

US EPA ARCHIVE DOCUMENT

**ENGINEERING MANAGEMENT SUPPORT, INC.**

**West Lake OU-1**

**STANDARD LEVEL IV  
REPORT OF ANALYSIS**

**WORK ORDER #13-07149-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

**13-07149**

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	JG	Data Compilation
		8-20-13	MLT	First Technical Data Review
		8/27/13	USA	Second Technical Data Review
		8/26/13	[Signature]	Data Entry/Electronic Deliverable
		8/26/13	[Signature]	Case Narrative
		8/27/13	KBA	Electronic Deliverable Proof
		8/27/13	USA	Samples Analyzed within Holding Time Yes? <input checked="" type="checkbox"/> No? <input type="checkbox"/>
		8/27/13	USA	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

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





# Internal Chain of Custody

Work Order #	<b>13-07149</b>
Lab Deadline	<b>8/13/2013</b>
Analysis	<b>UIISO - 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 &amp; 14 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13 &amp; 15 are DISSOLVED</b></p>	04	46	W1.1	
	05	46	W1.1	
	06	47	W1.1	
	07	47	W1.1	
	08	45	W1.1	
	09	45	W1.1	
	10	43	W1.1	
	11	43	W1.1	
	12	45	W1.1	
	13	45	W1.1	
	14	41	W1.1	
	15	41	W1.1	
	<p><b>MUST USE FXN 08 FOR DUP</b></p>			

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	Location (circle one)					Initials	Date
Received by	<u>Sample Storage</u>	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/13/13
Relinquished by	Sample Storage	Rough Prep	<u>Prep</u>	Separations	Count Room	J Wolfe	8/13/13
Received by	Sample Storage	Rough Prep	<u>Prep</u>	<u>Separations</u>	Count Room	0700 Tm	8/6/13
Relinquished by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	0945 Tm	8/9/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0945 Tm	8/12/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	C B	8/12/13
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		



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# Internal Chain of Custody

Work Order #	<b>13-07149</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><b>Fxns 04, 06, 08, 10, 12 &amp; 14 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13 &amp; 15 are DISSOLVED</b></p>	04	46	W1.1	
	05	46	W1.1	
	06	47	W1.1	
	07	47	W1.1	
	08	45	W1.1	
	09	45	W1.1	
	10	43	W1.1	
	11	43	W1.1	
	12	45	W1.1	
	13	45	W1.1	
	14	41	W1.1	
	15	41	W1.1	
	<p><b>MUST USE FXN 08 FOR DUP</b></p>			

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	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JLW	8/13/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JLW	8/13/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0700 TMM	8/13/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0940 TMM	8/12/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0940	8/12/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	KB	8/12/13 1647
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		





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# Internal Chain of Custody

Work Order #	<b>13-07149</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 &amp; 14 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13 &amp; 15 are DISSOLVED</b></p>	04	46	W1.1	
	05	46	W1.1	
	06	47	W1.1	
	07	47	W1.1	
	08	45	W1.1	
	09	45	W1.1	
	10	43	W1.1	
	11	43	W1.1	
	12	45	W1.1	
	13	45	W1.1	
	14	41	W1.1	
	15	41	W1.1	
	<p><b>MUST USE FXN 08 FOR DUP</b></p>			

	Location (circle one)					Initials	Date
	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/13/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/13/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/5/13 1700
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8-13 1138
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/6/13 1138
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/13/13 0512
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

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# Internal Chain of Custody

Work Order #	<b>13-07149</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 &amp; 14 are TOTAL</b></p> <p><b>Fxns 05, 07, 09, 11, 13 &amp; 15 are DISSOLVED</b></p>	04	46	W1.1	
	05	46	W1.1	
	06	47	W1.1	
	07	47	W1.1	
	08	45	W1.1	
	09	45	W1.1	
	10	43	W1.1	
	11	43	W1.1	
	12	45	W1.1	
	13	45	W1.1	
	14	41	W1.1	
	15	41	W1.1	
	<p><b>MUST USE FXN 08 FOR DUP</b></p>			

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JWD	8/13/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JWD	8/15/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/5/13 1700
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	OWA	8-6-13 1129
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	C	8/16/13 1178
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	OWA	8/19/13 1217
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/8/13 1217
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	OWA	8/14/13 0717
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		8/14/13 0712
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	C	8/14/13 1001
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

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

Internal Work Order

**13-07149**

Received By

**KCOULSTON**

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
01	LCS	0		WA	W1.1		
02	BLANK	0		WA	W1.1		
03	DUP	0		WA	W1.1		
04	PZ-302-AS TOT /	2		WA	W1.1	8.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	41
			2	<2	<2	4.0000	46
05	PZ-302-AS DIS /	2		WA	W1.1	0.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				41
			2				46
06	LR-100 TOT /	2		WA	W1.1	8.00	47
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	37
			2	<2	<2	4.0000	47
07	LR-100 DIS /	2		WA	W1.1	0.00	47
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				37
			2				47
08	D-81 TOT /	3		WA	W1.1	12.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	38
			2	<2	<2	4.0000	45
			3	<2	<2	4.0000	39
09	D-81 DIS /	3		WA	W1.1	0.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				38
			2				45
			3				39
10	PZ-204-SS TOT -	2		WA	W1.1	8.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	43
			2	<2	<2	4.0000	35
11	PZ-204-SS DIS /	2		WA	W1.1	0.00	43
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				43
			2				35
12	LR-103 TOT /	2		WA	W1.1	8.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	45
			2	<2	<2	4.0000	34
13	LR-103 DIS /	2		WA	W1.1	0.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				45
			2				34
14	PZ-111-KS TOT /	2		WA	W1.1	8.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	40
			2	<2	<2	4.0000	41
15	PZ-111-KS DIS /	2		WA	W1.1	0.00	41
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				40
			2				41

*Keyi  
07/23/13*

Received by: *Krista Coulston*

Date: 7/23/13

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





**Eberline Services – Oak Ridge Laboratory**

**SAMPLE RECEIPT CHECKLIST**

**13-07149** <sup>MP-001-2</sup>

WORK ORDER # \_\_\_\_\_

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	<input type="radio"/> N	
If aqueous, properly preserved	<input checked="" type="radio"/> Y	<input type="radio"/> N	N/A

WERE CHAIN OF CUSTODY SEALS:

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

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

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

SIGNATURE: *Hunter Culston*      DATE: 7/23/13

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**SECTION III  
CASE NARRATIVE**



EBS-OR-36005

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 # 13-07149-OR

SAMPLE RECEIPT

This work order contains six water samples received 07/22/2013. All samples were analyzed as total and dissolved for Isotopic Uranium, Isotopic Thorium and Radium-226/228.

<u>CLIENT ID</u>	<u>LAB ID</u>	<u>CLIENT ID</u>	<u>LAB ID</u>
PZ-302-AS TOT	13-07149-04	PZ-204-SS TOT	13-07149-10
PZ-302-AS DIS	13-07149-05	PZ-204-SS DIS	13-07149-11
LR-100 TOT	13-07149-06	LR-103 TOT	13-07149-12
LR-100 DIS	13-07149-07	LR-103 DIS	13-07149-13
D-81 TOT	13-07149-08	PZ-111-KS TOT	13-07149-14
D-81 DIS	13-07149-09	PZ-111-KS DIS	13-07149-15

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

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

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 2-sigma value.

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## ANALYTICAL RESULTS CONTINUED

### ISOTOPIC URANIUM

Samples were prepared by removing representative aliquots followed by mixed acid digestions as appropriate. Uranium was selectively extracted by ion exchange. Uranium was eluted, micro-precipitated and mounted on micro-porous filter media. Sample activities were then determined by alpha spectroscopy using energy specific regions of interest for Uranium-234, Uranium-235 and Uranium-238. Chemical recovery was determined by the use of a Uranium-232 tracer. Activity of the Uranium-232 tracer was determined by alpha spectroscopy using an energy specific region of interest.

Samples demonstrated acceptable results for all Uranium analyses. Chemical recovery was slightly low for sample numbers LR-100 TOT and LR-100 DIS. Chemical recovery was acceptable for all other samples. The Uranium-234 method blank demonstrated results slightly greater than the detection limit. The Uranium-235 and Uranium-238 method blank demonstrated acceptable results. Results for the Uranium-234 and Uranium-238 duplicate demonstrated an acceptable relative percent difference and normalized difference. Results for the Uranium-235 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Uranium-234 and Uranium-238 laboratory control sample demonstrated an acceptable percent recovery.

### ISOTOPIC THORIUM

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

### RADIUM-226

Samples were prepared by removing representative aliquots as appropriate. This was followed by selective sulfate precipitations of the Radium. Samples were then mounted by semi-micro-precipitations onto micro-porous filters. Samples were counted by alpha spectroscopy using an energy specific region of interest for Radium-226. Chemical recovery was calculated by the use of a Barium-133 tracer, which was determined by HPGe gamma spectroscopy.

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

ANALYTICAL RESULTS CONTINUED

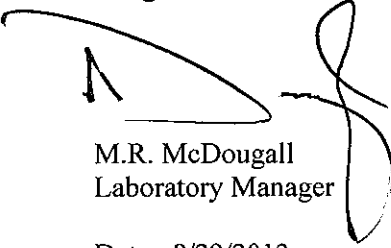
RADIUM-228

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

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

CERTIFICATION OF ACCURACY

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



M.R. McDougall  
Laboratory Manager

Date: 8/29/2013

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

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**SECTION IV  
ANALYTICAL RESULTS SUMMARY**

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Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
LCS13-07149-01	13-07149-01	08/07/2013 16:06:13	Radium-226	E903.0	11.53	1.37	2.80	0.16		pCi/l
LCS13-07149-01	13-07149-01	08/14/2013 07:52:49	Radium-228	E904.0	7.81	0.86	1.97	1.09		pCi/l
LCS13-07149-01	13-07149-01	08/12/2013 12:55:09	Thorium-228	HASL 300, 4.5.2	4.65	0.70	0.82	0.11		pCi/l
LCS13-07149-01	13-07149-01	08/12/2013 12:55:09	Thorium-230	HASL 300, 4.5.2	4.95	0.73	0.95	0.09		pCi/l
LCS13-07149-01	13-07149-01	08/12/2013 12:55:09	Thorium-232	HASL 300, 4.5.2	4.44	0.67	0.78	0.07		pCi/l
LCS13-07149-01	13-07149-01	08/12/2013 05:37:29	Uranium-234	HASL 300, 4.5.2	7.76	1.11	1.24	0.06		pCi/l
LCS13-07149-01	13-07149-01	08/12/2013 05:37:29	Uranium-235	HASL 300, 4.5.2	1.19	0.32	0.33	0.09		pCi/l
LCS13-07149-01	13-07149-01	08/12/2013 05:37:29	Uranium-238	HASL 300, 4.5.2	9.35	1.30	1.46	0.07		pCi/l
BLANK13-07149-02	13-07149-02	08/07/2013 16:06:14	Radium-226	E903.0	-0.02	0.09	0.09	0.29	U	pCi/l
BLANK13-07149-02	13-07149-02	08/14/2013 07:52:49	Radium-228	E904.0	0.95	0.52	0.56	0.98	J	pCi/l
BLANK13-07149-02	13-07149-02	08/12/2013 12:55:04	Thorium-228	HASL 300, 4.5.2	0.06	0.13	0.13	0.24	U	pCi/l
BLANK13-07149-02	13-07149-02	08/12/2013 12:55:04	Thorium-230	HASL 300, 4.5.2	0.40	0.24	0.24	0.20	J	pCi/l
BLANK13-07149-02	13-07149-02	08/12/2013 12:55:04	Thorium-232	HASL 300, 4.5.2	0.10	0.13	0.13	0.19	U	pCi/l
BLANK13-07149-02	13-07149-02	08/12/2013 05:37:30	Uranium-234	HASL 300, 4.5.2	0.23	0.11	0.12	0.08		pCi/l
BLANK13-07149-02	13-07149-02	08/12/2013 05:37:30	Uranium-235	HASL 300, 4.5.2	0.14	0.10	0.10	0.10	J	pCi/l
BLANK13-07149-02	13-07149-02	08/12/2013 05:37:30	Uranium-238	HASL 300, 4.5.2	0.13	0.08	0.08	0.06	J	pCi/l
D-81 TOT_07_17_2013 DUP	13-07149-03	08/07/2013 16:06:15	Radium-226	E903.0	0.84	0.39	0.43	0.32		pCi/l
D-81 TOT_07_17_2013 DUP	13-07149-03	08/14/2013 07:52:49	Radium-228	E904.0	0.97	0.58	0.62	1.12	J	pCi/l
D-81 TOT_07_17_2013 DUP	13-07149-03	08/12/2013 12:55:05	Thorium-228	HASL 300, 4.5.2	0.04	0.06	0.06	0.08	U	pCi/l
D-81 TOT_07_17_2013 DUP	13-07149-03	08/12/2013 12:55:05	Thorium-230	HASL 300, 4.5.2	0.26	0.12	0.13	0.06		pCi/l
D-81 TOT_07_17_2013 DUP	13-07149-03	08/12/2013 12:55:05	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.05	0.06	U	pCi/l
D-81 TOT_07_17_2013 DUP	13-07149-03	08/12/2013 05:37:32	Uranium-234	HASL 300, 4.5.2	1.88	0.40	0.42	0.06		pCi/l
D-81 TOT_07_17_2013 DUP	13-07149-03	08/12/2013 05:37:32	Uranium-235	HASL 300, 4.5.2	0.29	0.15	0.16	0.11		pCi/l
D-81 TOT_07_17_2013 DUP	13-07149-03	08/12/2013 05:37:32	Uranium-238	HASL 300, 4.5.2	1.30	0.32	0.33	0.06		pCi/l
PZ-302-AS TOT_07_16_2013	13-07149-04	08/07/2013 16:06:16	Radium-226	E903.0	0.85	0.40	0.44	0.34		pCi/l
PZ-302-AS TOT_07_16_2013	13-07149-04	08/14/2013 07:52:50	Radium-228	E904.0	1.26	0.64	0.70	1.23	J	pCi/l
PZ-302-AS TOT_07_16_2013	13-07149-04	08/12/2013 12:55:06	Thorium-228	HASL 300, 4.5.2	0.17	0.12	0.12	0.11	J	pCi/l
PZ-302-AS TOT_07_16_2013	13-07149-04	08/12/2013 12:55:06	Thorium-230	HASL 300, 4.5.2	0.43	0.19	0.20	0.08		pCi/l
PZ-302-AS TOT_07_16_2013	13-07149-04	08/12/2013 12:55:06	Thorium-232	HASL 300, 4.5.2	0.22	0.13	0.14	0.11	J	pCi/l
PZ-302-AS TOT_07_16_2013	13-07149-04	08/12/2013 09:40:25	Uranium-234	HASL 300, 4.5.2	2.35	0.59	0.61	0.12		pCi/l
PZ-302-AS TOT_07_16_2013	13-07149-04	08/12/2013 09:40:25	Uranium-235	HASL 300, 4.5.2	0.62	0.29	0.29	0.13		pCi/l
PZ-302-AS TOT_07_16_2013	13-07149-04	08/12/2013 09:40:25	Uranium-238	HASL 300, 4.5.2	1.44	0.43	0.44	0.15		pCi/l



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<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>CSU</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
PZ-302-AS DIS_07_16_2013	13-07149-05	08/07/2013 16:06:17	Radium-226	E903.0	0.34	0.26	0.27	0.26	J	pCi/l
PZ-302-AS DIS_07_16_2013	13-07149-05	08/14/2013 07:52:54	Radium-228	E904.0	1.43	0.81	0.87	1.57	J	pCi/l
PZ-302-AS DIS_07_16_2013	13-07149-05	08/12/2013 12:55:07	Thorium-228	HASL 300, 4.5.2	0.01	0.04	0.04	0.10	U	pCi/l
PZ-302-AS DIS_07_16_2013	13-07149-05	08/12/2013 12:55:07	Thorium-230	HASL 300, 4.5.2	0.26	0.13	0.13	0.07		pCi/l
PZ-302-AS DIS_07_16_2013	13-07149-05	08/12/2013 12:55:07	Thorium-232	HASL 300, 4.5.2	0.05	0.06	0.06	0.06	U	pCi/l
PZ-302-AS DIS_07_16_2013	13-07149-05	08/12/2013 05:37:35	Uranium-234	HASL 300, 4.5.2	2.45	0.54	0.56	0.09		pCi/l
PZ-302-AS DIS_07_16_2013	13-07149-05	08/12/2013 05:37:35	Uranium-235	HASL 300, 4.5.2	0.46	0.22	0.22	0.15		pCi/l
PZ-302-AS DIS_07_16_2013	13-07149-05	08/12/2013 05:37:35	Uranium-238	HASL 300, 4.5.2	1.39	0.37	0.39	0.12		pCi/l
LR-100 TOT_07_17_2013	13-07149-06	08/07/2013 16:06:18	Radium-226	E903.0	0.58	0.33	0.35	0.31	J	pCi/l
LR-100 TOT_07_17_2013	13-07149-06	08/14/2013 07:52:55	Radium-228	E904.0	-0.17	0.60	0.60	1.30	U	pCi/l
LR-100 TOT_07_17_2013	13-07149-06	08/12/2013 12:55:08	Thorium-228	HASL 300, 4.5.2	0.00	0.08	0.08	0.20	U	pCi/l
LR-100 TOT_07_17_2013	13-07149-06	08/12/2013 12:55:08	Thorium-230	HASL 300, 4.5.2	0.55	0.23	0.24	0.11		pCi/l
LR-100 TOT_07_17_2013	13-07149-06	08/12/2013 12:55:08	Thorium-232	HASL 300, 4.5.2	-0.01	0.04	0.04	0.11	U	pCi/l
LR-100 TOT_07_17_2013	13-07149-06	08/12/2013 05:37:37	Uranium-234	HASL 300, 4.5.2	0.35	0.33	0.33	0.30	J	pCi/l
LR-100 TOT_07_17_2013	13-07149-06	08/12/2013 05:37:37	Uranium-235	HASL 300, 4.5.2	0.00	0.24	0.24	0.53	U	pCi/l
LR-100 TOT_07_17_2013	13-07149-06	08/12/2013 05:37:37	Uranium-238	HASL 300, 4.5.2	0.12	0.20	0.20	0.34	U	pCi/l
LR-100 DIS_07_17_2013	13-07149-07	08/07/2013 16:06:19	Radium-226	E903.0	0.36	0.23	0.25	0.18	J	pCi/l
LR-100 DIS_07_17_2013	13-07149-07	08/14/2013 07:52:55	Radium-228	E904.0	0.51	0.65	0.66	1.34	U	pCi/l
LR-100 DIS_07_17_2013	13-07149-07	08/12/2013 12:55:09	Thorium-228	HASL 300, 4.5.2	0.05	0.07	0.07	0.11	U	pCi/l
LR-100 DIS_07_17_2013	13-07149-07	08/12/2013 12:55:09	Thorium-230	HASL 300, 4.5.2	0.41	0.19	0.20	0.11		pCi/l
LR-100 DIS_07_17_2013	13-07149-07	08/12/2013 12:55:09	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.05	0.08	U	pCi/l
LR-100 DIS_07_17_2013	13-07149-07	08/12/2013 05:37:38	Uranium-234	HASL 300, 4.5.2	0.38	0.30	0.30	0.29	J	pCi/l
LR-100 DIS_07_17_2013	13-07149-07	08/12/2013 05:37:38	Uranium-235	HASL 300, 4.5.2	0.31	0.29	0.29	0.27	J	pCi/l
LR-100 DIS_07_17_2013	13-07149-07	08/12/2013 05:37:38	Uranium-238	HASL 300, 4.5.2	0.08	0.15	0.15	0.27	U	pCi/l
D-81 TOT_07_17_2013	13-07149-08	08/07/2013 16:06:19	Radium-226	E903.0	0.30	0.28	0.29	0.39	J	pCi/l
D-81 TOT_07_17_2013	13-07149-08	08/14/2013 07:52:56	Radium-228	E904.0	1.22	0.63	0.68	1.21	J	pCi/l
D-81 TOT_07_17_2013	13-07149-08	08/12/2013 12:55:35	Thorium-228	HASL 300, 4.5.2	0.06	0.07	0.07	0.08	U	pCi/l
D-81 TOT_07_17_2013	13-07149-08	08/12/2013 12:55:35	Thorium-230	HASL 300, 4.5.2	0.37	0.17	0.18	0.10		pCi/l
D-81 TOT_07_17_2013	13-07149-08	08/12/2013 12:55:35	Thorium-232	HASL 300, 4.5.2	0.04	0.06	0.06	0.08	U	pCi/l
D-81 TOT_07_17_2013	13-07149-08	08/12/2013 05:37:40	Uranium-234	HASL 300, 4.5.2	1.66	0.46	0.48	0.12		pCi/l
D-81 TOT_07_17_2013	13-07149-08	08/12/2013 05:37:40	Uranium-235	HASL 300, 4.5.2	0.73	0.31	0.32	0.13		pCi/l
D-81 TOT_07_17_2013	13-07149-08	08/12/2013 05:37:40	Uranium-238	HASL 300, 4.5.2	1.39	0.42	0.43	0.15		pCi/l



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Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
D-81 DIS_07_17_2013	13-07149-09	08/07/2013 16:06:44	Radium-226	E903.0	0.84	0.35	0.40	0.21		pCi/l
D-81 DIS_07_17_2013	13-07149-09	08/14/2013 07:52:47	Radium-228	E904.0	1.15	0.59	0.65	1.14	J	pCi/l
D-81 DIS_07_17_2013	13-07149-09	08/12/2013 12:55:36	Thorium-228	HASL 300, 4.5.2	0.07	0.08	0.08	0.13	U	pCi/l
D-81 DIS_07_17_2013	13-07149-09	08/12/2013 12:55:36	Thorium-230	HASL 300, 4.5.2	0.30	0.15	0.15	0.12		pCi/l
D-81 DIS_07_17_2013	13-07149-09	08/12/2013 12:55:36	Thorium-232	HASL 300, 4.5.2	0.04	0.05	0.05	0.08	U	pCi/l
D-81 DIS_07_17_2013	13-07149-09	08/12/2013 05:37:42	Uranium-234	HASL 300, 4.5.2	2.10	0.52	0.54	0.15		pCi/l
D-81 DIS_07_17_2013	13-07149-09	08/12/2013 05:37:42	Uranium-235	HASL 300, 4.5.2	1.28	0.41	0.42	0.16		pCi/l
D-81 DIS_07_17_2013	13-07149-09	08/12/2013 05:37:42	Uranium-238	HASL 300, 4.5.2	1.80	0.47	0.49	0.16		pCi/l
PZ-204-SS TOT_07_17_2013	13-07149-10	08/07/2013 16:06:45	Radium-226	E903.0	0.88	0.40	0.44	0.26		pCi/l
PZ-204-SS TOT_07_17_2013	13-07149-10	08/14/2013 07:52:48	Radium-228	E904.0	0.20	0.80	0.81	1.69	U	pCi/l
PZ-204-SS TOT_07_17_2013	13-07149-10	08/12/2013 12:55:37	Thorium-228	HASL 300, 4.5.2	0.09	0.07	0.07	0.06	J	pCi/l
PZ-204-SS TOT_07_17_2013	13-07149-10	08/12/2013 12:55:37	Thorium-230	HASL 300, 4.5.2	0.29	0.13	0.14	0.08		pCi/l
PZ-204-SS TOT_07_17_2013	13-07149-10	08/12/2013 12:55:37	Thorium-232	HASL 300, 4.5.2	0.03	0.05	0.05	0.07	U	pCi/l
PZ-204-SS TOT_07_17_2013	13-07149-10	08/12/2013 05:37:43	Uranium-234	HASL 300, 4.5.2	2.85	0.54	0.58	0.08		pCi/l
PZ-204-SS TOT_07_17_2013	13-07149-10	08/12/2013 05:37:43	Uranium-235	HASL 300, 4.5.2	0.44	0.20	0.20	0.12		pCi/l
PZ-204-SS TOT_07_17_2013	13-07149-10	08/12/2013 05:37:43	Uranium-238	HASL 300, 4.5.2	1.73	0.39	0.41	0.10		pCi/l
PZ-204-SS DIS_07_17_2013	13-07149-11	08/07/2013 16:06:39	Radium-226	E903.0	0.58	0.29	0.31	0.15		pCi/l
PZ-204-SS DIS_07_17_2013	13-07149-11	08/14/2013 07:52:48	Radium-228	E904.0	1.34	0.76	0.82	1.48	J	pCi/l
PZ-204-SS DIS_07_17_2013	13-07149-11	08/12/2013 12:55:38	Thorium-228	HASL 300, 4.5.2	0.01	0.07	0.07	0.16	U	pCi/l
PZ-204-SS DIS_07_17_2013	13-07149-11	08/12/2013 12:55:38	Thorium-230	HASL 300, 4.5.2	0.55	0.23	0.24	0.13		pCi/l
PZ-204-SS DIS_07_17_2013	13-07149-11	08/12/2013 12:55:38	Thorium-232	HASL 300, 4.5.2	0.06	0.08	0.08	0.11	U	pCi/l
PZ-204-SS DIS_07_17_2013	13-07149-11	08/12/2013 05:37:45	Uranium-234	HASL 300, 4.5.2	2.42	0.47	0.50	0.09		pCi/l
PZ-204-SS DIS_07_17_2013	13-07149-11	08/12/2013 05:37:45	Uranium-235	HASL 300, 4.5.2	0.28	0.15	0.15	0.11		pCi/l
PZ-204-SS DIS_07_17_2013	13-07149-11	08/12/2013 05:37:45	Uranium-238	HASL 300, 4.5.2	1.50	0.35	0.36	0.09		pCi/l
LR-103 TOT_07_17_2013	13-07149-12	08/07/2013 16:06:41	Radium-226	E903.0	0.71	0.36	0.39	0.29		pCi/l
LR-103 TOT_07_17_2013	13-07149-12	08/14/2013 07:52:48	Radium-228	E904.0	0.72	0.76	0.78	1.55	U	pCi/l
LR-103 TOT_07_17_2013	13-07149-12	08/12/2013 12:55:39	Thorium-228	HASL 300, 4.5.2	0.06	0.09	0.09	0.14	U	pCi/l
LR-103 TOT_07_17_2013	13-07149-12	08/12/2013 12:55:39	Thorium-230	HASL 300, 4.5.2	0.52	0.22	0.23	0.10		pCi/l
LR-103 TOT_07_17_2013	13-07149-12	08/12/2013 12:55:39	Thorium-232	HASL 300, 4.5.2	0.06	0.07	0.07	0.11	U	pCi/l
LR-103 TOT_07_17_2013	13-07149-12	08/12/2013 05:37:47	Uranium-234	HASL 300, 4.5.2	0.83	0.37	0.37	0.15		pCi/l
LR-103 TOT_07_17_2013	13-07149-12	08/12/2013 05:37:47	Uranium-235	HASL 300, 4.5.2	0.53	0.32	0.32	0.19		pCi/l
LR-103 TOT_07_17_2013	13-07149-12	08/12/2013 05:37:47	Uranium-238	HASL 300, 4.5.2	0.64	0.32	0.32	0.15		pCi/l



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<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>CSU</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
LR-103 DIS_07_17_2013	13-07149-13	08/07/2013 16:06:43	Radium-226	E903.0	1.05	0.47	0.52	0.35		pCi/l
LR-103 DIS_07_17_2013	13-07149-13	08/14/2013 07:53:36	Radium-228	E904.0	1.99	0.74	0.87	1.37	J	pCi/l
LR-103 DIS_07_17_2013	13-07149-13	08/12/2013 12:55:40	Thorium-228	HASL 300, 4.5.2	0.02	0.06	0.06	0.13	U	pCi/l
LR-103 DIS_07_17_2013	13-07149-13	08/12/2013 12:55:40	Thorium-230	HASL 300, 4.5.2	0.55	0.20	0.22	0.11		pCi/l
LR-103 DIS_07_17_2013	13-07149-13	08/12/2013 12:55:40	Thorium-232	HASL 300, 4.5.2	0.09	0.08	0.08	0.10	J	pCi/l
LR-103 DIS_07_17_2013	13-07149-13	08/12/2013 05:37:49	Uranium-234	HASL 300, 4.5.2	0.18	0.14	0.14	0.12	J	pCi/l
LR-103 DIS_07_17_2013	13-07149-13	08/12/2013 05:37:49	Uranium-235	HASL 300, 4.5.2	0.12	0.13	0.13	0.18	U	pCi/l
LR-103 DIS_07_17_2013	13-07149-13	08/12/2013 05:37:49	Uranium-238	HASL 300, 4.5.2	0.14	0.12	0.12	0.11	J	pCi/l
PZ-111-KS TOT_07_17_2013	13-07149-14	08/07/2013 16:06:47	Radium-226	E903.0	0.21	0.19	0.20	0.25	J	pCi/l
PZ-111-KS TOT_07_17_2013	13-07149-14	08/14/2013 07:53:43	Radium-228	E904.0	0.52	0.63	0.64	1.28	U	pCi/l
PZ-111-KS TOT_07_17_2013	13-07149-14	08/12/2013 12:55:40	Thorium-228	HASL 300, 4.5.2	0.02	0.06	0.06	0.13	U	pCi/l
PZ-111-KS TOT_07_17_2013	13-07149-14	08/12/2013 12:55:40	Thorium-230	HASL 300, 4.5.2	0.42	0.17	0.18	0.07		pCi/l
PZ-111-KS TOT_07_17_2013	13-07149-14	08/12/2013 12:55:40	Thorium-232	HASL 300, 4.5.2	-0.02	0.03	0.03	0.10	U	pCi/l
PZ-111-KS TOT_07_17_2013	13-07149-14	08/12/2013 05:37:51	Uranium-234	HASL 300, 4.5.2	7.02	1.15	1.25	0.08		pCi/l
PZ-111-KS TOT_07_17_2013	13-07149-14	08/12/2013 05:37:51	Uranium-235	HASL 300, 4.5.2	0.82	0.29	0.30	0.10		pCi/l
PZ-111-KS TOT_07_17_2013	13-07149-14	08/12/2013 05:37:51	Uranium-238	HASL 300, 4.5.2	2.41	0.52	0.55	0.11		pCi/l
PZ-111-KS DIS_07_17_2013	13-07149-15	08/07/2013 16:06:49	Radium-226	E903.0	0.37	0.23	0.24	0.19	J	pCi/l
PZ-111-KS DIS_07_17_2013	13-07149-15	08/14/2013 07:53:43	Radium-228	E904.0	0.57	0.57	0.58	1.15	U	pCi/l
PZ-111-KS DIS_07_17_2013	13-07149-15	08/12/2013 12:55:41	Thorium-228	HASL 300, 4.5.2	0.00	0.04	0.04	0.11	U	pCi/l
PZ-111-KS DIS_07_17_2013	13-07149-15	08/12/2013 12:55:41	Thorium-230	HASL 300, 4.5.2	0.49	0.20	0.21	0.09		pCi/l
PZ-111-KS DIS_07_17_2013	13-07149-15	08/12/2013 12:55:41	Thorium-232	HASL 300, 4.5.2	0.00	0.03	0.03	0.10	U	pCi/l
PZ-111-KS DIS_07_17_2013	13-07149-15	08/12/2013 05:37:53	Uranium-234	HASL 300, 4.5.2	8.15	1.50	1.60	0.11		pCi/l
PZ-111-KS DIS_07_17_2013	13-07149-15	08/12/2013 05:37:53	Uranium-235	HASL 300, 4.5.2	0.99	0.38	0.39	0.19		pCi/l
PZ-111-KS DIS_07_17_2013	13-07149-15	08/12/2013 05:37:53	Uranium-238	HASL 300, 4.5.2	3.47	0.78	0.82	0.12		pCi/l



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



U-8

QA/QC REVIEWED  
Date 1/16/95 Initials JA

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	U-238NAT	Customer:	TMA EBERLINE
Half Life:	(4.468 ± 0.005) x 10 <sup>9</sup> years	P.O.No.:	OR2778
Catalog No.:	7338	Reference Date:	January 1 1995 12:00 PST.
Source No.:	479-50	Contained Radioactivity:	(Total U) 8.016 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).

  
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

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 479-50

CURRENT DATE 9/6/2012 0:00

SOLUTION # U-8

Principal Radionuclide

Half Life, Years

Half Life, Days

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

4.468E+09

1.632E+12

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

Reference Date 1/1/1995 0:00

Certified Activity 8.016E+00  $\mu\text{Ci}$

Certified Concentration                       $\mu\text{Ci per gram}$

Ampoule /Solution Gross	<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

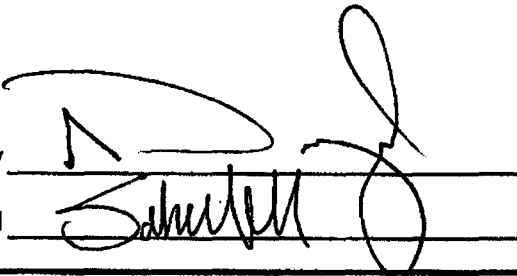
1.780E+07 dpm at the date listed above

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 Date 9/6/2012 0:00  
IPL 479-50 Solution # U-8a

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

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

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

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

SECONDARY VOLUMETRIC DILUTION

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

NOTES:

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

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

Expiration Date: September 6, 2013

Verified & Approved By [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 radioactive Tracer solution please read the instructions accompanying the package.  
  
AEA Technology operates a quality management system which has been independently audited and approved to ISO 9001.

Approved  
Signatory



Roger Wiltshire

Project Ref. AE2315

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



QUALITY CONTROL PROGRAM  
MP-009

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

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

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]  
QC Approval [Signature]

Date: 12/13/2012 0:00  
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**  
**AEA/Amersham 92/232/67**

Date: **12/7/2012 0:00**  
Solution # **U-10a**

Principal Radionuclide  
**<sup>232</sup>U**

Half Life, Years  
**7.200E+01**

Half Life, Days  
**2.630E+04**

Radionuclide of Interest **<sup>232</sup>U**  
Parent Solution Conc. **2.167E+03** dpm/ml

Reference Date **3/1/2000 0:00**

Chemical Composition of Standard Solution

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

Dilution Instructions:

Dilution Solvent Used

**2M HNO<sub>3</sub>**

SECONDARY VOLUMETRIC DILUTION

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

Final Activity Concentration: **2.1670E+01** dpm/ml

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: **December 7, 2013**

Verified & Approved By

Date: **12/13/2012 0:00**

QC Approval

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.

**Radioimpurities**

See attached technical data sheet

**Radioactive Daughters**

See attached technical data sheet

**Radionuclide Concentration**

0.207  $\mu$ Ci/gram.

**Method of Calibration**

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

**Uncertainty of Measurement**

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

**NIST Traceability**

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

**Notes**

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



**ISOTOPE 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**  
Parent Solution Conc. **2.30E+03** dpm/ml

Reference Date **11/1/1991 0:00**

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: 

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

Verified & Approved By: 

Date: **3/21/13**

QC Approval: 

Date: **3/21/13**

US EPA ARCHIVE DOCUMENT





# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

CURRENT DATE: 3/4/2013 0:00

SOLUTION REFERENCE #: IPL 388-116

SOLUTION #: Th-1

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>230</sup>Th

7.540E+04

2.754E+07

Radionuclide: <sup>230</sup>Thorium

Reference Date: 11/1/1991 0:00

Certified Activity: 1.036E+00  $\mu$ Ci

Certified Concentration:  $\mu$ Ci per gram

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

### Chemical Composition of Standard Solution

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

Dilution Instructions:

Dilution Solvent Used

0.1N HNO<sub>3</sub>

Dilute to a volume of 1000.00 milliliters


Certified Total Activity of 1.0360  $\mu$ Ci

Which Equals 2.300E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.300E+03 dpm/ml

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

Expiration Date: March 4, 2014

Recertified By: 

Date: 3/21/2013 0:00

QC Approval: 

Date: 3/21/13

US EPA ARCHIVE DOCUMENT

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

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

**Description of Solution**

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

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

c. Carrier content: None added

d. Density: Approx. 1.21 g/ml @ 20°C.

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

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

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

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

**Uncertainty of Measurement**

a. Systematic uncertainty in instrument calibration:  $\pm 3.0\%$

b. Random uncertainty in assay:  $\pm 0.0\%$

c. Random uncertainty in weighing(s):  $\pm 2.0\%$

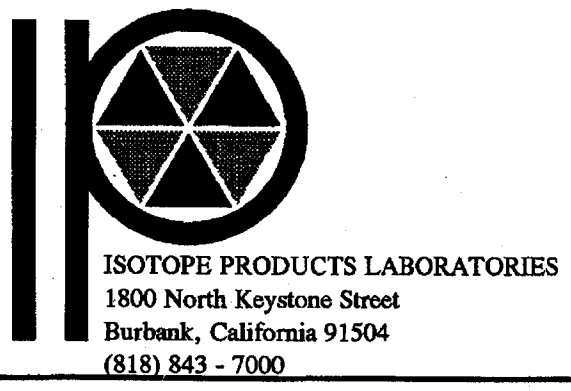
d. Total uncertainty at the 99% confidence level:  $\pm 3.6\%$

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

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

**Notes**

- Nuclear data were taken from "Table of Radioactive Isotopes", edited by Virginia S. Shirley, 1986.
- 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).



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

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

US EPA ARCHIVE DOCUMENT

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

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

### Description of Solution

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

Radioimpurities: None detected (other than daughters).

### Radioactive Daughters

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

### Radionuclide Concentration

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

### Method of Calibration

Activity calculations are based upon known specific activity and mass.

### Uncertainty of Measurement

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

### NIST Traceability

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

### Leak Test(s)

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

### Notes

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



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

*Anna U. Khan*  
QUALITY CONTROL

*Nov. 8, 1993*  
Date Signed



QUALITY CONTROL PROGRAM

MP-009

Rev.6; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

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

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

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

Radionuclide <sup>232</sup> & <sup>228</sup>Th Reference Date 11/17/1993 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

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**QUALITY CONTROL PROGRAM**  
MP-009

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

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

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

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

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

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

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

**SECONDARY VOLUMETRIC DILUTION**

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

NOTES:

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

Expiration Date: **October 9, 2013**

Verified & Approved By 

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

QC Approval 

Date: **11/12/12**

US EPA ARCHIVE DOCUMENT



**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

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# QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

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

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

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

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

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

### Chemical Composition of Standard Solution

<sup>228</sup>Th(NO<sub>3</sub>)<sub>4</sub> in 0.1M HNO<sub>3</sub>

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

Dilute to a volume of 1000.00 milliliters

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

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

Expiration Date: October 9, 2013

Verified & Approved By 

Date: 11/9/2012 0:00

QC Approval 

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM  
MP-009

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

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

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

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

Principal Radionuclide  
**<sup>228</sup>Th**

Half Life, Years  
**7.340E+03**

Half Life, Days  
**2.681E+06**

Radionuclide of Interest **<sup>228</sup>Th**  
Parent Solution Conc. **2.25E+03** dpm/ml

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

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 9/1/1993 0:00  
Certified Activity           $\mu\text{Ci}$   
Certified Concentration 1.318E+01  $\mu\text{Ci per gram}$

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

### Chemical Composition of Standard Solution

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

Dilution Instructions:      Dilution Solvent Used 1M HCl

Dilute to a volume of 1000.00 milliliters

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

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

Expiration Date: June 16, 2014

Verified & Approved By 

Date: 7/1/13

QC Approval 

Date: 7/2/13



QUALITY CONTROL PROGRAM  
QCP-009

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

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

Solution Reference # QCP-009-1-A Date 6/18/13  
NIST SRM4251C Solution # Ba-6a

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

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

Chemical Composition of Standard Solution

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

Dilution Instructions: Dilution Solvent Used 1M HCl

SECONDARY VOLUMETRIC DILUTION

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

NOTES:

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

Expiration Date: June 18, 2014

Verified & Approved By [Signature]

Date: 7/1/13

QC Approval [Signature]

Date: 7/2/13

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

*Ra-5*  
QA/QC REVIEWED  
Date *2/8/94* Initials *WA*

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

Description of Solution

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

Radioimpurities: None detected (other than daughters)

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

Radionuclide Concentration: (Ra-226) 0.1929 µCi/g.

Method of Calibration

Weighed aliquots of the solution were assayed using gamma spectrometry:  
 Energy peak(s) integrated under: 186 keV.  
 Branching ratio(s) used: 0.0351 gamma rays per decay.

Uncertainty of Measurement

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

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

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

Notes

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



*Ana H. Kuen*  
 QUALITY CONTROL  
 Feb. 3, 1994  
 Date Signed



**QUALITY CONTROL PROGRAM**  
MP 009

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

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

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

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

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

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

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

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

Dilute to a volume of 1000.00 milliliters

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

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

Expiration Date: November 9, 2013

Verified & Approved By 

Date: 11/9/2012

QC Approval 

Date: 11/12/12

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM

MP 009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

Solution Reference # **MP 009**  
**PL-453-26**

Date **11/9/2012 0:00**  
Solution # **Ra-5b**

Principal Radionuclide

Half Life, Years

Half Life, Days

<sup>226</sup>Radium

**1.600E+03**

**5.844E+05**

Radionuclide of Interest

<sup>228</sup>Radium

Reference Date

**2/1/1994 0:00**

Parent Solution Conc. **2.22E+03** dpm/ml

Chemical Composition of Standard Solution

<sup>228</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

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

QC Approval

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  $\mu\text{Ci}$   
Certified Concentration           $\mu\text{Ci per gram}$

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

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

Dilution Instructions: Dilution Solvent Used 0.5 M HCl

Dilute to a volume of 1000.00 milliliters

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

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

Expiration Date: March 26, 2014

Recertified By [Signature]

Date: 5/30/13

QC Approval [Signature]

Date: 5/30/13

US EPA ARCHIVE DOCUMENT



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

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07149</b>	<b>UIISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

**Laboratory Control Sample**

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
U-234	0.63	95.04%	16.03%	100.00%	3.60%	8.17E+00	2.94E-01	7.76E+00	1.24E+00	U-8a	3.52E+01	3.60E+00	5.14E-01
U-238	1.85	117.46%	15.62%	100.00%	3.60%	7.96E+00	2.87E-01	9.35E+00	1.46E+00	U-8a	3.44E+01	3.60E+00	5.14E-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)

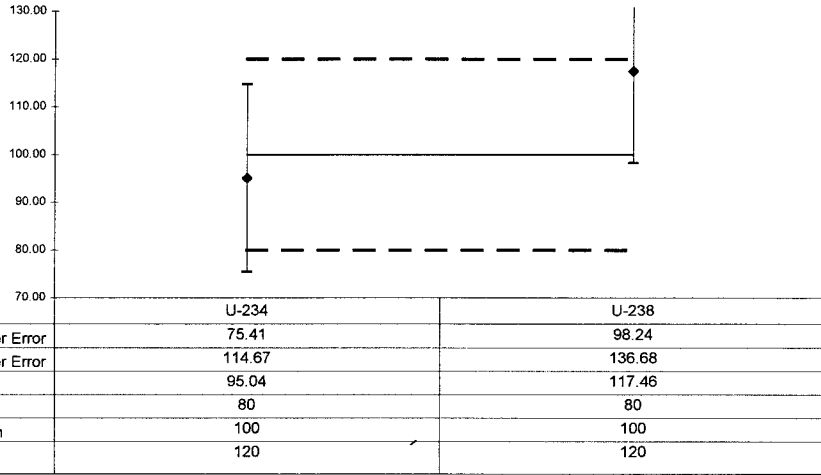
**Replicate Sample**

**QC Summary**

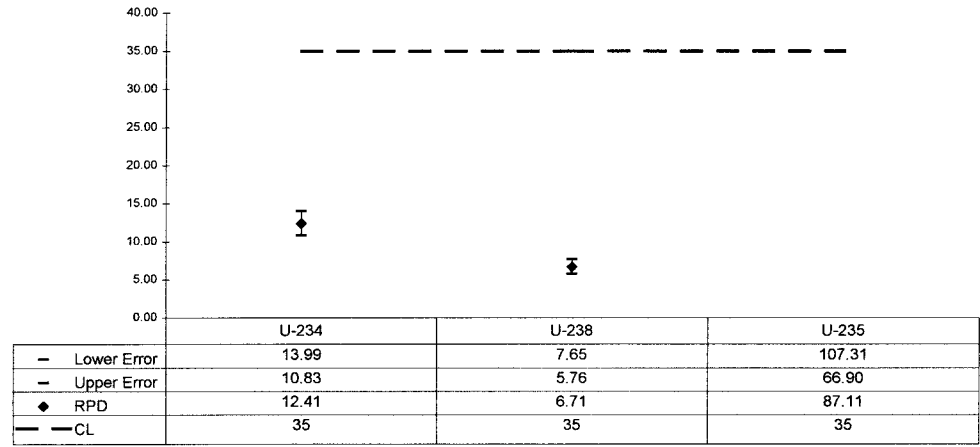
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
U-234	0.67	12.41	1.66E+00	4.80E-01	1.88E+00	4.22E-01	0.95	OK	OK			OK	OK
U-238	0.33	6.71	1.39E+00	4.29E-01	1.30E+00	3.30E-01	1.17	OK	OK			OK	OK
U-235	2.46	87.11	7.31E-01	3.17E-01	2.87E-01	1.55E-01		OK	OK			INV	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07149</b>	<b>UUISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

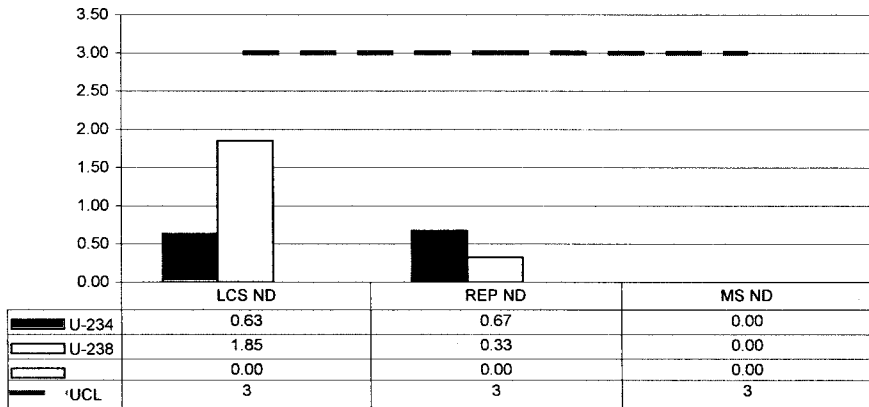
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07149</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	0.50	95.61%	17.73%	100.00%	3.60%	4.87E+00	1.75E-01	4.65E+00	8.25E-01	Th-8b	1.04E+02	3.60E+00	1.04E-01
TH-230	1.03	90.74%	19.29%	100.00%	2.70%	5.45E+00	1.47E-01	4.95E+00	9.55E-01	Th-1b	2.35E+01	2.70E+00	5.15E-01
TH-232	1.06	91.26%	17.52%	100.00%	3.60%	4.87E+00	1.75E-01	4.44E+00	7.78E-01	Th-8b	1.04E+02	3.60E+00	1.04E-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)

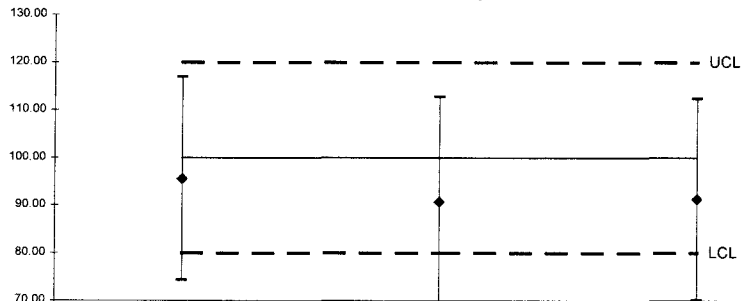
**Replicate Sample**

**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	0.44	37.64	6.31E-02	6.92E-02	4.31E-02	5.52E-02	0.96	OK	OK			NA	OK
TH-230	0.94	33.16	3.70E-01	1.77E-01	2.65E-01	1.29E-01	0.91	OK	OK			INV	OK
TH-232	0.18	16.85	4.47E-02	5.82E-02	3.77E-02	4.60E-02	0.91	OK	OK			NA	OK

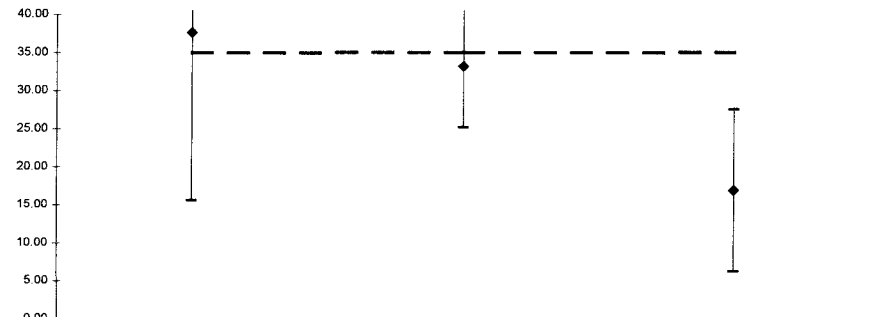
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07149</b>	<b>ThISO</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

### LCS % Recovery



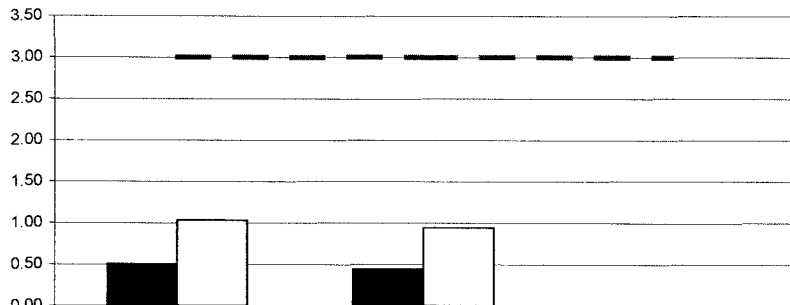
	TH-228	TH-230	TH-232
Lower Error	74.28	68.75	70.14
Upper Error	116.94	112.73	112.38
%R	95.61	90.74	91.26
LCL	80	80	80
Mean	100	100	100
UCL	120	120	120

### Replicate Sample RPD



	TH-228	TH-230	TH-232
Lower Error	59.68	41.15	27.51
Upper Error	15.59	25.18	6.19
RPD	37.64	33.16	16.85
CL	35	35	35

### Normalized Difference



	LCS ND	REP ND	MS ND
TH-228	0.50	0.44	0.00
TH-230	1.03	0.94	0.00
UCL	3	3	3

### No Matrix Spike

0052

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07149</b>	<b>Ra226</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

**Laboratory Control Sample**

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
RA-226	0.92	112.89%	24.26%	100.00%	4.60%	1.02E+01	4.70E-01	1.15E+01	2.80E+00	Ra-5b	4.41E+01	4.60E+00	5.15E-01

**Matrix Spike**

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

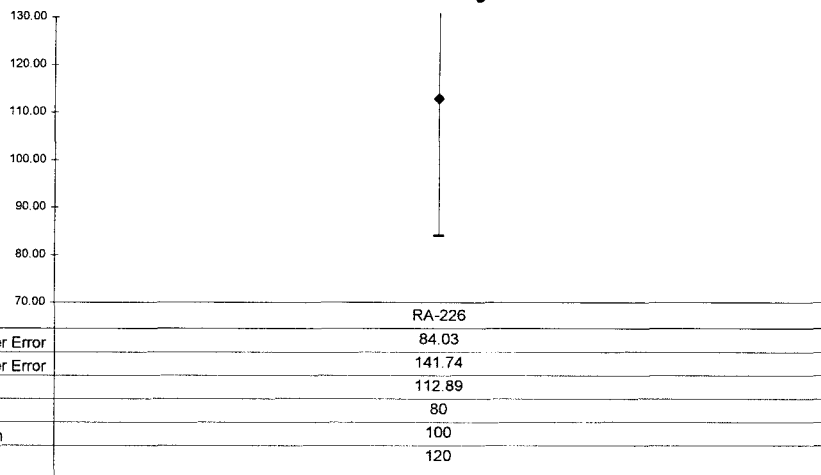
**Replicate Sample**

**QC Summary**

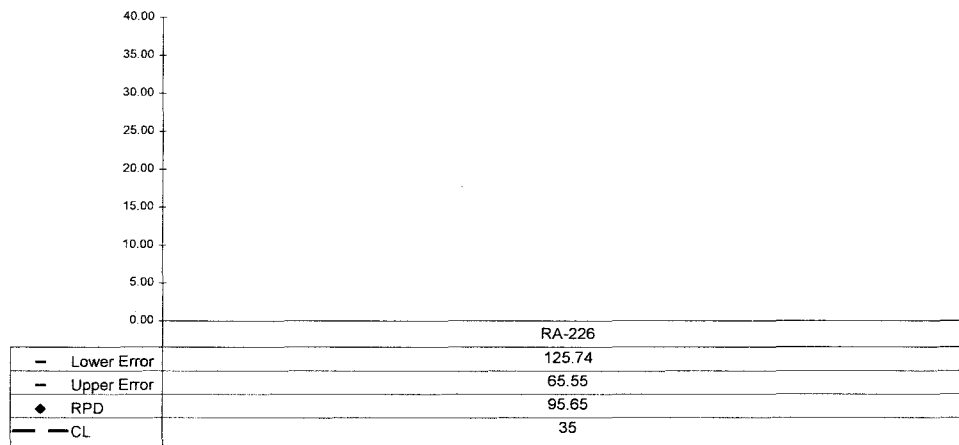
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-226	2.07	95.65	2.96E-01	2.89E-01	8.39E-01	4.26E-01	1.13	OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07149</b>	<b>Ra226</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

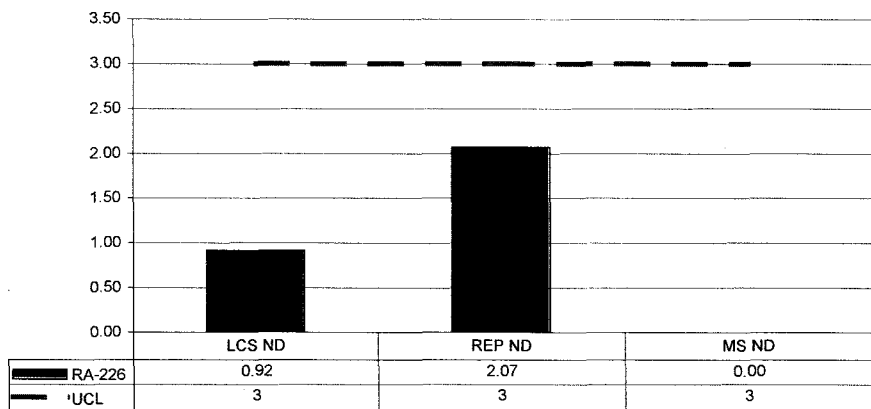
### LCS % Recovery



### Replicate Sample RPD



### Normalized Difference



### No Matrix Spike

0054

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07149</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	0.90	89.51%	25.17%	100.00%	5.10%	8.73E+00	4.45E-01	7.81E+00	1.97E+00	Ra-11	3.77E+01	5.10E+00	5.14E-01

**Matrix Spike**

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

**Replicate Sample**

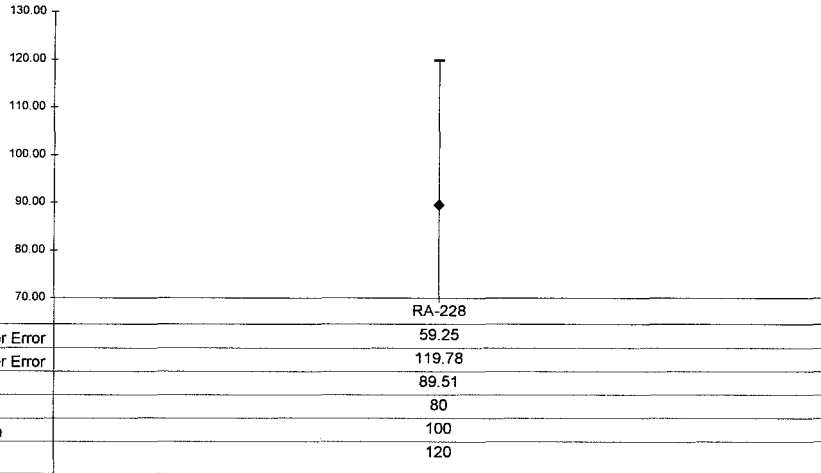
**QC Summary**

Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-228	0.54	23.04	1.22E+00	6.84E-01	9.69E-01	6.16E-01	0.90	OK	OK			NA	OK

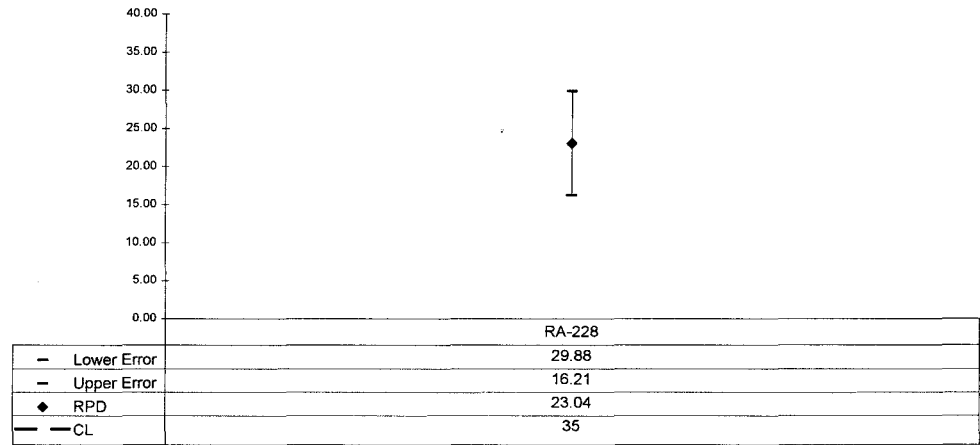


WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
<b>13-07149</b>	<b>Ra228</b>	<b>1</b>	<b>pCi</b>	<b>I</b>	<b>Engineering Management Support, Inc.</b>

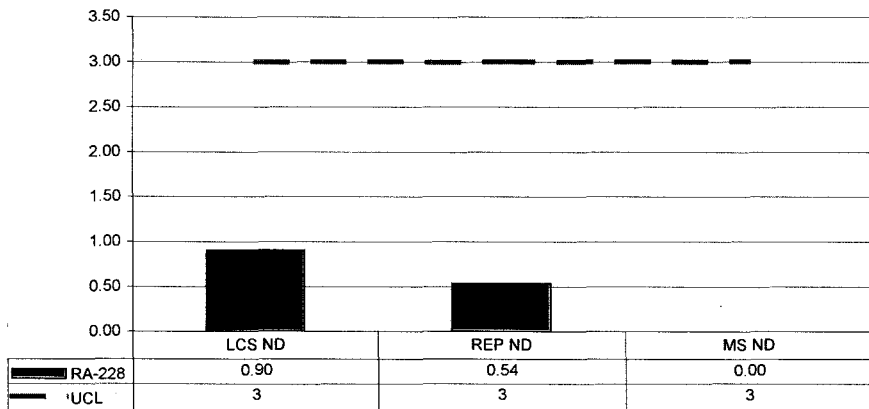
### LCS % Recovery



### Replicate Sample RPD




### Normalized Difference



### No Matrix Spike


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

ISO U NOTES

 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07149
		Analysis Code	UUISO
		Run Number	1


#	Date	Dept	User	Notes
1	08/05/13 09:26	PREP	JWOLFE	ALIQOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 12, 13 AND 15 WITH HNO3- DRIED SAMPLES DOWN

*J Wolfe*  
8/5/13

 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07149
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:26	PREP	JWOLFE	ALIQUTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 12, 13 AND 15 WITH HNO3- DRIED SAMPLES DOWN
2	08/08/13 18:36	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*  
 8/8/13

 <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	13-07149
		Analysis Code	UUISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:26	PREP	JWOLFE	ALIQOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 12, 13 AND 15 WITH HNO3- DRIED SAMPLES DOWN
2	08/08/13 18:36	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	08/09/13 06:53	CHEM	RMARTZ	ADDED 0.1 ML NEODYMIUM CARRIER, 0.3 ML TITANOUS CHLORIDE, & 1 ML HF TO C-TUBES; LET SET SIT IN ICE BATH FOR ONE HOUR. SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR, THEN SENT SET TO COUNT ROOM.

*RM*  
 8/9/13

US EPA ARCHIVE DOCUMENT



Reagents Used in an Analysis

Internal Work Order

**13-07149**

Analysis Code

Run

**UUISO**

**1**

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/5/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/8/2013
014217S	HCl - HF	6.5N - 0.04N	JDEMELAS	8/8/2013
014142D01	Hydrochloric Acid	0.5N	JDEMELAS	8/8/2013
014199S	Hydrochloric Acid	6.5N	JDEMELAS	8/8/2013
014225S	Hydrochloric Acid	8N	JDEMELAS	8/8/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/8/2013
014237S	Hydrochloric Acid	8N	JDEMELAS	8/8/2013
014241S	HCl - NH4I	8N - 0.1M	JDEMELAS	8/8/2013
014042S	Carbon substrate	Solution	RMARTZ	8/9/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/9/2013
013191S	Neodymium Carrier	1 mg/ml	RMARTZ	8/9/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/9/2013
014220P	Titanous Chloride	Reagent Grade	RMARTZ	8/9/2013

US EPA ARCHIVE DOCUMENT

# Alpha #3

Date	Sample #	Client	Food Item	CT	Analysis	Term
8/9/17	Daily Pulser	LAB	0506	1m	1m	-
8/9/17	SECCAL	LAB	0522	2hr	1m	-
8/9/17	1307147A(1-12)	Eng. Man	0904	2hr	1m	c
8/9/13	1307146A(4)	UWR	1204	2hr 50m	1m	100
8/9/13	1308003A(1-9)	Access	1209	2hr 50m	1m	100
8/9/13	System Bkgd	Lab	1624	16:40 hrs	2	100
8/10/13	Daily Pulser	Lab	1123	10 min	1m	AC
8/10/13	1307147A(9-19)	Eng. Manage	1502	2hr 50m	150-TH	AC
8/10/17	Daily Pulser	LAB	0515	1m	1m	-
8/11/17	1307149A(1-15)	Eng. Man	0577	2hr	4hr 30	c




Alpha # 3

Date	Sample #	Client	Food Item	OT Time	Surveyor	Test
8/9/17	Daily Pulser	LAB	0506	1m	nm	-
8/9/17	SECAL	LAB	0522	2hr	nm	-
8/9/17	1707154A(1-2)	Eng. Man	0904	2hr	Rel	C
8/9/17	1307146A(4)	UWR	1209	2hr 50m	Np	KB
8/9/17	1308003A(1-9)	Access	1209	2hr 50m	Rel	KB
8/9/17	System Bkgd	Lab	1624	16.40 hr	2	KB
8/10/17	Daily Pulser	Lab	1123	10 mn	NA	AG
8/10/17	1307147A(9-19)	Eng. Manage	1502	2hr 50m	iso-Th	AG
8/10/17	Daily Pulser	LAB	0515	1m	nm	-
8/12/17	1707149A(1-15)	Eng. Man	0577	2hr	4hr 50	C
8/12/17	1707152A(4-18)	Eng. Man	0879	2hr	4hr 50	-
8/12/17	1307145A(4)	Eng. Man	0940	2hr	4hr 50	-


US EPA ARCHIVE DOCUMENT

**ISO TH NOTES**

 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07149
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:26	PREP	JWOLFE	ALIQUTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 12, 13 AND 15 WITH HNO3- DRIED SAMPLES DOWN


*J Wolfe*  
 8/5/13

 <b>EBERLINE</b> <small>SERVICES</small> <b>Work Order Analysis Notes</b>	<b>Oak Ridge Laboratory</b> 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07149
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:26	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 12, 13 AND 15 WITH HNO3- DRIED SAMPLES DOWN
2	08/09/13 17:24	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.

