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NUCLIDE IDENTIFICATION CATALOG FOR GAMMA EMITTERS AND ALPHA EMITTERS

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PREFACE

This catalog contains an abbreviated listing of nuclides, alpha particles, gamma rays and spectra frequently encountered in radiation measurements and spectroscopy. The nuclides selected have importance in the following categories:

(1) Neutron activation analysis
(2) Commercial availability
(3) Use as a standard
(4) Use in medicine
(5) Naturally occurring nuclides
(6) Fission Products (Fallout)

Only the most prominent emissions for each of the listed nuclides are given. All gamma ray energies are expressed in keV. All alpha particle energies are expressed in MeV.

The catalog consists of six parts:

Parts I, II, III and IV contain information pertaining to Gamma Emitting Nuclides.

Parts V and VI contain information pertaining to Alpha Emitting Nuclides.

Part I is a gamma nuclide index. It is intended for use where information is needed on a specific nuclide. The elements are listed alphabetically for convenience. Beside each element-atomic number, all respective nuclides and their key gammas are listed. More complete information can then be obtained by locating the designated key gamma in Part II.

Part II is intended for use in identifying nuclides from gamma energies observed in a spectrum.

Column 1 includes all gamma rays listed in the table in ascending order of energy.

Column 4 lists a key gamma ray selected as being most characteristic of that nuclide, usually one of the most intense. Each gamma intensity expressed as a fraction is indicated in parentheses. The values cited represent the "best" available from the references attached, in the judgement of the authors. In many cases, the selections were influenced by measurements made at Oak Ridge Associated Universities.

Columns 5 and 6 list associated gammas and intensities, if any, that will be useful for confirmation of the identification.

Column 7 list parent (P) or daughter (D) products with their associated key gammas, if any, or decay series with which the isotope is associated.

Part III consists of examples of spectra available from the Heath catalog. However, it is emphasized that spectra were not available for all the nuclides listed in this catalog.

Part IV is an appendix consisting of three sections:

Actinium Series
Thorium Series
Uranium Series

Each section contains a pictorial chart and gamma energies listing for the particular decay series.

Part V is an alpha nuclide index arranged alphabetically by element, then by nuclide. This listing identifies the KEY ALPHA energy to locate in the SEARCH column in Section II in order to find more complete information on specific nuclides contained in this catalog.

Part VI is a listing to be used to identify alpha emitting nuclides according to energies in the alpha spectrum.

a. SEARCH column lists alpha peak energies in descending numerical order.

b. KEY ALPHA column identifies the peak energy that is most prominent for that nuclide.

c. ASSOCIATED ALPHAS lists peak energies that are simultaneously produced by the nuclide.

d. In the KEY ALPHA and ASSOCIATED ALPHAS columns, the alpha intensity in decimal form is shown in parentheses.

e. FEED column identifies products of which the nuclide is the parent. Alpha emitting products with KEY ALPHA energies in brackets can be further identified by locating the energy in the SEARCH column. Alpha emitting products preceded by * are so noted to designate production by decay mode other than alpha emission.

I. GAMMA NUCLIDE INDEX

ELEMENT - AT. NO.	NUCLIDE	KEY GAMMA
Actinium-89	Ac-228	911.1
Aluminum-13	Al-26	1808.7
	Al-28	1778.9
Americium-95	Am-241	59.5
Antimony-51	Sb-122	564.0
	Sb-124	602.7
	Sb-125	427.9
Argon-18	Ar-41	1293.6
Arsenic-33	As-74	595.9
	As-76	559.1
	As-77	239.0
Barium-56	Ba-131	496.3
	Ba-133	356.0
	Ba-137m	661.6
	Ba-139	165.9
	Ba-140	537.3
Beryllium-4	Be-7	477.6
Bismuth-83	Bi-207	569.7
	Bi-211	351.1
	Bi-212	727.2
	Bi-214	609.3
Bromine-35	Br-80	616.2
	Br-80m	37.0
	Br-82	776.5
Cadmium-48	Cd-109	88.0
	Cd-111m	245.4
	Cd-115	527.8
Calcium-20	Ca-47	1297.1
	Ca-49	3084.4
Cerium-58	Ce-139	165.8
	Ce-141	145.4
	Ce-143	293.2
	Ce-144	133.5
Cesium-55	Cs-134	795.8
	Cs-134m	127.4
	Cs-137	661.6
	Cs-138	1435.8
Chlorine-17	Cl-38	2167.5

ELEMENT - AT. NO.	NUCLIDE	KEY GAMMA
Chromium-24	Cr-51	320.1
Cobalt-27	Co-56	846.8
	Co-57	122.1
	Co-58	810.8
	Co-60	1332.5
	Co-60m	58.6
Copper-29	Cu-64	1345.8
	Cu-66	1039.2
	Cu-67	184.6
Dysprosium-66	Dy-165	94.7
	Dy-165m	108.2
Erbium-68	Er-171	308.3
Europium-63	Eu-152	1408.0
	Eu-152m	841.6
	Eu-154	123.1
	Eu-155	86.5
Fluorine-9	F-20	1633.5
Gadolinium-64	Gd-153	97.4
	Gd-159	363.5
Gallium-31	Ga-67	93.3
	Ga-68	1077.4
	Ga-72	834.0
Germanium-32	Ge-75	264.6
	Ge-77	264.4
Gold-79	Au-195	98.9
	Au-198	411.8
	Au-199	158.4
Hafnium-72	Hf-175	343.6
	Hf-180m	332.3
	Hf-181	482.0
Holmium-67	Ho-166	80.6
Indium-49	In-111	245.4
	In-113m	391.7
	In-114m	190.3
	In-115m	336.3
	In-116m	1097.3

ELEMENT - AT. NO.	NUCLIDE	KEY GAMMA
Iodine-53	I-125	35.5
	I-128	442.9
	I-129	39.6
	I-130	536.1
	I-131	364.5
	I-132	667.7
	I-135	1260.4
Iridium-77	Ir-192	316.5
	Ir-194	328.5
Iron-26	Fe-52	168.7
	Fe-59	1099.2
Krypton-36	Kr-85	514.0
	Kr-85m	151.2
	Kr-88	2392.0
Lanthanum-57	La-140	1596.1
Lead-82	Pb-210	46.5
	Pb-211	832.0
	Pb-212	238.6
	Pb-214	351.9
Lutetium-71	Lu-176m	88.3
	Lu-177	208.4
Magnesium-12	Mg-27	843.8
	Mg-28	1342.2
Manganese-25	Mn-52	1434.0
	Mn-54	834.8
	Mn-56	846.8
Mercury-80	Hg-197	77.4
	Hg-197m	133.9
	Hg-203	279.2
Molybdenum-42	Mo-99	739.5
	Mo-101	191.9
Neodymium-60	Nd-147	91.1
	Nd-149	211.3
	Nd-151	116.8
Neptunium-93	Np-239	106.1
Nickel-28	Ni-65	1481.8

ELEMENT - AT. NO.	NUCLIDE	KEY GAMMA
Niobium-41	Nb-94	871.1
	Nb-95	765.8
	Nb-97	657.9
	Nb-97m	743.4
Nitrogen-7	N-16	6129.2
Osmium-76	Os-191	129.4
Palladium-46	Pd-109	88.0
Platinum-78	Pt-195m	98.9
	Pt-199	542.9
Potassium-19	K-40	1460.8
	K-42	1524.7
	K-43	372.8
Praseodymium-59	Pr-142	1575.8
	Pr-144	696.5
Promethium-61	Pm-149	285.9
	Pm-151	340.1
Protactinium-91	Pa-231	302.7
	Pa-233	312.0
	Pa-234m	1001.0
Radium-88	Ra-223	269.5
	Ra-224	241.0
	Ra-226	186.2
Radon-86	Rn-219	271.2
Rhenium-75	Re-188	155.0
Rhodium-45	Rh-104m	51.4
	Rh-105	318.9
Rubidium-37	Rb-86	1076.6
	Rb-88	1836.0
Ruthenium-44	Ru-97	215.7
	Ru-103	497.1
	Ru-105	724.5
Samarium-62	Sm-153	103.2
	Sm-155	104.3

ELEMENT - AT. NO.	NUCLIDE	KEY GAMMA
Scandium-21	Sc-44	1157.0
	Sc-46	889.3
	Sc-46m	142.5
	Sc-47	159.4
	Sc-48	1312.1
Selenium-34	Se-75	264.7
Silver-47	Ag-108	633.0
	Ag-108m	722.9
	Ag-110m	657.7
	Ag-111	342.2
Sodium-11	Na-22	1274.5
	Na-24	2754.0
Strontium-38	Sr-85	514.0
	Sr-85m	231.7
	Sr-87m	388.5
	Sr-91	1024.3
	Sr-92	1384.0
Sulfur-16	S-37	3103.8
Tantalum-73	Ta-182	1221.4
Technetium-43	Tc-99m	140.5
	Tc-101	306.8
Tellurium-52	Te-123m	159.0
	Te-129	459.6
	Te-131	149.7
	Te-131m	773.7
	Te-132	228.2
Terbium-65	Tb-160	879.4
Thallium-81	Tl-201	167.4
	Tl-208	2614.7
Thorium-90	Th-227	236.0
	Th-228	84.4
	Th-230	67.7
	Th-231	84.2
	Th-233	86.5
	Th-234	92.6

ELEMENT - AT. NO.	NUCLIDE	KEY GAMMA
Thulium-69	Tm-170	84.3
Tin-50	Sn-113	255.1
	Sn-123m	160.3
	Sn-125	1066.6
	Sn-125m	331.9
Titanium-22	Ti-44	78.3
	Ti-51	320.1
Tungsten-74	W-187	685.8
Uranium-92	U-234	53.2
	U-235	185.7
	U-239	74.7
Vanadium-23	V-48	983.5
	V-52	1434.0
Xenon-54	Xe-133	81.0
	Xe-135	249.8
	Xe-135m	526.6
Ytterbium-70	Yb-169	198.0
	Yb-175	396.3
Yttrium-39	Y-88	1836.0
	Y-90m	202.5
	Y-91m	555.6
	Y-92	934.4
Zinc-30	Zn-65	1115.5
	Zn-69m	438.6
Zirconium-40	Zr-95	756.7
	Zr-97	507.6

II. SEARCH GAMMAS FOR NUCLIDE IDENTIFICATION

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
14.4	Co-57	271d	122.1 (.86)	136.5 (.11)	14.4 (.10)	
25.6	Th-231	25.52h	84.2 (.064)	81.2 (.009) 58.6 (.005)	90.0 (.009) 25.6 (.147)	Actinium Series Page 253
26.3	Am-241	432y	59.5 (.36)	26.3 (.024)		
27.4	Pa-231	3.276E4y	302.7 (.023)	300.1 (.023) 283.7 (.016) 102.0 (.005)	330.0 (.013) 90.9 (.010) 27.4 (.093)	Actinium Series Page 253
30.0	Ba-140	12.8d	537.3 (.24)	30.0 (.14) 304.8 (.045)	162.9 (.067) 423.7 (.032)	P. La-140 1596.1
30.6	Mg-28	20.9h	1342.2 (.526)	30.6 (.66) 400.7 (.366)	941.5 (.383) 1372.9 (.047)	P. Al-28 1778.9
31.8	Ba X-ray					
32.2	Ba X-ray					
35.5	Sb-125	2.77y	427.9 (.30)	600.6 (.18) 463.4 (.10) 606.6 (.05)	635.9 (.11) 176.3 (.069) 35.5 (.041)	D. Sn-125 1066.6
35.5	I-125	60.1d	35.5 (.065)			
36.4	Ba X-ray					
37.0	Br-80m	4.42h	37.0 (.39)			
39.6	I-129	1.57E7y	39.6 (.075)			
39.9	Bi-212	60.6m	727.2 (.12)	1620.6 (.028) 1078.6 (.010) 1512.8 (.006)	785.5 (.020) 893.4 (.007) 39.9 (.010)	Thorium Series Page 257
43.5	U-239	23.4m	74.7 (.49)	43.5 (.043)		
46.5	Pb-210	22.3y	46.5 (.04)			Uranium Series Page 261

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
50.1	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
51.4	Rh-104m	4.34m	51.4 (.48)	97.1 (.03) 555.8 (.02)	77.5 (.02)	
53.2	Pb-214	26.8m	351.9 (.372)	295.2 (.192) 785.9 (.011) 258.8 (.006)	242.0 (.075) 53.2 (.011) 487.1 (.004)	Uranium Series Page 261
53.2	U-234	2.445E5y	53.2 (.001)			Uranium Series Page 261
57.4	Ce-143	33.0h	293.2 (.42)	57.4 (.12) 722.0 (.051)	664.6 (.052)	
57.4	Hf-180m	5.50h	332.3 (.94)	443.2 (.82) 57.4 (.48) 500.7 (.13)	215.2 (.82) 93.3 (.17)	
57.8	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
58.0	Gd-159	18.6h	363.5 (.11)	58.0 (.018)	348.2 (.002)	
58.6	Th-231	25.52h	84.2 (.064)	81.2 (.009) 58.6 (.005)	90.0 (.009) 25.6 (.147)	Actinium Series Page 253

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
58.6	Co-60m	10.5m	58.6 (.02)			
59.5	Am-241	432y	59.5 (.36)	26.3 (.024)		
63.1	Yb-169	32.0d	198.0 (.35)	63.1 (.44) 109.8 (.18) 307.7 (.10)	177.2 (.22) 130.5 (.11)	
63.3	Th-234	24.1d	92.6 (.054)	63.3 (.038)		Uranium Series Page 261
67.7	Th-230	7.7E4y	67.7 (.004)			Uranium Series Page 261
67.8	Ta-182	115d	1221.4 (.27)	67.8 (.42) 1189.1 (.16) 1230.9 (.12)	1121.3 (.35) 100.1 (.14) 222.1 (.076)	
67.9	Ti-44	47.3y	78.3 (.98)	67.9 (.92)		P. Sc-44 1157.0
69.7	Sm-153	46.8h	103.2 (.28)	69.7 (.052)	97.4 (.007)	
69.7	Gd-153	242d	97.4 (.31)	103.2 (.22)	69.7 (.026)	
72.1	W-187	23.8h	685.8 (.29)	479.5 (.23) 134.2 (.095) 551.5 (.054)	72.1 (.12) 618.4 (.067) 772.9 (.044)	
72.8	Pb X-ray					
74.7	U-239	23.4m	74.7 (.49)	43.5 (.043)		
75.0	Pb X-ray					
77.4	Hg-197	64.1h	77.4 (.19)	191.4 (.005)		
77.5	Rh-104m	4.34m	51.4 (.48)	97.1 (.03) 555.8 (.02)	77.5 (.02)	
78.3	Ti-44	47.3y	78.3 (.98)	67.9 (.92)		P. Sc-44 1157.0

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
79.2	Ag-108m	127y	722.9 (.91)	614.4 (.91) 79.2 (.071)	433.9 (.90)	
79.6	Xe-133	5.25d	81.0 (.37)	79.6 (.002)		
79.8	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
80.1	Ce-144	284d	133.5 (.11)	80.1 (.016)		P. Pr-144 696.5
80.6	Ho-166	26.8h	80.6 (.062)	1379.4 (.009)	1581.9 (.002)	
81.0	Ba-133	10.5y	356.0 (.62)	81.0 (.33) 383.9 (.087)	302.8 (.19) 276.4 (.069)	
81.0	Xe-133	5.25d	81.0 (.37)	79.6 (.002)		
81.2	Th-231	25.52h	84.2 (.064)	81.2 (.009) 58.6 (.005)	90.0 (.009) 25.6 (.147)	Actinium Series Page 253
84.2	Th-231	25.52h	84.2 (.064)	81.2 (.009) 58.6 (.005)	90.0 (.009) 25.6 (.147)	Actinium Series Page 253
84.3	Tm-170	129d	84.3 (.032)			
84.4	Th-228	1.9132y	84.4 (.012)			Thorium Series Page 257
84.9	Pb X-ray					
86.5	Th-233	22.3m	86.5 (.027)	459.2 (.014)	669.8 (.007)	
86.5	Eu-155	4.76y	86.5 (.31)	105.3 (.20)		D. Sm-155 104.3

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
86.8	Tb-160	72.3d	879.4 (.29)	298.6 (.27) 1177.9 (.15) 962.3 (.09) 197.0 (.049)	966.1 (.25) 86.8 (.14) 1271.9 (.07)	
88.0	Cd-109	464d	88.0 (.037)			
88.0	Pd-109	13.4h	88.0 (.037)			
88.3	Lu-176m	3.69h	88.3 (.10)			
89.6	Hf-175	70.0d	343.6 (.85)	89.6 (.034)		
90.0	Th-231	25.52h	84.2 (.064)	81.2 (.009) 58.6 (.005)	90.0 (.009) 25.6 (.147)	Actinium Series Page 253
90.0	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
90.1	Pa-231	3.276E4y	302.7 (.023)	300.1 (.023) 283.7 (.016) 102.0 (.005)	330.0 (.013) 90.9 (.010) 27.4 (.093)	Actinium Series Page 253
91.1	Nd-147	11.0d	91.1 (.28)	531.0 (.13)	319.4 (.02)	
91.3	Cu-67	61.9h	184.6 (.48)	93.3 (.16) 300.2 (.008)	91.3 (.07)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
92.6	Th-234	24.1d	92.6 (.054)	63.3 (.038)		Uranium Series Page 261
93.3	Cu-67	61.9h	184.6 (.48)	93.3 (.16) 300.2 (.008)	91.3 (.07)	
93.3	Hf-180m	5.50h	332.3 (.94)	443.2 (.82) 57.4 (.48) 500.7 (.13)	215.2 (.82) 93.3 (.17)	
93.3	Ga-67	3.26d	93.3 (.38)	184.6 (.20) 393.5 (.045)	300.2 (.16) 209.0 (.022)	
93.4	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
94.0	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
94.7	Dy-165	2.33h	94.7 (.036)	361.7 (.008) 715.3 (.005)	633.4 (.006)	
97.1	Rh-104m	4.34m	51.4 (.48)	97.1 (.03) 555.8 (.02)	77.5 (.02)	
97.4	Sm-153	46.8h	103.2 (.28)	69.7 (.052)	97.4 (.007)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
97.4	Gd-153	242d	97.4 (.31)	103.2 (.22)	69.7 (.026)	
98.9	Au-195	183d	98.9 (.11)	129.8 (.008)		
98.9	Pt-195m	4.02d	98.9 (.11)	129.8 (.028)		
99.4	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium Series Page 257
				964.6 (.052)	794.7 (.046)	
				463.0 (.045)	209.3 (.044)	
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
100.1	Ta-182	115d	1221.4 (.27)	67.8 (.42)	1121.3 (.35)	
				1189.1 (.16)	100.1 (.14)	
				1230.9 (.12)	222.1 (.076)	
102.0	Pa-231	3.276E4y	302.7 (.023)	300.1 (.023)	330.0 (.013)	Actinium Series Page 253
				283.7 (.016)	90.9 (.010)	
				102.0 (.005)	27.4 (.093)	
102.1	Te-131m	30.0h	773.7 (.38)	852.2 (.21)	793.8 (.14)	P. I-131 364.5
				1125.5 (.11)	1206.6 (.098)	
				334.3 (.096)	102.1 (.079)	
				782.5 (.078)	240.9 (.076)	
				200.7 (.076)	882.8 (.061)	
				149.7 (.051)	665.1 (.044)	
				452.3 (.015)		
103.2	Sm-153	46.8h	103.2 (.28)	69.7 (.052)	97.4 (.007)	
103.2	Gd-153	242d	97.4 (.31)	103.2 (.22)	69.7 (.026)	
104.3	Sm-155	22.4m	104.3 (.75)	245.7 (.037)	141.4 (.02)	P. Eu-155 86.5

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
105.3	Eu-155	4.76y	86.5 (.31)	105.3 (.20)		D. Sm-155 104.3
106.1	Np-239	2.36d	106.1 (.23)	277.6 (.14) 209.8 (.032)	228.2 (.11)	
108.2	Dy-165m	1.26m	108.2 (.013)	515.5 (.007)		
109.1	U-235	7.038E8y	185.7 (.54)	143.8 (.105) 205.3 (.047) 109.1 (.015)	194.9 (.059) 163.4 (.047) 202.1 (.010)	Actinium Series Page 253
109.8	Yb-169	32.0d	198.0 (.35)	63.1 (.44) 109.8 (.18) 307.7 (.10)	177.2 (.22) 130.5 (.11)	
111.6	Er-171	7.52h	308.3 (.63)	295.9 (.28) 124.0 (.091)	111.6 (.21)	
113.0	Lu-177	6.71d	208.4 (.11)	113.0 (.064)		
113.1	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
113.5	Yb-175	4.19d	396.3 (.065)	282.5 (.03)	113.5 (.019)	
114.3	Nd-149	1.73h	211.3 (.27)	114.3 (.19) 423.6 (.094) 654.8 (.073) 267.7 (.06)	270.2 (.11) 540.5 (.077) 155.9 (.06)	P. Pm-149 285.9
115.2	Pb-212	10.6h	238.6 (.45)	300.1 (.034)	115.2 (.006)	Thorium Series Page 257
116.8	Nd-151	12.4m	116.8 (.60)	255.7 (.26) 175.1 (.11)	1180.9 (.17) 139.0 (.11)	
121.1	Se-75	120d	264.7 (.60)	136.0 (.57) 121.1 (.17)	279.5 (.25) 400.6 (.12)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
121.8	Eu-152	13.5y	1408.0 (.21)	121.8 (.28) 964.0 (.15) 778.9 (.13) 244.7 (.075)	344.3 (.27) 1112.0 (.13) 1085.8 (.10)	
121.8	Eu-152m	9.32h	841.6 (.13)	963.3 (.12) 344.3 (.025) 1389.0 (.009)	121.8 (.074) 1314.7 (.01)	
122.1	Co-57	271d	122.1 (.86)	136.5 (.11)	14.4 (.10)	
122.3	Ra-223	11.434d	269.5 (.136)	154.2 (.056) 144.2 (.032) 122.3 (.012) 158.6 (.007)	323.9 (.039) 338.3 (.027) 445.0 (.012)	Actinium Series Page 253
123.1	Eu-154	8.6y	123.1 (.40)	1274.5 (.36) 1004.8 (.18) 966.3 (.11)	723.3 (.19) 873.2 (.12) 247.9 (.066)	
123.8	Ba-131	11.8d	496.3 (.47)	123.8 (.29) 373.2 (.14)	216.1 (.20)	
124.0	Er-171	7.52h	308.3 (.63)	295.9 (.28) 124.0 (.091)	111.6 (.21)	
127.2	Tc-101	14.2m	306.8 (.90)	545.1 (.06) 184.1 (.016)	127.2 (.028)	D. Mo-101 191.9
127.4	Cs-134m	2.90h	127.4 (.13)			
129.1	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
129.4	Os-191	15.4d	129.4 (.26)			
129.8	Pt-195m	4.02d	98.9 (.11)	129.8 (.028)		
129.8	Au-195	183d	98.9 (.11)	129.8 (.008)		
130.5	Yb-169	32.0d	198.0 (.35)	63.1 (.44) 109.8 (.18) 307.7 (.10)	177.2 (.22) 130.5 (.11)	
133.0	Hf-181	42.4d	482.0 (.83)	133.0 (.42) 136.3 (.052)	345.9 (.17)	
133.5	Ce-144	284d	133.5 (.11)	80.1 (.016)		P. Pr-144 696.5
133.9	Hg-197m	23.8h	133.9 (.34)	279.0 (.05)		
134.2	W-187	23.8h	685.8 (.29)	479.5 (.23) 134.2 (.095) 551.5 (.054)	72.1 (.12) 618.4 (.067) 772.9 (.044)	
135.3	Tl-201	73.1h	167.4 (.10)	135.3 (.026)		
136.0	Se-75	120d	264.7 (.60)	136.0 (.57) 121.1 (.17)	279.5 (.25) 400.6 (.12)	
136.3	Hf-181	42.4d	482.0 (.83)	133.0 (.42) 136.3 (.052)	345.9 (.17)	
136.5	Co-57	271d	122.1 (.86)	136.5 (.11)	14.4 (.10)	
139.0	Nd-151	12.4m	116.8 (.60)	255.7 (.26) 175.1 (.11)	1180.9 (.17) 139.0 (.11)	
140.5	Tc-99m	6.02h	140.5 (.90)			D. Mo-99 739.5
140.5	Mo-99	66.0h	739.5 (.13)	181.1 (.062) 140.5 (.038)	778.0 (.045) 366.4 (.014)	P. Tc-99m 140.5
141.4	Sm-155	22.4m	104.3 (.75)	245.7 (.037)	141.4 (.02)	P. Eu-155 86.5

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
142.5	Sc-46m	18.7s	142.5 (.63)			F. Sc-46 889.3
143.8	U-235	7.038E8y	185.7 (.54)	143.8 (.105) 205.3 (.047) 109.1 (.015)	194.9 (.059) 163.4 (.047) 202.1 (.010)	Actinium Series Page 253
144.2	Ra-223	11.434d	269.5 (.136)	154.2 (.056) 144.2 (.032) 122.3 (.012) 158.6 (.007)	323.9 (.039) 338.3 (.027) 445.0 (.012)	Actinium Series Page 253
145.4	Ce-141	32.5d	145.4 (.48)			
149.7	Te-131	25.0m	149.7 (.68)	452.3 (.18) 492.7 (.048) 997.3 (.034)	1147.0 (.05) 602.0 (.042)	P. I-131 364.5
149.7	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
150.8	Cd-111m	48.6m	245.4 (.94)	150.8 (.30)		
151.2	Sr-85m	67.7m	231.7 (.85)	151.2 (.12)		
151.2	Kr-85m	4.48h	151.2 (.75)	304.9 (.14)		
154.2	Ra-223	11.434d	269.5 (.136)	154.2 (.056) 144.2 (.032) 122.3 (.012) 158.6 (.007)	323.9 (.039) 338.3 (.027) 445.0 (.012)	Actinium Series Page 253
154.2	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010)	Thorium Series Page 257

(cont.)

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
154.2 (cont.)	Ac-228	6.13h	911.1 (.28)	1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
155.0	Re-188	17.0h	155.0 (.15)	633.0 (.013)		
155.9	Nd-149	1.73h	211.3 (.27)	114.3 (.19) 423.6 (.094) 654.8 (.073) 267.7 (.06)	270.2 (.11) 540.5 (.077) 155.9 (.06)	P. Pm-149 285.9
158.4	Au-199	3.14d	158.4 (.37)	208.2 (.084)		D. Pt-199 542.9
158.6	Ra-223	11.434d	269.5 (.136)	154.2 (.056) 144.2 (.032) 122.3 (.012) 158.6 (.007)	323.9 (.039) 338.3 (.027) 445.0 (.012)	Actinium Series Page 253
159.0	Te-123m	120d	159.0 (.84)			
159.4	Sc-47	3.42d	159.4 (.68)			D. Ca-47 1297.1
160.3	Sn-123m	40.1m	160.3 (1.00)			
162.9	Ba-140	12.8d	537.3 (.24)	30.0 (.14) 304.8 (.045)	162.9 (.067) 423.7 (.032)	P. La-140 1596.1
163.4	U-235	7.038E8y	185.7 (.54)	143.8 (.105) 205.3 (.047) 109.1 (.015)	194.9 (.059) 163.4 (.047) 202.1 (.010)	Actinium Series Page 253
165.8	Ce-139	138d	165.8 (.80)			
165.9	Ba-139	83.1m	165.9 (.22)	1420.5 (.003)		
167.4	Tl-201	73.1h	167.4 (.10)	135.3 (.026)		

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
167.8	Pm-151	28.4h	340.1 (.23)	167.8 (.088) 717.8 (.041) 177.2 (.039)	275.2 (.072) 445.7 (.041)	D. Nd-151 116.8
168.7	Fe-52	8.28h	168.7 (.97)	511.0 (1.12)		P. Mn-52 1434.0
170.7	Mg-27	9.46m	843.8 (.72)	1014.4 (.28)	170.7 (.008)	
171.2	In-111	2.83d	245.4 (.94)	171.2 (.91)		
175.1	Nd-151	12.4m	116.8 (.60)	255.7 (.26) 175.1 (.11)	1180.9 (.17) 139.0 (.11)	
175.4	Sc-48	43.7h	1312.1 (1.00)	983.5 (1.00) 175.4 (.075)	1037.5 (.98)	
176.3	Sb-125	2.77y	427.9 (.30)	600.6 (.18) 463.4 (.10) 606.6 (.05)	635.9 (.11) 176.3 (.069) 35.5 (.041)	D. Sn-125 1066.6
177.2	Pm-151	28.4h	340.1 (.23)	167.8 (.088) 717.8 (.041) 177.2 (.039)	275.2 (.072) 445.7 (.041)	D. Nd-151 116.8
177.2	Yb-169	32.0d	198.0 (.35)	63.1 (.44) 109.8 (.18) 307.7 (.10)	177.2 (.22) 130.5 (.11)	
181.1	Mo-99	66.0h	739.5 (.13)	181.1 (.062) 140.5 (.038)	778.0 (.045) 366.4 (.014)	P. Tc-99m 140.5
184.1	Tc-101	14.2m	306.8 (.90)	545.1 (.06) 184.1 (.016)	127.2 (.028)	D. Mo-101 191.9
184.6	Ga-67	3.26d	93.3 (.38)	184.6 (.20) 393.5 (.045)	300.2 (.16) 209.0 (.022)	
184.6	Cu-67	61.9h	184.6 (.48)	93.3 (.16) 300.2 (.008)	91.3 (.07)	
185.6	Pt-199	30.0m	542.9 (.11)	493.3 (.036) 185.6 (.022)	317.0 (.034) 246.4 (.015)	P. Au-199 158.4
185.7	U-235	7.038E8y	185.7 (.54)	143.8 (.105) 205.3 (.047) 109.1 (.015)	194.9 (.059) 163.4 (.047) 202.1 (.010)	Actinium Series Page 253

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
186.2	Ra-226	1600y	186.2 (.033)			Uranium Series Page 261
190.3	In-114m	49.5d	190.3 (.16)	725.2 (.045)	558.4 (.045)	
191.4	Hg-197	64.1h	77.4 (.19)	191.4 (.005)		
191.9	Mo-101	14.6m	191.9 (.19)	590.8 (.17) 505.9 (.12)	1012.5 (.13) 2032.0 (.071)	P. Tc-101 306.8
192.3	Fe-59	44.6d	1099.2 (.56)	1291.6 (.43)	192.3 (.031)	
194.9	U-235	7.038E8y	185.7 (.54)	143.8 (.105) 205.3 (.047) 109.1 (.015)	194.9 (.059) 163.4 (.047) 202.1 (.010)	Actinium Series Page 253
196.1	Kr-88	2.84h	2392.0 (.35)	196.1 (.26) 834.7 (.13)	2195.9 (.13) 1529.8 (.11)	
197.0	Tb-160	72.3d	879.4 (.29)	298.6 (.27) 1177.9 (.15) 962.3 (.09) 197.0 (.049)	966.1 (.25) 86.8 (.14) 1271.9 (.07)	
198.0	Yb-169	32.0d	198.0 (.35)	63.1 (.44) 109.8 (.18) 307.7 (.10)	177.2 (.22) 130.5 (.11)	
198.6	Ge-75	82.8m	264.6 (.11)	198.6 (.014)		
200.7	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
194.9	U-235	7.038E8y	185.7 (.54)	143.8 (.105) 205.3 (.047) 109.1 (.015)	194.9 (.059) 163.4 (.047) 202.1 (.010)	Actinium Series Page 253

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
202.5	Y-90m	3.19h	202.5 (.97)	479.5 (.91)		
205.3	U-235	7.038E8y	185.7 (.54)	143.8 (.105) 205.3 (.047) 109.1 (.015)	194.9 (.059) 163.4 (.047) 202.1 (.010)	Actinium Series Page 253
205.8	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	
208.2	Au-199	3.14d	158.4 (.37)	208.2 (.084)		D. Pt-199 542.9
208.4	Lu-177	6.71d	208.4 (.11)	113.0 (.064)		
209.0	Ga-67	3.26d	93.3 (.38)	184.6 (.20) 393.5 (.045)	300.2 (.16) 209.0 (.022)	
209.3	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
209.8	Np-239	2.36d	106.1 (.23)	277.6 (.14) 209.8 (.032)	228.2 (.11)	
210.6	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
211.0	Ge-77	11.3h	264.4 (.54)	211.0 (.31) 416.3 (.22) 367.4 (.14) 1085.2 (.06)	215.5 (.29) 558.0 (.16) 631.8 (.069)	P. As-77 239.0
211.3	Nd-149	1.73h	211.3 (.27)	114.3 (.19) 423.6 (.094) 654.8 (.073) 267.7 (.06)	270.2 (.11) 540.5 (.077) 155.9 (.06)	P. Pm-149 285.9
215.2	Hf-180m	5.50h	332.3 (.94)	443.2 (.82) 57.4 (.48) 500.7 (.13)	215.2 (.82) 93.3 (.17)	
215.5	Ge-77	11.3h	264.4 (.54)	211.0 (.31) 416.3 (.22) 367.4 (.14) 1085.2 (.06)	215.5 (.29) 558.0 (.16) 631.8 (.069)	P. As-77 239.0
215.7	Ru-97	69.6h	215.7 (.86)	324.5 (.11)		
216.1	Ba-131	11.8d	496.3 (.47)	123.8 (.29) 373.2 (.14)	216.1 (.20)	
222.1	Ta-182	115d	1221.4 (.27)	67.8 (.42) 1189.1 (.16) 1230.9 (.12)	1121.3 (.35) 100.1 (.14) 222.1 (.076)	
228.2	Te-132	78.2h	228.2 (.88)			
228.2	Np-239	2.36d	106.1 (.23)	277.6 (.14) 209.8 (.032)	228.2 (.11)	
231.4	Cd-115	53.5h	527.8 (.27)	492.3 (.077) 231.4 (.008)	260.9 (.018)	P.In-115m 336.3
231.7	Sr-85m	67.7m	231.7 (.85)	151.2 (.12)		
234.9	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
236.0	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
238.6	Pb-212	10.6h	238.6 (.45)	300.1 (.034)		Thorium Series Page 257
239.0	As-77	38.8h	239.0 (.016)	520.7 (.006)		D. Ge-77 264.4
240.9	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
241.0	Ra-224	3.62d	241.0 (.04)			Thorium Series Page 257
241.5	Sr-92	2.71h	1384.0 (.90)	953.3 (.036)	241.5 (.03)	
242.0	Pb-214	26.8m	351.9 (.372)	295.2 (.192) 785.9 (.011) 258.8 (.006)	242.0 (.075) 53.2 (.011) 487.1 (.004)	Uranium Series Page 261
244.7	Eu-152	13.5y	1408.0 (.21)	121.8 (.28) 964.0 (.15) 778.9 (.13) 244.7 (.075)	344.3 (.27) 1112.0 (.13) 1085.8 (.10)	
245.4	Ag-111	7.45d	342.2 (.067)	245.4 (.012)		
245.4	Cd-111m	48.6m	245.4 (.94)	150.8 (.30)		
245.4	In-111	2.83d	245.4 (.94)	171.2 (.91)		
245.7	Sm-155	22.4m	104.3 (.75)	245.7 (.037)	141.4 (.02)	P. Eu-155 86.5

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
246.4	Pt-199	30.0m	542.9 (.11)	493.3 (.036) 185.6 (.022)	317.0 (.034) 246.4 (.015)	P. Au-199 158.4
247.9	Eu-154	8.6y	123.1 (.40)	1274.5 (.36) 1004.8 (.18) 966.3 (.11)	723.3 (.19) 873.2 (.12) 247.9 (.066)	
249.8	Xe-135	9.11h	249.8 (.90)			D. I-135 1260.4
250.1	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
250.6	Te-129	69.6m	459.6 (.071)	487.4 (.013) 278.4 (.005)	1083.8 (.005) 250.6 (.004)	P. I-129 39.6
252.6	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257
254.7	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
255.1	Sn-113	115d	255.1 (.019)			P. In-113m 391.7
255.7	Nd-151	12.4m	116.8 (.60)	255.7 (.26) 175.1 (.11)	1180.9 (.17) 139.0 (.11)	
256.2	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253

ultiply each intensity by 0.36 when assaying Th-228.

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
258.8	Pb-214	26.8m	351.9 (.372)	295.2 (.192) 785.9 (.011) 258.8 (.006)	242.0 (.075) 53.2 (.011) 487.1 (.004)	Uranium Series Page 261
260.9	Cd-115	53.5h	527.8 (.27)	492.3 (.077) 231.4 (.008)	260.9 (.018)	P. In-115m 336.3
262.9	Ru-105	4.43h	724.5 (.49)	469.4 (.18) 316.5 (.12)	676.4 (.17) 262.9 (.072)	P. Rh-105 318.9
264.4	Ge-77	11.3h	264.4 (.54)	211.0 (.31) 416.3 (.22) 367.4 (.14) 1085.2 (.06)	215.5 (.29) 558.0 (.16) 631.8 (.069)	P. As-77 239.0
264.6	Ge-75	82.8m	264.6 (.11)	198.6 (.014)		
264.7	Se-75	120d	264.7 (.60)	136.0 (.57) 121.1 (.17)	279.5 (.25) 400.6 (.12)	
267.7	Nd-149	1.73h	211.3 (.27)	114.3 (.19) 423.6 (.094) 654.8 (.073) 267.7 (.06)	270.2 (.11) 540.5 (.077) 155.9 (.06)	P. Pm-149 285.9
269.5	Ra-223	11.434d	269.5 (.136)	154.2 (.056) 144.2 (.032) 122.3 (.012) 158.6 (.007)	323.9 (.039) 338.3 (.027) 445.0 (.012)	Actinium Series Page 253
270.2	Nd-149	1.73h	211.3 (.27)	114.3 (.19) 423.6 (.094) 654.8 (.073) 267.7 (.06)	270.2 (.11) 540.5 (.077) 155.9 (.06)	P. Pm-149 285.9
270.2	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
271.2	Rn-219	3.96s	271.2 (.106)	401.8 (.065)		Actinium Series Page 253
273.0	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
275.2	Pm-151	28.4h	340.1 (.23)	167.8 (.088) 717.8 (.041) 177.2 (.039)	275.2 (.072) 445.7 (.041)	D. Nd-151 116.8
276.4	Ba-133	10.5y	356.0 (.62)	81.0 (.33) 383.9 (.087)	302.8 (.19) 276.4 (.069)	
277.4	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257
277.6	Np-239	2.36d	106.1 (.23)	277.6 (.14) 209.8 (.032)	228.2 (.11)	
278.4	Te-129	69.6m	459.6 (.071)	487.4 (.013) 278.4 (.005)	1083.8 (.005) 250.6 (.004)	P. I-129 39.6
279.0	Hg-197m	23.8h	133.9 (.34)	279.0 (.05)		
279.2	Hg-203	46.6d	279.2 (.77)			
279.5	Se-75	120d	264.7 (.60)	136.0 (.57) 121.1 (.17)	279.5 (.25) 400.6 (.12)	
282.5	Yb-175	4.19d	396.3 (.065)	282.5 (.03)	113.5 (.019)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
283.7	Pa-231	3.276E4y	302.7 (.023)	300.1 (.023) 283.7 (.016) 102.0 (.005)	330.0 (.013) 90.9 (.010) 27.4 (.093)	Actinium Series Page 253
284.3	I-131	8.04d	364.5 (.81)	637.0 (.073) 722.9 (.018)	284.3 (.06)	D. Te-131m 773.7
285.9	Pm-149	53.1h	285.9 (.031)			D. Nd-149 211.3
286.1	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
293.2	Ce-143	33.0h	293.2 (.42)	57.4 (.12) 722.0 (.051)	664.6 (.052)	
293.5	Ir-194	19.2h	328.5 (.13)	293.5 (.026)		
295.2	Pb-214	26.8m	351.9 (.372)	295.2 (.192) 785.9 (.011) 258.8 (.006)	242.0 (.075) 53.2 (.011) 487.1 (.004)	Uranium Series Page 261
295.9	Er-171	7.52h	308.3 (.63)	295.9 (.28) 124.0 (.091)	111.6 (.21)	
296.0	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	
298.6	Tb-160	72.3d	879.4 (.29)	298.6 (.27) 1177.9 (.15) 962.3 (.09) 197.0 (.049)	966.1 (.25) 86.8 (.14) 1271.9 (.07)	
299.8	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
300.1	Pa-233	27.0d	312.0 (.39)	300.1 (.066)	340.5 (.045)	D. Th-233 86.5

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
300.1	Pb-212	10.6h	238.6 (.45)	300.1 (.034)	115.2 (.006)	Thorium Series Page 257
300.1	Pa-231	3.276E4y	302.7 (.023)	300.1 (.023) 283.7 (.016) 102.0 (.005)	330.0 (.013) 90.9 (.010) 27.4 (.093)	Actinium Series Page 253
300.2	Ga-67	3.26d	93.3 (.38)	184.6 (.20) 393.5 (.045)	300.2 (.16) 209.0 (.022)	
300.2	Cu-67	61.9h	184.6 (.48)	93.3 (.16) 300.2 (.008)	91.3 (.07)	
302.7	Pa-231	3.276E4y	302.7 (.023)	300.1 (.023) 283.7 (.016) 102.0 (.005)	330.0 (.013) 90.9 (.010) 27.4 (.093)	Actinium Series Page 253
302.8	Ba-133	10.5y	356.0 (.62)	81.0 (.33) 383.9 (.087)	302.8 (.19) 276.4 (.069)	
304.4	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
304.8	Ba-140	12.8d	537.3 (.24)	30.0 (.14) 304.8 (.045)	162.9 (.067) 423.7 (.032)	P. La-140 1596.1
304.9	Kr-85m	4.48h	151.2 (.75)	304.9 (.14)		
306.3	Rh-105	35.4h	318.9 (.20)	306.3 (.051)		D. Ru-105 724.5
306.8	Tc-101	14.2m	306.8 (.90)	545.1 (.06) 184.1 (.016)	127.2 (.028)	D. Mo-101 191.9
307.7	Yb-169	32.0d	198.0 (.35)	63.1 (.44) 109.8 (.18) 307.7 (.10)	177.2 (.22) 130.5 (.11)	
308.3	Er-171	7.52h	308.3 (.63)	295.9 (.28) 124.0 (.091)	111.6 (.21)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
308.4	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	
312.0	Pa-233	27.0d	312.0 (.39)	300.1 (.066)	340.5 (.045)	D. Th-233 86.5
312.7	K-42	12.4h	1524.7 (.18)	312.7 (.003)		
316.5	Ru-105	4.43h	724.5 (.49)	469.4 (.18) 316.5 (.12)	676.4 (.17) 262.9 (.072)	P. Rh-105 318.9
316.5	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	
317.0	Pt-199	30.0m	542.9 (.11)	493.3 (.036) 185.6 (.022)	317.0 (.034) 246.4 (.015)	P. Au-199 158.4
318.9	Rh-105	35.4h	318.9 (.20)	306.3 (.051)		D. Ru-105 724.5
319.4	Nd-147	11.0d	91.1 (.28)	531.0 (.13)	319.4 (.02)	
320.1	Ti-51	5.75m	320.1 (.93)	928.6 (.069)	608.6 (.011)	
320.1	Cr-51	27.7d	320.1 (.098)			
323.9	Ra-223	11.434d	269.5 (.136)	154.2 (.056) 144.2 (.032) 122.3 (.012) 158.6 (.007)	323.9 (.039) 338.3 (.027) 445.0 (.012)	Actinium Series Page 253
324.5	Ru-97	69.5h	215.7 (.86)	324.5 (.11)		
327.6	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013)	Thorium Series Page 257

(cont.)

