Paragon Analytics

Radiochemistry Case Narrative
Isotopic Thorium

Kent & Sullivan Inc.

Ross Adams

PA WO 0405097

1. This report consists of the analytical results for 26 soil samples received by Paragon on 05/11/04. It is noted that Paragon Analytics did not perform the drying and grinding procedure. The samples were sent to Hazen for this procedure, and were returned to Paragon on 6/8/04.

2. These samples were prepared according to Paragon Analytics procedures PA SOP773R8, PA SOP777R7, and PA SOP721R10. Modifications were made to the method as described on QASS 270494, 277615, 277627, and 277655.

3. The samples were analyzed for the presence of isotopic thorium according to Paragon Analytics procedure PA SOP714R8. The analyses were completed on 07/17/04.

4. The isotopic analysis results for these samples are reported on a dry weight basis in units of pCi/gram.

5. Paragon Analytics follows the convention outlined in ANSI N42.23 for reporting significant digits in the TPU and MDC results. ANSI N42.23 states that the TPU result should be rounded to two significant digits and that the MDC result should be rounded to the same decimal place as the TPU result. In practice, this could result in an MDC result with a reported value of 0 for samples with significant activity, including the batch laboratory control sample.

6. Samples HR-01, 300-02, 700-02, 900-04, and 900-05 (Paragon IDs 0405097-1, -18, -20, -26, and -27) were initially prepared in batch AS040629-10 on 06/29/04. The initial analyses exhibited poor spectral quality due to the presence of greatly elevated native thorium in the samples. The samples were reprepared in batch AS040715-1 at a reduced aliquot. All quality control criteria were achieved for the repreparation. The results of these samples are reported from AS040715-1 without further qualification. Please refer to NCR 5812 in Section 5 of this report.

7. Many of the samples in this work order were prepared at reduced aliquots due to elevated activity detected in gamma spectroscopic analyses of these samples. Due to

the reduced aliquots taken for the preparation of these samples, the requested MDC of 0.1 pCi/gram was not achieved for the requested analytes. In each case, the amount of reportable activity exceeds the achieved MDC values. These samples are identified with an 'M3' flag on the final reports.

8. The method blanks associated with many of these samples (AS040629-8MB and AS040715-1MB) was also prepared at a similar reduced aliquot to facilitate an accurate comparison with the samples. Consequently, the requested MDC was not met for this method blank as well. It was only given a 300-minute count, but the achieved MDC values of this method blank are less than one fifth the activity measured in the associated samples, demonstrating that data quality is not affected by a shorter analysis time.

9. Th-232 activity is reported in method blank AS040715-1MB above the minimum detectable concentration value. The measured blank activity is less than one fifth the activity for associated samples. Results are acceptable according to PA SOP 715, and are submitted without further qualification.

10. No further anomalous situations were encountered during the preparation or analysis of these samples. All remaining quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

FOR 7-26-04

Sharon Muller — Date

Radiochemistry Instrumentation

7/26/04

Radiochemistry Final Data Review — Date

1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

SAMPLE RESULTS SUMMARY

Isotopic Thorium By Alpha Spectroscopy Sample Results Summary

Client Name: Kent & Sullivan Inc.
Client Project Name: Ross Adams
Client Project Number:

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Page: 1 of 9
Reported on: Friday, July 23, 2004 2:25:56 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-1	HR-01	Sample	Th-228	142 +/- 24	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-1	HR-01	Sample	Th-230	315 +/- 53	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-1	HR-01	Sample	Th-232	136 +/- 23	0	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-2	MR-01	Sample	Th-228	61 +/- 11	1	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-2	MR-01	Sample	Th-230	135 +/- 23	2	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-2	MR-01	Sample	Th-232	60 +/- 11	1	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-3	MR-02	Sample	Th-228	65 +/- 11	1	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-3	MR-02	Sample	Th-230	105 +/- 17	1	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-3	MR-02	Sample	Th-232	60 +/- 10	0	pCi/g	SOLID	AS040629-8	7/7/2004	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

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Client Project Name: Ross Adams
Client Project Number:

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Reported on: Friday, July 23, 2004 2:25:56 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-4	GR-01	Sample	Th-228	8.7 +/- 1.5	0.1	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-4	GR-01	Sample	Th-230	4.64 +/- 0.85	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-4	GR-01	Sample	Th-232	6.8 +/- 1.2	0	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-5	GR-02	Sample	Th-228	2.41 +/- 0.48	0.17	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-5	GR-02	Sample	Th-230	3.24 +/- 0.62	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-5	GR-02	Sample	Th-232	2.19 +/- 0.44	0.07	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-6	GR-03	Sample	Th-228	1.73 +/- 0.38	0.13	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-6	GR-03	Sample	Th-230	2.34 +/- 0.48	0.16	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-6	GR-03	Sample	Th-232	1.39 +/- 0.31	0.04	pCi/g	SOLID	AS040629-10	7/9/2004	

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

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Client Name: Kent & Sullivan Inc.
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Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Reported on: Friday, July 23, 2004 2:25:56 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-7	GR-04	Sample	Th-228	7.5 +/- 1.3	0.1	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-7	GR-04	Sample	Th-230	16.8 +/- 2.9	0.2	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-7	GR-04	Sample	Th-232	7.5 +/- 1.3	0	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-8	GR-05	Sample	Th-228	1.37 +/- 0.32	0.14	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-8	GR-05	Sample	Th-230	2.23 +/- 0.46	0.16	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-8	GR-05	Sample	Th-232	1.07 +/- 0.26	0.06	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-9	GR-06	Sample	Th-228	2.68 +/- 0.52	0.12	pCi/g	SOLID	AS040629-10	7/12/2004	M3
0405097-9	GR-06	Sample	Th-230	2.39 +/- 0.47	0.14	pCi/g	SOLID	AS040629-10	7/12/2004	M3
0405097-9	GR-06	Sample	Th-232	2.85 +/- 0.55	0.05	pCi/g	SOLID	AS040629-10	7/12/2004	

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

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PAI Work Order: 0405097

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Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-10	GR-07	Sample	Th-228	1.54 +/- 0.34	0.13	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-10	GR-07	Sample	Th-230	1.21 +/- 0.28	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-10	GR-07	Sample	Th-232	1.58 +/- 0.34	0.04	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-11	GR-08	Sample	Th-228	1.88 +/- 0.39	0.16	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-11	GR-08	Sample	Th-230	1.07 +/- 0.25	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-11	GR-08	Sample	Th-232	1.32 +/- 0.29	0.05	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-12	GR-09	Sample	Th-228	3.08 +/- 0.60	0.11	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-12	GR-09	Sample	Th-230	2.13 +/- 0.44	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-12	GR-09	Sample	Th-232	2.54 +/- 0.50	0.04	pCi/g	SOLID	AS040629-10	7/9/2004	

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

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Isotopic Thorium By Alpha Spectroscopy Sample Results Summary

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Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Reported on: Friday, July 23, 2004 2:25:56 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-13	GR-10	Sample	Th-228	2.14 +/- 0.44	0.14	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-13	GR-10	Sample	Th-230	2.29 +/- 0.47	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-13	GR-10	Sample	Th-232	2.32 +/- 0.47	0.07	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-14	QM-01	Sample	Th-228	0.70 +/- 0.20	0.17	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-14	QM-01	Sample	Th-230	0.72 +/- 0.19	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-14	QM-01	Sample	Th-232	0.60 +/- 0.16	0.06	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-15	QM-02	Sample	Th-228	0.82 +/- 0.21	0.12	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-15	QM-02	Sample	Th-230	0.84 +/- 0.22	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-15	QM-02	Sample	Th-232	0.91 +/- 0.22	0.04	pCi/g	SOLID	AS040629-10	7/9/2004	

Comments:

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Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-16	QM-03	Sample	Th-228	0.66 +/- 0.19	0.13	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-16	QM-03	Sample	Th-230	0.58 +/- 0.17	0.15	pCi/g	SOLID	AS040629-10	7/9/2004	M3
0405097-16	QM-03	Sample	Th-232	0.77 +/- 0.20	0.06	pCi/g	SOLID	AS040629-10	7/9/2004	
0405097-17	300-01	Sample	Th-228	208 +/- 38	9	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-17	300-01	Sample	Th-230	347 +/- 61	8	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-17	300-01	Sample	Th-232	175 +/- 33	3	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-18	300-02	Sample	Th-228	59 +/- 10	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-18	300-02	Sample	Th-230	69 +/- 12	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-18	300-02	Sample	Th-232	57 +/- 10	0	pCi/g	SOLID	AS040715-1	7/17/2004	M3

Comments:

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Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-20	700-02	Sample	Th-228	248 +/- 42	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-20	700-02	Sample	Th-230	491 +/- 82	2	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-20	700-02	Sample	Th-232	244 +/- 41	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-22	700-04	Sample	Th-228	75 +/- 14	2	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-22	700-04	Sample	Th-230	159 +/- 27	3	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-22	700-04	Sample	Th-232	61 +/- 11	1	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-24	900-02	Sample	Th-228	292 +/- 52	7	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-24	900-02	Sample	Th-230	740 +/- 130	10	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-24	900-02	Sample	Th-232	252 +/- 45	2	pCi/g	SOLID	AS040629-8	7/7/2004	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
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Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-25	900-03	Sample	Th-228	82 +/- 15	2	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-25	900-03	Sample	Th-230	169 +/- 29	3	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-25	900-03	Sample	Th-232	69 +/- 12	1	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-26	900-04	Sample	Th-228	120 +/- 21	2	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-26	900-04	Sample	Th-230	225 +/- 38	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-26	900-04	Sample	Th-232	119 +/- 20	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-27	900-05	Sample	Th-228	124 +/- 21	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-27	900-05	Sample	Th-230	214 +/- 36	1	pCi/g	SOLID	AS040715-1	7/17/2004	M3
0405097-27	900-05	Sample	Th-232	116 +/- 20	0	pCi/g	SOLID	AS040715-1	7/17/2004	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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PAI Work Order: 0405097

Reported on: Friday, July 23, 2004 2:25:57 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0405097-29	OSA-02	Sample	Th-228	72 +/- 14	3	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-29	OSA-02	Sample	Th-230	126 +/- 23	4	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-29	OSA-02	Sample	Th-232	64 +/- 12	1	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-30	OSA-03	Sample	Th-228	55 +/- 11	2	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-30	OSA-03	Sample	Th-230	93 +/- 17	3	pCi/g	SOLID	AS040629-8	7/7/2004	M3
0405097-30	OSA-03	Sample	Th-232	39.9 +/- 8.0	0.8	pCi/g	SOLID	AS040629-8	7/7/2004	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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Abbreviations:

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MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

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PARAGON ANALYTICS

Radiochemistry Data Package

2

Section 2

QC RESULTS SUMMARY

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Lab ID: AS040629-8MB

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 30-Jun-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes

Final Aliquot: 0.0300 g
Result Units: pCi/g
File Name: T6298B

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.8 +/- 2.4	5.3	U,M
14269-63-7	Th-230	0.6 +/- 2.5	5.6	U,M
7440-29-1	Th-232	-0.1 +/- 1.0	1.5	U,M

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	150.1	102	pCi/g	68.3	30 - 110 %	

Comments:

Qualifiers/Flags:

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LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Lab ID: AS040629-10MB

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 30-Jun-04
Date Prepared: 30-Jun-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 780 minutes

Final Aliquot: 1.00 g
Result Units: pCi/g
File Name: TR62910B

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.027 +/- 0.048	0.084	U
14269-63-7	Th-230	0.017 +/- 0.051	0.094	U
7440-29-1	Th-232	0.027 +/- 0.021	0.027	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.504	3.06	pCi/g	67.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Lab ID: AS040715-1MB

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 15-Jul-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 1000 minutes

Final Aliquot: 0.100 g
Result Units: pCi/g
File Name: TX7151B

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	-0.14 +/- 0.45	0.82	U,M
14269-63-7	Th-230	0.13 +/- 0.45	0.77	U,M
7440-29-1	Th-232	0.52 +/- 0.24	0.22	B,M

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	45.04	32.6	pCi/g	72.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Lab ID: AS040629-8LCS

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 30-Jun-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes

Final Aliquot: 0.0300 g
Result Units: pCi/g
File Name: T6298L

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14269-63-7	Th-230	158 +/- 28	5	150	105	85 - 121	P,M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	150.1	120	pCi/g	79.7	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Lab ID: AS040629-10LCS

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 30-Jun-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes

Final Aliquot: 1.00 g
Result Units: pCi/g
File Name: T62910L

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14269-63-7	Th-230	4.71 +/- 0.85	0.14	4.50	105	85 - 121	P,M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.504	3.49	pCi/g	77.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Lab ID: AS040715-1LCS

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 15-Jul-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 300 minutes

Final Aliquot: 0.100 g
Result Units: pCi/g
File Name: TX7151L

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14269-63-7	Th-230	51.5 +/- 9.4	1.5	45.0	114	85 - 121	P,M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	45.04	32.7	pCi/g	72.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS Recovery within control limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-04
Lab ID: 0405097-7DUP

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.02 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50977D

CASNO	Analyte	Sample Result +/- 2 s TPU	Duplicate Result +/- 2 s TPU	DER	Control Limit	Lab Qualifiers
14274-82-9	Th-228	7.5 +/- 1.3	7.7 +/- 1.4	0.10	2.13	M3
14269-63-7	Th-230	16.8 +/- 2.9	16.8 +/- 2.9	0.01	2.13	M3
7440-29-1	Th-232	7.5 +/- 1.3	7.4 +/- 1.3	0.06	2.13	

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: QM-03
Lab ID: 0405097-16DUP

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.04 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509716D

CASNO	Analyte	Sample Result +/- 2 s TPU	Duplicate Result +/- 2 s TPU	DER	Control Limit	Lab Qualifiers
14274-82-9	Th-228	0.66 +/- 0.19	0.74 +/- 0.20	0.28	2.13	M3
14269-63-7	Th-230	0.58 +/- 0.17	0.52 +/- 0.16	0.26	2.13	M3
7440-29-1	Th-232	0.77 +/- 0.20	0.63 +/- 0.17	0.52	2.13	

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 300-02
Lab ID: 0405097-18DUP

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.107 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: TX509718D

CASNO	Analyte	Sample Result +/- 2 s TPU	Duplicate Result +/- 2 s TPU	DER	Control Limit	Lab Qualifiers
14274-82-9	Th-228	59 +/- 10	53.8 +/- 9.7	0.33	2.13	M3
14269-63-7	Th-230	69 +/- 12	67 +/- 12	0.12	2.13	M3
7440-29-1	Th-232	57 +/- 10	45.8 +/- 8.3	0.86	2.13	M3

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: OSA-02
Lab ID: 0405097-29DUP

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 06-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0379 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509729D

CASNO	Analyte	Sample Result +/- 2 s TPU	Duplicate Result +/- 2 s TPU	DER	Control Limit	Lab Qualifiers
14274-82-9	Th-228	72 +/- 14	75 +/- 15	0.14	2.13	M3
14269-63-7	Th-230	126 +/- 23	140 +/- 25	0.41	2.13	M3
7440-29-1	Th-232	64 +/- 12	63 +/- 12	0.02	2.13	M3

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
LT - Result is less than Request MDC, greater than sample specific MDC
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
DER - Duplicate Error Ratio
BDL - Below Detection Limit
NR - Not Reported

Data Package ID: *TH0405097-1*

PARAGON ANALYTICS
Radiochemistry Data Package

3

Section 3

INDIVIDUAL SAMPLE RESULTS

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: HR-01
Lab ID: 0405097-1

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 06-May-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.106 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: TX50971

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	142 +/- 24	1	M3
14269-63-7	Th-230	315 +/- 53	1	M3
7440-29-1	Th-232	136 +/- 23	0	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	42.53	30.6	pCi/g	71.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: MR-01
Lab ID: 0405097-2

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0934 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50972

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	61 +/- 11	1	M3
14269-63-7	Th-230	135 +/- 23	2	M3
7440-29-1	Th-232	60 +/- 11	1	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	48.23	38.2	pCi/g	79.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: MR-02
Lab ID: 0405097-3

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.208 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50973

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	65 +/- 11	1	M3
14269-63-7	Th-230	105 +/- 17	1	M3
7440-29-1	Th-232	60 +/- 10	0	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	21.66	17.7	pCi/g	81.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-01
Lab ID: 0405097-4

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50974

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	8.7 +/- 1.5	0.1	M3
14269-63-7	Th-230	4.64 +/- 0.85	0.15	M3
7440-29-1	Th-232	6.8 +/- 1.2	0	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.462	3.60	pCi/g	80.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-02
Lab ID: 0405097-5

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.00 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50975

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.41 +/- 0.48	0.17	M3
14269-63-7	Th-230	3.24 +/- 0.62	0.15	M3
7440-29-1	Th-232	2.19 +/- 0.44	0.07	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.486	3.23	pCi/g	72.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-03
Lab ID: 0405097-6

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50976

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.73 +/- 0.38	0.13	M3
14269-63-7	Th-230	2.34 +/- 0.48	0.16	M3
7440-29-1	Th-232	1.39 +/- 0.31	0.04	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.456	2.90	pCi/g	65.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-04
Lab ID: 0405097-7

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: TR50977

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	7.5 +/- 1.3	0.1	M3
14269-63-7	Th-230	16.8 +/- 2.9	0.2	M3
7440-29-1	Th-232	7.5 +/- 1.3	0	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.439	2.97	pCi/g	66.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-04
Lab ID: 0405097-7DUP

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.02 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50977D

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	7.7 +/- 1.4	0.2	M3
14269-63-7	Th-230	16.8 +/- 2.9	0.2	M3
7440-29-1	Th-232	7.4 +/- 1.3	0	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.429	2.90	pCi/g	65.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-05
Lab ID: 0405097-8

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.05 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50978

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.37 +/- 0.32	0.14	M3
14269-63-7	Th-230	2.23 +/- 0.46	0.16	M3
7440-29-1	Th-232	1.07 +/- 0.26	0.06	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.276	2.62	pCi/g	61.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-06
Lab ID: 0405097-9

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 12-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.00 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T50979

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.68 +/- 0.52	0.12	M3
14269-63-7	Th-230	2.39 +/- 0.47	0.14	M3
7440-29-1	Th-232	2.85 +/- 0.55	0.05	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.483	3.31	pCi/g	73.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-07
Lab ID: 0405097-10

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.02 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509710

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.54 +/- 0.34	0.13	M3
14269-63-7	Th-230	1.21 +/- 0.28	0.15	M3
7440-29-1	Th-232	1.58 +/- 0.34	0.04	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.431	3.13	pCi/g	70.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-08
Lab ID: 0405097-11

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.02 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509711

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	1.88 +/- 0.39	0.16	M3
14269-63-7	Th-230	1.07 +/- 0.25	0.15	M3
7440-29-1	Th-232	1.32 +/- 0.29	0.05	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.426	3.34	pCi/g	75.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-09
Lab ID: 0405097-12

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.06 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509712

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	3.08 +/- 0.60	0.11	M3
14269-63-7	Th-230	2.13 +/- 0.44	0.15	M3
7440-29-1	Th-232	2.54 +/- 0.50	0.04	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.264	3.02	pCi/g	70.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: GR-10
Lab ID: 0405097-13

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.00 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509713

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	2.14 +/- 0.44	0.14	M3
14269-63-7	Th-230	2.29 +/- 0.47	0.15	M3
7440-29-1	Th-232	2.32 +/- 0.47	0.07	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.482	3.24	pCi/g	72.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: QM-01
Lab ID: 0405097-14

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.06 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509714

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.70 +/- 0.20	0.17	M3
14269-63-7	Th-230	0.72 +/- 0.19	0.15	M3
7440-29-1	Th-232	0.60 +/- 0.16	0.06	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.238	2.80	pCi/g	66.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: QM-02
Lab ID: 0405097-15

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.04 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509715

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.82 +/- 0.21	0.12	M3
14269-63-7	Th-230	0.84 +/- 0.22	0.15	M3
7440-29-1	Th-232	0.91 +/- 0.22	0.04	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.334	2.87	pCi/g	66.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: QM-03
Lab ID: 0405097-16

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.01 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509716

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.66 +/- 0.19	0.13	M3
14269-63-7	Th-230	0.58 +/- 0.17	0.15	M3
7440-29-1	Th-232	0.77 +/- 0.20	0.06	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.464	3.08	pCi/g	69.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: QM-03
Lab ID: 0405097-16DUP

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 03-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 09-Jul-04

Prep Batch: AS040629-10
QCBatchID: AS040629-10-1
Run ID: AS040629-10a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 1.04 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509716D

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	0.74 +/- 0.20	0.17	M3
14269-63-7	Th-230	0.52 +/- 0.16	0.15	M3
7440-29-1	Th-232	0.63 +/- 0.17	0.03	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	4.336	3.08	pCi/g	71.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 300-01
Lab ID: 0405097-17

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 04-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0178 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509717

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	208 +/- 38	9	M3
14269-63-7	Th-230	347 +/- 61	8	M3
7440-29-1	Th-232	175 +/- 33	3	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	252.7	198	pCi/g	78.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 300-02
Lab ID: 0405097-18

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.110 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: TX509718

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	59 +/- 10	1	M3
14269-63-7	Th-230	69 +/- 12	1	M3
7440-29-1	Th-232	57 +/- 10	0	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	40.80	32.8	pCi/g	80.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 300-02
Lab ID: 0405097-18DUP

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.107 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: TX509718D

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	53.8 +/- 9.7	1.5	M3
14269-63-7	Th-230	67 +/- 12	1	M3
7440-29-1	Th-232	45.8 +/- 8.3	0.4	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	42.09	32.4	pCi/g	77.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
LT - Result is less than Requested MDC, greater than sample specific MDC.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 700-02
Lab ID: 0405097-20

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.100 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: TX509720

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	248 +/- 42	1	M3
14269-63-7	Th-230	491 +/- 82	2	M3
7440-29-1	Th-232	244 +/- 41	1	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	44.81	33.0	pCi/g	73.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 700-04
Lab ID: 0405097-22

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0475 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509722

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	75 +/- 14	2	M3
14269-63-7	Th-230	159 +/- 27	3	M3
7440-29-1	Th-232	61 +/- 11	1	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	94.73	85	pCi/g	89.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 900-02
Lab ID: 0405097-24

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0174 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509724

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	292 +/- 52	7	M3
14269-63-7	Th-230	740 +/- 130	10	M3
7440-29-1	Th-232	252 +/- 45	2	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	259.1	207	pCi/g	79.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 900-03
Lab ID: 0405097-25

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0551 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509725

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	82 +/- 15	2	M3
14269-63-7	Th-230	169 +/- 29	3	M3
7440-29-1	Th-232	69 +/- 12	1	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	81.75	66	pCi/g	80.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 900-04
Lab ID: 0405097-26

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.106 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: TX509726

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	120 +/- 21	2	M3
14269-63-7	Th-230	225 +/- 38	1	M3
7440-29-1	Th-232	119 +/- 20	1	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	42.69	33.9	pCi/g	79.3	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: 900-05
Lab ID: 0405097-27

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 07-May-04
Date Prepared: 15-Jul-04
Date Analyzed: 17-Jul-04

Prep Batch: AS040715-1
QCBatchID: AS040715-1-1
Run ID: AS040715-1a
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.105 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: TX509727

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	124 +/- 21	1	M3
14269-63-7	Th-230	214 +/- 36	1	M3
7440-29-1	Th-232	116 +/- 20	0	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	42.93	34.1	pCi/g	79.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: OSA-02
Lab ID: 0405097-29

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 06-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0379 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509729

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	72 +/- 14	3	M3
14269-63-7	Th-230	126 +/- 23	4	M3
7440-29-1	Th-232	64 +/- 12	1	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	118.7	99	pCi/g	83.4	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Duplicate Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: OSA-02
Lab ID: 0405097-29DUP

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 06-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0379 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509729D

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	75 +/- 15	4	M3
14269-63-7	Th-230	140 +/- 25	4	M3
7440-29-1	Th-232	63 +/- 12	2	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	118.7	85	pCi/g	71.9	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

Isotopic Thorium By Alpha Spectroscopy

PAI 714 Rev 9

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0405097
Client Name: Kent & Sullivan Inc.
ClientProject ID: Ross Adams

Field ID: OSA-03
Lab ID: 0405097-30

Sample Matrix: SOLID
Prep SOP: PAI 777 Rev 7
Date Collected: 06-May-04
Date Prepared: 30-Jun-04
Date Analyzed: 07-Jul-04

Prep Batch: AS040629-8
QCBatchID: AS040629-8-1
Run ID: AS040629-8C
Count Time: 300 minutes
Report Basis: Dry Weight

Final Aliquot: 0.0451 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: T509730

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
14274-82-9	Th-228	55 +/- 11	2	M3
14269-63-7	Th-230	93 +/- 17	3	M3
7440-29-1	Th-232	39.9 +/- 8.0	0.8	M3

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Th-229	99.91	81	pCi/g	81.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *TH0405097-1*

PARAGON ANALYTICS
Radiochemistry Data Package

4

Section 4

RAW DATA

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: **Paragon Analytics**
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Thursday, July 22, 2004
5:03:45 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-1	Th-228	5/6/2004	AS040715-1	NA	NA	SOLID	0.106 g	Alpha Spec	AS040715-1a	7/17/2004	2046.000	30.42%	300	142	1	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040715-1-1	NA	NA	NA	0.106 g	10	TX50971	11:33 AM	20.000	1000	71.9%	24	NA	Dry Weight	NA	M3
0405097-1	Th-229	5/6/2004	AS040715-1	NA	NA	SOLID	0.106 g	Alpha Spec	AS040715-1a	7/17/2004	656.100	30.42%	300	30.6	0.3	pCi/g	NA	
SMP	Tracer	7:00:00 PM	AS040715-1-1	NA	NA	NA	0.106 g	10	TX50971	11:33 AM	3.000	1000	71.9%	5.1	NA	Dry Weight	NA	
0405097-1	Th-230	5/6/2004	AS040715-1	NA	NA	SOLID	0.106 g	Alpha Spec	AS040715-1a	7/17/2004	4852.928	30.42%	300	315	1	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040715-1-1	NA	NA	NA	0.106 g	10	TX50971	11:33 AM	60.238	1000	71.9%	53	NA	Dry Weight	NA	M3
0405097-1	Th-232	5/6/2004	AS040715-1	NA	NA	SOLID	0.106 g	Alpha Spec	AS040715-1a	7/17/2004	2094.700	30.42%	300	136	0	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040715-1-1	NA	NA	NA	0.106 g	10	TX50971	11:33 AM	1.000	1000	71.9%	23	NA	Dry Weight	NA	M3
0405097-2	Th-228	5/7/2004	AS040629-8	NA	NA	SOLID	0.0934 g	Alpha Spec	AS040629-8C	7/7/2004	862.100	30.43%	300	61	1	pCi/g	NA	
SMP	Trg. Analyte	1:30:00 PM	AS040629-8-1	NA	NA	NA	0.0934 g	43	T50972	10:16 AM	33.000	1000	79.2%	11	NA	Dry Weight	NA	M3
0405097-2	Th-229	5/7/2004	AS040629-8	NA	NA	SOLID	0.0934 g	Alpha Spec	AS040629-8C	7/7/2004	722.600	30.43%	300	38.2	0.5	pCi/g	NA	
SMP	Tracer	1:30:00 PM	AS040629-8-1	NA	NA	NA	0.0934 g	43	T50972	10:16 AM	8.000	1000	79.2%	6.3	NA	Dry Weight	NA	
0405097-2	Th-230	5/7/2004	AS040629-8	NA	NA	SOLID	0.0934 g	Alpha Spec	AS040629-8C	7/7/2004	2016.479	30.43%	300	135	2	pCi/g	NA	
SMP	Trg. Analyte	1:30:00 PM	AS040629-8-1	NA	NA	NA	0.0934 g	43	T50972	10:16 AM	61.735	1000	79.2%	23	NA	Dry Weight	NA	M3
0405097-2	Th-232	5/7/2004	AS040629-8	NA	NA	SOLID	0.0934 g	Alpha Spec	AS040629-8C	7/7/2004	895.200	30.43%	300	60	1	pCi/g	NA	
SMP	Trg. Analyte	1:30:00 PM	AS040629-8-1	NA	NA	NA	0.0934 g	43	T50972	10:16 AM	6.000	1000	79.2%	11	NA	Dry Weight	NA	M3
0405097-3	Th-228	5/7/2004	AS040629-8	NA	NA	SOLID	0.208 g	Alpha Spec	AS040629-8C	7/7/2004	2139.700	30.81%	300	65	1	pCi/g	NA	
SMP	Trg. Analyte	1:20:00 PM	AS040629-8-1	NA	NA	NA	0.208 g	44	T50973	10:17 AM	71.000	1000	81.5%	11	NA	Dry Weight	NA	M3
0405097-3	Th-229	5/7/2004	AS040629-8	NA	NA	SOLID	0.208 g	Alpha Spec	AS040629-8C	7/7/2004	753.500	30.81%	300	17.7	0.2	pCi/g	NA	
SMP	Tracer	1:20:00 PM	AS040629-8-1	NA	NA	NA	0.208 g	44	T50973	10:17 AM	5.000	1000	81.5%	2.9	NA	Dry Weight	NA	
0405097-3	Th-230	5/7/2004	AS040629-8	NA	NA	SOLID	0.208 g	Alpha Spec	AS040629-8C	7/7/2004	3638.813	30.81%	300	105	1	pCi/g	NA	
SMP	Trg. Analyte	1:20:00 PM	AS040629-8-1	NA	NA	NA	0.208 g	44	T50973	10:17 AM	67.289	1000	81.5%	17	NA	Dry Weight	NA	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Recieved' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Recieved'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
1:48:26 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-3	Th-232	5/7/2004	AS040629-8	NA	NA	SOLID	0.208 g	Alpha Spec	AS040629-8C	7/7/2004	2092.700	30.81%	300	60	0	pCi/g	NA	
SMP	Trg. Analyte	1:20:00 PM	AS040629-8-1	NA	NA	NA	0.208 g	44	T50973	10:17 AM	1.000	1000	81.5%	10	NA	Dry Weight	NA	M3
0405097-4	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	1195.500	27.02%	300	8.7	0.1	pCi/g	NA	
SMP	Trg. Analyte	1:11:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	57	T50974	7:34 AM	25.000	1000	80.8%	1.5	NA	Dry Weight	NA	M3
0405097-4	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	654.600	27.02%	300	3.60	0.05	pCi/g	NA	
SMP	Tracer	1:11:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	57	T50974	7:34 AM	8.000	1000	80.8%	0.60	NA	Dry Weight	NA	
0405097-4	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	680.766	27.02%	300	4.64	0.15	pCi/g	NA	
SMP	Trg. Analyte	1:11:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	57	T50974	7:34 AM	54.114	1000	80.8%	0.85	NA	Dry Weight	NA	M3
0405097-4	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	998.700	27.02%	300	6.8	0	pCi/g	NA	
SMP	Trg. Analyte	1:11:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	57	T50974	7:34 AM	1.000	1000	80.8%	1.2	NA	Dry Weight	NA	
0405097-5	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	336.500	30.84%	300	2.41	0.17	pCi/g	NA	
SMP	Trg. Analyte	1:38:00 PM	AS040629-10-1	NA	NA	NA	1 g	58	T50975	7:34 AM	65.000	1000	72.0%	0.48	NA	Dry Weight	NA	M3
0405097-5	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	666.100	30.84%	300	3.23	0.06	pCi/g	NA	
SMP	Tracer	1:38:00 PM	AS040629-10-1	NA	NA	NA	1 g	58	T50975	7:34 AM	13.000	1000	72.0%	0.53	NA	Dry Weight	NA	
0405097-5	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	481.581	30.84%	300	3.24	0.15	pCi/g	NA	
SMP	Trg. Analyte	1:38:00 PM	AS040629-10-1	NA	NA	NA	1 g	58	T50975	7:34 AM	58.064	1000	72.0%	0.62	NA	Dry Weight	NA	M3
0405097-5	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	325.300	30.84%	300	2.19	0.07	pCi/g	NA	
SMP	Trg. Analyte	1:38:00 PM	AS040629-10-1	NA	NA	NA	1 g	58	T50975	7:34 AM	9.000	1000	72.0%	0.44	NA	Dry Weight	NA	
0405097-6	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	217.700	30.61%	300	1.73	0.13	pCi/g	NA	
SMP	Trg. Analyte	2:00:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	59	T50976	7:35 AM	31.000	1000	65.1%	0.38	NA	Dry Weight	NA	M3
0405097-6	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	597.900	30.61%	300	2.90	0.06	pCi/g	NA	
SMP	Tracer	2:00:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	59	T50976	7:35 AM	17.000	1000	65.1%	0.49	NA	Dry Weight	NA	

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Recieved' while the Report Basis is 'Dry Weight'.

#* Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Recieved'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
6:43:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-6	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	313.572	30.61%	300	2.34	0.16	pCi/g	NA	
SMP	Trg. Analyte	2:00:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	59	T50976	7:35 AM	51.426	1000	65.1%	0.48	NA	Dry Weight	NA	M3
0405097-6	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	185.700	30.61%	300	1.39	0.04	pCi/g	NA	
SMP	Trg. Analyte	2:00:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	59	T50976	7:35 AM	1.000	1000	65.1%	0.31	NA	Dry Weight	NA	
0405097-7	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	947.000	29.88%	300	7.5	0.1	pCi/g	NA	
SMP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	18	TR50977	1:51 PM	30.000	1000	66.8%	1.3	NA	Dry Weight	NA	M3
0405097-7	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	598.600	29.88%	300	2.97	0.05	pCi/g	NA	
SMP	Tracer	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	18	TR50977	1:51 PM	8.000	1000	66.8%	0.50	NA	Dry Weight	NA	
0405097-7	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	2258.855	29.88%	300	16.8	0.2	pCi/g	NA	
SMP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	18	TR50977	1:51 PM	50.484	1000	66.8%	2.9	NA	Dry Weight	NA	M3
0405097-7	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	1008.700	29.88%	300	7.5	0	pCi/g	NA	
SMP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	18	TR50977	1:51 PM	1.000	1000	66.8%	1.3	NA	Dry Weight	NA	
0405097-7	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	964.600	30.14%	300	7.7	0.2	pCi/g	0.10	
DUP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	61	T50977D	7:36 AM	68.000	1000	65.5%	1.4	NA	Dry Weight	NA	M3
0405097-7	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	592.500	30.14%	300	2.90	0.04	pCi/g	NA	
DUP	Tracer	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	61	T50977D	7:36 AM	5.000	1000	65.5%	0.49	NA	Dry Weight	NA	
0405097-7	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	2244.706	30.14%	300	16.8	0.2	pCi/g	0.01	
DUP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	61	T50977D	7:36 AM	50.980	1000	65.5%	2.9	NA	Dry Weight	NA	M3
0405097-7	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	986.700	30.14%	300	7.4	0	pCi/g	0.06	
DUP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	61	T50977D	7:36 AM	1.000	1000	65.5%	1.3	NA	Dry Weight	NA	
0405097-8	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1.05 g	Alpha Spec	AS040629-10a	7/9/2004	165.300	29.94%	300	1.37	0.14	pCi/g	NA	
SMP	Trg. Analyte	2:38:00 PM	AS040629-10-1	NA	NA	NA	1.05 g	62	T50978	7:36 AM	29.000	1000	61.3%	0.32	NA	Dry Weight	NA	M3

Comments:

Data Package ID: *th0405097-1*

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U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

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000053

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
6:43:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-8	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1.05 g	Alpha Spec	AS040629-10a	7/9/2004	550.100	29.94%	300	2.62	0.03	pCi/g	NA	
SMP	Tracer	2:38:00 PM	AS040629-10-1	NA	NA	NA	1.05 g	62	T50978	7:36 AM	3.000	1000	61.3%	0.44	NA	Dry Weight	NA	
0405097-8	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1.05 g	Alpha Spec	AS040629-10a	7/9/2004	286.758	29.94%	300	2.23	0.16	pCi/g	NA	
SMP	Trg. Analyte	2:38:00 PM	AS040629-10-1	NA	NA	NA	1.05 g	62	T50978	7:36 AM	47.475	1000	61.3%	0.46	NA	Dry Weight	NA	M3
0405097-8	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1.05 g	Alpha Spec	AS040629-10a	7/9/2004	136.800	29.94%	300	1.07	0.06	pCi/g	NA	
SMP	Trg. Analyte	2:38:00 PM	AS040629-10-1	NA	NA	NA	1.05 g	62	T50978	7:36 AM	4.000	1000	61.3%	0.26	NA	Dry Weight	NA	
0405097-9	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/12/2004	380.300	30.67%	300	2.68	0.12	pCi/g	NA	
SMP	Trg. Analyte	2:58:00 PM	AS040629-10-1	NA	NA	NA	1 g	62	T50979	4:00 PM	29.000	1000	73.8%	0.52	NA	Dry Weight	NA	M3
0405097-9	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/12/2004	679.400	30.67%	300	3.31	0.03	pCi/g	NA	
SMP	Tracer	2:58:00 PM	AS040629-10-1	NA	NA	NA	1 g	62	T50979	4:00 PM	2.000	1000	73.8%	0.55	NA	Dry Weight	NA	
0405097-9	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/12/2004	361.851	30.67%	300	2.39	0.14	pCi/g	NA	
SMP	Trg. Analyte	2:58:00 PM	AS040629-10-1	NA	NA	NA	1 g	62	T50979	4:00 PM	57.164	1000	73.8%	0.47	NA	Dry Weight	NA	M3
0405097-9	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/12/2004	431.800	30.67%	300	2.85	0.05	pCi/g	NA	
SMP	Trg. Analyte	2:58:00 PM	AS040629-10-1	NA	NA	NA	1 g	62	T50979	4:00 PM	4.000	1000	73.8%	0.55	NA	Dry Weight	NA	
0405097-10	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	203.000	29.44%	300	1.54	0.13	pCi/g	NA	
SMP	Trg. Analyte	3:10:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	19	T509710	1:51 PM	30.000	1000	70.6%	0.34	NA	Dry Weight	NA	M3
0405097-10	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	623.800	29.44%	300	3.13	0.04	pCi/g	NA	
SMP	Tracer	3:10:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	19	T509710	1:51 PM	4.000	1000	70.6%	0.52	NA	Dry Weight	NA	
0405097-10	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	170.930	29.44%	300	1.21	0.15	pCi/g	NA	
SMP	Trg. Analyte	3:10:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	19	T509710	1:51 PM	53.567	1000	70.6%	0.28	NA	Dry Weight	NA	M3
0405097-10	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	222.400	29.44%	300	1.58	0.04	pCi/g	NA	
SMP	Trg. Analyte	3:10:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	19	T509710	1:51 PM	2.000	1000	70.6%	0.34	NA	Dry Weight	NA	

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

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Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

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TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

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BDL - Below Detection Limit

000053

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
6:43:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-11	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	260.000	28.83%	300	1.88	0.16	pCi/g	NA	
SMP	Trg. Analyte	3:10:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	21	T509711	1:52 PM	60.000	1000	75.5%	0.39	NA	Dry Weight	NA	M3
0405097-11	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	652.600	28.83%	300	3.34	0.05	pCi/g	NA	
SMP	Tracer	3:10:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	21	T509711	1:52 PM	8.000	1000	75.5%	0.55	NA	Dry Weight	NA	
0405097-11	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	157.316	28.83%	300	1.07	0.15	pCi/g	NA	
SMP	Trg. Analyte	3:10:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	21	T509711	1:52 PM	58.948	1000	75.5%	0.25	NA	Dry Weight	NA	M3
0405097-11	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1.02 g	Alpha Spec	AS040629-10a	7/9/2004	193.800	28.83%	300	1.32	0.05	pCi/g	NA	
SMP	Trg. Analyte	3:10:00 PM	AS040629-10-1	NA	NA	NA	1.02 g	21	T509711	1:52 PM	4.000	1000	75.5%	0.29	NA	Dry Weight	NA	
0405097-12	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1.06 g	Alpha Spec	AS040629-10a	7/9/2004	415.400	28.78%	300	3.08	0.11	pCi/g	NA	
SMP	Trg. Analyte	3:20:00 PM	AS040629-10-1	NA	NA	NA	1.06 g	22	T509712	1:52 PM	22.000	1000	70.9%	0.60	NA	Dry Weight	NA	M3
0405097-12	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1.06 g	Alpha Spec	AS040629-10a	7/9/2004	611.700	28.78%	300	3.02	0.03	pCi/g	NA	
SMP	Tracer	3:20:00 PM	AS040629-10-1	NA	NA	NA	1.06 g	22	T509712	1:52 PM	1.000	1000	70.9%	0.50	NA	Dry Weight	NA	
0405097-12	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1.06 g	Alpha Spec	AS040629-10a	7/9/2004	305.230	28.78%	300	2.13	0.15	pCi/g	NA	
SMP	Trg. Analyte	3:20:00 PM	AS040629-10-1	NA	NA	NA	1.06 g	22	T509712	1:52 PM	52.567	1000	70.9%	0.44	NA	Dry Weight	NA	M3
0405097-12	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1.06 g	Alpha Spec	AS040629-10a	7/9/2004	363.400	28.78%	300	2.54	0.04	pCi/g	NA	
SMP	Trg. Analyte	3:20:00 PM	AS040629-10-1	NA	NA	NA	1.06 g	22	T509712	1:52 PM	2.000	1000	70.9%	0.50	NA	Dry Weight	NA	
0405097-13	Th-228	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	278.300	28.56%	300	2.14	0.14	pCi/g	NA	
SMP	Trg. Analyte	3:35:00 PM	AS040629-10-1	NA	NA	NA	1 g	23	T509713	1:52 PM	39.000	1000	72.3%	0.44	NA	Dry Weight	NA	M3
0405097-13	Th-229	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	619.500	28.56%	300	3.24	0.04	pCi/g	NA	
SMP	Tracer	3:35:00 PM	AS040629-10-1	NA	NA	NA	1 g	23	T509713	1:52 PM	5.000	1000	72.3%	0.54	NA	Dry Weight	NA	
0405097-13	Th-230	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	317.036	28.56%	300	2.29	0.15	pCi/g	NA	
SMP	Trg. Analyte	3:35:00 PM	AS040629-10-1	NA	NA	NA	1 g	23	T509713	1:52 PM	53.212	1000	72.3%	0.47	NA	Dry Weight	NA	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Recieved' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Recieved'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

000061

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
6:43:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-13	Th-232	5/7/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	320.600	28.56%	300	2.32	0.07	pCi/g	NA	
SMP	Trg. Analyte	3:35:00 PM	AS040629-10-1	NA	NA	NA	1 g	23	T509713	1:52 PM	8.000	1000	72.3%	0.47	NA	Dry Weight	NA	
0405097-14	Th-228	5/3/2004	AS040629-10	NA	NA	SOLID	1.06 g	Alpha Spec	AS040629-10a	7/9/2004	98.700	32.35%	300	0.70	0.17	pCi/g	NA	
SMP	Trg. Analyte	1:40:00 PM	AS040629-10-1	NA	NA	NA	1.06 g	24	T509714	1:53 PM	71.000	1000	66.0%	0.20	NA	Dry Weight	NA	M3
0405097-14	Th-229	5/3/2004	AS040629-10	NA	NA	SOLID	1.06 g	Alpha Spec	AS040629-10a	7/9/2004	640.300	32.35%	300	2.80	0.06	pCi/g	NA	
SMP	Tracer	1:40:00 PM	AS040629-10-1	NA	NA	NA	1.06 g	24	T509714	1:53 PM	19.000	1000	66.0%	0.46	NA	Dry Weight	NA	
0405097-14	Th-230	5/3/2004	AS040629-10	NA	NA	SOLID	1.06 g	Alpha Spec	AS040629-10a	7/9/2004	109.121	32.35%	300	0.72	0.15	pCi/g	NA	
SMP	Trg. Analyte	1:40:00 PM	AS040629-10-1	NA	NA	NA	1.06 g	24	T509714	1:53 PM	62.931	1000	66.0%	0.19	NA	Dry Weight	NA	M3
0405097-14	Th-232	5/3/2004	AS040629-10	NA	NA	SOLID	1.06 g	Alpha Spec	AS040629-10a	7/9/2004	91.200	32.35%	300	0.60	0.06	pCi/g	NA	
SMP	Trg. Analyte	1:40:00 PM	AS040629-10-1	NA	NA	NA	1.06 g	24	T509714	1:53 PM	6.000	1000	66.0%	0.16	NA	Dry Weight	NA	
0405097-15	Th-228	5/3/2004	AS040629-10	NA	NA	SOLID	1.04 g	Alpha Spec	AS040629-10a	7/9/2004	110.900	31.60%	300	0.82	0.12	pCi/g	NA	
SMP	Trg. Analyte	2:00:00 PM	AS040629-10-1	NA	NA	NA	1.04 g	42	T509715	1:53 PM	27.000	1000	66.3%	0.21	NA	Dry Weight	NA	M3
0405097-15	Th-229	5/3/2004	AS040629-10	NA	NA	SOLID	1.04 g	Alpha Spec	AS040629-10a	7/9/2004	628.800	31.60%	300	2.87	0.04	pCi/g	NA	
SMP	Tracer	2:00:00 PM	AS040629-10-1	NA	NA	NA	1.04 g	42	T509715	1:53 PM	4.000	1000	66.3%	0.48	NA	Dry Weight	NA	
0405097-15	Th-230	5/3/2004	AS040629-10	NA	NA	SOLID	1.04 g	Alpha Spec	AS040629-10a	7/9/2004	121.406	31.60%	300	0.84	0.15	pCi/g	NA	
SMP	Trg. Analyte	2:00:00 PM	AS040629-10-1	NA	NA	NA	1.04 g	42	T509715	1:53 PM	51.981	1000	66.3%	0.22	NA	Dry Weight	NA	M3
0405097-15	Th-232	5/3/2004	AS040629-10	NA	NA	SOLID	1.04 g	Alpha Spec	AS040629-10a	7/9/2004	131.700	31.60%	300	0.91	0.04	pCi/g	NA	
SMP	Trg. Analyte	2:00:00 PM	AS040629-10-1	NA	NA	NA	1.04 g	42	T509715	1:53 PM	1.000	1000	66.3%	0.22	NA	Dry Weight	NA	
0405097-16	Th-228	5/3/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	87.800	30.43%	300	0.66	0.13	pCi/g	NA	
SMP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	43	T509716	1:54 PM	34.000	1000	69.1%	0.19	NA	Dry Weight	NA	M3
0405097-16	Th-229	5/3/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	630.300	30.43%	300	3.08	0.05	pCi/g	NA	
SMP	Tracer	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	43	T509716	1:54 PM	9.000	1000	69.1%	0.51	NA	Dry Weight	NA	

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Recieved' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Recieved'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

