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START
0041459

TMA
Thermo Analytical Inc.

TMA/Norcal
2030 Wright Avenue
P. O. Box 4040
Richmond, CA 94804-0040
(510) 235-2633 Fax No. (510) 235-2439

SEP 1992
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September 17, 1992

SENT BY FEDERAL EXPRESS

Ref. TMA/Norcal N2-07-075-7059

Mr. John Bourgeault
Westinghouse Hanford Company
2355 Stevens Drive
Richland, WA 99352

Dear Mr. Bourgeault:

Enclosed on the Summary Data Section, are the gamma scan results for the soil samples from Sodium Dichromate Barrel-ERA Site 5AF-92-226, we received 17 July 1992. The QA/QC results are also given in the Summary Data Section.

Please call if you have any questions concerning this data.

Sincerely,

Dinkar P. Kharkar, Ph.D.
Manager, Nuclear Programs

DPK/ss

Enclosures: Section 1 through 6
Appendices

JUN 1995
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SEE NEXT PAGE FOR APPENDICES TO BE INCLUDED IN THE DATA PACKAGE

INDEX OF APPENDICES TO BE INCLUDED IN DATA PACKAGE

7059

____	Appendix 1 :	Tritium Standard Solution Certificate and Preparation Information.
____	Appendix 2 :	Isotopic Uranium Standard Solution Certificates and Preparation Information.
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SECTION 1 Summary Data Including QC's

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TMA NORCAL
REPORTING GROUP 7059

SDG	7059
Contact	Dinkar Kharkar

Client	Westinghouse Hanford
Contract	MBH-SVV-069262

SUMMARY DATA SECTION

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Lab id	TMAN
Protocol	WHC-HEIS
Version	Ver 1.0
Form	DVD-TOC
Version	2.16
Report date	09/17/92

TMA NORCAL
REPORTING GROUP 7059

SDG 7059
Contact Dinkar Kharkar

REPORT GUIDE

Client Westinghouse Hanf
Contract MBH-SVV-069262

ABOUT THE DATA SUMMARY SECTION

The Data Summary Section of a Data Package has all data, in several useful orders, necessary for first level, routine review of the data package for a Sample Delivery Group (SDG). This section follows the Data Package Narrative, which has an overview of the data package and a discussion of special problems. It is followed by the Raw Data Section, which has full details.

The Data Summary Section has several groups of reports:

SAMPLE SUMMARIES

The Sample Summary Reports (variously titled LAB, SAMPLE, DEPARTMENT and QC SUMMARY to reflect the sort order) show all samples, including QC samples, reported in one SDG. These reports cross-reference client and lab sample identifiers.

PREPARATION BATCH SUMMARY

The Preparation Batch Summary Report shows all preparation batches (lab groupings reflecting how work was organized) relevant to the reported SDG with information necessary to check the completeness and consistency of the SDG.

WORK SUMMARY

The Work Summary Report shows all samples and work done on them relevant to the reported SDG.

REAGENT BLANKS

The Reagent Blank Reports, one for each Reagent Blank relevant to the SDG, show all results and primary supporting information for the blanks.

LAB CONTROL SAMPLES

The Lab Control Sample Reports, one for each Lab Control Sample relevant to the SDG, show all results, recoveries and primary supporting information for these QC samples.

Lab id TMAN
Protocol WHC-HEI
Version Ver 1.0
Form DVD-RG
Version 2.16
Report date 09/17/9

ABOUT THE DATA SUMMARY SECTION

REPLICATES

The Replicate Reports, one for each Replicate and Original sample pair relevant to the SDG, show all results, differences and primary supporting information for these QC samples.

MATRIX SPIKES

The Matrix Spike Reports, one for each Spiked and Original sample pair relevant to the SDG, show all results, recoveries and primary supporting information for these QC samples.

DATA SHEETS

The Data Sheet Reports, one for each client sample in the SDG, show all results and primary supporting information for these samples.

RESULT SUMMARIES

The Result Summary Reports, one for each test used in the SDG, show all results and QC for one parameter on one page. (A test is a short code for the method used to do certain work to the client's specification.)

METHOD SUMMARIES

The Method Summary Reports, one for each test used in the SDG, show performance data for each method on one page.

REPORT GUIDES

The Report Guides, one for each of the above groups of reports, have documentation on how to read the associated reports.

TMA NORCAL

REPORTING GROUP 7059

SAMPLE SUMMARY

SDG 7059
Contact Dinkar Kharkar

Client Westinghouse Hanford
Contract MBH-SVV-069262

CLIENT SAMPLE ID	MATRIX	CHAIN OF CUSTODY	COLLECTED	RECEIVED	SAMPLE WT/VOL	LAB SAMPLE ID	DEPARTMENT SAMPLE ID	QC BATCH
B018Z1	SOIL	002698	07/15/92	07/17/92		N207075-01	7059-001	7059
B018Z2	SOIL	002698	07/15/92	07/17/92		N207075-02	7059-002	7059
B018Z4	SOIL	002698	07/15/92	07/17/92		N207075-03	7059-003	7059
Reagent Blank	SOIL					N207075-05	7059-005	7059
Lab Control Sample	SOIL					N207075-04	7059-004	7059
Replicate (N207075-01)	SOIL		07/15/92			N207075-06	7059-006	7059

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-CS
Version 2.16
Report date 09/17/92

9513354.1223

TMA NORCAL

REPORTING GROUP 7059

QC SUMMARY

SDG 7059
Contact Dinkar Kharkar

Client Westinghouse Hanford
Contract MBH-SVV-069262

QC BATCH	CHAIN OF CUSTODY	CLIENT SAMPLE ID	MATRIX	COLLECTED	RECEIVED	SAMPLE WT/VOL	LAB SAMPLE ID	DEPARTMENT SAMPLE ID
7059	002698	B018Z1	SOIL	07/15/92	07/17/92		N207075-01	7059-001
		B018Z2	SOIL	07/15/92	07/17/92		N207075-02	7059-002
		B018Z4	SOIL	07/15/92	07/17/92		N207075-03	7059-003
		Reagent Blank	SOIL				N207075-05	7059-005
		Lab Control Sample	SOIL				N207075-04	7059-004
		Replicate (N207075-01)	SOIL	07/15/92			N207075-06	7059-006

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-QS
Version 2.16
Report date 09/17/92

9513354.1224

TMA NORCAL

REPORTING GROUP 7059

SDG 7059
Contact Dinkar Kharkar

PREPARATION BATCH SUMMARY

Client Westinghouse Hanford
Contract MBH-SVV-069262

TEST	MATRIX	METHOD	PREPARATION BATCH	PLANCHETS ANALYZED CLIENT	BLANK	LCS	REP/ORIG	MS/ORIG	QUALI-FIERS	FIRST REVIEW	BY	SECOND REVIEW	BY
Gamma Spectroscopy													
GAM	SOIL	Gamma Scan	2713-028	3	1	1	1/1			09/14/92	DPK		

Replicates and Matrix Spikes are those with original (Client) sample in this Sample Delivery Group.
Blank and LCS planchets are those in the same preparation batch as some Client, Replicate or Spike sample.

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-PBS
Version 2.16
Report date 09/17/92

TMA NORCAL

REPORTING GROUP 7059

WORK SUMMARY

SDG 7059
Contact Dinkar Kharkar

Client Westinghouse Hanford
Contract MBH-SVV-069262

CLIENT SAMPLE ID / MATRIX / CUSTODY	LAB SAMPLE ID / COLLECTED / RECEIVED	PLANCHET	TEST	SUF-FIX	ANALYZED	METHOD	REFERENCE
B018Z1 / SOIL / 002698	N207075-01 / 07/15/92 / 07/17/92	7059-001	GAM		08/29/92	Gamma Scan	
B018Z2 / SOIL / 002698	N207075-02 / 07/15/92 / 07/17/92	7059-002	GAM		08/30/92	Gamma Scan	
B018Z4 / SOIL / 002698	N207075-03 / 07/15/92 / 07/17/92	7059-003	GAM		09/09/92	Gamma Scan	
Reagent Blank / SOIL	N207075-05	7059-005	GAM		08/30/92	Gamma Scan	
Lab Control Sample / SOIL	N207075-04	7059-004	GAM		08/30/92	Gamma Scan	
Replicate (N207075-01) / SOIL / 002698	N207075-06 / 07/15/92 / 07/17/92	7059-006	GAM		08/29/92	Gamma Scan	

COUNTS OF TESTS BY SAMPLE TYPE

TEST	CLIENT	BLANK	LCS	REP	SPIKE	TOTALS
GAM	3	1	1	1		6
TOTALS	3	1	1	1	0	6

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-CWS
Version 2.16
Report date 09/17/92

9513354.1226

N207075-05

TMA NORCAL
REPORTING GROUP 7059

REAGENT BLANK

Reagent Blank

SDG	7059	Client	Westinghouse Hanford
Contact	Dinkar Kharkar	Contract	MBH-SVV-069262
Lab sample id	N207075-05	Matrix	SOIL
Dept sample id	7059-005	Material	

PARAMETER	CAS NO	RESULT pCi/G	2σ ERR (COUNT)	MDA pCi/G	RDL pCi/G	QUALI-FIERS	TES
GAMMA SCAN ANALYTES							
Potassium 40	13966-00-2	U		1.8		U	GAM
Iron 59		U		0.24		U	GAM
Chromium 51	14392-02-0	U		0.83		U	GAM
Cobalt 60	10198-40-0	U		0.097		U	GAM
Zinc 65	17982-39-3	U		0.22		U	GAM
Ruthenium 106	13967-48-1	U		0.78		U	GAM
Cesium 134	17967-70-9	U		0.13		U	GAM
Cesium 137	10045-97-3	U		0.13		U	GAM
Europium 152	14683-23-9	U		0.21		U	GAM
Europium 154	15585-10-1	U		0.14		U	GAM
Radium 226	13982-67-7	U		0.26		U	GAM
Thorium 228	14274-82-9	U		0.20		U	GAM
Thorium 232	7440-29-1	U		0.48		U	GAM

Lab id	TMAN
Protocol	WHC-HEIS
Version	Ver 1.0
Form	DVD-DS
Version	2.16
Report date	09/17/92

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N207075-04

TMA NORCAL

REPORTING GROUP 7059

LAB CONTROL SAMPLE

LAB CONTROL SAMPLE

SDG 7059
Contact Dinkar Kharkar

Client Westinghouse Hanford
Contract MBH-SVV-069262

Lab sample id N207075-04
Dept sample id 7059-004

Matrix SOIL
Material

PARAMETER	RESULT pCi/G	2σ ERR (COUNT)	MDA pCi/G	RDL pCi/G	QUALI-FIERS	TEST	ADDED pCi/G	2σ ERR pCi/G	REC %	3σ LMTS (TOTAL)	PROTOCOL LIMITS
GAMMA SCAN ANALYTES											
Potassium 40	U		2.5		U	GAM					80-120
Iron 59	U		0.36		U	GAM					80-120
Chromium 51	U		1.0		U	GAM					80-120
Cobalt 60	0.90	0.22				GAM	1.30	0.052	69	70-130	80-120
Zinc 65	U		0.45		U	GAM					80-120
Ruthenium 106	U		1.5		U	GAM					80-120
Cesium 134	U		0.18		U	GAM					80-120
Cesium 137	0.93	0.22				GAM	1.25	0.050	74	68-132	80-120
Europium 152	U		0.31		U	GAM					80-120
Europium 154	U		0.20		U	GAM					80-120
Radium 226	U		0.36		U	GAM					80-120
Thorium 228	U		0.22		U	GAM					80-120
Thorium 232	U		0.83		U	GAM					80-120

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-LCS
Version 2.16
Report date 09/17/92

9513354.1228

N207075-06

TMA NORCAL

REPORTING GROUP 7059

REPLICATE

B018Z1

SDG 7059
Contact Dinkar Kharkar

Client Westinghouse Hanford
Contract MBH-SVV-069262

REPLICATE
Lab sample id N207075-06
Dept sample id 7059-006

ORIGINAL
Lab sample id N207075-01
Dept sample id 7059-001
Received 07/17/92

Client sample id B018Z1
Matrix SOIL
Collected 07/15/92
Chain of custody id 002698

PARAMETER	REPLICATE pCi/G	2σ ERR (COUNT)	MDA pCi/G	RDL pCi/G	QUALI-FIERS	TEST	ORIGINAL pCi/G	2σ ERR (COUNT)	MDA pCi/G	QUALI-FIERS	RPD %	3σ TOT	PROT LIMIT
GAMMA SCAN ANALYTES													
Potassium 40	10	1.8				GAM	11	1.9			10	50	35
Iron 59	U		0.50		U	GAM	U		0.58	U	-		
Chromium 51	U		1.8		U	GAM	U		1.9	U	-		
Cobalt 60	U		0.11		U	GAM	U		0.10	U	-		
Zinc 65	U		0.31		U	GAM	U		0.28	U	-		
Ruthenium 106	U		0.93		U	GAM	U		0.97	U	-		
Cesium 134	U		0.12		U	GAM	U		0.11	U	-		
Cesium 137	U		0.12		U	GAM	U		0.10	U	-		
Europium 152	U		0.18		U	GAM	U		0.16	U	-		
Europium 154	U		0.11		U	GAM	U		0.11	U	-		
Radium 226	0.33	0.22				GAM	0.41	0.17			22	118	35
Thorium 228	0.85	0.16				GAM	0.79	0.18			7	54	35
Thorium 232	0.81	0.43				GAM	U		0.78	U	4	171	35

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-REP
Version 2.16
Report date 09/17/92

9513354.1229

N207075-01

TMA NORCAL
REPORTING GROUP 7059

DATA SHEET

B018Z1

SDG	7059	Client	Westinghouse Hanford
Contact	Dinkar Kharkar	Contract	MBH-SVV-069262
Lab sample id	N207075-01	Client sample id	B018Z1
Dept sample id	7059-001	Matrix	SOIL
Received	07/17/92	Collected	07/15/92
		Chain of custody id	002698

PARAMETER	CAS NO	RESULT pCi/G	2σ ERR (COUNT)	MDA pCi/G	RDL pCi/G	QUALI-FIERS	TES
GAMMA SCAN ANALYTES							
Potassium 40	13966-00-2	11	1.9				GAM
Iron 59		U		0.58		U	GAM
Chromium 51	14392-02-0	U		1.9		U	GAM
Cobalt 60	10198-40-0	U		0.10		U	GAM
Zinc 65	17982-39-3	U		0.28		U	GAM
Ruthenium 106	13967-48-1	U		0.97		U	GAM
Cesium 134	17967-70-9	U		0.11		U	GAM
Cesium 137	10045-97-3	U		0.10		U	GAM
Europium 152	14683-23-9	U		0.16		U	GAM
Europium 154	15585-10-1	U		0.11		U	GAM
Radium 226	13982-67-7	0.41	0.17				GAM
Thorium 228	14274-82-9	0.79	0.18				GAM
Thorium 232	7440-29-1	U		0.78		U	GAM

Lab id	TMAN
Protocol	WHC-HEIS
Version	Ver 1.0
Form	DVD-DS
Version	2.16
Report date	09/17/92

9513354.1230

N207075-02

TMA NORCAL
REPORTING GROUP 7059

DATA SHEET

B018Z2

SDG 7059
Contact Dinkar Kharkar

Client Westinghouse Hanford
Contract MBH-SVV-069262

Lab sample id N207075-02
Dept sample id 7059-002
Received 07/17/92

Client sample id B018Z2
Matrix SOIL
Collected 07/15/92
Chain of custody id 002698

PARAMETER	CAS NO	RESULT pCi/G	2σ ERR (COUNT)	MDA pCi/G	RDL pCi/G	QUALI-FIERS	TEST
GAMMA SCAN ANALYTES							
Potassium 40	13966-00-2	13	0.79				GAM
Iron 59		U		0.20		U	GAM
Chromium 51	14392-02-0	U		0.78		U	GAM
Cobalt 60	10198-40-0	U		0.038		U	GAM
Zinc 65	17982-39-3	U		0.11		U	GAM
Ruthenium 106	13967-48-1	U		0.32		U	GAM
Cesium 134	17967-70-9	U		0.045		U	GAM
Cesium 137	10045-97-3	0.040	0.039				GAM
Europium 152	14683-23-9	U		0.084		U	GAM
Europium 154	15585-10-1	U		0.056		U	GAM
Radium 226	13982-67-7	0.59	0.079				GAM
Thorium 228	14274-82-9	0.86	0.061				GAM
Thorium 232	7440-29-1	0.77	0.18				GAM

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-DS
Version 2.16
Report date 09/17/92

9513354.1231

N207075-03

TMA NORCAL
REPORTING GROUP 7059

DATA SHEET

B018Z4

SDG	7059	Client	Westinghouse Hanford
Contact	Dinkar Kharkar	Contract	MBH-SVV-069262
Lab sample id	N207075-03	Client sample id	B018Z4
Dept sample id	7059-003	Matrix	SOIL
Received	07/17/92	Collected	07/15/92
		Chain of custody id	002698

PARAMETER	CAS NO	RESULT pCi/G	2σ ERR (COUNT)	MDA pCi/G	RDL pCi/G	QUALI-FIERS	TES
GAMMA SCAN ANALYTES							
Potassium 40	13966-00-2	5.7	0.58				GAM
Iron 59		U		0.17		U	GAM
Chromium 51	14392-02-0	U		0.57		U	GAM
Cobalt 60	10198-40-0	U		0.037		U	GAM
Zinc 65	17982-39-3	U		0.074		U	GAM
Ruthenium 106	13967-48-1	U		0.24		U	GAM
Cesium 134	17967-70-9	U		0.030		U	GAM
Cesium 137	10045-97-3	U		0.025		U	GAM
Europium 152	14683-23-9	U		0.054		U	GAM
Europium 154	15585-10-1	U		0.038		U	GAM
Radium 226	13982-67-7	0.18	0.045				GAM
Thorium 228	14274-82-9	0.20	0.029				GAM
Thorium 232	7440-29-1	0.19	0.11				GAM

Lab id	TMAN
Protocol	WHC-HEIS
Version	Ver 1.0
Form	DVD-DS
Version	2.16
Report date	09/17/92

9513354.1232

TMA NORCAL

REPORTING GROUP 7059

Test GAM Matrix SOIL
SDG 7059
Contact Dinkar Kharkar

RESULT SUMMARY

GAMMA SCAN

GAMMA SPECTROSCOPY

Client Westinghouse Hanford
Contract MBH-SVV-069262

CLIENT SAMPLE ID	LAB SAMPLE ID	SUF-FIX	PLANCHET	Cobalt 60	Cesium 137
Preparation batch 2713-028 Prep error 15.0 %					
B018Z1	N207075-01		7059-001	U	U
B018Z2	N207075-02		7059-002	U	0.040
B018Z4	N207075-03		7059-003	U	U
Blank (Stnd=QC-8720)	N207075-05		7059-005	U	U
LCS (Stnd=QC-8719)	N207075-04		7059-004	LOW	LOW
Replicate (N207075-01)	N207075-06		7059-006	- U	- U

Nominal values and limits from method RDLs (pCi/G)

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-CRS
Version 2.16
Report date 09/17/92

TMA NORCAL

REPORTING GROUP 7059

Test GAM Matrix SOIL
SDG 7059
Contact Dinkar Kharkar

METHOD SUMMARY

GAMMA SCAN

GAMMA SPECTROSCOPY

Client Westinghouse Hanford
Contract MBH-SVV-069262

CLIENT SAMPLE ID	LAB SAMPLE ID	SUF-FIX	PLANCHET	MAX MDA pCi/G	ALIQUOT G	RESID mg	YIELD %	COUNT min	FWHM keV	DAYS HELD	PREPARED	ANAL-YZED	DETECTOR
Preparation batch 2713-028 Prep error 15.0 %													
B018Z1	N207075-01		7059-001	1.9	210			109		45		08/29/92	JR,01,00
B018Z2	N207075-02		7059-002	0.78	900			112		47		08/30/92	MB,05,00
B018Z4	N207075-03		7059-003	0.57	1000			100		57		09/09/92	MB,02,00
Blank (Stnd=QC-8720)	N207075-05		7059-005	1.8	100			113				08/30/92	MB,05,00
LCS (Stnd=QC-8719)	N207075-04		7059-004	2.5	100			112				08/30/92	MB,03,00
Replicate (N207075-01)	N207075-06		7059-006	1.8	220			106		45		08/29/92	JR,01,00
Nominal values and limits from method					100	-	-	100		180			

PROCEDURES RC-30 Ge(Li) Preparation

AVERAGES ± 2 SD FOR 6 SAMPLES
MDA 1.6 ± 1.5
YIELD ____ ± ____
FWHM ____ ± ____

Lab id TMAN
Protocol WHC-HEIS
Version Ver 1.0
Form DVD-CMS
Version 2.16
Report date 09/17/92

TMA NORCAL
REPORTING GROUP 7059

SDG 7059
Contact Dinkar Kharkar

REPORT GUIDE

Client Westinghouse Hanf
Contract MBH-SVV-069262

SAMPLE SUMMARY

The Sample Summary Reports (variously titled LAB, SAMPLE, DEPARTMENT and QC SUMMARY to reflect the sort order) show all samples, including QC samples, reported in one Sample Delivery Group (SDG).

The following notes apply to this report:

* LAB SAMPLE ID is the lab's primary identification for a sample.

* DEPARTMENT SAMPLE ID is an alternate lab id, for example one assigned by a radiochemistry department in a lab.

* CLIENT SAMPLE ID is the client's primary identification for a sample. It includes any sample preparation done by the client that is necessary to identify the sample.

* QC BATCH is a lab assigned code that groups samples to be processed and QCed together. These samples should have similar matrices.

  QC BATCH is not necessarily the same as SDG, which reflects samples received and reported together.

* All Lab Control Samples, Reagent Blanks and Replicates are shown that QC any of the samples. Due to possible reanalyses, not all results for all these QC samples may be relevant to the SDG. The Lab Control Sample Reports, the Reagent Blank Reports, the Replicate Reports and the Result Summary Reports detail these relationships.

Lab id TMAN
Protocol WHC-HE
Version Ver 1.
Form DVD-RG
Version 2.16
Report date 09/17/

SDG 7059
Contact Dinkar Kharkar

TMA NORCAL
REPORTING GROUP 7059

REPORT GUIDE

Client Westinghouse Han
Contract MBH-SVV-069262

PREPARATION BATCH SUMMARY

The Preparation Batch Summary Report shows all preparation batches in one Sample Delivery Group (SDG) with information necessary to check the completeness and consistency of the SDG.

The following notes apply to this report:

* The preparation batches are shown in the same order as the Report and Method Summary Reports are printed.

* Only analyses of planchets relevant to the SDG are counted.

* Each preparation batch should have at least one Reagent Blank and LCS in it to validate other results.

* The QUALIFIERS shown are all qualifiers other than U, J and B that occur on any analysis in the preparation batch. The Result Summary Report has these qualifiers on a per sample basis.

  These qualifiers should be reviewed as follows:

  X — Some data has been manually entered or modified. Transcription errors are possible.

  P — One or more results are 'preliminary'. The data is not ready for final reporting.

  2 — There were two or more results for one parameter on one planchet imported at one time. The results in DVD may not be the same as on the raw data sheets.

  Other lab defined qualifiers may occur. In general, these should be addressed in the SDG narrative.

Lab id TMAN
Protocol WHC-HE
Version Ver 1.
Form DVD-RG
Version 2.16
Report date 09/17/

TMA NORCAL
REPORTING GROUP 7059

SDG 7059
Contact Dinkar Kharkar

REPORT GUIDE

Client Westinghouse Hanf
Contract MBH-SVV-069262

WORK SUMMARY

The Work Summary Report shows all samples, including QC samples, and all relevant analyses in one Sample Delivery Group (SDG).

The following notes apply to this report:

* TEST is a code for the method used to measure related parameters. Results and related information for each parameter are on the Data Sheet Report.

* SUFFIX is the lab's code to distinguish multiple analyses (recounts, reworks, reanalyses) of a fraction of the sample. The suffix indicates which result is being reported. An empty suffix normally identifies the first attempt to analyze the sample.

