Georgia Institute of Technology
Research Reactor

Final Survey Package 14

Yard Open Land Areas

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Section 1

Survey Package 14 Worksheet for Yard Open Land Areas

Duratek Inc.
Survey Package Worksheet for Elevator Equipment Room and Elevator Shaft
Georgia Institute of Technology Research Reactor

Package Identification No.: 14	Prepared by: John McGehee/Paul Jones
Location: Yard Open Land Areas	Date prepared: 06/29/2001
Area Classification: Unaffected Open Land Areas	

Area Description

Unaffected Open Land Areas of the Reactor Facility Yard. The Open Land Areas of the Reactor Facility Yard border the south and east sides of the reactor containment building and the paved yard as depicted in the attached drawing Survey Package E14, Yard Unaffected Open Land Areas. The unaffected yard area includes open land areas for this survey package. The unaffected open land area occupies approximately 908 square meters of area. The soil open land areas were not used for storage of radioactive material.

Historical Information

No decontamination was required on the Unaffected Reactor Facility Yard surfaces.

General Survey Instructions

1) Mark the survey measurement locations with a survey flag as shown on the attached drawing(s).
2) Perform a gamma scan of 9 m^2 around each survey measurement location to identify areas of elevated activity.
3) Obtain 1 exposure rate measurement at 1 meter above the surface at each survey measurement location.
4) Obtain a 0-6" depth soil sample for gamma spectrum analysis.

Use only the Package ID, L2, and L8 codes when labeling samples for analysis.

Use all location codes provided below when taking exposure rate measurement readings.

Special Instructions
Source check meters to Cs-137 for gamma scans and exposure rate measurements. Use NaI(Tl) detector model number 44-2 for surveys. The exposure rate measurements should be taken in the center of each 9 m^2 scanned area. During scanning the detector is to be kept approximately 6" to the surface as possible and moved across the surface at a slow speed (scan speed shall not exceed one probe width per sec). The scan should be performed using the audible output and using headphones whenever necessary.

Survey performance (Initial and date as each survey is complete)

Location Code					General Description	9 m^2 Gamma Scan	Direct Beta	1 meter Gamma	Soil Samples for Gamma Spec	LS Smear
L1	L2	L6	L7	L8						
~~Georgia Tech Research Reactor 2nd Floor Lower Walls and Floor~~ YARD - OPEN LAND AREAS										
E1400	01LO1	B0016	NA	1 thru 30	Soil Open Land Areas	(30) BSK 7-14-01	NA	(30) BSK 7-14-01	(30) BSK 7-14-01	NA

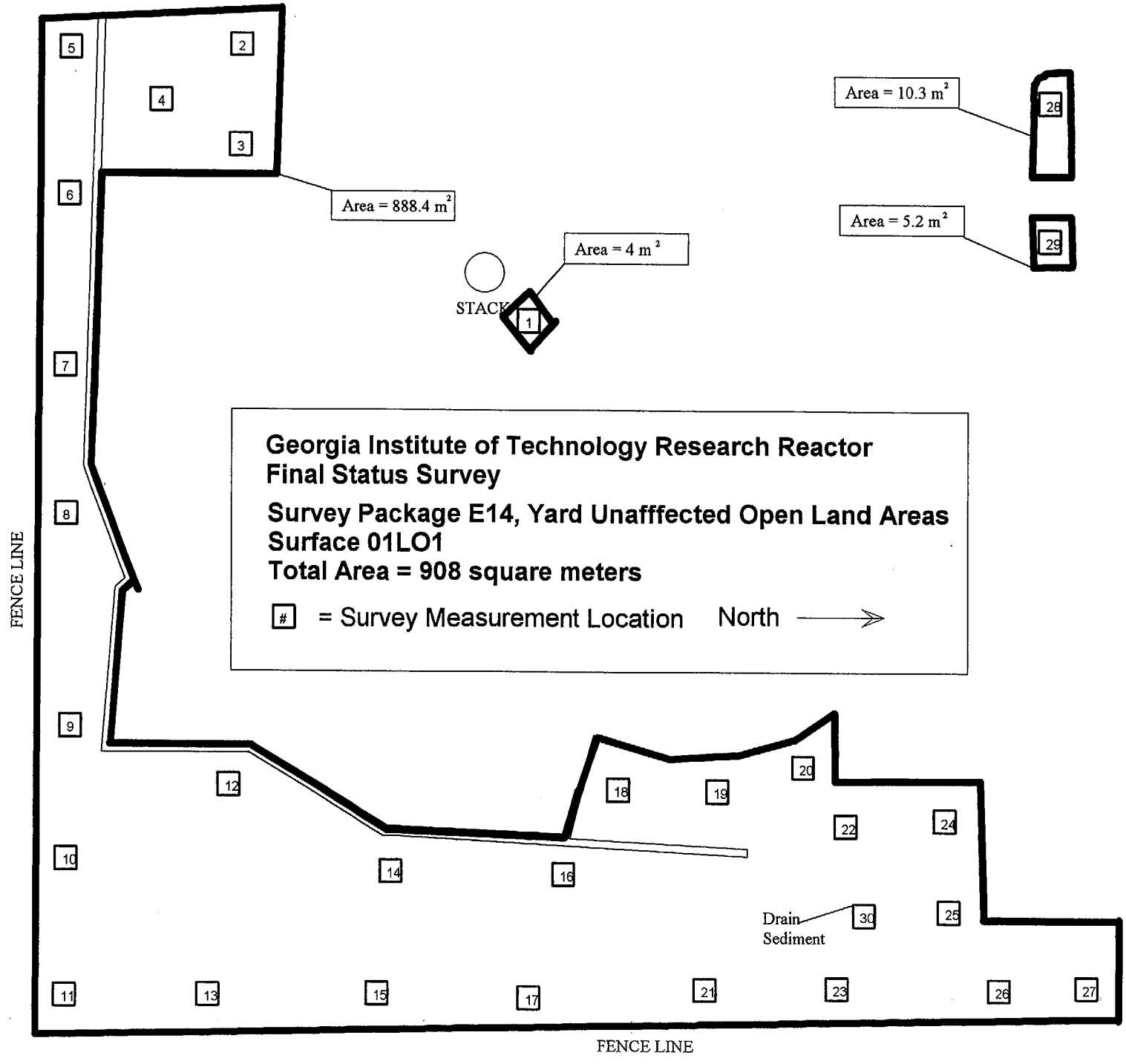
N A

Package Review	
Date Package Completed	5/21/02
Package Reviewed by and Date	Paul A Jones 5/21/02

Survey Comments

Section 2

Package 14
Unaffected Open Land Areas Drawings


Georgia Institute of Technology Research Reactor
Final Status Survey
Survey Package E14, Yard Unafffected Open Land Areas
Surface 01LO1
Total Area = 908 square meters
= Survey Measurement Location
North
Area = 888.4 m²
Area = 4 m²
Area = 10.3 m²
Area = 5.2 m²
STACK
Drain
Sediment
FENCE LINE
FENCE LINE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
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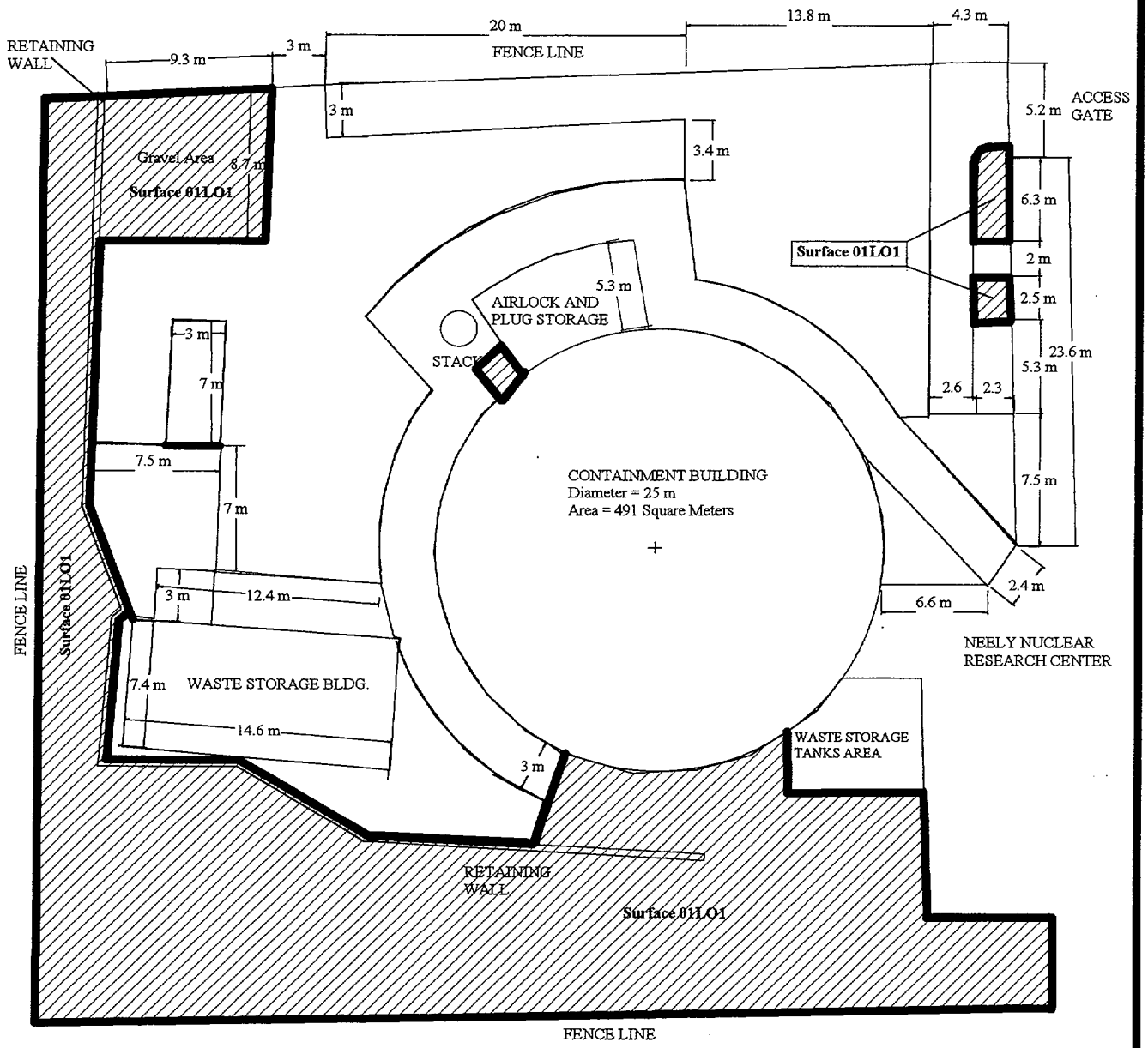
29
30

008

Georgia Institute of Technology Research Reactor
Final Status Survey
Survey Package E14, Yard Unafffected Open Land Areas



= Unafffected Open Land Areas

North →

Section 3

Package 14
Open Land Areas of the Reactor Yard Soil Samples Gamma Spectoscopy Results

Georgia Institute of Technology
Open Land Areas of the Reactor Yard Soil Samples
Gamma Spectroscopy Results

SAMPLE 1							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 2							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	3.3116E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 3							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 4							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	2.1931E-1	3.1647E-1	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 5							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 6							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 7							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	2.8515E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 8							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	2.3105E-1	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 9							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	5.5901E-1	ND	ND	2.3879E-1	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 9							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	6.6839E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N

SAMPLE 10							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 11							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	5.1477E-1	ND	ND	2.8940E-1	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 12							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 13							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	5.1321E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 14							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	5.3419E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 15							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	6.4240E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 16							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	4.1563E-1	ND	ND	2.5035E-1	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 17							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	3.3850E-1	ND	ND	2.0613E-1	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 17 QC							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 18							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	4.1211E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 19							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	3.4755E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N

SAMPLE 20							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	7.8097E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 21							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	5.367E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 22							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	3.6222E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 23							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	5.5403E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 24							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	ND	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 25							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	3.8700E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 26							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	3.9772E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 27							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	4.3390E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 28							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	3.8199E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 29							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	1.43E-1	2.57E-1	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N
SAMPLE 30							
RADIIONUCLIDE	Cs-134	Cs-137	Co-60	Eu-152	Mn-54	Ag-110m	Zn-65
CONCENTRATION (pci/g)	ND	2.6984E-1	ND	ND	ND	ND	ND
>10% GL Y or N	N	N	N	N	N	N	N

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ple description
E1400 #1
SN#245

Spectrum Filename: C:\User\00010403.An1

Acquisition information
Start time 19-Jul-2001 06:52:31
Live time 599
Real time 600
Dead time .10%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 418.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 4.1800E+02)
= 2.3923E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:02:32 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010403.An1

ergy calibration normalized difference: 1.0000
unknown peaks passed sensitivity test.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	215.56	53.81	13.	34.	.057	81.30	.328s
EU-155	345.94	86.45	5.	7.	.011	128.29	.791D
CD-109	352.29	88.04	6.	1.	.002	620.10	.793D
EU-155	423.50	105.87	0.	4.	.007	100.00	.501s
EU-152	487.05	121.78	5.	5.	.008	169.33	.825D
EU-154	492.33	123.10	9.	7.	.011	148.57	.826D
CO-57	543.76	135.98	0.	17.	.028	48.51	.751s
FE-59	570.00	142.55	0.	1.	.002	200.00	.125s
FE-59	767.20	191.91	0.	10.	.017	63.25	.375s
EU-152	977.97	244.67	1.	1.	.002	293.67	.940D
EU-154	991.43	248.04	5.	7.	.012	110.12	.943D
EU-152	1386.33	346.88	0.	10.	.017	63.25	.250s
EU-152	1466.25	366.88	0.	10.	.017	63.25	.313s
EU-152	1633.25	408.67	0.	12.	.020	57.74	.375s
EU-152	1784.00	446.39	0.	13.	.022	55.47	.626s
85	2053.00	513.70	0.	0.	.000	.00	.000s
EU-154	2363.00	591.26	0.	0.	.000	.00	.000s
CS-137	2644.43	661.66	0.	19.	.032	45.88	1.188
EU-152	2752.23	688.63	1.	2.	.003	210.48	1.326D
EU-154	2767.70	692.50	3.	2.	.004	232.97	1.329D
EU-154	2892.00	723.59	0.	1.	.002	200.00	.250s
EU-154	3025.00	756.86	0.	3.	.005	115.47	.250s
EU-152	3112.00	778.62	0.	1.	.002	200.00	.250s
MN-54	3334.33	834.22	0.	3.	.005	115.47	.375s
EU-152	3458.00	865.15	0.	4.	.007	100.00	.250s
EU-154	3493.00	873.90	0.	3.	.005	115.47	.250s
EU-152	3841.00	960.92	0.	6.	.010	81.65	.250s
EU-154	3976.00	994.67	0.	3.	.005	115.47	.250s
EU-154	4013.33	1004.01	0.	4.	.007	100.00	.375s
EU-152	4340.50	1085.80	1.	1.	.001	477.74	1.633D
EU-152	4356.58	1089.82	2.	2.	.003	276.17	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	0.	1.	.002	176.72	1.653D
ZN-65	4459.39	1115.52	2.	3.	.004	211.96	1.655D
CO-60	4685.00	1171.92	0.	3.	.005	115.47	.250s
EU-152	4847.00	1212.41	0.	1.	.002	200.00	.250s
EU-154	5095.00	1274.39	0.	1.	.002	200.00	.250s
59	5162.00	1291.14	0.	2.	.003	141.42	.250s
152	5194.00	1299.13	0.	1.	.002	200.00	.250s
CO-60	5327.00	1332.37	0.	2.	.003	141.42	.250s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5628.00	1407.59	0.	0.	.000	.00	.000s

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clide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	7.416E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.365E-04	
			1291.56	0.000E+00	%	2.324E-04	
			192.34	0.000E+00	%	9.573E-04	
			142.65	0.000E+00	%	1.785E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	2.817E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.031E-04	
			1173.23	0.000E+00	%	9.776E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	?(	9.566E-05	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.009E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	5.703E-04	
			25.50	0.000E+00	=	0.000E+00	
CS-137		0.0000E+00	661.62	0.000E+00	%	1.107E-04	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	
EU-152		0.0000E+00	121.78	0.000E+00	%	8.549E-05	
			688.63	0.000E+00	%	7.576E-03	
			367.71	0.000E+00	%	5.587E-03	
			344.30	0.000E+00	&	1.677E-04	
			1408.08	0.000E+00	?	4.464E-04	
			964.00	0.000E+00	&	6.445E-04	
			1112.07	0.000E+00	%	6.272E-04	
			778.90	0.000E+00	%	4.833E-04	
			1085.80	0.000E+00	%	8.464E-04	
			244.67	0.000E+00	%	3.410E-04	
			867.39	0.000E+00	&	1.915E-03	
			444.00	0.000E+00	&	2.116E-03	

clide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
		411.09	0.000E+00	&	2.432E-03	
		1089.82	0.000E+00	%	5.590E-03	
		1299.19	0.000E+00	%	5.573E-03	
		1212.89	0.000E+00	%	6.208E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.055E-05	
		1274.80	0.000E+00	%	2.636E-04	
		723.30	0.000E+00	%	3.001E-04	
		1004.80	0.000E+00	%	5.115E-04	
		873.20	0.000E+00	%	6.804E-04	
		996.30	0.000E+00	%	7.990E-04	
		248.04	0.000E+00	%	5.575E-04	
		591.70	0.000E+00	?	1.015E-03	
		756.70	0.000E+00	%	1.670E-03	
		1597.30	0.000E+00	?	6.211E-03	
		692.50	0.000E+00	%	4.204E-03	
		1397.80	0.000E+00	?	5.881E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	7.523E-05	
		105.31	0.000E+00	%	9.167E-05	
		60.01	0.000E+00	&	3.673E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
* - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:02:32 Page 5
IT Lab @ Georgia Tech Research Spectrum name: 00010403.An1

P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	1.7743E-07	0.000E+00	0.000E+00
FE-59	<	3.2665E-07	0.000E+00	0.000E+00
CO-57	<	6.7397E-07	0.000E+00	0.000E+00
CO-60	<	2.4662E-07	0.000E+00	0.000E+00
Kr-85	<	2.2884E-07	0.000E+00	0.000E+00
ZN-65	<	4.8073E-07	0.000E+00	0.000E+00
CD-109	<	1.3643E-06	0.000E+00	0.000E+00
CS-137	<	2.6477E-07	0.000E+00	0.000E+00
EU-152	<	2.0451E-07	0.000E+00	0.000E+00
EU-154	<	1.6879E-07	0.000E+00	0.000E+00
155	<	1.7998E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 0.0000000E+00 uCi/g

Analyzed by: 7/19/01
OPERATOR

Reviewed by: 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:27:47 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010404.An1

ple description
E1400 #2 SN#246

Spectrum Filename: C:\User\00010404.An1

Acquisition information
Start time 19-Jul-2001 07:17:45
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 358.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.5800E+02)
= 2.7933E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:27:47 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010404.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
251.88	62.90	31.	117.	.195	33.45	.605	PA-234	sM
299.90	74.92	68.	103.	.172	30.07	.780	PB-214	D
310.23	77.51	58.	143.	.238	22.61	.782	PB-214	D
955.24	238.98	0.	316.	.527	11.25	.763	PB-212	
1179.86	295.20	0.	97.	.162	20.31	.657	PB-214	s
2330.70	583.18	0.	91.	.152	20.97	.902	TL-208	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
155	236.78	59.12	37.	27.	.045	100.61	.265s
EU-155	345.94	86.45	66.	13.	.021	188.18	.791D
CD-109	352.29	88.04	76.	19.	.032	135.99	.793D
EU-155	421.64	105.40	24.	16.	.027	125.89	.377s
EU-152	487.05	121.78	15.	20.	.033	72.84	.825D
EU-154	492.33	123.10	33.	9.	.015	195.40	.826D
CO-57	542.37	135.63	18.	20.	.033	95.92	.286s
FE-59	577.54	144.43	56.	59.	.098	93.19	.391s
FE-59	771.71	193.04	8.	52.	.087	46.79	.653s
EU-152	977.97	244.67	7.	0.	.000	.00	.940
EU-154	992.40	248.28	0.	39.	.065	32.03	.553s
EU-152	1370.76	342.98	4.	24.	.039	58.96	.355s
EU-152	1445.77	361.75	5.	26.	.043	61.30	.289s
EU-152	1648.32	412.44	3.	14.	.023	80.60	.518s
EU-152	1773.33	443.72	1.	0.	.001	221.11	.197s
Kr-85	2044.16	511.49	0.	88.	.147	21.32	.407s
EU-154	2364.00	591.51	0.	8.	.013	70.71	.250s
CS-137	2623.09	656.33	0.	49.	.082	28.57	.375s
EU-152	2748.86	687.79	0.	7.	.012	75.59	.438s
EU-154	2767.70	692.50	1.	0.	.000	.00	1.329
EU-154	2880.00	720.59	0.	19.	.032	45.88	.250s
EU-154	3004.33	751.69	0.	21.	.035	43.64	.375s
152	3096.00	774.61	0.	11.	.018	60.30	.250s
54	3339.30	835.46	0.	10.	.017	63.25	.375s
EU-152	3472.80	868.85	0.	8.	.013	70.71	.500s
EU-154	3491.50	873.52	0.	5.	.008	89.44	.500s
EU-152	3856.33	964.75	0.	43.	.072	30.50	.292s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:27:47 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010404.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
MN-54	3972.80	993.87	0.	19.	.032	45.88	.375s
EU-154	4018.00	1005.17	0.	3.	.005	115.47	.250s
EU-152	4340.50	1085.80	7.	4.	.006	235.89	1.633D
EU-152	4356.58	1089.82	2.	2.	.004	230.79	1.636D
FE-59	4381.00	1095.92	0.	7.	.012	75.59	.250s
EU-152	4445.58	1112.07	3.	2.	.004	220.46	1.653D
ZN-65	4459.39	1115.52	2.	1.	.002	311.03	1.655D
CO-60	4672.50	1168.79	0.	16.	.027	50.00	.250s
EU-152	4850.00	1213.16	0.	9.	.015	66.67	.250s
EU-154	5098.25	1275.20	0.	15.	.025	51.64	.375s
FE-59	5167.00	1292.39	0.	9.	.015	66.67	.250s
EU-152	5194.00	1299.13	0.	2.	.003	141.42	.250s
CO-60	5324.33	1331.70	0.	8.	.013	70.71	.250s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5625.00	1406.84	0.	8.	.013	70.71	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

NUCLIDE	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	9.427E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	&	1.912E-04	
			1291.56	0.000E+00	%	3.028E-04	
			192.34	0.000E+00	%	1.726E-03	
			142.65	0.000E+00	&	5.920E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	3.687E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.305E-04	
			1173.23	0.000E+00	&	1.416E-04	
Kr-85		3.3684E-04	513.99	3.368E-04	&(	9.569E-05	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.847E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.346E-03	
			25.50	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	1.1856E-04	661.62	1.186E-04	&(	6.049E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.260E-04	
		688.63	0.000E+00	%	8.843E-03	
		367.71	0.000E+00	&	7.890E-03	
		344.30	0.000E+00	%	2.258E-04	
		1408.08	0.000E+00	%	6.446E-04	
		964.00	8.188E-04	?	1.152E-03	
		1112.07	0.000E+00	%	7.494E-04	
		778.90	0.000E+00	&	7.033E-04	
		1085.80	0.000E+00	%	1.161E-03	
		244.67	0.000E+00		4.205E-04	
		867.39	0.000E+00	%	2.203E-03	
		444.00	0.000E+00	%	1.390E-03	
		411.09	0.000E+00	%	2.690E-03	
		1089.82	0.000E+00	%	5.592E-03	
		1299.19	0.000E+00	%	5.917E-03	
		1212.89	0.000E+00	%	8.582E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	9.753E-05	
		1274.80	0.000E+00	%	4.183E-04	
		723.30	0.000E+00	&	5.114E-04	
		1004.80	0.000E+00	%	4.893E-04	
		873.20	0.000E+00	%	7.409E-04	
		996.30	0.000E+00	&	1.219E-03	
		248.04	5.438E-04		8.142E-04	
		591.70	0.000E+00	%	1.465E-03	
		756.70	0.000E+00	&	2.631E-03	
		1597.30	0.000E+00	?	6.213E-03	
		692.50	0.000E+00		3.459E-03	
		1397.80	0.000E+00	?	5.883E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.441E-04	
		105.31	0.000E+00	%	1.723E-04	
		60.01	0.000E+00	%	4.137E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
` - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
r - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
: - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	2.6332E-07	0.000E+00	0.000E+00
FE-59	<	5.3416E-07	0.000E+00	0.000E+00
CO-57	<	1.0298E-06	0.000E+00	0.000E+00
CO-60	<	3.6463E-07	0.000E+00	0.000E+00
~~Kr-85~~	~~#~~	~~9.4091E-07~~ 9.409 E-7	~~2.006E-07~~	~~2.025E-07~~
ZN-65	<	5.1586E-07	0.000E+00	0.000E+00
CD-109	<	3.7584E-06	0.000E+00	0.000E+00
CS-137	#	3.3116E-07	9.462E-08	9.560E-08
EU-152	<	3.5196E-07	0.000E+00	0.000E+00
EU-154	<	2.7242E-07	0.000E+00	0.000E+00
EU-155	<	4.0247E-07	0.000E+00	0.000E+00

Not Present, software misidentified 511 Ann. Peak. P. [illegible] 8/6/01

: All peaks for activity calculation had bad shape.
< Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 1.2720670E-06 uCi/g

Analyzed by: _____ 7/19/01
OPERATOR

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:27:47 Page 6
IT Lab @ Georgia Tech Research Spectrum name: 00010404.An1

...viewed by: _____ 8/7/07
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:43:39 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010405.An1

ple description
E1400 #3 SN#247

Spectrum Filename: C:\User\00010405.An1

Acquisition information
Start time 19-Jul-2001 07:33:37
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 382.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.8200E+02)
= 2.6178E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:43:39 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010405.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
955.11	238.95	16.	274.	.457	16.80	.921	PB-212	sM
1180.07	295.26	8.	128.	.213	27.00	.697	PB-214	sM
1406.39	351.90	0.	174.	.290	15.16	1.018	PB-214	M
2435.45	609.39	0.	120.	.200	18.26	1.013	BI-214	s

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	253.36	63.27	99.	115.	.192	55.16	.786s
EU-155	345.94	86.45	80.	23.	.038	119.53	.791D
-109	352.29	88.04	82.	41.	.069	69.48	.793D
EU-155	412.27	103.06	56.	17.	.029	208.43	.260s
EU-152	487.05	121.78	35.	2.	.003	1052.92	.825D
EU-154	492.33	123.10	39.	7.	.012	251.16	.826D
CO-57	544.07	136.05	46.	34.	.057	104.82	.609s
FE-59	576.09	144.07	74.	36.	.060	134.21	.376s
FE-59	775.30	193.94	0.	61.	.102	25.61	.375s
EU-152	977.97	244.67	13.	5.	.008	235.54	.940D
EU-154	991.43	248.04	14.	5.	.008	239.66	.943D
EU-152	1379.00	345.04	0.	30.	.050	36.51	.313s
EU-152	1484.67	371.49	0.	38.	.063	32.44	.876
EU-152	1644.00	411.36	0.	27.	.045	38.49	.250s
EU-152	1766.00	441.89	0.	40.	.067	31.62	.250s
Kr-85	2052.10	513.48	5.	0.	.000	.00	.141s
EU-154	2370.88	593.23	0.	39.	.065	32.03	.500s
CS-137	2644.50	661.68	0.	5.	.008	89.44	.500s
EU-152	2752.23	688.63	2.	8.	.014	83.93	1.326D
EU-154	2767.70	692.50	7.	7.	.012	126.16	1.329D
EU-154	2852.25	713.65	0.	26.	.043	39.22	.313s
EU-154	3008.50	752.73	0.	22.	.037	42.64	.313s
EU-152	3112.00	778.62	0.	0.	.000	.00	.000s
MN-54	3339.00	835.39	0.	5.	.008	89.44	.250s
-152	3472.67	868.81	0.	10.	.017	63.25	.313s
-154	3504.64	876.81	0.	40.	.067	31.62	.313s
EU-152	3850.00	963.17	0.	2.	.003	141.42	.250s
EU-154	3980.00	995.67	0.	3.	.005	115.47	.250s
EU-154	4019.00	1005.42	0.	7.	.012	75.59	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:43:39 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010405.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	4340.50	1085.80	4.	5.	.008	160.60	1.633D
EU-152	4356.58	1089.82	8.	6.	.011	145.34	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	3.	2.	.004	220.46	1.653D
ZN-65	4459.39	1115.52	4.	5.	.008	161.52	1.655D
CO-60	4676.00	1169.67	0.	27.	.045	38.49	.250s
EU-152	4832.00	1208.66	0.	15.	.025	51.64	.375s
EU-154	5103.00	1276.39	0.	7.	.012	75.59	.250s
FE-59	5162.00	1291.14	0.	0.	.000	.00	.000s
EU-152	5193.00	1298.88	0.	0.	.000	.00	.000s
CO-60	5323.00	1331.37	0.	11.	.018	60.30	.375s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5633.33	1408.92	0.	9.	.015	66.67	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	8.076E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	?(	2.039E-04	
			192.34	1.533E-03	&	1.737E-03	
			142.65	0.000E+00	&	5.832E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	4.905E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.414E-04	
			1173.23	8.802E-05	&	1.673E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.296E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.285E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.498E-03	
			25.50	0.000E+00	=	0.000E+00	
C[illegible]-137		0.0000E+00	661.62	0.000E+00	%	7.901E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	

:lide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
EU-152	0.0000E+00	121.78	0.000E+00	%	1.285E-04	
		688.63	0.000E+00	%	9.630E-03	
		367.71	5.572E-03	&	8.483E-03	
		344.30	1.320E-04	*	2.341E-04	
		1408.08	0.000E+00	%	6.631E-04	
		964.00	0.000E+00	%	5.428E-04	
		1112.07	0.000E+00	%	7.494E-04	
		778.90	0.000E+00	?	4.500E-04	
		1085.80	0.000E+00	%	1.103E-03	
		244.67	0.000E+00	%	5.385E-04	
		867.39	0.000E+00	%	2.328E-03	
		444.00	2.070E-03	&	3.050E-03	
		411.09	1.642E-03	?	3.121E-03	
		1089.82	0.000E+00	%	7.443E-03	
		1299.19	0.000E+00	?	5.189E-03	
		1212.89	0.000E+00	&	9.850E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	1.009E-04	
		1274.80	0.000E+00	%	3.437E-04	
		723.30	2.906E-04	&	5.662E-04	
		1004.80	0.000E+00	%	5.709E-04	
		873.20	9.075E-04	&	1.337E-03	
		996.30	0.000E+00	%	7.994E-04	
		248.04	0.000E+00	%	6.380E-04	
		591.70	1.583E-03	?	2.371E-03	
		756.70	0.000E+00	&	2.671E-03	
		1597.30	0.000E+00	?	6.213E-03	
		692.50	0.000E+00	%	5.379E-03	
		1397.80	0.000E+00	?	5.883E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.606E-04	
		105.31	0.000E+00	&	2.169E-04	
		60.01	0.000E+00	&	6.855E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
. - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
2 - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	2.1142E-07	0.000E+00	0.000E+00
FE-59	<	3.5757E-07	0.000E+00	0.000E+00
CO-57	<	1.2841E-06	0.000E+00	0.000E+00
CO-60	<	3.7004E-07	0.000E+00	0.000E+00
Kr-85	<	3.3929E-07	0.000E+00	0.000E+00
ZN-65	<	5.9822E-07	0.000E+00	0.000E+00
CD-109	<	3.9220E-06	0.000E+00	0.000E+00
CS-137	<	2.0683E-07	0.000E+00	0.000E+00
EU-152	<	3.3649E-07	0.000E+00	0.000E+00
EU-154	<	2.6408E-07	0.000E+00	0.000E+00
EU-155	<	4.2035E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 0.0000000E+00 uCi/g

Analyzed by: _____ 7/19/01
OPERATOR

Reviewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:57:19 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010406.An1

ple description
E1400 #4 SN#248

Spectrum Filename: C:\User\00010406.An1

Acquisition information
Start time 19-Jul-2001 07:47:17
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 342.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.4200E+02)
= 2.9240E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:57:19 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010406.An1

ergy calibration normalized difference: .3558

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE
954.49	238.79	30.	294.	.491	17.40	1.017	PB-212
1353.08	338.56	0.	79.	.132	22.50	.930	AC-228 s
2435.38	609.37	0.	110.	.184	19.07	.846	BI-214 s