*John Demelas*  
 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	13-07149
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/05/13 09:26	PREP	JWOLFE	ALIQUTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-7, 12, 13 AND 15 WITH HNO3- DRIED SAMPLES DOWN
2	08/09/13 17:24	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	08/12/13 05:47	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.

*RJ*  
*8/12/13*



Reagents Used in an Analysis

Internal Work Order

**13-07149**

Analysis Code

Run

**ThISO**

**1**

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/5/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/9/2013
014237S	Hydrochloric Acid	8N	JDEMELAS	8/9/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/9/2013
014236S	Nitric Acid	8N	JDEMELAS	8/9/2013
014109P	Nitric Acid	Reagent Grade	JDEMELAS	8/9/2013
014042S	Carbon substrate	Solution	RMARTZ	8/12/2013
014040S	Cerrium Carrier	0.1mg/ml	RMARTZ	8/12/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/12/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/12/2013

US EPA ARCHIVE DOCUMENT

# Alpha #1

Date	Sample #	Client	Lead Time (CT Time)	Analysis	Spec
8/7/12	1708006A(1-4)	Ucon	0917	2hrs	Pu 20
8/7/12	1308016A(1-4)	Unitech	0914	2hr	uuzo
8/7/13	1308006A(1-4)	UCOR	1243	2hr 50mins	Np
8/7/13	1307138A(1-4)	Unitech	1243	2hr 50mins	UU
8/7/13	1307146A(15-20)	EMS	1603	2hr 50-	UU
8/7/13	1307110B(1-2)	EMS	1607	2hr 50-	UU
8/8/12	Daily Pulse	LAB	0578	1hr	m
8/8/12	1707147A(1-8)	Eng Man	0906	2hr	uuzo
8/8/13	1307116B(4,6,9)	UCOR	1159	2hr 50mins	PU
8/8/13	1307116B(4,6)	UCOR	1200	2hr 50min	PUNT
8/8/13	1307140A(1-3)	UCOR	1200	2hr 50-	PU
8/8/13	1307152A(1+19)	EMS	1454	2hr 50-	Re
8/9/12	Daily Pulse	LAB	0506	1hr	m
8/9/12	SEC CAL	LAB	0800	2hr	m
8/9/12	1708071A(1-5)	Ucon	1076	2hr	uuzo
8/9/12	1707186A(1-7)	Ucon	1076	2hr	NP 237
8/9/13	1307171A(2-4,6)	Ucon	1729	2hr	uuzo
8/9/13	System Bkgd	Lab	1624	16.40 hrs	2
8/10/13	Daily Pulse	Lab	1123	10min	NA
8/10/13	1307147A(1-8)	Eng Manage	1455	2hr 50min	iso-Th
8/12/12	Daily Pulse	LAB	0519	1hr	m
8/12/12	1707172A(1-4)	Ucon	0936	2hr	uuzo
8/12/12	1707171A(1-4)	Ucon	0937	2hr	uuzo
8/12/12	1707171A(1-7)	Ucon	0937	2hr 50-	Pu 20
8/12/13	1307152A(19)	EMS	1254	2hr 50min	UU
8/12/13	1307149A(1-7)	EMS	1255	2hr 50mins	Th


# Alpha #2

Date	Sample #	Client	Target	CT Time	Analysis	Final
8/6/13	Daily Pulse	UAB	0528	1 hr	---	---
8/6/13	1707171A(4-6)	UWON	0936	2 hrs	Am20	---
8/6/13	1308006A(1-4)	UWON	0977	2 hrs	U250	---
8/6/13	1307170A(1-7)	United	0978	2 hrs	U250	---
8/6/13	1307171A(3-4,6)	UWON	1245	2 hrs	Am	ICB
8/6/13	1307146A(1-6)	EMS	1246	2 hrs	Th	ICB
8/6/13	1307172A(3-4)	UWON	1634	2 hrs	Rad	ICB
8/6/13	1307147A(1-7)	EMS	1635	2 hrs	Rad	ICB
8/7/13	Daily Pulse	UAB	0572	1 hr	---	---
8/7/13	1708016A(5)	United	0914	2 hrs	U250	---
8/7/13	1707110B(1-7,10)	Englman	0915	2 hrs	U250	---
8/7/13	1307185A(1-4)	Western Adv.	0916	2 hrs	Rad	---
8/7/13	1307185A(1-4)	Western	1244	2 hrs	Am	ICB
8/7/13	1307172A(1-4)	UWON	1244	2 hrs	Am	ICB
8/7/13	1307146A(1)	EMS	1246	2 hrs	Am	ICB
8/7/13	1307172A(4)	UWON	1605	2 hrs	Am23	ICB
8/7/13	1307149A(1-3)	EMS	1606	2 hrs	Rad	ICB
8/8/13	Daily Pulse	UAB	0578	1 hr	---	---
8/8/13	1707109B(1-4,7)	UWON	0951	2 hrs	Pulse	---
8/8/13	1307109A(1-4)	UWON	0952	2 hrs	Rad	---
8/8/13	1707116B(1-7)	UWON	0953	2 hrs	Pulse	---
8/8/13	1307112A(1-13)	Englman	1252	2 hrs	Rad	---
8/9/13	Daily Pulse	UAB	0506	1 hr	---	---
8/9/13	1707114A(7)	Englman	0926	2 hrs	Rad	---
8/9/13	1707186A(1-4)	UWON	0927	2 hrs	Am20	---
8/9/13	1707186A(1-4)	UWON	0927	2 hrs	Am20	---
8/9/13	SEC CAL	Lab	1228	2 1/2 hrs	---	ICB
8/9/13	System Bkqd	Lab	1624	16.40 hrs	---	ICB
8/10/13	Daily Pulse	Lab	1123	10 min	NA	AG
8/12/13	Daily Pulse	UAB	0515	1 hr	---	---
8/12/13	1707171A(4,6,9)	UWON	0977	2 hrs	Pulse	---
8/12/13	1707171A(1-4,6)	UWON	0978	2 hrs	Rad	---
8/12/13	1707172A(1-7)	Englman	0978	2 hrs	U250	---
8/12/13	1307149A(8-15)	EMS	1255	2 hrs	Th	ICB

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	13-07149
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:37	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 4 AND 5 DOWN AND DIGESTED DUE TO HIGH AMOUNT OF SOLIDS PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

*J Wolfe*  
*8/2/13*

 <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	13-07149
			Analysis Code	Ra226
			Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:37	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 4 AND 5 DOWN AND DIGESTED DUE TO HIGH AMOUNT OF SOLIDS PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/27/13 12:13	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*  
 8/27/13



Reagents Used in an Analysis

Internal Work Order

13-07149

Analysis Code

Run

Ra226

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	8/2/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	8/2/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	8/2/2013
014008D02	Lead Carrier	166 mg/ml	JWOLFE	8/2/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/2/2013
013416P	Perchloric Acid	Reagent Grade	JWOLFE	8/2/2013
009098P	Sulfuric Acid	Reagent Grade	JWOLFE	8/2/2013
011383P	Acetic Acid	Reagent Grade	TSMITH	8/6/2013
013575D05	Ammonium Sulfate	200 mg/ml	TSMITH	8/6/2013

US EPA ARCHIVE DOCUMENT


# Alpha #3

Date	Stamp #	Client	Location	CT Time	Analysis	Task
8/1/13	1307128A(4-6)	UWOR	0948	2hr	TLNT	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(1-6 &amp; 11)</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)	Accustest	1612	2hr50m	Rate	ICB
8/5/13	1307171A(4-6)	UWOR	1613	2hr50m	Rate	ICB
8/6/13	Daily Puff	UW3	0928	1hr	Rate	-
8/6/13	1307179A(1-1)	TBE	0950	2hr	Rate	C
8/6/13	1307170A(4)	Unitech	0978	2hr	Unitech	-
8/6/13	1307178A(1-5)	Unitech	0941	2hr	Rate	C
8/6/13	1707178A(1-5)	Mirion Tech	0942	5hr	Unitech	C
8/6/13	1707178A(1-2)	Unitech	0942	2hr	Rate	C
8/6/13	1307146A(7-14)	EMS	1246	2hr50m	Th	ICB
8/6/13	1307147A(8-19)	EMS	1636	2hr50m	Rate	ICB
8/7/13	Daily Puff	UW3	0972	1hr	Rate	-
8/7/13	1307172A(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

# Alpha #2

Date	Sample #	Client	Latitude	CTD	Depth	Depth
8/6/13	Daily Pulse	UW	0928	1m	1m	
8/6/13	1707171A(4-6)	UW	0936	2hr	Am243	
8/6/13	1308006A(1-4)	UW	0977	2hr	UW243	
8/6/13	1307170A(1-7)	United	0978	2hr	UW243	
8/6/13	1307171A(3-4,6)	UW	1245	2hr 50mins	Np	ICB
8/6/13	1307146A(1-6)	EMS	1246	2hr 50-	Th	ICB
8/6/13	1307172A(3-4)	UW	1634	2hr 50-	Rab	ICB
8/6/13	1307147A(1-7)	EMS	1635	2hr 50-	Rab	ICB
8/7/13	Daily Pulse	UW	0972	1m	1m	
8/7/13	1708016A(5)	United	0914	2hr	UW243	
8/7/13	1707110B(1-7,10)	Englman	0915	2hr	UW243	
8/7/13	1307185A(1-4)	Western Adv.	0916	2hr	Ph 243	
8/7/13	1307185A(1-4)	Western	1244	2hr 50mins	UW	ICB
8/7/13	1307172A(1-4)	UW	1244	2hr 50-	Np	ICB
8/7/13	1307146A(1)	EMS	1246	2hr 50-	UW	ICB
8/7/13	1307172A(4)	UW	1605	2hr 50-	Am243	ICB
8/7/13	1307149A(1-8)	EMS	1606	2hr 50-	Rab	ICB


**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	13-07149
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:36	PREP	JWOLFE	<del>ALIQUTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 4 AND 5 DOWN AND DIGESTED</del> <del>DUE TO HIGH AMOUNT OF SOLIDS PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB</del> <del>CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED</del> <del>RADIUM PRECIP TO SEPARATIONS</del>
2	08/02/13 08:37	PREP	JWOLFE	ALIQUTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 4 AND 5 DOWN AND DIGESTED DUE TO HIGH AMOUNT OF SOLIDS PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS


*J Wolfe*  
 8/2/13




 <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	13-07149
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:36	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 4 AND 5 DOWN AND DIGESTED DUE TO HIGH AMOUNT OF SOLIDS PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/02/13 08:37	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 4 AND 5 DOWN AND DIGESTED DUE TO HIGH AMOUNT OF SOLIDS PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
3	08/08/13 12:39	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
4	08/13/13 19:05	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)

*L. Walker*  
 8/13/13

 <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	13-07149
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	08/02/13 08:36	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 4 AND 5 DOWN AND DIGESTED DUE TO HIGH AMOUNT OF SOLIDS PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/02/13 08:37	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- DRIED FRACTIONS 4 AND 5 DOWN AND DIGESTED DUE TO HIGH AMOUNT OF SOLIDS PRESENT- PH'D ALL SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
3	08/08/13 12:39	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
4	08/13/13 19:05	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)
5	08/14/13 05:51	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  




Reagents Used in an Analysis

Internal Work Order

13-07149

Analysis Code

Run

Ra228

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	8/2/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	8/2/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	8/2/2013
014008D02	Lead Carrier	166 mg/ml	JWOLFE	8/2/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/2/2013
013416P	Perchloric Acid	Reagent Grade	JWOLFE	8/2/2013
009098P	Sulfuric Acid	Reagent Grade	JWOLFE	8/2/2013
011504D33	Ammonium Sulfide	2%	LWALKER	8/13/2013
014008D03	Lead Carrier	1.5 mg/ml	LWALKER	8/13/2013
014109P	Nitric Acid	Reagent Grade	LWALKER	8/13/2013
013065D06	Sodium Hydroxide	10M	LWALKER	8/13/2013
013955D01	Yttrium Carrier	9 mg/ml	LWALKER	8/13/2013
013763D02	Ammonium Oxalate	5%	TSMITH	8/14/2013
013910D07	Nitric Acid	1N	TSMITH	8/14/2013
013065D09	Sodium Hydroxide	18M	TSMITH	8/14/2013
014110D04	Nitric Acid	6N	TSMITH	8/14/2013
013065D10	Sodium Hydroxide	10M	TSMITH	8/14/2013

Date	Sample #	Circle	Transfer	Citation	Amount	Tab
8/8/17	1707186Pb(1-4)	UWOL	0918112	2h	Pb210	C
8/8/17	17071215S4(12-9)	Test Area	1006	2h	Sready	C
8/8/17	1707186Pb(1-4)	UWOL	1217	2hrs	Pb210	KB
8/15/17	EF70c	WIS	0702	7a	L13	C
8/15/17	BUCD0c	WIS	0774	6a	L13	C
8/15/17	1707186NA(1-4)	UWOL	0770	2h	PL8	C
8/15/17	1708004NA(1-7)	UWOL	0770	2h	PL8	C
8/15/17	1708005NA(1-4)	UWOL	0770	2h	PL8	C
8/15/17	1707129NA(1-7)	Miss Rep	0918	2h	PL8	C
8/15/17	1707186MP(1-4)	UWOL	1007	10a	NP274	C
8/15/17	1708001Pb(1-4)	UWOL	1026	2h	Pb210	C
8/10/17	Weekly Bldg	lab	1138	12hr	αB	AG
8/12/17	EF70c	WIS	0718	3a	L13	C
8/12/17	BUCD0c	WIS	0751	6a	L13	C
8/12/17	1707142NA(1-4)	Acadest	0747	2h	PL8	C
8/12/17	1707146NA(1-4)	Engman	1116	2h	PL8	C
8/17/17	EF70c	WIS	0710	3a	L13	C
8/17/17	BUCD0c	WIS	0744	6a	L13	C
8/17/17	1707144NA(1-4)	UTAH Div. 0710	0770	2h	L13	C
8/17/17	1707144NA(1-4)	UTAH Div. 0710	0750	3a	L13	C
8/17/17	1708004NA(1-3)	UWOL	0844	10a	NP274	C
8/17/17	1707152NA(1-3)	Engman	1047	2h	PL8	C
8/14/17	EF70c	WIS	0712	3a	L13	C
8/14/17	BUCD0c	WIS	0746	6a	L13	C
8/14/17	1707149NA(1-4)	Engman	0754	2h	PL8	C

US EPA ARCHIVE DOCUMENT

Date	Sample #	Client	Facid Thin	CT Time	Analysis	Test
8/13/17	1707119ADK(2-5)	ERK	1119	2L	L10	C
8/17/17	1707119AB2(6-7)	ERA	1257	2L	L13	C
8/14/17	BULLDOG	UM	0712	6m	L13	C
8/14/17	ET 762	UM	0646	30m	L13	C
8/14/17	1707149RA(13-15)	Engma	0755	2L	RA8	C

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

Work Order	13-07149	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	UUISO	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-81 TOT	45	07/17/13 10:43	1.0000E+00
Lab Deadline	8/13/2013	04	TRG	PZ-302-AS TOT	46	07/16/13 15:30	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-302-AS DIS	46	07/16/13 15:30	1.0000E+00
Project	West Lake OU-1	06	TRG	LR-100 TOT	47	07/17/13 10:23	1.0000E+00
Report Level	4	07	TRG	LR-100 DIS	47	07/17/13 10:23	1.0000E+00
Activity Units	pCi	08	DO	D-81 TOT	45	07/17/13 10:43	1.0000E+00
Aliquot Units	I	09	TRG	D-81 DIS	45	07/17/13 10:43	1.0000E+00
Matrix	WA	10	TRG	PZ-204-SS TOT	43	07/17/13 11:40	1.0000E+00
Method	HASL 300, 4.5.2	11	TRG	PZ-204-SS DIS	43	07/17/13 11:40	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	LR-103 TOT	45	07/17/13 12:15	1.0000E+00
Radiometric Tracer	U-232	13	TRG	LR-103 DIS	45	07/17/13 12:15	1.0000E+00
Radiometric Sol#	U-10a	14	TRG	PZ-111-KS TOT	41	07/17/13 13:09	1.0000E+00
Tracer Act (dpm/g)	19.042	15	TRG	PZ-111-KS DIS	41	07/17/13 13:09	1.0000E+00
Carrier							
Carrier Conc (mg/ml)							

\* 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	0.6131	11.7		0.00								
02	MBL	0.6051	11.5		0.00								
03	DUP	0.6057	11.5		0.00								
04	TRG	0.6025	11.5		0.00								
05	TRG	0.6027	11.5		0.00								
06	TRG	0.6005	11.4		0.00								
07	TRG	0.6011	11.4		0.00								
08	DO	0.6039	11.5		0.00								
09	TRG	0.6016	11.5		0.00								
10	TRG	0.6021	11.5		0.00								
11	TRG	0.6020	11.5		0.00								
12	TRG	0.6010	11.4		0.00								
13	TRG	0.5979	11.4		0.00								
14	TRG	0.5994	11.4		0.00								
15	TRG	0.5993	11.4		0.00								

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

0087



<i>Internal Fraction</i>	<i>Sample Desc</i>	<i>Rough Prep Date</i>	<i>Rough Prep By</i>	<i>Prep Date</i>	<i>Prep By</i>	<i>Sep t0 Date/Time</i>	<i>Sep t0 By</i>	<i>Sep t1 Date/Time</i>	<i>Sep t1 By</i>
01	LCS			08/05/13 09:21	JWOLFE				
02	MBL			08/05/13 09:21	JWOLFE				
03	DUP			08/05/13 09:21	JWOLFE				
04	TRG			08/05/13 09:21	JWOLFE				
05	TRG			08/05/13 09:21	JWOLFE				
06	TRG			08/05/13 09:21	JWOLFE				
07	TRG			08/05/13 09:21	JWOLFE				
08	DO			08/05/13 09:21	JWOLFE				
09	TRG			08/05/13 09:21	JWOLFE				
10	TRG			08/05/13 09:21	JWOLFE				
11	TRG			08/05/13 09:21	JWOLFE				
12	TRG			08/05/13 09:21	JWOLFE				
13	TRG			08/05/13 09:21	JWOLFE				
14	TRG			08/05/13 09:21	JWOLFE				
15	TRG			08/05/13 09:21	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

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	7.76E+00	1.11E+00	6.30E-02	8.17E+00	95.04	OK		OK	
02	U-234	MBL	BLANK	pCi/l	2.34E-01	1.14E-01	7.81E-02					OK	OK
03	U-234	DUP	D-81 TOT	pCi/l	1.88E+00	4.00E-01	6.48E-02				OK	OK	
04	U-234	TRG	PZ-302-AS TOT	pCi/l	2.35E+00	5.89E-01	1.21E-01					OK	
05	U-234	TRG	PZ-302-AS DIS	pCi/l	2.45E+00	5.36E-01	9.42E-02					OK	
06	U-234	TRG	LR-100 TOT	pCi/l	3.46E-01	3.25E-01	2.99E-01					OK	
07	U-234	TRG	LR-100 DIS	pCi/l	3.82E-01	3.02E-01	2.95E-01					OK	
08	U-234	DO	D-81 TOT	pCi/l	1.66E+00	4.65E-01	1.19E-01					OK	
09	U-234	TRG	D-81 DIS	pCi/l	2.10E+00	5.18E-01	1.54E-01					OK	
10	U-234	TRG	PZ-204-SS TOT	pCi/l	2.85E+00	5.41E-01	7.75E-02					OK	
11	U-234	TRG	PZ-204-SS DIS	pCi/l	2.42E+00	4.73E-01	9.23E-02					OK	
12	U-234	TRG	LR-103 TOT	pCi/l	8.26E-01	3.68E-01	1.51E-01					OK	
13	U-234	TRG	LR-103 DIS	pCi/l	1.85E-01	1.37E-01	1.15E-01					OK	
14	U-234	TRG	PZ-111-KS TOT	pCi/l	7.02E+00	1.15E+00	7.95E-02					OK	
15	U-234	TRG	PZ-111-KS DIS	pCi/l	8.15E+00	1.50E+00	1.08E-01					OK	

Run	1
	UUISO
Analysis Code	UUISO
Eberline Services Work Order	13-07149
Client	Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-UUISO-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	U-234	LCS	07/23/13 00:00	1.00E+00	95.11	0.00	0.00			
02	U-234	MBL	07/23/13 00:00	1.00E+00	109.87	0.00	0.00			
03	U-234	DUP	07/17/13 10:43	1.00E+00	93.61	0.00	0.00			
04	U-234	TRG	07/16/13 15:30	1.00E+00	62.23	0.00	0.00			
05	U-234	TRG	07/16/13 15:30	1.00E+00	75.62	0.00	0.00			
06	U-234	TRG	07/17/13 10:23	1.00E+00	21.54	0.00	0.00			
07	U-234	TRG	07/17/13 10:23	1.00E+00	25.87	0.00	0.00			
08	U-234	DO	07/17/13 10:43	1.00E+00	56.19	0.00	0.00			
09	U-234	TRG	07/17/13 10:43	1.00E+00	61.66	0.00	0.00			
10	U-234	TRG	07/17/13 11:40	1.00E+00	88.76	0.00	0.00			
11	U-234	TRG	07/17/13 11:40	1.00E+00	86.08	0.00	0.00			
12	U-234	TRG	07/17/13 12:15	1.00E+00	38.24	0.00	0.00			
13	U-234	TRG	07/17/13 12:15	1.00E+00	57.62	0.00	0.00			
14	U-234	TRG	07/17/13 13:09	1.00E+00	77.94	0.00	0.00			
15	U-234	TRG	07/17/13 13:09	1.00E+00	56.31	0.00	0.00			

Run	1
	UUISO
Analysis Code	UUISO
Eberline Services Work Order	13-07149
Client	Engineering Management Support, Inc.

0500

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-UUISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-234	LCS	08/12/13 05:37		A_Spec	Alpha_033	170	5.14 E+02	1.00 E-03	18.5
02	U-234	MBL	08/12/13 05:37		A_Spec	Alpha_034	170	1.80 E+01	0.00 E+00	18.6
03	U-234	DUP	08/12/13 05:37		A_Spec	Alpha_035	170	1.21 E+02	1.00 E-03	18.3
04	U-234	TRG	08/12/13 09:40		A_Spec	Alpha_048	170	9.27 E+01	2.00 E-03	16.8
05	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_037	170	1.25 E+02	2.00 E-03	17.8
06	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_038	170	4.83 E+00	1.00 E-03	17.2
07	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_039	170	7.32 E+00	4.00 E-03	19.7
08	U-234	DO	08/12/13 05:37		A_Spec	Alpha_040	170	6.67 E+01	2.00 E-03	19
09	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_041	170	9.36 E+01	8.00 E-03	19.2
10	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_042	170	1.76 E+02	2.00 E-03	18.5
11	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_043	170	1.57 E+02	0.00 E+00	20
12	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_044	170	2.28 E+01	1.00 E-03	19.2
13	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_045	170	7.66 E+00	2.00 E-03	19.1
14	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_046	170	3.69 E+02	1.00 E-03	17.9
15	U-234	TRG	08/12/13 05:37		A_Spec	Alpha_047	170	3.15 E+02	1.00 E-03	18.2

Run 1

Analysis Code UUISO

Eberline Services Work Order 13-07149

Client Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-UUISO-1**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-238	LCS	LCS	pCi/l	9.35E+00	1.30E+00	7.19E-02	7.96E+00	117.46	OK		OK	
02	U-238	MBL	BLANK	pCi/l	1.25E-01	8.17E-02	6.20E-02					OK	OK
03	U-238	DUP	D-81 TOT	pCi/l	1.30E+00	3.16E-01	6.45E-02				OK	OK	
04	U-238	TRG	PZ-302-AS TOT	pCi/l	1.44E+00	4.32E-01	1.52E-01					OK	
05	U-238	TRG	PZ-302-AS DIS	pCi/l	1.39E+00	3.73E-01	1.18E-01					OK	
06	U-238	TRG	LR-100 TOT	pCi/l	1.18E-01	2.02E-01	3.41E-01					OK	
07	U-238	TRG	LR-100 DIS	pCi/l	7.75E-02	1.48E-01	2.73E-01					OK	
08	U-238	DO	D-81 TOT	pCi/l	1.39E+00	4.17E-01	1.48E-01					OK	
09	U-238	TRG	D-81 DIS	pCi/l	1.80E+00	4.68E-01	1.59E-01					OK	
10	U-238	TRG	PZ-204-SS TOT	pCi/l	1.73E+00	3.88E-01	1.02E-01					OK	
11	U-238	TRG	PZ-204-SS DIS	pCi/l	1.50E+00	3.46E-01	9.19E-02					OK	
12	U-238	TRG	LR-103 TOT	pCi/l	6.42E-01	3.19E-01	1.50E-01					OK	
13	U-238	TRG	LR-103 DIS	pCi/l	1.36E-01	1.18E-01	1.15E-01					OK	
14	U-238	TRG	PZ-111-KS TOT	pCi/l	2.41E+00	5.21E-01	1.14E-01					OK	
15	U-238	TRG	PZ-111-KS DIS	pCi/l	3.47E+00	7.77E-01	1.23E-01					OK	



Run

1

Analysis Code

UUISO

Eberline Services Work Order

13-07149

Client

Engineering Management Support, Inc.

2009



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-UISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-238	LCS	08/12/13 05:37		A_Spec	Alpha_033	170	6.22 E+02	2.00 E-03	18.5
02	U-238	MBL	08/12/13 05:37		A_Spec	Alpha_034	170	9.66 E+00	2.00 E-03	18.6
03	U-238	DUP	08/12/13 05:37		A_Spec	Alpha_035	170	8.38 E+01	1.00 E-03	18.3
04	U-238	TRG	08/12/13 09:40		A_Spec	Alpha_048	170	5.70 E+01	0.00 E+00	16.8
05	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_037	170	7.10 E+01	0.00 E+00	17.8
06	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_038	170	1.66 E+00	2.00 E-03	17.2
07	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_039	170	1.49 E+00	3.00 E-03	19.7
08	U-238	DO	08/12/13 05:37		A_Spec	Alpha_040	170	5.60 E+01	0.00 E+00	19
09	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_041	170	8.05 E+01	9.00 E-03	19.2
10	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_042	170	1.07 E+02	6.00 E-03	18.5
11	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_043	170	9.80 E+01	0.00 E+00	20
12	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_044	170	1.78 E+01	1.00 E-03	19.2
13	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_045	170	5.66 E+00	2.00 E-03	19.1
14	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_046	170	1.27 E+02	0.00 E+00	17.9
15	U-238	TRG	08/12/13 05:37		A_Spec	Alpha_047	170	1.35 E+02	2.00 E-03	18.2



Run **1**

Analysis Code **UISO**

Eberline Services Work Order **13-07149**

Client **Engineering Management Support, Inc.**

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-UUISO-1**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-235	LCS	LCS	pCi/l	1.19E+00	3.22E-01	8.91E-02					OK	
02	U-235	MBL	BLANK	pCi/l	1.45E-01	1.01E-01	9.63E-02					OK	OK
03	U-235	DUP	D-81 TOT	pCi/l	2.87E-01	1.54E-01	1.15E-01				INV	OK	
04	U-235	TRG	PZ-302-AS TOT	pCi/l	6.21E-01	2.89E-01	1.31E-01					OK	
05	U-235	TRG	PZ-302-AS DIS	pCi/l	4.62E-01	2.21E-01	1.46E-01					OK	
06	U-235	TRG	LR-100 TOT	pCi/l	0.00E+00	2.45E-01	5.30E-01					OK	
07	U-235	TRG	LR-100 DIS	pCi/l	3.11E-01	2.90E-01	2.69E-01					OK	
08	U-235	DO	D-81 TOT	pCi/l	7.31E-01	3.13E-01	1.28E-01					OK	
09	U-235	TRG	D-81 DIS	pCi/l	1.28E+00	4.12E-01	1.56E-01					OK	
10	U-235	TRG	PZ-204-SS TOT	pCi/l	4.40E-01	1.95E-01	1.20E-01					OK	
11	U-235	TRG	PZ-204-SS DIS	pCi/l	2.85E-01	1.53E-01	1.14E-01					OK	
12	U-235	TRG	LR-103 TOT	pCi/l	5.28E-01	3.16E-01	1.86E-01					OK	
13	U-235	TRG	LR-103 DIS	pCi/l	1.19E-01	1.32E-01	1.79E-01					OK	
14	U-235	TRG	PZ-111-KS TOT	pCi/l	8.18E-01	2.92E-01	9.80E-02					OK	
15	U-235	TRG	PZ-111-KS DIS	pCi/l	9.90E-01	3.83E-01	1.91E-01					OK	

  
 Run **1**  
 Analysis Code **UUISO**  
 Eberline Services Work Order **13-07149**  
 Client **Engineering Management Support, Inc.**

5500






Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-UUISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-235	LCS	08/12/13 05:37		A_Spec	Alpha_033	170	6.37 E+01	2.00 E-03	18.5
02	U-235	MBL	08/12/13 05:37		A_Spec	Alpha_034	170	9.00 E+00	0.00 E+00	18.6
03	U-235	DUP	08/12/13 05:37		A_Spec	Alpha_035	170	1.50 E+01	0.00 E+00	18.3
04	U-235	TRG	08/12/13 09:40		A_Spec	Alpha_048	170	1.98 E+01	1.00 E-03	16.8
05	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_037	170	1.90 E+01	0.00 E+00	17.8
06	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_038	170	1.00 E+00	0.00 E+00	17.2
07	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_039	170	4.83 E+00	1.00 E-03	19.7
08	U-235	DO	08/12/13 05:37		A_Spec	Alpha_040	170	2.38 E+01	1.00 E-03	19
09	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_041	170	4.63 E+01	4.00 E-03	19.2
10	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_042	170	2.20 E+01	0.00 E+00	18.5
11	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_043	170	1.50 E+01	0.00 E+00	20
12	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_044	170	1.18 E+01	1.00 E-03	19.2
13	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_045	170	4.00 E+00	0.00 E+00	19.1
14	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_046	170	3.48 E+01	1.00 E-03	17.9
15	U-235	TRG	08/12/13 05:37		A_Spec	Alpha_047	170	3.10 E+01	0.00 E+00	18.2

  
 Run **1**  
 Analysis Code **UUISO**  
 Eberline Services Work Order **13-07149**  
 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*
37-47 01	LCS	LCS	07/23/13 00:00	1.0000	0.6131	11.6747		0.00		
02	MBL	BLANK	07/23/13 00:00	1.0000	0.6051	11.5223		0.00		
03	DUP	D-81 TOT	07/17/13 10:43	1.0000	0.6057	11.5337		0.00		
04	TRG	PZ-302-AS TOT	07/16/13 15:30	1.0000	0.6025	11.4728		0.00		
05	TRG	PZ-302-AS DIS	07/16/13 15:30	1.0000	0.6027	11.4766		0.00		
06	TRG	LR-100 TOT	07/17/13 10:23	1.0000	0.6005	11.4347		0.00		
07	TRG	LR-100 DIS	07/17/13 10:23	1.0000	0.6011	11.4461		0.00		
08	DO	D-81 TOT	07/17/13 10:43	1.0000	0.6039	11.4995		0.00		
09	TRG	D-81 DIS	07/17/13 10:43	1.0000	0.6016	11.4557		0.00		
10	TRG	PZ-204-SS TOT	07/17/13 11:40	1.0000	0.6021	11.4652		0.00		
11	TRG	PZ-204-SS DIS	07/17/13 11:40	1.0000	0.6020	11.4633		0.00		
12	TRG	LR-103 TOT	07/17/13 12:15	1.0000	0.6010	11.4442		0.00		
13	TRG	LR-103 DIS	07/17/13 12:15	1.0000	0.5979	11.3852		0.00		
14	TRG	PZ-111-KS TOT	07/17/13 13:09	1.0000	0.5994	11.4138		0.00		
15	TRG	PZ-111-KS DIS	07/17/13 13:09	1.0000	0.5993	11.4119		0.00		

# Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
<b>13-07149</b>	<b>1</b>	<b>UUISO</b>	<b>8/5/2013 9:20</b>	<b>JWOLFE</b>		

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	Volume Used (g)	Volume Used (g)	Volume Used (g)	Volume Used (g)	Known pCi	Error Estimate	Added pCi	Error Estimate	Known pCi	Error Estimate	Added pCi	Error Estimate
U-234	U-8a	35.240	8/5/2013	0.500	0.5144				8.17	0.294	0.00	0.000	0.00	0.000	0.00	0.000
U-238	U-8a	34.350	8/5/2013	0.500	0.5144				7.96	0.287	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	19.042	8/5/2013	0.6131	0.6300		
02	U-232	U-10a	19.042	8/5/2013	0.6051	0.6300		
03	U-232	U-10a	19.042	8/5/2013	0.6057	0.6300		
04	U-232	U-10a	19.042	8/5/2013	0.6025	0.6300		
05	U-232	U-10a	19.042	8/5/2013	0.6027	0.6300		
06	U-232	U-10a	19.042	8/5/2013	0.6005	0.6300		
07	U-232	U-10a	19.042	8/5/2013	0.6011	0.6300		
08	U-232	U-10a	19.042	8/5/2013	0.6039	0.6300		
09	U-232	U-10a	19.042	8/5/2013	0.6016	0.6300		
10	U-232	U-10a	19.042	8/5/2013	0.6021	0.6300		
11	U-232	U-10a	19.042	8/5/2013	0.6020	0.6300		
12	U-232	U-10a	19.042	8/5/2013	0.6010	0.6300		
13	U-232	U-10a	19.042	8/5/2013	0.5979	0.6300		
14	U-232	U-10a	19.042	8/5/2013	0.5994	0.6300		
15	U-232	U-10a	19.042	8/5/2013	0.5993	0.6300		
							<div data-bbox="1155 584 1323 1136" data-label="Text"> <p>0.6131 0.6051 0.6057 0.6025 0.6027 0.6005 0.6011 0.6039 0.6016 0.6021 0.6020 0.6010 0.5979 0.5994 0.5993</p> </div>	<div data-bbox="1743 665 1890 698" data-label="Text"> <p>0.3144</p> </div>
								<div data-bbox="1638 876 1806 909" data-label="Text"> <p>Matrix Spike</p> </div>

0000

# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07149</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-81 TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-302-AS TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-302-AS DIS	TRG					1.0000E+00	1.0000E+00				
06	LR-100 TOT	TRG					1.0000E+00	1.0000E+00				
07	LR-100 DIS	TRG					1.0000E+00	1.0000E+00				
08	D-81 TOT	DO					1.0000E+00	1.0000E+00				
09	D-81 DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-204-SS TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-204-SS DIS	TRG					1.0000E+00	1.0000E+00				
12	LR-103 TOT	TRG					1.0000E+00	1.0000E+00				
13	LR-103 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-111-KS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-111-KS DIS	TRG					1.0000E+00	1.0000E+00				

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

0010

8/12/13

Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 8/12/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:29 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.613 mL  
 Effective Efficiency: 0.1758 +/- 0.0103  
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM  
 Chem. Recovery Factor: 0.9511 +/- 0.0580

Control Certificate Name: NatU\_U-8A  
 Chem. Recov. of Control: U-238 5.646925 +/- 0.434635  
 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 5.285	346.83	10.53	0.17	0.00E+000	26.2
U-234	4.741	513.83	8.65	0.17	0.00E+000	36.8
U-235	4.405	63.66	24.64	0.34	0.00E+000	3.7
U-238	4.161	621.66	7.86	0.34	0.00E+000	25.8

T = Tracer Peak used for Effective Efficiency

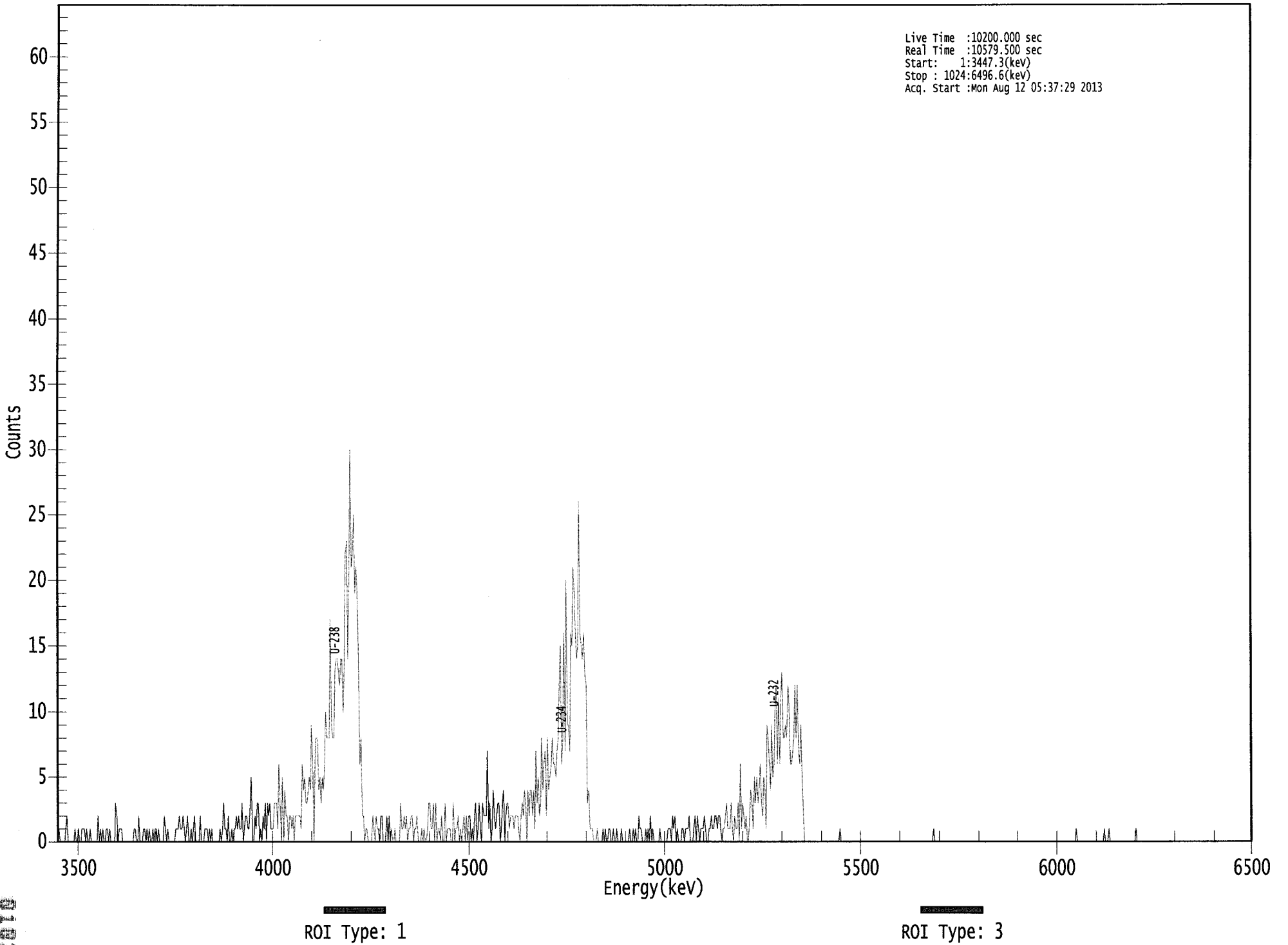
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 NUCLIDE ANALYSIS RESULTS  
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Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.998	5302.50*	5.24E+000 +/- 6.00E-001	6.30E-002 +/- 7.22E-003
U-234	0.997	4761.50*	7.76E+000 +/- 1.11E+000	6.30E-002 +/- 7.22E-003
U-235	0.997	4385.50*	1.19E+000 +/- 3.22E-001	8.91E-002 +/- 1.02E-002
U-238	0.996	4184.40*	9.35E+000 +/- 1.30E+000	7.19E-002 +/- 8.23E-003

AG  
 8/12/13

000065854.CNF

Live Time :10200.000 sec  
Real Time :10579.500 sec  
Start: 1:3447.3(kev)  
Stop : 1024:6496.6(kev)  
Acq. Start :Mon Aug 12 05:37:29 2013



0102

\*\*\*\*\*  
 \*\*\*\*\* 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: 10580

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	1	0	0	0	0	0	1
9:	2	0	0	0	0	0	0	1
17:	0	0	1	0	0	1	1	1
25:	0	1	0	0	1	0	0	0
33:	0	0	0	2	0	1	0	1
41:	0	0	1	1	0	1	0	0
49:	0	0	3	2	0	1	1	1
57:	0	0	0	0	0	0	0	0
65:	0	0	1	1	0	0	2	0
73:	0	0	1	1	0	1	0	1
81:	0	0	1	0	1	1	0	1
89:	0	0	0	0	2	1	0	1
97:	0	0	0	0	0	0	1	1
105:	1	2	1	1	2	1	0	1
113:	2	0	0	1	0	1	2	0
121:	0	0	0	2	0	0	0	1
129:	1	1	0	1	0	1	0	0
137:	0	0	0	0	1	0	1	3
145:	1	1	0	2	0	0	1	0
153:	1	1	2	1	2	1	1	3
161:	0	1	2	2	1	1	3	5
169:	0	0	2	1	3	3	0	1
177:	0	2	1	3	0	3	2	3
185:	1	1	1	3	3	3	1	6
193:	3	0	5	0	4	2	2	0
201:	2	2	1	2	0	2	2	2
209:	2	2	1	6	4	5	3	3
217:	4	5	4	9	6	0	7	8
225:	8	4	5	3	5	4	6	10
233:	8	8	8	17	9	8	8	13
241:	14	14	13	12	14	14	10	14
249:	22	23	14	21	30	21	22	25
257:	19	21	19	14	6	8	2	2
265:	0	1	1	0	0	0	0	2
273:	1	0	2	1	1	0	2	2
281:	0	0	0	2	0	2	0	1
289:	0	0	1	0	0	0	0	3
297:	1	1	2	1	2	0	1	1
305:	2	2	0	1	1	2	0	0
313:	0	1	0	1	0	0	1	3
321:	3	1	1	3	0	3	0	1
329:	1	0	2	0	0	3	0	1
337:	1	1	0	0	3	0	1	1
345:	2	0	1	0	1	2	0	2
353:	0	2	2	0	1	0	2	3
361:	0	1	3	1	0	3	2	2



369: 2 7 1 3 0 1 4 2

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
377:	1	2	3	3	0	1	3	4
385:	0	2	3	3	1	2	2	2
393:	1	2	2	2	1	0	2	3
401:	2	4	3	0	4	2	4	4
409:	2	4	1	7	3	5	2	3
417:	8	4	6	7	2	8	4	5
425:	6	8	6	6	5	7	8	12
433:	15	6	8	16	7	20	9	9
441:	7	16	15	21	19	16	14	15
449:	26	16	15	14	16	13	12	3
457:	4	1	1	1	0	0	0	1
465:	0	0	0	0	1	0	1	0
473:	0	1	1	0	0	1	0	0
481:	1	0	0	0	1	0	0	0
489:	0	0	0	1	0	0	1	0
497:	1	0	0	2	1	1	0	0
505:	0	1	0	1	0	2	0	1
513:	0	0	0	0	0	1	0	0
521:	0	0	0	0	1	1	1	0
529:	2	1	2	0	1	0	0	0
537:	1	1	0	1	1	1	2	0
545:	0	0	1	2	0	2	1	0
553:	1	1	1	2	1	0	0	1
561:	1	2	1	1	2	2	1	2
569:	2	1	0	1	1	2	3	1
577:	1	1	3	1	0	2	1	1
585:	3	0	6	1	3	2	1	2
593:	0	0	2	4	3	1	5	3
601:	5	3	4	6	3	2	5	4
609:	1	9	8	6	4	9	5	6
617:	10	12	6	11	6	11	13	8
625:	8	9	8	12	11	6	6	7
633:	8	12	8	12	7	6	9	5
641:	2	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	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	1
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: 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	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	1	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	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	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



8/12/13

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 02  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 8/12/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:30 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.605 mL  
 Effective Efficiency: 0.2039 +/- 0.0113  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Chem. Recovery Factor: 1.0987 +/- 0.0637

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	5.285	397.00	9.85	0.00	0.00E+000	12.1
U-234	4.723	18.00	47.46	0.00	0.00E+000	3.0
U-235	4.374	9.00	68.87	0.00	0.00E+000	3.0
U-238	4.157	9.66	64.35	0.34	0.00E+000	5.9

T = Tracer Peak used for Effective Efficiency

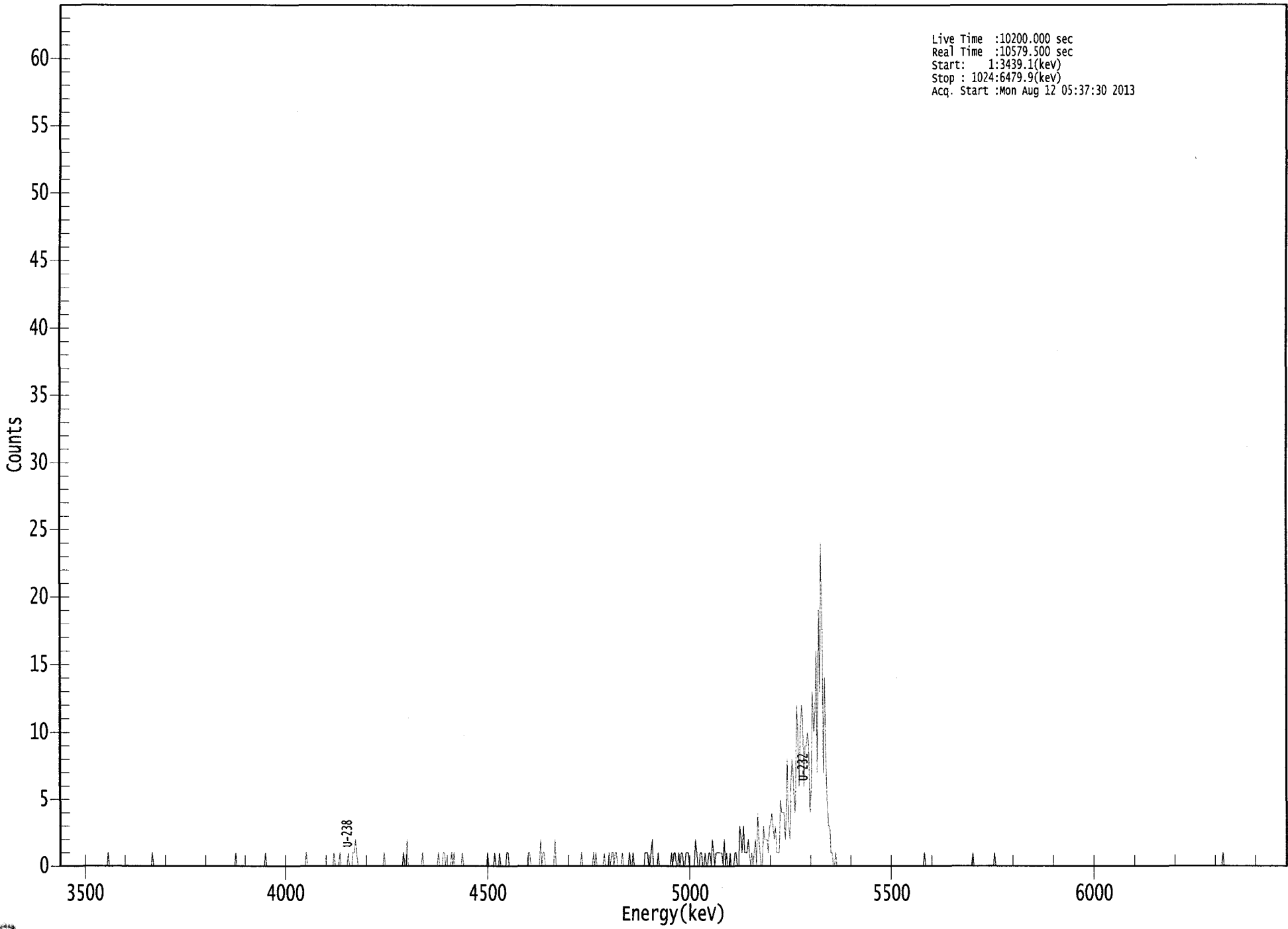
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.998	5302.50*	5.17E+000 +/- 5.60E-001	7.81E-002 +/- 8.46E-003
U-234	0.989	4761.50*	2.34E-001 +/- 1.14E-001	7.81E-002 +/- 8.46E-003
U-235	0.999	4385.50*	1.45E-001 +/- 1.01E-001	9.63E-002 +/- 1.04E-002
U-238	0.995	4184.40*	1.25E-001 +/- 8.17E-002	6.20E-002 +/- 6.72E-003

AG  
 8/12/13

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10579.500 sec  
Start: 1:3439.1(kev)  
Stop : 1024:6479.9(kev)  
Acq. Start :Mon Aug 12 05:37:30 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: 02

Elapsed Live time: 10200

Elapsed Real Time: 10580

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:	1	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	1	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	1	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	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	0	0	0	0	1	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	1	0	0	0	0	0
241:	0	1	0	0	0	1	1	2
249:	1	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	1
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	1
289:	0	0	2	0	0	0	0	0
297:	0	0	0	0	0	0	0	1
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	1	0	0	0
321:	1	1	0	0	0	0	0	1
329:	0	1	0	0	0	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	1	0	0
361:	0	0	0	1	0	0	0	1

369: 0 0 0 0 0 1 1 0

Sample Title: 02

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	1
393:	1	0	0	0	0	0	0	0
401:	0	2	0	1	1	0	0	0
409:	0	0	0	0	0	2	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	1	0	0	0	0
441:	0	0	0	0	0	1	0	1
449:	0	0	0	0	0	0	1	0
457:	0	0	1	0	1	1	0	1
465:	1	0	0	0	0	1	0	0
473:	0	0	0	1	0	0	1	0
481:	0	0	0	0	0	0	0	0
489:	1	1	1	0	0	1	2	0
497:	0	0	0	1	0	0	0	0
505:	0	0	0	0	0	0	1	0
513:	1	1	0	0	1	0	1	1
521:	0	0	1	1	1	0	0	0
529:	0	0	2	1	0	0	1	1
537:	0	0	1	0	0	1	1	0
545:	2	1	0	1	1	1	1	1
553:	1	0	2	0	1	0	0	1
561:	0	0	0	1	1	0	0	3
569:	2	1	3	1	1	1	2	1
577:	0	1	0	1	2	0	4	2
585:	1	0	0	3	2	2	2	1
593:	3	3	4	3	2	3	1	1
601:	1	5	4	4	4	2	4	8
609:	3	2	6	8	7	4	5	12
617:	10	6	10	12	11	6	9	9
625:	10	9	4	6	13	10	11	16
633:	7	19	13	24	17	7	14	9
641:	5	3	3	1	1	0	0	1
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	1	0	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	1	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	1	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 02

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



C  
8/12/13

Sample Description: D-81 TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:32 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.606 mL  
 Effective Efficiency: 0.1709 +/- 0.0102  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Chem. Recovery Factor: 0.9361 +/- 0.0581

Peak Match Tolerance: 0.150 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232 T	5.279	333.15	10.75	0.85	0.00E+000	13.7
U-234	4.733	120.83	17.85	0.17	0.00E+000	3.4
U-235	4.389	15.00	52.27	0.00	0.00E+000	2.9
U-238	4.154	83.83	21.43	0.17	0.00E+000	5.1

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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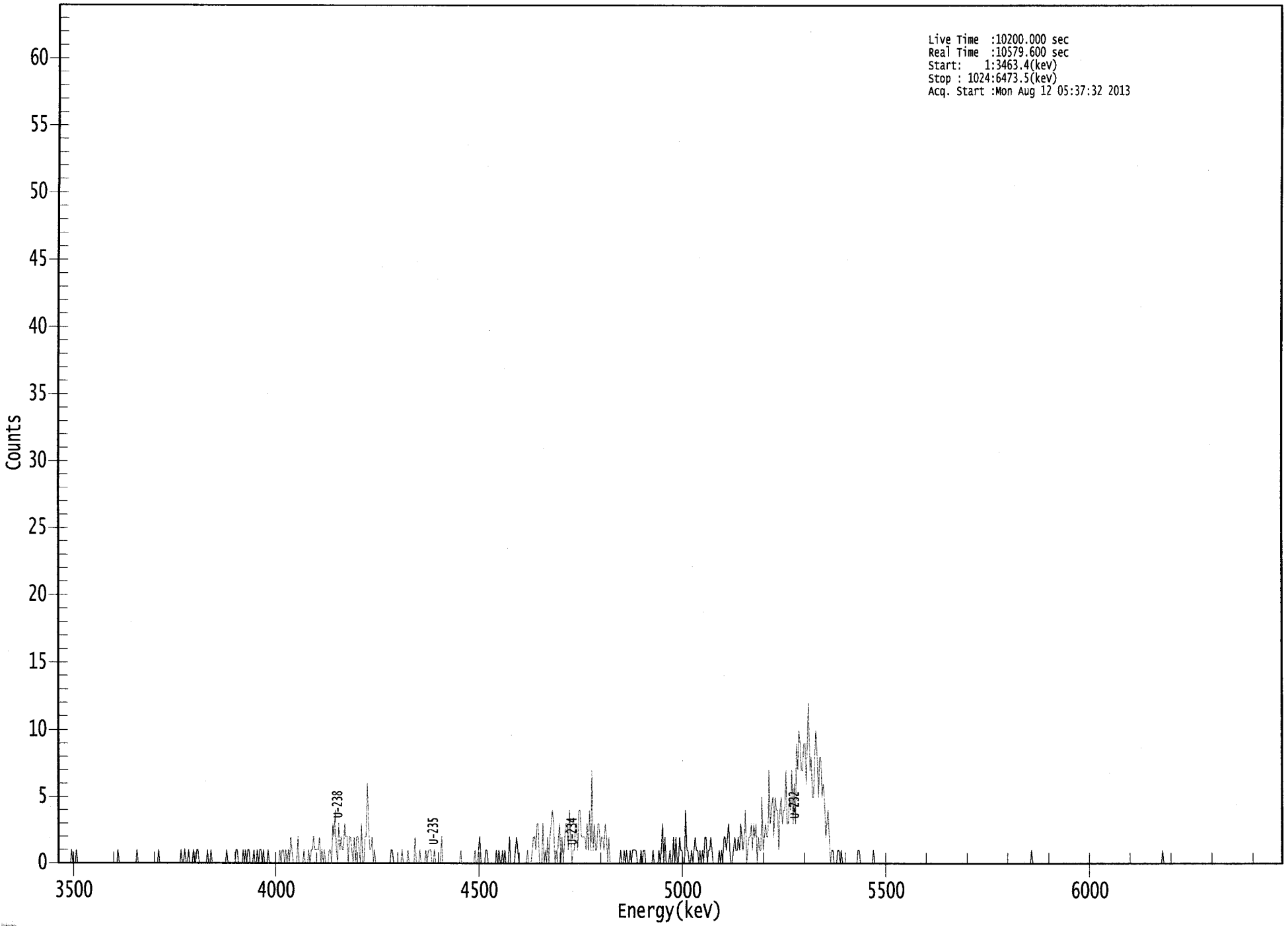
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.18E+000 +/- 6.04E-001	9.31E-002 +/- 1.09E-002
U-234	0.994	4761.50*	1.88E+000 +/- 4.00E-001	6.48E-002 +/- 7.56E-003
U-235	1.000	4385.50*	2.87E-001 +/- 1.54E-001	1.15E-001 +/- 1.34E-002
U-238	0.993	4184.40*	1.30E+000 +/- 3.16E-001	6.45E-002 +/- 7.53E-003

AG  
8/12/13

US EPA ARCHIVE DOCUMENT



Live Time :10200.000 sec  
Real Time :10579.600 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :Mon Aug 12 05:37:32 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: 03

Elapsed Live time: 10200

Elapsed Real Time: 10580

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

369: 0 1 0 0 1 0 1 0

Sample Title: 03

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

801: 0 0 0 0 0 0 0 0

Sample Title: 03

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

KB  
8/12/13

Sample Description: PZ-302-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-UU  
 Sample Identification: 04  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

Detector Name: Alpha\_048  
 Chamber Serial Number: 02030596B  
 Detector Serial Number: 83111  
 Env. Background: System Bkgd 64792  
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 9:34:57 AM  
 Acquisition Date/Time: 8/12/2013 9:40:25 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: 0.1045 +/- 0.0077  
 Counting Efficiency: 0.1680 +/- 0.0030 on 12/16/2012 5:49:20 PM  
 Chem. Recovery Factor: 0.6223 +/- 0.0473

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 5.273	202.66	13.78	0.34	0.00E+000	7.0
U-234	4.723	92.66	20.41	0.34	0.00E+000	7.4
U-235	4.421	19.83	44.23	0.17	0.00E+000	3.0
U-238	4.143	57.00	26.19	0.00	0.00E+000	7.0

T = Tracer Peak used for Effective Efficiency

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

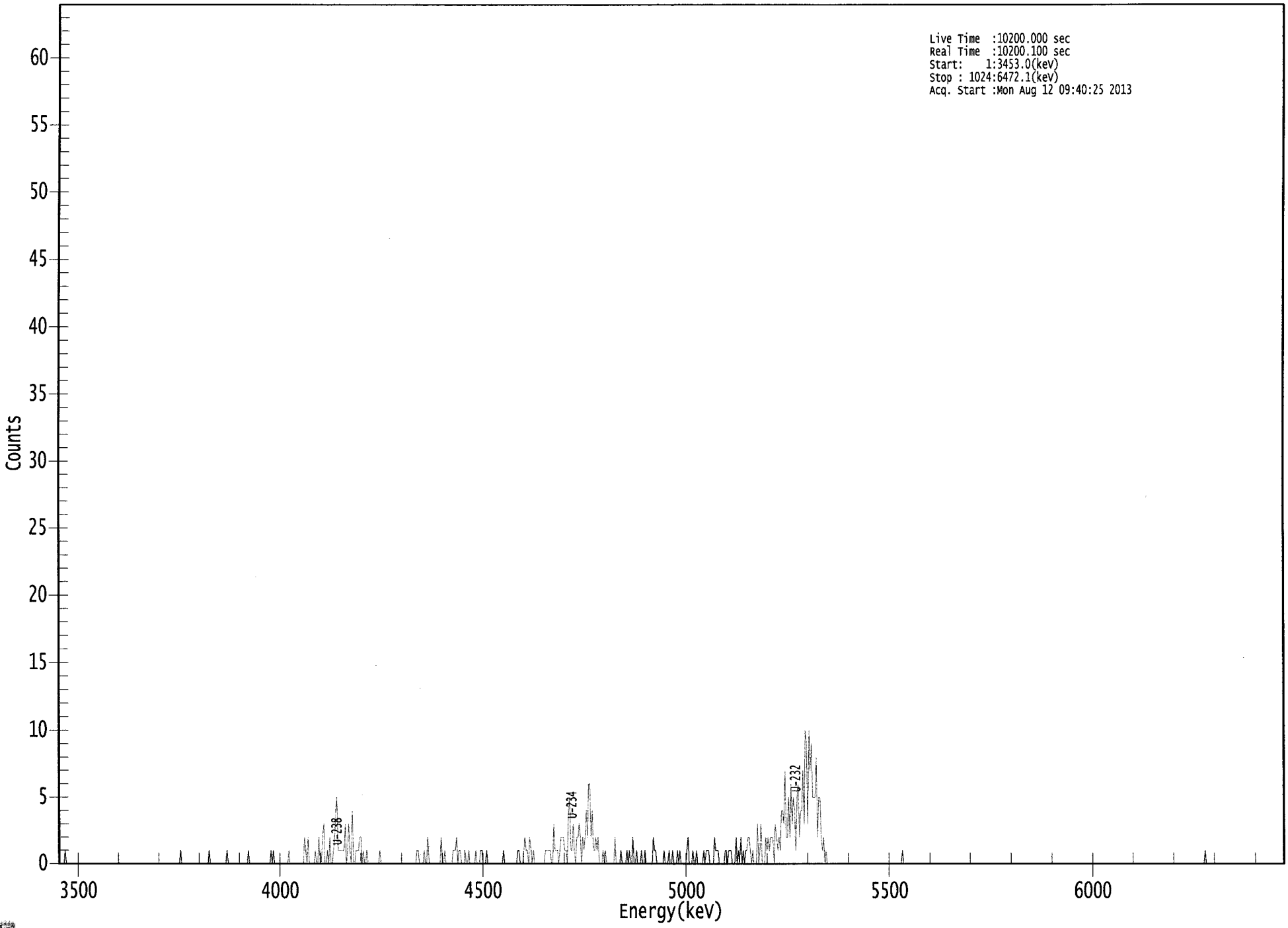
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.994	5302.50*	5.15E+000 +/- 7.47E-001	1.22E-001 +/- 1.76E-002
U-234	0.989	4761.50*	2.35E+000 +/- 5.89E-001	1.21E-001 +/- 1.76E-002
U-235	0.991	4385.50*	6.21E-001 +/- 2.89E-001	1.31E-001 +/- 1.90E-002
U-238	0.988	4184.40*	1.44E+000 +/- 4.32E-001	1.52E-001 +/- 2.20E-002

AG  
8/12/13

US EPA ARCHIVE DOCUMENT

0000065901.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3453.0(kev)  
Stop : 1024:6472.1(kev)  
Acq. Start :Mon Aug 12 09:40:25 2013



ROI Type: 1

ROI Type: 3

0117

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

Sample Title: 04

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	1	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	1	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	1	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	1	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	1
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	1	0	1	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	2	1
209:	0	2	0	0	0	0	0	1
217:	0	0	2	0	0	2	3	0
225:	0	1	0	2	0	0	1	2
233:	4	5	1	1	1	1	1	1
241:	3	0	1	3	1	0	4	0
249:	0	1	1	1	2	2	0	1
257:	0	0	1	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	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	1	1	0	0
305:	0	0	1	0	0	2	0	0
313:	0	0	0	0	0	0	0	0
321:	2	0	0	1	0	0	0	0
329:	0	0	1	1	1	2	0	1
337:	1	0	0	0	1	0	0	1
345:	0	0	0	0	0	1	0	0
353:	0	1	1	0	0	0	1	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 1 0 0 0