* The LAB SAMPLE ID, TEST and SUFFIX uniquely identify all supporting data for a result. The Method Summary Report for each TEST has method performance data, such as yield, for each lab sample id and suffix and procedures used in the method.

* PLANCHET is an alternate lab identifier for work done for one test. It, combined with the TEST and SUFFIX, may be the best link to raw data.

* For QC samples, only analyses that directly QC some regular sample are shown. The Lab Control Sample Reports, the Reagent Blank Reports, the Replicate Reports and the Result Summary Reports detail these relationships.

Lab id TMAN
Protocol WHC-HEI
Version Ver 1.0
Form DVD-RG
Version 2.16
Report date 09/17/9

TMA NORCAL
REPORTING GROUP 7059

SDG 7059
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DATA SHEET

The Data Sheet Report shows all results and primary supporting information for one client sample or Reagent Blank. This report corresponds to both the CLP Inorganics and Organics Data Sheet.

The following notes apply to this report:

* TEST is a code for the method used to measure a parameter. If the TEST is empty, no data is available; the parameter was not analyzed for.

* The LAB SAMPLE ID and TEST uniquely identify work within the Summary Data Section of a Data Package. The Work Summary and Method Summary Reports further identify raw data that underlies this work.

  The Method Summary Report for each TEST has method performance data, such as yield, for each Lab Sample ID and a list of procedures used in the method.

* ERRORs can be labeled TOTAL or COUNT. TOTAL implies a preparation (non-counting method) error has been added (as sum of squares) to the counting error denoted by COUNT. The preparation errors, which may vary by preparation batch, are shown on the Method Summary Report.

* A RESULT can be 'N.R.' (Not Reported). This means the lab did this work but chooses not to report it now, possibly because it was reported at another time.

* When reporting a Reagent Blank a RESULT can be 'N.A.' (Not Applicable). This means there is no reported client sample work in the same preparation batch as the Blank's result. This is likely to occur when the Reagent Blank is associated with reanalyses of selected work for a few samples in the SDG.

The following qualifiers are defined by the DVD system:

U The RESULT is less than the MDA (Minimum Detectable Activity). If the MDA is blank, the ERROR is used as the limit.

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J — If the RESULT is less than the RDL (Required Detection Limit) and no U qualifier is assigned.

B — Some Reagent Blank that QC's this sample had a non-U result and, after correcting for possibly different aliquots, that result is greater than or equal to the MDA for this sample.

For each sample result, all Reagent Blank results in the same preparation batch are compared. The Result Summary Report documents this relationship.

P — The RESULT is 'preliminary'.

T — The test code shown is not the same as on the raw data for this result. It has been changed to match that used for corresponding QC. See the narrative for details.

X — Some data necessary to compute the RESULT, ERROR or MDA was manually entered or modified.

2 — There were two or more results available for this parameter. The reported result may not be the same as in the raw data.

Other qualifiers are lab defined. Definitions should be in the SDG narrative.

The following values are underlined to indicate possible problems:

* An MDA is underlined if it is bigger than its RDL.

* An ERROR is underlined if the 2 sigma counting error is bigger than both the MDA and the RESULT, implying that the MDA may not be a good estimate of the 'real' minimum detectable activity.

* A negative RESULT is underlined if it is less than the negative of its 2 sigma counting ERROR.

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LAB CONTROL SAMPLE

The Lab Control Sample Report shows all results, recoveries and primary supporting information for one Lab Control Sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. Refer to its Report Guide for details.

* Amounts ADDED are the lab's estimate of the actual amount spiked into this sample with their ERROR an estimate of the error of this amount.

  An amount is underlined if its ratio to the corresponding RDL is outside protocol specified limits.

* REC (Recovery) is RESULT divided by ADDED expressed as a percent.

* The first, computed limits for the recovery reflect:

  1. The error of RESULT, including that introduced by rounding the result prior to printing.

     If the limits are labeled (TOTAL), they include preparation error in the result. If labeled (COUNT), they do not.

  2. The error of ADDED.

  3. A lab specified, per parameter bias. The bias changes the center of the computed limit range.

* The second limits are protocol defined upper and lower QC limits for the recovery.

* The recovery is underlined (out of spec) if it is outside either of these ranges.

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REPLICATE

The Replicate Report shows all results, differences and primary supporting information for one Replicate and associated Original sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. This applies both to the Replicate and Original sample data. Refer to the Data Sheet Report Guide for details.

  If the Replicate has data for a TEST and the lab did not do this test to the Original, the Original's RESULTs are underlined.

* The RPD (Relative Percent Difference) is the absolute value of the difference of the RESULTs divided by their average expressed as a percent.

  If both RESULTs are less than their MDAs, no RPD is computed and a '-' is printed.

  For a parameter, if the lab did work for both samples but has data for only one, the MDA from the sample with data is used as the other's result in the RPD.

* The first, computed limit for the RPD reflects:

  1. The errors of RESULTs, including that introduced by rounding the RESULTs prior to printing.

     If this limit is labeled TOT, it includes the preparation error in the RESULTs. If labeled CNT, it does not.

  2. Error introduced by the arithmetic done to compute the RPD.

  This value reported for this limit is at most 999.

* The second limit for the RPD is the larger of:

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REPLICATE

1. A fixed percentage specified in the protocol.

2. A protocol factor (typically 2) times the average MDA as a percent of the average result. This limit applies when the results are close to the MDAs.

* The RPD is underlined (out of spec) if it is greater than either limit.

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MATRIX SPIKE

The Matrix Spike Report shows all results, recoveries and primary supporting information for one Matrix Spike and associated Original sample.

The following notes apply to this report:

* All fields in common with the Data Sheet Report have similar usage. This applies both to the Spiked and Original sample data. Refer to the Data Sheet Report Guide for details.

  If the Spike has data for a TEST and the lab did not do this test to the Original, the Original's RESULTs are underlined.

* Amounts ADDED are the lab's estimate of the actual amount spiked into the Spike sample with their ERROR an estimate of the error of this amount.

  An amount is underlined if its ratio to the corresponding RDL is outside protocol specified limits.

* REC (Recovery) is the Spike RESULT minus the Original RESULT divided by ADDED expressed as a percent.

* The first, computed limits for the recovery reflect:

  1. The errors of the RESULTs, including that introduced by rounding them prior to printing.

     If the limits are labeled (TOTAL), they include preparation error in the result. If labeled (COUNT), they do not.

  2. The error of ADDED.

  3. A lab specified, per parameter bias. The bias changes the center of the computed limit range.

* The second limits are protocol defined upper and lower QC limits for the recovery.

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MATRIX SPIKE

These limits are left blank if the Original RESULT is more than a protocol defined factor (typically 4) times ADDED. This is a way of accounting for that when the spike is small compared to the amount in the original sample, the recovery is unreliable.

* The recovery is underlined (out of spec) if it is outside either of these ranges.

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RESULT SUMMARY

The Result Summary Report shows up to four results measured using one method. There is one report for each TEST, as used on the Data Sheet Report. The corresponding Method Summary Report has method performance data.

The following notes apply to this report:

* Each per method report is subdivided into sections, one for each preparation batch. A preparation batch should be work done over a restricted period of time by a small group of people in a defined area of the lab.

  There should be Lab Control Sample and Reagent Blank results in each preparation batch since this close correspondence makes the QC meaningful. Depending on lab polcy, Replicates need not occur in each batch since they QC sample dependencies such as matrix effects.

* If a result is less than both its MDA and RDL, it is replaced by just 'U' on this report. If it is greater than or equal to the RDL but less than the MDA, the result is shown with a 'U' flag.

  The J and X flags are as on the data sheet.

* Non-U results for Reagent Blanks are underlined to indicate possible contamination of other samples in the preparation batch. The Reagent Blank Report has supporting data.

* Lab Control Sample results are shown as: ok, No data, LOW or HIGH, with the last two underlined. 'No data' means no amount ADDED was specified. 'LOW' and 'HIGH' correspond to when the recovery is underlined on the Lab Control Sample Report. See it for supporting data.

* Replicate sample results are shown as: ok, No data, or OUT, with the last two underlined. 'No data' means there was no original sample data found for this replicate. 'OUT' corresponds to when the RPD is underlined on the Replicate Report. See it for supporting data.

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RESULT SUMMARY

For some methods, ratios as percentages and error estimates for them are computed for pairs of results. A ratio column header like '1÷3' means the ratio of the first result column and the third result column.

The error estimate for a ratio reflects the errors of RESULTs, including errors introduced by rounding the RESULTs prior to printing and the preparation error if one is shown for the preparation batch.

> The preparation error is included once, not once for each result, since preparation errors for the results should be highly correlated.

The ratio is underlined (out of spec) if the absolute value of its difference from a nominal value is greater than its error estimate.

Average ratios are computed. These do not include ratios from Lab Control Sample or Reagent Blank results since their matrices are not necessarily similar to normal sample's.

For Gross Alpha or Gross Beta results, there may be a column showing the sum of other Alpha or Beta emitters. This sum includes all relevant results in the DVD database, whether reported or not. Results in the sum are weighted by a particles/decay value specified by the lab for each relevant parameter. Results less than their MDA are not included. No sums are computed for QC Samples since their various planchets may not be physically related.

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METHOD SUMMARY

The Method Summary Report shows performance data for one method. There is one report for each TEST, as used on the Data Sheet Report.

The following notes apply to this report:

* Each per method report is subdivided into sections, one for each preparation batch. A preparation batch should be work done over a restricted period of time by a small group of people in a defined area of the lab.

  There should be Lab Control Sample and Reagent Blank results in each preparation batch since this close correspondence makes the QC meaningful. Depending on lab policy, Replicates need not occur in each batch since they QC sample dependencies such as matrix effects.

* If the MDA column is labeled 'MAX MDA', there was more than one result measured by the reported method and the MDA shown is the largest MDA. If not all these results have the same RDL, the MAX MDA reflects only those results with RDL equal to the smallest one.

  MDAs are underlined if greater than the RDL; the smallest RDL if there is more than one.

* Aliquots are underlined if less than a nominal value specified for the method.

* Residues are underlined if outside a range specified for the method.

* Yields, which may be a gravimetric yield, chemical recovery or detector efficiency depending on the method, are underlined if outside a range specified for the method.

* Count times are underlined if less than a nominal value specified for the method.

* Resolutions (as FWHM; Full Width at Half Max) are underlined if

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greater than a method specified limit.

* Days Held are underlined if greater than a holding time specified in the protocol.

* Analysis dates are underlined if before their sample's preparation date.

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SECTION 2 Case Narrative

TMA

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CASE NARRATIVE

1.0 GENERAL

Soil sample results from the Sodiumon Dichromate Barrel-ERA Site 5AF-92-226 (TMA/Norcal Group 7059) are reported herein. TMA/Norcal Group 7059 is comprised of the three samples listed on the Chain-of-Custody documents and is identified as Samples 1, 2, and 3.

1.1 CHAINS-OF-CUSTODY

This report includes data from the sample delivered under Chain-of-Custody documents Field Logbook WHC-N-205-15.

1.2 SAMPLE VOLUME

1000 mL bottles of the samples were received for the analyses.

1.3 MISSING SAMPLES

All samples were accounted for in an undamaged condition.

1.4 HOLDING TIMES

The collections were made on 7/15/92 and the sample processing was initiated within 180 days of collection.

2.0 QUALITY CONTROL

The internal quality control consisted of one sample each of a laboratory control, a blank, and a replicate. All original analyses were performed with QC samples 7059-4 5, and 6.

The QC samples were prepared and labelled by the quality control officer. Copies of The QC notebook pages are included in the data package.

2.1 LABORATORY CONTROL SAMPLES

LCS recoveries for ^{60}Co and ^{137}Cs were 69% and 74% respectively and were within the 3 σ limits.

2.2 BLANKS

The blank results for the gamma scan nuclides were less than MDA.

2.3 REPLICATES

Results were satisfactory for the replicate analyses.

3.0 ANALYTICAL NOTES

3.1 Gamma Scan Analyses: Gamma scan analysis did not find positive concentration of gamma nuclides in the samples.

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SECTION 3: COPIES OF CHAINS-OF-CUSTODY

9513354.1251

Westinghouse Hanford Company	CHAIN OF CUSTODY 002638

Custody Form Initiator CE ZERBY

Company Contact K.POOL/C.E.Heiden Telephone (509)3762640

Project Designation/Sampling Locations Soduim Dichromate Barrel-ERA Collection Date 7-15-92

Site SAF 92-226

Ice Chest No. 80-JEm Field Logbook No. WHC-N-205 15

Bill of Lading/Airbill No. 2 5098 6 9 1 5 3 Offsite Property No.

Method of Shipment Emery Air Express

Shipped to TMA/Norcal

Possible Sample Hazards/Remarks None Detected

See S.A.R. for individual bottle sizes and Analysis

Sample Identification

B018Z1 (3) Bottles

B018Z2 (3) Bottles

B018Z4 (3) Bottles

CEZ 7-16-92

CEZ 7-16-92

☐ Field Transfer of Custody

CHAIN OF POSSESSION (Sign and Print Names)

Relinquished by:	Received by:	Date/Time:
CE Zerby CE Zerby	Kermit Blum	7-17-92 1130
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:
Relinquished by:	Received by:	Date/Time:

Final Sample Disposition

Disposal Method:	Disposed by:	Date/Time:

Comments:

A-6000-407 (12/90)

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Westinghouse Hanford Company

SAMPLE ANALYSIS REQUEST C.O.C. 002699

Collector CE ZERBY Date 7-15-92

Company Contact K Pool/CE Heiden Telephone (509-) 3762640

Sample Number	*	Date Collected	Time Collected	Number and Type of Sample Containers/Analysis Requested
B018Z1	S	7-15-92	1155	(1) 250ml aG Cr 6+ SW846-7196
B018Z1	S	7-15-92	1155	(1) 250ml aG ICP Metals for(totat Chromium) CIP
CEZ-7-16-92 B018Z1	S	7-15-92	1155	(1) 1Liter ClG GammaSpec PRO-042-5
B018Z2	S	7-15-92	1155	(1) 250ml Cr 6+ SW846-7196
B018Z2	S	7-15-92	1155	(1) 250ml ICP Metals(total chromium) CIP
B018Z2	S	7-15-92	1155	(1) 1Liter ClG Gamma spec PRO-042-5
B018Z4	S	7-15-92	1415 & CEZ 7-16-92	(1) 250ml Cr 6+ SW846-7196
B018Z4	S	7-15-92	1415	(1) 250ml ICP Metals (total chromium) CIP
B018Z4	S	7-15-92	1415	(1) 1Liter ClG Gamma Spec PRO-042-5

CEZ 7-16-92

*Type of Sample A = Air; L = Liquid; SE = Sediment; T = Tissue; X = Other; DL = Drum Liquids; O = Oil; SL = Sludge; W = Water; DS = Drum Solids; S = Soil; SO = Solid; WI = Wipe

Field Information SAF 92-226 Soduim Dichromate Barral- ERA site 100 D area

Priority Turn Around. Run Analysis even though hold times are missed.

Special Handling and/or Storage Samples maintained to 4°c

Possible Sample Hazards None detected with field instustments

A-6000-406 (06/91)

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SECTION 4: ANALYTICAL METHODS USED

ANALYTICAL METHODS USED - SOIL AND PLANT MATERIAL

1. Gross Alpha and Gross Beta: Approximately 5 gram of soil was dissolved by $HF-HNO_3-HCl$ treatment. The dissolved solution was made to a known volume. A volume equivalent to 0.1 gram of soil was uniformly deposited on a stainless steel planchet, weighted, and counted on a low background proportional counter for gross alpha and gross beta determination.

2. Carbon-14 Analysis: An aliquot of soil is combusted in the furnace at 925°C in the presence of oxygen and CuO. The Co_2 is absorbed in $BaCl_2$ to form $BaCo_3$, filtered and placed in a scintillation vial and counted in the LSC counter in the presence of the scintillator.

3. Strontium-90: ^{90}Sr was determined on a 1 gram aliquot. Approximately 3 gram dry soil was dissolved completely by $HF-HNO_3-HCl$ treatment and made to a known volume. One gram aliquot was taken for ^{90}Sr determination. Yttrium carrier was added Yttrium was extracted by HDEHP extraction. Yttrium was converted to yttrium oxide and beta counted.

4. Isotopic Uranium, Plutonium, Americium, and Curium: U, Pu, Am, and Cm were determined by adding appropriate tracers in the dissolved sample and purified by selective ion exchange procedures. Am and Cm are further purified with a DDCP extraction procedure and coprecipitated with a yttrium scavenge. The purified extract is electrodeposited on a stainless steel disc for alpha pulse height spectroscopy. The plutonium plate is striped with HNO_3 and ^{241}Pu is counted in a liquid scintillation counter with an appropriate cocktail.

5. Technetium-99: Approximately 2 gram was ashed at 500°C with ^{99m}Tc tracer and ammonia. The ash was leached with H_2SO_4 and $K_2S_2O_8$. The leached sample is filtered. H_2SO4 and $K_2S_2O_8$ was added to a 10 mL aliquot of water. The water and the leached sample of soil was extracted with TBP and purified by coprecipitation and anion exchange procedure. The purified Tc was electroplated on a stainless steel disc and counted on a gamma detector to determine yield. After decay of ^{99m}Tc, the disc was counted on a low background beta counter.

6. Gamma-Scan: Approximately 200 to 750 gram dry soil was placed in an appropriate geometry and counted on a Ge(Li) detector.

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SECTION 5: ALIQUOT INFORMATION

28 7059 soil

JB 8-18-92

TMA #	Customer ID	T°	Received weight G	T	N	Done By	
7059-1	B018Z1	7-15-92	1089.91	44.97	1044.94	~~7~~ 8-18-92	T
-2	B018Z2		1038.90	45.07	993.83		
-3	B018Z4		1409.11	45.19	1363.92		
-4	QC-LCS 8719						
-5	QC-BLANK 8720						
-6	QC-DUP OF #1 8721	7-15-92					

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7059

	Done	Checked	Dry Weight		Done	Checked	Weight After Sieve	Done	Checked
N	By	By	G	N	By	By	N	By	By
1044.94	8-18-92	TC 9/13/92	1068.80	1023.83	VE/ 8-20-92	TC 9/17/92	1023.58	VE 8/21/92	TC 9/17/92
993.83	↓	↓	1018.68	973.61	↓	↓	973.55	↓	↓
1363.92	↓	↓	1408.67	1363.48	↓	↓	1362.48	↓	↓

7059

JB 8-18-92

TMA #	GLS Aliquot / GEO	Sample preparation	Analyst Date
7059-1	209.18 g / JR	~~N/A~~ - Sand TC 8/20	VE/TC 8/19
-2	902.97 / MB	~~N/A~~ - Sand TC 8/20	
-3	1018.20 / MB	~~N/A~~ Sand TC 8/20	
-4	1.0 smpl. / MB		
-5	1.0 smpl. / MB		
-6	216.56 g / JR		

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WORK RECORD

Analyst Date	Sample's	Analysis	Procedure	Steps
VE/TC 8/19	1 – 3	Soil prep. Aliquot	EP-3	All

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SECTION 6: RAW DATA FOR GAMMA SCAN

9513354.1261

TMA/NORCAL GE(LI) ANALYSIS REPORT

10-SEP-92 DK 9/14

NUCLIDE	DPM/GRAM	PCI /GRAM	+/- ACT ERR 2 sigma	%ERR 2 sigma
B018Z1	00000839	TMA # (GLS) 7059		1
TZERO = 197.292 1992		209.1800 GRAM		Aliquot
K 40	2.525E+01	(1.138 +/- 0.186) E+01		16.4%
Cr 51	< 4.288E+00	< 1.931E+00		DET LIM
Mn 54	< 2.618E-01	< 1.179E-01		DET LIM
Co 58	< 3.589E-01	< 1.616E-01		DET LIM
Fe 59	< 1.291E+00	< 5.816E-01		DET LIM
Co 60	< 2.298E-01	< 1.035E-01		DET LIM
Zn 65	< 6.264E-01	< 2.822E-01		DET LIM
Nb 94	< 2.134E-01	< 9.614E-02		DET LIM
Ru106	< 2.160E+00	< 9.732E-01		DET LIM
Cs134	< 2.533E-01	< 1.141E-01		DET LIM
Cs137	< 2.275E-01	< 1.025E-01		DET LIM
Eu152	< 3.510E-01	< 1.581E-01		DET LIM
Eu154	< 2.341E-01	< 1.055E-01		DET LIM
Eu155	< 4.407E-01	< 1.985E-01		DET LIM
Ra226	9.089E-01	(4.094 +/- 1.662) E-01		40.6%
Th228	1.753E+00	(7.898 +/- 1.838) E-01		23.3%
Th232	< 1.730E+00	< 7.793E-01		DET LIM
B018Z2	00000840	TMA # (GLS) 7059		2
TZERO = 197.292 1992		902.9700 GRAM		Aliquot
K 40	2.797E+01	(1.260 +/- 0.079) E+01		6.2%
Cr 51	< 1.727E+00	< 7.781E-01		DET LIM
Mn 54	< 8.771E-02	< 3.951E-02		DET LIM
Co 58	< 1.108E-01	< 4.993E-02		DET LIM
Fe 59	< 4.389E-01	< 1.964E-01		DET LIM
Co 60	< 8.444E-02	< 3.803E-02		DET LIM
Zn 65	< 2.406E-01	< 1.084E-01		DET LIM
Nb 94	< 7.258E-02	< 3.269E-02		DET LIM
Ru106	< 7.113E-01	< 3.204E-01		DET LIM
Cs134	< 1.006E-01	< 4.533E-02		DET LIM
Cs137	8.944E-02	(4.029 +/- 3.934) E-02		97.7%
Eu152	< 1.860E-01	< 8.378E-02		DET LIM
Eu154	< 1.235E-01	< 5.565E-02		DET LIM
Eu155	< 2.506E-01	< 1.129E-01		DET LIM
Ra226	1.305E+00	(5.879 +/- 0.787) E-01		13.4%
Th228	1.908E+00	(8.594 +/- 0.613) E-01		7.1%
Th232	1.710E+00	(7.703 +/- 1.772) E-01		23.0%

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10-SEP-92 TMA/NORCAL GE(LI) ANALYSIS REPORT

D.C. 9/14

NUCLIDE	DPM/GRAM	PCI /GRAM	+/- ACT ERR 2 sigma	%ERR 2 sigma
B01BZ4		00000841	TMA # (GLS) 7059	3
TZERO = 197.292 1992			1018.2000 GRAM	Aliquot
K 40	1.256E+01	(5.659 +/- 0.583) E+00		10.3%
Cr 51	< 1.266E+00	< 5.701E-01		DET LIM
Mn 54	< 6.480E-02	< 2.919E-02		DET LIM
Co 58	< 8.287E-02	< 3.733E-02		DET LIM
Fe 59	< 3.733E-01	< 1.682E-01		DET LIM
Co 60	< 8.192E-02	< 3.690E-02		DET LIM
Zn 65	< 1.649E-01	< 7.428E-02		DET LIM
Nb 94	< 4.760E-02	< 2.144E-02		DET LIM
Ru106	< 5.219E-01	< 2.351E-01		DET LIM
Cs134	< 6.618E-02	< 2.981E-02		DET LIM
Cs137	< 5.561E-02	< 2.505E-02		DET LIM
Eu152	< 1.190E-01	< 5.361E-02		DET LIM
Eu154	< 8.467E-02	< 3.814E-02		DET LIM
Eu155	< 1.713E-01	< 7.718E-02		DET LIM
Ra226	3.929E-01	(1.770 +/- 0.447) E-01		25.3%
Th228	4.419E-01	(1.991 +/- 0.290) E-01		14.6%
Th232	4.177E-01	(1.882 +/- 1.121) E-01		59.6%
QC 8719 LCS		00000842	TMA # (GLS) 7059	4
TZERO = 243.879 1992			1.0000 SMPL	Aliquot
K 40	< 5.646E+02	< 2.543E+02		DET LIM
Cr 51	< 2.286E+02	< 1.030E+02		DET LIM
Mn 54	< 3.806E+01	< 1.714E+01		DET LIM
Co 58	< 3.512E+01	< 1.582E+01		DET LIM
Fe 59	< 7.883E+01	< 3.551E+01		DET LIM
Co 60	2.004E+02	(9.026 +/- 2.217) E+01		24.6%
Zn 65	< 9.926E+01	< 4.471E+01		DET LIM
Nb 94	< 4.151E+01	< 1.870E+01		DET LIM
Ru106	< 3.397E+02	< 1.530E+02		DET LIM
Cs134	< 4.063E+01	< 1.830E+01		DET LIM
Cs137	2.071E+02	(9.328 +/- 2.227) E+01		23.9%
Eu152	< 6.842E+01	< 3.082E+01		DET LIM
Eu154	< 4.454E+01	< 2.006E+01		DET LIM
Eu155	< 8.948E+01	< 4.030E+01		DET LIM
Ra226	< 7.896E+01	< 3.557E+01		DET LIM
Th228	< 4.894E+01	< 2.204E+01		DET LIM
Th232	< 1.833E+02	< 8.257E+01		DET LIM

QC-8719 KY 9/14/92	Added (pCi)	(2σ)	F/A	2σ
Co-60 ~~Added~~ =	130.2	(±4.2)	0.693	(±25.2)
Cs-137 =	124.7	(±4.2)	0.748	(±24.2)

KY 9/14/92

TMA/Norcal

Q.C. Sample Log Sheet DUPLICATE SAMPLE

Group No. 7059 — 7059-6 is a duplicate of 7059-1

Prepared by: KY

Date: 9/14/92

Program Mgr: DPK

197,292-92

Q.C.#	Smp#	Nuclide	pCi/gram ± 2σ % error Found	Added	Found/Added
8721	6	K-40	10.40 (16.9%)	11.38 (16.4%)	0.914 (±24.7%)
		Cr-51	See attached data sheets		–
		Co-60			–
		Zn-65			–
		Cs-134			–
		Cs-137			–
		Ra-226	0.3329 (64.9%)	0.4094 (40.6%)	0.813 (±77.7%)
		Th-228	0.8491 (19.2%)	0.7898 (23.3%)	1.075 (±30.7%)
		Th-232	0.8077 (53.5%)	< 0.7793	–

Entered: KY Date: 9/14/92 Entered: KY Date: 9/14/92

NOTE: Reference times are normally time of count (blanks) or first of the year (spikes). If different times are used, list them below.