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	240.00	59.93	12.	0.	.000	.00	.000s
EU-155	345.94	86.45	53.	15.	.025	147.88	.791D
CD-109	352.29	88.04	68.	39.	.065	68.24	.793D
EU-155	414.99	103.74	53.	33.	.055	128.58	.292s
152	487.05	121.78	28.	11.	.018	151.90	.825D
EU-154	492.33	123.10	32.	2.	.004	704.47	.826D
CO-57	547.01	136.79	59.	38.	.064	105.42	.468s
FE-59	570.29	142.62	31.	20.	.034	109.37	.229s
FE-59	776.17	194.16	0.	37.	.062	32.88	.443s
EU-152	977.97	244.67	10.	4.	.007	248.83	.940D
EU-154	991.43	248.04	10.	6.	.010	170.02	.943D
EU-152	1374.17	343.83	0.	8.	.013	70.71	.438s
EU-152	1450.72	362.99	6.	38.	.064	54.01	.310s
EU-152	1650.55	413.00	0.	20.	.033	44.72	.375s
EU-152	1772.00	443.39	0.	1.	.002	200.00	.125s
Kr-85	2053.63	513.86	1.	1.	.001	312.69	.375s
EU-154	2367.80	592.46	0.	5.	.008	89.44	.500s
CS-137	2643.00	661.31	0.	31.	.052	35.92	.625s
EU-152	2752.23	688.63	4.	6.	.010	132.28	1.326D
EU-154	2767.70	692.50	7.	5.	.009	158.87	1.329D
EU-154	2908.38	727.69	0.	42.	.070	30.86	.500s
EU-154	3017.67	755.02	0.	33.	.055	34.82	.250s
EU-152	3116.33	779.70	0.	9.	.015	66.67	.250s
MN-54	3333.00	833.89	0.	3.	.005	115.47	.250s
EU-152	3464.33	866.73	0.	4.	.007	100.00	.375s
EU-154	3475.00	869.40	0.	24.	.040	40.82	.313s
152	3854.00	964.17	0.	7.	.012	75.59	.250s
-154	3974.83	994.38	0.	18.	.030	47.14	.313s
EU-154	4014.00	1004.17	0.	7.	.012	75.59	.250s
EU-152	4340.50	1085.80	12.	5.	.008	211.41	1.633D
EU-152	4356.58	1089.82	7.	3.	.006	235.22	1.636D

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 07:57:19 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010406.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
[illegible]-59	4393.00	1098.92	0.	1.	.002	200.00	.250s
EU-152	4445.58	1112.07	3.	3.	.004	232.90	1.653D
ZN-65	4459.39	1115.52	5.	3.	.004	274.12	1.655D
CO-60	4686.63	1172.32	0.	32.	.053	35.36	.417s
EU-152	4839.50	1210.53	0.	22.	.037	42.64	.250s
EU-154	5068.00	1267.64	0.	21.	.035	43.64	.250s
FE-59	5162.00	1291.14	0.	0.	.000	.00	.000s
EU-152	5190.00	1298.13	0.	18.	.030	47.14	.250s
CO-60	5328.83	1332.83	0.	31.	.052	35.92	.364s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5628.20	1407.64	0.	5.	.008	89.44	.375s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
[illegible]4		0.0000E+00	834.81	0.000E+00	%	7.419E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	1.468E-04	
			1291.56	0.000E+00	?	2.039E-04	
			192.34	9.296E-04	&	1.439E-03	
			142.65	0.000E+00	%	4.290E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	5.306E-04	
CO-60		1.0823E-04	1332.51	1.121E-04	(	9.044E-05	
			1173.23	1.043E-04	(	8.150E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.091E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.221E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.413E-03	
			25.50	0.000E+00	=	0.000E+00	
CS-137		7.5004E-05	661.62	7.500E-05	?(	6.049E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
EU-152	0.0000E+00	121.78	0.000E+00	%	1.310E-04	
		688.63	0.000E+00	%	9.630E-03	
		367.71	0.000E+00	&	8.951E-03	
		344.30	0.000E+00	%	1.588E-04	
		1408.08	0.000E+00	%	5.833E-04	
		964.00	0.000E+00	%	6.665E-04	
		1112.07	0.000E+00	%	7.770E-04	
		778.90	0.000E+00	%	6.681E-04	
		1085.80	0.000E+00	%	1.313E-03	
		244.67	0.000E+00	%	4.997E-04	
		867.39	0.000E+00	%	1.916E-03	
		444.00	0.000E+00	%	1.390E-03	
		411.09	0.000E+00	&	2.829E-03	
		1089.82	0.000E+00	%	6.794E-03	
		1299.19	0.000E+00	%	9.341E-03	
		1212.89	0.000E+00	%	1.108E-02	
EU-154	0.0000E+00	123.10	0.000E+00	%	9.035E-05	
		1274.80	0.000E+00	&	4.638E-04	
		723.30	4.694E-04	&	6.706E-04	
		1004.80	0.000E+00	%	5.709E-04	
		873.20	0.000E+00	&	1.119E-03	
		996.30	0.000E+00	%	1.199E-03	
		248.04	0.000E+00	%	6.055E-04	
		591.70	0.000E+00	%	1.326E-03	
		756.70	1.838E-03	?	3.064E-03	
		1597.30	0.000E+00	?	6.213E-03	
		692.50	0.000E+00	%	5.152E-03	
		1397.80	0.000E+00	?	5.883E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.357E-04	
		105.31	0.000E+00	&	2.317E-04	
		60.01	0.000E+00	%	2.412E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
- Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	2.1694E-07	0.000E+00	0.000E+00
FE-59	<	4.2913E-07	0.000E+00	0.000E+00
CO-57	<	1.5515E-06	0.000E+00	0.000E+00
CO-60		3.1647E-07	7.975E-08	8.081E-08
Kr-85	<	3.1907E-07	0.000E+00	0.000E+00
ZN-65	<	6.4952E-07	0.000E+00	0.000E+00
CD-109	<	4.1325E-06	0.000E+00	0.000E+00
CS-137	#	2.1931E-07	7.878E-08	7.930E-08
EU-152	<	3.8308E-07	0.000E+00	0.000E+00
EU-154	<	2.6418E-07	0.000E+00	0.000E+00
EU-155	<	3.9685E-07	0.000E+00	0.000E+00

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 5.3577960E-07 uCi/g

Analyzed by: 7/19/01
OPERATOR

Reviewed by: 8/7/01
Supervisor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:17:49 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010407.An1

ıple description
E1400 #5 SN#249

Spectrum Filename: C:\User\00010407.An1

Acquisition information
Start time 19-Jul-2001 08:07:47
Live time 599
Real time 600
Dead time .16%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 348.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.4800E+02)
= 2.8736E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:17:49 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010407.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
300.62	75.10	79.	120.	.200	27.93	.780	PB-214	D
309.68	77.37	76.	194.	.323	19.21	.782	PB-214	D
955.44	239.03	70.	284.	.474	27.36	.857	PB-212	M
1180.64	295.40	37.	172.	.288	33.73	1.187	PB-214	sM
1353.69	338.71	18.	120.	.200	35.12	.983	AC-228	sM
1407.33	352.13	5.	183.	.305	17.92	.672	PB-214	sM
2435.47	609.39	0.	145.	.242	16.61	1.087	BI-214	s

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	252.65	63.10	130.	145.	.242	47.54	.660s
EU-155	345.94	86.45	73.	12.	.019	217.37	.791D
CD-109	352.29	88.04	83.	43.	.071	68.11	.793D
EU-155	420.34	105.08	69.	9.	.015	557.77	.469s
EU-152	487.05	121.78	29.	7.	.011	238.66	.825D
EU-154	492.33	123.10	37.	9.	.015	197.40	.826D
CO-57	542.62	135.69	19.	47.	.078	55.05	1.528s
FE-59	553.97	138.53	66.	88.	.148	71.00	1.102s
FE-59	756.25	189.17	65.	52.	.087	100.72	.310s
EU-152	976.56	244.32	14.	4.	.006	332.58	.348s
EU-154	991.43	248.04	14.	0.	.000	.00	.943
EU-152	1376.63	344.45	7.	9.	.014	137.60	.299s
EU-152	1469.59	367.71	4.	20.	.033	68.03	.361s
EU-152	1645.08	411.63	5.	6.	.010	165.83	.211s
EU-152	1750.85	438.10	11.	26.	.043	93.26	.492s
Kr-85	2053.93	513.94	6.	5.	.008	286.78	.176s
EU-154	2356.33	589.59	0.	19.	.032	45.88	.250s
CS-137	2645.47	661.92	3.	33.	.056	41.38	.511s
EU-152	2752.23	688.63	1.	2.	.003	274.14	1.326D
EU-154	2767.70	692.50	3.	3.	.004	232.73	1.329D
EU-154	2867.75	717.52	0.	26.	.043	39.22	.313s
[illegible]-154	3023.50	756.48	0.	4.	.007	100.00	1.000s
[illegible]-152	3114.00	779.12	0.	7.	.012	75.59	.250s
MN-54	3330.00	833.14	0.	19.	.032	45.88	.250s
EU-152	3437.91	860.12	0.	27.	.045	38.49	.313s
EU-154	3489.50	873.02	0.	2.	.003	141.42	.500s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:17:49 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010407.An1

lide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
-152	3873.27	968.99	0.	64.	.107	25.00	1.417
EU-154	3985.00	996.92	0.	2.	.003	141.42	.250s
EU-154	4015.00	1004.42	0.	0.	.000	.00	.000s
EU-152	4340.50	1085.80	1.	3.	.004	173.69	1.633D
EU-152	4356.58	1089.82	7.	4.	.007	188.56	1.636D
FE-59	4394.33	1099.26	0.	14.	.023	53.45	.375s
EU-152	4445.58	1112.07	3.	0.	.001	1225.19	1.653D
ZN-65	4459.39	1115.52	3.	1.	.001	847.08	1.655D
CO-60	4693.00	1173.92	0.	10.	.017	63.25	.250s
EU-152	4853.00	1213.91	0.	14.	.023	53.45	.375s
EU-154	5059.60	1265.54	0.	23.	.038	41.70	.500s
FE-59	5162.00	1291.14	0.	0.	.000	.00	.000s
EU-152	5198.00	1300.13	0.	7.	.012	75.59	.375s
CO-60	5322.00	1331.12	0.	3.	.005	115.47	.250s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5628.00	1407.59	0.	1.	.002	200.00	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

JCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	1.132E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	%	2.282E-04	
			1291.56	0.000E+00	?	2.040E-04	
			192.34	0.000E+00	&	2.262E-03	
			142.65	0.000E+00	&	6.726E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	4.544E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.085E-04	
			1173.23	0.000E+00	%	1.243E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.496E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.932E-04	
			8.13	0.000E+00	=	0.000E+00	
(109		0.0000E+00	88.04	0.000E+00	%	1.514E-03	
			25.50	0.000E+00	=	0.000E+00	

:lide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	0.0000E+00	661.62	0.000E+00	%	1.373E-04	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.273E-04	
		688.63	0.000E+00	%	7.581E-03	
		367.71	0.000E+00	%	7.134E-03	
		344.30	0.000E+00	%	1.911E-04	
		1408.08	0.000E+00	%	4.799E-04	
		964.00	1.219E-03	&	1.341E-03	
		1112.07	0.000E+00	%	6.886E-04	
		778.90	0.000E+00	%	6.301E-04	
		1085.80	0.000E+00	%	9.321E-04	
		244.67	0.000E+00	%	5.292E-04	
		867.39	1.649E-03	&	3.134E-03	
		444.00	0.000E+00	&	2.966E-03	
		411.09	0.000E+00	%	2.378E-03	
		1089.82	0.000E+00	%	6.966E-03	
		1299.19	0.000E+00	%	7.266E-03	
		1212.89	0.000E+00	%	9.657E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	1.009E-04	
		1274.80	0.000E+00	&	4.777E-04	
		723.30	2.906E-04	&	5.663E-04	
		1004.80	0.000E+00	?	4.078E-04	
		873.20	0.000E+00	%	6.469E-04	
		996.30	0.000E+00	%	7.597E-04	
		248.04	0.000E+00		5.824E-04	
		591.70	0.000E+00	&	1.858E-03	
		756.70	0.000E+00	%	1.748E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	4.362E-03	
		1397.80	0.000E+00	?	5.885E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.484E-04	
		105.31	0.000E+00	%	2.227E-04	
		60.01	0.000E+00	&	7.663E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
& - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.2527E-07	0.000E+00	0.000E+00
FE-59	<	6.5580E-07	0.000E+00	0.000E+00
CO-57	<	1.3058E-06	0.000E+00	0.000E+00
CO-60	<	3.1192E-07	0.000E+00	0.000E+00
Kr-85	<	4.2989E-07	0.000E+00	0.000E+00
ZN-65	<	5.5511E-07	0.000E+00	0.000E+00
CD-109	<	4.3500E-06	0.000E+00	0.000E+00
CS-137	<	3.9450E-07	0.000E+00	0.000E+00
EU-152	<	3.6582E-07	0.000E+00	0.000E+00
EU-154	<	2.8993E-07	0.000E+00	0.000E+00
EU-155	<	4.2656E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TAL ACTIVITY (49.9 to 2000.0 keV) 0.0000000E+00 uCi/g

Analyzed by: 7/19/01
OPERATOR

Reviewed by: 8/7/01

Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:36:37 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010408.An1

ple description
E1400 #6 SN#250

Spectrum Filename: C:\User\00010408.An1

Acquisition information
Start time 19-Jul-2001 08:26:35
Live time 599
Real time 600
Dead time .15%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 302.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.0200E+02)
= 3.3113E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:36:37 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010408.Anl

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
300.29	75.02	49.	124.	.206	24.15	.780	PB-214	D
309.82	77.41	38.	179.	.299	17.82	.782	PB-214	D
740.91	185.33	22.	136.	.226	28.54	.852	U-235	s
954.70	238.85	22.	295.	.492	15.17	.966	PB-212	
1180.41	295.34	3.	94.	.157	23.10	.678	PB-214	s
1406.57	351.94	5.	152.	.254	18.70	.809	PB-214	s
2435.54	609.41	0.	115.	.192	18.65	1.132	BI-214	
5840.86	1460.77	0.	191.	.319	14.47	1.374	K-40	s

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	253.76	63.37	123.	212.	.354	43.09	1.064s
EU-155	345.94	86.45	51.	4.	.007	479.96	.791D
CD-109	352.29	88.04	64.	25.	.042	98.82	.793D
EU-155	428.84	107.21	36.	105.	.175	48.37	.999s
EU-152	487.05	121.78	11.	9.	.016	117.56	.825D
EU-154	492.33	123.10	18.	3.	.004	477.70	.826D
CO-57	553.79	138.49	27.	18.	.031	138.23	.289s
FE-59	574.70	143.72	57.	55.	.092	95.46	.268s
FE-59	766.82	191.82	26.	9.	.015	244.96	.248s
EU-152	977.97	244.67	0.	13.	.022	56.64	.940D
EU-154	991.43	248.04	15.	10.	.016	129.25	.943D
EU-152	1379.00	345.04	4.	13.	.021	88.54	.480s
EU-152	1464.33	366.40	0.	18.	.030	47.14	.250s
EU-152	1638.13	409.89	0.	47.	.078	29.17	.500s
EU-152	1765.85	441.85	0.	17.	.028	48.51	.500s
Kr-85	2057.58	514.85	0.	13.	.022	55.47	.500s
EU-154	2376.08	594.53	0.	40.	.067	31.62	.300s
CS-137	2645.33	661.89	0.	24.	.040	40.82	.521s
EU-152	2752.23	688.63	8.	3.	.005	309.76	1.326D
EU-154	2767.70	692.50	3.	1.	.002	456.60	1.329D
EU-154	2894.50	724.22	0.	23.	.038	41.70	.250s
-154	3023.00	756.36	0.	0.	.000	.00	.000s
-152	3107.00	777.37	0.	5.	.008	89.44	.750s
MN-54	3337.80	835.09	0.	9.	.015	66.67	.313s
EU-152	3457.50	865.02	0.	10.	.017	63.25	.500s
EU-154	3483.00	871.40	0.	4.	.007	100.00	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:36:37 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010408.An1

:lide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
-152	3859.00	965.42	0.	11.	.018	60.30	.250s
EU-154	3986.00	997.17	0.	9.	.015	66.67	.375s
EU-154	4021.00	1005.92	0.	7.	.012	75.59	.250s
EU-152	4340.50	1085.80	3.	0.	.000	.00	1.633
EU-152	4349.00	1087.93	0.	7.	.012	75.59	.750s
FE-59	4387.60	1097.57	0.	16.	.027	50.00	.375s
EU-152	4445.58	1112.07	7.	6.	.009	159.22	1.653D
ZN-65	4459.39	1115.52	3.	2.	.004	226.05	1.655D
CO-60	4686.25	1172.23	0.	5.	.008	89.44	.375s
EU-152	4846.00	1212.16	0.	10.	.017	63.25	.250s
EU-154	5091.00	1273.39	0.	2.	.003	141.42	.250s
FE-59	5151.00	1288.39	0.	11.	.018	60.30	.250s
EU-152	5193.00	1298.88	0.	0.	.000	.00	.000s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5589.00	1397.84	0.	1.	.002	200.00	.250s
EU-152	5631.00	1408.34	0.	2.	.003	141.42	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

*** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

-UCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	9.181E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	2.373E-04	
			1291.56	0.000E+00	&	3.188E-04	
			192.34	0.000E+00	%	1.411E-03	
			142.65	0.000E+00	%	5.877E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	3.923E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.044E-05	
			1173.23	0.000E+00	%	1.065E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.565E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.010E-04	
			8.13	0.000E+00	=	0.000E+00	
C :09		0.0000E+00	88.04	0.000E+00	%	1.310E-03	
			25.50	0.000E+00	=	0.000E+00	

·lide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	0.0000E+00	661.62	0.000E+00	%	1.194E-04	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.043E-04	
		688.63	0.000E+00	%	9.873E-03	
		367.71	0.000E+00	%	6.599E-03	
		344.30	0.000E+00	%	1.946E-04	
		1408.08	0.000E+00	%	5.093E-04	
		964.00	0.000E+00	%	7.441E-04	
		1112.07	0.000E+00	%	9.385E-04	
		778.90	0.000E+00	%	5.878E-04	
		1085.80	0.000E+00		8.891E-04	
		244.67	0.000E+00	%	4.955E-04	
		867.39	0.000E+00	&	2.328E-03	
		444.00	0.000E+00	&	2.289E-03	
		411.09	2.859E-03	?	3.806E-03	
		1089.82	0.000E+00	%	6.238E-03	
		1299.19	0.000E+00	?	5.190E-03	
		1212.89	0.000E+00	%	8.813E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.678E-05	
		1274.80	0.000E+00	%	2.799E-04	
		723.30	0.000E+00	%	5.437E-04	
		1004.80	0.000E+00	%	5.709E-04	
		873.20	0.000E+00	%	7.119E-04	
		996.30	0.000E+00	%	9.892E-04	
		248.04	0.000E+00	%	6.972E-04	
		591.70	1.624E-03	&	2.393E-03	
		756.70	0.000E+00	?	1.393E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	4.041E-03	
		1397.80	0.000E+00	%	6.322E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.250E-04	
		105.31	0.000E+00	&	2.847E-04	
		60.01	0.000E+00	&	8.372E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
  - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.0402E-07	0.000E+00	0.000E+00
FE-59	<	7.8565E-07	0.000E+00	0.000E+00
CO-57	<	1.2991E-06	0.000E+00	0.000E+00
CO-60	<	2.9948E-07	0.000E+00	0.000E+00
Kr-85	<	5.1836E-07	0.000E+00	0.000E+00
ZN-65	<	6.6569E-07	0.000E+00	0.000E+00
CD-109	<	4.3382E-06	0.000E+00	0.000E+00
CS-137	<	3.9522E-07	0.000E+00	0.000E+00
EU-152	<	3.4551E-07	0.000E+00	0.000E+00
EU-154	<	2.5423E-07	0.000E+00	0.000E+00
EU-155	<	4.1377E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TAL ACTIVITY (49.9 to 2000.0 keV) 0.0000000E+00 uCi/g

Analyzed by: 7/19/01
OPERATOR

Reviewed by: 8/2/01

Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:48:12 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010409.An1

ple description
E1400 #7 SN#251

Spectrum Filename: C:\User\00010409.An1

Acquisition information
Start time 19-Jul-2001 08:38:11
Live time 599
Real time 600
Dead time .16%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 314.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.1400E+02)
= 3.1847E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:48:12 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010409.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
307.19	76.75	143.	395.	.659	22.46	.906	BI-207	s
954.48	238.79	66.	389.	.650	18.82	.969	PB-212	s
1179.84	295.20	29.	148.	.247	29.99	1.113	PB-214	s
1407.06	352.07	3.	145.	.242	17.73	.909	PB-214	s
2330.50	583.13	0.	115.	.192	18.65	1.057	TL-208	sM
2435.23	609.33	0.	133.	.222	17.34	1.230	BI-214	s
5840.93	1460.79	0.	191.	.319	14.47	1.249	K-40	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	236.74	59.11	100.	53.	.088	110.21	.764s
EU-155	345.94	86.45	85.	5.	.009	500.90	.791D
CD-109	352.29	88.04	87.	34.	.058	83.63	.793D
EU-155	429.08	107.27	63.	75.	.125	69.66	.270s
EU-152	487.05	121.78	31.	4.	.007	389.99	.825D
EU-154	492.33	123.10	21.	1.	.002	989.39	.826D
CO-57	544.60	136.19	78.	48.	.080	113.11	.269s
FE-59	569.34	142.38	30.	30.	.050	101.11	.830s
FE-59	781.19	195.41	55.	41.	.068	108.50	.358s
EU-152	977.97	244.67	13.	0.	.000	.00	.940
EU-154	981.07	245.45	26.	21.	.035	124.87	.211s
EU-152	1366.18	341.83	7.	50.	.084	47.77	.351s
EU-152	1468.00	367.32	0.	0.	.000	.00	.000s
EU-152	1634.03	408.87	0.	33.	.055	34.82	.751s
EU-152	1749.41	437.74	6.	32.	.054	62.25	.578s
Kr-85	2059.42	515.31	3.	13.	.022	82.11	.479s
EU-154	2362.40	591.11	0.	31.	.052	35.92	.292s
CS-137	2645.09	661.83	0.	37.	.062	32.88	.500s
EU-152	2752.23	688.63	5.	7.	.012	112.66	1.326D
EU-154	2767.70	692.50	2.	1.	.002	285.77	1.329D
EU-154	2907.56	727.48	0.	27.	.045	38.49	.500s
-154	3026.00	757.11	0.	1.	.002	200.00	.250s
-152	3135.50	784.49	0.	30.	.050	36.51	.292s
MN-54	3336.60	834.79	0.	18.	.030	47.14	.375s
EU-152	3465.00	866.90	0.	0.	.000	.00	.000s
EU-154	3480.25	870.71	0.	17.	.028	48.51	.313s

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3875.08	969.44	0.	72.	.120	23.57	.913s
EU-154	3984.00	996.67	0.	3.	.005	115.47	.250s
EU-154	4015.50	1004.55	0.	4.	.007	100.00	.375s
EU-152	4340.50	1085.80	5.	5.	.009	150.56	1.633D
EU-152	4356.58	1089.82	5.	5.	.008	163.10	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	5.	7.	.011	125.57	1.653D
ZN-65	4459.39	1115.52	2.	2.	.004	202.85	1.655D
CO-60	4691.33	1173.50	0.	14.	.023	53.45	.250s
EU-152	4848.00	1212.66	0.	9.	.015	66.67	.250s
EU-154	5070.33	1268.23	0.	19.	.032	45.88	.375s
FE-59	5152.00	1288.64	0.	10.	.017	63.25	.250s
EU-152	5195.00	1299.38	0.	1.	.002	200.00	.250s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5574.00	1394.09	0.	7.	.012	75.59	.250s
EU-152	5625.00	1406.84	0.	7.	.012	75.59	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

*** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

NUCLIDE NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	1.113E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	&	3.110E-04	
			192.34	0.000E+00	&	2.083E-03	
			142.65	0.000E+00	%	4.568E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	5.919E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.045E-05	
			1173.23	0.000E+00	%	1.362E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.662E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.932E-04	
			8.13	0.000E+00	=	0.000E+00	
[illegible].09		0.0000E+00	88.04	0.000E+00	%	1.488E-03	
			25.50	0.000E+00	=	0.000E+00	

lide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	8.9536E-05	661.62	8.954E-05	?(	6.050E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.260E-04	
		688.63	0.000E+00	%	1.011E-02	
		367.71	0.000E+00	?	3.667E-03	
		344.30	0.000E+00	&	2.964E-04	
		1408.08	0.000E+00	%	6.253E-04	
		964.00	1.371E-03	&	1.405E-03	
		1112.07	0.000E+00	%	9.181E-04	
		778.90	5.400E-04	&	9.576E-04	
		1085.80	0.000E+00	%	1.132E-03	
		244.67	0.000E+00		4.894E-04	
		867.39	0.000E+00	?	1.527E-03	
		444.00	0.000E+00	&	2.994E-03	
		411.09	2.008E-03	&	3.346E-03	
		1089.82	0.000E+00	%	6.795E-03	
		1299.19	0.000E+00	%	5.576E-03	
		1212.89	0.000E+00	%	8.584E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.794E-05	
		1274.80	0.000E+00	&	4.494E-04	
		723.30	3.018E-04	&	5.736E-04	
		1004.80	0.000E+00	%	5.118E-04	
		873.20	0.000E+00	&	1.003E-03	
		996.30	0.000E+00	%	7.995E-04	
		248.04	0.000E+00	&	8.725E-04	
		591.70	1.259E-03	?	2.185E-03	
		756.70	0.000E+00	%	1.497E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	3.865E-03	
		1397.80	0.000E+00	&	8.238E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.519E-04	
		105.31	0.000E+00	&	2.821E-04	
		60.01	0.000E+00	%	5.925E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
› - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
: - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.5449E-07	0.000E+00	0.000E+00
FE-59	<	4.3508E-07	0.000E+00	0.000E+00
CO-57	<	1.8849E-06	0.000E+00	0.000E+00
CO-60	<	2.8807E-07	0.000E+00	0.000E+00
Kr-85	<	5.2943E-07	0.000E+00	0.000E+00
ZN-65	<	6.1520E-07	0.000E+00	0.000E+00
CD-109	<	4.7393E-06	0.000E+00	0.000E+00
CS-137	#	2.8515E-07	9.376E-08	9.449E-08
EU-152	<	4.0135E-07	0.000E+00	0.000E+00
EU-154	<	2.4823E-07	0.000E+00	0.000E+00
EU-155	<	4.8386E-07	0.000E+00	0.000E+00

* All peaks for activity calculation had bad shape.
< Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 2.8514750E-07 uCi/g

Analyzed by: _____ 7/19/01
OPERATOR

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 08:48:12 Page 6
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Reviewed by: _____
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 09:26:23 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010410.An1

ple description
E1400 #8 SN#252

Spectrum Filename: C:\User\00010410.An1

Acquisition information

Start time	19-Jul-2001 09:16:22
Live time	599
Real time	600
Dead time	.16%
Detector/Geometry IDs	1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters

Start channel	200 for an energy of 49.91keV
Stop channel	8000 for an energy of 2000.02keV
Peak rejection level	20.000%
Peak search sensitivity:	3
Sample Size:	364.000
Activity scaling factor	1.0000E+00/(1.0000E+00* 3.6400E+02) = 2.7473E-03

Detection limit method:
MDA - EG&G ORTEC method

Additional random error:	1.0000000E+00
Additional systematic error:	1.0000000E+00
Fraction Limit:	.000%

Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

ections

	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 09:26:23 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010410.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
299.41	74.80	93.	104.	.174	32.70	.780	PB-214	D
309.78	77.40	72.	178.	.297	20.13	.782	PB-214	D
373.35	93.31	71.	156.	.261	34.99	1.456	U-235	s
744.04	186.11	38.	86.	.144	37.14	.983	PA-234	s
953.98	238.66	27.	220.	.368	15.01	.934	PB-212	D
966.82	241.88	27.	73.	.122	30.81	.937	PB-214	D
1180.31	295.32	21.	134.	.224	30.88	1.187	PB-214	sM
1407.05	352.06	5.	206.	.344	15.32	1.054	PB-214	sM
3642.06	911.17	0.	54.	.090	27.22	.850	AC-228	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	238.00	59.43	203.	0.	.000	.00	.000s
EU-155	345.94	86.45	89.	17.	.028	165.87	.791D
CD-109	352.29	88.04	94.	52.	.087	59.73	.793D
EU-155	422.25	105.56	62.	70.	.117	64.95	.502s
EU-152	487.05	121.78	17.	14.	.023	101.95	.825D
EU-154	492.33	123.10	33.	2.	.003	893.17	.826D
CO-57	543.77	135.98	46.	2.	.003	1667.33	.455s
FE-59	582.73	145.73	120.	54.	.090	180.27	1.020s
FE-59	765.92	191.59	54.	48.	.079	92.32	.355s
EU-152	977.97	244.67	8.	14.	.023	79.37	.940D
EU-154	991.43	248.04	6.	8.	.014	109.47	.943D
EU-152	1376.28	344.36	3.	10.	.017	95.91	.214s
EU-152	1462.87	366.03	0.	19.	.032	45.88	.334s
EU-152	1643.00	411.11	1.	0.	.000	200.00	.000s
EU-152	1766.60	442.04	0.	43.	.072	30.50	.250s
Kr-85	2054.00	513.95	1.	0.	.000	200.00	.000s
EU-154	2361.57	590.90	0.	9.	.015	66.67	.438s
CS-137	2645.50	661.93	0.	4.	.007	100.00	.500s
EU-152	2752.23	688.63	6.	9.	.015	104.04	1.326D
[illegible]54	2767.70	692.50	5.	4.	.007	165.83	1.329D
[illegible]54	2888.00	722.59	0.	5.	.008	89.44	.375s
EU-154	3023.00	756.36	0.	0.	.000	.00	.000s
EU-152	3111.00	778.37	0.	1.	.002	200.00	.250s
IN-54	3356.73	839.82	0.	34.	.057	34.30	.563s

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IT Lab @ Georgia Tech Research Spectrum name: 00010410.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3470.33	868.23	0.	8.	.013	70.71	.250s
EU-154	3491.00	873.40	0.	7.	.012	75.59	.250s
EU-152	3854.17	964.21	0.	10.	.017	63.25	.375s
EU-154	3985.50	997.05	0.	2.	.003	141.42	.500s
EU-154	3996.33	999.76	0.	22.	.037	42.64	.500s
EU-152	4340.50	1085.80	7.	5.	.009	168.62	1.633D
EU-152	4356.58	1089.82	6.	4.	.007	185.37	1.636D
FE-59	4389.00	1097.92	0.	5.	.008	89.44	.250s
EU-152	4445.58	1112.07	1.	1.	.002	216.02	1.653D
ZN-65	4459.39	1115.52	1.	1.	.001	528.80	1.655D
CO-60	4688.00	1172.67	0.	8.	.013	70.71	.250s
EU-152	4847.00	1212.41	0.	0.	.000	.00	.000s
EU-154	5091.50	1273.52	0.	20.	.033	44.72	.500s
FE-59	5163.25	1291.45	0.	18.	.030	47.14	.375s
EU-152	5207.25	1302.44	0.	12.	.020	57.74	.375s
CO-60	5329.00	1332.87	0.	3.	.005	115.47	.750s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5625.00	1406.84	0.	12.	.020	57.74	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
~ Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		8.4103E-05	834.81	8.410E-05	&(	6.184E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	1.785E-04	
			1291.56	0.000E+00	%	3.671E-04	
			192.34	0.000E+00	%	2.136E-03	
			142.65	0.000E+00	&	7.090E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	4.020E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.085E-04	
			1173.23	0.000E+00	%	1.177E-04	
Cr-85		0.0000E+00	513.99	0.000E+00	%	1.028E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.755E-04	
			8.13	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CD-109	0.0000E+00	88.04	0.000E+00	%	1.612E-03	
		25.50	0.000E+00	=	0.000E+00	
CS-137	0.0000E+00	661.62	0.000E+00	%	7.593E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.207E-04	
		688.63	0.000E+00	%	1.077E-02	
		367.71	0.000E+00	&	6.712E-03	
		344.30	0.000E+00	%	1.800E-04	
		1408.08	0.000E+00	%	7.147E-04	
		964.00	0.000E+00	%	7.260E-04	
		1112.07	0.000E+00	%	6.543E-04	
		778.90	0.000E+00	%	4.836E-04	
		1085.80	0.000E+00	%	1.188E-03	
		244.67	0.000E+00	%	5.738E-04	
		867.39	0.000E+00	%	2.204E-03	
		444.00	2.226E-03	&	3.133E-03	
		411.09	0.000E+00	%	1.634E-03	
		1089.82	0.000E+00	%	6.795E-03	
		1299.19	0.000E+00	&	8.304E-03	
		1212.89	0.000E+00	?	5.781E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	9.131E-05	
		1274.80	0.000E+00	%	4.567E-04	
		723.30	0.000E+00	%	3.650E-04	
		1004.80	0.000E+00	&	7.821E-04	
		873.20	0.000E+00	%	7.942E-04	
		996.30	0.000E+00	%	7.597E-04	
		248.04	0.000E+00	%	5.824E-04	
		591.70	0.000E+00	%	1.507E-03	
		756.70	0.000E+00	?	1.393E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	4.782E-03	
		1397.80	0.000E+00	?	5.885E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.625E-04	
		105.31	0.000E+00	%	2.768E-04	
		60.01	0.000E+00	%	7.050E-03	

(- This peak used in the nuclide activity average.