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
327.6 (cont.)	Ac-228	6.13h	911.1 (.28)	755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
328.5	Ir-194	19.2h	328.5 (.13)	293.5 (.026)		
328.8	La-140	40.2h	1596.1 (.96)	487.0 (.45) 328.8 (.21) 867.8 (.056)	815.8 (.23) 925.2 (.071)	D. Ba-140 537.3
329.7	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
330.0	Pa-231	3.276E4y	302.7 (.023)	300.1 (.023) 283.7 (.016) 102.0 (.005)	330.0 (.013) 90.9 (.010) 27.4 (.093)	Actinium Series Page 253
331.9	Sn-125m	9.52m	331.9 (1.00)			
332.3	Hf-180m	5.50h	332.3 (.94)	443.2 (.82) 57.4 (.48) 500.7 (.13)	215.2 (.82) 93.3 (.17)	
334.2	Th-227	18.718d	236.0 (.115)	50.1 (.084) 329.7 (.029) 299.8 (.018) 94.0 (.014) 210.6 (.013) 254.7 (.009) 273.0 (.005) 234.9 (.005)	256.2 (.063) 79.8 (.020) 286.1 (.016) 304.4 (.014) 334.2 (.012) 113.1 (.005) 250.1 (.005)	Actinium Series Page 253
334.3 (cont.)	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061)	P. I-131 364.5

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
334.3 (cont.)	Te-131m	30.0h	773.7 (.38)	149.7 (.051) 452.3 (.015)	665.1 (.044)	P. I-131 364.5
336.3	In-115m	4.36h	336.3 (.48)			D. Cd-115 527.8
338.3	Ra-223	11.434d	269.5 (.136)	154.2 (.056) 144.2 (.032) 122.3 (.012) 158.6 (.007)	323.9 (.039) 338.3 (.027) 445.0 (.012)	Actinium Series Page 253
338.3	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
340.1	Pm-151	28.4h	340.1 (.23)	167.8 (.088) 717.8 (.041) 177.2 (.039)	275.2 (.072) 445.7 (.041)	D. Nd-151 116.8
340.5	Pa-233	27.0d	312.0 (.39)	300.1 (.066)	340.5 (.045)	D. Th-233 86.5
341.1	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
342.2	Ag-111	7.45d	342.2 (.067)	245.4 (.012)		
343.6	Hf-175	70.0d	343.6 (.85)	89.6 (.034)		
344.3	Eu-152	13.5y	1408.0 (.21)	121.8 (.28) 964.0 (.15) 778.9 (.13) 244.7 (.075)	344.3 (.27) 1112.0 (.13) 1085.8 (.10)	
344.3	Eu-152m	9.32h	841.6 (.13)	963.3 (.12) 344.3 (.025) 1389.0 (.009)	121.8 (.074) 1314.7 (.01)	
345.9	Hf-181	42.4d	482.0 (.83)	133.0 (.42) 136.3 (.052)	345.9 (.17)	
346.6	Na-24	15.0h	2754.0 (1.00)	1368.6 (1.00) 1732.0 (DE) 346.6 (DE)	2243.0 (SE) 857.6 (SE)	
348.2	Gd-159	18.6h	363.5 (.11)	58.0 (.018)	348.2 (.002)	
351.1	Bi-211	2.13m	351.1 (.129)			Actinium Series Page 253
351.9	Pb-214	26.8m	351.9 (.372)	295.2 (.192) 785.9 (.011) 258.8 (.006)	242.0 (.075) 53.2 (.011) 487.1 (.004)	Uranium Series Page 261
355.4	Zr-97	16.9h	507.6 (.053)	1148.0 (.026) 1750.5 (.014)	355.4 (.023) 1362.7 (.014)	P. Nb-97m 743.4
356.0	Ba-133	10.5y	356.0 (.62)	81.0 (.33) 383.9 (.087)	302.8 (.19) 276.4 (.069)	
361.7	Dy-165	2.33h	94.7 (.036)	361.7 (.008) 715.3 (.005)	633.4 (.006)	
363.5	Gd-159	18.6h	363.5 (.11)	58.0 (.018)	348.2 (.002)	
364.5	I-131	8.04d	364.5 (.81)	637.0 (.073) 722.9 (.018)	284.3 (.06)	D. Te-131m 773.7

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
366.3	Ni-65	2.52h	1481.8 (.24)	1115.5 (.15)	366.3 (.05)	
366.4	Mo-99	66.0h	739.5 (.13)	181.1 (.062) 140.5 (.038)	778.0 (.045) 366.4 (.014)	P. Tc-99m 140.5
367.4	Ge-77	11.3h	264.4 (.54)	211.0 (.31) 416.3 (.22) 367.4 (.14) 1085.2 (.06)	215.5 (.29) 558.0 (.16) 631.8 (.069)	P. As-77 239.0
372.8	K-43	22.6h	372.8 (.87)	617.5 (.81) 396.9 (.11)	593.4 (.11)	
373.2	Ba-131	11.8d	496.3 (.47)	123.8 (.29) 373.2 (.14)	216.1 (.20)	
383.9	Ba-133	10.5y	356.0 (.62)	81.0 (.33) 383.9 (.087)	302.8 (.19) 276.4 (.069)	
388.5	Sr-87m	2.81h	388.5 (.82)			
391.7	In-113m	1.66h	391.7 (.65)			D. Sn-113 255.1
393.5	Ga-67	3.26d	93.3 (.38)	184.6 (.20) 393.5 (.045)	300.2 (.16) 209.0 (.022)	
396.3	Yb-175	4.19d	396.3 (.065)	282.5 (.03)	113.5 (.019)	
396.9	K-43	22.6h	372.8 (.87)	617.5 (.81) 396.9 (.11)	593.4 (.11)	
400.6	Se-75	120d	264.7 (.60)	136.0 (.57) 121.1 (.17)	279.5 (.25) 400.6 (.12)	
400.7	Mg-28	20.9h	1342.2 (.53)	30.6 (.66) 400.7 (.37)	941.5 (.38)	P. Al-28 1778.9
401.8	Rn-219	3.96s	271.2 (.106)	401.8		Actinium Series Page 253
404.8	Pb-211	36.1m	832.0 (.029)	404.8 (.029) 766.5 (.005)	427.1 (.013)	Actinium Series Page 253

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
409.5	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium Series Page 257
				964.6 (.052)	794.7 (.046)	
				463.0 (.045)	209.3 (.044)	
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
411.8	Au-198	2.69d	411.8 (.95)	675.9 (.011)		
416.3	Ge-77	11.3h	264.4 (.54)	211.0 (.31)	215.5 (.29)	P. As-77 239.0
				416.3 (.22)	558.0 (.16)	
				367.4 (.14)	631.8 (.069)	
				1085.2 (.06)		
417.0	In-116m	54.2m	1097.3 (.56)	1293.5 (.84)	417.0 (.28)	
				2122.3 (.16)	818.7 (.12)	
				1507.6 (.10)		
418.0	I-130	12.4h	536.1 (.99)	668.5 (.96)	739.5 (.82)	
				418.0 (.34)	1157.5 (.11)	
423.6	Nd-149	1.73h	211.3 (.27)	114.3 (.19)	270.2 (.11)	P. Pm-149 285.9
				423.6 (.094)	540.5 (.077)	
				654.8 (.073)	155.9 (.06)	
				267.7 (.06)		
423.7	Ba-140	12.8d	537.3 (.24)	30.0 (.14)	162.9 (.067)	P. La-140 1596.1
				304.8 (.045)	423.7 (.032)	
427.1	Pb-211	36.1m	832.0 (.029)	404.8 (.029)	427.1 (.013)	Actinium Series Page 253
				766.5 (.005)		
427.9	Sb-125	2.77y	427.9 (.30)	600.6 (.18)	635.9 (.11)	D. Sn-125 1066.6
				463.4 (.10)	176.3 (.069)	
				606.6 (.05)	35.5 (.041)	
433.9	Ag-108	2.37m	633.0 (.017)	433.9 (.005)	618.9 (.003)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
433.9	Ag-108m	127y	722.9 (.91)	614.4 (.91) 79.2 (.071)	433.9 (.90)	
438.6	Zn-69m	13.8h	438.6 (.95)			
442.9	I-128	25.0m	442.9 (.14)	526.6 (.014)	969.4 (.004)	
443.2	Hf-180m	5.50h	332.3 (.94)	443.2 (.82) 57.4 (.48) 500.7 (.13)	215.2 (.82) 93.3 (.17)	
445.0	Ra-223	11.434d	269.5 (.136)	154.2 (.056) 144.2 (.032) 122.3 (.012) 158.6 (.007)	323.9 (.039) 338.3 (.027) 445.0 (.012)	Actinium Series Page 253
445.7	Pm-151	28.4h	340.1 (.23)	167.8 (.088) 717.8 (.041) 177.2 (.039)	275.2 (.072) 445.7 (.041)	D. Nd-151 116.8
448.5	Y-92	3.54d	934.4 (.14)	1405.4 (.048) 448.5 (.023)	561.1 (.024) 844.3 (.013)	
452.3	Te-131	25.0m	149.7 (.68)	452.3 (.18) 492.7 (.048) 997.3 (.034)	1147.0 (.05) 602.0 (.042)	P. I-131 364.5
452.3	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
459.2	Th-233	22.3m	86.5 (.027)	459.2 (.014)	669.8 (.007)	
459.6	Te-129	69.6m	459.6 (.071)	487.4 (.013) 278.4 (.005)	1083.8 (.005) 250.6 (.004)	P. I-129 39.6
462.8	Cs-138	32.2m	1435.8 (.76)	462.8 (.31) 2218.0 (.15) 2639.6 (.076)	1009.7 (.30) 546.8 (.10)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
463.0	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
463.4	Sb-125	2.77y	427.9 (.30)	600.6 (.18) 463.4 (.10) 606.6 (.05)	635.9 (.11) 176.3 (.069) 35.5 (.041)	D. Sn-125 1066.6
468.1	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	
469.4	Ru-105	4.43h	724.5 (.49)	469.4 (.18) 316.5 (.12)	676.4 (.17) 262.9 (.072)	P. Rh-105 318.9
469.9	Sn-125	9.64d	1066.6 (.085)	1088.9 (.04) 822.6 (.038) 469.9 (.013)	915.7 (.038) 2002.0 (.021)	P. Sb-125 427.9
477.6	Be-7	53.3d	477.6 (.103)			
479.5	W-187	23.8h	685.8 (.29)	479.5 (.23) 134.2 (.095) 551.5 (.054)	72.1 (.12) 618.4 (.067) 772.9 (.044)	
479.5	Y-90m	3.19h	202.5 (.97)	479.5 (.91)		
482.0	Hf-181	42.4d	482.0 (.83)	133.0 (.42) 136.3 (.052)	345.9 (.17)	
484.6	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
487.0	La-140	40.2h	1596.1 (.96)	487.0 (.45) 328.8 (.21) 867.8 (.056)	815.8 (.23) 925.2 (.071)	D. Ba-140 537.3
487.1	Pb-214	26.8m	351.9 (.372)	295.2 (.192) 785.9 (.011) 258.8 (.006)	242.0 (.075) 53.2 (.011) 487.1 (.004)	Uranium Series Page 261
487.4	Te-129	69.6m	459.6 (.071)	487.4 (.013) 278.4 (.005)	1083.8 (.005) 250.6 (.004)	P. I-129 39.6
489.2	Ca-47	4.54d	1297.1 (.75)	807.9 (.069)	489.2 (.067)	P. Sc-47 159.4
492.3	Cd-115	53.5h	527.8 (.27)	492.3 (.077) 231.4 (.008)	260.9 (.018)	P. In-115m 336.3
492.7	Te-131	25.0m	149.7 (.68)	452.3 (.18) 492.7 (.048) 997.3 (.034)	1147.0 (.05) 602.0 (.042)	P. I-131 364.5
493.3	Pt-199	30.0m	542.9 (.11)	493.3 (.036) 185.6 (.022)	317.0 (.034) 246.4 (.015)	P. Au-199 158.4
496.3	Ba-131	11.8d	496.3 (.47)	123.8 (.29) 373.2 (.14)	216.1 (.20)	
497.1	Ru-103	39.4d	497.1 (.89)	610.3 (.056)		
500.7	Hf-180m	5.50h	332.3 (.94)	443.2 (.82) 57.4 (.48) 500.7 (.13)	215.2 (.82) 93.3 (.17)	
505.9	I-132	2.30h	667.7 (.99)	772.6 (.76) 522.6 (.16) 1398.6 (.071) 671.6 (.052)	954.6 (.18) 630.2 (.14) 812.3 (.056) 505.9 (.05)	
505.9	Mo-101	14.6m	191.9 (.19)	590.8 (.17) 505.9 (.12)	1012.5 (.13) 2032.0 (.071)	P. Tc-101 306.8
507.6	Zr-97	16.9h	507.6 (.053)	1148.0 (.026) 1750.5 (.014)	355.4 (.023) 1362.7 (.014)	P. Nb-97m 743.4

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
509.6	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium Series Page 257
				964.6 (.052)	794.7 (.046)	
				463.0 (.045)	209.3 (.044)	
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
511.0	Annihilation Radiation					
514.0	Sr-85	64.9d	514.0 (.99)			
514.0	Kr-85	10.7y	514.0 (.004)			
515.5	Dy-165m	1.26m	108.2 (.013)	515.5 (.007)		
520.7	As-77	38.8h	239.0 (.016)	520.7 (.006)		D. Ge-77 264.4
522.6	I-132	2.30h	667.7 (.99)	772.6 (.76)	954.6 (.18)	
				522.6 (.16)	630.2 (.14)	
				1398.6 (.071)	812.3 (.056)	
				671.6 (.052)	505.9 (.05)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
526.6	Xe-135m	15.4m	526.6 (.81)			D. I-135 1260.4
526.6	I-128	25.0m	442.9 (.14)	526.6 (.014)	969.4 (.004)	
527.8	Cd-115	53.5h	527.8 (.27)	492.3 (.077) 231.4 (.008)	260.9 (.018)	P. In-115m 336.3
531.0	Nd-147	11.0d	91.1 (.28)	531.0 (.13)	319.4 (.02)	
536.1	I-130	12.4h	536.1 (.99)	668.5 (.96) 418.0 (.34)	739.5 (.82) 1157.5 (.11)	
537.3	Ba-140	12.8d	537.3 (.24)	30.0 (.14) 304.8 (.045)	162.9 (.067) 423.7 (.032)	P. La-140 1596.1
540.5	Nd-149	1.73h	211.3 (.27)	114.3 (.19) 423.6 (.094) 654.8 (.073) 267.7 (.06)	270.2 (.11) 540.5 (.077) 155.9 (.06)	P. Pm-149 285.9
542.9	Pt-199	30.0m	542.9 (.11)	493.3 (.036) 185.6 (.022)	317.0 (.034) 246.4 (.015)	P. Au-199 158.4
545.1	Tc-101	14.2m	306.8 (.90)	545.1 (.06) 184.1 (.016)	127.2 (.028)	D. Mo-101 191.9
546.8	Cs-138	32.2m	1435.8 (.76)	462.8 (.31) 2218.0 (.15) 2639.6 (.076)	1009.7 (.30) 546.8 (.10)	
551.5	W-187	23.8h	685.8 (.29)	479.5 (.23) 134.2 (.095) 551.5 (.054)	72.1 (.12) 618.4 (.067) 772.9 (.044)	
554.3	Br-82	35.3h	776.5 (.83)	554.3 (.71) 698.3 (.28) 1044.0 (.27) 1474.8 (.17)	619.1 (.43) 1317.5 (.27) 827.8 (.24)	
555.6	Y-91m	49.7m	555.6 (.95)			D. Sr-91 1024.3
555.8	Rh-104m	4.34m	51.4 (.48)	97.1 (.03) 555.8 (.02)	77.5 (.02)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
558.0	Ge-77	11.3h	264.4 (.54)	211.0 (.31) 416.3 (.22) 367.4 (.14) 1085.2 (.06)	215.5 (.29) 558.0 (.16) 631.8 (.069)	P. As-77 239.0
558.4	In-114m	49.5d	190.3 (.16)	725.2 (.045)	558.4 (.045)	
559.1	As-76	26.3h	559.1 (.45)	657.0 (.061)	1216.0 (.038)	
561.1	Y-92	3.54h	934.4 (.14)	1405.4 (.048) 448.5 (.023)	561.1 (.024) 844.3 (.013)	
562.3	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
563.2	Cs-134	2.06y	604.7 (.976)	795.8 (.854) 801.9 (.087)	569.3 (.154) 563.3 (.084)	
564.0	Sb-122	2.70d	564.0 (.71)	692.8 (.037) 1140.2 (.008)	1256.9 (.008)	
569.3	Cs-134	2.06y	604.7 (.976)	795.8 (.854) 801.9 (.087)	569.3 (.154) 563.3 (.084)	
569.7	Bi-207	33.4y	569.7 (.98)	1063.6 (.75)	1770.2 (.068)	
583.1	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257

*Multiply each intensity by 0.36 when assaying Th-228.2

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
588.6	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	
590.8	Mo-101	14.6m	191.9 (.19)	590.8 (.17) 505.9 (.12)	1012.5 (.13) 2032.0 (.071)	P. Tc-101 306.8
593.4	K-43	22.6h	372.8 (.87)	617.5 (.81) 396.9 (.11)	593.4 (.11)	
595.9	As-74	17.8d	595.9 (.60)	634.8 (.15)	511.0 (.59)	
600.6	Sb-125	2.77y	427.9 (.30)	600.6 (.18) 463.4 (.10) 606.6 (.05)	635.9 (.11) 176.3 (.069) 35.5 (.041)	D. Sn-125 1066.6
600.9	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	
602.0	Te-131	25.0m	149.7 (.68)	452.3 (.18) 492.7 (.048) 997.3 (.034)	1147.0 (.05) 602.0 (.042)	P. I-131 364.5
602.7	Sb-124	60.2d	602.7 (.98)	1691.0 (.49) 645.9 (.073) 1368.2 (.025)	722.8 (.11) 2091.0 (.057)	
604.7	Cs-134	2.06y	604.7 (.976)	795.8 (.854) 801.9 (.087)	569.3 (.154) 563.3 (.084)	
604.9	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	
606.6	Sb-125	2.77y	427.9 (.30)	600.6 (.18) 463.4 (.10) 606.6 (.05)	635.9 (.11) 176.3 (.069) 35.5 (.041)	D. Sn-125 1066.6
608.6	Ti-51	5.75m	320.1 (.93)	928.6 (.069)	608.6 (.011)	
609.3 (cont.)	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05)	1120.3 (.15) 768.4 (.05) 1377.7 (.041)	Uranium Series Page 261

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
609.3 (cont.)	Bi-214	19.9m	609.3 (.463)	934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
610.3	Ru-103	39.4d	497.1 (.89)	610.5 (.056)		
612.5	Ir-192	74.2d	316.5 (.83)	468.1 (.48) 296.0 (.29) 612.5 (.053) 205.8 (.033)	308.5 (.30) 604.9 (.082) 588.6 (.046) 484.6 (.032)	
614.4	Ag-108m	127y	722.9 (.91)	614.4 (.91) 79.2 (.071)	433.9 (.90)	
616.2	Br-80	17.6m	616.2 (.066)	665.8 (.011)	511.0 (.044)	
617.5	K-43	22.6h	372.8 (.87)	617.5 (.81) 396.9 (.11)	593.4 (.11)	
618.4	W-187	23.8h	685.8 (.29)	479.5 (.23) 134.2 (.095) 551.5 (.054)	72.1 (.12) 618.4 (.067) 772.9 (.044)	
618.9	Ag-108	2.37m	633.0 (.017)	433.9 (.005)	618.9 (.003)	
619.1	Br-82	35.3h	776.5 (.83)	554.3 (.71) 698.3 (.28) 1044.0 (.27) 1474.8 (.17)	619.1 (.43) 1317.5 (.27) 827.8 (.24)	
629.9	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	
630.2	I-132	2.30h	667.7 (.99)	772.6 (.76) 522.6 (.16) 1398.6 (.071) 671.6 (.052)	954.6 (.18) 630.2 (.14) 812.3 (.056) 505.9 (.05)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
631.8	Ge-77	11.3h	264.4 (.54)	211.0 (.31) 416.3 (.22) 367.4 (.14) 1085.2 (.06)	215.5 (.29) 558.0 (.16) 631.8 (.069)	P. As-77 239.0
633.0	Re-188	17.0h	155.0 (.15)	633.0 (.013)		
633.0	Ag-108	2.37m	633.0 (.017)	433.9 (.005)	618.9 (.003)	
633.4	Dy-165	2.33h	94.7 (.036)	361.7 (.008) 715.3 (.005)	633.4 (.006)	
634.8	As-74	17.8d	595.9 (.60)	634.8 (.15)	511.0 (.59)	
635.9	Sb-125	2.77y	427.9 (.30)	600.6 (.18) 463.4 (.10) 606.6 (.05)	635.9 (.11) 176.3 (.069) 35.5 (.041)	D. Sn-125 1066.6
637.0	I-131	8.04d	364.5 (.81)	637.0 (.073) 722.9 (.018)	284.3 (.06)	D. Te-131m 773.7
645.9	Sb-124	60.2d	602.7 (.98)	1691.0 (.49) 645.9 (.073) 1368.2 (.025)	722.8 (.11) 2091.0 (.057)	
652.9	Sr-91	9.48h	1024.3 (.33)	749.8 (.23)	652.9 (.11)	P. Y-91m 555.6
654.8	Nd-149	1.73h	211.3 (.27)	114.3 (.19) 423.6 (.094) 654.8 (.073) 267.7 (.06)	270.2 (.11) 540.5 (.077) 155.9 (.06)	P. Pm-149 285.9
657.0	As-76	26.3h	559.1 (.45)	657.0 (.061)	1216.0 (.038)	
657.7	Ag-110m	250d	657.7 (.95)	884.7 (.73) 1384.3 (.24) 706.7 (.17) 677.6 (.11)	937.5 (.34) 763.9 (.22) 1505.0 (.13) 818.0 (.073)	
657.9	Nb-97	72.1m	657.9 (.98)	1024.5 (.011)		D. Nb-97m 743.4
661.6	Ba-137m	2.55m	661.6 (.90)	32.2 x-ray		D. Cs-137 661.6

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
661.6	Cs-137	30.2y	661.6 (.85)	32.2 x-ray		P. Ba-137m 661.6
664.6	Ce-143	33.0h	293.2 (.42)	57.4 (.12) 722.0 (.051)	664.6 (.052)	
665.1	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
665.5	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
665.8	Br-80	17.6m	616.2 (.066)	665.8 (.011)	511.0 (.044)	
667.7	I-132	2.30h	667.7 (.99)	772.6 (.76) 522.6 (.16) 1398.6 (.071) 671.6 (.052)	954.6 (.18) 630.2 (.14) 812.3 (.056) 505.9 (.05)	
668.5	I-130	12.4h	536.1 (.99)	668.5 (.96) 418.0 (.34)	739.5 (.82) 1157.5 (.11)	
669.8	Th-233	22.3m	86.5 (.027)	459.2 (.014)	669.8 (.007)	
671.6	I-132	2.30h	667.7 (.99)	772.6 (.76) 522.6 (.16) 1398.6 (.071) 671.6 (.052)	954.6 (.18) 630.2 (.14) 812.3 (.056) 505.9 (.05)	
675.9	Au-198	2.69d	411.8 (.95)	675.9 (.011)		

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
676.3	Ru-105	4.43h	724.5 (.49)	469.4 (.18) 316.5 (.12)	676.4 (.17) 262.9 (.072)	P. Rh-105 318.9
677.6	Ag-110m	250d	657.7 (.95)	884.7 (.73) 1384.3 (.24) 706.7 (.17) 677.6 (.11)	937.5 (.34) 763.9 (.22) 1505.0 (.13) 818.0 (.073)	
685.8	W-187	23.8h	685.8 (.29)	479.5 (.23) 134.2 (.095) 551.5 (.054)	72.1 (.12) 618.4 (.067) 772.9 (.044)	
692.8	Sb-122	2.70d	564.0 (.71)	692.8 (.037) 1140.2 (.008)	1256.9 (.008)	
696.5	Pr-144	17.3m	696.5 (.015)	2185.7 (.008)		D. Ce-144 133.5
698.3	Br-82	35.3h	776.5 (.83)	554.3 (.71) 698.3 (.28) 1044.0 (.27) 1474.8 (.17)	619.1 (.43) 1317.5 (.27) 827.8 (.24)	
702.6	Nb-94	2.0E4y	871.1 (1.00)	702.6 (1.00)		
703.1	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
706.7	Ag-110m	250d	657.7 (.95)	884.7 (.73) 1384.3 (.24) 706.7 (.17) 677.6 (.11)	937.5 (.34) 763.9 (.22) 1505.0 (.13) 818.0 (.073)	
715.3	Dy-165	2.33h	94.7 (.036)	361.7 (.008) 715.3 (.005)	633.4 (.006)	
717.8	Pm-151	28.4h	340.1 (.23)	167.8 (.088) 717.8 (.041) 177.2 (.039)	275.2 (.072) 445.7 (.041)	D. Nd-151 116.8

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
722.0	Ce-143	33.0h	293.2 (.42)	57.4 (.12) 722.0 (.051)	664.6 (.052)	
722.8	Sb-124	60.2d	602.7 (.98)	1691.0 (.49) 645.9 (.073) 1368.2 (.025)	722.8 (.11) 2091.0 (.057)	
722.9	Ag-108m	127y	722.9 (.91)	614.4 (.91) 79.2 (.071)	433.9 (.90)	
722.9	I-131	8.04d	364.5 (.81)	637.0 (.073) 722.9 (.018)	284.3 (.06)	D. Te-131m 773.7
723.3	Eu-154	8.6y	123.1 (.40)	1274.5 (.36) 1004.8 (.18) 966.3 (.11)	723.3 (.19) 873.2 (.12) 247.9 (.066)	
724.2	Zr-95	64.0d	756.7 (.55)	724.2 (.44)		P. Nb-95 765.8
724.5	Ru-105	4.43h	724.5 (.49)	469.4 (.18) 316.5 (.12)	676.4 (.17) 262.9 (.072)	P. Rh-105 318.9
725.2	In-114m	49.5d	190.3 (.16)	725.2 (.045)	558.4 (.045)	
727.0	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
727.2	Bi-212	60.6m	727.2 (.12)	1620.6 (.028) 1078.6 (.010) 1512.8 (.006)	785.5 (.020) 893.4 (.007) 39.9 (.010)	Thorium Series Page 257
739.5	I-130	12.4h	536.1 (.99)	668.5 (.96) 418.0 (.34)	739.5 (.82) 1157.5 (.11)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
739.5	Mo-99	66.0h	739.5 (.13)	181.1 (.062) 140.5 (.038)	778.0 (.045) 366.4 (.014)	P. Tc-99m 140.5
743.4	Nb-97m	60.0s	743.4 (.98)			D. Zr-97 507.6
744.2	Mn-52	5.59d	1434.0 (1.00)	935.5 (.94) 1333.6 (.051)	744.2 (.90) 511.0 (.59)	D. Fe-52 168.7
749.8	Sr-91	9.48h	1024.3 (.33)	749.8 (.23)	652.9 (.11)	P. Y-91m 555.6
755.2	Ac-228	6.13h	911.1 (.28)	.969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
756.7	Zr-95	64.0d	756.7 (.55)	724.2 (.44)		P. Nb-95 765.8
756.9	Al-28	2.24m	1778.9 (1.00)	1267.9 (SE)	756.9 (DE)	D. Mg-28 1342.2
763.1	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257
763.9	Ag-110m	250d	657.7 (.95)	884.7 (.73) 1384.3 (.24) 706.7 (.17) 677.6 (.11)	937.5 (.34) 763.9 (.22) 1505.0 (.13) 818.0 (.073)	
765.8	Nb-95	35.1d	765.8 (1.00)			D. Zr-95 756.7

*Multiply each intensity by 0.36 when assaying Th-228.

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
766.4	Pa-234m	1.17m	1001.0 (.006)	766.4 (.002)		Uranium Series Page 261
766.5	Pb-211	36.1m	832.0 (.029)	404.8 (.029) 766.5 (.005)	427.1 (.013)	Actinium Series Page 253
768.4	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
772.2	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
772.6	I-132	2.30h	667.7 (.99)	772.6 (.76) 522.6 (.16) 1398.6 (.071) 671.6 (.052)	954.6 (.18) 630.2 (.14) 812.3 (.056) 505.9 (.05)	
772.9	W-187	23.8h	685.8 (.29)	479.5 (.23) 134.2 (.095) 551.5 (.054)	72.1 (.12) 618.4 (.067) 772.9 (.044)	
773.7 (cont.)	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096)	793.8 (.14) 1206.6 (.098) 102.1 (.079)	P. I-131 364.5

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
773.7 (cont.)	Te-131m	30.0h	773.7	782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
776.5	Br-82	35.3h	776.5 (.83)	554.3 (.71) 698.3 (.28) 1044.0 (.27) 1474.8 (.17)	619.1 (.43) 1317.5 (.27) 827.8 (.24)	
778.0	Mo-99	66.0h	739.5 (.13)	181.1 (.062) 140.5 (.038)	778.0 (.045) 366.4 (.014)	P. Tc-99m 140.5
778.9	Eu-152	13.5y	1408.0 (.21)	121.8 (.28) 964.0 (.15) 778.9 (.13) 244.7 (.075)	344.3 (.27) 1112.0 (.13) 1085.8 (.10)	
782.0	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
782.5	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
785.5	Bi-212	60.6m	727.2 (.12)	1620.6 (.028) 1078.6 (.010) 1512.8 (.006)	785.5 (.020) 893.4 (.007) 39.9 (.010)	Thorium Series Page 257

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
785.9	Pb-214	26.8m	351.9 (.372)	295.2 (.192) 785.9 (.011) 258.8 (.006)	242.0 (.075) 53.2 (.011) 487.1 (.004)	Uranium Series Page 261
793.8	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
794.7	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
795.8	Cs-134	2.06y	604.7 (.976)	795.8 (.854) 801.9 (.087)	569.3 (.154) 563.3 (.084)	
801.9	Cs-134	2.06y	604.7 (.976)	795.8 (.854) 801.9 (.087)	569.3 (.154) 563.3 (.084)	
806.2	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
807.9	Ca-47	4.54d	1297.1 (.75)	807.9 (.069)	489.2 (.067)	P. Sc-47 159.4

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
810.8	Co-58	70.8d	810.8 (.99)	511.0 (.30)		
812.3	I-132	2.30h	667.7 (.99)	772.6 (.76) 522.6 (.16) 1398.6 (.071) 671.6 (.052)	954.6 (.18) 630.2 (.14) 812.3 (.056) 505.9 (.05)	
814.0	Y-88	106.6d	1836.0 (.99)	898.0 (.93) 1325.0 (SE)	2734.0 (.006) 814.0 (DE)	
815.8	La-140	40.2h	1596.1 (.96)	487.0 (.45) 328.8 (.21) 867.8 (.056)	815.8 (.23) 925.2 (.071)	D. Ba-140 537.3
818.0	Ag-110m	250d	657.7 (.95)	884.7 (.73) 1384.3 (.24) 706.7 (.17) 677.6 (.11)	937.5 (.34) 763.9 (.22) 1505.0 (.13) 818.0 (.073)	
818.7	In-116m	54.2m	1097.3 (.56)	1293.5 (.84) 2122.3 (.16) 1507.6 (.10)	417.0 (.28) 818.7 (.12)	
822.6	Sn-125	9.64d	1066.6 (.085)	1088.9 (.04) 822.6 (.038) 469.9 (.013)	915.7 (.038) 2002.0 (.021)	P. Sb-125 427.9
822.8	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
827.8	Br-82	35.3h	776.5 (.83)	554.3 (.71) 698.3 (.28) 1044.0 (.27) 1474.8 (.17)	619.1 (.43) 1317.5 (.27) 827.8 (.24)	
830.5	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010)	Thorium Series Page 257

(cont.)

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
830.5 (cont.)	Ac-228	6.13h	911.1 (.28)	1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	Thorium
				830.5 (.006)	1246.4 (.005)	Series
				1638.0 (.005)	782.0 (.005)	Page 257
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
832.0	Pb-211	36.1m	832.0 (.029)	404.8 (.029)	427.1 (.013)	Actinium
				766.5 (.005)		Series
						Page 253
834.0	Ga-72	14.1h	834.0 (.96)	2201.7 (.26)	629.9 (.25)	
				2507.8 (.13)	894.2 (.099)	
				2490.9 (.075)	1050.7 (.069)	
				600.9 (.056)	1861.0 (.052)	
				1596.7 (.042)	1464.0 (.036)	
834.7	Kr-88	2.84h	2392.0 (.35)	196.1 (.26)	2195.9 (.13)	
				834.7 (.13)	1529.8 (.11)	
834.8	Mn-54	313d	834.8 (1.00)			
835.5	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium
				964.6 (.052)	794.7 (.046)	Series
				463.0 (.045)	209.3 (.044)	Page 257
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
840.0	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium
				964.6 (.052)	794.7 (.046)	Series
				463.0 (.045)	209.3 (.044)	Page 257
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
(cont.)				755.2 (.010)	1459.3 (.010)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
840.0 (cont.)	Ac-228	6.13h	911.1 (.28)	1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
841.6	Eu-152m	9.32h	841.6 (.13)	963.3 (.12) 344.3 (.025) 1389.0 (.009)	121.8 (.074) 1314.7 (.01)	
843.8	Mg-27	9.46m	843.8 (.72)	1014.4 (.28)	170.7 (.008)	
846.8	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
846.8	Mn-56	2.58h	846.8 (.99)	1810.7 (.27)	2113.0 (.14)	
852.2	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
857.6	Na-24	15.0h	2754.0 (1.00)	1368.6 (1.00) 1732.0 (DE) 346.6 (DE)	2243.0 (SE) 857.6 (SE)	
860.4	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257
867.8	La-140	40.2h	1596.1 (.96)	487.0 (.45) 328.8 (.21) 867.8 (.056)	815.8 (.23) 925.2 (.071)	D. Ba-140 537.3
871.1	Nb-94	2.0E4y	871.1 (1.00)	702.6 (1.00)		

Multiply each intensity by 0.36 when assaying Th-228.

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
873.2	Eu-154	8.6y	123.1 (.40)	1274.5 (.36) 1004.8 (.18) 966.3 (.11)	723.3 (.19) 873.2 (.12) 247.9 (.066)	
879.4	Tb-160	72.3d	879.4 (.29)	298.6 (.27) 1177.9 (.15) 962.3 (.09) 197.0 (.049)	966.1 (.25) 86.8 (.14) 1271.9 (.07)	
884.7	Ag-110m	250d	657.7 (.95)	884.7 (.73) 1384.3 (.24) 706.7 (.17) 677.6 (.11)	937.5 (.34) 763.9 (.22) 1505.0 (.13) 818.0 (.073)	
889.3	Sc-46	83.8d	889.3 (1.00)	1120.5 (1.00)		
893.4	Bi-212	60.6m	727.2 (.12)	1620.6 (.028) 1078.6 (.010) 1512.8 (.006)	785.5 (.020) 893.4 (.007) 39.9 (.010)	Thorium Series Page 257
894.2	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	
898.0	Rb-88	17.8m	1836.0 (.22)	898.0 (.14)	2677.9 (.02)	
898.0	Y-88	106.6d	1836.0 (.99)	898.0 (.93) 1325.0 (SE)	2734.0 (.006) 814.0 (DE)	
904.5	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
911.1	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium Series Page 257
				964.6 (.052)	794.7 (.046)	
				463.0 (.045)	209.3 (.044)	
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
915.7	Sn-125	9.64d	1066.6 (.085)	1088.9 (.04)	915.7 (.038)	P. Sb-125 427.9
				822.6 (.038)	2002.0 (.021)	
				469.9 (.013)		
925.2	La-140	40.2h	1596.1 (.96)	487.0 (.45)	815.8 (.23)	D. Ba-140 537.3
				328.8 (.21)	925.2 (.071)	
				867.8 (.056)		
928.6	Ti-51	5.75m	320.1 (.93)	928.6 (.069)	608.6 (.011)	
934.1	Bi-214	19.9m	609.3 (.463)	1764.5 (.158)	1120.3 (.15)	Uranium Series Page 261
				1238.1 (.059)	768.4 (.05)	
				2204.2 (.05)	1377.7 (.041)	
				934.1 (.032)	1729.6 (.03)	
				1408.0 (.025)	1509.2 (.022)	
				1847.4 (.021)	1155.2 (.017)	
				665.5 (.016)	2447.9 (.016)	
				1281.0 (.015)	1401.5 (.014)	
				806.2 (.012)	1661.3 (.012)	
				2118.6 (.012)	1385.3 (.008)	
				1583.2 (.007)	703.1 (.005)	
				1207.7 (.005)		
934.4	Y-92	3.54h	934.4 (.14)	561.1 (.024)	448.5 (.023)	
				1405.4 (.048)	844.3 (.013)	
935.5	Mn-52	5.59d	1434.0 (1.00)	935.5 (.94)	744.2 (.90)	D. Fe-52 168.7
				1333.6 (.051)	511.0 (.59)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
937.5	Ag-110m	250d	657.7 (.95)	884.7 (.73) 1384.3 (.24) 706.7 (.17) 677.6 (.11)	937.5 (.34) 763.9 (.22) 1505.0 (.13) 818.0 (.073)	
941.5	Mg-28	20.9h	1342.2 (.526)	30.6 (.66) 400.7 (.366)	941.5 (.38) 1372.9 (.047)	P. Al-28 1778.9
944.1	V-48	16.0d	983.5 (1.00)	1312.1 (.98) 511.0 (1.00)	944.1 (.078)	
953.3	Sr-92	2.71h	1384.0 (.90)	953.3 (.036)	241.5 (.03)	
954.6	I-132	2.30h	667.7 (.99)	772.6 (.76) 522.6 (.16) 1398.6 (.071) 671.6 (.052)	954.6 (.18) 630.2 (.14) 812.3 (.056) 505.9 (.05)	
962.3	Tb-160	72.3d	879.4 (.29)	298.6 (.27) 1177.9 (.15) 962.3 (.09) 197.0 (.049)	966.1 (.25) 86.8 (.14) 1271.9 (.07)	
963.3	Eu-152m	9.32h	841.6 (.13)	963.3 (.12) 344.3 (.025) 1389.0 (.009)	121.8 (.074) 1314.7 (.01)	
964.0	Eu-152	13.5y	1408.0 (.21)	121.8 (.28) 964.0 (.15) 778.9 (.13) 244.7 (.075)	344.3 (.27) 1112.0 (.13) 1085.8 (.10)	
964.6	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
966.1	Tb-160	72.3d	879.4 (.29)	298.6 (.27) 1177.9 (.15) 962.3 (.09) 197.0 (.049)	966.1 (.25) 86.8 (.14) 1271.9 (.07)	
969.1	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
969.4	I-128	25.0m	442.9 (.14)	526.6 (.014)	969.4 (.004)	
977.4	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
983.5	Sc-48	43.7h	1312.1 (1.00)	983.5 (1.00) 175.4 (.075)	1037.5 (.98)	
983.5	V-48	16.0d	983.5 (1.00)	1312.1 (.98) 511.0 (1.00)	944.1 (.078)	
996.3	Eu-154	8.6y	123.1 (.40)	1274.5 (.36) 1004.8 (.18) 966.3 (.11)	723.3 (.19) 873.2 (.12) 247.9 (.066)	
997.3	Te-131	25.0m	149.7 (.68)	452.3 (.18) 492.7 (.048) 997.3 (.034)	1147.0 (.05) 602.0 (.042)	P. I-131 364.5
1001.0	Pa-234m	1.17m	1001.0 (.006)	766.4 (.002)		Uranium Series Page 261

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1004.8	Eu-154	8.6y	123.1 (.40)	1274.5 (.36) 1004.8 (.18) 966.3 (.11)	723.3 (.19) 873.2 (.12) 247.9 (.066)	
1009.7	Cs-138	32.2m	1435.8 (.76)	462.8 (.31) 2218.0 (.15) 2639.6 (.076)	1009.7 (.30) 546.8 (.10)	
1012.5	Mo-101	14.6m	191.9 (.19)	590.8 (.17) 505.9 (.12)	1012.5 (.13) 2032.0 (.071)	P. Tc-101 306.8
1014.4	Mg-27	9.46m	843.8 (.72)	1014.4 (.28)	170.7 (.008)	
1024.3	Sr-91	9.48h	1024.3 (.33)	749.8 (.23)	652.9 (.11)	P. Y-91m 555.6
1024.5	Nb-97	72.1m	657.9 (.98)	1024.5 (.011)		D. Nb-97m 743.4
1037.5	Sc-48	43.7h	1312.1 (1.00)	983.5 (1.00) 175.4 (.075)	1037.5 (.98)	
1037.9	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
1038.7	I-135	6.61h	1260.4 (.29)	1131.6 (.18)	1038.7 (.079)	P. Xe-135 249.8 P. Xe-135m 526.6
1039.2	Cu-66	5.10m	1039.2 (.090)			
1044.0	Br-82	35.3h	776.5 (.83)	554.3 (.71) 698.3 (.28) 1044.0 (.27) 1474.8 (.17)	619.1 (.43) 1317.5 (.27) 827.8 (.24)	
1050.7	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1063.6	Bi-207	33.4y	569.7 (.98)	1063.6 (.75)	1770.2 (.068)	
1066.6	Sn-125	9.64d	1066.6 (.085)	1088.9 (.04) 822.6 (.038) 469.9 (.013)	915.7 (.038) 2002.0 (.021)	P. Sb-125 427.9
1076.6	Rb-86	18.7d	1076.6 (.088)			
1077.4	Ga-68	68.0m	1077.4 (.033)	1883.1 (.001)	511.0 (1.78)	
1078.6	Bi-212	60.6m	727.2 (.12) 257	1620.6 (.028) 1078.6 (.010) 1512.8 (.006)	785.5 (.020) 893.4 (.007) 39.9 (.010)	Thorium Series Page 257
1083.8	Te-129	69.6m	459.6 (.071)	487.4 (.013) 278.4 (.005)	1083.8 (.005) 250.6 (.004)	P. I-129 39.6
1085.2	Ge-77	11.3h	264.4 (.54)	211.0 (.31) 416.3 (.22) 367.4 (.14) 1085.2 (.06)	215.5 (.29) 558.0 (.16) 631.8 (.069)	P. As-77 239.0
1085.8	Eu-152	13.5y	1408.0 (.21)	121.8 (.28) 964.0 (.15) 778.9 (.13) 244.7 (.075)	344.3 (.27) 1112.0 (.13) 1085.8 (.10)	
1088.9	Sn-125	9.64d	1066.6 (.085)	1088.9 (.04) 822.6 (.038) 469.9 (.013)	915.7 (.038) 2002.0 (.021)	P. Sb-125 427.9
1093.9	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257
1097.3	In-116m	54.2m	1097.3 (.56)	1293.5 (.84) 2122.3 (.16) 1507.6 (.10)	417.0 (.28) 818.7 (.12)	
1099.2	Fe-59	44.6d	1099.2 (.56)	1291.6 (.43)	192.3 (.031)	
1110.4 (cont.)	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045)	338.3 (.11) 794.7 (.046) 209.3 (.044)	Thorium Series Page 257

*Multiply each intensity by 0.36 when assaying Th-228.5

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1110.4 (cont.)	Ac-228	6.13h	911.1 (.28)	270.2 (.036)	1588.0 (.035)	Thorium Series Page 257
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
1112.0	Eu-152	13.5y	1408.0 (.21)	121.8 (.28)	344.3 (.27)	
				964.0 (.15)	1112.0 (.13)	
				778.9 (.13)	1085.8 (.10)	
				244.7 (.075)		
1115.5	Zn-65	244d	1115.5 (.508)	511.0 (.028)		
1115.5	Ni-65	2.52h	1481.8 (.24)	1115.5 (.15)	366.3 (.05)	
1120.3	Bi-214	19.9m	609.3 (.463)	1764.5 (.158)	1120.3 (.15)	Uranium Series Page 261
				1238.1 (.059)	768.4 (.05)	
				2204.2 (.05)	1377.7 (.041)	
				934.1 (.032)	1729.6 (.03)	
				1408.0 (.025)	1509.2 (.022)	
				1847.4 (.021)	1155.2 (.017)	
				665.5 (.016)	2447.9 (.016)	
				1281.0 (.015)	1401.5 (.014)	
				806.2 (.012)	1661.3 (.012)	
				2118.6 (.012)	1385.3 (.008)	
				1583.2 (.007)	703.1 (.005)	
				1207.7 (.005)		
1120.5	Sc-46	83.8d	889.3 (1.00)	1120.5 (1.00)		
1121.3	Ta-182	115d	1221.4 (.27)	67.8 (.42)	1121.3 (.35)	
				1189.1 (.16)	100.1 (.14)	
				1230.9 (.12)	222.1 (.076)	
1125.5	Te-131m	30.0h	773.7 (.38)	852.2 (.21)	793.8 (.14)	P. I-131 364.5
				1125.5 (.11)	1206.6 (.098)	
				334.3 (.096)	102.1 (.079)	
				782.5 (.078)	240.9 (.076)	
(cont.)				200.7 (.076)	882.8 (.061)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1125.5 (cont.)	Te-131m	30.0h	773.7 (.38)	149.7 (.051) 452.3 (.015)	665.1 (.044)	P. I-131 364.5
1129.6	Al-26	7.4E5y	1808.7 (1.00)	1129.6 (.025)	511.0 (1.63)	
1131.6	I-135	6.61h	1260.4 (.29)	1131.6 (.18)	1038.7 (.079)	P. Xe-135 249.8 P. Xe-135m 526.6
1140.2	Sb-122	2.70d	564.0 (.71)	692.8 (.037) 1140.2 (.008)	1256.9 (.008)	
1147.0	Te-131	25.0m	149.7 (.68)	452.3 (.18) 492.7 (.048) 997.3 (.034)	1147.0 (.05) 602.0 (.042)	P. I-131 364.5
1148.0	Zr-97	16.9h	507.6 (.053)	1148.0 (.026) 1750.5 (.014)	355.4 (.023) 1362.7 (.014)	P. Nb-97m 743.4
1155.2	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1157.0	Sc-44	3.93h	1157.0 (1.00)	1499.4 (.009)	511.0 (1.89)	D. Ti-44 78.3
1157.5	I-130	12.4h	536.1 (.99)	668.5 (.96) 418.0 (.34)	739.5 (.82) 1157.5 (.11)	
1173.2	Co-60	5.27y	1332.5 (1.00)	1173.2 (1.00)		
1175.1	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1177.9	Tb-160	72.3d	879.4 (.29)	298.6 (.27) 1177.9 (.15) 962.3 (.09) 197.0 (.049)	966.1 (.25) 86.8 (.14) 1271.9 (.07)	
1180.9	Nd-151	12.4m	116.8 (.60)	255.7 (.26) 175.1 (.11)	1180.9 (.17) 139.0 (.11)	
1189.1	Ta-182	115d	1221.4 (.27)	67.8 (.42) 1189.1 (.16) 1230.9 (.12)	1121.3 (.35) 100.1 (.14) 222.1 (.076)	
1206.6	Te-131m	30.0h	773.7 (.38)	852.2 (.21) 1125.5 (.11) 334.3 (.096) 782.5 (.078) 200.7 (.076) 149.7 (.051) 452.3 (.015)	793.8 (.14) 1206.6 (.098) 102.1 (.079) 240.9 (.076) 882.8 (.061) 665.1 (.044)	P. I-131 364.5
1207.7	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1216.0	As-76	26.3h	559.1 (.45)	657.0 (.061)	1216.0 (.038)	
1221.4	Ta-182	115d	1221.4 (.27)	67.8 (.42) 1189.1 (.16) 1230.9 (.12)	1121.3 (.35) 100.1 (.14) 222.1 (.076)	
1230.9	Ta-182	115d	1221.4 (.27)	67.8 (.42) 1189.1 (.16) 1230.9 (.12)	1121.3 (.35) 100.1 (.14) 222.1 (.076)	
1238.1	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017)	Uranium Series Page 261

(cont.)

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1238.1 (cont.)	Bi-214	19.9m	609.3 (.463)	665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1238.3	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
1246.4	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
1256.9	Sb-122	2.70d	564.0 (.71)	692.8 (.037) 1140.2 (.008)	1256.9 (.008)	
1260.4	I-135	6.61h	1260.4 (.29)	1131.6 (.18)	1038.7 (.079)	P. Xe-135 249.8 P. Xe-135m 526.6
1267.9	Al-28	2.24m	1778.9 (1.00)	1267.9 (SE)	756.9 (DE)	D. Mg-28 1342.2
1271.9	Tb-160	72.3d	879.4 (.29)	298.6 (.27) 1177.9 (.15) 962.3 (.09) 197.0 (.049)	966.1 (.25) 86.8 (.14) 1271.9 (.07)	
1274.5	Na-22	2.60y	1274.5 (1.00)	511.0 (1.80)		

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1274.5	Eu-154	8.6y	123.1 (.40)	1274.5 (.36) 1004.8 (.18) 966.3 (.11)	723.3 (.19) 873.2 (.12) 247.9 (.066)	
1281.0	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1291.6	Fe-59	44.6d	1099.2 (.56)	1291.6 (.43)	192.3 (.031)	
1293.5	In-116m	54.2m	1097.3 (.56)	1293.5 (.84) 2122.3 (.16) 1507.6 (.10)	417.0 (.28) 818.7 (.12)	
1293.6	Ar-41	1.83h	1293.6 (.99)			
1297.1	Ca-47	4.54d	1297.1 (.75)	807.9 (.069)	489.2 (.067)	P. Sc-47 159.4
1312.1	Sc-48	43.7h	1312.1 (1.00)	983.5 (1.00) 175.4 (.075)	1037.5 (.98)	
1312.1	V-48	16.0d	983.5 (1.00)	1312.1 (.98) 511.0 (1.00)	944.1 (.078)	
1314.7	Eu-152m	9.32h	841.6 (.13)	963.3 (.12) 344.3 (.025) 1389.0 (.009)	121.8 (.074) 1314.7 (.01)	
1317.5	Br-82	35.3h	776.5 (.83)	554.3 (.71) 698.3 (.28) 1044.0 (.27) 1474.8 (.17)	619.1 (.43) 1317.5 (.27) 827.8 (.24)	
1325.0	Y-88	106.6d	1836.0 (.99)	898.0 (.93) 1325.0 (SE)	2734.0 (.006) 814.0 (DE)	
1332.5	Co-60	5.27y	1332.5 (1.00)	1173.2 (1.00)		

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1333.6	Mn-52	5.59d	1434.0 (1.00)	935.5 (.94) 1333.6 (.051)	744.2 (.90) 511.0 (.59)	D. Fe-52 168.7
1342.2	Mg-28	20.9h	1342.2 (.526)	30.6 (.66) 400.7 (.366)	941.5 (.383) 1372.9 (.047)	P. Al-28 1778.9
1345.8	Cu-64	12.7h	1345.8 (.005)	511.0 (.36)		
1360.2	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
1362.7	Zr-97	16.9h	507.6 (.053)	1148.0 (.026) 1750.5 (.014)	355.4 (.023) 1362.7 (.014)	P. Nb-97m 743.4
1368.2	Sb-124	60.2d	602.7 (.98)	1691.0 (.49) 645.9 (.073) 1368.2 (.025)	722.8 (.11) 2091.0 (.057)	
1368.6	Na-24	15.0h	2754.0 (1.00)	1368.6 (1.00) 1732.0 (DE) 346.6 (DE)	2243.0 (SE) 857.6 (SE)	
1372.9	Mg-28	20.9h	1342.2 (.526)	30.6 (.66) 400.7 (.366)	941.5 (.383) 1372.9 (.047)	P. Al-28 1778.9
1377.7	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1379.4	Ho-166	26.8h	80.6 (.062)	1379.4 (.009)	1581.9 (.002)	
1384.0	Sr-92	2.71h	1384.0 (.90)	953.3 (.036)	241.5 (.03)	
1384.3	Ag-110m	250d	657.7 (.95)	884.7 (.73) 1384.3 (.24) 706.7 (.17) 677.6 (.11)	937.5 (.34) 763.9 (.22) 1505.0 (.13) 818.0 (.073)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1385.3	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1389.0	Eu-152m	9.32h	841.6 (.13)	963.3 (.12) 344.3 (.025) 1389.0 (.009)	121.8 (.074) 1314.7 (.01)	
1398.6	I-132	2.30h	667.7 (.99)	772.6 (.76) 522.6 (.16) 1398.6 (.071) 671.6 (.052)	954.6 (.18) 630.2 (.14) 812.3 (.056) 505.9 (.05)	
1401.5	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1405.4	Y-92	3.54d	934.4 (.14)	1405.4 (.048) 448.5 (.023)	561.1 (.024) 844.3 (.013)	
1408.0	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1408.0	Eu-152	13.5y	1408.0 (.21)	121.8 (.28) 964.0 (.15) 778.9 (.13) 244.7 (.075)	344.3 (.27) 1112.0 (.13) 1085.8 (.10)	
1420.5	Ba-139	83.1m	165.9 (.22)	1420.5 (.003)		
1434.0	V-52	3.75m	1434.0 (1.00)			
1434.0	Mn-52	5.59d	1434.0 (1.00)	935.5 (.94) 1333.6 (.051)	744.2 (.90) 511.0 (.59)	D. Fe-52 168.7
1435.8	Cs-138	32.2m	1435.8 (.76)	462.8 (.31) 2218.0 (.15) 2639.6 (.076)	1009.7 (.30) 546.8 (.10)	
1459.3	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
1460.8	K-40	1.3E9y	1460.8 (.11)			
1464.0	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	
1474.8	Br-82	35.5h	776.5 (.83)	554.3 (.71) 698.3 (.28) 1044.0 (.27) 1474.8 (.17)	619.1 (.43) 1317.5 (.27) 827.8 (.24)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1481.8	Ni-65	2.52h	1481.8 (.24)	1115.5 (.15)	366.3 (.05)	
1495.8	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium Series Page 257
				964.6 (.052)	794.7 (.046)	
				463.0 (.045)	209.3 (.044)	
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
1499.4	Sc-44	3.93h	1157.0 (1.00)	1499.4 (.009)	511.0 (1.89)	D. Ti-44 78.3
1501.5	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium Series Page 257
				964.6 (.052)	794.7 (.046)	
				463.0 (.045)	209.3 (.044)	
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
1505.0	Ag-110m	250d	657.7 (.95)	884.7 (.73)	937.5 (.34)	
				1384.3 (.24)	763.9 (.22)	
				706.7 (.17)	1505.0 (.13)	
				677.6 (.11)	818.0 (.073)	
1507.6	In-116m	54.2m	1097.3 (.56)	1293.5 (.84)	417.0 (.28)	
				2122.3 (.16)	818.7 (.12)	
				1507.6 (.10)		

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1509.2	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1512.8	Bi-212	60.6m	727.2 (.12)	1620.6 (.028) 1078.6 (.010) 1512.8 (.006)	785.5 (.020) 893.4 (.007) 39.9 (.010)	Thorium Series Page 257
1524.7	K-42	12.4h	1524.7 (.18)	312.7 (.003)		
1529.8	Kr-88	2.84h	2392.0 (.35)	196.1 (.26) 834.7 (.13)	2195.9 (.13) 1529.8 (.11)	
1575.8	Pr-142	19.1h	1575.8 (.037)			
1580.2	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
1581.9	Ho-166	26.8h	80.6 (.062)	1379.4 (.009)	1581.9 (.002)	
1583.2 (cont.)	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03)	Uranium Series Page 261

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1583.2 (cont.)	Bi-214	19.9m	609.3 (.463)	1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1588.0	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036) 327.6 (.032) 409.5 (.021) 1630.4 (.019) 772.2 (.016) 755.2 (.010) 1495.8 (.010) 154.2 (.009) 727.0 (.008) 1580.2 (.007) 830.5 (.006) 1638.0 (.005) 509.6 (.005) 93.4 (.035)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035) 129.1 (.028) 90.0 (.021) 835.5 (.018) 99.4 (.013) 1459.3 (.010) 562.3 (.009) 840.0 (.009) 904.5 (.008) 1501.5 (.006) 1246.4 (.005) 782.0 (.005) 57.8 (.005)	Thorium Series Page 257
1592.6	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257
1596.1	La-140	40.2h	1596.1 (.96)	487.0 (.45) 328.8 (.21) 867.8 (.056)	815.8 (.23) 925.2 (.071)	D. Ba-140 537.3
1596.7	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	
1620.6	Bi-212	60.6m	727.2 (.12)	1620.6 (.028) 1078.6 (.010) 1512.8 (.006)	785.5 (.020) 893.4 (.007) 39.9 (.010)	Thorium Series Page 257
1630.4 (cont.)	Ac-228	6.13h	911.1 (.28)	969.1 (.17) 964.6 (.052) 463.0 (.045) 270.2 (.036)	338.3 (.11) 794.7 (.046) 209.3 (.044) 1588.0 (.035)	Thorium Series Page 257

*Multiply each intensity by 0.36 when assaying Th-228.

