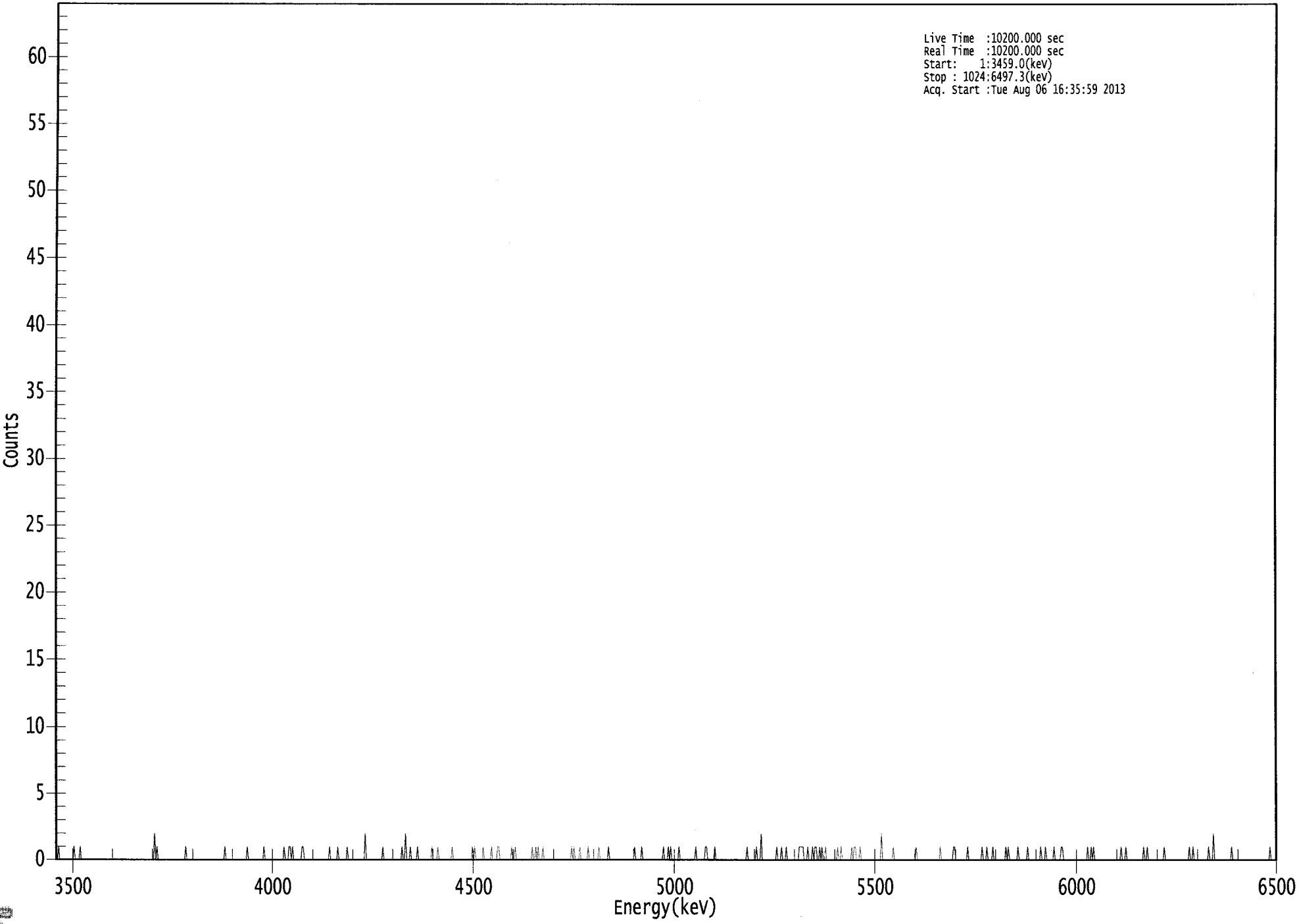
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.950	5685.50*	5.95E-001 +/- 3.65E-001	3.19E-001 +/- 1.09E-002
RA-226	0.960	4785.00*	9.82E-001 +/- 4.44E-001	2.64E-001 +/- 8.99E-003

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065336.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Tue Aug 06 16:35:59 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: 14

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	1
17:	0	0	0	0	1	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	2	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	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:	0	0	0	0	0	0	1	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	0	0	0
185:	0	0	0	0	0	0	0	0
193:	1	0	0	0	1	1	0	1
201:	0	0	0	0	0	0	0	1
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	1	0
233:	0	0	0	0	0	1	0	0
241:	0	0	0	0	0	1	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	2	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	1	0	0	2	0
297:	0	0	1	0	0	0	0	0
305:	1	0	0	0	0	0	0	0
313:	0	0	0	0	1	0	0	0
321:	0	1	0	0	0	0	0	0
329:	0	0	0	0	0	1	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	1	0
353:	1	0	0	0	0	0	0	1
361:	0	0	0	0	0	0	1	0

369: 0 0 0 1 1 0 0 0

Sample Title: 14

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	1
385:	0	0	1	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	1	0	0	1	0	1	0	0
409:	0	1	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	1	0	1	0	0	0	0
441:	1	0	0	0	0	0	0	1
449:	0	0	0	0	0	0	0	0
457:	1	0	0	0	0	0	0	0
465:	1	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	1	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	1	0
513:	0	0	1	0	1	0	0	0
521:	0	0	0	1	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	1	0	0	0	0	0	0
545:	0	1	1	0	0	0	0	0
553:	0	1	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	1	0	0	0
585:	0	0	0	0	1	0	0	0
593:	2	0	0	0	0	0	0	0
601:	0	0	0	0	0	1	0	0
609:	0	1	0	0	0	1	0	0
617:	0	0	0	0	0	0	0	0
625:	1	1	1	1	0	0	0	1
633:	0	0	0	1	0	1	1	0
641:	0	1	0	1	0	0	1	0
649:	0	0	0	0	0	0	0	0
657:	1	0	0	1	0	0	0	0
665:	0	0	0	0	1	0	1	1
673:	0	0	0	1	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	2	0	0
697:	0	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	1	0	0	0	0	0
729:	0	0	0	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	1	1	0	0	0	0	0
761:	0	0	0	0	0	1	0	0
769:	0	0	0	0	0	0	0	0
777:	0	1	0	0	0	1	0	0
785:	0	0	1	0	0	0	0	0
793:	0	0	0	0	0	1	0	1

801: 0 0 0 0 0 0 0 1

Sample Title: 14

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	1
817:	0	0	0	0	0	0	0	0
825:	0	0	1	0	0	0	1	0
833:	0	0	0	0	0	1	0	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	0	0
865:	0	1	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	1	0	0
897:	0	1	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	1	0	0	1	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	1	0
953:	0	1	0	0	0	0	0	0
961:	0	0	0	0	0	0	1	0
969:	0	0	2	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	1	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	1	0	0	0	0	0	0





*c*  
*8/7*

Sample Description: MW-104 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

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  
 Generic Mult. Factor: 2.580E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:36:02 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9716 +/- 0.0000  
 Counting Efficiency: 0.1978 +/- 0.0034 on 12/16/2012 5:49:31 PM  
 Effective Efficiency: 0.1922 +/- 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	5.456	1.49	190.02	0.51	0.00E+000	3.0
RA-226	4.569	6.79	88.39	2.21	0.00E+000	3.0

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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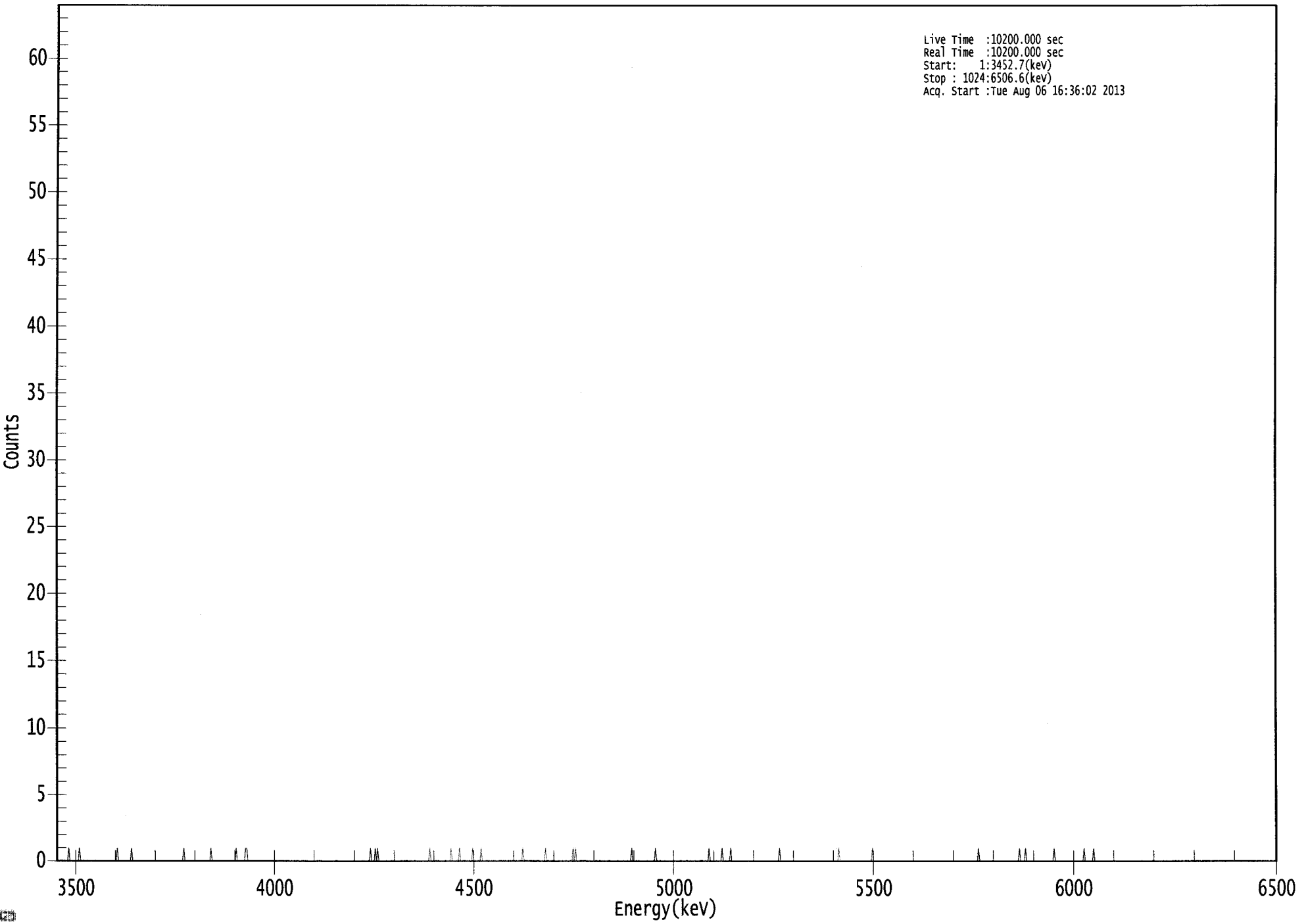
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.933	5685.50*	5.61E-002 +/- 1.07E-001	1.98E-001 +/- 6.70E-003
RA-226	0.941	4785.00*	2.41E-001 +/- 2.14E-001	2.84E-001 +/- 9.63E-003

*AG*  
*8/7/13*

US EPA ARCHIVE DOCUMENT

0000065338.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3452.7(kev)  
Stop : 1024:6506.6(kev)  
Acq. Start :Tue Aug 06 16:36:02 2013



0000065338

ROI Type: 1

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

Sample Title: 15

Elapsed Live time: 10200  
Elapsed Real Time: 10200

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

369: 0 0 0 0 0 0 0 0

Sample Title: 15

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	1	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	1	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	1	0	1	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	1	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	1
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	1	0	0	0
553:	0	0	0	0	0	0	0	1
561:	0	0	0	0	0	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	0	0	0	0	0	0	0
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	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	1	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	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	1	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:	1	0	0	0	0	1	0
817:	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0
833:	0	0	0	0	0	1	0
841:	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	1
865:	0	0	0	0	0	0	1
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	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



C  
8/17

Sample Description: PZ-204A-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 16  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

Detector Name: Alpha\_042  
 Chamber Serial Number: 05026930B  
 Detector Serial Number: 84185  
 Env. Background: System Bkgd 64059  
 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: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:36:04 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9272 +/- 0.0000  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Effective Efficiency: 0.1712 +/- 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	5.509	25.81	39.61	1.19	0.00E+000	4.5
RA-226	4.618	48.15	28.54	0.85	0.00E+000	3.7

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

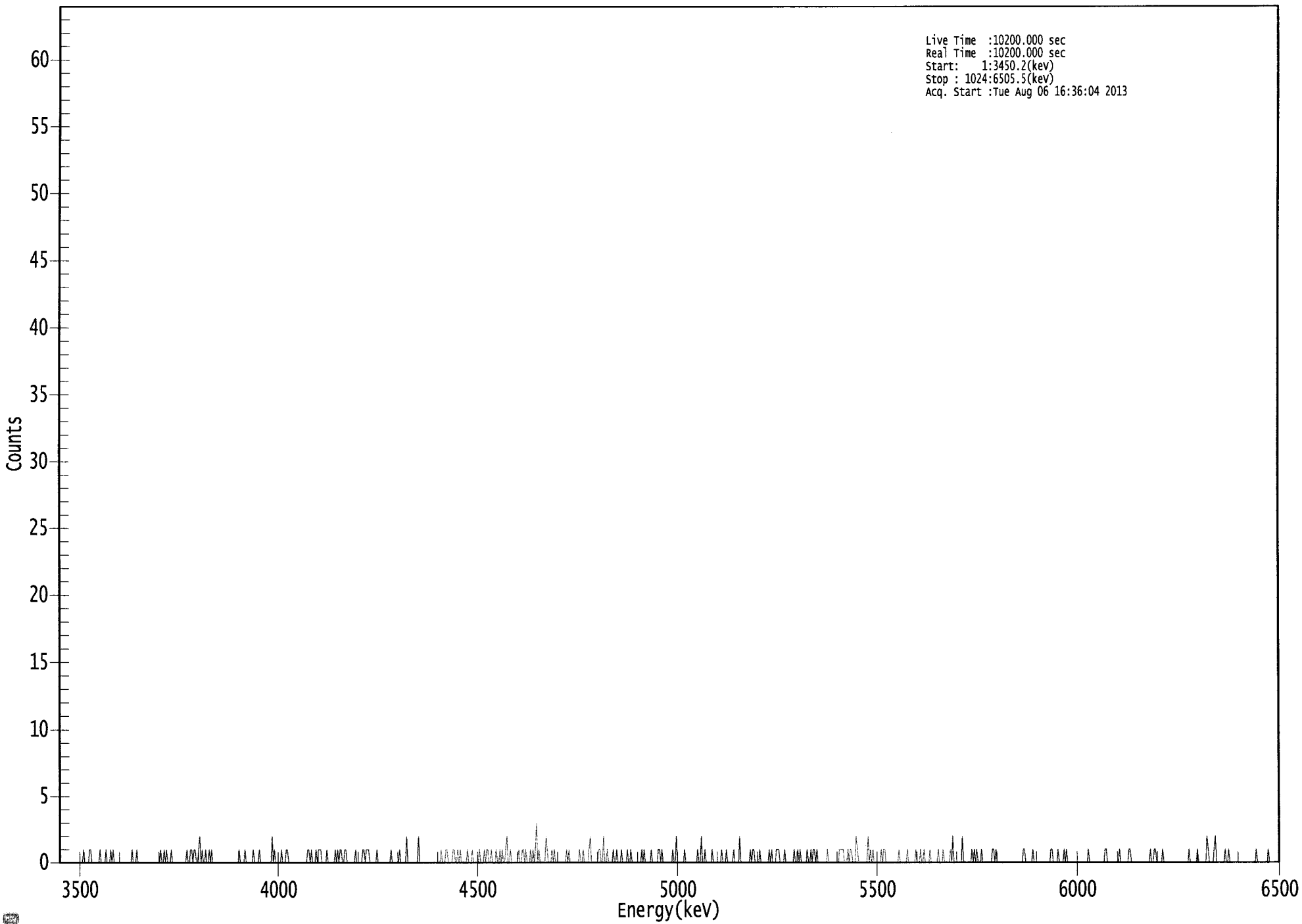
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.960	5685.50*	1.03E+000 +/- 4.10E-001	2.63E-001 +/- 9.00E-003
RA-226	0.964	4785.00*	1.82E+000 +/- 5.23E-001	2.26E-001 +/- 7.71E-003

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065337.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3450.2(kev)  
Stop : 1024:6505.5(kev)  
Acq. Start :Tue Aug 06 16:36:04 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:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	1	0	0	0
25:	0	1	1	0	0	0	0	0
33:	0	0	1	0	0	0	0	1
41:	0	0	0	1	0	1	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	1	0	0
65:	0	1	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	1	0	0
89:	1	0	1	0	0	0	1	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	1	0	0	1	1
113:	0	1	1	0	0	1	2	0
121:	1	0	0	1	0	0	1	0
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	1
153:	0	0	0	0	1	0	0	0
161:	0	0	0	1	0	0	0	0
169:	1	0	0	0	0	0	0	0
177:	0	0	0	2	0	1	0	0
185:	0	0	0	1	0	0	0	1
193:	1	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	1	1	0	1	0	0	0
217:	1	0	1	1	1	0	0	0
225:	0	1	0	0	0	0	0	0
233:	1	0	1	0	1	1	0	0
241:	1	1	0	0	0	0	0	0
249:	0	1	0	0	0	0	0	1
257:	1	0	1	1	1	0	0	0
265:	0	0	0	1	0	0	0	0
273:	0	0	0	0	0	0	0	1
281:	0	0	0	0	0	0	1	0
289:	0	0	0	0	2	0	0	0
297:	0	0	0	0	0	0	2	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	1	0	0	0	1	1	0
329:	0	0	0	1	1	0	0	1
337:	0	1	0	0	0	0	0	1
345:	0	0	0	1	0	0	0	0
353:	0	1	0	0	0	1	0	1
361:	1	0	0	1	0	0	0	1



369: 0 0 1 0 1 0 0 1

Sample Title: 16

Channel	1	2	3	4	5	6	7	8
377:	2	0	0	1	0	0	0	0
385:	0	0	1	0	0	1	1	0
393:	1	0	0	0	1	0	1	0
401:	1	3	0	1	0	0	0	0
409:	0	2	1	0	0	0	1	0
417:	1	0	0	0	0	0	0	0
425:	0	0	1	0	1	0	0	0
433:	0	0	0	0	0	1	0	0
441:	1	0	0	0	0	1	2	0
449:	0	0	0	0	0	1	1	0
457:	0	2	0	0	1	0	0	0
465:	0	1	0	0	1	0	0	0
473:	1	0	0	0	0	1	0	0
481:	1	0	0	0	0	0	0	0
489:	0	1	0	1	0	0	0	0
497:	0	1	0	0	0	0	0	1
505:	1	0	1	0	0	0	0	0
513:	0	0	0	1	0	0	2	0
521:	0	0	0	0	0	1	0	0
529:	0	0	0	0	0	0	0	0
537:	1	0	0	2	0	0	1	0
545:	0	0	0	0	1	0	0	0
553:	0	0	0	0	1	0	0	0
561:	1	0	0	0	0	0	1	0
569:	0	0	0	2	0	0	0	0
577:	0	0	0	0	1	0	1	1
585:	0	0	0	0	1	0	0	0
593:	0	0	0	0	1	0	1	0
601:	0	0	1	1	1	0	0	0
609:	0	1	0	0	0	0	0	0
617:	0	1	0	0	1	0	1	0
625:	0	0	0	0	1	0	0	1
633:	0	1	1	0	1	0	0	0
641:	0	0	0	0	0	1	0	0
649:	0	0	0	0	0	0	0	1
657:	1	1	1	0	0	0	1	0
665:	1	1	0	0	0	2	1	0
673:	0	0	0	0	0	0	0	2
681:	0	1	0	1	0	0	0	0
689:	0	0	1	0	1	1	0	0
697:	0	0	0	0	0	0	0	0
705:	0	1	0	0	0	0	0	0
713:	1	0	0	0	0	0	0	1
721:	0	0	0	1	0	0	1	0
729:	0	0	0	1	0	0	0	0
737:	0	0	1	0	0	0	1	0
745:	0	0	0	0	1	0	2	0
753:	0	0	0	0	0	0	2	0
761:	0	0	0	0	0	0	1	0
769:	1	0	1	0	0	0	1	0
777:	0	0	0	0	0	0	0	1
785:	1	0	1	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	1	1	0	0	0	0	0
817:	0	1	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	1	1	0	0	0	0	1	0
841:	0	0	0	1	0	1	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	1
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	1	1	0
881:	0	0	0	0	0	0	0	0
889:	0	1	0	0	0	0	0	0
897:	0	1	1	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	1	0	0	1	1
921:	0	0	0	0	0	1	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	1	0	0	0	0
953:	0	0	1	0	0	0	0	0
961:	0	0	2	1	0	0	0	0
969:	1	2	0	0	0	0	0	0
977:	0	1	0	0	1	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	1	0	0	0	0
1009:	0	0	0	0	0	1	0	0
1017:	0	0	0	0	0	0	0	0