Comments:

TS-130

9513354.1264

TMA/NORCAL GE(LI) ANALYSIS REPORT

10-SEP-92

DK 9/14

NUCLIDE	DPM/GRAM	PCI /GRAM	+/- ACT ERR 2 sigma	%ERR 2 sigma
QC 8720 BLANK	00000843		TMA # (GLS) 7059	5
TZERO = 243.879 1992			1.0000 SMPL	Aliquot
K 40	< 3.993E+02	< 1.799E+02		DET LIM
Cr 51	< 1.839E+02	< 8.282E+01		DET LIM
Mn 54	< 2.186E+01	< 9.848E+00		DET LIM
Co 58	< 2.584E+01	< 1.164E+01		DET LIM
Fe 59	< 5.388E+01	< 2.427E+01		DET LIM
Co 60	< 2.159E+01	< 9.727E+00		DET LIM
Zn 65	< 4.852E+01	< 2.186E+01		DET LIM
Nb 94	< 2.421E+01	< 1.091E+01		DET LIM
Ru106	< 1.733E+02	< 7.804E+01		DET LIM
Cs134	< 2.778E+01	< 1.251E+01		DET LIM
Cs137	< 2.917E+01	< 1.314E+01		DET LIM
Eu152	< 4.665E+01	< 2.101E+01		DET LIM
Eu154	< 3.121E+01	< 1.406E+01		DET LIM
Eu155	< 6.681E+01	< 3.010E+01		DET LIM
Ra226	< 5.708E+01	< 2.571E+01		DET LIM
Th228	< 4.423E+01	< 1.993E+01		DET LIM
Th232	< 1.055E+02	< 4.751E+01		DET LIM

QC-8720 ; Added = 0 KK 9/14/92

QC 8721 REP 1	00000844		TMA # (GLS) 7059	6
TZERO = 197.292 1992			216.5600 GRAM	Aliquot
K 40	2.308E+01	(1.040 +/- 0.175) E+01		16.9%
Cr 51	< 3.973E+00	< 1.790E+00		DET LIM
Mn 54	< 2.386E-01	< 1.075E-01		DET LIM
Co 58	< 3.345E-01	< 1.507E-01		DET LIM
Fe 59	< 1.117E+00	< 5.032E-01		DET LIM
Co 60	< 2.499E-01	< 1.126E-01		DET LIM
Zn 65	< 6.896E-01	< 3.106E-01		DET LIM
Nb 94	< 2.292E-01	< 1.032E-01		DET LIM
Ru106	< 2.075E+00	< 9.347E-01		DET LIM
Cs134	< 2.684E-01	< 1.209E-01		DET LIM
Cs137	< 2.622E-01	< 1.181E-01		DET LIM
Eu152	< 3.940E-01	< 1.775E-01		DET LIM
Eu154	< 2.544E-01	< 1.146E-01		DET LIM
Eu155	< 4.493E-01	< 2.024E-01		DET LIM
Ra226	7.390E-01	(3.329 +/- 2.161) E-01		64.9%
Th228	1.885E+00	(8.491 +/- 1.632) E-01		19.2%
Th232	1.793E+00	(8.077 +/- 4.322) E-01		53.5%

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****

7059 GLS 1 G-1 JR 242.710 92 108.57 MIN 209.17999 GR 559

LIBR=ARLI REF TIME= 197.292 92

****

9/9/92

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00		
1460 (1460.85)	0.110000	0.00353	2.048	5.283E+03 s	8.19%	1.138E+01
Cr 51 2.772E+01 DAYS		LAMBDA= 2.501E-02		DECAY= 3.212E-01	1G	
**** (320.03)	0.102000	0.01685	0.495	2.881E+02 s	<	1.931E+00
Mn 54 3.125E+02 DAYS		LAMBDA= 2.218E-03		DECAY= 9.042E-01	2G	
**** (834.83)	1.000000	0.00622	0.308	4.951E+01 s	<	1.179E-01
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 6.431E-01	4G	
**** (810.76)	0.990000	0.00641	0.306	4.827E+01 s	<	1.616E-01
Fe 59 4.460E+01 DAYS		LAMBDA= 1.554E-02		DECAY= 4.937E-01	6G	
**** (1099.22)	0.565000	0.00472	0.252	9.428E+01 s	<	4.112E-01
**** (1291.56)	0.432000	0.00400	0.231	1.333E+02 s	<	5.816E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.837E-01	4G	
**** (1173.21)	0.999200	0.00442	0.242	5.471E+01 s	<	1.198E-01
**** (1332.48)	1.000000	0.00388	0.183	4.729E+01 s	<	1.035E-01
Zn 65 2.440E+02 DAYS		LAMBDA= 2.841E-03		DECAY= 8.790E-01	1G	
**** (1115.52)	0.507500	0.00465	0.272	1.152E+02 s	<	2.822E-01
Nb 94 7.414E+06 DAYS		LAMBDA= 9.349E-08		DECAY= 1.000E+00	3G	
**** (871.10)	1.000000	0.00596	0.266	4.465E+01 s	<	9.614E-02
**** (1573.70)	1.000000	0.00326	0.177	5.409E+01 s	<	1.165E-01
Ru106 3.670E+02 DAYS		LAMBDA= 1.889E-03		DECAY= 9.178E-01	41G	
**** (621.80)	0.097600	0.00848	0.343	4.148E+02 s	<	9.732E-01
**** (1050.10)	0.014500	0.00495	0.254	3.540E+03 s	<	8.306E+00
I 131 8.040E+00 DAYS		LAMBDA= 8.621E-02		DECAY= 1.993E-02	9G	
**** (364.50)	0.820000	0.01473	0.420	3.473E+01 s	<	3.753E+00
Ba133 3.981E+03 DAYS		LAMBDA= 1.741E-04		DECAY= 9.921E-01	10G	
**** (276.30)	0.075000	0.01951	0.540	3.693E+02 s	<	8.015E-01
**** (302.70)	0.196000	0.01781	0.528	1.514E+02 s	<	3.286E-01
**** (355.90)	0.621000	0.01512	0.579	6.163E+01 s	<	1.338E-01
**** (383.70)	0.094000	0.01392	0.439	3.353E+02 s	<	7.279E-01
Cs134 7.531E+02 DAYS		LAMBDA= 9.204E-04		DECAY= 9.591E-01	9G	
**** (475.30)	0.015000	0.01114	0.370	2.216E+03 s	<	4.975E+00
**** (604.60)	0.980000	0.00873	0.448	5.240E+01 s	<	1.176E-01
**** (795.80)	0.880000	0.00654	0.292	5.082E+01 s	<	1.141E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.971E-01	3G	
**** (661.64)	0.851000	0.00794	0.321	4.746E+01 s	<	1.025E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.935E-01	48G	
**** (121.78)	0.254000	0.03943	0.731	7.295E+01 s	<	1.581E-01
**** (344.31)	0.245000	0.01566	0.478	1.245E+02 s	<	2.699E-01

005

****	(778.87)	0.120000	0.00668	0.297	3.698E+02	s	<	8.016E-01
****	(963.36)	0.132000	0.00540	0.324	4.550E+02	s	<	9.861E-01
****	(1112.04)	0.124000	0.00467	0.226	3.909E+02	s	<	8.472E-01
****	(1408.02)	0.198000	0.00366	0.161	2.222E+02	s	<	4.817E-01

Eu154 3.105E+03 DAYS LAMBDA= 2.232E-04 DECAY= 9.899E-01 48G

****	(123.07)	0.390000	0.03923	0.742	4.848E+01	s	<	1.055E-01
****	(723.26)	0.202000	0.00723	0.310	2.122E+02	s	<	4.617E-01
****	(873.16)	0.117000	0.00595	0.273	3.928E+02	s	<	8.544E-01
****	(1004.75)	0.170000	0.00518	0.286	3.248E+02	s	<	7.066E-01
1130	(1128.50)	0.003000	0.00460	0.712	5.159E+04		37.70%	1.122E+02
****	(1274.49)	0.336000	0.00406	0.247	1.808E+02	s	<	3.933E-01

Eu155 1.812E+03 DAYS LAMBDA= 3.825E-04 DECAY= 9.828E-01 6G

****	(86.54)	0.320000	0.04364	1.029	7.369E+01	s	<	1.615E-01
****	(105.30)	0.200000	0.04218	0.764	9.060E+01	s	<	1.985E-01

Ta182 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 7.605E-01 33G

****	(67.80)	0.410000	0.04383	1.073	5.971E+01	s	<	1.691E-01
****	(100.10)	0.144000	0.04279	0.831	1.348E+02	s	<	3.817E-01
****	(1121.30)	0.358000	0.00463	0.317	1.914E+02	s	<	5.421E-01
****	(1189.05)	0.166000	0.00436	0.243	3.361E+02	s	<	9.516E-01
****	(1221.40)	0.277000	0.00424	0.263	2.241E+02	s	<	6.344E-01
****	(1231.01)	0.117000	0.00421	0.279	5.661E+02	s	<	1.603E+00

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 9.999E-01 48G

****	(186.10)	0.040000	0.02913	0.770	6.611E+02	s	<	1.424E+00
****	(242.00)	0.078000	0.02236	0.920	5.277E+02	s	<	1.136E+00
****	(351.96)	0.393000	0.01531	0.667	1.109E+02	s	~~<r~~	~~2.387E-01~~
609	(609.32)	0.484000	0.00866	0.797	1.901E+02	s	20.29%	4.094E-01

Th228 6.987E+02 DAYS LAMBDA= 9.921E-04 DECAY= ~~9.559E-01 31G~~

239	(238.62)	0.448000	0.02269	3.564	3.506E+02	s	11.63%	7.898E-01
****	(583.17)	0.287000	0.00906	0.489	1.881E+02	s	<r	4.238E-01

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 41G

339	(338.40)	0.104000	0.01594	0.854	5.153E+02	s	16.59%	1.110E+00
912	(911.10)	0.250000	0.00570	0.227	1.595E+02	s	76.90%	3.435E-01
****	(968.90)	0.150000	0.00536	0.340	4.227E+02	s	<	9.103E-01
1460	(1459.20)	0.009000	0.00353	2.048	6.449E+04		8.19%	1.389E+02

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```
*****************************************************************************
7059    GLS   1        G-1 JR 242.710 92  108.57 MIN   209.17999 GR       559
LIBR=ARLI   REF TIME= 197.292 92
*****************************************************************************

*****************************************************************************
* Group.......................... 7059 * Time of count          242.710 1992 *
* Sample......................... 1 * Reference GMT........ 197.292 1992 *
* Element.......................... * Elapsed Live Tm.......... 108.5667 *
* Type code..................... GLS * Dead Time Pct............ 0.107345 *
* ID.......................... B018Z1 * Background GMT....... 236.834 1992 *
* Geometry, detector........... JR-1 * Standard GMT......... 240.879 1992 *
* Aliquot..................... 209.18 * Days since TO............ 45.41769 *
* Unit of Aliquot............... GRAM * Time on.......... 10:02 PDT 29-AUG *
* Data Sheet Units........ PCI /GRAM * Time off......... 11:50 PDT 29-AUG *
* Library....................... ARLI * Calc Time......... 13:26 01-SEP-92 *
*****************************************************************************
* Slope...................... 1.006277 * Width slope.............. 0.004796 *
* Intercept................. -9.38779 * Width offset............. 7.638496 *
* X**2 TERM.......... 0.22045691E-06 * Sensitivity..................... 4. *
  NP:[7,671559.GSP                    17 PEAKS

*****************************************************************************
 PK  IT    ENRG  LEFT  WD  BKGND  FWHM    AREA    CHAN        CPM  ERR   EFF  K   FIT
  1   4    14.9    19  29     59  7.39     818    24.1   7.54E+00  4.00.020  0  2.95
  2   4    27.1    19  29    320  4.81     133    36.2   1.22E+00 29.10.119  0  0.00
  3   4    33.9    19  29    326  5.18     120    43.0   1.11E+00 26.20.233  0  0.00
  4   0    76.4    81  10    639  4.06     345    85.2   3.17E+00 15.3 4.38  0  0.00
  5   0    93.2    99   7    398  1.29      75   102.0   6.90E-01 47.8 4.33  0  0.00
  6   0   183.9   185  16    350  8.99     198   192.1   1.82E+00 23.5 2.94  0  0.00
  7   0   238.9   239  15    272  3.02     408   246.8   3.76E+00 11.0 2.27  0  0.00
  8   0   295.8   298  12    187  2.80      84   303.3   7.78E-01 36.1 1.85  0  0.00
  9   5   338.8   343  29     65  4.61      97   346.0   8.95E-01 15.8 1.60  0  1.56
 10   5   351.4   343  29    104  3.28     136   358.5   1.25E+00 17.5 1.53  0  0.00
 11   0   511.9   513  16     90  4.10      91   518.0   8.42E-01 27.1 1.04  0  0.00
 12   0   582.4   580  14     56  1.63      97   588.0   8.91E-01 22.20.909  0  0.00
 13   0   609.0   609  10     53  2.65      95   614.5   8.79E-01 18.10.868  0  0.00
 14   0   911.8   909  14     57  2.09      31   915.2   2.88E-01 60.40.574  0  0.00
 15   0   967.3   963  12     42  2.11      35   970.4   3.22E-01 40.70.539  0  0.00
 16   0  1129.6  1118  29     36  5.88      77  1131.6   7.12E-01 37.70.461  0  0.00
 17   0  1460.3  1450  17     14  3.92     241  1460.1   2.22E+00  7.50.354  0  0.00

*****************************************************************************
BACKGROUND INFO 7059    GLS   1        242.710 92 G- 1      BG DATE 236.834 92
*****************************************************************************

v--------PEAK---------v      v------BACKGROUND------v      v------NET----v
ENERGY       CPM  %ERROR      ENERGY       CPM  %ERROR          CPM  %ERROR

  93.25    0.6901 47.78        92.00   0.5325   0.00          0.1576209.25R
 238.94    3.7573 10.97       238.60   0.1933  23.70          3.5641  11.63
 295.80    0.7781 36.06       295.20   0.0395   0.00          0.7386  37.99
 338.79    0.8945 15.84       338.40   0.0405   0.00          0.8541  16.59
 351.37    1.2496 17.52       351.90   0.0828  25.35          1.1668  18.85
 511.92    0.8422 27.08       511.00   0.4975  11.14          0.3447  68.09
 582.36    0.8906 22.16       583.10   0.0690  26.39          0.8217  24.13
 609.02    0.8792 18.08       609.30   0.0825  35.52          0.7968  20.29
 911.79    0.2882 60.44       911.10   0.0608  24.99          0.2273  76.90
 967.27    0.3224 40.71       968.90   0.0290   0.00          0.2934  44.72
1460.34    2.2174  7.51      1461.00   0.1690  11.42          2.0484   8.19
    1 PEAKS REJECTED BY BACKGROUND
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*****************************************************************************
INTERFERING ISOTOPE ANALYSIS 7059     GLS    1        242.710 92 G- 1
*****************************************************************************

RA226      609.32  0.4840                CALC FROM REF PEAK

v------------PEAK------------------v     v--CALCULATED--v     v-----NET---------v
ENERGY      CPM        DPM  %ERROR        ENERGY    CPM            CPM   %ERROR

 295.80     0.739      198.6 37.99        295.20   0.7052        0.0335941.03 R
 351.37     1.167      193.6 18.85        351.96   1.1431        0.0236****** R
 609.02     0.797      189.6 20.29        609.32   0.7968    <-reference peak->

TH228      238.62  0.4480                CALC FROM REF PEAK

v------------PEAK------------------v     v--CALCULATED--v     v-----NET---------v
ENERGY      CPM        DPM  %ERROR        ENERGY    CPM            CPM   %ERROR

 238.94     3.564      350.5 11.63        238.62   3.5641    <-reference peak->
 511.92     0.345      434.0 68.09        510.69   0.2784        0.0663357.35 R
 582.36     0.822      314.8 24.13        583.17   0.9149       -0.0932****** R

