

US EPA ARCHIVE DOCUMENT

ENGINEERING MANAGEMENT SUPPORT, INC.

West Lake OU-1

**STANDARD LEVEL IV
REPORT OF ANALYSIS**

WORK ORDER #13-07154-OR

August 29, 2013

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

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
I	Chain of Custody & pH Check Sheet	0004
II	Sample Acknowledgement	0011
III	Case Narrative	0014
IV	Analytical Results Summary	0018
V	Analytical Standards	0023
VI	Quality Control Sample Results Summary	0047
VII	Laboratory Technician's Notes	0056
VIII	Analytical Data (Isotopic Uranium)	0086
IX	Analytical Data (Isotopic Thorium)	0170
X	Analytical Data (Radium-226)	0254
XI	Analytical Data (Radium-228)	0333
XII	Barium-133 Analytical Tracer Data	0350
	Last Page Number	0401



Eberline Services – Oak Ridge Laboratory
LABORATORY DATA SUPPORT CHECKLIST
MP-001-3

Eberline Services Work Order # 13-07154

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

Date for Partial	Initials	Date	Initials	Checklist Items
		7/24/13	KC	Sample Log-In
		8-15-13	JG	Data Compilation
		8-22-13	MLT	First Technical Data Review
		8/22/13	MSA	Second Technical Data Review
		8/28/13	[Signature]	Data Entry/Electronic Deliverable
		8/28/13	[Signature]	Case Narrative
		8/28/13	KBS	Electronic Deliverable Proof
		8/28/13	MSA	Samples Analyzed within Holding Time Yes? <input checked="" type="checkbox"/> No? <input type="checkbox"/>
		8/28/13	MSA	QA/QC/Review
				Client in Possession of Data Electronic or Hard Copy
				Invoiced by Laboratory

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

Date package approved by: [Signature] 8/29/13
 Laboratory Manager Date

Copy No. _____

Radiochemistry Services

US EPA ARCHIVE DOCUMENT

SECTION I
CHAIN OF CUSTODY
&
pH CHECK SHEET



Internal Chain of Custody

Work Order #	13-07154
Lab Deadline	8/13/2013
Analysis	UIISO - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location	
<p>Fxns 04, 06, 08, 10 & 12 are TOTAL</p> <p>Fxns 05, 07, 09, 11 & 13 are DISSOLVED</p>	04	42	W1.4	
	05	42	W1.4	
	06	38	W1.4	
	07	38	W1.4	
	08	46	W1.4	
	09	46	W1.4	
	10	45	W1.4	
	11	45	W1.4	
	12	44	W1.4	
	13	44	W1.4	
	<p>MUST USE FXN 08 FOR DUP</p>			

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	Location (circle one)					Initials	Date
Received by	<u>Sample Storage</u>	Rough Prep	Prep	Separations	Count Room	J Wolfe	8/7/13 1000
Relinquished by	Sample Storage	Rough Prep	<u>Prep</u>	Separations	Count Room	J Wolfe	8/9/13 1130
Received by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	0430 PM	8/9/13
Relinquished by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	0900 PM	8/14/13
Received by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>	0905 PM	8/14
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>	163	8/14/13 1250
Received by	<u>Sample Storage</u>	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		



Internal Chain of Custody

Work Order #	13-07154
Lab Deadline	8/13/2013
Analysis	THISO - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location	
<p>Fxns 04, 06, 08, 10 & 12 are TOTAL</p> <p>Fxns 05, 07, 09, 11 & 13 are DISSOLVED</p>	04	42	W1.4	
	05	42	W1.4	
	06	38	W1.4	
	07	38	W1.4	
	08	46	W1.4	
	09	46	W1.4	
	10	45	W1.4	
	11	45	W1.4	
	12	44	W1.4	
	13	44	W1.4	
	<p>MUST USE FXN 08 FOR DUP</p>			

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	Wolf	8/7/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	Wolf	8/9/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	1000 RM	8/9/13
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	5900 RM	8/14/13
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	0907	
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	14B	8/14/13 1554
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		



Internal Chain of Custody

Work Order #	13-07154
Lab Deadline	8/13/2013
Analysis	Ra226 - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location	
<p>Fxns 04, 06, 08, 10 & 12 are TOTAL</p> <p>Fxns 05, 07, 09, 11 & 13 are DISSOLVED</p>	04	42	W1.4	
	05	42	W1.4	
	06	38	W1.4	
	07	38	W1.4	
	08	46	W1.4	
	09	46	W1.4	
	10	45	W1.4	
	11	45	W1.4	
	12	44	W1.4	
	13	44	W1.4	
	<p>MUST USE FXN 08 FOR DUP</p>			

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	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	WLB	8/7/13 100
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/7/13 1920
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/7/13 1945
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/8/13 1700
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	ICB	8/8/13 1701
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	ICB	8/9/13 1245
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		




Internal Chain of Custody

Work Order #	13-07154
Lab Deadline	8/13/2013
Analysis	Ra228 - Level 4
Sample Matrix	Water

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location	
<p>Fxns 04, 06, 08, 10 & 12 are TOTAL</p> <p>Fxns 05, 07, 09, 11 & 13 are DISSOLVED</p>	04	42	W1.4	
	05	42	W1.4	
	06	38	W1.4	
	07	38	W1.4	
	08	46	W1.4	
	09	46	W1.4	
	10	45	W1.4	
	11	45	W1.4	
	12	44	W1.4	
	13	44	W1.4	
	<p>MUST USE FXN 08 FOR DUP</p>			

US EPA ARCHIVE DOCUMENT

	Location (circle one)					Initials	Date
Received by	<u>Sample Storage</u>	Rough Prep	Prep	Separations	Count Room	JW	8/7/13 1920
Relinquished by	Sample Storage	Rough Prep	<u>Prep</u>	Separations	Count Room	JW	8/7/13 1945
Received by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	JW	8/8/13 1700
Relinquished by	Sample Storage	Rough Prep	Prep	<u>Separations</u>	Count Room	JW	8/8/13 1701
Received by	Sample Storage	Rough Prep	Prep	Separations	<u>Count Room</u>	ICB	8/9/13 1245
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/9/13 1750
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8-15-13 0735
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	JW	8/15/13 0735
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		

	Sample Receiving Report (Volumes, pH, & CPM)	Internal Work Order
		13-07154
		Received By KCOULSTON

FR	ClientID	# Btls	Comments	Matrix	Storage	Rec Vol Ttl	CPM Max
01	LCS	0		WA	W1.4		
02	BLANK	0		WA	W1.4		
03	DUP	0		WA	W1.4		
04	PZ-200-SS TOT ✓	2		WA	W1.4	8.00	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	37
			2	<2	<2	4.0000	42
05	PZ-200-SS DIS ✓	2		WA	W1.4	0.00	42
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				37
			2				42
06	PZ-102-SS TOT ✓	2		WA	W1.4	8.00	38
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	38
			2	<2	<2	4.0000	35
07	PZ-102-SS DIS ✓	2		WA	W1.4	0.00	38
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				38
			2				35
08	PZ-107-SS TOT ✓	3		WA	W1.4	12.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	39
			2	<2	<2	4.0000	43
			3	<2	<2	4.0000	46
09	PZ-107-SS DIS ✓	3		WA	W1.4	0.00	46
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				39
			2				43
			3				46
10	PZ-106-KS TOT ✓	2		WA	W1.4	8.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	45
			2	<2	<2	4.0000	45
11	PZ-106-KS DIS ✓	2		WA	W1.4	0.00	45
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				45
			2				45
12	DUP 08 TOT ✓	2		WA	W1.4	8.00	44
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1	<2	<2	4.0000	38
			2	<2	<2	4.0000	44
13	DUP 08 DIS ✓	2		WA	W1.4	0.00	44
			Container Number	pH Orig	pH Final	Volume (L)	CPM
			1				38
			2				44

EJF
07/24/13

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Received by: *Kristen Coulston* Date: *7/24/13*

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

0010

SECTION II
SAMPLE ACKNOWLEDGEMENT



Eberline Services – Oak Ridge Laboratory

SAMPLE RECEIPT CHECKLIST
MP-001-2

WORK ORDER # 13-07154

SAMPLE MATRIX/MATRICES:

(CIRCLE ONE OR BOTH)

AQUEOUS NON-AQUEOUS

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

WERE SAMPLES:

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

WERE CHAIN OF CUSTODY SEALS:

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

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

REMARKS: _____

SIGNATURE: Kristen Coulston DATE: 7/24/13

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**SECTION III
CASE NARRATIVE**



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

EBS-OR-36009

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 # 13-07154-OR

SAMPLE RECEIPT

This work order contains five 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-200-SS TOT	13-07154-04	PZ-107-SS DIS	13-07154-09
PZ-200-SS DIS	13-07154-05	PZ-106-KS TOT	13-07154-10
PZ-102-SS TOT	13-07154-06	PZ-106-KS DIS	13-07154-11
PZ-102-SS DIS	13-07154-07	DUP 08 TOT	13-07154-12
PZ-107-SS TOT	13-07154-08	DUP 08 DIS	13-07154-13

ANALYTICAL METHODS

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

Laboratory qualifiers are as follows:

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

ANALYTICAL RESULTS

Combined Standard Uncertainty is reported at 2-sigma value.

US EPA ARCHIVE DOCUMENT

ANALYTICAL RESULTS CONTINUED

ISOTOPIC URANIUM

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

Samples demonstrated acceptable results for all Uranium analyses. Chemical recovery was acceptable for all 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 duplicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Thorium-230 and 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 an acceptable relative percent difference and normalized difference. Results for the Radium-226 laboratory control sample demonstrated an acceptable percent recovery.

ANALYTICAL RESULTS CONTINUED

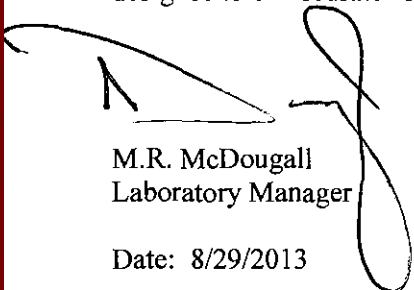
RADIUM-228

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.

**SECTION IV
ANALYTICAL RESULTS SUMMARY**

Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
LCS13-07154-01	13-07154-01	08/09/2013 09:04:56	Radium-226	E903.0	10.39	1.17	2.49	0.16		pCi/l
LCS13-07154-01	13-07154-01	08/15/2013 07:52:38	Radium-228	E904.0	8.26	1.74	2.55	1.74		pCi/l
LCS13-07154-01	13-07154-01	08/14/2013 12:46:13	Thorium-228	HASL 300, 4.5.2	4.75	0.87	0.98	0.13		pCi/l
LCS13-07154-01	13-07154-01	08/14/2013 12:46:13	Thorium-230	HASL 300, 4.5.2	4.35	0.82	0.98	0.09		pCi/l
LCS13-07154-01	13-07154-01	08/14/2013 12:46:13	Thorium-232	HASL 300, 4.5.2	4.63	0.85	0.95	0.08		pCi/l
LCS13-07154-01	13-07154-01	08/14/2013 09:26:34	Uranium-234	HASL 300, 4.5.2	7.96	1.08	1.22	0.06		pCi/l
LCS13-07154-01	13-07154-01	08/14/2013 09:26:34	Uranium-235	HASL 300, 4.5.2	1.16	0.30	0.31	0.09		pCi/l
LCS13-07154-01	13-07154-01	08/14/2013 09:26:34	Uranium-238	HASL 300, 4.5.2	8.93	1.19	1.35	0.07		pCi/l
BLANK13-07154-02	13-07154-02	08/09/2013 09:04:58	Radium-226	E903.0	0.14	0.15	0.15	0.19	U	pCi/l
BLANK13-07154-02	13-07154-02	08/15/2013 07:50:55	Radium-228	E904.0	0.59	0.50	0.51	0.99	J	pCi/l
BLANK13-07154-02	13-07154-02	08/14/2013 12:46:14	Thorium-228	HASL 300, 4.5.2	-0.02	0.07	0.07	0.19	U	pCi/l
BLANK13-07154-02	13-07154-02	08/14/2013 12:46:14	Thorium-230	HASL 300, 4.5.2	0.08	0.08	0.09	0.11	U	pCi/l
BLANK13-07154-02	13-07154-02	08/14/2013 12:46:14	Thorium-232	HASL 300, 4.5.2	0.04	0.07	0.07	0.11	U	pCi/l
BLANK13-07154-02	13-07154-02	08/14/2013 09:26:35	Uranium-234	HASL 300, 4.5.2	0.31	0.13	0.13	0.07		pCi/l
BLANK13-07154-02	13-07154-02	08/14/2013 09:26:35	Uranium-235	HASL 300, 4.5.2	0.06	0.06	0.06	0.07	U	pCi/l
BLANK13-07154-02	13-07154-02	08/14/2013 09:26:35	Uranium-238	HASL 300, 4.5.2	0.06	0.06	0.06	0.07	U	pCi/l
PZ-107-SS TOT_07_19_2013 DUP	13-07154-03	08/09/2013 09:04:59	Radium-226	E903.0	5.07	0.94	1.42	0.18		pCi/l
PZ-107-SS TOT_07_19_2013 DUP	13-07154-03	08/15/2013 07:50:56	Radium-228	E904.0	2.54	0.82	1.00	1.45		pCi/l
PZ-107-SS TOT_07_19_2013 DUP	13-07154-03	08/14/2013 12:46:15	Thorium-228	HASL 300, 4.5.2	0.87	0.31	0.32	0.12		pCi/l
PZ-107-SS TOT_07_19_2013 DUP	13-07154-03	08/14/2013 12:46:15	Thorium-230	HASL 300, 4.5.2	1.32	0.41	0.44	0.12		pCi/l
PZ-107-SS TOT_07_19_2013 DUP	13-07154-03	08/14/2013 12:46:15	Thorium-232	HASL 300, 4.5.2	1.28	0.40	0.42	0.09		pCi/l
PZ-107-SS TOT_07_19_2013 DUP	13-07154-03	08/14/2013 09:26:36	Uranium-234	HASL 300, 4.5.2	1.31	0.35	0.36	0.11		pCi/l
PZ-107-SS TOT_07_19_2013 DUP	13-07154-03	08/14/2013 09:26:36	Uranium-235	HASL 300, 4.5.2	0.26	0.16	0.16	0.14	J	pCi/l
PZ-107-SS TOT_07_19_2013 DUP	13-07154-03	08/14/2013 09:26:36	Uranium-238	HASL 300, 4.5.2	1.44	0.37	0.39	0.08		pCi/l
PZ-200-SS TOT_07_19_2013	13-07154-04	08/09/2013 09:05:01	Radium-226	E903.0	0.97	0.39	0.44	0.26		pCi/l
PZ-200-SS TOT_07_19_2013	13-07154-04	08/15/2013 07:50:56	Radium-228	E904.0	1.95	0.72	0.85	1.30	J	pCi/l
PZ-200-SS TOT_07_19_2013	13-07154-04	08/14/2013 12:46:39	Thorium-228	HASL 300, 4.5.2	0.17	0.10	0.11	0.07	J	pCi/l
PZ-200-SS TOT_07_19_2013	13-07154-04	08/14/2013 12:46:39	Thorium-230	HASL 300, 4.5.2	0.46	0.18	0.19	0.09		pCi/l
PZ-200-SS TOT_07_19_2013	13-07154-04	08/14/2013 12:46:39	Thorium-232	HASL 300, 4.5.2	0.24	0.12	0.12	0.07		pCi/l
PZ-200-SS TOT_07_19_2013	13-07154-04	08/14/2013 09:27:34	Uranium-234	HASL 300, 4.5.2	0.96	0.26	0.27	0.09		pCi/l
PZ-200-SS TOT_07_19_2013	13-07154-04	08/14/2013 09:27:34	Uranium-235	HASL 300, 4.5.2	0.17	0.12	0.12	0.11	J	pCi/l
PZ-200-SS TOT_07_19_2013	13-07154-04	08/14/2013 09:27:34	Uranium-238	HASL 300, 4.5.2	0.80	0.24	0.24	0.08		pCi/l



<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>CSU</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
PZ-200-SS DIS_07_19_2013	13-07154-05	08/09/2013 09:05:03	Radium-226	E903.0	1.80	0.55	0.67	0.29		pCi/l
PZ-200-SS DIS_07_19_2013	13-07154-05	08/15/2013 07:50:57	Radium-228	E904.0	1.77	0.60	0.72	1.08		pCi/l
PZ-200-SS DIS_07_19_2013	13-07154-05	08/14/2013 12:46:40	Thorium-228	HASL 300, 4.5.2	0.07	0.09	0.09	0.14	U	pCi/l
PZ-200-SS DIS_07_19_2013	13-07154-05	08/14/2013 12:46:40	Thorium-230	HASL 300, 4.5.2	0.14	0.11	0.11	0.12	J	pCi/l
PZ-200-SS DIS_07_19_2013	13-07154-05	08/14/2013 12:46:40	Thorium-232	HASL 300, 4.5.2	0.02	0.05	0.05	0.08	U	pCi/l
PZ-200-SS DIS_07_19_2013	13-07154-05	08/14/2013 09:27:34	Uranium-234	HASL 300, 4.5.2	0.49	0.18	0.18	0.09		pCi/l
PZ-200-SS DIS_07_19_2013	13-07154-05	08/14/2013 09:27:34	Uranium-235	HASL 300, 4.5.2	0.06	0.08	0.08	0.13	U	pCi/l
PZ-200-SS DIS_07_19_2013	13-07154-05	08/14/2013 09:27:34	Uranium-238	HASL 300, 4.5.2	0.41	0.16	0.16	0.06		pCi/l
PZ-102-SS TOT_07_19_2013	13-07154-06	08/09/2013 09:05:04	Radium-226	E903.0	7.69	1.16	2.00	0.31		pCi/l
PZ-102-SS TOT_07_19_2013	13-07154-06	08/15/2013 07:51:00	Radium-228	E904.0	5.39	1.88	2.24	3.39		pCi/l
PZ-102-SS TOT_07_19_2013	13-07154-06	08/14/2013 12:46:41	Thorium-228	HASL 300, 4.5.2	2.99	0.65	0.71	0.07		pCi/l
PZ-102-SS TOT_07_19_2013	13-07154-06	08/14/2013 12:46:41	Thorium-230	HASL 300, 4.5.2	2.88	0.63	0.72	0.09		pCi/l
PZ-102-SS TOT_07_19_2013	13-07154-06	08/14/2013 12:46:41	Thorium-232	HASL 300, 4.5.2	2.71	0.60	0.65	0.08		pCi/l
PZ-102-SS TOT_07_19_2013	13-07154-06	08/14/2013 09:27:35	Uranium-234	HASL 300, 4.5.2	4.67	0.75	0.82	0.08		pCi/l
PZ-102-SS TOT_07_19_2013	13-07154-06	08/14/2013 09:27:35	Uranium-235	HASL 300, 4.5.2	0.64	0.23	0.23	0.11		pCi/l
PZ-102-SS TOT_07_19_2013	13-07154-06	08/14/2013 09:27:35	Uranium-238	HASL 300, 4.5.2	4.43	0.72	0.79	0.09		pCi/l
PZ-102-SS DIS_07_19_2013	13-07154-07	08/09/2013 09:05:06	Radium-226	E903.0	3.12	0.65	0.93	0.18		pCi/l
PZ-102-SS DIS_07_19_2013	13-07154-07	08/15/2013 07:51:01	Radium-228	E904.0	1.88	0.64	0.76	1.15		pCi/l
PZ-102-SS DIS_07_19_2013	13-07154-07	08/14/2013 12:46:42	Thorium-228	HASL 300, 4.5.2	-0.01	0.06	0.06	0.16	U	pCi/l
PZ-102-SS DIS_07_19_2013	13-07154-07	08/14/2013 12:46:42	Thorium-230	HASL 300, 4.5.2	0.19	0.13	0.13	0.13	J	pCi/l
PZ-102-SS DIS_07_19_2013	13-07154-07	08/14/2013 12:46:42	Thorium-232	HASL 300, 4.5.2	-0.02	0.04	0.04	0.11	U	pCi/l
PZ-102-SS DIS_07_19_2013	13-07154-07	08/14/2013 09:27:36	Uranium-234	HASL 300, 4.5.2	5.84	0.89	0.98	0.08		pCi/l
PZ-102-SS DIS_07_19_2013	13-07154-07	08/14/2013 09:27:36	Uranium-235	HASL 300, 4.5.2	0.98	0.29	0.30	0.12		pCi/l
PZ-102-SS DIS_07_19_2013	13-07154-07	08/14/2013 09:27:36	Uranium-238	HASL 300, 4.5.2	3.85	0.65	0.70	0.08		pCi/l
PZ-107-SS TOT_07_19_2013	13-07154-08	08/09/2013 09:05:07	Radium-226	E903.0	6.39	1.22	1.82	0.35		pCi/l
PZ-107-SS TOT_07_19_2013	13-07154-08	08/15/2013 07:51:01	Radium-228	E904.0	3.03	0.84	1.08	1.44		pCi/l
PZ-107-SS TOT_07_19_2013	13-07154-08	08/14/2013 12:46:43	Thorium-228	HASL 300, 4.5.2	1.13	0.35	0.36	0.14		pCi/l
PZ-107-SS TOT_07_19_2013	13-07154-08	08/14/2013 12:46:43	Thorium-230	HASL 300, 4.5.2	1.66	0.45	0.49	0.10		pCi/l
PZ-107-SS TOT_07_19_2013	13-07154-08	08/14/2013 12:46:43	Thorium-232	HASL 300, 4.5.2	1.38	0.39	0.41	0.10		pCi/l
PZ-107-SS TOT_07_19_2013	13-07154-08	08/14/2013 09:27:37	Uranium-234	HASL 300, 4.5.2	1.65	0.36	0.38	0.09		pCi/l
PZ-107-SS TOT_07_19_2013	13-07154-08	08/14/2013 09:27:37	Uranium-235	HASL 300, 4.5.2	0.18	0.12	0.12	0.11	J	pCi/l
PZ-107-SS TOT_07_19_2013	13-07154-08	08/14/2013 09:27:37	Uranium-238	HASL 300, 4.5.2	1.42	0.32	0.34	0.06		pCi/l



Client Sample ID	Lab Sample ID	Analysis Date/Time	Analyte	Method	Result	Error	CSU	MDA	Qualifier	Units
PZ-107-SS DIS_07_19_2013	13-07154-09	08/09/2013 09:05:09	Radium-226	E903.0	5.33	0.89	1.43	0.19		pCi/l
PZ-107-SS DIS_07_19_2013	13-07154-09	08/15/2013 07:51:02	Radium-228	E904.0	2.38	0.63	0.83	1.08		pCi/l
PZ-107-SS DIS_07_19_2013	13-07154-09	08/14/2013 12:46:44	Thorium-228	HASL 300, 4.5.2	-0.04	0.14	0.14	0.39	U	pCi/l
PZ-107-SS DIS_07_19_2013	13-07154-09	08/14/2013 12:46:44	Thorium-230	HASL 300, 4.5.2	0.32	0.27	0.28	0.32	J	pCi/l
PZ-107-SS DIS_07_19_2013	13-07154-09	08/14/2013 12:46:44	Thorium-232	HASL 300, 4.5.2	0.04	0.13	0.13	0.29	U	pCi/l
PZ-107-SS DIS_07_19_2013	13-07154-09	08/14/2013 09:27:38	Uranium-234	HASL 300, 4.5.2	1.85	0.55	0.57	0.19		pCi/l
PZ-107-SS DIS_07_19_2013	13-07154-09	08/14/2013 09:27:38	Uranium-235	HASL 300, 4.5.2	0.16	0.17	0.17	0.21	U	pCi/l
PZ-107-SS DIS_07_19_2013	13-07154-09	08/14/2013 09:27:38	Uranium-238	HASL 300, 4.5.2	0.83	0.34	0.35	0.18		pCi/l
PZ-106-KS TOT_07_19_2013	13-07154-10	08/09/2013 09:05:10	Radium-226	E903.0	0.33	0.23	0.24	0.18	J	pCi/l
PZ-106-KS TOT_07_19_2013	13-07154-10	08/15/2013 07:50:54	Radium-228	E904.0	0.22	0.60	0.61	1.27	U	pCi/l
PZ-106-KS TOT_07_19_2013	13-07154-10	08/14/2013 12:46:45	Thorium-228	HASL 300, 4.5.2	-0.01	0.06	0.06	0.16	U	pCi/l
PZ-106-KS TOT_07_19_2013	13-07154-10	08/14/2013 12:46:45	Thorium-230	HASL 300, 4.5.2	0.14	0.10	0.10	0.09	J	pCi/l
PZ-106-KS TOT_07_19_2013	13-07154-10	08/14/2013 12:46:45	Thorium-232	HASL 300, 4.5.2	0.03	0.06	0.06	0.12	U	pCi/l
PZ-106-KS TOT_07_19_2013	13-07154-10	08/14/2013 09:27:39	Uranium-234	HASL 300, 4.5.2	2.04	0.43	0.45	0.09		pCi/l
PZ-106-KS TOT_07_19_2013	13-07154-10	08/14/2013 09:27:39	Uranium-235	HASL 300, 4.5.2	0.31	0.16	0.16	0.10		pCi/l
PZ-106-KS TOT_07_19_2013	13-07154-10	08/14/2013 09:27:39	Uranium-238	HASL 300, 4.5.2	0.93	0.26	0.27	0.08		pCi/l
PZ-106-KS DIS_07_19_2013	13-07154-11	08/09/2013 09:05:12	Radium-226	E903.0	0.35	0.24	0.25	0.21	J	pCi/l
PZ-106-KS DIS_07_19_2013	13-07154-11	08/15/2013 07:50:54	Radium-228	E904.0	2.73	0.71	0.94	1.23		pCi/l
PZ-106-KS DIS_07_19_2013	13-07154-11	08/14/2013 12:46:46	Thorium-228	HASL 300, 4.5.2	0.04	0.13	0.13	0.28	U	pCi/l
PZ-106-KS DIS_07_19_2013	13-07154-11	08/14/2013 12:46:46	Thorium-230	HASL 300, 4.5.2	0.06	0.12	0.12	0.23	U	pCi/l
PZ-106-KS DIS_07_19_2013	13-07154-11	08/14/2013 12:46:46	Thorium-232	HASL 300, 4.5.2	0.05	0.12	0.12	0.26	U	pCi/l
PZ-106-KS DIS_07_19_2013	13-07154-11	08/14/2013 09:27:40	Uranium-234	HASL 300, 4.5.2	2.02	0.51	0.53	0.14		pCi/l
PZ-106-KS DIS_07_19_2013	13-07154-11	08/14/2013 09:27:40	Uranium-235	HASL 300, 4.5.2	0.22	0.16	0.16	0.14	J	pCi/l
PZ-106-KS DIS_07_19_2013	13-07154-11	08/14/2013 09:27:40	Uranium-238	HASL 300, 4.5.2	0.78	0.30	0.30	0.21		pCi/l
DUP 08 TOT_07_19_2013	13-07154-12	08/09/2013 09:05:14	Radium-226	E903.0	5.32	0.97	1.48	0.18		pCi/l
DUP 08 TOT_07_19_2013	13-07154-12	08/15/2013 07:50:54	Radium-228	E904.0	3.84	0.87	1.23	1.47		pCi/l
DUP 08 TOT_07_19_2013	13-07154-12	08/14/2013 12:46:58	Thorium-228	HASL 300, 4.5.2	1.15	0.37	0.38	0.10		pCi/l
DUP 08 TOT_07_19_2013	13-07154-12	08/14/2013 12:46:58	Thorium-230	HASL 300, 4.5.2	1.33	0.40	0.43	0.12		pCi/l
DUP 08 TOT_07_19_2013	13-07154-12	08/14/2013 12:46:58	Thorium-232	HASL 300, 4.5.2	1.57	0.45	0.47	0.08		pCi/l
DUP 08 TOT_07_19_2013	13-07154-12	08/14/2013 09:28:09	Uranium-234	HASL 300, 4.5.2	1.74	0.58	0.60	0.16		pCi/l
DUP 08 TOT_07_19_2013	13-07154-12	08/14/2013 09:28:09	Uranium-235	HASL 300, 4.5.2	0.31	0.24	0.25	0.22	J	pCi/l
DUP 08 TOT_07_19_2013	13-07154-12	08/14/2013 09:28:09	Uranium-238	HASL 300, 4.5.2	1.51	0.53	0.54	0.18		pCi/l



EBERLINE ANALYTICAL CORPORATION

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

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

Project: West Lake OU-1
SDG: 1307154
Received: 07/22/2013
Matrix: Water

Final Report of Analysis
Date: 8/29/2013
Page 4 of 4

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Analysis Date/Time</u>	<u>Analyte</u>	<u>Method</u>	<u>Result</u>	<u>Error</u>	<u>CSU</u>	<u>MDA</u>	<u>Qualifier</u>	<u>Units</u>
DUP 08 DIS_07_19_2013	13-07154-13	08/09/2013 09:26:50	Radium-226	E903.0	5.09	0.96	1.44	0.32		pCi/l
DUP 08 DIS_07_19_2013	13-07154-13	08/15/2013 07:50:55	Radium-228	E904.0	2.68	0.73	0.95	1.26		pCi/l
DUP 08 DIS_07_19_2013	13-07154-13	08/14/2013 12:47:00	Thorium-228	HASL 300, 4.5.2	0.16	0.12	0.13	0.10	J	pCi/l
DUP 08 DIS_07_19_2013	13-07154-13	08/14/2013 12:47:00	Thorium-230	HASL 300, 4.5.2	0.25	0.16	0.16	0.14	J	pCi/l
DUP 08 DIS_07_19_2013	13-07154-13	08/14/2013 12:47:00	Thorium-232	HASL 300, 4.5.2	0.04	0.06	0.06	0.09	U	pCi/l
DUP 08 DIS_07_19_2013	13-07154-13	08/14/2013 09:28:10	Uranium-234	HASL 300, 4.5.2	1.57	0.45	0.46	0.15		pCi/l
DUP 08 DIS_07_19_2013	13-07154-13	08/14/2013 09:28:10	Uranium-235	HASL 300, 4.5.2	0.24	0.18	0.18	0.18	J	pCi/l
DUP 08 DIS_07_19_2013	13-07154-13	08/14/2013 09:28:10	Uranium-238	HASL 300, 4.5.2	0.93	0.32	0.33	0.12		pCi/l

US EPA ARCHIVE DOCUMENT

0022



EBERLINE ANALYTICAL CORPORATION

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

SECTION V
ANALYTICAL STANDARDS

U-8

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

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	U-238NAT	Customer:	TMA EBERLINE
Half Life:	$(4.468 \pm 0.005) \times 10^9$ years	P.O.No.:	OR2778
Catalog No.:	7338	Reference Date:	January 1 1995 12:00 PST.
Source No.:	479-50	Contained Radioactivity:	(Total U) 8.016 μ Ci
		Contained Radioactivity:	(Total U) 297 kBq

Description of Solution

a. Mass of solution:	65.2896 g in a 50 ml flame sealed ampoule
b. Chemical form:	Uranyl Nitrate in H ₂ 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 μ 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).

[Signature]
ERIC ALIAS
QUALITY CONTROL

29 DECEMBER 1994
Date Signed



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



QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

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

Principal Radionuclide ^{234, 235, 238}U Half Life, Years 4.468E+09 Half Life, Days 1.632E+12

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

Ampoule /Solution Gross 97.6400 Weight, Grams
Empty Ampoule 32.5020 Weight, Grams
Solution Net 65.1380 Weight, Grams
Total Activity in Ampoule 8.0160 μCi

Chemical Composition of Standard Solution

Uranyl nitrate in dilute HNO₃

Dilution Instructions: Dilution Solvent Used 1M HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 8.0160 μCi Which Equals 1.780E+07 dpm at the date listed above

And after dilution the activity of this solution is 1.77955E+04 dpm/ml

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

Expiration Date: September 6, 2013

Verified & Approved By [Signature]

Date: 9/26/2012 0:00

QC Approval [Signature]

Date: 9/26/12



QUALITY CONTROL PROGRAM
MP-009

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

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

Solution Reference # MP-009 Date 9/6/2012 0:00
IPL 479-50 Solution # U-8a

Principal Radionuclide ^{234, 235, 238}U Half Life, Years 4.468E+09 Half Life, Days 1.632E+12

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

Chemical Composition of Standard Solution

Uranly Nitrate in 1M HNO₃

Dilution Instructions: Dilution Solvent Used 1M HNO₃

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

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:

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 +/- 3.8%

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

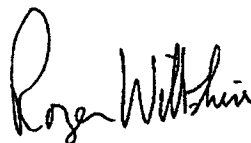
Chemical Composition Calculated weight of U-232, 4.42E-08 grams, as 2M HNO₃ solution in a flame sealed glass vial.
This Tracer solution has been produced 'carrier free'.

Physical Data Recommended half life of uranium 232: 6.980E+01 years
Principle energies of alpha emissions (MeV): 5.263 31.7%, 5.320 68.0%
Branching ratio for alpha emission: 100%
Calculated specific activity of uranium 232: 8.167E+05 Bq per microgram U-232.

Remarks For safety information and notes to ensure correct usage by all persons handling this radioactive Tracer solution please read the instructions accompanying the package.

AEA Technology operates a quality management system which has been independently audited and approved to ISO 9001.

Approved
Signatory



Roger Wilshire

Project Ref. AE2315

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



QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

CURRENT DATE: 12/13/2012 0:00

SOLUTION REFERENCE #: AEA/Amersham 92/232/67

SOLUTION #: U-10

Principal Radionuclide

Half Life, Years

Half Life, Days

²³²U

7.200E+01

2.630E+04

Radionuclide

²³²U

Reference Date

3/1/2000 0:00

Certified Activity

9.760E-01

μCi

Certified Concentration

μCi per gram

Ampoule /Solution Gross

Weight, Grams

Empty Ampoule

Weight, Grams

Solution Net

Weight, Grams

Total Activity in Ampoule

0.9760 μCi

Chemical Composition of Standard Solution

²³²U(NO₃)₆ in 2M-HNO₃

Dilution Instructions:

Dilution Solvent Used

2M HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.9760 μCi

Which Equals 2.167E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.167E+03 dpm/ml

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

Expiration Date: December 7, 2013

Verified & Approved By

Date: 12/13/2012 0:00

QC Approval

Date: 12/13/12



QUALITY CONTROL PROGRAM
MP-009

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

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

Solution Reference #		MP-009	Date	12/7/2012 0:00
AEA/Amersham 92/232/67		Solution #	U-10a	
Principal Radionuclide	Half Life, Years	Half Life, Days		
²³² U	7.200E+01	2.630E+04		
Radionuclide of Interest	Parent Solution Conc.	Reference Date		
²³² U	2.167E+03 dpm/ml	3/1/2000 0:00		
Chemical Composition of Standard Solution				
²³² U(NO ₃) ₆ in 2M HNO ₃				

Dilution Instructions: Dilution Solvent Used **2M HNO₃**

SECONDARY VOLUMETRIC DILUTION

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

NOTES:

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

Expiration Date: December 7, 2013

Verified & Approved By 

Date: 12/13/2012 0:00

QC Approval 

Date: 12/13/12

QA/QC REVIEWED

Date 10/14/91 Initials ut

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Received
OCT 14 1991
TMA/Eberline
Oak Ridge Lab

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

Description of Solution

- a. Mass of solution: 5.0042 grams.
- b. Chemical form: Th(NO₃)₄ in 0.1N HNO₃
- 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 μ 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]
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QUALITY CONTROL PROGRAM
MP-009

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

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

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

Principal Radionuclide ²³⁰Th Half Life, Years 7.540E+04 Half Life, Days 2.754E+07

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

Chemical Composition of Standard Solution
²³⁰Th(NO₃)₄ in 0.1N HNO₃

Dilution Instructions: Dilution Solvent Used 0.1N HNO₃

SECONDARY VOLUMETRIC DILUTION

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

NOTES:

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

Expiration Date: March 4, 2014

Recertified By [Signature]

Date: 3/21/2013 0:00

Verified & Approved By [Signature]

Date: 3/21/13

QC Approval [Signature]

Date: 3/21/13

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QUALITY CONTROL PROGRAM

MP-009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

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

Principal Radionuclide ²³⁰Th Half Life, Years 7.540E+04 Half Life, Days 2.754E+07

Radionuclide ²³⁰Thorium Reference Date 11/1/1991 0:00
Certified Activity 1.036E+00 μ Ci
Certified Concentration μ 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 μ Ci

Chemical Composition of Standard Solution
²³⁰Th(NO₃)₄ in 0.1N HNO₃

Dilution Instructions: Dilution Solvent Used 0.1N HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0360 μ 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

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 μ 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 ₃) ₄ 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 μ Ci/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).



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

Arma U. Khan

QUALITY CONTROL

Nov. 8, 1993

Date Signed



QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

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

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

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

Radionuclide ²³² & ²²⁸Th Reference Date 11/1/1993 0:00
Certified Activity 9.330E-02 μ Ci
Certified Concentration μ 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 μ Ci

Chemical Composition of Standard Solution
Th(NO₃)₄ in H₂O

Dilution Instructions: Dilution Solvent Used 1% Nitric Acid

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 0.0933 μ 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



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

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

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

Chemical Composition of Standard Solution
Th(NO₃)₄ in 1% HNO₃

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

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution:	500.0000 ml	Final Activity Concentration:	1.0365E+02 dpm/ml
Total Activity:	1.0365E+05 dpm		
Final Volume:	1000.00 ml		

NOTES:

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

Expiration Date: **October 9, 2013**

Verified & Approved By 

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

Radionuclide: Th-229	Customer: EBERLINE SERVICES
Half-life: 7340 ± 160 years	P.O. No.: 00009633
Catalog No.: 7229	Reference Date: 15-Jan-02 12:00 PST
Source No.: 867-54	Contained Radioactivity: 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 ₃) ₄ in 0.1M HNO ₃ |
| C. Carrier content: | 10μg Th/mL |
| D. Density: | 1.0016 g/mL @ 20°C. |

Radioimpurities:

None detected (daughters in equilibrium)

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

Method of Calibration:

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

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

Uncertainty of Measurement:

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

Notes:

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

Ann U Khan

Quality Control

9-Jan-02

Date Signed

IPL Ref. No.: 867-54

ISO 9001 CERTIFIED

Medical Imaging Laboratory
24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory
1800 North Keystone Street Burbank, California 91504



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 ²²⁸Th Half Life, Years 7.340E+03 Half Life, Days 2.681E+06

Radionuclide ²²⁸Th Reference Date 1/15/2002 0:00
Certified Activity 1.013E+00 μCi
Certified Concentration 1.0130 $\mu\text{Ci per gram}$

Ampoule /Solution Gross 8.7752 Weight, Grams
Empty Ampoule 3.7591 Weight, Grams
Solution Net 5.0161 Weight, Grams
Total Activity in Ampoule 1.0130 μCi

Chemical Composition of Standard Solution

²²⁸Th(NO₃)₄ in 0.1M HNO₃

Dilution Instructions: Dilution Solvent Used 0.1 M HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0130 μCi 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 [Signature]

Date: 11/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12



QUALITY CONTROL PROGRAM
MP-009

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

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

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

Principal Radionuclide ²²⁹Th Half Life, Years 7.340E+03 Half Life, Days 2.681E+06

Radionuclide of Interest ²²⁹Th Reference Date 1/15/2002 0:00
Parent Solution Conc. 2.25E+03 dpm/ml

Chemical Composition of Standard Solution
TH(NO₃)₄ in 0.1M HNO₃

Dilution Instructions: Dilution Solvent Used 0.1M HNO₃

SECONDARY VOLUMETRIC DILUTION

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

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

Expiration Date: October 9, 2013

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

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

US EPA ARCHIVE DOCUMENT



National Institute of Standards & Technology

Certificate

Ba-6
(#6a)

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

US EPA ARCHIVE DOCUMENT



QUALITY CONTROL PROGRAM

QCP-009

Rev.8; 11/10/03

Title: Radioactive Reference Standards Solutions & Records

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

CURRENT DATE 6/16/2013 0:00

SOLUTION REFERENCE # NIST SRM4251C

SOLUTION # Ba-6

Principal Radionuclide

Half Life, Years

Half Life, Days

¹³³Barium

1.048E+01

3.828E+03

Radionuclide ¹³³Barium

Reference Date 9/1/1993 0:00

Certified Activity μCi

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 μCi

Chemical Composition of Standard Solution

¹³³BaCl₂ in 1M HCl

Dilution Instructions:

Dilution Solvent Used

1M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 66.5577 μCi

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	Half Life, Years	Half Life, Days
¹³³ Ba	1.048E+01	3.828E+03

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

Chemical Composition of Standard Solution

¹³³BaCl₂ in 1M HCl

Dilution Instructions: Dilution Solvent Used **1M HCl**

SECONDARY VOLUMETRIC DILUTION

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

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: **June 18, 2014**

Verified & Approved By 

Date: **7/1/13**

QC Approval 

Date: **7/2/13**

US EPA ARCHIVE DOCUMENT

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

^{Ra-5}
QA/QC REVIEWED
Date 2/8/94 Initials WT

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

Description of Solution

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

Radioimpurities: None detected (other than daughters)

Radioactive Daughters

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

Radionuclide Concentration

(Ra-226) 0.1929 μCi/g.

Method of Calibration

Weighed aliquots of the solution were assayed using gamma spectrometry:

Energy peak(s) integrated under: 186 keV.

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

Uncertainty of Measurement

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

NIST Traceability

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

Leak Test(s)

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

Notes

- 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).



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

Anna H. Kuen
QUALITY CONTROL

Feb. 3, 1994
Date Signed



QUALITY CONTROL PROGRAM

MP 009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

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

Principal Radionuclide ²²⁶Radium Half Life, Years 1.600E+03 Half Life, Days 5.844E+05

Radionuclide ²²⁶Radium Reference Date 2/1/1994 0:00
Certified Activity 1.001E+00 μCi
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 μCi

Chemical Composition of Standard Solution
²²⁶Ra(NO₃)₂ in 1M HNO₃

Dilution Instructions: Dilution Solvent Used 1M HNO₃

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 1.0010 μCi Which Equals 2.222E+06 dpm at the date listed above

And after dilution the activity of this solution is 2.222E+03 dpm/ml

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

Expiration Date: November 9, 2013

Verified & Approved By
QC Approval

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



QUALITY CONTROL PROGRAM

MP 009

Rev.8; 11/01/03

Title: Radioactive Reference Standards Solutions & Records

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

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

Principal Radionuclide ²²⁶Radium Half Life, Years 1.600E+03 Half Life, Days 5.844E+05

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

Chemical Composition of Standard Solution

²²⁶Ra(NO₃)₂ in 1M HNO₃

Dilution Instructions: Dilution Solvent Used 1M HNO₃

SECONDARY VOLUMETRIC DILUTION

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

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

NOTES:

Expiration Date: November 9, 2013

Verified & Approved By [Signature]

Date: 11/9/2012 0:00

QC Approval [Signature]

Date: 11/12/12

US EPA ARCHIVE DOCUMENT

ANALYTICS

RA-11

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

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

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

62680-416

Ra-228 5 mL Liquid in Flame Sealed Vial

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

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

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

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

*99% Confidence Level

Impurities: γ -impurities (other than decay products) <0.1%

5.07198 grams 0.1M HCl solution with 50 μ g/g Ba carrier.

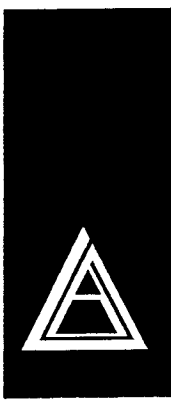
P O NUMBER 9508, Item 1 (Part #4339A)

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

Q A APPROVED: RCW 11/7/01

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

US EPA ARCHIVE DOCUMENT





QUALITY CONTROL PROGRAM

MP-009

Rev.8; 1/10/03

Title: Radioactive Reference Standards Solutions & Records

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

SOLUTION REFERENCE # Analytics 62680-416 CURRENT DATE 3/11/2013 0:00
SOLUTION # Ra-11

Principal Radionuclide ²²⁸Ra Half Life, Years 5.750E+00 Half Life, Days 2.100E+03

Radionuclide ²²⁸Ra Reference Date 11/7/2001 0:00
Certified Activity 6.986E-02 μCi
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 μCi

Chemical Composition of Standard Solution

²²⁸Ra(NO₃)₂ 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 μCi Which Equals 1.551E+05 dpm at the date listed above

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

Expiration Date: March 26, 2014

Recertified By [Signature]

Date: 5/30/13

QC Approval [Signature]

Date: 5/30/13

SECTION VI
QUALITY CONTROL SAMPLE RESULTS SUMMARY

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07154	UUISO	1	pCi	I	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
U-234	0.34	97.39%	15.38%	100.00%	3.60%	8.17E+00	2.94E-01	7.96E+00	1.22E+00	U-8a	3.52E+01	3.60E+00	5.15E-01
U-238	1.39	112.17%	15.14%	100.00%	3.60%	7.96E+00	2.87E-01	8.93E+00	1.35E+00	U-8a	3.44E+01	3.60E+00	5.15E-01

Matrix Spike

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

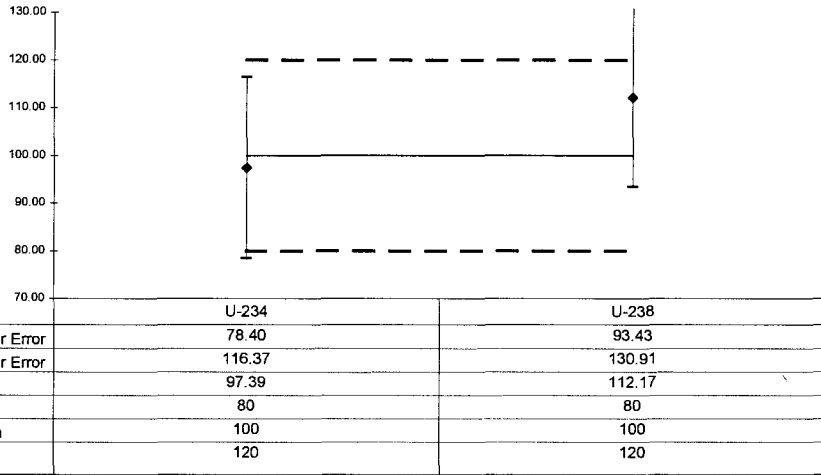
Replicate Sample

QC Summary

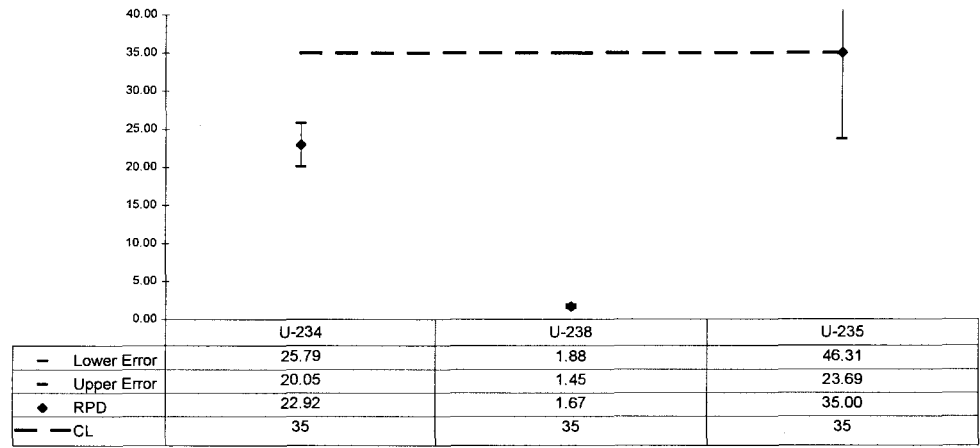
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
U-234	1.27	22.92	1.65E+00	3.77E-01	1.31E+00	3.63E-01	0.97	OK	OK			OK	OK
U-238	0.09	1.67	1.42E+00	3.40E-01	1.44E+00	3.85E-01	1.12	OK	OK			OK	OK
U-235	0.74	35.00	1.80E-01	1.19E-01	2.56E-01	1.62E-01		OK	OK			NA	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07154	UUISO	1	pCi	I	Engineering Management Support, Inc.

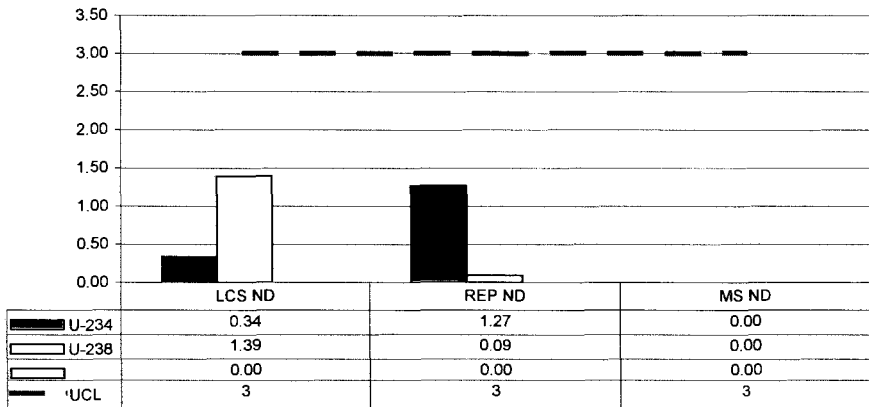
LCS % Recovery



Replicate Sample RPD



Normalized Difference



No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07154	THISO	1	pCi	I	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
TH-228	0.40	95.89%	20.66%	100.00%	3.60%	4.96E+00	1.79E-01	4.75E+00	9.83E-01	Th-8b	1.04E+02	3.60E+00	1.06E-01
TH-230	2.32	78.91%	22.47%	100.00%	2.70%	5.51E+00	1.49E-01	4.35E+00	9.77E-01	Th-1b	2.35E+01	2.70E+00	5.20E-01
TH-232	0.68	93.30%	20.47%	100.00%	3.60%	4.96E+00	1.79E-01	4.63E+00	9.47E-01	Th-8b	1.04E+02	3.60E+00	1.06E-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

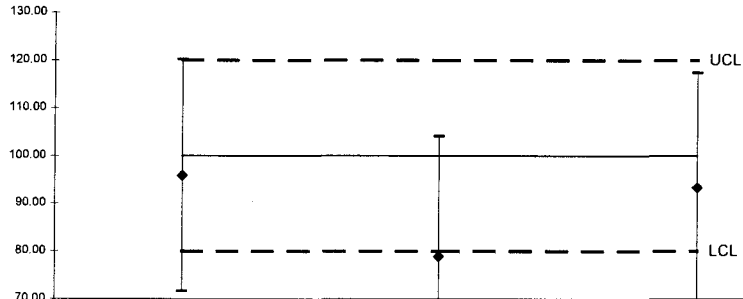
QC Summary

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	1.05	26.21	1.13E+00	3.64E-01	8.67E-01	3.25E-01	0.96	OK	OK			NA	OK
TH-230	1.02	23.21	1.66E+00	4.94E-01	1.32E+00	4.41E-01	0.79	OK	OK			NA	OK
TH-232	0.31	6.88	1.38E+00	4.11E-01	1.28E+00	4.18E-01	0.93	OK	OK			NA	OK

0050

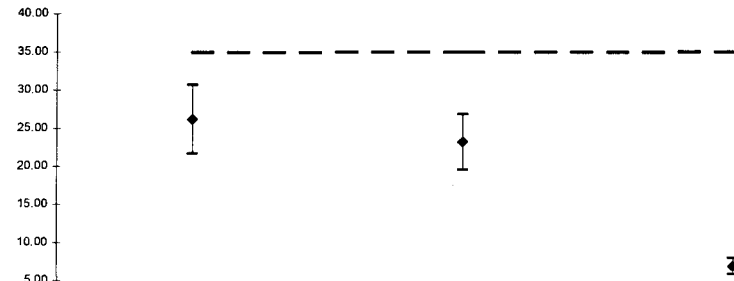
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07154	ThISO	1	pCi	I	Engineering Management Support, Inc.

LCS % Recovery



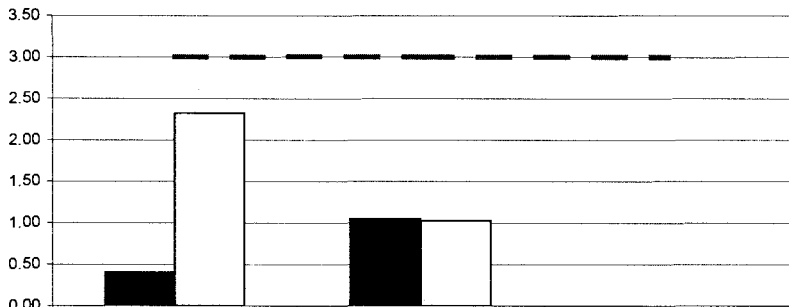
	TH-228	TH-230	TH-232
Lower Error	71.62	53.74	69.23
Upper Error	120.15	104.08	117.37
%R	95.89	78.91	93.30
LCL	80	80	80
Mean	100	100	100
UCL	120	120	120

Replicate Sample RPD



	TH-228	TH-230	TH-232
Lower Error	30.74	26.86	7.95
Upper Error	21.69	19.57	5.81
RPD	26.21	23.21	6.88
CL	35	35	35

Normalized Difference



	LCS ND	REP ND	MS ND
TH-228	0.40	1.05	0.00
TH-230	2.32	1.02	0.00
UCL	3	3	3

No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07154	Ra226	1	pCi	I	Engineering Management Support, Inc.

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	CSU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	CSU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
RA-226	0.03	100.32%	23.94%	100.00%	4.60%	1.04E+01	4.76E-01	1.04E+01	2.49E+00	Ra-5b	4.41E+01	4.60E+00	5.22E-01

Matrix Spike

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

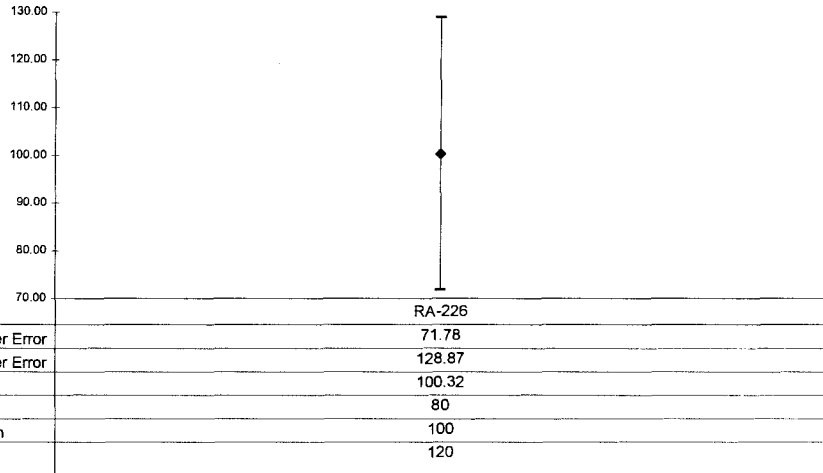
Replicate Sample

QC Summary

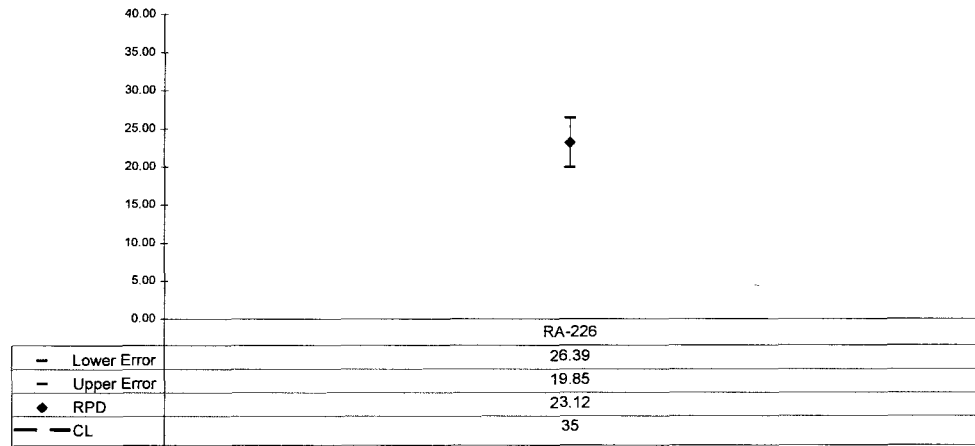
Analyte	Normalized Difference	RPD	Original Result	Original CSU	Replicate Result	Replicate CSU	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
RA-226	1.12	23.12	6.39E+00	1.82E+00	5.07E+00	1.42E+00	1.00	OK	OK			OK	OK

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07154	Ra226	1	pCi	I	Engineering Management Support, Inc.

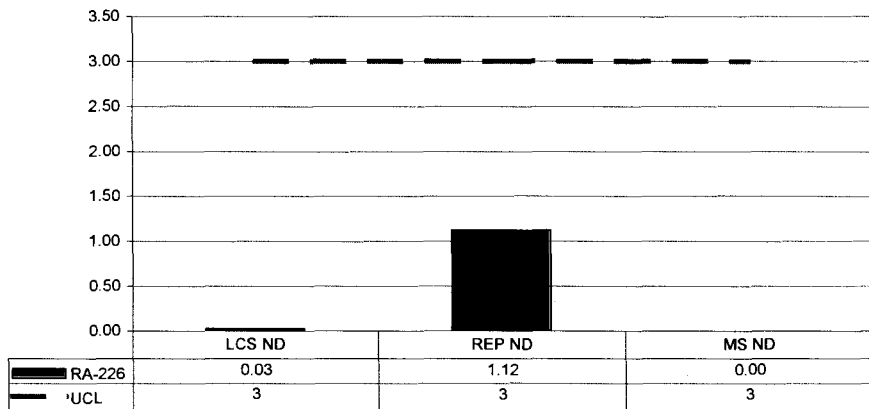
LCS % Recovery



Replicate Sample RPD



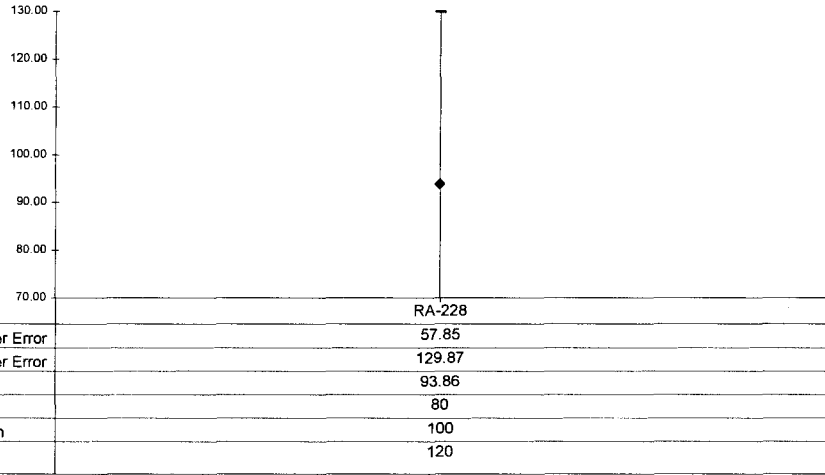
Normalized Difference



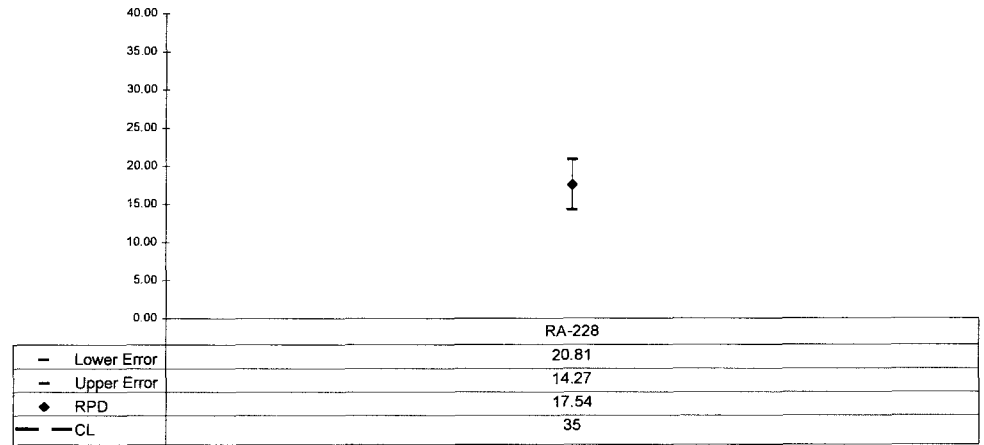
No Matrix Spike

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
13-07154	Ra228	1	pCi	I	Engineering Management Support, Inc.