000061

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
6:43:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-16	Th-230	5/3/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	82.069	30.43%	300	0.58	0.15	pCi/g	NA	
SMP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	43	T509716	1:54 PM	53.105	1000	69.1%	0.17	NA	Dry Weight	NA	M3
0405097-16	Th-232	5/3/2004	AS040629-10	NA	NA	SOLID	1.01 g	Alpha Spec	AS040629-10a	7/9/2004	108.200	30.43%	300	0.77	0.06	pCi/g	NA	
SMP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.01 g	43	T509716	1:54 PM	6.000	1000	69.1%	0.20	NA	Dry Weight	NA	
0405097-16	Th-228	5/3/2004	AS040629-10	NA	NA	SOLID	1.04 g	Alpha Spec	AS040629-10a	7/9/2004	105.400	30.81%	300	0.74	0.17	pCi/g	0.28	
DUP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.04 g	44	T509716D	1:54 PM	72.000	1000	71.1%	0.20	NA	Dry Weight	NA	M3
0405097-16	Th-229	5/3/2004	AS040629-10	NA	NA	SOLID	1.04 g	Alpha Spec	AS040629-10a	7/9/2004	656.900	30.81%	300	3.08	0.04	pCi/g	NA	
DUP	Tracer	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.04 g	44	T509716D	1:54 PM	7.000	1000	71.1%	0.51	NA	Dry Weight	NA	
0405097-16	Th-230	5/3/2004	AS040629-10	NA	NA	SOLID	1.04 g	Alpha Spec	AS040629-10a	7/9/2004	78.909	30.81%	300	0.52	0.15	pCi/g	0.26	
DUP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.04 g	44	T509716D	1:54 PM	60.304	1000	71.1%	0.16	NA	Dry Weight	NA	M3
0405097-16	Th-232	5/3/2004	AS040629-10	NA	NA	SOLID	1.04 g	Alpha Spec	AS040629-10a	7/9/2004	95.700	30.81%	300	0.63	0.03	pCi/g	0.52	
DUP	Trg. Analyte	2:20:00 PM	AS040629-10-1	NA	NA	NA	1.04 g	44	T509716D	1:54 PM	1.000	1000	71.1%	0.17	NA	Dry Weight	NA	
0405097-17	Th-228	5/4/2004	AS040629-8	NA	NA	SOLID	0.0178 g	Alpha Spec	AS040629-8C	7/7/2004	568.600	31.34%	300	208	9	pCi/g	NA	
SMP	Trg. Analyte	9:50:00 AM	AS040629-8-1	NA	NA	NA	0.0178 g	45	T509717	10:17 AM	68.000	1000	78.2%	38	NA	Dry Weight	NA	M3
0405097-17	Th-229	5/4/2004	AS040629-8	NA	NA	SOLID	0.0178 g	Alpha Spec	AS040629-8C	7/7/2004	735.600	31.34%	300	198	3	pCi/g	NA	
SMP	Tracer	9:50:00 AM	AS040629-8-1	NA	NA	NA	0.0178 g	45	T509717	10:17 AM	8.000	1000	78.2%	32	NA	Dry Weight	NA	
0405097-17	Th-230	5/4/2004	AS040629-8	NA	NA	SOLID	0.0178 g	Alpha Spec	AS040629-8C	7/7/2004	1011.457	31.34%	300	347	8	pCi/g	NA	
SMP	Trg. Analyte	9:50:00 AM	AS040629-8-1	NA	NA	NA	0.0178 g	45	T509717	10:17 AM	71.810	1000	78.2%	61	NA	Dry Weight	NA	M3
0405097-17	Th-232	5/4/2004	AS040629-8	NA	NA	SOLID	0.0178 g	Alpha Spec	AS040629-8C	7/7/2004	508.900	31.34%	300	175	3	pCi/g	NA	
SMP	Trg. Analyte	9:50:00 AM	AS040629-8-1	NA	NA	NA	0.0178 g	45	T509717	10:17 AM	7.000	1000	78.2%	33	NA	Dry Weight	NA	M3
0405097-18	Th-228	5/7/2004	AS040715-1	NA	NA	SOLID	0.11 g	Alpha Spec	AS040715-1a	7/17/2004	935.900	29.04%	300	59	1	pCi/g	NA	
SMP	Trg. Analyte	4:30:00 PM	AS040715-1-1	NA	NA	NA	0.11 g	11	TX509718	11:34 AM	17.000	1000	80.4%	10	NA	Dry Weight	NA	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Recieved' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Recieved'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Thursday, July 22, 2004
5:03:45 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-18	Th-229	5/7/2004	AS040715-1	NA	NA	SOLID	0.11 g	Alpha Spec	AS040715-1a	7/17/2004	700.100	29.04%	300	32.8	0.3	pCi/g	NA	
SMP	Tracer	4:30:00 PM	AS040715-1-1	NA	NA	NA	0.11 g	11	TX509718	11:34 AM	3.000	1000	80.4%	5.4	NA	Dry Weight	NA	
0405097-18	Th-230	5/7/2004	AS040715-1	NA	NA	SOLID	0.11 g	Alpha Spec	AS040715-1a	7/17/2004	1186.438	29.04%	300	69	1	pCi/g	NA	
SMP	Trg. Analyte	4:30:00 PM	AS040715-1-1	NA	NA	NA	0.11 g	11	TX509718	11:34 AM	61.875	1000	80.4%	12	NA	Dry Weight	NA	M3
0405097-18	Th-232	5/7/2004	AS040715-1	NA	NA	SOLID	0.11 g	Alpha Spec	AS040715-1a	7/17/2004	976.700	29.04%	300	57	0	pCi/g	NA	
SMP	Trg. Analyte	4:30:00 PM	AS040715-1-1	NA	NA	NA	0.11 g	11	TX509718	11:34 AM	1.000	1000	80.4%	10	NA	Dry Weight	NA	M3
0405097-18	Th-228	5/7/2004	AS040715-1	NA	NA	SOLID	0.107 g	Alpha Spec	AS040715-1a	7/17/2004	797.400	28.94%	300	53.8	1.5	pCi/g	0.33	
DUP	Trg. Analyte	4:30:00 PM	AS040715-1-1	NA	NA	NA	0.107 g	12	TX509718D	11:34 AM	62.000	1000	77.1%	9.7	NA	Dry Weight	NA	M3
0405097-18	Th-229	5/7/2004	AS040715-1	NA	NA	SOLID	0.107 g	Alpha Spec	AS040715-1a	7/17/2004	669.000	28.94%	300	32.4	0.5	pCi/g	NA	
DUP	Tracer	4:30:00 PM	AS040715-1-1	NA	NA	NA	0.107 g	12	TX509718D	11:34 AM	10.000	1000	77.1%	5.4	NA	Dry Weight	NA	
0405097-18	Th-230	5/7/2004	AS040715-1	NA	NA	SOLID	0.107 g	Alpha Spec	AS040715-1a	7/17/2004	1066.609	28.94%	300	67	1	pCi/g	0.12	
DUP	Trg. Analyte	4:30:00 PM	AS040715-1-1	NA	NA	NA	0.107 g	12	TX509718D	11:34 AM	61.304	1000	77.1%	12	NA	Dry Weight	NA	M3
0405097-18	Th-232	5/7/2004	AS040715-1	NA	NA	SOLID	0.107 g	Alpha Spec	AS040715-1a	7/17/2004	726.100	28.94%	300	45.8	0.4	pCi/g	0.86	
DUP	Trg. Analyte	4:30:00 PM	AS040715-1-1	NA	NA	NA	0.107 g	12	TX509718D	11:34 AM	3.000	1000	77.1%	8.3	NA	Dry Weight	NA	M3
0405097-20	Th-228	5/7/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	3580.700	31.40%	300	248	1	pCi/g	NA	
SMP	Trg. Analyte	5:30:00 PM	AS040715-1-1	NA	NA	NA	0.1 g	13	TX509720	11:34 AM	41.000	1000	73.6%	42	NA	Dry Weight	NA	M3
0405097-20	Th-229	5/7/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	693.400	31.40%	300	33.0	0.5	pCi/g	NA	
SMP	Tracer	5:30:00 PM	AS040715-1-1	NA	NA	NA	0.1 g	13	TX509720	11:34 AM	12.000	1000	73.6%	5.4	NA	Dry Weight	NA	
0405097-20	Th-230	5/7/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	7598.804	31.40%	300	491	2	pCi/g	NA	
SMP	Trg. Analyte	5:30:00 PM	AS040715-1-1	NA	NA	NA	0.1 g	13	TX509720	11:34 AM	67.321	1000	73.6%	82	NA	Dry Weight	NA	M3
0405097-20	Th-232	5/7/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	3772.900	31.40%	300	244	1	pCi/g	NA	
SMP	Trg. Analyte	5:30:00 PM	AS040715-1-1	NA	NA	NA	0.1 g	13	TX509720	11:34 AM	7.000	1000	73.6%	41	NA	Dry Weight	NA	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

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P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

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B - Analyte concentration greater than MDC.

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Notes:

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MDC - Minimum Detectable Concentration (see PAI SOP 709)

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BDL - Below Detection Limit

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
1:48:26 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-22	Th-228	5/7/2004	AS040629-8	NA	NA	SOLID	0.0475 g	Alpha Spec	AS040629-8C	7/7/2004	592.800	29.61%	300	75	2	pCi/g	NA	
SMP	Trg. Analyte	6:00:00 PM	AS040629-8-1	NA	NA	NA	0.0475 g	46	T509722	10:18 AM	14.000	1000	89.3%	14	NA	Dry Weight	NA	M3
0405097-22	Th-229	5/7/2004	AS040629-8	NA	NA	SOLID	0.0475 g	Alpha Spec	AS040629-8C	7/7/2004	793.500	29.61%	300	85	2	pCi/g	NA	
SMP	Tracer	6:00:00 PM	AS040629-8-1	NA	NA	NA	0.0475 g	46	T509722	10:18 AM	25.000	1000	89.3%	14	NA	Dry Weight	NA	
0405097-22	Th-230	5/7/2004	AS040629-8	NA	NA	SOLID	0.0475 g	Alpha Spec	AS040629-8C	7/7/2004	1330.221	29.61%	300	159	3	pCi/g	NA	
SMP	Trg. Analyte	6:00:00 PM	AS040629-8-1	NA	NA	NA	0.0475 g	46	T509722	10:18 AM	72.596	1000	89.3%	27	NA	Dry Weight	NA	M3
0405097-22	Th-232	5/7/2004	AS040629-8	NA	NA	SOLID	0.0475 g	Alpha Spec	AS040629-8C	7/7/2004	509.700	29.61%	300	61	1	pCi/g	NA	
SMP	Trg. Analyte	6:00:00 PM	AS040629-8-1	NA	NA	NA	0.0475 g	46	T509722	10:18 AM	11.000	1000	89.3%	11	NA	Dry Weight	NA	M3
0405097-24	Th-228	5/7/2004	AS040629-8	NA	NA	SOLID	0.0174 g	Alpha Spec	AS040629-8C	7/7/2004	809.600	31.87%	300	292	7	pCi/g	NA	
SMP	Trg. Analyte	12:10:00 PM	AS040629-8-1	NA	NA	NA	0.0174 g	47	T509724	10:18 AM	38.000	1000	79.8%	52	NA	Dry Weight	NA	M3
0405097-24	Th-229	5/7/2004	AS040629-8	NA	NA	SOLID	0.0174 g	Alpha Spec	AS040629-8C	7/7/2004	762.900	31.87%	300	207	3	pCi/g	NA	
SMP	Tracer	12:10:00 PM	AS040629-8-1	NA	NA	NA	0.0174 g	47	T509724	10:18 AM	7.000	1000	79.8%	34	NA	Dry Weight	NA	
0405097-24	Th-230	5/7/2004	AS040629-8	NA	NA	SOLID	0.0174 g	Alpha Spec	AS040629-8C	7/7/2004	2190.480	31.87%	300	740	10	pCi/g	NA	
SMP	Trg. Analyte	12:10:00 PM	AS040629-8-1	NA	NA	NA	0.0174 g	47	T509724	10:18 AM	65.066	1000	79.8%	130	NA	Dry Weight	NA	M3
0405097-24	Th-232	5/7/2004	AS040629-8	NA	NA	SOLID	0.0174 g	Alpha Spec	AS040629-8C	7/7/2004	740.700	31.87%	300	252	2	pCi/g	NA	
SMP	Trg. Analyte	12:10:00 PM	AS040629-8-1	NA	NA	NA	0.0174 g	47	T509724	10:18 AM	1.000	1000	79.8%	45	NA	Dry Weight	NA	M3
0405097-25	Th-228	5/7/2004	AS040629-8	NA	NA	SOLID	0.0551 g	Alpha Spec	AS040629-8C	7/7/2004	703.400	30.66%	300	82	2	pCi/g	NA	
SMP	Trg. Analyte	12:30:00 PM	AS040629-8-1	NA	NA	NA	0.0551 g	48	T509725	10:19 AM	22.000	1000	80.6%	15	NA	Dry Weight	NA	M3
0405097-25	Th-229	5/7/2004	AS040629-8	NA	NA	SOLID	0.0551 g	Alpha Spec	AS040629-8C	7/7/2004	741.500	30.66%	300	66	1	pCi/g	NA	
SMP	Tracer	12:30:00 PM	AS040629-8-1	NA	NA	NA	0.0551 g	48	T509725	10:19 AM	25.000	1000	80.6%	11	NA	Dry Weight	NA	
0405097-25	Th-230	5/7/2004	AS040629-8	NA	NA	SOLID	0.0551 g	Alpha Spec	AS040629-8C	7/7/2004	1532.111	30.66%	300	169	3	pCi/g	NA	
SMP	Trg. Analyte	12:30:00 PM	AS040629-8-1	NA	NA	NA	0.0551 g	48	T509725	10:19 AM	76.297	1000	80.6%	29	NA	Dry Weight	NA	M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
+ - Duplicate RPD not within limits.
LT - Result is less than Request MDC, greater than sample specific MDC
* - Aliquot Basis is 'As Recieved' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Recieved'.

M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).
2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
DER - Duplicate Error Ratio
BDL - Below Detection Limit

000064

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: **Paragon Analytics**
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
1:48:26 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
0405097-25	Th-232	5/7/2004	AS040629-8	NA	NA	SOLID	0.0551 g	Alpha Spec	AS040629-8C	7/7/2004	620.800	30.66%	300	69	1	pCi/g	NA	
SMP	Trg. Analyte	12:30:00 PM	AS040629-8-1	NA	NA	NA	0.0551 g	48	T509725	10:19 AM	4.000	1000	80.6%	12	NA	Dry Weight	NA	M3
0405097-26	Th-228	5/7/2004	AS040715-1	NA	NA	SOLID	0.106 g	Alpha Spec	AS040715-1a	7/17/2004	1839.500	29.50%	300	120	2	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040715-1-1	NA	NA	NA	0.106 g	15	TX509726	11:34 AM	75.000	1000	79.3%	21	NA	Dry Weight	NA	M3
0405097-26	Th-229	5/7/2004	AS040715-1	NA	NA	SOLID	0.106 g	Alpha Spec	AS040715-1a	7/17/2004	701.800	29.50%	300	33.9	0.4	pCi/g	NA	
SMP	Tracer	7:00:00 PM	AS040715-1-1	NA	NA	NA	0.106 g	15	TX509726	11:34 AM	4.000	1000	79.3%	5.6	NA	Dry Weight	NA	
0405097-26	Th-230	5/7/2004	AS040715-1	NA	NA	SOLID	0.106 g	Alpha Spec	AS040715-1a	7/17/2004	3698.696	29.50%	300	225	1	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040715-1-1	NA	NA	NA	0.106 g	15	TX509726	11:34 AM	61.015	1000	79.3%	38	NA	Dry Weight	NA	M3
0405097-26	Th-232	5/7/2004	AS040715-1	NA	NA	SOLID	0.106 g	Alpha Spec	AS040715-1a	7/17/2004	1960.500	29.50%	300	119	1	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040715-1-1	NA	NA	NA	0.106 g	15	TX509726	11:34 AM	5.000	1000	79.3%	20	NA	Dry Weight	NA	M3
0405097-27	Th-228	5/7/2004	AS040715-1	NA	NA	SOLID	0.105 g	Alpha Spec	AS040715-1a	7/17/2004	1862.200	29.09%	300	124	1	pCi/g	NA	
SMP	Trg. Analyte	6:40:00 PM	AS040715-1-1	NA	NA	NA	0.105 g	16	TX509727	11:35 AM	36.000	1000	79.4%	21	NA	Dry Weight	NA	M3
0405097-27	Th-229	5/7/2004	AS040715-1	NA	NA	SOLID	0.105 g	Alpha Spec	AS040715-1a	7/17/2004	693.100	29.09%	300	34.1	0.4	pCi/g	NA	
SMP	Tracer	6:40:00 PM	AS040715-1-1	NA	NA	NA	0.105 g	16	TX509727	11:35 AM	3.000	1000	79.4%	5.6	NA	Dry Weight	NA	
0405097-27	Th-230	5/7/2004	AS040715-1	NA	NA	SOLID	0.105 g	Alpha Spec	AS040715-1a	7/17/2004	3459.611	29.09%	300	214	1	pCi/g	NA	
SMP	Trg. Analyte	6:40:00 PM	AS040715-1-1	NA	NA	NA	0.105 g	16	TX509727	11:35 AM	61.296	1000	79.4%	36	NA	Dry Weight	NA	M3
0405097-27	Th-232	5/7/2004	AS040715-1	NA	NA	SOLID	0.105 g	Alpha Spec	AS040715-1a	7/17/2004	1872.700	29.09%	300	116	0	pCi/g	NA	
SMP	Trg. Analyte	6:40:00 PM	AS040715-1-1	NA	NA	NA	0.105 g	16	TX509727	11:35 AM	1.000	1000	79.4%	20	NA	Dry Weight	NA	M3
0405097-29	Th-228	5/6/2004	AS040629-8	NA	NA	SOLID	0.0379 g	Alpha Spec	AS040629-8C	7/7/2004	387.500	27.02%	300	72	3	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040629-8-1	NA	NA	NA	0.0379 g	57	T509729	10:19 AM	25.000	1000	83.4%	14	NA	Dry Weight	NA	M3
0405097-29	Th-229	5/6/2004	AS040629-8	NA	NA	SOLID	0.0379 g	Alpha Spec	AS040629-8C	7/7/2004	675.900	27.02%	300	99	1	pCi/g	NA	
SMP	Tracer	7:00:00 PM	AS040629-8-1	NA	NA	NA	0.0379 g	57	T509729	10:19 AM	7.000	1000	83.4%	16	NA	Dry Weight	NA	

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

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PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

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0405097-29	Th-230	5/6/2004	AS040629-8	NA	NA	SOLID	0.0379 g	Alpha Spec	AS040629-8C	7/7/2004	717.938	27.02%	300	126	4	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040629-8-1	NA	NA	NA	0.0379 g	57	T509729	10:19 AM	56.874	1000	83.4%	23	NA	Dry Weight	NA	M3
0405097-29	Th-232	5/6/2004	AS040629-8	NA	NA	SOLID	0.0379 g	Alpha Spec	AS040629-8C	7/7/2004	362.700	27.02%	300	64	1	pCi/g	NA	
SMP	Trg. Analyte	7:00:00 PM	AS040629-8-1	NA	NA	NA	0.0379 g	57	T509729	10:19 AM	1.000	1000	83.4%	12	NA	Dry Weight	NA	M3
0405097-29	Th-228	5/6/2004	AS040629-8	NA	NA	SOLID	0.0379 g	Alpha Spec	AS040629-8C	7/7/2004	396.500	30.84%	300	75	4	pCi/g	0.14	
DUP	Trg. Analyte	7:00:00 PM	AS040629-8-1	NA	NA	NA	0.0379 g	58	T509729D	10:20 AM	65.000	1000	71.9%	15	NA	Dry Weight	NA	M3
0405097-29	Th-229	5/6/2004	AS040629-8	NA	NA	SOLID	0.0379 g	Alpha Spec	AS040629-8C	7/7/2004	665.400	30.84%	300	85	1	pCi/g	NA	
DUP	Tracer	7:00:00 PM	AS040629-8-1	NA	NA	NA	0.0379 g	58	T509729D	10:20 AM	12.000	1000	71.9%	14	NA	Dry Weight	NA	
0405097-29	Th-230	5/6/2004	AS040629-8	NA	NA	SOLID	0.0379 g	Alpha Spec	AS040629-8C	7/7/2004	784.298	30.84%	300	140	4	pCi/g	0.41	
DUP	Trg. Analyte	7:00:00 PM	AS040629-8-1	NA	NA	NA	0.0379 g	58	T509729D	10:20 AM	59.006	1000	71.9%	25	NA	Dry Weight	NA	M3
0405097-29	Th-232	5/6/2004	AS040629-8	NA	NA	SOLID	0.0379 g	Alpha Spec	AS040629-8C	7/7/2004	354.600	30.84%	300	63	2	pCi/g	0.02	
DUP	Trg. Analyte	7:00:00 PM	AS040629-8-1	NA	NA	NA	0.0379 g	58	T509729D	10:20 AM	8.000	1000	71.9%	12	NA	Dry Weight	NA	M3
0405097-30	Th-228	5/6/2004	AS040629-8	NA	NA	SOLID	0.0451 g	Alpha Spec	AS040629-8C	7/7/2004	387.400	30.61%	300	55	2	pCi/g	NA	
SMP	Trg. Analyte	5:00:00 PM	AS040629-8-1	NA	NA	NA	0.0451 g	59	T509730	10:20 AM	32.000	1000	81.6%	11	NA	Dry Weight	NA	M3
0405097-30	Th-229	5/6/2004	AS040629-8	NA	NA	SOLID	0.0451 g	Alpha Spec	AS040629-8C	7/7/2004	748.900	30.61%	300	81	1	pCi/g	NA	
SMP	Tracer	5:00:00 PM	AS040629-8-1	NA	NA	NA	0.0451 g	59	T509730	10:20 AM	17.000	1000	81.6%	13	NA	Dry Weight	NA	
0405097-30	Th-230	5/6/2004	AS040629-8	NA	NA	SOLID	0.0451 g	Alpha Spec	AS040629-8C	7/7/2004	695.527	30.61%	300	93	3	pCi/g	NA	
SMP	Trg. Analyte	5:00:00 PM	AS040629-8-1	NA	NA	NA	0.0451 g	59	T509730	10:20 AM	64.909	1000	81.6%	17	NA	Dry Weight	NA	M3
0405097-30	Th-232	5/6/2004	AS040629-8	NA	NA	SOLID	0.0451 g	Alpha Spec	AS040629-8C	7/7/2004	298.400	30.61%	300	39.9	0.8	pCi/g	NA	
SMP	Trg. Analyte	5:00:00 PM	AS040629-8-1	NA	NA	NA	0.0451 g	59	T509730	10:20 AM	2.000	1000	81.6%	8.0	NA	Dry Weight	NA	M3
AS040629-10	Th-228	6/30/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/17/2004	9.460	30.40%	780	0.027	0.084	pCi/g	NA	
MB	Trg. Analyte	2:14:43 PM	AS040629-10-1	NA	NA	NA	1 g	18	TR62910B	11:32 AM	43.000	1000	67.9%	0.048	NA	Dry Weight	NA	U

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
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Notes:

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Abbreviations:

TR- Tracer TA - Target Analyte
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
DER - Duplicate Error Ratio
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Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
6:43:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
AS040629-10	Th-229	6/30/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/17/2004	1609.540	30.40%	780	3.06	0.03	pCi/g	NA	
MB	Tracer	2:14:43 PM	AS040629-10-1	NA	NA	NA	1 g	18	TR62910B	11:32 AM	7.000	1000	67.9%	0.47	NA	Dry Weight	NA	
AS040629-10	Th-230	6/30/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/17/2004	6.183	30.40%	780	0.017	0.094	pCi/g	NA	
MB	Trg. Analyte	2:14:43 PM	AS040629-10-1	NA	NA	NA	1 g	18	TR62910B	11:32 AM	56.175	1000	67.9%	0.051	NA	Dry Weight	NA	U
AS040629-10	Th-232	6/30/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/17/2004	9.660	30.40%	780	0.027	0.027	pCi/g	NA	
MB	Trg. Analyte	2:14:43 PM	AS040629-10-1	NA	NA	NA	1 g	18	TR62910B	11:32 AM	3.000	1000	67.9%	0.021	NA	Dry Weight	NA	U
AS040629-10	Th-229	6/30/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	710.600	30.61%	300	3.49	0.07	pCi/g	NA	
LCS	Tracer	2:14:43 PM	AS040629-10-1	NA	NA	NA	1 g	59	T62910L	1:58 PM	18.000	1000	77.4%	0.57	NA	Dry Weight	NA	
AS040629-10	Th-230	6/30/2004	AS040629-10	NA	NA	SOLID	1 g	Alpha Spec	AS040629-10a	7/9/2004	743.777	30.61%	300	4.71	0.14	pCi/g	NA	105
LCS	Trg. Analyte	2:14:43 PM	AS040629-10-1	NA	NA	NA	1 g	59	T62910L	1:58 PM	60.743	1000	77.4%	0.85	NA	Dry Weight	NA	P,M3
AS040629-8	Th-228	6/30/2004	AS040629-8	NA	NA	SOLID	0.03 g	Alpha Spec	AS040629-8C	7/7/2004	3.000	26.17%	300	0.8	5.3	pCi/g	NA	
MB	Trg. Analyte	1:47:48 PM	AS040629-8-1	NA	NA	NA	0.03 g	60	T6298B	10:21 AM	40.000	1000	68.3%	2.4	NA	Dry Weight	NA	U,M
AS040629-8	Th-229	6/30/2004	AS040629-8	NA	NA	SOLID	0.03 g	Alpha Spec	AS040629-8C	7/7/2004	535.900	26.17%	300	102	2	pCi/g	NA	
MB	Tracer	1:47:48 PM	AS040629-8-1	NA	NA	NA	0.03 g	60	T6298B	10:21 AM	7.000	1000	68.3%	17	NA	Dry Weight	NA	
AS040629-8	Th-230	6/30/2004	AS040629-8	NA	NA	SOLID	0.03 g	Alpha Spec	AS040629-8C	7/7/2004	2.110	26.17%	300	0.6	5.6	pCi/g	NA	
MB	Trg. Analyte	1:47:48 PM	AS040629-8-1	NA	NA	NA	0.03 g	60	T6298B	10:21 AM	46.301	1000	68.3%	2.5	NA	Dry Weight	NA	U,M
AS040629-8	Th-232	6/30/2004	AS040629-8	NA	NA	SOLID	0.03 g	Alpha Spec	AS040629-8C	7/7/2004	-0.300	26.17%	300	-0.1	1.5	pCi/g	NA	
MB	Trg. Analyte	1:47:48 PM	AS040629-8-1	NA	NA	NA	0.03 g	60	T6298B	10:21 AM	1.000	1000	68.3%	1.0	NA	Dry Weight	NA	U,M
AS040629-8	Th-229	6/30/2004	AS040629-8	NA	NA	SOLID	0.03 g	Alpha Spec	AS040629-8C	7/7/2004	720.800	30.14%	300	120	1	pCi/g	NA	
LCS	Tracer	1:47:48 PM	AS040629-8-1	NA	NA	NA	0.03 g	61	T6298L	10:21 AM	4.000	1000	79.7%	20	NA	Dry Weight	NA	
AS040629-8	Th-230	6/30/2004	AS040629-8	NA	NA	SOLID	0.03 g	Alpha Spec	AS040629-8C	7/7/2004	760.524	30.14%	300	158	5	pCi/g	NA	105
LCS	Trg. Analyte	1:47:48 PM	AS040629-8-1	NA	NA	NA	0.03 g	61	T6298L	10:21 AM	61.586	1000	79.7%	28	NA	Dry Weight	NA	P,M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Recieved' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Recieved'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

000067

Isotopic Thorium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Thursday, July 22, 2004
5:03:45 PM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QCBatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist.	Samp Alq Analy Alq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CntDur(min) Yield	Activity +/- 2 s TPU	MDC DecLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
AS040715-1	Th-228	7/15/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	-7.000	30.87%	1000	-0.14	0.82	pCi/g	NA	
MB	Trg. Analyte	10:51:21 AM	AS040715-1-1	NA	NA	NA	0.1 g	17	TX7151B	5:08 PM	66.000	1000	72.4%	0.45	NA	Dry Weight	NA	U,M
AS040715-1	Th-229	7/15/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	2236.000	30.87%	1000	32.6	0.3	pCi/g	NA	
MB	Tracer	10:51:21 AM	AS040715-1-1	NA	NA	NA	0.1 g	17	TX7151B	5:08 PM	12.000	1000	72.4%	5.0	NA	Dry Weight	NA	
AS040715-1	Th-230	7/15/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	6.547	30.87%	1000	0.13	0.77	pCi/g	NA	
MB	Trg. Analyte	10:51:21 AM	AS040715-1-1	NA	NA	NA	0.1 g	17	TX7151B	5:08 PM	58.453	1000	72.4%	0.45	NA	Dry Weight	NA	U,M
AS040715-1	Th-232	7/15/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	26.000	30.87%	1000	0.52	0.22	pCi/g	NA	
MB	Trg. Analyte	10:51:21 AM	AS040715-1-1	NA	NA	NA	0.1 g	17	TX7151B	5:08 PM	3.000	1000	72.4%	0.24	NA	Dry Weight	NA	B,M
AS040715-1	Th-229	7/15/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	637.500	29.31%	300	32.7	0.4	pCi/g	NA	
LCS	Tracer	10:51:21 AM	AS040715-1-1	NA	NA	NA	0.1 g	19	TX7151L	11:35 AM	5.000	1000	72.5%	5.4	NA	Dry Weight	NA	
AS040715-1	Th-230	7/15/2004	AS040715-1	NA	NA	SOLID	0.1 g	Alpha Spec	AS040715-1a	7/17/2004	729.290	29.31%	300	51.5	1.5	pCi/g	NA	114
LCS	Trg. Analyte	10:51:21 AM	AS040715-1-1	NA	NA	NA	0.1 g	19	TX7151L	11:35 AM	55.700	1000	72.5%	9.4	NA	Dry Weight	NA	P,M3

Comments:

Data Package ID: *th0405097-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Recieved' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Recieved'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/20/04 7:02:48 AM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-1 TAS040715-1
Analysis Type: Thorium

Detector: MCB 2 Input 2
Date/Time of Count: 7/17/04 11:33:43 AM

Sample Volume: 0.100 Total, 0.100 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **71.90%**
Real Time: 300.02 Minutes

Total Eff.: 21.87 %
Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 30.42%
Analysis: Relative Region-Of-Interest

Original: 3,009 + 10.1061 * Chn + -0.00083 * Chn **2.

Spectrum Calibration: 3,009 + 9.9406 * Chn + -0.00083 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TX50971.SPC**
Background File: **C:\USER\ALPHA\BKGND\B4071010.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	248.77	226	253	2.00	235.00	2,052.00	6.00	2046.00	31.18
2	171.37	146	176	6.00	489.00	4,871.00	1.80	4852.93	73.96
3	101.91	76	107	6.00	205.00	2,095.00	0.30	2094.70	31.92
Tracer	187.69	177	214	8.00	49.00	657.00	0.90	656.10	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.05	140.449	n/a	4.34 %
2	Th-230	4687.70	57.93	333.132	n/a	2.82 %
3	Th-232	4013.00	58.62	143.792	n/a	4.28 %
Tracer	Th-229	4845.00	77.02	45.038	n/a	7.65 %

Totals

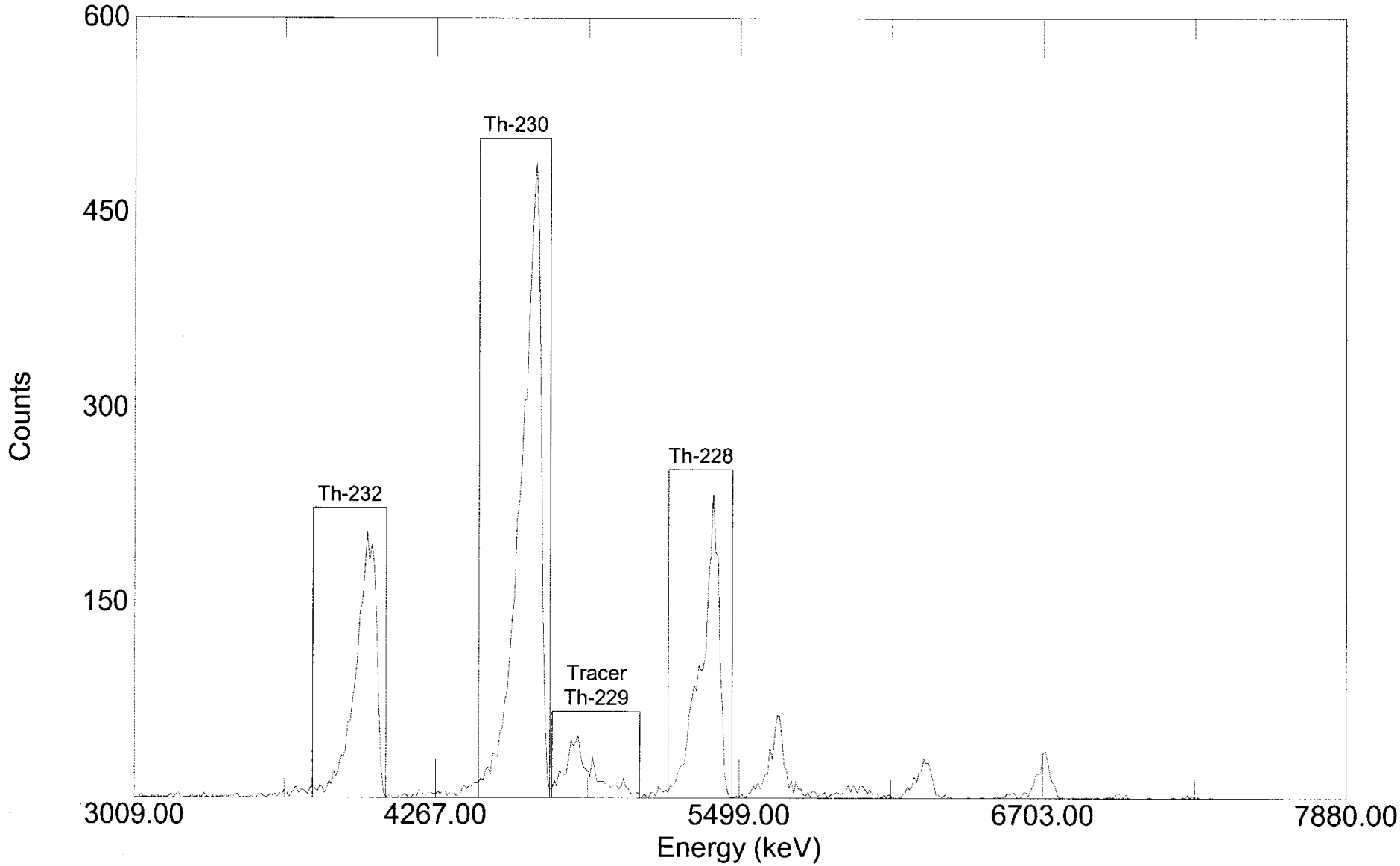
		% Total
Gross Count:	11,232.00	100.00
Net Area:	11,170.50	99.45
Background:	61.50	0.55
Composite Fit:	9,675.00	86.14
Residuals:	1,557.00	13.86

Analyzed By: SD

Checked By: Sm

000063

TX50971 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 11:33:43 on 17-Jul-2004
File: C:\User\Alpha\ALPHA\TX50971.SPC
Sample: 0405097-1 TAS040715-1

Real Time: 18001.24 s. Live Time: 18000.00 s.
Detector: #10 MCB 2 Input 2
Type: Thorium

000073

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:10:02 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-2 TAS040629-8

Analysis Type: Thorium

Detector: MCB 6 Input 3

Date/Time of Count: 7/7/04 10:16:47 AM

Sample Volume: 0.090 Total, 0.090 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **79.17%**

Real Time: 300.26 Minutes

Total Eff.: 24.09 %

Dead Time: 0.1 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.43%

Analysis: Relative Region-Of-Interest

Original: 3,033 + 9.8447 * Chn + 0.00003 * Chn **2.

Spectrum Calibration: 3,033 + 9.8655 * Chn + 0.00003 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T50972.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070643.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	242.77	221	246	2.00	102.00	872.00	9.90	862.10	11.93
2	167.63	146	173	4.00	207.00	2,035.00	0.60	2016.48	27.90
3	99.30	76	107	6.00	98.00	897.00	1.80	895.20	12.39
Tracer	183.56	174	209	12.00	57.00	725.00	2.40	722.60	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.76	59.703	n/a	6.72 %
2	Th-230	4687.70	39.51	139.648	n/a	4.38 %
3	Th-232	4013.00	59.23	61.996	n/a	6.56 %
Tracer	Th-229	4845.00	118.53	50.043	n/a	7.28 %

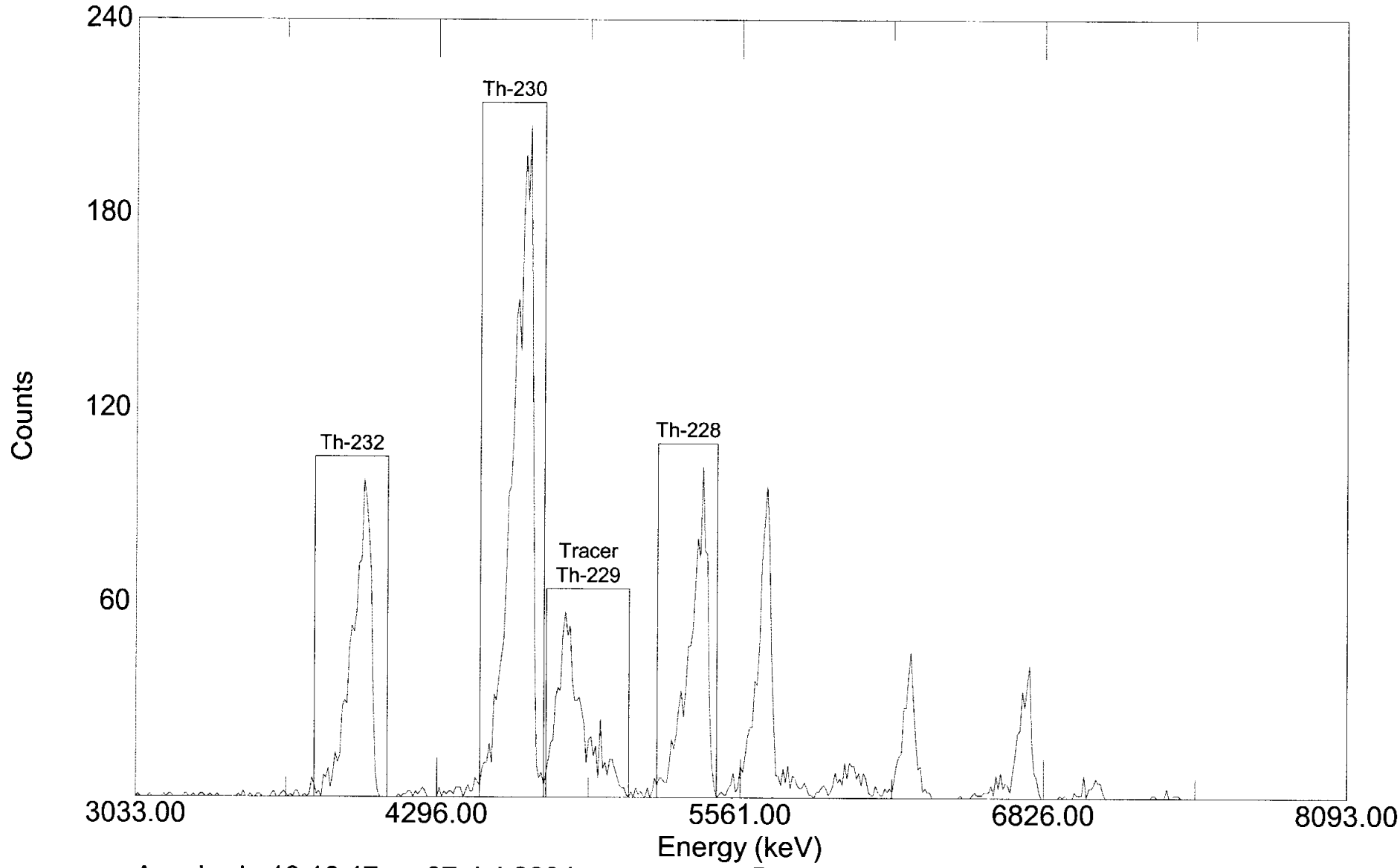
Totals

		% Total
Gross Count:	6,095.00	100.00
Net Area:	6,008.60	98.58
Background:	86.40	1.42
Composite Fit:	4,529.00	74.31
Residuals:	1,566.00	25.69

Analyzed By: SD

Checked By: Sm

T50972 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:16:47 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T50972.SPC
Sample: 0405097-2 TAS040629-8

Real Time: 18015.74 s. Live Time: 18000.00 s.
Detector: #43 MCB 6 Input 3
Type: Thorium

000072

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:10:53 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-3 TAS040629-8

Analysis Type: Thorium

Detector: MCB 6 Input 4

Date/Time of Count: 7/7/04 10:17:14 AM

Sample Volume: 0.200 Total, 0.200 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **81.53%**

Real Time: 300.26 Minutes

Total Eff.: 25.12 %

Dead Time: 0.1 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.81%

Analysis: Relative Region-Of-Interest

Original: 3,015 + 10.0739 * Chn + -0.00055 * Chn **2.

Spectrum Calibration: 3,015 + 10.1009 * Chn + -0.00055 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T50973.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070644.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	242.28	221	246	4.00	193.00	2,161.00	21.30	2139.70	28.39
2	167.13	146	171	4.00	343.00	3,659.00	1.50	3638.81	48.28
3	99.36	76	104	6.00	186.00	2,093.00	0.30	2092.70	27.77
Tracer	183.00	172	209	14.00	47.00	755.00	1.50	753.50	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	39.35	63.947	n/a	4.26 %
2	Th-230	4687.70	39.67	108.750	n/a	3.26 %
3	Th-232	4013.00	59.96	62.543	n/a	4.28 %
Tracer	Th-229	4845.00	138.62	22.519	n/a	7.13 %

Totals

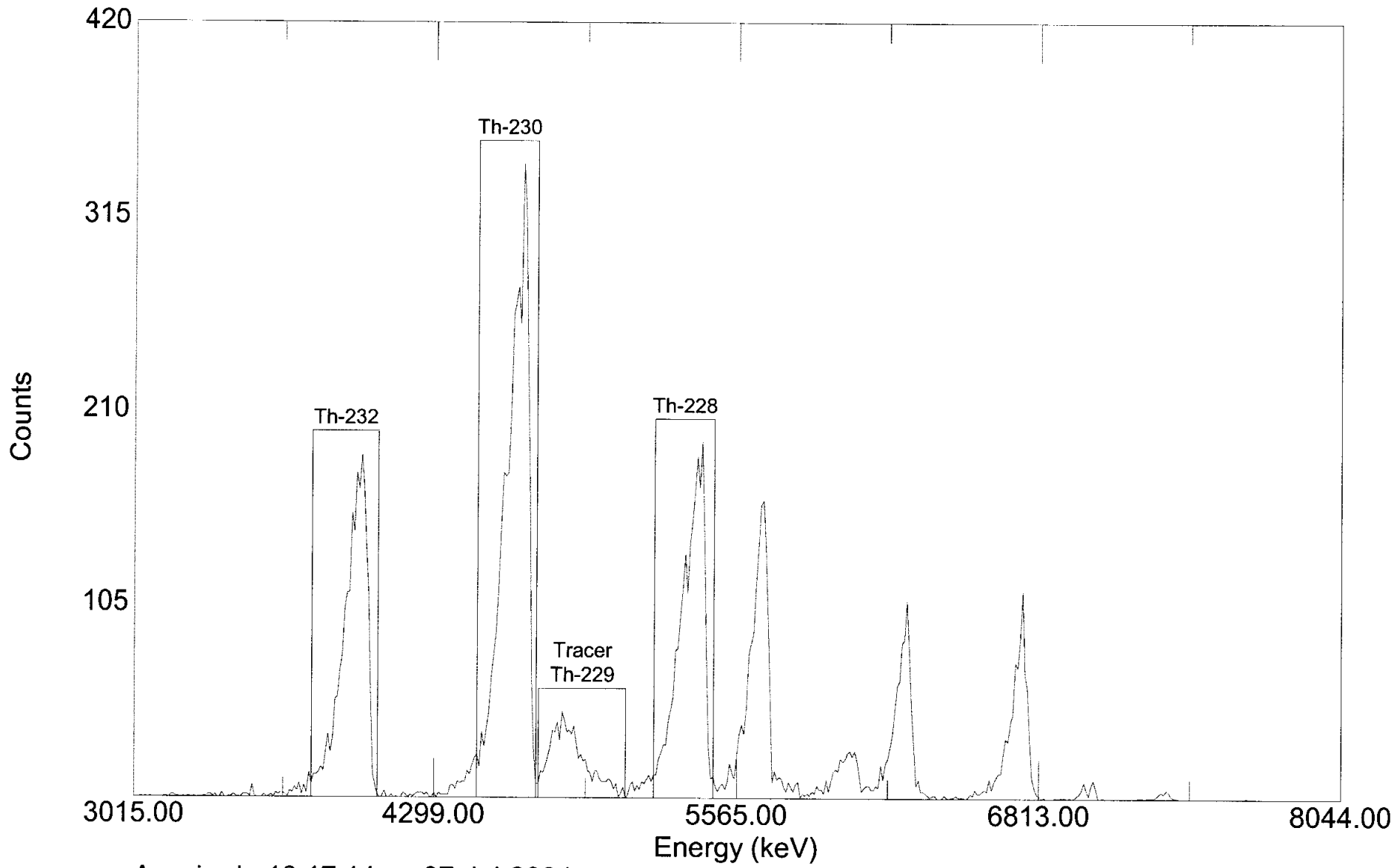
		% Total
Gross Count:	12,541.00	100.00
Net Area:	12,413.80	98.99
Background:	127.20	1.01
Composite Fit:	8,668.00	69.12
Residuals:	3,873.00	30.88

Analyzed By: SD

Checked By: SM

T50973

AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:17:14 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T50973.SPC
Sample: 0405097-3 TAS040629-8

Real Time: 18015.76 s. Live Time: 18000.00 s.
Detector: #44 MCB 6 Input 4
Type: Thorium

000074

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:43:19 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-4 TAS040629-10
Analysis Type: Thorium

Detector: MCB 8 Input 1
Date/Time of Count: 7/9/04 7:34:30 AM

Sample Volume: 1.000 Total, 1.000 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **80.77%**
Real Time: 300.66 Minutes

Total Eff.: 21.82 %
Dead Time: 0.2 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 27.02%
Analysis: Relative Region-Of-Interest

Original: 3,054 + 9.7825 * Chn + -0.00029 * Chn **2.