BI214/PB214 RATIO      9.7974E-01+/-     2.68%
RGF SENT DATA FROM NP:[7,67]922424941.GTX          TO GSTOR 559
GLB WRITES THE FOLLOWING TO NP:[7,67]GYDCSVT01.DAT
 7059=GROUP          1=SAMPL       =ELM     GLS=TYP
    0=LRW            0=LRA       ARLI=LIBR
JLYKTL PARAMETERS
       JELYKTL READ
GEODET
       Old Effs replaced (forced)
EFFICIENCY FILE NP:[25,4]GELI01JRO.EFF
       Effs fetched  33.000   90
FETCH CAL LINE
       Cal line fetched240.879    1992
BKG FETCH ROUTINE GETS BG FOR  236.834 1992 IERR=   0
SPANF
        FETCHING SPANF
WHDTR CALLED
       HDR WRITTEN IN
GSTFIL
       PKFIL UPDATED
```

9513354.1269

QC USED IN DATA REDUCTION OF SAMPLE 7059 1 GLS RUN AT 242.710/1992

BACKGROUND FOR GELI DETECTOR 1 OF 236.834/1992

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.5444	0.00	511.0	0.4975	11.14	1120.3	0.0158	0.00
92.0	0.5325	0.00	583.1	0.0690	26.39	1173.2	0.0229	17.05
143.0	0.0807	0.00	609.3	0.0825	35.52	1238.1	0.0171	0.00
186.0	0.2265	22.91	661.6	0.0283	0.00	1332.5	0.0322	9.33
198.0	0.0656	0.00	727.2	0.0251	0.00	1377.7	0.0272	43.36
238.6	0.1933	23.70	846.0	0.0324	0.00	1461.0	0.1690	11.42
279.0	0.0000	0.00	860.4	0.0114	0.00	1586.0	0.0000	0.00
295.2	0.0395	0.00	911.1	0.0608	24.99	1591.0	0.0785	0.00
338.4	0.0405	0.00	968.9	0.0290	0.00	1729.6	0.0105	0.00
351.9	0.0828	25.35	1001.0	0.0177	0.00	1764.5	0.0277	31.44

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 9/ 1/92

HIGH RADIUM STANDARD					LOW RADIUM STANDARD				
GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
198.157	92	1.0394	2.629	11.	291.847	91	0.9970	3.154	12.
200.253	92	0.9993	3.010	10.	294.707	91	0.9976	1.439	19.
207.177	92	1.0249	3.041	11.	304.620	91	0.9991	3.696	12. NG
211.834	92	1.0386	4.503	10.	305.693	91	1.0106	1.144	25.
214.257	92	1.0271	2.893	10.	361.231	91	0.9884	2.764	20.
221.700	92	1.0091	3.394	15.	22.691	92	0.9995	2.008	14.
224.010	92	1.0330	2.912	14.	121.680	92	0.9942	2.816	69.
226.272	92	1.0195	3.492	10.	157.845	92	0.9834	1.693	23.
228.717	92	1.0080	2.459	12.	236.820	92	1.0004	1.735	15.
235.071	92	1.0192	4.669	13.	240.879	92	0.9957	1.667	18.
AVERAGE		1.0218	0.013		AVERAGE		0.9966	0.007	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 240.879 92
ENERGY= -9.387788 + 1.0062767*CH + 2.204569E-07*CH**2
FWHM =SQRT(7.6385 + 0.004797*ENERGY) (CO60= 3.746)

EFFICIENCIES FOR GEOMETRY JR1 CALIBRATED 33.000 1990

ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*
55.0	4.380*	110.0	4.150*	170.0	3.150*	400.0	1.330*	1200.0	0.432*
60.0	4.380*	120.0	3.970*	200.0	2.720*	500.0	1.060*	1500.0	0.343*
80.0	4.380*	130.0	3.820*	220.0	2.470*	600.0	0.880*	2000.0	0.255*
90.0	4.350*	140.0	3.650*	250.0	2.160*	800.0	0.650*	2500.0	0.202*
100.0	4.280*	150.0	3.450*	350.0	1.540*	1000.0	0.520*	3000.0	0.168*

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7059 1 GLS GSTOR 559

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	14.9	7.54	4.0		
	2	27.1	1.22	29.1		
	3	33.9	1.11	26.2		
	4	76.4	3.17	15.3		
	6	183.9	1.82	23.5		Cs137c
b	7	238.9	3.56	11.6		Th228s
~~b~~	~~9~~	~~338.8~~	~~0.85~~	~~16.6~~	~~Ac225~~	Th232s
b	13	609.0	0.80	20.3	Ru103	Ra226s
b	14	911.8	0.23	76.9	Ac228	Th232s
b	15	967.3	0.29	44.7		Sb124
	16	1129.6	0.71	37.7		
b	17	1460.3	2.05	8.2	Ac228	K 40s
			REJECTED PEAKS			
B	5	93.2	0.16	99.9		
bN	8	295.8	0.03	99.9	Ra226 Ru103	Ir192s
bN	10	351.4	0.02	99.9		Ra226s
bN	11	511.9	0.07	99.9	Th228 La140 Ru106	Na 22
bN	12	582.4	-0.09	99.9		Th228s

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****

7059 GLS 2 G-5 MB 243.794 92 112.43 MIN 902.96997 GR 487

LIBR=ARLI REF TIME= 197.292 92

****

6/10 9/9/92

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG	DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00			1G
1461 (1460.85)	0.110000	0.00353	9.802	2.525E+04 s		3.12%	1.260E+01
Cr 51 2.772E+01 DAYS		LAMBDA= 2.501E-02		DECAY= 3.126E-01			1G
**** (320.03)	0.102000	0.01435	0.714	4.876E+02 s		<	7.781E-01
Mn 54 3.125E+02 DAYS		LAMBDA= 2.218E-03		DECAY= 9.020E-01			2G
**** (834.83)	1.000000	0.00595	0.425	7.144E+01 s		<	3.951E-02
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 6.363E-01			4G
**** (810.76)	0.990000	0.00612	0.386	6.369E+01 s		<	4.993E-02
Fe 59 4.460E+01 DAYS		LAMBDA= 1.554E-02		DECAY= 4.854E-01			6G
**** (1099.22)	0.565000	0.00456	0.395	1.531E+02 s		<	1.573E-01
**** (1291.56)	0.432000	0.00393	0.324	1.911E+02 s		<	1.964E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.834E-01			4G
**** (1173.21)	0.999200	0.00429	0.452	1.055E+02 s		<	5.351E-02
**** (1332.48)	1.000000	0.00382	0.287	7.498E+01 s		<	3.804E-02
Zn 65 2.440E+02 DAYS		LAMBDA= 2.841E-03		DECAY= 8.763E-01			1G
**** (1115.52)	0.507500	0.00450	0.435	1.904E+02 s		<	1.084E-01
Nb 94 7.414E+06 DAYS		LAMBDA= 9.349E-08		DECAY= 1.000E+00			3G
**** (871.10)	1.000000	0.00572	0.375	6.554E+01 s		<	3.269E-02
**** (1573.70)	1.000000	0.00330	0.138	4.174E+01 s		<	2.082E-02
Ru106 3.670E+02 DAYS		LAMBDA= 1.889E-03		DECAY= 9.159E-01			41G
**** (621.80)	0.097600	0.00774	0.445	5.883E+02 s		<	3.204E-01
**** (1050.10)	0.014500	0.00477	0.399	5.767E+03 s		<	3.141E+00
I 131 8.040E+00 DAYS		LAMBDA= 8.621E-02		DECAY= 1.815E-02			9G
**** (364.50)	0.820000	0.01276	0.673	6.433E+01 s		<	1.768E+00
Ba133 3.981E+03 DAYS		LAMBDA= 1.741E-04		DECAY= 9.919E-01			10G
**** (276.30)	0.075000	0.01646	0.896	7.257E+02 s		<	3.649E-01
**** (302.70)	0.196000	0.01512	0.843	2.845E+02 s		<	1.431E-01
**** (355.90)	0.621000	0.01301	0.910	1.126E+02 s		<	5.663E-02
**** (383.70)	0.094000	0.01222	0.643	5.595E+02 s		<	2.814E-01
Cs134 7.531E+02 DAYS		LAMBDA= 9.204E-04		DECAY= 9.581E-01			9G
**** (475.30)	0.015000	0.01000	0.582	3.878E+03 s		<	2.019E+00
**** (604.60)	0.980000	0.00794	0.652	8.372E+01 s		<	4.359E-02
**** (795.80)	0.880000	0.00623	0.477	8.706E+01 s		<r	4.533E-02
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.971E-01			3G
663 (661.64)	0.851000	0.00732	0.502	8.052E+01 s		48.83%	4.029E-02
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.933E-01			48G
**** (121.78)	0.254000	0.03046	1.290	1.668E+02 s		<	8.378E-02
**** (344.31)	0.245000	0.01340	0.667	2.031E+02 s		<	1.020E-01

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**** ( 778.87)   0.120000   0.00635        0.406   5.336E+02 s      <  2.680E-01
**** ( 963.36)   0.132000   0.00519        0.476   6.953E+02 s      <  3.492E-01
**** (1112.04)   0.124000   0.00451        0.460   8.227E+02 s      <  4.132E-01
**** (1408.02)   0.198000   0.00364        0.287   3.973E+02 s      <r 1.995E-01

Eu154   3.105E+03 DAYS     LAMBDA= 2.232E-04     DECAY= 9.897E-01 48G
**** ( 123.07)   0.390000   0.03041        1.309   1.104E+02 s      <  5.565E-02
**** ( 723.26)   0.202000   0.00677        0.532   3.888E+02 s      <  1.960E-01
**** ( 873.16)   0.117000   0.00570        0.399   5.975E+02 s      <  3.012E-01
**** (1004.75)   0.170000   0.00498        0.358   4.233E+02 s      <  2.134E-01
**** (1274.49)   0.336000   0.00398        0.368   2.755E+02 s      <  1.388E-01

Eu155   1.812E+03 DAYS     LAMBDA= 3.825E-04     DECAY= 9.824E-01  6G
**** (  86.54)   0.320000   0.02343        1.663   2.218E+02 s      <  1.127E-01
**** ( 105.30)   0.200000   0.02944        1.309   2.223E+02 s      <  1.129E-01

Ta182   1.150E+02 DAYS     LAMBDA= 6.027E-03     DECAY= 7.556E-01 33G
**** (  67.80)   0.410000   0.01054        1.489   3.448E+02 s      <  2.276E-01
**** ( 100.10)   0.144000   0.02852        1.279   3.114E+02 s      <  2.056E-01
**** (1121.30)   0.358000   0.00448        0.596   3.715E+02 s      <r 2.453E-01
**** (1189.05)   0.166000   0.00424        0.443   6.294E+02 s      <  4.156E-01
**** (1221.40)   0.277000   0.00413        0.477   4.168E+02 s      <  2.752E-01
**** (1231.01)   0.117000   0.00410        0.449   9.356E+02 s      <  6.177E-01

Ra226   5.851E+05 DAYS     LAMBDA= 1.185E-06     DECAY= 9.999E-01 48G
 185 ( 186.10)   0.040000   0.02352        2.604   2.768E+03 s19.55%   1.381E+00
**** ( 242.00)   0.078000   0.01845        1.556   1.081E+03 s      <r 5.394E-01
**** ( 351.96)   0.393000   0.01314        1.298   2.513E+02 s      <r 1.254E-01
 609 ( 609.32)   0.484000   0.00789        4.499   1.178E+03 s 6.70%   5.879E-01

Th228   6.987E+02 DAYS     LAMBDA= 9.921E-04     DECAY= 9.549E-01 31G
 239 ( 238.62)   0.448000   0.01866       13.750   1.645E+03 s 3.56%   8.594E-01
**** ( 583.17)   0.287000   0.00821        0.957   4.059E+02 s      <r 2.121E-01

Th232   5.113E+12 DAYS     LAMBDA= 1.356E-13     DECAY= 1.000E+00 41G
**** ( 338.40)   0.104000   0.01362        0.962   6.792E+02 s      <r 3.388E-01
 911 ( 911.10)   0.250000   0.00547        2.113   1.544E+03 s11.50%   7.703E-01
**** ( 968.90)   0.150000   0.00516        0.616   7.966E+02 s      <r 3.974E-01

U 235   2.571E+11 DAYS     LAMBDA= 2.696E-12     DECAY= 1.000E+00 34G
**** ( 143.78)   0.132600   0.02917        1.305   3.372E+02 s      <  1.682E-01
 185 ( 185.72)   0.540000   0.02356        2.604   2.047E+02 s19.55%   1.021E-01
**** ( 205.31)   0.050000   0.02143        1.145   1.068E+03 s      <  5.330E-01
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7059 GLS 2 G-5 MB 243.794 92 112.43 MIN 902.96997 GR 487

LIBR=ARLI REF TIME= 197.292 92

Group	7059	Time of count	243.794 1992
Sample	2	Reference GMT	197.292 1992
Element		Elapsed Live Tm	112.4333
Type code	GLS	Dead Time Pct	0.059259
ID	B018Z2	Background GMT	236.834 1992
Geometry, detector	MB-5	Standard GMT	235.141 1992
Aliquot	902.97	Days since TO	46.50169
Unit of Aliquot	GRAM	Time on	12:03 PDT 30-AUG
Data Sheet Units	PCI /GRAM	Time off	13:55 PDT 30-AUG
Library	ARLI	Calc Time	14:44 31-AUG-92
Slope	1.004751	Width slope	0.001865
Intercept	-9.85099	Width offset	5.411687
X**2 TERM	0.58198392E-07	Sensitivity	4.

NP:[7,67]487.GSP 34 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	20.4	19	32	2342	9.21	3106	30.2	2.76E+01	5.0	0.051	0	0.00
2	0	76.0	78	14	2407	4.26	1179	85.4	1.05E+01	9.1	1.51	0	0.00
3	0	89.9	92	14	2157	8.96	854	99.3	7.60E+00	12.4	2.57	0	0.00
4	0	185.5	190	9	886	3.07	314	194.4	2.79E+00	18.1	2.36	0	0.00
5	0	208.8	213	9	785	1.96	190	217.6	1.69E+00	27.7	2.11	0	0.00
6	4	238.6	241	16	457	2.49	1576	247.3	1.40E+01	3.5	1.87	0	5.44
7	4	242.3	241	16	287	1.73	309	250.9	2.75E+00	13.2	1.85	0	0.00
8	0	270.1	276	6	278	3.38	128	278.6	1.13E+00	23.1	1.69	0	0.00
9	4	295.2	299	13	302	2.16	406	303.6	3.61E+00	8.4	1.56	0	1.21
10	4	299.8	299	13	309	2.11	66	308.1	5.91E-01	44.7	1.54	0	0.00
11	0	328.0	332	8	356	1.96	51	336.3	4.55E-01	64.3	1.41	0	0.00
12	0	338.2	342	8	310	2.35	236	346.4	2.10E+00	15.0	1.37	0	0.00
13	0	351.8	356	11	359	2.74	728	359.9	6.48E+00	6.4	1.31	0	0.00
14	0	463.4	465	12	239	2.02	111	471.0	9.86E-01	31.7	1.03	0	0.00
15	0	511.0	513	12	204	2.73	183	518.3	1.63E+00	17.2	0.932	0	0.00
16	0	583.5	585	13	242	2.62	377	590.5	3.35E+00	10.0	0.823	0	0.00
17	0	609.4	610	11	146	2.75	514	616.3	4.57E+00	6.6	0.791	0	0.00
18	0	662.8	666	11	181	2.20	56	669.4	5.02E-01	48.8	0.738	0	0.00
19	0	727.0	731	7	106	2.07	67	733.3	5.98E-01	28.3	0.680	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	794.6	798	9	97	2.92	44	800.6	3.88E-01	44.6	0.624	0	0.00
21	0	859.1	861	10	119	1.67	40	864.8	3.53E-01	54.0	0.582	0	0.00
22	0	911.2	913	11	100	2.79	242	916.6	2.15E+00	11.2	0.550	0	0.00
23	0	969.3	971	10	144	2.83	93	974.5	8.29E-01	28.6	0.517	0	0.00
24	0	1120.5	1122	7	86	2.33	100	1124.9	8.89E-01	18.6	0.450	0	0.00
25	0	1237.9	1239	7	94	2.71	46	1241.7	4.11E-01	40.7	0.410	0	0.00
26	0	1378.2	1379	9	34	2.16	36	1381.4	3.17E-01	37.3	0.374	0	0.00
27	0	1406.8	1407	11	32	2.95	19	1409.8	1.71E-01	68.1	0.367	0	0.00
28	0	1460.9	1457	14	10	2.85	1107	1463.7	9.84E+00	3.1	0.354	0	0.00
29	0	1543.9	1544	8	8	1.32	20	1546.3	1.78E-01	34.6	0.337	0	0.00
30	7	1587.8	1587	19	14	2.09	20	1590.0	1.82E-01	35.5	0.329	0	1.77
31	7	1592.5	1587	19	13	2.09	17	1594.6	1.55E-01	44.5	0.329	0	0.00
32	0	1730.9	1727	11	12	1.43	18	1732.3	1.57E-01	49.3	0.305	0	0.00
33	0	1765.1	1763	10	10	3.11	63	1766.4	5.60E-01	16.2	0.300	0	0.00
34	0	1819.2	1816	7	8	2.49	3	1820.2	2.51E-02	146.8	0.292	0	0.00

013

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BACKGROUND INFO 7059 GLS 2 243.794 92 G- 5 BG DATE 236.834 92

PEAK ENERGY	PEAK CPM	PEAK %ERROR	BACKGROUND ENERGY	BACKGROUND CPM	BACKGROUND %ERROR	NET CPM	NET %ERROR
185.46	2.7919	18.13	186.00	0.1880	28.94	2.6040	19.55
238.61	14.0169	3.48	238.60	0.2671	16.47	13.7498	3.56
295.24	3.6098	8.39	295.20	0.0492	36.41	3.5607	8.52
338.18	2.1008	15.02	338.40	0.0650	0.00	2.0358	15.50
351.81	6.4765	6.37	351.90	0.0791	30.85	6.3974	6.46
510.95	1.6308	17.16	511.00	0.5155	5.37	1.1153	25.21
583.47	3.3508	9.97	583.10	0.0749	23.51	3.2759	10.21
609.36	4.5678	6.59	609.30	0.0691	23.60	4.4988	6.70
662.78	0.5018	48.83	661.60	0.0000	0.00	0.5018	48.83
726.96	0.5981	28.33	727.20	0.0549	0.00	0.5433	31.19
859.13	0.3527	54.02	860.40	0.0000	0.00	0.3527	54.02
911.16	2.1548	11.25	911.10	0.0415	43.37	2.1133	11.50
969.35	0.8290	28.63	968.90	0.0255	57.30	0.8035	29.59
1120.46	0.8892	18.58	1120.30	0.0205	48.70	0.8687	19.06
1237.86	0.4109	40.75	1238.10	0.0156	0.00	0.3953	42.35
1378.23	0.3168	37.28	1377.70	0.0000	0.00	0.3168	37.28
1460.89	9.8429	3.10	1460.80	0.0407	28.26	9.8022	3.12
1587.83	0.1817	35.47	1586.00	0.0000	0.00	0.1817	35.47
1592.46	0.1554	44.51	1591.30	0.0262	0.00	0.1292	53.53
1730.89	0.1565	49.33	1729.60	0.0000	0.00	0.1565	49.33
1765.10	0.5603	16.21	1764.50	0.0192	0.00	0.5412	16.78

0 PEAKS REJECTED BY BACKGROUND

INTERFERING ISOTOPE ANALYSIS 7059 GLS 2 243.794 92 G- 5

RA226 609.32 0.4840 CALC FROM REF PEAK

PEAK ENERGY	PEAK CPM	PEAK DPM	PEAK %ERROR	CALCULATED ENERGY	CALCULATED CPM	NET CPM	NET %ERROR	
242.25	2.753	1908.0	13.24	242.00	1.6964	1.0563	36.14	S
295.24	3.561	1132.4	8.52	295.20	3.6972	-0.1365	******	R
351.81	6.397	1238.2	6.46	351.96	6.0749	0.3224	179.89	R
609.36	4.499	1175.8	6.70	609.32	4.4988	<-reference peak->		
1120.46	0.869	1206.1	19.06	1120.30	0.8469	0.0218	802.23	R
1237.86	0.395	1556.3	42.35	1238.10	0.2987	0.0967	174.46	R
1378.23	0.317	2028.4	37.28	1377.60	0.1837	0.1332	89.17	R
1406.81	0.171	1797.0	68.08	1408.00	0.1121	0.0592	197.35	R
1730.89	0.157	1669.4	49.33	1729.60	0.1103	0.0463	167.59	R
1765.10	0.541	1086.8	16.78	1764.50	0.5855	-0.0443	******	R

TH228 238.62 0.4480 CALC FROM REF PEAK

PEAK ENERGY	PEAK CPM	PEAK DPM	PEAK %ERROR	CALCULATED ENERGY	CALCULATED CPM	NET CPM	NET %ERROR	
238.61	13.750	1638.2	3.56	238.62	13.7498	<-reference peak->		
242.25	1.056	2549.4	36.14	240.92	0.6788	0.3775	101.31	R
299.76	0.591	1320.1	44.70	300.11	0.7329	-0.1423	******	R
328.01	0.455	26632.5	64.27	327.94	0.0280	0.4274	68.49	S
510.95	1.115	1561.8	25.21	510.69	1.1699	-0.0546	******	R
583.47	3.276	1386.8	10.21	583.17	3.8698	-0.5939	-60.94	R
726.96	0.543	1255.3	31.19	727.28	0.7090	-0.1657	******	R
859.13	0.353	1406.7	54.02	860.53	0.4108	-0.0580	******	R

AC228 911.10 0.2500 CALC FROM REF PEAK

PEAK ENERGY	PEAK CPM	PEAK DPM	PEAK %ERROR	CALCULATED ENERGY	CALCULATED CPM	NET CPM	NET %ERROR	
208.83	1.691	2056.0	27.69	209.40	1.2641	0.4273	114.75	R
270.11	1.134	2096.3	23.09	270.30	0.8315	0.3029	92.06	R
328.01	0.427	1042.9	68.49	328.00	0.6297	-0.2023	******	R
338.18	2.036	1429.6	15.50	338.40	2.1882	-0.1524	******	R
463.43	0.986	2396.1	31.67	463.00	0.6321	0.3535	90.66	R
510.95	-0.055	-1394.3	******	509.60	0.0602	-0.1148	******	R
726.96	-0.166	-3529.9	******	727.00	0.0721	-0.2379	-72.09	R
794.63	0.388	1481.7	44.57	794.80	0.4029	-0.0144	******	R
911.16	2.113	1536.6	11.50	911.10	2.1133	<-reference peak->		
969.35	0.603	1036.6	29.59	968.90	1.1911	-0.3876	-70.80	R
1587.83	0.182	1723.6	35.47	1587.90	0.1620	0.0197	340.24	R

BI214/PB214 RATIO 9.4960E-01+/- 3.73%

WT PCT U235 2.49116 +/- 20.67% DAUT
RGF SENT DATA FROM NP:[7,67]922435805.GTX TO GSTOR 487
GLB WRITES THE FOLLOWING TO NP:[7,67]GYDCSVT01.DAT
7059=GROUP 2=SAMPL =ELM GLS=TYP
0=LRW 0=LRA ARLI=LIBR
JLYKTL PARAMETERS
JELYKTL READ
GEODET
Old Effs replaced (forced)
EFFICIENCY FILE NP:[25,4]GELI05MBO.EFF
Effs fetched 33.000 90
FETCH CAL LINE
Cal line fetched235.141 1992
BKG FETCH ROUTINE GETS BG FOR 236.834 1992 IERR= 0
SPANF
FETCHING SPANF
WHDTR CALLED
HDR WRITTEN IN
GSTFIL
PKFIL UPDATED

QC USED IN DATA REDUCTION OF SAMPLE 7059 2 GLS RUN AT 243.794/1992

BACKGROUND FOR GELI DETECTOR 5 OF 236.834/1992

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0000	0.00	511.0	0.5155	5.37	1120.3	0.0205	48.70
92.0	0.0000	0.00	583.1	0.0749	23.51	1173.2	0.0208	0.00
143.0	0.0000	0.00	609.3	0.0691	23.60	1238.1	0.0156	0.00
186.0	0.1880	28.94	661.6	0.0000	0.00	1332.5	0.0291	20.96
198.0	0.0421	0.00	727.2	0.0549	0.00	1377.7	0.0000	0.00
238.6	0.2671	16.47	846.0	0.0453	19.20	1460.8	0.0407	28.26
279.0	0.0000	0.00	860.4	0.0000	0.00	1586.0	0.0000	0.00
295.2	0.0492	36.41	911.1	0.0415	43.37	1591.3	0.0262	0.00
338.4	0.0650	0.00	968.9	0.0255	57.30	1729.6	0.0000	0.00
351.9	0.0791	30.85	1001.0	0.0153	0.00	1764.5	0.0192	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 8/31/92

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
172.255	92	1.1153	3.122	10.
179.275	92	1.0871	3.288	10.
186.676	92	1.1189	2.574	12.
193.250	92	1.1132	3.968	11.
200.282	92	1.1256	4.870	11.
207.277	92	1.1196	2.597	11.
214.281	92	1.0699	3.689	11.
223.714	92	1.1280	3.072	12.
228.254	92	1.1208	5.412	11.
235.141	92	1.1357	3.034	10.
AVERAGE		1.1134	0.020	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
0.000	0	0.0000	0.000	0.
193.726	90	1.0656	17.337	63.
201.976	90	1.0026	7.798	28.
267.756	90	0.9958	17.344	100.
143.966	91	0.9928	3.560	34.
161.682	91	1.0972	1.613	19.
162.972	91	1.0585	1.586	16.
180.971	91	1.0568	2.669	22.
207.975	91	1.0647	2.084	11.
213.856	91	1.1437	10.869	44.
AVERAGE		1.0531	0.050	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 235.141 92
ENERGY= -9.850992 + 1.0047513*CH + 5.819839E-08*CH**2
FWHM =SQRT(5.4117 + 0.001866*ENERGY) (CO60= 2.810)

EFFICIENCIES FOR GEOMETRY MB5 CALIBRATED 33.000 1990

ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*
55.0	0.500*	110.0	3.000*	170.0	2.550*	400.0	1.180*	1200.0	0.420*
60.0	0.680*	120.0	3.050*	200.0	2.200*	500.0	0.950*	1500.0	0.345*
80.0	1.850*	130.0	3.000*	220.0	2.000*	600.0	0.800*	2000.0	0.265*
90.0	2.570*	140.0	2.950*	250.0	1.800*	800.0	0.620*	2500.0	0.215*
100.0	2.850*	150.0	2.850*	350.0	1.320*	1000.0	0.500*	3000.0	0.182*

9513354.1277

7059 2 GLS GSTOR 487

	PK	ENERGY	CPM	%ERR	COMMENT	
	1	20.4	27.62	5.0		
	2	76.0	10.48	9.1		
	3	89.9	7.60	12.4		
b	4	185.5	2.60	19.6		Cs137c U 235s Ra226s
b	6	238.6	13.75	3.6		Th228s
b	17	609.4	4.50	6.7		Ru103 Ra226s
b	18	662.8	0.50	48.8		Cs137s
b	22	911.2	2.11	11.5	Ac228	Th232s
b	28	1460.9	9.80	3.1	NO GEN.	K 40s
	29	1543.9	0.18	34.6		
b	31	1592.5	0.13	53.5	Th228p	
			REJECTED PEAKS			
N	5	208.8	0.43	99.9	Ac228	Sb125
N	7	242.3	0.38	99.9	Th228	La140 Ra226s
N	8	270.1	0.30	92.1	Ac228	Fe 59p
bN	9	295.2	-0.14	99.9	Ra226	Ru103 Ir192s
N	10	299.8	-0.14	99.9	Th228	
N	11	328.0	-0.20	99.9	Ac228 Th228	La140
bN	12	338.2	-0.15	99.9	Ac228	Th232s
bN	13	351.8	0.32	99.9		Ra226s
N	14	463.4	0.35	90.7	Ac228	Sb125
bN	15	511.0	-0.11	99.9	Ac228 Th228	La140 Ru106 Na 22
bN	16	583.5	-0.59	99.9		Th228s
bN	19	727.0	-0.24	99.9	Ac228 Th228	
N	20	794.6	-0.01	99.9	Ac228	Cs134s
bN	21	859.1	-0.06	99.9	Th228	Ag110
bN	23	969.3	-0.39	99.9	Ac228	Sb124 Th232s
bN	24	1120.5	0.02	99.9	Ra226	Ta182s
bN	25	1237.9	0.10	99.9	Ra226	
bN	26	1378.2	0.13	89.2	Ra226	
N	27	1406.8	0.06	99.9	Ra226	Cs134+ Eu152s
bN	30	1587.8	0.02	99.9	Ac228	
bN	32	1730.9	0.05	99.9	Ra226	
bN	33	1765.1	-0.04	99.9	Ra226	
	34	1819.2	0.03	99.9		

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****

7059 GLS 3 G-2 MB 253.917 92 100.28 MIN 1018.20001 GR 930

LIBR=APLI REF TIME= 197 292 92

****

Coco 9/10/92

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00 1G		
1461 (1460.85)	0.110000	0.00313	4.406	1.279E+04 s	5.15%	5.659E+00
Cr 51 2.772E+01 DAYS		LAMBDA= 2.501E-02		DECAY= 2.427E-01 1G		
**** (320.03)	0.102000	0.01315	0.419	3.128E+02 s	<	5.701E-01
Mn 54 3.125E+02 DAYS		LAMBDA= 2.218E-03		DECAY= 8.820E-01 2G		
**** (834.83)	1.000000	0.00543	0.316	5.819E+01 s	<	2.919E-02
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 5.767E-01 4G		
**** (810.76)	0.990000	0.00558	0.269	4.866E+01 s	<	3.733E-02
Fe 59 4.460E+01 DAYS		LAMBDA= 1.554E-02		DECAY= 4.148E-01 6G		
**** (1099.22)	0.565000	0.00418	0.257	1.088E+02 s	<	1.160E-01
**** (1291.56)	0.432000	0.00355	0.241	1.577E+02 s	<	1.682E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.798E-01 4G		
**** (1173.21)	0.999200	0.00391	0.332	8.508E+01 s	<	3.842E-02
**** (1332.48)	1.000000	0.00343	0.281	8.173E+01 s	<	3.690E-02
In 65 2.440E+02 DAYS		LAMBDA= 2.841E-03		DECAY= 8.514E-01 1G		
**** (1115.52)	0.507500	0.00412	0.299	1.430E+02 s	<	7.428E-02
Zr 95 6.550E+01 DAYS		LAMBDA= 1.058E-02		DECAY= 5.492E-01 2G		
724 (724.18)	0.430000	0.00618	0.166	6.253E+01 s	49.04%	5.037E-02
**** (756.72)	0.546000	0.00594	0.307	9.451E+01 s	<	7.613E-02
Nb 94 7.414E+06 DAYS		LAMBDA= 9.349E-08		DECAY= 1.000E+00 3G		
**** (871.10)	1.000000	0.00523	0.253	4.847E+01 s	<	2.144E-02
**** (1573.70)	1.000000	0.00290	0.128	4.398E+01 s	<	1.946E-02
Ru106 3.670E+02 DAYS		LAMBDA= 1.889E-03		DECAY= 8.986E-01 41G		
**** (621.80)	0.097600	0.00715	0.333	4.775E+02 s	<	2.351E-01
**** (1050.10)	0.014500	0.00438	0.259	4.074E+03 s	<	2.006E+00
I 131 8.040E+00 DAYS		LAMBDA= 8.621E-02		DECAY= 7.584E-03 9G		
**** (364.50)	0.820000	0.01182	0.399	4.115E+01 s	<	2.400E+00
724 (723.00)	0.016000	0.00619	0.167	1.682E+03	49.04%	9.815E+01
Ba133 3.981E+03 DAYS		LAMBDA= 1.741E-04		DECAY= 9.902E-01 10G		
**** (276.30)	0.075000	0.01500	0.529	4.701E+02 s	<	2.100E-01
**** (302.70)	0.196000	0.01381	0.507	1.872E+02 s	<	8.365E-02
**** (355.90)	0.621000	0.01204	0.452	6.051E+01 s	<	2.703E-02
**** (383.70)	0.094000	0.01136	0.395	3.699E+02 s	<	1.653E-01
Cs134 7.531E+02 DAYS		LAMBDA= 9.204E-04		DECAY= 9.492E-01 9G		
**** (475.30)	0.015000	0.00937	0.284	2.018E+03 s	<	9.405E-01
**** (604.60)	0.980000	0.00734	0.263	3.660E+01 s	<	1.706E-02
**** (795.80)	0.880000	0.00668	0.320	6.396E+01 s	<	2.981E-02
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.964E-01 3G		

****	(661.64)	0.851000	0.00673	0.333	5.642E+01	s	< 2.505E-02

Eu152 4.821E+03 DAYS LAMBDA= 1.438E-04 DECAY= 9.919E-01 48G

****	(121.78)	0.254000	0.02470	0.754	1.202E+02	s	< 5.361E-02
****	(344.31)	0.245000	0.01236	0.382	1.260E+02	s	< 5.622E-02
****	(778.87)	0.120000	0.00579	0.258	3.708E+02	s	< 1.654E-01
****	(963.36)	0.132000	0.00476	0.284	4.521E+02	s	< 2.016E-01
****	(1112.04)	0.124000	0.00413	0.289	5.643E+02	s	< 2.517E-01
****	(1408.02)	0.198000	0.00325	0.169	2.624E+02	s	< 1.170E-01

Eu154 3.105E+03 DAYS LAMBDA= 2.232E-04 DECAY= 9.874E-01 48G

****	(123.07)	0.390000	0.02477	0.822	8.512E+01	s	< 3.814E-02
724	(723.26)	0.202000	0.00619	0.166	1.329E+02	s	49.04% 5.955E-02
****	(873.16)	0.117000	0.00521	0.253	4.151E+02	s	< 1.860E-01
****	(1004.75)	0.170000	0.00458	0.266	3.421E+02	s	< 1.532E-01
****	(1274.49)	0.336000	0.00359	0.236	1.955E+02	s	< 8.761E-02

Eu155 1.812E+03 DAYS LAMBDA= 3.825E-04 DECAY= 9.786E-01 6G

****	(86.54)	0.320000	0.01810	0.935	1.614E+02	s	< 7.298E-02
****	(105.30)	0.200000	0.02310	0.789	1.707E+02	s	< 7.718E-02

Ta182 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 7.108E-01 33G

****	(67.80)	0.410000	0.01371	0.837	1.526E+02	s	< 9.495E-02
****	(100.10)	0.144000	0.02202	0.792	2.497E+02	s	< 1.554E-01
****	(1121.30)	0.358000	0.00410	0.407	2.776E+02	s	<r 1.727E-01
****	(1189.05)	0.166000	0.00386	0.307	4.786E+02	s	< 2.980E-01
****	(1221.40)	0.277000	0.00375	0.335	3.222E+02	s	< 2.005E-01
****	(1231.01)	0.117000	0.00372	0.346	7.950E+02	s	< 4.948E-01

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 9.999E-01 48G

186	(186.10)	0.040000	0.02159	0.638	7.394E+02	s	46.14% 3.271E-01
241	(242.00)	0.078000	0.01707	0.478	3.591E+02	s	60.16% 1.589E-01
****	(351.96)	0.393000	0.01215	0.748	1.566E+02	s	<r 6.929E-02
609	(609.32)	0.484000	0.00729	1.411	4.000E+02	s	12.64% 1.770E-01

Th228 6.987E+02 DAYS LAMBDA= 9.921E-04 DECAY= ~~9.454E-01 31G~~

238	(238.62)	0.448000	0.01731	3.299	4.254E+02	s	7.28% 1.991E-01
241	(240.92)	0.022400	0.01714	0.478	1.245E+03		60.16% 5.825E-01
****	(583.17)	0.287000	0.00762	0.542	2.480E+02	s	<r 1.161E-01

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 41G

****	(338.40)	0.104000	0.01254	0.614	4.708E+02	s	<r 2.083E-01
911	(911.10)	0.250000	0.00501	0.533	4.253E+02	s	29.79% 1.882E-01
****	(968.90)	0.150000	0.00474	0.408	5.742E+02	s	<r 2.540E-01

U 235 2.571E+11 DAYS LAMBDA= 2.696E-12 DECAY= 1.000E+00 34G

****	(143.78)	0.132600	0.02478	0.818	2.488E+02	s	< 1.101E-01
186	(185.72)	0.540000	0.02163	0.638	5.467E+01	s	46.14% 2.418E-02
****	(205.31)	0.050000	0.01978	0.704	7.119E+02	s	< 3.150E-01
241	(240.93)	0.000700	0.01714	0.478	3.983E+04		60.16% 1.762E+01

9513354.1280

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*****************************************************************************
7059    GLS   3        G-2 MB 253.917 92  100 28 MIN  1018.20001 GR      930
LIBR=ARLI  REF TIME= 197.292 92
*****************************************************************************

*****************************************************************************
* Group.......................... 7059 * Time of count          253.917 1992 *
* Sample.......................... 3 * Reference GMT........ 197.292 1992 *
* Element.......................... * Elapsed Live Tm.......... 100.2833 *
* Type code.......................... GLS * Dead Time Pct.............. 0.016616 *
* ID.......................... B018Z4 * Background GMT....... 249.640 1992 *
* Geometry, detector.......... MB-2 * Standard GMT..... 249.236 1992 *
* Aliquot.......................... 1018 2 * Days since TO.............. 56.62466 *
* Unit of Aliquot.......... GRAM * Time on.... .... 15:00 PDT  9-SEP *
* Data Sheet Units..... PCI /GRAM * Time off.. ..... 16:41 PDT  9-SEP *
* Library.......................... ARLI * Calc Time..... 23:00 09-SEP-92 *
*****************************************************************************
* Slope..................... 1.017168 * Width slope.. ............ 0.002721 *
* Intercept.................. -9.74451 * Width offset.............. 2.278491 *
* X**2 TERM........ -0.58627052E-07 * Sensitivity..................... 4. *
  NP: [7,671930.GSP                    22 PEAKS

*****************************************************************************
 PK  IT    ENRG  LEFT  WD  BKGND  FWHM    AREA    CHAN        CPM   ERR   EFF  K   FIT
  1   0    17.6    19  21   638  5.99     891    26.9   8.88E+00  8.00. 034  0  0.00
  2   0    76.3    80   8   339  3.36     210    84.6   2.09E+00 20.8  1.56  0  0.00
  3   0    93.5    99   6   361  1.52      52   101.5   5.19E-01 61.1  2.01  0  0.00
  4   0   186.0   189   7   255  1.59      83   192.4   8.27E-01 35.3  2.15  0  0.00
  5   4   238.4   240  11   103  1.37     346   243.9   3.45E+00  6.9  1.73  0  0.83
  6   4   241.2   240  11   107  2.18     118   246.7   1.17E+00 23.8  1.71  0  0.00
  7   0   294.6   297   7   133  1.80      68   299.3   6.79E-01 32.6  1.44  0  0.00
  8   0   300.2   303   5    83  2.88      27   304.7   2.69E-01 54.9  1.42  0  0.00
  9   0   337.7   339   7   105  1.29      70   341.6   6.99E-01 26.0  1.27  0  0.00
 10   0   351.5   350  10   118  1.93     181   355.1   1.80E+00 13.8  1.22  0  0.00
 11   0   439.5   438   8    60  2.60      21   441.7   2.09E-01 73.3  1.01  0  0.00
 12   0   511.0   508   9    59  2.24      68   512.0   6.73E-01 26.40.872  0  0.00
 13   0   583.1   582   6    60  1.19      75   582.8   7.50E-01 18.70.764  0  0.00
 14   0   609.3   604  11    46  2.14     145   608.6   1.44E+00 12.40.731  0  0.00
 15   4   723.5   718  13    23  2.44      17   720.9   1.66E-01 49.00.627  0  1.11
 16   4   727.1   718  13    23  1.72      27   724.4   2.68E-01 34.10.624  0  0.00
 17   0   910.9   900  10    52  1.59      58   905.2   5.74E-01 27.30.504  0  0.00
 18   0   968.9   958   9    42  2.06      41   962.2   4.10E-01 35.20.475  0  0.00
 19   0  1120.5  1107   9    43  1.65      40  1111.3   4.03E-01 34.00.411  0  0.00
 PK  IT    ENRG  LEFT  WD  BKGND  FWHM    AREA    CHAN        CPM   ERR   EFF  K   FIT
 20   0  1327.5  1311  11    32  6.77       6  1314.8   6.42E-02195.80.347  0  0.00
 21   0  1460.9  1442  11    19  2.46     445  1445.9   4.43E+00  5.10.314  0  0.00
 22   0  1765.3  1741  10     0  3.94      17  1745.2   1.70E-01 24.30.261  0  0.00

*****************************************************************************
BACKGROUND INFO 7059    GLS   3        253.917 92 G- 2      BG DATE 249.640 92
*****************************************************************************

v---------PEAK----------v      v-------BACKGROUND-------v      v------NET-----v
ENERGY        CPM   %ERROR      ENERGY        CPM   %ERROR        CPM   %ERROR

 93.50     0.5189 61.06        92.00   0.3080  7.82        0.2108150.70R
186.00     0.8267 35.34       186.00   0.1882 20.03        0.6385 46.14
238.35     3.4492  6.94       238.60   0.1502 12.18        3.2990  7.28
294.56     0.6789 32.58       295.20   0.0211 66.19        0.6577 33.69
337.75     0.6985 25.98       338.40   0.0440 50.88        0.6545 27.94
351.47     1.7999 13.76       351.90   0.0584  4.11        1.7415 14.22
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020

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 511.00    0.6731 26.43        511.00  0.4476  9.54        0.2255 81.14
 583.06    0.7503 18.70        583.10  0.0454 35.63        0.7049 20.04
 609.31    1.4425 12.36        609.30  0.0314 11.47        1.4111 12.64
 727.08    0.2678 34.09        727.20  0.0153  0.00        0.2525 36.16
 910.93    0.5743 27.31        911.10  0.0411 60.54        0.5332 29.79
 968.91    0.4096 35.26        968.90  0.0170 36.51        0.3926 36.80
1120.53    0.4034 34.01       1120.30  0.0246  0.00        0.3789 36.21
1460.89    4.4348  5.11       1461.00  0.0286 37.08        4.4062  5.13
1765.27    0.1695 24.25       1764.50  0.0237  0.00        0.1458 28.20
    1 PEAKS REJECTED BY BACKGROUND

*****************************************************************************
INTERFERING ISOTOPE ANALYSIS 7059     GLS   3        253.917 92 G- 2
*****************************************************************************

RA226      609.32  0.4840                CALC FROM REF PEAK

v-----------PEAK-----------------v      v--CALCULATED--v      v-----NET--------
ENERGY      CPM        DPM  %ERROR        ENERGY    CPM            CPM  %ERROR

 241.22     1.173     879.3 23.81        242.00  0.5323        0.6410 44.83 S
 294.56     0.658     226.9 33.69        295.20  1.1562       -0.4984-53.25 R
 351.47     1.741     364.4 14.22        351.96  1.9067       -0.1652****** R
 609.31     1.411     398.9 12.64        609.32  1.4111    <-reference peak->
1120.53     0.379     575.6 36.21       1120.30  0.2626        0.1163121.39 R
1765.27     0.146     335.9 28.20       1764.50  0.1732       -0.0273****** R

TH228      238.62  0.4480                CALC FROM REF PEAK

v-----------PEAK-----------------v      v--CALCULATED--v      v-----NET--------
ENERGY      CPM        DPM  %ERROR        ENERGY    CPM            CPM  %ERROR

 238.35     3.299     425.3  7.28        238.62  3.2990    <-reference peak->
 241.22     0.641    1672.7 44.83        240.92  0.1630        0.4780 60.16 S
 300.19     0.269     654.9 54.86        300.11  0.1749        0.0944157.07 R
 511.00     0.226     337.6 51.14        510.69  0.2841       -0.0586****** R
 583.06     0.705     321.6 20.04        583.17  0.9321       -0.2272-68.97 R