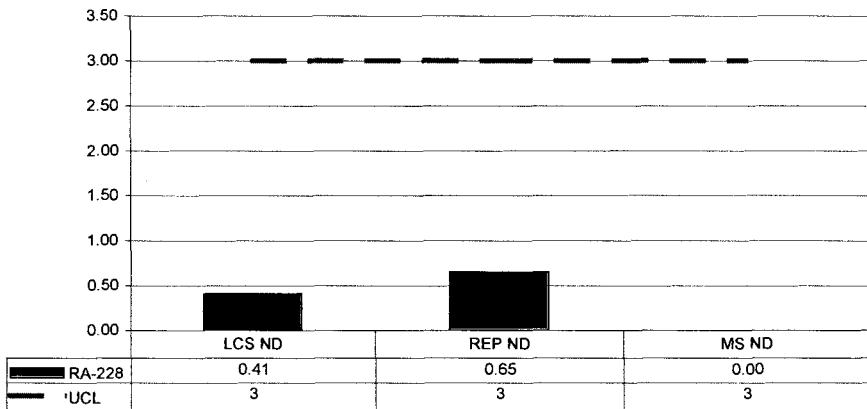
LCS % Recovery



Replicate Sample RPD




Normalized Difference



No Matrix Spike


SECTION VII
LABORATORY TECHNICIAN'S NOTES

ISO U NOTES

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	UISO
		Run Number	1


#	Date	Dept	User	Notes
1	08/08/13 07:51	PREP	JWOLFE	ALIUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-6, 8 AND 9, 12 AND 13 WITH HNO3- DRIED SAMPLES DOWN

J Wolfe
 8/8/13

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com		Internal Work Order	13-07154
			Analysis Code	UUISO
			Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 07:51	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-6, 8 AND 9, 12 AND 13 WITH HNO3- DRIED SAMPLES DOWN
2	08/13/13 15:45	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
 8/13/13

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	UUIISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 07:51	PREP	JWOLFE	ALIQUTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-6, 8 AND 9, 12 AND 13 WITH HNO3- DRIED SAMPLES DOWN
2	08/13/13 15:45	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	08/14/13 05:55	CHEM	RMARTZ	ADDED 0.1 ML NEODYMIUM CARRIER, 0.3 ML TITANOUS CHLORIDE, & 1 ML HF TO C-TUBES; LET SET SIT IN ICE BATH FOR ONE HOUR. SET UP FILTERS BY ADDING ALCOHOL & CARBON SUBSTRATE THEN ADDED SAMPLES; WHEN SAMPLES WERE THROUGH FILTERS, ADDED 10 ML DI H2O RINSES FROM C-TUBES, REMOVED FILTERS, LET DRY IN DESSICATOR, THEN SENT SET TO COUNT ROOM.

US EPA ARCHIVE DOCUMENT

RM
8/14/13



Reagents Used in an Analysis

Internal Work Order

13-07154

Analysis Code

Run

UUISO

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/8/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/13/2013
014230S	HCl - HF	6.5N - 0.04N	JDEMELAS	8/13/2013
014143D01	Hydrochloric Acid	0.5N	JDEMELAS	8/13/2013
014199S	Hydrochloric Acid	6.5N	JDEMELAS	8/13/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/13/2013
014256S	HCl - NH4I	8N - 0.1M	JDEMELAS	8/13/2013
014243S	Hydrochloric Acid	8N	JDEMELAS	8/13/2013
014042S	Carbon substrate	Solution	RMARTZ	8/14/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/14/2013
013191S	Neodymium Carrier	1 mg/ml	RMARTZ	8/14/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/14/2013
014220P	Titanous Chloride	Reagent Grade	RMARTZ	8/14/2013

US EPA ARCHIVE DOCUMENT

Alpha #2


Date	Sample #	Client	Facility	CT	Other	Analysis	Fee
9/12/13	1307153A(15-18)	EMS	1648	2hr50-		Rate	143
8/12/13	1307186A(1-4)	UCOR	1649	2hr50-		Rate	103
8/10/13	Daily Pulse	UCOR	0928	1hr		Rate	-
8/10/13	1707147B(1-2)(11-12)	Eng Man	0905	2hr		UCOR	C
8/10/13	1707186A(1-7)	UCOR	0905	2hr		UCOR	C
9/13/13	1307152A(1-8)	EMS	1217	2hr50-		Rate	143
8/14/13	Daily Pulse	UCOR	0927	1hr		Rate	C
8/14/13	1707154A(1-11)	Eng Man	0927	2hr		UCOR	C

Alpha # 3

Date	Sample #	Client	Food Item	CT Time	Analysis	Test
8/9/17	Daily Pulser	LAB	0506	1m	run	-
8/9/17	SECCAL	LAB	0522	2hr	run	-
8/9/17	1307154A(1-2)	Eng. Man	0904	2hr	Rule	C
8/9/13	1307146A(4)	ULON	1209	2hr50m	Np	KB
8/9/13	1308003A(1-9)	Access	1209	2hr50m	Rule	KB
8/9/13	System Bkgd	Lab	1624	16.40 hrs	x	KB
8/10/13	Daily Pulser	Lab	1123	10 mn	NA	AG
8/10/13	1307147A(9-19)	Eng. Manage	1502	2hr50m	iso-Th	AG
8/11/17	Daily Pulser	LAB	0515	1m	run	-
8/11/17	1307149A(1-15)	Eng. Man	0577	2hr	4hr50	C
8/12/17	1307152A(4-18)	Eng. Man	0979	2hr	4hr50	C
8/12/17	1307145A(4)	Eng. Man	0940	2hr	4hr50	C
8/12/13	1307170A(1-10)	EMS	1256	2hr50mins	Rule	KB
8/12/13	1307153A(1-6)	EMS	1256	2hr50min	Rule	KB
8/12/13	1308004A(1-3,5)	ULON	1649	2hr50m	Rule	KB
8/12/13	1307144A(1-5)	Cal Energy	1650	2hr50m	Rule	KB
8/12/17	Daily Pulser	LAB	0524	1m	run	-
8/12/17	1307186A(4)	ULON	0906	2hr	4hr50	C
8/12/17	1307157A(1-11)	Eng. Man	0906	2hr	4hr50	C
8/13/13	1307152A(9-19)	EMS	1218	2hr50m	Th	KB
8/13/13	1307182A(1-6)	Accutest	1622	2hr50m	Rule	KB
8/13/13	1308024A(1-5)	Gulf Coast	1623	2hr50m	Rule	KB
8/13/13	1308002A(1-4)	TEC	1624	2hr50m	Rule	KB
8/14/17	Daily Pulser	LAB	0522	1m	run	-
8/14/17	1307154A(12-13)	Eng. Man	0928	2hr	4hr50	C
8/14/17	1308004A(1-3,5,12)	ULON	0929	2hr	4hr50	C
8/14/17	1308004A(NT(5))	ULON	0971	2hr	4hr50	C
8/14/17	1307172A(1-4,7)	ULON	0972	2hr	4hr50	C
8/14/17	1307172A(NT(4))	ULON	0972	2hr	4hr50	C
8/14/17	1307186A(NT(4))	ULON	0972	2hr	4hr50	C


US EPA ARCHIVE DOCUMENT

ISO TH NOTES

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	ThISO
		Run Number	1


#	Date	Dept	User	Notes
1	08/08/13 07:51	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-6, 8 AND 9, 12 AND 13 WITH HNO3- DRIED SAMPLES DOWN

J Wolfe
8/8/13

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	THISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 07:51	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-6, 8 AND 9, 12 AND 13 WITH HNO3- DRIED SAMPLES DOWN
2	08/13/13 15:47	CHEM	JDEMELAS	Added concentrated HNO3 to sample beakers and heated to dryness; Added 20 ml 8N HNO3 to samples and transferred to new, labeled C-Tubes, adding 8N HNO3 to bring volume to ~35 ml; Preconditioned resin columns with 50 ml 8N HNO3; Centrifuged samples as needed, and passed through columns; Rinsed C-Tubes with 20 ml 8N HNO3; Centrifuged rinsates and loaded onto columns; Rinsed columns with 40 ml 8N HNO3; Eluted Thorium with 50 ml of 8N HCl into clean, labeled 100-ml beakers; Dried-down samples on hotplate; Dissolved samples in ~10 ml of concentrated HCl; Transferred to new, labeled C-Tubes with deionized water, bringing volume to ~15ml. Set samples aside for later precipitation and filtering.

JDEMELAS
 8/13/13

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	ThISO
		Run Number	1

#	Date	Dept	User	Notes
1	08/08/13 07:51	PREP	JWOLFE	ALIQUOTED AND ADDED SPIKES AND TRACERS- PRESERVED FRACTIONS 4-6, 8 AND 9, 12 AND 13 WITH HNO3- DRIED SAMPLES DOWN
2	08/13/13 15:47	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	08/14/13 05:57	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.

US EPA ARCHIVE DOCUMENT

Handwritten signature and date:
 [Signature]
 8/14/13



EBERLINE
SERVICES

Reagents Used in an Analysis

Internal Work Order

13-07154

Analysis Code

Run

ThISO

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/8/2013
014164P	Anion Exchange Resin	Reagent Grade	JDEMELAS	8/13/2013
014243S	Hydrochloric Acid	8N	JDEMELAS	8/13/2013
014142P	Hydrochloric Acid	Reagent Grade	JDEMELAS	8/13/2013
014249S	Nitric Acid	8N	JDEMELAS	8/13/2013
014236S	Nitric Acid	8N	JDEMELAS	8/13/2013
014109P	Nitric Acid	Reagent Grade	JDEMELAS	8/13/2013
014042S	Carbon substrate	Solution	RMARTZ	8/14/2013
014040S	Cerrium Carrier	0.1mg/ml	RMARTZ	8/14/2013
013221P	Hydrofluoric Acid	Reagent Grade	RMARTZ	8/14/2013
013574P	Reagent Alcohol	Reagent Grade	RMARTZ	8/14/2013

Alpha #1

Date	Sample #	Client	Facility	C/TOT	Analysis	Tech
8/14/17	1708004A(1-25)	UWON	0925	2hr	UITSO	C
8/14/17	1708004A(1-5)	UWON	0926	2hr	UWAT	C
8/14/17	1307154A(1-7)	Egman	0926	2hr	UITSO	C
9/14/13	1307186A(1-4,7)	UCOR	1245	2hr50-	PU	ICB
9/14/13	1307154A(1-3)	EMS	1246	2hr50-	TH	ICB


Alpha #2

Date	Sample #	Client	Location	CT Item	Analysis	Test
9/12/13	1307153A(15-19)	EMS	1648	2hr 50-	Rate	UB
8/12/13	1307186A(1-4)	UCOR	1649	2hr 50-	Rate	UB
8/12/13	Daily Pulse	UCOR	0925	1-0	m	-
8/12/13	1707147B(1-2)(11-12)	Eng Man	0905	2hr	UCOR	C
8/12/13	1707186A(1-7)	UCOR	0905	2hr	UCOR	C
9/13/13	1307152A(1-8)	EMS	1217	2hr 50-	TR	UB
8/14/13	Daily Pulse	UCOR	0927	1-0	m	C
8/14/13	1307154A(4-11)	Eng Man	0927	2hr	UCOR	C
8/14/13	1307186A(1-17)	UCOR	UB 8/14/13	2hr 50-	PU	UB
8/14/13	1307154A(1-3)	EMS		2hr 50-	TR	UB
8/14/13	1307154A(4-11)	EMS	1244	2hr 50-	TR	UB

Alpha # 3


Date	Sample #	Client	Food Item	OT	Surveys	Task
8/19/17	Daily Pulser	LAR3	0506	1m	---	---
8/19/17	SECCAL	LAR3	0522	2hr	---	---
8/19/17	1707154A(1-2)	Engma	0904	2hr	Rel	C
8/19/13	1307146A(4)	ULON	1209	2hr50m	Np	ICB
8/19/13	1308003A(1-9)	Access	1209	2hr50m	Rel	ICB
8/19/13	System Bldg	Lab	1624	16.40 hrs	α	ICB
8/10/13	Daily Pulser	Lab	1123	10 mn	NA	AG
8/10/13	1307147A(9-19)	Eng. Manage	1502	2hr50m	iso-Th	AG
8/10/17	Daily Pulser	LAR3	0515	1m	---	---
8/12/17	1307149A(1-15)	Eng. Man	0577	2hr	4hr50	C
8/12/17	1707152A(4-18)	Engma	0979	2hr	4hr50	---
8/12/17	1307145A(4)	Engma	0940	2hr	4hr50	---
8/12/13	1307170A(1-10)	EMS	1256	2hr50mins	Rel	ICB
8/12/13	1307153A(1-6)	EMS	1256	2hr50min	Rel	ICB
8/12/13	1308004A(1-3,5)	ULON	1649	2hr50m	Rel	ICB
8/12/13	1307144A(1-5)	CalEmergency	1650	2hr50m	Rel	ICB
8/12/17	Daily Pulser	LAR3	0525	1m	---	---
8/12/17	1707186A(4)	ULON	0906	2hr	4hr50	---
8/12/17	1707157A(1-11)	Engma	0506	2hr	4hr50	---
8/13/13	1307152A(9-19)	EMS	1218	2hr50m	Th	ICB
8/13/13	1307182A(1-6)	Accutest	1627	2hr50m	Rel	ICB
8/13/13	1308024A(1-5)	Gulf Coast	1623	2hr50m	Rel	ICB
8/13/13	1308002A(1-4)	TEC	1624	2hr50m	Rel	ICB
8/14/17	Daily Pulser	LAR3	0522	1m	---	---
8/14/17	1707154A(12-13)	Engma	0928	2hr	4hr50	---
8/14/17	1708004A(1-3,5,17)	ULON	0929	2hr	4hr50	---
8/14/17	1708004ANT(5)	ULON	0971	2hr	4hr50	---
8/14/17	1707172A(1-4,7)	ULON	0972	2hr	4hr50	---
8/14/17	1707172ANT(4)	ULON	0972	2hr	4hr50	---
8/14/17	1707186ANT(4)	ULON	0972	2hr	4hr50	---
8/14/13	1307154A(12-13)	EMS	1246	2hr50m	Th	ICB
8/14/13	1307153A(1-14)	EMS	1247	2hr50m	Th	ICB

RA-226 NOTES

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	08/07/13 10:35	PREP	JWOLFE	ALIQOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

J Wolfe
 8/7/13

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	Ra226
		Run Number	1

#	Date	Dept	User	Notes
1	08/07/13 10:35	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/07/13 19:42	PREP	LWALKER	ADDED EDTA TO PRECIP-VORTEX-LET SIT OVERNIGHT TO DIGEST.
3	08/08/13 16:57	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
 8/8/13



Reagents Used in an Analysis

Internal Work Order

13-07154

Analysis Code

Run

Ra226

1

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


US EPA ARCHIVE DOCUMENT

Alpha # 3

Date	Sample #	Client	Food Item	CT Item	Analysis	Test
6/19/17	Daily P. 150	VMS	0706	100	100	-
8/19/17	SECCAL	VMS	0522	2670	100	-
8/18/17	(707154A(112))	Gryther	0904	2670	100	c


Date	Sample #	Client	Time	CT Time	Analysis	Test
8/6/13	Daily Pulse	LAB	0828	1hr	run	run
8/6/13	1707171A(4-6)	UWON	0936	2hr	Ames	-
8/6/13	1308006A(1-4)	UWON	0977	2hr	Ames	-
8/6/13	1307170A(1-7)	United	0978	2hr	Ames	-
8/6/13	1307171A(3-4,6)	UWON	1245	2hr 50mins	Np	ICB
8/6/13	1307146A(1-6)	EMS	1246	2hr 50-	Th	ICB
8/6/13	1307172A(3-4)	UWON	1634	2hr 50-	Rab	ICB
8/6/13	1307147A(1-7)	EMS	1635	2hr 50-	Rab	ICB
8/7/13	Daily Pulse	LAB	0572	1hr	run	run
8/7/13	1708016A(5)	United	0914	2hr	Ames	-
8/7/13	1707110B(1-7,10)	Engman	0915	2hr	Ames	-
8/7/13	1307185A(1-4)	Western Adv.	0916	2hr	Pulse	-
8/7/13	1307185A(1-4)	Western	1244	2hr 50mins	UW	ICB
8/7/13	1307172A(1-4)	UWON	1244	2hr 50-	Np	ICB
8/7/13	1307146A(1)	EMS	1246	2hr 50-	UW	ICB
8/7/13	1307172A(4)	UWON	1605	2hr 50-	Ames	ICB
8/7/13	1307149A(1-3)	EMS	1606	2hr 50-	Rab	ICB
8/8/13	Daily Pulse	LAB	0578	1hr	run	run
8/8/13	1707193(1-4,7)	UWON	0951	2hr	Pulse	-
8/8/13	1307109A(1-4)	UWON	0952	2hr	Pulse	-
8/8/13	1707116B(1-7)	UWON	0953	2hr	Pulse	-
8/8/13	1307172A(1-13)	Engman	1252	2hr	Rab	-
8/9/13	Daily Pulse	LAB	0506	1hr	run	run
8/9/13	1707174A(7)	Engman	0926	2hr	Rab	-
8/9/13	1707186A(1-4)	UWON	0927	2hr	Ames	-
8/9/13	1707186A(1-4)	UWON	0927	2hr	Ames	-

RA-228 NOTES

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	Ra228
		Run Number	1


#	Date	Dept	User	Notes
1	08/07/13 10:35	PREP	JWOLFE	ALIQOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS

J Wolfe
 8/7/13

 EBERLINE <small>SERVICES</small> Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	08/07/13 10:35	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/09/13 17:56	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	08/14/13 17:12	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)

L. Walker
 8/14/13

 EBERLINE SERVICES Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	13-07154
		Analysis Code	Ra228
		Run Number	1

#	Date	Dept	User	Notes
1	08/07/13 10:35	PREP	JWOLFE	ALIUQUOTED AND ADDED SPIKES AND TRACERS- PH'D SAMPLES- PRECIPITATED WITH BA AND PB CARRIERS AND AMMONIUM SULFATE- DECANTED SAMPLES AND CENTRIFUGED- SUBMITTED RADIUM PRECIP TO SEPARATIONS
2	08/09/13 17:56	PREP	LWALKER	RECEIVED FILTERS BACK FROM COUNT ROOM-PUT BACK INTO C-TUBES-ADDED EDTA AND SWIRLED-LET SIT OVERNIGHT TO DIGEST.
3	08/14/13 17:12	PREP	LWALKER	FOLLOWED STEPS 12.1 TO 12.7 IN AP-007 REV 18 (CHEMICAL CLEANUP FOR RA 228)
4	08/15/13 06:11	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)

8-15-13
 JIM



Reagents Used in an Analysis

Internal Work Order

13-07154

Analysis Code

Run

Ra228

1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
013376P	Ammonium Hydroxide	Reagent Grade	JWOLFE	8/7/2013
013930D03	Ammonium Sulfate	200 mg/ml	JWOLFE	8/7/2013
014007D02	Barium Carrier	1 mg/ml	JWOLFE	8/7/2013
014008D02	Lead Carrier	166 mg/ml	JWOLFE	8/7/2013
014109P	Nitric Acid	Reagent Grade	JWOLFE	8/7/2013
011504D33	Ammonium Sulfide	2%	LWALKER	8/14/2013
014008D03	Lead Carrier	1.5 mg/ml	LWALKER	8/14/2013
014109P	Nitric Acid	Reagent Grade	LWALKER	8/14/2013
013065D10	Sodium Hydroxide	10M	LWALKER	8/14/2013
013955D01	Yttrium Carrier	9 mg/ml	LWALKER	8/14/2013
013763D02	Ammonium Oxalate	5%	TSMITH	8/15/2013
013910D07	Nitric Acid	1N	TSMITH	8/15/2013
014110D04	Nitric Acid	6N	TSMITH	8/15/2013
013065D10	Sodium Hydroxide	10M	TSMITH	8/15/2013
013065D09	Sodium Hydroxide	18M	TSMITH	8/15/2013

US EPA ARCHIVE DOCUMENT

Date	Sample #	Client	Facid This	CT Time	Analysis	Test
8/13/17	1307119ADK(2-5)	ERA	1119	2h	L11	C
8/17/17	1707119AB2(6-7)	ERA	1257	2h	L13	C
8/14/17	B1600C	UM3	0712	6m	L13	C
8/14/17	ET76C	UM3	0616	30m	L13	C
8/14/17	1707149RA(13-15)	Englha	0755	2h	RA8	C
8/14/17	130714054(2-4/6)	ULON	0843	2h	SL904	C
8/14/17	130717254(2-4/6)	ULON	0847	2h	SL904	C
8/14/17	130717154(6-8)	ULON	1002	2h	SL904	C
8/14/17	1307147RA(9-16)	EMS	1109	2hrs	RA8	UM
8/15/17	B1600C	UM3	0508	6m	L13	C
8/15/17	ET76C	UM3	0614	30m	L13	C
8/15/17	1308066AB(1-5)	ULON	0755	2h	L13	C
8/15/17	1307154RA(1)	Englha	0755	30m	RA8	C

SECTION VIII
ANALYTICAL DATA (ISOTOPIC URANIUM)

Work Order	13-07154	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	UUISO	01	LCS	LCS		07/24/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/24/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	PZ-107-SS TOT	46	07/19/13 12:10	1.0000E+00
Lab Deadline	8/13/2013	04	TRG	PZ-200-SS TOT	42	07/19/13 10:19	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-200-SS DIS	42	07/19/13 10:19	1.0000E+00
Project	West Lake OU-1	06	TRG	PZ-102-SS TOT	38	07/19/13 10:30	1.0000E+00
Report Level	4	07	TRG	PZ-102-SS DIS	38	07/19/13 10:30	1.0000E+00
Activity Units	pCi	08	DO	PZ-107-SS TOT	46	07/19/13 12:10	1.0000E+00
Aliquot Units	I	09	TRG	PZ-107-SS DIS	46	07/19/13 12:10	1.0000E+00
Matrix	WA	10	TRG	PZ-106-KS TOT	45	07/19/13 13:09	1.0000E+00
Method	HASL 300, 4.5.2	11	TRG	PZ-106-KS DIS	45	07/19/13 13:09	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	DUP 08 TOT	44	07/19/13 00:00	1.0000E+00
Radiometric Tracer	U-232	13	TRG	DUP 08 DIS	44	07/19/13 00:00	1.0000E+00
Radiometric Sol#	U-10a						
Tracer Act (dpm/g)	19.04						
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.

0007

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	0.6129	11.7		0.00								
02	MBL	0.6069	11.6		0.00								
03	DUP	0.6064	11.5		0.00								
04	TRG	0.6051	11.5		0.00								
05	TRG	0.6041	11.5		0.00								
06	TRG	0.6021	11.5		0.00								
07	TRG	0.6025	11.5		0.00								
08	DO	0.6025	11.5		0.00								
09	TRG	0.6058	11.5		0.00								
10	TRG	0.6002	11.4		0.00								
11	TRG	0.6056	11.5		0.00								
12	TRG	0.6049	11.5		0.00								
13	TRG	0.6040	11.5		0.00								

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

<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			08/08/13 07:47	JWOLFE				
02	MBL			08/08/13 07:47	JWOLFE				
03	DUP			08/08/13 07:47	JWOLFE				
04	TRG			08/08/13 07:47	JWOLFE				
05	TRG			08/08/13 07:47	JWOLFE				
06	TRG			08/08/13 07:47	JWOLFE				
07	TRG			08/08/13 07:47	JWOLFE				
08	DO			08/08/13 07:47	JWOLFE				
09	TRG			08/08/13 07:47	JWOLFE				
10	TRG			08/08/13 07:47	JWOLFE				
11	TRG			08/08/13 07:47	JWOLFE				
12	TRG			08/08/13 07:47	JWOLFE				
13	TRG			08/08/13 07:47	JWOLFE				

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

0000

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-UUISO-1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-234	LCS	LCS	pCi/l	7.96E+00	1.08E+00	6.48E-02	8.17E+00	97.39	OK		OK	
02	U-234	MBL	BLANK	pCi/l	3.12E-01	1.29E-01	7.42E-02					OK	OK
03	U-234	DUP	PZ-107-SS TOT	pCi/l	1.31E+00	3.51E-01	1.06E-01				OK	OK	
04	U-234	TRG	PZ-200-SS TOT	pCi/l	9.65E-01	2.65E-01	9.18E-02					OK	
05	U-234	TRG	PZ-200-SS DIS	pCi/l	4.86E-01	1.76E-01	9.47E-02					OK	
06	U-234	TRG	PZ-102-SS TOT	pCi/l	4.67E+00	7.50E-01	7.92E-02					OK	
07	U-234	TRG	PZ-102-SS DIS	pCi/l	5.84E+00	8.87E-01	8.42E-02					OK	
08	U-234	DO	PZ-107-SS TOT	pCi/l	1.65E+00	3.58E-01	9.18E-02					OK	
09	U-234	TRG	PZ-107-SS DIS	pCi/l	1.85E+00	5.55E-01	1.94E-01					OK	
10	U-234	TRG	PZ-106-KS TOT	pCi/l	2.04E+00	4.29E-01	9.02E-02					OK	
11	U-234	TRG	PZ-106-KS DIS	pCi/l	2.02E+00	5.10E-01	1.39E-01					OK	
12	U-234	TRG	DUP 08 TOT	pCi/l	1.74E+00	5.84E-01	1.55E-01					OK	
13	U-234	TRG	DUP 08 DIS	pCi/l	1.57E+00	4.46E-01	1.45E-01					OK	



Run **1**

Analysis Code **UUISO**

Eberline Services Work Order **13-07154**

Client **Engineering Management Support, Inc.**

0500

Preliminary Data Report & Analytical Calculations

Work Order: 13-07154-UUISO-1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	U-234	LCS	07/24/13 00:00	1.00E+00	104.75	0.00	0.00			
02	U-234	MBL	07/24/13 00:00	1.00E+00	116.05	0.00	0.00			
03	U-234	DUP	07/19/13 12:10	1.00E+00	95.27	0.00	0.00			
04	U-234	TRG	07/19/13 10:19	1.00E+00	104.50	0.00	0.00			
05	U-234	TRG	07/19/13 10:19	1.00E+00	120.62	0.00	0.00			
06	U-234	TRG	07/19/13 10:30	1.00E+00	102.86	0.00	0.00			
07	U-234	TRG	07/19/13 10:30	1.00E+00	103.98	0.00	0.00			
08	U-234	DO	07/19/13 12:10	1.00E+00	104.99	0.00	0.00			
09	U-234	TRG	07/19/13 12:10	1.00E+00	49.93	0.00	0.00			
10	U-234	TRG	07/19/13 13:09	1.00E+00	85.34	0.00	0.00			
11	U-234	TRG	07/19/13 13:09	1.00E+00	80.80	0.00	0.00			
12	U-234	TRG	07/19/13 00:00	1.00E+00	38.59	0.00	0.00			
13	U-234	TRG	07/19/13 00:00	1.00E+00	59.06	0.00	0.00			

	Run	1
Analysis Code	UUISO	
Eberline Services Work Order	13-07154	
Client	Engineering Management Support, Inc.	

1600

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-UIISO-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-234	LCS	08/14/13 09:26		A_Spec	Alpha_013	170.02	5.87 E+02	2.00 E-03	18.7
02	U-234	MBL	08/14/13 09:26		A_Spec	Alpha_014	170	2.52 E+01	5.00 E-03	18.5
03	U-234	DUP	08/14/13 09:26		A_Spec	Alpha_015	170.02	6.93 E+01	4.00 E-03	14.8
04	U-234	TRG	08/14/13 09:27		A_Spec	Alpha_019	170.02	6.30 E+01	0.00 E+00	16.6
05	U-234	TRG	08/14/13 09:27		A_Spec	Alpha_022	170.02	3.38 E+01	7.00 E-03	15.3
06	U-234	TRG	08/14/13 09:27		A_Spec	Alpha_023	170.02	3.09 E+02	3.00 E-03	17.1
07	U-234	TRG	08/14/13 09:27		A_Spec	Alpha_024	170.02	3.91 E+02	4.00 E-03	17.1
08	U-234	DO	08/14/13 09:27		A_Spec	Alpha_025	170.02	1.13 E+02	6.00 E-03	17.4
09	U-234	TRG	08/14/13 09:27		A_Spec	Alpha_027	170.02	6.00 E+01	6.00 E-03	17.3
10	U-234	TRG	08/14/13 09:27		A_Spec	Alpha_029	170	1.27 E+02	4.00 E-03	19.5
11	U-234	TRG	08/14/13 09:27		A_Spec	Alpha_031	170	8.72 E+01	5.00 E-03	14.2
12	U-234	TRG	08/14/13 09:28		A_Spec	Alpha_033	170	4.68 E+01	1.00 E-03	18.5
13	U-234	TRG	08/14/13 09:28		A_Spec	Alpha_034	170	6.50 E+01	0.00 E+00	18.6

	Run	1
	Analysis Code	UIISO
Eberline Services Work Order	13-07154	
Client	Engineering Management Support, Inc.	

2600

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-UUISO-1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	U-238	LCS	LCS	pCi/l	8.93E+00	1.19E+00	7.09E-02	7.96E+00	112.17	OK		OK	
02	U-238	MBL	BLANK	pCi/l	6.36E-02	6.03E-02	7.39E-02					OK	OK
03	U-238	DUP	PZ-107-SS TOT	pCi/l	1.44E+00	3.71E-01	7.84E-02				OK	OK	
04	U-238	TRG	PZ-200-SS TOT	pCi/l	8.00E-01	2.37E-01	8.00E-02					OK	
05	U-238	TRG	PZ-200-SS DIS	pCi/l	4.13E-01	1.58E-01	5.97E-02					OK	
06	U-238	TRG	PZ-102-SS TOT	pCi/l	4.43E+00	7.20E-01	9.47E-02					OK	
07	U-238	TRG	PZ-102-SS DIS	pCi/l	3.85E+00	6.46E-01	8.38E-02					OK	
08	U-238	DO	PZ-107-SS TOT	pCi/l	1.42E+00	3.24E-01	6.05E-02					OK	
09	U-238	TRG	PZ-107-SS DIS	pCi/l	8.32E-01	3.45E-01	1.83E-01					OK	
10	U-238	TRG	PZ-106-KS TOT	pCi/l	9.31E-01	2.64E-01	8.36E-02					OK	
11	U-238	TRG	PZ-106-KS DIS	pCi/l	7.79E-01	2.97E-01	2.10E-01					OK	
12	U-238	TRG	DUP 08 TOT	pCi/l	1.51E+00	5.33E-01	1.77E-01					OK	
13	U-238	TRG	DUP 08 DIS	pCi/l	9.33E-01	3.24E-01	1.15E-01					OK	

Client	Engineering Management Support, Inc.	Eberline Services Work Order	13-07154	Analysis Code	UUISO	Run	1

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-UUISO-1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	U-238	LCS	07/24/13 00:00	1.00E+00	104.75	0.00	0.00			
02	U-238	MBL	07/24/13 00:00	1.00E+00	116.05	0.00	0.00			
03	U-238	DUP	07/19/13 12:10	1.00E+00	95.27	0.00	0.00			
04	U-238	TRG	07/19/13 10:19	1.00E+00	104.50	0.00	0.00			
05	U-238	TRG	07/19/13 10:19	1.00E+00	120.62	0.00	0.00			
06	U-238	TRG	07/19/13 10:30	1.00E+00	102.86	0.00	0.00			
07	U-238	TRG	07/19/13 10:30	1.00E+00	103.98	0.00	0.00			
08	U-238	DO	07/19/13 12:10	1.00E+00	104.99	0.00	0.00			
09	U-238	TRG	07/19/13 12:10	1.00E+00	49.93	0.00	0.00			
10	U-238	TRG	07/19/13 13:09	1.00E+00	85.34	0.00	0.00			
11	U-238	TRG	07/19/13 13:09	1.00E+00	80.80	0.00	0.00			
12	U-238	TRG	07/19/13 00:00	1.00E+00	38.59	0.00	0.00			
13	U-238	TRG	07/19/13 00:00	1.00E+00	59.06	0.00	0.00			



Run 1

Analysis Code UUISO

Eberline Services Work Order 13-07154

Client Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-UUISO-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	U-238	LCS	08/14/13 09:26		A_Spec	Alpha_013	170.02	6.61 E+02	3.00 E-03	18.7
02	U-238	MBL	08/14/13 09:26		A_Spec	Alpha_014	170	5.15 E+00	5.00 E-03	18.5
03	U-238	DUP	08/14/13 09:26		A_Spec	Alpha_015	170.02	7.68 E+01	1.00 E-03	14.8
04	U-238	TRG	08/14/13 09:27		A_Spec	Alpha_019	170.02	5.25 E+01	3.00 E-03	16.6
05	U-238	TRG	08/14/13 09:27		A_Spec	Alpha_022	170.02	2.88 E+01	1.00 E-03	15.3
06	U-238	TRG	08/14/13 09:27		A_Spec	Alpha_023	170.02	2.95 E+02	6.00 E-03	17.1
07	U-238	TRG	08/14/13 09:27		A_Spec	Alpha_024	170.02	2.59 E+02	4.00 E-03	17.1
08	U-238	DO	08/14/13 09:27		A_Spec	Alpha_025	170.02	9.78 E+01	1.00 E-03	17.4
09	U-238	TRG	08/14/13 09:27		A_Spec	Alpha_027	170.02	2.71 E+01	5.00 E-03	17.3
10	U-238	TRG	08/14/13 09:27		A_Spec	Alpha_029	170	5.85 E+01	3.00 E-03	19.5
11	U-238	TRG	08/14/13 09:27		A_Spec	Alpha_031	170	3.38 E+01	1.90 E-02	14.2
12	U-238	TRG	08/14/13 09:28		A_Spec	Alpha_033	170	4.07 E+01	2.00 E-03	18.5
13	U-238	TRG	08/14/13 09:28		A_Spec	Alpha_034	170	3.87 E+01	2.00 E-03	18.6

	
Run	1
Analysis Code	UUISO
Eberline Services Work Order	13-07154
Client	Engineering Management Support, Inc.

5809

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-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	1.16E+00	3.03E-01	8.78E-02					OK	
02	U-235	MBL	BLANK	pCi/l	5.60E-02	6.07E-02	7.31E-02					OK	OK
03	U-235	DUP	PZ-107-SS TOT	pCi/l	2.56E-01	1.61E-01	1.40E-01				NA	OK	
04	U-235	TRG	PZ-200-SS TOT	pCi/l	1.70E-01	1.19E-01	1.13E-01					OK	
05	U-235	TRG	PZ-200-SS DIS	pCi/l	6.15E-02	8.00E-02	1.26E-01					OK	
06	U-235	TRG	PZ-102-SS TOT	pCi/l	6.39E-01	2.28E-01	1.05E-01					OK	
07	U-235	TRG	PZ-102-SS DIS	pCi/l	9.76E-01	2.88E-01	1.16E-01					OK	
08	U-235	DO	PZ-107-SS TOT	pCi/l	1.80E-01	1.19E-01	1.08E-01					OK	
09	U-235	TRG	PZ-107-SS DIS	pCi/l	1.64E-01	1.70E-01	2.14E-01					OK	
10	U-235	TRG	PZ-106-KS TOT	pCi/l	3.06E-01	1.59E-01	1.04E-01					OK	
11	U-235	TRG	PZ-106-KS DIS	pCi/l	2.19E-01	1.62E-01	1.37E-01					OK	
12	U-235	TRG	DUP 08 TOT	pCi/l	3.06E-01	2.45E-01	2.20E-01					OK	
13	U-235	TRG	DUP 08 DIS	pCi/l	2.39E-01	1.79E-01	1.79E-01					OK	

	
Run	1
Analysis Code	UUISO
Eberline Services Work Order	13-07154
Client	Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-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	08/14/13 09:26		A_Spec	Alpha_013	170.02	6.95 E+01	3.00 E-03	18.7
02	U-235	MBL	08/14/13 09:26		A_Spec	Alpha_014	170	3.66 E+00	2.00 E-03	18.5
03	U-235	DUP	08/14/13 09:26		A_Spec	Alpha_015	170.02	1.10 E+01	0.00 E+00	14.8
04	U-235	TRG	08/14/13 09:27		A_Spec	Alpha_019	170.02	9.00 E+00	0.00 E+00	16.6
05	U-235	TRG	08/14/13 09:27		A_Spec	Alpha_022	170.02	3.47 E+00	9.00 E-03	15.3
06	U-235	TRG	08/14/13 09:27		A_Spec	Alpha_023	170.02	3.43 E+01	4.00 E-03	17.1
07	U-235	TRG	08/14/13 09:27		A_Spec	Alpha_024	170.02	5.30 E+01	6.00 E-03	17.1
08	U-235	DO	08/14/13 09:27		A_Spec	Alpha_025	170.02	1.00 E+01	0.00 E+00	17.4
09	U-235	TRG	08/14/13 09:27		A_Spec	Alpha_027	170.02	4.32 E+00	4.00 E-03	17.3
10	U-235	TRG	08/14/13 09:27		A_Spec	Alpha_029	170	1.55 E+01	3.00 E-03	19.5
11	U-235	TRG	08/14/13 09:27		A_Spec	Alpha_031	170	7.66 E+00	2.00 E-03	14.2
12	U-235	TRG	08/14/13 09:28		A_Spec	Alpha_033	170	6.66 E+00	2.00 E-03	18.5
13	U-235	TRG	08/14/13 09:28		A_Spec	Alpha_034	170	8.00 E+00	0.00 E+00	18.6



Run 1

Analysis Code UUISO

Eberline Services Work Order 13-07154

Client Engineering Management Support, Inc.

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	07/24/13 00:00	1.0000	0.6129	11.6696		0.00		
02	MBL	BLANK	07/24/13 00:00	1.0000	0.6069	11.5554		0.00		
03	DUP	PZ-107-SS TOT	07/19/13 12:10	1.0000	0.6064	11.5459		0.00		
04	TRG	PZ-200-SS TOT	07/19/13 10:19	1.0000	0.6051	11.5211		0.00		
05	TRG	PZ-200-SS DIS	07/19/13 10:19	1.0000	0.6041	11.5021		0.00		
06	TRG	PZ-102-SS TOT	07/19/13 10:30	1.0000	0.6021	11.4640		0.00		
07	TRG	PZ-102-SS DIS	07/19/13 10:30	1.0000	0.6025	11.4716		0.00		
08	DO	PZ-107-SS TOT	07/19/13 12:10	1.0000	0.6025	11.4716		0.00		
09	TRG	PZ-107-SS DIS	07/19/13 12:10	1.0000	0.6058	11.5344		0.00		
10	TRG	PZ-106-KS TOT	07/19/13 13:09	1.0000	0.6002	11.4278		0.00		
11	TRG	PZ-106-KS DIS	07/19/13 13:09	1.0000	0.6056	11.5306		0.00		
12	TRG	DUP 08 TOT	07/19/13 00:00	1.0000	0.6049	11.5173		0.00		
13	TRG	DUP 08 DIS	07/19/13 00:00	1.0000	0.6040	11.5002		0.00		

0923
 15
 19
 0927
 31
 28
 33
 34

6699

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-07154	1	UUISO	liters	8/13/2013	JWOLFE

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No. of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	PZ-107-SS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-200-SS TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-200-SS DIS	TRG					1.0000E+00	1.0000E+00				
06	PZ-102-SS TOT	TRG					1.0000E+00	1.0000E+00				
07	PZ-102-SS DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-107-SS TOT	DO					1.0000E+00	1.0000E+00				
09	PZ-107-SS DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-106-KS TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-106-KS DIS	TRG					1.0000E+00	1.0000E+00				
12	DUP 08 TOT	TRG					1.0000E+00	1.0000E+00				
13	DUP 08 DIS	TRG					1.0000E+00	1.0000E+00				

Comments	
----------	--

Technician: J Wolfe Date: 8, 8, 13



Apex-Alpha™

105
8/14/13

Sample Description: SPIKE
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 01
 Sample Geometry: Shelf 2
 Procedure Description: U 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: 8/14/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:26:34 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.613 mL
 Effective Efficiency: 0.1958 +/- 0.0109
 Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM
 Chem. Recovery Factor: 1.0475 +/- 0.0617

Control Certificate Name: NatU_U-8A
 Chem. Recov. of Control: U-238 1.093428 +/- 0.081378
 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	386.15	9.99	0.85	0.00E+000	27.9
U-234	4.725	586.66	8.09	0.34	0.00E+000	31.9
U-235	4.406	69.49	23.61	0.51	0.00E+000	3.3
U-238	4.145	661.49	7.62	0.51	0.00E+000	25.4

T = Tracer Peak used for Effective Efficiency

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

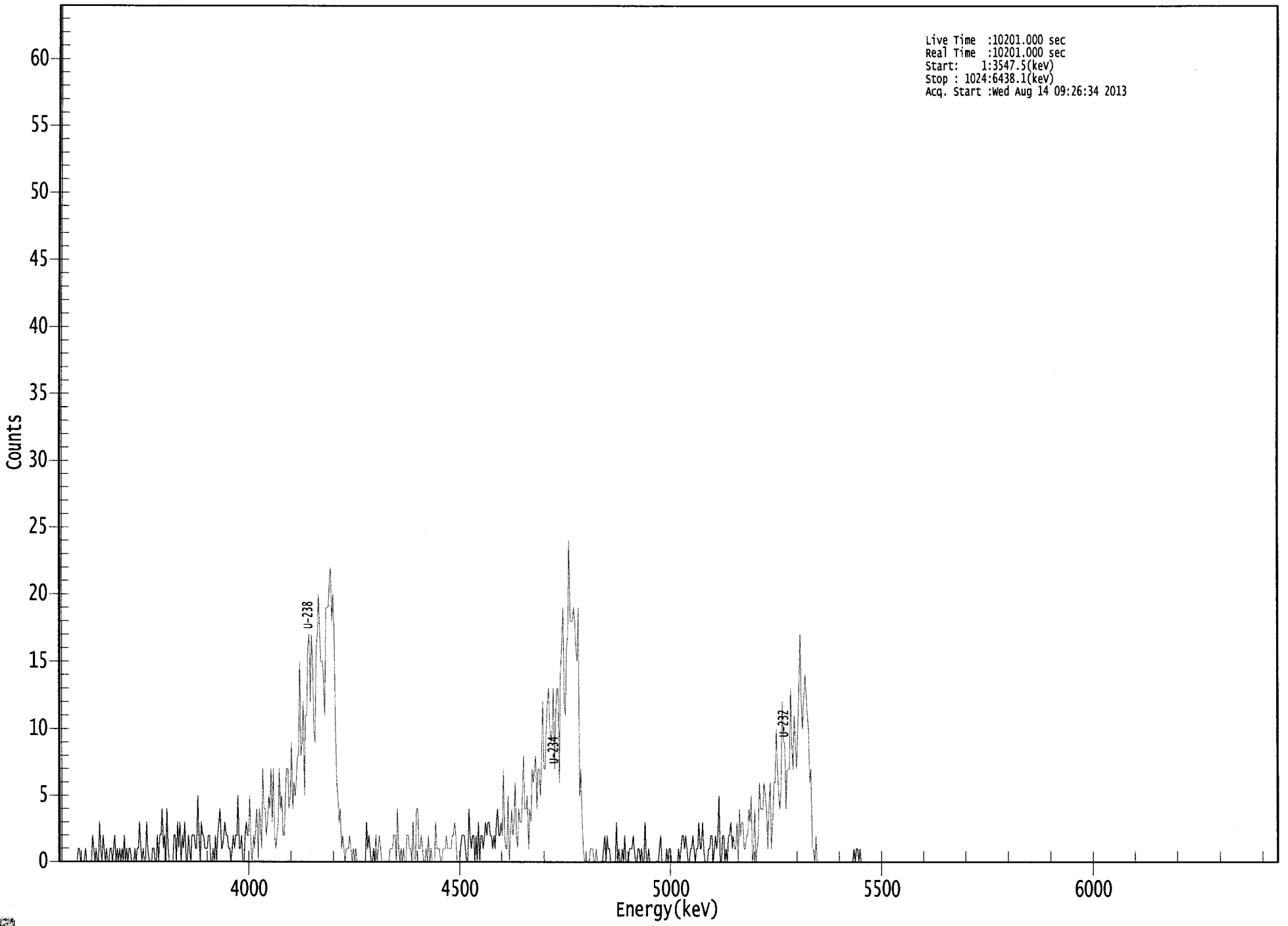
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.994	5302.50*	5.24E+000 +/- 5.74E-001	8.12E-002 +/- 8.90E-003
U-234	0.991	4761.50*	7.96E+000 +/- 1.08E+000	6.48E-002 +/- 7.10E-003
U-235	0.997	4385.50*	1.16E+000 +/- 3.03E-001	8.78E-002 +/- 9.62E-003
U-238	0.989	4184.40*	8.93E+000 +/- 1.19E+000	7.09E-002 +/- 7.76E-003

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066136.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3547.5(keV)
Stop : 1024:6438.1(keV)
Acq. Start :wed Aug 14 09:26:34 2013



ROI Type: 1

ROI Type: 3

010

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

Sample Title: 01

Elapsed Live time: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	1	1	0	0	0	0	1	0
25:	0	0	0	0	2	1	0	1
33:	0	0	3	1	0	2	1	0
41:	1	0	0	1	1	0	1	2
49:	0	1	0	1	0	1	0	2
57:	0	1	0	1	1	0	0	0
65:	1	0	1	1	3	1	0	1
73:	0	0	3	1	0	0	0	1
81:	1	0	0	2	0	2	2	4
89:	1	2	0	4	1	0	0	0
97:	0	2	2	0	3	1	3	0
105:	2	1	3	0	0	2	1	0
113:	2	2	2	1	1	5	2	0
121:	3	2	2	1	1	1	2	2
129:	0	0	1	0	2	0	2	3
137:	4	1	1	2	3	2	2	1
145:	1	0	1	2	1	2	2	5
153:	1	1	2	0	0	2	3	2
161:	2	5	1	0	2	1	3	4
169:	0	4	3	1	7	4	4	2
177:	3	5	4	7	3	7	2	1
185:	2	3	7	4	5	2	2	5
193:	7	7	4	5	9	4	6	5
201:	6	8	8	15	8	9	12	5
209:	11	11	16	17	12	17	15	10
217:	9	16	17	20	17	15	15	14
225:	11	19	19	19	21	22	18	20
233:	17	11	6	5	3	4	1	2
241:	1	0	1	1	1	2	1	0
249:	1	0	1	0	0	0	0	0
257:	0	0	0	3	1	2	1	0
265:	0	1	0	2	0	1	2	1
273:	0	0	0	0	0	0	0	1
281:	1	1	2	2	0	4	1	0
289:	1	0	1	0	0	2	2	1
297:	1	0	3	0	0	4	4	1
305:	1	2	1	0	0	1	0	2
313:	0	1	0	0	0	3	1	1
321:	1	0	0	1	1	1	2	1
329:	1	1	1	2	2	3	2	0
337:	0	0	1	2	2	2	1	0
345:	0	4	2	1	2	2	0	2
353:	0	3	0	2	2	1	2	3
361:	2	3	3	2	2	1	2	1

369: 3 4 2 2 3 2 7 2

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
377:	1	1	5	0	2	4	2	3
385:	6	2	1	4	3	3	5	8
393:	4	4	5	1	4	3	7	6
401:	7	8	4	7	7	5	8	12
409:	7	7	10	12	13	10	9	10
417:	13	7	11	13	13	6	14	16
425:	19	12	11	16	17	24	18	18
433:	18	19	18	16	15	19	5	7
441:	3	1	0	0	0	0	0	1
449:	1	1	0	0	1	0	0	0
457:	0	0	1	2	0	2	1	1
465:	0	0	0	0	0	3	0	1
473:	0	0	1	0	2	0	0	0
481:	1	1	1	2	1	0	0	1
489:	1	0	1	0	0	3	0	0
497:	1	0	0	0	0	0	0	0
505:	0	1	2	0	0	0	0	1
513:	0	1	1	0	0	0	0	0
521:	0	1	0	1	2	2	1	2
529:	1	0	0	1	1	2	1	0
537:	1	1	3	1	1	3	1	0
545:	0	0	1	1	2	2	0	1
553:	2	1	2	5	0	0	2	2
561:	0	1	0	2	2	3	1	2
569:	1	1	3	0	4	2	3	3
577:	1	1	2	2	4	3	5	0
585:	1	4	0	1	2	6	4	4
593:	4	6	5	4	1	4	6	1
601:	3	6	6	10	7	5	4	6
609:	12	9	9	4	7	7	7	13
617:	9	7	11	9	7	10	13	17
625:	12	10	12	14	13	11	10	6
633:	7	1	1	0	2	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	1	0	1	1
673:	0	1	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0 0

Sample Title: 01

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



Apex-Alpha™

2/14/13

Sample Description: BLANK
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 02
 Sample Geometry: Shelf 2
 Procedure Description: U 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: 8/14/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:26:35 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.607 mL
 Effective Efficiency: 0.2142 +/- 0.0116
 Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM
 Chem. Recovery Factor: 1.1605 +/- 0.0665

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	418.28	9.62	2.72	0.00E+000	11.6
U-234	4.735	25.15	39.85	0.85	0.00E+000	2.9
U-235	4.348	3.66	107.87	0.34	0.00E+000	2.9
U-238	4.124	5.15	94.34	0.85	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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

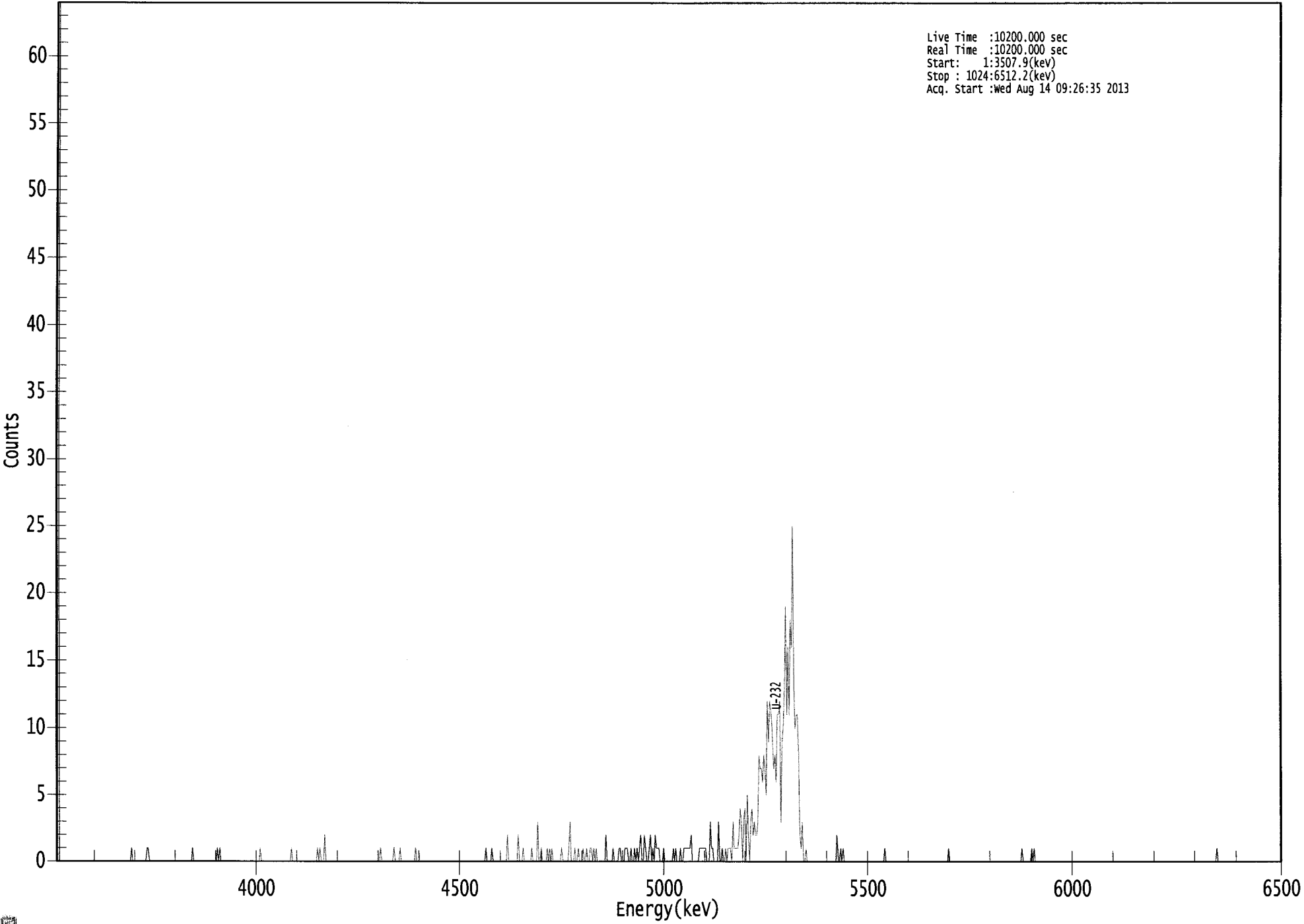
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.18E+000 +/- 5.51E-001	1.06E-001 +/- 1.13E-002
U-234	0.995	4761.50*	3.12E-001 +/- 1.29E-001	7.42E-002 +/- 7.89E-003
U-235	0.990	4385.50*	5.60E-002 +/- 6.07E-002	7.31E-002 +/- 7.77E-003
U-238	0.974	4184.40*	6.36E-002 +/- 6.03E-002	7.39E-002 +/- 7.85E-003

AG
 8/14/13

US EPA ARCHIVE DOCUMENT

000066137.CNF

Live Time :10200.000 sec
Real Time :10200.000 sec
Start: 1:3507.9(kev)
Stop : 1024:6512.2(kev)
Acq. Start :wed Aug 14 09:26:35 2013



ROI Type: 1

ROI Type: 3

0108

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

Sample Title: 02

Elapsed Live time: 10200

Elapsed Real Time: 10200

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10200	10200	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	0	0	0	0	0	0	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	1
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	1	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	1	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	1
137:	0	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	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	1	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	1	0	1	0	0
225:	0	2	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	1	0	0	0	0	0	0	0
281:	0	0	0	1	0	0	0	0
289:	1	0	0	0	0	0	0	0
297:	0	0	0	0	0	1	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	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:	1	0	0	0	0	1	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 02

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	2	0	0	0	0	0
385:	0	0	0	2	0	0	0	1
393:	0	0	0	0	0	0	1	0
401:	0	0	0	3	0	0	1	0
409:	0	0	0	1	0	1	0	1
417:	0	0	0	0	0	0	0	1
425:	0	0	0	0	0	1	3	0
433:	0	0	1	0	0	1	0	0
441:	0	1	0	0	1	0	0	1
449:	1	0	1	0	1	0	0	0
457:	0	0	0	0	2	0	0	0
465:	0	0	1	0	0	0	0	1
473:	1	0	0	0	1	1	1	0
481:	0	1	0	0	1	0	1	0
489:	1	2	0	0	2	1	0	0
497:	1	2	0	1	0	2	1	1
505:	1	0	0	0	1	0	0	0
513:	0	0	0	0	1	0	1	0
521:	0	0	1	0	0	1	1	1
529:	1	1	1	2	0	0	0	0
537:	0	0	1	1	1	1	1	1
545:	0	0	0	3	1	1	0	0
553:	0	0	3	0	0	1	0	0
561:	1	0	1	1	1	0	3	1
569:	1	1	1	2	4	3	0	3
577:	4	0	5	2	0	3	4	2
585:	3	2	2	3	8	7	7	6
593:	8	7	5	12	9	12	11	10
601:	7	8	6	11	11	12	3	9
609:	10	13	19	11	16	11	18	16
617:	25	13	10	11	11	8	2	1
625:	3	0	0	1	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	2	0	0
657:	1	0	1	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	1	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	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	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 1

Sample Title: 02

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



Apex-Alpha™

KCB
8/14/13

Sample Description: PZ-107-SS TOT-DUP
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 03
 Sample Geometry: Shelf 2
 Procedure Description: U 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: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:26:36 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.606 mL
 Effective Efficiency: 0.1407 +/- 0.0091
 Counting Efficiency: 0.1477 +/- 0.0027 on 7/20/2013 6:27:27 PM
 Chem. Recovery Factor: 0.9527 +/- 0.0639

Peak Match Tolerance: 0.150 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.283	274.66	11.84	0.34	0.00E+000	11.1
U-234	4.739	69.32	23.68	0.68	0.00E+000	4.0
U-235	4.396	11.00	61.72	0.00	0.00E+000	3.0
U-238	4.152	76.83	22.39	0.17	0.00E+000	8.2

T = Tracer Peak used for Effective Efficiency

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

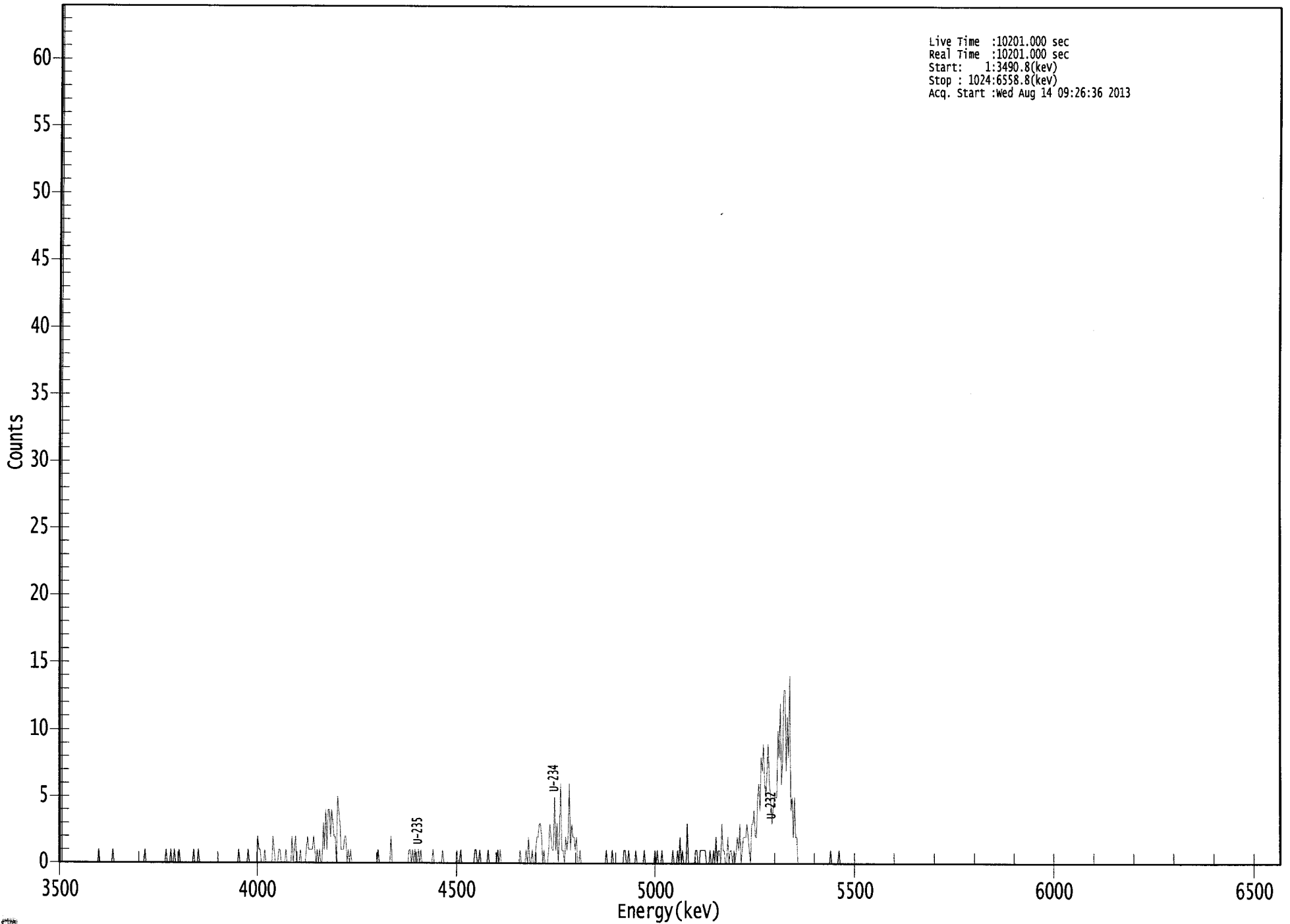
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.18E+000 +/- 6.57E-001	9.02E-002 +/- 1.14E-002
U-234	0.996	4761.50*	1.31E+000 +/- 3.51E-001	1.06E-001 +/- 1.35E-002
U-235	0.999	4385.50*	2.56E-001 +/- 1.61E-001	1.40E-001 +/- 1.77E-002
U-238	0.993	4184.40*	1.44E+000 +/- 3.71E-001	7.84E-002 +/- 9.93E-003

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066138.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3490.8(kev)
Stop : 1024:6558.8(kev)
Acq. Start :wed Aug 14 09:26:36 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: 03

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	1	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:	1	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	1	0	0	0	1	0
97:	0	1	0	0	0	1	0	0
105:	0	0	0	0	0	0	0	0
113:	0	1	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	1
153:	0	0	0	0	0	0	0	1
161:	0	0	0	0	0	0	0	2
169:	1	1	0	0	0	1	0	0
177:	0	0	0	0	2	1	0	0
185:	0	1	1	0	0	0	0	1
193:	0	0	0	0	2	0	1	2
201:	0	0	0	1	0	0	0	0
209:	1	2	1	1	1	1	2	1
217:	0	1	0	1	0	0	3	1
225:	4	1	4	4	2	4	3	2
233:	2	0	5	4	3	1	1	1
241:	2	2	0	1	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	2
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	1	1
297:	0	1	0	1	0	0	1	0
305:	1	0	0	0	0	0	0	0
313:	0	0	1	0	0	0	0	0
321:	0	0	1	0	0	0	0	0
329:	0	0	0	0	0	0	1	0
337:	0	1	0	0	0	0	0	0
345:	0	0	0	0	0	1	1	0
353:	0	1	0	0	0	0	0	0
361:	1	0	0	0	0	0	0	0