- Peak is too wide, but only one peak in library.
& - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.

) - Peak is too wide at FW25M, but ok at FWHM.
6 - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
- Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	#	2.3105E-07	7.925E-08	7.982E-08
FE-59	<	4.9026E-07	0.000E+00	0.000E+00
CO-57	<	1.1043E-06	0.000E+00	0.000E+00
CO-60	<	2.9820E-07	0.000E+00	0.000E+00
Kr-85	<	2.8253E-07	0.000E+00	0.000E+00
ZN-65	<	4.8222E-07	0.000E+00	0.000E+00
CD-109	<	4.4275E-06	0.000E+00	0.000E+00
CS-137	<	2.0859E-07	0.000E+00	0.000E+00
EU-152	<	3.3172E-07	0.000E+00	0.000E+00
[illegible]54	<	2.5084E-07	0.000E+00	0.000E+00
[illegible]-155	<	4.4652E-07	0.000E+00	0.000E+00

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 09:26:23 Page 6
IT Lab @ Georgia Tech Research Spectrum name: 00010410.An1

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 2.3105170E-07 uCi/g

Analyzed by: _____ 7/19/01
OPERATOR

Reviewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 09:33:46 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010451.An1

nple description
E1400 #9 SN253

Spectrum Filename: C:\User\00010451.An1

Acquisition information
Start time 15-Aug-2001 09:23:46
Live time 599
Real time 600
Dead time .15%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 290.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.9000E+02)
= 3.4483E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

ergy calibration normalized difference: .4788

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
298.66	74.61	127.	214.	.357	32.38	.628	PB-214	s
311.82	77.91	50.	248.	.414	23.83	.901	PB-214	s
373.93	93.46	18.	149.	.249	29.19	1.277	U-235	s
956.06	239.19	0.	316.	.527	11.25	.832	PB-212	s
1408.31	352.38	8.	144.	.240	19.48	1.036	PB-214	
2438.01	610.03	0.	121.	.202	18.18	1.360	RU-103	

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
[illegible]-155	254.50	63.56	176.	66.	.111	166.59	.572
[illegible]-155	345.94	86.45	49.	11.	.018	193.39	.791D
CD-109	352.29	88.04	69.	31.	.052	83.26	.793D
EU-155	416.63	104.15	27.	109.	.183	42.35	.844s
EU-152	487.05	121.78	12.	1.	.002	746.51	.825D
EU-154	492.33	123.10	19.	14.	.023	103.81	.826D
CO-57	554.04	138.55	20.	76.	.127	51.03	.986s
FE-59	571.00	142.80	4.	0.	.000	400.00	.000s
FE-59	770.50	192.74	15.	2.	.003	546.87	.356s
EU-152	977.97	244.67	11.	8.	.013	142.74	.940D
EU-154	991.43	248.04	5.	4.	.006	206.70	.943D
EU-152	1375.73	344.22	0.	41.	.068	31.23	.300s
EU-152	1467.00	367.07	0.	36.	.060	33.33	.584s
EU-152	1628.16	407.40	8.	17.	.029	118.52	.282s
EU-152	1757.55	439.77	0.	44.	.073	30.15	.938
Kr-85	2075.60	519.36	0.	17.	.028	48.51	.313s
EU-154	2349.78	587.95	0.	20.	.033	44.72	.751s
CS-137	2646.05	662.07	0.	62.	.103	25.40	.638s
EU-152	2752.23	688.63	1.	5.	.009	95.87	1.326D
EU-154	2767.70	692.50	2.	1.	.002	287.08	1.329D
EU-154	2884.50	721.71	0.	4.	.007	100.00	.500s
EU-154	3041.00	760.86	0.	18.	.030	47.14	.250s
EU-152	3112.00	778.62	0.	0.	.000	.00	.000s
[illegible]54	3335.00	834.39	0.	1.	.002	200.00	.250s
EU-152	3467.67	867.56	2.	0.	.001	424.26	.176s
EU-154	3486.33	872.23	0.	16.	.027	50.00	.250s
EU-152	3815.00	954.42	0.	30.	.050	36.51	.250s
EU-154	3981.00	995.92	0.	0.	.000	.00	.000s

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-154	4002.00	1001.17	0.	7.	.012	75.59	.250s
EU-152	4340.50	1085.80	7.	5.	.009	166.93	1.633D
EU-152	4356.58	1089.82	4.	3.	.004	266.33	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	6.	3.	.005	236.82	1.653D
ZN-65	4459.39	1115.52	4.	1.	.001	750.10	1.655D
CO-60	4692.00	1173.67	0.	21.	.035	43.64	.250s
EU-152	4841.50	1211.03	0.	9.	.015	66.67	.500s
EU-154	5100.75	1275.83	0.	12.	.020	57.74	.312s
FE-59	5164.00	1291.64	0.	6.	.010	81.65	.750s
EU-152	5195.67	1299.55	0.	3.	.005	115.47	.375s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5597.75	1400.03	0.	7.	.012	75.59	.375s
EU-152	5631.00	1408.34	0.	3.	.005	115.47	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	PEAK CODE	PEAK MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	6.644E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.762E-04	
			192.34	0.000E+00	%	1.111E-03	
			142.65	0.000E+00	%	2.087E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	5.284E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.045E-05	
			1173.23	0.000E+00	%	1.540E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	&	1.693E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.011E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.374E-03	
			25.50	0.000E+00	=	0.000E+00	
CS-137		1.5003E-04	661.62	1.500E-04	(	6.050E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	

:lide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	9.176E-05	
		688.63	0.000E+00	%	8.556E-03	
		367.71	5.280E-03		8.320E-03	
		344.30	1.805E-04	*	2.618E-04	
		1408.08	0.000E+00	%	5.360E-04	
		964.00	5.713E-04	&	1.013E-03	
		1112.07	0.000E+00	%	8.520E-04	
		778.90	0.000E+00	?	4.500E-04	
		1085.80	0.000E+00	%	1.188E-03	
		244.67	0.000E+00	%	5.476E-04	
		867.39	0.000E+00	%	1.741E-03	
		444.00	2.277E-03	&	3.160E-03	
		411.09	0.000E+00	&	3.042E-03	
		1089.82	0.000E+00	%	6.239E-03	
		1299.19	0.000E+00	%	6.228E-03	
		1212.89	0.000E+00	%	8.584E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.941E-05	
		1274.80	0.000E+00	%	3.928E-04	
		723.30	0.000E+00	%	3.507E-04	
		1004.80	0.000E+00	&	5.709E-04	
		873.20	0.000E+00	%	9.853E-04	
		996.30	0.000E+00	?	6.662E-04	
		248.04	0.000E+00	%	5.177E-04	
		591.70	0.000E+00	&	1.888E-03	
		756.70	0.000E+00	&	2.507E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	3.864E-03	
		1397.80	0.000E+00	%	8.238E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.292E-04	
		105.31	0.000E+00	%	2.804E-04	
		60.01	0.000E+00	&	7.238E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.

? - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	2.2910E-07	0.000E+00	0.000E+00
FE-59	<	4.7107E-07	0.000E+00	0.000E+00
CO-57	<	1.8221E-06	0.000E+00	0.000E+00
CO-60	<	3.1189E-07	0.000E+00	0.000E+00
Kr-85	<	5.8377E-07	0.000E+00	0.000E+00
ZN-65	<	6.9329E-07	0.000E+00	0.000E+00
CD-109	<	4.7394E-06	0.000E+00	0.000E+00
CS-137		5.1734E-07	1.314E-07	1.331E-07
EU-152	<	3.1643E-07	0.000E+00	0.000E+00
EU-154	<	3.0832E-07	0.000E+00	0.000E+00
EU-155	<	4.4566E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 5.1734080E-07 uCi/g

Analyzed by: _____ 8/15/01
OPERATOR

Reviewed by: _____ 8/17/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 09:50:06 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010452.An1

mple description
E1400 #9 QC SN253

Spectrum Filename: C:\User\00010452.An1

Acquisition information
Start time 15-Aug-2001 09:40:04
Live time 599
Real time 600
Dead time .15%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 286.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.8600E+02)
= 3.4965E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 09:50:06 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010452.An1

ergy calibration normalized difference: .6000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
253.20	63.23	40.	132.	.220	36.43	.997	PA-234	s
300.29	75.02	57.	100.	.166	29.40	.780	PB-214	D
310.32	77.53	50.	153.	.256	20.71	.782	PB-214	D
955.80	239.12	12.	308.	.514	13.81	.988	PB-212	
1181.79	295.69	5.	102.	.169	23.48	.965	PB-214	
1408.62	352.45	6.	155.	.259	20.43	1.271	PB-214	s
2332.16	583.54	0.	100.	.167	20.00	.785	TL-208	s
2437.89	610.00	0.	119.	.199	18.33	.824	RU-103	s

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	238.64	59.59	48.	30.	.050	112.74	.221s
EU-155	345.94	86.45	69.	7.	.012	330.20	.791D
CD-109	352.29	88.04	70.	40.	.066	67.53	.793D
EU-155	438.18	109.55	49.	76.	.126	60.97	.285s
EU-152	487.05	121.78	21.	11.	.019	127.11	.825D
EU-154	492.33	123.10	15.	2.	.004	490.87	.826D
CO-57	533.51	133.41	39.	38.	.063	87.42	.979s
FE-59	578.40	144.65	26.	37.	.062	80.46	.361s
FE-59	793.45	198.48	53.	36.	.059	125.33	.317s
EU-152	977.97	244.67	11.	2.	.004	418.46	.940D
EU-154	991.43	248.04	11.	13.	.021	92.74	.943D
EU-152	1355.26	339.10	26.	78.	.129	58.34	.662s
EU-152	1466.75	367.00	0.	12.	.020	57.74	.501s
EU-152	1652.09	413.38	0.	48.	.080	28.87	.292s
EU-152	1785.63	446.80	0.	23.	.038	41.70	.688s
Kr-85	2054.00	513.95	11.	9.	.016	237.76	.000s
EU-154	2363.00	591.26	0.	3.	.005	115.47	.250s
CS-137	2647.38	662.40	0.	79.	.132	22.50	1.397
EU-152	2752.23	688.63	5.	2.	.003	360.92	1.326D
EU-154	2767.70	692.50	2.	12.	.020	65.57	1.329D
EU-154	2889.00	722.84	0.	0.	.000	.00	.000s
[illegible]-154	3016.67	754.77	0.	11.	.018	60.30	.375s
EU-152	3109.00	777.87	0.	8.	.013	70.71	.500s
MN-54	3335.33	834.47	0.	19.	.032	45.88	.250s
EU-152	3469.50	868.02	0.	26.	.043	39.22	.250s
EU-154	3492.00	873.65	0.	2.	.003	141.42	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 09:50:06 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010452.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3849.75	963.11	0.	19.	.032	45.88	.313s
EU-154	3977.50	995.05	0.	5.	.008	89.44	.500s
EU-154	4010.60	1003.32	0.	6.	.010	81.65	.375s
EU-152	4340.50	1085.80	4.	4.	.007	168.99	1.633D
EU-152	4356.58	1089.82	4.	3.	.005	241.13	1.636D
FE-59	4407.00	1102.42	0.	11.	.018	60.30	.250s
EU-152	4445.58	1112.07	0.	7.	.012	75.09	1.653D
ZN-65	4459.39	1115.52	3.	6.	.009	124.28	1.655D
CO-60	4689.00	1172.92	0.	0.	.000	.00	.000s
EU-152	4846.20	1212.21	0.	5.	.008	89.44	.500s
EU-154	5097.00	1274.89	0.	1.	.002	200.00	.250s
FE-59	5156.00	1289.64	0.	11.	.018	60.30	.250s
EU-152	5193.00	1298.88	0.	0.	.000	.00	.000s
CO-60	5322.67	1331.29	0.	10.	.017	63.25	.375s
EU-154	5586.00	1397.09	0.	2.	.003	141.42	.250s
EU-152	5622.00	1406.09	0.	3.	.005	115.47	.250s
EU-154	6385.00	1596.71	0.	3.	.005	115.47	.250s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	1.132E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	&	2.135E-04	
			1291.56	0.000E+00	%	3.188E-04	
			192.34	0.000E+00	&	2.010E-03	
			142.65	0.000E+00	&	4.655E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	4.831E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.379E-04	
			1173.23	0.000E+00	?	8.151E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.780E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.285E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.430E-03	
			25.50	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	1.9116E-04	661.62	1.912E-04	(	6.049E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.221E-04	
		688.63	0.000E+00	%	8.844E-03	
		367.71	0.000E+00	%	5.866E-03	
		344.30	0.000E+00	&	3.756E-04	
		1408.08	0.000E+00	%	5.360E-04	
		964.00	0.000E+00	%	8.714E-04	
		1112.07	0.000E+00	%	8.056E-04	
		778.90	0.000E+00	%	6.495E-04	
		1085.80	0.000E+00	%	1.072E-03	
		244.67	0.000E+00	%	4.894E-04	
		867.39	1.588E-03	?	3.094E-03	
		444.00	0.000E+00	&	2.518E-03	
		411.09	2.920E-03	&	3.836E-03	
		1089.82	0.000E+00	%	6.239E-03	
		1299.19	0.000E+00	?	5.190E-03	
		1212.89	0.000E+00	%	7.550E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.189E-05	
		1274.80	0.000E+00	%	2.638E-04	
		723.30	0.000E+00	?	2.794E-04	
		1004.80	0.000E+00	%	5.523E-04	
		873.20	0.000E+00	%	6.469E-04	
		996.30	0.000E+00	%	8.702E-04	
		248.04	0.000E+00	%	6.878E-04	
		591.70	0.000E+00	%	1.218E-03	
		756.70	0.000E+00	%	2.177E-03	
		1597.30	0.000E+00	%	7.456E-03	
		692.50	0.000E+00	%	5.379E-03	
		1397.80	0.000E+00	%	6.710E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.419E-04	
		105.31	0.000E+00	&	2.705E-04	
		60.01	0.000E+00	%	4.476E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.9574E-07	0.000E+00	0.000E+00
FE-59	<	7.4656E-07	0.000E+00	0.000E+00
CO-57	<	1.6892E-06	0.000E+00	0.000E+00
CO-60	<	4.8218E-07	0.000E+00	0.000E+00
Kr-85	<	6.2246E-07	0.000E+00	0.000E+00
ZN-65	<	7.9911E-07	0.000E+00	0.000E+00
CD-109	<	4.9993E-06	0.000E+00	0.000E+00
CS-137		6.6839E-07	1.504E-07	1.529E-07
EU-152	<	4.2686E-07	0.000E+00	0.000E+00
EU-154	<	2.5135E-07	0.000E+00	0.000E+00
EU-155	<	4.9607E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TAL ACTIVITY (49.9 to 2000.0 keV) 6.6838950E-07 uCi/g

Analyzed by: 8/15/01
OPERATOR

Reviewed by: 8/17/01

Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 15:18:30 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010413.An1

ple description
E1400 #10 SN#254

Spectrum Filename: C:\User\00010413.An1

Acquisition information
Start time 19-Jul-2001 14:12:13
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 274.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.7400E+02)
= 3.6496E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 15:18:30 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010413.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
298.85	74.66	56.	98.	.163	29.60	.780	PB-214	D
309.52	77.33	68.	143.	.239	23.32	.782	PB-214	D
360.17	90.01	24.	52.	.087	38.15	.794	PB-214	D
373.48	93.35	20.	177.	.295	23.07	1.170	U-235	sM
741.70	185.53	8.	157.	.261	23.05	1.118	U-235	s
953.83	238.63	0.	333.	.556	10.96	1.086	PB-212	M
1179.68	295.16	0.	161.	.269	15.76	.882	PB-214	sM
1406.11	351.83	0.	140.	.234	16.90	.902	PB-214	sM
2435.14	609.31	0.	102.	.170	19.80	1.204	BI-214	
5841.48	1460.93	0.	164.	.274	15.62	1.128	K-40	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	240.49	60.05	55.	26.	.043	123.79	.348s
EU-155	345.94	86.45	64.	16.	.027	150.97	.791D
CD-109	352.29	88.04	66.	40.	.067	65.65	.793D
EU-155	425.44	106.36	9.	18.	.030	84.98	1.184s
EU-152	487.05	121.78	15.	9.	.014	145.67	.825D
EU-154	492.33	123.10	31.	11.	.019	150.11	.826D
CO-57	545.50	136.41	4.	0.	.000	400.00	.292s
FE-59	567.39	141.89	43.	76.	.127	57.49	.594s
FE-59	776.90	194.34	37.	14.	.024	285.17	.350s
EU-152	977.97	244.67	4.	3.	.005	248.59	.940D
EU-154	991.43	248.04	6.	7.	.011	134.93	.943D
EU-152	1374.00	343.79	0.	8.	.013	70.71	.751s
EU-152	1445.67	361.73	0.	23.	.038	41.70	.375s
EU-152	1634.68	409.03	0.	31.	.052	35.92	.438s
EU-152	1773.00	443.64	0.	0.	.000	.00	.000s
Kr-85	2064.00	516.45	0.	10.	.017	63.25	.250s
EU-154	2362.00	591.01	0.	4.	.007	100.00	.250s
CS-137	2643.63	661.46	0.	12.	.020	57.74	.292s
-152	2752.23	688.63	2.	8.	.014	81.65	1.326D
-154	2767.70	692.50	1.	5.	.008	111.64	1.329D
EU-154	2877.00	719.84	0.	11.	.018	60.30	.250s
EU-154	2998.33	750.19	0.	44.	.073	30.15	.292s
EU-152	3126.00	782.12	0.	32.	.053	35.36	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 15:18:30 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010413.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
MN-54	3339.38	835.48	0.	22.	.037	42.64	.750s
EU-152	3466.50	867.27	0.	9.	.015	66.67	1.000s
EU-154	3491.33	873.48	0.	5.	.008	89.44	.375s
EU-152	3848.33	962.75	0.	21.	.035	43.64	.375s
EU-154	3978.00	995.17	0.	3.	.005	115.47	.250s
EU-154	4032.00	1008.67	0.	15.	.025	51.64	.250s
EU-152	4340.50	1085.80	1.	3.	.005	157.79	1.633D
EU-152	4356.58	1089.82	1.	3.	.005	145.61	1.636D
FE-59	4402.80	1101.37	0.	9.	.015	66.67	.375s
EU-152	4445.58	1112.07	5.	1.	.001	919.04	1.653D
ZN-65	4459.39	1115.52	5.	5.	.008	168.85	1.655D
CO-60	4681.67	1171.08	0.	9.	.015	66.67	.375s
EU-152	4825.00	1206.91	0.	10.	.017	63.25	.250s
EU-154	5101.00	1275.89	0.	5.	.008	89.44	.375s
FE-59	5170.38	1293.23	0.	11.	.018	60.30	.500s
EU-152	5194.00	1299.13	0.	7.	.012	75.59	.250s
CO-60	5327.00	1332.37	0.	11.	.018	60.30	.250s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5622.00	1406.09	0.	4.	.007	100.00	.250s
EU-154	6389.00	1597.71	0.	1.	.002	200.00	.250s

Peak fails shape tests.
Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	1.186E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	%	2.028E-04	
			1291.56	0.000E+00	%	3.187E-04	
			192.34	0.000E+00	&	1.621E-03	
			142.65	0.000E+00	%	6.027E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	1.999E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.414E-04	
			1173.23	0.000E+00	%	1.210E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	&	1.459E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.346E-04	
			8.13	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CD-109	0.0000E+00	88.04	0.000E+00	%	1.408E-03	
		25.50	0.000E+00	=	0.000E+00	
CS-137	0.0000E+00	661.62	0.000E+00	%	9.678E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.107E-04	
		688.63	0.000E+00	%	9.630E-03	
		367.71	0.000E+00	&	7.133E-03	
		344.30	0.000E+00	%	1.588E-04	
		1408.08	0.000E+00	%	5.604E-04	
		964.00	0.000E+00	%	8.993E-04	
		1112.07	0.000E+00	%	7.770E-04	
		778.90	5.759E-04	&	9.792E-04	
		1085.80	0.000E+00	%	9.319E-04	
		244.67	0.000E+00	%	4.188E-04	
		867.39	0.000E+00	%	2.267E-03	
		444.00	0.000E+00	?	1.294E-03	
		411.09	1.886E-03	&	3.273E-03	
		1089.82	0.000E+00	%	5.592E-03	
		1299.19	0.000E+00	%	7.265E-03	
		1212.89	0.000E+00	&	8.812E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	9.752E-05	
		1274.80	0.000E+00	%	3.206E-04	
		723.30	0.000E+00	&	4.367E-04	
		1004.80	0.000E+00	&	6.949E-04	
		873.20	0.000E+00	%	7.409E-04	
		996.30	0.000E+00	%	7.993E-04	
		248.04	0.000E+00	%	5.702E-04	
		591.70	0.000E+00	%	1.274E-03	
		756.70	2.451E-03	&	3.400E-03	
		1597.30	0.000E+00	%	6.676E-03	
		692.50	0.000E+00	%	4.361E-03	
		1397.80	0.000E+00	?	5.883E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.448E-04	
		105.31	0.000E+00	%	1.500E-04	
		60.01	0.000E+00	%	4.544E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.

) - Peak is too wide at FW25M, but ok at FWHM.
6 - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
) - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	4.3272E-07	0.000E+00	0.000E+00
FE-59	<	7.4021E-07	0.000E+00	0.000E+00
CO-57	<	7.2974E-07	0.000E+00	0.000E+00
CO-60	<	5.1588E-07	0.000E+00	0.000E+00
Kr-85	<	5.3248E-07	0.000E+00	0.000E+00
ZN-65	<	8.5635E-07	0.000E+00	0.000E+00
CD-109	<	5.1378E-06	0.000E+00	0.000E+00
CS-137	<	3.5320E-07	0.000E+00	0.000E+00
EU-152	<	4.0390E-07	0.000E+00	0.000E+00
-154	<	3.5593E-07	0.000E+00	0.000E+00
-155	<	5.2851E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 0.0000000E+00 uCi/g

Analyzed by: 7/19/01

OPERATOR

Reviewed by: Pla Gas 8/7/01

Supervisor

089

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 16:37:27 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010414.An1

nple description
E1400 #11 SN#255

Spectrum Filename: C:\User\00010414.An1

Acquisition information
Start time 19-Jul-2001 16:24:36
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 282.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.8200E+02)
= 3.5461E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 16:37:27 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010414.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
298.68	74.62	70.	97.	.162	31.64	.780	PB-214	D
308.94	77.19	55.	173.	.289	19.39	.782	PB-214	D
371.77	92.92	60.	124.	.207	34.84	1.425	TH-234	s
954.25	238.73	0.	366.	.611	10.45	.925	PB-212	
1405.92	351.78	4.	133.	.223	18.99	.997	PB-214	s
2434.33	609.11	0.	110.	.184	19.07	.885	BI-214	s
5841.20	1460.86	0.	160.	.267	15.81	1.124	K-40	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	234.62	58.58	60.	14.	.023	195.71	.562
EU-155	345.94	86.45	72.	35.	.059	75.71	.791D
CD-109	352.29	88.04	81.	21.	.036	126.65	.793D
EU-155	417.51	104.37	26.	27.	.044	98.69	.349s
EU-152	487.05	121.78	21.	9.	.015	164.80	.825D
EU-154	492.33	123.10	28.	9.	.015	175.67	.826D
CO-57	548.06	137.05	12.	85.	.141	41.78	.465s
FE-59	575.49	143.92	19.	45.	.075	59.07	1.381s
FE-59	768.89	192.33	7.	43.	.072	50.20	.364s
EU-152	977.97	244.67	0.	10.	.016	66.61	.940D
EU-154	991.43	248.04	11.	16.	.027	77.52	.943D
EU-152	1375.76	344.23	0.	33.	.055	34.82	.563s
EU-152	1460.78	365.51	2.	10.	.016	93.80	.306s
EU-152	1646.34	411.95	2.	17.	.029	60.82	.413s
EU-152	1778.63	445.05	0.	22.	.037	42.64	.375s
Kr-85	2053.67	513.87	3.	2.	.004	263.42	.179s
EU-154	2369.33	592.84	0.	11.	.018	60.30	.250s
CS-137	2643.13	661.34	0.	60.	.100	25.82	1.689s
EU-152	2752.23	688.63	7.	2.	.004	320.82	1.326D
EU-154	2767.70	692.50	9.	7.	.012	139.17	1.329D
EU-154	2880.00	720.59	0.	18.	.030	47.14	.250s
-154	2995.00	749.35	0.	23.	.038	41.70	.250s
-152	3112.00	778.62	0.	0.	.000	.00	.000s
MN-54	3321.75	831.07	0.	33.	.055	34.82	.313s
EU-152	3456.00	864.65	0.	19.	.032	45.88	.250s
EU-154	3488.00	872.65	0.	9.	.015	66.67	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 16:37:27 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010414.An1

:lide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
-152	3852.00	963.67	0.	12.	.020	57.74	.250s
EU-154	3980.00	995.67	0.	2.	.003	141.42	.250s
EU-154	4015.00	1004.42	0.	0.	.000	.00	.000s
EU-152	4340.50	1085.80	2.	5.	.008	122.46	1.633D
EU-152	4356.58	1089.82	1.	2.	.003	223.63	1.636D
FE-59	4389.00	1097.92	0.	7.	.012	75.59	.250s
EU-152	4445.58	1112.07	5.	5.	.009	148.14	1.653D
ZN-65	4459.39	1115.52	0.	3.	.004	144.43	1.655D
CO-60	4689.00	1172.92	0.	3.	.005	115.47	.250s
EU-152	4842.00	1211.16	0.	11.	.018	60.30	.250s
EU-154	5082.00	1271.14	0.	19.	.032	45.88	.250s
FE-59	5160.00	1290.64	0.	3.	.005	115.47	.250s
EU-152	5201.33	1300.97	0.	6.	.010	81.65	.250s
CO-60	5329.00	1332.87	0.	3.	.005	115.47	.250s
EU-154	5584.00	1396.59	0.	5.	.008	89.44	.250s
EU-152	5628.00	1407.59	0.	3.	.005	115.47	.250s
EU-154	6389.50	1597.84	0.	2.	.003	141.42	.500s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

JCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		8.1610E-05	834.81	8.161E-05	&(	6.183E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	1.912E-04	
			1291.56	0.000E+00	%	2.447E-04	
			192.34	0.000E+00	%	1.609E-03	
			142.65	0.000E+00	&	4.683E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	5.306E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.085E-04	
			1173.23	0.000E+00	%	9.779E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.250E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.847E-04	
			8.13	0.000E+00	=	0.000E+00	
C 09		0.0000E+00	88.04	0.000E+00	%	1.385E-03	
			25.50	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	1.4516E-04	661.62	1.452E-04	*(	6.049E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.194E-04	
		688.63	0.000E+00	%	9.379E-03	
		367.71	0.000E+00	&	5.865E-03	
		344.30	1.452E-04	*	2.420E-04	
		1408.08	0.000E+00	%	5.359E-04	
		964.00	0.000E+00	%	7.616E-04	
		1112.07	0.000E+00	%	8.747E-04	
		778.90	0.000E+00	?	4.499E-04	
		1085.80	0.000E+00	%	1.040E-03	
		244.67	0.000E+00	%	4.561E-04	
		867.39	0.000E+00	&	2.794E-03	
		444.00	0.000E+00	%	2.481E-03	
		411.09	0.000E+00	%	2.784E-03	
		1089.82	0.000E+00	%	5.347E-03	
		1299.19	0.000E+00	%	7.028E-03	
		1212.89	0.000E+00	%	9.034E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	9.312E-05	
		1274.80	0.000E+00	&	4.493E-04	
		723.30	0.000E+00	&	5.029E-04	
		1004.80	0.000E+00	?	4.077E-04	
		873.20	0.000E+00	%	8.422E-04	
		996.30	0.000E+00	%	7.596E-04	
		248.04	0.000E+00	%	7.154E-04	
		591.70	0.000E+00	%	1.586E-03	
		756.70	0.000E+00	&	2.710E-03	
		1597.30	0.000E+00	%	7.085E-03	
		692.50	0.000E+00	%	5.593E-03	
		1397.80	0.000E+00	%	7.685E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.631E-04	
		105.31	0.000E+00	%	1.900E-04	
		60.01	0.000E+00	&	4.382E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
› - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	#	2.8940E-07	1.008E-07	1.015E-07
FE-59	<	6.7810E-07	0.000E+00	0.000E+00
CO-57	<	1.8815E-06	0.000E+00	0.000E+00
CO-60	<	3.8483E-07	0.000E+00	0.000E+00
Kr-85	<	4.4324E-07	0.000E+00	0.000E+00
ZN-65	<	6.5487E-07	0.000E+00	0.000E+00
CD-109	<	4.9131E-06	0.000E+00	0.000E+00
CS-137	#	5.1477E-07	1.329E-07	1.346E-07
EU-152	<	4.2323E-07	0.000E+00	0.000E+00
EU-154	<	3.3022E-07	0.000E+00	0.000E+00
EU-155	<	5.7847E-07	0.000E+00	0.000E+00

t All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 8.0416700E-07 uCi/g

Analyzed by: _____ 7/19/01
OPERATOR

EG&G ORTEC G V - I (63) WAN32 I4W02.88 19-JUL-2001 16:37:27 Page 6
IT Lab @ Georgia Tech Research Spectrum name: 00010414.An1

Reviewed by: _____
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 08:18:57 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010416.An1

ıple description
E1400 #12 #256

Spectrum Filename: C:\User\00010416.An1

Acquisition information
Start time 20-Jul-2001 08:08:56
Live time 599
Real time 600
Dead time .15%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 286.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.8600E+02)
= 3.4965E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 08:18:57 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010416.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
300.60	75.10	103.	132.	.221	27.82	.780	PB-214	D
309.33	77.29	92.	214.	.357	18.67	.782	PB-214	D
373.04	93.24	63.	163.	.273	26.73	1.193	U-235	sM
954.08	238.69	58.	343.	.573	18.73	.893	PB-212	M
1180.02	295.24	11.	130.	.218	26.62	.997	PB-214	M
1352.14	338.32	10.	77.	.128	30.56	.708	AC-228	sM
1406.75	351.99	10.	162.	.270	21.81	.522	PB-214	sM
2330.62	583.16	0.	97.	.162	20.31	.819	TL-208	s
2435.27	609.34	0.	163.	.272	15.67	1.073	BI-214	
5840.33	1460.64	0.	208.	.347	13.87	1.235	K-40	s

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	253.35	63.27	125.	176.	.294	45.22	.795s
EU-155	345.94	86.45	71.	19.	.031	136.29	.791D
CD-109	352.29	88.04	84.	31.	.051	91.61	.793D
EU-155	420.62	105.15	152.	14.	.023	629.11	.297s
EU-152	487.05	121.78	23.	5.	.008	296.53	.825D
EU-154	492.33	123.10	34.	13.	.022	135.03	.826D
CO-57	554.31	138.62	22.	101.	.169	37.45	.537s
FE-59	566.82	141.75	19.	33.	.055	61.88	.650
FE-59	766.53	191.74	16.	18.	.031	100.80	.668
EU-152	977.97	244.67	10.	3.	.005	310.93	.940D
EU-154	991.43	248.04	17.	3.	.004	473.41	.943D
EU-152	1375.50	344.17	2.	0.	.000	282.84	.292s
EU-152	1470.00	367.82	2.	0.	.000	282.84	.000s
EU-152	1641.00	410.61	0.	1.	.002	200.00	.125s
EU-152	1779.44	445.25	0.	31.	.052	35.92	.375s
Kr-85	2069.50	517.83	0.	31.	.052	35.92	.250s
EU-154	2373.20	593.81	0.	10.	.017	63.25	.250s
CS-137	2628.00	657.55	0.	23.	.038	41.70	.334s
-152	2752.23	688.63	2.	6.	.010	103.79	1.326D
-154	2767.70	692.50	5.	6.	.010	135.20	1.329D
EU-154	2865.00	716.84	0.	20.	.033	44.72	.250s
EU-154	3029.75	758.04	0.	22.	.037	42.64	.500s
EU-152	3126.44	782.23	0.	13.	.022	55.47	.563s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 08:18:57 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010416.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
MN-54	3337.11	834.92	0.	25.	.042	40.00	.500s
EU-152	3460.00	865.65	0.	6.	.010	81.65	1.250
EU-154	3493.25	873.96	0.	28.	.047	37.80	.313s
EU-152	3874.11	969.20	0.	66.	.110	24.62	1.084s
EU-154	3977.00	994.92	0.	8.	.013	70.71	.250s
EU-154	4015.00	1004.42	0.	0.	.000	.00	.000s
EU-152	4340.50	1085.80	1.	1.	.001	556.99	1.633D
EU-152	4356.58	1089.82	4.	6.	.010	128.70	1.636D
FE-59	4404.00	1101.67	0.	16.	.027	50.00	.250s
EU-152	4445.58	1112.07	1.	3.	.005	164.45	1.653D
ZN-65	4459.39	1115.52	3.	7.	.012	99.41	1.655D
CO-60	4667.33	1167.50	0.	20.	.033	44.72	.250s
EU-152	4842.50	1211.28	0.	39.	.065	32.03	.312s
EU-154	5088.00	1272.64	0.	5.	.008	89.44	.250s
FE-59	5156.00	1289.64	0.	3.	.005	115.47	.250s
EU-152	5179.00	1295.38	0.	14.	.023	53.45	.250s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5574.50	1394.22	0.	6.	.010	81.65	.500s
EU-152	5624.75	1406.77	0.	7.	.012	75.59	.375s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

Peak fails shape tests.
Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	1.237E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	%	2.373E-04	
			1291.56	0.000E+00	%	2.447E-04	
			192.34	0.000E+00	%	1.397E-03	
			142.65	0.000E+00	%	4.323E-03	
CO-57		6.4630E-04	136.43	6.463E-04	&(	3.038E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.045E-05	
			1173.23	0.000E+00	&	1.516E-04	
Kr-85		1.1867E-04	513.99	1.187E-04	&(	9.570E-05	
Zn-65		0.0000E+00	1115.52	0.000E+00	%	2.347E-04	
			8.13	0.000E+00	=	0.000E+00	

:lide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CD-109	0.0000E+00	88.04	0.000E+00	%	1.457E-03	
		25.50	0.000E+00	=	0.000E+00	
CS-137	0.0000E+00	661.62	0.000E+00	&	1.177E-04	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.166E-04	
		688.63	0.000E+00	%	9.118E-03	
		367.71	0.000E+00	%	4.181E-03	
		344.30	0.000E+00	%	1.255E-04	
		1408.08	0.000E+00	%	6.253E-04	
		964.00	1.257E-03	&	1.358E-03	
		1112.07	0.000E+00	%	7.200E-04	
		778.90	0.000E+00	&	7.361E-04	
		1085.80	0.000E+00	%	8.468E-04	
		244.67	0.000E+00	%	4.894E-04	
		867.39	0.000E+00	%	2.068E-03	
		444.00	1.605E-03	?	2.785E-03	
		411.09	0.000E+00	%	1.634E-03	
		1089.82	0.000E+00	%	6.794E-03	
		1299.19	0.000E+00	&	8.669E-03	
		1212.89	9.017E-03	?	1.350E-02	
EU-154	0.0000E+00	123.10	0.000E+00	%	1.017E-04	
		1274.80	0.000E+00	%	3.207E-04	
		723.30	0.000E+00	&	5.198E-04	
		1004.80	0.000E+00	?	4.078E-04	
		873.20	6.353E-04	?	1.179E-03	
		996.30	0.000E+00	%	9.616E-04	
		248.04	0.000E+00	%	6.485E-04	
		591.70	0.000E+00	&	1.548E-03	
		756.70	0.000E+00	%	2.671E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	5.033E-03	
		1397.80	0.000E+00	&	7.969E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.519E-04	
		105.31	0.000E+00	%	3.053E-04	
		60.01	0.000E+00	&	7.979E-03	

(- This peak used in the nuclide activity average.

