

14 0 897.9 890 13 9539 2.55 59416 897.2 4.06E+02 0.5 100. 0 0.00
 15 0 1173.1 1165 14 5138 2.89 38042 1172.5 2.60E+02 0.6 100. 0 0.00
 16 3 1325.5 1318 21 3048 4.40 1473 1325.1 1.01E+01 10.8 100. 0 52.80
 17 3 1332.5 1318 21 2234 3.25 34494 1332.1 2.35E+02 0.6 100. 0 0.00
 18 0 1835.7 1827 21 866 3.97 34037 1836.5 2.32E+02 0.6 100. 0 0.00
 19 0 1929.4 1928 8 148 1.89 33 1930.6 2.26E-01 68.5 100. 0 0.00
 WHM=SQRT(3.07145E+00 + 4.78615E-03 *E)

 BACKGROUND INFO 1057 GLY 4 182.204 98 G- 5 BG DATE 179.310 98

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
661.63	332.0463	0.66	661.60	0.0000	0.00	332.0463	0.66
1173.11	259.6752	0.65	1173.20	0.0280	0.00	259.6472	0.65
1332.49	235.4518	0.60	1332.50	0.0443	0.00	235.4075	0.60

0 PEAKS REJECTED BY BACKGROUND

 INTERFERING ISOTOPE ANALYSIS 1057 GLY 4 182.204 98 G- 5

 SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 5 OF 179.310/1998 1858.9 MIN								
ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0771	30.50	511.0	0.6265	5.20	1120.3	0.0157	0.00
92.0	0.3421	12.28	583.1	0.1034	28.53	1173.2	0.0280	0.00
143.0	0.0888	21.39	609.3	0.0416	36.33	1238.1	0.0090	0.00
186.0	0.2678	17.37	661.6	0.0000	0.00	1332.5	0.0443	0.00
198.0	0.0847	33.65	727.2	0.0500	0.00	1377.7	0.0000	0.00
238.6	0.2281	19.42	846.0	0.0423	38.34	1460.8	0.2349	4.30
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0748	0.00	911.1	0.0704	23.43	1591.3	0.0098	0.00
338.4	0.0691	34.76	968.9	0.0384	30.47	1729.6	0.0194	0.00
351.9	0.0518	15.05	1001.0	0.0333	0.00	1764.5	0.0326	30.63

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 7/30/98

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD				LOW RADIUM STANDARD					
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		
102.226	98	1.8169	3.354	23.*	180.971	91	1.0568	2.669	22.
109.201	98	1.2475	11.413	44.	207.975	91	1.0647	2.084	11.
116.243	98	0.9899	11.212	11.	213.856	91	1.1437	10.869	44.
130.191	98	0.9758	11.028	15.	104.847	98	1.5613	4.800	18.
131.691	98	0.9872	11.255	39.	104.889	98	1.0083	5.754	38.*
152.846	98	0.9940	11.606	167.	107.860	98	1.0121	5.168	32.*
158.250	98	0.9803	10.108	10.	123.228	98	0.9476	6.512	29.*
165.222	98	0.9668	11.642	12.	131.720	98	1.0055	5.765	51.*
198.994	98	0.9710	10.603	10.	199.694	98	0.9998	6.630	10.*
207.230	98	0.9555	10.341	19.	210.754	98	0.9223	6.492	145.*
AVERAGE		1.0076	0.091		AVERAGE		0.9826	0.038	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 165.222 98
 ENERGY= -0.064555 + 1.0022677*CH + -1.465570E-06*CH**2
 FWHM =SQRT(0.5129 + 0.007540*ENERGY) (CO60= 3.250)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

NO EFFICIENCIES

 1057 GLY 4 G-5 XX 198.089 98 202.12 MIN 2.00000 ML 146
 LIBR=C981 REF TIME= 121.500 98 Calibration 1234

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	DPM/ML AT TZERO
Am241 59 (59.54)	1.582E+05 DAYS 0.073342	LAMBDA= 4.381E-06 1.00000	DECAY= 9.997E-01 41G 81.606	1.113E+03	2.52%	5.565E+02
Cd109 88 (88.03)	4.530E+02 DAYS 0.041771	LAMBDA= 1.530E-03 1.00000	DECAY= 8.894E-01 1G 159.923	3.829E+03	1.27%	2.152E+03
Co 57 122 (122.06) 136 (136.47)	2.700E+02 DAYS 0.038133 0.111000	LAMBDA= 2.567E-03 1.00000 1.00000	DECAY= 8.215E-01 10G 200.562 25.090	5.260E+03 2.260E+02	1.04% 6.55%	3.201E+03 1.376E+02
Ce139 166 (165.80)	1.372E+02 DAYS 0.063273	LAMBDA= 5.052E-03 1.00000	DECAY= 6.791E-01 2G 283.870	4.486E+03	0.81%	3.303E+03
Cr 51 320 (320.03)	2.772E+01 DAYS 0.186701	LAMBDA= 2.501E-02 1.00000	DECAY= 1.473E-01 1G 109.167	5.847E+02	1.59%	1.984E+03
Sn113 392 (391.40)	1.150E+02 DAYS 0.134211	LAMBDA= 6.027E-03 1.00000	DECAY= 6.303E-01 4G 279.198	2.080E+03	0.67%	1.650E+03
As 85 514 (513.98)	6.520E+01 DAYS 0.248480	LAMBDA= 1.063E-02 1.00000	DECAY= 4.430E-01 4G 297.972	1.199E+03	0.58%	1.354E+03
Cs137 662 (661.64)	1.102E+04 DAYS 0.157793	LAMBDA= 6.290E-05 1.00000	DECAY= 9.952E-01 3G 325.888	2.065E+03	0.54%	1.038E+03
Y 88 898 (898.00) 1836 (1836.10)	1.066E+02 DAYS 0.394059 0.416536	LAMBDA= 6.502E-03 1.00000 1.00000	DECAY= 6.077E-01 7G 364.900 204.659	9.260E+02 4.913E+02	0.50% 0.52%	7.618E+02 4.042E+02
Co 60 1173 (1173.21) 1333 (1332.48)	1.921E+03 DAYS 0.221390 0.221520	LAMBDA= 3.608E-04 1.00000 1.00000	DECAY= 9.727E-01 4G 258.141 229.572	1.166E+03 1.036E+03	0.57% 0.51%	5.993E+02 5.327E+02

NP: [7,67]146. GSP 19 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	10.7	8	15	10390	3.91	46546	10.7	2.30E+02	0.60	0.007	0	*****
2	5	14.7	8	15	42158	4.83	26966	14.7	1.33E+02	1.90	0.019	0	0.00
3	0	59.4	55	9	47723	1.89	16494	59.3	8.16E+01	2.5	100.	0	0.00
4	0	70.5	69	4	21877	3.76	1130	70.4	5.59E+00	18.6	100.	0	0.00
5	0	88.0	84	8	45912	1.32	32320	87.9	1.60E+02	1.3	100.	0	0.00
6	0	122.0	118	8	46052	1.36	40530	121.8	2.01E+02	1.0	100.	0	0.00
7	0	136.5	133	7	38284	1.64	5070	136.2	2.51E+01	6.6	100.	0	0.00
8	0	165.8	161	9	48211	1.84	57354	165.6	2.84E+02	0.8	100.	0	0.00
9	0	255.1	252	7	26372	1.67	2722	254.7	1.35E+01	10.1	100.	0	0.00
10	0	320.1	315	10	28489	1.93	22025	319.6	1.09E+02	1.6	100.	0	0.00
11	0	391.7	386	11	22879	1.81	56407	391.1	2.79E+02	0.7	100.	0	0.00
12	0	514.0	507	11	16609	2.16	60180	513.3	2.98E+02	0.6	100.	0	0.00
13	0	661.8	655	11	15788	2.17	45047	661.8	3.26E+02	0.5	100.	0	0.00

```

14 0 813.9 809 9 7620 2.99 1716 813.1 8.49E+00 9.5 100. 0 0.00
15 0 898.2 890 14 13294 2.53 73719 897.4 3.65E+02 0.5 100. 0 0.00
16 0 1173.4 1165 16 7142 2.98 52179 1172.8 2.58E+02 0.6 100. 0 0.00
17 6 1326.2 1318 22 4583 5.91 2508 1325.8 1.24E+01 9.9 100. 0 42.90
18 6 1332.8 1318 22 2722 3.22 46408 1332.5 2.30E+02 0.5 100. 0 0.00
19 0 1835.8 1827 17 1048 4.06 41346 1836.6 2.05E+02 0.5 100. 0 0.00

```

WHM=SQRT(5.64138E+00 + 6.28274E-03 *E)

```

*****
BACKGROUND INFO 1057 GLY 4 198.089 98 G- 5 BG DATE 192.294 98
*****

```

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
661.82	325.8863	0.54	661.60	0.0000	0.00	325.8863	0.54
1173.41	258.1628	0.57	1173.20	0.0280	0.00	258.1348	0.57
1332.83	229.6109	0.51	1332.50	0.0443	0.00	229.5666	0.51

0 PEAKS REJECTED BY BACKGROUND

```

*****
INTERFERING ISOTOPE ANALYSIS 1057 GLY 4 198.089 98 G- 5
*****
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

```

BACKGROUND FOR GELI DETECTOR 5 OF 192.294/1998 2374.2 MIN								
ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0669	35.57	511.0	0.6311	3.44	1120.3	0.0241	29.42
92.0	0.3445	8.45	583.1	0.1056	25.77	1173.2	0.0280	0.00
143.0	0.0856	20.92	609.3	0.0449	38.06	1238.1	0.0090	0.00
186.0	0.2615	20.46	661.6	0.0000	0.00	1332.5	0.0443	0.00
198.0	0.0830	30.12	727.2	0.0500	0.00	1377.7	0.0000	0.00
238.6	0.2436	18.76	846.0	0.0367	51.26	1460.8	0.2388	4.73
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0748	0.00	911.1	0.0743	20.60	1591.3	0.0098	0.00
338.4	0.0662	46.68	968.9	0.0423	28.83	1729.6	0.0081	0.00
351.9	0.0458	29.71	1001.0	0.0324	3.70	1764.5	0.0303	30.35

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 7/30/98

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD					LOW RADIUM STANDARD				
GMT YEAR	NORMALISED %		LENGTH IN MINUTES		GMT YEAR	NORMALISED %		LENGTH IN MINUTES	
	CPM	ERROR				CPM	ERROR		
102.226	98	1.8169	3.354	23.*	180.971	91	1.0568	2.669	22.
109.201	98	1.2475	11.413	44.	207.975	91	1.0647	2.084	11.
116.243	98	0.9899	11.212	11.	213.856	91	1.1437	10.869	44.
130.191	98	0.9758	11.028	15.	104.847	98	1.5613	4.800	18.
131.691	98	0.9872	11.255	39.	104.889	98	1.0083	5.754	38.*
152.846	98	0.9940	11.606	167.	107.860	98	1.0121	5.168	32.*
158.250	98	0.9803	10.108	10.	123.228	98	0.9476	6.512	29.*
165.222	98	0.9668	11.642	12.	131.720	98	1.0055	5.765	51.*
198.994	98	0.9710	10.603	10.	199.694	98	0.9998	6.630	10.*
207.230	98	0.9555	10.341	19.	210.754	98	0.9223	6.492	145.*
AVERAGE		1.0076	0.091		AVERAGE		0.9826	0.038	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 165.222 98
 ENERGY= -0.064555 + 1.0022677*CH + -1.465570E-06*CH**2
 FWHM =SQRT(0.5129 + 0.007540*ENERGY) (CO60= 3.250)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

NO EFFICIENCIES

1057 GLY 4 G-5 XX 205.200 98 563.00 MIN 2.00000 ML 302

LIBR=C981 REF TIME= 121.500 98 Calibration 1234

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAF	DPM NOW	ERROR PCT	DPM/ML AT TZERO
Am241 59 (59.54)	1.582E+05 DAYS 0.073342	LAMBDA= 4.381E-06 1.00000	DECAY= 9.996E-01 78.894	41G 1.076E+03	± 1.55%	5.380E+02
Cd109 88 (88.03)	4.530E+02 DAYS 0.041771	LAMBDA= 1.530E-03 1.00000	DECAY= 8.798E-01 157.837	1G 3.779E+03	± 0.51%	2.147E+03
Co 57 122 (122.06) 136 (136.47)	2.700E+02 DAYS 0.038133 0.111000	LAMBDA= 2.567E-03 1.00000 1.00000	DECAY= 8.066E-01 196.707 24.427	10G 5.158E+03 2.201E+02	± 0.63% 4.41%	3.197E+03 1.364E+02
Ce139 166 (165.80)	1.372E+02 DAYS 0.063273	LAMBDA= 5.052E-03 1.00000	DECAY= 6.552E-01 271.769	2G 4.295E+03	± 0.50%	3.278E+03
Cr 51 320 (320.03)	2.772E+01 DAYS 0.186701	LAMBDA= 2.501E-02 1.00000	DECAY= 1.233E-01 93.346	1G 5.000E+02	± 1.00%	2.027E+03
Sn113 392 (391.40)	1.150E+02 DAYS 0.134211	LAMBDA= 6.027E-03 1.00000	DECAY= 6.038E-01 265.970	4G 1.982E+03	± 0.38%	1.641E+03
85 514 (513.98)	6.520E+01 DAYS 0.248480	LAMBDA= 1.063E-02 1.00000	DECAY= 4.107E-01 277.785	4G 1.118E+03	± 0.38%	1.361E+03
Cs137 662 (661.64)	1.102E+04 DAYS 0.157793	LAMBDA= 6.290E-05 1.00000	DECAY= 9.947E-01 326.407	3G 2.069E+03	± 0.32%	1.040E+03
Y 88 898 (898.00) 1835 (1836.10)	1.066E+02 DAYS 0.394059 0.416536	LAMBDA= 6.502E-03 1.00000 1.00000	DECAY= 5.803E-01 348.756 197.419	7G 8.850E+02 4.740E+02	± 0.31% ± 0.33%	7.626E+02 4.084E+02
Co 60 1173 (1173.21) 1332 (1332.48)	1.921E+03 DAYS 0.221390 0.221520	LAMBDA= 3.608E-04 1.00000 1.00000	DECAY= 9.703E-01 258.223 228.629	4G 1.166E+03 1.032E+03	± 0.33% ± 0.31%	6.011E+02 5.319E+02

NO EFFICIENCIES

1057 GLY 4 G-5 XX 205.200 98 563.00 MIN 2.00000 ML 302

LIBR=C981 REF TIME= 121.500 98 Calibration 1234

* Group..... 1057 * Time of count 205.200 1998 *
* Sample..... 4 * Reference GMT..... 121.500 1998 *
* Element..... * Elapsed Live Tm..... 563. *
* Type code..... GLY * Dead Time Pct..... 0.690871 *
* ID.... 0 MB 500 mLs in Marinelli * Background GMT..... 200.997 1998 *
* Geometry, detector..... XX-5 * Standard GMT..... 199.694 1998 *
* Aliquot..... 2. * Days since TO..... 83.69972 *
* Unit of Aliquot..... ML * Time on..... 21:47 PDT 23-JUL *
* Data Sheet Units..... DPM /ML * Time off..... 7:11 PDT 24-JUL *
* Library..... C981 * Calc Time..... 08:20 24-JUL-98 *

* Slope..... 1.002042 * Width slope..... 0.006389 *
* Intercept..... -.1187 * Width offset..... 1.085121 *
* X**2 TERM..... -0.14328937E-05 * Sensitivity..... 4. *
NP: [7,67]302.GSP 20 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	11.9	10	8176905	4.27	64051	12.0	1.14E+02	1.00	0.10	0	0.00	
2	0	59.3	55	9131066	1.95	44417	59.3	7.89E+01	1.5	100.	0	0.00	
3	0	70.2	68	6 87326	2.21	3365	70.2	5.98E+00	14.0	100.	0	0.00	
4	3	80.2	77	15 73628	1.83	3853	80.2	6.84E+00	10.7	100.	0	126.00	
5	3	87.9	77	15 58656	1.38	88836	87.9	1.58E+02	0.5	100.	0	0.00	
6	0	121.9	118	8124420	1.42	110690	121.8	1.97E+02	0.6	100.	0	0.00	
7	0	136.3	133	8117268	1.52	13745	136.2	2.44E+01	4.4	100.	0	0.00	
8	0	165.7	161	9130483	1.93	152854	165.5	2.71E+02	0.5	100.	0	0.00	
9	0	254.9	252	7 71888	1.85	7166	254.6	1.27E+01	6.3	100.	0	0.00	
10	0	319.9	315	9 68931	2.01	52296	319.5	9.29E+01	1.0	100.	0	0.00	
11	0	391.5	386	9 51268	1.71	149564	391.1	2.66E+02	0.4	100.	0	0.00	
12	0	513.8	507	12 49419	2.15	156066	513.2	2.77E+02	0.4	100.	0	0.00	
13	0	661.5	655	11 41915	2.17	183765	660.9	3.26E+02	0.3	100.	0	0.00	
14	0	758.7	756	6 15082	2.58	384	758.1	6.82E-01	51.0	100.	0	0.00	
15	0	813.6	809	8 18862	3.02	3964	813.0	7.04E+00	6.2	100.	0	0.00	
16	0	897.8	890	14 36661	2.56	196099	897.3	3.48E+02	0.3	100.	0	0.00	
17	0	1172.9	1165	15 18682	2.98	145385	1172.6	2.58E+02	0.3	100.	0	0.00	
18	4	1325.6	1318	21 11959	5.11	5961	1325.5	1.06E+01	6.2	100.	0	131.00	
19	4	1332.3	1318	21 7248	3.18	128734	1332.3	2.29E+02	0.3	100.	0	0.00	
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1835.3	1827	20 3354	4.09	111005	1836.5	1.97E+02	0.3	100.	0	0.00	

FWHM=SQRT(3.16640E+00 + 7.35169E-03 *E)

BACKGROUND INFO 1057 GLY 4 205.200 98 G- 5 BG DATE 200.997 98

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
661.53	326.4033	0.32	661.60	0.0000	0.00	326.4033	0.32
72.95	258.2331	0.33	1173.20	0.0280	0.00	258.2051	0.33
1332.33	228.6569	0.31	1332.50	0.0443	0.00	228.6126	0.31

0 PEAKS REJECTED BY BACKGROUND

INTERFERING ISOTOPE ANALYSIS 1057 GLY 4 205.200 98 G- 5

SPANF TABLE SAVED IN GSTR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 5 OF 200.997/1998 835.4 MIN								
ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0669	35.57	511.0	0.6157	8.25	1120.3	0.0241	29.42
92.0	0.3437	8.55	583.1	0.1128	29.43	1173.2	0.0280	0.00
143.0	0.0887	21.53	609.3	0.0456	32.64	1238.1	0.0090	0.00
186.0	0.2522	21.01	661.6	0.0000	0.00	1332.5	0.0443	0.00
198.0	0.0830	30.12	727.2	0.0500	0.00	1377.7	0.0000	0.00
238.6	0.2455	19.75	846.0	0.0367	51.26	1460.8	0.2436	6.45
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0748	0.00	911.1	0.0776	21.64	1591.3	0.0098	0.00
338.4	0.0662	46.68	968.9	0.0426	31.24	1729.6	0.0081	0.00
351.9	0.0458	29.71	1001.0	0.0324	3.70	1764.5	0.0285	36.09

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 DN 7/24/98

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD					LOW RADIUM STANDARD				
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	
316.886	94	1.1321	3.704	23.*	162.972	91	1.0585	1.586	16.
102.226	98	1.8169	3.354	23.*	180.971	91	1.0568	2.669	22.
109.201	98	1.2475	11.413	44.	207.975	91	1.0647	2.084	11.
116.243	98	0.9899	11.212	11.	213.856	91	1.1437	10.869	44.
130.191	98	0.9758	11.028	15.	104.847	98	1.5613	4.800	18.
131.691	98	0.9872	11.255	39.	104.889	98	1.0083	5.754	38.*
152.846	98	0.9940	11.606	167.	107.860	98	1.0121	5.168	32.*
158.250	98	0.9803	10.108	10.	123.228	98	0.9476	6.512	29.*
165.222	98	0.9668	11.642	12.	131.720	98	1.0055	5.765	51.*
198.994	98	0.9710	10.603	10.	199.694	98	0.9998	6.630	10.*
AVERAGE		1.0141	0.095		AVERAGE		0.9947	0.027	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 199.694 98
 ENERGY= -0.118700 + 1.0020416*CH + -1.432894E-06*CH**2
 FWHM =SQRT(1.0851 + 0.006390*ENERGY) (CO60= 3.098)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

Det ... GELI 5
Geo ... MB - Marinelli beaker
Shif ... 0
Ref ...

Date ... 02-FEB-90 Page 1
Version ... 1.00
File ... ND: [25,4]GELIOSMBO.EFF

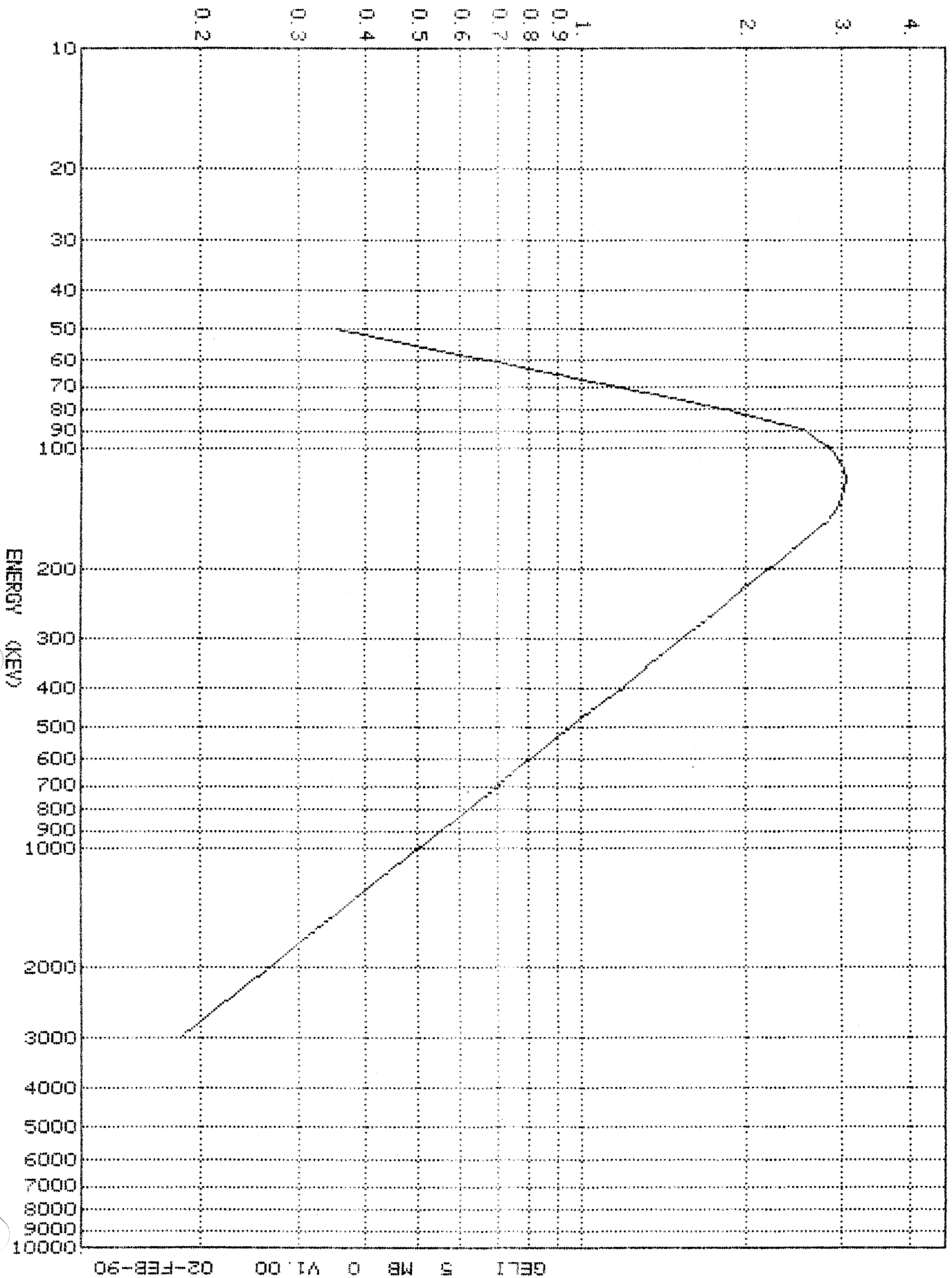
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.35702	108	2.97052	216	2.03704	324	1.41734	432	1.09498
51	0.38290	110	3.00000	218	2.01835	326	1.40933	434	1.09008
52	0.41010	112	3.01029	220	2.00000	328	1.40140	436	1.08522
53	0.43865	114	3.02042	222	1.98514	330	1.39357	438	1.08041
54	0.46861	116	3.03042	224	1.97052	332	1.38583	440	1.07563
55	0.50000	118	3.04028	226	1.95613	334	1.37818	442	1.07090
56	0.53287	120	3.05000	228	1.94198	336	1.37062	444	1.06622
57	0.56727	122	3.03961	230	1.92805	338	1.36314	446	1.06157
58	0.60322	124	3.02942	232	1.91434	340	1.35575	448	1.05697
59	0.64079	126	3.01942	234	1.90085	342	1.34844	450	1.05240
60	0.68000	128	3.00962	236	1.88756	344	1.34121	452	1.04788
61	0.72025	130	3.00000	238	1.87448	346	1.33406	454	1.04339
62	0.76217	132	2.98963	240	1.86159	348	1.32699	456	1.03895
63	0.80580	134	2.97945	242	1.84890	350	1.32000	458	1.03454
64	0.85118	136	2.96946	244	1.83640	352	1.31370	460	1.03017
65	0.89835	138	2.95964	246	1.82409	354	1.30747	462	1.02583
66	0.94736	140	2.95000	248	1.81196	356	1.30130	464	1.02154
67	0.99824	142	2.92916	250	1.80000	358	1.29519	466	1.01728
68	1.05104	144	2.90875	252	1.78883	360	1.28914	468	1.01305
69	1.10580	146	2.88877	254	1.77385	362	1.28316	470	1.00886
70	1.16256	148	2.86919	256	1.76108	364	1.27724	472	1.00471
71	1.22138	150	2.85000	258	1.74849	366	1.27138	474	1.00059
72	1.28228	152	2.81665	260	1.73609	368	1.26557	476	0.99651
73	1.34531	154	2.78412	262	1.72387	370	1.25983	478	0.99245
74	1.41052	156	2.75238	264	1.71183	372	1.25414	480	0.98844
75	1.47795	158	2.72140	266	1.69996	374	1.24850	482	0.98445
76	1.54765	160	2.69115	268	1.68826	376	1.24292	484	0.98050
77	1.61966	162	2.66160	270	1.67673	378	1.23740	486	0.97658
78	1.69402	164	2.63274	272	1.66536	380	1.23193	488	0.97269
79	1.77079	166	2.60453	274	1.65415	382	1.22651	490	0.96883
80	1.85000	168	2.57696	276	1.64310	384	1.22115	492	0.96501
81	1.91526	170	2.55000	278	1.63220	386	1.21583	494	0.96121
82	1.98199	172	2.52305	280	1.62145	388	1.21057	496	0.95744
83	2.05019	174	2.49669	282	1.61085	390	1.20535	498	0.95371
84	2.11987	176	2.47090	284	1.60039	392	1.20019	500	0.95000
85	2.19105	178	2.44567	286	1.59007	394	1.19507	502	0.94643
86	2.26375	180	2.42097	288	1.57989	396	1.19000	504	0.94289
87	2.33799	182	2.39679	290	1.56984	398	1.18498	506	0.93938
88	2.41376	184	2.37311	292	1.55993	400	1.18000	508	0.93589
89	2.49109	186	2.34992	294	1.55014	402	1.17430	510	0.93243
90	2.57000	188	2.32720	296	1.54049	404	1.16865	512	0.92900
91	2.59803	190	2.30494	298	1.53095	406	1.16305	514	0.92559
92	2.62604	192	2.28312	300	1.52154	408	1.15751	516	0.92221
93	2.65406	194	2.26172	302	1.51225	410	1.15203	518	0.91885
94	2.68207	196	2.24075	304	1.50308	412	1.14659	520	0.91552
95	2.71007	198	2.22018	306	1.49402	414	1.14121	522	0.91222
96	2.73807	200	2.20000	308	1.48508	416	1.13588	524	0.90893
97	2.76606	202	2.17822	310	1.47624	418	1.13060	526	0.90567
98	2.79404	204	2.15686	312	1.46752	420	1.12537	528	0.90244
99	2.82202	206	2.13592	314	1.45890	422	1.12018	530	0.89923
100	2.85000	208	2.11538	316	1.45039	424	1.11505	532	0.89604
102	2.88054	210	2.09524	318	1.44198	426	1.10996	534	0.89288
104	2.91080	212	2.07547	320	1.43367	428	1.10492	536	0.88974
106	2.94079	214	2.05607	322	1.42546	430	1.09993	538	0.88662

Det ... GELI 5
 Geo ... MB - Marinelli beaker
 Shif ... 0
 Ref ...

Date 02-FEB-90 Page 2
 Version ... 1.00
 File ND: [25, 4]GELI05MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	0.88353	660	0.73522	930	0.53623	1260	0.40232	1800	0.29188
542	0.88045	665	0.73032	935	0.53347	1270	0.39952	1810	0.29040
544	0.87740	670	0.72549	940	0.53073	1280	0.39677	1820	0.28894
546	0.87437	675	0.72072	945	0.52802	1290	0.39406	1830	0.28749
548	0.87136	680	0.71602	950	0.52534	1300	0.39139	1840	0.28606
550	0.86838	685	0.71139	955	0.52269	1310	0.38875	1850	0.28464
552	0.86541	690	0.70682	960	0.52007	1320	0.38615	1860	0.28324
554	0.86247	695	0.70232	965	0.51747	1330	0.38359	1870	0.28185
556	0.85954	700	0.69787	970	0.51490	1340	0.38107	1880	0.28047
558	0.85664	705	0.69348	975	0.51235	1350	0.37858	1890	0.27911
560	0.85375	710	0.68915	980	0.50983	1360	0.37612	1900	0.27776
562	0.85089	715	0.68488	985	0.50734	1370	0.37370	1925	0.27445
564	0.84804	720	0.68067	990	0.50487	1380	0.37131	1950	0.27122
566	0.84522	725	0.67650	995	0.50242	1390	0.36896	1975	0.26807
568	0.84241	730	0.67240	1000	0.50000	1400	0.36663	2000	0.26500
570	0.83963	735	0.66834	1005	0.49762	1410	0.36434	2025	0.26193
572	0.83686	740	0.66434	1010	0.49526	1420	0.36208	2050	0.25894
574	0.83411	745	0.66039	1015	0.49293	1430	0.35985	2075	0.25601
576	0.83138	750	0.65649	1020	0.49062	1440	0.35764	2100	0.25316
578	0.82867	755	0.65263	1025	0.48833	1450	0.35547	2125	0.25037
580	0.82598	760	0.64883	1030	0.48606	1460	0.35332	2150	0.24764
582	0.82330	765	0.64507	1035	0.48382	1470	0.35120	2175	0.24497
584	0.82064	770	0.64136	1040	0.48159	1480	0.34911	2200	0.24236
586	0.81800	775	0.63769	1045	0.47939	1490	0.34704	2225	0.23981
588	0.81538	780	0.63406	1050	0.47721	1500	0.34500	2250	0.23731
590	0.81277	785	0.63049	1055	0.47504	1510	0.34290	2275	0.23486
592	0.81019	790	0.62695	1060	0.47290	1520	0.34083	2300	0.23247
594	0.80761	795	0.62345	1065	0.47078	1530	0.33879	2325	0.23013
596	0.80506	800	0.62000	1070	0.46867	1540	0.33677	2350	0.22783
598	0.80252	805	0.61629	1075	0.46659	1550	0.33478	2375	0.22559
600	0.80000	810	0.61262	1080	0.46452	1560	0.33281	2400	0.22338
602	0.79764	815	0.60900	1085	0.46248	1570	0.33087	2425	0.22122
604	0.79530	820	0.60542	1090	0.46045	1580	0.32895	2450	0.21911
606	0.79298	825	0.60188	1095	0.45844	1590	0.32705	2475	0.21703
608	0.79067	830	0.59838	1100	0.45644	1600	0.32517	2500	0.21500
610	0.78837	835	0.59493	1105	0.45447	1610	0.32332	2525	0.21305
612	0.78609	840	0.59151	1110	0.45251	1620	0.32149	2550	0.21114
614	0.78382	845	0.58814	1115	0.45057	1630	0.31968	2575	0.20927
616	0.78156	850	0.58480	1120	0.44865	1640	0.31789	2600	0.20743
618	0.77932	855	0.58151	1125	0.44674	1650	0.31613	2625	0.20562
620	0.77709	860	0.57825	1130	0.44485	1660	0.31438	2650	0.20385
622	0.77488	865	0.57502	1135	0.44297	1670	0.31265	2675	0.20211
624	0.77268	870	0.57184	1140	0.44112	1680	0.31095	2700	0.20040
626	0.77049	875	0.56869	1150	0.43745	1690	0.30926	2725	0.19872
628	0.76831	880	0.56557	1160	0.43384	1700	0.30759	2750	0.19706
630	0.76615	885	0.56249	1170	0.43029	1710	0.30594	2775	0.19544
632	0.76401	890	0.55945	1180	0.42680	1720	0.30431	2800	0.19385
634	0.76187	895	0.55643	1190	0.42337	1730	0.30269	2825	0.19228
636	0.75975	900	0.55345	1200	0.42000	1740	0.30110	2850	0.19074
638	0.75764	905	0.55050	1210	0.41694	1750	0.29952	2875	0.18922
640	0.75554	910	0.54759	1220	0.41392	1760	0.29796	2900	0.18773
645	0.75035	915	0.54470	1230	0.41096	1770	0.29642	2925	0.18626
650	0.74523	920	0.54185	1240	0.40803	1780	0.29489	2950	0.18482
655	0.74019	925	0.53903	1250	0.40515	1790	0.29338	2975	0.18340

PERCENT EFFICIENCY



GELI 5 MB 0 V1.00 02-FEB-90

GELI 5 MB 0 V1.00 02-FEB-90

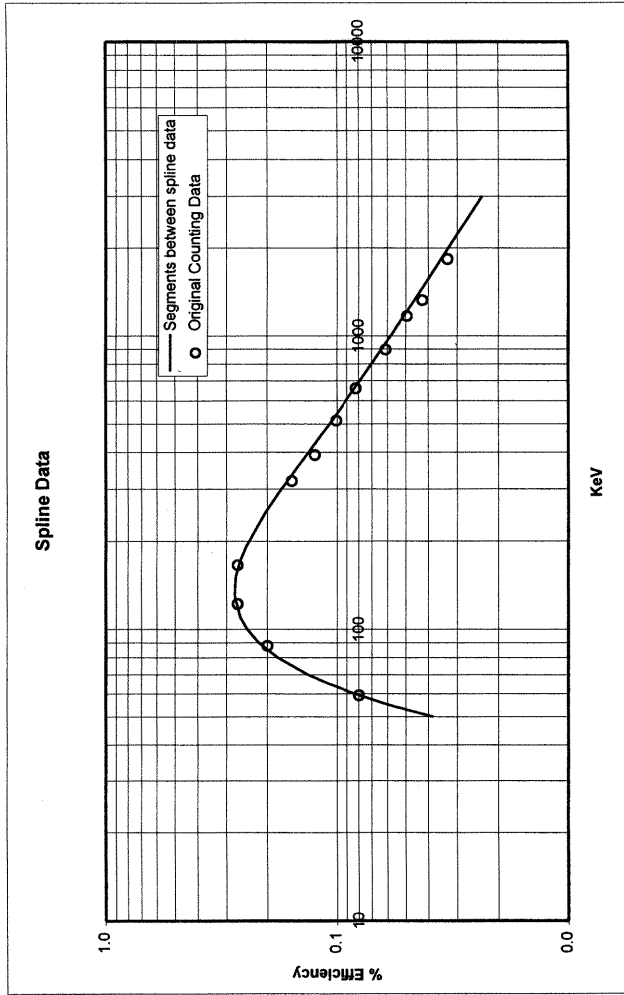
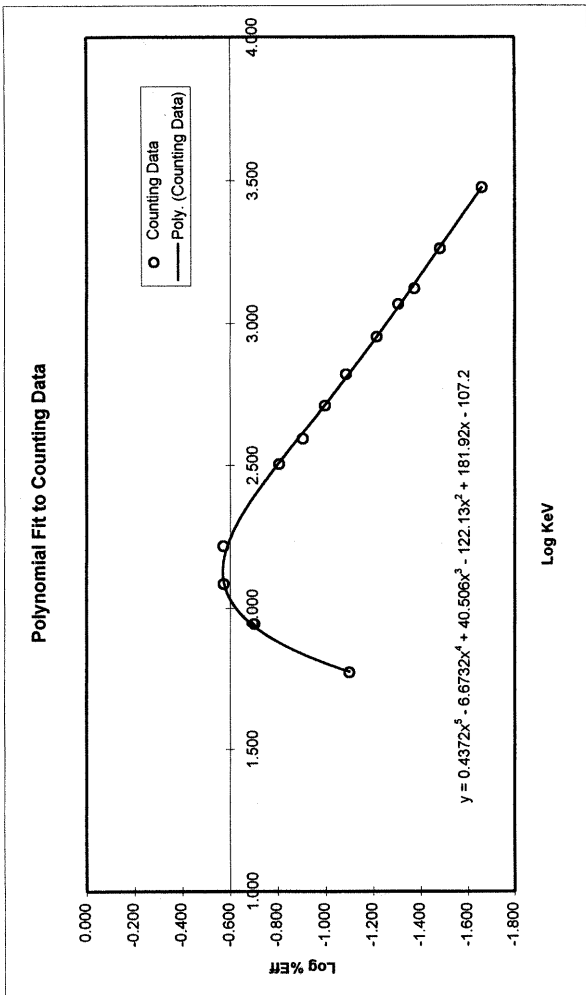
Gamma Spectrometer Efficiency Calculation

G5.xls

MM 5/5/00

Detector	G5	500 mL Marinelli beaker
Geometry	MB	Shelf 1
Std I.D.	1057-4	
Filename	G5LI05MB1.EFF	

Line	%Eff 1st.Cnt	%Eff 2nd.Cnt	Avg	%SD	LogKeV	Log%Eff	%Dev from Spline
59.5	0.07968		0.07969		1.775	-1.099	-1
88	0.19920		0.19920		1.944	-0.701	-5
122	0.2678		0.26780		2.086	-0.572	-2
166	0.2682		0.26820		2.220	-0.572	1
320	0.15660		0.15660		2.505	-0.805	-4
392	0.12450		0.12450		2.593	-0.905	-8
514	0.10080		0.10080		2.711	-0.997	-3
662	0.06190		0.06190		2.821	-1.087	-1
898	0.06086		0.06086		2.953	-1.216	-4
1173	0.04940		0.04940		3.069	-1.306	-3
1332	0.04239		0.04239		3.125	-1.373	-7
1836	0.03301		0.03301		3.264	-1.481	-6
3000	(artificial data)		0.02200		3.477	-1.658	-6
							-4



(shaded cells are manual entry, all others are calculated)

Generation of Spline Points from Polynomial Equation

Spline Values	keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
	50	0.03815	1.699	-1.418		
	55	0.05919	1.740	-1.228		
	60	0.08313	1.778	-1.080	#DIV/0!	
	65	0.10941	1.813	-0.965		
	70	0.13362	1.845	-0.874		
	80	0.17984	1.903	-0.745		
	90	0.21695	1.954	-0.664		
	100	0.24389	2.000	-0.613	#DIV/0!	
	110	0.26163	2.041	-0.582		
	130	0.27626	2.114	-0.559		
	150	0.27361	2.176	-0.563		
	170	0.26246	2.230	-0.581		
	190	0.24782	2.279	-0.606		
	250	0.20309	2.398	-0.692		
	300	0.17308	2.477	-0.762	#DIV/0!	
	500	0.10692	2.699	-0.971		
	700	0.07864	2.845	-1.104		
	1000	0.05786	3.000	-1.238	#DIV/0!	
	1400	0.04383	3.146	-1.358		
	2000	0.03271	3.301	-1.485		
	3000	0.02341	3.477	-1.631		

Gamma Spectrometer Calibration Counting Results

Detector: G5
 Geometry: MB*1 Descr: 500 ml in Marinel, Beaker
 Standard I.D.: 1057-4 on shelf #1

Gamma KeV	% Efficiency			
	GMT= 169.994	GMT=	GMT=	GMT=
59.5 (Am241)	0.07969			
88 (Cd109)	0.1992			
122 (Co57)	0.2678			
166 (Ce139)	0.2682			
320 (Cr51)	0.1566			
392 (Sn113)	0.1245			
514 (Sr85)	0.1006			
662 (Cs137)	0.0819			
898 (Y88)	0.06086			
1173 (Co60)	0.04940			
1332 (Co60)	0.04239			
1836 (Y88)	0.03301			

570

NO EFFICIENCIES

 1057 GLY 4*1 G-5 XX 169.994 98 110.50 MIN 2.00000 ML 570
 BR=C981 REF TIME= 121.500 98 Calibration 1234

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	DPM/ML AT TZERO
Am241 60 (59.54)	1.582E+05 DAYS 0.073342	LAMBDA= 4.381E-06 1.00000	DECAY= 9.998E-01 41G 11.686	1.593E+02	8.26%	7.969E+01
Cd109 88 (88.03)	4.530E+02 DAYS 0.041771	LAMBDA= 1.530E-03 1.00000	DECAY= 9.285E-01 1G 15.452	3.699E+02	4.44%	1.992E+02
Co 57 122 (122.06) 136 (136.47)	2.700E+02 DAYS 0.038133 0.111000	LAMBDA= 2.567E-03 1.00000 1.00000	DECAY= 8.829E-01 10G 18.034 1.180	4.729E+02 1.064E+01	5.83% 65.60%	2.678E+02 6.023E+00
Ce139 166 (165.80)	1.372E+02 DAYS 0.063273	LAMBDA= 5.052E-03 1.00000	DECAY= 7.827E-01 2G 26.561	4.198E+02	3.58%	2.682E+02
Cr 51 320 (320.03)	2.772E+01 DAYS 0.186701	LAMBDA= 2.501E-02 1.00000	DECAY= 2.974E-01 1G 17.390	9.314E+01	4.90%	1.566E+02
Sn113 392 (391.40)	1.150E+02 DAYS 0.134211	LAMBDA= 6.027E-03 1.00000	DECAY= 7.466E-01 4G 24.949	1.859E+02	3.16%	1.245E+02
Sr 85 514 (513.98)	6.520E+01 DAYS 0.248480	LAMBDA= 1.063E-02 1.00000	DECAY= 5.972E-01 4G 29.868	1.202E+02	2.12%	1.006E+02
Cs137 662 (661.64)	1.102E+04 DAYS 0.157793	LAMBDA= 6.290E-05 1.00000	DECAY= 9.970E-01 3G 25.769	1.633E+02	2.69%	8.190E+01
Y 88 898 (898.00) 1836 (1836.10)	1.066E+02 DAYS 0.394059 0.416536	LAMBDA= 6.502E-03 1.00000 1.00000	DECAY= 7.296E-01 7G 34.992 20.061	8.880E+01 4.816E+01	2.11% 2.24%	6.086E+01 3.301E+01
Co 60 1173 (1173.21) 1332 (1332.48)	1.921E+03 DAYS 0.221390 0.221520	LAMBDA= 3.608E-04 1.00000 1.00000	DECAY= 9.827E-01 4G 21.493 18.453	9.708E+01 8.330E+01	2.63% 2.84%	4.940E+01 4.239E+01

NP: [7,67]570. GSP 23 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	7	10.3	8	8	521	1.37	1329	10.4	1.20E+01	4.40	100.007	0	70.20
2	7	12.2	8	8	2751	2.41	1200	12.2	1.09E+01	8.20	100.011	0	0.00
3	0	59.5	56	8	3380	1.93	1291	59.4	1.17E+01	8.3	100.	0	0.00
4	3	85.1	83	9	2568	1.64	165	85.0	1.49E+00	47.9	100.	0	0.61
5	3	88.0	83	9	1967	1.30	1707	87.9	1.55E+01	4.4	100.	0	0.00
6	0	121.8	118	8	3803	1.32	1993	121.7	1.80E+01	5.8	100.	0	0.00
7	0	135.7	134	6	2869	1.15	130	135.5	1.18E+00	65.6	100.	0	0.00
8	0	165.8	163	7	2836	1.91	2934	165.6	2.66E+01	3.6	100.	0	0.00
9	0	255.2	252	6	1567	1.95	149	254.8	1.35E+00	43.0	100.	0	0.00
10	0	320.0	315	10	1942	1.99	1920	319.4	1.74E+01	4.9	100.	0	0.00
11	0	391.6	386	10	1331	1.65	2756	391.0	2.49E+01	3.2	100.	0	0.00
12	5	510.9	507	12	607	2.78	395	510.2	3.57E+00	12.1	100.	0	2.00
13	5	514.1	507	12	563	1.85	3299	513.2	2.99E+01	2.1	100.	0	0.00

14	0	609.4	605	7	472	2.46	106	608.6	9.58E-01	36.5	100.	0	0.00
15	0	661.6	655	11	841	2.05	2847	660.8	2.58E+01	2.7	100.	0	0.00
16	0	813.9	810	7	270	3.08	110	813.1	9.92E-01	27.4	100.	0	0.00
17	0	880.6	877	8	321	2.92	59	879.8	5.31E-01	57.3	100.	0	0.00
18	0	898.0	890	13	624	2.50	3866	897.2	3.50E+01	2.1	100.	0	0.00
19	0	1161.1	1157	8	181	1.29	45	1160.5	4.06E-01	57.4	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGD	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1173.0	1165	15	311	2.72	2378	1172.5	2.15E+01	2.6	100.	0	0.00
21	0	1332.4	1325	13	291	3.18	2044	1332.0	1.85E+01	2.8	100.	0	0.00
22	0	1461.2	1455	13	176	2.83	135	1461.1	1.22E+00	22.7	100.	0	0.00
23	0	1835.6	1826	19	45	3.81	2216	1836.4	2.01E+01	2.2	100.	0	0.00

FWHM=SQRT(2.34612E+00 + 4.91180E-03 *E)

BACKGROUND INFO 1057 GLY 4 169.994 98 G- 5 BG DATE 165.232 98

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
510.88	3.5747	12.08	511.00	0.6017	9.96	2.9730	14.66
609.35	0.9584	36.49	609.30	0.0383	18.29	0.9201	38.02
661.58	25.7687	2.69	661.60	0.0000	0.00	25.7687	2.69
1173.05	21.5206	2.63	1173.20	0.0280	0.00	21.4926	2.63
1332.39	18.4974	2.83	1332.50	0.0443	0.00	18.4531	2.84
1461.19	1.2175	22.72	1460.80	0.2327	3.40	0.9848	28.10

0 PEAKS REJECTED BY BACKGROUND

INTERFERING ISOTOPE ANALYSIS 1057 GLY 4 169.994 98 G- 5

ANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 5 OF 165.232/1998 1950.6 MIN								
ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0705	32.91	511.0	0.6017	9.96	1120.3	0.0157	0.00
92.0	0.3466	12.95	583.1	0.0971	32.23	1173.2	0.0280	0.00
143.0	0.0696	47.40	609.3	0.0383	18.29	1238.1	0.0090	0.00
186.0	0.2463	13.12	661.6	0.0000	0.00	1332.5	0.0443	0.00
198.0	0.0815	41.83	727.2	0.0500	0.00	1377.7	0.0000	0.00
238.6	0.2201	22.09	846.0	0.0363	47.62	1460.8	0.2327	3.40
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0748	0.00	911.1	0.0717	17.43	1591.3	0.0098	0.00
338.4	0.0653	33.06	968.9	0.0392	28.80	1729.6	0.0194	0.00
351.9	0.0788	58.41	1001.0	0.0333	0.00	1764.5	0.0325	43.10

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 7/30/98

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD				LOW RADIUM STANDARD			
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES
102.226 98	1.8169	3.354	23.*	180.971 91	1.0568	2.669	22.
109.201 98	1.2475	11.413	44.	207.975 91	1.0647	2.084	11.
116.243 98	0.9899	11.212	11.	213.856 91	1.1437	10.869	44.
130.191 98	0.9758	11.028	15.	104.847 98	1.5613	4.800	18.
131.691 98	0.9872	11.255	39.	104.889 98	1.0083	5.754	38.*
152.846 98	0.9940	11.606	167.	107.860 98	1.0121	5.168	32.*
158.250 98	0.9803	10.108	10.	123.228 98	0.9476	6.512	29.*
165.222 98	0.9668	11.642	12.	131.720 98	1.0055	5.765	51.*
198.994 98	0.9710	10.603	10.	199.694 98	0.9998	6.630	10.*
17.230 98	0.9555	10.341	19.	210.754 98	0.9223	6.492	145.*
AVERAGE	1.0076	0.091		AVERAGE	0.9826	0.038	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 165.222 98

ENERGY = -0.064555 + 1.0022677*CH + -1.465570E-06*CH**2
 FWHM = SQRT(0.5129 + 0.007540*ENERGY) (CD60 = 3.250)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

NO.	DATE	LOCATION	TIME	WIND	TEMP	HUMID	WAVE	SEA	CLOUD	REMARKS
1	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
2	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
3	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
4	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
5	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
6	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
7	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
8	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
9	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
11	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
12	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
13	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
14	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
15	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
16	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
17	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
18	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
19	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
20	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
21	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
22	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
23	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
24	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
25	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
26	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
27	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
28	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
29	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
30	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10

Det ... GELI 5
 Geo ... NY - Nylon planchet
 Shlf ... 0
 Ref ... Calibration 1234

Date ... 02-FEB-90 Page 1
 Version ... 1.00
 File ... ND: [25, 4]GELI05NYO. EFF

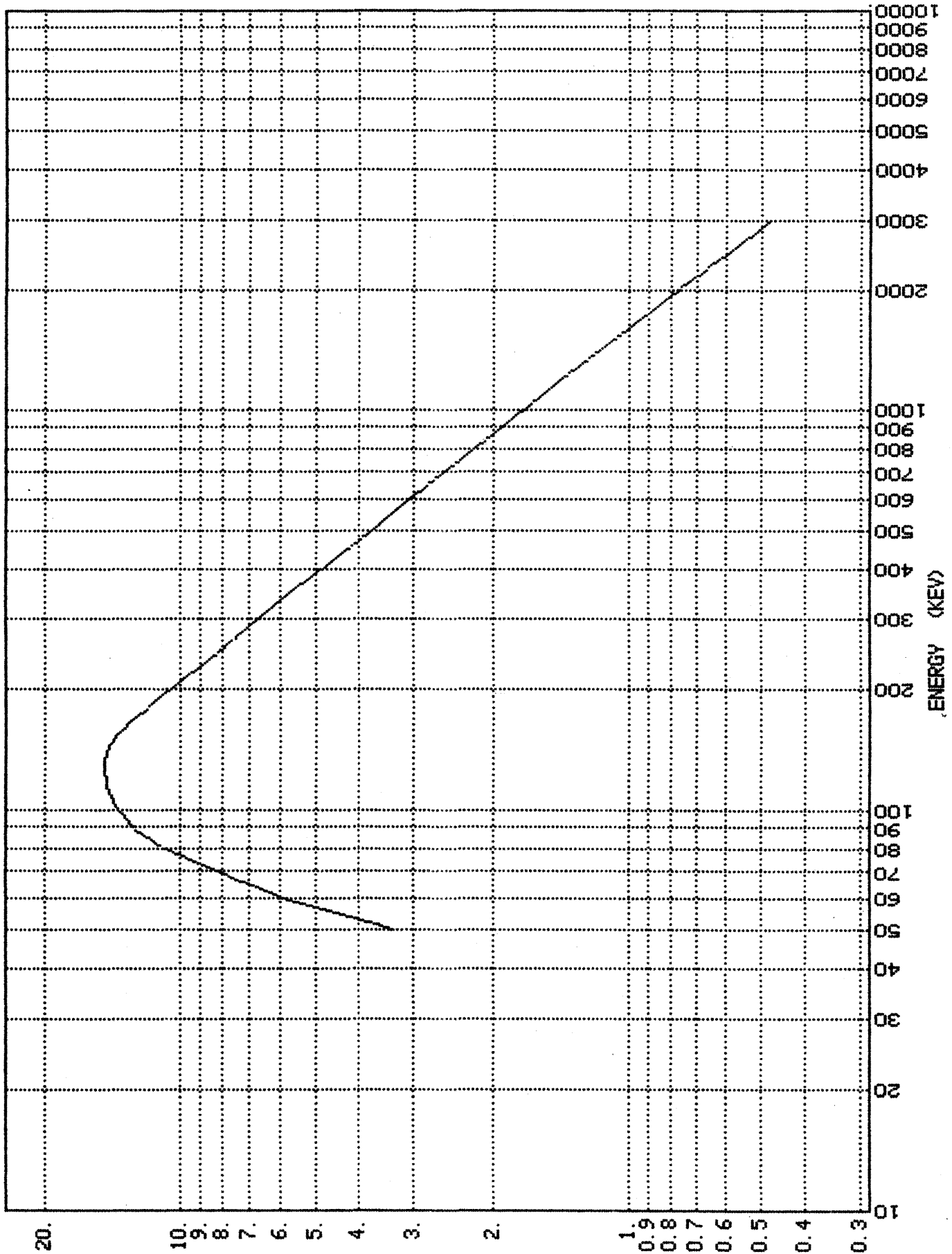
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	3.36057	108	14.26251	216	9.50233	324	6.12801	432	4.40824
51	3.57895	110	14.40000	218	9.40015	326	6.08846	434	4.38577
52	3.80686	112	14.44119	220	9.30000	328	6.04941	436	4.36352
53	4.04452	114	14.48177	222	9.20545	330	6.01084	438	4.34148
54	4.29216	116	14.52175	224	9.11270	332	5.97275	440	4.31965
55	4.55000	118	14.56115	226	9.02169	334	5.93512	442	4.29804
56	4.81826	120	14.60000	228	8.93239	336	5.89796	444	4.27662
57	5.09716	122	14.62060	230	8.84473	338	5.86125	446	4.25541
58	5.38694	124	14.64088	232	8.75869	340	5.82498	448	4.23440
59	5.68781	126	14.66087	234	8.67420	342	5.78914	450	4.21359
60	6.00000	128	14.68058	236	8.59125	344	5.75373	452	4.19297
61	6.20938	130	14.70000	238	8.50978	346	5.71875	454	4.17254
62	6.42249	132	14.65858	240	8.42974	348	5.68417	456	4.15230
63	6.63932	134	14.61789	242	8.35112	350	5.65000	458	4.13224
64	6.85989	136	14.57791	244	8.27387	352	5.61083	460	4.11237
65	7.08420	138	14.53862	246	8.19796	354	5.57215	462	4.09268
66	7.31224	140	14.50001	248	8.12335	356	5.53395	464	4.07317
67	7.54403	142	14.39576	250	8.05000	358	5.49623	466	4.05383
68	7.77956	144	14.29372	252	7.98280	360	5.45897	468	4.03467
69	8.01886	146	14.19379	254	7.91668	362	5.42216	470	4.01568
70	8.26191	148	14.09591	256	7.85161	364	5.38581	472	3.99686
71	8.50873	150	14.00000	258	7.78759	366	5.34990	474	3.97821
72	8.75931	152	13.83311	260	7.72457	368	5.31442	476	3.95973
73	9.01366	154	13.67034	262	7.66255	370	5.27937	478	3.94140
74	9.27178	156	13.51155	264	7.60148	372	5.24473	480	3.92324
75	9.53369	158	13.35660	266	7.54136	374	5.21050	482	3.90523
76	9.79937	160	13.20534	268	7.48216	376	5.17669	484	3.88738
77	10.06884	162	13.05764	270	7.42386	378	5.14326	486	3.86969
78	10.34210	164	12.91337	272	7.36643	380	5.11023	488	3.85215
79	10.61915	166	12.77242	274	7.30987	382	5.07758	490	3.83476
80	10.90000	168	12.63467	276	7.25415	384	5.04531	492	3.81752
81	11.07713	170	12.50000	278	7.19925	386	5.01341	494	3.80042
82	11.25491	172	12.33564	280	7.14515	388	4.98188	496	3.78347
83	11.43335	174	12.17530	282	7.09185	390	4.95070	498	3.76666
84	11.61241	176	12.01884	284	7.03931	392	4.91987	500	3.75000
85	11.79212	178	11.86612	286	6.98752	394	4.88940	502	3.73361
86	11.97245	180	11.71702	288	6.93648	396	4.85926	504	3.71735
87	12.15342	182	11.57141	290	6.88616	398	4.82947	506	3.70123
88	12.33500	184	11.42917	292	6.83654	400	4.80000	508	3.68524
89	12.51719	186	11.29020	294	6.78762	402	4.77359	510	3.66939
90	12.70000	188	11.15436	296	6.73937	404	4.74745	512	3.65366
91	12.80135	190	11.02157	298	6.69179	406	4.72159	514	3.63806
92	12.90240	192	10.89174	300	6.64486	408	4.69599	516	3.62259
93	13.00313	194	10.76475	302	6.59857	410	4.67065	518	3.60725
94	13.10357	196	10.64052	304	6.55290	412	4.64558	520	3.59202
95	13.20370	198	10.51897	306	6.50785	414	4.62076	522	3.57692
96	13.30354	200	10.40000	308	6.46340	416	4.59619	524	3.56194
97	13.40308	202	10.27933	310	6.41953	418	4.57186	526	3.54708
98	13.50234	204	10.16123	312	6.37624	420	4.54779	528	3.53234
99	13.60131	206	10.04561	314	6.33352	422	4.52395	530	3.51772
100	13.70000	208	9.93241	316	6.29135	424	4.50034	532	3.50320
102	13.84259	210	9.82155	318	6.24972	426	4.47698	534	3.48881
104	13.98384	212	9.71296	320	6.20863	428	4.45384	536	3.47453
106	14.12381	214	9.60658	322	6.16807	430	4.43093	538	3.46036

Det ... GELI 5
Geo ... NY - Nylon planchet
Shlf ... 0
Ref ... Calibration 1234

Date 02-FEB-90
Version ... 1.00
File ND: [25,4]GELI05NY0.EFF
Page 2

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	3.44629	660	2.74912	930	1.85602	1260	1.31271	1800	0.86503
542	3.43234	665	2.72519	935	1.84482	1270	1.30060	1810	0.85946
544	3.41849	670	2.70165	940	1.83374	1280	1.28869	1820	0.85395
546	3.40476	675	2.67848	945	1.82279	1290	1.27699	1830	0.84851
548	3.39112	680	2.65568	950	1.81196	1300	1.26548	1840	0.84314
550	3.37759	685	2.63324	955	1.80126	1310	1.25416	1850	0.83782
552	3.36417	690	2.61115	960	1.79067	1320	1.24303	1860	0.83257
554	3.35084	695	2.58941	965	1.78019	1330	1.23208	1870	0.82738
556	3.33761	700	2.56800	970	1.76984	1340	1.22130	1880	0.82225
558	3.32449	705	2.54691	975	1.75959	1350	1.21070	1890	0.81718
560	3.31146	710	2.52615	980	1.74946	1360	1.20027	1900	0.81216
562	3.29853	715	2.50570	985	1.73943	1370	1.19000	1925	0.79988
564	3.28570	720	2.48555	990	1.72952	1380	1.17990	1950	0.78793
566	3.27296	725	2.46571	995	1.71971	1390	1.16995	1975	0.77631
568	3.26031	730	2.44616	1000	1.71000	1400	1.16016	2000	0.76500
570	3.24776	735	2.42689	1005	1.70034	1410	1.15052	2025	0.75402
572	3.23530	740	2.40791	1010	1.69077	1420	1.14102	2050	0.74332
574	3.22293	745	2.38920	1015	1.68131	1430	1.13167	2075	0.73291
576	3.21066	750	2.37076	1020	1.67195	1440	1.12246	2100	0.72276
578	3.19847	755	2.35259	1025	1.66268	1450	1.11339	2125	0.71287
580	3.18637	760	2.33467	1030	1.65351	1460	1.10445	2150	0.70323
582	3.17435	765	2.31700	1035	1.64444	1470	1.09565	2175	0.69383
584	3.16242	770	2.29958	1040	1.63546	1480	1.08697	2200	0.68466
586	3.15058	775	2.28241	1045	1.62657	1490	1.07843	2225	0.67572
588	3.13882	780	2.26547	1050	1.61777	1500	1.07000	2250	0.66699
590	3.12715	785	2.24877	1055	1.60906	1510	1.06174	2275	0.65846
592	3.11556	790	2.23229	1060	1.60044	1520	1.05360	2300	0.65014
594	3.10405	795	2.21603	1065	1.59190	1530	1.04557	2325	0.64201
596	3.09262	800	2.20000	1070	1.58345	1540	1.03766	2350	0.63406
598	3.08127	805	2.18458	1075	1.57508	1550	1.02985	2375	0.62630
600	3.07000	810	2.16936	1080	1.56680	1560	1.02216	2400	0.61871
602	3.05819	815	2.15433	1085	1.55860	1570	1.01457	2425	0.61129
604	3.04646	820	2.13951	1090	1.55047	1580	1.00708	2450	0.60404
606	3.03482	825	2.12487	1095	1.54243	1590	0.99970	2475	0.59694
608	3.02326	830	2.11042	1100	1.53447	1600	0.99241	2500	0.59000
610	3.01178	835	2.09616	1105	1.52658	1610	0.98523	2525	0.58306
612	3.00038	840	2.08208	1110	1.51877	1620	0.97814	2550	0.57627
614	2.98907	845	2.06817	1115	1.51103	1630	0.97114	2575	0.56962
616	2.97783	850	2.05444	1120	1.50337	1640	0.96424	2600	0.56311
618	2.96667	855	2.04088	1125	1.49578	1650	0.95743	2625	0.55674
620	2.95559	860	2.02748	1130	1.48826	1660	0.95070	2650	0.55050
622	2.94458	865	2.01426	1135	1.48081	1670	0.94407	2675	0.54439
624	2.93365	870	2.00119	1140	1.47343	1680	0.93752	2700	0.53840
626	2.92280	875	1.98828	1150	1.45888	1690	0.93105	2725	0.53253
628	2.91202	880	1.97553	1160	1.44460	1700	0.92466	2750	0.52678
630	2.90132	885	1.96293	1170	1.43057	1710	0.91836	2775	0.52114
632	2.89068	890	1.95048	1180	1.41680	1720	0.91214	2800	0.51561
634	2.88012	895	1.93818	1190	1.40328	1730	0.90599	2825	0.51019
636	2.86963	900	1.92603	1200	1.39000	1740	0.89992	2850	0.50487
638	2.85922	905	1.91402	1210	1.37654	1750	0.89392	2875	0.49966
640	2.84887	910	1.90215	1220	1.36332	1760	0.88800	2900	0.49454
645	2.82331	915	1.89042	1230	1.35033	1770	0.88215	2925	0.48952
650	2.79817	920	1.87882	1240	1.33757	1780	0.87638	2950	0.48459
655	2.77344	925	1.86736	1250	1.32503	1790	0.87067	2975	0.47975

GELI 5 NY 0 V1.00 02-FEB-90



BACKGROUND FOR GELI DETECTOR 5 DF 254.053/2000 2197.2 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0834	27.68	511.0	0.6205	4.34	1120.3	0.0260	35.43
92.0	0.3517	10.46	583.1	0.1059	31.93	1173.2	0.0265	34.70
143.0	0.0573	0.00	609.3	0.0652	50.94	1238.1	0.0565	0.00
186.0	0.2493	12.55	661.6	0.0000	0.00	1332.5	0.0323	49.91
198.0	0.0849	24.86	727.2	0.0309	24.63	1377.7	0.0142	0.00
238.6	0.2504	15.50	846.0	0.0325	33.56	1460.8	0.2673	10.21
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0424	0.00	911.1	0.0850	19.07	1591.3	0.0364	34.08
338.4	0.0544	27.37	968.9	0.0603	22.39	1729.6	0.0081	0.00
351.9	0.0450	0.00	1001.0	0.0667	0.00	1764.5	0.0392	23.19

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 9/15/ 0

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

GMT YEAR	NORMALISED %		LENGTH IN	GMT YEAR	NORMALISED %		LENGTH IN		
	CPM	ERROR	MINUTES		CPM	ERROR	MINUTES		
8.794	0	0.9810	11.676	26.	190.969	0	1.0075	6.705	23.
22.334	94	0.9585	12.795	23.	195.631	0	1.0086	5.790	38.
22.334	0	0.9612	12.677	23.	202.731	0	1.0138	6.861	16.
50.904	0	0.9466	12.005	21.	204.861	0	0.9853	5.648	30.
102.623	0	0.9620	11.476	21.	211.875	0	1.0109	5.693	25.
127.280	0	0.9859	11.408	27.	219.126	0	1.0138	5.758	24.
154.857	94	0.9862	11.478	23.	225.894	0	1.0392	12.136	37.
162.890	0	1.0087	11.462	21.	232.901	0	1.0146	6.155	29.
169.779	0	0.9906	11.568	34.	239.950	0	1.0114	6.604	31.
154.030	0	0.9489	11.726	28.	245.694	0	0.9838	5.447	23.
AVERAGE	0.9730	0.020		AVERAGE	1.0089	0.016			

CALIBRATION LINE FROM STANDARD FOR G- 5 DF 254.030 0
 ENERGY= 0.197947 + 0.9956658*CH + -1.584219E-06*CH**2
 FWHM =SQRT(1.4040 + 0.007018*ENERGY) (CD60= 3.279)

EFFICIENCIES FOR GEOMETRY MB 5 CALIBRATED 186.000 2000

OK
MB 9-20-00

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.038100	100.0	0.243800	300.0	0.173000	0.0	0.000000
55.0	0.059100	110.0	0.261600	500.0	0.106900	0.0	0.000000
60.0	0.083100	130.0	0.276200	700.0	0.078600	0.0	0.000000
65.0	0.108400	150.0	0.273600	1000.0	0.057800	0.0	0.000000
70.0	0.133600	170.0	0.262400	1400.0	0.043800		
80.0	0.179800	190.0	0.247800	2000.0	0.032700		
90.0	0.216900	250.0	0.203000	3000.0	0.023400		

Det ... GELI 5
 Geo ... MB - Marinelli beaker
 Shlf ... 1
 Ref ... 500 ML MARINELLI BEAKER

Date ... 04-JUL-00
 Version ... 2.00
 File ... ND:[25,4]GELI05MB1.EFF

OK

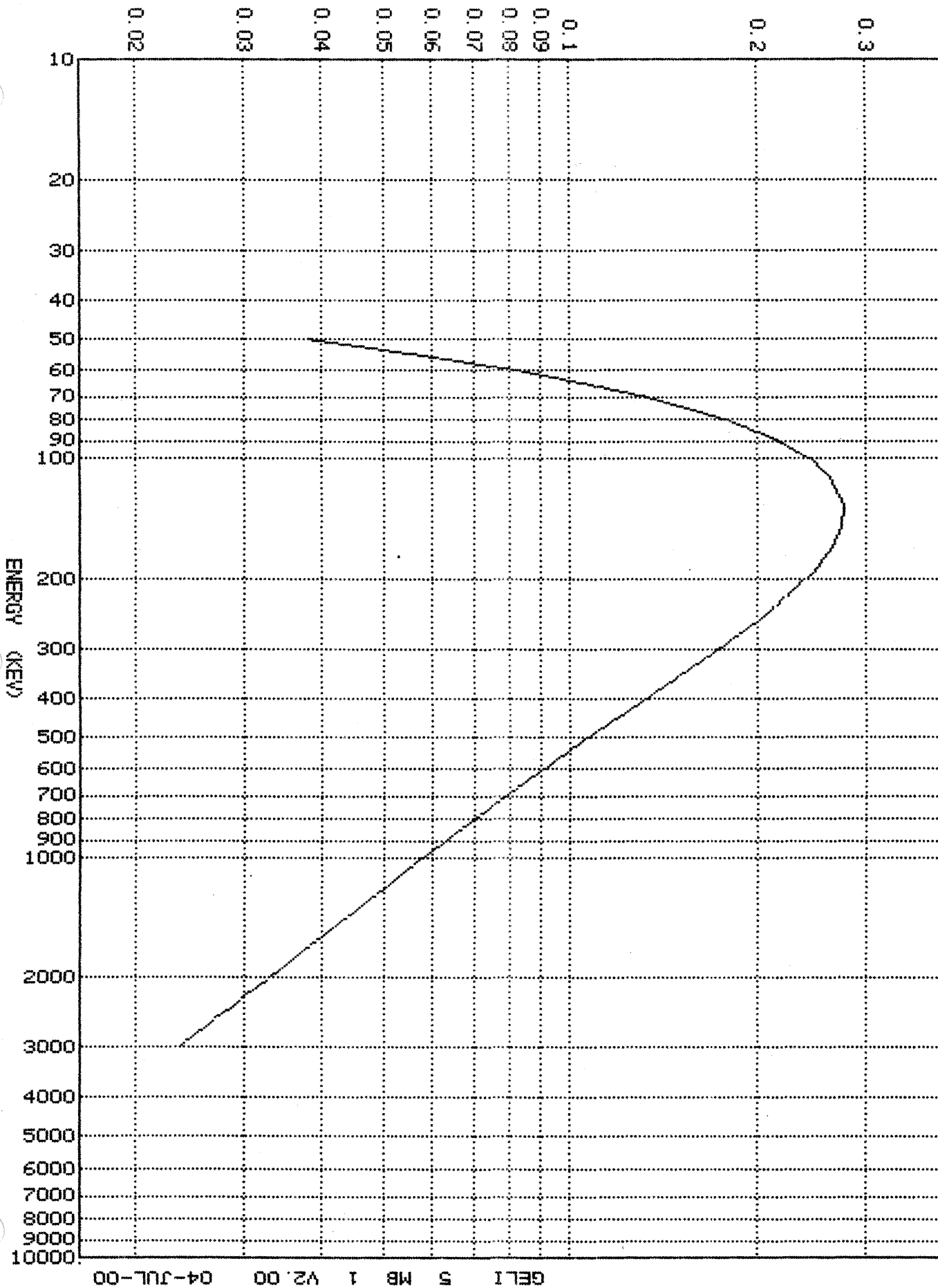
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.03815	108	0.25812	216	0.22581	324	0.16096	432	0.12272
51	0.04180	110	0.26163	218	0.22430	326	0.16003	434	0.12219
52	0.04571	112	0.26317	220	0.22282	328	0.15911	436	0.12166
53	0.04990	114	0.26469	222	0.22136	330	0.15820	438	0.12114
54	0.05439	116	0.26620	224	0.21993	332	0.15730	440	0.12062
55	0.05919	118	0.26768	226	0.21851	334	0.15642	442	0.12010
56	0.06350	120	0.26915	228	0.21712	336	0.15554	444	0.11959
57	0.06805	122	0.27060	230	0.21575	338	0.15467	446	0.11909
58	0.07283	124	0.27204	232	0.21440	340	0.15381	448	0.11858
59	0.07785	126	0.27346	234	0.21307	342	0.15296	450	0.11809
60	0.08313	128	0.27487	236	0.21176	344	0.15213	452	0.11760
61	0.08782	130	0.27626	238	0.21047	346	0.15130	454	0.11711
62	0.09268	132	0.27598	240	0.20919	348	0.15048	456	0.11662
63	0.09773	134	0.27570	242	0.20794	350	0.14967	458	0.11614
64	0.10298	136	0.27542	244	0.20670	352	0.14886	460	0.11567
65	0.10841	138	0.27515	246	0.20548	354	0.14807	462	0.11519
66	0.11318	140	0.27488	248	0.20428	356	0.14729	464	0.11473
67	0.11809	142	0.27462	250	0.20309	358	0.14651	466	0.11426
68	0.12313	144	0.27436	252	0.20168	360	0.14574	468	0.11380
69	0.12830	146	0.27411	254	0.20028	362	0.14498	470	0.11334
70	0.13362	148	0.27386	256	0.19891	364	0.14423	472	0.11289
71	0.13790	150	0.27361	258	0.19756	366	0.14349	474	0.11244
72	0.14226	152	0.27241	260	0.19622	368	0.14275	476	0.11200
73	0.14670	154	0.27123	262	0.19491	370	0.14202	478	0.11155
74	0.15120	156	0.27007	264	0.19361	372	0.14130	480	0.11112
75	0.15579	158	0.26892	266	0.19234	374	0.14059	482	0.11068
76	0.16045	160	0.26780	268	0.19108	376	0.13989	484	0.11025
77	0.16518	162	0.26670	270	0.18983	378	0.13919	486	0.10982
78	0.16999	164	0.26561	272	0.18861	380	0.13850	488	0.10940
79	0.17488	166	0.26455	274	0.18740	382	0.13781	490	0.10898
80	0.17984	168	0.26349	276	0.18621	384	0.13714	492	0.10856
81	0.18343	170	0.26246	278	0.18504	386	0.13647	494	0.10814
82	0.18705	172	0.26088	280	0.18388	388	0.13580	496	0.10773
83	0.19070	174	0.25933	282	0.18273	390	0.13515	498	0.10732
84	0.19437	176	0.25780	284	0.18160	392	0.13450	500	0.10692
85	0.19807	178	0.25631	286	0.18049	394	0.13385	502	0.10653
86	0.20180	180	0.25483	288	0.17939	396	0.13322	504	0.10615
87	0.20555	182	0.25338	290	0.17830	398	0.13258	506	0.10576
88	0.20932	184	0.25196	292	0.17723	400	0.13196	508	0.10538
89	0.21312	186	0.25056	294	0.17617	402	0.13134	510	0.10500
90	0.21695	188	0.24918	296	0.17513	404	0.13073	512	0.10463
91	0.21963	190	0.24782	298	0.17410	406	0.13012	514	0.10426
92	0.22231	192	0.24594	300	0.17308	408	0.12952	516	0.10389
93	0.22500	194	0.24410	302	0.17200	410	0.12892	518	0.10352
94	0.22769	196	0.24229	304	0.17093	412	0.12833	520	0.10316
95	0.23038	198	0.24052	306	0.16988	414	0.12775	522	0.10280
96	0.23308	200	0.23877	308	0.16884	416	0.12717	524	0.10244
97	0.23578	202	0.23705	310	0.16781	418	0.12659	526	0.10208
98	0.23848	204	0.23536	312	0.16680	420	0.12603	528	0.10173
99	0.24118	206	0.23370	314	0.16579	422	0.12546	530	0.10138
100	0.24389	208	0.23207	316	0.16480	424	0.12490	532	0.10103
102	0.24747	210	0.23047	318	0.16383	426	0.12435	534	0.10069
104	0.25104	212	0.22889	320	0.16286	428	0.12380	536	0.10034
106	0.25459	214	0.22734	322	0.16191	430	0.12326	538	0.10000

Det ... GELI 5
 Geo ... MB - Marinelli beaker
 Shif ... 1
 Ref ... 500 ML MARINELLI BEAKER

Date ... 04-JUL-00 Page 2
 Version ... 2.00
 File ... ND:[25,4]GELI05MB1.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	0.09967	660	0.08298	930	0.06159	1260	0.04781	1800	0.03566
542	0.09933	665	0.08241	935	0.06130	1270	0.04750	1810	0.03550
544	0.09900	670	0.08185	940	0.06102	1280	0.04719	1820	0.03534
546	0.09866	675	0.08129	945	0.06075	1290	0.04689	1830	0.03518
548	0.09834	680	0.08075	950	0.06047	1300	0.04659	1840	0.03503
550	0.09801	685	0.08021	955	0.06020	1310	0.04630	1850	0.03487
552	0.09769	690	0.07968	960	0.05993	1320	0.04601	1860	0.03472
554	0.09736	695	0.07916	965	0.05966	1330	0.04573	1870	0.03456
556	0.09704	700	0.07864	970	0.05940	1340	0.04544	1880	0.03441
558	0.09673	705	0.07816	975	0.05913	1350	0.04517	1890	0.03426
560	0.09641	710	0.07769	980	0.05887	1360	0.04489	1900	0.03412
562	0.09610	715	0.07722	985	0.05862	1370	0.04462	1925	0.03375
564	0.09579	720	0.07676	990	0.05836	1380	0.04435	1950	0.03340
566	0.09548	725	0.07630	995	0.05811	1390	0.04409	1975	0.03305
568	0.09517	730	0.07585	1000	0.05786	1400	0.04383	2000	0.03271
570	0.09486	735	0.07541	1005	0.05762	1410	0.04357	2025	0.03238
572	0.09456	740	0.07497	1010	0.05739	1420	0.04332	2050	0.03205
574	0.09426	745	0.07454	1015	0.05715	1430	0.04307	2075	0.03173
576	0.09396	750	0.07411	1020	0.05692	1440	0.04283	2100	0.03142
578	0.09367	755	0.07369	1025	0.05669	1450	0.04259	2125	0.03111
580	0.09337	760	0.07327	1030	0.05647	1460	0.04235	2150	0.03082
582	0.09308	765	0.07286	1035	0.05624	1470	0.04211	2175	0.03052
584	0.09279	770	0.07245	1040	0.05602	1480	0.04188	2200	0.03024
586	0.09250	775	0.07205	1045	0.05580	1490	0.04165	2225	0.02996
588	0.09221	780	0.07165	1050	0.05558	1500	0.04142	2250	0.02968
590	0.09192	785	0.07126	1055	0.05536	1510	0.04119	2275	0.02941
592	0.09164	790	0.07087	1060	0.05514	1520	0.04097	2300	0.02915
594	0.09136	795	0.07048	1065	0.05493	1530	0.04075	2325	0.02889
596	0.09108	800	0.07011	1070	0.05472	1540	0.04053	2350	0.02864
598	0.09080	805	0.06973	1075	0.05451	1550	0.04032	2375	0.02839
600	0.09052	810	0.06936	1080	0.05430	1560	0.04011	2400	0.02814
602	0.09025	815	0.06899	1085	0.05409	1570	0.03990	2425	0.02790
604	0.08998	820	0.06863	1090	0.05389	1580	0.03969	2450	0.02767
606	0.08971	825	0.06827	1095	0.05368	1590	0.03948	2475	0.02744
608	0.08944	830	0.06792	1100	0.05348	1600	0.03928	2500	0.02721
610	0.08917	835	0.06757	1105	0.05328	1610	0.03908	2525	0.02699
612	0.08890	840	0.06722	1110	0.05308	1620	0.03888	2550	0.02677
614	0.08864	845	0.06688	1115	0.05289	1630	0.03869	2575	0.02655
616	0.08838	850	0.06654	1120	0.05269	1640	0.03849	2600	0.02634
618	0.08811	855	0.06621	1125	0.05250	1650	0.03830	2625	0.02614
620	0.08785	860	0.06588	1130	0.05231	1660	0.03811	2650	0.02593
622	0.08760	865	0.06555	1135	0.05212	1670	0.03793	2675	0.02573
624	0.08734	870	0.06522	1140	0.05193	1680	0.03774	2700	0.02554
626	0.08709	875	0.06490	1150	0.05156	1690	0.03756	2725	0.02534
628	0.08683	880	0.06459	1160	0.05119	1700	0.03738	2750	0.02515
630	0.08658	885	0.06427	1170	0.05083	1710	0.03720	2775	0.02497
632	0.08633	890	0.06396	1180	0.05047	1720	0.03702	2800	0.02478
634	0.08608	895	0.06365	1190	0.05012	1730	0.03684	2825	0.02460
636	0.08583	900	0.06335	1200	0.04978	1740	0.03667	2850	0.02442
638	0.08559	905	0.06305	1210	0.04944	1750	0.03650	2875	0.02425
640	0.08534	910	0.06275	1220	0.04910	1760	0.03633	2900	0.02407
645	0.08474	915	0.06246	1230	0.04877	1770	0.03616	2925	0.02390
650	0.08414	920	0.06216	1240	0.04845	1780	0.03599	2950	0.02374
655	0.08356	925	0.06187	1250	0.04813	1790	0.03583	2975	0.02357

PERCENT EFFICIENCY



GELI 5 MB 1 V2.00 04-JUL-00

GELI 5 MB 1 V2.00 04-JUL-00

Gamma Spectrometer Efficiency Calculation

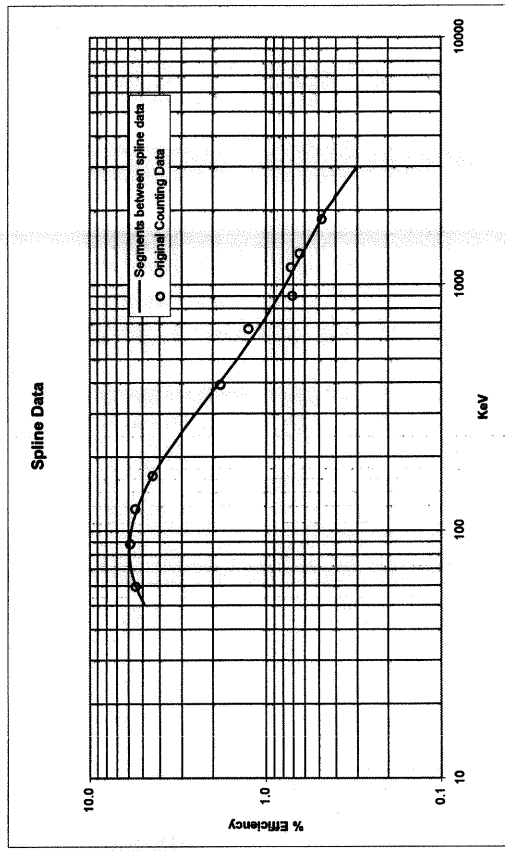
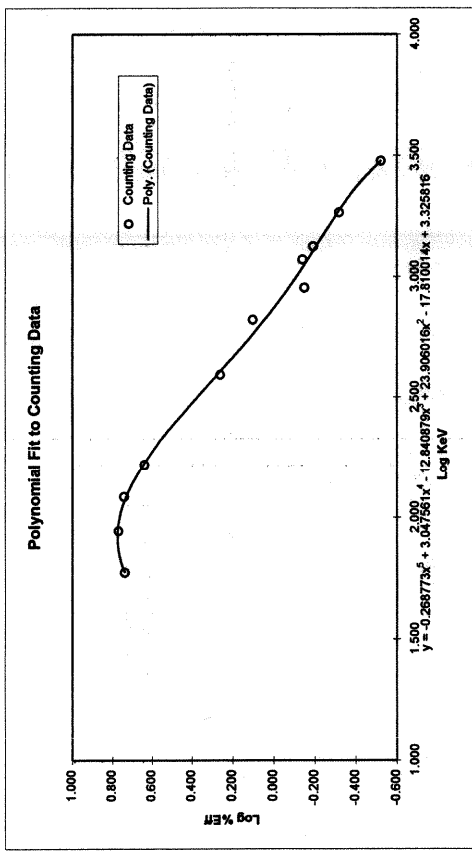
Detector	G6	500 mL Marinelli Beaker	EFF. DATE
Geometry	MB	Shelf 0	15-Aug-06
Std ID.	1000-243		
Filename	GEL08MBO.EFF		

Line	%EFF	%EFF	%EFF	%SD	LogKey
KeV	1stCnt	2ndCnt	Avg		
59.50	346179	546179	5.46179	1.775	0.737
88.00	346179	546179	5.46179	1.944	0.768
122.00	346179	546179	5.46179	2.066	0.739
166.00	346179	546179	5.46179	2.220	0.639
392.00	181338	181338	1.81338	2.593	0.258
662.00	125477	125477	1.25477	2.621	0.099
898.00	70548	70548	0.70548	2.953	-0.152
1173.00	3069	3069	0.3069	3.069	-0.142
1332.00	63961	63961	0.63961	3.125	-0.194
1836.00	47932	47932	0.47932	3.264	-0.319
3000	(artificial data)	(artificial data)	(artificial data)	#NUM!	#DIV/0!
				#NUM!	#DIV/0!
				3.477	-0.523

(shaded cells are manual entry, all others are calculated)

Generation of Spline Points from Polynomial Equation

Spline Values	keV	%EFF	Log%Eff	LogKey	Log%Eff	Ratio
						New/Old
50	4.85645	1.698	0.686	1.698	0.686	
55	5.20647	1.740	0.717	1.740	0.738	
60	5.47503	1.778	0.738	1.778	0.754	#DIV/0!
65	5.67173	1.813	0.754	1.813	0.764	
70	5.80662	1.845	0.764	1.845	0.773	
80	5.92862	1.903	0.773	1.903	0.771	
90	5.90713	1.954	0.771	1.954	0.763	
100	5.79221	2.000	0.763	2.000	0.750	#DIV/0!
110	5.61959	2.041	0.750	2.041	0.715	
130	5.19209	2.114	0.715	2.114	0.676	
150	4.73957	2.176	0.676	2.176	0.635	
170	4.31048	2.230	0.635	2.230	0.594	
190	3.92234	2.279	0.594	2.279	0.479	
250	3.01455	2.398	0.479	2.398	0.397	
300	2.49228	2.477	0.397	2.477	0.161	#DIV/0!
500	1.44887	2.699	0.161	2.699	0.018	
700	1.04336	2.845	0.018	2.845	-0.114	#DIV/0!
1000	0.76920	3.000	-0.114	3.000	-0.225	
1400	0.59592	3.146	-0.225	3.146	-0.344	
2000	0.45295	3.301	-0.344	3.301	-0.524	
3000	0.29924	3.477	-0.524	3.477		

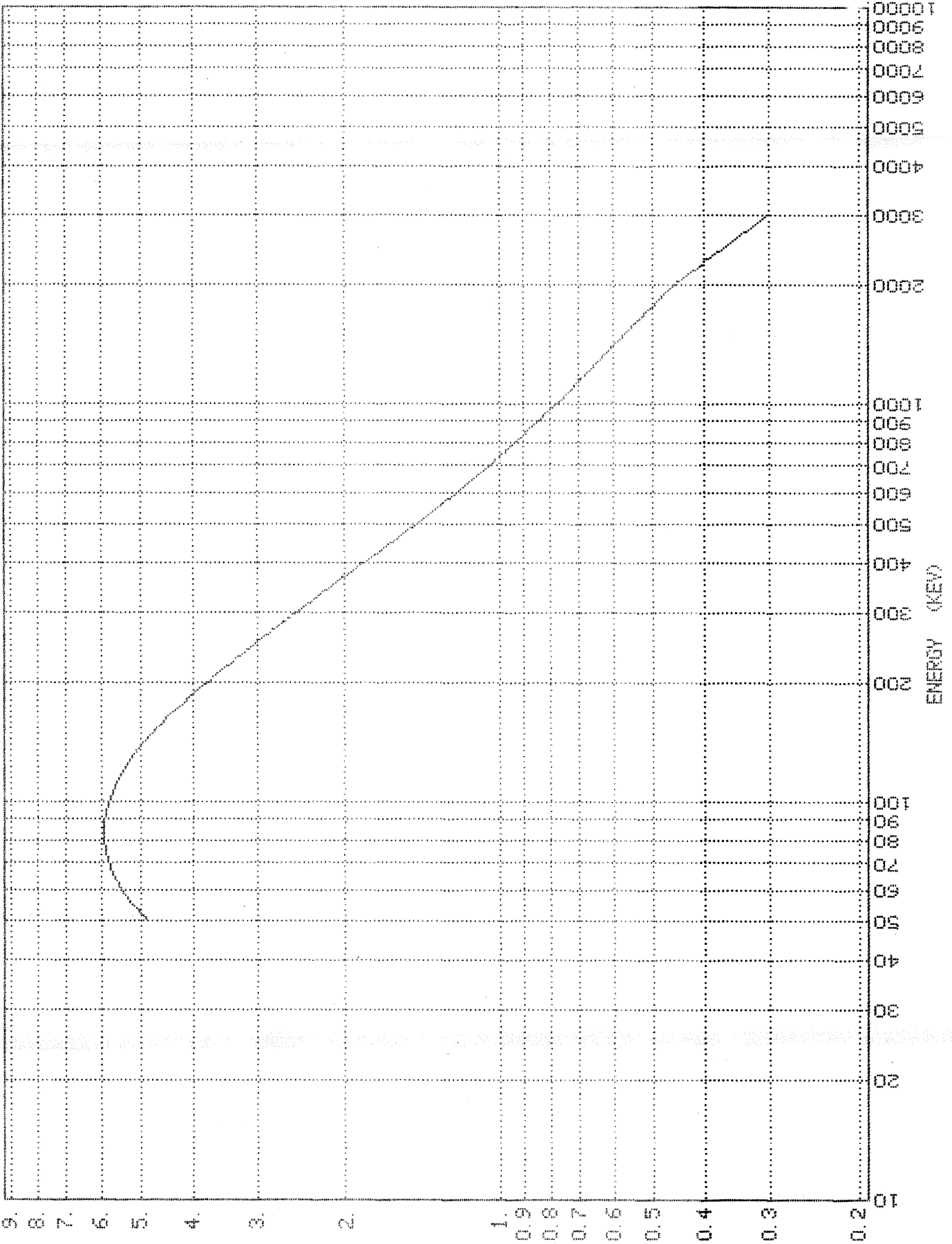


%Dev from Spline	0
	-1
	2
	-1
	-3
	14
	-16
	6
	3
	-1
#DIV/0!	
#DIV/0!	
avg	#DIV/0!

Polynomial Coefficients

x5 = -0.268773
 x4 = 3.047561
 x3 = -12.840879
 x2 = 3.047561
 x1 = -17.810014
 x0 = 3.325816

GELI 6 MB 0 V2.00 15-AUG-06



Det ... GELI 6
 Geo ... MB - Marinelli beaker
 Shif ... 0
 Ref ...

Date ... 15-AUG-06 Page 1
 Version ... 2.00
 File ... ND: [25, 4]GELI06MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	4.85600	108	5.65271	216	3.46839	324	2.29652	432	1.69221
51	4.92673	110	5.62000	218	3.43789	326	2.28157	434	1.68394
52	4.99708	112	5.57219	220	3.40794	328	2.26681	436	1.67574
53	5.06708	114	5.52562	222	3.37851	330	2.25223	438	1.66762
54	5.13671	116	5.48024	224	3.34959	332	2.23783	440	1.65957
55	5.20600	118	5.43600	226	3.32118	334	2.22361	442	1.65160
56	5.26060	120	5.39285	228	3.29326	336	2.20956	444	1.64371
57	5.31479	122	5.35075	230	3.26581	338	2.19569	446	1.63589
58	5.36858	124	5.30965	232	3.23882	340	2.18198	448	1.62814
59	5.42198	126	5.26952	234	3.21229	342	2.16844	450	1.62046
60	5.47500	128	5.23031	236	3.18620	344	2.15506	452	1.61285
61	5.51511	130	5.19200	238	3.16053	346	2.14184	454	1.60531
62	5.55486	132	5.14179	240	3.13529	348	2.12877	456	1.59783
63	5.59425	134	5.09281	242	3.11045	350	2.11586	458	1.59043
64	5.63330	136	5.04502	244	3.08601	352	2.10311	460	1.58309
65	5.67200	138	4.99835	246	3.06197	354	2.09050	462	1.57582
66	5.69955	140	4.95279	248	3.03830	356	2.07803	464	1.56861
67	5.72682	142	4.90827	250	3.01500	358	2.06571	466	1.56146
68	5.75382	144	4.86477	252	2.99000	360	2.05353	468	1.55438
69	5.78054	146	4.82225	254	2.96540	362	2.04149	470	1.54736
70	5.80700	148	4.78067	256	2.94120	364	2.02959	472	1.54040
71	5.81984	150	4.74000	258	2.91738	366	2.01782	474	1.53350
72	5.83253	152	4.69254	260	2.89393	368	2.00618	476	1.52667
73	5.84507	154	4.64616	262	2.87086	370	1.99467	478	1.51989
74	5.85746	156	4.60083	264	2.84813	372	1.98329	480	1.51317
75	5.86972	158	4.55652	266	2.82576	374	1.97204	482	1.50650
76	5.88184	160	4.51317	268	2.80373	376	1.96090	484	1.49990
77	5.89382	162	4.47078	270	2.78203	378	1.94989	486	1.49334
78	5.90567	164	4.42929	272	2.76066	380	1.93900	488	1.48685
79	5.91740	166	4.38868	274	2.73961	382	1.92823	490	1.48041
80	5.92900	168	4.34893	276	2.71886	384	1.91757	492	1.47402
81	5.92668	170	4.31000	278	2.69843	386	1.90702	494	1.46769
82	5.92438	172	4.26746	280	2.67829	388	1.89659	496	1.46141
83	5.92212	174	4.22582	282	2.65845	390	1.88627	498	1.45518
84	5.91988	176	4.18505	284	2.63889	392	1.87606	500	1.44900
85	5.91767	178	4.14514	286	2.61960	394	1.86595	502	1.44336
86	5.91548	180	4.10604	288	2.60060	396	1.85595	504	1.43776
87	5.91332	182	4.06774	290	2.58186	398	1.84605	506	1.43221
88	5.91119	184	4.03021	292	2.56339	400	1.83625	508	1.42670
89	5.90908	186	3.99342	294	2.54517	402	1.82656	510	1.42123
90	5.90700	188	3.95736	296	2.52720	404	1.81696	512	1.41581
91	5.89483	190	3.92200	298	2.50948	406	1.80746	514	1.41042
92	5.88282	192	3.88284	300	2.49200	408	1.79806	516	1.40508
93	5.87097	194	3.84447	302	2.47449	410	1.78875	518	1.39978
94	5.85926	196	3.80687	304	2.45721	412	1.77954	520	1.39452
95	5.84770	198	3.77001	306	2.44017	414	1.77041	522	1.38930
96	5.83629	200	3.73387	308	2.42335	416	1.76138	524	1.38412
97	5.82501	202	3.69844	310	2.40676	418	1.75244	526	1.37897
98	5.81388	204	3.66368	312	2.39039	420	1.74358	528	1.37387
99	5.80287	206	3.62959	314	2.37423	422	1.73481	530	1.36880
100	5.79200	208	3.59613	316	2.35828	424	1.72612	532	1.36378
102	5.75584	210	3.56331	318	2.34254	426	1.71752	534	1.35879
104	5.72059	212	3.53108	320	2.32700	428	1.70901	536	1.35383
106	5.68623	214	3.49945	322	2.31167	430	1.70057	538	1.34891

Det ... GELI 6
 Geo ... MB - Marinelli beaker
 Shif ... 0
 Ref ...