369: 1 0 1 0 0 0 0 0

Sample Title: 03

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

801: 0 0 0 0 0 0 0 0

Sample Title: 03

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

KCB
8/14/13

Apex-Alpha™

Sample Description: PZ-200-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 04
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_019
 Chamber Serial Number:
 Detector Serial Number: 19
 Env. Background: System Bkgd 64773
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:27:34 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.605 mL
 Effective Efficiency: 0.1734 +/- 0.0103
 Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM
 Chem. Recovery Factor: 1.0450 +/- 0.0645

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 5.248	337.66	10.67	0.34	0.00E+000	37.7
U-234	4.723	63.00	24.89	0.00	0.00E+000	7.1
U-235	4.415	9.00	68.87	0.00	0.00E+000	3.3
U-238	4.143	52.49	27.21	0.51	0.00E+000	4.9

T = Tracer Peak used for Effective Efficiency

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

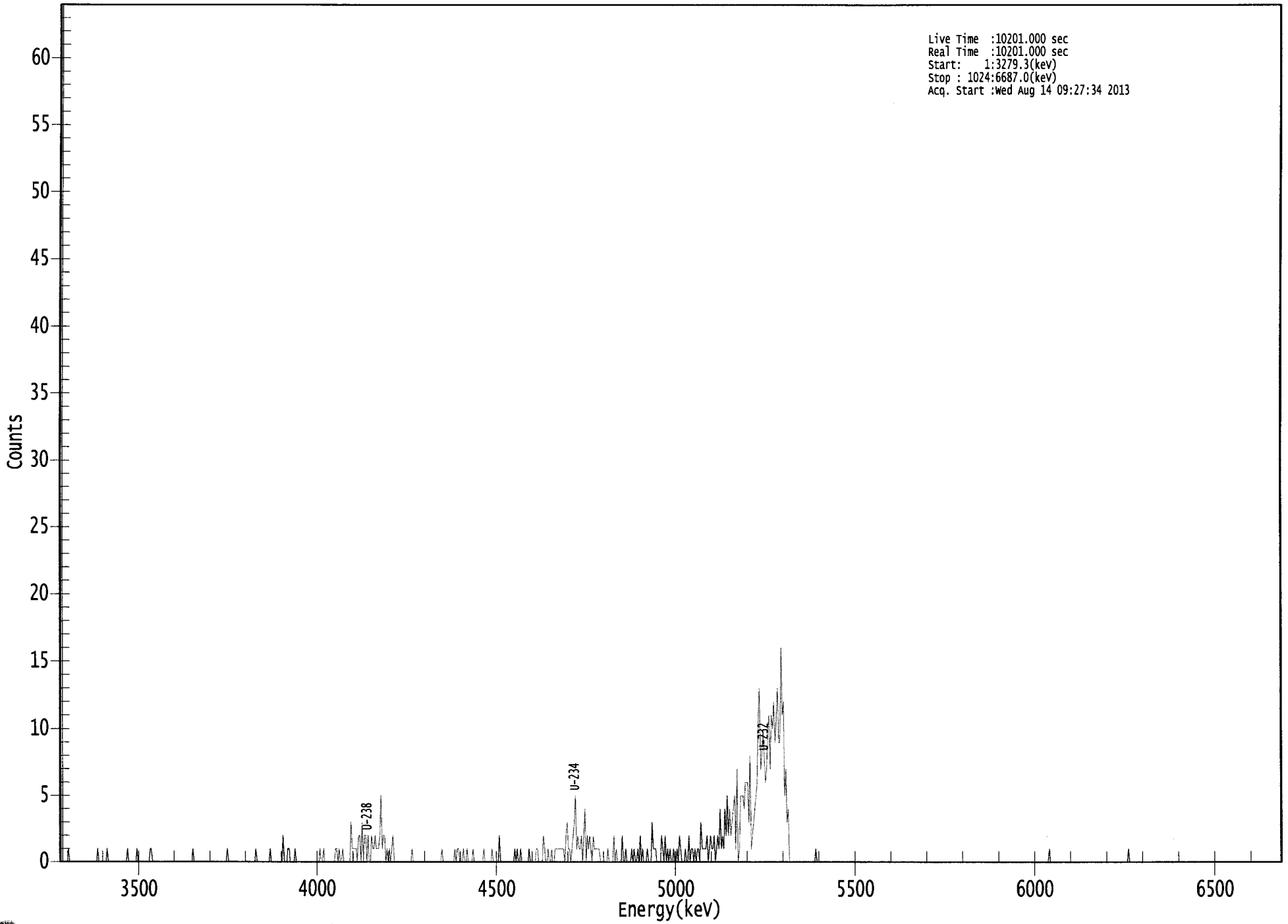
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.979	5302.50*	5.17E+000 +/- 5.99E-001	7.33E-002 +/- 8.49E-003
U-234	0.990	4761.50*	9.65E-001 +/- 2.65E-001	9.18E-002 +/- 1.06E-002
U-235	0.994	4385.50*	1.70E-001 +/- 1.19E-001	1.13E-001 +/- 1.31E-002
U-238	0.988	4184.40*	8.00E-001 +/- 2.37E-001	8.00E-002 +/- 9.27E-003

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066139.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3279.3(kev)
Stop : 1024:6687.0(kev)
Acq. Start :wed Aug 14 09:27:34 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: 10201

Elapsed Real Time: 10201

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	10201	10201	0	0	0	0	0	1
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0	0
33:	1	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	1	0	0	0	0	0	0
65:	0	1	0	0	0	0	0	0
73:	0	0	0	0	1	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:	1	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	1	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	1	0	0
169:	0	0	0	0	0	0	0	0
177:	0	1	0	0	0	0	0	0
185:	0	0	0	0	2	0	0	0
193:	1	1	0	0	0	0	1	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	1	0	0	1	0
225:	0	0	0	0	0	0	0	0
233:	1	1	0	1	0	0	1	0
241:	0	0	0	0	0	3	1	1
249:	1	1	0	2	2	0	3	0
257:	2	2	0	2	0	0	2	1
265:	1	2	1	1	1	2	5	1
273:	2	2	0	1	0	1	0	1
281:	2	0	0	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	1	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	1	0	0	0	0	0	0
329:	0	0	0	0	1	0	1	1
337:	0	0	0	1	0	0	1	0
345:	0	0	0	1	0	0	0	0
353:	0	0	0	0	1	0	0	0
361:	0	0	0	1	0	0	0	0

369: 0 2 0 0 0 0 0 0

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	1	0
385:	1	0	0	1	0	0	0	0
393:	0	0	1	0	0	0	0	0
401:	1	1	0	0	0	0	2	1
409:	0	0	1	0	0	1	0	0
417:	1	1	1	1	1	1	1	1
425:	0	2	3	1	1	0	1	2
433:	3	5	1	2	1	1	2	0
441:	2	4	0	2	1	2	1	0
449:	2	1	1	1	1	1	0	0
457:	0	0	0	0	1	0	0	0
465:	0	2	0	1	0	0	0	0
473:	2	0	0	1	0	0	0	0
481:	1	0	1	0	0	1	0	2
489:	0	1	0	0	0	1	0	0
497:	0	3	1	1	1	0	0	0
505:	0	2	1	0	2	0	1	0
513:	1	0	0	1	0	0	1	0
521:	2	1	0	0	0	1	0	0
529:	2	0	1	1	0	1	0	1
537:	1	0	3	1	1	1	1	2
545:	0	1	2	1	1	2	0	1
553:	2	1	4	1	2	1	4	2
561:	5	2	4	2	3	4	5	1
569:	7	0	1	5	5	5	4	6
577:	6	6	3	8	1	2	3	4
585:	5	6	11	13	7	8	10	8
593:	6	7	10	11	7	11	10	12
601:	9	11	13	9	9	16	11	12
609:	5	7	3	4	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	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: 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	1	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	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



KCS
8/14/13

Sample Description: PZ-200-SS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 05
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_022
 Chamber Serial Number:
 Detector Serial Number: 22
 Env. Background: System Bkgd 64774
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:27:34 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.604 mL
 Effective Efficiency: 0.1847 +/- 0.0107
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM
 Chem. Recovery Factor: 1.2062 +/- 0.0733

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	5.290	359.13	10.37	1.87	0.00E+000	31.2
U-234	4.716	33.81	34.40	1.19	0.00E+000	4.7
U-235	4.382	3.47	129.55	1.53	0.00E+000	3.1
U-238	4.154	28.83	36.63	0.17	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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

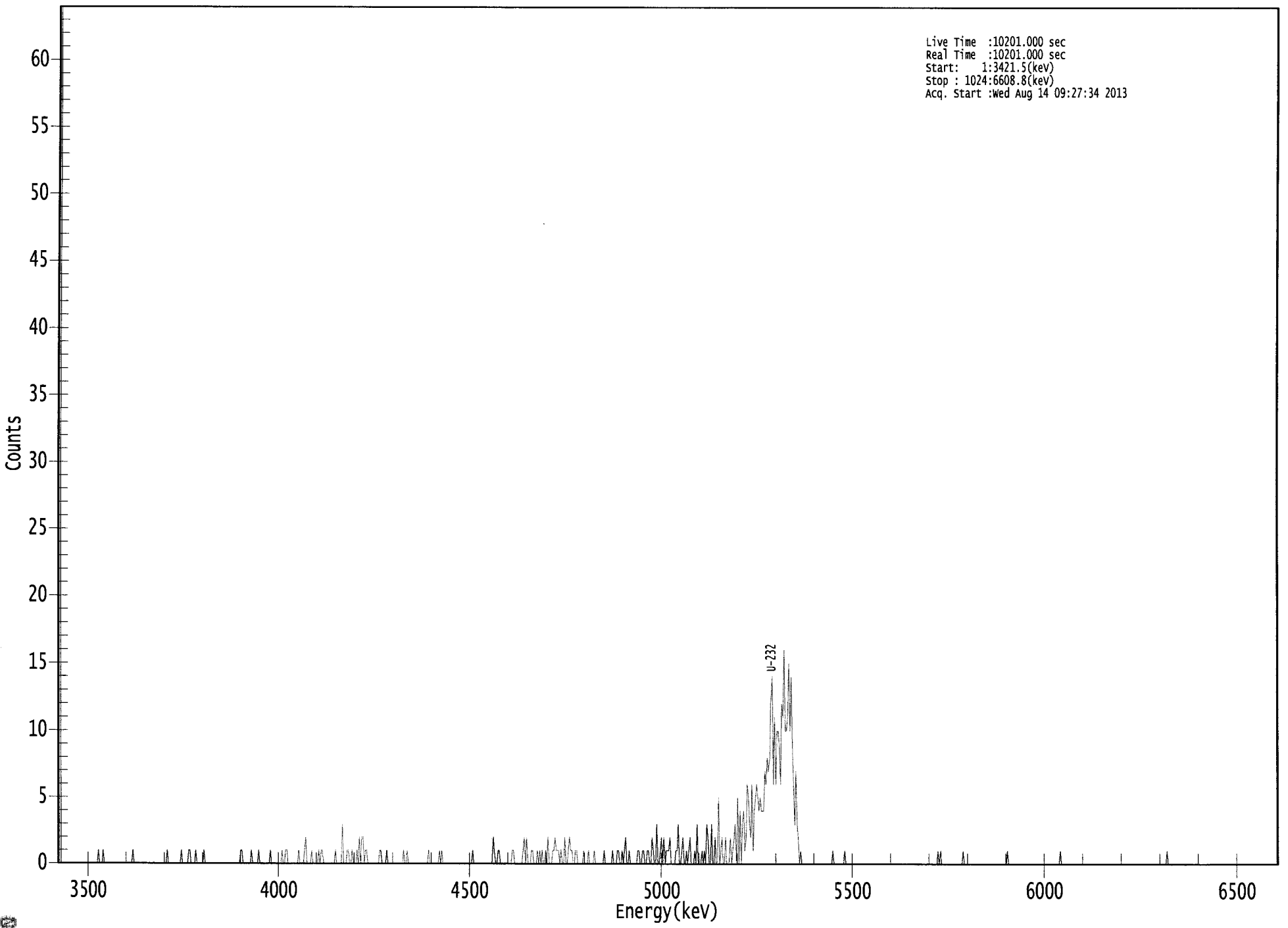
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.999	5302.50*	5.16E+000 +/- 5.84E-001	1.09E-001 +/- 1.23E-002
U-234	0.985	4761.50*	4.86E-001 +/- 1.76E-001	9.47E-002 +/- 1.07E-002
U-235	1.000	4385.50*	6.15E-002 +/- 8.00E-002	1.26E-001 +/- 1.43E-002
U-238	0.994	4184.40*	4.13E-001 +/- 1.58E-001	5.97E-002 +/- 6.76E-003

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066140.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3421.5(keV)
Stop : 1024:6608.8(keV)
Acq. Start :wed Aug 14 09:27:34 2013



ROI Type: 1

ROI Type: 3

0123

 ***** 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	1	0	0	0	1	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	1
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	1	0	0	0
97:	0	0	0	0	0	0	0	0
105:	1	0	0	0	0	0	1	1
113:	0	0	0	0	1	0	0	0
121:	0	0	0	1	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	1	1	0	0	0	0
161:	0	0	0	1	0	0	0	0
169:	0	1	0	0	0	0	0	0
177:	0	0	0	1	0	0	0	0
185:	0	0	0	0	0	1	0	0
193:	1	1	0	0	0	0	0	0
201:	0	0	0	1	0	0	0	0
209:	1	2	0	0	0	0	1	0
217:	0	0	0	0	1	0	1	1
225:	0	0	0	0	0	0	0	0
233:	0	0	1	0	0	0	0	0
241:	3	0	0	0	1	1	0	0
249:	1	0	0	0	1	0	2	0
257:	2	2	0	1	1	0	0	0
265:	0	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	1	0	0	1	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	1	0	1	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	1	0	0
353:	0	0	0	0	0	0	0	0
361:	0	0	0	0	0	0	2	1

369: 0 0 1 1 0 0 0 0

Sample Title: 05

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

801: 0 0 0 0 0 0 0 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	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	1	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



105
8/14/13

Sample Description: PZ-102-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 06
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_023
 Chamber Serial Number:
 Detector Serial Number: 23
 Env. Background: System Bkgd 64775
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:27:35 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.602 mL
 Effective Efficiency: 0.1759 +/- 0.0104
 Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM
 Chem. Recovery Factor: 1.0286 +/- 0.0632

Peak Match Tolerance: 0.150 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.283	340.83	10.62	0.17	0.00E+000	10.8
U-234	4.736	309.49	11.15	0.51	0.00E+000	4.5
U-235	4.393	34.32	33.84	0.68	0.00E+000	4.7
U-238	4.162	294.98	11.44	1.02	0.00E+000	20.9

T = Tracer Peak used for Effective Efficiency

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

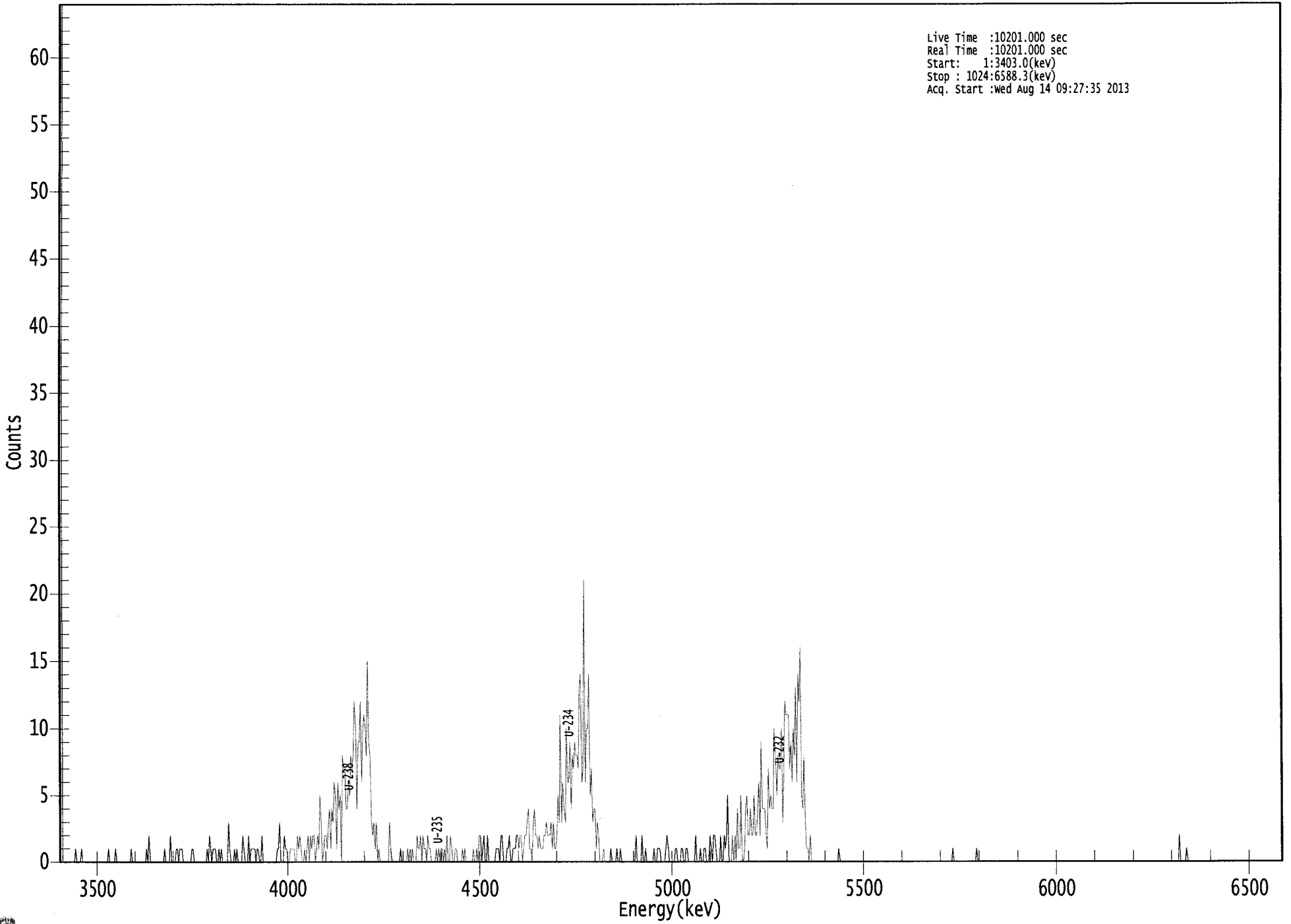
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.997	5302.50*	5.15E+000 +/- 5.94E-001	6.30E-002 +/- 7.27E-003
U-234	0.995	4761.50*	4.67E+000 +/- 7.50E-001	7.92E-002 +/- 9.14E-003
U-235	1.000	4385.50*	6.39E-001 +/- 2.28E-001	1.05E-001 +/- 1.21E-002
U-238	0.996	4184.40*	4.43E+000 +/- 7.20E-001	9.47E-002 +/- 1.09E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066141.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3403.0(keV)
Stop : 1024:6588.3(keV)
Acq. Start :wed Aug 14 09:27:35 2013



ROI Type: 1

ROI Type: 3

0128

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

Sample Title: 06

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 1 0 2 2 0 0 0 1

Sample Title: 06

Channel	1	2	3	4	5	6	7	8
377:	1	2	0	0	1	1	1	2
385:	2	1	2	2	0	1	2	2
393:	3	4	1	1	0	3	4	2
401:	2	1	2	1	1	1	2	2
409:	3	2	2	2	3	1	3	1
417:	1	2	5	3	11	3	6	4
425:	3	10	6	6	9	4	8	7
433:	9	8	8	7	13	14	6	7
441:	21	6	10	10	14	5	7	3
449:	4	4	1	3	2	0	0	0
457:	1	0	0	0	0	0	1	0
465:	0	0	0	1	0	0	1	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	2	0	0	0	0
489:	2	0	0	1	0	0	0	0
497:	0	0	1	0	0	1	1	1
505:	0	0	0	0	1	2	1	0
513:	0	0	0	0	1	1	0	0
521:	0	1	1	0	0	1	1	0
529:	0	0	0	0	0	2	0	0
537:	0	1	0	0	1	1	0	0
545:	0	2	1	0	2	2	1	0
553:	0	0	2	0	0	2	1	2
561:	5	0	0	0	2	0	2	0
569:	4	1	1	5	0	0	1	4
577:	5	2	2	4	2	2	5	2
585:	2	4	6	2	9	4	4	4
593:	2	1	7	4	5	4	4	10
601:	8	5	8	7	7	10	3	7
609:	12	11	11	11	7	9	6	10
617:	8	13	6	14	12	16	5	4
625:	8	3	1	1	0	2	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	1	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	1	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	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: 06

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



Apex-Alpha™

108
8/14/13

Sample Description: PZ-102-SS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 07
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_024
 Chamber Serial Number:
 Detector Serial Number: 24
 Env. Background: System Bkgd 64776
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:27:36 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: 0.1778 +/- 0.0104
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM
 Chem. Recovery Factor: 1.0398 +/- 0.0640

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 5.269	344.81	10.58	1.19	0.00E+000	31.9
U-234	4.719	391.32	9.92	0.68	0.00E+000	6.9
U-235	4.408	52.98	27.23	1.02	0.00E+000	3.1
U-238	4.136	259.32	12.19	0.68	0.00E+000	5.1

T = Tracer Peak used for Effective Efficiency

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

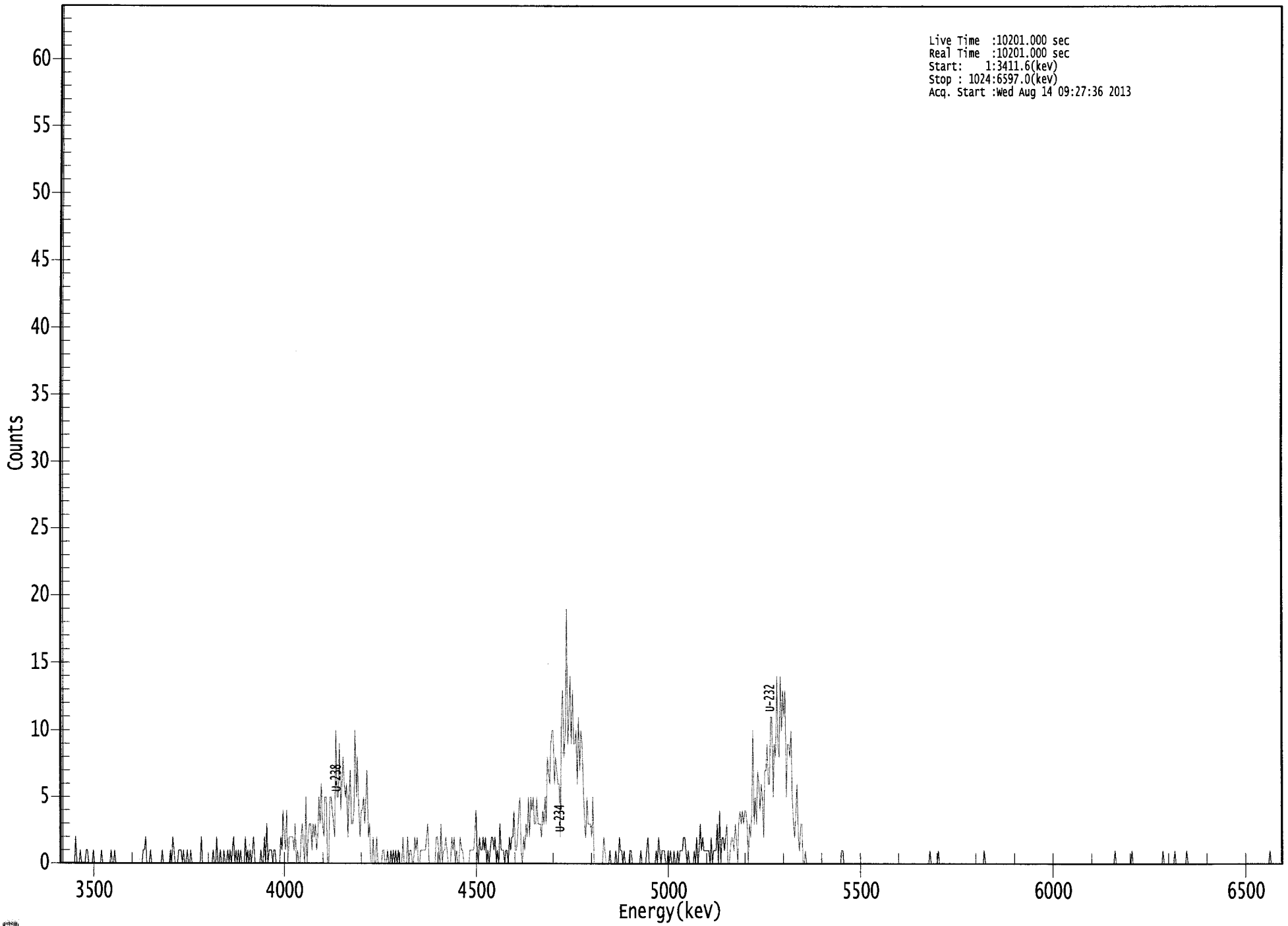
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.992	5302.50*	5.15E+000 +/- 5.92E-001	9.84E-002 +/- 1.13E-002
U-234	0.987	4761.50*	5.84E+000 +/- 8.87E-001	8.42E-002 +/- 9.68E-003
U-235	0.996	4385.50*	9.76E-001 +/- 2.88E-001	1.16E-001 +/- 1.33E-002
U-238	0.983	4184.40*	3.85E+000 +/- 6.46E-001	8.38E-002 +/- 9.64E-003

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066142.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3411.6(kev)
Stop : 1024:6597.0(kev)
Acq. Start :Wed Aug 14 09:27:36 2013



ROI Type: 1

ROI Type: 3

0133

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

Sample Title: 07

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 3 1 1 1 0 1 1

Sample Title: 07

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

801: 0 0 0 0 0 0 0 0

Sample Title: 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	1	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	1	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	1	0	0	0	0
929:	0	0	0	0	0	1	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:	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	1	0	0	0
1017:	0	0	0	0	0	0	0	0



KLS
8/14/13

Sample Description: PZ-107-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 08
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_025
 Chamber Serial Number:
 Detector Serial Number: 25
 Env. Background: System Bkgd 64777
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:27:37 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.603 mL
 Effective Efficiency: 0.1822 +/- 0.0106
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM
 Chem. Recovery Factor: 1.0499 +/- 0.0640

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 5.260	353.32	10.44	0.68	0.00E+000	4.4
U-234	4.708	112.98	18.54	1.02	0.00E+000	8.2
U-235	4.397	10.00	65.01	0.00	0.00E+000	3.1
U-238	4.140	97.83	19.84	0.17	0.00E+000	4.4

T = Tracer Peak used for Effective Efficiency

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

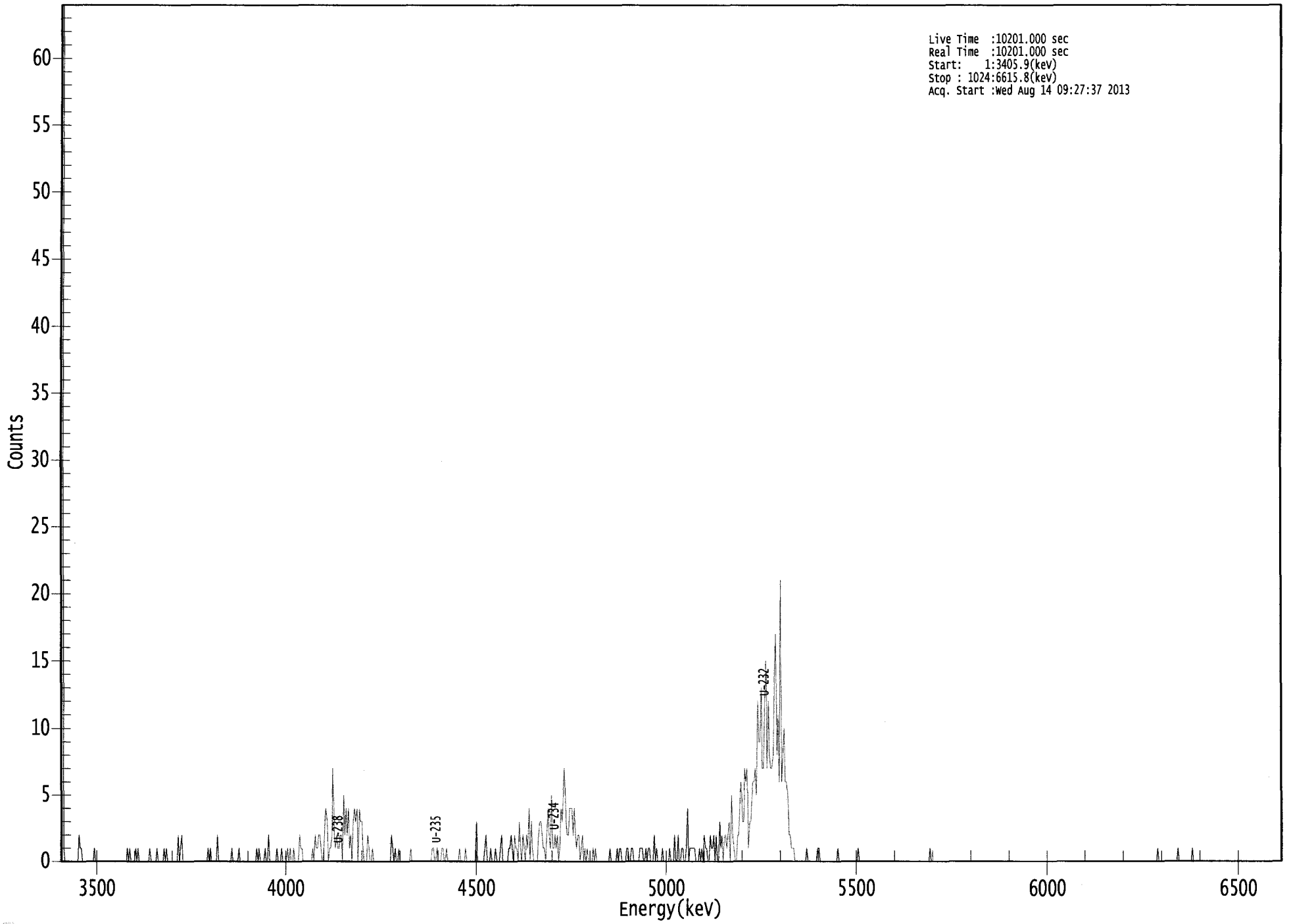
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.987	5302.50*	5.15E+000 +/- 5.86E-001	8.22E-002 +/- 9.35E-003
U-234	0.980	4761.50*	1.65E+000 +/- 3.58E-001	9.18E-002 +/- 1.04E-002
U-235	0.999	4385.50*	1.80E-001 +/- 1.19E-001	1.08E-001 +/- 1.23E-002
U-238	0.986	4184.40*	1.42E+000 +/- 3.24E-001	6.05E-002 +/- 6.88E-003

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066144.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3405.9(keV)
Stop : 1024:6615.8(keV)
Acq. Start :wed Aug 14 09:27:37 2013



ROI Type: 1

ROI Type: 3

0138

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

Sample Title: 08

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 1 2 0 0 0 0 0

Sample Title: 08

Channel	1	2	3	4	5	6	7	8
377:	1	1	2	1	0	2	1	1
385:	0	3	1	0	2	1	0	2
393:	1	4	0	3	1	0	0	0
401:	0	2	3	3	2	1	1	0
409:	2	4	2	1	5	1	1	2
417:	1	2	0	1	4	3	5	7
425:	3	2	2	4	4	4	2	4
433:	2	1	2	2	0	1	2	0
441:	1	0	1	0	0	0	0	1
449:	0	1	0	0	0	0	0	0
457:	0	0	0	0	0	1	0	0
465:	0	0	0	1	0	1	1	0
473:	0	0	0	1	1	0	0	1
481:	1	0	0	0	0	0	1	1
489:	1	0	0	1	0	1	1	0
497:	0	0	2	0	1	0	0	0
505:	0	1	0	0	0	0	0	1
513:	0	0	0	2	0	0	2	0
521:	0	1	1	0	0	1	4	0
529:	1	1	1	1	1	0	0	0
537:	1	0	1	0	2	1	1	0
545:	0	2	1	1	2	0	2	0
553:	0	3	1	2	0	2	2	1
561:	2	3	0	5	2	1	0	0
569:	2	2	5	6	3	3	7	6
577:	7	1	3	3	5	6	6	7
585:	5	12	9	9	13	7	7	12
593:	15	7	12	8	7	7	8	13
601:	17	8	11	6	21	6	8	10
609:	6	6	5	2	2	1	1	1
617:	0	0	0	0	0	0	0	0
625:	0	0	1	0	0	0	0	0
633:	0	0	0	1	1	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	1	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	1	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	1	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
817:	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	1
921:	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0
937:	1	0	0	0	0	0	0
945:	0	0	0	0	1	0	0
953:	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0



Apex-Alpha™

105
3/14/13

Sample Description: PZ-107-SS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 09
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_027
 Chamber Serial Number:
 Detector Serial Number: 27
 Env. Background: System Bkgd 64778
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:27:38 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.606 mL
 Effective Efficiency: 0.0863 +/- 0.0070
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM
 Chem. Recovery Factor: 0.4993 +/- 0.0414

Peak Match Tolerance: 0.150 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232 T	5.270	168.15	15.16	0.85	0.00E+000	4.9
U-234	4.710	59.98	25.56	1.02	0.00E+000	11.1
U-235	4.413	4.32	102.62	0.68	0.00E+000	3.2
U-238	4.147	27.15	38.30	0.85	0.00E+000	4.0

T = Tracer Peak used for Effective Efficiency

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

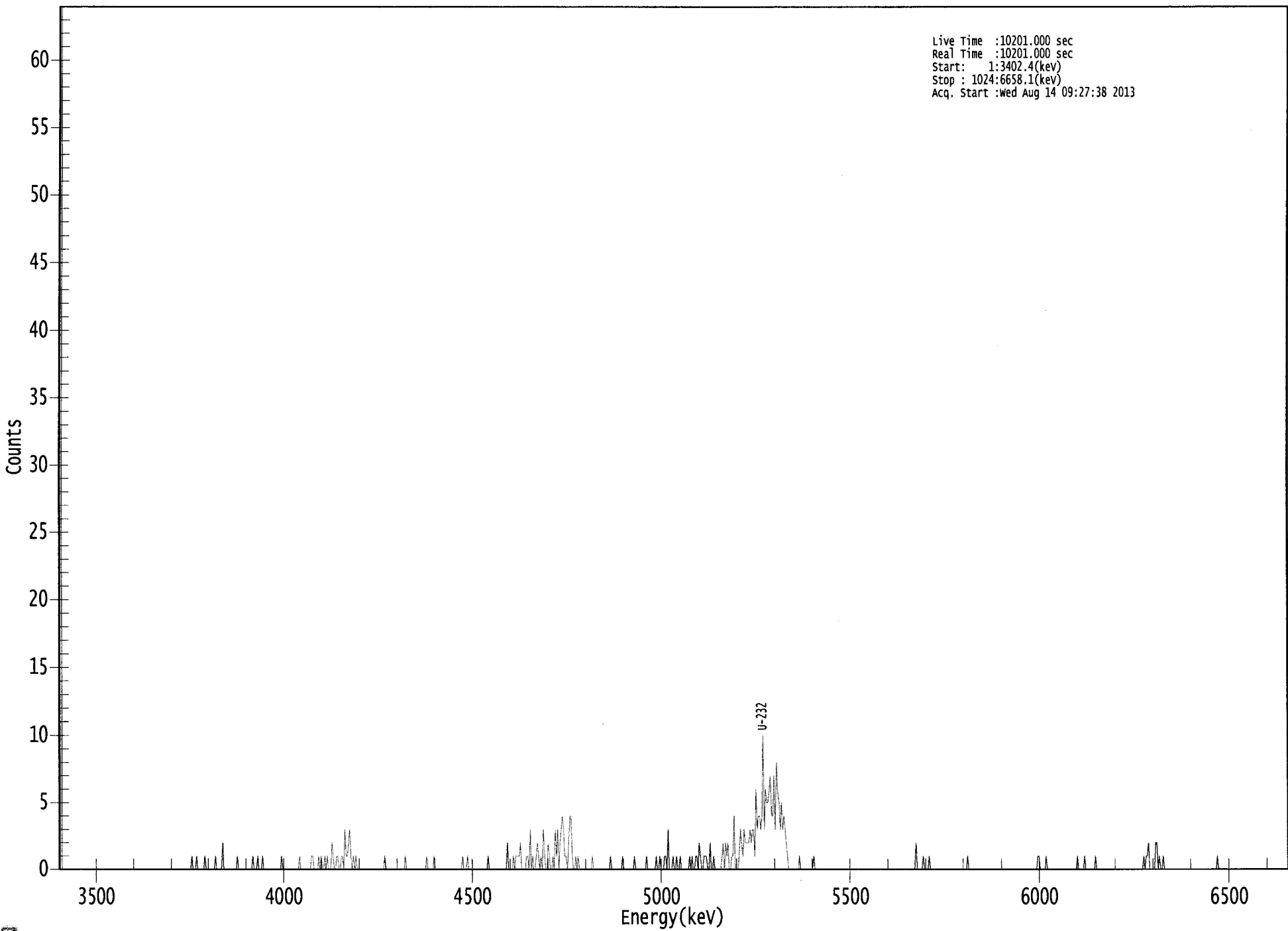
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.993	5302.50*	5.18E+000 +/- 8.19E-001	1.84E-001 +/- 2.92E-002
U-234	0.982	4761.50*	1.85E+000 +/- 5.55E-001	1.94E-001 +/- 3.07E-002
U-235	0.995	4385.50*	1.64E-001 +/- 1.70E-001	2.14E-001 +/- 3.39E-002
U-238	0.990	4184.40*	8.32E-001 +/- 3.45E-001	1.83E-001 +/- 2.90E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066143.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3402.4(keV)
Stop : 1024:6658.1(keV)
Acq. Start :wed Aug 14 09:27:38 2013



ROI Type: 1

ROI Type: 3

0143

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

Sample Title: 09

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	1
113:	0	0	0	1	0	0	0	0
121:	0	0	1	0	0	0	0	0
129:	0	0	0	1	0	0	0	0
137:	0	2	0	0	0	0	0	0
145:	0	0	0	0	0	1	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	1	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	1	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	1	0	0	0	0	0	0
209:	0	0	0	1	1	0	0	0
217:	0	1	0	1	0	0	1	0
225:	1	0	0	0	2	1	0	0
233:	1	1	0	0	1	1	0	3
241:	1	1	2	3	1	0	1	0
249:	1	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	1	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	0	0
305:	0	0	0	1	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	0	0	0	0
337:	0	1	0	0	0	1	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	1	0
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 2 0

Sample Title: 09

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	0	1
817:	1	0	0	0	0	0	1	0
825:	0	0	0	0	0	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	1	0	0	0	0	0	1	0
857:	0	0	0	0	0	0	0	1
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	1
905:	0	1	1	2	0	0	0	0
913:	0	2	2	0	1	0	0	1
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	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KS
8/14/13

Apex-Alpha™

Sample Description: PZ-106-KS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
Batch Identification: 1307154A-UU
Sample Identification: 10
Sample Geometry: Shelf 2
Procedure Description: U iso

Detector Name: Alpha_029
Chamber Serial Number:
Detector Serial Number: 29
Env. Background: System Bkgd 64779
Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
Sample Date/Time: 7/19/2013 7:26:18 AM
Acquisition Date/Time: 8/14/2013 9:27:39 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
Tracer Quantity: 0.600 mL
Effective Efficiency: 0.1660 +/- 0.0100
Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM
Chem. Recovery Factor: 0.8534 +/- 0.0540

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 5.274	320.64	10.97	1.36	0.00E+000	11.8
U-234	4.724	127.32	17.42	0.68	0.00E+000	4.0
U-235	4.409	15.49	50.75	0.51	0.00E+000	3.1
U-238	4.147	58.49	25.76	0.51	0.00E+000	4.1

T = Tracer Peak used for Effective Efficiency

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

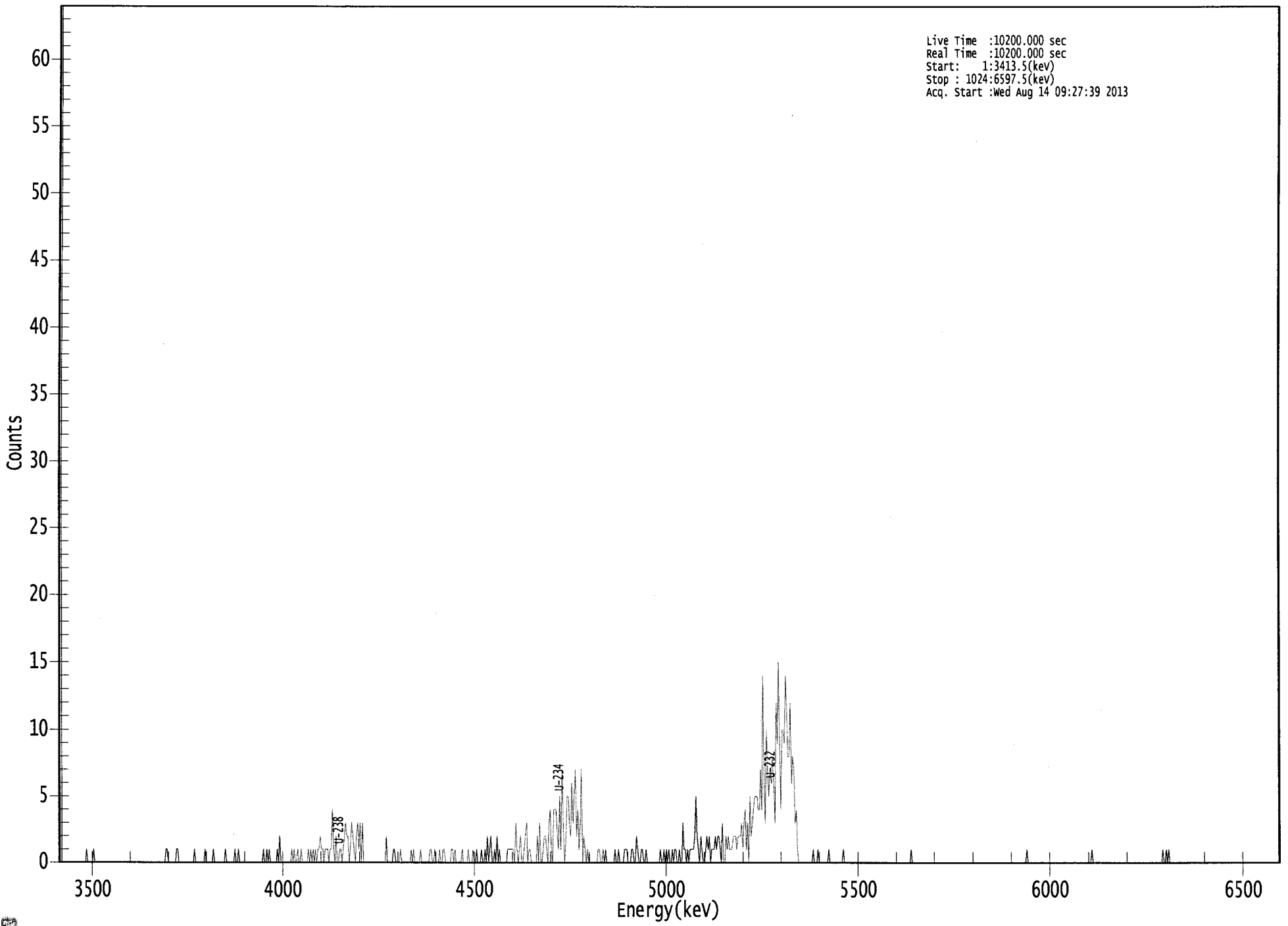
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.994	5302.50*	5.13E+000 +/- 6.09E-001	1.10E-001 +/- 1.30E-002
U-234	0.990	4761.50*	2.04E+000 +/- 4.29E-001	9.02E-002 +/- 1.07E-002
U-235	0.996	4385.50*	3.06E-001 +/- 1.59E-001	1.04E-001 +/- 1.23E-002
U-238	0.990	4184.40*	9.31E-001 +/- 2.64E-001	8.36E-002 +/- 9.91E-003

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066145.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 14 09:27:39 2013



ROI Type: 1

ROI Type: 3

0148

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

369: 2 0 1 0 0 0 0 0

Sample Title: 10

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 10

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



UCS
8/14/13

Sample Description: PZ-106-KS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 11
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_031
 Chamber Serial Number:
 Detector Serial Number: 31
 Env. Background: System Bkgd 64780
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:27:40 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.606 mL
 Effective Efficiency: 0.1146 +/- 0.0081
 Counting Efficiency: 0.1418 +/- 0.0034 on 6/13/2013 3:23:29 PM
 Chem. Recovery Factor: 0.8080 +/- 0.0605

Peak Match Tolerance: 0.150 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.265	223.32	13.14	0.68	0.00E+000	13.3
U-234	4.715	87.15	21.11	0.85	0.00E+000	4.2
U-235	4.414	7.66	72.63	0.34	0.00E+000	3.1
U-238	4.153	33.77	35.57	3.23	0.00E+000	7.1

T = Tracer Peak used for Effective Efficiency

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

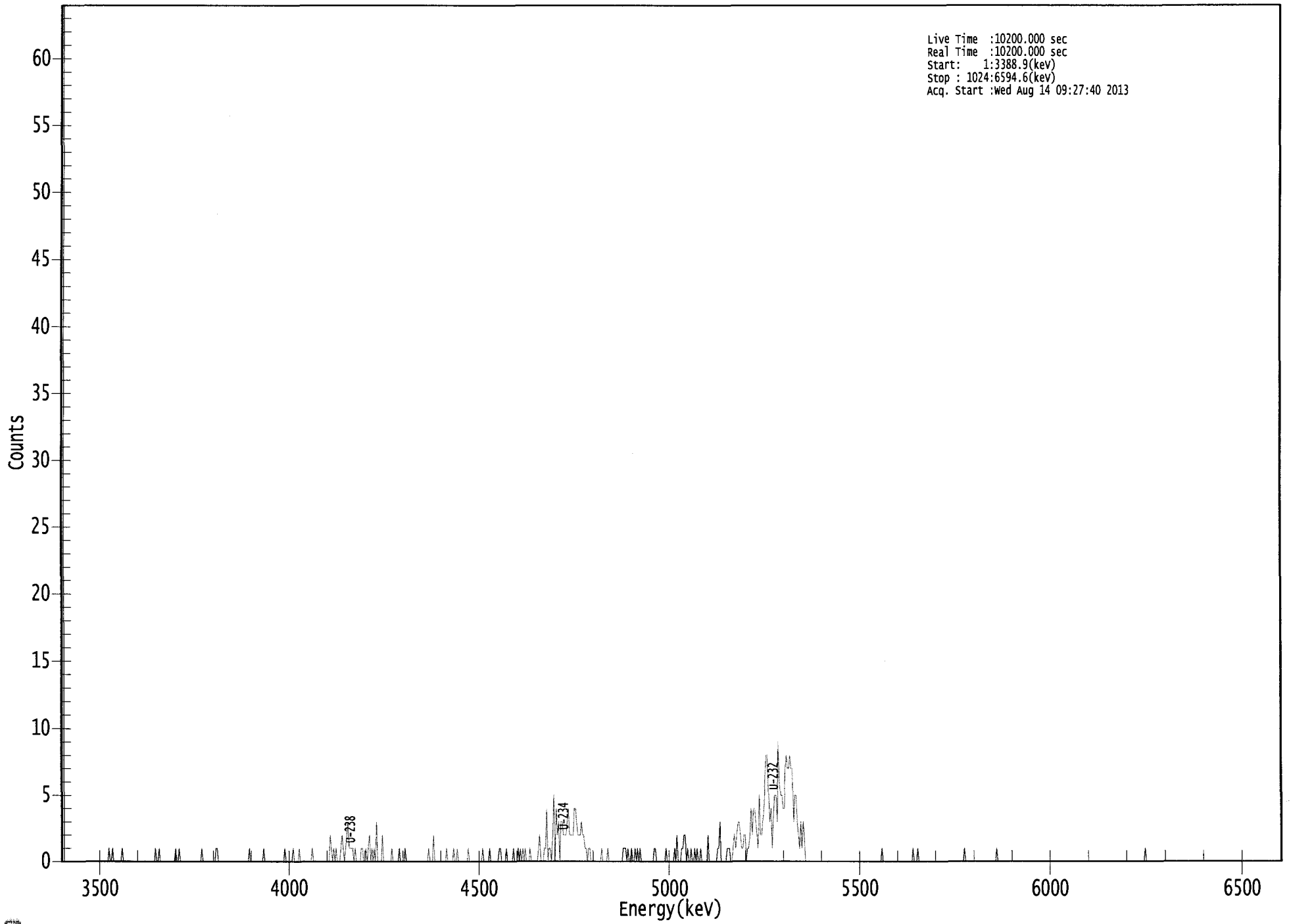
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.990	5302.50*	5.18E+000 +/- 7.19E-001	1.31E-001 +/- 1.82E-002
U-234	0.985	4761.50*	2.02E+000 +/- 5.10E-001	1.39E-001 +/- 1.93E-002
U-235	0.994	4385.50*	2.19E-001 +/- 1.62E-001	1.37E-001 +/- 1.90E-002
U-238	0.993	4184.40*	7.79E-001 +/- 2.97E-001	2.10E-001 +/- 2.92E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066146.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 14 09:27:40 2013



ROI Type: 1

ROI Type: 3

0153

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

369: 1 1 0 0 0 0 1 0

Sample Title: 11

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

165
8/14/13

Sample Description: DUP 08 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 12
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_033
 Chamber Serial Number: 04026479A
 Detector Serial Number: 91132
 Env. Background: System Bkgd 64781
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:28:09 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.605 mL
 Effective Efficiency: 0.0713 +/- 0.0063
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM
 Chem. Recovery Factor: 0.3859 +/- 0.0346

Peak Match Tolerance: 0.150 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
U-232	T 5.275	138.83	16.65	0.17	0.00E+000	10.1
U-234	4.738	46.83	28.70	0.17	0.00E+000	5.0
U-235	4.433	6.66	78.18	0.34	0.00E+000	3.0
U-238	4.158	40.66	30.89	0.34	0.00E+000	7.5

T = Tracer Peak used for Effective Efficiency

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

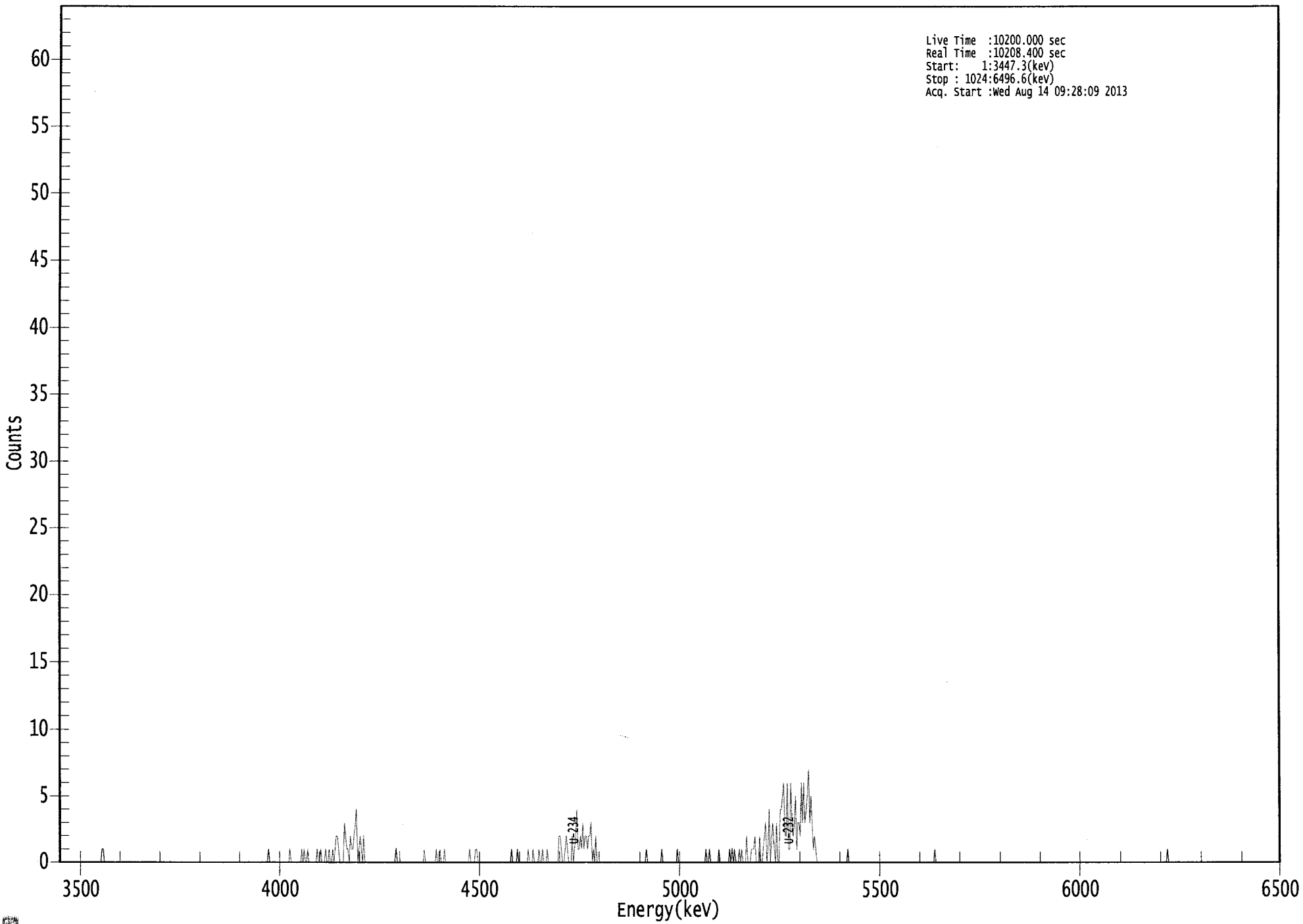
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.995	5302.50*	5.17E+000 +/- 8.92E-001	1.55E-001 +/- 2.68E-002
U-234	0.996	4761.50*	1.74E+000 +/- 5.84E-001	1.55E-001 +/- 2.68E-002
U-235	0.984	4385.50*	3.06E-001 +/- 2.45E-001	2.20E-001 +/- 3.79E-002
U-238	0.995	4184.40*	1.51E+000 +/- 5.33E-001	1.77E-001 +/- 3.06E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066148.CNF

Live Time :10200.000 sec
Real Time :10208.400 sec
Start: 1:3447.3(kev)
stop : 1024:6496.6(kev)
Acq. Start :Wed Aug 14 09:28:09 2013



ROI Type: 1

ROI Type: 3

0810

 ***** 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: 10208

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	1	0	0
41:	0	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	1	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	1	0	0	0	0	0
201:	0	0	0	0	1	0	1	0
209:	0	1	0	0	0	0	0	0
217:	0	1	0	0	1	0	0	0
225:	1	0	0	1	0	0	1	0
233:	1	2	2	1	0	0	0	0
241:	3	2	1	1	0	2	1	1
249:	2	3	4	0	1	2	1	0
257:	2	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	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	1	0	0	0	0
313:	0	0	0	0	0	1	0	0
321:	1	0	0	0	1	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	1	0	0	0	0	1	1
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: 12

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	1	0	0	0
385:	0	1	0	0	0	0	0	0
393:	0	0	1	0	0	0	1	0
401:	0	0	0	1	0	0	1	0
409:	0	0	1	0	0	0	0	0
417:	0	0	0	0	2	2	1	0
425:	0	1	2	1	0	0	0	2
433:	0	1	2	4	1	1	2	1
441:	3	1	2	2	1	2	2	3
449:	0	1	0	2	0	0	0	0
457:	0	0	0	0	0	0	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	0	0	0
481:	0	0	0	0	0	0	0	0
489:	0	0	0	0	0	1	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	1	0	0	0	0	0
513:	0	0	0	0	0	0	0	1
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	1
545:	0	0	1	0	0	0	0	0
553:	0	0	1	0	0	0	0	0
561:	0	0	0	1	0	1	0	1
569:	0	0	0	1	0	1	0	0
577:	0	2	0	0	0	1	1	1
585:	2	0	0	0	2	0	0	1
593:	2	3	0	1	4	0	2	3
601:	1	0	3	0	0	4	4	5
609:	6	2	2	6	1	1	6	3
617:	2	3	5	1	3	3	2	6
625:	3	6	3	4	5	7	3	5
633:	3	1	2	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	1	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	1
737:	0	0	0	0	0	0	0	0
745:	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: 12

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

KAS
8/14/13

Apex-Alpha™

Sample Description: DUP 08 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-UU
 Sample Identification: 13
 Sample Geometry: Shelf 2
 Procedure Description: U iso

Detector Name: Alpha_034
 Chamber Serial Number: 04026479B
 Detector Serial Number: 91136
 Env. Background: System Bkgd 64782
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:26:18 AM
 Acquisition Date/Time: 8/14/2013 9:28:10 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: U232_UU-10A
 Tracer Quantity: 0.604 mL
 Effective Efficiency: 0.1096 +/- 0.0079
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
 Chem. Recovery Factor: 0.5906 +/- 0.0440

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	213.00	13.46	0.00	0.00E+000	5.4
U-234	4.725	65.00	24.50	0.00	0.00E+000	4.8
U-235	4.448	8.00	73.50	0.00	0.00E+000	3.0
U-238	4.135	38.66	31.68	0.34	0.00E+000	3.7

T = Tracer Peak used for Effective Efficiency

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

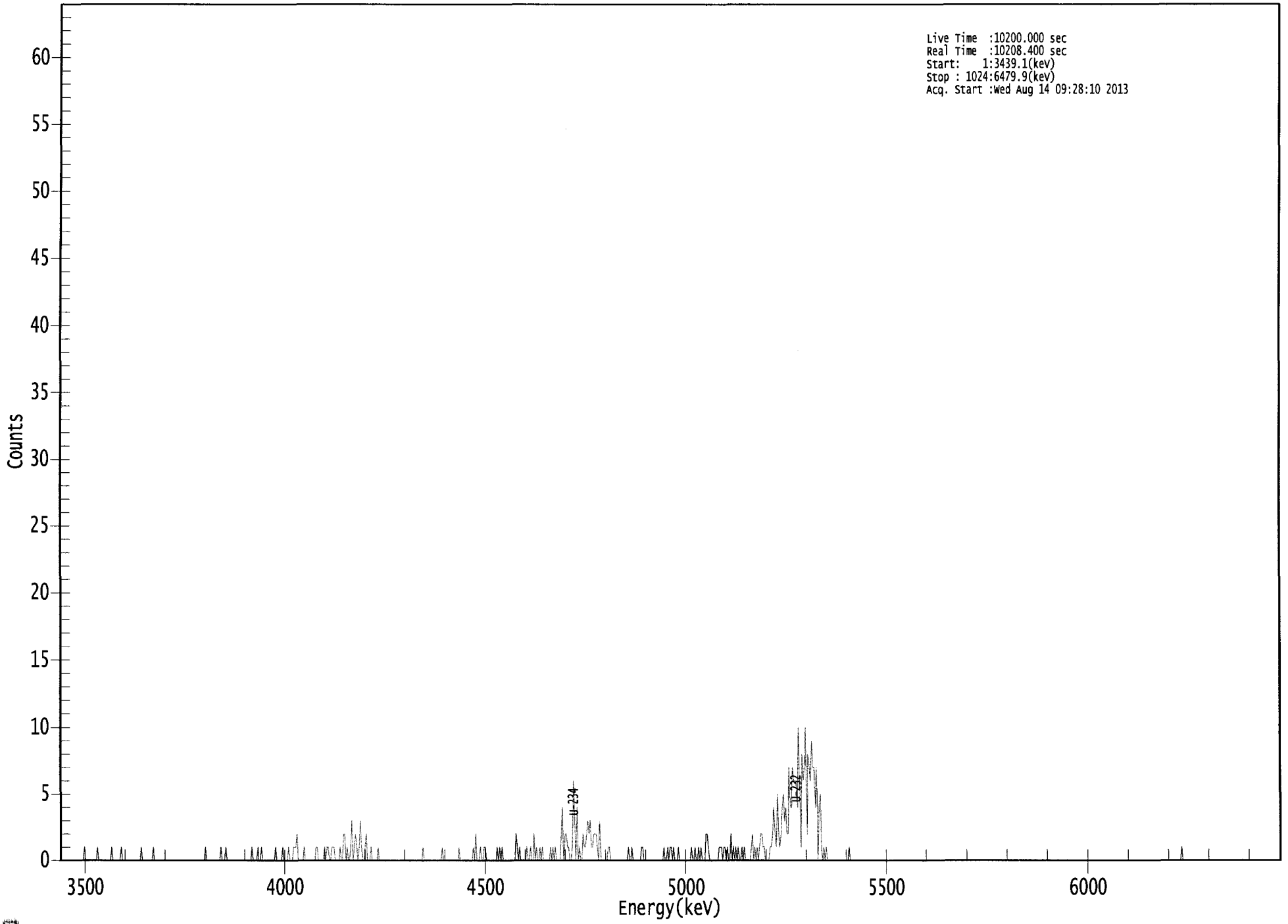
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
U-232	0.996	5302.50*	5.16E+000 +/- 7.33E-001	1.45E-001 +/- 2.06E-002
U-234	0.990	4761.50*	1.57E+000 +/- 4.46E-001	1.45E-001 +/- 2.06E-002
U-235	0.973	4385.50*	2.39E-001 +/- 1.79E-001	1.79E-001 +/- 2.54E-002
U-238	0.983	4184.40*	9.33E-001 +/- 3.24E-001	1.15E-001 +/- 1.64E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066147.CNF

Live Time :10200.000 sec
Real Time :10208.400 sec
Start: 1:3439.1(kev)
Stop : 1024:6479.9(kev)
Acq. Start :wed Aug 14 09:28:10 2013



ROI Type: 1

ROI Type: 3

0163

 ***** 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: 10208

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0	0
17:	0	0	0	0	1	0	0	0
25:	0	0	0	0	0	0	0	1
33:	0	0	0	0	0	0	0	0
41:	0	0	0	1	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	1	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	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	1
137:	0	0	0	1	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	1	0	0	0	0	1	0
169:	0	1	0	0	0	0	0	0
177:	0	0	0	0	0	1	0	0
185:	0	0	0	1	0	0	0	0
193:	1	0	0	0	1	1	1	2
201:	0	0	0	0	0	1	0	0
209:	0	0	0	0	0	0	0	1
217:	1	0	0	0	0	0	1	0
225:	1	1	0	0	1	1	1	0
233:	0	0	0	1	0	0	2	2
241:	0	1	0	0	1	3	0	1
249:	2	1	0	1	3	1	0	0
257:	1	2	0	0	0	1	0	0
265:	0	0	0	1	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	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	1	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	1
337:	0	0	0	0	0	0	0	0
345:	0	0	0	1	0	2	0	0
353:	0	1	0	0	1	1	0	0
361:	0	0	0	0	0	0	0	1

369: 0 1 0 1 0 0 0 0

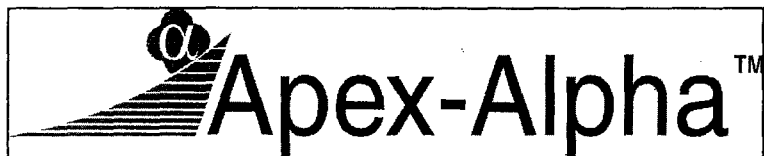
Sample Title: 13

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	0	0	0	2
385:	1	0	1	0	0	0	0	0
393:	1	0	0	1	0	0	2	0
401:	1	0	0	1	0	1	0	0
409:	0	0	0	0	1	0	1	0
417:	1	0	0	0	0	2	4	0
425:	2	2	1	1	0	0	1	6
433:	3	0	4	0	1	0	0	2
441:	1	1	2	3	2	3	1	1
449:	2	2	2	1	0	3	0	0
457:	0	0	0	0	1	1	0	0
465:	0	0	0	0	0	0	0	0
473:	0	0	0	0	0	1	0	0
481:	1	0	0	0	0	0	0	0
489:	1	1	0	0	0	0	0	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	1	0	0	1	0
513:	1	1	0	1	0	0	0	1
521:	0	0	0	0	0	0	0	0
529:	0	0	1	0	0	1	0	0
537:	1	0	1	0	0	0	2	2
545:	1	0	0	0	0	0	0	0
553:	0	1	1	1	0	1	1	0
561:	1	0	0	2	0	1	0	1
569:	0	1	0	0	1	0	1	0
577:	0	0	0	0	1	2	0	1
585:	0	1	0	1	2	2	1	1
593:	0	0	0	0	1	1	2	4
601:	2	1	5	2	1	2	4	5
609:	3	4	2	2	7	4	4	7
617:	6	6	6	4	10	5	1	8
625:	6	7	10	2	8	7	6	9
633:	7	7	4	7	0	4	5	1
641:	0	1	0	1	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	1	0
665:	0	0	0	0	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: 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	1	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 8/14/2013
Time : 5:45:39 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/14/2013 5:27:31 AM
Alpha 004	21f	ALL	Passed	8/14/2013 5:27:32 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	8/14/2013 5:27:33 AM
Alpha 011	21f	ALL	Passed	8/14/2013 5:27:34 AM
Alpha 012	21f	ALL	Passed	8/14/2013 5:27:34 AM
Alpha 013	21f	ALL	Passed	8/14/2013 5:27:35 AM
Alpha 014	21f	ALL	Passed	8/14/2013 5:27:36 AM
Alpha 015	21f	Peak Energy	Action	8/14/2013 5:27:37 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	8/14/2013 5:27:38 AM
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/14/2013 5:27:38 AM
Alpha 023	AIM730	ALL	Passed	8/14/2013 5:27:39 AM
Alpha 024	AIM730	ALL	Passed	8/14/2013 5:27:40 AM
Alpha 025	AIM730	ALL	Passed	8/14/2013 5:27:41 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/14/2013 5:27:42 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/14/2013 5:27:42 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/14/2013 5:27:43 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:44 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:46 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:31 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:49 AM
Alpha 037	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:50 AM
Alpha 038	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:52 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:54 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:56 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:58 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:28:00 AM

US EPA ARCHIVE DOCUMENT

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 043	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:28:02 AM
Alpha 044	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:28:04 AM
Alpha 045	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:28:07 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:28:10 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:28:13 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:28:15 AM

APPROVED BY: D

APPROVAL DATE: 8/14/13

US EPA ARCHIVE DOCUMENT

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

Nuclide Library Title: Uranium

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

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

* = key line

TOTALS: 4 Nuclides 4 Energy Lines

SECTION IX
ANALYTICAL DATA (ISOTOPIC THORIUM)

ThISO
Run 1

Work Order	13-07154	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	ThISO	01	LCS	LCS		07/24/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/24/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	PZ-107-SS TOT	46	07/19/13 12:10	1.0000E+00
Lab Deadline	8/13/2013	04	TRG	PZ-200-SS TOT	42	07/19/13 10:19	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-200-SS DIS	42	07/19/13 10:19	1.0000E+00
Project	West Lake OU-1	06	TRG	PZ-102-SS TOT	38	07/19/13 10:30	1.0000E+00
Report Level	4	07	TRG	PZ-102-SS DIS	38	07/19/13 10:30	1.0000E+00
Activity Units	pCi	08	DO	PZ-107-SS TOT	46	07/19/13 12:10	1.0000E+00
Aliquot Units	I	09	TRG	PZ-107-SS DIS	46	07/19/13 12:10	1.0000E+00
Matrix	WA	10	TRG	PZ-106-KS TOT	45	07/19/13 13:09	1.0000E+00
Method	HASL 300, 4.5.2	11	TRG	PZ-106-KS DIS	45	07/19/13 13:09	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	DUP 08 TOT	44	07/19/13 00:00	1.0000E+00
Radiometric Tracer	Th-229	13	TRG	DUP 08 DIS	44	07/19/13 00:00	1.0000E+00
Radiometric Sol#	Th-18a						
Tracer Act (dpm/g)	22.466						
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.