Spectrum Calibration: 3,054 + 9.7644 * Chn + -0.00029 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T50974.SPC**
Background File: **C:\User\Alpha\ALPHA\B4070657.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	245.12	223	248	2.00	156.00	1,203.00	7.50	1195.50	18.26
2	168.16	146	170	4.00	87.00	697.00	0.00	680.77	10.40
3	98.52	73	104	2.00	127.00	999.00	0.30	998.70	15.25
Tracer	184.44	171	210	14.00	49.00	657.00	2.40	654.60	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.25	8.225	n/a	5.69 %
2	Th-230	4687.70	38.67	4.684	n/a	7.60 %
3	Th-232	4013.00	19.42	6.871	n/a	6.20 %
Tracer	Th-229	4845.00	135.22	4.504	n/a	7.65 %

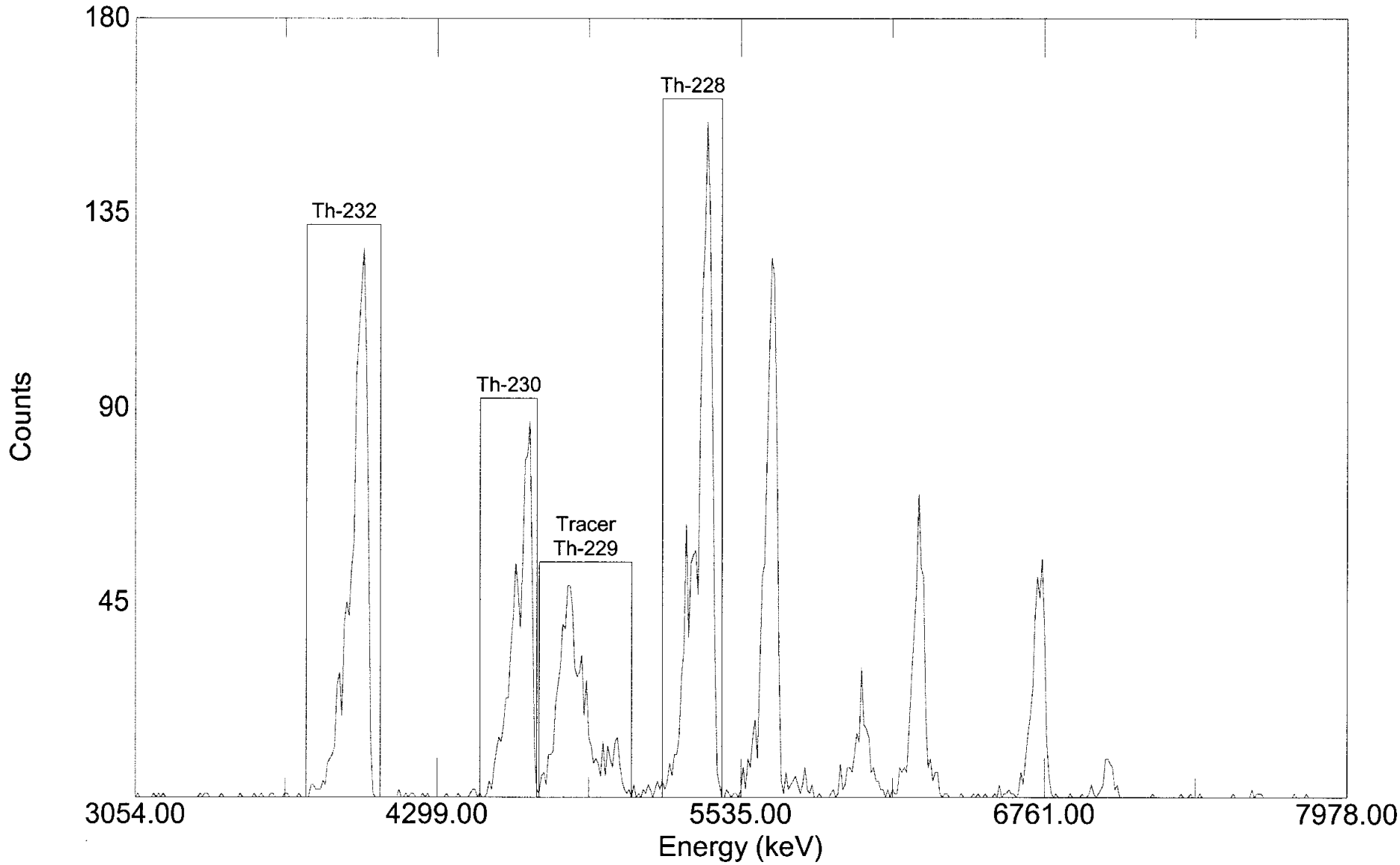
Totals

		% Total
Gross Count:	5,378.00	100.00
Net Area:	5,312.00	98.77
Background:	66.00	1.23
Composite Fit:	3,556.00	66.12
Residuals:	1,822.00	33.88

Analyzed By: Am

Checked By: SD

T50974 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 07:34:30 on 09-Jul-2004
File: C:\User\Alpha\ALPHA\T50974.SPC
Sample: 0405097-4 TAS040629-10

Real Time: 18039.56 s. Live Time: 18000.00 s.
Detector: #57 MCB 8 Input 1
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:45:15 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-5 TAS040629-10
Analysis Type: Thorium

Detector: MCB 8 Input 2
Date/Time of Count: 7/9/04 7:34:51 AM

Sample Volume: 1.000 Total, 1.000 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **72.01%**
Real Time: 300.66 Minutes

Total Eff.: 22.21 %
Dead Time: 0.2 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 30.84%
Analysis: Relative Region-Of-Interest

Original: 3,059 + 9.8157 * Chn + -0.00043 * Chn **2.

Spectrum Calibration: 3,059 + 9.8038 * Chn + -0.00043 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T50975.SPC**
Background File: **C:\User\Alpha\ALPHA\B4070658.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	244.47	224	250	2.00	39.00	356.00	19.50	336.50	5.05
2	167.35	145	169	4.00	49.00	499.00	0.90	481.58	7.23
3	97.72	75	106	2.00	35.00	328.00	2.70	325.30	4.88
Tracer	183.65	170	208	8.00	46.00	670.00	3.90	666.10	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.18	2.275	n/a	11.02 %
2	Th-230	4687.70	38.64	3.256	n/a	9.09 %
3	Th-232	4013.00	19.44	2.200	n/a	10.92 %
Tracer	Th-229	4845.00	77.16	4.504	n/a	7.57 %

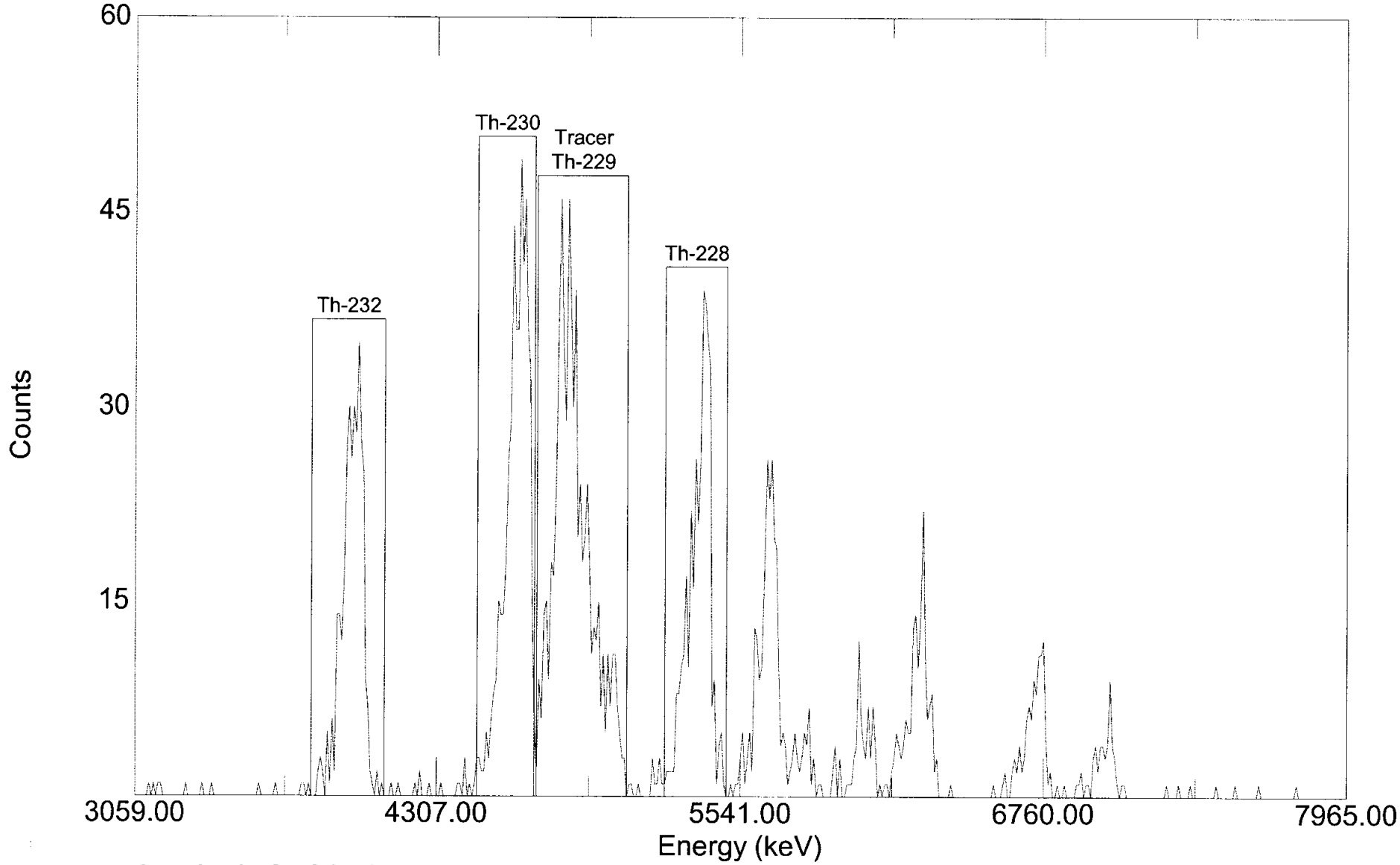
Totals

		% Total
Gross Count:	2,524.00	100.00
Net Area:	2,420.20	95.89
Background:	103.80	4.11
Composite Fit:	1,853.00	73.42
Residuals:	671.00	26.58

Analyzed By: Sm

Checked By: SD

T50975 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 07:34:51 on 09-Jul-2004
File: C:\User\Alpha\ALPHA\T50975.SPC
Sample: 0405097-5 TAS040629-10

Real Time: 18039.52 s. Live Time: 18000.00 s.
Detector: #58 MCB 8 Input 2
Type: Thorium

000078

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:46:52 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-6 TAS040629-10
Analysis Type: Thorium

Detector: MCB 8 Input 3
Date/Time of Count: 7/9/04 7:35:17 AM

Sample Volume: 1.000 Total, 1.000 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **65.12%**
Real Time: 300.66 Minutes

Total Eff.: 19.93 %
Dead Time: 0.2 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 30.61%
Analysis: Relative Region-Of-Interest

Original: 3,028 + 10.0729 * Chn + -0.00120 * Chn **2.

Spectrum Calibration: 3,028 + 10.0270 * Chn + -0.00120 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T50976.SPC**
Background File: **C:\User\Alpha\ALPHA\B4070659.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	246.85	225	250	2.00	25.00	227.00	9.30	217.70	3.64
2	168.94	150	173	4.00	33.00	329.00	0.60	313.57	5.24
3	99.42	74	105	4.00	18.00	186.00	0.30	185.70	3.11
Tracer	185.33	174	210	14.00	41.00	603.00	5.10	597.90	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	18.87	1.640	n/a	13.59 %
2	Th-230	4687.70	38.49	2.362	n/a	11.34 %
3	Th-232	4013.00	39.15	1.399	n/a	14.40 %
Tracer	Th-229	4845.00	134.15	4.504	n/a	7.98 %

Totals

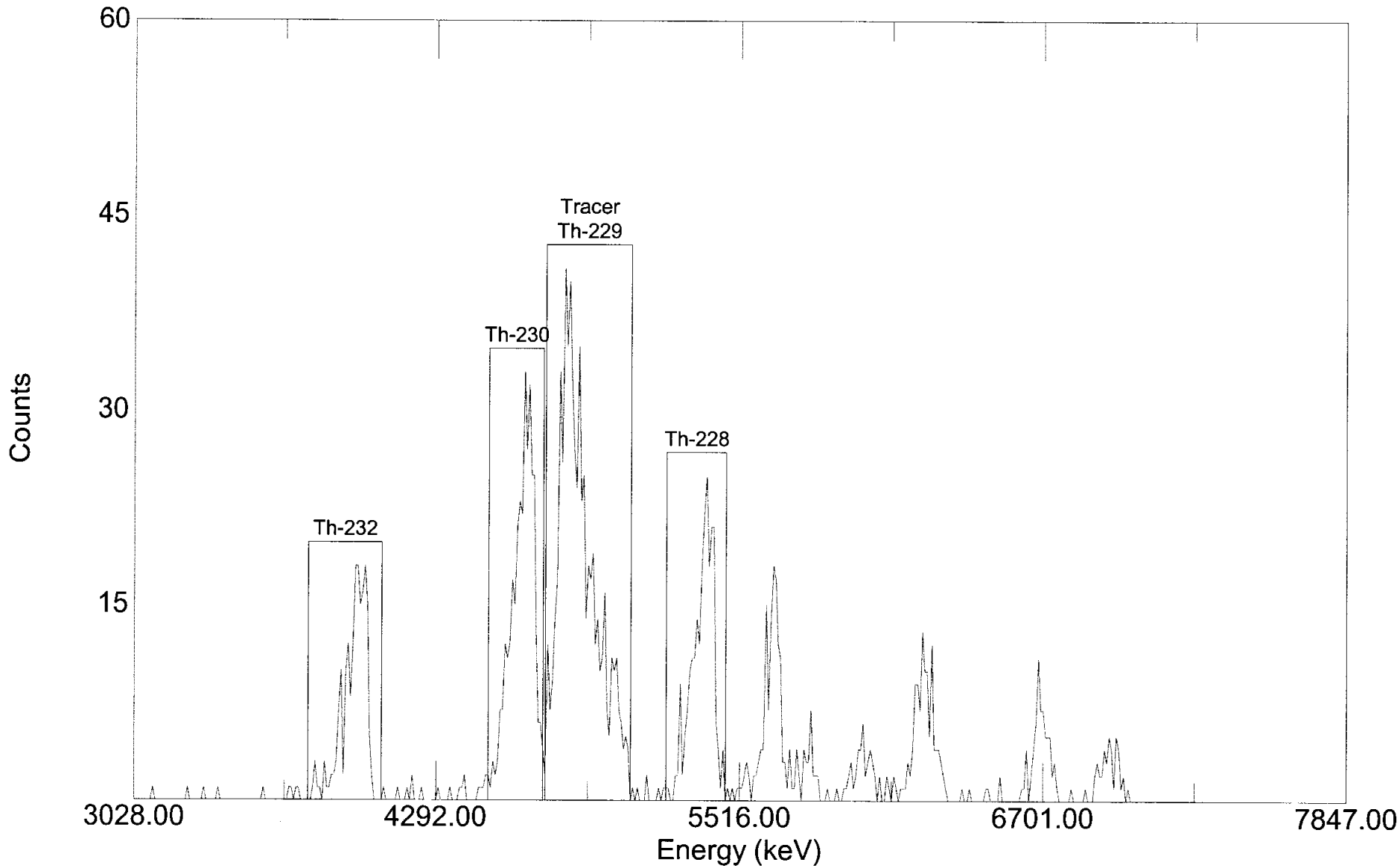
		% Total
Gross Count:	1,804.00	100.00
Net Area:	1,720.00	95.34
Background:	84.00	4.66
Composite Fit:	1,345.00	74.56
Residuals:	459.00	25.44

Analyzed By: Sm

Checked By: SD

T50976

AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 07:35:17 on 09-Jul-2004
File: C:\User\Alpha\ALPHA\T50976.SPC
Sample: 0405097-6 TAS040629-10

Real Time: 18039.46 s. Live Time: 18000.00 s.
Detector: #59 MCB 8 Input 3
Type: Thorium

000030

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:48:06 PM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-7 TAS040629-10

Analysis Type: Thorium

Detector: MCB 3 Input 2

Date/Time of Count: 7/9/04 1:51:17 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **66.79%**

Real Time: 300.06 Minutes

Total Eff.: 19.96 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 29.88%

Analysis: Relative Region-Of-Interest

Original: 3,033 + 10.0328 * Chn + -0.00079 * Chn **2.

Spectrum Calibration: 3,033 + 10.0684 * Chn + -0.00079 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TR50977.SPC**

Background File: **C:\User\Alpha\ALPHA\B4070618.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	242.76	222	247	2.00	97.00	956.00	9.00	947.00	15.82
2	166.57	147	170	4.00	227.00	2,274.00	0.30	2258.85	37.73
3	98.14	72	103	4.00	94.00	1,009.00	0.30	1008.70	16.85
Tracer	182.64	171	208	10.00	49.00	601.00	2.40	598.60	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.37	7.125	n/a	6.40 %
2	Th-230	4687.70	39.22	16.995	n/a	4.14 %
3	Th-232	4013.00	39.65	7.589	n/a	6.17 %
Tracer	Th-229	4845.00	97.79	4.504	n/a	8.00 %

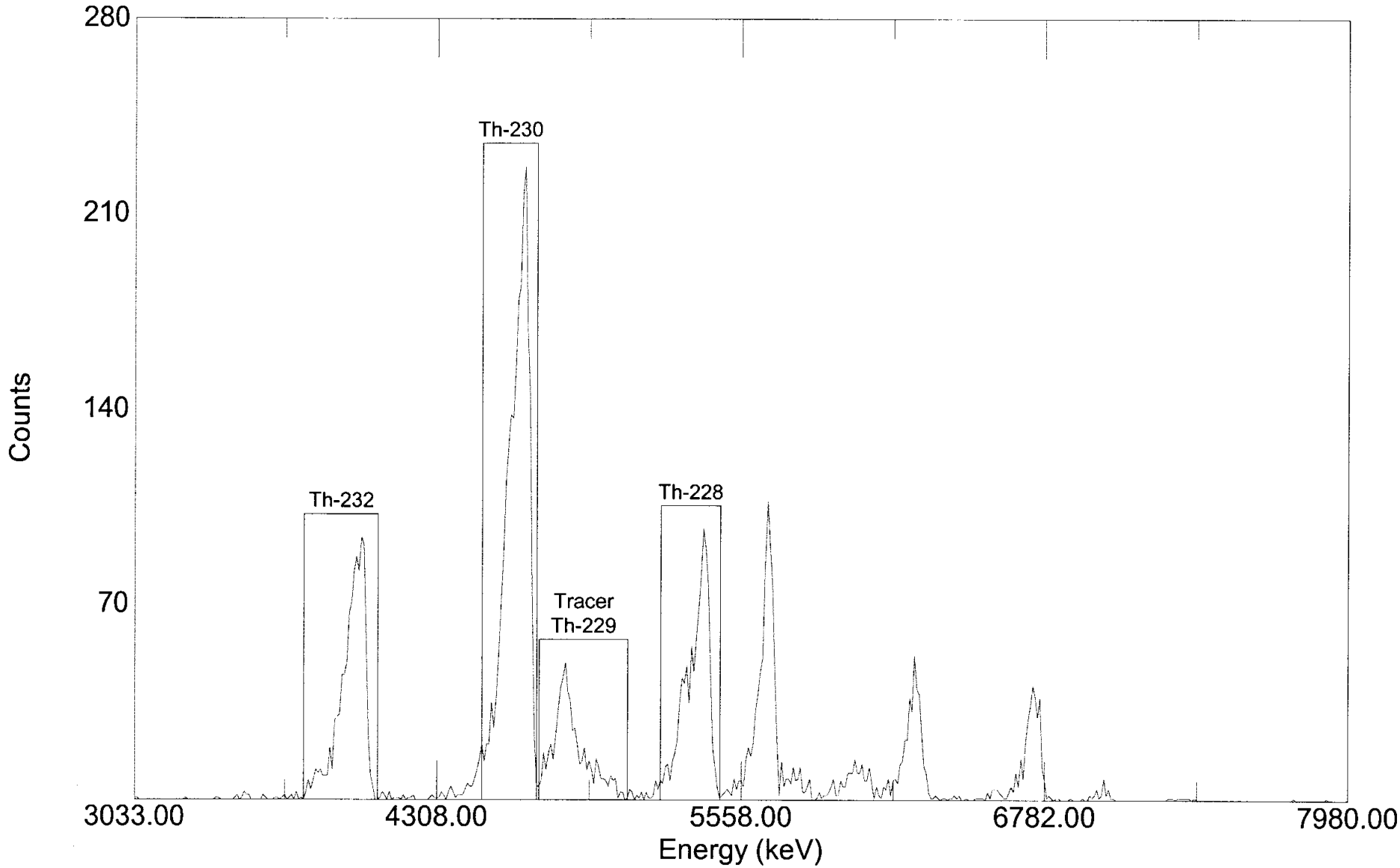
Totals

		% Total
Gross Count:	6,725.00	100.00
Net Area:	6,622.40	98.47
Background:	102.60	1.53
Composite Fit:	4,840.00	71.97
Residuals:	1,885.00	28.03

Analyzed By: Sm

Checked By: SD

TR50977 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:51:17 on 09-Jul-2004
File: C:\User\Alpha\ALPHA\TR50977.SPC
Sample: 0405097-7 TAS040629-10

Real Time: 18003.70 s. Live Time: 18000.00 s.
Detector: #18 MCB 3 Input 2
Type: Thorium

000082

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:49:11 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-7D TAS040629-10
Analysis Type: Thorium

Detector: MCB 8 Input 5
Date/Time of Count: 7/9/04 7:36:08 AM

Sample Volume: 1.000 Total, 1.000 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **65.54%**
Real Time: 300.66 Minutes

Total Eff.: 19.75 %
Dead Time: 0.2 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 30.14%
Analysis: Relative Region-Of-Interest

Original: 3,070 + 9.8188 * Chn + -0.00041 * Chn **2.

Spectrum Calibration: 3,070 + 9.8020 * Chn + -0.00041 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T50977D.SPC**
Background File: **C:\User\Alpha\ALPHA\B4070661.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	243.27	223	248	2.00	107.00	985.00	20.40	964.60	16.28
2	166.21	146	170	4.00	245.00	2,260.00	0.60	2244.71	37.88
3	96.61	74	105	4.00	103.00	987.00	0.30	986.70	16.65
Tracer	182.50	171	208	8.00	42.00	594.00	1.50	592.50	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.20	7.332	n/a	6.38 %
2	Th-230	4687.70	38.66	17.063	n/a	4.15 %
3	Th-232	4013.00	38.89	7.500	n/a	6.24 %
Tracer	Th-229	4845.00	77.21	4.504	n/a	8.04 %

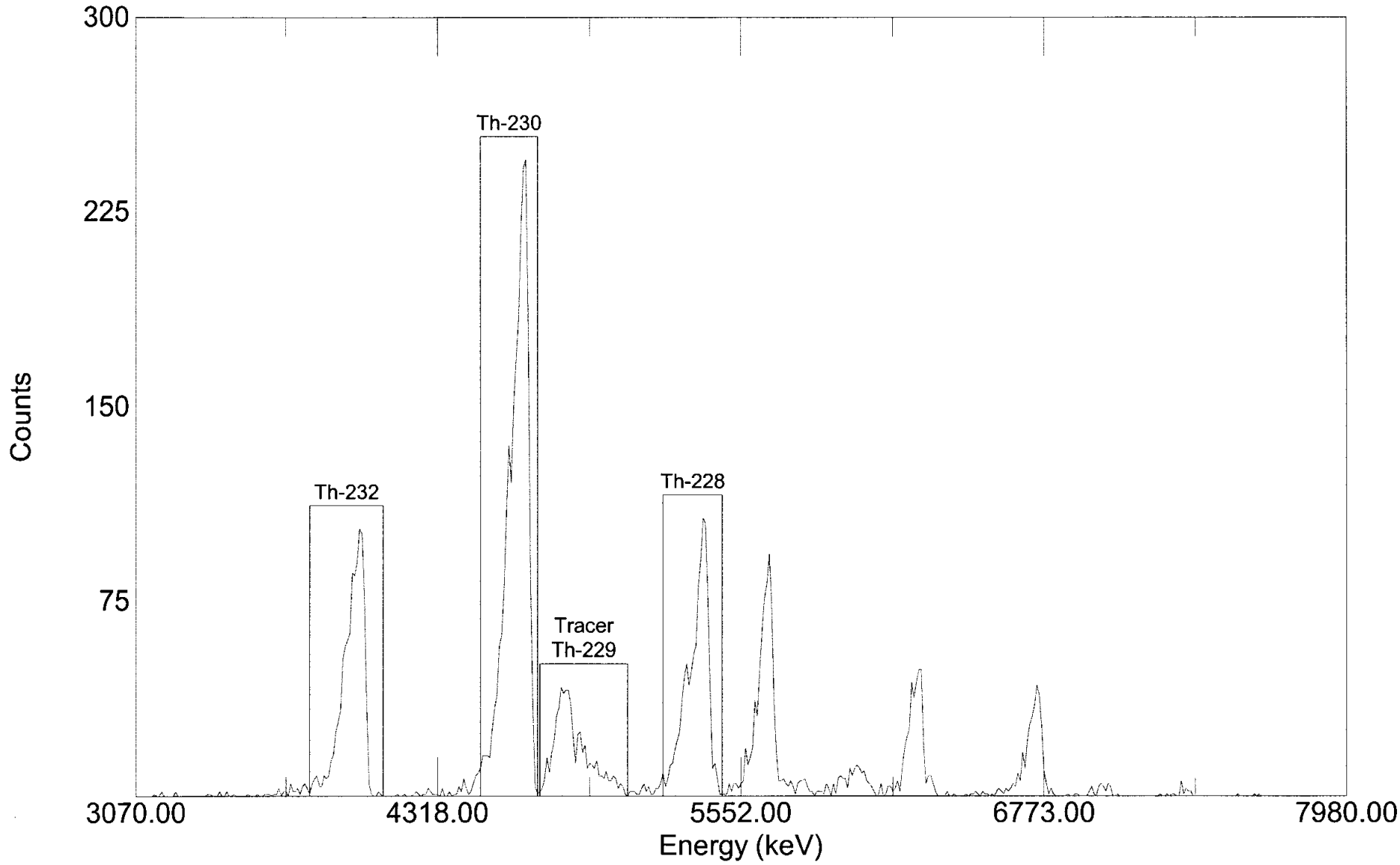
Totals

		% Total
Gross Count:	6,605.00	100.00
Net Area:	6,494.90	98.33
Background:	110.10	1.67
Composite Fit:	4,826.00	73.07
Residuals:	1,779.00	26.93

Analyzed By: Sm

Checked By: CD

T50977D AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 07:36:08 on 09-Jul-2004 Real Time: 18039.34 s. Live Time: 18000.00 s.
File: C:\User\Alpha\ALPHA\T50977D.SPC Detector: #61 MCB 8 Input 5
Sample: 0405097-7D TAS040629-10 Type: Thorium

000084

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:50:44 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-8 TAS040629-10
Analysis Type: Thorium

Detector: MCB 8 Input 6
Date/Time of Count: 7/9/04 7:36:37 AM

Sample Volume: 1.000 Total, 1.000 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **61.25%**
Real Time: 300.65 Minutes

Total Eff.: 18.34 %
Dead Time: 0.2 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 29.94%
Analysis: Relative Region-Of-Interest

Original: 3,060 + 9.7985 * Chn + -0.00042 * Chn **2.

Spectrum Calibration: 3,060 + 9.6893 * Chn + -0.00042 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T50978.SPC**
Background File: **C:\User\Alpha\ALPHA\B4070662.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	247.18	225	250	2.00	19.00	174.00	8.70	165.30	3.00
2	169.17	150	174	4.00	33.00	301.00	0.60	286.76	5.21
3	98.73	75	106	4.00	20.00	138.00	1.20	136.80	2.49
Tracer	185.66	175	212	8.00	44.00	551.00	0.90	550.10	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	18.97	1.353	n/a	15.68 %
2	Th-230	4687.70	38.19	2.348	n/a	11.86 %
3	Th-232	4013.00	38.43	1.120	n/a	16.84 %
Tracer	Th-229	4845.00	76.28	4.504	n/a	8.35 %

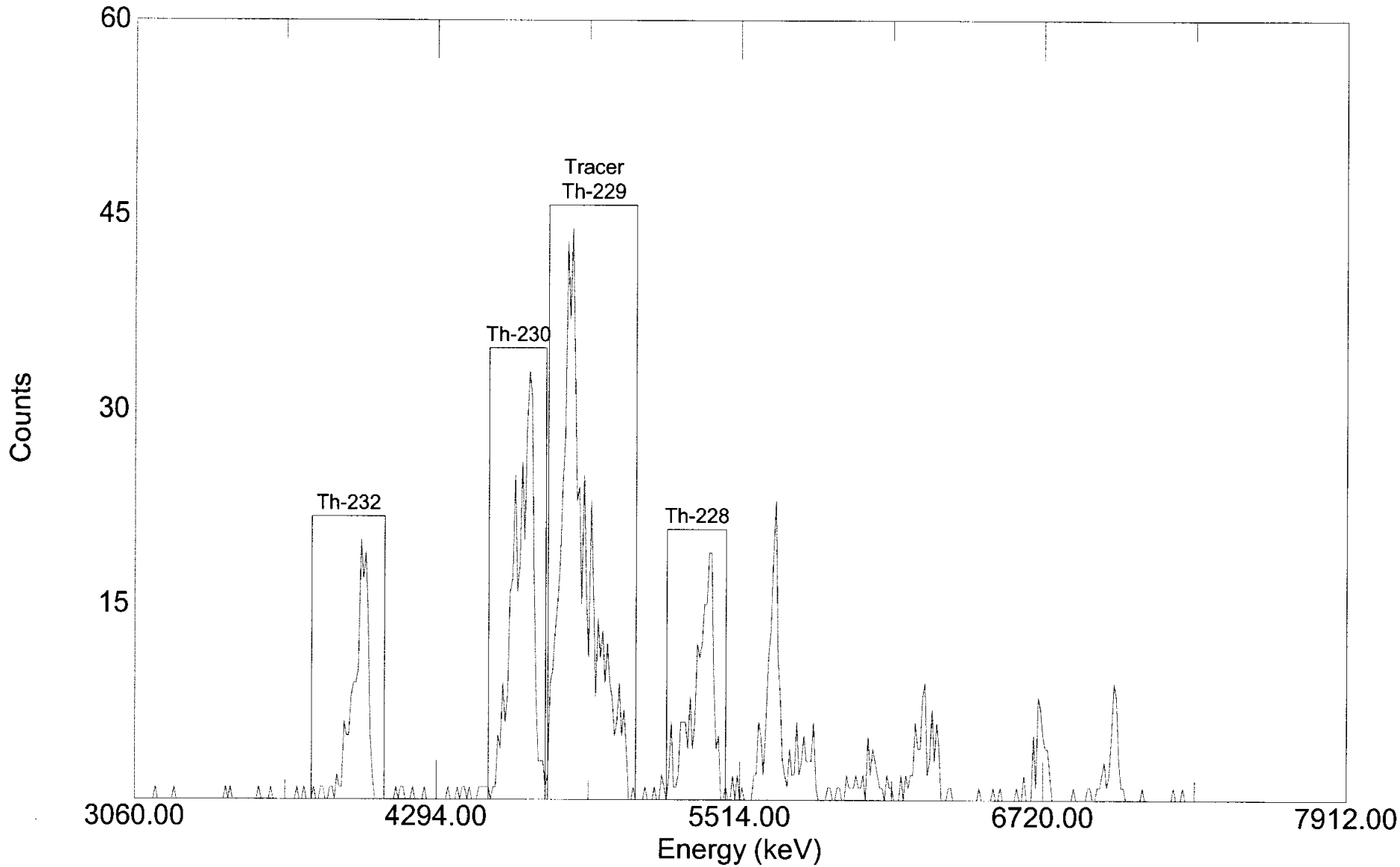
Totals

		% Total
Gross Count:	1,539.00	100.00
Net Area:	1,459.80	94.85
Background:	79.20	5.15
Composite Fit:	1,164.00	75.63
Residuals:	375.00	24.37

Analyzed By: Sm

Checked By: SD

T50978 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 07:36:37 on 09-Jul-2004
File: C:\User\Alpha\ALPHA\T50978.SPC
Sample: 0405097-8 TAS040629-10

Real Time: 18039.26 s. Live Time: 18000.00 s.
Detector: #62 MCB 8 Input 6
Type: Thorium

000089

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:52:31 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-9 TAS040629-10

Analysis Type: Thorium

Detector: MCB 8 Input 6

Date/Time of Count: 7/12/04 4:00:16 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **73.85%**

Real Time: 300.10 Minutes

Total Eff.: 22.65 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.67%

Analysis: Relative Region-Of-Interest

Original: 3,049 + 10.0054 * Chn + -0.00083 * Chn **2.

Spectrum Calibration: 3,049 + 9.9911 * Chn + -0.00083 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T50979.SPC**

Background File: **C:\User\Alpha\ALPHA\B4070662.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	243.21	224	248	2.00	54.00	389.00	8.70	380.30	5.60
2	166.29	146	169	2.00	43.00	379.00	0.30	361.85	5.33
3	97.25	73	104	4.00	56.00	433.00	1.20	431.80	6.35
Tracer	182.51	170	208	10.00	50.00	680.00	0.60	679.40	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.17	2.521	n/a	10.18 %
2	Th-230	4687.70	19.43	2.399	n/a	10.55 %
3	Th-232	4013.00	39.32	2.862	n/a	9.45 %
Tracer	Th-229	4845.00	96.88	4.504	n/a	7.52 %

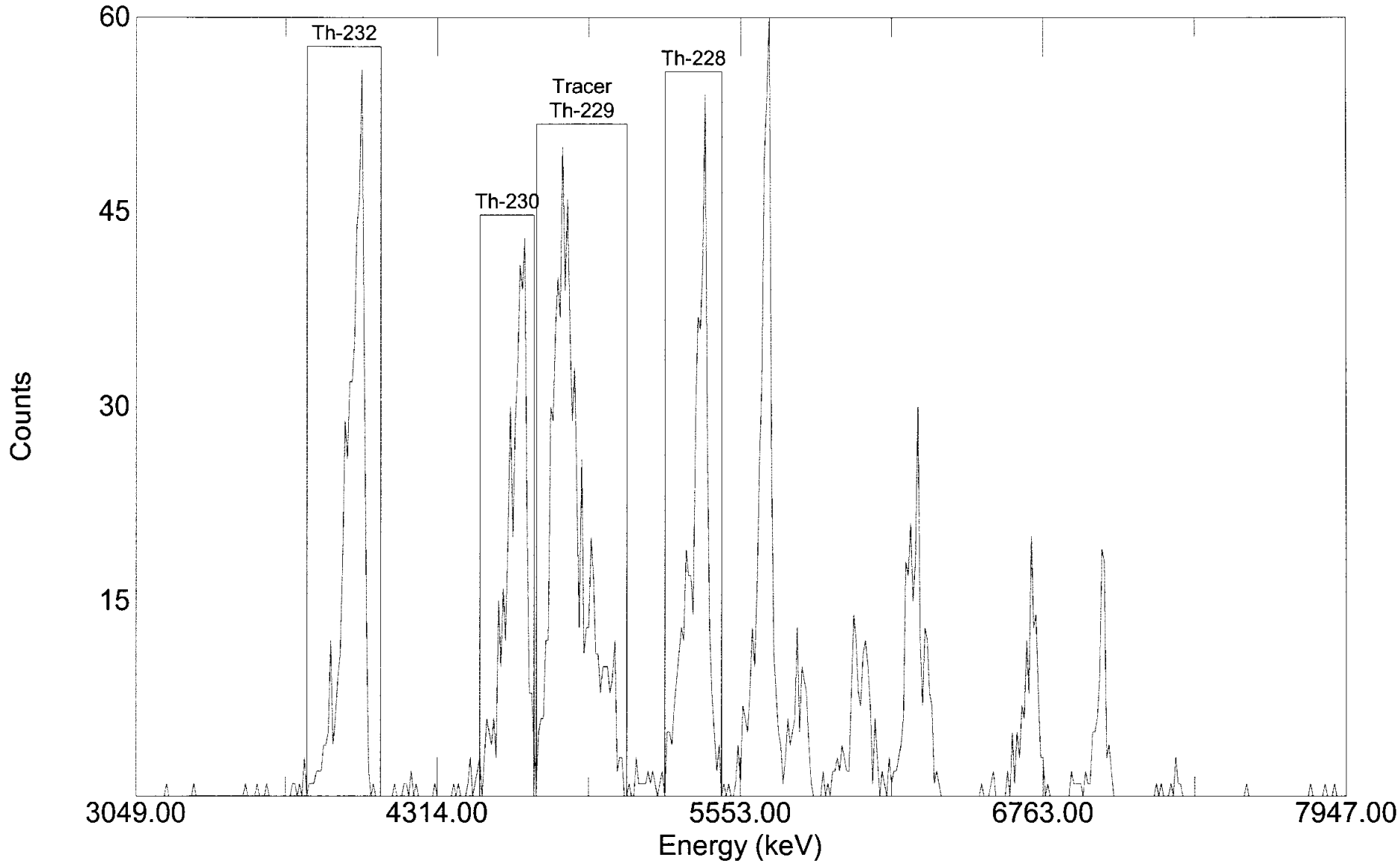
Totals

		% Total
Gross Count:	2,883.00	100.00
Net Area:	2,803.80	97.25
Background:	79.20	2.75
Composite Fit:	1,881.00	65.24
Residuals:	1,002.00	34.76

Analyzed By: Sm

Checked By: SD

T50979 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 16:00:16 on 12-Jul-2004
File: C:\User\Alpha\ALPHA\T50979.SPC
Sample: 0405097-9 TAS040629-10

Real Time: 18006.14 s. Live Time: 18000.00 s.
Detector: #62 MCB 8 Input 6
Type: Thorium

000033

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/9/04 6:52:23 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-10 TAS040629-10
Analysis Type: Thorium

Detector: MCB 3 Input 3
Date/Time of Count: 7/9/04 1:51:46 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **70.64%**
Real Time: 300.06 Minutes

Total Eff.: 20.80 %
Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 29.44%
Analysis: Relative Region-Of-Interest

Original: 3,020 + 10.1420 * Chn + -0.00094 * Chn **2.

Spectrum Calibration: 3,020 + 10.0758 * Chn + -0.00094 * Chn **2.

Cal File:

Spectrum File: **C:\USER\ALPHA\ALPHA\T509710.SPC**
Background File: **C:\USER\ALPHA\BKGND\B4070619.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	244.78	223	248	2.00	26.00	212.00	9.00	203.00	3.25
2	168.15	146	169	4.00	24.00	187.00	0.60	170.93	2.74
3	99.47	75	106	6.00	23.00	223.00	0.60	222.40	3.56
Tracer	184.29	170	209	10.00	45.00	625.00	1.20	623.80	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.23	1.466	n/a	14.08 %
2	Th-230	4687.70	39.03	1.234	n/a	15.68 %
3	Th-232	4013.00	59.33	1.606	n/a	13.16 %
Tracer	Th-229	4845.00	97.28	4.504	n/a	7.84 %

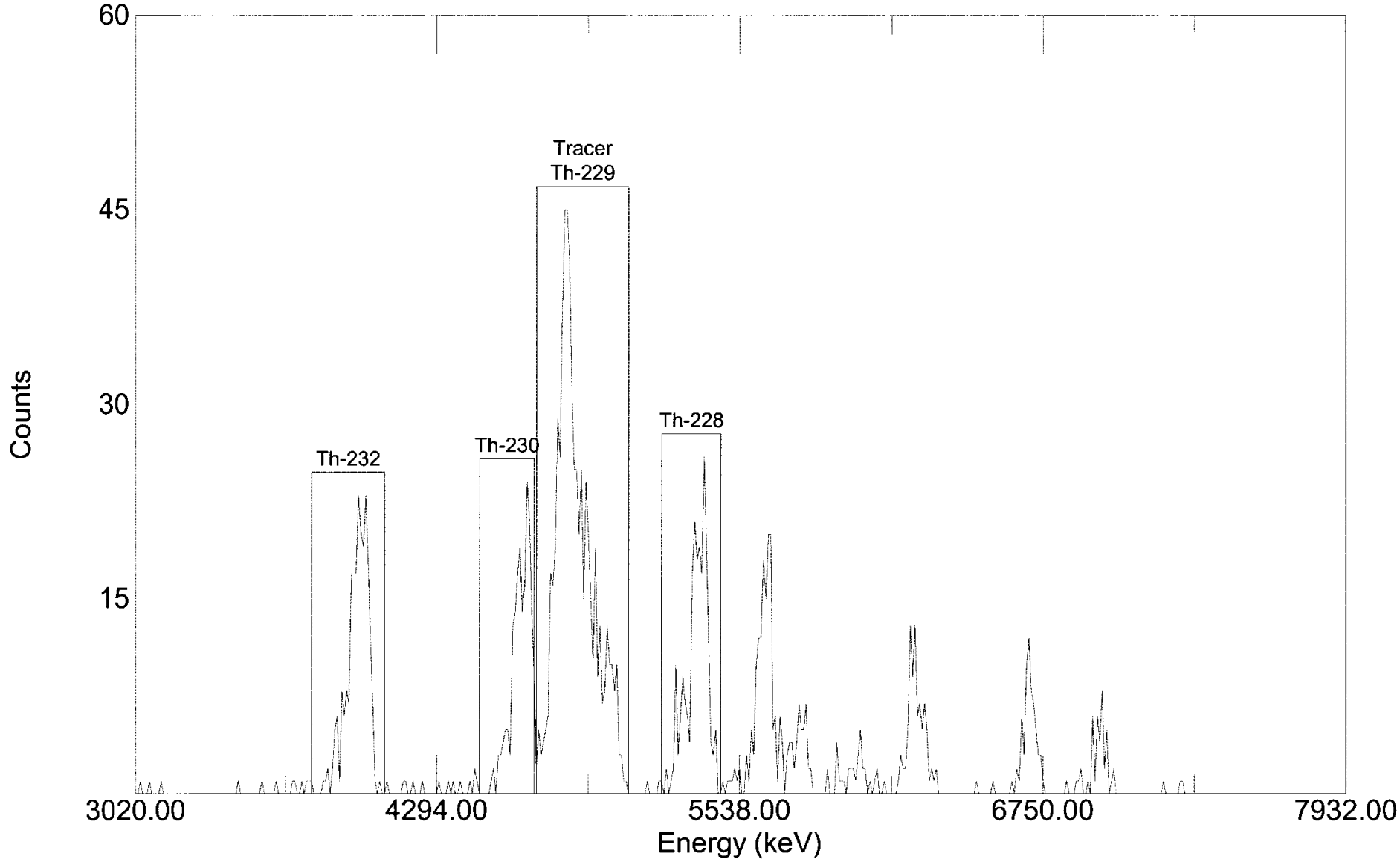
Totals

		% Total
Gross Count:	1,693.00	100.00
Net Area:	1,619.80	95.68
Background:	73.20	4.32
Composite Fit:	1,247.00	73.66
Residuals:	446.00	26.34

Analyzed By: Sm

Checked By: SD

T509710 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:51:46 on 09-Jul-2004 Real Time: 18003.70 s. Live Time: 18000.00 s.
File: C:\USER\ALPHA\ALPHA\T509710.SPC Detector: #19 MCB 3 Input 3
Sample: 0405097-10 TAS040629-10 Type: Thorium

000093

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:56:13 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-11 TAS040629-10

Analysis Type: Thorium

Detector: MCB 3 Input 5

Date/Time of Count: 7/9/04 1:52:13 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **75.47%**

Real Time: 300.06 Minutes

Total Eff.: 21.76 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 28.83%

Analysis: Relative Region-Of-Interest

Original: 2,987 + 10.4577 * Chn + -0.00180 * Chn **2.

Spectrum Calibration: 2,987 + 10.6328 * Chn + -0.00180 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509711.SPC**

Background File: **C:\User\Alpha\ALPHA\B4070621.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	239.43	222	247	2.00	25.00	278.00	18.00	260.00	3.98
2	164.49	142	165	4.00	17.00	175.00	1.50	157.32	2.41
3	98.09	73	102	2.00	19.00	195.00	1.20	193.80	2.97
Tracer	180.20	166	206	8.00	48.00	655.00	2.40	652.60	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.54	1.794	n/a	12.61 %
2	Th-230	4687.70	40.16	1.086	n/a	16.49 %
3	Th-232	4013.00	20.56	1.337	n/a	14.13 %
Tracer	Th-229	4845.00	79.87	4.504	n/a	7.66 %

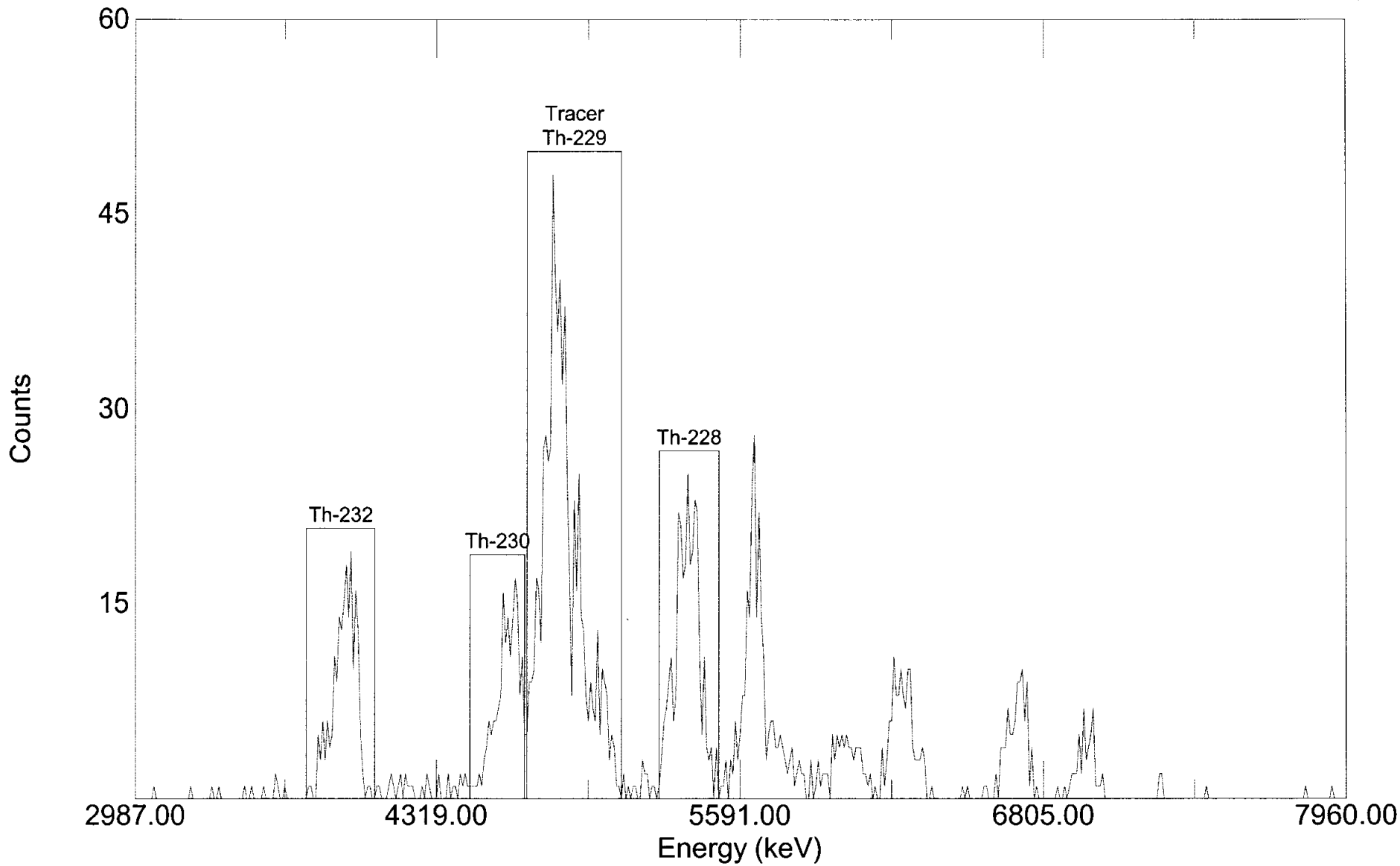
Totals

		% Total
Gross Count:	1,933.00	100.00
Net Area:	1,815.10	93.90
Background:	117.90	6.10
Composite Fit:	1,303.00	67.41
Residuals:	630.00	32.59

Analyzed By: Sm

Checked By: SD

T509711 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:52:13 on 09-Jul-2004 Real Time: 18003.70 s. Live Time: 18000.00 s.
File: C:\User\Alpha\ALPHA\T509711.SPC Detector: #21 MCB 3 Input 5
Sample: 0405097-11 TAS040629-10 Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/9/04 6:53:04 PM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-12 TAS040629-10

Analysis Type: Thorium

Detector: MCB 3 Input 6

Date/Time of Count: 7/9/04 1:52:35 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **70.86%**

Real Time: 300.06 Minutes

Total Eff.: 20.39 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 28.78%

Analysis: Relative Region-Of-Interest

Original: 3,020 + 10.1601 * Chn + -0.00097 * Chn **2.