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1630.4 (cont.)	Ac-228	6.13h	911.1 (.28)	327.6 (.032)	129.1 (.028)	Thorium Series Page 257
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
1633.5	F-20	11.4s	1633.5 (1.00)			
1638.0	Ac-228	6.13h	911.1 (.28)	969.1 (.17)	338.3 (.11)	Thorium Series Page 257
				964.6 (.052)	794.7 (.046)	
				463.0 (.045)	209.3 (.044)	
				270.2 (.036)	1588.0 (.035)	
				327.6 (.032)	129.1 (.028)	
				409.5 (.021)	90.0 (.021)	
				1630.4 (.019)	835.5 (.018)	
				772.2 (.016)	99.4 (.013)	
				755.2 (.010)	1459.3 (.010)	
				1495.8 (.010)	562.3 (.009)	
				154.2 (.009)	840.0 (.009)	
				727.0 (.008)	904.5 (.008)	
				1580.2 (.007)	1501.5 (.006)	
				830.5 (.006)	1246.4 (.005)	
				1638.0 (.005)	782.0 (.005)	
				509.6 (.005)	57.8 (.005)	
				93.4 (.035)		
1642.4	Cl-38	37.2m	2167.5 (.44)	1642.4 (.33)		
1661.3	Bi-214	19.9m	609.3 (.463)	1764.5 (.158)	1120.3 (.15)	Uranium Series Page 261
				1238.1 (.059)	768.4 (.05)	
				2204.2 (.05)	1377.7 (.041)	
				934.1 (.032)	1729.6 (.03)	
				1408.0 (.025)	1509.2 (.022)	
				1847.4 (.021)	1155.2 (.017)	
				665.5 (.016)	2447.9 (.016)	
				1281.0 (.015)	1401.5 (.014)	
				806.2 (.012)	1661.3 (.012)	
				2118.6 (.012)	1385.3 (.008)	
				1583.2 (.007)	703.1 (.005)	
				1207.7 (.005)		

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1691.0	Sb-124	60.2d	602.7 (.98)	1691.0 (.49) 645.9 (.073) 1368.2 (.025)	722.8 (.11) 2091.0 (.057)	
1729.6	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1732.0	Na-24	15.0h	2754.0 (1.00)	1368.6 (1.00) 1732.0 (DE) 346.6 (DE)	2243.0 (SE) 857.6 (SE)	
1750.5	Zr-97	16.9h	507.6 (.053)	1148.0 (.026) 1750.5 (.014)	355.4 (.023) 1362.7 (.014)	P. Nb-97m 743.4
1764.5	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1770.2	Bi-207	33.4y	569.7 (.98)	1063.6 (.75)	1770.2 (.068)	
1771.3	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
1778.9	Al-28	2.24m	1778.9 (1.00)	1267.9 (SE)	756.9 (DE)	D. Mg-28 1342.2

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
1808.7	Al-26	7.4E5y	1808.7 (1.00)	1129.6 (.025)	511.0 (1.63)	
1810.7	Mn-56	2.58h	846.8 (.99)	1810.7 (.27)	2113.0 (.14)	
1836.0	Rb-88	17.8m	1836.0 (.22)	898.0 (.14)	2677.9 (.02)	
1836.0	Y-88	106.6d	1836.0 (.99)	898.0 (.93) 1325.0 (SE)	2734.0 (.006) 814.0 (DE)	
1847.4	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
1861.0	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	
1883.1	Ga-68	68.0m	1077.4 (.033)	511.0 (1.78)	1883.1 (.001)	
2002.0	Sn-125	9.64d	1066.6 (.085)	1088.9 (.04) 822.6 (.038)	915.7 (.038) 2002.0 (.021)	
2015.4	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
2032.0	Mo-101	14.6m	191.9 (.19)	590.8 (.17) 505.9 (.12)	1012.5 (.13) 2032.0 (.071)	P. Tc-101 306.8
2034.8 (cont.)	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078)	

SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
2034.8 (cont.)	Co-56	78.8d	846.8 (1.00)	1360.2 (.043) 1175.1 (.023) 511.0 (.40)	2015.4 (.03) 977.4 (.014)	
2091.0	Sb-124	60.2d	602.7 (.98)	1691.0 (.49) 645.9 (.073) 1368.2 (.025)	722.8 (.11) 2091.0 (.057)	
2103.5	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257
2112.3	In-116m	54.2m	1097.3 (.56)	1293.5 (.84) 2122.3 (.16) 1507.6 (.10)	417.0 (.28) 818.7 (.12)	
2113.0	Mn-56	2.58h	846.8 (.99)	1810.7 (.27)	2113.0 (.14)	
2118.6	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
2167.5	Cl-38	37.2m	2167.5 (.44)	1642.4 (.33)		
2185.7	Pr-144	17.3m	696.5 (.015)	2185.7 (.008)		D. Ce-144 133.5
2195.9	Kr-88	2.84h	2392.0 (.35)	196.1 (.26) 834.7 (.13)	2195.9 (.13) 1529.8 (.11)	
2201.7	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	

*Multiply each intensity by 0.36 when assaying Th-228.

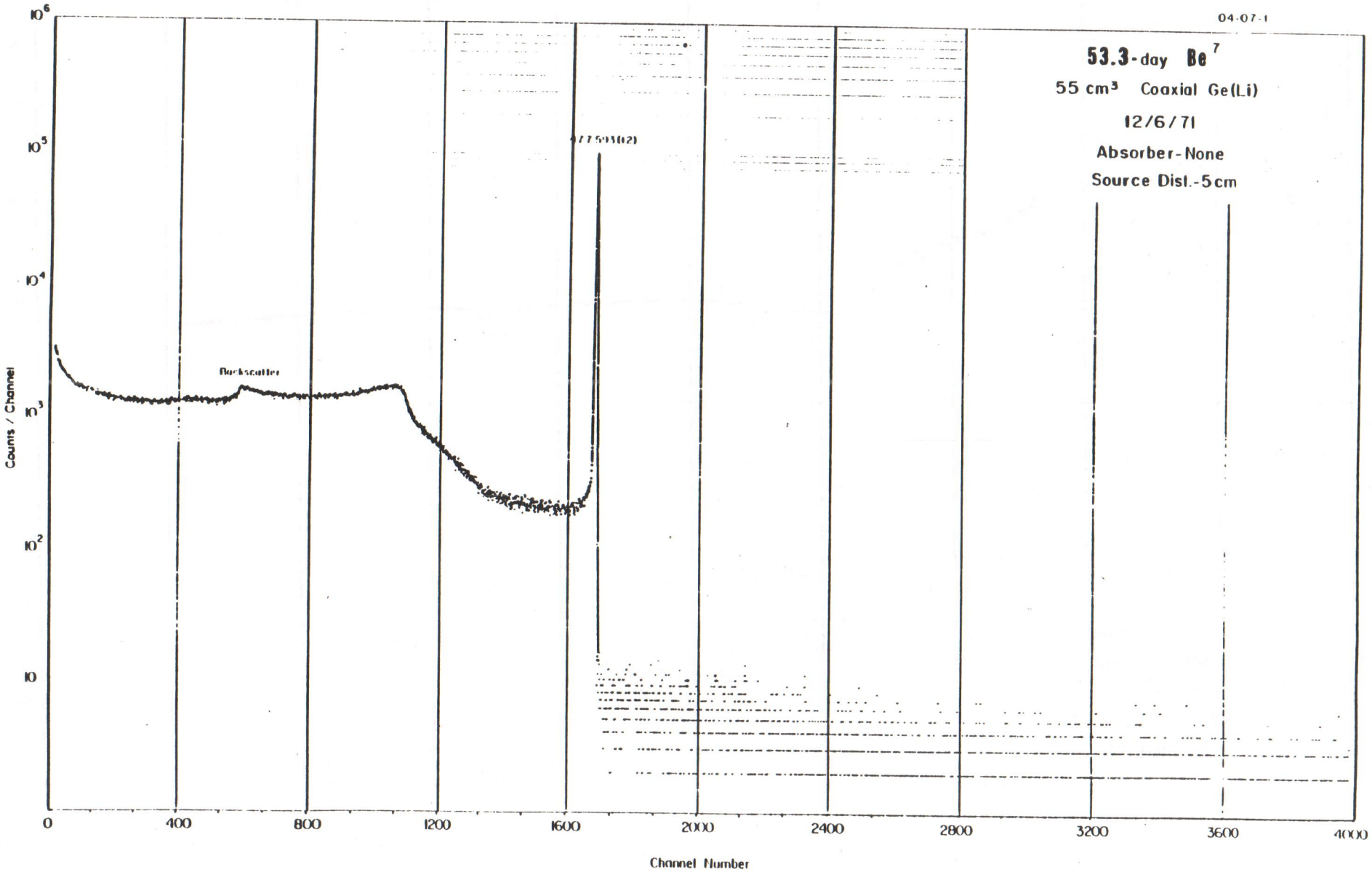
SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
2204.2	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
2218.0	Cs-138	32.2m	1435.8 (.76)	462.8 (.31) 2218.0 (.15) 2639.6 (.076)	1009.7 (.30) 546.8 (.10)	
2243.0	Na-24	15.0h	2754.0 (1.00)	1368.6 (1.00) 1732.0 (DE) 346.6 (DE)	2243.0 (SE) 857.6 (SE)	
2392.0	Kr-88	2.84h	2392.0 (.35)	196.1 (.26) 834.7 (.13)	2195.9 (.13) 1529.8 (.11)	
2447.9	Bi-214	19.9m	609.3 (.463)	1764.5 (.158) 1238.1 (.059) 2204.2 (.05) 934.1 (.032) 1408.0 (.025) 1847.4 (.021) 665.5 (.016) 1281.0 (.015) 806.2 (.012) 2118.6 (.012) 1583.2 (.007) 1207.7 (.005)	1120.3 (.15) 768.4 (.05) 1377.7 (.041) 1729.6 (.03) 1509.2 (.022) 1155.2 (.017) 2447.9 (.016) 1401.5 (.014) 1661.3 (.012) 1385.3 (.008) 703.1 (.005)	Uranium Series Page 261
2490.9	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	
2507.8	Ga-72	14.1h	834.0 (.96)	2201.7 (.26) 2507.8 (.13) 2490.9 (.075) 600.9 (.056) 1596.7 (.042)	629.9 (.25) 894.2 (.099) 1050.7 (.069) 1861.0 (.052) 1464.0 (.036)	

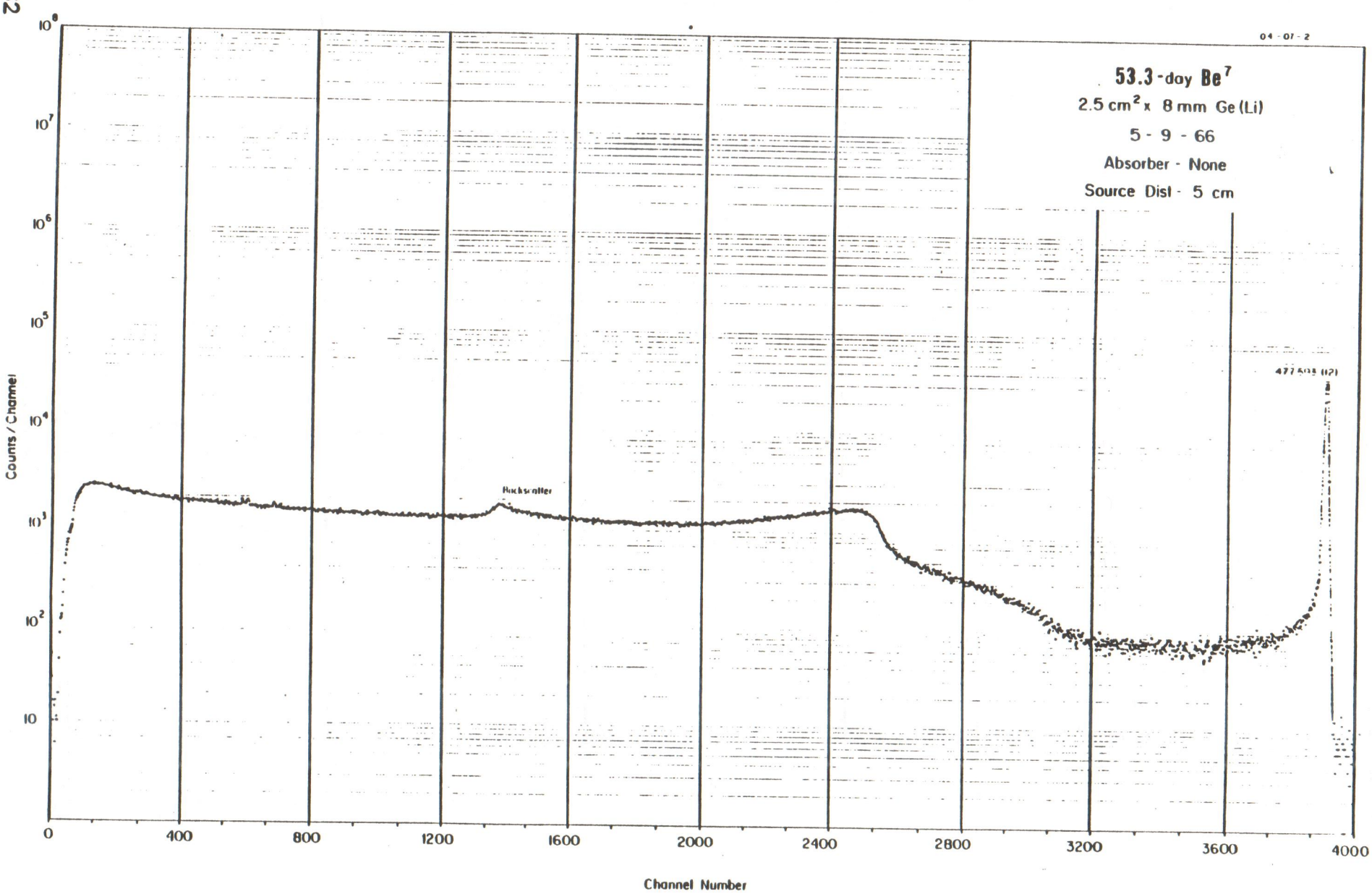
SEARCH	NUCLIDE	HALF-LIFE	KEY GAMMA	ASSOCIATED GAMMAS		P OR D
2598.4	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
2614.7	Tl-208	3.05m	2614.7 (1.00)*	583.1 (.84) 860.4 (.12) 763.1 (.016) 1093.9 (.004) 1592.6 (DE)	510.8 (.22) 277.4 (.068) 252.6 (.008) 2103.5 (SE)	Thorium Series Page 257
2639.6	Cs-138	32.2m	1435.8 (.76)	462.8 (.31) 2218.0 (.15) 2639.6 (.076)	1009.7 (.30) 546.8 (.10)	
2677.9	Rb-88	17.8m	1836.0 (.22)	898.0 (.14)	2677.9 (.02)	
2734.0	Y-88	106.6d	1836.0 (.99)	898.0 (.93) 1325.0 (SE)	2734.0 (.006) 814.0 (DE)	
2754.0	Na-24	15.0h	2754.0 (.999)	1368.6 (1.00) 1732.0 (DE) 346.6 (DE)	2243.0 (SE) 857.6 (SE)	
3084.4	Ca-49	8.72m	3084.4 (.92)	4071.9 (.07)		
3103.8	S-37	5.06m	3103.8 (1.00)			
3253.4	Co-56	78.8d	846.8 (1.00)	2034.8 (.78) 2598.4 (.169) 1037.9 (.14) 1360.2 (.043) 1175.1 (.023) 511.0 (.40)	1238.3 (.67) 1771.3 (.155) 3253.4 (.078) 2015.4 (.03) 977.4 (.014)	
4071.9	Ca-49	8.72m	3084.4 (.92)	4071.9 (.07)		
6129.2	N-16	7.10s	6129.2 (.69)	7115.2 (.05)		
7115.2	N-16	7.10s	6129.2 (.69)	7115.2 (.05)		

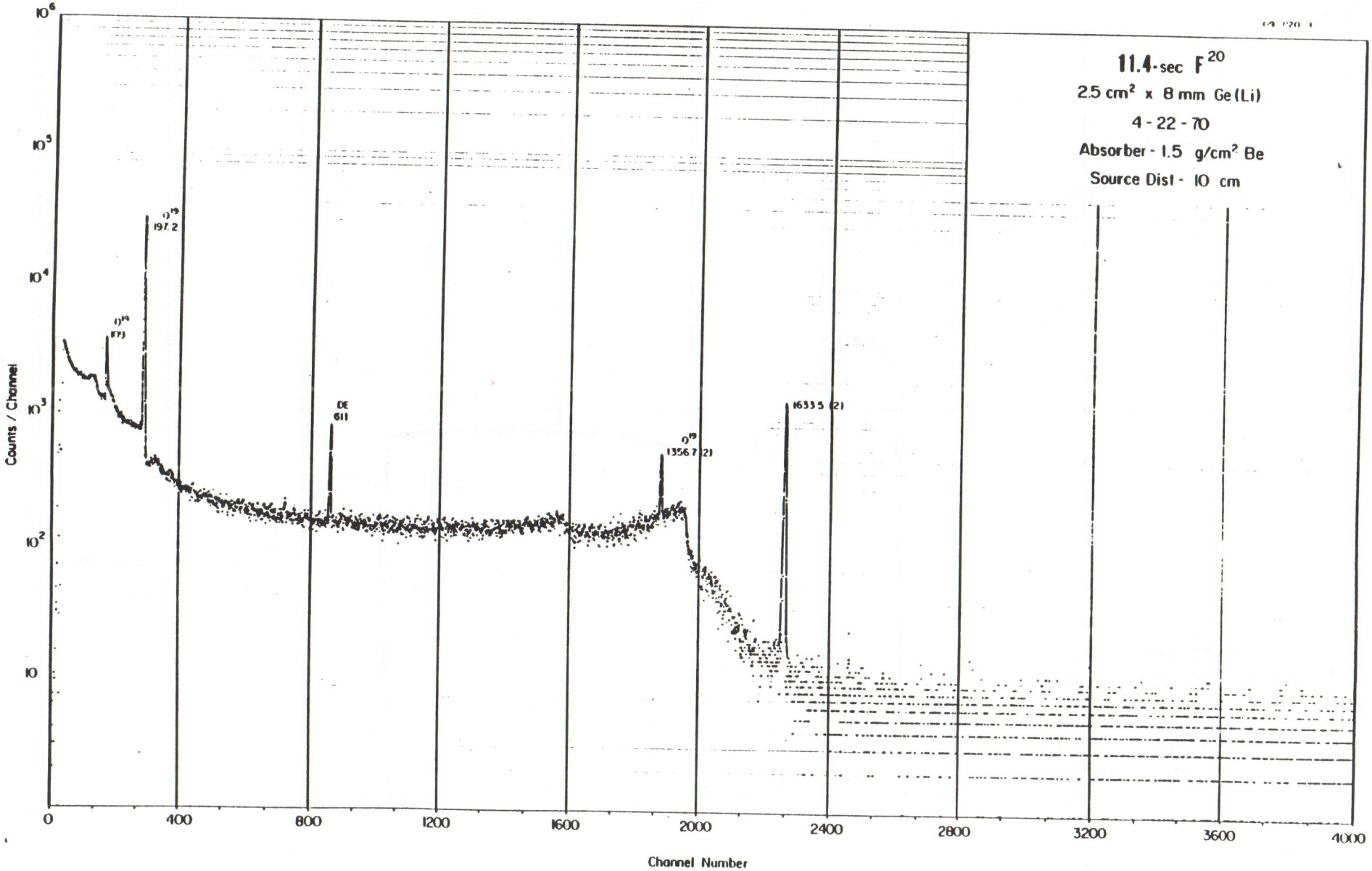
*Multiply each intensity by 0.36 when assaying Th-228.

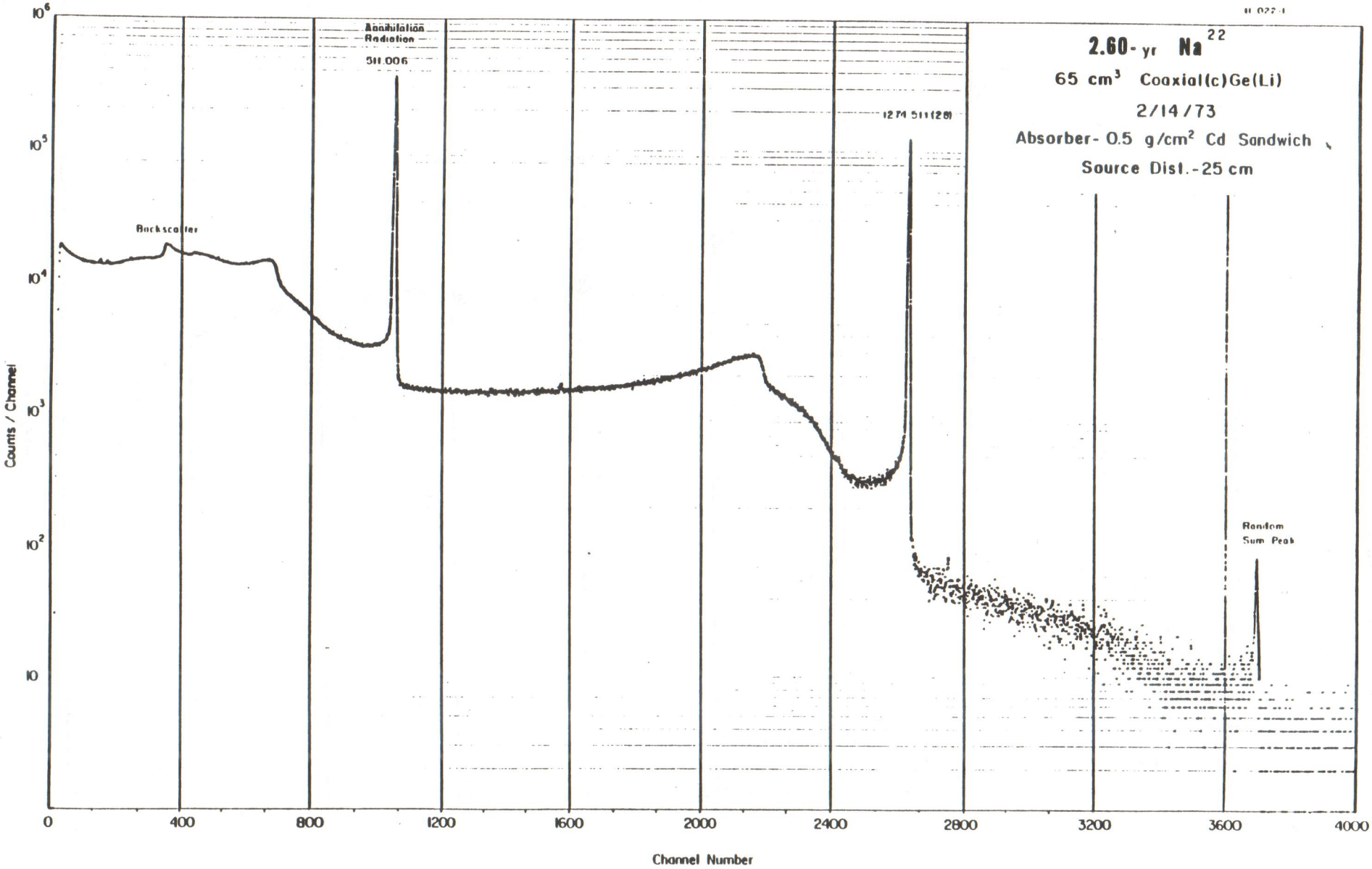
III. Ge(Li) AND Si(Li) SPECTRA

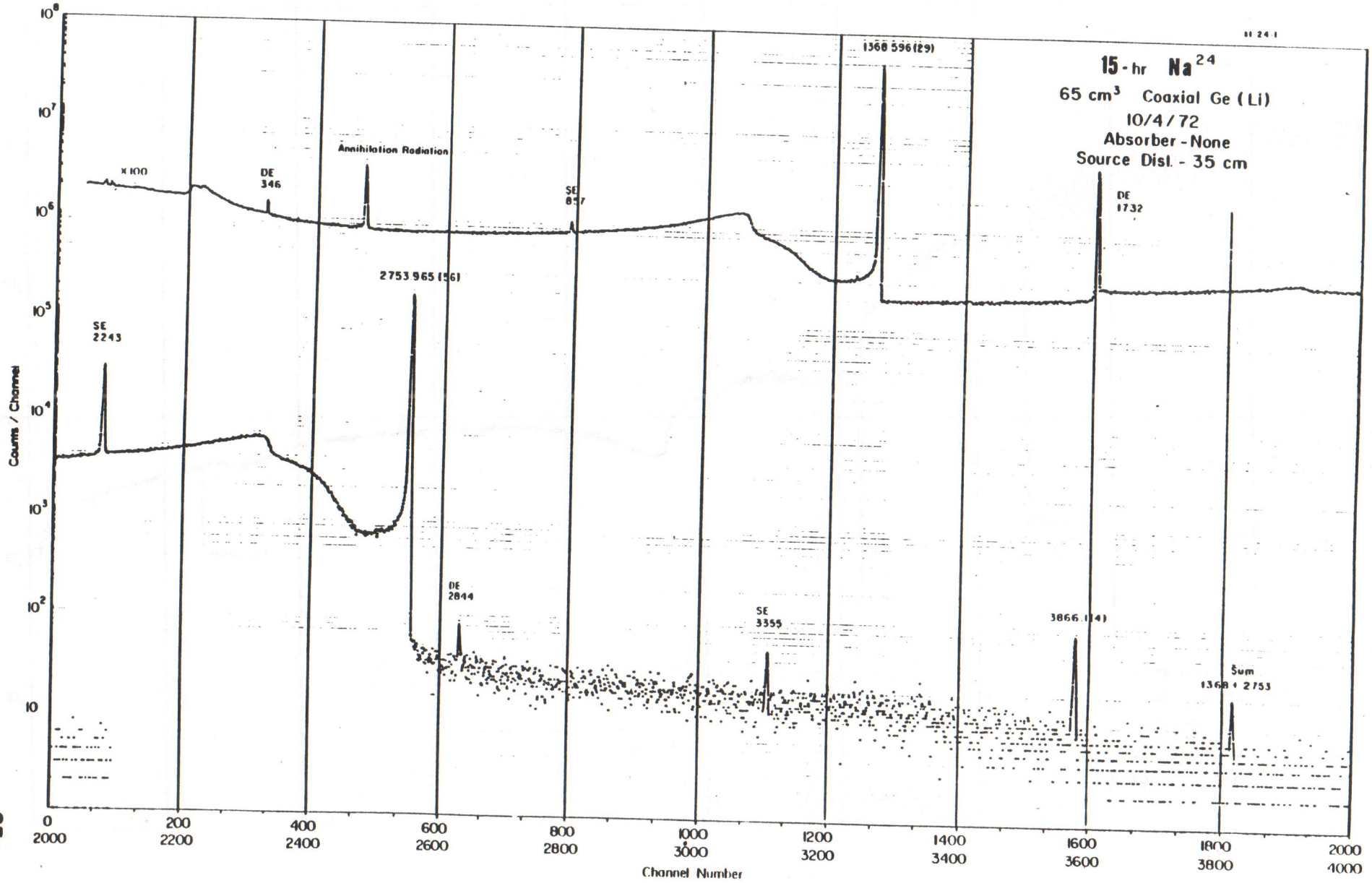
Selected examples of spectra available from Gamma-Ray Spectrum Catalogue, Ge(Li) and Si(Li) Spectrometry, Third Edition, Volume 2 of 2, by R. L. Heath, in order by atomic number.

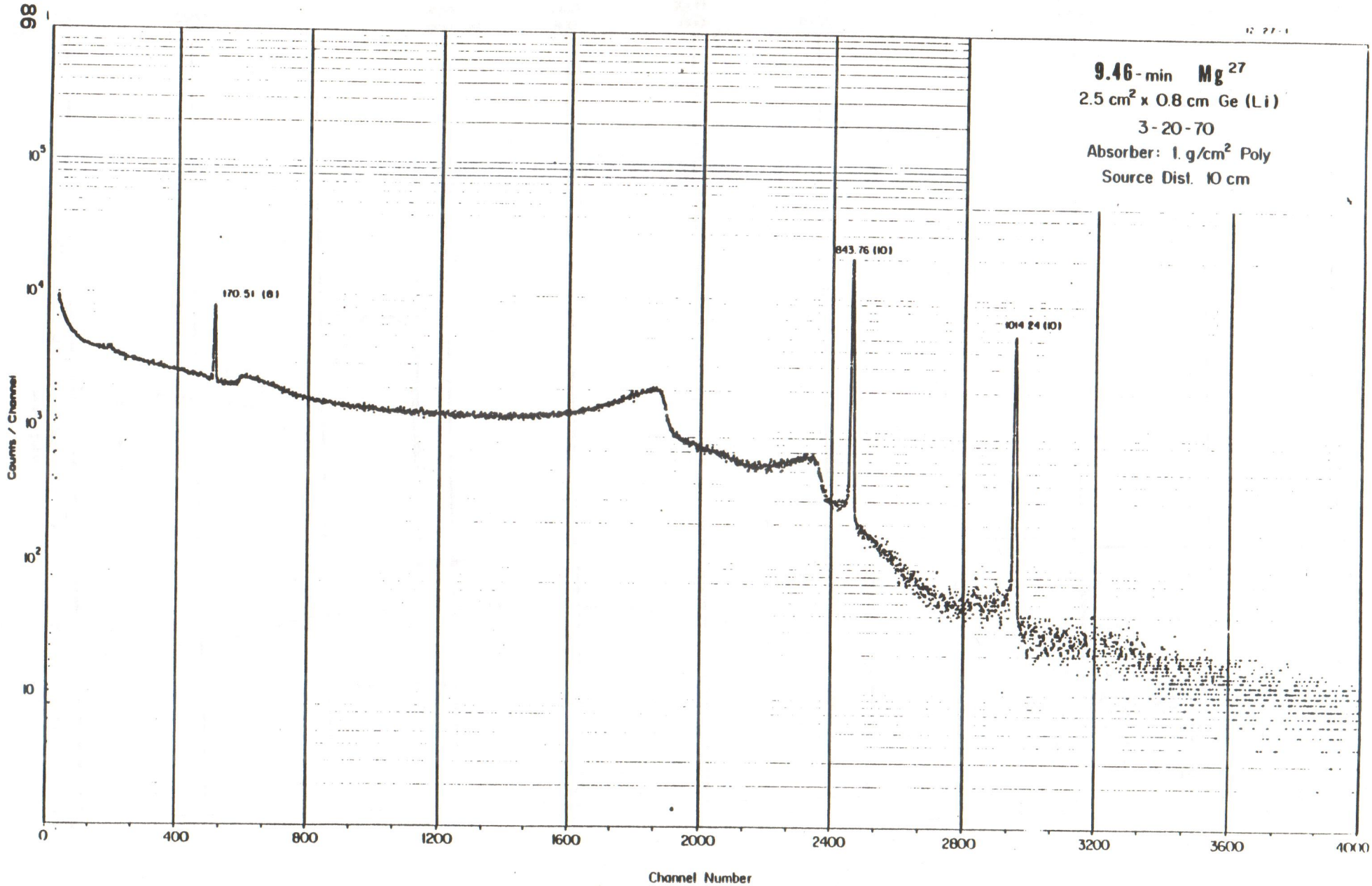

04-07-1
53.3-day Be7
55 cm3 Coaxial Ge(Li)
12/6/71
Absorber-None
Source Dist.-5cm
Backscatter
477.593(12)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

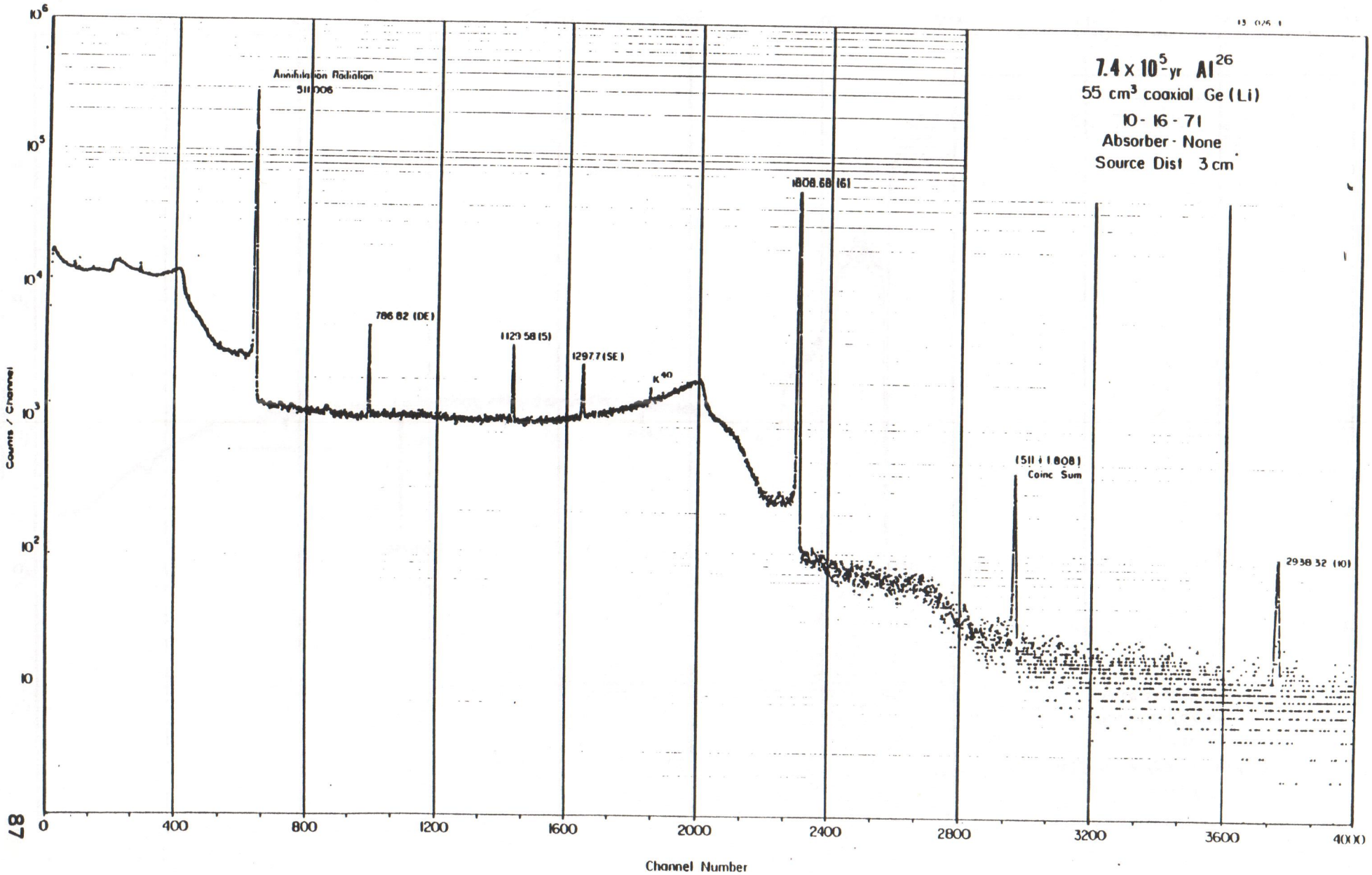

04 - 07 - 2
53.3 -day Be7
2.5 cm2 x 8 mm Ge (Li)
5 - 9 - 66
Absorber - None
Source Dist - 5 cm
Backscatter
477.605 (12)
Counts / Channel
10
10^2
10^3
10^4
10^5
10^6
10^7
10^8
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Channel Number

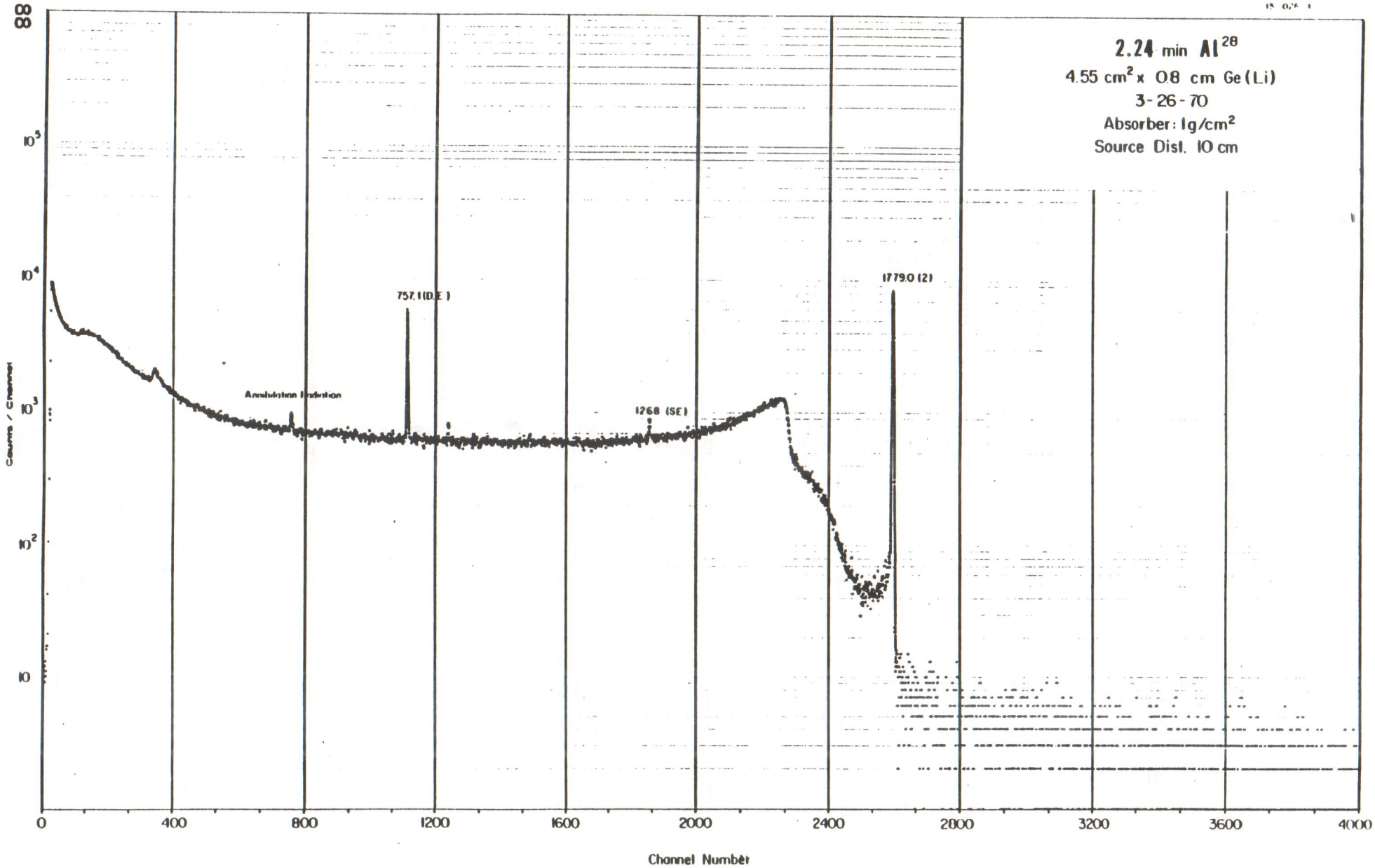

11.4-sec F20
2.5 cm2 x 8 mm Ge(Li)
4 - 22 - 70
Absorber - 1.5 g/cm2 Be
Source Dist - 10 cm
197.2
DE
611
1356.7 (2)
1633.5 (2)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

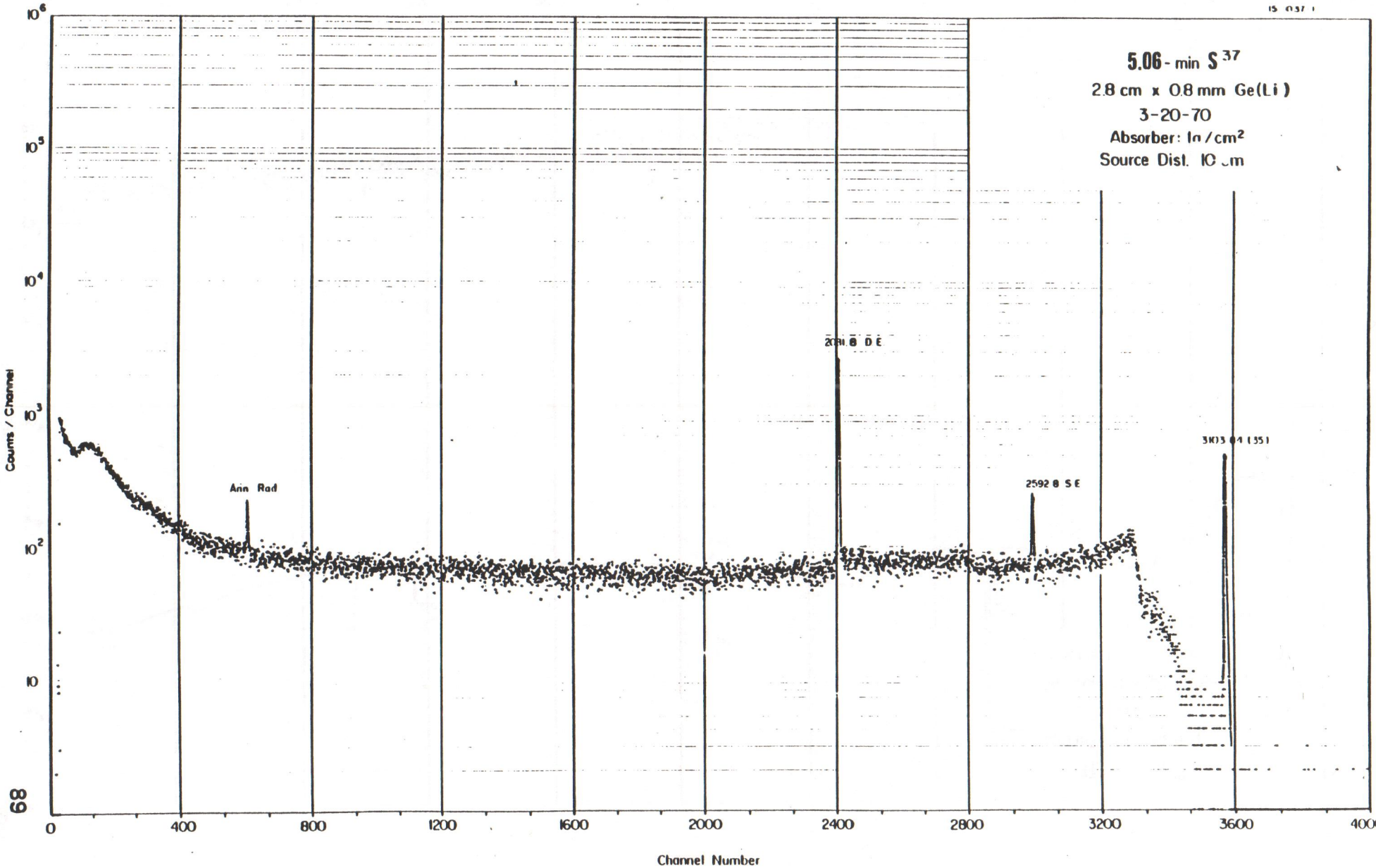

2.60-yr Na22
65 cm3 Coaxial(c)Ge(Li)
2/14/73
Absorber- 0.5 g/cm2 Cd Sandwich
Source Dist.-25 cm
Annihilation Radiation
511.006
1274.511(28)
Backscatter
Random Sum Peak
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

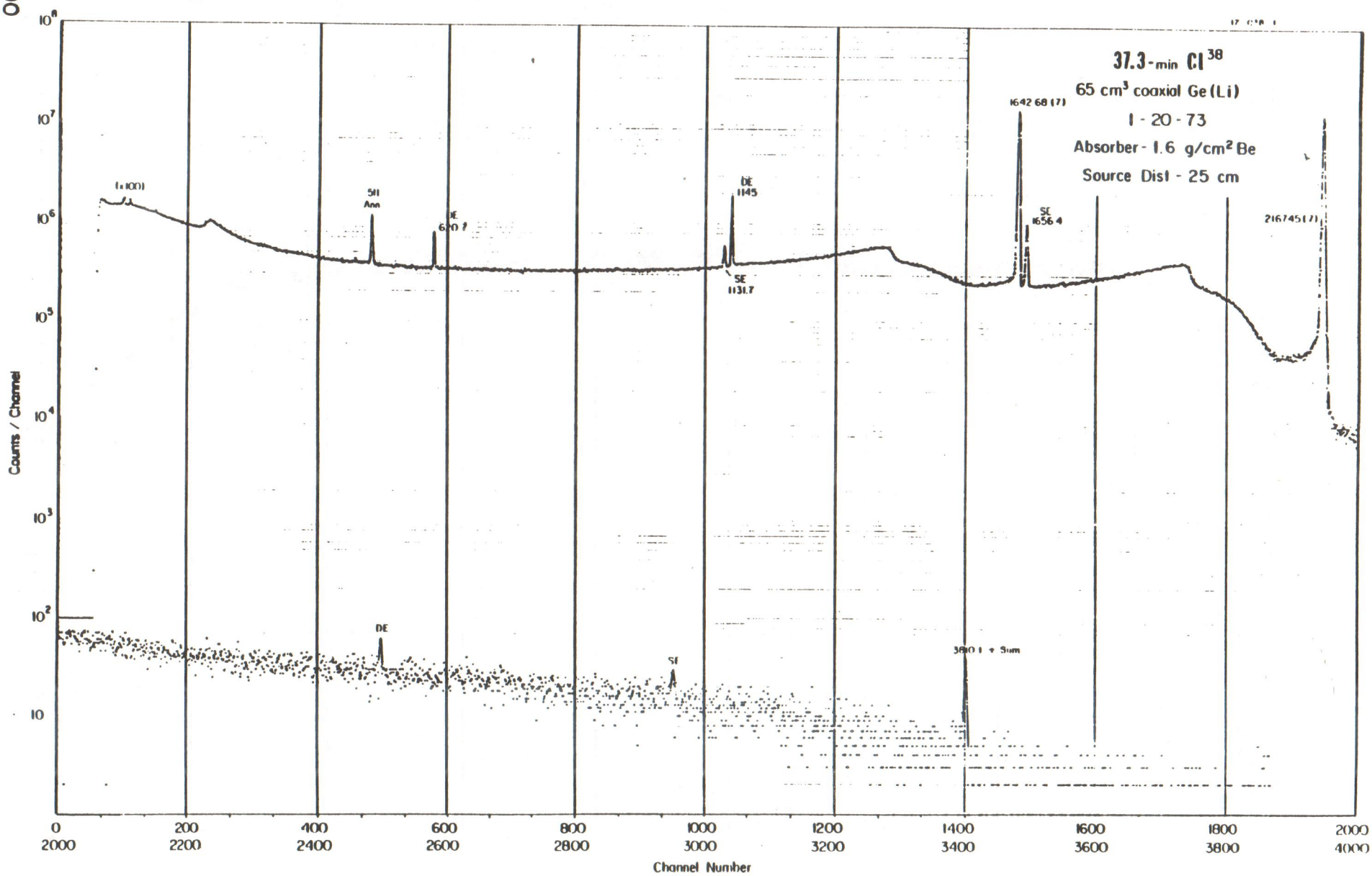

15-hr Na24
65 cm3 Coaxial Ge (Li)
10/4/72
Absorber - None
Source Dist. - 35 cm
x 100
DE 346
Annihilation Radiation
SE 857
1368.596(29)
DE 1732
SE 2243
2753.965(56)
DE 2844
SE 3355
3866.(14)
Sum 1368 + 2753
Counts / Channel
Channel Number
0 2000
200 2200
400 2400
600 2600
800 2800
1000 3000
1200 3200
1400 3400
1600 3600
1800 3800
2000 4000

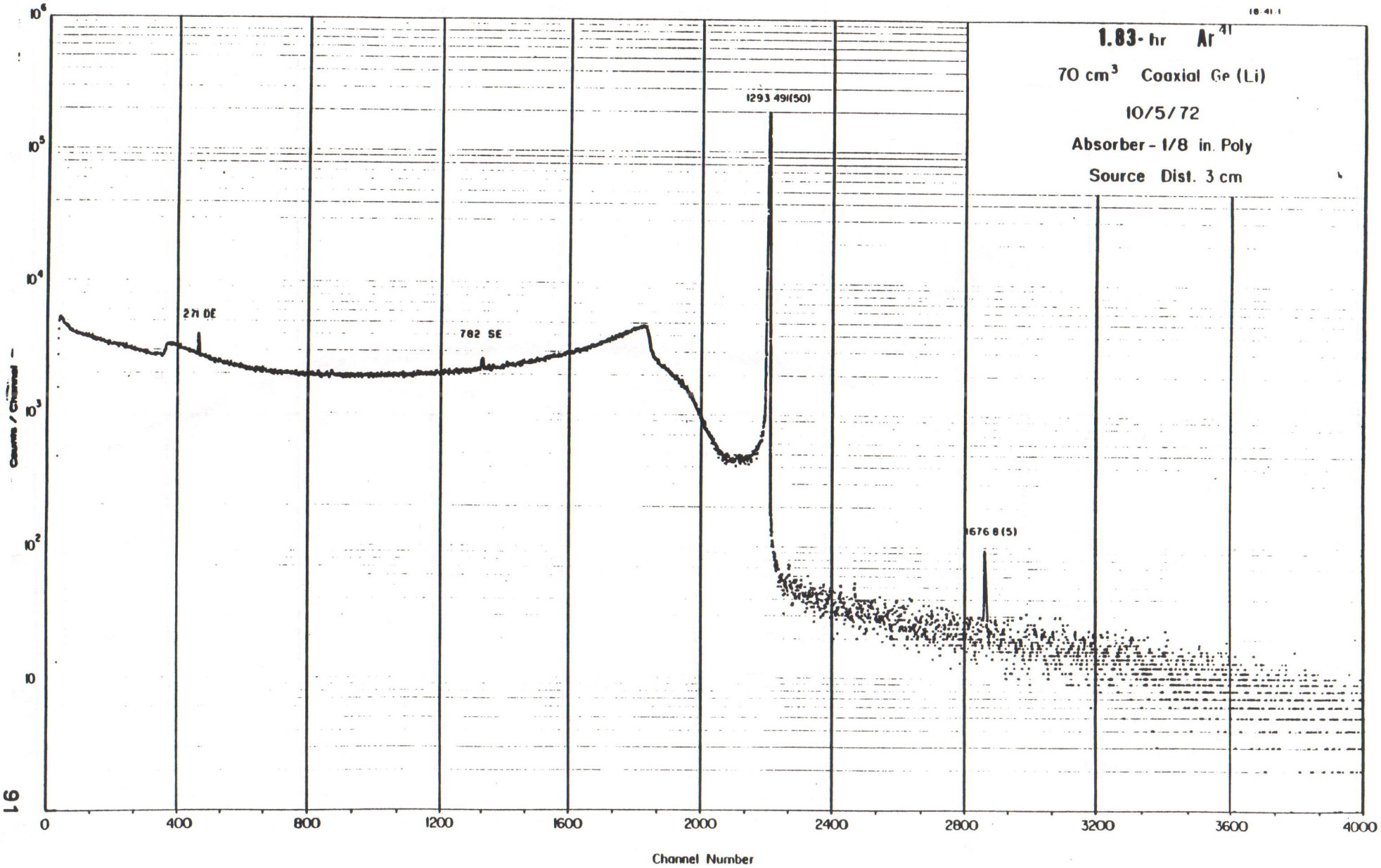

9.46-min Mg 27
2.5 cm² x 0.8 cm Ge (Li)
3-20-70
Absorber: 1. g/cm² Poly
Source Dist. 10 cm
170.51 (8)
843.76 (10)
1014.24 (10)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵

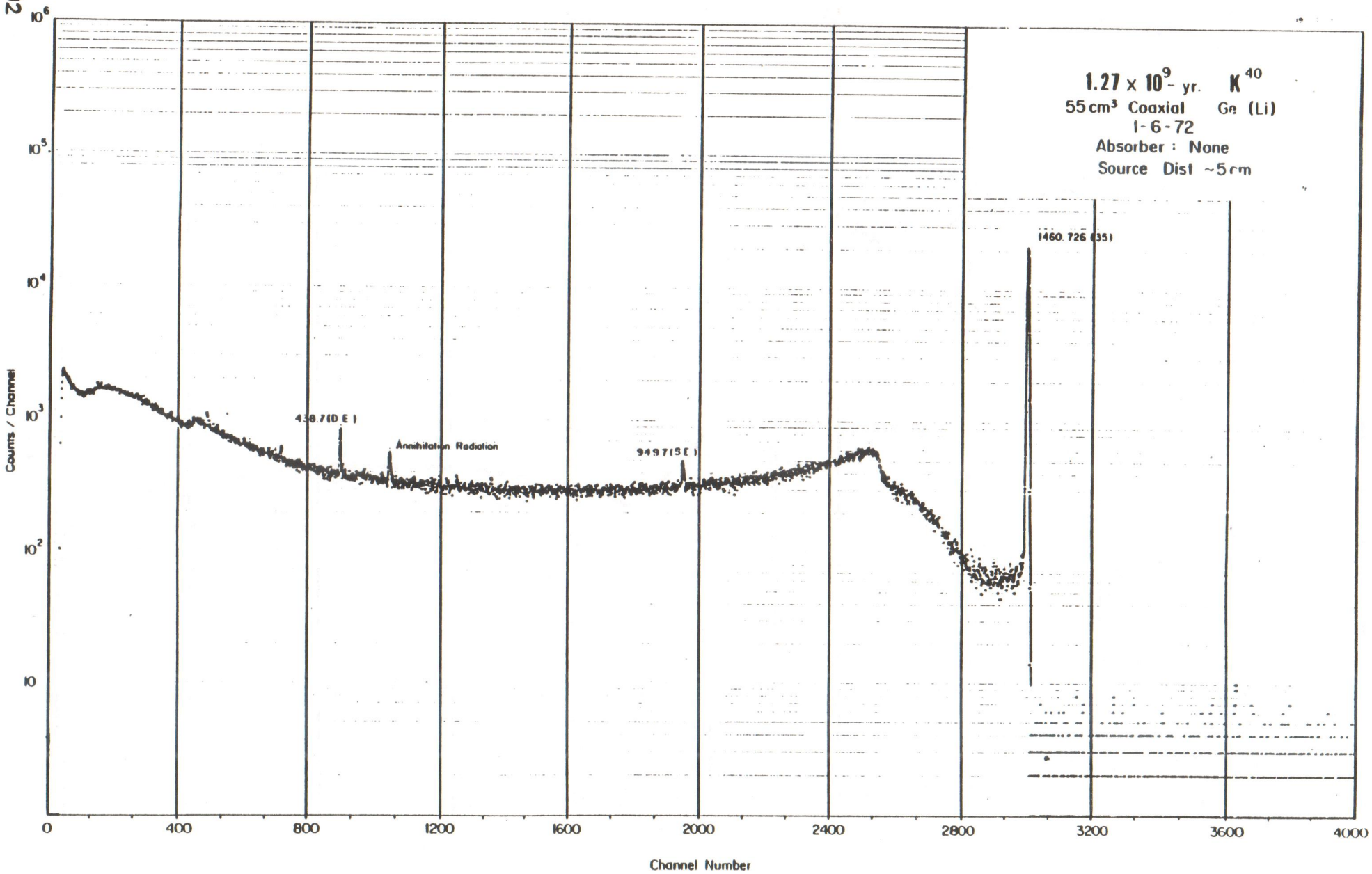

7.4 x 10^5 yr Al^26
55 cm³ coaxial Ge (Li)
10 - 16 - 71
Absorber - None
Source Dist 3 cm
Annihilation Radiation
511.006
786.82 (DE)
1129.58 (S)
1297.7 (SE)
K^40
1808.68 (6)
(511 + 1808)
Coinc Sum
2938.32 (10)
Counts / Channel
Channel Number
10^6
10^5
10^4
10^3
10^2
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

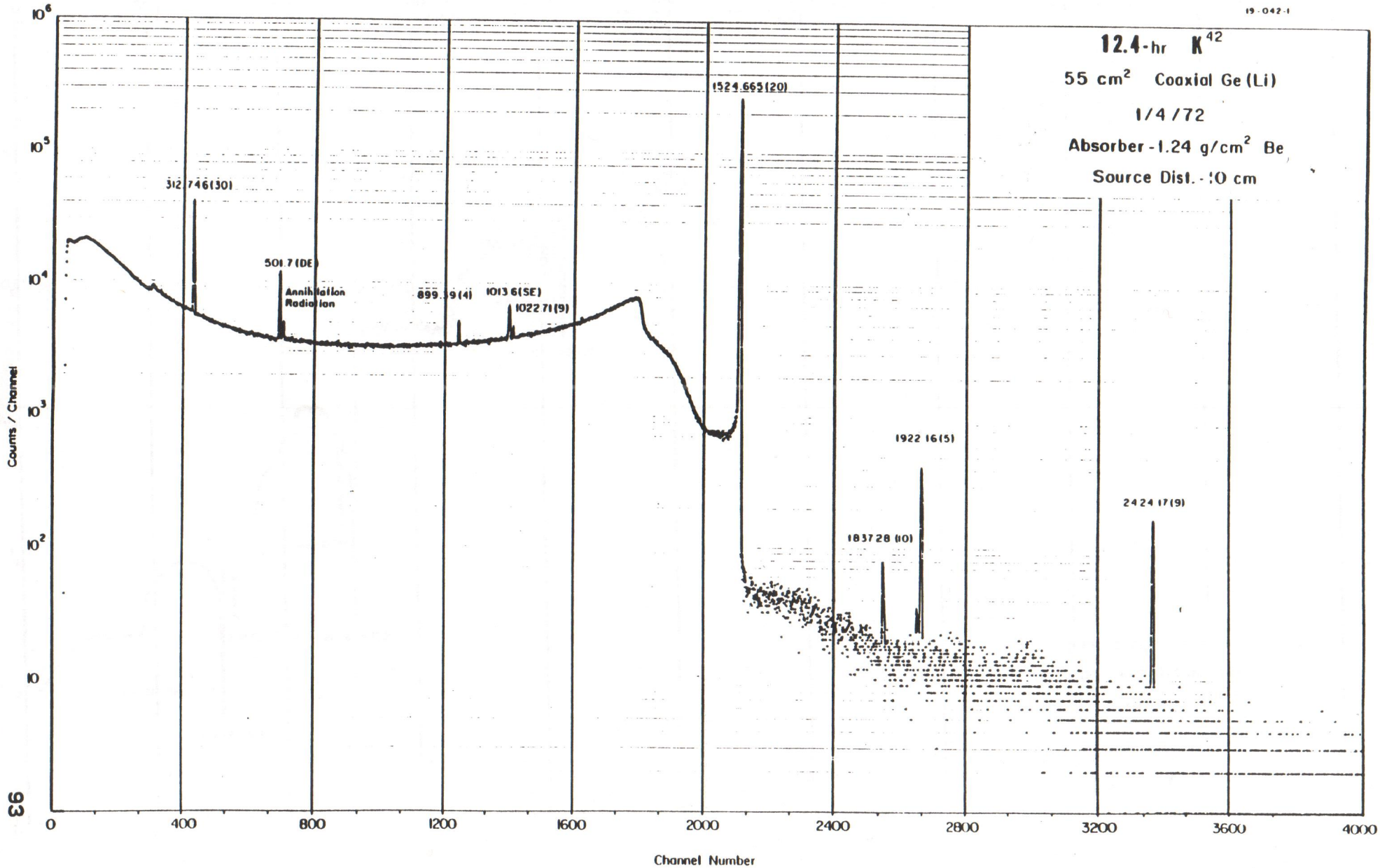

2.24 min Al28
4.55 cm2 x 0.8 cm Ge(Li)
3-26-70
Absorber: 1g/cm2
Source Dist. 10 cm
1779.0 (2)
757.1 (D.E.)
1268 (SE)
Annihilation Radiation
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10^2
10^3
10^4
10^5

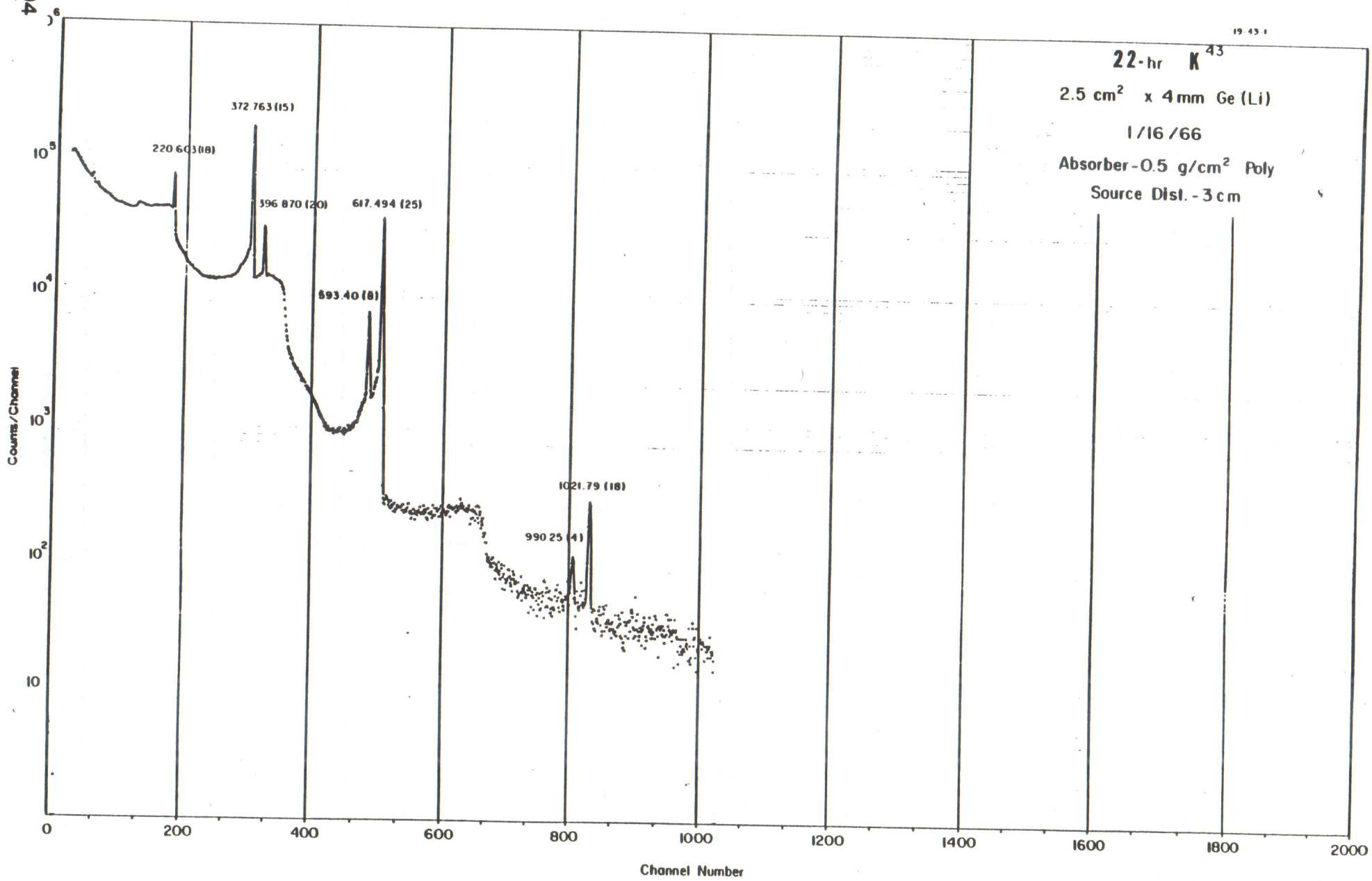

5.06 - min S 37
2.8 cm x 0.8 mm Ge(Li)
3-20-70
Absorber: 1g/cm2
Source Dist. 10 cm
Ann Rad
2592.8 S E
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
10
10^2
10^3
10^4
10^5
10^6

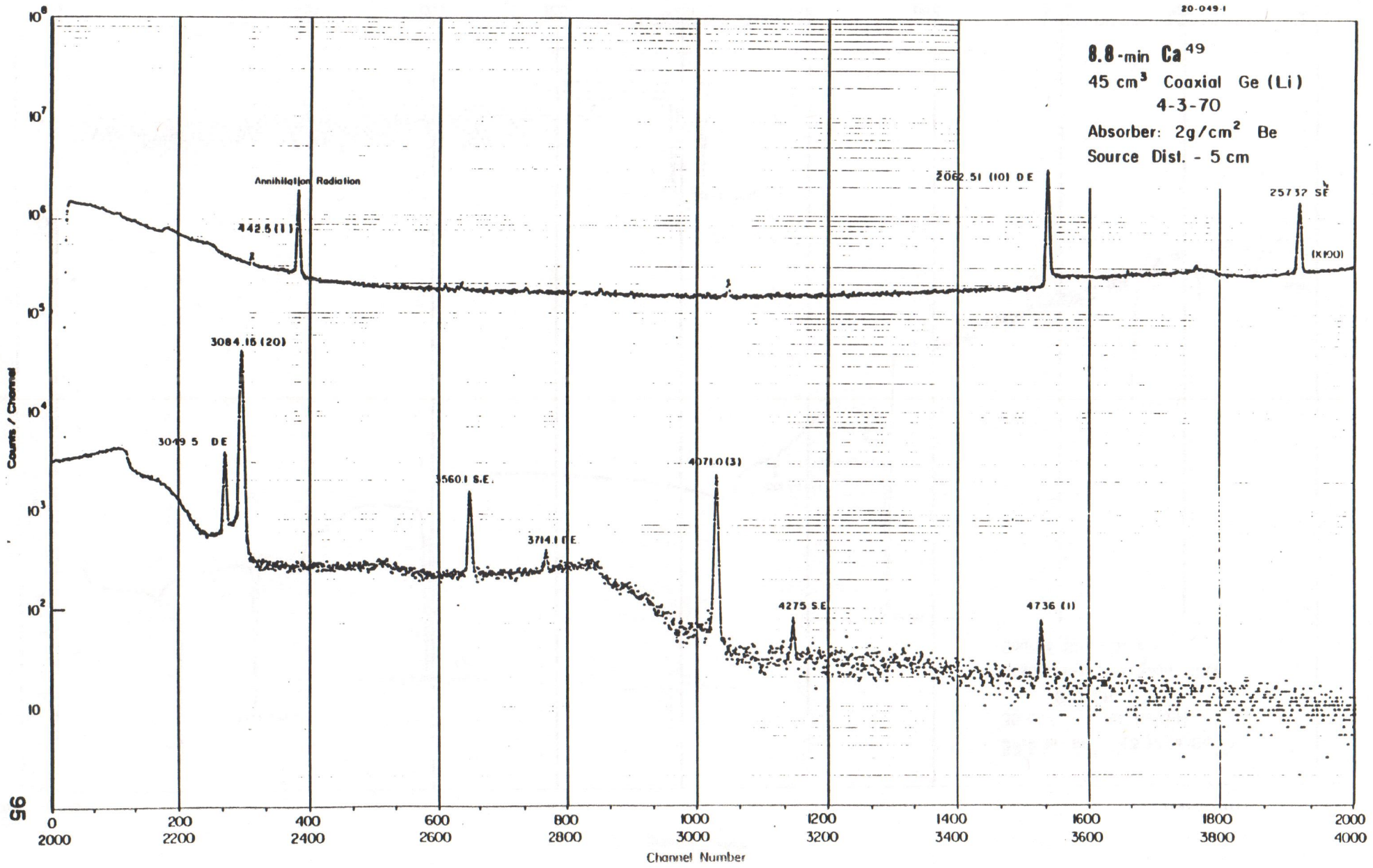

37.3-min Cl 38
65 cm³ coaxial Ge(Li)
1 - 20 - 73
Absorber - 1.6 g/cm² Be
Source Dist - 25 cm
511 Ann
DE 1145
SE 1131.7
1642.68 (7)
SE 1656.4
2167.45 (7)
DE
SE
Counts / Channel
Channel Number

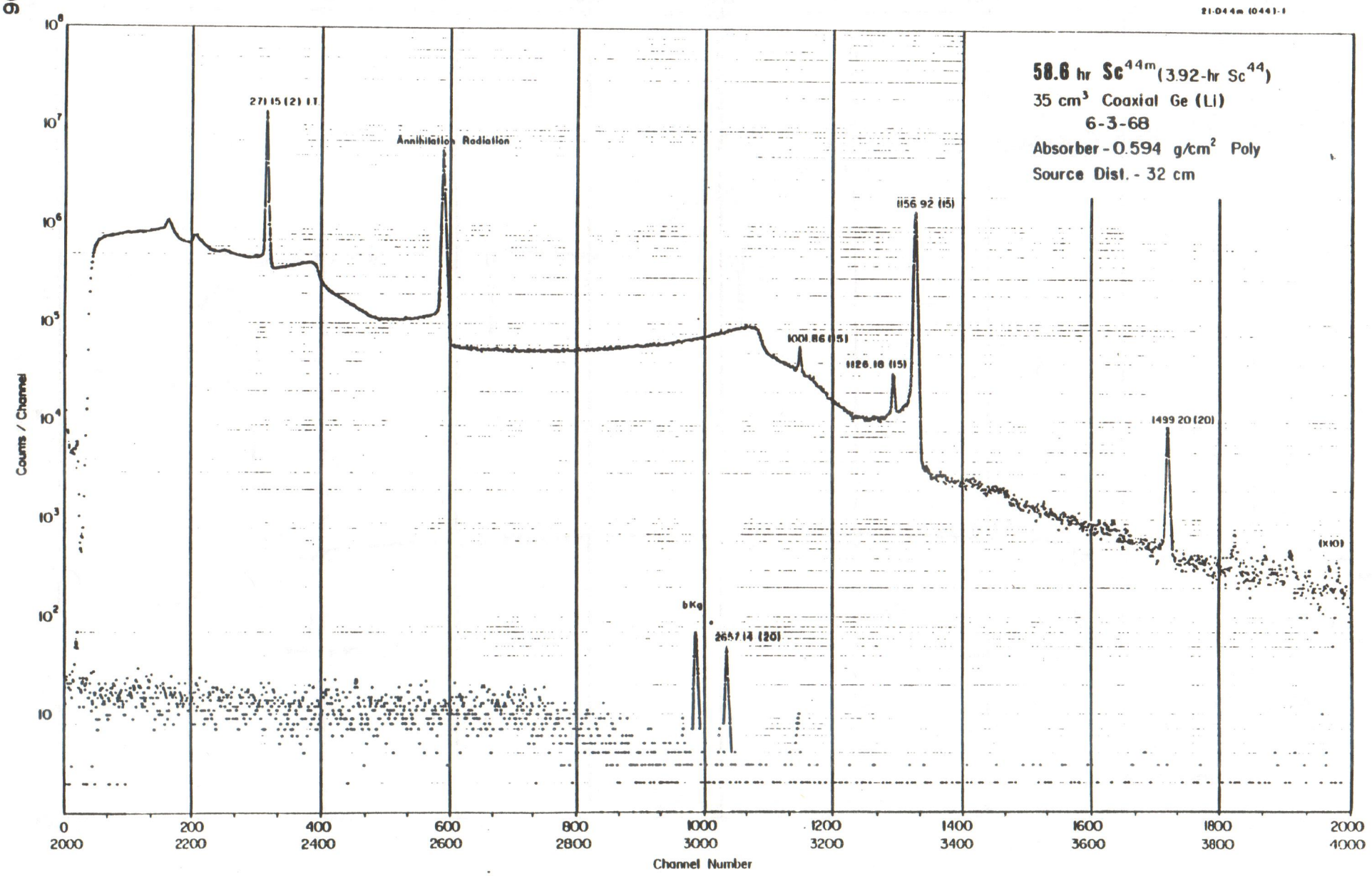

1.83- hr Ar41
70 cm3 Coaxial Ge (Li)
10/5/72
Absorber - 1/8 in. Poly
Source Dist. 3 cm
1293.49(50)
1676.8(5)
782 SE
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10^2
10^3
10^4
10^5
10^6

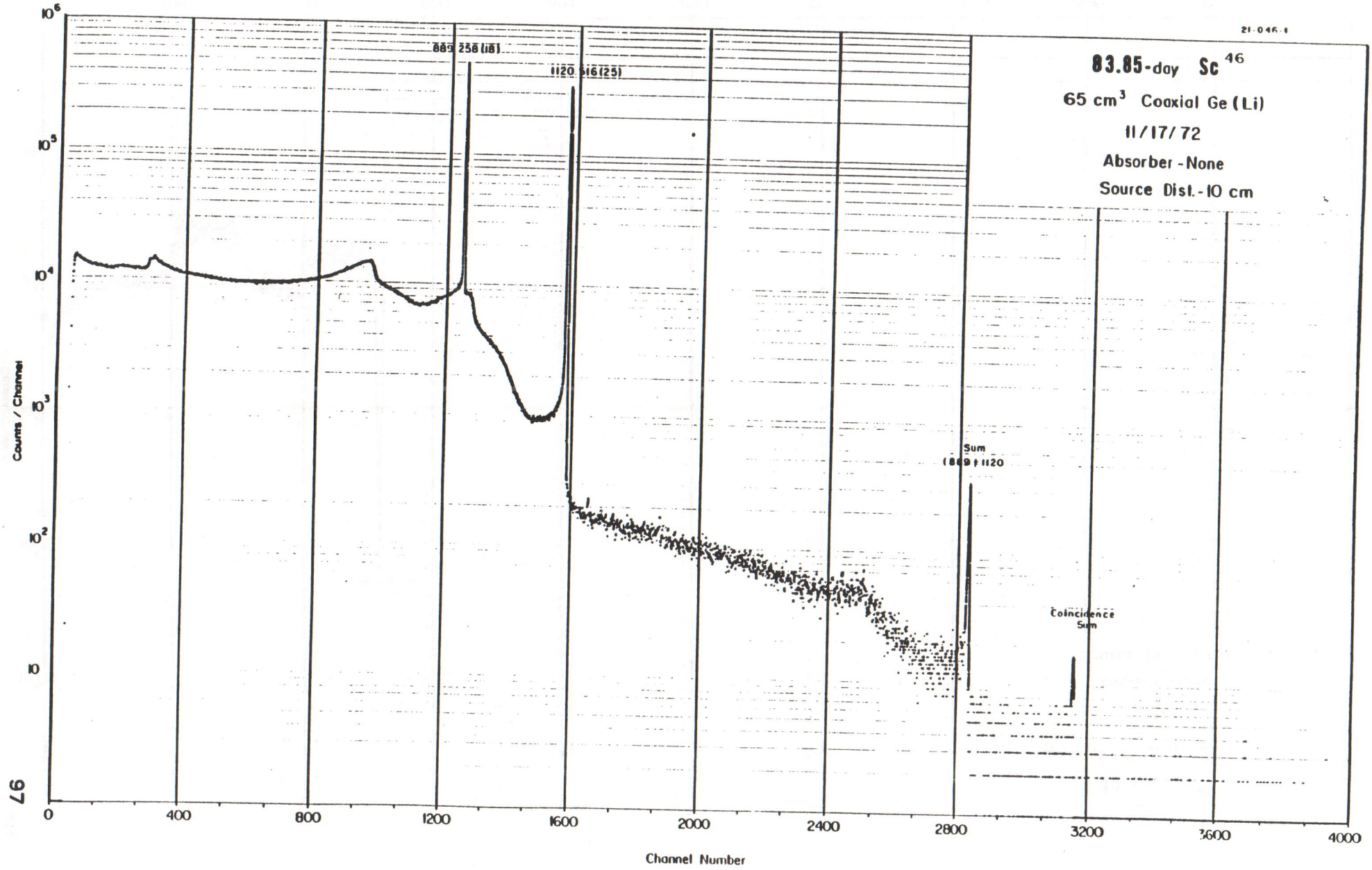

1.27 x 10^9 yr. K^40
55 cm³ Coaxial Ge (Li)
1-6-72
Absorber : None
Source Dist ~5 cm
1460.726 (35)
Annihilation Radiation
Counts / Channel
Channel Number
10^6
10^5
10^4
10^3
10^2
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

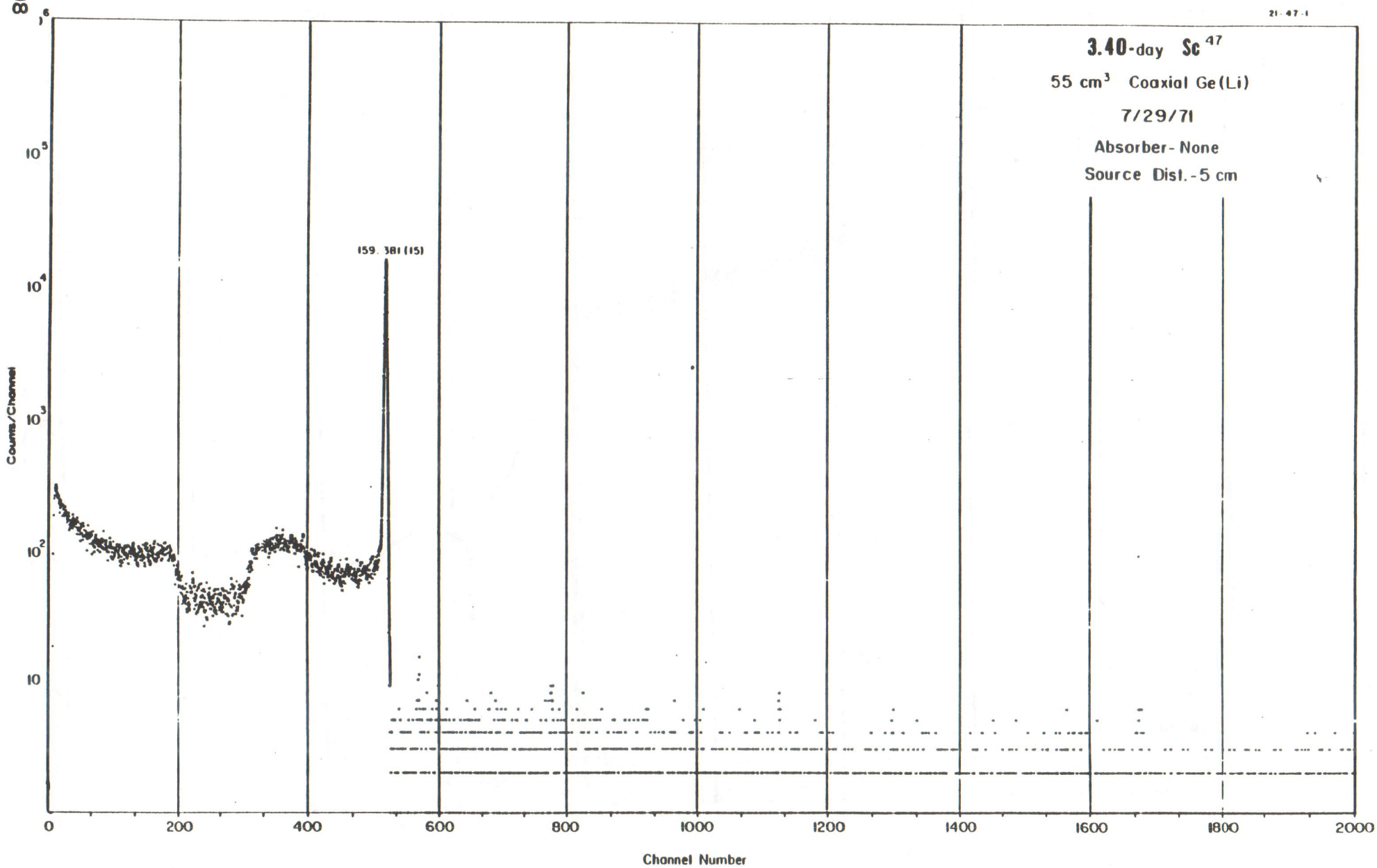

19-042-1
12.4-hr K42
55 cm2 Coaxial Ge (Li)
1/4/72
Absorber - 1.24 g/cm2 Be
Source Dist. - 10 cm
1524.665(20)
312.746(30)
501.7(DE)
Annihilation Radiation
899.9(4)
1013.6(SE)
1022.71(9)
1922.16(5)
1837.28(10)
2424.17(9)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

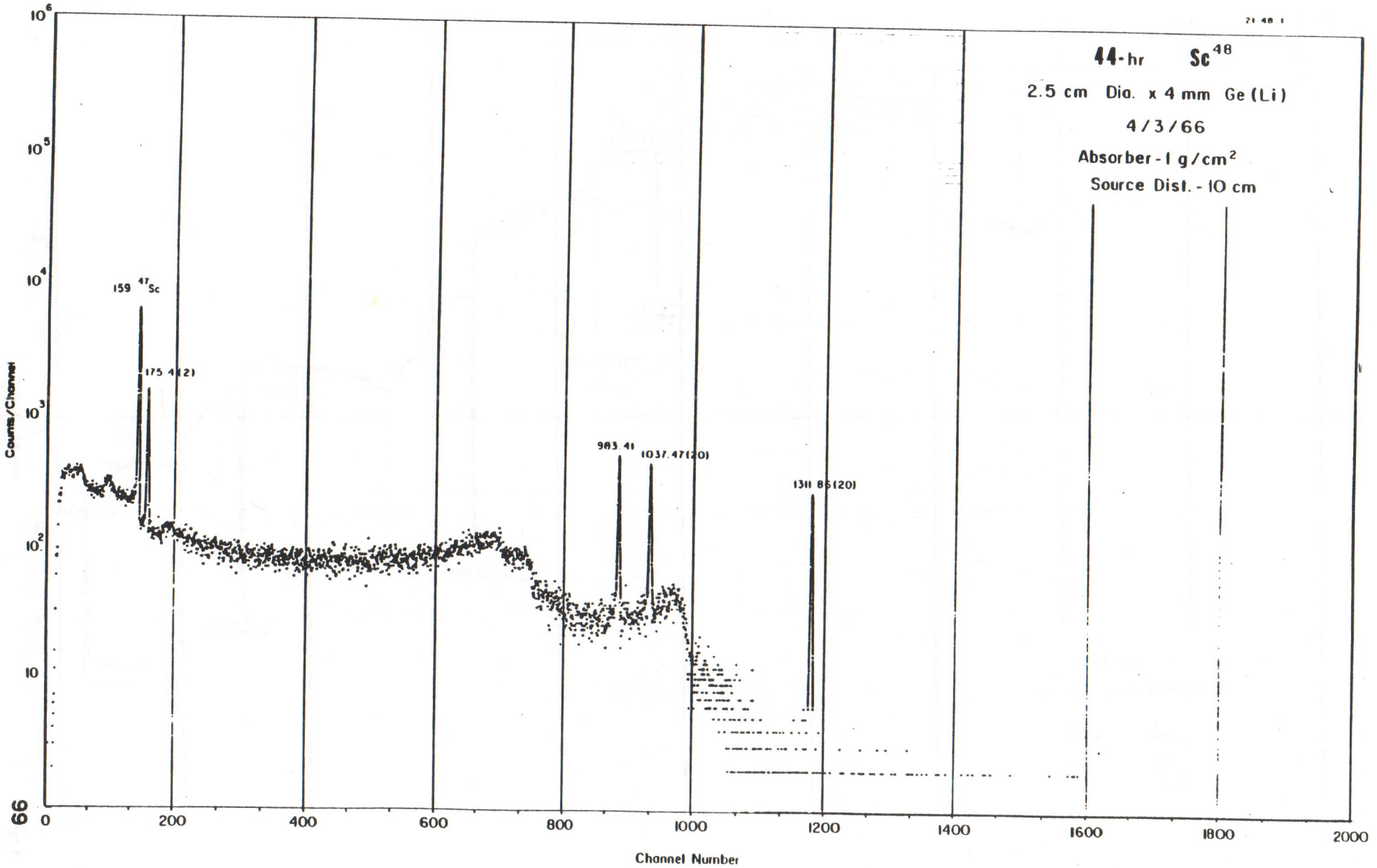

22-hr K43
2.5 cm2 x 4mm Ge (Li)
1/16/66
Absorber-0.5 g/cm2 Poly
Source Dist.-3cm
220.603 (18)
372.763 (15)
396.870 (20)
617.494 (25)
893.40 (8)
990.25 (4)
1021.79 (18)
Counts/Channel
Channel Number
10
10^2
10^3
10^4
10^5
0
200
400
600
800
1000
1200
1400
1600
1800
2000


20-049-1
8.8-min Ca49
45 cm3 Coaxial Ge (Li)
4-3-70
Absorber: 2g/cm2 Be
Source Dist. - 5 cm
Annihilation Radiation
442.5 (1)
2062.51 (10) DE
2573.7 SE
(X100)
3084.16 (20)
3049.5 DE
3560.1 S.E.
3714.1 DE
4071.0 (3)
4275 S.E.
4736 (1)
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸

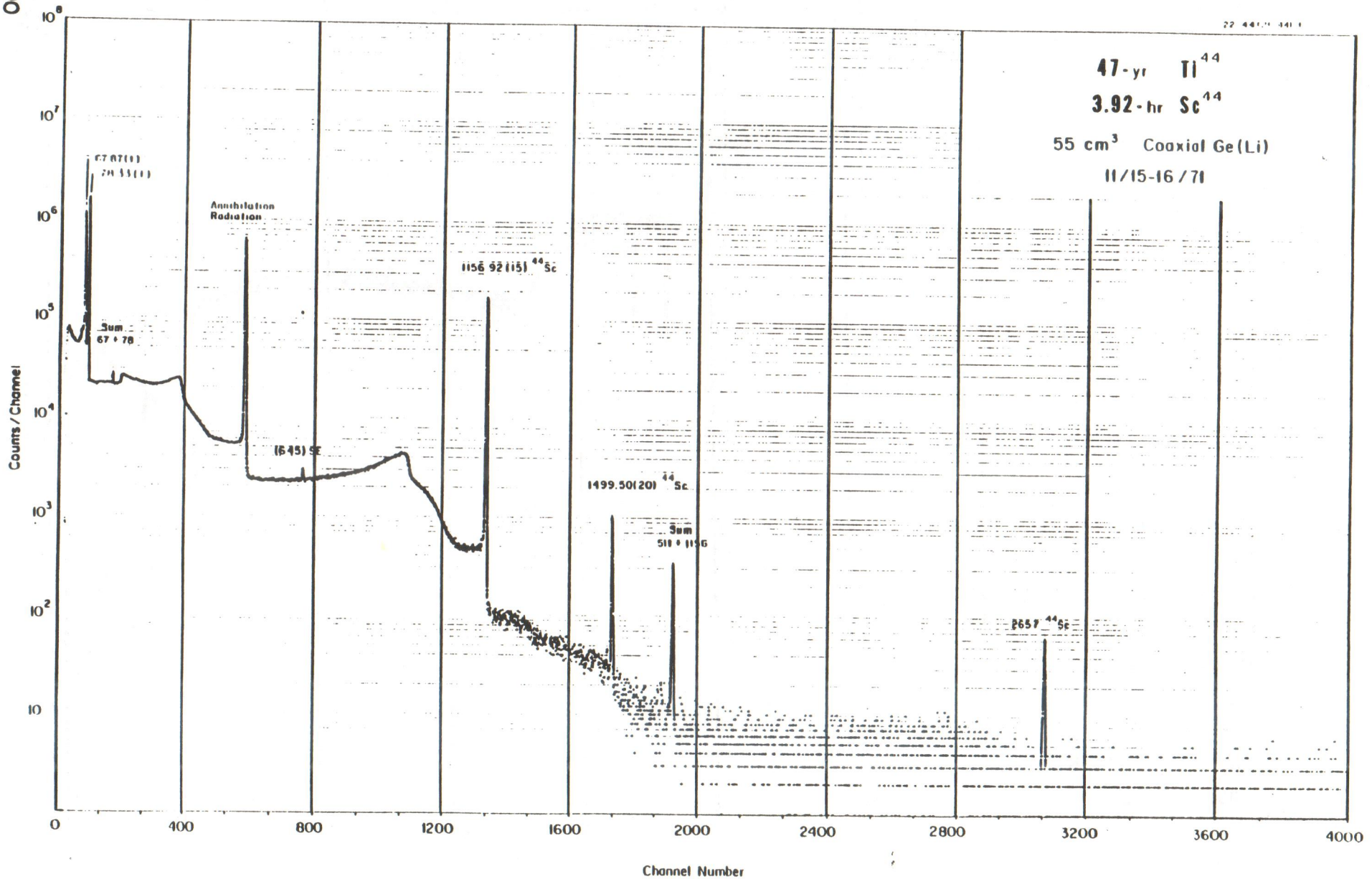

21-044m (0441-1
58.6 hr Sc44m (3.92-hr Sc44)
35 cm3 Coaxial Ge (Li)
6-3-68
Absorber - 0.594 g/cm2 Poly
Source Dist. - 32 cm
271.15 (2) I.T.
Annihilation Radiation
1001.86 (15)
1026.18 (15)
1156.92 (15)
1499.20 (20)
(x10)
bKa
2657.14 (20)
Counts / Channel
Channel Number

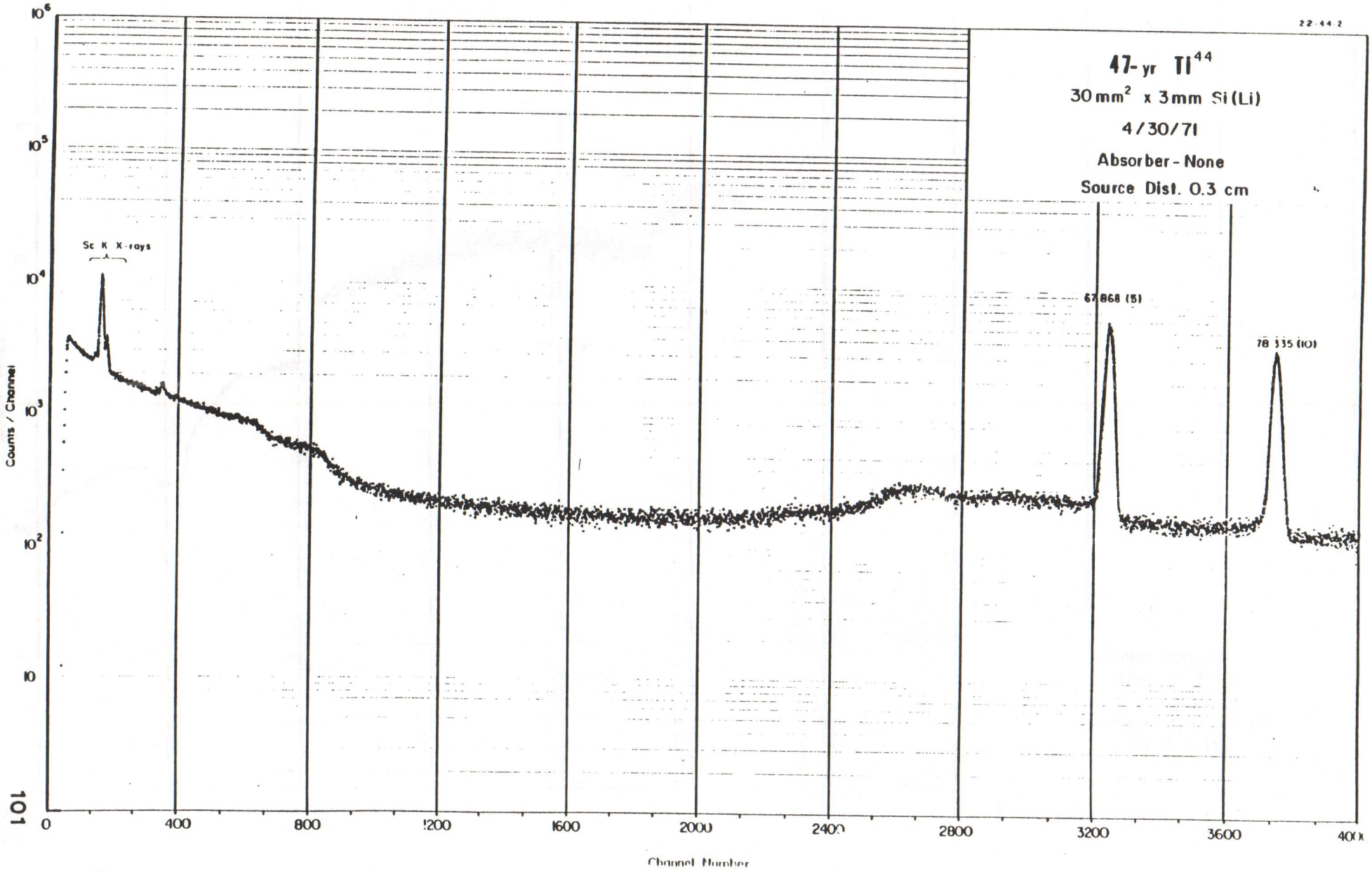

83.85-day Sc 46
65 cm3 Coaxial Ge (Li)
11/17/72
Absorber - None
Source Dist. - 10 cm
889.258 (18)
1120.516 (25)
Sum
(889 + 1120
Coincidence
Sum
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

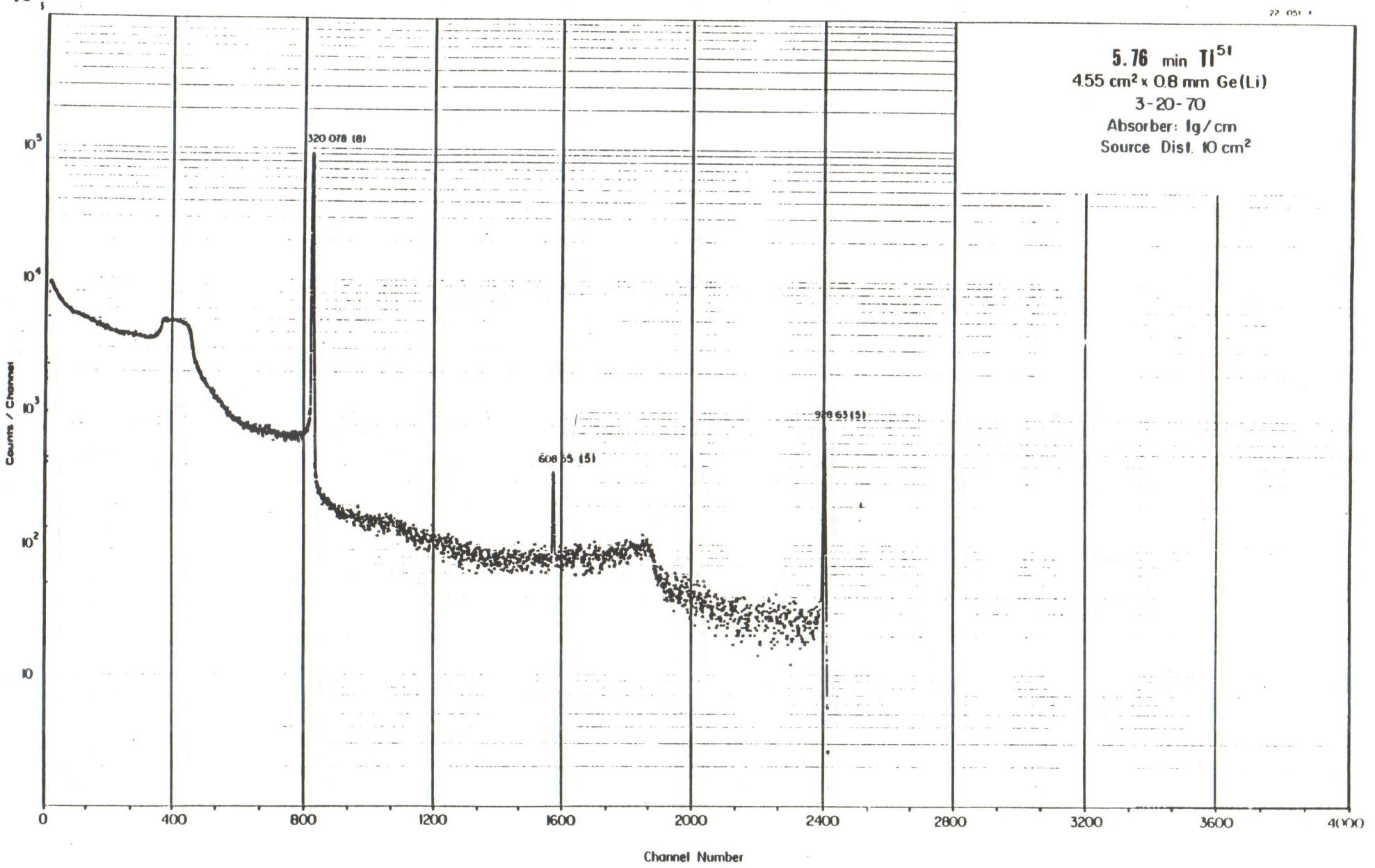

21-47-1
3.40-day Sc 47
55 cm3 Coaxial Ge(Li)
7/29/71
Absorber- None
Source Dist.-5 cm
159.381 (15)
Counts/Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
10
10^2
10^3
10^4
10^5
10^6

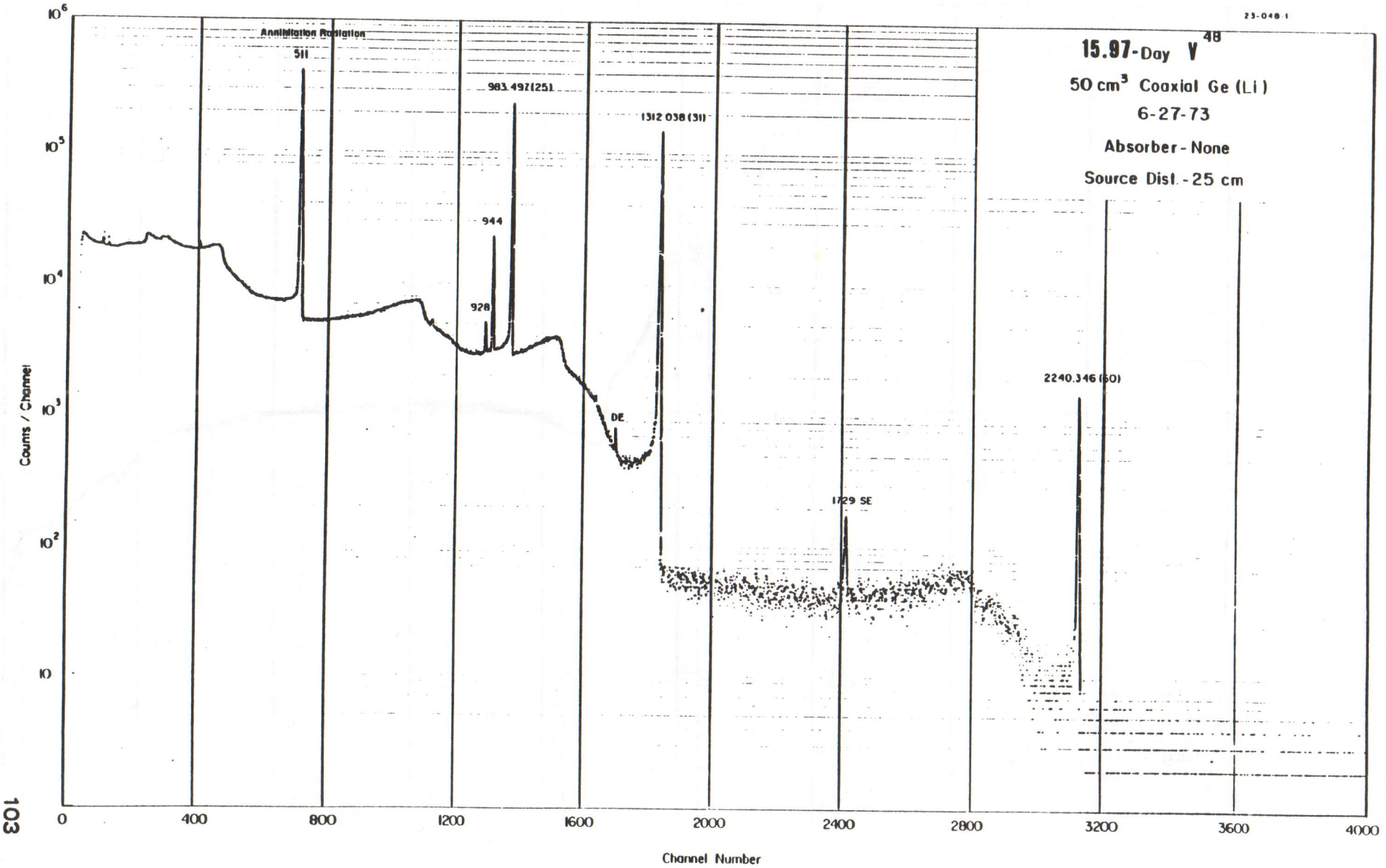

44-hr Sc48
2.5 cm Dia. x 4 mm Ge (Li)
4/3/66
Absorber - 1 g/cm2
Source Dist. - 10 cm
159 47Sc
175.4(2)
983.41
1037.47(20)
1311.85(20)
Counts/Channel
Channel Number
10^6
10^5
10^4
10^3
10^2
10
0
200
400
600
800
1000
1200
1400
1600
1800
2000