ThISO

Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS	0.4800	10.8		0.00								
02	MBL	0.2373	5.3		0.00								
03	DUP	0.2369	5.3		0.00								
04	TRG	0.2345	5.3		0.00								
05	TRG	0.2339	5.3		0.00								
06	TRG	0.2354	5.3		0.00								
07	TRG	0.2320	5.2		0.00								
08	DO	0.2328	5.2		0.00								
09	TRG	0.2361	5.3		0.00								
10	TRG	0.2338	5.3		0.00								
11	TRG	0.2346	5.3		0.00								
12	TRG	0.2345	5.3		0.00								
13	TRG	0.2350	5.3		0.00								

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

<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			08/08/13 07:46	JWOLFE				
02	MBL			08/08/13 07:46	JWOLFE				
03	DUP			08/08/13 07:46	JWOLFE				
04	TRG			08/08/13 07:46	JWOLFE				
05	TRG			08/08/13 07:46	JWOLFE				
06	TRG			08/08/13 07:46	JWOLFE				
07	TRG			08/08/13 07:46	JWOLFE				
08	DO			08/08/13 07:46	JWOLFE				
09	TRG			08/08/13 07:46	JWOLFE				
10	TRG			08/08/13 07:46	JWOLFE				
11	TRG			08/08/13 07:46	JWOLFE				
12	TRG			08/08/13 07:46	JWOLFE				
13	TRG			08/08/13 07:46	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.

0173

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-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	4.75E+00	8.75E-01	1.33E-01	4.96E+00	95.89	OK		OK	
02	TH-228	MBL	BLANK	pCi/l	-2.03E-02	7.09E-02	1.86E-01					OK	OK
03	TH-228	DUP	PZ-107-SS TOT	pCi/l	8.67E-01	3.14E-01	1.18E-01				NA	OK	
04	TH-228	TRG	PZ-200-SS TOT	pCi/l	1.72E-01	1.04E-01	7.06E-02					OK	
05	TH-228	TRG	PZ-200-SS DIS	pCi/l	7.25E-02	8.80E-02	1.37E-01					OK	
06	TH-228	TRG	PZ-102-SS TOT	pCi/l	2.99E+00	6.53E-01	7.37E-02					OK	
07	TH-228	TRG	PZ-102-SS DIS	pCi/l	-7.39E-03	5.91E-02	1.59E-01					OK	
08	TH-228	DO	PZ-107-SS TOT	pCi/l	1.13E+00	3.48E-01	1.35E-01					OK	
09	TH-228	TRG	PZ-107-SS DIS	pCi/l	-3.96E-02	1.38E-01	3.90E-01					OK	
10	TH-228	TRG	PZ-106-KS TOT	pCi/l	-1.31E-02	5.62E-02	1.56E-01					OK	
11	TH-228	TRG	PZ-106-KS DIS	pCi/l	4.33E-02	1.28E-01	2.79E-01					OK	
12	TH-228	TRG	DUP 08 TOT	pCi/l	1.15E+00	3.67E-01	1.04E-01					OK	
13	TH-228	TRG	DUP 08 DIS	pCi/l	1.58E-01	1.24E-01	9.65E-02					OK	

	Run	1
	Analysis Code	THISO
Eberline Services Work Order	13-07154	
Client	Engineering Management Support, Inc.	

4710

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-THISO-1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-228	LCS	07/24/13 00:00	1.00E+00	75.64	0.00	0.00			
02	TH-228	MBL	07/24/13 00:00	1.00E+00	76.40	0.00	0.00			
03	TH-228	DUP	07/19/13 12:10	1.00E+00	87.77	0.00	0.00			
04	TH-228	TRG	07/19/13 10:19	1.00E+00	111.03	0.00	0.00			
05	TH-228	TRG	07/19/13 10:19	1.00E+00	109.00	0.00	0.00			
06	TH-228	TRG	07/19/13 10:30	1.00E+00	103.20	0.00	0.00			
07	TH-228	TRG	07/19/13 10:30	1.00E+00	81.80	0.00	0.00			
08	TH-228	DO	07/19/13 12:10	1.00E+00	87.69	0.00	0.00			
09	TH-228	TRG	07/19/13 12:10	1.00E+00	35.40	0.00	0.00			
10	TH-228	TRG	07/19/13 13:09	1.00E+00	76.65	0.00	0.00			
11	TH-228	TRG	07/19/13 13:09	1.00E+00	43.40	0.00	0.00			
12	TH-228	TRG	07/19/13 00:00	1.00E+00	74.61	0.00	0.00			
13	TH-228	TRG	07/19/13 00:00	1.00E+00	63.44	0.00	0.00			

	
Run	1
Analysis Code	THISO
Eberline Services Work Order	13-07154
Client	Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-THISO-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff	A to B, Cor
01	TH-228	LCS	08/14/13 12:46		A_Spec	Alpha_013	170	2.53 E+02	9.00 E-03	18.7	
02	TH-228	MBL	08/14/13 12:46		A_Spec	Alpha_014	170.02	-1.08 E+00	2.40 E-02	18.5	
03	TH-228	DUP	08/14/13 12:46		A_Spec	Alpha_015	170.02	4.13 E+01	4.00 E-03	14.8	
04	TH-228	TRG	08/14/13 12:46		A_Spec	Alpha_019	170.02	1.17 E+01	2.00 E-03	16.6	
05	TH-228	TRG	08/14/13 12:46		A_Spec	Alpha_022	170.02	4.45 E+00	1.50 E-02	15.3	
06	TH-228	TRG	08/14/13 12:46		A_Spec	Alpha_023	170.02	1.94 E+02	2.00 E-03	17.1	
07	TH-228	TRG	08/14/13 12:46		A_Spec	Alpha_024	170.02	-3.80 E-01	1.40 E-02	17.1	
08	TH-228	DO	08/14/13 12:46		A_Spec	Alpha_025	170.02	6.31 E+01	1.10 E-02	17.4	
09	TH-228	TRG	08/14/13 12:46		A_Spec	Alpha_027	170.02	-8.90 E-01	1.70 E-02	17.3	
10	TH-228	TRG	08/14/13 12:46		A_Spec	Alpha_029	170.02	-7.20 E-01	1.60 E-02	19.5	
11	TH-228	TRG	08/14/13 12:46		A_Spec	Alpha_031	170	9.80 E-01	6.00 E-03	14.2	
12	TH-228	TRG	08/14/13 12:46		A_Spec	Alpha_033	170	5.85 E+01	3.00 E-03	18.5	
13	TH-228	TRG	08/14/13 12:47		A_Spec	Alpha_034	170	6.83 E+00	1.00 E-03	18.6	

	Run	1
	Analysis Code	THISO
Eberline Services Work Order	13-07154	
Client	Engineering Management Support, Inc.	

9210

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-THISO-1

	Run 1
Analysis Code THISO	13-07154
Eberline Services Work Order	THISO
Client Engineering Management Support, Inc.	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	4.35E+00	8.16E-01	8.98E-02	5.51E+00	78.91	OK		OK	
02	TH-230	MBL	BLANK	pCi/l	8.13E-02	8.48E-02	1.06E-01					OK	OK
03	TH-230	DUP	PZ-107-SS TOT	pCi/l	1.32E+00	4.10E-01	1.15E-01				NA	OK	
04	TH-230	TRG	PZ-200-SS TOT	pCi/l	4.61E-01	1.79E-01	8.64E-02					OK	
05	TH-230	TRG	PZ-200-SS DIS	pCi/l	1.42E-01	1.08E-01	1.24E-01					OK	
06	TH-230	TRG	PZ-102-SS TOT	pCi/l	2.88E+00	6.31E-01	9.01E-02					OK	
07	TH-230	TRG	PZ-102-SS DIS	pCi/l	1.86E-01	1.29E-01	1.25E-01					OK	
08	TH-230	DO	PZ-107-SS TOT	pCi/l	1.66E+00	4.49E-01	9.84E-02					OK	
09	TH-230	TRG	PZ-107-SS DIS	pCi/l	3.17E-01	2.73E-01	3.19E-01					OK	
10	TH-230	TRG	PZ-106-KS TOT	pCi/l	1.36E-01	1.02E-01	8.51E-02					OK	
11	TH-230	TRG	PZ-106-KS DIS	pCi/l	6.43E-02	1.23E-01	2.26E-01					OK	
12	TH-230	TRG	DUP 08 TOT	pCi/l	1.33E+00	4.02E-01	1.15E-01					OK	
13	TH-230	TRG	DUP 08 DIS	pCi/l	2.48E-01	1.61E-01	1.35E-01					OK	

2210

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-THISO-1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-230	LCS	07/24/13 00:00	1.00E+00	75.64	0.00	0.00			
02	TH-230	MBL	07/24/13 00:00	1.00E+00	76.40	0.00	0.00			
03	TH-230	DUP	07/19/13 12:10	1.00E+00	87.77	0.00	0.00			
04	TH-230	TRG	07/19/13 10:19	1.00E+00	111.03	0.00	0.00			
05	TH-230	TRG	07/19/13 10:19	1.00E+00	109.00	0.00	0.00			
06	TH-230	TRG	07/19/13 10:30	1.00E+00	103.20	0.00	0.00			
07	TH-230	TRG	07/19/13 10:30	1.00E+00	81.80	0.00	0.00			
08	TH-230	DO	07/19/13 12:10	1.00E+00	87.69	0.00	0.00			
09	TH-230	TRG	07/19/13 12:10	1.00E+00	35.40	0.00	0.00			
10	TH-230	TRG	07/19/13 13:09	1.00E+00	76.65	0.00	0.00			
11	TH-230	TRG	07/19/13 13:09	1.00E+00	43.40	0.00	0.00			
12	TH-230	TRG	07/19/13 00:00	1.00E+00	74.61	0.00	0.00			
13	TH-230	TRG	07/19/13 00:00	1.00E+00	63.44	0.00	0.00			


Run 1
Analysis Code THISO
Eberline Services Work Order 13-07154
Client Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-THISO-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff	A to B, Cor
01	TH-230	LCS	08/14/13 12:46		A_Spec	Alpha_013	170	2.32 E+02	2.00 E-03	18.7	
02	TH-230	MBL	08/14/13 12:46		A_Spec	Alpha_014	170.02	4.32 E+00	4.00 E-03	18.5	
03	TH-230	DUP	08/14/13 12:46		A_Spec	Alpha_015	170.02	6.43 E+01	4.00 E-03	14.8	
04	TH-230	TRG	08/14/13 12:46		A_Spec	Alpha_019	170.02	3.20 E+01	0.00 E+00	16.6	
05	TH-230	TRG	08/14/13 12:46		A_Spec	Alpha_022	170.02	8.96 E+00	1.20 E-02	15.3	
06	TH-230	TRG	08/14/13 12:46		A_Spec	Alpha_023	170.02	1.91 E+02	5.00 E-03	17.1	
07	TH-230	TRG	08/14/13 12:46		A_Spec	Alpha_024	170.02	9.81 E+00	7.00 E-03	17.1	
08	TH-230	DO	08/14/13 12:46		A_Spec	Alpha_025	170.02	9.53 E+01	4.00 E-03	17.4	
09	TH-230	TRG	08/14/13 12:46		A_Spec	Alpha_027	170.02	7.30 E+00	1.00 E-02	17.3	
10	TH-230	TRG	08/14/13 12:46		A_Spec	Alpha_029	170.02	7.66 E+00	2.00 E-03	19.5	
11	TH-230	TRG	08/14/13 12:46		A_Spec	Alpha_031	170	1.49 E+00	3.00 E-03	14.2	
12	TH-230	TRG	08/14/13 12:46		A_Spec	Alpha_033	170	6.90 E+01	0.00 E+00	18.5	
13	TH-230	TRG	08/14/13 12:47		A_Spec	Alpha_034	170	1.10 E+01	0.00 E+00	18.6	



Run 1

Analysis Code THISO

Eberline Services Work Order 13-07154

Client Engineering Management Support, Inc.

5210

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-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	4.63E+00	8.55E-01	7.82E-02	4.96E+00	93.30	OK		OK	
02	TH-232	MBL	BLANK	pCi/l	4.36E-02	6.55E-02	1.06E-01					OK	OK
03	TH-232	DUP	PZ-107-SS TOT	pCi/l	1.28E+00	4.02E-01	8.53E-02				NA	OK	
04	TH-232	TRG	PZ-200-SS TOT	pCi/l	2.40E-01	1.23E-01	6.88E-02					OK	
05	TH-232	TRG	PZ-200-SS DIS	pCi/l	2.36E-02	4.51E-02	8.33E-02					OK	
06	TH-232	TRG	PZ-102-SS TOT	pCi/l	2.71E+00	6.02E-01	7.88E-02					OK	
07	TH-232	TRG	PZ-102-SS DIS	pCi/l	-1.61E-02	3.98E-02	1.13E-01					OK	
08	TH-232	DO	PZ-107-SS TOT	pCi/l	1.38E+00	3.93E-01	1.04E-01					OK	
09	TH-232	TRG	PZ-107-SS DIS	pCi/l	3.51E-02	1.26E-01	2.85E-01					OK	
10	TH-232	TRG	PZ-106-KS TOT	pCi/l	3.22E-02	6.26E-02	1.17E-01					OK	
11	TH-232	TRG	PZ-106-KS DIS	pCi/l	4.95E-02	1.24E-01	2.58E-01					OK	
12	TH-232	TRG	DUP 08 TOT	pCi/l	1.57E+00	4.50E-01	8.02E-02					OK	
13	TH-232	TRG	DUP 08 DIS	pCi/l	4.12E-02	6.34E-02	9.39E-02					OK	

	Run	1
	Analysis Code	THISO
Eberline Services Work Order	13-07154	
Client	Engineering Management Support, Inc.	

0310

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-THISO-1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	TH-232	LCS	07/24/13 00:00	1.00E+00	75.64	0.00	0.00			
02	TH-232	MBL	07/24/13 00:00	1.00E+00	76.40	0.00	0.00			
03	TH-232	DUP	07/19/13 12:10	1.00E+00	87.77	0.00	0.00			
04	TH-232	TRG	07/19/13 10:19	1.00E+00	111.03	0.00	0.00			
05	TH-232	TRG	07/19/13 10:19	1.00E+00	109.00	0.00	0.00			
06	TH-232	TRG	07/19/13 10:30	1.00E+00	103.20	0.00	0.00			
07	TH-232	TRG	07/19/13 10:30	1.00E+00	81.80	0.00	0.00			
08	TH-232	DO	07/19/13 12:10	1.00E+00	87.69	0.00	0.00			
09	TH-232	TRG	07/19/13 12:10	1.00E+00	35.40	0.00	0.00			
10	TH-232	TRG	07/19/13 13:09	1.00E+00	76.65	0.00	0.00			
11	TH-232	TRG	07/19/13 13:09	1.00E+00	43.40	0.00	0.00			
12	TH-232	TRG	07/19/13 00:00	1.00E+00	74.61	0.00	0.00			
13	TH-232	TRG	07/19/13 00:00	1.00E+00	63.44	0.00	0.00			



Run 1

Analysis Code THISO

Eberline Services Work Order 13-07154

Client Engineering Management Support, Inc.

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-THISO-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff	A to B, Cor
01	TH-232	LCS	08/14/13 12:46		A_Spec	Alpha_013	170	2.47 E+02	1.00 E-03	18.7	
02	TH-232	MBL	08/14/13 12:46		A_Spec	Alpha_014	170.02	2.32 E+00	4.00 E-03	18.5	
03	TH-232	DUP	08/14/13 12:46		A_Spec	Alpha_015	170.02	6.28 E+01	1.00 E-03	14.8	
04	TH-232	TRG	08/14/13 12:46		A_Spec	Alpha_019	170.02	1.67 E+01	2.00 E-03	16.6	
05	TH-232	TRG	08/14/13 12:46		A_Spec	Alpha_022	170.02	1.49 E+00	3.00 E-03	15.3	
06	TH-232	TRG	08/14/13 12:46		A_Spec	Alpha_023	170.02	1.80 E+02	3.00 E-03	17.1	
07	TH-232	TRG	08/14/13 12:46		A_Spec	Alpha_024	170.02	-8.50 E-01	5.00 E-03	17.1	
08	TH-232	DO	08/14/13 12:46		A_Spec	Alpha_025	170.02	7.90 E+01	0.00 E+00	17.4	
09	TH-232	TRG	08/14/13 12:46		A_Spec	Alpha_027	170.02	8.10 E-01	7.00 E-03	17.3	
10	TH-232	TRG	08/14/13 12:46		A_Spec	Alpha_029	170.02	1.81 E+00	7.00 E-03	19.5	
11	TH-232	TRG	08/14/13 12:46		A_Spec	Alpha_031	170	1.15 E+00	5.00 E-03	14.2	
12	TH-232	TRG	08/14/13 12:46		A_Spec	Alpha_033	170	8.18 E+01	1.00 E-03	18.5	
13	TH-232	TRG	08/14/13 12:47		A_Spec	Alpha_034	170	1.83 E+00	1.00 E-03	18.6	



Run 1

Analysis Code THISO


Eberline Services Work Order 13-07154

Client Engineering Management Support, Inc.

3-15
 3-31
 3-34

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	07/24/13 00:00	1.0000	0.4800	10.7837		0.00		
02	MBL	BLANK	07/24/13 00:00	1.0000	0.2373	5.3312		0.00		
03	DUP	PZ-107-SS TOT	07/19/13 12:10	1.0000	0.2369	5.3222		0.00		
04	TRG	PZ-200-SS TOT	07/19/13 10:19	1.0000	0.2345	5.2683		0.00		
05	TRG	PZ-200-SS DIS	07/19/13 10:19	1.0000	0.2339	5.2548		0.00		
06	TRG	PZ-102-SS TOT	07/19/13 10:30	1.0000	0.2354	5.2885		0.00		
07	TRG	PZ-102-SS DIS	07/19/13 10:30	1.0000	0.2320	5.2121		0.00		
08	DO	PZ-107-SS TOT	07/19/13 12:10	1.0000	0.2328	5.2301		0.00		
09	TRG	PZ-107-SS DIS	07/19/13 12:10	1.0000	0.2361	5.3042		0.00		
10	TRG	PZ-106-KS TOT	07/19/13 13:09	1.0000	0.2338	5.2526		0.00		
11	TRG	PZ-106-KS DIS	07/19/13 13:09	1.0000	0.2346	5.2705		0.00		
12	TRG	DUP 08 TOT	07/19/13 00:00	1.0000	0.2345	5.2683		0.00		
13	TRG	DUP 08 DIS	07/19/13 00:00	1.0000	0.2350	5.2795		0.00		

Spike and Tracer Worksheet

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
13-07154	1	ThISO	8/8/2013 7:45	JWOLFE		

LCS & Matrix Spikes					LCS	MS	LCS	MSD	LCS		MS		LCS		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	8/8/2013	0.100	0.1063				4.96	0.179	0.00	0.000	0.00	0.000	0.00	0.000
Th-230	Th-1b	23.525	8/8/2013	0.500	0.5202				5.51	0.149	0.00	0.000	0.00	0.000	0.00	0.000
Th-232	Th-8b	103.560	8/8/2013	0.100	0.1063				4.96	0.179	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes	
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer	LCS
01	Th-229	Th-18a	22.466	8/8/2013	0.4800	0.2200		
02	Th-229	Th-18a	22.466	8/8/2013	0.2373	0.2200	0.4800 g	
03	Th-229	Th-18a	22.466	8/8/2013	0.2369	0.2200	0.2373 g	0.5202 g
04	Th-229	Th-18a	22.466	8/8/2013	0.2345	0.2200		0.1063 g
05	Th-229	Th-18a	22.466	8/8/2013	0.2339	0.2200	-0.2369 g	
06	Th-229	Th-18a	22.466	8/8/2013	0.2354	0.2200	-0.2345 g	
07	Th-229	Th-18a	22.466	8/8/2013	0.2320	0.2200	-0.2339 g	
08	Th-229	Th-18a	22.466	8/8/2013	0.2328	0.2200		
09	Th-229	Th-18a	22.466	8/8/2013	0.2361	0.2200	-0.2354 g	
10	Th-229	Th-18a	22.466	8/8/2013	0.2338	0.2200	-0.2320 g	
11	Th-229	Th-18a	22.466	8/8/2013	0.2346	0.2200	-0.2361 g	
12	Th-229	Th-18a	22.466	8/8/2013	0.2345	0.2200	-0.2338 g	
13	Th-229	Th-18a	22.466	8/8/2013	0.2350	0.2200	-0.2346 g	
							-0.2345 g	
							-0.2350 g	

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-07154	1	ThISO	liters	8/13/2013	JWOLFE

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	PZ-107-SS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-200-SS TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-200-SS DIS	TRG					1.0000E+00	1.0000E+00				
06	PZ-102-SS TOT	TRG					1.0000E+00	1.0000E+00				
07	PZ-102-SS DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-107-SS TOT	DO					1.0000E+00	1.0000E+00				
09	PZ-107-SS DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-106-KS TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-106-KS DIS	TRG					1.0000E+00	1.0000E+00				
12	DUP 08 TOT	TRG					1.0000E+00	1.0000E+00				
13	DUP 08 DIS	TRG					1.0000E+00	1.0000E+00				

Comments	
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Technician: J Wolfe Date: 8, 8, 13



Sample Description: SPIKE
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 01
 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: 8/14/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:13 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.480 mL
 Effective Efficiency: 0.1414 +/- 0.0098
 Counting Efficiency: 0.1869 +/- 0.0035 on 12/15/2012 11:26:45 AM
 Chem. Recovery Factor: 0.7564 +/- 0.0544

Control Certificate Name: NatTh_Th-8
 Chem. Recov. of Control: TH-232 0.932977 +/- 0.092309
 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	5.827	9.30	70.81	1.70	0.00E+000	0.0
TH-228	5.376	253.47	12.35	1.53	0.00E+000	21.5
TH-229 T	4.894	259.15	12.20	0.85	0.00E+000	4.8
TH-230	4.634	231.66	12.89	0.34	0.00E+000	25.3
TH-232	3.966	246.83	12.48	0.17	0.00E+000	4.6

T = Tracer Peak used for Effective Efficiency

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

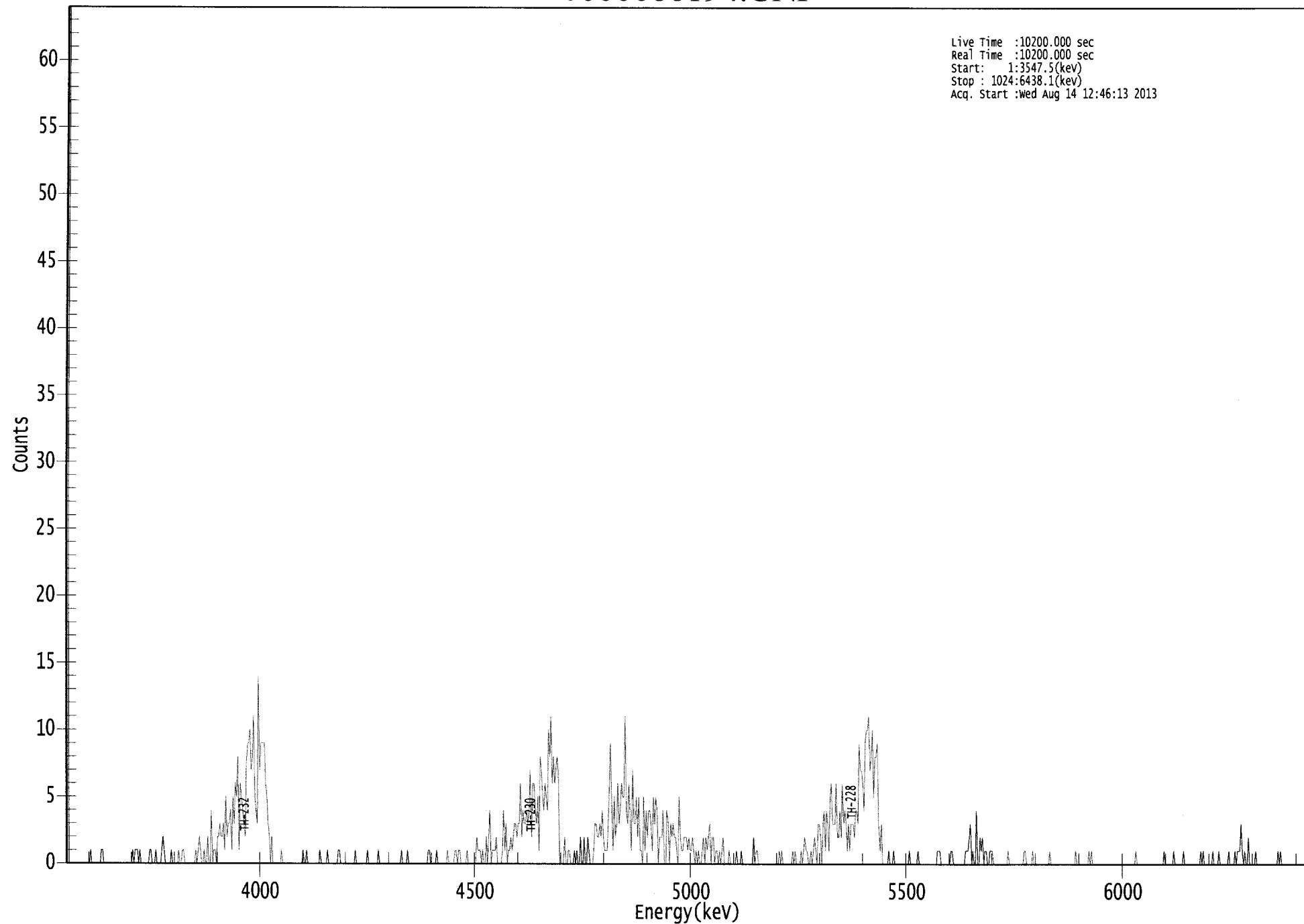
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.997	5850.00*	1.79E-001 +/- 1.29E-001	1.41E-001 +/- 1.92E-002
TH-228	0.997	5400.00*	4.75E+000 +/- 8.75E-001	1.33E-001 +/- 1.82E-002
TH-229	0.998	4872.00*	4.88E+000 +/- 6.65E-001	1.13E-001 +/- 1.54E-002
TH-230	0.992	4672.00*	4.35E+000 +/- 8.16E-001	8.98E-002 +/- 1.22E-002
TH-232	0.995	3997.00*	4.63E+000 +/- 8.55E-001	7.82E-002 +/- 1.07E-002

AG
 8/14/13

US EPA ARCHIVE DOCUMENT

000066194.CNF

Live Time :10200.000 sec
Real Time :10200.000 sec
Start : 1:3547.5(kev)
Stop : 1024:6438.1(kev)
Acq. Start :Wed Aug 14 12:46:13 2013



ROI Type: 1

0187

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

369: 1 2 3 3 2 3 3 6

Sample Title: 01

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

801: 0 0 0 0 0 0 0 0

Sample Title: 01

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	1	0	0	0	0	0	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	0	0	0	1	0
833:	0	0	0	0	0	0	0	0
841:	0	1	0	1	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	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	1	0
905:	0	0	0	0	0	0	1	0
913:	0	0	0	0	0	0	1	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	1	0	1	0
937:	0	0	0	0	0	0	1	0
945:	0	0	0	1	0	0	0	0
953:	0	0	0	1	0	0	0	0
961:	1	0	1	1	1	3	1	0
969:	1	0	0	2	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	1	0	1	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

KCS
8/14/13

Apex-Alpha™

Sample Description: BLANK
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 02
 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: 8/14/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:14 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.237 mL
 Effective Efficiency: 0.1410 +/- 0.0133
 Counting Efficiency: 0.1846 +/- 0.0034 on 12/15/2012 11:26:44 AM
 Chem. Recovery Factor: 0.7640 +/- 0.0733

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	5.873	5.28	107.99	2.72	0.00E+000	2.9
TH-228	5.362	-1.08	348.68	4.08	0.00E+000	2.9
TH-229 T	4.883	127.81	17.43	1.19	0.00E+000	4.7
TH-230	4.684	4.32	102.62	0.68	0.00E+000	2.9
TH-232	3.960	2.32	149.13	0.68	0.00E+000	2.9

T = Tracer Peak used for Effective Efficiency

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

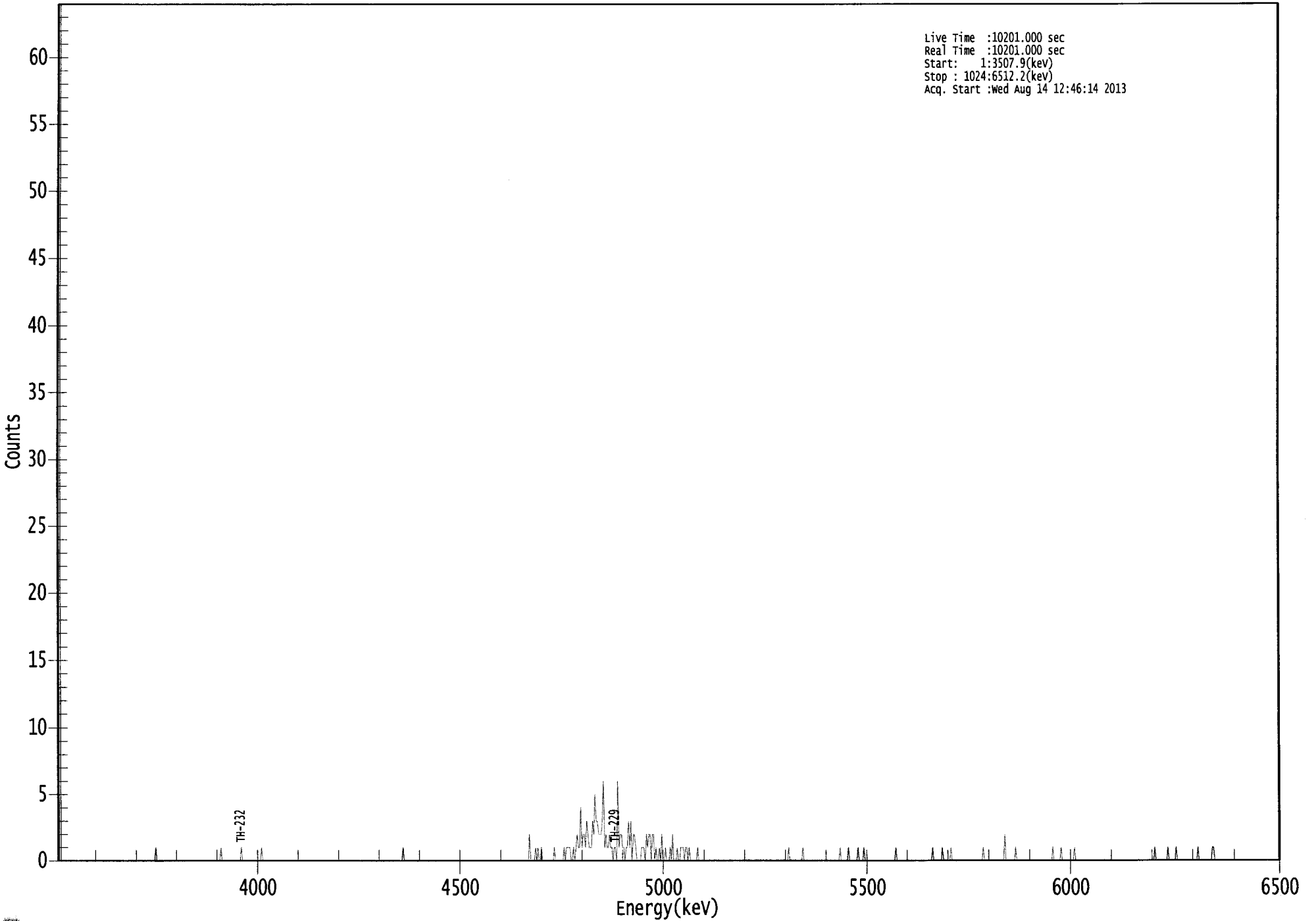
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.997	5850.00*	1.02E-001 +/- 1.11E-001	1.65E-001 +/- 3.05E-002
TH-228	0.992	5400.00*	-2.03E-002 +/- 7.09E-002	1.86E-001 +/- 3.43E-002
TH-229	0.999	4872.00*	2.41E+000 +/- 4.45E-001	1.24E-001 +/- 2.30E-002
TH-230	0.999	4672.00*	8.13E-002 +/- 8.48E-002	1.06E-001 +/- 1.96E-002
TH-232	0.993	3997.00*	4.36E-002 +/- 6.55E-002	1.06E-001 +/- 1.96E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066168.CNF

Live Time : 10201.000 sec
Real Time : 10201.000 sec
Start : 1:3507.9(kev)
Stop : 1024:6512.2(kev)
Acq. Start : Wed Aug 14 12:46:14 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: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 0 0 0 0 0

Sample Title: 02

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

801: 0 0 0 1 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	1	0	0	0	0	0
841:	0	1	0	0	0	0	0	0
849:	0	0	0	0	1	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	0	0
913:	0	0	0	0	0	0	0	1
921:	0	0	0	0	0	0	0	0
929:	0	0	1	0	0	0	0	0
937:	0	1	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	1	0	0	0	0
961:	0	0	0	0	0	0	0	1
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

ICB
8/14/13

Apex-Alpha™

Sample Description: PZ-107-SS TOT
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
Batch Identification: 1307154A-TH
Sample Identification: 03
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: 7/19/2013 7:22:05 AM
Acquisition Date/Time: 8/14/2013 12:46:15 PM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
Tracer Quantity: 0.237 mL
Effective Efficiency: 0.1297 +/- 0.0127
Counting Efficiency: 0.1477 +/- 0.0027 on 7/20/2013 6:27:27 PM
Chem. Recovery Factor: 0.8777 +/- 0.0872

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	5.763	1.15	249.60	0.85	0.00E+000	3.0
TH-228	5.391	41.32	30.78	0.68	0.00E+000	4.4
TH-229 T	4.878	117.32	18.16	0.68	0.00E+000	3.6
TH-230	4.648	64.32	24.59	0.68	0.00E+000	18.0
TH-232	3.971	62.83	24.77	0.17	0.00E+000	4.0

T = Tracer Peak used for Effective Efficiency

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

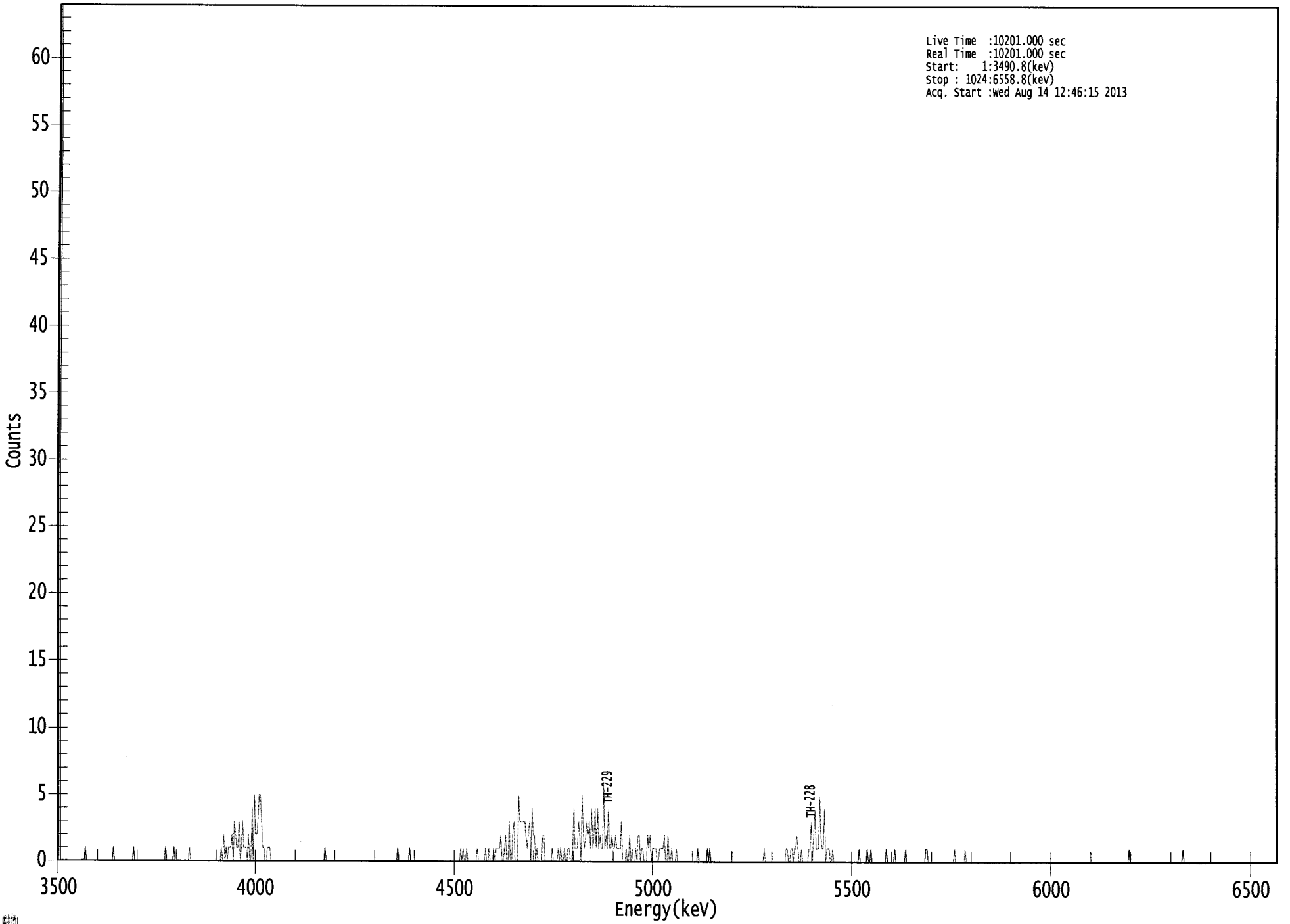
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.961	5850.00*	2.42E-002 +/- 6.05E-002	1.26E-001 +/- 2.41E-002
TH-228	1.000	5400.00*	8.67E-001 +/- 3.14E-001	1.18E-001 +/- 2.27E-002
TH-229	1.000	4872.00*	2.41E+000 +/- 4.61E-001	1.16E-001 +/- 2.22E-002
TH-230	0.997	4672.00*	1.32E+000 +/- 4.10E-001	1.15E-001 +/- 2.21E-002
TH-232	0.997	3997.00*	1.28E+000 +/- 4.02E-001	8.53E-002 +/- 1.63E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066169.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3490.8(kev)
Stop : 1024:6558.8(kev)
Acq. Start :wed Aug 14 12:46:15 2013



ROI Type: 1

ROI Type: 3

6197

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

Sample Title: 03

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	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	1
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	1	0	0	0	0	0	0	0
73:	0	0	0	0	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	1	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	0	0	0
137:	0	0	1	0	2	0	1	0
145:	1	1	1	2	0	3	2	1
153:	1	3	0	1	3	1	1	1
161:	0	2	0	0	4	0	5	2
169:	2	3	5	5	3	1	1	0
177:	0	1	1	1	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	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	1	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	1	0
289:	0	0	0	0	0	0	0	0
297:	1	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	1	0	1	0	0
345:	1	0	0	0	0	0	0	0
353:	0	1	0	0	0	0	0	0
361:	1	0	0	1	0	0	0	1

369: 0 1 1 1 1 2 0 0

Sample Title: 03

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

801: 0 0 0 0 0 0 0 0

Sample Title: 03

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



KCB
8/14/13

Sample Description: PZ-200-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 04
 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: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:39 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: 0.1842 +/- 0.0155
 Counting Efficiency: 0.1659 +/- 0.0029 on 2/17/2013 10:45:23 AM
 Chem. Recovery Factor: 1.1103 +/- 0.0953

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	5.914	1.64	214.85	1.36	0.00E+000	3.3
TH-228	5.358	11.66	58.37	0.34	0.00E+000	3.3
TH-229 T	4.877	165.00	15.30	0.00	0.00E+000	7.9
TH-230	4.636	32.00	35.19	0.00	0.00E+000	5.6
TH-232	3.973	16.66	48.59	0.34	0.00E+000	5.0

T = Tracer Peak used for Effective Efficiency

 NUCLIDE ANALYSIS RESULTS

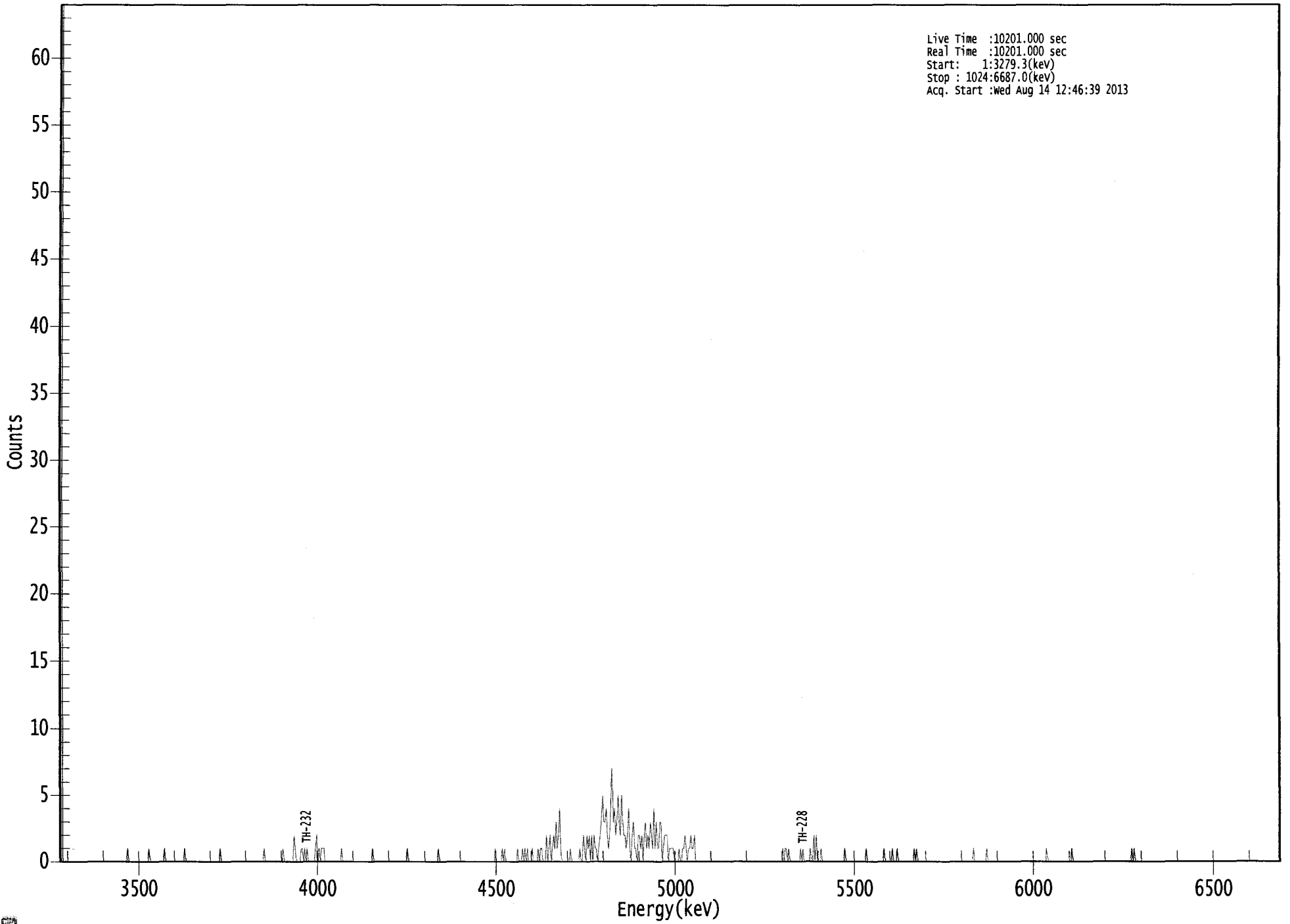
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.979	5850.00*	2.42E-002 +/- 5.22E-002	1.01E-001 +/- 1.67E-002
TH-228	0.991	5400.00*	1.72E-001 +/- 1.04E-001	7.06E-002 +/- 1.16E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 3.93E-001	8.67E-002 +/- 1.43E-002
TH-230	0.993	4672.00*	4.61E-001 +/- 1.79E-001	8.64E-002 +/- 1.42E-002
TH-232	0.997	3997.00*	2.40E-001 +/- 1.23E-001	6.88E-002 +/- 1.13E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066170.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3279.3(keV)
Stop : 1024:6687.0(keV)
Acq. Start :Wed Aug 14 12:46:39 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: 04

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	1	0	0	0	0	0	0
65:	0	0	0	0	0	0	0	0
73:	0	0	0	1	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	1	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0	0
105:	0	1	0	0	0	0	0	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	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	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	1	0	0	0
193:	0	0	0	0	0	2	1	0
201:	0	0	0	1	1	0	1	0
209:	1	0	0	0	0	0	0	1
217:	2	0	1	0	1	1	1	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	1
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	0	0	0	0	0
289:	0	0	0	0	1	0	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	0	0	0	0
361:	0	0	0	0	0	0	1	0

369: 0 0 0 0 1 0 1 0

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	1	0	0	0	1	0	1
393:	0	1	0	0	0	1	0	0
401:	0	0	1	0	1	1	0	0
409:	0	2	0	1	2	0	1	2
417:	1	3	1	2	4	1	0	0
425:	0	0	0	0	0	1	0	0
433:	0	0	0	0	0	1	0	0
441:	2	1	0	2	1	2	0	2
449:	0	2	1	1	0	1	2	3
457:	5	3	3	4	2	1	2	5
465:	7	3	4	2	3	5	3	2
473:	5	3	2	2	1	2	4	1
481:	0	2	3	1	1	0	2	2
489:	1	2	0	2	3	1	2	1
497:	3	2	1	4	1	3	1	1
505:	3	3	0	1	2	2	2	0
513:	1	1	1	1	0	0	0	0
521:	1	0	0	1	1	2	1	0
529:	1	1	2	1	1	2	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	1
609:	0	1	1	0	1	0	0	0
617:	0	0	0	0	0	0	1	0
625:	1	0	0	0	0	0	1	0
633:	0	2	0	2	0	0	0	1
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	1	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	1	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	1	0	0	0
697:	0	0	0	1	0	0	0	1
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	1	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	0	0	0	1
769:	0	0	0	0	0	0	0	0
777:	0	0	1	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	1	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	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	1	0	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	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

103
8/14/13

Apex-Alpha™

Sample Description: PZ-200-SS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 05
 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: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:40 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: 0.1669 +/- 0.0147
 Counting Efficiency: 0.1531 +/- 0.0029 on 12/15/2012 1:57:26 PM
 Chem. Recovery Factor: 1.0900 +/- 0.0983

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	5.804	1.64	214.85	1.36	0.00E+000	3.1
TH-228	5.398	4.45	120.09	2.55	0.00E+000	3.1
TH-229 T	4.902	149.13	16.17	1.87	0.00E+000	12.5
TH-230	4.597	8.96	73.69	2.04	0.00E+000	3.1
TH-232	3.993	1.49	190.03	0.51	0.00E+000	6.2

T = Tracer Peak used for Effective Efficiency

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

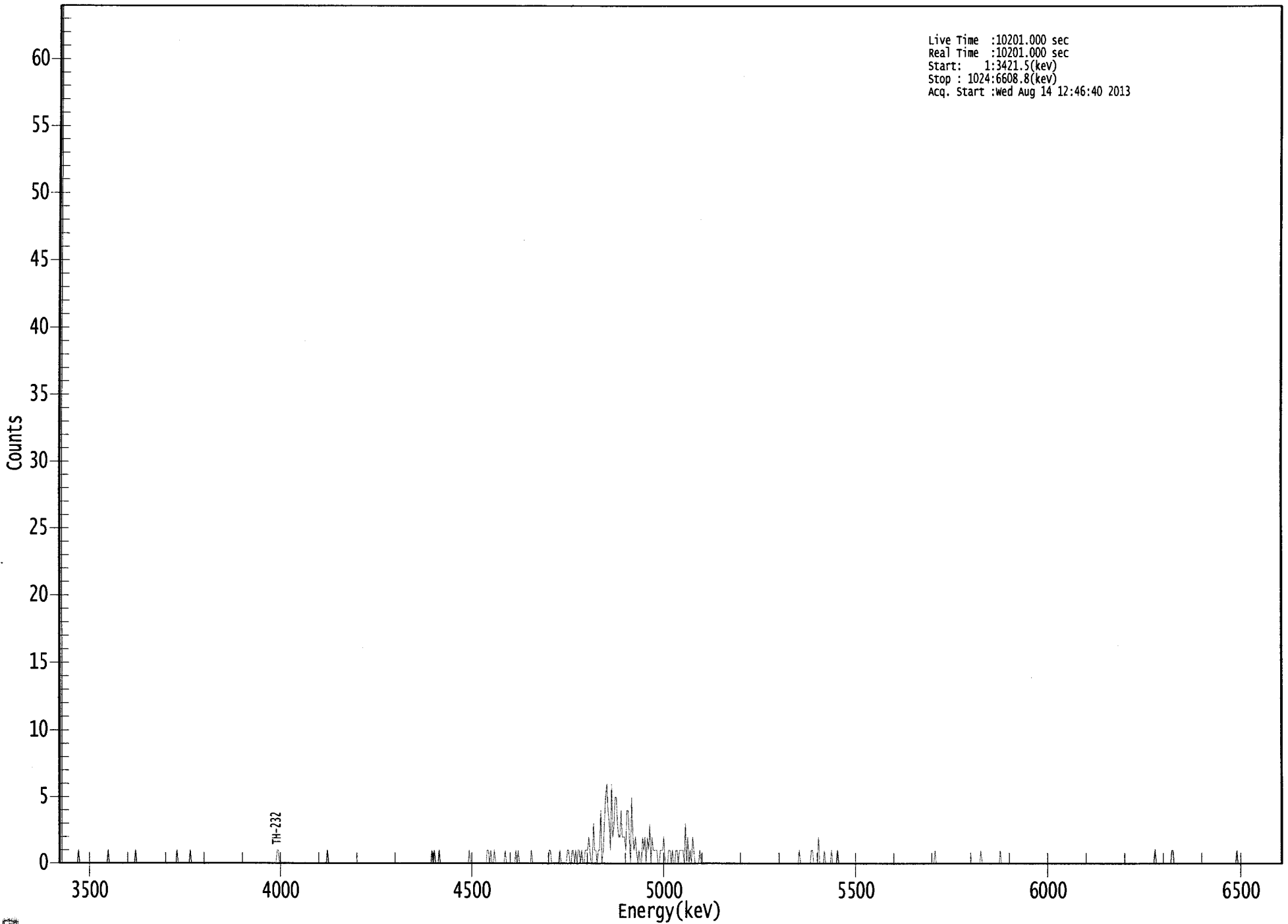
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.989	5850.00*	2.68E-002 +/- 5.77E-002	1.12E-001 +/- 1.93E-002
TH-228	1.000	5400.00*	7.25E-002 +/- 8.80E-002	1.37E-001 +/- 2.36E-002
TH-229	0.995	4872.00*	2.38E+000 +/- 4.11E-001	1.21E-001 +/- 2.09E-002
TH-230	0.971	4672.00*	1.42E-001 +/- 1.08E-001	1.24E-001 +/- 2.14E-002
TH-232	1.000	3997.00*	2.36E-002 +/- 4.51E-002	8.33E-002 +/- 1.44E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066171.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3421.5(kev)
Stop : 1024:6608.8(kev)
Acq. Start :Wed Aug 14 12:46:40 2013



ROI Type: 1

ROI Type: 3

0207

 ***** 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:	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	1	0	0	0	0	0	0
49:	0	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0	0
65:	1	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0	0
97:	0	0	0	1	0	0	0	0
105:	0	0	0	0	0	0	1	0
113:	0	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	1
185:	1	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	1	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	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	1	0	1	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	0	0	0	0	0	0
345:	1	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	1
361:	1	0	1	0	0	1	0	0

369: 0 0 0 0 0 0 1 0

Sample Title: 05

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	1
385:	0	1	0	0	0	0	0	0
393:	0	0	0	0	1	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	1	1	0	0	0
417:	0	0	0	0	1	0	0	0
425:	0	0	1	1	0	0	1	1
433:	0	1	0	1	1	0	1	0
441:	0	1	1	1	2	1	0	0
449:	3	1	1	0	1	1	4	0
457:	1	3	5	6	4	3	1	6
465:	2	3	5	5	3	2	2	4
473:	2	2	2	1	4	4	2	0
481:	5	2	1	2	1	0	1	0
489:	0	2	1	2	0	2	1	3
497:	0	2	1	1	1	1	0	0
505:	1	1	1	2	0	0	0	1
513:	1	0	1	0	0	1	1	0
521:	1	1	1	1	0	3	0	2
529:	0	1	0	2	1	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	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	1	1
633:	0	0	0	0	2	0	0	0
641:	0	1	0	0	0	0	0	1
649:	0	0	0	0	1	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	1	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	1	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: 05

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

KB
8/14/13

Apex-Alpha™

Sample Description: PZ-102-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 06
 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: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:41 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: 0.1765 +/- 0.0151
 Counting Efficiency: 0.1710 +/- 0.0030 on 7/20/2013 6:18:25 PM
 Chem. Recovery Factor: 1.0320 +/- 0.0899

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	5.876	12.15	58.49	0.85	0.00E+000	0.0
TH-228	5.393	193.66	14.10	0.34	0.00E+000	14.2
TH-229 T	4.909	158.66	15.58	0.34	0.00E+000	4.1
TH-230	4.650	191.15	14.21	0.85	0.00E+000	8.3
TH-232	3.979	180.49	14.61	0.51	0.00E+000	6.8