Spectrum Calibration: 3,020 + 10.1594 * Chn + -0.00097 * Chn **2.

Cal File:

Spectrum File: **C:\USER\ALPHA\ALPHA\T509712.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070622.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	242.85	221	246	2.00	52.00	422.00	6.60	415.40	6.79
2	166.81	145	168	4.00	42.00	321.00	0.60	305.23	4.99
3	98.67	75	106	2.00	37.00	364.00	0.60	363.40	5.94
Tracer	182.83	169	208	10.00	50.00	612.00	0.30	611.70	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.38	3.059	n/a	9.70 %
2	Th-230	4687.70	39.34	2.247	n/a	11.51 %
3	Th-232	4013.00	19.94	2.676	n/a	10.29 %
Tracer	Th-229	4845.00	98.05	4.504	n/a	7.92 %

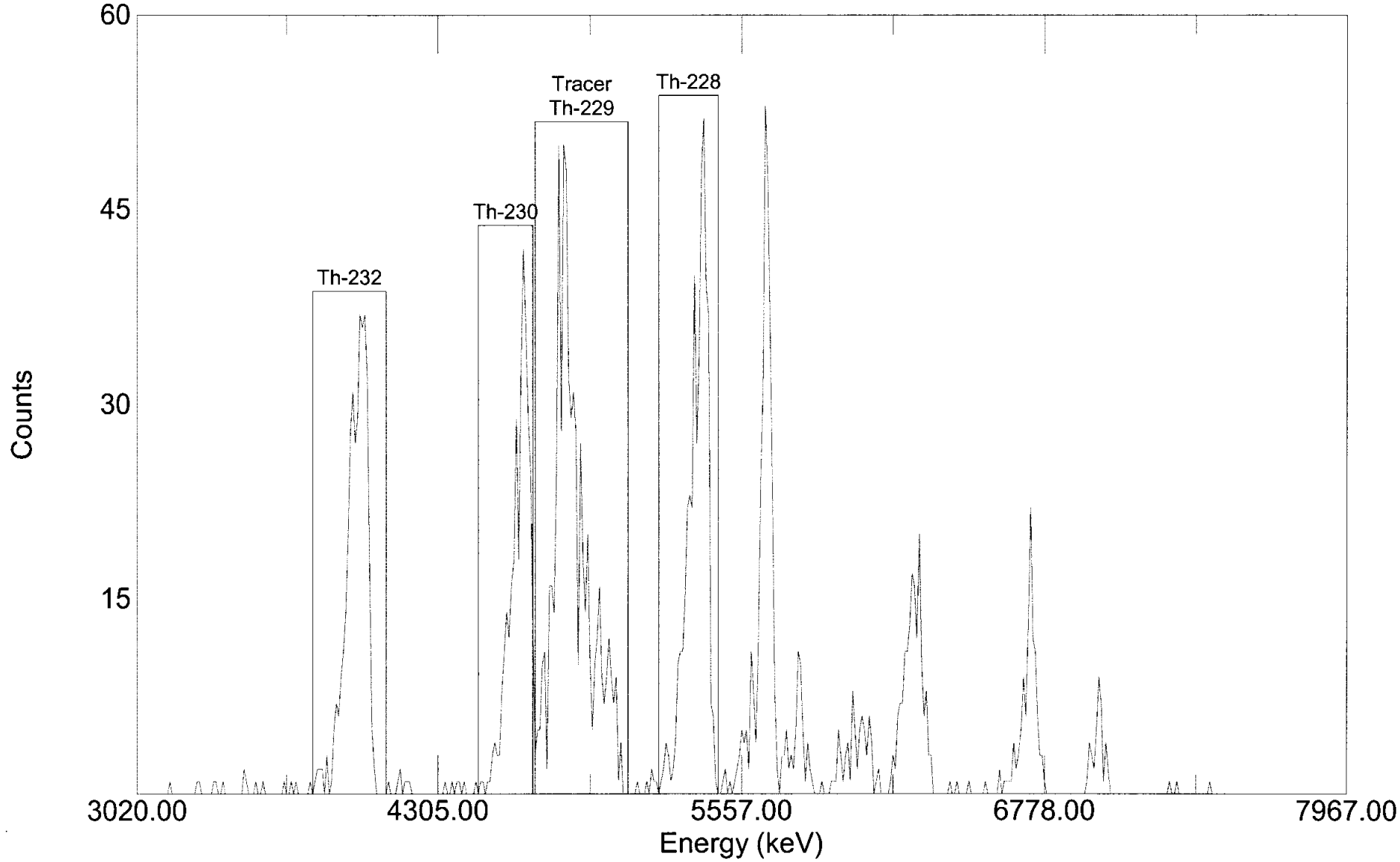
Totals

		% Total
Gross Count:	2,467.00	100.00
Net Area:	2,382.70	96.58
Background:	84.30	3.42
Composite Fit:	1,719.00	69.68
Residuals:	748.00	30.32

Analyzed By: Sm

Checked By: SD

T509712 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:52:35 on 09-Jul-2004 Real Time: 18003.72 s. Live Time: 18000.00 s.
File: C:\USER\ALPHA\ALPHA\T509712.SPC Detector: #22 MCB 3 Input 6
Sample: 0405097-12 TAS040629-10 Type: Thorium

000094

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/9/04 6:53:17 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-13 TAS040629-10

Analysis Type: Thorium

Detector: MCB 3 Input 7

Date/Time of Count: 7/9/04 1:52:58 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **72.31%**

Real Time: 300.06 Minutes

Total Eff.: 20.65 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 28.56%

Analysis: Relative Region-Of-Interest

Original: 3,016 + 10.0990 * Chn + -0.00081 * Chn **2.

Spectrum Calibration: 3,016 + 10.0492 * Chn + -0.00081 * Chn **2.

Cal File:

Spectrum File: **C:\USER\ALPHA\ALPHA\T509713.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070823.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	245.09	223	248	2.00	36.00	290.00	11.70	278.30	4.49
2	168.68	147	170	2.00	42.00	333.00	0.60	317.04	5.12
3	100.06	76	107	2.00	42.00	323.00	2.40	320.60	5.17
Tracer	184.79	171	210	8.00	48.00	621.00	1.50	619.50	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.31	2.023	n/a	12.02 %
2	Th-230	4687.70	19.55	2.305	n/a	11.28 %
3	Th-232	4013.00	19.78	2.331	n/a	10.99 %
Tracer	Th-229	4845.00	78.01	4.504	n/a	7.87 %

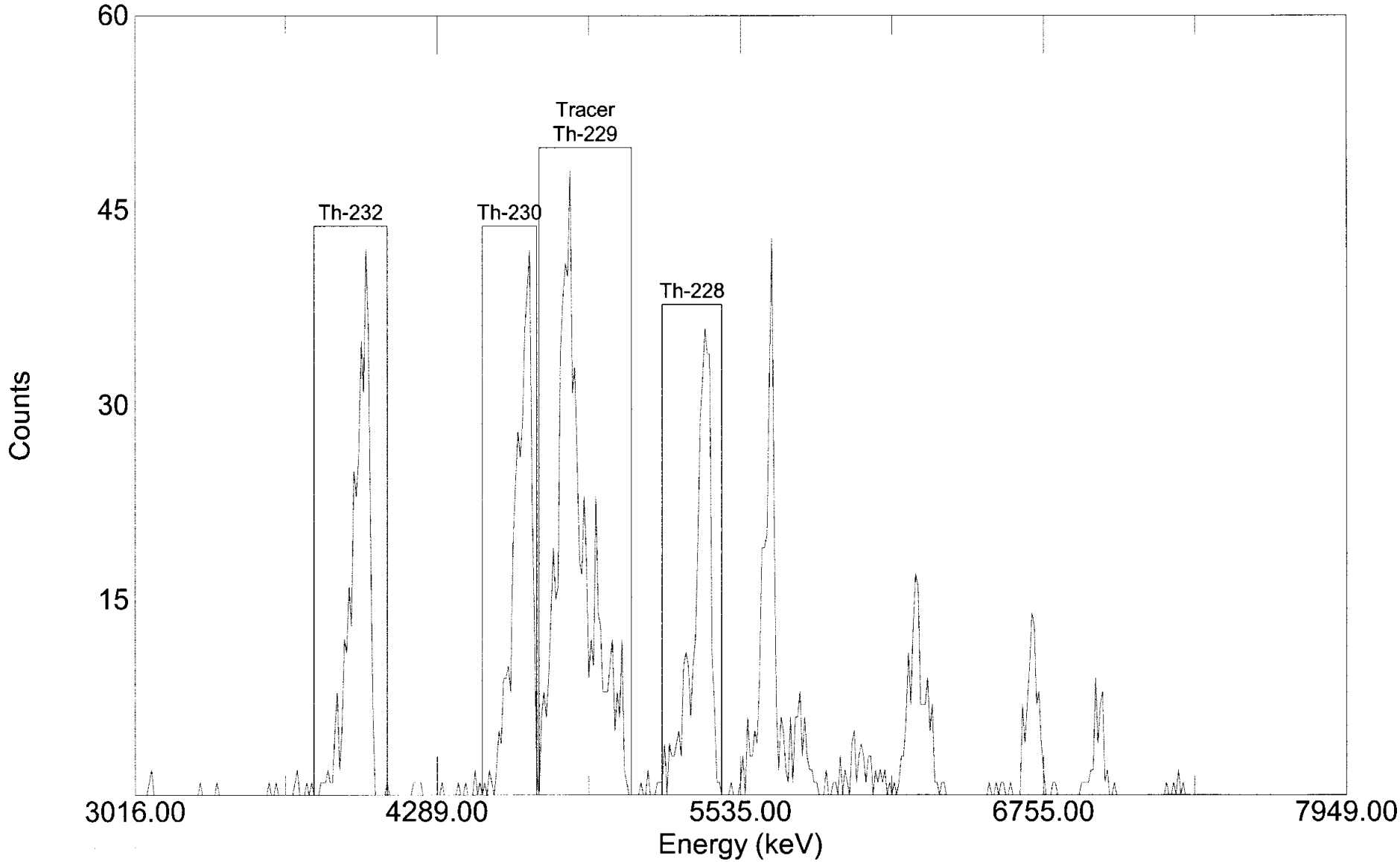
Totals

		% Total
Gross Count:	2,150.00	100.00
Net Area:	2,053.70	95.52
Background:	96.30	4.48
Composite Fit:	1,567.00	72.88
Residuals:	583.00	27.12

Analyzed By: Sm

Checked By: GD

T509713 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:52:58 on 09-Jul-2004 Real Time: 18003.70 s. Live Time: 18000.00 s.
File: C:\USER\ALPHA\ALPHA\T509713.SPC Detector: #23 MCB 3 Input 7
Sample: 0405097-13 TAS040629-10 Type: Thorium

000096

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 12:58:17 PM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-14 TAS040629-10

Analysis Type: Thorium

Detector: MCB 3 Input 8

Date/Time of Count: 7/9/04 1:53:18 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **65.99%**

Real Time: 300.06 Minutes

Total Eff.: 21.35 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 32.35%

Analysis: Relative Region-Of-Interest

Original: 3,053 + 9.8648 * Chn + -0.00034 * Chn **2.

Spectrum Calibration: 3,053 + 9.7846 * Chn + -0.00034 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509714.SPC**

Background File: **C:\User\Alpha\ALPHA\B4070824.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	245.07	223	248	2.00	16.00	120.00	21.30	98.70	1.54
2	168.09	146	170	2.00	15.00	128.00	3.00	109.12	1.70
3	98.49	74	105	6.00	11.00	93.00	1.80	91.20	1.42
Tracer	184.37	171	209	10.00	46.00	646.00	5.70	640.30	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.23	0.694	n/a	21.93 %
2	Th-230	4687.70	19.34	0.768	n/a	20.34 %
3	Th-232	4013.00	58.30	0.641	n/a	20.74 %
Tracer	Th-229	4845.00	96.59	4.504	n/a	7.71 %

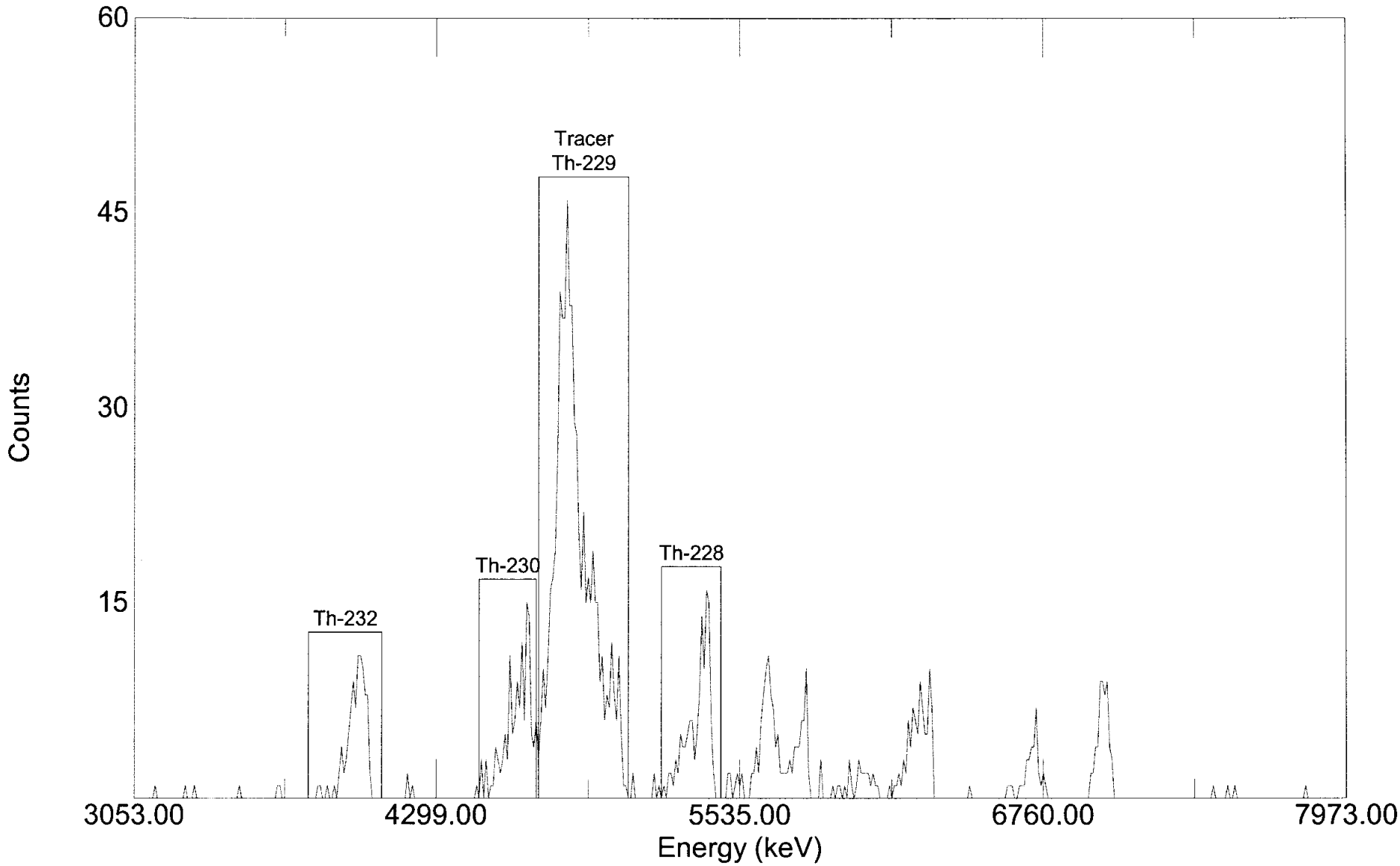
Totals

		% Total
Gross Count:	1,332.00	100.00
Net Area:	1,218.00	91.44
Background:	114.00	8.56
Composite Fit:	987.00	74.10
Residuals:	345.00	25.90

Analyzed By: Sm

Checked By: SD

T509714 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:53:18 on 09-Jul-2004 Real Time: 18003.70 s. Live Time: 18000.00 s.
File: C:\User\Alpha\ALPHA\T509714.SPC Detector: #24 MCB 3 Input 8
Sample: 0405097-14 TAS040629-10 Type: Thorium

000098

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 1:01:00 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-15 TAS040629-10
Analysis Type: Thorium

Detector: MCB 6 Input 2
Date/Time of Count: 7/9/04 1:53:47 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **66.34%**
Real Time: 302.16 Minutes

Total Eff.: 20.96 %
Dead Time: 0.7 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 31.60%
Analysis: Relative Region-Of-Interest

Original: 2,973 + 10.4170 * Chn + -0.00120 * Chn **2.

Spectrum Calibration: 2,973 + 10.2869 * Chn + -0.00120 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509715.SPC**
Background File: **C:\User\Alpha\ALPHA\B4070642.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	245.89	224	249	2.00	16.00	119.00	8.10	110.90	1.76
2	170.05	151	173	4.00	18.00	137.00	0.00	121.41	1.93
3	102.31	76	107	2.00	21.00	132.00	0.30	131.70	2.09
Tracer	186.00	174	211	6.00	55.00	630.00	1.20	628.80	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.39	0.794	n/a	19.34 %
2	Th-230	4687.70	39.51	0.870	n/a	18.90 %
3	Th-232	4013.00	20.08	0.943	n/a	17.10 %
Tracer	Th-229	4845.00	59.04	4.504	n/a	7.81 %

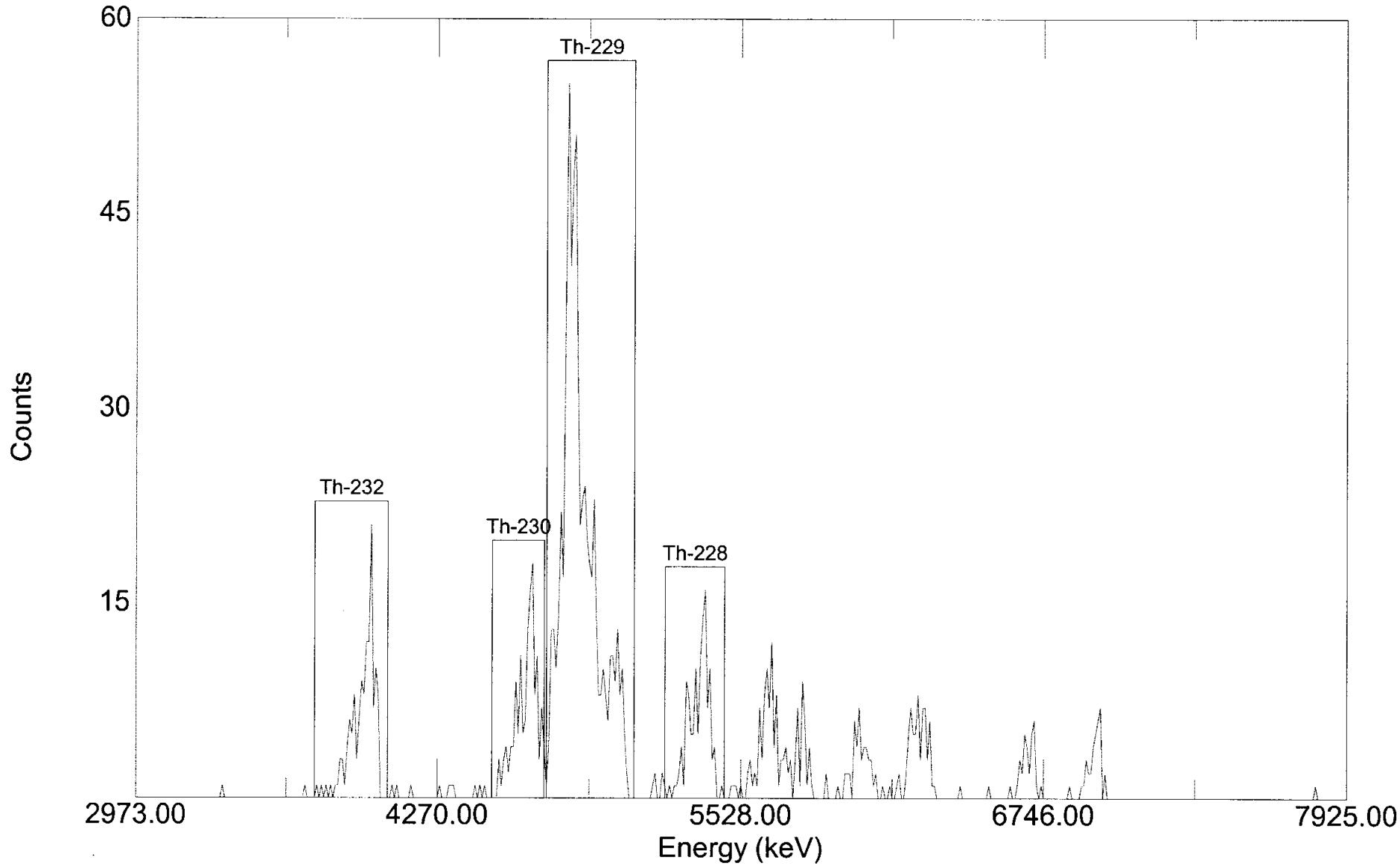
Totals

		% Total
Gross Count:	1,334.00	100.00
Net Area:	1,253.00	93.93
Background:	81.00	6.07
Composite Fit:	1,018.00	76.31
Residuals:	316.00	23.69

Analyzed By: Sm

Checked By: SD

T509715 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:53:47 on 09-Jul-2004
File: C:\User\Alpha\ALPHA\T509715.SPC
Sample: 0405097-15 TAS040629-10

Real Time: 18129.76 s. Live Time: 18000.00 s.
Detector: #42 MCB 6 Input 2
Type: Thorium

001100

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/9/04 6:56:30 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-16 TAS040629-10
Analysis Type: Thorium

Detector: MCB 6 Input 3
Date/Time of Count: 7/9/04 1:54:12 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **69.05%**
Real Time: 302.16 Minutes

Total Eff.: 21.01 %
Dead Time: 0.7 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 30.43%
Analysis: Relative Region-Of-Interest

Original: 3,033 + 9.8447 * Chn + 0.00003 * Chn **2.

Spectrum Calibration: 3,033 + 9.8235 * Chn + 0.00003 * Chn **2.

Cal File:

Spectrum File: **C:\USER\ALPHA\ALPHA\T509716.SPC**
Background File: **C:\USER\ALPHA\BKGND\B4070643.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	243.81	222	247	2.00	12.00	98.00	10.20	87.80	1.39
2	168.35	146	169	6.00	11.00	98.00	0.30	82.07	1.30
3	99.72	76	107	2.00	16.00	110.00	1.80	108.20	1.72
Tracer	184.34	170	209	10.00	48.00	633.00	2.70	630.30	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.68	0.627	n/a	22.20 %
2	Th-230	4687.70	59.01	0.586	n/a	23.65 %
3	Th-232	4013.00	19.66	0.773	n/a	19.01 %
Tracer	Th-229	4845.00	98.36	4.504	n/a	7.79 %

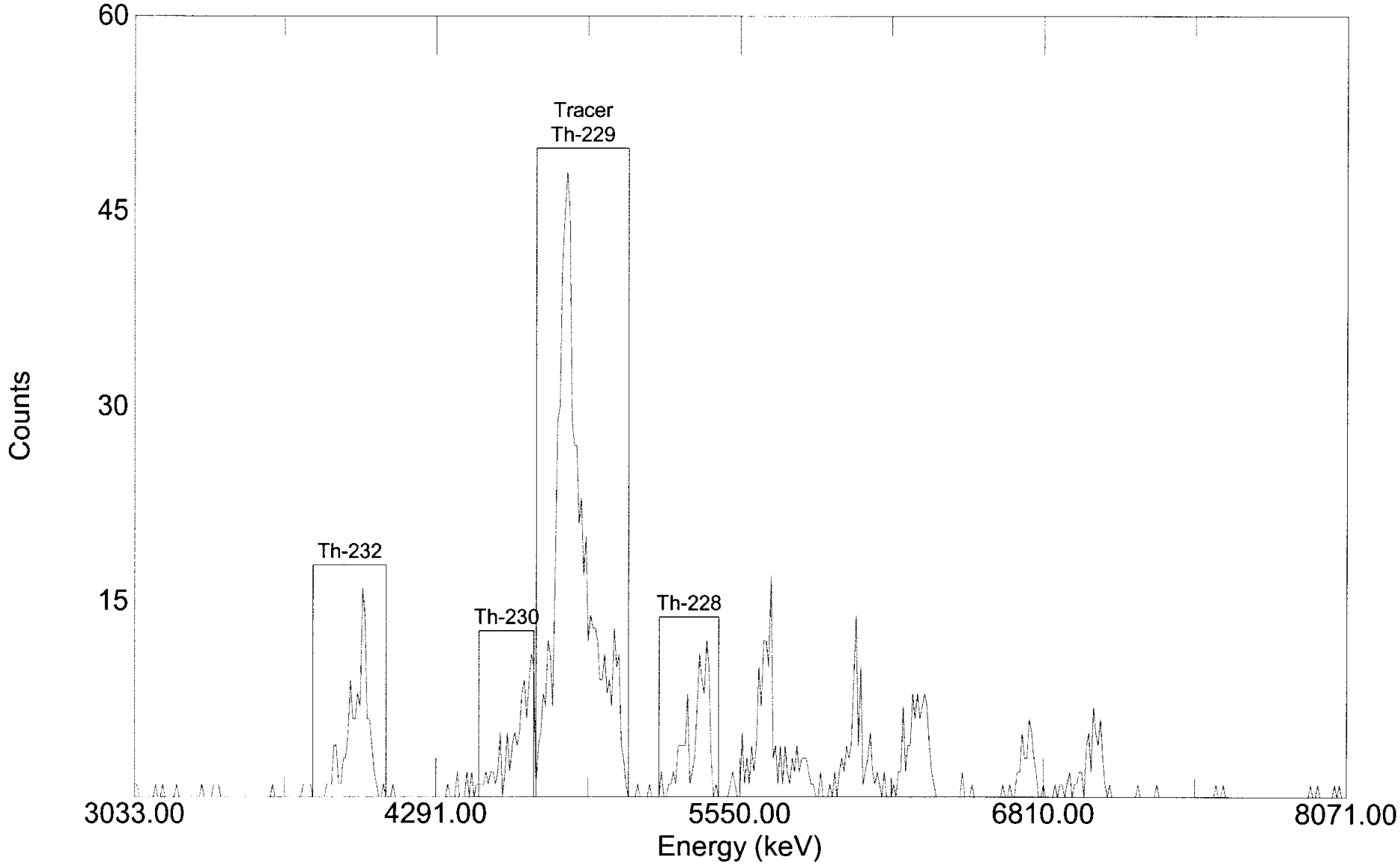
Totals

		% Total
Gross Count:	1,353.00	100.00
Net Area:	1,266.60	93.61
Background:	86.40	6.39
Composite Fit:	939.00	69.40
Residuals:	414.00	30.60

Analyzed By: Sm

Checked By: GD

T509716 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:54:12 on 09-Jul-2004 Real Time: 18129.82 s. Live Time: 18000.00 s.
File: C:\USER\ALPHA\ALPHA\T509716.SPC Detector: #43 MCB 6 Input 3
Sample: 0405097-16 TAS040629-10 Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 1:03:41 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-16D TAS040629-10

Analysis Type: Thorium

Detector: MCB 6 Input 4

Date/Time of Count: 7/9/04 1:54:36 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **71.08%**

Real Time: 302.16 Minutes

Total Eff.: 21.90 %

Dead Time: 0.7 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.81%

Analysis: Relative Region-Of-Interest

Original: 3,015 + 10.0739 * Chn + -0.00055 * Chn **2.

Spectrum Calibration: 3,015 + 10.0135 * Chn + -0.00055 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509716D.SPC**

Background File: **C:\User\Alpha\ALPHA\B4070644.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	244.45	222	247	2.00	18.00	127.00	21.60	105.40	1.60
2	168.61	145	168	2.00	18.00	97.00	1.80	78.91	1.20
3	100.23	76	107	6.00	11.00	96.00	0.30	95.70	1.46
Tracer	184.63	169	210	6.00	50.00	659.00	2.10	656.90	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.49	0.723	n/a	21.12 %
2	Th-230	4687.70	19.66	0.541	n/a	24.48 %
3	Th-232	4013.00	59.43	0.656	n/a	20.07 %
Tracer	Th-229	4845.00	58.87	4.504	n/a	7.64 %

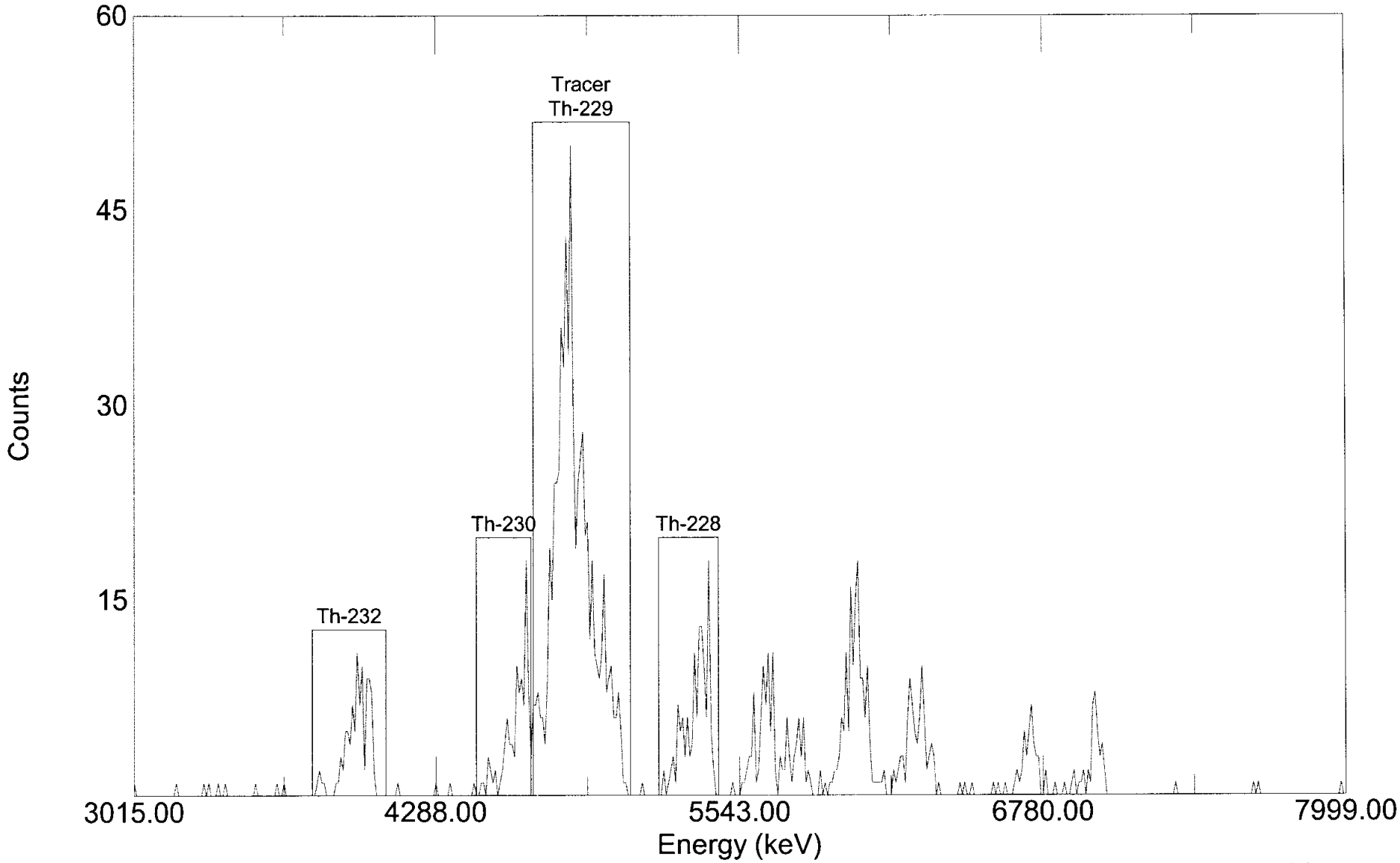
Totals

		% Total
Gross Count:	1,420.00	100.00
Net Area:	1,292.80	91.04
Background:	127.20	8.96
Composite Fit:	979.00	68.94
Residuals:	441.00	31.06

Analyzed By: Sm

Checked By: SD

T509716D AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:54:36 on 09-Jul-2004 Real Time: 18129.88 s. Live Time: 18000.00 s.
File: C:\User\Alpha\ALPHA\T509716D.SPC Detector: #44 MCB 6 Input 4
Sample: 0405097-16D TAS040629-10 Type: Thorium

000104

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:18:34 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-17 TAS040629-8

Analysis Type: Thorium

Detector: MCB 6 Input 5

Date/Time of Count: 7/7/04 10:17:51 AM

Sample Volume: 0.020 Total, 0.020 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **78.25%**

Real Time: 300.26 Minutes

Total Eff.: 24.52 %

Dead Time: 0.1 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 31.34%

Analysis: Relative Region-Of-Interest

Original: 3,004 + 10.1373 * Chn + -0.00072 * Chn **2.

Spectrum Calibration: 3,004 + 10.0881 * Chn + -0.00072 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509717.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070645.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	244.72	221	249	2.00	56.00	589.00	20.40	568.60	7.73
2	168.91	146	171	4.00	87.00	1,033.00	3.30	1011.46	13.75
3	100.72	76	108	2.00	52.00	511.00	2.10	508.90	6.92
Tracer	184.90	172	210	14.00	53.00	738.00	2.40	735.60	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.47	174.067	n/a	8.38 %
2	Th-230	4687.70	39.38	309.640	n/a	6.23 %
3	Th-232	4013.00	19.89	155.791	n/a	8.71 %
Tracer	Th-229	4845.00	137.52	225.191	n/a	7.21 %

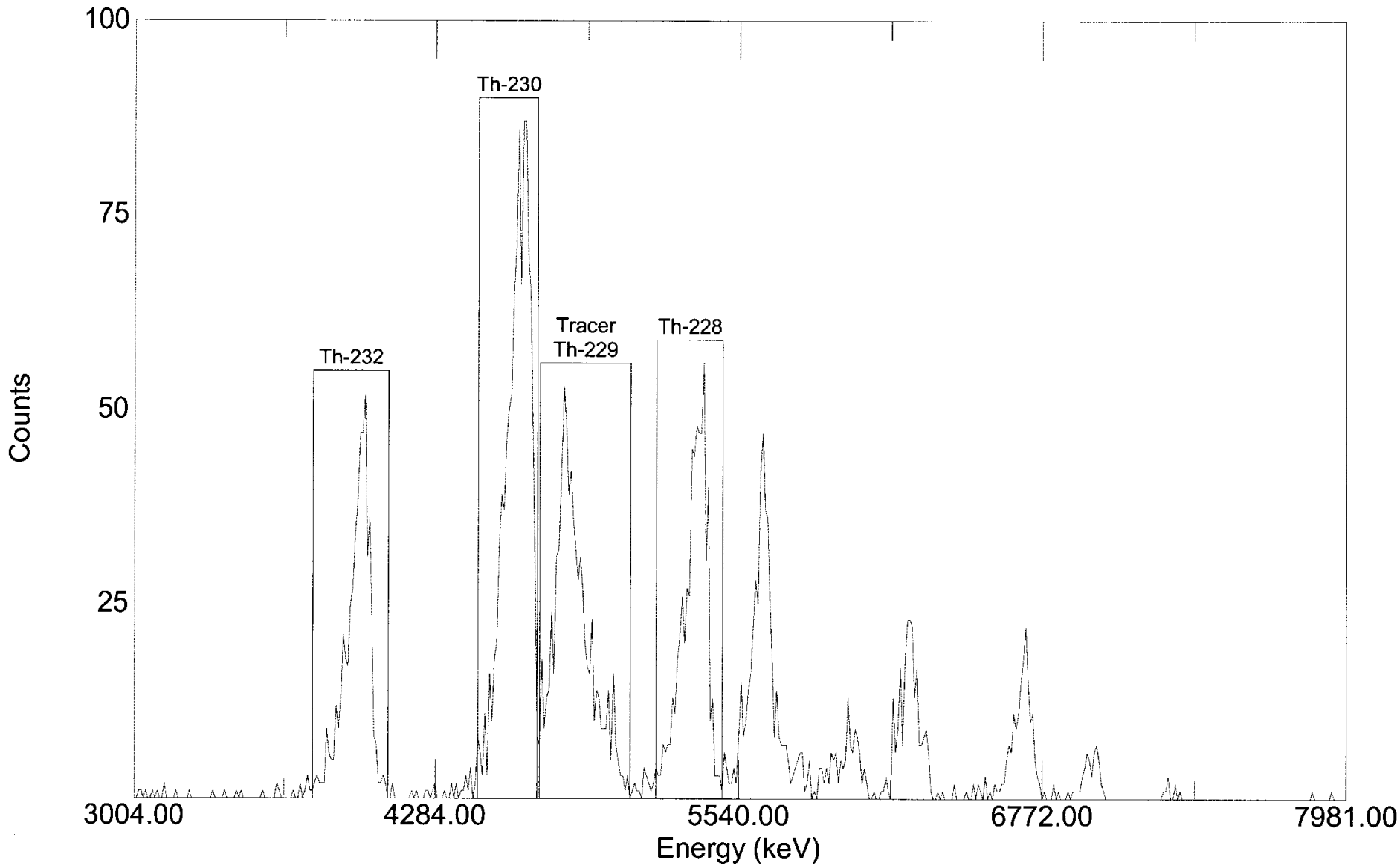
Totals

		% Total
Gross Count:	3,953.00	100.00
Net Area:	3,830.90	96.91
Background:	122.10	3.09
Composite Fit:	2,871.00	72.63
Residuals:	1,082.00	27.37

Analyzed By: _____

Checked By: _____

T509717 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:17:51 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T509717.SPC
Sample: 0405097-17 TAS040629-8

Real Time: 18015.78 s. Live Time: 18000.00 s.
Detector: #45 MCB 6 Input 5
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/20/04 7:04:33 AM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-18 TAS040715-1
Analysis Type: Thorium

Detector: MCB 2 Input 3
Date/Time of Count: 7/17/04 11:34:02 AM

Sample Volume: 0.100 Total, 0.100 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **80.37%**
Real Time: 300.02 Minutes

Total Eff.: 23.34 %
Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 29.04%
Analysis: Relative Region-Of-Interest

Original: 3,010 + 9.9861 * Chn + -0.00048 * Chn **2.

Spectrum Calibration: 3,010 + 9.9784 * Chn + -0.00048 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TX509718.SPC**
Background File: **C:\USER\ALPHA\BKGND\B4071011.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	245.38	223	248	2.00	126.00	941.00	5.10	935.90	13.37
2	169.49	147	172	4.00	151.00	1,205.00	1.20	1186.44	16.94
3	100.99	78	108	4.00	125.00	977.00	0.30	976.70	13.95
Tracer	185.53	173	209	6.00	55.00	701.00	0.90	700.10	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.49	60.208	n/a	6.43 %
2	Th-230	4687.70	39.27	76.325	n/a	5.73 %
3	Th-232	4013.00	39.53	62.832	n/a	6.27 %
Tracer	Th-229	4845.00	58.81	45.038	n/a	7.40 %

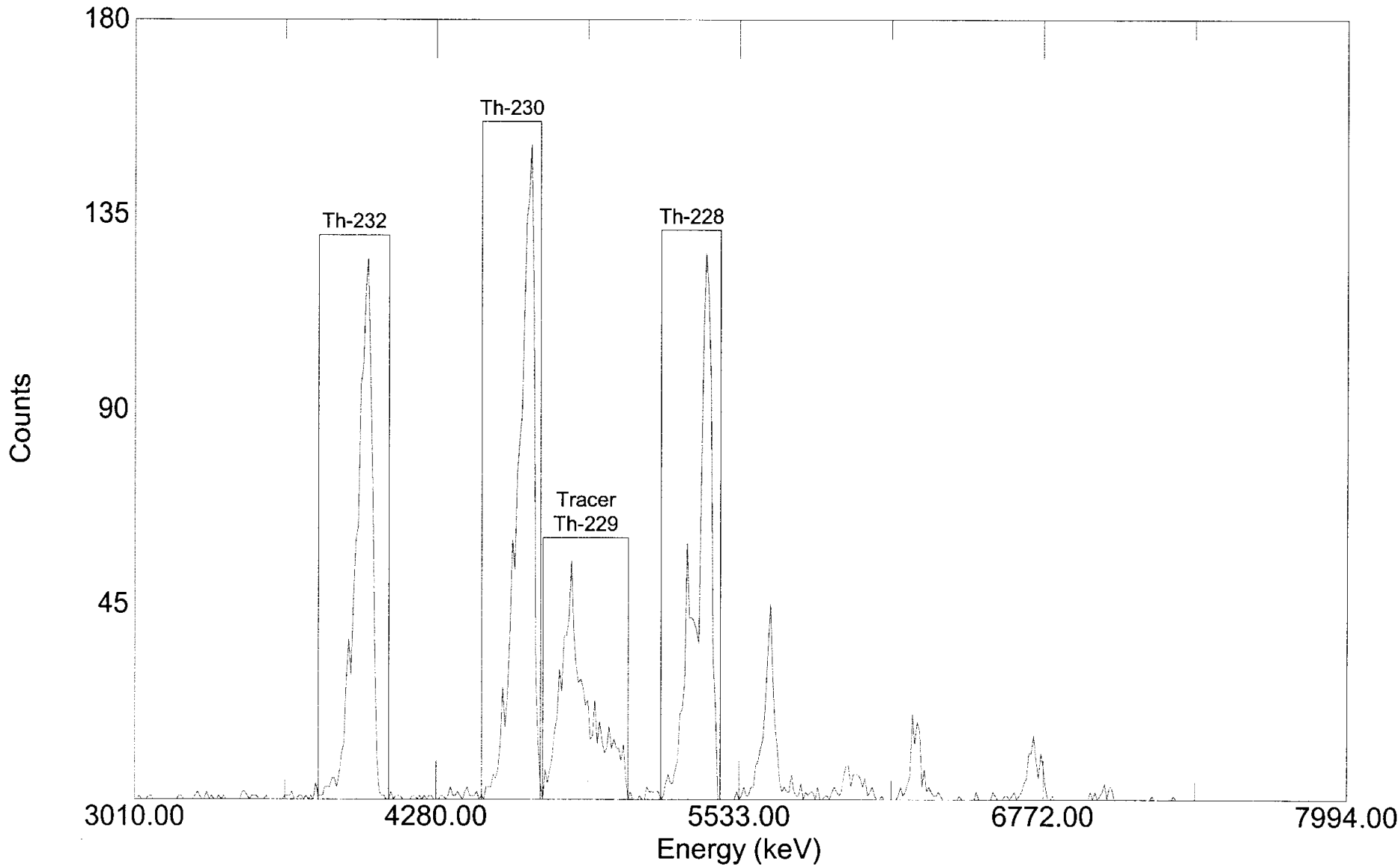
Totals

		% Total
Gross Count:	4,461.00	100.00
Net Area:	4,403.70	98.72
Background:	57.30	1.28
Composite Fit:	3,824.00	85.72
Residuals:	637.00	14.28

Analyzed By: SD

Checked By: Sm

TX509718 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 11:34:02 on 17-Jul-2004 Real Time: 18001.24 s. Live Time: 18000.00 s.
File: C:\User\Alpha\ALPHA\TX509718.SPC Detector: #11 MCB 2 Input 3
Sample: 0405097-18 TAS040715-1 Type: Thorium

000108

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/20/04 7:07:48 AM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-18D TAS040715-1
Analysis Type: Thorium

Detector: MCB 2 Input 4
Date/Time of Count: 7/17/04 11:34:18 AM

Sample Volume: 0.100 Total, 0.100 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **77.07%**
Real Time: 300.02 Minutes

Total Eff.: 22.30 %
Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 28.94%
Analysis: Relative Region-Of-Interest

Original: 3,035 + 9.8891 * Chn + -0.00036 * Chn **2.