Date ... 15-AUG-06 Page 2
 Version ... 2.00
 File ... ND: [25, 4]GELI06MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	1.34403	660	1.10472	930	0.81819	1260	0.64551	1800	0.49124
542	1.33918	665	1.09661	935	0.81445	1270	0.64166	1810	0.48915
544	1.33437	670	1.08861	940	0.81075	1280	0.63786	1820	0.48708
546	1.32960	675	1.08073	945	0.80708	1290	0.63411	1830	0.48503
548	1.32486	680	1.07296	950	0.80345	1300	0.63041	1840	0.48301
550	1.32015	685	1.06531	955	0.79986	1310	0.62676	1850	0.48100
552	1.31548	690	1.05777	960	0.79630	1320	0.62316	1860	0.47901
554	1.31083	695	1.05033	965	0.79277	1330	0.61961	1870	0.47703
556	1.30623	700	1.04300	970	0.78928	1340	0.61611	1880	0.47508
558	1.30165	705	1.03668	975	0.78582	1350	0.61265	1890	0.47315
560	1.29711	710	1.03043	980	0.78239	1360	0.60923	1900	0.47123
562	1.29260	715	1.02427	985	0.77900	1370	0.60586	1925	0.46652
564	1.28812	720	1.01819	990	0.77563	1380	0.60253	1950	0.46191
566	1.28367	725	1.01219	995	0.77230	1390	0.59924	1975	0.45740
568	1.27926	730	1.00626	1000	0.76900	1400	0.59600	2000	0.45300
570	1.27487	735	1.00041	1005	0.76610	1410	0.59275	2025	0.44727
572	1.27051	740	0.99463	1010	0.76323	1420	0.58953	2050	0.44168
574	1.26619	745	0.98893	1015	0.76038	1430	0.58636	2075	0.43623
576	1.26189	750	0.98329	1020	0.75755	1440	0.58322	2100	0.43091
578	1.25763	755	0.97772	1025	0.75475	1450	0.58013	2125	0.42572
580	1.25339	760	0.97222	1030	0.75197	1460	0.57707	2150	0.42065
582	1.24918	765	0.96679	1035	0.74922	1470	0.57405	2175	0.41569
584	1.24500	770	0.96143	1040	0.74649	1480	0.57106	2200	0.41085
586	1.24085	775	0.95612	1045	0.74378	1490	0.56811	2225	0.40612
588	1.23672	780	0.95088	1050	0.74110	1500	0.56520	2250	0.40150
590	1.23263	785	0.94571	1055	0.73844	1510	0.56231	2275	0.39698
592	1.22856	790	0.94059	1060	0.73580	1520	0.55947	2300	0.39256
594	1.22451	795	0.93553	1065	0.73318	1530	0.55665	2325	0.38824
596	1.22050	800	0.93053	1070	0.73058	1540	0.55387	2350	0.38400
598	1.21651	805	0.92559	1075	0.72801	1550	0.55112	2375	0.37986
600	1.21255	810	0.92071	1080	0.72545	1560	0.54840	2400	0.37581
602	1.20861	815	0.91588	1085	0.72292	1570	0.54571	2425	0.37184
604	1.20470	820	0.91111	1090	0.72041	1580	0.54305	2450	0.36795
606	1.20082	825	0.90639	1095	0.71792	1590	0.54042	2475	0.36414
608	1.19696	830	0.90172	1100	0.71544	1600	0.53782	2500	0.36041
610	1.19312	835	0.89710	1105	0.71299	1610	0.53525	2525	0.35676
612	1.18931	840	0.89254	1110	0.71056	1620	0.53271	2550	0.35318
614	1.18553	845	0.88802	1115	0.70814	1630	0.53019	2575	0.34966
616	1.18176	850	0.88356	1120	0.70574	1640	0.52770	2600	0.34622
618	1.17803	855	0.87914	1125	0.70337	1650	0.52524	2625	0.34284
620	1.17431	860	0.87477	1130	0.70101	1660	0.52281	2650	0.33953
622	1.17063	865	0.87045	1135	0.69867	1670	0.52040	2675	0.33628
624	1.16696	870	0.86617	1140	0.69635	1680	0.51801	2700	0.33309
626	1.16332	875	0.86194	1150	0.69176	1690	0.51565	2725	0.32995
628	1.15970	880	0.85776	1160	0.68723	1700	0.51332	2750	0.32688
630	1.15610	885	0.85361	1170	0.68278	1710	0.51101	2775	0.32386
632	1.15252	890	0.84951	1180	0.67839	1720	0.50872	2800	0.32090
634	1.14897	895	0.84546	1190	0.67407	1730	0.50646	2825	0.31799
636	1.14544	900	0.84144	1200	0.66981	1740	0.50422	2850	0.31513
638	1.14193	905	0.83747	1210	0.66561	1750	0.50200	2875	0.31233
640	1.13844	910	0.83354	1220	0.66148	1760	0.49981	2900	0.30957
645	1.12982	915	0.82964	1230	0.65740	1770	0.49763	2925	0.30686
650	1.12133	920	0.82579	1240	0.65338	1780	0.49548	2950	0.30419
655	1.11296	925	0.82197	1250	0.64942	1790	0.49335	2975	0.30157

1000 570 243 G-6 MB 179.561 6 1700.53 MIN 1.00000 SM 542

LIBR=ARL1 REF TIME= 274.708 3

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Be 7 5.328E+01 DAYS		LAMBDA= 1.301E-02	DECAY= 2.214E-06	10		
**** (477.59)	0.103000	0.00900	1.418	1.529E+03 s	<	3.110E+08
Na 22 9.504E+02 DAYS		LAMBDA= 7.293E-04	DECAY= 4.819E-01	20		
**** (511.00)	1.798000	0.00837	1.324	8.796E+01 s	<	8.222E+01
**** (1274.52)	0.999400	0.00325	0.436	1.343E+02 s	<	1.255E+02
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12	DECAY= 1.000E+00	10		
**** (1460.85)	0.110000	0.00283	0.302	9.722E+02 s	<	4.379E+02
Ct 51 2.772E+01 DAYS		LAMBDA= 2.501E-02	DECAY= 1.352E-11	10		
**** (320.03)	0.102000	0.01427	1.495	1.027E+03 s	<	3.422E+13
Mn 54 3.125E+02 DAYS		LAMBDA= 2.218E-03	DECAY= 1.086E-01	20		
**** (834.83)	1.000000	0.00493	1.153	2.340E+02 s	<	9.706E+02
Ca 57 2.700E+02 DAYS		LAMBDA= 2.567E-03	DECAY= 7.658E-02	100		
122 (122.06)	0.852000	0.02736	386.951	1.660E+04 s	0.29%	9.763E+04
136 (136.47)	0.111000	0.02737	46.465	1.530E+04 s	1.71%	8.997E+04
Ca 58 7.130E+01 DAYS		LAMBDA= 9.722E-03	DECAY= 5.948E-05	40		
**** (810.76)	0.990000	0.00508	1.133	2.250E+02 s	<	1.704E+06
Fe 59 4.460E+01 DAYS		LAMBDA= 1.554E-02	DECAY= 1.757E-07	60		
**** (1099.22)	0.565000	0.00374	1.141	5.395E+02 s	<	1.384E+09
**** (1291.56)	0.432000	0.00321	0.440	3.174E+02 s	<	8.139E+08
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04	DECAY= 6.969E-01	40		
1173 (1173.21)	0.999200	0.00352	1085.605	3.083E+05 s	0.09%	1.993E+05
1332 (1332.48)	1.000000	0.00311	973.614	3.133E+05 s	0.09%	2.025E+05
Zn 65 2.440E+02 DAYS		LAMBDA= 2.841E-03	DECAY= 5.824E-02	10		
**** (1115.52)	0.507500	0.00369	1.087	5.804E+02 s	<	4.489E+03
Se 75 1.200E+02 DAYS		LAMBDA= 5.776E-03	DECAY= 3.085E-03	160		
122 (121.11)	0.161500	0.02736	387.699	8.773E+04	0.29%	1.281E+07
136 (136.00)	0.562800	0.02737	46.554	3.022E+03 s	1.71%	4.412E+05
**** (264.65)	0.572800	0.01770	1.630	1.608E+02 s	<	2.348E+04
**** (279.53)	0.247600	0.01666	1.579	3.828E+02 s	<	5.590E+04
Kr 85 3.919E+03 DAYS		LAMBDA= 1.769E-04	DECAY= 8.378E-01	10		
**** (513.98)	0.004300	0.00832	1.305	3.649E+04 s	<	1.962E+04
Zr 95 6.550E+01 DAYS		LAMBDA= 1.058E-02	DECAY= 2.513E-05	20		
**** (724.18)	0.430000	0.00575	0.996	4.028E+02 s	<	7.220E+06
**** (756.72)	0.546000	0.00548	1.084	3.621E+02 s	<	6.490E+06
Nb 94 7.414E+06 DAYS		LAMBDA= 9.349E-08	DECAY= 9.999E-01	30		
**** (871.10)	1.000000	0.00471	1.201	2.548E+02 s	<	1.148E+02
**** (1573.70)	1.000000	0.00263	0.217	8.263E+01 s	<	3.723E+01
Nb 95 3.510E+01 DAYS		LAI	171	DECAY= 2.608E-09	10	

**** (765.79) 0.990000 0.00541 1.098 2.049E+02 s < 3.540E+10

Mo 99 2.779E+00 DAYS LAMBDA= 2.494E-01 DECAY= 1.000E-36 5G

**** (181.06) 0.976000 0.02469 1.812 7.522E+01 s < 1.000E+36

**** (739.58) 0.140000 0.00562 1.238 1.573E+03 s < 1.000E+36

c 99m 2.512E-01 DAYS LAMBDA= 2.759E+00 DECAY= 1.000E-36 5G

**** (140.30) 0.900000 0.02730 6.223 2.533E+02 s < 1.000E+36

Ru103 3.960E+01 DAYS LAMBDA= 1.750E-02 DECAY= 2.464E-08 11G

**** (497.08) 0.900000 0.00862 1.350 1.740E+02 s < 3.181E+09

**** (610.29) 0.058000 0.00694 1.143 2.839E+03 s < 5.189E+10

Ru106 3.670E+02 DAYS LAMBDA= 1.889E-03 DECAY= 1.510E-01 41G

511 (511.80) 0.205000 0.00836 2.934 1.713E+03 15.88% 5.109E+03

**** (621.80) 0.097600 0.00680 1.056 1.591E+03 s < 4.746E+03

662 (661.20) 0.000150 0.00636 1322.276 1.386E+09 0.08% 4.134E+09

**** (1050.10) 0.014500 0.00391 1.111 1.961E+04 s < 5.850E+04

Ag108m 4.748E+04 DAYS LAMBDA= 1.460E-05 DECAY= 9.855E-01 9G

**** (434.00) 0.910000 0.01001 1.551 1.703E+02 s < 7.784E+01

**** (614.37) 0.910000 0.00689 1.126 1.796E+02 s < 8.210E+01

**** (722.95) 0.910000 0.00576 1.058 2.017E+02 s < 9.219E+01

Ag110m 2.530E+02 DAYS LAMBDA= 2.740E-03 DECAY= 6.444E-02 48G

**** (132.60) 0.001400 0.02740 1.830 4.771E+04 s < 3.335E+05

218 (219.50) 0.000940 0.02151 4.485 2.218E+05 17.88% 1.551E+06

**** (620.24) 0.025000 0.00682 1.128 6.616E+03 s < 4.625E+04

**** (657.74) 0.938000 0.00640 3.120 5.199E+02 s < 3.635E+03

**** (763.93) 0.218000 0.00542 1.086 9.181E+02 s < 6.418E+03

**** (818.02) 0.071000 0.00504 1.150 3.215E+03 s < 2.247E+04

*** (884.67) 0.747000 0.00464 1.229 3.550E+02 s < 2.482E+03

**** (1384.22) 0.263000 0.00299 0.269 3.421E+02 s < 2.391E+03

Sn113 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 2.399E-03 4G

392 (391.40) 0.642000 0.01127 7.765 1.073E+03 s 6.58% 2.015E+05

Sb124 6.020E+01 DAYS LAMBDA= 1.151E-02 DECAY= 9.890E-06 16G

**** (602.70) 0.980000 0.00704 1.137 1.648E+02 s < 7.508E+06

1353 (1354.90) 0.006400 0.00306 0.673 3.442E+04 18.78% 1.568E+09

**** (1691.00) 0.457000 0.00245 0.203 1.807E+02 s < 8.229E+06

Sb125 9.971E+02 DAYS LAMBDA= 6.952E-04 DECAY= 4.987E-01 18G

**** (427.90) 0.304000 0.01017 1.544 4.993E+02 s < 4.510E+02

Sn125 9.650E+00 DAYS LAMBDA= 7.183E-02 DECAY= 6.004E-32 47G

**** (332.00) 0.012200 0.01367 1.514 9.082E+03 s < 6.813E+34

**** (469.70) 0.013800 0.00917 1.563 1.235E+04 s < 9.268E+34

821 (822.60) 0.038700 0.00501 2.984 1.540E+04 s 14.88% 1.156E+35

**** (915.50) 0.037600 0.00447 1.351 8.029E+03 s < 6.024E+34

**** (1066.60) 0.088700 0.00385 1.150 3.369E+03 s < 2.528E+34

**** (1088.90) 0.042900 0.00377 1.234 7.620E+03 s < 5.717E+34

1173 (1173.20) 0.002900 0.00352 1132.974 1.109E+08 0.09% 1.000E+36

**** (2001.70) 0.021100 0.00210 0.194 4.386E+03 s < 3.291E+34

Sn126 3.652E+07 DAYS LAMBDA= 1.898E-08 DECAY= 1.000E+00 7G

**** (86.90) 0.378000 0.02310 5.788 6.628E+02 s < 2.986E+02

88 (87.57) 0.378000 0.02335 2218.060 2.513E+05 0.08% 1.132E+05

I 131 8.040E+00 DAYS LAMBDA= 8.621E-02 DECAY= 3.360E-38 9G

**** (364.50) 0.820000 0.01225 1.490 1.484E+02 s < 1.000E+36

Ba133 3.981E+03 DAYS LAI 172 DECAY= 8.401E-01 10G

****	(276. 30)	0. 075000	0. 01688	1. 587	1. 254E+03	s	<	6. 723E+02
****	(302. 70)	0. 196000	0. 01522	1. 506	5. 049E+02	s	<	2. 707E+02
****	(355. 90)	0. 621000	0. 01260	1. 425	1. 822E+02	s	<	9. 768E+01
****	(383. 70)	0. 094000	0. 01153	1. 513	1. 396E+03	s	<	7. 483E+02

I 133 8. 750E-01 DAYS LAMBDA= 7. 922E-01 DECAY= 1. 000E-36 28G

511	(510. 40)	0. 015000	0. 00838	4. 548	3. 617E+04	15. 88%		1. 000E+36
****	(529. 50)	0. 870000	0. 00806	1. 798	2. 565E+02	s	<	1. 000E+36
821	(820. 90)	0. 001700	0. 00502	4. 436	5. 201E+05	14. 88%		1. 000E+36

Cs134 7. 531E+02 DAYS LAMBDA= 9. 204E-04 DECAY= 3. 980E-01 9G

****	(475. 30)	0. 015000	0. 00905	1. 444	1. 063E+04	s	<	1. 203E+04
****	(604. 60)	0. 980000	0. 00701	1. 131	1. 646E+02	s	<	1. 863E+02
9. 2488E-01 SUM CORR APPLIED TO 5. 1876E-03 BELOW								
****	(795. 80)	0. 854000	0. 00480	1. 110	2. 507E+02	s	<	2. 837E+02

Cs136 1. 300E+01 DAYS LAMBDA= 5. 332E-02 DECAY= 6. 668E-24 16G

68	(66. 90)	0. 137000	0. 01348	121. 478	6. 577E+04	0. 77%		4. 443E+27
88	(86. 40)	0. 058000	0. 02291	2290. 010	1. 723E+06	0. 08%		1. 164E+29
166	(166. 70)	0. 006500	0. 02575	37. 779	2. 257E+05	2. 07%		1. 525E+28
****	(340. 60)	0. 445000	0. 01326	1. 590	2. 694E+02	s	<	1. 820E+25
****	(818. 50)	1. 000000	0. 00503	1. 189	2. 363E+02	s	<	1. 596E+25
****	(1048. 10)	0. 805000	0. 00391	1. 151	3. 655E+02	s	<	2. 469E+25

Cs137 1. 102E+04 DAYS LAMBDA= 6. 290E-05 DECAY= 9. 390E-01 3G

662	(661. 64)	0. 851000	0. 00636	1320. 824	2. 442E+05	s	0. 08%	1. 172E+05
-----	------------	-----------	----------	-----------	------------	---	--------	------------

Ba140 1. 279E+01 DAYS LAMBDA= 5. 419E-02 DECAY= 2. 776E-24 10G

****	(537. 25)	0. 340000	0. 00794	1. 259	4. 668E+02	s	<	7. 574E+25
------	------------	-----------	----------	--------	------------	---	---	------------

La140 1. 279E+01 DAYS LAMBDA= 5. 419E-02 DECAY= 2. 776E-24 38G

68	(69. 00)	0. 001000	0. 01458	121. 541	8. 336E+06	0. 77%		1. 352E+30
****	(487. 10)	0. 467000	0. 00881	1. 428	3. 468E+02	s	<	5. 627E+25
511	(510. 90)	0. 004000	0. 00837	3. 028	9. 041E+04	15. 88%		1. 467E+28
898	(898. 70)	0. 002700	0. 00456	4. 832	3. 925E+05	9. 01%		6. 368E+28
****	(1596. 40)	0. 960000	0. 00259	0. 236	9. 470E+01	s	<	1. 536E+25

Ce141 3. 245E+01 DAYS LAMBDA= 2. 136E-02 DECAY= 5. 192E-10 2G

****	(145. 40)	0. 480000	0. 02712	1. 763	1. 354E+02	s	<	1. 175E+11
------	------------	-----------	----------	--------	------------	---	---	------------

Ce144 2. 842E+02 DAYS LAMBDA= 2. 439E-03 DECAY= 8. 707E-02 15G

****	(133. 53)	0. 108000	0. 02739	1. 887	6. 377E+02	s	<	3. 299E+03
------	------------	-----------	----------	--------	------------	---	---	------------

Eu152 4. 821E+03 DAYS LAMBDA= 1. 438E-04 DECAY= 8. 660E-01 48G

122	(121. 78)	0. 254000	0. 02736	386. 387	5. 559E+04	s	0. 29%	2. 892E+04
****	(344. 31)	0. 245000	0. 01310	1. 437	4. 478E+02	s	<	2. 329E+02
****	(778. 87)	0. 120000	0. 00531	1. 094	1. 717E+03	s	<	8. 932E+02
****	(963. 36)	0. 132000	0. 00425	1. 302	2. 322E+03	s	<	1. 208E+03
****	(1112. 04)	0. 124000	0. 00370	1. 185	2. 581E+03	s	<	1. 343E+03
****	(1408. 02)	0. 198000	0. 00294	0. 266	4. 581E+02	s	<	2. 383E+02

Eu154 3. 105E+03 DAYS LAMBDA= 2. 232E-04 DECAY= 7. 998E-01 48G

122	(123. 07)	0. 390000	0. 02737	386. 406	3. 621E+04	s	0. 29%	2. 039E+04
189	(188. 20)	0. 002000	0. 02415	9. 479	1. 963E+05	7. 34%		1. 106E+05
511	(511. 20)	0. 000600	0. 00837	2. 931	5. 839E+05	15. 88%		3. 289E+05
****	(723. 26)	0. 202000	0. 00576	0. 990	8. 506E+02	s	<	4. 791E+02
****	(873. 16)	0. 117000	0. 00470	1. 204	2. 190E+03	s	<	1. 233E+03
***	(1004. 75)	0. 170000	0. 00407	1. 226	1. 770E+03	s	<	9. 969E+02
****	(1274. 49)	0. 336000	0. 00325	0. 436	3. 993E+02	s	<	2. 249E+02

Eu155 1. 812E+03 DAYS LAMBDA= 3. 825E-04 DECAY= 6. 819E-01 6G

60	(60. 01)	0. 012800	0. 01000	6422. 489	5. 018E+07	0. 04%		3. 315E+07
88	(86. 54)	0. 320000	0.	1	3. 019E+05	s	0. 08%	1. 994E+05

**** (105.30) 0.200000 0.02740 1.865 3.403E+02 s < 2.248E+02

Ta182 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 2.399E-03 336
68 (67.80) 0.410000 0.01395 118.089 2.064E+04 s 0.77% 3.876E+06
**** (100.10) 0.144000 0.02674 1.910 4.960E+02 s < 9.312E+04
151 (152.44) 0.073000 0.02675 1.417 7.255E+02 38.36% 1.362E+05
114 (1113.20) 0.004100 0.00370 4.220 2.783E+05 10.58% 5.225E+07
**** (1121.30) 0.358000 0.00367 0.993 7.552E+02 s < 1.418E+05
**** (1189.05) 0.166000 0.00348 0.773 1.338E+03 s < 2.511E+05
**** (1221.40) 0.277000 0.00339 0.546 5.813E+02 s < 1.091E+05
**** (1231.01) 0.117000 0.00337 0.547 1.388E+03 s < 2.606E+05

I192 7.402E+01 DAYS LAMBDA= 9.364E-03 DECAY= 8.504E-05 226
136 (136.35) 0.001330 0.02737 46.655 1.282E+06 1.71% 6.789E+09
**** (295.95) 0.290900 0.01562 1.535 3.378E+02 s < 1.789E+06
**** (308.45) 0.297600 0.01489 1.624 3.664E+02 s < 1.941E+06
**** (316.50) 0.830700 0.01445 1.588 1.323E+02 s < 7.006E+05
**** (468.06) 0.476000 0.00920 1.612 3.680E+02 s < 1.949E+06

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 9.988E-01 486
**** (186.10) 0.040000 0.02431 1.754 1.804E+03 s < 8.136E+02
**** (242.00) 0.078000 0.01951 1.736 1.140E+03 s < 5.143E+02
**** (351.96) 0.393000 0.01276 1.432 2.856E+02 s < 1.288E+02
**** (609.32) 0.484000 0.00695 1.132 3.362E+02 s < 1.516E+02

Th228 6.987E+02 DAYS LAMBDA= 9.921E-04 DECAY= 3.705E-01 316
166 (166.37) 0.000900 0.02578 36.614 1.578E+06 2.07% 1.919E+06
**** (238.62) 0.448000 0.01981 1.753 1.976E+02 s < 2.402E+02
511 (510.69) 0.076600 0.00838 2.933 4.571E+03 15.88% 5.557E+03
**** (583.17) 0.287000 0.00728 1.138 5.446E+02 s < 6.621E+02

h232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 416
**** (338.40) 0.104000 0.01337 1.444 1.039E+03 s < 4.679E+02
**** (911.10) 0.250000 0.00450 1.284 1.142E+03 s < 5.146E+02
957 (958.50) 0.002700 0.00427 1.759 1.526E+05 25.62% 6.874E+04
**** (968.90) 0.150000 0.00422 1.222 1.929E+03 s < 8.691E+02

U 235 2.571E+11 DAYS LAMBDA= 2.696E-12 DECAY= 1.000E+00 346
60 (58.60) 0.001000 0.00933 6421.010 6.883E+08 0.04% 3.101E+08
136 (135.67) 0.000650 0.02738 46.393 2.607E+06 1.71% 1.174E+06
**** (143.78) 0.132600 0.02718 1.747 4.847E+02 s < 2.183E+02
151 (150.96) 0.001080 0.02684 1.412 4.870E+04 38.36% 2.194E+04
**** (185.72) 0.540000 0.02434 1.743 1.326E+02 s < 5.973E+01
**** (205.31) 0.050000 0.02276 1.756 1.544E+03 s < 6.954E+02
218 (217.93) 0.000360 0.02165 4.478 5.746E+05 17.88% 2.588E+05

U 238 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 26
**** (1001.10) 0.008280 0.00409 1.158 3.422E+04 s < 1.541E+04
**** (766.40) 0.002067 0.00541 1.087 9.729E+04 s < 4.382E+04

Am241 1.582E+05 DAYS LAMBDA= 4.381E-06 DECAY= 9.956E-01 416
60 (59.54) 0.359000 0.00977 6421.027 1.830E+06 s 0.04% 8.280E+05

Cm242 1.630E+02 DAYS LAMBDA= 4.252E-03 DECAY= 1.418E-02 86
**** (562.00) 0.000002 0.00757 1.081 7.141E+07 s < 2.269E+09

1000 STD 243 G-6 MB 179.561 6 1700.53 MIN 1.00000 SM 542

LIBR=ARLI REF TIME= 274.708 3

* Group..... 1000 * Time of count 179.561 2006 *
* Sample..... 243 * Reference GMT..... 274.708 2003 *
* Element..... * Elapsed Live Tm..... 1700.533 *
* Type code..... STD * Dead Time Pct..... 1.907399 *
* ID..... M MULTI GAMMA STANDARD * Background GMT..... 176.045 2006 *
* Geometry, detector..... MB-6 * Standard GMT..... 161.694 2006 *
* Aliquot..... 1. * Days since TO..... 1000.853 *
* Unit of Aliquot..... SMPL * Time on..... 6:27 PDT 28-JUN *
* Data Sheet Units..... PCI /SMPL * Time off..... 10:48 PDT 29-JUN *
* Library..... ARLI * Calc Time..... 11:15 29-JUN-06 *

* Slope..... 1.004232 * Width slope..... 0.004075 *
* Intercept..... -1.63488 * Width offset..... 5.505901 *
* X**2 TERM..... -0.13238429E-05 * Sensitivity..... 4. *
NP: [17,67]542. GSP 31 PEAKS

PK	IT	ENRG	LEFT	WD	BKGD	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	3	21.8	19	17264251	2.801827131	21.9	1.07E+03	0.10	0.062	0	0.00	0	0.00
2	3	26.1	19	17569780	2.073254964	26.1	1.91E+03	0.10	0.106	0	0.00	0	0.00
3	3	31.9	19	17*****	2.80 458717	32.0	2.70E+02	0.40	0.196	0	0.00	0	0.00
4	5	43.5	39	26*****	4.55 446116	43.5	2.62E+02	0.60	0.494	0	0.00	0	0.00
5	5	50.6	39	26*****	6.783392182	50.6	1.99E+03	0.20	0.781	0	0.00	0	0.00
6	5	59.5	39	26*****	2.55*****	59.4	6.42E+03	0.00	0.982	0	0.00	0	0.00
7	10	68.3	65	13894749	4.76 200087	68.2	1.18E+02	0.8	1.34	0354	0.00	0	0.00
8	10	73.9	65	13*****	4.53 380264	73.8	2.24E+02	0.5	1.63	0	0.00	0	0.00
9	0	87.9	81	13*****	2.573771885	87.7	2.22E+03	0.1	2.33	0	0.00	0	0.00
10	0	122.0	116	12750865	2.54 657007	121.6	3.86E+02	0.3	2.74	0	0.00	0	0.00
11	0	136.4	132	9533873	2.57 78893	136.0	4.64E+01	1.7	2.73	0	0.00	0	0.00
12	0	151.2	149	6337386	2.89 2401	150.8	1.41E+00	38.4	2.68	0	0.00	0	0.00
13	0	165.8	162	9489328	2.52 62226	165.3	3.66E+01	2.1	2.58	0	0.00	0	0.00
14	6	189.0	185	19462562	6.57 16117	188.4	9.48E+00	7.3	2.40	0	1.65	0	0.00
15	6	196.8	185	19873146	7.00 12647	196.2	7.44E+00	16.1	2.34	0	0.00	0	0.00
16	0	218.4	214	9571116	5.63 7615	217.7	4.48E+00	17.9	2.16	0	0.00	0	0.00
17	0	310.4	306	8335916	3.26 9327	309.3	5.48E+00	10.8	1.49	0	0.00	0	0.00
18	0	391.6	388	7268285	2.77 13156	390.3	7.74E+00	6.6	1.13	0	0.00	0	0.00
19	0	471.4	467	7290267	4.04 4559	469.8	2.68E+00	19.60	0.920	0	0.00	0	0.00
PK	IT	ENRG	LEFT	WD	BKGD	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	511.3	507	7195627	3.67 9215	509.6	5.42E+00	8.00	0.839	0	0.00	0	0.00
21	0	661.6	653	14309435	2.872246254	659.5	1.32E+03	0.10	0.642	0	0.00	0	0.00
22	0	821.5	816	8173924	2.83 4862	819.1	2.86E+00	14.90	0.503	0	0.00	0	0.00
23	0	898.0	893	7183842	2.68 7955	895.4	4.68E+00	9.00	0.461	0	0.00	0	0.00
24	0	957.3	952	7213756	4.22 2992	954.6	1.76E+00	25.60	0.430	0	0.00	0	0.00
25	0	1113.9	1107	9174435	6.17 7151	1111.0	4.21E+00	10.60	0.371	0	0.00	0	0.00
26	0	1173.0	1161	17203480	3.281845772	1170.0	1.09E+03	0.10	0.353	0	0.00	0	0.00
27	0	1332.2	1320	18 66269	3.421655412	1329.1	9.73E+02	0.10	0.312	0	0.00	0	0.00
28	0	1353.5	1346	9 13271	4.29 1137	1350.4	6.68E-01	18.80	0.307	0	0.00	0	0.00
29	0	1460.7	1452	12 10557	3.52 4204	1457.5	2.47E+00	5.10	0.283	0	0.00	0	0.00
30	0	1764.0	1758	9 5008	2.93 249	1760.8	1.47E-01	52.20	0.239	0	0.00	0	0.00
31	0	1835.4	1825	15 7982	3.72 5651	1832.3	3.32E+00	3.70	0.230	0	0.00	0	0.00

WHM=SQRT(1.72325E+01 + -2.18683E-03 *E)

BACKGROUND INFO 1000 STD 243 179.561 6 G-6 BG DATE 176.045 6

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v		
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR
196.85	7.4371	16.07	198.00	0.4005	0.00	7.0366	16.98	
511.28	5.4189	8.02	511.00	2.4879	6.68	2.9310	15.88	
661.55	1320.9115	0.08	661.60	0.1376	29.36	1320.7739	0.08	
172.98	1085.4080	0.09	1173.20	0.0388	54.96	1085.3693	0.09	
1332.18	973.4664	0.09	1332.50	0.0639	30.19	973.4024	0.09	
1460.70	2.4722	5.12	1461.00	3.4010	9.28	-0.9288	36.62R	
1764.02	0.1467	52.23	1764.50	0.3610	8.37	-0.2142	38.45R	

2 PEAKS REJECTED BY BACKGROUND

 INTERFERING ISOTOPE ANALYSIS 1000 STD 243 179.561 6 G- 6

 NONE FOUND

BACKGROUND FOR GELI DETECTOR 6 OF 176.045/2006 2471.4 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.5934	17.96	511.0	2.4879	6.68	1120.3	0.3575	9.43
92.0	0.6806	38.82	583.1	0.6833	13.35	1173.2	0.0388	54.96
143.0	0.2452	79.81	609.3	1.1785	13.62	1238.1	0.1704	18.25
186.0	0.4906	21.12	661.6	0.1376	29.36	1332.5	0.0639	30.19
198.0	0.4005	0.00	727.2	0.1791	14.74	1337.7	0.0000	0.00
238.6	1.7436	21.26	846.0	0.0000	0.00	1461.0	3.4010	9.28
279.0	0.2460	0.00	860.4	0.0850	36.73	1586.0	0.0000	0.00
295.2	0.7614	28.08	911.1	0.5639	16.63	1591.0	0.2203	21.97
338.4	0.4090	30.29	968.9	0.3345	26.82	1729.6	0.0668	27.68
351.9	1.1200	14.62	1001.0	0.0537	67.09	1764.5	0.3610	8.37

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 6/29/ 6

HIGH RADIUM STANDARD LOW RADIUM STANDARD

HIGH RADIUM STANDARD					LOW RADIUM STANDARD				
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	
149.708	6	2.2031	4.809	38.*	145.726	6	1.2290	4.435	67.
150.726	6	2.2442	5.051	29.*	146.689	6	1.2566	4.512	104.
152.017	6	2.2349	5.101	22.*	147.746	6	1.2362	4.964	43.
152.939	6	2.2207	4.875	30.*	149.738	6	1.2558	5.711	27. NG
153.997	6	2.2203	4.671	51.*	150.859	6	1.2208	6.682	40. NG
155.037	6	2.2357	4.908	30.*	151.928	6	1.2570	5.695	124. NG
156.995	6	2.2441	4.981	35.*	152.963	6	1.2467	5.181	27. NG
157.996	6	2.2251	5.333	57.*	155.060	6	1.2383	4.922	21. NG
159.751	6	2.2465	5.112	28.*	159.700	6	1.2320	5.223	37.
61.678	6	0.9922	4.921	20.	161.694	6	0.9956	6.569	21.*
AVERAGE		0.9922	0.000		AVERAGE		0.9956	0.000	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 161.694 6
 ENERGY= -0.163488 + 1.0042317*CH + -1.323843E-06*CH**2
 FWHM =SQRT(5.5059 + 0.004075*ENERGY) (CO60= 3.307)

EFFICIENCIES FOR GEOMETRY MB 6 CALIBRATED 26.000 1995

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	0.770900	130.0	2.740200	350.0	1.284500	1500.0	0.275100
60.0	0.999400	140.0	2.730700	400.0	1.098500	2000.0	0.210300
80.0	2.015200	150.0	2.689300	500.0	0.856900	2500.0	0.167000
90.0	2.421000	170.0	2.549100	600.0	0.707100	3000.0	0.138400
100.0	2.672400	200.0	2.320800	800.0	0.515800		
110.0	2.765300	220.0	2.146400	1000.0	0.409300		
120.0	2.736800	250.0	1.882200	1200.0	0.345200		

PK	ENERGY	CPM	%ERR	COMMENT
1	21.8	1074.45	0.1	
2	26.1	1914.08	0.1	
3	31.9	269.75	0.4	
4	43.5	262.34	0.6	NO GEN.
5	50.6	1994.78	0.2	
6	59.5	6421.01	0.0	Am241s
7	68.3	117.66	0.8	Ta182s
8	73.9	223.61	0.5	
9	87.9	2218.06	0.	Cs136 Cd109 Eu155s Sn126s
10	122.0	386.35	0.3	Eu154s Eu152s Co 57s
11	136.4	46.39	1.7	Se 75s Co 57s
12	151.2	1.41	38.4	
13	165.8	36.59	2.1	Ce139 Cs136
14	189.0	9.48	7.3	
b 15	196.8	7.04	17.0	
16	218.4	4.48	17.9	
17	310.4	5.48	10.8	Co 60p
18	391.6	7.74	6.6	NO GEN. Sn113s
19	471.4	2.68	19.6	
b 20	511.3	2.93	15.9	Th228 La140 Ru106 Na 22s
b 21	661.6	1320.77	0.1	Cs137s
22	821.5	2.86	14.9	Co 60p Sn125s
23	898.0	4.68	9.0	La140 Y 88
24	957.3	1.76	25.6	Ac228
25	1113.9	4.21	10.6	
b 26	1173.0	1085.37	0.1	Cs134+ Co 60s
b 27	1332.2	973.40	0.1	Co 60s
28	1353.5	6.67	18.8	Sb124
31	1835.4	3.32	3.7	Y 88
REJECTED PEAKS				
B 29	1460.7	-0.93	36.6	Ac228 K 40s
B 30	1764.0	-0.21	38.4	Ra226

Y88
 Cd109

Det ... GELI B
 Geo ... MB - Marinelli beaker
 Shif ... 0
 Ref ... 500 mLs in Marinelli Beaker

Date ... 4-SEP-00 Page 1
 Version ... 2.00
 File ... ND: [25, 4]GELI08MBO.EFF

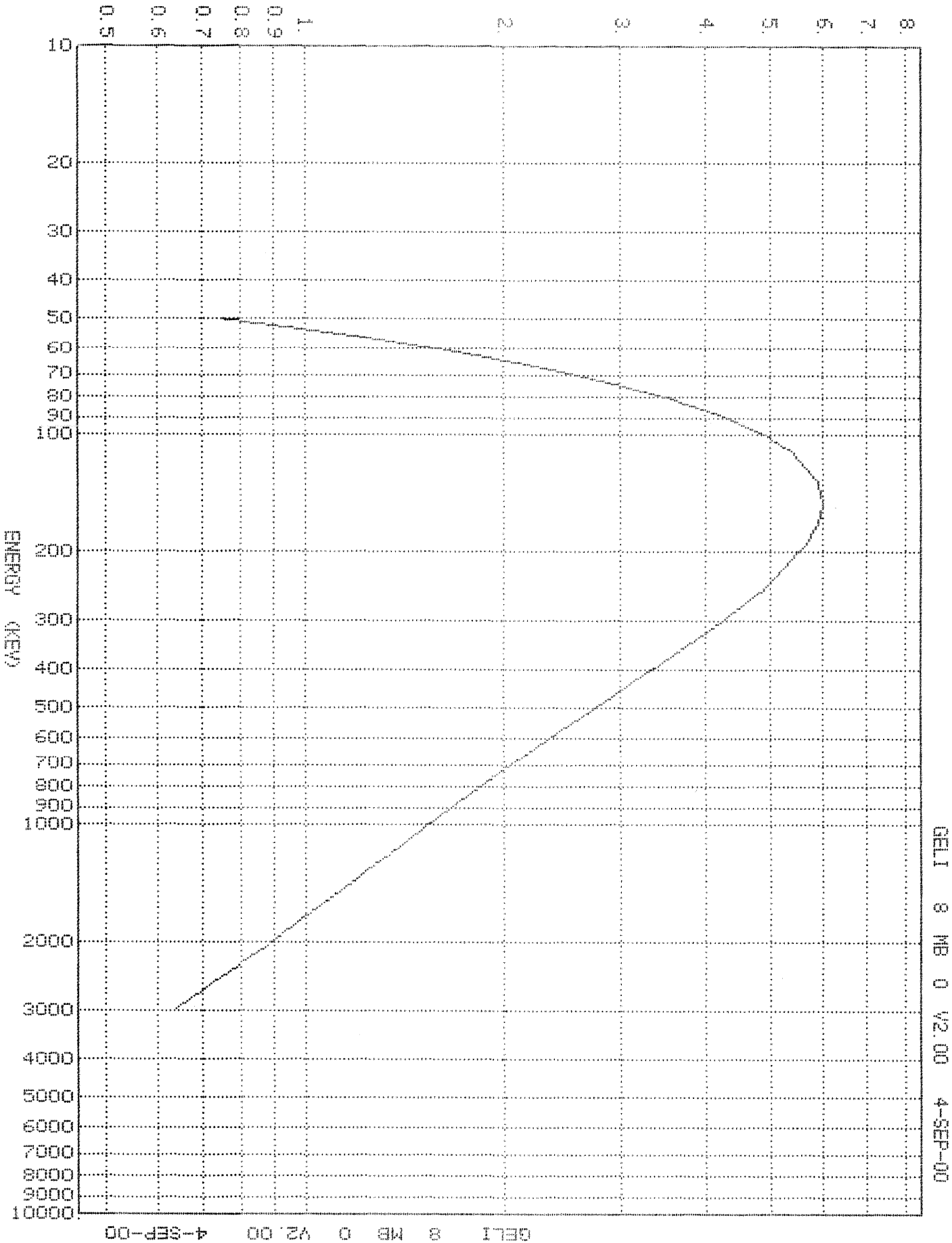
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.75241	108	5.30727	216	5.28819	324	3.97304	432	3.10124
51	0.82184	110	5.39786	218	5.26065	326	3.95204	434	3.08892
52	0.89615	112	5.44906	220	5.23351	328	3.93128	436	3.07672
53	0.97556	114	5.49983	222	5.20675	330	3.91075	438	3.06462
54	1.06033	116	5.55018	224	5.18037	332	3.89046	440	3.05262
55	1.15070	118	5.60011	226	5.15436	334	3.87039	442	3.04072
56	1.23295	120	5.64964	228	5.12870	336	3.85054	444	3.02892
57	1.31946	122	5.69878	230	5.10339	338	3.83091	446	3.01722
58	1.41039	124	5.74754	232	5.07842	340	3.81150	448	3.00562
59	1.50586	126	5.79593	234	5.05379	342	3.79230	450	2.99411
60	1.60602	128	5.84395	236	5.02949	344	3.77330	452	2.98270
61	1.69622	130	5.89162	238	5.00551	346	3.75451	454	2.97138
62	1.78990	132	5.90359	240	4.98184	348	3.73592	456	2.96016
63	1.88712	134	5.91541	242	4.95848	350	3.71753	458	2.94902
64	1.98798	136	5.92708	244	4.93541	352	3.69934	460	2.93798
65	2.09253	138	5.93860	246	4.91265	354	3.68133	462	2.92702
66	2.18589	140	5.94997	248	4.89017	356	3.66352	464	2.91615
67	2.28193	142	5.96120	250	4.86797	358	3.64589	466	2.90537
68	2.38066	144	5.97230	252	4.83894	360	3.62844	468	2.89468
69	2.48214	146	5.98327	254	4.81031	362	3.61117	470	2.88407
70	2.58638	148	5.99410	256	4.78206	364	3.59407	472	2.87354
71	2.67273	150	6.00481	258	4.75421	366	3.57716	474	2.86310
72	2.76069	152	5.99378	260	4.72673	368	3.56041	476	2.85274
73	2.85028	154	5.98292	262	4.69961	370	3.54383	478	2.84245
74	2.94149	156	5.97221	264	4.67286	372	3.52742	480	2.83225
75	3.03434	158	5.96166	266	4.64646	374	3.51117	482	2.82213
76	3.12883	160	5.95126	268	4.62040	376	3.49508	484	2.81208
77	3.22497	162	5.94101	270	4.59469	378	3.47915	486	2.80212
78	3.32277	164	5.93090	272	4.56930	380	3.46337	488	2.79222
79	3.42223	166	5.92093	274	4.54424	382	3.44775	490	2.78241
80	3.52336	168	5.91109	276	4.51949	384	3.43229	492	2.77267
81	3.59995	170	5.90139	278	4.49506	386	3.41697	494	2.76300
82	3.67723	172	5.87843	280	4.47094	388	3.40179	496	2.75340
83	3.75520	174	5.85583	282	4.44711	390	3.38677	498	2.74387
84	3.83386	176	5.83357	284	4.42358	392	3.37188	500	2.73442
85	3.91322	178	5.81164	286	4.40033	394	3.35714	502	2.72498
86	3.99325	180	5.79004	288	4.37738	396	3.34253	504	2.71560
87	4.07397	182	5.76875	290	4.35469	398	3.32806	506	2.70629
88	4.15537	184	5.74778	292	4.33228	400	3.31373	508	2.69706
89	4.23745	186	5.72711	294	4.31014	402	3.29953	510	2.68789
90	4.32021	188	5.70673	296	4.28826	404	3.28545	512	2.67878
91	4.38171	190	5.68664	298	4.26663	406	3.27151	514	2.66975
92	4.44340	192	5.66530	300	4.24526	408	3.25770	516	2.66078
93	4.50528	194	5.61993	302	4.22104	410	3.24401	518	2.65187
94	4.56735	196	5.58798	304	4.19711	412	3.23044	520	2.64303
95	4.62959	198	5.55594	306	4.17348	414	3.21700	522	2.63425
96	4.69203	200	5.52380	308	4.15014	416	3.20368	524	2.62553
97	4.75464	202	5.49276	310	4.12707	418	3.19047	526	2.61688
98	4.81744	204	5.46220	312	4.10428	420	3.17739	528	2.60828
99	4.88041	206	5.43209	314	4.08176	422	3.16442	530	2.59975
100	4.94356	208	5.40245	316	4.05950	424	3.15156	532	2.59127
102	5.03469	210	5.37324	318	4.03750	426	3.13881	534	2.58286
104	5.12568	212	5.34447	320	4.01576	428	3.12618	536	2.57451
106	5.21654	214	5.31612	322	3.99428	430	3.11365	538	2.56621

Det ... GELI 8
 Geo ... MB - Marinelli beaker
 Shif ... 0
 Ref ... 500 mLs in Marinelli Beaker

Date ... 4-SEP-00 Page 2
 Version ... 2.00
 File ... ND: [25, 4]GELI08MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	2.55797	660	2.14960	930	1.61767	1260	1.27158	1800	0.96172
542	2.54978	665	2.13559	935	1.61057	1270	1.26373	1810	0.95756
544	2.54166	670	2.12176	940	1.60353	1280	1.25599	1820	0.95344
546	2.53359	675	2.10813	945	1.59656	1290	1.24835	1830	0.94936
548	2.52557	680	2.09469	950	1.58966	1300	1.24082	1840	0.94532
550	2.51761	685	2.08143	955	1.58282	1310	1.23339	1850	0.94132
552	2.50970	690	2.06836	960	1.57604	1320	1.22606	1860	0.93735
554	2.50184	695	2.05545	965	1.56934	1330	1.21883	1870	0.93343
556	2.49404	700	2.04272	970	1.56269	1340	1.21169	1880	0.92954
558	2.48629	705	2.03082	975	1.55611	1350	1.20465	1890	0.92569
560	2.47860	710	2.01906	980	1.54958	1360	1.19770	1900	0.92187
562	2.47095	715	2.00746	985	1.54312	1370	1.19085	1925	0.91249
564	2.46335	720	1.99601	990	1.53672	1380	1.18408	1950	0.90332
566	2.45581	725	1.98470	995	1.53038	1390	1.17740	1975	0.89435
568	2.44831	730	1.97353	1000	1.52409	1400	1.17080	2000	0.88559
570	2.44086	735	1.96250	1005	1.51814	1410	1.16430	2025	0.87644
572	2.43346	740	1.95160	1010	1.51225	1420	1.15787	2050	0.86750
574	2.42611	745	1.94084	1015	1.50641	1430	1.15153	2075	0.85876
576	2.41881	750	1.93021	1020	1.50062	1440	1.14527	2100	0.85020
578	2.41155	755	1.91971	1025	1.49488	1450	1.13908	2125	0.84184
580	2.40434	760	1.90933	1030	1.48919	1460	1.13297	2150	0.83365
582	2.39718	765	1.89908	1035	1.48355	1470	1.12693	2175	0.82563
584	2.39006	770	1.88894	1040	1.47795	1480	1.12096	2200	0.81778
586	2.38299	775	1.87893	1045	1.47241	1490	1.11507	2225	0.81009
588	2.37596	780	1.86903	1050	1.46691	1500	1.10925	2250	0.80256
590	2.36898	785	1.85925	1055	1.46146	1510	1.10349	2275	0.79519
592	2.36204	790	1.84959	1060	1.45605	1520	1.09781	2300	0.78796
594	2.35515	795	1.84003	1065	1.45069	1530	1.09219	2325	0.78087
596	2.34830	800	1.83058	1070	1.44538	1540	1.08663	2350	0.77392
598	2.34149	805	1.82124	1075	1.44011	1550	1.08114	2375	0.76710
600	2.33472	810	1.81200	1080	1.43488	1560	1.07571	2400	0.76042
602	2.32800	815	1.80287	1085	1.42969	1570	1.07035	2425	0.75386
604	2.32131	820	1.79384	1090	1.42455	1580	1.06504	2450	0.74743
606	2.31467	825	1.78490	1095	1.41945	1590	1.05979	2475	0.74111
608	2.30807	830	1.77607	1100	1.41439	1600	1.05460	2500	0.73491
610	2.30151	835	1.76733	1105	1.40937	1610	1.04947	2525	0.72883
612	2.29499	840	1.75869	1110	1.40439	1620	1.04440	2550	0.72285
614	2.28851	845	1.75014	1115	1.39946	1630	1.03938	2575	0.71698
616	2.28207	850	1.74168	1120	1.39456	1640	1.03442	2600	0.71121
618	2.27567	855	1.73331	1125	1.38970	1650	1.02951	2625	0.70555
620	2.26930	860	1.72503	1130	1.38487	1660	1.02465	2650	0.69998
622	2.26298	865	1.71684	1135	1.38009	1670	1.01984	2675	0.69451
624	2.25669	870	1.70873	1140	1.37534	1680	1.01509	2700	0.68913
626	2.25044	875	1.70071	1150	1.36596	1690	1.01038	2725	0.68384
628	2.24422	880	1.69277	1160	1.35672	1700	1.00573	2750	0.67864
630	2.23805	885	1.68492	1170	1.34763	1710	1.00112	2775	0.67353
632	2.23191	890	1.67714	1180	1.33867	1720	0.99656	2800	0.66850
634	2.22580	895	1.66944	1190	1.32984	1730	0.99205	2825	0.66355
636	2.21973	900	1.66182	1200	1.32115	1740	0.98758	2850	0.65868
638	2.21370	905	1.65428	1210	1.31258	1750	0.98316	2875	0.65389
640	2.20771	910	1.64681	1220	1.30415	1760	0.97879	2900	0.64918
645	2.19286	915	1.63942	1230	1.29583	1770	0.97446	2925	0.64454
650	2.17824	920	1.63210	1240	1.28763	1780	0.97017	2950	0.63997
655	2.16382	925	1.62485	1250	1.27955	1790	0.96593	2975	0.63547

PERCENT EFFICIENCY



APPENDIX G

Section 19

EBERLINE SERVICES REPORT

April 23, 2007



EBERLINE

SERVICES

April 23, 2007

Ms. Michele Chamberlin
Test America, Inc.
17461 Derian Avenue, Suite 100
Irvine, CA 92614

Reference: Test America Project No. IQA2023
Eberline Services NELAP Cert #01120CA (exp. 01/31/08)
Eberline Services Report R702123-8658
R704019-8658
R704053-8658

Dear Ms. Chamberlin:

Enclosed is a Level IV data report (on CD) for the results of one water sample received at Eberline Services on February 21, 2007. The sample was originally analyzed according to the accompanying Test America Subcontract Order Form; results were reported on March 23, 2007. The originally requested analyses were gross alpha/gross beta (EPA900.0). This report contains the additionally requested gross beta (EPA900.0), Ra-226 (EPA903.1), Ra-228 (EPA904.0), and gamma spectroscopic (EPA901.1) results. Quality control samples consisted of LCS's, blank analyses, duplicate analyses, and matrix spikes (excluding Ra-228 and gamma spec). Analyses that involve the yielding of an analytical tracer or carrier, such as Sr-90 and Ra-228, do not require matrix spike analyses to be performed. All QC sample results were within the limits defined in Eberline Services Quality Control Procedures Manual.

Please call me if you have any questions concerning this report.

Regards,

Melissa Mannion
Senior Program Manager

MCM/njv

Enclosure: CD Report

Analytical Services
2030 Wright Avenue
P.O. Box 4040
Richmond, California 94804-0040
(510) 235-2633 Fax (510) 235-0438
Toll Free (800) 841-5487
www.eberlineservices.com
NPDES - 1574

Table of Contents

Section 1

Chain-of-Custody & Sample Receipt Information
Analysis Results
Sample Analysis Raw Data
Aliquot Information

Section 2

Preparation Logs & Standards Certification
for Quality Control Samples

Section 3

Instrument Calibration Information

Section 1

Chain-of-Custody & Sample Receipt Information

Analysis Results

Sample Analysis Raw Data

Aliquot Information

SUBCONTRACT ORDER - PROJECT # IQB2023

SENDING LABORATORY:

TestAmerica - Irvine, CA
 17461 Derian Avenue, Suite 100
 Irvine, CA 92614
 Phone: (949) 261-1022
 Fax: (949) 260-3297
 Project Manager: Michele Chamberlin

RECEIVING LABORATORY:

Eberline Services
 2030 Wright Avenue
 Richmond, CA 94804
 Phone: (510) 235-2633
 Fax: (510) 235-0438
 Project Location: California

8658

Standard TAT is requested unless specific due date is requested => Due Date: 3.0K TAT Initials: MC

Analysis	Expiration	Comments
Sample ID: IQB2023-01 Water	Sampled: 02/19/07 11:15	
EDD + Level 4	03/19/07 11:15	
Gross Alpha-O	08/18/07 11:15	* DONT FILTER, 900.0, RESULT > 15 pCi/L, run Rad 226&228
Gross Beta-O	08/18/07 11:15	* DONT FILTER, 900.0, RESULT > 50 pCi/L, run Rad 226&228
Radium, Combined-O	02/19/08 11:15	HOLD for G A&B results; EPA 903.1&904.0, NO FILTER
Strontium 90-O	02/19/08 11:15	HOLD for Ra 226&228 results, EPA 905.0, DONT FILTER
Tritium-O	02/19/08 11:15	HOLD for Ra 226&228 results, EPA 906.0, DONT FILTER

Containers Supplied:
 2.5 gal Poly (IQB2023-01S)
 40 ml Amber Voa Vial (IQB2023-01T)
 40 ml Amber Voa Vial (IQB2023-01U)
 40 ml Amber Voa Vial (IQB2023-01V)

* 5 day HT
 MC

SAMPLE INTEGRITY:

All containers intact: Yes No
 Sample labels/COC agree: Yes No
 Samples Received On Ice: Yes No
 Custody Seals Present: Yes No
 Samples Preserved Properly: Yes No
 Samples Received at (temp): _____

Released By: [Signature] Date: 2/20/07 Time: _____ Received By: [Signature] Date: 02/21/07 Time: 9:00

Released By: _____ Date: _____ Time: _____ Received By: _____ Date: _____ Time: _____

2/21/07 *TR*

Client: TEST AMERICA City IRVINE State CA
 Date/Time received 02/21/07 9:00 CoC No. 1QB2023
 Container I.D. No. WTA 10E QTEST Requested TAT (Days) 21 P.O. Received Yes [] No []

INSPECTION

- 1 Custody seals on shipping container intact? Yes No [] N/A []
- 2 Custody seals on shipping container dated & signed? Yes No [] N/A []
- 3 Custody seals on sample containers intact? Yes [] No [] N/A
- 4 Custody seals on sample containers dated & signed? Yes [] No [] N/A
- 5 Packing material is Wet [] Dry
- 6 Number of samples in shipping container 1 Sample Matrix W
- 7 Number of containers per sample 4 (Or see CoC _____)
- 8 Samples are in correct container Yes No []
- 9 Paperwork agrees with samples? Yes No []
- 10 Samples have: Tape [] Hazard labels [] Rad labels [] Appropriate sample labels
- 11 Samples are: In good condition [] Leaking Broken Container [] Missing []
- 12 Samples are: Preserved [] Not preserved [] pH _____ Preservative _____
- 13 Describe any anomalies:
LEAKING - REMAINING VOL. IS MORE OR LESS
HALF THE CONTENT.

14 Was P.M. notified of any anomalies? Yes [] No [] Date _____
 15 Inspected by MF Date 02/21/07 Time 10:15

Customer Sample No.	cpm	mR/hr	Wide	Customer Sample No.	cpm	mR/hr	Wide

Ion Chamber Ser. No. _____ Calibration date _____
 Alpha Meter Ser. No. _____ Calibration date _____
 Beta/Gamma Meter Ser. No. _____ Calibration date _____

17-APR-07
 14:35:18
 R702123
 MCM

TMA Corporation
 Ra226 calculation
 RADIUM V 1.03

8658- 1 Ra
 IQB2023-01

Reviewed BC Date 4/18/07

Decay Constants

De-emanation Times

Rn222 - 1.8129E-01
 Ra226 - 1.1700E-06

1st - 100.869 7
 2nd - 107.660 7

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %
107.829	7	RN	13	35	86.3	0.316	0.090	0.995	0.090 102.0

Rn-222 decay from 2nd De-em to Count time = 0.9698
 CPM @ 2nd De-emanation time = 0.0930
 Cell #18 Counting Efficiency = 2.4630
 Radon-222 in cell @ 2nd De-emanation time = 0.0378
 Rn-222 growth from 1st to 2nd De-em time = 0.7080
 Ra226 DPM in the bubbler = 0.0533

Ra226 calculation

T-zero 50.802 7
 Delta T 56.858 (days)
 Decay 9.9993E-01
 Yield 1.0000 (0.00 mGs)
 Aliquot 1.000E-01 1

dpm/l	1 sigma		2 sigma	
	dpm error	% error	dpm error	% error
5.3331E-01	5.4378E-01	101.96 %	1.0658E+00	199.85 %
pCi /l				
2.4023E-01	2.4495E-01		4.8009E-01	
8.4681E-01 (MDA(3.00))	8.3781E-01 (MDA(2.71))	3.7765E-01 (CL)	6.4439E-01 (LTV)	2733 (RECORD)

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	13 BK BK	106.963	80	937.3	0.085	0.056 - 0.118	0.089	-0.1
RN	13 EF SF	107.629	10002	3.6	1.020	0.992 - 1.052	1.022	-0.2
RN	13 BK BK18	92.674	38	120.3	0.316	0.078 - 0.428	0.259	1.1
RN	13 EF EF18	88.868	4008	63.9	2.463	2.100 - 2.628	2.341	1.4

Previous 3 counts	Time	Detector	ID	Length	Cpm
106.656	16-APR-07 8:44	RN	13 BK	125.3 min	0.00
106.963	16-APR-07 16:06	RN	13 BK	937.3 min	0.00
107.629	17-APR-07 8:05	RN	13 SF	3.6 min	0.00

Source	LCS
Sample No.	2
Analyte	Ra226
Geometry	LC
Reference Date	
Separation Date #1	100.869-7
Separation Date #2	107.660-7
Count Date	107.828-07
Aliquot	1
Aliquot Units	SMPL
Yield	1
Result	5.3006
Error @ 2s (abs.)	0.252
Error @ 2s (%)	4.8
MDA	0.095332
Result Units	PCI/SMPL
Nuclide	Ra226
Standard ID	N1-A-(09)
Qty (ml)	0.45
Activity (dpm)	24.95
Calib. Date	252.708-1991
Half Life (days)	585500
Decay Date	107.660-7
Added (pCi)	5.023
Added Error @ 2s (%)	4
F/A Ratio	1.055
F/A Ratio Error @ 2s (%)	6
LCL	0.79
LWL	0.86
UWL	1.14
UCL	1.21
Status	PASS
Flag	

④

Be
4-18-07

60928

Status: PASS

Source	BLANK
Sample No.	3
Analyte	Ra226
Geometry	LC
Reference Date	
Separation Date #1	100.869-7
Separation Date #2	107.660-7
Count Date	107.828-07
Aliquot	1
Aliquot Units	SMPL
Yield	1
Result	-0.015783
Error @ 2s (abs.)	0.033
Error @ 2s (%)	207.7
MDA	0.07533
Result Units	PCI/SMPL
Status	PASS
Flag	

CF

BLK
4-18-07

60929

17-APR-07
 14:35:14
 R702123
 MCM

TMA Corporation
 Ra226 calculation
 RADIUM V 1.03

8658- 3 Ra
 QC-BLANK #60929

Reviewed BU Date 4-18-07

Decay Constants

De-emanation Times

Rn222 - 1.8129E-01
 Ra226 - 1.1700E-06

1st - 100.869 7
 2nd - 107.660 7

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %
107.829	7	RN	10	5	60.0	0.141	-0.058	0.996	-0.058 106.0

Rn-222 decay from 2nd De-em to Count time = 0.9698
 CPM @ 2nd De-emanation time = -0.0597
 Cell #42 Counting Efficiency = 2.4070
 Radon-222 in cell @ 2nd De-emanation time = -0.0248
 Rn-222 growth from 1st to 2nd De-em time = 0.7080
 Ra226 DPM in the bubbler = -0.0350

Ra226 calculation

T-zero 107.660 7
 Delta T 0.000 (days)
 Decay 1.0000E+00
 Yield 1.0000 (0.00 mGs)
 Aliquot 1.000E+00 smpl

dpm/smpl	1 sigma		2 sigma	
	dpm error	% error	dpm error	% error
-3.5039E-02	3.7127E-02	-105.96 %	7.2769E-02	-207.68 %
pCi /smpl				
-1.5783E-02	1.6724E-02		3.2779E-02	
7.5330E-02 (MDA(3.00))	7.4008E-02 (MDA(2.71))	3.0895E-02 (CL)	2.7594E-02 (LTV)	2737 (RECORD)

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	10 BK BK	106.963	54	937.3	0.058	0.028 - 0.094	0.062	-0.3
RN	10 EF SF	107.619	10044	3.7	1.046	1.019 - 1.070	1.049	-0.3
RN	10 BK BK42	94.675	17	120.4	0.141	0.051 - 0.281	0.168	-0.6
RN	10 EF EF42	92.861	4311	70.5	2.407	2.121 - 2.721	2.419	-0.1

Previous 3 counts	Time	Detector	ID	Length	Cpm
106.842	16-APR-07 13:12	RN	10 Ra	137 856 \ 69.6 min	139.83
106.963	16-APR-07 16:06	RN	10 BK	\ 937.3 min	0.00
107.619	17-APR-07 7:51	RN	10 SF	\ 3.7 min	0.00

Status: PASS

Source	DUP	ORIGINAL
Sample No.	4	1
Analyte	Ra226	Ra226
Reference Date	50.802-7	50.802-7
Separation Date #1	100.869-7	100.869-7
Separation Date #2	107.660-7	107.660-7
Count Date	107.828-07	107.828-07
Aliquot	0.1	0.1
Aliquot Units	L	L
Yield	1	1
Result	-0.23357	0.24023
Error @ 2s (abs.)	0.391	0.480
Error @ 2s (%)	167.3	199.9
MDA	0.87478	0.84681
Result Units	PCI/L	PCI/L
RPD		
UCL	20.00	
RER		
Criterion	N	
Status	PASS	
Flag		

CF

BU
4/18/07

60930

17-APR-07
 14:35:15
 R702123
 MCM

TMA Corporation
 Ra226 calculation
 RADIUM V 1.03

8658- 4 Ra
 QC-DUP#1 60930

Reviewed BEU Date 4/18/07

Decay Constants

De-emanation Times

Rn222 - 1.8129E-01
 Ra226 - 1.1700E-06

1st - 100.869 7
 2nd - 107.660 7

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %
107.829	7	RN	11	7	60.0	0.202	-0.085	0.996	-0.086 85.3

Rn-222 decay from 2nd De-em to Count time = 0.9698
 CPM @ 2nd De-emanation time = -0.0884
 Cell #67 Counting Efficiency = 2.4070
 Radon-222 in cell @ 2nd De-emanation time = -0.0367
 Rn-222 growth from 1st to 2nd De-em time = 0.7080
 Ra226 DPM in the bubbler = -0.0518

Ra226 calculation

T-zero 50.802 7
 Delta T 56.858 (days)
 Decay 9.9993E-01
 Yield 1.0000 (0.00 mGs)
 Aliquot 1.000E-01 1

dpm/l	1 sigma		2 sigma	
	dpm error	% error	dpm error	% error
-5.1852E-01	4.4253E-01	-85.34 %	8.6735E-01	-167.28 %
pCi /l				
-2.3357E-01	1.9934E-01		3.9070E-01	
8.7478E-01 (MDA(3.00))	8.6156E-01 (MDA(2.71))	3.6981E-01 (CL)	3.2890E-01 (LTV)	2738 (RECORD)

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	11 BK BK	106.963	63	937.3	0.067	0.035 - 0.093	0.065	0.4
RN	11 EF SF	107.622	10129	3.7	1.037	1.016 - 1.070	1.045	-0.9
RN	11 BK BK67	92.762	25	123.7	0.202	0.068 - 0.274	0.174	0.9
RN	11 EF EF67	15.901	4337	70.9	2.407	2.100 - 2.651	2.358	0.6

Previous 3 counts	Time	Detector	ID	Length	Cpm
106.656	16-APR-07 8:44	RN	11 BK	\ 125.3 min	0.00
106.963	16-APR-07 16:06	RN	11 BK	\ 937.3 min	0.00
107.622	17-APR-07 7:55	RN	11 SF	\ 3.7 min	0.00

Status: PASS

Source	MS	ORIGINAL
Sample No.	5	1
Analyte	Ra226	Ra226
Reference Date	50.802-7	50.802-7
Separation Date #1	100.869-7	100.869-7
Separation Date #2	107.660-7	107.660-7
Count Date	107.828-07	107.828-07
Aliquot	0.1	0.1
Aliquot Units	L	L
Yield	1	1
Result	111.3	0.24023
Error @ 2s (abs.)	4.482	0.480
Error @ 2s (%)	4.0	199.9
MDA	0.91925	0.84681
Result Units	PCI/L	PCI/L
Nuclide	Ra226	
Standard ID	N1-A-(09)	
Qty (ml)	1	
Activity (dpm)	24.95	
Calib. Date	252.708-1991	
Half Life (days)	585500	
Decay Date	50.802-7	
Added (pCi)	11.16	
Added Error @ 2s (%)	4	
Spike Activity	11.130	
Original Activity	0.024	
Activity Difference	11.106	
Error Difference	4.058	
F/A Ratio	0.995	
F/A Ratio Error @ 2s (%)	5.698	
LCL	0.80	
LWL	0.87	
UWL	1.13	
UCL	1.20	
Status	PASS	
Flag		

(*)

Be
1-1807

60931

17-APR-07
 14:35:17
 R702123
 MCM

TMA Corporation
 Ra226 calculation
 RADIUM V 1.03

8658- 5 Ra
 QC-MS#1 60931

Reviewed BW Date 4-18-07

Decay Constants				De-emanation Times						
Rn222	-	1.8129E-01		1st	-	100.869	7			
Ra226	-	1.1700E-06		2nd	-	107.660	7			

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %	
107.829	7	RN	12	2408	60.0	0.217	39.903	0.996	40.054	2.1

Rn-222 decay from 2nd De-em to Count time = 0.9698
 CPM @ 2nd De-emanation time = 41.3000
 Cell #20 Counting Efficiency = 2.3610
 Radon-222 in cell @ 2nd De-emanation time = 17.4926
 Rn-222 growth from 1st to 2nd De-em time = 0.7080
 Ra226 DPM in the bubbler = 24.7060

Ra226 calculation

T-zero 50.802 7
 Delta T 56.858 (days)
 Decay 9.9993E-01
 Yield 1.0000 (0.00 mGs)
 Aliquot 1.000E-01 1

dpm/l	1 sigma		2 sigma	
	dpm error	% error	dpm error	% error
2.4708E+02	5.0761E+00	2.05 %	9.9491E+00	4.03 %
pCi /l				
1.1130E+02	2.2865E+00		4.4816E+00	
9.1925E-01 (MDA(3.00))	9.0578E-01 (MDA(2.71))	3.9076E-01 (CL)	1.1507E+02 (LTV)	2739 (RECORD)

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	12 BK BK	106.963	89	937.3	0.095	0.058 - 0.120	0.090	0.6
RN	12 EF SF	107.626	10003	3.6	1.036	1.005 - 1.080	1.044	-0.7
RN	12 BK BK20	88.776	26	120.1	0.217	0.061 - 0.273	0.169	1.4
RN	12 EF EF20	324.949	4108	79.4	2.361	2.100 - 2.523	2.304	0.9

Previous 3 counts	Time	Detector	ID	Length	Cpm
106.656	16-APR-07 8:44	RN	12 BK	125.3 min	0.00
106.963	16-APR-07 16:06	RN	12 BK	937.3 min	0.00
107.626	17-APR-07 8:01	RN	12 SF	3.6 min	0.00

18-APR-07
06:38:14
R702123
MCM

TMA Corporation
Beta Counting Data
AUTOB V 2.08

8658- 1

Ac
IQB2023-01

Reviewed Beu Date 4-18-07

Ac 228

Counter GRB 201
Length of count 0.0 Min.
Gross counts = 0.

Zero time 50.802 7
Separation time 107.617 7

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	ADJUSTED CPM	CORRECTED CPM
107.979	0.	0.0	0.00	0.000	0.00	0.03	0.03

CPM corrected for decay to Sept. Time. : 0.0882

Elapsed time (days) = 56.815
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 9.814E-01
Chemical yield (2) = 0.8125
PPT. correction (3) = 1.0847 (recovery = 33.10 mgs)
Aliquot (4) = 1.800 1

Product (1X2X3X4) = 1.556841E+00

C-zero	P-factor	dpm/l	dpm error	1 sigma percent sigma
5.6676E-02	2.0790	1.1783E-01	2.1555E-01	182.93 %

pCi /l	1 sigma	2 sigma
5.3076E-02	9.7093E-02	1.9030E-01

LTV 2.1328E-01

1st point MDA (3.00) 5.1832E-01
MDA (2.71) 5.1447E-01
Lc 2.4020E-01

DPM OF ALIQUOT 2.121E-01

Saved answer = 2.121E-01 182.93% (DPM of aliquot) (2740)

BTAIN V. 0.00

8658 - 1 Ac

Ac228 (lambda = 2.714E+00)
 Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @107.979	Error
107.979	GRB 201	66	150.0	0.42	1.051	0.02	0.02	464.4%
108.084	GRB 201	70	150.0	0.42	1.051	0.05	0.07	176.9%
108.189	GRB 201	64	150.0	0.42	1.051	0.00	0.01	2764.1%
108.293	GRB 201	71	150.0	0.42	1.051	0.06	0.14	153.6%
108.398	GRB 201	61	150.0	0.42	1.051	-0.02	-0.07	420.0%
108.502	GRB 201	31	75.9	0.42	1.051	-0.02	-0.07	575.5%
Weighted average							0.03	182.9%

Counting Data

	GMT	Det	Min.	Counts	CPM	Error	BKG	SF	CF
1.	107.979	GRB 201	150.00	66	0.02	474.3%	0.4240	1.0510	0
2.	108.084	GRB 201	150.00	70	0.04	180.6%	0.4240	1.0510	0
3.	108.189	GRB 201	150.00	64	0.00	2824.0%	0.4240	1.0510	0
4.	108.293	GRB 201	150.00	71	0.05	156.8%	0.4240	1.0510	0
5.	108.398	GRB 201	150.00	61	-0.02	429.3%	0.4240	1.0510	0
6.	108.502	GRB 201	75.89	31	-0.02	675.1%	0.4240	1.0510	0

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
GRB 201	EF SF	107.717	84131	10.0	1.049	1.022 - 1.082	1.051	-0.3
GRB 201	EF SF	107.717	84131	10.0	1.049	1.022 - 1.082	1.051	-0.3
GRB 201	EF SF	107.717	84131	10.0	1.049	1.022 - 1.082	1.051	-0.3
GRB 201	EF SF	107.717	84131	10.0	1.049	1.022 - 1.082	1.051	-0.3
GRB 201	EF SF	107.717	84131	10.0	1.049	1.022 - 1.082	1.051	-0.3
GRB 201	EF SF	107.717	84131	10.0	1.049	1.022 - 1.082	1.051	-0.3
GRB 201	BK BK	107.008	323	771.5	0.419	0.331 - 0.511	0.424	-0.1
GRB 201	BK BK	107.008	323	771.5	0.419	0.331 - 0.511	0.424	-0.1
GRB 201	BK BK	107.008	323	771.5	0.419	0.331 - 0.511	0.424	-0.1
GRB 201	BK BK	107.008	323	771.5	0.419	0.331 - 0.511	0.424	-0.1
GRB 201	BK BK	107.008	323	771.5	0.419	0.331 - 0.511	0.424	-0.1
GRB 201	BK BK	107.008	323	771.5	0.419	0.331 - 0.511	0.424	-0.1

Counting Log(s)

Previous	3 counts	Time	Detector	ID	Length	Cpm
106.682	16-APR-07	9:22	GRB 201	SF	10.0 min	0.00
107.008	16-APR-07	17:11	GRB 201	BK	771.5 min	0.00
107.717	17-APR-07	10:12	GRB 201	SF	10.0 min	0.00
107.008	16-APR-07	17:11	GRB 201	BK	771.5 min	0.00
107.717	17-APR-07	10:12	GRB 201	SF	10.0 min	0.00
107.979	17-APR-07	16:29	GRB 201	Ac 8658 1	150.0 min	0.02
107.717	17-APR-07	10:12	GRB 201	SF	10.0 min	0.00
107.979	17-APR-07	16:29	GRB 201	Ac 8658 1	150.0 min	0.02
108.084	17-APR-07	19:00	GRB 201	Ac 8658 1	150.0 min	0.04
107.979	17-APR-07	16:29	GRB 201	Ac 8658 1	150.0 min	0.02
108.084	17-APR-07	19:00	GRB 201	Ac 8658 1	150.0 min	0.04
108.189	17-APR-07	21:32	GRB 201	Ac 8658 1	150.0 min	0.00
108.084	17-APR-07	19:00	GRB 201	Ac 8658 1	150.0 min	0.04
108.189	17-APR-07	21:32	GRB 201	Ac 8658 1	150.0 min	0.00
108.293	18-APR-07	0:01	GRB 201	Ac 8658 1	150.0 min	0.05
108.189	17-APR-07	21:32	GRB 201	Ac 8658 1	150.0 min	0.00
108.293	18-APR-07	0:01	GRB 201	Ac 8658 1	150.0 min	0.05
108.398	18-APR-07	2:33	GRB 201	Ac 8658 1	150.0 min	-0.02

Source	LCS
Sample No.	2
Analyte	Ra228
Geometry	NY
Reference Date	
Separation Date #1	
Separation Date #2	107.617-7
Count Date	107.978-07
Aliquot	1
Aliquot Units	SMPL
Yield	0.7965
Result	12.368
Error @ 2s (abs.)	0.668
Error @ 2s (%)	5.4
MDA	0.83639
Result Units	PCI/SMPL
Nuclide	Ra228
Standard ID	S1-B-(7)
Qty (ml)	1.5
Activity (dpm)	34.34
Calib. Date	016.708-2001
Half Life (days)	2100
Decay Date	107.617-7
Added (pCi)	10.93
Added Error @ 2s (%)	4
F/A Ratio	1.132
F/A Ratio Error @ 2s (%)	7
LCL	0.69
LWL	0.79
UWL	1.21
UCL	1.31
Status	PASS
Flag	

BLU
4-18-07

60928

18-APR-07
09:19:22
R702123
MCM

TMA Corporation
Beta Counting Data
AUTOB V 2.08

8658- 2 Ac
QC-LCS #60928

Reviewed BEV Date 4-18-07

Ac 228

Counter GRB 202
Length of count 0.0 Min.
Gross counts = 0.

Zero time 107.617 7
Separation time 107.617 7

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	ADJUSTED CPM	CORRECTED CPM
107.979	0.	0.0	0.00	0.000	0.00	4.31	4.31

CPM corrected for decay to Sept. Time. : 11.5137

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 1.000E+00
Chemical yield (2) = 0.7965
PPT. correction (3) = 1.0945 (recovery = 32.45 mgs)
Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 8.717850E-01

C-zero	P-factor	dpm/smpl	dpm error	1 sigma percent sigma
1.3207E+01	2.0790	2.7458E+01	7.5625E-01	2.75 %

pCi /smpl	1 sigma	2 sigma
1.2368E+01	3.4065E-01	6.6768E-01

LTV 1.2930E+01

1st point MDA (3.00) 8.3639E-01
MDA (2.71) 8.2979E-01
Lc 3.8506E-01

DPM OF ALIQUOT 2.746E+01

Saved answer = 2.746E+01 2.75% (DPM of aliquot) (5530)

BTAIN V. 0.00

B658 - 2 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @107.979	Error
107.979	GRB 202	608	150.0	0.35	1.032	4.38	4.38	4.6%
108.084	GRB 202	428	150.0	0.35	1.032	2.96	3.94	5.8%
108.189	GRB 202	381	150.0	0.35	1.032	2.59	4.58	6.3%
108.293	GRB 202	293	150.0	0.35	1.032	1.89	4.44	7.6%
108.398	GRB 202	235	150.0	0.35	1.032	1.44	4.48	9.1%
Weighted average							4.31	2.8%

Counting Data

	GMT	Det	Min.	Counts	CPM	Error	BKG	SF	CF
1.	107.979	GRB 202	150.00	608	3.82	4.6%	0.3540	1.0320	0
2.	108.084	GRB 202	150.00	428	2.58	5.9%	0.3540	1.0320	0
3.	108.189	GRB 202	150.00	381	2.26	6.4%	0.3540	1.0320	0
4.	108.293	GRB 202	150.00	293	1.65	7.8%	0.3540	1.0320	0
5.	108.398	GRB 202	150.00	235	1.25	9.3%	0.3540	1.0320	0

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
GRB 202	EF SF	107.717	87519	10.0	1.035	1.003 - 1.063	1.032	0.2
GRB 202	EF SF	107.717	87519	10.0	1.035	1.003 - 1.063	1.032	0.2
GRB 202	EF SF	107.717	87519	10.0	1.035	1.003 - 1.063	1.032	0.2
GRB 202	EF SF	107.717	87519	10.0	1.035	1.003 - 1.063	1.032	0.2
GRB 202	EF SF	107.717	87519	10.0	1.035	1.003 - 1.063	1.032	0.2
GRB 202	BK BK	107.008	277	771.5	0.359	0.300 - 0.442	0.354	0.2
GRB 202	BK BK	107.008	277	771.5	0.359	0.300 - 0.442	0.354	0.2
GRB 202	BK BK	107.008	277	771.5	0.359	0.300 - 0.442	0.354	0.2
GRB 202	BK BK	107.008	277	771.5	0.359	0.300 - 0.442	0.354	0.2
GRB 202	BK BK	107.008	277	771.5	0.359	0.300 - 0.442	0.354	0.2

Counting Log(s)

Previous	3 counts	Time	Detector	ID	Length	Cpm
106.682	16-APR-07	9:22	GRB 202	SF	10.0 min	0.00
107.008	16-APR-07	17:11	GRB 202	BK	771.5 min	0.00
107.717	17-APR-07	10:12	GRB 202	SF	10.0 min	0.00
107.008	16-APR-07	17:11	GRB 202	BK	771.5 min	0.00
107.717	17-APR-07	10:12	GRB 202	SF	10.0 min	0.00
107.979	17-APR-07	16:29	GRB 202	Ac 8658 2	150.0 min	3.82
107.717	17-APR-07	10:12	GRB 202	SF	10.0 min	0.00
107.979	17-APR-07	16:29	GRB 202	Ac 8658 2	150.0 min	3.82
108.084	17-APR-07	19:00	GRB 202	Ac 8658 2	150.0 min	2.58
107.979	17-APR-07	16:29	GRB 202	Ac 8658 2	150.0 min	3.82
108.084	17-APR-07	19:00	GRB 202	Ac 8658 2	150.0 min	2.58
108.189	17-APR-07	21:32	GRB 202	Ac 8658 2	150.0 min	2.26
108.084	17-APR-07	19:00	GRB 202	Ac 8658 2	150.0 min	2.58
108.189	17-APR-07	21:32	GRB 202	Ac 8658 2	150.0 min	2.26
108.293	18-APR-07	0:01	GRB 202	Ac 8658 2	150.0 min	1.65

Status: PASS

Source	BLANK
Sample No.	3
Analyte	Ra228
Geometry	NY
Reference Date	
Separation Date #1	
Separation Date #2	107.617-7
Count Date	107.978-07
Aliquot	1
Aliquot Units	SMPL
Yield	0.8014
Result	-0.27045
Error @ 2s (abs.)	0.272
Error @ 2s (%)	100.6
MDA	0.83248
Result Units	PCI/SMPL
Status	PASS
Flag	

(K)

BW
4-18-07

18-APR-07
06:38:17
R702123
MCM

TMA Corporation
Beta Counting Data
AUTOB V 2.08

8658- 3 Ac
QC-BLANK #60929

Reviewed BV Date 4/20/07

Ac 228

Counter GRB 203
Length of count 0.0 Min.
Gross counts = 0.

Zero time 107.617 7
Separation time 107.617 7

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
107.979	0.	0.0	0.00	0.000	0.00		-0.09	-0.09

CPM corrected for decay to Sept. Time. : -0.2526

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 1.000E+00
Chemical yield (2) = 0.8014
PPT. correction (3) = 1.0914 (recovery = 32.65 mgs)
Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 8.746811E-01

C-zero	P-factor	dpm/smpl	dpm error	1 sigma percent sigma
-2.8880E-01	2.0790	-6.0041E-01	3.0804E-01	-51.30 %

pCi /smpl	1 sigma	2 sigma
-2.7045E-01	1.3876E-01	2.7196E-01

LTV 2.2895E-01

1st point MDA (3.00) 8.3248E-01
MDA (2.71) 8.2590E-01
Lc 3.8321E-01

DPM OF ALIQUOT -6.004E-01

Saved answer = -6.004E-01 -51.30% (DPM of aliquot) (2742)

Counting Data

	GMT	Det	Min.	Counts	CPM	Error	BKG	SF	CF
1.	107.979	GRB 203	150.00	40	-0.09	77.8%	0.3490	1.0380	0
2.	108.084	GRB 203	150.00	43	-0.06	104.4%	0.3490	1.0380	0
3.	108.189	GRB 203	150.00	54	0.01	625.0%	0.3490	1.0380	0
4.	108.293	GRB 203	150.00	42	-0.07	93.8%	0.3490	1.0380	0
5.	108.398	GRB 203	150.00	48	-0.03	230.3%	0.3490	1.0380	0
6.	108.502	GRB 203	75.89	22	-0.06	155.2%	0.3490	1.0380	0

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
GRB 203	EF SF	107.717	90574	10.0	1.041	1.009 - 1.050	1.038	0.7
GRB 203	EF SF	107.717	90574	10.0	1.041	1.009 - 1.050	1.038	0.7
GRB 203	EF SF	107.717	90574	10.0	1.041	1.009 - 1.050	1.038	0.7
GRB 203	EF SF	107.717	90574	10.0	1.041	1.009 - 1.050	1.038	0.7
GRB 203	EF SF	107.717	90574	10.0	1.041	1.009 - 1.050	1.038	0.7
GRB 203	EF SF	107.717	90574	10.0	1.041	1.009 - 1.050	1.038	0.7
GRB 203	BK BK	107.008	266	771.5	0.345	0.300 - 0.435	0.349	0.0
GRB 203	BK BK	107.008	266	771.5	0.345	0.300 - 0.435	0.349	0.0
GRB 203	BK BK	107.008	266	771.5	0.345	0.300 - 0.435	0.349	0.0
GRB 203	BK BK	107.008	266	771.5	0.345	0.300 - 0.435	0.349	0.0
GRB 203	BK BK	107.008	266	771.5	0.345	0.300 - 0.435	0.349	0.0
GRB 203	BK BK	107.008	266	771.5	0.345	0.300 - 0.435	0.349	0.0

Counting Log(s)

Previous	3 counts	Time	Detector	ID	Length	Cpm
106.682	16-APR-07	9:22	GRB 203	SF	10.0 min	0.00
107.008	16-APR-07	17:11	GRB 203	BK	771.5 min	0.00
107.717	17-APR-07	10:12	GRB 203	SF	10.0 min	0.00
107.008	16-APR-07	17:11	GRB 203	BK	771.5 min	0.00
107.717	17-APR-07	10:12	GRB 203	SF	10.0 min	0.00
107.979	17-APR-07	16:29	GRB 203	Ac 8658 3	150.0 min	-0.09
107.717	17-APR-07	10:12	GRB 203	SF	10.0 min	0.00
107.979	17-APR-07	16:29	GRB 203	Ac 8658 3	150.0 min	-0.09
108.084	17-APR-07	19:00	GRB 203	Ac 8658 3	150.0 min	-0.06
107.979	17-APR-07	16:29	GRB 203	Ac 8658 3	150.0 min	-0.09
108.084	17-APR-07	19:00	GRB 203	Ac 8658 3	150.0 min	-0.06
108.189	17-APR-07	21:32	GRB 203	Ac 8658 3	150.0 min	0.01
108.084	17-APR-07	19:00	GRB 203	Ac 8658 3	150.0 min	-0.06
108.189	17-APR-07	21:32	GRB 203	Ac 8658 3	150.0 min	0.01
108.293	18-APR-07	0:01	GRB 203	Ac 8658 3	150.0 min	-0.07
108.189	17-APR-07	21:32	GRB 203	Ac 8658 3	150.0 min	0.01
108.293	18-APR-07	0:01	GRB 203	Ac 8658 3	150.0 min	-0.07
108.398	18-APR-07	2:33	GRB 203	Ac 8658 3	150.0 min	-0.03

Status: PASS

Source	DUP	ORIGINAL
Sample No.	4	1
Analyte	Ra228	Ra228
Reference Date	50.802-7	50.802-7
Separation Date #1		
Separation Date #2	107.617-7	107.617-7
Count Date	107.978-07	107.978-07
Aliquot	1.8	1.8
Aliquot Units	L	L
Yield	0.8176	0.8125
Result	0.038167	0.053076
Error @ 2s (abs.)	0.175	0.190
Error @ 2s (%)	457.6	358.5
MDA	0.48707	0.51832
Result Units	PCI/L	PCI/L
RPD		
UCL	20.00	
RER		
Criterion	N	
Status	PASS	
Flag		

(T)

Ble
41807

60930

18-APR-07
06:38:19
R702123
MCM

TMA Corporation
Beta Counting Data
AUTOB V 2.08

8658- 4 Ac
QC-DUP#1 60930

Reviewed BW Date 4-18-07

Ac 228

Counter GRB 204
Length of count 0.0 Min.
Gross counts = 0.

Zero time 50.802 7
Separation time 107.617 7

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	ADJUSTED CPM	CORRECTED CPM
107.979	0.	0.0	0.00	0.000	0.00	0.02	0.02

CPM corrected for decay to Sept. Time. : 0.0637

Elapsed time (days) = 56.815
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 9.814E-01
Chemical yield (2) = 0.8176
PPT. correction (3) = 1.0820 (recovery = 33.31 mgs)
Aliquot (4) = 1.800 1

Product (1X2X3X4) = 1.562766E+00

C-zero	P-factor	dpm/l	dpm error	percent sigma
4.0755E-02	2.0790	8.4730E-02	1.9783E-01	233.49 %

pCi /l	1 sigma	2 sigma
3.8167E-02	8.9114E-02	1.7466E-01

LTV 1.8521E-01

1st point MDA (3.00) 4.8707E-01
MDA (2.71) 4.8339E-01
Lc 2.2489E-01

DPM OF ALIQUOT 1.525E-01

Saved answer = 1.525E-01 233.49% (DPM of aliquot) (2743)

BTAIN V. 0.00

8658 - 4 Ac

Ac228 (lambda = 2.714E+00)
 Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @107.979	Error
107.979	GRB 204	62	150.0	0.38	1.038	0.03	0.03	246.8%
108.084	GRB 204	64	150.0	0.38	1.038	0.05	0.07	169.3%
108.189	GRB 204	54	150.0	0.38	1.038	-0.03	-0.05	269.4%
108.293	GRB 204	62	150.0	0.38	1.038	0.03	0.08	246.8%
108.398	GRB 204	62	150.0	0.38	1.038	0.03	0.11	246.8%
108.502	GRB 204	22	75.9	0.38	1.038	-0.11	-0.44	81.1%
Weighted average							0.02	233.5%

Counting Data

	GMT	Det	Min.	Counts	CPM	Error	BKG	SF	CF
1.	107.979	GRB 204	150.00	62	0.03	257.5%	0.3850	1.0380	0
2.	108.084	GRB 204	150.00	64	0.04	176.5%	0.3850	1.0380	0
3.	108.189	GRB 204	150.00	54	-0.03	281.9%	0.3850	1.0380	0
4.	108.293	GRB 204	150.00	62	0.03	257.5%	0.3850	1.0380	0
5.	108.398	GRB 204	150.00	62	0.03	257.5%	0.3850	1.0380	0
6.	108.502	GRB 204	75.89	22	-0.10	99.2%	0.3850	1.0380	0

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
GRB 204	EF SF	107.717	69521	10.0	1.036	1.009 - 1.050	1.038	-0.3
GRB 204	EF SF	107.717	69521	10.0	1.036	1.009 - 1.050	1.038	-0.3
GRB 204	EF SF	107.717	69521	10.0	1.036	1.009 - 1.050	1.038	-0.3
GRB 204	EF SF	107.717	69521	10.0	1.036	1.009 - 1.050	1.038	-0.3
GRB 204	EF SF	107.717	69521	10.0	1.036	1.009 - 1.050	1.038	-0.3
GRB 204	EF SF	107.717	69521	10.0	1.036	1.009 - 1.050	1.038	-0.3
GRB 204	BK BK	107.008	292	771.5	0.378	0.300 - 0.475	0.385	-0.2
GRB 204	BK BK	107.008	292	771.5	0.378	0.300 - 0.475	0.385	-0.2
GRB 204	BK BK	107.008	292	771.5	0.378	0.300 - 0.475	0.385	-0.2
GRB 204	BK BK	107.008	292	771.5	0.378	0.300 - 0.475	0.385	-0.2
GRB 204	BK BK	107.008	292	771.5	0.378	0.300 - 0.475	0.385	-0.2
GRB 204	BK BK	107.008	292	771.5	0.378	0.300 - 0.475	0.385	-0.2

Counting Log(s)

Previous	3 counts	Time	Detector	ID	Length	Cpm
106.847	16-APR-07	13:19	GRB 204	Sr 7626	19 \ 100.0 min	-0.05
107.008	16-APR-07	17:11	GRB 204	BK	\ 771.5 min	0.00
107.717	17-APR-07	10:12	GRB 204	SF	\ 10.0 min	0.00
107.008	16-APR-07	17:11	GRB 204	BK	\ 771.5 min	0.00
107.717	17-APR-07	10:12	GRB 204	SF	\ 10.0 min	0.00
107.979	17-APR-07	16:29	GRB 204	Ac 8658	4 \ 150.0 min	0.03
107.717	17-APR-07	10:12	GRB 204	SF	\ 10.0 min	0.00
107.979	17-APR-07	16:29	GRB 204	Ac 8658	4 \ 150.0 min	0.03
108.084	17-APR-07	19:00	GRB 204	Ac 8658	4 \ 150.0 min	0.04
107.979	17-APR-07	16:29	GRB 204	Ac 8658	4 \ 150.0 min	0.03
108.084	17-APR-07	19:00	GRB 204	Ac 8658	4 \ 150.0 min	0.04
108.189	17-APR-07	21:32	GRB 204	Ac 8658	4 \ 150.0 min	-0.03
108.084	17-APR-07	19:00	GRB 204	Ac 8658	4 \ 150.0 min	0.04
108.189	17-APR-07	21:32	GRB 204	Ac 8658	4 \ 150.0 min	-0.03
108.293	18-APR-07	0:01	GRB 204	Ac 8658	4 \ 150.0 min	0.03
108.189	17-APR-07	21:32	GRB 204	Ac 8658	4 \ 150.0 min	-0.03
108.293	18-APR-07	0:01	GRB 204	Ac 8658	4 \ 150.0 min	0.03
108.398	18-APR-07	2:33	GRB 204	Ac 8658	4 \ 150.0 min	0.03

12-APR-07

TMA Corporation

8658- 1

82

15:16:33

Gross Alpha, Gross Beta Analysis

IQB2023-01

R702123

ABCALC V 1.05

MCM

Reviewed BLV Date 4-12-07

Counted 102.851- 7 on C1 for 100.00 min.