T = Tracer Peak used for Effective Efficiency

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

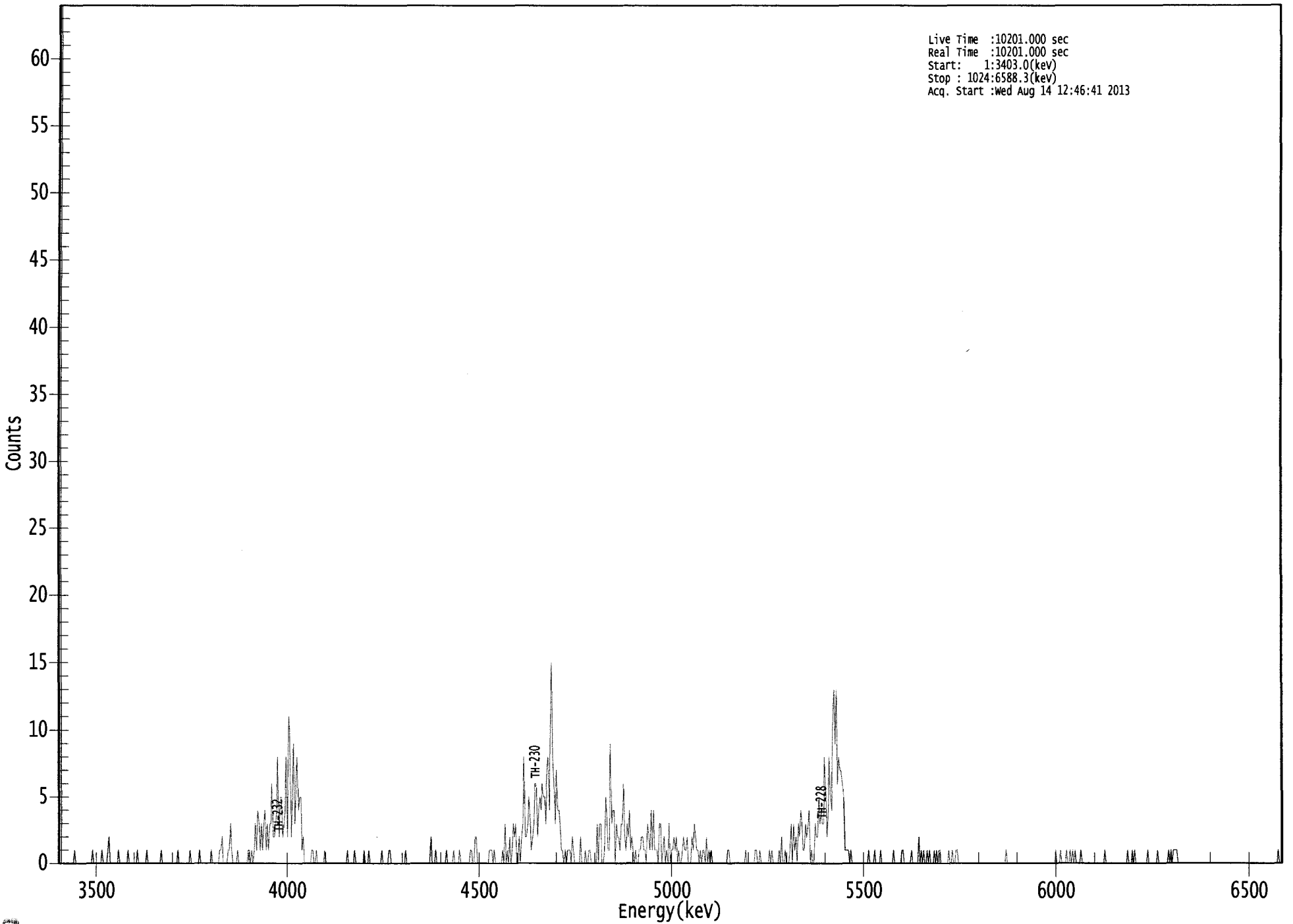
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.997	5850.00*	1.88E-001 +/- 1.14E-001	9.24E-002 +/- 1.55E-002
TH-228	1.000	5400.00*	2.99E+000 +/- 6.53E-001	7.37E-002 +/- 1.23E-002
TH-229	0.993	4872.00*	2.39E+000 +/- 4.00E-001	7.21E-002 +/- 1.21E-002
TH-230	0.997	4672.00*	2.88E+000 +/- 6.31E-001	9.01E-002 +/- 1.51E-002
TH-232	0.998	3997.00*	2.71E+000 +/- 6.02E-001	7.88E-002 +/- 1.32E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066172.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3403.0(keV)
Stop : 1024:6588.3(keV)
Acq. Start :Wed Aug 14 12:46:41 2013



ROI Type: 1

ROI Type: 3

0212

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

Sample Title: 06

Elapsed Live time: 10201
 Elapsed Real Time: 10201

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

369: 0 0 0 0 1 0 3 0

Sample Title: 06

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	1	0	2	0	1	3	2	3
385:	0	0	2	0	2	3	8	2
393:	2	3	5	3	1	2	3	6
401:	6	2	4	5	4	6	5	5
409:	3	7	8	4	10	15	8	6
417:	3	7	4	4	3	1	1	0
425:	1	0	1	1	1	0	2	1
433:	0	0	0	0	0	2	0	0
441:	0	1	0	0	1	1	0	0
449:	0	0	0	3	0	3	3	0
457:	0	1	5	3	1	1	9	3
465:	4	4	0	3	2	2	1	3
473:	3	6	2	1	3	2	4	1
481:	2	1	0	1	0	0	1	1
489:	2	2	1	1	0	3	2	1
497:	4	1	4	1	1	1	0	3
505:	3	0	1	2	0	1	0	3
513:	0	1	1	2	1	2	0	1
521:	0	0	1	2	1	1	2	0
529:	0	0	2	1	3	2	1	1
537:	0	1	0	1	1	0	2	0
545:	1	0	1	0	0	0	0	0
553:	0	0	0	0	0	0	0	0
561:	1	1	0	0	0	0	0	0
569:	0	0	0	0	0	0	0	1
577:	0	0	0	0	0	0	0	1
585:	1	0	0	1	0	0	0	0
593:	0	0	0	1	0	1	0	0
601:	0	0	0	1	0	2	0	0
609:	1	0	0	0	1	3	0	3
617:	1	2	0	3	2	4	3	1
625:	1	3	2	3	4	0	1	0
633:	0	3	2	2	5	3	4	3
641:	3	8	5	2	4	8	5	4
649:	11	13	9	13	6	8	7	7
657:	6	5	1	1	1	1	0	1
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	1	0
681:	0	0	0	1	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	1	0	0	0	0
713:	0	0	1	0	0	0	0	0
721:	2	0	1	0	1	0	0	1
729:	0	1	0	0	0	1	0	1
737:	0	1	1	0	0	0	0	0
745:	0	1	0	0	1	0	0	1
753:	1	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	1	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	1	0	0	0	1	0
841:	0	0	0	1	0	0	1	0
849:	1	0	1	0	0	0	0	1
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	1	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	1	0
897:	0	0	1	0	1	0	0	0
905:	0	0	0	0	0	0	0	1
913:	0	0	0	0	0	0	0	1
921:	0	0	0	0	0	0	0	0
929:	1	0	1	0	1	1	1	1
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	1	0	0	0	0



103
8/14/13

Sample Description: PZ-102-SS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 07
 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: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:42 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: 0.1399 +/- 0.0134
 Counting Efficiency: 0.1710 +/- 0.0032 on 12/15/2012 2:02:15 PM
 Chem. Recovery Factor: 0.8180 +/- 0.0799

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	5.871	-2.72	87.14	2.72	0.00E+000	0.0
TH-228	5.397	-0.38	799.43	2.38	0.00E+000	3.1
TH-229 T	4.854	123.96	17.77	2.04	0.00E+000	5.4
TH-230	4.620	9.81	66.87	1.19	0.00E+000	3.1
TH-232	3.947	-0.85	246.67	0.85	0.00E+000	0.0

T = Tracer Peak used for Effective Efficiency

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

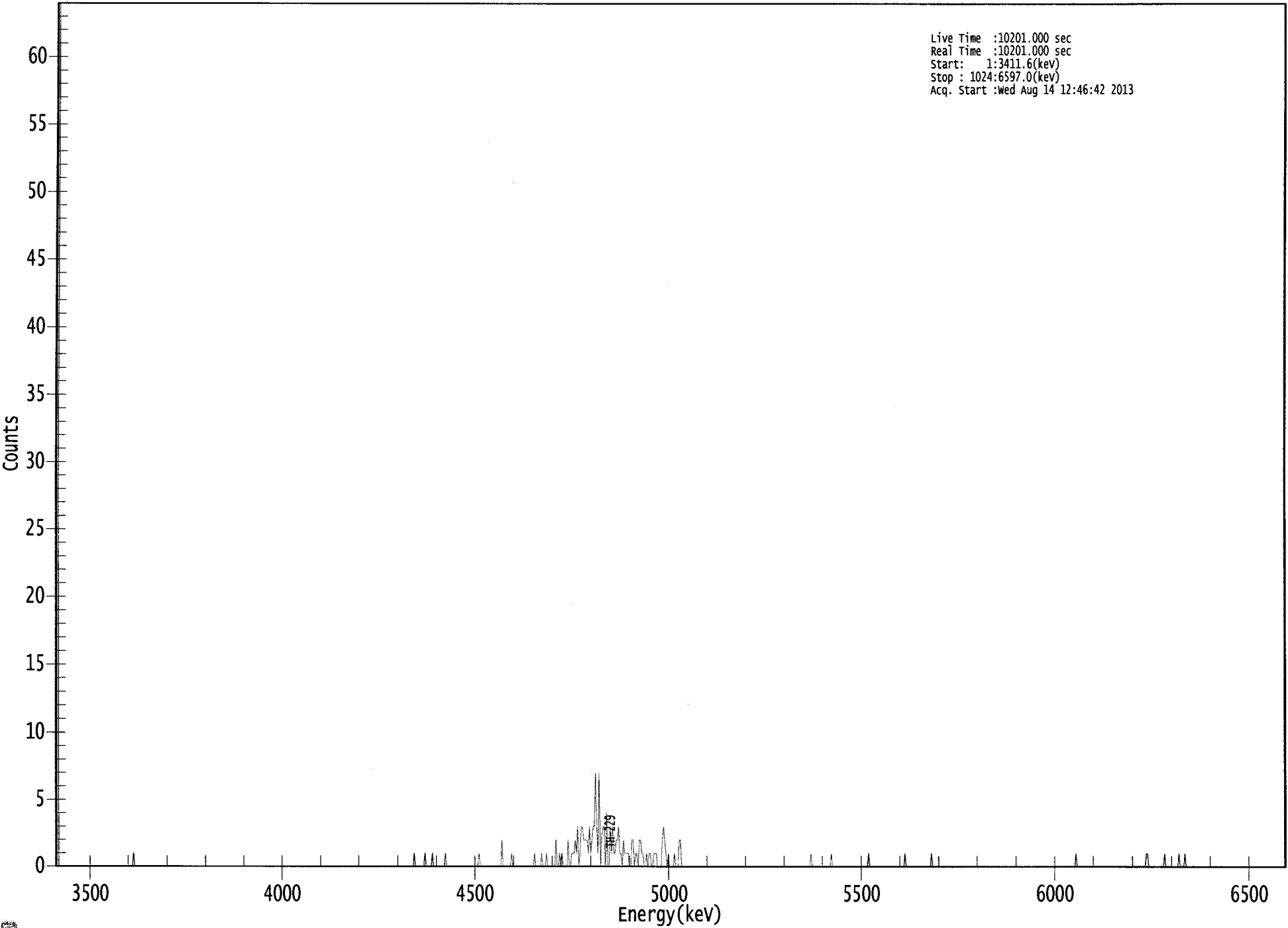
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.998	5850.00*	-5.30E-002 +/- 4.72E-002	1.67E-001 +/- 3.14E-002
TH-228	1.000	5400.00*	-7.39E-003 +/- 5.91E-002	1.59E-001 +/- 2.99E-002
TH-229	0.998	4872.00*	2.36E+000 +/- 4.43E-001	1.48E-001 +/- 2.78E-002
TH-230	0.986	4672.00*	1.86E-001 +/- 1.29E-001	1.25E-001 +/- 2.35E-002
TH-232	0.987	3997.00*	-1.61E-002 +/- 3.98E-002	1.13E-001 +/- 2.13E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066173.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3411.6(kev)
Stop : 1024:6597.0(kev)
Acq. Start :Wed Aug 14 12:46:42 2013



ROI Type: 1

ROI Type: 3

0217

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

Sample Title: 07

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 0 0 0 2 0 0 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
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	1
401:	0	0	0	0	0	1	0	0
409:	0	1	0	0	0	0	0	0
417:	0	2	0	0	1	0	1	0
425:	0	0	0	2	0	0	1	1
433:	1	2	1	3	0	1	3	3
441:	2	2	2	2	1	3	1	2
449:	3	3	7	3	1	7	0	2
457:	3	3	0	4	0	0	3	1
465:	3	1	1	2	2	3	1	1
473:	0	2	1	1	1	1	0	0
481:	2	2	0	1	1	0	2	2
489:	1	1	0	0	1	0	1	1
497:	0	0	1	1	1	0	0	0
505:	0	2	3	2	1	0	1	0
513:	0	0	0	1	0	0	0	2
521:	2	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	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	0	0	0
641:	0	0	0	0	0	0	1	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	1	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	1	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	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	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	1	1	0	0	0
913:	0	0	0	0	0	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	1	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



KCB
8/14/13

Sample Description: PZ-107-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 08
 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: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:43 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: 0.1522 +/- 0.0139
 Counting Efficiency: 0.1736 +/- 0.0032 on 12/15/2012 1:57:27 PM
 Chem. Recovery Factor: 0.8769 +/- 0.0820

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	5.911	1.81	193.79	1.19	0.00E+000	3.1
TH-228	5.347	63.13	25.09	1.87	0.00E+000	4.2
TH-229 T	4.865	135.32	16.90	0.68	0.00E+000	5.5
TH-230	4.637	95.32	20.16	0.68	0.00E+000	5.5
TH-232	3.970	79.00	22.19	0.00	0.00E+000	4.2

T = Tracer Peak used for Effective Efficiency

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

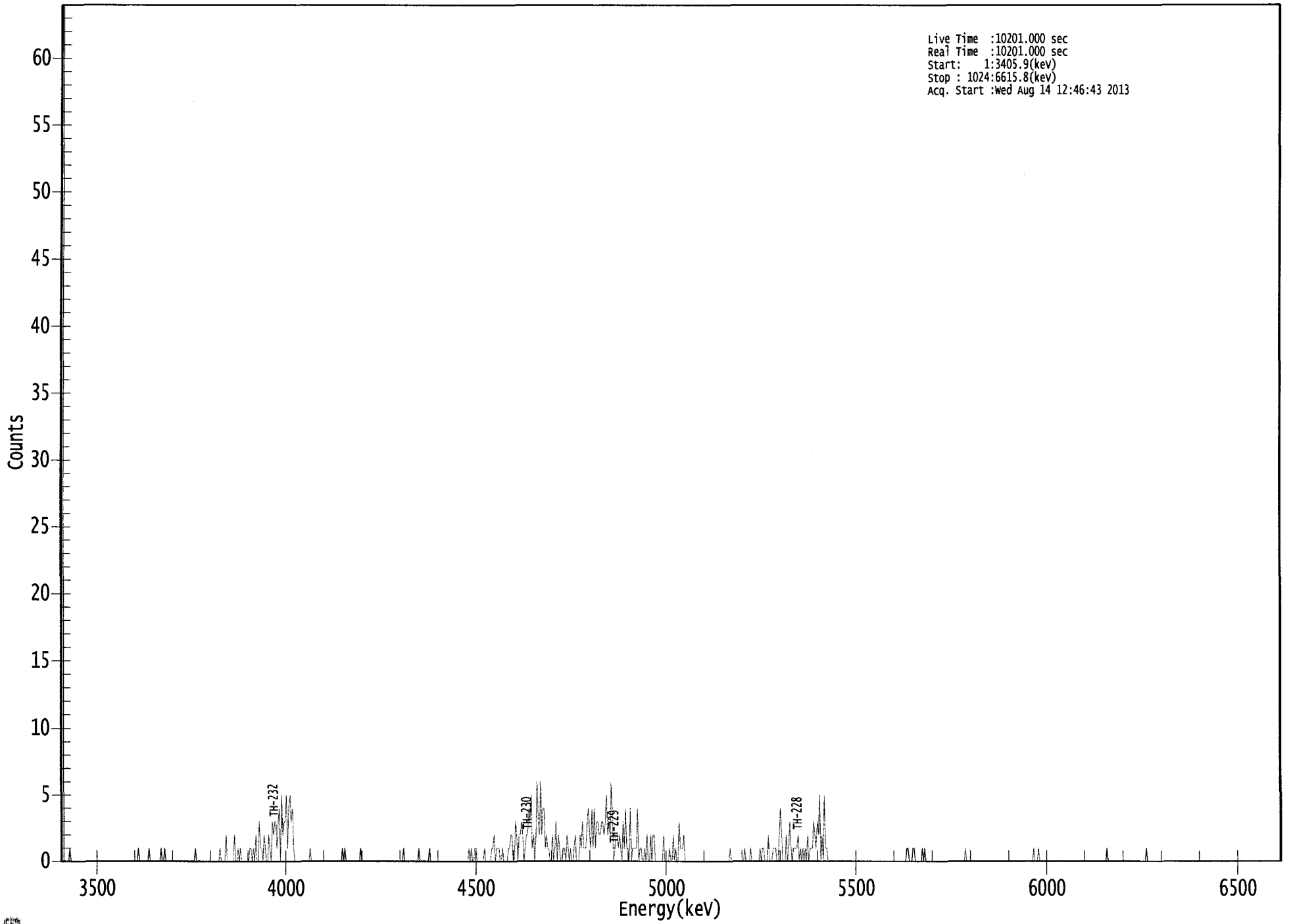
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.981	5850.00*	3.24E-002 +/- 6.30E-002	1.18E-001 +/- 2.12E-002
TH-228	0.986	5400.00*	1.13E+000 +/- 3.48E-001	1.35E-001 +/- 2.43E-002
TH-229	1.000	4872.00*	2.37E+000 +/- 4.25E-001	9.87E-002 +/- 1.77E-002
TH-230	0.994	4672.00*	1.66E+000 +/- 4.49E-001	9.84E-002 +/- 1.77E-002
TH-232	0.996	3997.00*	1.38E+000 +/- 3.93E-001	1.04E-001 +/- 1.87E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066174.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3405.9(kev)
Stop : 1024:6615.8(kev)
Acq. Start :wed Aug 14 12:46:43 2013



ROI Type: 1

ROI Type: 3

0222

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

Sample Title: 08

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 1 0 0 1 0 0 0 0

Sample Title: 08

Channel	1	2	3	4	5	6	7	8
377:	1	1	2	2	0	0	3	2
385:	0	2	2	3	2	0	1	2
393:	2	4	3	5	1	2	0	2
401:	6	3	2	6	2	4	4	1
409:	2	1	1	0	0	2	0	1
417:	3	0	2	1	0	0	1	1
425:	0	2	1	0	1	0	0	1
433:	2	0	0	0	2	1	3	1
441:	1	1	3	4	2	1	4	1
449:	4	1	3	3	2	2	3	3
457:	2	3	5	2	3	2	6	3
465:	0	1	2	2	1	2	1	0
473:	3	1	4	1	1	0	4	0
481:	1	1	1	1	4	0	1	1
489:	0	0	1	0	2	0	0	2
497:	0	2	2	0	0	0	0	0
505:	0	0	2	0	0	0	0	1
513:	0	0	2	0	1	0	0	3
521:	1	1	1	2	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	1	0	0	0	0	0
569:	0	0	0	0	0	0	1	0
577:	0	0	0	1	0	0	0	0
585:	0	0	0	1	0	1	1	0
593:	0	0	2	0	0	0	1	1
601:	1	0	0	2	4	2	0	0
609:	0	2	0	1	3	1	0	1
617:	1	1	1	2	0	1	0	1
625:	0	1	0	2	0	1	1	1
633:	3	2	1	3	2	5	0	2
641:	0	5	1	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:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	1	1
713:	0	0	0	1	1	0	0	0
721:	0	0	0	1	0	1	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	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	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:	1	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	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	1	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	0	0	0	0	0	1	0
913:	0	0	0	0	0	0	0	0
921:	0	0	0	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0



105
21/11/10

Sample Description: PZ-107-SS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 09
 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: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:44 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.236 mL
 Effective Efficiency: 0.0612 +/- 0.0085
 Counting Efficiency: 0.1728 +/- 0.0032 on 12/15/2012 2:27:41 PM
 Chem. Recovery Factor: 0.3540 +/- 0.0498

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	5.766	1.30	273.47	1.70	0.00E+000	3.2
TH-228	5.291	-0.89	347.50	2.89	0.00E+000	3.2
TH-229 T	4.866	55.15	26.63	0.85	0.00E+000	10.6
TH-230	4.632	7.30	81.83	1.70	0.00E+000	3.2
TH-232	3.972	0.81	359.15	1.19	0.00E+000	3.2

T = Tracer Peak used for Effective Efficiency

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

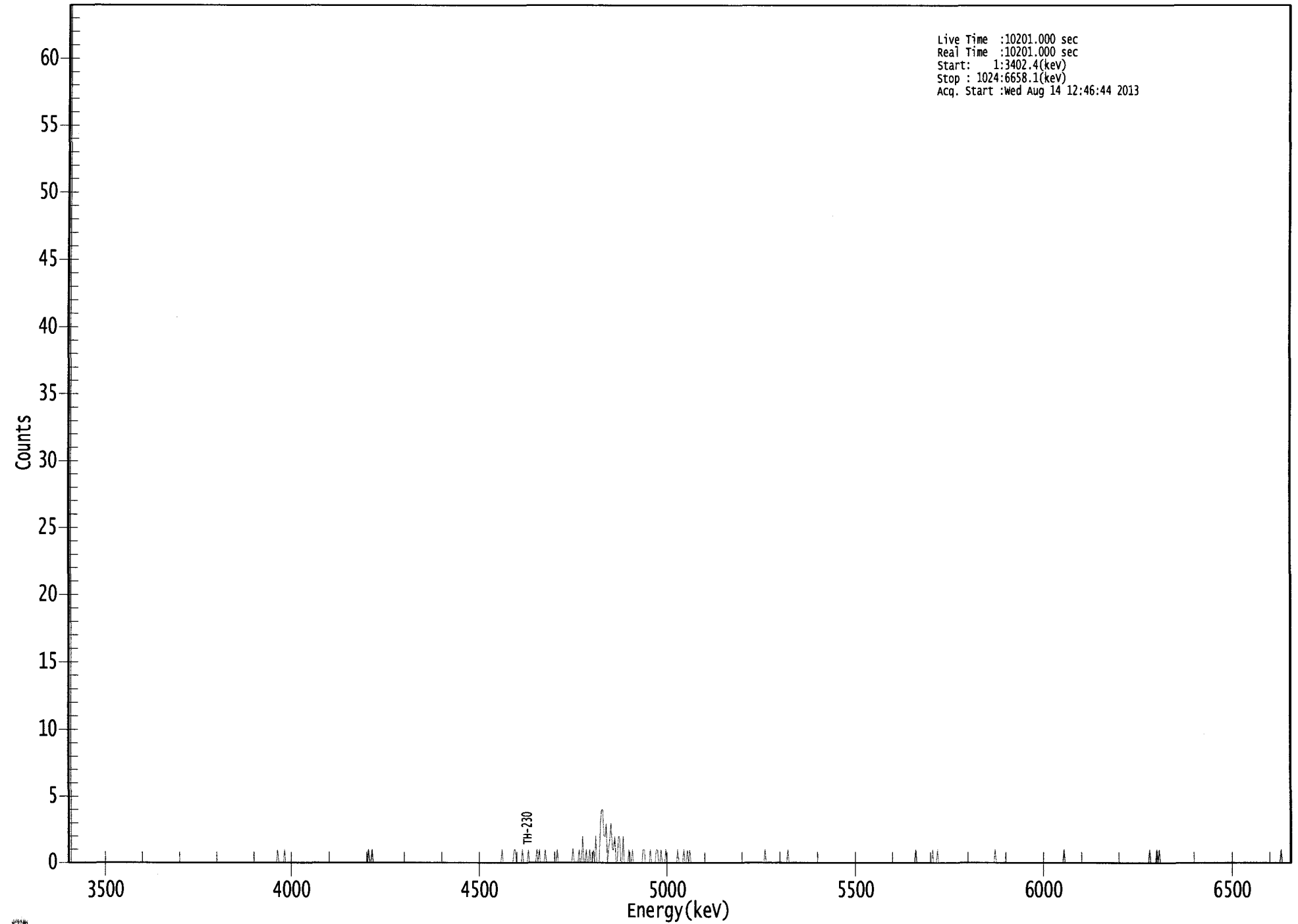
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.964	5850.00*	5.79E-002 +/- 1.59E-001	3.27E-001 +/- 8.94E-002
TH-228	0.940	5400.00*	-3.96E-002 +/- 1.38E-001	3.90E-001 +/- 1.06E-001
TH-229	1.000	4872.00*	2.40E+000 +/- 6.56E-001	2.61E-001 +/- 7.12E-002
TH-230	0.992	4672.00*	3.17E-001 +/- 2.73E-001	3.19E-001 +/- 8.71E-002
TH-232	0.997	3997.00*	3.51E-002 +/- 1.26E-001	2.85E-001 +/- 7.80E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

0000066175.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3402.4(kev)
Stop : 1024:6658.1(kev)
Acq. Start :wed Aug 14 12:46:44 2013



ROI Type: 1

ROI Type: 3

0227

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

Sample Title: 09

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	0	0	0	0
129:	0	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	1	0	0	0	0	0	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	0	0	0	0	0	0
249:	0	0	0	0	1	0	0	1
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	0	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	1	0	0	0

369: 0 0 0 0 0 0 1 1

Sample Title: 09

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	1	0	0
385:	0	0	1	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	1	0	0	0	0	0
417:	0	0	0	0	0	0	0	1
425:	0	0	0	0	1	0	0	2
433:	0	0	1	0	0	1	0	0
441:	1	0	2	0	0	0	3	4
449:	4	2	2	3	0	1	2	3
457:	1	1	2	0	0	2	2	0
465:	0	2	0	0	0	0	1	0
473:	0	1	0	0	0	0	0	0
481:	0	0	1	1	0	0	0	0
489:	1	0	0	0	0	1	1	0
497:	0	1	0	0	0	1	0	0
505:	0	0	0	0	0	0	0	1
513:	0	0	0	0	1	0	0	1
521:	0	1	0	0	0	0	0	0
529:	0	0	0	0	0	0	0	0
537:	0	0	0	0	0	0	0	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	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	0	0	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	1	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	1	0	0	0
729:	1	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	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: 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	1	0	0	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	0	0	0	0	0	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	0	0	0	0	0	0	0
905:	0	1	0	0	0	0	0	1
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	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	1	0
1017:	0	0	0	0	0	0	0	0

KB
8/14/13

Apex-Alpha™

Sample Description: PZ-106-KS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 10
 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: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:45 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: 0.1491 +/- 0.0138
 Counting Efficiency: 0.1945 +/- 0.0036 on 12/15/2012 2:30:02 PM
 Chem. Recovery Factor: 0.7665 +/- 0.0722

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	5.757	4.32	102.62	0.68	0.00E+000	3.1
TH-228	5.272	-0.72	427.02	2.72	0.00E+000	3.1
TH-229 T	4.880	133.15	17.05	0.85	0.00E+000	5.7
TH-230	4.621	7.66	72.63	0.34	0.00E+000	3.1
TH-232	3.950	1.81	193.79	1.19	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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

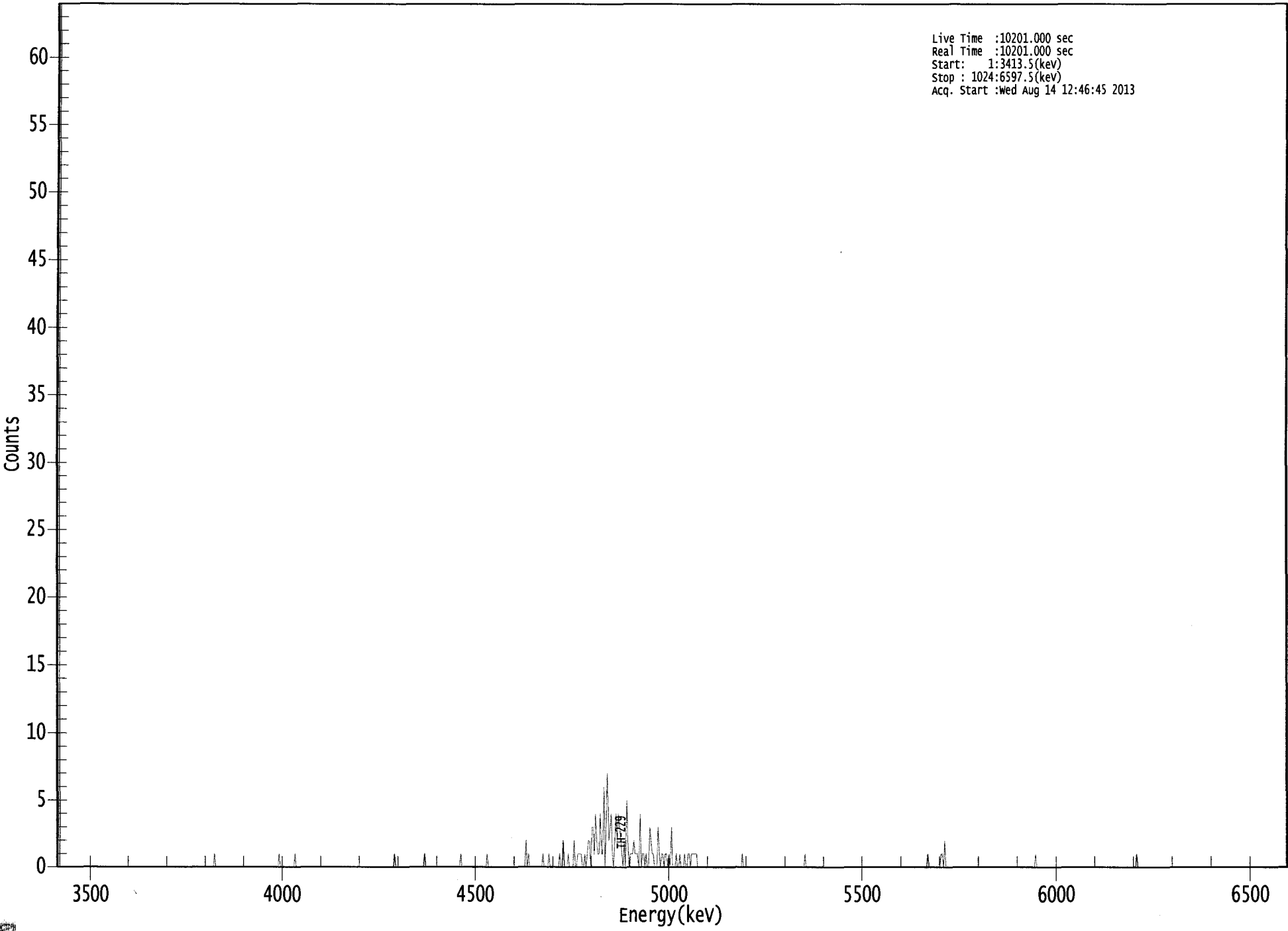
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.956	5850.00*	7.89E-002 +/- 8.22E-002	1.03E-001 +/- 1.86E-002
TH-228	0.917	5400.00*	-1.31E-002 +/- 5.62E-002	1.56E-001 +/- 2.83E-002
TH-229	1.000	4872.00*	2.38E+000 +/- 4.30E-001	1.07E-001 +/- 1.93E-002
TH-230	0.987	4672.00*	1.36E-001 +/- 1.02E-001	8.51E-002 +/- 1.54E-002
TH-232	0.988	3997.00*	3.22E-002 +/- 6.26E-002	1.17E-001 +/- 2.12E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066176.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3413.5(kev)
Stop : 1024:6597.5(kev)
Acq. Start :Wed Aug 14 12:46:45 2013



ROI Type: 1

ROI Type: 3

0232

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

Sample Title: 10

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	0	0	0	0
129:	0	0	0	0	1	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	1	0	0	0	0	0
193:	0	0	0	0	0	0	0	1
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	0	0	0	0	0
233:	0	0	0	0	0	0	0	0
241:	0	0	0	0	0	0	0	0
249:	0	0	0	0	0	0	0	0
257:	0	0	0	0	0	0	0	0
265:	0	0	0	0	0	0	0	0
273:	0	0	0	0	0	0	0	0
281:	0	0	1	0	0	0	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0	0
305:	0	0	0	1	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	1	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	1
361:	0	0	0	0	0	0	0	0

369: 0 0 0 0 0 0 0 0

Sample Title: 10

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

801: 0 0 0 0 0 0 0 0

Sample Title: 10

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



Apex-Alpha™

103
8/14/13

Sample Description: PZ-106-KS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 11
 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: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:46 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: 0.0616 +/- 0.0086
 Counting Efficiency: 0.1418 +/- 0.0034 on 6/13/2013 3:23:29 PM
 Chem. Recovery Factor: 0.4340 +/- 0.0614

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	5.817	1.32	215.97	0.68	0.00E+000	3.1
TH-228	5.387	0.98	294.85	1.02	0.00E+000	3.1
TH-229 T	4.890	55.15	26.63	0.85	0.00E+000	3.1
TH-230	4.592	1.49	190.02	0.51	0.00E+000	3.1
TH-232	3.958	1.15	249.59	0.85	0.00E+000	3.1

T = Tracer Peak used for Effective Efficiency

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

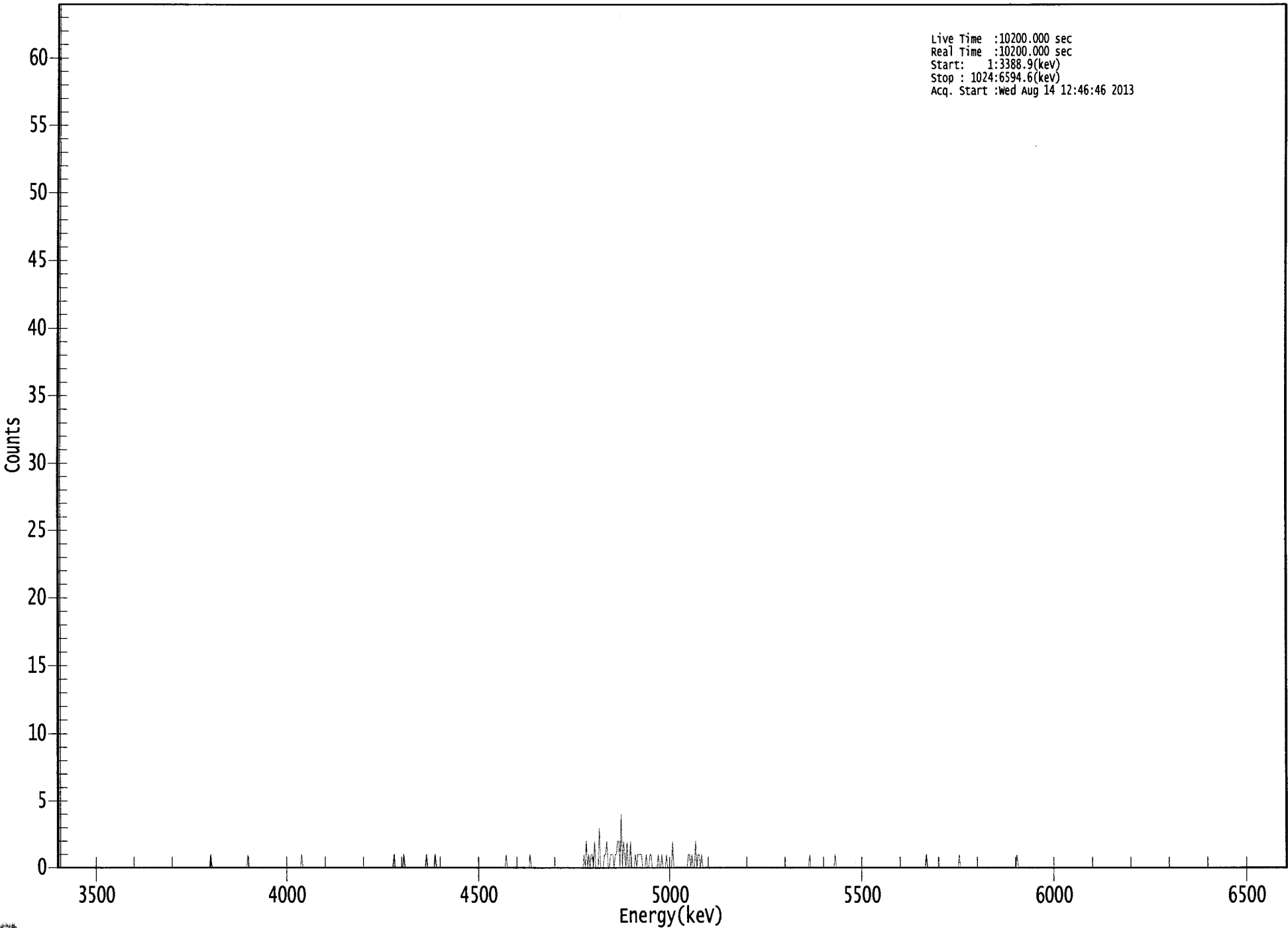
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.994	5850.00*	5.84E-002 +/- 1.27E-001	2.50E-001 +/- 6.82E-002
TH-228	0.999	5400.00*	4.33E-002 +/- 1.28E-001	2.79E-001 +/- 7.61E-002
TH-229	0.998	4872.00*	2.39E+000 +/- 6.52E-001	2.59E-001 +/- 7.07E-002
TH-230	0.967	4672.00*	6.43E-002 +/- 1.23E-001	2.26E-001 +/- 6.18E-002
TH-232	0.992	3997.00*	4.95E-002 +/- 1.24E-001	2.58E-001 +/- 7.04E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066177.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 14 12:46:46 2013



ROI Type: 1

ROI Type: 3

5237

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

369: 0 0 0 0 0 0 1 0

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	0	0	0	0
393:	0	0	1	0	0	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	1
441:	0	2	0	1	0	1	1	0
449:	2	0	0	0	3	0	0	0
457:	1	1	2	0	0	1	1	1
465:	0	1	1	2	2	0	4	0
473:	2	1	0	2	0	0	2	0
481:	0	0	1	0	1	1	1	1
489:	0	0	0	1	0	0	1	1
497:	0	0	0	0	0	1	0	0
505:	1	0	0	0	1	0	0	0
513:	0	2	0	0	0	0	0	0
521:	0	0	0	0	0	0	1	1
529:	0	1	0	0	2	0	1	1
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	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	0
641:	0	0	0	0	0	0	0	0
649:	1	0	0	0	0	0	0	0
657:	0	0	0	0	0	0	0	0
665:	0	0	0	0	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	1	0	0	0
729:	0	0	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	1

801: 0 0 0 0 0 0 0 0

Sample Title: 11

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

ICB
8/14/13

Apex-Alpha™

Sample Description: DUP 08 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\0000661
 Batch Identification: 1307154A-TH
 Sample Identification: 12
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_033
 Chamber Serial Number: 04026479A
 Detector Serial Number: 91132
 Env. Background: System Bkgd 64781
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:46:58 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.235 mL
 Effective Efficiency: 0.1379 +/- 0.0132
 Counting Efficiency: 0.1848 +/- 0.0032 on 7/20/2013 2:31:30 PM
 Chem. Recovery Factor: 0.7461 +/- 0.0724

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	5.836	3.15	126.67	0.85	0.00E+000	3.0
TH-228	5.386	58.49	25.76	0.51	0.00E+000	8.9
TH-229 T	4.894	123.49	17.68	0.51	0.00E+000	3.3
TH-230	4.648	69.00	23.77	0.00	0.00E+000	12.9
TH-232	3.979	81.83	21.69	0.17	0.00E+000	4.0

T = Tracer Peak used for Effective Efficiency

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

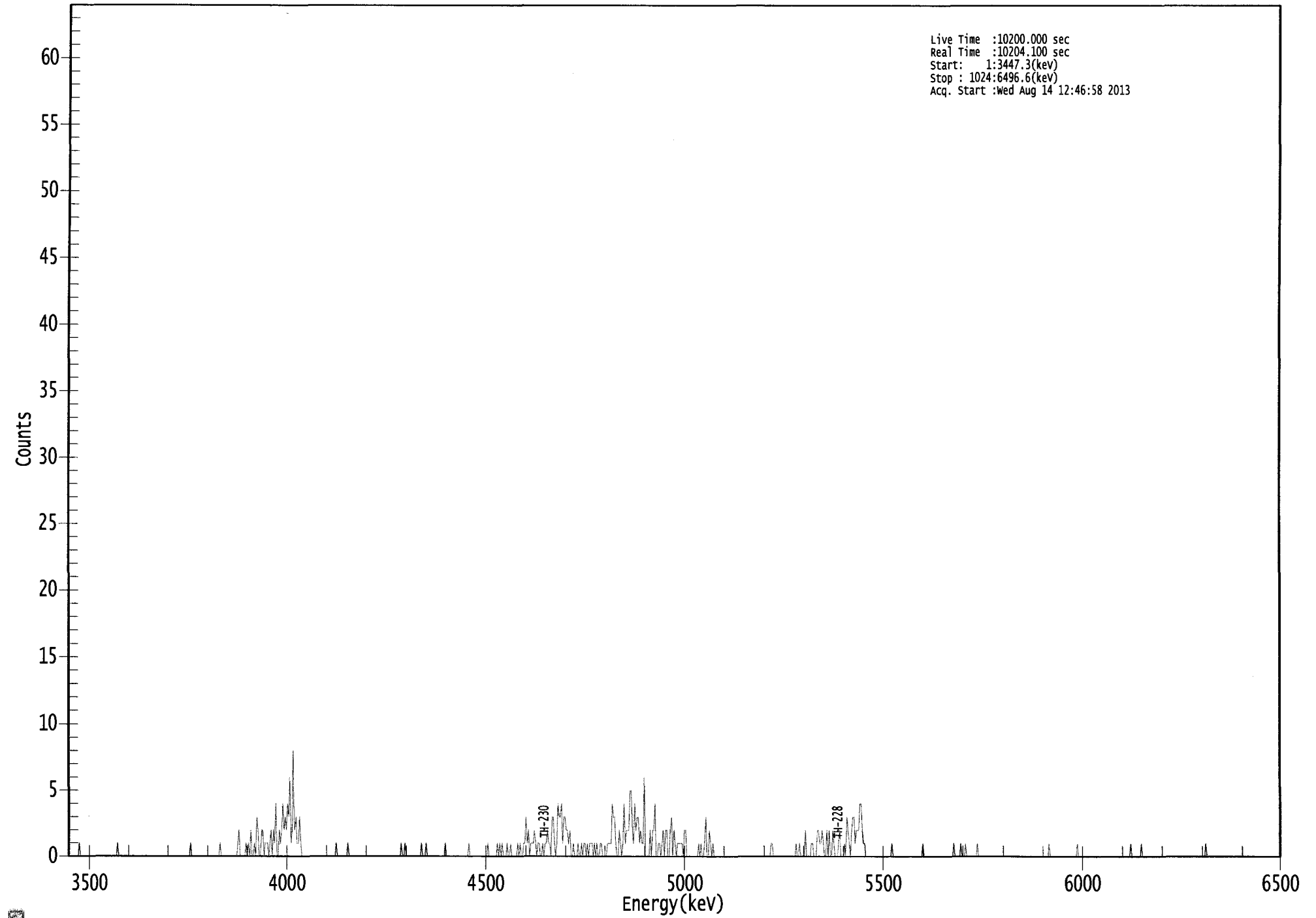
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.999	5850.00*	6.22E-002 +/- 7.97E-002	1.18E-001 +/- 2.21E-002
TH-228	0.999	5400.00*	1.15E+000 +/- 3.67E-001	1.04E-001 +/- 1.94E-002
TH-229	0.998	4872.00*	2.38E+000 +/- 4.46E-001	1.01E-001 +/- 1.89E-002
TH-230	0.997	4672.00*	1.33E+000 +/- 4.02E-001	1.15E-001 +/- 2.16E-002
TH-232	0.998	3997.00*	1.57E+000 +/- 4.50E-001	8.02E-002 +/- 1.50E-002

AG
8/14/13

US EPA ARCHIVE DOCUMENT

000066180.CNF

Live Time :10200.000 sec
Real Time :10204.100 sec
Start: 1:3447.3(keV)
Stop : 1024:6496.6(keV)
Acq. Start :wed Aug 14 12:46:58 2013



ROI Type: 1

ROI Type: 3

0242

 ***** 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: 10204

Channel	-----	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0	0
9:	0	1	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	1	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:	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	1	0	0	0	0	0	0
137:	0	0	0	0	0	0	0	0
145:	1	2	0	0	0	0	0	1
153:	0	1	0	2	0	0	1	0
161:	3	2	0	0	2	2	0	1
169:	1	1	0	1	2	0	2	1
177:	4	0	0	2	1	2	4	2
185:	3	2	4	3	6	1	2	8
193:	2	3	1	1	3	1	0	0
201:	0	0	0	0	0	0	0	0
209:	0	0	0	0	0	0	0	0
217:	0	0	0	0	0	0	0	0
225:	0	0	0	1	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	0	0	0	0	0	0
281:	0	0	1	0	0	1	0	0
289:	0	0	0	0	0	0	0	0
297:	0	0	0	1	0	0	0	1
305:	0	0	0	0	0	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	0	1	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	1	0	0	0	0
361:	0	0	0	1	0	1	0	1

369: 0 0 0 1 0 0 1 0

Sample Title: 12

Channel	1	2	3	4	5	6	7	8
377:	0	0	0	0	1	0	1	0
385:	0	1	1	3	1	2	0	1
393:	1	1	2	1	0	1	1	0
401:	0	1	0	1	1	2	1	1
409:	0	3	3	1	0	1	4	3
417:	3	4	1	3	3	2	2	1
425:	2	0	0	1	0	0	0	1
433:	0	0	1	0	1	1	0	1
441:	0	1	1	1	0	1	0	1
449:	0	0	1	1	0	0	0	0
457:	1	1	1	1	4	3	3	1
465:	0	0	2	1	0	1	4	1
473:	2	2	2	5	5	2	1	4
481:	2	3	3	1	2	1	1	6
489:	0	0	0	0	2	0	2	2
497:	4	0	0	1	1	0	1	2
505:	0	2	2	0	0	2	3	0
513:	2	1	0	1	1	1	1	1
521:	0	2	2	0	0	0	0	0
529:	0	0	0	0	0	1	0	1
537:	0	0	1	3	0	0	2	1
545:	0	1	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	1	1	0	0	0	0
601:	0	0	0	0	0	0	0	0
609:	0	0	0	0	0	0	0	1
617:	0	0	1	0	0	0	0	2
625:	0	0	0	0	1	1	0	0
633:	0	2	2	1	1	2	1	0
641:	0	2	0	2	0	0	2	1
649:	0	0	0	1	2	0	0	0
657:	1	0	3	2	1	0	2	3
665:	3	1	2	2	2	4	4	2
673:	1	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:	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	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	1	0	0	0
753:	0	0	1	0	0	0	1	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	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	1	0	0	0
857:	0	0	0	0	0	0	0	0
865:	0	0	0	0	0	0	0	0
873:	0	0	0	0	0	0	0	0
881:	0	0	0	0	0	0	0	0
889:	0	0	0	0	0	0	0	0
897:	0	1	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	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	0	0	0	0	0	0	0
961:	1	0	0	0	0	0	0	0
969:	0	0	0	0	0	0	0	0
977:	0	0	0	0	0	0	0	0
985:	0	0	0	0	0	0	0	0
993:	0	0	0	0	0	0	0	0
1001:	0	0	0	0	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	0	0	0	0	0	0	0

ICB
8/14/13

Apex-Alpha™

Sample Description: DUP 08 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000661
 Batch Identification: 1307154A-TH
 Sample Identification: 13
 Sample Geometry: Shelf 2
 Procedure Description: Th iso

Detector Name: Alpha_034
 Chamber Serial Number: 04026479B
 Detector Serial Number: 91136
 Env. Background: System Bkgd 64782
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Sample Date/Time: 7/19/2013 7:22:05 AM
 Acquisition Date/Time: 8/14/2013 12:47:00 PM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.1 minutes

Tracer Certificate: Th229_TH-18A
 Tracer Quantity: 0.235 mL
 Effective Efficiency: 0.1177 +/- 0.0120
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
 Chem. Recovery Factor: 0.6344 +/- 0.0658

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	5.874	-0.17	1169.4	0.17	0.00E+000	0.0
TH-228	5.391	6.83	76.08	0.17	0.00E+000	5.9
TH-229 T	4.871	105.66	19.10	0.34	0.00E+000	7.3
TH-230	4.632	11.00	61.72	0.00	0.00E+000	3.0
TH-232	3.884	1.83	152.56	0.17	0.00E+000	3.0

T = Tracer Peak used for Effective Efficiency

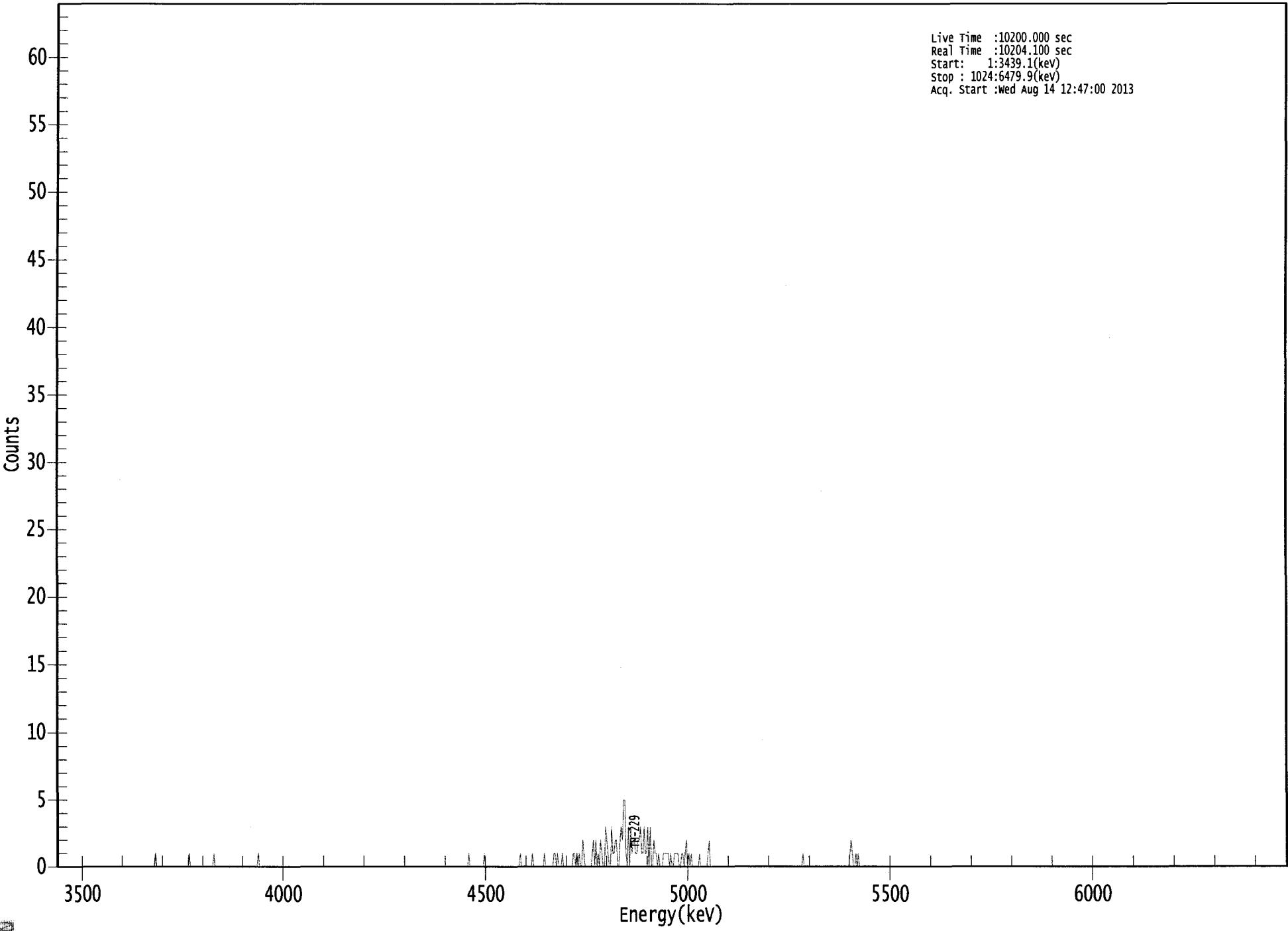
 ----- NUCLIDE ANALYSIS RESULTS -----

Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
TH-227	0.997	5850.00*	-3.93E-003 +/- 4.60E-002	9.66E-002 +/- 1.94E-002
TH-228	1.000	5400.00*	1.58E-001 +/- 1.24E-001	9.65E-002 +/- 1.93E-002
TH-229	1.000	4872.00*	2.39E+000 +/- 4.79E-001	1.08E-001 +/- 2.17E-002
TH-230	0.992	4672.00*	2.48E-001 +/- 1.61E-001	1.35E-001 +/- 2.71E-002
TH-232	0.935	3997.00*	4.12E-002 +/- 6.34E-002	9.39E-002 +/- 1.88E-002

AG
8/14/13

000066181.CNF

Live Time :10200.000 sec
Real Time :10204.100 sec
Start: 1:3439.1(kev)
Stop : 1024:6479.9(kev)
Acq. Start :wed Aug 14 12:47:00 2013



ROI Type: 1

ROI Type: 3

0247

***** 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: 10204

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

369: 0 0 0 0 0 0 0 0 0

Sample Title: 13

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	0	0	0	1	0	0	0
401:	0	0	0	0	0	0	1	0
409:	0	0	0	0	0	0	1	1
417:	0	1	0	0	0	1	0	0
425:	0	0	0	0	0	0	1	1
433:	0	1	0	1	0	0	2	1
441:	0	0	0	0	0	0	1	2
449:	0	2	0	1	0	2	1	0
457:	0	3	2	1	0	0	3	1
465:	1	2	2	0	0	2	3	2
473:	5	5	1	0	3	0	3	1
481:	2	2	1	1	2	2	3	1
489:	1	3	1	1	3	0	3	0
497:	0	2	1	1	0	1	0	0
505:	0	1	1	1	1	1	0	1
513:	0	0	1	1	1	1	0	0
521:	1	1	0	1	2	0	1	0
529:	1	0	0	0	0	0	0	1
537:	0	0	0	0	0	0	1	2
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	1	0	0
625:	0	0	0	0	0	0	0	0
633:	0	0	0	0	0	0	0	0
641:	0	0	0	0	0	0	0	0
649:	0	0	0	0	0	0	0	0
657:	0	0	0	0	1	2	1	0
665:	0	1	0	1	0	0	0	0
673:	0	0	0	0	0	0	0	0
681:	0	0	0	0	0	0	0	0
689:	0	0	0	0	0	0	0	0
697:	0	0	0	0	0	0	0	0
705:	0	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	0	0	0	0
769:	0	0	0	0	0	0	0	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 0 0 0 0 0 0 0 0

Sample Title: 13

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



QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 8/14/2013
Time : 5:45:39 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/14/2013 5:27:31 AM
Alpha 004	21f	ALL	Passed	8/14/2013 5:27:32 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	8/14/2013 5:27:33 AM
Alpha 011	21f	ALL	Passed	8/14/2013 5:27:34 AM
Alpha 012	21f	ALL	Passed	8/14/2013 5:27:34 AM
Alpha 013	21f	ALL	Passed	8/14/2013 5:27:35 AM
Alpha 014	21f	ALL	Passed	8/14/2013 5:27:36 AM
Alpha 015	21f	Peak Energy	Action	8/14/2013 5:27:37 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	8/14/2013 5:27:38 AM
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/14/2013 5:27:38 AM
Alpha 023	AIM730	ALL	Passed	8/14/2013 5:27:39 AM
Alpha 024	AIM730	ALL	Passed	8/14/2013 5:27:40 AM
Alpha 025	AIM730	ALL	Passed	8/14/2013 5:27:41 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/14/2013 5:27:42 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/14/2013 5:27:42 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/14/2013 5:27:43 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:44 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:46 AM
Alpha 035	Alpha Analyst100DC	ALL	Passed	8/13/2013 5:25:31 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:49 AM
Alpha 037	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:50 AM
Alpha 038	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:52 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:54 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:56 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:27:58 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/14/2013 5:28:00 AM

 ***** 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)

Ra226

Run 1

Work Order	13-07154	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	Ra226	01	LCS	LCS		07/24/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/24/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	PZ-107-SS TOT	46	07/19/13 12:10	1.0000E+00
Lab Deadline	8/13/2013	04	TRG	PZ-200-SS TOT	42	07/19/13 10:19	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-200-SS DIS	42	07/19/13 10:19	1.0000E+00
Project	West Lake OU-1	06	TRG	PZ-102-SS TOT	38	07/19/13 10:30	1.0000E+00
Report Level	4	07	TRG	PZ-102-SS DIS	38	07/19/13 10:30	1.0000E+00
Activity Units	pCi	08	DO	PZ-107-SS TOT	46	07/19/13 12:10	1.0000E+00
Aliquot Units	I	09	TRG	PZ-107-SS DIS	46	07/19/13 12:10	1.0000E+00
Matrix	WA	10	TRG	PZ-106-KS TOT	45	07/19/13 13:09	1.0000E+00
Method	E903.0	11	TRG	PZ-106-KS DIS	45	07/19/13 13:09	1.0000E+00
Instrument Type	Alpha Spectroscopy	12	TRG	DUP 08 TOT	44	07/19/13 00:00	1.0000E+00
Radiometric Tracer	Ba-133	13	TRG	DUP 08 DIS	44	07/19/13 00:00	1.0000E+00
Radiometric Sol#	Ba-6a						
Tracer Act (dpm/g)	990.223						
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.

0255

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	0.9259	916.8	438.4	106.15		0.0231	0.0291	0.0060		106.15	2.16	1.00
02	MBL	0.9151	906.2	393.9	96.50		0.0230	0.0292	0.0062		96.50	2.23	1.00
03	DUP	0.9164	907.4	310.4	75.94		0.0224	0.0287	0.0063		75.94	2.27	1.00
04	TRG	0.9147	905.8	316.8	77.65		0.0229	0.0288	0.0059		77.65	2.12	1.00
05	TRG	0.9134	904.5	392.2	96.26		0.0227	0.0302	0.0075		96.26	2.64	1.00
06	TRG	0.9122	903.3	128.6	31.61		0.0229	0.0260	0.0031		31.61	0.40	1.00
07	TRG	0.9120	903.1	413.2	101.57		0.0231	0.0300	0.0069		101.57	2.47	1.00
08	DO	0.9118	902.9	300.7	73.94		0.0233	0.0322	0.0089		73.94	2.99	1.00
09	TRG	0.9102	901.3	407.9	100.47		0.0230	0.0305	0.0075		100.47	2.64	1.00
10	TRG	0.9126	903.7	390.7	95.98		0.0227	0.0297	0.0070		95.98	2.50	1.00
11	TRG	0.9091	900.2	418.0	103.08		0.0228	0.0302	0.0074		103.08	2.61	1.00
12	TRG	0.9079	899.0	343.8	84.90		0.0227	0.0293	0.0066		84.90	2.37	1.00
13	TRG	0.9079	899.0	376.0	92.85		0.0226	0.0306	0.0080		92.85	2.77	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.

0255

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
02	MBL			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
03	DUP			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
04	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
05	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
06	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
07	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
08	DO			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
09	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
10	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
11	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
12	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		
13	TRG			08/07/13 10:33	JWOLFE	08/08/13 14:54	LWALKER		

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

0257

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-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	1.04E+01	1.17E+00	1.62E-01	1.04E+01	100.32	OK		OK	
02	RA-226	MBL	BLANK	pCi/l	1.43E-01	1.46E-01	1.86E-01					OK	OK
03	RA-226	DUP	PZ-107-SS TOT	pCi/l	5.07E+00	9.36E-01	1.81E-01				OK	OK	
04	RA-226	TRG	PZ-200-SS TOT	pCi/l	9.71E-01	3.89E-01	2.60E-01					OK	
05	RA-226	TRG	PZ-200-SS DIS	pCi/l	1.80E+00	5.54E-01	2.89E-01					OK	
06	RA-226	TRG	PZ-102-SS TOT	pCi/l	7.69E+00	1.16E+00	3.13E-01					OK	
07	RA-226	TRG	PZ-102-SS DIS	pCi/l	3.12E+00	6.53E-01	1.81E-01					OK	
08	RA-226	DO	PZ-107-SS TOT	pCi/l	6.39E+00	1.22E+00	3.47E-01					OK	
09	RA-226	TRG	PZ-107-SS DIS	pCi/l	5.33E+00	8.87E-01	1.92E-01					OK	
10	RA-226	TRG	PZ-106-KS TOT	pCi/l	3.34E-01	2.28E-01	1.84E-01					OK	
11	RA-226	TRG	PZ-106-KS DIS	pCi/l	3.54E-01	2.37E-01	2.14E-01					OK	
12	RA-226	TRG	DUP 08 TOT	pCi/l	5.32E+00	9.67E-01	1.84E-01					OK	
13	RA-226	TRG	DUP 08 DIS	pCi/l	5.09E+00	9.59E-01	3.16E-01					OK	



Run 1

Analysis Code Ra226

Eberline Services Work Order 13-07154

Client Engineering Management Support, Inc.