Sample Title: 04

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



801: 0 0 0 0 0 0 0 0

Sample Title: 04

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



C  
8/17/13

Sample Description: PZ-302-AS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 05  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/16/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:35 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.603 mL  
 Effective Efficiency: 0.1348 +/- 0.0089  
 Counting Efficiency: 0.1783 +/- 0.0033 on 1/26/2013 3:28:25 PM  
 Chem. Recovery Factor: 0.7562 +/- 0.0519

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 5.274	261.49	12.13	0.51	0.00E+000	5.4
U-234	4.726	124.66	17.58	0.34	0.00E+000	8.1
U-235	4.417	19.00	46.13	0.00	0.00E+000	2.9
U-238	4.147	71.00	23.42	0.00	0.00E+000	4.9

T = Tracer Peak used for Effective Efficiency

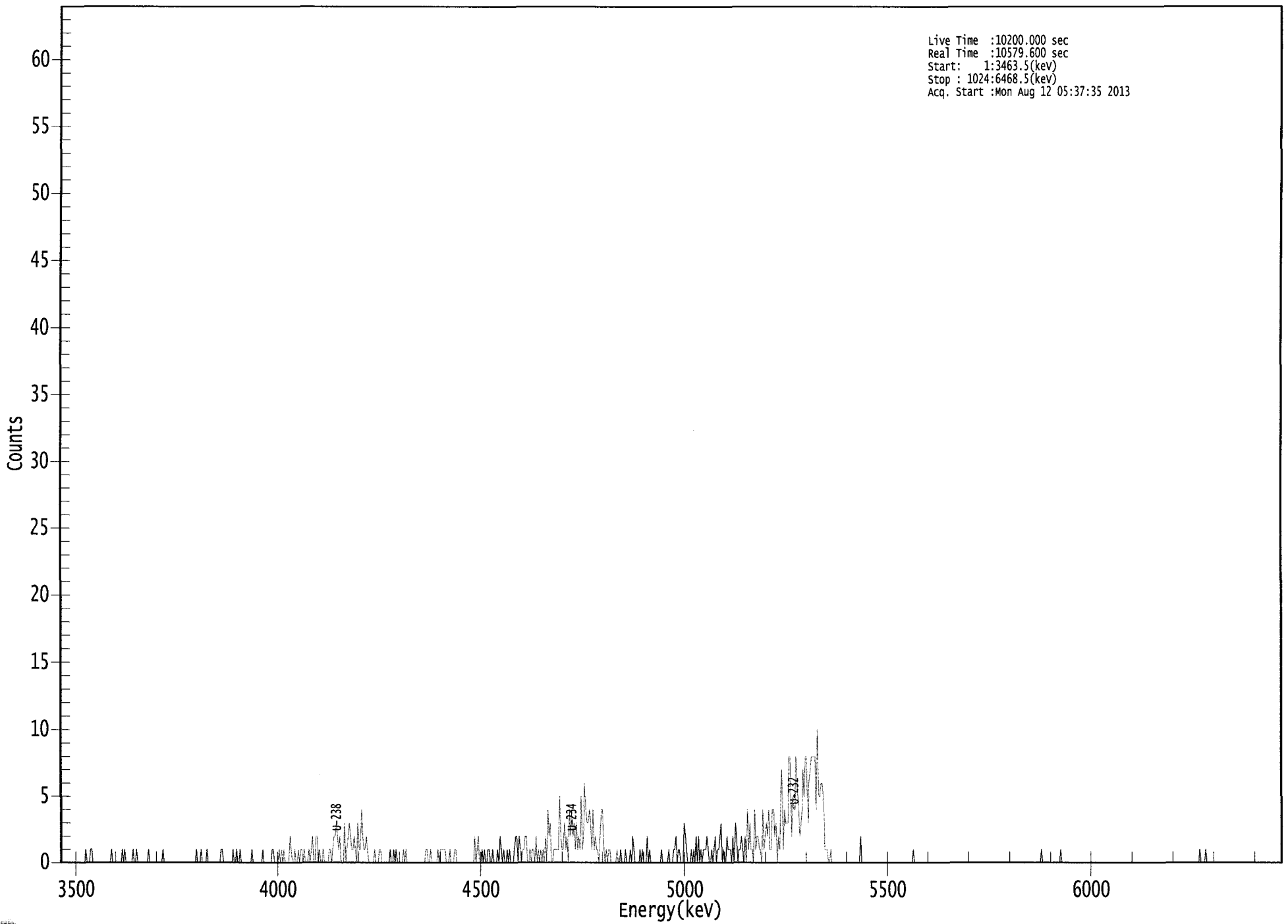
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.994	5302.50*	5.15E+000 +/- 6.67E-001	1.03E-001 +/- 1.34E-002
U-234	0.991	4761.50*	2.45E+000 +/- 5.36E-001	9.42E-002 +/- 1.22E-002
U-235	0.993	4385.50*	4.62E-001 +/- 2.21E-001	1.46E-001 +/- 1.89E-002
U-238	0.990	4184.40*	1.39E+000 +/- 3.73E-001	1.18E-001 +/- 1.52E-002

US EPA ARCHIVE DOCUMENT

000065845.CNF

Live Time :10200.000 sec  
Real Time :10579.600 sec  
Start: 1:3463.5(kev)  
Stop : 1024:6468.5(kev)  
Acq. Start :Mon Aug 12 05:37:35 2013



ROI Type: 1

ROI Type: 3

0122

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

Sample Title: 05

Elapsed Live time: 10200

Elapsed Real Time: 10580

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

369: 0 2 1 0 1 0 0 1

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	1	2	2
385:	0	2	1	0	1	1	2	2
393:	0	0	1	0	1	1	0	2
401:	0	1	0	1	0	1	0	2
409:	0	4	2	3	0	0	1	1
417:	1	1	1	5	2	1	1	3
425:	1	2	0	4	2	4	2	3
433:	1	3	1	2	1	5	1	2
441:	6	4	3	3	4	3	1	4
449:	1	2	1	1	0	2	4	4
457:	1	0	1	0	1	1	0	0
465:	0	0	0	1	0	0	1	0
473:	0	0	1	0	0	0	1	0
481:	2	1	0	0	0	0	1	0
489:	1	0	0	0	2	0	1	0
497:	0	0	0	0	0	0	0	0
505:	1	0	0	0	0	0	1	0
513:	0	0	1	1	2	0	1	1
521:	0	0	0	3	2	1	0	0
529:	0	1	0	1	0	2	0	2
537:	0	1	0	1	1	1	2	1
545:	0	0	1	0	1	2	0	1
553:	1	2	3	0	1	0	0	2
561:	1	1	1	0	2	0	3	2
569:	0	1	1	2	1	0	2	0
577:	4	1	3	1	1	0	4	1
585:	2	2	1	1	0	4	1	2
593:	3	2	4	1	1	4	4	2
601:	3	0	2	1	5	7	1	4
609:	3	3	3	8	8	2	5	4
617:	4	8	6	4	2	3	4	7
625:	5	8	8	3	6	7	8	8
633:	8	8	4	10	5	5	6	6
641:	5	1	1	1	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	2
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	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: 05

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



c  
B/mw

Sample Description: LR-100 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 06  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:37 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.600 mL  
 Effective Efficiency: 0.0371 +/- 0.0045  
 Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM  
 Chem. Recovery Factor: 0.2154 +/- 0.0263

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 5.285	71.66	23.22	0.34	0.00E+000	3.0
U-234	4.732	4.83	91.00	0.17	0.00E+000	3.0
U-235	4.397	0.00	1960.0	0.00	0.00E+000	0.0
U-238	4.173	1.66	169.38	0.34	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

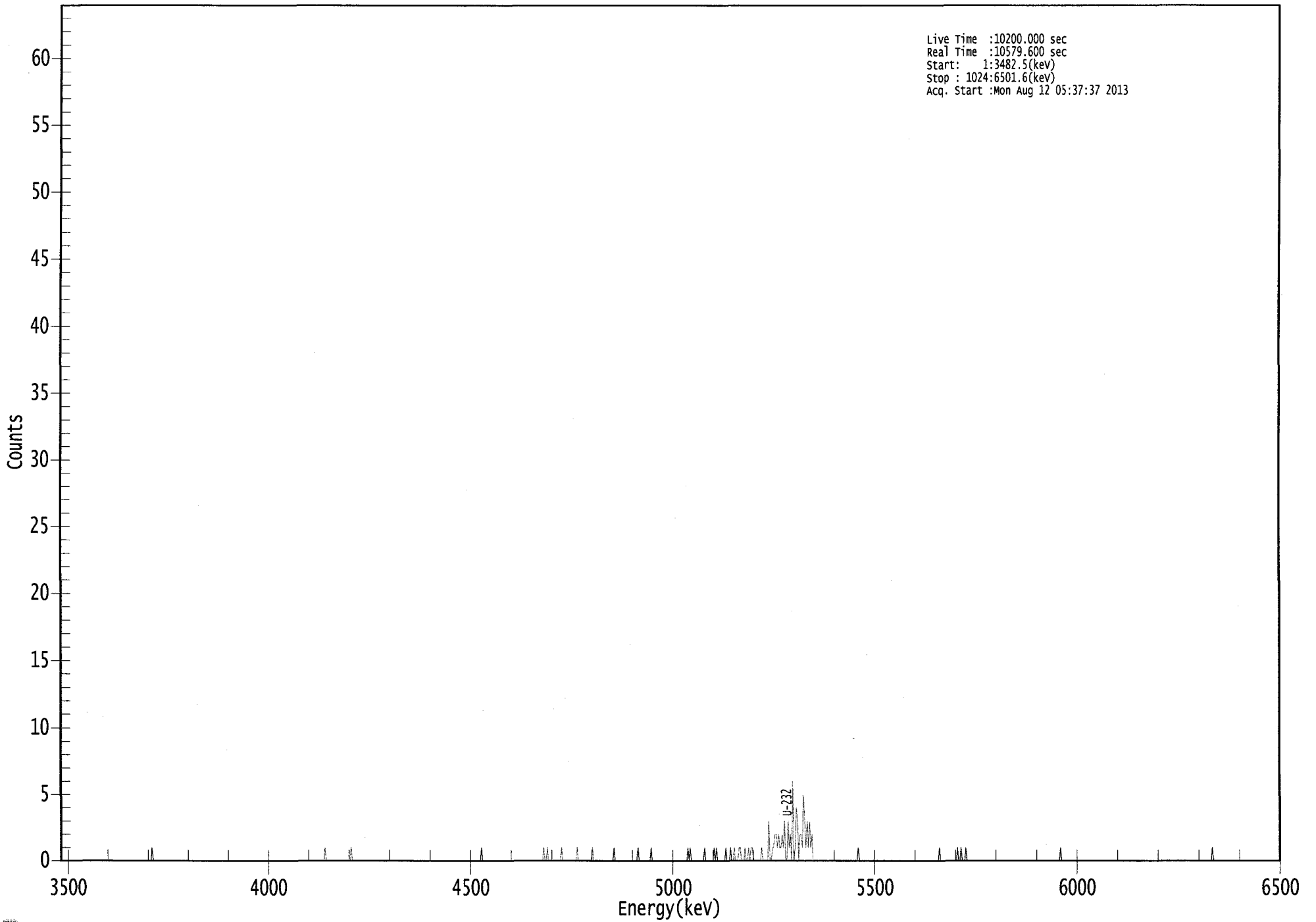
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.998	5302.50*	5.13E+000 +/- 1.21E+000	3.43E-001 +/- 8.10E-002
U-234	0.994	4761.50*	3.46E-001 +/- 3.25E-001	2.99E-001 +/- 7.07E-002
U-235	0.999	4385.50*	0.00E+000 +/- 2.45E-001	5.30E-001 +/- 1.25E-001
U-238	0.999	4184.40*	1.18E-001 +/- 2.02E-001	3.41E-001 +/- 8.06E-002

US EPA ARCHIVE DOCUMENT

0000065846.CNF

Live Time :10200.000 sec  
Real Time :10579.600 sec  
Start: 1:3482.5(kev)  
Stop : 1024:6501.6(kev)  
Acq. Start :Mon Aug 12 05:37:37 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: 10200

Elapsed Real Time: 10580

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

369: 0 0 0 0 0 0 0 0

Sample Title: 06

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	1	0
409:	0	1	0	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	1	0	0	0	0	0
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	1	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	1	0	0
489:	0	0	0	0	0	0	0	0
497:	1	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	1
529:	0	1	0	0	0	0	0	0
537:	0	0	0	0	0	1	0	0
545:	0	0	0	0	0	1	0	1
553:	0	0	0	0	0	0	0	1
561:	0	0	0	1	0	0	1	0
569:	0	0	1	1	0	0	0	1
577:	0	0	1	0	1	1	0	0
585:	0	0	0	0	0	1	0	0
593:	0	0	0	3	0	0	1	1
601:	2	2	1	2	1	1	2	1
609:	3	0	0	3	1	2	0	6
617:	0	1	4	3	0	2	2	1
625:	5	3	1	3	1	3	1	2
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	1	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	1	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	1	0	0	1	0	0	0
761:	1	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 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	1
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



C  
8/12/13

Sample Description: LR-100 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 07  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:38 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.601 mL  
 Effective Efficiency: 0.0508 +/- 0.0053  
 Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM  
 Chem. Recovery Factor: 0.2587 +/- 0.0272

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	98.32	19.85	0.68	0.00E+000	3.3
U-234	4.752	7.32	76.28	0.68	0.00E+000	3.0
U-235	4.392	4.83	91.00	0.17	0.00E+000	3.0
U-238	4.115	1.49	190.02	0.51	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

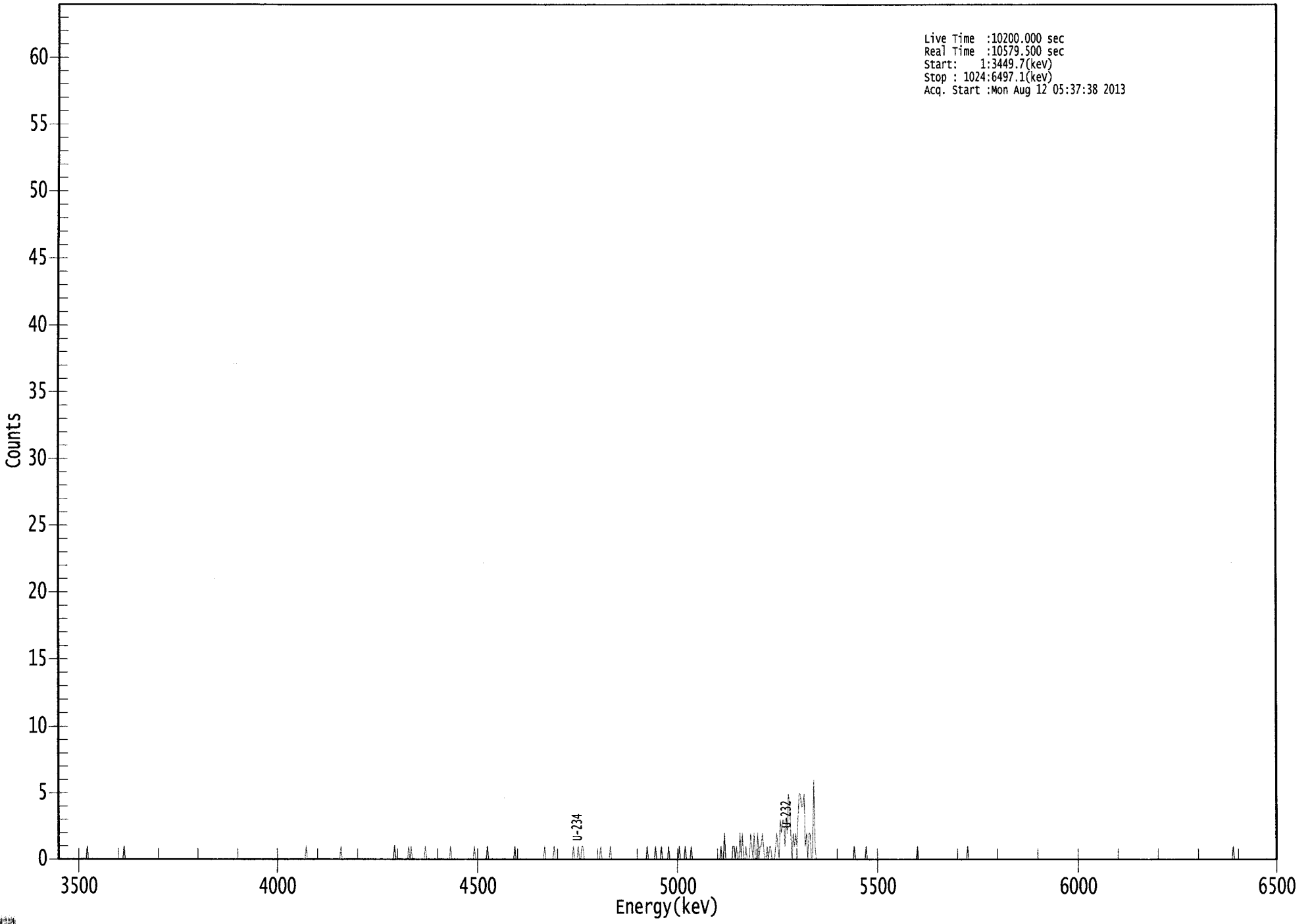
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.994	5302.50*	5.14E+000 +/- 1.05E+000	2.95E-001 +/- 6.00E-002
U-234	0.999	4761.50*	3.82E-001 +/- 3.02E-001	2.95E-001 +/- 6.00E-002
U-235	1.000	4385.50*	3.11E-001 +/- 2.90E-001	2.69E-001 +/- 5.47E-002
U-238	0.967	4184.40*	7.75E-002 +/- 1.48E-001	2.73E-001 +/- 5.55E-002

US EPA ARCHIVE DOCUMENT

0000065847.CNF

Live Time :10200.000 sec  
Real Time :10579.500 sec  
Start: 1:3449.7(keV)  
Stop : 1024:6497.1(keV)  
Acq. Start :Mon Aug 12 05:37:38 2013



ROI Type: 1

ROI Type: 3

25  
100

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

Sample Title: 07

Elapsed Live time: 10200  
 Elapsed Real Time: 10580

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:	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	1
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	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	1	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	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	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	0
289:	0	0	0	0	0	0	0	1
297:	0	1	0	0	0	0	0	0
305:	0	0	0	0	0	1	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	1	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	1	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 0 0 0

Sample Title: 07

Channel								
377:	0	0	0	0	0	0	0	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	0	0	0
409:	0	1	0	0	0	0	0	0
417:	0	1	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	1	0	0	0	1	0	0
441:	1	1	0	0	0	0	0	0
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	0	0
489:	0	0	0	0	0	0	0	1
497:	0	0	0	0	0	0	1	0
505:	0	0	0	1	0	0	0	0
513:	0	1	0	0	0	0	0	0
521:	0	0	1	0	0	0	0	1
529:	0	0	0	0	1	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	1	0	0
561:	2	0	0	0	0	0	0	1
569:	1	0	1	0	0	2	0	2
577:	0	0	1	0	0	0	2	1
585:	0	2	0	0	2	0	1	1
593:	2	1	0	0	1	0	1	1
601:	0	0	0	1	2	1	0	3
609:	2	3	3	1	3	2	5	4
617:	2	0	2	1	2	1	3	5
625:	5	4	4	5	1	2	0	2
633:	2	0	0	6	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	1	0	0
673:	0	0	0	0	0	0	0	1
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	1	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	1	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 07

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





C  
8/12/13

Sample Description: D-81 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:40 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.604 mL  
 Effective Efficiency: 0.1068 +/- 0.0078  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Chem. Recovery Factor: 0.5619 +/- 0.0423

Peak Match Tolerance: 0.150 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.277	207.49	13.63	0.51	0.00E+000	10.9
U-234	4.735	66.66	24.08	0.34	0.00E+000	4.3
U-235	4.393	23.83	40.32	0.17	0.00E+000	3.0
U-238	4.149	56.00	26.42	0.00	0.00E+000	3.0

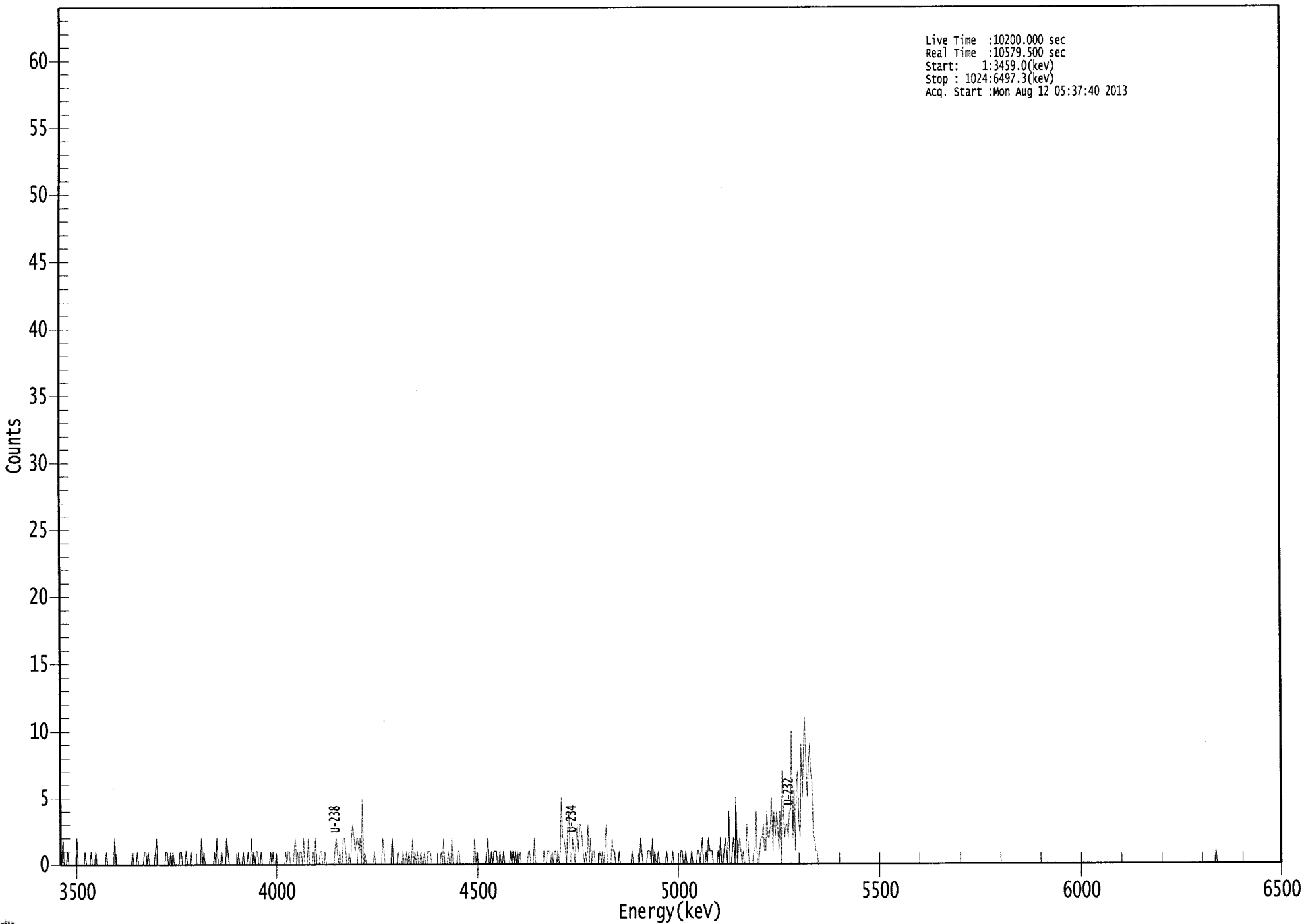
T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
U-232	0.995	5302.50*	5.16E+000 +/- 7.41E-001	1.31E-001 +/- 1.87E-002
U-234	0.995	4761.50*	1.66E+000 +/- 4.65E-001	1.19E-001 +/- 1.71E-002
U-235	1.000	4385.50*	7.31E-001 +/- 3.13E-001	1.28E-001 +/- 1.84E-002
U-238	0.991	4184.40*	1.39E+000 +/- 4.17E-001	1.48E-001 +/- 2.13E-002

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10579.500 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Mon Aug 12 05:37:40 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: 08

Elapsed Live time: 10200

Elapsed Real Time: 10580

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

369: 0 1 0 0 1 0 0 0

Sample Title: 08

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

Sample Description: D-81 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:42 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.602 mL  
 Effective Efficiency: 0.1182 +/- 0.0083  
 Counting Efficiency: 0.1917 +/- 0.0033 on 8/10/2013 2:59:03 PM  
 Chem. Recovery Factor: 0.6166 +/- 0.0445

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	5.276	228.83	12.96	0.17	0.00E+000	8.4
U-234	4.730	93.64	20.43	1.36	0.00E+000	4.0
U-235	4.406	46.32	29.04	0.68	0.00E+000	3.7
U-238	4.146	80.47	22.09	1.53	0.00E+000	6.5

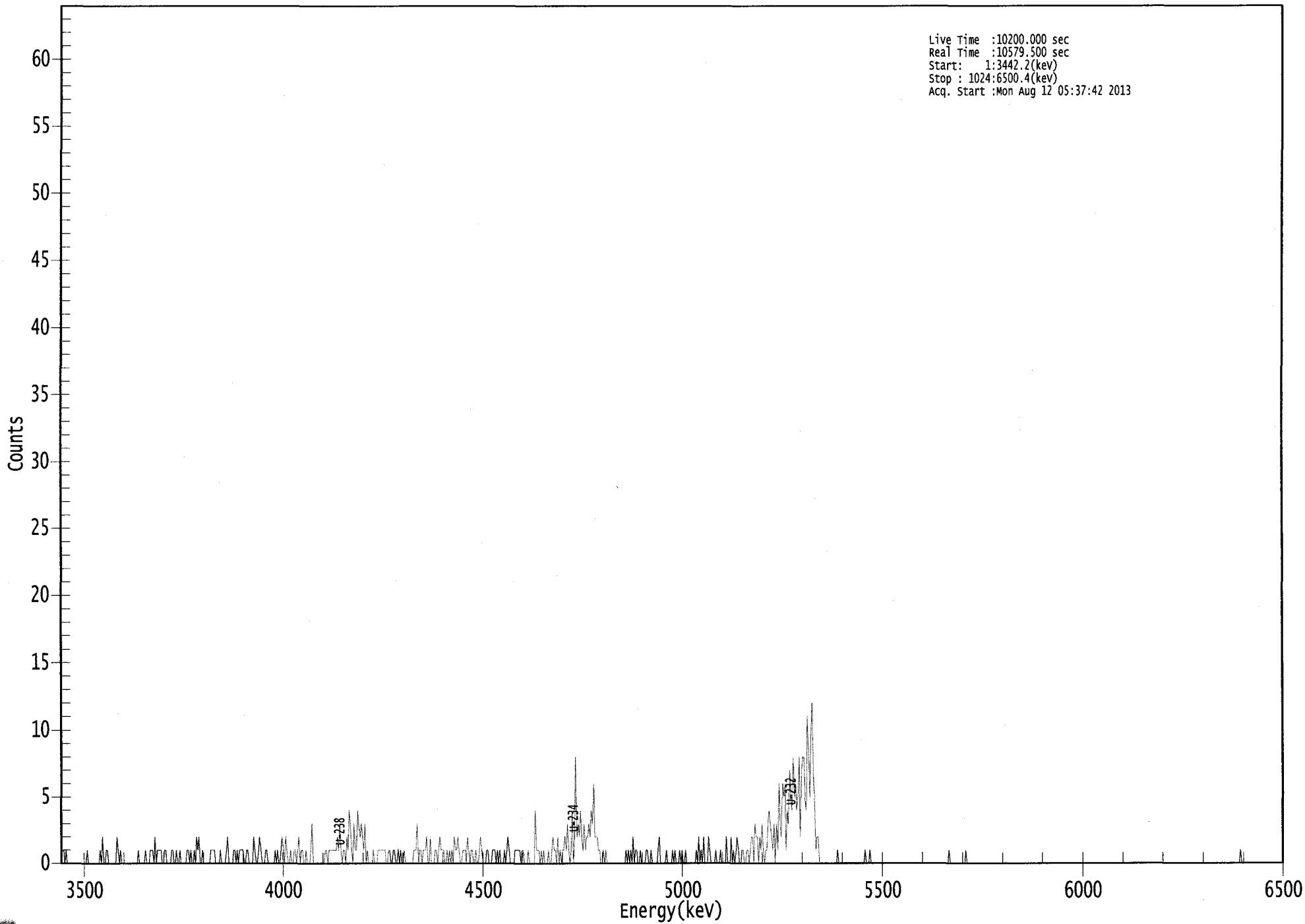
T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.995	5302.50*	5.14E+000 +/- 7.06E-001	9.38E-002 +/- 1.29E-002
U-234	0.993	4761.50*	2.10E+000 +/- 5.18E-001	1.54E-001 +/- 2.11E-002
U-235	0.997	4385.50*	1.28E+000 +/- 4.12E-001	1.56E-001 +/- 2.15E-002
U-238	0.989	4184.40*	1.80E+000 +/- 4.68E-001	1.59E-001 +/- 2.18E-002

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10579.500 sec  
Start: 1:3442.2(kev)  
Stop : 1024:6500.4(kev)  
Acq. Start :Mon Aug 12 05:37:42 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: 10580

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



369: 1 0 0 0 1 0 1 2

Sample Title: 09

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

801: 0 0 0 0 0 0 0 0

Sample Title: 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	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	1	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

*8/12/13*

Sample Description: PZ-204-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:43 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.602 mL  
 Effective Efficiency: 0.1639 +/- 0.0099  
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM  
 Chem. Recovery Factor: 0.8876 +/- 0.0560

Peak Match Tolerance: 0.150 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.279	317.49	11.01	0.51	0.00E+000	5.2
U-234	4.724	175.66	14.81	0.34	0.00E+000	12.3
U-235	4.424	22.00	42.73	0.00	0.00E+000	3.0
U-238	4.154	106.98	19.06	1.02	0.00E+000	4.0

T = Tracer Peak used for Effective Efficiency

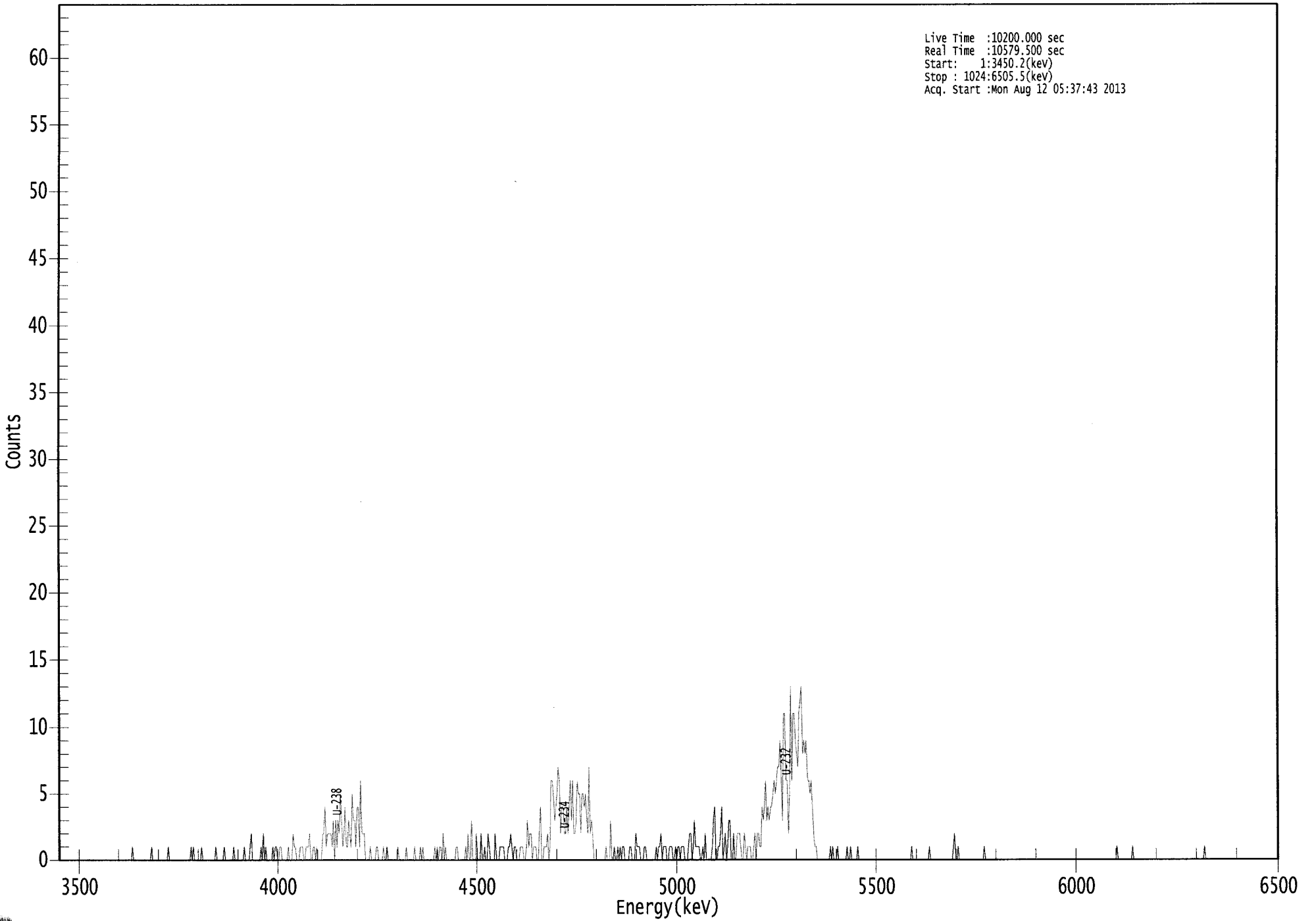
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
 -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.15E+000 +/- 6.13E-001	8.51E-002 +/- 1.01E-002
U-234	0.990	4761.50*	2.85E+000 +/- 5.41E-001	7.75E-002 +/- 9.22E-003
U-235	0.989	4385.50*	4.40E-001 +/- 1.95E-001	1.20E-001 +/- 1.43E-002
U-238	0.993	4184.40*	1.73E+000 +/- 3.88E-001	1.02E-001 +/- 1.21E-002

US EPA ARCHIVE DOCUMENT

000065851.CNF

Live Time :10200.000 sec  
Real Time :10579.500 sec  
Start: 1:3450.2(kev)  
Stop : 1024:6505.5(kev)  
Acq. Start :Mon Aug 12 05:37:43 2013



ROI Type: 1

ROI Type: 3

2710

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

Sample Title: 10

Elapsed Live time: 10200

Elapsed Real Time: 10580

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

369: 0 0 0 1 1 1 1 0

Sample Title: 10

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

801: 0 0 0 0 0 0 0 0

Sample Title: 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:	1	0	0	0	0	0	0	0
897:	0	0	0	0	0	1	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	1	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	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*  
*8/12/13*

Sample Description: PZ-204-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:45 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.602 mL  
 Effective Efficiency: 0.1724 +/- 0.0102  
 Counting Efficiency: 0.2003 +/- 0.0035 on 8/11/2013 2:21:17 PM  
 Chem. Recovery Factor: 0.8608 +/- 0.0533

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	334.00	10.74	0.00	0.00E+000	39.5
U-234	4.729	157.00	15.69	0.00	0.00E+000	8.9
U-235	4.383	15.00	52.27	0.00	0.00E+000	3.0
U-238	4.147	98.00	19.90	0.00	0.00E+000	6.6

T = Tracer Peak used for Effective Efficiency

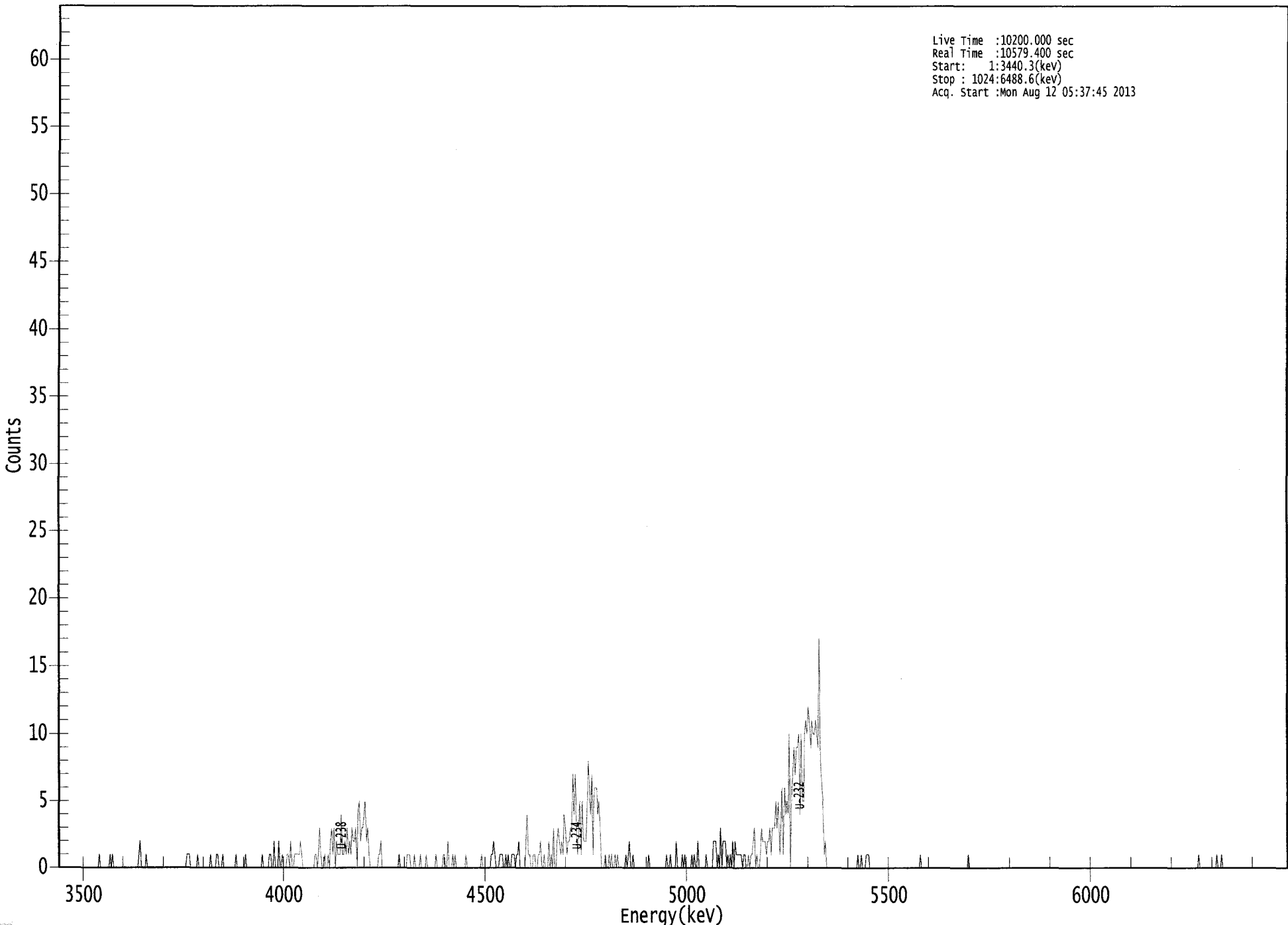
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.15E+000 +/- 6.00E-001	9.24E-002 +/- 1.08E-002
U-234	0.993	4761.50*	2.42E+000 +/- 4.73E-001	9.23E-002 +/- 1.08E-002
U-235	1.000	4385.50*	2.85E-001 +/- 1.53E-001	1.14E-001 +/- 1.33E-002
U-238	0.990	4184.40*	1.50E+000 +/- 3.46E-001	9.19E-002 +/- 1.07E-002

US EPA ARCHIVE DOCUMENT



Live Time :10200.000 sec  
Real Time :10579.400 sec  
Start: 1:3440.3(keV)  
Stop : 1024:6488.6(keV)  
Acq. Start :Mon Aug 12 05:37:45 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: 11

Elapsed Live time: 10200

Elapsed Real Time: 10579

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

369: 1 1 1 0 0 1 0 1

Sample Title: 11

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

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

*8/12/13*

Sample Description: LR-103 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:47 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 176.3 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.601 mL  
 Effective Efficiency: 0.0734 +/- 0.0064  
 Counting Efficiency: 0.1920 +/- 0.0033 on 8/11/2013 2:17:37 PM  
 Chem. Recovery Factor: 0.3824 +/- 0.0340

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 5.256	142.00	16.51	0.00	0.00E+000	4.7
U-234	4.709	22.83	41.20	0.17	0.00E+000	3.0
U-235	4.385	11.83	57.46	0.17	0.00E+000	3.0
U-238	4.143	17.83	46.68	0.17	0.00E+000	3.0

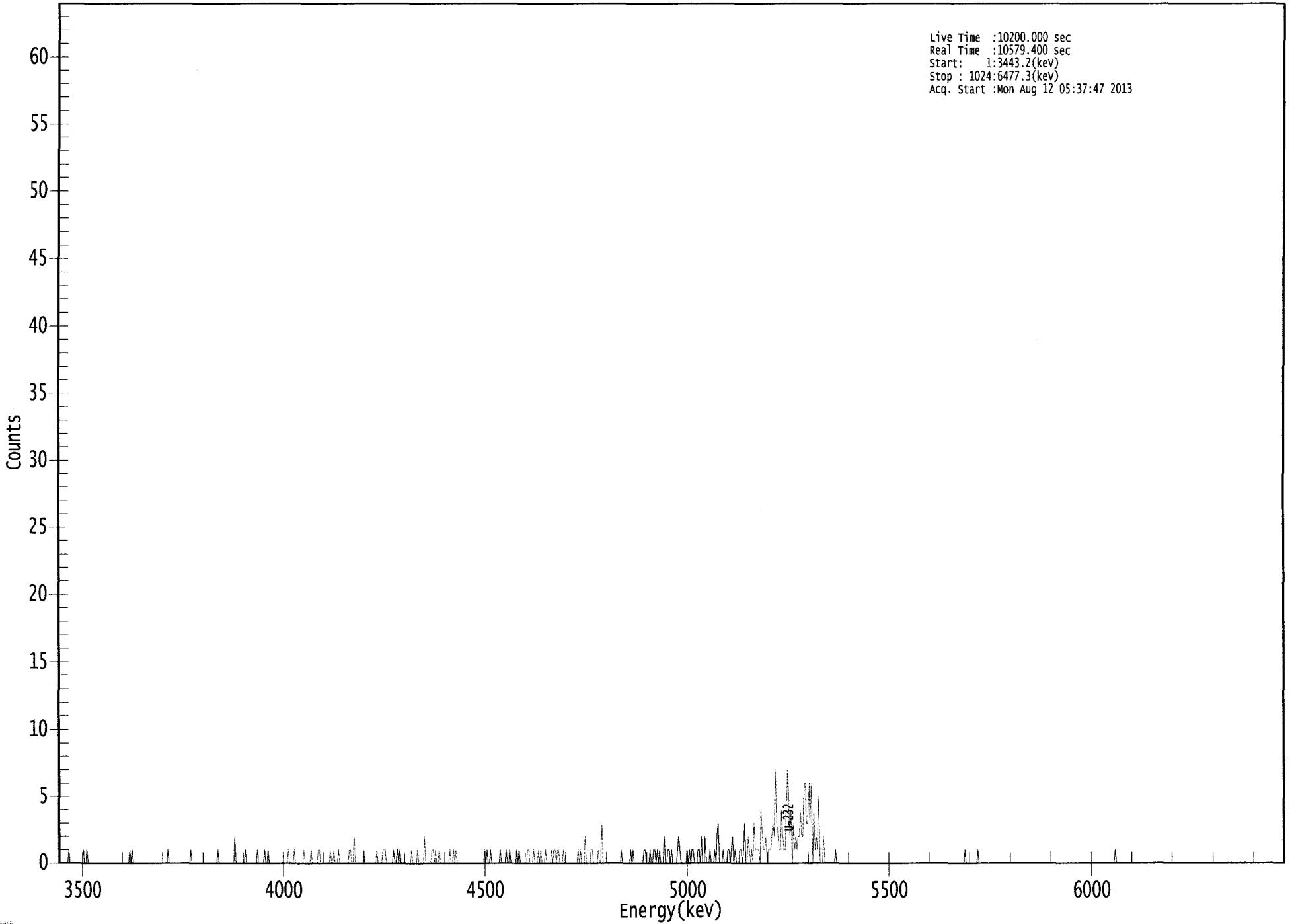
T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.985	5302.50*	5.14E+000 +/- 8.79E-001	2.17E-001 +/- 3.71E-002
U-234	0.981	4761.50*	8.26E-001 +/- 3.68E-001	1.51E-001 +/- 2.58E-002
U-235	1.000	4385.50*	5.28E-001 +/- 3.16E-001	1.86E-001 +/- 3.19E-002
U-238	0.988	4184.40*	6.42E-001 +/- 3.19E-001	1.50E-001 +/- 2.57E-002

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10579.400 sec  
Start: 1:3443.2(keV)  
Stop : 1024:6477.3(keV)  
Acq. Start :Mon Aug 12 05:37:47 2013



ROI Type: 1

ROI Type: 3

2013

\*\*\*\*\*  
 \*\*\*\*\* 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: 10579

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	1	0	0	0	0	0	0	0
17:	0	0	0	0	1	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	1	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	1	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	1	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	2	0	0	0	0
153:	0	0	0	0	1	0	0	0
161:	0	0	0	0	0	0	1	0
169:	0	0	0	0	1	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	0	1	0	0
201:	0	0	0	0	0	1	0	0
209:	0	0	0	1	0	0	0	0
217:	0	1	1	0	0	0	0	0
225:	0	0	0	1	0	0	1	0
233:	0	0	1	0	0	0	0	0
241:	0	0	0	1	1	0	0	2
249:	0	0	0	0	0	0	0	1
257:	0	0	0	0	0	0	0	0
265:	0	0	1	0	0	0	0	1
273:	1	1	0	0	0	0	0	0
281:	1	0	0	1	0	1	0	0
289:	0	0	0	0	0	0	0	1
297:	0	0	0	0	1	0	0	0
305:	0	0	2	0	0	0	0	0
313:	1	1	0	1	0	0	1	0
321:	0	0	0	0	0	0	0	1
329:	0	0	1	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	1	0	1	0
361:	0	1	0	0	0	0	0	0

369: 0 1 0 0 0 0 1 0

Sample Title: 12

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	1	0	0	0	0	0	1
385:	0	1	0	0	0	0	0	0
393:	1	1	0	0	0	1	0	0
401:	0	1	0	1	0	0	0	1
409:	0	0	0	0	1	0	1	1
417:	0	1	1	0	0	0	1	0
425:	0	0	0	0	0	0	0	0
433:	0	0	1	0	1	0	0	0
441:	2	0	0	0	0	1	1	0
449:	0	0	0	1	0	0	3	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	1	0
473:	0	0	0	0	0	0	1	0
481:	1	0	0	0	0	0	0	0
489:	0	1	1	0	0	0	1	0
497:	0	1	1	0	1	0	1	0
505:	0	0	2	0	0	1	1	0
513:	1	0	0	0	0	1	2	1
521:	0	0	0	0	0	1	0	1
529:	0	1	1	0	0	0	1	1
537:	0	2	0	0	2	0	0	0
545:	1	0	0	0	1	0	2	3
553:	0	0	0	1	0	0	0	1
561:	1	0	1	2	0	1	0	0
569:	0	1	1	0	1	3	0	0
577:	2	1	0	1	0	3	1	1
585:	1	1	0	4	2	1	1	2
593:	0	1	1	1	2	3	2	7
601:	3	2	1	1	4	2	1	1
609:	4	7	5	2	4	0	3	1
617:	2	1	2	2	4	2	2	6
625:	6	3	3	6	3	6	0	4
633:	1	2	1	5	0	0	0	2
641:	0	0	0	0	0	0	0	0
649:	0	1	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	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	1	0	0
761:	0	0	0	0	0	0	0	0
769:	1	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	1	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	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

*John*

Sample Description: LR-103 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:49 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.598 mL  
 Effective Efficiency: 0.1100 +/- 0.0080  
 Counting Efficiency: 0.1909 +/- 0.0033 on 7/20/2013 2:31:26 PM  
 Chem. Recovery Factor: 0.5762 +/- 0.0430

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	5.281	211.66	13.48	0.34	0.00E+000	9.0
U-234		4.774	7.66	72.63	0.34	0.00E+000	3.0
U-235		4.411	4.00	109.57	0.00	0.00E+000	3.0
U-238		4.140	5.66	85.23	0.34	0.00E+000	3.0

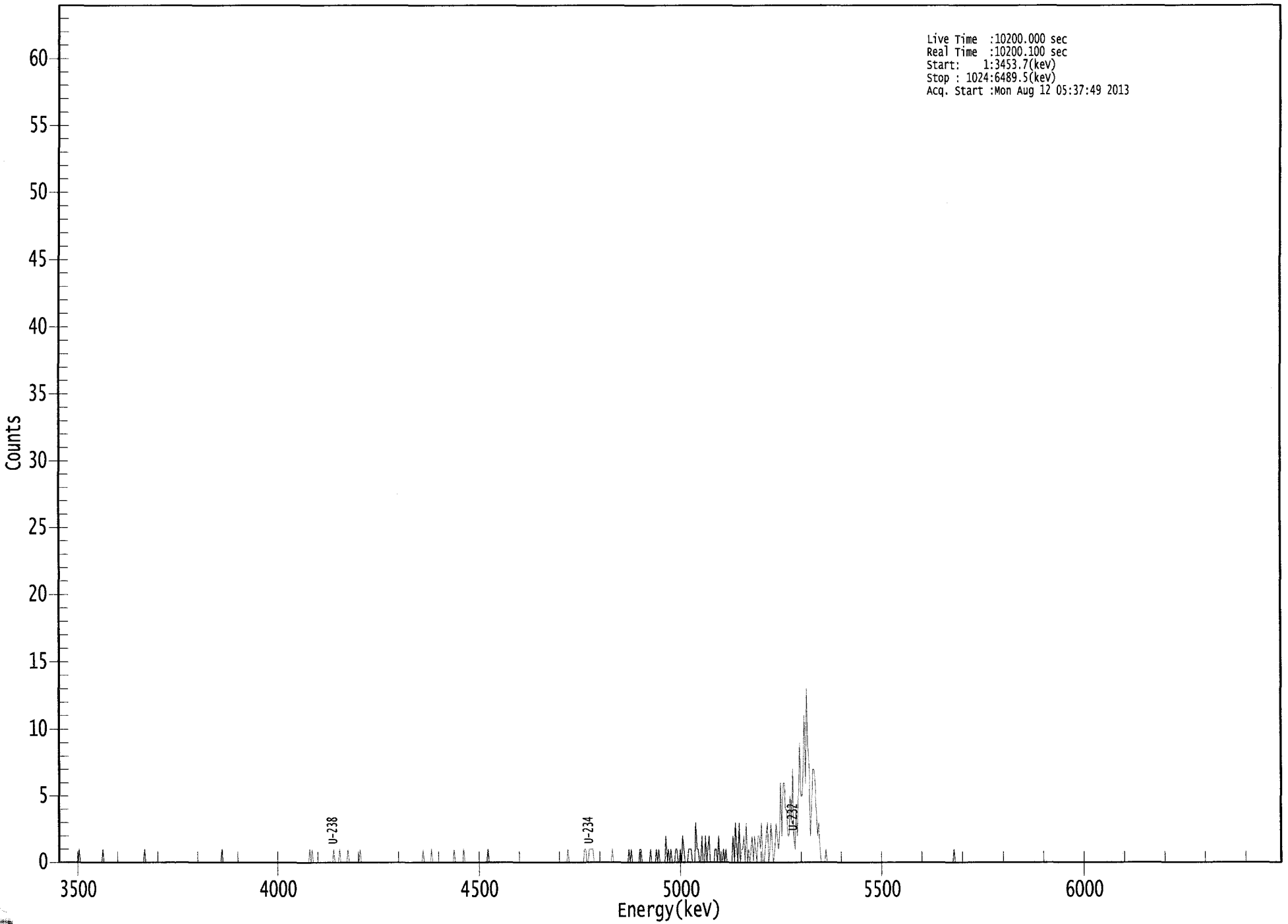
T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.11E+000 +/- 7.27E-001	1.15E-001 +/- 1.64E-002
U-234	0.999	4761.50*	1.85E-001 +/- 1.37E-001	1.15E-001 +/- 1.64E-002
U-235	0.995	4385.50*	1.19E-001 +/- 1.32E-001	1.79E-001 +/- 2.54E-002
U-238	0.986	4184.40*	1.36E-001 +/- 1.18E-001	1.15E-001 +/- 1.63E-002

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3453.7(kev)  
Stop : 1024:6489.5(kev)  
Acq. Start :Mon Aug 12 05:37:49 2013



ROI Type: 1

ROI Type: 3

0162

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

Sample Title: 13

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	1	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	1	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	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	1	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	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	1	0	1	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	1	0	0	0
241:	0	0	0	1	0	0	0	0
249:	0	0	0	0	0	1	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	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	1	0	0	0	0	0
313:	0	1	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	1	0	0	0
345:	0	0	0	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 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:	0	0	0	0	0	0	0	0	0
393:	0	0	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	0	0
425:	0	0	0	1	0	0	0	0	0
433:	0	0	0	0	0	0	0	0	0
441:	0	1	1	0	0	1	1	1	1
449:	1	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0	0
465:	1	0	0	0	0	0	0	1	0
473:	0	0	0	0	0	0	0	1	0
481:	1	0	0	0	0	0	0	0	1
489:	1	0	0	0	0	0	0	0	0
497:	1	0	0	0	0	1	0	0	1
505:	0	0	0	0	0	2	0	1	1
513:	0	1	0	0	0	1	1	1	0
521:	0	1	0	2	1	0	0	0	1
529:	1	1	1	0	0	0	3	2	1
537:	1	0	0	2	0	0	2	0	0
545:	1	2	0	0	0	0	1	1	1
553:	0	2	0	0	0	1	0	0	1
561:	0	0	0	0	0	2	0	3	3
569:	1	0	3	0	1	1	2	0	0
577:	3	0	1	0	1	2	0	2	2
585:	1	0	2	2	1	3	0	0	0
593:	1	2	3	0	1	3	1	0	0
601:	1	3	2	1	2	6	2	6	6
609:	6	4	4	2	2	5	3	7	7
617:	2	1	4	2	5	9	5	5	5
625:	7	11	6	13	9	7	2	4	4
633:	7	7	6	4	2	3	1	0	0
641:	0	0	0	1	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	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	1	0	0
753:	0	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0	0
769:	0	0	0	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: 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



8/17/13

Sample Description: PZ-111-KS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:51 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.599 mL  
 Effective Efficiency: 0.1395 +/- 0.0091  
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM  
 Chem. Recovery Factor: 0.7794 +/- 0.0527

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	5.270	269.00	11.97	0.00	0.00E+000	23.9
U-234	4.715	368.83	10.21	0.17	0.00E+000	28.7
U-235	4.408	34.83	33.31	0.17	0.00E+000	3.7
U-238	4.139	127.00	17.46	0.00	0.00E+000	5.4

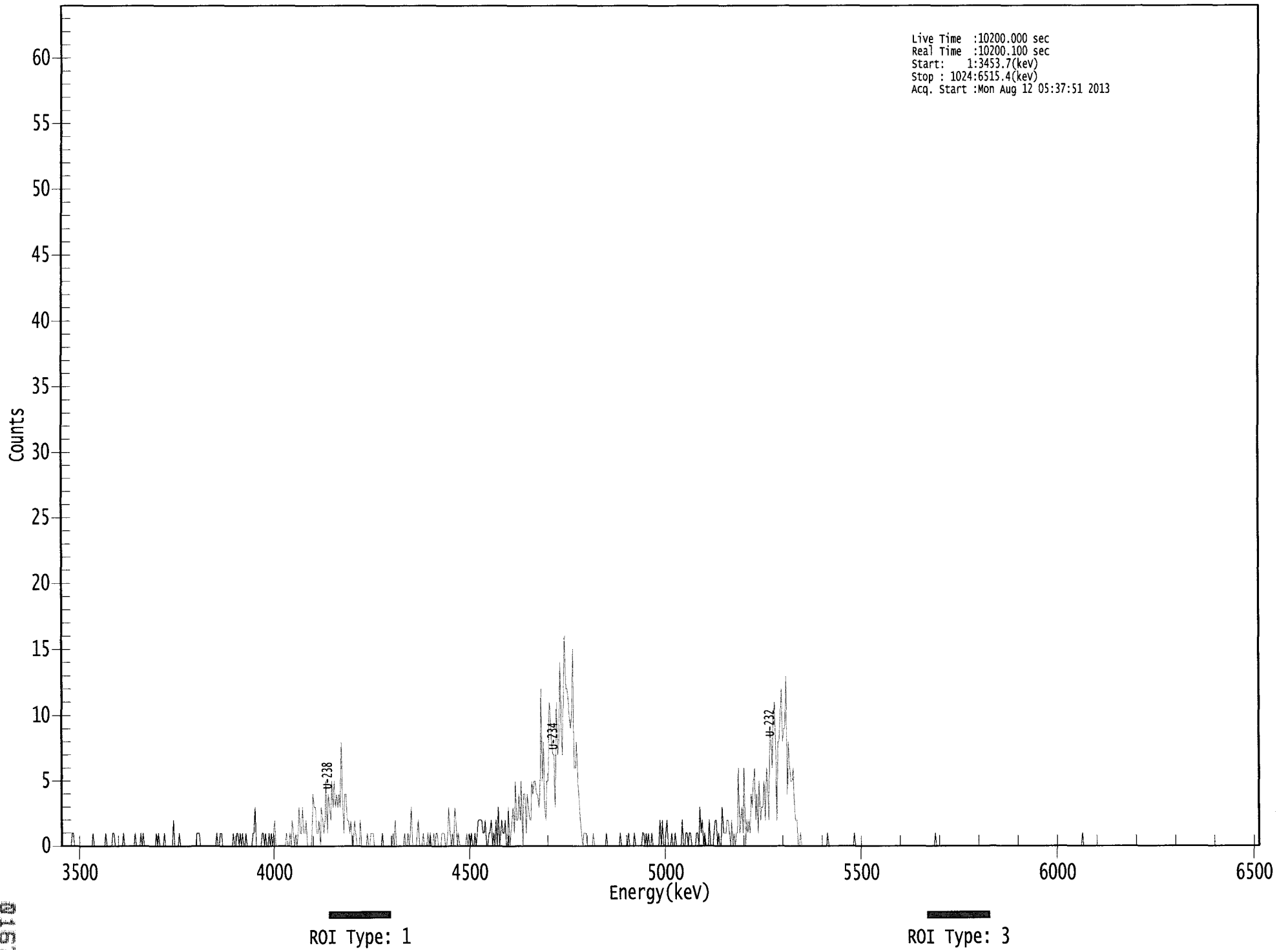
T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.992	5302.50*	5.12E+000 +/- 6.56E-001	1.14E-001 +/- 1.46E-002
U-234	0.985	4761.50*	7.02E+000 +/- 1.15E+000	7.95E-002 +/- 1.02E-002
U-235	0.996	4385.50*	8.18E-001 +/- 2.92E-001	9.80E-002 +/- 1.25E-002
U-238	0.986	4184.40*	2.41E+000 +/- 5.21E-001	1.14E-001 +/- 1.45E-002

US EPA ARCHIVE DOCUMENT

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3453.7(keV)  
Stop : 1024:6515.4(keV)  
Acq. Start :Mon Aug 12 05:37:51 2013





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

369: 2 0 1 0 2 0 3 0

Sample Title: 14

Channel	1	2	3	4	5	6	7	8
377:	1	2	1	1	2	0	0	3
385:	0	1	2	3	1	5	2	2
393:	4	2	5	0	4	4	1	4
401:	3	2	2	5	4	5	5	4
409:	4	3	4	12	5	8	3	2
417:	5	5	11	10	8	7	7	3
425:	11	7	8	14	9	7	12	16
433:	12	12	11	10	9	10	15	6
441:	6	8	5	4	2	1	0	1
449:	1	1	0	0	0	0	0	1
457:	0	0	0	0	0	0	0	0
465:	0	0	1	0	0	0	0	0
473:	0	0	0	0	0	0	1	0
481:	0	0	0	0	0	1	0	0
489:	0	0	1	0	0	0	0	0
497:	0	1	1	0	1	0	1	0
505:	0	1	0	0	0	0	0	0
513:	2	0	2	0	0	1	2	0
521:	0	0	1	0	0	1	0	0
529:	0	0	0	2	0	0	1	1
537:	0	1	1	0	0	0	0	0
545:	1	0	3	1	2	0	1	2
553:	0	0	2	0	0	0	1	1
561:	2	0	1	0	0	3	1	1
569:	1	2	2	1	0	2	0	1
577:	0	1	1	6	1	2	3	1
585:	6	0	2	1	2	1	4	3
593:	5	6	2	4	1	5	2	3
601:	3	5	2	6	5	2	9	8
609:	6	10	11	8	2	8	8	10
617:	12	8	9	9	13	4	8	6
625:	5	5	6	3	2	2	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	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	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	0
745:	0	0	0	1	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	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	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	1	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	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



*c*  
*8/12*

Sample Description: PZ-111-KS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000658  
 Batch Identification: 1307149A-UU  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: U iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:22:35 AM  
 Acquisition Date/Time: 8/12/2013 5:37:53 AM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232\_UU-10A  
 Tracer Quantity: 0.599 mL  
 Effective Efficiency: 0.1026 +/- 0.0077  
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM  
 Chem. Recovery Factor: 0.5631 +/- 0.0432

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 5.260	197.83	13.94	0.17	0.00E+000	5.3
U-234	4.716	314.83	11.05	0.17	0.00E+000	10.8
U-235	4.428	31.00	35.77	0.00	0.00E+000	3.7
U-238	4.133	134.66	16.92	0.34	0.00E+000	3.4