0.250 1

182.200 mg

182.200 mg

Aliquot

Sample Weight

Counted Weight

ALPHA

BETA

Instrument =	GAW 209	GRB 209
Counts =	6.000	1478.000
Gross cpm =	0.060	14.780
Background =	0.113	1.047
Observed CPM =	-0.053	13.733
Cross talk fac =	0.005	0.374
True CPM =	-0.122	13.779
Inst Std. Fac. =	1.143	0.985
Adjusted CPM =	-0.140	13.572
Eff (cpm/dpm) =	0.037	0.369
DPM of Aliquot =	-3.742	36.733

pCi /l = -6.74 66.2

9 F

1 sigma % Err =	34.028	2.887
2 sigma % Err =	66.695	5.659
(1 sigma err) =	2.29	1.91
(2 sigma err) =	4.50	3.75
LTV (95 %) =	3.79	69.3
MDA (3.00) =	8.99	2.47
MDA (2.71) =	8.85	2.45
CRITICAL LEVEL =	3.78	1.16

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	79.904	7	0.113	1.047	0.00
SF	102.667	0	1.143	0.985	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.284	11-APR-07 23:48	GAW 209	(92)9700 6 \	400.0 min	0.88
102.667	12-APR-07 9:00	GAW 209	SF \	10.0 min	0.00
102.706	12-APR-07 9:56	GAW 209	(91)8541 1R2\	100.0 min	2.09

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.284	11-APR-07 23:48	GRB 209	(92)9700 6 \	400.0 min	0.59
102.653	12-APR-07 8:40	GRB 209	SF \	10.0 min	0.00
102.706	12-APR-07 9:56	GRB 209	(91)8541 1R2\	100.0 min	3.83

Status: PASS

Source	LCS
Sample No.	2
Analyte	GrBeta
Geometry	ST
Reference Date	
Separation Date #1	
Separation Date #2	
Count Date	102.851-07
Aliquot	1
Aliquot Units	SMPL
Yield	1
Result	11.174
Error @ 2s (abs.)	0.746
Error @ 2s (%)	6.7
MDA	0.55471
Result Units	PCI/SMPL
Nuclide	Sr 90
Standard ID	AA1-B-(15)
Qty (ml)	0.6
Activity (dpm)	27.31
Calib. Date	306.500-1996
Half Life (days)	10580
Decay Date	102.851-07
Added (pCi)	11.50
Added Error @ 2s (%)	4
F/A Ratio	0.972
F/A Ratio Error @ 2s (%)	8
LCL	0.80
LWL	0.87
UWL	1.13
UCL	1.20
Status	PASS
Flag	

BLE
4/12/07

60928

12-APR-07
 15:16:34
 R702123
 MCM

TMA Corporation
 Gross Alpha, Gross Beta Analysis
 ABCALC V 1.05

8658- 2 82
 QC-LCS #60928

Reviewed BEV Date 4-12-07

Counted 102.851- 7 on C2 for 100.00 min.

1.00	smpl	60.100 mg	60.100 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight
		ALPHA	BETA
		-----	-----
Instrument =	GAW 210	GRB 210	
Counts =	6.000	1127.000	
Gross cpm =	0.060	11.270	
Background =	0.134	1.016	
Observed CPM =	-0.074	10.254	
Cross talk fac =	0.006	0.290	
True CPM =	-0.135	10.293	
Inst Std. Fac. =	1.022	0.976	
Adjusted CPM =	-0.137	10.046	
Eff (cpm/dpm) =	0.077	0.405	
DPM of Aliquot =	-1.786	24.807	
pCi /smpl =	-0.805	11.2	(9)
1 sigma % Err =	32.744	3.405	
2 sigma % Err =	64.178	6.674	
(1 sigma err) =	0.263	0.381	
(2 sigma err) =	0.516	0.746	
LTV (95 %) =	0.435	11.8	
MDA (3.00) =	1.17	0.555	
MDA (2.71) =	1.15	0.551	
CRITICAL LEVEL =	0.499	0.261	

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	79.904	7	0.134	1.016	0.00
SF	102.667	0	1.022	0.976	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.284	11-APR-07 23:48	GAW 210	(92)9700 1 \	400.0 min	-0.03
102.667	12-APR-07 9:00	GAW 210	SF \	10.0 min	0.00
102.706	12-APR-07 9:56	GAW 210	(91)8541 2R2\	100.0 min	0.83

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.284	11-APR-07 23:48	GRB 210	(92)9700 1 \	400.0 min	0.99
102.653	12-APR-07 8:40	GRB 210	SF \	10.0 min	0.00
102.706	12-APR-07 9:56	GRB 210	(91)8541 2R2\	100.0 min	4.94

Status: PASS

Source	BLANK
Sample No.	3
Analyte	GrBeta
Geometry	ST
Reference Date	
Separation Date #1	
Separation Date #2	
Count Date	102.851-07
Aliquot	1
Aliquot Units	SMPL
Yield	1
Result	-0.10244
Error @ 2s (abs.)	0.297
Error @ 2s (%)	290.0
MDA	0.56258
Result Units	PCI/SMPL
Status	PASS
Flag	

Ⓢ

BLK
4-12-07

60929

12-APR-07

15:16:35

R702123

MCM

Counted 102.851- 7 on C3 for 100.00 min.

TMA Corporation

Gross Alpha, Gross Beta Analysis

ABCALC V 1.05

8658- 3

82

QC-BLANK #60929

Reviewed BW Date 4-12-07

1.00	smpl	61.200 mg	61.200 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 211	GRB 211
Counts =	9.000	95.000
Gross cpm =	0.090	0.950
Background =	0.089	1.045
Observed CPM =	0.001	-0.095
Cross talk fac =	0.006	0.291
True CPM =	0.002	-0.095
Inst Std. Fac. =	1.017	0.964
Adjusted CPM =	0.002	-0.092
Eff (cpm/dpm) =	0.077	0.405
DPM of Aliquot =	0.021	-0.227

pCi /smpl = 9.328E-03 -0.102

1 sigma % Err =	2711.256	147.971
2 sigma % Err =	5314.063	290.022
(1 sigma err) =	0.253	0.152
(2 sigma err) =	0.496	0.297
LTV (95 %) =	0.427	0.250
MDA (3.00) =	0.992	0.563
MDA (2.71) =	0.975	0.559
CRITICAL LEVEL =	0.409	0.265

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	79.904	7	0.089	1.045	0.00
SF	102.667	0	1.017	0.964	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.284	11-APR-07 23:48	GAW 211	(92)9700	7 \ 400.0 min	1.20
102.667	12-APR-07 9:00	GAW 211	SF	\ 10.0 min	0.00
102.706	12-APR-07 9:56	GAW 211	(91)8541	3R2\ 100.0 min	0.46

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.284	11-APR-07 23:48	GRB 211	(92)9700	7 \ 400.0 min	0.49
102.653	12-APR-07 8:40	GRB 211	SF	\ 10.0 min	0.00
102.706	12-APR-07 9:56	GRB 211	(91)8541	3R2\ 100.0 min	5.41

Status: PASS

Source	DUP	ORIGINAL
Sample No.	4	1
Analyte	GrBeta	GrBeta
Reference Date	50.802-7	50.802-7
Separation Date #1		
Separation Date #2		
Count Date	102.851-07	102.851-07
Aliquot	0.25	0.25
Aliquot Units	L	L
Yield	1	1
Result	70.584	66.185
Error @ 2s (abs.)	4.203	3.745
Error @ 2s (%)	6.0	5.7
MDA	3.9357	2.4666
Result Units	PCI/L	PCI/L
RPD	6	
UCL	30.00	
RER		
Criterion		
Status	PASS	
Flag		

(F)

BU
4-12-07

60930

12-APR-07
 15:16:36
 R702123
 MCM

TMA Corporation
 Gross Alpha, Gross Beta Analysis
 ABCALC V 1.05

8658- 4 82
 QC-DUP#1 60930

Reviewed BW Date 4-12-07

Counted 102.851- 7 on D1 for 100.00 min.

0.250	1	181.200 mg	181.200 mg
Aliquot		Sample Weight	Counted Weight
		ALPHA	BETA
Instrument =	GAW 213	GRB 213	
Counts =	22.000	1774.000	
Gross cpm =	0.220	17.740	
Background =	0.077	2.797	
Observed CPM =	0.143	14.943	
Cross talk fac =	0.005	0.372	
True CPM =	0.068	14.918	
Inst Std. Fac. =	1.037	0.971	
Adjusted CPM =	0.070	14.485	
Eff (cpm/dpm) =	0.038	0.370	
DPM of Aliquot =	1.872	39.174	
pCi /l =	3.37	70.6	
1 sigma % Err =	80.214	3.038	
2 sigma % Err =	157.220	5.954	
(1 sigma err) =	2.71	2.14	
(2 sigma err) =	5.30	4.20	
LTV (95 %) =	7.84	74.1	
MDA (3.00) =	7.61	3.94	
MDA (2.71) =	7.47	3.92	
CRITICAL LEVEL =	3.09	1.90	

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	95.992	7	0.077	2.797	0.00
SF	102.667	0	1.037	0.971	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.113	11-APR-07 19:42	GAW 213	(72H)9700	5 \ 100.0 min	-0.02
102.667	12-APR-07 9:00	GAW 213	SF	\ 10.0 min	0.00
102.706	12-APR-07 9:56	GAW 213	(30D)9694	2 \ 100.0 min	1.52

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.113	11-APR-07 19:42	GRB 213	(72H)9700	5 \ 100.0 min	0.12
102.653	12-APR-07 8:40	GRB 213	SF	\ 10.0 min	0.00
102.706	12-APR-07 9:56	GRB 213	(30D)9694	2 \ 100.0 min	9.52

Status: PASS

Source	MS	ORIGINAL
Sample No.	5	1
Analyte	GrBeta	GrBeta
Reference Date	50.802-7	50.802-7
Separation Date #1		
Separation Date #2		
Count Date	102.851-07	102.851-07
Aliquot	0.25	0.25
Aliquot Units	L	L
Yield	1	1
Result	152.83	66.185
Error @ 2s (abs.)	5.677	3.745
Error @ 2s (%)	3.7	5.7
MDA	3.8147	2.4666
Result Units	PCI/L	PCI/L
Nuclide	Sr 90	
Standard ID	AA1-B-(15)	
Qty (ml)	1.1	
Activity (dpm)	27.31	
Calib. Date	306.500-1996	
Half Life (days)	10580	
Decay Date	102.851-07	
Added (pCi)	21.08	
Added Error @ 2s (%)	4	
Spike Activity	38.208	
Original Activity	16.546	
Activity Difference	21.661	
Error Difference	7.850	
F/A Ratio	1.028	
F/A Ratio Error @ 2s (%)	8.810	
LCL	0.80	
LWL	0.87	
UWL	1.13	
UCL	1.20	
Status	PASS	
Flag		

(Handwritten mark)

*Blu
4-12-07*

60931

12-APR-07
 15:16:37
 R702123
 MCM

TMA Corporation
 Gross Alpha, Gross Beta Analysis
 ABCALC V 1.05

8658- 5 82
 QC-MS#1 60931

Reviewed BW Date 4-12-07

Counted 102.851- 7 on D2 for 100.00 min.

0.250 1 183.700 mg 183.700 mg

 Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 214	GRB 214
Counts =	19.000	3488.000
Gross cpm =	0.190	34.880
Background =	0.127	2.611
Observed CPM =	0.063	32.269
Cross talk fac =	0.005	0.377
True CPM =	-0.099	32.306
Inst Std. Fac. =	1.047	0.969
Adjusted CPM =	-0.104	31.305
Eff (cpm/dpm) =	0.037	0.369
DPM of Aliquot =	-2.809	84.822

pCi /l =	-5.06	153.
1 sigma % Err =	56.879	1.895
2 sigma % Err =	111.482	3.715
(1 sigma err) =	2.88	2.90
(2 sigma err) =	5.64	5.68
LTV (95 %) =	4.75	158.
MDA (3.00) =	9.56	3.81
MDA (2.71) =	9.42	3.80
CRITICAL LEVEL =	4.06	1.84

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	95.992	7	0.127	2.611	0.00
SF	102.667	0	1.047	0.969	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.113	11-APR-07 19:42	GAW 214	(72H)9700	8 \ 100.0 min	-0.11
102.667	12-APR-07 9:00	GAW 214	SF	\ 10.0 min	0.00
102.706	12-APR-07 9:56	GAW 214	(30D)9694	3 \ 100.0 min	-0.10

Previous 3 counts	Time	Detector	ID	Length	Cpm
102.113	11-APR-07 19:42	GRB 214	(72H)9700	8 \ 100.0 min	0.31
102.653	12-APR-07 8:40	GRB 214	SF	\ 10.0 min	0.00
102.706	12-APR-07 9:56	GRB 214	(30D)9694	3 \ 100.0 min	-0.04

17-APR-07

PAGE 1

P 17.07

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
IQB2023-01		00047027	TMA # (GLY) 8658	1
TZERO = 50.802 2007			0.5000 L	Aliquot
K 40	1.684E+02	<	1.684E+02	DET LIM
Cs137	8.509E+00	<	8.509E+00	DET LIM
Tl208	9.242E+00	<	9.243E+00	DET LIM
Pb210	1.951E+03	<	1.951E+03	DET LIM
Bi212	6.242E+01	<	6.242E+01	DET LIM
Pb212	1.418E+01	<	1.418E+01	DET LIM
Bi214	1.788E+01	<	1.788E+01	DET LIM
Pb214	1.638E+01	<	1.638E+01	DET LIM
Ra226	1.444E+02	<	1.444E+02	DET LIM
Ac228	3.762E+01	<	3.762E+01	DET LIM
Th234	2.578E+02	<	2.578E+02	DET LIM
U 235	5.212E+01	<	5.212E+01	DET LIM
U 238	1.067E+03	<	1.068E+03	DET LIM

QC-LCS #60928		00047028	TMA # (GLY) 8658	2
TZERO = 107.015 2007			1.0000 SMPL	Aliquot
K 40	1.289E+02	<	1.289E+02	DET LIM
Co 60	7.154E+00	(2.915 +/- 0.108) E+02		3.7%
Cs137	7.268E+00	(3.087 +/- 0.097) E+02		3.1%
Tl208	6.475E+00	<	6.475E+00	DET LIM
Pb210	3.040E+02	<	3.040E+02	DET LIM
Bi212	4.518E+01	<	4.518E+01	DET LIM
Pb212	9.999E+00	<	9.999E+00	DET LIM
Bi214	1.271E+01	<	1.271E+01	DET LIM
Pb214	1.283E+01	<	1.283E+01	DET LIM
Ra226	8.996E+01	<	8.996E+01	DET LIM
Ac228	2.917E+01	<	2.917E+01	DET LIM
Th234	1.267E+02	<	1.267E+02	DET LIM
U 235	3.477E+01	<	3.477E+01	DET LIM
U 238	8.097E+02	<	8.097E+02	DET LIM

17-APR-07

PAGE 2

NUCLIDE	MDA	PCI	+/- ACT ERR 2 sigma	%ERR 2 sigma
QC-BLANK #60929		00047029	TMA # (GLY) 8658	3
TZERO = 107.555 2007			1.0000 SMPL	Aliquot
K 40	1.208E+02	<	1.208E+02	DET LIM
Cs137	5.576E+00	<	5.576E+00	DET LIM
Tl208	5.727E+00	<	5.727E+00	DET LIM
Pb210	3.917E+02	<	7.496E+02	DET LIM
Bi212	4.096E+01	<	4.096E+01	DET LIM
Pb212	9.093E+00	<	9.093E+00	DET LIM
Bi214	1.253E+01	<	1.253E+01	DET LIM
Pb214	1.199E+01	<	1.199E+01	DET LIM
Ra226	8.588E+01	<	8.588E+01	DET LIM
Ac228	2.449E+01	<	2.449E+01	DET LIM
Th234	1.242E+02	<	1.242E+02	DET LIM
U 235	3.202E+01	<	3.202E+01	DET LIM
U 238	7.033E+02	<	7.033E+02	DET LIM

QC-DUP#1 60930		00047030	TMA # (GLY) 8658	4
TZERO = 50.802 2007			0.5000 L	Aliquot
K 40	3.572E+02	<	3.572E+02	DET LIM
Cs137	1.344E+01	<	1.344E+01	DET LIM
Tl208	1.403E+01	<	1.403E+01	DET LIM
Pb210	2.164E+02	<	3.630E+02	DET LIM
Bi212	1.030E+02	<	1.030E+02	DET LIM
Pb212	2.023E+01	<	2.023E+01	DET LIM
Bi214	2.943E+01	<	2.943E+01	DET LIM
Pb214	2.740E+01	<	2.740E+01	DET LIM
Ra226	1.923E+02	<	1.923E+02	DET LIM
Ac228	5.741E+01	<	5.741E+01	DET LIM
Th234	2.147E+02	<	2.147E+02	DET LIM
U 235	7.193E+01	<	7.193E+01	DET LIM
U 238	1.574E+03	<	1.574E+03	DET LIM

Source	LCS	LCS
Sample No.	2	2
Analyte	Co 60	Cs137
Geometry	MB	MB
Reference Date		
Separation Date #1		
Separation Date #2		
Count Date	107.015-07	107.015-07
Aliquot	1	1
Aliquot Units	SMPL	SMPL
Yield	1	1
Result	291.5	308.7
Error @ 2s (abs.)	10.800	9.700
Error @ 2s (%)	3.7	3.1
MDA	7.154	7.268
Result Units	PCI/SMPL	PCI/SMPL
Nuclide	Co 60	Cs137
Standard ID	K1-F-(03)	Q1-A-(03)
Qty (ml)	0.35	0.3
Activity (dpm)	9340	2200
Calib. Date	001.708-1995	353.708-2005
Half Life (days)	1925	11020
Decay Date	107.015-07	107.015-07
Added (pCi)	292.5	288.4
Added Error @ 2s (%)	4	4
F/A Ratio	0.996	1.070
F/A Ratio Error @ 2s (%)	5	5
LCL	0.80	0.80
LWL	0.87	0.87
UWL	1.13	1.13
UCL	1.20	1.20
Status	PASS	PASS
Flag		

BU
4-18-07

60928

Status: PASS

Source	BLANK
Sample No.	3
Analyte	Cs137
Geometry	MB
Reference Date	
Separation Date #1	
Separation Date #2	
Count Date	107.555-07
Aliquot	1
Aliquot Units	SMPL
Yield	
Result	< 5.576
Error @ 2s (abs.)	0.000
Error @ 2s (%)	0.0
MDA	5.576
Result Units	PCI/SMPL
Status	PASS
Flag	

BL
4-18-07

60929

Status: PASS

Source	DUP	ORIGINAL
Sample No.	4	1
Analyte	Cs137	Cs137
Reference Date	50.802-7	50.802-7
Separation Date #1		
Separation Date #2		
Count Date	107.555-07	107.021-07
Aliquot	0.5	0.5
Aliquot Units	L	L
Yield		
Result	13.44	8.509
Error @ 2s (abs.)	0.000	0.000
Error @ 2s (%)	0.0	0.0
MDA	13.44	8.509
Result Units	PCI/L	PCI/L
RPD		
UCL	20	
RER		
Criterion	N	
Status	PASS	
Flag		

See
4-18-07

60930

 0658 GLY 1 G-5 MB 107.022 7 757.35 MIN 0.50000 L 562
 LIBR=GRWR REF TIME= 50.802 7 1098-1

Md. 17-01

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEY	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/L AT TZERO
K 40	4.602E+11 DAYS	LAMBDA= 1.506E-12	DECAY= 1.000E+00	1G		
**** (1460.85)	0.110000	0.00478	0.098	1.869E+02 s	< r	1.684E+02
Mn 54	3.125E+02 DAYS	LAMBDA= 2.218E-03	DECAY= 8.828E-01	2G		
**** (834.83)	1.000000	0.00810	0.072	8.925E+00 s	<	9.108E+00
Co 57	2.700E+02 DAYS	LAMBDA= 2.567E-03	DECAY= 8.656E-01	10G		
**** (122.06)	0.852000	0.03201	0.165	6.048E+00 s	<	6.295E+00
**** (136.47)	0.111000	0.03254	0.163	4.521E+01 s	<	4.705E+01
Co 58	7.130E+01 DAYS	LAMBDA= 9.722E-03	DECAY= 5.789E-01	4G		
**** (810.76)	0.990000	0.00831	0.075	9.164E+00 s	<	1.426E+01
**** (863.60)	0.006400	0.00786	0.067	1.331E+03 s	<	2.072E+03
**** (1674.80)	0.005000	0.00415	0.044	2.095E+03 s	<	3.260E+03
Fe 59	4.460E+01 DAYS	LAMBDA= 1.554E-02	DECAY= 4.174E-01	6G		
**** (192.20)	0.028000	0.02847	0.148	1.860E+02 s	<	4.014E+02
**** (1099.22)	0.565000	0.00632	0.059	1.665E+01 s	<	3.594E+01
**** (1291.56)	0.432000	0.00541	0.056	2.379E+01 s	<	5.135E+01
Co 60	1.921E+03 DAYS	LAMBDA= 3.608E-04	DECAY= 9.799E-01	4G		
**** (1173.21)	0.999200	0.00594	0.061	1.026E+01 s	<	9.437E+00
**** (1332.48)	1.000000	0.00524	0.055	1.048E+01 s	<	9.639E+00
Zn 65	2.440E+02 DAYS	LAMBDA= 2.841E-03	DECAY= 8.524E-01	1G		
**** (1115.52)	0.507500	0.00623	0.058	1.841E+01 s	<	1.946E+01
Nb 95	6.550E+01 DAYS	LAMBDA= 1.058E-02	DECAY= 5.516E-01	1G		
**** (765.79)	0.990000	0.00874	0.076	8.748E+00 s	<	1.429E+01
Zr 95	6.550E+01 DAYS	LAMBDA= 1.058E-02	DECAY= 5.516E-01	2G		
**** (724.18)	0.430000	0.00918	0.068	1.728E+01 s	<	2.822E+01
**** (756.72)	0.546000	0.00883	0.072	1.491E+01 s	<	2.436E+01
Ru106	3.670E+02 DAYS	LAMBDA= 1.889E-03	DECAY= 8.993E-01	41G		
**** (511.80)	0.205000	0.01233	0.156	6.191E+01 s	< r	6.202E+01
**** (621.80)	0.097600	0.01043	0.083	8.179E+01 s	<	8.194E+01
**** (1050.10)	0.014500	0.00660	0.064	6.733E+02 s	<	6.745E+02
Sn113	1.150E+02 DAYS	LAMBDA= 6.027E-03	DECAY= 7.126E-01	4G		
**** (391.40)	0.642000	0.01557	0.102	1.023E+01 s	<	1.293E+01
Ba133	3.981E+03 DAYS	LAMBDA= 1.741E-04	DECAY= 9.903E-01	10G		
**** (302.70)	0.196000	0.01961	0.125	3.254E+01 s	<	2.960E+01
**** (355.90)	0.670000	0.01695	0.123	1.079E+01 s	<	9.815E+00
Cs134	7.531E+02 DAYS	LAMBDA= 9.204E-04	DECAY= 9.496E-01	10G		
**** (604.60)	0.980000	0.01068	0.092	8.750E+00 s	<	8.301E+00
	9.4195E-01 SUM CORR APPLIED TO		8.4494E-03 BELOW			
795 (795.80)	0.854000	0.00796	0.046	6.729E+00 s	59.98%	6.384E+00
**** (476.30)	0.015000	0.01312	0.098	4.999E+02 s	<	4.743E+02

Cs137	1.102E+04 DAYS	LAMBDA= 6.290E-05	DECAY= 9.965E-01	3G
**** (661.64)	0.851000	0.00990	0.079 9.412E+00 s	< 8.509E+00
Ce141	3.245E+01 DAYS	LAMBDA= 2.136E-02	DECAY= 3.009E-01	2G
**** (145.40)	0.480000	0.03233	0.166 1.068E+01 s	< 3.198E+01
Ce144	2.842E+02 DAYS	LAMBDA= 2.439E-03	DECAY= 8.719E-01	15G
**** (133.53)	0.108000	0.03252	0.164 4.659E+01 s	< 4.814E+01
**** (696.40)	0.015000	0.00950	0.086 6.026E+02 s	< 6.226E+02
Tl208	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	19G
**** (583.14)	0.860000	0.01101	0.097 1.026E+01 s	< 9.243E+00
**** (860.37)	0.123000	0.00789	0.063 6.539E+01 s	< 5.891E+01
Pb210	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	1G
**** (46.50)	0.040500	0.00153	0.134 2.165E+03 s	< 1.951E+03
Bi212	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	22G
**** (727.17)	0.118290	0.00915	0.075 6.928E+01 s	< 6.242E+01
**** (1620.56)	0.027459	0.00430	0.044 3.757E+02 s	< 3.385E+02
Pb212	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	4G
**** (238.63)	0.431000	0.02416	0.164 1.574E+01 s	<r 1.418E+01
Bi214	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 9.999E-01	48G
**** (609.30)	0.470000	0.01061	0.099 1.985E+01 s	<r 1.788E+01
**** (1120.40)	0.170000	0.00620	0.058 5.516E+01 s	< 4.969E+01
**** (1764.00)	0.170000	0.00394	0.053 7.881E+01 s	< 7.101E+01
Pb214	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 9.999E-01	23G
139 (137.40)	0.000600	0.03254	0.104 5.350E+03 64.67%	4.820E+03
**** (241.90)	0.076000	0.02388	0.139 7.675E+01 s	< 6.915E+01
**** (295.20)	0.190000	0.02006	0.123 3.240E+01 s	< 2.919E+01
**** (352.00)	0.360000	0.01712	0.112 1.818E+01 s	< 1.638E+01
Ra226	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 9.999E-01	48G
**** (186.10)	0.040000	0.02907	0.186 1.602E+02 s	<r 1.444E+02
Ac228	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	41G
**** (911.10)	0.250000	0.00750	0.078 4.176E+01 s	<r 3.762E+01
**** (968.90)	0.150000	0.00710	0.074 6.983E+01 s	< 6.291E+01
Th234	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	10G
**** (62.80)	0.038116	0.00761	0.163 5.619E+02 s	< 5.062E+02
**** (92.30)	0.026880	0.02464	0.189 2.861E+02 s	<r 2.578E+02
U 235	2.571E+11 DAYS	LAMBDA= 2.696E-12	DECAY= 1.000E+00	34G
**** (143.78)	0.097200	0.03239	0.182 5.785E+01 s	< 5.212E+01
**** (185.72)	0.540000	0.02911	0.186 1.185E+01 s	<r 1.068E+01
Np239	2.350E+00 DAYS	LAMBDA= 2.950E-01	DECAY= 6.286E-08	32G
**** (106.14)	0.278000	0.02937	0.181 2.216E+01 s	< 3.176E+08
**** (277.62)	0.145000	0.02120	0.141 4.595E+01 s	< 6.586E+08
U 238	1.633E+12 DAYS	LAMBDA= 4.245E-13	DECAY= 1.000E+00	1G
**** (1001.10)	0.008280	0.00690	0.068 1.185E+03 s	< 1.068E+03

8658 GLY 1 G-5 MB 107.022 7 757.35 MIN 0.50000 L 562

LIBR=GRWR REF TIME= 50.802 7 1098-1

```

*****
* Group..... 8658 * Time of count      107.022 2007 *
* Sample..... 1 * Reference GMT..... 50.802 2007 *
* Element..... * Elapsed Live Tm..... 757.35 *
* Type code..... GLY * Dead Time Pct..... 0.004401 *
* ID..... IQB2023-01 * Background GMT..... 104.044 2007 *
* Geometry, detector..... MB-5 * Standard GMT..... 103.937 2007 *
* Aliquot..... 0.5 * Days since T0..... 56.21957 *
* Unit of Aliquot..... L * Time on..... 17:31 PDT 16-APR *
* Data Sheet Units..... PCI /L * Time off..... 6:09 PDT 17-APR *
* Library..... GRWR * Calc Time..... 08:14 17-APR-07 *
*****
* Slope..... 1.002844 * Width slope..... 0.007588 *
* Intercept..... 0.350604 * Width offset..... 0.342201 *
* X**2 TERM..... -0.15763643E-05 * Sensitivity..... 4. *
NP: [7,67]562. GSP 14 PEAKS

```

```

*****
PK IT ENRG LEFT WD BKGND FWHM AREA CHAN CPM ERR EFF K FIT
1 4 27.2 24 11 240 2.72 510 26.7 6.74E-01 7.70.160 0 46.00
2 4 31.0 24 11 855 3.78 346 30.6 4.57E-01 16.80.239 0 0.00
3 0 92.1 88 8 1243 1.43 335 91.5 4.43E-01 19.4 2.44 0 0.00
4 0 138.6 136 6 976 2.72 79 137.9 1.04E-01 64.7 3.23 0 0.00
5 0 185.3 181 8 1090 1.44 228 184.5 3.01E-01 26.1 2.91 0 0.00
6 0 238.5 233 9 888 1.68 200 237.6 2.64E-01 27.7 2.42 0 0.00
7 0 367.7 362 8 427 1.74 46 366.5 6.04E-02 80.2 1.70 0 0.00
8 0 511.3 503 14 431 2.87 481 509.9 6.35E-01 10.5 1.24 0 0.00
9 0 609.5 604 9 240 2.59 52 608.0 6.88E-02 55.9 1.08 0 0.00
10 0 795.1 789 8 116 2.81 35 793.5 4.57E-02 60.00.856 0 0.00
11 0 911.0 906 8 85 2.79 63 909.4 8.33E-02 28.90.758 0 0.00
12 0 970.3 964 10 84 2.89 68 968.6 8.98E-02 30.80.713 0 0.00
13 0 1461.2 1455 11 63 3.38 183 1460.1 2.42E-01 11.50.481 0 0.00
14 0 1720.9 1716 13 46 2.86 24 1720.4 3.17E-02 61.50.410 0 0.00
FWHM=SQRT( 5.68687E+00 + 2.24179E-03 *E)

```

BACKGROUND INFO 8658 GLY 1 107.022 7 G- 5 BG DATE 104.044 7

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
92.11	0.4427	19.35	92.00	0.3553	7.77	0.0874	102.93R
185.32	0.3010	26.09	186.00	0.2575	20.24	0.0436	216.23R
238.51	0.2642	27.68	238.60	0.2362	14.52	0.0280	288.86R
511.26	0.6354	10.48	511.00	0.6162	3.38	0.0192	363.31R
609.53	0.0688	55.94	609.30	0.0567	40.71	0.0120	373.19R
911.05	0.0833	28.88	911.10	0.0702	30.64	0.0131	245.76R
970.26	0.0898	30.84	968.90	0.0453	46.78	0.0445	78.44
1461.21	0.2416	11.50	1460.80	0.2436	5.54	-0.0019	*****R

7 PEAKS REJECTED BY BACKGROUND

```

*****
INTERFERING ISOTOPE ANALYSIS 8658 GLY 1 107.022 7 G- 5
*****
SPANF TABLE SAVED IN GSTR SAYS NATO NOT REQUIRED

```


BACKGROUND FOR GELI DETECTOR 5 OF 104.044/2007 3662.4 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0620	31.60	511.0	0.6162	3.38	1120.3	0.0374	72.76
92.0	0.3553	7.77	583.1	0.0809	23.36	1173.2	0.0319	0.00
143.0	0.0760	0.00	609.3	0.0567	40.71	1238.1	0.0135	0.00
186.0	0.2575	20.24	661.6	0.0238	0.00	1332.5	0.0196	0.00
198.0	0.0886	32.30	727.2	0.0219	0.00	1377.7	0.0257	0.00
238.6	0.2362	14.52	846.0	0.0459	17.21	1460.8	0.2436	5.54
279.0	0.0510	0.00	860.4	0.0351	0.00	1586.0	0.0131	0.00
295.2	0.0493	39.35	911.1	0.0702	30.64	1591.3	0.0321	0.00
338.4	0.0589	32.57	968.9	0.0453	46.78	1729.6	0.0145	0.00
351.9	0.0615	57.24	1001.0	0.0238	54.51	1764.5	0.0254	37.03

GELI STANDARD EFFICIENCY GC FOR DETECTOR G- 5 ON 4/17/ 7

HIGH RADIUM STANDARD LOW RADIUM STANDARD

HIGH RADIUM STANDARD				LOW RADIUM STANDARD					
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		
26.974	7	0.9532	10.394	34.	120.831	5	1.0112	5.396	22.
34.875	7	0.9302	10.832	21.	123.895	5	1.0173	6.576	33.
47.951	7	0.9344	10.954	27.	127.778	5	0.9253	8.428	21.
55.923	7	0.9310	10.143	20.	163.023	5	1.0185	6.233	33.
61.927	7	0.9529	11.244	25.	262.653	5	0.8772	2.731	23.
69.956	7	0.9615	10.491	28.	361.604	5	0.9753	4.215	14.
76.810	7	0.9501	9.859	33.	120.933	6	0.9544	3.970	23.
81.670	7	0.9362	11.417	23.	130.842	6	1.0028	5.576	21.
96.836	7	0.6837	2.518	24. NG	92.687	7	0.9684	5.181	32.
103.937	7	0.6761	3.425	21. NG	96.820	7	0.9834	2.940	21.
AVERAGE		0.9437	0.012		AVERAGE		0.9841	0.032	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 103.937 7

ENERGY= 0.350604 + 1.0028437*CH + -1.576364E-06*CH**2
 FWHM =SQRT(0.3422 + 0.007588*ENERGY) (CO60= 3.233)

EFFICIENCIES FOR GEOMETRY MB 5 CALIBRATED 68.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.190020	100.0	2.758490	300.0	1.976590	0.0	0.000000
55.0	0.366930	110.0	3.024350	500.0	1.258780	0.0	0.000000
60.0	0.605530	130.0	3.243550	700.0	0.945520	0.0	0.000000
65.0	0.890520	150.0	3.208910	1000.0	0.690860	0.0	0.000000
70.0	1.201490	170.0	3.058700	1400.0	0.499470		
80.0	1.823920	190.0	2.867890	2000.0	0.345950		
90.0	2.358930	250.0	2.320410	3000.0	0.240430		

PK	ENERGY	CPM	%ERR	COMMENT
1	27.2	0.67	7.7	
2	31.0	0.46	16.8	
4	138.6	0.10	64.7	
7	367.7	0.06	80.2	
10	795.1	0.05	60.0	Ac228 Cs134s
b 12	970.3	0.04	78.4	Ac228s
14	1720.9	0.03	61.5	
REJECTED PEAKS				
B 3	92.1	0.09	99.9	Th234s
B 5	185.3	0.04	99.9	Cs137c U 235s Ra226s
B 6	238.5	0.03	99.9	Th228 Pb212s
B 8	511.3	0.02	99.9	Th228 La140 Na 22 Ru106s
B 9	609.5	0.01	99.9	Ra226 Ru103 Bi214s
B 11	911.0	0.01	99.9	Ac228s
B 13	1461.2	0.00	99.9	K 40s

 8658 GLY 2 G-2 MB 107.015 7 766.60 MIN 1.00000 SM 093
 LIBR=GRWR REF TIME= 107.015 7 1098-1

Aug. 17 87

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEY	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	0.01212	0.381	2.862E+02 s	<	1.289E+02
Mn 54	3.125E+02 DAYS	LAMBDA= 2.218E-03	DECAY= 1.000E+00	2G		
**** (834.83)	1.000000	0.01920	0.251	1.306E+01 s	<	5.883E+00
Co 57	2.700E+02 DAYS	LAMBDA= 2.567E-03	DECAY= 1.000E+00	10G		
**** (122.06)	0.852000	0.06078	0.453	8.745E+00 s	<	3.939E+00
**** (136.47)	0.111000	0.06051	0.416	6.196E+01 s	<	2.791E+01
Co 58	7.130E+01 DAYS	LAMBDA= 9.722E-03	DECAY= 1.000E+00	4G		
**** (810.76)	0.990000	0.01964	0.243	1.249E+01 s	<	5.627E+00
**** (863.60)	0.006400	0.01870	0.245	2.043E+03 s	<	9.203E+02
**** (1674.80)	0.005000	0.01070	0.103	1.927E+03 s	<	8.681E+02
Fe 59	4.460E+01 DAYS	LAMBDA= 1.554E-02	DECAY= 1.000E+00	6G		
**** (192.20)	0.028000	0.05362	0.414	2.760E+02 s	<	1.243E+02
**** (1099.22)	0.565000	0.01544	0.240	2.756E+01 s	<	1.241E+01
**** (1291.56)	0.432000	0.01348	0.169	2.896E+01 s	<	1.304E+01
Co 60	1.921E+03 DAYS	LAMBDA= 3.608E-04	DECAY= 1.000E+00	4G		
1172 (1173.21)	0.999200	0.01462	9.227	6.315E+02 s	1.90%	2.844E+02
1332 (1332.48)	1.000000	0.01313	8.496	6.471E+02 s	1.86%	2.915E+02
Zn 65	2.440E+02 DAYS	LAMBDA= 2.841E-03	DECAY= 1.000E+00	1G		
**** (1115.52)	0.507500	0.01525	0.254	3.277E+01 s	<	1.476E+01
Nb 95	6.550E+01 DAYS	LAMBDA= 1.058E-02	DECAY= 1.000E+00	1G		
**** (765.79)	0.990000	0.02052	0.256	1.262E+01 s	<	5.686E+00
Zr 95	6.550E+01 DAYS	LAMBDA= 1.058E-02	DECAY= 1.000E+00	2G		
**** (724.18)	0.430000	0.02141	0.256	2.782E+01 s	<	1.253E+01
**** (756.72)	0.546000	0.02070	0.242	2.137E+01 s	<	9.624E+00
Ru106	3.670E+02 DAYS	LAMBDA= 1.889E-03	DECAY= 1.000E+00	41G		
**** (511.80)	0.205000	0.02763	0.393	6.940E+01 s	<	3.126E+01
**** (621.80)	0.097600	0.02394	0.262	1.122E+02 s	<	5.056E+01
661 (661.20)	0.000150	0.02290	13.354	3.888E+06	1.57%	1.751E+06
**** (1050.10)	0.014500	0.01604	0.238	1.023E+03 s	<	4.608E+02
Sn113	1.150E+02 DAYS	LAMBDA= 6.027E-03	DECAY= 1.000E+00	4G		
**** (391.40)	0.642000	0.03353	0.333	1.545E+01 s	<	6.959E+00
Ba133	3.981E+03 DAYS	LAMBDA= 1.741E-04	DECAY= 1.000E+00	10G		
53 (53.20)	0.019500	0.01846	0.318	8.832E+02	42.63%	3.978E+02
**** (302.70)	0.196000	0.04026	0.371	4.703E+01 s	<	2.118E+01
**** (355.90)	0.670000	0.03590	0.344	1.430E+01 s	<	6.439E+00
Cs134	7.531E+02 DAYS	LAMBDA= 9.204E-04	DECAY= 1.000E+00	10G		
**** (604.60)	0.980000	0.02444	0.309	1.290E+01 s	<	5.812E+00
		8.4966E-01 SUM CORR APPLIED TO	1.9919E-02 BELOW			
**** (795.80)	0.854000	0.	47	1.492E+01 s	<	6.719E+00

****	(476.30)	0.015000	0.02911	0.308	7.050E+02 s	<	3.176E+02
Ce137	1.102E+04 DAYS	LAMBDA= 6.290E-05	DECAY= 1.000E+00	3G			
661	(661.64)	0.851000	0.02289	13.347	6.853E+02 s	1.57%	3.087E+02
Ce141	3.245E+01 DAYS	LAMBDA= 2.136E-02	DECAY= 1.000E+00	2G			
****	(145.40)	0.480000	0.05981	0.454	1.582E+01 s	<	7.125E+00
Ce144	2.842E+02 DAYS	LAMBDA= 2.439E-03	DECAY= 1.000E+00	15G			
53	(53.91)	0.000900	0.01931	0.318	1.830E+04	42.63%	8.241E+03
****	(133.53)	0.108000	0.06066	0.411	6.274E+01 s	<	2.826E+01
****	(696.40)	0.015000	0.02205	0.258	7.787E+02 s	<	3.507E+02
Tl208	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	19G			
****	(583.14)	0.860000	0.02510	0.310	1.437E+01 s	<r	6.475E+00
****	(860.37)	0.123000	0.01876	0.255	1.104E+02 s	<	4.972E+01
Pb210	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	1G			
****	(46.50)	0.040500	0.01181	0.323	6.749E+02 s	<	3.040E+02
Bi212	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	22G			
****	(727.17)	0.118290	0.02134	0.253	1.003E+02 s	<r	4.518E+01
****	(1620.56)	0.027459	0.01103	0.116	3.838E+02 s	<	1.729E+02
Pb212	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	4G			
****	(238.63)	0.431000	0.04726	0.452	2.220E+01 s	<r	9.999E+00
Bi214	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 1.000E+00	48G			
****	(609.30)	0.470000	0.02430	0.322	2.822E+01 s	<r	1.271E+01
768	(768.70)	0.050000	0.02046	0.182	1.782E+02	43.33%	8.028E+01
****	(1120.40)	0.170000	0.01520	0.252	9.753E+01 s	<	4.393E+01
1763	(1764.00)	0.170000	0.01021	0.135	7.900E+01 s	69.62%	3.513E+01
Pb214	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 1.000E+00	23G			
53	(53.20)	0.022000	0.01846	0.318	7.828E+02	42.63%	3.526E+02
****	(241.90)	0.076000	0.04685	0.426	1.197E+02 s	<	5.390E+01
****	(295.20)	0.190000	0.04098	0.369	4.737E+01 s	<r	2.134E+01
****	(352.00)	0.360000	0.03619	0.371	2.848E+01 s	<r	1.283E+01
768	(768.40)	0.000800	0.02046	0.182	1.114E+04	43.33%	5.016E+03
Ra226	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 1.000E+00	48G			
****	(186.10)	0.040000	0.05451	0.435	1.997E+02 s	<r	8.996E+01
768	(768.40)	0.053200	0.02046	0.182	1.674E+02	43.33%	7.543E+01
1763	(1764.50)	0.166000	0.01021	0.135	7.990E+01 s	69.62%	3.599E+01
Ac228	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	41G			
****	(911.10)	0.250000	0.01794	0.291	6.476E+01 s	<r	2.917E+01
****	(968.90)	0.150000	0.01711	0.283	1.105E+02 s	<r	4.977E+01
Th234	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	10G			
****	(62.80)	0.038116	0.03006	0.352	3.069E+02 s	<	1.383E+02
****	(92.30)	0.026880	0.05438	0.411	2.812E+02 s	<r	1.267E+02
U 235	2.571E+11 DAYS	LAMBDA= 2.696E-12	DECAY= 1.000E+00	34G			
73	(72.81)	0.004000	0.04078	5.605	3.436E+04	5.05%	1.548E+04
84	(84.24)	0.051000	0.04993	1.976	7.762E+02	6.81%	3.496E+02
****	(143.78)	0.097200	0.05996	0.450	7.719E+01 s	<	3.477E+01
****	(185.72)	0.540000	0.05456	0.469	1.593E+01 s	<r	7.176E+00
Np239	2.350E+00 DAYS	LAMBDA= 2.950E-01	DECAY= 1.000E+00	32G			
****	(106.14)	0.278000	0.05894	0.428	2.614E+01 s	<	1.178E+01
****	(277.62)	0.145000	0.04276	0.418	6.742E+01 s	<	3.037E+01

U 238 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 1G
**** (1001.10) 0.008280 0.01668 0.248 1.797E+03 s < 8.097E+02

8658 GLY 2 G-2 MB 107.015 7 766.60 MIN 1.00000 SM 093

LIBR=GRWR REF TIME= 107.015 7 1098-1

```

*****
* Group..... 8658 * Time of count      107.015 2007 *
* Sample..... 2 * Reference GMT..... 107.015 2007 *
* Element..... * Elapsed Live Tm..... 766.6 *
* Type code..... GLY * Dead Time Pct..... 0.008695 *
* ID..... QC-LCS #60928 * Background GMT..... 104.001 2007 *
* Geometry, detector..... MB-2 * Standard GMT..... 103.937 2007 *
* Aliquot..... 1. * Days since TO..... 0.0 *
* Unit of Aliquot..... SMPL * Time on..... 17:21 PDT 16-APR *
* Data Sheet Units..... PCI /SMPL * Time off..... 6:07 PDT 17-APR *
* Library..... GRWR * Calc Time..... 08:49 17-APR-07 *
*****
* Slope..... 1.004698 * Width slope..... 0.027197 *
* Intercept..... 0.837452 * Width offset..... 0.0 *
* X**2 TERM..... -0.16105726E-05 * Sensitivity..... 4. *
NP: [7,67]J093.GSP                26 PEAKS
  
```

```

*****
PK IT  ENRG LEFT WD  BKGND FWHM  AREA  CHAN  CPM  ERR  EFF  K  FIT
  1  4   23.9  21 10   533  2.59  1587  22.9  2.07E+00  3.80  1.09  0  70.00
  2  4   26.7  21 10  3855  4.03  1801  25.7  2.35E+00  7.10  1.52  0  0.00
  3  0   52.9  49  6  4265  1.54   244  51.8  3.18E-01  42.6  1.85  0  0.00
  4  4   63.1  57 22  6439  4.42   825  62.0  1.08E+00  18.1  3.02  0  43.80
  5  4   72.5  57 22  9848  4.42  4296  71.4  5.60E+00  5.0  4.01  0  0.00
  6  4   84.4  79 10  3981  1.83  1515  83.2  1.98E+00  6.8  4.96  0  1.03
  7  4   86.9  79 10  3205  1.28   376  85.7  4.90E-01  22.8  5.12  0  0.00
  8  0   92.0  89  6  4792  1.43   509  90.8  6.64E-01  21.9  5.41  0  0.00
  9  0  185.4  181  7  5546  1.57   346 183.7  4.52E-01  35.9  5.46  0  0.00
 10  0  239.1  233 10  6161  2.13  1178 237.2  1.54E+00  12.9  4.72  0  0.00
 11  0  294.8  290  6  2822  1.73   302 292.7  3.94E-01  28.8  4.10  0  0.00
 12  0  336.6  333  7  2741  2.06   159 334.3  2.07E-01  56.2  3.79  0  0.00
 13  0  351.5  345  9  3231  2.59   814 349.2  1.06E+00  13.1  3.69  0  0.00
 14  0  510.3  501 13  2864  3.58  2253 507.5  2.94E+00  5.4  2.78  0  0.00
 15  0  582.6  574 10  1834  3.62   698 579.6  9.10E-01  12.3  2.54  0  0.00
 16  0  609.0  601 11  2099  3.27   862 606.0  1.12E+00  10.9  2.46  0  0.00
 17  0  661.2  649 17  2617  3.52 10350 657.9  1.35E+01  1.5  2.30  0  0.00
 18  0  726.1  720 10  1449  3.69   107 722.7  1.39E-01  67.8  2.15  0  0.00
 19  0  768.2  761  8  1143  3.67   140 764.7  1.82E-01  43.3  2.06  0  0.00
PK IT  ENRG LEFT WD  BKGND FWHM  AREA  CHAN  CPM  ERR  EFF  K  FIT
 20  0  910.8  901 11  1561  5.87   532 907.0  6.93E-01  15.2  1.81  0  0.00
 21  0  968.9  961  9  1210  4.80   304 965.0  3.96E-01  22.4  1.72  0  0.00
 22  0 1172.4 1156 21  1781  5.99  7137 1168.3  9.31E+00  1.9  1.48  0  0.00
 23  0 1331.5 1313 29  1137  6.88  6582 1327.3  8.59E+00  1.8  1.32  0  0.00
 24  0 1459.8 1441 33  990  6.98  3489 1455.6  4.55E+00  2.8  1.22  0  0.00
 25  0 1730.1 1717 15  269  7.12   57 1725.9  7.47E-02  56.6  1.05  0  0.00
 26  0 1763.4 1744 29  386  6.64   496 1759.3  6.46E-01  10.9  1.03  0  0.00
FWHM=SQRT( 2.25464E+00 + 2.60905E-02 *E)
  
```

BACKGROUND INFO 8658 GLY 2 107.015 7 G-2 BG DATE 104.001 7

```

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

  63.11      1.0763 18.11      62.00      0.2702 23.62      0.8062 25.45
  92.04      0.6642 21.94                50                ) 45      -0.0887186 70R
  
```

185.39	0.4517	35.90	186.00	0.6275	18.25	-0.1758112.95R
239.09	1.5363	12.87	238.60	1.3746	25.35	0.1617247.76R
294.77	0.3938	28.84	295.20	0.4042	20.51	-0.0103*****R
336.57	0.2070	56.16	338.40	0.2856	33.09	-0.0786190.49R
351.46	1.0614	13.09	351.90	0.9903	22.03	0.0711363.78R
510.31	2.9390	5.38	511.00	2.9279	6.17	0.0110*****R
582.57	0.9101	12.34	583.10	0.7057	27.76	0.2043110.50R
609.04	1.1243	10.86	609.30	1.2440	19.99	-0.1197231.42R
661.17	13.5005	1.50	661.60	0.1536	34.06	13.3470 1.57
726.14	0.1395	67.80	727.20	0.1603	27.88	-0.0209501.37R
910.77	0.6933	15.21	911.10	0.6268	23.69	0.0666273.65R
968.88	0.3963	22.38	968.90	0.5543	25.81	-0.1581106.51R
1172.38	9.3099	1.88	1173.20	0.0838	12.17	9.2261 1.90
1331.51	8.5854	1.80	1332.50	0.0906	36.33	8.4949 1.86
1459.83	4.5509	2.78	1461.00	4.2121	24.71	0.3388309.48R
1730.09	0.0747	56.64	1729.60	0.0949	44.24	-0.0203294.13R
1763.43	0.6465	10.94	1764.50	0.5111	12.19	0.1354 69.62

14 PEAKS REJECTED BY BACKGROUND

 INTERFERING ISOTOPE ANALYSIS 8658 GLY 2 107.015 7 G- 2

 SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 2 OF 104.001/2007 3723.8 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.2702	23.62	511.0	2.9279	6.17	1120.3	0.4531	18.12
92.0	0.7529	10.45	583.1	0.7057	27.76	1173.2	0.0838	12.17
143.0	0.1199	0.00	609.3	1.2440	19.99	1238.1	0.1961	16.47
186.0	0.6275	18.25	661.6	0.1536	34.06	1332.5	0.0906	36.33
198.0	0.1307	43.31	727.2	0.1603	27.88	1377.7	0.1236	16.91
238.6	1.3746	25.35	846.0	0.1009	0.00	1461.0	4.2121	24.71
279.0	0.1058	18.25	860.4	0.1242	37.78	1586.0	0.1866	0.00
295.2	0.4042	20.51	911.1	0.6268	23.69	1591.0	0.2223	23.39
338.4	0.2856	33.09	968.9	0.5543	25.81	1729.6	0.0949	44.24
351.9	0.9903	22.03	1001.0	0.0557	32.70	1764.5	0.5111	12.19

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 2 ON 4/17/ 7

HIGH RADIUM STANDARD LOW RADIUM STANDARD

HIGH RADIUM STANDARD				LOW RADIUM STANDARD					
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		
316.021	6	0.8983	14.333	26.	87.992	3	1.0291	16.710	23.
322.777	6	0.8988	15.140	31.	274.713	3	1.0765	19.151	37.
336.771	6	0.9369	15.100	28. NG	177.930	4	1.0605	15.962	29.
336.830	6	0.9014	16.271	27.	212.869	4	1.0853	21.056	40.
349.983	6	0.8953	16.435	28.	105.966	5	1.0312	16.624	29.
356.761	6	0.8975	16.992	28.	294.616	5	1.0280	16.773	23.
27.023	7	1.0341	22.055	21. NG	58.691	6	1.0330	19.250	87.
34.851	7	1.0165	20.783	29. NG	4.930	7	1.0463	14.861	33.
55.907	7	1.0306	22.290	20. NG	26.607	7	1.0249	16.849	23.
69.979	7	1.0137	19.133	22. NG	103.937	7	0.9980	15.828	21.
AVERAGE	0.8983	0.002		AVERAGE	1.0413	0.026			

CALIBRATION LINE FROM STANDARD FOR G- 2 OF 103.937 7

ENERGY= 0.837452 + 1.0046980*CH + -1.610573E-06*CH**2
 FWHM =SQRT(-4.3354 + 0.027197*ENERGY) (CO60= 5.648)

EFFICIENCIES FOR GEOMETRY MB 2 CALIBRATED 40.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	1.468700	100.0	5.732900	300.0	4.051400	0.0	0.000000
55.0	2.064200	110.0	5.964100	500.0	2.811300	0.0	0.000000
60.0	2.673200	130.0	6.076800	700.0	2.197100	0.0	0.000000
65.0	3.259500	150.0	5.932900	1000.0	1.669000	0.0	0.000000
70.0	3.799000	170.0	5.680600	1400.0	1.258300		
80.0	4.691800	190.0	5.393600	2000.0	0.909600		
90.0	5.325300	250.0	4.584000	3000.0	0.629200		

PK	ENERGY	CPM	%ERR	COMMENT
1	23.9	2.07	3.8	.....
2	26.7	2.35	7.1	.....
3	52.9	0.32	42.6	.....
b 4	63.1	0.81	25.4	..... Th234s
5	72.5	5.60	5.0	.....
6	84.4	1.98	6.8	.....
7	86.9	0.49	22.8	..... Cs136 Cd109
b 17	661.2 /	13.35	1.6	..... Cs137s
19	768.2	0.18	43.3	Ra226
b 22	1172.4 <	9.23	1.9	..... Co 60s
b 23	1331.5 /	8.49	1.9	..... Co 60s
b 26	1763.4	0.14	69.6	Ra226

REJECTED PEAKS

B 8	92.0	-0.09	99.9	..... Th234s
B 9	185.4	-0.18	99.9	..... Cs137c U 235s Ra226s
B 10	239.1	0.16	99.9	Th228
B 11	294.8	-0.01	99.9	Ra226
B 12	336.6	-0.08	99.9	..... Ru103 Pb214s
B 13	351.5	0.07	99.9	Ra226
B 14	510.3	0.01	99.9	Ac228 Th228
B 15	582.6	0.20	99.9	Th228
B 16	609.0	-0.12	99.9	Ra226
B 18	726.1	-0.02	99.9	Ac228 Th228
B 20	910.8	0.07	99.9	..... Ac228s
B 21	968.9	-0.16	99.9	..... Sb124 Ac228s
B 24	1459.8	0.34	99.9	Ac228
B 25	1730.1	-0.02	99.9	Ra226

8658 GLY 3 G-2 MB 107.555 7 443.15 MIN 1.00000 SM 582

LIBR=GRWR REF TIME= 107.555 7 1098-1

On 1707

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECA	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
K 40	4.602E+11 DAYS	LAMBDA= 1.506E-12	DECAY= 1.000E+00	10		
**** (1460.85)	0.110000	0.01212	0.357	2.682E+02 s	<	1.208E+02
Mn 54	3.125E+02 DAYS	LAMBDA= 2.218E-03	DECAY= 1.000E+00	20		
**** (834.83)	1.000000	0.01920	0.217	1.130E+01 s	<	5.090E+00
Co 57	2.700E+02 DAYS	LAMBDA= 2.567E-03	DECAY= 1.000E+00	100		
**** (122.06)	0.852000	0.06078	0.415	8.023E+00 s	<	3.614E+00
**** (136.47)	0.111000	0.06051	0.384	5.724E+01 s	<	2.579E+01
Co 58	7.130E+01 DAYS	LAMBDA= 9.722E-03	DECAY= 1.000E+00	40		
**** (810.76)	0.990000	0.01964	0.213	1.094E+01 s	<	4.928E+00
**** (863.60)	0.006400	0.01870	0.205	1.713E+03 s	<	7.717E+02
**** (1674.80)	0.005000	0.01070	0.115	2.156E+03 s	<	9.711E+02
Fe 59	4.460E+01 DAYS	LAMBDA= 1.554E-02	DECAY= 1.000E+00	60		
**** (192.20)	0.028000	0.05362	0.382	2.546E+02 s	<	1.147E+02
**** (1099.22)	0.565000	0.01544	0.196	2.245E+01 s	<	1.011E+01
**** (1291.56)	0.432000	0.01348	0.174	2.985E+01 s	<	1.345E+01
Co 60	1.921E+03 DAYS	LAMBDA= 3.608E-04	DECAY= 1.000E+00	40		
**** (1173.21)	0.999200	0.01462	0.194	1.327E+01 s	<	5.978E+00
**** (1332.48)	1.000000	0.01313	0.169	1.286E+01 s	<	5.791E+00
Zn 65	2.440E+02 DAYS	LAMBDA= 2.841E-03	DECAY= 1.000E+00	10		
**** (1115.52)	0.507500	0.01525	0.213	2.748E+01 s	<	1.238E+01
Nb 95	6.550E+01 DAYS	LAMBDA= 1.058E-02	DECAY= 1.000E+00	10		
**** (765.79)	0.990000	0.02052	0.235	1.156E+01 s	<	5.208E+00
Zr 95	6.550E+01 DAYS	LAMBDA= 1.058E-02	DECAY= 1.000E+00	20		
**** (724.18)	0.430000	0.02141	0.229	2.489E+01 s	<	1.121E+01
**** (756.72)	0.546000	0.02070	0.228	2.014E+01 s	<	9.073E+00
Ru106	3.670E+02 DAYS	LAMBDA= 1.889E-03	DECAY= 1.000E+00	410		
**** (511.80)	0.205000	0.02763	0.416	7.336E+01 s	<	3.304E+01
**** (621.80)	0.097600	0.02394	0.236	1.010E+02 s	<	4.548E+01
**** (1050.10)	0.014500	0.01604	0.200	8.603E+02 s	<	3.875E+02
Sn113	1.150E+02 DAYS	LAMBDA= 6.027E-03	DECAY= 1.000E+00	40		
**** (391.40)	0.642000	0.03353	0.295	1.370E+01 s	<	6.170E+00
Ba133	3.981E+03 DAYS	LAMBDA= 1.741E-04	DECAY= 1.000E+00	100		
52 (53.20)	0.019500	0.01846	0.448	1.245E+03	29.09%	5.608E+02
**** (302.70)	0.196000	0.04026	0.337	4.266E+01 s	<	1.921E+01
**** (355.90)	0.670000	0.03590	0.323	1.343E+01 s	<	6.051E+00
Cs134	7.531E+02 DAYS	LAMBDA= 9.204E-04	DECAY= 1.000E+00	100		
**** (604.60)	0.980000	0.02444	0.299	1.249E+01 s	<	5.627E+00
	8.4966E-01 SUM CORR APPLIED TO		1.9919E-02 BELOW			
**** (795.80)	0.854000	0.01692	0.218	1.281E+01 s	<	5.771E+00
**** (476.30)	0.015000	0.	54	5.961E+02 s	<	2.685E+02

Cs137	1.102E+04 DAYS	LAMBDA= 6.290E-05	DECAY= 1.000E+00	3G
**** (661.64)	0.851000	0.02289	0.241	1.238E+01 s < 5.576E+00
Ce141	3.245E+01 DAYS	LAMBDA= 2.136E-02	DECAY= 1.000E+00	2G
**** (145.40)	0.480000	0.05981	0.417	1.454E+01 s < 6.550E+00
Ce144	2.842E+02 DAYS	LAMBDA= 2.439E-03	DECAY= 1.000E+00	15G
52 (53.91)	0.000900	0.01931	0.448	2.578E+04 29.09% 1.161E+04
**** (133.53)	0.108000	0.06066	0.380	5.804E+01 s < 2.614E+01
**** (676.40)	0.015000	0.02205	0.244	7.383E+02 s < 3.326E+02
Tl208	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	19G
**** (583.14)	0.860000	0.02510	0.274	1.271E+01 s <r 5.727E+00
**** (860.37)	0.123000	0.01876	0.216	9.343E+01 s < 4.209E+01
Pb210	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	1G
46 (46.50)	0.040500	0.01181	0.532	1.113E+03 s30.02% 5.013E+02
Bi212	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	22G
**** (727.17)	0.118290	0.02134	0.230	9.092E+01 s < 4.096E+01
**** (1620.56)	0.027459	0.01103	0.120	3.967E+02 s < 1.787E+02
Pb212	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	4G
**** (238.63)	0.431000	0.04726	0.411	2.019E+01 s <r 9.093E+00
Bi214	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 1.000E+00	48G
**** (609.30)	0.470000	0.02430	0.318	2.782E+01 s <r 1.253E+01
**** (1120.40)	0.170000	0.01520	0.215	8.302E+01 s < 3.740E+01
**** (1764.00)	0.170000	0.01021	0.172	9.899E+01 s < 4.459E+01
Pb214	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 1.000E+00	23G
52 (53.20)	0.022000	0.01846	0.448	1.103E+03 29.09% 4.971E+02
**** (241.90)	0.076000	0.04685	0.394	1.107E+02 s < 4.986E+01
**** (295.20)	0.190000	0.04098	0.337	4.332E+01 s <r 1.951E+01
**** (352.00)	0.360000	0.03619	0.347	2.662E+01 s <r 1.199E+01
Ra226	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 1.000E+00	48G
**** (186.10)	0.040000	0.05451	0.416	1.907E+02 s <r 8.588E+01
1052 (1052.00)	0.003240	0.01601	0.157	3.019E+03 58.69% 1.360E+03
Ac228	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	41G
**** (911.10)	0.250000	0.01794	0.244	5.437E+01 s <r 2.449E+01
**** (968.90)	0.150000	0.01711	0.240	9.359E+01 s <r 4.216E+01
Th234	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	10G
**** (62.80)	0.038116	0.03006	0.351	3.061E+02 s < 1.379E+02
**** (92.30)	0.026880	0.05438	0.403	2.757E+02 s <r 1.242E+02
U 235	2.571E+11 DAYS	LAMBDA= 2.696E-12	DECAY= 1.000E+00	34G
74 (72.81)	0.004000	0.04078	3.539	2.170E+04 8.04% 9.774E+03
85 (84.24)	0.051000	0.04993	1.628	6.394E+02 12.48% 2.880E+02
**** (143.78)	0.097200	0.05996	0.414	7.109E+01 s < 3.202E+01
**** (185.72)	0.540000	0.05456	0.441	1.496E+01 s <r 6.738E+00
Np239	2.350E+00 DAYS	LAMBDA= 2.950E-01	DECAY= 1.000E+00	32G
**** (106.14)	0.278000	0.05894	0.388	2.369E+01 s < 1.067E+01
**** (277.62)	0.145000	0.04276	0.380	6.126E+01 s < 2.759E+01
U 238	1.633E+12 DAYS	LAMBDA= 4.245E-13	DECAY= 1.000E+00	1G
**** (1001.10)	0.008280	0.01668	0.216	1.561E+03 s < 7.033E+02

 8658 GLY 3 G-2 MB 107.555 7 443.15 MIN 1.00000 SM 582

LIBR=GRWR REF TIME= 107.555 7 1098-1

 * Group..... 8658 * Time of count 107.555 2007 *
 * Sample..... 3 * Reference GMT..... 107.555 2007 *
 * Element..... * Elapsed Live Tm..... 443.15 *
 * Type code..... GLY * Dead Time Pct..... 0.030078 *
 * ID..... 9 QC-BLANK #60929 * Background GMT..... 104.001 2007 *
 * Geometry, detector..... MB-2 * Standard GMT..... 103.937 2007 *
 * Aliquot..... 1. * Days since TO..... 0.0 *
 * Unit of Aliquot..... SMPL * Time on..... 6:19 PDT 17-APR *
 * Data Sheet Units..... PCI /SMPL * Time off..... 13:42 PDT 17-APR *
 * Library..... GRWR * Calc Time..... 15:23 17-APR-07 *

 * Slope..... 1.004698 * Width slope..... 0.027197 *
 * Intercept..... 0.837452 * Width offset..... 0.0 *
 * X**2 TERM..... -0.16105726E-05 * Sensitivity..... 4. *
 NP: [7,671582.GSP 23 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	25.4	21	9	1024	3.76	927	24.4	2.09E+00	7.00	131	0	0.00
2	5	33.0	31	9	428	2.07	103	32.0	2.32E-01	25.70	287	0	2.17
3	5	38.0	31	9	1179	2.07	67	36.9	1.50E-01	84.60	437	0	0.00
4	0	46.0	41	8	1521	3.58	236	45.0	5.32E-01	30.00	779	0	0.00
5	0	52.4	49	6	1206	3.10	199	51.4	4.48E-01	29.1	1.81	0	0.00
6	0	73.8	67	13	3449	3.83	1568	72.7	3.54E+00	8.0	4.12	0	0.00
7	0	85.1	80	9	2151	2.10	722	83.9	1.63E+00	12.5	5.00	0	0.00
8	0	92.1	89	7	1640	1.46	258	90.8	5.83E-01	27.0	5.41	0	0.00
9	0	185.2	181	7	1447	2.26	267	183.6	6.01E-01	24.9	5.46	0	0.00
10	0	197.1	193	6	1191	1.71	125	195.5	2.81E-01	45.2	5.29	0	0.00
11	0	239.0	234	9	1430	2.55	376	237.1	8.48E-01	19.3	4.72	0	0.00
12	0	294.5	289	9	1123	1.52	103	292.4	2.32E-01	60.9	4.11	0	0.00
13	0	338.5	333	8	821	2.69	92	336.2	2.09E-01	56.1	3.78	0	0.00
14	0	352.1	345	10	1010	2.49	252	349.9	5.68E-01	24.3	3.68	0	0.00
15	0	510.5	502	13	792	4.03	1001	507.7	2.26E+00	6.7	2.78	0	0.00
16	0	582.6	575	12	561	3.25	188	579.5	4.25E-01	25.9	2.54	0	0.00
17	4	595.5	588	27	346	4.02	137	592.5	3.09E-01	25.8	2.50	0	2.33
18	4	609.0	588	27	576	4.50	465	605.9	1.05E+00	12.0	2.46	0	0.00
19	0	910.5	901	17	546	4.14	109	906.7	2.45E-01	49.3	1.81	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	967.8	957	14	343	6.31	189	964.0	4.27E-01	22.5	1.72	0	0.00
21	0	1051.6	1041	14	292	8.93	69	1047.6	1.57E-01	58.7	1.61	0	0.00
22	0	1460.3	1444	26	270	6.81	1006	1456.1	2.27E+00	5.0	1.22	0	0.00
23	0	1765.8	1754	19	119	4.49	156	1761.7	3.53E-01	17.2	1.03	0	0.00

FWHM=SQRT(4.78190E+00 + 2.40920E-02 *E)

 BACKGROUND INFO 8658 GLY 3 107.555 7 G- 2 BG DATE 104.001 7

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v		
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR
92.09	0.5826	27.05	92.00	0.7529	10.45	-0.1702	103.47R	
185.21	0.6015	24.93	186.00	0.6275	18.25	-0.0261	1724.07R	
197.15	0.2812	45.19	198.00	0.1307	43.31	0.1505	92.43R	
239.01	0.8482	19.26	238.60	1.3746	25.35	-0.5264	73.11R	
294.46	0.2316	60.92	56		51	-0.1726	94.84R	

338.45	0.2087	56.12	338.40	0.2856	33.09	-0.0769	195.64R
352.15	0.5676	24.30	351.90	0.9903	22.03	-0.4226	61.08R
510.53	2.2590	6.67	511.00	2.9279	6.17	-0.6690	35.15R
582.56	0.4249	25.94	583.10	0.7057	27.76	-0.2808	80.06R
609.03	1.0503	11.96	609.30	1.2440	19.99	-0.1938	143.80R
910.51	0.2454	49.33	911.10	0.6268	23.69	-0.3814	50.23R
967.84	0.4273	22.52	968.90	0.5543	25.81	-0.1270	135.75R
1460.32	2.2703	5.02	1461.00	4.2121	24.71	-1.9418	53.91R
1765.81	0.3527	17.24	1764.50	0.5111	12.19	-0.1584	54.96R

14 PEAKS REJECTED BY BACKGROUND

 INTERFERING ISOTOPE ANALYSIS 8658 GLY 3 107.555 7 G- 2

 SPANF TABLE SAVED IN GSDR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 2 OF 104.001/2007 3723.8 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.2702	23.62	511.0	2.9279	6.17	1120.3	0.4531	18.12
92.0	0.7529	10.45	583.1	0.7057	27.76	1173.2	0.0838	12.17
143.0	0.1199	0.00	609.3	1.2440	19.99	1238.1	0.1961	16.47
186.0	0.6275	18.25	661.6	0.1536	34.06	1332.5	0.0906	36.33
198.0	0.1307	43.31	727.2	0.1603	27.88	1377.7	0.1236	16.91
238.6	1.3746	25.35	846.0	0.1009	0.00	1461.0	4.2121	24.71
279.0	0.1058	18.25	860.4	0.1242	37.78	1586.0	0.1866	0.00
295.2	0.4042	20.51	911.1	0.6268	23.69	1591.0	0.2223	23.39
338.4	0.2856	33.09	968.9	0.5543	25.81	1729.6	0.0949	44.24
351.9	0.9903	22.03	1001.0	0.0557	32.70	1764.5	0.5111	12.19

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 2 ON 4/17/ 7

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD				LOW RADIUM STANDARD					
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		
316.021	6	0.8983	14.333	26.	87.992	3	1.0291	16.710	23.
322.777	6	0.8988	15.140	31.	274.713	3	1.0765	19.151	37.
336.771	6	0.9369	15.100	28. NG	177.930	4	1.0605	15.962	29.
336.830	6	0.9014	16.271	27.	212.869	4	1.0853	21.056	40.
349.983	6	0.8953	16.435	28.	105.966	5	1.0312	16.624	29.
356.761	6	0.8975	16.992	28.	294.616	5	1.0280	16.773	23.
27.023	7	1.0341	22.055	21. NG	58.691	6	1.0330	19.250	87.
34.851	7	1.0165	20.783	29. NG	4.930	7	1.0463	14.861	33.
55.907	7	1.0306	22.290	20. NG	26.607	7	1.0249	16.849	23.
69.979	7	1.0137	19.133	22. NG	103.937	7	0.9980	15.828	21.
AVERAGE		0.8983	0.002		AVERAGE		1.0413	0.026	

CALIBRATION LINE FROM STANDARD FOR G- 2 OF 103.937 7

ENERGY= 0.837452 + 1.0046980*CH + -1.610573E-06*CH**2
 FWHM =SQRT(-4.3354 + 0.027197*ENERGY) (CO60= 5.648)

EFFICIENCIES FOR GEOMETRY MB 2 CALIBRATED 40.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	1.468700	100.0	5.732900	300.0	4.051400	0.0	0.000000
55.0	2.064200	110.0	5.964100	500.0	2.811300	0.0	0.000000
60.0	2.673200	130.0	6.076800	700.0	2.197100	0.0	0.000000
65.0	3.259500	150.0	5.932900	1000.0	1.669000	0.0	0.000000
70.0	3.799000	170.0	5.680600	1400.0	1.258300		
80.0	4.691800	190.0	5.393600	2000.0	0.909600		
90.0	5.325300	250.0	4.584000	3000.0	0.629200		

PK	ENERGY	CPM	%ERR	COMMENT
1	25.4	2.09	7.0	.....
2	33.0	0.23	25.7	.....
3	38.0	0.15	84.6	.....
4	46.0	0.53	30.0	..... Np239s Pb210s
5	52.4	0.45	29.1	.....
6	73.8	3.54	8.0	.....
7	85.1	1.63	12.5	NO GEN. Cs136
17	595.5	0.31	25.8	.....
21	1051.6	0.16	58.7	Ra226
REJECTED PEAKS				
B 8	92.1	-0.17	99.9	..... Th234s
B 9	185.2	-0.03	99.9	..... Cs137c U 235s Ra226s
B 10	197.1	0.15	92.4	.....
B 11	239.0	-0.53	73.1	Th228 Pb212s
B 12	294.5	-0.17	94.8	Ra226 Ru103 Pb214s
B 13	338.5	-0.08	99.9	Ac228
B 14	352.1	-0.42	61.1	Ra226 Pb214s
B 15	510.5	-0.67	35.2	Ac228 Th228 La140 Na 22 Ru106s
B 16	582.6	-0.28	80.1	Th228 Tl208s
B 18	609.0	-0.19	99.9	Ra226 Ru103 Bi214s
B 19	910.5	-0.38	50.2	..... Ac228s
B 20	967.8	-0.13	99.9	..... Sb124 Ac228s
B 22	1460.3	-1.94	53.9	Ac228 K 40s
B 23	1765.8	-0.16	55.0	Ra226

 8658 GLY 4 G-6 MB 107.555 7 443.45 MIN 0.50000 L 584
 LIBR=GRWR REF TIME= 50.802 7

mc. 1707

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEY	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECA	DPM NOW	ERROR PCT	PCI/L AT TZERO
K 40	4.602E+11 DAYS	LAMBDA= 1.506E-12	DECAY= 1.000E+00	10		
**** (1460.85)	0.110000	0.00928	0.405	3.965E+02 s	< r	3.572E+02
Mn 54	3.125E+02 DAYS	LAMBDA= 2.218E-03	DECAY= 8.817E-01	20		
**** (834.83)	1.000000	0.01516	0.197	1.298E+01 s	<	1.326E+01
Co 57	2.700E+02 DAYS	LAMBDA= 2.567E-03	DECAY= 8.644E-01	100		
**** (122.06)	0.852000	0.06160	0.403	7.687E+00 s	<	8.011E+00
**** (136.47)	0.111000	0.05832	0.431	6.657E+01 s	<	6.937E+01
Co 58	7.130E+01 DAYS	LAMBDA= 9.722E-03	DECAY= 5.760E-01	40		
**** (810.76)	0.990000	0.01554	0.214	1.388E+01 s	<	2.172E+01
**** (863.60)	0.006400	0.01473	0.193	2.053E+03 s	<	3.211E+03
**** (1674.80)	0.005000	0.00818	0.102	2.491E+03 s	<	3.896E+03
Fe 59	4.460E+01 DAYS	LAMBDA= 1.554E-02	DECAY= 4.139E-01	60		
**** (192.20)	0.028000	0.04742	0.388	2.924E+02 s	<	6.364E+02
**** (1099.22)	0.565000	0.01196	0.194	2.867E+01 s	<	6.239E+01
**** (1291.56)	0.432000	0.01036	0.161	3.590E+01 s	<	7.814E+01
Co 60	1.921E+03 DAYS	LAMBDA= 3.608E-04	DECAY= 9.797E-01	40		
**** (1173.21)	0.999200	0.01128	0.182	1.614E+01 s	<	1.484E+01
**** (1332.48)	1.000000	0.01008	0.157	1.562E+01 s	<	1.437E+01
Zn 65	2.440E+02 DAYS	LAMBDA= 2.841E-03	DECAY= 8.511E-01	10		
**** (1115.52)	0.507500	0.01180	0.194	3.237E+01 s	<	3.427E+01
Nb 95	6.550E+01 DAYS	LAMBDA= 1.058E-02	DECAY= 5.485E-01	10		
**** (765.79)	0.990000	0.01632	0.218	1.350E+01 s	<	2.218E+01
Zr 95	6.550E+01 DAYS	LAMBDA= 1.058E-02	DECAY= 5.485E-01	20		
**** (724.18)	0.430000	0.01711	0.229	3.113E+01 s	<	5.114E+01
**** (756.72)	0.546000	0.01648	0.204	2.268E+01 s	<	3.726E+01
Ru106	3.670E+02 DAYS	LAMBDA= 1.889E-03	DECAY= 8.984E-01	410		
**** (511.80)	0.205000	0.02274	0.408	8.748E+01 s	< r	8.773E+01
**** (621.80)	0.097600	0.01939	0.224	1.182E+02 s	<	1.186E+02
**** (1050.10)	0.014500	0.01245	0.180	9.978E+02 s	<	1.001E+03
Sn113	1.150E+02 DAYS	LAMBDA= 6.027E-03	DECAY= 7.103E-01	40		
**** (391.40)	0.642000	0.02809	0.287	1.592E+01 s	<	2.020E+01
Ba133	3.981E+03 DAYS	LAMBDA= 1.741E-04	DECAY= 9.902E-01	100		
81 (81.00)	0.360000	0.06938	0.344	1.375E+01	21.76%	1.251E+01
**** (302.70)	0.196000	0.03427	0.322	4.787E+01 s	<	4.355E+01
**** (355.90)	0.670000	0.03025	0.315	1.553E+01 s	<	1.413E+01
Cs134	7.531E+02 DAYS	LAMBDA= 9.204E-04	DECAY= 9.491E-01	100		
**** (604.60)	0.980000	0.01984	0.233	1.198E+01 s	<	1.137E+01
	8.4001E-01 SUM CORR APPLIED TO		1.5791E-02 BELOW			
**** (795.80)	0.854000	0.01326	0.211	1.564E+01 s	<	1.485E+01
**** (476.30)	0.015000	0.	60	6.515E+02 s	<	6.184E+02

Cs137	1.102E+04 DAYS	LAMBDA= 6.290E-05	DECAY= 9.964E-01	3G
**** (661.64)	0.851000	0.01843	0.233	1.486E+01 s < 1.344E+01
Ce141	3.245E+01 DAYS	LAMBDA= 2.136E-02	DECAY= 2.975E-01	2G
**** (145.40)	0.480000	0.05631	0.434	1.607E+01 s < 4.866E+01
Ce144	2.842E+02 DAYS	LAMBDA= 2.439E-03	DECAY= 8.707E-01	15G
81 (80.12)	0.015400	0.06944	0.344	3.213E+02 21.76% 3.325E+02
**** (133.53)	0.108000	0.05899	0.441	6.918E+01 s < 7.158E+01
**** (696.40)	0.015000	0.01768	0.221	8.341E+02 s < 8.630E+02
Tl208	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	19G
**** (583.14)	0.860000	0.02043	0.274	1.557E+01 s <r 1.403E+01
**** (860.37)	0.123000	0.01478	0.208	1.146E+02 s < 1.032E+02
Pb210	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	1G
46 (46.50)	0.040500	0.04912	0.523	2.628E+02 s32.34% 2.367E+02
Bi212	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	22G
**** (727.17)	0.118290	0.01705	0.231	1.144E+02 s < 1.030E+02
**** (1620.56)	0.027459	0.00843	0.111	4.796E+02 s < 4.321E+02
Pb212	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	4G
**** (238.63)	0.431000	0.04083	0.395	2.245E+01 s <r 2.023E+01
Bi214	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 9.999E-01	48G
**** (609.30)	0.470000	0.01971	0.303	3.267E+01 s <r 2.943E+01
769 (768.70)	0.050000	0.01626	0.137	1.688E+02 50.15% 1.521E+02
**** (1120.40)	0.170000	0.01176	0.223	1.115E+02 s <r 1.005E+02
**** (1764.00)	0.170000	0.00780	0.153	1.154E+02 s < 1.040E+02
Pb214	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 9.999E-01	23G
**** (241.90)	0.076000	0.04043	0.359	1.169E+02 s < 1.053E+02
**** (295.20)	0.190000	0.03492	0.355	5.343E+01 s <r 4.814E+01
**** (352.00)	0.360000	0.03051	0.334	3.041E+01 s <r 2.740E+01
769 (768.40)	0.000800	0.01627	0.137	1.055E+04 50.15% 9.501E+03
Ra226	5.851E+05 DAYS	LAMBDA= 1.185E-06	DECAY= 9.999E-01	48G
**** (186.10)	0.040000	0.04843	0.414	2.134E+02 s < 1.923E+02
769 (768.40)	0.053200	0.01627	0.137	1.586E+02 50.15% 1.429E+02
Ac228	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	41G
**** (911.10)	0.250000	0.01407	0.224	6.372E+01 s <r 5.741E+01
**** (968.90)	0.150000	0.01335	0.215	1.071E+02 s < 9.652E+01
Th234	5.113E+12 DAYS	LAMBDA= 1.356E-13	DECAY= 1.000E+00	10G
**** (62.80)	0.038116	0.06801	0.438	1.688E+02 s <r 1.521E+02
**** (92.30)	0.026880	0.06791	0.435	2.383E+02 s <r 2.147E+02
U 235	2.571E+11 DAYS	LAMBDA= 2.696E-12	DECAY= 1.000E+00	34G
73 (72.81)	0.004000	0.06956	3.115	1.120E+04 7.44% 1.009E+04
81 (81.20)	0.006500	0.06936	0.344	7.619E+02 21.76% 6.864E+02
85 (84.24)	0.051000	0.06908	2.122	6.023E+02 8.37% 5.426E+02
**** (143.78)	0.097200	0.05667	0.440	7.985E+01 s < 7.193E+01
**** (185.72)	0.540000	0.04850	0.413	1.575E+01 s < 1.419E+01
Np239	2.350E+00 DAYS	LAMBDA= 2.950E-01	DECAY= 5.371E-08	32G
**** (106.14)	0.278000	0.06516	0.417	2.302E+01 s < 3.861E+08
**** (277.62)	0.145000	0.03656	0.333	6.286E+01 s < 1.054E+09
U 238	1.633E+12 DAYS	LAMBDA= 4.245E-13	DECAY= 1.000E+00	1G
**** (1001.10)	0.008280	0.	61	3 1.747E+03 s < 1.574E+03

8658 GLY 4 G-6 MB 107.555 7 443.45 MIN 0.50000 L 584

LIBR=GRWR REF TIME= 50.802 7

```

*****
* Group..... 8658 * Time of count      107.555 2007 *
* Sample..... 4 * Reference GMT..... 50.802 2007 *
* Element..... * Elapsed Live Tm..... 443.45 *
* Type code.... GLY * Dead Time Pct..... 0.026301 *
* ID..... QC-DUP#1 60930 * Background GMT..... 104.044 2007 *
* Geometry, detector..... MB-6 * Standard GMT..... 104.028 2007 *
* Aliquot..... 0.5 * Days since TO..... 56.75296 *
* Unit of Aliquot..... L * Time on..... 6:19 PDT 17-APR *
* Data Sheet Units..... PCI /L * Time off..... 13:42 PDT 17-APR *
* Library..... GRWR * Calc Time..... 15:23 17-APR-07 *
*****
* Slope..... 0.992513 * Width slope..... 0.012238 *
* Intercept..... -250314 * Width offset..... 0.0 *
* X**2 TERM..... -0.14823797E-05 * Sensitivity..... 4. *
NP: [7,67]584. GSP                23 PEAKS

```

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	8	24.6	22	10	260	1.73	500	25.0	1.13E+00	8.30	119	0	9.81
2	8	27.1	22	10	1010	2.67	364	27.5	8.20E-01	17.50	158	0	0.00
3	0	46.0	44	7	2019	1.68	232	46.6	5.23E-01	32.30	779	0	0.00
4	0	63.6	61	7	2634	1.23	191	64.4	4.31E-01	45.4	6.82	0	0.00
5	6	72.9	70	11	2802	2.16	1381	73.7	3.12E+00	7.4	6.94	0	2.12
6	6	75.0	70	11	1475	1.48	1676	75.8	3.78E+00	4.4	6.94	0	0.00
7	8	81.2	81	10	669	1.96	152	82.1	3.44E-01	21.8	6.93	0	11.90
8	8	84.8	81	10	2005	1.96	941	85.7	2.12E+00	8.4	6.89	0	0.00
9	0	92.4	91	6	1956	2.12	367	93.3	8.27E-01	19.9	6.78	0	0.00
10	0	239.2	237	10	2022	1.97	443	241.4	9.99E-01	19.8	4.09	0	0.00
11	0	294.9	294	8	1231	2.65	171	297.5	3.86E-01	36.9	3.50	0	0.00
12	0	351.7	350	9	1058	1.57	287	354.8	6.48E-01	21.8	3.11	0	0.00
13	0	387.3	388	6	570	3.12	119	390.7	2.68E-01	34.2	2.90	0	0.00
14	0	510.9	508	16	1135	3.23	1034	515.4	2.33E+00	7.9	2.28	0	0.00
15	0	582.6	583	11	654	2.34	231	587.8	5.21E-01	22.7	2.07	0	0.00
16	0	609.2	609	11	602	2.23	385	614.6	8.68E-01	13.5	1.99	0	0.00
17	0	768.5	773	7	307	1.53	61	775.5	1.37E-01	50.1	1.64	0	0.00
18	0	910.9	914	11	314	2.69	213	919.3	4.79E-01	18.2	1.42	0	0.00
19	0	1120.5	1128	8	200	3.13	194	1131.2	4.37E-01	15.3	1.19	0	0.00
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1238.1	1244	14	334	3.38	126	1250.1	2.83E-01	33.9	1.09	0	0.00
21	0	1460.8	1464	22	182	3.87	1443	1475.3	3.25E+00	3.80	933	0	0.00
22	0	1766.2	1779	18	103	4.64	151	1784.6	3.40E-01	19.90	790	0	0.00
23	0	1802.2	1814	12	66	7.15	18	1821.0	4.13E-02	97.30	775	0	0.00

FWHM=SQRT(9.78240E-01 + 1.37495E-02 *E)

BACKGROUND INFO 8658 GLY 4 107.555 7 G-6 BG DATE 104.044 7

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v		
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR
63.64	0.4311	45.41	62.00	0.6176	51.32	-0.1866	199.69R	
92.37	0.8273	19.94	92.00	0.8880	12.05	-0.0607	323.97R	
239.23	0.9995	19.79	238.60	1.0410	24.11	-0.0415	769.59R	
294.90	0.3862	36.93	295.20	0.4649	26.46	-0.0786	239.51R	
351.69	0.6479	21.81	62		7.13	-0.3442	68.75R	

510.88	2.3322	7.87	511.00	2.6225	9.17	-0.2903104.24R
582.62	0.5214	22.69	583.10	0.6299	27.02	-0.1086190.92R
609.21	0.8678	13.55	609.30	1.1408	22.58	-0.2730103.74R
910.94	0.4792	18.19	911.10	0.4988	26.28	-0.0196804.05R
1120.54	0.4368	15.30	1120.30	0.4059	16.51	0.0309305.92R
1238.14	0.2830	33.87	1238.10	0.2046	25.86	0.0785139.57R
1460.78	3.2546	3.77	1461.00	3.7519	19.59	-0.4973149.86R
1766.24	0.3403	19.90	1764.50	0.4284	11.23	-0.0881 94.33R

13 PEAKS REJECTED BY BACKGROUND

 INTERFERING ISOTOPE ANALYSIS 8658 GLY 4 107.555 7 G- 6

 SPANF TABLE SAVED IN QSTOR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 6 OF 104.044/2007 3662.6 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.6176	51.32	511.0	2.6225	9.17	1120.3	0.4059	16.51
92.0	0.8880	12.05	583.1	0.6299	27.02	1173.2	0.0446	51.11
143.0	0.1067	0.00	609.3	1.1408	22.58	1238.1	0.2046	25.86
186.0	0.5149	16.32	661.6	0.1181	63.17	1332.5	0.0579	18.13
198.0	0.1238	19.30	727.2	0.1447	37.31	1337.7	0.0000	0.00
238.6	1.0410	24.11	846.0	0.0625	0.00	1461.0	3.7519	19.59
279.0	0.1009	3.47	860.4	0.1108	24.92	1586.0	0.0773	0.00
295.2	0.4649	26.46	911.1	0.4988	26.28	1591.0	0.1588	13.35
338.4	0.2182	38.18	968.9	0.4137	34.83	1729.6	0.0846	19.62
351.9	0.9921	19.13	1001.0	0.0615	42.61	1764.5	0.4284	11.23

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 4/17/ 7

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD				LOW RADIUM STANDARD					
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		
26.607	7	1.4487	13.714	22.NG	20.778	7	1.3707	13.413	21.NG
34.893	7	1.4070	11.890	23.NG	29.886	7	1.3666	12.322	68.NG
47.974	7	1.4316	12.505	25.	34.911	7	1.3575	14.031	26.NG
55.959	7	1.3986	10.685	22.	47.994	7	1.3550	14.222	23.NG
61.903	7	1.3933	11.019	20.	55.939	7	1.3656	13.681	27.NG
69.881	7	1.4140	11.728	31.	61.811	7	1.3744	14.949	20.NG
76.856	7	1.4175	11.605	29.	69.906	7	1.3635	14.524	20.
81.753	7	1.4002	11.462	21.	76.810	7	1.3438	13.154	35.
92.687	7	1.3435	14.360	31.NG	81.696	7	1.3658	13.879	25.
96.820	7	1.3228	14.218	21.NG	104.028	7	1.3821	15.760	22.
AVERAGE		1.4092	0.014		AVERAGE		0.0000	0.011	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 104.028 7

ENERGY= -0.250314 + 0.9925134*CH + -1.482380E-06*CH**2
 FWHM =SQRT(-0.7778 + 0.012239*ENERGY) (CD60= 3.941)

EFFICIENCIES FOR GEOMETRY MB 6 CALIBRATED 26.000 2007

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	6.107200	100.0	6.645700	300.0	3.450500	0.0	0.000000
55.0	6.465200	110.0	6.429700	500.0	2.317600	0.0	0.000000
60.0	6.706800	130.0	5.979700	700.0	1.760600	0.0	0.000000
65.0	6.856800	150.0	5.530600	1000.0	1.300000	0.0	0.000000
70.0	6.935900	170.0	5.131300	1400.0	0.964500		
80.0	6.944800	190.0	4.777700	2000.0	0.695400		
90.0	6.828800	250.0	3.948100	3000.0	0.479200		

PK	ENERGY	CPM	%ERR	COMMENT
1	24.6	1.13	8.3	
2	27.1	0.82	17.5	
3	46.0	0.52	32.3	Np239s Pb210s
5	72.9	3.12	7.4	
6	75.0	3.78	4.4	
7	81.2	0.34	21.8	Ce144 I 131
8	84.8	2.12	8.4	NO GEN.
13	387.3	0.27	34.2	
17	768.5	0.14	50.1	Ra226
23	1802.2	0.04	97.3	
REJECTED PEAKS				
B 4	63.6	-0.19	99.9	Th234s
B 9	92.4	-0.06	99.9	Th234s
B 10	239.2	-0.04	99.9	Th228 Pb212s
B 11	294.9	-0.08	99.9	Ra226 Ru103 Pb214s
B 12	351.7	-0.34	68.7	Ra226 Pb214s
B 14	510.9	-0.29	99.9	Ac228 Th228 La140 Na 22 Ru106s
B 15	582.6	-0.11	99.9	Th228 Tl208s
B 16	609.2	-0.27	99.9	Ra226 Ru103 Bi214s
B 18	910.9	-0.02	99.9	Ac228s
B 19	1120.5	0.03	99.9	Ra226 Bi214s
B 20	1238.1	0.08	99.9	Ra226
B 21	1460.8	-0.50	99.9	K 40s
B 22	1766.2	-0.09	94.3	

LOG-IN VERIFICATION

All samples
All planchets

RUSH

Jac 4/18/07

Chem book # 6104 p. 97

R702123 TA_IRVINE
TestAmerica - Irvin
17461 Derian Avenue

Pr Mgr.... MCM Rcvd... 02/21/07
Charge.... 00-000 Due.... 18-APR-07
Chemist... Value... 0.
Created... 22-FEB-07 Billed.. 0.
Billing status.. open
Calc. units.... PCI /Unit alq Min Pri
/ 0

PROJECT# IQB2023

Record book 0 6107
P.P.