8520

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-Ra226-1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	RA-226	LCS	07/24/13 00:00	1.00E+00	100.00	0.00	106.15		8/8/2013 14:54	
02	RA-226	MBL	07/24/13 00:00	1.00E+00	96.50	0.00	96.50		8/8/2013 14:54	
03	RA-226	DUP	07/19/13 12:10	1.00E+00	75.94	0.00	75.94		8/8/2013 14:54	
04	RA-226	TRG	07/19/13 10:19	1.00E+00	77.65	0.00	77.65		8/8/2013 14:54	
05	RA-226	TRG	07/19/13 10:19	1.00E+00	96.26	0.00	96.26		8/8/2013 14:54	
06	RA-226	TRG	07/19/13 10:30	1.00E+00	31.60	0.00	31.61		8/8/2013 14:54	
07	RA-226	TRG	07/19/13 10:30	1.00E+00	100.00	0.00	101.57		8/8/2013 14:54	
08	RA-226	DO	07/19/13 12:10	1.00E+00	73.94	0.00	73.94		8/8/2013 14:54	
09	RA-226	TRG	07/19/13 12:10	1.00E+00	100.00	0.00	100.47		8/8/2013 14:54	
10	RA-226	TRG	07/19/13 13:09	1.00E+00	95.98	0.00	95.98		8/8/2013 14:54	
11	RA-226	TRG	07/19/13 13:09	1.00E+00	100.00	0.00	103.08		8/8/2013 14:54	
12	RA-226	TRG	07/19/13 00:00	1.00E+00	84.90	0.00	84.90		8/8/2013 14:54	
13	RA-226	TRG	07/19/13 00:00	1.00E+00	92.85	0.00	92.85		8/8/2013 14:54	


 Run **1**
 Analysis Code **Ra226**
 Eberline Services Work Order **13-07154**
 Client **Engineering Management Support, Inc.**

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-Ra226-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-226	LCS	08/09/13 09:04		A_Spec	Alpha_033	170	3.35 E+02	3.00 E-03	18.5
02	RA-226	MBL	08/09/13 09:04		A_Spec	Alpha_034	170	4.32 E+00	4.00 E-03	18.6
03	RA-226	DUP	08/09/13 09:04		A_Spec	Alpha_035	170	1.17 E+02	1.00 E-03	18.3
04	RA-226	TRG	08/09/13 09:05		A_Spec	Alpha_036	170	2.56 E+01	8.00 E-03	19.1
05	RA-226	TRG	08/09/13 09:05		A_Spec	Alpha_038	170	4.26 E+01	8.00 E-03	17.2
06	RA-226	TRG	08/09/13 09:05		A_Spec	Alpha_039	170	1.80 E+02	1.00 E-02	19.7
07	RA-226	TRG	08/09/13 09:05		A_Spec	Alpha_040	170	9.05 E+01	3.00 E-03	19
08	RA-226	DO	08/09/13 09:05		A_Spec	Alpha_042	170	1.10 E+02	5.00 E-03	18.5
09	RA-226	TRG	08/09/13 09:05		A_Spec	Alpha_045	170	1.45 E+02	3.00 E-03	19.1
10	RA-226	TRG	08/09/13 09:05		A_Spec	Alpha_046	170	8.66 E+00	2.00 E-03	17.9
11	RA-226	TRG	08/09/13 09:05		A_Spec	Alpha_047	170	9.32 E+00	4.00 E-03	18.2
12	RA-226	TRG	08/09/13 09:05		A_Spec	Alpha_048	170	1.21 E+02	1.00 E-03	16.8
13	RA-226	TRG	08/09/13 09:26		A_Spec	Alpha_018	170.02	1.14 E+02	9.00 E-03	17.8

Run	1
Eberline Services Work Order	13-07154
Client	Engineering Management Support, Inc.

0256

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	07/24/13 00:00	1.0000	0.9259	916.8475	438.4000	106.15	2.16	1.00
02	MBL	BLANK	07/24/13 00:00	1.0000	0.9151	906.1531	393.9000	96.50	2.23	1.00
03	DUP	PZ-107-SS TOT	07/19/13 12:10	1.0000	0.9164	907.4404	310.4000	75.94	2.27	1.00
04	TRG	PZ-200-SS TOT	07/19/13 10:19	1.0000	0.9147	905.7570	316.8000	77.65	2.12	1.00
05	TRG	PZ-200-SS DIS	07/19/13 10:19	1.0000	0.9134	904.4697	392.2000	96.26	2.64	1.00
06	TRG	PZ-102-SS TOT	07/19/13 10:30	1.0000	0.9122	903.2814	128.6000	31.61	0.40	1.00
07	TRG	PZ-102-SS DIS	07/19/13 10:30	1.0000	0.9120	903.0834	413.2000	101.57	2.47	1.00
08	DO	PZ-107-SS TOT	07/19/13 12:10	1.0000	0.9118	902.8853	300.7000	73.94	2.99	1.00
09	TRG	PZ-107-SS DIS	07/19/13 12:10	1.0000	0.9102	901.3010	407.9000	100.47	2.64	1.00
10	TRG	PZ-106-KS TOT	07/19/13 13:09	1.0000	0.9126	903.6775	390.7000	95.98	2.50	1.00
11	TRG	PZ-106-KS DIS	07/19/13 13:09	1.0000	0.9091	900.2117	418.0000	103.08	2.61	1.00
12	TRG	DUP 08 TOT	07/19/13 00:00	1.0000	0.9079	899.0235	343.8000	84.90	2.37	1.00
13	TRG	DUP 08 DIS	07/19/13 00:00	1.0000	0.9079	899.0235	376.0000	92.85	2.77	1.00

57244
 0904

18

Spike and Tracer Worksheet

Internal Work Order		Run	Analysis Code		Date	Technician		Technician Initials		Witness Initials	
13-07154		1	Ra226		8/7/2013 10:32	JWOLFE		JW			

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	Volume Used (g)	Volume Used (g)	Volume Used (g)	Volume Used (g)	Known pCi	Error Estimate	Added pCi	Error Estimate	Known pCi	Error Estimate	Added pCi	Error Estimate
Ra-226	Ra-5b	44.066	8/7/2013	0.500	0.5217				10.36	0.476	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes	
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer	LCS
01	Ba-133	Ba-6a	990.223	8/7/2013	0.9259	1.0200		
02	Ba-133	Ba-6a	990.223	8/7/2013	0.9151	1.0200		
03	Ba-133	Ba-6a	990.223	8/7/2013	0.9164	1.0200		
04	Ba-133	Ba-6a	990.223	8/7/2013	0.9147	1.0200		
05	Ba-133	Ba-6a	990.223	8/7/2013	0.9134	1.0200		
06	Ba-133	Ba-6a	990.223	8/7/2013	0.9122	1.0200		
07	Ba-133	Ba-6a	990.223	8/7/2013	0.9120	1.0200		
08	Ba-133	Ba-6a	990.223	8/7/2013	0.9118	1.0200		
09	Ba-133	Ba-6a	990.223	8/7/2013	0.9102	1.0200		
10	Ba-133	Ba-6a	990.223	8/7/2013	0.9126	1.0200		
11	Ba-133	Ba-6a	990.223	8/7/2013	0.9091	1.0200		
12	Ba-133	Ba-6a	990.223	8/7/2013	0.9079	1.0200		
13	Ba-133	Ba-6a	990.223	8/7/2013	0.9079	1.0200		
							0.9259 g 0.9151 g -0.9164 g -0.9147 g -0.9134 g -0.9122 g -0.9120 g -0.9118 g -0.9102 g -0.9126 g -0.9091 g -0.9079 g -0.9079 g	0.5217 g 0.5194 g
								Matrix Spike

262

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-07154	1	Ra226	liters	8/13/2013	JWOLFE

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	PZ-107-SS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-200-SS TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-200-SS DIS	TRG					1.0000E+00	1.0000E+00				
06	PZ-102-SS TOT	TRG					1.0000E+00	1.0000E+00				
07	PZ-102-SS DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-107-SS TOT	DO					1.0000E+00	1.0000E+00				
09	PZ-107-SS DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-106-KS TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-106-KS DIS	TRG					1.0000E+00	1.0000E+00				
12	DUP 08 TOT	TRG					1.0000E+00	1.0000E+00				
13	DUP 08 DIS	TRG					1.0000E+00	1.0000E+00				

Comments	
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Technician: J Wolfe Date: 8/7/13

Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
13-07154	1	Ra226			LWALKER

TRetec	Engineering Management Support, Inc.	Sample	Carrier Data	Filter Data			Gravimetric
Fraction	Client ID	Type	Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)	% Recovery
01	LCS	LCS		0.0231	0.0291	0.0060	
02	BLANK	MBL		0.0230	0.0292	0.0062	
03	DUP	DUP		0.0224	0.0287	0.0063	
04	PZ-200-SS TOT	TRG		0.0229	0.0288	0.0059	
05	PZ-200-SS DIS	TRG		0.0227	0.0302	0.0075	
06	PZ-102-SS TOT	TRG		0.0229	0.0260	0.0031	
07	PZ-102-SS DIS	TRG		0.0231	0.0300	0.0069	
08	PZ-107-SS TOT	DO		0.0233	0.0322	0.0089	
09	PZ-107-SS DIS	TRG		0.0230	0.0305	0.0075	
10	PZ-106-KS TOT	TRG		0.0227	0.0297	0.0070	
11	PZ-106-KS DIS	TRG		0.0228	0.0302	0.0074	
12	DUP 08 TOT	TRG		0.0227	0.0293	0.0066	
13	DUP 08 DIS	TRG		0.0226	0.0306	0.0080	

Technician: J. Walker Date: 8, 8, 13

0264

ICS
8/9/13



Sample Description: SPIKE
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 01
 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: 2.160E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 8/9/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:04:56 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 175.7 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

Control Certificate Name: Ra226_Ra-5b
 Chem. Recov. of Control: RA-226 0.464441 +/- 0.030076
 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	5.538	532.15	8.50	0.85	0.00E+000	8.1
RA-226	4.546	335.49	10.71	0.51	0.00E+000	4.0

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

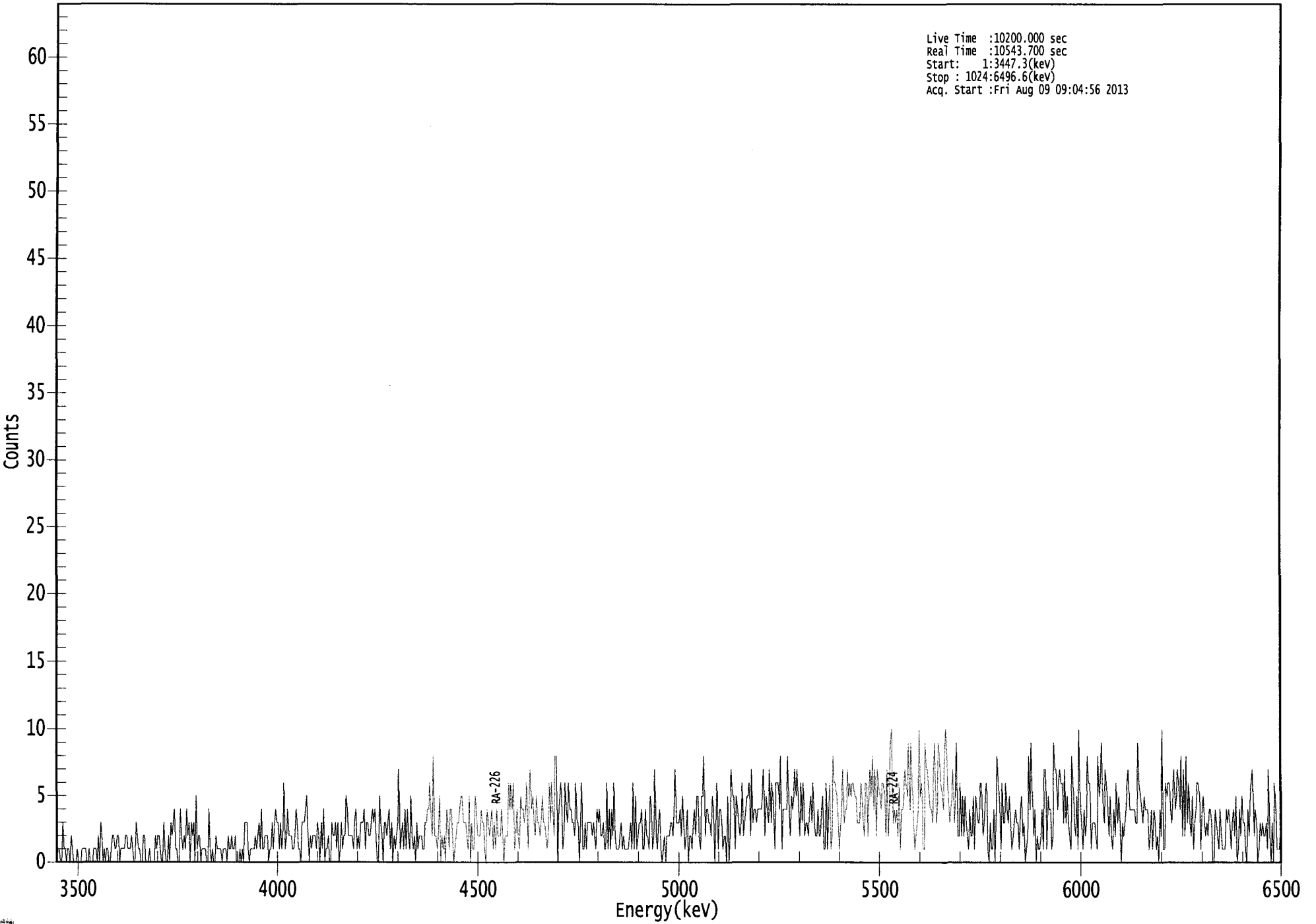
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.972	5685.50*	1.73E+001 +/- 1.59E+000	1.95E-001 +/- 6.70E-003
RA-226	0.928	4785.00*	1.04E+001 +/- 1.17E+000	1.62E-001 +/- 5.59E-003

AG
8/9/13

US EPA ARCHIVE DOCUMENT

000065676.CNF

Live Time :10200.000 sec
Real Time :10543.700 sec
Start: 1:3447.3(kev)
Stop : 1024:6496.6(kev)
Acq. Start :Fri Aug 09 09:04:56 2013



02556
9920

ROI Type: 1

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

Sample Title: 01

Elapsed Live time: 10200
Elapsed Real Time: 10544

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

369: 1 4 2 2 2 4 2 0

Sample Title: 01

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

801: 2 3 4 3 3 1 4 5

Sample Title: 01

Channel	1	2	3	4	5	6	7	8
809:	2	3	0	1	2	8	4	9
817:	5	2	4	0	2	1	1	2
825:	4	1	7	7	1	5	4	4
833:	1	2	9	7	7	4	6	7
841:	6	6	3	7	3	5	3	2
849:	1	8	6	3	2	5	1	10
857:	4	3	1	4	2	3	8	6
865:	6	1	3	3	3	2	1	8
873:	5	6	9	4	3	7	6	4
881:	2	5	2	1	4	2	6	3
889:	5	3	0	3	2	3	4	6
897:	7	4	4	4	4	4	3	3
905:	9	6	5	4	3	5	4	4
913:	4	1	2	4	1	4	3	1
921:	2	0	4	2	10	1	1	6
929:	5	6	6	4	3	5	7	4
937:	5	7	6	4	8	2	7	2
945:	8	3	6	3	2	5	1	3
953:	4	6	6	5	1	4	5	3
961:	2	3	2	4	4	3	0	0
969:	4	3	2	1	4	2	1	1
977:	1	4	3	4	3	1	3	4
985:	2	5	0	1	4	2	5	3
993:	3	1	0	4	2	5	6	7
1001:	2	4	3	0	1	3	2	3
1009:	2	2	3	1	7	2	0	3
1017:	0	6	4	1	1	1	3	7

10/3
8/9/13

Apex-Alpha™

Sample Description: BLANK
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 02
 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: 2.230E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 8/9/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:04:58 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 175.7 minutes

Chem. Recovery Factor: 0.9650 +/- 0.0000
 Counting Efficiency: 0.1856 +/- 0.0032 on 12/16/2012 5:49:43 PM
 Effective Efficiency: 0.1791 +/- 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	5.532	3.83	102.72	0.17	0.00E+000	3.0
RA-226	4.613	4.32	102.62	0.68	0.00E+000	3.0

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

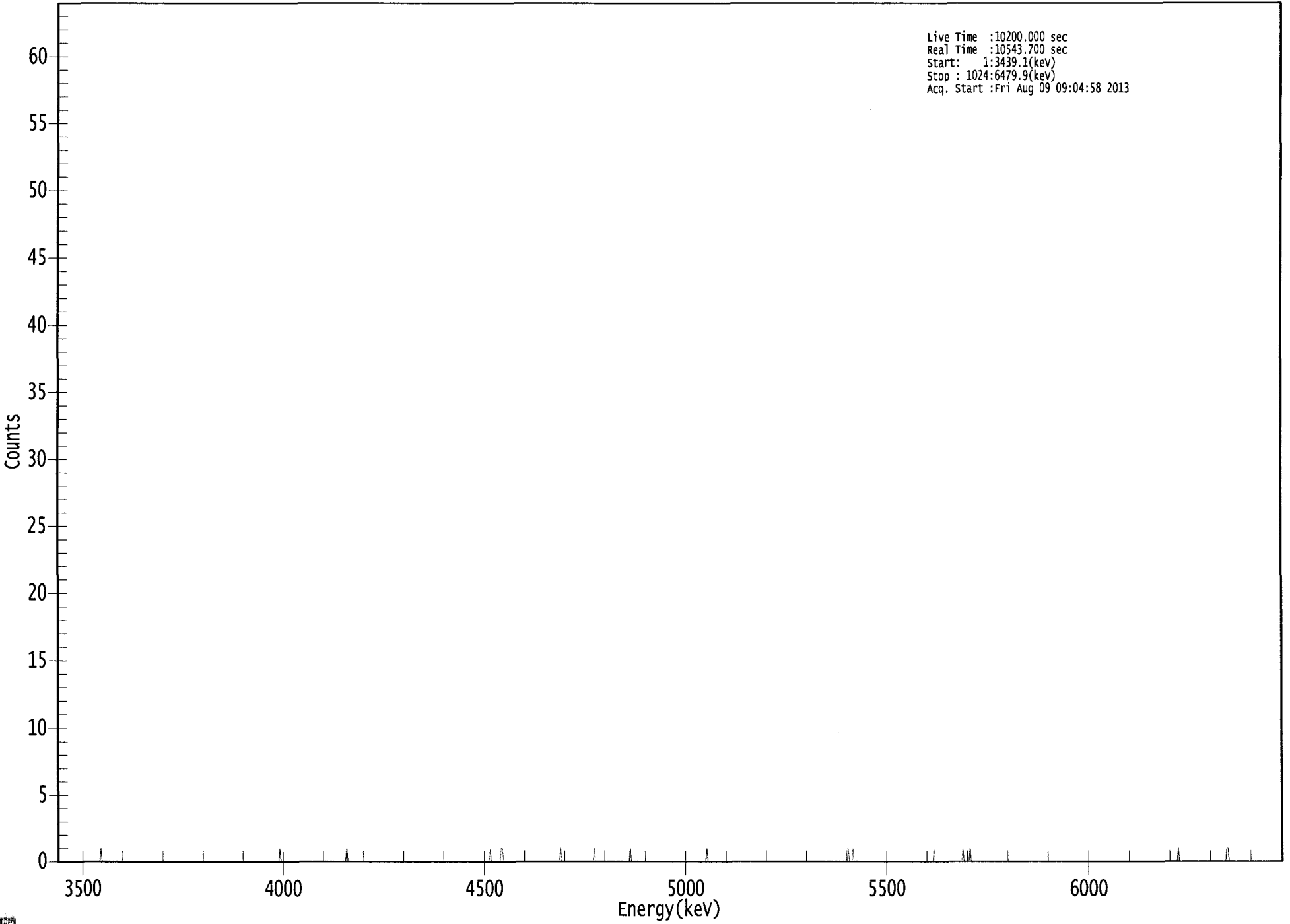
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.970	5685.50*	1.33E-001 +/- 1.37E-001	1.45E-001 +/- 4.94E-003
RA-226	0.962	4785.00*	1.43E-001 +/- 1.46E-001	1.86E-001 +/- 6.35E-003

AG
8/9/13

US EPA ARCHIVE DOCUMENT

0000065664.CNF

Live Time :10200.000 sec
Real Time :10543.700 sec
Start: 1:3439.1(keV)
Stop : 1024:6479.9(keV)
Acq. Start :Fri Aug 09 09:04:58 2013



0271

ROI Type: 1

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

Sample Title: 02

Elapsed Live time: 10200

Elapsed Real Time: 10544

Channel	-----	-----	-----	-----	-----	-----	-----
1:	0	0	0	0	0	0	0
9:	0	0	0	0	0	0	0
17:	0	0	0	0	0	0	0
25:	0	0	0	0	0	0	0
33:	0	0	0	0	1	0	0
41:	0	0	0	0	0	0	0
49:	0	0	0	0	0	0	0
57:	0	0	0	0	0	0	0
65:	0	0	0	0	0	0	0
73:	0	0	0	0	0	0	0
81:	0	0	0	0	0	0	0
89:	0	0	0	0	0	0	0
97:	0	0	0	0	0	0	0
105:	0	0	0	0	0	0	0
113:	0	0	0	0	0	0	0
121:	0	0	0	0	0	0	0
129:	0	0	0	0	0	0	0
137:	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0
153:	0	0	0	0	0	0	0
161:	0	0	0	0	0	0	0
169:	0	0	0	0	0	0	0
177:	0	0	0	0	0	0	0
185:	0	0	1	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	0	0
289:	0	0	0	0	0	0	0
297:	0	0	0	0	0	0	0
305:	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0
361:	0	0	1	0	0	0	0

369: 0 0 0 1 1 0 0 0

Sample Title: 02

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

801: 0 0 0 0 0 0 0 0

Sample Title: 02

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

KO
8/19/13

Apex-Alpha™

Sample Description: PZ-107-SS TOT-DUP
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 03
 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: 2.270E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:04:59 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 175.7 minutes

Chem. Recovery Factor: 0.7594 +/- 0.0000
 Counting Efficiency: 0.1826 +/- 0.0032 on 12/16/2012 5:49:42 PM
 Effective Efficiency: 0.1387 +/- 0.0024

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	5.512	36.66	32.55	0.34	0.00E+000	4.4
RA-226	4.580	116.83	18.15	0.17	0.00E+000	3.4

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

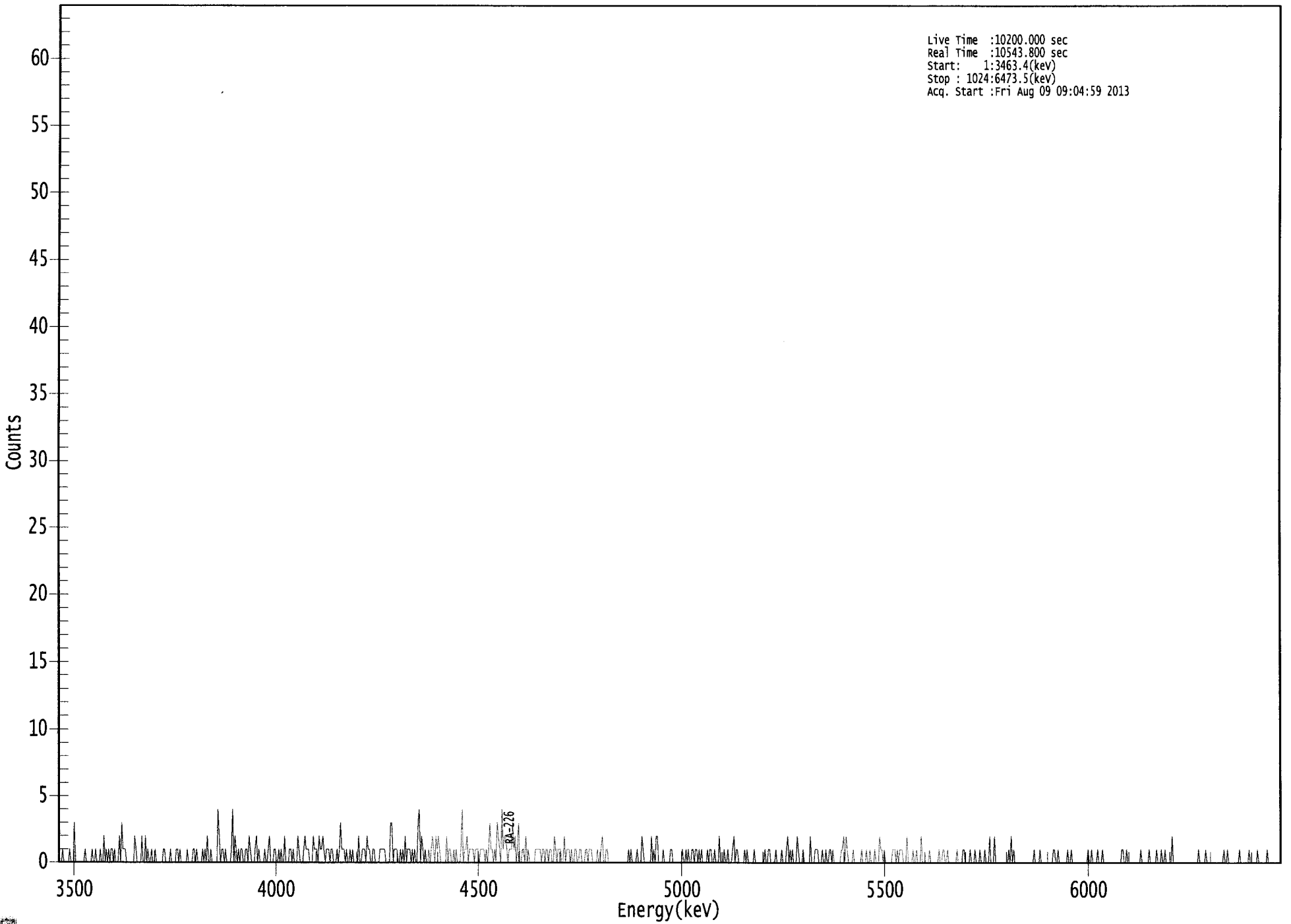
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.961	5685.50*	1.68E+000 +/- 5.51E-001	2.20E-001 +/- 7.54E-003
RA-226	0.946	4785.00*	5.07E+000 +/- 9.36E-001	1.81E-001 +/- 6.20E-003

AG
8/5/13

US EPA ARCHIVE DOCUMENT

0000065662.CNF

Live Time :10200.000 sec
Real Time :10543.800 sec
Start: 1:3463.4(keV)
Stop : 1024:6473.5(keV)
Acq. Start :Fri Aug 09 09:04:59 2013



9276

ROI Type: 1

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

Sample Title: 03

Elapsed Live time: 10200

Elapsed Real Time: 10544

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

369: 3 2 1 0 4 1 2 2

Sample Title: 03

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

801: 1 0 0 0 0 0 0 0

Sample Title: 03

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

ICB
8/9/13

Apex-Alpha™

Sample Description: PZ-200-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 04
 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: 2.120E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:05:01 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 175.7 minutes

Chem. Recovery Factor: 0.7765 +/- 0.0000
 Counting Efficiency: 0.1910 +/- 0.0033 on 7/20/2013 2:31:37 PM
 Effective Efficiency: 0.1483 +/- 0.0026

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	5.545	13.32	55.28	0.68	0.00E+000	3.0
RA-226	4.539	25.64	39.89	1.36	0.00E+000	3.0

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

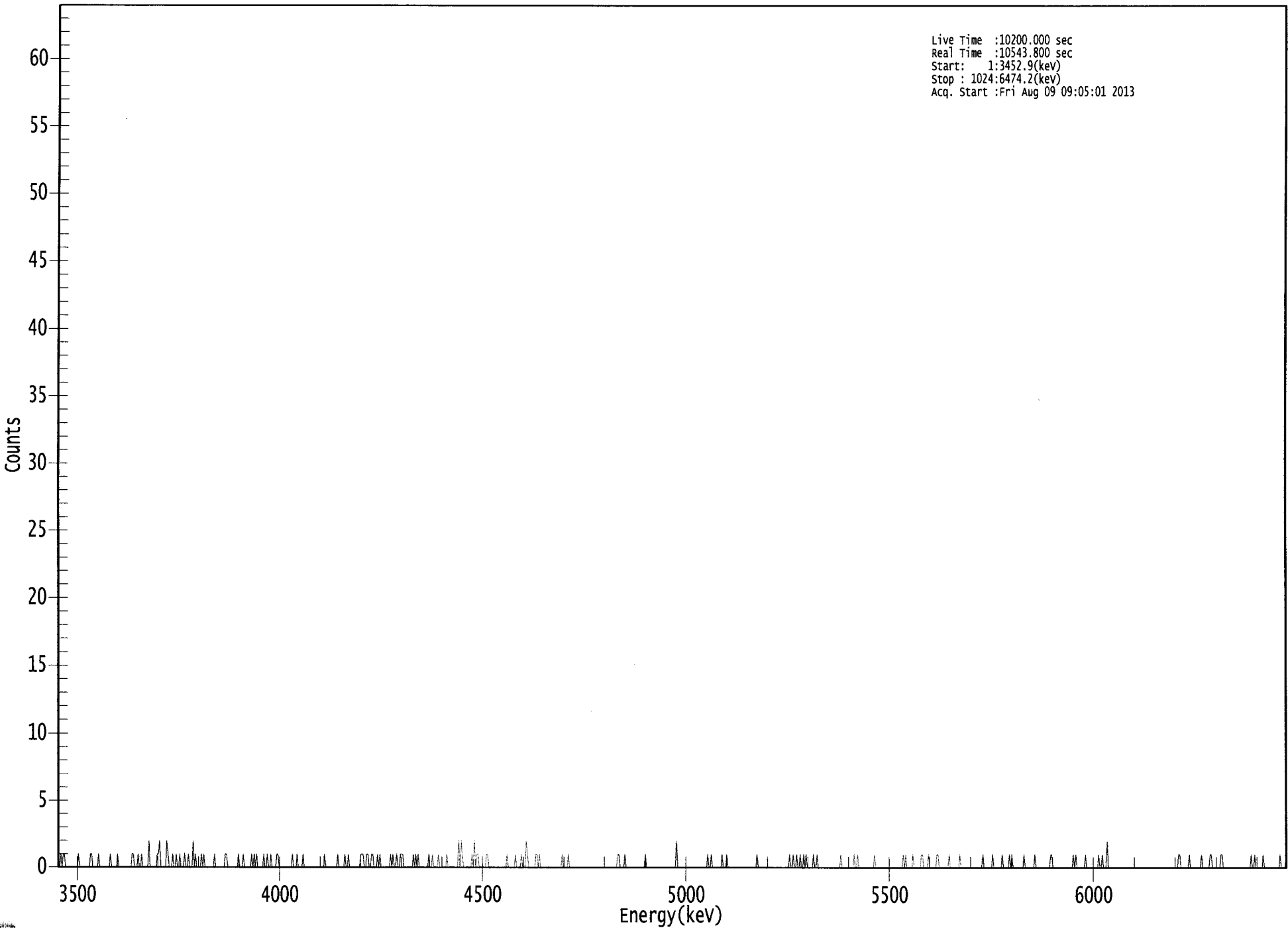
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.975	5685.50*	5.34E-001 +/- 2.96E-001	2.26E-001 +/- 7.73E-003
RA-226	0.924	4785.00*	9.71E-001 +/- 3.89E-001	2.60E-001 +/- 8.85E-003

AG
8/9/13

US EPA ARCHIVE DOCUMENT

000065661.CNF

Live Time :10200.000 sec
Real Time :10543.800 sec
Start: 1:3452.9(kev)
Stop : 1024:6474.2(kev)
Acq. Start :Fri Aug 09 09:05:01 2013



0281

ROI Type: 1

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

Sample Title: 04

Elapsed Live time: 10200
 Elapsed Real Time: 10544

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

369: 0 0 0 0 0 0 0 0 1

Sample Title: 04

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

801: 0 0 0 0 0 1 0 0

Sample Title: 04

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	1	0
817:	0	0	0	0	0	0	0	0
825:	0	0	0	1	1	0	0	0
833:	0	0	0	0	0	0	0	0
841:	0	0	0	0	0	0	1	0
849:	1	0	0	0	0	0	0	0
857:	1	0	0	0	0	0	0	0
865:	0	0	0	1	0	0	1	0
873:	0	0	2	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	1	1	0
937:	0	0	0	0	0	0	1	0
945:	0	0	0	0	0	0	0	0
953:	1	0	0	0	0	0	0	1
961:	1	0	0	0	0	0	0	0
969:	1	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	1	0	0	1	0	0	0
1001:	0	0	0	1	0	0	0	0
1009:	0	0	0	0	0	0	0	0
1017:	0	1	0	0	0	0	1	0

105
8/9/13

Apex-Alpha™

Sample Description: PZ-200-SS DIS
Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
Batch Identification: 1307154A-RA
Sample Identification: 05
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: 2.640E+000 Generic Div. Factor: 1.000E+000
Sample Date/Time: 7/19/2013 8:51:08 AM
Acquisition Date/Time: 8/9/2013 9:05:03 AM
Acquisition Live Time: 170.0 minutes
Acquisition Real Time: 175.7 minutes

Chem. Recovery Factor: 0.9626 +/- 0.0000
Counting Efficiency: 0.1722 +/- 0.0030 on 5/11/2013 5:13:35 PM
Effective Efficiency: 0.1657 +/- 0.0029

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.525	11.15	61.26	0.85	0.00E+000	3.0
RA-226	4.594	42.64	30.57	1.36	0.00E+000	4.4

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

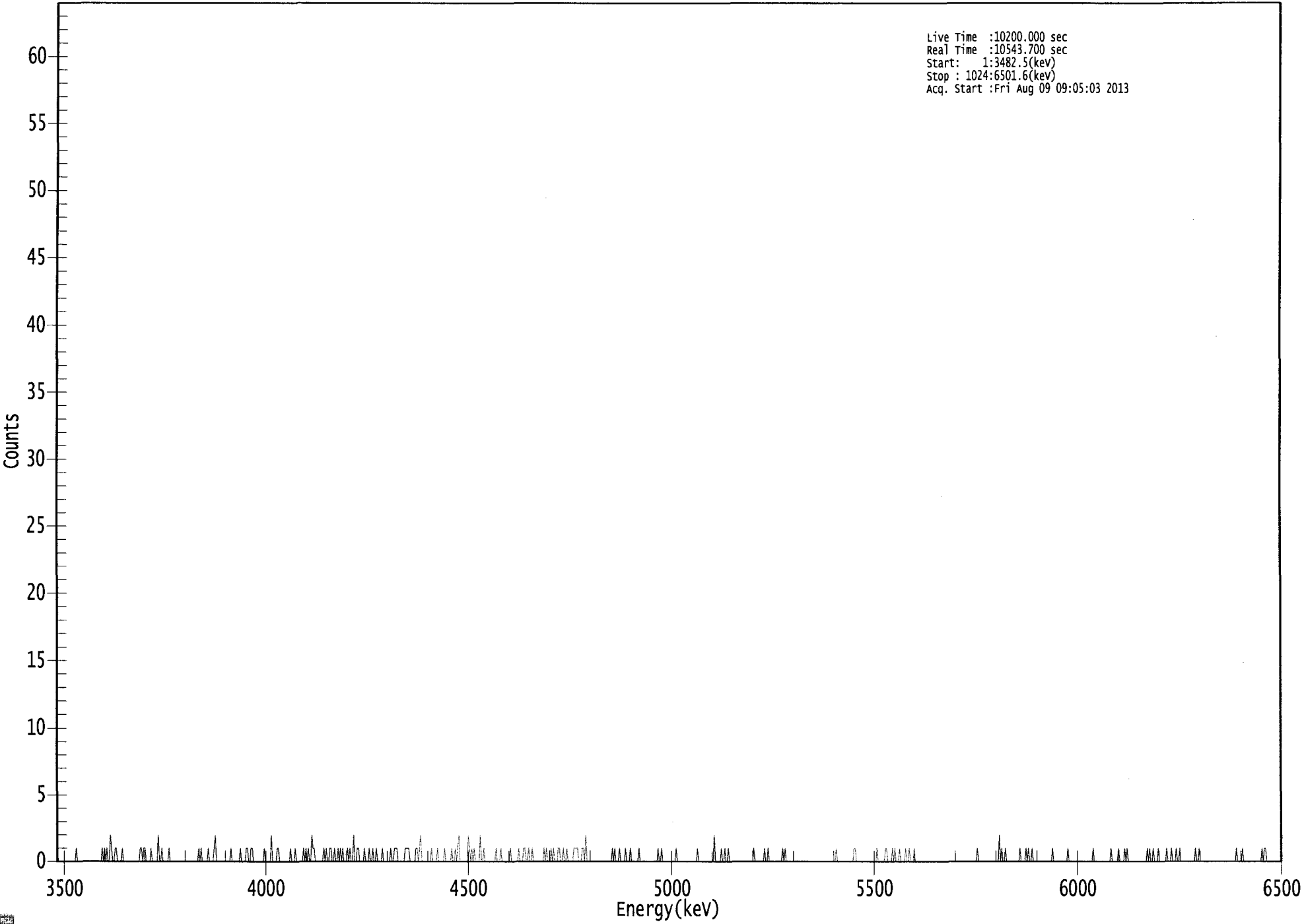
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.967	5685.50*	4.98E-001 +/- 3.06E-001	2.68E-001 +/- 9.23E-003
RA-226	0.954	4785.00*	1.80E+000 +/- 5.54E-001	2.89E-001 +/- 9.96E-003

AG
8/7/13

US EPA ARCHIVE DOCUMENT

000065658.CNF

Live Time :10200.000 sec
Real Time :10543.700 sec
Start: 1:3482.5(keV)
Stop : 1024:6501.6(keV)
Acq. Start :Fri Aug 09 09:05:03 2013



9820

ROI Type: 1

369: 1 0 0 0 1 0 0 0

Sample Title: 05

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

801: 0 0 0 0 0 1 0 0

Sample Title: 05

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



Sample Description: PZ-102-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 06
 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
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:05:04 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 175.7 minutes

Chem. Recovery Factor: 0.3160 +/- 0.0000
 Counting Efficiency: 0.1965 +/- 0.0034 on 4/20/2013 2:01:25 PM
 Effective Efficiency: 0.0621 +/- 0.0011

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	5.526	56.66	26.13	0.34	0.00E+000	3.7
RA-226	4.609	180.30	14.68	1.70	0.00E+000	5.0

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

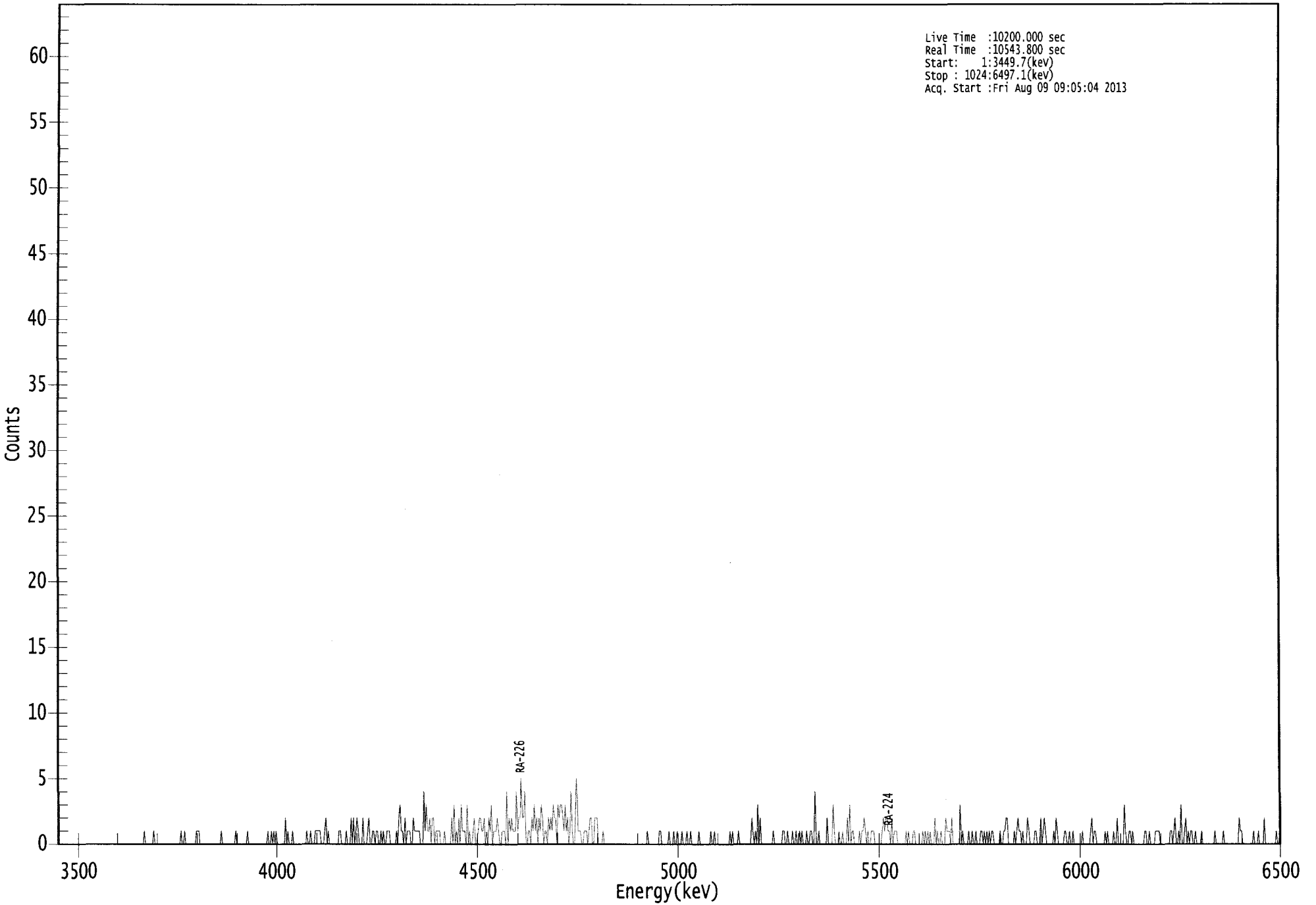
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.967	5685.50*	2.56E+000 +/- 6.75E-001	2.16E-001 +/- 7.35E-003
RA-226	0.960	4785.00*	7.69E+000 +/- 1.16E+000	3.13E-001 +/- 1.06E-002

AG
 8/9/13

US EPA ARCHIVE DOCUMENT

000065677.CNF

Live Time :10200.000 sec
Real Time :10543.800 sec
Start : 1:3449.7(kev)
Stop : 1024:6497.1(kev)
Acq. Start :Fri Aug 09 09:05:04 2013



ROI Type: 1

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

Sample Title: 06

Elapsed Live time: 10200
 Elapsed Real Time: 10544

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

369: 1 2 1 0 0 1 1 1

Sample Title: 06

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

801: 0 1 0 1 2 1 1 0

Sample Title: 06

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

ICB
8/9/13



Sample Description: PZ-102-SS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 07
 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: 2.470E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:05:06 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 175.7 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

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.569	17.15	48.68	0.85	0.00E+000	3.0
RA-226	4.580	90.49	20.67	0.51	0.00E+000	3.7

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

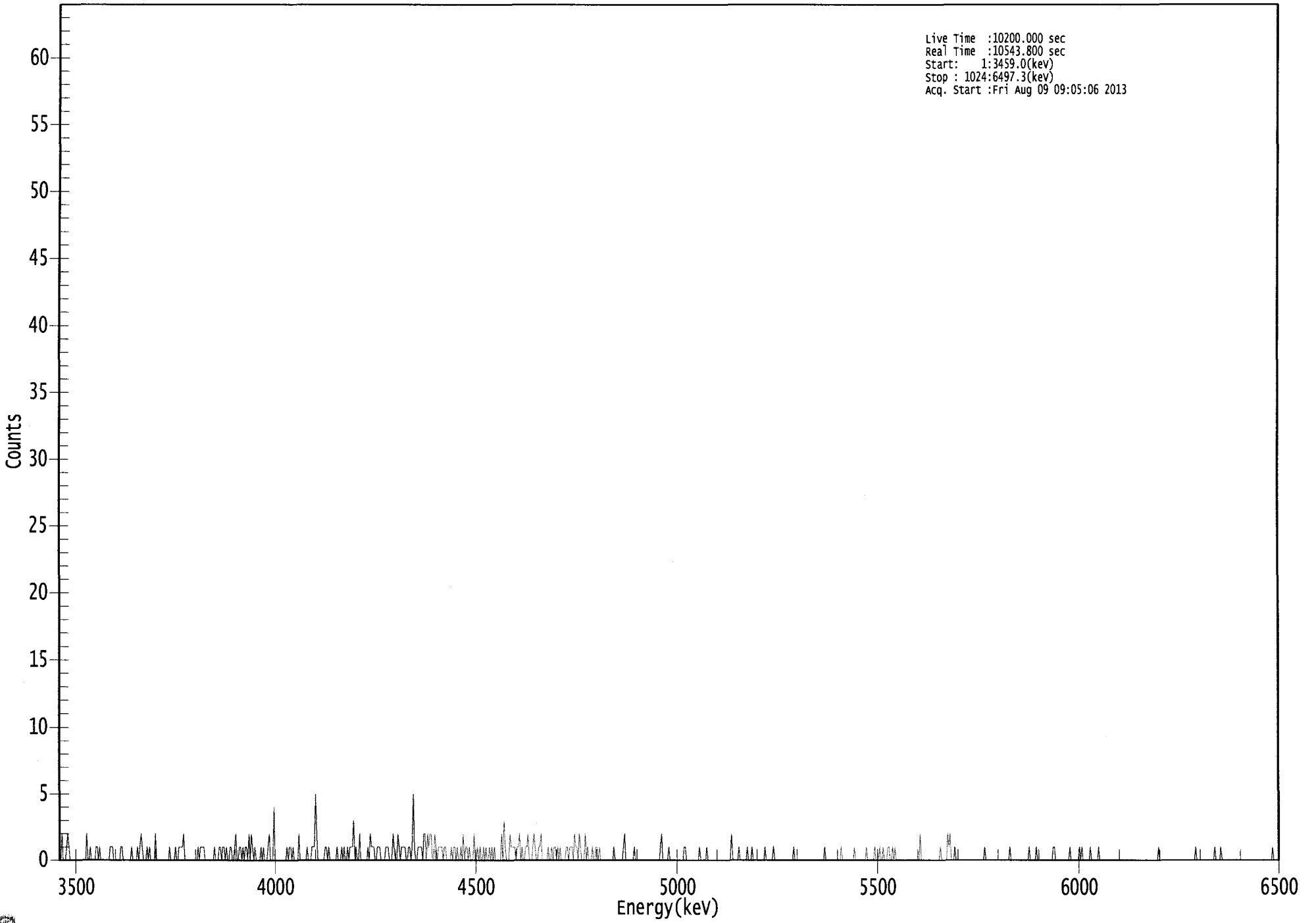
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.982	5685.50*	6.25E-001 +/- 3.05E-001	2.18E-001 +/- 7.44E-003
RA-226	0.946	4785.00*	3.12E+000 +/- 6.53E-001	1.81E-001 +/- 6.15E-003

AG
8/9/13

US EPA ARCHIVE DOCUMENT

0000065660.CNF

Live Time :10200.000 sec
Real Time :10543.800 sec
Start: 1:3459.0(kev)
Stop : 1024:6497.3(kev)
Acq. Start :Fri Aug 09 09:05:06 2013



9620

ROI Type: 1

 ***** 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: 10544

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

369: 0 0 0 0 2 0 3 1

Sample Title: 07

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 07

Channel	-----	-----	-----	-----	-----	-----	-----	-----
809:	0	0	0	0	0	0	1	0
817:	0	0	0	0	1	0	0	0
825:	0	0	0	0	0	0	0	0
833:	0	0	1	1	0	0	0	0
841:	0	0	0	0	0	0	0	0
849:	1	0	0	0	0	0	0	0
857:	1	0	1	0	0	0	0	0
865:	0	1	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	1	0	0	0	0	0
929:	0	0	0	0	0	0	0	0
937:	0	0	0	0	0	0	0	0
945:	0	0	0	0	0	0	0	0
953:	0	1	0	0	0	0	0	0
961:	0	0	0	0	0	0	0	0
969:	0	1	0	0	0	0	1	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	1	0	0	0	0	0	1

KCB
8/9/13

Apex-Alpha™

Sample Description: PZ-107-SS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 08
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_042
 Chamber Serial Number: 05026930B
 Detector Serial Number: 84185
 Env. Background: System Bkgd 64059
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.990E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:05:07 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 175.7 minutes

Chem. Recovery Factor: 0.7394 +/- 0.0000
 Counting Efficiency: 0.1846 +/- 0.0032 on 12/16/2012 5:49:29 PM
 Effective Efficiency: 0.1365 +/- 0.0024

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	5.524	33.81	34.40	1.19	0.00E+000	6.0
RA-226	4.596	110.15	18.76	0.85	0.00E+000	4.5

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

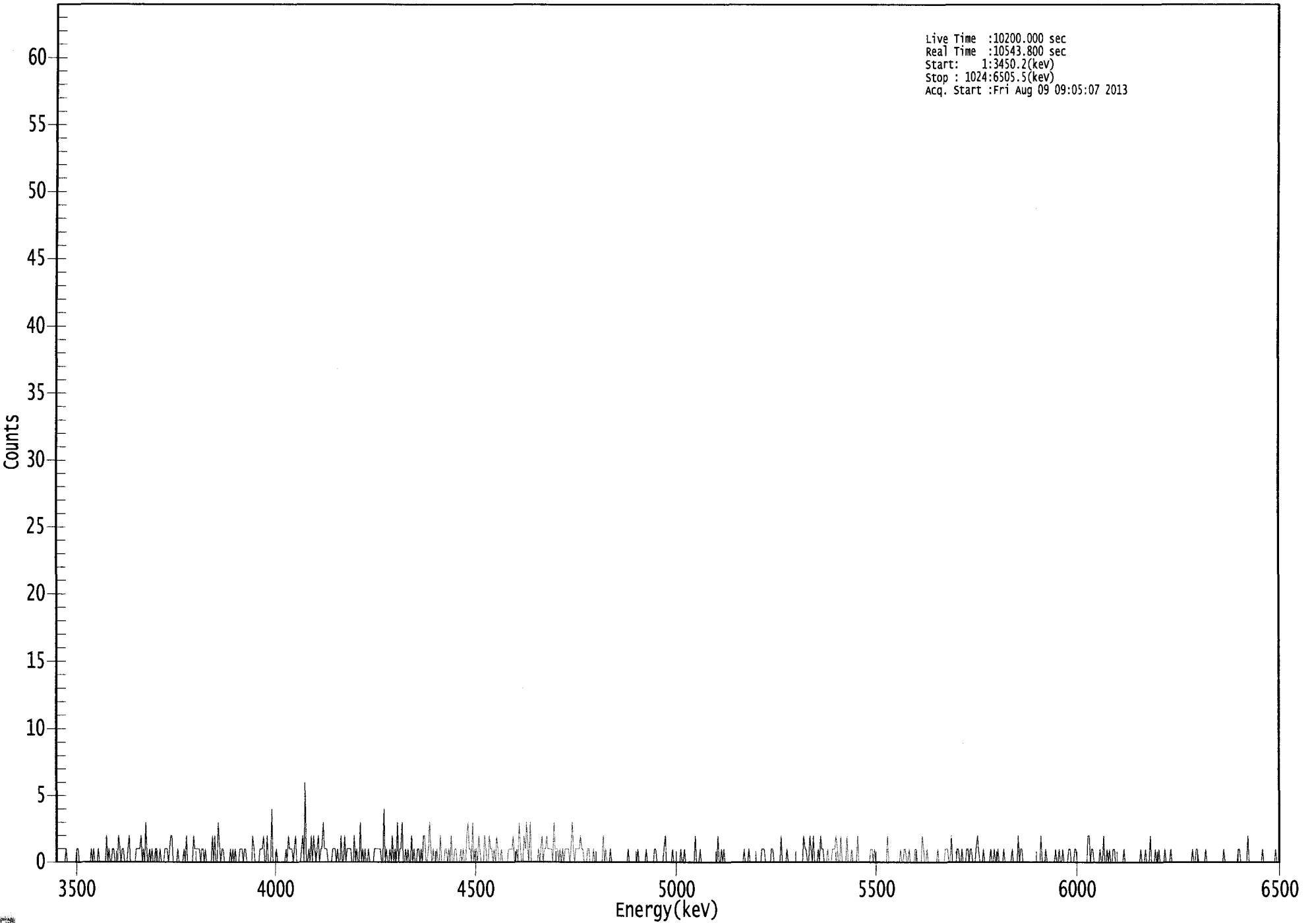
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.967	5685.50*	2.08E+000 +/- 7.18E-001	4.05E-001 +/- 1.38E-002
RA-226	0.955	4785.00*	6.39E+000 +/- 1.22E+000	3.47E-001 +/- 1.18E-002

AG
8/9/13

US EPA ARCHIVE DOCUMENT

0000065659.CNF

Live Time :10200.000 sec
Real Time :10543.800 sec
Start: 1:3450.2(kev)
Stop : 1024:6505.5(kev)
Acq. Start :Fri Aug 09 09:05:07 2013



1000

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: 10544

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

369: 0 2 1 0 0 1 0 0

Sample Title: 08

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

801: 1 0 0 0 0 2 0 1

Sample Title: 08

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

108
8/9/13

Apex-Alpha™

Sample Description: PZ-107-SS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 09
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_045
 Chamber Serial Number: 04026482A
 Detector Serial Number: 91131
 Env. Background: System Bkgd 64060
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.640E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:05:09 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

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

Peak Match Tolerance: 0.350 MeV

 PEAK AREA REPORT

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.532	23.49	40.95	0.51	0.00E+000	3.0
RA-226	4.574	145.49	16.28	0.51	0.00E+000	4.9

 NUCLIDE ANALYSIS RESULTS

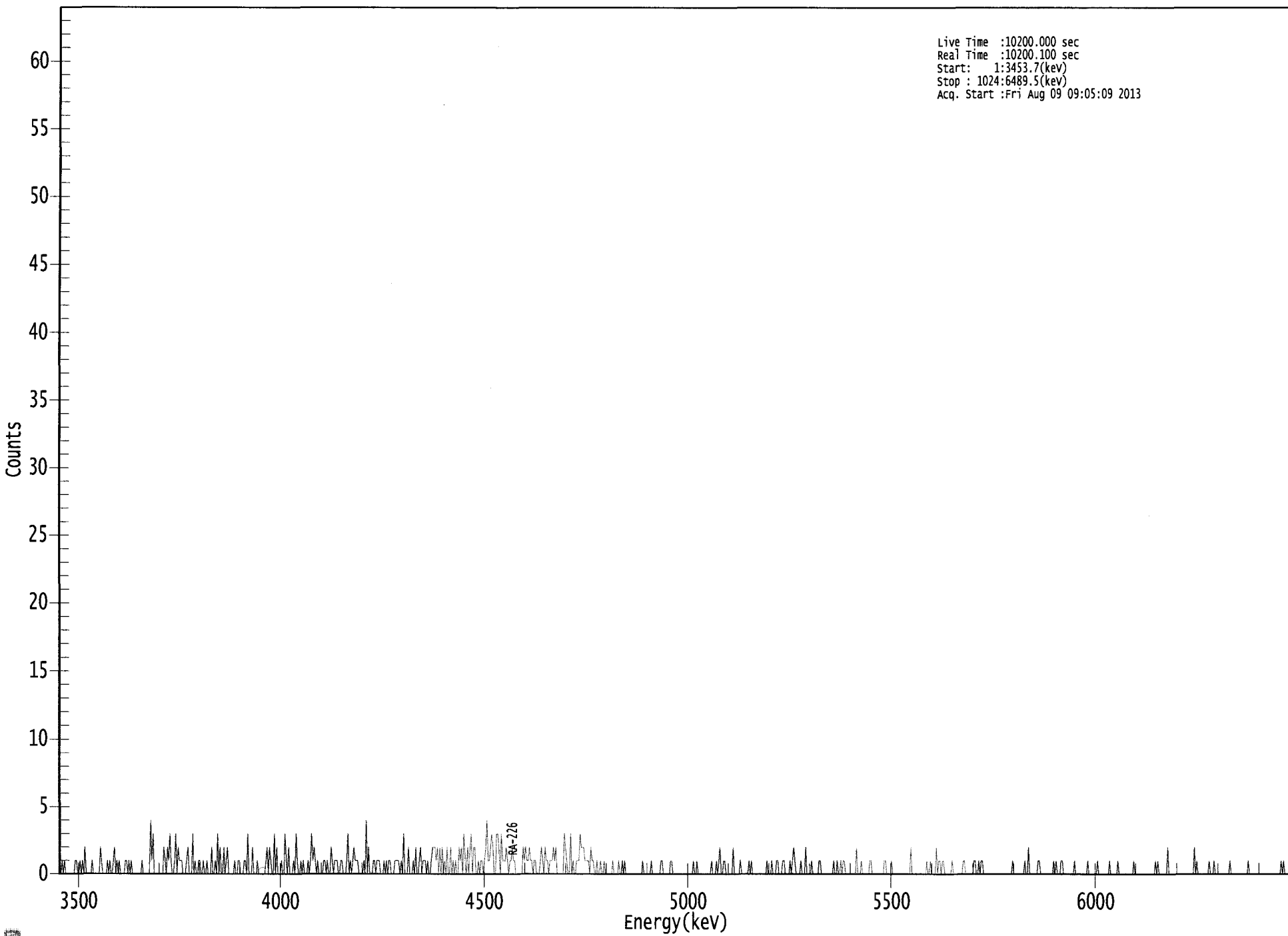
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.970	5685.50*	9.11E-001 +/- 3.74E-001	2.04E-001 +/- 6.96E-003
RA-226	0.943	4785.00*	5.33E+000 +/- 8.87E-001	1.92E-001 +/- 6.55E-003

AG
8/9/13

US EPA ARCHIVE DOCUMENT

0000065654.CNF

Live Time :10200.000 sec
Real Time :10200.100 sec
Start: 1:3453.7(kev)
Stop : 1024:6489.5(kev)
Acq. Start :Fri Aug 09 09:05:09 2013



0300
0909
ROI Type: 1

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

Sample Title: 09

Elapsed Live time: 10200

Elapsed Real Time: 10200

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

369: 1 1 1 2 1 0 1 1

Sample Title: 09

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

801: 1 0 0 2 0 0 0 0

Sample Title: 09

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

KCS
8/9/13

Apex-Alpha™

Sample Description: PZ-106-KS TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 10
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_046
 Chamber Serial Number: 04026482B
 Detector Serial Number: 58762
 Env. Background: System Bkgd 64061
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.500E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:05:10 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9598 +/- 0.0000
 Counting Efficiency: 0.1789 +/- 0.0031 on 12/16/2012 5:49:23 PM
 Effective Efficiency: 0.1717 +/- 0.0030

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.556	2.83	120.53	0.17	0.00E+000	3.0
RA-226	4.679	8.66	68.12	0.34	0.00E+000	3.0

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

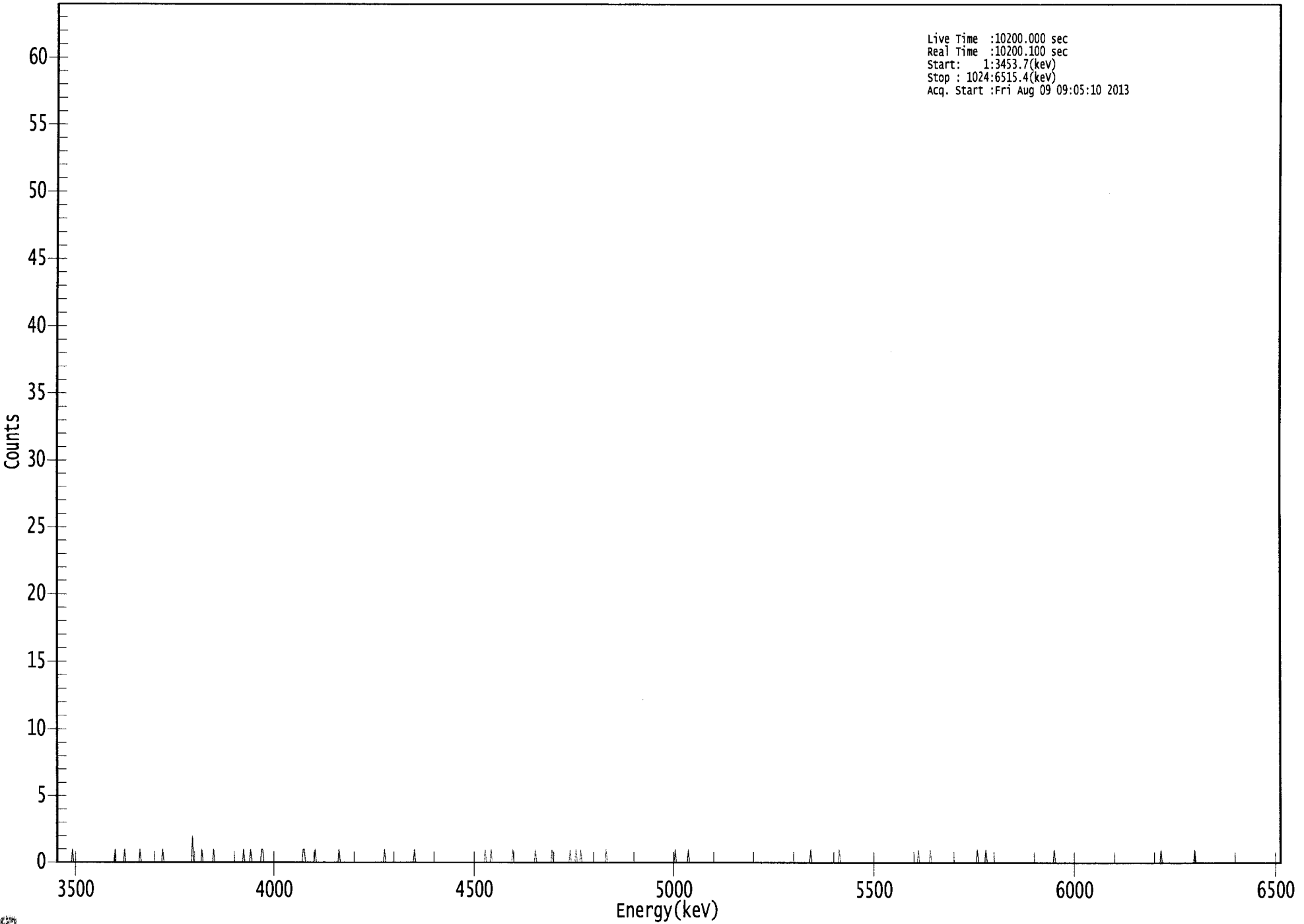
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.978	5685.50*	1.16E-001 +/- 1.39E-001	1.70E-001 +/- 5.88E-003
RA-226	0.985	4785.00*	3.34E-001 +/- 2.28E-001	1.84E-001 +/- 6.34E-003