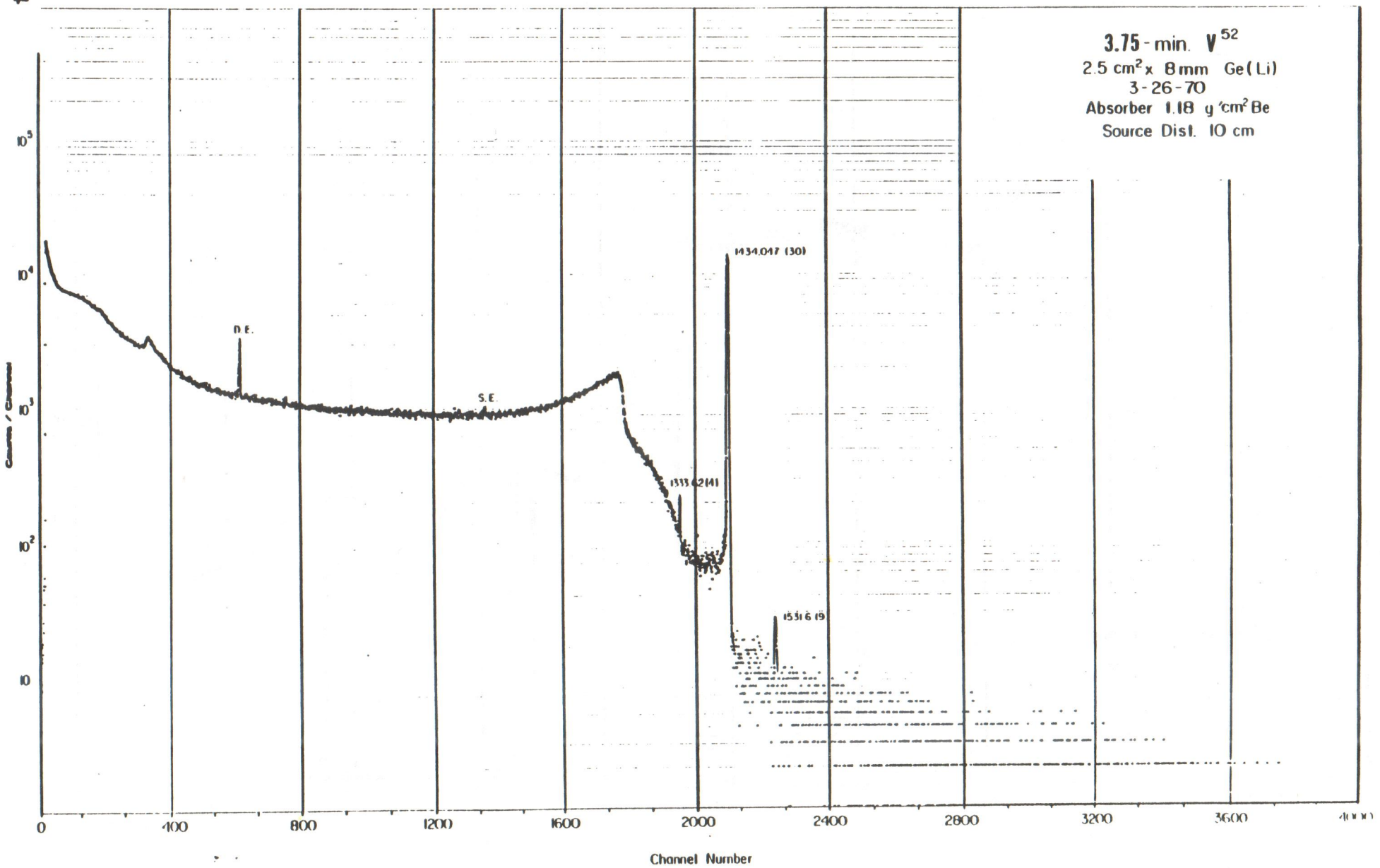
66

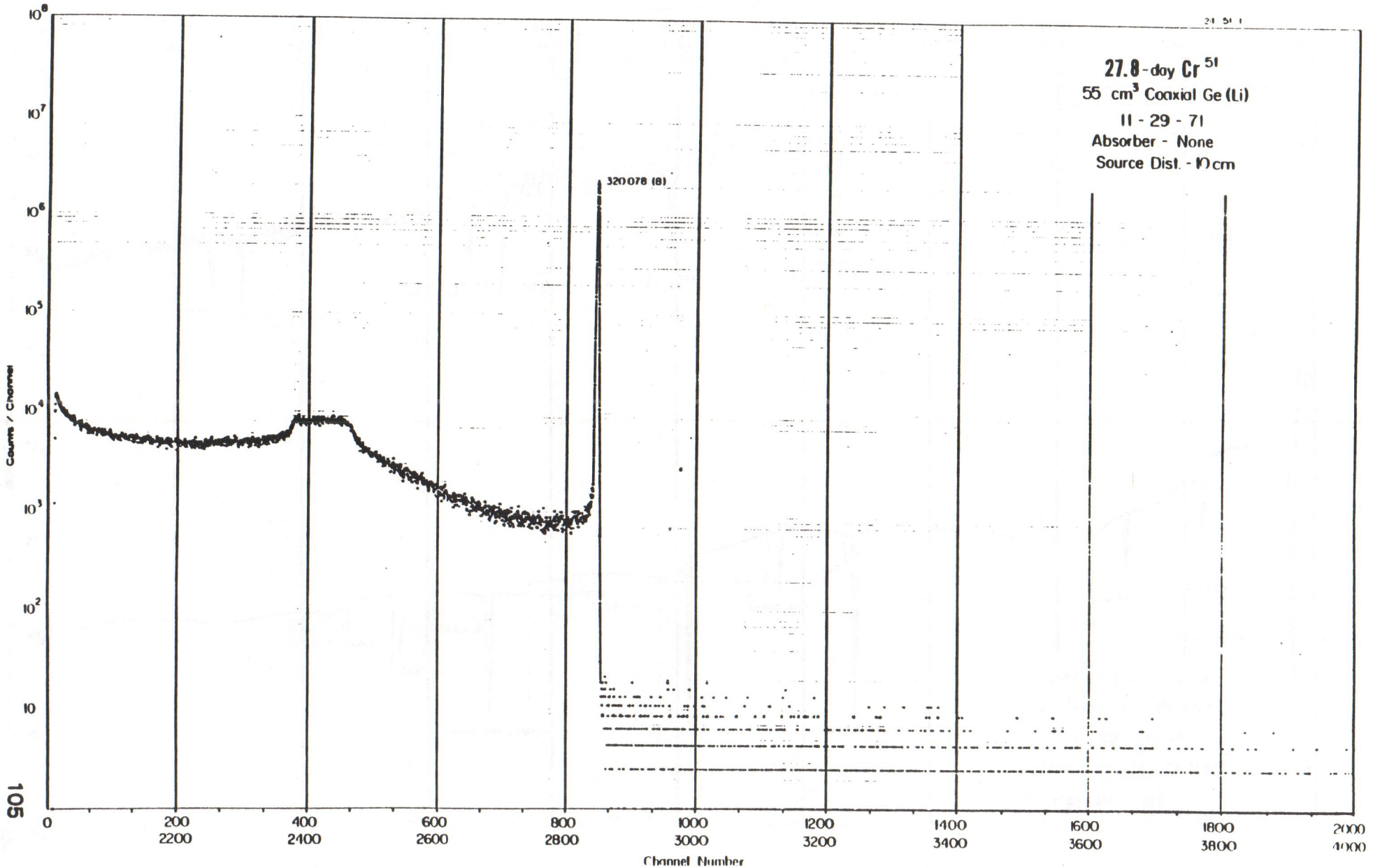

47-yr Ti44
3.92-hr Sc44
55 cm3 Coaxial Ge(Li)
11/15-16/71
Annihilation Radiation
Sum 67 + 78
(645) SE
1156.92(15) 44Sc
1499.50(20) 44Sc
Sum 511 + 1156
2657 44Sc
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸

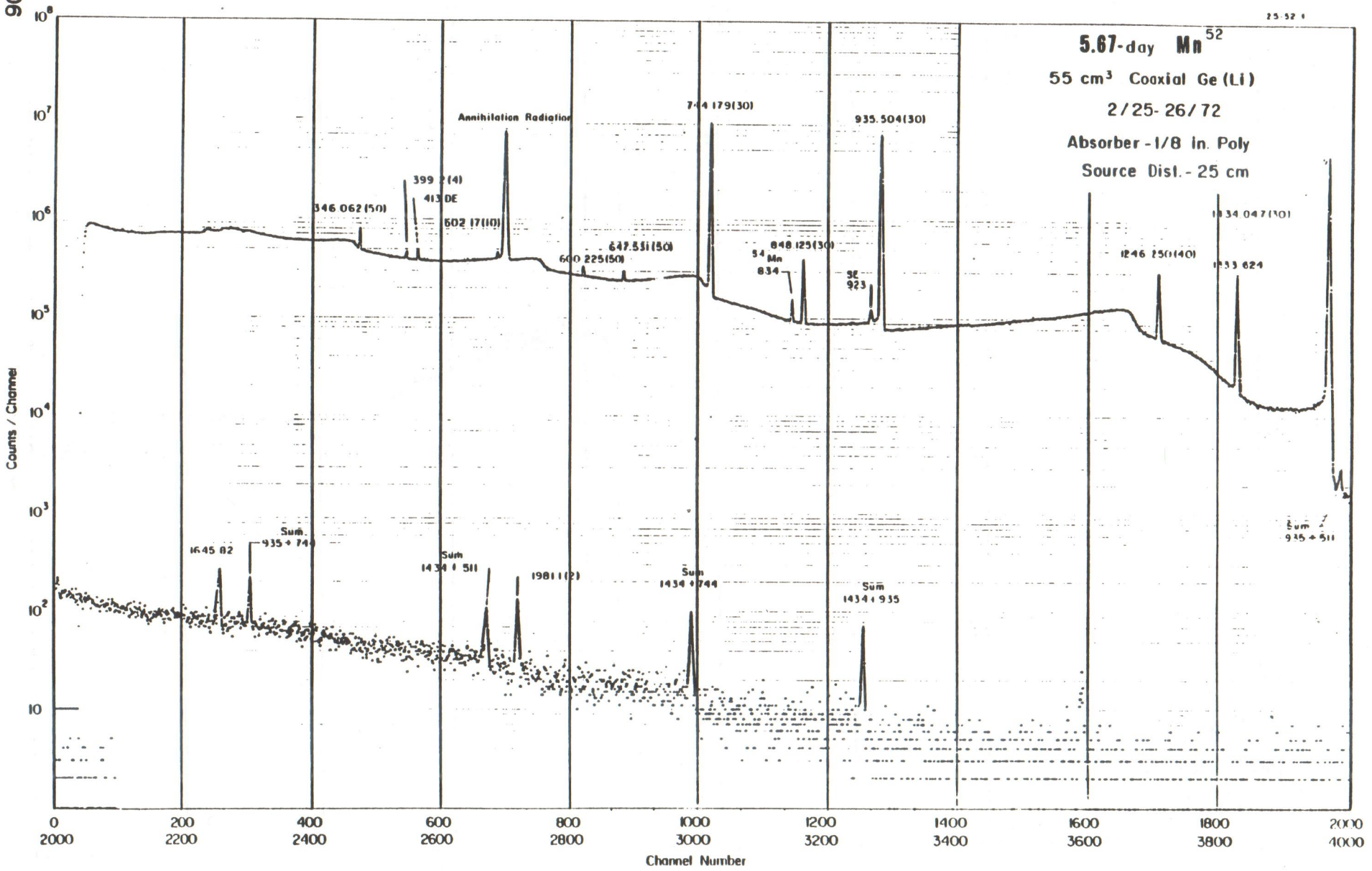

22-44-2
47-yr Ti44
30 mm2 x 3mm Si(Li)
4/30/71
Absorber - None
Source Dist. 0.3 cm
Sc K X-rays
67.868 (5)
78.335 (10)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

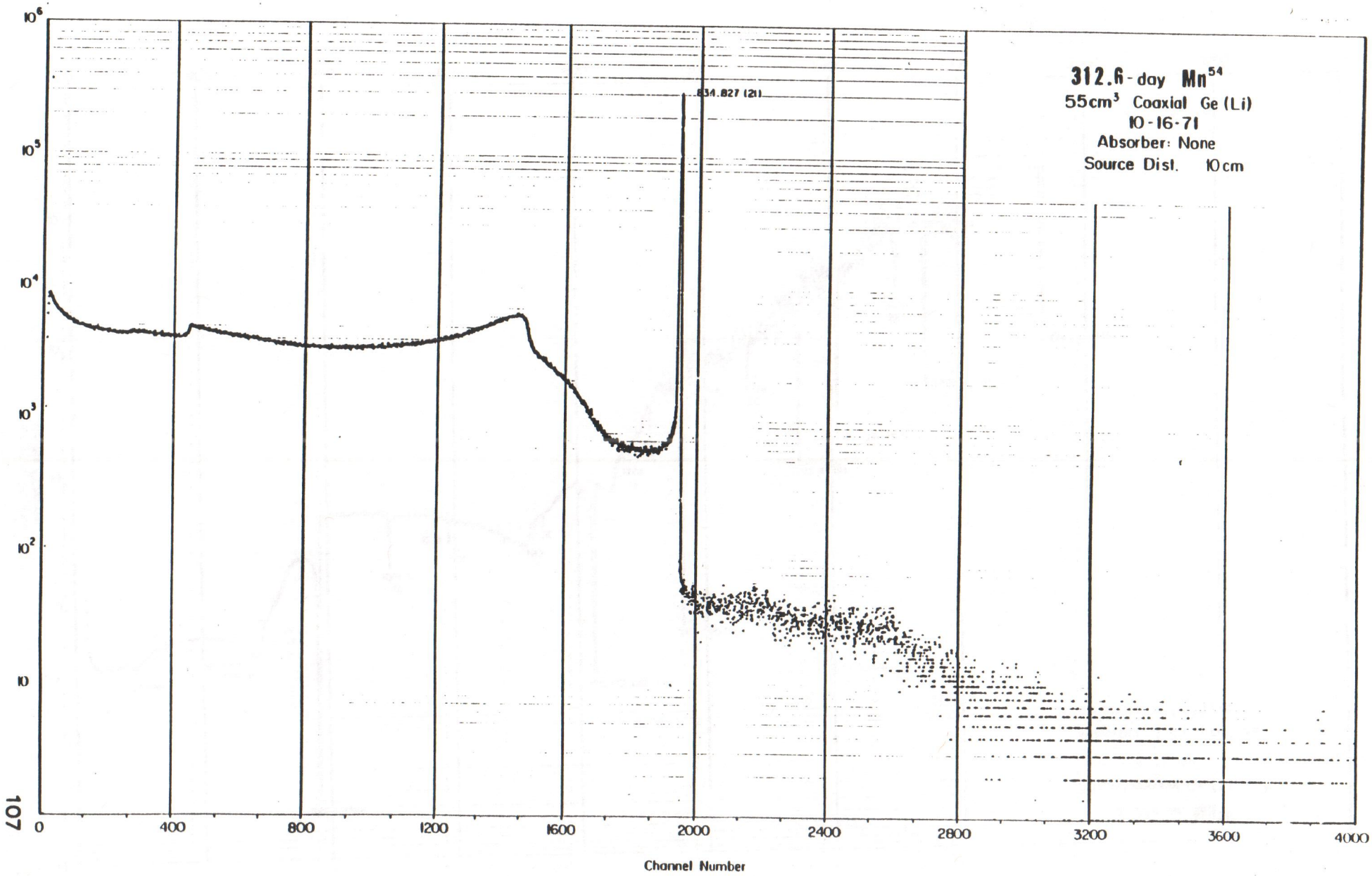

5.76 min Tl51
4.55 cm2 x 0.8 mm Ge(Li)
3-20-70
Absorber: 1g/cm
Source Dist. 10 cm2
320 078 (8)
608 55 (5)
928 63 (5)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

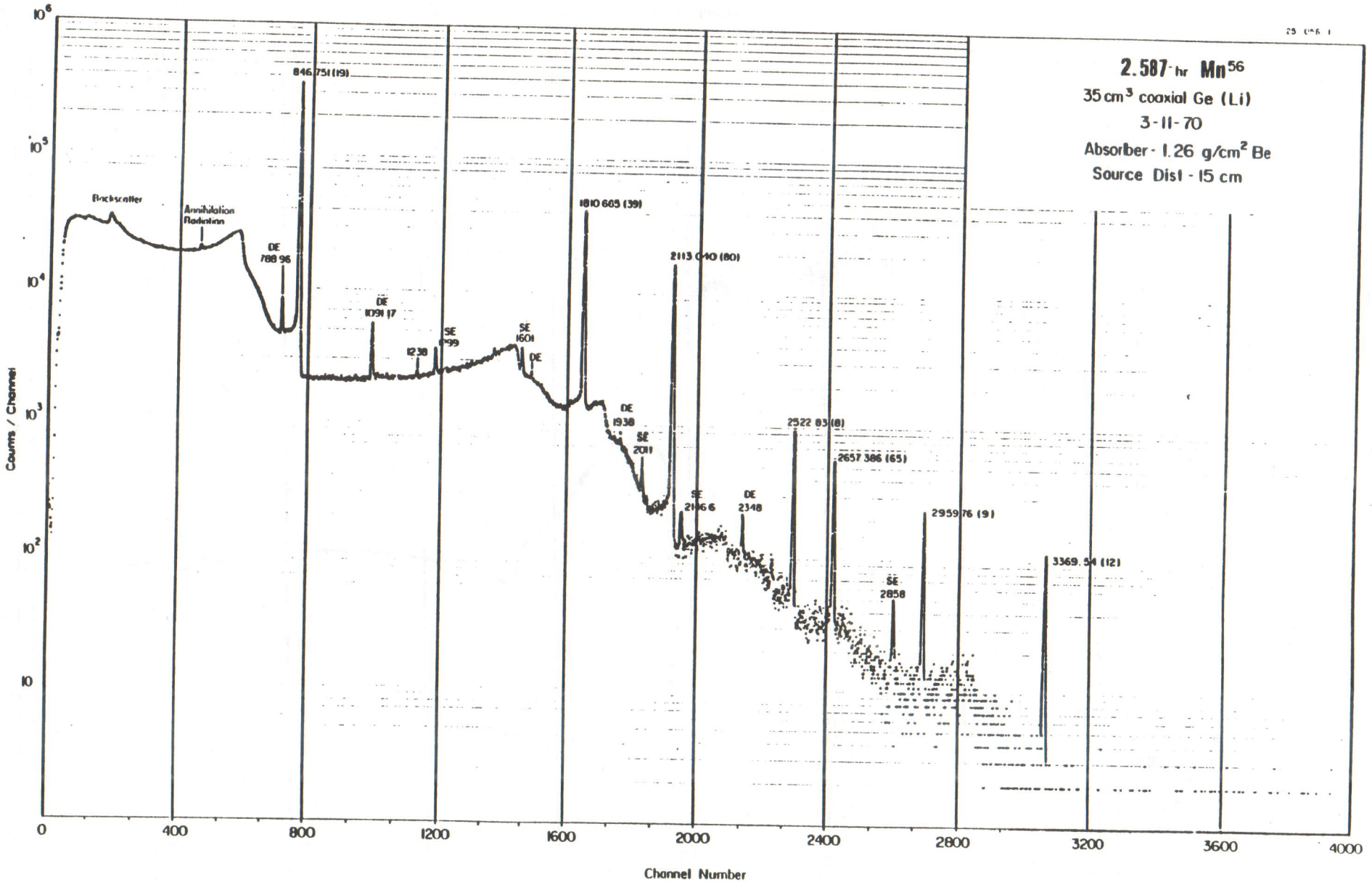

23-048-1
15.97-Day V48
50 cm3 Coaxial Ge (Li)
6-27-73
Absorber - None
Source Dist. - 25 cm
Annihilation Radiation
511
983.497(25)
944
928
1312.038(31)
DE
1729 SE
2240.346(60)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

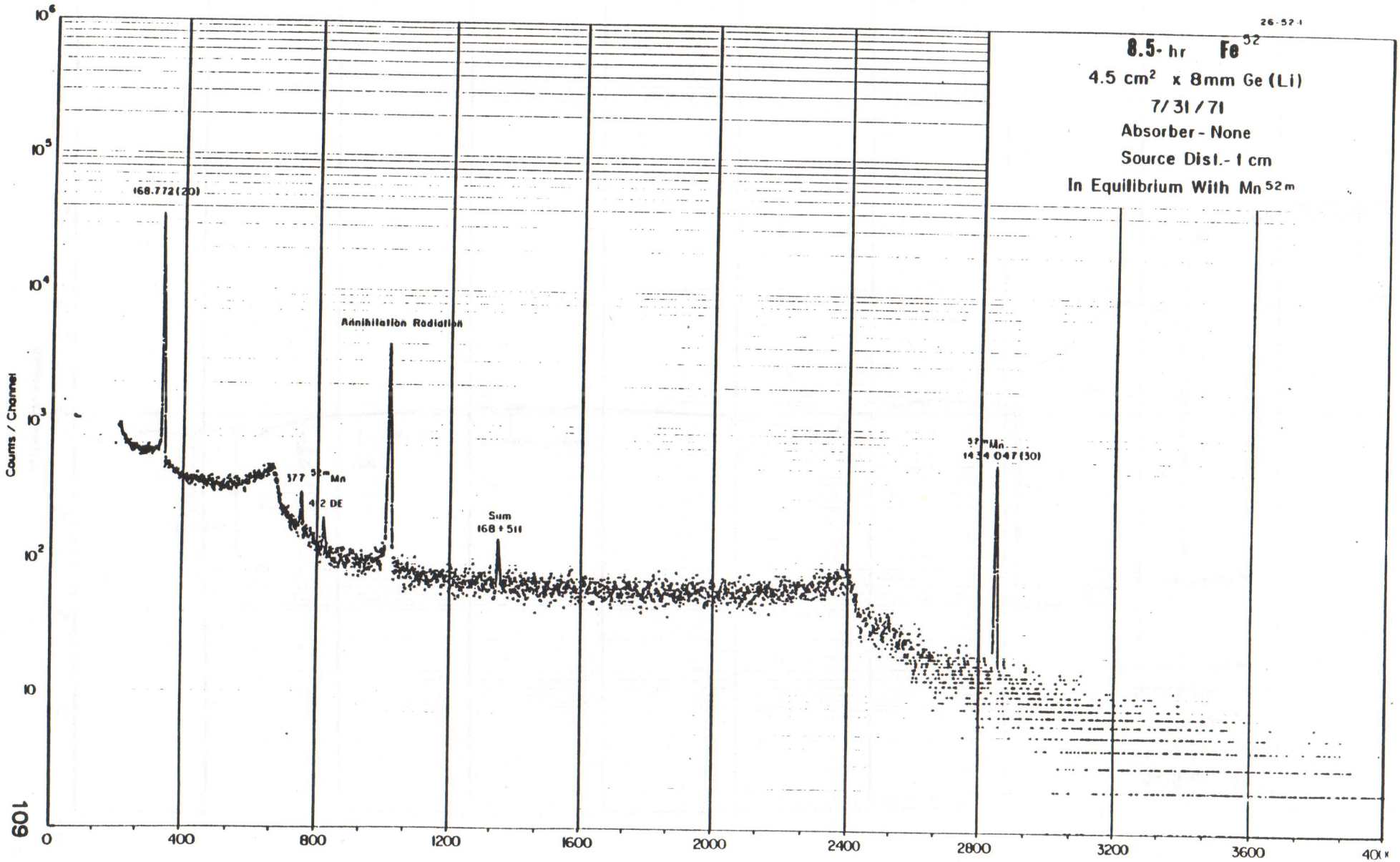

3.75 - min. V 52
2.5 cm² x 8 mm Ge(Li)
3-26-70
Absorber 1.18 g/cm² Be
Source Dist. 10 cm
1434.047 (30)
D.E.
S.E.
1333 (214)
1531.6 (9)
Counts / Channel
10
10²
10³
10⁴
10⁵
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Channel Number

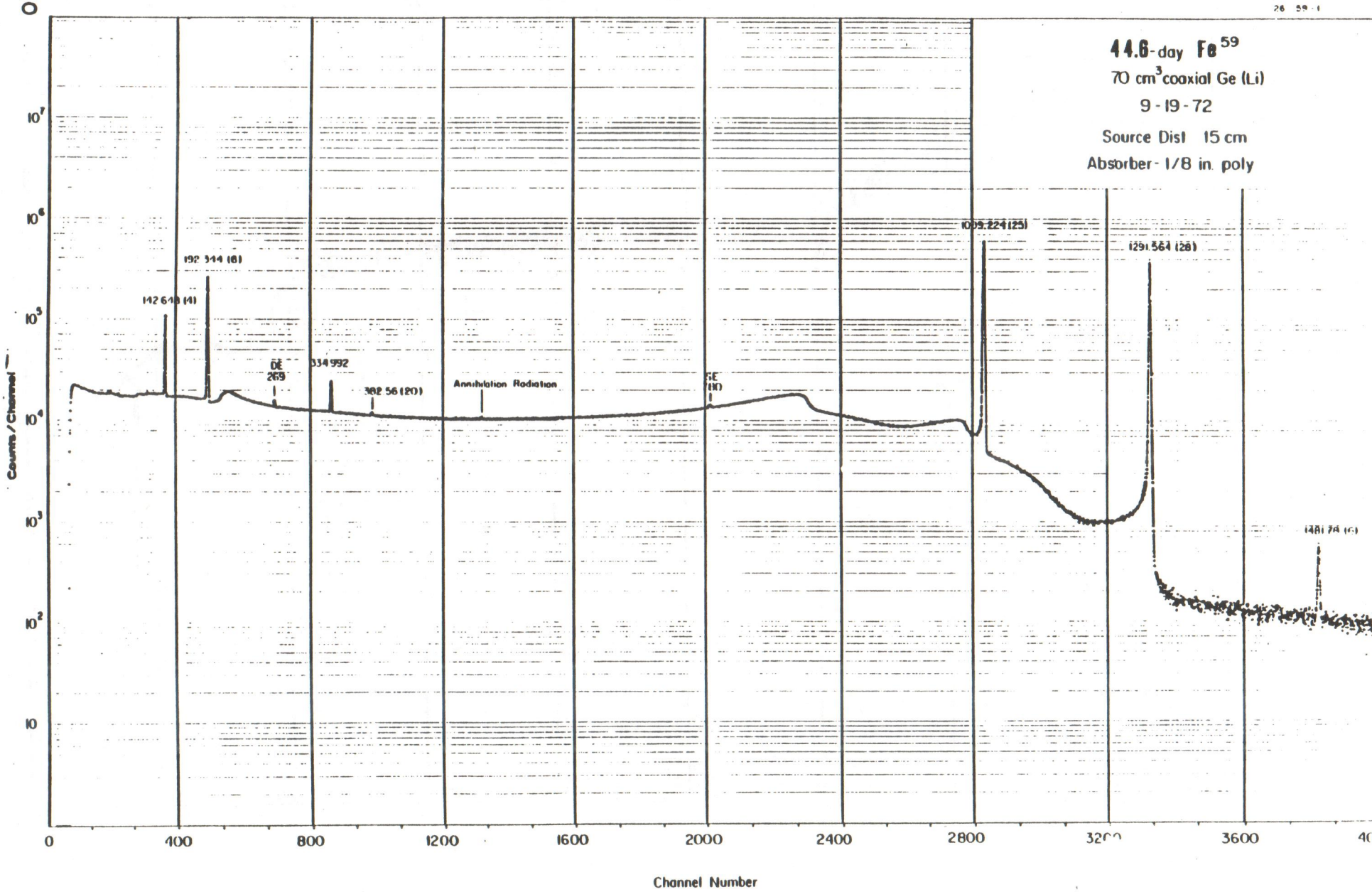

27.8-day Cr 51
55 cm3 Coaxial Ge (Li)
11 - 29 - 71
Absorber - None
Source Dist. - 10 cm
320.078 (8)
Counts / Channel
Channel Number
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10
0
200
2200
400
2400
600
2600
800
2800
1000
3000
1200
3200
1400
3400
1600
3600
1800
3800
2000
4000

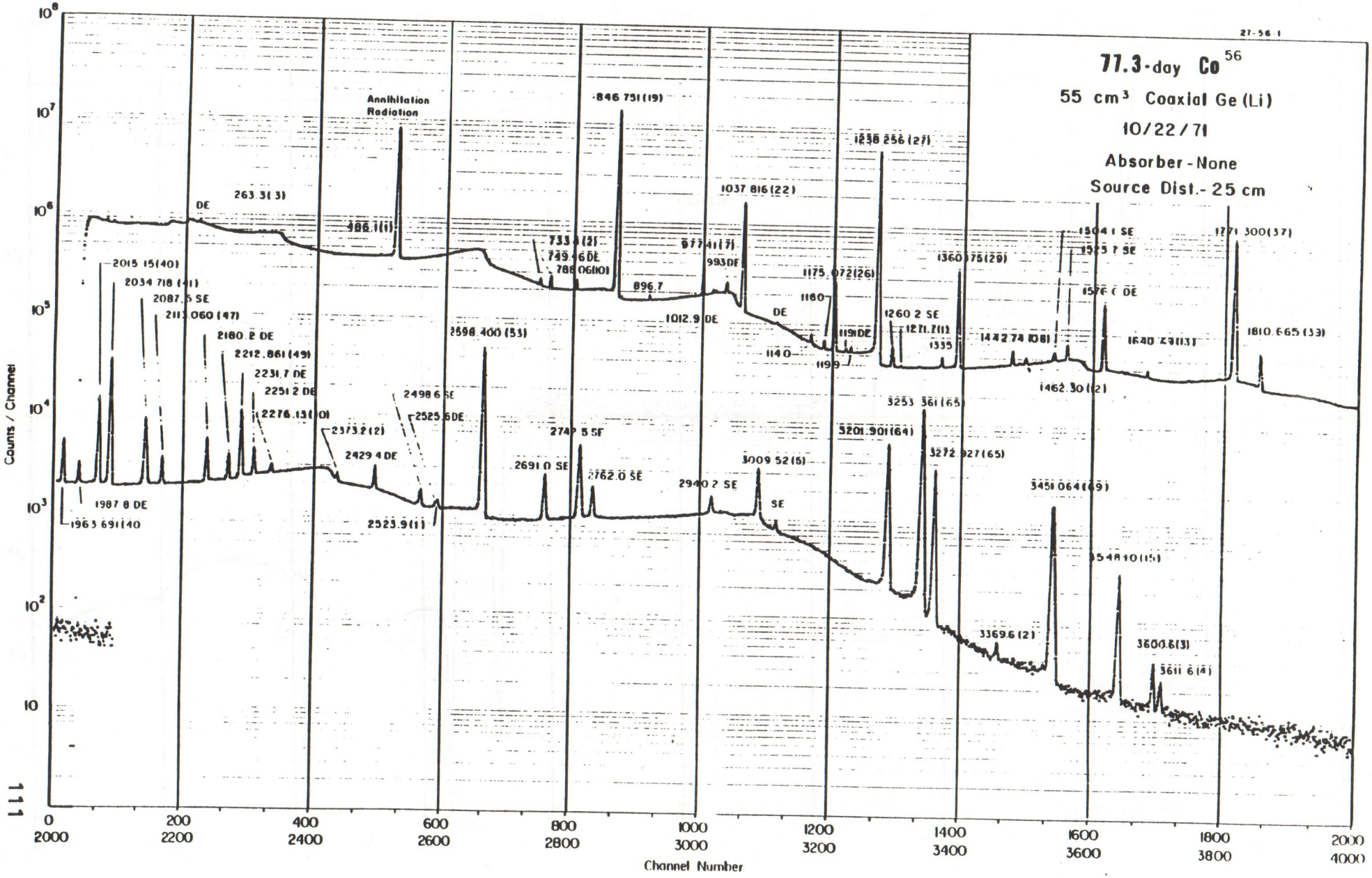

5.67-day Mn52
55 cm3 Coaxial Ge (Li)
2/25-26/72
Absorber - 1/8 in. Poly
Source Dist. - 25 cm
Annihilation Radiation
744.179(30)
935.504(30)
346.062(50)
602.17(10)
600.225(50)
647.551(50)
848.125(30)
54 Mn
834
923
1246.250(40)
1434.047(30)
1333.624
1645.82
Sum 935 + 744
Sum 1434 + 511
1981.1(2)
Sum 1434 + 744
Sum 1434 + 935
Sum 935 + 511
Counts / Channel
Channel Number

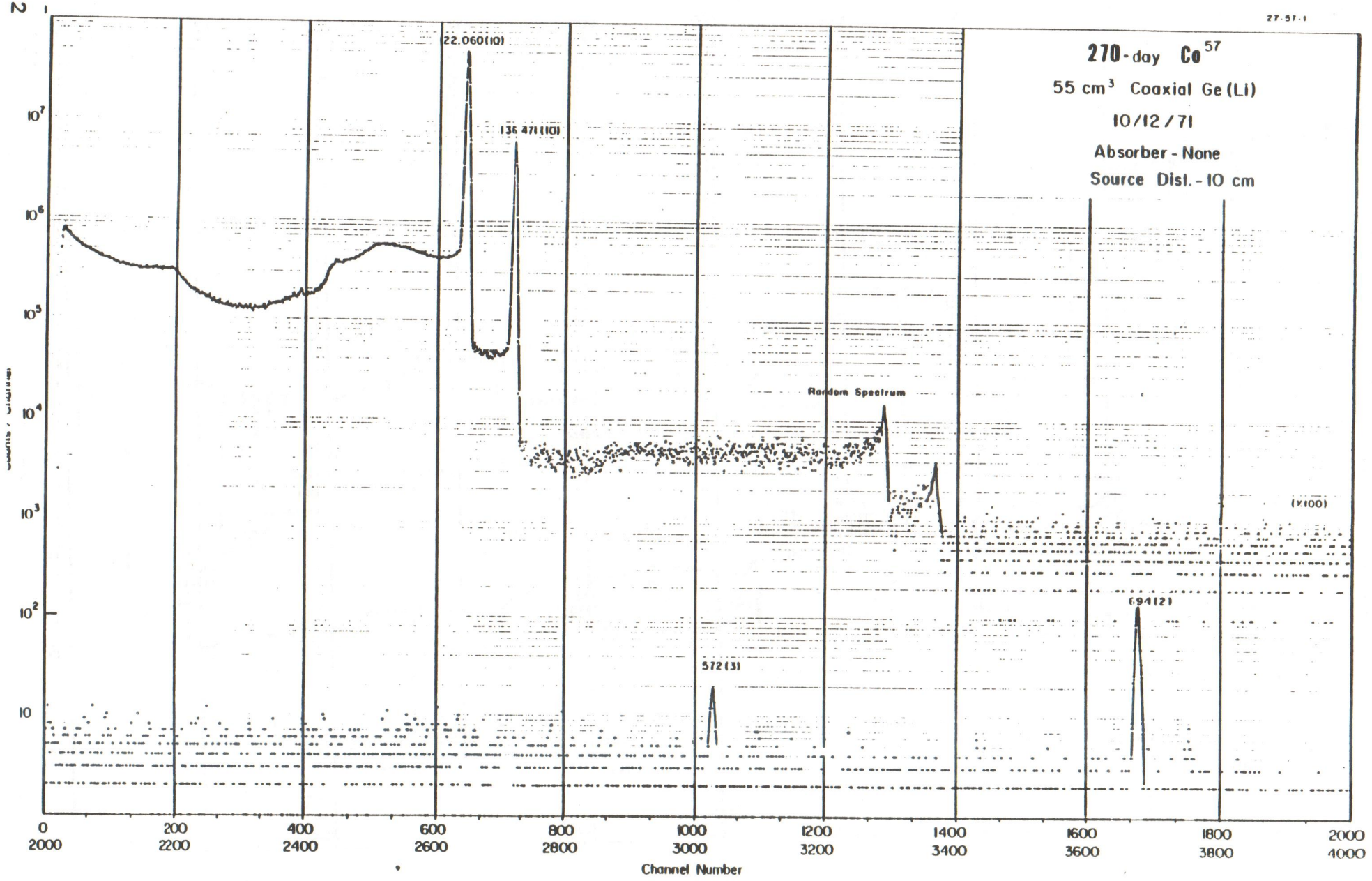

312.6-day Mn54
55cm3 Coaxial Ge (Li)
10-16-71
Absorber: None
Source Dist. 10cm
834.827 (21)
10^6
10^5
10^4
10^3
10^2
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Channel Number

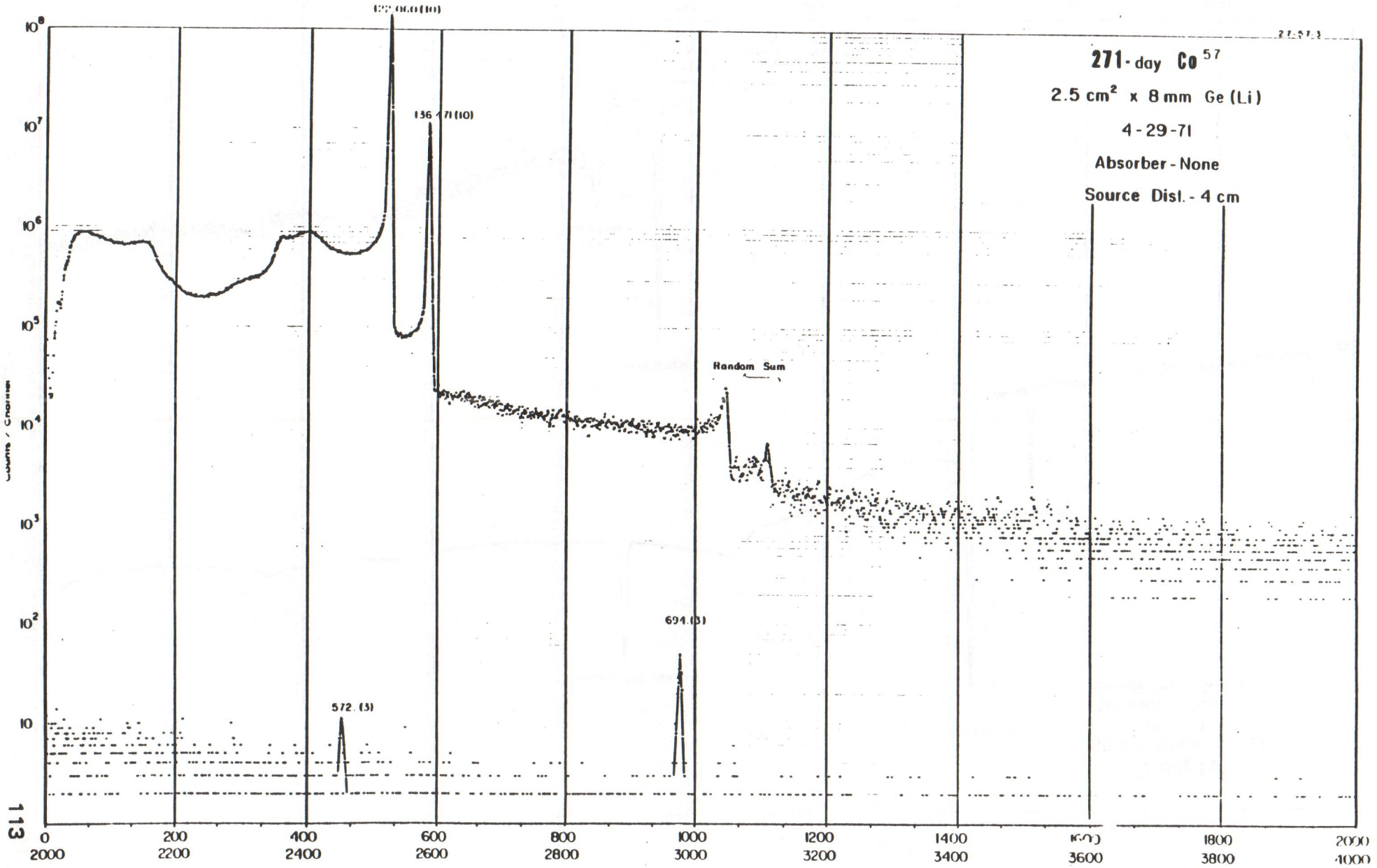

2.587-hr Mn56
35 cm3 coaxial Ge (Li)
3-11-70
Absorber - 1.26 g/cm2 Be
Source Dist - 15 cm
Backscatter
Annihilation Radiation
DE 788.96
846.751 (19)
DE 1091.17
1238
SE 1199
SE 1601
DE
1810.665 (39)
DE 1938
SE 2011
2113.040 (80)
SE 2166
DE 2348
2522.83 (8)
2657.386 (65)
SE 2858
2959.76 (9)
3369.54 (12)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10^2
10^3
10^4
10^5
10^6

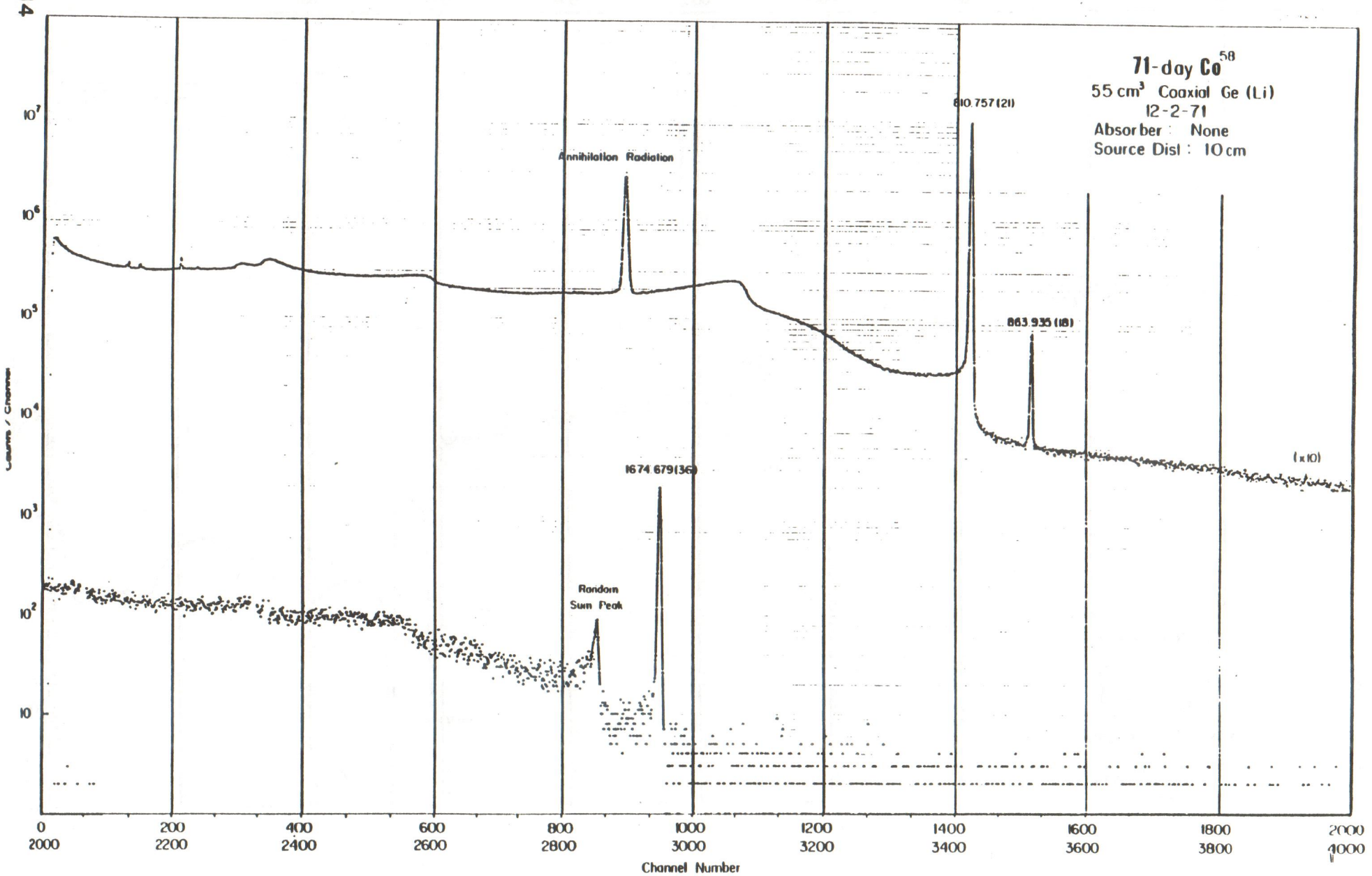

8.5- hr Fe 52
4.5 cm² x 8mm Ge (Li)
7/31/71
Absorber - None
Source Dist.- 1 cm
In Equilibrium With Mn 52m
168.772(20)
Annihilation Radiation
377 52m Mn
4.2 DE
Sum
168 + 511
52m Mn
1434.047(30)
Counts / Channel
10⁶
10⁵
10⁴
10³
10²
10
1
0
400
800
1200
1600
2000
2400
2800
3200
3600

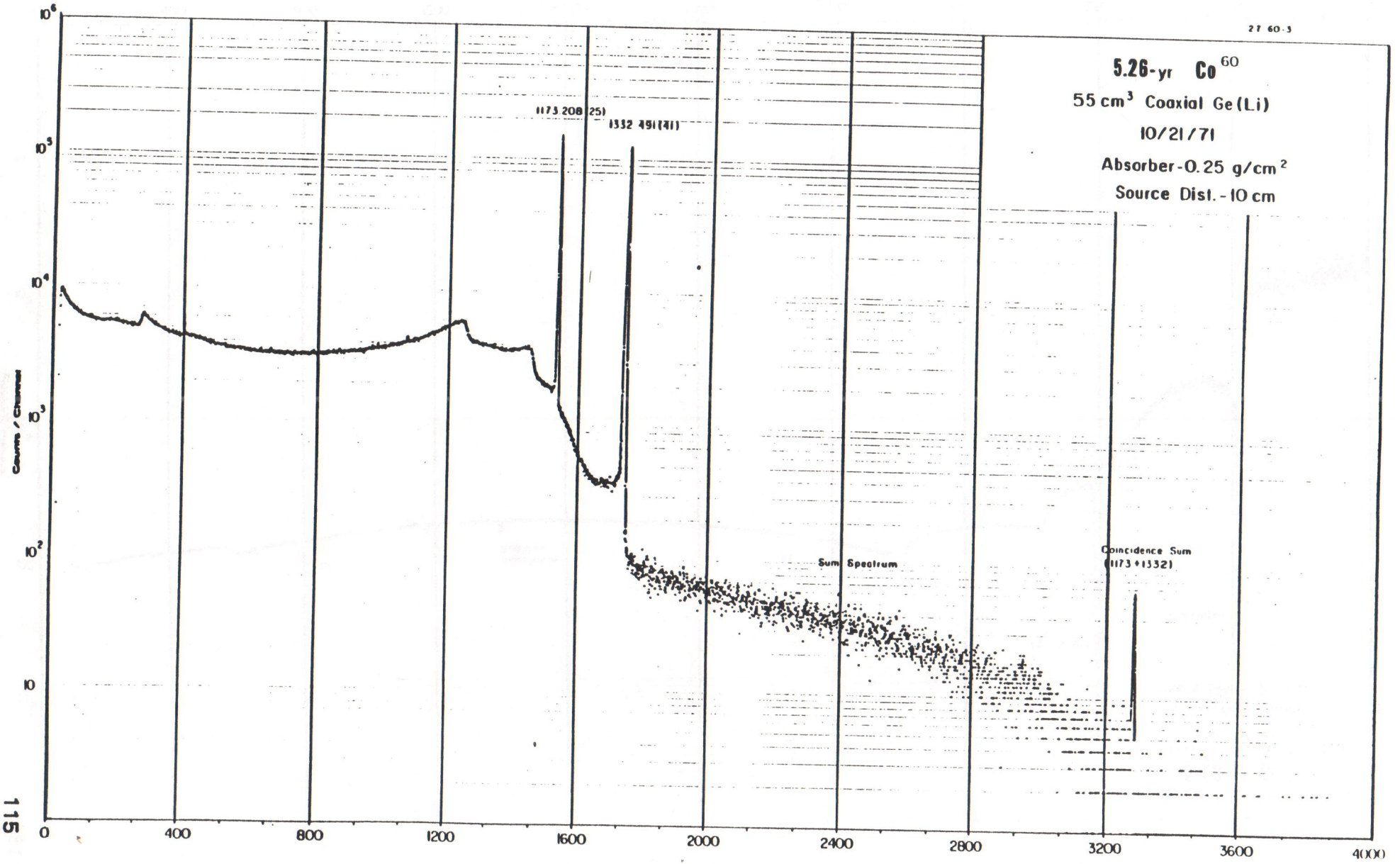

44.6-day Fe59
70 cm3 coaxial Ge (Li)
9-19-72
Source Dist 15 cm
Absorber - 1/8 in. poly
192.344 (8)
DE 269
334.992
382.56 (20)
Annihilation Radiation
1099.224 (25)
1291.564 (28)
Counts/Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3600
10
10²
10³
10⁴
10⁵
10⁶
10⁷