% - Peak is too wide, but only one peak in library.
& - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.

? - Peak is too wide at FW25M, but ok at FWHM.
6 - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
› - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g	
MN-54	<	4.3241E-07	0.000E+00	0.000E+00	
FE-59	<	8.2964E-07	0.000E+00	0.000E+00	
CO-57	#	2.2598E-06	8.464E-07	8.522E-07	
CO-60	<	3.1625E-07	0.000E+00	0.000E+00	
~~Kr-85~~	~~#~~	~~< 4.1494E-7 4.1494E-07~~	~~1.491E-07~~	~~1.496E-07~~	Not Present upon visual inspection of spectrum. Software misidentified. Peak has bad shape at 517 KeV. P. Gores 8/7/01
ZN-65	<	8.2053E-07	0.000E+00	0.000E+00	
CD-109	<	5.0931E-06	0.000E+00	0.000E+00	
CS-137	<	4.1154E-07	0.000E+00	0.000E+00	
EU-152	<	4.0757E-07	0.000E+00	0.000E+00	
-154	<	3.5560E-07	0.000E+00	0.000E+00	
-155	<	5.3120E-07	0.000E+00	0.000E+00	

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 08:18:57 Page 6
IT Lab @ Georgia Tech Research Spectrum name: 00010416.An1

---------- S U M M A R Y ----------

TAL ACTIVITY (49.9 to 2000.0 keV) 2.6747470E-06 uCi/g

Analyzed by: 7/20/01
OPERATOR

Reviewed by: 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 08:31:15 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010417.An1

ıple description
E1400 #13 #257

Spectrum Filename: C:\User\00010417.An1

Acquisition information
Start time 20-Jul-2001 08:21:14
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 264.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.6400E+02)
= 3.7879E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 08:31:15 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010417.An1

ergy calibration normalized difference: .0341

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
372.78	93.17	57.	117.	.195	32.87	.976	U-235	s
954.59	238.82	0.	288.	.481	11.79	.905	PB-212	s
1180.13	295.27	11.	76.	.126	37.76	.914	PB-214	
1406.53	351.93	0.	144.	.240	16.67	1.059	PB-214	s
2331.21	583.31	0.	86.	.144	21.57	.751	TL-208	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
[illegible]-155	238.61	59.58	62.	30.	.050	131.92	.290s
[illegible]-155	345.94	86.45	49.	26.	.044	84.82	.791D
CD-109	352.29	88.04	66.	31.	.052	82.70	.793D
EU-155	429.71	107.42	21.	50.	.083	65.79	.420s
EU-152	483.30	120.84	17.	8.	.013	186.30	.272s
EU-154	492.33	123.10	14.	0.	.000	.00	.826
CO-57	543.67	135.95	27.	16.	.027	154.19	.438s
FE-59	570.17	142.59	36.	23.	.038	110.50	.470s
FE-59	780.03	195.12	13.	71.	.118	51.98	.417s
EU-152	977.97	244.67	7.	0.	.000	.00	.940
EU-154	987.18	246.98	8.	6.	.010	157.21	.480s
EU-152	1377.00	344.54	0.	4.	.007	100.00	.501s
EU-152	1464.45	366.43	0.	24.	.040	40.82	.375s
EU-152	1633.06	408.62	0.	45.	.075	29.81	.313s
EU-152	1777.69	444.81	0.	38.	.063	32.44	.563s
Kr-85	2053.00	513.70	0.	0.	.000	.00	.000s
EU-154	2359.00	590.26	0.	19.	.032	45.88	.375s
CS-137	2644.08	661.58	0.	56.	.093	26.73	.438s
EU-152	2712.25	678.63	0.	27.	.045	38.49	.375s
EU-154	2767.70	692.50	0.	0.	.000	.00	.250D
EU-154	2889.00	722.84	0.	0.	.000	.00	.000s
EU-154	3023.00	756.36	0.	0.	.000	.00	.000s
EU-152	3112.00	778.62	0.	0.	.000	.00	.000s
[illegible]-54	3335.33	834.47	0.	12.	.020	57.74	.375s
[illegible]-152	3470.00	868.15	0.	7.	.012	75.59	.250s
EU-154	3489.00	872.90	0.	0.	.000	.00	.000s
EU-152	3856.38	964.76	0.	16.	.027	50.00	.333s
EU-154	3985.75	997.11	0.	12.	.020	57.74	.375s

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
[illegible]-154	4012.00	1003.67	0.	4.	.007	100.00	.250s
EU-152	4340.50	1085.80	5.	2.	.004	300.86	1.633D
EU-152	4356.58	1089.82	3.	1.	.002	401.30	1.636D
FE-59	4387.80	1097.62	0.	12.	.020	57.74	.375s
EU-152	4445.58	1112.07	5.	7.	.012	115.66	1.653D
ZN-65	4459.39	1115.52	4.	7.	.012	103.11	1.655D
CO-60	4667.00	1167.42	0.	14.	.023	53.45	.750s
EU-152	4858.50	1215.28	0.	23.	.038	41.70	.625s
EU-154	5090.00	1273.14	0.	8.	.013	70.71	.250s
FE-59	5163.00	1291.39	0.	1.	.002	200.00	.250s
EU-152	5196.75	1299.82	0.	11.	.018	60.30	.375s
CO-60	5325.00	1331.87	0.	1.	.002	200.00	.250s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5632.33	1408.67	0.	7.	.012	75.59	.375s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	9.892E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	2.185E-04	
			1291.56	0.000E+00	%	2.191E-04	
			192.34	0.000E+00	&	1.972E-03	
			142.65	0.000E+00	%	4.537E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	3.857E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	9.717E-05	
			1173.23	0.000E+00	&	1.361E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	?(	9.569E-05	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.405E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.357E-03	
			25.50	0.000E+00	=	0.000E+00	
C[illegible]-137		1.3549E-04	661.62	1.355E-04	(	6.049E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.122E-04	
		688.63	6.821E-03	&	1.296E-02	
		367.71	0.000E+00	%	7.233E-03	
		344.30	0.000E+00	%	1.381E-04	
		1408.08	0.000E+00	%	6.252E-04	
		964.00	0.000E+00	%	8.268E-04	
		1112.07	0.000E+00	%	9.179E-04	
		778.90	0.000E+00	?	4.499E-04	
		1085.80	0.000E+00	%	1.040E-03	
		244.67	0.000E+00		4.136E-04	
		867.39	0.000E+00	%	2.137E-03	
		444.00	1.967E-03	?	2.994E-03	
		411.09	2.737E-03	&	3.744E-03	
		1089.82	0.000E+00	%	5.592E-03	
		1299.19	0.000E+00	%	8.111E-03	
		1212.89	0.000E+00	%	1.125E-02	
EU-154	0.0000E+00	123.10	0.000E+00	(	6.788E-05	
		1274.80	0.000E+00	%	3.543E-04	
		723.30	0.000E+00	?(	2.794E-04	
		1004.80	0.000E+00	%	5.117E-04	
		873.20	0.000E+00	?(	5.672E-04	
		996.30	0.000E+00	%	1.066E-03	
		248.04	0.000E+00	%	5.823E-04	
		591.70	0.000E+00	%	1.858E-03	
		756.70	0.000E+00	?(	1.393E-03	
		1597.30	0.000E+00	?(	6.213E-03	
		692.50	0.000E+00	?(	3.220E-03	
		1397.80	0.000E+00	?(	5.883E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.411E-04	
		105.31	0.000E+00	&	2.145E-04	
		60.01	0.000E+00	%	4.785E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.

c - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.7470E-07	0.000E+00	0.000E+00
FE-59	<	8.2781E-07	0.000E+00	0.000E+00
CO-57	<	1.4610E-06	0.000E+00	0.000E+00
CO-60	<	3.6806E-07	0.000E+00	0.000E+00
Kr-85	<	3.6247E-07	0.000E+00	0.000E+00
ZN-65	<	9.1113E-07	0.000E+00	0.000E+00
CD-109	<	5.1403E-06	0.000E+00	0.000E+00
CS-137		5.1321E-07	1.372E-07	1.388E-07
EU-152	<	4.2491E-07	0.000E+00	0.000E+00
EU-154	<	2.5712E-07	0.000E+00	0.000E+00
EU-155	<	5.3450E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 5.1320950E-07 uCi/g

Analyzed by: _____ 7/20/01
OPERATOR

Reviewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 10:03:35 Page 1
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ıple description
E1400 #14 SN258

Spectrum Filename: C:\User\00010453.An1

Acquisition information
Start time 15-Aug-2001 09:53:33
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 308.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.0800E+02)
= 3.2468E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

ᴗorrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 10:03:35 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010453.An1

rgy calibration normalized difference: .6303

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
300.78	75.15	52.	75.	.126	35.54	.780	PB-214	D
310.08	77.47	47.	142.	.238	21.55	.782	PB-214	D
955.63	239.08	25.	314.	.523	19.28	1.024	PB-212	sM
1181.13	295.52	0.	102.	.170	19.80	.993	PB-214	sM
1408.41	352.40	0.	139.	.232	16.96	1.053	PB-214	sM
2332.99	583.75	0.	105.	.175	19.52	.590	TL-208	s
2438.09	610.05	0.	119.	.199	18.33	.935	RU-103	s

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	239.44	59.79	26.	35.	.058	91.89	.322s
EU-155	345.94	86.45	41.	4.	.006	498.21	.791D
CD-109	352.29	88.04	46.	43.	.071	54.74	.793D
EU-155	413.90	103.46	28.	35.	.058	86.85	.599s
EU-152	487.05	121.78	23.	6.	.010	238.85	.825D
EU-154	492.33	123.10	14.	6.	.010	201.84	.826D
CO-57	558.95	139.78	20.	44.	.073	76.60	.429s
FE-59	569.80	142.50	7.	6.	.010	157.53	.200s
FE-59	768.72	192.29	0.	18.	.030	47.14	.334s
EU-152	977.97	244.67	12.	4.	.006	278.73	.940D
EU-154	991.43	248.04	14.	11.	.018	116.38	.943D
EU-152	1378.33	344.88	0.	6.	.010	81.65	.375s
EU-152	1476.32	369.40	0.	24.	.040	40.82	.501s
EU-152	1645.00	411.61	0.	5.	.008	89.44	.250s
EU-152	1779.58	445.29	0.	29.	.048	37.14	.417s
Kr-85	2054.00	513.95	1.	0.	.000	200.00	.000s
EU-154	2362.75	591.20	0.	30.	.050	36.51	.313s
CS-137	2647.54	662.44	0.	68.	.113	24.25	.750s
EU-152	2752.23	688.63	4.	4.	.006	196.55	1.326D
EU-154	2767.70	692.50	7.	6.	.010	149.67	1.329D
EU-154	2889.00	722.84	0.	0.	.000	.00	.000s
154	3019.25	755.42	0.	19.	.032	45.88	.292s
152	3105.25	776.93	0.	8.	.013	70.71	.313s
MN-54	3345.33	836.97	0.	8.	.013	70.71	.250s
EU-152	3471.00	868.40	0.	7.	.012	75.59	.250s
EU-154	3489.00	872.90	0.	0.	.000	.00	.000s

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3854.00	964.17	1.	0.	.000	219.85	.189s
EU-154	3978.00	995.17	0.	6.	.010	81.65	.750s
EU-154	4015.00	1004.42	0.	0.	.000	.00	.000s
EU-152	4340.50	1085.80	2.	2.	.004	200.73	1.633D
EU-152	4356.58	1089.82	1.	2.	.004	181.96	1.636D
FE-59	4392.00	1098.67	0.	6.	.010	81.65	.250s
EU-152	4445.58	1112.07	3.	3.	.005	216.80	1.653D
ZN-65	4459.39	1115.52	2.	1.	.001	603.80	1.655D
CO-60	4689.00	1172.92	0.	4.	.007	100.00	.250s
EU-152	4847.00	1212.41	0.	0.	.000	.00	.000s
EU-154	5099.00	1275.39	0.	2.	.003	141.42	.250s
FE-59	5162.00	1291.14	0.	0.	.000	.00	.000s
EU-152	5192.00	1298.63	0.	1.	.002	200.00	.250s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5590.00	1398.09	0.	4.	.007	100.00	.250s
EU-152	5608.00	1402.59	0.	17.	.028	48.51	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

NUCLIDE NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	8.925E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	1.850E-04	
			1291.56	0.000E+00	?	2.039E-04	
			192.34	0.000E+00	%	1.131E-03	
			142.65	0.000E+00	%	2.719E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	4.489E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.044E-05	
			1173.23	0.000E+00	%	1.023E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.028E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.847E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.310E-03	
			25.50	0.000E+00	=	0.000E+00	

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Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	1.6453E-04	661.62	1.645E-04	(	6.049E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.180E-04	
		688.63	0.000E+00	%	9.117E-03	
		367.71	0.000E+00	&	7.234E-03	
		344.30	0.000E+00	%	1.490E-04	
		1408.08	0.000E+00	&	7.900E-04	
		964.00	0.000E+00	%	5.115E-04	
		1112.07	0.000E+00	%	7.770E-04	
		778.90	0.000E+00	%	6.495E-04	
		1085.80	0.000E+00	%	9.319E-04	
		244.67	0.000E+00	%	5.196E-04	
		867.39	0.000E+00	%	2.137E-03	
		444.00	1.501E-03		2.721E-03	
		411.09	0.000E+00	%	1.987E-03	
		1089.82	0.000E+00	%	5.347E-03	
		1299.19	0.000E+00	%	5.576E-03	
		1212.89	0.000E+00	?	5.780E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.559E-05	
		1274.80	0.000E+00	%	2.799E-04	
		723.30	0.000E+00	?	2.794E-04	
		1004.80	0.000E+00	?	4.078E-04	
		873.20	0.000E+00	?	5.672E-04	
		996.30	0.000E+00	%	9.022E-04	
		248.04	0.000E+00	%	6.972E-04	
		591.70	1.218E-03	?	2.160E-03	
		756.70	0.000E+00	%	2.549E-03	
		1597.30	0.000E+00	?	6.213E-03	
		692.50	0.000E+00	%	5.267E-03	
		1397.80	0.000E+00	%	7.384E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.158E-04	
		105.31	0.000E+00	&	2.046E-04	
		60.01	0.000E+00	%	4.034E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
^ - Peak is too narrow.
& - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
- Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	2.8976E-07	0.000E+00	0.000E+00
FE-59	<	6.0067E-07	0.000E+00	0.000E+00
CO-57	<	1.4575E-06	0.000E+00	0.000E+00
CO-60	<	2.9364E-07	0.000E+00	0.000E+00
Kr-85	<	3.3384E-07	0.000E+00	0.000E+00
ZN-65	<	5.9962E-07	0.000E+00	0.000E+00
CD-109	<	4.2535E-06	0.000E+00	0.000E+00
CS-137		5.3419E-07	1.296E-07	1.314E-07
EU-152	<	3.8302E-07	0.000E+00	0.000E+00
EU-154	<	2.4543E-07	0.000E+00	0.000E+00
EU-155	<	3.7603E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 5.3419250E-07 uCi/g

Analyzed by: 8/15/01
OPERATOR

Reviewed by: 8/17/01

Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:13:13 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010420.An1

mple description
E1400 #15 #259

Spectrum Filename: C:\User\00010420.An1

Acquisition information
Start time 20-Jul-2001 10:03:11
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 290.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.9000E+02)
= 3.4483E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

ctions

	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:13:13 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010420.An1

ergy calibration normalized difference: .0161

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
300.47	75.07	65.	98.	.164	30.83	.780	PB-214	D
309.49	77.33	49.	193.	.322	17.69	.782	PB-214	D
369.37	92.32	68.	215.	.359	34.44	.561	NP-237	s
954.99	238.92	22.	280.	.468	15.44	.997	PB-212	
1180.51	295.36	0.	180.	.300	14.91	.826	PB-214	s
1406.06	351.81	0.	142.	.237	16.78	1.046	PB-214	

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	239.48	59.80	25.	3.	.005	440.78	.247s
[illegible]155	345.94	86.45	57.	14.	.024	156.44	.791D
CD-109	352.29	88.04	82.	25.	.042	109.12	.793D
EU-155	420.79	105.19	36.	44.	.073	82.82	.353s
EU-152	487.05	121.78	8.	5.	.009	166.03	.825D
EU-154	492.33	123.10	21.	2.	.004	547.18	.826D
CO-57	545.00	136.29	3.	0.	.000	346.41	.000s
FE-59	571.33	142.88	63.	72.	.120	82.50	.295s
FE-59	768.00	192.11	5.	0.	.000	.00	.000s
EU-152	977.97	244.67	14.	3.	.006	316.34	.940D
EU-154	991.43	248.04	10.	0.	.000	7647.58	.943D
EU-152	1387.15	347.08	6.	17.	.028	99.13	.245s
EU-152	1468.00	367.32	0.	1.	.002	200.00	.125s
EU-152	1637.39	409.71	0.	50.	.083	28.28	.751s
EU-152	1774.00	443.89	1.	0.	.000	200.00	.000s
Kr-85	2064.10	516.48	0.	24.	.040	40.82	.334s
EU-154	2387.50	597.39	0.	37.	.062	32.88	.250s
CS-137	2644.34	661.64	0.	77.	.129	22.79	.384s
EU-152	2752.23	688.63	6.	3.	.005	255.46	1.326D
EU-154	2767.70	692.50	4.	1.	.002	391.99	1.329D
EU-154	2875.17	719.38	0.	21.	.035	43.64	.375s
EU-154	2989.00	747.85	0.	25.	.042	40.00	.250s
EU-152	3139.20	785.42	0.	23.	.038	41.70	.292s
[illegible]4	3337.33	834.97	1.	0.	.001	221.11	.197s
[illegible]52	3465.00	866.90	0.	0.	.000	.00	.000s
EU-154	3487.50	872.52	0.	3.	.005	115.47	.500s
EU-152	3852.50	963.79	0.	7.	.012	75.59	.250s
EU-154	3979.33	995.51	0.	16.	.027	50.00	.375s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:13:13 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010420.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
[illegible]-154	4015.00	1004.42	0.	0.	.000	.00	.000s
EU-152	4340.50	1085.80	2.	0.	.000	1829.78	1.633D
EU-152	4356.58	1089.82	3.	2.	.003	318.53	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	3.	5.	.008	133.26	1.653D
ZN-65	4459.39	1115.52	5.	5.	.009	142.27	1.655D
CO-60	4689.00	1172.92	0.	0.	.000	.00	.000s
EU-152	4836.00	1209.66	0.	9.	.015	66.67	.250s
EU-154	5088.00	1272.64	0.	6.	.010	81.65	.250s
FE-59	5163.67	1291.55	2.	1.	.002	427.14	.175s
EU-152	5194.00	1299.13	0.	3.	.005	115.47	.250s
CO-60	5323.00	1331.37	0.	3.	.005	115.47	.250s
EU-154	5592.20	1398.64	0.	5.	.008	89.44	.312s
EU-152	5629.33	1407.92	0.	7.	.012	75.59	.375s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	PEAK CODE	PEAK MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	6.643E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.447E-04	
			192.34	0.000E+00	%	8.507E-04	
			142.65	0.000E+00	%	6.357E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	1.912E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.085E-04	
			1173.23	0.000E+00	?	8.150E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	&	1.888E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.346E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.413E-03	
			25.50	0.000E+00	=	0.000E+00	
[illegible]7		1.8630E-04	661.62	1.863E-04	(	6.049E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:13:13 Page 4
IT Lab @ Georgia Tech Research Spectrum name: 00010420.An1

clide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	9.175E-05	
		688.63	0.000E+00	%	9.379E-03	
		367.71	0.000E+00	%	3.939E-03	
		344.30	0.000E+00	&	2.141E-04	
		1408.08	0.000E+00	%	6.252E-04	
		964.00	0.000E+00	%	6.664E-04	
		1112.07	0.000E+00	%	8.280E-04	
		778.90	0.000E+00	&	8.755E-04	
		1085.80	0.000E+00	%	8.467E-04	
		244.67	0.000E+00	%	5.291E-04	
		867.39	0.000E+00	?	1.527E-03	
		444.00	0.000E+00	%	1.390E-03	
		411.09	3.042E-03	*	3.896E-03	
		1089.82	0.000E+00	%	5.820E-03	
		1299.19	0.000E+00	%	6.227E-03	
		1212.89	0.000E+00	&	8.582E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.906E-05	
		1274.80	0.000E+00	%	3.325E-04	
		723.30	0.000E+00	&	5.279E-04	
		1004.80	0.000E+00	?	4.077E-04	
		873.20	0.000E+00	%	6.806E-04	
		996.30	0.000E+00	%	1.157E-03	
		248.04	0.000E+00	%	5.315E-04	
		591.70	1.502E-03	&	2.326E-03	
		756.70	0.000E+00	&	2.785E-03	
		1597.30	0.000E+00	?	6.213E-03	
		692.50	0.000E+00	%	4.206E-03	
		1397.80	0.000E+00	%	7.685E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.381E-04	
		105.31	0.000E+00	%	2.250E-04	
		60.01	0.000E+00	%	3.051E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.

c - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	2.2907E-07	0.000E+00	0.000E+00
FE-59	<	4.7099E-07	0.000E+00	0.000E+00
CO-57	<	6.5927E-07	0.000E+00	0.000E+00
CO-60	<	3.7421E-07	0.000E+00	0.000E+00
Kr-85	<	6.5106E-07	0.000E+00	0.000E+00
ZN-65	<	8.0911E-07	0.000E+00	0.000E+00
CD-109	<	4.8733E-06	0.000E+00	0.000E+00
CS-137		6.4240E-07	1.464E-07	1.488E-07
EU-152	<	3.1638E-07	0.000E+00	0.000E+00
EU-154	<	2.7263E-07	0.000E+00	0.000E+00
EU-155	<	4.7606E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 6.4239670E-07 uCi/g

Analyzed by: _____ 7/20/01
OPERATOR

Reviewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:50:16 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010421.An1

nple description
E1400 #16 #260

Spectrum Filename: C:\User\00010421.An1

Acquisition information
Start time 20-Jul-2001 10:40:14
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 326.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.2600E+02)
= 3.0675E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:50:16 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010421.An1

ergy calibration normalized difference: .2430

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
743.82	186.06	11.	61.	.101	34.98	.404	PA-234	s
954.04	238.68	14.	337.	.562	13.83	.796	PB-212	s
1179.95	295.22	0.	78.	.130	22.65	1.001	PB-214	s
1406.89	352.02	0.	138.	.230	17.03	.934	PB-214	
2330.06	583.02	0.	85.	.142	21.69	.478	TL-208	s
2435.83	609.48	0.	82.	.137	22.09	.658	BI-214	s
3641.21	910.96	0.	81.	.135	22.22	.708	AC-228	s
3873.31	969.00	0.	30.	.050	37.12	1.547	AC-228	D

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	236.43	59.03	63.	81.	.135	64.66	.575s
EU-155	345.94	86.45	58.	33.	.054	75.14	.791D
CD-109	352.29	88.04	60.	43.	.072	59.20	.793D
EU-155	414.61	103.64	39.	7.	.012	318.16	.350s
EU-152	487.05	121.78	19.	4.	.007	312.92	.825D
EU-154	492.33	123.10	25.	5.	.009	289.29	.826D
CO-57	546.59	136.68	24.	53.	.088	69.68	.306s
FE-59	574.71	143.72	14.	30.	.050	75.42	.505s
FE-59	743.62	186.01	117.	54.	.090	168.54	.379s
EU-152	977.97	244.67	4.	0.	.000	.00	.940
EU-154	993.68	248.60	0.	66.	.110	24.62	.542s
EU-152	1377.50	344.67	0.	30.	.050	36.51	.313s
EU-152	1483.80	371.27	9.	28.	.046	90.96	.467s
EU-152	1636.60	409.51	5.	21.	.034	67.82	.608s
EU-152	1803.10	451.17	0.	51.	.085	28.01	.563s
Kr-85	2052.00	513.45	0.	5.	.008	89.44	.250s
EU-154	2363.00	591.26	0.	0.	.000	.00	.000s
CS-137	2645.52	661.94	0.	56.	.093	26.73	.750s
EU-152	2752.23	688.63	7.	3.	.006	235.20	1.326D
EU-154	2767.70	692.50	3.	6.	.011	107.60	1.329D
EU-154	2884.67	721.76	0.	13.	.022	55.47	.375s
EU-154	3024.43	756.71	0.	17.	.028	48.51	.500s
EU-152	3112.00	778.62	0.	0.	.000	.00	.000s
MN-54	3313.29	828.96	0.	33.	.055	34.82	.313s
EU-152	3465.00	866.90	0.	0.	.000	.00	.000s
EU-154	3488.00	872.65	0.	3.	.005	115.47	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:50:16 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010421.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3853.33	964.00	10.	6.	.010	180.19	1.543D
EU-154	3962.86	991.39	0.	26.	.043	39.22	.375s
EU-154	4021.50	1006.05	0.	9.	.015	66.67	.250s
EU-152	4340.50	1085.80	2.	0.	.001	1015.47	1.633D
EU-152	4356.58	1089.82	1.	2.	.004	167.07	1.636D
FE-59	4385.33	1097.01	0.	13.	.022	55.47	.375s
EU-152	4445.58	1112.07	3.	4.	.006	164.01	1.653D
ZN-65	4459.39	1115.52	5.	6.	.011	122.42	1.655D
CO-60	4689.00	1172.92	0.	3.	.005	115.47	.250s
EU-152	4837.67	1210.08	0.	16.	.027	50.00	.313s
EU-154	5096.00	1274.64	0.	1.	.002	200.00	.250s
FE-59	5163.00	1291.39	0.	1.	.002	200.00	.250s
EU-152	5193.00	1298.88	0.	0.	.000	.00	.000s
CO-60	5329.00	1332.87	0.	4.	.007	100.00	.250s
EU-154	5591.50	1398.47	0.	2.	.003	141.42	.500s
EU-152	5619.00	1405.34	0.	10.	.017	63.25	.250s
EU-154	6389.00	1597.71	0.	2.	.003	141.42	.250s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

NUCLIDE NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		8.1616E-05	834.81	8.162E-05	&(	6.183E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	2.234E-04	
			1291.56	0.000E+00	%	2.191E-04	
			192.34	0.000E+00	&	2.658E-03	
			142.65	0.000E+00	%	4.059E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	4.831E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.135E-04	
			1173.23	0.000E+00	%	9.780E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.250E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.406E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.391E-03	
			25.50	0.000E+00	=	0.000E+00	

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:50:16 Page 4
IT Lab @ Georgia Tech Research Spectrum name: 00010421.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	1.3550E-04	661.62	1.355E-04	(	6.049E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.091E-04	
		688.63	0.000E+00	%	9.631E-03	
		367.71	0.000E+00	&	8.402E-03	
		344.30	1.320E-04	?	2.341E-04	
		1408.08	0.000E+00	%	6.809E-04	
		964.00	0.000E+00	%	8.269E-04	
		1112.07	0.000E+00	%	8.032E-04	
		778.90	0.000E+00	?	4.500E-04	
		1085.80	0.000E+00	%	8.468E-04	
		244.67	0.000E+00		3.811E-04	
		867.39	0.000E+00	?	1.527E-03	
		444.00	2.640E-03	&	3.339E-03	
		411.09	0.000E+00	%	3.082E-03	
		1089.82	0.000E+00	%	5.347E-03	
		1299.19	0.000E+00	?	5.189E-03	
		1212.89	0.000E+00	&	1.004E-02	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.647E-05	
		1274.80	0.000E+00	%	2.638E-04	
		723.30	0.000E+00	%	4.571E-04	
		1004.80	0.000E+00	%	6.055E-04	
		873.20	0.000E+00	%	6.807E-04	
		996.30	6.928E-04	&	1.350E-03	
		248.04	9.203E-04	*	9.940E-04	
		591.70	0.000E+00	?	1.015E-03	
		756.70	0.000E+00	%	2.463E-03	
		1597.30	0.000E+00	%	7.085E-03	
		692.50	0.000E+00	%	4.781E-03	
		1397.80	0.000E+00	%	6.709E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.526E-04	
		105.31	0.000E+00	&	1.814E-04	
		60.01	0.000E+00	%	5.773E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
- Peak is too narrow.
- Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
- - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
- Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	#	2.5035E-07	8.716E-08	8.777E-08
FE-59	<	6.8541E-07	0.000E+00	0.000E+00
CO-57	<	1.4818E-06	0.000E+00	0.000E+00
CO-60	<	3.4816E-07	0.000E+00	0.000E+00
Kr-85	<	3.8344E-07	0.000E+00	0.000E+00
ZN-65	<	7.3789E-07	0.000E+00	0.000E+00
CD-109	<	4.2674E-06	0.000E+00	0.000E+00
CS-137		4.1563E-07	1.111E-07	1.124E-07
EU-152	<	3.3478E-07	0.000E+00	0.000E+00
EU-154	<	2.6525E-07	0.000E+00	0.000E+00
EU-155	<	4.6810E-07	0.000E+00	0.000E+00

All peaks for activity calculation had bad shape.
Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 6.6598750E-07 uCi/g

Analyzed by: _____ OPERATOR 7/20/01

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 10:50:16 Page 6
IT Lab @ Georgia Tech Research Spectrum name: 00010421.An1

Reviewed by: Paul Jones 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:02:47 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010422.An1

mple description
E1400 #17 #261

Spectrum Filename: C:\User\00010422.An1

Acquisition information
Start time 20-Jul-2001 10:52:45
Live time 599
Real time 600
Dead time .16%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 336.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.3600E+02)
= 2.9762E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:02:47 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010422.An1

ergy calibration normalized difference: .1076

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
300.26	75.01	70.	152.	.254	22.44	.780	PB-214	D
309.50	77.33	51.	283.	.473	13.86	.782	PB-214	D
372.36	93.07	76.	200.	.334	28.43	1.153	TH-234	sM
953.92	238.65	29.	290.	.484	12.87	.934	PB-212	D
967.22	241.98	34.	66.	.110	35.22	.937	PB-214	D
1180.12	295.27	22.	159.	.266	24.59	1.016	PB-214	s
1406.03	351.81	0.	222.	.371	13.42	.965	PB-214	s
2330.20	583.05	0.	106.	.177	19.43	.859	TL-208	s
2435.62	609.43	0.	132.	.220	17.41	.980	BI-214	