T = Tracer Peak used for Effective Efficiency

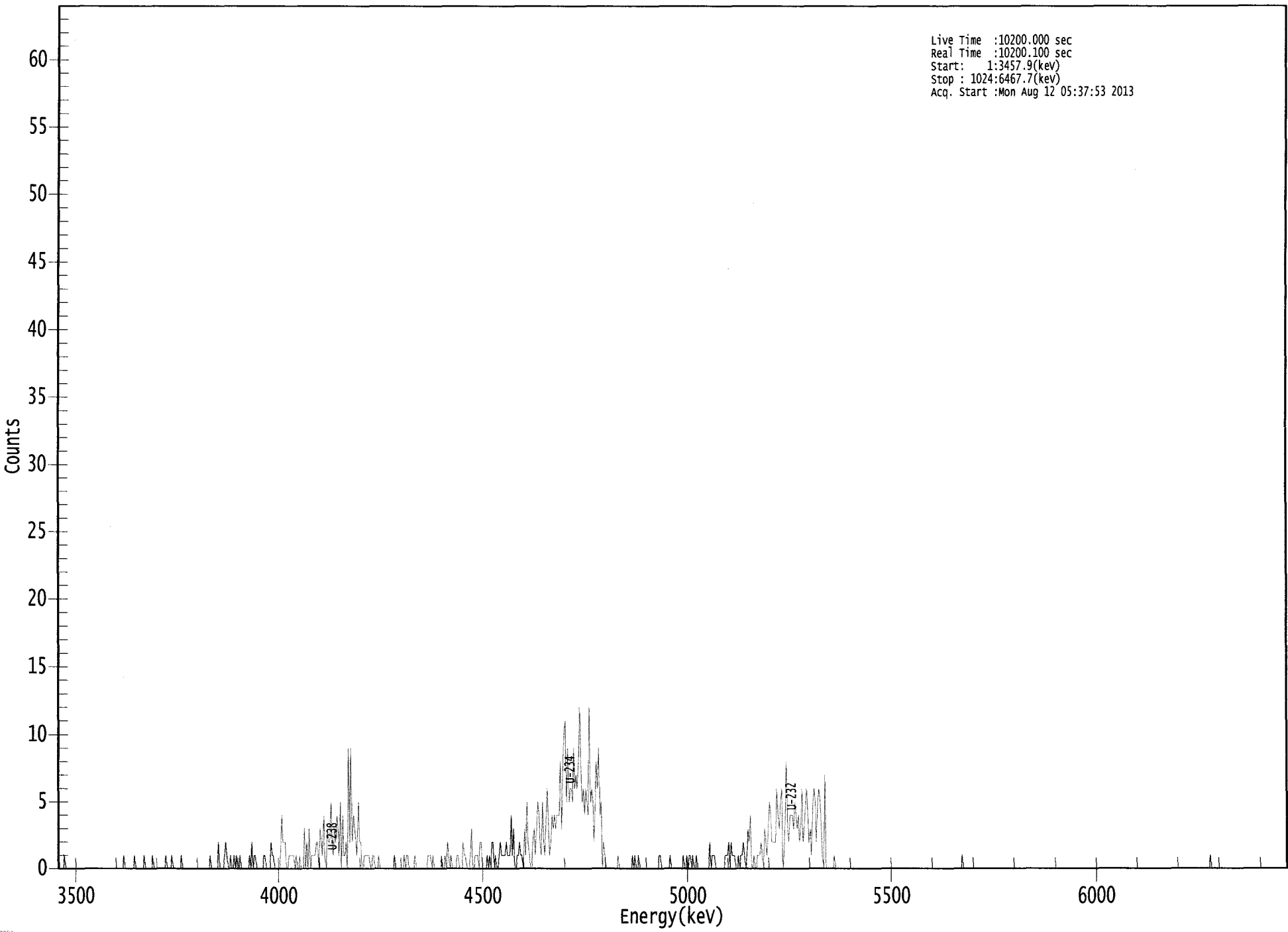
-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.987	5302.50*	5.12E+000 +/- 7.51E-001	1.08E-001 +/- 1.58E-002
U-234	0.985	4761.50*	8.15E+000 +/- 1.50E+000	1.08E-001 +/- 1.58E-002
U-235	0.987	4385.50*	9.90E-001 +/- 3.83E-001	1.91E-001 +/- 2.81E-002
U-238	0.982	4184.40*	3.47E+000 +/- 7.77E-001	1.23E-001 +/- 1.81E-002

US EPA ARCHIVE DOCUMENT

0000065844.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3457.9(kev)  
Stop : 1024:6467.7(kev)  
Acq. Start :Mon Aug 12 05:37:53 2013



ROI Type: 1

ROI Type: 3

2219

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 15

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 2 1 1 1 1 2 1

Sample Title: 15

Channel	1	2	3	4	5	6	7	8
377:	1	1	4	1	3	0	0	1
385:	1	2	1	1	0	3	1	5
393:	2	1	0	0	2	3	1	3
401:	5	4	2	1	5	2	1	4
409:	6	3	1	2	4	3	4	3
417:	4	4	4	8	3	7	10	11
425:	5	9	5	6	6	5	9	6
433:	7	6	8	12	8	5	6	4
441:	6	5	4	12	5	6	5	2
449:	5	8	6	9	4	5	0	2
457:	1	0	0	0	0	0	0	0
465:	0	0	0	1	0	0	0	0
473:	0	0	0	0	0	0	0	1
481:	0	1	0	0	1	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	1	1	0
505:	0	0	0	0	0	0	1	0
513:	0	0	0	0	0	0	0	0
521:	0	1	0	0	1	0	1	1
529:	0	1	0	0	1	0	0	0
537:	0	0	0	0	0	0	0	2
545:	0	1	1	1	0	0	0	0
553:	0	0	0	0	1	1	1	2
561:	0	2	1	1	1	0	0	1
569:	0	1	1	2	1	0	1	3
577:	2	4	0	0	1	0	0	1
585:	1	1	2	1	0	3	2	1
593:	3	5	4	2	2	2	2	6
601:	4	3	5	6	0	1	4	8
609:	3	2	4	4	4	3	5	4
617:	3	4	2	3	6	2	3	5
625:	6	4	2	3	1	5	6	5
633:	2	5	6	5	3	1	0	7
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	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	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: 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	1
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0





## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

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

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/12/2013 5:20:50 AM
Alpha 004	21f	ALL	Passed	8/12/2013 5:20:50 AM
Alpha 005	21f	ALL	Not Done	
Alpha 006	21f	ALL	Not Done	
Alpha 007	21f	ALL	Not Done	
Alpha 008	21f	ALL	Not Done	
Alpha 009	21f	ALL	Not Done	
Alpha 010	21f	ALL	Passed	8/12/2013 5:20:51 AM
Alpha 011	21f	ALL	Passed	8/12/2013 5:20:52 AM
Alpha 012	21f	ALL	Passed	8/12/2013 5:20:53 AM
Alpha 013	21f	ALL	Passed	8/12/2013 5:20:53 AM
Alpha 014	21f	ALL	Passed	8/12/2013 5:20:54 AM
Alpha 015	21f	Peak Energy	Action	8/12/2013 5:20:55 AM
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	8/10/2013 11:23:01 AM
Alpha 019	AIM730	ALL	Passed	8/12/2013 5:20:55 AM
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/12/2013 5:20:56 AM
Alpha 023	AIM730	ALL	Passed	8/12/2013 5:20:57 AM
Alpha 024	AIM730	ALL	Passed	8/12/2013 5:20:57 AM
Alpha 025	AIM730	ALL	Passed	8/12/2013 5:20:58 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/12/2013 5:20:59 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/12/2013 5:20:59 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/12/2013 5:21:00 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:01 AM
Alpha 034	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:02 AM
Alpha 035	Alpha Analyst100DC	Peak CPS	Action	8/9/2013 5:06:44 AM
Alpha 036	Alpha Analyst100DC	Peak FWHM	Action	8/12/2013 5:21:05 AM
Alpha 036	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:05 AM
Alpha 037	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:06 AM
Alpha 038	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:09 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:10 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:12 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:22:26 AM

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

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

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

US EPA ARCHIVE DOCUMENT

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

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

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

\* = key line

TOTALS: 4 Nuclides 4 Energy Lines

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

Work Order	13-07149	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	ThISO	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-81 TOT	45	07/17/13 10:43	1.0000E+00
Lab Deadline	8/13/2013	04	TRG	PZ-302-AS TOT	46	07/16/13 15:30	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-302-AS DIS	46	07/16/13 15:30	1.0000E+00
Project	West Lake OU-1	06	TRG	LR-100 TOT	47	07/17/13 10:23	1.0000E+00
Report Level	4	07	TRG	LR-100 DIS	47	07/17/13 10:23	1.0000E+00
Activity Units	pCi	08	DO	D-81 TOT	45	07/17/13 10:43	1.0000E+00
Aliquot Units	I	09	TRG	D-81 DIS	45	07/17/13 10:43	1.0000E+00
Matrix	WA	10	TRG	PZ-204-SS TOT	43	07/17/13 11:40	1.0000E+00
Method	HASL 300, 4.5.2	11	TRG	PZ-204-SS DIS	43	07/17/13 11:40	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	LR-103 TOT	45	07/17/13 12:15	1.0000E+00
Radiometric Tracer	Th-229	13	TRG	LR-103 DIS	45	07/17/13 12:15	1.0000E+00
Radiometric Sol#	Th-18a	14	TRG	PZ-111-KS TOT	41	07/17/13 13:09	1.0000E+00
Tracer Act (dpm/g)	22.466	15	TRG	PZ-111-KS DIS	41	07/17/13 13:09	1.0000E+00
Carrier							
Carrier Conc (mg/ml)							

\* 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: 13-07149-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	4.65E+00	6.99E-01	1.13E-01	4.87E+00	95.61	OK		OK	
02	TH-228	MBL	BLANK	pCi/l	5.87E-02	1.29E-01	2.44E-01					OK	OK
03	TH-228	DUP	D-81 TOT	pCi/l	4.31E-02	5.50E-02	8.19E-02				NA	OK	
04	TH-228	TRG	PZ-302-AS TOT	pCi/l	1.69E-01	1.19E-01	1.11E-01					OK	
05	TH-228	TRG	PZ-302-AS DIS	pCi/l	6.72E-03	4.22E-02	1.02E-01					OK	
06	TH-228	TRG	LR-100 TOT	pCi/l	-1.60E-03	8.50E-02	1.98E-01					OK	
07	TH-228	TRG	LR-100 DIS	pCi/l	4.57E-02	6.87E-02	1.11E-01					OK	
08	TH-228	DO	D-81 TOT	pCi/l	6.31E-02	6.90E-02	8.24E-02					OK	
09	TH-228	TRG	D-81 DIS	pCi/l	6.92E-02	8.39E-02	1.30E-01					OK	
10	TH-228	TRG	PZ-204-SS TOT	pCi/l	9.05E-02	7.22E-02	6.50E-02					OK	
11	TH-228	TRG	PZ-204-SS DIS	pCi/l	1.22E-02	7.10E-02	1.61E-01					OK	
12	TH-228	TRG	LR-103 TOT	pCi/l	5.89E-02	8.58E-02	1.43E-01					OK	
13	TH-228	TRG	LR-103 DIS	pCi/l	1.69E-02	6.32E-02	1.33E-01					OK	
14	TH-228	TRG	PZ-111-KS TOT	pCi/l	1.94E-02	6.28E-02	1.30E-01					OK	
15	TH-228	TRG	PZ-111-KS DIS	pCi/l	-3.39E-04	3.58E-02	1.06E-01					OK	

Run	1	THISO	13-07149	Engineering Management Support, Inc.





Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-THISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-228	LCS	08/12/13 12:55		A_Spec	Alpha_004	170.02	4.02 E+02	2.30 E-02	19.4
02	TH-228	MBL	08/12/13 12:55		A_Spec	Alpha_010	170.02	2.11 E+00	1.70 E-02	19.7
03	TH-228	DUP	08/12/13 12:55		A_Spec	Alpha_011	170	3.15 E+00	5.00 E-03	20.5
04	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_012	170	9.15 E+00	5.00 E-03	19.9
05	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_013	170.02	4.70 E-01	9.00 E-03	18.7
06	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_014	170	-7.99 E-02	2.40 E-02	18.5
07	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_015	170	2.32 E+00	4.00 E-03	14.8
08	TH-228	DO	08/12/13 12:55		A_Spec	Alpha_019	170	3.66 E+00	2.00 E-03	16.6
09	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_022	170	4.45 E+00	1.50 E-02	15.3
10	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_023	170	6.66 E+00	2.00 E-03	17.1
11	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_024	170	6.20 E-01	1.40 E-02	17.1
12	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_025	170.02	3.13 E+00	1.10 E-02	17.4
13	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_027	170.02	1.11 E+00	1.70 E-02	17.3
14	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_029	170.02	1.28 E+00	1.60 E-02	19.5
15	TH-228	TRG	08/12/13 12:55		A_Spec	Alpha_031	170.02	-2.01 E-02	6.00 E-03	14.2

	Run	1
	Analysis Code	THISO
Eberline Services Work Order	13-07149	
Client	Engineering Management Support, Inc.	

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-THISO-1**

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	TH-230	LCS	LCS	pCi/l	4.95E+00	7.33E-01	8.51E-02	5.45E+00	90.74	OK		OK	
02	TH-230	MBL	BLANK	pCi/l	3.98E-01	2.38E-01	2.05E-01					OK	OK
03	TH-230	DUP	D-81 TOT	pCi/l	2.65E-01	1.24E-01	5.57E-02				INV	OK	
04	TH-230	TRG	PZ-302-AS TOT	pCi/l	4.29E-01	1.90E-01	7.51E-02					OK	
05	TH-230	TRG	PZ-302-AS DIS	pCi/l	2.60E-01	1.27E-01	6.67E-02					OK	
06	TH-230	TRG	LR-100 TOT	pCi/l	5.53E-01	2.31E-01	1.10E-01					OK	
07	TH-230	TRG	LR-100 DIS	pCi/l	4.10E-01	1.93E-01	1.08E-01					OK	
08	TH-230	DO	D-81 TOT	pCi/l	3.70E-01	1.71E-01	1.01E-01					OK	
09	TH-230	TRG	D-81 DIS	pCi/l	3.03E-01	1.50E-01	1.18E-01					OK	
10	TH-230	TRG	PZ-204-SS TOT	pCi/l	2.94E-01	1.33E-01	7.94E-02					OK	
11	TH-230	TRG	PZ-204-SS DIS	pCi/l	5.51E-01	2.31E-01	1.26E-01					OK	
12	TH-230	TRG	LR-103 TOT	pCi/l	5.20E-01	2.17E-01	1.04E-01					OK	
13	TH-230	TRG	LR-103 DIS	pCi/l	5.53E-01	2.04E-01	1.09E-01					OK	
14	TH-230	TRG	PZ-111-KS TOT	pCi/l	4.23E-01	1.71E-01	7.06E-02					OK	
15	TH-230	TRG	PZ-111-KS DIS	pCi/l	4.85E-01	1.96E-01	8.63E-02					OK	

Run	<b>1</b>
Analysis Code	<b>THISO</b>
Eberline Services Work Order	<b>13-07149</b>
Client	<b>Engineering Management Support, Inc.</b>



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-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	08/12/13 12:55		A_Spec	Alpha_004	170.02	4.27 E+02	1.00 E-02	19.4
02	TH-230	MBL	08/12/13 12:55		A_Spec	Alpha_010	170.02	1.43 E+01	1.00 E-02	19.7
03	TH-230	DUP	08/12/13 12:55		A_Spec	Alpha_011	170	1.98 E+01	1.00 E-03	20.5
04	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_012	170	2.38 E+01	1.00 E-03	19.9
05	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_013	170.02	1.87 E+01	2.00 E-03	18.7
06	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_014	170	2.83 E+01	4.00 E-03	18.5
07	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_015	170	2.13 E+01	4.00 E-03	14.8
08	TH-230	DO	08/12/13 12:55		A_Spec	Alpha_019	170	2.20 E+01	0.00 E+00	16.6
09	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_022	170	2.00 E+01	1.20 E-02	15.3
10	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_023	170	2.22 E+01	5.00 E-03	17.1
11	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_024	170	2.88 E+01	7.00 E-03	17.1
12	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_025	170.02	2.83 E+01	4.00 E-03	17.4
13	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_027	170.02	3.73 E+01	1.00 E-02	17.3
14	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_029	170.02	2.87 E+01	2.00 E-03	19.5
15	TH-230	TRG	08/12/13 12:55		A_Spec	Alpha_031	170.02	2.95 E+01	3.00 E-03	14.2

Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07149
Client	Engineering Management Support, Inc.

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-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	4.44E+00	6.72E-01	6.92E-02	4.87E+00	91.26	OK		OK	
02	TH-232	MBL	BLANK	pCi/l	1.01E-01	1.27E-01	1.91E-01					OK	OK
03	TH-232	DUP	D-81 TOT	pCi/l	3.77E-02	4.58E-02	5.56E-02				NA	OK	
04	TH-232	TRG	PZ-302-AS TOT	pCi/l	2.18E-01	1.34E-01	1.08E-01					OK	
05	TH-232	TRG	PZ-302-AS DIS	pCi/l	5.33E-02	5.54E-02	5.81E-02					OK	
06	TH-232	TRG	LR-100 TOT	pCi/l	-1.32E-02	4.04E-02	1.10E-01					OK	
07	TH-232	TRG	LR-100 DIS	pCi/l	3.51E-02	5.40E-02	8.01E-02					OK	
08	TH-232	DO	D-81 TOT	pCi/l	4.47E-02	5.81E-02	8.03E-02					OK	
09	TH-232	TRG	D-81 DIS	pCi/l	3.77E-02	5.25E-02	7.94E-02					OK	
10	TH-232	TRG	PZ-204-SS TOT	pCi/l	3.29E-02	4.59E-02	6.94E-02					OK	
11	TH-232	TRG	PZ-204-SS DIS	pCi/l	6.02E-02	7.71E-02	1.14E-01					OK	
12	TH-232	TRG	LR-103 TOT	pCi/l	5.50E-02	7.26E-02	1.10E-01					OK	
13	TH-232	TRG	LR-103 DIS	pCi/l	8.60E-02	7.91E-02	9.75E-02					OK	
14	TH-232	TRG	PZ-111-KS TOT	pCi/l	-1.75E-02	3.18E-02	9.71E-02					OK	
15	TH-232	TRG	PZ-111-KS DIS	pCi/l	2.46E-03	3.44E-02	9.83E-02					OK	



**Run**  
1

**Analysis Code**  
ThISO

**Eberline Services Work Order**  
13-07149

**Client**  
Engineering Management Support, Inc.



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-THISO-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	TH-232	LCS	08/12/13 12:55		A_Spec	Alpha_004	170.02	3.84 E+02	5.00 E-03	19.4
02	TH-232	MBL	08/12/13 12:55		A_Spec	Alpha_010	170.02	3.64 E+00	8.00 E-03	19.7
03	TH-232	DUP	08/12/13 12:55		A_Spec	Alpha_011	170	2.83 E+00	1.00 E-03	20.5
04	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_012	170	1.21 E+01	5.00 E-03	19.9
05	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_013	170.02	3.83 E+00	1.00 E-03	18.7
06	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_014	170	-6.80 E-01	4.00 E-03	18.5
07	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_015	170	1.83 E+00	1.00 E-03	14.8
08	TH-232	DO	08/12/13 12:55		A_Spec	Alpha_019	170	2.66 E+00	2.00 E-03	16.6
09	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_022	170	2.49 E+00	3.00 E-03	15.3
10	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_023	170	2.49 E+00	3.00 E-03	17.1
11	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_024	170	3.15 E+00	5.00 E-03	17.1
12	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_025	170.02	3.00 E+00	0.00 E+00	17.4
13	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_027	170.02	5.81 E+00	7.00 E-03	17.3
14	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_029	170.02	-1.19 E+00	7.00 E-03	19.5
15	TH-232	TRG	08/12/13 12:55		A_Spec	Alpha_031	170.02	1.50 E-01	5.00 E-03	14.2

Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07149
Client	Engineering Management Support, Inc.

10  
10  
10



*nr*

4-5

4-31

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	0.4782	10.7432		0.00		
02	MBL	BLANK	07/23/13 00:00	1.0000	0.2381	5.3492		0.00		
03	DUP	D-81 TOT	07/17/13 10:43	1.0000	0.2355	5.2907		0.00		
04	TRG	PZ-302-AS TOT	07/16/13 15:30	1.0000	0.2340	5.2570		0.00		
05	TRG	PZ-302-AS DIS	07/16/13 15:30	1.0000	0.2352	5.2840		0.00		
06	TRG	LR-100 TOT	07/17/13 10:23	1.0000	0.2345	5.2683		0.00		
07	TRG	LR-100 DIS	07/17/13 10:23	1.0000	0.2339	5.2548		0.00		
08	DO	D-81 TOT	07/17/13 10:43	1.0000	0.2339	5.2548		0.00		
09	TRG	D-81 DIS	07/17/13 10:43	1.0000	0.2321	5.2144		0.00		
10	TRG	PZ-204-SS TOT	07/17/13 11:40	1.0000	0.2323	5.2189		0.00		
11	TRG	PZ-204-SS DIS	07/17/13 11:40	1.0000	0.2340	5.2570		0.00		
12	TRG	LR-103 TOT	07/17/13 12:15	1.0000	0.2307	5.1829		0.00		
13	TRG	LR-103 DIS	07/17/13 12:15	1.0000	0.2327	5.2278		0.00		
14	TRG	PZ-111-KS TOT	07/17/13 13:09	1.0000	0.2333	5.2413		0.00		
15	TRG	PZ-111-KS DIS	07/17/13 13:09	1.0000	0.2323	5.2189		0.00		

### Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
<b>13-07149</b>	<b>1</b>	<b>ThISO</b>	<b>8/5/2013 9:18</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	8/5/2013	0.100	0.1043				4.87	0.175	0.00	0.000	0.00	0.000	0.00	0.000
Th-230	Th-1b	23.525	8/5/2013	0.500	0.5146				5.45	0.147	0.00	0.000	0.00	0.000	0.00	0.000
Th-232	Th-8b	103.560	8/5/2013	0.100	0.1043				4.87	0.175	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	8/5/2013	0.4782	0.2200	<p>0.4782 g 0.2381 g 0.2355 g 0.2340 g 0.2352 g <u>0.2339</u> 0.2345 g 0.2339 g 0.2321 g 0.2323 g 0.2307 g 0.2327 g 0.2333 g 0.2323 g</p>					<p>0.5146 g 0.1043 g</p>				
02	Th-229	Th-18a	22.466	8/5/2013	0.2381	0.2200										
03	Th-229	Th-18a	22.466	8/5/2013	0.2355	0.2200										
04	Th-229	Th-18a	22.466	8/5/2013	0.2340	0.2200										
05	Th-229	Th-18a	22.466	8/5/2013	0.2352	0.2200										
06	Th-229	Th-18a	22.466	8/5/2013	0.2345	0.2200										
07	Th-229	Th-18a	22.466	8/5/2013	0.2339	0.2200										
08	Th-229	Th-18a	22.466	8/5/2013	0.2339	0.2200										
09	Th-229	Th-18a	22.466	8/5/2013	0.2321	0.2200										
10	Th-229	Th-18a	22.466	8/5/2013	0.2323	0.2200										
11	Th-229	Th-18a	22.466	8/5/2013	0.2340	0.2200										
12	Th-229	Th-18a	22.466	8/5/2013	0.2307	0.2200										
13	Th-229	Th-18a	22.466	8/5/2013	0.2327	0.2200										
14	Th-229	Th-18a	22.466	8/5/2013	0.2333	0.2200										
15	Th-229	Th-18a	22.466	8/5/2013	0.2323	0.2200										
												Matrix Spike				

# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07149</b>	<b>1</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	D-81 TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-302-AS TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-302-AS DIS	TRG					1.0000E+00	1.0000E+00				
06	LR-100 TOT	TRG					1.0000E+00	1.0000E+00				
07	LR-100 DIS	TRG					1.0000E+00	1.0000E+00				
08	D-81 TOT	DO					1.0000E+00	1.0000E+00				
09	D-81 DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-204-SS TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-204-SS DIS	TRG					1.0000E+00	1.0000E+00				
12	LR-103 TOT	TRG					1.0000E+00	1.0000E+00				
13	LR-103 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-111-KS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-111-KS DIS	TRG					1.0000E+00	1.0000E+00				

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

*J Wolfe* Date: 8/5/13

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8/12/13

# Apex-Alpha™

Sample Description: SPIKE  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 01  
 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: 8/12/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:09 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.478 mL  
 Effective Efficiency: 0.2292 +/- 0.0133  
 Counting Efficiency: 0.1940 +/- 0.0036 on 12/15/2012 11:26:46 AM  
 Chem. Recovery Factor: 1.1813 +/- 0.0718

Control Certificate Name: NatTh\_Th-8  
 Chem. Recov. of Control: TH-232 0.185048 +/- 0.015336  
 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	5.856	25.15	39.85	0.85	0.00E+000	2.9
TH-228	5.361	402.09	9.83	3.91	0.00E+000	12.4
TH-229 T	4.871	418.64	9.60	1.36	0.00E+000	5.1
TH-230	4.622	427.30	9.50	1.70	0.00E+000	15.2
TH-232	3.953	384.15	10.01	0.85	0.00E+000	12.5

T = Tracer Peak used for Effective Efficiency

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 NUCLIDE ANALYSIS RESULTS  
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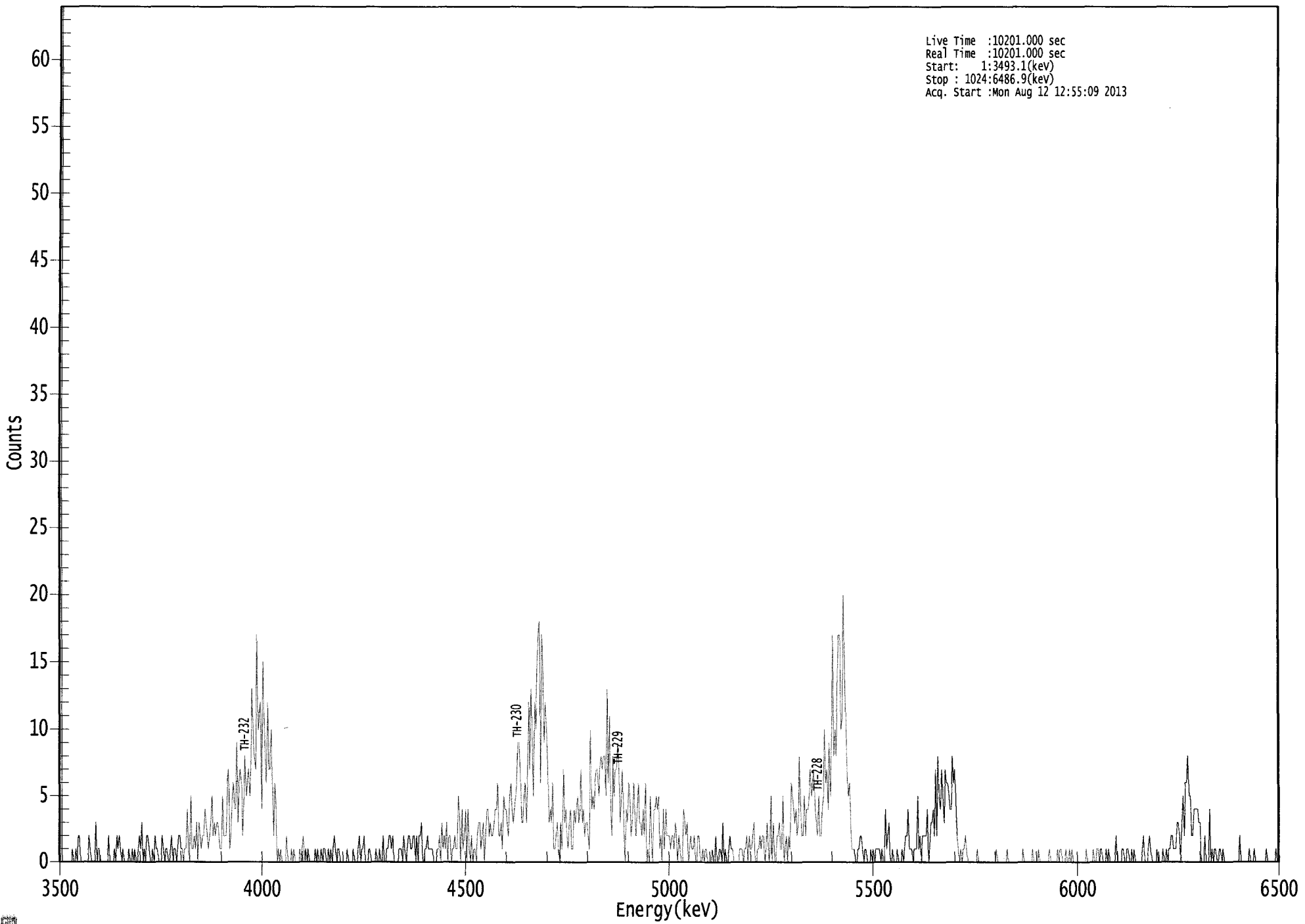
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	1.000	5850.00*	2.98E-001 +/- 1.24E-001	7.10E-002 +/- 8.06E-003
TH-228	0.992	5400.00*	4.65E+000 +/- 6.99E-001	1.13E-001 +/- 1.28E-002
TH-229	1.000	4872.00*	4.86E+000 +/- 5.52E-001	7.96E-002 +/- 9.05E-003
TH-230	0.987	4672.00*	4.95E+000 +/- 7.33E-001	8.51E-002 +/- 9.66E-003
TH-232	0.990	3997.00*	4.44E+000 +/- 6.72E-001	6.92E-002 +/- 7.86E-003

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

000065907.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3493.1(kev)  
Stop : 1024:6486.9(kev)  
Acq. Start :Mon Aug 12 12:55:09 2013



ROI Type: 1

ROI Type: 3

0195

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 01

Elapsed Live time: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	1	0	0	1	0
17:	2	2	0	0	0	0	0	0
25:	0	2	1	0	0	0	0	3
33:	0	1	1	0	0	0	0	0
41:	0	0	2	0	0	0	0	1
49:	0	2	1	2	1	0	1	0
57:	0	0	0	1	0	0	1	0
65:	1	0	0	1	2	1	3	0
73:	1	0	2	2	1	0	0	1
81:	0	2	1	1	0	0	0	2
89:	1	0	1	1	0	0	1	2
97:	0	1	1	0	1	2	2	1
105:	1	0	1	1	4	1	0	5
113:	1	1	2	1	3	0	3	2
121:	1	2	2	4	3	2	1	2
129:	3	5	2	3	2	3	3	2
137:	1	1	5	2	2	2	6	7
145:	1	2	5	6	4	4	9	3
153:	6	7	6	2	5	8	5	6
161:	7	5	7	13	9	8	7	17
169:	10	11	12	4	15	11	8	6
177:	12	7	7	10	6	2	6	4
185:	0	1	0	1	0	0	0	0
193:	2	0	0	0	1	0	1	0
201:	0	0	0	1	0	1	2	0
209:	1	0	1	0	0	0	0	0
217:	1	0	1	0	0	1	0	1
225:	1	0	0	1	0	1	0	1
233:	2	1	0	1	1	0	0	0
241:	0	0	0	1	0	0	0	0
249:	1	0	0	0	1	2	0	1
257:	1	2	0	0	0	1	1	0
265:	0	0	0	1	0	0	1	0
273:	0	2	0	0	1	1	2	2
281:	1	2	0	0	0	0	1	1
289:	1	0	2	1	0	1	2	2
297:	1	1	2	2	0	2	0	2
305:	2	3	0	0	1	1	2	1
313:	1	1	1	0	0	0	1	1
321:	2	0	3	1	2	1	3	0
329:	2	2	0	1	1	2	1	1
337:	5	3	0	4	1	2	4	0
345:	4	1	0	2	0	1	1	0
353:	2	3	3	1	2	3	0	2
361:	4	4	2	3	2	2	3	4

369: 4 6 2 2 3 1 5 4

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	4	3	2	5	6	4	3	4
385:	5	6	9	9	7	3	3	5
393:	6	3	6	12	7	13	9	5
401:	12	10	15	17	18	6	17	14
409:	9	12	10	7	3	4	3	6
417:	1	1	2	3	1	0	3	1
425:	7	3	4	2	1	3	4	1
433:	1	4	3	4	5	3	4	7
441:	3	4	2	3	3	2	1	10
449:	4	5	4	6	7	7	5	7
457:	8	7	8	8	5	13	6	11
465:	4	2	8	5	7	7	9	7
473:	3	5	7	3	0	4	3	6
481:	5	2	3	6	4	2	4	6
489:	3	3	2	4	2	6	0	1
497:	0	5	2	0	4	4	5	4
505:	5	1	2	0	4	1	4	2
513:	2	2	1	2	2	1	3	2
521:	0	2	1	0	0	4	3	2
529:	3	0	1	2	1	1	2	0
537:	0	2	2	0	0	1	0	1
545:	1	0	0	0	0	1	0	0
553:	2	0	0	1	1	0	3	0
561:	1	0	0	1	2	1	1	0
569:	0	0	0	0	1	1	1	0
577:	1	1	2	0	2	1	1	2
585:	3	0	0	1	1	2	1	2
593:	2	0	1	3	1	0	5	0
601:	3	0	0	2	2	3	1	1
609:	5	0	1	2	0	2	1	6
617:	5	4	3	4	2	3	8	4
625:	2	2	5	2	4	4	5	7
633:	5	6	7	4	3	2	5	2
641:	2	4	5	10	6	7	4	9
649:	5	9	17	8	10	8	15	17
657:	17	10	11	20	14	11	7	5
665:	6	3	1	1	1	0	0	1
673:	1	2	2	1	0	1	1	0
681:	0	0	1	0	1	0	1	1
689:	1	1	0	1	0	0	4	1
697:	2	3	0	0	1	0	0	0
705:	1	0	0	0	1	0	1	2
713:	2	4	1	1	1	0	1	1
721:	1	5	1	2	0	2	2	2
729:	2	4	0	1	3	3	4	2
737:	7	2	8	5	4	7	5	3
745:	7	6	6	5	4	4	8	6
753:	7	4	2	1	0	1	0	1
761:	1	2	1	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	1	0	0	0	0
793:	0	0	0	0	1	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 01

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



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8/12/13

# Apex-Alpha™

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 02  
 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: 8/12/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:04 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.238 mL  
 Effective Efficiency: 0.0952 +/- 0.0108  
 Counting Efficiency: 0.1967 +/- 0.0036 on 12/15/2012 11:26:40 AM  
 Chem. Recovery Factor: 0.4842 +/- 0.0556

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	5.823	4.28	125.11	2.72	0.00E+000	2.9
TH-228	5.410	2.11	217.70	2.89	0.00E+000	2.9
TH-229 T	4.871	86.62	21.40	2.38	0.00E+000	3.4
TH-230	4.620	14.30	55.32	1.70	0.00E+000	2.9
TH-232	3.928	3.64	123.16	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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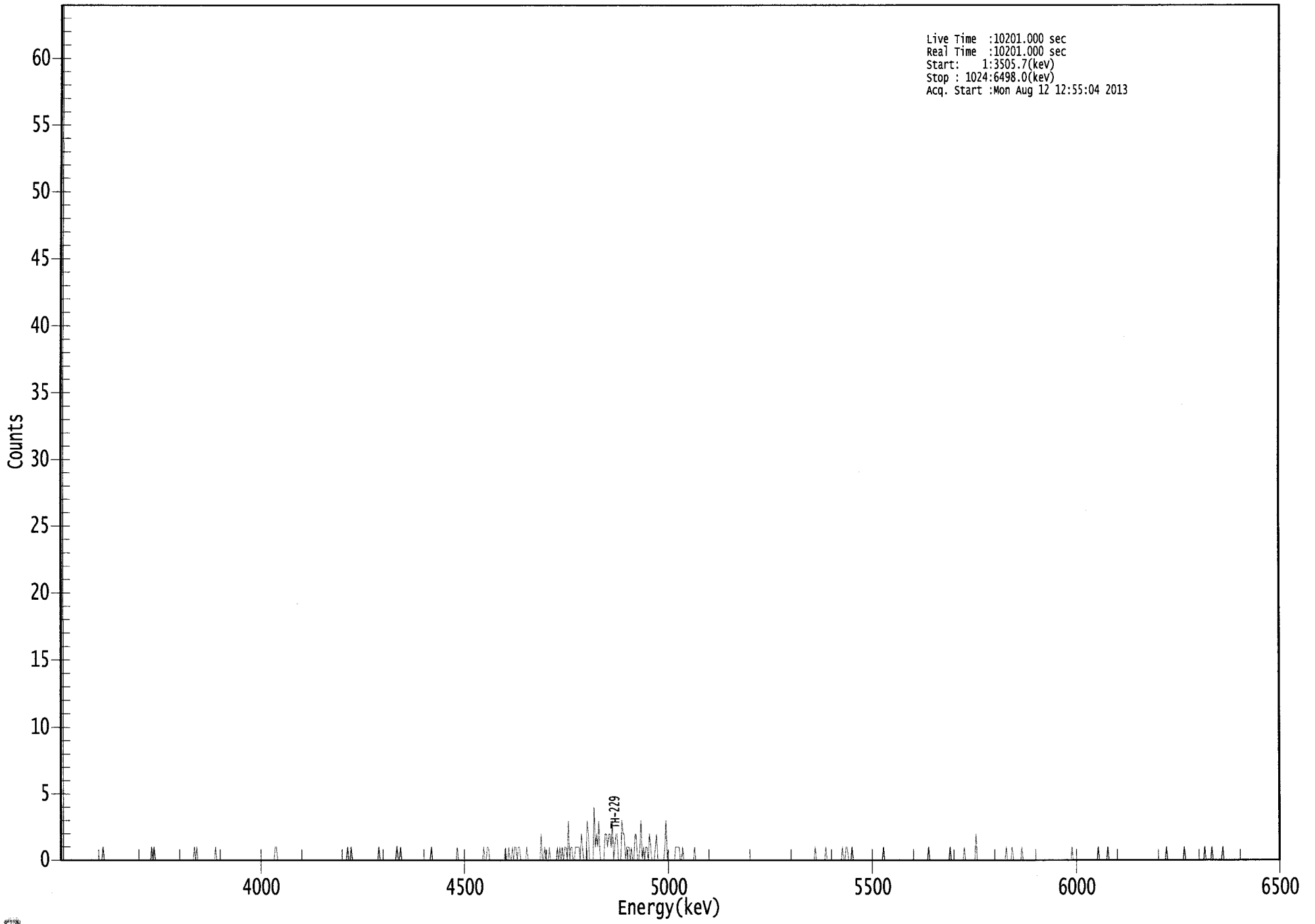
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.996	5850.00*	1.22E-001 +/- 1.55E-001	2.45E-001 +/- 5.44E-002
TH-228	0.999	5400.00*	5.87E-002 +/- 1.29E-001	2.44E-001 +/- 5.42E-002
TH-229	1.000	4872.00*	2.42E+000 +/- 5.38E-001	2.29E-001 +/- 5.10E-002
TH-230	0.986	4672.00*	3.98E-001 +/- 2.38E-001	2.05E-001 +/- 4.55E-002
TH-232	0.976	3997.00*	1.01E-001 +/- 1.27E-001	1.91E-001 +/- 4.24E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

000065910.CNF

Live Time : 10201.000 sec  
Real Time : 10201.000 sec  
Start : 1:3505.7(keV)  
Stop : 1024:6498.0(keV)  
Acq. Start : Mon Aug 12 12:55:04 2013



ROI Type: 1

ROI Type: 3

0201

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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	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	1	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	1	0	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	1	0	1	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	1	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	1	1	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	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	1	0	0	1	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	1	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	1	0	0	1	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:	1	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	1	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	1	0	0	1
361:	1	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 1 0

Sample Title: 02

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

801: 0 0 0 0 0 0 0 0 1

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	1	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	1
873:	0	0	0	0	0	0	0	1
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	0	0	0
937:	0	0	0	0	0	0	0	1
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	1	0	0	0	0	0	1	0
969:	0	0	0	0	0	0	0	1
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

10/13  
2/12/13

# Apex-Alpha™

Sample Description: D-81 TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 03  
 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: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:05 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: 0.1988 +/- 0.0161  
 Counting Efficiency: 0.2051 +/- 0.0035 on 7/20/2013 2:50:46 PM  
 Chem. Recovery Factor: 0.9695 +/- 0.0803

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	5.940	2.15	161.66	0.85	0.00E+000	2.6
TH-228	5.348	3.15	126.67	0.85	0.00E+000	2.6
TH-229 T	4.880	178.83	14.66	0.17	0.00E+000	4.2
TH-230	4.608	19.83	44.23	0.17	0.00E+000	2.6
TH-232	3.915	2.83	120.53	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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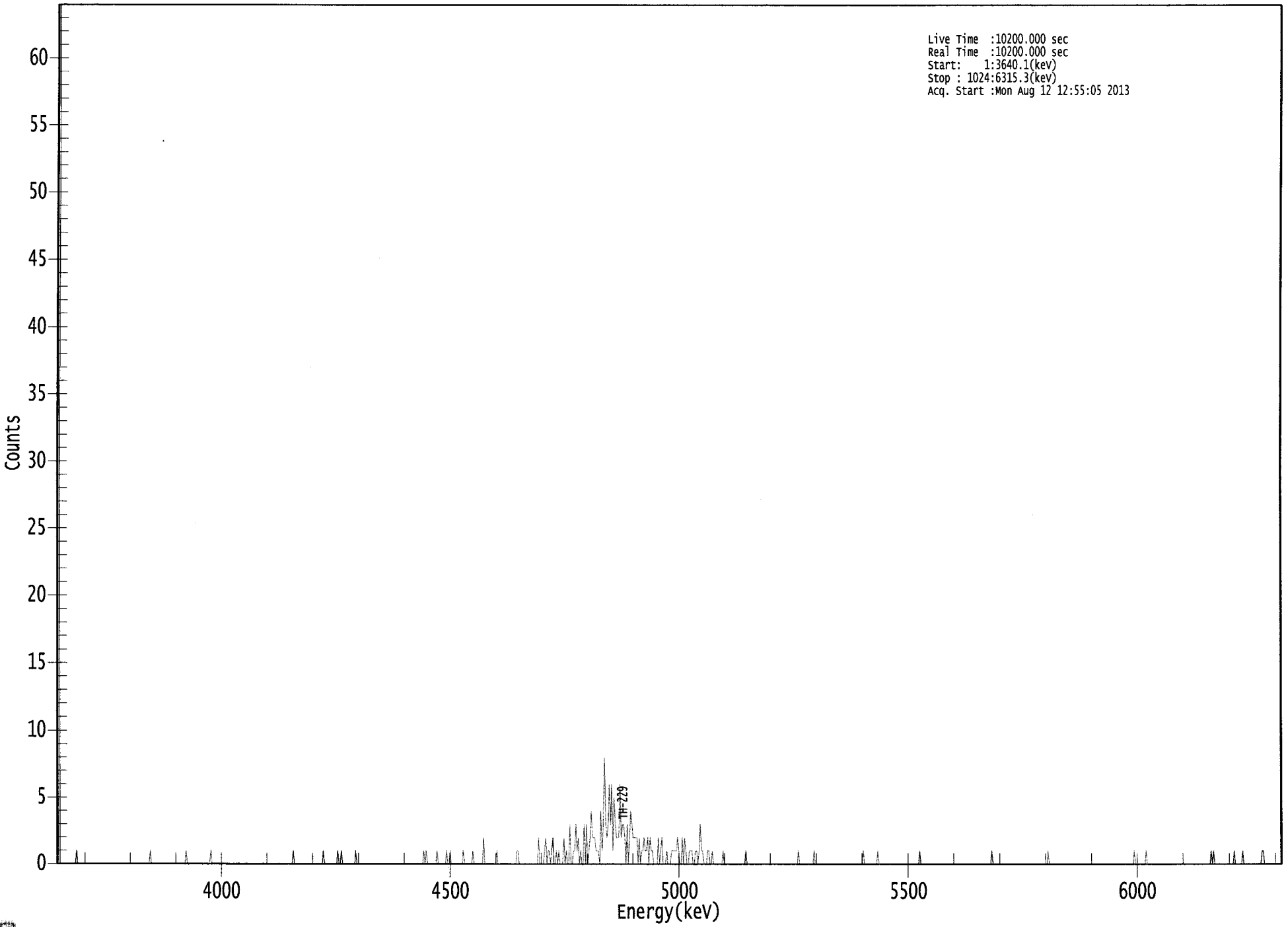
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.959	5850.00*	2.95E-002 +/- 4.78E-002	8.20E-002 +/- 1.30E-002
TH-228	0.986	5400.00*	4.31E-002 +/- 5.50E-002	8.19E-002 +/- 1.30E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 3.80E-001	5.59E-002 +/- 8.87E-003
TH-230	0.979	4672.00*	2.65E-001 +/- 1.24E-001	5.57E-002 +/- 8.84E-003
TH-232	0.965	3997.00*	3.77E-002 +/- 4.58E-002	5.56E-002 +/- 8.83E-003

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

000065911.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3640.1(keV)  
Stop : 1024:6315.3(keV)  
Acq. Start :Mon Aug 12 12:55:05 2013



ROI Type: 1

ROI Type: 3

9206

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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:	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	1	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	1	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	1	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	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	0
217:	0	0	0	0	0	0	0	1
225:	0	0	0	0	0	0	0	0
233:	0	0	0	1	0	0	1	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	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	1	0	1	0	0
313:	0	0	0	0	0	0	1	0
321:	0	0	0	0	0	0	1	0
329:	0	1	0	0	0	0	0	0
337:	0	0	0	0	1	0	0	0
345:	0	0	0	0	1	0	0	0
353:	0	0	0	0	0	2	0	0
361:	0	0	0	0	0	0	0	0



369: 1 0 0 0 0 0 0 0 0

Sample Title: 03

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	1	1	0	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	2	0	0	0	0
409:	1	2	0	1	1	0	1	2
417:	0	0	1	0	1	0	0	0
425:	2	0	1	0	0	3	0	0
433:	1	1	3	1	2	0	1	0
441:	0	3	0	3	0	1	2	4
449:	2	2	2	1	1	1	0	4
457:	1	3	8	3	2	3	6	3
465:	6	1	5	3	2	2	2	6
473:	2	3	3	2	0	3	0	2
481:	4	3	2	2	2	2	0	2
489:	0	1	1	2	1	1	2	0
497:	2	1	1	0	0	0	0	2
505:	0	1	2	0	0	0	1	0
513:	0	0	1	1	1	1	1	2
521:	1	0	0	2	0	2	1	0
529:	0	1	1	1	0	0	1	1
537:	0	1	3	1	1	0	0	0
545:	1	1	0	0	1	0	0	0
553:	0	0	0	0	0	1	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	1	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	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	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	0
665:	0	0	0	0	0	0	0	0
673:	0	0	1	0	0	0	0	0
681:	0	0	0	0	0	0	1	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	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	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: 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	1	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	1	0	0	0
905:	0	0	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	1	0	1	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	1
985:	0	0	0	0	0	0	1	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	1	1
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

WDS  
8/12/13

# Apex-Alpha™

Sample Description: PZ-302-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 04  
 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: 7/16/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:06 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: 0.1475 +/- 0.0136  
 Counting Efficiency: 0.1989 +/- 0.0034 on 12/11/2011 2:21:56 PM  
 Chem. Recovery Factor: 0.7415 +/- 0.0698

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	5.824	5.83	82.55	0.17	0.00E+000	3.0
TH-228	5.358	9.15	68.23	0.85	0.00E+000	3.0
TH-229 T	4.866	131.83	17.08	0.17	0.00E+000	3.3
TH-230	4.595	23.83	40.32	0.17	0.00E+000	3.0
TH-232	3.946	12.15	58.49	0.85	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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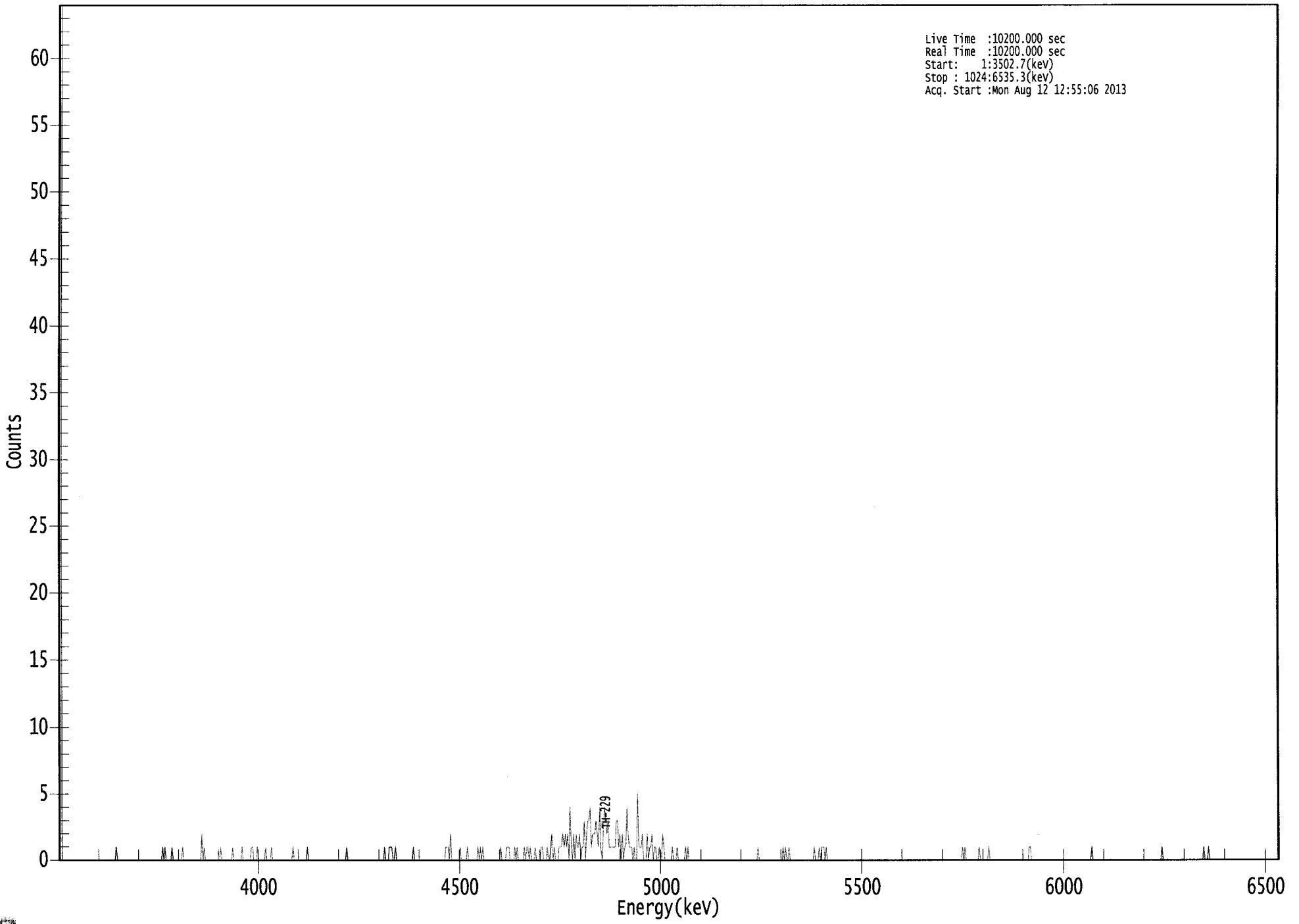
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.997	5850.00*	1.08E-001 +/- 9.10E-002	7.71E-002 +/- 1.40E-002
TH-228	0.991	5400.00*	1.69E-001 +/- 1.19E-001	1.11E-001 +/- 2.00E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.31E-001	7.53E-002 +/- 1.37E-002
TH-230	0.969	4672.00*	4.29E-001 +/- 1.90E-001	7.51E-002 +/- 1.36E-002
TH-232	0.987	3997.00*	2.18E-001 +/- 1.34E-001	1.08E-001 +/- 1.95E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065912.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3502.7(keV)  
Stop : 1024:6535.3(keV)  
Acq. Start :Mon Aug 12 12:55:06 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:	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	1
89:	0	1	0	0	0	0	0	1
97:	0	0	0	0	0	0	0	0
105:	1	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	2	0	1	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	1	0	0	0	0	0	0	0
145:	0	0	1	0	0	0	0	0
153:	0	0	1	0	0	0	0	0
161:	0	0	1	1	0	0	0	1
169:	0	0	0	0	0	0	1	0
177:	0	0	0	1	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	1	0	0
201:	0	0	0	0	0	0	0	0
209:	0	1	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	1	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	1	0	0	0	1	1
281:	1	0	0	1	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	1	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	1	1	1
329:	0	2	0	0	0	0	0	0
337:	0	1	0	0	0	0	0	1
345:	0	0	0	0	0	0	0	0
353:	1	0	1	0	1	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 1 0 0 0 0

Sample Title: 04

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

Sample Title: 04

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

100  
8/12/13

# Apex-Alpha™

Sample Description: PZ-302-AS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 05  
 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: 7/16/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:07 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: 0.1903 +/- 0.0158  
 Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM  
 Chem. Recovery Factor: 1.0184 +/- 0.0864

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	5.814	0.30	988.92	1.70	0.00E+000	2.8
TH-228	5.436	0.47	627.11	1.53	0.00E+000	2.8
TH-229 T	4.865	170.98	15.04	1.02	0.00E+000	5.7
TH-230	4.611	18.66	45.85	0.34	0.00E+000	2.8
TH-232	4.011	3.83	102.72	0.17	0.00E+000	5.7

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.993	5850.00*	4.29E-003 +/- 4.24E-002	1.05E-001 +/- 1.71E-002
TH-228	0.993	5400.00*	6.72E-003 +/- 4.22E-002	1.02E-001 +/- 1.65E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 3.88E-001	8.81E-002 +/- 1.43E-002
TH-230	0.980	4672.00*	2.60E-001 +/- 1.27E-001	6.67E-002 +/- 1.08E-002
TH-232	0.999	3997.00*	5.33E-002 +/- 5.54E-002	5.81E-002 +/- 9.42E-003

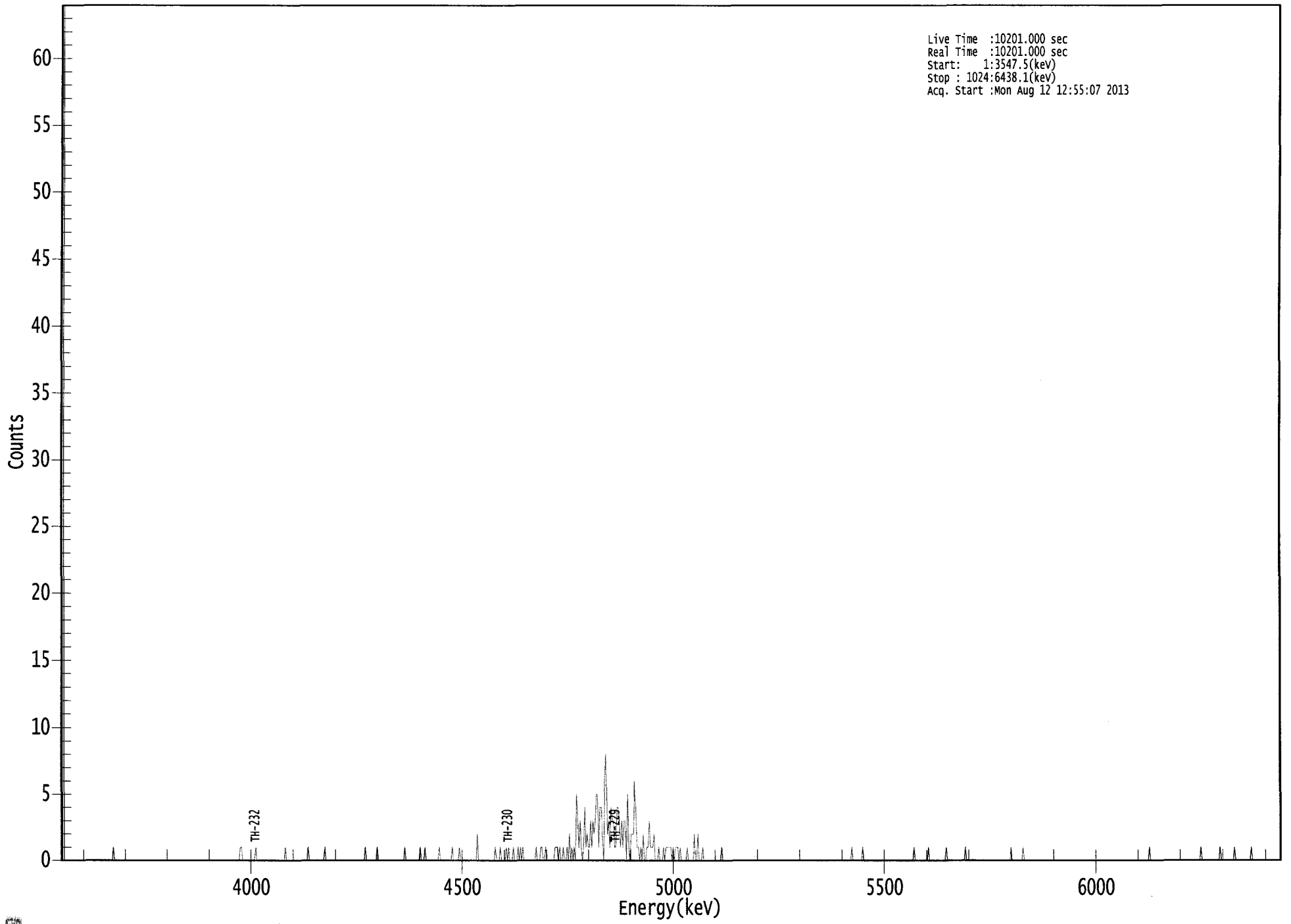
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US EPA ARCHIVE DOCUMENT



0000065913.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3547.5(keV)  
Stop : 1024:6438.1(keV)  
Acq. Start :Mon Aug 12 12:55:07 2013



ROI Type: 1

ROI Type: 3

9216

\*\*\*\*\*  
 \*\*\*\*\* 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	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	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	1
153:	1	0	0	0	0	0	0	0
161:	0	0	0	0	1	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	1	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	1	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	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	1	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	1	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	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	1	0	0	0	0	0	1
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	2	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	1	0	0

369: 0 1 0 0 0 0 1 0

Sample Title: 05

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

801: 0 0 0 0 0 0 0 0 1

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	1	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	1	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	1	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: LR-100 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000660  
 Batch Identification: 1307149A-TH  
 Sample Identification: 06  
 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: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:08 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: 0.1360 +/- 0.0131  
 Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM  
 Chem. Recovery Factor: 0.7369 +/- 0.0722

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	5.771	0.28	1302.3	2.72	0.00E+000	2.9
TH-228	5.288	-0.08	5312.3	4.08	0.00E+000	2.9
TH-229 T	4.882	121.81	17.86	1.19	0.00E+000	8.8
TH-230	4.606	28.32	37.34	0.68	0.00E+000	2.9
TH-232	3.963	-0.68	304.44	0.68	0.00E+000	0.0

T = Tracer Peak used for Effective Efficiency

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

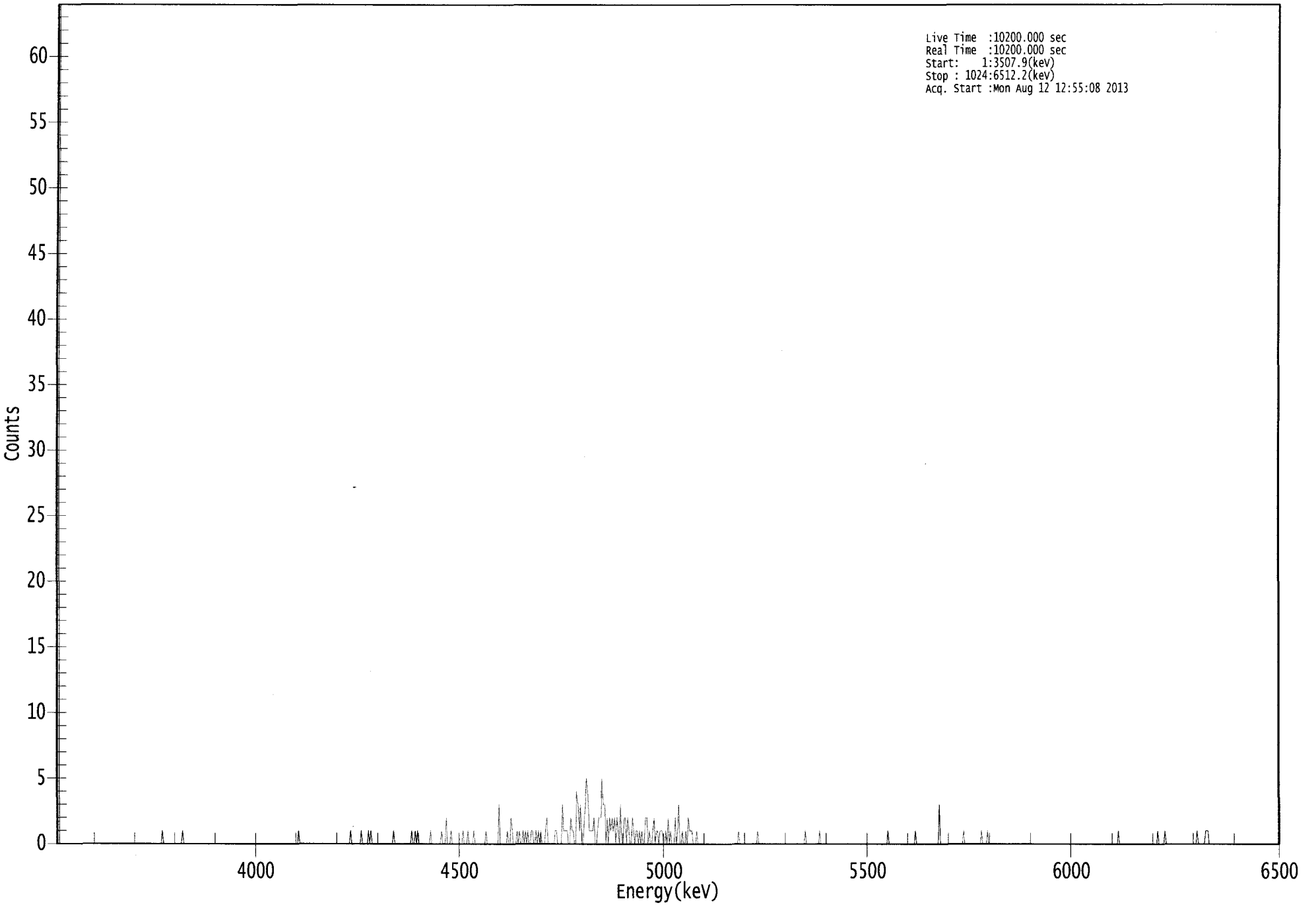
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.968	5850.00*	5.61E-003 +/- 7.30E-002	1.72E-001 +/- 3.24E-002
TH-228	0.936	5400.00*	-1.60E-003 +/- 8.50E-002	1.98E-001 +/- 3.73E-002
TH-229	0.999	4872.00*	2.38E+000 +/- 4.50E-001	1.29E-001 +/- 2.43E-002
TH-230	0.978	4672.00*	5.53E-001 +/- 2.31E-001	1.10E-001 +/- 2.08E-002
TH-232	0.994	3997.00*	-1.32E-002 +/- 4.04E-002	1.10E-001 +/- 2.07E-002