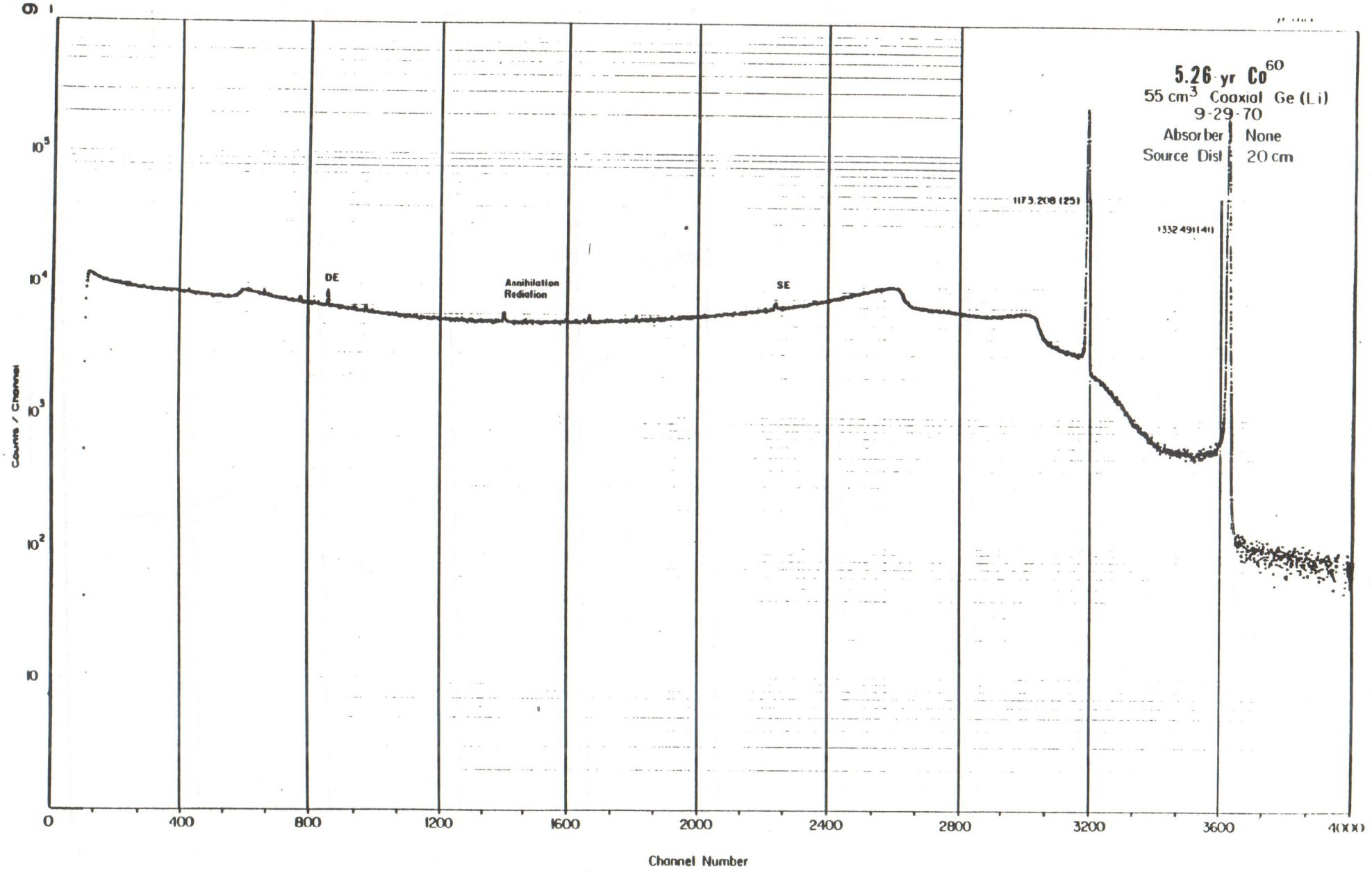

77.3-day Co 56
55 cm³ Coaxial Ge (Li)
10/22/71
Absorber - None
Source Dist. - 25 cm
Annihilation Radiation
Counts / Channel
Channel Number

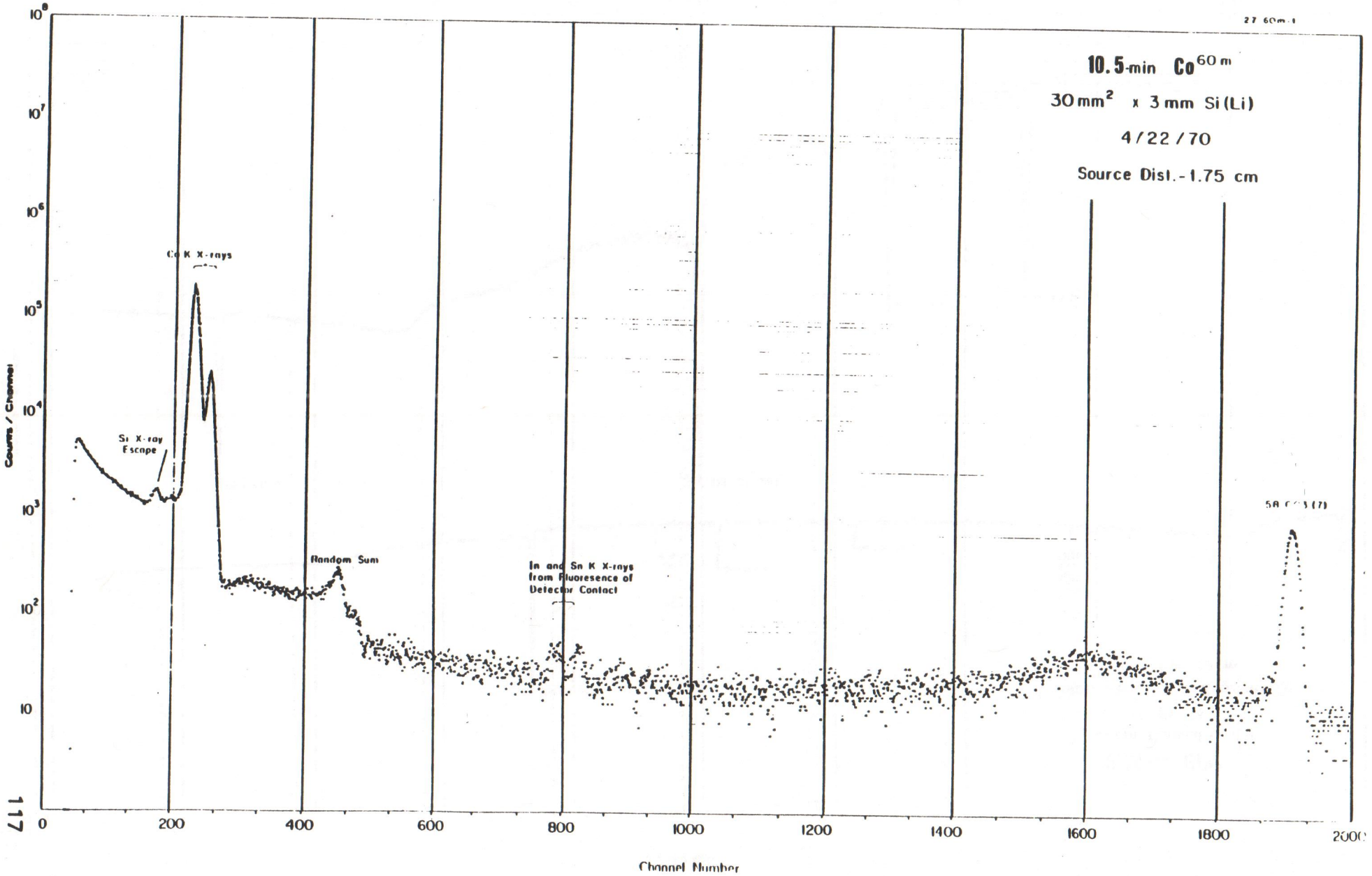

27-57-1
270-day Co57
55 cm3 Coaxial Ge(Li)
10/12/71
Absorber - None
Source Dist. - 10 cm
22.060(10)
136.471(10)
Random Spectrum
(x100)
694(2)
572(3)
10^7
10^6
10^5
10^4
10^3
10^2
10
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000
Channel Number

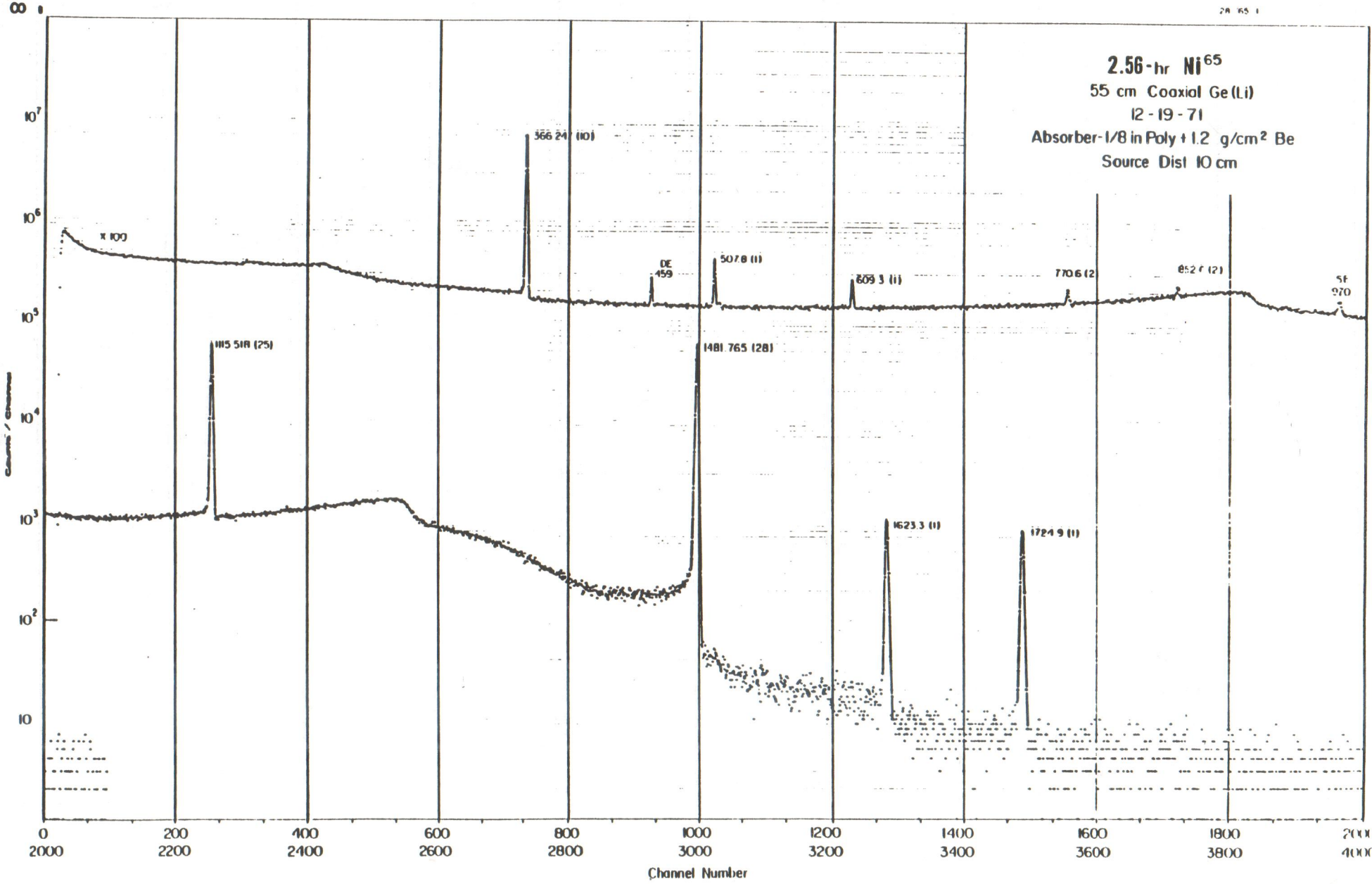

271-day Co 57
2.5 cm² x 8 mm Ge (Li)
4-29-71
Absorber - None
Source Dist. - 4 cm
Random Sum
572.(3)
694.(3)
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000

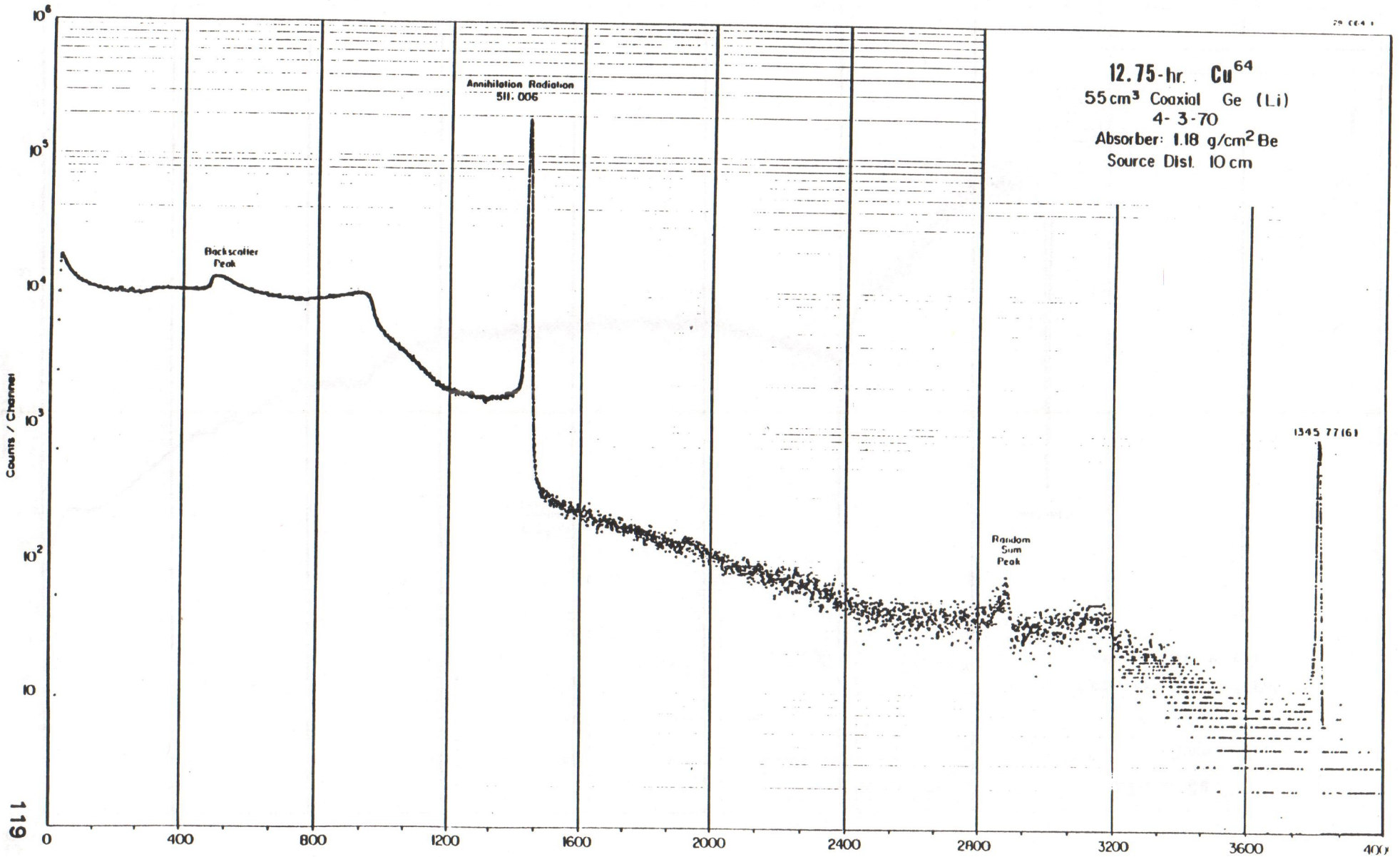

71-day Co58
55 cm3 Coaxial Ge (Li)
12-2-71
Absorber : None
Source Dist : 10 cm
Annihilation Radiation
810.757(21)
863.935(18)
1674.679(36)
Random
Sum Peak
(x10)
Counts / Channel
10
10^2
10^3
10^4
10^5
10^6
10^7
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000
Channel Number

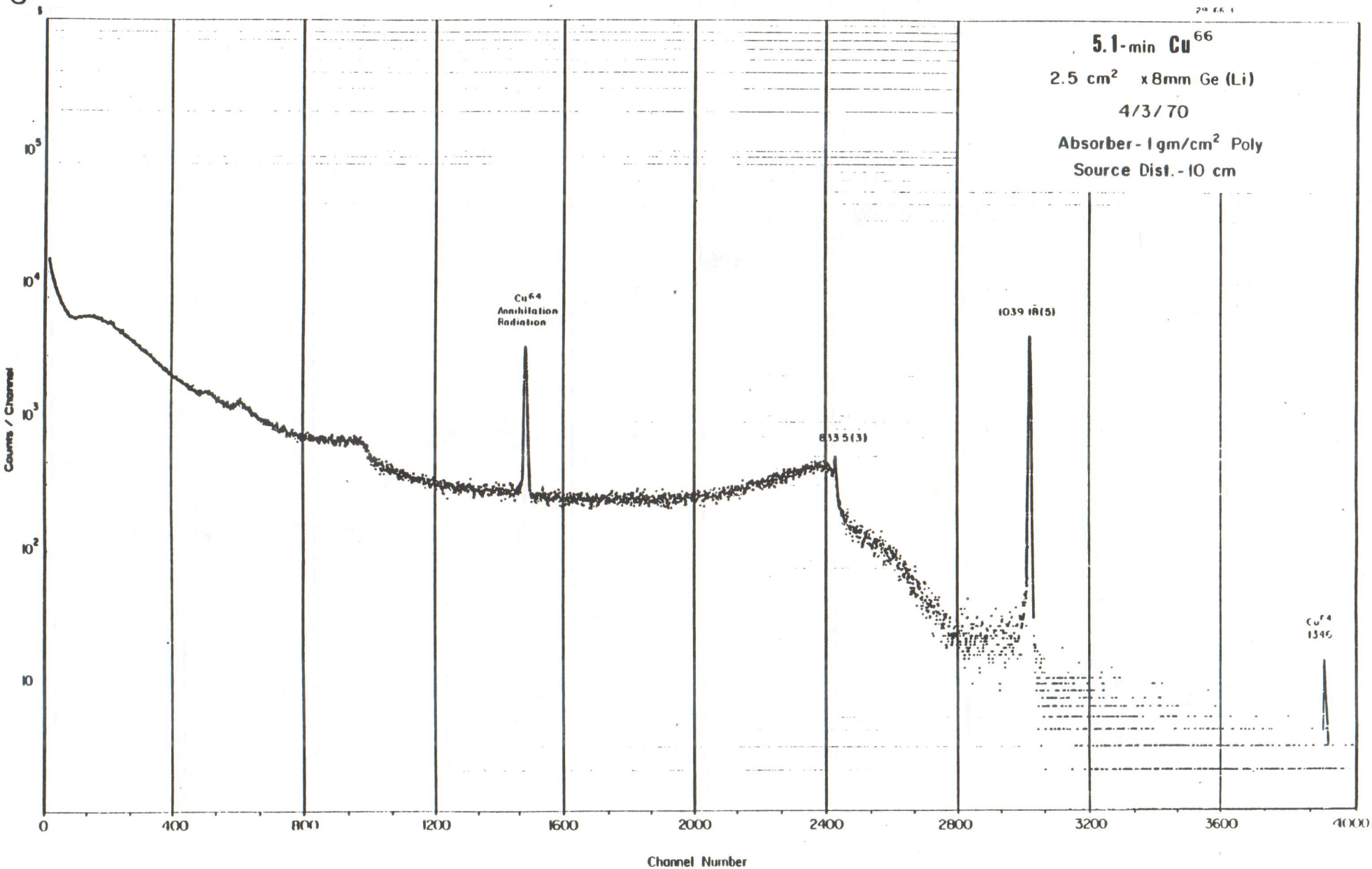

27 60-3
5.26-yr Co 60
55 cm3 Coaxial Ge(Li)
10/21/71
Absorber-0.25 g/cm2
Source Dist.-10 cm
1173.208(25)
1332.491(41)
Sum Spectrum
Coincidence Sum
(1173+1332)
Counts / Channel
10^6
10^5
10^4
10^3
10^2
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

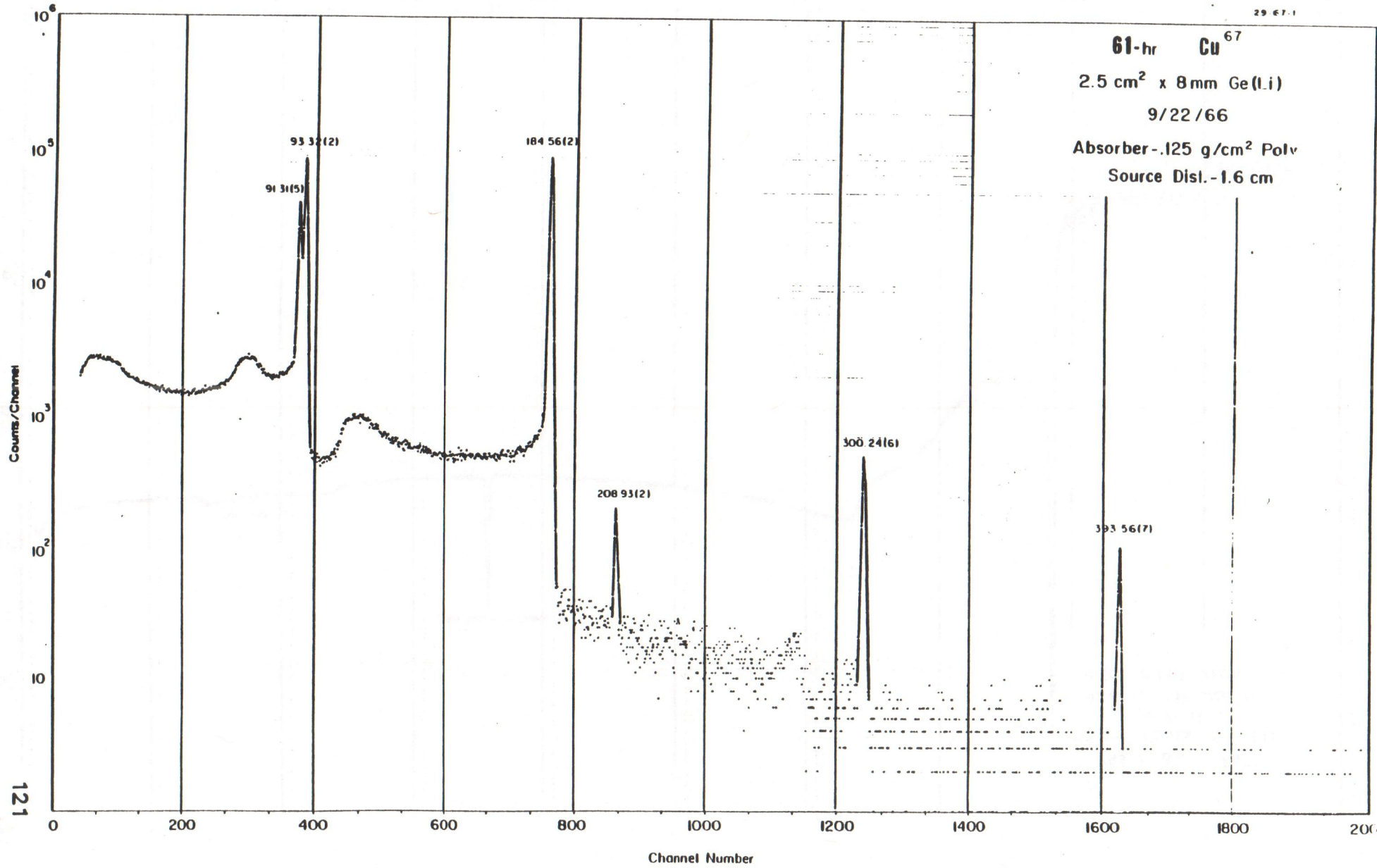

5.26 yr Co60
55 cm3 Coaxial Ge (Li)
9-29-70
Absorber None
Source Dist 20 cm
1173.208 (25)
1332.491 (41)
DE
Annihilation Radiation
SE
Counts / Channel
10
10²
10³
10⁴
10⁵
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Channel Number

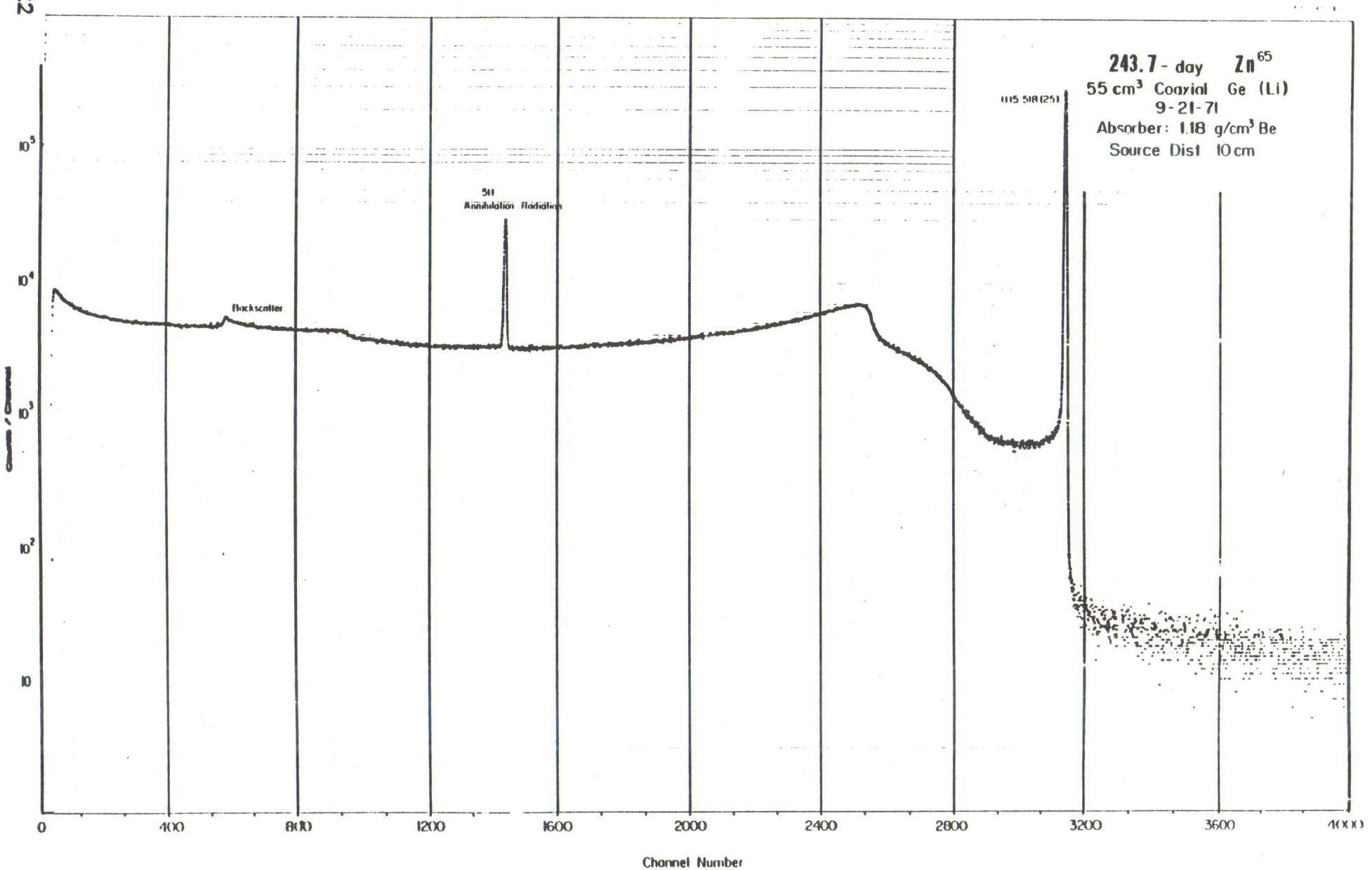

10.5-min Co60m
30 mm2 x 3 mm Si(Li)
4/22/70
Source Dist.-1.75 cm
Co K X-rays
Si X-ray Escape
Random Sum
In and Sn K X-rays from Fluoresence of Detector Contact
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸

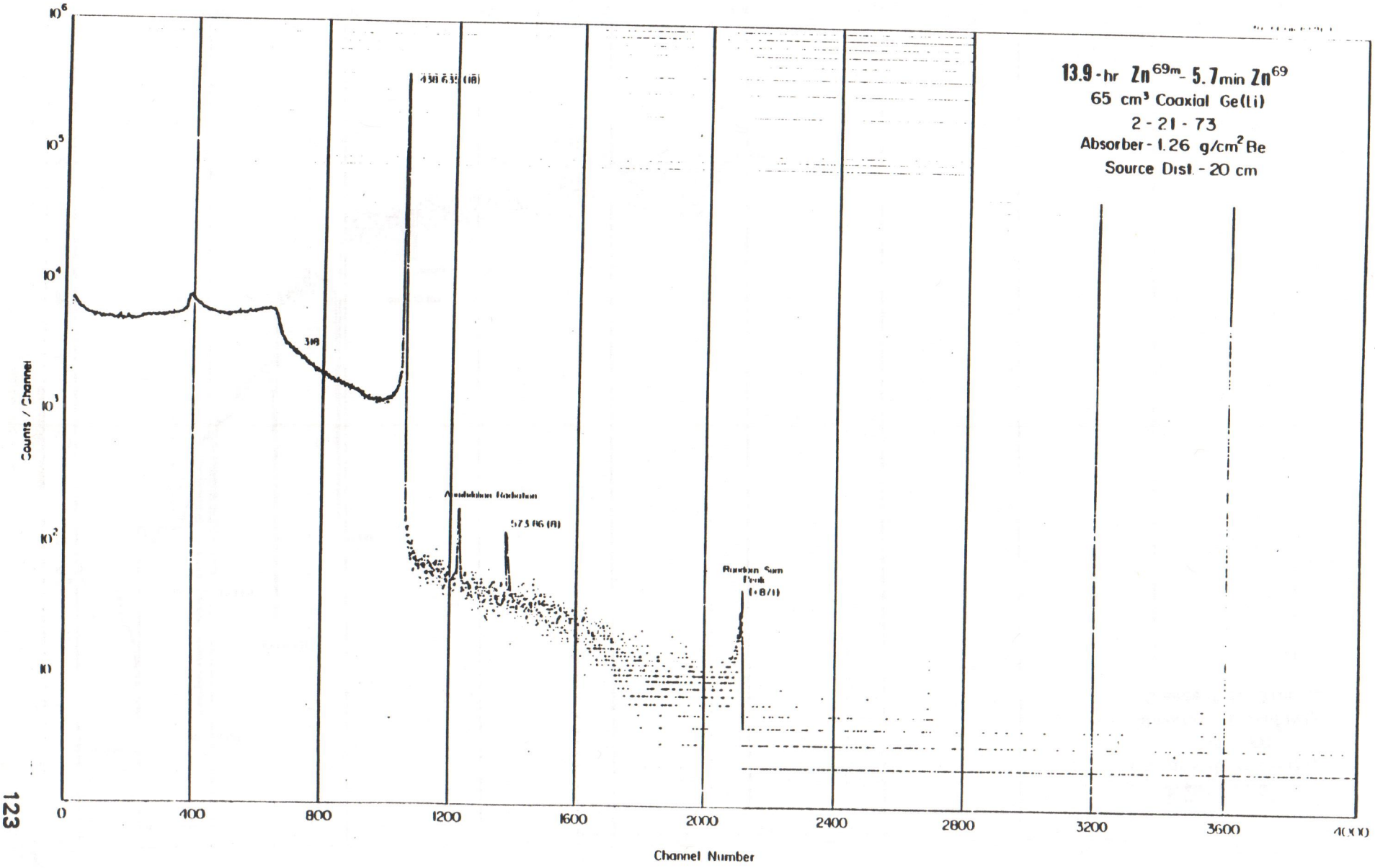

2.56-hr Ni65
55 cm Coaxial Ge(Li)
12-19-71
Absorber-1/8 in Poly + 1.2 g/cm2 Be
Source Dist 10 cm
366.24 (10)
DE 459
507.8 (1)
609.3 (1)
770.6 (2)
852.7 (2)
SE 970
x 100
1115.518 (25)
1481.765 (28)
1623.3 (1)
1724.9 (1)
Counts / Channel
Channel Number

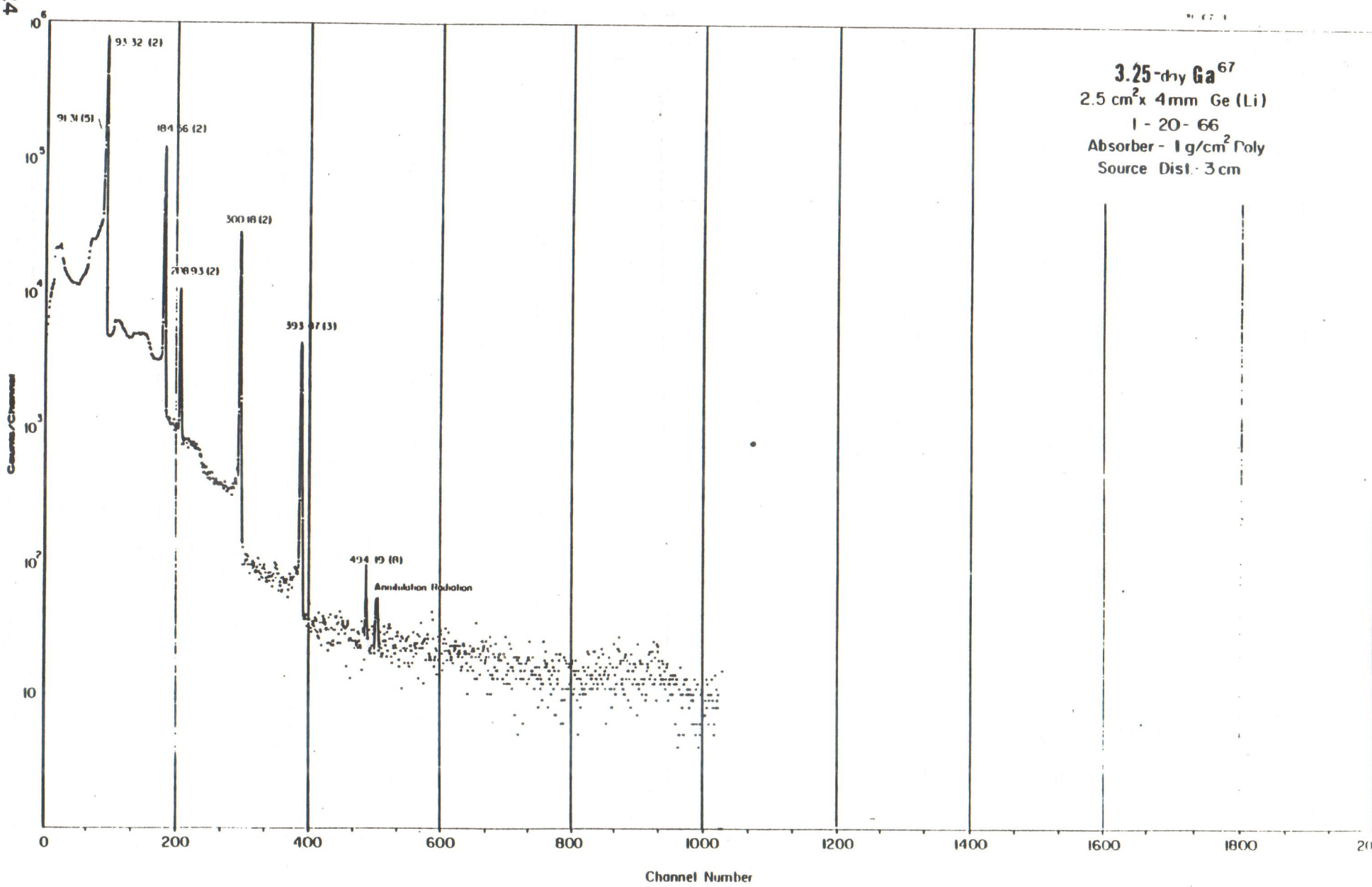

12.75-hr. Cu64
55 cm3 Coaxial Ge (Li)
4-3-70
Absorber: 1.18 g/cm2 Be
Source Dist. 10 cm
Annihilation Radiation
511.006
Backscatter Peak
Random Sum Peak
1345.77(6)
Counts / Channel
10^6
10^5
10^4
10^3
10^2
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

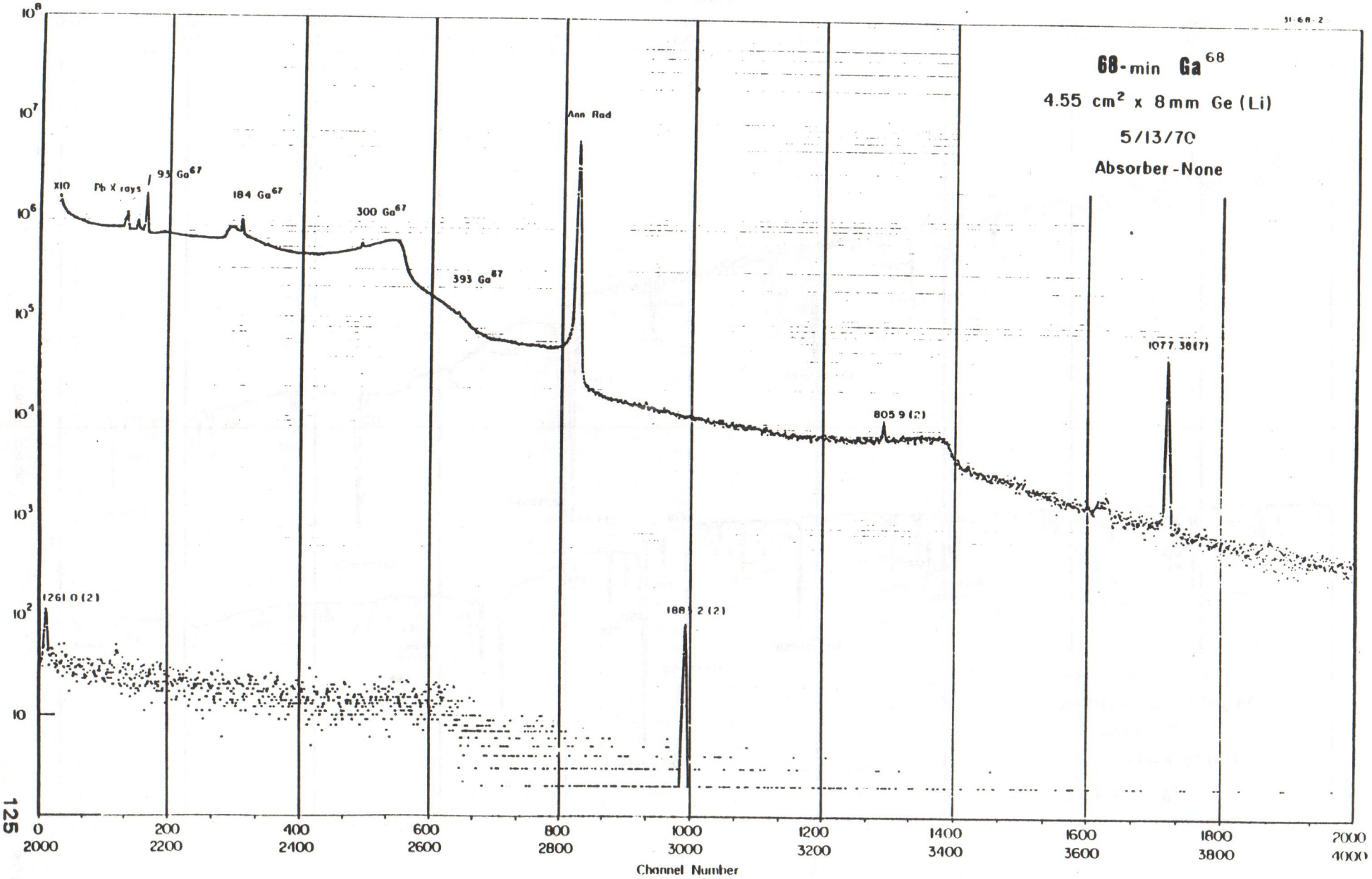

5.1-min Cu66
2.5 cm2 x 8mm Ge (Li)
4/3/70
Absorber - 1 gm/cm2 Poly
Source Dist. - 10 cm
Cu64 Annihilation Radiation
1039 18(5)
833 5(3)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵

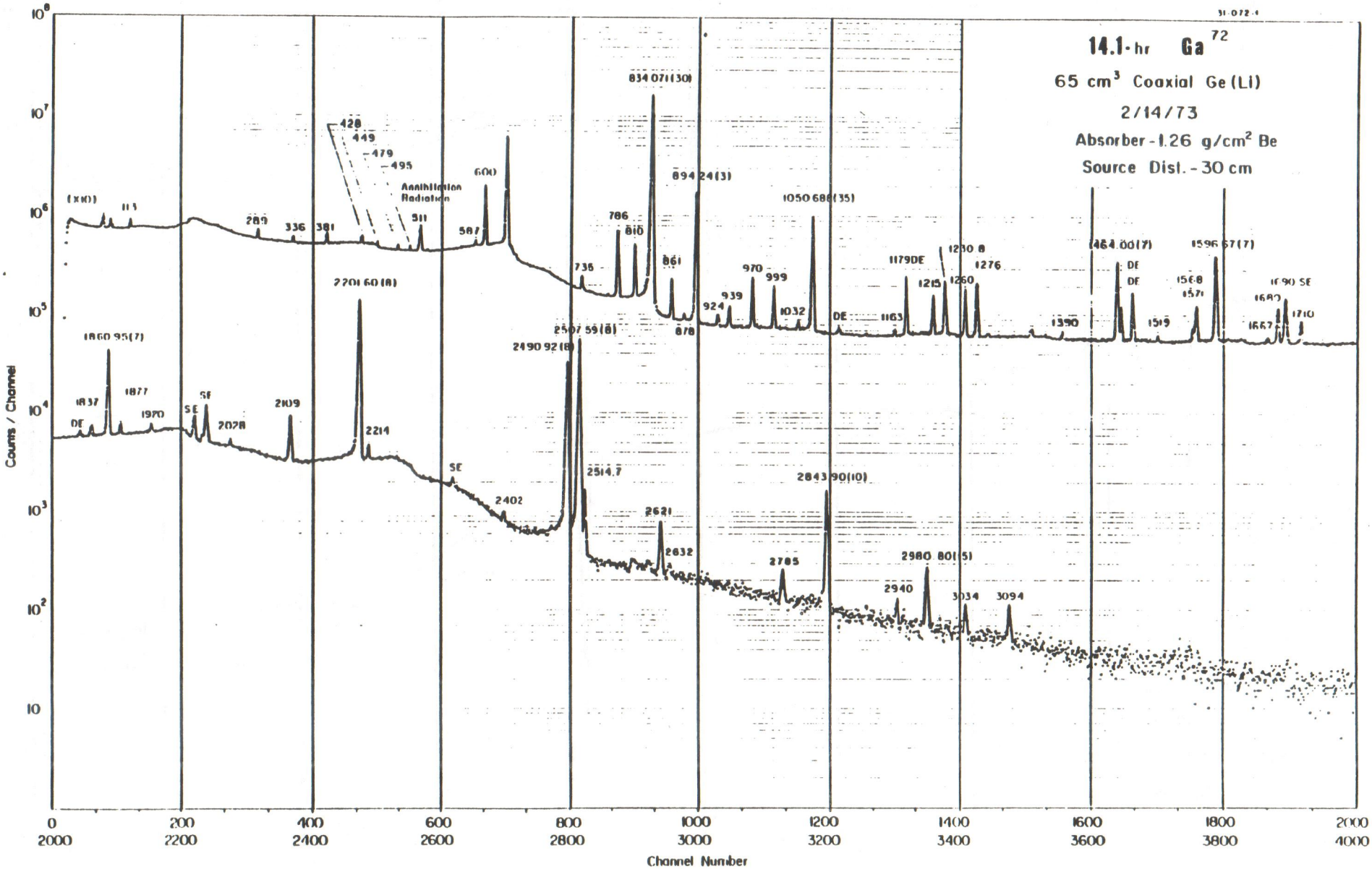

61-hr Cu67
2.5 cm2 x 8mm Ge(Li)
9/22/66
Absorber-.125 g/cm2 Poly
Source Dist.-1.6 cm
93.32(2)
91.31(5)
184.56(2)
208.93(2)
300.24(6)
393.56(7)
Counts/Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
200
400
600
800
1000
1200
1400
1600
1800

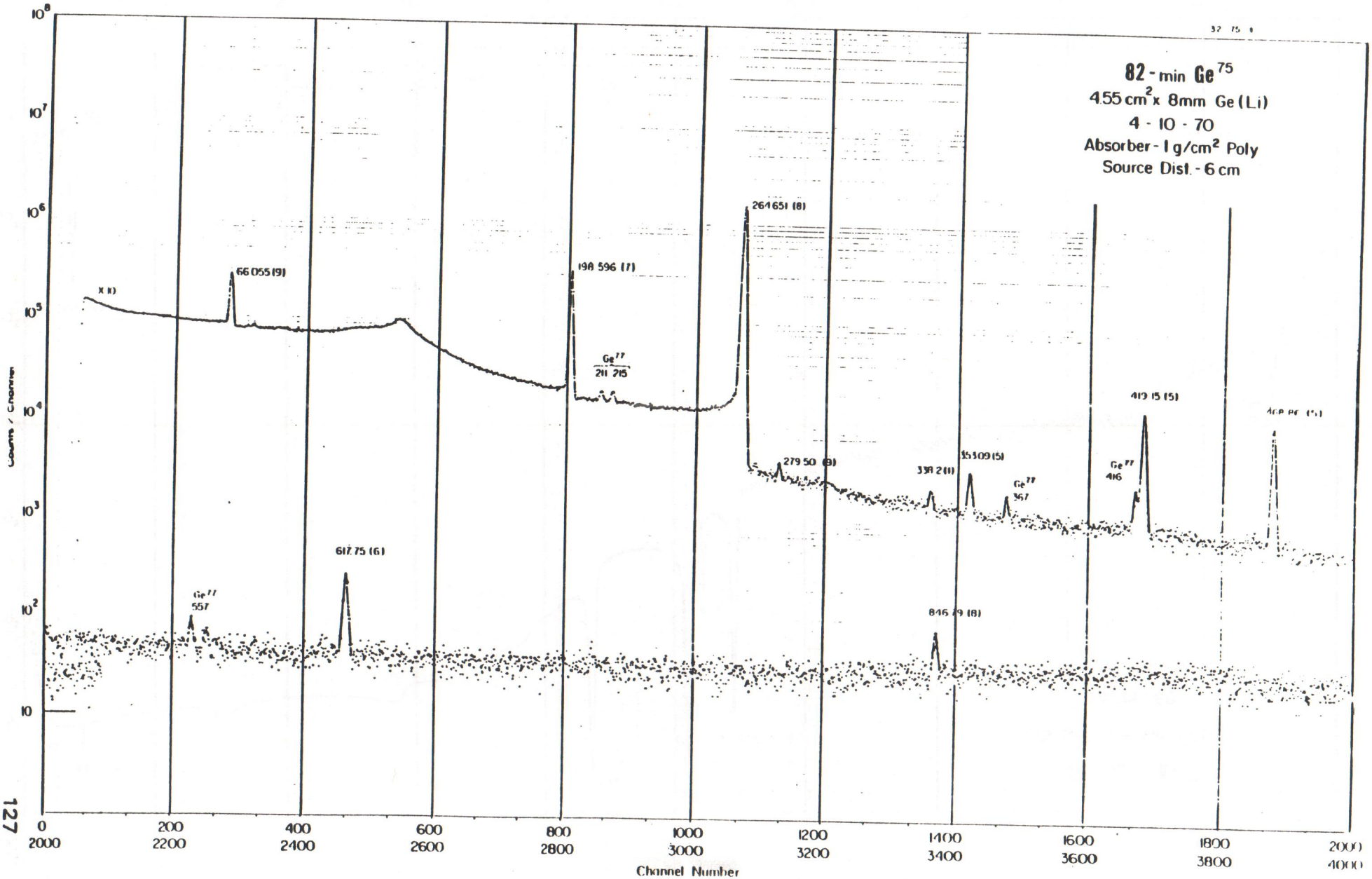

243.7 - day Zn65
55 cm3 Coaxial Ge (Li)
9-21-71
Absorber: 1.18 g/cm3 Be
Source Dist 10 cm
1115.518(25)
511
Annihilation Radiation
Backscatter
10
10²
10³
10⁴
10⁵
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Channel Number

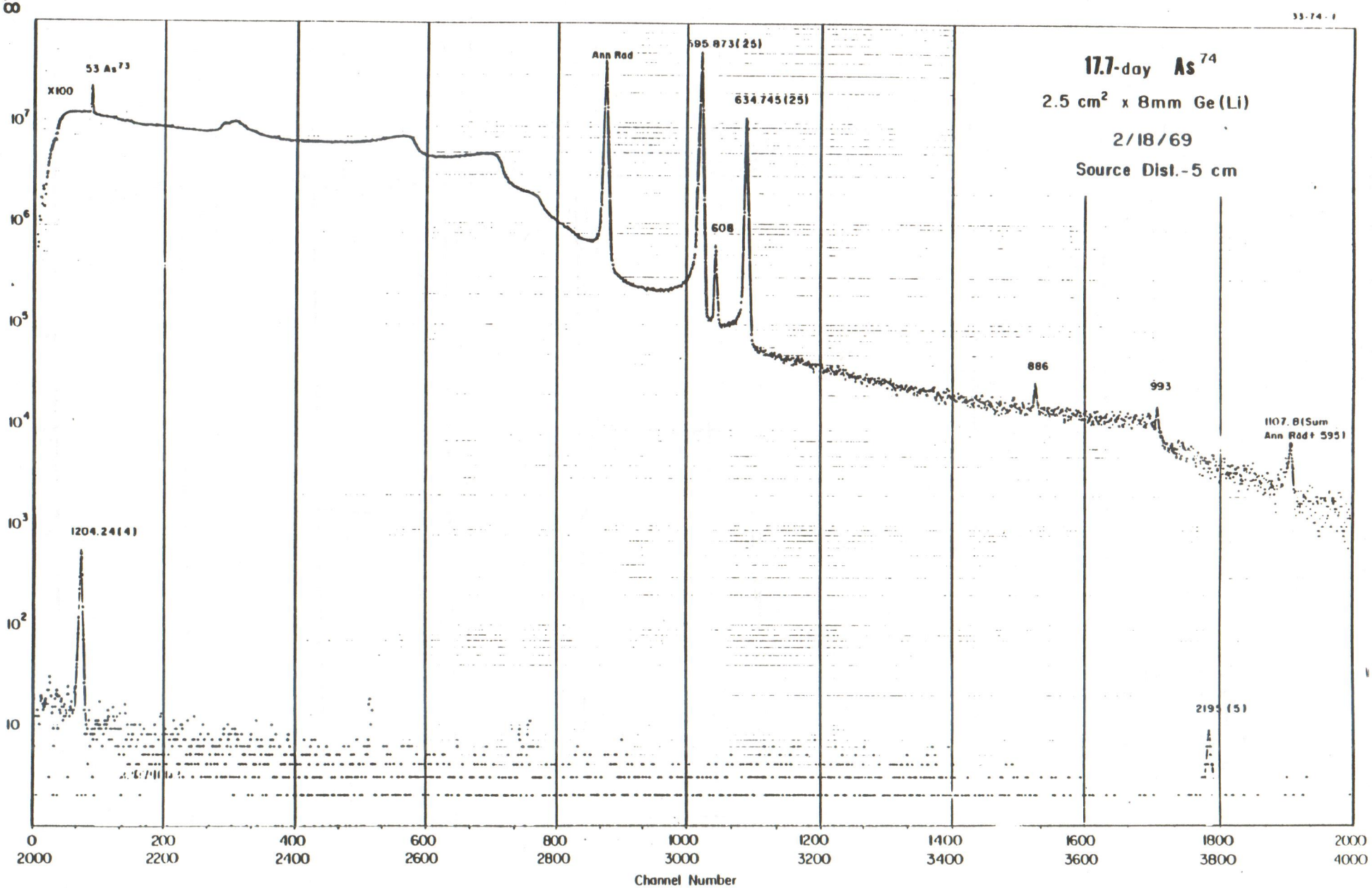

13.9-hr Zn69m - 5.7min Zn69
65 cm3 Coaxial Ge(Li)
2 - 21 - 73
Absorber - 1.26 g/cm2 Be
Source Dist. - 20 cm
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10^2
10^3
10^4
10^5
10^6