C  
8/7/13

Sample Description: PZ-204A-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 17  
 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: 2.530E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:36:07 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

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	5.481	12.49	56.77	0.51	0.00E+000	3.0
RA-226	4.587	30.49	35.84	0.51	0.00E+000	4.5

-----  
 NUCLIDE ANALYSIS RESULTS  
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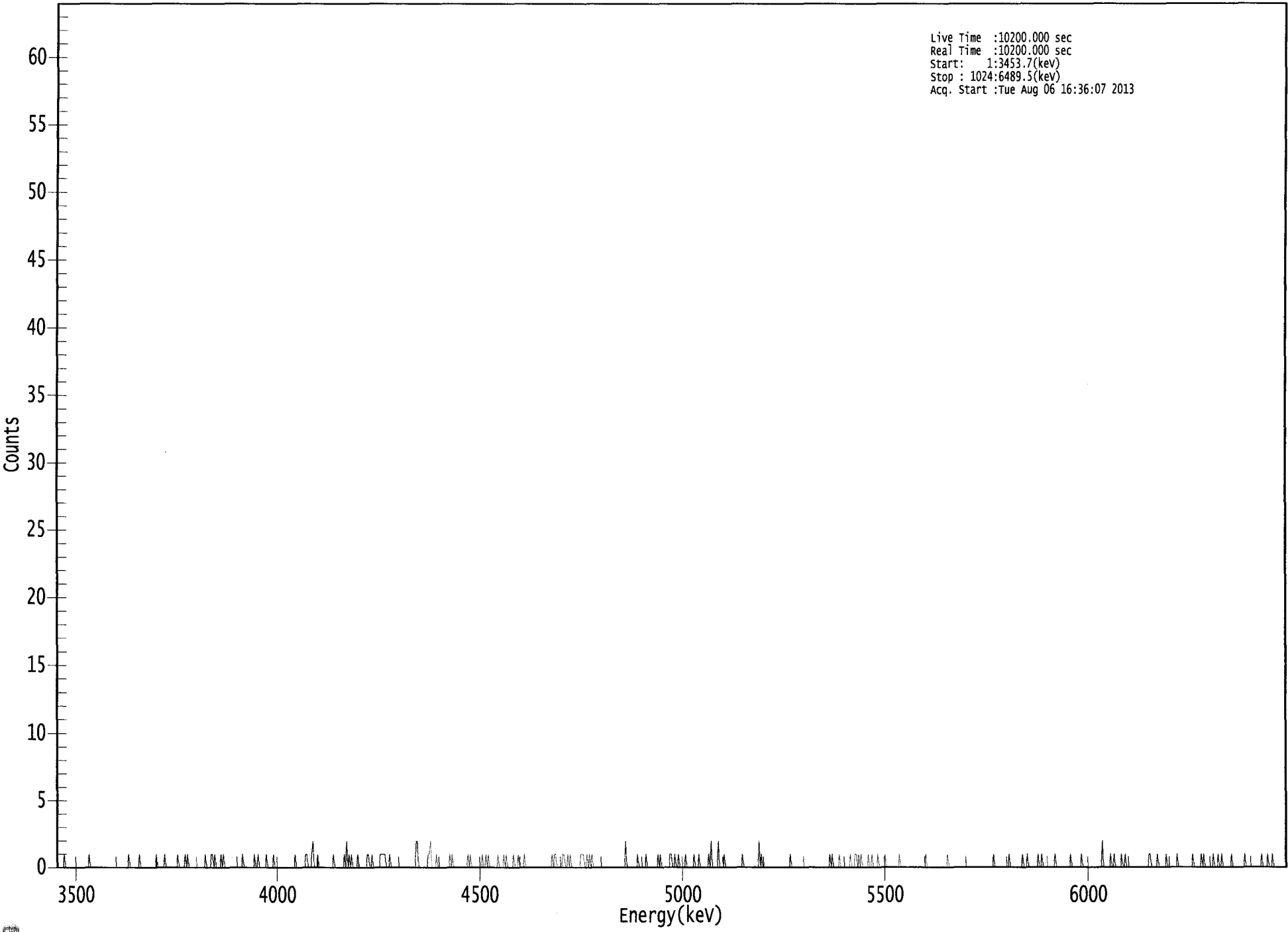
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.947	5685.50*	4.64E-001 +/- 2.64E-001	1.95E-001 +/- 6.67E-003
RA-226	0.950	4785.00*	1.07E+000 +/- 3.85E-001	1.84E-001 +/- 6.28E-003

AG  
 8/7/13

US EPA ARCHIVE DOCUMENT

0000065329.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6489.5(kev)  
Acq. Start :Tue Aug 06 16:36:07 2013



6489  
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: 17

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 0 0 0 0 1 0 1

Sample Title: 17

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	1	0	0
385:	0	1	0	0	0	0	1	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	1	0	1
417:	1	0	0	0	0	0	1	1
425:	0	0	1	0	1	0	0	0
433:	0	0	0	0	0	1	1	1
441:	0	0	1	0	1	0	1	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	2	0	0	0	0	0
481:	0	0	0	0	1	0	0	0
489:	0	0	0	1	0	0	0	0
497:	0	0	0	0	0	1	0	1
505:	0	0	0	0	0	0	0	1
513:	1	0	0	1	0	0	1	0
521:	0	0	0	0	1	0	0	0
529:	0	0	0	1	0	0	0	1
537:	0	0	0	0	0	0	0	1
545:	0	2	0	0	0	0	0	2
553:	0	0	0	0	1	0	0	0
561:	0	0	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	2	0	1	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	1	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	1	0
649:	0	0	0	0	1	0	0	0
657:	0	0	0	0	0	1	0	0
665:	0	1	1	0	1	0	1	0
673:	0	0	0	0	1	0	0	1
681:	0	0	0	0	1	0	0	0
689:	0	0	1	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	1	0	0	0
729:	0	0	0	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	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	1	0	0	0	0	0	0

801: 0 0 0 0 1 0 0 0

Sample Title: 17

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



C  
8/7/13

Sample Description: PZ-302-AI TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 18  
 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: 2.500E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:36:09 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

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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	5.540	5.83	82.55	0.17	0.00E+000	3.0
RA-226	4.579	21.66	42.50	0.34	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	0.973	5685.50*	2.29E-001 +/- 1.89E-001	1.64E-001 +/- 5.64E-003
RA-226	0.946	4785.00*	8.02E-001 +/- 3.42E-001	1.77E-001 +/- 6.09E-003

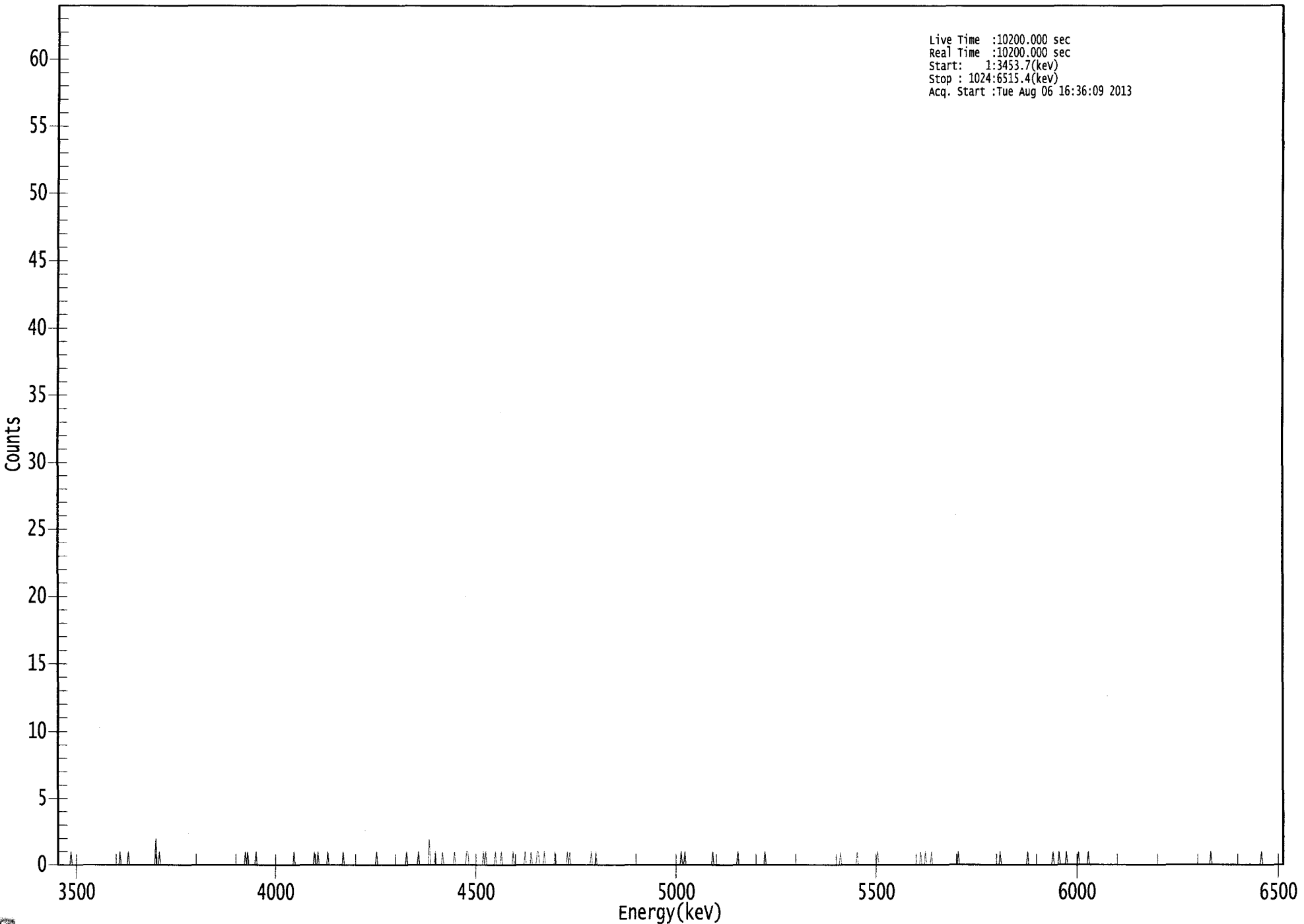
AG  
8/7/13

US EPA ARCHIVE DOCUMENT



0000065328.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6515.4(kev)  
Acq. Start :Tue Aug 06 16:36:09 2013



6534

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:	0	0	0	0	0	0	0	0
9:	0	0	0	1	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	1	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:	0	0	2	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	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	1	0	1
161:	0	0	0	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	1	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	1
217:	0	0	1	0	0	0	0	0
225:	0	0	1	0	0	0	0	0
233:	0	0	0	0	0	0	0	1
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	1	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	1	0	0	0
297:	0	0	0	0	0	0	1	0
305:	0	0	0	0	0	0	0	2
313:	0	0	0	0	1	0	0	0
321:	0	0	1	0	0	0	0	0
329:	0	0	0	0	1	0	0	0
337:	0	0	0	0	0	0	1	1
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	1	0	1	0
361:	0	0	0	0	0	0	1	0

369: 0 0 0 1 0 0 0 0

Sample Title: 18

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	1	0	0
385:	0	0	0	0	0	0	0	1
393:	0	0	0	0	1	0	0	0
401:	0	1	1	0	0	0	0	1
409:	0	0	0	0	0	0	0	0
417:	1	0	0	0	0	0	0	0
425:	0	0	1	0	1	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	1	0
449:	0	0	1	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	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	1	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	1	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	1	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	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	1	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	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	0	0	0
721:	0	1	0	0	0	1	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:	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	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: 18

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	1	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	1	0	0	0
841:	0	0	1	0	0	0	0	0
849:	0	0	0	0	1	0	0	0
857:	0	0	0	0	1	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	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	1	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



C  
BIA

Sample Description: PZ-302-AI DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000653  
 Batch Identification: 1307147A-RA  
 Sample Identification: 19  
 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: 2.500E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 2:34:11 PM  
 Acquisition Date/Time: 8/6/2013 4:36:11 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8652 +/- 0.0000  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Effective Efficiency: 0.1576 +/- 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	5.594	4.83	91.00	0.17	0.00E+000	2.9
RA-226	4.618	16.32	49.69	0.68	0.00E+000	2.9

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 NUCLIDE ANALYSIS RESULTS  
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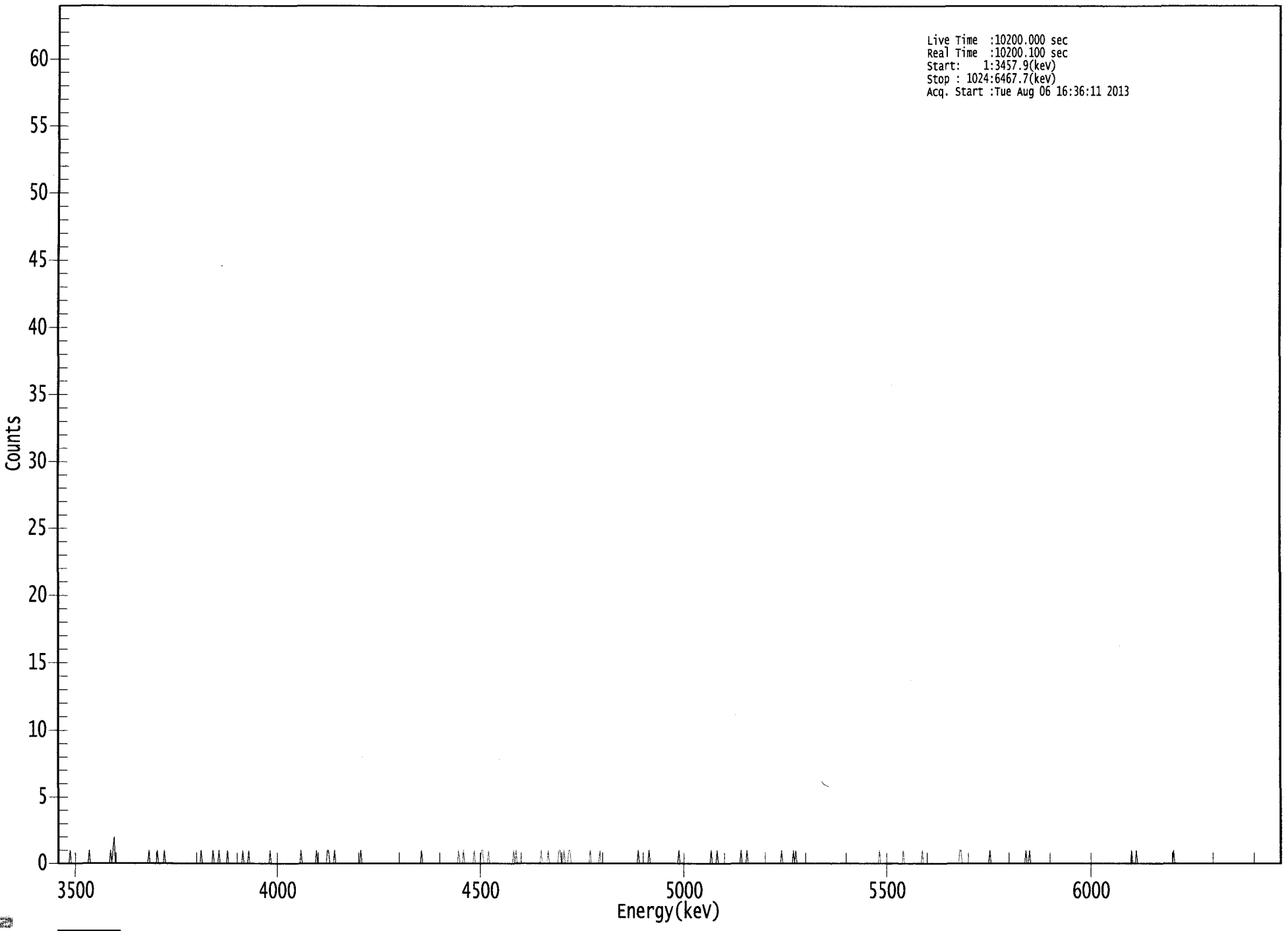
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.989	5685.50*	2.15E-001 +/- 1.96E-001	1.86E-001 +/- 6.39E-003
RA-226	0.964	4785.00*	6.86E-001 +/- 3.42E-001	2.37E-001 +/- 8.14E-003

AG  
8/7/13

US EPA ARCHIVE DOCUMENT

0000065339.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3457.9(kev)  
Stop : 1024:6467.7(kev)  
Acq. Start :Tue Aug 06 16:36:11 2013



0000065339

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: 19

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	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	0	1	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	1	0	1	2
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	1	0	0	0	0
89:	0	1	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	1	0	0	0	0	0	0	0
129:	0	0	1	0	0	0	0	1
137:	0	0	0	0	0	0	1	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	1	0	0	0	0
161:	1	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	1	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	1	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	1	0	0	0	0
233:	1	0	0	0	0	0	0	0
241:	0	0	0	0	0	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	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	1	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:	1	0	0	0	1	0	0	0
345:	0	0	0	0	0	1	0	0
353:	0	0	0	1	1	0	0	0
361:	0	1	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 19

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	1	0
385:	1	0	0	0	0	0	0	0
393:	0	0	0	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	0	1	1	0	0
425:	1	0	0	0	1	1	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	1	0
449:	0	0	0	0	0	0	1	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	1
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	1	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	1	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	1	0	0	0
577:	0	1	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:	1	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:	1	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	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	0	0	0	0	0	0
753:	0	0	0	1	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	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: 19

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



## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

Date : 8/6/2013  
Time : 5:51:01 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/6/2013 5:29:13 AM
Alpha 004	21f	ALL	Passed	8/6/2013 5:29:14 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	8/6/2013 5:29:14 AM
Alpha 011	21f	ALL	Passed	8/6/2013 5:29:15 AM
Alpha 012	21f	ALL	Passed	8/6/2013 5:29:16 AM
Alpha 013	21f	ALL	Passed	8/6/2013 5:29:17 AM
Alpha 014	21f	ALL	Passed	8/6/2013 5:29:18 AM
Alpha 015	21f	ALL	Passed	8/6/2013 5:29:18 AM
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	8/6/2013 5:29:19 AM
Alpha 019	AIM730	ALL	Passed	8/6/2013 5:29:20 AM
Alpha 020	AIM730	ALL	Passed	8/2/2013 5:14:08 AM
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/6/2013 5:29:21 AM
Alpha 023	AIM730	ALL	Passed	8/6/2013 5:29:22 AM
Alpha 024	AIM730	ALL	Passed	8/6/2013 5:29:22 AM
Alpha 025	AIM730	ALL	Passed	8/6/2013 5:29:23 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/6/2013 5:29:24 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/6/2013 5:29:25 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/6/2013 5:29:26 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:27 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:28 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:30 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:31 AM
Alpha 037	Alpha Analyst100DC	ALL	Not Done	
Alpha 038	Alpha Analyst100DC	Peak FWHM	Action	8/6/2013 5:29:32 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:34 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:35 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:37 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:38 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	8/6/2013 5:29:40 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:42 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:43 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	8/6/2013 5:29:45 AM

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



APPROVAL DATE: \_\_\_\_\_



US EPA ARCHIVE DOCUMENT

\*\*\*\*\*  
\*\*\*\*\* LIBRARY LISTING REPORT \*\*\*\*\*  
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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	13-07147	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	Ra228	01	LCS	LCS		07/23/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/23/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	D-12 TOT	46	07/15/13 15:27	1.0000E+00
Lab Deadline	8/13/2013	04	DO	D-12 TOT	46	07/15/13 15:27	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	D-12 DIS	46	07/15/13 15:27	1.0000E+00
Project	West Lake OU-1	06	TRG	DUP05 TOT	45	07/15/13 00:00	1.0000E+00
Report Level	4	07	TRG	DUP05 DIS	45	07/15/13 00:00	1.0000E+00
Activity Units	pCi	08	TRG	PZ-208-SS TOT	43	07/16/13 09:25	1.0000E+00
Aliquot Units	I	09	TRG	PZ-208-SS DIS	43	07/16/13 09:25	1.0000E+00
Matrix	WA	10	TRG	PZ-304-AI TOT	46	07/16/13 12:05	1.0000E+00
Method	E904.0	11	TRG	PZ-304-AI DIS	46	07/16/13 12:05	1.0000E+00
Instrument Type	Alpha/Beta GPC	12	TRG	PZ-304-AS TOT	41	07/16/13 12:34	1.0000E+00
Radiometric Tracer	Ba-133	13	TRG	PZ-304-AS DIS	41	07/16/13 12:34	1.0000E+00
Radiometric Sol#	Ba-6a	14	TRG	MW-104 TOT	41	07/16/13 13:25	1.0000E+00
Tracer Act (dpm/g)	991.479	15	TRG	MW-104 DIS	41	07/16/13 13:25	1.0000E+00
Carrier	Yttrium	16	TRG	PZ-204A-SS TOT	40	07/16/13 13:56	1.0000E+00
Carrier Conc (mg/ml)	34	17	TRG	PZ-204A-SS DIS	40	07/16/13 13:56	1.0000E+00
		18	TRG	PZ-302-AI TOT	44	07/16/13 15:18	1.0000E+00
		19	TRG	PZ-302-AI DIS	44	07/16/13 15:18	1.0000E+00