 727.08     0.252     636.6 36.16        727.28  0.1687        0.0838109.92 R

AC228      911.10  0.2500                CALC FROM REF PEAK

v-----------PEAK-----------------v      v--CALCULATED--v      v-----NET--------
ENERGY      CPM        DPM  %ERROR        ENERGY    CPM            CPM  %ERROR

 337.75     0.654     497.2 27.94        338.40  0.5568        0.0977252.73 R
 511.00    -0.059   -1600.2******       509.60  0.0155       -0.0741****** R
 727.08     0.084    1947.8109.92        727.00  0.0182        0.0656140.65 R
 910.93     0.533     423.0 29.79        911.10  0.5332    <-reference peak->
 968.91     0.393     550.9 36.80        968.90  0.3014        0.0912186.60 R

BI214/PB214 RATIO      1.0949E+00+/-     4.74%

WT PCT U235    1.98593 +/-    47.84%      DAUT
RGF SENT DATA FROM NP:[7,67]922536942.GTX          TO GSTOR 930
GLB WRITES THE FOLLOWING TO NP:[7,67]GYDCSVT02.DAT
 7059=GROUP          3=SAMPL        =ELM     GLS=TYP
    0=LRW            0=LRA        ARLI=LIBR
JLYKTL PARAMETERS
       JELYKTL READ
GEODET
       Old Effs replaced (forced)
EFFICIENCY FILE NP:[25,4]GELI02MB0.EFF
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```
        Effs fetched  33.000    90
FETCH CAL LINE
        Cal line fetched249.236     1992
BKG FETCH ROUTINE GETS BG FOR  249.640 1992 IERR=   0
SPANF
         FETCHING SPANF
WHDTR CALLED
        HDR WRITTEN IN
GSTFIL
        PKFIL UPDATED
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QC USED IN DATA REDUCTION OF SAMPLE 7059 3 GLS RUN AT 253.917/1992

BACKGROUND FOR GELI DETECTOR 2 OF 249.640/1992

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0889	25.19	511.0	0.4476	9.54	1120.3	0.0246	0.00
92.0	0.3080	7.82	583.1	0.0454	35.65	1173.2	0.0533	26.07
143.0	0.0255	56.80	609.3	0.0314	11.47	1238.1	0.0159	0.00
186.0	0.1862	20.03	661.6	0.0270	0.00	1332.5	0.0581	26.70
198.0	0.1275	0.00	727.2	0.0153	0.00	1377.7	0.0000	0.00
238.6	0.1502	12.18	846.0	0.0280	45.04	1461.0	0.0286	37.08
279.0	0.0384	0.00	860.4	0.0000	0.00	1586.0	0.0133	0.00
295.2	0.0211	66.19	911.1	0.0411	60.54	1591.0	0.0065	0.00
339.4	0.0440	50.85	968.9	0.0170	36.51	1729.6	0.0000	0.00
351.9	0.0584	4.11	1001.0	0.0294	0.00	1764.5	0.0237	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 2 ON 9/ 9/92

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
179.197	92	1.0524	2.863	11.
188.665	92	1.0704	5.559	14.
192.968	92	1.0447	2.397	10.
200.271	92	1.0396	1.924	14.
207.266	92	1.0436	3.470	14.
209.920	92	1.0501	2.372	11.
214.273	92	1.0200	2.394	10.
228.232	92	1.0199	2.291	13.
235.133	92	1.0411	2.492	10.
249.236	92	1.0368	1.983	10.
AVERAGE		1.0419	0.015	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
270.968	90	1.0095	4.535	17.
21.729	91	1.1688	8.879	26.
22.699	91	1.1454	8.427	17.
23.715	91	1.1388	9.086	14.
28.708	91	1.1368	8.059	20.
114.690	91	0.9794	2.007	23.
207.739	91	0.9624	2.205	12.
278.670	91	0.9748	1.107	19.
280.877	91	1.1327	2.091	17.
221.700	92	0.9750	2.072	16.
AVERAGE		1.0624	0.088	

CALIBRATION LINE FROM STANDARD FOR G- 2 OF 249.236 92
ENERGY= -9.505981 + 1.0166260*CH + -5.859581E-05*CH**2
FWHM =SQRT(2.2785 + 0.002722*ENERGY) (C060= 2.430)

EFFICIENCIES FOR GEOMETRY MB2 CALIBRATED 33.000 1990

ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*
55.0	1.050*	110.0	2.380*	170.0	2.320*	400.0	1.100*	1200.0	0.382*
60.0	1.180*	120.0	2.460*	200.0	2.020*	500.0	0.890*	1500.0	0.305*
80.0	1.650*	130.0	2.500*	220.0	1.870*	600.0	0.740*	2000.0	0.228*
90.0	1.900*	140.0	2.490*	250.0	1.650*	800.0	0.565*	2500.0	0.182*
100.0	2.200*	150.0	2.450*	350.0	1.220*	1000.0	0.460*	3000.0	0.150*

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7059 3 GLS GSTOR 930

	PK	ENERGY	CPM	%ERR	COMMENT
	1	17.6	8.88	8.0	
	2	76.3	2.09	20.8	
b	4	186.0	0.64	46.1	Cs136 U 235s Ra226s
b	5	238.4	3.30	7.3	Th228s
n	6	241.2	0.48	60.2	Th228 NO GEN La140 Ra226s
	11	439.5	0.21	73.3	K 40s
b	14	609.3	1.41	12.6	Ru103 Ra226s
	15	723.5	0.17	49.0	I 131 Sb124 Eu154s Zr 95s
b	17	910.9	0.53	29.8	Ac228 Th232s
b	21	1460.9	4.41	5.2	K 40s
			REJECTED PEAKS		
B	3	93.5	0.21	99.9	
bN	7	294.6	-0.50	99.9	Ra226 Ru103 Ir192s
N	8	300.2	0.09	99.9	Th228
bN	9	337.7	0.10	99.9	Ac228 Th232s
bN	10	351.5	-0.17	99.9	Ra226s
bN	12	511.0	-0.07	99.9	Ac228 Th228 La140 Ru106 Na 22
bN	13	583.1	-0.23	99.9	Th228s
bN	16	727.1	0.07	99.9	Ac228 Th228
bN	18	968.9	0.09	99.9	Ac228 Sb124 Th232s
bN	19	1120.5	0.12	99.9	Ra226 Ta182s
	20	1327.5	0.06	99.9	
bN	22	1765.3	-0.03	99.9	Ra226

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7059    GLS   4        G-3 MB 243.879 92  112.45 MIN     1.00000 SM      494
LIBR=ARLI  REF TIME= 243.879 92
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Gro 9/9/99

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00		1G
**** (1460.85)	0.110000	0.00334	0.207	5.646E+02 s		<r 2.543E+02
Cr 51 2.772E+01 DAYS		LAMBDA= 2.501E-02		DECAY= 1.000E+00		1G
**** (320.03)	0.102000	0.01562	0.364	2.286E+02 s		< 1.030E+02
Mn 54 3.125E+02 DAYS		LAMBDA= 2.218E-03		DECAY= 1.000E+00		2G
**** (834.83)	1.000000	0.00585	0.223	3.806E+01 s		< 1.714E+01
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 1.000E+00		4G
**** (810.76)	0.990000	0.00602	0.209	3.512E+01 s		< 1.582E+01
Fe 59 4.460E+01 DAYS		LAMBDA= 1.554E-02		DECAY= 1.000E+00		6G
**** (1099.22)	0.565000	0.00445	0.206	8.180E+01 s		< 3.685E+01
**** (1291.56)	0.432000	0.00378	0.129	7.883E+01 s		< 3.551E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00		4G
1172 (1173.21)	0.999200	0.00416	0.809	1.944E+02 s	16.09%	8.759E+01
1331 (1332.48)	1.000000	0.00366	0.733	2.004E+02 s	12.28%	9.026E+01
Zn 65 2.440E+02 DAYS		LAMBDA= 2.841E-03		DECAY= 1.000E+00		1G
**** (1115.52)	0.507500	0.00439	0.221	9.926E+01 s		< 4.471E+01
Nb 94 7.414E+06 DAYS		LAMBDA= 9.349E-08		DECAY= 1.000E+00		3G
**** (871.10)	1.000000	0.00561	0.233	4.151E+01 s		< 1.870E+01
**** (1573.70)	1.000000	0.00310	0.091	2.953E+01 s		< 1.330E+01
Ru106 3.670E+02 DAYS		LAMBDA= 1.889E-03		DECAY= 1.000E+00		41G
**** (621.80)	0.097600	0.00781	0.259	3.397E+02 s		< 1.530E+02
661 (661.20)	0.000150	0.00735	1.294	1.174E+06	11.94%	5.289E+05
**** (1050.10)	0.014500	0.00466	0.181	2.679E+03 s		< 1.207E+03
I 131 8.040E+00 DAYS		LAMBDA= 8.621E-02		DECAY= 1.000E+00		9G
**** (364.50)	0.820000	0.01368	0.326	2.903E+01 s		< 1.308E+01
Ba133 3.981E+03 DAYS		LAMBDA= 1.741E-04		DECAY= 1.000E+00		10G
53 (53.20)	0.019500	0.01756	0.522	1.523E+03	47.20%	6.862E+02
**** (276.30)	0.075000	0.01767	0.412	3.108E+02 s		< 1.400E+02
**** (302.70)	0.196000	0.01636	0.311	9.690E+01 s		< 4.365E+01
**** (355.90)	0.621000	0.01410	0.308	3.522E+01 s		< 1.586E+01
**** (383.70)	0.094000	0.01278	0.364	3.032E+02 s		< 1.366E+02
Cs134 7.531E+02 DAYS		LAMBDA= 9.204E-04		DECAY= 1.000E+00		9G
**** (475.30)	0.015000	0.01019	0.291	1.907E+03 s		< 8.592E+02
**** (604.60)	0.980000	0.00804	0.270	3.428E+01 s		< 1.544E+01
**** (795.80)	0.880000	0.00613	0.219	4.063E+01 s		< 1.830E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00		3G
661 (661.64)	0.851000	0.00734	1.294	2.071E+02 s	11.94%	9.328E+01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00		48G

****	(121.78)	0.254000	0.03123	0.543	6.842E+01	s	< 3.082E+01
****	(344.31)	0.245000	0.01463	0.354	9.872E+01	s	< 4.447E+01
****	(778.87)	0.120000	0.00626	0.212	2.818E+02	s	< 1.269E+02
****	(963.36)	0.132000	0.00508	0.217	3.241E+02	s	< 1.460E+02
****	(1112.04)	0.124000	0.00440	0.180	3.298E+02	s	< 1.486E+02
****	(1408.02)	0.198000	0.00346	0.129	1.875E+02	s	< 8.447E+01

Eu154 3.105E+03 DAYS LAMBDA= 2.232E-04 DECAY= 1.000E+00 48G

****	(123.07)	0.390000	0.03125	0.543	4.454E+01	s	< 2.006E+01
****	(723.26)	0.202000	0.00673	0.242	1.782E+02	s	< 8.028E+01
****	(873.16)	0.117000	0.00560	0.224	3.422E+02	s	< 1.542E+02
****	(1004.75)	0.170000	0.00488	0.216	2.608E+02	s	< 1.175E+02
****	(1274.49)	0.336000	0.00383	0.151	1.170E+02	s	< 5.272E+01

Eu155 1.812E+03 DAYS LAMBDA= 3.825E-04 DECAY= 1.000E+00 6G

****	(86.54)	0.320000	0.02601	0.524	6.291E+01	s	< 2.834E+01
****	(105.30)	0.200000	0.03004	0.538	8.948E+01	s	< 4.030E+01

Ta182 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 1.000E+00 33G

****	(67.80)	0.410000	0.01806	0.541	7.309E+01	s	< 3.292E+01
****	(100.10)	0.144000	0.02922	0.518	1.232E+02	s	< 5.549E+01
****	(1121.30)	0.358000	0.00436	0.235	1.507E+02	s	< 6.789E+01
****	(1189.05)	0.166000	0.00411	0.129	1.896E+02	s	< 8.542E+01
****	(1221.40)	0.277000	0.00400	0.206	1.859E+02	s	< 8.373E+01
****	(1231.01)	0.117000	0.00397	0.184	3.955E+02	s	< 1.782E+02

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

****	(186.10)	0.040000	0.02614	0.488	4.664E+02	s	< 2.101E+02
****	(242.00)	0.078000	0.02012	0.452	2.881E+02	s	< 1.298E+02
****	(351.96)	0.393000	0.01430	0.357	6.358E+01	s	< 2.864E+01
****	(609.32)	0.484000	0.00798	0.305	7.896E+01	s	< 3.557E+01

Th228 6.987E+02 DAYS LAMBDA= 9.921E-04 DECAY= 1.000E+00 31G

****	(238.62)	0.448000	0.02043	0.448	4.894E+01	s	< 2.204E+01
****	(583.17)	0.287000	0.00834	0.245	1.023E+02	s	< 4.608E+01

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 41G

****	(338.40)	0.104000	0.01487	0.352	2.273E+02	s	< 1.024E+02
****	(911.10)	0.250000	0.00537	0.246	1.833E+02	s	<T 8.257E+01
****	(968.90)	0.150000	0.00505	0.247	3.261E+02	s	< 1.469E+02

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7059    GLS   4        G-3 MB 243.879 92  112.45 MIN     1.00000 SM      494
LIBR=ARLI  REF TIME= 243.879 92
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* Group........................ 7059 * Time of count          243.879 1992 *
* Sample.......................... 4 * Reference GMT........ 243.879 1992 *
* Element.......................... * Elapsed Live Tm............ 112.45 *
* Type code...................... GLS * Dead Time Pct............ 0.014819 *
* ID.................... QC 8719 LCS * Background GMT....... 236.834 1992 *
* Geometry, detector........... MB-3 * Standard GMT......... 235.081 1992 *
* Aliquot.......................... 1. * Days since TO................... 0.0 *
* Unit of Aliquot............... SMPL * Time on.......... 14:05 PDT 30-AUG *
* Data Sheet Units........ PCI /SMPL * Time off......... 15:58 PDT 30-AUG *
* Library...................... ARLI * Calc Time......... 15:55 31-AUG-92 *
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* Slope..................... 0.999194 * Width slope............... 0.003448 *
* Intercept................ -10.1168 * Width offset............. 2.235532 *
* X**2 TERM........ -0.82052836E-08 * Sensitivity..................... 4. *
  NP:[7,67]494.GSP                    9 PEAKS

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 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
  1  9   12.4   19 22    27 3.24    292   22.5  2.60E+00  7.50.012  0  7.82
  2  9   20.7   19 22   152 3.24     97   30.9  8.59E-01 28.30.055  0  0.00
  3  0   53.1   59  9   196 1.95     59   63.2  5.22E-01 47.20.909  0  0.00
  4  0  511.0  518  8    47 1.74     43  521.5  3.85E-01 30.90.956  0  0.00
  5  0  661.3  666 10    46 1.97    149  672.0  1.32E+00 11.70.743  0  0.00
  6  0  911.2  917  8    23 1.80     12  922.1  1.10E-01 77.10.540  0  0.00
  7  0 1172.1 1178 11    22 1.89     94 1183.2  8.34E-01 15.60.418  0  0.00
  8  0 1331.3 1337 10     4 2.40     86 1342.5  7.63E-01 11.80.369  0  0.00
  9  0 1460.9 1468 11     2 2.54     20 1472.2  1.78E-01 33.40.335  0  0.00

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BACKGROUND INFO 7059    GLS   4        243.879 92 G- 3     BG DATE 236.834 92
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v--------PEAK---------v     v------BACKGROUND------v     v------NET----v
ENERGY       CPM  %ERROR      ENERGY       CPM  %ERROR         CPM  %ERROR

 511.00    0.3846 30.85       511.00  0.4167  8.59        -0.0321385.93R
 661.32    1.3217 11.68       661.60  0.0276 23.90         1.2941 11.94
 911.21    0.1100 77.11       911.10  0.0557 46.89         0.0544163.28R
1172.09    0.8338 15.61      1173.20  0.0246 10.99         0.8092 16.09
1331.29    0.7627 11.81      1332.50  0.0294  0.00         0.7332 12.28
1460.89    0.1779 33.42      1461.00  0.1373 11.95         0.0406151.99R
    3 PEAKS REJECTED BY BACKGROUND

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INTERFERING ISOTOPE ANALYSIS 7059    GLS   4        243.879 92 G- 3
*****************************************************************************
NONE FOUND

RGF SENT DATA FROM NP:[7,67]922436653.GTX          TO GSTOR 494
GLB WRITES THE FOLLOWING TO NP:[7,67]GYDCSVTO1.DAT
 7059=GROUP          4=SAMPL       =ELM     GLS=TYP
    0=LRW            0=LRA       ARLI=LIBR
JLYKTL PARAMETERS
       JELYKTL READ
GEODET
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        Old Effs replaced (forced)
EFFICIENCY FILE NP:[25,41GEL103MBO.EFF
        Effs fetched  33.000   90
FETCH CAL LINE
        Cal line fetched235.081     1992
BKG FETCH ROUTINE GETS BG FOR  236.834 1992 IERR=   0
SPANF
         FETCHING SPANF
WHDTR CALLED
        HDR WRITTEN IN
GSTFIL
        PKFIL UPDATED
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QC USED IN DATA REDUCTION OF SAMPLE 7059 4 GLS RUN AT 243.879/1992

BACKGROUND FOR GELI DETECTOR 3 OF 236.834/1992

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0000	0.00	511.0	0.4167	8.59	1120.3	0.0145	0.00
92.0	0.0000	0.00	583.1	0.0686	47.98	1173.2	0.0246	10.99
143.0	0.0000	0.00	609.3	0.0484	37.02	1238.1	0.0649	0.00
186.0	0.1325	39.33	661.6	0.0276	23.90	1332.5	0.0294	0.00
198.0	0.0702	0.00	727.2	0.0453	0.00	1377.7	0.0000	0.00
238.6	0.1849	25.90	846.0	0.0349	0.00	1461.0	0.1373	11.95
279.0	0.0233	0.00	860.4	0.0601	0.00	1586.0	0.0000	0.00
295.2	0.0553	7.96	911.1	0.0557	46.89	1591.0	0.0173	0.00
338.4	0.0675	0.00	968.9	0.0272	0.00	1729.6	0.0138	0.00
351.9	0.0439	0.00	1001.0	0.0311	0.00	1764.5	0.0204	67.15

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 3 ON 8/31/92

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
172.232	92	1.0099	4.006	15.
179.213	92	1.0373	3.146	11.
186.667	92	1.0542	2.417	11.
193.242	92	1.0437	3.284	11.
200.263	92	1.0181	3.671	10.
207.250	92	1.0471	2.512	12.
214.265	92	1.0348	4.038	10.
221.713	92	1.0483	2.529	23.
228.242	92	1.0460	2.656	15.
235.081	92	1.0402	2.981	11.
AVERAGE		1.0380	0.014	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
207.956	91	1.0116	4.840	10.
211.649	91	0.9872	4.182	11.
220.956	91	1.0360	4.214	11.
238.659	91	1.1746	4.813	18.
242.698	91	0.9701	3.651	13.
266.648	91	0.9629	4.714	12.
278.685	91	1.1581	3.814	10.
300.009	91	0.1835	7.688	10.
119.896	92	1.0178	4.468	11.
145.739	92	0.9856	4.773	27.
AVERAGE		0.9959	0.027	

CALIBRATION LINE FROM STANDARD FOR G- 3 OF 235.081 92
ENERGY= -9.849163 + 0.9983228*CH + -8.198124E-09*CH**2
FWHM =SQRT(2.2355 + 0.003449*ENERGY) (CO60= 2.614)

EFFICIENCIES FOR GEOMETRY MB3 CALIBRATED 33.000 1990

ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*
55.0	1.030*	110.0	3.060*	170.0	2.810*	400.0	1.210*	1200.0	0.407*
60.0	1.340*	120.0	3.120*	200.0	2.450*	500.0	0.975*	1500.0	0.325*
80.0	2.370*	130.0	3.120*	220.0	2.230*	600.0	0.810*	2000.0	0.245*
90.0	2.700*	140.0	3.100*	250.0	1.940*	800.0	0.610*	2500.0	0.197*
100.0	2.920*	150.0	3.050*	350.0	1.440*	1000.0	0.490*	3000.0	0.164*

9513354.1290

****

7059 4 GLS GSTOR 494

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	PK	ENERGY	CPM	%ERR	COMMENT	
	1	12.4	2.60	7.5	NO GEN.	
	2	20.7	0.86	28.3		
	3	53.1	0.52	47.2		
b	5	661.3	1.29	11.9		Cs137s
b	7	1172.1	0.81	16.1		Co 60s
b	8	1331.3	0.73	12.3		Co 60s
			REJECTED PEAKS			
B	4	511.0	-0.03	99.9	Ac228 Th228	La140 Ru106 Na 22
B	6	911.2	0.05	99.9	Ac228	Th232s
B	9	1460.9	0.04	99.9		K 40s

9513354.1291

****

7059 GLS 5 G-5 MB 243.879 92 112.57 MIN 1.00000 SM 496

LIBR=ARLI REF TIME= 243.879 92

****

G 9/9/92

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00		1G
**** (1460.85)	0.110000	0.00353	0.155	3.993E+02 s		< 1.799E+02
Cr 51 2.772E+01 DAYS		LAMBDA= 2.501E-02		DECAY= 1.000E+00		1G
**** (320.03)	0.102000	0.01435	0.269	1.839E+02 s		< 8.282E+01
Mn 54 3.125E+02 DAYS		LAMBDA= 2.218E-03		DECAY= 1.000E+00		2G
**** (834.83)	1.000000	0.00595	0.130	2.186E+01 s		< 9.848E+00
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 1.000E+00		4G
**** (810.76)	0.990000	0.00612	0.157	2.584E+01 s		< 1.164E+01
Fe 59 4.460E+01 DAYS		LAMBDA= 1.554E-02		DECAY= 1.000E+00		6G
**** (1099.22)	0.565000	0.00456	0.160	6.207E+01 s		< 2.796E+01
**** (1291.56)	0.432000	0.00393	0.091	5.388E+01 s		< 2.427E+01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 1.000E+00		4G
**** (1173.21)	0.999200	0.00429	0.152	3.538E+01 s		< 1.594E+01
**** (1332.48)	1.000000	0.00382	0.083	2.160E+01 s		< 9.728E+00
Zn 65 2.440E+02 DAYS		LAMBDA= 2.841E-03		DECAY= 1.000E+00		1G
**** (1115.52)	0.507500	0.00450	0.111	4.852E+01 s		< 2.186E+01
Nb 94 7.414E+06 DAYS		LAMBDA= 9.349E-08		DECAY= 1.000E+00		3G
**** (871.10)	1.000000	0.00572	0.138	2.421E+01 s		< 1.091E+01
**** (1573.70)	1.000000	0.00330	0.083	2.498E+01 s		< 1.125E+01
Ru106 3.670E+02 DAYS		LAMBDA= 1.889E-03		DECAY= 1.000E+00		41G
**** (621.80)	0.097600	0.00774	0.131	1.733E+02 s		< 7.804E+01
**** (1050.10)	0.014500	0.00477	0.145	2.094E+03 s		< 9.431E+02
I 131 8.040E+00 DAYS		LAMBDA= 8.621E-02		DECAY= 1.000E+00		9G
**** (364.50)	0.820000	0.01276	0.224	2.139E+01 s		< 9.634E+00
Ba133 3.981E+03 DAYS		LAMBDA= 1.741E-04		DECAY= 1.000E+00		10G
**** (276.30)	0.075000	0.01646	0.281	2.279E+02 s		< 1.027E+02
**** (302.70)	0.196000	0.01512	0.255	8.608E+01 s		< 3.877E+01
**** (355.90)	0.621000	0.01301	0.248	3.069E+01 s		< 1.383E+01
**** (383.70)	0.094000	0.01222	0.201	1.751E+02 s		< 7.885E+01
Cs134 7.531E+02 DAYS		LAMBDA= 9.204E-04		DECAY= 1.000E+00		9G
**** (475.30)	0.015000	0.01000	0.244	1.624E+03 s		< 7.315E+02
**** (604.60)	0.980000	0.00794	0.175	2.253E+01 s		< 1.015E+01
**** (795.80)	0.880000	0.00623	0.152	2.778E+01 s		< 1.251E+01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 1.000E+00		3G
**** (661.64)	0.851000	0.00732	0.182	2.917E+01 s		< 1.314E+01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 1.000E+00		48G
**** (121.78)	0.254000	0.03046	0.361	4.665E+01 s		< 2.101E+01
**** (344.31)	0.245000	0.01340	0.223	6.783E+01 s		< 3.055E+01

031

****	(778.87)	0.120000	0.00635	0.141	1.848E+02	s	< 8.323E+01
****	(963.36)	0.132000	0.00519	0.111	1.619E+02	s	< 7.294E+01
****	(1112.04)	0.124000	0.00451	0.121	2.162E+02	s	< 9.739E+01
****	(1408.02)	0.198000	0.00364	0.083	1.144E+02	s	< 5.155E+01

Eu154 3.105E+03 DAYS LAMBDA= 2.232E-04 DECAY= 1.000E+00 48G

****	(123.07)	0.390000	0.03041	0.370	3.121E+01	s	< 1.406E+01
****	(723.26)	0.202000	0.00677	0.155	1.133E+02	s	< 5.104E+01
****	(873.16)	0.117000	0.00570	0.132	1.973E+02	s	< 8.887E+01
****	(1004.75)	0.170000	0.00498	0.154	1.817E+02	s	< 8.184E+01
****	(1274.49)	0.336000	0.00398	0.083	6.178E+01	s	< 2.783E+01

Eu155 1.812E+03 DAYS LAMBDA= 3.825E-04 DECAY= 1.000E+00 6G

****	(86.54)	0.320000	0.02343	0.434	5.791E+01	s	< 2.609E+01
****	(105.30)	0.200000	0.02944	0.393	6.681E+01	s	< 3.010E+01

Ta182 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 1.000E+00 33G

****	(67.80)	0.410000	0.01054	0.445	1.030E+02	s	< 4.642E+01
****	(100.10)	0.144000	0.02852	0.382	9.299E+01	s	< 4.189E+01
****	(1121.30)	0.358000	0.00448	0.122	7.599E+01	s	< 3.423E+01
****	(1189.05)	0.166000	0.00424	0.114	1.619E+02	s	< 7.293E+01
****	(1221.40)	0.277000	0.00413	0.105	9.185E+01	s	< 4.137E+01
****	(1231.01)	0.117000	0.00410	0.083	1.720E+02	s	< 7.746E+01

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 1.000E+00 48G

****	(186.10)	0.040000	0.02352	0.389	4.131E+02	s	<r 1.861E+02
****	(242.00)	0.078000	0.01845	0.347	2.411E+02	s	< 1.086E+02
****	(351.96)	0.393000	0.01314	0.236	4.567E+01	s	< 2.057E+01
****	(609.32)	0.484000	0.00789	0.218	5.708E+01	s	< 2.571E+01

Th228 6.987E+02 DAYS LAMBDA= 9.921E-04 DECAY= 1.000E+00 31G

****	(238.62)	0.448000	0.01866	0.370	4.423E+01	s	< 1.993E+01
585	(583.17)	0.287000	0.00821	0.121	5.116E+01	s	56.89% 2.304E+01

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 41G

****	(338.40)	0.104000	0.01362	0.271	1.912E+02	s	< 8.613E+01
****	(911.10)	0.250000	0.00547	0.144	1.055E+02	s	< 4.751E+01
****	(968.90)	0.150000	0.00516	0.161	2.086E+02	s	< 9.395E+01

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*****************************************************************************
7059    GLS   5        G-5 MB 243.879 92  112.57 MIN     1.00000 SM      496
LIBR=ARLI   REF TIME= 243.879 92
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* Group.......................... 7059 * Time of count          243.879 1992 *
* Sample.......................... 5 * Reference GMT........ 243.879 1992 *
* Element.......................... * Elapsed Live Tm.......... 112.5667 *
* Type code.................... GLS * Dead Time Pct.................. 0.0 *
* ID.................... QC 8720 BLANK * Background GMT....... 236.834 1992 *
* Geometry, detector........... MB-5 * Standard GMT......... 235.141 1992 *
* Aliquot.......................... 1. * Days since TO................. 0.0 *
* Unit of Aliquot.............. SMPL * Time on.......... 14:05 PDT 30-AUG *
* Data Sheet Units........ PCI /SMPL * Time off......... 15:58 PDT 30-AUG *
* Library...................... ARLI * Calc Time........ 15:58 31-AUG-92 *
*****************************************************************************
* Slope..................... 1.004751 * Width slope............... 0.001865 *
* Intercept................ -9.85099 * Width offset............. 5.411687 *
* X**2 TERM.......... 0.58198392E-07 * Sensitivity..................... 4. *
  NP:[7,67]496.GSP                    5 PEAKS

*****************************************************************************
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN        CPM  ERR   EFF  K  FIT
  1  3   13.5   19 27     8 7.39    232   23.3  2.07E+00  7.10.015  0  4.20
  2  3   19.2   19 27    69 7.39    173   28.9  1.54E+00 18.10.043  0  0.00
  3  0  185.6  191  8    59 2.27     25  194.5  2.26E-01 59.9 2.36  0  0.00
  4  0  511.9  514 12    15 3.95     63  519.3  5.62E-01 18.80.931  0  0.00
  5  0  584.6  587 11    11 1.93     22  591.6  1.95E-01 33.90.821  0  0.00

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BACKGROUND INFO 7059    GLS   5        243.879 92 G- 5     BG DATE 236.834 92
*****************************************************************************

v--------PEAK---------v      v------BACKGROUND------v      v------NET----v
ENERGY       CPM  %ERROR      ENERGY       CPM  %ERROR          CPM  %ERROR

 185.56    0.2257 59.94       186.00  0.1880 28.94          0.0378386.01R
 511.94    0.5616 18.78       511.00  0.5155  5.37          0.0461236.81R
 584.57    0.1954 33.92       583.10  0.0749 23.51          0.1206 56.89
    2 PEAKS REJECTED BY BACKGROUND

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INTERFERING ISOTOPE ANALYSIS 7059    GLS   5        243.879 92 G- 5
*****************************************************************************
NONE FOUND

RGF SENT DATA FROM NP:[7,67]922436655.GTX          TO GSTOR 496
GLB WRITES THE FOLLOWING TO NP:[7,67]GYDCSVTO1.DAT
 7059=GROUP          5=SAMPL       =ELM    GLS=TYP
    0=LRW            0=LRA       ARLI=LIBR
JLYKTL PARAMETERS
       JELYKTL READ
GEODET
       Old Effs replaced (forced)
EFFICIENCY FILE NP:[25,4]GELI05MBO.EFF
       Effs fetched  33.000   90
FETCH CAL LINE
       Cal line fetched235.141     1992
BKG FETCH ROUTINE GETS BG FOR  236.834 1992 IERR=   0
SPANF
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FETCHING SPANF
WHDTR CALLED
HDR WRITTEN IN
GSTFIL
PKFIL UPDATED
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QC USED IN DATA REDUCTION OF SAMPLE 7059 5 GLS RUN AT 243.879/1992

BACKGROUND FOR GELI DETECTOR 5 OF 236.834/1992

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0000	0.00	511.0	0.5155	5.37	1120.3	0.0205	48.70
92.0	0.0000	0.00	583.1	0.0749	23.51	1173.2	0.0208	0.00
143.0	0.0000	0.00	609.3	0.0691	23.60	1238.1	0.0156	0.00
186.0	0.1880	28.94	661.6	0.0000	0.00	1332.5	0.0291	20.96
198.0	0.0421	0.00	727.2	0.0549	0.00	1377.7	0.0000	0.00
238.6	0.2671	16.47	846.0	0.0453	19.20	1460.8	0.0407	28.26
279.0	0.0000	0.00	860.4	0.0000	0.00	1586.0	0.0000	0.00
295.2	0.0492	36.41	911.1	0.0415	43.37	1591.3	0.0262	0.00
338.4	0.0650	0.00	968.9	0.0255	57.30	1729.6	0.0000	0.00
351.9	0.0791	30.85	1001.0	0.0153	0.00	1764.5	0.0192	0.00

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 8/31/92

HIGH RADIUM STANDARD					LOW RADIUM STANDARD				
GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
172.255	92	1.1153	3.122	10.	0.000	0	0.0000	0.000	0.
179.275	92	1.0871	3.288	10.	193.726	90	1.0656	17.337	63.
186.676	92	1.1189	2.574	12.	201.976	90	1.0026	7.798	28.
193.250	92	1.1132	3.968	11.	267.756	90	0.9958	17.344	100.
200.282	92	1.1256	4.870	11.	143.966	91	0.9928	3.560	34.
207.277	92	1.1196	2.597	11.	161.682	91	1.0972	1.613	19.
214.281	92	1.0699	3.689	11.	162.972	91	1.0585	1.586	16.
223.714	92	1.1280	3.072	12.	180.971	91	1.0568	2.669	22.
228.254	92	1.1208	5.412	11.	207.975	91	1.0647	2.084	11.
235.141	92	1.1357	3.034	10.	213.856	91	1.1437	10.869	44.
AVERAGE		1.1134	0.020		AVERAGE		1.0531	0.050	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 235.141 92
ENERGY= -9.850992 + 1.0047513*CH + 5.819839E-08*CH**2
FWHM =SQRT(5.4117 + 0.001866*ENERGY) (CO60= 2.810)

EFFICIENCIES FOR GEOMETRY MB5 CALIBRATED 33.000 1990

ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*
55.0	0.500*	110.0	3.000*	170.0	2.550*	400.0	1.180*	1200.0	0.420*
60.0	0.680*	120.0	3.050*	200.0	2.200*	500.0	0.950*	1500.0	0.345*
80.0	1.850*	130.0	3.000*	220.0	2.000*	600.0	0.800*	2000.0	0.265*
90.0	2.570*	140.0	2.950*	250.0	1.800*	800.0	0.620*	2500.0	0.215*
100.0	2.850*	150.0	2.850*	350.0	1.320*	1000.0	0.500*	3000.0	0.182*

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7059    5            GLS                                          GSTOR 496
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     PK   ENERGY     CPM  %ERR       COMMENT
      1    13.5    2.07   7.1 ..............................................
      2    19.2    1.54  18.1 ..............................................
b     5   584.6    0.12  56.9 ........................................ Th228s
                    REJECTED PEAKS
B     3   185.6    0.04  99.9 ........................... Cs137c U 235s Ra226s
B     4   511.9    0.05  99.9 Th228 ......................... La140 Ru106 Na 22
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7059 GLS 6 G-1 GR 242.787 92 106.43 MIN 216.56000 GR 574

LIBR=ARLI REF TIME= 197.292 92

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CRO 9/9/92

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/GRAM AT TZERO
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12		DECAY= 1.000E+00		
1461 (1460.85)	0.110000	0.00353	1.938	4.999E+03 s	8.43%	1.040E+01
Cr 51 2.772E+01 DAYS		LAMBDA= 2.501E-02		DECAY= 3.206E-01	1G	
**** (320.03)	0.102000	0.01685	0.474	2.759E+02 s	<	1.790E+00
Mn 54 3.125E+02 DAYS		LAMBDA= 2.218E-03		DECAY= 9.040E-01	2G	
**** (834.83)	1.000000	0.00622	0.291	4.671E+01 s	<	1.075E-01
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03		DECAY= 6.426E-01	4G	
**** (810.76)	0.990000	0.00641	0.295	4.655E+01 s	<	1.507E-01
Fe 59 4.460E+01 DAYS		LAMBDA= 1.554E-02		DECAY= 4.931E-01	6G	
**** (1099.22)	0.565000	0.00472	0.304	1.141E+02 s	<	4.812E-01
**** (1291.56)	0.432000	0.00400	0.206	1.193E+02 s	<	5.032E-01
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04		DECAY= 9.837E-01	4G	
**** (1173.21)	0.999200	0.00442	0.297	6.730E+01 s	<	1.423E-01
**** (1332.48)	1.000000	0.00388	0.206	5.323E+01 s	<	1.126E-01
Zn 65 2.440E+02 DAYS		LAMBDA= 2.841E-03		DECAY= 8.788E-01	1G	
**** (1115.52)	0.507500	0.00465	0.310	1.312E+02 s	<	3.106E-01
Nb 94 7.414E+06 DAYS		LAMBDA= 9.349E-08		DECAY= 1.000E+00	3G	
**** (871.10)	1.000000	0.00596	0.296	4.963E+01 s	<	1.032E-01
**** (1573.70)	1.000000	0.00326	0.182	5.565E+01 s	<r	1.157E-01
Ru106 3.670E+02 DAYS		LAMBDA= 1.889E-03		DECAY= 9.177E-01	41G	
**** (621.80)	0.097600	0.00848	0.341	4.124E+02 s	<	9.347E-01
**** (1050.10)	0.014500	0.00495	0.245	3.420E+03 s	<	7.753E+00
I 131 8.040E+00 DAYS		LAMBDA= 8.621E-02		DECAY= 1.980E-02	9G	
**** (364.50)	0.820000	0.01473	0.467	3.863E+01 s	<	4.058E+00
Ba133 3.981E+03 DAYS		LAMBDA= 1.741E-04		DECAY= 9.921E-01	10G	
**** (276.30)	0.075000	0.01951	0.543	3.709E+02 s	<	7.775E-01
**** (302.70)	0.196000	0.01781	0.533	1.527E+02 s	<	3.200E-01
**** (355.90)	0.621000	0.01512	0.599	6.383E+01 s	<	1.338E-01
**** (383.70)	0.094000	0.01392	0.427	3.260E+02 s	<	6.836E-01
Cs134 7.531E+02 DAYS		LAMBDA= 9.204E-04		DECAY= 9.590E-01	9G	
**** (475.30)	0.015000	0.01114	0.374	2.238E+03 s	<	4.854E+00
**** (604.60)	0.980000	0.00873	0.478	5.589E+01 s	<	1.212E-01
**** (795.80)	0.880000	0.00654	0.321	5.575E+01 s	<	1.209E-01
Cs137 1.102E+04 DAYS		LAMBDA= 6.290E-05		DECAY= 9.971E-01	3G	
**** (661.64)	0.851000	0.00794	0.383	5.662E+01 s	<	1.181E-01
Eu152 4.821E+03 DAYS		LAMBDA= 1.438E-04		DECAY= 9.935E-01	48G	
**** (121.78)	0.254000	0.03943	0.849	8.477E+01 s	<	1.775E-01
**** (344.31)	0.245000	0.01566	0.470	1.225E+02 s	<	2.564E-01

037

****	(778.87)	0.120000	0.00668	0.269	3.353E+02	s	< 7.021E-01
****	(963.36)	0.132000	0.00540	0.310	4.356E+02	s	< 9.121E-01
****	(1112.04)	0.124000	0.00467	0.267	4.610E+02	s	< 9.653E-01
****	(1408.02)	0.198000	0.00366	0.182	2.515E+02	s	< 5.265E-01

Eu154 3.105E+03 DAYS LAMBDA= 2.232E-04 DECAY= 9.899E-01 48G

****	(123.07)	0.390000	0.03923	0.834	5.453E+01	s	< 1.146E-01
187	(188.20)	0.002000	0.02883	0.543	9.425E+03	60.01%	1.980E+01
****	(723.26)	0.202000	0.00723	0.358	2.451E+02	s	< 5.150E-01
****	(873.16)	0.117000	0.00595	0.300	4.304E+02	s	< 9.044E-01
****	(1004.75)	0.170000	0.00518	0.279	3.167E+02	s	< 6.654E-01
****	(1274.49)	0.336000	0.00406	0.220	1.611E+02	s	< 3.385E-01

Eu155 1.812E+03 DAYS LAMBDA= 3.825E-04 DECAY= 9.827E-01 6G

88	(86.54)	0.320000	0.04364	0.765	5.481E+01	s45.50%	1.160E-01
****	(105.30)	0.200000	0.04218	0.807	9.563E+01	s	< 2.024E-01

Ta182 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 7.602E-01 33G

****	(67.80)	0.410000	0.04383	1.131	6.295E+01	s	< 1.722E-01
****	(100.10)	0.144000	0.04279	0.864	1.402E+02	s	< 3.837E-01
****	(1121.30)	0.358000	0.00463	0.317	1.915E+02	s	< 5.240E-01
****	(1189.05)	0.166000	0.00436	0.241	3.334E+02	s	< 9.123E-01
****	(1221.40)	0.277000	0.00424	0.280	2.382E+02	s	< 6.516E-01
****	(1231.01)	0.117000	0.00421	0.275	5.588E+02	s	< 1.529E+00

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 9.999E-01 48G

187	(186.10)	0.040000	0.02913	0.543	4.664E+02	s60.01%	9.702E-01
****	(242.00)	0.078000	0.02236	1.008	5.781E+02	s	< 1.203E+00
****	(351.96)	0.393000	0.01531	0.696	1.157E+02	s	<r 2.407E-01
610	(609.32)	0.484000	0.00866	0.671	1.600E+02	s32.45%	3.329E-01

Th228 6.987E+02 DAYS LAMBDA= 9.921E-04 DECAY= 9.559E-01 31G

239	(238.62)	0.448000	0.02269	3.967	3.902E+02	s 9.61%	8.491E-01
****	(583.17)	0.287000	0.00906	0.524	2.016E+02	s	<r 4.387E-01

Th232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 41G

338	(338.40)	0.104000	0.01594	0.551	3.325E+02	s33.84%	6.916E-01
910	(911.10)	0.250000	0.00570	0.553	3.883E+02	s26.75%	8.077E-01
****	(968.90)	0.150000	0.00536	0.400	4.973E+02	s	< 1.034E+00

U 235 2.571E+11 DAYS LAMBDA= 2.696E-12 DECAY= 1.000E+00 34G

****	(143.78)	0.132600	0.03575	0.803	1.695E+02	s	< 3.526E-01
187	(185.72)	0.540000	0.02919	0.543	3.448E+01	s60.01%	7.173E-02
****	(205.31)	0.050000	0.02650	0.712	5.369E+02	s	< 1.117E+00

9513354.1299