20-22

4/18/07 AK carr/
trac

smp	elm	typ	mg	rec	dpm rec Ash wgt	1st sep	2nd sep	aliquot		
1	B0		90.90	✓0.0000		0.000	0 0.000	0 0.1200	✓	1 # 0
	Ra		0.00	0.0000		100.869	✓7 107.660	✓7 0.1000	✓	1 # 0
	Ac		33.10	0.0000 ✓		0.000	0 107.617	✓7 1.800	✓	1 # 1
	B2		182.20	✓0.0000		0.000	0 0.000	0 0.2500	✓	1 # 0
	GLY		0.00	0.0000		0.000	0 0.000	0 0.5000	✓	1 # 0
2	Ra		0.00	0.0000		100.869	✓7 107.660	✓7 1.000		smp1 ✓ # 0
	Ac		32.45	0.0000 ✓		0.000	0 107.617	✓7 1.000		smp1 ✓ # 1
	B2		60.10	✓0.0000		0.000	0 0.000	0 1.000	✓	smp1 # 0
	GLY		0.00	0.0000		0.000	0 0.000	0 1.000	✓	smp1 # 0
3	Ra		0.00	0.0000		100.869	✓7 107.660	✓7 1.000		smp1 ✓ # 0
	Ac		32.65	0.0000 ✓		0.000	0 107.617	✓7 1.000		smp1 ✓ # 1
	B2		61.20	✓0.0000		0.000	0 0.000	0 1.000	✓	smp1 # 0
	GLY		0.00	0.0000		0.000	0 0.000	0 1.000	✓	smp1 # 0
4	Ra		0.00	0.0000		100.869	✓7 107.660	✓7 0.1000	✓	1 # 0
	Ac		33.31	0.0000 ✓		0.000	0 107.617	✓7 1.800	✓	1 # 1
	B2		181.20	✓0.0000		0.000	0 0.000	0 0.2500	✓	1 # 0
	GLY		0.00	0.0000		0.000	0 0.000	0 0.5000	✓	1 # 0
5	Ra		0.00	0.0000		100.869	✓7 107.660	✓7 0.1000	✓	1 # 0
	B2		183.70	✓0.0000		0.000	0 0.000	0 0.2500	✓	1 # 0

Carriers/Tracers used -----

1 1.000 mls of Y 0 E-D1-(03)OXAL9 @ 40.74 mg/ml

8656, 8657, 8658, 8659

WORK RECORD

Date	Analyst	Proc / steps	Sample	Analyte	Remarks
02.21.07	Vreed, pH	DWP-007	ALL	LS	
"	FILTR'N	DWP-050	8657-1	LS/AR	SAMPLES ALIQUOTE FOR AC AND LA ANALYSIS HAVE BEEN FILTERED AND FILTERS DIGESTED. LS/AR.
02.22.07	Ac, Ra, Se	DWP-062	8657-1,4	LS	
"	Ra	"	8657-1,4,5	LS	
"	[80]	DWP-121	8656-1 8657-1,4,5 8658-1 8659-1	LS	71-7.2
03.06.07	[80]	DWP-121 → 7.2 → 10	ALL	DWP	
03.16.07	[80]	DWP-121 → ALL	8657-5	DWP	
04.05.07	FILTR'N	DWP-050	8658-1	LS	ALIQUOTE FOR AC AND LA HAS BEEN FILTERED AND DIGESTED. FILTERS SOL'N WAS ADDED. LS
"	Ac	DWP-062	"	LS	
"	Ra	DWP-062	8658-1,4,5	LS	
04.11.07	[82]	DWP-121	8658-1,4,5	LS	71-7.2
	GLY	DWP-100		LS	

RECOVERY:

[80]

	G	T	N	DONE SF
8657-5 _R	19.2825	19.2140	685	DWP 03.16.07
	ALIQ 82(L)	ALIB GLY(L)		
8658--1	0.250	0.5		
- 2 LGS		1.0 sample		
- 3 BLANK		1.0 samp.		
- 4 dup#1	0.250	0.5		
- 5 MS#1	0.250	-		

[82] → RECOVERY SEE PAGE 22 pl...

202121

Test America

JK

21

2.22.07 8656, 8657, 8658, 8659

WATER

4/18/07 Rec'd: 02.21.07
Due: 03.14.07

[80], [Ac], [Ra], [SR]

MR DUP

Cur. ID TO	FRAC	VOLUME RSJ(L)	PH	ALQ 80(L)	MLQ Ac(L)	MLQ Ra(L)	MLQ SR(L)
8656-1 IQB2021-01 02.19.07 09:30	1	10.0	6.5	0.3	HOLD	HOLD	HOLD
8657-1 IQB2022-01 02.19.07 12:00	1	10.0	6.5 20 87.2	0.3	1.8	0.1	0.5
-2 LCS							
-3 BLANK							
-4 Dup #1 2.19.07 12:00				0.3	1.8	0.1	0.5
-5 MS #1 2.19.07 12:00				0.3	N/A	0.1	N/A
8658-1 IQB2023-01 02.19.07 11:15	1	7.00	6.0	0.200	HOLD 1.8	HOLD 0.1	HOLD
8659-1 IQB2024-01 02.19.07 10:15	1	10.00	7.0	0.200	HOLD	HOLD	HOLD
DONE BY:			LS 2/22	→			
8658-4 Dup #1 (Ra, Ac)					1.8	0.1	-
-5 MS #1 (Ra)					-	0.1	-
			Recovery:	04/05 LS →			

[80]

	G	T	N	DONE BY	CHK OF
8656-1	19.2568	19.1855	71.3	DUP 03.06.07	MM 03.06.07
8657-1	19.3392	19.2783	60.9		
✓	19.3643	19.3005	63.8		
3	19.3792	19.3159	63.3		
4	19.2724	19.2126	59.8		
5	19.2738	19.2140	59.8		
8658-1	19.3469	19.2860	90.9		
8659-1	19.3338	19.2766	107.2		

JEC
4/17/07

8658

DUE: 4-18-07

TA IRVINE (Water)

[Ac, Ra]

CUST ID

- 1 IQB2023-01
- 2 LES #60928 [Ra]^{BM} 04.10.07 [Ac] MGS 4.9.07
- 3 Blank
- 4 Dup # 1
- 5 MS # 1 # 60931 [Ra]^{BM} 04.10.07

1-4 10 ml Y, E-DI-(03) DXAL 9 MGS 4.9.07 / NW 04.17.07

8658

Recovery

[A]

	G	T	N	Septime	DONE	CARD
1	77.87	44.77	33.10	107.617	MGS 4-17-07	PAS 4-17-07
2	75.29	42.84	32.45	↓	↓	↓
3	74.52	41.87	32.65	↓	↓	↓
4	76.17	42.86	33.31	↓	↓	↓

8867

WORK RECORD

Date	Analysis	Proc. / Steps	Sample	Analyst	Remarks
02-22-07	MOIST WT		1-20	MFW	
02-23-07	GLS	HWP 100	1-23	MFW	

RECOVER:

[82]

	G	T	N	DONE (BT) DYP 04.12.07	OK'D (BT) PTZ 04.12.07
8658 - 1	19.5159	19.3337	182.2		
2	19.3537	19.2936	60.1		
3	19.3247	19.2635	61.2		
4	19.4998	19.3186	181.2		
5	19.4887	19.3050	183.7	↓	↓

SAMPLE #	FIRST DM	SECOND DM	GMT SN	COUNT TIME	AURT UNIT	CELL #	BKG (cpm)	SYS #	RN #	GROSS (cpm)
03-27-07										
9694-1	086.899	095.690	095.864	78.52		43	0.14	3	11	0.38
LCS-2	↓	↓	↓	149.19	1.0 SMPL	41	0.33	1	9	22.50
BLK-3	↓	↓	↓	100.83	↓	58	0.19	2	10	0.18
5	↓	↓	↓	↓		12	0.17	4	12	0.94
04-02-07										
9695-1	102.757	100.657	100.825	60.18		75	0.07	3	11	0.33
LCS-2	↓	↓	↓	149.04	1.0 SMPL	25	0.33	1	9	18.71
BLK-3	↓	↓	↓	70.04	↓	10	0.12	2	10	0.21
04-10-07										
8658-1	100.869	107.660	107.827	86.27		18	0.32	5	13	0.41
LCS-2	↓	↓	↓	98.35	1.0 SMPL	33	0.39	1	9	18.45
BLK-3	↓	↓	↓	60.02	↓	42	0.14	2	10	0.08
DUP#1-4	↓	↓	↓	↓		67	0.20	3	11	0.11
MS#1-5	↓	↓	↓	↓		20	0.22	4	12	AD.11
04-10-07										
8485-1	100.906									
LCS-2	↓				1.0 SMPL					
BLK-3	↓				↓					
DUP#1-4	↓									
MS#1-5	↓									
8486-1	↓									
04-16-07										
2053-1	106.883									
2	↓									
LCS-3	↓				1.0 SMPL					
BLK-4	↓				↓					
DUP#1-5	↓									
MS#2-6	↓									
2059-1	106.903									
2	↓									
3	↓									

Section 2

**Standards Certification &
Preparation Logs for Quality Control Samples**

#372 Rec'd 4/2/2001 R Brenton P.O. 8555



Certificate of calibration of absolutely
standardised radioactive solutions

Sr⁹⁰AA1

ISSUED BY: Nycomed Amersham plc
Radiation & Radioactivity
Calibration Laboratory
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ISSUED FOR: AEA Technology plc
Isotrak
329 Harwell
Didcot
Oxfordshire
OX11 0QJ

Sr⁹⁰ 13653 dpm/ml ± 0.4% @ 306,500-96 5/7/01 R Brenton
in 1N HCl carrier content 0.1899 SrCO₃ mg/ml + D1.580 mg/ml Y₂O₃

Description Principal radionuclide: Strontium-90
Daughter radionuclide: Yttrium-90

Product code: SIZ24
Solution number: S6/11/196

K. Yamamoto
5/7/01

Measurement Reference time:

1200 GMT on 1 November 1996 306,500-96

Radioactive concentration of strontium-90:

4.557 kilobecquerels per gram of solution

which is equivalent to:

123.2 nanocuries per gram of solution

Mass of solution:

5.0309 grams

Total activity of strontium-90:

22.93 kilobecquerels

which is equivalent to:

620 nanocuries

Method of measurement used:

4π efficiency tracing using a liquid scintillation counter.

Calibration date(s): 17 November 1996 to 30 November 1996

The calibration date is provided for added information only, and must not be confused with the reference date. It is the reference date that must be used in all calculations relating to the values of activity.

Uncertainty Expanded uncertainty in the radioactive concentration quoted above: ± 0.88 %

Combined Type A uncertainty: ± 0.09 %

Combined Type B uncertainty: ± 0.43 %

Approved Signatory

D A Tattam

Date of issue

20 March 2001

D A Tattam

Page 1 of 2 pages

Nycomed
Amersham

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

#372 Rec'd 4/2/00, R. Prenton Po 8555

Certificate of calibration of absolutely standardised radioactive solution

UKAS ACCREDITED CALIBRATION LABORATORY No. 0146

Radionuclidic Purity The estimated activities of any radioactive impurities found by high-resolution gamma ray spectrometry, or in any other examination of the solution, are listed below expressed as percentages of the activity of the principal radionuclide at the reference time.

Other radionuclides 0.002(1) %

Chemical Composition 0.1M HCl containing 100 micrograms of strontium and 100 micrograms of yttrium per ml.

Physical Data Recommended half life: 29.12 ± 0.24 years (1 year = 365.25 days)

Strontium-90: 100% beta particle emission.

Yttrium-90: 100% beta particle emission. Half life 2.670 ± 0.004 days.

The activity of the yttrium-90 is equal to the activity of the strontium-90.

Remarks This product meets the quality assurance requirements for achieving traceability to NIST as defined in ANSI N42.22-1995.

Nuclear data quoted on this certificate are taken from the Joint European File, Version 2.2.

Tests made over a period of 2 years on standardised solutions of strontium-90 stored in glass ampoules have shown that loss of strontium-90 from solution is negligible other than by radioactive decay.

Expression of Uncertainties The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, which for a t -distribution with $v_{eff} = \infty$ effective degrees of freedom corresponds to a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Unless indicated, all other uncertainties are expressed at the confidence level associated with one standard uncertainty.

The format used for the uncertainties in the values of radionuclidic purity is illustrated in the following examples;

6.5(21) = 6.5 ± 2.1
6.54(21) = 6.54 ± 0.21
6.543(21) = 6.543 ± 0.021

10/27/06
RP

Prep of Sr⁹⁰ AA1-B-(15) QC 1B

Procedure CT-T04 Rev 03 6/16/06

Pipetted 0.5 mL = 0.50g of Sr⁹⁰ AA1
13653 dpm/mL \pm 0.4% into a 250 mL vol. flask.

Added 1 mL Sr M-A1 carrier 17.90 mg/mL +
1 mL Y E-D1 " 15.23 "

into sam vol. flask.

Diluted to mark with 0.1N HCl. Transferred to
a 8oz WM PB.

27.31 dpm/mL \pm 0.5% @ 306,500 96

R. Prenton

10/27/06
RP

Prep of Am²⁴¹ RI-A QC 1B

Procedure CT-T04 Rev 03 6/16/06

Pipetted 2.5 mL (2x1000 mL + 500 mL) = 2.55g
of Am²⁴¹ RI 2249 dpm/mL \pm 1.0%

into a 250 mL vol. flask. Diluted to
mark with 1N HCl. Transferred
into 8oz WM PB.

22.49 dpm/mL \pm 1.1% @ 353,708 05

R. Prenton

Key 11/2/06



389 P O # 00000081 Rec'd 1/16/03 R Prenton
National Institute of Standards & Technology

Certificate

Ra²²⁶NI

Standard Reference Material 4967 Radioactivity Standard

Radionuclide	Radium-226 ^{(1)*}
Source identification	SRM 4967
Source description	Liquid in a 5-mL, flame-sealed NIST borosilicate-glass ampoule ⁽²⁾
Solution composition	Approximately 1.4 mol • L ⁻¹ HCl ⁽³⁾ containing 1.74 mg BaCl ₂ per gram of solution ⁽⁴⁾ and Ra ⁺² ⁽⁵⁾
Solution density	1.019 ± 0.001 g • mL ⁻¹ at 22 °C ⁽⁶⁾
Solution mass	5.1167 ± 0.0027 g ⁽⁷⁾
Radium-226 activity concentration	2729 Bq • g ⁻¹ ⁽⁸⁾
Reference time	1200 EST 9 September 1991 <i>252.708-91</i>
Overall uncertainty	1.18 percent ⁽⁹⁾
Half life	1600 ± 7 years ⁽¹⁰⁾
Calibration method	NIST pressurized "4π"γ ionization chamber "A" calibrated with the national radium standards ⁽¹¹⁾ ; and confirmatory measurements ⁽¹²⁾

This standard reference material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD
January 1992

William P. Reed, Chief
Standard Reference Materials Program

*Notes on back

Ra²²⁶NI in 1.4M HCl
 $5.0800 \text{ g} \times 2729 \frac{\text{Bq}}{\text{g}} \times \frac{60 \text{ dpm}}{\text{Bq}} \times \frac{1}{100 \text{ mL}} = 8318 \text{ dpm/mL}$ *Ra²²⁶ ± 0.4% @ 252.708-91*
R Prenton 1/20/03
K. Yamamoto 1/20/03
 carrier content 0.0991 mg/mL BaSO₄

11/20/03
RPPrep of Ra^{226} NI

113 Q.C.

Gross wt. 73.8875 g
Tare wt. 68.8075
Net wt. 5.0800 g

Balance Used # 2
Satorius Model 1702

Tared a 100 mL vol. flask a top. Opened
 Ra^{226} vial NIST SRM 4967, Log # 389, 2729 Bq·g⁻¹
on 1200 EST 9 Sept. 1991. Transferred
 Ra^{226} solution into tared vol. flask.
Weighed Ra^{226} sol. flask + top. Diluted to
mark with 1.4 M HCl. Transferred 4oz P.B.
Carrier content ~~88~~^{180/03 RP} mg/mL BaCl₂ or 0.0991 mg/mL BaSO₄
0.0884

$$5.0800 \text{ g} \times 2729 \frac{\text{Bq}}{\text{g}} \times 60 \frac{\text{dem}}{\text{Bq}} \times 1 = 8318 \text{ dpm/mL } Ra^{226}$$

$$\text{g} \quad \text{Bq} \quad 100 \text{ mL} \quad \pm 0.4\% @ 252,708-91$$

A. Prenton

Calculations checked K. Yamamoto 1/20/03

11/20/03
RPPrep of Ra^{226} NI-A

Q.C. 1B

Pipetted 0.3 mL (3x 100 μ L) - 0.3055 g of Ra^{226}
NI, 8318 dpm/mL $\pm 0.4\%$ into a 100 mL
vol. flask. Added 10 mL of Ba H-B3 carrier
17.30 mg/mL BaSO₄ into same flask. Diluted to
mark with 1.4 M HCl. Transferred to 4oz W.M. P.B.

$$24.95 \text{ mg/dpm/mL } Ra^{226} \pm 0.7\% @ 252,708-91$$

11/20/03 RP

carrier content 0.002 mg/mL BaSO₄

A. Prenton

7/25/06
RP Verif of U Mix A3-(17) 1501 490-492

Pipetted into 3 ea 50mL beakers;

7.0mL U Mix A3-(17) and 0.5mL U²³² J1

Contd Procedure CT-C VU-4, Rev 01 6/16/06
Septime 206.658-06 7/24/06 RP

R. Prenton

7/26/07
RP Prep of Ra²²⁶ N1-A-(09) 1B Q C

Procedure CT-T04, Rev 03 6/16/06

Pipetted 0.6mL (100mL + 500mL) ~ 0.61 g of
Ra²²⁶ N1 8318 dpm/mL $\pm 0.4\%$ into a 200mL

vol. flask. Added 20mL BaH-B4 carrier

17.27mg/mL BaSO₄. Diluted to mark with 1.4M HCL.

Transferred to a 802 WM PB.

24.95 dpm/mL $\pm 0.6\%$ @ 252.708 9/

R. Prenton

RP 8/1/06

10/7/04
~~10/7/02~~
 RP
~~10/17/04 RP~~

Standardization of Ba H-B⁴ carrier IF

Prod Procedure CT-CBA, Rev 02, 4/15/02
 7.2 Standardization; Balance used # Sartorius 151702
 Aliquot taken from Ba H-B³. Prep see
 Book C-3, Pg 116, 11/25/98

	1	2	3	4
Tare wt	17.0842 g	17.2560 g	17.4847 g	17.5220 g
"	17.0842	17.2560	17.4847	17.5220
Avg "	17.0842 g	17.2560 g	17.4847 g	17.5220 g

17.1709 g	17.3422 g	17.5709 g	17.6083 g
17.1708	17.3422	17.50	17.6083
<u>17.17085 g</u>	<u>17.3422 g</u>	<u>17.5709</u>	<u>17.6083 g</u>
17.08420	17.2560	17.4	17.5220
<u>0.086656</u>	<u>0.0862 g</u>	<u>17.5709 g</u>	<u>0.0863 g</u>
		17.4847	
		<u>0.0862 g</u>	

mean $\frac{86.338 \text{ mg}}{5 \text{ mL}} = 17.27 \text{ mg/mL Ba SO}_4 \pm 0.12 \%$ 281 - ⁰⁴~~02~~
 10/17/04 RP

R Prenton

K. Yamamoto 10/8/04

ANALYTICS

#370 Rec'd 1/18/01 R. Benton

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

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

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

Ra²²⁸SI

60867-207

Ra-228 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared using an aliquot measured gravimetrically from a calibrated master radionuclide solution source which was calibrated using a germanium gamma spectrometer system.

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

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

ISOTOPE:	Ra-228
ACTIVITY (dps):	3.845 E3
HALF-LIFE:	5.75 years
CALIBRATION DATE:	January 16, 2001 12:00 EST <i>D16,708-D1</i>
TOTAL UNCERTAINTY*:	5.1%
SYSTEMATIC:	3.6%
RANDOM:	1.5%

*99% Confidence Level

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

5.044433 grams 0.1M HCl solution with 50 ppm Ba carrier.

P O NUMBER 00008301, Item 1

SOURCE PREPARED BY:

M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: *2/12/01 RP*

Rec'd 1/16/01

Ra²²⁸SI ~~Prep'd~~ *Prep'd* *2/12/01* in .1M HCl

$$\frac{5.0061g \times 3845 \text{ dps} \times 60 \text{ sec} \times \frac{1}{100 \text{ ml}}}{5.044433g} = 2289 \text{ dpm/ml/Ra} \approx 1.7\% \text{ @ } D16,708-D1$$

R. Benton 2/12/01

carrier content *0.0902 mg/ml BaSO₄ or 0.0531 mg/ml Ba²⁺* *K. Yamamoto 2/13/01*

2/12/01 Prep of Ra^{228} SI

RP

Gross 74.2294g

Tare 69.2233g

Net 5.0061g

Balance #2

Sartorius 1702

Tared a 100ml vol flask + top, Opened Ra^{228} Analytics 60867-207 vial 3.845 E3 (dps) @ Jan. 16, 2001 17:00 EST. Transferred Ra^{228} sol. into the tared vol. flask. Weighed vol. flask + top + Ra^{228} solution. Pipetted 0.5ml of Ba H-B2 carrier 17.20 mg/ml $BaSO_4$ into same vol. flask. Diluted to mark with 0.1 M HCl. Transferred to a 4oz P.B. #370

$$\frac{5.0061g \times 3845 \text{ dps}}{5.044433g} \times \left(\frac{60 \text{ sec}}{60 \text{ min}} \right) \times \frac{1}{100 \text{ ml}} = 2289 \text{ dpm/ml } Ra^{228} \pm 1.7\% @ 016.708-01$$

carrier content

$$\left[\frac{(0.5 \text{ ml} \times 17.20 \text{ mg/ml } BaSO_4)}{1.69943 \text{ BaSO}_4/Ba} + \frac{(5.0061g \times 25 \text{ mg } Ba^0)}{5.005044433g} \right] \times \frac{1}{100 \text{ ml}} = 0.0531 \text{ mg/ml } Ba^0$$

2/12/01 RP

or

0.0902 mg/ml $BaSO_4$

K. Yamamoto

Calculation checked. K. Yamamoto 2/13/01

-11-06 Prep of Ra²²⁸ Si-B-(7) 1B QC
TAC

Procedure CT-T04, Rev 02 4115102

Pipetted 3.75 mL (3 x 100 mL x 500 mL x 250 mL) ~ 3.73 g
of Ra²²⁸ Si, 2289 dpm/mL ± 1.7% into a 250 mL Vol. Flask.
Added 1.0 mL Ba H-B4 17.27 mg/mL Ba SO₄ carrier into
same Vol. Flask.

Diluted to mark with 0.1 N HCl, transferred to a 802
WM PB

34.34 dpm/mL ± 1.8% @ 0.16.708-01

T. ALAUI

+12-06 Prep of Pu²⁴² H-C2-(A)
TAC

Procedure CT-T04, Rev 02, 4115102.

Pipetted 10 mL (11.31) g Pu²⁴² H-C2 2284 dpm/mL ± 0.5%
into 1000 mL Vol. Flask, Diluted to mark with 4 N HNO₃,
Transferred to a 3802 P.B.

22.84 dpm/mL ± 0.5% @ 073.820-06

T. ALAUI

Prep of Th²²⁹ C2-A-(25)

4-12-06 Transferred 50 mL Th²²⁹ C2-A-(24) into a 202 WM PB

11.78 dpm/mL ± 0.6% @ 032.833-02

T. ALAUI

Ky 1/14/06

6/16/06 RP Prep + Standardization of Y E-DI carrier

Procedure CT-CY, Rev 03, 6-16-06

7.1 Weighed 53.75g Y_2O_3 Yttrium Oxide
Aldrich Y_2O_3 , Lot KN08813 BY, Dissolved
Balance used #36, 37 in 3500mL INHNO₃

7.2 5mL aliquot used

	1	2		
6/19/06 RP Tare wt	11.2528 g	11.4685 g	11.5162 g	11.9110 g
" "	11.2528	11.4685	11.5163	11.9111
Avg "	11.2528 g	11.4685 g	11.51625 g	11.91105 g

6/20/06 RP Gross wt	11.3290 g	11.5445 g	11.5912 g	11.9871 g
" "	11.3291	11.5562	11.5912	11.9871
Avg Gross	11.32905 g	11.5446 g	11.5912 g	11.9871 g

Avg Gross	11.32905 g	11.5446 g	11.59120 g	11.98710 g
Avg Tare	11.25280	11.4685	11.51625	11.91105
Net	0.07625 g	0.0761 g	0.07495 g	0.07605 g

Sample #3 loss of ppt, WT not used

Mean $\frac{76.133 \text{ mg}}{5 \text{ mL}} = 15.23 \text{ mg/mL} \pm 0.1\%$
 @ 171.000 06

R. Brenton

K. Yamamoto

10/24/06
RPPrep of Cs D-A6-(03) carrierTransferred - 50 mL Cs D-A6 carrier
into a 4oz WM PB.50.77 mg/mL \pm 0.17% @ 180 05

A. Prenton

11/14/06
RPPrep of Sr M-A1-(06) BATransferred - ~~50~~ 1000 mL of Sr M-A1
into a 32 oz PB17.90 mg/mL \pm 0.1% @ 067 06

A. Prenton

11/14/06
RPPrep of Y E-D1-(03) BATransferred 500 mL of Y E-D1
into a 16oz PB40.74 mg/mL Yoxal \pm 0.1% @ 171 06
15.23 mg/mL Y₂O₃

A. Prenton

RP 12/4/06

361



National Institute of Standards & Technology

Certificate

Co⁶⁰K1

Standard Reference Material 4915E Cobalt-60 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive cobalt-60 chloride, non-radioactive cobalt chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of ionization chambers and solid-state gamma-ray spectrometry systems.

Radiological Hazard

The SRM ampoule contains cobalt-60 with a total activity of approximately 400 kBq. Cobalt-60 decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 8 to 2500 keV are emitted. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least January 2005.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
April 1995 (Text only revised November 1997)

Thomas E. Gills, Chief
Standard Reference Materials Program

SRM 4915E, page 1 of 6

Re cd 5/5/00 L. Prenter

*Notes and references are on pages 5 and 6.

Recommended Procedure for Opening the SRM Ampoule

- 1) If the SRM solution is to be diluted, it is recommended that the diluting solution have an acid concentration and a carrier concentration comparable to that of the SRM solution.
- 2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.
- 3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.
- 4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.
- 5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.
- 6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.
- 7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.
- 8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. **NEVER PIPETTE BY MOUTH.**
- 9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

#361

PROPERTIES OF SRM 4915E
(Certified values are shown in bold type)

Co⁶⁰KI

Source identification number	NIST SRM 4915E		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter	(16.5 ± 0.5) mm	
	Wall Thickness	(0.60 ± 0.04) mm	
	Barium content	Less than 2.5%	
	Lead-oxide content	Less than 0.02%	
	Other heavy elements	Trace quantities	
Solution density	(1.016 ± 0.002) g·mL ⁻¹ at 22.1 °C [b]*		
Solution mass	(5.063 ± 0.002) g [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L ⁻¹)	Mass Fraction (g·g ⁻¹)
	H ₂ O	54	0.96
	HCl	1.0	0.04
	CoCl ₂	1 × 10 ⁻³	1 × 10 ⁻⁴
	⁶⁰ CoCl ₂	3 × 10 ⁻⁸	4 × 10 ⁻⁹
Radiological Properties:			
Radionuclide	Cobalt-60		
Reference time	1200 EST, 1 January 1995		
Massic activity of the solution [c] (Activity per unit mass of solution)	75.55 kBq·g ⁻¹		
Relative expanded uncertainty (k=2)	0.54% [d]		
Photon-emitting impurities	None detected [e]		
Half lives used	Cobalt-60: (5.2714 ± 0.0005) a [f] Radium-226: (1600 ± 7) a [f]		
Measuring instrument	Pressurized "4π"γ ionization chamber A calibrated using a cobalt-60 solution whose activity was determined by 4πβ-γ-coincidence and anticoincidence counting		

Co⁶⁰KI prep. in 1N HCl.

7/7/00 RP
5.06

$$5.0262g \times 75.55 \frac{kBq}{g} \times 60 \frac{dpm}{kBq} \times 1000 \times \frac{L}{100ml} = 2.278 E 5 dpm/ml \pm 0.28$$

carrier content: 0.1104 mol/ml Co⁰

© 001-833-95 7/10/00
001-708-95
K. Yamamoto 7/10/00

*Notes and references are on pages 5 and 6.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i , the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [g]	Relative Sensitivity Factor, $|\partial y/\partial x_i| \cdot$ (x_i/y) [h]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [i]
PIC A net response per gram of SRM 4915E, measured relative to RRS10 [j]	Standard deviation of the mean for 350 repeated measurements (A)	0.02	1.0	0.02
PIC A background response, measured relative to RRS10	Standard deviation of the mean for >250 repeated measurements (A)	0.25	0.001 [k]	0.0003
PIC A net response for RRS100, measured relative to RRS10	Standard deviation of the mean for >100 repeated measurements (A)	0.06	1.0	0.06
PIC A net response per Bq of cobalt-60 in solution, measured relative to RRS100.	Standard deviation of the mean for 720 repeated measurements (A)	0.02	1.0	0.02
Gravimetric measurements	Estimated (B)	0.01	1.0	0.01
Half life of cobalt-60 Half life of radium-226	Standard uncertainty of the half life (A)	0.01 [m] 0.44 [m]	0.03 [n] 0.006 [n]	0.0003 0.003
Activity used to calibrate PIC A net response per Bq of cobalt-60 in solution	Standard uncertainty of the activity determined by $4\pi\beta$ - γ - coincidence and anticoincidence counting (B)	0.20	1.0	0.20
Live-time [p]	Estimated (B)	0.10	1.0	0.10
PIC A charge collection	Estimated (B)	0.05	1.0	0.05
Source Positioning	Estimated (B)	0.05	1.0	0.05
Photon-emitting impurities	Limit of detection (B) [q]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)				0.27
Coverage Factor, k				<u>x 2</u>
Relative Expanded Uncertainty of the Output Quantity, U/y , (%)				0.54

- [j] The response of pressurized ionization chamber A (PIC A) is determined from measurement of the time required to collect a given amount of charge on a stable fixed capacitor. All of the response measurements in the NIST pressurized ionization chambers are made relative to the response of one or more artifact standards. These artifact standards consist of microgram quantities of aged radium-226 in small welded stainless-steel capsules. These capsules are encapsulated in plastic rods whose dimensions are similar to those of the standard NIST ampoule. The artifact standards are called **Radium Reference Sources** and are designated as RRSx, where x is the nominal mass (in micrograms) of radium-226 in the capsule.
- [k] $|\partial y/\partial x_i| \cdot (x_i/y) = (\text{average background response})/(\text{average net sample response})$
- [m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.
- [n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$
- [p] The live time is determined by counting the pulses from a gated oscillator.
- [q] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y) = \{(\text{response per Bq of impurity})/(\text{response per Bq of Co-60})\} \cdot \{(\text{Bq of impurity})/(\text{Bq of Co-60})\}$. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

- [1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.
- [2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)
- [3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.
- [4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.
- [5] Evaluated Nuclear Structure Data File (ENSDF), January 1995.

361

Co⁶⁰K1

NOTES

- [a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.
 Distance from Ampoule (cm): 1 30 100
 Approximate Dose Rate ($\mu\text{Sv/h}$): 300 2 0.3
- [b] The stated uncertainty is two times the standard uncertainty.
- [c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].
- [d] The reported value, y , of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \dots, x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i , used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y , $u_i(y) = |\partial y/\partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y .

The **combined standard uncertainty** of y , $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U , the **expanded uncertainty** of y .

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

- [e] Estimated limits of detection for photon-emitting impurities are:
 $76 \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 90 and 1169 keV,
 $24 \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 1177 and 1328 keV, and
 $8 \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 1336 and 1900 keV, provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of cobalt-60.
- [f] The stated uncertainty is the standard uncertainty. See reference [5].
- [g] Relative standard uncertainty of the input quantity x_i .
- [h] The relative change in the output quantity y divided by the relative change in the input quantity x_i . If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y . If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y .
- [i] Relative component of combined standard uncertainty of output quantity y , rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y = |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

7/7/00 RP Prep of Co^{60} KI

Gross 84.3604 g
Tare 79.3342 g
Net 5.0262 g

Balance used #2
Satorius Model 1702

Tared a 100 ml. vol. flask and top.
Opened Co^{60} NIST 4915E, 10g #361, 75.55 kBq/g
@ 1200 EST, 1 Jan 1995. Transferred
 Co^{60} solution into a tared vol. flask.
Weighed Co^{60} solution, flask and top.
Pipetted 1 ml of Co PI carrier (10.81 mg/ml Co^{60})
into the flask. Diluted to mark with
1N HCl. Transfer to 4oz P.B.

$$5.0262 \text{ g} \times 75.55 \text{ kBq/g} \times \frac{\text{dem}}{1000} \times \frac{1}{100 \text{ ml}} = 2.278 \text{ ES/dpm/ml}$$

@ 101.708-95 @ 101.833-95
7/7/00 RP 101.833-95

Co^{60} carrier content

$$\left[(5.0262 \text{ g} \times \frac{10.81 \text{ mg CoCl}_2}{1000 \text{ g}} \times 0.4539 \text{ Co}^{60}) + 10.81 \text{ mg Co}^{60} \right] \times \frac{1}{100 \text{ ml}}$$

$$= 0.1104 \text{ mg/ml Co}^{60}$$

Calculations checked, K. Yamamoto 7/10/00
K. Yamamoto

12/2/05
RP

Verification of Cs¹³⁷ NI

1501 451-453

In triplicate; Pipetted 0.1 mL Cs-137 NI into 3 ea Geli jars.
Contd Procedure CT-VE-1, Rev 02, 4/15/02

R Brenton

12/2/05
RP

Prep of Cs¹³⁷ NI-E (2)

1B QC

Pipetted 0.3 mL (0.3) ^{↑ x 10⁴} g into a 100 mL vol. flask of Cs¹³⁷ NI 1.567 dpm/mL ± 0.5%
Added 500 μL Cs D-A6 carrier into the flask.
Diluted to mark with 0.1N HCl.
Transferred to 4oz WM PB

47.01 dpm/mL ± 0.7% @ 245.500 00

R Brenton

12/2/05

Prep of Co⁶⁰ KI-F

1B QC

Procedure CT-T04, Rev 02 4/15/02 ~~12/2/05 RP~~

Pipetted 4.1 mL (4.18 g) of Co⁶⁰ KI 2.278 ES dpm/mL ± 0.3% into a 100 mL vol. flask.
Diluted to mark with 1N HCl.
Transferred to 4oz WM PB

9340 dpm/mL ± 0.7% @ 001.708 95

R Brenton

104 12/7/05

11/13/06
RPPrep of Co^{60} KI-F-(03) IB

11/13/06 RP

Procedure CT-T04, Rev 03 6/16/06

Pipetted 4.1 mL (4x100mL+100mL) ~4.18g

of Co^{60} KI 2.278E5 dpm/mL $\pm 0.3\%$

into a 100mL vol flask, Diluted to mark with INHCL. Transferred to a 4oz WMPB.

9340 dpm/mL $\pm 0.7\%$ @ ADI. 708 95

Shenton

11/13/06
RPPrep of Cs^{137} QI-A-(03) IB

Procedure CT-T04 Rev 03, 6/16/06

Pipetted 10mL ~10.00 g of Cs^{137} QI22000 dpm/mL $\pm 0.9\%$ into a 100mL vol flask.

Diluted to mark with D. INHCL. Transferred to a 4oz WMPB

2200 dpm/mL $\pm 0.9\%$ @ 353.708 05

Shenton

RP 11/14/06

409 Rec'd 12/21/05 R. Prentice

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

72016-207

Cs¹³⁷ Q1

Cs-137 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated with an ionization chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

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

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

ISOTOPE:	Cs-137
ACTIVITY (dps):	3.690 E4
HALF-LIFE:	3.007 E1 years
CALIBRATION DATE:	December 19, 2005 12:00 EST 353.708 DS
RELATIVE EXPANDED UNCERTAINTY (k=2):	1.7%

Impurities: γ -impurities <0.1%

5.01264 grams 0.1M HCl solution with 30 μ g/g Cs carrier.

P O NUMBER: 00003035, Item 2

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

Q A APPROVED: [Signature] 12-20-2005

Cs-137 Q1 pred 11/01/06 IN HCL

$$4.9808g \times \frac{36900 \text{ dps}}{5.01264g} \times \frac{60 \text{ sec}}{\text{min}} \times \frac{1}{100 \text{ mL}} = 2.200E4 \text{ dps/mL} \pm 0.9\% @ 353.708 \text{ DS}$$

0.0546 mg/mL Cs₂PTCl₆ carrier content

R. Prentice 11/01/06
✓ K. Gammeter 11/2/06

1/10/06
RP

Prep of Cs¹³⁷ Q1

1A QC

Gross wt. 76.0174g
Tare wt ~~71.~~ 71.0366g
Net wt 4.9808g

Balance Used
#36

Procedure CT-T03, Rev 2, 4/15/02

Tared a 100mL vol. flask + top. Opened
Cs-137 vial Analytics 78 72016-307,
Log 409 3.690E4 dps in 5.01267g on
Dec. 19, 2005 12:00 EST. Transferred
Cs-137 sol. into the tared vol. flask.
Tared Cs-137 sol. vol. flask + top.
Added 100μL Cs D-Ab carrier 50.77
mg/mL Cs₂PTCl₆ to the same flask.
Diluted to mark with 0.1M HCL.
Transferred to 4oz PB.

$$\frac{4.9808g \times 36900dps \times 60sec \times L}{5.01267g \text{ min } 100mL} = 2.200E4 dp/mL \pm 0.9\% @ 353.70805$$

carrier content
0.0546 mg/mL Cs₂PTCl₆

R. Brenton

✓ K. Yamamoto 1/12/06

6/27/05 Standardization of Cs D-A6 carrier
 RP

PB,

Procedure CI-CES, Rev 02. 4/15/02
 7.2 Standardization, Balance 2 Model 11702 Sartorius
 2 mL a/g from Cs D-A5
 Prep. see C-3 pg 39

6/27/05 RP	21	22	23	1
Tare wt	12.4876 g	12.5112 g	12.4712 g	12.5446 g
"	12.4876 ^{6/27/05}	<u>12.5112</u>	<u>12.4712</u>	<u>12.5446</u>
"	<u>12.4876</u>			
Avg wt	12.4876 g	12.5112 g	12.4712 g	12.5446 g
Gross wt	12.5893 g	12.6126 g	12.5732 g	12.6458 g
"	<u>12.5893</u>	<u>12.6127</u>	<u>12.5730</u>	<u>12.6456</u>
Avg "	12.5893 g	12.61265 g	12.5731 g	12.6457 g
Avg Tarent	<u>12.4876</u>	<u>12.5112</u>	<u>12.4712</u>	<u>12.5446</u>
	<u>0.1017 g</u>	<u>0.10145 g</u>	<u>0.1019 g</u>	<u>0.1011 g</u>

mean $\frac{101.54 \text{ mg}}{2 \text{ mL}} = 50.77 \text{ mg/mL Cs}_2\text{PtCl}_6 \pm 0.17\% @ 180 \text{ } ^\circ\text{C}$

R. Trenton

K. Yamamoto 6/29/05

11/13/06
RP

Verification of Cs¹³⁷ Q1

1501 454-456

In triplicate; Pipetted 0.1 mL Cs¹³⁷ Q1 into three each Gel jars.

Contd Procedure CT-VG-1, Rev 02 4/15/02

R Prenton

11/13/06
RP

~~Prep~~ Prep of Cs¹³⁷ Q1-A

1B

Procedure CT-T04, Rev 02, 4/15/02

Pipetted 10 mL (2 x 5 mL) - 10.01 g of Cs¹³⁷ Q1
22000 dpm/mL 1 mL ± 0.9% into a 100 mL vol.
flask, ^{11/13/06 RP} Diluted to mark with 0.1 N HCl.
Transferred to a 4oz WM PB.

25

2200 dpm/mL ± 1.0% @ 353.708-05

R Prenton

KY 1/20/06

11/13/06
RPPrep of Co^{60} KI-F-(03) IB

Procedure CT-T04, Rev 03 6/16/06

Pipetted 4.1 mL (4x1000mL+100mL) ~4.18 g
of Co^{60} KI 2.278E5 dpm/mL $\pm 0.3\%$ into a 100mL vol flask, Diluted to mark
with 1N HCl. Transferred to a 4oz
WMPB.9340 dpm/mL $\pm 0.7\%$ @ ADI. 708 95

Arenton

11/13/06
RPPrep of Cs^{137} QI-A-(03) IB

Procedure CT-T04 Rev 03, 6/16/06

Pipetted 10mL ~10.00 g of Cs^{137} QI22000 dpm/mL $\pm 0.9\%$ into a 100mL vol flask.Diluted to mark with 0.1N HCl. Transferred to
a 4oz WMPB.2200 dpm/mL $\pm 0.9\%$ @ 353.708 OS

Arenton

KJ 11/14/06

Section 3

Instrument Calibration Information

Richmond, CA Laboratory

Verification of Primary Calibration

Analysis Gross A/B Detector system LB4000 Date 2-26-03

Type: 80/93
TLW No. of Primary calibration being verified: _____ Date: _____

Standard Solution used: <u>Sr 90 Zr Am 241 Pl</u>	Prepared by: <u>RP</u>
Reference Date: <u>102 + 708 - 95 109 + 500 - 96</u>	Date: <u>11-10-00</u>

Preparation of secondary Solution(s):

Sample Preparation:

Counting Results:

Sample	Count GMT	Calculated Dpm ± 2σ error	Known Dpm	Ratio Found Dpm / Known Dpm
See attached Summary: For Gross Alpha, only the results from D drawers were used in the calculation. Data from sample # B and BR were not used, (unreliable data). QAP-11 has a control limit of: 0.70 - 1.30 for GRA 0.80 - 1.20 for GRB The results of the verification is within the warning limits. CW 2-26-03				
Average Found/known ratio				$\frac{0.912}{0.90} \quad \frac{0.998}{0.93}$
Acceptance limits (from RCP-00, section 7.5)				$\frac{1.10}{1.07}$

Attach all raw data sheets Verification: outside limits within limits

Prepared by: <u>[Signature]</u>	Q.A. Review: <u>[Signature]</u>
Signature <u>[Signature]</u>	Signature <u>[Signature]</u>
Date <u>2-26-03</u>	Date <u>02-26-03</u>

Gross Alpha / Beta Verification

										ALPHA		BETA
										WTSmg	AVG	AVG
SAMPLE	INST.ID	REGION	GMT	YR	DPM	DELTA	DECAY	DPM@TZ	F/A			
					Am-241 = 1074	DPM @ 109.500	1996		lambda(-d) =			4.0291E-06
					Sr-90 = 1186	DPM @ 182.708	1995		lambda(-d) =			6.8630E-05
1074-1	C1	BETA	20.697	2003	1950.06	2467.947	0.84419	1976.80	0.986	18.300		
1074-1	D2	BETA	27.869	2003	1893.32	2475.119	0.84378	1976.80	0.958	18.300		
1074-1	C1	BETA	30.874	2003	1959.57	2478.124	0.84360	1976.80	0.991	18.300		
1074-1	D3	BETA	31.861	2003	1963.10	2479.111	0.84419	1976.80	0.993	18.300		0.981
1074-2	C2	BETA	20.697	2003	1989.68	2467.947	0.99008	1976.80	1.007	29.400		
1074-2	D3	BETA	27.869	2003	1860.23	2475.119	0.99007	1976.80	0.941	29.400		
1074-2	D2	BETA	28.807	2003	1965.22	2476.057	0.99007	1976.80	0.994	29.400		
1074-2	C2	BETA	30.874	2003	1977.60	2478.124	1.00000	1976.80	1.000	29.400		0.985
1074-3	C3	BETA	20.697	2003	1987.18	2467.947	0.84419	1976.80	1.005	40.800		
1074-3	C3	BETA	30.874	2003	2003.12	2478.124	0.84360	1976.80	1.013	40.800		
1074-3	D3	BETA	34.867	2003	2004.16	2482.117	0.84337	1976.80	1.014	40.800		
1074-3	D3	BETA	37.653	2003	2001.45	2484.903	0.84321	1976.80	1.012	40.800		1.011
1074-4	C4	BETA	20.697	2003	2009.01	2467.947	0.84419	1976.80	1.016	53.500		
1074-4	C4	BETA	30.874	2003	2032.88	2478.124	0.84360	1976.80	1.028	53.500		
1074-4	D3	BETA	35.753	2003	1985.58	2483.003	0.84332	1976.80	1.004	53.500		
1074-4	D3	BETA	37.849	2003	2008.09	2485.099	0.84320	1976.80	1.016	53.500		
1074-5	C1	ALPHA	20.778	2003	865.81	2468.028	0.99011	1074.00	0.806	18.400		
1074-5	C1	ALPHA	28.807	2003	865.81	2476.057	0.99007	1074.00	0.806	18.400	0.806	
1074-5	D3	ALPHA	31.764	2003	1021.03	2479.014	0.99006	1074.00	0.951	18.400		
1074-5	D3	ALPHA	34.686	2003	1014.95	2481.936	0.99005	1074.00	0.945	18.400	0.948 *	
1074-6	C2	ALPHA	20.778	2003	800.12	2468.028	0.99011	1074.00	0.745	29.800		
1074-6	C2	ALPHA	28.807	2003	799.06	2476.057	0.99007	1074.00	0.744	29.800	0.745	
1074-6	D3	ALPHA	34.768	2003	959.56	2482.018	0.99005	1074.00	0.893	29.800		
1074-6	D2	ALPHA	44.652	2003	921.68	2491.902	0.99001	1074.00	0.858	29.800	0.876 *	
1074-7	C3	ALPHA	20.778	2003	834.94	2468.028	0.99011	1074.00	0.777	48.700		
1074-7	C3	ALPHA	28.807	2003	820.85	2476.057	0.99007	1074.00	0.764	48.700	0.771	
1074-7	D3	ALPHA	35.853	2003	973.05	2483.103	0.99005	1074.00	0.906	48.700		
1074-7	D3	ALPHA	44.652	2003	985.79	2491.902	0.99001	1074.00	0.918	48.700		
1074-8	C4	ALPHA	20.778	2003	717.54	2468.028	0.84419	1074.00	0.668	58.200		
1074-8	C4	ALPHA	28.807	2003	704.05	2476.057	0.84372	1074.00	0.656	58.200	0.662	
1074-8	D3	ALPHA	37.920	2003	874.15	2485.170	0.84320	1074.00	0.814	58.200		
1074-8	D2	ALPHA	44.756	2003	825.49	2492.006	0.84280	1074.00	0.769	58.200	0.791	
1074-8	B1	ALPHA	45.792	2003	739.75	2493.042	0.84274	1074.00	0.689	49.900		
1074-8	D2	ALPHA	52.655	2003	740.27	2499.905	0.84234	1074.00	0.689	49.900	0.689	
1074-8	C1	ALPHA	50.656	2003	897.94	2497.906	0.84246	1074.00	0.836	49.900		
1074-8	D2	ALPHA	52.892	2003	863.68	2500.142	0.84233	1074.00	0.804	49.900	0.82	

1.016
 Ave. 0.998 ± 1.8%
 CN
 2/26/03

0.912 *
 Ave. 0.912 ± 3.6% *
 CN
 2/26/03

GROSS ALPHA/BETA VERIFICATION CALIBRATION - 2/2003

SAMPLE NO.	INST. ID	WTS. MG	SR-90 ADDED	BETA CPM	ALPHA CPM	BETA EFF.	ALPHA FR BETA	EFF USED	F/A-EFF
1074-1	C1	18.3	1976.8	802.681	0.860	0.4061	0.0011	0.418	0.9714
1074-1	D2	18.3	1976.8	780.973	1.343	0.3951	0.0017	0.418	0.9451
1074-1	C1	18.3	1976.8	805.117	1.378	0.4073	0.0017	0.418	0.9744
1074-1	D3	18.3	1976.8	804.744	0.241	0.4071	0.0003	0.418	0.9739
1074-2	C2	29.4	1976.8	812.030	2.115	0.4108	0.0026	0.414	0.9922
1074-2	D3	29.4	1976.8	757.040	0.390	0.3830	0.0005	0.414	0.9250
1074-2	D2	29.4	1976.8	804.780	1.560	0.4071	0.0019	0.414	0.9834
1074-2	C2	29.4	1976.8	807.589	2.196	0.4085	0.0027	0.414	0.9868
1074-3	C3	40.8	1976.8	813.073	0.720	0.4113	0.0009	0.411	1.0007
1074-3	C3	40.8	1976.8	819.593	0.719	0.4146	0.0009	0.411	1.0088
1074-3	D3	40.8	1976.8	807.820	0.183	0.4087	0.0002	0.411	0.9943
1074-3	D3	40.8	1976.8	807.580	0.446	0.4085	0.0006	0.411	0.9940
1074-4	C4	53.5	1976.8	811.754	0.692	0.4106	0.0009	0.407	1.0089
1074-4	C4	53.5	1976.8	820.582	0.697	0.4151	0.0008	0.407	1.0199
1074-4	D3	53.5	1976.8	792.721	0.199	0.4010	0.0003	0.407	0.9853
1074-4	D3	53.5	1976.8	802.520	0.306	0.4060	0.0004	0.407	0.9975

SAMPLE NO	INST. ID	WTS mg	Am-241 ADDED	ALPHA CPM	BETA CPM	ALPHA EFF	BETA FR. ALPHA	EFF. USED	F/A - EFF
1074-5	C1	18.4	1062	142.663	31.510	0.1343	0.2209	0.190	0.7070
1074-5	C1	18.4	1062	141.372	33.117	0.1331	0.2343	0.190	0.7006
1074-5	D3	18.4	1062	187.491	43.064	0.1765	0.2297	0.190	0.9292
1074-5	D3	18.4	1062	183.393	45.990	0.1727	0.2508	0.190	0.9089
1074-6	C2	29.8	1062	116.905	26.293	0.1101	0.2249	0.172	0.6400
1074-6	C2	29.8	1062	116.655	27.020	0.1098	0.2316	0.172	0.6386
1074-6	D3	29.8	1062	159.313	37.910	0.1500	0.2380	0.172	0.8722
1074-6	D2	29.8	1062	151.838	34.190	0.1430	0.2252	0.172	0.8312
1074-7	C3	48.7	1062	107.920	26.693	0.1016	0.2473	0.147	0.6913
1074-7	C3	48.7	1062	106.101	26.761	0.0999	0.2522	0.147	0.6796
1074-7	D3	48.7	1062	137.309	33.981	0.1293	0.2475	0.147	0.8795
1074-7	D3	48.7	1062	139.323	36.340	0.1312	0.2608	0.147	0.8924
1074-8	C4	58.2	1062	88.312	23.488	0.0832	0.2660	0.142	0.5856
1074-8	C4	58.2	1062	86.853	24.095	0.0818	0.2774	0.142	0.5759
1074-8	D3	58.2	1062	119.936	30.380	0.1129	0.2533	0.142	0.7953
1074-8	D2	58.2	1062	112.488	26.510	0.1059	0.2357	0.142	0.7459
1074-8R	B1	49.9	1062	93.749	24.961	0.0883	0.2663	0.145	0.6088
1074-8R	D2	49.9	1062	125.018	31.130	0.1177	0.2490	0.145	0.8119
1074-8R	C1	49.9	1062	92.132	25.278	0.0868	0.2744	0.145	0.5983
1074-8R	D2	49.9	1062	120.227	27.548	0.1132	0.2291	0.145	0.7807

Date: 1-13-03

To: Ruby Prenton/ Kats Yamamoto

From: Cesar Sangalang *CS*

Subj: Request for preparation of Calibration Standards of Group 1074 Gross Alpha/Beta

1074

Please prepare four (4) tubes each with about 1000 dpm of Sr-90 (soln. Sr-90 Z1) and another for tubes each with about 1000 dpm of Am-241 (soln. Am-241 P1).

Sample Nos. will be 1074-1 to 4 type "80" for Sr and 1074- 5 to 8 type "80" for Am .

I need to start with this work tomorrow, 1-14-03 with a projected finish date of 2-07-03

Thank you

Cesar

Verification
Book 2583 pg 86
565-572
Radiometrics Prep

Page 101, BK # 2775 Calibration

B efficiency -

counted in 2 diff. drawer C- Aluminized mylar
D- (Amidized) Gold in mylar.

2 counts on each drawer
4 count per samples.

α efficiency -

β efficiency -

α from beta -

β from alpha -

Added 1186 dpm of Sr 90 Z1

1074 dpm of Am²⁴¹ P1

Log Book Group's Sample Entry #	DATE	ANALYSIS	Reg. Sample #	Volume & ID of TRACER ADDED	TOTAL ACTIVITY (CPM)	ACTIVITY DATE	STANDARD WT. (g)	MATRIX	CONTAINER	Event ID	Additional Information on Comment
564	10/18/02	Pu241	MUT RP	350uL Pu ²⁴¹ M1	2849.7	336.708-95	0.39	1.6542 ON HANDS + 18 mL U ²³⁵ MA Gold AB	LSC VIAL	MUT	Pu-241 Calib. check 10/18/02 K-gamma meter 2/14/03
565	1074-1	Type 80CS	RP	0.1 mL Sr ⁹⁰ Z1	1186	182.708-95	0.5	10m L/MNHCl	50mL Poly Tube	CS	GRB Verification 1/13/03 K-gamma meter
566	2	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
567	3	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
568	4	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
569	5	"	RP	0.1 mL Am ²⁴¹ PI	1074	109.500-96	0.92	2/15/03 RP	"	"	"
70	6	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	1.0	"	"	"	"
71	7	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	"	"	"	"	"
72	8	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	"	"	"	"	"
106											
575	1075-1	Rn ²²²	CS	6.0 mL Rn ²²² N1-A	149.7	252.708-91	0.13	6m L/MNHCl + 4mL H ₂ O	LSC VIAL	CS	Rn ²²² Verification 1/21/03 K-gamma meter 2/14/03
576	2	"	RP	6.0 mL Rn ²²² N1-A	149.7	"	0.13	"	"	"	"
575	3	"	RP	6.0 mL Rn ²²² N1-A	149.7	"	0.13	"	"	"	"
576	1076-1	Sr ⁹⁰	CS	200uL Sr ⁹⁰ Z1	2372	182.708-95	0.21	0.1 N HANDS	50mL Poly Tube	CS	Sr ⁹⁰ Verification 2/14/03 K-gamma meter
577	2	"	RP	"	"	"	0.21	"	"	"	"
578	3	"	RP	"	"	"	0.21	"	"	"	"
579	4	"	RP	"	"	"	0.21	"	"	"	"
580	5	"	RP	"	"	"	0.21	"	"	"	"
581	6	"	RP	"	"	"	0.21	"	"	"	"

Log Book Group's Sample Entry #	DATE	ANALYSIS	Reg. Sample #	Volume & ID of TRACER ADDED	TOTAL ACTIVITY (CPM)	ACTIVITY DATE	STANDARD WT. (g)	MATRIX	CONTAINER	Event ID	Additional Information on Comment
564	10/18/02	Pu241	MUT RP	350uL Pu ²⁴¹ M1	2849.7	336.708-95	0.39	1.6542 ON HANDS + 18 mL U ²³⁵ MA Gold AB	LSC VIAL	MUT	Pu-241 Calib. check 10/18/02 K-gamma meter 2/14/03
565	1074-1	Type 80CS	RP	0.1 mL Sr ⁹⁰ Z1	1186	182.708-95	0.5	10m L/MNHCl	50mL Poly Tube	CS	GRB Verification 1/13/03 K-gamma meter
566	2	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
567	3	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
568	4	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
569	5	"	RP	0.1 mL Am ²⁴¹ PI	1074	109.500-96	0.92	2/15/03 RP	"	"	"
70	6	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	1.0	"	"	"	"
71	7	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	"	"	"	"	"
72	8	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	"	"	"	"	"
106											
575	1075-1	Rn ²²²	CS	6.0 mL Rn ²²² N1-A	149.7	252.708-91	0.13	6m L/MNHCl + 4mL H ₂ O	LSC VIAL	CS	Rn ²²² Verification 1/21/03 K-gamma meter 2/14/03
576	2	"	RP	6.0 mL Rn ²²² N1-A	149.7	"	0.13	"	"	"	"
575	3	"	RP	6.0 mL Rn ²²² N1-A	149.7	"	0.13	"	"	"	"
576	1076-1	Sr ⁹⁰	CS	200uL Sr ⁹⁰ Z1	2372	182.708-95	0.21	0.1 N HANDS	50mL Poly Tube	CS	Sr ⁹⁰ Verification 2/14/03 K-gamma meter
577	2	"	RP	"	"	"	0.21	"	"	"	"
578	3	"	RP	"	"	"	0.21	"	"	"	"
579	4	"	RP	"	"	"	0.21	"	"	"	"
580	5	"	RP	"	"	"	0.21	"	"	"	"
581	6	"	RP	"	"	"	0.21	"	"	"	"



U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TRACEABILITY *Am-241 P1*

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory
Las Vegas, Nevada

Radionuclide Americium-241
Source identification 94030-1, prepared by EMSL
Source description Liquid in 5-mL flame-sealed glass ampoule
Source mass Approximately 5.0 grams
Source composition Americium-241 in 0.1 mol·L⁻¹ HCl
Reference time 0700 EST April 18, 1996

NIST DATA

EMSL DATA

Radioactivity concentration	3.574 x 10 ² Bq·g ⁻¹	9.6 nanocuries/gram
Expanded uncertainty	0.46 percent ^{(1,2)*}	±2.75 percent ⁽³⁾
Photon-emitting impurities	None observed ⁽⁴⁾	None reported
Measuring instrument	2π α liquid-scintillation counter	Liquid-scintillation counter
Half life	432.2 ± 0.7 years ⁽⁵⁾	
Difference from NIST		+0.06 percent ⁽⁶⁾

For the Director,

J.M. Robin Hutchinson, Group Leader
Radioactivity Group
Physics Laboratory

*Notes on next page

(over)

Gaithersburg, MD 20899
November 1996

As guidance for the proper use of this Report, it should be emphasized that the National Institute of Standards and Technology is concerned only with fostering good measurements capability and consistency with the national measurements system. The assurance of the proper application of that capability to the ultimate consumer products is the responsibility of each manufacturer of these products and of the Federal regulatory agencies.

A continuing traceability program in radioactivity demonstrates, to the degree established by the periodic assays of calibrated radioactivity samples, a continuing competence to maintain the instrument systems and standards necessary for accurate measurement. Such a program cannot, however, endorse each and every measurement nor the final product, any more than a spot check can vouch for every unchecked item. Care should be taken, therefore, not to imply such endorsement. The proper use of this Report is governed by section 200.114 of Title 15 of the Code of Federal Regulations. These regulations may be met if Reports are quoted only in their entirety. Excerpts out of context may be misleading.

NOTES

- (1) The uncertainty analysis methodology and nomenclature used for the reported uncertainties are based on uniform NIST guidelines and are compatible with those adopted by the principal international metrology standardization bodies [cf., B.N. Taylor and C.E. Kuyatt, *NIST Technical Note 1297* (1994)].
- (2) The combined standard uncertainty, $u_c = 0.23$ percent, is the quadratic combination of the standard deviation (or standard deviation of the mean where appropriate), or approximations thereof, for the following component uncertainties:
- | | |
|---|--------------|
| a) 20 measurements on each of 5 samples | 0.03 percent |
| b) gravimetric | 0.05 percent |
| c) dead time | 0.10 percent |
| d) background | 0.01 percent |
| e) detection efficiency | 0.20 percent |

The expanded uncertainty, $U = 0.46$ percent, is obtained by multiplying u_c by a coverage factor of $k = 2$ and is assumed to provide an uncertainty interval of approximately 95 percent confidence.

- (3) "Overall uncertainty" reported by EMSL.
- (4) The limits of detection, as a percentage of the 59.5-keV photons emitted in the decay of americium-241, are:

0.02 percent between 63.5 and 1900 keV,

provided that the impurity photons are separated in energy by four keV or more from those emitted in the decay of americium-241.

- (5) Evaluated Nuclear Structure Data File (ENSDF), September 1996.
- (6) This result demonstrates the traceability of EMSL to NIST, for this measurement, to within five percent as specified in the appendix, Traceability Studies, of the EPA-NIST interagency agreement of April 1976, as amended.

For further information, please contact Jeffrey T. Cessna at 301-975-5539.

Source identification 94030-1



318
Rec'd 6/24/97
K. Yamamoto

Calibration Certificate

Am-241 P1

OFFICE OF
RESEARCH AND DEVELOPMENT

Description

Principal Radionuclide.....	Americium-241
Total Mass of this Solution.....	Approx. 5 grams
Total Activity.....	Approx. 48 nanocuries
Half-life.....	432.7 ± 0.5 years
Activity Concentration.....	9.6 nanocuries/gram
Date and Time of Standardization.....	April 18, 1996 0400 hours PST
Solution Number.....	109,500-96 94030-1

Measurement

Method of Measurement:

The activity of the dilution was measured using liquid scintillation.

The activity of the primary solution was measured using a liquid scintillation counter.

Activity of daughter radionuclide:

The principal activity was accompanied at the quoted time by less than:

[] of the daughter nuclide..... []

Useful Life

We recommend that this solution should not be used after..... [January, 2003]

Am-241 P1 Rec'd 12/04/2001 in 1M HCl
 $5.0386 \text{ g} \times 9.6 \text{ nCi/g} \times 2220 \text{ dpm/nCi} \times \frac{1}{100 \text{ mL}} = 1074 \text{ dpm/mL} \pm 0.92\%$
 109,500-96
 R. Prentice 12/4/01
 K. Yamamoto 12/4/01
 NPDES - 1683

Purity:

The activities other than that of the principal nuclide and of its daughter nuclides were estimated to be:

- (1) None stated < of the principal activity
- (2) < of the principal activity
- (3) < of the principal activity

The activities of the impurities are not included in the quoted figures of the principal activity.

Random Errors:

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than $\pm 0.23\%$.

The 99.7% confidence limits are given by $t(sm)$ where t is obtained from the Student t factor for the degree of freedom ($n-1$), and is calculated to be $\pm 0.75\%$.

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta, -\delta'$). These have been estimated not to exceed $\pm 2.0\%$.

The overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [$t(sm)$] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$). The overall uncertainty is therefore calculated on the basis of $+ [t(sm) + \delta], - [t(sm) + \delta']$ and is $\pm 2.75\%$ of the quoted radioactive concentration.

Decay Schemes:

This standardization is based on the following assumptions of the principal nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Americium-241 decays 100 percent by alpha emission.

Chemical Composition of Solution:

Carrier content per gram of solution:

Other components:

Preservative: 1.0 M HCl

Remarks:

Date Certificate Prepared April 26, 1996

Approval Signature 



National Institute of Standards & Technology

Certificate

Sr⁹⁰Zr

Standard Reference Material 4919H Strontium-90 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive strontium-90 chloride, non-radioactive strontium chloride, non-radioactive yttrium chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of beta-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains strontium-90 with a total activity of approximately 20 kBq. Strontium-90 decays by beta-particle emission to yttrium-90, which also decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. The beta particles emitted from strontium-90 and yttrium-90 produce bremsstrahlung photons with energies up to 2 MeV. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 0.9 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least July 2005.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
December 1995

Thomas E. Gills, Chief
Standard Reference Materials Program

Recommended Procedure for Opening the SRM Ampoule

- 1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.
- 2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.
- 3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.
- 4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.
- 5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.
- 6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.
- 7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.
- 8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.
- 9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss. See also reference [4]*.

- [a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.
- | | | | |
|---|----|------|-----|
| Distance from Ampoule (cm): | 1 | 30 | 100 |
| Approximate Dose Rate ($\mu\text{Sv/h}$): | 15 | <0.1 | - |

- [b] The stated uncertainty is two times the standard uncertainty.

- [c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

- [d] The reported value, y , of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \dots, x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i , used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y , $u_i(y) = |\partial y / \partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y .

The **combined standard uncertainty** of y , $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U , the **expanded uncertainty** of y .

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

- [e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the liquid-scintillation counting is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

- [f] The estimated limit of detection for alpha-particle-emitting impurities is:
 $0.05 \alpha \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 3 and 12 MeV.

- [g] Estimated limits of detection for photon-emitting impurities are:
 $0.04 \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 40 and 507 keV and
 $0.004 \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 515 and 1900 keV.

- [h] The stated uncertainty is the standard uncertainty. See reference [5].

- [i] Relative standard uncertainty of the input quantity x_i .

- [j] The relative change in the output quantity y divided by the relative change in the input quantity x_i . If $|\partial y / \partial x_i| \cdot (x_i / y) = 1.0$, then a 1% change in x_i results in a 1% change in y . If $|\partial y / \partial x_i| \cdot (x_i / y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y .

- [k] Relative component of combined standard uncertainty of output quantity y , rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y = |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.
- [m] The live time is determined by counting the pulses from a gated crystal-controlled oscillator.
- [n] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y) = \{(\text{response per Bq of impurity})/(\text{response per Bq of Sr-90})\} \cdot \{(\text{Bq of impurity})/(\text{Bq of Sr-90})\}$. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.
- [p] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.
- [q] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$, multiplied by other sensitivity factors where appropriate.
- [r] The relationship between the detection efficiency for Sr-90 and Y-90 and the detection efficiency for H-3 was computed using the CIEMAT/NIST method as embodied in the computer program EFFY4. See references [6, 7, 8]. The program computes the detection efficiency for each radionuclide based upon an assumed model. No estimate is made of the uncertainty associated with this model.

REFERENCES

- [1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.
- [2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)
- [3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.
- [4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.
- [5] Evaluated Nuclear Structure Data File (ENSDF), July 1995.
- [6] E. Garcia-Toraño and A. Grau Malonda, EFFY, A New Program to Compute the Counting Efficiency of Beta Particles in Liquid Scintillators, *Computer Phys. Comm.* **36** (1985) 307.
- [7] A. Grau Malonda, E. Garcia-Toraño, and J.M. Los Arcos, Liquid-Scintillation Counting Efficiency as a Function of the Figure of Merit for Pure Beta-Particle Emitters, *Int. J. Appl. Radiat. Isot.* **36** (1985) 157.
- [8] B.M. Coursey, W.B. Mann, A. Grau Malonda, E. Garcia-Toraño, J.M. Los Arcos, J.A.B. Gibson, and D. Reher, Standardization of Carbon-14 by $4\pi\beta$ Liquid Scintillation Efficiency Tracing with Hydrogen-3, *Appl. Radiat. Isot.* **37** (1986) 403.

PROPERTIES OF SRM 4919H
(Certified values are shown in bold type)

Sr⁹⁰Z1

Source identification number	NIST SRM 4919H		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter	(16.5 ± 0.5) mm	
	Wall Thickness	(0.60 ± 0.04) mm	
	Barium content	Less than 2.5%	
	Lead-oxide content	Less than 0.02%	
	Other heavy elements	Trace quantities	
Solution density	(1.014 ± 0.002) g·mL⁻¹ at 21.5 °C [b]*		
Solution mass	Approximately 5.0 grams		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L ⁻¹)	Mass Fraction (g·g ⁻¹)
	H ₂ O	54	0.96
	HCl	0.9	0.04
	SrCl ₂	0.001	0.0002
	YCl ₃	0.001	0.0002
	⁹⁰ SrCl ₂	9 × 10 ⁻⁹	1 × 10 ⁻⁹
Radiological Properties:			
Radionuclide	Strontium-90		
Reference time	1200 EST, 1 July 1995		
Massic activity of the solution [c]	4.010 kBq·g ⁻¹		
Relative expanded uncertainty (k=2)	0.74% [d] [e]		
Alpha-particle-emitting impurities	None detected [f]		
Photon-emitting impurities	None detected [g]		
Half lives used in the decay corrections	Hydrogen-3: (12.33 ± 0.06) a [h] Strontium-90: (28.78 ± 0.04) a [h] Yttrium-90: (64.10 ± 0.08) h [h]		
Beta-particle maximum energies used in the EFFY4 computations	Hydrogen-3: (18.594 ± 0.008) keV [h] Strontium-90: (546.0 ± 1.6) keV [h] Yttrium-90: (521 ± 3) keV [h] (2281.5 ± 2.5) keV [h]		
Calibration method	4πB liquid-scintillation counting. The Sr-90 plus Y-90 detection efficiency was calculated using the CIEMAT/NIST method with H-3 as the detection-efficiency monitor. [r]		

Sr⁹⁰Z1 in 1N HCL

$$4.9313g \times 4.010 \frac{kBq}{g} \times 1000 \times 60 \frac{dpm}{Bq} \times \frac{1}{100ml} = 1.186E4 \frac{dpm}{ml} @ 182.708 - 95$$
11/10/00 0.38
11/10/00 RP
Carrier content 0.132 mg/ml SrCO₃ + 0.1107 mg/ml Y₂O₃
0.1907
K. Yamamoto
NPDES 1689

Counted 20.697- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.300 mg	18.300 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 109	GRB 109
Counts =	90.000	80370.000
Gross cpm =	0.900	803.700
Background =	0.037	1.019
Observed CPM =	0.863	802.681
Cross talk fac =	0.006	0.209
True CPM =	-4.096	803.538
Inst Std. Fac. =	1.163	1.014
Adjusted CPM =	-4.764	814.787
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	-25.046	1950.059

pCi /smpl =	-11.3	878.
1 sigma % Err =	2.363	0.353
2 sigma % Err =	4.632	0.692

(1 sigma err) = 0.267 3.10

(2 sigma err) = 0.523 6.08

LTV (95 %) = 0.440 884.

MDA (3.00) = 0.283 0.538

MDA (2.71) = 0.276 0.535

CRITICAL LEVEL = 0.106 0.254

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.037	1.019	0.00
SF	20.633	0	1.163	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.738	17-JAN-03 9:42	GAW 109	(50)9025 1	100.0 min	0.75
17.986	17-JAN-03 15:39	GAW 109	BK	3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 109	SF	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.738	17-JAN-03 9:42	GRB 109	(50)9025 1	100.0 min	12.57
17.986	17-JAN-03 15:39	GRB 109	BK	3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 109	SF	10.0 min	0.00

CS
Counted 27.869- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.300 mg	18.300 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 114	GRB 114
Counts =	138.000	78303.000
Gross cpm =	1.380	783.030
Background =	0.037	2.057
Observed CPM =	1.343	780.973
Cross talk fac =	0.006	0.209
True CPM =	-3.482	781.701
Inst Std. Fac. =	1.045	1.012
Adjusted CPM =	-3.638	791.082
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	-19.128	1893.323

Count

pCi /smpl	=	-8.62	853.
1 sigma % Err	=	3.419	0.358
2 sigma % Err	=	6.701	0.703

(1 sigma err) = 0.295 3.06

(2 sigma err) = 0.577 5.99

LTV (95 %) = 0.486 858.

MDA (3.00) = 0.283 0.751

MDA (2.71) = 0.276 0.748

CRITICAL LEVEL = 0.106 0.360

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	25.006	3	0.037	2.057	0.00
SF	27.619	0	1.045	1.012	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.620	27-JAN-03 6:52	GAW 114	SF	10.0 min	0.00
27.664	27-JAN-03 7:56	GAW 114	(93)2158 14	100.0 min	9.48
27.756	27-JAN-03 10:08	GAW 114	(93)7426 16	100.0 min	8.17

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.633	27-JAN-03 7:11	GRB 114	SF	10.0 min	0.00
27.664	27-JAN-03 7:56	GRB 114	(93)2158 14	100.0 min	25.28
27.756	27-JAN-03 10:08	GRB 114	(93)7426 16	100.0 min	21.12

CS
Counted 30.874- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.300 mg	18.300 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 109	GRB 109
Counts =	142.000	80616.000
Gross cpm =	1.420	806.160
Background =	0.042	1.043
Observed CPM =	1.378	805.117
Cross talk fac =	0.006	0.209
True CPM =	-3.596	805.869
Inst Std. Fac. =	1.165	1.016
Adjusted CPM =	-4.189	818.763
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	-22.023	1959.574

2 counts done
(c)

pCi /smpl =	-9.92	883.
1 sigma % Err =	3.363	0.353
2 sigma % Err =	6.591	0.691

(1 sigma err) = 0.334 3.11

(2 sigma err) = 0.654 6.10

LTV (95 %) = 0.550 888.

MDA (3.00) = 0.297 0.544

MDA (2.71) = 0.290 0.541

CRITICAL LEVEL = 0.113 0.257

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	29.937	3	0.042	1.043	0.00
SF	30.616	0	1.165	1.016	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.616	30-JAN-03 6:47	GAW 109	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GAW 109	(50)9035 1 \	100.0 min	0.82
30.867	30-JAN-03 12:48	GAW 109	(50)9035 1 \	6.0 min	0.73

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.626	30-JAN-03 7:01	GRB 109	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GRB 109	(50)9035 1 \	100.0 min	20.30
30.867	30-JAN-03 12:48	GRB 109	(50)9035 1 \	6.0 min	24.17

CS
Counted 31.861- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.300 mg	18.300 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	29.000	80626.000
Gross cpm =	0.290	806.260
Background =	0.049	1.516
Observed CPM =	0.241	804.744
Cross talk fac =	0.006	0.209
True CPM =	-4.732	805.734
Inst Std. Fac. =	1.035	1.018
Adjusted CPM =	-4.898	820.237
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	-25.748	1963.102

2nd Count
Done
D

pCi /smpl =	-11.6	884.
1 sigma % Err =	1.230	0.353
2 sigma % Err =	2.412	0.691

(1 sigma err) = 0.143 3.12

(2 sigma err) = 0.280 6.11

LTV (95 %) = 0.235 889.

MDA (3.00) = 0.315 0.650

MDA (2.71) = 0.308 0.646

CRITICAL LEVEL = 0.122 0.309

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	30.966	3	0.049	1.516	0.00
SF	31.614	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.966	30-JAN-03 15:11	GAW 115	BK	929.7 min	0.00
31.614	31-JAN-03 6:44	GAW 115	SF	10.0 min	0.00
31.764	31-JAN-03 10:20	GAW 115	(80)1074	5 \ 100.0 min	194.10

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.966	30-JAN-03 15:11	GRB 115	BK	929.7 min	0.00
31.625	31-JAN-03 7:00	GRB 115	SF	10.0 min	0.00
31.764	31-JAN-03 10:20	GRB 115	(80)1074	5 \ 100.0 min	43.83

CS
Counted 20.697- 3 on C2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.400 mg	29.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 110	GRB 110
Counts =	217.000	81414.000
Gross cpm =	2.170	814.140
Background =	0.055	1.637
Observed CPM =	2.115	812.503
Cross talk fac =	0.006	0.215
True CPM =	-2.840	813.113
Inst Std. Fac. =	1.176	1.014
Adjusted CPM =	-3.340	824.496
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	-19.370	1989.682

pCi /smpl =	-8.73	896.
1 sigma % Err =	5.252	0.351
2 sigma % Err =	10.293	0.688

(1 sigma err) = 0.458 3.15

(2 sigma err) = 0.898 6.17

LTV (95 %) = 0.756 901.

MDA (3.00) = 0.363 0.679

MDA (2.71) = 0.356 0.676

CRITICAL LEVEL = 0.143 0.324

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.055	1.637	0.00
SF	20.633	0	1.176	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.617	17-JAN-03 6:48	GAW 110	SF	\ 10.0 min	0.00
17.986	17-JAN-03 15:39	GAW 110	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 110	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.631	17-JAN-03 7:08	GRB 110	SF	\ 10.0 min	0.00
17.986	17-JAN-03 15:39	GRB 110	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 110	SF	\ 10.0 min	0.00

CS
Counted 27.869- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.400 mg	29.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
-----	-----	-----
Instrument =	GAW 115	GRB 115
Counts =	46.000	75955.000
Gross cpm =	0.460	759.550
Background =	0.070	1.746
Observed CPM =	0.390	757.804
Cross talk fac =	0.006	0.215
True CPM =	-4.234	758.713
Inst Std. Fac. =	1.037	1.016
Adjusted CPM =	-4.390	770.852
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	-25.460	1860.228
pCi /smpl =	-11.5	838.
1 sigma % Err =	1.720	0.364
2 sigma % Err =	3.370	0.713
(1 sigma err) =	0.197	3.05
(2 sigma err) =	0.387	5.97
LTV (95 %) =	0.325	843.
MDA (3.00) =	0.400	0.701
MDA (2.71) =	0.392	0.697
CRITICAL LEVEL =	0.161	0.335

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	25.006	3	0.070	1.746	0.00
SF	27.619	0	1.037	1.016	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.620	27-JAN-03 6:52	GAW 115	SF	10.0 min	0.00
27.664	27-JAN-03 7:56	GAW 115	(93)7426 15	100.0 min	1.59
27.756	27-JAN-03 10:08	GAW 115	(93)8035 4	100.0 min	4.05

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.633	27-JAN-03 7:11	GRB 115	SF	10.0 min	0.00
27.664	27-JAN-03 7:56	GRB 115	(93)7426 15	100.0 min	2.32
27.756	27-JAN-03 10:08	GRB 115	(93)8035 4	100.0 min	10.41

CS
Counted 28.807- 3 on D2 for 100.00 min. Reviewed _____ Date _____

1.00	smpl	29.400 mg	29.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 114	GRB 114
Counts =	159.000	80684.000
Gross cpm =	1.590	806.840
Background =	0.030	2.060
Observed CPM =	1.560	804.780
Cross talk fac =	0.006	0.215
True CPM =	-3.349	805.499
Inst Std. Fac. =	1.043	1.011
Adjusted CPM =	-3.493	814.360
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	-20.255	1965.220

2
Count.
dmc

(D)

pCi /smpl	=	-9.12	885.
1 sigma % Err	=	3.801	0.353
2 sigma % Err	=	7.449	0.692

(1 sigma err) = 0.347 3.13

(2 sigma err) = 0.680 6.13

LTV (95 %) = 0.572 890.

MDA (3.00) = 0.289 0.758

MDA (2.71) = 0.281 0.755

CRITICAL LEVEL = 0.105 0.364

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.030	2.060	0.00
SF	28.606	0	1.043	1.011	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.957	27-JAN-03 14:58	GAW 114	BK	927.7 min	0.00
28.606	28-JAN-03 6:32	GAW 114	SF	10.0 min	0.00
28.652	28-JAN-03 7:38	GAW 114	(88)9033 2	100.0 min	4.31

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.869	27-JAN-03 12:51	GRB 114	(80)1074 1	100.0 min	790.00
27.957	27-JAN-03 14:58	GRB 114	BK	927.7 min	0.00
28.616	28-JAN-03 6:47	GRB 114	SF	10.0 min	0.00

CS
Counted 30.874- 3 on C2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.400 mg	29.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 110	GRB 110
Counts =	224.000	80924.000
Gross cpm =	2.240	809.240
Background =	0.044	1.651
Observed CPM =	2.196	807.589
Cross talk fac =	0.006	0.215
True CPM =	-2.729	808.175
Inst Std. Fac. =	1.177	1.014
Adjusted CPM =	-3.212	819.489
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	-18.628	1977.599

2 Counts done

(C)

pCi /smpl =	-8.39	891.
1 sigma % Err =	9.938	0.352
2 sigma % Err =	10.854	0.691

(1 sigma err) = 0.465 3.14

(2 sigma err) = 0.911 6.15

LTV (95 %) = 0.767 896.

MDA (3.00) = 0.333 0.682

MDA (2.71) = 0.326 0.679

CRITICAL LEVEL = 0.128 0.325

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	29.937	3	0.044	1.651	0.00
SF	30.616	0	1.177	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.616	30-JAN-03 6:47	GAW 110	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GAW 110	(50)9035	100.0 min	0.94
30.867	30-JAN-03 12:48	GAW 110	(50)9035	6.0 min	1.52

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.626	30-JAN-03 7:01	GRB 110	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GRB 110	(50)9035	100.0 min	18.21
30.867	30-JAN-03 12:48	GRB 110	(50)9035	6.0 min	17.59

CS
Counted 20.697- 3 on CS for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	40.800 mg	40.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 111	GRB 111
Counts =	75.000	81424.000
Gross cpm =	0.750	814.240
Background =	0.030	1.167
Observed CPM =	0.720	813.073
Cross talk fac =	0.006	0.220
True CPM =	-4.176	813.993
Inst Std. Fac. =	1.136	1.003
Adjusted CPM =	-4.744	816.435
Eff (cpm/dpm) =	0.157	0.411
DPM of Aliquot =	-30.289	1987.176

pCi /smpl =	-13.6	895.
1 sigma % Err =	2.115	0.351
2 sigma % Err =	4.145	0.688

(1 sigma err) = 0.289 3.14

(2 sigma err) = 0.566 6.15

LTV (95 %) = 0.476 900.

MDA (3.00) = 0.318 0.584

MDA (2.71) = 0.310 0.580

CRITICAL LEVEL = 0.116 0.276

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.030	1.167	0.00
SF	20.633	0	1.136	1.003	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.836	17-JAN-03 12:03	GAW 111	(50)9025 3 \	24.0 min	0.40
17.986	17-JAN-03 15:39	GAW 111	BK \	3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 111	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.836	17-JAN-03 12:03	GRB 111	(50)9025 3 \	24.0 min	6.18
17.986	17-JAN-03 15:39	GRB 111	BK \	3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 111	SF \	10.0 min	0.00

Counted 30.874- 3 on C3 for 100.00 min.

1.00	smpl	40.800 mg	40.800 mg
-----	-----	-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 111	GRB 111
Counts =	75.000	82078.000
Gross cpm =	0.750	820.780
Background =	0.031	1.187
Observed CPM =	0.719	819.593
Cross talk fac =	0.006	0.220
True CPM =	-4.216	820.522
Inst Std. Fac. =	1.136	1.003
Adjusted CPM =	-4.789	822.984
Eff (cpm/dpm) =	0.157	0.411
DPM of Aliquot =	-30.582	2003.115

2 counts done

(C)

pCi /smpl =	-13.8	902.
1 sigma % Err =	2.096	0.349
2 sigma % Err =	4.109	0.685
(1 sigma err) =	0.289	3.15
(2 sigma err) =	0.566	6.18
LTV (95 %) =	0.476	908.
MDA (3.00) =	0.322	0.588
MDA (2.71) =	0.313	0.585
CRITICAL LEVEL =	0.118	0.278

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	29.937	3	0.031	1.187	0.00
SF	30.616	0	1.136	1.003	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.616	30-JAN-03 6:47	GAW 111	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GAW 111	(50)9035	100.0 min	0.67
30.867	30-JAN-03 12:48	GAW 111	(50)9035	6.0 min	1.10

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.626	30-JAN-03 7:01	GRB 111	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GRB 111	(50)9035	100.0 min	17.98
30.867	30-JAN-03 12:48	GRB 111	(50)9035	6.0 min	17.04

CS
Counted 37.653- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smp1	40.800 mg	40.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight
		ALPHA	BETA
		-----	-----
Instrument =	GAW 115	GRB 115	
Counts =	50.000	80909.000	
Gross cpm =	0.500	809.090	
Background =	0.054	1.510	
Observed CPM =	0.446	807.580	
Cross talk fac =	0.006	0.220	
True CPM =	-4.417	808.553	
Inst Std. Fac. =	1.036	1.017	
Adjusted CPM =	-4.576	822.299	
Eff (cpm/dpm) =	0.157	0.411	
DPM of Aliquot =	-29.219	2001.448	
pCi /smp1 =	-13.2	902.	
1 sigma % Err =	1.685	0.352	
2 sigma % Err =	3.303	0.690	
(1 sigma err) =	0.222	3.17	
(2 sigma err) =	0.435	6.22	
LTV (95 %) =	0.366	907.	
MDA (3.00) =	0.397	0.659	
MDA (2.71) =	0.389	0.656	
CRITICAL LEVEL =	0.156	0.314	

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	36.943	3	0.054	1.510	0.00
SF	37.605	0	1.036	1.017	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
36.943	5-FEB-03 14:37	GAW 115	BK	\ 949.8 min	0.00
37.605	6-FEB-03 6:31	GAW 115	SF	\ 10.0 min	0.00
37.648	6-FEB-03 7:33	GAW 115	(80)1074	7 \ 1.0 min	158.43

Previous 3 counts	Time	Detector	ID	Length	Cpm
36.943	5-FEB-03 14:37	GRB 115	BK	\ 949.8 min	0.00
37.618	6-FEB-03 6:49	GRB 115	SF	\ 10.0 min	0.00
37.648	6-FEB-03 7:33	GRB 115	(80)1074	7 \ 1.0 min	36.08

CS
Counted 20.697- 3 on C4 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	53.500 mg	53.500 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 112	GRB 112
Counts =	74,000	81327,000
Gross cpm =	0.740	813.270
Background =	0.048	1.516
Observed CPM =	0.692	811.754
Cross talk fac =	0.006	0.227
True CPM =	-4.124	812.689
Inst Std. Fac. =	1.155	1.006
Adjusted CPM =	-4.763	817.565
Eff (cpm/dpm) =	0.141	0.407
DPM of Aliquot =	-33.695	2009.006

pCi /smpl =	-15.2	905.
1 sigma % Err =	2.153	0.351
2 sigma % Err =	4.219	0.685

(1 sigma err) = 0.327 3.18

(2 sigma err) = 0.640 6.23

LTV (95 %) = 0.539 910.

MDA (3.00) = 0.420 0.667

MDA (2.71) = 0.411 0.664

CRITICAL LEVEL = 0.163 0.318

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.048	1.516	0.00
SF	20.633	0	1.155	1.006	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.836	17-JAN-03 12:03	GAW 112	(50)9025 4 \	24.0 min	0.52
17.986	17-JAN-03 15:39	GAW 112	BK \	3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 112	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.836	17-JAN-03 12:03	GRB 112	(50)9025 4 \	24.0 min	5.72
17.986	17-JAN-03 15:39	GRB 112	BK \	3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 112	SF \	10.0 min	0.00

30-JAN-03
15:01:55

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 4 80
CALIBRATION Std.

CS
Counted 30.874- 3 on C4 for 100.00 min.

Reviewed _____ Date _____

1.00 smpl 53.500 mg 53.500 mg

Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 112	GRB 112
Counts =	75.000	82210.000
Gross cpm =	0.750	822.100
Background =	0.053	1.518
Observed CPM =	0.697	820.582
Cross talk fac =	0.006	0.227
True CPM =	-4.171	821.528
Inst Std. Fac. =	1.154	1.007
Adjusted CPM =	-4.813	827.278
Eff (cpm/dpm) =	0.141	0.407
DPM of Aliquot =	-34.052	2032.875

2 Counts done

pCi /smpl = -15.3 916.
1 sigma % Err = 2.148 0.349
2 sigma % Err = 4.211 0.685

(1 sigma err) = 0.330 3.20

(2 sigma err) = 0.646 6.27

LTV (95 %) = 0.544 921.

MDA (3.00) = 0.437 0.667

MDA (2.71) = 0.428 0.664

CRITICAL LEVEL = 0.171 0.318

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	29.937	3	0.053	1.518	0.00
SF	30.616	0	1.154	1.007	0.00

Previous	3 counts	Time	Detector	ID	Length	Cpm
30.616	30-JAN-03	6:47	GAW 112	SF	10.0 min	0.00
30.678	30-JAN-03	8:16	GAW 112	(50)9035 4	100.0 min	0.99
30.867	30-JAN-03	12:48	GAW 112	(50)9035 4	6.0 min	1.28

Previous	3 counts	Time	Detector	ID	Length	Cpm
30.626	30-JAN-03	7:01	GRB 112	SF	10.0 min	0.00
30.678	30-JAN-03	8:16	GRB 112	(50)9035 4	100.0 min	17.23
30.867	30-JAN-03	12:48	GRB 112	(50)9035 4	6.0 min	14.25

06-FEB-03
13:49:44

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 4 80
CALIBRATION Std.

CS
Counted 35.753- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smp1	53.500 mg	53.500 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 115	GRB 115
Counts =	25.000	79426.000
Gross cpm =	0.250	794.260
Background =	0.051	1.539
Observed CPM =	0.199	792.721
Cross talk fac =	0.006	0.227
True CPM =	-4.504	793.742
Inst Std. Fac. =	1.036	1.018
Adjusted CPM =	-4.666	808.030
Eff (cpm/dpm) =	0.141	0.407
DPM of Aliquot =	-33.014	1985.575

pCi /smp1	=	-14.9	894.
1 sigma % Err	=	1.218	0.355
2 sigma % Err	=	2.387	0.697

(1 sigma err) = 0.181 3.18

(2 sigma err) = 0.355 6.23

LTV (95 %) = 0.299 900.

MDA (3.00) = 0.430 0.672

MDA (2.71) = 0.421 0.669

CRITICAL LEVEL = 0.168 0.320

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	34.947	3	0.051	1.539	0.00
SF	35.623	0	1.036	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
35.623	4-FEB-03 6:57	GAW 115	SF	10.0 min	0.00
35.650	4-FEB-03 7:36	GAW 115	(80)1074	6 \ 1.0 min	155.36
35.655	4-FEB-03 7:43	GAW 115	(80)9036	3 \ 100.0 min	4.76

Previous 3 counts	Time	Detector	ID	Length	Cpm
35.633	4-FEB-03 7:11	GRB 115	SF	10.0 min	0.00
35.650	4-FEB-03 7:36	GRB 115	(80)1074	6 \ 1.0 min	42.21
35.655	4-FEB-03 7:43	GRB 115	(80)9036	3 \ 100.0 min	12.82

06-FEB-03
13:49:45

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 4 80
CALIBRATION Std.

CS
Counted 37.849- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00 smpl 53.500 mg 53.500 mg

Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	36.000	80403.000
Gross cpm =	0.360	804.030
Background =	0.054	1.510
Observed CPM =	0.306	802.520
Cross talk fac =	0.006	0.227
True CPM =	-4.455	803.530
Inst Std. Fac. =	1.036	1.017
Adjusted CPM =	-4.616	817.190
Eff (cpm/dpm) =	0.141	0.407
DPM of Aliquot =	-32.654	2008.085

pCi /smpl	= -14.7	905.
1 sigma % Err	= 1.444	0.353
2 sigma % Err	= 2.831	0.692

(1 sigma err) = 0.212 3.19

(2 sigma err) = 0.416 6.26

LTV (95 %) = 0.351 910.

MDA (3.00) = 0.440 0.666

MDA (2.71) = 0.431 0.662

CRITICAL LEVEL = 0.173 0.317

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	36.943	3	0.054	1.510	0.00
SF	37.605	0	1.036	1.017	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
37.605	6-FEB-03 6:31	GAW 115	SF	10.0 min	0.00
37.648	6-FEB-03 7:33	GAW 115	(80)1074 7	1.0 min	158.43
37.654	6-FEB-03 7:41	GAW 115	(80)1074 3	100.0 min	0.46

Previous 3 counts	Time	Detector	ID	Length	Cpm
37.618	6-FEB-03 6:49	GRB 115	SF	10.0 min	0.00
37.648	6-FEB-03 7:33	GRB 115	(80)1074 7	1.0 min	36.08
37.654	6-FEB-03 7:41	GRB 115	(80)1074 3	100.0 min	821.08

2nd Count done
D

CS
Counted 20.778- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.400 mg	18.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 109	GRB 109
Counts =	14270.000	3257.000
Gross cpm =	142.700	32.570
Background =	0.037	1.019
Observed CPM =	142.663	31.551
Cross talk fac =	0.006	0.209
True CPM =	142.652	1.708
Inst Std. Fac. =	1.163	1.014
Adjusted CPM =	165.905	1.732
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	873.036	4.146

pCi /smpl =	393.	1.87
1 sigma % Err =	0.838	33.930
2 sigma % Err =	1.642	66.503

(1 sigma err) = 3.29 0.634

(2 sigma err) = 6.46 1.24

LTV (95 %) = 399. 2.91

MDA (3.00) = 0.283 0.538

MDA (2.71) = 0.276 0.535

CRITICAL LEVEL = 0.106 0.254

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.037	1.019	0.00
SF	20.633	0	1.163	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GAW 109	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 109	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GAW 109	(80)1074 1	\ 100.0 min	1.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GRB 109	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 109	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GRB 109	(80)1074 1	\ 100.0 min	814.16

CS

Reviewed _____ Date _____

Counted 28.807- 3 on C1 for 100.00 min.

1.00	smp1	18.400 mg	18.400 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 109	GRB 109
Counts =	14140.000	3417.000
Gross cpm =	141.400	34.170
Background =	0.028	1.053
Observed CPM =	141.372	33.117
Cross talk fac =	0.006	0.209
True CPM =	141.350	3.547
Inst Std. Fac. =	1.164	1.016
Adjusted CPM =	164.532	3.603
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	865.810	8.625

*2 Counts
dne*

(C)

pCi /smp1 =	390.	3.88
1 sigma % Err =	0.841	16.734
2 sigma % Err =	1.649	32.799

(1 sigma err) = 3.28 0.650

(2 sigma err) = 6.43 1.27

LTV (95 %) = 395. 4.96

MDA (3.00) = 0.256 0.547

MDA (2.71) = 0.249 0.544

CRITICAL LEVEL = 9.242E-02 0.258

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.028	1.053	0.00
SF	28.606	0	1.164	1.016	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GAW 109	(80) 903	16 \ 10.0 min	1.35
27.957	27-JAN-03 14:58	GAW 109	BK	\ 927.5 min	0.00
28.606	28-JAN-03 6:32	GAW 109	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GRB 109	(80) 903	16 \ 10.0 min	4.32
27.957	27-JAN-03 14:58	GRB 109	BK	\ 927.5 min	0.00
28.616	28-JAN-03 6:47	GRB 109	SF	\ 10.0 min	0.00

CS

Reviewed _____ Date _____

Counted 31.764- 3 on D3 for 100.00 min.

