ALPHA SPECTROMETRY

ENERGY CALIBRATION

AND

DETECTOR EFFICIENCY

(GEOMETRY CORRECTION)

Supplemental Material, Technical Activity Supporting Documentation: Experimental Data for Alpha Spectrometry Samples, Energy Calibration and Detector Efficiency (Geometry Correction) (11/07/1989 through 07/15/1994)

Energy Calibration

EG&G ORTEC ALPHA SPECTROMETERS - ENERGY CALIBRATION					
MCB #	Channel #	Model	Date	Source	File Name
1	1	676A			
1	2	676A			
1	3	676A			
1	4	676A			
1	5	676A			
1	6	676A			
1	7	576A	7/15/94	7400-SRC-0034	7CAL.chn
1	8	576A	7/15/94	7400-SRC-0034	8CAL.chn
1	9	576A	7/14/94	7400-SRC-0034	9CAL.chn
1	10	576A	7/14/94	7400-SRC-0034	10CAL.chn
1	11	576A	7/13/94	7400-SRC-0034	11CAL.chn
1	12	576A	7/13/94	7400-SRC-0034	12CAL.chn
1	13	576A	7/12/94	7400-SRC-0034	13CAL.chn
1	14	576A	7/12/94	7400-SRC-0034	14CAL.chn
1	15	576A	7/12/94	7400-SRC-0034	15CAL.chn
1	16	576A	7/12/94	7400-SRC-0034	16CAL.chn

EG&G ORTEC ALPHA SPECTROMETERS - ENERGY CALIBRATION					
MCB #	Channel #	Model	Date	Source	File Name
1	1	676A			
1	2	676A			
1	3	676A			
1	4	676A			
1	5	676A			
1	6	676A			
1	7	576A	7/15/94	7400-SRC-0034	7CAL.chn
1	8	576A	7/15/94	7400-SRC-0034	8CAL.chn
1	9	576A	7/14/94	7400-SRC-0034	9CAL.chn
1	10	576A	7/14/94	7400-SRC-0034	10CAL.chn
1	11	576A	7/13/94	7400-SRC-0034	11CAL.chn
1	12	576A	7/13/94	7400-SRC-0034	12CAL.chn
1	13	576A	7/12/94	7400-SRC-0034	13CAL.chn
1	14	576A	7/12/94	7400-SRC-0034	14CAL.chn
1	15	576A	7/12/94	7400-SRC-0034	15CAL.chn
1	16	576A	7/12/94	7400-SRC-0034	16CAL.chn

EG&G ORTEC ALPHA SPECTROMETERS - ENERGY CALIBRATION				
MCB #	Channel #	Model	Date	Source
1	1	676A		
1	2	676A		
1	3	676A		
1	4	676A		
1	5	676A		
1	6	676A		
1	7	576A		
1	8	576A	7/15/94	7400-SRC-0034
1	9	576A	7/14/94	7400-SRC-0034
1	10	576A	7/13/94	7400-SRC-0034
1	11	576A	7/13/94	7400-SRC-0034
1	12	576A	7/14/94	7400-SRC-0034
1	13	576A	7/12/94	7400-SRC-0034
1	14	576A	7/12/94	7400-SRC-0034
1	15	576A	7/12/94	7400-SRC-0034
1	16	576A	7/12/94	7400-SRC-0034

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

REPORT OF TEST

for

Florida State University
Tallahassie, Florida

Radionuclide	^{210}Po, ^{234}U, ^{235}U, ^{238}U, ^{239}Pu and ^{241}Am
Source identification	FSU
2π alpha-particle counting rate	3.369 s^{-1} (1)*
Overall uncertainty	1.8 percent (2)
Relative activity	
^{210}Po	0.005 (± 26 percent)
^{234}U	0.949 (± 1.6 percent)
^{235}U	0.037 (± 4.6 percent)
^{238}U	0.954 (± 1.6 percent)
^{239}Pu	0.961 (± 1.6 percent)
^{241}Am	1.000 percent (3),(4)
Reference time	March 3, 1993
Measuring instruments	NIST $2\pi\alpha$ proportional counter and Si surface-barrier detector