```
*****************************************************************************
7059    GLS   6        G-1 JR 242.787 92  106.43 MIN   216.56000 GR       574
LIBR=ARLI   REF TIME= 197.292 92
*****************************************************************************

*****************************************************************************
* Group.......................... 7059 * Time of count          242.787 1992 *
* Sample.......................... 6 * Reference GMT........ 197.292 1992 *
* Element.......................... * Elapsed Live Tm.......... 106.4333 *
* Type code..................... GLS * Dead Time Pct............ 0.093867 *
* ID.................... QC 8721 REP 1 * Background GMT....... 236.834 1992 *
* Geometry, detector........... JR-1 * Standard GMT......... 240.879 1992 *
* Aliquot..................... 216.56 * Days since TO............ 45.49466 *
* Unit of Aliquot............... GRAM * Time on.......... 11:53 PDT 29-AUG *
* Data Sheet Units.... PCI /GRAM * Time off......... 13:39 PDT 29-AUG *
* Library...................... ARLI * Calc Time......... 13:29 01-SEP-92 *
*****************************************************************************
* Slope..................... 1.006277 * Width slope............... 0.004796 *
* Intercept................. -9.38779 * Width offset............. 7.638496 *
* X**2 TERM.......... 0.22045691E-06 * Sensitivity..................... 4. *
  NP:[7,67]574.GSP                    19 PEAKS