Spectrum Calibration: 3,035 + 9.7769 * Chn + -0.00036 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TX509718D.SPC**
Background File: **C:\USER\ALPHA\BKGND\B4071012.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	247.20	222	252	2.00	88.00	816.00	18.60	797.40	11.92
2	170.11	140	172	2.00	104.00	1,085.00	1.80	1066.61	15.94
3	100.41	75	106	4.00	78.00	727.00	0.90	726.10	10.85
Tracer	186.41	173	211	6.00	51.00	672.00	3.00	669.00	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.20	53.682	n/a	7.03 %
2	Th-230	4687.70	19.31	71.806	n/a	6.05 %
3	Th-232	4013.00	38.82	48.882	n/a	7.28 %
Tracer	Th-229	4845.00	57.87	45.038	n/a	7.56 %

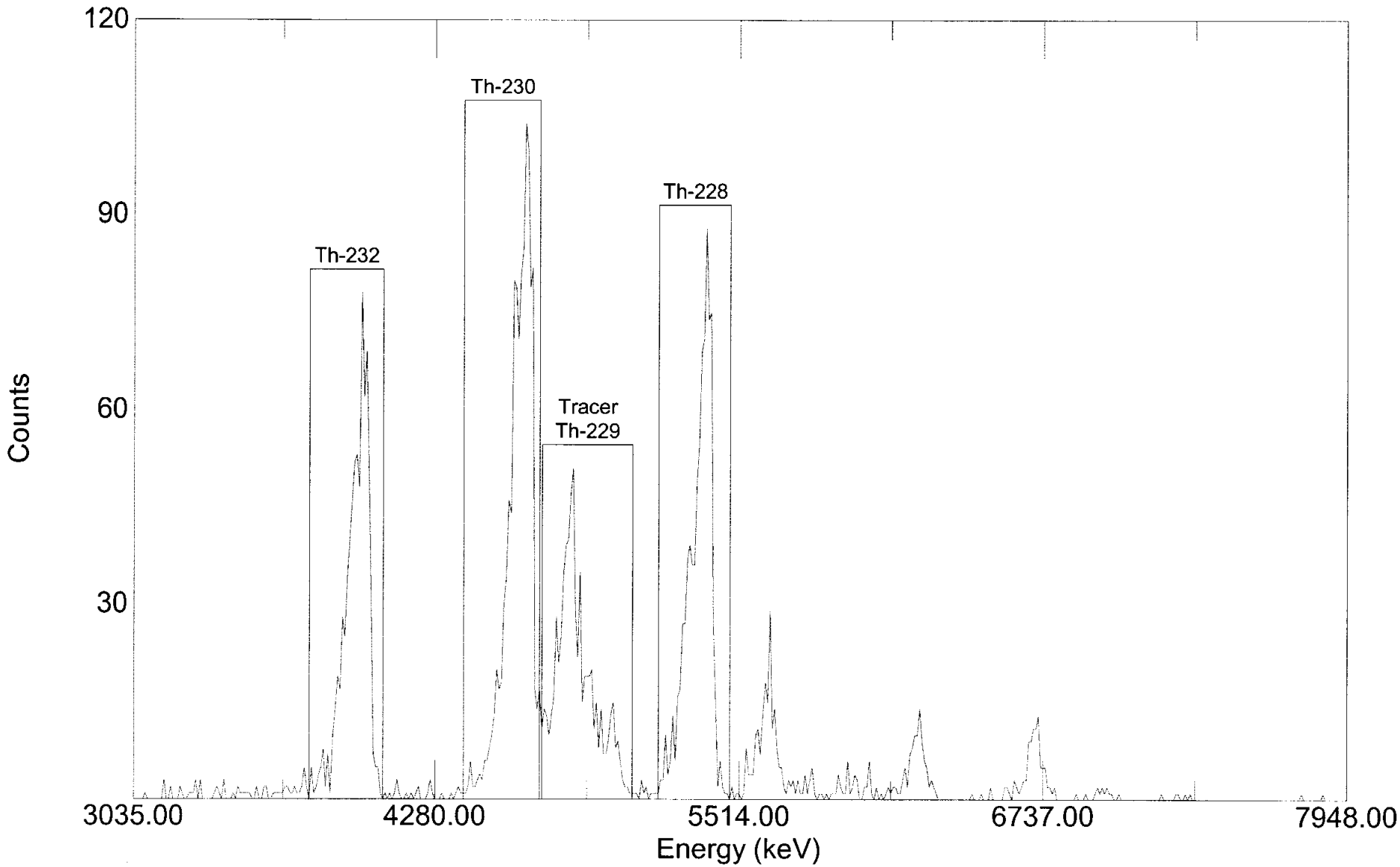
Totals

		% Total
Gross Count:	3,859.00	100.00
Net Area:	3,745.00	97.05
Background:	114.00	2.95
Composite Fit:	3,300.00	85.51
Residuals:	559.00	14.49

Analyzed By: SD

Checked By: SM

TX509718D AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 11:34:18 on 17-Jul-2004 Real Time: 18001.26 s. Live Time: 18000.00 s.
File: C:\User\Alpha\ALPHA\TX509718D.SPC Detector: #12 MCB 2 Input 4
Sample: 0405097-18D TAS040715-1 Type: Thorium

000110

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/20/04 7:09:54 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-20 TAS040715-1

Analysis Type: Thorium

Detector: MCB 2 Input 5

Date/Time of Count: 7/17/04 11:34:35 AM

Sample Volume: 0.100 Total, 0.100 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **73.62%**

Real Time: 300.02 Minutes

Total Eff.: 23.12 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 31.40%

Analysis: Relative Region-Of-Interest

Original: 3,018 + 10.1302 * Chn + -0.00091 * Chn **2.

Spectrum Calibration: 3,018 + 10.1418 * Chn + -0.00091 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TX509720.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4071013.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	243.14	221	246	2.00	327.00	3,593.00	12.30	3580.70	51.63
2	167.16	145	170	4.00	608.00	7,619.00	3.00	7598.80	109.57
3	99.01	72	103	2.00	308.00	3,775.00	2.10	3772.90	54.40
Tracer	183.17	171	207	12.00	43.00	697.00	3.60	693.40	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.40	232.577	n/a	3.28 %
2	Th-230	4687.70	39.35	493.564	n/a	2.25 %
3	Th-232	4013.00	19.92	245.061	n/a	3.19 %
Tracer	Th-229	4845.00	117.71	45.038	n/a	7.42 %

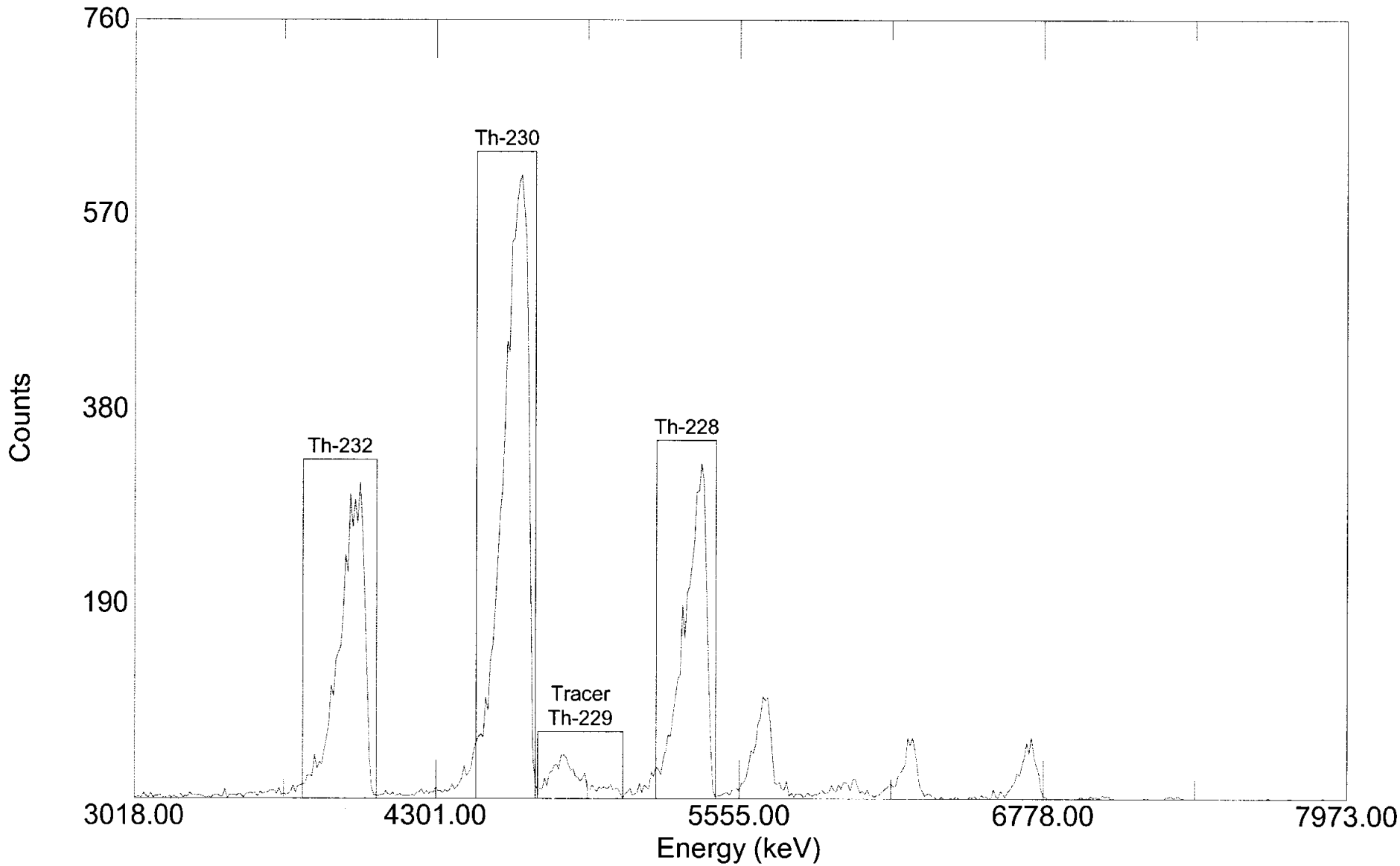
Totals

		% Total
Gross Count:	18,826.00	100.00
Net Area:	18,736.60	99.53
Background:	89.40	0.47
Composite Fit:	15,684.00	83.31
Residuals:	3,142.00	16.69

Analyzed By: SD

Checked By: Sm

TX509720 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 11:34:35 on 17-Jul-2004
File: C:\User\Alpha\ALPHA\TX509720.SPC
Sample: 0405097-20 TAS040715-1

Real Time: 18001.24 s. Live Time: 18000.00 s.
Detector: #13 MCB 2 Input 5
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:11:52 AM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-22 TAS040629-8

Analysis Type: Thorium

Detector: MCB 6 Input 6

Date/Time of Count: 7/7/04 10:18:18 AM

Sample Volume: 0.050 Total, 0.050 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **89.34%**

Real Time: 300.26 Minutes

Total Eff.: 26.45 %

Dead Time: 0.1 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 29.61%

Analysis: Relative Region-Of-Interest

Original: 3,011 + 9.9562 * Chn + -0.00027 * Chn **2.

Spectrum Calibration: 3,011 + 9.9138 * Chn + -0.00027 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509722.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070646.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	245.68	223	248	2.00	69.00	597.00	4.20	592.80	7.47
2	169.93	147	171	2.00	151.00	1,352.00	2.10	1330.22	16.76
3	101.36	77	108	4.00	56.00	513.00	3.30	509.70	6.42
Tracer	185.96	172	212	8.00	53.00	801.00	7.50	793.50	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.56	67.294	n/a	8.08 %
2	Th-230	4687.70	19.64	151.004	n/a	5.42 %
3	Th-232	4013.00	39.43	57.860	n/a	8.71 %
Tracer	Th-229	4845.00	78.50	90.077	n/a	6.93 %

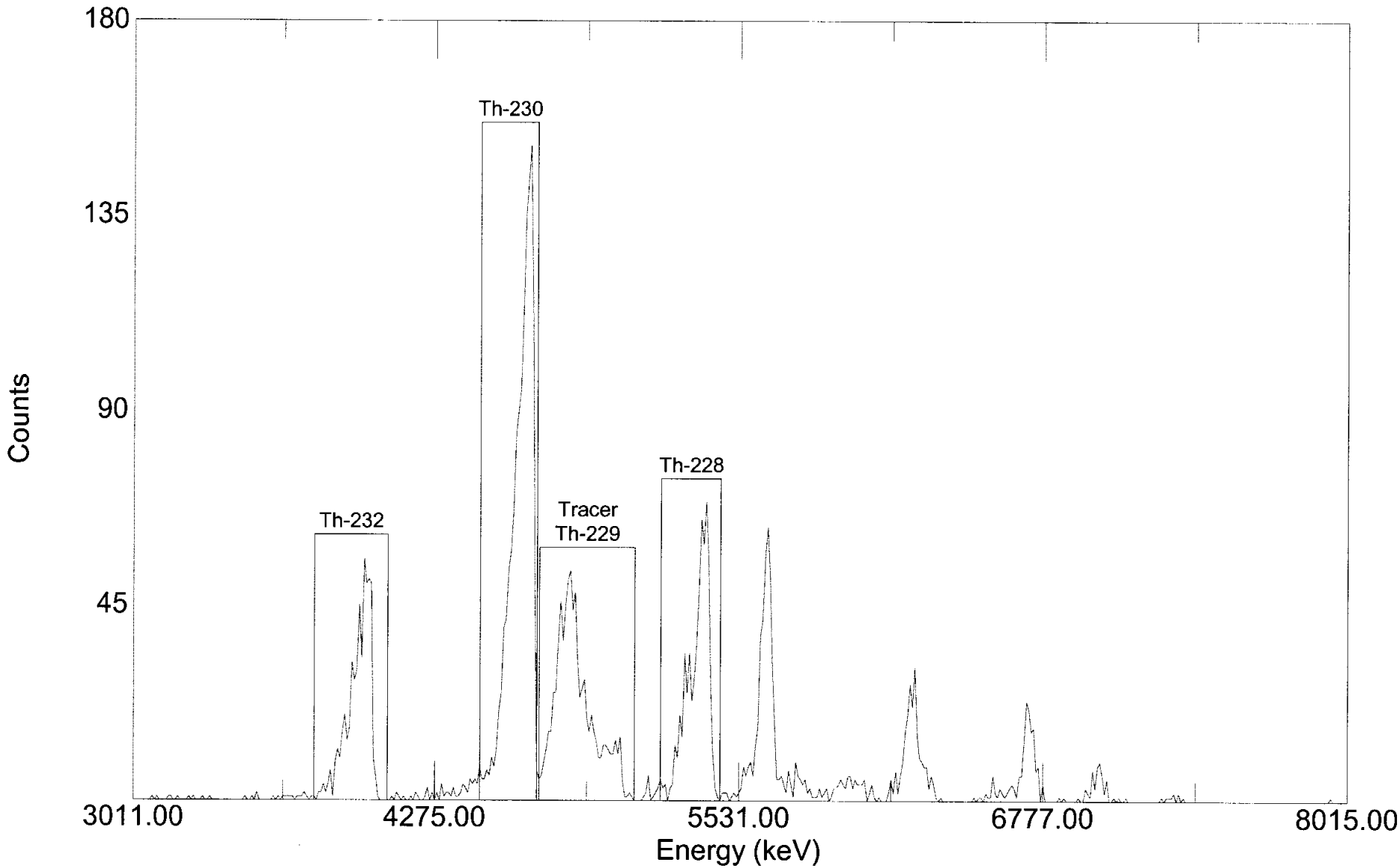
Totals

		% Total
Gross Count:	4,329.00	100.00
Net Area:	4,247.70	98.12
Background:	81.30	1.88
Composite Fit:	3,263.00	75.38
Residuals:	1,066.00	24.62

Analyzed By: SD

Checked By: Sm

T509722 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:18:18 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T509722.SPC
Sample: 0405097-22 TAS040629-8

Real Time: 18015.78 s. Live Time: 18000.00 s.
Detector: #46 MCB 6 Input 6
Type: Thorium

000114

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:12:29 AM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-24 TAS040629-8

Analysis Type: Thorium

Detector: MCB 6 Input 7

Date/Time of Count: 7/7/04 10:18:48 AM

Sample Volume: 0.020 Total, 0.020 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **79.80%**

Real Time: 300.26 Minutes

Total Eff.: 25.43 %

Dead Time: 0.1 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 31.87%

Analysis: Relative Region-Of-Interest

Original: 2,950 + 10.5378 * Chn + -0.00160 * Chn **2.

Spectrum Calibration: 2,950 + 10.5466 * Chn + -0.00160 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509724.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070647.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
3	102.42	79	110	4.00	83.00	741.00	0.30	740.70	9.71
Tracer	184.90	175	210	18.00	50.00	765.00	2.10	762.90	10.00
1	244.24	222	248	4.00	97.00	821.00	11.40	809.60	10.61
2	169.14	147	174	4.00	241.00	2,210.00	0.60	2190.48	28.71

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
3	Th-232	4013.00	40.88	218.638	n/a	7.20 %
Tracer	Th-229	4845.00	179.19	225.191	n/a	7.09 %
1	Th-228	5430.00	39.06	238.976	n/a	6.94 %
2	Th-230	4687.70	40.02	646.582	n/a	4.21 %

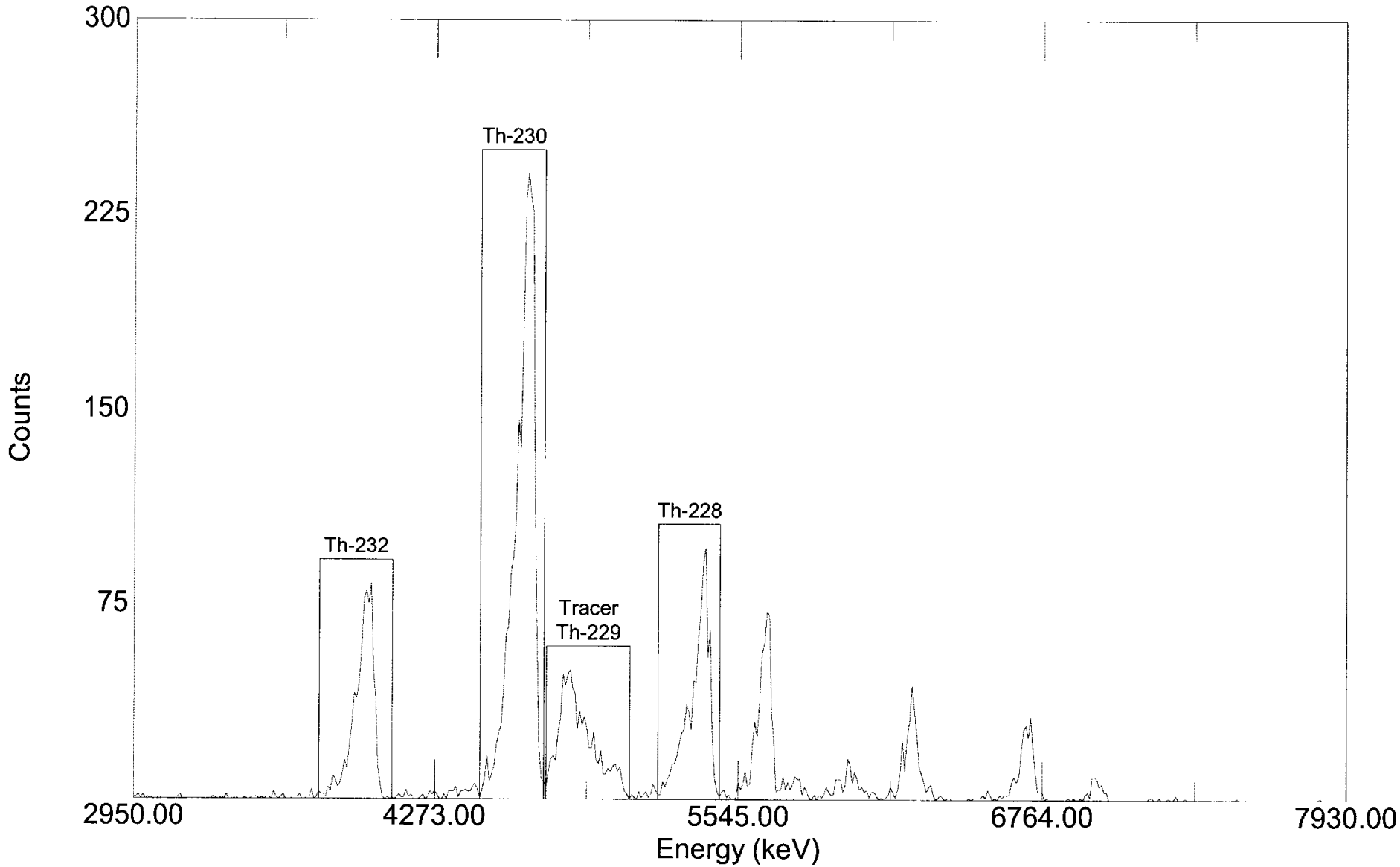
Totals

		% Total
Gross Count:	5,927.00	100.00
Net Area:	5,853.80	98.76
Background:	73.20	1.24
Composite Fit:	4,537.00	76.55
Residuals:	1,390.00	23.45

Analyzed By: SD

Checked By: Sn

T509724 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:18:48 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T509724.SPC
Sample: 0405097-24 TAS040629-8

Real Time: 18015.78 s. Live Time: 18000.00 s.
Detector: #47 MCB 6 Input 7
Type: Thorium

090116

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:13:05 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-25 TAS040629-8

Analysis Type: Thorium

Detector: MCB 6 Input 8

Date/Time of Count: 7/7/04 10:19:13 AM

Sample Volume: 0.060 Total, 0.060 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **80.63%**

Real Time: 300.26 Minutes

Total Eff.: 24.72 %

Dead Time: 0.1 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.66%

Analysis: Relative Region-Of-Interest

Original: 3,027 + 9.8890 * Chn + -0.00044 * Chn **2.

Spectrum Calibration: 3,027 + 9.7461 * Chn + -0.00044 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509725.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070648.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	249.33	228	253	2.00	81.00	710.00	6.60	703.40	9.48
2	171.69	147	174	4.00	184.00	1,555.00	4.50	1532.11	20.66
3	101.60	76	107	6.00	60.00	622.00	1.20	620.80	8.37
Tracer	188.10	175	214	6.00	63.00	749.00	7.50	741.50	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.05	71.207	n/a	7.43 %
2	Th-230	4687.70	38.38	155.099	n/a	5.05 %
3	Th-232	4013.00	57.94	62.845	n/a	7.87 %
Tracer	Th-229	4845.00	57.48	75.064	n/a	7.16 %

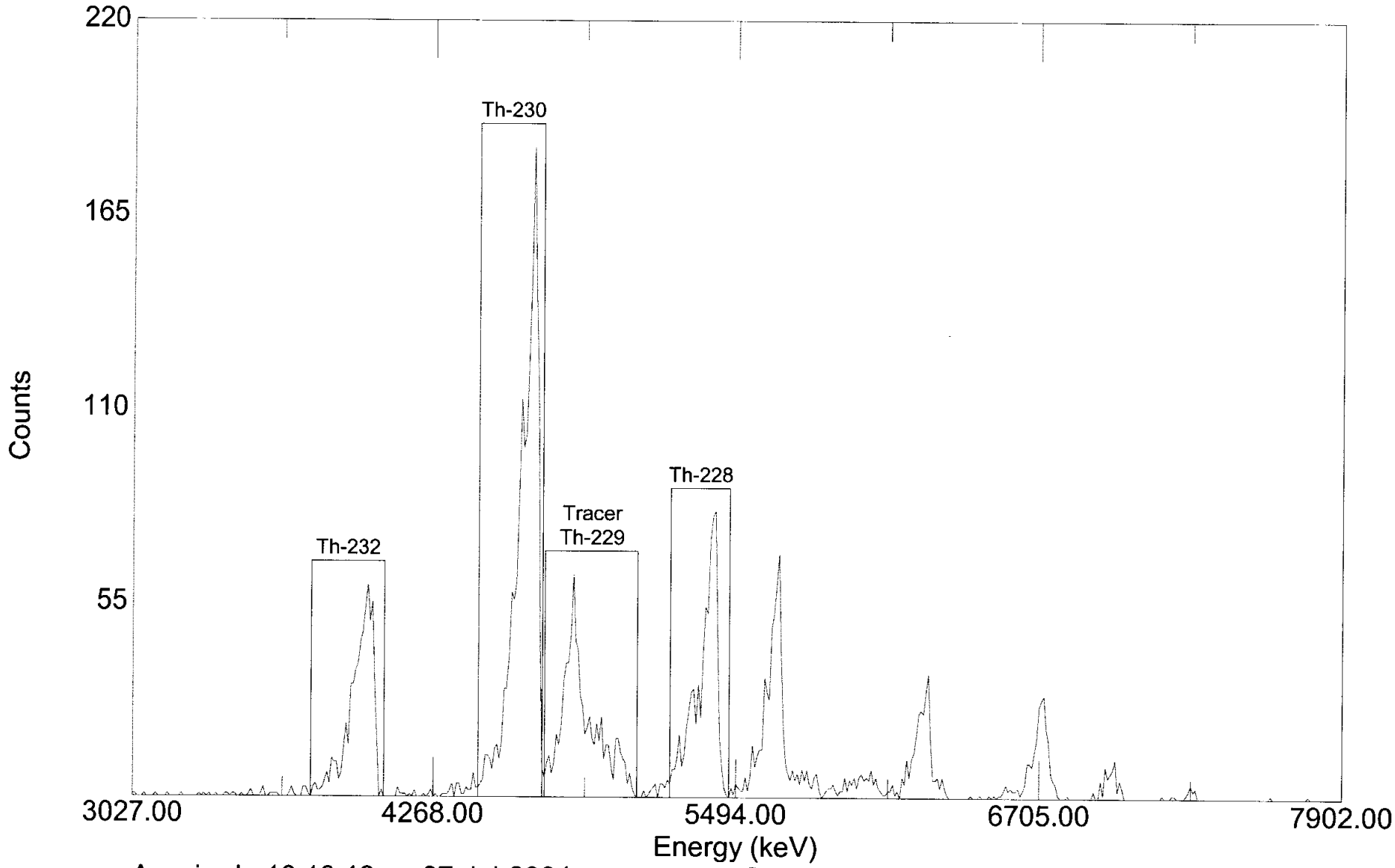
Totals

		% Total
Gross Count:	4,982.00	100.00
Net Area:	4,906.40	98.48
Background:	75.60	1.52
Composite Fit:	3,636.00	72.98
Residuals:	1,346.00	27.02

Analyzed By: SD

Checked By: Sm

T509725 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:19:13 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T509725.SPC
Sample: 0405097-25 TAS040629-8

Real Time: 18015.78 s. Live Time: 18000.00 s.
Detector: #48 MCB 6 Input 8
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/20/04 7:11:22 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-26 TAS040715-1

Analysis Type: Thorium

Detector: MCB 2 Input 7

Date/Time of Count: 7/17/04 11:34:49 AM

Sample Volume: 0.100 Total, 0.100 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **79.31%**

Real Time: 300.02 Minutes

Total Eff.: 23.40 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 29.50%

Analysis: Relative Region-Of-Interest

Original: 3,028 + 9.9689 * Chn + -0.00060 * Chn **2.

Spectrum Calibration: 3,028 + 10.0135 * Chn + -0.00060 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TX509726.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4071015.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	243.46	223	247	4.00	178.00	1,862.00	22.50	1839.50	26.21
2	167.45	146	171	6.00	350.00	3,717.00	0.90	3698.70	52.70
3	98.98	75	106	4.00	180.00	1,962.00	1.50	1960.50	27.93
Tracer	183.50	172	211	6.00	51.00	703.00	1.20	701.80	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	38.88	118.051	n/a	4.60 %
2	Th-230	4687.70	58.87	237.365	n/a	3.23 %
3	Th-232	4013.00	39.58	125.816	n/a	4.43 %
Tracer	Th-229	4845.00	58.76	45.038	n/a	7.39 %

Totals

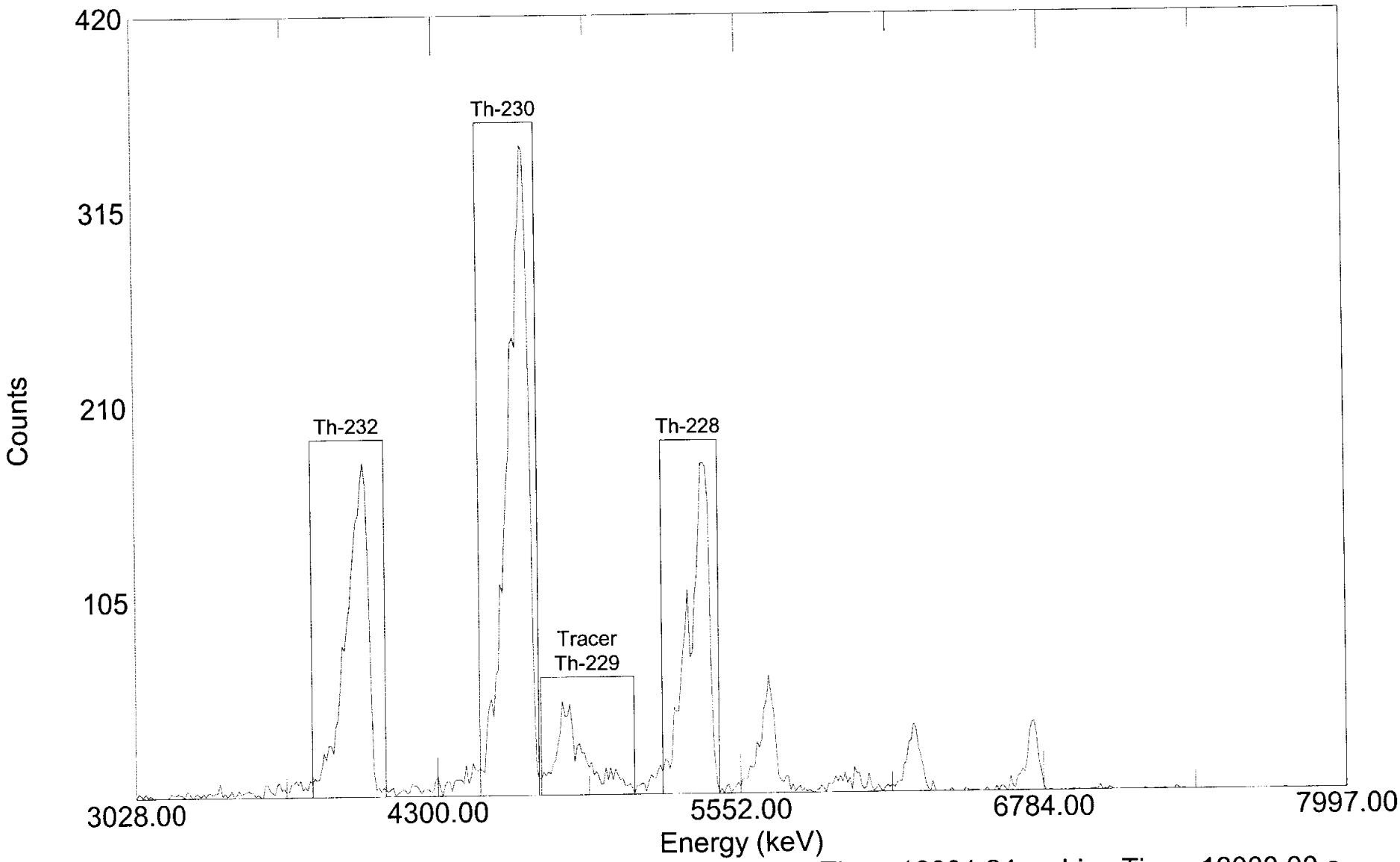
		% Total
Gross Count:	10,025.00	100.00
Net Area:	9,920.90	98.96
Background:	104.10	1.04
Composite Fit:	8,244.00	82.23
Residuals:	1,781.00	17.77

Analyzed By: SD

Checked By: Sm

TX509726

AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 11:34:49 on 17-Jul-2004
File: C:\User\Alpha\ALPHA\TX509726.SPC
Sample: 0405097-26 TAS040715-1

Real Time: 18001.24 s. Live Time: 18000.00 s.
Detector: #15 MCB 2 Input 7
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/20/04 7:12:07 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-27 TAS040715-1

Analysis Type: Thorium

Detector: MCB 2 Input 8

Date/Time of Count: 7/17/04 11:35:03 AM

Sample Volume: 0.100 Total, 0.100 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **79.43%**

Real Time: 300.02 Minutes

Total Eff.: 23.11 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 29.09%

Analysis: Relative Region-Of-Interest

Original: 3,021 + 9.9602 * Chn + -0.00048 * Chn **2.

Spectrum Calibration: 3,021 + 9.3202 * Chn + -0.00048 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TX509727.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4071016.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	261.98	223	249	2.00	214.00	1,873.00	10.80	1862.20	26.86
2	180.47	147	173	2.00	403.00	3,478.00	1.20	3459.61	49.91
3	107.00	76	107	2.00	215.00	1,873.00	0.30	1872.70	27.02
Tracer	197.69	174	211	2.00	45.00	694.00	0.90	693.10	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	18.14	121.008	n/a	4.56 %
2	Th-230	4687.70	18.29	224.809	n/a	3.34 %
3	Th-232	4013.00	18.43	121.690	n/a	4.53 %
Tracer	Th-229	4845.00	18.26	45.038	n/a	7.44 %

Totals

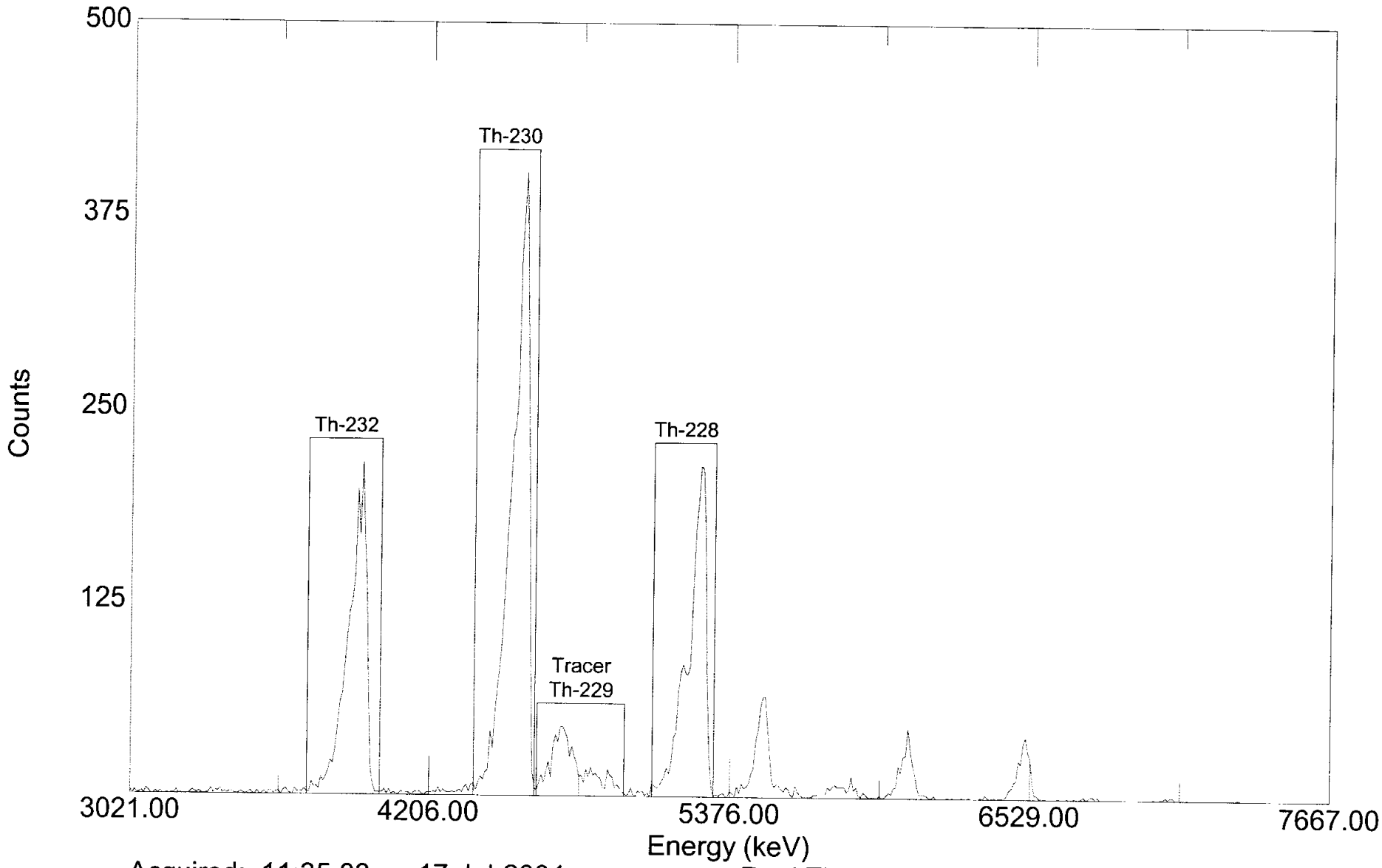
		% Total
Gross Count:	9,337.00	100.00
Net Area:	9,259.60	99.17
Background:	77.40	0.83
Composite Fit:	7,918.00	84.80
Residuals:	1,419.00	15.20

Analyzed By: SD

Checked By: Sm

TX509727

AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 11:35:03 on 17-Jul-2004
File: C:\User\Alpha\ALPHA\TX509727.SPC
Sample: 0405097-27 TAS040715-1

Real Time: 18001.24 s. Live Time: 18000.00 s.
Detector: #16 MCB 2 Input 8
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:13:36 AM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-29 TAS040629-8

Analysis Type: Thorium

Detector: MCB 8 Input 1

Date/Time of Count: 7/7/04 10:19:44 AM

Sample Volume: 0.040 Total, 0.040 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **83.40%**

Real Time: 300.01 Minutes

Total Eff.: 22.53 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 27.02%

Analysis: Relative Region-Of-Interest

Original: 3,054 + 9.7825 * Chn + -0.00029 * Chn **2.

Spectrum Calibration: 3,054 + 9.7351 * Chn + -0.00029 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509729.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070657.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	245.86	223	248	2.00	47.00	395.00	7.50	387.50	5.73
2	168.67	146	172	2.00	92.00	735.00	0.30	717.94	10.62
3	98.81	74	105	4.00	49.00	363.00	0.30	362.70	5.37
Tracer	185.00	173	210	4.00	66.00	678.00	2.10	675.90	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.19	64.552	n/a	10.06 %
2	Th-230	4687.70	19.28	119.599	n/a	7.40 %
3	Th-232	4013.00	38.71	60.421	n/a	10.30 %
Tracer	Th-229	4845.00	38.52	112.596	n/a	7.53 %

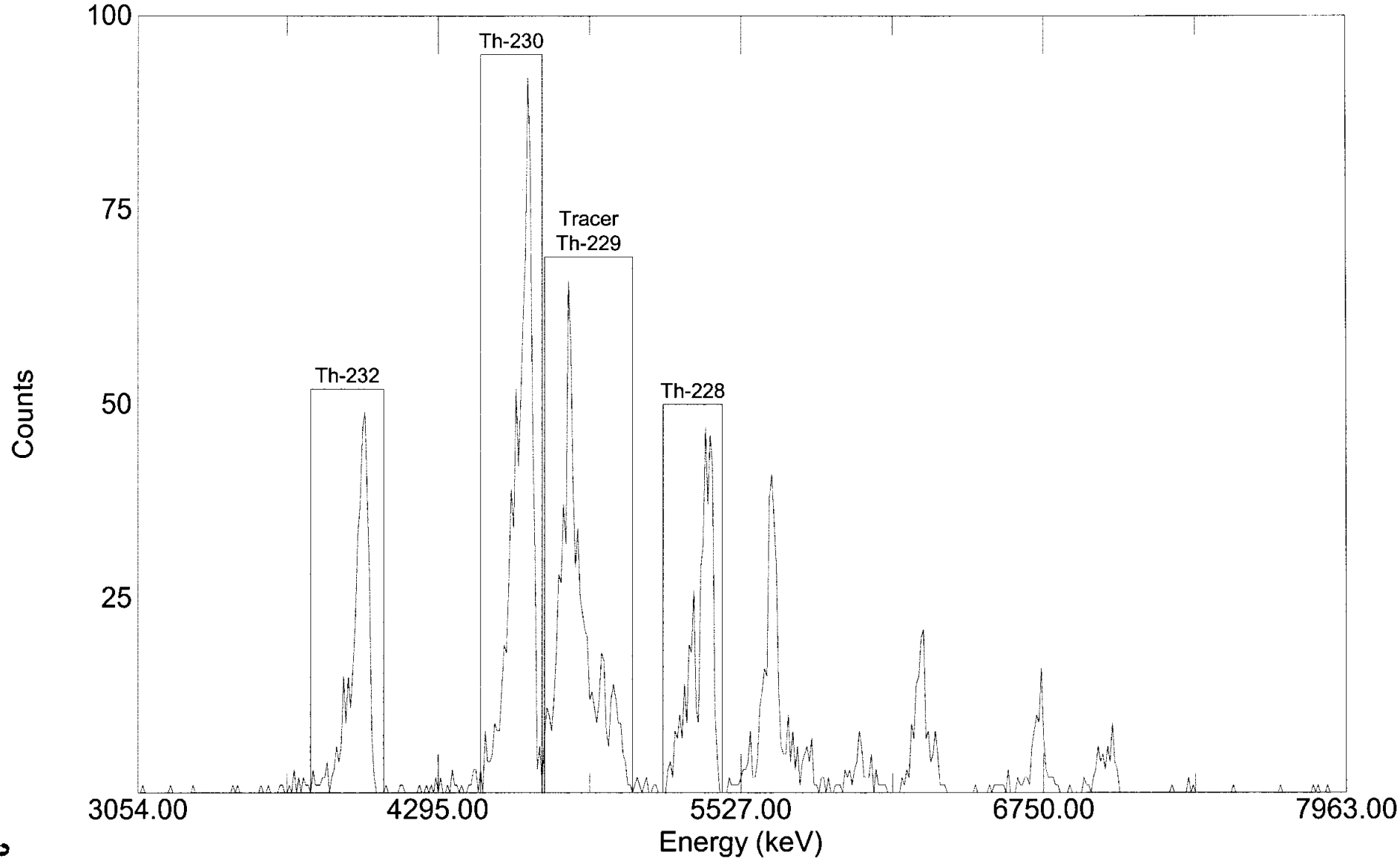
Totals

		% Total
Gross Count:	2,885.00	100.00
Net Area:	2,819.00	97.71
Background:	66.00	2.29
Composite Fit:	2,171.00	75.25
Residuals:	714.00	24.75

Analyzed By: SD

Checked By: SM

T509729 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:19:44 on 07-Jul-2004 Real Time: 18000.70 s. Live Time: 18000.00 s.
File: C:\User\Alpha\ALPHA\T509729.SPC Detector: #57 MCB 8 Input 1
Sample: 0405097-29 TAS040629-8 Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:14:11 AM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-29D TAS040629-8

Analysis Type: Thorium

Detector: MCB 8 Input 2

Date/Time of Count: 7/7/04 10:20:08 AM

Sample Volume: 0.040 Total, 0.040 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **71.93%**

Real Time: 300.01 Minutes

Total Eff.: 22.18 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.84%

Analysis: Relative Region-Of-Interest

Original: 3,059 + 9.8157 * Chn + -0.00043 * Chn **2.

Spectrum Calibration: 3,059 + 9.7890 * Chn + -0.00043 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509729D.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070658.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	244.85	222	247	2.00	41.00	416.00	19.50	396.50	5.96
2	167.61	145	171	2.00	83.00	802.00	1.20	784.30	11.79
3	97.87	74	105	2.00	37.00	357.00	2.40	354.60	5.33
Tracer	183.93	172	209	6.00	48.00	669.00	3.60	665.40	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.15	67.094	n/a	10.10 %
2	Th-230	4687.70	19.29	132.715	n/a	7.08 %
3	Th-232	4013.00	19.41	60.004	n/a	10.45 %
Tracer	Th-229	4845.00	57.78	112.596	n/a	7.58 %

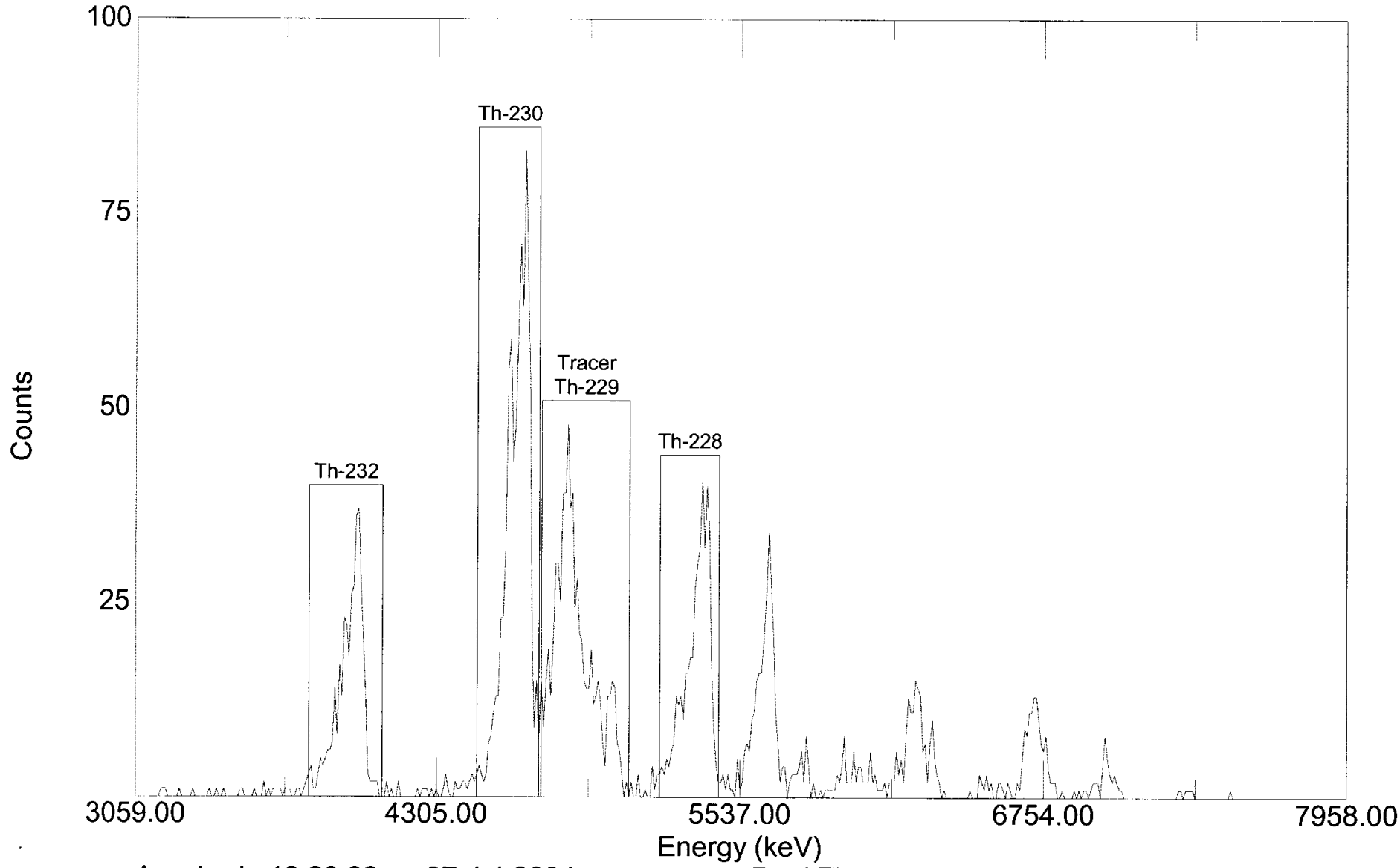
Totals

		% Total
Gross Count:	3,015.00	100.00
Net Area:	2,911.20	96.56
Background:	103.80	3.44
Composite Fit:	2,244.00	74.43
Residuals:	771.00	25.57

Analyzed By: SD

Checked By: SM

T509729D AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:20:08 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T509729D.SPC
Sample: 0405097-29D TAS040629-8

Real Time: 18000.70 s. Live Time: 18000.00 s.
Detector: #58 MCB 8 Input 2
Type: Thorium

000126

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/8/04 8:14:40 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: 0405097-30 TAS040629-8

Analysis Type: Thorium

Detector: MCB 8 Input 3

Date/Time of Count: 7/7/04 10:20:39 AM

Sample Volume: 0.050 Total, 0.050 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **81.57%**

Real Time: 300.01 Minutes

Total Eff.: 24.97 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.61%

Analysis: Relative Region-Of-Interest

Original: 3,028 + 10.0729 * Chn + -0.00120 * Chn **2.