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.9234	915.5	386.3	93.67	2.000	0.0911	0.1514	0.0603	88.68	83.06	1.00	1.00
02	MBL	0.9145	906.7	383.0	93.77	2.000	0.0916	0.1498	0.0582	85.59	80.26	1.00	1.00
03	DUP	0.9149	907.1	402.4	98.48	2.000	0.0914	0.1486	0.0572	84.12	82.84	1.00	1.00
04	DO	0.9109	903.1	361.1	88.76	2.000	0.0912	0.1468	0.0556	81.76	72.58	1.00	1.00
05	TRG	0.9102	902.4	389.0	95.69	2.000	0.0922	0.1490	0.0568	83.53	79.93	1.00	1.00
06	TRG	0.9138	906.0	380.7	93.28	2.000	0.0922	0.1507	0.0585	86.03	80.25	1.00	1.00
07	TRG	0.9128	905.0	385.0	94.44	2.000	0.0919	0.1476	0.0557	81.91	77.36	1.00	1.00
08	TRG	0.9113	903.5	366.7	90.10	2.000	0.0923	0.1482	0.0559	82.21	74.07	1.00	1.00
09	TRG	0.9122	904.4	406.4	99.75	2.000	0.0923	0.1480	0.0557	81.91	81.71	1.00	1.00
10	TRG	0.9115	903.7	372.5	91.50	2.000	0.0923	0.1472	0.0549	80.74	73.88	1.00	1.00
11	TRG	0.9100	902.2	395.5	97.31	2.000	0.0923	0.1461	0.0538	79.12	76.99	1.00	1.00
12	TRG	0.9079	900.2	383.4	94.55	2.000	0.0925	0.1472	0.0547	80.44	76.06	1.00	1.00
13	TRG	0.9121	904.3	357.3	87.71	2.000	0.0922	0.1487	0.0565	83.09	72.88	1.00	1.00
14	TRG	0.9090	901.3	356.2	87.74	2.000	0.0921	0.1486	0.0565	83.09	72.90	1.00	1.00
15	TRG	0.9091	901.4	394.5	97.16	2.000	0.0921	0.1485	0.0564	82.94	80.59	1.00	1.00
16	TRG	0.9109	903.1	377.2	92.72	2.000	0.0918	0.1477	0.0559	82.21	76.22	1.00	1.00
17	TRG	0.9061	898.4	406.4	100.43	2.000	0.0921	0.1482	0.0561	82.50	82.85	1.00	1.00
18	TRG	0.9064	898.7	436.4	107.80	2.000	0.0920	0.1494	0.0574	84.41	91.00	1.00	1.00
19	TRG	0.9104	902.6	351.8	86.52	2.000	0.0918	0.1483	0.0565	83.09	71.89	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.

0458

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			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
02	MBL			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
03	DUP			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
04	DO			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
05	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
06	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
07	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
08	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
09	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
10	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
11	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
12	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
13	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
14	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
15	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
16	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
17	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
18	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	TSMITH
19	TRG			07/31/13 12:41	JWOLFE	08/05/13 13:55	LWALKER	08/14/13 06:53	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: 13-07147-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	8.18E+00	9.14E-01	1.17E+00	8.81E+00	92.87	OK		OK	
02	RA-228	MBL	BLANK	pCi/l	1.01E+00	5.67E-01	1.08E+00					OK	OK
03	RA-228	DUP	D-12 TOT	pCi/l	3.76E-01	5.83E-01	1.21E+00				NA	OK	
04	RA-228	DO	D-12 TOT	pCi/l	1.13E+00	6.70E-01	1.30E+00					OK	
05	RA-228	TRG	D-12 DIS	pCi/l	1.74E+00	6.83E-01	1.26E+00					OK	
06	RA-228	TRG	DUP05 TOT	pCi/l	9.66E-01	7.01E-01	1.39E+00					OK	
07	RA-228	TRG	DUP05 DIS	pCi/l	1.44E+00	7.15E-01	1.37E+00					OK	
08	RA-228	TRG	PZ-208-SS TOT	pCi/l	2.37E+00	8.03E-01	1.46E+00					OK	
09	RA-228	TRG	PZ-208-SS DIS	pCi/l	1.10E+00	6.98E-01	1.37E+00					OK	
10	RA-228	TRG	PZ-304-AI TOT	pCi/l	2.52E+00	7.57E-01	1.33E+00					OK	
11	RA-228	TRG	PZ-304-AI DIS	pCi/l	2.43E+00	7.96E-01	1.44E+00					OK	
12	RA-228	TRG	PZ-304-AS TOT	pCi/l	1.79E+00	6.98E-01	1.28E+00					OK	
13	RA-228	TRG	PZ-304-AS DIS	pCi/l	1.93E+00	7.95E-01	1.49E+00					OK	
14	RA-228	TRG	MW-104 TOT	pCi/l	1.72E+00	7.86E-01	1.49E+00					OK	
15	RA-228	TRG	MW-104 DIS	pCi/l	8.48E-01	7.24E-01	1.46E+00					OK	
16	RA-228	TRG	PZ-204A-SS TOT	pCi/l	5.73E-01	7.32E-01	1.50E+00					OK	
17	RA-228	TRG	PZ-204A-SS DIS	pCi/l	1.59E+00	7.23E-01	1.37E+00					OK	
18	RA-228	TRG	PZ-302-AI TOT	pCi/l	8.53E-01	7.57E-01	1.53E+00					OK	
19	RA-228	TRG	PZ-302-AI DIS	pCi/l	1.34E+00	8.83E-01	1.74E+00					OK	

Run	1
Analysis Code	Ra228
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

0270

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-Ra228-1**

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep 10 Date/Time	Sep 11 Date/Time
01	RA-228	LCS	07/23/13 00:00	1.00E+00	93.67	88.68	83.06	1.00	8/5/2013 13:55	8/14/2013 6:53
02	RA-228	MBL	07/23/13 00:00	1.00E+00	93.77	85.59	80.26	1.00	8/5/2013 13:55	8/14/2013 6:53
03	RA-228	DUP	07/15/13 15:27	1.00E+00	98.48	84.12	82.84	1.00	8/5/2013 13:55	8/14/2013 6:53
04	RA-228	DO	07/15/13 15:27	1.00E+00	88.76	81.76	72.58	1.00	8/5/2013 13:55	8/14/2013 6:53
05	RA-228	TRG	07/15/13 15:27	1.00E+00	95.69	83.53	79.93	1.00	8/5/2013 13:55	8/14/2013 6:53
06	RA-228	TRG	07/15/13 00:00	1.00E+00	93.28	86.03	80.25	1.00	8/5/2013 13:55	8/14/2013 6:53
07	RA-228	TRG	07/15/13 00:00	1.00E+00	94.44	81.91	77.36	1.00	8/5/2013 13:55	8/14/2013 6:53
08	RA-228	TRG	07/16/13 09:25	1.00E+00	90.10	82.21	74.07	1.00	8/5/2013 13:55	8/14/2013 6:53
09	RA-228	TRG	07/16/13 09:25	1.00E+00	99.75	81.91	81.71	1.00	8/5/2013 13:55	8/14/2013 6:53
10	RA-228	TRG	07/16/13 12:05	1.00E+00	91.50	80.74	73.88	1.00	8/5/2013 13:55	8/14/2013 6:53
11	RA-228	TRG	07/16/13 12:05	1.00E+00	97.31	79.12	76.99	1.00	8/5/2013 13:55	8/14/2013 6:53
12	RA-228	TRG	07/16/13 12:34	1.00E+00	94.55	80.44	76.06	1.00	8/5/2013 13:55	8/14/2013 6:53
13	RA-228	TRG	07/16/13 12:34	1.00E+00	87.71	83.09	72.88	1.00	8/5/2013 13:55	8/14/2013 6:53
14	RA-228	TRG	07/16/13 13:25	1.00E+00	87.74	83.09	72.90	1.00	8/5/2013 13:55	8/14/2013 6:53
15	RA-228	TRG	07/16/13 13:25	1.00E+00	97.16	82.94	80.59	1.00	8/5/2013 13:55	8/14/2013 6:53
16	RA-228	TRG	07/16/13 13:56	1.00E+00	92.72	82.21	76.22	1.00	8/5/2013 13:55	8/14/2013 6:53
17	RA-228	TRG	07/16/13 13:56	1.00E+00	100.43	82.50	82.85	1.00	8/5/2013 13:55	8/14/2013 6:53
18	RA-228	TRG	07/16/13 15:18	1.00E+00	107.80	84.41	91.00	1.00	8/5/2013 13:55	8/14/2013 6:53
19	RA-228	TRG	07/16/13 15:18	1.00E+00	86.52	83.09	71.89	1.00	8/5/2013 13:55	8/14/2013 6:53

	
Run	1
Analysis Code	Ra228
Eberline Services Work Order	13-07147
Client	Engineering Management Support, Inc.

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07147-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	08/14/13 11:08		LB4110R	A1	120	606	1.083333333	0.4776
02	RA-228	MBL	08/14/13 11:08		LB4110R	A2	120	156	0.833333333	0.4699
03	RA-228	DUP	08/14/13 11:08		LB4110R	A3	120	162	1.166666667	0.4809
04	RA-228	DO	08/14/13 11:08		LB4110R	A4	120	177	1	0.4732
05	RA-228	TRG	08/14/13 11:08		LB4110R	B1	120	237	1.166666667	0.4754
06	RA-228	TRG	08/14/13 11:08		LB4110R	B2	120	219	1.383333333	0.4658
07	RA-228	TRG	08/14/13 11:08		LB4110R	B3	120	229	1.266666667	0.4713
08	RA-228	TRG	08/14/13 11:08		LB4110R	B4	120	287	1.366666667	0.4773
09	RA-228	TRG	08/14/13 11:09		LB4110A	B1	120	225	1.366666667	0.4626
10	RA-228	TRG	08/14/13 11:09		LB4110A	B2	120	256	1.066666667	0.4691
11	RA-228	TRG	08/14/13 11:09		LB4110A	B3	120	273	1.25	0.449
12	RA-228	TRG	08/14/13 11:09		LB4110A	B4	120	214	1.016666667	0.4619
13	RA-228	TRG	08/14/13 11:09		LB4110A	C1	120	252	1.3	0.4667
14	RA-228	TRG	08/14/13 11:09		LB4110A	C2	120	234	1.25	0.4578
15	RA-228	TRG	08/14/13 11:09		LB4110A	C3	120	233	1.55	0.4699
16	RA-228	TRG	08/14/13 11:09		LB4110A	C4	120	206	1.466666667	0.4692
17	RA-228	TRG	08/14/13 12:03		LB4110R	C1	120	222	1.166666667	0.4705
18	RA-228	TRG	08/14/13 12:03		LB4110R	C2	120	260	1.766666667	0.4676
19	RA-228	TRG	08/14/13 12:03		LB4110R	C3	120	225	1.383333333	0.4614

Run	1
Analysis Code	Ra228
Eberline Services Work Order	13-07147
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	07/23/13 00:00	1.0000	0.9234	915.5317	386.3000	93.67	1.00	1.00
02	MBL	BLANK	07/23/13 00:00	1.0000	0.9145	906.7075	383.0000	93.77	1.00	1.00
03	DUP	D-12 TOT	07/15/13 15:27	1.0000	0.9149	907.1041	402.4000	98.48	1.00	1.00
04	DO	D-12 TOT	07/15/13 15:27	1.0000	0.9109	903.1382	361.1000	88.76	1.00	1.00
05	TRG	D-12 DIS	07/15/13 15:27	1.0000	0.9102	902.4442	389.0000	95.69	1.00	1.00
06	TRG	DUP05 TOT	07/15/13 00:00	1.0000	0.9138	906.0135	380.7000	93.28	1.00	1.00
07	TRG	DUP05 DIS	07/15/13 00:00	1.0000	0.9128	905.0220	385.0000	94.44	1.00	1.00
08	TRG	PZ-208-SS TOT	07/16/13 09:25	1.0000	0.9113	903.5348	366.7000	90.10	1.00	1.00
09	TRG	PZ-208-SS DIS	07/16/13 09:25	1.0000	0.9122	904.4271	406.4000	99.75	1.00	1.00
10	TRG	PZ-304-AI TOT	07/16/13 12:05	1.0000	0.9115	903.7331	372.5000	91.50	1.00	1.00
11	TRG	PZ-304-AI DIS	07/16/13 12:05	1.0000	0.9100	902.2459	395.5000	97.31	1.00	1.00
12	TRG	PZ-304-AS TOT	07/16/13 12:34	1.0000	0.9079	900.1638	383.4000	94.55	1.00	1.00
13	TRG	PZ-304-AS DIS	07/16/13 12:34	1.0000	0.9121	904.3280	357.3000	87.71	1.00	1.00
14	TRG	MW-104 TOT	07/16/13 13:25	1.0000	0.9090	901.2544	356.2000	87.74	1.00	1.00
15	TRG	MW-104 DIS	07/16/13 13:25	1.0000	0.9091	901.3536	394.5000	97.16	1.00	1.00
16	TRG	PZ-204A-SS TOT	07/16/13 13:56	1.0000	0.9109	903.1382	377.2000	92.72	1.00	1.00
17	TRG	PZ-204A-SS DIS	07/16/13 13:56	1.0000	0.9061	898.3791	406.4000	100.43	1.00	1.00
18	TRG	PZ-302-AI TOT	07/16/13 15:18	1.0000	0.9064	898.6766	436.4000	107.80	1.00	1.00
19	TRG	PZ-302-AI DIS	07/16/13 15:18	1.0000	0.9104	902.6425	351.8000	86.52	1.00	1.00



# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07147</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	D-12 TOT	DUP					1.0000E+00	1.0000E+00				
04	D-12 TOT	DO					1.0000E+00	1.0000E+00				
05	D-12 DIS	TRG					1.0000E+00	1.0000E+00				
06	DUP05 TOT	TRG					1.0000E+00	1.0000E+00				
07	DUP05 DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-208-SS TOT	TRG					1.0000E+00	1.0000E+00				
09	PZ-208-SS DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-304-AI TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-304-AI DIS	TRG					1.0000E+00	1.0000E+00				
12	PZ-304-AS TOT	TRG					1.0000E+00	1.0000E+00				
13	PZ-304-AS DIS	TRG					1.0000E+00	1.0000E+00				
14	MW-104 TOT	TRG					1.0000E+00	1.0000E+00				
15	MW-104 DIS	TRG					1.0000E+00	1.0000E+00				
16	PZ-204A-SS TOT	TRG					1.0000E+00	1.0000E+00				
17	PZ-204A-SS DIS	TRG					1.0000E+00	1.0000E+00				
18	PZ-302-AI TOT	TRG					1.0000E+00	1.0000E+00				
19	PZ-302-AI DIS	TRG					1.0000E+00	1.0000E+00				

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

*J Wolfe* Date: 7/31/13

# Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
<b>13-07147</b>	<b>1</b>	<b>Ra228</b>	<b>Yttrium</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	0.0911	0.1514	0.0603	88.68
02	BLANK	MBL	2.0000	0.0916	0.1498	0.0582	85.59
03	DUP	DUP	2.0000	0.0914	0.1486	0.0572	84.12
04	D-12 TOT	DO	2.0000	0.0912	0.1468	0.0556	81.76
05	D-12 DIS	TRG	2.0000	0.0922	0.1490	0.0568	83.53
06	DUP05 TOT	TRG	2.0000	0.0922	0.1507	0.0585	86.03
07	DUP05 DIS	TRG	2.0000	0.0919	0.1476	0.0557	81.91
08	PZ-208-SS TOT	TRG	2.0000	0.0923	0.1482	0.0559	82.21
09	PZ-208-SS DIS	TRG	2.0000	0.0923	0.1480	0.0557	81.91
10	PZ-304-AI TOT	TRG	2.0000	0.0923	0.1472	0.0549	80.74
11	PZ-304-AI DIS	TRG	2.0000	0.0923	0.1461	0.0538	79.12
12	PZ-304-AS TOT	TRG	2.0000	0.0925	0.1472	0.0547	80.44
13	PZ-304-AS DIS	TRG	2.0000	0.0922	0.1487	0.0565	83.09
14	MW-104 TOT	TRG	2.0000	0.0921	0.1486	0.0565	83.09
15	MW-104 DIS	TRG	2.0000	0.0921	0.1485	0.0564	82.94
16	PZ-204A-SS TOT	TRG	2.0000	0.0918	0.1477	0.0559	82.21
17	PZ-204A-SS DIS	TRG	2.0000	0.0921	0.1482	0.0561	82.50
18	PZ-302-AI TOT	TRG	2.0000	0.0920	0.1494	0.0574	84.41
19	PZ-302-AI DIS	TRG	2.0000	0.0918	0.1483	0.0565	83.09

Technician: *T Smith*

Date: 8, 14, 13

C  
8/14/13  
TD

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
A1	1307147-01	12	606	120	1400	8/14/13 13:08
A2	1307147-02	19	156	120	1400	8/14/13 13:08
A3	1307147-03	18	162	120	1400	8/14/13 13:08
A4	1307147-04	16	177	120	1400	8/14/13 13:08
B1	1307147-05	12	237	120	1400	8/14/13 13:08
B2	1307147-06	7	219	120	1400	8/14/13 13:08
B3	1307147-07	10	229	120	1400	8/14/13 13:08
B4	1307147-08	7	287	120	1400	8/14/13 13:08

077



8/14/13  
A

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
B1	1307147-09	12	225	120	1400	8/14/13 13:09
B2	1307147-10	7	256	120	1400	8/14/13 13:09
B3	1307147-11	10	273	120	1400	8/14/13 13:09
B4	1307147-12	11	214	120	1400	8/14/13 13:09
C1	1307147-13	18	252	120	1400	8/14/13 13:09
C2	1307147-14	18	234	120	1400	8/14/13 13:09
C3	1307147-15	16	233	120	1400	8/14/13 13:09
C4	1307147-16	19	206	120	1400	8/14/13 13:09

Ⓜ  
8/14/13  
KD

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
C1	1307147-17	14	222	120	1400	8/14/13 14:03
C2	1307147-18	9	260	120	1400	8/14/13 14:03
C3	1307147-19	12	225	120	1400	8/14/13 14:03

GPC Detector Report  
(ALL Backgrounds)