1.00	smpl	18.400 mg	18.400 mg
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	18754.000	4458.000
Gross cpm =	187.540	44.580
Background =	0.049	1.516
Observed CPM =	187.491	43.064
Cross talk fac =	0.006	0.209
True CPM =	187.467	3.846
Inst Std. Fac. =	1.035	1.018
Adjusted CPM =	194.029	3.915
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	1021.031	9.371

1st count

pCi /smpl =	460.	4.22
1 sigma % Err =	0.731	17.654
2 sigma % Err =	1.432	34.601

(1 sigma err) = 3.36 0.745

(2 sigma err) = 6.59 1.46

LTV (95 %) = 465. 5.45

MDA (3.00) = 0.315 0.650

MDA (2.71) = 0.308 0.647

CRITICAL LEVEL = 0.122 0.309

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	30.966	3	0.049	1.516	0.00
SF	31.614	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.861	30-JAN-03 12:39	GAW 115	(80)1075	5 \ 100.0 min	191.94
30.966	30-JAN-03 15:11	GAW 115	BK	\ 929.7 min	0.00
31.614	31-JAN-03 6:44	GAW 115	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.861	30-JAN-03 12:39	GRB 115	(80)1075	5 \ 100.0 min	46.51
30.966	30-JAN-03 15:11	GRB 115	BK	\ 929.7 min	0.00
31.625	31-JAN-03 7:00	GRB 115	SF	\ 10.0 min	0.00

03-FEB-03
10:26:11

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 5 80
CALIBRATION Std.

CS
Counted 34.686- 3 on D3 for 100.00 min

Reviewed _____ Date _____

1.00 smpl 18.400 mg 18.400 mg

Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	18646.000	4753.000
Gross cpm =	186.460	47.530
Background =	0.067	1.540
Observed CPM =	186.393	45.990
Cross talk fac =	0.006	0.209
True CPM =	186.350	7.006
Inst Std. Fac. =	1.035	1.018
Adjusted CPM =	192.872	7.132
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	1014.943	17.070

2nd Count
Done

pCi /smpl =	457.	7.69
1 sigma % Err =	0.733	9.999
2 sigma % Err =	1.436	19.598

(1 sigma err) = 3.35 0.769

(2 sigma err) = 6.57 1.51

LTV (95 %) = 463. 8.96

MDA (3.00) = 0.356 0.654

MDA (2.71) = 0.350 0.651

CRITICAL LEVEL = 0.143 0.312

GC Summary

GC	GMT	YR	ALPHA	BETA	TIME
BKG	31.942	3	0.067	1.540	0.00
SF	34.615	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
31.861	31-JAN-03 12:39	GAW 115	(80)1074 1	100.0 min	0.25
31.942	31-JAN-03 14:36	GAW 115	BK	3838.3 min	0.00
34.615	3-FEB-03 6:45	GAW 115	SF	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
31.861	31-JAN-03 12:39	GRB 115	(80)1074 1	100.0 min	819.14
31.942	31-JAN-03 14:36	GRB 115	BK	3838.3 min	0.00
34.636	3-FEB-03 7:15	GRB 115	SF	10.0 min	0.00

CS
Counted 20.778- 3 on C2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 110	GRB 110
Counts =	11696.000	2793.000
Gross cpm =	116.960	27.930
Background =	0.055	1.637
Observed CPM =	116.905	26.293
Cross talk fac =	0.006	0.215
True CPM =	116.898	1.172
Inst Std. Fac. =	1.176	1.014
Adjusted CPM =	137.472	1.188
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	800.120	2.868

pCi /smpl =	360.	1.29
1 sigma % Err =	0.925	46.409
2 sigma % Err =	1.814	90.962

(1 sigma err) = 3.34 0.600

(2 sigma err) = 6.54 1.18

LTV (95 %) = 366. 2.28

MDA (3.00) = 0.365 0.680

MDA (2.71) = 0.357 0.676

CRITICAL LEVEL = 0.143 0.324

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.055	1.637	0.00
SF	20.633	0	1.176	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GAW 110	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 110	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GAW 110	(80)1074	2 \ 100.0 min	2.49

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GRB 110	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 110	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GRB 110	(80)1074	2 \ 100.0 min	823.70

CS
Counted 28.807- 3 on C2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 110	GRB 110
Counts =	11671.000	2868.000
Gross cpm =	116.710	28.680
Background =	0.055	1.660
Observed CPM =	116.655	27.020
Cross talk fac =	0.006	0.215
True CPM =	116.643	1.953
Inst Std. Fac. =	1.177	1.014
Adjusted CPM =	137.289	1.981
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	799.056	4.781

2 counts done

C

pCi /smpl =	360.	2.15
1 sigma % Err =	0.926	28.198
2 sigma % Err =	1.816	55.268

(1 sigma err) = 3.33 0.607

(2 sigma err) = 6.54 1.19

LTV (95 %) = 365. 3.16

MDA (3.00) = 0.365 0.684

MDA (2.71) = 0.357 0.681

CRITICAL LEVEL = 0.143 0.326

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.055	1.660	0.00
SF	28.606	0	1.177	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GAW 110	(80) 903 17 \	10.0 min	0.35
27.957	27-JAN-03 14:58	GAW 110	BK \	927.5 min	0.00
28.606	28-JAN-03 6:32	GAW 110	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GRB 110	(80) 903 17 \	10.0 min	0.35
27.957	27-JAN-03 14:58	GRB 110	BK \	927.5 min	0.00
28.616	28-JAN-03 6:47	GRB 110	SF \	10.0 min	0.00

CS
Counted 34.762- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	15938.000	3945.000
Gross cpm =	159.380	39.450
Background =	0.067	1.540
Observed CPM =	159.313	37.910
Cross talk fac =	0.006	0.215
True CPM =	159.291	3.678
Inst Std. Fac. =	1.035	1.018
Adjusted CPM =	164.866	3.745
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	959.560	9.039

pCi /smpl =	432.	4.07
1 sigma % Err =	0.793	17.405
2 sigma % Err =	1.554	34.114

(1 sigma err) = 3.43 0.709

(2 sigma err) = 6.72 1.39

LTV (95 %) = 438. 5.24

MDA (3.00) = 0.394 0.660

MDA (2.71) = 0.387 0.657

CRITICAL LEVEL = 0.158 0.314

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	31.942	3	0.067	1.540	0.00
SF	34.615	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
31.942	31-JAN-03 14:36	GAW 115	BK	\ 3838.3 min	0.00
34.615	3-FEB-03 6:45	GAW 115	SF	\ 10.0 min	0.00
34.686	3-FEB-03 8:27	GAW 115	(80)1074	5 \ 100.0 min	192.99

Previous 3 counts	Time	Detector	ID	Length	Cpm
31.942	31-JAN-03 14:36	GRB 115	BK	\ 3838.3 min	0.00
34.636	3-FEB-03 7:15	GRB 115	SF	\ 10.0 min	0.00
34.686	3-FEB-03 8:27	GRB 115	(80)1074	5 \ 100.0 min	46.82

04-FEB-03
08:15:15

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 6 80
CALIBRATION Std.

CS
Counted 35.650- 3 on D3 for 1.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 115	GRB 115
Counts =	150.000	43.000
Gross cpm =	150.000	43.000
Background =	0.051	1.539
Observed CPM =	149.949	41.461
Cross talk fac =	0.006	0.215
True CPM =	149.893	9.249
Inst Std. Fac. =	1.036	1.018
Adjusted CPM =	155.289	9.416
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	903.819	22.728

2nd Count
Done
D

pCi /smpl =	407.	10.2
1 sigma % Err =	8.172	72.156
2 sigma % Err =	16.018	141.426

(1 sigma err) = 33.3 7.39

(2 sigma err) = 65.2 14.5

LTV (95 %) = 462. 22.4

MDA (3.00) = 10.6 9.53

MDA (2.71) = 9.86 9.22

CRITICAL LEVEL = 1.38 3.14

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	34.947	3	0.051	1.539	0.00
SF	35.623	0	1.036	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
34.867	3-FEB-03 12:48	GAW 115	(80)1074	3 \ 100.0 min	0.19
34.947	3-FEB-03 14:43	GAW 115	BK	\ 953.9 min	0.00
35.623	4-FEB-03 6:57	GAW 115	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
34.867	3-FEB-03 12:48	GRB 115	(80)1074	3 \ 100.0 min	822.35
34.947	3-FEB-03 14:43	GRB 115	BK	\ 953.9 min	0.00
35.633	4-FEB-03 7:11	GRB 115	SF	\ 10.0 min	0.00

CS
Counted 44.652- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 114	GRB 114
Counts =	15189.000	3663.000
Gross cpm =	151.890	36.630
Background =	0.052	2.440
Observed CPM =	151.838	34.190
Cross talk fac =	0.006	0.215
True CPM =	151.828	1.562
Inst Std. Fac. =	1.043	1.012
Adjusted CPM =	158.357	1.581
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	921.678	3.816

pCi /smpl =	415.	1.72
1 sigma % Err =	0.812	40.015
2 sigma % Err =	1.591	78.430

(1 sigma err) = 3.37 0.688

(2 sigma err) = 6.61 1.35

LTV (95 %) = 421. 2.85

MDA (3.00) = 0.357 0.822

MDA (2.71) = 0.349 0.819

CRITICAL LEVEL = 0.139 0.396

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	43.940	3	0.052	2.440	0.00
SF	44.610	0	1.043	1.012	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
43.622	12-FEB-03 6:55	GAW 114	SF	10.0 min	0.00
43.940	12-FEB-03 14:33	GAW 114	BK	962.3 min	0.00
44.611	13-FEB-03 6:39	GAW 114	SF	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
43.640	12-FEB-03 7:21	GRB 114	SF	10.0 min	0.00
43.940	12-FEB-03 14:33	GRB 114	BK	962.3 min	0.00
44.620	13-FEB-03 6:52	GRB 114	SF	10.0 min	0.00

20-JAN-03
12:57:07

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 7 80
CALIBRATION Std.

CS
Counted 20.778- 3 on C3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 111	GRB 111
Counts =	10795.000	2813.000
Gross cpm =	107.950	28.130
Background =	0.030	1.167
Observed CPM =	107.920	26.963
Cross talk fac =	0.006	0.224
True CPM =	107.904	2.755
Inst Std. Fac. =	1.136	1.003
Adjusted CPM =	122.578	2.763
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	834.935	6.766

pCi /smpl =	376.	3.05
1 sigma % Err =	0.963	19.648
2 sigma % Err =	1.888	38.510

(1 sigma err) =	3.62	0.599
(2 sigma err) =	7.10	1.17
LTV (95 %) =	382.	4.04
MDA (3.00) =	0.339	0.587
MDA (2.71) =	0.330	0.584
CRITICAL LEVEL =	0.124	0.278

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.030	1.167	0.00
SF	20.633	0	1.136	1.003	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GAW 111	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 111	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GAW 111	(80)1074	3 \ 100.0 min	0.82

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GRB 111	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 111	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GRB 111	(80)1074	3 \ 100.0 min	815.46

CS
Counted 28.807- 3 on C3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 111	GRB 111
Counts =	10613.000	2795.000
Gross cpm =	106.130	27.950
Background =	0.029	1.189
Observed CPM =	106.101	26.761
Cross talk fac =	0.006	0.224
True CPM =	106.083	2.961
Inst Std. Fac. =	1.136	1.003
Adjusted CPM =	120.511	2.970
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	820.850	7.272

2 Counts Done

(C)

pCi /smpl =	370.	3.28
1 sigma % Err =	0.971	18.229
2 sigma % Err =	1.904	35.729

(1 sigma err) = 3.59 0.597

(2 sigma err) = 7.04 1.17

LTV (95 %) = 376. 4.26

MDA (3.00) = 0.335 0.592

MDA (2.71) = 0.326 0.589

CRITICAL LEVEL = 0.122 0.260

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.029	1.189	0.00
SF	28.606	0	1.136	1.003	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GAW 111	(80) 903 18 \	10.0 min	0.42
27.957	27-JAN-03 14:58	GAW 111	BK \	927.5 min	0.00
28.606	28-JAN-03 6:32	GAW 111	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GRB 111	(80) 903 18 \	10.0 min	0.42
27.957	27-JAN-03 14:58	GRB 111	BK \	927.5 min	0.00
28.616	28-JAN-03 6:47	GRB 111	SF \	10.0 min	0.00

CS
Counted 35.853- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg		48.700 mg
Aliquot		Sample Weight		Counted Weight
		ALPHA	BETA	
Instrument =	GAW 115	GRB 115		
Counts =	13796.000	3552.000		
Gross cpm =	137.960	35.520		
Background =	0.051	1.539		
Observed CPM =	137.909	33.981		
Cross talk fac =	0.006	0.224		
True CPM =	137.891	3.045		
Inst Std. Fac. =	1.036	1.018		
Adjusted CPM =	142.855	3.100		
Eff (cpm/dpm) =	0.147	0.408		
DPM of Aliquot =	973.047	7.591		
pCi /smpl =	438.	3.42		
1 sigma % Err =	0.852	19.991		
2 sigma % Err =	1.670	39.182		
(1 sigma err) =	3.73	0.684		
(2 sigma err) =	7.32	1.34		
LTV (95 %) =	444.	4.55		
MDA (3.00) =	0.414	0.669		
MDA (2.71) =	0.405	0.666		
CRITICAL LEVEL =	0.161	0.319		

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	34.947	3	0.051	1.539	0.00
SF	35.623	0	1.036	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
35.650	4-FEB-03 7:36	GAW 115	(80)1074 6 \	1.0 min	155.36
35.655	4-FEB-03 7:43	GAW 115	(80)9036 3 \	100.0 min	4.76
35.753	4-FEB-03 10:04	GAW 115	(80)1074 4 \	100.0 min	0.21

Previous 3 counts	Time	Detector	ID	Length	Cpm
35.650	4-FEB-03 7:36	GRB 115	(80)1074 6 \	1.0 min	42.21
35.655	4-FEB-03 7:43	GRB 115	(80)9036 3 \	100.0 min	12.82
35.753	4-FEB-03 10:04	GRB 115	(80)1074 4 \	100.0 min	807.07

CS
Counted 37.648- 3 on D3 for 1.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 115	GRB 115
Counts =	153.000	37.000
Gross cpm =	153.000	37.000
Background =	0.054	1.510
Observed CPM =	152.946	35.490
Cross talk fac =	0.006	0.224
True CPM =	152.939	1.178
Inst Std. Fac. =	1.036	1.017
Adjusted CPM =	158.445	1.198
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	1079.236	2.934

2nd count
D

pCi /smpl =	486.	1.32
1 sigma % Err =	8.089	526.731
2 sigma % Err =	15.855	1032.393
(1 sigma err) =	39.3	6.96
(2 sigma err) =	77.1	13.6
LTV (95 %) =	551.	12.8
MDA (3.00) =	12.5	9.61
MDA (2.71) =	11.6	9.29
CRITICAL LEVEL =	1.66	3.16

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	36.943	3	0.054	1.510	0.00
SF	37.605	0	1.036	1.017	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
36.614	5-FEB-03 6:44	GAW 115	SF	10.0 min	0.00
36.943	5-FEB-03 14:37	GAW 115	BK	949.8 min	0.00
37.605	6-FEB-03 6:31	GAW 115	SF	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
36.658	5-FEB-03 7:47	GRB 115	SF	10.0 min	0.00
36.943	5-FEB-03 14:37	GRB 115	BK	949.8 min	0.00
37.618	6-FEB-03 6:49	GRB 115	SF	10.0 min	0.00

CS
Counted 44.652- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 115	GRB 115
Counts =	13939.000	3784.000
Gross cpm =	139.390	37.840
Background =	0.067	1.500
Observed CPM =	139.323	36.340
Cross talk fac =	0.006	0.224
True CPM =	139.293	5.090
Inst Std. Fac. =	1.039	1.017
Adjusted CPM =	144.725	5.176
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	985.785	12.674

pCi /smpl =	444.	5.71
1 sigma % Err =	0.848	12.323
2 sigma % Err =	1.662	24.154

(1 sigma err) = 3.76 0.704

(2 sigma err) = 7.38 1.38

LTV (95 %) = 450. 6.87

MDA (3.00) = 0.461 0.661

MDA (2.71) = 0.452 0.658

CRITICAL LEVEL = 0.185 0.315

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	43.940	3	0.067	1.500	0.00
SF	44.610	0	1.039	1.017	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
43.759	12-FEB-03 10:12	GAW 115	(93)8034 1 \	100.0 min	1.43
43.940	12-FEB-03 14:33	GAW 115	BK \	962.3 min	0.00
44.611	13-FEB-03 6:39	GAW 115	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
43.759	12-FEB-03 10:12	GRB 115	(93)8034 1 \	100.0 min	2.99
43.940	12-FEB-03 14:33	GRB 115	BK \	962.3 min	0.00
44.620	13-FEB-03 6:52	GRB 115	SF \	10.0 min	0.00

CS
Counted 20.778- 3 on C4 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	52.800 mg	52.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 112	GRB 112
Counts =	8836.000	2500.000
Gross cpm =	88.360	25.000
Background =	0.048	1.516
Observed CPM =	88.312	23.484
Cross talk fac =	0.006	0.226
True CPM =	88.291	3.495
Inst Std. Fac. =	1.155	1.006
Adjusted CPM =	101.976	3.516
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	717.537	8.635

pCi /smpl =	323.	3.89
1 sigma % Err =	1.065	14.734
2 sigma % Err =	2.087	28.879

(1 sigma err) = 3.44 0.573

(2 sigma err) = 6.75 1.12

LTV (95 %) = 329. 4.84

MDA (3.00) = 0.418 0.667

MDA (2.71) = 0.409 0.663

CRITICAL LEVEL = 0.162 0.317

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.048	1.516	0.00
SF	20.633	0	1.155	1.006	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GAW 112	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 112	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GAW 112	(80)1074 4	\ 100.0 min	0.80

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GRB 112	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 112	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GRB 112	(80)1074 4	\ 100.0 min	816.62

CS
Counted 28.807- 3 on C4 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	52.800 mg	52.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 112	GRB 112
Counts =	8662.000	2562.000
Gross cpm =	86.620	25.620
Background =	0.037	1.525
Observed CPM =	86.583	24.095
Cross talk fac =	0.006	0.226
True CPM =	86.556	4.499
Inst Std. Fac. =	1.156	1.007
Adjusted CPM =	100.059	4.530
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	704.047	11.126

2 Counts Done
(C)

pCi /smpl =	317.	5.01
1 sigma % Err =	1.075	11.581
2 sigma % Err =	2.108	22.700

(1 sigma err) = 3.41 0.580

(2 sigma err) = 6.69 1.14

LTV (95 %) = 323. 5.97

MDA (3.00) = 0.379 0.668

MDA (2.71) = 0.369 0.665

CRITICAL LEVEL = 0.142 0.318

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.037	1.525	0.00
SF	28.606	0	1.156	1.007	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GAW 112	(80) 903 19 \	10.0 min	0.41
27.957	27-JAN-03 14:58	GAW 112	BK \	927.5 min	0.00
28.606	28-JAN-03 6:32	GAW 112	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GRB 112	(80) 903 19 \	10.0 min	2.59
27.957	27-JAN-03 14:58	GRB 112	BK \	927.5 min	0.00
28.616	28-JAN-03 6:47	GRB 112	SF \	10.0 min	0.00

Reviewed _____ Date _____

Counted 37.920- 3 on D3 for 100.00 min.

1.00	smpl	52.800 mg	52.800 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 115	GRB 115
Counts =	11999.000	3189.000
Gross cpm =	119.990	31.890
Background =	0.054	1.510
Observed CPM =	119.936	30.380
Cross talk fac =	0.006	0.226
True CPM =	119.917	3.231
Inst Std. Fac. =	1.036	1.017
Adjusted CPM =	124.234	3.286
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	874.147	8.070

pCi /smpl =	394.	3.64
1 sigma % Err =	0.914	17.888
2 sigma % Err =	1.791	35.060

(1 sigma err) = 3.60 0.650

(2 sigma err) = 7.05 1.27

LTV (95 %) = 400. 4.71

MDA (3.00) = 0.438 0.665

MDA (2.71) = 0.428 0.662

CRITICAL LEVEL = 0.172 0.317

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	36.943	3	0.054	1.510	0.00
SF	37.605	0	1.036	1.017	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
37.648	6-FEB-03 7:33	GAW 115	(80)1074 7 \	1.0 min	158.43
37.654	6-FEB-03 7:41	GAW 115	(80)1074 3 \	100.0 min	0.46
37.849	6-FEB-03 12:22	GAW 115	(80)1074 4 \	100.0 min	0.32

Previous 3 counts	Time	Detector	ID	Length	Cpm
37.648	6-FEB-03 7:33	GRB 115	(80)1074 7 \	1.0 min	36.08
37.654	6-FEB-03 7:41	GRB 115	(80)1074 3 \	100.0 min	821.08
37.849	6-FEB-03 12:22	GRB 115	(80)1074 4 \	100.0 min	815.94

CS
Counted 38.748- 3 on D3 for 2.29 min. Reviewed _____ Date _____

1.00 smpl 52.800 mg 52.800 mg

Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	269.000	83.000
Gross cpm =	117.467	36.245
Background =	0.071	1.512
Observed CPM =	117.396	34.733
Cross talk fac =	0.006	0.226
True CPM =	117.348	8.165
Inst Std. Fac. =	1.037	1.018
Adjusted CPM =	121.690	8.312
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	856.246	20.414

2nd Count Done

D

pCi /smpl =	386.	9.20
1 sigma % Err =	6.105	49.730
2 sigma % Err =	11.966	97.472

(1 sigma err) = 23.5 4.57

(2 sigma err) = 46.2 8.96

LTV (95 %) = 425. 16.7

MDA (3.00) = 6.75 5.63

MDA (2.71) = 6.35 5.49

CRITICAL LEVEL = 1.30 2.09

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	38.133	3	0.071	1.512	0.00
SF	38.724	0	1.037	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
38.134	6-FEB-03 19:12	GAW 115	BK	685.8 min	0.00
38.612	7-FEB-03 6:41	GAW 115	SF	10.0 min	0.00
38.724	7-FEB-03 9:22	GAW 115	SF	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
38.624	7-FEB-03 6:58	GRB 115	SF	10.0 min	0.00
38.654	7-FEB-03 7:41	GRB 115	SF	10.0 min	0.00
38.688	7-FEB-03 8:30	GRB 115	SF	10.0 min	0.00

CS
Counted 44.756- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	52.800 mg	52.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 114	GRB 114
Counts =	11254.000	2895.000
Gross cpm =	112.540	28.950
Background =	0.052	2.440
Observed CPM =	112.488	26.510
Cross talk fac =	0.006	0.226
True CPM =	112.482	1.044
Inst Std. Fac. =	1.043	1.012
Adjusted CPM =	117.319	1.057
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	825.489	2.595

pCi /smpl =	372.	1.17
1 sigma % Err =	0.943	53.659
2 sigma % Err =	1.849	105.172

(1 sigma err) = 3.51 0.627

(2 sigma err) = 6.88 1.23

LTV (95 %) = 378. 2.20

MDA (3.00) = 0.431 0.837

MDA (2.71) = 0.422 0.834

CRITICAL LEVEL = 0.168 0.403

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	43.940	3	0.052	2.440	0.00
SF	44.610	0	1.043	1.012	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
44.611	13-FEB-03 6:39	GAW 114	SF	10.0 min	0.00
44.652	13-FEB-03 7:38	GAW 114	(93)1074	6 \ 100.0 min	158.39
44.652	13-FEB-03 7:38	GAW 114	(80)1074	6 \ 100.0 min	158.39

Previous 3 counts	Time	Detector	ID	Length	Cpm
44.620	13-FEB-03 6:52	GRB 114	SF	10.0 min	0.00
44.652	13-FEB-03 7:38	GRB 114	(93)1074	6 \ 100.0 min	34.61
44.652	13-FEB-03 7:38	GRB 114	(80)1074	6 \ 100.0 min	34.61

19-FEB-03
12:25:20

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- BR1 80
CALIBRATION Std.

CS
Counted 50.656- 3 on B1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 105	GRB 105
Counts =	9377.000	2649.000
Gross cpm =	93.770	26.490
Background =	0.021	1.529
Observed CPM =	93.749	24.961
Cross talk fac =	0.006	0.225
True CPM =	93.726	3.877
Inst Std. Fac. =	1.147	1.024
Adjusted CPM =	107.504	3.970
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	739.751	9.731

pCi /smpl =	333.	4.38
1 sigma % Err =	1.033	13.652
2 sigma % Err =	2.025	26.758

(1 sigma err) = 3.44 0.598

(2 sigma err) = 6.75 1.17

LTV (95 %) = 339. 5.37

MDA (3.00) = 0.302 0.668

MDA (2.71) = 0.293 0.665

CRITICAL LEVEL = 0.105 0.318

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	49.916	3	0.021	1.529	0.00
SF	50.610	0	1.147	1.024	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.918	14-FEB-03 14:01	GAW 105	BK	\ 5342.8 min	0.00
49.916	18-FEB-03 13:59	GAW 105	BK	\ 995.9 min	0.00
50.610	19-FEB-03 6:38	GAW 105	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.918	14-FEB-03 14:01	GRB 105	BK	\ 5342.8 min	0.00
49.916	18-FEB-03 13:59	GRB 105	BK	\ 995.9 min	0.00
50.626	19-FEB-03 7:01	GRB 105	SF	\ 10.0 min	0.00

19-FEB-03
12:25:19

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- BR1 80
CALIBRATION Std.

CS
Counted 45.792- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 114	GRB 114
Counts =	12507.000	3357.000
Gross cpm =	125.070	33.570
Background =	0.052	2.440
Observed CPM =	125.018	31.130
Cross talk fac =	0.006	0.225
True CPM =	125.000	3.011
Inst Std. Fac. =	1.044	1.012
Adjusted CPM =	130.500	3.047
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	897.994	7.468

pCi /smpl =	405.	3.36
1 sigma % Err =	0.895	19.928
2 sigma % Err =	1.754	39.059

(1 sigma err) = 3.62 0.670

(2 sigma err) = 7.09 1.31

LTV (95 %) = 410. 4.47

MDA (3.00) = 0.422 0.835

MDA (2.71) = 0.413 0.832

CRITICAL LEVEL = 0.165 0.402

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	43.940	3	0.052	2.440	0.00
SF	45.607	0	1.044	1.012	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.654	14-FEB-03 7:41	GAW 114	(93) 7437 5 \	100.0 min	8.50
45.751	14-FEB-03 10:01	GAW 114	(80) 903 44 \	10.0 min	0.36
45.783	14-FEB-03 10:47	GAW 114	(80) 903 53 \	10.0 min	0.15

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.654	14-FEB-03 7:41	GRB 114	(93) 7437 5 \	100.0 min	21.47
45.751	14-FEB-03 10:01	GRB 114	(80) 903 44 \	10.0 min	0.36
45.783	14-FEB-03 10:47	GRB 114	(80) 903 53 \	10.0 min	0.97

14-FEB-03
13:32:36

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- BR1 80
CALIBRATION Std.

CS
Counted 45.792- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smp1	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 114	GRB 114
Counts =	12507.000	3357.000
Gross cpm =	125.070	33.570
Background =	0.052	2.440
Observed CPM =	125.018	31.130
Cross talk fac =	0.006	0.225
True CPM =	125.000	3.011
Inst Std. Fac. =	1.044	1.012
Adjusted CPM =	130.500	3.047
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	897.994	7.468

pCi /smp1 =	405.	3.36
1 sigma % Err =	0.895	19.928
2 sigma % Err =	1.754	39.059

(1 sigma err) = 3.62 0.670

(2 sigma err) = 7.09 1.31

LTV (95 %) = 410. 4.47

MDA (3.00) = 0.422 0.835

MDA (2.71) = 0.413 0.832

CRITICAL LEVEL = 0.165 0.402

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	43.940	3	0.052	2.440	0.00
SF	45.607	0	1.044	1.012	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.654	14-FEB-03 7:41	GAW 114	(93)7437	5 \ 100.0 min	8.50
45.751	14-FEB-03 10:01	GAW 114	(80) 903	44 \ 10.0 min	0.36
45.783	14-FEB-03 10:47	GAW 114	(80) 903	53 \ 10.0 min	0.15

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.654	14-FEB-03 7:41	GRB 114	(93)7437	5 \ 100.0 min	21.47
45.751	14-FEB-03 10:01	GRB 114	(80) 903	44 \ 10.0 min	0.36
45.783	14-FEB-03 10:47	GRB 114	(80) 903	53 \ 10.0 min	0.97

21-FEB-03
10:17:02

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- BR1 80
CALIBRATION Std.

CS
Counted 52.655- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 109	GRB 109
Counts =	9219.000	2631.000
Gross cpm =	92.190	26.310
Background =	0.058	1.032
Observed CPM =	92.132	25.278
Cross talk fac =	0.006	0.225
True CPM =	92.105	4.559
Inst Std. Fac. =	1.168	1.018
Adjusted CPM =	107.578	4.641
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	740.267	11.374

pCi /smpl =	333.	5.12
1 sigma % Err =	1.043	11.470
2 sigma % Err =	2.044	22.480

(1 sigma err) =	3.48	0.588
(2 sigma err) =	6.82	1.15
LTV (95 %) =	339.	6.09
MDA (3.00) =	0.440	0.555
MDA (2.71) =	0.431	0.551
CRITICAL LEVEL =	0.174	0.261

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME

BKG	52.114	3	0.058	1.032	0.00
SF	52.615	0	1.168	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm

51.900	20-FEB-03 13:36	GAW 109	(93)2001 1 \	300.0 min	0.08
52.114	20-FEB-03 18:44	GAW 109	BK \	718.4 min	0.00
52.615	21-FEB-03 6:45	GAW 109	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm

51.900	20-FEB-03 13:36	GRB 109	(93)2001 1 \	300.0 min	0.28
52.114	20-FEB-03 18:44	GRB 109	BK \	718.4 min	0.00
52.626	21-FEB-03 7:01	GRB 109	SF \	10.0 min	0.00

23-FEB-03
08:58:07

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- BR1 80
CALIBRATION Std.

CS
Counted 52.892- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 114	GRB 114
Counts =	12027.000	3002.000
Gross cpm =	120.270	30.020
Background =	0.043	2.472
Observed CPM =	120.227	27.548
Cross talk fac =	0.006	0.225
True CPM =	120.224	0.504
Inst Std. Fac. =	1.044	1.009
Adjusted CPM =	125.514	0.508
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	863.683	1.245

pCi /smpl =	389.	0.561
1 sigma % Err =	0.912	113.186
2 sigma % Err =	1.788	221.845

(1 sigma err) = 3.55 0.635

(2 sigma err) = 6.96 1.24

LTV (95 %) = 395. 1.61

MDA (3.00) = 0.392 0.840

MDA (2.71) = 0.383 0.837

CRITICAL LEVEL = 0.150 0.404

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	52.114	3	0.043	2.472	0.00
SF	52.617	0	1.044	1.009	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
52.114	20-FEB-03 18:44	GAW 114	BK	718.5 min	0.00
52.617	21-FEB-03 6:48	GAW 114	SF	10.0 min	0.00
52.656	21-FEB-03 7:44	GAW 114	(93)2000 4	300.0 min	4.38

Previous 3 counts	Time	Detector	ID	Length	Cpm
52.114	20-FEB-03 18:44	GRB 114	BK	718.5 min	0.00
52.626	21-FEB-03 7:01	GRB 114	SF	10.0 min	0.00
52.656	21-FEB-03 7:44	GRB 114	(93)2000 4	300.0 min	10.40

CS
Counted 50.656- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----	-----	-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 114	GRB 114
Counts =	15119.000	3552.000
Gross cpm =	151.190	35.520
Background =	0.055	2.486
Observed CPM =	151.135	33.034
Cross talk fac =	0.006	0.215
True CPM =	151.132	0.556
Inst Std. Fac. =	1.045	1.010
Adjusted CPM =	157.933	0.561
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	919.206	1.355

pCi /smpl =	414.	0.610
1 sigma % Err =	0.814	110.916
2 sigma % Err =	1.595	217.396

(1 sigma err) = 3.37 0.677

(2 sigma err) = 6.60 1.33

LTV (95 %) = 420. 1.73

MDA (3.00) = 0.365 0.830

MDA (2.71) = 0.357 0.827

CRITICAL LEVEL = 0.143 0.399

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	49.916	3	0.055	2.486	0.00
SF	50.610	0	1.045	1.010	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.918	14-FEB-03 14:01	GAW 114	BK	\ 5342.9 min	0.00
49.916	18-FEB-03 13:59	GAW 114	BK	\ 995.9 min	0.00
50.610	19-FEB-03 6:38	GAW 114	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.918	14-FEB-03 14:01	GRB 114	BK	\ 5342.9 min	0.00
49.916	18-FEB-03 13:59	GRB 114	BK	\ 995.9 min	0.00
50.622	19-FEB-03 6:55	GRB 114	SF	\ 10.0 min	0.00

CS
Counted 50.728- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 114	GRB 114
Counts =	13006.000	3332.000
Gross cpm =	130.060	33.320
Background =	0.055	2.486
Observed CPM =	130.005	30.834
Cross talk fac =	0.006	0.224
True CPM =	129.995	1.670
Inst Std. Fac. =	1.045	1.010
Adjusted CPM =	135.845	1.686
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	925.298	4.129

pCi /smpl =	417.	1.86
1 sigma % Err =	0.877	35.840
2 sigma % Err =	1.720	70.246

(1 sigma err) = 3.66 0.667

(2 sigma err) = 7.17 1.31

LTV (95 %) = 423. 2.96

MDA (3.00) = 0.427 0.842

MDA (2.71) = 0.418 0.839

CRITICAL LEVEL = 0.168 0.405

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	49.916	3	0.055	2.486	0.00
SF	50.610	0	1.045	1.010	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
49.916	18-FEB-03 13:59	GAW 114	BK	995.9 min	0.00
50.610	19-FEB-03 6:38	GAW 114	SF	10.0 min	0.00
50.656	19-FEB-03 7:44	GAW 114	(80)1074 6	100.0 min	157.90

Previous 3 counts	Time	Detector	ID	Length	Cpm
49.916	18-FEB-03 13:59	GRB 114	BK	995.9 min	0.00
50.622	19-FEB-03 6:55	GRB 114	SF	10.0 min	0.00
50.656	19-FEB-03 7:44	GRB 114	(80)1074 6	100.0 min	33.36

EBERLINE SERVICES

ANALYTICAL SERVICES GROUP

Richmond, CA Laboratory

Implementation of Primary Calibration

Ra228/5

Nuclide Ac 228

Date 7/7/01

Calibration Title AC228PGRB0701

Detectors GRB 201-232

Place P-factor(s) in Constants file

Date:

By:

7-7-1

wt

List P-Factor(s) 3.175

Create RCE Curve File(s)

7-7-1

wt

List File name(s): AC228GRB.PPT

Other (list)

Place Documentation in Calibration files

06.12.03

LGJ

Update Calibration Log

06.12.03

LGJ

Comments:

Ac-228 Primary Calibration

00-May-2001

AC228PGRB0701

A primary calibration for Ac-228 was performed in early 2001 by taking 16 aliquots of Ra-228 (stock # R1-A and adding various amounts of Y oxalate with 9 hydrates (stock # E-A2-(07)) so as to generate an efficiency curve between 1 and 75 mgs. (see attachment 1; 'planchet Log-In sheet').

Each planchet produced by following procedure XX-000 was counted on several of the beta counters in the Eberline Services LB4110 Gross Beta detector system over a 24 hour period. (see attachment 2: 'raw counting data').

The results of the counting produced a series of results (table 1) that was used to generate a relative efficiency curve (figure I). These results were normalized to 12.00 mg/cm² assuming an area of 3.30 cm². (see table 2) to produce a PPT curve (see figure II) with a normalized efficiency of 0.315.

In keeping with the practice at Eberline Services of using P-factors one was calculated $(1.0 / 0.315) = 3.175$.

Using the results of table 2 a table of PPT vs correction factors was generated. These were placed into the DEC data base to be used by Eberline Services Spline table lookup routines (see table 3).

The above P-factor and Spline table were put into effect on 07-July-2001.

The following attachments are attached at the end of this summary:

- A. Copy of QA departments notebooks for standardizations of Ra-228 stock # R1-A and Y stock # E-A2-(07).
- B. Copy of Laboratory planchet Log_in sheets about the preparation of the planchets.
- C. Raw counting data.
- D. Copy of spread sheets used to generate the Spline table.

Thermo NUtech Richmond

Originator: A Chuc 1/31/01

Logged by: BB

Date: 1-31-01

PLANCHET LOG-IN

Notebook Ref: _____

Date: _____

GROUP	SAMPLE	ELM	TYPE	GEO	AMOUNT COUNTED	AMOUNT RECOV.	1ST SEP TIME	FINAL SEP TIME	ALIQUOT & UNITS	Carrier/Tracer	
										#mLs. Elm.	Iso. I.D.
1067	25	Ac			3.98		29.733	31.774	1.0 sample	0.20	E-A2-(07)
	26				7.56					0.30	
	27				11.78					0.40	
	28				15.23					0.50	
	29				19.54					0.60	
	30				24.15					0.70	
	31				29.09					0.80	
	32				31.40					0.90	
	33				31.98					1.0	
	34				40.66					1.2	
	35				51.84					1.4	
	36				58.92					1.6	
	37				66.78					1.8	
↓	38				75.68		↓	↓	↓	2.0	↓

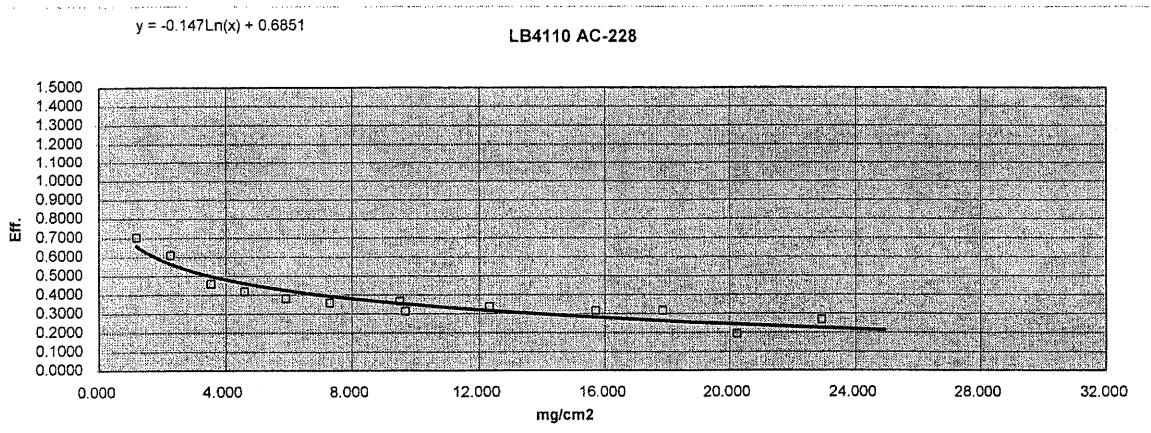
162

LB4110 1" Nylon Planchet with yttrium oxalate mount

TRACER:

Ra-228; R1-A-14
 Tzero = 189.708 2000
 DPM/ML 71.01 LAMBDA = 3.30E-04 (5.75 YEARS)
 MG/ML 40.15

Gram Rcvd	mG/cm2	mL carrier	SAMPLE	Tc	CPM	DELTA	DECAY	Yield	CZERO	EFF	PPT
3.98	1.206	0.200	25	31.774	23.070	208.066	0.93363	0.49564	49.9	0.7021	
7.56	2.291	0.300	26	31.774	25.274	208.066	0.93363	0.62765	43.1	0.6074	
11.78	3.570	0.400	27	31.774	22.300	208.066	0.93363	0.73350	32.6	0.4586	1.467454
15.23	4.615	0.500	28	31.774	21.010	208.066	0.93363	0.75866	29.7	0.4177	1.336672
19.54	5.921	0.600	29	31.774	20.435	208.066	0.93363	0.81112	27.0	0.3800	1.216007
24.15	7.318	0.700	30	31.774	20.324	208.066	0.93363	0.85928	25.3	0.3568	1.141651
31.40	9.515	0.900	32	31.774	20.980	208.066	0.93363	0.86896	25.9	0.3642	1.165375
31.98	9.691	1.000	33	31.774	16.503	208.066	0.93363	0.79651	22.2	0.3125	1.000072
40.66	12.321	1.200	34	31.774	18.841	208.066	0.93363	0.84392	23.9	0.3367	1.077576
51.84	15.709	1.400	35	31.774	19.194	208.066	0.93363	0.92226	22.3	0.3139	1.004546
58.92	17.855	1.600	36	31.774	19.229	208.066	0.93363	0.91719	22.5	0.3162	1.011947
66.78	20.236	1.800	37	31.774	11.833	208.066	0.93363	0.92403	13.7	0.1932	
75.68	22.933	2.000	38	31.774	16.647	208.066	0.93363	0.94247	18.9	0.2664	



77

76

Lab Entry	Group Number	Sample Date	Analysis	Rep By	Volume	ID#	Standard	Total Activity DPM	Activity Date	Standard Wt (g)	Matrix	Container	Remarks
424	1067	11/2/60	AC 228	CS	1.0 ml	R0 228	RFA-A	7101	189,708-00	1.01	- .1M HCl	50ml Poly Tube	AC 228 CURVE
425			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	Lab
426			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
427			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
428			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
429			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
430			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
431			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
432			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
433			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
434			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
435			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
436	1067	12/1/60	AC 228	CS	1.0 ml	R0 228	RFA-A	7101	189,708-00	1.01	- .1M HCl	50ml Poly Tube	AC 228 2. He D
437			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	Lab
438			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
439			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
440			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
441			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
442			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
443			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
444			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
445			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
446			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
447			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
448	1067	11/27/60	AC 228	CS	1.0 ml	R0 228	RFA-A	7101	189,708-00	1.01	- .1M HCl	50ml Poly Tube	
449			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
450			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
451			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
452			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
453			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
454			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
455			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
456			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
457			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	

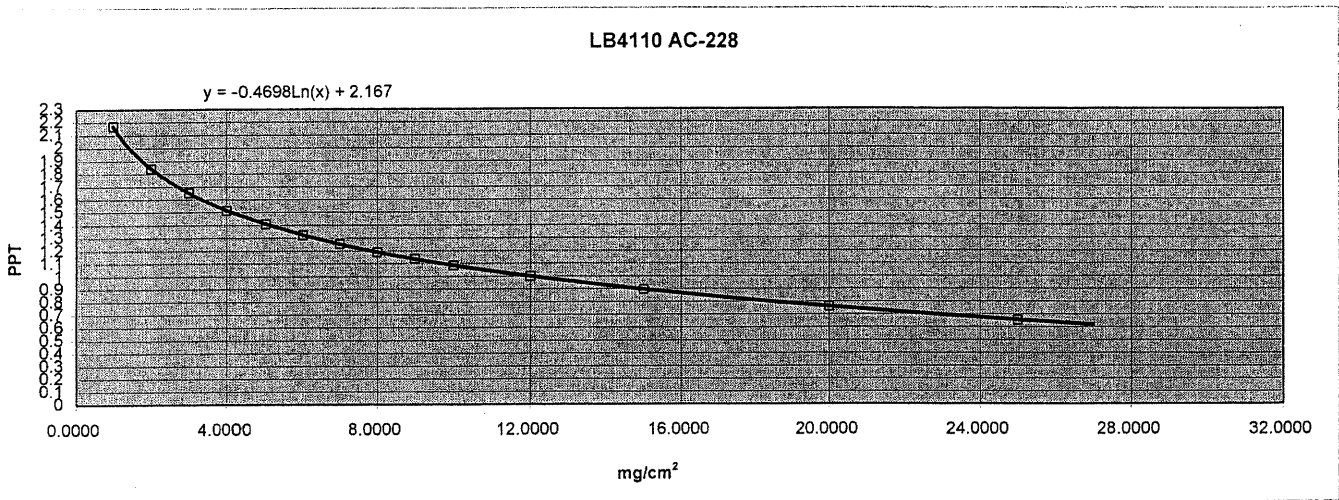
Lab Entry	Group Number	Sample Date	Analysis	Rep By	Volume	ID#	Standard	Total Activity DPM	Activity Date	Standard Wt (g)	Matrix	Container	Remarks
424	1067	11/2/60	AC 228	CS	1.0 ml	R0 228	RFA-A	7101	189,708-00	1.01	- .1M HCl	50ml Poly Tube	AC 228 CURVE
425			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	Lab
426			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
427			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
428			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
429			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
430			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
431			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
432			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
433			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
434			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
435			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
436	1067	12/1/60	AC 228	CS	1.0 ml	R0 228	RFA-A	7101	189,708-00	1.01	- .1M HCl	50ml Poly Tube	AC 228 2. He D
437			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	Lab
438			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
439			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
440			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
441			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
442			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
443			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
444			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
445			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
446			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
447			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	"
448	1067	11/27/60	AC 228	CS	1.0 ml	R0 228	RFA-A	7101	189,708-00	1.01	- .1M HCl	50ml Poly Tube	
449			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
450			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
451			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
452			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
453			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
454			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
455			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
456			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	
457			AC 228	RP	1.0 ml	R0 228	RFA-A	7101	"	1.01	"	"	

79

78

Log Book Entry	Group & Sample Number	Date	Assay / Size / Reg	Prep By	Volume	Std	Activity DATE	Std WTS	Matrix	Container	Grid #	Comments
	10-67-35	1/24/01	Ac 228	CS RP	1.0 ml		189,708-00	1.01	-	50 ml Poly Tube		
458	10-67-36	"	"	"	1.0 ml		"	1.01				
459	10-67-37	"	"	"	1.0 ml		"	1.01				
460	10-67-38	"	"	"	1.0 ml		"	1.01				
461												

mg/cm2	PPT	Eff.
0.0000		
1.0000	2.168	0.683
2.0000	1.841	0.58
3.0000	1.651	0.52
4.0000	1.514	0.477
5.0000	1.41	0.444
6.0000	1.323	0.417
7.0000	1.254	0.395
8.0000	1.19	0.375
9.0000	1.137	0.358
10.0000	1.086	0.342
12.0000	1	0.315
15.0000	0.895	0.282
20.0000	0.759	0.239
25.0000	0.654	0.206



02-FEB-01
09:19:13
R011183
ACC

TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 25

Ac

Reviewed AK Date 2-2-01

Ac 228

Counter GRB 217
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.136	0.	0.0	0.00	0.000	0.00		8.64	8.64

CPM corrected for decay to Sept. Time. : 23.0697

Elapsed time (days) = 0.000
 Lambda = 3.300E-04 Reciprocal days
 exp(-lambda X t) (1)= 1.000E+00
 Chemical yield (2)= 1.3258
 PPT. correction (3)= 0.9700 (recovery = 3.980 mgs)
 Aliquot (4)= 1.000 smpl

Product (1X2X3X4) = 1.285977E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
1.7939E+01	1.8280	3.2793E+01	9.7470E-01	2.97 %

LTV 3.4401E+01

1st point MDA 1.3384E+00

DPM OF ALIQUOT 3.279E+01

Saved answer = 3.279E+01 2.97% (DPM of aliquot) (28516)



1067 - 25 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @ 32.136	Error	
32.136	GRB	217	838	100.0	0.37	1.021	8.97	8.97	3.7%
32.208	GRB	217	381	60.0	0.37	1.021	6.45	7.84	5.5%
32.258	GRB	217	381	60.0	0.37	1.021	6.45	8.98	5.5%
32.740	GRB	217	182	100.0	0.37	1.021	1.62	8.34	9.8%
32.828	GRB	221	160	100.0	0.38	1.014	1.35	8.84	11.1%
Weighted average							8.64	3.0%	

Error shown is 1.2 times that expected from counting statistics.

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

8.9675E+00 8.9675E+00 3.2818E-01 8.6369E+00 2.5671E-01 2.9723E+00
8.9675E+00 8.9675E+00 3.2818E-01 8.6369E+00 2.5671E-01 2.9723E+00

06-FEB-01
13:10:05
R0111B3
ACC

TMA 169
Beta Counting Data
AUTOB V 2.07

1067- 26

Ac

Reviewed AK Date 2-6-01

Ac 228

Counter GRB 218
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.136	0.	0.0	0.00	0.000	0.00		9.46	9.46

CPM corrected for decay to Sept. Time. : 25.2742

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 1.000E+00
Chemical yield (2) = 1.6789
PPT. correction (3) = 0.9965 (recovery = 7.560 mgs)
Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 1.672989E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
1.5107E+01	1.8280	2.7616E+01	6.5148E-01	2.36 %

LTV 2.8691E+01

1st point MDA 9.8384E-01

DPM OF ALIQUOT 2.762E+01

Saved answer = 2.762E+01 2.36% (DPM of aliquot) (29365)

1067 - 26 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @ 32.136	Error
32.136	GRB 218	901	100.0	0.35	1.005	9.55	9.55	3.5%
32.208	GRB 218	463	60.0	0.35	1.005	7.83	9.52	4.9%
32.258	GRB 218	409	60.0	0.35	1.005	6.87	9.57	5.3%
32.740	GRB 218	207	100.0	0.35	1.005	1.90	9.76	8.7%
32.828	GRB 222	144	100.0	0.35	1.006	1.21	7.89	11.6%
Weighted average							9.46	2.4%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

9.5481E+00 9.5481E+00 3.3423E-01 9.4623E+00 2.2322E-01 2.3591E+00
 9.5481E+00 9.5481E+00 3.3423E-01 9.4623E+00 2.2322E-01 2.3591E+00

01-FEB-01
23:31:53
R011183
ACC

171
TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 27

Ac

Reviewed AK Date 2-2-01

Ac 228

Counter GRB 219
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.136	0.	0.0	0.00	0.000	0.00		8.35	8.35

CPM corrected for decay to Sept. Time. : 22.3003

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 1.000E+00
Chemical yield (2) = 1.9620
PPT. correction (3) = 1.0050 (recovery = 11.78 mgs)
Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 1.971835E+00

C-zero	P-factor	dpm/smpl	dpm error	1 sigma percent sigma
1.1309E+01	1.8280	2.0674E+01	5.2447E-01	2.54 %

LTV 2.1539E+01

1st point MDA 8.5999E-01

DPM OF ALIQUOT 2.067E+01

Saved answer = 2.067E+01 2.54% (DPM of aliquot) (28159)

(P)

1067 - 27 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM	Error
							@ 32.136	
32.136	GRB	219	803	100.0	0.37	1.012	8.51	3.7%
32.208	GRB	219	410	60.0	0.37	1.012	6.92	5.3%
32.258	GRB	219	343	60.0	0.37	1.012	5.72	5.8%
32.740	GRB	219	172	100.0	0.37	1.012	1.50	10.2%
32.856	GRB	207	156	100.0	0.36	1.047	1.38	11.0%
33.210	GRB	231	74	100.0	0.41	1.026	0.37	29.7%
Weighted average							8.35	2.5%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

8.5065E+00 8.5065E+00 3.1846E-01 8.3489E+00 2.1180E-01 2.5369E+00
8.5065E+00 8.5065E+00 3.1846E-01 8.3489E+00 2.1180E-01 2.5369E+00

01-FEB-01
23:32:43
R011183
ACC

173
TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 28 Ac

Reviewed AK Date 2-2-1

Ac 228

Counter GRB 220
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.136	0.	0.0	0.00	0.000	0.00		7.87	7.87

CPM corrected for decay to Sept. Time. : 21.0095

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 1.000E+00
Chemical yield (2) = 2.0273
PPT. correction (3) = 1.0032 (recovery = 15.23 mgs)
Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 2.035715E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
1.0320E+01	1.8280	1.8866E+01	4.9387E-01	2.62 %

LTV 1.9681E+01

1st point MDA 8.0734E-01

DPM OF ALIQUOT 1.887E+01

Saved answer = 1.887E+01 2.62% (DPM of aliquot) (28160)

1067 - 28 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @ 32.136	Error
32.136	GRB	220	782	100.0	0.35	1.007	8.25	3.8%
32.208	GRB	220	367	60.0	0.35	1.007	6.14	5.6%
32.258	GRB	220	343	60.0	0.35	1.007	5.72	5.8%
32.740	GRB	220	164	100.0	0.35	1.007	1.43	10.4%
32.856	GRB	208	134	100.0	0.47	1.037	0.99	14.9%
33.210	GRB	232	67	100.0	0.36	1.024	0.34	30.3%
Weighted average							7.87	2.6%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

8.2545E+00 8.2545E+00 3.1242E-01 7.8656E+00 2.0591E-01 2.6178E+00
8.2545E+00 8.2545E+00 3.1242E-01 7.8656E+00 2.0591E-01 2.6178E+00

02-FEB-01
15:33:19
R011183
ACC

TMA Corporation
Beta Counting Data
AUTOB V 2 07

1067- 29

Ac

Reviewed _____ Date _____

Ac 228

Counter GRB 221
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.113	0.	0.0	0.00	0.000	0.00		8.14	8.14

CPM corrected for decay to Sept. Time. : 20.4348

Elapsed time (days) = 0.000
 Lambda = 3.300E-04 Reciprocal days
 exp(-lambda X t) (1)= 1.000E+00
 Chemical yield (2)= 2.1697
 PPT. correction (3)= 1.0002 (recovery = 19.54 mgs)
 Aliquot (4)= 1.000 smpl

Product (1X2X3X4) = 2.170007E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
9.4169E+00	1.8280	1.7214E+01	4.6224E-01	2.69 %

LTV 1.7977E+01

1st point MDA 7.4959E-01

DPM OF ALIQUOT 1.721E+01

Saved answer = 1.721E+01 2.69% (DPM of aliquot) (28161)

1067 - 29 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM	
							@ 32.113	Error
32.113	GRB 221	771	100.0	0.38	1.014	8.15	8.15	3.8%
32.208	GRB 221	357	60.0	0.38	1.014	5.97	7.72	5.7%
32.257	GRB 221	347	60.0	0.38	1.014	5.79	8.56	5.8%
32.741	GRB 221	185	100.0	0.38	1.014	1.63	8.96	9.8%
33.213	GRB 202	60	100.0	0.36	1.039	0.27	5.35	37.5%
33.783	GRB 217	31	60.0	0.38	1.021	0.15	13.72	75.7%
Weighted average							8.14	2.7%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

8.1495E+00 8.1495E+00 3.1317E-01 8.1433E+00 2.1867E-01 2.6853E+00
 8.1495E+00 8.1495E+00 3.1317E-01 8.1433E+00 2.1867E-01 2.6853E+00

02-FEB-01
15:33:52
R011183
ACC

TMA Corporation
Beta Counting Data
AUTOD V 2.07

1067- 30

Ac

Reviewed _____ Date _____

Ac 228

Counter GRB 222
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.113	0.	0.0	0.00	0.000	0.00		8.10	8.10

CPM corrected for decay to Sept. Time. : 20.3242

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 1.000E+00
Chemical yield (2) = 2.2985
PPT. correction (3) = 0.9960 (recovery = 24.15 mgs)
Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 2.289378E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
8.8776E+00	1.8280	1.6228E+01	4.3225E-01	2.66 %

LTV 1.6941E+01

1st point MDA 6.7203E-01

DPM OF ALIQUOT 1.623E+01

Saved answer = 1.623E+01 2.66% (DPM of aliquot) (28162)

1067 - 30 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM	
							@ 32.113	Error
32.113	GRB	222	761	100.0	0.35	1.006	8.02	3.8%
32.208	GRB	222	368	60.0	0.35	1.006	6.16	5.6%
32.257	GRB	222	343	60.0	0.35	1.006	5.71	5.8%
32.741	GRB	222	166	100.0	0.35	1.006	1.45	10.3%
33.213	GRB	203	78	100.0	0.34	1.039	0.50	22.3%
33.783	GRB	218	23	60.0	0.36	1.005	0.03	373.2%
Weighted average							8.10	2.7%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

8.0167E+00 8.0167E+00 3.0794E-01 8.0992E+00 2.1573E-01 2.6636E+00
 8.0167E+00 8.0167E+00 3.0794E-01 8.0992E+00 2.1573E-01 2.6636E+00

02-FEB-01
15:34:24
R011183
ACC

TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 31

Ac

Reviewed _____ Date _____

Ac 228

Counter GRB 223
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.113	0.	0.0	0.00	0.000	0.00		7.25	7.25

CPM corrected for decay to Sept. Time. : 18.2036

Elapsed time (days) = 0.000
 Lambda = 3.300E-04 Reciprocal days
 exp(-lambda X t) (1) = 1.000E+00
 Chemical yield (2) = 2.4226
 PPT. correction (3) = 0.9875 (recovery = 29.09 mgs)
 Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 2.392218E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
7.6095E+00	1.8280	1.3910E+01	3.9871E-01	2.87 %

LTV 1.4568E+01

1st point MDA 6.7919E-01

DPM OF ALIQUOT 1.391E+01

Saved answer = 1.391E+01 2.87% (DPM of aliquot) (28173)

1067 - 31 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @ 32.113	Error
32.113	GRB	223	703	100.0	0.39	1.012	7.38	4.1%
32.208	GRB	223	354	60.0	0.39	1.012	5.90	5.7%
32.257	GRB	223	278	60.0	0.39	1.012	4.55	6.6%
32.741	GRB	223	162	100.0	0.39	1.012	1.37	11.0%
33.213	GRB	204	58	100.0	0.42	1.040	0.18	56.7%
33.783	GRB	219	17	60.0	0.36	1.012	-0.09	100.9%
Weighted average							7.25	2.9%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

7.3772E+00 7.3772E+00 2.9886E-01 7.2542E+00 2.0793E-01 2.8663E+00
7.3772E+00 7.3772E+00 2.9886E-01 7.2542E+00 2.0793E-01 2.8663E+00

02-FEB-01
15:32:46
R011183
ACC

TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 32

Ac

Reviewed _____ Date _____

Ac 228

Counter ORB 224
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.113	0.	0.0	0.00	0.000	0.00		8.36	8.36

CPM corrected for decay to Sept. Time. : 20.9804

Elapsed time (days) = 0.000
 Lambda = 3.300E-04 Reciprocal days
 exp(-lambda X t) (1) = 1.000E+00
 Chemical yield (2) = 2.3244
 PPT. correction (3) = 0.9808 (recovery = 31.40 mgs)
 Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 2.279861E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
9.2025E+00	1.8280	1.6822E+01	4.4022E-01	2.62 %

LTV 1.7548E+01

1st point MDA 6.8591E-01

DPM OF ALIQUOT 1.682E+01

Saved answer = 1.682E+01 2.62% (DPM of aliquot) (28174)

1067 - 32 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S.F.	CPM	CPM	Error
							@ 32.113	
32.113	GRB	224	783	100.0	0.36	1.000	8.19	3.8%
32.208	GRB	224	396	60.0	0.36	1.000	6.60	5.4%
32.257	GRB	224	346	60.0	0.36	1.000	5.71	5.8%
32.741	GRB	224	179	100.0	0.36	1.000	1.56	9.9%
33.337	GRB	203	226	400.0	0.34	1.039	0.33	25.1%
33.758	GRB	221	34	60.0	0.38	1.014	0.19	59.2%
Weighted average							8.36	2.6%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

8.1917E+00 8.1917E+00 3.1074E-01 8.3607E+00 2.1879E-01 2.6169E+00
8.1917E+00 8.1917E+00 3.1074E-01 8.3607E+00 2.1879E-01 2.6169E+00

01-FEB-01
19:14:21
R011183
ACC

TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 33

Ac

Reviewed AK Date 2-2-1

Ac 228

Counter GRB 229
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.112	0.	0.0	0.00	0.000	0.00		6.59	6.59

CPM corrected for decay to Sept. Time. : 16.5033

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1)= 1.000E+00
Chemical yield (2)= 2.1306
PPT. correction (3)= 0.9791 (recovery = 31.98 mgs)
Aliquot (4)= 1.000 smpl

Product (1X2X3X4) = 2.086031E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
7.9113E+00	1.8280	1.4462E+01	4.2415E-01	2.93 %

LTV 1.5162E+01

1st point MDA 7.9542E-01

DPM OF ALIQUOT 1.446E+01

Saved answer = 1.446E+01 2.93% (DPM of aliquot) (28175)

1067 - 33 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @ 32.112	Error
32.112	GRB	229	635	100.0	0.40	1.025	6.70	4.3%
32.208	GRB	229	297	60.0	0.40	1.025	6.41	6.4%
32.257	GRB	229	266	60.0	0.40	1.025	6.49	6.8%
32.740	GRB	229	143	100.0	0.40	1.025	6.37	12.5%
32.829	GRB	217	123	100.0	0.37	1.021	6.70	14.0%
32.852	GRB	229	127	100.0	0.40	1.025	7.30	14.1%
Weighted average							6.59	2.9%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

6.6960E+00 6.6960E+00 2.8839E-01 6.5945E+00 1.9340E-01 2.9328E+00
6.6960E+00 6.6960E+00 2.8839E-01 6.5945E+00 1.9340E-01 2.9328E+00

01-FEB-01
19:15:04
R011183
ACC

185
TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 34

Ac

Reviewed AK Date 2-2-1

Ac 228

Counter GRB 230
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.112	0.	0.0	0.00	0.000	0.00		7.53	7.53

CPM corrected for decay to Sept. Time. : 18.8406

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 1.000E+00
Chemical yield (2) = 2.2574
PPT. correction (3) = 0.9349 (recovery = 40.66 mgs)
Aliquot (4) = 1.000 μ mpl

Product (1X2X3X4) = 2.110421E+00

C-zero	F-factor	dpm/ μ mpl	dpm error	percent sigma
8.9274E+00	1.8280	1.6319E+01	5.5090E-01	3.38 %

LTV 1.7228E+01

1st point MDA 7.3940E-01

DPM OF ALIQUOT 1.632E+01

Saved answer = 1.632E+01 3.38% (DPM of aliquot) (28191)

1067 - 34 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM	
							@ 32.112	Error
32.112	GRB	230	744	100.0	0.36	1.011	7.86	3.9%
32.208	GRB	230	317	60.0	0.36	1.011	5.27	6.1%
32.257	GRB	230	332	60.0	0.36	1.011	5.54	5.9%
32.740	GRB	230	147	100.0	0.35	1.011	1.24	11.5%
32.829	GRB	218	130	100.0	0.35	1.005	1.05	12.8%
32.852	GRB	230	115	100.0	0.35	1.011	0.89	14.4%
Weighted average							7.53	3.4%

Error shown is 1.3 times that expected from counting statistics.

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

7.8580E+00 7.8580E+00 3.0626E-01 7.5284E+00 2.5414E-01 3.3758E+00
7.8580E+00 7.8580E+00 3.0626E-01 7.5284E+00 2.5414E-01 3.3758E+00

01-FEB-01
19:15:47
R011183
ACC

187
TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067-35 Ac

Reviewed AK Date 2-2-1

Ac 228

Counter GRB 231
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.112	0.	0.0	0.00	0.000	0.00		7.67	7.67

CPM corrected for decay to Sept. Time. : 19.1941

Elapsed time (days) = 0.000
Lambda = 3.300E-04 Reciprocal days
exp(-lambda X t) (1) = 1.000E+00
Chemical yield (2) = 2.4669
PPT. correction (3) = 0.8705 (recovery = 51.84 mgs)
Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 2.147527E+00

C-zero	F-factor	dpm/smpl	dpm error	percent sigma
8.9378E+00	1.8280	1.6338E+01	4.4208E-01	2.71 %

LTV 1.7068E+01

1st point MDA 7.8925E-01

DPM OF ALIQUOT 1.634E+01

Saved answer = 1.634E+01 2.71% (DPM of aliquot) (28192)

1067 - 35 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM @ 32.112	Error
32.112	GRB 231	727	100.0	0.41	1.026	7.72	7.72	4.0%
32.208	GRB 231	358	60.0	0.41	1.026	6.03	7.82	5.7%
32.257	GRB 231	321	60.0	0.41	1.026	5.36	7.94	6.1%
32.740	GRB 231	147	100.0	0.41	1.026	1.20	6.58	12.3%
32.829	GRB 219	148	100.0	0.37	1.012	1.23	8.64	11.7%
32.852	GRB 231	113	100.0	0.41	1.026	0.81	6.06	16.2%
Weighted average							7.67	2.7%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

7.7179E+00 7.7179E+00 3.0864E-01 7.6697E+00 2.0753E-01 2.7058E+00
7.7179E+00 7.7179E+00 3.0864E-01 7.6697E+00 2.0753E-01 2.7058E+00

01-FEB-01
19:16:30
R011183
ACC

TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 36

Ac

Reviewed AK Date 2-2-1

Ac 228

Counter GRB 232
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.112	0.	0.0	0.00	0.000	0.00		7.68	7.68

CPM corrected for decay to Sept. Time. : 19.2292

Elapsed time (days) = 0.000
 Lambda = 3.300E-04 Reciprocal days
 exp(-lambda X t) (1) = 1.000E+00
 Chemical yield (2) = 2.4534
 PPT. correction (3) = 0.8298 (recovery = 58.92 mgs)
 Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 2.035712E+00

C-zero	P-factor	dpm/smpl	dpm error	percent sigma
9.4459E+00	1.8280	1.7267E+01	4.6107E-01	2.67 %

LTV 1.8028E+01

1st point MDA 7.8451E-01

DPM OF ALIQUOT 1.727E+01

Saved answer = 1.727E+01 2.67% (DPM of aliquot) (28193)

(P)

1067 - 36 Ac

Ac228 (lambda = 2.714E+00)
Corrected for decay during counting

GMT	Det	Cnts	Min.	Bkg	S. F.	CPM	CPM e 32.112	Error	
32.112	GRB	232	734	100.0	0.36	1.024	7.84	7.84	3.9%
32.208	GRB	232	364	60.0	0.36	1.024	6.18	8.01	5.6%
32.257	GRB	232	290	60.0	0.36	1.024	4.84	7.17	6.4%
32.740	GRB	232	140	100.0	0.36	1.024	1.16	6.40	12.2%
32.829	GRB	220	134	100.0	0.35	1.007	1.09	7.66	12.4%
32.852	GRB	232	146	100.0	0.36	1.024	1.23	9.18	11.7%
Weighted average								7.68	2.7%

CRATE1, DCPM1, ERR1, AVCPM, AVERR, AVPERR

7.8377E+00 7.8377E+00 3.0832E-01 7.6837E+00 2.0517E-01 2.6702E+00
7.8377E+00 7.8377E+00 3.0832E-01 7.6837E+00 2.0517E-01 2.6702E+00

02-FEB-01
08:07:14
R011183
ACC

TMA Corporation
Data Counting Data
AUTOB V 2.07

1067-37

Ac

Reviewed AK Date 2-2-01

Ac 228

Counter GRB 207
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	ADJUSTED CPM	CORRECTED CPM
32.122	0.	0.0	0.00	0.000	0.00	4.60	4.60

CPM corrected for decay to Sept. Time. : 11.8328

Elapsed time (days) = 0.000
 Lambda = 3.300E-04 Reciprocal days
 exp(-lambda X t) (1)= 1.000E+00
 Chemical yield (2)= 2.4717
 PPT. correction (3)= 0.7845 (recovery = 66.78 mgs)
 Aliquot (4)= 1.000 smpl

Product (1X2X3X4) = 1.939060E+00

C-zero	P-factor	dpm/smpl	dpm error	1 sigma percent sigma
6.1023E+00	1.8280	1.1155E+01	4.1194E-01	3.69 %

LTV 1.1835E+01

1st point MDA 8.5695E-01

DPM OF ALIQUOT 1.116E+01

Saved answer = 1.116E+01 3.69% (DPM of aliquot) (28194)

02-FEB-01
08:08:14
R011183
ACC

TMA Corporation
Beta Counting Data
AUTOB V 2.07

1067- 38

Ac

Reviewed AK Date 2-2-01

Ac 228

Counter GRB 208
Length of count 0.0 Min.
Gross counts = 0.

Zero time 31.774 1
Separation time 31.774 1

GMT TIME	GROSS COUNT	COUNTING TIME	TOTAL CPM	BKGD	NET CPM	CPM	ADJUSTED CPM	CORRECTED CPM
32.122	0.	0.0	0.00	0.000	0.00		6.47	6.47

CPM corrected for decay to Sept. Time. : 16.6470

Elapsed time (days) = 0.000
 Lambda = 3.300E-04 Reciprocal days
 exp(-lambda X t) (1) = 1.000E+00
 Chemical yield (2) = 2.5210
 PPT. correction (3) = 0.7333 (recovery = 75.68 mgs)
 Aliquot (4) = 1.000 smpl

Product (1X2X3X4) = 1.848555E+00

C-zero	F-factor	dpm/smpl	dpm error	percent sigma
9.0054E+00	1.8280	1.6462E+01	5.1993E-01	3.16 %

LTV 1.7320E+01

1st point MDA 1.0136E+00

DPM OF ALIQUOT 1.646E+01

Saved answer = 1.646E+01 3.16% (DPM of aliquot) (28195)

Reviewed _____ Date _____

Decay Constants

De-emanation Times

Rn222 - 1.8129E-01
Ra226 - 1.1700E-06

1st - 340.732 6
2nd - 88.692 7

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %
88.868	7	RN	13	4008	63.9	0.277	62.407	0.996	62.658 1.6

Rn-222 decay from 2nd De-em to Count time = 0.9686
 CPM @ 2nd De-emanation time = 64.6897
 Rn-222 growth from 1st to 2nd De-em time = 1.0000
 Ra-226 decay (tracer date to 2nd De-em) = 0.9939

Efficiency Determination for Cell #18

Tracer used : Ra226 M1-A-(06)
 Amount used : 1.0 mLs
 DPM per mL : 26.42 +/- 1.8 %
 Standardization Date : 1.500 93

Cell #18 Efficiency = 2.463 +/- 0.059
 @ 88.868 7

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	13 BK BK	88.012	79	923.7	0.086	0.049 - 0.115	0.080	0.3
RN	13 EF SF	88.669	10054	3.6	1.012	0.989 - 1.049	1.018	-0.8
RN	13 BK BK18	86.683	35	126.2	0.277	0.076 - 0.434	0.253	0.4
RN	13 EF EF18	88.868	4008	63.9	2.463	2.100 - 2.628	2.341	1.4

Previous	3 counts	Time	Detector	ID	Length	Cpm
88.013	28-MAR-07	17:18	RN	13 BK	\ 923.7 min	0.00
88.669	29-MAR-07	9:03	RN	13 SF	\ 3.6 min	0.00
88.686	29-MAR-07	9:27	RN	13 BK	\ 127.3 min	0.00

Reviewed ### Date #####

Decay Constants

De-emanation Times

Rn222 - 1.8129E-01
Ra226 - 1.1700E-06

1st - 265.696 6
2nd - 314.714 6

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %	
314.886	6	RN	9	4016	70.1	0.293	56.988	0.996	57.240	1.6

Rn-222 decay from 2nd De-em to Count time = 0.9693
 CPM @ 2nd De-emanation time = 59.0533
 Rn-222 growth from 1st to 2nd De-em time = -0.9999
 Ra-226 decay (tracer date to 2nd De-em) = 0.9941

Efficiency Determination for Cell #33

Tracer used : Ra226 M1-A-(06)
 Amount used : 1.0 mLs
 DPM per mL : 26.42 +/- 1.8 %
 Standardization Date : 1.500 93

Cell #33 Efficiency = 2.249 +/- 0.054
 @ 314.886 6

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	9 BK BK	314.056	174	869.2	0.200	0.134 - 0.270	0.202	-0.1
RN	9 EF SF	314.660	10022	3.7	1.029	0.988 - 1.048	1.018	1.1
RN	9 BK BK33	312.720	40	136.3	0.293	0.178 - 0.478	0.334	-0.7
RN	9 EF EF33	314.886	4016	70.1	2.249	2.100 - 2.606	2.296	-0.8

Previous	3 counts	Time	Detector	ID	Length	Cpm
313.940	9-NGV-06	14:33	RN	9 Ra	137 780	69.1 min 134.23
314.056	9-NGV-06	17:20	RN	9 BK		869.2 min 0.00
314.660	10-NGV-06	7:50	RN	9 SF		3.7 min 0.00

Decay Constants

De-emanation Times

Rn222 - 1.8129E-01
 Ra226 - 1.1700E-06

1st - 10.733 7
 2nd - 92.689 7

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %
92.861	7	RN	10	4311	70.5	0.158	61.000	0.996	61.271 1.5

Rn-222 decay from 2nd De-em to Count time = 0.9693
 CPM @ 2nd De-emanation time = 63.2112
 Rn-222 growth from 1st to 2nd De-em time = 1.0000
 Ra-226 decay (tracer date to 2nd De-em) = 0.9939

```

=====
Efficiency Determination for Cell #42
-----
Tracer used : Ra226 M1-A-(06)
Amount used : 1.0 mLs
DPM per mL : 26.42 +/- 1.8 %
Standardization Date : 1.500 93

Cell #42 Efficiency = 2.407 +/- 0.057
@ 92.861 7
=====
  
```

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	10 BK BK	89.001	59	935.5	0.063	0.035 - 0.098	0.065	-0.3
RN	10 EF SF	92.649	10002	3.6	1.045	1.011 - 1.070	1.045	0.1
RN	10 BK BK42	68.833	19	120.1	0.158	0.051 - 0.289	0.166	-0.3
RN	10 EF EF42	92.861	4311	70.5	2.407	2.121 - 2.721	2.419	-0.1

Previous	3 counts	Time	Detector	ID	Length	Cpm
89.655	30-MAR-07	8:43	RN	10 SF	3.7 min	0.00
89.867	30-MAR-07	13:48	RN	10 Ra 9692	5 78.0 min	-0.16
92.649	2-APR-07	8:34	RN	10 SF	3.6 min	0.00

Reviewed _____ Date _____

Decay Constants

De-emanation Times

Rn222 - 1.8129E-01
Ra226 - 1.1700E-06

1st - 333.738 6
2nd - 15.730 7

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %
15.901	7	RN	11	4337	70.9	0.173	60.989	0.996	61.262 1.5

Rn-222 decay from 2nd De-em to Count time = 0.9695
 CPM @ 2nd De-emanation time = 63.1906
 Rn-222 growth from 1st to 2nd De-em time = 0.9998
 Ra-226 decay (tracer date to 2nd De-em) = 0.9940

```

=====
|           Efficiency Determination for Cell #67           |
|-----|
|
|           Tracer used : Ra226 M1-A-(06)                 |
|           Amount used : 1.0 mLs                         |
|           DPM per mL  : 26.42 +/- 1.8 %                 |
|           Standardization Date : 1.500 93               |
|
|           Cell #67 Efficiency = 2.407 +/- 0.057         |
|           @ 15.901 7                                     |
|-----|
=====
  
```

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	11 BK BK	12.051	72	931.5	0.077	0.059 - 0.089	0.075	0.7
RN	11 EF SF	15.688	10041	3.7	1.069	0.993 - 1.070	1.044	2.9
RN	11 BK BK67	9.725	22	127.1	0.173	0.047 - 0.235	0.142	1.0
RN	11 EF EF67	15.901	4337	70.9	2.407	2.100 - 2.651	2.358	0.6

Previous 3 counts	Time	Detector	ID	Length	Cpm
12.704	12-JAN-07 8:53	RN 11	SF	3.6 min	0.00
12.915	12-JAN-07 13:57	RN 11	Ra 8643 6	62.7 min	-0.02
15.688	15-JAN-07 8:30	RN 11	SF	3.7 min	0.00

Reviewed _____ Date _____

Decay Constants

De-emanation Times

Rn222 - 1.8129E-01
Ra226 - 1.1700E-06

1st - 313.769 6
2nd - 324.770 6

GMT	YR	Det	Cnts	Min.	Bkg	Net CPM	Decay during cntg	CPM	(1 sig) %
324.949	6	RN	12	4108	79.4	0.103	51.602	0.995	51.861 1.6

Rn-222 decay from 2nd De-em to Count time = 0.9681
 CPM @ 2nd De-emanation time = 53.5715
 Rn-222 growth from 1st to 2nd De-em time = 0.8639
 Ra-226 decay (tracer date to 2nd De-em) = 0.9941

Efficiency Determination for Cell #20

Tracer used : Ra226 M1-A-(06)
 Amount used : 1.0 mLs
 DPM per mL : 26.42 +/- 1.8 %
 Standardization Date : 1.500 93

Cell #20 Efficiency = 2.361 +/- 0.056
 @ 324.949 6

Quality Control Summary

Detector	Continuing Calibr:	Date (GMT)	Gross Cnts	Time (min)	Value	Control Limits	New Avg	Norm dev
RN	12 BK BK	321.047	86	931.1	0.092	0.062 - 0.110	0.086	0.8
RN	12 EF SF	324.715	10067	3.7	1.061	1.012 - 1.080	1.059	0.1
RN	12 BK BK20	311.728	13	126.4	0.103	0.053 - 0.282	0.157	-1.7
RN	12 EF EF20	324.949	4108	79.4	2.361	2.100 - 2.523	2.304	0.9

Previous 3 counts	Time	Detector	ID	Length	Cpm
324.715	20-NOV-06 9:09	RN 12	SF	3.7 min	0.00
324.738	20-NOV-06 9:42	RN 12	BK	120.6 min	0.00
324.824	20-NOV-06 11:46	RN 12	BK	128.5 min	0.00

Det ... GELI 2
 Geo ... MB - Marinelli beaker
 Shift ... 0
 Ref ... 1000-210

Date ... 08-NOV-99 Page 1
 Version ... 2.00
 File ... ND: [25.4]GELI02MBO.EFF

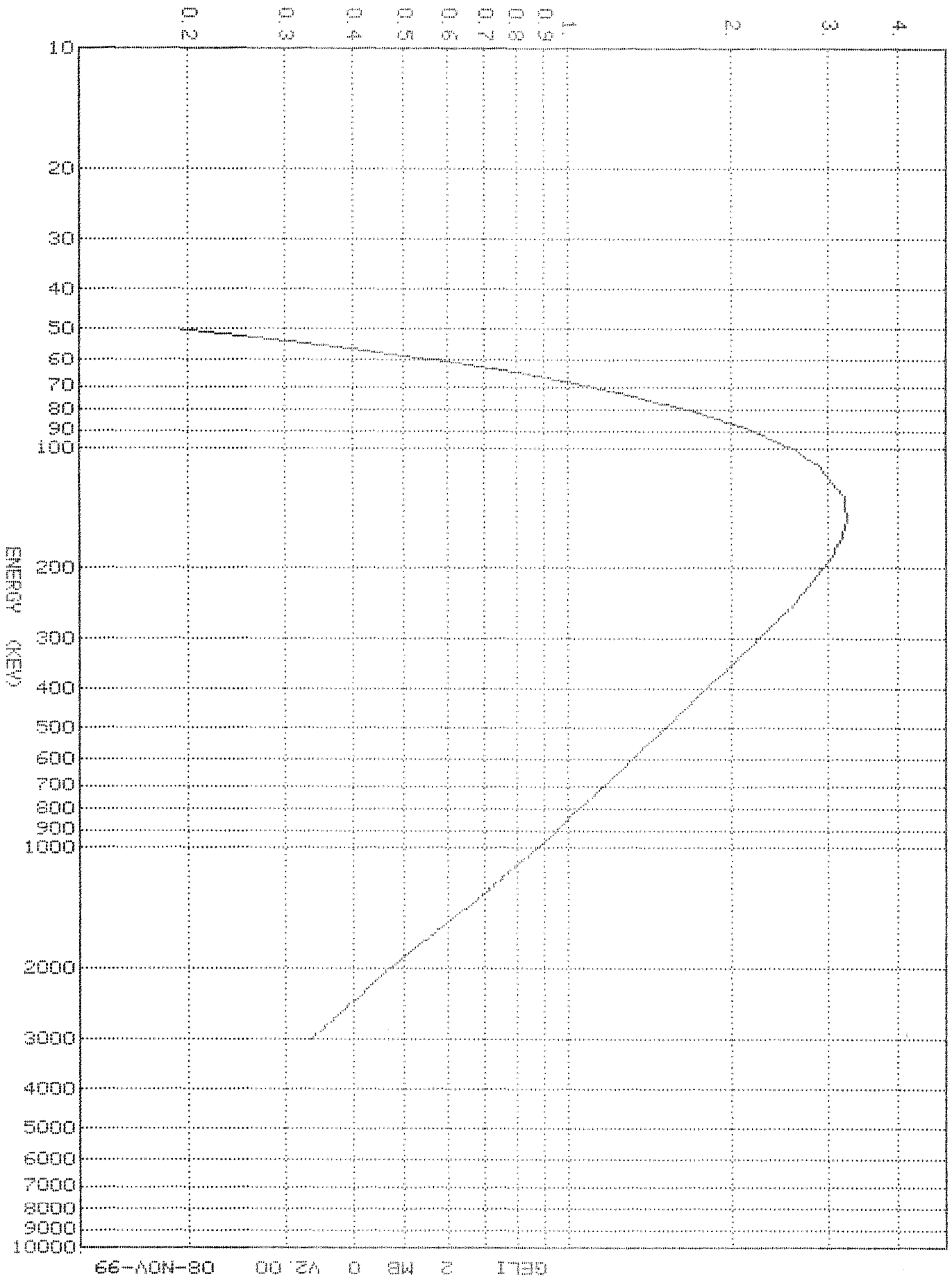
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.19308	108	2.82158	216	2.78380	324	2.10001	432	1.67970
51	0.21961	110	2.87889	218	2.76838	326	2.09000	434	1.67369
52	0.24916	112	2.90916	220	2.75318	328	2.08010	436	1.66772
53	0.28201	114	2.93920	222	2.73821	330	2.07031	438	1.66181
54	0.31846	116	2.96902	224	2.72345	332	2.06062	440	1.65594
55	0.35881	118	2.99862	226	2.70890	334	2.05104	442	1.65012
56	0.39599	120	3.02802	228	2.69456	336	2.04155	444	1.64435
57	0.43625	122	3.05720	230	2.68041	338	2.03217	446	1.63862
58	0.47981	124	3.08619	232	2.66647	340	2.02288	448	1.63294
59	0.52685	126	3.11499	234	2.65271	342	2.01369	450	1.62730
60	0.57760	128	3.14359	236	2.63914	344	2.00460	452	1.62171
61	0.62349	130	3.17201	238	2.62575	346	1.99560	454	1.61616
62	0.67219	132	3.17718	240	2.61254	348	1.98669	456	1.61066
63	0.72382	134	3.18227	242	2.59951	350	1.97787	458	1.60519
64	0.77850	136	3.18730	244	2.58665	352	1.96914	460	1.59977
65	0.83638	138	3.19227	246	2.57396	354	1.96050	462	1.59439
66	0.88798	140	3.19717	248	2.56143	356	1.95194	464	1.58906
67	0.94192	142	3.20201	250	2.54906	358	1.94347	466	1.58376
68	0.99826	144	3.20678	252	2.53417	360	1.93508	468	1.57850
69	1.05708	146	3.21150	254	2.51949	362	1.92678	470	1.57329
70	1.11844	148	3.21617	256	2.50500	364	1.91856	472	1.56811
71	1.16853	150	3.22077	258	2.49071	366	1.91041	474	1.56297
72	1.22011	152	3.21241	260	2.47661	368	1.90235	476	1.55787
73	1.27321	154	3.20417	262	2.46270	370	1.89436	478	1.55281
74	1.32784	156	3.19607	264	2.44897	372	1.88645	480	1.54778
75	1.38405	158	3.18808	266	2.43542	374	1.87861	482	1.54279
76	1.44184	160	3.18022	268	2.42204	376	1.87085	484	1.53784
77	1.50124	162	3.17247	270	2.40884	378	1.86316	486	1.53293
78	1.56227	164	3.16484	272	2.39581	380	1.85554	488	1.52805
79	1.62496	166	3.15732	274	2.38294	382	1.84800	490	1.52320
80	1.68933	168	3.14990	276	2.37023	384	1.84052	492	1.51839
81	1.73635	170	3.14259	278	2.35768	386	1.83311	494	1.51362
82	1.78407	172	3.12810	280	2.34529	388	1.82578	496	1.50888
83	1.83250	174	3.11385	282	2.33305	390	1.81850	498	1.50417
84	1.88164	176	3.09982	284	2.32096	392	1.81130	500	1.49950
85	1.93150	178	3.08601	286	2.30902	394	1.80415	502	1.49490
86	1.98207	180	3.07242	288	2.29722	396	1.79708	504	1.49033
87	2.03336	182	3.05903	290	2.28556	398	1.79006	506	1.48579
88	2.08537	184	3.04585	292	2.27404	400	1.78311	508	1.48128
89	2.13809	186	3.03287	294	2.26266	402	1.77622	510	1.47681
90	2.19154	188	3.02008	296	2.25141	404	1.76939	512	1.47237
91	2.23058	190	3.00748	298	2.24029	406	1.76262	514	1.46795
92	2.26987	192	2.98856	300	2.22930	408	1.75591	516	1.46357
93	2.30942	194	2.96996	302	2.21783	410	1.74926	518	1.45922
94	2.34923	196	2.95166	304	2.20650	412	1.74266	520	1.45489
95	2.38928	198	2.93366	306	2.19529	414	1.73612	522	1.45060
96	2.42960	200	2.91594	308	2.18422	416	1.72964	524	1.44633
97	2.47016	202	2.89851	310	2.17327	418	1.72321	526	1.44210
98	2.51097	204	2.88135	312	2.16245	420	1.71684	528	1.43789
99	2.55204	206	2.86446	314	2.15175	422	1.71052	530	1.43371
100	2.59335	208	2.84783	316	2.14117	424	1.70425	532	1.42956
102	2.65025	210	2.83146	318	2.13071	426	1.69803	534	1.42543
104	2.70725	212	2.81533	320	2.12036	428	1.69187	536	1.42134
106	2.76436	214	2.79945	322	2.11013	430	1.68576	538	1.41727

Det ... GELI 2
Geo ... MB - Marinelli beaker
Shlf ... 0
Ref ... 1000-210

Date ... 08-NOV-99 Page 2
Version ... 2.00
File ... ND: [25.4]GELI02MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	1.41322	660	1.21090	930	0.92282	1260	0.71301	1800	0.51597
542	1.40921	665	1.20388	935	0.91888	1270	0.70814	1810	0.51333
544	1.40522	670	1.19696	940	0.91499	1280	0.70335	1820	0.51072
546	1.40125	675	1.19012	945	0.91113	1290	0.69863	1830	0.50814
548	1.39731	680	1.18338	950	0.90731	1300	0.69397	1840	0.50559
550	1.39340	685	1.17672	955	0.90352	1310	0.68938	1850	0.50307
552	1.38951	690	1.17015	960	0.89977	1320	0.68486	1860	0.50057
554	1.38564	695	1.16366	965	0.89605	1330	0.68040	1870	0.49809
556	1.38180	700	1.15726	970	0.89237	1340	0.67600	1880	0.49564
558	1.37799	705	1.15071	975	0.88872	1350	0.67166	1890	0.49322
560	1.37420	710	1.14425	980	0.88510	1360	0.66738	1900	0.49082
562	1.37043	715	1.13787	985	0.88152	1370	0.66316	1925	0.48493
564	1.36669	720	1.13157	990	0.87797	1380	0.65900	1950	0.47918
566	1.36297	725	1.12535	995	0.87446	1390	0.65489	1975	0.47357
568	1.35927	730	1.11920	1000	0.87097	1400	0.65084	2000	0.46810
570	1.35560	735	1.11313	1005	0.86722	1410	0.64657	2025	0.46328
572	1.35195	740	1.10714	1010	0.86350	1420	0.64237	2050	0.45857
574	1.34832	745	1.10121	1015	0.85981	1430	0.63821	2075	0.45396
576	1.34471	750	1.09536	1020	0.85616	1440	0.63412	2100	0.44946
578	1.34113	755	1.08957	1025	0.85255	1450	0.63007	2125	0.44505
580	1.33757	760	1.08386	1030	0.84896	1460	0.62609	2150	0.44073
582	1.33403	765	1.07821	1035	0.84541	1470	0.62215	2175	0.43651
584	1.33051	770	1.07263	1040	0.84189	1480	0.61826	2200	0.43237
586	1.32701	775	1.06711	1045	0.83840	1490	0.61443	2225	0.42832
588	1.32353	780	1.06165	1050	0.83494	1500	0.61064	2250	0.42435
590	1.32008	785	1.05626	1055	0.83151	1510	0.60690	2275	0.42047
592	1.31664	790	1.05093	1060	0.82812	1520	0.60321	2300	0.41666
594	1.31323	795	1.04566	1065	0.82475	1530	0.59957	2325	0.41292
596	1.30983	800	1.04045	1070	0.82141	1540	0.59597	2350	0.40926
598	1.30646	805	1.03530	1075	0.81810	1550	0.59242	2375	0.40567
600	1.30310	810	1.03020	1080	0.81482	1560	0.58891	2400	0.40214
602	1.29977	815	1.02517	1085	0.81157	1570	0.58544	2425	0.39869
604	1.29645	820	1.02018	1090	0.80834	1580	0.58202	2450	0.39530
606	1.29316	825	1.01525	1095	0.80515	1590	0.57863	2475	0.39197
608	1.28988	830	1.01038	1100	0.80198	1600	0.57529	2500	0.38870
610	1.28662	835	1.00555	1105	0.79883	1610	0.57199	2525	0.38549
612	1.28338	840	1.00078	1110	0.79572	1620	0.56872	2550	0.38234
614	1.28016	845	0.99606	1115	0.79263	1630	0.56550	2575	0.37924
616	1.27696	850	0.99139	1120	0.78956	1640	0.56231	2600	0.37620
618	1.27378	855	0.98676	1125	0.78652	1650	0.55916	2625	0.37322
620	1.27061	860	0.98219	1130	0.78351	1660	0.55605	2650	0.37028
622	1.26747	865	0.97766	1135	0.78052	1670	0.55297	2675	0.36740
624	1.26434	870	0.97318	1140	0.77755	1680	0.54993	2700	0.36456
626	1.26123	875	0.96875	1150	0.77170	1690	0.54692	2725	0.36177
628	1.25813	880	0.96436	1160	0.76593	1700	0.54395	2750	0.35903
630	1.25506	885	0.96002	1170	0.76026	1710	0.54101	2775	0.35634
632	1.25200	890	0.95572	1180	0.75468	1720	0.53810	2800	0.35368
634	1.24896	895	0.95146	1190	0.74918	1730	0.53523	2825	0.35107
636	1.24593	900	0.94725	1200	0.74378	1740	0.53238	2850	0.34851
638	1.24292	905	0.94307	1210	0.73845	1750	0.52957	2875	0.34598
640	1.23993	910	0.93894	1220	0.73321	1760	0.52679	2900	0.34349
645	1.23252	915	0.93485	1230	0.72804	1770	0.52404	2925	0.34105
650	1.22522	920	0.93080	1240	0.72296	1780	0.52132	2950	0.33864
655	1.21801	925	0.92679	1250	0.71794	1790	0.51863	2975	0.33627

PERCENT EFFICIENCY



08-NOV-99 2 MB 0 V2.00

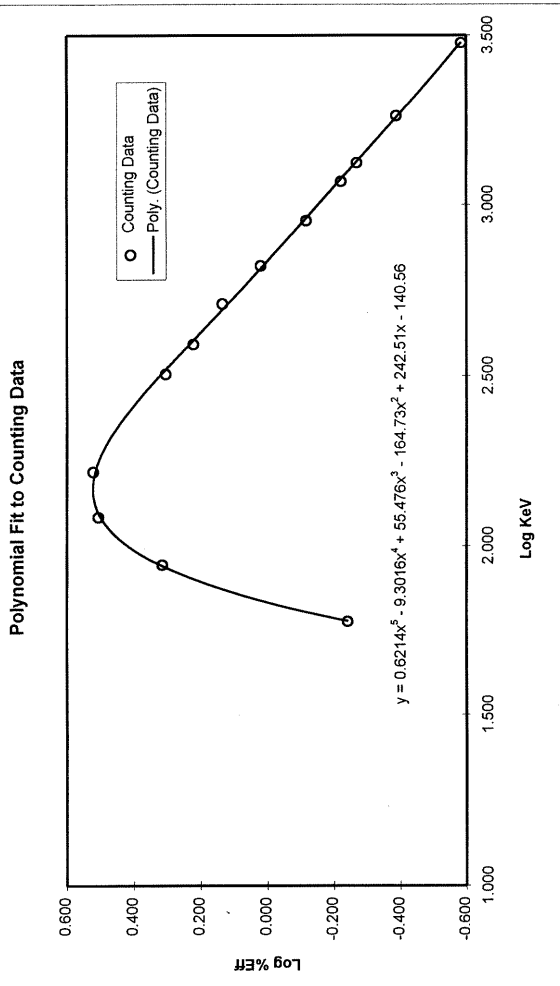
GELI 2 MB 0 V2.00 08-NOV-99

Gamma Spectrometer Efficiency Calculation

G5.XLS

Detector Geometry	G5	500 mL Marinelli beaker
Std I.D.	MB	Shelf 0
Filename	1057-4	
	[25.4]	G-E1105MB0.EFF