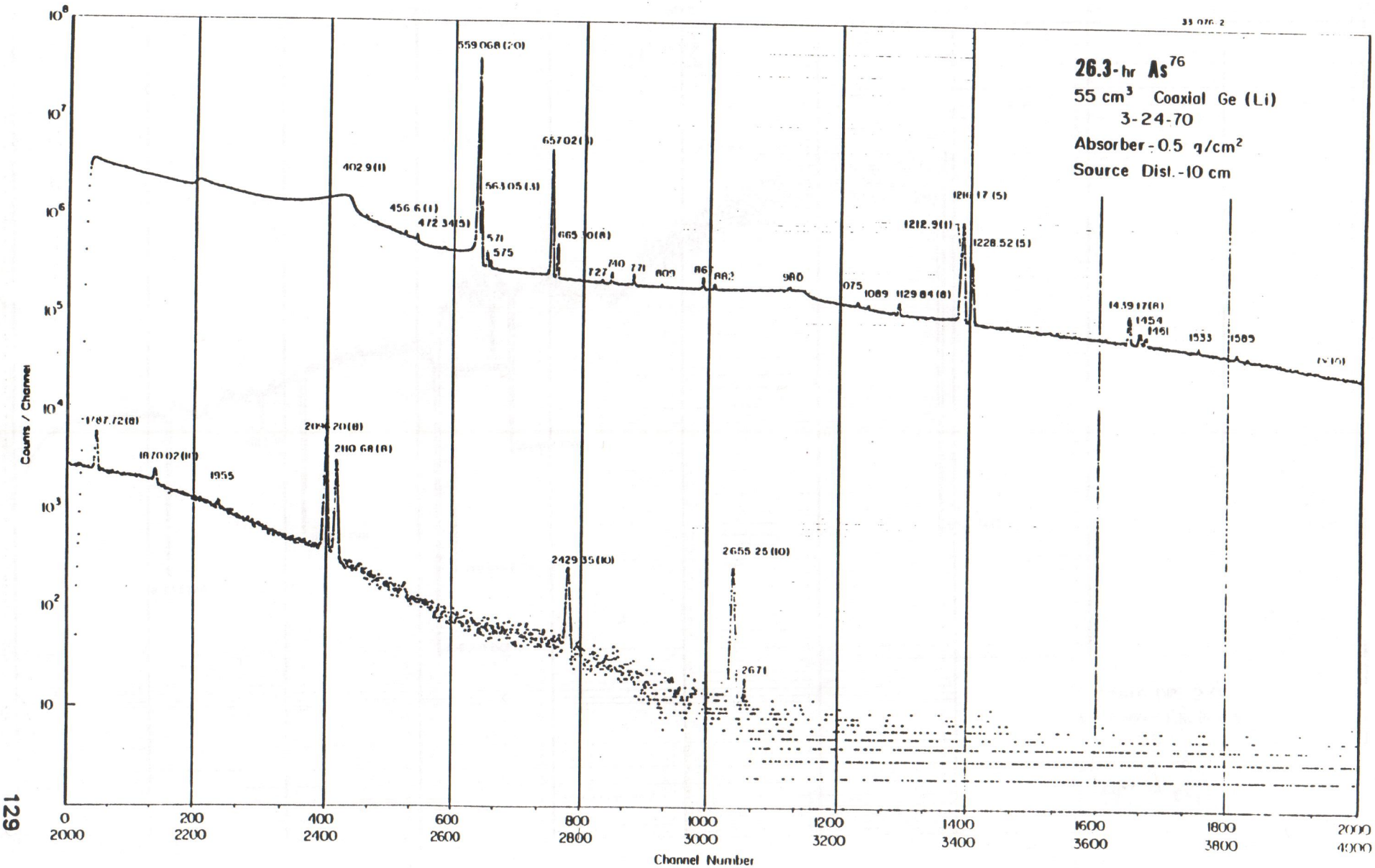

3.25-day Ga67
2.5 cm2 x 4mm Ge (Li)
1 - 20 - 66
Absorber - 1 g/cm2 Poly
Source Dist. - 3 cm
93.32 (2)
91.31 (5)
184.56 (2)
208.93 (2)
300.18 (2)
393.97 (3)
494.19 (8)
Annihilation Radiation
Counts/Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
10
10^2
10^3
10^4
10^5
10^6

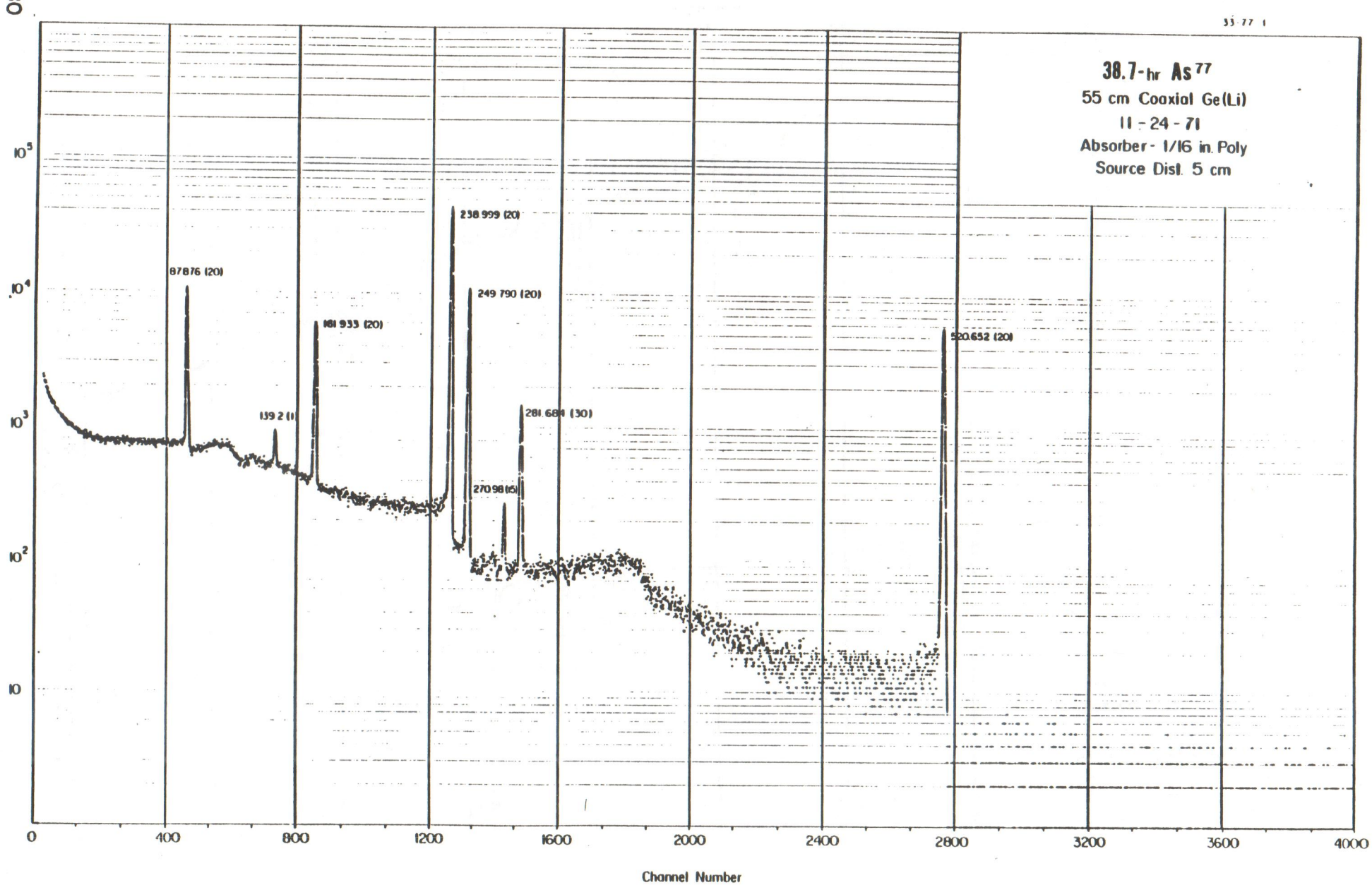

68-min Ga68
4.55 cm² x 8mm Ge (Li)
5/13/70
Absorber - None
Ann Rad
X10
Pb X rays
93 Ga67
184 Ga67
300 Ga67
393 Ga67
1077.38(7)
805.9(2)
1261.0(2)
188.2(2)
Channel Number

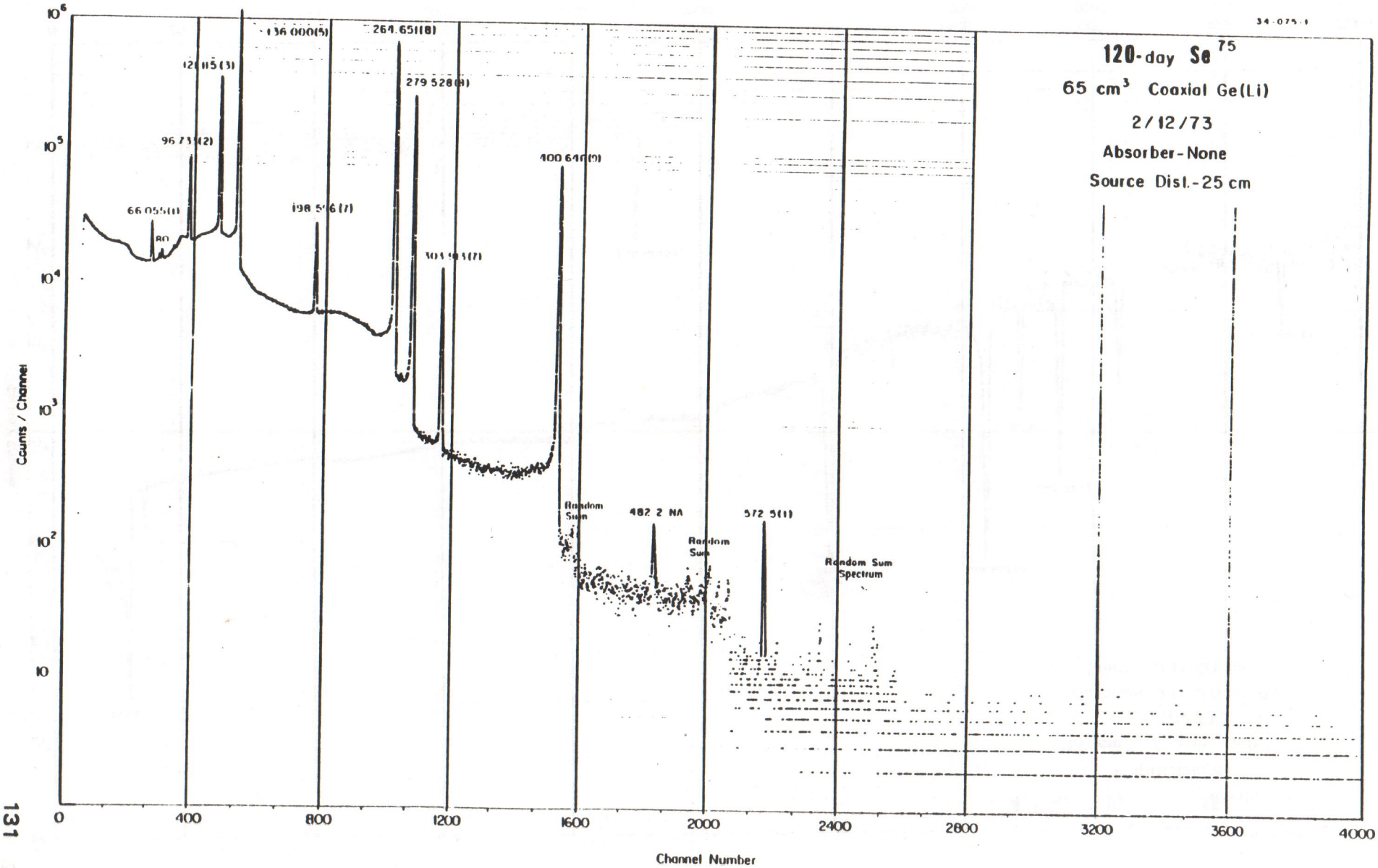

14.1-hr Ga 72
65 cm3 Coaxial Ge(Li)
2/14/73
Absorber - 1.26 g/cm2 Be
Source Dist. - 30 cm
Counts / Channel
Channel Number
Annihilation Radiation
834.07(30)
894.24(3)
1050.68(35)
1464.00(7)
1596.67(7)
2201.60(8)
2490.92(8)
2507.59(8)
2843.90(10)
2980.80(5)

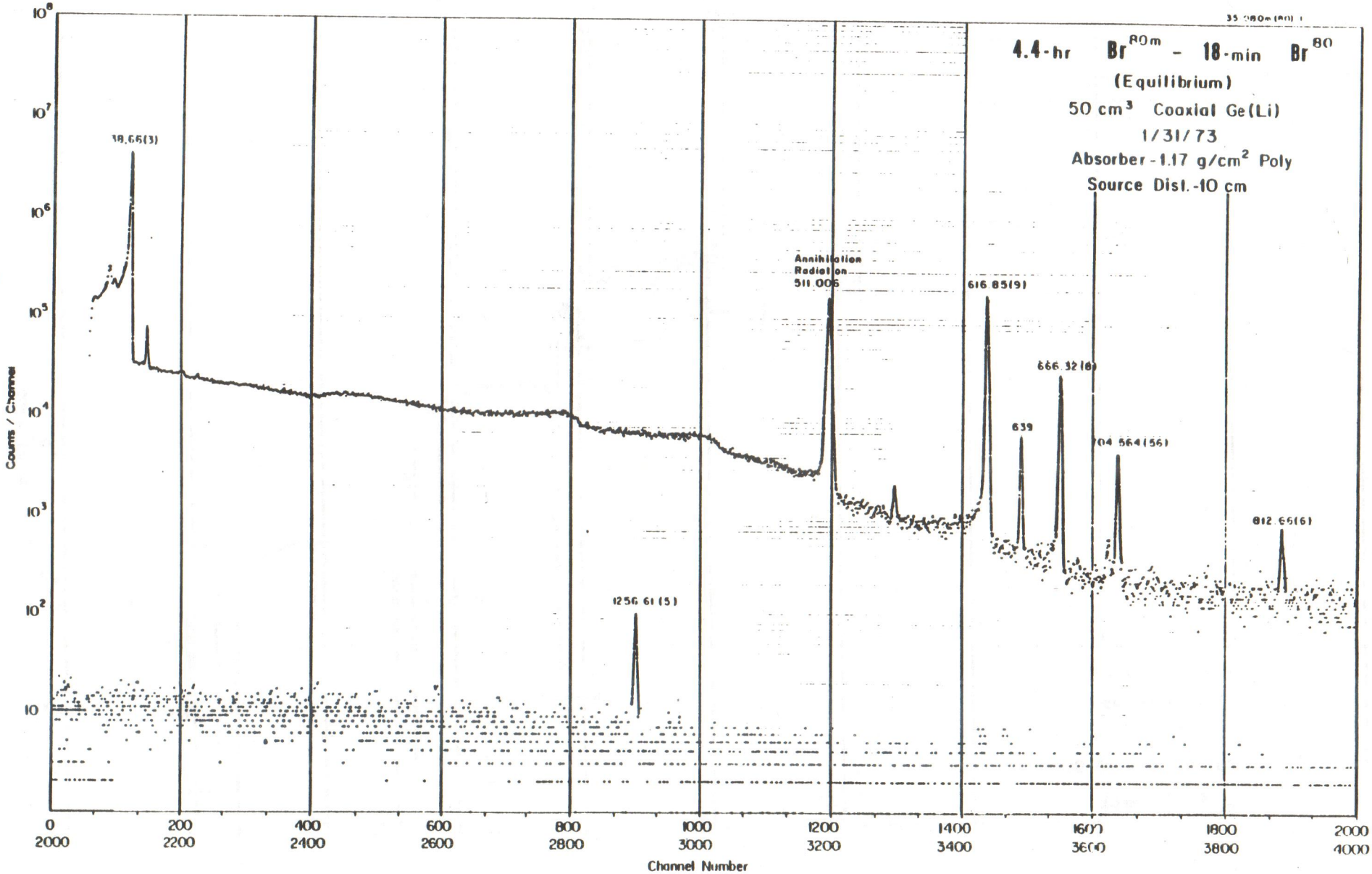

82 - min Ge 75
4.55 cm² x 8mm Ge (Li)
4 - 10 - 70
Absorber - 1 g/cm² Poly
Source Dist. - 6 cm
Counts / Channel
Channel Number
66.055 (9)
198.596 (7)
264.651 (8)
617.75 (6)
419.15 (5)
Ge 77
557
Ge 77
211.215
Ge 77
416
Ge 77
367
279.50
338.2 (1)
353.09 (5)
846.79 (8)
X 10

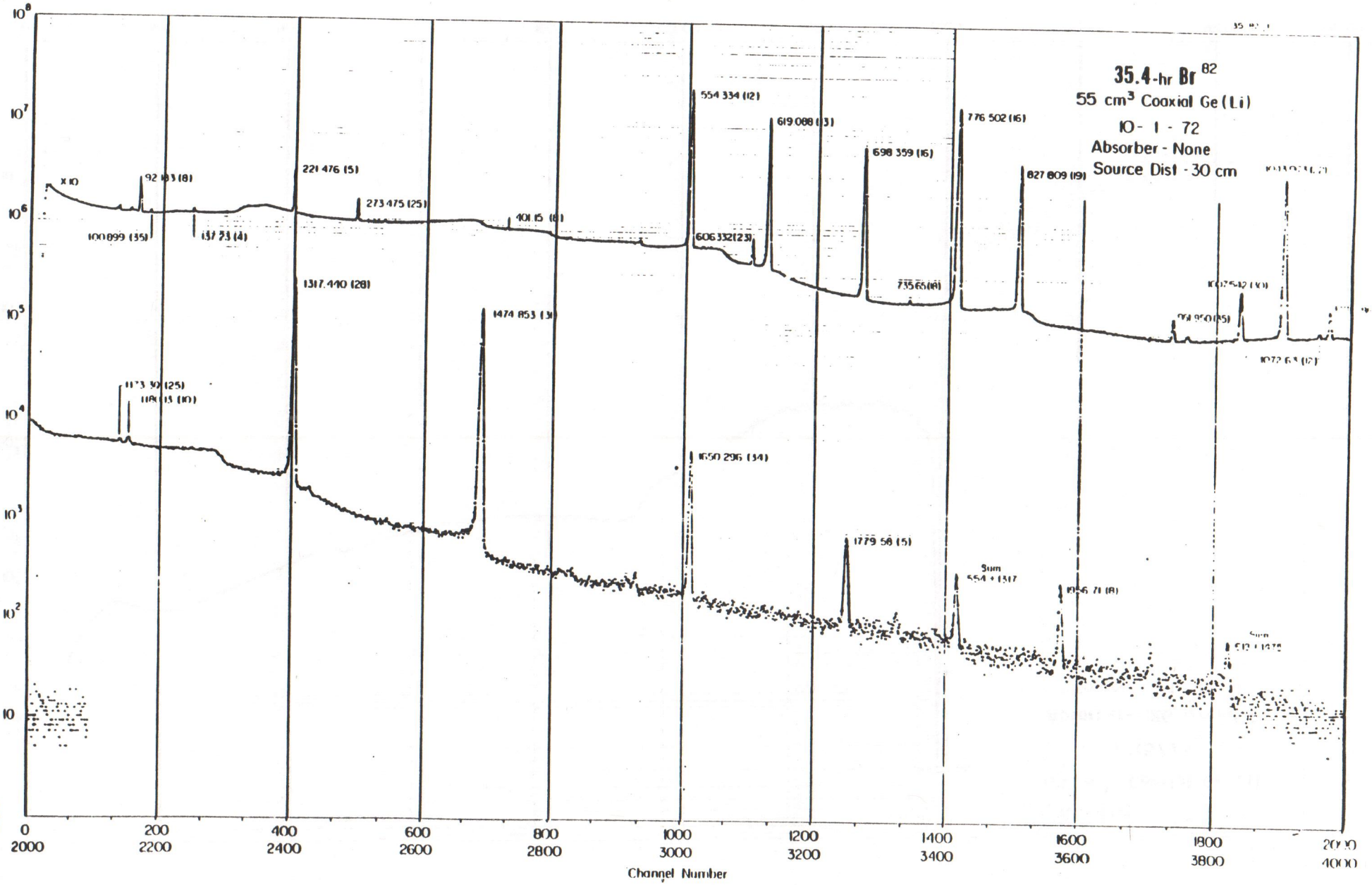

17.7-day As 74
2.5 cm² x 8mm Ge(Li)
2/18/69
Source Dist.-5 cm
53 As 73
X100
Ann Rad
595.873(25)
634.745(25)
608
886
993
1107.8(Sum Ann Rad+595)
1204.24(4)
2195 (5)
10⁷
10⁶
10⁵
10⁴
10³
10²
10
0 200 400 600 800 1000 1200 1400 1600 1800 2000
2000 2200 2400 2600 2800 3000 3200 3400 3600 3800 4000
Channel Number

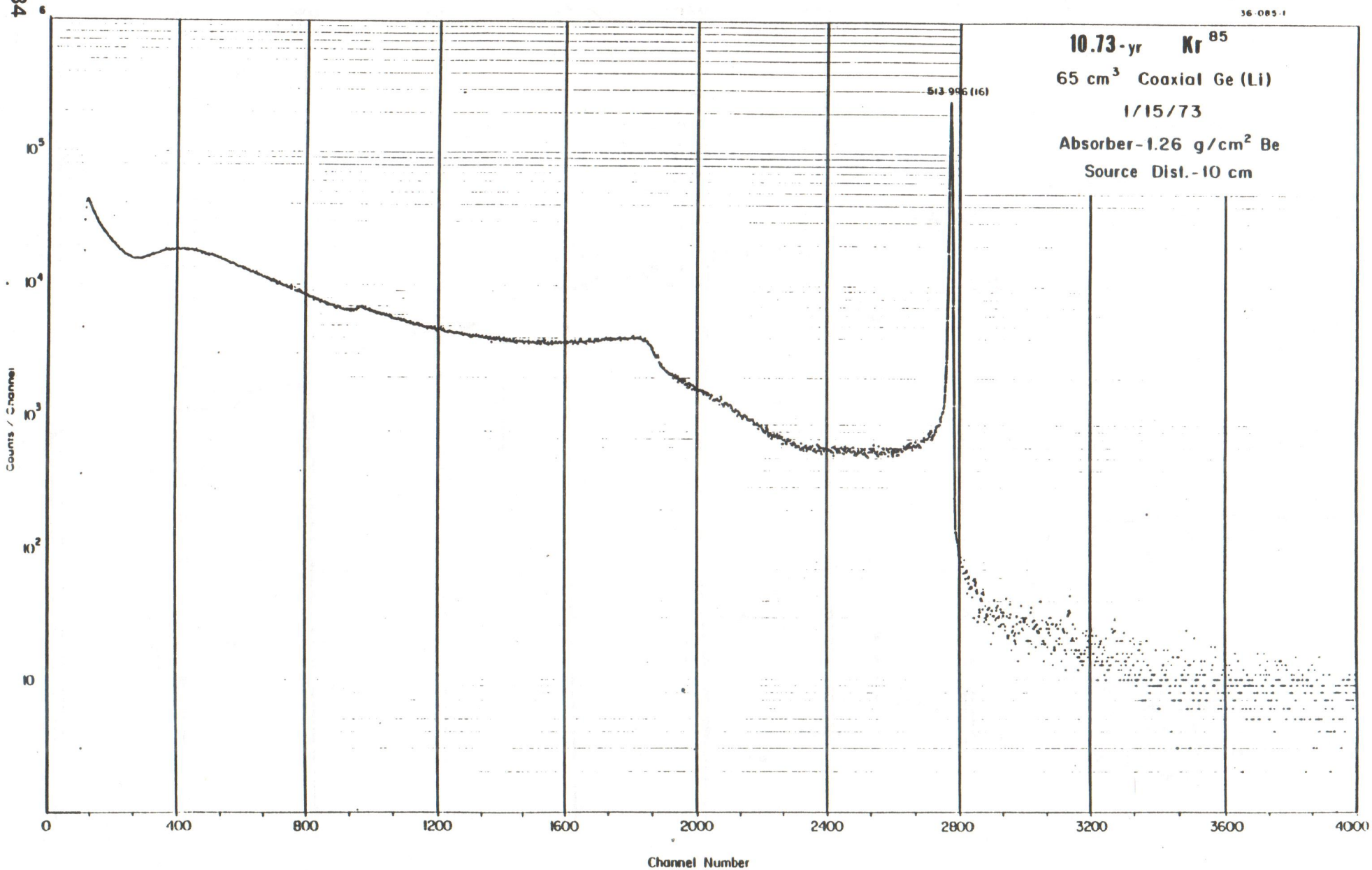

26.3-hr As76
55 cm3 Coaxial Ge (Li)
3-24-70
Absorber - 0.5 g/cm2
Source Dist. - 10 cm
559.068 (20)
657.02
402.9 (1)
456.6 (1)
472.34 (5)
563.05 (3)
571
575
727
740
771
809
882
980
1089
1129.84 (8)
1212.9 (1)
1228.52 (5)
1439.17 (8)
1454
1461
1533
1585
1955
2429.35 (10)
2655.25 (10)
2671
Counts / Channel
Channel Number

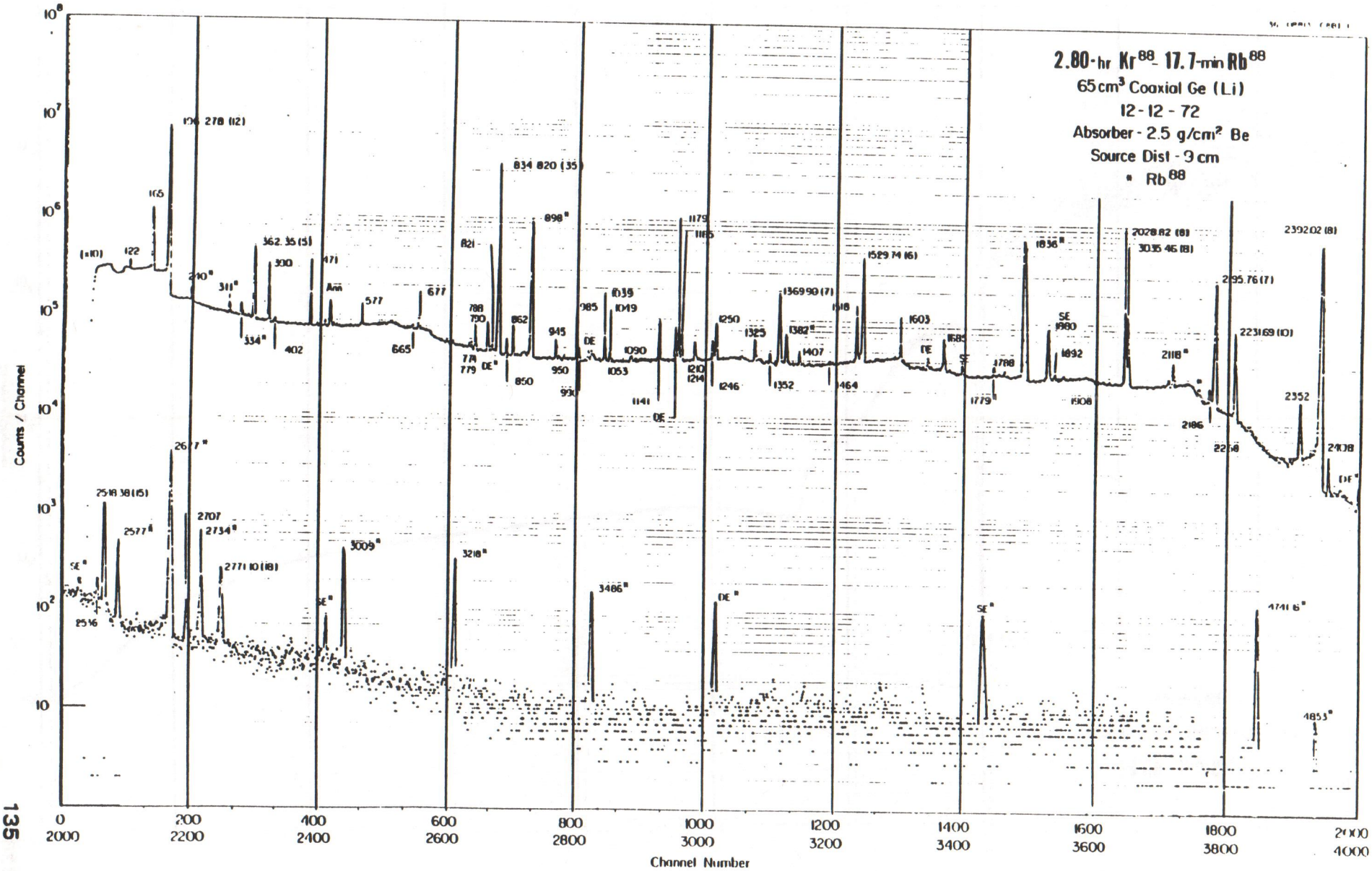

38.7-hr As77
55 cm Coaxial Ge(Li)
11-24-71
Absorber - 1/16 in. Poly
Source Dist. 5 cm
87.876 (20)
139.2 (1)
181.933 (20)
238.999 (20)
249.790 (20)
270.98 (5)
281.684 (30)
520.652 (20)
10
10²
10³
10⁴
10⁵
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Channel Number

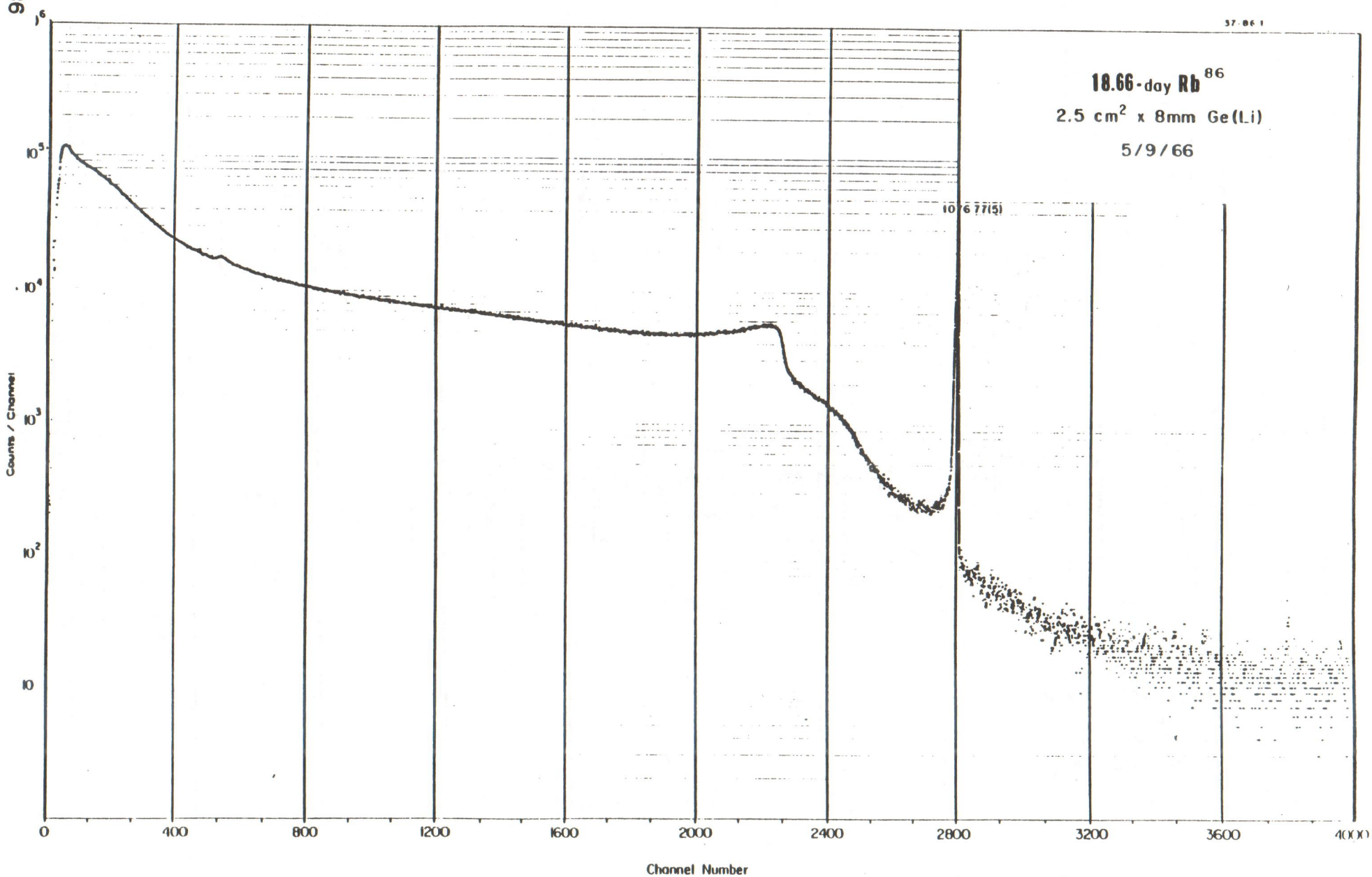

120-day Se 75
65 cm3 Coaxial Ge(Li)
2/12/73
Absorber-None
Source Dist.-25 cm
Counts / Channel
Channel Number
Random Sum
Random Sum Spectrum
482 2 NA
572 5(1)
400 640(9)
279 528(4)
264.65(18)
136 000(5)
198 5 6(7)
96 73(2)
66 055(1)
80

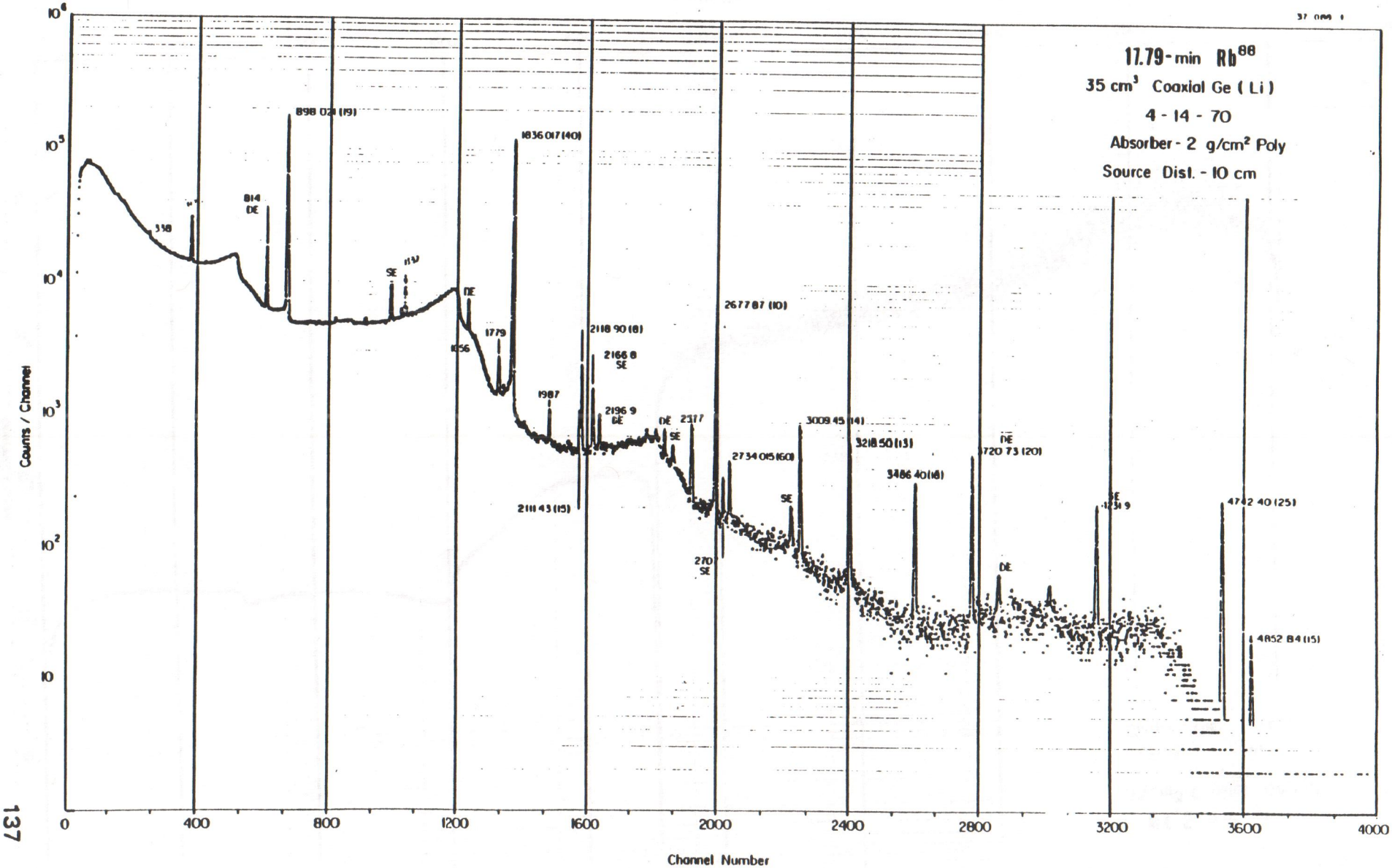

4.4-hr Br80m - 18-min Br80
(Equilibrium)
50 cm3 Coaxial Ge(Li)
1/31/73
Absorber - 1.17 g/cm2 Poly
Source Dist.-10 cm
Annihilation Radiation 511.006
616.85(9)
639
666.32(8)
704.564(56)
812.66(6)
1256.61(5)
Counts / Channel
Channel Number

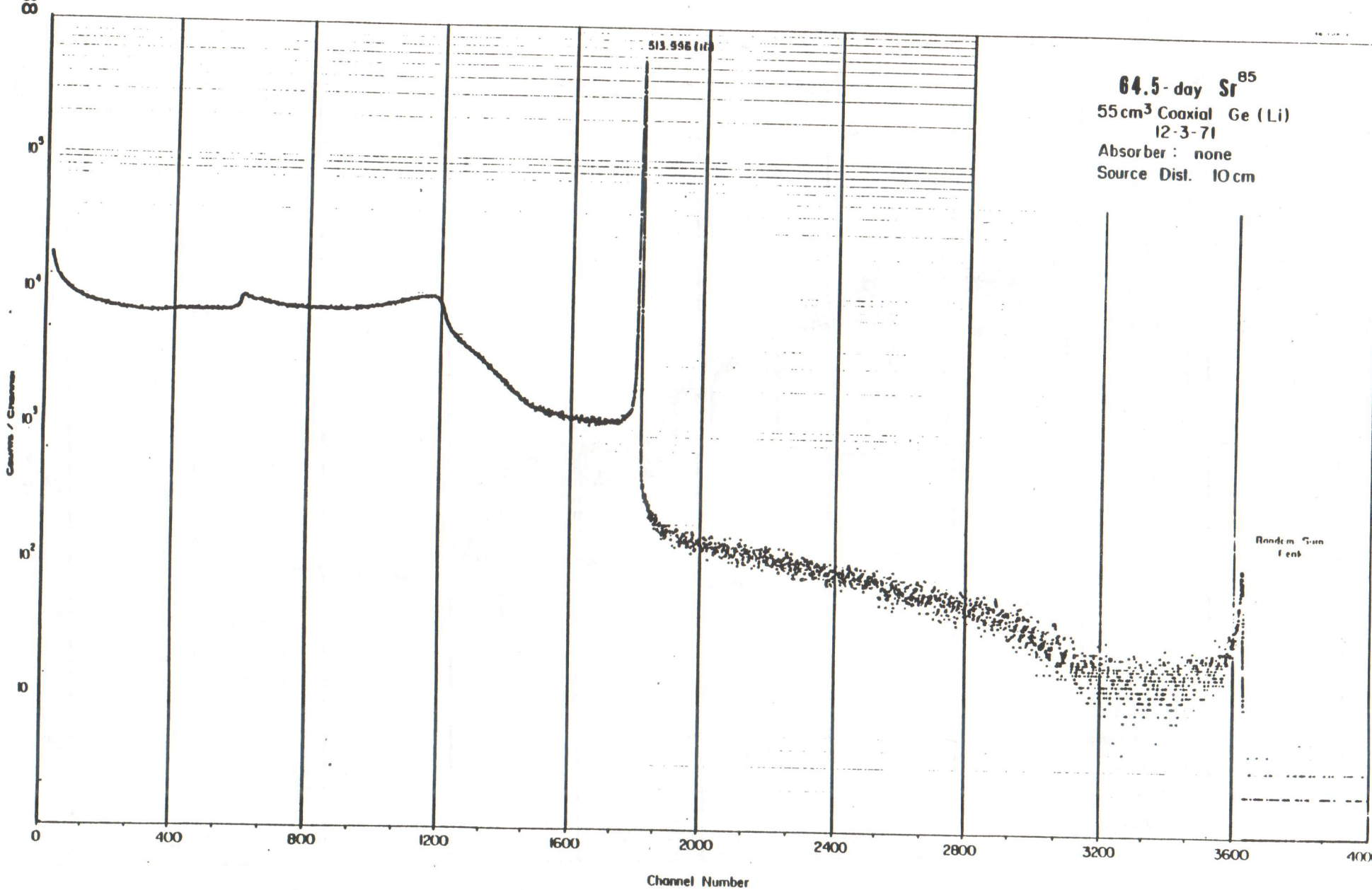

35.4-hr Br 82
55 cm3 Coaxial Ge (Li)
10 - 1 - 72
Absorber - None
Source Dist - 30 cm
554 334 (12)
619 088 (13)
698 359 (16)
776 502 (16)
827 809 (19)
221 476 (5)
273 475 (25)
1317.440 (28)
1474 853 (3)
1650 296 (34)
1779 58 (5)
Channel Number

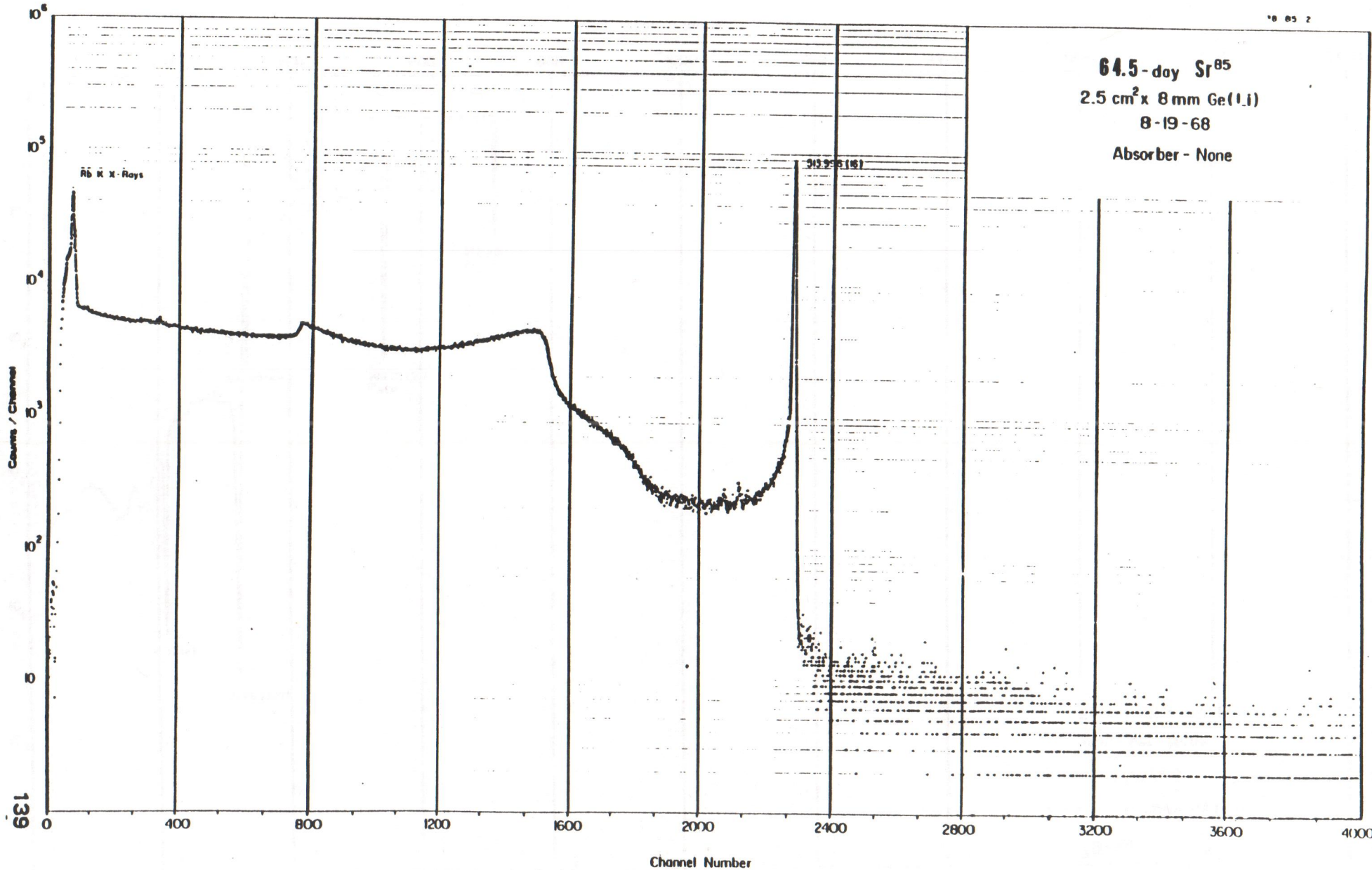

36-085-1
10.73-yr Kr 85
65 cm3 Coaxial Ge (Li)
1/15/73
Absorber-1.26 g/cm2 Be
Source Dist.-10 cm
513.996 (16)
Counts / Channel
10
10^2
10^3
10^4
10^5
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Channel Number

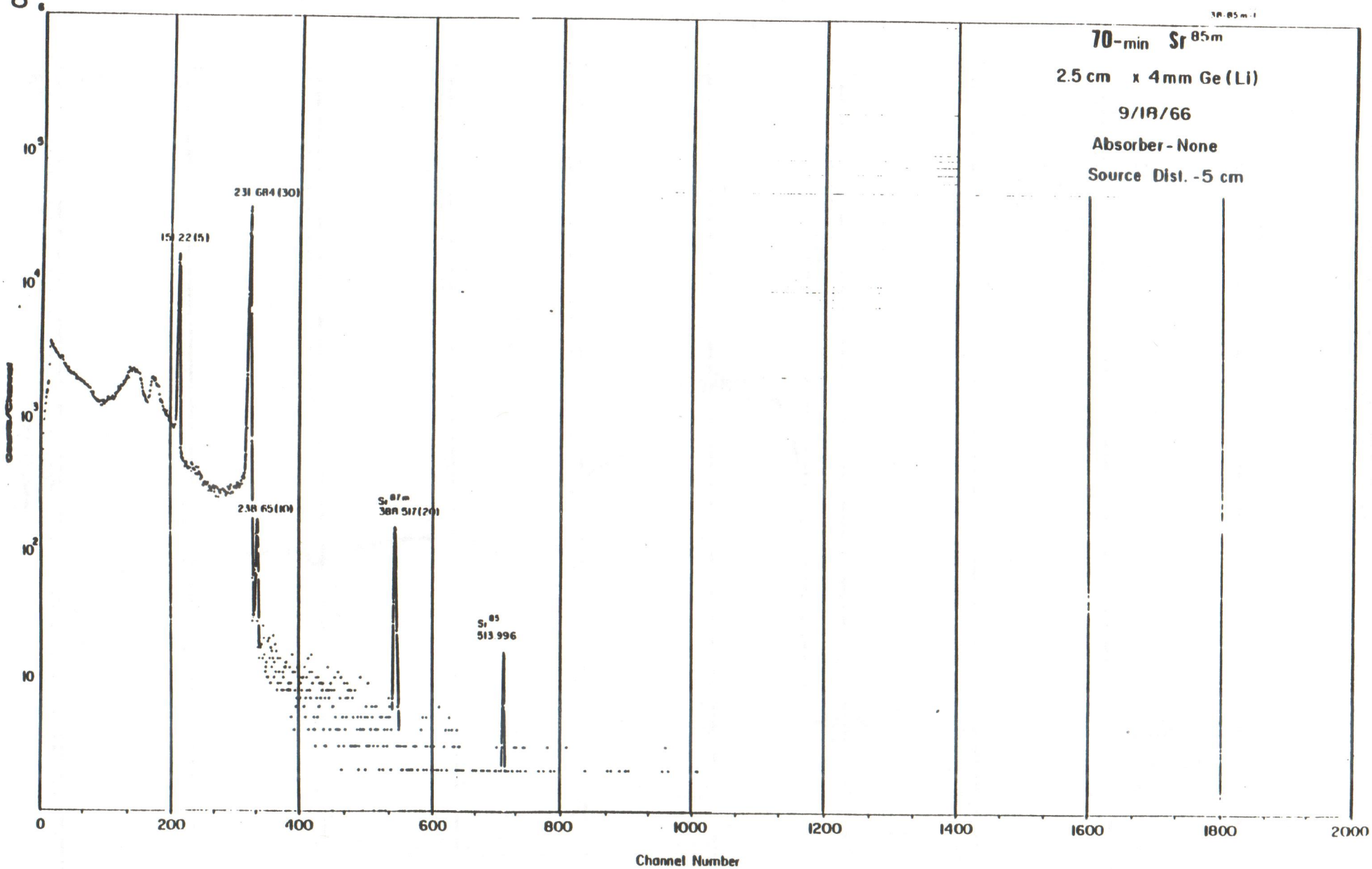

2.80-hr Kr88 - 17.7-min Rb88
65 cm3 Coaxial Ge (Li)
12-12-72
Absorber - 2.5 g/cm2 Be
Source Dist - 9 cm
* Rb88
Counts / Channel
Channel Number