*****************************************************************************
 PK IT   ENRG LEFT WD BKGND FWHM   AREA   CHAN       CPM  ERR  EFF  K  FIT
  1  0   16.3   19 19   447 5.00    622   25.6  5.84E+00  9.10.026  0  0.00
  2  0   76.9   81 12   840 4.27    384   85.8  3.61E+00 16.7 4.38  0  0.00
  3  0   87.6   93  7   454 2.58     81   96.4  7.65E-01 45.5 4.36  0  0.00
  4  0   92.4   99  8   480 1.54     42  101.1  3.94E-01 95.1 4.33  0  0.00
  5  0  186.7  190 10   311 2.94     82  194.9  7.70E-01 41.8 2.90  0  0.00
  6  0  239.3  241 13   249 2.85    443  247.1  4.16E+00  9.1 2.27  0  0.00
  7  0  296.1  298 12   172 2.17     97  303.6  9.12E-01 29.1 1.85  0  0.00
  8  0  338.1  341  8    99 3.44     63  345.3  5.92E-01 31.5 1.60  0  0.00
  9  0  351.4  355 10   123 2.68    134  358.5  1.26E+00 17.8 1.53  0  0.00
 10  0  509.8  508 16   112 3.89    103  515.9  9.67E-01 25.0 1.04  0  0.00
 11  0  583.0  584 11    76 2.55     71  588.6  6.70E-01 25.70.908  0  0.00
 12  0  609.8  610 12    96 2.41     80  615.3  7.53E-01 28.60.867  0  0.00
 13  0  641.3  641 10    45 1.40     18  646.5  1.67E-01 79.70.827  0  0.00
 14  0  910.3  907 14    46 2.44     65  913.7  6.14E-01 24.00.575  0  0.00
 15  0  967.4  963 15    30 6.18     65  970.5  6.11E-01 26.30.539  0  0.00
 16  0 1460.7 1453 15     4 3.36    224 1460.5  2.11E+00  7.70.354  0  0.00
 17  0 1575.0 1575  2     1 1.34      1 1574.0  6.26E-03212.10.328  0  0.00
 18  0 1583.9 1579 12    14 1.27      2 1582.8  1.82E-02372.20.326  0  0.00
 19  0 1765.3 1758 10     4 2.88     16 1763.0  1.47E-01 42.90.293  0  0.00

*****************************************************************************
BACKGROUND INFO 7059    GLS   6        242.787 92 G- 1      BG DATE 236.834 92
*****************************************************************************

v---------PEAK----------v     v-------BACKGROUND-------v     v------NET----v
ENERGY        CPM  %ERROR       ENERGY        CPM  %ERROR          CPM  %ERROR

  92.39     0.3936 95.05        92.00   0.5325  0.00        -0.1389269.42R
 186.74     0.7700 41.81       186.00   0.2265 22.91         0.5435 60.01
 239.25     4.1598  9.10       238.60   0.1933 23.70         3.9666  9.61
 296.09     0.9124 29.13       295.20   0.0395  0.00         0.8729 30.44
 338.06     0.5916 31.53       338.40   0.0405  0.00         0.5511 33.84
 351.35     1.2589 17.81       351.90   0.0828 25.35         1.1761 19.15
 509.82     0.9665 25.03       511.00   0.4975 11.14         0.4690 52.91
 582.97     0.6702 25.70       583.10   0.0690 26.39         0.6012 28.81
 609.81     0.7532 28.64       609.30   0.0825 35.52         0.6707 32.45
 910.28     0.6143 23.98       911.10   0.0608 24.99         0.5535 26.75
```

039

```
 967.37    0.6107 26.29      968.90  0.0290  0.00        0.5818 27.59
1460.70    2.1075  7.70     1461.00  0.1690 11.42        1.9385  8.43
1765.34    0.1470 42.86     1764.50  0.0277 31.44        0.1194 53.30
    1 PEAKS REJECTED BY BACKGROUND

*****************************************************************************
INTERFERING ISOTOPE ANALYSIS 7059    GLS   6        242.787 92 G- 1
*****************************************************************************

RA226      609.32  0.4840                CALC FROM REF PEAK

v-----------PEAK-----------------v      v--CALCULATED--v      v-----NET---------
ENERGY      CPM        DPM  %ERROR        ENERGY    CPM            CPM  %ERROR

 296.09     0.873      235.0 30.44       295.20  0.5937         0.2792117.57 R
 351.35     1.176      195.1 19.15       351.96  0.9635         0.2126181.26 R
 609.81     0.671      159.8 32.45       609.32  0.6707     <-reference peak->
1583.91     0.018      733.9372.19      1583.10  0.0040         0.0142475.88 R
1765.34     0.119      245.4 53.30      1764.50  0.0778         0.0416164.46 R

TH228      238.62  0.4480                CALC FROM REF PEAK

v-----------PEAK-----------------v      v--CALCULATED--v      v-----NET---------
ENERGY      CPM        DPM  %ERROR        ENERGY    CPM            CPM  %ERROR

 239.25     3.967      390.7  9.61       238.62  3.9666     <-reference peak->
 509.82     0.469      588.3 52.91       510.69  0.3115         0.1576158.65 R
 582.97     0.601      230.6 28.81       583.17  1.0185        -0.4172-47.68 R