*C*  
*81140*

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	8/14/2013	5.00E-02	P	-2.13E+01	2.82E-01	2.19E+01
LB4110A - A2	Alpha	11/18/2007	8/14/2013	8.33E-02	P	-1.81E+01	2.54E-01	1.86E+01
LB4110A - A3	Alpha	11/18/2007	8/14/2013	1.00E-01	P	-1.76E+01	2.16E-01	1.80E+01
LB4110A - A4	Alpha	11/18/2007	8/14/2013	6.67E-02	P	-1.87E+01	2.36E-01	1.92E+01
LB4110A - B1	Alpha	11/18/2007	8/14/2013	8.33E-02	P	-9.68E-02	7.51E-02	2.47E-01
LB4110A - B2	Alpha	11/18/2007	8/14/2013	6.67E-02	P	-7.81E-02	7.22E-02	2.22E-01
LB4110A - B3	Alpha	11/18/2007	8/14/2013	6.67E-02	P	-6.29E-02	5.34E-02	1.70E-01
LB4110A - B4	Alpha	11/18/2007	8/14/2013	1.67E-02	P	-1.40E-01	7.88E-02	2.98E-01
LB4110A - C1	Alpha	11/18/2007	8/14/2013	5.00E-02	P	-1.49E-01	8.86E-02	3.26E-01
LB4110A - C2	Alpha	11/18/2007	8/14/2013	8.33E-02	P	-1.77E-01	8.67E-02	3.50E-01
LB4110A - C3	Alpha	11/18/2007	8/14/2013	1.00E-01	P	-1.72E-01	1.00E-01	3.72E-01
LB4110A - C4	Alpha	11/18/2007	8/14/2013	1.33E-01	P	-6.27E-02	6.83E-02	1.99E-01
LB4110A - D1	Alpha	11/18/2007	8/14/2013	1.67E-02	P	-5.36E-02	8.33E-02	2.20E-01
LB4110A - D2	Alpha	11/18/2007	8/14/2013	5.00E-02	P	-6.98E-02	6.06E-02	1.91E-01
LB4110A - D3	Alpha	11/18/2007	8/14/2013	6.67E-02	P	-4.85E-02	7.07E-02	1.90E-01
LB4110A - D4	Alpha	11/18/2007	8/14/2013	6.67E-02	P	-5.72E-02	7.03E-02	1.98E-01
LB4110R - A1	Alpha	11/24/2006	8/14/2013	5.00E-02	P	-9.81E-02	1.01E-01	3.00E-01
LB4110R - A2	Alpha	11/24/2006	8/14/2013	3.33E-02	P	-8.92E-02	7.63E-02	2.42E-01
LB4110R - A3	Alpha	11/24/2006	8/14/2013	8.33E-02	P	-7.32E-02	7.73E-02	2.28E-01
LB4110R - A4	Alpha	11/24/2006	8/14/2013	1.17E-01	P	-5.27E-02	7.09E-02	1.94E-01
LB4110R - B1	Alpha	11/24/2006	8/14/2013	5.00E-02	P	-9.41E-02	6.16E-02	2.17E-01
LB4110R - B2	Alpha	11/24/2006	8/14/2013	5.00E-02	P	-6.94E-02	6.33E-02	1.96E-01
LB4110R - B3	Alpha	11/24/2006	8/14/2013	6.67E-02	P	-6.49E-02	6.99E-02	2.05E-01
LB4110R - B4	Alpha	11/24/2006	8/14/2013	6.67E-02	P	-6.38E-02	7.02E-02	2.04E-01
LB4110R - C1	Alpha	11/24/2006	8/14/2013	6.67E-02	P	-7.67E-02	7.36E-02	2.24E-01
LB4110R - C2	Alpha	11/24/2006	8/14/2013	6.67E-02	P	-7.54E-02	7.10E-02	2.17E-01
LB4110R - C3	Alpha	11/24/2006	8/14/2013	1.67E-02	P	-8.79E-02	8.43E-02	2.57E-01
LB4110R - C4	Alpha	11/24/2006	8/14/2013	6.67E-02	P	-6.18E-02	8.12E-02	2.24E-01
LB4110R - D1	Alpha	11/24/2006	8/14/2013	0.00E+00	P	-1.03E-01	7.01E-02	2.43E-01
LB4110R - D2	Alpha	11/24/2006	8/14/2013	0.00E+00	P	-7.79E-02	6.96E-02	2.17E-01
LB4110R - D3	Alpha	11/24/2006	8/14/2013	0.00E+00	P	-8.29E-02	6.93E-02	2.22E-01
LB4110R - D4	Alpha	11/24/2006	8/14/2013	0.00E+00	P	-7.53E-02	7.41E-02	2.23E-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)

*C*  
*81142*

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	8/14/2013	8.53E+00	P	-2.89E+02	7.63E+00	3.04E+02
LB4110A - A2	Beta	11/18/2007	8/14/2013	3.42E+00	P	-3.03E+01	2.59E+00	3.55E+01
LB4110A - A3	Beta	11/18/2007	8/14/2013	1.32E+00	P	-5.01E+01	2.63E+00	5.54E+01
LB4110A - A4	Beta	11/18/2007	8/14/2013	7.37E+00	P	-3.24E+01	3.22E+00	3.88E+01
LB4110A - B1	Beta	11/18/2007	8/14/2013	1.37E+00	P	-1.04E+01	3.23E+00	1.68E+01
LB4110A - B2	Beta	11/18/2007	8/14/2013	1.07E+00	P	-7.62E+00	2.00E+00	1.16E+01
LB4110A - B3	Beta	11/18/2007	8/14/2013	1.25E+00	P	1.16E-01	1.36E+00	2.60E+00
LB4110A - B4	Beta	11/18/2007	8/14/2013	1.02E+00	P	-7.61E+00	1.97E+00	1.16E+01
LB4110A - C1	Beta	11/18/2007	8/14/2013	1.30E+00	P	-5.38E+00	2.12E+00	9.62E+00
LB4110A - C2	Beta	11/18/2007	8/14/2013	1.25E+00	P	3.81E-01	1.27E+00	2.15E+00
LB4110A - C3	Beta	11/18/2007	8/14/2013	1.55E+00	P	4.72E-01	1.46E+00	2.45E+00
LB4110A - C4	Beta	11/18/2007	8/14/2013	1.47E+00	P	-1.75E+00	2.10E+00	5.95E+00
LB4110A - D1	Beta	11/18/2007	8/14/2013	2.17E+00	P	-2.31E+00	2.56E+00	7.43E+00
LB4110A - D2	Beta	11/18/2007	8/14/2013	1.45E+00	P	-6.40E-01	1.56E+00	3.76E+00
LB4110A - D3	Beta	11/18/2007	8/14/2013	4.92E+00	P	1.29E+00	4.48E+00	7.66E+00
LB4110A - D4	Beta	11/18/2007	8/14/2013	1.25E+00	P	-4.23E-01	1.37E+00	3.16E+00
LB4110R - A1	Beta	11/24/2006	8/14/2013	1.08E+00	P	-6.08E+01	3.66E+00	6.81E+01
LB4110R - A2	Beta	11/24/2006	8/14/2013	8.33E-01	P	-4.83E+01	2.01E+00	5.23E+01
LB4110R - A3	Beta	11/24/2006	8/14/2013	1.17E+00	P	-4.47E+01	2.73E+00	5.02E+01
LB4110R - A4	Beta	11/24/2006	8/14/2013	1.00E+00	P	-4.46E+01	1.99E+00	4.86E+01
LB4110R - B1	Beta	11/24/2006	8/14/2013	1.17E+00	P	-4.69E+01	2.02E+00	5.10E+01
LB4110R - B2	Beta	11/24/2006	8/14/2013	1.38E+00	P	-4.69E+01	2.05E+00	5.10E+01
LB4110R - B3	Beta	11/24/2006	8/14/2013	1.27E+00	P	-4.67E+01	2.65E+00	5.20E+01
LB4110R - B4	Beta	11/24/2006	8/14/2013	1.37E+00	P	-4.70E+01	1.92E+00	5.09E+01
LB4110R - C1	Beta	11/24/2006	8/14/2013	1.17E+00	P	-4.68E+01	2.96E+00	5.27E+01
LB4110R - C2	Beta	11/24/2006	8/14/2013	1.77E+00	P	-4.68E+01	2.71E+00	5.22E+01
LB4110R - C3	Beta	11/24/2006	8/14/2013	1.38E+00	P	-4.72E+01	2.52E+00	5.23E+01
LB4110R - C4	Beta	11/24/2006	8/14/2013	1.75E+00	P	-5.33E+01	2.95E+00	5.92E+01
LB4110R - D1	Beta	11/24/2006	8/14/2013	0.00E+00	P	-4.44E+01	5.55E+00	5.55E+01
LB4110R - D2	Beta	11/24/2006	8/14/2013	0.00E+00	P	-4.77E+01	1.87E+00	5.15E+01
LB4110R - D3	Beta	11/24/2006	8/14/2013	0.00E+00	P	-5.11E+01	5.52E+00	6.22E+01
LB4110R - D4	Beta	11/24/2006	8/14/2013	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)

*C*  
*Billey*

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	8/14/2013	0.2512	P	-0.0128	0.2159	0.4446
LB4110A - A2	Alpha	11/18/2007	8/14/2013	0.1976	P	-0.0503	0.1741	0.3986
LB4110A - A3	Alpha	11/18/2007	8/14/2013	0.2062	P	-0.0736	0.1634	0.4004
LB4110A - A4	Alpha	11/18/2007	8/14/2013	0.2163	P	-0.0521	0.1821	0.4162
LB4110A - B1	Alpha	11/18/2007	8/14/2013	0.2161	P	0.1943	0.2243	0.2543
LB4110A - B2	Alpha	11/18/2007	8/14/2013	0.2080	P	0.1923	0.2213	0.2502
LB4110A - B3	Alpha	11/18/2007	8/14/2013	0.2305	P	0.1279	0.2323	0.3366
LB4110A - B4	Alpha	11/18/2007	8/14/2013	0.2253	P	0.2088	0.2364	0.2639
LB4110A - C1	Alpha	11/18/2007	8/14/2013	0.2185	P	0.1976	0.2207	0.2439
LB4110A - C2	Alpha	11/18/2007	8/14/2013	0.2271	P	0.1971	0.2252	0.2532
LB4110A - C3	Alpha	11/18/2007	8/14/2013	0.2512	P	0.2234	0.2494	0.2755
LB4110A - C4	Alpha	11/18/2007	8/14/2013	0.2224	P	0.1969	0.2256	0.2544
LB4110A - D1	Alpha	11/18/2007	8/14/2013	0.2246	P	0.2028	0.2328	0.2628
LB4110A - D2	Alpha	11/18/2007	8/14/2013	0.2532	P	0.2277	0.2580	0.2884
LB4110A - D3	Alpha	11/18/2007	8/14/2013	0.2557	P	0.2309	0.2634	0.2958
LB4110A - D4	Alpha	11/18/2007	8/14/2013	0.1884	P	0.1642	0.1992	0.2342
LB4110R - A1	Alpha	11/24/2006	8/14/2013	0.2327	P	0.1983	0.2385	0.2786
LB4110R - A2	Alpha	11/24/2006	8/14/2013	0.2088	P	0.1851	0.2201	0.2551
LB4110R - A3	Alpha	11/24/2006	8/14/2013	0.2141	P	0.1924	0.2243	0.2563
LB4110R - A4	Alpha	11/24/2006	8/14/2013	0.2384	P	0.2118	0.2453	0.2789
LB4110R - B1	Alpha	11/24/2006	8/14/2013	0.2190	P	0.1832	0.2257	0.2681
LB4110R - B2	Alpha	11/24/2006	8/14/2013	0.2072	P	0.1754	0.2169	0.2585
LB4110R - B3	Alpha	11/24/2006	8/14/2013	0.2453	P	0.2015	0.2438	0.2861
LB4110R - B4	Alpha	11/24/2006	8/14/2013	0.2154	P	0.1882	0.2312	0.2742
LB4110R - C1	Alpha	11/24/2006	8/14/2013	0.2126	P	0.1833	0.2150	0.2466
LB4110R - C2	Alpha	11/24/2006	8/14/2013	0.2208	P	0.1932	0.2245	0.2558
LB4110R - C3	Alpha	11/24/2006	8/14/2013	0.2345	P	0.2034	0.2394	0.2754
LB4110R - C4	Alpha	11/24/2006	8/14/2013	0.2093	P	0.1826	0.2222	0.2618
LB4110R - D1	Alpha	11/24/2006	8/14/2013	0.0000	F	0.0035	0.1992	0.3949
LB4110R - D2	Alpha	11/24/2006	8/14/2013	0.0000	F	0.0047	0.2265	0.4484
LB4110R - D3	Alpha	11/24/2006	8/14/2013	0.0000	F	0.0046	0.2225	0.4404
LB4110R - D4	Alpha	11/24/2006	8/14/2013	0.0000	F	0.0023	0.1793	0.3564
LB5100 - 1	Alpha	7/10/2006	10/26/2007	0.3368	P	0.3332	0.3455	0.3578

0482

GPC Detector Report  
(ALL Efficiencies)

*C*  
*8/14*

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	8/14/2013	0.5501	P	0.2112	0.5625	0.9138
LB4110A - A2	Beta	11/18/2007	8/14/2013	0.4861	P	0.1621	0.4648	0.7676
LB4110A - A3	Beta	11/18/2007	8/14/2013	0.4623	P	0.0901	0.4572	0.8243
LB4110A - A4	Beta	11/18/2007	8/14/2013	0.5187	P	0.1429	0.4892	0.8355
LB4110A - B1	Beta	11/18/2007	8/14/2013	0.5074	P	0.4634	0.5297	0.5961
LB4110A - B2	Beta	11/18/2007	8/14/2013	0.5085	P	0.4632	0.5268	0.5904
LB4110A - B3	Beta	11/18/2007	8/14/2013	0.5253	P	0.3169	0.5314	0.7459
LB4110A - B4	Beta	11/18/2007	8/14/2013	0.5471	P	0.4918	0.5538	0.6158
LB4110A - C1	Beta	11/18/2007	8/14/2013	0.5013	P	0.4511	0.5026	0.5542
LB4110A - C2	Beta	11/18/2007	8/14/2013	0.4973	P	0.4293	0.5010	0.5728
LB4110A - C3	Beta	11/18/2007	8/14/2013	0.6105	P	0.5291	0.5907	0.6523
LB4110A - C4	Beta	11/18/2007	8/14/2013	0.5262	P	0.4578	0.5248	0.5918
LB4110A - D1	Beta	11/18/2007	8/14/2013	0.5361	P	0.4784	0.5530	0.6275
LB4110A - D2	Beta	11/18/2007	8/14/2013	0.5635	P	0.4887	0.5871	0.6855
LB4110A - D3	Beta	11/18/2007	8/14/2013	0.6122	P	0.5374	0.6149	0.6924
LB4110A - D4	Beta	11/18/2007	8/14/2013	0.4431	P	0.3845	0.4719	0.5592
LB4110R - A1	Beta	11/24/2006	8/14/2013	0.5579	P	0.4743	0.5672	0.6601
LB4110R - A2	Beta	11/24/2006	8/14/2013	0.5014	P	0.4158	0.5085	0.6013
LB4110R - A3	Beta	11/24/2006	8/14/2013	0.5143	P	0.4503	0.5384	0.6264
LB4110R - A4	Beta	11/24/2006	8/14/2013	0.5879	P	0.5032	0.5914	0.6797
LB4110R - B1	Beta	11/24/2006	8/14/2013	0.5302	P	0.4463	0.5422	0.6380
LB4110R - B2	Beta	11/24/2006	8/14/2013	0.5048	P	0.4247	0.5195	0.6144
LB4110R - B3	Beta	11/24/2006	8/14/2013	0.6049	P	0.4939	0.5917	0.6895
LB4110R - B4	Beta	11/24/2006	8/14/2013	0.5211	P	0.4540	0.5489	0.6438
LB4110R - C1	Beta	11/24/2006	8/14/2013	0.4606	P	0.4159	0.5015	0.5871
LB4110R - C2	Beta	11/24/2006	8/14/2013	0.5183	P	0.4440	0.5283	0.6126
LB4110R - C3	Beta	11/24/2006	8/14/2013	0.5685	P	0.4755	0.5706	0.6656
LB4110R - C4	Beta	11/24/2006	8/14/2013	0.4916	P	0.4258	0.5249	0.6241
LB4110R - D1	Beta	11/24/2006	8/14/2013	0.0000	F	0.0076	0.4763	0.9450
LB4110R - D2	Beta	11/24/2006	8/14/2013	0.0000	F	0.0092	0.5352	1.0613
LB4110R - D3	Beta	11/24/2006	8/14/2013	0.0000	F	0.0089	0.5198	1.0308
LB4110R - D4	Beta	11/24/2006	8/14/2013	0.0000	F	0.0044	0.4279	0.8514
LB5100 - 1	Beta	7/10/2006	10/26/2007	0.4428	F	0.4555	0.4731	0.4906

0403

**SECTION XII**  
**BARIUM-133 ANALYTICAL TRACER DATA**

816112

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714701\_GE3\_BAFIL\_194347.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : SPIKE  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 09:20:14.  
 Sample ID : 1307147-01 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 00:15:04.59 0.5%  
 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	30.83	2139	86	1.58	31.15	26	13	2.38E+00	2.3	1.01E+01
2	2	34.96	540	71	1.57	35.28	26	13	6.00E-01	5.0	
3	0	52.44	59	129	2.54	52.76	48	9	6.52E-02	37.4	
4	1	61.75	244	62	1.51	62.06	57	17	2.71E-01	8.3	5.25E+00
5	1	65.72	108	59	1.52	66.04	57	17	1.20E-01	15.4	
6	3	81.05	806	55	1.48	81.36	77	23	8.95E-01	3.7	3.32E+00
7	3	85.15	20	60	1.87	85.47	77	23	2.26E-02	72.6	
8	3	87.84	28	58	1.88	88.16	77	23	3.13E-02	51.6	
9	3	92.69	29	55	1.89	93.01	77	23	3.24E-02	49.9	
10	2	111.79	214	50	1.75	112.10	107	13	2.38E-01	8.6	2.88E+00
11	2	115.95	65	46	1.76	116.27	107	13	7.21E-02	20.5	
12	0	161.37	17	72	0.88	161.68	158	7	1.84E-02	88.2	
13	0	187.85	49	126	7.46	188.16	182	12	5.45E-02	48.3	
14	0	238.42	28	59	1.13	238.73	235	8	3.13E-02	50.6	
15	0	276.61	56	37	1.24	276.91	273	7	6.26E-02	22.3	
16	0	303.09	116	52	1.67	303.40	298	9	1.28E-01	14.7	
17	1	307.53	34	7	1.81	307.84	307	8	3.76E-02	10.7	8.67E+00
18	1	311.86	11	15	1.81	312.16	307	8	1.26E-02	65.0	
19	3	333.74	94	12	1.88	334.05	329	15	1.04E-01	12.3	3.66E+00
20	3	338.14	30	14	2.22	338.45	329	15	3.32E-02	33.9	
21	0	356.31	548	21	1.95	356.62	354	9	6.09E-01	4.5	
22	2	377.05	12	27	2.05	377.36	374	23	1.29E-02	68.2	4.00E+00
23	2	384.05	120	24	2.06	384.36	374	23	1.34E-01	11.3	
24	2	387.02	222	19	1.85	387.32	374	23	2.47E-01	7.9	
25	2	391.34	49	16	2.06	391.64	374	23	5.40E-02	22.1	
26	2	414.72	38	20	2.08	415.02	411	11	4.24E-02	25.1	2.71E+00
27	2	418.06	16	26	2.09	418.36	411	11	1.75E-02	65.3	
28	0	437.26	120	4	2.00	437.56	434	7	1.33E-01	9.5	
29	2	468.07	20	4	2.13	468.37	464	14	2.20E-02	28.3	7.27E-01
30	2	473.33	10	1	2.13	473.63	464	14	1.14E-02	44.0	
31	3	511.29	12	2	2.38	511.59	507	11	1.32E-02	39.5	6.04E-01
32	3	514.88	6	0	1.97	515.18	507	11	6.21E-03	72.2	
33	0	911.22	8	0	1.33	911.50	908	7	8.89E-03	35.4	



Summary of Nuclide Activity

Sample ID : 1307147-01

Acquisition date : 6-AUG-2013 09:20:14

Total number of lines in spectrum 33  
 Number of unidentified lines 28  
 Number of lines tentatively identified by NID 5 15.15%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
CD-109	464.00D	1.00	1.328E+02	1.329E+02	1.378E+02	103.66		
BA-133	10.50Y	1.00	3.863E+02	3.863E+02	0.675E+02	17.47		
NP-237	2.14E+06Y	1.00	3.838E+01	3.838E+01	3.978E+01	103.65		
Total Activity :			5.575E+02	5.576E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean		Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
TH-234	4.47E+09Y	1.00	7.277E+02	7.277E+02	1.308E+02	17.98		
Total Activity :			7.277E+02	7.277E+02				

Grand Total Activity : 1.285E+03 1.285E+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
CD-109	88.03	3.72*	1.712E+01	1.328E+02	1.329E+02	103.66	OK

Final Mean for 1 Valid Peaks = 1.329E+02+/- 1.378E+02 (103.66%)

BA-133	81.00	33.00*	1.899E+01	3.863E+02	3.863E+02	17.47	OK
	302.84	17.80	6.222E+00	3.134E+02	3.134E+02	35.93	OK
	356.01	60.00	5.860E+00	4.679E+02	4.679E+02	16.37	OK

Final Mean for 3 Valid Peaks = 3.863E+02+/- 6.747E+01 ( 17.47%)

NP-237	86.50	12.60*	1.749E+01	3.838E+01	3.838E+01	103.65	OK
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Final Mean for 1 Valid Peaks = 3.838E+01+/- 3.978E+01 (103.65%)

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	7.277E+02	7.277E+02	17.98	OK

Final Mean for 1 Valid Peaks = 7.277E+02+/- 1.308E+02 ( 17.98%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CD-109	1.329E+02	1.378E+02	1.949E+02	1.607E+01	0.682
BA-133	3.863E+02	6.747E+01	1.973E+01	3.017E+00	19.583
TH-234	7.277E+02	1.308E+02	1.265E+02	6.793E+00	5.754
NP-237	3.838E+01	3.978E+01	5.624E+01	4.546E+00	0.683

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	4.144E+00	6.242E+00	1.083E+01	1.238E+00	0.382
PA-231	2.484E+00	1.561E+00	3.135E+00	4.459E-02	0.792
PA-234	4.020E+00	1.449E+00	2.802E+00	3.985E-02	1.435
AM-241	3.309E+01	1.000E+01	1.916E+01	9.422E-01	1.727