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

LIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	240.63	60.08	137.	54.	.090	118.39	.513s
EU-155	345.94	86.45	97.	24.	.040	123.66	.791D
CD-109	352.29	88.04	96.	65.	.108	49.61	.793D
EU-155	423.25	105.81	30.	64.	.107	59.62	2.102s
EU-152	487.05	121.78	29.	9.	.015	185.66	.825D
EU-154	492.33	123.10	34.	7.	.011	255.34	.826D
CO-57	541.05	135.30	92.	69.	.115	93.97	.290s
FE-59	575.68	143.97	42.	47.	.078	63.60	.427s
FE-59	745.09	186.38	77.	165.	.276	45.20	1.069s
EU-152	977.97	244.67	22.	6.	.010	246.27	.940D
EU-154	991.43	248.04	19.	14.	.023	106.28	.943D
EU-152	1372.35	343.38	0.	40.	.067	31.62	.338s
EU-152	1460.20	365.36	0.	47.	.078	29.17	.313s
EU-152	1643.00	411.11	1.	0.	.000	200.00	.000s
EU-152	1775.00	444.14	0.	20.	.033	44.72	.375s
Kr-85	2052.57	513.59	2.	1.	.002	382.97	.328s
EU-154	2363.64	591.42	0.	19.	.032	45.88	.500s
CS-137	2643.69	661.48	0.	47.	.078	29.17	.813s
EU-152	2752.23	688.63	8.	4.	.007	204.82	1.326D
[illegible] 154	2767.70	692.50	2.	8.	.013	91.95	1.329D
[illegible]-154	2889.00	722.84	0.	0.	.000	.00	.000s
EU-154	2994.00	749.10	0.	34.	.057	34.30	.250s
EU-152	3112.75	778.80	0.	4.	.007	100.00	.375s
MN-54	3333.67	834.05	0.	28.	.047	37.80	.375s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:02:47 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010422.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3461.75	866.08	0.	23.	.038	41.70	.313s
EU-154	3490.33	873.23	0.	5.	.008	89.44	.250s
EU-152	3849.25	962.98	0.	6.	.010	81.65	.375s
EU-154	3964.00	991.67	0.	9.	.015	66.67	.250s
EU-154	4023.00	1006.42	0.	6.	.010	81.65	.250s
EU-152	4340.50	1085.80	1.	3.	.005	167.48	1.633D
EU-152	4356.58	1089.82	3.	4.	.007	149.11	1.636D
FE-59	4380.33	1095.76	0.	16.	.027	50.00	.375s
EU-152	4445.58	1112.07	5.	7.	.011	125.12	1.653D
ZN-65	4459.39	1115.52	2.	3.	.006	152.65	1.655D
CO-60	4678.00	1170.17	0.	10.	.017	63.25	.250s
EU-152	4841.50	1211.03	0.	6.	.010	81.65	.500s
EU-154	5106.00	1277.14	0.	7.	.012	75.59	.250s
FE-59	5149.00	1287.89	0.	7.	.012	75.59	.250s
EU-152	5192.00	1298.63	0.	3.	.005	115.47	.750s
CO-60	5306.50	1327.25	0.	20.	.033	44.72	.375s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5631.00	1408.34	0.	1.	.002	200.00	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		6.9259E-05	834.81	6.926E-05	?(	6.184E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	&	2.373E-04	
			1291.56	0.000E+00	&	2.855E-04	
			192.34	0.000E+00	&	3.096E-03	
			142.65	0.000E+00	&	5.345E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	6.571E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	&	1.683E-04	
			1173.23	0.000E+00	&	1.243E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.149E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.011E-04	
			8.13	0.000E+00	=	0.000E+00	

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:02:47 Page 4
IT Lab @ Georgia Tech Research Spectrum name: 00010422.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CD-109	0.0000E+00	88.04	0.000E+00	%	1.681E-03	
		25.50	0.000E+00	=	0.000E+00	
CS-137	1.1374E-04	661.62	1.137E-04	(	6.050E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.298E-04	
		688.63	0.000E+00	%	1.011E-02	
		367.71	6.893E-03	&	9.176E-03	
		344.30	1.761E-04	*	2.594E-04	
		1408.08	0.000E+00	%	4.799E-04	
		964.00	0.000E+00	%	6.449E-04	
		1112.07	0.000E+00	%	9.181E-04	
		778.90	0.000E+00	%	5.648E-04	
		1085.80	0.000E+00	%	9.321E-04	
		244.67	0.000E+00	%	6.217E-04	
		867.39	0.000E+00	%	2.971E-03	
		444.00	0.000E+00	%	2.407E-03	
		411.09	0.000E+00	%	1.634E-03	
		1089.82	0.000E+00	%	6.239E-03	
		1299.19	0.000E+00	%	6.228E-03	
		1212.89	0.000E+00	%	7.829E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	9.668E-05	
		1274.80	0.000E+00	%	3.437E-04	
		723.30	0.000E+00	?	2.795E-04	
		1004.80	0.000E+00	%	5.524E-04	
		873.20	0.000E+00	%	7.410E-04	
		996.30	0.000E+00	&	9.893E-04	
		248.04	0.000E+00	%	7.670E-04	
		591.70	0.000E+00	%	1.858E-03	
		756.70	1.894E-03	&	3.097E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	4.910E-03	
		1397.80	0.000E+00	?	5.884E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.718E-04	
		105.31	0.000E+00	%	2.403E-04	
		60.01	0.000E+00	%	6.522E-03	

(- This peak used in the nuclide activity average.

- Peak is too wide, but only one peak in library.
- Peak is part of a multiplet and this area went negative during deconvolution.

? - Peak is too narrow.

ϑ - Peak is too wide at FW25M, but ok at FWHM.
, - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
` - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	#	2.0613E-07	7.791E-08	7.837E-08
FE-59	<	7.0622E-07	0.000E+00	0.000E+00
CO-57	<	1.9557E-06	0.000E+00	0.000E+00
CO-60	<	5.0076E-07	0.000E+00	0.000E+00
Kr-85	<	3.4182E-07	0.000E+00	0.000E+00
ZN-65	<	5.9839E-07	0.000E+00	0.000E+00
CD-109	<	5.0019E-06	0.000E+00	0.000E+00
CS-137		3.3850E-07	9.875E-08	9.973E-08
EU-152	<	3.8633E-07	0.000E+00	0.000E+00
154	<	2.8775E-07	0.000E+00	0.000E+00
155	<	5.1123E-07	0.000E+00	0.000E+00

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:02:47 Page 6
IT Lab @ Georgia Tech Research Spectrum name: 00010422.An1

---------- S U M M A R Y ----------

AL ACTIVITY (49.9 to 2000.0 keV) 5.4462550E-07 uCi/g

Analyzed by: 7/20/01
OPERATOR

Reviewed by: 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:14:40 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010423.An1

ıple description
E1400 #17 QC #261

Spectrum Filename: C:\User\00010423.An1

Acquisition information
Start time 20-Jul-2001 11:04:38
Live time 599
Real time 600
Dead time .16%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 320.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.2000E+02)
= 3.1250E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:14:40 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010423.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
301.07	75.22	95.	137.	.229	26.33	.780	PB-214	D
309.53	77.34	84.	228.	.381	17.46	.782	PB-214	D
370.23	92.53	112.	329.	.549	26.48	1.070	TH-234	sM
954.26	238.73	16.	252.	.420	13.41	.934	PB-212	D
967.20	241.97	28.	60.	.101	35.61	.937	PB-214	D
1179.23	295.04	11.	143.	.239	24.73	.858	PB-214	sM
1406.43	351.91	8.	213.	.356	17.20	1.018	PB-214	sM
2434.37	609.11	0.	128.	.214	17.68	1.157	BI-214	s

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	230.09	57.45	87.	37.	.062	116.22	.424s
EU-155	345.94	86.45	50.	19.	.032	112.15	.791D
CD-109	352.29	88.04	78.	58.	.096	50.70	.793D
EU-155	424.11	106.02	34.	74.	.124	51.65	.671s
EU-152	487.05	121.78	23.	9.	.015	167.68	.825D
EU-154	492.33	123.10	28.	13.	.022	126.65	.826D
CO-57	552.54	138.17	24.	28.	.047	111.57	.304s
FE-59	580.99	145.30	72.	36.	.060	166.67	.250s
FE-59	761.00	190.36	84.	11.	.018	626.42	.000s
EU-152	977.97	244.67	19.	3.	.005	424.49	.940D
EU-154	991.43	248.04	23.	12.	.019	130.95	.943D
EU-152	1381.20	345.59	12.	18.	.029	117.48	.364s
EU-152	1470.00	367.82	1.	0.	.000	200.00	.000s
EU-152	1641.00	410.61	0.	0.	.000	.00	.000s
EU-152	1776.79	444.59	0.	37.	.062	32.88	.417s
Kr-85	2052.06	513.47	3.	1.	.002	331.66	.134s
EU-154	2363.00	591.26	0.	0.	.000	.00	.000s
CS-137	2644.71	661.73	0.	24.	.040	40.82	.365s
EU-152	2752.23	688.63	2.	5.	.009	112.73	1.326D
EU-154	2767.70	692.50	0.	10.	.016	63.64	1.329D
154	2891.20	723.39	0.	6.	.010	81.65	.500s
-154	3023.00	756.36	0.	0.	.000	.00	.000s
EU-152	3112.00	778.62	0.	0.	.000	.00	.000s
MN-54	3339.50	835.51	0.	8.	.013	70.71	.375s
EU-152	3461.00	865.90	0.	4.	.007	100.00	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:14:40 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010423.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
MN-54	3491.27	873.47	0.	30.	.050	36.51	.375s
EU-152	3873.48	969.04	0.	76.	.127	22.94	.458s
EU-154	3991.00	998.42	0.	19.	.032	45.88	.375s
EU-154	4016.00	1004.67	0.	1.	.002	200.00	.250s
EU-152	4340.50	1085.80	6.	5.	.008	173.51	1.633D
EU-152	4356.58	1089.82	1.	2.	.004	184.05	1.636D
FE-59	4397.33	1100.01	0.	16.	.027	50.00	.250s
EU-152	4445.58	1112.07	6.	5.	.008	170.99	1.653D
ZN-65	4459.39	1115.52	2.	5.	.008	120.88	1.655D
CO-60	4683.00	1171.42	0.	8.	.013	70.71	.250s
EU-152	4846.00	1212.16	0.	5.	.008	89.44	.250s
EU-154	5099.00	1275.39	0.	1.	.002	200.00	.250s
FE-59	5162.00	1291.14	0.	0.	.000	.00	.000s
EU-152	5189.00	1297.88	0.	3.	.005	115.47	.250s
CO-60	5326.50	1332.25	0.	2.	.003	141.42	.500s
EU-154	5590.00	1398.09	0.	10.	.017	63.25	.250s
EU-152	5629.00	1407.84	0.	17.	.028	48.51	.375s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	8.926E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	2.373E-04	
			1291.56	0.000E+00	?	2.040E-04	
			192.34	0.000E+00	&	2.074E-03	
			142.65	0.000E+00	&	5.789E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	4.143E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.031E-04	
			1173.23	0.000E+00	%	1.177E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.201E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.155E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.564E-03	
			25.50	0.000E+00	=	0.000E+00	

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:14:40 Page 4
IT Lab @ Georgia Tech Research Spectrum name: 00010423.An1

clide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	0.0000E+00	661.62	0.000E+00	%	1.194E-04	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.221E-04	
		688.63	0.000E+00	%	8.845E-03	
		367.71	0.000E+00	%	3.940E-03	
		344.30	0.000E+00	%	2.314E-04	
		1408.08	0.000E+00	%	7.901E-04	
		964.00	1.447E-03	&	1.436E-03	
		1112.07	0.000E+00	%	8.969E-04	
		778.90	0.000E+00	?	4.501E-04	
		1085.80	0.000E+00	%	1.161E-03	
		244.67	0.000E+00	%	5.738E-04	
		867.39	0.000E+00	%	1.916E-03	
		444.00	1.915E-03	?	2.966E-03	
		411.09	0.000E+00	?	1.521E-03	
		1089.82	0.000E+00	%	5.348E-03	
		1299.19	0.000E+00	%	6.228E-03	
		1212.89	0.000E+00	%	7.551E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	9.669E-05	
		1274.80	0.000E+00	%	2.638E-04	
		723.30	0.000E+00	%	3.785E-04	
		1004.80	0.000E+00	%	4.382E-04	
		873.20	6.808E-04	?	1.207E-03	
		996.30	0.000E+00	%	1.220E-03	
		248.04	0.000E+00	%	7.832E-04	
		591.70	0.000E+00	?	1.015E-03	
		756.70	0.000E+00	?	1.393E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	4.895E-03	
		1397.80	0.000E+00	%	8.972E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.365E-04	
		105.31	0.000E+00	%	2.545E-04	
		60.01	0.000E+00	&	5.418E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	2.7894E-07	0.000E+00	0.000E+00
FE-59	<	7.4156E-07	0.000E+00	0.000E+00
CO-57	<	1.2948E-06	0.000E+00	0.000E+00
CO-60	<	3.2234E-07	0.000E+00	0.000E+00
Kr-85	<	3.7537E-07	0.000E+00	0.000E+00
ZN-65	<	6.7344E-07	0.000E+00	0.000E+00
CD-109	<	4.8862E-06	0.000E+00	0.000E+00
CS-137	<	3.7303E-07	0.000E+00	0.000E+00
EU-152	<	3.8155E-07	0.000E+00	0.000E+00
EU-154	<	3.0215E-07	0.000E+00	0.000E+00
EU-155	<	4.2667E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TAL ACTIVITY (49.9 to 2000.0 keV) 0.0000000E+00 uCi/g

Analyzed by: 7/20/01
OPERATOR

Reviewed by: 8/7/01

Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:29:59 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010424.An1

ple description
E1400 #18 #262

Spectrum Filename: C:\User\00010424.An1

Acquisition information
Start time 20-Jul-2001 11:19:56
Live time 599
Real time 600
Dead time .12%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 270.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.7000E+02)
= 3.7037E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rections Status Comments
Decay correct to date NO
Decay during acquisition NO
Decay during collection NO
Peaked background correction NO

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:29:59 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010424.An1

ergy calibration normalized difference: .4728

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
299.46	74.81	23.	63.	.105	33.01	.780	PB-214	D
309.74	77.39	26.	112.	.187	22.86	.782	PB-214	D
954.57	238.81	0.	182.	.304	14.82	.872	PB-212	M
1406.26	351.86	0.	96.	.160	20.41	.923	PB-214	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	233.89	58.40	11.	40.	.066	48.57	.523s
EU-155	345.94	86.45	35.	2.	.004	743.41	.791D
109	352.29	88.04	50.	20.	.034	106.90	.793D
EU-155	419.95	104.98	9.	41.	.069	52.21	.438s
EU-152	487.05	121.78	16.	2.	.003	597.14	.825D
EU-154	492.33	123.10	19.	10.	.017	132.52	.826D
CO-57	551.96	138.03	21.	15.	.025	129.10	.480s
FE-59	578.08	144.57	0.	60.	.100	25.82	.338s
FE-59	760.19	190.16	5.	40.	.066	49.54	.482s
EU-152	977.97	244.67	4.	12.	.020	72.68	.940D
EU-154	991.43	248.04	7.	3.	.005	266.72	.943D
EU-152	1372.71	343.47	0.	34.	.057	34.30	.313s
EU-152	1489.00	372.57	0.	14.	.023	53.45	.250s
EU-152	1632.67	408.52	0.	10.	.017	63.25	.375s
EU-152	1765.00	441.64	0.	10.	.017	63.25	.250s
Kr-85	2060.67	515.62	0.	6.	.010	81.65	.375s
EU-154	2350.00	588.01	0.	15.	.025	51.64	.250s
CS-137	2644.97	661.80	0.	46.	.077	29.49	.792s
EU-152	2752.23	688.63	8.	4.	.007	229.51	1.326D
EU-154	2767.70	692.50	9.	5.	.008	205.59	1.329D
EU-154	2893.33	723.92	0.	7.	.012	75.59	.250s
EU-154	3014.00	754.11	0.	10.	.017	63.25	.250s
EU-152	3116.00	779.62	0.	20.	.033	44.72	.250s
MN-54	3310.00	828.14	5.	6.	.009	245.37	.246s
152	3468.00	867.65	0.	2.	.003	141.42	.250s
154	3503.33	876.48	0.	11.	.018	60.30	.250s
EU-152	3856.00	964.67	0.	7.	.012	75.59	.750s
EU-154	3980.00	995.67	0.	1.	.002	200.00	.250s
EU-154	4013.00	1003.92	0.	5.	.008	89.44	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 11:29:59 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010424.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	4340.50	1085.80	1.	2.	.004	178.57	1.633D
EU-152	4356.58	1089.82	2.	2.	.004	214.54	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	5.	2.	.003	329.48	1.653D
ZN-65	4459.39	1115.52	2.	2.	.004	194.17	1.655D
CO-60	4689.00	1172.92	0.	0.	.000	.00	.000s
EU-152	4840.50	1210.78	0.	4.	.007	100.00	.500s
EU-154	5096.00	1274.64	0.	2.	.003	141.42	.250s
FE-59	5157.00	1289.89	0.	4.	.007	100.00	.250s
EU-152	5194.00	1299.13	0.	1.	.002	200.00	.250s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5625.00	1406.84	0.	3.	.005	115.47	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	&	9.662E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.559E-04	
			192.34	0.000E+00	&	1.546E-03	
			142.65	3.989E-03	&	4.566E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	3.615E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.042E-05	
			1173.23	0.000E+00	?(	8.148E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.296E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.931E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.189E-03	
			25.50	0.000E+00	=	0.000E+00	
C 37		1.1127E-04	661.62	1.113E-04	(	6.047E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
EU-152	0.0000E+00	121.78	0.000E+00	%	1.009E-04	
		688.63	0.000E+00	%	1.010E-02	
		367.71	0.000E+00	&	6.123E-03	
		344.30	1.496E-04		2.446E-04	
		1408.08	0.000E+00	%	5.358E-04	
		964.00	0.000E+00	%	6.663E-04	
		1112.07	0.000E+00	%	8.030E-04	
		778.90	0.000E+00	%	8.368E-04	
		1085.80	0.000E+00	%	8.909E-04	
		244.67	0.000E+00	%	5.195E-04	
		867.39	0.000E+00	%	1.740E-03	
		444.00	0.000E+00	&	1.972E-03	
		411.09	0.000E+00	&	2.318E-03	
		1089.82	0.000E+00	%	5.591E-03	
		1299.19	0.000E+00	%	5.574E-03	
		1212.89	0.000E+00	%	7.252E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.544E-05	
		1274.80	0.000E+00	%	2.799E-04	
		723.30	0.000E+00	%	3.911E-04	
		1004.80	0.000E+00	%	5.325E-04	
		873.20	0.000E+00	&	8.863E-04	
		996.30	0.000E+00	%	7.156E-04	
		248.04	0.000E+00	%	5.314E-04	
		591.70	0.000E+00	&	1.729E-03	
		756.70	0.000E+00	&	2.123E-03	
		1597.30	0.000E+00	?	6.212E-03	
		692.50	0.000E+00	%	5.377E-03	
		1397.80	0.000E+00	?	5.882E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.078E-04	
		105.31	0.000E+00	%	1.871E-04	
		60.01	0.000E+00	&	3.761E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- Peak activity higher than counting uncertainty range.
- Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
- Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.5783E-07	0.000E+00	0.000E+00
FE-59	<	5.0578E-07	0.000E+00	0.000E+00
CO-57	<	1.3388E-06	0.000E+00	0.000E+00
CO-60	<	3.3487E-07	0.000E+00	0.000E+00
Kr-85	<	4.7992E-07	0.000E+00	0.000E+00
ZN-65	<	7.1517E-07	0.000E+00	0.000E+00
CD-109	<	4.4041E-06	0.000E+00	0.000E+00
CS-137		4.1211E-07	1.215E-07	1.227E-07
EU-152	<	3.7385E-07	0.000E+00	0.000E+00
EU-154	<	3.1646E-07	0.000E+00	0.000E+00
EU-155	<	3.9914E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 4.1211430E-07 uCi/g

Analyzed by: _____ 7/20/01
OPERATOR

iewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 13:04:11 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010425.An1

mple description
E1400 #19 #263

Spectrum Filename: C:\User\00010425.An1

Acquisition information
Start time 20-Jul-2001 12:54:10
Live time 599
Real time 600
Dead time .12%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 348.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.4800E+02)
= 2.8736E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 13:04:11 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010425.An1

ergy calibration normalized difference: .0777

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
745.70	186.53	0.	107.	.179	19.33	.438	PA-234	sM
953.98	238.67	0.	190.	.317	14.51	.913	PB-212	M
2435.38	609.37	0.	90.	.150	21.08	1.009	BI-214	s

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	252.52	63.06	56.	102.	.170	39.97	.960s
EU-155	345.94	86.45	37.	13.	.021	149.17	.791D
[illegible]-109	352.29	88.04	43.	13.	.022	151.02	.793D
[illegible]-155	420.53	105.13	13.	31.	.052	63.93	.609s
EU-152	487.05	121.78	16.	11.	.019	115.74	.825D
EU-154	492.33	123.10	11.	14.	.023	88.01	.826D
CO-57	544.69	136.21	5.	24.	.039	61.00	.364s
FE-59	572.94	143.28	12.	64.	.107	52.29	.386s
FE-59	769.15	192.40	5.	11.	.018	109.09	.550s
EU-152	977.97	244.67	7.	0.	.000	.00	.940
EU-154	982.86	245.89	0.	18.	.030	47.14	.688s
EU-152	1374.00	343.79	0.	8.	.013	70.71	.501s
EU-152	1465.80	366.77	0.	18.	.030	47.14	.292s
EU-152	1644.25	411.42	0.	14.	.023	53.45	.375s
EU-152	1785.83	446.85	0.	21.	.035	43.64	.313s
Kr-85	2041.22	510.75	0.	31.	.052	35.92	.563s
EU-154	2365.00	591.76	0.	2.	.003	141.42	.250s
CS-137	2643.85	661.52	0.	50.	.083	28.28	.413s
EU-152	2752.23	688.63	1.	1.	.002	239.97	1.326D
EU-154	2767.70	692.50	7.	6.	.010	143.38	1.329D
EU-154	2889.00	722.84	0.	0.	.000	.00	.000s
EU-154	3027.00	757.36	0.	3.	.005	115.47	.250s
EU-152	3109.00	777.87	0.	9.	.015	66.67	.250s
MN-54	3351.00	838.39	0.	18.	.030	47.14	.250s
EU-152	3459.00	865.40	0.	5.	.008	89.44	.250s
[illegible]-154	3489.00	872.90	0.	0.	.000	.00	.000s
[illegible]-152	3854.80	964.37	0.	11.	.018	60.30	.688s
EU-154	3981.25	995.99	0.	5.	.008	89.44	.375s
EU-154	4015.00	1004.42	0.	0.	.000	.00	.000s
EU-152	4340.50	1085.80	7.	7.	.011	136.50	1.633D

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 13:04:11 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010425.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	4356.58	1089.82	5.	4.	.007	179.24	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	2.	0.	.000	.00	1.653
ZN-65	4461.00	1115.92	0.	1.	.002	200.00	.250s
CO-60	4689.00	1172.92	0.	0.	.000	.00	.000s
EU-152	4849.00	1212.91	0.	4.	.007	100.00	.250s
EU-154	5095.00	1274.39	0.	0.	.000	.00	.000s
FE-59	5157.00	1289.89	0.	5.	.008	89.44	.250s
EU-152	5180.00	1295.63	0.	8.	.013	70.71	.250s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5632.00	1408.59	0.	1.	.002	200.00	.250s
EU-154	6386.00	1596.96	0.	1.	.002	200.00	.250s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	PEAK CODE	PEAK MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	&	1.113E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.663E-04	
			192.34	0.000E+00	%	1.091E-03	
			142.65	0.000E+00	%	5.013E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	3.350E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.042E-05	
			1173.23	0.000E+00	?(	8.148E-05	
Kr-85		1.1863E-04	513.99	1.186E-04	&(	9.567E-05	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.653E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.090E-03	
			25.50	0.000E+00	=	0.000E+00	
CS-137		1.2095E-04	661.62	1.209E-04	(	6.047E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	

:lide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
EU-152	0.0000E+00	121.78	0.000E+00	%	1.151E-04	
		688.63	0.000E+00	%	7.201E-03	
		367.71	0.000E+00	%	6.597E-03	
		344.30	0.000E+00	%	1.588E-04	
		1408.08	0.000E+00	%	4.797E-04	
		964.00	0.000E+00	%	7.439E-04	
		1112.07	0.000E+00		6.522E-04	
		778.90	0.000E+00	%	6.680E-04	
		1085.80	0.000E+00	%	1.240E-03	
		244.67	0.000E+00		4.187E-04	
		867.39	0.000E+00	%	1.994E-03	
		444.00	0.000E+00	&	2.444E-03	
		411.09	0.000E+00	%	2.540E-03	
		1089.82	0.000E+00	%	6.615E-03	
		1299.19	0.000E+00	&	7.488E-03	
		1212.89	0.000E+00	%	7.252E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.125E-05	
		1274.80	0.000E+00	?	2.454E-04	
		723.30	0.000E+00	?	2.793E-04	
		1004.80	0.000E+00	?	4.077E-04	
		873.20	0.000E+00	?	5.671E-04	
		996.30	0.000E+00	%	8.699E-04	
		248.04	0.000E+00	&	6.273E-04	
		591.70	0.000E+00	%	1.157E-03	
		756.70	0.000E+00	%	1.671E-03	
		1597.30	0.000E+00	%	6.674E-03	
		692.50	0.000E+00	%	5.266E-03	
		1397.80	0.000E+00	?	5.882E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.205E-04	
		105.31	0.000E+00	%	1.784E-04	
		60.01	5.990E-03	&	6.005E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.1972E-07	0.000E+00	0.000E+00
FE-59	<	3.9242E-07	0.000E+00	0.000E+00
CO-57	<	9.6267E-07	0.000E+00	0.000E+00
CO-60	<	2.5982E-07	0.000E+00	0.000E+00
~~Kr-85~~	~~#~~	~~3.4090E-07~~ < 3.4090E-7	~~1.225E-07~~	~~1.229E-07~~
ZN-65	<	4.7505E-07	0.000E+00	0.000E+00
CD-109	<	3.1315E-06	0.000E+00	0.000E+00
CS-137		3.4755E-07	9.830E-08	9.934E-08
EU-152	<	3.3073E-07	0.000E+00	0.000E+00
EU-154	<	2.3349E-07	0.000E+00	0.000E+00
EU-155	<	3.4615E-07	0.000E+00	0.000E+00

Ann. Peak. Software misidentified the ann. peak. P. Jones 8/7/01

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 6.8844820E-07 uCi/g

Analyzed by: [signature] 7/23/01
OPERATOR

Reviewed by: [signature] 8/7/01
Supervisor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 13:27:55 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010426.An1

ple description
E1400 #20 #264

Spectrum Filename: C:\User\00010426.An1

Acquisition information
Start time 20-Jul-2001 13:17:53
Live time 599
Real time 600
Dead time .11%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 446.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 4.4600E+02)
= 2.2422E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 13:27:55 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010426.An1

ergy calibration normalized difference: .0020

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
953.86	238.64	8.	86.	.143	25.94	.563	PB-212	s
1180.09	295.26	0.	69.	.115	24.08	.494	PB-214	s

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	242.81	60.63	26.	21.	.035	107.33	.418s
EU-155	345.94	86.45	19.	13.	.022	106.94	.791D
CD-109	352.29	88.04	36.	15.	.025	124.75	.793D
EU-155	413.57	103.38	23.	37.	.061	87.01	.438s
-152	487.05	121.78	2.	9.	.015	78.80	.825D
-154	492.33	123.10	7.	3.	.005	285.42	.826D
CO-57	546.60	136.69	18.	23.	.038	95.06	.264s
FE-59	570.50	142.67	2.	0.	.000	282.84	.292s
FE-59	767.50	191.99	2.	0.	.000	282.84	.292s
EU-152	977.97	244.67	10.	9.	.015	117.58	.940D
EU-154	991.43	248.04	11.	8.	.014	131.99	.943D
EU-152	1367.00	342.04	0.	15.	.025	51.64	.751s
EU-152	1463.33	366.15	0.	10.	.017	63.25	.375s
EU-152	1646.20	411.91	0.	21.	.035	43.64	.250s
EU-152	1761.00	440.64	0.	20.	.033	44.72	.250s
Kr-85	2056.00	514.45	0.	1.	.002	200.00	.250s
EU-154	2363.00	591.26	0.	0.	.000	.00	.000s
CS-137	2644.24	661.62	0.	144.	.240	16.67	.818s
EU-152	2752.23	688.63	1.	5.	.008	120.39	1.326D
EU-154	2767.70	692.50	2.	1.	.002	345.52	1.329D
EU-154	2889.00	722.84	0.	0.	.000	.00	.000s
EU-154	3034.00	759.11	0.	10.	.017	63.25	.250s
EU-152	3114.00	779.12	0.	3.	.005	115.47	.250s
MN-54	3339.00	835.39	0.	1.	.002	200.00	.250s
EU-152	3466.00	867.15	0.	1.	.002	200.00	.250s
EU-154	3489.00	872.90	0.	0.	.000	.00	.000s
EU-152	3857.83	965.13	0.	13.	.022	55.47	.313s
-154	3981.00	995.92	0.	0.	.000	.00	.000s
EU-154	4015.00	1004.42	0.	0.	.000	.00	.000s
EU-152	4340.50	1085.80	0.	2.	.003	182.31	1.633D
EU-152	4356.58	1089.82	1.	2.	.003	200.94	1.636D
FE-59	4392.00	1098.67	0.	2.	.003	141.42	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 13:27:55 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010426.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	4445.58	1112.07	4.	2.	.004	250.30	1.653D
ZN-65	4459.39	1115.52	3.	1.	.001	831.28	1.655D
CO-60	4689.00	1172.92	0.	0.	.000	.00	.000s
EU-152	4851.00	1213.41	0.	1.	.002	200.00	.250s
EU-154	5094.00	1274.14	0.	4.	.007	100.00	.250s
FE-59	5162.00	1291.14	0.	0.	.000	.00	.000s
EU-152	5193.00	1298.88	0.	0.	.000	.00	.000s
CO-60	5328.00	1332.62	0.	3.	.005	115.47	.250s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5627.00	1407.34	0.	1.	.002	200.00	.250s
EU-154	6389.00	1597.71	0.	1.	.002	200.00	.250s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN 54		0.0000E+00	834.81	0.000E+00	%	6.641E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	%	1.557E-04	
			1291.56	0.000E+00	?	2.039E-04	
			192.34	0.000E+00	%	7.161E-04	
			142.65	0.000E+00	%	1.895E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	3.755E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.085E-04	
			1173.23	0.000E+00	?	8.148E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.028E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.931E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.051E-03	
			25.50	0.000E+00	=	0.000E+00	
CS-137		3.4831E-04	661.62	3.483E-04	(	6.047E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
EU-152	0.0000E+00	121.78	0.000E+00	%	8.765E-05	
		688.63	0.000E+00	%	8.552E-03	
		367.71	0.000E+00	%	5.588E-03	
		344.30	0.000E+00	&	1.874E-04	
		1408.08	0.000E+00	%	4.797E-04	
		964.00	0.000E+00	%	7.785E-04	
		1112.07	0.000E+00	%	7.768E-04	
		778.90	0.000E+00	%	5.398E-04	
		1085.80	0.000E+00	%	8.465E-04	
		244.67	0.000E+00	%	5.474E-04	
		867.39	0.000E+00	%	1.640E-03	
		444.00	0.000E+00	&	2.406E-03	
		411.09	0.000E+00	%	2.872E-03	
		1089.82	0.000E+00	%	5.345E-03	
		1299.19	0.000E+00	?	5.188E-03	
		1212.89	0.000E+00	%	6.208E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	6.194E-05	
		1274.80	0.000E+00	%	3.080E-04	
		723.30	0.000E+00	?	2.793E-04	
		1004.80	0.000E+00	?	4.077E-04	
		873.20	0.000E+00	?	5.671E-04	
		996.30	0.000E+00	?	6.660E-04	
		248.04	0.000E+00	%	6.379E-04	
		591.70	0.000E+00	?	1.015E-03	
		756.70	0.000E+00	&	2.123E-03	
		1597.30	0.000E+00	%	6.674E-03	
		692.50	0.000E+00	%	3.863E-03	
		1397.80	0.000E+00	?	5.882E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.023E-04	
		105.31	0.000E+00	&	2.007E-04	
		60.01	0.000E+00	%	3.674E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	1.4891E-07	0.000E+00	0.000E+00
FE-59	<	3.4914E-07	0.000E+00	0.000E+00
CO-57	<	8.4194E-07	0.000E+00	0.000E+00
CO-60	<	2.4326E-07	0.000E+00	0.000E+00
Kr-85	<	2.3048E-07	0.000E+00	0.000E+00
ZN-65	<	4.3293E-07	0.000E+00	0.000E+00
CD-109	<	2.3575E-06	0.000E+00	0.000E+00
CS-137		7.8097E-07	1.302E-07	1.341E-07
EU-152	<	1.9652E-07	0.000E+00	0.000E+00
EU-154	<	1.3888E-07	0.000E+00	0.000E+00
EU-155	<	2.2946E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 7.8097420E-07 uCi/g