BI214/PB214 RATIO      8.1923E-01+/-    3.04%

WT PCT U235   3.09514 +/-   68.22%     DAUT
RGF SENT DATA FROM NP:[7,67]922425691.GTX          TO GSTOR 574
GLB WRITES THE FOLLOWING TO NP:[7,67]GYDCSVT01.DAT
 7059=GROUP          6=SAMPL       =ELM    GLS=TYP
    0=LRW            0=LRA       ARLI=LIBR
JLYKTL PARAMETERS
       JELYKTL READ
GEODET
       Old Effs replaced (forced)
EFFICIENCY FILE NP:[25,4]GELI01JRO.EFF
       Effs fetched  33.000   90
FETCH CAL LINE
       Cal line fetched240.879    1992
BKG FETCH ROUTINE GETS BG FOR  236.834 1992 IERR=   0
SPANF
        FETCHING SPANF
WHDTR CALLED
       HDR WRITTEN IN
GSTFIL
       PKFIL UPDATED
```

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QC USED IN DATA REDUCTION OF SAMPLE 7059 6 GLS RUN AT 242.787/1992

BACKGROUND FOR GELI DETECTOR 1 OF 236.834/1992

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.5444	0.00	511.0	0.4975	11.14	1120.3	0.0158	0.00
92.0	0.5325	0.00	583.1	0.0690	26.39	1173.2	0.0229	17.05
143.0	0.0807	0.00	609.3	0.0825	35.52	1238.1	0.0171	0.00
186.0	0.2265	22.91	661.6	0.0283	0.00	1332.5	0.0322	9.33
198.0	0.0656	0.00	727.2	0.0251	0.00	1377.7	0.0272	43.36
238.6	0.1933	23.70	846.0	0.0324	0.00	1461.0	0.1690	11.42
279.0	0.0000	0.00	860.4	0.0114	0.00	1586.0	0.0000	0.00
295.2	0.0395	0.00	911.1	0.0608	24.99	1591.0	0.0785	0.00
338.4	0.0405	0.00	968.9	0.0290	0.00	1729.6	0.0105	0.00
351.9	0.0828	25.35	1001.0	0.0177	0.00	1764.5	0.0277	31.44

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 1 ON 9/ 1/92

HIGH RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
198.157	92	1.0394	2.629	11.
200.253	92	0.9993	3.010	10.
207.177	92	1.0249	3.041	11.
211.834	92	1.0386	4.503	10.
214.257	92	1.0271	2.893	10.
221.700	92	1.0091	3.394	15.
224.010	92	1.0330	2.912	14.
226.272	92	1.0195	3.492	10.
229.717	92	1.0080	2.459	12.
235.071	92	1.0192	4.669	13.
AVERAGE		1.0218	0.013	

LOW RADIUM STANDARD

GMT	YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
291.847	91	0.9970	3.154	12.
294.707	91	0.9976	1.439	19.
304.620	91	0.9991	3.696	12. NG
305.693	91	1.0106	1.144	25.
361.231	91	0.9884	2.764	20.
22.691	92	0.9995	2.008	14.
121.680	92	0.9942	2.816	69.
157.845	92	0.9834	1.693	23.
236.820	92	1.0004	1.735	15.
240.879	92	0.9957	1.667	18.
AVERAGE		0.9966	0.007	

CALIBRATION LINE FROM STANDARD FOR G- 1 OF 240.879 92
ENERGY= -9.387788 + 1.0062767*CH + 2.204569E-07*CH**2
FWHM =SQRT(7.6385 + 0.004797*ENERGY) (CO60= 3.746)

EFFICIENCIES FOR GEOMETRY JR1 CALIBRATED 33.000 1990

ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*	ENERGY	EFFC*
55.0	4.380*	110.0	4.150*	170.0	3.150*	400.0	1.330*	1200.0	0.432*
60.0	4.380*	120.0	3.970*	200.0	2.720*	500.0	1.060*	1500.0	0.343*
80.0	4.380*	130.0	3.820*	220.0	2.470*	600.0	0.880*	2000.0	0.255*
90.0	4.350*	140.0	3.650*	250.0	2.160*	800.0	0.650*	2500.0	0.202*
100.0	4.280*	150.0	3.450*	350.0	1.540*	1000.0	0.520*	3000.0	0.168*

9513354.1302

7059 6 GLS GSTOR 574

	PK	ENERGY	CPM	%ERR	COMMENT
	1	16.3	5.84	9.1	
	2	76.9	3.61	16.7	
	3	87.6	0.77	45.5	Cs136 Cd109 Eu155s
b	5	186.7	0.54	60.0	Cs136 U 235s Ra226s
b	6	239.3	3.97	9.6	Th228s
b	8	338.1	0.55	33.8	Ac228 Th232s
b	12	609.8	0.67	32.5	NO GEN. Ru103 Ra226s
	13	641.3	0.17	79.7	I 131
b	14	910.3	0.55	26.8	Ac228 Th232s
b	15	967.4	0.58	27.6	Sb124
b	16	1460.7	1.94	8.4	K 40s
			REJECTED PEAKS		
B	4	92.4	-0.14	99.9	
bN	7	296.1	0.28	99.9	Ra226 Ru103 Ir192s
bN	9	351.4	0.21	99.9	Ra226s
bN	10	509.8	0.16	99.9	Ac228 Th228 La140 Na 22
bN	11	583.0	-0.42	99.9	Th228s
	17	1575.0	0.01	99.9	Nb 94s
N	18	1583.9	0.01	99.9	Ra226
bN	19	1765.3	0.04	99.9	Ra226

9513354.1303

28 7059 soil

JB 8-18-92

TMA #	Customer ID	T°	Received weight G	T	N
7059-1	B018Z1	7-15-92	1089.91	44.97	1044.94
-2	B018Z2		1038.90	45.07	993.83
-3	B018Z4		1409.11	45.19	1363.92
-4	QC-LCS 8719				
-5	QC-BLANK 8720				
-6	QC-DUP OF #1 8721	7-15-92			

04

7059

JB 8-18-92

TMA #	GLS Aliquot / GEO	Sample preparation	
7059-1	209.18 g/JR	~~N/A~~ - Sand TC 8/20	
-2	902.97 / MB	~~N/A~~ - Sand TC 8/20	
-3	1018.20/MB	~~N/A~~ - Sand TC 8/20	
-4	1.0 smd. / MB		
-5	1.0 smd. / MB		
-6	216.56 g/ JR		

9513554.1305

PLANCHET SUMMARY
All samples

N207075 WHC
Westinghouse Hanfor
2355 Stevens Drive

Pr Mgr.... BPK Rcvd... 07/17/92
Charge.... 00-000 Due.... 09/15/9
Chemist... Value... 0.
Created... 04-AUG-92 Billed.. 0.
Billing status.. open
Calc. units..... PCI /Unit alq Min Pri

SAF 92-226

Sample elm	Ref. GMT	Description Typ	qpo	aliquot		Customer I.D. care/ trac	count instr	
1	197,292 92					8018Z1		
Type 61.5		BK	209.2	gram		¢ 0	¢ 0±	calc
2	197,292 92					8018Z2		
Type 61.5		MB	903.0	gram		¢ 0	¢ 0±	calc
3	197,292 92					8018Z4		
Type 61.5		MB	1018.	gram		¢ 0	¢ 0±	cntg
4						QC 8719 LCS		
Type 61.5		MB	1.000	smpl		¢ 0	¢ 0±	calc
5						QC 8720 BLANK		
Type 61.5		MB	1.000	smpl		¢ 0	¢ 0±	calc
6	197,292 92					QC 8721 REP 1		
Type 61.5		BK	216.6	gram		¢ 0	¢ 0±	calc

9513354.1306

Appendix 4 Preparation Log For QC Samples.

QC Number	IMA/Non-QA Number	Date	Analysis	Requisition/Program	Prepd By	Initials	SPIKE: Volume & I.D. of Spike Tracer	SPIKE: Total Activity (dpm)	SPIKE: % 1σ Error	SPIKE: Activity Date	INFORMATION: Sp. Wt (g)	INFORMATION: Matrix	INFORMATION: Container	INFORMATION: Remarks	ANALYSES: Date Rec'd	ANALYSES: From	ANALYSES: Analysis	ANALYSES: OK	ANALYSES: NG	ANALYSES: C
8714	2016-14	8-17-92	Cs^{137} Sr^{90}	TC/E	RP	✓	—	—		—	—	10ml 1N HCl	100ml Beaker	Reliquoted. Ky 8/20/92						
8715	14	"	U^{235}	"	RP	✓	—	—		—	—	10 1N HNO_3	"	Reliquoted. Ky 8/20/92						
8716	14	"	H^3	"	RP	✓	—	—		—	—	5ml H_2O	KSC vial	Reliquoted. Ky 8/20/92						
8717	14	"	80	"	RP	✓	—	—		—	—	10ml 1N HCl	100ml Beaker	Reliquoted. Ky 8/20/92						
8718	Ky 8/24/92 2016-~~15~~ 19	"	80	"			Dupof 2016-10 1.0ml 8-17-92K	—		—	—									
8719	7059-4	"	GLY	"	RP	✓	1.5ml Co^{60} EI-B 1.5ml Cs^{137} FI-A-(3)	315.4 Ky 8/28/92 ~~126.1~~ 281.1	2.0 "	1.0-92 "	6.01 1.50	10ml 1N HCl	50ml Beaker							
8720	5	"	GLY	"	RP	✓	—	—		—	—	"	"							
8721	-6		GLY	"			Dup of 7059-1													
8722	7060-6	"	80	"	RP	✓	1ml Am EI-E 1ml Sr MI-D(2)	44.06 β: 36.48	2.0 "	1.0-92 "	1.00 1.0	10ml 1N HCl	50ml Beaker							
8723	6	"	GLY	"	RP	✓	1.5ml Cs^{137} EI-A-(3) 1ml Co^{60} EI-B	281.1 ~~126.1~~ 315.4 Ky 8/28/92	" "	" "	1.50 1.00	"	"							
8724	6	"	Sr^{90}	"	RP	✓	500µl Sr^{90} MI-F	19.16	"	"	.50	"	"							
8725	6	"	Pu^{239} Am^{241}	"	RP	✓	2ml Pu^{239} HI-A-B 2ml Am^{241} FI-D	2,000 2,004	" "	" "	2.27 2.00	10ml 1N HNO_3	"							
8726	6	"	C^{14} oxy	"			Spike prep by Lab													
8727	6	"	U^{235}	"	RP	✓	1ml U^{235} EI-E	9.640	2.0	1.0-92	1.02	10ml "	50ml Beaker							
8728	7060-7	"	80	"	RP	✓	—	—		—	—	10ml 1N HCl	"							
8729	7	"	GLY	"	RP	✓	—	—		—	—	"	"							

9513354.1308

APPENDIX 10 = GAMMA SCAN SPIKE

9513354.1309

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Co^{60} E1

Calibration Certificate

escription

Principal radionuclide: COBALT-60 Half-life: 5.271 years

Nominal activity: 90.2 nano curies

Nominal volume: 5 ml in ampoule/bottle number: 2506-1

asurement Activity of principal radionuclide

Activity per gram of this solution

18.04 nano curies of Cobalt-60

at 0400 hours PST on July 19, 1988

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

curies Per gram

of the daughter nuclide

Total mass of this solution

Approx. 5.0 grams

Method of measurement

ife

This radionuclide has decayed through 0.02 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after January 1999

E1

$\frac{Ci}{g} \times 4.9584\,g \times 2220\,\frac{dpm}{nCi} \times \frac{1}{100\,ml} = 1986.\,dpm\ Co^{60}/ml \pm 0.842.$ @ 201,500-88

Co Content = 0.0265 mg Co/ml 0.1 ≅ 1 Ci Prep'd by K. Gleinemann

9513354.1310

FEB 92 Preparation of U^{232} F-G1-B-(4). MCS/NM
KY Transferred the remainder, ~225 ml, of U^{232} E-G1-B-(1) into an 8oz PB.

5,164 dpm U^{232}/ml ± 0.3% @ 206,842-91

K. Yamamoto

FEB 92 Preparation of Th^{227} B-C1-B-(11) MCS/NM
KY Transferred ~250ml of Th^{227} B-C1-B-(8) into an 8oz PB.

9,647 dpm Ac^{227}-Th^{227}/ml ± 0.7% @ 144,655-90

K. Yamamoto

4 FEB 92 Preparation of Co^{60} E1
KY Gross 84.2915 g ∴ Tared a 100ml vol. flask with top
Tare 79.3331 using the Balance A (Mettler H10).
Net 4.9584 g Broke off the tips of the sealed vial (EPA ampoule no. 2506-1, 18.04 nCi Co^{60}/g at 0400 hrs PST on 7/19/88)
Transferred the Co^{60} solution to the tared flask. Weighed the flask + tops + Co^{60} solution. Pipetted 250 µl of ~~Co~~ KY 2/24/92 Co Carrier F1 (10.00 mg Co/ml) into the flask. Diluted to mark with 0.1N HCl. Transferred to a 4oz PB.

From Certificate: KY 2/24/92

$$18.04\,\frac{nCi}{g} \times 4.9584\,g \times 2220\,\frac{nCi}{g}\,\frac{dpm}{nCi} \times \frac{1}{100\,ml} = 1986\ dpm\ Co^{60}/ml \pm 0.84\%$$

@ 201.500-88

Carrier Content:

$$\left(\left[4.9584\,g \times 0.030\,\frac{mg\ Co}{g}\right] + \left[0.250\,ml \times 10.00\,\frac{mg\ Co}{ml}\right]\right) \times \frac{1}{100\,ml} = 0.0265\ mg\ Co/ml$$

KY 2/24/92

K. Yamamoto

9513354.1311

24 FEB 92 Preparation of Co^{60} E1-A
KY Pipetted 10 ml of Co^{60} E1 into a 100 ml vol. flask. Pipetted 250 µl of Co Carrier F1 (10.00 mg Co/ml) into the flask. Diluted to mark with 0.1 N HCl. Transferred to a 4 oz PB.
KY 2/24/92
~~19.86~~ 198.6 dpm Co^{60}/ml ± 0.92 @ 201.500-88

$$\left[\left(0.0265\,\frac{mg\,Co}{ml} \times 10\,ml\right) + \left(0.25\,ml \times 10.00\,\frac{mg\,Co}{ml}\right)\right]\frac{1}{100\,ml} = 0.0277\ mg\ Co/ml$$

K Yamamoto

12 MAR 92 Preparation of U^{232} F-G1-B-(5)
KY Pipetted 5 ml of U^{232} F-G1 into a 500 ml vol. flask. Diluted to mark with dist. 2 N HNO_3. Transferred to a 32 oz PB. Pipetted, again, 5 ml of U^{232} F-G1 into the cleaned 500 ml vol. flask and diluted to mark with dist. 2 N HNO_3. Transferred to the same 32 oz PB for a total volume of 1000 m

5,164 dpm U^{232}/ml ± 0.3% @ 206.842-91

K. Yamamoto

MAR 92 Preparation of U^{232} F-G1-A-(9)
KY Transferred the remainder, ~160 ml, of U^{232} F-G1-A-(5) into an 8 oz PB.

10.33 dpm U^{232}/ml ± 0.3% @ 206.842-91

K. Yamamoto

MARCH 92 Preparation of U^{232} F-G1-A-(10)
KY Pipetted 10 ml of U^{232} F-G1 into a 500 ml vol. flask. Diluted to mark with dist. 2 N HNO_3. Transferred to a 32 oz PB. Pipetted, again, 10 ml of U^{232} F-G1 into the cleaned 500 ml vol. flask. Diluted to mark with dist. 2 N HNO_3. Transferred to the same 32 oz PB for a total volume of 1000 ml.

10.33 dpm U^{232}/ml ± 0.3% @ 206.842-91

K Yamamoto

7/27/92 RP — Prep of Am^{243} H-E2-C-(3)

Pipetted 25ml of Am^{243} H-E2 into a 250ml vol flask, diluted to 250ml with 1NHCl. Transferred to 8oz P.B.

99.08 dpm/ml ± 0.7% 262.000-91

R Brenton

D4. 7/27/92 RP — Prep of Am^{243} H-E2-C-(4)

Transferred 100ml of Am^{243} H-E2-C-(3) into 4oz PB

99.08 dpm/ml Am^{243} ± 0.7% 262.000-91

R Brenton

3/4 7/27/92 RP — Dilution Check of Am^{243} H-E2-C-(3) 1008 (112, 113)

Pipetted 500ul Am^{243} H-E2-C-(3) and 1ml Am^{241} A-F3-A into 2 each 50ml beakers Cont TS-AM-1 4/88 Rev 1, Step 2-9.

R Brenton

2 7/27/92 RP — Prep of Co^{60} ~~E1-R~~

Pipeted 25ml of Co^{60} E1 into 100ml vol Flask, add 200ul of Co G1 (1000mg/ml) carrier, diluted to mark with .1NHCl. Transferred to 4oz PB.

496.5 dpm/ml Co^{60} ± 0.9% @ 201.500-89

$[(.0265 \frac{mg}{ml}(Co) \times 25ml) + .2ml \times 10.00 \frac{mg}{ml}(Co)] \frac{L}{100ml} = .0266$ mg Co/ml

R Brenton

9513354.1313

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Cs^{137} F1

Description

Principal radionuclide: CESIUM-137 Half-life: 30.17 years

Nominal activity: 45.8 nano curies

Nominal volume: 5 ml in ampoule/bottle number: 2437-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

9.16 nano curies of Cesium-137

at 0400 hours PST on September 21, 1988

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

8.67 nano curies Per gram

of the daughter nuclide Barium-137m

Total mass of this solution

APPROX. 5.0 grams

Method of measurement

The activity of the primary solution was measured using four pi efficiency tracing.

The activity of the dilution was measured using gamma spectroscopy counting.

Useful Life

This radionuclide has decayed through 0.07 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after January 1995

Cs^{137} F1 Prep'd 2/5/90 by K. Yamamoto

$9.16 \frac{nCi}{g} \times 4.9682 g \times 2220 \frac{dpm}{nCi} \times \frac{1}{100 ml} = 1010. dpm\ Cs^{137}/ml \pm 1.0\%$ @ 265,500-88

0.1N HCl Cs Carrier Conc = 111. µg Cs/ml or 281 µg Cs_2PtCl_6/ml

Rec'd. 3/27/89
K. Yamamoto

5 FEB 90 KY **Preparation of Cs^{137} F1**

Gross 74.4073 g
TARE 69.4391
NET 4.9682 g ✓

Tared a 100 ml vol. flask with top. Broke off the tip of the sealed vial (EPA ampoule # 2437-2, 9.16 nCi Cs^{137}/g at 0400 hrs. PST on 9/21/88). Transferred the Cs^{137} solution to the tared 100 ml vol. flask using a transfer pipet. Weighed the flask + Cs^{137} solution + the top. Pipetted 500λ of Cs Carrier B-A1-A-(6) (53.82 mg Cs_2PtCl_6/ml) into the flask. Diluted to mark with 0.1N HCl. Transferred to 4oz. PB.

$$\frac{9.16\ nCi}{g} \times 4.9682\ g \times \frac{2220\ dpm}{nCi} \times \frac{1}{100\ ml} = 1010.\ dpm\ Cs^{137}/ml \pm 1.0\%$$ ✓ @ 265,500-88 ✓

$$\left[\left(0.1\ \frac{mg}{g} \times 4.9682\ g\right) + \left(53.82\ \frac{mg\ Cs_2PtCl_6}{ml} \times 0.5\ ml \times 0.3945\right)\right] \times \frac{1}{100\ ml} = 0.111\ \frac{mg\ Cs}{ml}$$ ✓

or $2.5348 \times 0.111 = 0.281\ mg\ Cs_2PtCl_6/ml$ ✓

K. Yamamoto
2-5-90

5 FEB 90 KY **Preparation of Cs^{137} F1-A**

Pipetted 10 ml (2 x 5 ml) of Cs^{137} F1 into a 50 ml vol. flask. Pipetted 200λ of Cs Carrier B-A1-A-(6) into the flask. Diluted to mark with 0.1N HCl. Transferred to 4oz. PB.

202.0 dpm Cs^{137}/ml ± 1.1% @ 265,500-88

$$\left[\left(.281\ \frac{mg}{ml} \times 10\ ml\right) + \left(53.82\ \frac{mg}{ml}\right)(0.2\ ml)\right] \times \frac{1}{50\ ml} = 0.271\ mg\ Cs_2PtCl_6/ml$$

K. Yamamoto

6

12 Prep of Pu^{239} H1-A-B 4-14-
Pipetted 2.5 ml (1+1.5 ml) of Pu^{239} H1-A into a 250 ml vol flask. Dilute to mark with 4 $NHNO_3$. Transfer to 8oz PB. RP

1,000 dpm Pu^{239}/ml ± 1.4% @ 81,501-88
R Preston

12 Prep of Cs^{137} F1-A(3) 4-7-92 RP
Pipetted ~~10 ml (2×5 ml) Cs^{137} F1~~ 20 ml Cs^{137} F1 into 100 ml vol flask. Pipetted 200x Cs carrier B-B1 into flask. Diluted to mark with .1 N HCl. Transfer to 4oz PB 4-14 B

202.0 dpm Cs^{137}/ml ± 1.0% @ 265,500-88

$$\left[\left(\frac{.281\,mg}{ml} \times 20\,ml\right) + \left(\frac{53.24\,mg}{ml}\right)(0.2\,ml)\right] \times \frac{1}{100\,ml} = 0.163\,mg\ CsCl/ml$$

R Preston 4-15 ó

12 Prep of Am242 H-E2-D-(4) TC

Transferred ~250 ml Am^{242} H-E2-D-(1) into 8oz PB.

4,954 dpm/ml ± .7% @ 262,000-91 4-15
R Preston

12 Prep of Pu^{242} C4-D2-A-(16) TC

Transfer ~250 ml Pu^{242} C4-D2-A-(14) into 8oz PB

~~5,952~~ 4/13/92
5,962 dpm/ml ± 0.6% 160-26940

APPENDIX 16 = PRIMARY CALIBRATION REFERENCES. INCLUDED ARE CERTIFICATES OF CALIBRATION FOR THE FOLLOWING DETECTORS:

- LBG Beta Counters
- LB4000 Gas Proportional Counters
- LB4000 GPC for Gross Alpha/Beta
- Gamma Spectrometers G1, G2, G3, G4, and G5 for Efficiency Versus Energy

Certificate of Calibration		TMA/*Norcal*
Calibration: ^{90}Y	Instrument: LBG beta counters	Type: Gas Flow Geiger Counter
Calibration Standard: ^{90}Y - Solution SRM 4234-38 from NBS (^{90}Sr)		
Status	Date	Reference Document
Original Calibration:	March, 1980	CAL 7902
Verification:		
Summary of Results	Standard Efficiency = 56.85% P-Factor = 1.759	

Self Absorption Correction Table
Spline fit

Planchet area = 3.30 sq cm
T = Sample thickness in mg/sq cm = total weight/3.30
PPT = Self absorption divisor

T	PPT	T	PPT	T	PPT	T	PPT
0.00	0.9450	3.05	0.9990	6.09	0.9888	9.14	0.9779
0.14	0.9531	3.18	0.9990	6.23	0.9883	9.28	0.9774
0.27	0.9613	3.32	0.9990	6.37	0.9878	9.41	0.9769
0.41	0.9694	3.45	0.9985	6.50	0.9873	9.55	0.9764
0.54	0.9775	3.59	0.9977	6.64	0.9868	9.68	0.9760
0.68	0.9849	3.72	0.9972	6.77	0.9864	9.82	0.9755
0.81	0.9895	3.86	0.9967	6.91	0.9859	9.95	0.9750
0.95	0.9940	4.00	0.9962	7.04	0.9854	10.09	0.9745
1.08	0.9967	4.13	0.9958	7.18	0.9849	10.23	0.9740
1.22	0.9982	4.27	0.9953	7.31	0.9844	10.36	0.9735
1.35	0.9995	4.40	0.9948	7.45	0.9840	10.50	0.9730
1.56	1.0010	4.60	0.9941	7.65	0.9832	10.70	0.9723
1.69	1.0010	4.74	0.9936	7.79	0.9828	10.83	0.9718
1.83	1.0010	4.88	0.9931	7.92	0.9823	10.97	0.9713
1.96	1.0010	5.01	0.9926	8.06	0.9818	11.11	0.9709
2.10	1.0010	5.15	0.9921	8.19	0.9813	11.24	0.9704
2.23	1.0000	5.28	0.9917	8.33	0.9808	11.38	0.9699
2.37	1.0000	5.42	0.9912	8.46	0.9803	11.51	0.9694
2.51	1.0000	5.55	0.9907	8.60	0.9798	11.65	0.9689
2.64	0.9997	5.69	0.9902	8.74	0.9794	11.78	0.9684
2.78	0.9994	5.82	0.9897	8.87	0.9789	11.92	0.9679
2.91	0.9992	5.96	0.9893	9.01	0.9784	12.05	0.9675

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Certificate of Calibration		TMA/*Norcal*
Calibration: ^{90}Y	Instrument: LB4000 (2")	Type: 2" Gas Proportional Counter

Calibration Standard:

^{90}Y - Solution 2454-2 from EPA - EMSL

Status	Date	Reference Document
Original Calibration:	January, 1991	TLW 6229
Verification:		

Summary of Results

Standard Efficiency = 63.57%
P-Factor = 1.573

Self Absorption Correction Table
Spline fit

Planchet area = 3.30 sq cm
T = Sample thickness in mg/sq cm = total weight/3.30
PPT = Self absorption divisor

T	PPT	T	PPT	T	PPT	T	PPT
0.00	1.0400	3.05	0.9999	6.09	0.9879	9.14	0.9758
0.14	1.0372	3.18	0.9994	6.23	0.9873	9.28	0.9752
0.27	1.0343	3.32	0.9989	6.37	0.9868	9.41	0.9746
0.41	1.0314	3.45	0.9983	6.50	0.9863	9.55	0.9740
0.54	1.0285	3.59	0.9978	6.64	0.9857	9.68	0.9735
0.68	1.0263	3.72	0.9972	6.77	0.9852	9.82	0.9729
0.81	1.0250	3.86	0.9967	6.91	0.9846	9.95	0.9723
0.95	1.0231	4.00	0.9962	7.04	0.9841	10.09	0.9717
1.08	1.0200	4.13	0.9956	7.18	0.9836	10.23	0.9711
1.22	1.0169	4.27	0.9951	7.31	0.9830	10.36	0.9705
1.35	1.0161	4.40	0.9946	7.45	0.9825	10.50	0.9700
1.49	1.0152	4.54	0.9940	7.58	0.9820	10.63	0.9694
1.63	1.0136	4.67	0.9935	7.72	0.9814	10.77	0.9688
1.76	1.0118	4.81	0.9930	7.86	0.9809	10.90	0.9682
1.90	1.0102	4.94	0.9924	7.99	0.9804	11.04	0.9676
2.03	1.0089	5.08	0.9919	8.13	0.9798	11.17	0.9671
2.17	1.0075	5.21	0.9913	8.26	0.9793	11.31	0.9665
2.30	1.0062	5.35	0.9908	8.40	0.9787	11.44	0.9659
2.44	1.0048	5.49	0.9903	8.53	0.9782	11.58	0.9653
2.57	1.0030	5.62	0.9897	8.67	0.9777	11.71	0.9647
2.71	1.0013	5.76	0.9892	8.80	0.9771	11.85	0.9642
2.84	1.0006	5.89	0.9887	8.94	0.9766	11.99	0.9636
2.98	1.0002	6.03	0.9881	9.07	0.9761	12.12	0.9630

Certificate of Calibration		TMA/*Norcal*
Calibration: Gross Alpha, Beta	Instrument: LB4000 (2")	Type: 2" Gas Proportional Counter

Calibration Standard:

^{241}Am - Solution S3/46/30 from Amersham Corporation
^{90}Sr - Solution SRM 4919-E from National Bureau of Standards

Status	Date	Reference Document
Original Calibration:	March, 1990	TLW 6227
Verification:		

Summary of Results

Tabulated Data For Efficiency and Correction Curves

mg	Gross Alpha % eff	% Alpha In Beta Channel	Gross Beta % Eff	% Beta In Alpha Channel
0	28.0	35.7	44.0	0.650
10	22.7	23.3	43.5	0.645
20	20.5	23.9	43.0	0.641
30	18.5	24.8	42.5	0.636
40	16.5	25.4	42.3	0.632
50	15.0	26.0	42.2	0.627
60	13.5	26.9	42.0	0.623
70	12.5	27.6	41.8	0.618
80	11.0	28.3	41.5	0.613
90	10.5	29.4	41.3	0.609
100	9.5	30.2	41.0	0.604
110	9.0	31.3	40.8	0.600
120	8.5	32.1	40.6	0.595
130	7.7	33.0	40.5	0.590
140	7.4	34.0	40.4	0.586
150	7.0	35.0	40.2	0.581
160	6.8	35.9	40.0	0.577
170	6.5	36.8	40.0	0.572
180	6.0	37.5	40.0	0.568
190	5.8	38.3	40.0	0.563
200	5.6	39.2	40.0	0.558
210	5.4	40.5	40.0	0.554
220	5.2	41.9	40.0	0.549
230	5.0	43.1	40.0	0.545
240	5.0	44.9	40.0	0.540
250	5.0	46.5	40.0	0.536

Certificate of Calibration		TMA/*Norcal*
Calibration: Efficiency vs Energy	Instrument: G1	Type: Germanium Gamma Spectrometer
Calibration Standard: Multi-gamma standard solution R9/10/135 from Amersham Corporation		
Status	Date	Reference Document
Original Calibration:	March, 1989	*1989 Ge(Li) Calibration, G1*
Verification:		

Summary of Results

The following geometries were calibrated:

60-ml Petri Dish	PD
2" Stainless Steel Planchet	ST
Nylon Planchet	NY,PL
Gamma Well Vial	GW
Small Petri Dish	SP
125-ml Plastic Jar	JR
1" Stainless Steel Cup	CP
3 Filter Papers	FL

Complete efficiency curves can be found in the above referenced document.

Certificate of Calibration		TMA/*Norcal*
Calibration: Efficiency vs Energy	Instrument: G2	Type: Germanium Gamma Spectrometer
Calibration Standard: Multi-gamma standard solution R9/10/135 from Amersham Corporation		
Status	**Date**	**Reference Document**
Original Calibration:	March, 1989	*1989 Ge(Li) Calibration, G2*
Verification:		

Summary of Results

The following geometries were calibrated:

Marinelli Beaker	MB
60-ml Petri Dish	PD
2" Stainless Steel Planchet	ST
Nylon Planchet	NY,PL
Gamma Well Vial	GW
Small Petri Dish	SP
125-ml Plastic Jar	JR
1" Stainless Steel Cup	CP
3 Filter Papers	FL
1" Stainless Steel Cup (0.1g)	CL

Complete efficiency curves can be found in the above referenced document.

Certificate of Calibration		TMA/*Norcal*
Calibration: Efficiency vs Energy	Instrument: G3	Type: Germanium Gamma Spectrometer
Calibration Standard: Multi-gamma standard solution R9/10/135 from Amersham Corporation		
Status	Date	Reference Document
Original Calibration:	March, 1989	*1989 Ge(Li) Calibration, G3*
Verification:		

Summary of Results

The following geometries were calibrated:

Marinelli Beaker	MB
60-ml Petri Dish	PD
2" Stainless Steel Planchet	ST
Nylon Planchet	NY,PL
Gamma Well Vial	GW
Small Petri Dish	SP
125-ml Plastic Jar	JR
1" Stainless Steel Cup	CP
3 Filter Papers	FL
1" Stainless Steel Cup (0.1g)	CL

Complete efficiency curves can be found in the above referenced document.

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Certificate of Calibration		TMA/*Norcal*
Calibration: Efficiency vs Energy	Instrument: G4	Type: Germanium Gamma Spectrometer
Calibration Standard: Multi-gamma standard solution R9/10/135 from Amersham Corporation		
Status	**Date**	**Reference Document**
Original Calibration:	March, 1989	*1989 Ge(Li) Calibration, G4*
Verification:		

Summary of Results

The following geometries were calibrated:

Marinelli Beaker	MB
60-ml Petri Dish	PD
2" Stainless Steel Planchet	ST
Nylon Planchet	NY,PL
Small Petri Dish	SP
125-ml Plastic Jar	JR
1" Stainless Steel Cup	CP
3 Filter Papers	FL
1" Stainless Steel Cup (0.1g)	CL

Complete efficiency curves can be found in the above referenced document.

9513354.1324

Certificate of Calibration		TMA/*Norcal*
Calibration: Efficiency vs Energy	Instrument: G5	Type: Germanium Gamma Spectrometer
Calibration Standard: Multi-gamma standard solution R9/10/135 from Amersham Corporation		

Status	Date	Reference Document
Original Calibration:	March, 1989	*1989 Ge(Li) Calibration, G5*
Verification:		

Summary of Results

The following geometries were calibrated:

Marinelli Beaker	MB
60-ml Petri Dish	PD
2" Stainless Steel Planchet	ST
Nylon Planchet	NY,PL
Gamma Well Vial	GW
Small Petri Dish	SP
125-ml Plastic Jar	JR
1" Stainless Steel Cup	CP
3 Filter Papers	FL
1" Stainless Steel Cup (0.1g)	CL

Complete efficiency curves can be found in the above referenced document.