AG
8/9/13

US EPA ARCHIVE DOCUMENT

000065655.CNF

Live Time :10200.000 sec
Real Time :10200.100 sec
Start: 1:3453.7(kev)
Stop : 1024:6515.4(kev)
Acq. Start :Fri Aug 09 09:05:10 2013



ROI Type: 1

 ***** 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	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:	0	0	0	0	0	0	0	0
49:	0	1	0	0	0	0	0	0
57:	0	1	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	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	2	0	0	0	0	0
121:	0	0	1	0	0	0	0	0
129:	0	0	0	0	1	0	0	0
137:	0	0	0	0	0	0	0	0
145:	0	0	0	0	0	0	0	0
153:	0	0	0	0	0	1	0	0
161:	0	0	0	1	0	0	0	0
169:	0	0	0	0	1	1	0	0
177:	0	0	0	0	0	0	0	0
185:	0	0	0	0	0	0	0	0
193:	0	0	0	0	0	0	0	0
201:	0	0	0	0	0	0	0	1
209:	1	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	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	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	1	0	0	0
305:	0	0	0	0	0	0	0	0
313:	0	0	0	0	0	0	0	0
321:	0	0	0	0	0	0	0	0
329:	0	0	0	0	0	0	0	0
337:	0	0	0	0	0	0	0	0
345:	0	0	0	0	0	0	0	0
353:	0	0	0	0	0	0	0	1
361:	0	0	0	0	1	0	0	0

369: 0 0 0 0 0 0 0 0 0

Sample Title: 10

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



108
8/9/13

Sample Description: PZ-106-KS DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 11
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_047
 Chamber Serial Number: 02030596A
 Detector Serial Number: 91086
 Env. Background: System Bkgd 64062
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.610E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:05:12 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 1.0000 +/- 0.0000
 Counting Efficiency: 0.1822 +/- 0.0032 on 12/16/2012 5:49:21 PM
 Effective Efficiency: 0.1822 +/- 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	5.479	3.83	102.72	0.17	0.00E+000	2.9
RA-226	4.639	9.32	66.89	0.68	0.00E+000	2.9

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

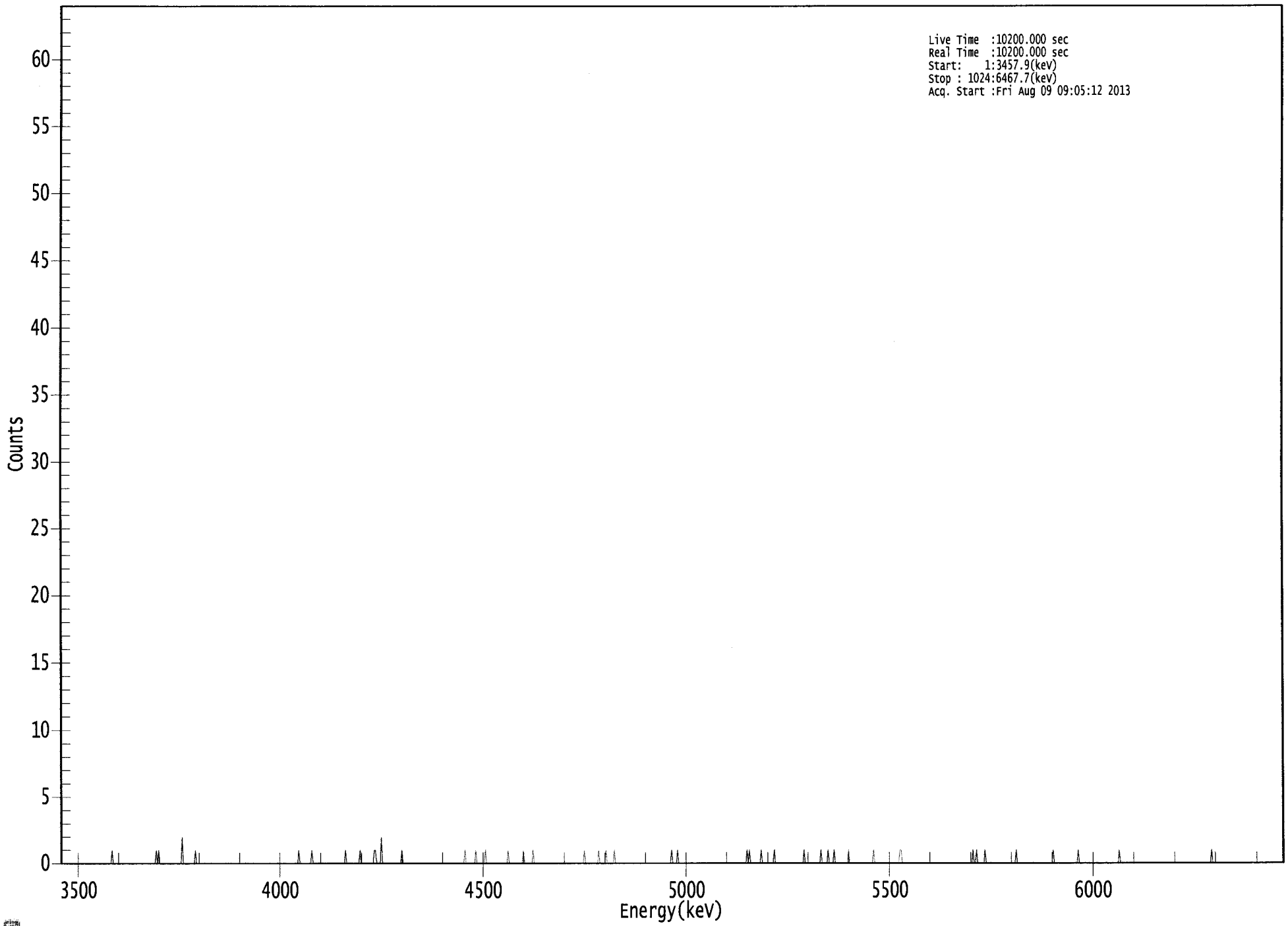
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.946	5685.50*	1.54E-001 +/- 1.58E-001	1.68E-001 +/- 5.77E-003
RA-226	0.972	4785.00*	3.54E-001 +/- 2.37E-001	2.14E-001 +/- 7.35E-003

AG
8/9/13

US EPA ARCHIVE DOCUMENT

0000065656.CNF

Live Time :10200.000 sec
Real Time :10200.000 sec
Start: 1:3457.9(kev)
Stop : 1024:6467.7(kev)
Acq. Start :Fri Aug 09 09:05:12 2013



0316
ROI Type: 1

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

369: 0 0 0 0 0 0 0 0 1

Sample Title: 11

Channel	-----	-----	-----	-----	-----	-----	-----	-----
377:	0	0	0	0	0	0	0	0
385:	0	0	0	0	1	0	0	0
393:	0	0	0	0	1	0	0	0
401:	0	0	0	0	0	0	0	0
409:	0	0	0	0	0	0	0	0
417:	0	0	0	0	0	0	0	0
425:	0	0	0	0	0	0	0	0
433:	0	0	0	0	0	0	0	1
441:	0	0	0	0	0	0	0	0
449:	0	0	0	1	0	0	0	0
457:	0	1	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	0
497:	0	0	0	0	0	0	0	0
505:	0	0	0	0	0	0	0	0
513:	1	0	0	0	0	1	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	1	0	0	0	0	0	0
585:	0	0	0	1	0	0	0	0
593:	0	0	0	0	0	0	1	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	1	0	0
641:	0	0	0	1	0	0	0	0
649:	1	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	1	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:	1	0	0	0	0	0	0	0
713:	0	0	0	0	0	0	0	0
721:	0	0	0	0	0	0	0	0
729:	0	0	0	0	0	0	0	0
737:	0	0	0	0	0	0	0	0
745:	0	0	0	0	0	0	0	0
753:	0	0	0	0	0	0	0	0
761:	0	0	0	0	1	0	0	1
769:	0	0	0	0	0	0	1	0
777:	0	0	0	0	0	0	0	0
785:	0	0	0	0	0	0	0	0
793:	0	0	0	0	0	0	0	0

801: 1 0 0 0 0 0 0 0

Sample Title: 11

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

193
8/9/13

Apex-Alpha™

Sample Description: DUP 08 TOT
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 12
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_048
 Chamber Serial Number: 02030596B
 Detector Serial Number: 83111
 Env. Background: System Bkgd 64063
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.370E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:05:14 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.8490 +/- 0.0000
 Counting Efficiency: 0.1680 +/- 0.0030 on 12/16/2012 5:49:20 PM
 Effective Efficiency: 0.1426 +/- 0.0025

Peak Match Tolerance: 0.350 MeV

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

Nuclide	Energy (MeV)	Net Pk Area	Pk Area Error %	Ambient Backgnd	Reagent Backgnd	FWHM (keV)
RA-224	5.505	33.32	34.36	0.68	0.00E+000	3.0
RA-226	4.575	120.83	17.85	0.17	0.00E+000	4.9

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

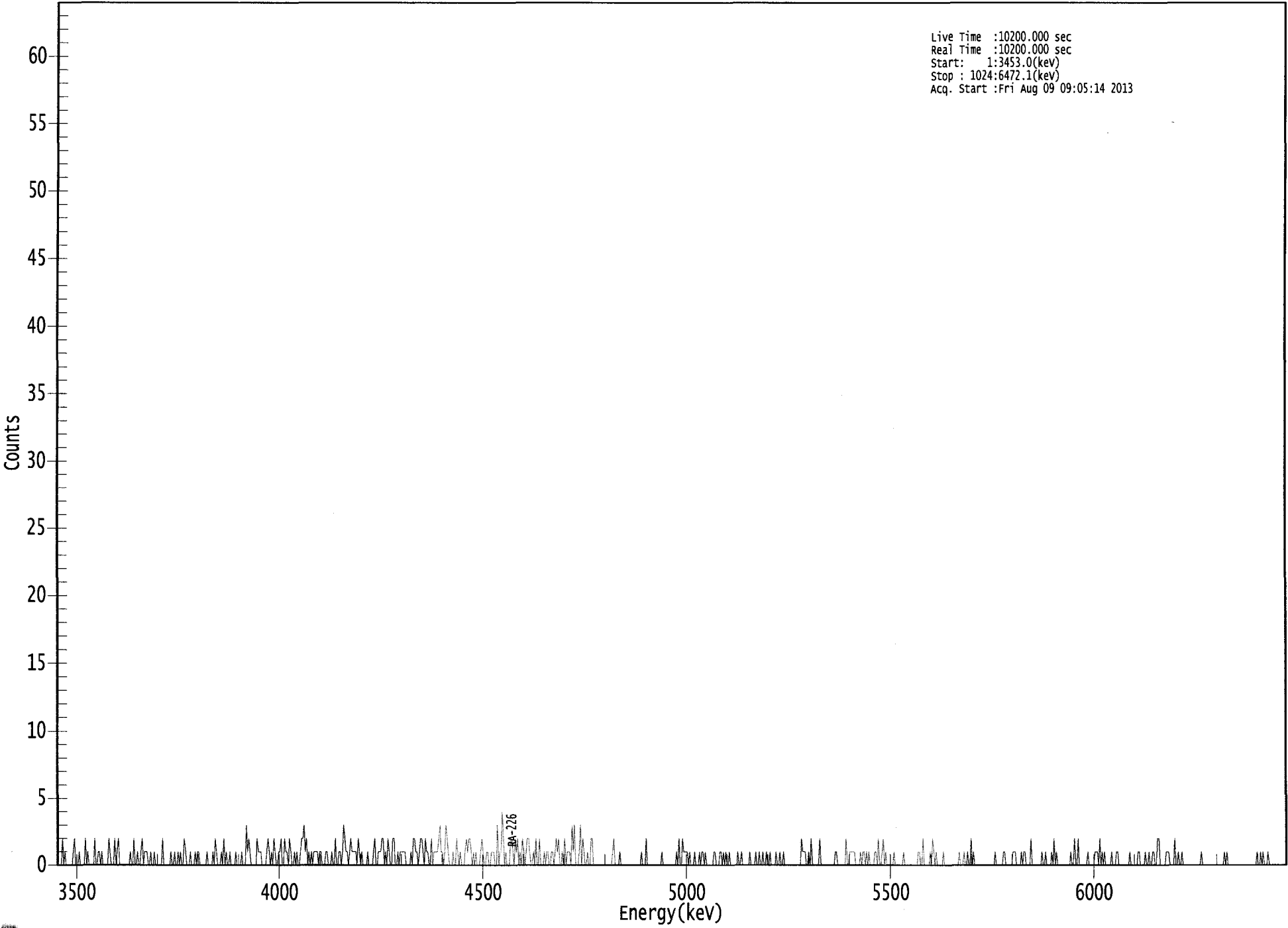
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.958	5685.50*	1.55E+000 +/- 5.36E-001	2.63E-001 +/- 9.13E-003
RA-226	0.944	4785.00*	5.32E+000 +/- 9.67E-001	1.84E-001 +/- 6.36E-003

AG
8/9/13

US EPA ARCHIVE DOCUMENT

000065657.CNF

Live Time :10200.000 sec
Real Time :10200.000 sec
Start: 1:3453.0(keV)
Stop : 1024:6472.1(keV)
Acq. Start :Fri Aug 09 09:05:14 2013



0321

ROI Type: 1

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

369: 0 1 1 4 2 0 1 0

Sample Title: 12

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

801: 0 0 0 1 0 1 1 0

Sample Title: 12

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

10/8
2/19/13

Apex-Alpha™

Sample Description: DUP 08 DIS
 Spectrum File: \\OR-ALPHA1\Canberra\ApexAlpha\Root\Data\00000656
 Batch Identification: 1307154A-RA
 Sample Identification: 13
 Sample Geometry: Shelf 2
 Procedure Description: Ra

Detector Name: Alpha_018
 Chamber Serial Number:
 Detector Serial Number: 18
 Env. Background: System Bkgd 64042
 Reagent Blank: <not performed>

Sample Size: 1.000E+000 +/- 0.000E+000 liter
 Generic Mult. Factor: 2.770E+000 Generic Div. Factor: 1.000E+000
 Sample Date/Time: 7/19/2013 8:51:08 AM
 Acquisition Date/Time: 8/9/2013 9:26:50 AM
 Acquisition Live Time: 170.0 minutes
 Acquisition Real Time: 170.0 minutes

Chem. Recovery Factor: 0.9285 +/- 0.0000
 Counting Efficiency: 0.1776 +/- 0.0033 on 12/15/2012 1:57:26 PM
 Effective Efficiency: 0.1649 +/- 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	5.512	13.26	62.08	3.74	0.00E+000	0.0
RA-226	4.575	114.47	18.46	1.53	0.00E+000	6.3

 NUCLIDE ANALYSIS RESULTS

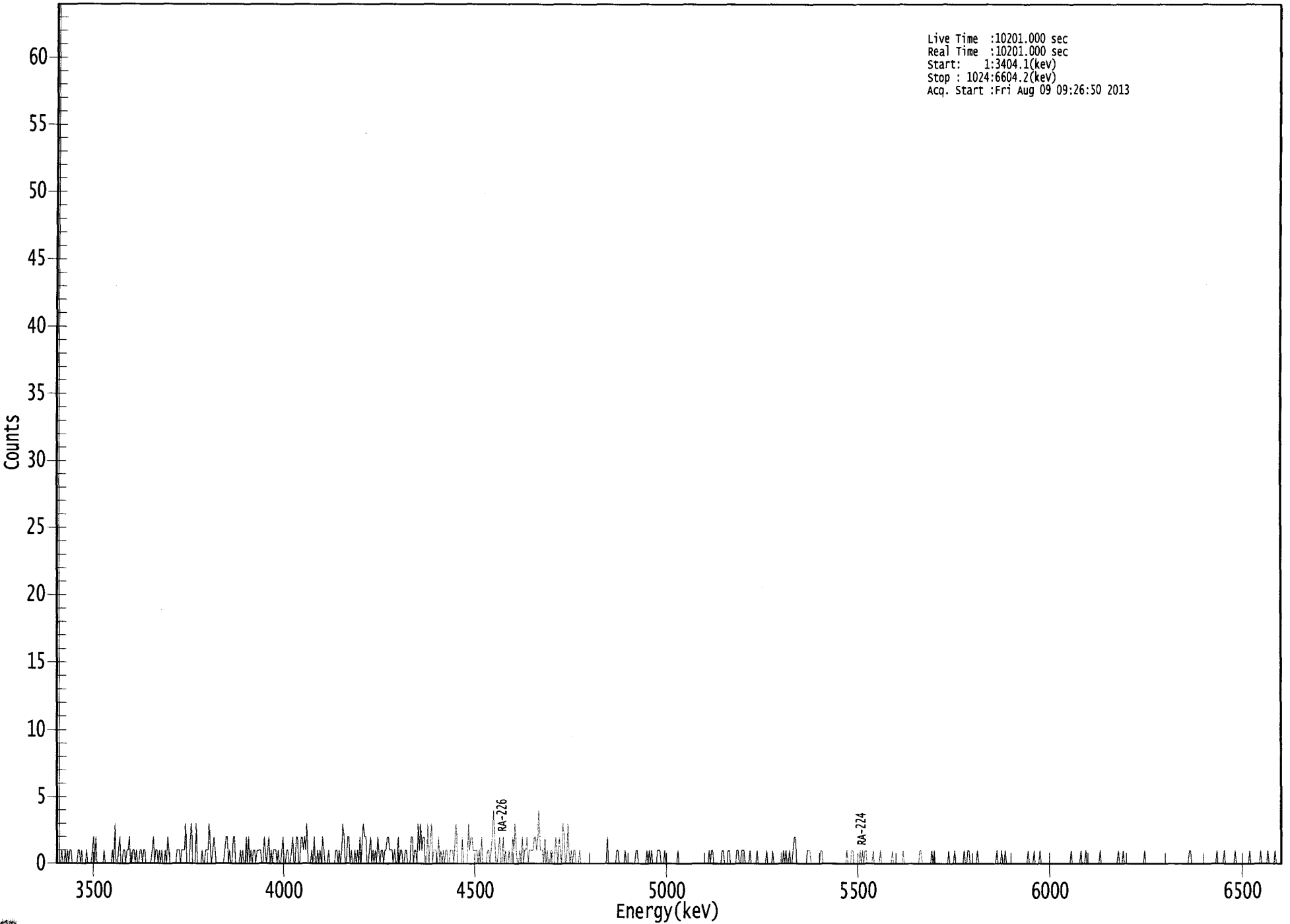
Nuclide	Id Conf.	Energy (keV)	Activity (pCi/liter)	MDA (pCi/liter)
RA-224	0.961	5685.50*	6.25E-001 +/- 3.88E-001	4.52E-001 +/- 1.65E-002
RA-226	0.944	4785.00*	5.09E+000 +/- 9.59E-001	3.16E-001 +/- 1.15E-002

AG
 8/9/13

US EPA ARCHIVE DOCUMENT

0000065666.CNF

Live Time :10201.000 sec
Real Time :10201.000 sec
Start: 1:3404.1(kev)
Stop : 1024:6604.2(kev)
Acq. Start :Fri Aug 09 09:26:50 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: 13

Elapsed Live time: 10201

Elapsed Real Time: 10201

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

369: 0 0 1 2 0 0 2 0

Sample Title: 13

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

801: 0 0 0 0 0 0 0 0 0

Sample Title: 13

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



QA SUMMARY REPORT

Review Of QA Results - Pulser Check

Date : 8/9/2013
Time : 5:22:10 AM

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 001	21f	ALL	Not Done	
Alpha 002	21f	ALL	Not Done	
Alpha 003	21f	ALL	Passed	8/9/2013 5:06:27 AM
Alpha 004	21f	ALL	Passed	8/9/2013 5:06:28 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	8/9/2013 5:06:29 AM
Alpha 011	21f	ALL	Passed	8/9/2013 5:06:30 AM
Alpha 012	21f	ALL	Passed	8/9/2013 5:06:31 AM
Alpha 013	21f	ALL	Passed	8/9/2013 5:06:31 AM
Alpha 014	21f	ALL	Passed	8/9/2013 5:06:32 AM
Alpha 015	21f	Peak Energy	Action	8/9/2013 5:06:33 AM
Alpha 016	21f	ALL	Not Done	
Alpha 017	AIM730	ALL	Not Done	
Alpha 018	AIM730	ALL	Passed	8/9/2013 5:06:34 AM
Alpha 019	AIM730	ALL	Passed	8/9/2013 5:06:35 AM
Alpha 020	AIM730	ALL	Not Done	
Alpha 021	AIM730	ALL	Not Done	
Alpha 022	AIM730	ALL	Passed	8/9/2013 5:06:35 AM
Alpha 023	AIM730	ALL	Passed	8/9/2013 5:06:36 AM
Alpha 024	AIM730	ALL	Passed	8/9/2013 5:06:37 AM
Alpha 025	AIM730	ALL	Passed	8/9/2013 5:06:38 AM
Alpha 026	AIM730	ALL	Not Done	
Alpha 027	AIM730	ALL	Passed	8/9/2013 5:06:39 AM
Alpha 028	AIM730	ALL	Not Done	
Alpha 029	AIM730	ALL	Passed	8/9/2013 5:06:39 AM
Alpha 030	AIM730	ALL	Not Done	
Alpha 031	AIM730	ALL	Passed	8/9/2013 5:06:40 AM
Alpha 032	AIM730	ALL	Not Done	
Alpha 033	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:06:41 AM
Alpha 034	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:06:43 AM
Alpha 035	Alpha Analyst100DC	Peak CPS	Action	8/9/2013 5:06:44 AM
Alpha 036	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:06:46 AM
Alpha 037	Alpha Analyst100DC	ALL	Not Done	
Alpha 038	Alpha Analyst100DC	Peak FWHM	Action	8/9/2013 5:06:48 AM
Alpha 039	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:06:50 AM
Alpha 040	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:06:53 AM
Alpha 041	Alpha Analyst100DC	ALL	Passed	8/8/2013 5:39:00 AM
Alpha 042	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:06:55 AM

US EPA ARCHIVE DOCUMENT

CHAMBER	DEVICE	PARAMETER	FLAG	DATE
Alpha 043	Alpha Analyst100DC	ALL	Not Done	
Alpha 044	Alpha Analyst100DC	ALL	Not Done	
Alpha 045	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:06:58 AM
Alpha 046	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:07:00 AM
Alpha 047	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:07:03 AM
Alpha 048	Alpha Analyst100DC	ALL	Passed	8/9/2013 5:07:05 AM

APPROVED BY: _____ ✓

APPROVAL DATE: 8/9/13

US EPA ARCHIVE DOCUMENT

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

Nuclide Library Title: Radium

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

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

* = key line

TOTALS: 3 Nuclides 3 Energy Lines

SECTION XI
ANALYTICAL DATA (RADIUM-228)

Work Order	13-07154	Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
Analysis Code	Ra228	01	LCS	LCS		07/24/13 00:00	1.0000E+00
Run	1	02	MBL	BLANK		07/24/13 00:00	1.0000E+00
Date Received	7/22/2013	03	DUP	PZ-107-SS TOT	46	07/19/13 12:10	1.0000E+00
Lab Deadline	8/13/2013	04	TRG	PZ-200-SS TOT	42	07/19/13 10:19	1.0000E+00
Client	Engineering Management Support, Inc.	05	TRG	PZ-200-SS DIS	42	07/19/13 10:19	1.0000E+00
Project	West Lake OU-1	06	TRG	PZ-102-SS TOT	38	07/19/13 10:30	1.0000E+00
Report Level	4	07	TRG	PZ-102-SS DIS	38	07/19/13 10:30	1.0000E+00
Activity Units	pCi	08	DO	PZ-107-SS TOT	46	07/19/13 12:10	1.0000E+00
Aliquot Units	I	09	TRG	PZ-107-SS DIS	46	07/19/13 12:10	1.0000E+00
Matrix	WA	10	TRG	PZ-106-KS TOT	45	07/19/13 13:09	1.0000E+00
Method	E904.0	11	TRG	PZ-106-KS DIS	45	07/19/13 13:09	1.0000E+00
Instrument Type	Alpha/Beta GPC	12	TRG	DUP 08 TOT	44	07/19/13 00:00	1.0000E+00
Radiometric Tracer	Ba-133	13	TRG	DUP 08 DIS	44	07/19/13 00:00	1.0000E+00
Radiometric Sol#	Ba-6a						
Tracer Act (dpm/g)	990.223						
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.

0334

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	0.9259	916.8	438.4	106.15	2.000	0.0920	0.1459	0.0539	79.26	84.14	1.00	1.00
02	MBL	0.9151	906.2	393.9	96.50	2.000	0.0917	0.1494	0.0577	84.85	81.88	1.00	1.00
03	DUP	0.9164	907.4	310.4	75.94	2.000	0.0916	0.1476	0.0560	82.35	62.54	1.00	1.00
04	TRG	0.9147	905.8	316.8	77.65	2.000	0.0925	0.1481	0.0556	81.76	63.49	1.00	1.00
05	TRG	0.9134	904.5	392.2	96.26	2.000	0.0926	0.1489	0.0563	82.79	79.70	1.00	1.00
06	TRG	0.9122	903.3	128.6	31.61	2.000	0.0922	0.1493	0.0571	83.97	26.54	1.00	1.00
07	TRG	0.9120	903.1	413.2	101.57	2.000	0.0922	0.1480	0.0558	82.06	83.35	1.00	1.00
08	DO	0.9118	902.9	300.7	73.94	2.000	0.0924	0.1495	0.0571	83.97	62.08	1.00	1.00
09	TRG	0.9102	901.3	407.9	100.47	2.000	0.0919	0.1475	0.0556	81.76	82.15	1.00	1.00
10	TRG	0.9126	903.7	390.7	95.98	2.000	0.0920	0.1474	0.0554	81.47	78.20	1.00	1.00
11	TRG	0.9091	900.2	418.0	103.08	2.000	0.0924	0.1472	0.0548	80.59	83.07	1.00	1.00
12	TRG	0.9079	899.0	343.8	84.90	2.000	0.0918	0.1475	0.0557	81.91	69.54	1.00	1.00
13	TRG	0.9079	899.0	376.0	92.85	2.000	0.0920	0.1473	0.0553	81.32	75.51	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.

035

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
02	MBL			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
03	DUP			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
04	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
05	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
06	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
07	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
08	DO			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
09	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
10	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
11	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
12	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	TSMITH
13	TRG			08/07/13 10:34	JWOLFE	08/08/13 14:54	LWALKER	08/15/13 04:18	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.

0330

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-Ra228-1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	RA-228	LCS	LCS	pCi/l	8.26E+00	1.74E+00	1.74E+00	8.80E+00	93.86	OK		OK	
02	RA-228	MBL	BLANK	pCi/l	5.94E-01	4.97E-01	9.90E-01					OK	OK
03	RA-228	DUP	PZ-107-SS TOT	pCi/l	2.54E+00	8.16E-01	1.45E+00				NA	OK	
04	RA-228	TRG	PZ-200-SS TOT	pCi/l	1.95E+00	7.20E-01	1.30E+00					OK	
05	RA-228	TRG	PZ-200-SS DIS	pCi/l	1.77E+00	6.04E-01	1.08E+00					OK	
06	RA-228	TRG	PZ-102-SS TOT	pCi/l	5.39E+00	1.88E+00	3.39E+00					INV	
07	RA-228	TRG	PZ-102-SS DIS	pCi/l	1.88E+00	6.35E-01	1.15E+00					OK	
08	RA-228	DO	PZ-107-SS TOT	pCi/l	3.03E+00	8.36E-01	1.44E+00					OK	
09	RA-228	TRG	PZ-107-SS DIS	pCi/l	2.38E+00	6.32E-01	1.08E+00					OK	
10	RA-228	TRG	PZ-106-KS TOT	pCi/l	2.22E-01	6.03E-01	1.27E+00					OK	
11	RA-228	TRG	PZ-106-KS DIS	pCi/l	2.73E+00	7.07E-01	1.23E+00					OK	
12	RA-228	TRG	DUP 08 TOT	pCi/l	3.84E+00	8.72E-01	1.47E+00					OK	
13	RA-228	TRG	DUP 08 DIS	pCi/l	2.68E+00	7.26E-01	1.26E+00					OK	

	
Run	1
Analysis Code	Ra228
Eberline Services Work Order	13-07154
Client	Engineering Management Support, Inc.

488

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-Ra228-1

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-228	LCS	07/24/13 00:00	1.00E+00	106.15	79.26	84.14	1.00	8/8/2013 14:54	8/15/2013 4:18
02	RA-228	MBL	07/24/13 00:00	1.00E+00	96.50	84.85	81.88	1.00	8/8/2013 14:54	8/15/2013 4:18
03	RA-228	DUP	07/19/13 12:10	1.00E+00	75.94	82.35	62.54	1.00	8/8/2013 14:54	8/15/2013 4:18
04	RA-228	TRG	07/19/13 10:19	1.00E+00	77.65	81.76	63.49	1.00	8/8/2013 14:54	8/15/2013 4:18
05	RA-228	TRG	07/19/13 10:19	1.00E+00	96.26	82.79	79.70	1.00	8/8/2013 14:54	8/15/2013 4:18
06	RA-228	TRG	07/19/13 10:30	1.00E+00	31.61	83.97	26.54	1.00	8/8/2013 14:54	8/15/2013 4:18
07	RA-228	TRG	07/19/13 10:30	1.00E+00	101.57	82.06	83.35	1.00	8/8/2013 14:54	8/15/2013 4:18
08	RA-228	DO	07/19/13 12:10	1.00E+00	73.94	83.97	62.08	1.00	8/8/2013 14:54	8/15/2013 4:18
09	RA-228	TRG	07/19/13 12:10	1.00E+00	100.47	81.76	82.15	1.00	8/8/2013 14:54	8/15/2013 4:18
10	RA-228	TRG	07/19/13 13:09	1.00E+00	95.98	81.47	78.20	1.00	8/8/2013 14:54	8/15/2013 4:18
11	RA-228	TRG	07/19/13 13:09	1.00E+00	103.08	80.59	83.07	1.00	8/8/2013 14:54	8/15/2013 4:18
12	RA-228	TRG	07/19/13 00:00	1.00E+00	84.90	81.91	69.54	1.00	8/8/2013 14:54	8/15/2013 4:18
13	RA-228	TRG	07/19/13 00:00	1.00E+00	92.85	81.32	75.51	1.00	8/8/2013 14:54	8/15/2013 4:18

	
Run	1
Analysis Code	Ra228
Eberline Services Work Order	13-07154
Client	Engineering Management Support, Inc.

8228

Preliminary Data Report & Analytical Calculations
Work Order: 13-07154-Ra228-1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	RA-228	LCS	08/15/13 07:52		LB4110A	D2	30	184	1.45	0.4682
02	RA-228	MBL	08/15/13 07:50		LB4110R	A1	120	143	0.883333333	0.4776
03	RA-228	DUP	08/15/13 07:50		LB4110R	A2	120	249	1.083333333	0.4699
04	RA-228	TRG	08/15/13 07:50		LB4110R	A3	120	207	0.933333333	0.4809
05	RA-228	TRG	08/15/13 07:50		LB4110R	A4	120	224	0.983333333	0.4732
06	RA-228	TRG	08/15/13 07:51		LB4110R	B1	120	238	1.083333333	0.4754
07	RA-228	TRG	08/15/13 07:51		LB4110R	B2	120	258	1.183333333	0.4658
08	RA-228	DO	08/15/13 07:51		LB4110R	B3	120	267	1.05	0.4713
09	RA-228	TRG	08/15/13 07:51		LB4110R	B4	120	276	1.066666667	0.4773
10	RA-228	TRG	08/15/13 07:50		LB4110R	C1	120	169	1.3	0.4705
11	RA-228	TRG	08/15/13 07:50		LB4110R	C2	120	333	1.366666667	0.4676
12	RA-228	TRG	08/15/13 07:50		LB4110R	C3	120	356	1.333333333	0.4614
13	RA-228	TRG	08/15/13 07:50		LB4110R	C4	120	296	1.2	0.4714



Run
1

Analysis Code
Ra228

Eberline Services Work Order
13-07154


Client
Engineering Management Support, Inc.

5550

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	07/24/13 00:00	1.0000	0.9259	916.8475	438.4000	106.15	1.00	1.00
02	MBL	BLANK	07/24/13 00:00	1.0000	0.9151	906.1531	393.9000	96.50	1.00	1.00
03	DUP	PZ-107-SS TOT	07/19/13 12:10	1.0000	0.9164	907.4404	310.4000	75.94	1.00	1.00
04	TRG	PZ-200-SS TOT	07/19/13 10:19	1.0000	0.9147	905.7570	316.8000	77.65	1.00	1.00
05	TRG	PZ-200-SS DIS	07/19/13 10:19	1.0000	0.9134	904.4697	392.2000	96.26	1.00	1.00
06	TRG	PZ-102-SS TOT	07/19/13 10:30	1.0000	0.9122	903.2814	128.6000	31.61	1.00	1.00
07	TRG	PZ-102-SS DIS	07/19/13 10:30	1.0000	0.9120	903.0834	413.2000	101.57	1.00	1.00
08	DO	PZ-107-SS TOT	07/19/13 12:10	1.0000	0.9118	902.8853	300.7000	73.94	1.00	1.00
09	TRG	PZ-107-SS DIS	07/19/13 12:10	1.0000	0.9102	901.3010	407.9000	100.47	1.00	1.00
10	TRG	PZ-106-KS TOT	07/19/13 13:09	1.0000	0.9126	903.6775	390.7000	95.98	1.00	1.00
11	TRG	PZ-106-KS DIS	07/19/13 13:09	1.0000	0.9091	900.2117	418.0000	103.08	1.00	1.00
12	TRG	DUP 08 TOT	07/19/13 00:00	1.0000	0.9079	899.0235	343.8000	84.90	1.00	1.00
13	TRG	DUP 08 DIS	07/19/13 00:00	1.0000	0.9079	899.0235	376.0000	92.85	1.00	1.00

0340

Spike and Tracer Worksheet

Internal Work Order		Run	Analysis Code		Date	Technician		Technician Initials		Witness Initials	
13-07154		1	Ra228		8/7/2013 10:33	JWOLFE					

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	Volume Used (g)	Volume Used (g)	Volume Used (g)	Volume Used (g)	Known pCi	Error Estimate	Added pCi	Error Estimate	Known pCi	Error Estimate	Added pCi	Error Estimate
Ra-228	Ra-11	37.628	8/7/2013	0.530	0.5194				8.80	0.449	0.00	0.000	0.00	0.000	0.00	0.000

Tracers							Balance Printer Tapes							
fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition	Tracer				LCS			
01	Ba-133	Ba-6a	990.223	8/7/2013	0.9259	1.0200								
02	Ba-133	Ba-6a	990.223	8/7/2013	0.9151	1.0200								
03	Ba-133	Ba-6a	990.223	8/7/2013	0.9164	1.0200								
04	Ba-133	Ba-6a	990.223	8/7/2013	0.9147	1.0200								
05	Ba-133	Ba-6a	990.223	8/7/2013	0.9134	1.0200								
06	Ba-133	Ba-6a	990.223	8/7/2013	0.9122	1.0200								
07	Ba-133	Ba-6a	990.223	8/7/2013	0.9120	1.0200								
08	Ba-133	Ba-6a	990.223	8/7/2013	0.9118	1.0200								
09	Ba-133	Ba-6a	990.223	8/7/2013	0.9102	1.0200								
10	Ba-133	Ba-6a	990.223	8/7/2013	0.9126	1.0200					Matrix Spike			
11	Ba-133	Ba-6a	990.223	8/7/2013	0.9091	1.0200								
12	Ba-133	Ba-6a	990.223	8/7/2013	0.9079	1.0200								
13	Ba-133	Ba-6a	990.223	8/7/2013	0.9079	1.0200								

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
13-07154	1	Ra228	liters	8/13/2013	JWOLFE

Lab Fraction	Engineering Management Support, Inc. Client ID	Sample Type	Muffle Data	Dilution Data			Aliquot Data		MS Aliquot Data		H-3 Solids Only	
			Ratio Post/Pre	No of Dils	Dil Factor	Ratio	Aliquot	Net Equiv	Aliquot	Net Equiv	Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	PZ-107-SS TOT	DUP					1.0000E+00	1.0000E+00				
04	PZ-200-SS TOT	TRG					1.0000E+00	1.0000E+00				
05	PZ-200-SS DIS	TRG					1.0000E+00	1.0000E+00				
06	PZ-102-SS TOT	TRG					1.0000E+00	1.0000E+00				
07	PZ-102-SS DIS	TRG					1.0000E+00	1.0000E+00				
08	PZ-107-SS TOT	DO					1.0000E+00	1.0000E+00				
09	PZ-107-SS DIS	TRG					1.0000E+00	1.0000E+00				
10	PZ-106-KS TOT	TRG					1.0000E+00	1.0000E+00				
11	PZ-106-KS DIS	TRG					1.0000E+00	1.0000E+00				
12	DUP 08 TOT	TRG					1.0000E+00	1.0000E+00				
13	DUP 08 DIS	TRG					1.0000E+00	1.0000E+00				

Comments

Technician: J Wolfe Date: 8/7/13

0342

Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
13-07154	1	Ra228	Yttrium	34.0000	TSMITH

TRetek	Engineering Management Support, Inc.	Sample	Carrier Data	Filter Data			Gravimetric
Fraction	Client ID	Type	Carrier Added (ml)	Filter Tare (g)	Filter Final (g)	Filter Net (g)	% Recovery
01	LCS	LCS	2.0000	0.0920	0.1459	0.0539	79.26
02	BLANK	MBL	2.0000	0.0917	0.1494	0.0577	84.85
03	DUP	DUP	2.0000	0.0916	0.1476	0.0560	82.35
04	PZ-200-SS TOT	TRG	2.0000	0.0925	0.1481	0.0556	81.76
05	PZ-200-SS DIS	TRG	2.0000	0.0926	0.1489	0.0563	82.79
06	PZ-102-SS TOT	TRG	2.0000	0.0922	0.1493	0.0571	83.97
07	PZ-102-SS DIS	TRG	2.0000	0.0922	0.1480	0.0558	82.06
08	PZ-107-SS TOT	DO	2.0000	0.0924	0.1495	0.0571	83.97
09	PZ-107-SS DIS	TRG	2.0000	0.0919	0.1475	0.0556	81.76
10	PZ-106-KS TOT	TRG	2.0000	0.0920	0.1474	0.0554	81.47
11	PZ-106-KS DIS	TRG	2.0000	0.0924	0.1472	0.0548	80.59
12	DUP 08 TOT	TRG	2.0000	0.0918	0.1475	0.0557	81.91
13	DUP 08 DIS	TRG	2.0000	0.0920	0.1473	0.0553	81.32

Technician: SCM

Date: 8, 15, 13

0343

C
El 15m
A

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
D2	1307154-01	8	184	30	1400	8/15/13 8:22

C
8/15/13
①

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
C1	1307154-10	15	169	120	1400	8/15/13 9:50
C2	1307154-11	38	333	120	1400	8/15/13 9:50
C3	1307154-12	17	356	120	1400	8/15/13 9:50
C4	1307154-13	16	296	120	1400	8/15/13 9:50
A1	1307154-02	17	143	120	1400	8/15/13 9:50
A2	1307154-03	11	249	120	1400	8/15/13 9:50
A3	1307154-04	16	207	120	1400	8/15/13 9:50
A4	1307154-05	5	224	120	1400	8/15/13 9:50
B1	1307154-06	8	238	120	1400	8/15/13 9:51
B2	1307154-07	21	258	120	1400	8/15/13 9:51
B3	1307154-08	13	267	120	1400	8/15/13 9:51
B4	1307154-09	15	276	120	1400	8/15/13 9:51

C
8/11/13

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	8/15/2013	6.67E-02	P	-2.13E+01	2.82E-01	2.19E+01
LB4110A - A2	Alpha	11/18/2007	8/15/2013	1.67E-02	P	-1.81E+01	2.53E-01	1.86E+01
LB4110A - A3	Alpha	11/18/2007	8/15/2013	5.00E-02	P	-1.76E+01	2.16E-01	1.80E+01
LB4110A - A4	Alpha	11/18/2007	8/15/2013	3.33E-02	P	-1.87E+01	2.36E-01	1.92E+01
LB4110A - B1	Alpha	11/18/2007	8/15/2013	0.00E+00	P	-9.69E-02	7.51E-02	2.47E-01
LB4110A - B2	Alpha	11/18/2007	8/15/2013	8.33E-02	P	-7.81E-02	7.22E-02	2.22E-01
LB4110A - B3	Alpha	11/18/2007	8/15/2013	1.00E-01	P	-6.29E-02	5.35E-02	1.70E-01
LB4110A - B4	Alpha	11/18/2007	8/15/2013	5.00E-02	P	-1.40E-01	7.87E-02	2.98E-01
LB4110A - C1	Alpha	11/18/2007	8/15/2013	6.67E-02	P	-1.49E-01	8.86E-02	3.26E-01
LB4110A - C2	Alpha	11/18/2007	8/15/2013	3.33E-02	P	-1.77E-01	8.66E-02	3.50E-01
LB4110A - C3	Alpha	11/18/2007	8/15/2013	8.33E-02	P	-1.72E-01	1.00E-01	3.72E-01
LB4110A - C4	Alpha	11/18/2007	8/15/2013	1.67E-02	P	-6.27E-02	6.83E-02	1.99E-01
LB4110A - D1	Alpha	11/18/2007	8/15/2013	5.00E-02	P	-5.36E-02	8.32E-02	2.20E-01
LB4110A - D2	Alpha	11/18/2007	8/15/2013	1.67E-02	P	-6.99E-02	6.06E-02	1.91E-01
LB4110A - D3	Alpha	11/18/2007	8/15/2013	1.67E-02	P	-4.85E-02	7.06E-02	1.90E-01
LB4110A - D4	Alpha	11/18/2007	8/15/2013	1.67E-02	P	-5.72E-02	7.03E-02	1.98E-01
LB4110R - A1	Alpha	11/24/2006	8/15/2013	8.33E-02	P	-9.81E-02	1.01E-01	3.00E-01
LB4110R - A2	Alpha	11/24/2006	8/15/2013	6.67E-02	P	-8.91E-02	7.63E-02	2.42E-01
LB4110R - A3	Alpha	11/24/2006	8/15/2013	1.33E-01	P	-7.31E-02	7.73E-02	2.28E-01
LB4110R - A4	Alpha	11/24/2006	8/15/2013	1.00E-01	P	-5.26E-02	7.09E-02	1.94E-01
LB4110R - B1	Alpha	11/24/2006	8/15/2013	0.00E+00	P	-9.42E-02	6.16E-02	2.17E-01
LB4110R - B2	Alpha	11/24/2006	8/15/2013	3.33E-02	P	-6.94E-02	6.33E-02	1.96E-01
LB4110R - B3	Alpha	11/24/2006	8/15/2013	6.67E-02	P	-6.48E-02	6.99E-02	2.05E-01
LB4110R - B4	Alpha	11/24/2006	8/15/2013	5.00E-02	P	-6.38E-02	7.02E-02	2.04E-01
LB4110R - C1	Alpha	11/24/2006	8/15/2013	6.67E-02	P	-7.67E-02	7.36E-02	2.24E-01
LB4110R - C2	Alpha	11/24/2006	8/15/2013	1.67E-02	P	-7.55E-02	7.09E-02	2.17E-01
LB4110R - C3	Alpha	11/24/2006	8/15/2013	8.33E-02	P	-8.78E-02	8.43E-02	2.56E-01
LB4110R - C4	Alpha	11/24/2006	8/15/2013	3.33E-02	P	-6.18E-02	8.12E-02	2.24E-01
LB4110R - D1	Alpha	11/24/2006	8/15/2013	0.00E+00	P	-1.03E-01	7.01E-02	2.43E-01
LB4110R - D2	Alpha	11/24/2006	8/15/2013	0.00E+00	P	-7.80E-02	6.95E-02	2.17E-01
LB4110R - D3	Alpha	11/24/2006	8/15/2013	0.00E+00	P	-8.30E-02	6.93E-02	2.22E-01
LB4110R - D4	Alpha	11/24/2006	8/15/2013	0.00E+00	P	-7.54E-02	7.40E-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
8/15/13

Detector	Alpha/Beta	Calibration Date	Count Date	Bkg CPM	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	8/15/2013	7.57E+00	P	-2.89E+02	7.63E+00	3.04E+02
LB4110A - A2	Beta	11/18/2007	8/15/2013	3.50E+00	P	-3.03E+01	2.59E+00	3.55E+01
LB4110A - A3	Beta	11/18/2007	8/15/2013	1.85E+00	P	-5.01E+01	2.63E+00	5.54E+01
LB4110A - A4	Beta	11/18/2007	8/15/2013	7.47E+00	P	-3.24E+01	3.22E+00	3.88E+01
LB4110A - B1	Beta	11/18/2007	8/15/2013	1.45E+00	P	-1.04E+01	3.23E+00	1.68E+01
LB4110A - B2	Beta	11/18/2007	8/15/2013	1.27E+00	P	-7.62E+00	1.99E+00	1.16E+01
LB4110A - B3	Beta	11/18/2007	8/15/2013	1.18E+00	P	1.16E-01	1.36E+00	2.60E+00
LB4110A - B4	Beta	11/18/2007	8/15/2013	1.12E+00	P	-7.61E+00	1.97E+00	1.16E+01
LB4110A - C1	Beta	11/18/2007	8/15/2013	1.40E+00	P	-5.38E+00	2.12E+00	9.61E+00
LB4110A - C2	Beta	11/18/2007	8/15/2013	1.00E+00	P	3.81E-01	1.27E+00	2.15E+00
LB4110A - C3	Beta	11/18/2007	8/15/2013	1.22E+00	P	4.72E-01	1.46E+00	2.45E+00
LB4110A - C4	Beta	11/18/2007	8/15/2013	1.02E+00	P	-1.75E+00	2.10E+00	5.95E+00
LB4110A - D1	Beta	11/18/2007	8/15/2013	1.90E+00	P	-2.31E+00	2.56E+00	7.43E+00
LB4110A - D2	Beta	11/18/2007	8/15/2013	1.45E+00	P	-6.39E-01	1.56E+00	3.76E+00
LB4110A - D3	Beta	11/18/2007	8/15/2013	3.97E+00	P	1.29E+00	4.47E+00	7.66E+00
LB4110A - D4	Beta	11/18/2007	8/15/2013	1.22E+00	P	-4.23E-01	1.37E+00	3.16E+00
LB4110R - A1	Beta	11/24/2006	8/15/2013	8.83E-01	P	-6.08E+01	3.66E+00	6.81E+01
LB4110R - A2	Beta	11/24/2006	8/15/2013	1.08E+00	P	-4.83E+01	2.01E+00	5.23E+01
LB4110R - A3	Beta	11/24/2006	8/15/2013	9.33E-01	P	-4.47E+01	2.73E+00	5.01E+01
LB4110R - A4	Beta	11/24/2006	8/15/2013	9.83E-01	P	-4.46E+01	1.99E+00	4.85E+01
LB4110R - B1	Beta	11/24/2006	8/15/2013	1.08E+00	P	-4.69E+01	2.02E+00	5.09E+01
LB4110R - B2	Beta	11/24/2006	8/15/2013	1.18E+00	P	-4.69E+01	2.04E+00	5.10E+01
LB4110R - B3	Beta	11/24/2006	8/15/2013	1.05E+00	P	-4.67E+01	2.65E+00	5.20E+01
LB4110R - B4	Beta	11/24/2006	8/15/2013	1.07E+00	P	-4.70E+01	1.92E+00	5.08E+01
LB4110R - C1	Beta	11/24/2006	8/15/2013	1.30E+00	P	-4.68E+01	2.96E+00	5.27E+01
LB4110R - C2	Beta	11/24/2006	8/15/2013	1.37E+00	P	-4.68E+01	2.71E+00	5.22E+01
LB4110R - C3	Beta	11/24/2006	8/15/2013	1.33E+00	P	-4.72E+01	2.51E+00	5.23E+01
LB4110R - C4	Beta	11/24/2006	8/15/2013	1.20E+00	P	-5.33E+01	2.95E+00	5.92E+01
LB4110R - D1	Beta	11/24/2006	8/15/2013	0.00E+00	P	-4.44E+01	5.55E+00	5.55E+01
LB4110R - D2	Beta	11/24/2006	8/15/2013	0.00E+00	P	-4.77E+01	1.87E+00	5.15E+01
LB4110R - D3	Beta	11/24/2006	8/15/2013	0.00E+00	P	-5.11E+01	5.52E+00	6.21E+01
LB4110R - D4	Beta	11/24/2006	8/15/2013	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

0347

GPC Detector Report
(ALL Efficiencies)

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Alpha	11/18/2007	8/15/2013	0.2503	P	-0.0127	0.2159	0.4446
LB4110A - A2	Alpha	11/18/2007	8/15/2013	0.2107	P	-0.0502	0.1742	0.3986
LB4110A - A3	Alpha	11/18/2007	8/15/2013	0.2046	P	-0.0735	0.1634	0.4003
LB4110A - A4	Alpha	11/18/2007	8/15/2013	0.2184	P	-0.0520	0.1821	0.4162
LB4110A - B1	Alpha	11/18/2007	8/15/2013	0.2045	P	0.1943	0.2243	0.2543
LB4110A - B2	Alpha	11/18/2007	8/15/2013	0.2161	P	0.1924	0.2213	0.2502
LB4110A - B3	Alpha	11/18/2007	8/15/2013	0.2237	P	0.1279	0.2323	0.3366
LB4110A - B4	Alpha	11/18/2007	8/15/2013	0.2259	P	0.2088	0.2364	0.2639
LB4110A - C1	Alpha	11/18/2007	8/15/2013	0.2175	P	0.1976	0.2207	0.2438
LB4110A - C2	Alpha	11/18/2007	8/15/2013	0.2284	P	0.1971	0.2252	0.2532
LB4110A - C3	Alpha	11/18/2007	8/15/2013	0.2575	P	0.2234	0.2494	0.2755
LB4110A - C4	Alpha	11/18/2007	8/15/2013	0.2236	P	0.1969	0.2256	0.2543
LB4110A - D1	Alpha	11/18/2007	8/15/2013	0.2173	P	0.2028	0.2328	0.2628
LB4110A - D2	Alpha	11/18/2007	8/15/2013	0.2485	P	0.2276	0.2580	0.2884
LB4110A - D3	Alpha	11/18/2007	8/15/2013	0.2535	P	0.2309	0.2634	0.2958
LB4110A - D4	Alpha	11/18/2007	8/15/2013	0.1880	P	0.1642	0.1992	0.2342
LB4110R - A1	Alpha	11/24/2006	8/15/2013	0.2269	P	0.1983	0.2385	0.2786
LB4110R - A2	Alpha	11/24/2006	8/15/2013	0.2058	P	0.1851	0.2201	0.2551
LB4110R - A3	Alpha	11/24/2006	8/15/2013	0.2158	P	0.1924	0.2243	0.2563
LB4110R - A4	Alpha	11/24/2006	8/15/2013	0.2442	P	0.2118	0.2453	0.2789
LB4110R - B1	Alpha	11/24/2006	8/15/2013	0.2197	P	0.1832	0.2257	0.2681
LB4110R - B2	Alpha	11/24/2006	8/15/2013	0.2072	P	0.1754	0.2169	0.2585
LB4110R - B3	Alpha	11/24/2006	8/15/2013	0.2481	P	0.2016	0.2438	0.2861
LB4110R - B4	Alpha	11/24/2006	8/15/2013	0.2171	P	0.1882	0.2312	0.2742
LB4110R - C1	Alpha	11/24/2006	8/15/2013	0.2136	P	0.1833	0.2150	0.2466
LB4110R - C2	Alpha	11/24/2006	8/15/2013	0.2152	P	0.1932	0.2245	0.2558
LB4110R - C3	Alpha	11/24/2006	8/15/2013	0.2329	P	0.2034	0.2394	0.2754
LB4110R - C4	Alpha	11/24/2006	8/15/2013	0.2062	P	0.1826	0.2222	0.2618
LB4110R - D1	Alpha	11/24/2006	8/15/2013	0.0000	F	0.0031	0.1991	0.3951
LB4110R - D2	Alpha	11/24/2006	8/15/2013	0.0000	F	0.0042	0.2264	0.4486
LB4110R - D3	Alpha	11/24/2006	8/15/2013	0.0000	F	0.0041	0.2224	0.4407
LB4110R - D4	Alpha	11/24/2006	8/15/2013	0.0000	F	0.0019	0.1792	0.3566
LB5100 - 1	Alpha	7/10/2006	10/26/2007	0.3368	P	0.3332	0.3455	0.3578

C
8/15/13

GPC Detector Report
(ALL Efficiencies)

Detector	Alpha/Beta	Calibration Date	Count Date	Eff	PFW	LCL	Mean	UCL
LB4110A - A1	Beta	11/18/2007	8/15/2013	0.5664	P	0.2113	0.5625	0.9137
LB4110A - A2	Beta	11/18/2007	8/15/2013	0.4909	P	0.1622	0.4649	0.7675
LB4110A - A3	Beta	11/18/2007	8/15/2013	0.4732	P	0.0902	0.4572	0.8242
LB4110A - A4	Beta	11/18/2007	8/15/2013	0.5253	P	0.1430	0.4892	0.8355
LB4110A - B1	Beta	11/18/2007	8/15/2013	0.4878	P	0.4633	0.5297	0.5961
LB4110A - B2	Beta	11/18/2007	8/15/2013	0.5066	P	0.4632	0.5268	0.5904
LB4110A - B3	Beta	11/18/2007	8/15/2013	0.5143	P	0.3169	0.5314	0.7458
LB4110A - B4	Beta	11/18/2007	8/15/2013	0.5187	P	0.4918	0.5538	0.6158
LB4110A - C1	Beta	11/18/2007	8/15/2013	0.5027	P	0.4511	0.5026	0.5541
LB4110A - C2	Beta	11/18/2007	8/15/2013	0.4959	P	0.4293	0.5010	0.5727
LB4110A - C3	Beta	11/18/2007	8/15/2013	0.6057	P	0.5291	0.5907	0.6523
LB4110A - C4	Beta	11/18/2007	8/15/2013	0.5217	P	0.4578	0.5248	0.5918
LB4110A - D1	Beta	11/18/2007	8/15/2013	0.5241	P	0.4784	0.5529	0.6275
LB4110A - D2	Beta	11/18/2007	8/15/2013	0.5458	P	0.4887	0.5871	0.6855
LB4110A - D3	Beta	11/18/2007	8/15/2013	0.5996	P	0.5374	0.6149	0.6924
LB4110A - D4	Beta	11/18/2007	8/15/2013	0.4392	P	0.3845	0.4718	0.5592
LB4110R - A1	Beta	11/24/2006	8/15/2013	0.5525	P	0.4744	0.5672	0.6601
LB4110R - A2	Beta	11/24/2006	8/15/2013	0.4942	P	0.4158	0.5085	0.6013
LB4110R - A3	Beta	11/24/2006	8/15/2013	0.5065	P	0.4503	0.5384	0.6264
LB4110R - A4	Beta	11/24/2006	8/15/2013	0.5924	P	0.5032	0.5914	0.6796
LB4110R - B1	Beta	11/24/2006	8/15/2013	0.5274	P	0.4463	0.5421	0.6380
LB4110R - B2	Beta	11/24/2006	8/15/2013	0.5029	P	0.4247	0.5195	0.6144
LB4110R - B3	Beta	11/24/2006	8/15/2013	0.6058	P	0.4939	0.5917	0.6895
LB4110R - B4	Beta	11/24/2006	8/15/2013	0.5251	P	0.4540	0.5489	0.6437
LB4110R - C1	Beta	11/24/2006	8/15/2013	0.4689	P	0.4159	0.5015	0.5871
LB4110R - C2	Beta	11/24/2006	8/15/2013	0.5136	P	0.4440	0.5283	0.6126
LB4110R - C3	Beta	11/24/2006	8/15/2013	0.5626	P	0.4755	0.5705	0.6656
LB4110R - C4	Beta	11/24/2006	8/15/2013	0.5001	P	0.4258	0.5249	0.6240
LB4110R - D1	Beta	11/24/2006	8/15/2013	0.0000	F	0.0066	0.4761	0.9455
LB4110R - D2	Beta	11/24/2006	8/15/2013	0.0000	F	0.0081	0.5349	1.0618
LB4110R - D3	Beta	11/24/2006	8/15/2013	0.0000	F	0.0077	0.5195	1.0314
LB4110R - D4	Beta	11/24/2006	8/15/2013	0.0000	F	0.0035	0.4277	0.8518
LB5100 - 1	Beta	7/10/2006	10/26/2007	0.4428	F	0.4555	0.4731	0.4906

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8/15/13

0349

SECTION XII
BARIUM-133 ANALYTICAL TRACER DATA

K/B
9/2/17

VAX/VMS Peak Search Report Generated 8-AUG-2013 17:19:55.52

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP_130715401_GE5_BAFIL_194500.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : SPIKE
Deposition Date :
Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 17:04:36.
Sample ID : 1307154-01 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.22 0.1%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	19.93	24	13	0.66	196.59	191	27	2.72E-02	40.1	1.27E+00
2	3	21.05	91	36	0.67	207.38	191	27	1.02E-01	19.3	
3	3	28.27	46	9	0.71	276.63	268	52	5.08E-02	31.5	2.18E+00
4	3	30.97	2066	38	0.73	302.52	268	52	2.30E+00	2.4	
5	2	35.08	322	84	0.62	341.96	332	24	3.57E-01	9.0	2.30E+00
6	2	35.90	59	64	0.62	349.86	332	24	6.55E-02	32.5	
7	0	61.69	256	22	0.86	597.32	586	22	2.85E-01	7.4	
8	0	65.80	108	37	0.73	636.79	627	22	1.19E-01	15.5	
9	2	79.41	34	11	0.84	767.40	759	34	3.83E-02	27.3	9.52E-01
10	2	80.96	868	10	0.69	782.29	759	34	9.65E-01	3.5	
11	0	84.26	14	16	0.58	813.91	804	14	1.60E-02	57.1	
12	0	111.82	156	71	0.72	1078.38	1067	23	1.73E-01	14.4	
13	0	116.10	50	25	0.35	1119.42	1106	21	5.57E-02	25.3	
14	0	160.35	21	17	0.48	1544.08	1533	19	2.39E-02	41.0	
15	4	275.19	18	2	1.03	2646.00	2636	24	2.00E-02	41.0	6.75E-01
16	4	275.85	38	2	0.91	2652.34	2636	24	4.18E-02	19.2	
17	1	301.66	91	0	1.06	2900.00	2888	28	1.01E-01	12.4	4.78E+00
18	1	302.49	91	0	1.06	2908.00	2888	28	1.02E-01	11.2	
19	0	306.60	28	6	0.43	2947.40	2935	22	3.06E-02	25.3	
20	1	331.98	11	6	1.10	3191.00	3184	26	1.24E-02	59.3	3.21E+00
21	1	332.61	73	13	1.10	3197.00	3184	26	8.10E-02	13.6	
22	0	355.11	431	3	1.04	3412.87	3396	31	4.79E-01	4.9	
23	0	382.89	57	29	1.01	3679.49	3663	25	6.38E-02	19.8	
24	7	385.13	40	19	1.16	3701.00	3693	27	4.40E-02	27.1	2.15E+00
25	7	385.81	64	16	0.55	3707.47	3693	27	7.09E-02	20.5	
26	7	386.59	27	7	0.94	3714.94	3693	27	3.01E-02	30.7	
27	0	390.09	28	12	0.18	3748.56	3732	26	3.16E-02	30.2	

Summary of Nuclide Activity

Sample ID : 1307154-01

Acquisition date : 8-AUG-2013 17:04:36

Total number of lines in spectrum 27
 Number of unidentified lines 22
 Number of lines tentatively identified by NID 5 18.52%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter				
BA-133	10.50Y	1.00	4.383E+02	4.384E+02	0.735E+02	16.77		
Total Activity :			4.383E+02	4.384E+02				

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter				
TH-234	4.47E+09Y	1.00	2.314E+02	2.314E+02	0.356E+02	15.37		
Total Activity :			2.314E+02	2.314E+02				