*C*  
*8/6/13*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714702\_GE3\_BAFIL\_194349.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : BLANK  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 09:37:50.  
 Sample ID : 1307147-02 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 00:15:05.58 0.6%  
 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	6	27.81	39	50	1.43	28.13	27	14	4.31E-02	25.3	3.80E+01
2	6	30.88	1886	89	1.43	31.20	27	14	2.10E+00	2.4	
3	6	34.95	546	129	2.33	35.27	27	14	6.06E-01	6.8	
4	3	53.23	55	52	1.80	53.55	49	25	6.16E-02	25.8	4.11E+00
5	3	61.74	252	55	1.82	62.06	49	25	2.80E-01	7.8	
6	3	65.75	114	72	1.83	66.07	49	25	1.27E-01	16.7	
7	3	69.82	19	62	1.52	70.14	49	25	2.10E-02	65.1	
8	2	80.98	799	66	1.70	81.29	76	13	8.88E-01	3.8	9.71E+00
9	2	84.63	19	54	1.70	84.95	76	13	2.16E-02	112.2	
10	0	94.08	54	94	1.96	94.40	89	10	5.99E-02	36.4	
11	4	111.88	224	44	1.80	112.20	107	14	2.49E-01	8.0	1.81E+00
12	4	116.01	57	37	2.13	116.32	107	14	6.28E-02	28.3	
13	0	143.05	44	115	2.79	143.36	138	13	4.88E-02	52.4	
14	0	276.92	46	37	1.14	277.23	273	8	5.14E-02	27.2	
15	4	303.17	161	16	1.74	303.48	301	14	1.79E-01	8.4	6.23E+00
16	4	307.44	42	19	2.29	307.75	301	14	4.63E-02	31.5	
17	4	311.62	11	18	2.41	311.92	301	14	1.21E-02	88.3	
18	0	333.95	81	17	1.79	334.25	331	6	9.05E-02	13.6	
19	0	338.84	20	31	1.63	339.15	337	6	2.21E-02	48.0	
20	0	356.22	496	21	1.90	356.52	351	12	5.51E-01	4.9	
21	1	384.70	92	11	1.70	385.00	381	14	1.02E-01	12.9	2.55E+01
22	1	390.70	42	4	1.71	391.00	381	14	4.69E-02	28.7	
23	0	417.21	84	20	4.65	417.52	412	13	9.31E-02	15.4	
24	0	437.31	103	13	1.83	437.61	432	10	1.15E-01	11.7	
25	0	468.19	29	10	1.82	468.49	462	9	3.22E-02	26.5	
26	0	510.97	14	7	1.85	511.27	507	9	1.58E-02	42.3	
27	0	609.20	12	2	2.06	609.49	606	8	1.31E-02	36.1	

Summary of Nuclide Activity

Sample ID : 1307147-02

Acquisition date : 6-AUG-2013 09:37:50

Total number of lines in spectrum 27  
 Number of unidentified lines 22  
 Number of lines tentatively identified by NID 5 18.52%

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	3.830E+02	3.830E+02	0.672E+02	17.54	
NP-237	2.14E+06Y	1.00	2.654E+01	2.654E+01	5.962E+01	224.64	
Total Activity :			4.095E+02	4.095E+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	7.529E+02	7.529E+02	1.284E+02	17.05	
Total Activity :			7.529E+02	7.529E+02			

Grand Total Activity : 1.162E+03 1.162E+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	3.830E+02	3.830E+02	17.54	OK
	302.84	17.80	6.222E+00	4.372E+02	4.372E+02	26.56	OK
	356.01	60.00	5.860E+00	4.234E+02	4.235E+02	16.75	OK

Final Mean for 3 Valid Peaks = 3.830E+02 +/- 6.719E+01 ( 17.54%)

NP-237	86.50	12.60*	1.749E+01	2.654E+01	2.654E+01	224.64	OK
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Final Mean for 1 Valid Peaks = 2.654E+01 +/- 5.962E+01 (224.64%)

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	7.529E+02	7.529E+02	17.05	OK

Final Mean for 1 Valid Peaks = 7.529E+02 +/- 1.284E+02 ( 17.05%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.830E+02	6.719E+01	1.860E+01	2.845E+00	20.585
TH-234	7.529E+02	1.284E+02	1.225E+02	6.579E+00	6.147
NP-237	2.654E+01	5.962E+01	4.593E+01	3.713E+00	0.578

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.768E-01	5.037E+00	8.335E+00	9.522E-01	0.033
CD-109	7.425E+00	1.118E+02	1.617E+02	1.333E+01	0.046
PA-231	2.343E+00	1.536E+00	3.080E+00	4.381E-02	0.761
PA-234	4.132E+00	1.399E+00	2.834E+00	4.030E-02	1.458
AM-241	2.858E+01	9.064E+00	1.813E+01	8.915E-01	1.576

C  
8/6/13

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714703\_GE3\_BAFIL\_194350.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-12 TOT  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 09:56:04.  
 Sample ID : 1307147-03 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 00:15:05.25 0.6%  
 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	30.84	1960	99	1.54	31.16	26	15	2.18E+00	2.4	9.20E+00
2	3	35.12	434	78	1.73	35.44	26	15	4.83E-01	5.9	
3	0	52.33	48	114	2.52	52.65	49	8	5.30E-02	41.6	
4	3	61.88	259	71	1.81	62.19	58	16	2.87E-01	7.7	1.72E+00
5	3	66.00	105	83	1.83	66.32	58	16	1.17E-01	17.6	
6	3	76.68	14	23	1.40	77.00	76	12	1.58E-02	45.4	9.58E+01
7	3	81.26	839	57	1.87	81.58	76	12	9.33E-01	3.6	
8	3	84.22	30	49	1.87	84.53	76	12	3.31E-02	78.0	
9	5	111.83	228	43	1.63	112.15	108	24	2.54E-01	7.8	1.21E+00
10	5	115.89	37	51	2.34	116.20	108	24	4.14E-02	43.9	
11	0	135.15	31	66	2.31	135.47	132	10	3.46E-02	51.7	
12	3	246.22	16	9	2.12	246.53	245	13	1.73E-02	28.0	1.40E+00
13	3	253.29	19	23	2.13	253.60	245	13	2.07E-02	48.7	
14	0	276.84	62	23	1.41	277.15	274	7	6.84E-02	18.1	
15	4	303.06	141	17	1.76	303.37	297	18	1.56E-01	9.3	1.61E+00
16	4	307.37	25	17	2.40	307.67	297	18	2.73E-02	49.4	
17	4	311.32	13	15	2.41	311.63	297	18	1.48E-02	69.9	
18	3	333.66	63	26	1.94	333.97	330	16	7.03E-02	17.7	4.85E+00
19	3	338.27	22	24	2.22	338.57	330	16	2.43E-02	50.8	
20	3	352.70	12	6	1.68	353.00	351	12	1.37E-02	40.4	2.11E+00
21	3	356.35	452	15	1.51	356.66	351	12	5.02E-01	4.8	
22	0	365.62	9	29	1.34	365.93	362	7	9.63E-03	109.4	
23	2	384.05	108	12	2.06	384.36	381	15	1.20E-01	11.5	2.52E+01
24	2	387.34	222	14	2.06	387.64	381	15	2.47E-01	7.6	
25	2	391.59	42	15	1.87	391.90	381	15	4.71E-02	21.9	
26	5	416.75	47	2	2.77	417.05	412	18	5.22E-02	20.7	4.20E+00
27	5	422.34	12	0	2.09	422.64	412	18	1.30E-02	47.7	
28	0	437.24	125	2	1.98	437.54	434	8	1.39E-01	9.2	
29	0	467.93	23	1	1.79	468.23	465	6	2.51E-02	22.7	
30	0	511.41	18	14	3.93	511.71	507	11	1.99E-02	46.6	
31	0	610.71	14	0	2.96	611.00	607	9	1.56E-02	26.7	



Summary of Nuclide Activity

Sample ID : 1307147-03

Acquisition date : 6-AUG-2013 09:56:04

Total number of lines in spectrum 31  
 Number of unidentified lines 26  
 Number of lines tentatively identified by NID 5 16.13%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	4.023E+02	4.024E+02	0.700E+02	17.39	
Total Activity :			4.023E+02	4.024E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	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	7.722E+02	7.722E+02	1.299E+02	16.82	
Total Activity :			7.722E+02	7.722E+02			

Grand Total Activity : 1.175E+03 1.175E+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	4.023E+02	4.024E+02	17.39	OK
	302.84	17.80	6.222E+00	3.813E+02	3.813E+02	27.80	OK
	356.01	60.00	5.860E+00	3.859E+02	3.859E+02	16.73	OK

Final Mean for 3 Valid Peaks = 4.024E+02+/- 6.999E+01 ( 17.39%)

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	7.722E+02	7.722E+02	16.82	OK

Final Mean for 1 Valid Peaks = 7.722E+02+/- 1.299E+02 ( 16.82%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.024E+02	6.999E+01	1.746E+01	2.670E+00	23.045
TH-234	7.722E+02	1.299E+02	1.147E+02	6.161E+00	6.732

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	7.321E-01	5.673E+00	9.369E+00	1.070E+00	0.078
CD-109	-4.558E+01	1.005E+02	1.536E+02	1.267E+01	-0.297
PA-231	2.620E+00	1.586E+00	3.188E+00	4.534E-02	0.822
PA-234	4.592E+00	1.445E+00	2.853E+00	4.058E-02	1.610
NP-237	1.611E+01	2.912E+01	5.031E+01	4.067E+00	0.320
AM-241	2.660E+01	8.952E+00	1.729E+01	8.502E-01	1.538

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Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714704\_GE3\_BAFIL\_194351.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-12 TOT  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 10:16:58.  
 Sample ID : 1307147-04 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 00:15:05.13 0.6%  
 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	27.94	63	74	1.87	28.26	26	15	7.03E-02	21.9	3.23E+01
2	4	30.89	1814	67	1.42	31.21	26	15	2.02E+00	2.4	
3	4	34.80	498	88	1.93	35.12	26	15	5.54E-01	7.0	
4	0	53.32	78	109	2.76	53.64	50	9	8.64E-02	27.0	
5	2	61.88	252	67	1.62	62.20	58	16	2.80E-01	7.9	3.70E+00
6	2	65.86	112	59	1.67	66.18	58	16	1.24E-01	14.5	
7	9	81.09	753	63	1.55	81.41	78	10	8.37E-01	4.0	5.34E+00
8	9	84.50	39	40	1.78	84.82	78	10	4.32E-02	56.3	
9	3	111.71	220	54	1.93	112.02	108	22	2.44E-01	8.9	2.31E+00
10	3	116.20	43	51	1.93	116.52	108	22	4.83E-02	32.0	
11	0	267.95	14	13	2.79	268.26	266	5	1.56E-02	46.4	
12	0	277.07	43	31	1.31	277.38	274	7	4.77E-02	26.5	
13	4	303.05	121	16	1.85	303.35	300	17	1.35E-01	10.3	2.08E+00
14	4	307.43	34	13	1.93	307.74	300	17	3.74E-02	25.7	
15	0	334.06	65	31	2.03	334.37	331	7	7.24E-02	18.7	
16	0	356.36	495	34	1.93	356.66	352	11	5.50E-01	5.1	
17	0	365.32	32	11	1.76	365.63	362	9	3.58E-02	25.7	
18	1	384.70	94	11	1.70	385.00	381	15	1.04E-01	12.5	2.23E+01
19	1	391.61	44	4	1.88	391.91	381	15	4.87E-02	20.1	
20	1	410.87	7	0	1.89	411.17	410	11	7.84E-03	31.7	5.48E+00
21	1	414.87	35	4	1.89	415.17	410	11	3.84E-02	23.5	
22	0	437.41	83	15	1.89	437.71	433	11	9.23E-02	14.0	
23	0	468.25	19	9	1.43	468.55	465	7	2.16E-02	33.8	
24	0	512.20	14	5	3.50	512.50	507	9	1.59E-02	37.7	

Summary of Nuclide Activity

Sample ID : 1307147-04

Acquisition date : 6-AUG-2013 10:16:58

Total number of lines in spectrum 24  
 Number of unidentified lines 19  
 Number of lines tentatively identified by NID 5 20.83%

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	3.611E+02	3.611E+02	0.638E+02	17.68	
NP-237	2.14E+06Y	1.00	5.295E+01	5.295E+01	5.981E+01	112.96	
Total Activity :			4.140E+02	4.141E+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	7.518E+02	7.518E+02	1.291E+02	17.17	
Total Activity :			7.518E+02	7.518E+02			

Grand Total Activity : 1.166E+03 1.166E+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	3.611E+02	3.611E+02	17.68	OK
	302.84	17.80	6.222E+00	3.283E+02	3.283E+02	29.13	OK
	356.01	60.00	5.860E+00	4.224E+02	4.225E+02	16.99	OK

Final Mean for 3 Valid Peaks = 3.611E+02 +/- 6.385E+01 ( 17.68%)

NP-237	86.50	12.60*	1.749E+01	5.295E+01	5.295E+01	112.96	OK
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Final Mean for 1 Valid Peaks = 5.295E+01 +/- 5.981E+01 (112.96%)

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	7.518E+02	7.518E+02	17.17	OK

Final Mean for 1 Valid Peaks = 7.518E+02 +/- 1.291E+02 ( 17.17%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.611E+02	6.385E+01	1.958E+01	2.995E+00	18.440
TH-234	7.518E+02	1.291E+02	1.184E+02	6.358E+00	6.351
NP-237	5.295E+01	5.981E+01	4.757E+01	3.846E+00	1.113

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-9.929E-01	5.481E+00	9.410E+00	1.075E+00	-0.106
CD-109	3.522E-02	1.016E+02	1.649E+02	1.359E+01	0.000
PA-231	2.874E+00	1.516E+00	3.116E+00	4.431E-02	0.922
PA-234	2.473E+00	1.395E+00	2.569E+00	3.654E-02	0.963
AM-241	2.606E+01	8.539E+00	1.673E+01	8.227E-01	1.558

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VAX/VMS Peak Search Report Generated 6-AUG-2013 10:50:25.79

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714705\_GE3\_BAFIL\_194353.CN  
Analyses by : PEAK V16.9 PEAKEFF V2.2  
Client ID : D-12 DIS  
Deposition Date :  
Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 10:35:05.  
Sample ID : 1307147-05 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 00:15:05.71 0.6%  
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	30.80	1884	85	1.44	31.12	26	15	2.09E+00	2.5	1.42E+01
2	1	34.81	422	66	1.45	35.13	26	15	4.69E-01	6.1	
3	0	52.69	44	101	1.45	53.01	49	7	4.93E-02	40.7	
4	4	61.83	279	72	1.64	62.15	57	15	3.10E-01	7.5	2.55E+00
5	4	65.88	127	93	2.02	66.19	57	15	1.41E-01	16.2	
6	2	77.49	24	33	1.69	77.81	76	11	2.69E-02	36.9	5.30E+00
7	2	80.98	812	48	1.69	81.29	76	11	9.02E-01	3.7	
8	0	111.43	161	162	1.36	111.74	108	8	1.79E-01	15.7	
9	0	116.60	54	67	2.43	116.91	115	6	5.96E-02	28.4	
10	1	160.83	38	39	1.66	161.15	158	24	4.25E-02	31.3	2.41E+00
11	1	178.70	13	53	1.68	179.01	158	24	1.47E-02	79.2	
12	2	276.42	52	16	1.96	276.73	272	13	5.83E-02	19.7	1.31E+00
13	2	281.35	13	18	1.96	281.66	272	13	1.44E-02	61.7	
14	0	303.10	125	20	1.75	303.41	300	6	1.39E-01	10.5	
15	3	333.79	89	9	1.81	334.09	328	14	9.88E-02	11.7	7.33E-01
16	3	338.14	27	11	2.22	338.45	328	14	2.98E-02	34.9	
17	0	356.29	465	36	1.87	356.60	352	10	5.16E-01	5.2	
18	4	383.62	105	12	1.82	383.92	381	20	1.16E-01	11.2	5.37E+00
19	4	387.13	224	11	1.75	387.43	381	20	2.49E-01	7.6	
20	4	391.68	44	12	1.95	391.98	381	20	4.86E-02	21.0	
21	1	414.87	35	7	1.89	415.17	411	17	3.87E-02	21.9	5.23E-01
22	1	418.87	23	8	1.90	419.17	411	17	2.55E-02	34.4	
23	1	422.87	10	9	1.90	423.17	411	17	1.12E-02	64.6	
24	0	437.57	85	13	1.62	437.87	434	9	9.47E-02	13.3	
25	0	468.96	19	10	2.08	469.26	465	7	2.10E-02	36.5	
26	0	510.52	24	6	2.02	510.81	506	11	2.70E-02	27.7	



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	3.890E+02	3.890E+02	0.679E+02	17.46		
Total Activity :			3.890E+02	3.890E+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	8.320E+02	8.320E+02	1.367E+02	16.43		
Total Activity :			8.320E+02	8.320E+02				

Grand Total Activity : 1.221E+03 1.221E+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	3.890E+02	3.890E+02	17.46	OK
	302.84	17.80	6.222E+00	3.394E+02	3.394E+02	29.48	OK
	356.01	60.00	5.860E+00	3.969E+02	3.970E+02	17.21	OK

Final Mean for 3 Valid Peaks = 3.890E+02 +/- 6.792E+01 ( 17.46%)

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	8.320E+02	8.320E+02	16.43	OK

Final Mean for 1 Valid Peaks = 8.320E+02 +/- 1.367E+02 ( 16.43%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.890E+02	6.792E+01	1.840E+01	2.814E+00	21.140
TH-234	8.320E+02	1.367E+02	1.184E+02	6.358E+00	7.029

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.502E+00	5.862E+00	1.001E+01	1.143E+00	0.250
CD-109	2.772E+01	9.819E+01	1.652E+02	1.362E+01	0.168
PA-231	2.967E+00	1.595E+00	3.243E+00	4.612E-02	0.915
PA-234	3.479E+00	1.420E+00	2.710E+00	3.855E-02	1.284
NP-237	7.882E+00	2.919E+01	4.891E+01	3.953E+00	0.161
AM-241	2.841E+01	9.266E+00	1.785E+01	8.776E-01	1.591

KB  
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VAX/VMS Peak Search Report Generated 6-AUG-2013 11:06:09.27

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714706\_GE3\_BAFIL\_194354.CN  
Analyses by : PEAK V16.9 PEAKEFF V2.2  
Client ID : DUP05 TOT  
Deposition Date :  
Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 10:50:38.  
Sample ID : 1307147-06 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 00:15:05.28 0.6%  
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	30.83	1940	100	1.44	31.15	26	15	2.16E+00	2.4	3.87E+00
2	3	35.11	480	101	1.68	35.43	26	15	5.34E-01	5.7	
3	0	52.25	84	106	3.14	52.57	49	8	9.38E-02	23.6	
4	3	61.77	267	78	1.58	62.09	58	12	2.96E-01	7.9	7.09E-01
5	3	66.00	148	86	1.83	66.32	58	12	1.65E-01	13.0	
6	0	80.93	794	91	1.83	81.25	77	7	8.82E-01	4.1	
7	0	93.98	32	75	1.74	94.30	90	9	3.51E-02	52.4	
8	6	111.82	239	56	1.59	112.13	108	15	2.65E-01	8.0	1.32E+00
9	6	116.17	70	69	2.28	116.49	108	15	7.80E-02	26.0	
10	0	177.77	25	48	2.83	178.08	176	6	2.74E-02	48.4	
11	0	276.58	56	22	1.56	276.89	273	8	6.20E-02	19.8	
12	0	298.21	4	4	2.19	298.52	298	3	4.31E-03	91.2	
13	2	303.01	139	8	1.63	303.32	300	26	1.55E-01	8.9	1.74E+00
14	2	307.35	31	11	1.99	307.66	300	26	3.44E-02	25.2	
15	2	311.04	12	11	1.99	311.35	300	26	1.35E-02	66.2	
16	2	321.67	9	12	2.00	321.98	300	26	9.57E-03	71.3	
17	3	334.07	84	13	2.21	334.37	328	20	9.30E-02	14.0	1.75E+00
18	3	337.91	25	11	2.20	338.22	328	20	2.75E-02	40.8	
19	3	344.44	11	11	2.22	344.74	328	20	1.24E-02	56.2	
20	3	351.70	12	2	1.68	352.00	351	13	1.38E-02	9.6	2.91E+00
21	3	356.29	520	9	1.55	356.60	351	13	5.78E-01	4.5	
22	1	383.87	106	32	1.87	384.17	381	10	1.17E-01	14.2	2.78E+01
23	1	386.87	192	41	1.79	387.17	381	10	2.13E-01	10.0	
24	0	391.55	44	13	2.58	391.85	391	6	4.93E-02	23.8	
25	3	414.91	46	8	2.29	415.21	410	12	5.10E-02	20.5	2.60E+00
26	3	418.27	36	4	1.94	418.57	410	12	4.04E-02	23.2	
27	0	437.23	127	0	1.92	437.54	434	9	1.41E-01	8.9	
28	0	468.39	25	2	1.43	468.69	466	6	2.81E-02	21.3	
29	0	473.27	9	1	1.14	473.57	472	6	1.03E-02	37.8	
30	0	512.01	26	0	5.88	512.31	507	11	2.89E-02	19.6	