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 8/13/13

US EPA ARCHIVE DOCUMENT

000066015.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3507.9(kev)  
Stop : 1024:6512.2(kev)  
Acq. Start :Mon Aug 12 12:55:08 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: 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	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	1	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	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:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	1	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	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	1
249:	0	0	0	0	0	0	0	0
257:	1	0	0	0	0	0	1	0
265:	1	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	1	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	1	0	0	1	0	1
305:	0	0	0	0	0	0	0	0
313:	0	0	1	0	0	0	0	0
321:	0	0	0	1	0	0	0	2
329:	0	0	0	1	0	0	0	0
337:	0	0	0	0	0	1	0	0
345:	0	1	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 3 0 0 0 0

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	0	0	2	1	0
385:	0	0	1	0	1	0	0	1
393:	0	1	0	1	0	0	1	1
401:	0	0	1	0	1	0	1	0
409:	0	0	1	2	0	0	0	0
417:	0	0	1	1	0	0	0	0
425:	3	1	1	1	1	0	0	2
433:	1	1	0	0	4	3	1	3
441:	0	0	2	3	5	4	1	1
449:	1	1	2	0	0	1	2	2
457:	2	5	3	3	0	2	0	2
465:	1	2	1	2	0	2	1	0
473:	3	0	0	2	2	0	2	1
481:	0	0	2	1	0	1	1	0
489:	1	0	1	0	0	2	2	0
497:	1	0	0	1	2	0	1	1
505:	0	1	1	1	0	0	1	0
513:	2	0	1	0	0	0	2	0
521:	1	3	0	0	1	0	0	1
529:	0	2	1	1	1	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	1	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	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	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	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	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:	1	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	1
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	3	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	1
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	1	0
777:	0	0	0	1	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:	1	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	1	0	0	0	0	0	1
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	1	0	0	0	0	0
961:	0	1	1	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

1008  
8/12/13

# Apex-Alpha™

Sample Description: LR-100 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 07  
 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: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:09 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: 0.1381 +/- 0.0132  
 Counting Efficiency: 0.1477 +/- 0.0027 on 7/20/2013 6:27:27 PM  
 Chem. Recovery Factor: 0.9345 +/- 0.0908

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	5.872	-0.85	246.69	0.85	0.00E+000	0.0
TH-228	5.400	2.32	149.12	0.68	0.00E+000	6.0
TH-229 T	4.866	123.32	17.71	0.68	0.00E+000	3.0
TH-230	4.618	21.32	43.23	0.68	0.00E+000	3.0
TH-232	3.924	1.83	152.56	0.17	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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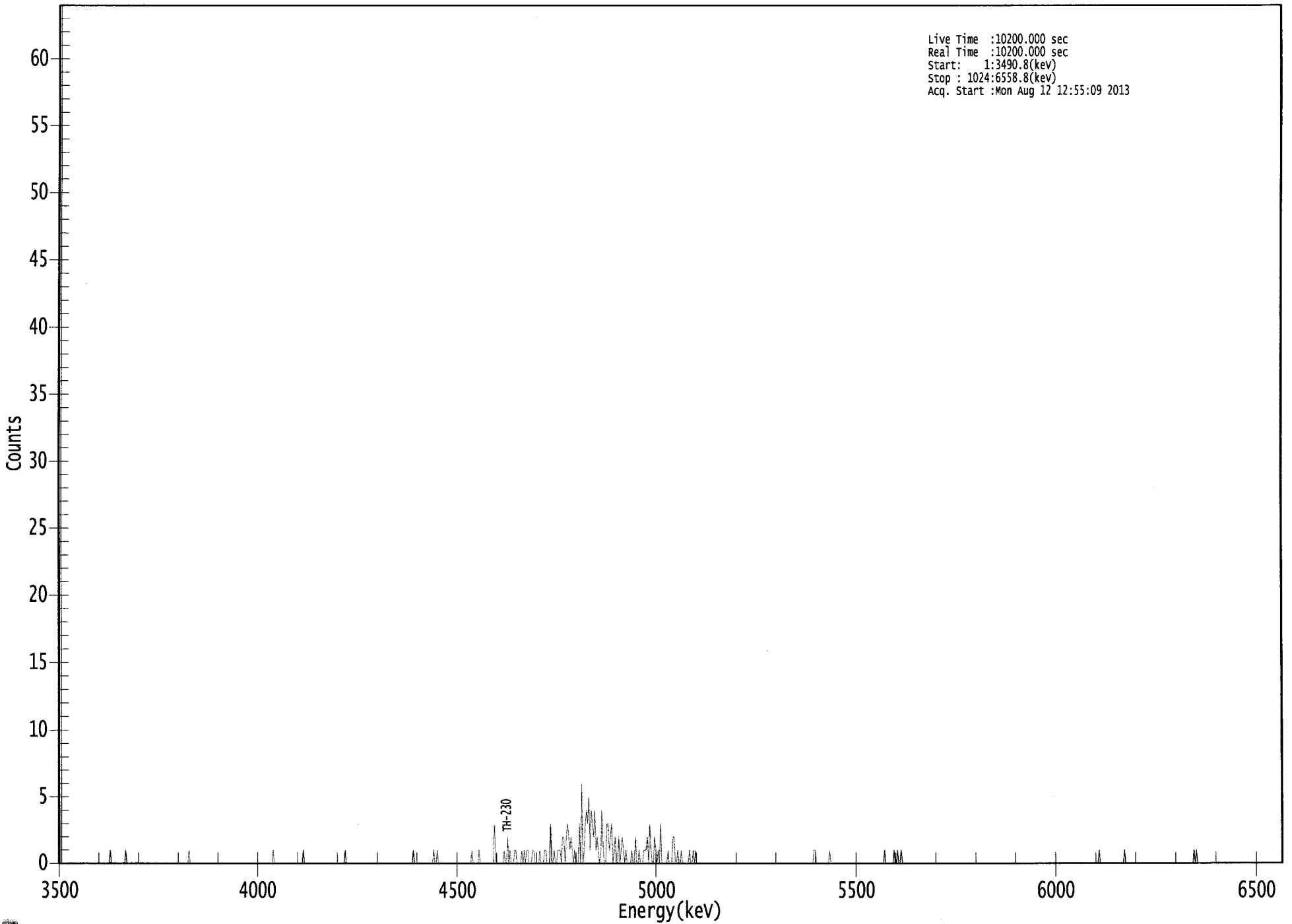
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.997	5850.00*	-1.68E-002 +/- 4.15E-002	1.18E-001 +/- 2.21E-002
TH-228	1.000	5400.00*	4.57E-002 +/- 6.87E-002	1.11E-001 +/- 2.08E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.45E-001	1.09E-001 +/- 2.04E-002
TH-230	0.985	4672.00*	4.10E-001 +/- 1.93E-001	1.08E-001 +/- 2.03E-002
TH-232	0.973	3997.00*	3.51E-002 +/- 5.40E-002	8.01E-002 +/- 1.50E-002

AG  
8/12/13

US EPA ARCHIVE DOCUMENT

0000065909.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3490.8(kev)  
Stop : 1024:6558.8(kev)  
Acq. Start :Mon Aug 12 12:55:09 2013



ROI Type: 1

ROI Type: 3

9226

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

Sample Title: 07

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	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	1	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	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	1	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	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	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	0	0	0	0	0
233:	0	0	0	0	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	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	1	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	1	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	0	0	0	0	0
345:	0	0	1	0	0	0	0	0
353:	1	0	0	0	0	0	0	0
361:	0	0	0	0	0	3	0	0

369: 0 0 0 0 0 1 0 0

Sample Title: 07

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

801: 0 0 0 0 0 0 0 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	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	1	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	1	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

148  
8/12/13

# Apex-Alpha™

Sample Description: D-81 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 08  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:35 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: 0.1578 +/- 0.0142  
 Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM  
 Chem. Recovery Factor: 0.9513 +/- 0.0873

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	5.768	5.64	93.45	1.36	0.00E+000	5.0
TH-228	5.295	3.66	107.87	0.34	0.00E+000	3.3
TH-229 T	4.869	141.00	16.56	0.00	0.00E+000	6.0
TH-230	4.622	22.00	42.73	0.00	0.00E+000	6.7
TH-232	3.982	2.66	128.85	0.34	0.00E+000	3.3

T = Tracer Peak used for Effective Efficiency

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

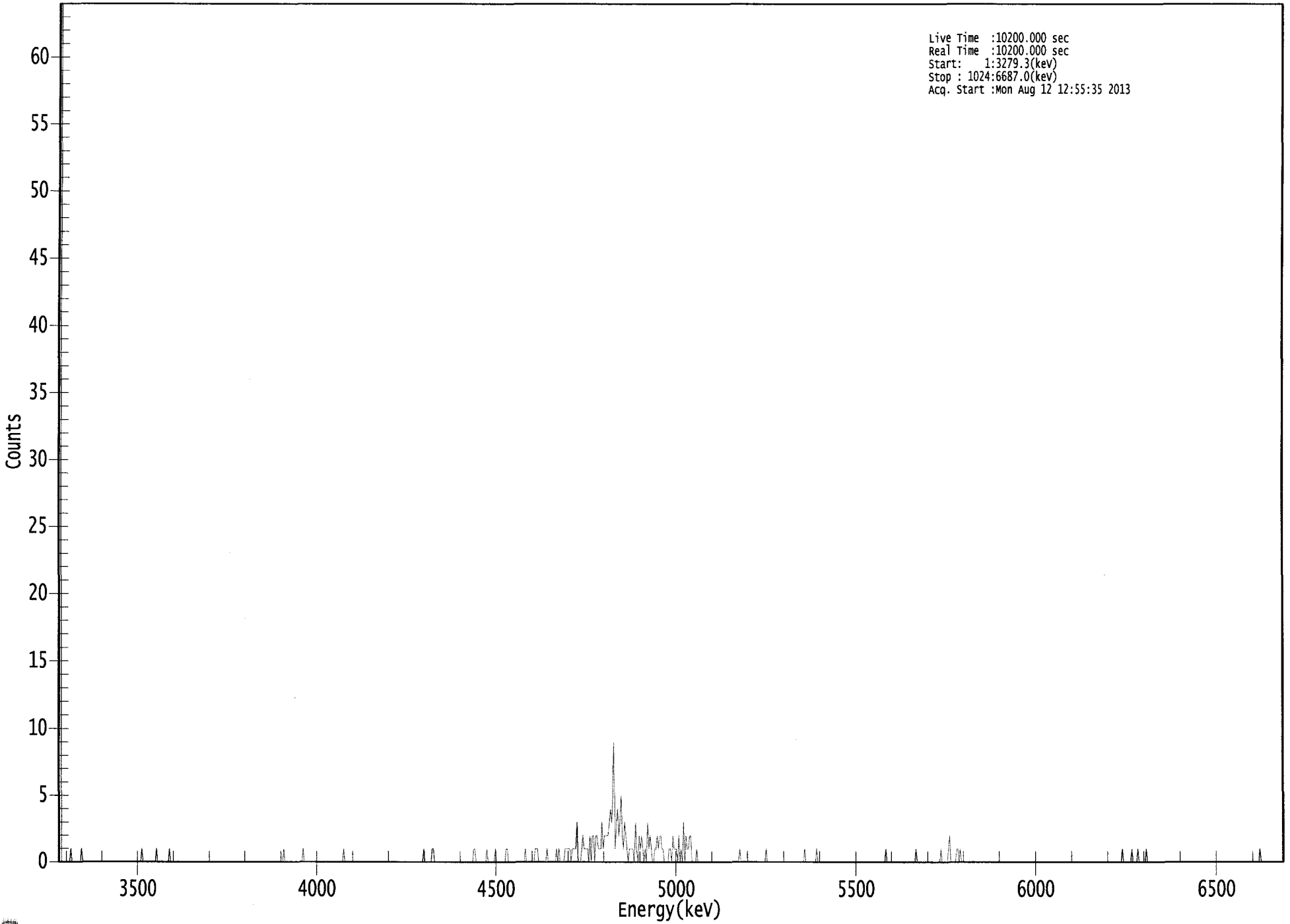
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.965	5850.00*	9.73E-002 +/- 9.26E-002	1.18E-001 +/- 2.09E-002
TH-228	0.944	5400.00*	6.31E-002 +/- 6.90E-002	8.24E-002 +/- 1.45E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.20E-001	1.01E-001 +/- 1.78E-002
TH-230	0.987	4672.00*	3.70E-001 +/- 1.71E-001	1.01E-001 +/- 1.78E-002
TH-232	0.999	3997.00*	4.47E-002 +/- 5.81E-002	8.03E-002 +/- 1.42E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065914.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3279.3(kev)  
Stop : 1024:6687.0(kev)  
Acq. Start :Mon Aug 12 12:55:35 2013



ROI Type: 1

ROI Type: 3

0231



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

Sample Title: 08

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0	0
9:	0	0	1	0	0	0	0	0
17:	0	0	0	1	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	1	0
73:	0	0	0	0	0	0	0	0
81:	0	0	1	0	0	0	0	0
89:	0	0	0	0	0	1	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	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	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	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	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	1	0	0	0	0	0
313:	0	1	1	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	1	1	0	0
353:	0	0	0	0	0	0	0	1
361:	0	0	0	0	0	0	1	0

369: 0 0 0 0 0 0 0 0 1

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	1
393:	0	0	0	0	0	0	0	1
401:	1	1	0	0	0	0	0	0
409:	0	1	0	0	0	0	0	0
417:	0	1	0	1	0	0	0	0
425:	1	1	1	1	1	0	1	1
433:	1	1	3	0	0	0	1	2
441:	1	1	1	1	0	2	0	2
449:	2	0	2	2	1	1	1	3
457:	1	2	2	2	2	3	4	3
465:	5	9	1	3	4	2	3	5
473:	2	1	3	2	1	0	1	1
481:	1	1	0	3	1	0	2	1
489:	2	1	0	1	0	3	1	2
497:	1	0	0	1	1	2	1	2
505:	2	1	1	0	0	0	0	1
513:	1	0	2	1	1	1	0	2
521:	0	1	0	3	0	2	1	1
529:	2	2	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	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	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	1	0	0	0	0	0	0	0
633:	0	0	1	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	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	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	1	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	0	0	0	0
745:	1	2	0	0	0	0	0	1
753:	1	0	1	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 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	1	0	0	0	0	0	0
897:	0	1	0	0	0	0	1	0
905:	0	0	0	0	0	1	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	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

KB  
8/12/13

# Apex-Alpha™

Sample Description: D-81 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 09  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:36 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.232 mL  
 Effective Efficiency: 0.1750 +/- 0.0152  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Chem. Recovery Factor: 1.1428 +/- 0.1013

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	5.785	3.64	123.16	1.36	0.00E+000	3.1
TH-228	5.308	4.45	120.09	2.55	0.00E+000	3.1
TH-229 T	4.890	155.13	15.85	1.87	0.00E+000	4.8
TH-230	4.611	19.96	46.42	2.04	0.00E+000	3.1
TH-232	4.036	2.49	138.29	0.51	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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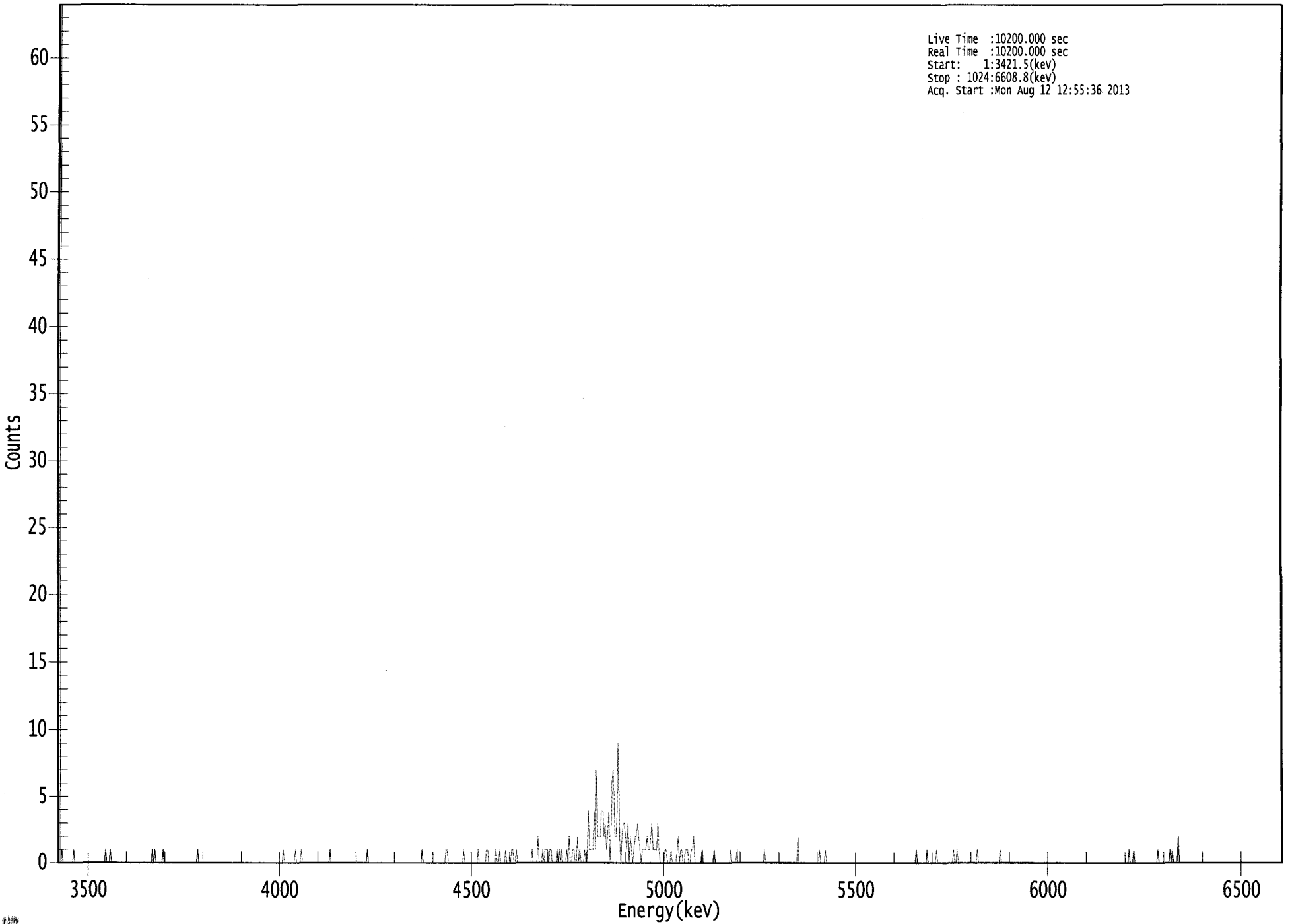
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.978	5850.00*	5.67E-002 +/- 7.04E-002	1.07E-001 +/- 1.81E-002
TH-228	0.957	5400.00*	6.92E-002 +/- 8.39E-002	1.30E-001 +/- 2.21E-002
TH-229	0.998	4872.00*	2.36E+000 +/- 4.01E-001	1.15E-001 +/- 1.96E-002
TH-230	0.980	4672.00*	3.03E-001 +/- 1.50E-001	1.18E-001 +/- 2.01E-002
TH-232	0.992	3997.00*	3.77E-002 +/- 5.25E-002	7.94E-002 +/- 1.35E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065915.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3421.5(kev)  
Stop : 1024:6608.8(kev)  
Acq. Start :Mon Aug 12 12:55:36 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:	10200	10200	0	1	0	0	0	0
9:	0	0	0	0	0	1	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	1	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	1
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	1	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	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	1	0	0
193:	0	0	0	0	0	0	0	1
201:	0	0	0	0	1	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	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	1	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	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	1	1	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	1	0	0	0
345:	0	0	0	0	0	0	0	0
353:	1	0	0	0	0	0	0	1
361:	1	0	0	0	0	0	0	1

369: 0 0 1 0 0 0 0 0 1

Sample Title: 09

Channel	1	2	3	4	5	6	7	8	9
377:	0	0	0	0	1	1	0	0	
385:	1	0	0	0	0	0	0	0	
393:	0	0	0	0	0	1	0	0	
401:	0	0	2	0	0	0	1	0	
409:	1	1	1	0	1	1	0	0	
417:	0	0	1	0	1	0	1	0	
425:	0	0	1	0	2	0	0	1	
433:	1	0	0	2	0	1	0	0	
441:	0	1	0	0	4	1	1	1	
449:	1	4	1	7	2	2	2	4	
457:	4	2	3	1	2	4	0	3	
465:	6	7	2	2	4	9	2	0	
473:	2	3	3	2	1	3	0	2	
481:	1	0	1	2	2	3	2	1	
489:	0	1	1	1	1	2	1	1	
497:	2	3	1	1	1	1	3	1	
505:	0	0	0	0	1	1	0	0	
513:	0	1	0	0	0	0	1	2	
521:	0	1	1	0	0	1	1	1	
529:	0	0	1	1	2	0	0	0	
537:	0	0	0	1	0	0	0	0	
545:	0	0	0	0	0	1	0	0	
553:	0	0	0	0	0	0	0	0	
561:	0	0	0	1	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	2	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	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	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	1	0	
721:	0	0	0	0	0	0	0	1	
729:	0	0	0	0	0	0	0	1	
737:	0	0	0	0	0	0	0	0	
745:	0	0	0	0	0	1	0	0	
753:	1	0	0	0	0	0	0	0	
761:	0	0	0	0	0	0	0	0	
769:	0	1	0	0	0	0	0	0	
777:	0	0	0	0	0	0	0	0	
785:	0	0	0	0	1	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	1
897:	0	0	0	1	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	1
921:	0	0	0	0	0	0	0	0
929:	0	1	0	1	0	0	0	0
937:	2	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



KCS  
8/12/13

# Apex-Alpha™

Sample Description: PZ-204-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 10  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:37 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.232 mL  
 Effective Efficiency: 0.2003 +/- 0.0163  
 Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM  
 Chem. Recovery Factor: 1.1711 +/- 0.0974

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	5.818	1.15	249.58	0.85	0.00E+000	6.2
TH-228	5.345	6.66	78.18	0.34	0.00E+000	3.1
TH-229 T	4.884	177.66	14.72	0.34	0.00E+000	4.6
TH-230	4.600	22.15	42.57	0.85	0.00E+000	3.1
TH-232	4.015	2.49	138.29	0.51	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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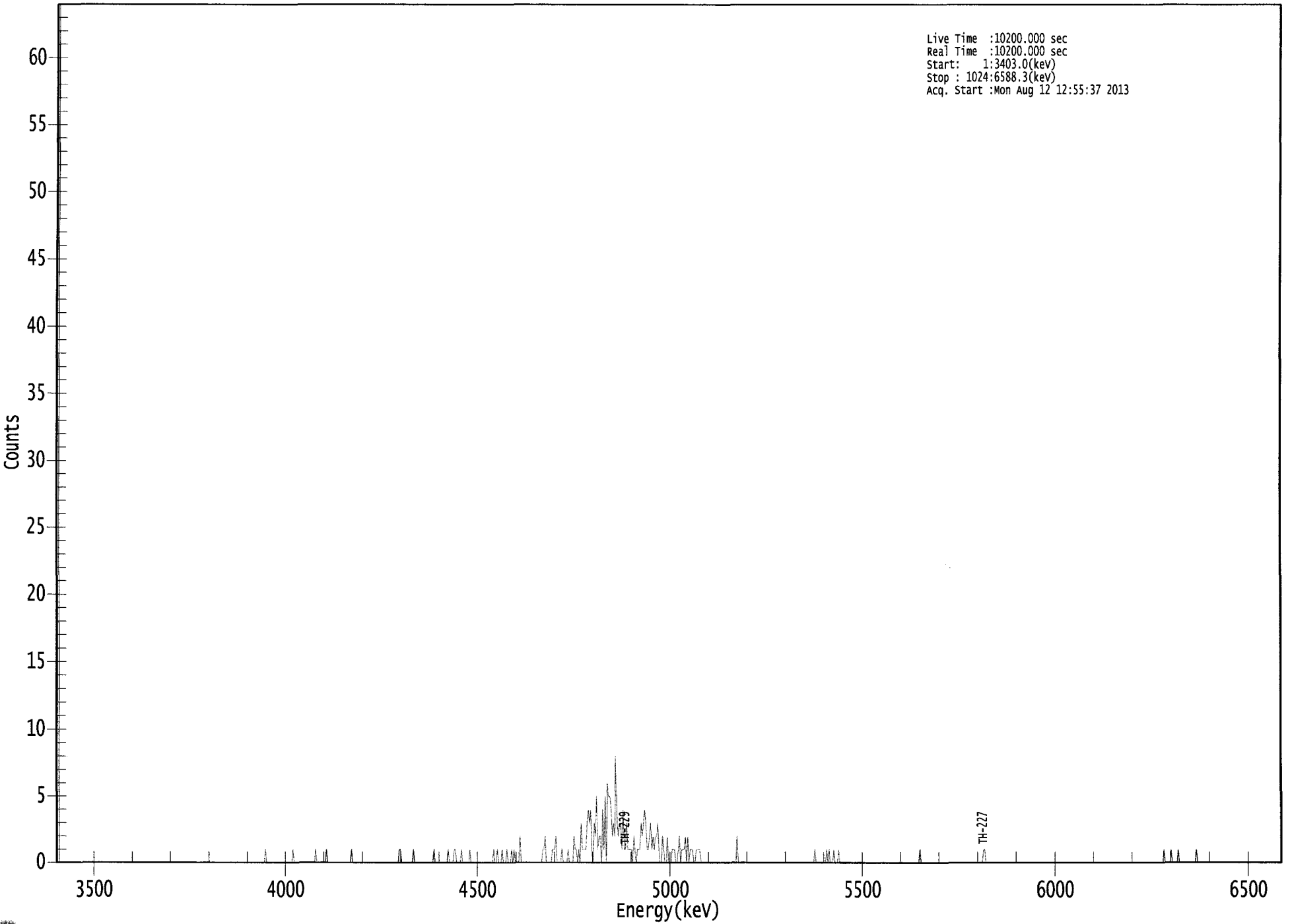
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.995	5850.00*	1.56E-002 +/- 3.91E-002	8.14E-002 +/- 1.30E-002
TH-228	0.984	5400.00*	9.05E-002 +/- 7.22E-002	6.50E-002 +/- 1.03E-002
TH-229	0.999	4872.00*	2.36E+000 +/- 3.76E-001	6.36E-002 +/- 1.01E-002
TH-230	0.974	4672.00*	2.94E-001 +/- 1.33E-001	7.94E-002 +/- 1.26E-002
TH-232	0.998	3997.00*	3.29E-002 +/- 4.59E-002	6.94E-002 +/- 1.11E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065916.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3403.0(kev)  
Stop : 1024:6588.3(kev)  
Acq. Start :Mon Aug 12 12:55:37 2013



ROI Type: 1

ROI Type: 3

1420

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

Sample Title: 10

Elapsed Live time: 10200  
Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	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	1
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	0
217:	0	1	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:	0	0	0	0	0	0	0	1
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	1
289:	1	0	0	0	0	0	0	0
297:	0	0	0	1	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:	1	0	0	0	0	1	1	0
337:	0	0	0	1	0	0	0	0
345:	0	0	1	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	1	0

369: 0 1 0 0 0 1 0 0

Sample Title: 10

Channel	1	2	3	4	5	6	7	8
377:	0	1	0	0	0	1	0	1
385:	0	0	0	0	2	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	1
409:	1	2	0	0	0	0	0	1
417:	1	1	2	0	0	0	0	1
425:	0	0	0	0	1	0	0	0
433:	0	2	1	1	0	1	0	3
441:	1	1	1	1	3	4	3	4
449:	1	0	3	2	5	1	2	2
457:	0	4	1	5	0	6	5	5
465:	4	2	3	2	8	3	2	3
473:	3	1	4	1	1	3	1	1
481:	1	1	0	2	1	0	1	1
489:	1	3	2	3	4	3	1	1
497:	2	3	1	2	1	2	2	3
505:	1	0	0	2	1	0	0	2
513:	0	0	0	1	1	1	0	0
521:	1	2	0	1	1	1	2	0
529:	2	0	1	1	1	0	0	1
537:	1	1	1	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	2	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	1	0	0	0	0	0
641:	0	0	0	0	1	0	1	0
649:	0	0	1	0	0	0	1	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	1	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	1
777:	1	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 10

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

KCB  
8/12/13

# Apex-Alpha™

Sample Description: PZ-204-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 11  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:38 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: 0.1387 +/- 0.0133  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Chem. Recovery Factor: 0.8110 +/- 0.0792

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	5.809	-1.72	137.81	2.72	0.00E+000	3.1
TH-228	5.374	0.62	583.27	2.38	0.00E+000	3.1
TH-229 T	4.865	123.96	17.77	2.04	0.00E+000	3.4
TH-230	4.600	28.81	37.39	1.19	0.00E+000	6.2
TH-232	3.866	3.15	126.67	0.85	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

-----  
 NUCLIDE ANALYSIS RESULTS  
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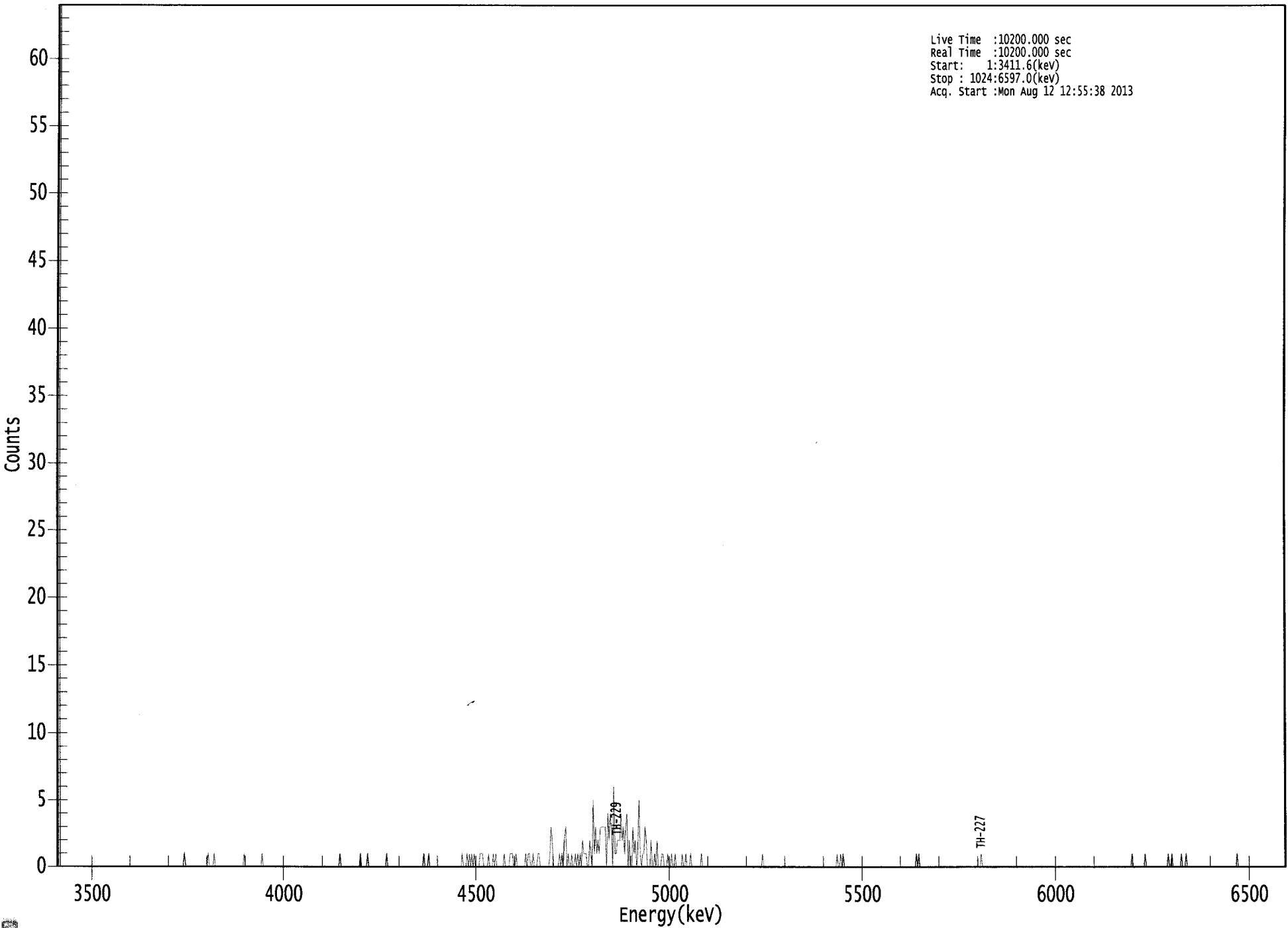
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.991	5850.00*	-3.38E-002 +/- 4.70E-002	1.68E-001 +/- 3.16E-002
TH-228	0.997	5400.00*	1.22E-002 +/- 7.10E-002	1.61E-001 +/- 3.02E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.47E-001	1.50E-001 +/- 2.81E-002
TH-230	0.974	4672.00*	5.51E-001 +/- 2.31E-001	1.26E-001 +/- 2.37E-002
TH-232	0.914	3997.00*	6.02E-002 +/- 7.71E-002	1.14E-001 +/- 2.15E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065917.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3411.6(kev)  
Stop : 1024:6597.0(kev)  
Acq. Start :Mon Aug 12 12:55:38 2013



ROI Type: 1

ROI Type: 3

9245

\*\*\*\*\*  
 \*\*\*\*\* 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:	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	1	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	1	0
129:	0	0	0	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	1	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	1	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	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	1	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	1	0	0
257:	0	0	0	1	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	1	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	1	0	0	0	1	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	1	0	0	0	1	0
345:	1	0	1	0	1	0	0	0
353:	0	1	1	1	0	0	0	0
361:	1	0	0	0	1	0	1	0



369: 0 0 0 0 0 1 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	1	1	1	0	0	1
385:	0	0	0	0	0	0	0	1
393:	0	1	1	0	0	1	0	0
401:	0	1	1	0	0	0	0	0
409:	0	0	0	1	3	2	0	0
417:	0	0	0	1	0	1	0	2
425:	3	0	1	0	0	1	0	0
433:	1	0	1	0	1	0	2	1
441:	1	1	0	0	2	1	0	5
449:	1	3	1	2	1	3	3	3
457:	3	3	0	4	2	4	3	0
465:	6	1	1	2	2	2	4	2
473:	3	1	3	4	0	2	0	0
481:	3	1	2	0	1	5	1	0
489:	1	1	3	2	0	0	0	2
497:	0	0	1	0	2	0	0	0
505:	1	1	0	0	0	1	0	0
513:	1	0	0	1	0	0	0	0
521:	0	1	0	0	1	0	0	0
529:	1	0	0	0	0	0	0	0
537:	0	1	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	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	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	0	1	0	0	1	0	1
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	1	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	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: 11

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	1
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	0	0	1	0	0
929:	1	0	0	0	0	0	0	0
937:	1	0	0	0	1	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	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	0	0	0	0

ICB  
8/12/13

# Apex-Alpha™

Sample Description: LR-103 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 12  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:39 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.231 mL  
 Effective Efficiency: 0.1445 +/- 0.0136  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Chem. Recovery Factor: 0.8325 +/- 0.0799

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	5.755	1.81	193.79	1.19	0.00E+000	3.1
TH-228	5.411	3.13	144.41	1.87	0.00E+000	3.1
TH-229	T 4.847	127.32	17.42	0.68	0.00E+000	4.6
TH-230	4.646	28.32	37.34	0.68	0.00E+000	3.1
TH-232	3.893	3.00	130.67	0.00	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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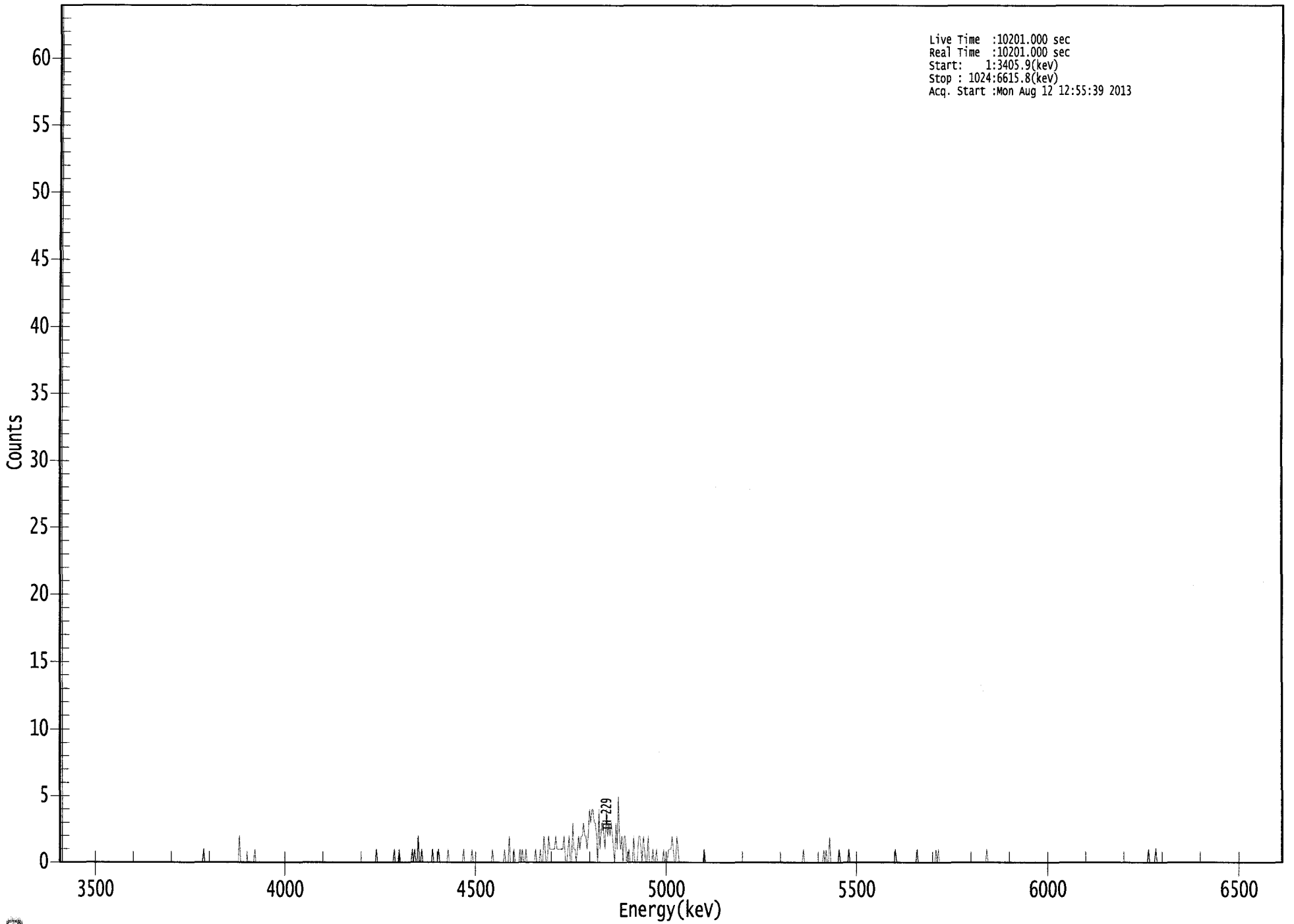
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.954	5850.00*	3.41E-002 +/- 6.64E-002	1.24E-001 +/- 2.29E-002
TH-228	0.999	5400.00*	5.89E-002 +/- 8.58E-002	1.43E-001 +/- 2.63E-002
TH-229	0.997	4872.00*	2.35E+000 +/- 4.33E-001	1.04E-001 +/- 1.92E-002
TH-230	0.996	4672.00*	5.20E-001 +/- 2.17E-001	1.04E-001 +/- 1.91E-002
TH-232	0.945	3997.00*	5.50E-002 +/- 7.26E-002	1.10E-001 +/- 2.03E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065918.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3405.9(kev)  
Stop : 1024:6615.8(kev)  
Acq. Start :Mon Aug 12 12:55:39 2013



ROI Type: 1

ROI Type: 3

0251

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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: 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	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	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:	0	0	0	0	0	0	0	2
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	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	1	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	1	0	0	0	1	0	0
289:	0	0	0	0	0	0	0	0
297:	1	0	1	0	0	2	0	0
305:	1	0	0	0	0	0	0	0
313:	0	1	0	0	0	0	1	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	1	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	1	0	0	0	0

369: 0 0 0 0 0 1 0 0

Sample Title: 12

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	2	0	0	0	1	0	0
385:	0	0	1	0	1	0	0	1
393:	0	0	0	0	0	0	0	1
401:	0	0	0	1	0	0	2	1
409:	0	0	2	1	1	1	1	1
417:	2	1	1	1	1	1	1	2
425:	0	0	1	2	0	0	3	1
433:	1	0	1	2	1	2	2	3
441:	2	2	1	2	4	3	4	4
449:	3	3	2	0	4	1	3	3
457:	2	1	4	2	3	2	3	2
465:	1	0	3	1	5	2	1	2
473:	0	2	2	0	0	1	0	0
481:	0	2	0	0	0	2	2	1
489:	0	2	1	0	0	2	0	0
497:	0	1	0	0	1	0	0	0
505:	0	0	1	0	0	0	1	1
513:	1	2	1	0	0	2	1	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	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	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	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	1	0	1	0	0	2	0	0
649:	0	0	0	0	0	1	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	1	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	1	0
737:	1	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:	1	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	1
913:	0	0	0	0	0	1	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

108  
8/12/13

# Apex-Alpha™

Sample Description: LR-103 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 13  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:40 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.233 mL  
 Effective Efficiency: 0.1791 +/- 0.0153  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Chem. Recovery Factor: 1.0365 +/- 0.0906

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	5.878	1.30	273.47	1.70	0.00E+000	3.2
TH-228	5.319	1.11	374.31	2.89	0.00E+000	3.2
TH-229 T	4.874	159.15	15.58	0.85	0.00E+000	5.1
TH-230	4.601	37.30	32.94	1.70	0.00E+000	3.2
TH-232	3.926	5.81	90.54	1.19	0.00E+000	3.2

T = Tracer Peak used for Effective Efficiency

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.996	5850.00*	1.98E-002 +/- 5.42E-002	1.12E-001 +/- 1.87E-002
TH-228	0.966	5400.00*	1.69E-002 +/- 6.32E-002	1.33E-001 +/- 2.23E-002
TH-229	1.000	4872.00*	2.37E+000 +/- 3.96E-001	8.90E-002 +/- 1.49E-002
TH-230	0.974	4672.00*	5.53E-001 +/- 2.04E-001	1.09E-001 +/- 1.82E-002
TH-232	0.974	3997.00*	8.60E-002 +/- 7.91E-002	9.75E-002 +/- 1.63E-002

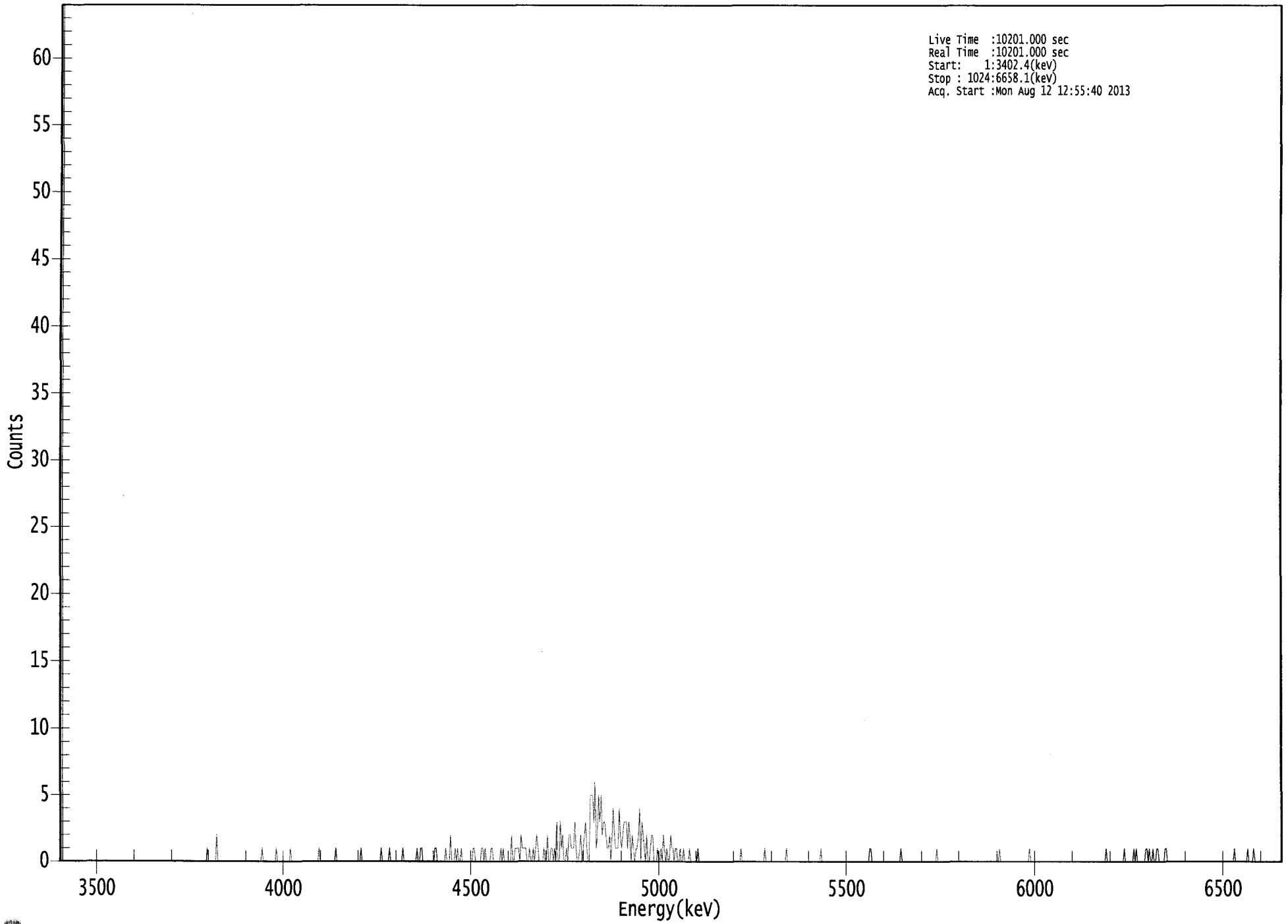
AG  
8/13/13

US EPA ARCHIVE DOCUMENT



0000065919.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3402.4(kev)  
Stop : 1024:6658.1(kev)  
Acq. Start :Mon Aug 12 12:55:40 2013



ROI Type: 1

ROI Type: 3

0255  
9520

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

Sample Title: 13

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	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	1	0	0	0
129:	0	0	0	0	2	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	1	0	0	0	0	0
177:	0	0	0	0	0	0	1	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	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:	1	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	1	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	1	0
273:	0	0	0	0	0	1	0	0
281:	0	0	0	0	0	0	0	0
289:	1	0	0	0	0	0	0	0
297:	0	0	0	0	1	0	0	1
305:	1	0	0	0	0	0	0	0
313:	0	0	0	1	1	0	0	0
321:	0	0	0	0	1	0	0	0
329:	2	0	0	0	1	0	1	0
337:	0	1	0	0	0	0	0	0
345:	0	0	0	1	1	0	0	0
353:	0	0	1	1	0	1	0	0
361:	0	0	1	1	0	0	0	0

369: 0 0 1 0 1 0 0 0

Sample Title: 13

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	2	0	0	1	1
385:	1	1	0	2	1	1	1	1
393:	0	0	1	0	0	1	0	1
401:	2	1	0	0	0	0	1	0
409:	0	2	0	0	1	1	0	1
417:	0	3	0	0	3	1	2	0
425:	0	1	0	2	2	1	1	1
433:	3	1	0	0	1	2	0	1
441:	2	3	1	0	0	5	5	5
449:	3	6	1	2	5	3	5	2
457:	3	3	2	1	1	2	0	2
465:	4	2	1	1	1	4	2	1
473:	2	3	3	3	1	3	2	0
481:	2	1	0	1	1	2	4	0
489:	3	2	1	0	2	0	0	1
497:	2	2	0	0	0	1	0	0
505:	1	0	2	1	0	1	0	0
513:	2	1	1	0	1	1	0	0
521:	1	0	0	1	0	0	0	0
529:	1	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	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	1
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	1	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	1	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	1
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	1	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	1
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	1	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 13

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

KCS  
8/12/13

# Apex-Alpha™

Sample Description: PZ-111-KS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 14  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:40 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.233 mL  
 Effective Efficiency: 0.1797 +/- 0.0153  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Chem. Recovery Factor: 0.9239 +/- 0.0804

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	5.798	3.32	119.77	0.68	0.00E+000	3.1
TH-228	5.356	1.28	323.54	2.72	0.00E+000	3.1
TH-229 T	4.879	160.15	15.54	0.85	0.00E+000	13.2
TH-230	4.641	28.66	36.86	0.34	0.00E+000	4.7
TH-232	3.949	-1.19	180.58	1.19	0.00E+000	0.0

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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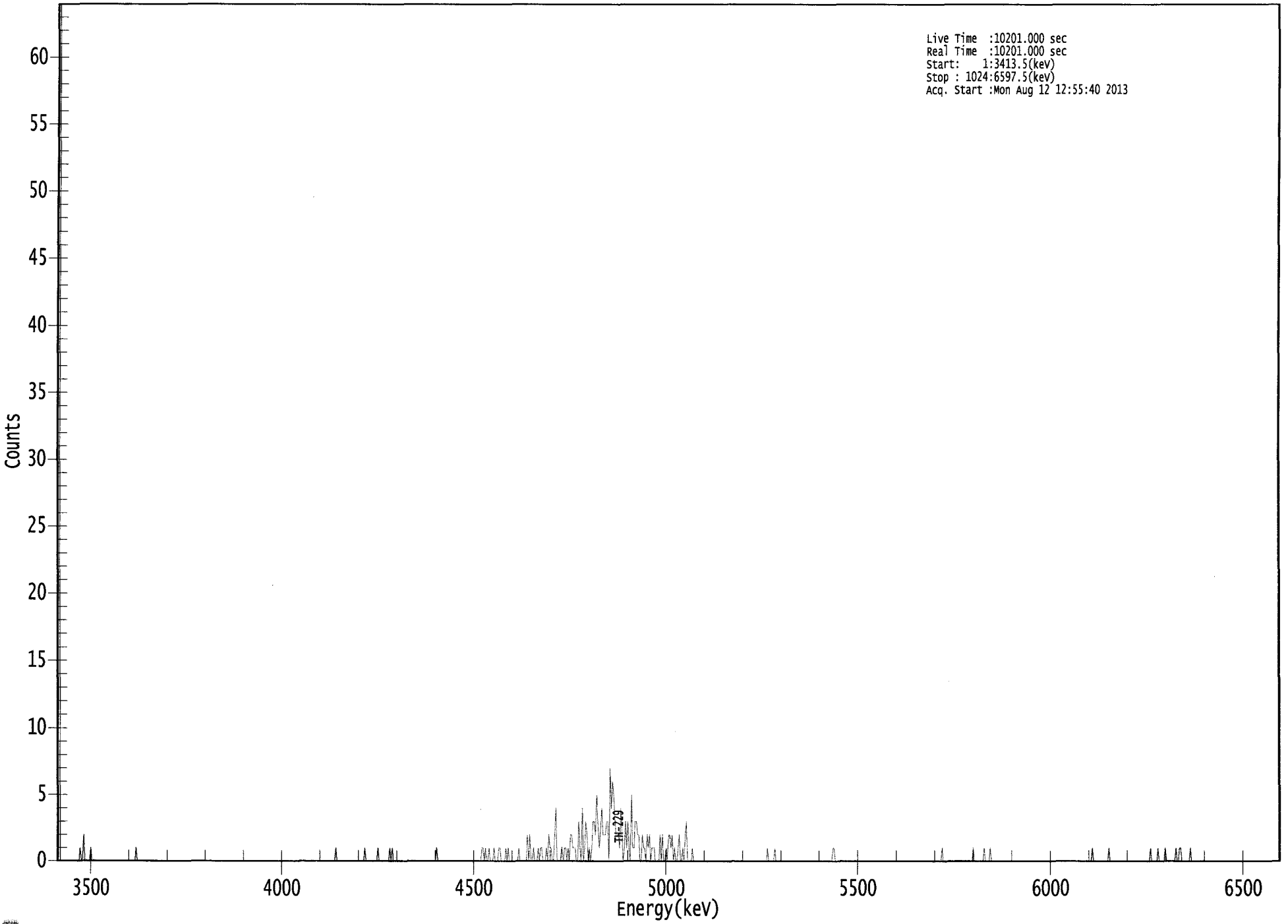
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.986	5850.00*	5.03E-002 +/- 6.08E-002	8.55E-002 +/- 1.43E-002
TH-228	0.990	5400.00*	1.94E-002 +/- 6.28E-002	1.30E-001 +/- 2.17E-002
TH-229	1.000	4872.00*	2.37E+000 +/- 3.96E-001	8.87E-002 +/- 1.48E-002
TH-230	0.995	4672.00*	4.23E-001 +/- 1.71E-001	7.06E-002 +/- 1.18E-002
TH-232	0.988	3997.00*	-1.75E-002 +/- 3.18E-002	9.71E-002 +/- 1.62E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065920.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3413.5(kev)  
Stop : 1024:6597.5(kev)  
Acq. Start :Mon Aug 12 12:55:40 2013



ROI Type: 1

ROI Type: 3

0261

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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: 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	2	0
25:	0	0	0	0	1	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	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	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	1	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	1	0	0	0	0	0
265:	0	0	0	0	0	1	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	0	1	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	1	1	0	1
361:	0	0	1	0	0	0	1	0

369: 0 0 1 1 0 0 0 0

Sample Title: 14

Channel	1	2	3	4	5	6	7	8
377:	1	0	1	0	0	0	0	0
385:	0	0	0	1	0	0	0	0
393:	0	0	2	0	2	0	0	1
401:	0	0	0	1	0	1	1	0
409:	0	0	1	0	2	1	1	0
417:	0	2	4	0	0	0	0	1
425:	0	1	1	0	1	0	2	2
433:	1	1	1	0	0	3	1	0
441:	4	0	1	3	2	0	1	0
449:	1	3	3	2	5	3	1	2
457:	4	2	2	2	3	3	0	7
465:	4	6	5	3	2	2	2	1
473:	4	2	0	1	3	1	3	1
481:	0	5	1	1	3	3	2	2
489:	0	0	2	1	1	0	2	1
497:	2	0	1	1	1	0	0	0
505:	0	2	0	2	0	0	1	0
513:	2	2	1	2	0	1	0	0
521:	1	2	0	0	1	0	2	3
529:	0	0	0	0	1	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	1	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	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	1	1	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	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	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	1
769:	0	0	0	0	0	0	0	0
777:	1	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: 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	1	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	1	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	1	0	0	0	0	0	1
929:	0	0	0	0	0	0	0	0
937:	1	0	0	1	1	0	0	0
945:	0	0	0	0	1	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



UCB  
8/12/13

Sample Description: PZ-111-KS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000659  
 Batch Identification: 1307149A-TH  
 Sample Identification: 15  
 Sample Geometry: Shelf 2  
 Procedure Description: Th iso

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Sample Date/Time: 7/17/2013 7:20:26 AM  
 Acquisition Date/Time: 8/12/2013 12:55:41 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229\_TH-18A  
 Tracer Quantity: 0.232 mL  
 Effective Efficiency: 0.1613 +/- 0.0144  
 Counting Efficiency: 0.1418 +/- 0.0034 on 6/13/2013 3:23:29 PM  
 Chem. Recovery Factor: 1.1375 +/- 0.1054

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	5.921	6.32	82.73	0.68	0.00E+000	3.1
TH-228	5.441	-0.02	10563.	1.02	0.00E+000	3.1
TH-229 T	4.871	143.15	16.44	0.85	0.00E+000	7.1
TH-230	4.634	29.49	36.46	0.51	0.00E+000	3.1
TH-232	3.912	0.15	1398.6	0.85	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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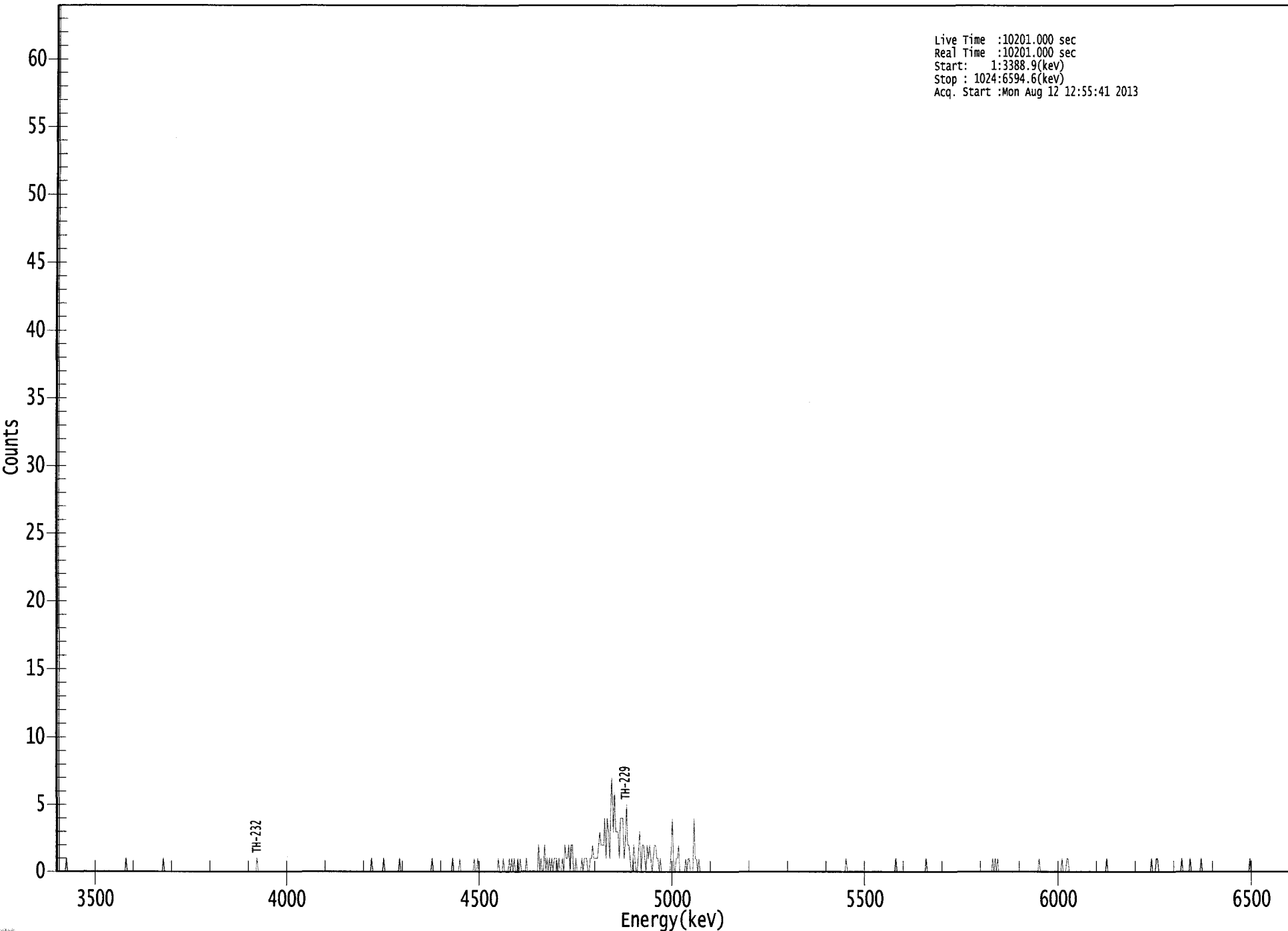
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
TH-227	0.974	5850.00*	1.07E-001 +/- 9.02E-002	9.52E-002 +/- 1.67E-002
TH-228	0.991	5400.00*	-3.39E-004 +/- 3.58E-002	1.06E-001 +/- 1.86E-002
TH-229	1.000	4872.00*	2.36E+000 +/- 4.14E-001	9.88E-002 +/- 1.73E-002
TH-230	0.993	4672.00*	4.85E-001 +/- 1.96E-001	8.63E-002 +/- 1.51E-002
TH-232	0.963	3997.00*	2.46E-003 +/- 3.44E-002	9.83E-002 +/- 1.72E-002

AG  
8/13/13

US EPA ARCHIVE DOCUMENT

0000065921.CNF

Live Time :10201.000 sec  
Real Time :10201.000 sec  
Start: 1:3388.9(kev)  
Stop : 1024:6594.6(kev)  
Acq. Start :Mon Aug 12 12:55:41 2013



ROI Type: 1

ROI Type: 3

9920

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\*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 15

Elapsed Live time: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	0	0	0	0	0	0
9:	1	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	1	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	1	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	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	1
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	1	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	1	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:	1	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	1	0	0	0	0	0	1
337:	0	0	0	0	0	0	0	0
345:	0	0	0	1	0	0	1	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	1

369: 0 0 0 1 0 0 0 0

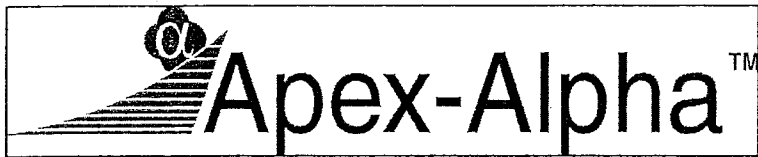
Sample Title: 15

Channel	1	2	3	4	5	6	7	8
377:	1	0	1	0	1	0	0	1
385:	0	1	0	0	0	0	1	0
393:	0	0	0	0	0	0	0	0
401:	2	0	1	0	0	2	0	1
409:	0	1	0	1	0	1	1	1
417:	0	1	0	0	1	0	2	1
425:	1	2	0	2	2	0	0	1
433:	0	0	0	0	1	0	1	1
441:	1	0	0	1	1	2	1	1
449:	1	1	2	3	2	2	2	4
457:	1	4	3	1	5	7	3	6
465:	3	3	3	1	4	4	4	1
473:	2	5	2	2	1	0	0	2
481:	1	0	0	2	3	0	2	2
489:	1	0	2	1	2	1	0	1
497:	2	2	1	1	0	1	0	0
505:	0	0	0	0	0	0	2	4
513:	0	0	1	1	2	0	0	0
521:	0	0	1	0	1	1	0	0
529:	0	4	1	1	0	1	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	1
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	1	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	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:	1	0	1	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: 15

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



## QA SUMMARY REPORT


### Review Of QA Results - Pulser Check

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

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/12/2013 5:20:50 AM
Alpha 004	21f	ALL	Passed	8/12/2013 5:20:50 AM
Alpha 005	21f	ALL	Not Done	
Alpha 006	21f	ALL	Not Done	
Alpha 007	21f	ALL	Not Done	
Alpha 008	21f	ALL	Not Done	
Alpha 009	21f	ALL	Not Done	
Alpha 010	21f	ALL	Passed	8/12/2013 5:20:51 AM
Alpha 011	21f	ALL	Passed	8/12/2013 5:20:52 AM
Alpha 012	21f	ALL	Passed	8/12/2013 5:20:53 AM
Alpha 013	21f	ALL	Passed	8/12/2013 5:20:53 AM
Alpha 014	21f	ALL	Passed	8/12/2013 5:20:54 AM
Alpha 015	21f	Peak Energy	Action	8/12/2013 5:20:55 AM
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	8/10/2013 11:23:01 AM
Alpha 019	AIM730	ALL	Passed	8/12/2013 5:20:55 AM
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/12/2013 5:20:56 AM
Alpha 023	AIM730	ALL	Passed	8/12/2013 5:20:57 AM
Alpha 024	AIM730	ALL	Passed	8/12/2013 5:20:57 AM
Alpha 025	AIM730	ALL	Passed	8/12/2013 5:20:58 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/12/2013 5:20:59 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/12/2013 5:20:59 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/12/2013 5:21:00 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:01 AM
Alpha 034	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:02 AM
Alpha 035	Alpha Analyst100DC	Peak CPS	Action	8/9/2013 5:06:44 AM
Alpha 036	Alpha Analyst100DC	Peak FWHM	Action	8/12/2013 5:21:05 AM
Alpha 036	Alpha Analyst100DC	Peak CPS	Action	8/12/2013 5:21:05 AM
Alpha 037	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:06 AM
Alpha 038	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:09 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:10 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:21:12 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/12/2013 5:22:26 AM

US EPA ARCHIVE DOCUMENT

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

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

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

US EPA ARCHIVE DOCUMENT



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

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	13-07149	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-81 TOT	45	07/17/13 10:43	1.0000E+00
Lab Deadline	8/13/2013	04	TRG	PZ-302-AS TOT	46	07/16/13 15:30	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-302-AS DIS	46	07/16/13 15:30	1.0000E+00
Project	West Lake OU-1	06	TRG	LR-100 TOT	47	07/17/13 10:23	1.0000E+00
Report Level	4	07	TRG	LR-100 DIS	47	07/17/13 10:23	1.0000E+00
Activity Units	pCi	08	DO	D-81 TOT	45	07/17/13 10:43	1.0000E+00
Aliquot Units	I	09	TRG	D-81 DIS	45	07/17/13 10:43	1.0000E+00
Matrix	WA	10	TRG	PZ-204-SS TOT	43	07/17/13 11:40	1.0000E+00
Method	E903.0	11	TRG	PZ-204-SS DIS	43	07/17/13 11:40	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	LR-103 TOT	45	07/17/13 12:15	1.0000E+00
Radiometric Tracer	Ba-133	13	TRG	LR-103 DIS	45	07/17/13 12:15	1.0000E+00
Radiometric Sol#	Ba-6a	14	TRG	PZ-111-KS TOT	41	07/17/13 13:09	1.0000E+00
Tracer Act (dpm/g)	991.12	15	TRG	PZ-111-KS DIS	41	07/17/13 13:09	1.0000E+00
Carrier							
Carrier Conc (mg/ml)							

\* 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	0.9174	909.3	404.0	98.64		0.0229	0.0296	0.0067		98.64	2.40	1.00
02	MBL	0.9114	903.3	414.1	101.77		0.0230	0.0295	0.0065		101.77	2.34	1.00
03	DUP	0.9088	900.7	413.9	102.01		0.0225	0.0302	0.0077		102.01	2.69	1.00
04	TRG	0.9069	898.8	369.8	91.33		0.0227	0.0301	0.0074		91.33	2.61	1.00
05	TRG	0.9085	900.4	296.5	73.10		0.0227	0.0289	0.0062		73.10	2.23	1.00
06	TRG	0.9097	901.6	387.5	95.41		0.0229	0.0301	0.0072		95.41	2.55	1.00
07	TRG	0.9089	900.8	369.4	91.03		0.0224	0.0294	0.0070		91.03	2.50	1.00
08	DO	0.9075	899.4	425.3	104.97		0.0227	0.0303	0.0076		104.97	2.66	1.00
09	TRG	0.9080	899.9	426.5	105.21		0.0225	0.0299	0.0074		105.21	2.61	1.00
10	TRG	0.9048	896.8	348.6	86.30		0.0228	0.0307	0.0079		86.30	2.74	1.00
11	TRG	0.9036	895.6	411.9	102.10		0.0226	0.0297	0.0071		102.10	2.53	1.00
12	TRG	0.9110	902.9	384.1	94.44		0.0226	0.0312	0.0086		94.44	2.91	1.00
13	TRG	0.9075	899.4	362.3	89.42		0.0225	0.0313	0.0088		89.42	2.96	1.00
14	TRG	0.9057	897.7	410.4	101.50		0.0228	0.0299	0.0071		101.50	2.53	1.00
15	TRG	0.9097	901.6	429.9	105.85		0.0226	0.0297	0.0071		105.85	2.53	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.