Spectrum Calibration: 3,028 + 10.0218 * Chn + -0.00120 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T509730.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4070659.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	246.99	224	251	2.00	46.00	397.00	9.60	387.40	5.17
2	169.03	147	172	2.00	68.00	715.00	0.90	695.53	9.29
3	99.47	75	106	2.00	36.00	299.00	0.60	298.40	3.98
Tracer	185.43	173	209	8.00	58.00	754.00	5.10	748.90	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	18.86	46.596	n/a	10.09 %
2	Th-230	4687.70	19.23	83.657	n/a	7.54 %
3	Th-232	4013.00	19.57	35.891	n/a	11.36 %
Tracer	Th-229	4845.00	76.61	90.077	n/a	7.14 %

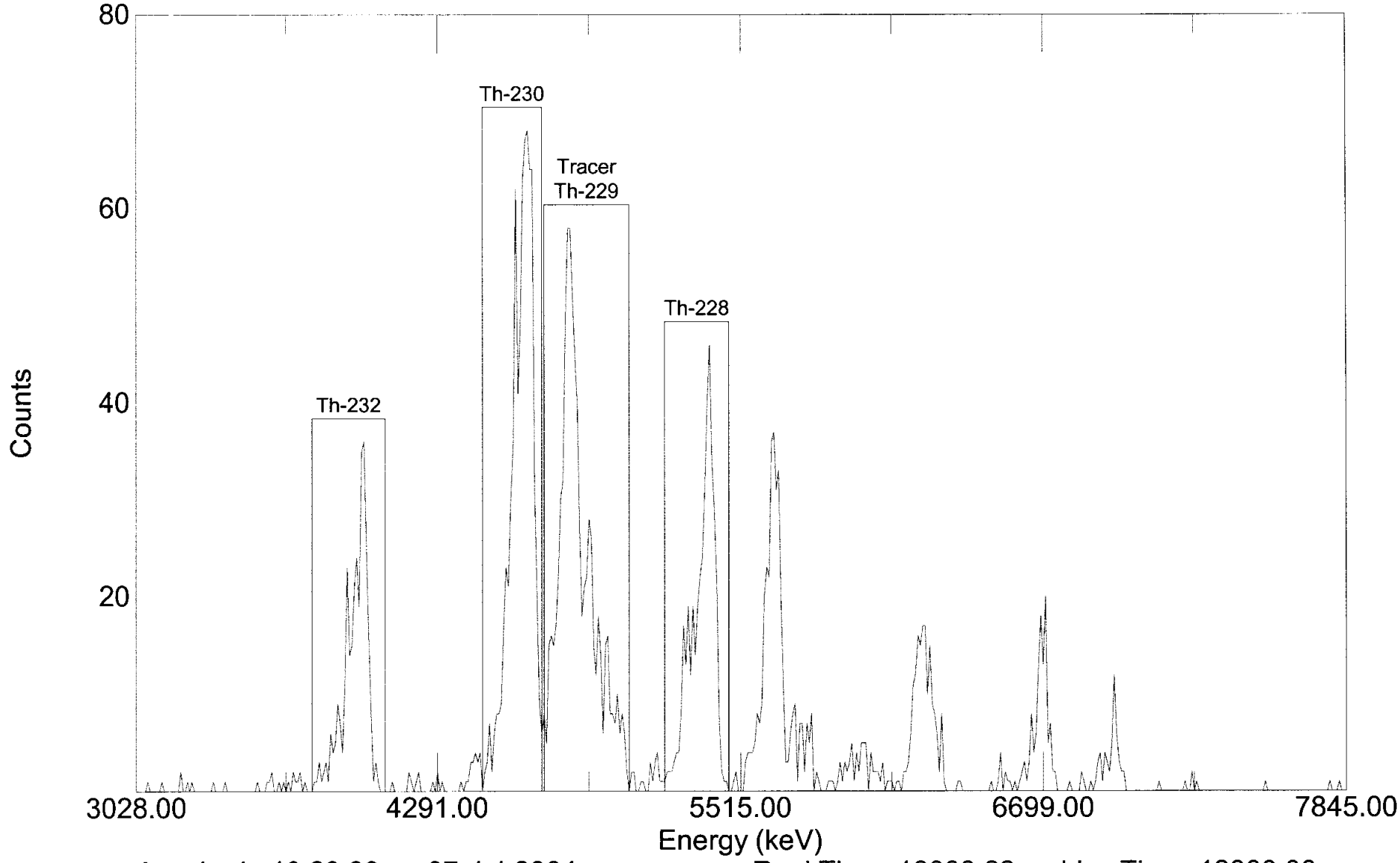
Totals

		% Total
Gross Count:	2,991.00	100.00
Net Area:	2,907.00	97.19
Background:	84.00	2.81
Composite Fit:	2,165.00	72.38
Residuals:	826.00	27.62

Analyzed By: SD

Checked By: Sm

T509730 AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:20:39 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T509730.SPC
Sample: 0405097-30 TAS040629-8

Real Time: 18000.68 s. Live Time: 18000.00 s.
Detector: #59 MCB 8 Input 3
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/17/04 2:39:19 PM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: AS040629-10MB TAS040629-10

Analysis Type: Thorium

Detector: MCB 3 Input 2

Date/Time of Count: 7/17/04 11:32:38 AM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **780.00 Minutes**

Chem. Yield: **67.89%**

Real Time: 780.02 Minutes

Total Eff.: 20.64 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.40%

Analysis: Relative Region-Of-Interest

Original: 3,045 + 9.9457 * Chn + -0.00061 * Chn **2.

Spectrum Calibration: 3,045 + 9.9003 * Chn + -0.00061 * Chn **2.

Cal File:

Spectrum File: **C:\USER\ALPHA\ALPHA\TR62910B.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4071018.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	244.60	223	248	4.00	4.00	43.00	33.54	9.46	0.06
2	167.69	146	169	82.00	6.00	50.00	3.90	6.18	0.04
3	98.41	74	105	2.00	2.00	12.00	2.34	9.66	0.06
Tracer	183.92	170	209	12.00	110.00	1,615.00	5.46	1609.54	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	38.42	0.026	n/a	164.98 %
2	Th-230	4687.70	795.19	0.017	n/a	229.39 %
3	Th-232	4013.00	19.56	0.027	n/a	74.34 %
Tracer	Th-229	4845.00	116.13	4.504	n/a	4.88 %

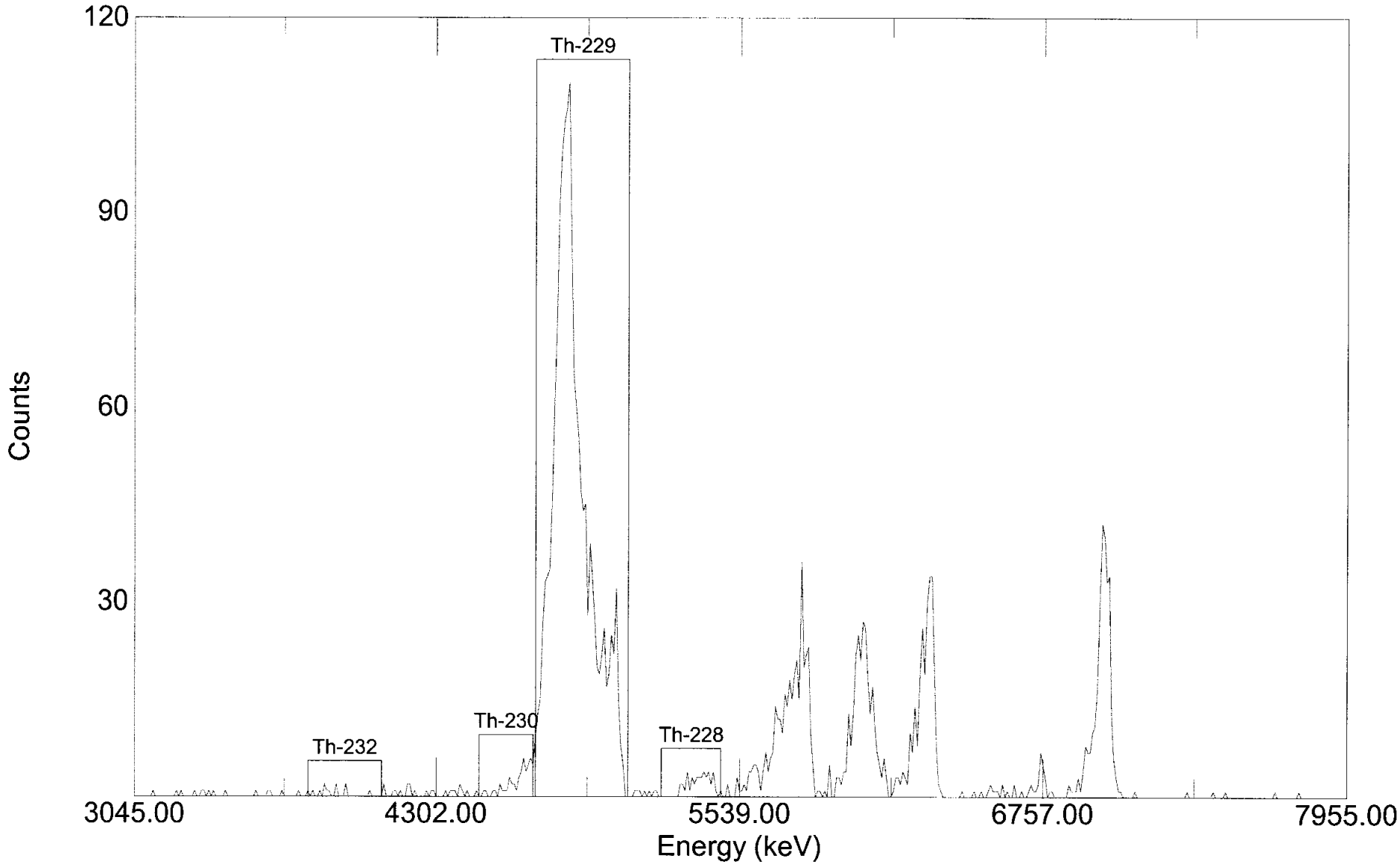
Totals

		% Total
Gross Count:	2,940.00	100.00
Net Area:	2,629.56	89.44
Background:	310.44	10.56
Composite Fit:	1,720.00	58.50
Residuals:	1,220.00	41.50

Analyzed By: SD

Checked By: Sm

TR62910B AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 11:32:38 on 17-Jul-2004 Real Time: 46801.20 s. Live Time: 46800.00 s.
File: C:\USER\ALPHA\ALPHA\TR62910B.SPC Detector: #18 MCB 3 Input 2
Sample: AS040629-10MB TAS040629-10 Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/15/04 1:07:38 PM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: AS040629-10LCS TAS040629-10

Analysis Type: Thorium

Detector: MCB 8 Input 3

Date/Time of Count: 7/9/04 1:58:16 PM

Sample Volume: 1.000 Total, 1.000 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **77.39%**

Real Time: 301.29 Minutes

Total Eff.: 23.69 %

Dead Time: 0.4 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.61%

Analysis: Relative Region-Of-Interest

Original: 3,028 + 10.0729 * Chn + -0.00120 * Chn **2.

Spectrum Calibration: 3,028 + 10.0050 * Chn + -0.00120 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T62910L.SPC**

Background File: **C:\User\Alpha\ALPHA\B4070659.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	247.42	225	250	4.00	3.00	13.00	9.30	3.70	0.05
2	169.33	150	173	2.00	95.00	762.00	0.60	743.78	10.47
3	99.64	75	106	2.00	1.00	6.00	0.60	5.40	0.08
Tracer	185.75	174	211	10.00	57.00	716.00	5.40	710.60	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	37.64	0.023	n/a	197.05 %
2	Th-230	4687.70	19.20	4.714	n/a	7.27 %
3	Th-232	4013.00	19.53	0.034	n/a	89.31 %
Tracer	Th-229	4845.00	95.59	4.504	n/a	7.32 %

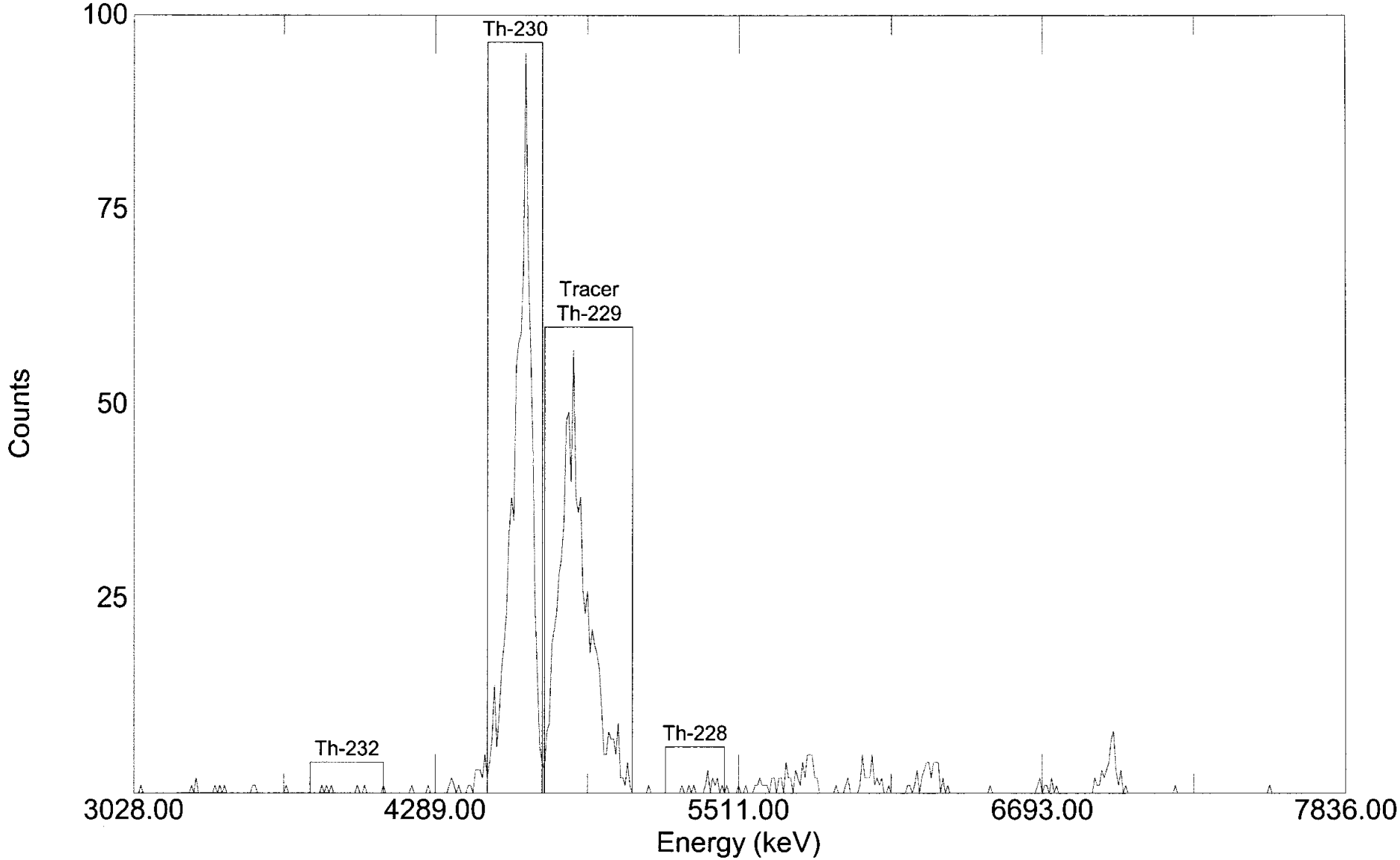
Totals

		% Total
Gross Count:	1,704.00	100.00
Net Area:	1,620.00	95.07
Background:	84.00	4.93
Composite Fit:	1,497.00	87.85
Residuals:	207.00	12.15

Analyzed By: Sm

Checked By: SD

T62910L AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 13:58:16 on 09-Jul-2004 Real Time: 18077.14 s. Live Time: 18000.00 s.
File: C:\User\Alpha\ALPHA\T62910L.SPC Detector: #59 MCB 8 Input 3
Sample: AS040629-10LCS TAS040629-10 Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/23/04 12:50:57 PM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: AS040629-8MB TAS040629-8

Analysis Type: Thorium

Detector: MCB 8 Input 4

Date/Time of Count: 7/7/04 10:21:06 AM

Sample Volume: 0.030 Total, 0.030 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **68.27%**

Real Time: 300.01 Minutes

Total Eff.: 17.87 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 26.17%

Analysis: Relative Region-Of-Interest

Original: 3,038 + 9.8969 * Chn + -0.00059 * Chn **2.

Spectrum Calibration: 3,038 + 9.8005 * Chn + -0.00059 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T6298B.SPC**

Background File: **C:\User\Alpha\ALPHA\B4070660.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	247.77	223	248	2.00	5.00	15.00	12.00	3.00	0.06
2	170.08	146	170	2.00	2.00	16.00	0.60	2.11	0.04
3	100.09	75	106	0.00	0.00	0.00	0.30	-0.30	-0.01
Tracer	186.48	171	210	10.00	39.00	538.00	2.10	535.90	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.02	0.840	n/a	261.99 %
2	Th-230	4687.70	19.20	0.591	n/a	372.25 %
3	Th-232	4013.00	0.00	-0.084	n/a	-107.35 %
Tracer	Th-229	4845.00	95.80	150.128	n/a	8.45 %

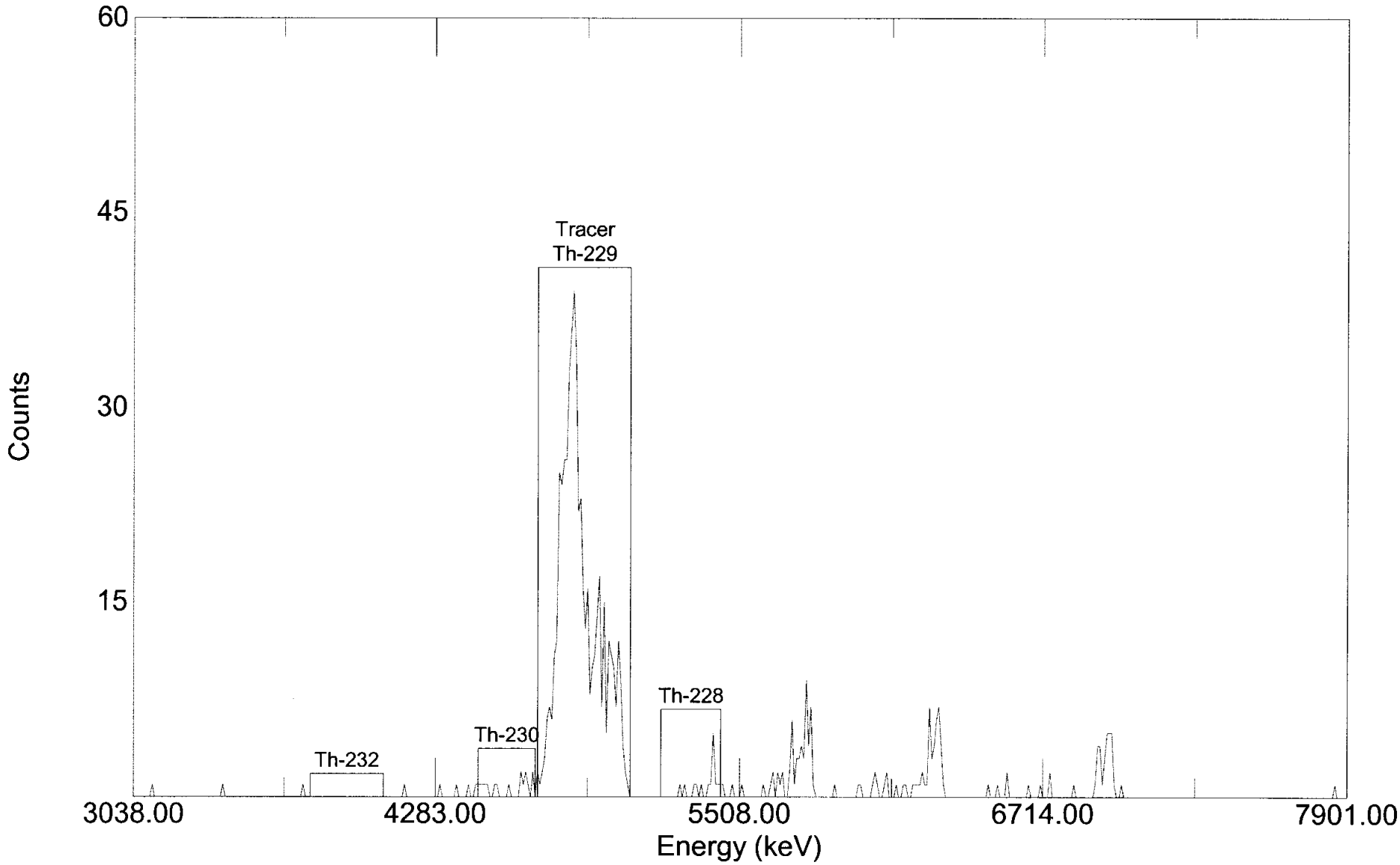
Totals

		% Total
Gross Count:	725.00	100.00
Net Area:	652.10	89.94
Background:	72.90	10.06
Composite Fit:	569.00	78.48
Residuals:	156.00	21.52

Analyzed By: Sm

Checked By: JP

T6298B AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:21:06 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T6298B.SPC
Sample: AS040629-8MB TAS040629-8

Real Time: 18000.70 s. Live Time: 18000.00 s.
Detector: #60 MCB 8 Input 4
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/23/04 12:52:07 PM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: AS040629-8LCS TAS040629-8
Analysis Type: Thorium

Detector: MCB 8 Input 5
Date/Time of Count: 7/7/04 10:21:34 AM

Sample Volume: 0.030 Total, 0.030 Aliquot.
Live Time: **300.00 Minutes**

Chem. Yield: **79.73%**
Real Time: 300.01 Minutes

Total Eff.: 24.03 %
Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate
Acquisition: 512 Channels

Efficiency: 30.14%
Analysis: Relative Region-Of-Interest

Original: 3,070 + 9.8188 * Chn + -0.00041 * Chn **2.

Spectrum Calibration: 3,070 + 9.8023 * Chn + -0.00041 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\T6298L.SPC**
Background File: **C:\User\Alpha\ALPHA\B4070661.SPC**
Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	243.27	221	246	2.00	2.00	17.00	20.10	-3.10	-0.04
2	166.21	144	169	4.00	97.00	779.00	0.60	760.52	10.55
3	96.60	72	103	2.00	1.00	3.00	0.60	2.40	0.03
Tracer	182.49	170	206	12.00	62.00	722.00	1.20	720.80	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.20	-0.646	n/a	-274.21 %
2	Th-230	4687.70	38.66	158.401	n/a	7.19 %
3	Th-232	4013.00	19.44	0.500	n/a	142.72 %
Tracer	Th-229	4845.00	115.81	150.128	n/a	7.29 %

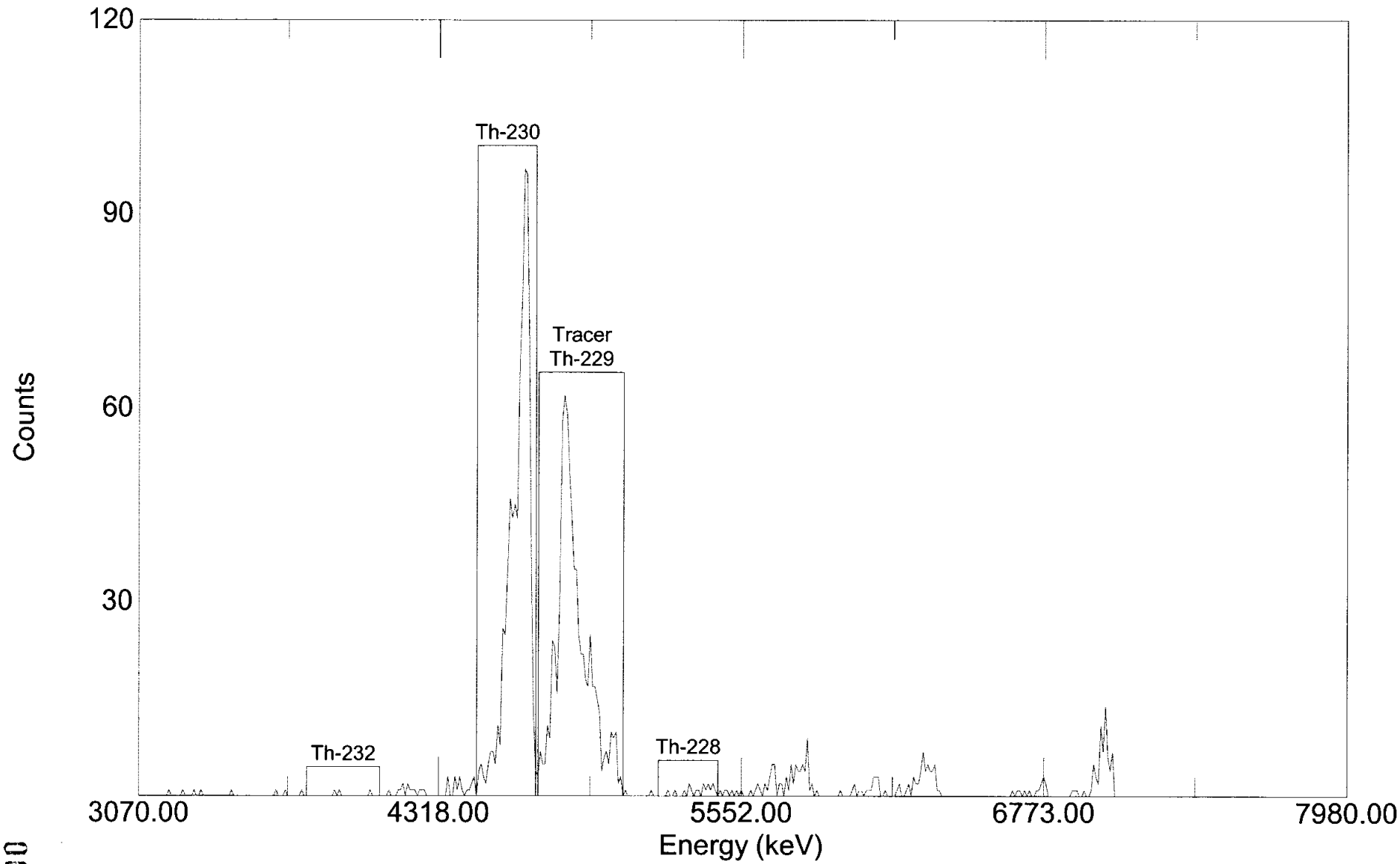
Totals

		% Total
Gross Count:	1,784.00	100.00
Net Area:	1,673.90	93.83
Background:	110.10	6.17
Composite Fit:	1,521.00	85.26
Residuals:	263.00	14.74

Analyzed By: Sm

Checked By: JP

T6298L AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 10:21:34 on 07-Jul-2004
File: C:\User\Alpha\ALPHA\T6298L.SPC
Sample: AS040629-8LCS TAS040629-8

Real Time: 18000.68 s. Live Time: 18000.00 s.
Detector: #61 MCB 8 Input 5
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/20/04 7:14:25 AM
Para0327.rpt
rev 11/13/03 KVG

Sample Name: AS040715-1MB TAS040715-1

Analysis Type: Thorium

Detector: MCB 3 Input 1

Date/Time of Count: 7/17/04 5:08:33 PM

Sample Volume: 0.100 Total, 0.100 Aliquot.

Live Time: **1,000.00 Minutes**

Chem. Yield: **72.44%**

Real Time: 1,000.04 Minutes

Total Eff.: 22.36 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 30.87%

Analysis: Relative Region-Of-Interest

Original: 3,036 + 10.0787 * Chn + -0.00093 * Chn **2.

Spectrum Calibration: 3,036 + 10.0034 * Chn + -0.00093 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TX7151B.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4071017.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	244.92	225	249	2.00	8.00	59.00	66.00	-7.00	-0.03
2	167.75	139	162	84.00	9.00	65.00	3.00	6.55	0.03
3	98.59	74	105	2.00	3.00	29.00	3.00	26.00	0.12
Tracer	184.01	163	211	12.00	144.00	2,248.00	12.00	2236.00	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.09	-0.141	n/a	-313.05 %
2	Th-230	4687.70	814.05	0.132	n/a	246.86 %
3	Th-232	4013.00	19.64	0.524	n/a	42.64 %
Tracer	Th-229	4845.00	115.93	45.038	n/a	4.13 %

Totals

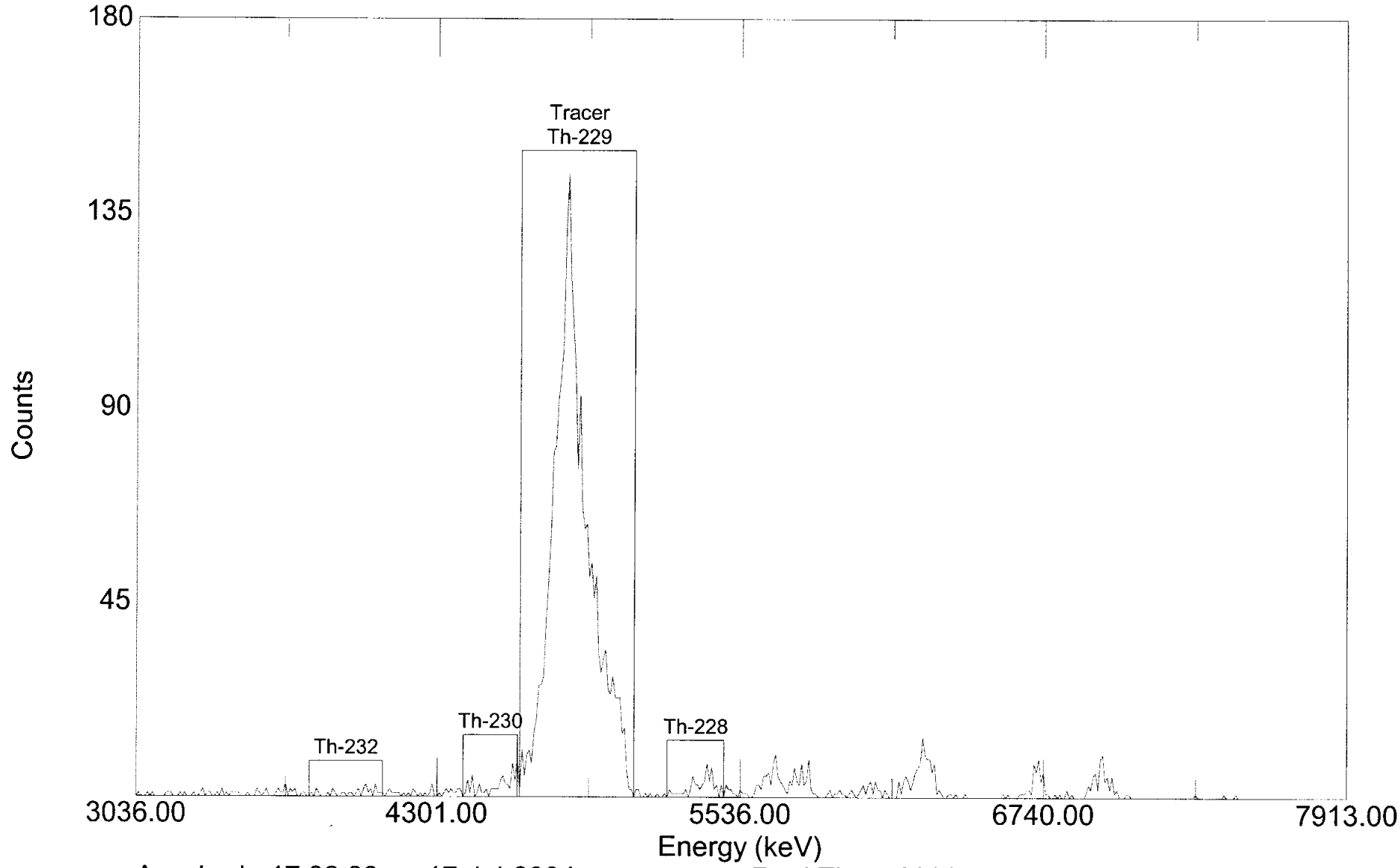
		% Total
Gross Count:	2,868.00	100.00
Net Area:	2,494.00	86.96
Background:	374.00	13.04
Composite Fit:	2,401.00	83.72
Residuals:	467.00	16.28

Analyzed By: SD

Checked By: Sm

TX7151B

AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 17:08:33 on 17-Jul-2004
File: C:\User\Alpha\ALPHA\TX7151B.SPC
Sample: AS040715-1MB TAS040715-1

Real Time: 60002.24 s. Live Time: 60000.00 s.
Detector: #17 MCB 3 Input 1
Type: Thorium

Paragon Analytics
Alpha Spectroscopy Analysis

Report Printed:
7/20/04 7:13:34 AM

Para0327.rpt
rev 11/13/03 KVG

Sample Name: AS040715-1LCS TAS040715-1

Analysis Type: Thorium

Detector: MCB 3 Input 3

Date/Time of Count: 7/17/04 11:35:36 AM

Sample Volume: 0.100 Total, 0.100 Aliquot.

Live Time: **300.00 Minutes**

Chem. Yield: **72.51%**

Real Time: 300.02 Minutes

Total Eff.: 21.25 %

Dead Time: 0.0 %

Tracer Amount: 9.999 DPM, With Contaminate

Acquisition: 512 Channels

Efficiency: 29.31%

Analysis: Relative Region-Of-Interest

Original: 2,969 + 10.6146 * Chn + -0.00210 * Chn **2.

Spectrum Calibration: 2,969 + 10.6122 * Chn + -0.00210 * Chn **2.

Cal File:

Spectrum File: **C:\User\Alpha\ALPHA\TX7151L.SPC**

Background File: **C:\USER\ALPHA\BKGND\B4071019.SPC**

Library File: C:\User\Alpha\ALPHAVIS.ALB

Peaks

Peak	Channel	Start	End	FWHM	Height	Gross Cts	Bkg Cts	Net Area	DPM
1	243.69	222	247	2.00	2.00	13.00	10.50	2.50	0.04
2	167.55	145	171	2.00	101.00	746.00	0.90	729.29	11.44
3	100.41	77	107	2.00	2.00	18.00	0.00	18.00	0.28
Tracer	183.48	172	208	6.00	58.00	639.00	1.50	637.50	10.00

Analysis Results

Peak	Nuclide	Energy (keV)	Width (keV)	Aliquot pCi	MDA pCi	% Error
1	Th-228	5430.00	19.18	0.177	n/a	292.77 %
2	Th-230	4687.70	19.82	51.523	n/a	7.34 %
3	Th-232	4013.00	20.38	1.272	n/a	46.20 %
Tracer	Th-229	4845.00	59.05	45.038	n/a	7.75 %

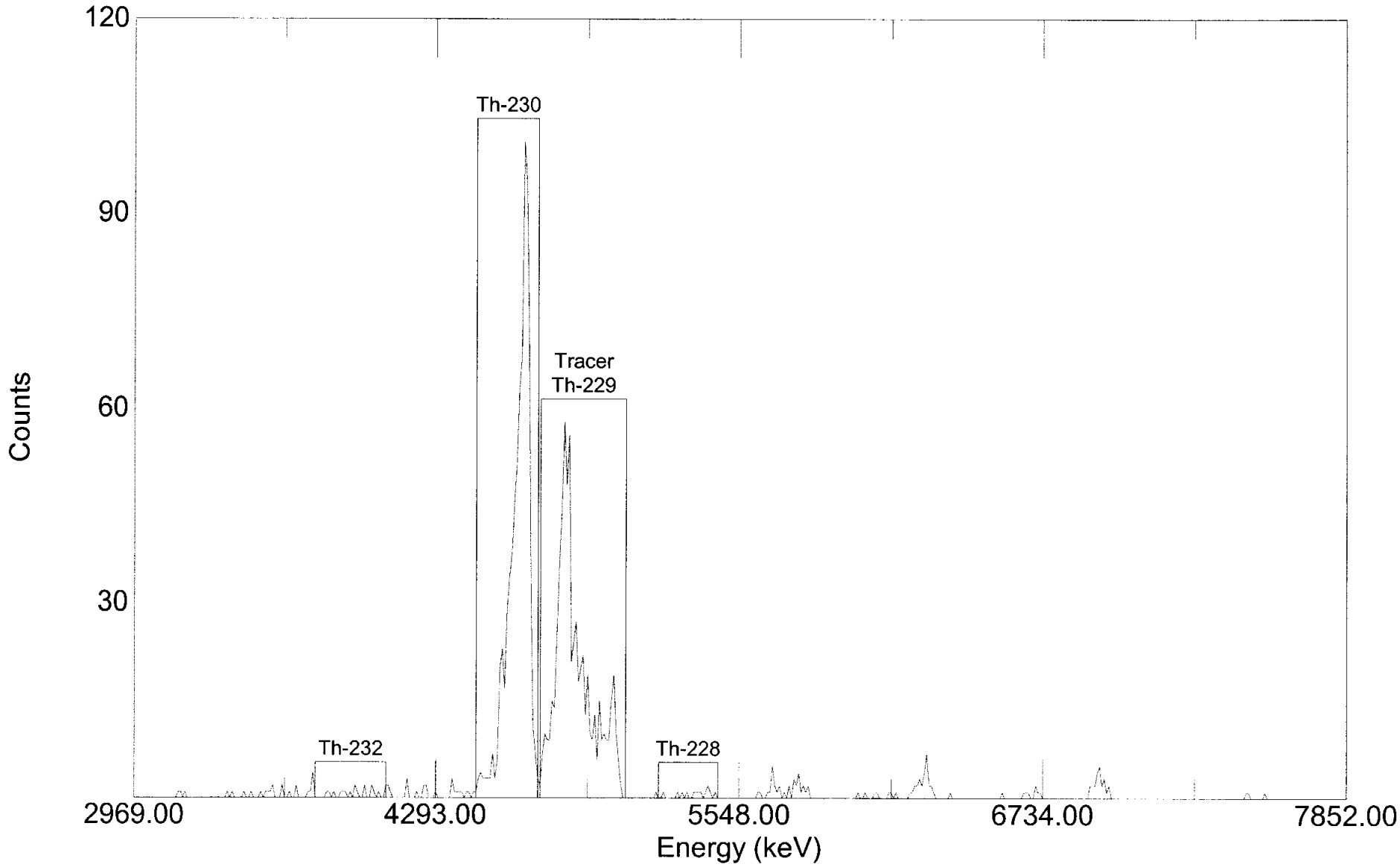
Totals

		% Total
Gross Count:	1,564.00	100.00
Net Area:	1,481.20	94.71
Background:	82.80	5.29
Composite Fit:	1,416.00	90.54
Residuals:	148.00	9.46

Analyzed By: SD

Checked By: Sm

TX7151L AlphaVision Relative Region-Of-Interest (Slope Recalibration)



Acquired: 11:35:36 on 17-Jul-2004
File: C:\User\Alpha\ALPHA\TX7151L.SPC
Sample: AS040715-1LCS TAS040715-1

Real Time: 18001.02 s. Live Time: 18000.00 s.
Detector: #19 MCB 3 Input 3
Type: Thorium

FORM 746r6.xls (11/8/2000)

279210

Paragon Analytics

Alpha Spectrometer Instrument Run Log

Date: 7/7/04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
49	276533	0418033-1	Pu/V	300	SD	P180331
50		2				2
51		3				3
52		4				4
53	AS040624-1	0406029-4	Np/L	1000		NR60294
54		4D				4D
55		5				5
56		6				6
25		0406097-3				NR60973
26		3D				3D
27		4				4
28		5				5
29		AS040624-1MB				NR6241B
30	AS040621-1	0405054-31	Am/F			AR505431
31		AS040621-1MMB				A6211MB
32	AS040623-6	0405054-3				A50543
33		4				4
34		7				7
35		9				9
37		10				10
38		11 SD				11
36		AS040623-6 15 ml MLCS				A6236ML
39		AS040623-6 PLCS				PL
43	AS040623-9	0406099-7D	Th/S	300	SD	TR60997D

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
9	AS040623-12	0406154-1	U/S	300	SD	UC61541
10		2				2
11		3				3
12		3D				3D
13		4				4
15		5				5
16		6				6
17		7				7
18		AS040623-12MB				UC62312B
19		LCS				L
21	AS040629-8	0405097-19	Th/Ac/S			TA50971 9
22		19D				19D
23		21				21
24		23				23
42		28				28
43		2	Th/S			T50972
44		3				3
45		17				17
46		22				22
47		24				24
48		25				25
57		29				29
58		29D				29D
59		30				30

Notes: cont'd on 279211

Reviewed by: SM

Date: 7-8-04

Paragon Analytics

Alpha Spectrometer Instrument Run Log

FORM 746r6.xls (11/8/2000) 279211

Date: 7/7/04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
60	AS040629-8	AS040629-8MB	Th/S	300	SD	T6298B
61	↓	↓ LCS	↓	↓	↓	↓ L
62	AS040629-1	040617S-1	U/S	↓	↓	U61751
63	↓	↓ 2	↓	↓	↓	↓ 2
64	↓	↓ 3	↓	↓	↓	↓ 3
~~↓~~	~~↓~~	~~↓ 4~~	~~↓~~	~~↓~~	~~↓~~	~~↓ 4~~
SD 7/7/04 49	AS040629-2	040611-1	Pu/S	300	SD	P61111
50	↓	↓ 1D	↓	↓	↓	↓ 1D
51	↓	↓ 2	↓	↓	↓	↓ 2
52	↓	↓ 3	↓	↓	↓	↓ 3
9	AS040623-12	AS040623-12MB	U/S	300	SD	UR62312B
10	AS040629-1	040617S-4	U/S	↓	↓	U61754
11	↓	↓ 4D	↓	↓	↓	↓ 4D
12	↓	↓ 5	↓	↓	↓	↓ 5
13	↓	↓ 6	↓	↓	↓	↓ 6
15	↓	↓ 7	↓	↓	↓	↓ 7
16	↓	↓ 8	↓	↓	↓	↓ 8
17	↓	↓ 9	↓	↓	↓	↓ 9
18	↓	↓ 9D	↓	↓	↓	↓ 9D
19	↓	↓ 10	↓	↓	↓	↓ 10
21	↓	↓ 11	↓	↓	↓	↓ 11
22	↓	↓ 12	↓	↓	↓	↓ 12
23	↓	↓ 13	↓	↓	↓	↓ 13
24	↓	AS040629-1MB	↓	↓	↓	U6291B
42	↓	↓ LCS	↓	↓	↓	↓ L

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
44	AS040623-7	040609S-4	Th/L	1000	SD	TR60894
45	↓	040609T-3	↓	↓	↓	TR60973
46	AS040629-5	040429T-2	U/S	300	↓	UX42912
47	↓	↓ 2MS	↓	↓	↓	↓ 2M
48	↓	↓ 2MSD	↓	↓	↓	↓ 2N
57	↓	040431T-2	↓	↓	↓	UX43142
58	↓	↓ 2MS	↓	↓	↓	↓ 2M
59	↓	↓ 2MSD	↓	↓	↓	↓ 2N
60	↓	040505T-4	↓	↓	↓	UX50504
61	↓	↓ 4MS	↓	↓	↓	↓ 4M
62	↓	↓ 4MSD	↓	↓	↓	↓ 4N
63	↓	AS040629-5MB	↓	↓	↓	UX6295B
64	↓	↓ LCS	↓	↓	↓	↓ L

SD 7/8/04

Notes: cont'd from 279210

Reviewed by: SD

Date: 7/8/04

00011

Paragon Analytics

Alpha Spectrometer Instrument Run Log

FORM 746r6.xls (11/8/2000)

279215

Date: 7-9-04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
1	AS040630-2	0406120-1-4	P/S	300	Sm	P61204
2		-2 6				6
3		-3 7				7
5		-3D 8				8
7		-4 9				9
8		-6 10				10
49		-7 11				11
50		-8 12				12
51		-9 13				13
52		-10 13D				13D
53		AS040630-2MB1				P6302B
54		2LCS1				L
56	AS040630-3	0406121-1	P/S	300		P61211
25		-2				2
26		-3				3
27		-4				4
28		-6				6
29		-7				7
31		-8				8
32		-8D				8D
33		-9				9
34		-10				10
35		-11				11
37		AS040630-3MB				P6303B

Sm 7/9/04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
38	AS040630-3	AS040630-3LCS	P/S	300	Sm	P6303L
11	276539	0419013-1	U/W	300		UR190131
13		-2				2
15	AS040629-7	0405097-2	U/S			U50972
16		-2D				2D
17		-3				3
18		-17				17
19		-19				19
21		-21				21
22		-22				22
23		-23				23
24		-23D				23D
42		-24				24
43		-25				25
44		-28				28
45		-29				29
46		-30				30
47		AS040629-7MB				U6297B
63		-7LCS				L
48	AS040629-10	0405097-1	Th/S			T50971
57		-4				4
58		-5				5
59		-6				6
60		-7				7

Notes: Cont on page 279216 Sm 7/9/04

Reviewed by: Sm

Date: 7/9/04

000143

Paragon Analytics

FORM 746r6.xls (11/8/2000) 279216 Alpha Spectrometer Instrument Run Log Date: 7-9-04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
61	AS040629-10	0405097-7D	Th/S	300	Sm	T50977D
62	↓	↓ -8	↓	↓	↓	↓ 8
11	AS040629-7	0405097-3	U/S	300	Sm	UR50973
13	↓	↓ -19	↓	↓	↓	↓ 19
15		-21				21
16		-25				25
17		-29				29
18	AS040629-10	0405097-7	Th/S	300		TR50977
19		-10				T509710
21		-11				1
22		-12				2
23		-13				3
24		-14				4
42		-15				5
43		-16				6
44		-16D				6D
45		-18				8
46		-20				20
47		-26				26
57		↓ -27				↓ 27
58		AS040629-10MB Sm 7/9/04				T62910B
59	↓	↓ -10LCS	↓	↓	↓	↓ L
48	AS040623-5	AS040623-5MLCS	U/F	785	↓	UR6235ML
						Sm 7/9/04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
61	AS040707-1	0406215-1	U/W	300	Sm	U62151
62	↓	↓ 2	↓	↓	↓	↓ 2
63		4				4
64	↓	↓ 5	↓	↓		↓ 5
1	AS040623-6	0405054-26	Am/F	805		AR505426
23		-32				A505432
34		34				34
57		35				35
78		36		↓		36
48		↓ 37		805		↓ 37
50	↓	AS040623-6PLCS		805		A6236PL
49	↓	↓ -6MMB	↓	↓		↓ MB
34	AS040623-5	0405054-41		800		A505441
35		42				2
37		43				3
38	↓	↓ 44	↓	↓		↓ 4
51	AS040623-5	0405054-41	Pu/F	795		P505441
52		42				42
53		43				43
54		44				44
56		45				45
25		46				46
27		47				47
28	↓	↓ 48	↓	↓	↓	↓ 48

Notes: Cont. from page 279215 Sm 7/9/04
Cont on page 279217 Sm 7/9/04

Reviewed by: Sm
Date: 7-11-04

000144

Paragon Analytics

Alpha Spectrometer Instrument Run Log

FORM 746r6.xls (11/8/2000) 279221

Date: 7-12-04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
46	AS040629-1	0406175-2	U/S	300	Sm	UR61752
47		-3				3
48		-4				4
57		-7				7
58		-8				8
59		-9				9
64		-9D				9D
61		-10				10
62		-11				11
63		AS040629-1LCS				UR62911L
46	276538	0419011-1	Th/W	300	Sm	TR190111
47	276536	0419006-1	U/W	300	Sm	U190061
48		-2				2
57		-3				3
58		-4				4
59		-5				5
61		-6				6
62	AS040621-10	0405097-9	Th/S	300	Sm	T50979
63	AS040707-1	0406215-8	U/W	300	Sm	U62158
64		-9				9
43	AS040707-3	0406110-11D	U/S	300	Sm	UR611011D
44		AS040707-3LCSD				UR7073LD
3	AS040630-3	0406121-11	Pu/S	300	Sm	P612111
24	AS040629-1	0406175-13	U/S	300	Sm	UR617513

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
4	276536	0419006-1	Pu/W	300	Sm	P190061
5		-2				2
7		-3				3
8		-4				4
49		-5				5
50		-6				6
51	276536	0419006-1	Am/W	300	Sm	A190061
52		-2				2
53		-3				3
54		-4				4
56		-5				5
25		-6				6
1	AS040707-2	0406160-9	Pu/S	300	Sm	PR61609
2		0406163-4				PR61634
33		AS040707-2MB		360		P7072B

Sm 7/13/04

Notes: Cont. from page 279220 Sm 7-12-04

Reviewed by: Sm

Date: 7/13/04

000145

Paragon Analytics

FORM 746r6.xls (11/8/2000) 279228

Alpha Spectrometer Instrument Run Log

Date: 7/16/04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
~~9~~	~~AS040712-2~~	~~0406246-2~~				
9	AS040712-2	0406246-2	U/W	300	SD	URL62462
10	AS040712-5	0405097-1	U/S			UX50971
11		20				20
12		20D				20D
13		26				26
15		27				27
16		AS040712-5MB		1000		UX7125B
17		US		300		+ L
18	AS040629-10	AS040629-10MB	Th/S	780	SD	TR62910B
19	AS040629-1	0406175-3	U/S	300	SD	UZ61753
21	AS040712-1	0406206-1	Th/W		SD	T62061
22		2				2
23		3				3
24		0406213-2				T62132
42		0406218-1				T62181
43		2				2
44		3				3
45		4				4
46		5				5
47		6				6
48		6D				6D
57		7				7
58		8				8

SD 7/16/04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
59	AS040712-1	0406221-2	Th/W	300	SD	T62212
61		0406245-1				T62451
62		2				2
63		2D				2D
64		3				3
1	AS040712-3	0406206-1	Pu/W		SD	P62061
2		2				2
3		3				3
4		3D				3D
5		0406218-1				P62181
7		2				2
8		3				3
49		4				4
50		5				5
51		6				6
52		7				7
53		8				8
54		0406225-1				P62251
56		0406245-1				P62451
25		2				2
26		3				3
27		5				5
28		6				6
29		6D				6D

Notes:

Cont'd to Pg 279229

Reviewed by: JP
Date: 7/17/04

Paragon Analytics

FORM 746r6.xls (11/8/2000) 279230 Alpha Spectrometer Instrument Run Log Date: 7/17/04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
9	AS040712-1	0406252-2	Th/W	300	JP	TR62522
10	AS040715-1	0405097-1	Th/S	300	JP	TX50971
11	↓	-18	↓	↓	↓	18
12	↓	-18D	↓	↓	↓	18D
13	↓	-20	↓	↓	↓	20
15	↓	-26	↓	↓	↓	26
16	↓	-27	↓	↓	↓	27
17	↓	AS040715-1MB	↓	1000	JP	TX7151B
19	↓	LCS	↓	300	JP	L
21	276546	0419021-S1	U/T	300	JP	U190211
22	↓	S2	↓	↓	↓	2
23	↓	S3	↓	↓	↓	3
24	↓	S4	↓	↓	↓	4
42	↓	S5	↓	↓	↓	5
43	↓	B1	↓	↓	↓	B1
44	276547	0419022-S1	Th/T	300	JP	T190221
45	↓	S2	↓	↓	↓	2
46	↓	S3	↓	↓	↓	3
47	↓	S4	↓	↓	↓	4
48	↓	S5	↓	↓	↓	5
57	↓	B1	↓	↓	↓	B1
9	AS040712-4	AS040712-4LCS	V/S	300	JP	VR7124L
						JP 7/17/04

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial	File ID/Comm.
58	AS040712-4	0406264-1	U/S	300	JP	U62641
59	↓	↓ -1D	↓	↓	↓	↓ 1D
61	↓	↓ -2	↓	↓	↓	↓ 2
62	↓	AS040712-4MB	↓	↓	↓	U7124B
63	↓	↓ LCS	↓	↓	↓	↓ L
10	AS040713-2	0406090-1	Th/S	↓	JP	T60901
11	↓	0406206-4	↓	↓	↓	T62064
12	↓	0406221-7	↓	↓	↓	T62217
13	↓	↓ -7D	↓	↓	↓	↓ 7D
15	↓	0406245-7	↓	↓	↓	T62457
16	↓	↓ -9	↓	↓	↓	↓ 9
18	↓	AS040713-2MB	↓	↓	↓	T7132B
19	↓	LCS	↓	↓	↓	L
21	↓	↓ LCSD	↓	↓	↓	↓ LD
22	AS040713-3	0406206-4	U/S	↓	JP	U62064
23	↓	0406245-7	↓	↓	↓	U62457
24	↓	↓ -7D	↓	↓	↓	↓ 7D
42	↓	↓ -9	↓	↓	↓	↓ 9
43	↓	AS040713-3MB	↓	↓	↓	U7133B
44	↓	↓ LCS	↓	↓	↓	↓ L
						JP 7/17/04

Notes:

Cont. on page 279231. JP 7/17/04

Reviewed by: JP

Date: 7/19/04

000147

PARAGON ANALYTICS
Radiochemistry Data Package

Section 5

QUALITY ASSURANCE SUMMARY REPORTS

5

NCR # 005812

CONTROLLED

Paragon Analytics

NON-CONFORMANCE REPORT

Initiated by Sm Date 7-15-04

Reason: X Non-Conformance
___ Client Inquiry
___ Other _____

Method/Procedure IsoTh

Work Orders Affected 0405097
AS0406 29-10

Clients Kent and Sullivan

SECTION I TYPE OF EVENT (circle as appropriate)

___ 1. LCS / Surrogate / IS / Tracer or Chemical Yield Criteria Not Met
___ 2. Calibration Criteria Not Met (ICAL, ICV, CCV)
___ 3. Method Requirements Not Met (HTV, MB, ____)
___ 4. Deviation from LQAP / SOP (i.e., PAI criteria not met)
___ 5. Client Criteria Not Met (MDC, DER, _____)
___ 6. Equipment Failure or Laboratory Incident / Error
X 7. Other Spectral quality

Explanation: Samples 0405097-1, -18, -20, -26, -27 exhibit poor spectral quality likely caused by mass attenuation.