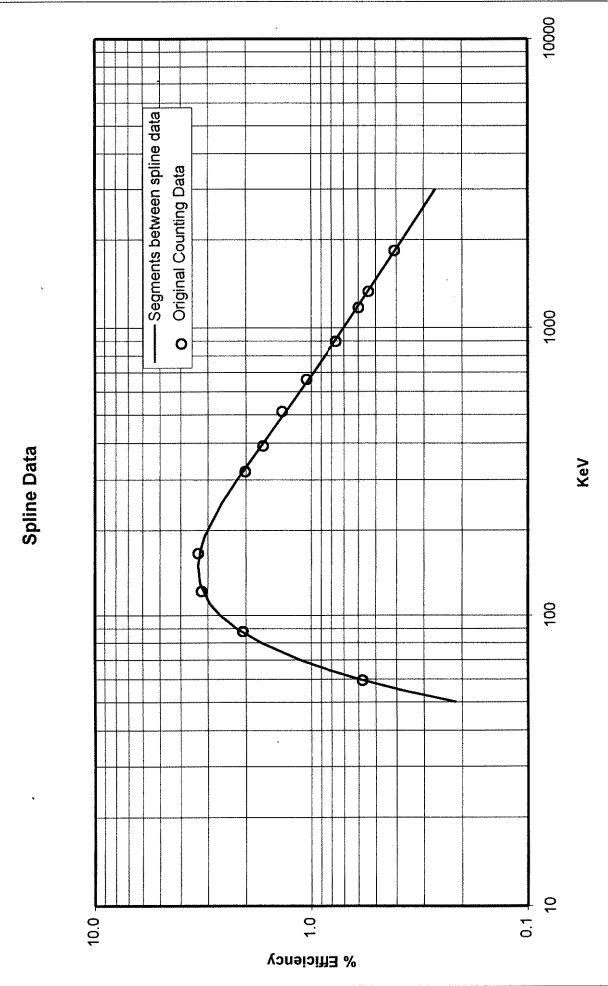
Line KeV	%Eff 1st Cnt	%Eff 2nd Cnt	Avg %Eff	%SD	LogKeV	Log%Eff	%Dev from Spline
59.5	0.59700	0.55650	0.57375	4	1.775	-0.241	0
88	1.97600	2.15200	2.06400	6	1.944	0.315	-2
122	3.2060	3.2010	3.20350	0	2.086	0.506	1
166	3.3380	3.32050	3.32950	1	2.220	0.521	2
320	2.04000	1.98400	2.01200	2	2.505	0.304	-3
392	1.67800	1.65000	1.66400	1	2.593	0.221	-2
514	1.37700	1.35400	1.36550	1	2.711	0.134	5
662	1.05600	1.03800	1.04700	1	2.821	0.020	2
898	0.76390	0.76780	0.76285	0	2.953	-0.118	-1
1173	0.59940	0.59930	0.59935	0	3.069	-0.222	-1
1332	0.54370	0.53270	0.53790	1	3.125	-0.269	0
1836	0.41400	0.40420	0.40910	2	3.264	-0.388	1
3000	(artificial data)	0.26000	0.26000		3.477	-0.585	-1
							0



(shaded cells are manual entry, all others are calculated)

Generation of Spline Points from Polynomial Equation

Spline Values keV	%Eff	LogKeV	Log%Eff	%Eff Prev	Calib	Ratio New/Old	Polynomial Coefficients
50	0.21376	1.699	-0.670				x5 = 0.62145
55	0.38172	1.740	-0.418				x4 = -9.3016
60	0.59913	1.778	-0.222		#DIV/0!		x3 = 55.476
65	0.85410	1.813	-0.068				x2 = -164.73
70	1.13176	1.845	0.054				x1 = 242.51
80	1.69823	1.903	0.230				x0 = -140.55
90	2.20993	1.954	0.344				
100	2.62301	2.000	0.419		#DIV/0!		
110	2.92779	2.041	0.467				
130	3.25632	2.114	0.513				
150	3.32367	2.176	0.522				
170	3.24605	2.230	0.511				
190	3.09843	2.279	0.491				
250	2.57081	2.398	0.410				
300	2.19270	2.477	0.341		#DIV/0!		
500	1.33824	2.699	0.127				
700	0.97023	2.845	-0.013				
1000	0.69944	3.000	-0.155		#DIV/0!		
1400	0.51685	3.146	-0.287				
2000	0.37498	3.301	-0.426				
3000	0.26327	3.477	-0.580				



Det ... GELI 5
 Geo ... MB - Marinelli beaker
 Shlf ... 0
 Ref ... 1057 - 4

Date ... 01-SEP-99 Page 1
 Version ... 1.01
 File ... ND:[25,4]GELI05MBO.EFF

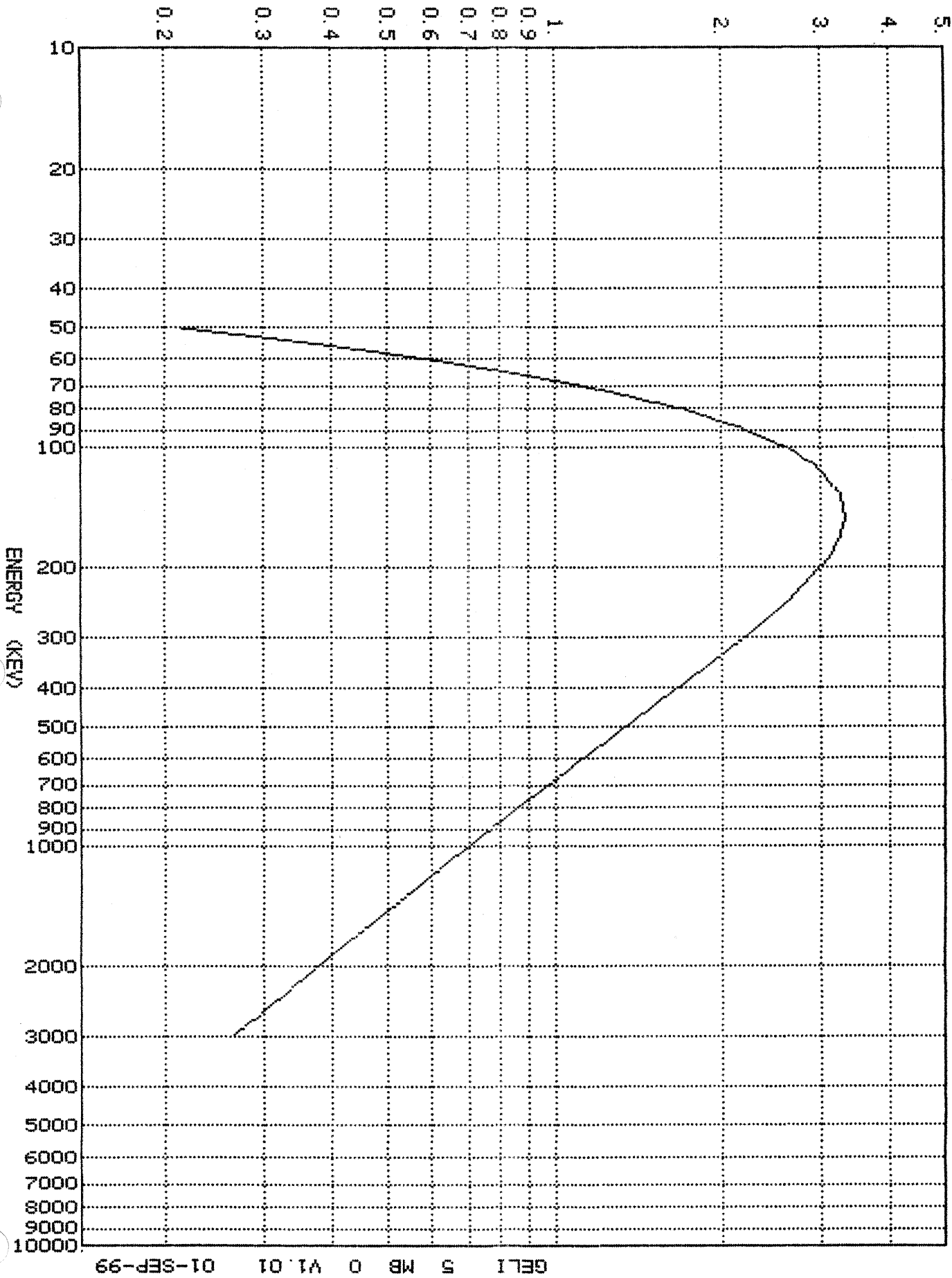
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.21376	108	2.86648	216	2.83958	324	2.03550	432	1.54135
51	0.24113	110	2.92779	218	2.82183	326	2.02343	434	1.53448
52	0.27136	112	2.96157	220	2.80436	328	2.01150	436	1.52768
53	0.30470	114	2.99513	222	2.78715	330	1.99971	438	1.52094
54	0.34140	116	3.02847	224	2.77020	332	1.98807	440	1.51425
55	0.38172	118	3.06161	226	2.75350	334	1.97656	442	1.50763
56	0.41907	120	3.09455	228	2.73705	336	1.96519	444	1.50106
57	0.45931	122	3.12728	230	2.72083	338	1.95395	446	1.49456
58	0.50262	124	3.15982	232	2.70486	340	1.94283	448	1.48811
59	0.54917	126	3.19217	234	2.68911	342	1.93185	450	1.48171
60	0.59913	128	3.22434	236	2.67359	344	1.92099	452	1.47538
61	0.64464	130	3.25632	238	2.65828	346	1.91026	454	1.46909
62	0.69279	132	3.26365	240	2.64320	348	1.89964	456	1.46286
63	0.74368	134	3.27088	242	2.62832	350	1.88915	458	1.45669
64	0.79741	136	3.27802	244	2.61364	352	1.87877	460	1.45057
65	0.85410	138	3.28507	246	2.59917	354	1.86851	462	1.44450
66	0.90509	140	3.29203	248	2.58490	356	1.85837	464	1.43848
67	0.95830	142	3.29891	250	2.57081	358	1.84833	466	1.43251
68	1.01377	144	3.30571	252	2.55300	360	1.83840	468	1.42659
69	1.07157	146	3.31243	254	2.53545	362	1.82858	470	1.42072
70	1.13176	148	3.31907	256	2.51816	364	1.81887	472	1.41490
71	1.18162	150	3.32563	258	2.50112	366	1.80926	474	1.40913
72	1.23292	152	3.31712	260	2.48432	368	1.79976	476	1.40341
73	1.28571	154	3.30874	262	2.46776	370	1.79035	478	1.39773
74	1.33998	156	3.30049	264	2.45144	372	1.78105	480	1.39210
75	1.39577	158	3.29236	266	2.43535	374	1.77184	482	1.38652
76	1.45310	160	3.28436	268	2.41949	376	1.76273	484	1.38098
77	1.51199	162	3.27647	270	2.40384	378	1.75371	486	1.37549
78	1.57247	164	3.26870	272	2.38841	380	1.74479	488	1.37004
79	1.63454	166	3.26104	274	2.37319	382	1.73596	490	1.36463
80	1.69823	168	3.25349	276	2.35818	384	1.72722	492	1.35927
81	1.74606	170	3.24605	278	2.34337	386	1.71857	494	1.35395
82	1.79463	172	3.23020	280	2.32876	388	1.71000	496	1.34867
83	1.84394	174	3.21461	282	2.31434	390	1.70153	498	1.34343
84	1.89399	176	3.19928	284	2.30011	392	1.69313	500	1.33824
85	1.94478	178	3.18418	286	2.28607	394	1.68482	502	1.33314
86	1.99631	180	3.16933	288	2.27221	396	1.67660	504	1.32809
87	2.04859	182	3.15471	290	2.25853	398	1.66845	506	1.32307
88	2.10162	184	3.14032	292	2.24503	400	1.66039	508	1.31809
89	2.15540	186	3.12614	294	2.23170	402	1.65240	510	1.31315
90	2.20993	188	3.11218	296	2.21853	404	1.64450	512	1.30825
91	2.25001	190	3.09843	298	2.20554	406	1.63666	514	1.30338
92	2.29036	192	3.07644	300	2.19270	408	1.62891	516	1.29855
93	2.33099	194	3.05483	302	2.17866	410	1.62123	518	1.29376
94	2.37189	196	3.03359	304	2.16481	412	1.61362	520	1.28901
95	2.41306	198	3.01272	306	2.15113	414	1.60608	522	1.28429
96	2.45451	200	2.99219	308	2.13762	416	1.59862	524	1.27960
97	2.49623	202	2.97201	310	2.12429	418	1.59123	526	1.27495
98	2.53822	204	2.95216	312	2.11113	420	1.58390	528	1.27033
99	2.58048	206	2.93263	314	2.09813	422	1.57664	530	1.26575
100	2.62301	208	2.91342	316	2.08529	424	1.56945	532	1.26120
102	2.68361	210	2.89452	318	2.07261	426	1.56233	534	1.25669
104	2.74439	212	2.87591	320	2.06009	428	1.55527	536	1.25221
106	2.80535	214	2.85760	322	2.04772	430	1.54828	538	1.24776

Det ... GELI 5
Geo ... MB - Marinelli beaker
Shlf ... 0
Ref ... 1057 - 4

Date 01-SEP-99
Version ... 1.01
File ND:[25,4]GELI05MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	1.24334	660	1.02635	930	0.74760	1260	0.56821	1800	0.41226
542	1.23895	665	1.01898	935	0.74393	1270	0.56418	1810	0.41021
544	1.23460	670	1.01171	940	0.74030	1280	0.56022	1820	0.40818
546	1.23028	675	1.00455	945	0.73670	1290	0.55631	1830	0.40618
548	1.22599	680	0.99749	950	0.73314	1300	0.55246	1840	0.40419
550	1.22173	685	0.99053	955	0.72962	1310	0.54867	1850	0.40222
552	1.21749	690	0.98366	960	0.72613	1320	0.54493	1860	0.40028
554	1.21329	695	0.97690	965	0.72268	1330	0.54124	1870	0.39835
556	1.20912	700	0.97023	970	0.71926	1340	0.53761	1880	0.39645
558	1.20498	705	0.96391	975	0.71588	1350	0.53403	1890	0.39456
560	1.20087	710	0.95768	980	0.71253	1360	0.53050	1900	0.39269
562	1.19678	715	0.95154	985	0.70921	1370	0.52701	1925	0.38810
564	1.19273	720	0.94547	990	0.70592	1380	0.52358	1950	0.38362
566	1.18870	725	0.93949	995	0.70266	1390	0.52019	1975	0.37925
568	1.18470	730	0.93358	1000	0.69944	1400	0.51685	2000	0.37498
570	1.18072	735	0.92775	1005	0.69631	1410	0.51355	2025	0.37094
572	1.17678	740	0.92200	1010	0.69321	1420	0.51030	2050	0.36699
574	1.17286	745	0.91632	1015	0.69014	1430	0.50708	2075	0.36313
576	1.16897	750	0.91072	1020	0.68710	1440	0.50392	2100	0.35936
578	1.16510	755	0.90518	1025	0.68408	1450	0.50079	2125	0.35566
580	1.16126	760	0.89972	1030	0.68110	1460	0.49770	2150	0.35205
582	1.15745	765	0.89432	1035	0.67814	1470	0.49465	2175	0.34852
584	1.15366	770	0.88899	1040	0.67520	1480	0.49165	2200	0.34506
586	1.14989	775	0.88373	1045	0.67230	1490	0.48868	2225	0.34168
588	1.14615	780	0.87853	1050	0.66942	1500	0.48574	2250	0.33837
590	1.14244	785	0.87339	1055	0.66657	1510	0.48285	2275	0.33512
592	1.13875	790	0.86832	1060	0.66374	1520	0.47999	2300	0.33194
594	1.13509	795	0.86331	1065	0.66094	1530	0.47717	2325	0.32883
596	1.13145	800	0.85835	1070	0.65816	1540	0.47438	2350	0.32577
598	1.12783	805	0.85346	1075	0.65541	1550	0.47163	2375	0.32278
600	1.12424	810	0.84863	1080	0.65268	1560	0.46890	2400	0.31984
602	1.12067	815	0.84385	1085	0.64997	1570	0.46622	2425	0.31697
604	1.11712	820	0.83913	1090	0.64729	1580	0.46356	2450	0.31414
606	1.11360	825	0.83446	1095	0.64463	1590	0.46094	2475	0.31137
608	1.11010	830	0.82985	1100	0.64200	1600	0.45834	2500	0.30865
610	1.10662	835	0.82528	1105	0.63939	1610	0.45578	2525	0.30599
612	1.10316	840	0.82078	1110	0.63680	1620	0.45325	2550	0.30337
614	1.09973	845	0.81632	1115	0.63423	1630	0.45075	2575	0.30080
616	1.09631	850	0.81191	1120	0.63168	1640	0.44828	2600	0.29827
618	1.09292	855	0.80755	1125	0.62916	1650	0.44583	2625	0.29579
620	1.08955	860	0.80325	1130	0.62665	1660	0.44341	2650	0.29336
622	1.08620	865	0.79899	1135	0.62417	1670	0.44102	2675	0.29096
624	1.08288	870	0.79477	1140	0.62171	1680	0.43866	2700	0.28861
626	1.07957	875	0.79060	1150	0.61684	1690	0.43633	2725	0.28630
628	1.07628	880	0.78648	1160	0.61206	1700	0.43402	2750	0.28403
630	1.07302	885	0.78240	1170	0.60736	1710	0.43173	2775	0.28180
632	1.06977	890	0.77837	1180	0.60273	1720	0.42947	2800	0.27960
634	1.06655	895	0.77438	1190	0.59817	1730	0.42724	2825	0.27744
636	1.06334	900	0.77043	1200	0.59369	1740	0.42503	2850	0.27532
638	1.06015	905	0.76652	1210	0.58927	1750	0.42284	2875	0.27323
640	1.05699	910	0.76266	1220	0.58493	1760	0.42068	2900	0.27117
645	1.04916	915	0.75883	1230	0.58065	1770	0.41854	2925	0.26915
650	1.04144	920	0.75505	1240	0.57644	1780	0.41643	2950	0.26716
655	1.03384	925	0.75130	1250	0.57229	1790	0.41433	2975	0.26520

PERCENT EFFICIENCY



GELI 5 MB 0 V1.01 01-SEP-99

GELI 5 MB 0 V1.01 01-SEP-99

Gamma Spectrometer Calibration Counting Results

Detector: 65
 Geometry: MB Descr: 500 ml in Marinelli Beaker
 Standard I.D.: 1057-4

Gamma KeV	% Efficiency			
	GMT=182.204	GMT=198.089	GMT=205.200	GMT=
59.5 (Am241)	0.5910	0.5565	0.5380	
88 (Cd109)	1.976	2.152	2.147	
122 (Co57)	3.206	3.201	3.197	
166 (Ce139)	3.338	3.303	3.278	
320 (Cr51)	2.040	1.984	2.027	
392 (Sn113)	1.678	1.650	1.641	
514 (Sr85)	1.371	1.354	1.361	
662 (Cs137)	1.056	1.038	1.040	
898 (Y88)	0.7639	0.7618	0.7626	
1173 (Co60)	0.5994	0.7 0.5993	0.6011	
1332 (Co60)	0.5431	0.5327	0.5319	
1836 (Y88)	0.4140	0.4042	0.4084	

761

146

302

NO EFFICIENCIES

 1057 GLY 4 G-5 XX 182.204 98 146.50 MIN 2.00000 ML 761
 LIBR=C981 REF TIME= 121.500 98 Calibration 1234

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	DPM/ML AT TZERO
Am241 59 (59.54)	1.582E+05 DAYS 0.073342	LAMBDA= 4.381E-06 1.00000	DECAY= 9.997E-01 41G 86.662	1.182E+03	2.66%	5.910E+02
Cd109 88 (88.03)	4.530E+02 DAYS 0.041771	LAMBDA= 1.530E-03 1.00000	DECAY= 9.113E-01 1G 150.413	3.601E+03	1.51%	1.976E+03
Co 57 122 (122.06) 136 (136.47)	2.700E+02 DAYS 0.038133 0.111000	LAMBDA= 2.567E-03 1.00000 1.00000	DECAY= 8.557E-01 10G 209.218 25.461	5.487E+03 2.294E+02	1.23% 7.95%	3.206E+03 1.340E+02
Ce139 166 (165.80)	1.372E+02 DAYS 0.063273	LAMBDA= 5.052E-03 1.00000	DECAY= 7.359E-01 2G 310.800	4.912E+03	0.91%	3.338E+03
Cr 51 320 (320.03)	2.772E+01 DAYS 0.186701	LAMBDA= 2.501E-02 1.00000	DECAY= 2.192E-01 1G 166.965	8.943E+02	1.31%	2.040E+03
Sn113 392 (391.40)	1.150E+02 DAYS 0.134211	LAMBDA= 6.027E-03 1.00000	DECAY= 6.936E-01 4G 312.417	2.328E+03	0.69%	1.678E+03
85 514 (513.98)	6.520E+01 DAYS 0.248480	LAMBDA= 1.063E-02 1.00000	DECAY= 5.245E-01 4G 357.369	1.438E+03	0.63%	1.371E+03
Cs137 662 (661.64)	1.102E+04 DAYS 0.157793	LAMBDA= 6.290E-05 1.00000	DECAY= 9.962E-01 3G 332.047	2.104E+03	0.66%	1.056E+03
Y 88 898 (898.00) 1836 (1836.10)	1.066E+02 DAYS 0.394059 0.416536	LAMBDA= 6.502E-03 1.00000 1.00000	DECAY= 6.739E-01 7G 405.708 232.409	1.030E+03 5.580E+02	0.53% 0.59%	7.639E+02 4.140E+02
Co 60 1173 (1173.21) 1332 (1332.48)	1.921E+03 DAYS 0.221390 0.221520	LAMBDA= 3.608E-04 1.00000 1.00000	DECAY= 9.783E-01 4G 259.652 235.412	1.173E+03 1.063E+03	0.65% 0.60%	5.994E+02 5.431E+02

NP: [7,67]761.GSP

19 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	11.7	8	10	36730	3.37	35157	11.8	2.40E+02	1.20	0.010	0	0.00
2	0	59.2	55	8	33334	1.86	12696	59.2	8.67E+01	2.7	100.	0	0.00
3	0	70.1	68	5	21455	1.26	743	70.0	5.07E+00	29.8	100.	0	0.00
4	0	87.8	84	7	33484	1.36	22034	87.7	1.50E+02	1.5	100.	0	0.00
5	0	121.9	118	8	36856	1.56	30646	121.7	2.09E+02	1.2	100.	0	0.00
6	0	136.4	133	7	30453	1.29	3729	136.2	2.55E+01	7.9	100.	0	0.00
7	0	165.7	161	9	38917	1.93	45520	165.4	3.11E+02	0.9	100.	0	0.00
8	0	254.8	252	7	20978	1.96	2033	254.4	1.39E+01	12.1	100.	0	0.00
9	0	319.9	315	10	22375	2.01	24429	319.4	1.67E+02	1.3	100.	0	0.00
10	0	391.6	386	10	15967	1.65	45755	391.0	3.12E+02	0.7	100.	0	0.00
11	0	513.9	507	12	13843	2.08	52326	513.2	3.57E+02	0.6	100.	0	0.00
12	0	661.6	655	12	13470	2.14	48645	660.8	3.32E+02	0.7	100.	0	0.00
13	0	813.7	809	9	6000	2.58	1199	812.9	8.18E+00	12.1	100.	0	0.00

14 0 897.9 890 13 9539 2.55 59416 897.2 4.06E+02 0.5 100. 0 0.00
 15 0 1173.1 1165 14 5138 2.89 38042 1172.5 2.60E+02 0.6 100. 0 0.00
 16 3 1325.5 1318 21 3048 4.40 1473 1325.1 1.01E+01 10.8 100. 0 52.80
 17 3 1332.5 1318 21 2234 3.25 34494 1332.1 2.35E+02 0.6 100. 0 0.00
 18 0 1835.7 1827 21 866 3.97 34037 1836.5 2.32E+02 0.6 100. 0 0.00
 19 0 1929.4 1928 8 148 1.89 33 1930.6 2.26E-01 68.5 100. 0 0.00
 WHM=SQRT(3.07145E+00 + 4.78615E-03 *E)

 BACKGROUND INFO 1057 GLY 4 182.204 98 G- 5 BG DATE 179.310 98

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
661.63	332.0463	0.66	661.60	0.0000	0.00	332.0463	0.66
1173.11	259.6752	0.65	1173.20	0.0280	0.00	259.6472	0.65
1332.49	235.4518	0.60	1332.50	0.0443	0.00	235.4075	0.60

0 PEAKS REJECTED BY BACKGROUND

 INTERFERING ISOTOPE ANALYSIS 1057 GLY 4 182.204 98 G- 5

 SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 5 OF 179.310/1998 1858.9 MIN								
ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0771	30.50	511.0	0.6265	5.20	1120.3	0.0157	0.00
92.0	0.3421	12.28	583.1	0.1034	28.53	1173.2	0.0280	0.00
143.0	0.0888	21.39	609.3	0.0416	36.33	1238.1	0.0090	0.00
186.0	0.2678	17.37	661.6	0.0000	0.00	1332.5	0.0443	0.00
198.0	0.0847	33.65	727.2	0.0500	0.00	1377.7	0.0000	0.00
238.6	0.2281	19.42	846.0	0.0423	38.34	1460.8	0.2349	4.30
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0748	0.00	911.1	0.0704	23.43	1591.3	0.0098	0.00
338.4	0.0691	34.76	968.9	0.0384	30.47	1729.6	0.0194	0.00
351.9	0.0518	15.05	1001.0	0.0333	0.00	1764.5	0.0326	30.63

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 7/30/98

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD				LOW RADIUM STANDARD					
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		
102.226	98	1.8169	3.354	23.*	180.971	91	1.0568	2.669	22.
109.201	98	1.2475	11.413	44.	207.975	91	1.0647	2.084	11.
116.243	98	0.9899	11.212	11.	213.856	91	1.1437	10.869	44.
130.191	98	0.9758	11.028	15.	104.847	98	1.5613	4.800	18.
131.691	98	0.9872	11.255	39.	104.889	98	1.0083	5.754	38.*
152.846	98	0.9940	11.606	167.	107.860	98	1.0121	5.168	32.*
158.250	98	0.9803	10.108	10.	123.228	98	0.9476	6.512	29.*
165.222	98	0.9668	11.642	12.	131.720	98	1.0055	5.765	51.*
198.994	98	0.9710	10.603	10.	199.694	98	0.9998	6.630	10.*
207.230	98	0.9555	10.341	19.	210.754	98	0.9223	6.492	145.*
AVERAGE		1.0076	0.091		AVERAGE		0.9826	0.038	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 165.222 98
 ENERGY= -0.064555 + 1.0022677*CH + -1.465570E-06*CH**2
 FWHM =SQRT(0.5129 + 0.007540*ENERGY) (CO60= 3.250)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

NO EFFICIENCIES

 1057 GLY 4 G-5 XX 198.089 98 202.12 MIN 2.00000 ML 146
 LIBR=C981 REF TIME= 121.500 98 Calibration 1234

SPECIAL ANALYSIS						
PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	DPM/ML AT TZERO
Am241 59 (59.54)	1.582E+05 DAYS 0.073342	LAMBDA= 4.381E-06 1.00000	DECAY= 9.997E-01 41G 81.606	1.113E+03	2.52%	5.565E+02
Cd109 88 (88.03)	4.530E+02 DAYS 0.041771	LAMBDA= 1.530E-03 1.00000	DECAY= 8.894E-01 1G 159.923	3.829E+03	1.27%	2.152E+03
Co 57 122 (122.06) 136 (136.47)	2.700E+02 DAYS 0.038133 0.111000	LAMBDA= 2.567E-03 1.00000 1.00000	DECAY= 8.215E-01 10G 200.562 25.090	5.260E+03 2.260E+02	1.04% 6.55%	3.201E+03 1.376E+02
Ce139 166 (165.80)	1.372E+02 DAYS 0.063273	LAMBDA= 5.052E-03 1.00000	DECAY= 6.791E-01 2G 283.870	4.486E+03	0.81%	3.303E+03
Cr 51 320 (320.03)	2.772E+01 DAYS 0.186701	LAMBDA= 2.501E-02 1.00000	DECAY= 1.473E-01 1G 109.167	5.847E+02	1.59%	1.984E+03
Sn113 392 (391.40)	1.150E+02 DAYS 0.134211	LAMBDA= 6.027E-03 1.00000	DECAY= 6.303E-01 4G 279.198	2.080E+03	0.67%	1.650E+03
As 85 514 (513.98)	6.520E+01 DAYS 0.248480	LAMBDA= 1.063E-02 1.00000	DECAY= 4.430E-01 4G 297.972	1.199E+03	0.58%	1.354E+03
Cs137 662 (661.64)	1.102E+04 DAYS 0.157793	LAMBDA= 6.290E-05 1.00000	DECAY= 9.952E-01 3G 325.888	2.065E+03	0.54%	1.038E+03
Y 88 898 (898.00) 1836 (1836.10)	1.066E+02 DAYS 0.394059 0.416536	LAMBDA= 6.502E-03 1.00000 1.00000	DECAY= 6.077E-01 7G 364.900 204.659	9.260E+02 4.913E+02	0.50% 0.52%	7.618E+02 4.042E+02
Co 60 1173 (1173.21) 1333 (1332.48)	1.921E+03 DAYS 0.221390 0.221520	LAMBDA= 3.608E-04 1.00000 1.00000	DECAY= 9.727E-01 4G 258.141 229.572	1.166E+03 1.036E+03	0.57% 0.51%	5.993E+02 5.327E+02

NP: [7,67]146. GSP 19 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	5	10.7	8	15	10390	3.91	46546	10.7	2.30E+02	0.60	0.007	0	*****
2	5	14.7	8	15	42158	4.83	26966	14.7	1.33E+02	1.90	0.019	0	0.00
3	0	59.4	55	9	47723	1.89	16494	59.3	8.16E+01	2.5	100.	0	0.00
4	0	70.5	69	4	21877	3.76	1130	70.4	5.59E+00	18.6	100.	0	0.00
5	0	88.0	84	8	45912	1.32	32320	87.9	1.60E+02	1.3	100.	0	0.00
6	0	122.0	118	8	46052	1.36	40530	121.8	2.01E+02	1.0	100.	0	0.00
7	0	136.5	133	7	38284	1.64	5070	136.2	2.51E+01	6.6	100.	0	0.00
8	0	165.8	161	9	48211	1.84	57354	165.6	2.84E+02	0.8	100.	0	0.00
9	0	255.1	252	7	26372	1.67	2722	254.7	1.35E+01	10.1	100.	0	0.00
10	0	320.1	315	10	28489	1.93	22025	319.6	1.09E+02	1.6	100.	0	0.00
11	0	391.7	386	11	22879	1.81	56407	391.1	2.79E+02	0.7	100.	0	0.00
12	0	514.0	507	11	16609	2.16	60180	513.3	2.98E+02	0.6	100.	0	0.00
13	0	661.8	655	11	15788	2.17	45047	661.8	3.26E+02	0.5	100.	0	0.00

```

14 0 813.9 809 9 7620 2.99 1716 813.1 8.49E+00 9.5 100. 0 0.00
15 0 898.2 890 14 13294 2.53 73719 897.4 3.65E+02 0.5 100. 0 0.00
16 0 1173.4 1165 16 7142 2.98 52179 1172.8 2.58E+02 0.6 100. 0 0.00
17 6 1326.2 1318 22 4583 5.91 2508 1325.8 1.24E+01 9.9 100. 0 42.90
18 6 1332.8 1318 22 2722 3.22 46408 1332.5 2.30E+02 0.5 100. 0 0.00
19 0 1835.8 1827 17 1048 4.06 41346 1836.6 2.05E+02 0.5 100. 0 0.00

```

WHM=SQRT(5.64138E+00 + 6.28274E-03 *E)

```

*****
BACKGROUND INFO 1057 GLY 4 198.089 98 G- 5 BG DATE 192.294 98
*****

```

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
661.82	325.8863	0.54	661.60	0.0000	0.00	325.8863	0.54
1173.41	258.1628	0.57	1173.20	0.0280	0.00	258.1348	0.57
1332.83	229.6109	0.51	1332.50	0.0443	0.00	229.5666	0.51

0 PEAKS REJECTED BY BACKGROUND

```

*****
INTERFERING ISOTOPE ANALYSIS 1057 GLY 4 198.089 98 G- 5
*****
SPANF TABLE SAVED IN GSTOR SAYS NATO NOT REQUIRED

```

BACKGROUND FOR GELI DETECTOR 5 OF 192.294/1998 2374.2 MIN								
ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0669	35.57	511.0	0.6311	3.44	1120.3	0.0241	29.42
92.0	0.3445	8.45	583.1	0.1056	25.77	1173.2	0.0280	0.00
143.0	0.0856	20.92	609.3	0.0449	38.06	1238.1	0.0090	0.00
186.0	0.2615	20.46	661.6	0.0000	0.00	1332.5	0.0443	0.00
198.0	0.0830	30.12	727.2	0.0500	0.00	1377.7	0.0000	0.00
238.6	0.2436	18.76	846.0	0.0367	51.26	1460.8	0.2388	4.73
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0748	0.00	911.1	0.0743	20.60	1591.3	0.0098	0.00
338.4	0.0662	46.68	968.9	0.0423	28.83	1729.6	0.0081	0.00
351.9	0.0458	29.71	1001.0	0.0324	3.70	1764.5	0.0303	30.35

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 7/30/98

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD					LOW RADIUM STANDARD				
GMT YEAR	NORMALISED %		LENGTH IN MINUTES		GMT YEAR	NORMALISED %		LENGTH IN MINUTES	
	CPM	ERROR				CPM	ERROR		
102.226	98	1.8169	3.354	23.*	180.971	91	1.0568	2.669	22.
109.201	98	1.2475	11.413	44.	207.975	91	1.0647	2.084	11.
116.243	98	0.9899	11.212	11.	213.856	91	1.1437	10.869	44.
130.191	98	0.9758	11.028	15.	104.847	98	1.5613	4.800	18.
131.691	98	0.9872	11.255	39.	104.889	98	1.0083	5.754	38.*
152.846	98	0.9940	11.606	167.	107.860	98	1.0121	5.168	32.*
158.250	98	0.9803	10.108	10.	123.228	98	0.9476	6.512	29.*
165.222	98	0.9668	11.642	12.	131.720	98	1.0055	5.765	51.*
198.994	98	0.9710	10.603	10.	199.694	98	0.9998	6.630	10.*
207.230	98	0.9555	10.341	19.	210.754	98	0.9223	6.492	145.*
AVERAGE		1.0076	0.091		AVERAGE		0.9826	0.038	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 165.222 98
 ENERGY= -0.064555 + 1.0022677*CH + -1.465570E-06*CH**2
 FWHM =SQRT(0.5129 + 0.007540*ENERGY) (CO60= 3.250)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

NO EFFICIENCIES

1057 GLY 4 G-5 XX 205.200 98 563.00 MIN 2.00000 ML 302

LIBR=C981 REF TIME= 121.500 98 Calibration 1234

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAF	DPM NOW	ERROR PCT	DPM/ML AT TZERO
Am241 59 (59.54)	1.582E+05 DAYS 0.073342	LAMBDA= 4.381E-06 1.00000	78.894	DECAY= 9.996E-01 1.076E+03	41G s 1.55%	5.380E+02
Cd109 88 (88.03)	4.530E+02 DAYS 0.041771	LAMBDA= 1.530E-03 1.00000	157.837	DECAY= 8.798E-01 3.779E+03	1G s 0.51%	2.147E+03
Co 57 122 (122.06) 136 (136.47)	2.700E+02 DAYS 0.038133 0.111000	LAMBDA= 2.567E-03 1.00000 1.00000	196.707 24.427	DECAY= 8.066E-01 5.158E+03 2.201E+02	10G s 0.63% 4.41%	3.197E+03 1.364E+02
Ce139 166 (165.80)	1.372E+02 DAYS 0.063273	LAMBDA= 5.052E-03 1.00000	271.769	DECAY= 6.552E-01 4.295E+03	2G s 0.50%	3.278E+03
Cr 51 320 (320.03)	2.772E+01 DAYS 0.186701	LAMBDA= 2.501E-02 1.00000	93.346	DECAY= 1.233E-01 5.000E+02	1G s 1.00%	2.027E+03
Sn113 392 (391.40)	1.150E+02 DAYS 0.134211	LAMBDA= 6.027E-03 1.00000	265.970	DECAY= 6.038E-01 1.982E+03	4G s 0.38%	1.641E+03
85 514 (513.98)	6.520E+01 DAYS 0.248480	LAMBDA= 1.063E-02 1.00000	277.785	DECAY= 4.107E-01 1.118E+03	4G s 0.38%	1.361E+03
Cs137 662 (661.64)	1.102E+04 DAYS 0.157793	LAMBDA= 6.290E-05 1.00000	326.407	DECAY= 9.947E-01 2.069E+03	3G s 0.32%	1.040E+03
Y 88 898 (898.00) 1835 (1836.10)	1.066E+02 DAYS 0.394059 0.416536	LAMBDA= 6.502E-03 1.00000 1.00000	348.756 197.419	DECAY= 5.803E-01 8.850E+02 4.740E+02	7G s 0.31% s 0.33%	7.626E+02 4.084E+02
Co 60 1173 (1173.21) 1332 (1332.48)	1.921E+03 DAYS 0.221390 0.221520	LAMBDA= 3.608E-04 1.00000 1.00000	258.223 228.629	DECAY= 9.703E-01 1.166E+03 1.032E+03	4G s 0.33% s 0.31%	6.011E+02 5.319E+02

NO EFFICIENCIES

 1057 GLY 4 G-5 XX 205.200 98 563.00 MIN 2.00000 ML 302

LIBR=C981 REF TIME= 121.500 98 Calibration 1234

 * Group..... 1057 * Time of count 205.200 1998 *
 * Sample..... 4 * Reference GMT..... 121.500 1998 *
 * Element..... * Elapsed Live Tm..... 563. *
 * Type code..... GLY * Dead Time Pct..... 0.690871 *
 * ID.... 0 MB 500 mLs in Marinelli * Background GMT..... 200.997 1998 *
 * Geometry, detector..... XX-5 * Standard GMT..... 199.694 1998 *
 * Aliquot..... 2. * Days since TO..... 83.69972 *
 * Unit of Aliquot..... ML * Time on..... 21:47 PDT 23-JUL *
 * Data Sheet Units..... DPM /ML * Time off..... 7:11 PDT 24-JUL *
 * Library..... C981 * Calc Time..... 08:20 24-JUL-98 *

 * Slope..... 1.002042 * Width slope..... 0.006389 *
 * Intercept..... -.1187 * Width offset..... 1.085121 *
 * X**2 TERM..... -0.14328937E-05 * Sensitivity..... 4. *
 NP: [7,67]302.GSP 20 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	0	11.9	10	8176905	4.27	64051	12.0	1.14E+02	1.00	0.10	0	0.00	
2	0	59.3	55	9131066	1.95	44417	59.3	7.89E+01	1.5	100.	0	0.00	
3	0	70.2	68	6 87326	2.21	3365	70.2	5.98E+00	14.0	100.	0	0.00	
4	3	80.2	77	15 73628	1.83	3853	80.2	6.84E+00	10.7	100.	0	126.00	
5	3	87.9	77	15 58656	1.38	88836	87.9	1.58E+02	0.5	100.	0	0.00	
6	0	121.9	118	8124420	1.42	110690	121.8	1.97E+02	0.6	100.	0	0.00	
7	0	136.3	133	8117268	1.52	13745	136.2	2.44E+01	4.4	100.	0	0.00	
8	0	165.7	161	9130483	1.93	152854	165.5	2.71E+02	0.5	100.	0	0.00	
9	0	254.9	252	7 71888	1.85	7166	254.6	1.27E+01	6.3	100.	0	0.00	
10	0	319.9	315	9 68931	2.01	52296	319.5	9.29E+01	1.0	100.	0	0.00	
11	0	391.5	386	9 51268	1.71	149564	391.1	2.66E+02	0.4	100.	0	0.00	
12	0	513.8	507	12 49419	2.15	156066	513.2	2.77E+02	0.4	100.	0	0.00	
13	0	661.5	655	11 41915	2.17	183765	660.9	3.26E+02	0.3	100.	0	0.00	
14	0	758.7	756	6 15082	2.58	384	758.1	6.82E-01	51.0	100.	0	0.00	
15	0	813.6	809	8 18862	3.02	3964	813.0	7.04E+00	6.2	100.	0	0.00	
16	0	897.8	890	14 36661	2.56	196099	897.3	3.48E+02	0.3	100.	0	0.00	
17	0	1172.9	1165	15 18682	2.98	145385	1172.6	2.58E+02	0.3	100.	0	0.00	
18	4	1325.6	1318	21 11959	5.11	5961	1325.5	1.06E+01	6.2	100.	0	131.00	
19	4	1332.3	1318	21 7248	3.18	128734	1332.3	2.29E+02	0.3	100.	0	0.00	
PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1835.3	1827	20 3354	4.09	111005	1836.5	1.97E+02	0.3	100.	0	0.00	

FWHM=SQR(3.16640E+00 + 7.35169E-03 *E)

BACKGROUND INFO 1057 GLY 4 205.200 98 G- 5 BG DATE 200.997 98

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
661.53	326.4033	0.32	661.60	0.0000	0.00	326.4033	0.32
72.95	258.2331	0.33	1173.20	0.0280	0.00	258.2051	0.33
1332.33	228.6569	0.31	1332.50	0.0443	0.00	228.6126	0.31

0 PEAKS REJECTED BY BACKGROUND

INTERFERING ISOTOPE ANALYSIS 1057 GLY 4 205.200 98 G- 5

SPANF TABLE SAVED IN GSTR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 5 OF 200.997/1998 835.4 MIN								
ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0669	35.57	511.0	0.6157	8.25	1120.3	0.0241	29.42
92.0	0.3437	8.55	583.1	0.1128	29.43	1173.2	0.0280	0.00
143.0	0.0887	21.53	609.3	0.0456	32.64	1238.1	0.0090	0.00
186.0	0.2522	21.01	661.6	0.0000	0.00	1332.5	0.0443	0.00
198.0	0.0830	30.12	727.2	0.0500	0.00	1377.7	0.0000	0.00
238.6	0.2455	19.75	846.0	0.0367	51.26	1460.8	0.2436	6.45
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0748	0.00	911.1	0.0776	21.64	1591.3	0.0098	0.00
338.4	0.0662	46.68	968.9	0.0426	31.24	1729.6	0.0081	0.00
351.9	0.0458	29.71	1001.0	0.0324	3.70	1764.5	0.0285	36.09

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 DN 7/24/98

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD					LOW RADIUM STANDARD				
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	
316.886	94	1.1321	3.704	23.*	162.972	91	1.0585	1.586	16.
102.226	98	1.8169	3.354	23.*	180.971	91	1.0568	2.669	22.
109.201	98	1.2475	11.413	44.	207.975	91	1.0647	2.084	11.
116.243	98	0.9899	11.212	11.	213.856	91	1.1437	10.869	44.
130.191	98	0.9758	11.028	15.	104.847	98	1.5613	4.800	18.
131.691	98	0.9872	11.255	39.	104.889	98	1.0083	5.754	38.*
152.846	98	0.9940	11.606	167.	107.860	98	1.0121	5.168	32.*
158.250	98	0.9803	10.108	10.	123.228	98	0.9476	6.512	29.*
165.222	98	0.9668	11.642	12.	131.720	98	1.0055	5.765	51.*
198.994	98	0.9710	10.603	10.	199.694	98	0.9998	6.630	10.*
AVERAGE		1.0141	0.095		AVERAGE		0.9947	0.027	

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 199.694 98
 ENERGY= -0.118700 + 1.0020416*CH + -1.432894E-06*CH**2
 FWHM =SQRT(1.0851 + 0.006390*ENERGY) (CO60= 3.098)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

Det ... GELI 5
 Geo ... MB - Marinelli beaker
 Shift ... 0
 Ref ...

Date ... 02-FEB-90 Page 1
 Version ... 1.00
 File ... ND: [25,4]GELIOSMBO.EFF

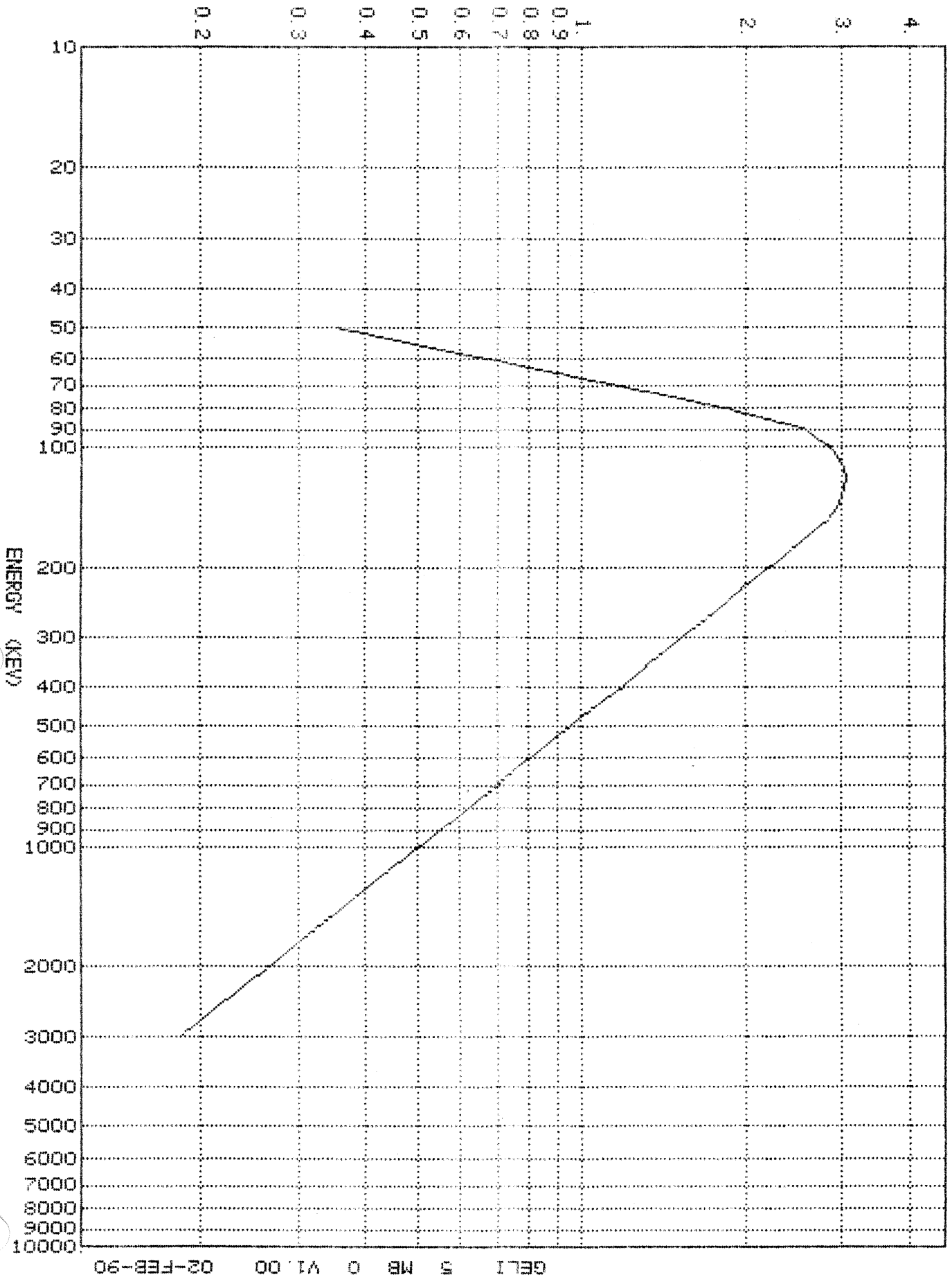
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.35702	108	2.97052	216	2.03704	324	1.41734	432	1.09498
51	0.38290	110	3.00000	218	2.01835	326	1.40933	434	1.09008
52	0.41010	112	3.01029	220	2.00000	328	1.40140	436	1.08522
53	0.43865	114	3.02042	222	1.98514	330	1.39357	438	1.08041
54	0.46861	116	3.03042	224	1.97052	332	1.38583	440	1.07563
55	0.50000	118	3.04028	226	1.95613	334	1.37818	442	1.07090
56	0.53287	120	3.05000	228	1.94198	336	1.37062	444	1.06622
57	0.56727	122	3.03961	230	1.92805	338	1.36314	446	1.06157
58	0.60322	124	3.02942	232	1.91434	340	1.35575	448	1.05697
59	0.64079	126	3.01942	234	1.90085	342	1.34844	450	1.05240
60	0.68000	128	3.00962	236	1.88756	344	1.34121	452	1.04788
61	0.72025	130	3.00000	238	1.87448	346	1.33406	454	1.04339
62	0.76217	132	2.98963	240	1.86159	348	1.32699	456	1.03895
63	0.80580	134	2.97945	242	1.84890	350	1.32000	458	1.03454
64	0.85118	136	2.96946	244	1.83640	352	1.31370	460	1.03017
65	0.89835	138	2.95964	246	1.82409	354	1.30747	462	1.02583
66	0.94736	140	2.95000	248	1.81196	356	1.30130	464	1.02154
67	0.99824	142	2.92916	250	1.80000	358	1.29519	466	1.01728
68	1.05104	144	2.90875	252	1.78883	360	1.28914	468	1.01305
69	1.10580	146	2.88877	254	1.77385	362	1.28316	470	1.00886
70	1.16256	148	2.86919	256	1.76108	364	1.27724	472	1.00471
71	1.22138	150	2.85000	258	1.74849	366	1.27138	474	1.00059
72	1.28228	152	2.81665	260	1.73609	368	1.26557	476	0.99651
73	1.34531	154	2.78412	262	1.72387	370	1.25983	478	0.99245
74	1.41052	156	2.75238	264	1.71183	372	1.25414	480	0.98844
75	1.47795	158	2.72140	266	1.69996	374	1.24850	482	0.98445
76	1.54765	160	2.69115	268	1.68826	376	1.24292	484	0.98050
77	1.61966	162	2.66160	270	1.67673	378	1.23740	486	0.97658
78	1.69402	164	2.63274	272	1.66536	380	1.23193	488	0.97269
79	1.77079	166	2.60453	274	1.65415	382	1.22651	490	0.96883
80	1.85000	168	2.57696	276	1.64310	384	1.22115	492	0.96501
81	1.91526	170	2.55000	278	1.63220	386	1.21583	494	0.96121
82	1.98199	172	2.52305	280	1.62145	388	1.21057	496	0.95744
83	2.05019	174	2.49669	282	1.61085	390	1.20535	498	0.95371
84	2.11987	176	2.47090	284	1.60039	392	1.20019	500	0.95000
85	2.19105	178	2.44567	286	1.59007	394	1.19507	502	0.94643
86	2.26375	180	2.42097	288	1.57989	396	1.19000	504	0.94289
87	2.33799	182	2.39679	290	1.56984	398	1.18498	506	0.93938
88	2.41376	184	2.37311	292	1.55993	400	1.18000	508	0.93589
89	2.49109	186	2.34992	294	1.55014	402	1.17430	510	0.93243
90	2.57000	188	2.32720	296	1.54049	404	1.16865	512	0.92900
91	2.59803	190	2.30494	298	1.53095	406	1.16305	514	0.92559
92	2.62604	192	2.28312	300	1.52154	408	1.15751	516	0.92221
93	2.65406	194	2.26172	302	1.51225	410	1.15203	518	0.91885
94	2.68207	196	2.24075	304	1.50308	412	1.14659	520	0.91552
95	2.71007	198	2.22018	306	1.49402	414	1.14121	522	0.91222
96	2.73807	200	2.20000	308	1.48508	416	1.13588	524	0.90893
97	2.76606	202	2.17822	310	1.47624	418	1.13060	526	0.90567
98	2.79404	204	2.15686	312	1.46752	420	1.12537	528	0.90244
99	2.82202	206	2.13592	314	1.45890	422	1.12018	530	0.89923
100	2.85000	208	2.11538	316	1.45039	424	1.11505	532	0.89604
102	2.88054	210	2.09524	318	1.44198	426	1.10996	534	0.89288
104	2.91080	212	2.07547	320	1.43367	428	1.10492	536	0.88974
106	2.94079	214	2.05607	322	1.42546	430	1.09993	538	0.88662

Det ... GELI 5
 Geo ... MB - Marinelli beaker
 Shlf ... 0
 Ref ...

Date 02-FEB-90 Page 2
 Version ... 1.00
 File ND: [25, 4]GELI05MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	0.88353	660	0.73522	930	0.53623	1260	0.40232	1800	0.29188
542	0.88045	665	0.73032	935	0.53347	1270	0.39952	1810	0.29040
544	0.87740	670	0.72549	940	0.53073	1280	0.39677	1820	0.28894
546	0.87437	675	0.72072	945	0.52802	1290	0.39406	1830	0.28749
548	0.87136	680	0.71602	950	0.52534	1300	0.39139	1840	0.28606
550	0.86838	685	0.71139	955	0.52269	1310	0.38875	1850	0.28464
552	0.86541	690	0.70682	960	0.52007	1320	0.38615	1860	0.28324
554	0.86247	695	0.70232	965	0.51747	1330	0.38359	1870	0.28185
556	0.85954	700	0.69787	970	0.51490	1340	0.38107	1880	0.28047
558	0.85664	705	0.69348	975	0.51235	1350	0.37858	1890	0.27911
560	0.85375	710	0.68915	980	0.50983	1360	0.37612	1900	0.27776
562	0.85089	715	0.68488	985	0.50734	1370	0.37370	1925	0.27445
564	0.84804	720	0.68067	990	0.50487	1380	0.37131	1950	0.27122
566	0.84522	725	0.67650	995	0.50242	1390	0.36896	1975	0.26807
568	0.84241	730	0.67240	1000	0.50000	1400	0.36663	2000	0.26500
570	0.83963	735	0.66834	1005	0.49762	1410	0.36434	2025	0.26193
572	0.83686	740	0.66434	1010	0.49526	1420	0.36208	2050	0.25894
574	0.83411	745	0.66039	1015	0.49293	1430	0.35985	2075	0.25601
576	0.83138	750	0.65649	1020	0.49062	1440	0.35764	2100	0.25316
578	0.82867	755	0.65263	1025	0.48833	1450	0.35547	2125	0.25037
580	0.82598	760	0.64883	1030	0.48606	1460	0.35332	2150	0.24764
582	0.82330	765	0.64507	1035	0.48382	1470	0.35120	2175	0.24497
584	0.82064	770	0.64136	1040	0.48159	1480	0.34911	2200	0.24236
586	0.81800	775	0.63769	1045	0.47939	1490	0.34704	2225	0.23981
588	0.81538	780	0.63406	1050	0.47721	1500	0.34500	2250	0.23731
590	0.81277	785	0.63049	1055	0.47504	1510	0.34290	2275	0.23486
592	0.81019	790	0.62695	1060	0.47290	1520	0.34083	2300	0.23247
594	0.80761	795	0.62345	1065	0.47078	1530	0.33879	2325	0.23013
596	0.80506	800	0.62000	1070	0.46867	1540	0.33677	2350	0.22783
598	0.80252	805	0.61629	1075	0.46659	1550	0.33478	2375	0.22559
600	0.80000	810	0.61262	1080	0.46452	1560	0.33281	2400	0.22338
602	0.79764	815	0.60900	1085	0.46248	1570	0.33087	2425	0.22122
604	0.79530	820	0.60542	1090	0.46045	1580	0.32895	2450	0.21911
606	0.79298	825	0.60188	1095	0.45844	1590	0.32705	2475	0.21703
608	0.79067	830	0.59838	1100	0.45644	1600	0.32517	2500	0.21500
610	0.78837	835	0.59493	1105	0.45447	1610	0.32332	2525	0.21305
612	0.78609	840	0.59151	1110	0.45251	1620	0.32149	2550	0.21114
614	0.78382	845	0.58814	1115	0.45057	1630	0.31968	2575	0.20927
616	0.78156	850	0.58480	1120	0.44865	1640	0.31789	2600	0.20743
618	0.77932	855	0.58151	1125	0.44674	1650	0.31613	2625	0.20562
620	0.77709	860	0.57825	1130	0.44485	1660	0.31438	2650	0.20385
622	0.77488	865	0.57502	1135	0.44297	1670	0.31265	2675	0.20211
624	0.77268	870	0.57184	1140	0.44112	1680	0.31095	2700	0.20040
626	0.77049	875	0.56869	1150	0.43745	1690	0.30926	2725	0.19872
628	0.76831	880	0.56557	1160	0.43384	1700	0.30759	2750	0.19706
630	0.76615	885	0.56249	1170	0.43029	1710	0.30594	2775	0.19544
632	0.76401	890	0.55945	1180	0.42680	1720	0.30431	2800	0.19385
634	0.76187	895	0.55643	1190	0.42337	1730	0.30269	2825	0.19228
636	0.75975	900	0.55345	1200	0.42000	1740	0.30110	2850	0.19074
638	0.75764	905	0.55050	1210	0.41694	1750	0.29952	2875	0.18922
640	0.75554	910	0.54759	1220	0.41392	1760	0.29796	2900	0.18773
645	0.75035	915	0.54470	1230	0.41096	1770	0.29642	2925	0.18626
650	0.74523	920	0.54185	1240	0.40803	1780	0.29489	2950	0.18482
655	0.74019	925	0.53903	1250	0.40515	1790	0.29338	2975	0.18340

PERCENT EFFICIENCY



GELI 5 MB 0 V1.00 02-FEB-90

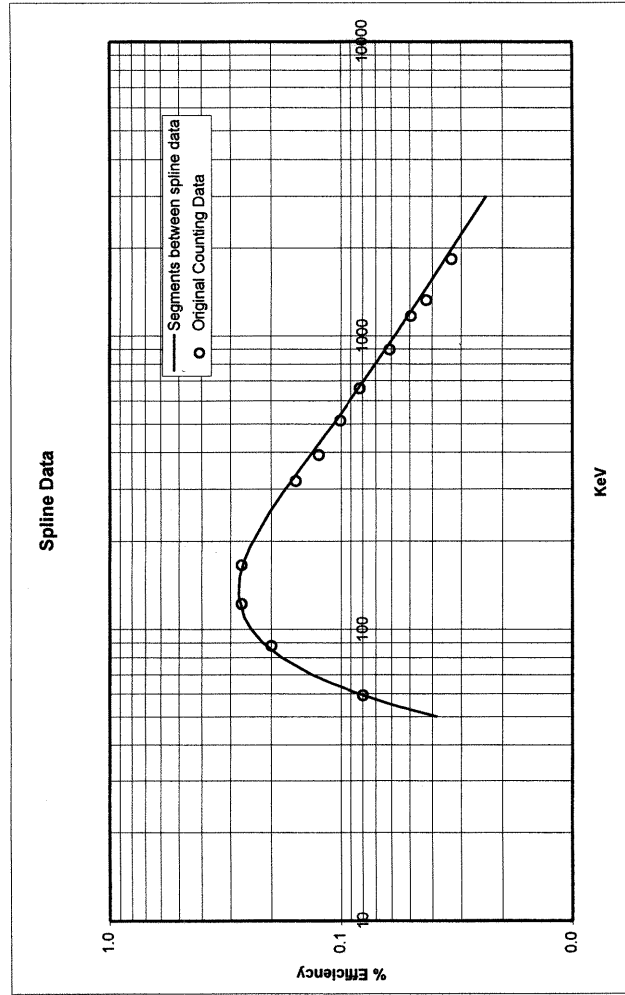
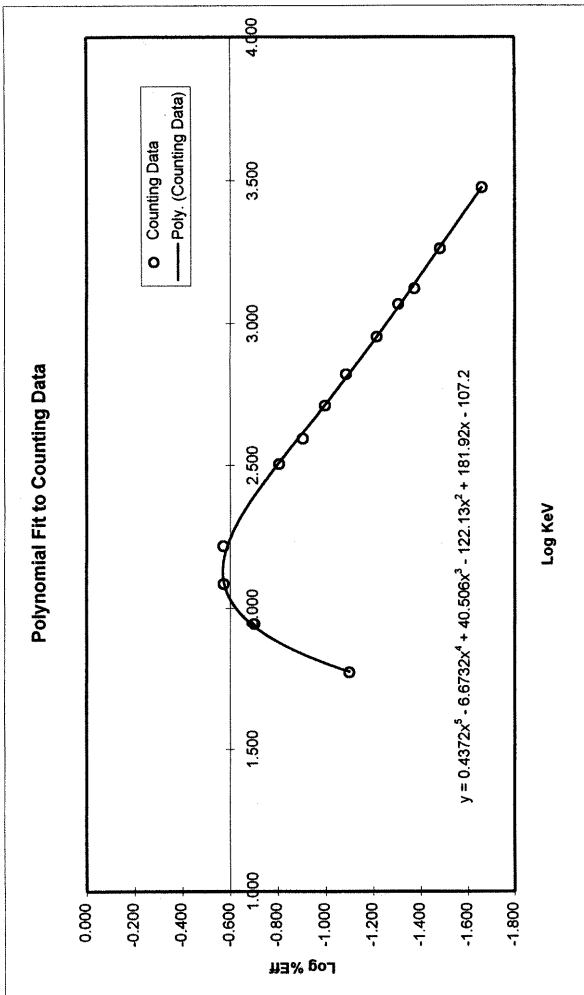
Gamma Spectrometer Efficiency Calculation

G5.xls

MM 5/5/00

Detector	G5	500 mL Marinelli beaker
Geometry	MB	Shelf 1
Std I.D.	1057-4	
Filename	G5LI05MB1.EFF	

Line	%Eff 1st.Cnt	%Eff 2nd.Cnt	Avg %Eff	%SD	LogKeV	Log%Eff	%Dev from Spline
59.5	0.07968		0.07969		1.775	-1.099	-5
88	0.19920		0.19920		1.944	-0.701	-1
122	0.2678		0.26780		2.086	-0.572	-2
166	0.2682		0.26820		2.220	-0.572	1
320	0.15660		0.15660		2.505	-0.805	-4
392	0.12450		0.12450		2.593	-0.905	-8
514	0.10080		0.10080		2.711	-0.997	-3
662	0.06190		0.06190		2.821	-1.087	-1
898	0.06086		0.06086		2.953	-1.216	-4
1173	0.04940		0.04940		3.069	-1.306	-3
1332	0.04239		0.04239		3.125	-1.373	-7
1836	0.03301		0.03301		3.264	-1.481	-6
3000	(artificial data)		0.02200		3.477	-1.658	-6
							-4



(shaded cells are manual entry, all others are calculated)

Generation of Spline Points from Polynomial Equation

Spline Values	keV	%Eff	LogkeV	Log%Eff	%Eff Prev Calib	Ratio New/ Old
	50	0.03815	1.699	-1.418		
	55	0.05919	1.740	-1.228		
	60	0.08313	1.778	-1.080	#DIV/0!	
	65	0.10841	1.813	-0.965		
	70	0.13362	1.845	-0.874		
	80	0.17984	1.903	-0.745		
	90	0.21695	1.954	-0.664		
	100	0.24389	2.000	-0.613	#DIV/0!	
	110	0.26163	2.041	-0.582		
	130	0.27626	2.114	-0.559		
	150	0.27361	2.176	-0.563		
	170	0.26246	2.230	-0.581		
	190	0.24782	2.279	-0.606		
	250	0.20309	2.398	-0.692	#DIV/0!	
	300	0.17308	2.477	-0.762		
	500	0.10692	2.699	-0.971		
	700	0.07864	2.845	-1.104	#DIV/0!	
	1000	0.05786	3.000	-1.238		
	1400	0.04383	3.146	-1.358		
	2000	0.03271	3.301	-1.485		
	3000	0.02341	3.477	-1.631		

Gamma Spectrometer Calibration Counting Results

Detector: G5
 Geometry: MB*1 Descr: 500 ml in Marinelli Beaker
 Standard I.D.: 1057-4 on shelf #1

Gamma KeV	% Efficiency			
	GMT= 169.994	GMT=	GMT=	GMT=
59.5 (Am241)	0.07969			
88 (Cd109)	0.1992			
122 (Co57)	0.2678			
166 (Ce139)	0.2682			
320 (Cr51)	0.1566			
392 (Sn113)	0.1245			
514 (Sr85)	0.1006			
662 (Cs137)	0.0819			
898 (Y88)	0.06086			
1173 (Co60)	0.04940			
1332 (Co60)	0.04239			
1836 (Y88)	0.03301			

570

NO EFFICIENCIES

 1057 GLY 4*1 G-5 XX 169.994 98 110.50 MIN 2.00000 ML 570
 BR=C981 REF TIME= 121.500 98 Calibration 1234

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEY	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	DPM/ML AT TZERO
Am241 60 (59.54)	1.582E+05 DAYS 0.073342	LAMBDA= 4.381E-06 1.00000	DECAY= 9.998E-01 41G 11.686	1.593E+02	8.26%	7.969E+01
Cd109 88 (88.03)	4.530E+02 DAYS 0.041771	LAMBDA= 1.530E-03 1.00000	DECAY= 9.285E-01 1G 15.452	3.699E+02	4.44%	1.992E+02
Co 57 122 (122.06) 136 (136.47)	2.700E+02 DAYS 0.038133 0.111000	LAMBDA= 2.567E-03 1.00000 1.00000	DECAY= 8.829E-01 10G 18.034 1.180	4.729E+02 1.064E+01	5.83% 65.60%	2.678E+02 6.023E+00
Ce139 166 (165.80)	1.372E+02 DAYS 0.063273	LAMBDA= 5.052E-03 1.00000	DECAY= 7.827E-01 2G 26.561	4.198E+02	3.58%	2.682E+02
Cr 51 320 (320.03)	2.772E+01 DAYS 0.186701	LAMBDA= 2.501E-02 1.00000	DECAY= 2.974E-01 1G 17.390	9.314E+01	4.90%	1.566E+02
Sn113 392 (391.40)	1.150E+02 DAYS 0.134211	LAMBDA= 6.027E-03 1.00000	DECAY= 7.466E-01 4G 24.949	1.859E+02	3.16%	1.245E+02
Sr 85 514 (513.98)	6.520E+01 DAYS 0.248480	LAMBDA= 1.063E-02 1.00000	DECAY= 5.972E-01 4G 29.868	1.202E+02	2.12%	1.006E+02
Cs137 662 (661.64)	1.102E+04 DAYS 0.157793	LAMBDA= 6.290E-05 1.00000	DECAY= 9.970E-01 3G 25.769	1.633E+02	2.69%	8.190E+01
Y 88 898 (898.00) 1836 (1836.10)	1.066E+02 DAYS 0.394059 0.416536	LAMBDA= 6.502E-03 1.00000 1.00000	DECAY= 7.296E-01 7G 34.992 20.061	8.880E+01 4.816E+01	2.11% 2.24%	6.086E+01 3.301E+01
Co 60 1173 (1173.21) 1332 (1332.48)	1.921E+03 DAYS 0.221390 0.221520	LAMBDA= 3.608E-04 1.00000 1.00000	DECAY= 9.827E-01 4G 21.493 18.453	9.708E+01 8.330E+01	2.63% 2.84%	4.940E+01 4.239E+01

NP: [7,67]570. GSP 23 PEAKS

PK	IT	ENRG	LEFT	WD	BKGND	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	7	10.3	8	8	521	1.37	1329	10.4	1.20E+01	4.40	100.007	0	70.20
2	7	12.2	8	8	2751	2.41	1200	12.2	1.09E+01	8.20	100.011	0	0.00
3	0	59.5	56	8	3380	1.93	1291	59.4	1.17E+01	8.3	100.	0	0.00
4	3	85.1	83	9	2568	1.64	165	85.0	1.49E+00	47.9	100.	0	0.61
5	3	88.0	83	9	1967	1.30	1707	87.9	1.55E+01	4.4	100.	0	0.00
6	0	121.8	118	8	3803	1.32	1993	121.7	1.80E+01	5.8	100.	0	0.00
7	0	135.7	134	6	2869	1.15	130	135.5	1.18E+00	65.6	100.	0	0.00
8	0	165.8	163	7	2836	1.91	2934	165.6	2.66E+01	3.6	100.	0	0.00
9	0	255.2	252	6	1567	1.95	149	254.8	1.35E+00	43.0	100.	0	0.00
10	0	320.0	315	10	1942	1.99	1920	319.4	1.74E+01	4.9	100.	0	0.00
11	0	391.6	386	10	1331	1.65	2756	391.0	2.49E+01	3.2	100.	0	0.00
12	5	510.9	507	12	607	2.78	395	510.2	3.57E+00	12.1	100.	0	2.00
13	5	514.1	507	12	563	1.85	3399	513.3	2.99E+01	2.1	100.	0	0.00

14	0	609.4	605	7	472	2.46	106	608.6	9.58E-01	36.5	100.	0	0.00
15	0	661.6	655	11	841	2.05	2847	660.8	2.58E+01	2.7	100.	0	0.00
16	0	813.9	810	7	270	3.08	110	813.1	9.92E-01	27.4	100.	0	0.00
17	0	880.6	877	8	321	2.92	59	879.8	5.31E-01	57.3	100.	0	0.00
18	0	898.0	890	13	624	2.50	3866	897.2	3.50E+01	2.1	100.	0	0.00
9	0	1161.1	1157	8	181	1.29	45	1160.5	4.06E-01	57.4	100.	0	0.00
PK	IT	ENRG	LEFT	WD	BKGD	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	1173.0	1165	15	311	2.72	2378	1172.5	2.15E+01	2.6	100.	0	0.00
21	0	1332.4	1325	13	291	3.18	2044	1332.0	1.85E+01	2.8	100.	0	0.00
22	0	1461.2	1455	13	176	2.83	135	1461.1	1.22E+00	22.7	100.	0	0.00
23	0	1835.6	1826	19	45	3.81	2216	1836.4	2.01E+01	2.2	100.	0	0.00

FWHM=SQRT(2.34612E+00 + 4.91180E-03 *E)

BACKGROUND INFO 1057 GLY 4 169.994 98 G- 5 BG DATE 165.232 98

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v	
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	CPM	%ERROR
510.88	3.5747	12.08	511.00	0.6017	9.96	2.9730	14.66
609.35	0.9584	36.49	609.30	0.0383	18.29	0.9201	38.02
661.58	25.7687	2.69	661.60	0.0000	0.00	25.7687	2.69
1173.05	21.5206	2.63	1173.20	0.0280	0.00	21.4926	2.63
1332.39	18.4974	2.83	1332.50	0.0443	0.00	18.4531	2.84
1461.19	1.2175	22.72	1460.80	0.2327	3.40	0.9848	28.10

0 PEAKS REJECTED BY BACKGROUND

INTERFERING ISOTOPE ANALYSIS 1057 GLY 4 169.994 98 G- 5

ANF TABLE SAVED IN GSTR SAYS NATO NOT REQUIRED

BACKGROUND FOR GELI DETECTOR 5 OF 165.232/1998 1950.6 MIN								
ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0705	32.91	511.0	0.6017	9.96	1120.3	0.0157	0.00
92.0	0.3466	12.95	583.1	0.0971	32.23	1173.2	0.0280	0.00
143.0	0.0696	47.40	609.3	0.0383	18.29	1238.1	0.0090	0.00
186.0	0.2463	13.12	661.6	0.0000	0.00	1332.5	0.0443	0.00
198.0	0.0815	41.83	727.2	0.0500	0.00	1377.7	0.0000	0.00
238.6	0.2201	22.09	846.0	0.0363	47.62	1460.8	0.2327	3.40
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0748	0.00	911.1	0.0717	17.43	1591.3	0.0098	0.00
338.4	0.0653	33.06	968.9	0.0392	28.80	1729.6	0.0194	0.00
351.9	0.0788	58.41	1001.0	0.0333	0.00	1764.5	0.0325	43.10

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 7/30/98

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

HIGH RADIUM STANDARD				LOW RADIUM STANDARD					
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		
102.226	98	1.8169	3.354	23.*	180.971	91	1.0568	2.669	22.
109.201	98	1.2475	11.413	44.	207.975	91	1.0647	2.084	11.
116.243	98	0.9899	11.212	11.	213.856	91	1.1437	10.869	44.
130.191	98	0.9758	11.028	15.	104.847	98	1.5613	4.800	18.
131.691	98	0.9872	11.255	39.	104.889	98	1.0083	5.754	38.*
152.846	98	0.9940	11.606	167.	107.860	98	1.0121	5.168	32.*
158.250	98	0.9803	10.108	10.	123.228	98	0.9476	6.512	29.*
165.222	98	0.9668	11.642	12.	131.720	98	1.0055	5.765	51.*
198.994	98	0.9710	10.603	10.	199.694	98	0.9998	6.630	10.*
17.230	98	0.9555	10.341	19.	210.754	98	0.9223	6.492	145.*
AVERAGE 1.0076 0.091				AVERAGE 0.9826 0.038					

CALIBRATION LINE FROM STANDARD FOR G- 5 OF 165.222 98

ENERGY = -0.064555 + 1.0022677*CH + -1.465570E-06*CH**2
 FWHM = SQRT(0.5129 + 0.007540*ENERGY) (CD60 = 3.250)

EFFICIENCIES FOR GEOMETRY XX 5 CALIBRATED 33.000 1990

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	100.000000	130.0	100.000000	350.0	100.000000	1500.0	100.000000
60.0	100.000000	140.0	100.000000	400.0	100.000000	2000.0	100.000000
80.0	100.000000	150.0	100.000000	500.0	100.000000	2500.0	100.000000
90.0	100.000000	170.0	100.000000	600.0	100.000000	3000.0	100.000000
100.0	100.000000	200.0	100.000000	800.0	100.000000		
110.0	100.000000	220.0	100.000000	1000.0	100.000000		
120.0	100.000000	250.0	100.000000	1200.0	100.000000		

NO.	NAME	ADDRESS	CITY	STATE	ZIP	DATE	TIME	TYPE	REMARKS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50

Det ... GELI 5
 Geo ... NY - Nylon planchet
 Shlf ... 0
 Ref ... Calibration 1234

Date ... 02-FEB-90 Page 1
 Version ... 1.00
 File ... ND: [25, 4]GELI05NYO. EFF

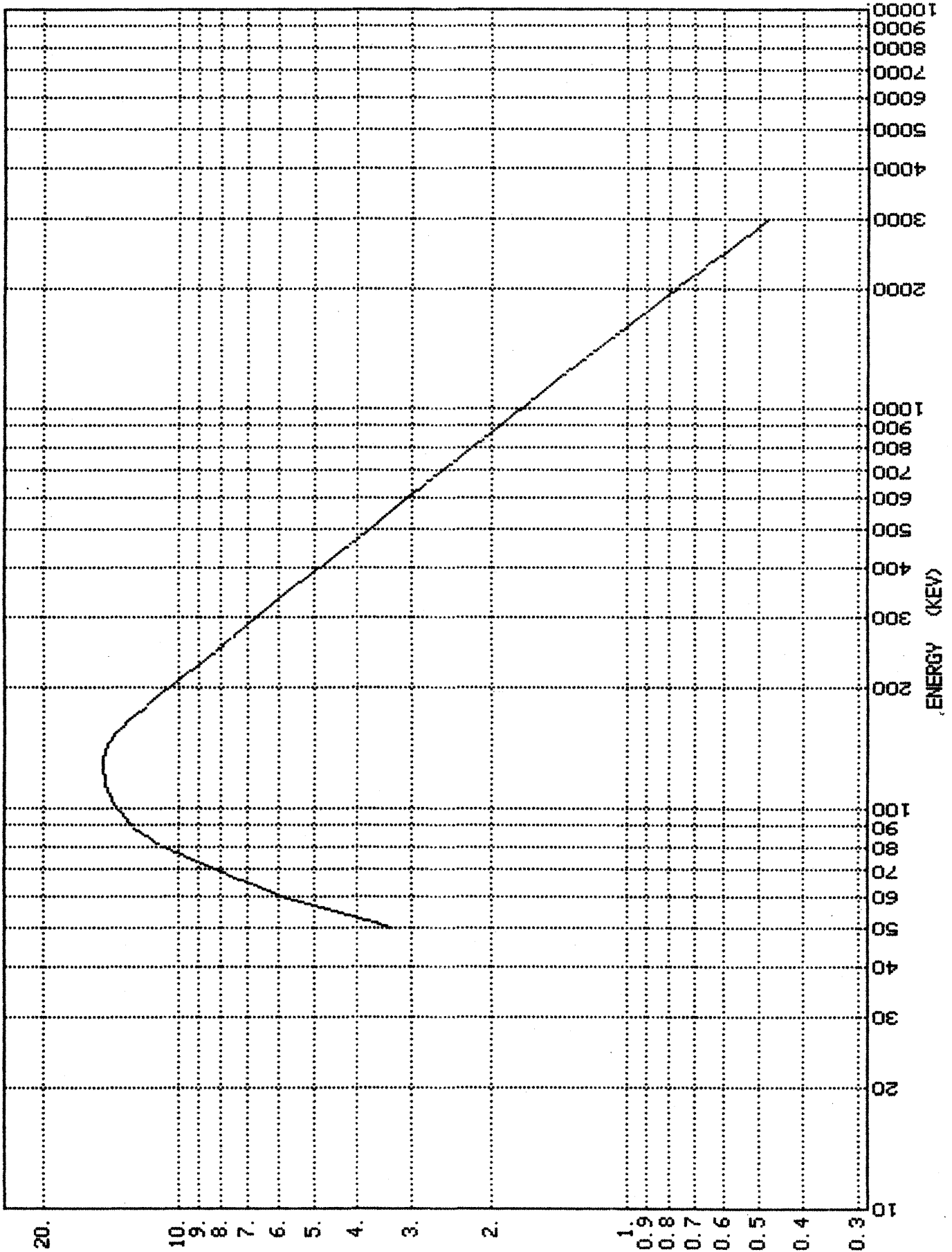
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	3.36057	108	14.26251	216	9.50233	324	6.12801	432	4.40824
51	3.57895	110	14.40000	218	9.40015	326	6.08846	434	4.38577
52	3.80686	112	14.44119	220	9.30000	328	6.04941	436	4.36352
53	4.04452	114	14.48177	222	9.20545	330	6.01084	438	4.34148
54	4.29216	116	14.52175	224	9.11270	332	5.97275	440	4.31965
55	4.55000	118	14.56115	226	9.02169	334	5.93512	442	4.29804
56	4.81826	120	14.60000	228	8.93239	336	5.89796	444	4.27662
57	5.09716	122	14.62060	230	8.84473	338	5.86125	446	4.25541
58	5.38694	124	14.64088	232	8.75869	340	5.82498	448	4.23440
59	5.68781	126	14.66087	234	8.67420	342	5.78914	450	4.21359
60	6.00000	128	14.68058	236	8.59125	344	5.75373	452	4.19297
61	6.20938	130	14.70000	238	8.50978	346	5.71875	454	4.17254
62	6.42249	132	14.65858	240	8.42974	348	5.68417	456	4.15230
63	6.63932	134	14.61789	242	8.35112	350	5.65000	458	4.13224
64	6.85989	136	14.57791	244	8.27387	352	5.61083	460	4.11237
65	7.08420	138	14.53862	246	8.19796	354	5.57215	462	4.09268
66	7.31224	140	14.50001	248	8.12335	356	5.53395	464	4.07317
67	7.54403	142	14.39576	250	8.05000	358	5.49623	466	4.05383
68	7.77956	144	14.29372	252	7.98280	360	5.45897	468	4.03467
69	8.01886	146	14.19379	254	7.91668	362	5.42216	470	4.01568
70	8.26191	148	14.09591	256	7.85161	364	5.38581	472	3.99686
71	8.50873	150	14.00000	258	7.78759	366	5.34990	474	3.97821
72	8.75931	152	13.83311	260	7.72457	368	5.31442	476	3.95973
73	9.01366	154	13.67034	262	7.66255	370	5.27937	478	3.94140
74	9.27178	156	13.51155	264	7.60148	372	5.24473	480	3.92324
75	9.53369	158	13.35660	266	7.54136	374	5.21050	482	3.90523
76	9.79937	160	13.20534	268	7.48216	376	5.17669	484	3.88738
77	10.06884	162	13.05764	270	7.42386	378	5.14326	486	3.86969
78	10.34210	164	12.91337	272	7.36643	380	5.11023	488	3.85215
79	10.61915	166	12.77242	274	7.30987	382	5.07758	490	3.83476
80	10.90000	168	12.63467	276	7.25415	384	5.04531	492	3.81752
81	11.07713	170	12.50000	278	7.19925	386	5.01341	494	3.80042
82	11.25491	172	12.33564	280	7.14515	388	4.98188	496	3.78347
83	11.43335	174	12.17530	282	7.09185	390	4.95070	498	3.76666
84	11.61241	176	12.01884	284	7.03931	392	4.91987	500	3.75000
85	11.79212	178	11.86612	286	6.98752	394	4.88940	502	3.73361
86	11.97245	180	11.71702	288	6.93648	396	4.85926	504	3.71735
87	12.15342	182	11.57141	290	6.88616	398	4.82947	506	3.70123
88	12.33500	184	11.42917	292	6.83654	400	4.80000	508	3.68524
89	12.51719	186	11.29020	294	6.78762	402	4.77359	510	3.66939
90	12.70000	188	11.15436	296	6.73937	404	4.74745	512	3.65366
91	12.80135	190	11.02157	298	6.69179	406	4.72159	514	3.63806
92	12.90240	192	10.89174	300	6.64486	408	4.69599	516	3.62259
93	13.00313	194	10.76475	302	6.59857	410	4.67065	518	3.60725
94	13.10357	196	10.64052	304	6.55290	412	4.64558	520	3.59202
95	13.20370	198	10.51897	306	6.50785	414	4.62076	522	3.57692
96	13.30354	200	10.40000	308	6.46340	416	4.59619	524	3.56194
97	13.40308	202	10.27933	310	6.41953	418	4.57186	526	3.54708
98	13.50234	204	10.16123	312	6.37624	420	4.54779	528	3.53234
99	13.60131	206	10.04561	314	6.33352	422	4.52395	530	3.51772
100	13.70000	208	9.93241	316	6.29135	424	4.50034	532	3.50320
102	13.84259	210	9.82155	318	6.24972	426	4.47698	534	3.48881
104	13.98384	212	9.71296	320	6.20863	428	4.45384	536	3.47453
106	14.12381	214	9.60658	322	6.16807	430	4.43093	538	3.46036

Det ... GELI 5
 Geo ... NY - Nylon planchet
 Shlf ... 0
 Ref ... Calibration 1234

Date 02-FEB-90 Page 2
 Version ... 1.00
 File ND: [25,4]GELI05NY0.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	3.44629	660	2.74912	930	1.85602	1260	1.31271	1800	0.86503
542	3.43234	665	2.72519	935	1.84482	1270	1.30060	1810	0.85946
544	3.41849	670	2.70165	940	1.83374	1280	1.28869	1820	0.85395
546	3.40476	675	2.67848	945	1.82279	1290	1.27699	1830	0.84851
548	3.39112	680	2.65568	950	1.81196	1300	1.26548	1840	0.84314
550	3.37759	685	2.63324	955	1.80126	1310	1.25416	1850	0.83782
552	3.36417	690	2.61115	960	1.79067	1320	1.24303	1860	0.83257
554	3.35084	695	2.58941	965	1.78019	1330	1.23208	1870	0.82738
556	3.33761	700	2.56800	970	1.76984	1340	1.22130	1880	0.82225
558	3.32449	705	2.54691	975	1.75959	1350	1.21070	1890	0.81718
560	3.31146	710	2.52615	980	1.74946	1360	1.20027	1900	0.81216
562	3.29853	715	2.50570	985	1.73943	1370	1.19000	1925	0.79988
564	3.28570	720	2.48555	990	1.72952	1380	1.17990	1950	0.78793
566	3.27296	725	2.46571	995	1.71971	1390	1.16995	1975	0.77631
568	3.26031	730	2.44616	1000	1.71000	1400	1.16016	2000	0.76500
570	3.24776	735	2.42689	1005	1.70034	1410	1.15052	2025	0.75402
572	3.23530	740	2.40791	1010	1.69077	1420	1.14102	2050	0.74332
574	3.22293	745	2.38920	1015	1.68131	1430	1.13167	2075	0.73291
576	3.21066	750	2.37076	1020	1.67195	1440	1.12246	2100	0.72276
578	3.19847	755	2.35259	1025	1.66268	1450	1.11339	2125	0.71287
580	3.18637	760	2.33467	1030	1.65351	1460	1.10445	2150	0.70323
582	3.17435	765	2.31700	1035	1.64444	1470	1.09565	2175	0.69383
584	3.16242	770	2.29958	1040	1.63546	1480	1.08697	2200	0.68466
586	3.15058	775	2.28241	1045	1.62657	1490	1.07843	2225	0.67572
588	3.13882	780	2.26547	1050	1.61777	1500	1.07000	2250	0.66699
590	3.12715	785	2.24877	1055	1.60906	1510	1.06174	2275	0.65846
592	3.11556	790	2.23229	1060	1.60044	1520	1.05360	2300	0.65014
594	3.10405	795	2.21603	1065	1.59190	1530	1.04557	2325	0.64201
596	3.09262	800	2.20000	1070	1.58345	1540	1.03766	2350	0.63406
598	3.08127	805	2.18458	1075	1.57508	1550	1.02985	2375	0.62630
600	3.07000	810	2.16936	1080	1.56680	1560	1.02216	2400	0.61871
602	3.05819	815	2.15433	1085	1.55860	1570	1.01457	2425	0.61129
604	3.04646	820	2.13951	1090	1.55047	1580	1.00708	2450	0.60404
606	3.03482	825	2.12487	1095	1.54243	1590	0.99970	2475	0.59694
608	3.02326	830	2.11042	1100	1.53447	1600	0.99241	2500	0.59000
610	3.01178	835	2.09616	1105	1.52658	1610	0.98523	2525	0.58306
612	3.00038	840	2.08208	1110	1.51877	1620	0.97814	2550	0.57627
614	2.98907	845	2.06817	1115	1.51103	1630	0.97114	2575	0.56962
616	2.97783	850	2.05444	1120	1.50337	1640	0.96424	2600	0.56311
618	2.96667	855	2.04088	1125	1.49578	1650	0.95743	2625	0.55674
620	2.95559	860	2.02748	1130	1.48826	1660	0.95070	2650	0.55050
622	2.94458	865	2.01426	1135	1.48081	1670	0.94407	2675	0.54439
624	2.93365	870	2.00119	1140	1.47343	1680	0.93752	2700	0.53840
626	2.92280	875	1.98828	1150	1.45888	1690	0.93105	2725	0.53253
628	2.91202	880	1.97553	1160	1.44460	1700	0.92466	2750	0.52678
630	2.90132	885	1.96293	1170	1.43057	1710	0.91836	2775	0.52114
632	2.89068	890	1.95048	1180	1.41680	1720	0.91214	2800	0.51561
634	2.88012	895	1.93818	1190	1.40328	1730	0.90599	2825	0.51019
636	2.86963	900	1.92603	1200	1.39000	1740	0.89992	2850	0.50487
638	2.85922	905	1.91402	1210	1.37654	1750	0.89392	2875	0.49966
640	2.84887	910	1.90215	1220	1.36332	1760	0.88800	2900	0.49454
645	2.82331	915	1.89042	1230	1.35033	1770	0.88215	2925	0.48952
650	2.79817	920	1.87882	1240	1.33757	1780	0.87638	2950	0.48459
655	2.77344	925	1.86736	1250	1.32503	1790	0.87067	2975	0.47975

GELI 5 NY 0 V1.00 02-FEB-90



BACKGROUND FOR GELI DETECTOR 5 DF 254.053/2000 2197.2 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.0834	27.68	511.0	0.6205	4.34	1120.3	0.0260	35.43
92.0	0.3517	10.46	583.1	0.1059	31.93	1173.2	0.0265	34.70
143.0	0.0573	0.00	609.3	0.0652	50.94	1238.1	0.0565	0.00
186.0	0.2493	12.55	661.6	0.0000	0.00	1332.5	0.0323	49.91
198.0	0.0849	24.86	727.2	0.0309	24.63	1377.7	0.0142	0.00
238.6	0.2504	15.50	846.0	0.0325	33.56	1460.8	0.2673	10.21
279.0	0.1650	0.00	860.4	0.0000	0.00	1586.0	0.0131	0.00
295.2	0.0424	0.00	911.1	0.0850	19.07	1591.3	0.0364	34.08
338.4	0.0544	27.37	968.9	0.0603	22.39	1729.6	0.0081	0.00
351.9	0.0450	0.00	1001.0	0.0667	0.00	1764.5	0.0392	23.19

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 5 ON 9/15/ 0

HIGH RADIUM STANDARD

LOW RADIUM STANDARD

GMT YEAR	NORMALISED %		LENGTH IN	GMT YEAR	NORMALISED %		LENGTH IN		
	CPM	ERROR	MINUTES		CPM	ERROR	MINUTES		
8.794	0	0.9810	11.676	26.	190.969	0	1.0075	6.705	23.
22.334	94	0.9585	12.795	23.	195.631	0	1.0086	5.790	38.
22.334	0	0.9612	12.677	23.	202.731	0	1.0138	6.861	16.
50.904	0	0.9466	12.005	21.	204.861	0	0.9853	5.648	30.
102.623	0	0.9620	11.476	21.	211.875	0	1.0109	5.693	25.
127.280	0	0.9859	11.408	27.	219.126	0	1.0138	5.758	24.
154.857	94	0.9862	11.478	23.	225.894	0	1.0392	12.136	37.
162.890	0	1.0087	11.462	21.	232.901	0	1.0146	6.155	29.
169.779	0	0.9906	11.568	34.	239.950	0	1.0114	6.604	31.
154.030	0	0.9489	11.726	28.	245.694	0	0.9838	5.447	23.
AVERAGE	0.9730	0.020		AVERAGE	1.0089	0.016			

CALIBRATION LINE FROM STANDARD FOR G- 5 DF 254.030 0
 ENERGY= 0.197947 + 0.9956658*CH + -1.584219E-06*CH**2
 FWHM =SQRT(1.4040 + 0.007018*ENERGY) (CD60= 3.279)

EFFICIENCIES FOR GEOMETRY MB 5 CALIBRATED 186.000 2000

OK
 MB 9-20-00

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
50.0	0.038100	100.0	0.243800	300.0	0.173000	0.0	0.000000
55.0	0.059100	110.0	0.261600	500.0	0.106900	0.0	0.000000
60.0	0.083100	130.0	0.276200	700.0	0.078600	0.0	0.000000
65.0	0.108400	150.0	0.273600	1000.0	0.057800	0.0	0.000000
70.0	0.133600	170.0	0.262400	1400.0	0.043800		
80.0	0.179800	190.0	0.247800	2000.0	0.032700		
90.0	0.216900	250.0	0.203000	3000.0	0.023400		

Det ... GELI - 5
Geo ... MB - Marinelli beaker
Shlf ... 1
Ref ... 500 ML MARINELLI BEAKER