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-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	1.15E+01	1.37E+00	1.62E-01	1.02E+01	112.89	OK		OK	
02	RA-226	MBL	BLANK	pCi/l	-2.15E-02	8.91E-02	2.88E-01					OK	OK
03	RA-226	DUP	D-81 TOT	pCi/l	8.39E-01	3.87E-01	3.16E-01				NA	OK	
04	RA-226	TRG	PZ-302-AS TOT	pCi/l	8.47E-01	4.02E-01	3.35E-01					OK	
05	RA-226	TRG	PZ-302-AS DIS	pCi/l	3.41E-01	2.60E-01	2.63E-01					OK	
06	RA-226	TRG	LR-100 TOT	pCi/l	5.79E-01	3.25E-01	3.10E-01					OK	
07	RA-226	TRG	LR-100 DIS	pCi/l	3.61E-01	2.33E-01	1.79E-01					OK	
08	RA-226	DO	D-81 TOT	pCi/l	2.96E-01	2.82E-01	3.87E-01					OK	
09	RA-226	TRG	D-81 DIS	pCi/l	8.35E-01	3.54E-01	2.11E-01					OK	
10	RA-226	TRG	PZ-204-SS TOT	pCi/l	8.76E-01	4.00E-01	2.56E-01					OK	
11	RA-226	TRG	PZ-204-SS DIS	pCi/l	5.81E-01	2.89E-01	1.53E-01					OK	
12	RA-226	TRG	LR-103 TOT	pCi/l	7.11E-01	3.59E-01	2.93E-01					OK	
13	RA-226	TRG	LR-103 DIS	pCi/l	1.05E+00	4.72E-01	3.49E-01					OK	
14	RA-226	TRG	PZ-111-KS TOT	pCi/l	2.15E-01	1.93E-01	2.51E-01					OK	
15	RA-226	TRG	PZ-111-KS DIS	pCi/l	3.70E-01	2.31E-01	1.85E-01					OK	

Client	Engineering Management Support, Inc.	Eberline Services Work Order	13-07149	Analysis Code	Ra226	Run	1

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-Ra226-1**

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	RA-226	LCS	07/23/13 00:00	1.00E+00	98.64	0.00	98.64		8/6/2013 9:39	
02	RA-226	MBL	07/23/13 00:00	1.00E+00	100.00	0.00	101.77		8/6/2013 9:39	
03	RA-226	DUP	07/17/13 10:43	1.00E+00	100.00	0.00	102.01		8/6/2013 9:39	
04	RA-226	TRG	07/16/13 15:30	1.00E+00	91.33	0.00	91.33		8/6/2013 9:39	
05	RA-226	TRG	07/16/13 15:30	1.00E+00	73.10	0.00	73.10		8/6/2013 9:39	
06	RA-226	TRG	07/17/13 10:23	1.00E+00	95.41	0.00	95.41		8/6/2013 9:39	
07	RA-226	TRG	07/17/13 10:23	1.00E+00	91.03	0.00	91.03		8/6/2013 9:39	
08	RA-226	DO	07/17/13 10:43	1.00E+00	100.00	0.00	104.97		8/6/2013 9:39	
09	RA-226	TRG	07/17/13 10:43	1.00E+00	100.00	0.00	105.21		8/6/2013 9:39	
10	RA-226	TRG	07/17/13 11:40	1.00E+00	86.30	0.00	86.30		8/6/2013 9:39	
11	RA-226	TRG	07/17/13 11:40	1.00E+00	100.00	0.00	102.10		8/6/2013 9:39	
12	RA-226	TRG	07/17/13 12:15	1.00E+00	94.44	0.00	94.44		8/6/2013 9:39	
13	RA-226	TRG	07/17/13 12:15	1.00E+00	89.42	0.00	89.42		8/6/2013 9:39	
14	RA-226	TRG	07/17/13 13:09	1.00E+00	100.00	0.00	101.50		8/6/2013 9:39	
15	RA-226	TRG	07/17/13 13:09	1.00E+00	100.00	0.00	105.85		8/6/2013 9:39	

Client	Engineering Management Support, Inc.	Eberline Services Work Order	13-07149	Analysis Code	Ra226	Run	1

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Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-Ra226-1**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-226	LCS	08/07/13 16:06		A_Spec	Alpha_019	170	2.97 E+02	1.00 E-03	16.6
02	RA-226	MBL	08/07/13 16:06		A_Spec	Alpha_022	170	-5.30 E-01	9.00 E-03	15.3
03	RA-226	DUP	08/07/13 16:06		A_Spec	Alpha_023	170	2.01 E+01	1.10 E-02	17.1
04	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_024	170	1.91 E+01	1.10 E-02	17.1
05	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_025	170	7.32 E+00	4.00 E-03	17.4
06	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_027	170	1.41 E+01	1.10 E-02	17.3
07	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_029	170	9.66 E+00	2.00 E-03	19.5
08	RA-226	DO	08/07/13 16:06		A_Spec	Alpha_031	170	5.96 E+00	1.20 E-02	14.2
09	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_033	170	2.23 E+01	4.00 E-03	18.5
10	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_034	170	1.93 E+01	4.00 E-03	18.6
11	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_035	170	1.58 E+01	1.00 E-03	18.3
12	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_036	170	1.66 E+01	8.00 E-03	19.1
13	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_038	170	2.06 E+01	8.00 E-03	17.2
14	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_039	170	6.30 E+00	1.00 E-02	19.7
15	RA-226	TRG	08/07/13 16:06		A_Spec	Alpha_040	170	1.05 E+01	3.00 E-03	19

	Run	1
	Analysis Code	Ra226
Eberline Services Work Order	13-07149	
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	0.9174	909.2535	404.0000	98.64	2.40	1.00
02	MBL	BLANK	07/23/13 00:00	1.0000	0.9114	903.3068	414.1000	101.77	2.34	1.00
03	DUP	D-81 TOT	07/17/13 10:43	1.0000	0.9088	900.7299	413.9000	102.01	2.69	1.00
04	TRG	PZ-302-AS TOT	07/16/13 15:30	1.0000	0.9069	898.8467	369.8000	91.33	2.61	1.00
05	TRG	PZ-302-AS DIS	07/16/13 15:30	1.0000	0.9085	900.4325	296.5000	73.10	2.23	1.00
06	TRG	LR-100 TOT	07/17/13 10:23	1.0000	0.9097	901.6219	387.5000	95.41	2.55	1.00
07	TRG	LR-100 DIS	07/17/13 10:23	1.0000	0.9089	900.8290	369.4000	91.03	2.50	1.00
08	DO	D-81 TOT	07/17/13 10:43	1.0000	0.9075	899.4414	425.3000	104.97	2.66	1.00
09	TRG	D-81 DIS	07/17/13 10:43	1.0000	0.9080	899.9370	426.5000	105.21	2.61	1.00
10	TRG	PZ-204-SS TOT	07/17/13 11:40	1.0000	0.9048	896.7654	348.6000	86.30	2.74	1.00
11	TRG	PZ-204-SS DIS	07/17/13 11:40	1.0000	0.9036	895.5760	411.9000	102.10	2.53	1.00
12	TRG	LR-103 TOT	07/17/13 12:15	1.0000	0.9110	902.9103	384.1000	94.44	2.91	1.00
13	TRG	LR-103 DIS	07/17/13 12:15	1.0000	0.9075	899.4414	362.3000	89.42	2.96	1.00
14	TRG	PZ-111-KS TOT	07/17/13 13:09	1.0000	0.9057	897.6574	410.4000	101.50	2.53	1.00
15	TRG	PZ-111-KS DIS	07/17/13 13:09	1.0000	0.9097	901.6219	429.9000	105.85	2.53	1.00

0731  
 0731



# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07149</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-81 TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-302-AS TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-302-AS DIS	TRG					1.0000E+00	1.0000E+00				
06	LR-100 TOT	TRG					1.0000E+00	1.0000E+00				
07	LR-100 DIS	TRG					1.0000E+00	1.0000E+00				
08	D-81 TOT	DO					1.0000E+00	1.0000E+00				
09	D-81 DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-204-SS TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-204-SS DIS	TRG					1.0000E+00	1.0000E+00				
12	LR-103 TOT	TRG					1.0000E+00	1.0000E+00				
13	LR-103 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-111-KS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-111-KS 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\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 01  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.400E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 8/7/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:13 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9864 +/- 0.0000  
 Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM  
 Effective Efficiency: 0.1637 +/- 0.0029

Control Certificate Name: Ra226\_Ra-5b  
 Chem. Recov. of Control: RA-226 0.470344 +/- 0.031846  
 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	5.528	470.15	9.05	0.85	0.00E+000	6.1
RA-226	4.706	296.83	11.38	0.17	0.00E+000	8.8

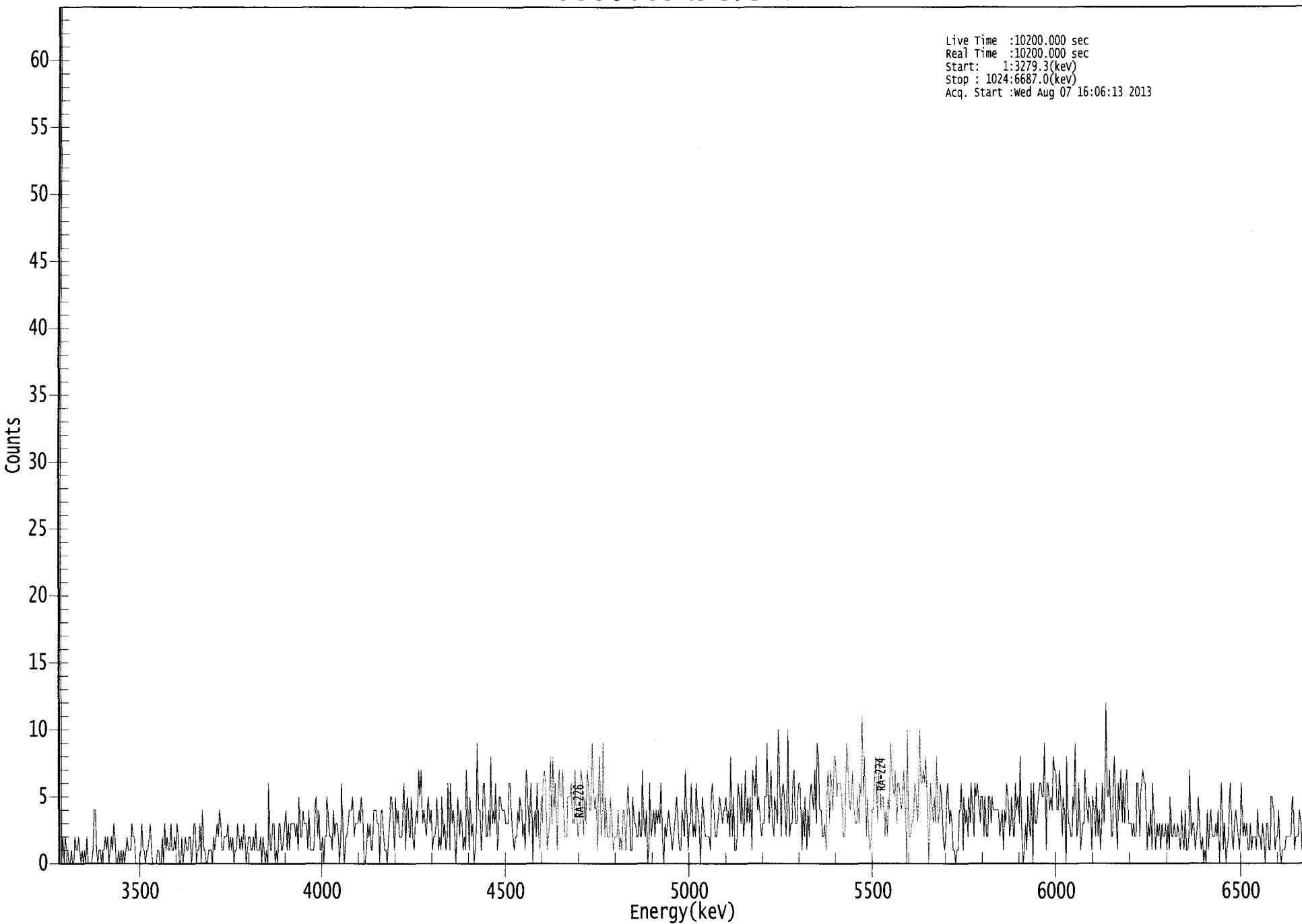
-----  
 NUCLIDE ANALYSIS RESULTS  
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Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.968	5685.50*	1.92E+001 +/- 1.86E+000	2.45E-001 +/- 8.48E-003
RA-226	0.992	4785.00*	1.15E+001 +/- 1.37E+000	1.62E-001 +/- 5.62E-003

AG  
 8/8/13

0000065496.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3279.3(keV)  
Stop : 1024:6687.0(keV)  
Acq. Start :wed Aug 07 16:06:13 2013



ROI Type: 1

0285

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

369: 3 3 6 6 3 2 1 2

Sample Title: 01

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



801: 3 3 4 5 6 6 5 5

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
809:	9	1	6	6	4	5	4	8
817:	7	7	4	4	7	5	2	5
825:	4	0	8	3	3	2	2	5
833:	4	9	2	3	6	1	2	3
841:	3	7	5	3	5	4	1	5
849:	4	2	6	2	4	1	3	6
857:	3	5	12	5	5	7	2	2
865:	6	8	3	1	6	4	7	3
873:	6	3	6	7	3	3	3	2
881:	3	2	2	6	6	2	5	6
889:	7	6	6	1	3	2	4	1
897:	6	3	1	3	2	3	1	3
905:	2	2	3	1	3	1	5	2
913:	2	3	2	2	3	2	1	4
921:	2	1	4	1	1	2	7	2
929:	3	3	1	2	3	5	2	1
937:	2	0	1	0	4	1	3	4
945:	2	2	2	3	2	4	0	3
953:	6	1	3	0	1	2	4	6
961:	2	1	3	4	3	2	1	3
969:	6	2	3	2	3	1	1	3
977:	1	2	2	2	1	4	2	2
985:	1	3	2	0	3	3	1	1
993:	5	5	4	1	2	2	4	1
1001:	0	1	1	1	2	2	2	2
1009:	2	4	5	1	2	2	2	4
1017:	3	1	5	1	1	4	1	0



C  
8/8/13

Sample Description: BLANK  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 02  
 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: 2.340E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 8/7/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:14 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM  
 Effective Efficiency: 0.1531 +/- 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	5.640	-0.55	555.92	2.55	0.00E+000	3.1
RA-226	4.764	-0.53	415.13	1.53	0.00E+000	3.1

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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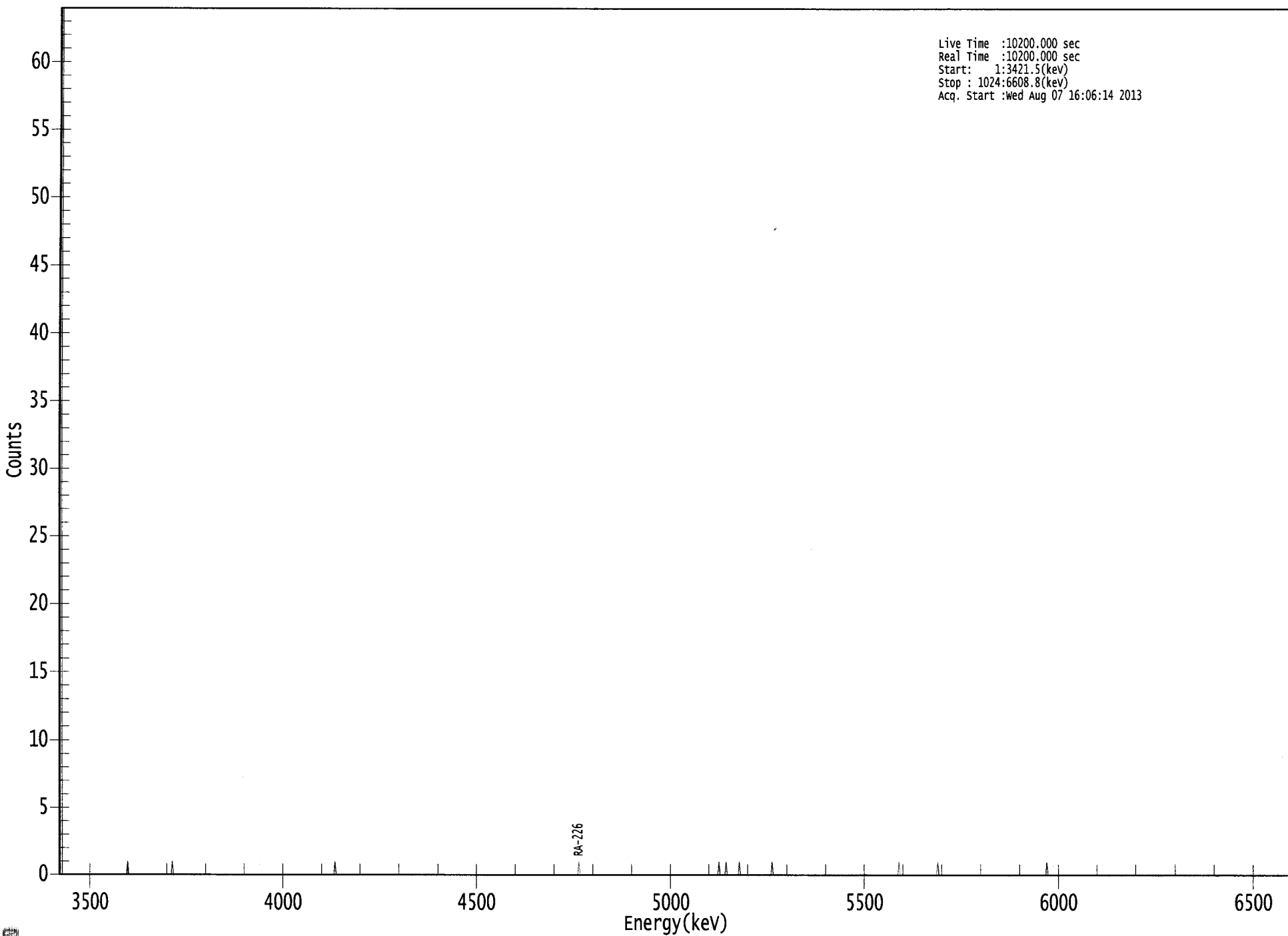
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.997	5685.50*	-2.34E-002 +/- 1.30E-001	3.57E-001 +/- 1.33E-002
RA-226	0.999	4785.00*	-2.15E-002 +/- 8.91E-002	2.88E-001 +/- 1.07E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065452.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3421.5(kev)  
Stop : 1024:6608.8(kev)  
Acq. Start :Wed Aug 07 16:06:14 2013



ROI Type: 1

0290

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

Sample Title:    02

Elapsed Live time:        10200

Elapsed Real Time:        10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	1	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	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	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	1	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	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0

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	1
433:	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	0
449:	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0
465:	0	0	0	0	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:	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0
545:	0	0	0	1	0	0	0
553:	0	1	0	0	0	0	0
561:	0	0	0	0	1	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	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	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	0	0
657:	0	0	0	0	0	0	0
665:	0	0	0	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:	1	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:	1	0	0	0	0	0	0
737:	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0
777:	0	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	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	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	1



9  
8/8/13

Sample Description: D-81 TOT-DUP  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 03  
 Sample Geometry: Shelf 2  
 Procedure Description: Ra

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

Sample Size: 1.000E+000 +/- 0.000E+000 liter  
 Generic Mult. Factor: 2.690E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:15 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM  
 Effective Efficiency: 0.1710 +/- 0.0030

Peak Match Tolerance: 0.350 MeV

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 PEAK AREA REPORT  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.541	12.45	61.85	2.55	0.00E+000	3.1
RA-226	4.601	20.13	46.00	1.87	0.00E+000	3.1

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 NUCLIDE ANALYSIS RESULTS  
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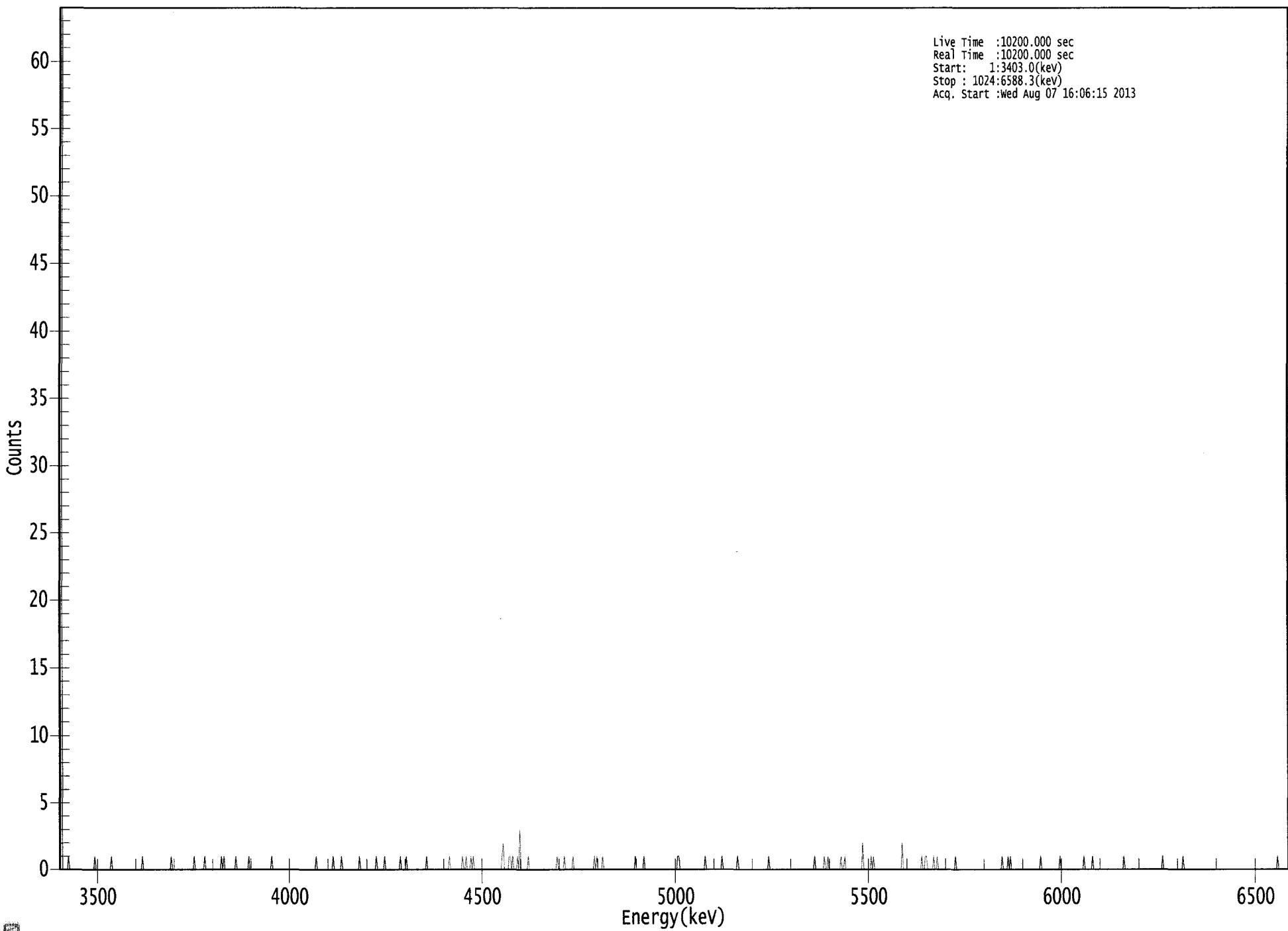
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.973	5685.50*	5.50E-001 +/- 3.40E-001	3.70E-001 +/- 1.28E-002
RA-226	0.957	4785.00*	8.39E-001 +/- 3.87E-001	3.16E-001 +/- 1.09E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065453.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3403.0(kev)  
Stop : 1024:6588.3(kev)  
Acq. Start :Wed Aug 07 16:06:15 2013



0295

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:    03

Elapsed Live time:        10200

Elapsed Real Time:        10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	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	1	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	1	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	1	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	1	0	0	0	0	0	0	0
121:	0	1	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	1
137:	0	1	0	0	0	0	0	0
145:	0	0	0	1	0	0	0	0
153:	0	0	0	0	0	0	1	0
161:	0	0	0	0	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	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	1	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	1	0	0	0
233:	0	0	0	1	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:	1	0	0	0	0	0	0	1
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	1	0	0	0
289:	0	1	0	0	0	0	0	0
297:	0	0	0	0	0	0	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	0	0	0	0	0
337:	1	0	0	1	0	0	0	1
345:	0	1	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 1 2 0 0 0 0 1

Sample Title: 03

Channel	1	2	3	4	5	6	7	8
377:	1	0	1	0	0	0	1	0
385:	3	0	0	0	0	0	0	1
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	1
417:	0	0	0	0	0	1	0	0
425:	0	0	0	0	1	0	0	0
433:	0	0	0	0	0	0	0	0
441:	0	0	0	0	0	0	1	0
449:	1	0	0	0	0	1	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	1	0	0	0	0	0	0	1
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	1	1	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	1	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	1	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	1
593:	0	0	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	1	0	0
633:	0	0	0	0	0	1	0	0
641:	1	0	0	0	0	0	0	0
649:	0	0	0	1	0	0	1	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	2	0	0
673:	0	0	0	0	1	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	2	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	1	0
721:	0	1	1	0	0	0	0	0
729:	1	0	0	1	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	1	0	0	0	0	0
753:	0	0	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	1	0	0	0	0	1	0
793:	1	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	1	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	1	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	1	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	1	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	1	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	1
937:	0	0	0	0	0	0	0	0
945:	0	0	0	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	1	0	0
1017:	0	0	0	0	0	0	0	0



*8/8/13*

Sample Description: PZ-302-AS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 04  
 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: 2.610E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:16 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9133 +/- 0.0000  
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM  
 Effective Efficiency: 0.1562 +/- 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	5.565	7.64	77.95	1.36	0.00E+000	3.1
RA-226	4.580	19.13	47.31	1.87	0.00E+000	3.1

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 NUCLIDE ANALYSIS RESULTS  
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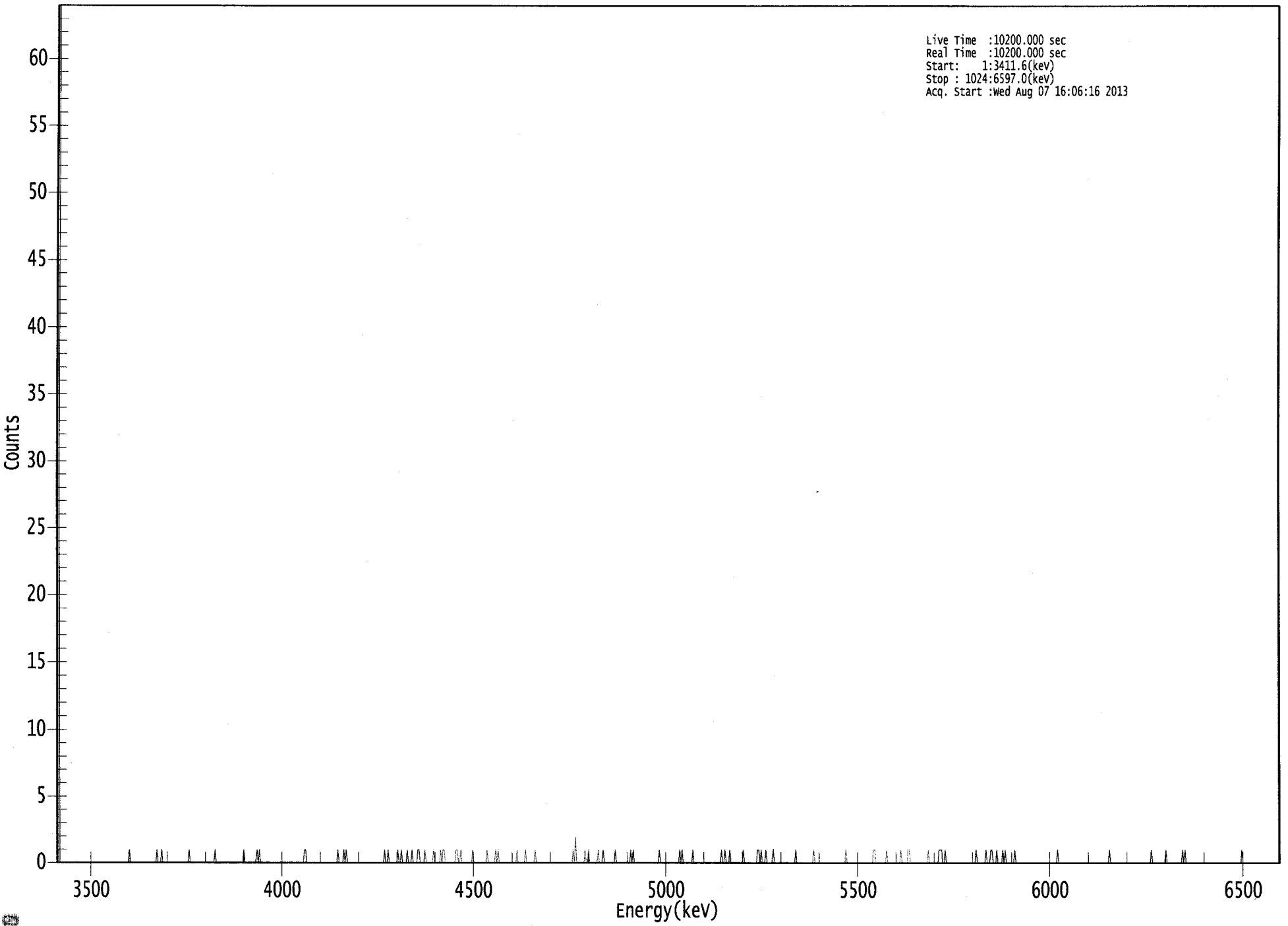
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.981	5685.50*	3.58E-001 +/- 2.80E-001	3.22E-001 +/- 1.18E-002
RA-226	0.947	4785.00*	8.47E-001 +/- 4.02E-001	3.35E-001 +/- 1.23E-002

*AG  
8/8/13*

US EPA ARCHIVE DOCUMENT

0000065454.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3411.6(kev)  
Stop : 1024:6597.0(kev)  
Acq. Start :wed Aug 07 16:06:16 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: 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	1	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	1
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	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	1	0	0
161:	0	0	0	0	0	0	0	0
169:	1	0	1	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:	1	1	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	1	0	0	0
241:	0	1	0	1	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	1	0	0	1	0
281:	0	0	0	0	0	0	1	0
289:	0	1	0	0	0	0	1	0
297:	0	0	1	0	0	0	0	1
305:	1	0	0	0	0	1	0	0
313:	0	0	0	0	1	0	0	0
321:	0	0	1	0	1	1	0	0
329:	0	0	0	0	0	0	0	1
337:	1	0	0	1	0	0	0	0
345:	0	0	0	0	0	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	1	0	0	0	0	0	0

369: 1 0 1 0 0 0 0 0

Sample Title: 04

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	0
385:	0	0	1	0	0	0	0	0
393:	0	1	0	0	0	0	0	0
401:	0	1	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	1	0	2	0	0	0	0
441:	0	0	0	1	0	0	1	0
449:	0	0	0	0	0	0	1	0
457:	0	0	1	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	1	0	1	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	1	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	1	0	1	0	0	0
529:	0	0	0	0	0	1	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	1	0	0
561:	1	0	0	0	1	0	0	0
569:	0	0	0	0	0	0	0	1
577:	0	0	0	0	0	0	0	0
585:	0	0	0	1	1	0	1	0
593:	0	0	1	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	1	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	1	0	0	0	0	0
641:	0	0	0	0	0	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	1	1	0	0
689:	0	0	0	0	0	0	0	1
697:	0	0	0	0	0	0	0	0
705:	0	0	0	1	0	0	0	0
713:	0	1	1	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	1	1	1	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	1	0	0	0	0	0
777:	0	0	1	0	0	0	1	1
785:	0	0	0	1	0	0	0	0
793:	1	0	1	0	0	0	0	0

801: 0 0 1 0 0 0 0 0

Sample Title: 04

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





8/8/10

Sample Description: PZ-302-AS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 05  
 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: 2.230E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/16/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:17 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.7310 +/- 0.0000  
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM  
 Effective Efficiency: 0.1269 +/- 0.0024

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	5.481	2.13	191.21	1.87	0.00E+000	3.1
RA-226	4.610	7.32	76.28	0.68	0.00E+000	4.7

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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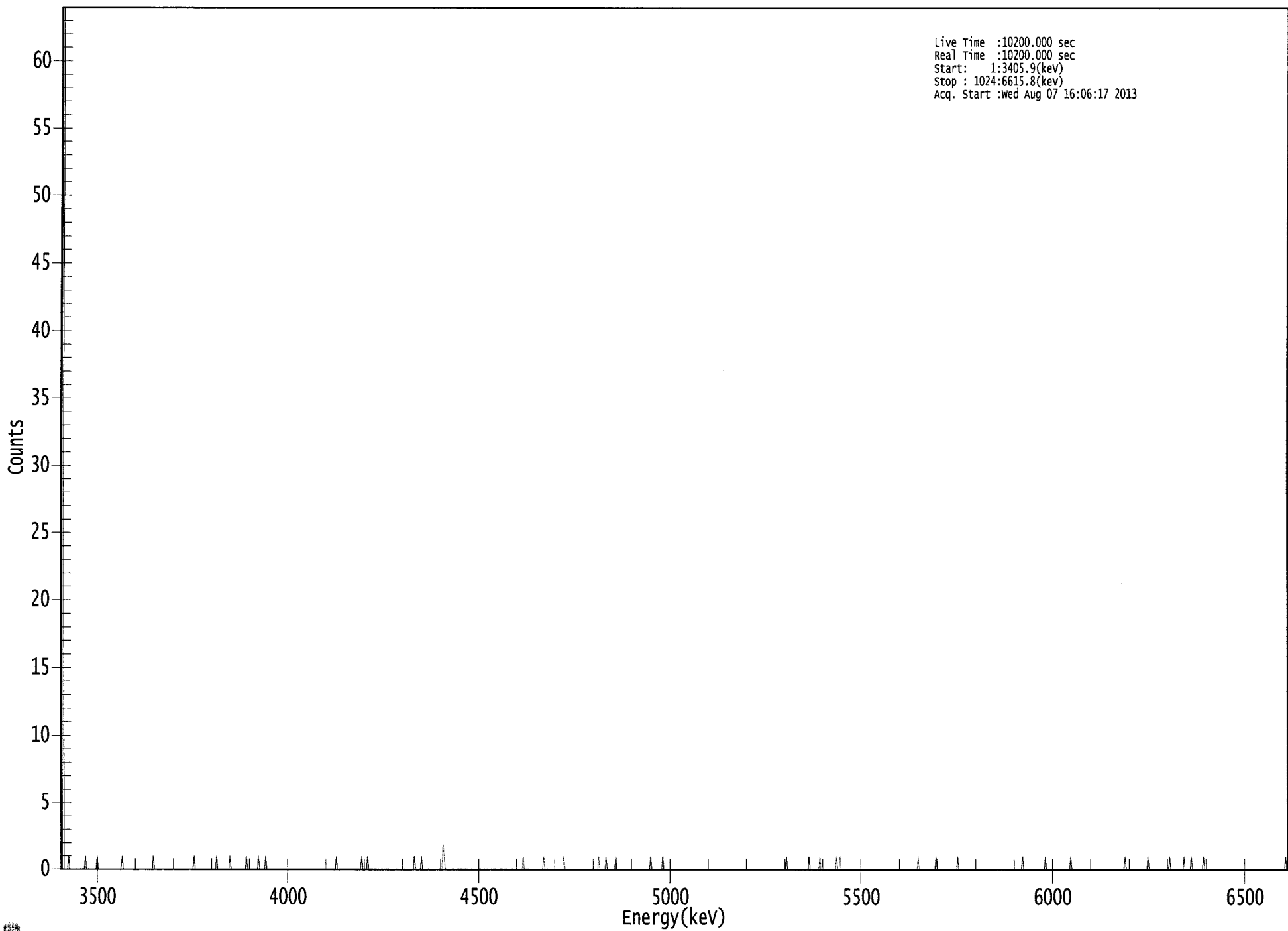
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.947	5685.50*	1.05E-001 +/- 2.01E-001	3.74E-001 +/- 1.37E-002
RA-226	0.961	4785.00*	3.41E-001 +/- 2.60E-001	2.63E-001 +/- 9.60E-003

AG  
 8/8/13

US EPA ARCHIVE DOCUMENT

0000065455.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3405.9(kev)  
Stop : 1024:6615.8(kev)  
Acq. Start :wed Aug 07 16:06:17 2013



ROI Type: 1

0000065455.CNF

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 \*\*\*\*\* S P E C T R A L D A T A R E P O R T \*\*\*\*\*  
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Sample Title: 05

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	1	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	1	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	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	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	1
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	1	0	0	0	0	0
137:	0	0	0	0	0	1	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	1	0	0	0	0
161:	0	0	0	0	0	1	0	0
169:	0	0	0	1	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	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	1	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	1	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	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	1	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	2
321:	1	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 05

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

801: 0 0 1 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	1	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	1	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	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	0	1	0	0	0
929:	0	0	0	0	0	0	0	0
937:	1	0	0	0	0	0	1	0
945:	0	0	0	0	0	0	0	0
953:	1	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	1	0	0	0



C  
8/8/13

Sample Description: LR-100 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 06  
 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: 2.550E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:18 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9541 +/- 0.0000  
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM  
 Effective Efficiency: 0.1648 +/- 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	5.475	0.96	373.51	2.04	0.00E+000	3.2
RA-226	4.636	14.13	56.03	1.87	0.00E+000	3.2

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

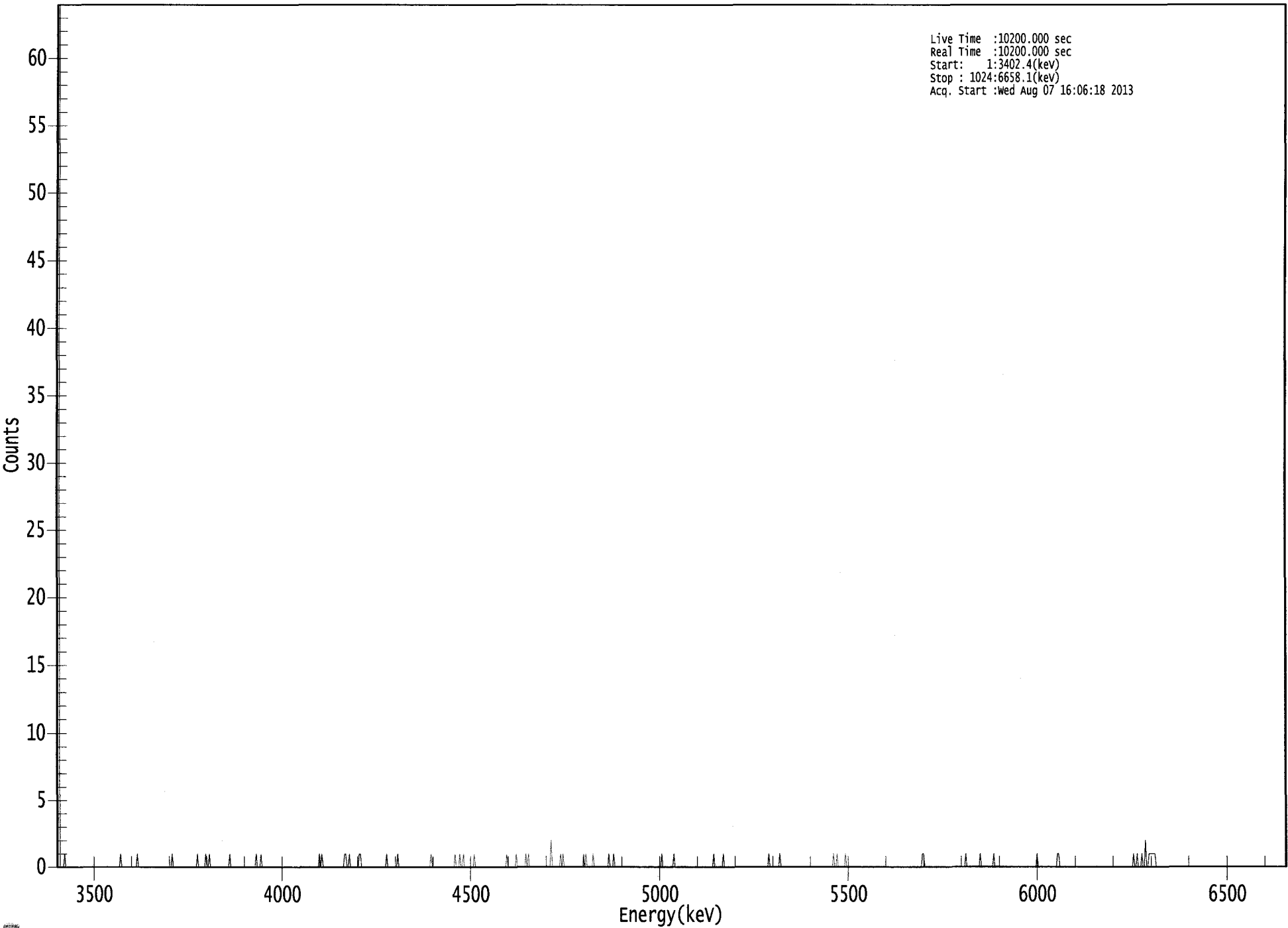
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.944	5685.50*	4.17E-002 +/- 1.56E-001	3.38E-001 +/- 1.24E-002
RA-226	0.971	4785.00*	5.79E-001 +/- 3.25E-001	3.10E-001 +/- 1.14E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065456.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3402.4(kev)  
Stop : 1024:6658.1(kev)  
Acq. Start :Wed Aug 07 16:06:18 2013



ROI Type: 1

\*\*\*\*\*  
 \*\*\*\*\* 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	1	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	1	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	1	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:	1	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	1	0	0
121:	0	0	0	0	1	0	0	1
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	1	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	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	1	0	1	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	1	1	0	0	1	0	0	0
249:	0	0	0	0	1	1	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	1	0	0	0	0
281:	0	0	0	0	1	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	1	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:	1	0	0	1	0	0	0	0
345:	0	0	0	0	1	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0



369: 0 0 0 0 0 0 0 0 1

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	1
385:	0	0	0	0	0	0	0	1
393:	0	1	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	2	0	0	0
417:	0	0	0	0	1	0	1	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	1
441:	0	1	0	0	0	0	0	1
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	1	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	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	1	0	0	0	0	0	0	0
513:	0	0	1	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	1	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	1	0	0	0	0	0	0
601:	0	0	1	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	1
649:	0	0	1	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	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	1	1	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	1	0	0
761:	0	0	0	0	0	0	0	0
769:	0	1	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: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	1	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	1	1	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:	1	0	0	1	0	0	0	1
905:	0	0	2	0	0	1	1	1
913:	1	1	1	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



C  
8/8/13

Sample Description: LR-100 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 07  
 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: 2.500E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:19 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9103 +/- 0.0000  
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM  
 Effective Efficiency: 0.1771 +/- 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	5.508	2.96	153.11	2.04	0.00E+000	3.1
RA-226	4.558	9.66	64.35	0.34	0.00E+000	3.1

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

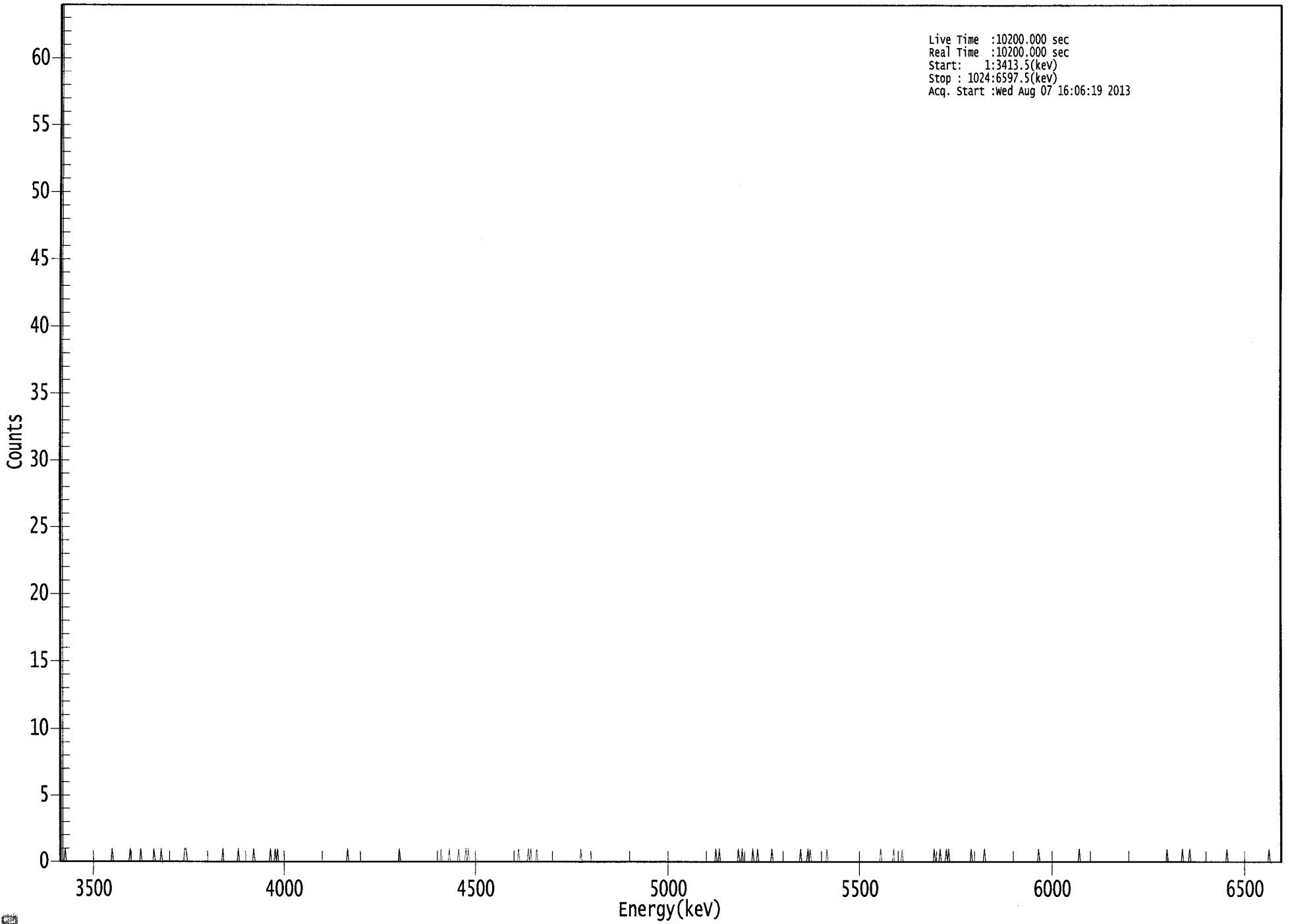
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.960	5685.50*	1.17E-001 +/- 1.80E-001	3.09E-001 +/- 1.11E-002
RA-226	0.935	4785.00*	3.61E-001 +/- 2.33E-001	1.79E-001 +/- 6.44E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065458.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3413.5(kev)  
Stop : 1024:6597.5(kev)  
Acq. Start :wed Aug 07 16:06:19 2013



ROI Type: 1

0000065458

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

Sample Title:    07

Elapsed Live time:        10200

Elapsed Real Time:       10200

Channel	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	1	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	1	0	0
49:	0	0	0	0	0	0	0
57:	0	0	0	1	0	0	0
65:	0	0	0	0	1	0	0
73:	0	0	0	0	0	0	1
81:	0	0	0	0	0	1	0
89:	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0
105:	0	1	1	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	1	0	0	0	0	0
145:	0	0	0	0	0	0	1
153:	0	0	0	0	0	0	0
161:	0	0	0	1	0	0	0
169:	0	0	0	0	0	0	0
177:	0	1	0	0	0	1	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	1	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	1	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:	1	0	0	0	0	0	1
329:	0	0	0	0	0	0	1
337:	0	0	0	0	0	1	1
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 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	1	0	0	0	0	0	0
393:	0	1	0	1	0	0	0	0
401:	1	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	1	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	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	1	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	1	0	0	1	0	0	0
577:	0	0	0	0	0	1	0	0
585:	0	1	0	0	0	0	0	0
593:	0	0	0	0	0	1	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	1	0	0
625:	0	0	0	1	0	1	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	1	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	1	0	0	0	0
705:	0	0	1	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	1	0	0
737:	0	0	1	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	1	0	0	0
769:	0	0	0	0	0	0	0	1
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: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	1	0	0	0
825:	0	0	0	0	0	0	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	1	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	1
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	1	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	1	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	1	0	0	0
1017:	0	0	0	0	0	0	0	0



C  
8/8/17

Sample Description: D-81 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 08  
 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: 2.660E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:19 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

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

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.468	2.32	149.12	0.68	0.00E+000	3.1
RA-226	4.634	5.96	95.01	2.04	0.00E+000	3.1

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

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.940	5685.50*	1.22E-001 +/- 1.82E-001	2.97E-001 +/- 1.41E-002
RA-226	0.971	4785.00*	2.96E-001 +/- 2.82E-001	3.87E-001 +/- 1.84E-002

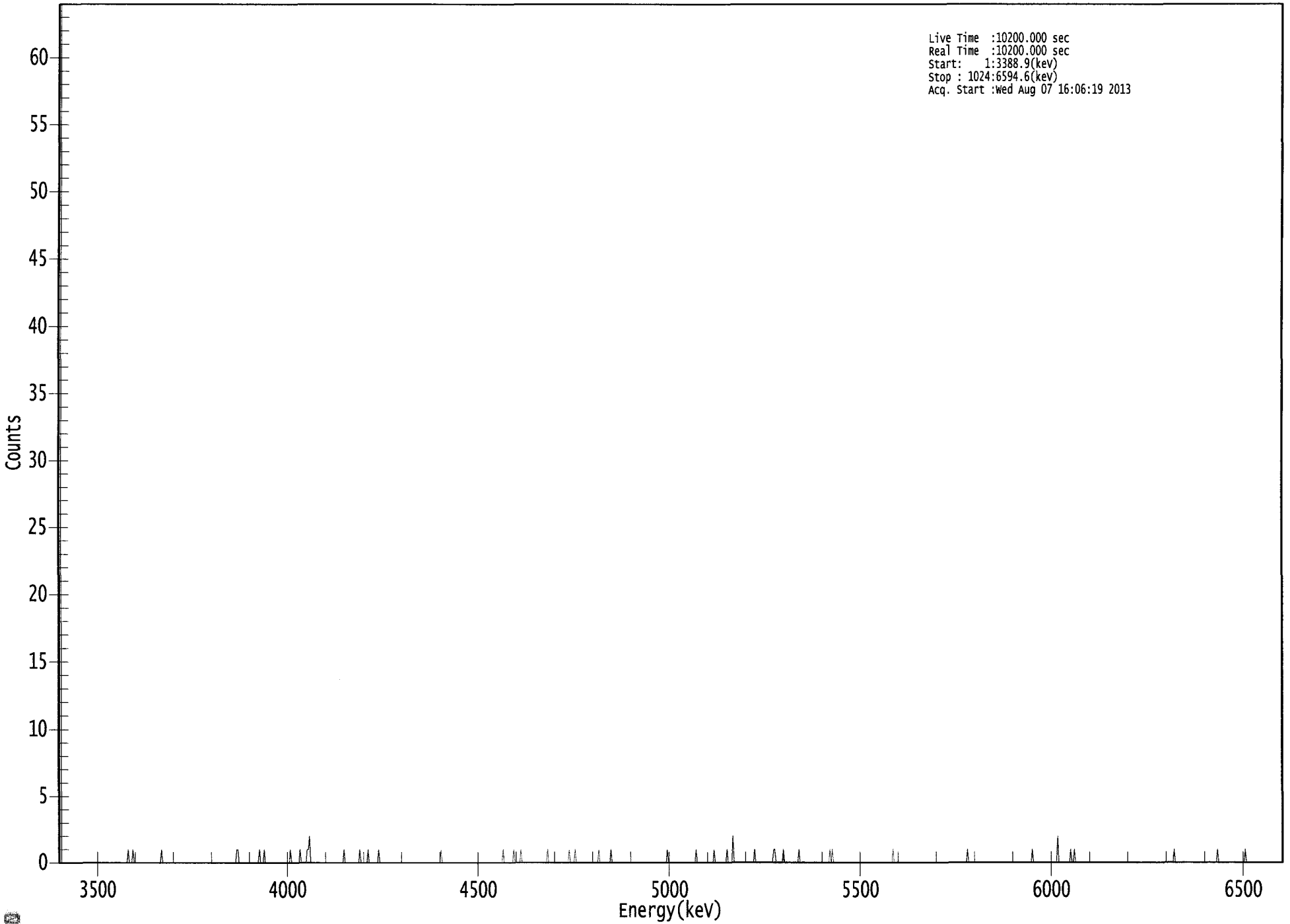
AG  
8/8/13

US EPA ARCHIVE DOCUMENT



0000065457.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3388.9(keV)  
Stop : 1024:6594.6(keV)  
Acq. Start :Wed Aug 07 16:06:19 2013



0328

ROI Type: 1

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

Sample Title:    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	1	0	0	0	1	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	1	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	1	1	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	1	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	1	0	0	0	0	0
201:	0	0	1	0	0	0	0	0
209:	1	1	2	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:	0	0	0	0	0	0	0	0
249:	0	0	0	0	1	0	0	0
257:	0	0	0	1	0	0	0	0
265:	0	0	0	0	1	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	1	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 1 0 0 0

Sample Title: 08

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	1	0	0
385:	0	0	0	1	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	0
425:	0	0	0	1	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	1	0	0	0
457:	0	0	0	0	0	0	1	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	1	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	1	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	2	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	1	1
601:	0	0	0	0	0	0	1	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	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	1
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	1	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	1	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	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	1	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	2	0	0	0	0
841:	0	0	0	0	0	0	1	0
849:	0	1	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	1	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	1	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	0



C  
8/8/13

Sample Description: D-81 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 09  
 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: 2.610E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:44 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM  
 Effective Efficiency: 0.1848 +/- 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	5.489	5.15	94.34	0.85	0.00E+000	3.0
RA-226	4.613	22.32	42.22	0.68	0.00E+000	3.0

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

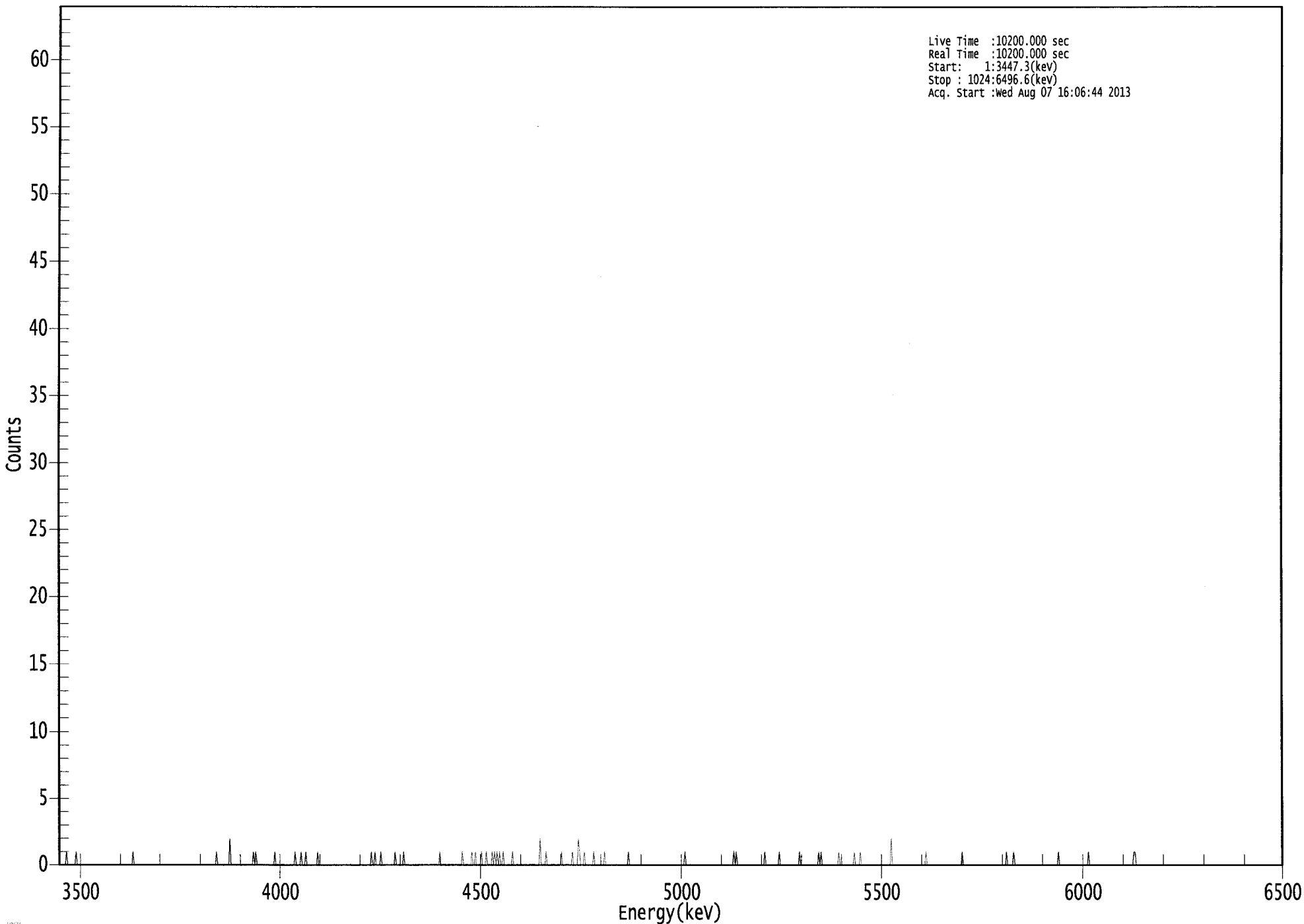
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.951	5685.50*	2.04E-001 +/- 1.93E-001	2.37E-001 +/- 8.17E-003
RA-226	0.962	4785.00*	8.35E-001 +/- 3.54E-001	2.11E-001 +/- 7.25E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065459.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3447.3(kev)  
Stop : 1024:6496.6(kev)  
Acq. Start :Wed Aug 07 16:06:44 2013