For the Director,

J.M.R. Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
March, 1993

*Notes on back

7400-SRC-0034

Certification Date: Jan. 31, 1993

Nuclide	U-238	U-234	Pu-239	Am-241	Total Alpha
Energy (MeV)	4.20 419.6	4.77	5.15	5.49 548.6	3 - 8 MeV
Counting time (sec)	140421				
Background count time (sec)	264043				
Detector Efficiency (%) *	21.89 ± 0.42				
Gross counts	49476 ± 222	48811 ± 221	51269 ± 226	51852 ± 228	203752 ± 451
Gross count rate (cpm)	21.14 ± 0.10	20.86 ± 0.09	21.91 ± 0.10	22.16 ± 0.10	87.06 ± 0.19
Background count rate (cpm)	0.001 ± 0.0001	0.002 ± 0.0002	0.001 ± 0.0001	0.001 ± 0.0001	0.0072 ± 0.001
Net std count rate	21.14 ± 0.1863	20.85 ± 0.1850	21.91 ± 0.1896	22.15 ± 0.1907	87.05 ± 0.3780
Standard activity (dpm)	96.6 ± 2.0 1.61 Bq 43.5 pCi	95.3 ± 2.0	100.1 ± 2.1	101.2 ± 2.1	397.7 ± 7.8
Uncertainty at 95% level (%)	2.1%	2.1%	2.1%	2.1%	2.0%

*Traceable to NIST via attached calibration certificate

Detector Efficiecy

EG&G ORTEC ALPHA SPECTROMETERS - DETECTOR EFFICIENCY						
Source: Th-230, serial# 6373, The Source						
Activity=	27400	dpm	on	11/7/89		
				Source	**Th-230**	
MCB #	**Channel #**	**Model**	**Date**	**Activity**	**CPM**	**Efficiency**
1	1	676A	7/21/94	27398.81279	4432	16.1758834
1	2	676A	7/21/94	23798.81279	4243	15.7123596
1	3	676A	7/21/94	27398.81279	4305	15.7123596
1	4	676A	-	-	-	-
1	5	676A	-	-	-	-
1	6	676A	7/15/94	27398.81694	2586.59	9.44051711
1	7	576A	7/15/94	27398.81694	4186.5	15.2799
1	8	576A	7/14/94	27398.81763	3926.11	14.329487
1	9	576A	7/14/94	27398.81763	4526.58	16.5210779
1	10	576A	7/13/94	27398.81832	3468.57	12.6595606
1	11	576A	7/14/94	27398.81763	4429.29	16.1659896
1	12	576A	7/13/94	27398.81832	4124.18	15.3808823
1	13	576A	7/13/94	27398.81832	4318.32	15.7609717
1	14	576A	7/12/94	27398.81901	4573.63	16.6927998
1	15	576A	7/12/94	27398.81901	4356.78	15.9011342
1	16	576A	7/21/94	27398.81279	4353	15.8875497