Analyzed by: _____ 7/23/01
OPERATOR

Reviewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 10:16:43 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010454.An1

ıple description
E1400 #21 SN265

Spectrum Filename: C:\User\00010454.An1

Acquisition information
Start time 15-Aug-2001 10:06:41
Live time 599
Real time 600
Dead time .14%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 284.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.8400E+02)
= 3.5211E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 10:16:43 Page 2
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ergy calibration normalized difference: .4121

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
310.36	77.54	40.	116.	.194	24.01	.782	PB-214	D
742.15	185.64	28.	102.	.170	37.38	.756	U-235	sM
955.89	239.14	0.	279.	.466	11.97	.751	PB-212	sM
1181.11	295.52	6.	83.	.139	27.52	1.090	PB-214	sM
1409.00	352.55	0.	138.	.230	17.03	1.108	PB-214	sM
5846.24	1462.11	0.	127.	.212	17.75	1.416	K-40	s

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
[illegible]155	242.00	60.43	36.	2.	.003	1280.62	.000s
EU-155	345.94	86.45	55.	12.	.020	179.72	.791D
CD-109	352.29	88.04	47.	27.	.045	82.10	.793D
EU-155	423.52	105.87	27.	14.	.024	130.94	.337s
EU-152	487.05	121.78	21.	1.	.002	1075.20	.825D
EU-154	492.33	123.10	15.	8.	.014	144.60	.826D
CO-57	546.84	136.75	6.	9.	.016	100.85	.362s
FE-59	564.09	141.07	32.	24.	.040	119.53	.721
FE-59	773.75	193.55	33.	49.	.082	82.85	.355s
EU-152	977.97	244.67	2.	2.	.004	198.18	.940D
EU-154	991.43	248.04	13.	0.	.000	3837.30	.943D
EU-152	1376.00	344.29	1.	0.	.000	200.00	.000s
EU-152	1470.67	367.98	1.	0.	.001	221.11	.197s
EU-152	1667.60	417.27	0.	43.	.072	30.50	.417s
EU-152	1759.00	440.14	0.	34.	.057	34.30	.751s
Kr-85	2042.13	510.98	0.	62.	.103	25.40	.594s
EU-154	2364.33	591.59	0.	14.	.023	53.45	.250s
CS-137	2646.40	662.16	0.	63.	.105	25.20	1.032
EU-152	2752.23	688.63	10.	5.	.008	218.28	1.326D
EU-154	2767.70	692.50	7.	5.	.009	170.06	1.329D
EU-154	2892.67	723.76	0.	4.	.007	100.00	.375s
EU-154	2993.83	749.06	0.	37.	.062	32.88	.313s
152	3107.00	777.37	0.	14.	.023	53.45	.250s
[illegible]-54	3339.36	835.48	0.	44.	.073	30.15	.375s
EU-152	3475.50	869.52	0.	14.	.023	53.45	.250s
EU-154	3490.00	873.15	0.	1.	.002	200.00	.250s
EU-152	3852.00	963.67	0.	0.	.000	.00	.000s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 10:16:43 Page 3
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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-154	3981.00	995.92	0.	0.	.000	.00	.000s
EU-154	3996.75	999.86	0.	19.	.032	45.88	.375s
EU-152	4340.50	1085.80	3.	3.	.004	245.42	1.633D
EU-152	4356.58	1089.82	4.	0.	.001	1174.42	1.636D
FE-59	4374.00	1094.17	0.	23.	.038	41.70	.250s
EU-152	4445.58	1112.07	0.	3.	.004	146.19	1.653D
ZN-65	4459.39	1115.52	1.	5.	.008	103.63	1.655D
CO-60	4684.00	1171.67	0.	6.	.010	81.65	.250s
EU-152	4855.00	1214.41	0.	6.	.010	81.65	.250s
EU-154	5099.33	1275.47	0.	5.	.008	89.44	.250s
FE-59	5162.00	1291.14	0.	4.	.007	100.00	.250s
EU-152	5189.33	1297.97	0.	4.	.007	100.00	.375s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5586.00	1397.09	0.	2.	.003	141.42	.250s
EU-152	5628.00	1407.59	0.	0.	.000	.00	.000s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	PEAK CODE	PEAK MDA VALUE microCi	COMMENTS
MN-54		1.0881E-04	834.81	1.088E-04	?(	6.183E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	&	2.658E-04	
			1291.56	0.000E+00	%	2.559E-04	
			192.34	0.000E+00	%	1.953E-03	
			142.65	0.000E+00	&	4.447E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	2.715E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.043E-05	
			1173.23	0.000E+00	%	1.104E-04	
Kr-85		2.3731E-04	513.99	2.373E-04	&(	9.569E-05	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.084E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.216E-03	
			25.50	0.000E+00	=	0.000E+00	

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 10:16:43 Page 4
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Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	1.5242E-04	661.62	1.524E-04	(	6.049E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.076E-04	
		688.63	0.000E+00	%	1.076E-02	
		367.71	0.000E+00	%	3.939E-03	
		344.30	0.000E+00	%	1.182E-04	
		1408.08	0.000E+00	?	4.466E-04	
		964.00	0.000E+00	?	4.760E-04	
		1112.07	0.000E+00	%	6.884E-04	
		778.90	0.000E+00	%	7.516E-04	
		1085.80	0.000E+00	%	1.006E-03	
		244.67	0.000E+00	%	3.754E-04	
		867.39	0.000E+00	%	2.550E-03	
		444.00	1.760E-03	&	2.877E-03	
		411.09	2.616E-03	&	3.682E-03	
		1089.82	0.000E+00	%	5.592E-03	
		1299.19	0.000E+00	%	6.512E-03	
		1212.89	0.000E+00	%	7.828E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.906E-05	
		1274.80	0.000E+00	%	3.206E-04	
		723.30	0.000E+00	%	3.506E-04	
		1004.80	0.000E+00	&	7.463E-04	
		873.20	0.000E+00	%	6.094E-04	
		996.30	0.000E+00	?	6.661E-04	
		248.04	0.000E+00	%	5.702E-04	
		591.70	0.000E+00	%	1.695E-03	
		756.70	2.061E-03	&	3.191E-03	
		1597.30	0.000E+00	?	6.213E-03	
		692.50	0.000E+00	%	5.152E-03	
		1397.80	0.000E+00	%	6.709E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.349E-04	
		105.31	0.000E+00	%	1.738E-04	
		60.01	0.000E+00	%	3.398E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
` - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	#	3.8315E-07	1.155E-07	1.166E-07
FE-59	<	9.3576E-07	0.000E+00	0.000E+00
CO-57	<	9.5603E-07	0.000E+00	0.000E+00
CO-60	<	3.1843E-07	0.000E+00	0.000E+00
Kr-85	#	< 8.3561E-7 ~~8.3561E-07~~	~~2.122E-07~~	~~2.137E-07~~
ZN-65	<	7.3392E-07	0.000E+00	0.000E+00
CD-109	<	4.2815E-06	0.000E+00	0.000E+00
CS-137		5.3670E-07	1.352E-07	1.370E-07
EU-152	<	3.7875E-07	0.000E+00	0.000E+00
EU-154	<	2.7839E-07	0.000E+00	0.000E+00
EU-155	<	4.7509E-07	0.000E+00	0.000E+00

Not present, software misidentified 511keV ann. peak. P. Geo 8/17/01

: All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 1.7554620E-06 uCi/g

Analyzed by: _____ 8/15/01
OPERATOR

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 10:16:43 Page 6
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Reviewed by: _____ 8/17/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 11:12:04 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010455.An1

nple description
E1400 #22 SN266

Spectrum Filename: C:\User\00010455.An1

Acquisition information
Start time 15-Aug-2001 11:02:02
Live time 599
Real time 600
Dead time .15%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

nalysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 334.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.3400E+02)
= 2.9940E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 11:12:04 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010455.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
299.64	74.86	68.	87.	.145	34.49	.780	PB-214	D
310.04	77.46	32.	194.	.324	16.52	.782	PB-214	D
370.18	92.52	80.	199.	.332	29.11	.696	TH-234	s
955.37	239.01	8.	178.	.297	15.64	.934	PB-212	D
968.02	242.18	18.	56.	.094	34.07	.937	PB-214	D
1181.02	295.49	6.	127.	.212	22.22	.894	PB-214	s
1408.43	352.41	7.	181.	.302	17.90	1.109	PB-214	
2437.77	609.96	0.	119.	.199	18.33	.901	RU-103	s

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	234.74	58.61	57.	132.	.220	52.81	.469s
EU-155	345.94	86.45	65.	19.	.032	128.55	.791D
CD-109	352.29	88.04	60.	40.	.067	62.53	.793D
EU-155	433.57	108.39	84.	38.	.063	167.93	.349s
EU-152	487.05	121.78	28.	7.	.012	225.31	.825D
EU-154	492.33	123.10	18.	1.	.001	1541.47	.826D
CO-57	552.00	138.04	19.	43.	.071	65.49	.342s
FE-59	567.59	141.94	6.	20.	.033	72.34	.338s
FE-59	772.88	193.33	36.	14.	.023	176.86	.256s
EU-152	977.97	244.67	12.	6.	.009	196.75	.940D
EU-154	991.43	248.04	11.	1.	.002	793.53	.943D
EU-152	1355.60	339.19	0.	91.	.152	20.97	.667s
EU-152	1467.22	367.12	0.	37.	.062	32.88	.292s
EU-152	1635.12	409.14	8.	51.	.085	51.54	.405s
EU-152	1772.06	443.41	0.	24.	.040	40.82	.313s
Sr-85	2041.96	510.94	0.	98.	.164	20.20	.393s
EU-154	2347.00	587.26	0.	31.	.052	35.92	.375s
CS-137	2648.17	662.60	0.	50.	.083	28.28	.375s
EU-152	2752.23	688.63	5.	3.	.005	232.99	1.326D
EU-154	2767.70	692.50	2.	3.	.005	185.44	1.329D
EU-154	2908.36	727.68	0.	40.	.067	31.62	.800s
[illegible]	3027.60	757.51	0.	13.	.022	55.47	.313s
EU-152	3113.00	778.87	0.	1.	.002	200.00	.125s
EU-154	3337.50	835.01	0.	15.	.025	51.64	.375s
EU-152	3443.07	861.41	0.	28.	.047	37.80	.333s
EU-154	3499.00	875.40	0.	9.	.015	66.67	.250s

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IT Lab @ Georgia Tech Research Spectrum name: 00010455.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3852.00	963.67	0.	0.	.000	.00	.000s
EU-154	3974.25	994.23	0.	7.	.012	75.59	.313s
EU-154	4019.00	1005.42	0.	3.	.005	115.47	.250s
EU-152	4340.50	1085.80	5.	7.	.012	112.41	1.633D
EU-152	4356.58	1089.82	6.	6.	.010	135.76	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	6.	6.	.010	148.94	1.653D
ZN-65	4459.39	1115.52	4.	3.	.005	238.74	1.655D
CO-60	4690.33	1173.25	0.	16.	.027	50.00	.375s
EU-152	4850.25	1213.22	0.	5.	.008	89.44	.375s
EU-154	5118.17	1280.18	0.	15.	.025	51.64	.500s
FE-59	5163.50	1291.51	0.	2.	.003	141.42	.500s
EU-152	5182.00	1296.13	0.	9.	.015	66.67	.250s
CO-60	5321.00	1330.87	0.	6.	.010	81.65	.250s
EU-154	5586.00	1397.09	0.	1.	.002	200.00	.250s
EU-152	5628.00	1407.59	0.	0.	.000	.00	.000s
EU-154	6385.00	1596.71	0.	3.	.005	115.47	.250s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	PEAK CODE	PEAK MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	1.054E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.326E-04	
			192.34	0.000E+00	%	1.609E-03	
			142.65	0.000E+00	%	3.325E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	4.434E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.225E-04	
			1173.23	0.000E+00	%	1.416E-04	
Kr-85		3.7515E-04	513.99	3.751E-04	&(	9.570E-05	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.155E-04	
			8.13	0.000E+00	=	0.000E+00	
[illegible]9		0.0000E+00	88.04	0.000E+00	%	1.374E-03	
			25.50	0.000E+00	=	0.000E+00	

clide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	1.2098E-04	661.62	1.210E-04	?(	6.049E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.260E-04	
		688.63	0.000E+00	%	9.117E-03	
		367.71	5.426E-03	?	8.402E-03	
		344.30	4.005E-04	&	3.569E-04	
		1408.08	0.000E+00	?	4.466E-04	
		964.00	0.000E+00	?	4.761E-04	
		1112.07	0.000E+00	%	9.180E-04	
		778.90	0.000E+00	%	4.835E-04	
		1085.80	0.000E+00	%	1.188E-03	
		244.67	0.000E+00	%	5.385E-04	
		867.39	1.710E-03	&	3.172E-03	
		444.00	0.000E+00	%	2.553E-03	
		411.09	0.000E+00	&	4.151E-03	
		1089.82	0.000E+00	%	7.130E-03	
		1299.19	0.000E+00	&	7.706E-03	
		1212.89	0.000E+00	%	7.550E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.439E-05	
		1274.80	0.000E+00	&	4.184E-04	
		723.30	4.471E-04	&	6.587E-04	
		1004.80	0.000E+00	%	4.893E-04	
		873.20	0.000E+00	%	8.423E-04	
		996.30	0.000E+00	%	9.326E-04	
		248.04	0.000E+00	%	5.578E-04	
		591.70	1.259E-03	&	2.185E-03	
		756.70	0.000E+00	%	2.278E-03	
		1597.30	0.000E+00	%	7.456E-03	
		692.50	0.000E+00	%	4.206E-03	
		1397.80	0.000E+00	%	6.322E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.477E-04	
		105.31	0.000E+00	&	2.677E-04	
		60.01	0.000E+00	&	6.492E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
- Peak is too narrow.
- Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
. - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.1548E-07	0.000E+00	0.000E+00
FE-59	<	4.0899E-07	0.000E+00	0.000E+00
CO-57	<	1.3275E-06	0.000E+00	0.000E+00
CO-60	<	3.6676E-07	0.000E+00	0.000E+00
Kr-85	#	~~1.1232E-06~~	~~2.269E-07~~	~~2.293E-07~~ Not present, software misidentified 511 KeV ann. peak. P. Jess 8/17/01
ZN-65	<	6.4513E-07	0.000E+00	0.000E+00
CD-109	<	4.1147E-06	0.000E+00	0.000E+00
CS-137	#	3.6222E-07	1.025E-07	1.035E-07
EU-152	<	3.7728E-07	0.000E+00	0.000E+00
EU-154	<	2.2271E-07	0.000E+00	0.000E+00
EU-155	<	4.4225E-07	0.000E+00	0.000E+00

All peaks for activity calculation had bad shape.
Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 1.4854200E-06 uCi/g

Analyzed by: _____ 8/15/01
OPERATOR

EG&G ORTEC G V - I (63) WAN32 I4W02.88 15-AUG-2001 11:12:04 Page 6
IT Lab @ Georgia Tech Research Spectrum name: 00010455.An1

Reviewed by: _____ 8/17/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 14:22:13 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010429.An1

mple description
E1400 #23 #267

Spectrum Filename: C:\User\00010429.An1

Acquisition information
Start time 20-Jul-2001 14:12:11
Live time 599
Real time 600
Dead time .13%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 262.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.6200E+02)
= 3.8168E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 14:22:13 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010429.An1

ergy calibration normalized difference: .0454

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
299.35	74.79	69.	108.	.181	28.93	.780	PB-214	D
309.42	77.31	41.	159.	.266	19.49	.782	PB-214	D
954.39	238.77	30.	300.	.501	16.21	.895	PB-212	M
1407.13	352.08	7.	123.	.205	24.74	.855	PB-214	M
2435.82	609.48	0.	105.	.175	19.52	.467	BI-214	s
5840.99	1460.80	0.	135.	.225	17.21	.636	K-40	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
[illegible]155	252.29	63.00	130.	101.	.169	63.44	.826s
EU-155	345.94	86.45	47.	28.	.047	78.33	.791D
CD-109	352.29	88.04	58.	17.	.029	134.97	.793D
EU-155	410.86	102.71	55.	35.	.058	109.95	.286s
EU-152	487.05	121.78	15.	1.	.002	799.79	.825D
EU-154	492.33	123.10	26.	7.	.011	227.03	.826D
CO-57	545.84	136.50	16.	2.	.003	520.39	.248s
FE-59	564.44	141.15	33.	55.	.092	74.35	.504s
FE-59	796.06	199.14	25.	61.	.101	62.69	.391s
EU-152	977.97	244.67	5.	10.	.016	94.00	.940D
EU-154	991.43	248.04	8.	13.	.021	84.18	.943D
EU-152	1378.25	344.85	2.	1.	.002	351.78	.729s
EU-152	1469.00	367.57	1.	0.	.000	200.00	.000s
EU-152	1636.62	409.51	0.	32.	.053	35.36	.334s
EU-152	1754.67	439.05	0.	22.	.037	42.64	.751s
Kr-85	2040.99	510.70	0.	95.	.159	20.52	.584s
EU-154	2362.83	591.22	0.	6.	.010	81.65	.500s
CS-137	2644.49	661.68	0.	60.	.100	25.82	1.251
EU-152	2752.23	688.63	6.	3.	.006	231.16	1.326D
EU-154	2767.70	692.50	5.	5.	.008	163.96	1.329D
EU-154	2892.33	723.67	0.	8.	.013	70.71	.250s
EU-154	3023.00	756.36	0.	0.	.000	.00	.000s
[illegible] 152	3112.00	778.62	0.	0.	.000	.00	.000s
[illegible]54	3334.60	834.29	0.	14.	.023	53.45	.375s
EU-152	3449.50	863.02	0.	8.	.013	70.71	.500s
EU-154	3477.50	870.02	0.	13.	.022	55.47	.375s
EU-152	3845.00	961.92	0.	16.	.027	50.00	.375s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 14:22:13 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010429.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-154	3950.00	988.17	0.	22.	.037	42.64	.250s
EU-154	4018.00	1005.17	0.	3.	.005	115.47	.250s
EU-152	4340.50	1085.80	2.	5.	.008	127.36	1.633D
EU-152	4356.58	1089.82	4.	3.	.005	200.25	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	4.	2.	.004	289.70	1.653D
ZN-65	4459.39	1115.52	3.	6.	.011	104.51	1.655D
CO-60	4688.00	1172.67	0.	1.	.002	200.00	.125s
EU-152	4836.44	1209.77	0.	25.	.042	40.00	.500s
EU-154	5094.00	1274.14	0.	1.	.002	200.00	.250s
FE-59	5156.33	1289.72	0.	8.	.013	70.71	.250s
EU-152	5193.00	1298.88	0.	0.	.000	.00	.000s
CO-60	5321.00	1330.87	0.	3.	.005	115.47	.250s
EU-154	5585.00	1396.84	0.	3.	.005	115.47	.250s
EU-152	5632.00	1408.59	0.	10.	.017	63.25	.250s
EU-154	6386.50	1597.09	0.	3.	.005	115.47	.500s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

NUCLIDE	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	PEAK CODE	PEAK MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	1.033E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.943E-04	
			192.34	0.000E+00	&	1.991E-03	
			142.65	0.000E+00	&	5.319E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	2.868E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.085E-04	
			1173.23	0.000E+00	%	8.756E-05	
Kr-85		3.6360E-04	513.99	3.636E-04	&(	9.568E-05	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.285E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.222E-03	
			25.50	0.000E+00	=	0.000E+00	

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 14:22:13 Page 4
IT Lab @ Georgia Tech Research Spectrum name: 00010429.An1

clide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CS-137	1.4516E-04	661.62	1.452E-04	(	6.048E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	9.742E-05	
		688.63	0.000E+00	%	9.378E-03	
		367.71	0.000E+00	%	3.939E-03	
		344.30	0.000E+00	%	1.320E-04	
		1408.08	0.000E+00	%	6.808E-04	
		964.00	0.000E+00	%	8.268E-04	
		1112.07	0.000E+00	%	7.769E-04	
		778.90	0.000E+00	?	4.499E-04	
		1085.80	0.000E+00	%	1.039E-03	
		244.67	0.000E+00	%	5.097E-04	
		867.39	0.000E+00	&	2.203E-03	
		444.00	0.000E+00	&	2.481E-03	
		411.09	1.946E-03	*	3.309E-03	
		1089.82	0.000E+00	%	6.237E-03	
		1299.19	0.000E+00	?	5.189E-03	
		1212.89	0.000E+00	&	1.156E-02	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.939E-05	
		1274.80	0.000E+00	%	2.637E-04	
		723.30	0.000E+00	%	4.033E-04	
		1004.80	0.000E+00	%	4.893E-04	
		873.20	0.000E+00	&	9.277E-04	
		996.30	0.000E+00	&	1.277E-03	
		248.04	0.000E+00	%	6.585E-04	
		591.70	0.000E+00	%	1.375E-03	
		756.70	0.000E+00	?	1.392E-03	
		1597.30	0.000E+00	%	7.455E-03	
		692.50	0.000E+00	%	4.909E-03	
		1397.80	0.000E+00	%	7.059E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.411E-04	
		105.31	0.000E+00	&	2.360E-04	
		60.01	0.000E+00	&	7.089E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
- Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide

failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.9417E-07	0.000E+00	0.000E+00
FE-59	<	5.2129E-07	0.000E+00	0.000E+00
CO-57	<	1.0945E-06	0.000E+00	0.000E+00
CO-60	<	4.1418E-07	0.000E+00	0.000E+00
Kr-85	#	<1.3878E-6 ~~1.3878E-06~~	~~2.848E-07~~	~~2.877E-07~~
ZN-65	<	8.7213E-07	0.000E+00	0.000E+00
CD-109	<	4.6657E-06	0.000E+00	0.000E+00
CS-137		5.5403E-07	1.430E-07	1.449E-07
EU-152	<	3.7182E-07	0.000E+00	0.000E+00
EU-154	<	3.4119E-07	0.000E+00	0.000E+00
EU-155	<	5.3855E-07	0.000E+00	0.000E+00

8/7/01 Ann. Peak misidentified by software.

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 1.9418230E-06 uCi/g

Analyzed by: _____ 7/23/01
OPERATOR

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 14:22:13 Page 6
IT Lab @ Georgia Tech Research Spectrum name: 00010429.An1

Reviewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:18:24 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010430.An1

ıple description
E1400 #24 #268

Spectrum Filename: C:\User\00010430.An1

Acquisition information
Start time 20-Jul-2001 15:08:22
Live time 599
Real time 600
Dead time .12%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 318.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.1800E+02)
= 3.1447E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

Corrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:18:24 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010430.An1

rgy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
369.71	92.40	31.	248.	.414	28.04	1.337	PB-214	s
745.37	186.45	28.	129.	.215	31.65	.824	PA-234	s
954.64	238.83	85.	287.	.478	28.36	.925	PB-212	
1180.78	295.43	19.	161.	.268	33.43	.934	PB-214	
1406.90	352.02	10.	200.	.333	21.74	.980	PB-214	
2436.41	609.62	0.	136.	.227	17.15	1.001	BI-214	s

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
[illegible]-155	239.00	59.68	103.	0.	.000	.00	.000s
[illegible]-155	345.94	86.45	57.	13.	.021	179.61	.791D
CD-109	352.29	88.04	64.	37.	.062	69.13	.793D
EU-155	421.87	105.46	25.	19.	.032	106.48	.752
EU-152	487.05	121.78	17.	16.	.026	90.94	.825D
EU-154	492.33	123.10	14.	11.	.019	110.32	.826D
CO-57	555.71	138.97	75.	67.	.112	82.89	.281s
FE-59	580.59	145.20	79.	48.	.080	104.02	.226s
FE-59	774.82	193.82	53.	24.	.040	159.54	.217s
EU-152	977.97	244.67	8.	7.	.012	131.30	.940D
EU-154	991.43	248.04	18.	11.	.019	120.17	.943D
EU-152	1379.70	345.22	3.	21.	.035	63.56	.310s
EU-152	1483.87	371.29	0.	37.	.062	32.88	.626s
EU-152	1602.67	401.02	0.	86.	.144	21.57	.250s
EU-152	1775.43	444.25	0.	13.	.022	55.47	.313s
Kr-85	2042.05	510.96	0.	74.	.123	23.25	.644s
EU-154	2350.29	588.08	0.	25.	.042	40.00	.313s
CS-137	2645.67	661.97	0.	22.	.037	42.64	.338s
EU-152	2752.23	688.63	3.	4.	.006	180.80	1.326D
EU-154	2767.70	692.50	9.	7.	.011	149.80	1.329D
EU-154	2894.70	724.27	0.	29.	.048	37.14	.750s
EU-154	3030.00	758.11	0.	10.	.017	63.25	.250s
EU-152	3090.60	773.26	0.	27.	.045	38.49	.375s
[illegible]54	3313.33	828.97	0.	17.	.028	48.51	.375s
EU-152	3466.00	867.15	0.	20.	.033	44.72	.250s
EU-154	3493.60	874.05	0.	6.	.010	81.65	.375s
EU-152	3854.17	964.21	0.	16.	.027	50.00	.292s
EU-154	3971.00	993.42	0.	8.	.013	70.71	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:18:24 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010430.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-154	4015.00	1004.42	0.	0.	.000	.00	.000s
EU-152	4340.50	1085.80	0.	2.	.004	129.18	1.633D
EU-152	4356.58	1089.82	0.	2.	.003	164.17	1.636D
FE-59	4392.00	1098.67	0.	1.	.002	200.00	.125s
EU-152	4445.58	1112.07	6.	7.	.011	127.79	1.653D
ZN-65	4459.39	1115.52	4.	1.	.002	470.40	1.655D
CO-60	4667.75	1167.60	0.	23.	.038	41.70	.375s
EU-152	4849.00	1212.91	0.	3.	.005	115.47	.250s
EU-154	5095.00	1274.39	0.	0.	.000	.00	.000s
FE-59	5151.75	1288.57	0.	12.	.020	57.74	.312s
EU-152	5172.25	1293.70	0.	15.	.025	51.64	.375s
CO-60	5335.67	1334.54	0.	12.	.020	57.74	.375s
EU-154	5588.00	1397.59	0.	2.	.003	141.42	.250s
EU-152	5628.50	1407.71	0.	4.	.007	100.00	.500s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	&	1.093E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	%	1.467E-04	
			1291.56	0.000E+00	&	3.262E-04	
			192.34	0.000E+00	&	1.904E-03	
			142.65	0.000E+00	&	6.194E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	6.225E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.447E-04	
			1173.23	0.000E+00	&	1.585E-04	
Kr-85		2.8321E-04	513.99	2.832E-04	&(	9.568E-05	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.010E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.380E-03	
			25.50	0.000E+00	=	0.000E+00	
CS-137		0.0000E+00	661.62	0.000E+00	%	1.160E-04	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.234E-04	
		688.63	0.000E+00	%	8.841E-03	
		367.71	5.425E-03	&	8.400E-03	
		344.30	0.000E+00	%	2.170E-04	
		1408.08	0.000E+00	%	5.604E-04	
		964.00	0.000E+00	%	8.267E-04	
		1112.07	0.000E+00	%	9.383E-04	
		778.90	4.859E-04	&	9.234E-04	
		1085.80	0.000E+00	%	8.647E-04	
		244.67	0.000E+00	%	5.097E-04	
		867.39	0.000E+00	%	2.839E-03	
		444.00	0.000E+00	%	2.116E-03	
		411.09	5.231E-03	&	4.821E-03	
		1089.82	0.000E+00	%	5.080E-03	
		1299.19	0.000E+00	&	8.842E-03	
		1212.89	0.000E+00	%	6.935E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.126E-05	
		1274.80	0.000E+00	?	2.454E-04	
		723.30	3.241E-04	?	5.875E-04	
		1004.80	0.000E+00	?	4.077E-04	
		873.20	0.000E+00	%	7.681E-04	
		996.30	0.000E+00	&	9.613E-04	
		248.04	0.000E+00	%	7.330E-04	
		591.70	0.000E+00	&	2.030E-03	
		756.70	0.000E+00	%	2.123E-03	
		1597.30	0.000E+00	?	6.212E-03	
		692.50	0.000E+00	%	5.592E-03	
		1397.80	0.000E+00	%	6.708E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.373E-04	
		105.31	0.000E+00	%	1.784E-04	
		60.01	0.000E+00	%	5.184E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.

- Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.4386E-07	0.000E+00	0.000E+00
FE-59	<	4.6144E-07	0.000E+00	0.000E+00
CO-57	<	1.9574E-06	0.000E+00	0.000E+00
CO-60	<	4.5495E-07	0.000E+00	0.000E+00
Kr-85	#	<8.9059E-7 ~~8.9059E-07~~	~~2.071E-07~~	~~2.087E-07~~
ZN-65	<	6.3205E-07	0.000E+00	0.000E+00
CD-109	<	4.3386E-06	0.000E+00	0.000E+00
CS-137	<	3.6472E-07	0.000E+00	0.000E+00
EU-152	<	3.8798E-07	0.000E+00	0.000E+00
EU-154	<	2.5553E-07	0.000E+00	0.000E+00
EU-155	<	4.3165E-07	0.000E+00	0.000E+00

Software misidentified ann. peak at 511 KeV. Kr-85 not present P.Jones 8/7/01

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

'AL ACTIVITY (49.9 to 2000.0 keV) 8.9059220E-07 uCi/g

Analyzed by: [signature] 7/23/01
OPERATOR

Reviewed by: [signature] 8/7/01

Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:29:41 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010431.An1

ple description
E1400 #25 #269

Spectrum Filename: C:\User\00010431.An1

Acquisition information
Start time 20-Jul-2001 15:19:39
Live time 599
Real time 600
Dead time .11%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 300.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.0000E+02)
= 3.3333E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:29:41 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010431.An1

ergy calibration normalized difference: .5185

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
369.70	92.40	66.	175.	.292	33.02	.535	TH-234	sM
748.49	187.23	7.	157.	.262	22.49	.829	PA-234	sM
954.82	238.87	25.	211.	.351	21.89	.797	PB-212	M
1408.16	352.34	0.	153.	.255	16.17	.665	PB-214	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	233.34	58.26	33.	29.	.048	85.24	.645s
EU-155	345.94	86.45	55.	15.	.025	148.58	.791D
109	352.29	88.04	52.	37.	.061	64.84	.793D
EU-155	426.20	106.55	40.	22.	.037	143.26	.289s
EU-152	487.05	121.78	23.	8.	.014	177.84	.825D
EU-154	492.33	123.10	26.	5.	.008	316.51	.826D
CO-57	529.31	132.36	23.	61.	.101	55.01	.479s
FE-59	576.52	144.18	56.	74.	.123	84.18	.329s
FE-59	770.00	192.61	4.	1.	.001	670.82	.000s
EU-152	977.97	244.67	17.	5.	.008	273.38	.940D
EU-154	991.43	248.04	16.	5.	.008	262.57	.943D
EU-152	1374.08	343.81	3.	13.	.021	93.26	.577s
EU-152	1465.75	366.75	0.	15.	.025	51.64	.876
EU-152	1621.83	405.81	0.	49.	.082	28.57	.626s
EU-152	1798.69	450.07	0.	32.	.053	35.36	.365s
Kr-85	2057.17	514.74	0.	8.	.013	70.71	.375s
EU-154	2357.50	589.88	0.	34.	.057	34.30	.375s
CS-137	2646.96	662.30	0.	48.	.080	28.87	.375s
EU-152	2752.23	688.63	3.	7.	.011	105.90	1.326D
EU-154	2767.70	692.50	2.	4.	.006	155.78	1.329D
EU-154	2890.00	723.09	0.	5.	.008	89.44	.375s
EU-154	3019.57	755.50	0.	8.	.013	70.71	.333s
EU-152	3110.20	778.17	0.	9.	.015	66.67	.500s
MN-54	3335.00	834.39	0.	0.	.000	.00	.000s
152	3463.00	866.40	0.	10.	.017	63.25	.250s
154	3482.00	871.15	0.	10.	.017	63.25	.250s
EU-152	3827.33	957.50	0.	15.	.025	51.64	.250s
EU-154	3969.33	993.01	0.	8.	.013	70.71	.250s
EU-154	4033.67	1009.09	0.	19.	.032	45.88	.375s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:29:41 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010431.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	4340.50	1085.80	2.	2.	.003	322.33	1.633D
EU-152	4356.58	1089.82	6.	1.	.002	477.38	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	1.	0.	.000	.00	1.653
ZN-65	4455.00	1114.42	0.	5.	.008	89.44	.250s
CO-60	4689.00	1172.92	0.	0.	.000	.00	.000s
EU-152	4844.00	1211.66	0.	5.	.008	89.44	.250s
EU-154	5094.00	1274.14	0.	1.	.002	200.00	.250s
FE-59	5161.67	1291.05	0.	3.	.005	115.47	.375s
EU-152	5186.00	1297.13	0.	7.	.012	75.59	.250s
CO-60	5322.50	1331.25	0.	3.	.005	115.47	.500s
EU-154	5591.00	1398.34	0.	1.	.002	200.00	.250s
EU-152	5625.00	1406.84	0.	6.	.010	81.65	.250s
EU-154	6392.67	1598.63	0.	5.	.008	89.44	.375s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	?(	6.181E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.446E-04	
			192.34	0.000E+00	%	8.202E-04	
			142.65	0.000E+00	&	6.254E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	5.002E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.085E-04	
			1173.23	0.000E+00	?	8.147E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.381E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.010E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.310E-03	
			25.50	0.000E+00	=	0.000E+00	
C 137		1.1610E-04	661.62	1.161E-04	(	6.047E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:29:41 Page 4
IT Lab @ Georgia Tech Research Spectrum name: 00010431.An1

:lide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
EU-152	0.0000E+00	121.78	0.000E+00	%	1.207E-04	
		688.63	0.000E+00	%	9.627E-03	
		367.71	0.000E+00	%	6.246E-03	
		344.30	0.000E+00	%	1.910E-04	
		1408.08	0.000E+00	%	6.047E-04	
		964.00	0.000E+00	&	8.110E-04	
		1112.07	0.000E+00		6.162E-04	
		778.90	0.000E+00	%	6.679E-04	
		1085.80	0.000E+00	%	9.316E-04	
		244.67	0.000E+00	%	5.735E-04	
		867.39	0.000E+00	%	2.327E-03	
		444.00	1.656E-03	&	2.815E-03	
		411.09	2.980E-03	&	3.865E-03	
		1089.82	0.000E+00	%	6.236E-03	
		1299.19	0.000E+00	%	7.263E-03	
		1212.89	0.000E+00	%	7.547E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.743E-05	
		1274.80	0.000E+00	%	2.637E-04	
		723.30	0.000E+00	%	3.649E-04	
		1004.80	0.000E+00	&	7.461E-04	
		873.20	0.000E+00	%	8.646E-04	
		996.30	0.000E+00	&	9.612E-04	
		248.04	0.000E+00	%	6.584E-04	
		591.70	1.380E-03	?	2.256E-03	
		756.70	0.000E+00	%	2.010E-03	
		1597.30	0.000E+00	%	8.113E-03	
		692.50	0.000E+00	%	4.360E-03	
		1397.80	0.000E+00	%	6.320E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.372E-04	
		105.31	0.000E+00	&	2.033E-04	
		60.01	0.000E+00	&	4.085E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\- - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	2.0603E-07	0.000E+00	0.000E+00
FE-59	<	4.5517E-07	0.000E+00	0.000E+00
CO-57	<	1.6672E-06	0.000E+00	0.000E+00
CO-60	<	3.6164E-07	0.000E+00	0.000E+00
Kr-85	<	4.6028E-07	0.000E+00	0.000E+00
ZN-65	<	6.6989E-07	0.000E+00	0.000E+00
CD-109	<	4.3655E-06	0.000E+00	0.000E+00
CS-137		3.8700E-07	1.117E-07	1.129E-07
EU-152	<	4.0229E-07	0.000E+00	0.000E+00
EU-154	<	2.9145E-07	0.000E+00	0.000E+00
EU-155	<	4.5749E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 3.8700320E-07 uCi/g

Analyzed by: _____ 7/23/01
OPERATOR

Reviewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:40:34 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010432.An1

mple description
E1400 #26 #270

Spectrum Filename: C:\User\00010432.An1

Acquisition information
Start time 20-Jul-2001 15:30:32
Live time 599
Real time 600
Dead time .11%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 298.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.9800E+02)
= 3.3557E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections Status Comments
Decay correct to date NO
Decay during acquisition NO
Decay during collection NO
Peaked background correction NO

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:40:34 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010432.An1

ergy calibration normalized difference: .5829

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
298.99	74.70	61.	106.	.177	28.53	.780	PB-214	D
310.29	77.52	62.	147.	.245	22.45	.782	PB-214	D
373.68	93.40	50.	129.	.216	35.01	.747	U-235	s
955.32	239.00	34.	292.	.488	18.89	.892	PB-212	sM
1408.24	352.36	0.	145.	.242	16.61	.876	PB-214	sM

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CENTROID CHANNEL	ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
[illegible]-155	252.33	63.01	101.	129.	.215	47.64	.393s
[illegible]-155	345.94	86.45	68.	12.	.020	198.27	.791D
CD-109	352.29	88.04	62.	41.	.068	62.73	.793D
EU-155	426.34	106.58	33.	35.	.058	87.22	.910
EU-152	487.05	121.78	20.	7.	.012	195.80	.825D
EU-154	492.33	123.10	27.	2.	.003	814.41	.826D
CO-57	535.43	133.89	31.	46.	.076	68.85	.278s
FE-59	573.29	143.37	40.	60.	.101	65.15	.478s
FE-59	763.53	190.99	10.	20.	.033	97.47	.314s
EU-152	977.97	244.67	8.	1.	.002	861.04	.940D
EU-154	991.43	248.04	14.	2.	.004	444.35	.943D
EU-152	1378.29	344.86	3.	24.	.039	63.80	.485s
EU-152	1474.30	368.89	0.	24.	.040	40.82	1.001
EU-152	1644.00	411.36	0.	1.	.002	200.00	.125s
EU-152	1775.50	444.27	0.	9.	.015	66.67	.500s
Kr-85	2063.00	516.20	0.	17.	.028	48.51	.250s
EU-154	2363.00	591.26	0.	0.	.000	.00	.000s
CS-137	2647.29	662.38	0.	49.	.082	28.57	1.251
EU-152	2752.23	688.63	4.	2.	.003	324.13	1.326D
EU-154	2767.70	692.50	5.	5.	.009	139.07	1.329D
EU-154	2860.31	715.66	6.	14.	.023	121.72	.244s
EU-154	3004.20	751.65	0.	17.	.028	48.51	.375s
EU-152	3111.50	778.49	0.	2.	.003	141.42	.500s
[illegible]54	3334.75	834.32	0.	9.	.015	66.67	.375s
[illegible]-152	3463.00	866.40	0.	4.	.007	100.00	.250s
EU-154	3486.25	872.21	0.	5.	.008	89.44	.375s
EU-152	3830.00	958.17	0.	18.	.030	47.14	.375s
EU-154	3976.50	994.80	0.	8.	.013	70.71	.250s

IT Lab @ Georgia Tech Research Spectrum name: 00010432.Anl

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
MN-54	4022.50	1006.30	0.	6.	.010	81.65	.375s
EU-152	4340.50	1085.80	4.	1.	.002	419.91	1.633D
EU-152	4356.58	1089.82	4.	8.	.013	106.38	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	0.	2.	.003	204.43	1.653D
ZN-65	4459.39	1115.52	0.	3.	.005	111.71	1.655D
CO-60	4689.00	1172.92	0.	0.	.000	.00	.000s
EU-152	4848.88	1212.88	0.	21.	.035	43.64	.625s
EU-154	5090.43	1273.25	0.	17.	.028	48.51	.625s
FE-59	5162.00	1291.14	0.	2.	.003	141.42	.250s
EU-152	5186.00	1297.13	0.	6.	.010	81.65	.250s
CO-60	5327.00	1332.37	0.	2.	.003	141.42	.250s
EU-154	5587.00	1397.34	0.	0.	.000	.00	.000s
EU-152	5631.00	1408.34	0.	3.	.005	115.47	.750s
EU-154	6385.00	1596.71	0.	4.	.007	100.00	.250s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	9.178E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.325E-04	
			192.34	0.000E+00	&	1.336E-03	
			142.65	0.000E+00	%	5.604E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	4.829E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.031E-04	
			1173.23	0.000E+00	?	8.147E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	&	1.692E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.864E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.391E-03	
			25.50	0.000E+00	=	0.000E+00	
CS-137		1.1852E-04	661.62	1.185E-04	(	6.047E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	

clide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	1.151E-04	
		688.63	0.000E+00	%	8.552E-03	
		367.71	0.000E+00	%	7.231E-03	
		344.30	0.000E+00	%	2.257E-04	
		1408.08	0.000E+00	%	5.357E-04	
		964.00	0.000E+00	&	8.566E-04	
		1112.07	0.000E+00	%	6.540E-04	
		778.90	0.000E+00	%	5.129E-04	
		1085.80	0.000E+00	%	9.697E-04	
		244.67	0.000E+00	%	4.482E-04	
		867.39	0.000E+00	%	1.915E-03	
		444.00	0.000E+00	%	1.921E-03	
		411.09	0.000E+00	%	1.634E-03	
		1089.82	0.000E+00	%	7.127E-03	
		1299.19	0.000E+00	%	7.026E-03	
		1212.89	0.000E+00	%	1.092E-02	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.544E-05	
		1274.80	0.000E+00	%	4.341E-04	
		723.30	0.000E+00	&	5.196E-04	
		1004.80	0.000E+00	%	5.521E-04	
		873.20	0.000E+00	%	7.407E-04	
		996.30	0.000E+00	%	9.612E-04	
		248.04	0.000E+00	%	6.053E-04	
		591.70	0.000E+00	?	1.015E-03	
		756.70	0.000E+00	&	2.463E-03	
		1597.30	0.000E+00	%	7.795E-03	
		692.50	0.000E+00	%	4.908E-03	
		1397.80	0.000E+00	?	5.882E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.448E-04	
		105.31	0.000E+00	&	2.108E-04	
		60.01	0.000E+00	&	7.074E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
\- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.

EG&G ORTEC G V - I (63) WAN32 I4W02.88 20-JUL-2001 15:40:34 Page 5
IT Lab @ Georgia Tech Research Spectrum name: 00010432.An1

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.0799E-07	0.000E+00	0.000E+00
FE-59	<	4.5823E-07	0.000E+00	0.000E+00
CO-57	<	1.6205E-06	0.000E+00	0.000E+00
CO-60	<	3.4596E-07	0.000E+00	0.000E+00
Kr-85	<	5.6785E-07	0.000E+00	0.000E+00
ZN-65	<	6.2555E-07	0.000E+00	0.000E+00
CD-109	<	4.6668E-06	0.000E+00	0.000E+00
CS-137		3.9772E-07	1.136E-07	1.148E-07
EU-152	<	3.8620E-07	0.000E+00	0.000E+00
EU-154	<	2.8670E-07	0.000E+00	0.000E+00
EU-155	<	4.8582E-07	0.000E+00	0.000E+00

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 3.9771730E-07 uCi/g

Analyzed by: _____ 7/23/01
OPERATOR

Reviewed by: _____ 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 23-JUL-2001 08:19:25 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010438.An1

ıple description
E1400 #27 #271

Spectrum Filename: C:\User\00010438.An1

Acquisition information
Start time 23-Jul-2001 08:09:23
Live time 599
Real time 600
Dead time .15%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 290.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.9000E+02)
= 3.4483E-03
Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rections Status Comments
Decay correct to date NO
Decay during acquisition NO
Decay during collection NO
Peaked background correction NO

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

ergy calibration normalized difference: .8202

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
361.68	90.39	24.	62.	.103	34.04	.795	PB-214	D
373.42	93.33	57.	81.	.136	34.24	.798	U-235	D
955.39	239.02	15.	289.	.482	17.55	.820	PB-212	s
1408.19	352.35	4.	177.	.296	16.22	.885	PB-214	
2437.43	609.88	0.	105.	.175	19.52	1.231	RU-103	

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	241.65	60.34	55.	16.	.027	191.15	.270s
EU-155	345.94	86.45	60.	19.	.032	124.91	.791D
[illegible]-109	352.29	88.04	58.	52.	.086	50.20	.793D
EU-155	422.15	105.53	70.	0.	.000	.00	.221s
EU-152	487.05	121.78	23.	6.	.010	234.60	.825D
EU-154	492.33	123.10	23.	5.	.008	315.54	.826D
CO-57	538.43	134.64	23.	22.	.037	100.64	.289s
FE-59	561.40	140.39	50.	52.	.087	90.36	.483s
FE-59	761.50	190.48	34.	22.	.037	114.27	.354s
EU-152	977.97	244.67	3.	6.	.010	109.83	.940D
EU-154	991.43	248.04	7.	16.	.026	70.50	.943D
EU-152	1379.41	345.15	0.	31.	.052	35.92	.313s
EU-152	1471.00	368.07	0.	1.	.002	200.00	.125s
EU-152	1606.17	401.89	8.	50.	.083	55.29	.290s
EU-152	1757.00	439.64	0.	17.	.028	48.51	.250s
Kr-85	2052.06	513.47	7.	2.	.003	641.25	.134s
EU-154	2377.33	594.85	0.	26.	.043	39.22	.500s
CS-137	2647.36	662.40	0.	52.	.087	27.74	.538s
EU-152	2752.23	688.63	1.	0.	.000	.00	1.326
EU-154	2759.00	690.32	0.	1.	.002	200.00	.250s
EU-154	2866.33	717.17	0.	19.	.032	45.88	.250s
EU-154	3021.80	756.06	0.	20.	.033	44.72	.313s
EU-152	3099.14	775.40	0.	22.	.037	42.64	.313s
MN-54	3323.00	831.39	0.	14.	.023	53.45	.250s
[illegible]152	3466.00	867.15	0.	27.	.045	38.49	.375s
[illegible]-154	3481.00	870.90	0.	6.	.010	81.65	.250s
EU-152	3876.14	969.70	0.	41.	.068	31.23	.550s
EU-154	3985.00	996.92	0.	5.	.008	89.44	.250s
EU-154	4002.33	1001.26	0.	9.	.015	66.67	.250s

EG&G ORTEC G V - I (63) WAN32 I4W02.88 23-JUL-2001 08:19:25 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010438.An1

clide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
-152	4340.50	1085.80	6.	7.	.012	119.57	1.633D
EU-152	4356.58	1089.82	5.	2.	.004	308.48	1.636D
FE-59	4394.00	1099.17	0.	1.	.002	200.00	.250s
EU-152	4445.58	1112.07	5.	4.	.006	204.05	1.653D
ZN-65	4459.39	1115.52	1.	1.	.002	282.24	1.655D
CO-60	4686.00	1172.17	0.	3.	.005	115.47	.250s
EU-152	4851.50	1213.53	0.	37.	.062	32.88	.250s
EU-154	5099.00	1275.39	0.	5.	.008	89.44	.250s
FE-59	5157.00	1289.89	0.	5.	.008	89.44	.250s
EU-152	5193.00	1298.88	0.	0.	.000	.00	.000s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5591.00	1398.34	0.	2.	.003	141.42	.250s
EU-152	5628.50	1407.71	0.	4.	.007	100.00	.500s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	CODE	MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	&	1.033E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	%	1.468E-04	
			1291.56	0.000E+00	%	2.664E-04	
			192.34	0.000E+00	&	1.680E-03	
			142.65	0.000E+00	&	5.653E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	3.923E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.045E-05	
			1173.23	0.000E+00	%	9.781E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.421E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	1.755E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.430E-03	
			25.50	0.000E+00	=	0.000E+00	
C 137		1.2583E-04	661.62	1.258E-04	?(	6.050E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
EU-152	0.0000E+00	121.78	0.000E+00	%	1.180E-04	
		688.63	0.000E+00		6.781E-03	
		367.71	0.000E+00	%	3.940E-03	
		344.30	1.364E-04		2.368E-04	
		1408.08	0.000E+00	%	5.605E-04	
		964.00	7.808E-04	&	1.133E-03	
		1112.07	0.000E+00	%	8.520E-04	
		778.90	0.000E+00	&	8.630E-04	
		1085.80	0.000E+00	%	1.215E-03	
		244.67	0.000E+00	%	4.442E-04	
		867.39	1.649E-03	?	3.134E-03	
		444.00	0.000E+00	&	2.289E-03	
		411.09	0.000E+00	&	4.124E-03	
		1089.82	0.000E+00	%	6.239E-03	
		1299.19	0.000E+00	?	5.190E-03	
		1212.89	8.555E-03	?	1.325E-02	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.445E-05	
		1274.80	0.000E+00	%	3.207E-04	
		723.30	0.000E+00	&	5.115E-04	
		1004.80	0.000E+00	&	6.056E-04	
		873.20	0.000E+00	&	7.683E-04	
		996.30	0.000E+00	%	8.702E-04	
		248.04	0.000E+00	%	6.783E-04	
		591.70	1.056E-03	&	2.057E-03	
		756.70	0.000E+00	%	2.591E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	&	3.460E-03	
		1397.80	0.000E+00	%	6.710E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.441E-04	
		105.31	0.000E+00	%	2.232E-04	
		60.01	0.000E+00	%	4.311E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
\- Peak activity higher than counting uncertainty range.
\- Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

**** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.5619E-07	0.000E+00	0.000E+00
FE-59	<	5.0615E-07	0.000E+00	0.000E+00
CO-57	<	1.3529E-06	0.000E+00	0.000E+00
CO-60	<	3.1189E-07	0.000E+00	0.000E+00
Kr-85	<	4.9005E-07	0.000E+00	0.000E+00
ZN-65	<	6.0523E-07	0.000E+00	0.000E+00
CD-109	<	4.9306E-06	0.000E+00	0.000E+00
CS-137	#	4.3390E-07	1.203E-07	1.217E-07
EU-152	<	4.0683E-07	0.000E+00	0.000E+00
EU-154	<	2.9122E-07	0.000E+00	0.000E+00
EU-155	<	4.9691E-07	0.000E+00	0.000E+00

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 4.3389870E-07 uCi/g

Analyzed by: 7/23/01
OPERATOR

Reviewed by: 8/7/01
Supervisor

EG&G ORTEC G V - I (63) WAN32 I4W02.88 23-JUL-2001 08:32:22 Page 1
IT Lab @ Georgia Tech Research Spectrum name: 00010439.An1

ıple description
E1400 #28 #272

Spectrum Filename: C:\User\00010439.An1

Acquisition information
Start time 23-Jul-2001 08:22:21
Live time 599
Real time 600
Dead time .13%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 304.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 3.0400E+02)
= 3.2895E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

...rections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

EG&G ORTEC G V - I (63) WAN32 I4W02.88 23-JUL-2001 08:32:22 Page 2
IT Lab @ Georgia Tech Research Spectrum name: 00010439.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
299.62	74.85	44.	154.	.256	36.49	1.116	BI-207	s
312.85	78.17	36.	158.	.264	32.12	.913	PB-214	s
956.13	239.20	5.	211.	.353	15.74	1.054	PB-212	
1408.50	352.43	0.	133.	.222	17.34	.876	PB-214	s

s Peak fails shape tests.
D Peak area deconvoluted.

********** I D E N T I F I E D P E A K S U M M A R Y **********

NUCLIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	240.21	59.98	43.	29.	.048	124.33	.261s
EU-155	345.94	86.45	38.	6.	.011	280.00	.791D
CD-109	352.29	88.04	42.	29.	.048	73.83	.793D
[illegible]-155	435.56	108.89	19.	79.	.132	53.10	.905s
EU-152	487.05	121.78	14.	6.	.010	191.36	.825D
EU-154	492.33	123.10	21.	8.	.014	166.26	.826D
CO-57	541.00	135.29	4.	2.	.003	414.55	.079s
FE-59	558.82	139.75	9.	46.	.077	54.43	.220s
FE-59	767.38	191.96	3.	9.	.015	94.28	.471s
EU-152	977.97	244.67	4.	6.	.010	121.26	.940D
EU-154	991.43	248.04	5.	7.	.012	119.82	.943D
EU-152	1376.00	344.29	1.	0.	.000	200.00	.000s
EU-152	1458.50	364.94	0.	45.	.075	29.81	.250s
EU-152	1643.50	411.23	0.	14.	.023	53.45	.250s
EU-152	1781.13	445.67	0.	25.	.042	40.00	.500s
Kr-85	2053.67	513.87	1.	0.	.001	221.11	.197s
EU-154	2361.00	590.76	0.	2.	.003	141.42	.250s
CS-137	2646.88	662.28	0.	48.	.080	28.87	1.167
EU-152	2752.23	688.63	3.	8.	.014	91.56	1.326D
EU-154	2767.70	692.50	6.	7.	.012	125.93	1.329D
EU-154	2889.00	722.84	0.	0.	.000	.00	.000s
EU-154	3025.20	756.91	0.	9.	.015	66.67	.313s
EU-152	3096.00	774.61	0.	17.	.028	48.51	.250s
MN-54	3322.33	831.22	0.	25.	.042	40.00	.250s
EU-152	3465.00	866.90	0.	0.	.000	.00	.000s
[illegible]-154	3489.00	872.90	0.	0.	.000	.00	.000s
[illegible]-152	3852.00	963.67	0.	0.	.000	.00	.000s
EU-154	3981.00	995.92	0.	0.	.000	.00	.000s
EU-154	4013.00	1003.92	0.	3.	.005	115.47	.250s
EU-152	4340.50	1085.80	0.	5.	.009	87.19	1.633D

EG&G ORTEC G V - I (63) WAN32 I4W02.88 23-JUL-2001 08:32:22 Page 3
IT Lab @ Georgia Tech Research Spectrum name: 00010439.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	4356.58	1089.82	2.	0.	.000	2050.12	1.636D
FE-59	4393.00	1098.92	0.	1.	.002	200.00	.250s
EU-152	4445.58	1112.07	2.	3.	.005	161.53	1.653D
ZN-65	4459.39	1115.52	3.	5.	.009	127.02	1.655D
CO-60	4678.00	1170.17	0.	4.	.007	100.00	.250s
EU-152	4825.00	1206.91	0.	18.	.030	47.14	.250s
EU-154	5095.67	1274.56	0.	6.	.010	81.65	.375s
FE-59	5162.00	1291.14	0.	0.	.000	.00	.000s
EU-152	5186.00	1297.13	0.	5.	.008	89.44	.250s
CO-60	5326.00	1332.12	0.	0.	.000	.00	.000s
EU-154	5585.00	1396.84	0.	2.	.003	141.42	.250s
EU-152	5630.00	1408.09	0.	7.	.012	75.59	.250s
EU-154	6386.00	1596.96	0.	2.	.003	141.42	.250s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	PEAK CODE	PEAK MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	&	1.236E-04	
FE-59		0.0000E+00	1099.22	0.000E+00	%	1.467E-04	
			1291.56	0.000E+00	?	2.039E-04	
			192.34	0.000E+00	%	1.005E-03	
			142.65	0.000E+00	&	4.416E-03	
CO-57		0.0000E+00	136.43	0.000E+00	%	2.081E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	?(	9.043E-05	
			1173.23	0.000E+00	&	1.023E-04	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.028E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.221E-04	
			8.13	0.000E+00	=	0.000E+00	
CD-109		0.0000E+00	88.04	0.000E+00	%	1.196E-03	
			25.50	0.000E+00	=	0.000E+00	
CS-137		1.1612E-04	661.62	1.161E-04	?(	6.048E-05	
			32.19	0.000E+00	=	0.000E+00	
			31.82	0.000E+00	=	0.000E+00	
			36.40	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
EU-152	0.0000E+00	121.78	0.000E+00	%	1.043E-04	
		688.63	0.000E+00	%	9.871E-03	
		367.71	6.598E-03	&	9.025E-03	
		344.30	0.000E+00	%	1.182E-04	
		1408.08	0.000E+00	%	6.252E-04	
		964.00	0.000E+00	?	4.760E-04	
		1112.07	0.000E+00	%	7.493E-04	
		778.90	0.000E+00	&	7.958E-04	
		1085.80	0.000E+00	%	9.794E-04	
		244.67	0.000E+00	%	4.561E-04	
		867.39	0.000E+00	?	1.526E-03	
		444.00	0.000E+00	%	2.587E-03	
		411.09	0.000E+00	%	2.540E-03	
		1089.82	0.000E+00	%	5.080E-03	
		1299.19	0.000E+00	%	6.778E-03	
		1212.89	0.000E+00	&	1.040E-02	
EU-154	0.0000E+00	123.10	0.000E+00	%	8.545E-05	
		1274.80	0.000E+00	%	3.324E-04	
		723.30	0.000E+00	?	2.794E-04	
		1004.80	0.000E+00	%	4.893E-04	
		873.20	0.000E+00	?	5.671E-04	
		996.30	0.000E+00	?	6.661E-04	
		248.04	0.000E+00	%	5.577E-04	
		591.70	0.000E+00	%	1.157E-03	
		756.70	0.000E+00	%	2.068E-03	
		1597.30	0.000E+00	%	7.084E-03	
		692.50	0.000E+00	%	5.267E-03	
		1397.80	0.000E+00	%	6.708E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.148E-04	
		105.31	0.000E+00	&	2.443E-04	
		60.01	0.000E+00	%	4.334E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.
@ - Peak is too wide at FW25M, but ok at FWHM.
% - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- Peak activity higher than counting uncertainty range.
- Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the

library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
P - Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	4.0672E-07	0.000E+00	0.000E+00
FE-59	<	4.8272E-07	0.000E+00	0.000E+00
CO-57	<	6.8454E-07	0.000E+00	0.000E+00
CO-60	<	2.9746E-07	0.000E+00	0.000E+00
Kr-85	<	3.3819E-07	0.000E+00	0.000E+00
ZN-65	<	7.3064E-07	0.000E+00	0.000E+00
CD-109	<	3.9341E-06	0.000E+00	0.000E+00
CS-137	#	3.8199E-07	1.103E-07	1.114E-07
EU-152	<	3.4318E-07	0.000E+00	0.000E+00
EU-154	<	2.8110E-07	0.000E+00	0.000E+00
EU-155	<	3.7776E-07	0.000E+00	0.000E+00

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

---------- S U M M A R Y ----------

TOTAL ACTIVITY (49.9 to 2000.0 keV) 3.8198760E-07 uCi/g

Analyzed by: _____ 7/23/01
OPERATOR

Reviewed by: _____ 8/7/01
Supervisor

****
**** GAMMA SPECTRUM ANALYSIS *****
****

Report Generated On	09/28/01 2:05:17 PM
Detector	DET04
Sample I.D.	Georgia Tech
Spectrum Number	MF0753.CNF
Sample Description	E1400, #29
Sample Type	SOIL
Sample Geometry	D4g01
Peak Locate Threshold	3.50
Peak Locate Range (in channels)	100 - 4096
Peak Area Range (in channels)	100 - 4096
Identification Energy Tolerance	1.00 keV
Sample Size	1.188E+003 g
Sample Collection Date	09/27/01 3:22:00 PM
Spectrum Collection Date	09/27/01 3:22:36 PM
Decay Corrected To	09/27/01 3:22:00 PM
Collected By	W. Alderman
Live Time	1500.0 seconds
Real Time	1500.9 seconds
% Dead Time	0.06 %
Background Type	STEP

Energy Calibration Performed On	03/28/01
Efficiency Calibration Performed On	03/31/01
Calibration Geometry Used	D4g01

Reviewed By W. Alderman Date 9/28/01

COPY

PEAK LOCATE REPORT

Detector	DET04
Sample I.D.	Georgia Tech
Spectrum Number	MF0753.CNF
Sample Description	E1400, #29
Sample Type	SOIL
Peak Locate Performed on	09/28/01 2:05:16 PM
Peak Locate From Channel	100
Peak Locate To Channel	4096
Peak Search Sensitivity	3.50
MDA Confidence	5.00

Peak No.	Centroid Channel	Centroid Uncertainty	Energy (keV)	Peak Significance	FWHM (keV)
1	150.00	0.4865	74.74	4.22	0.8169
2	154.48	0.3449	77.06	4.40	0.8216
3	477.56	0.2003	238.61	13.88	0.9891
4	484.21	0.3804	241.82	3.96	0.9930
5	590.53	0.2839	295.13	6.29	1.0923
6	676.82	0.2858	338.25	6.82	1.1005
7	703.96	0.2044	351.80	12.29	1.1373
8	1021.66	0.3562	510.58	3.99	2.0468
9	1166.18	0.2156	583.01	10.16	1.1738
10	1218.24	0.2091	609.07	10.38	1.3922
11	1323.10	0.2930	661.50	4.52	1.4878
12	1454.12	0.3444	726.96	3.83	1.2693
13	1720.73	0.3509	860.29	3.87	0.9157
14	1821.97	0.2335	910.92	7.83	1.5278
15	1937.32	0.2945	968.78	4.56	1.3407
16	2240.10	0.2856	1120.07	5.02	1.6502
17	2345.60	0.2415	1172.82	6.66	1.6685
18	2474.84	0.3373	1237.36	3.88	1.0426
19	2664.53	0.2419	1332.19	5.62	1.8851
20	2921.26	0.1621	1460.51	12.75	1.9353
21	3529.22	0.2674	1764.14	4.68	1.8532

Errors quoted at 1.96 sigma

COPY

****
***** P E A K A N A L Y S I S R E P O R T *****
****

Detector DET04
Sample I.D. Georgia Tech
Spectrum Number MF0753.CNF
Sample Description E1400, #29

Peak Analysis Performed on 09/28/01 2:05:16 PM
Peak Analysis From Channel 100
Peak Analysis To Channel 4096

	Peak No.	ROI start	ROI end	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
M	1	145-	158	149.89	74.74	1.42E+002	32.56	2.65E+002
m	2	145-	158	154.54	77.06	2.22E+002	39.84	2.71E+002
M	3	469-	489	477.60	238.61	8.43E+002	61.09	1.74E+002
m	4	469-	489	484.02	241.82	1.64E+002	27.06	1.62E+002
F	5	585-	595	590.63	295.13	2.45E+002	35.79	1.86E+002
F	6	668-	681	676.86	338.25	1.81E+002	28.38	1.50E+002
F	7	697-	709	703.94	351.80	5.24E+002	46.58	1.45E+002
F	8	1011-	1029	1021.43	510.58	1.36E+002	22.42	9.97E+001
F	9	1162-	1173	1166.24	583.01	2.91E+002	34.03	6.93E+001
F	10	1208-	1228	1218.34	609.07	4.02E+002	38.63	1.09E+002
F	11	1319-	1329	1323.17	661.50	1.15E+002	21.78	6.70E+001
F	12	1446-	1458	1454.05	726.96	4.68E+001	15.45	5.18E+001
F	13	1716-	1724	1720.64	860.29	2.56E+001	13.17	3.15E+001
F	14	1815-	1827	1821.88	910.92	1.87E+002	26.24	4.44E+001
F	15	1933-	1942	1937.56	968.78	6.95E+001	19.27	6.18E+001
F	16	2230-	2245	2240.11	1120.07	8.59E+001	18.93	5.38E+001
F	17	2338-	2353	2345.62	1172.82	1.44E+002	24.02	6.09E+001
F	18	2470-	2481	2474.71	1237.36	2.80E+001	12.74	3.31E+001
F	19	2657-	2669	2664.39	1332.19	1.45E+002	22.91	2.21E+001
F	20	2912-	2928	2921.13	1460.51	5.70E+002	45.50	3.32E+001
F	21	3522-	3534	3528.87	1764.14	6.21E+001	15.38	5.41E+000

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.96 sigma

COPY

****
***** N U C L I D E I D E N T I F I C A T I O N R E P O R T *****
****

Sample I.D. Georgia Tech
Nuclide Library Used C:\GENIE2K\CAMFILES\Mfds_Soil.nlb

..... IDENTIFIED NUCLIDES .....