5325  
ROI Type: 1

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

Sample Title: 09

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 0 1 0 0 1 0 0 0

Sample Title: 09

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	1	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	2	0	0	0	0
409:	1	0	0	0	0	0	0	0
417:	0	0	0	0	0	1	0	0
425:	0	0	0	0	0	0	1	0
433:	0	0	0	2	1	0	0	0
441:	1	0	0	0	0	0	0	0
449:	1	0	0	0	0	0	0	0
457:	0	1	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	1	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	1	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	1	0	1
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	1
593:	0	0	0	0	0	0	0	0
601:	0	0	0	1	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	0
633:	0	0	0	0	1	0	1	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	1	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	2	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	1	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	1	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	1	0	0	0	0	0	1



801: 0 0 0 0 0 0 0 0

Sample Title: 09

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



C  
8/8/17

Sample Description: PZ-204-SS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 10  
 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: 2.740E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:45 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8630 +/- 0.0000  
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM  
 Effective Efficiency: 0.1601 +/- 0.0028

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.556	8.83	66.70	0.17	0.00E+000	3.0
RA-226	4.614	19.32	45.50	0.68	0.00E+000	3.0

-----  
 ----- NUCLIDE ANALYSIS RESULTS -----  
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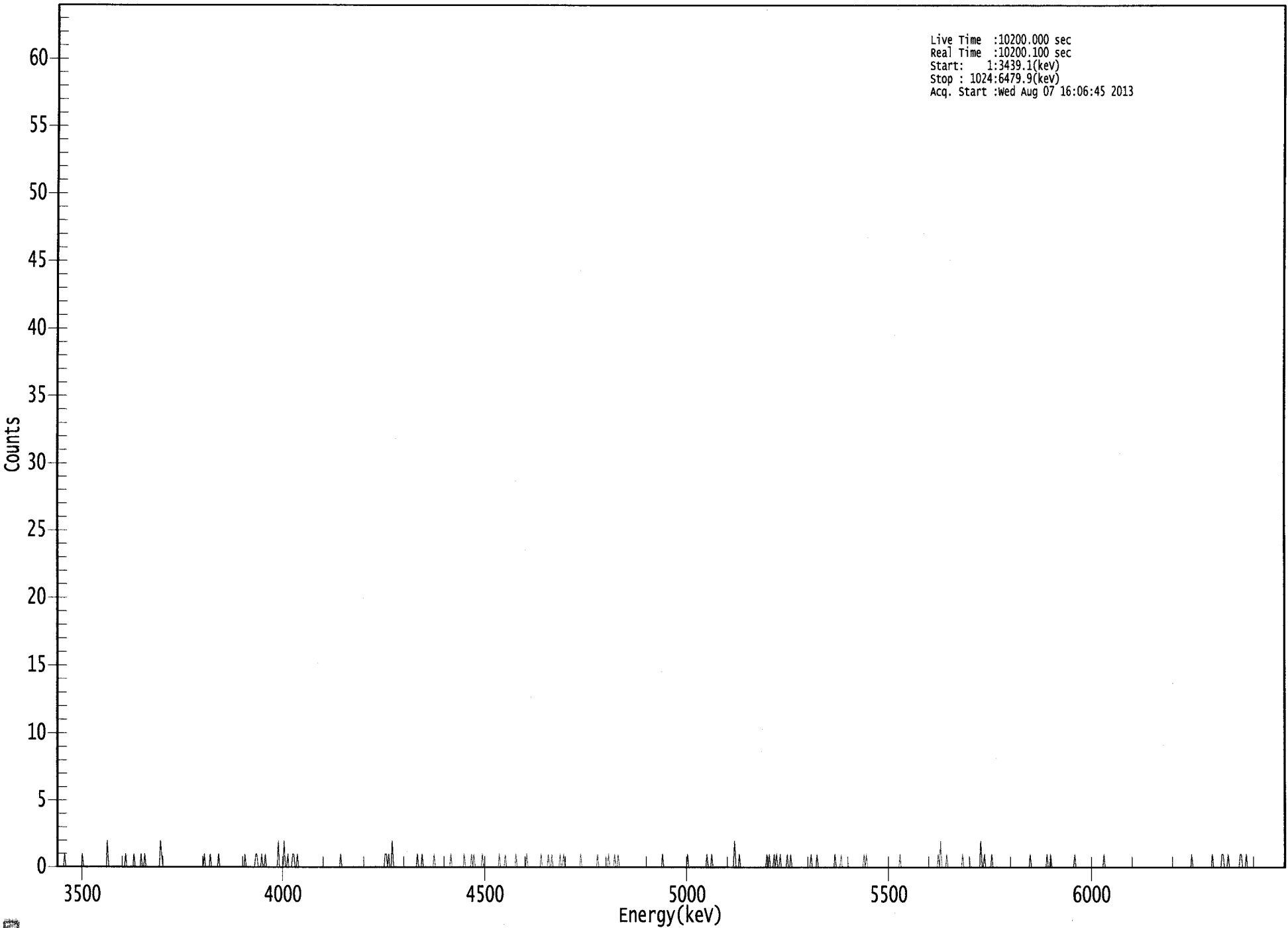
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.978	5685.50*	4.24E-001 +/- 2.83E-001	2.00E-001 +/- 6.85E-003
RA-226	0.962	4785.00*	8.76E-001 +/- 4.00E-001	2.56E-001 +/- 8.73E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065460.CNF

Live Time :10200.000 sec  
Real Time :10200.100 sec  
Start: 1:3439.1(kev)  
Stop : 1024:6479.9(kev)  
Acq. Start :Wed Aug 07 16:06:45 2013



0330

ROI Type: 1

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

Sample Title: 10

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	1	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	1	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	2	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	1	0	0	0	0	0	0
65:	1	0	0	0	0	0	1	0
73:	0	1	0	0	0	0	0	0
81:	0	0	0	0	0	0	2	1
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	1	0	0	0	0
129:	1	0	0	0	0	0	0	1
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	0
161:	0	0	0	0	0	0	1	1
169:	0	0	0	1	0	0	1	0
177:	0	0	0	0	0	0	0	0
185:	0	2	0	0	0	0	2	0
193:	0	1	0	0	0	1	1	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	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	0	0	0	0	0	0	0
273:	0	0	1	1	0	1	0	0
281:	2	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	1	0	0
305:	0	1	0	0	0	0	0	0
313:	0	0	0	1	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	1	0	0	0	0	0	0
337:	0	0	0	0	1	0	0	0
345:	0	0	1	0	1	0	0	0
353:	0	0	0	1	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 1 0 0 0 0 1 0

Sample Title: 10

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	1
385:	0	0	0	0	0	0	0	0
393:	1	0	0	0	0	0	0	0
401:	0	0	0	0	1	0	0	0
409:	0	0	1	0	0	1	0	0
417:	0	0	0	0	1	0	0	1
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	1	0	0
441:	0	0	0	0	0	0	0	0
449:	0	0	0	1	0	0	0	0
457:	0	0	0	0	1	0	0	0
465:	0	1	0	0	1	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	1	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	1	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	1	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	2	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:	1	0	1	0	0	0	1	0
601:	1	0	0	1	0	0	0	0
609:	0	1	0	0	1	0	0	0
617:	0	0	0	0	0	0	0	0
625:	0	0	0	0	0	1	0	0
633:	0	0	1	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	1	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	1	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	1
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	1
737:	0	2	0	0	0	0	1	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	1	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	2	0	0	1	0	0
777:	0	0	0	1	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 10

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	1	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	1	0	0	1	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	1	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	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	1	0	0	0	0	0
969:	0	0	1	1	0	0	0	1
977:	0	0	0	0	0	0	0	0
985:	0	1	1	0	0	0	1	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  
018(1)

Sample Description: PZ-204-SS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 11  
 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: 2.530E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:39 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM  
 Effective Efficiency: 0.1826 +/- 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	5.518	15.66	50.15	0.34	0.00E+000	2.9
RA-226	4.675	15.83	49.57	0.17	0.00E+000	4.4

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

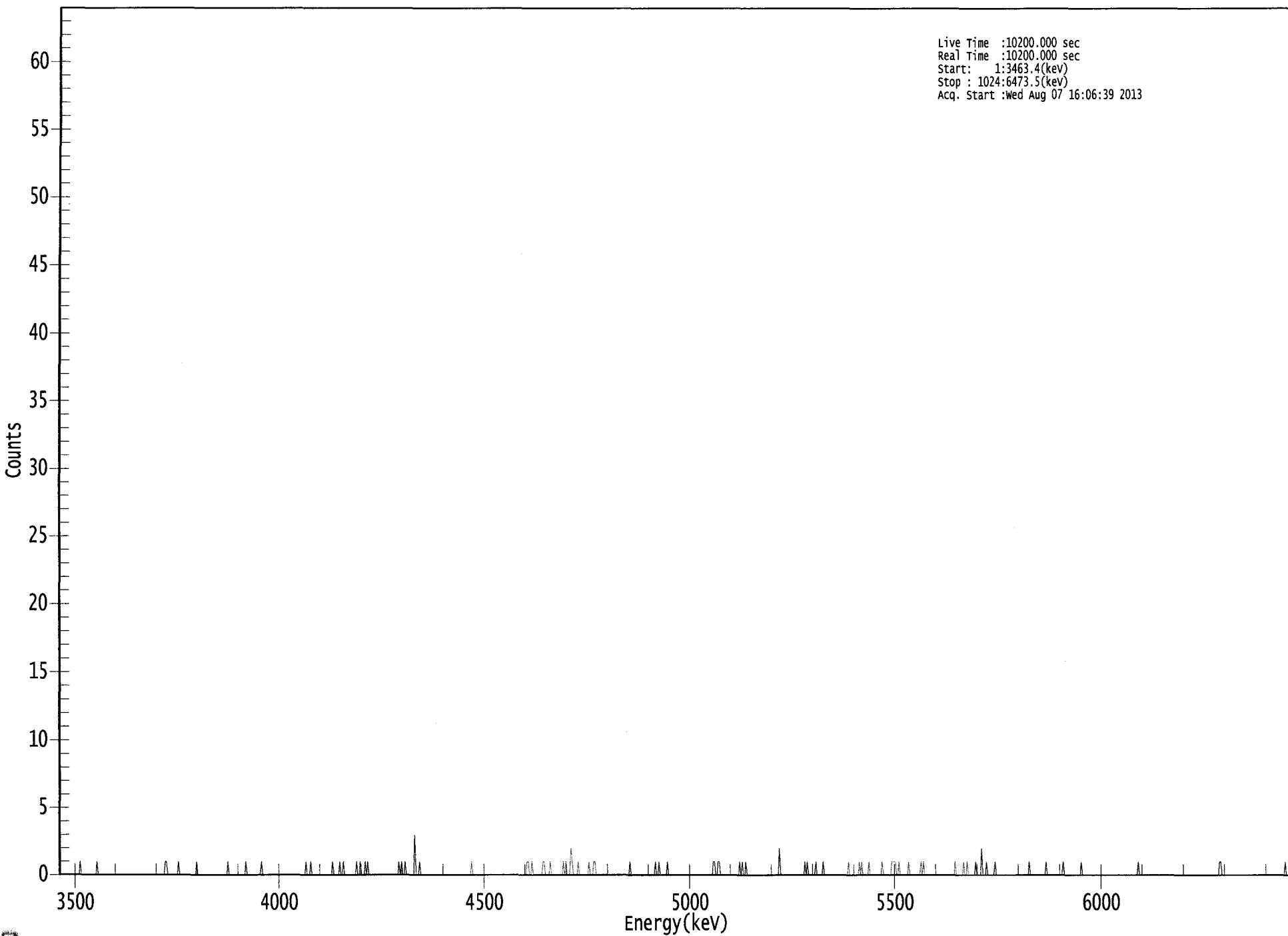
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.964	5685.50*	6.09E-001 +/- 3.06E-001	1.86E-001 +/- 6.38E-003
RA-226	0.984	4785.00*	5.81E-001 +/- 2.89E-001	1.53E-001 +/- 5.25E-003

AG  
8/21/13

US EPA ARCHIVE DOCUMENT

0000065461.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3463.4(kev)  
Stop : 1024:6473.5(kev)  
Acq. Start :Wed Aug 07 16:06:39 2013



0530

ROI Type: 1





369: 0 0 0 0 0 0 0 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	1	1	0	0
393:	1	0	0	0	0	0	0	0
401:	0	1	1	0	0	0	0	1
409:	0	0	0	0	0	0	0	0
417:	0	0	1	0	1	0	0	0
425:	2	1	0	0	0	0	1	0
433:	0	0	0	0	0	0	0	1
441:	0	0	0	1	1	0	0	0
449:	0	0	0	0	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	1	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	1	0	0	0	0	0	0
505:	1	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	1	1
545:	0	0	1	1	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	1	0	1	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	2	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	1	0	0	0
625:	0	0	0	1	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	1	0
657:	0	0	0	0	0	0	0	1
665:	0	1	0	0	0	0	0	1
673:	0	0	0	0	0	0	0	0
681:	0	0	1	0	0	0	0	0
689:	0	0	1	1	1	1	0	0
697:	1	0	0	0	0	0	0	0
705:	1	0	0	0	0	0	0	0
713:	0	0	1	0	1	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	1	0
745:	0	0	0	0	0	1	0	0
753:	1	0	0	0	0	0	0	1
761:	0	0	0	0	2	0	0	0
769:	1	0	0	0	0	0	0	1
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: 11

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	1
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	1	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	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	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	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:	1	1	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	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	1	0
1017:	0	0	0	0	0	0	0	0



8/8/13

Sample Description: LR-103 TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 12  
 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: 2.910E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:41 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9444 +/- 0.0000  
 Counting Efficiency: 0.1910 +/- 0.0033 on 7/20/2013 2:31:37 PM  
 Effective Efficiency: 0.1804 +/- 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	5.559	3.32	119.77	0.68	0.00E+000	3.0
RA-226	4.583	16.64	50.29	1.36	0.00E+000	5.9

-----  
 NUCLIDE ANALYSIS RESULTS  
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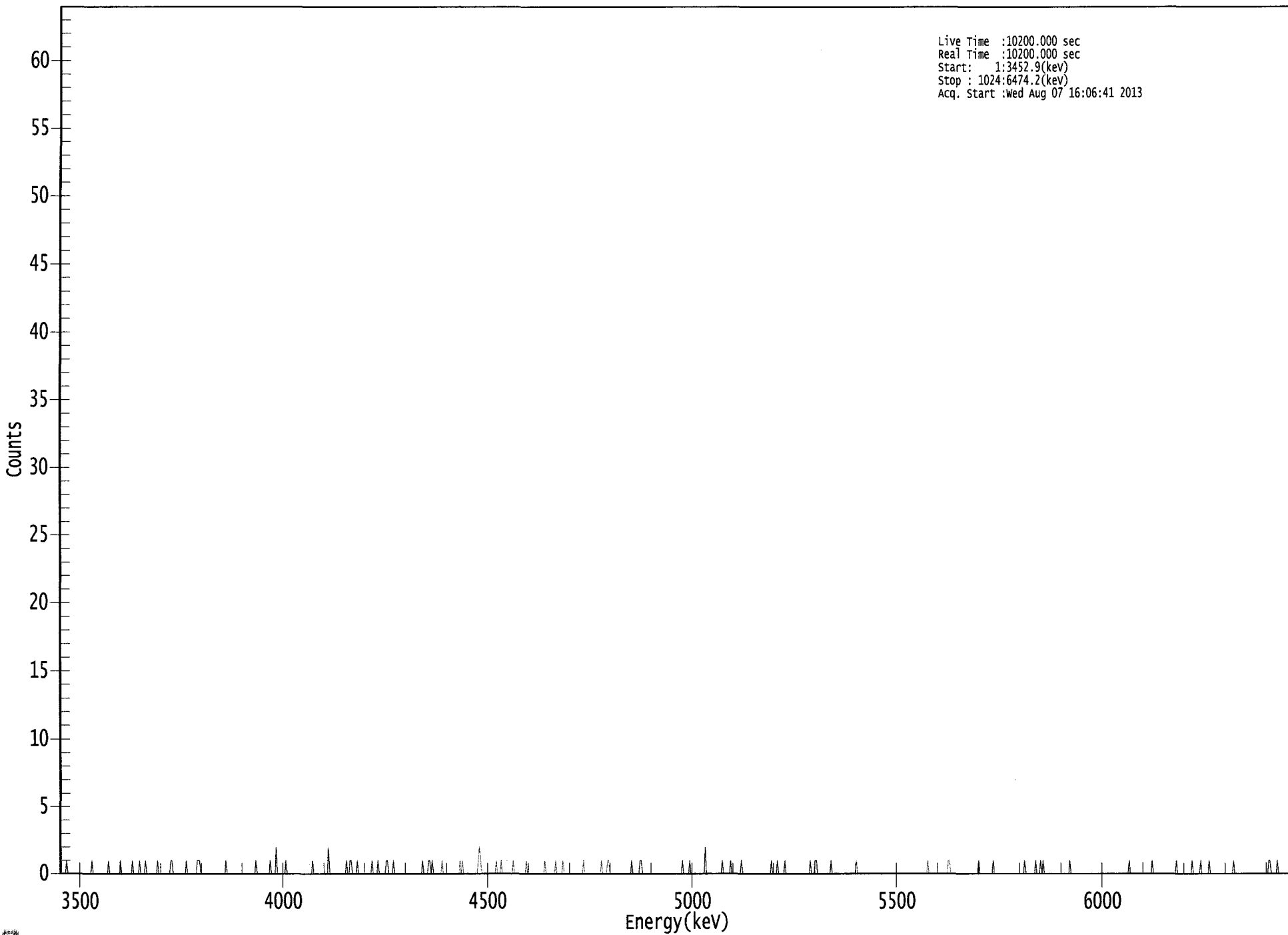
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.979	5685.50*	1.50E-001 +/- 1.80E-001	2.55E-001 +/- 8.72E-003
RA-226	0.948	4785.00*	7.11E-001 +/- 3.59E-001	2.93E-001 +/- 9.99E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065462.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3452.9(kev)  
Stop : 1024:6474.2(kev)  
Acq. Start :Wed Aug 07 16:06:41 2013



ROI Type: 1

0348

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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:	0	0	0	0	0	1	0	0
9:	0	0	0	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:	1	0	0	0	0	0	0	0
49:	0	0	1	0	0	0	0	0
57:	0	0	0	0	1	0	0	0
65:	0	0	1	0	0	0	0	1
73:	0	0	0	0	0	0	0	0
81:	0	1	0	0	0	0	0	0
89:	0	0	0	0	1	1	0	0
97:	0	0	0	0	0	0	0	0
105:	0	1	0	0	0	0	0	0
113:	0	0	1	1	1	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	1	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	1	0	0	0	0
169:	0	0	0	0	0	0	0	1
177:	0	0	0	0	2	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	2
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	1	0
241:	0	1	1	0	0	0	0	1
249:	0	0	0	0	0	0	0	0
257:	0	0	0	1	0	0	0	0
265:	1	0	0	0	0	0	0	1
273:	1	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	0	1	0	0
305:	0	0	1	1	0	1	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	1	0	1	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	1	2	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	1	0	0	0	1	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 12

Channel	1	2	3	4	5	6	7	8
377:	1	0	0	0	0	0	0	0
385:	0	0	0	1	0	0	0	0
393:	0	0	0	0	0	0	0	0
401:	0	0	1	0	0	0	0	0
409:	0	0	0	1	0	0	0	0
417:	0	1	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	1	0	0	0	0	0
441:	0	0	0	0	0	0	0	0
449:	0	1	0	0	0	0	1	1
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	1	0	0	0	0	0
481:	0	1	1	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	1	0	0	0
521:	0	0	1	0	0	0	0	0
529:	0	0	0	0	0	0	0	2
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	1	0	0
553:	0	0	0	0	1	0	0	0
561:	0	0	0	0	0	1	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	1	0
593:	0	0	0	1	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	0	1	0
625:	0	0	1	1	0	0	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	0	1	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	1
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	1	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	1	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	1

801: 0 0 0 0 0 0 0 0

Sample Title: 12

Channel	1	2	3	4	5	6	7	8
809:	1	0	0	0	1	0	1	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	1	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	1	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	1	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	1	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	1	0	0	0	0	0	0
945:	1	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	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:	1	1	0	0	0	0	0	1
1009:	0	0	0	0	0	0	0	0
1017:	0	0	1	0	0	0	0	0





C  
8/8/13

Sample Description: LR-103 DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 13  
 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: 2.960E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:43 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8942 +/- 0.0000  
 Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM  
 Effective Efficiency: 0.1539 +/- 0.0027

Peak Match Tolerance: 0.350 MeV

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 ----- PEAK AREA REPORT -----  
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Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.543	10.15	64.46	0.85	0.00E+000	3.0
RA-226	4.608	20.64	44.77	1.36	0.00E+000	3.0

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 ----- NUCLIDE ANALYSIS RESULTS -----  
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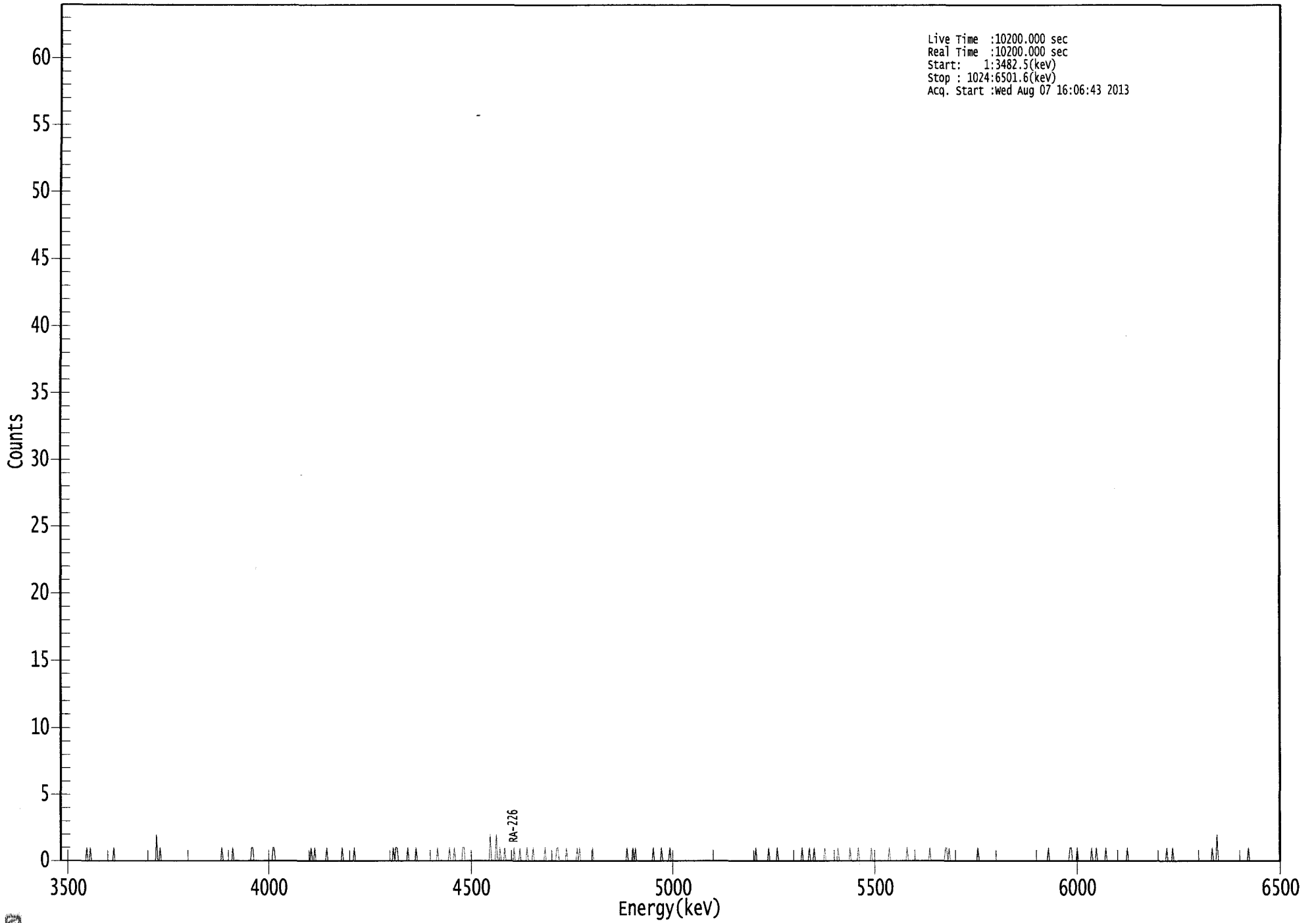
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.974	5685.50*	5.48E-001 +/- 3.53E-001	3.23E-001 +/- 1.11E-002
RA-226	0.960	4785.00*	1.05E+000 +/- 4.72E-001	3.49E-001 +/- 1.20E-002

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065463.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3482.5(kev)  
Stop : 1024:6501.6(kev)  
Acq. Start :wed Aug 07 16:06:43 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: 13

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	1	0
25:	0	1	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	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	2	0	0	1	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	1	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	1	1	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	1	1	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	1	0	0	1	0
217:	0	0	0	0	0	0	0	0
225:	1	0	0	0	0	0	0	0
233:	0	0	0	0	0	1	0	0
241:	0	0	0	0	0	0	0	1
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:	1	0	1	1	0	0	0	0
289:	0	0	0	0	1	0	0	0
297:	0	0	0	1	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	1	0	0
321:	0	0	0	0	0	0	0	1
329:	0	0	0	1	0	0	0	0
337:	0	0	1	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	2	0	0	0	0	2	0

369: 0 1 0 0 0 1 0 0

Sample Title: 13

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	1	0	0
385:	0	0	1	0	0	0	0	0
393:	1	0	0	0	0	1	0	0
401:	0	0	0	0	0	0	0	1
409:	0	0	0	0	0	0	0	0
417:	0	1	1	0	0	0	0	0
425:	0	1	0	0	0	0	0	0
433:	0	0	1	0	1	0	0	0
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	1	0	0	0
481:	0	1	0	1	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	1	0	0	0	0	0
505:	0	1	0	0	0	0	0	0
513:	1	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	0
577:	0	0	0	0	0	0	0	0
585:	1	0	0	0	0	0	0	0
593:	0	0	0	1	0	0	0	0
601:	0	0	1	0	0	0	0	0
609:	0	0	0	0	0	0	0	0
617:	0	0	0	0	0	0	0	1
625:	0	0	0	0	0	1	0	0
633:	0	1	0	0	0	0	0	0
641:	0	0	1	0	0	0	0	0
649:	0	0	0	0	0	1	0	0
657:	0	0	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	1	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	1	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	1
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	1
745:	1	0	1	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: 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	1	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	1
849:	1	0	0	0	0	1	0	0
857:	0	0	0	0	0	0	0	0
865:	0	1	0	0	0	1	0	0
873:	0	0	0	0	0	1	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	1
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	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	1	0
969:	0	0	2	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	1	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



C  
8/8/13

Sample Description: PZ-111-KS TOT  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 14  
 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: 2.530E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:47 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM  
 Effective Efficiency: 0.1965 +/- 0.0034

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	5.573	4.66	94.59	0.34	0.00E+000	3.0
RA-226	4.555	6.30	89.57	1.70	0.00E+000	3.0

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

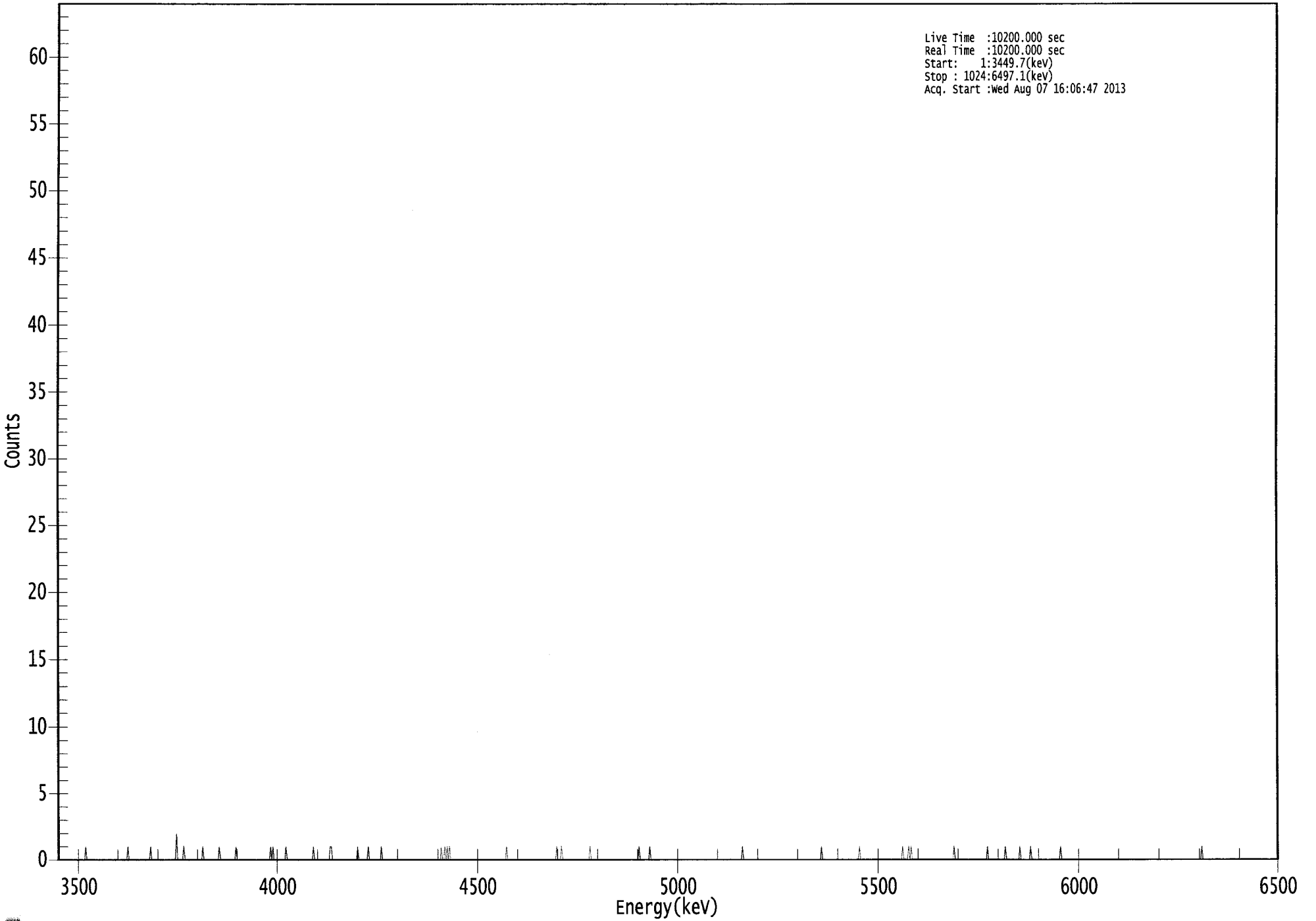
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.984	5685.50*	1.68E-001 +/- 1.59E-001	1.73E-001 +/- 5.88E-003
RA-226	0.933	4785.00*	2.15E-001 +/- 1.93E-001	2.51E-001 +/- 8.51E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

0000065464.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3449.7(keV)  
Stop : 1024:6497.1(keV)  
Acq. Start :Wed Aug 07 16:06:47 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	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	1
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	1	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	1	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	2	0	0	0
105:	0	0	1	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:	1	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	1	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	1	0	1	0	0
185:	0	0	0	0	0	0	0	0
193:	1	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	1
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	1	1	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	1	0	0	0
257:	0	0	0	0	0	1	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	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	1	0	0	1	0	1
329:	0	1	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0



369: 0 0 0 0 0 0 0 0 0

Sample Title: 14

Channel	1	2	3	4	5	6	7	8
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	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	1	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	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:	1	0	0	0	0	0	0	0
497:	0	1	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	0
545:	0	0	0	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	0	0	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	1
577:	0	0	0	0	0	0	0	0
585:	0	0	0	0	0	0	0	0
593:	0	0	0	0	0	0	0	0
601:	0	0	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	1	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	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	1	0	0
713:	0	0	1	0	1	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	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	1	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	1	0	0	0	0

801: 0 0 0 0 0 0 0 0 1

Sample Title: 14

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	1	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	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	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	1
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



c  
8/8/13

Sample Description: PZ-111-KS DIS  
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000654  
 Batch Identification: 1307149A-RA  
 Sample Identification: 15  
 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: 2.530E+000 Generic Div. Factor: 1.000E+000  
 Sample Date/Time: 7/17/2013 1:10:08 PM  
 Acquisition Date/Time: 8/7/2013 4:06:49 PM  
 Acquisition Live Time: 170.0 minutes  
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000  
 Counting Efficiency: 0.1900 +/- 0.0033 on 12/16/2012 5:49:33 PM  
 Effective Efficiency: 0.1900 +/- 0.0033

Peak Match Tolerance: 0.350 MeV

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 PEAK AREA REPORT  
 -----

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.535	1.15	249.59	0.85	0.00E+000	3.0
RA-226	4.603	10.49	62.21	0.51	0.00E+000	0.0

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

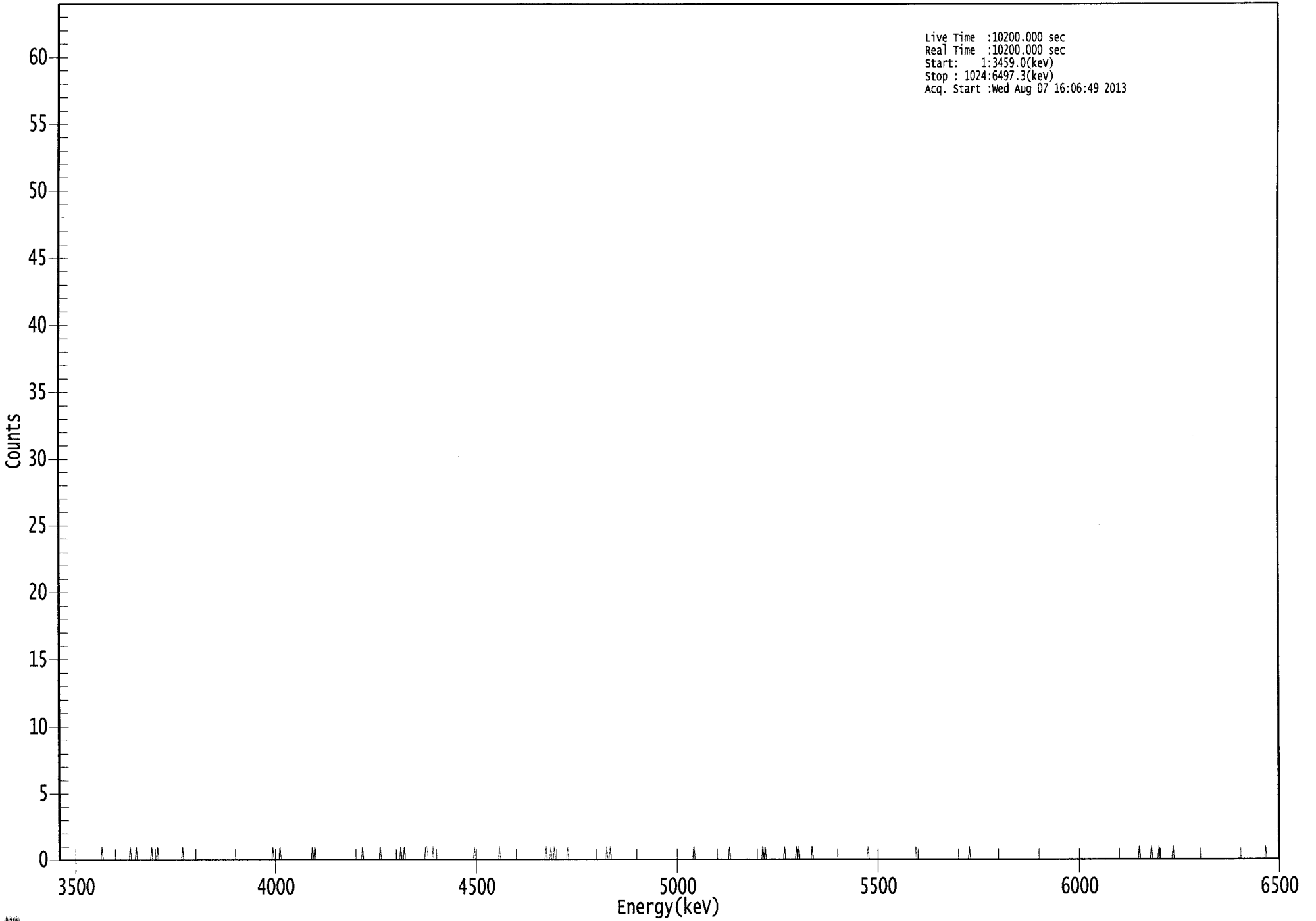
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter )	MDA (pCi/liter )
RA-224	0.971	5685.50*	4.30E-002 +/- 1.07E-001	2.24E-001 +/- 7.63E-003
RA-226	0.958	4785.00*	3.70E-001 +/- 2.31E-001	1.85E-001 +/- 6.30E-003

AG  
8/8/13

US EPA ARCHIVE DOCUMENT

# 0000065465.CNF

Live Time :10200.000 sec  
Real Time :10200.000 sec  
Start: 1:3459.0(kev)  
Stop : 1024:6497.3(kev)  
Acq. Start :Wed Aug 07 16:06:49 2013



ROI Type: 1

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 \*\*\*\*\* S P E C T R A L   D A T A   R E P O R T   \*\*\*\*\*  
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Sample Title: 15

Elapsed Live time: 10200  
 Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	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	1	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	1	0	0	0	0	0	0
73:	0	0	0	0	0	0	1	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	0	0
105:	1	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	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	1	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	1	0	1
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	1
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	1	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	1
289:	0	0	1	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	0	1	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	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	0	0

369: 0 0 1 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:	0	0	0	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	1	0	0	0	1	0	0
417:	1	0	0	0	0	0	0	0
425:	0	0	0	1	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	1	0	0	1
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	0	0	0	0	0	0	0	0
521:	0	0	0	0	0	0	0	0
529:	0	0	0	0	0	1	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	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	1
593:	0	1	0	0	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	1	0	0	0	0	0	0
617:	0	0	0	1	0	1	0	0
625:	0	0	0	0	0	0	0	0
633:	1	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	1
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	1
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	1	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 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	1	0	0	0	0	0
913:	0	0	0	0	1	0	0	0
921:	0	0	1	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	1	0	0	0	0
1017:	0	0	0	0	0	0	0	0



## QA SUMMARY REPORT

### Review Of QA Results - Pulser Check

Date : 8/7/2013  
Time : 6:51:42 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/7/2013 5:32:16 AM
Alpha 004	21f	ALL	Passed	8/7/2013 5:32:17 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	8/7/2013 5:32:18 AM
Alpha 011	21f	ALL	Passed	8/7/2013 5:32:18 AM
Alpha 012	21f	ALL	Passed	8/7/2013 5:32:19 AM
Alpha 013	21f	ALL	Passed	8/7/2013 5:32:20 AM
Alpha 014	21f	ALL	Passed	8/7/2013 5:32:21 AM
Alpha 015	21f	Peak Energy	Action	8/7/2013 5:32:22 AM
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	8/7/2013 5:32:23 AM
Alpha 019	AIM730	ALL	Passed	8/7/2013 5:32:24 AM
Alpha 020	AIM730	ALL	Passed	8/2/2013 5:14:08 AM
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/7/2013 5:32:24 AM
Alpha 023	AIM730	ALL	Passed	8/7/2013 5:32:25 AM
Alpha 024	AIM730	ALL	Passed	8/7/2013 5:32:26 AM
Alpha 025	AIM730	ALL	Passed	8/7/2013 5:32:27 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/7/2013 5:32:28 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/7/2013 5:32:28 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/7/2013 5:32:29 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:30 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:32 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:33 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:35 AM
Alpha 037	Alpha Analyst100DC	ALL	Not Done	
Alpha 038	Alpha Analyst100DC	Peak FWHM	Action	8/7/2013 5:32:37 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:38 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:41 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:43 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:45 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	8/7/2013 5:32:48 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:50 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:53 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	8/7/2013 5:32:55 AM

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

APPROVAL DATE: 8/7/13

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\*\*\*\*\* 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)**

Ra228

Run 1

Work Order	13-07149	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-81 TOT	45	07/17/13 10:43	1.0000E+00
Lab Deadline	8/13/2013	04	TRG	PZ-302-AS TOT	46	07/16/13 15:30	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-302-AS DIS	46	07/16/13 15:30	1.0000E+00
Project	West Lake OU-1	06	TRG	LR-100 TOT	47	07/17/13 10:23	1.0000E+00
Report Level	4	07	TRG	LR-100 DIS	47	07/17/13 10:23	1.0000E+00
Activity Units	pCi	08	DO	D-81 TOT	45	07/17/13 10:43	1.0000E+00
Aliquot Units	I	09	TRG	D-81 DIS	45	07/17/13 10:43	1.0000E+00
Matrix	WA	10	TRG	PZ-204-SS TOT	43	07/17/13 11:40	1.0000E+00
Method	E904.0	11	TRG	PZ-204-SS DIS	43	07/17/13 11:40	1.0000E+00
Instrument Type	Alpha/Beta GPC	12	TRG	LR-103 TOT	45	07/17/13 12:15	1.0000E+00
Radiometric Tracer	Ba-133	13	TRG	LR-103 DIS	45	07/17/13 12:15	1.0000E+00
Radiometric Sol#	Ba-6a	14	TRG	PZ-111-KS TOT	41	07/17/13 13:09	1.0000E+00
Tracer Act (dpm/g)	991.12	15	TRG	PZ-111-KS DIS	41	07/17/13 13:09	1.0000E+00
Carrier	Yttrium						
Carrier Conc (mg/ml)	34						

\* 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.

0363

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	0.9174	909.3	404.0	98.64	2.000	0.0901	0.1486	0.0585	86.03	84.86	1.00	1.00
02	MBL	0.9114	903.3	414.1	101.77	2.000	0.0915	0.1477	0.0562	82.65	84.11	1.00	1.00
03	DUP	0.9088	900.7	413.9	102.01	2.000	0.0918	0.1484	0.0566	83.24	84.91	1.00	1.00
04	TRG	0.9069	898.8	369.8	91.33	2.000	0.0917	0.1462	0.0545	80.15	73.20	1.00	1.00
05	TRG	0.9085	900.4	296.5	73.10	2.000	0.0916	0.1486	0.0570	83.82	61.28	1.00	1.00
06	TRG	0.9097	901.6	387.5	95.41	2.000	0.0916	0.1501	0.0585	86.03	82.08	1.00	1.00
07	TRG	0.9089	900.8	369.4	91.03	2.000	0.0915	0.1477	0.0562	82.65	75.24	1.00	1.00
08	DO	0.9075	899.4	425.3	104.97	2.000	0.0916	0.1471	0.0555	81.62	85.68	1.00	1.00
09	TRG	0.9080	899.9	426.5	105.21	2.000	0.0921	0.1473	0.0552	81.18	85.41	1.00	1.00
10	TRG	0.9048	896.8	348.6	86.30	2.000	0.0916	0.1471	0.0555	81.62	70.43	1.00	1.00
11	TRG	0.9036	895.6	411.9	102.10	2.000	0.0913	0.1395	0.0482	70.88	72.37	1.00	1.00
12	TRG	0.9110	902.9	384.1	94.44	2.000	0.0917	0.1464	0.0547	80.44	75.97	1.00	1.00
13	TRG	0.9075	899.4	362.3	89.42	2.000	0.0912	0.1481	0.0569	83.68	74.83	1.00	1.00
14	TRG	0.9057	897.7	410.4	101.50	2.000	0.0915	0.1482	0.0567	83.38	84.63	1.00	1.00
15	TRG	0.9097	901.6	429.9	105.85	2.000	0.0913	0.1471	0.0558	82.06	86.86	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.

0363A

<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 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
02	MBL			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
03	DUP			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
04	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
05	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
06	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
07	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
08	DO			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
09	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
10	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
11	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
12	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
13	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
14	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	TSMITH
15	TRG			08/02/13 08:19	JWOLFE	08/06/13 09:40	TSMITH	08/14/13 04:03	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.

0324

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-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	7.81E+00	8.58E-01	1.09E+00	8.73E+00	89.51	OK		OK	
02	RA-228	MBL	BLANK	pCi/l	9.52E-01	5.17E-01	9.85E-01					OK	OK
03	RA-228	DUP	D-81 TOT	pCi/l	9.69E-01	5.75E-01	1.12E+00				NA	OK	
04	RA-228	TRG	PZ-302-AS TOT	pCi/l	1.26E+00	6.43E-01	1.23E+00					OK	
05	RA-228	TRG	PZ-302-AS DIS	pCi/l	1.43E+00	8.10E-01	1.57E+00					OK	
06	RA-228	TRG	LR-100 TOT	pCi/l	-1.70E-01	5.97E-01	1.30E+00					OK	
07	RA-228	TRG	LR-100 DIS	pCi/l	5.12E-01	6.53E-01	1.34E+00					OK	
08	RA-228	DO	D-81 TOT	pCi/l	1.22E+00	6.26E-01	1.21E+00					OK	
09	RA-228	TRG	D-81 DIS	pCi/l	1.15E+00	5.93E-01	1.14E+00					OK	
10	RA-228	TRG	PZ-204-SS TOT	pCi/l	1.97E-01	8.04E-01	1.69E+00					OK	
11	RA-228	TRG	PZ-204-SS DIS	pCi/l	1.34E+00	7.63E-01	1.48E+00					OK	
12	RA-228	TRG	LR-103 TOT	pCi/l	7.25E-01	7.62E-01	1.55E+00					OK	
13	RA-228	TRG	LR-103 DIS	pCi/l	1.99E+00	7.43E-01	1.37E+00					OK	
14	RA-228	TRG	PZ-111-KS TOT	pCi/l	5.25E-01	6.27E-01	1.28E+00					OK	
15	RA-228	TRG	PZ-111-KS DIS	pCi/l	5.68E-01	5.67E-01	1.15E+00					OK	

Client	Engineering Management Support, Inc.	Eberline Services Work Order	13-07149	Analysis Code	Ra228	Run	1

5950

Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-Ra228-1**

Run	1
Analysis Code	Ra228
Eberline Services Work Order	13-07149
Client	Engineering Management Support, Inc.

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	RA-228	LCS	07/23/13 00:00	1.00E+00	98.64	86.03	84.86	1.00	8/6/2013 9:40	8/14/2013 4:03
02	RA-228	MBL	07/23/13 00:00	1.00E+00	101.77	82.65	84.11	1.00	8/6/2013 9:40	8/14/2013 4:03
03	RA-228	DUP	07/17/13 10:43	1.00E+00	102.01	83.24	84.91	1.00	8/6/2013 9:40	8/14/2013 4:03
04	RA-228	TRG	07/16/13 15:30	1.00E+00	91.33	80.15	73.20	1.00	8/6/2013 9:40	8/14/2013 4:03
05	RA-228	TRG	07/16/13 15:30	1.00E+00	73.10	83.82	61.28	1.00	8/6/2013 9:40	8/14/2013 4:03
06	RA-228	TRG	07/17/13 10:23	1.00E+00	95.41	86.03	82.08	1.00	8/6/2013 9:40	8/14/2013 4:03
07	RA-228	TRG	07/17/13 10:23	1.00E+00	91.03	82.65	75.24	1.00	8/6/2013 9:40	8/14/2013 4:03
08	RA-228	DO	07/17/13 10:43	1.00E+00	104.97	81.62	85.68	1.00	8/6/2013 9:40	8/14/2013 4:03
09	RA-228	TRG	07/17/13 10:43	1.00E+00	105.21	81.18	85.41	1.00	8/6/2013 9:40	8/14/2013 4:03
10	RA-228	TRG	07/17/13 11:40	1.00E+00	86.30	81.62	70.43	1.00	8/6/2013 9:40	8/14/2013 4:03
11	RA-228	TRG	07/17/13 11:40	1.00E+00	102.10	70.88	72.37	1.00	8/6/2013 9:40	8/14/2013 4:03
12	RA-228	TRG	07/17/13 12:15	1.00E+00	94.44	80.44	75.97	1.00	8/6/2013 9:40	8/14/2013 4:03
13	RA-228	TRG	07/17/13 12:15	1.00E+00	89.42	83.68	74.83	1.00	8/6/2013 9:40	8/14/2013 4:03
14	RA-228	TRG	07/17/13 13:09	1.00E+00	101.50	83.38	84.63	1.00	8/6/2013 9:40	8/14/2013 4:03
15	RA-228	TRG	07/17/13 13:09	1.00E+00	105.85	82.06	86.86	1.00	8/6/2013 9:40	8/14/2013 4:03



Preliminary Data Report & Analytical Calculations  
**Work Order: 13-07149-Ra228-1**



Run **1**

Analysis Code **Ra228**

Eberline Services Work Order **13-07149**

Client **Engineering Management Support, Inc.**

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halfife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-228	LCS	08/14/13 07:52		LB4110R	A1	120	618	1.083333333	0.4776
02	RA-228	MBL	08/14/13 07:52		LB4110R	A2	120	158	0.833333333	0.4699
03	RA-228	DUP	08/14/13 07:52		LB4110R	A3	120	201	1.166666667	0.4809
04	RA-228	TRG	08/14/13 07:52		LB4110R	A4	120	187	1	0.4732
05	RA-228	TRG	08/14/13 07:52		LB4110R	B1	120	204	1.166666667	0.4754
06	RA-228	TRG	08/14/13 07:52		LB4110R	B2	120	156	1.383333333	0.4658
07	RA-228	TRG	08/14/13 07:52		LB4110R	B3	120	180	1.266666667	0.4713
08	RA-228	DO	08/14/13 07:52		LB4110R	B4	120	241	1.366666667	0.4773
09	RA-228	TRG	08/14/13 07:52		LB4110R	C1	120	211	1.166666667	0.4705
10	RA-228	TRG	08/14/13 07:52		LB4110R	C2	120	222	1.766666667	0.4676
11	RA-228	TRG	08/14/13 07:52		LB4110R	C3	120	235	1.383333333	0.4614
12	RA-228	TRG	08/14/13 07:52		LB4110R	C4	120	250	1.75	0.4714
13	RA-228	TRG	08/14/13 07:53		LB4110A	A3	120	266	1.316666667	0.4719
14	RA-228	TRG	08/14/13 07:53		LB4110A	D2	120	206	1.45	0.4682
15	RA-228	TRG	08/14/13 07:53		LB4110A	D4	120	186	1.25	0.4741

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	0.9174	909.2535	404.0000	98.64	1.00	1.00
02	MBL	BLANK	07/23/13 00:00	1.0000	0.9114	903.3068	414.1000	101.77	1.00	1.00
03	DUP	D-81 TOT	07/17/13 10:43	1.0000	0.9088	900.7299	413.9000	102.01	1.00	1.00
04	TRG	PZ-302-AS TOT	07/16/13 15:30	1.0000	0.9069	898.8467	369.8000	91.33	1.00	1.00
05	TRG	PZ-302-AS DIS	07/16/13 15:30	1.0000	0.9085	900.4325	296.5000	73.10	1.00	1.00
06	TRG	LR-100 TOT	07/17/13 10:23	1.0000	0.9097	901.6219	387.5000	95.41	1.00	1.00
07	TRG	LR-100 DIS	07/17/13 10:23	1.0000	0.9089	900.8290	369.4000	91.03	1.00	1.00
08	DO	D-81 TOT	07/17/13 10:43	1.0000	0.9075	899.4414	425.3000	104.97	1.00	1.00
09	TRG	D-81 DIS	07/17/13 10:43	1.0000	0.9080	899.9370	426.5000	105.21	1.00	1.00
10	TRG	PZ-204-SS TOT	07/17/13 11:40	1.0000	0.9048	896.7654	348.6000	86.30	1.00	1.00
11	TRG	PZ-204-SS DIS	07/17/13 11:40	1.0000	0.9036	895.5760	411.9000	102.10	1.00	1.00
12	TRG	LR-103 TOT	07/17/13 12:15	1.0000	0.9110	902.9103	384.1000	94.44	1.00	1.00
13	TRG	LR-103 DIS	07/17/13 12:15	1.0000	0.9075	899.4414	362.3000	89.42	1.00	1.00
14	TRG	PZ-111-KS TOT	07/17/13 13:09	1.0000	0.9057	897.6574	410.4000	101.50	1.00	1.00
15	TRG	PZ-111-KS DIS	07/17/13 13:09	1.0000	0.9097	901.6219	429.9000	105.85	1.00	1.00



# Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
<b>13-07149</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-81 TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-302-AS TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-302-AS DIS	TRG					1.0000E+00	1.0000E+00				
06	LR-100 TOT	TRG					1.0000E+00	1.0000E+00				
07	LR-100 DIS	TRG					1.0000E+00	1.0000E+00				
08	D-81 TOT	DO					1.0000E+00	1.0000E+00				
09	D-81 DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-204-SS TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-204-SS DIS	TRG					1.0000E+00	1.0000E+00				
12	LR-103 TOT	TRG					1.0000E+00	1.0000E+00				
13	LR-103 DIS	TRG					1.0000E+00	1.0000E+00				
14	PZ-111-KS TOT	TRG					1.0000E+00	1.0000E+00				
15	PZ-111-KS DIS	TRG					1.0000E+00	1.0000E+00				

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

*J Wolfe* Date: 8/2/13

# Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
<b>13-07149</b>	<b>1</b>	<b>Ra228</b>	<b>Yttirum</b>	<b>34.0000</b>	<b>TSMITH</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	2.0000	0.0901	0.1486	0.0585	86.03
02	BLANK	MBL	2.0000	0.0915	0.1477	0.0562	82.65
03	DUP	DUP	2.0000	0.0918	0.1484	0.0566	83.24
04	PZ-302-AS TOT	TRG	2.0000	0.0917	0.1462	0.0545	80.15
05	PZ-302-AS DIS	TRG	2.0000	0.0916	0.1486	0.0570	83.82
06	LR-100 TOT	TRG	2.0000	0.0916	0.1501	0.0585	86.03
07	LR-100 DIS	TRG	2.0000	0.0915	0.1477	0.0562	82.65
08	D-81 TOT	DO	2.0000	0.0916	0.1471	0.0555	81.62
09	D-81 DIS	TRG	2.0000	0.0921	0.1473	0.0552	81.18
10	PZ-204-SS TOT	TRG	2.0000	0.0916	0.1471	0.0555	81.62
11	PZ-204-SS DIS	TRG	2.0000	0.0913	0.1395	0.0482	70.88
12	LR-103 TOT	TRG	2.0000	0.0917	0.1464	0.0547	80.44
13	LR-103 DIS	TRG	2.0000	0.0912	0.1481	0.0569	83.68
14	PZ-111-KS TOT	TRG	2.0000	0.0915	0.1482	0.0567	83.38
15	PZ-111-KS DIS	TRG	2.0000	0.0913	0.1471	0.0558	82.06

Technician: SM

Date: 8, 14, 13

C  
8/14/13  
A

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
A3	1307149-13	16	266	120	1400	8/14/13 9:53
D2	1307149-14	10	206	120	1400	8/14/13 9:53
D4	1307149-15	15	186	120	1400	8/14/13 9:53

D371A

8/14/13  
R

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
C1	1307149-09	11	211	120	1400	8/14/13 9:52
C2	1307149-10	9	222	120	1400	8/14/13 9:52
C3	1307149-11	17	235	120	1400	8/14/13 9:52
C4	1307149-12	7	250	120	1400	8/14/13 9:52
A1	1307149-01	18	618	120	1400	8/14/13 9:52
A2	1307149-02	17	158	120	1400	8/14/13 9:52
A3	1307149-03	8	201	120	1400	8/14/13 9:52
A4	1307149-04	13	187	120	1400	8/14/13 9:52
B1	1307149-05	9	204	120	1400	8/14/13 9:52
B2	1307149-06	10	156	120	1400	8/14/13 9:52
B3	1307149-07	11	180	120	1400	8/14/13 9:52
B4	1307149-08	6	241	120	1400	8/14/13 9:52

GPC Detector Report  
(ALL Backgrounds)

*C*  
*8/14/13*

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

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GPC Detector Report  
(ALL Efficiencies)

*C*  
*B1141*

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

GPC Detector Report  
(ALL Efficiencies)

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

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**SECTION XII**

**BARIUM-133 ANALYTICAL TRACER DATA**

C  
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Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714901\_GE2\_BAFIL\_194399.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : SPIKE  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 07:30:54.  
 Sample ID : 1307149-01 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.31 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	28.25	52	166	1.66	28.36	26	15	5.80E-02	46.5	1.11E+01
2	3	30.98	2033	115	1.37	31.09	26	15	2.26E+00	2.3	
3	3	35.05	515	113	1.68	35.17	26	15	5.73E-01	5.6	
4	0	52.18	70	74	1.54	52.29	49	7	7.77E-02	23.6	
5	1	61.76	184	50	1.46	61.87	57	13	2.05E-01	9.5	2.21E+00
6	1	65.83	114	55	1.47	65.95	57	13	1.27E-01	13.3	
7	2	77.17	18	50	1.64	77.28	76	11	2.05E-02	54.1	2.41E+00
8	2	81.10	799	52	1.45	81.21	76	11	8.87E-01	3.8	
9	0	93.19	26	83	2.65	93.30	90	7	2.89E-02	61.5	
10	1	111.82	200	60	1.55	111.93	107	15	2.23E-01	9.2	2.43E+00
11	1	115.92	29	62	1.56	116.04	107	15	3.24E-02	43.4	
12	0	162.03	30	89	3.16	162.14	158	9	3.30E-02	60.4	
13	0	185.80	21	108	1.98	185.91	182	9	2.28E-02	93.9	
14	0	238.59	54	36	1.48	238.70	235	9	6.00E-02	24.2	
15	0	276.83	64	26	2.00	276.94	273	7	7.08E-02	18.3	
16	3	295.50	12	21	2.15	295.61	292	15	1.29E-02	90.4	4.72E+00
17	3	302.86	116	49	1.53	302.97	292	15	1.29E-01	12.0	
18	0	307.32	24	19	1.31	307.42	306	5	2.67E-02	34.3	
19	0	317.94	13	11	2.89	318.05	315	7	1.45E-02	49.9	
20	1	333.82	72	16	1.81	333.93	330	12	7.99E-02	14.4	7.69E-01
21	1	337.94	20	13	1.82	338.05	330	12	2.20E-02	41.3	
22	0	356.03	529	18	1.51	356.14	351	10	5.88E-01	4.6	
23	0	378.29	10	16	3.07	378.40	375	6	1.15E-02	67.6	
24	1	383.76	140	25	1.86	383.87	380	15	1.55E-01	10.2	2.39E+01
25	1	386.99	215	18	1.71	387.10	380	15	2.39E-01	7.3	
26	1	391.06	51	19	1.86	391.17	380	15	5.71E-02	21.7	
27	0	437.17	94	11	1.81	437.28	433	9	1.04E-01	12.2	
28	0	468.07	19	7	1.80	468.18	464	7	2.13E-02	32.3	
29	0	511.26	32	6	5.04	511.36	505	12	3.56E-02	23.4	
30	0	860.92	7	2	1.47	861.02	858	6	7.28E-03	56.0	
31	0	911.57	9	0	2.06	911.67	909	6	1.00E-02	33.3	

Summary of Nuclide Activity

Sample ID : 1307149-01

Acquisition date : 7-AUG-2013 07:30:54

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	4.040E+02	4.040E+02	0.769E+02	19.03	
Total Activity :			4.040E+02	4.040E+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	6.326E+02	6.326E+02	1.340E+02	21.18	
Total Activity :			6.326E+02	6.326E+02			

Grand Total Activity : 1.037E+03 1.037E+03

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	4.040E+02	4.040E+02	19.03	OK
	302.84	17.80	7.560E+00	2.589E+02	2.589E+02	38.36	OK
	356.01	60.00	7.170E+00	3.695E+02	3.696E+02	17.71	OK

Final Mean for 3 Valid Peaks = 4.040E+02+/- 7.689E+01 ( 19.03%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	6.326E+02	6.326E+02	21.18	OK

Final Mean for 1 Valid Peaks = 6.326E+02+/- 1.340E+02 ( 21.18%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.040E+02	7.689E+01	1.867E+01	3.179E+00	21.643
TH-234	6.326E+02	1.340E+02	1.443E+02	1.192E+01	4.385

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-3.827E+00	6.561E+00	9.788E+00	1.503E+00	-0.391
CD-109	3.114E+00	1.195E+02	1.727E+02	1.983E+01	0.018
PA-231	2.069E+01	3.886E+00	7.674E+00	1.461E-01	2.696
PA-234	2.531E+00	1.806E+00	3.201E+00	6.602E-02	0.791
NP-237	1.327E+01	3.277E+01	5.038E+01	5.688E+00	0.263
AM-241	2.035E+01	1.036E+01	1.902E+01	1.472E+00	1.070