Date ... 04-JUL-00
Version ... 2.00
File ... ND:[25,4]GELI05MB1.EFF

OK

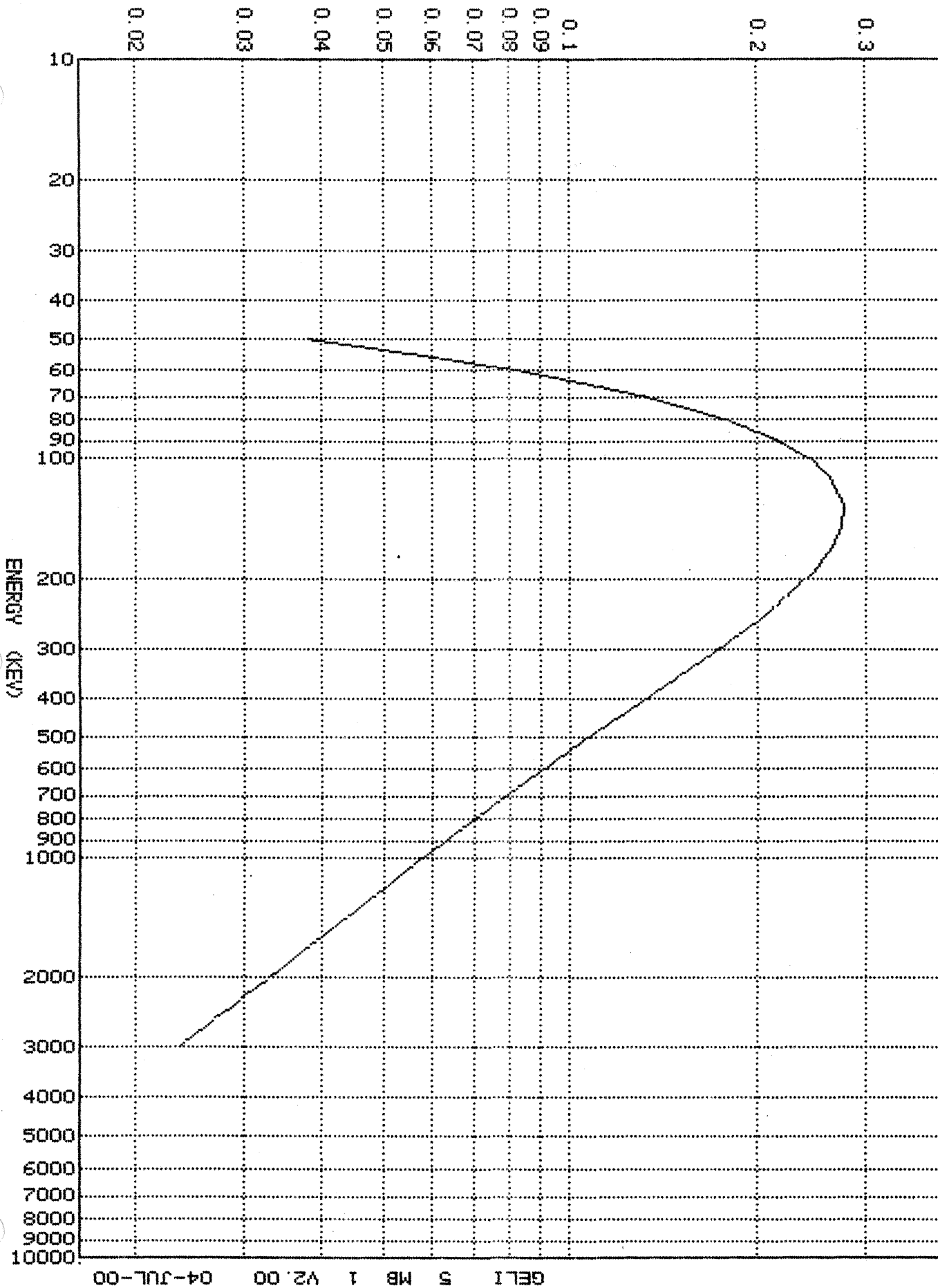
KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	0.03815	108	0.25812	216	0.22581	324	0.16096	432	0.12272
51	0.04180	110	0.26163	218	0.22430	326	0.16003	434	0.12219
52	0.04571	112	0.26317	220	0.22282	328	0.15911	436	0.12166
53	0.04990	114	0.26469	222	0.22136	330	0.15820	438	0.12114
54	0.05439	116	0.26620	224	0.21993	332	0.15730	440	0.12062
55	0.05919	118	0.26768	226	0.21851	334	0.15642	442	0.12010
56	0.06350	120	0.26915	228	0.21712	336	0.15554	444	0.11959
57	0.06805	122	0.27060	230	0.21575	338	0.15467	446	0.11909
58	0.07283	124	0.27204	232	0.21440	340	0.15381	448	0.11858
59	0.07785	126	0.27346	234	0.21307	342	0.15296	450	0.11809
60	0.08313	128	0.27487	236	0.21176	344	0.15213	452	0.11760
61	0.08782	130	0.27626	238	0.21047	346	0.15130	454	0.11711
62	0.09268	132	0.27598	240	0.20919	348	0.15048	456	0.11662
63	0.09773	134	0.27570	242	0.20794	350	0.14967	458	0.11614
64	0.10298	136	0.27542	244	0.20670	352	0.14886	460	0.11567
65	0.10841	138	0.27515	246	0.20548	354	0.14807	462	0.11519
66	0.11318	140	0.27488	248	0.20428	356	0.14729	464	0.11473
67	0.11809	142	0.27462	250	0.20309	358	0.14651	466	0.11426
68	0.12313	144	0.27436	252	0.20168	360	0.14574	468	0.11380
69	0.12830	146	0.27411	254	0.20028	362	0.14498	470	0.11334
70	0.13362	148	0.27386	256	0.19891	364	0.14423	472	0.11289
71	0.13790	150	0.27361	258	0.19756	366	0.14349	474	0.11244
72	0.14226	152	0.27241	260	0.19622	368	0.14275	476	0.11200
73	0.14670	154	0.27123	262	0.19491	370	0.14202	478	0.11155
74	0.15120	156	0.27007	264	0.19361	372	0.14130	480	0.11112
75	0.15579	158	0.26892	266	0.19234	374	0.14059	482	0.11068
76	0.16045	160	0.26780	268	0.19108	376	0.13989	484	0.11025
77	0.16518	162	0.26670	270	0.18983	378	0.13919	486	0.10982
78	0.16999	164	0.26561	272	0.18861	380	0.13850	488	0.10940
79	0.17488	166	0.26455	274	0.18740	382	0.13781	490	0.10898
80	0.17984	168	0.26349	276	0.18621	384	0.13714	492	0.10856
81	0.18343	170	0.26246	278	0.18504	386	0.13647	494	0.10814
82	0.18705	172	0.26088	280	0.18388	388	0.13580	496	0.10773
83	0.19070	174	0.25933	282	0.18273	390	0.13515	498	0.10732
84	0.19437	176	0.25780	284	0.18160	392	0.13450	500	0.10692
85	0.19807	178	0.25631	286	0.18049	394	0.13385	502	0.10653
86	0.20180	180	0.25483	288	0.17939	396	0.13322	504	0.10615
87	0.20555	182	0.25338	290	0.17830	398	0.13258	506	0.10576
88	0.20932	184	0.25196	292	0.17723	400	0.13196	508	0.10538
89	0.21312	186	0.25056	294	0.17617	402	0.13134	510	0.10500
90	0.21695	188	0.24918	296	0.17513	404	0.13073	512	0.10463
91	0.21963	190	0.24782	298	0.17410	406	0.13012	514	0.10426
92	0.22231	192	0.24594	300	0.17308	408	0.12952	516	0.10389
93	0.22500	194	0.24410	302	0.17200	410	0.12892	518	0.10352
94	0.22769	196	0.24229	304	0.17093	412	0.12833	520	0.10316
95	0.23038	198	0.24052	306	0.16988	414	0.12775	522	0.10280
96	0.23308	200	0.23877	308	0.16884	416	0.12717	524	0.10244
97	0.23578	202	0.23705	310	0.16781	418	0.12659	526	0.10208
98	0.23848	204	0.23536	312	0.16680	420	0.12603	528	0.10173
99	0.24118	206	0.23370	314	0.16579	422	0.12546	530	0.10138
100	0.24389	208	0.23207	316	0.16480	424	0.12490	532	0.10103
102	0.24747	210	0.23047	318	0.16383	426	0.12435	534	0.10069
104	0.25104	212	0.22889	320	0.16286	428	0.12380	536	0.10034
106	0.25459	214	0.22734	322	0.16191	430	0.12326	538	0.10000

Det ... GELI 5
Geo ... MB - Marinelli beaker
Shlf ... 1
Ref ... 500 ML MARINELLI BEAKER

Date ... 04-JUL-00 Page 2
Version ... 2.00
File ... ND:[25,4]GELI05MB1.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	0.09967	660	0.08298	930	0.06159	1260	0.04781	1800	0.03566
542	0.09933	665	0.08241	935	0.06130	1270	0.04750	1810	0.03550
544	0.09900	670	0.08185	940	0.06102	1280	0.04719	1820	0.03534
546	0.09866	675	0.08129	945	0.06075	1290	0.04689	1830	0.03518
548	0.09834	680	0.08075	950	0.06047	1300	0.04659	1840	0.03503
550	0.09801	685	0.08021	955	0.06020	1310	0.04630	1850	0.03487
552	0.09769	690	0.07968	960	0.05993	1320	0.04601	1860	0.03472
554	0.09736	695	0.07916	965	0.05966	1330	0.04573	1870	0.03456
556	0.09704	700	0.07864	970	0.05940	1340	0.04544	1880	0.03441
558	0.09673	705	0.07816	975	0.05913	1350	0.04517	1890	0.03426
560	0.09641	710	0.07769	980	0.05887	1360	0.04489	1900	0.03412
562	0.09610	715	0.07722	985	0.05862	1370	0.04462	1925	0.03375
564	0.09579	720	0.07676	990	0.05836	1380	0.04435	1950	0.03340
566	0.09548	725	0.07630	995	0.05811	1390	0.04409	1975	0.03305
568	0.09517	730	0.07585	1000	0.05786	1400	0.04383	2000	0.03271
570	0.09486	735	0.07541	1005	0.05762	1410	0.04357	2025	0.03238
572	0.09456	740	0.07497	1010	0.05739	1420	0.04332	2050	0.03205
574	0.09426	745	0.07454	1015	0.05715	1430	0.04307	2075	0.03173
576	0.09396	750	0.07411	1020	0.05692	1440	0.04283	2100	0.03142
578	0.09367	755	0.07369	1025	0.05669	1450	0.04259	2125	0.03111
580	0.09337	760	0.07327	1030	0.05647	1460	0.04235	2150	0.03082
582	0.09308	765	0.07286	1035	0.05624	1470	0.04211	2175	0.03052
584	0.09279	770	0.07245	1040	0.05602	1480	0.04188	2200	0.03024
586	0.09250	775	0.07205	1045	0.05580	1490	0.04165	2225	0.02996
588	0.09221	780	0.07165	1050	0.05558	1500	0.04142	2250	0.02968
590	0.09192	785	0.07126	1055	0.05536	1510	0.04119	2275	0.02941
592	0.09164	790	0.07087	1060	0.05514	1520	0.04097	2300	0.02915
594	0.09136	795	0.07048	1065	0.05493	1530	0.04075	2325	0.02889
596	0.09108	800	0.07011	1070	0.05472	1540	0.04053	2350	0.02864
598	0.09080	805	0.06973	1075	0.05451	1550	0.04032	2375	0.02839
600	0.09052	810	0.06936	1080	0.05430	1560	0.04011	2400	0.02814
602	0.09025	815	0.06899	1085	0.05409	1570	0.03990	2425	0.02790
604	0.08998	820	0.06863	1090	0.05389	1580	0.03969	2450	0.02767
606	0.08971	825	0.06827	1095	0.05368	1590	0.03948	2475	0.02744
608	0.08944	830	0.06792	1100	0.05348	1600	0.03928	2500	0.02721
610	0.08917	835	0.06757	1105	0.05328	1610	0.03908	2525	0.02699
612	0.08890	840	0.06722	1110	0.05308	1620	0.03888	2550	0.02677
614	0.08864	845	0.06688	1115	0.05289	1630	0.03869	2575	0.02655
616	0.08838	850	0.06654	1120	0.05269	1640	0.03849	2600	0.02634
618	0.08811	855	0.06621	1125	0.05250	1650	0.03830	2625	0.02614
620	0.08785	860	0.06588	1130	0.05231	1660	0.03811	2650	0.02593
622	0.08760	865	0.06555	1135	0.05212	1670	0.03793	2675	0.02573
624	0.08734	870	0.06522	1140	0.05193	1680	0.03774	2700	0.02554
626	0.08709	875	0.06490	1150	0.05156	1690	0.03756	2725	0.02534
628	0.08683	880	0.06459	1160	0.05119	1700	0.03738	2750	0.02515
630	0.08658	885	0.06427	1170	0.05083	1710	0.03720	2775	0.02497
632	0.08633	890	0.06396	1180	0.05047	1720	0.03702	2800	0.02478
634	0.08608	895	0.06365	1190	0.05012	1730	0.03684	2825	0.02460
636	0.08583	900	0.06335	1200	0.04978	1740	0.03667	2850	0.02442
638	0.08559	905	0.06305	1210	0.04944	1750	0.03650	2875	0.02425
640	0.08534	910	0.06275	1220	0.04910	1760	0.03633	2900	0.02407
645	0.08474	915	0.06246	1230	0.04877	1770	0.03616	2925	0.02390
650	0.08414	920	0.06216	1240	0.04845	1780	0.03599	2950	0.02374
655	0.08356	925	0.06187	1250	0.04813	1790	0.03583	2975	0.02357

PERCENT EFFICIENCY



GELI 5 MB 1 V2.00 04-JUL-00

GELI 5 MB 1 V2.00 04-JUL-00

Gamma Spectrometer Efficiency Calculation

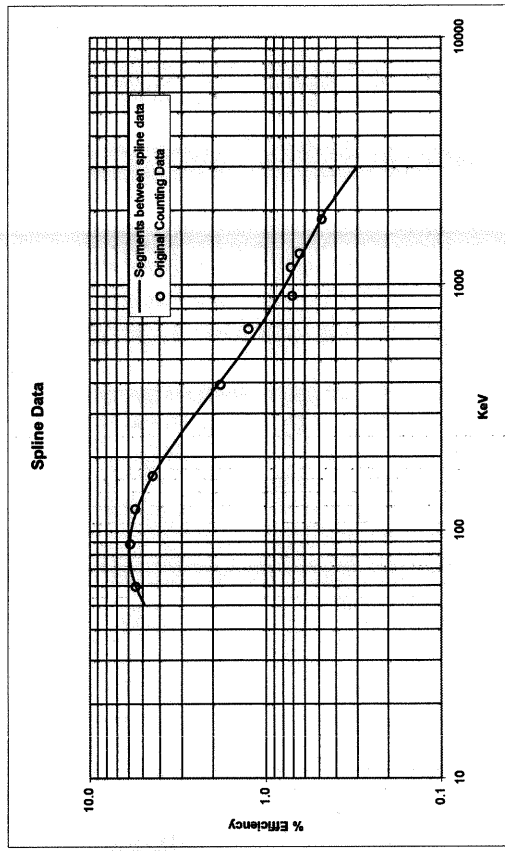
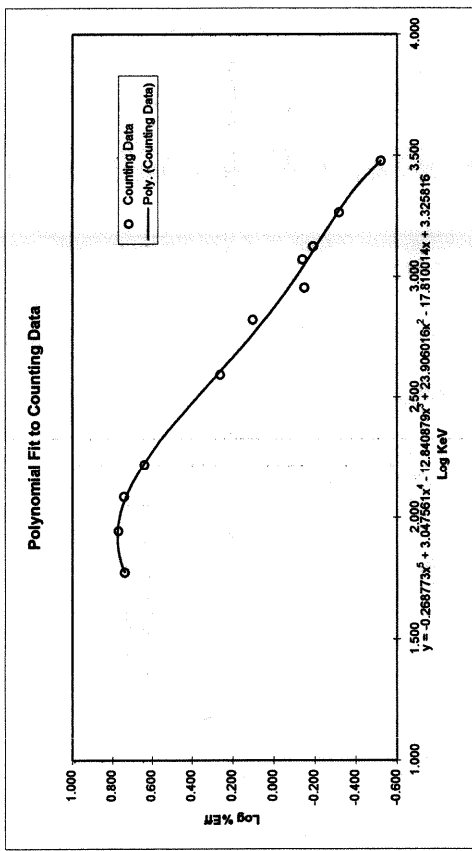
Detector	G6	500 mL Marinelli Beaker	EFF. DATE
Geometry	MB	Shelf 0	15-Aug-06
Std ID.	1000-243		
Filename	GEL08MBO.EFF		

Line	%Eff	%Eff	%SD	LogKey	Log%Eff
KeV	1stCnt	2ndCnt	Avg		
59.50	346173	546179	1.775	0.737	
88.00	345961	546801	1.944	0.768	
122.00	348773	548473	2.066	0.739	
166.00	345673	545673	2.220	0.639	
392.00	181338	1.81338	2.593	0.258	
662.00	125477	1.25477	2.621	0.099	
898.00	70548	0.70548	2.953	-0.152	
1173.00	70039	0.72039	3.069	-0.142	
1332.00	63661	0.63961	3.125	-0.194	
1836.00	47932	0.47932	3.264	-0.319	
3000	(artificial data)	0.73932	#NUM!	#DIV/0!	
			#NUM!	#DIV/0!	
			3.477	-0.523	

(shaded cells are manual entry, all others are calculated)

Generation of Spline Points from Polynomial Equation

Spline Values	keV	%Eff	Log%Eff	LogKey	Log%Eff	Ratio
						New/Old
50	4.85645	1.698	0.686	1.698	0.686	
55	5.20647	1.740	0.717	1.740	0.738	#DIV/0!
60	5.47503	1.778	0.738	1.778	0.754	
65	5.67173	1.813	0.754	1.813	0.764	
70	5.80662	1.845	0.764	1.845	0.773	
80	5.92862	1.903	0.773	1.903	0.771	
90	5.90713	1.954	0.771	1.954	0.763	#DIV/0!
100	5.79221	2.000	0.763	2.000	0.750	
110	5.61959	2.041	0.750	2.041	0.715	
130	5.19209	2.114	0.715	2.114	0.676	
150	4.73957	2.176	0.676	2.176	0.635	
170	4.31048	2.230	0.635	2.230	0.594	
190	3.92234	2.279	0.594	2.279	0.479	
250	3.01455	2.398	0.479	2.398	0.397	
300	2.49228	2.477	0.397	2.477	0.161	#DIV/0!
500	1.44887	2.699	0.161	2.699	0.018	
700	1.04336	2.845	0.018	2.845	-0.114	
1000	0.76920	3.000	-0.114	3.000	-0.225	#DIV/0!
1400	0.59592	3.146	-0.225	3.146	-0.344	
2000	0.45295	3.301	-0.344	3.301	-0.524	
3000	0.29924	3.477	-0.524	3.477		



%Dev from Spline	avg	#DIV/0!
0		
-1		
2		
-1		
-3		
14		
-16		
6		
3		
-1		
#DIV/0!		
#DIV/0!		
0		

Polynomial Coefficients

x5 = -0.268773

x4 = 3.047501

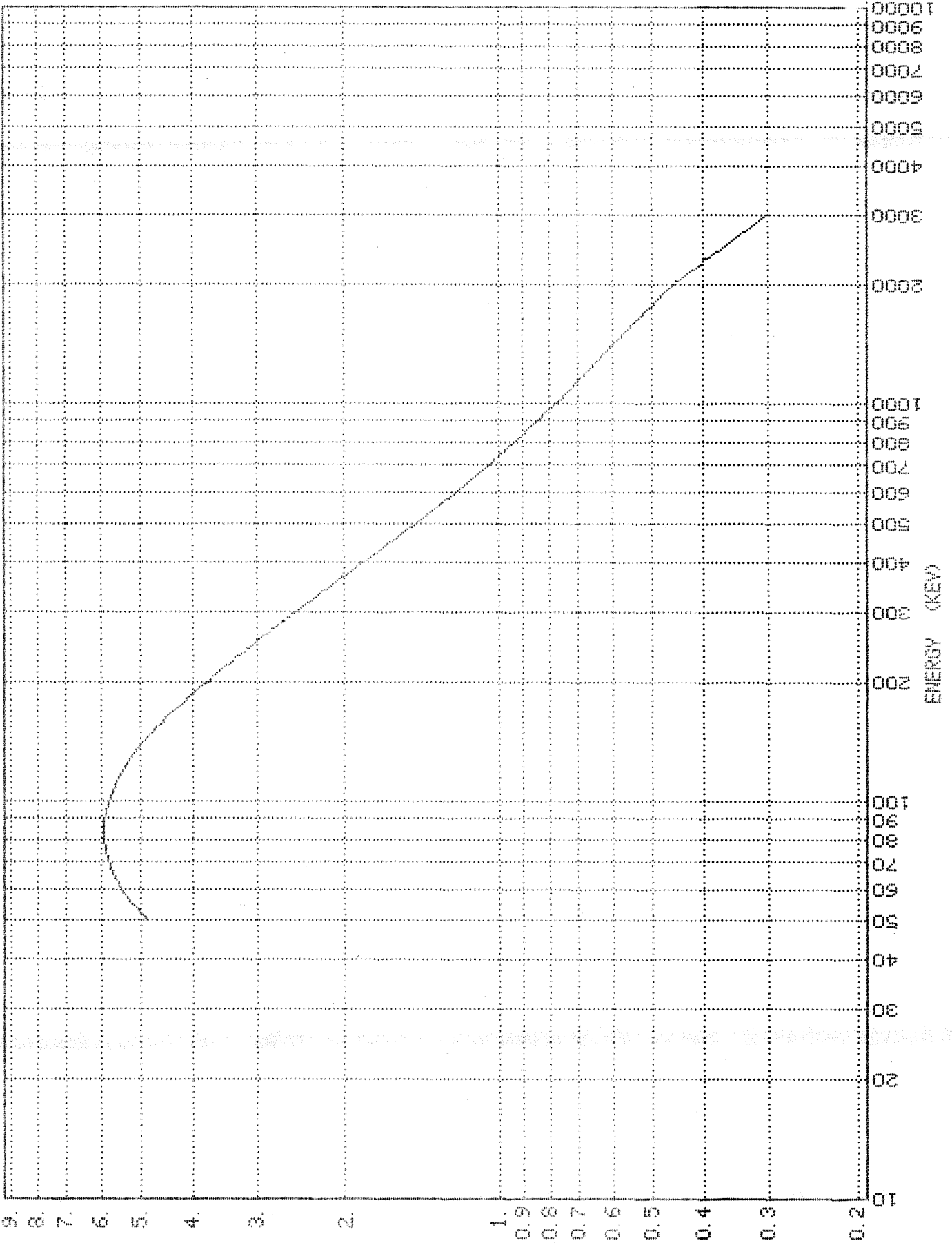
x3 = -12.840879

x2 = 3.047501

x1 = -17.810014

x0 = 3.325816

GELI 6 MB 0 V2.00 15-AUG-06



Det ... GELI 6
 Geo ... MB - Marinelli beaker
 Shif ... 0
 Ref ...

Date ... 15-AUG-06 Page 1
 Version ... 2.00
 File ... ND: [25, 4]GELI06MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
50	4.85600	108	5.65271	216	3.46839	324	2.29652	432	1.69221
51	4.92673	110	5.62000	218	3.43789	326	2.28157	434	1.68394
52	4.99708	112	5.57219	220	3.40794	328	2.26681	436	1.67574
53	5.06708	114	5.52562	222	3.37851	330	2.25223	438	1.66762
54	5.13671	116	5.48024	224	3.34959	332	2.23783	440	1.65957
55	5.20600	118	5.43600	226	3.32118	334	2.22361	442	1.65160
56	5.26060	120	5.39285	228	3.29326	336	2.20956	444	1.64371
57	5.31479	122	5.35075	230	3.26581	338	2.19569	446	1.63589
58	5.36858	124	5.30965	232	3.23882	340	2.18198	448	1.62814
59	5.42198	126	5.26952	234	3.21229	342	2.16844	450	1.62046
60	5.47500	128	5.23031	236	3.18620	344	2.15506	452	1.61285
61	5.51511	130	5.19200	238	3.16053	346	2.14184	454	1.60531
62	5.55486	132	5.14179	240	3.13529	348	2.12877	456	1.59783
63	5.59425	134	5.09281	242	3.11045	350	2.11586	458	1.59043
64	5.63330	136	5.04502	244	3.08601	352	2.10311	460	1.58309
65	5.67200	138	4.99835	246	3.06197	354	2.09050	462	1.57582
66	5.69955	140	4.95279	248	3.03830	356	2.07803	464	1.56861
67	5.72682	142	4.90827	250	3.01500	358	2.06571	466	1.56146
68	5.75382	144	4.86477	252	2.99000	360	2.05353	468	1.55438
69	5.78054	146	4.82225	254	2.96540	362	2.04149	470	1.54736
70	5.80700	148	4.78067	256	2.94120	364	2.02959	472	1.54040
71	5.81984	150	4.74000	258	2.91738	366	2.01782	474	1.53350
72	5.83253	152	4.69254	260	2.89393	368	2.00618	476	1.52667
73	5.84507	154	4.64616	262	2.87086	370	1.99467	478	1.51989
74	5.85746	156	4.60083	264	2.84813	372	1.98329	480	1.51317
75	5.86972	158	4.55652	266	2.82576	374	1.97204	482	1.50650
76	5.88184	160	4.51317	268	2.80373	376	1.96090	484	1.49990
77	5.89382	162	4.47078	270	2.78203	378	1.94989	486	1.49334
78	5.90567	164	4.42929	272	2.76066	380	1.93900	488	1.48685
79	5.91740	166	4.38868	274	2.73961	382	1.92823	490	1.48041
80	5.92900	168	4.34893	276	2.71886	384	1.91757	492	1.47402
81	5.92668	170	4.31000	278	2.69843	386	1.90702	494	1.46769
82	5.92438	172	4.26746	280	2.67829	388	1.89659	496	1.46141
83	5.92212	174	4.22582	282	2.65845	390	1.88627	498	1.45518
84	5.91988	176	4.18505	284	2.63889	392	1.87606	500	1.44900
85	5.91767	178	4.14514	286	2.61960	394	1.86595	502	1.44336
86	5.91548	180	4.10604	288	2.60060	396	1.85595	504	1.43776
87	5.91332	182	4.06774	290	2.58186	398	1.84605	506	1.43221
88	5.91119	184	4.03021	292	2.56339	400	1.83625	508	1.42670
89	5.90908	186	3.99342	294	2.54517	402	1.82656	510	1.42123
90	5.90700	188	3.95736	296	2.52720	404	1.81696	512	1.41581
91	5.89483	190	3.92200	298	2.50948	406	1.80746	514	1.41042
92	5.88282	192	3.88284	300	2.49200	408	1.79806	516	1.40508
93	5.87097	194	3.84447	302	2.47449	410	1.78875	518	1.39978
94	5.85926	196	3.80687	304	2.45721	412	1.77954	520	1.39452
95	5.84770	198	3.77001	306	2.44017	414	1.77041	522	1.38930
96	5.83629	200	3.73387	308	2.42335	416	1.76138	524	1.38412
97	5.82501	202	3.69844	310	2.40676	418	1.75244	526	1.37897
98	5.81388	204	3.66368	312	2.39039	420	1.74358	528	1.37387
99	5.80287	206	3.62959	314	2.37423	422	1.73481	530	1.36880
100	5.79200	208	3.59613	316	2.35828	424	1.72612	532	1.36378
102	5.75584	210	3.56331	318	2.34254	426	1.71752	534	1.35879
104	5.72059	212	3.53108	320	2.32700	428	1.70901	536	1.35383
106	5.68623	214	3.49945	322	2.31167	430	1.70057	538	1.34891

Det ... GELI 6
Geo ... MB - Marinelli beaker
Shif ... 0
Ref ...

Date ... 15-AUG-06 Page 2
Version ... 2.00
File ... ND: [25, 4]GELI06MBO.EFF

KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.	KEV	EFF.
540	1.34403	660	1.10472	930	0.81819	1260	0.64551	1800	0.49124
542	1.33918	665	1.09661	935	0.81445	1270	0.64166	1810	0.48915
544	1.33437	670	1.08861	940	0.81075	1280	0.63786	1820	0.48708
546	1.32960	675	1.08073	945	0.80708	1290	0.63411	1830	0.48503
548	1.32486	680	1.07296	950	0.80345	1300	0.63041	1840	0.48301
550	1.32015	685	1.06531	955	0.79986	1310	0.62676	1850	0.48100
552	1.31548	690	1.05777	960	0.79630	1320	0.62316	1860	0.47901
554	1.31083	695	1.05033	965	0.79277	1330	0.61961	1870	0.47703
556	1.30623	700	1.04300	970	0.78928	1340	0.61611	1880	0.47508
558	1.30165	705	1.03668	975	0.78582	1350	0.61265	1890	0.47315
560	1.29711	710	1.03043	980	0.78239	1360	0.60923	1900	0.47123
562	1.29260	715	1.02427	985	0.77900	1370	0.60586	1925	0.46652
564	1.28812	720	1.01819	990	0.77563	1380	0.60253	1950	0.46191
566	1.28367	725	1.01219	995	0.77230	1390	0.59924	1975	0.45740
568	1.27926	730	1.00626	1000	0.76900	1400	0.59600	2000	0.45300
570	1.27487	735	1.00041	1005	0.76610	1410	0.59275	2025	0.44727
572	1.27051	740	0.99463	1010	0.76323	1420	0.58953	2050	0.44168
574	1.26619	745	0.98893	1015	0.76038	1430	0.58636	2075	0.43623
576	1.26189	750	0.98329	1020	0.75755	1440	0.58322	2100	0.43091
578	1.25763	755	0.97772	1025	0.75475	1450	0.58013	2125	0.42572
580	1.25339	760	0.97222	1030	0.75197	1460	0.57707	2150	0.42065
582	1.24918	765	0.96679	1035	0.74922	1470	0.57405	2175	0.41569
584	1.24500	770	0.96143	1040	0.74649	1480	0.57106	2200	0.41085
586	1.24085	775	0.95612	1045	0.74378	1490	0.56811	2225	0.40612
588	1.23672	780	0.95088	1050	0.74110	1500	0.56520	2250	0.40150
590	1.23263	785	0.94571	1055	0.73844	1510	0.56231	2275	0.39698
592	1.22856	790	0.94059	1060	0.73580	1520	0.55947	2300	0.39256
594	1.22451	795	0.93553	1065	0.73318	1530	0.55665	2325	0.38824
596	1.22050	800	0.93053	1070	0.73058	1540	0.55387	2350	0.38400
598	1.21651	805	0.92559	1075	0.72801	1550	0.55112	2375	0.37986
600	1.21255	810	0.92071	1080	0.72545	1560	0.54840	2400	0.37581
602	1.20861	815	0.91588	1085	0.72292	1570	0.54571	2425	0.37184
604	1.20470	820	0.91111	1090	0.72041	1580	0.54305	2450	0.36795
606	1.20082	825	0.90639	1095	0.71792	1590	0.54042	2475	0.36414
608	1.19696	830	0.90172	1100	0.71544	1600	0.53782	2500	0.36041
610	1.19312	835	0.89710	1105	0.71299	1610	0.53525	2525	0.35676
612	1.18931	840	0.89254	1110	0.71056	1620	0.53271	2550	0.35318
614	1.18553	845	0.88802	1115	0.70814	1630	0.53019	2575	0.34966
616	1.18176	850	0.88356	1120	0.70574	1640	0.52770	2600	0.34622
618	1.17803	855	0.87914	1125	0.70337	1650	0.52524	2625	0.34284
620	1.17431	860	0.87477	1130	0.70101	1660	0.52281	2650	0.33953
622	1.17063	865	0.87045	1135	0.69867	1670	0.52040	2675	0.33628
624	1.16696	870	0.86617	1140	0.69635	1680	0.51801	2700	0.33309
626	1.16332	875	0.86194	1150	0.69176	1690	0.51565	2725	0.32995
628	1.15970	880	0.85776	1160	0.68723	1700	0.51332	2750	0.32688
630	1.15610	885	0.85361	1170	0.68278	1710	0.51101	2775	0.32386
632	1.15252	890	0.84951	1180	0.67839	1720	0.50872	2800	0.32090
634	1.14897	895	0.84546	1190	0.67407	1730	0.50646	2825	0.31799
636	1.14544	900	0.84144	1200	0.66981	1740	0.50422	2850	0.31513
638	1.14193	905	0.83747	1210	0.66561	1750	0.50200	2875	0.31233
640	1.13844	910	0.83354	1220	0.66148	1760	0.49981	2900	0.30957
645	1.12982	915	0.82964	1230	0.65740	1770	0.49763	2925	0.30686
650	1.12133	920	0.82579	1240	0.65338	1780	0.49548	2950	0.30419
655	1.11296	925	0.82197	1250	0.64942	1790	0.49335	2975	0.30157

1000 570 243 G-6 MB 179.561 6 1700.53 MIN 1.00000 SM 542

LIBR=ARL1 REF TIME= 274.708 3

SPECIAL ANALYSIS

PK-ENERGY-GAMMA KEV	BRANCH FRAC	EFFICIENCY FRAC	CPM CORR CNTG DECAY	DPM NOW	ERROR PCT	PCI/SMPL AT TZERO
Be 7 5.328E+01 DAYS		LAMBDA= 1.301E-02	DECAY= 2.214E-06	10		
**** (477.59)	0.103000	0.00900	1.418	1.529E+03 s	<	3.110E+08
Na 22 9.504E+02 DAYS		LAMBDA= 7.293E-04	DECAY= 4.819E-01	20		
**** (511.00)	1.798000	0.00837	1.324	8.796E+01 s	<	8.222E+01
**** (1274.52)	0.999400	0.00325	0.436	1.343E+02 s	<	1.255E+02
K 40 4.602E+11 DAYS		LAMBDA= 1.506E-12	DECAY= 1.000E+00	10		
**** (1460.85)	0.110000	0.00283	0.302	9.722E+02 s	<	4.379E+02
Cr 51 2.772E+01 DAYS		LAMBDA= 2.501E-02	DECAY= 1.352E-11	10		
**** (320.03)	0.102000	0.01427	1.495	1.027E+03 s	<	3.422E+13
Mn 54 3.125E+02 DAYS		LAMBDA= 2.218E-03	DECAY= 1.086E-01	20		
**** (834.83)	1.000000	0.00493	1.153	2.340E+02 s	<	9.706E+02
Ca 57 2.700E+02 DAYS		LAMBDA= 2.567E-03	DECAY= 7.658E-02	100		
122 (122.06)	0.852000	0.02736	386.951	1.660E+04 s	0.29%	9.763E+04
136 (136.47)	0.111000	0.02737	46.465	1.530E+04 s	1.71%	8.997E+04
Co 58 7.130E+01 DAYS		LAMBDA= 9.722E-03	DECAY= 5.948E-05	40		
**** (810.76)	0.990000	0.00508	1.133	2.250E+02 s	<	1.704E+06
Fe 59 4.460E+01 DAYS		LAMBDA= 1.554E-02	DECAY= 1.757E-07	60		
**** (1099.22)	0.565000	0.00374	1.141	5.395E+02 s	<	1.384E+09
**** (1291.56)	0.432000	0.00321	0.440	3.174E+02 s	<	8.139E+08
Co 60 1.921E+03 DAYS		LAMBDA= 3.608E-04	DECAY= 6.969E-01	40		
1173 (1173.21)	0.999200	0.00352	1085.605	3.083E+05 s	0.09%	1.993E+05
1332 (1332.48)	1.000000	0.00311	973.614	3.133E+05 s	0.09%	2.025E+05
Zn 65 2.440E+02 DAYS		LAMBDA= 2.841E-03	DECAY= 5.824E-02	10		
**** (1115.52)	0.507500	0.00369	1.087	5.804E+02 s	<	4.489E+03
Se 75 1.200E+02 DAYS		LAMBDA= 5.776E-03	DECAY= 3.085E-03	160		
122 (121.11)	0.161500	0.02736	387.699	8.773E+04	0.29%	1.281E+07
136 (136.00)	0.562800	0.02737	46.554	3.022E+03 s	1.71%	4.412E+05
**** (264.65)	0.572800	0.01770	1.630	1.608E+02 s	<	2.348E+04
**** (279.53)	0.247600	0.01666	1.579	3.828E+02 s	<	5.590E+04
Kr 85 3.919E+03 DAYS		LAMBDA= 1.769E-04	DECAY= 8.378E-01	10		
**** (513.98)	0.004300	0.00832	1.305	3.649E+04 s	<	1.962E+04
Zr 95 6.550E+01 DAYS		LAMBDA= 1.058E-02	DECAY= 2.513E-05	20		
**** (724.18)	0.430000	0.00575	0.996	4.028E+02 s	<	7.220E+06
**** (756.72)	0.546000	0.00548	1.084	3.621E+02 s	<	6.490E+06
Nb 94 7.414E+06 DAYS		LAMBDA= 9.349E-08	DECAY= 9.999E-01	30		
**** (871.10)	1.000000	0.00471	1.201	2.548E+02 s	<	1.148E+02
**** (1573.70)	1.000000	0.00263	0.217	8.263E+01 s	<	3.723E+01
Nb 95 3.510E+01 DAYS		LAI	239	DECAY= 2.608E-09	10	

**** (765.79) 0.990000 0.00541 1.098 2.049E+02 s < 3.540E+10

Mo 99 2.779E+00 DAYS LAMBDA= 2.494E-01 DECAY= 1.000E-36 5G

**** (181.06) 0.976000 0.02469 1.812 7.522E+01 s < 1.000E+36

**** (739.58) 0.140000 0.00562 1.238 1.573E+03 s < 1.000E+36

c 99m 2.512E-01 DAYS LAMBDA= 2.759E+00 DECAY= 1.000E-36 5G

**** (140.30) 0.900000 0.02730 6.223 2.533E+02 s < 1.000E+36

Ru103 3.960E+01 DAYS LAMBDA= 1.750E-02 DECAY= 2.464E-08 11G

**** (497.08) 0.900000 0.00862 1.350 1.740E+02 s < 3.181E+09

**** (610.29) 0.058000 0.00694 1.143 2.839E+03 s < 5.189E+10

Ru106 3.670E+02 DAYS LAMBDA= 1.889E-03 DECAY= 1.510E-01 41G

511 (511.80) 0.205000 0.00836 2.934 1.713E+03 15.88% 5.109E+03

**** (621.80) 0.097600 0.00680 1.056 1.591E+03 s < 4.746E+03

662 (661.20) 0.000150 0.00636 1322.276 1.386E+09 0.08% 4.134E+09

**** (1050.10) 0.014500 0.00391 1.111 1.961E+04 s < 5.850E+04

Ag108m 4.748E+04 DAYS LAMBDA= 1.460E-05 DECAY= 9.855E-01 9G

**** (434.00) 0.910000 0.01001 1.551 1.703E+02 s < 7.784E+01

**** (614.37) 0.910000 0.00689 1.126 1.796E+02 s < 8.210E+01

**** (722.95) 0.910000 0.00576 1.058 2.017E+02 s < 9.219E+01

Ag110m 2.530E+02 DAYS LAMBDA= 2.740E-03 DECAY= 6.444E-02 48G

**** (132.60) 0.001400 0.02740 1.830 4.771E+04 s < 3.335E+05

218 (219.50) 0.000940 0.02151 4.485 2.218E+05 17.88% 1.551E+06

**** (620.24) 0.025000 0.00682 1.128 6.616E+03 s < 4.625E+04

**** (657.74) 0.938000 0.00640 3.120 5.199E+02 s < 3.635E+03

**** (763.93) 0.218000 0.00542 1.086 9.181E+02 s < 6.418E+03

**** (818.02) 0.071000 0.00504 1.150 3.215E+03 s < 2.247E+04

*** (884.67) 0.747000 0.00464 1.229 3.550E+02 s < 2.482E+03

**** (1384.22) 0.263000 0.00299 0.269 3.421E+02 s < 2.391E+03

Sn113 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 2.399E-03 4G

392 (391.40) 0.642000 0.01127 7.765 1.073E+03 s 6.58% 2.015E+05

Sb124 6.020E+01 DAYS LAMBDA= 1.151E-02 DECAY= 9.890E-06 16G

**** (602.70) 0.980000 0.00704 1.137 1.648E+02 s < 7.508E+06

1353 (1354.90) 0.006400 0.00306 0.673 3.442E+04 18.78% 1.568E+09

**** (1691.00) 0.457000 0.00245 0.203 1.807E+02 s < 8.229E+06

Sb125 9.971E+02 DAYS LAMBDA= 6.952E-04 DECAY= 4.987E-01 18G

**** (427.90) 0.304000 0.01017 1.544 4.993E+02 s < 4.510E+02

Sn125 9.650E+00 DAYS LAMBDA= 7.183E-02 DECAY= 6.004E-32 47G

**** (332.00) 0.012200 0.01367 1.514 9.082E+03 s < 6.813E+34

**** (469.70) 0.013800 0.00917 1.563 1.235E+04 s < 9.268E+34

821 (822.60) 0.038700 0.00501 2.984 1.540E+04 s 14.88% 1.156E+35

**** (915.50) 0.037600 0.00447 1.351 8.029E+03 s < 6.024E+34

**** (1066.60) 0.088700 0.00385 1.150 3.369E+03 s < 2.528E+34

**** (1088.90) 0.042900 0.00377 1.234 7.620E+03 s < 5.717E+34

1173 (1173.20) 0.002900 0.00352 1132.974 1.109E+08 0.09% 1.000E+36

**** (2001.70) 0.021100 0.00210 0.194 4.386E+03 s < 3.291E+34

Sn126 3.652E+07 DAYS LAMBDA= 1.898E-08 DECAY= 1.000E+00 7G

**** (86.90) 0.378000 0.02310 5.788 6.628E+02 s < 2.986E+02

88 (87.57) 0.378000 0.02335 2218.060 2.513E+05 0.08% 1.132E+05

I 131 8.040E+00 DAYS LAMBDA= 8.621E-02 DECAY= 3.360E-38 9G

**** (364.50) 0.820000 0.01225 1.490 1.484E+02 s < 1.000E+36

Ba133 3.981E+03 DAYS LAI 240 DECAY= 8.401E-01 10G

****	(276. 30)	0. 075000	0. 01688	1. 587	1. 254E+03	s	<	6. 723E+02
****	(302. 70)	0. 196000	0. 01522	1. 506	5. 049E+02	s	<	2. 707E+02
****	(355. 90)	0. 621000	0. 01260	1. 425	1. 822E+02	s	<	9. 768E+01
****	(383. 70)	0. 094000	0. 01153	1. 513	1. 396E+03	s	<	7. 483E+02

I 133 8. 750E-01 DAYS LAMBDA= 7. 922E-01 DECAY= 1. 000E-36 28G

511	(510. 40)	0. 015000	0. 00838	4. 548	3. 617E+04	15. 88%		1. 000E+36
****	(529. 50)	0. 870000	0. 00806	1. 798	2. 565E+02	s	<	1. 000E+36
821	(820. 90)	0. 001700	0. 00502	4. 436	5. 201E+05	14. 88%		1. 000E+36

Cs134 7. 531E+02 DAYS LAMBDA= 9. 204E-04 DECAY= 3. 980E-01 9G

****	(475. 30)	0. 015000	0. 00905	1. 444	1. 063E+04	s	<	1. 203E+04
****	(604. 60)	0. 980000	0. 00701	1. 131	1. 646E+02	s	<	1. 863E+02
9. 2488E-01 SUM CORR APPLIED TO 5. 1876E-03 BELOW								
****	(795. 80)	0. 854000	0. 00480	1. 110	2. 507E+02	s	<	2. 837E+02

Cs136 1. 300E+01 DAYS LAMBDA= 5. 332E-02 DECAY= 6. 668E-24 16G

68	(66. 90)	0. 137000	0. 01348	121. 478	6. 577E+04	0. 77%		4. 443E+27
88	(86. 40)	0. 058000	0. 02291	2290. 010	1. 723E+06	0. 08%		1. 164E+29
166	(166. 70)	0. 006500	0. 02575	37. 779	2. 257E+05	2. 07%		1. 525E+28
****	(340. 60)	0. 445000	0. 01326	1. 590	2. 694E+02	s	<	1. 820E+25
****	(818. 50)	1. 000000	0. 00503	1. 189	2. 363E+02	s	<	1. 596E+25
****	(1048. 10)	0. 805000	0. 00391	1. 151	3. 655E+02	s	<	2. 469E+25

Cs137 1. 102E+04 DAYS LAMBDA= 6. 290E-05 DECAY= 9. 390E-01 3G

662	(661. 64)	0. 851000	0. 00636	1320. 824	2. 442E+05	s	0. 08%	1. 172E+05
-----	------------	-----------	----------	-----------	------------	---	--------	------------

Ba140 1. 279E+01 DAYS LAMBDA= 5. 419E-02 DECAY= 2. 776E-24 10G

****	(537. 25)	0. 340000	0. 00794	1. 259	4. 668E+02	s	<	7. 574E+25
------	------------	-----------	----------	--------	------------	---	---	------------

La140 1. 279E+01 DAYS LAMBDA= 5. 419E-02 DECAY= 2. 776E-24 38G

68	(69. 00)	0. 001000	0. 01458	121. 541	8. 336E+06	0. 77%		1. 352E+30
****	(487. 10)	0. 467000	0. 00881	1. 428	3. 468E+02	s	<	5. 627E+25
511	(510. 90)	0. 004000	0. 00837	3. 028	9. 041E+04	15. 88%		1. 467E+28
898	(898. 70)	0. 002700	0. 00456	4. 832	3. 925E+05	9. 01%		6. 368E+28
****	(1596. 40)	0. 960000	0. 00259	0. 236	9. 470E+01	s	<	1. 536E+25

Ce141 3. 245E+01 DAYS LAMBDA= 2. 136E-02 DECAY= 5. 192E-10 2G

****	(145. 40)	0. 480000	0. 02712	1. 763	1. 354E+02	s	<	1. 175E+11
------	------------	-----------	----------	--------	------------	---	---	------------

Ce144 2. 842E+02 DAYS LAMBDA= 2. 439E-03 DECAY= 8. 707E-02 15G

****	(133. 53)	0. 108000	0. 02739	1. 887	6. 377E+02	s	<	3. 299E+03
------	------------	-----------	----------	--------	------------	---	---	------------

Eu152 4. 821E+03 DAYS LAMBDA= 1. 438E-04 DECAY= 8. 660E-01 48G

122	(121. 78)	0. 254000	0. 02736	386. 387	5. 559E+04	s	0. 29%	2. 892E+04
****	(344. 31)	0. 245000	0. 01310	1. 437	4. 478E+02	s	<	2. 329E+02
****	(778. 87)	0. 120000	0. 00531	1. 094	1. 717E+03	s	<	8. 932E+02
****	(963. 36)	0. 132000	0. 00425	1. 302	2. 322E+03	s	<	1. 208E+03
****	(1112. 04)	0. 124000	0. 00370	1. 185	2. 581E+03	s	<	1. 343E+03
****	(1408. 02)	0. 198000	0. 00294	0. 266	4. 581E+02	s	<	2. 383E+02

Eu154 3. 105E+03 DAYS LAMBDA= 2. 232E-04 DECAY= 7. 998E-01 48G

122	(123. 07)	0. 390000	0. 02737	386. 406	3. 621E+04	s	0. 29%	2. 039E+04
189	(188. 20)	0. 002000	0. 02415	9. 479	1. 963E+05	7. 34%		1. 106E+05
511	(511. 20)	0. 000600	0. 00837	2. 931	5. 839E+05	15. 88%		3. 289E+05
****	(723. 26)	0. 202000	0. 00576	0. 990	8. 506E+02	s	<	4. 791E+02
****	(873. 16)	0. 117000	0. 00470	1. 204	2. 190E+03	s	<	1. 233E+03
***	(1004. 75)	0. 170000	0. 00407	1. 226	1. 770E+03	s	<	9. 969E+02
****	(1274. 49)	0. 336000	0. 00325	0. 436	3. 993E+02	s	<	2. 249E+02

Eu155 1. 812E+03 DAYS LAMBDA= 3. 825E-04 DECAY= 6. 819E-01 6G

60	(60. 01)	0. 012800	0. 01000	6422. 489	5. 018E+07	0. 04%		3. 315E+07
88	(86. 54)	0. 320000	0.	241	1	3. 019E+05	s	0. 08%

**** (105.30) 0.200000 0.02740 1.865 3.403E+02 s < 2.248E+02

Ta182 1.150E+02 DAYS LAMBDA= 6.027E-03 DECAY= 2.399E-03 336
68 (67.80) 0.410000 0.01395 118.089 2.064E+04 s 0.77% 3.876E+06
**** (100.10) 0.144000 0.02674 1.910 4.960E+02 s < 9.312E+04
151 (152.44) 0.073000 0.02675 1.417 7.255E+02 38.36% 1.362E+05
114 (1113.20) 0.004100 0.00370 4.220 2.783E+05 10.58% 5.225E+07
**** (1121.30) 0.358000 0.00367 0.993 7.552E+02 s < 1.418E+05
**** (1189.05) 0.166000 0.00348 0.773 1.338E+03 s < 2.511E+05
**** (1221.40) 0.277000 0.00339 0.546 5.813E+02 s < 1.091E+05
**** (1231.01) 0.117000 0.00337 0.547 1.388E+03 s < 2.606E+05

Ir192 7.402E+01 DAYS LAMBDA= 9.364E-03 DECAY= 8.504E-05 226
136 (136.35) 0.001330 0.02737 46.655 1.282E+06 1.71% 6.789E+09
**** (295.95) 0.290900 0.01562 1.535 3.378E+02 s < 1.789E+06
**** (308.45) 0.297600 0.01489 1.624 3.664E+02 s < 1.941E+06
**** (316.50) 0.830700 0.01445 1.588 1.323E+02 s < 7.006E+05
**** (468.06) 0.476000 0.00920 1.612 3.680E+02 s < 1.949E+06

Ra226 5.851E+05 DAYS LAMBDA= 1.185E-06 DECAY= 9.988E-01 486
**** (186.10) 0.040000 0.02431 1.754 1.804E+03 s < 8.136E+02
**** (242.00) 0.078000 0.01951 1.736 1.140E+03 s < 5.143E+02
**** (351.96) 0.393000 0.01276 1.432 2.856E+02 s < 1.288E+02
**** (609.32) 0.484000 0.00695 1.132 3.362E+02 s < 1.516E+02

Th228 6.987E+02 DAYS LAMBDA= 9.921E-04 DECAY= 3.705E-01 316
166 (166.37) 0.000900 0.02578 36.614 1.578E+06 2.07% 1.919E+06
**** (238.62) 0.448000 0.01981 1.753 1.976E+02 s < 2.402E+02
511 (510.69) 0.076600 0.00838 2.933 4.571E+03 15.88% 5.557E+03
**** (583.17) 0.287000 0.00728 1.138 5.446E+02 s < 6.621E+02

h232 5.113E+12 DAYS LAMBDA= 1.356E-13 DECAY= 1.000E+00 416
**** (338.40) 0.104000 0.01337 1.444 1.039E+03 s < 4.679E+02
**** (911.10) 0.250000 0.00450 1.284 1.142E+03 s < 5.146E+02
957 (958.50) 0.002700 0.00427 1.759 1.526E+05 25.62% 6.874E+04
**** (968.90) 0.150000 0.00422 1.222 1.929E+03 s < 8.691E+02

U 235 2.571E+11 DAYS LAMBDA= 2.696E-12 DECAY= 1.000E+00 346
60 (58.60) 0.001000 0.00933 6421.010 6.883E+08 0.04% 3.101E+08
136 (135.67) 0.000650 0.02738 46.393 2.607E+06 1.71% 1.174E+06
**** (143.78) 0.132600 0.02718 1.747 4.847E+02 s < 2.183E+02
151 (150.96) 0.001080 0.02684 1.412 4.870E+04 38.36% 2.194E+04
**** (185.72) 0.540000 0.02434 1.743 1.326E+02 s < 5.973E+01
**** (205.31) 0.050000 0.02276 1.756 1.544E+03 s < 6.954E+02
218 (217.93) 0.000360 0.02165 4.478 5.746E+05 17.88% 2.588E+05

U 238 1.633E+12 DAYS LAMBDA= 4.245E-13 DECAY= 1.000E+00 26
**** (1001.10) 0.008280 0.00409 1.158 3.422E+04 s < 1.541E+04
**** (766.40) 0.002067 0.00541 1.087 9.729E+04 s < 4.382E+04

Am241 1.582E+05 DAYS LAMBDA= 4.381E-06 DECAY= 9.956E-01 416
60 (59.54) 0.359000 0.00977 6421.027 1.830E+06 s 0.04% 8.280E+05

Cm242 1.630E+02 DAYS LAMBDA= 4.252E-03 DECAY= 1.418E-02 86
**** (562.00) 0.000002 0.00757 1.081 7.141E+07 s < 2.269E+09

 1000 STD 243 G-6 MB 179.561 6 1700.53 MIN 1.00000 SM 542

LIBR=ARLI REF TIME= 274.708 3

```

*****
* Group..... 1000 * Time of count      179.561 2006 *
* Sample..... 243 * Reference GMT..... 274.708 2003 *
* Element..... * Elapsed Live Tm..... 1700.533 *
* Type code... STD * Dead Time Pct..... 1.907399 *
* ID..... M MULTI GAMMA STANDARD * Background GMT..... 176.045 2006 *
* Geometry, detector..... MB-6 * Standard GMT..... 161.694 2006 *
* Aliquot..... 1. * Days since TO..... 1000.853 *
* Unit of Aliquot..... SMPL * Time on..... 6:27 PDT 28-JUN *
* Data Sheet Units..... PCI /SMPL * Time off..... 10:48 PDT 29-JUN *
* Library..... ARLI * Calc Time..... 11:15 29-JUN-06 *
*****
* Slope..... 1.004232 * Width slope..... 0.004075 *
* Intercept..... -1.63488 * Width offset..... 5.505901 *
* X**2 TERM..... -0.13238429E-05 * Sensitivity..... 4. *
NP: [17,67]542. GSP 31 PEAKS
  
```

PK	IT	ENRG	LEFT	WD	BKGD	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
1	3	21.8	19	17264251	2.80	1827131	21.9	1.07E+03	0.10	0.62	0	*****	
2	3	26.1	19	17569780	2.07	3254964	26.1	1.91E+03	0.10	1.06	0	0.00	
3	3	31.9	19	17*****	2.80	458717	32.0	2.70E+02	0.40	1.96	0	0.00	
4	5	43.5	39	26*****	4.55	446116	43.5	2.62E+02	0.60	0.494	0	*****	
5	5	50.6	39	26*****	6.78	3392182	50.6	1.99E+03	0.20	0.781	0	0.00	
6	5	59.5	39	26*****	2.55*****		59.4	6.42E+03	0.00	0.982	0	0.00	
7	10	68.3	65	13894749	4.76	200087	68.2	1.18E+02	0.8	1.34	0	0354.00	
8	10	73.9	65	13*****	4.53	380264	73.8	2.24E+02	0.5	1.63	0	0.00	
9	0	87.9	81	13*****	2.57	3771885	87.7	2.22E+03	0.1	2.33	0	0.00	
10	0	122.0	116	12750865	2.54	657007	121.6	3.86E+02	0.3	2.74	0	0.00	
11	0	136.4	132	9533873	2.57	78893	136.0	4.64E+01	1.7	2.73	0	0.00	
12	0	151.2	149	6337386	2.89	2401	150.8	1.41E+00	38.4	2.68	0	0.00	
13	0	165.8	162	9489328	2.52	62226	165.3	3.66E+01	2.1	2.58	0	0.00	
14	6	189.0	185	19462562	6.57	16117	188.4	9.48E+00	7.3	2.40	0	1.65	
15	6	196.8	185	19873146	7.00	12647	196.2	7.44E+00	16.1	2.34	0	0.00	
16	0	218.4	214	9571116	5.63	7615	217.7	4.48E+00	17.9	2.16	0	0.00	
17	0	310.4	306	8335916	3.26	9327	309.3	5.48E+00	10.8	1.49	0	0.00	
18	0	391.6	388	7268285	2.77	13156	390.3	7.74E+00	6.6	1.13	0	0.00	
19	0	471.4	467	7290267	4.04	4559	469.8	2.68E+00	19.60	0.920	0	0.00	
PK	IT	ENRG	LEFT	WD	BKGD	FWHM	AREA	CHAN	CPM	ERR	EFF	K	FIT
20	0	511.3	507	7195627	3.67	9215	509.6	5.42E+00	8.00	0.839	0	0.00	
21	0	661.6	653	14309435	2.87	2246254	659.5	1.32E+03	0.10	0.642	0	0.00	
22	0	821.5	816	8173924	2.83	4862	819.1	2.86E+00	14.90	0.503	0	0.00	
23	0	898.0	893	7183842	2.68	7955	895.4	4.68E+00	9.00	0.461	0	0.00	
24	0	957.3	952	7213756	4.22	2992	954.6	1.76E+00	25.60	0.430	0	0.00	
25	0	1113.9	1107	9174435	6.17	7151	1111.0	4.21E+00	10.60	0.371	0	0.00	
26	0	1173.0	1161	17203480	3.28	1845772	1170.0	1.09E+03	0.10	0.353	0	0.00	
27	0	1332.2	1320	1866269	3.42	1655412	1329.1	9.73E+02	0.10	0.312	0	0.00	
28	0	1353.5	1346	913271	4.29	1137	1350.4	6.68E-01	18.80	0.307	0	0.00	
29	0	1460.7	1452	1210557	3.52	4204	1457.5	2.47E+00	5.10	0.283	0	0.00	
30	0	1764.0	1758	95008	2.93	249	1760.8	1.47E-01	52.20	0.239	0	0.00	
31	0	1835.4	1825	157982	3.72	5651	1832.3	3.32E+00	3.70	0.230	0	0.00	

WHM=SQRT(1.72325E+01 + -2.18683E-03 *E)

 BACKGROUND INFO 1000 STD 243 179.561 6 G-6 BG DATE 176.045 6

v-----PEAK-----v			v-----BACKGROUND-----v			v-----NET-----v		
ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR	ENERGY	CPM	%ERROR
196.85	7.4371	16.07	198.00	0.4005	0.00	7.0366	16.98	
511.28	5.4189	8.02	511.00	2.4879	6.68	2.9310	15.88	
661.55	1320.9115	0.08	661.60	0.1376	29.36	1320.7739	0.08	
172.98	1085.4080	0.09	1173.20	0.0388	54.96	1085.3693	0.09	
1332.18	973.4664	0.09	1332.50	0.0639	30.19	973.4024	0.09	
1460.70	2.4722	5.12	1461.00	3.4010	9.28	-0.9288	36.62R	
1764.02	0.1467	52.23	1764.50	0.3610	8.37	-0.2142	38.45R	

2 PEAKS REJECTED BY BACKGROUND

 INTERFERING ISOTOPE ANALYSIS 1000 STD 243 179.561 6 G- 6

 NONE FOUND

BACKGROUND FOR GELI DETECTOR 6 OF 176.045/2006 2471.4 MIN

ENERGY	CPM	ERROR	ENERGY	CPM	ERROR	ENERGY	CPM	ERROR
62.0	0.5934	17.96	511.0	2.4879	6.68	1120.3	0.3575	9.43
92.0	0.6806	38.82	583.1	0.6833	13.35	1173.2	0.0388	54.96
143.0	0.2452	79.81	609.3	1.1785	13.62	1238.1	0.1704	18.25
186.0	0.4906	21.12	661.6	0.1376	29.36	1332.5	0.0639	30.19
198.0	0.4005	0.00	727.2	0.1791	14.74	1337.7	0.0000	0.00
238.6	1.7436	21.26	846.0	0.0000	0.00	1461.0	3.4010	9.28
279.0	0.2460	0.00	860.4	0.0850	36.73	1586.0	0.0000	0.00
295.2	0.7614	28.08	911.1	0.5639	16.63	1591.0	0.2203	21.97
338.4	0.4090	30.29	968.9	0.3345	26.82	1729.6	0.0668	27.68
351.9	1.1200	14.62	1001.0	0.0537	67.09	1764.5	0.3610	8.37

GELI STANDARD EFFICIENCY QC FOR DETECTOR G- 6 ON 6/29/ 6

HIGH RADIUM STANDARD					LOW RADIUM STANDARD				
GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES		GMT YEAR	NORMALISED CPM	% ERROR	LENGTH IN MINUTES	
149.708	6	2.2031	4.809	38.*	145.726	6	1.2290	4.435	67.
150.726	6	2.2442	5.051	29.*	146.689	6	1.2566	4.512	104.
152.017	6	2.2349	5.101	22.*	147.746	6	1.2362	4.964	43.
152.939	6	2.2207	4.875	30.*	149.738	6	1.2558	5.711	27. NG
153.997	6	2.2203	4.671	51.*	150.859	6	1.2208	6.682	40. NG
155.037	6	2.2357	4.908	30.*	151.928	6	1.2570	5.695	124. NG
156.995	6	2.2441	4.981	35.*	152.963	6	1.2467	5.181	27. NG
157.996	6	2.2251	5.333	57.*	155.060	6	1.2383	4.922	21. NG
159.751	6	2.2465	5.112	28.*	159.700	6	1.2320	5.223	37.
61.678	6	0.9922	4.921	20.	161.694	6	0.9956	6.569	21.*
AVERAGE		0.9922	0.000		AVERAGE		0.9956	0.000	

CALIBRATION LINE FROM STANDARD FOR G- 6 OF 161.694 6
 ENERGY= -0.163488 + 1.0042317*CH + -1.323843E-06*CH**2
 FWHM =SQRT(5.5059 + 0.004075*ENERGY) (CO60= 3.307)

EFFICIENCIES FOR GEOMETRY MB 6 CALIBRATED 26.000 1995

ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY	ENERGY	% EFFCY
55.0	0.770900	130.0	2.740200	350.0	1.284500	1500.0	0.275100
60.0	0.999400	140.0	2.730700	400.0	1.098500	2000.0	0.210300
80.0	2.015200	150.0	2.689300	500.0	0.856900	2500.0	0.167000
90.0	2.421000	170.0	2.549100	600.0	0.707100	3000.0	0.138400
100.0	2.672400	200.0	2.320800	800.0	0.515800		
110.0	2.765300	220.0	2.146400	1000.0	0.409300		
120.0	2.736800	250.0	1.882200	1200.0	0.345200		

PK	ENERGY	CPM	%ERR	COMMENT
1	21.8	1074.45	0.1	
2	26.1	1914.08	0.1	
3	31.9	269.75	0.4	
4	43.5	262.34	0.6	NO GEN.
5	50.6	1994.78	0.2	
6	59.5	6421.01	0.0	Am241s
7	68.3	117.66	0.8	Ta182s
8	73.9	223.61	0.5	
9	87.9	2218.06	0.	Cs136 Cd109 Eu155s Sn126s
10	122.0	386.35	0.3	Eu154s Eu152s Co 57s
11	136.4	46.39	1.7	Se 75s Co 57s
12	151.2	1.41	38.4	
13	165.8	36.59	2.1	Ce139 Cs136
14	189.0	9.48	7.3	
b 15	196.8	7.04	17.0	
16	218.4	4.48	17.9	
17	310.4	5.48	10.8	Co 60p
18	391.6	7.74	6.6	NO GEN. Sn113s
19	471.4	2.68	19.6	
b 20	511.3	2.93	15.9	Th228 La140 Ru106 Na 22s
b 21	661.6	1320.77	0.1	Cs137s
22	821.5	2.86	14.9	Co 60p Sn125s
23	898.0	4.68	9.0	La140 Y 88
24	957.3	1.76	25.6	Ac228
25	1113.9	4.21	10.6	
b 26	1173.0	1085.37	0.1	Cs134+ Co 60s
b 27	1332.2	973.40	0.1	Co 60s
28	1353.5	6.67	18.8	Sb124
31	1835.4	3.32	3.7	Y 88
REJECTED PEAKS				
B 29	1460.7	-0.93	36.6	Ac228 K 40s
B 30	1764.0	-0.21	38.4	Ra226

Y 88
Cd 109

APPENDIX G

Section 19

EBERLINE SERVICES REPORT

April 24, 2007



EBERLINE SERVICES

April 24, 2007

Ms. Michele Chamberlin
Test America, Inc.
17461 Derian Avenue, Suite 100
Irvine, CA 92614

Reference: Test America Project No. IQB2967
Eberline Services NELAP Cert #01120CA (exp. 01/31/08)
Eberline Services Report R704064-8665

Dear Ms. Chamberlin:

Enclosed is a Level IV data report (on CD) for the results of one water sample received at Eberline Services on April 11, 2007. The sample was analyzed according to the accompanying Test America Subcontract Order Form. The requested analysis was gross beta (EPA900.0). Quality control samples consisted of an LCS, a blank analysis, a duplicate analysis, and a matrix spike. All QC sample results were within the limits defined in Eberline Services Quality Control Procedures Manual. A copy of this report (on CD) was mailed to Ms. Elizabeth Wessling, 12269 E. Vassar Dr., Aurora CO 80014.

Please call me if you have any questions concerning this report.

Regards,

Melissa Mannion
Senior Program Manager

MCM/njv

Enclosure: CD Report

Analytical Services
2030 Wright Avenue
P.O. Box 4040
Richmond, California 94804-0040
(510) 235-2633 Fax (510) 235-0438
Toll Free (800) 841-5487
www.eberlineservices.com
NPDES - 1821

Table of Contents

Section 1

Chain-of-Custody & Sample Receipt Information
Analysis Results
Sample Analysis Raw Data
Aliquot Information

Section 2

Preparation Logs & Standards Certification
for Quality Control Samples

Section 3

Instrument Calibration Information

Section 1

Chain-of-Custody & Sample Receipt Information

Analysis Results

Sample Analysis Raw Data

Aliquot Information

SUBCONTRACT ORDER

TestAmerica - Irvine, CA

IQB2967

SENDING LABORATORY:

TestAmerica - Irvine, CA
17461 Derian Avenue. Suite 100
Irvine, CA 92614
Phone: (949) 261-1022
Fax: (949) 260-3297
Project Manager: Michele Chamberlin

RECEIVING LABORATORY:

Eberline Services
2030 Wright Avenue
Richmond, CA 94804
Phone : (510) 235-2633
Fax: (510) 235-0438
Project Location: California
Receipt Temperature: _____ °C Ice: Y / N

Analysis	Due	Expires	Comments
Sample ID: IQB2967-01	Water		Sampled: 02/27/07 11:30
Gross Beta-O	03/27/07 12:00	08/26/07 11:30	DONT FILTER, 900.0, RESULT > 50 pCi/L, run Rad 226&228
Level 4 Data Package - Out	04/17/07 12:00	03/27/07 11:30	
Radium, Combined-O	04/17/07 12:00	02/27/08 11:30	HOLD for G A&B results; EPA 903.1&904.0, NO FILTER
Strontium 90-O	04/17/07 12:00	02/27/08 11:30	HOLD for Ra 226&228 results, EPA 905.0, DONT FILTER
Tritium-O	04/17/07 12:00	02/27/08 11:30	HOLD for Ra 226&228 results, EPA 906.0, DONT FILTER
<i>Containers Supplied:</i>			
500 ml Poly (G)	500 ml Poly (H)	500 ml Poly (I)	1 Liter Poly (K)

Released By	Date	Received By	Date



RICHMOND, CA LABORATORY

SAMPLE RECEIPT CHECKLIST

Client: Test America City IRVINE State CA

Date/Time received 4/11/07 10:20 CoC No. 12B2967

Container I.D. No. BOX Requested TAT (Days) _____ P.O. Received Yes [] No []

INSPECTION

1. Custody seals on shipping container intact? Yes [] No [] N/A []
2. Custody seals on shipping container dated & signed? Yes [] No [] N/A []
3. Custody seals on sample containers intact? Yes [] No [] N/A []
4. Custody seals on sample containers dated & signed? Yes [] No [] N/A []
5. Packing material is: Wet [] Dry [] N/A []
6. Number of samples in shipping container: 1 Sample Matrix WATER
7. Number of containers per sample: 4 (Or see CoC)
8. Samples are in correct container Yes [] No []
9. Paperwork agrees with samples? Yes [] No []
10. Samples have: Tape [] Hazard labels [] Rad labels [] Appropriate sample labels []
11. Samples are: In good condition [] Leaking [] Broken Container [] Missing []
12. Samples are: Preserved [] Not preserved [] pH 6 Preservative _____

13. Describe any anomalies:
1.0L bottles has 0.25L, not leak
Called client concerning sample. Michelle Chamberlain

14. Was P.M. notified of any anomalies? Yes [] No [] Date 4/11/07

15. Inspected by AK Date: 4/11/07 Time: 11:30

Customer Sample No.	cpm	mR/hr	Wipe	Customer Sample No.	cpm	mR/hr	wipe

Ion Chamber Ser. No. _____
Alpha Meter Ser. No. _____
Beta/Gamma Meter Ser. No. _____


Calibration date _____
Calibration date _____
Calibration date _____

Eberline Services

ANALYSIS RESULTS

SDG <u>8665</u>	Client <u>TA IRVINE</u>
Work Order <u>R704064-01</u>	Contract <u>PROJECT# IQB2967</u>
Received Date <u>04/11/07</u>	Matrix <u>WATER</u>

<u>Client</u>	<u>Lab</u>	<u>Collected</u>	<u>Analyzed</u>	<u>Nuclide</u>	<u>Results + 2σ</u>	<u>Units</u>	<u>MDA</u>
<u>Sample ID</u>	<u>Sample ID</u>						
IQB2967-01	8665-001	02/27/07	04/17/07	Gross Beta	23.5 ± 2.2	pCi/L	2.0

Certified by 
Report Date <u>04/18/07</u>
Page 1

Eberline Services

QC RESULTS

SDG <u>8665</u>	Client <u>TA IRVINE</u>
Work Order <u>R704064-01</u>	Contract <u>PROJECT# IQB2967</u>
Received Date <u>04/11/07</u>	Matrix <u>WATER</u>

Lab

<u>Sample ID</u>	<u>Nuclide</u>	<u>Results</u>	<u>Units</u>	<u>Amount Added</u>	<u>MDA</u>	<u>Evaluation</u>
<u>LCS</u>						
8665-002	Gross Beta	9.30 ± 0.71	pCi/Smpl	9.58	0.56	97% recovery
<u>BLANK</u>						
8665-003	Gross Beta	0.160 ± 0.32	pCi/Smpl	NA	0.56	<MDA

DUPLICATES				ORIGINALS			
<u>Sample ID</u>	<u>Nuclide</u>	<u>Results + 2σ</u>	<u>MDA</u>	<u>Sample ID</u>	<u>Results + 2σ</u>	<u>MDA</u>	<u>RPD (Tot) Eval</u>
8665-004	Gross Beta	23.9 ± 2.6	3.2	8665-001	23.5 ± 2.2	2.0	3σ 2 48 satis.

SPIKED SAMPLE				ORIGINAL SAMPLE				
<u>Sample ID</u>	<u>Nuclide</u>	<u>Results + 2σ</u>	<u>MDA</u>	<u>Sample ID</u>	<u>Results + 2σ</u>	<u>MDA</u>	<u>Added</u>	<u>%Recv</u>
8665-005	Gross Beta	91.8 ± 4.1	3.0	8665-001	23.5 ± 2.2	2.0	63.9	107

Certified by <u></u> Report Date <u>04/18/07</u> Page 2

17-APR-07
 09:05:07
 R704064
 MCM

TMA Corporation
 Gross Alpha, Gross Beta Analysis
 ABCALC V 1.05

8665- 1 82
 IQB2967-01

Reviewed EV Date 4/17/07

Counted 107.583- 7 on C1 for 100.00 min.

0.300	1	126.600 mg	126.600 mg
Aliquot		Sample Weight	Counted Weight
		ALPHA	BETA
Instrument =	GAW 209	GRB 209	
Counts =	4.000	716.000	
Gross cpm =	0.040	7.160	
Background =	0.063	1.044	
Observed CPM =	-0.023	6.116	
Cross talk fac =	0.005	0.300	
True CPM =	-0.056	6.133	
Inst Std. Fac. =	1.141	0.983	
Adjusted CPM =	-0.064	6.029	
Eff (cpm/dpm) =	0.056	0.385	
DPM of Aliquot =	-1.138	15.651	
pCi /l =	-1.71	23.5	(C) (F)
1 sigma % Err =	57.104	4.670	
2 sigma % Err =	111.924	9.154	
(1 sigma err) =	0.976	1.10	
(2 sigma err) =	1.91	2.15	
LTV (95 %) =	1.61	25.3	
MDA (3.00) =	3.91	1.97	
MDA (2.71) =	3.83	1.96	
CRITICAL LEVEL =	1.56	0.928	

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	106.745	7	0.063	1.044	0.00
SF	106.693	0	1.141	0.983	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
104.906	14-APR-07 14:44	GAW 209	BK	\ 2499.2 min	0.00
106.693	16-APR-07 9:37	GAW 209	SF	\ 10.0 min	0.00
106.745	16-APR-07 10:52	GAW 209	BK	\ 1150.2 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
104.906	14-APR-07 14:44	GRB 209	BK	\ 2499.2 min	0.00
106.682	16-APR-07 9:22	GRB 209	SF	\ 10.0 min	0.00
106.745	16-APR-07 10:52	GRB 209	BK	\ 1150.2 min	0.00

Source	LCS
Sample No.	2
Analyte	GrBeta
Geometry	ST
Reference Date	
Separation Date #1	
Separation Date #2	
Count Date	107.583-07
Aliquot	1
Aliquot Units	SMPL
Yield	1
Result	9.3008
Error @ 2s (abs.)	0.693
Error @ 2s (%)	7.5
MDA	0.55685
Result Units	PCI/SMPL
Nuclide	Sr 90
Standard ID	AA1-B-(15)
Qty (ml)	0.5
Activity (dpm)	27.31
Calib. Date	306.500-1996
Half Life (days)	10580
Decay Date	107.583-07
Added (pCi)	9.579
Added Error @ 2s (%)	4
F/A Ratio	0.971
F/A Ratio Error @ 2s (%)	8
LCL	0.80
LWL	0.87
UWL	1.13
UCL	1.20
Status	PASS
Flag	

(*)

BW
4-17-07

17-APR-07

09:05:09

R704064

MCM

Counted 107.583- 7 on C2 for 100.00 min.

TMA Corporation

Gross Alpha, Gross Beta Analysis

ABCALC V 1.05

8665- 2

82

QC-LCS #61022

Reviewed FW Date 4/17/07

1.00 smpl

62.100 mg

62.100 mg

Aliquot

Sample Weight

Counted Weight

ALPHA

BETA

Instrument =	GAW 210	GRB 210
Counts =	7.000	956.000
Gross cpm =	0.070	9.560
Background =	0.072	1.021
Observed CPM =	-0.002	8.539
Cross talk fac =	0.006	0.292
True CPM =	-0.052	8.554
Inst Std. Fac. =	1.017	0.976
Adjusted CPM =	-0.053	8.349
Eff (cpm/dpm) =	0.076	0.404
DPM of Aliquot =	-0.695	20.648

pCi /smpl = -0.313 9.30

1 sigma % Err =	72.227	3.803
2 sigma % Err =	141.564	7.453
(1 sigma err) =	0.226	0.354
(2 sigma err) =	0.443	0.693
LTV (95 %) =	0.373	9.88

MDA (3.00) = 0.913 0.557

MDA (2.71) = 0.896 0.554

CRITICAL LEVEL = 0.369 0.262

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	106.745	7	0.072	1.021	0.00
SF	106.693	0	1.017	0.976	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
104.906	14-APR-07 14:44	GAW 210	BK	\ 2499.2 min	0.00
106.693	16-APR-07 9:37	GAW 210	SF	\ 10.0 min	0.00
106.745	16-APR-07 10:52	GAW 210	BK	\ 1150.2 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
104.906	14-APR-07 14:44	GRB 210	BK	\ 2499.2 min	0.00
106.682	16-APR-07 9:22	GRB 210	SF	\ 10.0 min	0.00
106.745	16-APR-07 10:52	GRB 210	BK	\ 1150.2 min	0.00

Status: PASS

Source	BLANK
Sample No.	3
Analyte	GrBeta
Geometry	ST
Reference Date	
Separation Date #1	
Separation Date #2	
Count Date	107.583-07
Aliquot	1
Aliquot Units	SMPL
Yield	1
Result	0.16043
Error @ 2s (abs.)	0.314
Error @ 2s (%)	196.0
MDA	0.56306
Result Units	PCI/SMPL
Status	PASS
Flag	

(K)

BL
4/17/07

61023

17-APR-07

09:05:10

R704064

MCM

Counted 107.583- 7 on C3 for 100.00 min.

TMA Corporation

Gross Alpha, Gross Beta Analysis

ABCALC V 1.05

8665- 3

82

QC-BLANK #61023

Reviewed EW Date 4-17-07

1.00	smpl	62.900 mg	62.900 mg
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 211	GRB 211
Counts =	3.000	118.000
Gross cpm =	0.030	1.180
Background =	0.074	1.044
Observed CPM =	-0.044	0.136
Cross talk fac =	0.006	0.293
True CPM =	-0.045	0.149
Inst Std. Fac. =	1.011	0.965
Adjusted CPM =	-0.045	0.144
Eff (cpm/dpm) =	0.076	0.404
DPM of Aliquot =	-0.596	0.356

pCi /smpl = -0.268 0.160 Q

1 sigma % Err =	71.866	99.992
2 sigma % Err =	140.857	195.983
(1 sigma err) =	0.193	0.160
(2 sigma err) =	0.378	0.314
LTV (95 %) =	0.318	0.425
MDA (3.00) =	0.926	0.563
MDA (2.71) =	0.909	0.560
CRITICAL LEVEL =	0.375	0.265

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	104.906	7	0.074	1.044	0.00
SF	106.693	0	1.011	0.965	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
104.906	14-APR-07 14:44	GAW 211	BK	\ 2499.2 min	0.00
106.693	16-APR-07 9:37	GAW 211	SF	\ 10.0 min	0.00
106.745	16-APR-07 10:52	GAW 211	BK	\ 1150.2 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
104.906	14-APR-07 14:44	GRB 211	BK	\ 2499.2 min	0.00
106.682	16-APR-07 9:22	GRB 211	SF	\ 10.0 min	0.00
106.745	16-APR-07 10:52	GRB 211	BK	\ 1150.2 min	0.00

Status: PASS

Source	DUP	ORIGINAL
Sample No.	4	1
Analyte	GrBeta	GrBeta
Reference Date	58.813-7	58.813-7
Separation Date #1		
Separation Date #2		
Count Date	107.583-07	107.583-07
Aliquot	0.3	0.3
Aliquot Units	L	L
Yield	1	1
Result	23.856	23.5
Error @ 2s (abs.)	2.559	2.151
Error @ 2s (%)	10.7	9.2
MDA	3.1505	1.969
Result Units	PCI/L	PCI/L
RPD	2	
UCL	30.00	
RER		
Criterion		
Status	PASS	
Flag		

(Y)

BW
4-17-07

61024

17-APR-07

09:05:12

R704064

MCM

Counted 107.583- 7 on D1 for 100.00 min.

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.05

8665- 4

82

QC-DUP#1 61024

Reviewed BU Date 4-17-07

0.300	1	126.100 mg	126.100 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 213	GRB 213
Counts =	10.000	910.000
Gross cpm =	0.100	9.100
Background =	0.093	2.803
Observed CPM =	0.007	6.297
Cross talk fac =	0.005	0.300
True CPM =	-0.027	6.305
Inst Std. Fac. =	1.037	0.971
Adjusted CPM =	-0.028	6.122
Eff (cpm/dpm) =	0.057	0.385
DPM of Aliquot =	-0.498	15.888

pCi /l = -0.748 23.9

1 sigma % Err =	161.770	5.472
2 sigma % Err =	317.070	10.725
(1 sigma err) =	1.21	1.31
(2 sigma err) =	2.37	2.56
LTV (95 %) =	2.00	26.0
MDA (3.00) =	4.56	3.15
MDA (2.71) =	4.48	3.14
CRITICAL LEVEL =	1.89	1.52

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	107.007	7	0.093	2.803	0.00
SF	106.692	0	1.037	0.971	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
106.846	16-APR-07 13:18	GAW 213	(50)9033	4 \ 100.0 min	-0.06
106.922	16-APR-07 15:07	GAW 213	(91)8541	7 \ 100.0 min	0.52
107.007	16-APR-07 17:10	GAW 213	BK	\ 771.4 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
106.846	16-APR-07 13:18	GRB 213	(50)9033	4 \ 100.0 min	2.63
106.922	16-APR-07 15:07	GRB 213	(91)8541	7 \ 100.0 min	7.46
107.007	16-APR-07 17:10	GRB 213	BK	\ 771.4 min	0.00

Source	MS	ORIGINAL
Sample No.	5	1
Analyte	GrBeta	GrBeta
Reference Date	58.813-7	58.813-7
Separation Date #1		
Separation Date #2		
Count Date	107.583-07	107.583-07
Aliquot	0.3	0.3
Aliquot Units	L	L
Yield	1	1
Result	91.839	23.5
Error @ 2s (abs.)	4.022	2.151
Error @ 2s (%)	4.4	9.2
MDA	3.0407	1.969
Result Units	PCI/L	PCI/L
Nuclide	Sr 90	
Standard ID	AA1-B-(15)	
Qty (ml)	1	
Activity (dpm)	27.31	
Calib. Date	306.500-1996	
Half Life (days)	10580	
Decay Date	107.583-07	
Added (pCi)	19.16	
Added Error @ 2s (%)	4	
Spike Activity	27.552	
Original Activity	7.050	
Activity Difference	20.502	
Error Difference	6.674	
F/A Ratio	1.070	
F/A Ratio Error @ 2s (%)	7.781	
LCL	0.80	
LWL	0.87	
UWL	1.13	
UCL	1.20	
Status	PASS	
Flag		

Ⓢ

BU
11/10/07

61025

17-APR-07

TMA Corporation

8665- 5

82

09:05:13

Gross Alpha, Gross Beta Analysis

QC-MS#1 61025

R704064

ABCALC V 1.05

MCM

Reviewed BV Date 4-17-07

Counted 107.583- 7 on D2 for 100.00 min.

0.300	1	126.800 mg	126.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 214	GRB 214
Counts =	11.000	2684.000
Gross cpm =	0.110	26.840
Background =	0.131	2.601
Observed CPM =	-0.021	24.239
Cross talk fac =	0.005	0.300
True CPM =	-0.152	24.285
Inst Std. Fac. =	1.048	0.970
Adjusted CPM =	-0.160	23.556
Eff (cpm/dpm) =	0.056	0.385
DPM of Aliquot =	-2.839	61.165
pCi /l =	-4.26	91.8 9
1 sigma % Err =	32.204	2.234
2 sigma % Err =	63.120	4.379
(1 sigma err) =	1.37	2.05
(2 sigma err) =	2.69	4.02
LTV (95 %) =	2.26	95.2
MDA (3.00) =	5.29	3.04
MDA (2.71) =	5.21	3.03
CRITICAL LEVEL =	2.25	1.47

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	107.007	7	0.131	2.601	0.00
SF	106.692	0	1.048	0.970	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
106.846	16-APR-07 13:18	GAW 214	(50)9035 1 \	100.0 min	0.39
106.922	16-APR-07 15:07	GAW 214	(91)8541 8 \	100.0 min	0.63
107.007	16-APR-07 17:10	GAW 214	BK \	771.4 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
106.846	16-APR-07 13:18	GRB 214	(50)9035 1 \	100.0 min	12.53
106.922	16-APR-07 15:07	GRB 214	(91)8541 8 \	100.0 min	6.38
107.007	16-APR-07 17:10	GRB 214	BK \	771.4 min	0.00

LOG-IN VERIFICATION

All samples
All planchets

RUSH

R704064 TA_IRVINE
TestAmerica - Irvin
17461 Derian Avenue

Pr Mgr.... MCM Rcvd... 04/11/07
Charge.... 00-000 Due.... 04/18/07
Chemist... Value... 0.
Created... 12-APR-07 Billed.. 0.
Billing status.. open
Calc. units..... PCI /Unit alq Min Pri
/ 0

PROJECT# IQB2967

*Record book 06107 p.p.
63-64
4/17/07*

smp	elm	typ	mg	rec	dpm rec		1st sep	2nd sep	aliquot		carr/ trac			
					Ash	wgt								
1	82		126.60	✓	0.0000		0.000	0	0.000	0	0.3000 ✓	1	#	0
2	82		62.10	✓	0.0000		0.000	0	0.000	0	1.000 ✓	smpl	#	0
3	82		62.90	✓	0.0000		0.000	0	0.000	0	1.000 ✓	smpl	#	0
4	82		126.10	✓	0.0000		0.000	0	0.000	0	0.3000 ✓	1	#	0
5	82		126.80	✓	0.0000		0.000	0	0.000	0	0.3000 ✓	1	#	0

Carriers/Tracers used -----

64

704064

TEST AMERICA

JK 4/17/07

Rec'd: 04.11.07.

DUE: 04.18.07.

4.12.07 8665

WATER

[82]

Mte DWP

				FRAC	VOLUME	PH	MLR
Cuff. ID TO					RSV(L)		82(L)
8665 - 1	1R.22967 - 01	02.27.07	11:30	4	1.7	6	03
- 2	LCS						
- 3	BANK						
- 4	Dup. #1	2.27.07	11:30				03
- 5	MJ #2	2.27.07	11:30				03
DONE BY:					LS 04.12.07		

RECOVERY:

[82]

	G	T	N	DONE BY	CHK BY
8665 - 1	19.4132	19.2866	126.6	BVP 04.13.07	TS 04.13.07
✓	19.3530	19.2909	62.1		
↳	19.4027	19.3398	62.9		
†	19.4013	19.2752	126.1		
5	19.5038	19.3770	126.8	✓	✓

Section 2
Standards Certification &
Preparation Logs for Quality Control Samples

#372 Rec'd 4/2/2001 R Brenton P.O. 8555



Certificate of calibration of absolutely
standardised radioactive solutions

Sr⁹⁰AA1

ISSUED BY: Nycomed Amersham plc
Radiation & Radioactivity
Calibration Laboratory
Amersham Laboratories
White Lion Road
Amersham
Buckinghamshire
HP7 9LL

ISSUED FOR: AEA Technology plc
Isotrak
329 Harwell
Didcot
Oxfordshire
OX11 0QJ

Sr⁹⁰ 13653 dpm/ml ± 0.4% @ 306,500-96 5/7/01 R Brenton
in 1N HCl carrier content 0.1899 SrCO₃ mg/ml + D1.580 mg/ml Y₂O₃

Description Principal radionuclide: Strontium-90
Daughter radionuclide: Yttrium-90

Product code: SIZ24
Solution number: S6/11/196

K. Yamamoto
5/7/01

Measurement Reference time:

1200 GMT on 1 November 1996 306,500-96

Radioactive concentration of strontium-90:

4.557 kilobecquerels per gram of solution

which is equivalent to:

123.2 nanocuries per gram of solution

Mass of solution:

5.0309 grams

Total activity of strontium-90:

22.93 kilobecquerels

which is equivalent to:

620 nanocuries

Method of measurement used:

4π efficiency tracing using a liquid scintillation counter.

Calibration date(s): 17 November 1996 to 30 November 1996

The calibration date is provided for added information only, and must not be confused with the reference date. It is the reference date that must be used in all calculations relating to the values of activity.

Uncertainty Expanded uncertainty in the radioactive concentration quoted above: ± 0.88 %

Combined Type A uncertainty: ± 0.09 %

Combined Type B uncertainty: ± 0.43 %

Approved Signatory

D A Tattam

Date of issue

20 March 2001

D A Tattam

Page 1 of 2 pages

Nycomed
Amersham

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

#372 Rec'd 4/2/00, R. Prenton Po 8555

Certificate of calibration of absolutely
standardised radioactive solution

UKAS ACCREDITED CALIBRATION LABORATORY No. 0146

Radionuclidic Purity The estimated activities of any radioactive impurities found by high-resolution gamma ray spectrometry, or in any other examination of the solution, are listed below expressed as percentages of the activity of the principal radionuclide at the reference time.

Other radionuclides 0.002(1) %

Chemical Composition 0.1M HCl containing 100 micrograms of strontium and 100 micrograms of yttrium per ml.

Physical Data Recommended half life: 29.12 ± 0.24 years (1 year = 365.25 days)

Strontium-90: 100% beta particle emission.

Yttrium-90: 100% beta particle emission. Half life 2.670 ± 0.004 days.

The activity of the yttrium-90 is equal to the activity of the strontium-90.

Remarks This product meets the quality assurance requirements for achieving traceability to NIST as defined in ANSI N42.22-1995.

Nuclear data quoted on this certificate are taken from the Joint European File, Version 2.2.

Tests made over a period of 2 years on standardised solutions of strontium-90 stored in glass ampoules have shown that loss of strontium-90 from solution is negligible other than by radioactive decay.

Expression of Uncertainties The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2.00$, which for a t -distribution with $v_{\text{eff}} = \infty$ effective degrees of freedom corresponds to a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Unless indicated, all other uncertainties are expressed at the confidence level associated with one standard uncertainty.

The format used for the uncertainties in the values of radionuclidic purity is illustrated in the following examples;

6.5(21)	=	6.5 ± 2.1
6.54(21)	=	6.54 ± 0.21
6.543(21)	=	6.543 ± 0.021

Page 2 of 2 pages

10/27/06
RP

Prep of Sr⁹⁰ AA1-B-(15) QC 1B

Procedure CT-T04 Rev 03 6/16/06

Pipetted 0.5 mL = 0.50g of Sr⁹⁰ AA1
13653 dpm/mL \pm 0.4% into a 250 mL vol. flask.

Added 1 mL Sr M-A1 carrier 17.90 mg/mL +
1 mL Y E-D1 " 15.23 "

into same vol. flask.

Diluted to mark with 0.1N HCl. Transferred to
a 8oz WM PB.

27.31 dpm/mL \pm 0.5% @ 306,500 96

R. Prenton

10/27/06
RP

Prep of Am²⁴¹ RI-A QC 1B

Procedure CT-T04 Rev 03 6/16/06

Pipetted 2.5 mL (2x1000 mL + 500 mL) = 2.55g
of Am²⁴¹ RI 2249 dpm/mL \pm 1.0%

into a 250 mL vol. flask. Diluted to
mark with 1N HCl. Transferred
into 8oz WM PB.