Grand Total Activity : 6.697E+02 6.698E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	4.383E+02	4.384E+02	16.77	OK
	302.84	17.80	2.575E+00	5.990E+02	5.991E+02	34.56	OK
	356.01	60.00	4.312E+00	5.005E+02	5.006E+02	17.45	OK

Final Mean for 3 Valid Peaks = 4.384E+02+/- 7.353E+01 (16.77%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.314E+02	2.314E+02	15.37	OK

Final Mean for 1 Valid Peaks = 2.314E+02+/- 3.556E+01 (15.37%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.384E+02	7.353E+01	1.235E+01	1.818E+00	35.495
TH-234	2.314E+02	3.556E+01	3.063E+01	3.940E-01	7.555

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-3.619E+00		1.441E+01	2.557E+01	8.667E+00	-0.142
CD-109	4.468E+01		9.296E+01	1.815E+02	1.746E+01	0.246
PA-231	-3.260E-02		8.351E-01	1.539E+00	1.732E-02	-0.021
PA-234	4.228E+00	+	1.644E+00	2.289E+00	2.577E-02	1.847
NP-237	-6.580E+00		2.512E+01	4.253E+01	3.752E+00	-0.155
AM-241	-5.619E-01		1.704E+00	2.429E+00	2.734E-02	-0.231

W/S
8/8/13

VAX/VMS Peak Search Report Generated 8-AUG-2013 17:35:36.41

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715402_GE5_BAFIL_194504.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : BLANK
Deposition Date :
Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 17:20:19.
Sample ID : 1307154-02 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.17 0.1%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	5.41	20	13	0.99	57.31	49	14	2.17E-02	46.3	
2	0	10.56	20	9	0.30	106.70	102	11	2.17E-02	36.5	
3	0	21.26	95	15	0.81	209.38	203	15	1.06E-01	13.6	
4	0	25.84	13	14	0.91	253.31	247	13	1.44E-02	73.1	
5	0	28.73	9	54	0.88	281.06	268	17	1.02E-02	187.3	
6	0	30.97	1919	143	0.72	302.57	291	23	2.13E+00	2.8	
7	2	35.12	446	26	0.68	342.36	330	30	4.95E-01	5.8	9.58E-01
8	2	36.02	99	11	0.57	351.00	330	30	1.11E-01	20.0	
9	0	52.78	86	14	1.60	511.88	496	27	9.50E-02	16.1	
10	0	61.74	245	46	1.20	597.85	583	27	2.72E-01	9.1	
11	0	66.01	109	41	0.34	638.80	627	27	1.21E-01	16.7	
12	0	70.01	19	11	0.43	677.17	668	13	2.09E-02	38.8	
13	0	81.00	780	58	0.65	782.61	772	20	8.67E-01	4.1	
14	0	111.56	230	18	0.59	1075.86	1061	25	2.56E-01	7.7	
15	0	115.85	56	29	0.95	1117.09	1101	29	6.22E-02	26.8	
16	0	275.72	31	11	0.90	2651.15	2636	21	3.50E-02	27.8	
17	3	301.17	21	3	1.17	2895.35	2889	26	2.35E-02	34.4	1.12E+00
18	3	302.14	100	7	0.85	2904.62	2889	26	1.12E-01	12.0	
19	0	306.62	22	5	0.53	2947.64	2931	25	2.44E-02	28.6	
20	6	332.51	77	5	1.21	3196.05	3182	28	8.60E-02	12.0	1.43E+00
21	6	333.65	10	1	0.58	3206.97	3182	28	1.17E-02	26.1	
22	0	355.12	401	19	0.86	3413.04	3396	31	4.46E-01	5.4	
23	1	382.53	59	13	1.16	3676.00	3662	29	6.52E-02	19.3	9.56E-01
24	1	383.15	14	10	1.16	3682.00	3662	29	1.60E-02	71.4	
25	6	385.67	86	12	1.18	3706.17	3694	26	9.60E-02	15.8	4.72E+00
26	6	386.28	132	8	1.16	3712.00	3694	26	1.46E-01	9.4	
27	5	389.40	12	0	1.16	3742.00	3733	27	1.31E-02	43.1	2.09E+00
28	5	389.93	44	0	1.16	3747.00	3733	27	4.91E-02	15.5	
29	5	390.36	14	0	0.69	3751.18	3733	27	1.60E-02	46.2	
30	1	412.88	19	6	1.31	3967.28	3960	20	2.15E-02	30.0	1.02E+00
31	1	413.58	25	12	1.19	3974.00	3960	20	2.78E-02	24.1	

Total number of lines in spectrum 31
 Number of unidentified lines 24
 Number of lines tentatively identified by NID 7 22.58%

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	3.939E+02	3.939E+02	0.683E+02	17.33	
Total Activity :			3.939E+02	3.939E+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
PA-231	3.28E+04Y	1.00	1.394E+00	1.394E+00	1.020E+00	73.14	
PA-234	4.47E+09Y	1.00	4.396E+00	4.396E+00	1.207E+00	27.46	
TH-234	4.47E+09Y	1.00	2.214E+02	2.214E+02	0.412E+02	18.60	
Total Activity :			2.272E+02	2.272E+02			

Grand Total Activity : 6.211E+02 6.211E+02

Flags: "K" = Keyline not found "M" = Manually accepted
 "E" = Manually edited "A" = Nuclide specific abn. limit

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	3.939E+02	3.939E+02	17.33	OK
	302.84	17.80	2.575E+00	6.582E+02	6.583E+02	35.69	OK
	356.01	60.00	4.312E+00	4.659E+02	4.660E+02	18.10	OK

Final Mean for 3 Valid Peaks = 3.939E+02+/- 6.826E+01 (17.33%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
PA-231	9.28	42.00*	1.000E+02	1.394E+00	1.394E+00	73.14	OK
	10.11	20.20	1.000E+02	2.899E+00	2.899E+00	73.14	OK
	283.67	1.60	2.191E+00	-----	Line Not Found	-----	Absent
	302.67	2.30	2.572E+00	5.102E+03	5.102E+03	34.26	OK

Final Mean for 3 Valid Peaks = 1.394E+00+/- 1.020E+00 (73.14%)

PA-234	9.89	89.00	1.000E+02	6.580E-01	6.580E-01	73.14	OK
	21.72	64.90*	1.000E+02	4.396E+00	4.396E+00	27.46	OK
	37.93	23.75	1.000E+02	1.258E+01	1.258E+01	40.17	OK
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 3 Valid Peaks = 4.396E+00+/- 1.207E+00 (27.46%)

TH-234	63.29	3.80*	8.750E+01	2.214E+02	2.214E+02	18.60	OK
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Final Mean for 1 Valid Peaks = 2.214E+02+/- 4.119E+01 (18.60%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.939E+02	6.826E+01	1.280E+01	1.885E+00	30.775
PA-231	1.394E+00	1.020E+00	1.192E+00	1.342E-02	1.170
PA-234	4.396E+00	1.207E+00	9.485E-01	1.068E-02	4.634
TH-234	2.214E+02	4.119E+01	2.545E+01	3.275E-01	8.700

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.777E+00		1.522E+01	2.839E+01	9.625E+00	0.063
CD-109	8.695E+01		8.132E+01	1.741E+02	1.676E+01	0.499
NP-237	-4.200E+01		2.759E+01	3.862E+01	3.406E+00	-1.088
AM-241	-7.289E-01		1.730E+00	2.423E+00	2.728E-02	-0.301

10/3
8/8/13

VAX/VMS Peak Search Report Generated 8-AUG-2013 17:51:21.26

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP_130715403_GE5_BAFIL_194505.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-107-SS TOT
Deposition Date :
Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 17:36:05.
Sample ID : 1307154-03 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.10 0.1%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	21.11	70	32	0.99	207.94	195	20	7.78E-02	22.7	
2	0	30.97	1605	84	0.81	302.60	290	28	1.78E+00	3.0	
3	0	35.06	306	80	0.63	341.82	328	21	3.40E-01	9.8	
4	0	36.26	15	54	0.22	353.35	348	10	1.64E-02	105.8	
5	1	61.72	137	31	0.71	597.64	583	25	1.53E-01	12.9	1.66E+00
6	1	62.38	49	7	0.65	604.00	583	25	5.40E-02	16.1	
7	0	66.15	90	42	0.37	640.12	629	22	1.00E-01	19.0	
8	6	79.37	33	14	1.17	767.00	760	39	3.69E-02	27.2	1.00E+00
9	6	79.79	26	19	0.69	771.00	760	39	2.87E-02	64.2	
10	6	80.98	615	16	0.65	782.42	760	39	6.83E-01	4.3	
11	0	111.70	152	34	0.73	1077.18	1065	23	1.69E-01	11.7	
12	0	115.79	48	14	0.86	1116.45	1104	20	5.29E-02	21.7	
13	0	186.26	10	19	0.26	1792.65	1777	19	1.10E-02	87.1	
14	0	275.97	22	17	0.77	2653.53	2639	22	2.48E-02	41.2	
15	1	301.87	33	0	1.06	2902.00	2888	27	3.67E-02	25.7	5.47E+00
16	1	302.60	77	0	1.06	2909.00	2888	27	8.61E-02	7.9	
17	0	332.82	28	16	0.87	3199.08	3186	21	3.12E-02	31.7	
18	6	354.38	54	3	1.11	3405.89	3396	28	6.04E-02	29.0	1.87E+00
19	6	355.19	172	9	0.82	3413.72	3396	28	1.91E-01	10.2	
20	3	382.06	32	4	1.04	3671.56	3664	26	3.61E-02	22.3	2.23E+00
21	3	382.84	17	9	1.16	3679.00	3664	26	1.89E-02	58.3	
22	3	383.45	29	6	0.84	3684.83	3664	26	3.26E-02	21.3	
23	4	385.55	105	13	1.16	3705.00	3692	26	1.16E-01	12.1	4.98E+00
24	4	386.33	33	4	0.76	3712.46	3692	26	3.71E-02	24.3	

Summary of Nuclide Activity

Sample ID : 1307154-03

Acquisition date : 8-AUG-2013 17:36:05

Total number of lines in spectrum 24
 Number of unidentified lines 18
 Number of lines tentatively identified by NID 6 25.00%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.104E+02	3.104E+02	0.544E+02	17.51	
Total Activity :			3.104E+02	3.104E+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	4.386E+01	4.386E+01	1.426E+01	32.51	
Total Activity :			4.386E+01	4.386E+01			

Grand Total Activity : 3.542E+02 3.543E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	3.104E+02	3.104E+02	17.51	OK
	302.84	17.80	2.575E+00	5.074E+02	5.075E+02	30.72	OK
	356.01	60.00	4.312E+00	1.994E+02	1.995E+02	25.09	OK

Final Mean for 3 Valid Peaks = 3.104E+02+/- 5.437E+01 (17.51%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	4.386E+01	4.386E+01	32.51	OK

Final Mean for 1 Valid Peaks = 4.386E+01+/- 1.426E+01 (32.51%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.104E+02	5.437E+01	1.134E+01	1.670E+00	27.366
TH-234	4.386E+01	1.426E+01	2.817E+01	3.624E-01	1.557

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-8.348E+00		1.070E+01	1.645E+01	5.577E+00	-0.507
CD-109	6.846E+01		8.296E+01	1.721E+02	1.657E+01	0.398
PA-231	1.180E-01		6.567E-01	1.302E+00	1.466E-02	0.091
PA-234	3.241E+00	+	1.475E+00	1.827E+00	2.057E-02	1.774
NP-237	4.610E+00		2.185E+01	4.213E+01	3.716E+00	0.109
AM-241	7.681E-01		1.258E+00	2.202E+00	2.479E-02	0.349

KP
9/19/13

VAX/VMS Peak Search Report Generated 8-AUG-2013 18:06:54.42

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715404_GE5_BAFIL_194506.CN
Analyses by : PEAK V16.9 PEAKEFF V2.2
Client ID : PZ-200-SS TOT
Deposition Date :
Sample Date : 8-AUG-2013 00:00:00. Acquisition date : 8-AUG-2013 17:51:33.
Sample ID : 1307154-04 Sample Quantity : 1.00000E+00 filter
Sample type : FILTER Sample Geometry : 0
Detector name : GE5 Detector Geometry: BAFIL
Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.13 0.1%
Start channel : 25 End channel : 4096
Sensitivity : 3.00000 Gaussian : 10.00000
Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	10.09	16	8	0.90	102.19	94	15	1.72E-02	46.1	
2	0	21.07	69	32	0.17	207.52	195	21	7.68E-02	23.6	
3	0	25.49	12	16	0.23	250.00	239	16	1.33E-02	79.9	
4	0	30.97	1499	80	0.78	302.52	291	23	1.67E+00	3.0	
5	0	35.24	385	55	0.64	343.55	333	26	4.28E-01	7.4	
6	0	39.34	9	5	0.39	382.83	377	10	1.00E-02	57.2	
7	0	53.55	20	27	0.18	519.19	506	18	2.26E-02	63.7	
8	0	61.74	206	13	0.90	597.84	585	27	2.29E-01	8.1	
9	1	65.58	70	9	0.72	634.63	619	35	7.74E-02	16.4	3.00E+00
10	1	66.45	31	4	0.66	643.00	619	35	3.47E-02	36.5	
11	1	67.11	32	0	0.73	649.36	619	35	3.58E-02	16.0	
12	2	79.40	26	0	0.71	767.31	764	29	2.92E-02	18.7	1.63E+00
13	2	80.96	627	0	0.72	782.25	764	29	6.97E-01	4.0	
14	1	111.65	97	29	0.84	1076.73	1065	21	1.07E-01	16.4	1.66E+00
15	1	112.20	46	5	0.77	1082.00	1065	21	5.13E-02	20.7	
16	5	275.30	23	0	1.49	2647.08	2638	24	2.51E-02	26.2	9.66E-01
17	5	275.83	35	0	1.01	2652.20	2638	24	3.88E-02	16.9	
18	1	301.87	86	0	1.06	2902.00	2887	27	9.55E-02	11.2	2.49E+00
19	1	302.49	52	0	0.96	2908.02	2887	27	5.75E-02	16.9	
20	0	332.85	39	3	0.81	3199.30	3184	25	4.34E-02	17.8	
21	0	355.08	301	8	1.05	3412.59	3396	28	3.35E-01	6.1	
22	1	382.75	77	5	1.27	3678.11	3663	29	8.57E-02	12.1	4.26E+00
23	1	383.26	32	5	1.16	3683.00	3663	29	3.55E-02	27.2	
24	5	385.85	109	13	1.26	3707.87	3693	26	1.21E-01	11.3	1.90E+00
25	5	386.28	12	9	1.16	3712.00	3693	26	1.31E-02	88.3	

Summary of Nuclide Activity

Sample ID : 1307154-04

Acquisition date : 8-AUG-2013 17:51:33

Total number of lines in spectrum 25
 Number of unidentified lines 18
 Number of lines tentatively identified by NID 7 28.00%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.167E+02	3.168E+02	0.546E+02	17.23	
Total Activity :			3.167E+02	3.168E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
PA-231	3.28E+04Y	1.00	1.108E+00	1.108E+00	1.024E+00	92.35	
PA-234	4.47E+09Y	1.00	3.198E+00	3.198E+00	1.516E+00	47.41	
TH-234	4.47E+09Y	1.00	1.858E+02	1.858E+02	0.312E+02	16.79	
Total Activity :			1.902E+02	1.902E+02			

Grand Total Activity : 5.069E+02 5.069E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	3.167E+02	3.168E+02	17.23	OK
	302.84	17.80	2.575E+00	3.389E+02	3.389E+02	42.81	OK
	356.01	60.00	4.312E+00	3.495E+02	3.496E+02	18.86	OK

Final Mean for 3 Valid Peaks = 3.168E+02 +/- 5.459E+01 (17.23%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
PA-231	9.28	42.00*	1.000E+02	1.108E+00	1.108E+00	92.35	OK
	10.11	20.20	1.000E+02	2.304E+00	2.304E+00	92.35	OK
	283.67	1.60	2.191E+00	-----	Line Not Found	-----	Absent
	302.67	2.30	2.572E+00	2.627E+03	2.627E+03	41.63	OK

Final Mean for 3 Valid Peaks = 1.108E+00 +/- 1.024E+00 (92.35%)

PA-234	9.89	89.00	1.000E+02	5.230E-01	5.230E-01	92.35	OK
	21.72	64.90*	1.000E+02	3.198E+00	3.198E+00	47.41	OK
	37.93	23.75	1.000E+02	1.138E+00	1.138E+00	114.47	OK
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 3 Valid Peaks = 3.198E+00 +/- 1.516E+00 (47.41%)

TH-234	63.29	3.80*	8.750E+01	1.858E+02	1.858E+02	16.79	OK
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Final Mean for 1 Valid Peaks = 1.858E+02 +/- 3.121E+01 (16.79%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.168E+02	5.459E+01	9.133E+00	1.345E+00	34.683
PA-231	1.108E+00	1.024E+00	1.375E+00	1.548E-02	0.806
PA-234	3.198E+00	1.516E+00	8.382E-01	9.435E-03	3.815
TH-234	1.858E+02	3.121E+01	1.531E+01	1.969E-01	12.143

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	4.539E+00		1.297E+01	2.548E+01	8.636E+00	0.178
CD-109	-2.333E+01		6.529E+01	1.167E+02	1.123E+01	-0.200
NP-237	-1.632E-02		1.958E+01	3.711E+01	3.273E+00	0.000
AM-241	4.199E-01		1.270E+00	2.111E+00	2.376E-02	0.199

8/9/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715405_GE5_BAFIL_194509.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PZ-200-SS DIS
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 06:29:33.
 Sample ID : 1307154-05 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE5 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.16 0.1%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	8.11	15	4	0.37	83.17	79	9	1.70E-02	35.4	
2	0	18.55	12	7	0.84	183.39	176	13	1.28E-02	54.4	
3	1	20.33	23	18	0.55	200.48	195	22	2.51E-02	45.1	2.44E+00
4	1	21.05	59	24	0.56	207.37	195	22	6.56E-02	24.3	
5	3	24.21	9	3	0.38	237.72	236	23	9.75E-03	30.4	1.27E+00
6	3	25.01	18	11	0.63	245.33	236	23	1.99E-02	47.8	
7	0	30.97	1967	132	0.79	302.58	283	35	2.19E+00	2.9	
8	2	35.12	450	16	0.68	342.39	330	30	5.00E-01	5.6	1.12E+00
9	2	36.02	92	3	0.57	351.00	330	30	1.02E-01	20.6	
10	0	53.33	42	17	0.53	517.08	509	15	4.70E-02	23.9	
11	0	61.70	242	26	0.96	597.40	584	25	2.69E-01	8.0	
12	3	65.83	90	14	0.88	637.09	626	29	1.00E-01	14.5	9.29E-01
13	3	66.66	29	13	0.66	645.00	626	29	3.23E-02	42.0	
14	2	79.64	46	22	0.81	769.62	755	38	5.09E-02	40.0	1.33E+00
15	2	80.95	777	13	0.71	782.20	755	38	8.63E-01	3.7	
16	0	92.83	9	10	0.47	896.19	887	14	1.05E-02	67.8	
17	0	111.64	160	35	0.85	1076.62	1064	21	1.78E-01	11.1	
18	0	115.90	72	7	0.92	1117.54	1107	22	7.95E-02	14.4	
19	0	158.34	6	7	0.11	1524.75	1516	13	7.03E-03	76.7	
20	1	275.50	62	0	1.03	2649.00	2637	24	6.94E-02	11.3	7.93E-01
21	1	276.21	24	0	0.93	2655.78	2637	24	2.69E-02	23.0	
22	1	301.87	160	7	1.06	2902.00	2887	28	1.78E-01	7.3	6.84E+00
23	1	302.70	22	4	0.96	2910.02	2887	28	2.50E-02	32.7	
24	0	306.39	39	0	0.35	2945.38	2928	29	4.33E-02	16.0	
25	0	332.83	51	10	0.45	3199.14	3182	28	5.65E-02	18.9	
26	0	355.16	423	3	0.93	3413.39	3397	31	4.70E-01	4.9	
27	6	382.32	12	1	1.16	3674.00	3667	23	1.31E-02	57.3	1.33E+00
28	6	382.87	77	4	0.98	3679.31	3667	23	8.55E-02	12.4	
29	0	385.87	141	14	0.94	3708.05	3692	29	1.57E-01	9.9	

Summary of Nuclide Activity

Sample ID : 1307154-05

Acquisition date : 9-AUG-2013 06:29:33

Total number of lines in spectrum 29
 Number of unidentified lines 22
 Number of lines tentatively identified by NID 7 24.14%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.922E+02	3.922E+02	0.665E+02	16.97	
Total Activity :			3.922E+02	3.922E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
PA-234	4.47E+09Y	1.00	2.731E+00	2.731E+00	1.330E+00	48.70	
TH-234	4.47E+09Y	1.00	2.190E+02	2.190E+02	0.360E+02	16.46	
Total Activity :			2.217E+02	2.217E+02			

Grand Total Activity : 6.139E+02 6.139E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	3.922E+02	3.922E+02	16.97	OK
	302.84	17.80	2.575E+00	1.474E+02	1.474E+02	70.46	OK
	356.01	60.00	4.312E+00	4.907E+02	4.907E+02	17.51	OK

Final Mean for 3 Valid Peaks = 3.922E+02+/- 6.654E+01 (16.97%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
PA-234	9.89	89.00	1.000E+02	5.150E-01	5.150E-01	70.84	OK
	21.72	64.90*	1.000E+02	2.731E+00	2.731E+00	48.70	OK
	37.93	23.75	1.000E+02	1.158E+01	1.158E+01	41.48	OK
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 3 Valid Peaks = 2.731E+00+/- 1.330E+00 (48.70%)

TH-234	63.29	3.80*	8.750E+01	2.190E+02	2.190E+02	16.46	OK
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Final Mean for 1 Valid Peaks = 2.190E+02+/- 3.604E+01 (16.46%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.922E+02	6.654E+01	1.139E+01	1.677E+00	34.424
PA-234	2.731E+00	1.330E+00	1.134E+00	1.276E-02	2.409
TH-234	2.190E+02	3.604E+01	2.063E+01	2.655E-01	10.613

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-4.628E+00		1.261E+01	2.206E+01	7.478E+00	-0.210
CD-109	1.551E+01		8.594E+01	1.634E+02	1.573E+01	0.095
PA-231	1.091E+00	+	7.731E-01	1.426E+00	1.605E-02	0.766
NP-237	-4.130E+00		2.426E+01	4.367E+01	3.852E+00	-0.095
AM-241	2.965E-01		1.469E+00	2.335E+00	2.628E-02	0.127

01910

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715406_GE5_BAFIL_194511.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PZ-102-SS TOT
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 06:51:07.
 Sample ID : 1307154-06 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE5 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.03 0.1%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	3.54	15	20	0.14	39.40	38	5	1.68E-02	59.7	
2	0	8.44	6	6	0.27	86.37	81	9	6.39E-03	90.7	
3	0	17.61	15	0	0.13	174.33	169	11	1.67E-02	25.8	
4	0	21.21	26	7	0.54	208.94	201	14	2.89E-02	29.2	
5	0	30.95	733	29	0.74	302.41	290	22	8.14E-01	4.1	
6	1	35.14	151	24	0.62	342.54	334	23	1.68E-01	11.0	3.13E+00
7	1	35.91	48	10	0.57	350.00	334	23	5.31E-02	26.6	
8	0	53.42	14	12	0.48	518.00	508	17	1.51E-02	65.9	
9	1	61.65	52	3	0.65	597.00	587	19	5.80E-02	19.4	1.58E+00
10	1	62.18	35	2	0.65	602.00	587	19	3.93E-02	17.3	
11	0	65.74	36	14	0.60	636.17	627	20	4.03E-02	26.8	
12	0	81.00	255	33	0.66	782.63	773	18	2.83E-01	7.7	
13	0	111.79	52	15	0.50	1078.13	1065	20	5.76E-02	20.4	
14	1	301.97	14	2	1.06	2903.00	2890	25	1.55E-02	52.4	1.25E+00
15	1	302.49	34	2	1.06	2908.00	2890	25	3.80E-02	17.9	
16	0	333.20	19	6	0.63	3202.66	3192	19	2.16E-02	30.8	
17	0	355.09	174	7	0.47	3412.75	3396	28	1.94E-01	8.2	
18	0	382.94	20	8	0.87	3679.94	3666	25	2.27E-02	33.5	
19	0	386.03	49	13	0.76	3709.65	3695	26	5.43E-02	20.0	

Summary of Nuclide Activity

Sample ID : 1307154-06

Acquisition date : 9-AUG-2013 06:51:07

Total number of lines in spectrum 19
 Number of unidentified lines 13
 Number of lines tentatively identified by NID 6 31.58%

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	1.286E+02	1.286E+02	0.279E+02	21.71		
Total Activity :			1.286E+02	1.286E+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	4.111E-01	4.111E-01	7.458E-01	181.41		
PA-234	4.47E+09Y	1.00	1.202E+00	1.202E+00	0.704E+00	58.55		
TH-234	4.47E+09Y	1.00	3.195E+01	3.195E+01	1.112E+01	34.81		
Total Activity :			3.356E+01	3.356E+01				

Grand Total Activity : 1.621E+02 1.621E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	1.286E+02	1.286E+02	21.71	OK
	302.84	17.80	2.575E+00	2.242E+02	2.243E+02	44.54	OK
	356.01	60.00	4.312E+00	2.023E+02	2.023E+02	21.87	OK

Final Mean for 3 Valid Peaks = 1.286E+02 +/- 2.792E+01 (21.71%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
PA-231	9.28	42.00*	1.000E+02	4.111E-01	4.111E-01	181.41	OK
	10.11	20.20	1.000E+02	8.548E-01	8.548E-01	181.41	OK
	283.67	1.60	2.191E+00	-----	Line Not Found	-----	Absent
	302.67	2.30	2.572E+00	1.738E+03	1.738E+03	43.40	OK

Final Mean for 3 Valid Peaks = 4.111E-01 +/- 7.458E-01 (181.41%)

PA-234	9.89	89.00	1.000E+02	1.940E-01	1.940E-01	181.41	OK
	21.72	64.90*	1.000E+02	1.202E+00	1.202E+00	58.55	OK
	37.93	23.75	1.000E+02	-----	Line Not Found	-----	Absent
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 2 Valid Peaks = 1.202E+00 +/- 7.035E-01 (58.55%)

TH-234	63.29	3.80*	8.750E+01	3.195E+01	3.195E+01	34.81	OK
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Final Mean for 1 Valid Peaks = 3.195E+01 +/- 1.112E+01 (34.81%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	1.286E+02	2.792E+01	1.359E+01	2.000E+00	9.464
PA-231	4.111E-01	7.458E-01	1.287E+00	1.449E-02	0.319
PA-234	1.202E+00	7.035E-01	7.761E-01	8.736E-03	1.548
TH-234	3.195E+01	1.112E+01	1.653E+01	2.127E-01	1.933

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-3.239E+00		9.874E+00	1.780E+01	6.035E+00	-0.182
CD-109	2.610E+01		6.947E+01	1.408E+02	1.355E+01	0.185
NP-237	3.314E+00		1.870E+01	3.677E+01	3.243E+00	0.090
AM-241	5.661E-01		9.621E-01	1.782E+00	2.006E-02	0.318

8(911)

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715407_GE5_BAFIL_194514.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PZ-102-SS DIS
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 07:13:24.
 Sample ID : 1307154-07 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE5 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.10 0.1%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	21.04	95	23	0.56	207.32	198	18	1.06E-01	15.5	
2	0	30.98	1856	137	0.84	302.71	292	28	2.06E+00	3.0	
3	1	35.10	350	19	0.62	342.22	329	33	3.89E-01	6.5	9.19E-01
4	1	36.02	77	10	0.57	351.00	329	33	8.58E-02	23.6	
5	0	45.73	16	0	0.26	444.19	435	19	1.78E-02	25.0	
6	0	53.22	45	0	0.41	516.11	510	13	5.00E-02	14.9	
7	0	55.69	22	7	0.38	539.80	531	15	2.42E-02	31.8	
8	0	61.69	275	18	0.76	597.31	586	22	3.05E-01	6.9	
9	2	65.62	78	13	0.80	635.01	626	29	8.65E-02	17.3	6.45E-01
10	2	66.27	47	21	0.80	641.33	626	29	5.24E-02	32.0	
11	2	79.62	57	8	0.84	769.40	756	37	6.35E-02	29.9	7.22E-01
12	2	81.00	818	7	0.68	782.62	756	37	9.09E-01	3.6	
13	0	83.73	33	7	1.44	808.83	798	20	3.72E-02	23.6	
14	0	111.74	187	56	0.96	1077.63	1065	22	2.08E-01	11.3	
15	0	275.77	41	5	1.27	2651.63	2637	24	4.58E-02	19.4	
16	0	302.18	102	8	0.79	2905.06	2890	26	1.13E-01	11.2	
17	1	333.03	98	6	1.10	3201.00	3185	27	1.09E-01	9.3	2.23E+00
18	1	333.55	11	3	1.10	3206.00	3185	27	1.24E-02	60.2	
19	0	355.17	380	3	0.83	3413.47	3396	37	4.22E-01	5.2	
20	1	382.53	28	4	1.16	3676.00	3661	32	3.14E-02	35.2	5.36E-01
21	1	383.15	66	5	1.16	3682.00	3661	32	7.38E-02	14.4	
22	9	385.88	162	9	1.27	3708.13	3693	25	1.80E-01	8.4	9.40E-01
23	9	386.07	12	8	1.16	3710.00	3693	25	1.31E-02	111.0	

Summary of Nuclide Activity

Sample ID : 1307154-07

Acquisition date : 9-AUG-2013 07:13:24

Total number of lines in spectrum 23
 Number of unidentified lines 17
 Number of lines tentatively identified by NID 6 26.09%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	4.132E+02	4.132E+02	0.697E+02	16.87	
Total Activity :			4.132E+02	4.132E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
TH-234	4.47E+09Y	1.00	2.480E+02	2.480E+02	0.358E+02	14.45	
Total Activity :			2.480E+02	2.480E+02			

Grand Total Activity : 6.613E+02 6.613E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	4.132E+02	4.132E+02	16.87	OK
	302.84	17.80	2.575E+00	6.674E+02	6.674E+02	34.63	OK
	356.01	60.00	4.312E+00	4.405E+02	4.406E+02	17.87	OK

Final Mean for 3 Valid Peaks = 4.132E+02 +/- 6.971E+01 (16.87%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.480E+02	2.480E+02	14.45	OK

Final Mean for 1 Valid Peaks = 2.480E+02 +/- 3.583E+01 (14.45%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.132E+02	6.971E+01	1.188E+01	1.749E+00	34.778
TH-234	2.480E+02	3.583E+01	1.820E+01	2.341E-01	13.631

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	6.332E+00		1.530E+01	2.942E+01	9.973E+00	0.215
CD-109	-4.166E+01		9.524E+01	1.636E+02	1.575E+01	-0.255
PA-231	4.196E-02		8.984E-01	1.663E+00	1.872E-02	0.025
PA-234	4.419E+00	+	1.383E+00	1.962E+00	2.209E-02	2.252
NP-237	-4.532E+00		2.389E+01	4.115E+01	3.629E+00	-0.110
AM-241	1.166E+00		1.657E+00	2.791E+00	3.142E-02	0.418

Handwritten signature

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715408_GE5_BAFIL_194518.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PZ-107-SS TOT
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 07:34:55.
 Sample ID : 1307154-08 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE5 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.11 0.1%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	13.31	8	3	0.70	133.11	127	12	8.64E-03	57.5	
2	0	21.15	60	37	0.22	208.34	196	21	6.69E-02	28.3	
3	0	30.97	1447	105	0.72	302.57	290	25	1.61E+00	3.3	
4	1	35.12	275	23	0.62	342.43	332	29	3.06E-01	7.7	1.65E+00
5	1	36.12	75	17	0.57	352.00	332	29	8.31E-02	21.6	
6	0	53.27	42	3	0.43	516.59	510	14	4.65E-02	18.1	
7	0	61.70	189	31	0.86	597.41	583	27	2.10E-01	10.1	
8	0	66.03	67	35	0.79	638.99	623	26	7.41E-02	23.8	
9	6	79.61	45	5	0.60	769.28	762	31	5.03E-02	18.0	1.13E+00
10	6	80.97	596	7	0.72	782.38	762	31	6.62E-01	4.2	
11	0	111.77	119	34	0.84	1077.90	1065	22	1.32E-01	13.9	
12	0	160.92	29	17	0.30	1549.55	1533	27	3.21E-02	35.1	
13	0	275.96	26	7	0.67	2653.46	2636	23	2.86E-02	27.4	
14	0	302.22	86	9	0.41	2905.44	2889	28	9.53E-02	12.7	
15	0	332.83	44	3	0.63	3199.15	3182	28	4.86E-02	16.9	
16	0	355.09	286	13	0.59	3412.75	3395	29	3.17E-01	6.5	
17	1	382.74	56	5	1.16	3678.00	3668	23	6.24E-02	14.2	1.30E+00
18	1	383.36	26	8	1.16	3684.00	3668	23	2.91E-02	29.3	
19	0	385.87	82	17	1.20	3708.12	3696	21	9.09E-02	14.2	

Summary of Nuclide Activity

Sample ID : 1307154-08

Acquisition date : 9-AUG-2013 07:34:55

Total number of lines in spectrum 19
 Number of unidentified lines 13
 Number of lines tentatively identified by NID 6 31.58%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.007E+02	3.007E+02	0.524E+02	17.42	
Total Activity :			3.007E+02	3.007E+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	1.705E+02	1.705E+02	0.351E+02	20.59	
Total Activity :			1.705E+02	1.705E+02			

Grand Total Activity : 4.711E+02 4.711E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	3.007E+02	3.007E+02	17.42	OK
	302.84	17.80	2.575E+00	5.616E+02	5.617E+02	36.63	OK
	356.01	60.00	4.312E+00	3.315E+02	3.316E+02	19.51	OK

Final Mean for 3 Valid Peaks = 3.007E+02 +/- 5.237E+01 (17.42%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	1.705E+02	1.705E+02	20.59	OK

Final Mean for 1 Valid Peaks = 1.705E+02 +/- 3.510E+01 (20.59%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.007E+02	5.237E+01	1.033E+01	1.522E+00	29.095
TH-234	1.705E+02	3.510E+01	2.063E+01	2.655E-01	8.261

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-5.213E+00		1.339E+01	2.321E+01	7.867E+00	-0.225
CD-109	6.935E+01		8.785E+01	1.794E+02	1.727E+01	0.386
PA-231	-2.456E-01		7.100E-01	1.258E+00	1.416E-02	-0.195
PA-234	2.786E+00	+	1.580E+00	1.752E+00	1.973E-02	1.590
NP-237	-2.104E+01		2.156E+01	3.333E+01	2.940E+00	-0.631
AM-241	7.914E-01		1.476E+00	2.476E+00	2.787E-02	0.320

VAX/VMS Peak Search Report Generated 9-AUG-2013 08:15:00.33

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715409_GE5_BAFIL_194522.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PZ-107-SS DIS
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 07:59:41.
 Sample ID : 1307154-09 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE5 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.13 0.1%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	21.23	80	31	0.37	209.12	201	15	8.90E-02	19.2	
2	0	30.96	2012	92	0.71	302.50	289	25	2.24E+00	2.5	
3	3	35.09	387	34	0.60	342.07	331	26	4.30E-01	6.2	1.20E+00
4	3	35.97	87	10	0.59	350.58	331	26	9.64E-02	19.5	
5	0	53.35	33	28	0.48	517.33	506	17	3.64E-02	41.8	
6	0	56.63	13	6	0.34	548.78	541	13	1.40E-02	45.7	
7	0	61.72	250	33	0.66	597.67	587	22	2.78E-01	8.0	
8	4	65.29	50	4	0.64	631.87	627	27	5.55E-02	19.0	3.65E+00
9	4	65.82	108	9	0.66	637.00	627	27	1.20E-01	12.4	
10	0	81.00	808	74	0.71	782.65	771	21	8.98E-01	4.2	
11	0	111.81	150	49	0.65	1078.23	1068	22	1.67E-01	13.3	
12	2	115.32	25	17	0.93	1111.93	1102	24	2.83E-02	41.2	1.97E+00
13	2	115.85	49	15	0.77	1117.00	1102	24	5.49E-02	20.9	
14	0	117.49	5	8	0.24	1132.78	1125	10	5.73E-03	105.7	
15	0	175.94	17	8	1.23	1693.70	1680	21	1.89E-02	39.8	
16	0	182.59	16	16	0.50	1757.42	1745	21	1.78E-02	53.4	
17	0	275.70	43	5	0.59	2650.93	2637	24	4.78E-02	18.9	
18	10	301.98	103	4	1.25	2903.05	2888	26	1.15E-01	11.0	4.97E+00
19	10	302.23	67	3	0.66	2905.54	2888	26	7.46E-02	16.3	
20	10	302.78	12	1	0.46	2910.80	2888	26	1.34E-02	46.8	
21	0	332.88	41	10	0.50	3199.58	3185	25	4.56E-02	21.3	
22	0	355.12	384	13	0.93	3413.00	3398	27	4.27E-01	5.4	
23	4	382.53	124	5	1.16	3676.00	3667	23	1.38E-01	6.4	6.08E+00
24	4	383.70	13	0	0.76	3687.25	3667	23	1.46E-02	29.2	
25	0	385.75	131	5	1.12	3706.91	3693	26	1.46E-01	9.3	
26	0	389.96	28	10	0.50	3747.30	3733	24	3.16E-02	28.7	
27	0	413.53	11	8	0.61	3973.51	3961	19	1.27E-02	50.7	

Summary of Nuclide Activity

Sample ID : 1307154-09

Acquisition date : 9-AUG-2013 07:59:41

Total number of lines in spectrum 27
 Number of unidentified lines 21
 Number of lines tentatively identified by NID 6 22.22%

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	4.079E+02	4.079E+02	0.709E+02	17.37	
Total Activity :			4.079E+02	4.079E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean Uncorrected pCi/filter	Wtd Mean Decay Corr pCi/filter	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
TH-234	4.47E+09Y	1.00	2.257E+02	2.257E+02	0.375E+02	16.63	
Total Activity :			2.257E+02	2.257E+02			

Grand Total Activity : 6.335E+02 6.335E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	4.079E+02	4.079E+02	17.37	OK
	302.84	17.80	2.575E+00	7.908E+01	7.908E+01	97.34	OK
	356.01	60.00	4.312E+00	4.462E+02	4.462E+02	18.07	OK

Final Mean for 3 Valid Peaks = 4.079E+02+/- 7.087E+01 (17.37%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
TH-234	63.29	3.80*	8.750E+01	2.257E+02	2.257E+02	16.63	OK

Final Mean for 1 Valid Peaks = 2.257E+02+/- 3.753E+01 (16.63%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.079E+02	7.087E+01	1.405E+01	2.069E+00	29.032
TH-234	2.257E+02	3.753E+01	2.397E+01	3.083E-01	9.415

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

Nuclide	Key-Line Activity K.L. (pCi/filter) Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	5.753E+00	1.444E+01	2.798E+01	9.485E+00	0.206
CD-109	-5.298E+01	8.683E+01	1.452E+02	1.398E+01	-0.365
PA-231	2.399E-02	8.182E-01	1.528E+00	1.720E-02	0.016
PA-234	3.707E+00 +	1.435E+00	2.096E+00	2.359E-02	1.768
NP-237	1.177E+01	2.432E+01	4.778E+01	4.214E+00	0.246
AM-241	1.817E+00	1.392E+00	2.634E+00	2.966E-02	0.690

819113

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715410_GE5_BAFIL_194526.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PZ-106-KS TOT
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 08:21:07.
 Sample ID : 1307154-10 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE5 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:01.10 0.1%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	0	10.43	7	11	0.28	105.43	99	10	7.78E-03	100.3	
2	0	20.85	76	35	0.80	205.41	194	20	8.42E-02	22.3	
3	0	30.98	1937	74	0.76	302.64	293	20	2.15E+00	2.5	
4	1	35.07	397	9	0.62	341.92	330	29	4.41E-01	5.5	9.96E-01
5	1	36.07	66	8	0.62	351.46	330	29	7.37E-02	25.4	
6	0	61.72	213	52	0.70	597.63	587	22	2.37E-01	10.0	
7	0	66.29	92	57	1.01	641.44	624	29	1.02E-01	22.5	
8	0	80.99	774	37	0.57	782.52	773	22	8.60E-01	4.0	
9	1	110.29	48	41	0.84	1063.73	1049	39	5.31E-02	31.5	1.82E+00
10	1	111.65	211	22	0.83	1076.73	1049	39	2.34E-01	8.5	
11	1	115.74	25	12	0.77	1116.00	1104	30	2.76E-02	42.7	7.07E-01
12	1	116.47	26	10	0.77	1123.00	1104	30	2.91E-02	40.3	
13	0	275.97	29	12	0.56	2653.47	2638	23	3.17E-02	30.0	
14	6	302.07	100	4	0.78	2903.94	2891	24	1.11E-01	11.3	5.93E-01
15	6	302.77	13	2	0.86	2910.64	2891	24	1.43E-02	53.7	
16	0	306.56	27	5	0.31	2947.01	2930	25	3.00E-02	24.7	
17	0	332.97	60	12	0.88	3200.49	3183	27	6.68E-02	16.7	
18	2	354.39	11	5	1.12	3406.00	3397	30	1.27E-02	137.8	1.09E+00
19	2	355.20	340	14	0.91	3413.76	3397	30	3.78E-01	6.0	
20	1	382.53	41	7	1.16	3676.00	3660	28	4.53E-02	25.0	1.03E+00
21	1	383.27	49	4	1.04	3683.11	3660	28	5.39E-02	13.8	
22	0	385.86	133	11	1.20	3708.02	3693	28	1.48E-01	9.9	

Summary of Nuclide Activity

Sample ID : 1307154-10

Acquisition date : 9-AUG-2013 08:21:07

Total number of lines in spectrum 22
 Number of unidentified lines 15
 Number of lines tentatively identified by NID 7 31.82%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
BA-133	10.50Y	1.00	3.907E+02	3.907E+02	0.674E+02	17.25	
Total Activity :			3.907E+02	3.907E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma	Flags
			Uncorrected	Decay Corr			
PA-231	3.28E+04Y	1.00	5.005E-01	5.005E-01	10.04E-01	200.55	
PA-234	4.47E+09Y	1.00	3.505E+00	3.505E+00	1.572E+00	44.84	
TH-234	4.47E+09Y	1.00	1.925E+02	1.925E+02	0.393E+02	20.42	
Total Activity :			1.965E+02	1.965E+02			

Grand Total Activity : 5.872E+02 5.872E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.802E+01	3.907E+02	3.907E+02	17.25	OK
	302.84	17.80	2.575E+00	8.414E+01	8.415E+01	110.65	OK
	356.01	60.00	4.312E+00	3.945E+02	3.945E+02	18.75	OK

Final Mean for 3 Valid Peaks = 3.907E+02 +/- 6.741E+01 (17.25%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
PA-231	9.28	42.00*	1.000E+02	5.005E-01	5.005E-01	200.55	OK
	10.11	20.20	1.000E+02	1.041E+00	1.041E+00	200.55	OK
	283.67	1.60	2.191E+00	-----	Line Not Found	-----	Absent
	302.67	2.30	2.572E+00	6.522E+02	6.522E+02	110.19	OK

Final Mean for 3 Valid Peaks = 5.005E-01 +/- 1.004E+00 (200.55%)

PA-234	9.89	89.00	1.000E+02	2.362E-01	2.362E-01	200.55	OK
	21.72	64.90*	1.000E+02	3.505E+00	3.505E+00	44.84	OK
	37.93	23.75	1.000E+02	8.385E+00	8.385E+00	50.92	OK
	131.42	20.40	2.473E+00	-----	Line Not Found	-----	Absent

Final Mean for 3 Valid Peaks = 3.505E+00 +/- 1.572E+00 (44.84%)

TH-234	63.29	3.80*	8.750E+01	1.925E+02	1.925E+02	20.42	OK
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Final Mean for 1 Valid Peaks = 1.925E+02 +/- 3.930E+01 (20.42%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.907E+02	6.741E+01	1.732E+01	2.549E+00	22.563
PA-231	5.005E-01	1.004E+00	1.923E+00	2.164E-02	0.260
PA-234	3.505E+00	1.572E+00	1.175E+00	1.322E-02	2.984
TH-234	1.925E+02	3.930E+01	4.103E+01	5.279E-01	4.691

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-4.240E+00		1.470E+01	2.585E+01	8.764E+00	-0.164
CD-109	1.002E+01		8.260E+01	1.566E+02	1.507E+01	0.064
NP-237	-8.085E+00		2.301E+01	4.041E+01	3.565E+00	-0.200
AM-241	2.368E-01		1.560E+00	2.439E+00	2.746E-02	0.097

C
3 (911)

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715411_GE2_BAFIL_194513.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : PZ-106-KS DIS
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 07:12:50.
 Sample ID : 1307154-11 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	30.98	2013	116	1.35	31.10	27	14	2.24E+00	2.3	3.78E+00
2	3	35.26	481	101	1.56	35.38	27	14	5.34E-01	5.7	
3	0	52.89	60	57	2.25	53.00	50	6	6.63E-02	23.9	
4	1	61.92	191	60	1.46	62.03	57	14	2.12E-01	9.7	1.87E+00
5	1	65.75	82	61	1.47	65.87	57	14	9.15E-02	17.8	
6	0	81.12	826	116	1.52	81.23	77	9	9.18E-01	4.2	
7	0	94.73	29	86	1.74	94.84	90	9	3.25E-02	60.4	
8	4	111.92	193	53	1.60	112.03	108	13	2.14E-01	9.0	2.52E+00
9	4	116.23	31	61	2.07	116.34	108	13	3.49E-02	49.0	
10	0	160.75	51	57	1.41	160.87	157	8	5.64E-02	29.5	
11	0	167.60	21	46	2.93	167.71	165	7	2.28E-02	58.9	
12	0	185.76	31	70	3.10	185.87	182	8	3.41E-02	50.5	
13	6	276.12	40	19	2.04	276.23	270	15	4.45E-02	25.8	3.62E+00
14	6	281.13	13	18	2.83	281.23	270	15	1.48E-02	63.5	
15	1	299.05	8	3	1.78	299.16	297	21	9.28E-03	45.6	2.52E+00
16	1	303.00	158	8	1.78	303.10	297	21	1.76E-01	8.2	
17	1	306.94	30	12	1.79	307.05	297	21	3.30E-02	31.7	
18	1	333.86	69	15	1.74	333.96	328	14	7.70E-02	14.5	1.38E+00
19	1	338.05	27	9	1.82	338.16	328	14	2.96E-02	28.9	
20	0	356.09	517	33	1.52	356.20	351	9	5.75E-01	4.8	
21	0	364.86	11	25	1.64	364.97	361	9	1.22E-02	87.2	
22	3	383.91	101	11	2.06	384.02	380	10	1.12E-01	12.9	1.86E+00
23	3	386.95	160	10	1.49	387.06	380	10	1.77E-01	9.0	
24	0	391.35	40	14	1.99	391.46	390	6	4.48E-02	21.7	
25	1	414.72	29	10	1.88	414.83	411	14	3.25E-02	24.8	1.58E+00
26	1	418.07	16	11	1.89	418.17	411	14	1.83E-02	48.1	
27	0	437.45	76	18	1.70	437.55	433	9	8.44E-02	15.3	
28	0	468.02	18	7	1.74	468.12	464	7	2.02E-02	33.5	
29	0	511.23	24	8	1.35	511.34	509	7	2.64E-02	28.9	
30	0	583.36	13	0	1.90	583.46	580	8	1.44E-02	27.7	
31	0	697.78	14	2	4.42	697.88	694	8	1.58E-02	31.5	
32	0	1002.28	8	0	2.98	1002.38	998	8	8.89E-03	35.4	

Summary of Nuclide Activity

Sample ID : 1307154-11

Acquisition date : 9-AUG-2013 07:12:50

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	4.180E+02	4.180E+02	0.811E+02	19.40	
Total Activity :			4.180E+02	4.180E+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	6.543E+02	6.543E+02	1.400E+02	21.40	
Total Activity :			6.543E+02	6.543E+02			

Grand Total Activity : 1.072E+03 1.072E+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	4.180E+02	4.180E+02	19.40	OK
	302.84	17.80	7.560E+00	3.527E+02	3.527E+02	34.07	OK
	356.01	60.00	7.170E+00	3.611E+02	3.612E+02	17.95	OK

Final Mean for 3 Valid Peaks = 4.180E+02+/- 8.108E+01 (19.40%)

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	6.543E+02	6.543E+02	21.40	OK

Final Mean for 1 Valid Peaks = 6.543E+02+/- 1.400E+02 (21.40%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	4.180E+02	8.108E+01	1.713E+01	2.917E+00	24.401
TH-234	6.543E+02	1.400E+02	1.269E+02	1.049E+01	5.156

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-3.074E+00		5.658E+00	8.499E+00	1.305E+00	-0.362
CD-109	-1.316E+02		1.358E+02	1.643E+02	1.887E+01	-0.801
PA-231	2.418E+01		3.813E+00	7.676E+00	1.462E-01	3.150
PA-234	4.076E+00		1.652E+00	3.251E+00	6.706E-02	1.254
NP-237	2.312E+01		3.217E+01	5.169E+01	5.836E+00	0.447
AM-241	2.292E+01		9.654E+00	1.834E+01	1.420E+00	1.249

C.B. 13/11/13

Configuration : DKA100:[GAMMA.SCUSR.ARCHIVE]SMP_130715412_GE2_BAFIL_194517.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : DUP 08 TOT
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 07:34:12.
 Sample ID : 1307154-12 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE2 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.26 0.0%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	3	28.03	38	131	1.66	28.14	26	14	4.25E-02	55.1	1.43E+01
2	3	31.02	1666	96	1.35	31.14	26	14	1.85E+00	2.6	
3	3	35.03	347	106	1.68	35.14	26	14	3.86E-01	7.1	
4	0	47.03	32	44	1.54	47.14	45	5	3.60E-02	35.9	
5	0	52.46	37	65	1.96	52.58	50	6	4.16E-02	37.4	
6	1	61.84	156	66	1.46	61.96	57	14	1.73E-01	10.8	1.19E+00
7	1	65.87	62	63	1.47	65.98	57	14	6.89E-02	22.8	
8	0	81.09	679	114	1.51	81.20	77	9	7.55E-01	4.8	
9	0	92.24	42	87	1.41	92.36	88	9	4.71E-02	42.6	
10	4	109.89	26	29	1.41	110.00	107	17	2.94E-02	38.9	1.14E+01
11	4	115.91	47	49	1.89	116.02	107	17	5.19E-02	30.0	
12	0	186.04	38	59	1.06	186.15	183	7	4.23E-02	37.3	
13	0	243.10	15	19	2.62	243.21	241	6	1.67E-02	53.1	
14	0	276.52	38	21	1.78	276.62	274	6	4.17E-02	25.3	
15	4	302.95	120	6	1.63	303.06	299	23	1.33E-01	9.6	1.85E+00
16	4	307.58	24	5	2.38	307.69	299	23	2.65E-02	36.8	
17	3	334.06	59	10	2.00	334.17	330	11	6.51E-02	15.9	1.84E+00
18	3	338.01	22	6	2.20	338.11	330	11	2.50E-02	28.6	
19	2	356.16	412	16	1.49	356.27	352	16	4.57E-01	5.1	2.41E+00
20	2	363.89	16	18	2.02	364.00	352	16	1.73E-02	49.1	
21	1	377.06	13	17	1.85	377.17	373	23	1.41E-02	49.4	2.84E+00
22	1	384.06	87	14	1.86	384.17	373	23	9.63E-02	13.1	
23	1	386.97	156	5	1.64	387.08	373	23	1.73E-01	8.9	
24	1	391.06	53	2	1.86	391.17	373	23	5.90E-02	19.0	
25	0	415.50	46	18	1.35	415.61	412	8	5.09E-02	21.8	
26	0	437.36	70	21	2.00	437.46	431	12	7.78E-02	17.7	
27	0	510.95	38	0	3.11	511.05	506	12	4.22E-02	16.2	
28	0	712.90	6	0	2.88	713.00	710	6	6.67E-03	40.8	

Summary of Nuclide Activity

Sample ID : 1307154-12

Acquisition date : 9-AUG-2013 07:34:12

Total number of lines in spectrum 28
 Number of unidentified lines 24
 Number of lines tentatively identified by NID 4 14.29%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr	2-Sigma Error	2-Sigma	Flags
			Uncorrected	Decay Corr				
BA-133	10.50Y	1.00	3.438E+02	3.438E+02	0.685E+02	19.91		
Total Activity :			3.438E+02	3.438E+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	5.335E+02	5.335E+02	1.255E+02	23.53		
Total Activity :			5.335E+02	5.335E+02				

Grand Total Activity : 8.772E+02 8.772E+02

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

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

Nuclide Type: FISSION

Nuclide	Energy	%Abn	%Eff	Uncorrected pCi/filter	Decay Corr pCi/filter	2-Sigma %Error	Status
BA-133	81.00	33.00*	1.799E+01	3.438E+02	3.438E+02	19.91	OK
	302.84	17.80	7.560E+00	2.679E+02	2.679E+02	35.51	OK
	356.01	60.00	7.170E+00	2.874E+02	2.874E+02	18.22	OK

Final Mean for 3 Valid Peaks = 3.438E+02 +/- 6.846E+01 (19.91%)

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	5.335E+02	5.335E+02	23.53	OK

Final Mean for 1 Valid Peaks = 5.335E+02 +/- 1.255E+02 (23.53%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.438E+02	6.846E+01	1.695E+01	2.886E+00	20.281
TH-234	5.335E+02	1.255E+02	1.392E+02	1.150E+01	3.833

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	1.135E+00		5.186E+00	8.746E+00	1.343E+00	0.130
CD-109	-3.176E+00		1.263E+02	1.803E+02	2.071E+01	-0.018
PA-231	2.274E+01		3.804E+00	7.618E+00	1.451E-01	2.985
PA-234	3.323E+00		1.753E+00	3.200E+00	6.600E-02	1.039
NP-237	3.911E+00		3.491E+01	5.110E+01	5.770E+00	0.077
AM-241	1.645E+01		9.758E+00	1.783E+01	1.379E+00	0.923

VAX/VMS Peak Search Report Generated 9-AUG-2013 08:14:27.17

Configuration : DKA100: [GAMMA.SCUSR.ARCHIVE] SMP_130715413_GE2_BAFIL_194521.CN
 Analyses by : PEAK V16.9 PEAKEFF V2.2
 Client ID : DUP 08 DIS
 Deposition Date :
 Sample Date : 9-AUG-2013 00:00:00. Acquisition date : 9-AUG-2013 07:59:09.
 Sample ID : 1307154-13 Sample Quantity : 1.00000E+00 filter
 Sample type : FILTER Sample Geometry : 0
 Detector name : GE2 Detector Geometry: BAFIL
 Elapsed live time: 0 00:15:00.00 Elapsed real time: 0 00:15:00.29 0.0%
 Start channel : 25 End channel : 4096
 Sensitivity : 3.00000 Gaussian : 10.00000
 Critical level : No

Pk	It	Energy	Area	Bkgnd	FWHM	Channel	Left	Pw	Cts/Sec	%Err	Fit
1	4	30.96	1935	119	1.43	31.08	26	14	2.15E+00	2.4	9.04E+00
2	4	35.23	477	119	1.52	35.35	26	14	5.30E-01	5.8	
3	0	52.81	65	54	2.05	52.92	50	6	7.26E-02	21.6	
4	1	59.02	18	36	1.45	59.13	57	16	1.97E-02	59.2	5.37E+00
5	1	62.02	197	45	1.46	62.13	57	16	2.19E-01	8.9	
6	1	65.75	94	58	1.47	65.87	57	16	1.04E-01	15.9	
7	1	81.02	743	43	1.50	81.14	77	11	8.26E-01	4.0	8.39E+00
8	1	83.89	27	46	1.37	84.00	77	11	2.98E-02	69.5	
9	0	93.13	23	115	2.72	93.24	89	9	2.61E-02	84.7	
10	4	111.96	176	50	1.69	112.07	108	14	1.96E-01	9.6	1.24E+00
11	4	115.78	55	53	2.07	115.89	108	14	6.08E-02	28.4	
12	0	161.41	18	51	1.03	161.52	158	5	1.99E-02	64.6	
13	0	276.81	60	27	1.88	276.92	273	8	6.66E-02	19.9	
14	1	302.90	152	17	1.58	303.01	299	19	1.69E-01	9.1	2.42E+00
15	1	307.73	34	11	1.79	307.84	299	19	3.81E-02	24.8	
16	1	311.80	7	9	1.79	311.91	299	19	8.25E-03	83.4	
17	0	333.80	56	29	1.31	333.91	330	7	6.18E-02	21.1	
18	0	338.33	24	13	2.25	338.44	337	5	2.66E-02	32.5	
19	0	356.11	496	25	1.59	356.22	351	10	5.51E-01	4.9	
20	0	376.15	26	6	1.69	376.26	373	8	2.86E-02	25.8	
21	3	383.85	107	10	2.13	383.95	380	16	1.19E-01	12.0	5.21E+00
22	3	387.05	183	12	1.84	387.16	380	16	2.03E-01	9.4	
23	3	391.26	43	17	2.26	391.37	380	16	4.76E-02	26.4	
24	0	416.01	57	19	1.64	416.11	412	9	6.38E-02	18.8	
25	1	436.79	94	7	1.90	436.90	433	15	1.04E-01	10.7	1.98E+00
26	1	440.07	10	9	1.90	440.17	433	15	1.12E-02	96.7	
27	1	509.90	7	13	1.78	510.00	507	14	7.58E-03	78.9	2.59E+00
28	1	518.00	6	4	1.97	518.11	507	14	7.06E-03	81.4	
29	0	609.97	14	0	1.74	610.07	607	7	1.56E-02	26.7	
30	0	769.68	9	0	2.59	769.78	766	7	1.00E-02	33.3	
31	0	899.41	6	2	1.53	899.51	896	7	6.87E-03	53.8	

Summary of Nuclide Activity

Sample ID : 1307154-13

Acquisition date : 9-AUG-2013 07:59:09

Total number of lines in spectrum 31
 Number of unidentified lines 26
 Number of lines tentatively identified by NID 5 16.13%

Nuclide Type : FISSION

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
BA-133	10.50Y	1.00	3.760E+02	3.760E+02	0.723E+02	19.23	
Total Activity :			3.760E+02	3.760E+02			

Nuclide Type : NATURAL

Nuclide	Hlife	Decay	Wtd Mean	Wtd Mean	Decay Corr 2-Sigma Error	2-Sigma %Error	Flags
			Uncorrected pCi/filter	Decay Corr pCi/filter			
TH-234	4.47E+09Y	1.00	6.748E+02	6.748E+02	1.348E+02	19.98	
AM-241	432.20Y	1.00	6.018E+00	6.018E+00	7.149E+00	118.81	
Total Activity :			6.808E+02	6.808E+02			

Grand Total Activity : 1.057E+03 1.057E+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	Status
				pCi/filter	pCi/filter	pCi/filter	pCi/filter	%Error	
BA-133	81.00	33.00*	1.799E+01	3.760E+02	3.760E+02	3.760E+02	3.760E+02	19.23	OK
	302.84	17.80	7.560E+00	3.392E+02	3.392E+02	3.393E+02	3.393E+02	34.95	OK
	356.01	60.00	7.170E+00	3.461E+02	3.461E+02	3.461E+02	3.461E+02	18.01	OK

Final Mean for 3 Valid Peaks = 3.760E+02+/- 7.232E+01 (19.23%)

Nuclide Type: NATURAL

Nuclide	Energy	%Abn	%Eff	Uncorrected		Decay	Corr	2-Sigma	Status
				pCi/filter	pCi/filter	pCi/filter	pCi/filter	%Error	
TH-234	63.29	3.80*	2.305E+01	6.748E+02	6.748E+02	6.748E+02	6.748E+02	19.98	OK

Final Mean for 1 Valid Peaks = 6.748E+02+/- 1.348E+02 (19.98%)

AM-241	59.54	35.90*	2.461E+01	6.018E+00	6.018E+00	6.018E+00	6.018E+00	118.81	OK
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Final Mean for 1 Valid Peaks = 6.018E+00+/- 7.149E+00 (118.81%)

Flag: "*" = Keyline

---- Identified Nuclides ----

Nuclide	Activity (pCi/filter)	Act error	MDA (pCi/filter)	MDA error	Act/MDA
BA-133	3.760E+02	7.232E+01	1.978E+01	3.367E+00	19.013
TH-234	6.748E+02	1.348E+02	1.269E+02	1.049E+01	5.317
AM-241	6.018E+00	7.149E+00	1.255E+01	9.711E-01	0.480

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

Nuclide	Key-Line Activity (pCi/filter)	K.L. Ided	Act error	MDA (pCi/filter)	MDA error	Act/MDA
CO-57	-6.663E-01		5.686E+00	9.103E+00	1.398E+00	-0.073
CD-109	-5.625E+01		1.247E+02	1.662E+02	1.909E+01	-0.338
PA-231	2.271E+01		3.917E+00	7.784E+00	1.482E-01	2.917
PA-234	3.371E+00		1.787E+00	3.251E+00	6.706E-02	1.037
NP-237	-1.598E+01		3.618E+01	4.834E+01	5.458E+00	-0.331