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Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714902\_GE2\_BAFIL\_194401.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : BLANK  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 07:54:29.  
 Sample ID : 1307149-02 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.30 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.93	2118	103	1.43	31.04	26	15	2.35E+00	2.3	7.79E+00
2	3	35.20	513	93	1.51	35.32	26	15	5.70E-01	5.4	
3	0	52.28	61	100	1.79	52.40	49	8	6.82E-02	30.8	
4	5	61.92	253	65	1.72	62.03	58	16	2.81E-01	7.8	1.83E+00
5	5	65.92	111	69	2.15	66.04	58	16	1.23E-01	16.7	
6	1	81.02	818	54	1.50	81.14	77	11	9.09E-01	3.8	3.78E+00
7	1	83.89	18	43	1.37	84.00	77	11	1.97E-02	103.2	
8	0	92.50	42	102	1.78	92.61	88	10	4.64E-02	47.9	
9	1	111.92	193	70	1.55	112.03	108	15	2.15E-01	9.7	1.68E+00
10	1	116.02	39	50	1.56	116.14	108	15	4.32E-02	35.4	
11	0	160.66	17	97	1.42	160.77	158	9	1.84E-02	110.6	
12	0	185.07	37	54	1.39	185.18	182	6	4.09E-02	36.1	
13	0	239.86	14	43	1.45	239.97	235	7	1.56E-02	82.4	
14	0	277.00	59	52	1.82	277.11	272	11	6.60E-02	26.5	
15	1	302.88	150	18	1.46	302.99	299	12	1.67E-01	8.9	2.06E+00
16	1	307.05	21	24	1.79	307.16	299	12	2.29E-02	47.5	
17	3	333.86	88	15	1.70	333.96	328	18	9.75E-02	12.1	1.68E+00
18	3	338.44	23	16	2.20	338.55	328	18	2.59E-02	40.6	
19	0	356.12	546	54	1.37	356.23	352	8	6.06E-01	4.9	
20	4	383.83	127	31	2.05	383.94	380	10	1.41E-01	11.2	1.40E+01
21	4	386.86	154	46	1.49	386.97	380	10	1.71E-01	9.9	
22	0	391.35	48	16	1.70	391.45	390	6	5.38E-02	20.4	
23	1	414.72	60	10	1.88	414.83	411	14	6.69E-02	14.5	4.23E+00
24	1	418.07	25	8	1.89	418.17	411	14	2.75E-02	37.7	
25	0	437.30	81	16	1.69	437.40	433	9	9.00E-02	14.2	
26	0	467.92	20	6	1.33	468.03	465	6	2.22E-02	29.6	
27	0	510.56	32	7	3.73	510.67	506	12	3.58E-02	23.4	
28	0	526.73	6	0	1.98	526.83	524	6	6.67E-03	40.8	

Summary of Nuclide Activity

Sample ID : 1307149-02

Acquisition date : 7-AUG-2013 07:54:29

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	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	4.141E+02	4.141E+02	0.789E+02	19.05	
Total Activity :			4.141E+02	4.141E+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	8.687E+02	8.687E+02	1.577E+02	18.15	
Total Activity :			8.687E+02	8.687E+02			

Grand Total Activity : 1.283E+03 1.283E+03

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	4.141E+02	4.141E+02	19.05	OK
	302.84	17.80	7.560E+00	3.348E+02	3.348E+02	34.84	OK
	356.01	60.00	7.170E+00	3.809E+02	3.809E+02	18.02	OK

Final Mean for 3 Valid Peaks = 4.141E+02+/- 7.888E+01 ( 19.05%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	8.687E+02	8.687E+02	18.15	OK

Final Mean for 1 Valid Peaks = 8.687E+02+/- 1.577E+02 ( 18.15%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.141E+02	7.888E+01	1.998E+01	3.402E+00	20.727
TH-234	8.687E+02	1.577E+02	1.297E+02	1.072E+01	6.695

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-4.776E+00		6.159E+00	8.903E+00	1.367E+00	-0.536
CD-109	3.444E+01		1.146E+02	1.732E+02	1.989E+01	0.199
PA-231	2.592E+01		3.961E+00	7.943E+00	1.513E-01	3.264
PA-234	4.257E+00		1.854E+00	3.422E+00	7.058E-02	1.244
NP-237	9.829E+00		3.322E+01	5.020E+01	5.668E+00	0.196
AM-241	2.456E+01		9.943E+00	1.887E+01	1.461E+00	1.302

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Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714903\_GE2\_BAFIL\_194404.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-81 TOT  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 08:20:31.  
 Sample ID : 1307149-03 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.29 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	28.10	32	147	1.66	28.22	26	15	3.56E-02	72.3	9.30E+00
2	3	30.98	2081	101	1.36	31.10	26	15	2.31E+00	2.3	
3	3	35.05	498	97	1.68	35.17	26	15	5.53E-01	5.6	
4	0	52.64	73	95	2.69	52.75	49	9	8.10E-02	26.7	
5	0	61.58	244	124	1.45	61.70	58	7	2.71E-01	9.9	
6	0	66.11	78	86	1.32	66.22	65	5	8.62E-02	21.8	
7	3	81.07	818	54	1.40	81.19	76	12	9.09E-01	3.7	1.50E+00
8	3	84.60	27	35	1.82	84.72	76	12	3.01E-02	71.6	
9	0	92.67	39	86	1.66	92.78	89	7	4.33E-02	42.6	
10	1	111.87	206	47	1.55	111.99	107	17	2.29E-01	8.8	3.03E+00
11	1	116.75	34	49	1.56	116.86	107	17	3.82E-02	37.0	
12	1	120.03	15	50	1.56	120.14	107	17	1.67E-02	74.1	
13	0	161.62	26	84	1.23	161.73	158	7	2.89E-02	61.7	
14	0	186.40	46	75	2.80	186.51	182	8	5.17E-02	35.5	
15	0	239.09	51	22	4.12	239.20	235	8	5.66E-02	21.6	
16	1	272.89	10	10	1.59	273.00	272	8	1.06E-02	53.1	1.14E+01
17	1	276.73	46	21	1.76	276.84	272	8	5.07E-02	21.0	
18	2	302.87	141	11	1.56	302.98	299	11	1.57E-01	9.1	2.87E+00
19	2	306.80	27	12	1.97	306.91	299	11	2.99E-02	33.2	
20	2	333.75	67	5	1.78	333.86	328	18	7.43E-02	14.1	1.80E+00
21	2	338.24	31	10	2.00	338.35	328	18	3.49E-02	24.9	
22	1	351.98	21	3	1.83	352.09	350	14	2.31E-02	22.8	1.03E+00
23	1	355.99	525	11	1.55	356.10	350	14	5.83E-01	4.5	
24	3	383.79	156	13	1.82	383.89	380	15	1.74E-01	8.2	6.98E+00
25	3	387.01	201	11	1.92	387.11	380	15	2.23E-01	9.2	
26	3	391.45	51	7	2.02	391.56	380	15	5.62E-02	18.3	
27	1	411.76	7	12	1.88	411.86	409	12	8.02E-03	106.6	5.91E+00
28	1	414.94	45	19	1.88	415.04	409	12	5.03E-02	21.8	
29	0	437.09	89	12	1.31	437.19	433	8	9.89E-02	12.6	
30	1	467.88	23	4	1.93	467.98	465	15	2.54E-02	23.7	8.99E-01
31	1	473.07	9	2	1.93	473.18	465	15	9.77E-03	50.2	
32	0	510.40	18	12	1.20	510.50	507	8	2.00E-02	40.8	
33	0	603.34	7	4	2.45	603.44	601	6	8.18E-03	53.5	
34	0	609.27	12	2	1.50	609.37	607	6	1.32E-02	36.3	

Total number of lines in spectrum 34  
 Number of unidentified lines 29  
 Number of lines tentatively identified by NID 5 14.71%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	4.138E+02	4.139E+02	0.786E+02	19.00		
NP-237	2.14E+06Y	1.00	3.812E+01	3.812E+01	5.479E+01	143.72		
Total Activity :			4.520E+02	4.520E+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	8.374E+02	8.374E+02	1.833E+02	21.89		
Total Activity :			8.374E+02	8.374E+02				

Grand Total Activity : 1.289E+03 1.289E+03

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	4.138E+02	4.139E+02	19.00	OK
	302.84	17.80	7.560E+00	3.152E+02	3.152E+02	35.00	OK
	356.01	60.00	7.170E+00	3.663E+02	3.663E+02	17.59	OK

Final Mean for 3 Valid Peaks = 4.139E+02+/- 7.863E+01 ( 19.00%)

NP-237	86.50	12.60*	1.691E+01	3.812E+01	3.812E+01	143.72	OK
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Final Mean for 1 Valid Peaks = 3.812E+01+/- 5.479E+01 (143.72%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	8.374E+02	8.374E+02	21.89	OK

Final Mean for 1 Valid Peaks = 8.374E+02+/- 1.833E+02 ( 21.89%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.139E+02	7.863E+01	1.978E+01	3.367E+00	20.928
TH-234	8.374E+02	1.833E+02	1.684E+02	1.391E+01	4.973
NP-237	3.812E+01	5.479E+01	3.895E+01	4.398E+00	0.979

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.412E+00		6.073E+00	9.536E+00	1.464E+00	-0.148
CD-109	7.316E+01		9.900E+01	1.626E+02	1.867E+01	0.450
PA-231	2.418E+01		3.732E+00	7.558E+00	1.439E-01	3.199
PA-234	4.151E+00		1.810E+00	3.353E+00	6.916E-02	1.238
AM-241	2.835E+01		1.125E+01	1.981E+01	1.533E+00	1.431



8(710)

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714904\_GE2\_BAFIL\_194406.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-302-AS TOT  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 08:48:54.  
 Sample ID : 1307149-04 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	28.05	54	133	1.66	28.16	26	15	5.98E-02	42.2	6.42E+00
2	3	30.98	1777	94	1.39	31.10	26	15	1.97E+00	2.5	
3	3	35.05	433	97	1.68	35.17	26	15	4.81E-01	6.0	
4	0	52.67	65	78	2.37	52.78	48	9	7.27E-02	27.4	
5	4	61.82	189	59	1.94	61.94	57	13	2.10E-01	10.1	3.25E+00
6	4	65.80	72	78	1.95	65.92	57	13	7.98E-02	23.5	
7	0	81.05	731	115	1.44	81.17	76	10	8.12E-01	4.6	
8	0	93.08	35	72	1.29	93.19	89	7	3.87E-02	44.3	
9	1	111.75	140	54	1.55	111.86	108	11	1.56E-01	12.2	3.68E+00
10	1	115.75	29	63	1.56	115.86	108	11	3.20E-02	43.5	
11	2	276.23	43	13	1.93	276.34	272	27	4.77E-02	21.5	2.14E+00
12	2	284.82	16	14	1.94	284.92	272	27	1.79E-02	43.5	
13	2	295.55	10	15	1.95	295.66	272	27	1.06E-02	75.9	
14	3	302.81	135	13	1.47	302.92	299	12	1.50E-01	9.2	1.78E+00
15	3	306.85	25	25	2.16	306.96	299	12	2.72E-02	39.5	
16	0	325.52	14	14	3.40	325.63	322	8	1.51E-02	55.1	
17	2	333.55	57	7	1.99	333.65	329	15	6.30E-02	16.0	1.72E+00
18	2	337.84	23	4	2.00	337.95	329	15	2.57E-02	29.0	
19	0	356.11	482	36	1.48	356.22	352	8	5.35E-01	5.0	
20	0	368.91	25	28	7.53	369.02	362	13	2.79E-02	50.1	
21	0	377.33	14	11	1.88	377.43	375	6	1.51E-02	46.9	
22	1	383.79	95	20	1.86	383.89	381	9	1.05E-01	14.9	8.51E-01
23	1	386.84	195	19	1.64	386.95	381	9	2.17E-01	9.1	
24	0	391.46	40	18	1.82	391.56	390	6	4.41E-02	23.9	
25	2	414.91	30	6	2.07	415.02	411	12	3.34E-02	24.8	6.69E-01
26	2	418.08	22	9	2.08	418.18	411	12	2.44E-02	37.4	
27	0	437.06	94	10	1.70	437.16	433	7	1.05E-01	11.6	
28	3	467.94	18	7	2.33	468.04	463	13	2.00E-02	35.8	7.68E-01
29	3	472.15	6	10	2.34	472.26	463	13	7.22E-03	86.0	
30	0	511.87	31	2	6.76	511.97	507	11	3.40E-02	20.8	
31	0	523.57	4	4	2.66	523.67	521	5	4.44E-03	89.0	
32	0	596.61	10	2	2.75	596.71	593	7	1.14E-02	37.7	
33	0	610.30	8	9	2.63	610.40	606	8	9.25E-03	73.1	

Summary of Nuclide Activity

Sample ID : 1307149-04

Acquisition date : 7-AUG-2013 08:48:54

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	3.698E+02	3.698E+02	0.731E+02	19.77		
Total Activity :			3.698E+02	3.698E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
PA-231	3.28E+04Y	1.00	2.337E+03	2.337E+03	0.786E+03	33.65		
TH-234	4.47E+09Y	1.00	6.483E+02	6.483E+02	1.435E+02	22.14		
Total Activity :			2.985E+03	2.985E+03				

Grand Total Activity : 3.355E+03 3.355E+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 Decay Corr		2-Sigma %Error	Status
				pCi/filter	pCi/filter		
BA-133	81.00	33.00*	1.799E+01	3.698E+02	3.698E+02	19.77	OK
	302.84	17.80	7.560E+00	3.020E+02	3.021E+02	35.14	OK
	356.01	60.00	7.170E+00	3.363E+02	3.363E+02	18.20	OK

Final Mean for 3 Valid Peaks = 3.698E+02+/- 7.311E+01 ( 19.77%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected Decay Corr		2-Sigma %Error	Status
				pCi/filter	pCi/filter		
PA-231	9.28	42.00*	1.000E+02	----- Line Out Of Range		----	Absent
	10.11	20.20	1.000E+02	----- Line Out Of Range		----	Absent
	283.67	1.60	7.750E+00	3.910E+02	3.910E+02	91.11	OK
	302.67	2.30	7.562E+00	2.337E+03	2.337E+03	33.65	OK

Final Mean for 2 Valid Peaks = 2.337E+03+/- 7.863E+02 ( 33.65%)

TH-234	63.29	3.80*	2.305E+01	6.483E+02	6.483E+02	22.14	OK
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Final Mean for 1 Valid Peaks = 6.483E+02+/- 1.435E+02 ( 22.14%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.698E+02	7.311E+01	1.867E+01	3.179E+00	19.811
PA-231	2.337E+03	7.863E+02	7.985E+00	1.521E-01	292.663
TH-234	6.483E+02	1.435E+02	1.418E+02	1.171E+01	4.573

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.255E+00		5.991E+00	1.029E+01	1.580E+00	0.316
CD-109	3.799E+01		1.123E+02	1.711E+02	1.964E+01	0.222
PA-234	3.825E+00		1.829E+00	3.350E+00	6.910E-02	1.142
NP-237	-4.332E+00		3.350E+01	4.736E+01	5.348E+00	-0.091
AM-241	1.606E+01		9.870E+00	1.793E+01	1.388E+00	0.895

*8/7/13*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714905\_GE2\_BAFIL\_194409.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-302-AS DIS  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 09:12:32.  
 Sample ID : 1307149-05 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.27 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	1	30.94	1495	86	1.38	31.06	26	13	1.66E+00	2.8	6.70E+00
2	1	35.01	371	75	1.39	35.13	26	13	4.12E-01	6.4	
3	1	61.75	167	54	1.46	61.87	58	12	1.85E-01	10.1	4.15E+00
4	1	65.90	48	65	1.47	66.02	58	12	5.29E-02	27.9	
5	0	81.01	586	126	1.31	81.12	77	8	6.51E-01	5.3	
6	2	111.78	135	36	1.71	111.89	109	16	1.50E-01	11.1	1.18E+00
7	2	115.96	46	34	1.71	116.07	109	16	5.10E-02	24.4	
8	0	204.74	27	44	4.42	204.85	201	8	2.98E-02	47.6	
9	0	276.80	39	27	1.69	276.91	272	7	4.37E-02	26.9	
10	1	302.88	148	22	1.51	302.98	298	14	1.64E-01	9.4	2.21E+00
11	1	307.79	11	30	1.79	307.89	298	14	1.27E-02	68.4	
12	0	333.73	61	21	2.12	333.84	330	7	6.79E-02	17.8	
13	1	351.73	9	6	1.83	351.83	350	24	9.60E-03	50.1	1.83E+00
14	1	356.03	430	15	1.52	356.14	350	24	4.78E-01	5.0	
15	9	384.11	64	21	2.35	384.22	380	18	7.10E-02	24.6	4.83E+00
16	9	387.03	141	14	1.96	387.14	380	18	1.57E-01	11.5	
17	9	391.26	30	12	2.39	391.36	380	18	3.29E-02	35.3	
18	4	414.11	26	10	2.51	414.22	410	19	2.88E-02	27.0	4.24E+00
19	4	418.37	21	8	2.51	418.48	410	19	2.34E-02	38.2	
20	4	421.65	9	6	2.52	421.76	410	19	1.03E-02	83.2	
21	4	424.50	10	5	2.52	424.60	410	19	1.06E-02	68.7	
22	0	437.05	71	4	1.77	437.16	434	7	7.91E-02	12.7	
23	0	468.26	14	5	2.07	468.37	464	7	1.52E-02	38.8	
24	0	511.14	24	2	1.66	511.25	508	8	2.63E-02	23.2	

Total number of lines in spectrum 24  
 Number of unidentified lines 20  
 Number of lines tentatively identified by NID 4 16.67%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	2.965E+02	2.965E+02	0.606E+02	20.45	
Total Activity :			2.965E+02	2.965E+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	5.721E+02	5.721E+02	1.273E+02	22.26	
Total Activity :			5.721E+02	5.721E+02			

Grand Total Activity : 8.686E+02 8.686E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	2.965E+02	2.965E+02	20.45	OK
	302.84	17.80	7.560E+00	3.303E+02	3.303E+02	35.29	OK
	356.01	60.00	7.170E+00	3.004E+02	3.004E+02	18.17	OK

Final Mean for 3 Valid Peaks = 2.965E+02+/- 6.064E+01 ( 20.45%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	5.721E+02	5.721E+02	22.26	OK

Final Mean for 1 Valid Peaks = 5.721E+02+/- 1.273E+02 ( 22.26%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	2.965E+02	6.064E+01	1.947E+01	3.314E+00	15.233
TH-234	5.721E+02	1.273E+02	1.489E+02	1.230E+01	3.842

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.100E+00		4.877E+00	8.845E+00	1.358E+00	0.124
CD-109	6.847E+00		1.042E+02	1.718E+02	1.972E+01	0.040
PA-231	2.690E+01		3.953E+00	7.958E+00	1.516E-01	3.380
PA-234	2.474E+00		1.652E+00	2.976E+00	6.139E-02	0.831
NP-237	-2.505E+01		3.324E+01	4.919E+01	5.554E+00	-0.509
AM-241	1.357E+01		9.486E+00	1.796E+01	1.390E+00	0.756



*8/17*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714906\_GE2\_BAFIL\_194413.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : LR-100 TOT  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 09:30:41.  
 Sample ID : 1307149-06 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	30.91	1885	111	1.38	31.02	26	14	2.09E+00	2.4	4.11E+00
2	4	35.25	436	101	1.64	35.36	26	14	4.84E-01	6.0	
3	0	52.90	44	79	2.55	53.01	49	7	4.92E-02	36.5	
4	3	61.83	212	82	1.76	61.95	57	13	2.36E-01	9.5	2.28E+00
5	3	65.80	101	81	1.77	65.91	57	13	1.12E-01	17.8	
6	0	81.06	766	120	1.32	81.17	77	8	8.51E-01	4.4	
7	1	108.03	14	19	1.54	108.14	107	15	1.56E-02	50.7	2.08E+00
8	1	111.92	159	37	1.55	112.03	107	15	1.76E-01	10.4	
9	1	115.89	38	34	1.41	116.00	107	15	4.25E-02	27.2	
10	0	160.70	38	66	2.90	160.81	158	8	4.18E-02	40.5	
11	0	185.02	35	66	1.29	185.13	181	7	3.86E-02	42.4	
12	0	276.49	47	35	1.80	276.60	273	8	5.24E-02	26.7	
13	2	299.11	8	6	1.96	299.22	298	8	9.22E-03	44.3	2.21E+00
14	2	302.88	135	18	1.56	302.99	298	8	1.50E-01	9.7	
15	3	333.73	71	7	2.19	333.84	330	13	7.91E-02	14.8	1.73E+00
16	3	337.91	31	7	2.20	338.02	330	13	3.46E-02	26.9	
17	0	356.08	480	30	1.39	356.18	352	8	5.33E-01	5.0	
18	6	383.84	135	19	2.04	383.95	380	17	1.50E-01	10.5	5.17E+00
19	6	386.87	158	13	1.56	386.98	380	17	1.76E-01	9.3	
20	6	390.92	37	17	2.83	391.03	380	17	4.11E-02	41.2	
21	1	414.72	30	3	1.88	414.83	411	17	3.29E-02	23.5	2.26E+00
22	1	418.07	31	3	1.89	418.17	411	17	3.50E-02	23.7	
23	1	422.07	12	3	1.89	422.17	411	17	1.30E-02	43.9	
24	0	437.00	82	7	1.48	437.10	433	9	9.12E-02	12.4	
25	4	464.04	7	0	1.92	464.15	463	12	8.05E-03	28.4	8.50E-01
26	4	467.92	28	2	2.57	468.03	463	12	3.07E-02	23.2	
27	1	508.07	6	2	1.96	508.18	507	8	6.22E-03	43.8	1.94E+00
28	1	511.08	15	6	1.96	511.18	507	8	1.66E-02	38.4	

Summary of Nuclide Activity

Sample ID : 1307149-06

Acquisition date : 7-AUG-2013 09:30:41

Total number of lines in spectrum 28  
 Number of unidentified lines 24  
 Number of lines tentatively identified by NID 4 14.29%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
BA-133	10.50Y	1.00	3.875E+02	3.875E+02	0.758E+02	19.56	
Total Activity :			3.875E+02	3.875E+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	7.285E+02	7.285E+02	1.539E+02	21.13	
Total Activity :			7.285E+02	7.285E+02			

Grand Total Activity : 1.116E+03 1.116E+03

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.875E+02	3.875E+02	19.56	OK
	302.84	17.80	7.560E+00	3.021E+02	3.022E+02	35.69	OK
	356.01	60.00	7.170E+00	3.349E+02	3.349E+02	18.12	OK

Final Mean for 3 Valid Peaks = 3.875E+02+/- 7.581E+01 ( 19.56%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	7.285E+02	7.285E+02	21.13	OK

Final Mean for 1 Valid Peaks = 7.285E+02+/- 1.539E+02 ( 21.13%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.875E+02	7.581E+01	1.695E+01	2.886E+00	22.860
TH-234	7.285E+02	1.539E+02	1.528E+02	1.262E+01	4.769

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.459E+00		5.223E+00	8.868E+00	1.362E+00	0.164
CD-109	6.970E+01		1.016E+02	1.792E+02	2.057E+01	0.389
PA-231	2.554E+01		3.976E+00	7.955E+00	1.515E-01	3.211
PA-234	2.723E+00		1.779E+00	3.181E+00	6.560E-02	0.856
NP-237	-9.894E+00		3.042E+01	4.778E+01	5.395E+00	-0.207
AM-241	2.350E+01		1.107E+01	2.026E+01	1.568E+00	1.160

*817m*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714907\_GE3\_BAFIL\_194402.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : LR-100 DIS  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 07:54:58.  
 Sample ID : 1307149-07 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 00:15:05.60 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	1969	87	1.59	31.14	26	15	2.19E+00	2.3	1.06E+01
2	3	35.11	490	70	1.64	35.43	26	15	5.44E-01	5.3	
3	0	52.36	46	122	2.64	52.68	48	8	5.10E-02	44.2	
4	4	61.89	254	75	1.66	62.21	58	12	2.82E-01	8.0	1.65E+00
5	4	65.74	137	74	2.02	66.06	58	12	1.53E-01	14.8	
6	2	80.98	771	73	1.70	81.29	76	26	8.56E-01	4.0	7.13E+00
7	2	83.68	29	49	1.41	84.00	76	26	3.27E-02	74.3	
8	2	92.98	26	58	1.72	93.30	76	26	2.86E-02	51.3	
9	2	111.93	204	42	1.75	112.24	107	16	2.26E-01	8.9	5.99E+00
10	2	114.83	29	33	1.60	115.15	107	16	3.23E-02	51.8	
11	0	160.57	28	74	1.24	160.88	158	7	3.11E-02	54.2	
12	0	191.50	15	90	1.55	191.81	190	8	1.71E-02	2109.7	
13	0	277.13	57	44	1.98	277.43	274	10	6.31E-02	25.4	
14	3	303.11	141	12	1.73	303.41	300	22	1.57E-01	9.0	2.17E+00
15	3	307.03	37	11	2.19	307.34	300	22	4.14E-02	32.0	
16	3	311.24	21	9	2.19	311.54	300	22	2.32E-02	42.2	
17	0	334.09	81	18	1.95	334.40	332	5	9.02E-02	13.5	
18	3	356.26	465	13	1.63	356.56	351	19	5.17E-01	4.8	2.15E+00
19	3	364.71	21	27	2.24	365.01	351	19	2.32E-02	40.5	
20	3	384.06	86	21	2.26	384.36	381	10	9.54E-02	19.5	1.91E+01
21	3	387.18	189	34	1.74	387.48	381	10	2.10E-01	8.9	
22	0	391.61	24	32	1.59	391.91	391	6	2.70E-02	44.4	
23	2	415.06	40	17	2.08	415.36	411	11	4.39E-02	22.5	5.69E+00
24	2	418.53	24	20	2.09	418.84	411	11	2.70E-02	36.1	
25	0	437.37	92	9	2.02	437.67	432	10	1.02E-01	12.3	
26	0	459.44	7	4	1.18	459.74	456	8	7.37E-03	65.7	
27	0	468.87	18	16	1.80	469.17	465	9	2.00E-02	46.3	
28	0	511.49	17	9	1.83	511.79	506	12	1.89E-02	42.9	

Summary of Nuclide Activity

Sample ID : 1307149-07

Acquisition date : 7-AUG-2013 07:54:58

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	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.694E+02	3.694E+02	0.653E+02	17.68	
Total Activity :			3.694E+02	3.694E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
TH-234	4.47E+09Y	1.00	7.580E+02	7.580E+02	1.319E+02	17.40	
Total Activity :			7.580E+02	7.580E+02			

Grand Total Activity : 1.127E+03 1.127E+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	3.694E+02	3.694E+02	17.68	OK
	302.84	17.80	6.222E+00	3.823E+02	3.823E+02	27.30	OK
	356.01	60.00	5.860E+00	3.971E+02	3.972E+02	16.66	OK

Final Mean for 3 Valid Peaks = 3.694E+02 +/- 6.531E+01 ( 17.68%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	7.580E+02	7.580E+02	17.40	OK

Final Mean for 1 Valid Peaks = 7.580E+02 +/- 1.319E+02 ( 17.40%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.694E+02	6.531E+01	2.069E+01	3.165E+00	17.853
TH-234	7.580E+02	1.319E+02	1.251E+02	6.717E+00	6.061

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-6.017E-01	5.861E+00	9.352E+00	1.068E+00	-0.064
CD-109	-1.145E+02	1.093E+02	1.710E+02	1.410E+01	-0.669
PA-231	7.952E-01	1.579E+00	2.947E+00	4.191E-02	0.270
PA-234	4.077E+00	1.528E+00	2.910E+00	4.139E-02	1.401
NP-237	-3.425E+01	3.143E+01	4.896E+01	3.958E+00	-0.700
AM-241	2.322E+01	8.771E+00	1.731E+01	8.509E-01	1.342



*817*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714908\_GE3\_BAFIL\_194405.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-81 TOT  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 08:21:10.  
 Sample ID : 1307149-08 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 00:15:05.99 0.7%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	30.83	2045	95	1.49	31.15	26	15	2.27E+00	2.3	7.93E+00
2	4	35.10	494	98	1.64	35.42	26	15	5.49E-01	5.5	
3	0	51.80	60	120	3.06	52.11	50	8	6.67E-02	33.8	
4	0	61.85	217	144	1.30	62.17	59	6	2.41E-01	11.1	
5	0	66.05	81	112	1.71	66.36	65	5	9.00E-02	22.9	
6	2	76.98	18	39	1.69	77.29	76	14	1.95E-02	49.4	1.71E+01
7	2	80.98	887	56	1.70	81.29	76	14	9.86E-01	3.5	
8	2	84.68	21	39	1.41	85.00	76	14	2.38E-02	51.8	
9	0	92.23	23	81	1.88	92.55	90	8	2.59E-02	69.6	
10	3	111.87	252	49	1.82	112.18	107	19	2.80E-01	7.5	2.57E+00
11	3	116.78	45	52	1.93	117.10	107	19	4.99E-02	32.5	
12	0	277.41	48	39	1.23	277.71	274	7	5.29E-02	26.1	
13	0	294.74	17	16	1.75	295.05	292	7	1.89E-02	45.7	
14	4	303.16	153	13	1.81	303.46	299	16	1.70E-01	8.7	1.78E+00
15	4	307.53	24	15	2.03	307.84	299	16	2.62E-02	35.1	
16	0	334.02	67	29	1.53	334.33	330	7	7.49E-02	17.9	
17	0	356.30	478	35	1.93	356.61	352	10	5.32E-01	5.1	
18	7	383.79	59	33	1.88	384.09	381	10	6.50E-02	26.0	9.03E+01
19	7	386.97	173	70	1.87	387.27	381	10	1.92E-01	11.6	
20	0	391.57	50	27	2.57	391.87	391	6	5.53E-02	25.6	
21	4	415.10	50	20	2.52	415.40	412	11	5.53E-02	24.2	2.57E+00
22	4	418.41	38	19	2.07	418.71	412	11	4.26E-02	27.2	
23	0	437.73	95	20	1.74	438.03	433	9	1.05E-01	13.4	
24	0	468.28	21	14	1.67	468.58	464	8	2.35E-02	37.5	
25	0	511.54	10	7	1.41	511.84	508	7	1.10E-02	54.4	
26	0	610.28	11	3	2.02	610.57	607	7	1.21E-02	41.0	

Summary of Nuclide Activity

Sample ID : 1307149-08

Acquisition date : 7-AUG-2013 08:21:10

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	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	4.253E+02	4.253E+02	0.736E+02	17.32	
NP-237	2.14E+06Y	1.00	2.915E+01	2.915E+01	3.034E+01	104.06	
Total Activity :			4.545E+02	4.545E+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	6.483E+02	6.483E+02	1.498E+02	23.11	
Total Activity :			6.483E+02	6.483E+02			

Grand Total Activity : 1.103E+03 1.103E+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	4.253E+02	4.253E+02	17.32	OK
	302.84	17.80	6.222E+00	4.139E+02	4.139E+02	26.97	OK
	356.01	60.00	5.860E+00	4.086E+02	4.086E+02	17.06	OK

Final Mean for 3 Valid Peaks = 4.253E+02+/- 7.365E+01 ( 17.32%)

NP-237	86.50	12.60*	1.749E+01	2.915E+01	2.915E+01	104.06	OK
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Final Mean for 1 Valid Peaks = 2.915E+01+/- 3.034E+01 (104.06%)

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	6.483E+02	6.483E+02	23.11	OK

Final Mean for 1 Valid Peaks = 6.483E+02+/- 1.498E+02 ( 23.11%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.253E+02	7.365E+01	1.778E+01	2.719E+00	23.922
TH-234	6.483E+02	1.498E+02	1.611E+02	8.651E+00	4.025
NP-237	2.915E+01	3.034E+01	5.069E+01	4.098E+00	0.575

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.910E+00		6.263E+00	1.146E+01	1.309E+00	0.341
CD-109	5.733E+01		1.109E+02	1.716E+02	1.415E+01	0.334
PA-231	1.035E+00		1.482E+00	2.825E+00	4.018E-02	0.366
PA-234	3.729E+00		1.522E+00	2.868E+00	4.080E-02	1.300
AM-241	2.894E+01		1.039E+01	1.830E+01	8.999E-01	1.581

*817*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714909\_GE3\_BAFIL\_194407.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : D-81 DIS  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 08:49:28.  
 Sample ID : 1307149-09 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 00:15:05.21 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	27.95	53	60	1.57	28.27	27	14	5.84E-02	23.8	3.54E+01
2	6	30.84	2062	73	1.49	31.16	27	14	2.29E+00	2.3	
3	6	34.96	629	94	2.07	35.28	27	14	6.99E-01	5.8	
4	0	53.01	70	114	3.12	53.33	50	8	7.81E-02	28.9	
5	1	61.75	252	74	1.51	62.07	58	12	2.80E-01	8.4	5.52E+00
6	1	65.82	101	78	1.52	66.14	58	12	1.12E-01	17.4	
7	0	81.03	890	147	1.81	81.35	76	11	9.89E-01	4.3	
8	0	92.79	51	67	1.39	93.11	90	7	5.68E-02	30.0	
9	0	111.71	238	95	1.95	112.03	108	7	2.64E-01	9.4	
10	0	159.85	34	74	1.99	160.17	158	8	3.82E-02	45.8	
11	0	170.35	23	46	2.31	170.66	168	6	2.53E-02	51.8	
12	0	276.49	61	23	1.61	276.79	273	7	6.83E-02	18.1	
13	1	302.86	137	15	1.80	303.16	299	15	1.52E-01	9.8	3.38E+00
14	1	307.53	28	15	1.81	307.84	299	15	3.06E-02	29.6	
15	3	333.68	90	22	1.87	333.99	329	17	9.96E-02	13.8	2.10E+00
16	3	338.38	22	15	2.22	338.68	329	17	2.49E-02	46.7	
17	0	356.26	474	30	1.98	356.57	351	12	5.27E-01	5.1	
18	0	365.45	29	12	2.46	365.75	362	7	3.25E-02	27.0	
19	1	383.71	121	26	1.87	384.02	381	10	1.35E-01	12.2	2.17E+01
20	1	386.87	185	49	1.87	387.17	381	10	2.05E-01	10.7	
21	0	391.62	38	17	2.65	391.92	391	6	4.28E-02	27.4	
22	6	415.15	47	18	2.52	415.45	410	12	5.26E-02	22.9	8.08E-01
23	6	418.34	23	14	2.11	418.64	410	12	2.55E-02	41.8	
24	0	437.17	107	0	2.00	437.47	435	6	1.19E-01	9.7	
25	0	467.87	33	7	1.22	468.17	465	7	3.63E-02	22.1	
26	0	498.50	4	3	2.66	498.79	495	6	4.60E-03	81.9	
27	0	511.08	21	2	3.66	511.38	508	8	2.30E-02	25.1	
28	0	532.29	6	2	1.37	532.58	529	6	7.15E-03	49.7	
29	0	609.26	10	2	1.53	609.55	607	6	1.14E-02	36.8	
30	0	1016.15	7	0	1.12	1016.43	1013	7	7.78E-03	37.8	

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	4.265E+02	4.265E+02	0.766E+02	17.97	
Total Activity :			4.265E+02	4.265E+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	7.512E+02	7.512E+02	1.358E+02	18.08	
Total Activity :			7.512E+02	7.512E+02			

Grand Total Activity : 1.178E+03 1.178E+03

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.899E+01	4.265E+02	4.265E+02	17.97	OK
	302.84	17.80	6.222E+00	3.715E+02	3.715E+02	28.45	OK
	356.01	60.00	5.860E+00	4.052E+02	4.053E+02	17.08	OK

Final Mean for 3 Valid Peaks = 4.265E+02 +/- 7.664E+01 ( 17.97%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.648E+01	7.512E+02	7.512E+02	18.08	OK

Final Mean for 1 Valid Peaks = 7.512E+02 +/- 1.358E+02 ( 18.08%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.265E+02	7.664E+01	1.840E+01	2.814E+00	23.176
TH-234	7.512E+02	1.358E+02	1.480E+02	7.948E+00	5.077

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-4.659E+00		6.419E+00	1.028E+01	1.175E+00	-0.453
CD-109	-2.444E+01		1.144E+02	1.576E+02	1.299E+01	-0.155
PA-231	1.349E+00		1.673E+00	3.168E+00	4.505E-02	0.426
PA-234	2.966E+00		1.368E+00	2.688E+00	3.823E-02	1.103
NP-237	-6.651E+00		3.448E+01	4.760E+01	3.848E+00	-0.140
AM-241	2.051E+01		1.027E+01	1.842E+01	9.056E-01	1.113



*8/7u*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714910\_GE3\_BAFIL\_194410.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-204-SS TOT  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 09:13:05.  
 Sample ID : 1307149-10 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 00:15:05.69 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	2082	88	1.48	31.16	27	13	2.31E+00	2.3	6.28E+00
2	3	35.07	567	75	1.71	35.39	27	13	6.30E-01	4.9	
3	0	52.28	52	86	1.51	52.60	50	6	5.72E-02	31.7	
4	4	61.78	250	73	1.68	62.10	57	16	2.78E-01	8.1	2.58E+00
5	4	65.81	154	74	1.95	66.13	57	16	1.71E-01	13.2	
6	2	80.98	727	54	1.70	81.29	76	12	8.08E-01	4.1	1.15E+01
7	2	83.68	22	33	1.41	84.00	76	12	2.45E-02	92.0	
8	0	112.80	315	91	1.98	113.12	108	11	3.50E-01	8.2	
9	0	142.96	17	74	2.03	143.27	141	7	1.93E-02	84.6	
10	1	276.65	58	21	1.78	276.96	273	19	6.47E-02	16.2	4.19E+00
11	1	286.85	12	14	1.79	287.16	273	19	1.38E-02	53.8	
12	6	303.08	138	27	1.70	303.38	300	12	1.53E-01	9.9	4.73E+00
13	6	307.49	27	30	1.95	307.80	300	12	3.01E-02	38.6	
14	3	333.64	75	17	1.91	333.95	329	13	8.36E-02	15.5	4.26E+00
15	3	338.14	18	24	2.22	338.45	329	13	2.01E-02	56.4	
16	0	356.21	456	27	1.96	356.52	352	10	5.07E-01	5.1	
17	2	384.01	131	5	2.06	384.31	381	18	1.46E-01	9.8	5.09E+00
18	2	387.05	222	3	2.06	387.36	381	18	2.46E-01	8.4	
19	2	391.34	58	0	2.06	391.64	381	18	6.48E-02	16.3	
20	3	414.92	51	11	2.29	415.23	412	17	5.63E-02	17.9	3.82E+00
21	3	418.27	31	7	2.07	418.57	412	17	3.39E-02	30.8	
22	3	422.04	18	5	2.30	422.34	412	17	2.00E-02	42.1	
23	0	437.08	108	2	2.05	437.38	433	8	1.20E-01	9.9	
24	0	467.28	25	8	2.28	467.58	463	10	2.82E-02	28.3	
25	0	511.20	21	2	3.90	511.50	507	9	2.32E-02	25.4	
26	0	610.51	7	3	2.40	610.80	606	7	7.33E-03	60.8	
27	0	660.38	6	0	1.00	660.67	658	6	6.67E-03	40.8	

Summary of Nuclide Activity

Sample ID : 1307149-10

Acquisition date : 7-AUG-2013 09:13:05

Total number of lines in spectrum 27  
 Number of unidentified lines 23  
 Number of lines tentatively identified by NID 4 14.81%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	3.486E+02	3.486E+02	0.620E+02	17.77	
Total Activity :			3.486E+02	3.486E+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	7.466E+02	7.466E+02	1.309E+02	17.54	
Total Activity :			7.466E+02	7.466E+02			

Grand Total Activity : 1.095E+03 1.095E+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	3.486E+02	3.486E+02	17.77	OK
	302.84	17.80	6.222E+00	3.730E+02	3.730E+02	28.58	OK
	356.01	60.00	5.860E+00	3.897E+02	3.897E+02	17.09	OK

Final Mean for 3 Valid Peaks = 3.486E+02+/- 6.195E+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	7.466E+02	7.466E+02	17.54	OK

Final Mean for 1 Valid Peaks = 7.466E+02+/- 1.309E+02 ( 17.54%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.486E+02	6.195E+01	1.855E+01	2.838E+00	18.789
TH-234	7.466E+02	1.309E+02	1.231E+02	6.610E+00	6.066

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.294E+00	5.732E+00	9.980E+00	1.140E+00	0.330
CD-109	-2.488E+01	1.023E+02	1.609E+02	1.327E+01	-0.155
PA-231	2.978E+00	1.607E+00	3.262E+00	4.640E-02	0.913
PA-234	2.153E+00	1.460E+00	2.754E+00	3.917E-02	0.782
NP-237	1.556E+00	2.859E+01	4.680E+01	3.783E+00	0.033
AM-241	2.856E+01	9.509E+00	1.816E+01	8.931E-01	1.573

*C*  
*8/7*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714911\_GE3\_BAFIL\_194414.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-204-SS DIS  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 09:31:32.  
 Sample ID : 1307149-11 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 00:15:05.65 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	1995	92	1.48	31.15	26	14	2.22E+00	2.3	5.50E+00
2	3	35.06	492	82	1.72	35.38	26	14	5.47E-01	5.5	
3	3	53.03	49	68	1.80	53.35	50	20	5.42E-02	30.2	3.31E+00
4	3	61.83	261	68	1.82	62.15	50	20	2.90E-01	7.6	
5	3	65.86	126	81	1.83	66.18	50	20	1.39E-01	16.1	
6	0	81.05	859	130	1.87	81.37	76	11	9.55E-01	4.3	
7	0	111.96	237	112	1.74	112.27	108	7	2.63E-01	9.9	
8	0	225.35	34	56	3.97	225.66	221	9	3.83E-02	43.2	
9	0	277.03	57	39	1.97	277.34	273	9	6.37E-02	23.9	
10	0	295.98	9	65	5.61	296.28	282	17	1.01E-02	2205.1	
11	2	302.94	136	21	1.69	303.25	299	19	1.51E-01	9.8	1.22E+00
12	2	307.65	30	22	1.99	307.96	299	19	3.29E-02	31.7	
13	3	333.78	79	14	1.98	334.09	330	12	8.80E-02	13.7	2.49E+00
14	3	337.84	33	9	2.22	338.15	330	12	3.67E-02	31.2	
15	3	352.51	15	6	2.23	352.82	351	12	1.72E-02	32.0	1.34E+00
16	3	356.19	480	10	1.61	356.49	351	12	5.34E-01	4.7	
17	3	383.79	76	40	2.17	384.09	381	10	8.46E-02	23.1	1.40E+01
18	3	387.03	194	39	1.81	387.33	381	10	2.16E-01	8.7	
19	0	391.74	50	16	1.17	392.04	391	5	5.58E-02	19.9	
20	1	414.53	37	8	1.89	414.83	410	15	4.15E-02	19.7	9.48E-01
21	1	417.87	29	7	1.90	418.17	410	15	3.19E-02	29.9	
22	1	421.53	11	6	1.90	421.83	410	15	1.20E-02	56.3	
23	0	437.36	105	9	1.84	437.66	434	8	1.17E-01	11.0	
24	0	468.55	22	13	1.62	468.84	464	10	2.49E-02	36.4	
25	0	511.54	18	6	1.96	511.84	507	8	2.02E-02	33.0	

Total number of lines in spectrum 25  
 Number of unidentified lines 21  
 Number of lines tentatively identified by NID 4 16.00%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	4.119E+02	4.119E+02	0.740E+02	17.96	
Total Activity :			4.119E+02	4.119E+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	7.790E+02	7.790E+02	1.298E+02	16.66	
Total Activity :			7.790E+02	7.790E+02			

Grand Total Activity : 1.191E+03 1.191E+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	4.119E+02	4.119E+02	17.96	OK
	302.84	17.80	6.222E+00	3.692E+02	3.693E+02	28.39	OK
	356.01	60.00	5.860E+00	4.103E+02	4.104E+02	16.53	OK

Final Mean for 3 Valid Peaks = 4.119E+02+/- 7.399E+01 ( 17.96%)

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	7.790E+02	7.790E+02	16.66	OK

Final Mean for 1 Valid Peaks = 7.790E+02+/- 1.298E+02 ( 16.66%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.119E+02	7.399E+01	1.646E+01	2.517E+00	25.026
TH-234	7.790E+02	1.298E+02	1.172E+02	6.293E+00	6.649

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.056E+00		5.335E+00	9.567E+00	1.093E+00	0.110
CD-109	-4.659E+01		1.004E+02	1.532E+02	1.263E+01	-0.304
PA-231	4.497E+00		1.679E+00	3.533E+00	5.025E-02	1.273
PA-234	3.202E+00		1.436E+00	2.703E+00	3.844E-02	1.185
NP-237	1.620E+01		2.913E+01	5.034E+01	4.069E+00	0.322
AM-241	2.832E+01		8.811E+00	1.776E+01	8.732E-01	1.594



*C*  
*B/R*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714912\_GE3\_BAFIL\_194416.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : LR-103 TOT  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 09:51:55.  
 Sample ID : 1307149-12 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 00:15:05.21 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	28.00	47	96	1.90	28.32	26	18	5.26E-02	29.0	1.22E+01
2	4	30.85	2047	71	1.40	31.17	26	18	2.27E+00	2.3	
3	4	34.98	533	57	1.93	35.30	26	18	5.92E-01	6.6	
4	0	44.78	25	55	2.93	45.10	44	5	2.76E-02	48.3	
5	0	52.29	76	97	3.54	52.61	49	9	8.40E-02	26.5	
6	2	61.87	285	49	1.66	62.19	58	16	3.17E-01	7.1	2.00E+00
7	2	65.79	118	52	1.67	66.11	58	16	1.31E-01	13.8	
8	0	81.11	801	135	1.88	81.42	78	9	8.90E-01	4.4	
9	0	92.48	27	76	1.14	92.80	90	6	3.00E-02	54.3	
10	5	111.83	227	55	1.91	112.14	108	15	2.53E-01	8.4	8.70E-01
11	5	116.09	57	71	2.34	116.41	108	15	6.35E-02	30.8	
12	0	160.27	32	74	1.67	160.59	158	7	3.50E-02	48.5	
13	0	186.50	24	62	1.22	186.81	183	7	2.66E-02	58.9	
14	0	276.30	69	28	1.54	276.61	273	9	7.63E-02	18.3	
15	2	302.95	148	12	1.60	303.26	298	20	1.64E-01	8.7	3.01E+00
16	2	307.35	25	9	1.99	307.66	298	20	2.78E-02	31.3	
17	2	311.35	12	7	1.99	311.66	298	20	1.30E-02	57.5	
18	2	314.56	10	6	1.99	314.86	298	20	1.14E-02	64.1	
19	3	333.56	78	21	1.88	333.86	330	17	8.65E-02	14.6	1.37E+00
20	3	338.14	28	20	2.22	338.45	330	17	3.15E-02	36.4	
21	0	356.25	493	33	1.93	356.56	351	11	5.48E-01	5.0	
22	2	383.93	130	16	2.06	384.23	381	18	1.45E-01	10.0	4.87E+00
23	2	387.04	222	8	1.74	387.35	381	18	2.46E-01	7.7	
24	2	391.06	53	5	2.06	391.36	381	18	5.84E-02	25.2	
25	3	414.92	47	8	2.29	415.23	411	14	5.22E-02	19.9	3.50E+00
26	3	417.92	29	9	2.29	418.23	411	14	3.28E-02	32.8	
27	3	421.86	10	7	2.30	422.16	411	14	1.09E-02	49.8	
28	3	437.16	96	5	1.96	437.46	434	20	1.06E-01	11.8	1.49E+00
29	3	445.23	7	7	2.32	445.53	434	20	8.02E-03	68.2	
30	0	468.33	16	10	1.82	468.63	465	7	1.78E-02	41.5	
31	0	473.31	13	2	1.95	473.61	472	6	1.39E-02	34.4	
32	0	511.41	15	2	3.18	511.71	507	8	1.65E-02	30.9	

Summary of Nuclide Activity

Sample ID : 1307149-12

Acquisition date : 7-AUG-2013 09:51:55

Total number of lines in spectrum 32  
 Number of unidentified lines 28  
 Number of lines tentatively identified by NID 4 12.50%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.840E+02	3.841E+02	0.695E+02	18.10	
Total Activity :			3.840E+02	3.841E+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	8.511E+02	8.511E+02	1.340E+02	15.74	
Total Activity :			8.511E+02	8.511E+02			

Grand Total Activity : 1.235E+03 1.235E+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	3.840E+02	3.841E+02	18.10	OK
	302.84	17.80	6.222E+00	4.000E+02	4.001E+02	26.97	OK
	356.01	60.00	5.860E+00	4.212E+02	4.212E+02	16.96	OK

Final Mean for 3 Valid Peaks = 3.841E+02 +/- 6.950E+01 ( 18.10%)

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	8.511E+02	8.511E+02	15.74	OK

Final Mean for 1 Valid Peaks = 8.511E+02 +/- 1.340E+02 ( 15.74%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.841E+02	6.950E+01	1.958E+01	2.995E+00	19.611
TH-234	8.511E+02	1.340E+02	8.938E+01	4.801E+00	9.522

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	3.269E+00		6.151E+00	1.055E+01	1.206E+00	0.310
CD-109	-2.328E+01		1.220E+02	1.682E+02	1.387E+01	-0.138
PA-231	2.461E+00		1.475E+00	3.004E+00	4.273E-02	0.819
PA-234	3.482E+00		1.506E+00	2.823E+00	4.015E-02	1.233
NP-237	7.216E+00		3.624E+01	5.290E+01	4.276E+00	0.136
AM-241	3.279E+01		8.325E+00	1.712E+01	8.416E-01	1.916

*817u*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714913\_GE2\_BAFIL\_194415.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : LR-103 DIS  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 09:51:15.  
 Sample ID : 1307149-13 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.28 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	1	30.89	1798	115	1.38	31.00	26	15	2.00E+00	2.5	6.89E+00
2	1	35.01	394	93	1.39	35.13	26	15	4.38E-01	6.5	
3	0	52.68	46	72	1.41	52.79	49	7	5.11E-02	33.9	
4	1	61.76	189	47	1.46	61.87	59	17	2.10E-01	9.1	7.38E-01
5	1	66.02	95	52	1.47	66.13	59	17	1.05E-01	15.1	
6	1	71.02	17	54	1.48	71.13	59	17	1.94E-02	62.6	
7	0	81.03	716	145	1.44	81.15	76	10	7.96E-01	4.9	
8	0	93.02	44	77	1.71	93.13	89	8	4.91E-02	37.7	
9	1	111.81	195	65	1.55	111.92	107	18	2.17E-01	9.3	2.95E+00
10	1	116.03	42	55	1.56	116.14	107	18	4.63E-02	32.9	
11	0	135.00	48	62	2.75	135.11	130	10	5.34E-02	33.9	
12	0	143.11	32	39	2.56	143.22	140	7	3.50E-02	37.2	
13	3	161.40	29	45	1.96	161.51	157	20	3.25E-02	42.6	1.56E+00
14	3	164.40	12	42	1.97	164.51	157	20	1.38E-02	95.8	
15	3	170.88	17	37	1.98	170.99	157	20	1.85E-02	66.6	
16	0	186.09	24	82	1.22	186.20	182	8	2.69E-02	67.9	
17	0	276.71	69	42	2.01	276.82	273	10	7.67E-02	21.4	
18	1	302.85	157	9	1.51	302.95	299	11	1.74E-01	8.5	1.19E+00
19	1	307.05	27	6	1.79	307.16	299	11	3.01E-02	30.8	
20	1	331.06	10	1	1.81	331.16	330	16	1.13E-02	15.6	5.28E+00
21	1	334.01	72	8	1.81	334.11	330	16	8.05E-02	13.7	
22	1	337.73	27	12	1.82	337.83	330	16	2.95E-02	28.3	
23	0	356.05	512	26	1.37	356.16	352	8	5.69E-01	4.7	
24	1	383.72	100	18	1.86	383.83	381	9	1.11E-01	13.5	7.97E+00
25	1	386.83	170	27	1.52	386.94	381	9	1.89E-01	8.8	
26	0	391.00	32	18	1.34	391.11	390	5	3.60E-02	27.3	
27	1	411.89	8	2	1.71	412.00	411	15	8.98E-03	14.8	1.37E+01
28	1	414.89	51	10	1.88	414.99	411	15	5.64E-02	16.3	
29	1	418.07	24	11	1.89	418.17	411	15	2.63E-02	37.6	
30	2	432.68	8	1	2.09	432.79	432	9	9.02E-03	28.2	2.66E+00
31	2	437.05	87	1	1.88	437.15	432	9	9.65E-02	11.2	
32	1	464.97	7	6	1.92	465.08	462	9	8.16E-03	70.8	1.07E+00
33	1	467.84	17	6	1.93	467.94	462	9	1.84E-02	37.3	
34	0	511.05	25	6	2.46	511.16	507	8	2.77E-02	26.3	
35	0	608.41	14	2	4.63	608.51	605	7	1.59E-02	30.4	

Summary of Nuclide Activity

Sample ID : 1307149-13

Acquisition date : 7-AUG-2013 09:51:15

Total number of lines in spectrum 35  
 Number of unidentified lines 30  
 Number of lines tentatively identified by NID 5 14.29%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.623E+02	3.623E+02	0.726E+02	20.03	
Total Activity :			3.623E+02	3.623E+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	6.479E+02	6.479E+02	1.325E+02	20.45	
Total Activity :			6.479E+02	6.479E+02			

Grand Total Activity : 1.010E+03 1.010E+03

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.623E+02	3.623E+02	20.03	OK
	302.84	17.80	7.560E+00	3.498E+02	3.498E+02	34.36	OK
	356.01	60.00	7.170E+00	3.575E+02	3.575E+02	17.87	OK

Final Mean for 3 Valid Peaks = 3.623E+02 +/- 7.259E+01 ( 20.03%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	6.479E+02	6.479E+02	20.45	OK

Final Mean for 1 Valid Peaks = 6.479E+02 +/- 1.325E+02 ( 20.45%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.623E+02	7.259E+01	1.978E+01	3.367E+00	18.322
TH-234	6.479E+02	1.325E+02	1.297E+02	1.072E+01	4.993

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.767E+00		5.798E+00	9.818E+00	1.508E+00	-0.180
CD-109	2.071E+01		1.134E+02	1.686E+02	1.936E+01	0.123
PA-231	2.677E+01		3.972E+00	7.983E+00	1.520E-01	3.353
PA-234	3.379E+00		1.772E+00	3.231E+00	6.665E-02	1.046
NP-237	-8.749E+00		3.738E+01	5.168E+01	5.835E+00	-0.169
AM-241	2.109E+01		9.342E+00	1.776E+01	1.374E+00	1.187



*C*  
*8/12*

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP\_130714914\_GE2\_BAFIL\_194418.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-111-KS TOT  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 10:09:53.  
 Sample ID : 1307149-14 Sample Quantity : 1.00000E+00 filter  
 Sample type : FILTER Sample Geometry : 0  
 Detector name : GE2 Detector Geometry: BAFIL  
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.30 0.0%  
 Start channel : 25 End channel : 4096  
 Sensitivity : 3.00000 Gaussian : 10.00000  
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	30.92	2008	115	1.43	31.03	26	14	2.23E+00	2.3	7.81E+00
2	3	35.18	486	108	1.68	35.29	26	14	5.40E-01	5.8	
3	0	52.24	83	65	1.62	52.36	49	7	9.17E-02	19.6	
4	2	61.78	228	70	1.60	61.89	57	13	2.54E-01	8.7	2.25E+00
5	2	65.90	97	74	1.61	66.02	57	13	1.07E-01	17.0	
6	0	81.08	811	126	1.38	81.20	77	8	9.01E-01	4.3	
7	0	92.75	17	80	1.30	92.87	90	7	1.89E-02	90.1	
8	1	108.03	13	28	1.54	108.14	107	9	1.42E-02	69.5	5.27E+00
9	1	111.77	170	97	1.55	111.88	107	9	1.89E-01	11.3	
10	0	163.30	28	86	4.33	163.41	158	8	3.14E-02	60.6	
11	0	237.74	21	36	1.93	237.85	232	9	2.36E-02	55.3	
12	0	277.05	64	36	1.86	277.16	271	12	7.14E-02	22.4	
13	0	302.86	154	27	1.23	302.97	300	6	1.71E-01	9.7	
14	0	307.56	29	17	1.55	307.66	306	4	3.25E-02	27.1	
15	0	333.96	70	28	1.43	334.07	330	7	7.78E-02	17.3	
16	0	338.16	23	16	2.45	338.27	337	6	2.59E-02	35.4	
17	0	356.05	566	22	1.42	356.16	352	8	6.29E-01	4.4	
18	2	383.70	101	13	1.89	383.81	380	19	1.12E-01	12.6	3.92E+00
19	2	387.02	186	8	1.87	387.13	380	19	2.07E-01	9.0	
20	2	391.24	43	4	2.05	391.35	380	19	4.75E-02	24.5	
21	1	414.72	45	18	1.88	414.83	411	11	4.98E-02	21.8	8.97E+00
22	1	418.07	14	33	1.89	418.17	411	11	1.60E-02	71.7	
23	0	436.89	100	13	1.48	437.00	432	8	1.11E-01	11.7	
24	4	509.72	32	1	2.61	509.83	507	9	3.55E-02	19.6	7.28E+00
25	4	512.90	10	2	1.78	513.00	507	9	1.16E-02	57.9	
26	0	595.99	11	0	3.94	596.09	593	7	1.22E-02	30.2	

Total number of lines in spectrum 26  
 Number of unidentified lines 22  
 Number of lines tentatively identified by NID 4 15.38%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	4.104E+02	4.104E+02	0.798E+02	19.45	
Total Activity :			4.104E+02	4.104E+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	7.826E+02	7.826E+02	1.542E+02	19.71	
Total Activity :			7.826E+02	7.826E+02			

Grand Total Activity : 1.193E+03 1.193E+03

Flags: "K" = Keyline not found "M" = Manually accepted  
 "E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	4.104E+02	4.104E+02	19.45	OK
	302.84	17.80	7.560E+00	3.436E+02	3.437E+02	35.60	OK
	356.01	60.00	7.170E+00	3.949E+02	3.949E+02	17.56	OK

Final Mean for 3 Valid Peaks = 4.104E+02+/- 7.981E+01 ( 19.45%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	2.305E+01	7.826E+02	7.826E+02	19.71	OK

Final Mean for 1 Valid Peaks = 7.826E+02+/- 1.542E+02 ( 19.71%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.104E+02	7.981E+01	2.008E+01	3.419E+00	20.438
TH-234	7.826E+02	1.542E+02	1.379E+02	1.139E+01	5.676

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-1.488E+00		5.204E+00	8.877E+00	1.363E+00	-0.168
CD-109	-4.469E+01		1.183E+02	1.598E+02	1.835E+01	-0.280
PA-231	2.590E+01		4.073E+00	8.108E+00	1.544E-01	3.194
PA-234	2.299E+00		1.852E+00	3.246E+00	6.696E-02	0.708
NP-237	-4.798E+00		3.563E+01	5.015E+01	5.662E+00	-0.096
AM-241	2.567E+01		1.045E+01	1.963E+01	1.520E+00	1.307

*C*  
*Q/m*

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP\_130714915\_GE3\_BAFIL\_194419.CN  
 Analyses by : PEAK V16.9 PEAKEFF V2.2  
 Client ID : PZ-111-KS DIS  
 Deposition Date :  
 Sample Date : 7-AUG-2013 00:00:00. Acquisition date : 7-AUG-2013 10:10:29.  
 Sample ID : 1307149-15 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 00:15:05.66 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	1928	89	1.37	31.15	26	16	2.14E+00	2.4	3.26E+00
2	4	35.07	439	82	1.66	35.39	26	16	4.88E-01	5.8	
3	0	52.55	58	132	1.51	52.86	49	9	6.45E-02	37.9	
4	0	61.86	182	151	1.23	62.18	59	6	2.02E-01	13.0	
5	0	65.89	73	110	1.79	66.21	65	5	8.16E-02	25.0	
6	2	80.98	897	58	1.59	81.29	78	21	9.97E-01	3.5	1.07E+01
7	2	83.68	16	50	1.41	84.00	78	21	1.73E-02	136.8	
8	2	92.38	16	64	1.72	92.70	78	21	1.83E-02	77.1	
9	5	111.87	293	47	2.16	112.18	107	18	3.26E-01	6.9	2.60E+00
10	5	116.41	52	39	2.34	116.73	107	18	5.75E-02	33.5	
11	3	237.21	15	37	2.11	237.52	234	14	1.62E-02	66.7	2.88E+00
12	3	242.16	18	26	2.11	242.47	234	14	2.04E-02	56.1	
13	0	276.49	58	23	1.28	276.80	274	6	6.45E-02	18.5	
14	0	303.10	141	29	1.83	303.40	300	7	1.57E-01	10.5	
15	0	312.26	10	22	1.43	312.56	311	7	1.09E-02	86.2	
16	0	334.91	55	44	1.97	335.21	329	9	6.06E-02	25.9	
17	3	351.70	15	2	1.68	352.00	351	9	1.68E-02	7.9	7.57E+00
18	3	356.26	512	9	1.54	356.56	351	9	5.69E-01	4.5	
19	4	383.83	91	8	1.99	384.13	381	18	1.01E-01	12.6	6.19E+00
20	4	387.05	224	4	2.04	387.35	381	18	2.49E-01	7.9	
21	4	391.15	31	1	2.50	391.45	381	18	3.45E-02	39.6	
22	4	415.04	52	9	2.52	415.34	411	18	5.77E-02	19.4	2.74E+00
23	4	418.25	21	7	2.52	418.55	411	18	2.37E-02	48.3	
24	4	421.77	13	5	2.53	422.08	411	18	1.45E-02	62.5	
25	0	437.30	104	5	1.97	437.60	435	9	1.15E-01	10.5	
26	0	469.22	24	7	4.34	469.52	465	9	2.68E-02	28.1	
27	0	511.52	28	0	3.33	511.82	509	7	3.11E-02	18.9	

Total number of lines in spectrum 27  
 Number of unidentified lines 23  
 Number of lines tentatively identified by NID 4 14.81%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	4.299E+02	4.299E+02	0.744E+02	17.30		
Total Activity :			4.299E+02	4.299E+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	5.428E+02	5.428E+02	1.459E+02	26.88		
Total Activity :			5.428E+02	5.428E+02				

Grand Total Activity : 9.726E+02 9.726E+02

Flags: "K" = Keyline not found  
 "E" = Manually edited

"M" = Manually accepted  
 "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.899E+01	4.299E+02	4.299E+02	17.30	OK
	302.84	17.80	6.222E+00	3.828E+02	3.829E+02	29.39	OK
	356.01	60.00	5.860E+00	4.372E+02	4.372E+02	16.34	OK

Final Mean for 3 Valid Peaks = 4.299E+02+/- 7.438E+01 ( 17.30%)

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	5.428E+02	5.428E+02	26.88	OK

Final Mean for 1 Valid Peaks = 5.428E+02+/- 1.459E+02 ( 26.88%)

Flag: "\*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.299E+02	7.438E+01	1.663E+01	2.543E+00	25.849
TH-234	5.428E+02	1.459E+02	1.674E+02	8.992E+00	3.242

---- Non-Identified Nuclides ----

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	8.698E-01		5.463E+00	9.095E+00	1.039E+00	0.096
CD-109	3.349E+01		9.691E+01	1.752E+02	1.444E+01	0.191
PA-231	2.606E+00		1.561E+00	3.150E+00	4.480E-02	0.827
PA-234	4.397E+00		1.517E+00	2.925E+00	4.160E-02	1.503
NP-237	5.921E+00		2.758E+01	4.936E+01	3.990E+00	0.120
AM-241	2.653E+01		1.013E+01	1.776E+01	8.732E-01	1.494