22.49 dpm/mL \pm 1.1% @ 353,708 05

R. Prenton

Key 11/2/06

Section 3

Instrument Calibration Information

Richmond, CA Laboratory

Verification of Primary Calibration

Analysis Gross A/B Detector system LB4000 Date 2-26-03

Type: 80/93
TLW No. of Primary calibration being verified: _____ Date: _____

Standard Solution used: <u>Sr 90 Zr Am 241 Pl</u>	Prepared by: <u>RP</u>
Reference Date: <u>102 + 708 - 95 109 + 500 - 96</u>	Date: <u>11-10-00</u>

Preparation of secondary Solution(s):

Sample Preparation:

Counting Results:

Sample	Count GMT	Calculated Dpm ± 2σ error	Known Dpm	Ratio Found Dpm/ Known Dpm
See attached Summary: For Gross Alpha, only the results from D drawers were used in the calculation. Data from sample # B and BR were not used, (unreliable data). QAP-11 has a control limit of: 0.70 - 1.30 for GRA 0.80 - 1.20 for GRB The results of the verification is within the warning limits. CS 2-26-03				

Average Found/known ratio	$\frac{0.912}{0.90}$	$\frac{0.998}{0.93}$
Acceptance limits (from RCP-00, section 7.5)	1.10	1.07

Attach all raw data sheets Verification: outside limits within limits

Prepared by: <u>[Signature]</u>	Q.A. Review: <u>[Signature]</u>
Signature <u>[Signature]</u>	Signature <u>[Signature]</u>
Date <u>2-26-03</u>	Date <u>02-26-03</u>

Gross Alpha / Beta Verification

										ALPHA		BETA
										WTSmg	AVG	AVG
SAMPLE	INST.ID	REGION	GMT	YR	DPM	DELTA	DECAY	DPM@TZ	F/A			
					Am-241 = 1074	DPM @ 109.500	1996		lambda(-d) =			4.0291E-06
					Sr-90 = 1186	DPM @ 182.708	1995		lambda(-d) =			6.8630E-05
1074-1	C1	BETA	20.697	2003	1950.06	2467.947	0.84419	1976.80	0.986	18.300		
1074-1	D2	BETA	27.869	2003	1893.32	2475.119	0.84378	1976.80	0.958	18.300		
1074-1	C1	BETA	30.874	2003	1959.57	2478.124	0.84360	1976.80	0.991	18.300		
1074-1	D3	BETA	31.861	2003	1963.10	2479.111	0.84419	1976.80	0.993	18.300		0.981
1074-2	C2	BETA	20.697	2003	1989.68	2467.947	0.99008	1976.80	1.007	29.400		
1074-2	D3	BETA	27.869	2003	1860.23	2475.119	0.99007	1976.80	0.941	29.400		
1074-2	D2	BETA	28.807	2003	1965.22	2476.057	0.99007	1976.80	0.994	29.400		
1074-2	C2	BETA	30.874	2003	1977.60	2478.124	1.00000	1976.80	1.000	29.400		0.985
1074-3	C3	BETA	20.697	2003	1987.18	2467.947	0.84419	1976.80	1.005	40.800		
1074-3	C3	BETA	30.874	2003	2003.12	2478.124	0.84360	1976.80	1.013	40.800		
1074-3	D3	BETA	34.867	2003	2004.16	2482.117	0.84337	1976.80	1.014	40.800		
1074-3	D3	BETA	37.653	2003	2001.45	2484.903	0.84321	1976.80	1.012	40.800		1.011
1074-4	C4	BETA	20.697	2003	2009.01	2467.947	0.84419	1976.80	1.016	53.500		
1074-4	C4	BETA	30.874	2003	2032.88	2478.124	0.84360	1976.80	1.028	53.500		
1074-4	D3	BETA	35.753	2003	1985.58	2483.003	0.84332	1976.80	1.004	53.500		
1074-4	D3	BETA	37.849	2003	2008.09	2485.099	0.84320	1976.80	1.016	53.500		
1074-5	C1	ALPHA	20.778	2003	865.81	2468.028	0.99011	1074.00	0.806	18.400		
1074-5	C1	ALPHA	28.807	2003	865.81	2476.057	0.99007	1074.00	0.806	18.400	0.806	
1074-5	D3	ALPHA	31.764	2003	1021.03	2479.014	0.99006	1074.00	0.951	18.400		
1074-5	D3	ALPHA	34.686	2003	1014.95	2481.936	0.99005	1074.00	0.945	18.400	0.948 *	
1074-6	C2	ALPHA	20.778	2003	800.12	2468.028	0.99011	1074.00	0.745	29.800		
1074-6	C2	ALPHA	28.807	2003	799.06	2476.057	0.99007	1074.00	0.744	29.800	0.745	
1074-6	D3	ALPHA	34.768	2003	959.56	2482.018	0.99005	1074.00	0.893	29.800		
1074-6	D2	ALPHA	44.652	2003	921.68	2491.902	0.99001	1074.00	0.858	29.800	0.876 *	
1074-7	C3	ALPHA	20.778	2003	834.94	2468.028	0.99011	1074.00	0.777	48.700		
1074-7	C3	ALPHA	28.807	2003	820.85	2476.057	0.99007	1074.00	0.764	48.700	0.771	
1074-7	D3	ALPHA	35.853	2003	973.05	2483.103	0.99005	1074.00	0.906	48.700		
1074-7	D3	ALPHA	44.652	2003	985.79	2491.902	0.99001	1074.00	0.918	48.700	0.912 *	
1074-8	C4	ALPHA	20.778	2003	717.54	2468.028	0.84419	1074.00	0.668	58.200		
1074-8	C4	ALPHA	28.807	2003	704.05	2476.057	0.84372	1074.00	0.656	58.200	0.662	
1074-8	D3	ALPHA	37.920	2003	874.15	2485.170	0.84320	1074.00	0.814	58.200		
1074-8	D2	ALPHA	44.756	2003	825.49	2492.006	0.84280	1074.00	0.769	58.200	0.791	
1074-8	B1	ALPHA	45.792	2003	739.75	2493.042	0.84274	1074.00	0.689	49.900		
1074-8	D2	ALPHA	52.655	2003	740.27	2499.905	0.84234	1074.00	0.689	49.900	0.689	
1074-8	C1	ALPHA	50.656	2003	897.94	2497.906	0.84246	1074.00	0.836	49.900		
1074-8	D2	ALPHA	52.892	2003	863.68	2500.142	0.84233	1074.00	0.804	49.900	0.82	

1.016
 Ave. 0.998 ± 1.8%
 CN
 2/26/03

0.912 *
 Ave. 0.912 ± 3.6% *
 CN
 2/26/03

GROSS ALPHA/BETA VERIFICATION CALIBRATION - 2/2003

SAMPLE NO.	INST. ID	WTS. MG	SR-90 ADDED	BETA CPM	ALPHA CPM	BETA EFF.	ALPHA FR BETA	EFF USED	F/A-EFF
1074-1	C1	18.3	1976.8	802.681	0.860	0.4061	0.0011	0.418	0.9714
1074-1	D2	18.3	1976.8	780.973	1.343	0.3951	0.0017	0.418	0.9451
1074-1	C1	18.3	1976.8	805.117	1.378	0.4073	0.0017	0.418	0.9744
1074-1	D3	18.3	1976.8	804.744	0.241	0.4071	0.0003	0.418	0.9739
1074-2	C2	29.4	1976.8	812.030	2.115	0.4108	0.0026	0.414	0.9922
1074-2	D3	29.4	1976.8	757.040	0.390	0.3830	0.0005	0.414	0.9250
1074-2	D2	29.4	1976.8	804.780	1.560	0.4071	0.0019	0.414	0.9834
1074-2	C2	29.4	1976.8	807.589	2.196	0.4085	0.0027	0.414	0.9868
1074-3	C3	40.8	1976.8	813.073	0.720	0.4113	0.0009	0.411	1.0007
1074-3	C3	40.8	1976.8	819.593	0.719	0.4146	0.0009	0.411	1.0088
1074-3	D3	40.8	1976.8	807.820	0.183	0.4087	0.0002	0.411	0.9943
1074-3	D3	40.8	1976.8	807.580	0.446	0.4085	0.0006	0.411	0.9940
1074-4	C4	53.5	1976.8	811.754	0.692	0.4106	0.0009	0.407	1.0089
1074-4	C4	53.5	1976.8	820.582	0.697	0.4151	0.0008	0.407	1.0199
1074-4	D3	53.5	1976.8	792.721	0.199	0.4010	0.0003	0.407	0.9853
1074-4	D3	53.5	1976.8	802.520	0.306	0.4060	0.0004	0.407	0.9975

SAMPLE NO	INST. ID	WTS mg	Am-241 ADDED	ALPHA CPM	BETA CPM	ALPHA EFF	BETA FR. ALPHA	EFF. USED	F/A - EFF
1074-5	C1	18.4	1062	142.663	31.510	0.1343	0.2209	0.190	0.7070
1074-5	C1	18.4	1062	141.372	33.117	0.1331	0.2343	0.190	0.7006
1074-5	D3	18.4	1062	187.491	43.064	0.1765	0.2297	0.190	0.9292
1074-5	D3	18.4	1062	183.393	45.990	0.1727	0.2508	0.190	0.9089
1074-6	C2	29.8	1062	116.905	26.293	0.1101	0.2249	0.172	0.6400
1074-6	C2	29.8	1062	116.655	27.020	0.1098	0.2316	0.172	0.6386
1074-6	D3	29.8	1062	159.313	37.910	0.1500	0.2380	0.172	0.8722
1074-6	D2	29.8	1062	151.838	34.190	0.1430	0.2252	0.172	0.8312
1074-7	C3	48.7	1062	107.920	26.693	0.1016	0.2473	0.147	0.6913
1074-7	C3	48.7	1062	106.101	26.761	0.0999	0.2522	0.147	0.6796
1074-7	D3	48.7	1062	137.309	33.981	0.1293	0.2475	0.147	0.8795
1074-7	D3	48.7	1062	139.323	36.340	0.1312	0.2608	0.147	0.8924
1074-8	C4	58.2	1062	88.312	23.488	0.0832	0.2660	0.142	0.5856
1074-8	C4	58.2	1062	86.853	24.095	0.0818	0.2774	0.142	0.5759
1074-8	D3	58.2	1062	119.936	30.380	0.1129	0.2533	0.142	0.7953
1074-8	D2	58.2	1062	112.488	26.510	0.1059	0.2357	0.142	0.7459
1074-8R	B1	49.9	1062	93.749	24.961	0.0883	0.2663	0.145	0.6088
1074-8R	D2	49.9	1062	125.018	31.130	0.1177	0.2490	0.145	0.8119
1074-8R	C1	49.9	1062	92.132	25.278	0.0868	0.2744	0.145	0.5983
1074-8R	D2	49.9	1062	120.227	27.548	0.1132	0.2291	0.145	0.7807

Date: 1-13-03

To: Ruby Prenton/ Kats Yamamoto

From: Cesar Sangalang *CS*

Subj: Request for preparation of Calibration Standards of Group 1074 Gross Alpha/Beta

1074

Please prepare four (4) tubes each with about 1000 dpm of Sr-90 (soln. Sr-90 Z1) and another for tubes each with about 1000 dpm of Am-241 (soln. Am-241 P1).

Sample Nos. will be 1074-1 to 4 type "80" for Sr and 1074- 5 to 8 type "80" for Am .

I need to start with this work tomorrow, 1-14-03 with a projected finish date of 2-07-03

Thank you

Cesar

Verification
Book 2583 pg 86
565-572
Radiometrics Prep

Page 101, BK # 2775 Calibration

β efficiency -

counted in 2 diff. drawer C- Aluminized mylar
D- (Amidized) Gold in mylar.

2 counts on each drawer
& count per samples.

α efficiency -

β efficiency -

α from beta -

β from alpha -

Added 1186 dpm of Sr 90 Z1

1074 dpm of Am²⁴¹ P1

Log Book Group's Sample Entry #	DATE	ANALYSIS	Reg. Sample #	Volume & ID of TRACER ADDED	TOTAL ACTIVITY (CPM)	ACTIVITY DATE	STANDARD WT. (g)	MATRIX	CONTAINER	Event ID	Additional Information on Comment
564	10/18/02	Pu241	MUT RP	350uL Pu ²⁴¹ M1	2849.7	336.708-95	0.39	1.6542 ON HANDS + 18 mL U ²³⁵ MA Gold AB	LSC VIAL	MUT	Pu-241 Calib. check 10/18/02 K-gamma meter 2/14/03
565	11/13/03	Type 80CS	RP	0.1 mL Sr ⁹⁰ Z1	1186	182.708-95	0.5	10m L/MNHCl	50mL Poly Tube	CS	ERA, GRB Verification 11/13/03 K-gamma meter 2/14/03
566	"	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
567	"	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
568	"	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
569	"	"	RP	0.1 mL Am ²⁴¹ PI	1074	109.500-96	0.92	2/15/03 RP	"	"	"
570	"	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	1.0	"	"	"	"
571	"	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	"	"	"	"	"
572	"	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	"	"	"	"	"
573	11/21/03	Rn ²²²	CS	6.0 mL Rn ²²² N1-A	149.7	252.708-91	0.13	6m L/MNHCl + 4mL H ₂ O = 10mL	LSC VIAL	CS	Rn ²²² Verification 11/21/03 K-gamma meter 2/14/03
574	"	"	RP	6.0 mL Rn ²²² N1-A	149.7	"	0.13	"	"	"	"
575	"	"	RP	6.0 mL Rn ²²² N1-A	149.7	"	0.13	"	"	"	"
576	2/14/03	Sr ⁹⁰	CS	200uL Sr ⁹⁰ Z1	2372	182.708-95	0.21	0.1N HNO ₃	50mL Poly Tube	CS	Sr ⁹⁰ Verification 2/14/03 K-gamma meter 2/14/03
577	"	"	RP	"	"	"	0.21	"	"	"	"
578	"	"	RP	"	"	"	0.21	"	"	"	"
579	"	"	RP	"	"	"	0.21	"	"	"	"
580	"	"	RP	"	"	"	0.21	"	"	"	"
581	"	"	RP	"	"	"	0.21	"	"	"	"

Log Book Group's Sample Entry #	DATE	ANALYSIS	Reg. Sample #	Volume & ID of TRACER ADDED	TOTAL ACTIVITY (CPM)	ACTIVITY DATE	STANDARD WT. (g)	MATRIX	CONTAINER	Event ID	Additional Information on Comment
564	10/18/02	Pu241	MUT RP	350uL Pu ²⁴¹ M1	2849.7	336.708-95	0.39	1.6542 ON HANDS + 18 mL U ²³⁵ MA Gold AB	LSC VIAL	MUT	Pu-241 Calib. check 10/18/02 K-gamma meter 2/14/03
565	11/13/03	Type 80CS	RP	0.1 mL Sr ⁹⁰ Z1	1186	182.708-95	0.5	10m L/MNHCl	50mL Poly Tube	CS	ERA, GRB Verification 11/13/03 K-gamma meter 2/14/03
566	"	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
567	"	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
568	"	"	RP	0.1 mL Sr ⁹⁰ Z1	1186	"	"	"	"	"	"
569	"	"	RP	0.1 mL Am ²⁴¹ PI	1074	109.500-96	0.92	2/15/03 RP	"	"	"
570	"	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	1.0	"	"	"	"
571	"	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	"	"	"	"	"
572	"	"	RP	0.1 mL Am ²⁴¹ PI	1074	"	"	"	"	"	"
573	11/21/03	Rn ²²²	CS	6.0 mL Rn ²²² N1-A	149.7	252.708-91	0.13	6m L/MNHCl + 4mL H ₂ O = 10mL	LSC VIAL	CS	Rn ²²² Verification 11/21/03 K-gamma meter 2/14/03
574	"	"	RP	6.0 mL Rn ²²² N1-A	149.7	"	0.13	"	"	"	"
575	"	"	RP	6.0 mL Rn ²²² N1-A	149.7	"	0.13	"	"	"	"
576	2/14/03	Sr ⁹⁰	CS	200uL Sr ⁹⁰ Z1	2372	182.708-95	0.21	0.1N HNO ₃	50mL Poly Tube	CS	Sr ⁹⁰ Verification 2/14/03 K-gamma meter 2/14/03
577	"	"	RP	"	"	"	0.21	"	"	"	"
578	"	"	RP	"	"	"	0.21	"	"	"	"
579	"	"	RP	"	"	"	0.21	"	"	"	"
580	"	"	RP	"	"	"	0.21	"	"	"	"
581	"	"	RP	"	"	"	0.21	"	"	"	"



REPORT OF TRACEABILITY *Am-241 P1*

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory
Las Vegas, Nevada

Radionuclide	Americium-241
Source identification	94030-1, prepared by EMSL
Source description	Liquid in 5-mL flame-sealed glass ampoule
Source mass	Approximately 5.0 grams
Source composition	Americium-241 in 0.1 mol·L ⁻¹ HCl
Reference time	0700 EST April 18, 1996

NIST DATA

EMSL DATA

Radioactivity concentration	3.574 x 10 ² Bq·g ⁻¹	9.6 nanocuries/gram
Expanded uncertainty	0.46 percent ^{(1,2)*}	±2.75 percent ⁽³⁾
Photon-emitting impurities	None observed ⁽⁴⁾	None reported
Measuring instrument	2π α liquid-scintillation counter	Liquid-scintillation counter
Half life	432.2 ± 0.7 years ⁽⁵⁾	
Difference from NIST		+0.06 percent ⁽⁶⁾

For the Director,

J.M. Robin Hutchinson, Group Leader
Radioactivity Group
Physics Laboratory

*Notes on next page

(over)

Gaithersburg, MD 20899
November 1996

As guidance for the proper use of this Report, it should be emphasized that the National Institute of Standards and Technology is concerned only with fostering good measurements capability and consistency with the national measurements system. The assurance of the proper application of that capability to the ultimate consumer products is the responsibility of each manufacturer of these products and of the Federal regulatory agencies.

A continuing traceability program in radioactivity demonstrates, to the degree established by the periodic assays of calibrated radioactivity samples, a continuing competence to maintain the instrument systems and standards necessary for accurate measurement. Such a program cannot, however, endorse each and every measurement nor the final product, any more than a spot check can vouch for every unchecked item. Care should be taken, therefore, not to imply such endorsement. The proper use of this Report is governed by section 200.114 of Title 15 of the Code of Federal Regulations. These regulations may be met if Reports are quoted only in their entirety. Excerpts out of context may be misleading.

NOTES

- (1) The uncertainty analysis methodology and nomenclature used for the reported uncertainties are based on uniform NIST guidelines and are compatible with those adopted by the principal international metrology standardization bodies [cf., B.N. Taylor and C.E. Kuyatt, *NIST Technical Note 1297* (1994)].
- (2) The combined standard uncertainty, $u_c = 0.23$ percent, is the quadratic combination of the standard deviation (or standard deviation of the mean where appropriate), or approximations thereof, for the following component uncertainties:
- | | |
|---|--------------|
| a) 20 measurements on each of 5 samples | 0.03 percent |
| b) gravimetric | 0.05 percent |
| c) dead time | 0.10 percent |
| d) background | 0.01 percent |
| e) detection efficiency | 0.20 percent |

The expanded uncertainty, $U = 0.46$ percent, is obtained by multiplying u_c by a coverage factor of $k = 2$ and is assumed to provide an uncertainty interval of approximately 95 percent confidence.

- (3) "Overall uncertainty" reported by EMSL.
- (4) The limits of detection, as a percentage of the 59.5-keV photons emitted in the decay of americium-241, are:

0.02 percent between 63.5 and 1900 keV,

provided that the impurity photons are separated in energy by four keV or more from those emitted in the decay of americium-241.

- (5) Evaluated Nuclear Structure Data File (ENSDF), September 1996.
- (6) This result demonstrates the traceability of EMSL to NIST, for this measurement, to within five percent as specified in the appendix, Traceability Studies, of the EPA-NIST interagency agreement of April 1976, as amended.

For further information, please contact Jeffrey T. Cessna at 301-975-5539.

Source identification 94030-1



318
Rec'd 6/24/97
K. Yamamoto

Calibration Certificate

Am-241 P1

OFFICE OF
RESEARCH AND DEVELOPMENT

Description

Principal Radionuclide.....	Americium-241
Total Mass of this Solution.....	Approx. 5 grams
Total Activity.....	Approx. 48 nanocuries
Half-life.....	432.7 ± 0.5 years
Activity Concentration.....	9.6 nanocuries/gram
Date and Time of Standardization.....	April 18, 1996 0400 hours PST
Solution Number.....	109,500-96 94030-1

Measurement

Method of Measurement:

The activity of the dilution was measured using liquid scintillation.

The activity of the primary solution was measured using a liquid scintillation counter.

Activity of daughter radionuclide:

The principal activity was accompanied at the quoted time by less than:

[] of the daughter nuclide..... []

Useful Life

We recommend that this solution should not be used after..... [January, 2003]

Am-241 P1 Rec'd 12/04/2001 in 1M HCl
 $5.0386 \text{ g} \times 9.6 \text{ nCi/g} \times 2220 \text{ dpm/nCi} \times \frac{1}{100 \text{ mL}} = 1074 \text{ dpm/mL} \pm 0.92\%$
 109,500-96
 R. Prentice 12/4/01
 K. Yamamoto 12/4/01
 NPDES - 1853

Purity:

The activities other than that of the principal nuclide and of its daughter nuclides were estimated to be:

- (1) None stated < of the principal activity
- (2) < of the principal activity
- (3) < of the principal activity

The activities of the impurities are not included in the quoted figures of the principal activity.

Random Errors:

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than $\pm 0.23\%$.

The 99.7% confidence limits are given by $t(sm)$ where t is obtained from the Student t factor for the degree of freedom ($n-1$), and is calculated to be $\pm 0.75\%$.

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta, -\delta'$). These have been estimated not to exceed $\pm 2.0\%$.

The overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [$t(sm)$] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$). The overall uncertainty is therefore calculated on the basis of $+ [t(sm) + \delta], - [t(sm) + \delta']$ and is $\pm 2.75\%$ of the quoted radioactive concentration.

Decay Schemes:

This standardization is based on the following assumptions of the principal nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Americium-241 decays 100 percent by alpha emission.

Chemical Composition of Solution:

Carrier content per gram of solution:

Other components:

Preservative: 1.0 M HCl

Remarks:

Date Certificate Prepared April 26, 1996

Approval Signature *J. L. Mills*



National Institute of Standards & Technology

Certificate

Sr⁹⁰Z1

Standard Reference Material 4919H Strontium-90 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive strontium-90 chloride, non-radioactive strontium chloride, non-radioactive yttrium chloride, and hydrochloric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of beta-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains strontium-90 with a total activity of approximately 20 kBq. Strontium-90 decays by beta-particle emission to yttrium-90, which also decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. The beta particles emitted from strontium-90 and yttrium-90 produce bremsstrahlung photons with energies up to 2 MeV. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 0.9 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least July 2005.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
December 1995

Thomas E. Gills, Chief
Standard Reference Materials Program

Recommended Procedure for Opening the SRM Ampoule

- 1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.
- 2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.
- 3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.
- 4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.
- 5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.
- 6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.
- 7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.
- 8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.
- 9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss. See also reference [4]*.

- [a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.
- | | | | |
|---|----|------|-----|
| Distance from Ampoule (cm): | 1 | 30 | 100 |
| Approximate Dose Rate ($\mu\text{Sv/h}$): | 15 | <0.1 | - |

- [b] The stated uncertainty is two times the standard uncertainty.

- [c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

- [d] The reported value, y , of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \dots, x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i , used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y , $u_i(y) \equiv |\partial y / \partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y .

The **combined standard uncertainty** of y , $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U , the **expanded uncertainty** of y .

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

- [e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the liquid-scintillation counting is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

- [f] The estimated limit of detection for alpha-particle-emitting impurities is:
 $0.05 \alpha \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 3 and 12 MeV.

- [g] Estimated limits of detection for photon-emitting impurities are:
 $0.04 \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 40 and 507 keV and
 $0.004 \gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 515 and 1900 keV.

- [h] The stated uncertainty is the standard uncertainty. See reference [5].

- [i] Relative standard uncertainty of the input quantity x_i .

- [j] The relative change in the output quantity y divided by the relative change in the input quantity x_i . If $|\partial y / \partial x_i| \cdot (x_i / y) = 1.0$, then a 1% change in x_i results in a 1% change in y . If $|\partial y / \partial x_i| \cdot (x_i / y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y .

- [k] Relative component of combined standard uncertainty of output quantity y , rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y = |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.
- [m] The live time is determined by counting the pulses from a gated crystal-controlled oscillator.
- [n] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y) = \{(\text{response per Bq of impurity})/(\text{response per Bq of Sr-90})\} \cdot \{(\text{Bq of impurity})/(\text{Bq of Sr-90})\}$. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.
- [p] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.
- [q] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$, multiplied by other sensitivity factors where appropriate.
- [r] The relationship between the detection efficiency for Sr-90 and Y-90 and the detection efficiency for H-3 was computed using the CIEMAT/NIST method as embodied in the computer program EFFY4. See references [6, 7, 8]. The program computes the detection efficiency for each radionuclide based upon an assumed model. No estimate is made of the uncertainty associated with this model.

REFERENCES

- [1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.
- [2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)
- [3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.
- [4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.
- [5] Evaluated Nuclear Structure Data File (ENSDF), July 1995.
- [6] E. Garcia-Toraño and A. Grau Malonda, EFFY, A New Program to Compute the Counting Efficiency of Beta Particles in Liquid Scintillators, *Computer Phys. Comm.* **36** (1985) 307.
- [7] A. Grau Malonda, E. Garcia-Toraño, and J.M. Los Arcos, Liquid-Scintillation Counting Efficiency as a Function of the Figure of Merit for Pure Beta-Particle Emitters, *Int. J. Appl. Radiat. Isot.* **36** (1985) 157.
- [8] B.M. Coursey, W.B. Mann, A. Grau Malonda, E. Garcia-Toraño, J.M. Los Arcos, J.A.B. Gibson, and D. Reher, Standardization of Carbon-14 by $4\pi\beta$ Liquid Scintillation Efficiency Tracing with Hydrogen-3, *Appl. Radiat. Isot.* **37** (1986) 403.

PROPERTIES OF SRM 4919H
(Certified values are shown in bold type)

Sr⁹⁰Z1

Source identification number	NIST SRM 4919H		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter	(16.5 ± 0.5) mm	
	Wall Thickness	(0.60 ± 0.04) mm	
	Barium content	Less than 2.5%	
	Lead-oxide content	Less than 0.02%	
	Other heavy elements	Trace quantities	
Solution density	(1.014 ± 0.002) g·mL⁻¹ at 21.5 °C [b]*		
Solution mass	Approximately 5.0 grams		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L ⁻¹)	Mass Fraction (g·g ⁻¹)
	H ₂ O	54	0.96
	HCl	0.9	0.04
	SrCl ₂	0.001	0.0002
	YCl ₃	0.001	0.0002
	⁹⁰ SrCl ₂	9 × 10 ⁻⁹	1 × 10 ⁻⁹
Radiological Properties:			
Radionuclide	Strontium-90		
Reference time	1200 EST, 1 July 1995		
Massic activity of the solution [c]	4.010 kBq·g ⁻¹		
Relative expanded uncertainty (k=2)	0.74% [d] [e]		
Alpha-particle-emitting impurities	None detected [f]		
Photon-emitting impurities	None detected [g]		
Half lives used in the decay corrections	Hydrogen-3: (12.33 ± 0.06) a [h] Strontium-90: (28.78 ± 0.04) a [h] Yttrium-90: (64.10 ± 0.08) h [h]		
Beta-particle maximum energies used in the EFFY4 computations	Hydrogen-3: (18.594 ± 0.008) keV [h] Strontium-90: (546.0 ± 1.6) keV [h] Yttrium-90: (521 ± 3) keV [h] (2281.5 ± 2.5) keV [h]		
Calibration method	4πB liquid-scintillation counting. The Sr-90 plus Y-90 detection efficiency was calculated using the CIEMAT/NIST method with H-3 as the detection-efficiency monitor. [r]		

Sr⁹⁰Z1 in 1N HCL
 $4.9313g \times 4.010 \frac{kBq}{g} \times 1000 \times 60 \frac{dpm}{Bq} \times \frac{1}{100ml} = 1.186E4 \frac{dpm}{ml} @ 182.708 - 95$
 SRM 4919H, page 3 of 6
 carrier content $0.132 \frac{mg}{ml} SrCO_3 + 0.1107 \frac{mg}{ml} Y_2O_3$
 0.1907
 11/10/00 P.38
 Notes and references are on pages 5 and 6.
 K. Yamamoto
 NPDES 1859

Counted 20.697- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.300 mg	18.300 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 109	GRB 109
Counts =	90.000	80370.000
Gross cpm =	0.900	803.700
Background =	0.037	1.019
Observed CPM =	0.863	802.681
Cross talk fac =	0.006	0.209
True CPM =	-4.096	803.538
Inst Std. Fac. =	1.163	1.014
Adjusted CPM =	-4.764	814.787
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	-25.046	1950.059

pCi /smpl =	-11.3	878.
1 sigma % Err =	2.363	0.353
2 sigma % Err =	4.632	0.692

(1 sigma err) = 0.267 3.10

(2 sigma err) = 0.523 6.08

LTV (95 %) = 0.440 884.

MDA (3.00) = 0.283 0.538

MDA (2.71) = 0.276 0.535

CRITICAL LEVEL = 0.106 0.254

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.037	1.019	0.00
SF	20.633	0	1.163	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.738	17-JAN-03 9:42	GAW 109	(50)9025 1	100.0 min	0.75
17.986	17-JAN-03 15:39	GAW 109	BK	3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 109	SF	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.738	17-JAN-03 9:42	GRB 109	(50)9025 1	100.0 min	12.57
17.986	17-JAN-03 15:39	GRB 109	BK	3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 109	SF	10.0 min	0.00

CS
Counted 27.869- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.300 mg	18.300 mg
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 114	GRB 114
Counts =	138.000	78303.000
Gross cpm =	1.380	783.030
Background =	0.037	2.057
Observed CPM =	1.343	780.973
Cross talk fac =	0.006	0.209
True CPM =	-3.482	781.701
Inst Std. Fac. =	1.045	1.012
Adjusted CPM =	-3.638	791.082
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	-19.128	1893.323

Count

pCi /smpl =	-8.62	853.
1 sigma % Err =	3.419	0.358
2 sigma % Err =	6.701	0.703

(1 sigma err) = 0.295 3.06

(2 sigma err) = 0.577 5.99

LTV (95 %) = 0.486 858.

MDA (3.00) = 0.283 0.751

MDA (2.71) = 0.276 0.748

CRITICAL LEVEL = 0.106 0.360

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	25.006	3	0.037	2.057	0.00
SF	27.619	0	1.045	1.012	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.620	27-JAN-03 6:52	GAW 114	SF	10.0 min	0.00
27.664	27-JAN-03 7:56	GAW 114	(93)2158 14	100.0 min	9.48
27.756	27-JAN-03 10:08	GAW 114	(93)7426 16	100.0 min	8.17

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.633	27-JAN-03 7:11	GRB 114	SF	10.0 min	0.00
27.664	27-JAN-03 7:56	GRB 114	(93)2158 14	100.0 min	25.28
27.756	27-JAN-03 10:08	GRB 114	(93)7426 16	100.0 min	21.12

CS
Counted 30.874- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.300 mg	18.300 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 109	GRB 109
Counts =	142.000	80616.000
Gross cpm =	1.420	806.160
Background =	0.042	1.043
Observed CPM =	1.378	805.117
Cross talk fac =	0.006	0.209
True CPM =	-3.596	805.869
Inst Std. Fac. =	1.165	1.016
Adjusted CPM =	-4.189	818.763
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	-22.023	1959.574

2 counts done
(c)

pCi /smpl =	-9.92	883.
1 sigma % Err =	3.363	0.353
2 sigma % Err =	6.591	0.691

(1 sigma err) = 0.334 3.11

(2 sigma err) = 0.654 6.10

LTV (95 %) = 0.550 888.

MDA (3.00) = 0.297 0.544

MDA (2.71) = 0.290 0.541

CRITICAL LEVEL = 0.113 0.257

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	29.937	3	0.042	1.043	0.00
SF	30.616	0	1.165	1.016	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.616	30-JAN-03 6:47	GAW 109	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GAW 109	(50)9035 1 \	100.0 min	0.82
30.867	30-JAN-03 12:48	GAW 109	(50)9035 1 \	6.0 min	0.73

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.626	30-JAN-03 7:01	GRB 109	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GRB 109	(50)9035 1 \	100.0 min	20.30
30.867	30-JAN-03 12:48	GRB 109	(50)9035 1 \	6.0 min	24.17

CS
Counted 31.861- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.300 mg	18.300 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	29.000	80626.000
Gross cpm =	0.290	806.260
Background =	0.049	1.516
Observed CPM =	0.241	804.744
Cross talk fac =	0.006	0.209
True CPM =	-4.732	805.734
Inst Std. Fac. =	1.035	1.018
Adjusted CPM =	-4.898	820.237
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	-25.748	1963.102

2nd Count
Done
D

pCi /smpl =	-11.6	884.
1 sigma % Err =	1.230	0.353
2 sigma % Err =	2.412	0.691

(1 sigma err) = 0.143 3.12

(2 sigma err) = 0.280 6.11

LTV (95 %) = 0.235 889.

MDA (3.00) = 0.315 0.650

MDA (2.71) = 0.308 0.646

CRITICAL LEVEL = 0.122 0.309

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	30.966	3	0.049	1.516	0.00
SF	31.614	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.966	30-JAN-03 15:11	GAW 115	BK	929.7 min	0.00
31.614	31-JAN-03 6:44	GAW 115	SF	10.0 min	0.00
31.764	31-JAN-03 10:20	GAW 115	(80)1074	5 \ 100.0 min	194.10

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.966	30-JAN-03 15:11	GRB 115	BK	929.7 min	0.00
31.625	31-JAN-03 7:00	GRB 115	SF	10.0 min	0.00
31.764	31-JAN-03 10:20	GRB 115	(80)1074	5 \ 100.0 min	43.83

CS
Counted 20.697- 3 on C2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.400 mg	29.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 110	GRB 110
Counts =	217.000	81414.000
Gross cpm =	2.170	814.140
Background =	0.055	1.637
Observed CPM =	2.115	812.503
Cross talk fac =	0.006	0.215
True CPM =	-2.840	813.113
Inst Std. Fac. =	1.176	1.014
Adjusted CPM =	-3.340	824.496
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	-19.370	1989.682

pCi /smpl =	-8.73	896.
1 sigma % Err =	5.252	0.351
2 sigma % Err =	10.293	0.688

(1 sigma err) = 0.458 3.15

(2 sigma err) = 0.898 6.17

LTV (95 %) = 0.756 901.

MDA (3.00) = 0.363 0.679

MDA (2.71) = 0.356 0.676

CRITICAL LEVEL = 0.143 0.324

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.055	1.637	0.00
SF	20.633	0	1.176	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.617	17-JAN-03 6:48	GAW 110	SF	\ 10.0 min	0.00
17.986	17-JAN-03 15:39	GAW 110	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 110	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.631	17-JAN-03 7:08	GRB 110	SF	\ 10.0 min	0.00
17.986	17-JAN-03 15:39	GRB 110	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 110	SF	\ 10.0 min	0.00

CS
Counted 27.869- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.400 mg	29.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
-----	-----	-----
Instrument =	GAW 115	GRB 115
Counts =	46.000	75955.000
Gross cpm =	0.460	759.550
Background =	0.070	1.746
Observed CPM =	0.390	757.804
Cross talk fac =	0.006	0.215
True CPM =	-4.234	758.713
Inst Std. Fac. =	1.037	1.016
Adjusted CPM =	-4.390	770.852
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	-25.460	1860.228
pCi /smpl =	-11.5	838.
1 sigma % Err =	1.720	0.364
2 sigma % Err =	3.370	0.713
(1 sigma err) =	0.197	3.05
(2 sigma err) =	0.387	5.97
LTV (95 %) =	0.325	843.
MDA (3.00) =	0.400	0.701
MDA (2.71) =	0.392	0.697
CRITICAL LEVEL =	0.161	0.335

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	25.006	3	0.070	1.746	0.00
SF	27.619	0	1.037	1.016	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.620	27-JAN-03 6:52	GAW 115	SF	10.0 min	0.00
27.664	27-JAN-03 7:56	GAW 115	(93)7426 15	100.0 min	1.59
27.756	27-JAN-03 10:08	GAW 115	(93)8035 4	100.0 min	4.05

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.633	27-JAN-03 7:11	GRB 115	SF	10.0 min	0.00
27.664	27-JAN-03 7:56	GRB 115	(93)7426 15	100.0 min	2.32
27.756	27-JAN-03 10:08	GRB 115	(93)8035 4	100.0 min	10.41

CS
Counted 28.807- 3 on D2 for 100.00 min. Reviewed _____ Date _____

1.00	smpl	29.400 mg	29.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 114	GRB 114
Counts =	159.000	80684.000
Gross cpm =	1.590	806.840
Background =	0.030	2.060
Observed CPM =	1.560	804.780
Cross talk fac =	0.006	0.215
True CPM =	-3.349	805.499
Inst Std. Fac. =	1.043	1.011
Adjusted CPM =	-3.493	814.360
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	-20.255	1965.220

2
Count.
dmc

D

pCi /smpl	=	-9.12	885.
1 sigma % Err	=	3.801	0.353
2 sigma % Err	=	7.449	0.692

(1 sigma err)	=	0.347	3.13
(2 sigma err)	=	0.680	6.13
LTV (95 %)	=	0.572	890.
MDA (3.00)	=	0.289	0.758
MDA (2.71)	=	0.281	0.755
CRITICAL LEVEL	=	0.105	0.364

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.030	2.060	0.00
SF	28.606	0	1.043	1.011	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.957	27-JAN-03 14:58	GAW 114	BK	927.7 min	0.00
28.606	28-JAN-03 6:32	GAW 114	SF	10.0 min	0.00
28.652	28-JAN-03 7:38	GAW 114	(88)9033 2	100.0 min	4.31

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.869	27-JAN-03 12:51	GRB 114	(80)1074 1	100.0 min	790.00
27.957	27-JAN-03 14:58	GRB 114	BK	927.7 min	0.00
28.616	28-JAN-03 6:47	GRB 114	SF	10.0 min	0.00

CS
Counted 30.874- 3 on C2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.400 mg	29.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 110	GRB 110
Counts =	224.000	80924.000
Gross cpm =	2.240	809.240
Background =	0.044	1.651
Observed CPM =	2.196	807.589
Cross talk fac =	0.006	0.215
True CPM =	-2.729	808.175
Inst Std. Fac. =	1.177	1.014
Adjusted CPM =	-3.212	819.489
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	-18.628	1977.599

2 Counts done

(C)

pCi /smpl =	-8.39	891.
1 sigma % Err =	9.938	0.352
2 sigma % Err =	10.854	0.691

(1 sigma err) = 0.465 3.14

(2 sigma err) = 0.911 6.15

LTV (95 %) = 0.767 896.

MDA (3.00) = 0.333 0.682

MDA (2.71) = 0.326 0.679

CRITICAL LEVEL = 0.128 0.325

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	29.937	3	0.044	1.651	0.00
SF	30.616	0	1.177	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.616	30-JAN-03 6:47	GAW 110	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GAW 110	(50)9035	100.0 min	0.94
30.867	30-JAN-03 12:48	GAW 110	(50)9035	6.0 min	1.52

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.626	30-JAN-03 7:01	GRB 110	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GRB 110	(50)9035	100.0 min	18.21
30.867	30-JAN-03 12:48	GRB 110	(50)9035	6.0 min	17.59

CS
Counted 20.697- 3 on CS for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	40.800 mg	40.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 111	GRB 111
Counts =	75.000	81424.000
Gross cpm =	0.750	814.240
Background =	0.030	1.167
Observed CPM =	0.720	813.073
Cross talk fac =	0.006	0.220
True CPM =	-4.176	813.993
Inst Std. Fac. =	1.136	1.003
Adjusted CPM =	-4.744	816.435
Eff (cpm/dpm) =	0.157	0.411
DPM of Aliquot =	-30.289	1987.176

pCi /smpl =	-13.6	895.
1 sigma % Err =	2.115	0.351
2 sigma % Err =	4.145	0.688

(1 sigma err) = 0.289 3.14

(2 sigma err) = 0.566 6.15

LTV (95 %) = 0.476 900.

MDA (3.00) = 0.318 0.584

MDA (2.71) = 0.310 0.580

CRITICAL LEVEL = 0.116 0.276

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.030	1.167	0.00
SF	20.633	0	1.136	1.003	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.836	17-JAN-03 12:03	GAW 111	(50)9025 3 \	24.0 min	0.40
17.986	17-JAN-03 15:39	GAW 111	BK \	3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 111	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.836	17-JAN-03 12:03	GRB 111	(50)9025 3 \	24.0 min	6.18
17.986	17-JAN-03 15:39	GRB 111	BK \	3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 111	SF \	10.0 min	0.00

Counted 30.874- 3 on C3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	40.800 mg	40.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 111	GRB 111
Counts =	75.000	82078.000
Gross cpm =	0.750	820.780
Background =	0.031	1.187
Observed CPM =	0.719	819.593
Cross talk fac =	0.006	0.220
True CPM =	-4.216	820.522
Inst Std. Fac. =	1.136	1.003
Adjusted CPM =	-4.789	822.984
Eff (cpm/dpm) =	0.157	0.411
DPM of Aliquot =	-30.582	2003.115

2 Counts done

@

pCi /smpl =	-13.8	902.
1 sigma % Err =	2.096	0.349
2 sigma % Err =	4.109	0.685

(1 sigma err) = 0.289 3.15

(2 sigma err) = 0.566 6.18

LTV (95 %) = 0.476 908.

MDA (3.00) = 0.322 0.588

MDA (2.71) = 0.313 0.585

CRITICAL LEVEL = 0.118 0.278

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	29.937	3	0.031	1.187	0.00
SF	30.616	0	1.136	1.003	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.616	30-JAN-03 6:47	GAW 111	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GAW 111	(50)9035 3	100.0 min	0.67
30.867	30-JAN-03 12:48	GAW 111	(50)9035 3	6.0 min	1.10

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.626	30-JAN-03 7:01	GRB 111	SF	10.0 min	0.00
30.678	30-JAN-03 8:16	GRB 111	(50)9035 3	100.0 min	17.98
30.867	30-JAN-03 12:48	GRB 111	(50)9035 3	6.0 min	17.04

CS
Counted 34.867- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smp1	40.800 mg	40.800 mg
Aliquot		Sample Weight	
		ALPHA	BETA

Instrument =	GAW 115	GRB 115	
Counts =	25.000	80936.000	
Gross cpm =	0.250	809.360	
Background =	0.067	1.540	
Observed CPM =	0.183	807.820	
Cross talk fac =	0.006	0.220	
True CPM =	-4.682	808.852	
Inst Std. Fac. =	1.035	1.018	
Adjusted CPM =	-4.846	823.411	
Eff (cpm/dpm) =	0.157	0.411	
DPM of Aliquot =	-30.941	2004.155	

2nd Count done

D

pCi /smp1 =	-13.9	903.	
1 sigma % Err =	1.203	0.352	
2 sigma % Err =	2.357	0.690	

(1 sigma err) = 0.168 3.18

(2 sigma err) = 0.329 6.23

LTV (95 %) = 0.277 908.

MDA (3.00) = 0.432 0.666

MDA (2.71) = 0.424 0.662

CRITICAL LEVEL = 0.173 0.317

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	31.942	3	0.067	1.540	0.00
SF	34.615	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
34.615	3-FEB-03 6:45	GAW 115	SF	10.0 min	0.00
34.686	3-FEB-03 8:27	GAW 115	(80)1074	5 \ 100.0 min	192.99
34.762	3-FEB-03 10:17	GAW 115	(80)1074	6 \ 100.0 min	164.95

Previous 3 counts	Time	Detector	ID	Length	Cpm
34.636	3-FEB-03 7:15	GRB 115	SF	10.0 min	0.00
34.686	3-FEB-03 8:27	GRB 115	(80)1074	5 \ 100.0 min	46.82
34.762	3-FEB-03 10:17	GRB 115	(80)1074	6 \ 100.0 min	38.59

CS
Counted 37.653- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smp1	40.800 mg	40.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight
		ALPHA	BETA
		-----	-----
Instrument =	GAW 115	GRB 115	
Counts =	50.000	80909.000	
Gross cpm =	0.500	809.090	
Background =	0.054	1.510	
Observed CPM =	0.446	807.580	
Cross talk fac =	0.006	0.220	
True CPM =	-4.417	808.553	
Inst Std. Fac. =	1.036	1.017	
Adjusted CPM =	-4.576	822.299	
Eff (cpm/dpm) =	0.157	0.411	
DPM of Aliquot =	-29.219	2001.448	
pCi /smp1 =	-13.2	902.	
1 sigma % Err =	1.685	0.352	
2 sigma % Err =	3.303	0.690	
(1 sigma err) =	0.222	3.17	
(2 sigma err) =	0.435	6.22	
LTV (95 %) =	0.366	907.	
MDA (3.00) =	0.397	0.659	
MDA (2.71) =	0.389	0.656	
CRITICAL LEVEL =	0.156	0.314	

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME

BKG	36.943	3	0.054	1.510	0.00
SF	37.605	0	1.036	1.017	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm

36.943	5-FEB-03 14:37	GAW 115	BK	\ 949.8 min	0.00
37.605	6-FEB-03 6:31	GAW 115	SF	\ 10.0 min	0.00
37.648	6-FEB-03 7:33	GAW 115	(80)1074	7 \ 1.0 min	158.43

Previous 3 counts	Time	Detector	ID	Length	Cpm

36.943	5-FEB-03 14:37	GRB 115	BK	\ 949.8 min	0.00
37.618	6-FEB-03 6:49	GRB 115	SF	\ 10.0 min	0.00
37.648	6-FEB-03 7:33	GRB 115	(80)1074	7 \ 1.0 min	36.08

CS
Counted 20.697- 3 on C4 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	53.500 mg	53.500 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 112	GRB 112
Counts =	74.000	81327.000
Gross cpm =	0.740	813.270
Background =	0.048	1.516
Observed CPM =	0.692	811.754
Cross talk fac =	0.006	0.227
True CPM =	-4.124	812.689
Inst Std. Fac. =	1.155	1.006
Adjusted CPM =	-4.763	817.565
Eff (cpm/dpm) =	0.141	0.407
DPM of Aliquot =	-33.695	2009.006

pCi /smpl =	-15.2	905.
1 sigma % Err =	2.153	0.351
2 sigma % Err =	4.219	0.685

(1 sigma err) = 0.327 3.18

(2 sigma err) = 0.640 6.23

LTV (95 %) = 0.539 910.

MDA (3.00) = 0.420 0.667

MDA (2.71) = 0.411 0.664

CRITICAL LEVEL = 0.163 0.318

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.048	1.516	0.00
SF	20.633	0	1.155	1.006	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.836	17-JAN-03 12:03	GAW 112	(50)9025 4 \	24.0 min	0.52
17.986	17-JAN-03 15:39	GAW 112	BK \	3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 112	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.836	17-JAN-03 12:03	GRB 112	(50)9025 4 \	24.0 min	5.72
17.986	17-JAN-03 15:39	GRB 112	BK \	3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 112	SF \	10.0 min	0.00

30-JAN-03
15:01:55

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 4 80
CALIBRATION Std.

CS
Counted 30.874- 3 on C4 for 100.00 min.

Reviewed _____ Date _____

1.00 smpl 53.500 mg 53.500 mg

Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 112	GRB 112
Counts =	75.000	82210.000
Gross cpm =	0.750	822.100
Background =	0.053	1.518
Observed CPM =	0.697	820.582
Cross talk fac =	0.006	0.227
True CPM =	-4.171	821.528
Inst Std. Fac. =	1.154	1.007
Adjusted CPM =	-4.813	827.278
Eff (cpm/dpm) =	0.141	0.407
DPM of Aliquot =	-34.052	2032.875

2 Counts done

pCi /smpl =	-15.3	916.
1 sigma % Err =	2.148	0.349
2 sigma % Err =	4.211	0.685

(1 sigma err) = 0.330 3.20

(2 sigma err) = 0.646 6.27

LTV (95 %) = 0.544 921.

MDA (3.00) = 0.437 0.667

MDA (2.71) = 0.428 0.664

CRITICAL LEVEL = 0.171 0.318

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	29.937	3	0.053	1.518	0.00
SF	30.616	0	1.154	1.007	0.00

Previous	3 counts	Time	Detector	ID	Length	Cpm
30.616	30-JAN-03	6:47	GAW 112	SF	10.0 min	0.00
30.678	30-JAN-03	8:16	GAW 112	(50)9035 4	100.0 min	0.99
30.867	30-JAN-03	12:48	GAW 112	(50)9035 4	6.0 min	1.28

Previous	3 counts	Time	Detector	ID	Length	Cpm
30.626	30-JAN-03	7:01	GRB 112	SF	10.0 min	0.00
30.678	30-JAN-03	8:16	GRB 112	(50)9035 4	100.0 min	17.23
30.867	30-JAN-03	12:48	GRB 112	(50)9035 4	6.0 min	14.25

06-FEB-03
13:49:44

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 4 80
CALIBRATION Std.

CS
Counted 35.753- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smp1	53.500 mg	53.500 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 115	GRB 115
Counts =	25.000	79426.000
Gross cpm =	0.250	794.260
Background =	0.051	1.539
Observed CPM =	0.199	792.721
Cross talk fac =	0.006	0.227
True CPM =	-4.504	793.742
Inst Std. Fac. =	1.036	1.018
Adjusted CPM =	-4.666	808.030
Eff (cpm/dpm) =	0.141	0.407
DPM of Aliquot =	-33.014	1985.575

pCi /smp1	=	-14.9	894.
1 sigma % Err	=	1.218	0.355
2 sigma % Err	=	2.387	0.697

(1 sigma err) = 0.181 3.18

(2 sigma err) = 0.355 6.23

LTV (95 %) = 0.299 900.

MDA (3.00) = 0.430 0.672

MDA (2.71) = 0.421 0.669

CRITICAL LEVEL = 0.168 0.320

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	34.947	3	0.051	1.539	0.00
SF	35.623	0	1.036	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
35.623	4-FEB-03 6:57	GAW 115	SF	10.0 min	0.00
35.650	4-FEB-03 7:36	GAW 115	(80)1074 6	1.0 min	155.36
35.655	4-FEB-03 7:43	GAW 115	(80)9036 3	100.0 min	4.76

Previous 3 counts	Time	Detector	ID	Length	Cpm
35.633	4-FEB-03 7:11	GRB 115	SF	10.0 min	0.00
35.650	4-FEB-03 7:36	GRB 115	(80)1074 6	1.0 min	42.21
35.655	4-FEB-03 7:43	GRB 115	(80)9036 3	100.0 min	12.82

CS
Counted 20.778- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	18.400 mg	18.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 109	GRB 109
Counts =	14270.000	3257.000
Gross cpm =	142.700	32.570
Background =	0.037	1.019
Observed CPM =	142.663	31.551
Cross talk fac =	0.006	0.209
True CPM =	142.652	1.708
Inst Std. Fac. =	1.163	1.014
Adjusted CPM =	165.905	1.732
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	873.036	4.146

pCi /smpl =	393.	1.87
1 sigma % Err =	0.838	33.930
2 sigma % Err =	1.642	66.503

(1 sigma err) = 3.29 0.634

(2 sigma err) = 6.46 1.24

LTV (95 %) = 399. 2.91

MDA (3.00) = 0.283 0.538

MDA (2.71) = 0.276 0.535

CRITICAL LEVEL = 0.106 0.254

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.037	1.019	0.00
SF	20.633	0	1.163	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GAW 109	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 109	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GAW 109	(80)1074 1	\ 100.0 min	1.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GRB 109	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 109	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GRB 109	(80)1074 1	\ 100.0 min	814.16

CS
Counted 28.807- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smp1	18.400 mg	18.400 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 109	GRB 109
Counts =	14140.000	3417.000
Gross cpm =	141.400	34.170
Background =	0.028	1.053
Observed CPM =	141.372	33.117
Cross talk fac =	0.006	0.209
True CPM =	141.350	3.547
Inst Std. Fac. =	1.164	1.016
Adjusted CPM =	164.532	3.603
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	865.810	8.625

*2 Counts
dpm*

(C)

pCi /smp1 =	390.	3.88
1 sigma % Err =	0.841	16.734
2 sigma % Err =	1.649	32.799

(1 sigma err) = 3.28 0.650

(2 sigma err) = 6.43 1.27

LTV (95 %) = 395. 4.96

MDA (3.00) = 0.256 0.547

MDA (2.71) = 0.249 0.544

CRITICAL LEVEL = 9.242E-02 0.258

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.028	1.053	0.00
SF	28.606	0	1.164	1.016	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GAW 109	(80) 903	16 \ 10.0 min	1.35
27.957	27-JAN-03 14:58	GAW 109	BK	\ 927.5 min	0.00
28.606	28-JAN-03 6:32	GAW 109	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GRB 109	(80) 903	16 \ 10.0 min	4.32
27.957	27-JAN-03 14:58	GRB 109	BK	\ 927.5 min	0.00
28.616	28-JAN-03 6:47	GRB 109	SF	\ 10.0 min	0.00

CS

Reviewed _____ Date _____

Counted 31.764- 3 on D3 for 100.00 min.

1.00	smpl	18.400 mg	18.400 mg
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	18754.000	4458.000
Gross cpm =	187.540	44.580
Background =	0.049	1.516
Observed CPM =	187.491	43.064
Cross talk fac =	0.006	0.209
True CPM =	187.467	3.846
Inst Std. Fac. =	1.035	1.018
Adjusted CPM =	194.029	3.915
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	1021.031	9.371

1st count

pCi /smpl =	460.	4.22
1 sigma % Err =	0.731	17.654
2 sigma % Err =	1.432	34.601

(1 sigma err) = 3.36 0.745

(2 sigma err) = 6.59 1.46

LTV (95 %) = 465. 5.45

MDA (3.00) = 0.315 0.650

MDA (2.71) = 0.308 0.647

CRITICAL LEVEL = 0.122 0.309

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	30.966	3	0.049	1.516	0.00
SF	31.614	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.861	30-JAN-03 12:39	GAW 115	(80)1075	5 \ 100.0 min	191.94
30.966	30-JAN-03 15:11	GAW 115	BK	\ 929.7 min	0.00
31.614	31-JAN-03 6:44	GAW 115	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
30.861	30-JAN-03 12:39	GRB 115	(80)1075	5 \ 100.0 min	46.51
30.966	30-JAN-03 15:11	GRB 115	BK	\ 929.7 min	0.00
31.625	31-JAN-03 7:00	GRB 115	SF	\ 10.0 min	0.00

03-FEB-03
10:26:11

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 5 80
CALIBRATION Std.

CS
Counted 34.686- 3 on D3 for 100.00 min

Reviewed _____ Date _____

1.00	smpl	18.400 mg	18.400 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	18646.000	4753.000
Gross cpm =	186.460	47.530
Background =	0.067	1.540
Observed CPM =	186.393	45.990
Cross talk fac =	0.006	0.209
True CPM =	186.350	7.006
Inst Std. Fac. =	1.035	1.018
Adjusted CPM =	192.872	7.132
Eff (cpm/dpm) =	0.190	0.418
DPM of Aliquot =	1014.943	17.070

2nd Count Done

pCi /smpl =	457.	7.69
1 sigma % Err =	0.733	9.999
2 sigma % Err =	1.436	19.598

(1 sigma err) = 3.35 0.769

(2 sigma err) = 6.57 1.51

LTV (95 %) = 463. 8.96

MDA (3.00) = 0.356 0.654

MDA (2.71) = 0.350 0.651

CRITICAL LEVEL = 0.143 0.312

GC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	31.942	3	0.067	1.540	0.00
SF	34.615	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
31.861	31-JAN-03 12:39	GAW 115	(80)1074 1	100.0 min	0.25
31.942	31-JAN-03 14:36	GAW 115	BK	3838.3 min	0.00
34.615	3-FEB-03 6:45	GAW 115	SF	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
31.861	31-JAN-03 12:39	GRB 115	(80)1074 1	100.0 min	819.14
31.942	31-JAN-03 14:36	GRB 115	BK	3838.3 min	0.00
34.636	3-FEB-03 7:15	GRB 115	SF	10.0 min	0.00

CS
Counted 20.778- 3 on C2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 110	GRB 110
Counts =	11696.000	2793.000
Gross cpm =	116.960	27.930
Background =	0.055	1.637
Observed CPM =	116.905	26.293
Cross talk fac =	0.006	0.215
True CPM =	116.898	1.172
Inst Std. Fac. =	1.176	1.014
Adjusted CPM =	137.472	1.188
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	800.120	2.868

pCi /smpl =	360.	1.29
1 sigma % Err =	0.925	46.409
2 sigma % Err =	1.814	90.962

(1 sigma err) = 3.34 0.600

(2 sigma err) = 6.54 1.18

LTV (95 %) = 366. 2.28

MDA (3.00) = 0.365 0.680

MDA (2.71) = 0.357 0.676

CRITICAL LEVEL = 0.143 0.324

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.055	1.637	0.00
SF	20.633	0	1.176	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GAW 110	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 110	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GAW 110	(80)1074	2 \ 100.0 min	2.49

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GRB 110	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 110	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GRB 110	(80)1074	2 \ 100.0 min	823.70

CS
Counted 28.807- 3 on C2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 110	GRB 110
Counts =	11671.000	2868.000
Gross cpm =	116.710	28.680
Background =	0.055	1.660
Observed CPM =	116.655	27.020
Cross talk fac =	0.006	0.215
True CPM =	116.643	1.953
Inst Std. Fac. =	1.177	1.014
Adjusted CPM =	137.289	1.981
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	799.056	4.781

2 counts done
C

pCi /smpl =	360.	2.15
1 sigma % Err =	0.926	28.198
2 sigma % Err =	1.816	55.268

(1 sigma err) = 3.33 0.607

(2 sigma err) = 6.54 1.19

LTV (95 %) = 365. 3.16

MDA (3.00) = 0.365 0.684

MDA (2.71) = 0.357 0.681

CRITICAL LEVEL = 0.143 0.326

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.055	1.660	0.00
SF	28.606	0	1.177	1.014	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GAW 110	(80) 903 17 \	10.0 min	0.35
27.957	27-JAN-03 14:58	GAW 110	BK \	927.5 min	0.00
28.606	28-JAN-03 6:32	GAW 110	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GRB 110	(80) 903 17 \	10.0 min	0.35
27.957	27-JAN-03 14:58	GRB 110	BK \	927.5 min	0.00
28.616	28-JAN-03 6:47	GRB 110	SF \	10.0 min	0.00

CS
Counted 34.762- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	15938.000	3945.000
Gross cpm =	159.380	39.450
Background =	0.067	1.540
Observed CPM =	159.313	37.910
Cross talk fac =	0.006	0.215
True CPM =	159.291	3.678
Inst Std. Fac. =	1.035	1.018
Adjusted CPM =	164.866	3.745
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	959.560	9.039

pCi /smpl =	432.	4.07
1 sigma % Err =	0.793	17.405
2 sigma % Err =	1.554	34.114

(1 sigma err) = 3.43 0.709

(2 sigma err) = 6.72 1.39

LTV (95 %) = 438. 5.24

MDA (3.00) = 0.394 0.660

MDA (2.71) = 0.387 0.657

CRITICAL LEVEL = 0.158 0.314

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	31.942	3	0.067	1.540	0.00
SF	34.615	0	1.035	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
31.942	31-JAN-03 14:36	GAW 115	BK	\ 3838.3 min	0.00
34.615	3-FEB-03 6:45	GAW 115	SF	\ 10.0 min	0.00
34.686	3-FEB-03 8:27	GAW 115	(80)1074	5 \ 100.0 min	192.99

Previous 3 counts	Time	Detector	ID	Length	Cpm
31.942	31-JAN-03 14:36	GRB 115	BK	\ 3838.3 min	0.00
34.636	3-FEB-03 7:15	GRB 115	SF	\ 10.0 min	0.00
34.686	3-FEB-03 8:27	GRB 115	(80)1074	5 \ 100.0 min	46.82

04-FEB-03
08:15:15

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 6 80
CALIBRATION Std.

CS
Counted 35.650- 3 on D3 for 1.00 min.

Reviewed _____ Date _____

1.00	smpl	29.800 mg	29.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 115	GRB 115
Counts =	150.000	43.000
Gross cpm =	150.000	43.000
Background =	0.051	1.539
Observed CPM =	149.949	41.461
Cross talk fac =	0.006	0.215
True CPM =	149.893	9.249
Inst Std. Fac. =	1.036	1.018
Adjusted CPM =	155.289	9.416
Eff (cpm/dpm) =	0.172	0.414
DPM of Aliquot =	903.819	22.728

2nd Count
Done
D

pCi /smpl =	407.	10.2
1 sigma % Err =	8.172	72.156
2 sigma % Err =	16.018	141.426

(1 sigma err) = 33.3 7.39

(2 sigma err) = 65.2 14.5

LTV (95 %) = 462. 22.4

MDA (3.00) = 10.6 9.53

MDA (2.71) = 9.86 9.22

CRITICAL LEVEL = 1.38 3.14

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	34.947	3	0.051	1.539	0.00
SF	35.623	0	1.036	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
34.867	3-FEB-03 12:48	GAW 115	(80)1074	3 \ 100.0 min	0.19
34.947	3-FEB-03 14:43	GAW 115	BK	\ 953.9 min	0.00
35.623	4-FEB-03 6:57	GAW 115	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
34.867	3-FEB-03 12:48	GRB 115	(80)1074	3 \ 100.0 min	822.35
34.947	3-FEB-03 14:43	GRB 115	BK	\ 953.9 min	0.00
35.633	4-FEB-03 7:11	GRB 115	SF	\ 10.0 min	0.00

20-JAN-03
12:57:07

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 7 80
CALIBRATION Std.

CS
Counted 20.778- 3 on C3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 111	GRB 111
Counts =	10795.000	2813.000
Gross cpm =	107.950	28.130
Background =	0.030	1.167
Observed CPM =	107.920	26.963
Cross talk fac =	0.006	0.224
True CPM =	107.904	2.755
Inst Std. Fac. =	1.136	1.003
Adjusted CPM =	122.578	2.763
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	834.935	6.766

pCi /smpl =	376.	3.05
1 sigma % Err =	0.963	19.648
2 sigma % Err =	1.888	38.510

(1 sigma err) = 3.62 0.599

(2 sigma err) = 7.10 1.17

LTV (95 %) = 382. 4.04

MDA (3.00) = 0.339 0.587

MDA (2.71) = 0.330 0.584

CRITICAL LEVEL = 0.124 0.278

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.030	1.167	0.00
SF	20.633	0	1.136	1.003	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GAW 111	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 111	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GAW 111	(80)1074	3 \ 100.0 min	0.82

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GRB 111	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 111	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GRB 111	(80)1074	3 \ 100.0 min	815.46

CS
Counted 28.807- 3 on C3 for 100.00 min.

Reviewed _____ Date _____

1.00 smpl 48.700 mg 48.700 mg

Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 111	GRB 111
Counts =	10613.000	2795.000
Gross cpm =	106.130	27.950
Background =	0.029	1.189
Observed CPM =	106.101	26.761
Cross talk fac =	0.006	0.224
True CPM =	106.083	2.961
Inst Std. Fac. =	1.136	1.003
Adjusted CPM =	120.511	2.970
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	820.850	7.272

2 Counts Done
(C)

pCi /smpl =	370.	3.28
1 sigma % Err =	0.971	18.229
2 sigma % Err =	1.904	35.729
(1 sigma err) =	3.59	0.597
(2 sigma err) =	7.04	1.17
LTV (95 %) =	376.	4.26
MDA (3.00) =	0.335	0.592
MDA (2.71) =	0.326	0.589
CRITICAL LEVEL =	0.122	0.260

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.029	1.189	0.00
SF	28.606	0	1.136	1.003	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GAW 111	(80) 903 18 \	10.0 min	0.42
27.957	27-JAN-03 14:58	GAW 111	BK \	927.5 min	0.00
28.606	28-JAN-03 6:32	GAW 111	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GRB 111	(80) 903 18 \	10.0 min	0.42
27.957	27-JAN-03 14:58	GRB 111	BK \	927.5 min	0.00
28.616	28-JAN-03 6:47	GRB 111	SF \	10.0 min	0.00

CS
Counted 35.853- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
Aliquot		Sample Weight	Counted Weight
		ALPHA	BETA
Instrument =	GAW 115	GRB 115	
Counts =	13796.000	3552.000	
Gross cpm =	137.960	35.520	
Background =	0.051	1.539	
Observed CPM =	137.909	33.981	
Cross talk fac =	0.006	0.224	
True CPM =	137.891	3.045	
Inst Std. Fac. =	1.036	1.018	
Adjusted CPM =	142.855	3.100	
Eff (cpm/dpm) =	0.147	0.408	
DPM of Aliquot =	973.047	7.591	
pCi /smpl =	438.	3.42	
1 sigma % Err =	0.852	19.991	
2 sigma % Err =	1.670	39.182	
(1 sigma err) =	3.73	0.684	
(2 sigma err) =	7.32	1.34	
LTV (95 %) =	444.	4.55	
MDA (3.00) =	0.414	0.669	
MDA (2.71) =	0.405	0.666	
CRITICAL LEVEL =	0.161	0.319	

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	34.947	3	0.051	1.539	0.00
SF	35.623	0	1.036	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
35.650	4-FEB-03 7:36	GAW 115	(80)1074 6 \	1.0 min	155.36
35.655	4-FEB-03 7:43	GAW 115	(80)9036 3 \	100.0 min	4.76
35.753	4-FEB-03 10:04	GAW 115	(80)1074 4 \	100.0 min	0.21

Previous 3 counts	Time	Detector	ID	Length	Cpm
35.650	4-FEB-03 7:36	GRB 115	(80)1074 6 \	1.0 min	42.21
35.655	4-FEB-03 7:43	GRB 115	(80)9036 3 \	100.0 min	12.82
35.753	4-FEB-03 10:04	GRB 115	(80)1074 4 \	100.0 min	807.07

13-FEB-03
10:20:13

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- 7 80
CALIBRATION Std.

CS
Counted 44.652- 3 on D3 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 115	GRB 115
Counts =	13939.000	3784.000
Gross cpm =	139.390	37.840
Background =	0.067	1.500
Observed CPM =	139.323	36.340
Cross talk fac =	0.006	0.224
True CPM =	139.293	5.090
Inst Std. Fac. =	1.039	1.017
Adjusted CPM =	144.725	5.176
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	985.785	12.674

pCi /smpl =	444.	5.71
1 sigma % Err =	0.848	12.323
2 sigma % Err =	1.662	24.154

(1 sigma err) = 3.76 0.704

(2 sigma err) = 7.38 1.38

LTV (95 %) = 450. 6.87

MDA (3.00) = 0.461 0.661

MDA (2.71) = 0.452 0.658

CRITICAL LEVEL = 0.185 0.315

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	43.940	3	0.067	1.500	0.00
SF	44.610	0	1.039	1.017	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
43.759	12-FEB-03 10:12	GAW 115	(93)8034 1 \	100.0 min	1.43
43.940	12-FEB-03 14:33	GAW 115	BK \	962.3 min	0.00
44.611	13-FEB-03 6:39	GAW 115	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
43.759	12-FEB-03 10:12	GRB 115	(93)8034 1 \	100.0 min	2.99
43.940	12-FEB-03 14:33	GRB 115	BK \	962.3 min	0.00
44.620	13-FEB-03 6:52	GRB 115	SF \	10.0 min	0.00

CS
Counted 20.778- 3 on C4 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	52.800 mg	52.800 mg
-----		-----	-----
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 112	GRB 112
Counts =	8836.000	2500.000
Gross cpm =	88.360	25.000
Background =	0.048	1.516
Observed CPM =	88.312	23.484
Cross talk fac =	0.006	0.226
True CPM =	88.291	3.495
Inst Std. Fac. =	1.155	1.006
Adjusted CPM =	101.976	3.516
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	717.537	8.635

pCi /smpl =	323.	3.89
1 sigma % Err =	1.065	14.734
2 sigma % Err =	2.087	28.879

(1 sigma err) = 3.44 0.573

(2 sigma err) = 6.75 1.12

LTV (95 %) = 329. 4.84

MDA (3.00) = 0.418 0.667

MDA (2.71) = 0.409 0.663

CRITICAL LEVEL = 0.162 0.317

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	17.986	3	0.048	1.516	0.00
SF	20.633	0	1.155	1.006	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GAW 112	BK	\ 3774.4 min	0.00
20.633	20-JAN-03 7:11	GAW 112	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GAW 112	(80)1074 4	\ 100.0 min	0.80

Previous 3 counts	Time	Detector	ID	Length	Cpm
17.986	17-JAN-03 15:39	GRB 112	BK	\ 3774.4 min	0.00
20.648	20-JAN-03 7:33	GRB 112	SF	\ 10.0 min	0.00
20.697	20-JAN-03 8:43	GRB 112	(80)1074 4	\ 100.0 min	816.62

CS
Counted 28.807- 3 on C4 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	52.800 mg	52.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
Instrument =	GAW 112	GRB 112
Counts =	8662.000	2562.000
Gross cpm =	86.620	25.620
Background =	0.037	1.525
Observed CPM =	86.583	24.095
Cross talk fac =	0.006	0.226
True CPM =	86.556	4.499
Inst Std. Fac. =	1.156	1.007
Adjusted CPM =	100.059	4.530
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	704.047	11.126

2 Counts Done
C

pCi /smpl =	317.	5.01
1 sigma % Err =	1.075	11.581
2 sigma % Err =	2.108	22.700

(1 sigma err) = 3.41 0.580

(2 sigma err) = 6.69 1.14

LTV (95 %) = 323. 5.97

MDA (3.00) = 0.379 0.668

MDA (2.71) = 0.369 0.665

CRITICAL LEVEL = 0.142 0.318

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	27.957	3	0.037	1.525	0.00
SF	28.606	0	1.156	1.007	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GAW 112	(80) 903 19 \	10.0 min	0.41
27.957	27-JAN-03 14:58	GAW 112	BK \	927.5 min	0.00
28.606	28-JAN-03 6:32	GAW 112	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
27.798	27-JAN-03 11:09	GRB 112	(80) 903 19 \	10.0 min	2.59
27.957	27-JAN-03 14:58	GRB 112	BK \	927.5 min	0.00
28.616	28-JAN-03 6:47	GRB 112	SF \	10.0 min	0.00

Reviewed _____ Date _____

Counted 37.920- 3 on D3 for 100.00 min.

1.00 smpl 52.800 mg 52.800 mg

 Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	11999.000	3189.000
Gross cpm =	119.990	31.890
Background =	0.054	1.510
Observed CPM =	119.936	30.380
Cross talk fac =	0.006	0.226
True CPM =	119.917	3.231
Inst Std. Fac. =	1.036	1.017
Adjusted CPM =	124.234	3.286
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	874.147	8.070

pCi /smpl =	394.	3.64
1 sigma % Err =	0.914	17.888
2 sigma % Err =	1.791	35.060

(1 sigma err) = 3.60 0.650

(2 sigma err) = 7.05 1.27

LTV (95 %) = 400. 4.71

MDA (3.00) = 0.438 0.665

MDA (2.71) = 0.428 0.662

CRITICAL LEVEL = 0.172 0.317

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	36.943	3	0.054	1.510	0.00
SF	37.605	0	1.036	1.017	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
37.648	6-FEB-03 7:33	GAW 115	(80)1074 7 \	1.0 min	158.43
37.654	6-FEB-03 7:41	GAW 115	(80)1074 3 \	100.0 min	0.46
37.849	6-FEB-03 12:22	GAW 115	(80)1074 4 \	100.0 min	0.32

Previous 3 counts	Time	Detector	ID	Length	Cpm
37.648	6-FEB-03 7:33	GRB 115	(80)1074 7 \	1.0 min	36.08
37.654	6-FEB-03 7:41	GRB 115	(80)1074 3 \	100.0 min	821.08
37.849	6-FEB-03 12:22	GRB 115	(80)1074 4 \	100.0 min	815.94

CS
Counted 38.748- 3 on D3 for 2.29 min.

Reviewed _____ Date _____

1.00 smpl 52.800 mg 52.800 mg

Aliquot Sample Weight Counted Weight

	ALPHA	BETA
Instrument =	GAW 115	GRB 115
Counts =	269.000	83.000
Gross cpm =	117.467	36.245
Background =	0.071	1.512
Observed CPM =	117.396	34.733
Cross talk fac =	0.006	0.226
True CPM =	117.348	8.165
Inst Std. Fac. =	1.037	1.018
Adjusted CPM =	121.690	8.312
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	856.246	20.414

2nd Count Done
D

pCi /smpl =	386.	9.20
1 sigma % Err =	6.105	49.730
2 sigma % Err =	11.966	97.472
(1 sigma err) =	23.5	4.57
(2 sigma err) =	46.2	8.96
LTV (95 %) =	425.	16.7
MDA (3.00) =	6.75	5.63
MDA (2.71) =	6.35	5.49
CRITICAL LEVEL =	1.30	2.09

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	38.133	3	0.071	1.512	0.00
SF	38.724	0	1.037	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
38.134	6-FEB-03 19:12	GAW 115	BK	685.8 min	0.00
38.612	7-FEB-03 6:41	GAW 115	SF	10.0 min	0.00
38.724	7-FEB-03 9:22	GAW 115	SF	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
38.624	7-FEB-03 6:58	GRB 115	SF	10.0 min	0.00
38.654	7-FEB-03 7:41	GRB 115	SF	10.0 min	0.00
38.688	7-FEB-03 8:30	GRB 115	SF	10.0 min	0.00

CS
Counted 44.756- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	52.800 mg	52.800 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 114	GRB 114
Counts =	11254.000	2895.000
Gross cpm =	112.540	28.950
Background =	0.052	2.440
Observed CPM =	112.488	26.510
Cross talk fac =	0.006	0.226
True CPM =	112.482	1.044
Inst Std. Fac. =	1.043	1.012
Adjusted CPM =	117.319	1.057
Eff (cpm/dpm) =	0.142	0.407
DPM of Aliquot =	825.489	2.595

pCi /smpl =	372.	1.17
1 sigma % Err =	0.943	53.659
2 sigma % Err =	1.849	105.172

(1 sigma err) = 3.51 0.627

(2 sigma err) = 6.88 1.23

LTV (95 %) = 378. 2.20

MDA (3.00) = 0.431 0.837

MDA (2.71) = 0.422 0.834

CRITICAL LEVEL = 0.168 0.403

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	43.940	3	0.052	2.440	0.00
SF	44.610	0	1.043	1.012	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
44.611	13-FEB-03 6:39	GAW 114	SF	10.0 min	0.00
44.652	13-FEB-03 7:38	GAW 114	(93)1074	6 \ 100.0 min	158.39
44.652	13-FEB-03 7:38	GAW 114	(80)1074	6 \ 100.0 min	158.39

Previous 3 counts	Time	Detector	ID	Length	Cpm
44.620	13-FEB-03 6:52	GRB 114	SF	10.0 min	0.00
44.652	13-FEB-03 7:38	GRB 114	(93)1074	6 \ 100.0 min	34.61
44.652	13-FEB-03 7:38	GRB 114	(80)1074	6 \ 100.0 min	34.61

19-FEB-03
12:25:20

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- BR1 80
CALIBRATION Std.

CS
Counted 50.656- 3 on B1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 105	GRB 105
Counts =	9377.000	2649.000
Gross cpm =	93.770	26.490
Background =	0.021	1.529
Observed CPM =	93.749	24.961
Cross talk fac =	0.006	0.225
True CPM =	93.726	3.877
Inst Std. Fac. =	1.147	1.024
Adjusted CPM =	107.504	3.970
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	739.751	9.731

pCi /smpl =	333.	4.38
1 sigma % Err =	1.033	13.652
2 sigma % Err =	2.025	26.758

(1 sigma err) = 3.44 0.598

(2 sigma err) = 6.75 1.17

LTV (95 %) = 339. 5.37

MDA (3.00) = 0.302 0.668

MDA (2.71) = 0.293 0.665

CRITICAL LEVEL = 0.105 0.318

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	49.916	3	0.021	1.529	0.00
SF	50.610	0	1.147	1.024	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.918	14-FEB-03 14:01	GAW 105	BK	\ 5342.8 min	0.00
49.916	18-FEB-03 13:59	GAW 105	BK	\ 995.9 min	0.00
50.610	19-FEB-03 6:38	GAW 105	SF	\ 10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.918	14-FEB-03 14:01	GRB 105	BK	\ 5342.8 min	0.00
49.916	18-FEB-03 13:59	GRB 105	BK	\ 995.9 min	0.00
50.626	19-FEB-03 7:01	GRB 105	SF	\ 10.0 min	0.00

19-FEB-03
12:25:19

TMA Corporation
Gross Alpha, Gross Beta Analysis
ABCALC V 1.04

1074- BR1 80
CALIBRATION Std.

CS
Counted 45.792- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 114	GRB 114
Counts =	12507.000	3357.000
Gross cpm =	125.070	33.570
Background =	0.052	2.440
Observed CPM =	125.018	31.130
Cross talk fac =	0.006	0.225
True CPM =	125.000	3.011
Inst Std. Fac. =	1.044	1.012
Adjusted CPM =	130.500	3.047
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	897.994	7.468

pCi /smpl =	405.	3.36
1 sigma % Err =	0.895	19.928
2 sigma % Err =	1.754	39.059

(1 sigma err) = 3.62 0.670

(2 sigma err) = 7.09 1.31

LTV (95 %) = 410. 4.47

MDA (3.00) = 0.422 0.835

MDA (2.71) = 0.413 0.832

CRITICAL LEVEL = 0.165 0.402

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	43.940	3	0.052	2.440	0.00
SF	45.607	0	1.044	1.012	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.654	14-FEB-03 7:41	GAW 114	(93) 7437 5 \	100.0 min	8.50
45.751	14-FEB-03 10:01	GAW 114	(80) 903 44 \	10.0 min	0.36
45.783	14-FEB-03 10:47	GAW 114	(80) 903 53 \	10.0 min	0.15

Previous 3 counts	Time	Detector	ID	Length	Cpm
45.654	14-FEB-03 7:41	GRB 114	(93) 7437 5 \	100.0 min	21.47
45.751	14-FEB-03 10:01	GRB 114	(80) 903 44 \	10.0 min	0.36
45.783	14-FEB-03 10:47	GRB 114	(80) 903 53 \	10.0 min	0.97

CS
Counted 52.655- 3 on C1 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA
	-----	-----
Instrument =	GAW 109	GRB 109
Counts =	9219.000	2631.000
Gross cpm =	92.190	26.310
Background =	0.058	1.032
Observed CPM =	92.132	25.278
Cross talk fac =	0.006	0.225
True CPM =	92.105	4.559
Inst Std. Fac. =	1.168	1.018
Adjusted CPM =	107.578	4.641
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	740.267	11.374

pCi /smpl =	333.	5.12
1 sigma % Err =	1.043	11.470
2 sigma % Err =	2.044	22.480

(1 sigma err) =	3.48	0.588
(2 sigma err) =	6.82	1.15
LTV (95 %) =	339.	6.09
MDA (3.00) =	0.440	0.555
MDA (2.71) =	0.431	0.551
CRITICAL LEVEL =	0.174	0.261

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	52.114	3	0.058	1.032	0.00
SF	52.615	0	1.168	1.018	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
51.900	20-FEB-03 13:36	GAW 109	(93)2001 1 \	300.0 min	0.08
52.114	20-FEB-03 18:44	GAW 109	BK \	718.4 min	0.00
52.615	21-FEB-03 6:45	GAW 109	SF \	10.0 min	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
51.900	20-FEB-03 13:36	GRB 109	(93)2001 1 \	300.0 min	0.28
52.114	20-FEB-03 18:44	GRB 109	BK \	718.4 min	0.00
52.626	21-FEB-03 7:01	GRB 109	SF \	10.0 min	0.00

CS
Counted 52.892- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	49.900 mg	49.900 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 114	GRB 114
Counts =	12027.000	3002.000
Gross cpm =	120.270	30.020
Background =	0.043	2.472
Observed CPM =	120.227	27.548
Cross talk fac =	0.006	0.225
True CPM =	120.224	0.504
Inst Std. Fac. =	1.044	1.009
Adjusted CPM =	125.514	0.508
Eff (cpm/dpm) =	0.145	0.408
DPM of Aliquot =	863.683	1.245

pCi /smpl =	389.	0.561
1 sigma % Err =	0.912	113.186
2 sigma % Err =	1.788	221.845

(1 sigma err) = 3.55 0.635

(2 sigma err) = 6.96 1.24

LTV (95 %) = 395. 1.61

MDA (3.00) = 0.392 0.840

MDA (2.71) = 0.383 0.837

CRITICAL LEVEL = 0.150 0.404

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	52.114	3	0.043	2.472	0.00
SF	52.617	0	1.044	1.009	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
52.114	20-FEB-03 18:44	GAW 114	BK	718.5 min	0.00
52.617	21-FEB-03 6:48	GAW 114	SF	10.0 min	0.00
52.656	21-FEB-03 7:44	GAW 114	(93)2000 4	300.0 min	4.38

Previous 3 counts	Time	Detector	ID	Length	Cpm
52.114	20-FEB-03 18:44	GRB 114	BK	718.5 min	0.00
52.626	21-FEB-03 7:01	GRB 114	SF	10.0 min	0.00
52.656	21-FEB-03 7:44	GRB 114	(93)2000 4	300.0 min	10.40

CS
Counted 50.728- 3 on D2 for 100.00 min.

Reviewed _____ Date _____

1.00	smpl	48.700 mg	48.700 mg
-----		-----	
Aliquot		Sample Weight	Counted Weight

	ALPHA	BETA

Instrument =	GAW 114	GRB 114
Counts =	13006.000	3332.000
Gross cpm =	130.060	33.320
Background =	0.055	2.486
Observed CPM =	130.005	30.834
Cross talk fac =	0.006	0.224
True CPM =	129.995	1.670
Inst Std. Fac. =	1.045	1.010
Adjusted CPM =	135.845	1.686
Eff (cpm/dpm) =	0.147	0.408
DPM of Aliquot =	925.298	4.129

pCi /smpl =	417.	1.86
1 sigma % Err =	0.877	35.840
2 sigma % Err =	1.720	70.246

(1 sigma err) =	3.66	0.667
(2 sigma err) =	7.17	1.31
LTV (95 %) =	423.	2.96
MDA (3.00) =	0.427	0.842
MDA (2.71) =	0.418	0.839
CRITICAL LEVEL =	0.168	0.405

QC Summary

QC	GMT	YR	ALPHA	BETA	TIME
BKG	49.916	3	0.055	2.486	0.00
SF	50.610	0	1.045	1.010	0.00

Previous 3 counts	Time	Detector	ID	Length	Cpm
49.916	18-FEB-03 13:59	GAW 114	BK	995.9 min	0.00
50.610	19-FEB-03 6:38	GAW 114	SF	10.0 min	0.00
50.656	19-FEB-03 7:44	GAW 114	(80)1074 6	100.0 min	157.90

Previous 3 counts	Time	Detector	ID	Length	Cpm
49.916	18-FEB-03 13:59	GRB 114	BK	995.9 min	0.00
50.622	19-FEB-03 6:55	GRB 114	SF	10.0 min	0.00
50.656	19-FEB-03 7:44	GRB 114	(80)1074 6	100.0 min	33.36

APPENDIX G

Section 19

EBERLINE SERVICES REPORT

May 11, 2007



EBERLINE SERVICES

May 11, 2007

Ms. Michele Chamberlin
Test America, Inc.
17461 Derian Avenue, Suite 100
Irvine, CA 92614

Reference: Test America Project No(s). – See Table Below
Eberline Services NELAP Cert #01120CA (exp. 01/31/08)
Eberline Services Reports - See Table Below

Dear Ms. Chamberlin:

Enclosed are results from the additional analyses requested for five water sample received at Eberline Services. The samples were analyzed for gamma spectroscopy (EPA901.1). The samples were not filtered prior to analysis. Please find below the associated Test America project numbers, Eberline Services report numbers, aliquoting information, and count times on a per sample basis.

Test America Project No.	Eberline Services Report No.	Aliquot (Liters)	Count Time (minutes)
IQA2793-01	R705035-8655	4.0	1,084
IQB2023-01	R705047-8658	1.7	2,343
IQC0154-01	R705021-8660	4.0	1,053
IQC0289-01	R705022-8661	4.0	1,048
IQD2657-01	R705023-8666	4.0	876

Quality control samples consisted of an LCS, blank analysis, and duplicate analysis. The duplicate analysis is not reported herein; the duplicate is still counting and will be reported at a later date. The LCS and blank QC sample results were within the limits defined in Eberline Services Quality Control Procedures Manual.

Please call me if you have any questions concerning this report.

Regards,

Melissa Mannion
Senior Program Manager

MCM/

Enclosure: Reports

Analytical Services
2030 Wright Avenue
P.O. Box 4040
Richmond, California 94804-0040
(510) 235-2633 Fax (510) 235-0438
Toll Free (800) 841-5487
www.eberlineservices.com

Eberline Services

ANALYSIS RESULTS

SDG <u>8655</u>	Client <u>TA IRVINE</u>
Work Order <u>R705035-01</u>	Contract <u>PROJECT# IQA2793</u>
Received Date <u>05/08/07</u>	Matrix <u>WATER</u>

<u>Client</u>	<u>Lab</u>	<u>Collected</u>	<u>Analyzed</u>	<u>Nuclide</u>	<u>Results + 2σ</u>	<u>Units</u>	<u>MDA</u>
<u>Sample ID</u>	<u>Sample ID</u>						
IQA2793-01	8655-001	01/28/07	05/10/07	K-40	U	pCi/L	24
			05/10/07	Mn-54	U	pCi/L	1.1
			05/10/07	Co-58	U	pCi/L	2.3
			05/10/07	Co-60	U	pCi/L	0.99
			05/10/07	Cs-134	U	pCi/L	1.3
			05/10/07	Cs-137	U	pCi/L	1.1
			05/10/07	Eu-152	U	pCi/L	3.0
			05/10/07	Eu-154	U	pCi/L	3.0
			05/10/07	Tl-208	U	pCi/L	1.1
			05/10/07	Pb-210	U	pCi/L	160
			05/10/07	Bi-212	U	pCi/L	13
			05/10/07	Pb-212	U	pCi/L	1.8
			05/10/07	Bi-214	U	pCi/L	2.2
			05/10/07	Pb-214	U	pCi/L	2.3
			05/10/07	Ra-226	U	pCi/L	2.1
			05/10/07	Ac-228	U	pCi/L	4.2
			05/10/07	Th-228	U	pCi/L	4.2
			05/10/07	Th-232	U	pCi/L	4.2
			05/10/07	U-238	U	pCi/L	160
			05/10/07	U-235	U	pCi/L	5.1
05/10/07	Am-241	U	pCi/L	6.4			
05/10/07	U-234	U	pCi/L	280			

Certified by <u><i>Meri Marni</i></u>
Report Date <u>05/11/07</u>
Page 1

Eberline Services

ANALYSIS RESULTS

SDG <u>8658</u> Work Order <u>R705047-01</u> Received Date <u>05/08/07</u>	Client <u>TA IRVINE</u> Contract <u>PROJECT# IQB2023</u> Matrix <u>WATER</u>
--	--

<u>Client</u>	<u>Lab</u>	<u>Collected</u>	<u>Analyzed</u>	<u>Nuclide</u>	<u>Results ± 2σ</u>	<u>Units</u>	<u>MDA</u>
<u>Sample ID</u>	<u>Sample ID</u>						
IQB2023-01	8658-001	02/19/07	05/09/07	K-40	U	pCi/L	52
			05/09/07	Mn-54	U	pCi/L	1.9
			05/09/07	Co-58	U	pCi/L	3.4
			05/09/07	Co-60	U	pCi/L	1.9
			05/09/07	Cs-134	U	pCi/L	2.7
			05/09/07	Cs-137	U	pCi/L	1.8
			05/09/07	Eu-152	U	pCi/L	5.1
			05/09/07	Eu-154	U	pCi/L	5.4
			05/09/07	Tl-208	U	pCi/L	1.9
			05/09/07	Pb-210	U	pCi/L	100
			05/09/07	Bi-212	U	pCi/L	24
			05/09/07	Pb-212	U	pCi/L	3.0
			05/09/07	Bi-214	U	pCi/L	4.1
			05/09/07	Pb-214	U	pCi/L	3.8
			05/09/07	Ra-226	U	pCi/L	4.0
			05/09/07	Ac-228	U	pCi/L	8.0
			05/09/07	Th-228	U	pCi/L	8.0
05/09/07	Th-232	U	pCi/L	8.0			
05/09/07	U-238	U	pCi/L	270			
05/09/07	U-235	U	pCi/L	7.4			
05/09/07	Am-241	U	pCi/L	1.9			
05/09/07	U-234	U	pCi/L	390			

Certified by <u><i>Mel Manno</i></u> Report Date <u>05/11/07</u> Page 1

Eberline Services

ANALYSIS RESULTS

SDG <u>8660</u> Work Order <u>R705021-01</u> Received Date <u>05/03/07</u>	Client <u>TA IRVINE</u> Contract <u>PROJECT# IQC0154</u> Matrix <u>WATER</u>
--	--

<u>Client</u>	<u>Lab</u>						
<u>Sample ID</u>	<u>Sample ID</u>	<u>Collected</u>	<u>Analyzed</u>	<u>Nuclide</u>	<u>Results + 2σ</u>	<u>Units</u>	<u>MDA</u>
IQC0154-01	8660-001	03/01/07	05/10/07	K-40	187 ± 180	pCi/L	10
			05/10/07	Mn-54	U	pCi/L	1.2
			05/10/07	Co-58	U	pCi/L	2.0
			05/10/07	Co-60	U	pCi/L	1.1
			05/10/07	Cs-134	U	pCi/L	1.4
			05/10/07	Cs-137	U	pCi/L	1.1
			05/10/07	Eu-152	U	pCi/L	3.0
			05/10/07	Eu-154	U	pCi/L	3.6
			05/10/07	Tl-208	U	pCi/L	1.1
			05/10/07	Pb-210	U	pCi/L	55
			05/10/07	Bi-212	U	pCi/L	14
			05/10/07	Pb-212	U	pCi/L	1.8
			05/10/07	Bi-214	U	pCi/L	2.3
			05/10/07	Pb-214	U	pCi/L	2.4
			05/10/07	Ra-226	U	pCi/L	2.3
			05/10/07	Ac-228	U	pCi/L	4.8
			05/10/07	Th-228	U	pCi/L	4.8
			05/10/07	Th-232	U	pCi/L	4.8
			05/10/07	U-238	U	pCi/L	180
			05/10/07	U-235	U	pCi/L	4.6
05/10/07	Am-241	U	pCi/L	3.1			
05/10/07	U-234	U	pCi/L	240			

Certified by <u><i>M. Manna</i></u> Report Date <u>05/11/07</u> Page 1
--

Eberline Services

ANALYSIS RESULTS

SDG <u>8661</u> Work Order <u>R705022-01</u> Received Date <u>05/03/07</u>	Client <u>TA IRVINE</u> Contract <u>PROJECT# IQC0289</u> Matrix <u>WATER</u>
--	--

<u>Client</u>	<u>Lab</u>				<u>Results ± 2σ</u>	<u>Units</u>	<u>MDA</u>
<u>Sample ID</u>	<u>Sample ID</u>	<u>Collected</u>	<u>Analyzed</u>	<u>Nuclide</u>			
IQC0289-01	8661-001	03/02/07	05/10/07	K-40	302 ± 15	pCi/L	8.7
			05/10/07	Mn-54	U	pCi/L	0.71
			05/10/07	Co-58	U	pCi/L	1.2
			05/10/07	Co-60	U	pCi/L	0.82
			05/10/07	Cs-134	U	pCi/L	0.82
			05/10/07	Cs-137	U	pCi/L	1.1
			05/10/07	Eu-152	U	pCi/L	1.7
			05/10/07	Eu-154	U	pCi/L	2.2
			05/10/07	Tl-208	U	pCi/L	0.67
			05/10/07	Pb-210	U	pCi/L	37
			05/10/07	Bi-212	U	pCi/L	8.5
			05/10/07	Pb-212	U	pCi/L	1.8
			05/10/07	Bi-214	U	pCi/L	1.3
			05/10/07	Pb-214	U	pCi/L	1.3
			05/10/07	Ra-226	U	pCi/L	1.3
			05/10/07	Ac-228	U	pCi/L	2.9
			05/10/07	Th-228	U	pCi/L	2.9
			05/10/07	Th-232	U	pCi/L	3.7
			05/10/07	U-238	U	pCi/L	120
			05/10/07	U-235	U	pCi/L	2.3
05/10/07	Am-241	U	pCi/L	0.86			
05/10/07	U-234	U	pCi/L	120			

Certified by <u><i>Mari Marni</i></u> Report Date <u>05/11/07</u> Page 1
--

Eberline Services

ANALYSIS RESULTS

SDG <u>8666</u>	Client <u>TA IRVINE</u>
Work Order <u>R705023-01</u>	Contract <u>PROJECT# IQD2657</u>
Received Date <u>05/03/07</u>	Matrix <u>WATER</u>

Client	Lab						
<u>Sample ID</u>	<u>Sample ID</u>	<u>Collected</u>	<u>Analyzed</u>	<u>Nuclide</u>	<u>Results ± 2σ</u>	<u>Units</u>	<u>MDA</u>
IQD2657-01	8666-001	04/25/07	05/10/07	K-40	135 ± 19	pCi/L	12
			05/10/07	Mn-54	U	pCi/L	0.99
			05/10/07	Co-58	U	pCi/L	1.1
			05/10/07	Co-60	U	pCi/L	1.2
			05/10/07	Cs-134	U	pCi/L	1.2
			05/10/07	Cs-137	U	pCi/L	1.2
			05/10/07	Eu-152	U	pCi/L	2.8
			05/10/07	Eu-154	U	pCi/L	3.5
			05/10/07	Tl-208	U	pCi/L	1.1
			05/10/07	Pb-210	U	pCi/L	230
			05/10/07	Bi-212	U	pCi/L	14
			05/10/07	Pb-212	U	pCi/L	1.7
			05/10/07	Bi-214	U	pCi/L	2.0
			05/10/07	Pb-214	U	pCi/L	2.0
			05/10/07	Ra-226	U	pCi/L	2.0
			05/10/07	Ac-228	U	pCi/L	4.7
			05/10/07	Th-228	U	pCi/L	4.7
			05/10/07	Th-232	U	pCi/L	4.7
			05/10/07	U-238	U	pCi/L	180
			05/10/07	U-235	U	pCi/L	4.6
05/10/07	Am-241	U	pCi/L	6.5			
05/10/07	U-234	U	pCi/L	230			

Certified by <u><i>Melvin Manning</i></u> Report Date <u>05/11/07</u> Page 1
--

Eberline Services

QC RESULTS

SDG <u>8666</u>	Client <u>TA IRVINE</u>
Work Order <u>R705023-01</u>	Contract <u>PROJECT# IQD2657</u>
Received Date <u>05/03/07</u>	Matrix <u>WATER</u>

Lab	Sample ID	Nuclide	Results	Units	Amount Added	MDA	Evaluation
<u>LCS</u>							
	8666-006	Co-60	279 ± 11	pCi/Smpl	290	5.7	96% recovery
		Cs-137	305 ± 10	pCi/Smpl	288	7.4	106% recovery
<u>BLANK</u>							
	8666-007	K-40	U	pCi/Smpl	NA	110	<MDA
		Mn-54	U	pCi/Smpl	NA	4.3	<MDA
		Co-58	U	pCi/Smpl	NA	4.2	<MDA
		Co-60	U	pCi/Smpl	NA	4.9	<MDA
		Cs-134	U	pCi/Smpl	NA	5.6	<MDA
		Cs-137	U	pCi/Smpl	NA	5.0	<MDA
		Eu-152	U	pCi/Smpl	NA	14	<MDA
		Eu-154	U	pCi/Smpl	NA	13	<MDA
		Tl-208	U	pCi/Smpl	NA	5.1	<MDA
		Pb-210	U	pCi/Smpl	NA	690	<MDA
		Bi-212	U	pCi/Smpl	NA	63	<MDA
		Pb-212	U	pCi/Smpl	NA	8.5	<MDA
		Bi-214	U	pCi/Smpl	NA	10	<MDA
		Pb-214	U	pCi/Smpl	NA	11	<MDA
		Ra-226	U	pCi/Smpl	NA	10	<MDA
		Ac-228	U	pCi/Smpl	NA	21	<MDA
		Th-228	U	pCi/Smpl	NA	21	<MDA
		Th-232	U	pCi/Smpl	NA	21	<MDA
		U-238	U	pCi/Smpl	NA	750	<MDA
		U-235	U	pCi/Smpl	NA	25	<MDA
		Am-241	U	pCi/Smpl	NA	30	<MDA
		U-234	U	pCi/Smpl	NA	1300	<MDA

Certified by <u>Mel' Mami</u> Report Date <u>05/11/07</u> Page 2
--