Total number of lines in spectrum 30  
 Number of unidentified lines 26  
 Number of lines tentatively identified by NID 4 13.33%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.806E+02	3.807E+02	0.677E+02	17.77	
Total Activity :			3.806E+02	3.807E+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	7.956E+02	7.956E+02	1.358E+02	17.07	
Total Activity :			7.956E+02	7.956E+02			

Grand Total Activity : 1.176E+03 1.176E+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	3.806E+02	3.807E+02	17.77	OK
	302.84	17.80	6.222E+00	3.775E+02	3.775E+02	27.20	OK
	356.01	60.00	5.860E+00	4.439E+02	4.440E+02	16.31	OK

Final Mean for 3 Valid Peaks = 3.807E+02+/- 6.766E+01 ( 17.77%)

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	7.956E+02	7.956E+02	17.07	OK

Final Mean for 1 Valid Peaks = 7.956E+02+/- 1.358E+02 ( 17.07%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.807E+02	6.766E+01	1.885E+01	2.884E+00	20.190
TH-234	7.956E+02	1.358E+02	1.287E+02	6.912E+00	6.183

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.817E+00		6.207E+00	1.036E+01	1.183E+00	0.175
CD-109	-1.157E+02		1.077E+02	1.499E+02	1.236E+01	-0.772
PA-231	3.558E+00		1.756E+00	3.546E+00	5.043E-02	1.004
PA-234	3.821E+00		1.560E+00	2.928E+00	4.164E-02	1.305
NP-237	1.750E+01		3.130E+01	4.891E+01	3.953E+00	0.358
AM-241	2.791E+01		9.742E+00	1.840E+01	9.047E-01	1.517

*C*  
*8/6/13*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714707\_GE3\_BAFIL\_194355.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : DUP05 DIS  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 11:06:54.  
 Sample ID : 1307147-07 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 00:15:04.88 0.5%  
 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	30.76	1943	109	1.54	31.08	27	13	2.16E+00	2.4	1.32E+01
2	4	35.13	503	96	1.56	35.45	27	13	5.59E-01	5.4	
3	0	52.59	55	160	2.35	52.91	48	10	6.11E-02	45.1	
4	2	61.77	228	78	1.66	62.09	58	12	2.53E-01	9.0	4.50E+00
5	2	65.65	93	76	1.67	65.97	58	12	1.03E-01	19.4	
6	7	81.04	803	64	1.50	81.36	76	11	8.93E-01	3.8	1.92E+00
7	7	84.13	21	56	1.51	84.44	76	11	2.34E-02	103.7	
8	5	111.86	240	47	1.82	112.18	107	15	2.67E-01	7.7	1.47E+00
9	5	116.43	80	48	2.34	116.74	107	15	8.91E-02	22.2	
10	0	159.10	34	89	3.68	159.42	156	9	3.74E-02	53.2	
11	0	276.91	68	25	1.60	277.21	274	8	7.58E-02	17.4	
12	0	303.19	124	39	1.91	303.50	300	7	1.38E-01	12.2	
13	0	307.66	17	24	1.30	307.96	307	5	1.92E-02	50.3	
14	1	333.79	62	14	1.83	334.09	328	15	6.83E-02	16.1	1.96E+00
15	1	337.73	23	13	1.83	338.04	328	15	2.55E-02	39.1	
16	0	356.30	472	40	1.89	356.61	352	9	5.24E-01	5.2	
17	3	384.04	111	9	2.26	384.34	380	17	1.24E-01	13.8	2.94E+00
18	3	387.23	178	5	1.92	387.53	380	17	1.97E-01	9.2	
19	3	391.29	68	4	2.21	391.59	380	17	7.56E-02	20.0	
20	3	414.84	46	10	2.16	415.14	411	19	5.07E-02	17.5	2.53E+00
21	3	418.87	19	8	1.90	419.17	411	19	2.16E-02	37.6	
22	0	437.16	119	7	2.03	437.46	432	10	1.32E-01	10.1	
23	0	468.76	16	9	1.86	469.06	464	7	1.76E-02	40.2	
24	0	472.79	11	3	1.83	473.09	471	6	1.22E-02	39.1	
25	0	511.14	17	5	3.69	511.43	508	9	1.84E-02	34.2	
26	0	609.71	9	0	1.67	610.00	607	6	1.00E-02	33.3	



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 %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	3.850E+02	3.850E+02	0.676E+02	17.56	
Total Activity :			3.850E+02	3.850E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	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	6.805E+02	6.805E+02	1.302E+02	19.14	
Total Activity :			6.805E+02	6.805E+02			

Grand Total Activity : 1.065E+03 1.065E+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	3.850E+02	3.850E+02	17.56	OK
	302.84	17.80	6.222E+00	3.360E+02	3.360E+02	32.01	OK
	356.01	60.00	5.860E+00	4.027E+02	4.028E+02	17.17	OK

Final Mean for 3 Valid Peaks = 3.850E+02+/- 6.762E+01 ( 17.56%)

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	6.805E+02	6.805E+02	19.14	OK

Final Mean for 1 Valid Peaks = 6.805E+02+/- 1.302E+02 ( 19.14%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.850E+02	6.762E+01	1.885E+01	2.884E+00	20.420
TH-234	6.805E+02	1.302E+02	1.287E+02	6.912E+00	5.288

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.537E+00	5.994E+00	9.113E+00	1.041E+00	-0.278
CD-109	-3.784E+01	1.112E+02	1.721E+02	1.419E+01	-0.220
PA-231	9.146E-01	1.566E+00	2.943E+00	4.186E-02	0.311
PA-234	2.789E+00	1.486E+00	2.848E+00	4.051E-02	0.979
NP-237	-2.254E+01	3.308E+01	4.902E+01	3.962E+00	-0.460
AM-241	2.705E+01	9.682E+00	1.825E+01	8.972E-01	1.482

*c*  
8/6/13

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714708\_GE3\_BAFIL\_194357.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-208-SS TOT  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 11:22:25.  
 Sample ID : 1307147-08 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 00:15:05.44 0.6%  
 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	30.79	1775	72	1.44	31.11	26	15	1.97E+00	2.5	1.52E+01
2	1	34.81	399	50	1.45	35.13	26	15	4.44E-01	6.0	
3	0	53.09	73	114	2.56	53.41	49	9	8.08E-02	29.2	
4	5	61.83	266	57	1.86	62.15	58	16	2.96E-01	7.5	2.23E+00
5	5	66.10	124	58	2.22	66.42	58	16	1.37E-01	15.6	
6	5	69.97	23	54	2.23	70.29	58	16	2.53E-02	69.9	
7	0	80.99	765	135	1.81	81.31	76	11	8.50E-01	4.7	
8	0	92.76	26	50	1.09	93.08	91	5	2.89E-02	45.3	
9	4	111.92	214	47	1.68	112.23	108	12	2.38E-01	8.3	5.73E-01
10	4	116.01	26	41	2.13	116.33	108	12	2.88E-02	58.7	
11	6	134.82	29	30	2.61	135.14	133	15	3.17E-02	32.9	9.51E-01
12	6	141.89	41	57	2.63	142.21	133	15	4.57E-02	36.3	
13	0	159.97	35	68	1.90	160.28	158	7	3.90E-02	41.9	
14	0	199.16	82	115	13.20	199.47	190	18	9.09E-02	32.9	
15	0	211.58	42	48	5.23	211.89	208	9	4.71E-02	33.0	
16	0	276.47	51	11	1.77	276.78	275	5	5.63E-02	17.0	
17	5	296.59	15	12	2.63	296.90	294	13	1.66E-02	54.3	7.33E+00
18	5	302.97	140	24	1.64	303.28	294	13	1.55E-01	9.7	
19	0	323.39	13	14	2.67	323.69	320	7	1.44E-02	55.2	
20	2	334.00	73	11	2.01	334.30	331	14	8.08E-02	14.3	1.99E+00
21	2	338.73	20	14	2.02	339.03	331	14	2.24E-02	40.3	
22	0	356.30	441	40	1.92	356.61	352	11	4.90E-01	5.5	
23	1	383.87	112	9	1.87	384.17	374	23	1.25E-01	11.5	2.82E+00
24	1	386.87	177	9	1.87	387.17	374	23	1.97E-01	10.1	
25	1	391.53	49	9	1.88	391.83	374	23	5.47E-02	18.7	
26	1	414.78	31	11	1.89	415.08	410	12	3.43E-02	26.1	2.49E+00
27	1	418.53	15	14	1.90	418.83	410	12	1.72E-02	50.9	
28	0	437.27	89	5	1.93	437.57	434	8	9.87E-02	11.6	
29	1	467.86	21	2	1.93	468.16	465	12	2.37E-02	25.4	2.39E-01
30	1	472.62	8	5	1.94	472.92	465	12	8.81E-03	57.1	
31	0	512.04	10	7	2.94	512.33	509	6	1.13E-02	52.1	
32	0	608.83	10	2	1.90	609.12	605	8	1.13E-02	39.3	
33	0	697.82	9	0	3.22	698.11	695	7	1.00E-02	33.3	

Total number of lines in spectrum 33  
 Number of unidentified lines 28  
 Number of lines tentatively identified by NID 5 15.15%

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	3.667E+02	3.667E+02	0.673E+02	18.35		
Total Activity :			3.667E+02	3.667E+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	7.945E+02	7.945E+02	1.311E+02	16.50		
Total Activity :			7.945E+02	7.945E+02				

Grand Total Activity : 1.161E+03 1.161E+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	3.667E+02	3.667E+02	18.35	OK
	302.84	17.80	6.222E+00	3.783E+02	3.783E+02	28.35	OK
	356.01	60.00	5.860E+00	3.768E+02	3.768E+02	17.56	OK

Final Mean for 3 Valid Peaks = 3.667E+02+/- 6.729E+01 ( 18.35%)

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	7.945E+02	7.945E+02	16.50	OK

Final Mean for 1 Valid Peaks = 7.945E+02+/- 1.311E+02 ( 16.50%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.667E+02	6.729E+01	1.915E+01	2.929E+00	19.150
TH-234	7.945E+02	1.311E+02	1.001E+02	5.375E+00	7.940

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.000E+00		5.589E+00	9.726E+00	1.111E+00	0.308
CD-109	9.377E+01		1.264E+02	1.973E+02	1.627E+01	0.475
PA-231	1.718E+00		1.487E+00	2.926E+00	4.162E-02	0.587
PA-234	4.363E+00		1.403E+00	2.777E+00	3.950E-02	1.571
NP-237	1.011E+01		3.906E+01	5.704E+01	4.611E+00	0.177
AM-241	2.947E+01		8.497E+00	1.701E+01	8.363E-01	1.732

*C*  
*8/16/13*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714709\_GE3\_BAFIL\_194359.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-208-SS DIS  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 11:37:58.  
 Sample ID : 1307147-09 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 00:15:05.63 0.6%  
 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	27.64	37	83	1.90	27.96	26	15	4.13E-02	37.7	1.67E+01
2	4	30.86	2015	73	1.44	31.18	26	15	2.24E+00	2.3	
3	4	34.92	498	90	1.93	35.24	26	15	5.53E-01	7.1	
4	0	46.63	39	91	2.16	46.94	42	8	4.36E-02	45.1	
5	0	52.48	81	95	2.83	52.80	50	8	9.03E-02	23.4	
6	2	61.66	286	67	1.66	61.98	58	11	3.18E-01	7.5	4.77E+00
7	2	65.70	97	65	1.67	66.02	58	11	1.08E-01	17.0	
8	0	81.10	848	123	1.91	81.42	77	10	9.42E-01	4.2	
9	0	92.41	25	62	1.36	92.73	90	6	2.81E-02	52.9	
10	3	111.88	237	60	1.66	112.20	108	16	2.64E-01	8.0	1.99E+00
11	3	115.97	66	56	1.93	116.28	108	16	7.36E-02	26.2	
12	0	141.16	40	82	3.99	141.48	138	9	4.39E-02	44.1	
13	0	160.77	32	57	1.74	161.08	158	6	3.55E-02	41.6	
14	0	276.68	58	21	1.32	276.99	273	7	6.47E-02	18.5	
15	4	303.15	165	13	1.75	303.46	299	17	1.83E-01	8.2	2.84E+00
16	4	307.33	40	8	2.24	307.64	299	17	4.45E-02	30.7	
17	4	312.16	12	4	2.41	312.47	299	17	1.38E-02	57.9	
18	4	333.80	86	13	1.89	334.10	329	15	9.51E-02	13.3	1.34E+00
19	4	338.21	18	17	2.44	338.52	329	15	1.95E-02	54.1	
20	0	356.29	507	26	1.94	356.60	351	10	5.64E-01	4.8	
21	4	384.18	127	10	1.92	384.48	382	13	1.41E-01	13.0	4.22E-01
22	4	387.07	227	5	1.83	387.37	382	13	2.52E-01	7.6	
23	4	391.31	50	4	2.24	391.61	382	13	5.58E-02	25.5	
24	1	414.87	35	16	1.89	415.17	409	17	3.94E-02	23.6	1.77E+00
25	1	418.53	16	8	1.90	418.83	409	17	1.79E-02	48.9	
26	1	422.86	10	4	1.90	423.16	409	17	1.09E-02	61.6	
27	0	437.31	99	15	1.90	437.61	432	9	1.10E-01	12.1	
28	0	468.68	13	16	1.97	468.98	466	7	1.49E-02	54.7	
29	0	511.65	21	5	2.93	511.95	508	10	2.33E-02	29.5	



Summary of Nuclide Activity

Sample ID : 1307147-09

Acquisition date : 6-AUG-2013 11:37:58

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 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	4.064E+02	0.728E+02	17.93	
Total Activity :			4.063E+02	4.064E+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	8.543E+02	8.543E+02	1.404E+02	16.44	
Total Activity :			8.543E+02	8.543E+02			

Grand Total Activity : 1.261E+03 1.261E+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	4.063E+02	4.064E+02	17.93	OK
	302.84	17.80	6.222E+00	4.461E+02	4.461E+02	26.33	OK
	356.01	60.00	5.860E+00	4.334E+02	4.335E+02	16.69	OK

Final Mean for 3 Valid Peaks = 4.064E+02+/- 7.284E+01 ( 17.93%)

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	8.543E+02	8.543E+02	16.44	OK

Final Mean for 1 Valid Peaks = 8.543E+02+/- 1.404E+02 ( 16.44%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.064E+02	7.284E+01	1.840E+01	2.814E+00	22.082
TH-234	8.543E+02	1.404E+02	1.276E+02	6.852E+00	6.696

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.564E+00		6.187E+00	9.636E+00	1.101E+00	-0.162
CD-109	5.719E+01		1.026E+02	1.616E+02	1.333E+01	0.354
PA-231	3.815E+00		1.672E+00	3.451E+00	4.908E-02	1.106
PA-234	4.878E+00		1.540E+00	2.999E+00	4.266E-02	1.627
NP-237	3.004E+01		3.090E+01	5.106E+01	4.128E+00	0.588
AM-241	3.657E+01		1.030E+01	1.981E+01	9.740E-01	1.846

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VAX/VMS Peak Search Report Generated 6-AUG-2013 12:08:52.50

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714710\_GE3\_BAFIL\_194361.CN  
Analyses by : PEAK V16.9 PEAKEFF V2.2  
Client ID : PZ-304-AI TOT  
Deposition Date :  
Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 11:53:32.  
Sample ID : 1307147-10 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 00:15:05.24 0.6%  
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	30.82	1980	84	1.50	31.14	26	18	2.20E+00	2.3	5.44E+00
2	3	35.07	559	66	1.69	35.39	26	18	6.21E-01	4.9	
3	0	46.24	25	72	1.08	46.56	44	6	2.78E-02	57.3	
4	0	52.45	64	75	2.34	52.77	50	6	7.07E-02	24.9	
5	6	61.82	226	86	1.52	62.13	58	12	2.51E-01	9.0	2.41E+00
6	6	65.97	124	122	2.34	66.29	58	12	1.37E-01	18.0	
7	0	81.21	777	148	1.96	81.52	76	11	8.64E-01	4.7	
8	0	93.01	29	78	2.70	93.33	90	7	3.26E-02	53.0	
9	1	111.83	196	53	1.59	112.14	108	13	2.17E-01	9.5	2.84E+00
10	1	115.78	44	56	1.60	116.10	108	13	4.87E-02	30.2	
11	0	185.97	28	87	2.32	186.28	183	8	3.10E-02	60.6	
12	0	276.58	67	42	1.55	276.89	272	10	7.41E-02	22.0	
13	3	299.69	11	5	1.64	300.00	299	20	1.24E-02	39.5	8.11E+00
14	3	303.04	154	12	1.84	303.35	299	20	1.71E-01	8.5	
15	3	307.37	33	16	2.19	307.68	299	20	3.70E-02	34.5	
16	3	311.52	13	17	2.19	311.83	299	20	1.43E-02	63.0	
17	0	335.13	64	63	1.53	335.44	330	10	7.16E-02	26.1	
18	0	356.31	524	21	1.96	356.61	351	12	5.82E-01	4.7	
19	0	366.45	26	15	2.25	366.76	362	10	2.88E-02	35.6	
20	4	383.81	101	17	2.04	384.11	381	15	1.12E-01	12.6	7.16E+00
21	4	387.14	240	13	2.04	387.44	381	15	2.67E-01	7.8	
22	4	391.09	47	11	2.50	391.39	381	15	5.24E-02	29.4	
23	2	414.90	36	7	2.08	415.20	410	20	3.97E-02	21.1	1.31E+00
24	2	418.51	31	3	2.09	418.81	410	20	3.49E-02	24.8	
25	2	421.87	12	1	2.09	422.17	410	20	1.37E-02	51.3	
26	2	426.71	7	0	2.09	427.01	410	20	7.96E-03	53.6	
27	0	437.28	111	3	1.88	437.59	435	6	1.23E-01	9.8	
28	0	468.25	21	4	1.76	468.55	464	8	2.32E-02	27.5	
29	0	473.46	9	2	1.19	473.76	472	5	1.04E-02	37.9	
30	0	511.05	19	7	3.86	511.34	507	9	2.12E-02	33.7	
31	0	610.15	12	2	2.81	610.45	606	9	1.33E-02	36.4	

Summary of Nuclide Activity

Sample ID : 1307147-10

Acquisition date : 6-AUG-2013 11:53:32

Total number of lines in spectrum 31  
 Number of unidentified lines 27  
 Number of lines tentatively identified by NID 4 12.90%

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	3.725E+02	3.725E+02	0.685E+02	18.39	
Total Activity :			3.725E+02	3.725E+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	6.741E+02	6.741E+02	1.295E+02	19.22	
Total Activity :			6.741E+02	6.741E+02			

Grand Total Activity : 1.047E+03 1.047E+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	3.725E+02	3.725E+02	18.39	OK
	302.84	17.80	6.222E+00	4.165E+02	4.165E+02	26.72	OK
	356.01	60.00	5.860E+00	4.477E+02	4.478E+02	16.57	OK

Final Mean for 3 Valid Peaks = 3.725E+02+/- 6.850E+01 ( 18.39%)

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	6.741E+02	6.741E+02	19.22	OK

Final Mean for 1 Valid Peaks = 6.741E+02+/- 1.295E+02 ( 19.22%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.725E+02	6.850E+01	1.871E+01	2.861E+00	19.914
TH-234	6.741E+02	1.295E+02	1.409E+02	7.570E+00	4.783

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.923E+00		6.416E+00	1.086E+01	1.241E+00	0.269
CD-109	-4.896E+01		1.249E+02	1.663E+02	1.371E+01	-0.294
PA-231	2.093E+00		1.536E+00	3.049E+00	4.336E-02	0.687
PA-234	4.279E+00		1.492E+00	2.882E+00	4.099E-02	1.485
NP-237	2.113E+01		3.315E+01	5.187E+01	4.193E+00	0.407
AM-241	1.646E+01		9.051E+00	1.715E+01	8.432E-01	0.960

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VAX/VMS Peak Search Report Generated 6-AUG-2013 12:24:42.99