Actions to Prevent Recurrence (Retrain, etc.): N/A - matrix characteristics

SECTION II NOTIFICATION

Client Contacted? (Y / N) Name Sue Kent Date: 7/15/04 Time: email

SECTION III CORRECTIVE ACTIONS

✓ 1. Submit for Re-Prep, or Clean-up @ 0.1 g
___ 2. Re-analyze
___ 3. Resubmit Data (hc, edd, narrative)
___ 4. Document in Narrative
___ 5. Other _____

Approved by: DB DPM ___ PM

SECTION IV REQUEST FOR REWORK

Initial Batch ID: AS040629-10 Date: 6-29-04

Reworked Batch ID: AS040715-1 Date: 7-15-04

Outcome: Spectral quality improved and is adequate for accurate quantification

Approved by: RG 7/22/04

Matrix Effect or Elevated / Sample Activity Suspected? (circle applicable)

SECTION V DISPOSITION **Use as is** **Repair** **Reject**

SECTION VI COMMENTS Report the results for the samples listed in section I from the second batch - AS040715-1.
RG 7/22/04

SECTION VII APPROVAL SIGNATURES

Project Manager (PM) Debbie Fajio Date 7/15/04

Department Manager (DPM) [signature] Date 7/22/04 (Verification of Disposition)

QA Manager [signature] Date 7/22/04

SECTION VIII DISTRIBUTION DJF PM RC Dept. Manager KDC Lab Director ___ Rpt.Group or ✓ Rad

DCB

FORM 313r14.doc (3/8/04)

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAI W.O. # / BATCH 0405097/GS040611-1
TEST γ
METHOD prep
SOP/REV (PREP) 739 r8
SOP/REV (ANAL)

277615

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

The samples were digested per SOP 773r8 without the addition of boric acid in step 8.3.10 to prevent interferences with any other tests (such as Pb-210). The samples were brought to 1L with DI water and packed as a Geol. After gamma analysis the samples will be used to aliquot for other analyses.

CW 6/16/04

TECHNICIAN/ANALYST [signature] DATE 6/16/04

DEPARTMENT MANAGER Chroncavage DATE 6/16/04

FORM 302r6.doc (4/22/04)

000153

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

277627

PAI W.O. # / BATCH 0405097/AS040629-7,-8
TEST U-ISO, Th-ISO
METHOD Prep
SOP/REV (PREP) 778/9, 777/7
SOP/REV (ANAL) _____

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

TC 7/3/04

The following applies to batches AS040629-7 and AS040629-8 for the analysis of Th-ISO and U-ISO.

TC 7/3/04

1. Aliquots for the samples were taken from gamma fraction digestates (See QASS 277615). Aliquot sizes from the digestates were determined by the activity seen in the gamma analysis data. Actual aliquot sizes were entered onto the benchsheet using the following equation:

TC 7/3/04

$$\text{Sample Size (x)} = \frac{\text{(Original Sample weight) * (Digestate taken for analysis)}}{\text{(Total volume of digestate)}}$$

2. A consistent 20-25 mL of ammonium hydroxide was used per sample in order to form the ferric hydroxide precipitate prior to running a chloride column.

TC 7/3/04

TC 7/3/04

TECHNICIAN/ANALYST Z Elhart DATE 7/3/04

DEPARTMENT MANAGER John Petrosa DATE 7/3/04

FORM 302r6.doc (4/22/04)

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAI W.O. # / BATCH A0407 15-1
TEST Th-iso
METHOD Prep
SOP/REV (PREP) 7777
SOP/REV (ANAL)

277655

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

TE 7/16/04

1. Per NCR 005812, a sample aliquot of approximately .1g was taken for samples 0405097-1, 18, 20, 26, and 27. TE 7/16/04

TE 7/16/04

2. A consistent 20-25 mL of ammonium hydroxide was used per sample in order to form the ferric hydroxide precipitate prior to running a nitrate column.

TE 7/16/04

TE 7/16/04

TECHNICIAN/ANALYST T Elhart DATE 7/16/04

DEPARTMENT MANAGER [signature] DATE 7/16/04

FORM 302r6.doc (4/22/04)

Paragon Analytics, Inc.

QUALITY ASSURANCE SUMMARY SHEET

PAI W.O. # / BATCH A5016629-10
TEST Th-ISO
METHOD Prep
270494 SOP/REV (PREP) 77517
SOP/REV (ANAL)

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor; dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

TC 7/6/04

The following applies to work orders 0405097, 0405228, and 0406020 for U-ISO and/or Th-ISO analysis:

1. Due to possible alpha activity a reduced aliquot of approximately 1g was taken for all samples in work order 0405097. TC 7/6/04 TC 7/6/04

2. A consistent 20-25 mL of ammonium hydroxide was used per sample in order to form the ferric hydroxide precipitate prior to running a chloride or a nitrate column.

TC 7/6/04

TC 7/6/04

TECHNICIAN/ANALYST T. Eldridge DATE 7/6/04
DEPARTMENT MANAGER [signature] DATE 7/6/04

FORM 302r5.FRM (04/30/01)

Paragon Analytics, Inc.

QUALITY ASSURANCE SUMMARY SHEET

PAI W.O. # / BATCH Various
TEST Various
METHOD
SOP/REV (PREP)
SOP/REV (ANAL) 714 R9

248989

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

Due to a power outage 7/10/04, calibrations needed to be re-run before sample counting could continue. In order to most efficiently facilitate sample counting, it was decided to recalibrate that day, 7/10/04, even though that date was a Saturday. Normally, ~~weekly~~ SOP 7/20/04 weekly recalibrations would occur one week later, however since that was the following Saturday, recalibrations occurred on Monday, July 19th. Therefore, samples counted 7/17 and 7/18, Saturday + Sunday, on the 7th + 8th day after the 7/10/04 weekly calibrations. This is a deviation ~~to~~ SOP 7/20/04 from SOP 714, however data quality is not affected + it is believed that all client DQO's are met. Note: two samples counted 7/19/04, the 9th day. Data quality not affected.

TECHNICIAN/ANALYST [signature] DATE 7/20/04

DEPARTMENT MANAGER [signature] DATE 7/20/04

FORM 302r5.FRM (04/30/01)

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

LABORATORY BENCH SHEETS

6

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: AS040629-8

Prep Procedure: ThISO

Analytical QASS / NCR? Y / N

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0405097-2	SMP	0.093386	0.093386	g	_50972	43	SD	_50972			50972			
1	0405097-3	SMP	0.207944	0.207944	g	_50973	44		_50973			_50973			
1	0405097-17	SMP	0.017823	0.017823	g	_509717	45		_509717			_509717			
1	0405097-22	SMP	0.047545	0.047545	g	_509722	46		_509722			_509722			
1	0405097-24	SMP	0.01738	0.01738	g	_509724	47		_509724			_509724			
1	0405097-25	SMP	0.055092	0.055092	g	_509725	48		_509725			_509725			
1	0405097-29	SMP	0.037929	0.037929	g	_509729	51		_509729			_509729			
1	0405097-29	DUP	0.037929	0.037929	g	_509729D	58		_509729D			_509729D			
1	0405097-30	SMP	0.045079	0.045079	g	_509730	59		_509730			_509730			
1	AS040629-8	MB	0.03	0.03	g	_6298B	60		_6298B			_6298B			
1	AS040629-8	LCS	0.03	0.03	g	_6298L	61		_6298L			_6298L			

Sm 7/23/04

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	TH-229	630.2613.45	19.997	DPM/ml	06/30/04	0.5	ml	AW004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	TH-230	581.2382.60	20.003	DPM/ml	06/30/04	0.5	ml	AW004

000159

Supersedes: NA

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: AS040629-8

Prep Procedure: ThISO

Reviewed By: tde TDE **Review Date:** 7/3/04 7/3/04

Non-Routine Pre-Treatment? (Y) / N **Batch:** See QASS 277615 **Re-Prep?** Y / (N) **Batch:** NA **Prep QASS / NCR?** (Y) / N 277615, 277627

Prep SOP: PAI 777 **Rev:** 7
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart TE
Prep Date: 6/30/04
Prep Dept: AP

Balance: 10
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Total Digestate Vol(ml)	Digestate Vol Taken(ml)	Decay Date/Time	Micro Init	Micro Date	Standards	Prep Notes
1	1	0405097-2	SMP		0.093386	0.093386	Dry Weight	1000	106	7/1/04@1000	TE	7/3/04	T1	
2	1	0405097-3	SMP		0.207944	0.207944	Dry Weight	1000	220				T1	
3	1	0405097-17	SMP		0.017823	0.017823	Dry Weight	1000	13				T1	
4	1	0405097-22	SMP		0.047545	0.047545	Dry Weight	1000	31				T1	
5	1	0405097-24	SMP		0.01738	0.01738	Dry Weight	1000	9				T1	
6	1	0405097-25	SMP		0.055092	0.055092	Dry Weight	1000	38				T1	
7	1	0405097-29	SMP		0.037929	0.037929	Dry Weight	1000	28				T1	
8	1	0405097-29	DUP		0.037929	0.037929	Dry Weight	1000	28				T1	
9	1	0405097-30	SMP		0.045079	0.045079	Dry Weight	1000	38				T1	
10	1	AS040629-8	MB		0.03	0.03	Dry Weight	1000	30				T1	
11	1	AS040629-8	LCS		0.03	0.03	Dry Weight	1000	30				S1,T1	

TE 7/3/04

Spiked By: Tambrae Elhart **Date:** 6/30/04
Witnessed By: Grace Campagnola **Date:** 6/30/04

Relinquished By: TE
Date: 7/3/04
Received By: [illegible]
Date: 7/6/04

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	TH-229	630.2613.45	19.997	DPM/ml	06/30/04	0.5	ml	AW004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	TH-230	581.2382.60	20.003	DPM/ml	06/30/04	0.5	ml	AW004

00015

Comments

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: AS040629-8

Prep Procedure: ThISO

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? (Y) / N **Batch:** Common Digestion **Re-Prep?** Y / N **Batch:** _____ **Prep QASS / NCR?** Y / N _____

Prep SOP: PAI 777 **Rev:** 7
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart TE
Prep Date: ~~6/29/04~~ 6/30/04
Prep Dept: AP

Balance: 10
Balance:

	Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Total Digestate Vol(ml)	Digestate Vol Taken(ml)	Decay Date/Time	Micro Init	Micro Date	Standards	Prep Notes
37	1	1	0405097-2	SMP		0.093386	0.093386	As Received	1000	106	7/1/04-1000			T1	
36	2	1	0405097-3	SMP		0.208889	0.208889	As Received	1000	~~227~~ 220				T1	
41	3	1	0405097-17	SMP		0.017823	0.017823	As Received	1000	13				T1	
38	4	1	0405097-22	SMP		0.047545	0.047545	As Received	1000	31				T1	
28	5	1	0405097-24	SMP		0.01738	0.01738	As Received	1000	9				T1	
25	6	1	0405097-25	SMP		0.055092	0.055092	As Received	1000	38				T1	
9	7	1	0405097-29	SMP		0.037929	0.037929	As Received	1000	28				T1	
4	8	1	0405097-29	DUP		0.037929	0.037929	As Received	1000	28				T1	
24	9	1	0405097-30	SMP		0.045079	0.045079	As Received	1000	38				T1	
31	10	1	AS040629-8	MB		0.03	0.03	As Received	1000	30				T1	
30	11	1	AS040629-8	LCS		0.03	0.03	As Received	1000	30				S1,T1	

Spiked By: Tambrae Elhart TE **Date:** 6/30/04 6/30/04
Witnessed By: AC **Date:** 6/30/04

Relinquished By: _____
Date: _____
Received By: _____
Date: _____

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	TH-229	630.2613.45	19.997	DPM/ml	06/29/04	0.5	ml	AW004

Exp 5/10/05

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	TH-230	581.2382.60	20.003	DPM/ml	06/29/04	0.5	ml	AW004

Exp 2/10/05

000153

Comments

Supersedes: NA

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: AS040629-10

Prep Procedure: ThISO

Analytical QASS (NCR? Y) / N 5812

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0405097-1	SMP	1.0053	1.0053	g	T_50971	48*	Sm	_50971			_50971			* Mass attenuation. Sm 7/12/04
1	0405097-4	SMP	1.0093	1.0093	g	_50974	57		50974			50974			
1	0405097-5	SMP	1.004	1.004	g	_50975	58		_50975			_50975			
1	0405097-6	SMP	1.0107	1.0107	g	_50976	59		50976			_50976			Sm 7/23/04
1	0405097-7	SMP	1.0145	1.0145	g	_50977	60	TR	50977 **	18	Sm	_50977			** Peak Shift. Sm 7/14/04
1	0405097-7	DUP	1.017	1.017	g	_50977D	61		50977D			50977D			
1	0405097-8	SMP	1.0533	1.0533	g	_50978	62		_50978			50978			Sm 7/23/04
1	0405097-9	SMP	1.0047	1.0047	g	_50979	~~63~~ Sm 7/9/04		T_50979	62	Sm	_50979			
1	0405097-10	SMP	1.0165	1.0165	g	_509710	19	Sm	_509710			_509710			
1	0405097-11	SMP	1.0177	1.0177	g	_509711	21		_509711			_509711			
1	0405097-12	SMP	1.0563	1.0563	g	_509712	22		_509712			_509712			
1	0405097-13	SMP	1.0048	1.0048	g	_509713	23		_509713			_509713			
1	0405097-14	SMP	1.0628	1.0628	g	_509714	24		_509714			_509714			
1	0405097-15	SMP	1.0393	1.0393	g	_509715	42		_509715			_509715			
1	0405097-16	SMP	1.0089	1.0089	g	_509716	43		_509716			509716			
1	0405097-16	DUP	1.0387	1.0387	g	_509716D	44		_509716D			_509716D			
1	0405097-18	SMP	1.0071	1.0071	g	_509718	45*		_509718			_509718			
1	0405097-20	SMP	1.0276	1.0276	g	_509720	46*		_509720			_509720			
1	0405097-26	SMP	1.0164	1.0164	g	_509726	47*		_509726			_509726			
1	0405097-27	SMP	1.067	1.067	g	_509727	57*		509727			509727			Sm 7/23/04
1	AS040629-10	MB	1	1	g	_62910B	58	TR	62910B △	18		_62910B			△ MDC not met. SD 7/15/04
1	AS040629-10	LCS	1	1	g	_62910L	59		_62910L			_62910L			

Sm 7/23/04

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	TH-229	630.2613.45	19.997	DPM/ml	06/30/04	0.5	ml	AW004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	TH-230	581.2382.60	20.003	DPM/ml	06/30/04	0.5	ml	AW004

000153

Supersedes: NA

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: AS040629-10

Prep Procedure: ThISO

Reviewed By: tde TDE **Review Date:** 7/4/04 7/4/04

Non-Routine Pre-Treatment? (Y) / N **Batch:** Muffling **Re-Prep?** Y / (N) **Batch:** NA **Prep QASS / NCR?** (Y) / N 270494

Prep SOP: PAI 777 **Rev:** 7
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart TE
Prep Date: 6/30/04
Prep Dept: AP

Balance: 23
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	0405097-1	SMP		1.0053	1.0053	Dry Weight	TE	7/4/04	T1	
2	1	0405097-4	SMP		1.0093	1.0093	Dry Weight			T1	
3	1	0405097-5	SMP		1.004	1.004	Dry Weight			T1	
4	1	0405097-6	SMP		1.0107	1.0107	Dry Weight			T1	
5	1	0405097-7	SMP		1.0145	1.0145	Dry Weight			T1	
6	1	0405097-7	DUP		1.017	1.017	Dry Weight			T1	
7	1	0405097-8	SMP		1.0533	1.0533	Dry Weight			T1	
8	1	0405097-9	SMP		1.0047	1.0047	Dry Weight			T1	
9	1	0405097-10	SMP		1.0165	1.0165	Dry Weight			T1	
10	1	0405097-11	SMP		1.0177	1.0177	Dry Weight			T1	
11	1	0405097-12	SMP		1.0563	1.0563	Dry Weight			T1	
12	1	0405097-13	SMP		1.0048	1.0048	Dry Weight			T1	
13	1	0405097-14	SMP		1.0628	1.0628	Dry Weight			T1	
14	1	0405097-15	SMP		1.0393	1.0393	Dry Weight			T1	
15	1	0405097-16	SMP		1.0089	1.0089	Dry Weight			T1	
16	1	0405097-16	DUP		1.0387	1.0387	Dry Weight			T1	
17	1	0405097-18	SMP		1.0071	1.0071	Dry Weight			T1	
18	1	0405097-20	SMP		1.0276	1.0276	Dry Weight			T1	
19	1	0405097-26	SMP		1.0164	1.0164	Dry Weight			T1	
20	1	0405097-27	SMP		1.067	1.067	Dry Weight			T1	
21	1	AS040629-10	MB		1	1	Dry Weight			T1	
22	1	AS040629-10	LCS		1	1	Dry Weight			S1,T1	

TE 7/4/04

Spiked By: Tambrae Elhart **Date:** 6/30/04

Witnessed By: Carissa Moncavage **Date:** 6/30/04

Relinquished By: TE ~~7/4/04~~ 7/4/04
Date: 7/4/04
Received By: Sm
Date: 7-6-04

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	TH-229	630.2613.45	19.997	DPM/ml	06/30/04	0.5	ml	AW004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	TH-230	581.2382.60	20.003	DPM/ml	06/30/04	0.5	ml	AW004

000160

Comments
Samples were muffled overnight at 600 C. A PEG treatment was performed on all samples.

Supersedes: 6/29/04 14:17

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: AS040629-10

Prep Procedure: ThISO

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep? Y / N** **Batch:** _____ **Prep QASS / NCR? Y / N** _____

Prep SOP: PAI 777 **Rev:** 7
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart TE
Prep Date: ~~6/29/04~~ 6/30/04
Prep Dept: AP

Balance:
Balance:

	Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
22	1	1	0405097-1	SMP		1	1	As Received	431	1.0053	T1	
3	2	1	0405097-4	SMP		1	1	As Received	492	1.0093	T1	
9	3	1	0405097-5	SMP		1	1	As Received	472	1.0040	T1	
29	4	1	0405097-6	SMP		1	1	As Received	595	1.0107	T1	
23	5	1	0405097-7	SMP		1	1	As Received	563	1.0145	T1	
4	6	1	0405097-7	DUP		1	1	As Received	602	1.0170	T1	
21	7	1	0405097-8	SMP		1	1	As Received	314	1.0533	T1	
6	8	1	0405097-9	SMP		1	1	As Received	458	1.0047	T1	
28	9	1	0405097-10	SMP		1	1	As Received	451	1.0165	T1	
8	10	1	0405097-11	SMP		1	1	As Received	571	1.0177	T1	
30	11	1	0405097-12	SMP		1	1	As Received	568	1.0563	T1	
31	12	1	0405097-13	SMP		1	1	As Received	496	1.0048	T1	
25	13	1	0405097-14	SMP		1	1	As Received	471	1.0628	T1	
24	14	1	0405097-15	SMP		1	1	As Received	460	1.0393	T1	
2	15	1	0405097-16	SMP		1	1	As Received	484	1.0089	T1	
38	16	1	0405097-16	DUP		1	1	As Received	1066	1.0387	T1	
35	17	1	0405097-18	SMP		1	1	As Received	301	1.0071	T1	
40	18	1	0405097-20	SMP		1	1	As Received	463	1.0276	T1	
36	19	1	0405097-26	SMP		1	1	As Received	467	1.0164	T1	
37	20	1	0405097-27	SMP		1	1	As Received	562	1.0670	T1	
34	21	1	AS040629-10	MB		1	1	As Received	597	1.000	T1	
39	22	1	AS040629-10	LCS		1	1	As Received	437	1.000	S1,T1	

Spiked By: TE **Date:** 6/30/04
Witnessed By: [illegible] **Date:** 6/30/04

Relinquished By: _____
Date: _____
Received By: _____
Date: _____

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	TH-229	630.2613.45	19.997	DPM/ml	06/29/04	0.5	ml	AW004

Exp 2/10/05

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	TH-230	581.2382.60	20.003	DPM/ml	06/29/04	0.5	ml	AW004

Exp ~~6~~ 5/10/05

Comments

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: AS040715-1

Prep Procedure: ThISO

Analytical QASS NCR? Y / N 218989

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0405097-1	SMP	0.1059	0.1059	g	TX _50971	10	JP	_50971			_50971			
1	0405097-18	SMP	0.1104	0.1104	g	_509718	11		_509718			_509718			
1	0405097-18	DUP	0.107	0.107	g	_509718D	12		_509718D			_509718D			
1	0405097-20	SMP	0.1005	0.1005	g	_509720	13		_509720			_509720			
1	0405097-26	SMP	0.1055	0.1055	g	_509726	15		_509726			_509726			
1	0405097-27	SMP	0.1049	0.1049	g	_509727	16		_509727			_509727			
1	AS040715-1	MB	0.1	0.1	g	_7151B	17	SD	_7151B			_7151B			
1	AS040715-1	LCS	0.1	0.1	g	_7151L	19	JP	_7151L			_7151L			

SD 7/21/04

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	TH-229	630.2613.45	19.997	DPM/ml	07/15/04	0.5	ml	AW004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	TH-230	581.2382.60	20.003	DPM/ml	07/15/04	0.5	ml	AW004

001162

Supersedes: NA

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: AS040715-1

Prep Procedure: ThISO

Reviewed By: tde TDE **Review Date:** 7/16/04 7/16/04

Non-Routine Pre-Treatment? Y (N) **Batch:** NA **Re-Prep?** (Y) / N **Batch:** AS040629-10 **Prep QASS / NCR?** (Y) / N 277655

Prep SOP: PAI 777 **Rev:** 7
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart TE
Prep Date: 7/15/04
Prep Dept: AP

Balance: 23
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	0405097-1	SMP		0.1059	0.1059	Dry Weight	TE	7/16/04	T1	
2	1	0405097-18	SMP		0.1104	0.1104	Dry Weight			T1	
3	1	0405097-18	DUP		0.107	0.107	Dry Weight			T1	
4	1	0405097-20	SMP		0.1005	0.1005	Dry Weight			T1	
5	1	0405097-26	SMP		0.1055	0.1055	Dry Weight			T1	
6	1	0405097-27	SMP		0.1049	0.1049	Dry Weight			T1	
7	1	AS040715-1	MB		0.1	0.1	Dry Weight			T1	
8	1	AS040715-1	LCS		0.1	0.1	Dry Weight			S1,T1	

TE 7/16/04

Spiked By: Tambrae Elhart **Date:** 7/15/04

Witnessed By: Aaron Peterson **Date:** 7/15/04

Relinquished By: TE
Date: 7/16/04
Received By: JP
Date: 7/17/04

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	TH-229	630.2613.45	19.997	DPM/ml	07/15/04	0.5	ml	AW004

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	TH-230	581.2382.60	20.003	DPM/ml	07/15/04	0.5	ml	AW004

000163

Comments

Supersedes: 7/15/04 (0:57)

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: AS040715-1

Prep Procedure: ThISO

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? Y / N **Batch:** _____ **Re-Prep? Y / N** **Batch:** _____ **Prep QASS / NCR? Y / N** _____

Prep SOP: PAI 777 **Rev:** 7
Prep SOP: NONE
Matrix Class: solid

Prep Analyst: Tambrae Elhart TE
Prep Date: 7/15/04
Prep Dept: AP

Balance:
Balance:

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Micro Init	Micro Date	Prep Notes
1	1	0405097-1	SMP		0.1	0.1	Dry Weight	.1059	TE	
2	1	0405097-18	SMP		0.1	0.1	Dry Weight	.1104		
3	1	0405097-18	DUP		0.1	0.1	Dry Weight	.1070		
4	1	0405097-20	SMP		0.1	0.1	Dry Weight	.1005		
5	1	0405097-26	SMP		0.1	0.1	Dry Weight	.1055		
6	1	0405097-27	SMP		0.1	0.1	Dry Weight	.1049		
7	1	AS040715-1	MB		0.1	0.1	Dry Weight	.1000		
8	1	AS040715-1	LCS		0.1	0.1	Dry Weight	.1000	✓/S1	

Spiked By: TE **Date:** 7/15/04
Witnessed By: ap **Date:** 7/15/04

Relinquished By: _____
Date: _____
Received By: _____
Date: _____

Tracer

Th-229 630.2613.45 20.00 .5mL Ancoy
Exp 5/10/05

Spike

Th-230 581.2382.60 20.00 .5mL Ancoy
Exp 2/10/05

000164

Comments

Supersedes: NA

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TE

ANALYSIS DATE: 6/29/04 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
0405097	2	dry	ground	fine
	3			
	17			
	19			
	21			
	22			
	23			
	24			
	25			
	28			
	29			
	30			
			TE	6/29/04

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TC

ANALYSIS DATE: 6/29/04 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
0405097	1	dry	ground	fine
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
	16			
	18			
	20			
	26			
	27			
0405228	1			
0406020	4			

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: TE

ANALYSIS DATE: 7/15/04 METHOD: Prep

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		Dry/Wet	TEXTURE	Remarks
0405097	1	dry	ground	fine
	18			
	20			
	26			
	27			

TE 7/15/04

000067

26114

Paragon Analytics, Inc.

Sample Digestions Worksheet

Paragon Sample ID	Original sample weight (g)	As Rec'd / Dry Wt (g)	Total ~~Weight~~ Volume of digestate ~~(g)~~ mL	% moist	Sample Matrix	Digest.* Solution Nature	digestate size taken for analysis ~~(g)~~ mL											
							Pu	U	Th	Am/Cm	Np	Fe-55	Pu-241	Sr	a/b	H-3	C-14	other
0405097-2	.881	Dry wt	1000	NA	Soil	Nitric, DI H2O		160	106									
2-D	.881							160	6/30/04									
3	.9452							330	220									
17	1.371							19	13									
19	1.4461							10	7									
19-D	1.4461							6/30/04	7									
21	1.0375							20	14									
22	1.5337							46	31									
23	1.1558							85	58									
23-D	1.1558							85	6/30/04									
24	1.9311							13	9									
25	1.4498							57	38									
28	1.5248							18	12									
29	1.3546							42	28									
29-D	1.3546							6/30/04	28									
30	1.1863							58	38									
MB	1.0000							50	30									
LCS	1.0000							50	30									

7C 6/30/04

Prep Analyst 7C
Prep Date 6/30/04
Balance No. NA
QASS#
SOP/REV

* Digest solution nature = The name of digestate media (e.g., 8N HNO3)

Reviewed by 7C Date 7/3/04

Form 780r2.xls (10/17/2001)

000163

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

STANDARDS TRACEABILITY DOCUMENTS

7

PROJECT Th-229 630.2613.45

Th-229
Prepare a working level dilution of Th-229 (630.2382.28) at 20.00 dpm/ml by diluting with 0.5 M HNO_3 → Lot # 43059

1) Determine the density of 0.5 M HNO_3
Mass of empty 100 mL Class A volumetric flask 68.3266 g (bal 12)
Mass of flask + 100 mL of 0.5 M HNO_3 169.4627 g
Net mass of 0.5 M HNO_3 101.1361 g
ρ = 1.0114 g/mL

2) Add/transfer approx 10.0 g of Th-229 (630.2382.28) to a 1L nalgene bottle
Mass of empty nalgene bottle without lid (bal 12) 74.1499 g
Mass of nalgene bottle + standard 84.3850 g
net mass of standard transferred 10.2351 g

3) Dilute to final volume with 1.0 M HNO_3
Mass of empty nalgene bottle w/out lid (from above) 74.1499 g
Mass of bottle, standard + 1.0 M HNO_3 926.7 g (bal 26)
Net mass of standard 852.5501 g

4) Final Activity Calculation

$$\frac{(1647.2\ dpm/g)(10.2351\ g)(1.0114\ g/mL)}{852.5501\ g} = 20.00\ dpm/mL$$

SD 5/27/04

Stnd ID: 630.2613.45
Description: Th-229
Expiration: 5/10/2005
Activity: 20.00 dpm/mL
2s Uncertainty: 2.33 dpm/mL
Ref. Date: 7/17/2002
Ref Time: N/A
Prep Date: 5/2/2004 Prep by: CDM
Matrix/Comp. 0.5 M HNO3
Half Life (y): 7.34E+03
Th-228, Th-230, Th-232 impurities
SD 5/27/04

SD 5/27/04

SD 5/27/04

Continued on Page

Read and Understood By

Chroncavage 5/2/04 [signature] 5/27/04
Signed Date Signed Date

Prepare a 1° dilution of Analytics 64206-307 by transferring contents of the ampule to a ~~40 ml~~ DCS 8/15/02 VOA 250 ml Nalgene bottle & diluting to approx 150 ml w/ 0.5 N HNO_3. (Lot # K2933831 DCS 8/15/02)

1) Transfer contents of ampule to 250 ml bottle

Mass of empty Nalgene bottle (w/o lid)	23.9862 g	(Bal 12)
Mass of opened ampule + 50 ml beaker	37.8911 g	
Mass of empty ampule + beaker	33.1523 g	
Net mass of std. transferred	4.7388 g	

2) Dilute std in Nalgene bottle

Mass of empty bottle (from above)	23.9862 g	
Mass of bottle + std + .5 N HNO_3	170.5635 g	(Bal 12)
Net mass of std.	146.5773 g	

3) Final Activity Calculation

$$\left(\frac{4.258 \times 10^3 \text{ dps}}{5.01424 \text{ g}}\right)\left(\frac{4.7388 \text{ g}}{146.5773 \text{ g}}\right)(60 \text{ s/m}) = 1647.2 \text{ dpm/g}$$

RB 9/16/02

Continued on Page ____

Read and Understood By

Signed	8/15/02 Date	Signed	9/16/02 Date

ANALYTICS

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

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

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

PAID 00630
Rec'd 7-19-02

64206-307

Th-229 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by liquid scintillation counting.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. 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:	Th-229
ACTIVITY (dps):	4.258 E3
HALF-LIFE:	7340 years
CALIBRATION DATE:	July 17, 2002 12:00 EST
TOTAL UNCERTAINTY*:	3.5%
SYSTEMATIC:	2.6%
RANDOM:	0.9%

*99% confidence level.

Impurities:

Th-228	26.9 dps
Th-230	26.5 dps
Th-232	1.8 dps

5.01424 grams 0.5M HNO3 solution.

P O NUMBER 001620, Item 1

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

Q A APPROVED: 7-18-02

60
PROJECT Th-230 581.2382.60
Notebook No. 2382
Continued From Page

Th-230
Prepare a working level dilution of Th-230 (581.1808.65) to 20 dpm/mL by diluting w/ 0.1M HNO_3 (Lot #42270)

1) Determine the density of 0.1M HNO_3

mass of empty 100 mL volumetric flask	64.6140 g (Bal 12)
mass of flask + 0.1M HNO_3	164.5730 g ↓
net mass of 0.1M HNO_3	99.959 g
	ρ = 0.9996 g/mL

2) Transfer approx 17 g of Th-230 (581.1808.65) to a 1L nalgene bottle

mass of empty 1L nalgene bottle w/o lid	74.4414 g (Bal 12)
mass of bottle + std	91.5530 g ↓
net mass of std transferred	17.1116 g

3) Dilute to final volume w/ 0.1M HNO_3

mass of empty 1L nalgene bottle (from above)	74.4414 g
mass of bottle + std + 0.1M HNO_3	1068.5 g (Bal 26)
net mass of std	994.06 g

4) Final activity calc

$$\frac{(1162.00\ \text{dpm/mL})(17.1116\ \text{g})}{994.06\ \text{g}} = 20.00\ \text{dpm/mL}$$

RG 2/11/03

Stnd ID: 581.2382.60

Description: Th-230
Activity: 20.00 dpm/ml
2s Uncertainty: 0.427 ~~0.64~~ RG 2/11/03 dpm/ml
Ref. Date: 5/15/01
Ref Time: na
Prep Date: 2/2/03 Prep by: CDM
Expiration: 2/5/04
Matrix/Comp. 0.1M HNO3
Half Life (y): 7.54E+04

RG 2/11/03 RG 2/11/03 RG 2/11/03

SD 3/5/04

Reverification of std:

SD 3/5/04

Stnd ID: 581.2382.60
SD 3/5/04

Description: Th-230
Expiration: 2/10/05
Activity: 20.00 dpm/mL
2s Uncertainty: 0.43 dpm/mL
Ref. Date: 5/15/01
Ref Time: N/A
Prep Date: 1/20/03 Prep by: CDM
Matrix/Comp. 0.1 M HNO3
Half Life (y): 7.54E+04

SD 3/5/04 SD 3/5/04

Continued on Page

Read and Understood By

Carissa Moncavage 1/20/03 Signed Date

Renee Gallegos 1/30/03 Signed Date

PROJECT 581.1808.65 Th-230 Calibration Std. Continued From Page

5/10/01 Prepare a 1000 dpm/mL solution of Th-230 by diluting RSD # 581 with 0.1 M HNO_3

1) Determine density of 0.1 M HNO_3 (6.25 mL conc. HNO_3 diluted to 1L with DI H_2O)

Mass of 100 mL volumetric flask	64.6110 g (balance #12)
Mass of flask + 0.1 M HNO_3	164.5707 g
Net mass of 0.1 M HNO_3	99.9597 g

ρ = .9996 g/mL

2) Directly transfer approximately 40 mL to VOA vial – NO dilution

3) Transfer remaining standard in ampoule to 500 mL poly

Mass of 500 mL poly minus lid	32.5073 g (balance #12)
Mass of 500 mL poly + standard	43.0529 g
Mass of standard	10.5456 g

4) Bring standard to final dilution with 0.1 M HNO_3

Mass of empty bottle (from above)	32.5073 g (balance #12)
Mass of bottle + standard + 0.1 M HNO_3	233.16 g (balance #12)
Net mass of std (diluted)	200.65 g

5) Final Activity Calculation:

$$\frac{(18390\ Bq)(60\ dpm/Bq)(0.9996\ g/mL)(10.5456\ g)}{(49.88438\ g)(233.16\ g - 32.5073\ g)} = 1162.016\ dpm/mL$$

Stnd ID: 581.1808.65

Description: Th-230
Activity: 1162.00 dpm/ml
Uncertainty: 37.000 dpm/ml
Ref. Date: 5/15/01
Ref Time: na
Prep Date: 5/10/01 Prep by: RLF
Expiration: 5/22/03
Matrix/Comp. 0.1 M HNO3
Half Life (y): 7.54E+04

Continued on Page

Read and Understood By

Signed 5/10/01 Date Signed 5/10/01 Date

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

PAID 00581
Recd 5-02-01

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide:	Th-230	Customer:	PARAGON ANALYTICS, INC.
Half-life:	(7.54 ± 0.03)E+04 years	P.O. No.:	001295
Catalog No.:	7230	Reference Date:	15-May-01 12:00 PST
Source No.:	758-93	Contained Radioactivity: (Th-230 only)	0.4969 µCi 18.39 kBq

Physical Description:

A. Mass of solution: 49.88438 g in 50 mL flame-sealed ampoule
B. Chemical form: $Th(NO_3)_4$ in 0.1M HNO_3
C. Carrier content: 10 µg Th/mL of solution
D. Density: 1.0016 g/mL @ 20°C.

Radioimpurities:

Am-241 = 0.110%; Ra-226 daughter = 0.400% on 15 May 01

Radionuclide Concentration: 0.009961 µCi/g, 0.3686 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty: ± 1.2 %
B. Type B (systematic) uncertainty: ± 3.0 %
C. Uncertainty in aliquot weighing: ± 0.0 %
D. Total uncertainty at the 99% confidence level: ± 3.2 %

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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This solution has a working life of 5 years.

Daniel James Van Dalsen — Quality Control
26-Apr-01 — Date Signed
IPL Ref. No.: 758-93

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

CHAIN OF CUSTODY

8

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0405097
Client Name: Kent & Sullivan Inc.
Client Project Name: Ross Adams
Client Project Number:
Client PO Number:

Client Sample	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
HR-01	0405097-1		SOLID	06-May-04	19:00
MR-01	0405097-2		SOLID	07-May-04	13:30
MR-02	0405097-3		SOLID	07-May-04	13:20
GR-01	0405097-4		SOLID	07-May-04	13:11
GR-02	0405097-5		SOLID	07-May-04	13:38
GR-03	0405097-6		SOLID	07-May-04	14:00
GR-04	0405097-7		SOLID	07-May-04	14:20
GR-05	0405097-8		SOLID	07-May-04	14:38
GR-06	0405097-9		SOLID	07-May-04	14:58
GR-07	0405097-10		SOLID	07-May-04	15:10
GR-08	0405097-11		SOLID	07-May-04	15:10
GR-09	0405097-12		SOLID	07-May-04	15:20
GR-10	0405097-13		SOLID	07-May-04	15:35
QM-01	0405097-14		SOLID	03-May-04	13:40
QM-02	0405097-15		SOLID	03-May-04	14:00
QM-03	0405097-16		SOLID	03-May-04	14:20
300-01	0405097-17		SOLID	04-May-04	9:50
300-02	0405097-18		SOLID	07-May-04	16:30
700-01	0405097-19		SOLID	07-May-04	17:00
700-02	0405097-20		SOLID	07-May-04	17:30
700-03	0405097-21		SOLID	07-May-04	17:20
700-04	0405097-22		SOLID	07-May-04	18:00
900-01	0405097-23		SOLID	07-May-04	13:00
900-02	0405097-24		SOLID	07-May-04	12:10
900-03	0405097-25		SOLID	07-May-04	12:30
900-04	0405097-26		SOLID	07-May-04	19:00
900-05	0405097-27		SOLID	07-May-04	18:40
OSA-01	0405097-28		SOLID	06-May-04	14:00
OSA-02	0405097-29		SOLID	06-May-04	19:00
OSA-03	0405097-30		SOLID	06-May-04	17:00

Paragon Analytics, Inc.