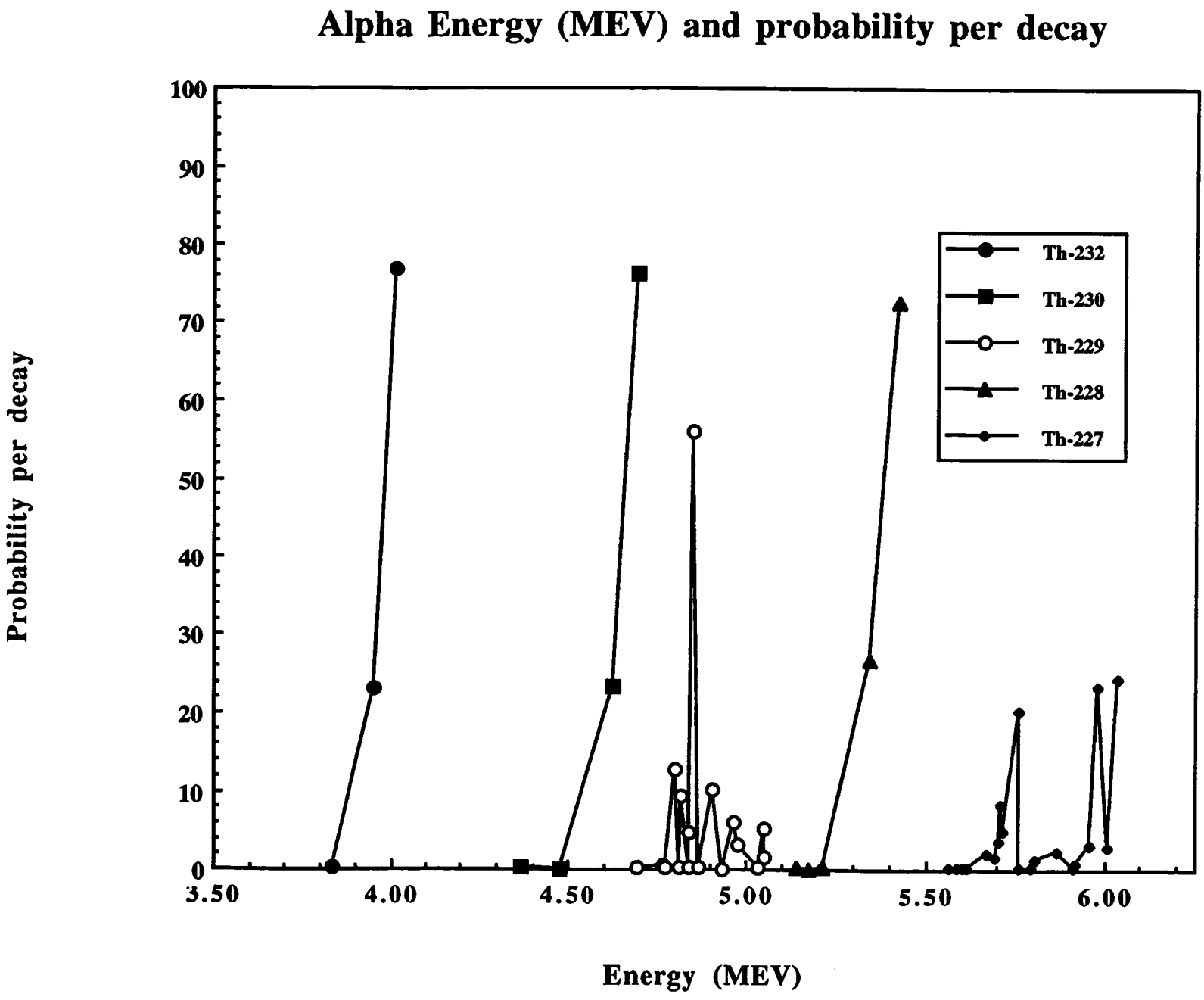
EG&G ORTEC ALPHA SPECTROMETERS - DETECTOR EFFICIENCY

Source: Th-230, serial# 6373, The Source

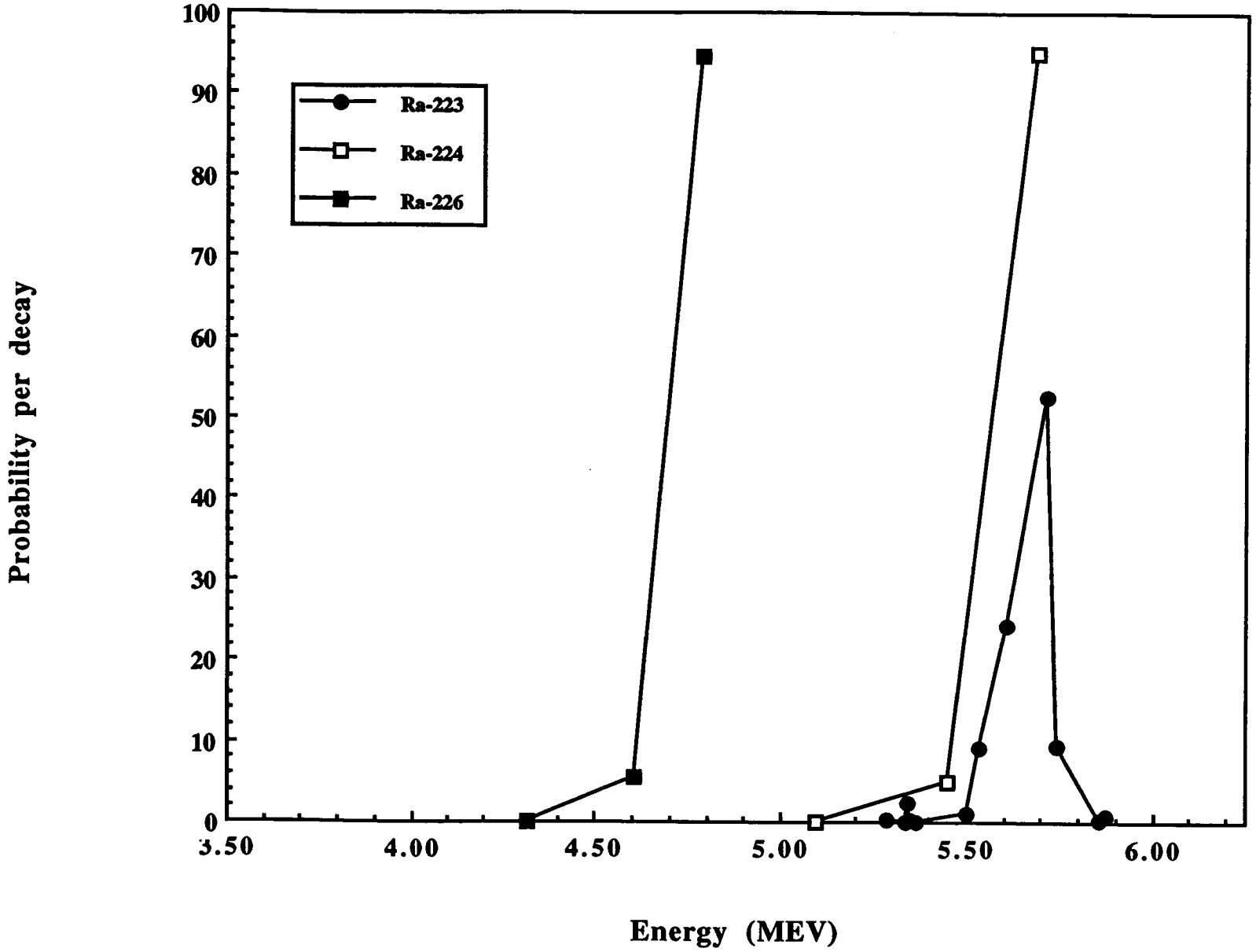
Activity= 27400 dpm on 11/7/89

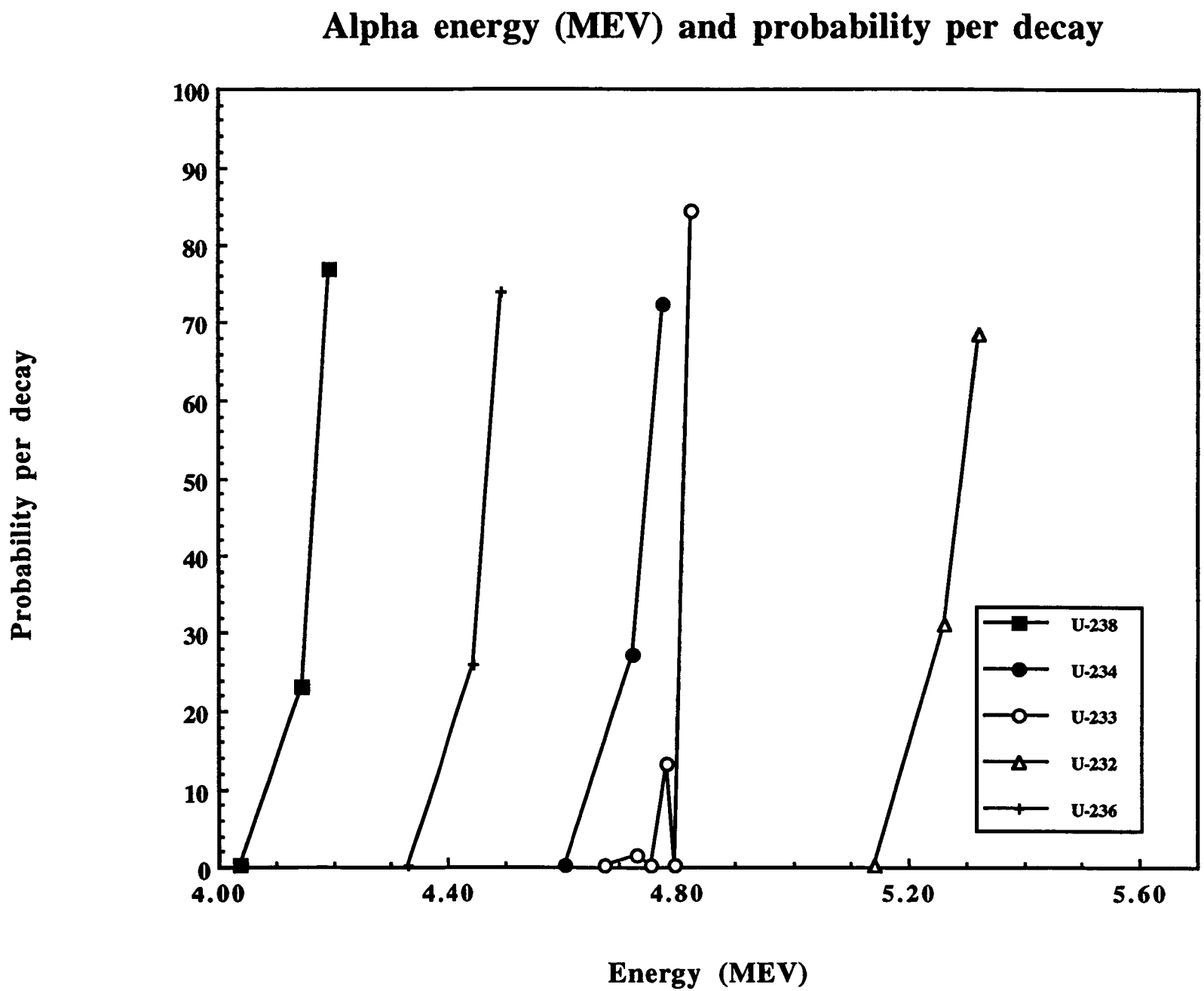
MCB #	Channel #	Model	Date	Source Activity	Th-230 CPM	Efficiency
1	1	676A				
1	2	676A				
1	3	676A				
1	4	676A				
1	5	676A				
1	6	676A	7/15/94	27398.81694	2586.59	9.44051711
1	7	576A	7/15/94	27398.81694	4186.5	15.2799
1	8	576A	7/14/94	27398.81763	3926.11	14.329487
1	9	576A	7/14/94	27398.81763	4526.58	16.5210779
1	10	576A	7/13/94	27398.81832	3468.57	12.6595606
1	11	576A	7/14/94	27398.81763	4429.29	16.1659896
1	12	576A	7/13/94	27398.81832	4124.18	15.3808823
1	13	576A	7/13/94	27398.81832	4318.32	15.7609717
1	14	576A	7/12/94	27398.81901	4573.63	16.6927998
1	15	576A	7/12/94	27398.81901	4356.78	15.9011342
1	16	576A	7/12/94	27398.81901	4353	15.8875461