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714711\_GE3\_BAFIL\_194362.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-304-AI DIS  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 12:09:21.  
 Sample ID : 1307147-11 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 00:15:05.54 0.6%  
 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	30.84	2064	83	1.52	31.16	26	17	2.29E+00	2.3	1.44E+01
2	3	35.10	507	56	1.70	35.42	26	17	5.63E-01	5.1	
3	3	38.55	23	39	1.46	38.87	26	17	2.52E-02	57.1	
4	0	52.47	44	134	2.32	52.79	49	9	4.92E-02	49.6	
5	2	61.79	258	75	1.66	62.11	58	13	2.87E-01	8.1	4.34E+00
6	2	65.66	135	79	1.67	65.98	58	13	1.50E-01	14.2	
7	0	80.99	825	155	1.89	81.31	76	10	9.17E-01	4.5	
8	0	92.45	27	81	1.00	92.76	89	6	2.99E-02	56.6	
9	0	101.40	24	76	2.13	101.72	99	7	2.67E-02	63.4	
10	2	111.92	258	63	1.69	112.24	108	15	2.86E-01	7.7	1.45E+00
11	2	115.99	45	52	1.76	116.30	108	15	4.95E-02	31.0	
12	0	160.47	14	88	1.08	160.79	157	8	1.56E-02	119.1	
13	0	276.90	49	32	1.47	277.21	274	8	5.42E-02	24.3	
14	3	303.01	138	18	1.65	303.31	299	15	1.53E-01	9.3	5.64E+00
15	3	307.24	33	16	2.19	307.54	299	15	3.71E-02	36.6	
16	7	333.98	70	16	2.06	334.28	329	15	7.83E-02	15.3	1.48E+00
17	7	338.40	18	25	2.22	338.70	329	15	2.05E-02	58.1	
18	0	356.24	471	39	1.95	356.54	352	11	5.24E-01	5.3	
19	5	384.07	99	40	1.90	384.37	382	9	1.10E-01	17.8	6.58E+00
20	5	387.20	202	49	1.78	387.50	382	9	2.24E-01	9.0	
21	1	414.72	35	30	1.89	415.02	411	11	3.90E-02	30.0	7.20E+00
22	1	418.53	11	43	1.90	418.83	411	11	1.27E-02	88.4	
23	0	422.53	17	12	1.52	422.84	421	5	1.86E-02	40.6	
24	0	437.41	94	7	1.67	437.71	433	9	1.05E-01	11.4	
25	0	468.51	26	16	1.67	468.81	464	9	2.88E-02	33.9	
26	0	511.27	19	3	2.44	511.57	508	10	2.10E-02	28.2	



Total number of lines in spectrum 26  
 Number of unidentified lines 21  
 Number of lines tentatively identified by NID 5 19.23%

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	3.955E+02	3.955E+02	0.719E+02	18.17	
Total Activity :			3.955E+02	3.955E+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	7.701E+02	7.701E+02	1.356E+02	17.61	
Total Activity :			7.701E+02	7.701E+02			

Grand Total Activity : 1.166E+03 1.166E+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	3.955E+02	3.955E+02	18.17	OK
	302.84	17.80	6.222E+00	3.745E+02	3.745E+02	27.73	OK
	356.01	60.00	5.860E+00	4.027E+02	4.027E+02	17.31	OK

Final Mean for 3 Valid Peaks = 3.955E+02+/- 7.187E+01 ( 18.17%)

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	7.701E+02	7.701E+02	17.61	OK

Final Mean for 1 Valid Peaks = 7.701E+02+/- 1.356E+02 ( 17.61%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.955E+02	7.187E+01	1.855E+01	2.838E+00	21.316
TH-234	7.701E+02	1.356E+02	1.135E+02	6.094E+00	6.787

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.042E+00		6.129E+00	1.029E+01	1.176E+00	0.198
CD-109	-2.256E+01		1.336E+02	1.840E+02	1.517E+01	-0.123
PA-231	1.569E+00		1.522E+00	2.959E+00	4.209E-02	0.530
PA-234	4.359E+00		1.472E+00	2.864E+00	4.074E-02	1.522
NP-237	-3.333E+00		3.874E+01	5.404E+01	4.369E+00	-0.062
AM-241	3.105E+01		9.232E+00	1.804E+01	8.871E-01	1.721

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VAX/VMS Peak Search Report Generated 6-AUG-2013 12:40:26.32

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714712\_GE3\_BAFIL\_194363.CN  
Analyses by : PEAK V16.9 PEAKEFF V2.2  
Client ID : PZ-304-AS TOT  
Deposition Date :  
Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 12:24:59.  
Sample ID : 1307147-12 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 00:15:05.27 0.6%  
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	30.88	1974	123	1.50	31.20	27	14	2.19E+00	2.4	5.93E+00
2	4	35.08	462	95	1.60	35.40	27	14	5.13E-01	5.7	
3	0	52.67	56	121	2.83	52.99	50	7	6.25E-02	35.2	
4	1	61.67	236	77	1.51	61.99	58	12	2.62E-01	8.9	7.57E+00
5	1	65.82	97	79	1.52	66.14	58	12	1.08E-01	18.1	
6	0	81.08	800	151	1.91	81.40	77	10	8.89E-01	4.6	
7	0	93.55	45	105	1.97	93.86	90	9	4.99E-02	44.1	
8	2	111.72	202	58	1.75	112.03	108	14	2.25E-01	9.1	3.59E+00
9	2	115.97	58	50	1.76	116.29	108	14	6.40E-02	23.7	
10	0	161.88	30	68	1.55	162.20	160	7	3.36E-02	48.8	
11	0	276.50	57	37	1.56	276.81	272	10	6.30E-02	24.2	
12	5	296.04	19	20	2.63	296.35	293	14	2.09E-02	49.0	1.01E+01
13	5	303.05	140	29	1.68	303.36	293	14	1.56E-01	9.9	
14	1	333.77	78	17	1.71	334.07	330	13	8.67E-02	13.6	1.49E+00
15	1	338.60	32	16	1.83	338.90	330	13	3.57E-02	27.9	
16	0	356.25	488	16	1.89	356.56	351	11	5.42E-01	4.8	
17	4	384.14	108	29	1.88	384.44	382	9	1.20E-01	15.4	9.17E+00
18	4	387.30	199	39	1.72	387.61	382	9	2.21E-01	9.0	
19	1	414.87	41	8	1.89	415.17	411	18	4.58E-02	18.5	1.27E+00
20	1	418.53	28	5	1.90	418.83	411	18	3.13E-02	27.7	
21	1	421.53	17	4	1.90	421.83	411	18	1.89E-02	41.9	
22	0	437.17	110	10	1.91	437.47	433	10	1.22E-01	10.9	
23	0	468.96	20	21	1.79	469.26	464	9	2.23E-02	46.3	
24	0	510.93	20	2	1.44	511.22	506	9	2.18E-02	26.6	
25	0	583.01	10	0	1.90	583.30	581	5	1.11E-02	31.6	
26	0	609.60	9	0	2.32	609.89	607	6	1.00E-02	33.3	

Summary of Nuclide Activity

Sample ID : 1307147-12

Acquisition date : 6-AUG-2013 12:24:59

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	3.834E+02	3.834E+02	0.699E+02	18.24	
Total Activity :			3.834E+02	3.834E+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	7.029E+02	7.029E+02	1.340E+02	19.07	
Total Activity :			7.029E+02	7.029E+02			

Grand Total Activity : 1.086E+03 1.086E+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	3.834E+02	3.834E+02	18.24	OK
	302.84	17.80	6.222E+00	3.809E+02	3.809E+02	28.55	OK
	356.01	60.00	5.860E+00	4.164E+02	4.164E+02	16.69	OK

Final Mean for 3 Valid Peaks = 3.834E+02+/- 6.994E+01 ( 18.24%)

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	7.029E+02	7.029E+02	19.07	OK

Final Mean for 1 Valid Peaks = 7.029E+02+/- 1.340E+02 ( 19.07%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.834E+02	6.994E+01	1.958E+01	2.995E+00	19.577
TH-234	7.029E+02	1.340E+02	1.412E+02	7.583E+00	4.978

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.900E-02		6.133E+00	9.893E+00	1.130E+00	0.002
CD-109	-6.671E+01		1.414E+02	1.858E+02	1.532E+01	-0.359
PA-231	1.725E+00		1.716E+00	3.280E+00	4.665E-02	0.526
PA-234	2.234E+00		1.351E+00	2.596E+00	3.692E-02	0.861
NP-237	7.427E+00		3.887E+01	5.630E+01	4.551E+00	0.132
AM-241	2.017E+01		9.872E+00	1.786E+01	8.781E-01	1.129

*C*  
*B11612*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714713\_GE3\_BAFIL\_194364.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-304-AS DIS  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 12:40:38.  
 Sample ID : 1307147-13 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 00:15:05.09 0.6%  
 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	30.85	2046	112	1.53	31.17	27	14	2.27E+00	2.3	6.09E+00
2	4	35.17	504	91	1.71	35.49	27	14	5.60E-01	5.4	
3	0	52.10	44	102	1.81	52.41	50	7	4.87E-02	40.8	
4	4	61.77	249	77	1.69	62.09	58	12	2.77E-01	8.3	2.37E+00
5	4	65.81	135	99	2.02	66.13	58	12	1.51E-01	15.3	
6	0	81.20	746	206	1.91	81.52	76	12	8.28E-01	5.3	
7	0	92.30	38	60	1.15	92.61	90	6	4.28E-02	35.6	
8	2	111.82	213	43	1.75	112.13	107	14	2.37E-01	8.4	2.39E+00
9	2	116.38	33	55	1.76	116.69	107	14	3.62E-02	38.9	
10	0	213.95	40	85	7.83	214.26	207	12	4.44E-02	49.8	
11	0	276.98	67	24	1.29	277.28	273	8	7.46E-02	17.6	
12	2	302.99	172	17	1.98	303.30	298	16	1.91E-01	8.2	8.76E+00
13	2	307.04	31	16	1.99	307.34	298	16	3.49E-02	38.3	
14	3	334.00	70	15	1.98	334.31	330	12	7.83E-02	15.1	2.59E+00
15	3	338.17	25	18	2.22	338.48	330	12	2.75E-02	40.7	
16	3	351.70	18	3	1.68	352.00	351	10	1.97E-02	9.3	9.97E+00
17	3	356.32	494	15	1.71	356.63	351	10	5.49E-01	4.6	
18	0	376.86	18	10	2.60	377.16	375	5	1.95E-02	36.2	
19	2	384.04	98	37	1.75	384.34	382	9	1.09E-01	14.4	1.49E+01
20	2	387.05	209	48	1.78	387.36	382	9	2.33E-01	8.8	
21	0	391.75	35	18	1.38	392.06	391	5	3.90E-02	27.3	
22	3	415.38	33	8	2.29	415.68	410	22	3.70E-02	27.3	2.20E+00
23	3	421.53	14	8	1.90	421.83	410	22	1.53E-02	48.3	
24	0	437.48	107	5	1.65	437.78	433	10	1.19E-01	10.4	
25	1	464.52	5	3	1.93	464.82	462	14	5.25E-03	74.0	1.68E+00
26	1	467.88	25	2	1.93	468.18	462	14	2.82E-02	23.8	
27	1	471.70	7	0	1.76	472.00	462	14	8.16E-03	67.5	
28	0	511.47	15	3	3.79	511.77	508	8	1.63E-02	34.8	
29	0	609.50	12	2	3.25	609.79	606	7	1.36E-02	33.7	



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	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.573E+02	3.573E+02	0.682E+02	19.07	
Total Activity :			3.573E+02	3.573E+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	7.446E+02	7.446E+02	1.330E+02	17.86	
Total Activity :			7.446E+02	7.446E+02			

Grand Total Activity : 1.102E+03 1.102E+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	3.573E+02	3.573E+02	19.07	OK
	302.84	17.80	6.222E+00	4.662E+02	4.662E+02	26.30	OK
	356.01	60.00	5.860E+00	4.220E+02	4.220E+02	16.44	OK

Final Mean for 3 Valid Peaks = 3.573E+02+/- 6.815E+01 ( 19.07%)

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	7.446E+02	7.446E+02	17.86	OK

Final Mean for 1 Valid Peaks = 7.446E+02+/- 1.330E+02 ( 17.86%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.573E+02	6.815E+01	1.987E+01	3.038E+00	17.987
TH-234	7.446E+02	1.330E+02	1.340E+02	7.200E+00	5.555

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.904E+00	7.013E+00	1.083E+01	1.238E+00	-0.176
CD-109	-6.396E+00	1.233E+02	1.736E+02	1.432E+01	-0.037
PA-231	2.780E+00	1.678E+00	3.345E+00	4.757E-02	0.831
PA-234	3.627E+00	1.437E+00	2.847E+00	4.049E-02	1.274
NP-237	1.611E+01	3.626E+01	5.466E+01	4.419E+00	0.295
AM-241	2.429E+01	9.766E+00	1.811E+01	8.902E-01	1.341

*8/6/13*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714714\_GE3\_BAFIL\_194366.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : MW-104 TOT  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 12:56:31.  
 Sample ID : 1307147-14 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 00:15:05.13 0.6%  
 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	30.81	1804	72	1.44	31.13	26	15	2.00E+00	2.5	1.52E+01
2	1	34.81	396	61	1.45	35.13	26	15	4.40E-01	6.1	
3	0	53.06	81	117	2.93	53.38	49	9	9.04E-02	26.4	
4	4	61.74	278	79	2.01	62.06	58	15	3.09E-01	7.8	2.13E+00
5	4	66.19	119	84	2.02	66.51	58	15	1.32E-01	16.7	
6	3	81.12	743	64	1.54	81.44	76	14	8.26E-01	4.0	4.13E+00
7	3	84.84	31	47	1.87	85.16	76	14	3.42E-02	75.3	
8	2	111.89	215	58	1.75	112.21	108	17	2.39E-01	8.6	1.66E+00
9	2	115.77	59	53	1.76	116.08	108	17	6.59E-02	27.3	
10	0	143.28	28	75	1.69	143.59	139	9	3.06E-02	59.6	
11	0	153.22	19	103	2.66	153.54	150	10	2.13E-02	101.3	
12	0	205.04	13	61	2.78	205.35	204	7	1.42E-02	103.3	
13	0	276.89	45	46	1.60	277.20	273	9	5.05E-02	30.5	
14	0	294.92	20	19	1.80	295.23	292	7	2.17E-02	43.7	
15	0	303.36	119	47	1.91	303.67	299	8	1.33E-01	13.6	
16	0	312.29	12	20	1.08	312.59	311	6	1.37E-02	62.4	
17	2	334.04	75	6	2.01	334.35	328	14	8.30E-02	13.4	1.68E+00
18	2	338.34	27	1	2.02	338.65	328	14	2.99E-02	25.4	
19	4	352.70	16	5	1.68	353.00	352	11	1.79E-02	17.7	3.32E+00
20	4	356.25	431	22	1.64	356.55	352	11	4.79E-01	5.1	
21	0	386.11	305	54	4.05	386.42	381	10	3.39E-01	7.4	
22	0	391.51	34	14	1.24	391.81	391	5	3.79E-02	26.8	
23	2	415.02	45	5	2.08	415.32	412	17	5.00E-02	18.2	8.92E-01
24	2	418.47	38	4	2.09	418.78	412	17	4.28E-02	22.3	
25	2	422.06	13	3	2.09	422.36	412	17	1.48E-02	54.4	
26	0	437.08	112	15	2.01	437.38	432	9	1.24E-01	11.4	
27	0	463.91	7	3	2.02	464.21	460	7	7.56E-03	59.1	
28	0	469.00	9	10	1.75	469.30	466	6	1.04E-02	60.9	
29	0	505.61	6	3	1.73	505.91	503	5	6.11E-03	60.6	
30	0	511.27	15	4	2.81	511.57	508	8	1.67E-02	34.6	
31	0	542.70	10	0	1.77	543.00	540	6	1.11E-02	31.6	
32	0	610.51	15	0	1.28	610.80	607	8	1.67E-02	25.8	
33	0	696.04	6	3	1.10	696.33	693	6	6.67E-03	61.2	

Summary of Nuclide Activity

Sample ID : 1307147-14

Acquisition date : 6-AUG-2013 12:56:31

Total number of lines in spectrum 33  
 Number of unidentified lines 28  
 Number of lines tentatively identified by NID 5 15.15%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	3.562E+02	3.562E+02	0.631E+02	17.70	
NP-237	2.14E+06Y	1.00	4.189E+01	4.189E+01	6.319E+01	150.85	
Total Activity :			3.981E+02	3.981E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	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	8.309E+02	8.309E+02	1.412E+02	16.99	
Total Activity :			8.309E+02	8.309E+02			

Grand Total Activity : 1.229E+03 1.229E+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	3.562E+02	3.562E+02	17.70	OK
	302.84	17.80	6.222E+00	3.238E+02	3.238E+02	34.05	OK
	356.01	60.00	5.860E+00	3.679E+02	3.679E+02	17.02	OK

Final Mean for 3 Valid Peaks = 3.562E+02+/- 6.306E+01 ( 17.70%)

NP-237	86.50	12.60*	1.749E+01	4.189E+01	4.189E+01	150.85	OK
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Final Mean for 1 Valid Peaks = 4.189E+01+/- 6.319E+01 (150.85%)

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	8.309E+02	8.309E+02	16.99	OK

Final Mean for 1 Valid Peaks = 8.309E+02+/- 1.412E+02 ( 16.99%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.562E+02	6.306E+01	1.809E+01	2.767E+00	19.686
TH-234	8.309E+02	1.412E+02	1.147E+02	6.161E+00	7.243
NP-237	4.189E+01	6.319E+01	5.158E+01	4.170E+00	0.812

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	5.151E-01		6.381E+00	1.036E+01	1.183E+00	0.050
CD-109	-1.644E+01		1.060E+02	1.683E+02	1.387E+01	-0.098
PA-231	1.870E+00		1.538E+00	3.024E+00	4.301E-02	0.618
PA-234	4.208E+00		1.427E+00	2.793E+00	3.972E-02	1.507
AM-241	3.178E+01		9.346E+00	1.825E+01	8.971E-01	1.742

C  
8/6/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714715\_GE3\_BAFIL\_194368.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : MW-104 DIS  
 Deposition Date :  
 Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 13:12:19.  
 Sample ID : 1307147-15 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 00:15:05.16 0.6%  
 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	30.81	1928	85	1.48	31.13	26	14	2.14E+00	2.3	1.30E+01
2	4	35.15	531	89	1.72	35.47	26	14	5.90E-01	5.1	
3	0	51.46	133	199	7.68	51.77	43	15	1.48E-01	24.7	
4	1	61.78	199	68	1.51	62.09	58	12	2.21E-01	10.0	6.17E+00
5	1	65.82	87	75	1.52	66.14	58	12	9.70E-02	20.1	
6	0	81.08	823	181	1.80	81.40	76	11	9.15E-01	4.7	
7	0	111.87	208	80	1.62	112.19	108	7	2.31E-01	9.9	
8	0	116.24	52	80	2.49	116.55	116	6	5.73E-02	32.6	
9	0	199.03	19	55	2.95	199.34	196	7	2.08E-02	70.2	
10	4	239.43	18	34	2.32	239.74	236	12	2.00E-02	59.7	1.14E+00
11	4	243.95	12	27	2.33	244.26	236	12	1.33E-02	85.5	
12	0	276.79	48	47	1.23	277.10	273	8	5.32E-02	28.9	
13	1	294.62	17	15	1.80	294.93	290	22	1.90E-02	43.6	2.32E+00
14	1	302.86	126	15	1.80	303.16	290	22	1.40E-01	10.1	
15	1	307.53	29	15	1.81	307.84	290	22	3.26E-02	27.2	
16	0	334.11	75	34	1.84	334.41	331	7	8.33E-02	17.2	
17	0	356.46	460	55	1.80	356.77	353	9	5.11E-01	5.6	
18	0	364.94	18	11	2.75	365.24	362	6	2.04E-02	36.5	
19	1	383.82	79	7	1.60	384.13	382	16	8.82E-02	14.3	6.64E+00
20	1	386.87	195	13	1.87	387.17	382	16	2.17E-01	9.2	
21	1	391.53	30	20	1.88	391.83	382	16	3.30E-02	30.3	
22	1	407.84	9	12	1.89	408.14	403	25	1.00E-02	66.6	1.36E+00
23	1	414.87	36	12	1.89	415.17	403	25	4.01E-02	22.1	
24	1	417.87	17	12	1.90	418.17	403	25	1.94E-02	52.8	
25	0	437.22	92	9	1.98	437.52	433	9	1.02E-01	12.0	
26	0	467.93	29	2	1.83	468.23	465	6	3.27E-02	19.6	
27	2	508.62	6	0	2.16	508.92	508	9	6.17E-03	31.2	1.36E+00
28	2	511.68	15	0	2.16	511.98	508	9	1.65E-02	31.6	
29	0	609.76	17	5	1.18	610.06	606	7	1.86E-02	33.4	
30	0	927.56	6	0	2.74	927.83	924	7	6.67E-03	40.8	



Summary of Nuclide Activity

Sample ID : 1307147-15

Acquisition date : 6-AUG-2013 13:12:19

Total number of lines in spectrum 30  
 Number of unidentified lines 26  
 Number of lines tentatively identified by NID 4 13.33%

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	3.945E+02	3.945E+02	0.726E+02	18.40		
Total Activity :			3.945E+02	3.945E+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	5.932E+02	5.932E+02	1.249E+02	21.05		
Total Activity :			5.932E+02	5.932E+02				