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/g)	Activity Uncertainty
K-40	0.986	1460.81*	10.67	1.072E+001	1.116E+000
CO-60	0.981	1173.22*	100.00	2.441E-001	4.326E-002
		1332.49*	100.00	2.711E-001	4.629E-002
CS-137	0.996	661.65*	85.12	1.430E-001	2.885E-002
TL-208	0.885	277.35	6.80		
		510.84* @	21.60	5.463E-001	9.816E-002
		583.14*	84.20	3.315E-001	4.568E-002
		860.37*	12.46	2.695E-001	1.394E-001
BI-212	0.595	727.17*	11.80	4.526E-001	1.523E-001
		785.42	2.00		
		1620.56	2.75		
PB-212	0.766	74.81*	9.60	1.153E+000	2.917E-001
		77.11*	17.50	9.238E-001	1.935E-001
		87.20	6.30		
		89.80	1.75		
		115.19	0.60		
		238.63*	44.60	1.005E+000	1.154E-001
		300.09	3.41		
BI-214	0.681	609.31*	46.30	8.600E-001	1.035E-001
		768.36	5.04		
		806.17	1.23		
		934.06	3.21		
		1120.29*	15.10	9.270E-001	2.114E-001
		1238.11*	5.94	8.308E-001	3.823E-001
		1377.67	4.11		
		1385.31	0.78		
		1407.98	2.48		
		1509.19	2.19		
		1729.60	3.05		
		1764.49*	15.80	9.029E-001	2.341E-001
PB-214	0.998	74.81*	6.33	1.748E+000	4.424E-001
		77.11*	10.70	1.511E+000	3.165E-001
		241.98*	7.49	1.175E+000	2.198E-001
		295.21*	19.20	7.658E-001	1.258E-001
		351.92*	37.20	9.428E-001	1.030E-001
AC-228	0.275	93.35	3.50		
		129.08	2.80		
		209.28	4.40		
		270.23	3.60		
		327.64	3.20		
		338.32*	11.40	1.036E+000	1.760E-001
		409.51	2.13		

COPY

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (pCi/g)	Activity Uncertainty
AC-228	0.275	463.00	4.40		
		794.70	4.60		
		911.07*	27.70	9.295E-001	1.395E-001
		964.60	5.20		
		969.10*	16.60	6.052E-001	1.710E-001
		1588.00	3.50		

* = Energy line found in the spectrum.
@ = Energy line not used for Weighted Mean Activity
Energy tolerance used was 1.000
Nuclide confidence index threshold = 0.10
Errors quoted at 1.960 sigma

COPY

****
*** I N T E R F E R E N C E C O R R E C T E D R E P O R T ***
****

Sample I.D. Georgia Tech
Spectrum Number MF0753.CNF

Report Reviewed By [signature] Date 9/28/01

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/g)	Wt mean Activity Uncertainty	Wt mean Activity % Uncertainty
K-40	0.986	1.07E+001	1.12E+000	10.4
CO-60	0.981	2.57E-001	3.16E-002	12.3
CS-137	0.996	1.43E-001	2.89E-002	20.2
TL-208 @	0.885	3.25E-001	4.34E-002	13.3
BI-212	0.595	4.53E-001	1.52E-001	33.7
PB-212	0.766	8.19E-001	9.51E-002	11.6
BI-214	0.681	8.75E-001	8.43E-002	9.6
PB-214	0.998	8.58E-001	7.29E-002	8.5
AC-228	0.275	8.65E-001	9.21E-002	10.7

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.96 sigma

********** U N I D E N T I F I E D P E A K S **********

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.96 sigma

COPY

****
** N U C L I D E M D A R E P O R T *****
****

Detector Name: DET04
Sample Geometry: D4g01
Sample Title: Georgia Tech
Nuclide Library Used: C:\GENIE2K\CAMFILES\Mfds_Soil.nlb

	Nuclide Name	Energy (keV)	Yield (%)	Critical Level (pCi/g)	Nuclide MDA (pCi/g)
+	K-40	1460.81*	10.67	2.79E-001	6.09E-001
	MN-54	834.83	99.97	2.76E-002	5.87E-002
	CO-58	810.76	99.40	2.39E-002	5.12E-002
	FE-59	142.65	1.03	1.74E+000	1.22E-001
		192.34	3.11	5.87E-001	
		1099.22	56.50	5.72E-002	
		1291.56	43.20	6.89E-002	
+	CO-60	1173.22*	100.00	3.32E-002	4.72E-002
		1332.49*	100.00	2.11E-002	
	ZN-65	1115.52	50.75	9.27E-002	1.94E-001
	SE-75	96.73	3.41	5.95E-001	5.66E-002
		121.11	16.70	1.01E-001	
		136.00	59.20	2.73E-002	
		198.60	1.45	1.20E+000	
		264.65	59.80	3.18E-002	
		279.53	25.20	8.09E-002	
		303.91	1.32	1.31E+000	
		400.65	11.40	1.79E-001	
	NB-94	702.63	100.00	2.60E-002	5.50E-002
		871.10	100.00	2.74E-002	
	RU-106	621.84	9.80	2.18E-001	4.64E-001
		1050.47	1.73	1.73E+000	
	CD-109	88.03	3.72	7.70E-001	1.58E+000
	SB-125	176.33	6.89	2.55E-001	1.52E-001
		380.43	1.50	1.29E+000	
		427.89	29.33	7.24E-002	
		463.38	10.35	2.23E-001	
		600.56	17.80	1.29E-001	
		606.64	5.02	1.01E+000	
		635.90	11.32	2.18E-001	
		671.41	1.81	1.27E+000	
	I-131	364.48	81.24	1.88E-002	3.99E-002
	BA-133	79.62	2.55	1.33E+000	6.31E-002
		81.00	33.00	8.47E-002	
		276.40	6.90	2.96E-001	
		302.84	17.80	1.07E-001	
		356.01	60.00	3.00E-002	
		383.85	8.70	2.34E-001	
	CS-134	475.35	1.46	1.48E+000	6.75E-002
		563.23	8.38	2.78E-001	
		569.32	15.43	1.39E-001	
		604.70	97.60	3.24E-002	

COPY

	Nuclide Name	Energy (keV)	Yield (%)	Critical Level (pCi/g)	Nuclide MDA (pCi/g)
	CS-134	795.84	85.40	3.61E-002	6.75E-002
		801.93	8.73	3.06E-001	
		1038.57	1.00	2.64E+000	
		1167.94	1.80	2.74E+000	
		1365.15	3.04	7.99E-001	
+	CS-137	661.65*	85.12	2.36E-002	5.06E-002
	CE-139	165.85	80.35	2.01E-002	4.18E-002
	CE-144	80.11	1.60	1.86E+000	3.27E-001
		133.54	10.80	1.58E-001	
	EU-152	121.78	28.40	5.84E-002	1.21E-001
		344.27	26.50	6.50E-002	
		443.98	3.11	6.91E-001	
		778.89	12.74	1.61E-001	
		867.32	4.16	6.04E-001	
		964.01	14.40	2.95E-001	
		1407.95	20.70	1.47E-001	
	EU-154	123.07	40.50	4.23E-002	8.76E-002
		1274.45	35.50	8.70E-002	
	EU-155	86.54	31.05	8.97E-002	1.85E-001
		105.31	20.70	8.99E-002	
+	TL-208	277.35	6.80	2.97E-001	4.76E-002
		510.84*	21.60	1.06E-001	
		583.14*	84.20	2.23E-002	
		860.37*	12.46	1.29E-001	
+	BI-212	727.17*	11.80	1.66E-001	3.57E-001
		785.42	2.00	1.26E+000	
		1620.56	2.75	9.52E-001	
+	PB-212	74.81*	9.60	3.07E-001	7.63E-002
		77.11*	17.50	1.59E-001	
		87.20	6.30	4.32E-001	
		89.80	1.75	1.54E+000	
		115.19	0.60	3.05E+000	
		238.63*	44.60	3.65E-002	
		300.09	3.41	5.86E-001	
+	BI-214	609.31*	46.30	6.09E-002	1.28E-001
		768.36	5.04	6.19E-001	
		806.17	1.23	2.14E+000	
		934.06	3.21	9.75E-001	
		1120.29*	15.10	2.03E-001	
		1238.11*	5.94	3.99E-001	
		1377.67	4.11	7.04E-001	
		1385.31	0.78	3.25E+000	
		1407.98	2.48	1.23E+000	
		1509.19	2.19	1.26E+000	
		1729.60	3.05	9.15E-001	
		1764.49*	15.80	8.03E-002	
+	PB-214	74.81*	6.33	4.65E-001	1.08E-001
		77.11*	10.70	2.61E-001	
		241.98*	7.49	2.12E-001	
		295.21*	19.20	9.79E-002	
		351.92*	37.20	5.15E-002	

COPY

	Nuclide Name	Energy (keV)	Yield (%)	Critical Level (pCi/g)	Nuclide MDA (pCi/g)
	RA-226	186.21	3.28	6.46E-001	1.33E+000
+	AC-228	93.35	3.50	7.70E-001	1.70E-001
		129.08	2.80	6.92E-001	
		209.28	4.40	5.16E-001	
		270.23	3.60	6.07E-001	
		327.64	3.20	6.34E-001	
		338.32*	11.40	1.71E-001	
		409.51	2.13	1.01E+000	
		463.00	4.40	5.24E-001	
		794.70	4.60	6.60E-001	
		911.07*	27.70	7.85E-002	
		964.60	5.20	8.93E-001	
		969.10*	16.60	1.57E-001	
		1588.00	3.50	8.28E-001	
	TH-234	63.29	3.80	1.16E+000	2.11E+000
		92.38	2.72	1.03E+000	
	U-235	89.96	1.50	1.79E+000	8.25E-002
		143.76	10.50	1.69E-001	
		163.35	4.70	3.48E-001	
		185.71	54.00	4.01E-002	
		205.31	4.70	4.44E-001	
	U-237	164.61	1.86	8.87E-001	2.14E-001
		208.01	22.00	1.04E-001	
		332.35	1.22	1.57E+000	
	AM-241	59.54	36.30	1.45E-001	3.02E-001

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

COPY

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IT Lab @ Georgia Tech Research Spectrum name: 00010441.An1

nple description
E1400 ~~#20~~ #9 8/7/01 #274
#30

Spectrum Filename: C:\User\00010441.An1

Acquisition information
Start time 23-Jul-2001 10:33:38
Live time 599
Real time 600
Dead time .15%
Detector/Geometry IDs 1 & 0

Detector system
MCB 1

Calibration
Filename: fscal.Clb
Created: 18-Jul-2001 19:44:24 & 18-Jul-2001 20:01:14
CALIBRATION USING 250ML MIXED GAMMA ANALYTICS #SRS59655-466

Zero offset -.165 keV; Gain .250 keV/channel
Quadratic -.467E-07 keV/channel^2

Library Files
Main analysis library: GT_RX.Lib
Library Match Width: 1.500

Analysis parameters
Start channel 200 for an energy of 49.91keV
Stop channel 8000 for an energy of 2000.02keV
Peak rejection level 20.000%
Peak search sensitivity: 3
Sample Size: 278.000
Activity scaling factor 1.0000E+00/(1.0000E+00* 2.7800E+02)
= 3.5971E-03

Detection limit method:
MDA - EG&G ORTEC method
Additional random error: 1.0000000E+00
Additional systematic error: 1.0000000E+00
Fraction Limit: .000%
Background width: best method (based on spectrum).
Peak acceptance width = 1.5000000E+00

rrections	Status	Comments
Decay correct to date	NO	
Decay during acquisition	NO	
Decay during collection	NO	
Peaked background correction	NO	

Absorption (Internal)	NO
Geometry correction	NO
Random summing	NO

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IT Lab @ Georgia Tech Research Spectrum name: 00010441.An1

ergy calibration normalized difference: 1.0000

********** U N I D E N T I F I E D P E A K S U M M A R Y **********

PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV	SUSPECTED NUCLIDE	
300.72	75.13	41.	122.	.204	23.35	.780	PB-214	D
309.78	77.40	37.	182.	.304	17.59	.782	PB-214	D
745.27	186.42	25.	104.	.173	39.75	1.001	PA-234	sM
954.63	238.83	7.	237.	.396	14.69	.982	PB-212	
1181.54	295.62	0.	114.	.190	18.73	.883	PB-214	
1353.43	338.64	3.	51.	.084	31.43	.533	AC-228	s
1408.10	352.33	14.	130.	.216	28.24	.423	PB-214	s
2437.57	609.91	0.	92.	.154	20.85	1.235	RU-103	
5845.56	1461.95	0.	120.	.200	18.26	.787	K-40	s

s Peak fails shape tests.
D Peak area deconvoluted.
M Peak is close to a library peak.

********** I D E N T I F I E D P E A K S U M M A R Y **********

LIDE	PEAK CHANNEL	CENTROID ENERGY	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2 SIGMA %	FWHM keV
EU-155	235.92	58.91	60.	25.	.041	155.25	.325s
EU-155	345.94	86.45	57.	7.	.011	321.40	.791D
CD-109	352.29	88.04	65.	31.	.051	82.93	.793D
EU-155	427.03	106.75	12.	24.	.041	84.62	.360s
EU-152	487.05	121.78	9.	6.	.011	152.39	.825D
EU-154	492.33	123.10	15.	1.	.002	906.22	.826D
CO-57	552.20	138.09	38.	85.	.142	55.99	.319s
FE-59	569.73	142.48	16.	47.	.079	51.49	.862s
FE-59	766.57	191.75	12.	11.	.018	130.45	.296s
EU-152	977.97	244.67	10.	1.	.002	614.59	.940D
EU-154	991.43	248.04	15.	9.	.016	131.17	.943D
EU-152	1379.37	345.14	2.	17.	.028	66.06	.408s
EU-152	1465.65	366.73	0.	21.	.035	43.64	.313s
EU-152	1623.38	406.20	5.	36.	.061	49.20	.434s
EU-152	1754.67	439.05	0.	38.	.063	32.44	.250s
Kr-85	2056.00	514.45	0.	2.	.003	141.42	.250s
EU-154	2362.00	591.01	0.	3.	.005	115.47	.750s
CS-137	2646.60	662.21	0.	31.	.052	35.92	.625s
EU-152	2752.23	688.63	7.	4.	.007	209.30	1.326D
154	2767.70	692.50	2.	2.	.004	219.91	1.329D
154	2909.09	727.86	0.	42.	.070	30.86	.646s
EU-154	3031.83	758.57	0.	29.	.048	37.14	.438s
EU-152	3088.67	772.78	0.	17.	.028	48.51	.375s
MN-54	3339.75	835.58	0.	6.	.010	81.65	.375s

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3451.00	863.40	0.	8.	.013	70.71	.250s
EU-154	3491.60	873.55	0.	5.	.008	89.44	.500s
EU-152	3848.00	962.67	0.	3.	.005	115.47	.250s
EU-154	3988.00	997.67	0.	6.	.010	81.65	.375s
EU-154	4004.60	1001.82	0.	11.	.018	60.30	.375s
EU-152	4340.50	1085.80	5.	6.	.010	131.47	1.633D
EU-152	4356.58	1089.82	7.	3.	.006	245.52	1.636D
FE-59	4393.00	1098.92	0.	0.	.000	.00	.000s
EU-152	4445.58	1112.07	2.	6.	.010	102.59	1.653D
ZN-65	4459.39	1115.52	5.	4.	.007	164.01	1.655D
CO-60	4689.00	1172.92	0.	0.	.000	.00	.000s
EU-152	4847.00	1212.41	0.	0.	.000	.00	.000s
EU-154	5087.00	1272.39	0.	7.	.012	75.59	.250s
FE-59	5160.00	1290.64	0.	4.	.007	100.00	.250s
EU-152	5194.00	1299.13	0.	5.	.008	89.44	.250s
CO-60	5328.00	1332.62	0.	2.	.003	141.42	.250s
EU-154	5589.00	1397.84	0.	1.	.002	200.00	.250s
EU-152	5644.00	1411.58	0.	11.	.018	60.30	.250s
EU-154	6386.00	1596.96	0.	0.	.000	.00	.000s

s Peak fails shape tests.
D Peak area deconvoluted.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- NUCLIDE - NAME	CODE	AVERAGE ACTIVITY microCi	PEAK ENERGY keV	PEAK ACTIVITY microCi	PEAK CODE	PEAK MDA VALUE microCi	COMMENTS
MN-54		0.0000E+00	834.81	0.000E+00	%	8.375E-05	
FE-59		0.0000E+00	1099.22	0.000E+00	?(	1.366E-04	
			1291.56	0.000E+00	%	2.560E-04	
			192.34	0.000E+00	%	1.222E-03	
			142.65	0.000E+00	%	4.655E-03	
CO-57		0.0000E+00	136.43	0.000E+00	&	5.858E-04	
CO-60		0.0000E+00	1332.51	0.000E+00	%	1.031E-04	
			1173.23	0.000E+00	?	8.151E-05	
Kr-85		0.0000E+00	513.99	0.000E+00	%	1.091E-04	
ZN-65		0.0000E+00	1115.52	0.000E+00	%	2.286E-04	
			8.13	0.000E+00	=	0.000E+00	

Nuclide	Ave activity	Energy	Activity	Code	Peak MDA	Comments
CD-109	0.0000E+00	88.04	0.000E+00	%	1.351E-03	
		25.50	0.000E+00	=	0.000E+00	
CS-137	7.5014E-05	661.62	7.501E-05	?(	6.050E-05	
		32.19	0.000E+00	=	0.000E+00	
		31.82	0.000E+00	=	0.000E+00	
		36.40	0.000E+00	=	0.000E+00	
EU-152	0.0000E+00	121.78	0.000E+00	%	9.560E-05	
		688.63	0.000E+00	%	9.874E-03	
		367.71	0.000E+00	%	6.927E-03	
		344.30	0.000E+00	%	2.014E-04	
		1408.08	0.000E+00	&	6.981E-04	
		964.00	0.000E+00	%	5.713E-04	
		1112.07	0.000E+00	%	8.282E-04	
		778.90	0.000E+00	&	7.960E-04	
		1085.80	0.000E+00	%	1.161E-03	
		244.67	0.000E+00	%	4.676E-04	
		867.39	0.000E+00	&	2.204E-03	
		444.00	1.967E-03	&	2.994E-03	
		411.09	0.000E+00	&	3.618E-03	
		1089.82	0.000E+00	%	6.795E-03	
		1299.19	0.000E+00	%	6.779E-03	
		1212.89	0.000E+00	?	5.781E-03	
EU-154	0.0000E+00	123.10	0.000E+00	%	7.059E-05	
		1274.80	0.000E+00	%	3.437E-04	
		723.30	4.695E-04	&	6.707E-04	
		1004.80	0.000E+00	&	6.374E-04	
		873.20	0.000E+00	%	7.410E-04	
		996.30	0.000E+00	%	9.023E-04	
		248.04	0.000E+00	%	6.879E-04	
		591.70	0.000E+00	%	1.218E-03	
		756.70	1.616E-03	?	2.929E-03	
		1597.30	0.000E+00	?	6.214E-03	
		692.50	0.000E+00	%	4.041E-03	
		1397.80	0.000E+00	%	6.322E-03	
EU-155	0.0000E+00	86.45	0.000E+00	%	1.325E-04	
		105.31	0.000E+00	&	1.658E-04	
		60.01	0.000E+00	%	4.612E-03	

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
& - Peak is part of a multiplet and this area went negative during deconvolution.
? - Peak is too narrow.

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@ - Peak is too wide at FW25M, but ok at FWHM.
6 - Peak fails sensitivity test.
$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
+ - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
= - Peak outside analysis energy range.
& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
P - Peakbackground subtraction

Nuclide Codes:
T - Thermal Neutron Activation
F - Fast Neutron Activation
I - Fission Product
N - Naturally Occurring Isotope
P - Photon Reaction
C - Charged Particle Reaction
M - No MDA Calculation

Peak Codes:
G - Gamma Ray
X - X-Ray
- Positron Decay
S - Single-Escape
D - Double-Escape
K - Key Line
A - Not in Average

- -

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

NUCLIDE		TIME OF COUNT ACTIVITY uCi/g	UNCERTAINTY COUNTING uCi/g	2 SIGMA TOTAL uCi/g
MN-54	<	3.0126E-07	0.000E+00	0.000E+00
FE-59	<	4.9141E-07	0.000E+00	0.000E+00
CO-57	<	2.1074E-06	0.000E+00	0.000E+00
CO-60	<	3.7101E-07	0.000E+00	0.000E+00
Kr-85	<	3.9258E-07	0.000E+00	0.000E+00
ZN-65	<	8.2213E-07	0.000E+00	0.000E+00
CD-109	<	4.8615E-06	0.000E+00	0.000E+00
CS-137	#	2.6984E-07	9.693E-08	9.756E-08
EU-152	<	3.4388E-07	0.000E+00	0.000E+00
154	<	2.5393E-07	0.000E+00	0.000E+00
155	<	4.7676E-07	0.000E+00	0.000E+00

All peaks for activity calculation had bad shape.
* Activity omitted from total
& Activity omitted from total and all peaks had bad shape.

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---------- S U M M A R Y ----------

TAL ACTIVITY (49.9 to 2000.0 keV) 2.6983600E-07 uCi/g

Analyzed by: 7/23/01
OPERATOR

Reviewed by: 8/7/01
Supervisor

Laboratory: IT Lab @ Georgia Tech Research Reactor

Section 4

Package 14
Yard Open Land Areas
Exposure Rate Measurements

E1400 Yard Open Land Areas Exposure Rate Measurements

Desc.	File	Sample Number	Gross Counts	Count Time (sec)	Material Type	Surface	Row	Location	Detector Cal. Constant (C/hr)/(R/hr)	Exposure Rate (μR/hr)
	186	4	480	10	B0016	01L01	ZZZZZ	00001	1.70095E+10	10.2
	186	5	488	10	B0016	01L01	ZZZZZ	00002	1.70095E+10	10.3
	186	6	441	10	B0016	01L01	ZZZZZ	00003	1.70095E+10	9.3
	186	7	393	10	B0016	01L01	ZZZZZ	00004	1.70095E+10	8.3
	186	8	493	10	B0016	01L01	ZZZZZ	00005	1.70095E+10	10.4
	186	9	522	10	B0016	01L01	ZZZZZ	00006	1.70095E+10	11.0
	186	10	544	10	B0016	01L01	ZZZZZ	00007	1.70095E+10	11.5
	186	11	544	10	B0016	01L01	ZZZZZ	00008	1.70095E+10	11.5
	186	12	583	10	B0016	01L01	ZZZZZ	00009	1.70095E+10	12.3
	186	13	578	10	B0016	01L01	ZZZZZ	00010	1.70095E+10	12.2
	186	14	573	10	B0016	01L01	ZZZZZ	00011	1.70095E+10	12.1
	186	15	573	10	B0016	01L01	ZZZZZ	00012	1.70095E+10	12.1
	186	16	612	10	B0016	01L01	ZZZZZ	00013	1.70095E+10	13.0
	186	17	615	10	B0016	01L01	ZZZZZ	00014	1.70095E+10	13.0
	186	18	566	10	B0016	01L01	ZZZZZ	00015	1.70095E+10	12.0
	186	19	496	10	B0016	01L01	ZZZZZ	00016	1.70095E+10	10.5
	186	20	562	10	B0016	01L01	ZZZZZ	00017	1.70095E+10	11.9
	186	21	446	10	B0016	01L01	ZZZZZ	00018	1.70095E+10	9.4
	186	22	465	10	B0016	01L01	ZZZZZ	00019	1.70095E+10	9.8
	186	23	444	10	B0016	01L01	ZZZZZ	00020	1.70095E+10	9.4
	186	24	561	10	B0016	01L01	ZZZZZ	00021	1.70095E+10	11.9
	186	25	552	10	B0016	01L01	ZZZZZ	00022	1.70095E+10	11.7
	186	26	662	10	B0016	01L01	ZZZZZ	00023	1.70095E+10	14.0
	186	27	683	10	B0016	01L01	ZZZZZ	00024	1.70095E+10	14.5
	186	28	615	10	B0016	01L01	ZZZZZ	00025	1.70095E+10	13.0
	186	29	630	10	B0016	01L01	ZZZZZ	00026	1.70095E+10	13.3
	186	30	583	10	B0016	01L01	ZZZZZ	00027	1.70095E+10	12.3
	186	32	600	10	B0016	01L01	ZZZZZ	00028	1.70095E+10	12.7
	186	33	549	10	B0016	01L01	ZZZZZ	00029	1.70095E+10	11.6
	186	31	556	10	B0016	01L01	ZZZZZ	00030	1.70095E+10	11.8

# Measurements	30
Average	11.6
Maximum	14.5
STD DEV	1.4
95% CL on Mean	12.1

ATTACHMENT 6.14
SURVEY DOWNLOAD DATA SHEET

241

Download Technician: Print Name: D. Schumacker Signature: [signature] Station: 2 File: 186

Serial No. Verification: Model 2350: ☐ Detector: ☐ Problems: ☐ (See Comments)

Survey Technician(s):
Print Name: Betty S. Kjos User ID BSK0490 Signature: Betty S Kjos Date: 7-13-01

Print Name: _____ User ID _____ Signature: _____ Date: _____

Survey Unit Description: E1400 Yard Open Land Areas
(Example: Survey Package + description i.e. D16, Building 43, Area 09, Room 100, Floor - Grid Locations A1 through A7)

Instrument Model and Serial No.: Model 2350 ☐ Model 2350-1 ☑: 126182

Instrument and Detector Calibration Due Dates: Survey Meter: 9-22-01 Detector: 12-6-01

Type Of Survey: ☑ Term Survey ☐ Characterization ☐ Information Only
☐ Other (explain):

Type of Measurement	Detector Serial Number	Detector Model Number	Detector Efficiency	Source Mean BKG Value	Pre & Post Use Info	
					Pre File No.	Post File No.
☐ Beta β		43-106B				
☐ Beta β		43-68B				
☐ Alpha α		43-68A				
☑ Gamma γ	PR091034	44-2	N/A		186	186

Local Area Background Measurements — MEAN Value in cpm

β Beta	1	2	3	4	5	6	
α Alpha	1	2	3	4	5	6	

COMMENTS: _____

GTS DURATEK RADIOLOGICAL ENGINEERING & FIELD SERVICES

GEORGIA INSTITUTE OF TECHNOLOGY

Gamma Radiation Survey Report, Micro-R/hour - Integrated Measurement

File Number: 186	Survey Description: E1400: YARD OPEN LAND AREAS		
Survey Reason: TERMINATION	User ID: BSK0490	Technician name: B.S. Kjos	
Instrument Model: M2350-1	S/N: 126182	Calibration Due: 9/22/01	Group: 2
Detector Model: 44-2	Detector S/N: 091034	Type: High Energy Gamma Scintillator, 1x1 NaI	
Background: 0.0 uR/hr	Gamma Calibration Constant: 1.70095 E10 c/R	PIC ratio: 1.000 (PIC/NaI)	Survey Date: 7/13/01

Pre and Post source checks are included on this download: Yes ✓ No ____
If No is answered, then list the Download Files which include the Pre and Post source checks.
Pre File #: _____ Post File #: _____

Technician Review:

I have reveiwed this cover sheet and 2 pages of the report, 1 pages of comments, and 1 graph.

I performed this survey: Betty S. Kjos (Print name) / Betty S Kjos (Signature) Date: 7-14-01

and,

I performed this survey: _____ (Print name) / _____ (Signature) Date: _____

Corrections and reason (required):

Comment Resolution:

Survey Reviewed and Approved by: PAUL JONES (Print name) / Paul A. Jones (Signature) Date: 07/16/01

Survey Date: 7/13/01 Report Date: 7/14/01 Station: 2
File: 186 Page: 1

Comments

Survey Code	L1	L2	L3	L4	L5	L6	Setup Number 2
	E1400	01L01	TAT01	03100	FLDCT	B0016	Det Cal Due: 12/06/01

L7 Code Grid ID	L8 Code Location Number	Sample Number	Count Time (sec)	Gross Counts	Gross Micro R/hr	Hi
ZZZZZ	00001	4	10	480	10.2	
ZZZZZ	00002	5	10	488	10.3	
ZZZZZ	00003	6	10	441	9.3	
ZZZZZ	00004	7	10	393	8.3	
ZZZZZ	00005	8	10	493	10.4	
ZZZZZ	00006	9	10	522	11.0	
ZZZZZ	00007	10	10	544	11.5	
ZZZZZ	00008	11	10	544	11.5	
ZZZZZ	00009	12	10	583	12.3	
ZZZZZ	00010	13	10	578	12.2	
ZZZZZ	00011	14	10	573	12.1	
ZZZZZ	00012	15	10	573	12.1	
ZZZZZ	00013	16	10	612	13.0	
ZZZZZ	00014	17	10	615	13.0	
ZZZZZ	00015	18	10	566	12.0	
ZZZZZ	00016	19	10	496	10.5	
ZZZZZ	00017	20	10	562	11.9	
ZZZZZ	00018	21	10	446	9.4	
ZZZZZ	00019	22	10	465	9.8	
ZZZZZ	00020	23	10	444	9.4	
ZZZZZ	00021	24	10	561	11.9	
ZZZZZ	00022	25	10	552	11.7	
ZZZZZ	00023	26	10	662	14.0	
ZZZZZ	00024	27	10	683	14.5	
ZZZZZ	00025	28	10	615	13.0	
ZZZZZ	00026	29	10	630	13.3	
ZZZZZ	00027	30	10	583	12.3	
ZZZZZ	00030	31	10	556	11.8	
ZZZZZ	00028	32	10	600	12.7	
ZZZZZ	00029	33	10	549	11.6	

Group Average: 3282 cpm Average uR/hr: 11.6
Number of measurements: 30

Survey Code	L1	L2	L3	L4	L5	L6	Setup Number 2
	ZZZZZ	19453	TAT01	03100	PRB00	ZZZZZ	Det Cal Due: 12/06/01

L7 Code Grid ID	L8 Code Location Number	Sample Number	Count Time (sec)	Gross Counts	Gross Micro R/hr	Hi
ZZZZZ	00000	1	60	548253	1933.9	*
ZZZZZ	00000	2	60	14299	50.4	*
ZZZZZ	00000	3	60	5145	18.1	*

Group Average: 189232 cpm Average uR/hr: 667.5
Number of measurements: 3

Survey Code	L1	L2	L3	L4	L5	L6	Setup Number 2
	ZZZZZ	19453	TAT01	03100	PTB00	ZZZZZ	Det Cal Due: 12/06/01

L7 Code Grid ID	L8 Code Location Number	Sample Number	Count Time (sec)	Gross Counts	Gross Micro R/hr	Hi
ZZZZZ	00000	36	60	550303	1941.2	*
ZZZZZ	00000	38	60	14591	51.5	*
ZZZZZ	00000	40	60	5449	19.2	*

* Hi flag set at 15.0 micro-R/hr.

Survey Date: 7/13/01 Report Date: 7/14/01 Station: 2
File: 186 Page: 2

Survey Code	L1	L2	L3	L4	L5	L6	Setup Number 2
	ZZZZZ	19453	TAT01	03100	PTB00	ZZZZZ	Det Cal Due: 12/06/01

L7 Code Grid ID	L8 Code Location Number	Sample Number	Count Time (sec)	Gross Counts	Gross Micro R/hr	Hi

Group Average: 190114 cpm Average uR/hr: 670.6
Number of measurements: 3

Survey Code	L1	L2	L3	L4	L5	L6	Setup Number 2
	ZZZZZ	ZZZZZ	TAT01	03100	PRBBK	ZZZZZ	Det Cal Due: 12/06/01

L7 Code Grid ID	L8 Code Location Number	Sample Number	Count Time (sec)	Gross Counts	Gross Micro R/hr	Hi
ZZZZZ	00000	0	300	19555	13.8	

Group Average: 3911 cpm Average uR/hr: 13.8
Number of measurements: 1

Survey Code	L1	L2	L3	L4	L5	L6	Setup Number 2
	ZZZZZ	ZZZZZ	TAT01	03100	PTBBK	ZZZZZ	Det Cal Due: 12/06/01

L7 Code Grid ID	L8 Code Location Number	Sample Number	Count Time (sec)	Gross Counts	Gross Micro R/hr	Hi
ZZZZZ	00001	35	300	19412	13.7	

Group Average: 3882 cpm Average uR/hr: 13.7
Number of measurements: 1

Total Number of Measurements on this Report: 38

Comments

NOTE: This report is grouped by:
Package (L1) (Package number)
Setup number (Detector parameters)
Det Type (L4) (GM pancake-flat surface, Beta 3.5-12" pipe, gamma at 1 m, etc.)
Reason (L3-345) (Char survey, source check, final survey, etc.)
Surface Cat (L2) (Wall, floor, drain, penetration, etc.)
Count Type (L5) (Field count, bkg, pre-, post-, etc.)
Bkgd Sub (L6) (Material code, i.e., wood, iron, concr, etc.)

* Hi flag set at 15.0 micro-R/hr.

GTS DURATEK RADIOLOGICAL ENGINEERING & FIELD SERVICES

GEORGIA INSTITUTE OF TECHNOLOGY

7/14/01 Comments Report for File 186 Station: 2

Comment Number	Comment
1	Deleted sample numbers from 37 to 37. Because SOURCE SLIPPED FROM SOURCE JIG.
2	Deleted sample numbers from 39 to 39. Because SOURCE SLIPPED FROM SOURCE JIG.
3	Deleted sample numbers from 34 to 34. Because A 10 MINUTE BACKGROUND WAS TAKEN INSTEAD OF A 5 MINUTE. SEE SAMPLE #35.

GTS:0143 :C:\PDOX35\M2350\COMMENTS:R1

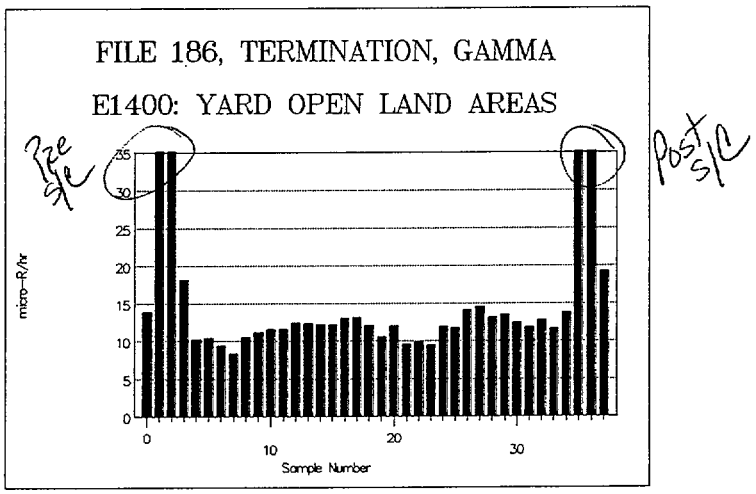
GTS DURATEK RADIOLOGICAL ENGINEERING & FIELD SERVICES

GEORGIA INSTITUTE OF TECHNOLOGY

7/14/2001 Graph of File 186 Station: 2

Survey Date: 7/13/2001 Survey Start Time: 11:03:12

Description: E1400: YARD OPEN LAND AREAS



Flag set for 15 micro-R/hr. Review values greater than this value.

Review this graph for visual outliers.

Mark outliers, source checks and backgrounds on the graph on this page.