225 Commerce Drive Fort Collins, CO 80524

800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

Chain-of-Custody

Accession Number (LAB ID) 0405097

Date _____ Page 5 of 9

Project Name / No.: _____ Sampler(s): _____ (circle one) Turnaround: Standard or Rush (Due _____) Dispose or Return to Client

Report To:
Phone:
Fax:
Company:
Address:

See pg 1

circle method or specify under comments

Sample ID	Date 2004	Time *	Lab ID	Matrix	No. of Containers	VOCs SW8260B E624 E524.2 OLMO__	BTEX (only) SW8021B	SVOCs SW8270C E625 E525 OLMO__	OC Pesticides SW8081A E608 E508 OLMO__	PCBs SW8082 E608 E508 OLMO__	OP Pesticides SW8141A E614	Herbicides SW8151A E615	TCLP Organics SW1311 8260B 8270C 8081A 8151A	TCLP Metals SW 1311 6010B 7471	Total Metals SW6010B 7470 7471 E200 ILMO__	Dissolved Metals SW6010B 7470 E200 ILMO__	Reactive CN / S SW846 Chapter 7	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions ** SW9056 E300.0	pH SW9040B 9045C	Oil & Grease SW9071A E413.2	TPH GRO DRO SW8015B (both)	TOX SW9020B	Gross Alpha / Beta SW9310 E900.0	Actinides by PAI SOP (circle): Pu / U / Am / Th / Cm	Uranium by KPA D5174-91 Isotopic	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 SW9315 E903.0 Radium 228 SW9320 E904.0	Strontium 89 D5811-95 Strontium 90 D5811-95	Gamma Isotopes ** E901.1	Th-isotopic	
SOIL-01 (*)	5-6	1600		SOIL	3										C											X			X			X	
SOIL-02	5-6	1540		SOIL	3										C											X			X			X	
SOIL-04	5-6	1504		SOIL	3										C											X			X			X	
SOIL-05	5-6	1510		SOIL	3										C											X			X			X	
SOIL-07	5-7	1350		SOIL	3										C											X			X			X	
SOIL-08	5-7	1615		SOIL	3										C											X			X			X	
SOIL-09	5-7	1410		SOIL	3										C											X			X			X	
SOIL-10	5-7	1640		SOIL	3										C											X			X			X	
HR-01	5-6	1900	1	RK	1										C											X			X			X	

Comments:

(*) on WO # 0405096
DW 5/12/04

Relinquished By: (1)
Signature Gerald Warrick
Printed Name Gerald Warrick
Date 5-10-04 Time 10:00
Company Kent & Sullivan

Relinquished By: (2)
Signature _____
Printed Name _____
Date _____ Time _____
Company _____

Received By: (1)
Signature _____
Printed Name Amy Wolf
Date 5/11/04 Time 1645
Company Paragon Analytics

Received By: (2)
Signature _____
Printed Name _____
Date _____ Time _____
Company _____

Form 202r4.xls (1/3/01)

0001173

* Time Zone (circle one): EST CST MST PST

** Indicate specific analytes under comments.

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Paragon Analytics, Inc.
225 Commerce Drive Fort Collins, CO 80524
800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

Chain-of-Custody

Accession Number (LAB ID) 0405097

Date _____ Page 6 of 9

Project Name / No.: _____ Sampler(s): _____ (circle one) Turnaround: Standard or Rush (Due _____) Dispose or Return to Client

Report To:
Phone:
Fax:
Company:
Address: See pg 1

circle method or specify under comments

Sample ID	Date 2004	Time *	Lab ID	Matrix	No. of Containers	VOCs SW8260B E624 E524.2 OLMO__	BTEX (only) SW8021B	SVOCs SW8270C E625 E525 OLMO__	OC Pesticides SW8081A E608 E508 OLMO__	PCBs SW8082 E608 E508 OLMO__	OP Pesticides SW8141A E614	Herbicides SW8151A E615	TCLP Organics SW1311 8260B 8270C 8081A 8151A	TCLP Metals SW 1311 6010B 7471	Total Metals SW6010B 7470 7471 E200 ILMO__	Dissolved Metals SW6010B 7470 E200 ILMO__	Reactive CN / S SW846 Chapter 7	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions ** SW9056 E300.0	pH SW9040B 9045C	Oil & Grease SW9071A E413.2	TPH GRO DRO SW8015B (both)	TOX SW9020B	Gross Alpha / Beta SW9310 E900.0	Actinides by PAI SOP (circle): Pu / U / Am / Th / Cm	Uranium by KPA D5174-91 Isotopic	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 SW9315 E903.0 Radium 228 SW9320 E904.0	Strontium 89 D5811-95 Strontium 90 D5811-95	Gamma Isotopes ** E901.1	Th- isotopic
MR-01	5-7	1330	2	RK	3										C											X			X			X
MR-02	5-7	1320	3	RK	3										C											X			X			X
GR-01	5-7	1311	4	RK	1										C											X			X			X
GR-02		1338	5		1										C																	
GR-03		1400	6		1										C																	
GR-04		1420	7		1										C																	
GR-05		1438	8		1										C																	
GR-06		1458	9		1										C																	
GR-07		1510	10		1										C																	

Comments:

Form 202r4.xls (1/3/01)

Relinquished By: (1)	Relinquished By: (2)
Signature Gerald Warrick	Signature
Printed Name Gerald Warrick	Printed Name
Date 5-10-04 Time 10:00	Date Time
Company Kent & Sullivan	Company

Received By: (1)	Received By: (2)
Signature	Signature
Printed Name Amy Wolf	Printed Name
Date 5/11/04 Time 1645	Date Time
Company Paragon Analytics	Company

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000177

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225 Commerce Drive Fort Collins, CO 80524
800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

Chain-of-Custody

Accession Number (LAB ID) 0405097

Date _____ Page 7 of 9

Project Name / No.: _____ Sampler(s): _____ (circle one) Turnaround: Standard or Rush (Due _____) Dispose or Return to Client

Report To:
Phone:
Fax:
Company:
Address:

circle method or specify under comments

Sample ID	Date 2004	Time *	Lab ID	Matrix	No. of Containers	VOCs SW8260B E624 E524.2 OLMO__	BTEX (only) SW8021B	SVOCs SW8270C E625 OLMO__	OC Pesticides SW8081A E608 E508 OLMO__	PCBs SW8082 E608 E508 OLMO__	OP Pesticides SW8141A E614	Herbicides SW8151A E615	TCLP Organics SW1311 8260B 8270C 8081A 8151A	TCLP Metals SW 1311 6010B 7471	Total Metals SW6010B 7470 7471 E200 ILMO__	Dissolved Metals SW6010B 7470 E200 ILMO__	Reactive CN / S SW846 Chapter 7	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions ** SW9056 E300.0	pH SW9040B 9045C	Oil & Grease SW9071A E413.2	TPH GRO DRO SW8015B (both)	TOX SW9020B	Gross Alpha / Beta SW9310 E900.0	Actinides by PAI SOP (circle): Pu / U / Am / Th / Cm	Total Uranium by KPA ~~D6134-01~~ Isotopic	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 SW9315 E903.0 Radium 228 SW9320 E904.0	Strontium 89 D5811-95 Strontium 90 D5811-95	Gamma Isotopes ** E901.1	Th 1 Isotopic
GR-08	5-7	1510	11	RK	1										C											X			X			X
GR-09	↓	1520	12	↓	1										C											X			X			X
GR-10	↓	1535	13	↓	1										C											X			X			X
QM-01	5-3	1340	14	RK	1										C											X			X			X
QM-02	↓	1400	15	↓	1										C											X			X			X
QM-03	↓	1420	16	↓	1										C											X			X			X
300-01	5-4	0950	17	RK	1										C											X			X			X
300-02	5-7	1630	18	RK	1										C											X			X			X

Comments:

Relinquished By: (1)
Signature Gerald Warrick
Printed Name Gerald Warrick
Date 5-10-04 Time 10:00
Company Kent & Sullivan

Relinquished By: (2)
Signature _____
Printed Name _____
Date _____ Time _____
Company _____

Received By: (1)
Signature _____
Printed Name Amy Wolf
Date 5/11/04 Time 1645
Company Paragon Analytics

Received By: (2)
Signature _____
Printed Name _____
Date _____ Time _____
Company _____

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225 Commerce Drive Fort Collins, CO 80524
800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

Chain-of-Custody

Accession Number (LAB ID) 0405097

Date _____ Page 8 of 9

Project Name / No.: _____ Sampler(s): _____ (circle one) Turnaround: Standard or Rush (Due _____) Dispose or Return to Client

Report To:
Phone:
Fax:
Company:
Address:

See pg 1

circle method or specify under comments

Sample ID	Date 2004	Time *	Lab ID	Matrix	No. of Containers	VOCs SW8260B E624 E524.2 OLMO__	BTEX (only) SW8021B	SVOCs SW8270C E625 E525 OLMO__	OC Pesticides SW8081A E608 E508 OLMO__	PCBs SW8082 E608 E508 OLMO__	OP Pesticides SW8141A E614	Herbicides SW8151A E615	TCLP Organics SW1311 8260B 8270C 8081A 8151A	TCLP Metals SW 1311 6010B 7471	Total Metals SW6010B 7470 7471 E200 ILMO__	Dissolved Metals SW6010B 7470 E200 ILMO__	Reactive CN / S SW846 Chapter 7	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions ** SW9056 E300.0	pH SW9040B 9045C	Oil & Grease SW9071A E413.2	TPH GRO DRO SW8015B (both)	TOX SW9020B	Gross Alpha / Beta SW9310 E900.0	Actinides by PAI SOP (circle): Pu / U / Am / Th / Cm	Total Uranium by KPA D5174-91 Isotopic	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 SW9315 E903.0 Radium 228 SW9320 E904.0	Strontium 89 D5811-95 Strontium 90 D5811-95	Gamma Isotopes ** E901.1	Th - isotopic	Ac 227 / Pa 231 / Pb 210
700-01	5-7	1700	19	RK	3										X											X			X			X	X
700-02	5-7	1730	20	RK	1										C											X			X			X	
700-03	5-7	1720	21	RK	3										X											X			X			X	X
700-04	5-7	18:00	22	RK	1										C											X			X			X	
900-01	5-7	1300	23	RK	3										X											X			X			X	X
900-02		1210	24		1										C																		
900-03		1230	25		1										C																		
900-04		1900	26		1										C																		
900-05		1840	27		1										C																		

Comments:
C Hold analysis pending metal results from samples 700-01, 700-02, 900-01, OSA-01

Relinquished By: (1)
Signature Gerald Warrick
Printed Name Gerald Warrick
Date 5-10-04 Time 10:00
Company Kent & Sullivan

Relinquished By: (2)
Signature _____
Printed Name _____
Date _____ Time _____
Company _____

Received By: (1)
Signature Amy Wolf
Printed Name Amy Wolf
Date 5/11/04 Time 1645
Company Paragon Analytics

Received By: (2)
Signature _____
Printed Name _____
Date _____ Time _____
Company _____

Form 202r4.xls (1/3/01)

Distribution: white / yellow (Paragon); pink retained by originator.

Paragon Analytics, Inc.

225 Commerce Drive Fort Collins, CO 80524
800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

Accession Number (LAB ID) 0405097

Chain-of-Custody

Date _____ Page 9 of ___

Project Name / No.: _____ Sampler(s): _____ (circle one) Turnaround: Standard or Rush (Due _____) Dispose or Return to Client

Report To:
Phone:
Fax:
Company:
Address:

per pgt

circle method or specify under comments

Sample ID	Date 2004	Time *	Lab ID	Matrix	No. of Containers	VOCs SW8260B E624 E524.2 OLMO__	BTEX (only) SW8021B	SVOCs SW8270C E625 E525 OLMO__	OC Pesticides SW8081A E608 E508 OLMO__	PCBs SW8082 E608 E508 OLMO__	OP Pesticides SW8141A E614	Herbicides SW8151A E615	TCLP Organics SW1311 8260B 8270C 8081A 8151A	TCLP Metals SW 1311 6010B 7471	Total Metals SW6010B 7470 7471 E200 ILMO__	Dissolved Metals SW6010B 7470 E200 ILMO__	Reactive CN / S SW846 Chapter 7	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions ** SW9056 E300.0	pH SW9040B 9045C	Oil & Grease SW9071A E413.2	TPH GRO DRO SW8015B (both)	TOX SW9020B	Gross Alpha / Beta SW9310 E900.0	Actinides by PAI SOP (circle): Pu / U / Am / Th / Cm	~~Total~~ Uranium ~~by KPA D5174-91~~ Isotopic	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 SW9315 E903.0 Radium 228 SW9320 E904.0	Strontium 89 D5811-95 Strontium 90 D5811-95	Gamma Isotopes ** E901.1	Th. isotopic	Ac-227 / Pa 231 / Pb 210
OSA-01	5-6	1400	28	RK	3										X											X			X			X	X
OSA-02	5-6	1900	29	↓	3										C											X			X			X	
OSA-03	5-6	1700	30	↓	3										C											X			X			X	

Comments:
C Hold analysis pending metal results from samples OSA-01, 700-01, 700-03, and 900-01.

Form 202r4.xls (1/3/01)

Relinquished By: (1)	Relinquished By: (2)
Signature Gerald Warrick	Signature
Printed Name Gerald Warrick	Printed Name
Date 5-10-04 Time 10:00	Date Time
Company Kent + Sullivan	Company

Received By: (1)	Received By: (2)
Signature [signature]	Signature
Printed Name Amy Wolf	Printed Name
Date 5/11/04 Time 1645	Date Time
Company Paragon Analytics	Company

Distribution: white / yellow (Paragon); pink retained by originator.

Paragon Analytics, Inc. -- Fort Collins, Colorado

CONDITION OF SAMPLE UPON RECEIPT FORM

CLIENT: Kent + Sullivan WORKORDER NO: 0405097

PROJECT MANAGER: Debbie Fazio INITIALS: AW DATE: 5/12/04

1. Does this project require any special handling in addition to standard Paragon procedures?		Yes	No
IS PRE-SCREENING REQUIRED? (radiochemistry, DOE, etc.)		Yes	No
2. Are custody seals on shipping containers intact? How many custody seals are provided? 2 each	N/A	Yes	No
3. Are the custody seals on sample containers intact?	N/A	Yes	No
4. Is there a Chain-of-Custody (COC) or other representative documents, letters, or shipping memos?		Yes	No
5. Is the COC complete? Relinquished: Yes ✓ No___ Analyses Requested: Yes ✓ No___	N/A	Yes	No
6. Is the COC in agreement with the samples received? No. of Samples: Yes ✓ No___ Sample ID's: Yes ✓ No___ Matrix: Yes ✓ No___ No. of Containers: Yes ✓ No___	N/A	Yes	No
7. Were COC (if applicable) and sample labels legible?		Yes	No
8. Were airbills present and/or removable?	N/A	Yes	No
9. Are all aqueous samples requiring chemical preservation preserved correctly (excluding volatile organics)?	N/A	Yes	No
Are all aqueous **non-preserved** samples at the correct pH?		Yes	No
10. Is there enough sample for requested analyses? If so, were samples placed in the proper containers?		Yes	No
11. Are all samples within holding times for the requested analyses?		Yes	No
12. Were all sample containers received intact? (not broken or leaking, etc.)		Yes	No
13. Are samples requiring no headspace (volatiles, reactive cyanide/sulfide, radon), headspace free? **Size of bubble:** ___ **< green pea;** ___ **> green pea** (List sample IDs and affected containers on Page 2)	N/A	Yes	No
14. Were samples checked for and free from the presence of residual chlorine?	N/A	Yes	No
15. Were the sample(s) shipped on ice?	N/A	Yes	No
16. Were cooler temperatures measured at 0.1 - 6 °C ? **IR Gun Used*:** 1 2	N/A	Yes	No
17. Were all samples cooled that should have been cooled?	N/A	Yes	No

Cooler #'s	924	898	897	749	868	22	
Temperature	10°	10°	9°	15°	12°	14°	°C

Project Manager Signature / Date: Debbie Fazio 5/12/04

A NO RESPONSE TO ANY QUESTION EXCEPT # 1 REQUIRES THE COMPLETION OF PAGE 2 OF THIS FORM

* IR Gun #1 (original): Raytek, SN SC-PM3/T29403
IR Gun #2 (newer): Oakton, SN 2SCIR1201

Paragon Analytics, Inc. -- Fort Collins, Colorado

CONDITION OF SAMPLE UPON RECEIPT FORM

CLIENT: Kent & Sullivan WORKORDER NO: 0405097

PROJECT MANAGER: Debbie Fazio INITIALS: DW DATE: 5/12/04

- [ ] **Custody seals** broken (on outside of shipping container or on sample containers).
- [ ] No Chain-of-Custody (COC) present.
- [ ] **Number of samples** on the COC do not match the number of samples received.
- [ ] Aqueous samples **not preserved correctly** (see pH discussion below).
- [ ] SVOC samples contained **residual chlorine** (list sample IDs and affected containers below).
- [x] Samples received at **inappropriate temperature.**
- [ ] **Insufficient sample** to perform requested analyses.
- [ ] Extraction or analytical **holding times** expired in transit.
- [ ] **Broken/leaking bottles** and intact bottles received in same cooler (list affected sample IDs below).
- [ ] **No analyses requested.**
- [ ] **Incorrect sample type** received.
- [ ] VOAs, reactive CN/S, radon not **headspace** free (list sample IDs and affected vials below).
- [ ] **Airbills** not present and/or removable (record applicable shipper's tracking number below).
- [ ] Other (describe below).

Describe discrepancy:

All samples received between 9° - 15° C. Refer to page 1 for cooler temperatures and refer to DOT Survey pages for cooler contents. Insufficient ice packed with samples.

Was the client contacted? ___ No; ✓ Yes: Name Sue Kent Date/Time 5/12/04

Was the pH of any sample adjusted by the laboratory? ___ No; ___ Yes (see Table below):

NOTE: No pH adjustments shall be made without prior consent of Project Manager. After pH adjustment, hold metals and radchem samples ≥ 16 hr before analysis.

Sample ID	*Initial pH*	*Final pH (wait 30 min)*	*Type of Reagent Used*	*Lot No. of Reagent Used*	*Initials / Date / Time*

Was the laboratory directed to proceed with the analysis of any samples yielding the presence of residual chlorine? ___ No; ___ Yes (see notes above).

Project Manager Signature / Date: DF 5/12/04

000184

0405096
0405097

1-800-2ALASKA

Aircraft Number: 027 KTN 5436-6152 Box No. 0001

Destination: DEN

Pieces	Total Weight	Date
17	865	10-MAY-04

14 RAIDOACTIVE COOLERS COOL
3 MT COOLERS

190

#924

2 seals

10°C

ARTIC 0-0410-3-1635

1-800-2ALASKA

Aircraft Number: 027 KTN 5436-6152 Box No. 0015

Destination: DEN

Pieces	Total Weight	Date
17	865	10-MAY-04

14 RAIDOACTIVE COOLERS COOL
3 MT COOLERS

140

#898

2 seals

ARTIC 0-0410-3-1635

1-800-2ALASKA

Aircraft Number: 027 KTN 5436-6152 Box No. 0011

Destination: DEN

Pieces	Total Weight	Date
17	865	10-MAY-04

14 RAIDOACTIVE COOLERS COOL
3 MT COOLERS

320

9°C

#897

2 seals

ARTIC 0-0410-3-1635

1-800-2ALASKA

Aircraft Number: 027 KTN 5436-6152 Box No. 0002

Destination: DEN

Pieces	Total Weight	Date
17	865	10-MAY-04

14 RAIDOACTIVE COOLERS COOL
3 MT COOLERS

300

15°C

#949

2 seals

ARTIC 0-0410-3-1635

0405096
0405097

AirCargo

1-800-2ALASKA

Airbill Number
027 KTN 5436-6152 Box No. 0006

Destination
DEN

Pieces	Total Weight	Date
17	865	10-MAY-04

14 RAIDOACTIVE COOLERS COOL
3 MT COOLERS

320

12°

2 seals

ARTIC 0-0410-3-1635

AirCargo

1-800-2ALASKA

Airbill Number
027 KTN 5436-6152 Box No. 0010

Destination
DEN

Pieces	Total Weight	Date
17	865	10-MAY-04

14 RAIDOACTIVE COOLERS COOL
3 MT COOLERS

260

14°C

2 seals

ARTIC 0-0410-3-1635

SAMPLE LOGIN / DOT SURVEY

Client: Kent & Sullivan Workorder No: 0405096 & 0405097

Project Manager: Debbie Fazio Initials: AW Date: 05/12/04

COOLER #: 924 External Micro R Meter Reading (μ R/hr): 190

Paragon Sample ID:	Client Sample ID:	Micro R Meter Reading (μ R/hr):
0405096-1-1	MSED-01	< background
0405096-1-2	MSED-01	< background
0405096-2-1	MSED-02	< background
0405096-2-2	MSED-02	< background
0405096-2-3	MSED-02	< background
0405096-3-1	MSED-03	< background
0405096-3-2	MSED-03	< background
0405096-3-3	MSED-03	< background
0405096-7-1	MSED-07	< background
0405096-7-2	MSED-07	< background
0405096-7-3	MSED-07	35
0405096-8-1	MSED-08	75
0405096-8-2	MSED-08	< background
0405096-8-3	MSED-08	30
0405096-9-1	MSED-09	< background
0405096-9-2	MSED-09	< background
0405096-9-3	MSED-09	150
0405096-10-1	MSED-10	> background
0405096-10-2	MSED-10	30
0405096-10-3	MSED-10	40
0405096-16-1	SSED-06	< background
0405096-16-2	SSED-06	< background
0405096-16-3	SSED-06	< background
0405097-2-1	MR-01	70
0405097-2-2	MR-01	60
0405097-2-3	MR-01	80
0405097-3-1	MR-02	85
0405097-3-2	MR-02	85
0405097-3-3	MR-02	85
0405097-17-1	300-01	800

If applicable, was the client contacted? **YES / NO / NA** Client Rep. Name:_____ Date/Time:_____

Project Manager Signature/ Date: _____

SAMPLE LOGIN / DOT SURVEY

Client: Kent & Sullivan Workorder No: 0405096 & 0405097

Project Manager: Debbie Fazio Initials: AW Date: 05/12/04

COOLER #: 898 External Micro R Meter Reading (μ R/hr): 140

Paragon Sample ID:	Client Sample ID:	Micro R Meter Reading (μ R/hr):
0405096-4-1	MSED-04	< background
0405096-4-2	MSED-04	< background
0405096-4-3	MSED-04	< background
0405096-11-1	SSED-01	< background
0405096-11-2	SSED-01	< background
0405096-11-3	SSED-01	< background
0405096-26-1	SOIL-02	< background
0405096-26-2	SOIL-02	< background
0405096-26-3	SOIL-02	< background
0405096-27-1	SOIL-04	< background
0405096-27-2	SOIL-04	40
0405096-27-3	SOIL-04	< background
0405096-28-1	SOIL-05	30
0405096-28-2	SOIL-05	< background
0405096-28-3	SOIL-05	< background
0405097-4-1	GR-01	< background
0405097-6-1	GR-03	< background
0405097-13-1	GR-10	< background
0405097-14-1	QM-01	< background
0405097-16-1	QM-03	< background
0405097-18-1	300-02	45
0405097-19-1	700-01	1000
0405097-19-2	700-01	950
0405097-19-3	700-01	1100

If applicable, was the client contacted? **YES / NO / NA** Client Rep. Name:_____ Date/Time:_____

Project Manager Signature/ Date: _____

SAMPLE LOGIN / DOT SURVEY

Client: Kent & Sullivan Workorder No: 0405096 & 0405097

Project Manager: Debbie Fazio Initials: AW Date: 05/12/04

COOLER #: 897 External Micro R Meter Reading (μ R/hr): 320

Paragon Sample ID:	Client Sample ID:	Micro R Meter Reading (μ R/hr):
0405096-5-1	MSED-05	< background
0405096-5-2	MSED-05	< background
0405096-5-3	MSED-05	< background
0405096-21-1	GEN-01	28
0405096-21-2	GEN-01	28
0405096-22-1	GEN-02	30
0405096-22-2	GEN-02	29
0405096-22-3	GEN-02	< background
0405096-22-4	GEN-02	< background
0405096-22-5	GEN-02	< background
0405096-23-1	GEN-03	< background
0405096-23-2	GEN-03	< background
0405096-24-1	GEN-04	< background
0405096-24-2	GEN-04	< background
0405097-9-1	GR-06	30
0405097-11-1	GR-08	< background
0405097-15-1	QM-02	< background
0405097-20-1	700-02	250
0405097-24-1	900-02	1500
0405097-25-1	900-03	300
0405097-27-1	900-05	100

If applicable, was the client contacted? YES / NO / NA Client Rep. Name:_____ Date/Time:_____

Project Manager Signature/ Date: _____

SAMPLE LOGIN / DOT SURVEY

Client: Kent & Sullivan Workorder No: 0405096 & 0405097

Project Manager: Debbie Fazio Initials: AW Date: 05/12/04

COOLER #: 749 External Micro R Meter Reading (μ R/hr): 300

Paragon Sample ID:	Client Sample ID:	Micro R Meter Reading (μ R/hr):
0405096-6-1	MSED-06	40
0405096-12-1	SSED-02	40
0405096-12-2	SSED-02	< background
0405096-12-3	SSED-02	< background
0405096-18-1	SSED-08	< background
0405096-18-2	SSED-08	< background
0405096-18-3	SSED-08	30
0405096-19-1	SSED-09	< background
0405096-19-2	SSED-09	< background
0405096-19-3	SSED-09	< background
0405096-25-1	SOIL-01	< background
0405096-25-2	SOIL-01	< background
0405096-25-3	SOIL-01	< background
0405097-1-1	HR-01	140
0405097-5-1	GR-02	< background
0405097-7-1	GR-04	90
0405097-28-1	OSA-01	1200
0405097-28-2	OSA-01	1100
0405097-28-3	OSA-01	1200

If applicable, was the client contacted? YES / NO / NA Client Rep. Name:_____ Date/Time:_____

Project Manager Signature/ Date: _____

SAMPLE LOGIN / DOT SURVEY

Client: Kent & Sullivan Workorder No: 0405096 & 0405097

Project Manager: Debbie Fazio Initials: AW Date: 05/12/04

COOLER #: 868 External Micro R Meter Reading (μ R/hr): 320

Paragon Sample ID:	Client Sample ID:	Micro R Meter Reading (μ R/hr):
0405096-13-1	SSED-03	< background
0405096-13-2	SSED-03	< background
0405096-13-3	SSED-03	< background
0405096-14-1	SSED-04	< background
0405096-14-2	SSED-04	< background
0405096-14-3	SSED-04	< background
0405096-15-1	SSED-05	< background
0405096-15-2	SSED-05	< background
0405096-15-3	SSED-05	< background
0405096-17-1	SSED-07	< background
0405096-17-2	SSED-07	< background
0405096-17-3	SSED-07	< background
0405096-20-1	SSED-10	< background
0405096-20-2	SSED-10	< background
0405096-20-3	SSED-10	< background
0405097-8-1	GR-05	< background
0405097-10-1	GR-07	< background
0405097-12-1	GR-09	< background
0405097-21-1	700-03	800
0405097-21-2	700-03	950
0405097-21-3	700-03	850
0405097-26-1	900-04	95
0405097-29-1	OSA-02	180
0405097-29-2	OSA-02	150
0405097-29-3	OSA-02	160
0405097-30-1	OSA-03	200
0405097-30-2	OSA-03	250
0405097-30-3	OSA-03	150

If applicable, was the client contacted? YES / NO / NA Client Rep. Name:_____ Date/Time:_____

Project Manager Signature/ Date: _____

SAMPLE LOGIN / DOT SURVEY

Client: Kent & Sullivan

Workorder No: 0405096 & 0405097

Project Manager: Debbie Fazio

Initials: AW

Date: 05/12/04

COOLER #: 22

External Micro R Meter Reading (μ R/hr): 260

Paragon Sample ID:	Client Sample ID:	Micro R Meter Reading (μ R/hr):
0405096-29-1	SOIL-07	< background
0405096-29-2	SOIL-07	< background
0405096-29-3	SOIL-07	< background
0405096-30-1	SOIL-08	45
0405096-30-2	SOIL-08	40
0405096-30-3	SOIL-08	40
0405096-31-1	SOIL-09	< background
0405096-31-2	SOIL-09	< background
0405096-31-3	SOIL-09	< background
0405096-32-1	SOIL-10	55
0405096-32-2	SOIL-10	50
0405096-32-3	SOIL-10	65
0405097-22-1	700-04	450
0405097-23-1	900-01	110
0405097-23-2	900-01	110
0405097-23-3	900-01	140

If applicable, was the client contacted? YES / NO / NA Client Rep. Name:_____ Date/Time:_____

Project Manager Signature/ Date: _____

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

Th-229 contribution to Th-230 Region-Of-Interest

Expires 3/31/05

The "Tracer Amount" field on theThorium raw data printouts show the activity amount, and the words "With Contamination". This is not actual contamination; it is the contribution of Th-229 counts to the Th-230 ROI. Using method blank data acquired from other Thorium analyses, a calculated percentage contribution of Th-229 counts to the Th-230 ROI was established to be 2.48%, shown below. During Thorium analyses, 2.48% of the counts in the Th-229 ROI are subtracted from the Th-230 net counts and become Th-230 background counts. Therefore, on the raw data printouts, the sum of the calibrated background counts and the Th-230 net counts does not equal the Th-230 Gross Counts. Correctly calculating the Th-230 gross counts requires the sum of the calibrated Th-230 background counts, the net Th-230 counts, and the 2.48% of the Th-229 counts. Furthermore, the Th-230 total background counts used in calculations can be found on the raw data summary. Th-230 total background counts are equal to the sum of the calibrated background counts and the 2.48% of the Th-229 counts.

Sample ID		Th-230 Counts	Th-229 Counts	% Ratio
AS031203-4MB		11.400	439.400	2.59%
AS031210-4MB		32.440	1232.440	2.63%
AS031216-MMB		47.000	951.000	4.94%
AS031216-4PMB		30.000	865.000	3.47%
AS031218-2MB		19.800	537.900	3.68%
AS031218-3MMB		18.000	847.000	2.13%
AS031218-3PMB		8.000	778.000	1.03%
AS031221-2MB		14.800	574.800	2.57%
AS031222-1MB		31.000	992.800	3.12%
AS0312230-3MB		32.000	1949.000	1.64%
AS031229-2MB		34.000	1511.000	2.25%
AS040108-1MB		13.000	667.000	1.95%
AS040110-2MB		9.920	620.560	1.60%
AS040110-3MB		22.280	686.960	3.24%
AS040114-4MB		18.000	1023.000	1.76%
AS040207-2MB		17.000	906.000	1.88%
AS040111-3MB		29.000	795.020	3.65%
AS040110-3MB		17.380	964.140	1.80%
AS040325-2MB		14.740	717.960	2.05%
AS040319-3MB		18.200	943.600	1.93%
AS040319-1MB		20.320	682.220	2.98%
AS040311-3MB		27.470	972.390	2.82%
AS040312-2MB		7.400	554.400	1.33%
AS040305-3MB		23.000	707.000	3.25%
AS040302-2MB		28.580	730.220	3.91%
AS040217-2MB		12.640	806.640	1.57%
AS040210-2MB		17.400	1229.800	1.41%
AS040207-2MB		11.000	673.520	1.63%
AS040203-2MB		16.700	566.100	2.95%
			AVERAGE=	2.48%

Th-229 contribution factor updated in alphavis.alb by: JP

Date: 3/31/04

AlphaVision >> File >> Edit Nuclide Library... >> C:\User\Alpha\alphavis.alb
r:\forms\thcont.xls

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency Calibrations

Calibration Data Summary

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Thursday, July 22, 2004
5:03:45 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
0405097-1	SMP	AS040715-1	ThISO	10	C4071010	7/10/2004	30.42	CI, Pass	28.38	28.88	30.86	31.36
TX50971		AS040715-1a			B4071010	7/11/2004	0.2050	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071010	7/10/2004	5541.2	CI, Pass	5497.3	5507.3	5587.3	5597.3
0405097-2	SMP	AS040629-8	ThISO	43	C4070643	7/6/2004	30.43	Pass	29.78	30.29	32.20	32.80
T50972		AS040629-8C			B4070643	7/7/2004	0.2880	Pass	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070643	7/6/2004	5555.4	Pass	5476.5	5486.5	5566.5	5576.5
0405097-3	SMP	AS040629-8	ThISO	44	C4070644	7/6/2004	30.81	Pass	29.31	29.84	31.78	32.40
T50973		AS040629-8C			B4070644	7/7/2004	0.4240	Warning	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070644	7/6/2004	5558.0	Pass	5508.2	5518.2	5598.2	5608.2
0405097-4	SMP	AS040629-10	ThISO	57	C4070657	7/6/2004	27.02	Warning	26.69	27.16	28.93	29.49
T50974		AS040629-10a			B4070657	7/7/2004	0.2200	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070657	7/6/2004	5539.3	Pass	5489.3	5499.3	5579.3	5589.3
0405097-5	SMP	AS040629-10	ThISO	58	C4070658	7/6/2004	30.84	Warning	29.80	30.90	32.10	33.00
T50975		AS040629-10a			B4070658	7/7/2004	0.3460	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070658	7/6/2004	5543.6	Pass	5484.4	5494.4	5574.4	5584.4
0405097-6	SMP	AS040629-10	ThISO	59	C4070659	7/6/2004	30.61	Warning	30.37	30.91	32.93	33.57
T50976		AS040629-10a			B4070659	7/7/2004	0.2800	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070659	7/6/2004	5528.0	Pass	5487.7	5497.7	5577.7	5587.7
0405097-7	SMP	AS040629-10	ThISO	18	C4070618	7/6/2004	29.88	Pass	28.80	29.32	31.23	31.84
TR50977		AS040629-10a			B4070618	7/7/2004	0.3420	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070618	7/6/2004	5549.0	Pass	5499.6	5509.6	5589.6	5599.6
0405097-7	DUP	AS040629-10	ThISO	61	C4070661	7/6/2004	30.14	Pass	29.44	29.97	31.92	32.54
T50977D		AS040629-10a			B4070661	7/7/2004	0.3670	Pass	0.0000	0.0500	0.5000	0.7500
7/9/2004					C4070661	7/6/2004	5556.4	Pass	5529.6	5535.6	5559.6	5565.6
0405097-8	SMP	AS040629-10	ThISO	62	C4070662	7/6/2004	29.94	Pass	28.57	29.08	31.06	31.57
T50978		AS040629-10a			B4070662	7/7/2004	0.2640	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070662	7/6/2004	5541.6	Pass	5493.0	5503.0	5583.0	5593.0

Data Package ID: *th0405097-1*

Abbreviations:

Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit
Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit

CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Calibration Data Summary

Laboratory Name: **Paragon Analytics**
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
6:43:24 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
0405097-9	SMP	AS040629-10	ThISO	62	C4071062	7/10/2004	30.67	Pass	28.57	29.08	31.06	31.57
T50979		AS040629-10a			B4071062	7/11/2004	0.2060	Pass	0.0000	0.0500	0.4000	0.5000
7/12/2004					C4071062	7/10/2004	5556.2	Pass	5493.0	5503.0	5583.0	5593.0
0405097-10	SMP	AS040629-10	ThISO	19	C4070619	7/6/2004	29.44	Pass	27.15	27.64	29.44	30.01
T509710		AS040629-10a			B4070619	7/7/2004	0.2440	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070619	7/6/2004	5554.7	Pass	5492.2	5502.2	5582.2	5592.2
0405097-11	SMP	AS040629-10	ThISO	21	C4070621	7/6/2004	28.83	Pass	27.83	28.32	30.17	30.75
T509711		AS040629-10a			B4070621	7/7/2004	0.3930	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070621	7/6/2004	5546.6	Pass	5491.1	5501.1	5581.1	5591.1
0405097-12	SMP	AS040629-10	ThISO	22	C4070622	7/6/2004	28.78	Pass	27.18	27.67	29.47	30.04
T509712		AS040629-10a			B4070622	7/7/2004	0.2810	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070622	7/6/2004	5557.4	Pass	5503.6	5513.6	5593.6	5603.6
0405097-13	SMP	AS040629-10	ThISO	23	C4070623	7/6/2004	28.56	Pass	27.21	27.72	29.53	30.10
T509713		AS040629-10a			B4070823	7/9/2004	0.3210	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070623	7/6/2004	5548.0	Pass	5490.3	5500.3	5580.3	5590.3
0405097-14	SMP	AS040629-10	ThISO	24	C4070624	7/6/2004	32.35	Pass	30.79	31.34	33.38	34.03
T509714		AS040629-10a			B4070824	7/9/2004	0.3800	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070624	7/6/2004	5555.6	Pass	5495.6	5505.6	5585.6	5595.6
0405097-15	SMP	AS040629-10	ThISO	42	C4070642	7/6/2004	31.60	Pass	29.74	30.28	32.25	32.88
T509715		AS040629-10a			B4070642	7/7/2004	0.2700	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070642	7/6/2004	5561.3	Pass	5494.2	5504.2	5584.2	5594.2
0405097-16	SMP	AS040629-10	ThISO	43	C4070643	7/6/2004	30.43	Pass	29.78	30.29	32.20	32.80
T509716		AS040629-10a			B4070643	7/7/2004	0.2880	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070643	7/6/2004	5555.4	Pass	5476.5	5486.5	5566.5	5576.5
0405097-16	DUP	AS040629-10	ThISO	44	C4070644	7/6/2004	30.81	Pass	29.31	29.84	31.78	32.40
T509716D		AS040629-10a			B4070644	7/7/2004	0.4240	Warning	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070644	7/6/2004	5558.0	Pass	5508.2	5518.2	5598.2	5608.2

Data Package ID: *th0405097-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

000197

Calibration Data Summary

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
1:48:26 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
0405097-17	SMP	AS040629-8	ThISO	45	C4070645	7/6/2004	31.34	Warning	31.07	31.62	33.68	34.34
T509717		AS040629-8C			B4070645	7/7/2004	0.4070	Warning	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070645	7/6/2004	5552.4	Pass	5497.4	5507.4	5587.4	5597.4
0405097-18	SMP	AS040715-1	ThISO	11	C4071011	7/10/2004	29.04	CI, Pass	26.79	27.27	29.13	29.61
TX509718		AS040715-1a			B4071011	7/11/2004	0.1910	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071011	7/10/2004	5535.4	CI, Pass	5484.4	5494.4	5574.4	5584.4
0405097-18	DUP	AS040715-1	ThISO	12	C4071012	7/10/2004	28.94	CI, Pass	27.56	28.05	29.97	30.46
TX509718D		AS040715-1a			B4071012	7/11/2004	0.3800	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071012	7/10/2004	5543.2	CI, Pass	5493.9	5503.9	5583.9	5593.9
0405097-20	SMP	AS040715-1	ThISO	13	C4071013	7/10/2004	31.40	CI, Pass	29.90	30.43	32.51	33.04
TX509720		AS040715-1a			B4071013	7/11/2004	0.2980	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071013	7/10/2004	5551.6	CI, Pass	5504.0	5514.0	5594.0	5604.0
0405097-22	SMP	AS040629-8	ThISO	46	C4070646	7/6/2004	29.61	Warning	29.36	29.89	31.97	32.50
T509722		AS040629-8C			B4070646	7/7/2004	0.2710	Pass	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070646	7/6/2004	5541.8	Pass	5485.1	5495.1	5575.1	5585.1
0405097-24	SMP	AS040629-8	ThISO	47	C4070647	7/6/2004	31.87	Pass	29.92	30.45	32.53	33.06
T509724		AS040629-8C			B4070647	7/7/2004	0.2440	Pass	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070647	7/6/2004	5542.4	Pass	5513.5	5523.5	5603.5	5613.3
0405097-25	SMP	AS040629-8	ThISO	48	C4070648	7/6/2004	30.66	Pass	30.08	30.62	32.70	33.24
T509725		AS040629-8C			B4070648	7/7/2004	0.2520	Pass	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070648	7/6/2004	5530.1	Pass	5480.8	5490.8	5570.8	5580.8
0405097-26	SMP	AS040715-1	ThISO	15	C4071015	7/10/2004	29.50	CI, Pass	28.43	28.94	30.83	31.43
TX509726		AS040715-1a			B4071015	7/11/2004	0.3470	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071015	7/10/2004	5540.4	CI, Pass	5535.0	5538.0	5550.0	5553.0
0405097-27	SMP	AS040715-1	ThISO	16	C4071016	7/10/2004	29.09	CI, Pass	27.77	28.27	30.11	30.69
TX509727		AS040715-1a			B4071016	7/11/2004	0.2580	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071016	7/10/2004	5539.6	CI, Pass	5506.9	5516.9	5596.9	5606.9

Data Package ID: *th0405097-1*

Abbreviations:
Eff - Efficiency; Bkg - Background; LCL - Lower Control Limit; UWL - Upper Warning Limit
Egy - Energy; CPM - Counts per Minute; LWL - Lower Warning Limit; UCL - Upper Control Limit; CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Calibration Data Summary

Laboratory Name: Paragon Analytics
PAI Work Order: 0405097

Prep SOP: PAI 777
Analytical SOP: PAI 714

Reported on: Friday, July 23, 2004
1:48:26 PM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
0405097-29	SMP	AS040629-8	ThISO	57	C4070657	7/6/2004	27.02	Warning	26.69	27.16	28.93	29.49
T509729		AS040629-8C			B4070657	7/7/2004	0.2200	Pass	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070657	7/6/2004	5539.3	Pass	5489.3	5499.3	5579.3	5589.3
0405097-29	DUP	AS040629-8	ThISO	58	C4070658	7/6/2004	30.84	Warning	29.80	30.90	32.10	33.00
T509729D		AS040629-8C			B4070658	7/7/2004	0.3460	Pass	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070658	7/6/2004	5543.6	Pass	5484.4	5494.4	5574.4	5584.4
0405097-30	SMP	AS040629-8	ThISO	59	C4070659	7/6/2004	30.61	Warning	30.37	30.91	32.93	33.57
T509730		AS040629-8C			B4070659	7/7/2004	0.2800	Pass	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070659	7/6/2004	5528.0	Pass	5487.7	5497.7	5577.7	5587.7
AS040629-10	MB	AS040629-10	ThISO	18	C4071018	7/10/2004	30.40	Pass	28.80	29.32	31.23	31.84
TR62910B		AS040629-10a			B4071018	7/11/2004	0.3980	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071018	7/10/2004	5551.0	Pass	5499.6	5509.6	5589.6	5599.6
AS040629-10	LCS	AS040629-10	ThISO	59	C4070659	7/6/2004	30.61	Warning	30.37	30.91	32.93	33.57
T62910L		AS040629-10a			B4070659	7/7/2004	0.2800	Pass	0.0000	0.0500	0.4000	0.5000
7/9/2004					C4070659	7/6/2004	5528.0	Pass	5487.7	5497.7	5577.7	5587.7
AS040629-8	MB	AS040629-8	ThISO	60	C4070660	7/6/2004	26.17	Pass	24.46	24.90	26.60	27.04
T6298B		AS040629-8C			B4070660	7/7/2004	0.2430	Pass	0.0000	0.0500	0.4000	0.5000
7/7/2004					C4070660	7/6/2004	5532.9	Pass	5489.5	5499.5	5579.5	5589.5
AS040629-8	LCS	AS040629-8	ThISO	61	C4070661	7/6/2004	30.14	Pass	29.44	29.97	31.92	32.54
T6298L		AS040629-8C			B4070661	7/7/2004	0.3670	Pass	0.0000	0.0500	0.5000	0.7500
7/7/2004					C4070661	7/6/2004	5556.4	Pass	5529.6	5535.6	5559.6	5565.6
AS040715-1	MB	AS040715-1	ThISO	17	C4071017	7/10/2004	30.87	CI, Pass	29.36	29.88	31.83	32.45
TX7151B		AS040715-1a			B4071017	7/11/2004	0.3740	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071017	7/10/2004	5554.9	CI, Pass	5483.4	5493.4	5573.4	5583.4
AS040715-1	LCS	AS040715-1	ThISO	19	C4071019	7/10/2004	29.31	Pass	27.15	27.64	29.44	30.01
TX7151L		AS040715-1a			B4071019	7/11/2004	0.2760	Pass	0.0000	0.0500	0.4000	0.5000
7/17/2004					C4071019	7/10/2004	5548.3	Pass	5492.2	5502.2	5582.2	5592.2

Data Package ID: *th0405097-1*

Abbreviations:

Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit
Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit

CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Alpha Spec Calibration Source Re-Certification

R:\INST\ALPHA\CLCRT304.XLS

Primary Certified Source

Source PAI ID 190 was recalibrated by Isotope Products Laboratories on 03-01-2003 and recieved by PAI on 03-04-2003.

Source ID: 92MIX223027; PAI ID 190 (Labled #9)
Total Activity: 3754 dpm
Ref. Date: 3/1/03
Count Date: 3/22/04

U-234 Activity:	79.06%	=	2967.90 dpm (decay corrected)
Am-241 Activity:	19.20%	=	719.56 dpm (decay corrected)
Combined Activity:		=	3687.46 dpm (decay corrected)

Detector 13 Efficiency Determination

Source Serial #	PAI ID	Seqential #	Count Date	Am-241 net cts	U-234 net cts	count dur (s)	Combined cpm	Known dpm	detector efficiency
92MIX223027	190	97-19-103-09	3/22/04	7824.65	32919.75	2100	1164.126	3687.46	31.57%

Sources 1 through 8 activity determination

Source Serial #	PAI ID	Seqential #	Count Date	Am-241 net cts	U-234 net cts	count dur (s)	detector efficiency	Am-241 dpm	U-234 dpm	combined dpm
92MIX2203026	182	97-19-103-01	3/22/04	13674.65	81078.76	2100	31.57%	1237.59	7337.81	8575.40
92MIX2203028	183	97-19-103-02	3/22/04	15497.65	153089.76	2100	31.57%	1402.57	13854.97	15257.54
92MIX2203024	184	97-19-103-03	3/22/04	72039.65	74346.76	2100	31.57%	6519.75	6728.55	13248.30
92MIX2203021	185	97-19-103-04	3/22/04	22309.65	63564.76	2100	31.57%	2019.07	5752.75	7771.83
92MIX2203025	186	97-19-103-05	3/22/04	102504.65	126055.76	2100	31.57%	9276.90	11408.33	20685.23
92MIX2203022	187	97-19-103-06	3/22/04	77656.69	83352.76	2100	31.57%	7028.11	7543.61	14571.72
92MIX2203023	188	97-19-103-07	3/22/04	46378.65	70580.76	2100	31.57%	4197.37	6387.72	10585.09
92MIX2203029	189	97-19-103-08	3/22/04	34881.65	219992.76	2100	31.57%	3156.87	19909.84	23066.71

Detector 13 Efficiency Verification

Source Serial #	PAI ID	Seqential #	Count Date	Am-241 net cts	U-234 net cts	count dur (s)	Combined cpm	Known dpm	detector efficiency	% difference from 1st count
92MIX223027	190	97-19-103-09	3/22/04	7546.69	32241.76	2100	1136.813	3687.46	30.83%	2.35%

Sources 1 through 8 activity re-verification

Source Serial #	PAI ID	Seqential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value Yes/No
92MIX2203026	182	97-19-103-01	8575.40	8730.07	1.77%	Yes
92MIX2203028	183	97-19-103-02	15257.54	15767.93	3.24%	Yes
92MIX2203024	184	97-19-103-03	13248.30	13517.34	1.99%	Yes
92MIX2203021	185	97-19-103-04	7771.83	8130.72	4.41%	Yes
92MIX2203025	186	97-19-103-05	20685.23	20951.92	1.27%	Yes
92MIX2203022	187	97-19-103-06	14571.72	15242.25	4.40%	Yes
92MIX2203023	188	97-19-103-07	10585.09	10755.77	1.59%	Yes
92MIX2203029	189	97-19-103-08	23066.71	23263.22	0.84%	Yes

*Sources 185,186,187, & 188 decay corrected to 04/01/03.
*Sources 182,183,184, & 189 decay corrected to 05/01/03.

OK - RG
EXP 3/22/05

Isotope Products Laboratories
An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661·309·1010
Fax 661·257·8303

α 1

PAI 182
recalibrate 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203026
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.354	nCi	(124.1 Bq)	Am-241:	0.5793	nCi	(21.43 Bq)
U-235:	0.06566	nCi	(2.429 Bq)	Total Activity:	3.999	nCi	(148.0 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

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α 2

PAI 183
Recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203028
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	6.467	nCi	(239.3 Bq)	Am-241:	0.6366	nCi	(23.55 Bq)
U-235:	0.1135	nCi	(4.200 Bq)	Total Activity:	7.217	nCi	(267.1 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 8091 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

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α3

PAT I.D 184
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203024
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.227	nCi	(119.4 Bq)	Am-241:	2.866	nCi	(106.0 Bq)
U-235:	0.05205	nCi	(1.926 Bq)	Total Activity:	6.145	nCi	(227.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.6%
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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 6889 α/min in 2π on 11 Apr 03.

Daniel James Van Delaan
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

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α4

PAI ID 00185
rec'd from recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203021
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	2.731	nCi	(101.0 Bq)	Am-241:	0.9325	nCi	(34.50 Bq)
U-235:	0.03416	nCi	(1.264 Bq)	Total Activity:	3.698	nCi	(136.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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α5

PAI ID 00186
recertification
received ~~186~~
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203025
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	5.486	nCi	(203.0 Bq)	Am-241:	3.958	nCi	(146.4 Bq)
U-235:	0.09221	nCi	(3.412 Bq)	Total Activity:	9.536	nCi	(352.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 10690 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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α 6

PAID, CC 187
recd for recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW030603/R2155
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203022
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	3.592	nCi	(132.9 Bq)	Am-241:	3.279	nCi	(121.3 Bq)
U-235:	0.08556	nCi	(3.166 Bq)	Total Activity:	6.957	nCi	(257.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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α 7

PA I.D. 188
rec'd for recalibration
3-28-03

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOURCE

Radionuclide A:	U-234	Customer:	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	P.O. No.:	EW030603/R2155
Radionuclide C:	Am-241	Catalog No.:	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	Reference Date:	1-Apr-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	Source No.:	92MIX2203023
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	2.895	nCi	(107.1 Bq)	Am-241:	1.953	nCi	(72.26 Bq)
U-235:	0.02502	nCi	(0.9257 Bq)	Total Activity:	4.873	nCi	(180.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 5463 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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[α 8]

PAI ID 189
recd 4-2-03
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION
MIXED ALPHA STANDARD SOURCE

Radionuclide A:	U-234	**Customer:**	PARAGON ANALYTICS, INC.
Radionuclide B:	U-235	**P.O. No.:**	EW040203/R2193
Radionuclide C:	Am-241	**Catalog No.:**	MISC-STD
Half Life (U-234):	(2.454 ± 0.006)E+05 years	**Reference Date:**	1-May-03 12:00 PST
Half Life (U-235):	(7.037 ± 0.011)E+08 years	**Source No.:**	92MIX2203029
Half Life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	9.048	nCi	(334.8 Bq)	Am-241:	1.433	nCi	(53.02 Bq)
U-235:	0.1771	nCi	(6.553 Bq)	Total Activity:	10.66	nCi	(394.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.5%
B. Type B (systematic) uncertainty:	± 3.0%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.0%

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 "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7