Grand Total Activity : 9.877E+02 9.877E+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		Decay Corr	2-Sigma	Status
				pCi/filter	pCi/filter	pCi/filter	%Error	
BA-133	81.00	33.00*	1.899E+01	3.945E+02	3.945E+02	3.945E+02	18.40	OK
	302.84	17.80	6.222E+00	3.419E+02	3.419E+02	3.419E+02	28.92	OK
	356.01	60.00	5.860E+00	3.932E+02	3.932E+02	3.932E+02	17.64	OK

Final Mean for 3 Valid Peaks = 3.945E+02+/- 7.260E+01 ( 18.40%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected		Decay Corr	2-Sigma	Status
				pCi/filter	pCi/filter	pCi/filter	%Error	
TH-234	63.29	3.80*	2.648E+01	5.932E+02	5.932E+02	5.932E+02	21.05	OK

Final Mean for 1 Valid Peaks = 5.932E+02+/- 1.249E+02 ( 21.05%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.945E+02	7.260E+01	2.225E+01	3.402E+00	17.734
TH-234	5.932E+02	1.249E+02	1.309E+02	7.028E+00	4.533

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.569E+00	5.654E+00	9.522E+00	1.088E+00	0.165
CD-109	1.362E+02	1.143E+02	2.052E+02	1.692E+01	0.664
PA-231	1.375E+00	1.503E+00	2.904E+00	4.131E-02	0.473
PA-234	4.828E+00	1.537E+00	2.990E+00	4.253E-02	1.614
NP-237	4.322E+01	3.480E+01	6.222E+01	5.029E+00	0.695
AM-241	1.760E+01	9.125E+00	1.662E+01	8.173E-01	1.059

KCS  
8/6/13

VAX/VMS Peak Search Report Generated 6-AUG-2013 13:43:11.85

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714716\_GE3\_BAFIL\_194369.CN  
Analyses by : PEAK V16.9 PEAKEFF V2.2  
Client ID : PZ-204A-SS TOT  
Deposition Date :  
Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 13:27:51.  
Sample ID : 1307147-16 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 00:15:05.39 0.6%  
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	28.26	72	135	1.90	28.58	26	15	7.95E-02	59.9	1.74E+01
2	4	30.89	2029	78	1.39	31.21	26	15	2.25E+00	2.3	
3	4	34.88	479	84	1.93	35.20	26	15	5.32E-01	7.5	
4	0	52.37	46	109	1.90	52.69	50	7	5.06E-02	40.8	
5	3	61.81	273	76	1.82	62.13	57	16	3.04E-01	7.5	2.67E+00
6	3	65.77	129	89	1.83	66.09	57	16	1.44E-01	15.8	
7	7	81.04	787	68	1.49	81.36	78	9	8.74E-01	3.8	5.27E+00
8	7	84.12	25	62	1.50	84.44	78	9	2.79E-02	88.2	
9	0	103.06	22	122	2.71	103.38	98	9	2.49E-02	92.2	
10	3	111.74	223	51	1.93	112.05	107	17	2.47E-01	8.7	4.69E+00
11	3	116.57	88	36	1.93	116.89	107	17	9.73E-02	16.8	
12	0	146.47	18	52	2.76	146.79	145	6	1.98E-02	67.2	
13	0	184.41	22	50	1.30	184.72	182	7	2.45E-02	56.9	
14	0	192.00	39	80	2.02	192.31	188	10	4.33E-02	45.8	
15	1	276.53	66	20	1.78	276.84	273	11	7.38E-02	14.7	4.43E+00
16	1	279.85	10	13	1.78	280.16	273	11	1.08E-02	95.3	
17	0	302.98	122	18	1.85	303.29	300	6	1.36E-01	10.6	
18	0	308.45	26	25	1.34	308.76	307	6	2.87E-02	38.3	
19	4	333.82	75	22	1.97	334.12	330	15	8.34E-02	15.1	1.94E+00
20	4	338.44	37	15	1.96	338.75	330	15	4.16E-02	24.8	
21	0	356.41	470	60	1.87	356.71	353	10	5.22E-01	5.7	
22	5	383.86	115	38	1.61	384.16	382	9	1.27E-01	12.7	2.49E+01
23	5	387.20	200	57	1.74	387.51	382	9	2.22E-01	9.2	
24	0	391.62	49	14	2.69	391.92	391	5	5.48E-02	21.1	
25	1	414.86	41	7	1.89	415.16	411	20	4.59E-02	19.8	1.40E+00
26	1	418.53	28	5	1.90	418.83	411	20	3.07E-02	28.5	
27	1	421.87	12	4	1.90	422.17	411	20	1.28E-02	56.1	
28	0	437.17	109	4	2.01	437.47	433	8	1.21E-01	10.1	
29	0	447.03	6	8	1.24	447.33	443	8	6.67E-03	91.3	
30	2	468.42	25	2	2.13	468.72	466	12	2.74E-02	24.5	8.40E-01
31	2	473.07	11	4	2.13	473.37	466	12	1.26E-02	45.4	
32	0	511.18	22	4	1.90	511.48	507	9	2.44E-02	27.4	
33	0	582.82	9	0	2.32	583.11	581	5	1.00E-02	33.3	
34	0	609.11	15	0	2.95	609.40	605	9	1.67E-02	25.8	

Summary of Nuclide Activity

Sample ID : 1307147-16

Acquisition date : 6-AUG-2013 13:27:51

Total number of lines in spectrum 34  
 Number of unidentified lines 30  
 Number of lines tentatively identified by NID 4 11.76%

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	3.772E+02	3.772E+02	0.662E+02	17.56			
Total Activity :			3.772E+02	3.772E+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	8.155E+02	8.155E+02	1.341E+02	16.44			
Total Activity :			8.155E+02	8.155E+02					

Grand Total Activity : 1.193E+03 1.193E+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	3.772E+02	3.772E+02	17.56	OK
	302.84	17.80	6.222E+00	3.319E+02	3.320E+02	29.49	OK
	356.01	60.00	5.860E+00	4.011E+02	4.011E+02	17.72	OK

Final Mean for 3 Valid Peaks = 3.772E+02+/- 6.624E+01 ( 17.56%)

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	8.155E+02	8.155E+02	16.44	OK

Final Mean for 1 Valid Peaks = 8.155E+02+/- 1.341E+02 ( 16.44%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.772E+02	6.624E+01	2.109E+01	3.226E+00	17.883
TH-234	8.155E+02	1.341E+02	1.172E+02	6.293E+00	6.960

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-6.618E+00		6.160E+00	8.340E+00	9.528E-01	-0.794
CD-109	-3.710E+01		1.071E+02	1.658E+02	1.367E+01	-0.224
PA-231	1.416E+00		1.657E+00	3.151E+00	4.481E-02	0.450
PA-234	2.695E+00		1.521E+00	2.764E+00	3.932E-02	0.975
NP-237	1.749E+01		3.094E+01	5.310E+01	4.292E+00	0.329
AM-241	3.082E+01		9.389E+00	1.821E+01	8.955E-01	1.692

1045  
8/26/13

VAX/VMS Peak Search Report Generated 6-AUG-2013 13:59:27.76

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714717\_GE3\_BAFIL\_194371.CN  
Analyses by : PEAK V16.9 PEAKEFF V2.2  
Client ID : PZ-204A-SS DIS  
Deposition Date :  
Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 13:44:07.  
Sample ID : 1307147-17 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 00:15:05.41 0.6%  
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	2043	101	1.52	31.15	26	15	2.27E+00	2.3	9.13E+00
2	4	35.04	518	94	1.59	35.36	26	15	5.75E-01	5.3	
3	0	53.94	53	117	1.94	54.25	49	8	5.84E-02	38.3	
4	1	61.71	286	63	1.51	62.02	58	12	3.18E-01	7.4	7.01E+00
5	1	65.63	104	68	1.52	65.95	58	12	1.16E-01	16.4	
6	0	81.06	848	118	1.90	81.37	77	10	9.42E-01	4.2	
7	1	92.83	32	37	1.56	93.14	90	17	3.58E-02	34.2	2.74E+00
8	1	96.68	16	29	1.43	97.00	90	17	1.80E-02	54.7	
9	1	111.79	236	35	1.59	112.11	107	17	2.62E-01	7.8	2.79E+00
10	1	116.54	61	35	1.60	116.85	107	17	6.78E-02	20.8	
11	0	160.80	29	111	1.54	161.11	157	9	3.18E-02	69.2	
12	1	186.53	26	51	1.69	186.85	183	11	2.87E-02	46.2	1.27E+00
13	1	190.62	21	47	1.69	190.94	183	11	2.28E-02	54.3	
14	0	276.76	57	17	1.42	277.07	274	7	6.34E-02	17.9	
15	0	293.97	22	14	3.19	294.28	291	7	2.41E-02	35.8	
16	2	299.44	13	10	1.98	299.75	298	17	1.44E-02	40.0	3.21E+00
17	2	303.04	154	10	1.92	303.34	298	17	1.72E-01	8.8	
18	2	307.78	24	5	1.99	308.09	298	17	2.70E-02	31.7	
19	1	333.74	81	13	1.72	334.05	330	12	9.02E-02	12.9	7.17E-01
20	1	338.53	21	18	1.83	338.83	330	12	2.34E-02	39.1	
21	0	356.35	508	32	1.90	356.66	353	8	5.65E-01	4.8	
22	4	384.01	103	41	2.32	384.32	381	10	1.14E-01	17.6	1.04E+01
23	4	387.09	157	54	1.71	387.39	381	10	1.75E-01	10.9	
24	0	415.89	78	9	4.52	416.20	410	12	8.70E-02	13.6	
25	0	437.23	114	12	1.95	437.53	432	12	1.27E-01	11.2	
26	0	468.39	16	7	1.29	468.69	465	7	1.78E-02	37.1	
27	0	510.98	19	2	2.12	511.27	507	10	2.11E-02	27.5	
28	0	610.07	5	2	0.90	610.36	607	5	5.24E-03	67.5	



Summary of Nuclide Activity

Sample ID : 1307147-17

Acquisition date : 6-AUG-2013 13:44:07

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	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	4.064E+02	4.064E+02	0.727E+02	17.90		
Total Activity :			4.064E+02	4.064E+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	8.548E+02	8.548E+02	1.390E+02	16.27		
Total Activity :			8.548E+02	8.548E+02				

Grand Total Activity : 1.261E+03 1.261E+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	4.064E+02	4.064E+02	17.90	OK
	302.84	17.80	6.222E+00	4.185E+02	4.186E+02	27.03	OK
	356.01	60.00	5.860E+00	4.342E+02	4.343E+02	16.74	OK

Final Mean for 3 Valid Peaks = 4.064E+02 +/- 7.274E+01 ( 17.90%)

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	8.548E+02	8.548E+02	16.27	OK

Final Mean for 1 Valid Peaks = 8.548E+02 +/- 1.390E+02 ( 16.27%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.064E+02	7.274E+01	1.809E+01	2.767E+00	22.461
TH-234	8.548E+02	1.390E+02	1.253E+02	6.732E+00	6.820

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-2.230E+00		5.920E+00	9.068E+00	1.036E+00	-0.246
CD-109	-1.826E+01		1.070E+02	1.490E+02	1.228E+01	-0.123
PA-231	9.626E-01		1.487E+00	2.823E+00	4.016E-02	0.341
PA-234	4.403E+00		1.484E+00	2.883E+00	4.101E-02	1.527
NP-237	1.051E+01		2.985E+01	4.557E+01	3.683E+00	0.231
AM-241	3.581E+01		1.014E+01	1.955E+01	9.614E-01	1.831

KB  
2/6/13

VAX/VMS Peak Search Report Generated 6-AUG-2013 14:14:59.81

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714718\_GE3\_BAFIL\_194373.CN  
Analyses by : PEAK V16.9 PEAKEFF V2.2  
Client ID : PZ-302-AI TOT  
Deposition Date :  
Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 13:59:38.  
Sample ID : 1307147-18 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 00:15:04.89 0.5%  
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	30.85	2106	91	1.47	31.17	26	15	2.34E+00	2.3	5.29E+00
2	4	35.09	503	97	1.62	35.41	26	15	5.59E-01	5.4	
3	0	46.46	33	90	1.20	46.78	44	7	3.72E-02	49.9	
4	0	52.96	54	115	2.03	53.28	50	7	5.98E-02	35.6	
5	2	61.74	295	67	1.66	62.06	58	16	3.28E-01	7.2	3.07E+00
6	2	65.91	137	72	1.67	66.23	58	16	1.52E-01	12.9	
7	2	70.52	16	74	1.68	70.84	58	16	1.78E-02	82.0	
8	0	81.17	910	99	1.89	81.48	77	10	1.01E+00	3.9	
9	0	92.68	37	76	1.90	92.99	90	6	4.12E-02	40.7	
10	2	111.87	227	57	1.74	112.18	108	19	2.52E-01	8.3	8.96E-01
11	2	115.87	56	46	1.76	116.18	108	19	6.20E-02	24.1	
12	0	241.22	12	39	1.50	241.53	238	6	1.34E-02	85.9	
13	0	255.60	19	32	4.46	255.91	252	9	2.08E-02	59.0	
14	0	277.07	67	20	1.60	277.37	274	8	7.48E-02	17.0	
15	6	303.04	172	13	1.67	303.35	300	15	1.91E-01	8.1	3.78E+00
16	6	307.15	28	10	2.19	307.46	300	15	3.14E-02	42.2	
17	6	310.43	14	11	2.91	310.74	300	15	1.59E-02	71.1	
18	2	333.89	84	22	2.01	334.20	329	13	9.31E-02	14.1	3.21E+00
19	2	338.34	24	19	2.02	338.65	329	13	2.69E-02	36.4	
20	0	356.26	511	33	1.95	356.56	351	10	5.68E-01	4.9	
21	0	376.91	12	29	1.15	377.22	373	8	1.34E-02	81.6	
22	2	383.90	133	16	2.06	384.20	380	16	1.48E-01	10.0	8.40E+00
23	2	387.05	205	10	1.84	387.35	380	16	2.27E-01	8.3	
24	2	391.06	38	7	2.06	391.36	380	16	4.27E-02	32.7	
25	1	414.76	37	17	1.89	415.06	412	13	4.08E-02	23.2	1.04E+01
26	1	417.87	28	10	1.90	418.17	412	13	3.12E-02	36.1	
27	0	437.40	98	7	1.89	437.70	434	7	1.09E-01	11.1	
28	0	468.11	21	13	1.77	468.41	463	9	2.32E-02	38.4	
29	0	510.49	23	0	1.66	510.78	506	9	2.56E-02	20.9	
30	0	609.58	8	4	3.81	609.87	606	8	8.61E-03	57.7	
31	0	804.86	7	0	2.70	805.14	802	6	7.78E-03	37.8	

Summary of Nuclide Activity

Sample ID : 1307147-18

Acquisition date : 6-AUG-2013 13:59:38

Total number of lines in spectrum 31  
 Number of unidentified lines 27  
 Number of lines tentatively identified by NID 4 12.90%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	4.363E+02	4.364E+02	0.770E+02	17.63	
Total Activity :			4.363E+02	4.364E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	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	8.800E+02	8.800E+02	1.393E+02	15.83	
Total Activity :			8.800E+02	8.800E+02			

Grand Total Activity : 1.316E+03 1.316E+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	4.363E+02	4.364E+02	17.63	OK
	302.84	17.80	6.222E+00	4.650E+02	4.650E+02	26.16	OK
	356.01	60.00	5.860E+00	4.367E+02	4.367E+02	16.79	OK

Final Mean for 3 Valid Peaks = 4.364E+02 +/- 7.695E+01 ( 17.63%)

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	8.800E+02	8.800E+02	15.83	OK

Final Mean for 1 Valid Peaks = 8.800E+02 +/- 1.393E+02 ( 15.83%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.364E+02	7.695E+01	1.840E+01	2.814E+00	23.713
TH-234	8.800E+02	1.393E+02	1.196E+02	6.422E+00	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	-4.744E+00		6.096E+00	9.697E+00	1.108E+00	-0.489
CD-109	3.469E+01		1.142E+02	1.708E+02	1.408E+01	0.203
PA-231	2.587E+00		1.524E+00	3.092E+00	4.398E-02	0.837
PA-234	3.648E+00		1.517E+00	2.854E+00	4.059E-02	1.278
NP-237	-8.539E-01		3.422E+01	4.856E+01	3.926E+00	-0.018
AM-241	3.399E+01		9.737E+00	1.891E+01	9.298E-01	1.797

K/S  
8/6/13

VAX/VMS Peak Search Report Generated 6-AUG-2013 14:30:49.52

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714719\_GE3\_BAFIL\_194374.CN  
Analyses by : PEAK V16.9 PEAKEFF V2.2  
Client ID : PZ-302-AI DIS  
Deposition Date :  
Sample Date : 6-AUG-2013 00:00:00. Acquisition date : 6-AUG-2013 14:15:25.  
Sample ID : 1307147-19 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 00:15:05.38 0.6%  
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	30.81	1958	70	1.45	31.13	27	14	2.18E+00	2.3	3.54E+00
2	4	35.06	473	81	1.68	35.38	27	14	5.25E-01	5.5	
3	0	51.90	58	113	3.81	52.22	49	8	6.44E-02	34.3	
4	4	61.85	264	71	1.66	62.17	57	13	2.94E-01	7.7	1.97E+00
5	4	66.02	118	80	2.02	66.34	57	13	1.32E-01	17.1	
6	2	80.98	734	76	1.70	81.29	77	13	8.16E-01	4.0	1.02E+01
7	2	83.68	17	52	1.41	84.00	77	13	1.84E-02	122.5	
8	4	111.86	200	47	1.60	112.18	108	13	2.22E-01	8.7	1.39E+00
9	4	116.51	47	50	2.13	116.83	108	13	5.18E-02	29.9	
10	0	142.30	31	42	2.86	142.61	140	6	3.47E-02	37.6	
11	0	163.18	43	75	2.05	163.50	159	10	4.77E-02	41.2	
12	0	276.70	54	27	1.44	277.01	274	8	6.01E-02	21.7	
13	0	303.01	129	58	1.74	303.32	299	8	1.44E-01	13.5	
14	1	333.68	76	18	1.83	333.98	329	14	8.48E-02	15.0	4.88E+00
15	1	338.56	18	28	1.83	338.87	329	14	1.97E-02	49.8	
16	0	356.28	510	19	1.94	356.59	354	9	5.67E-01	4.7	
17	5	383.84	115	13	1.98	384.14	380	16	1.28E-01	11.0	7.49E+00
18	5	387.09	217	8	2.05	387.39	380	16	2.41E-01	8.4	
19	5	391.68	39	4	1.99	391.98	380	16	4.36E-02	22.4	
20	2	414.72	42	9	2.08	415.02	411	15	4.67E-02	20.4	3.19E+00
21	2	417.90	35	9	1.91	418.20	411	15	3.92E-02	28.0	
22	2	421.89	8	9	2.09	422.19	411	15	8.97E-03	80.8	
23	0	437.76	104	25	1.86	438.06	432	11	1.16E-01	13.5	
24	0	468.16	17	9	2.02	468.46	465	7	1.89E-02	37.9	
25	0	512.63	15	6	1.51	512.92	509	8	1.70E-02	37.6	
26	0	830.05	6	0	1.92	830.33	827	6	6.67E-03	40.8	



Summary of Nuclide Activity

Sample ID : 1307147-19

Acquisition date : 6-AUG-2013 14:15:25

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	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.518E+02	3.518E+02	0.625E+02	17.76	
Total Activity :			3.518E+02	3.518E+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	7.890E+02	7.890E+02	1.332E+02	16.88	
Total Activity :			7.890E+02	7.890E+02			

Grand Total Activity : 1.141E+03 1.141E+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	3.518E+02	3.518E+02	17.76	OK
	302.84	17.80	6.222E+00	3.505E+02	3.506E+02	33.90	OK
	356.01	60.00	5.860E+00	4.360E+02	4.360E+02	16.52	OK

Final Mean for 3 Valid Peaks = 3.518E+02 +/- 6.246E+01 ( 17.76%)

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	7.890E+02	7.890E+02	16.88	OK

Final Mean for 1 Valid Peaks = 7.890E+02 +/- 1.332E+02 ( 16.88%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.518E+02	6.246E+01	1.900E+01	2.906E+00	18.513
TH-234	7.890E+02	1.332E+02	1.207E+02	6.485E+00	6.535

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	2.369E+00		5.850E+00	9.963E+00	1.138E+00	0.238
CD-109	-4.838E+00		1.098E+02	1.763E+02	1.453E+01	-0.027
PA-231	2.306E+00		1.658E+00	3.260E+00	4.636E-02	0.707
PA-234	3.074E+00		1.364E+00	2.692E+00	3.829E-02	1.142
NP-237	-7.896E+00		3.047E+01	5.182E+01	4.189E+00	-0.152
AM-241	2.812E+01		9.361E+00	1.794E+01	8.821E-01	1.567