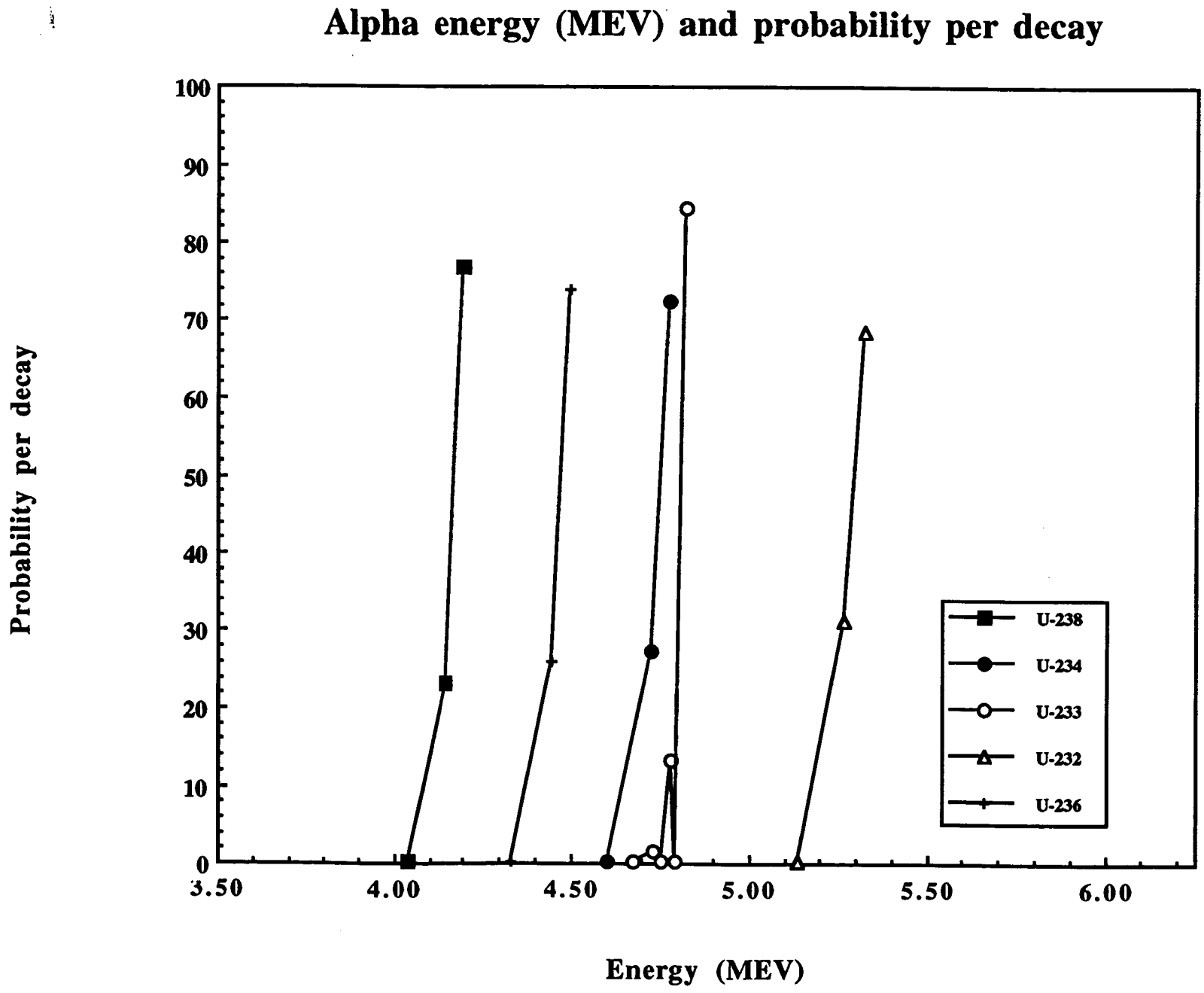
EG&G ORTEC ALPHA SPECTROMETERS - DETECTOR EFFICIENCY						
Source: Th-230, serial# 6373, The Source						
Activity=	27400	dpm	on	11/7/89		
				Source	**Th-230**	
MCB #	**Channel #**	**Model**	**Date**	**Activity**	**CPM**	**Efficiency**
1	1	676A				
1	2	676A				
1	3	676A				
1	4	676A				
1	5	676A				
1	6	676A	7/15/94			
1	7	576A	7/14/94			
1	8	576A	7/14/94			
1	9	576A	7/14/94			
1	10	576A	7/13/94			
1	11	576A	7/12/94			
1	12	576A	7/12/94			
1	13	576A	7/13/94			
1	14	576A	7/12/94			
1	15	576A	7/12/94			
1	16	576A	7/12/94			


Alpha Energy (MEV) and probability per decay
Probability per decay
Energy (MEV)
100
90
80
70
60
50
40
30
20
10
0
3.50
4.00
4.50
5.00
5.50
6.00
Th-232
Th-230
Th-229
Th-228
Th-227

Alpha Energy (MEV) and probability per decay




Alpha energy (MEV) and probability per decay
Probability per decay
100
90
80
70
60
50
40
30
20
10
0
4.00
4.40
4.80
5.20
5.60
Energy (MEV)
U-238
U-234
U-233
U-232
U-236


Alpha energy (MEV) and probability per decay
Probability per decay
100
90
80
70
60
50
40
30
20
10
0
3.50
4.00
4.50
5.00
5.50
6.00
Energy (MEV)
U-238
U-234
U-233
U-232
U-236