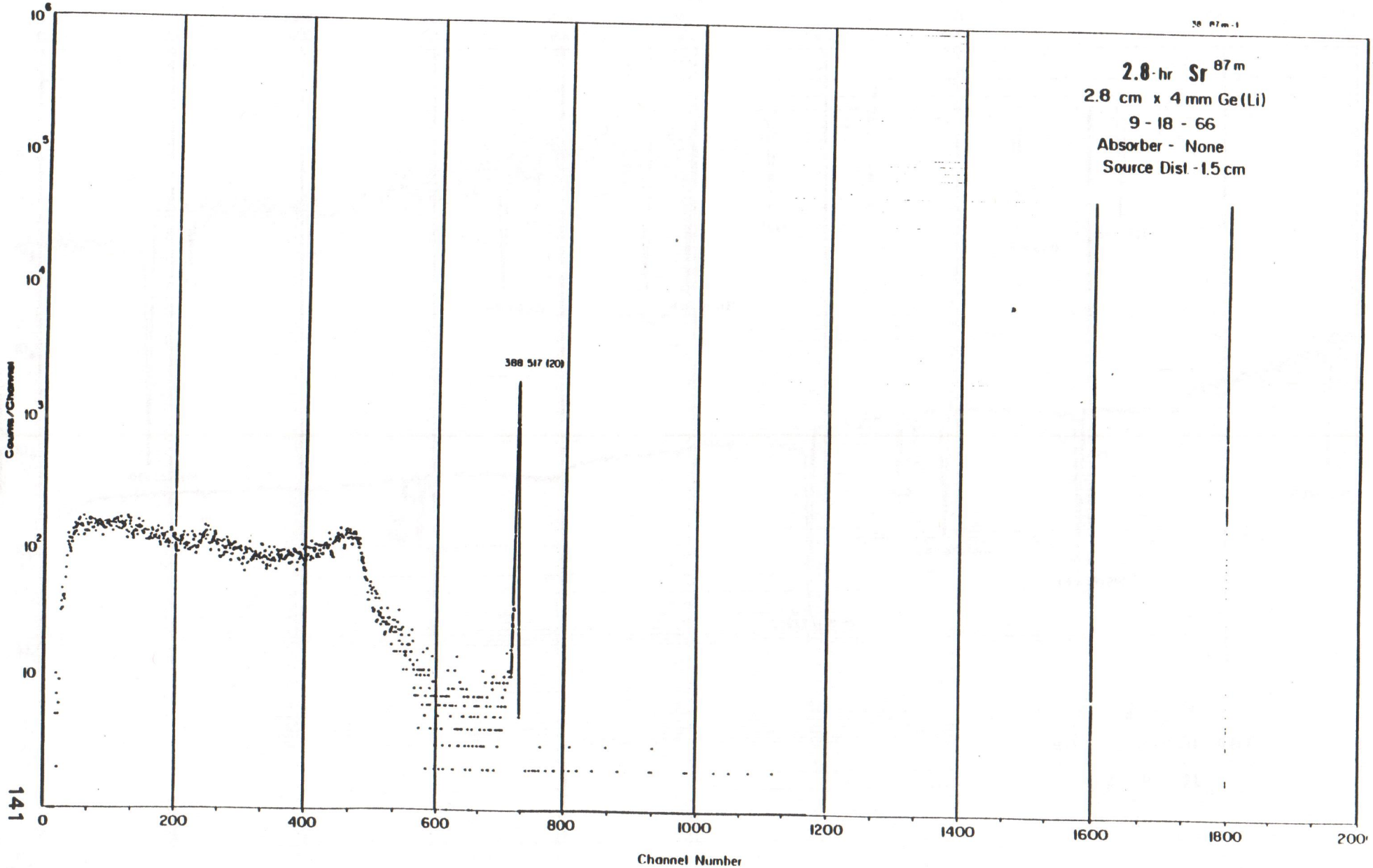

18.66-day Rb86
2.5 cm2 x 8mm Ge(Li)
5/9/66
1076.7(5)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

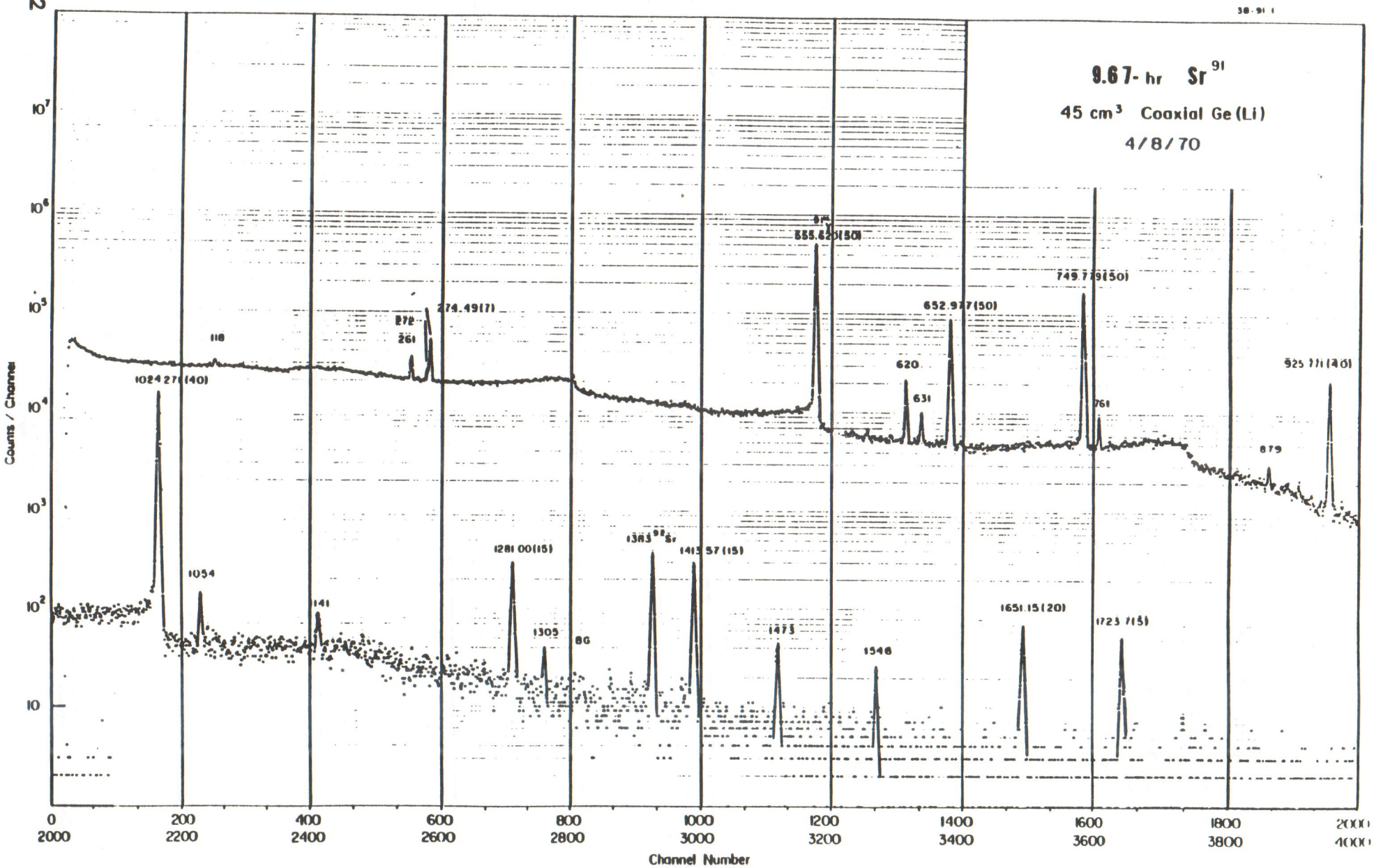

17.79-min Rb88
35 cm3 Coaxial Ge (Li)
4 - 14 - 70
Absorber - 2 g/cm2 Poly
Source Dist. - 10 cm
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10^2
10^3
10^4
10^5
10^6
898 02 (19)
1836 01 (40)
2677 87 (10)
3009 45 (14)
3218 50 (13)
3486 40 (18)
4742 40 (25)
4852 84 (15)

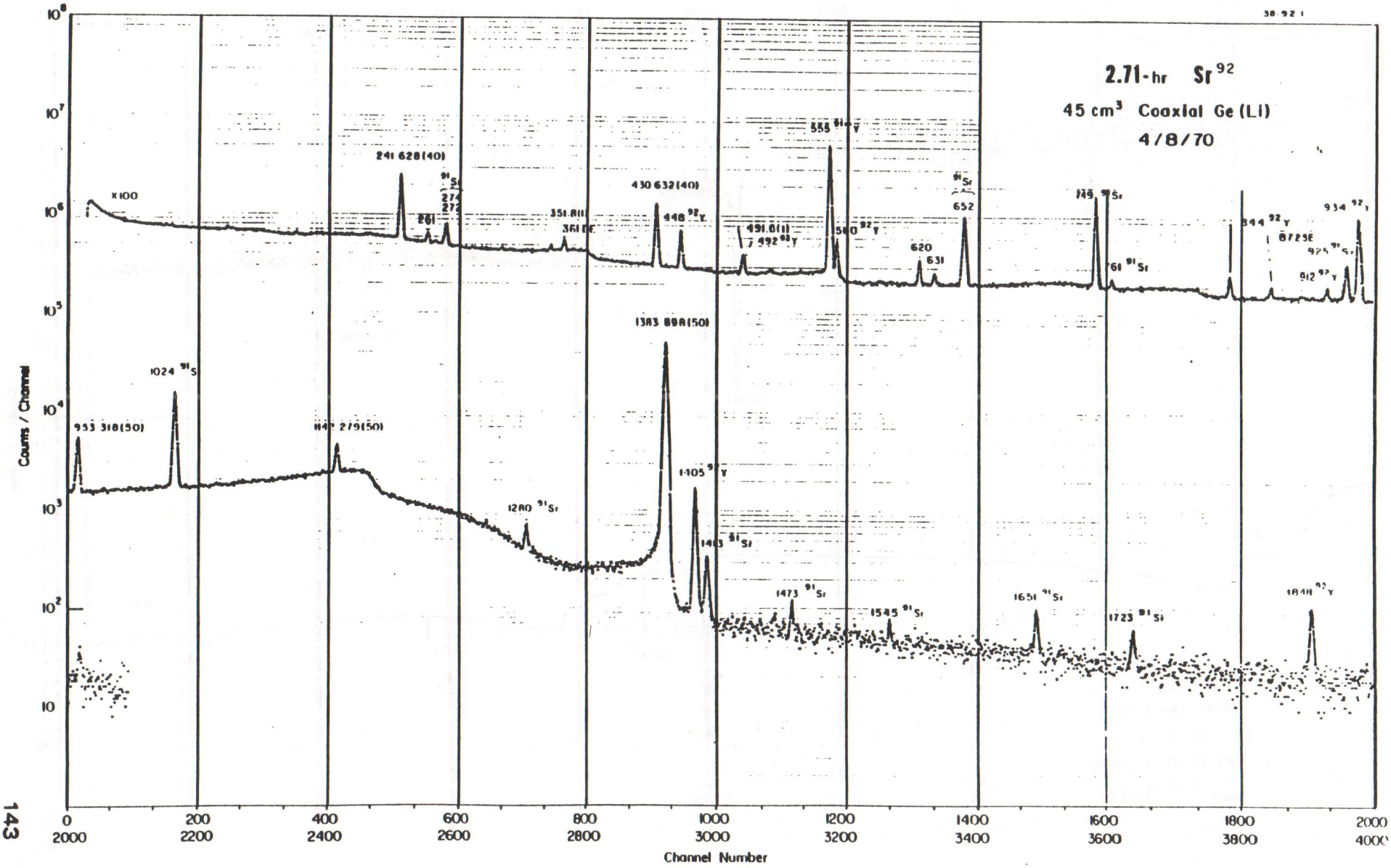

64.5 - day Sr85
55 cm3 Coaxial Ge (Li)
12-3-71
Absorber : none
Source Dist. 10 cm
513.996 (1E)
Random Sum Peak
Counts / Channel
10
10²
10³
10⁴
10⁵
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Channel Number

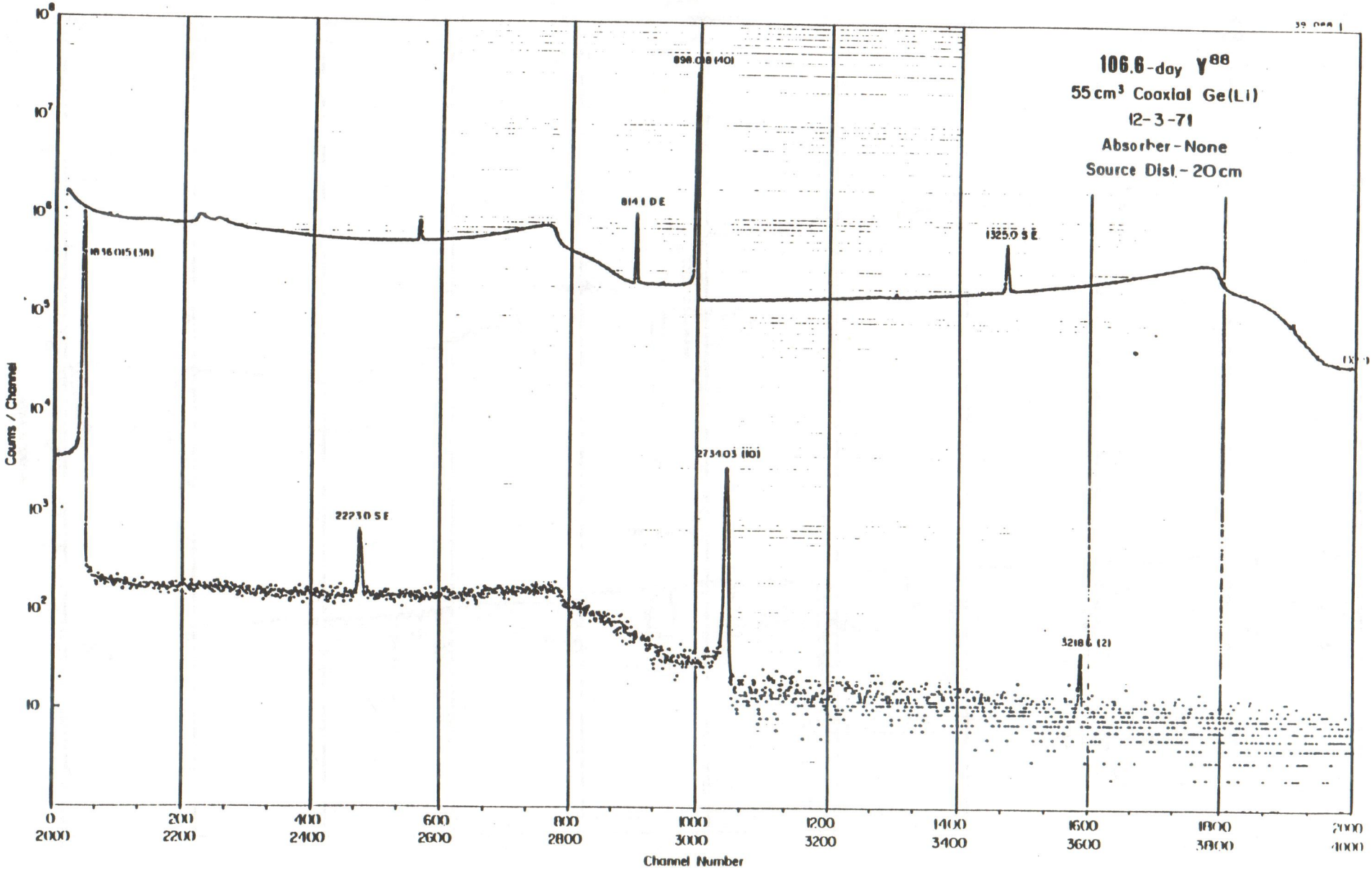

64.5 - day Sr85
2.5 cm2 x 8 mm Ge(Li)
8-19-68
Absorber - None
Rb K X-Rays
Counts / Channel
Channel Number
10^6
10^5
10^4
10^3
10^2
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

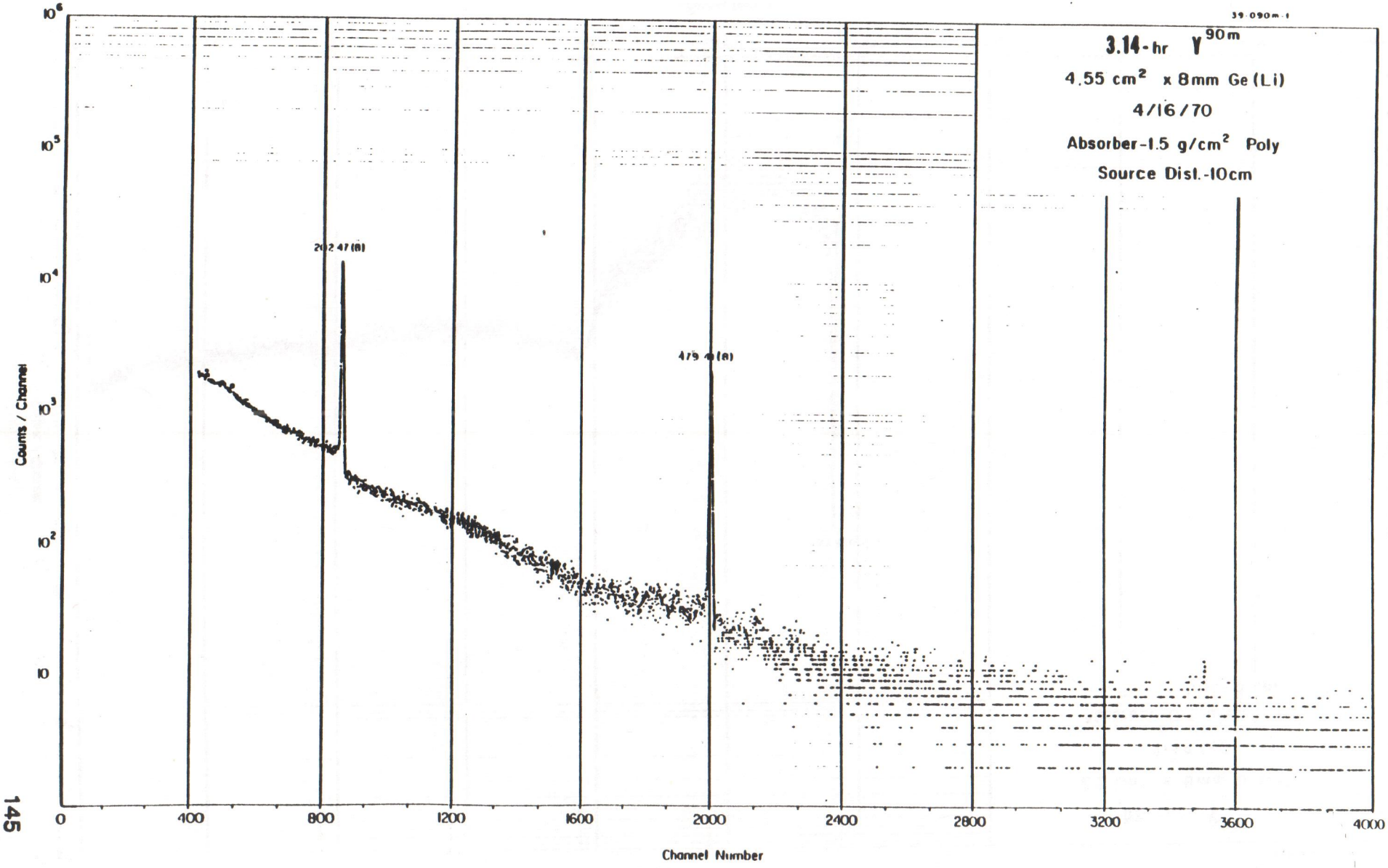

70-min Sr 85m
2.5 cm x 4 mm Ge (Li)
9/18/66
Absorber - None
Source Dist. -5 cm
151 22 (5)
231 684 (30)
238 65 (10)
Sr 87m
388 517 (20)
Sr 85
513 996
10^5
10^4
10^3
10^2
10
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Channel Number

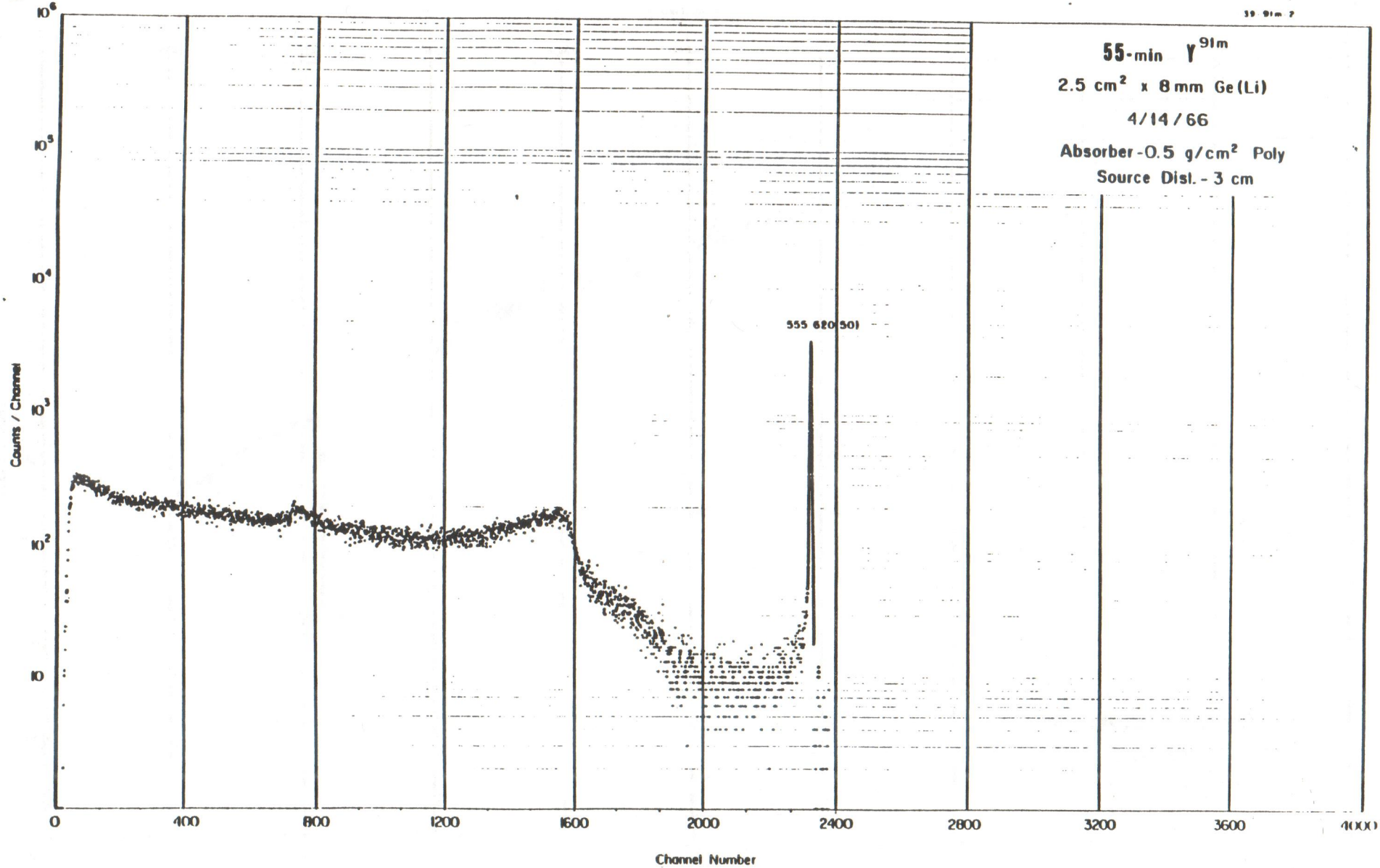

2.8-hr Sr 87m
2.8 cm x 4 mm Ge(Li)
9 - 18 - 66
Absorber - None
Source Dist - 1.5 cm
388 517 (20)
Counts/Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
10
10²
10³
10⁴
10⁵
10⁶

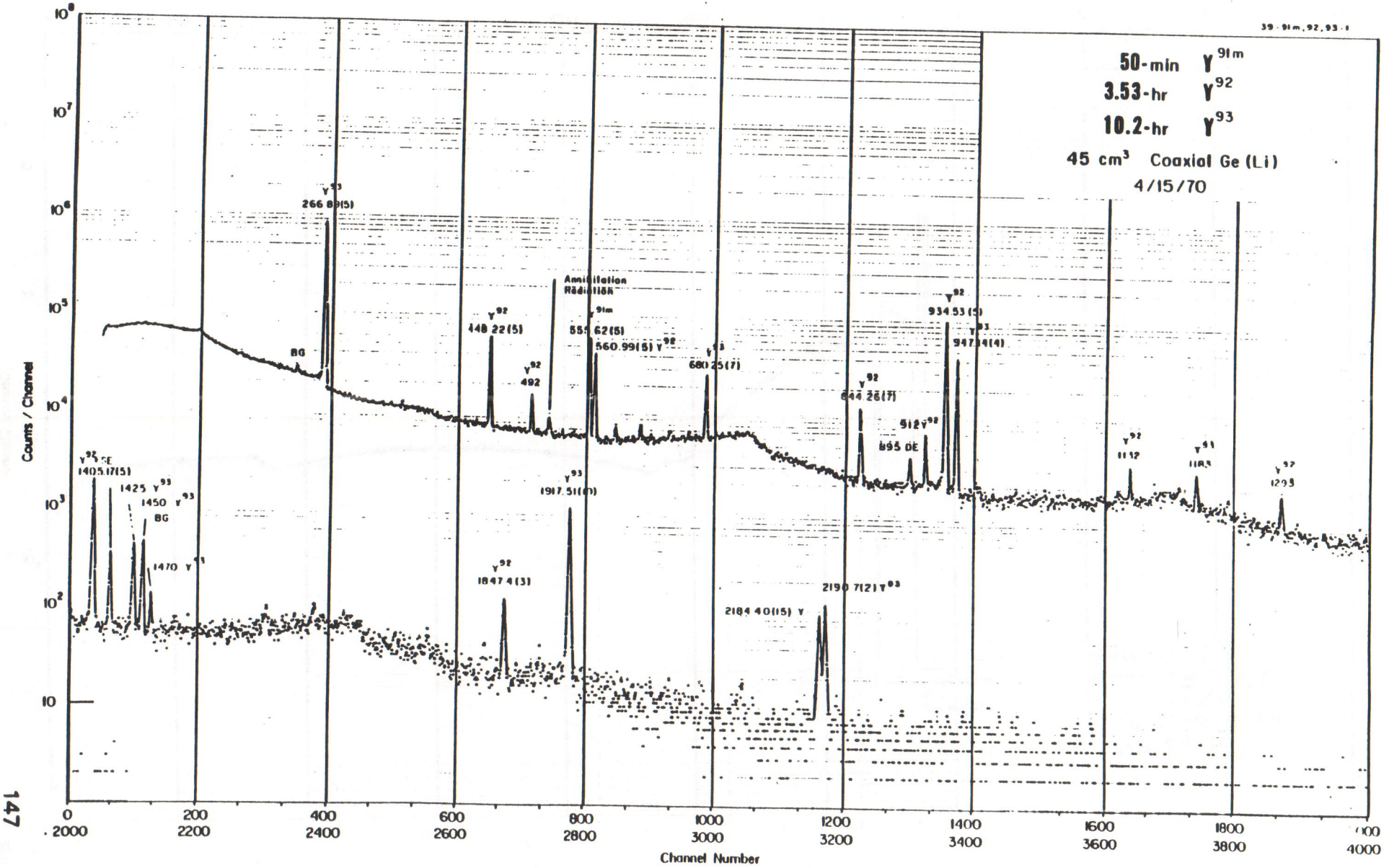

9.67-hr Sr91
45 cm3 Coaxial Ge(Li)
4/8/70
Counts / Channel
Channel Number
118
1024.27(40)
1054
141
274.49(7)
272
261
1281.00(15)
1305
BG
1383 92Sr
1415.57(15)
1473
1546
555.62(50)
620
631
652.97(50)
749.79(50)
761
879
925.77(40)
1651.15(20)
1723.7(5)

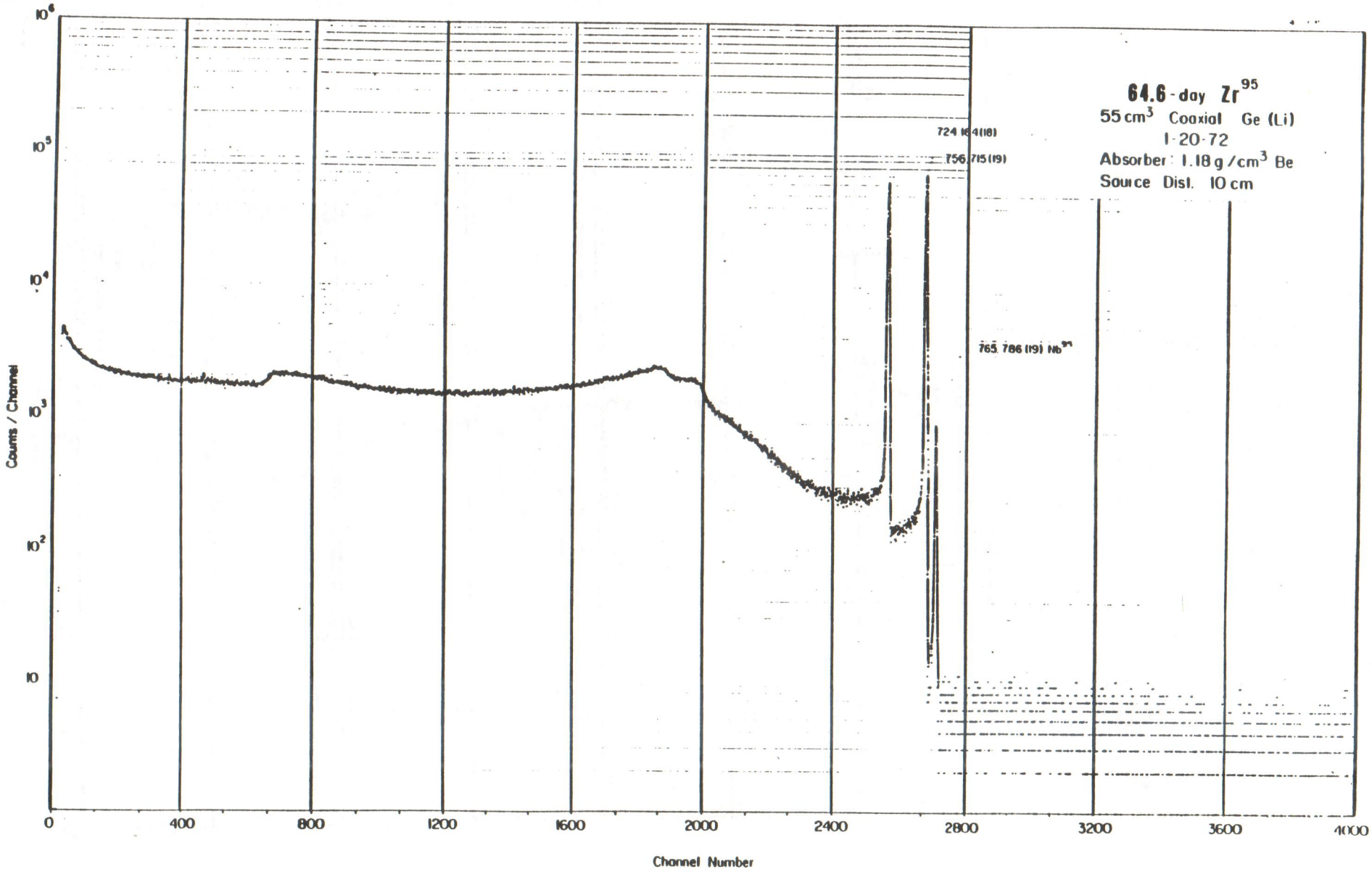

2.71-hr Sr 92
45 cm3 Coaxial Ge (Li)
4/8/70
Counts / Channel
Channel Number
x100
241 628(40)
430 632(40)
1383 898(50)
953 318(50)
1024 91Sr
1280 91Sr
1105 91Y
1473 91Sr
1545 91Sr
1651 91Sr
1723 91Sr
1848 92Y
555 91Sr
652
620
631
745 91Sr
761 91Sr
934 92Y
344 92Y
912 92Y
925 91Sr
0 200 400 600 800 1000 1200 1400 1600 1800 2000
2000 2200 2400 2600 2800 3000 3200 3400 3600 3800 4000

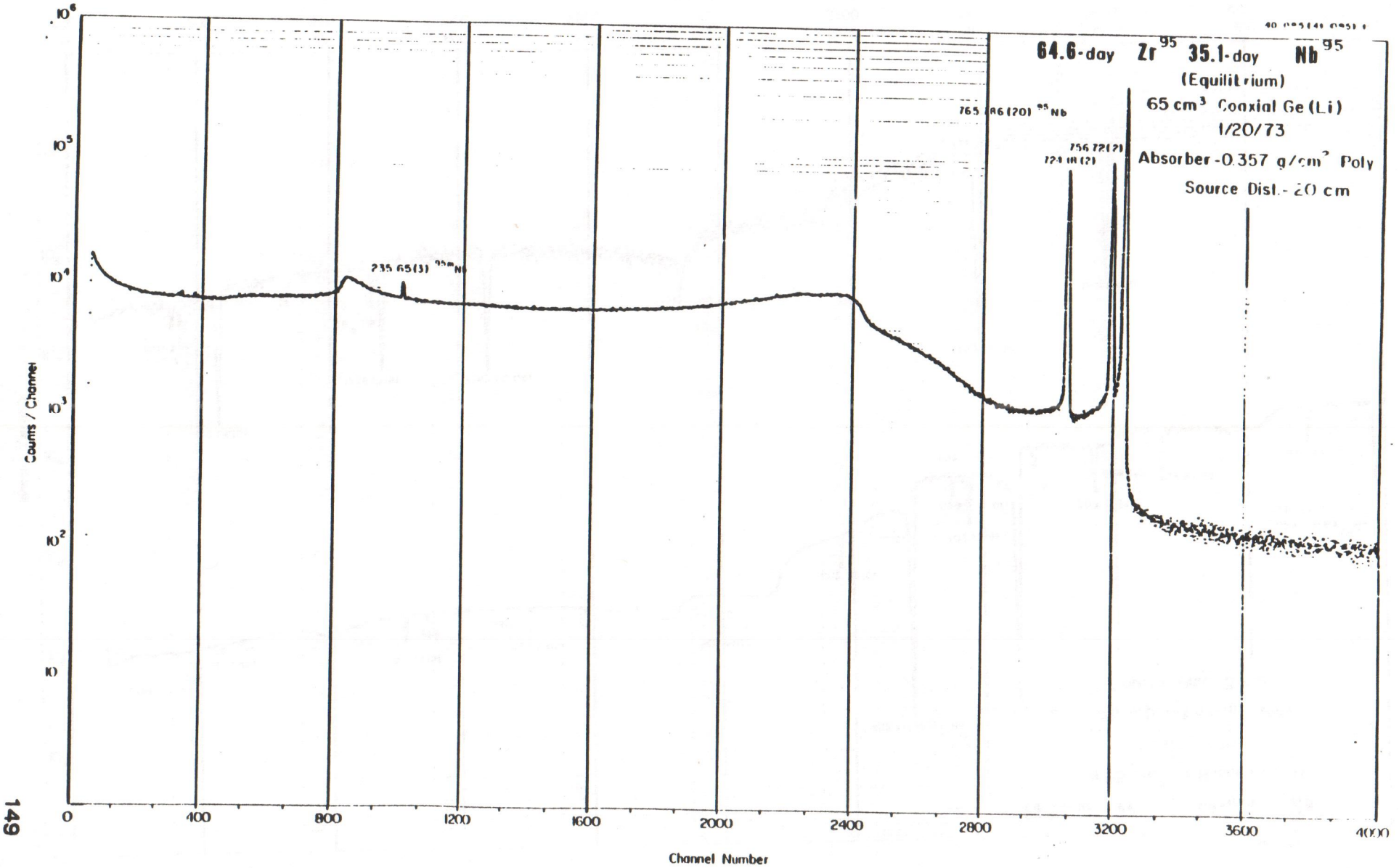

106.6-day Y88
55 cm³ Coaxial Ge(Li)
12-3-71
Absorber - None
Source Dist. - 20 cm
898.018 (40)
814.1 DE
1325.0 SE
1836.015 (38)
2223.0 SE
2734.03 (10)
3218.6 (2)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000

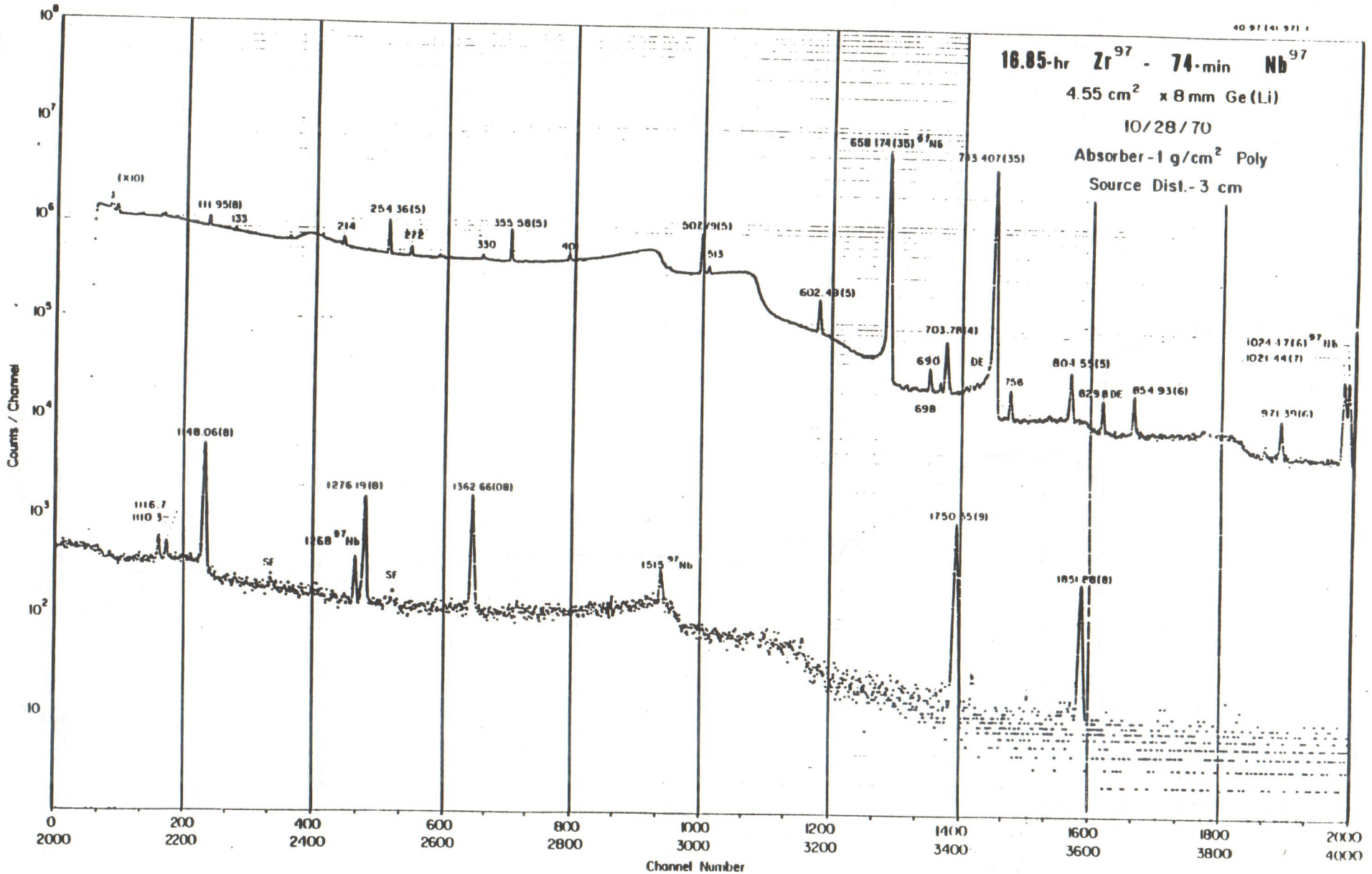

3.14-hr γ 90m
4.55 cm² x 8mm Ge(Li)
4/16/70
Absorber-1.5 g/cm² Poly
Source Dist.-10cm
Counts / Channel
Channel Number
10⁶
10⁵
10⁴
10³
10²
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

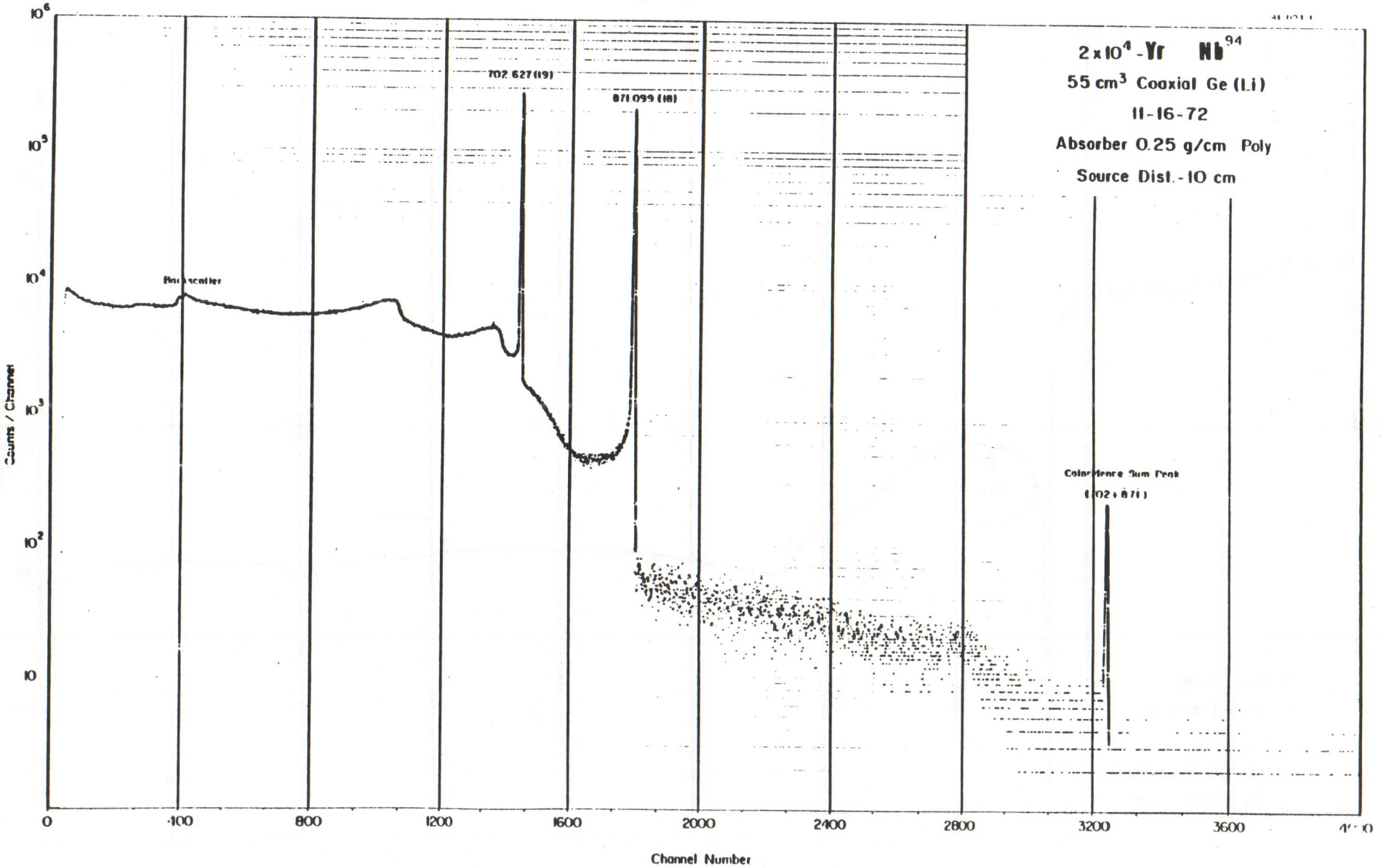

55-min γ 91m
2.5 cm² x 8 mm Ge(Li)
4/14/66
Absorber-0.5 g/cm² Poly
Source Dist. - 3 cm
555 620 501
Counts / Channel
Channel Number
10⁶
10⁵
10⁴
10³
10²
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

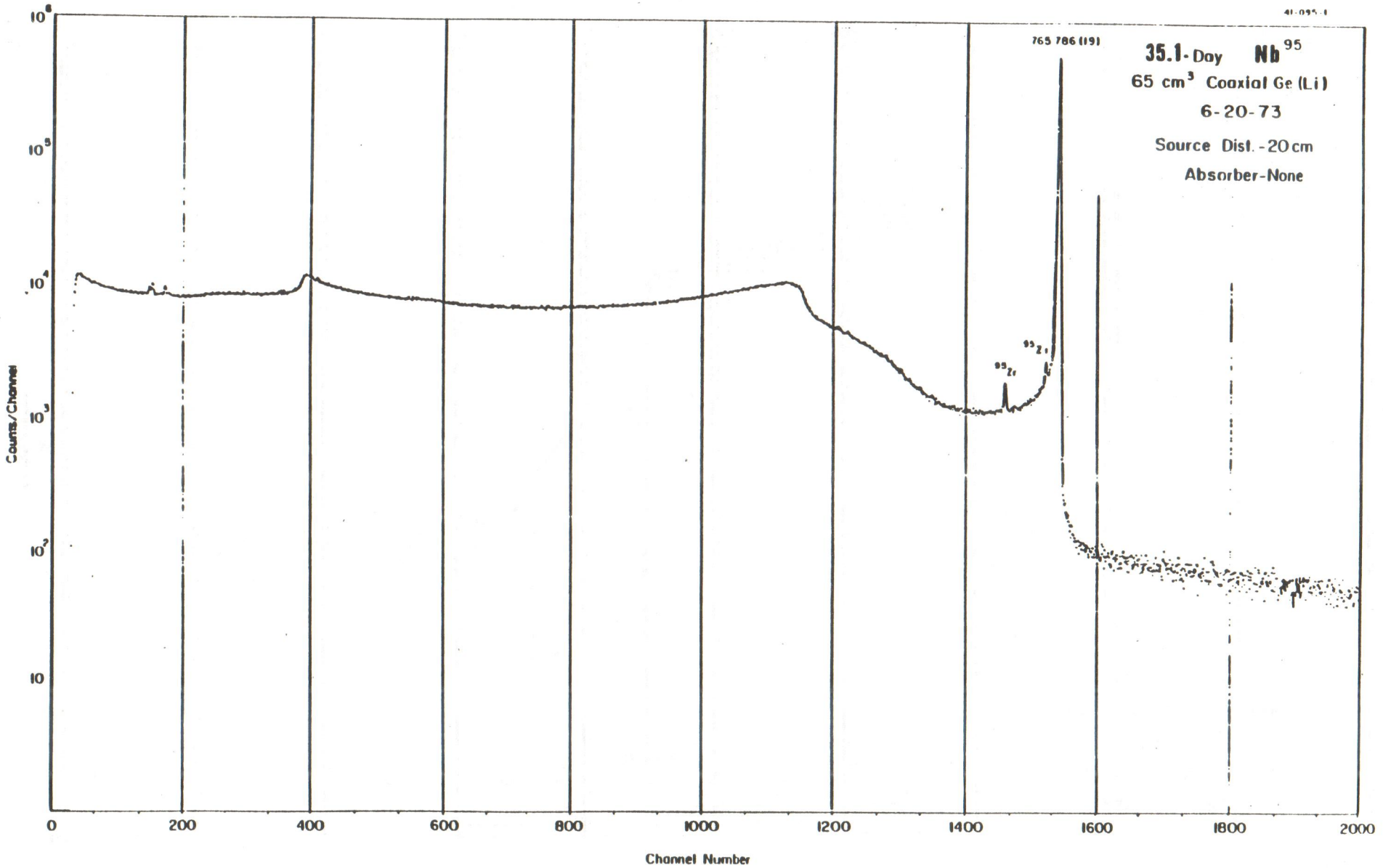

50-min Y91m
3.53-hr Y92
10.2-hr Y93
45 cm3 Coaxial Ge (Li)
4/15/70
Counts / Channel
Channel Number
Annihilation Radiation
BG
266.89(5)
448.22(5)
492
560.99(5)
680.25(7)
934.53(5)
1405.17(5)
1425
1450
1470
1847.4(3)
1917.51(10)
2184.40(15)
2190.7(2)
1112
1293

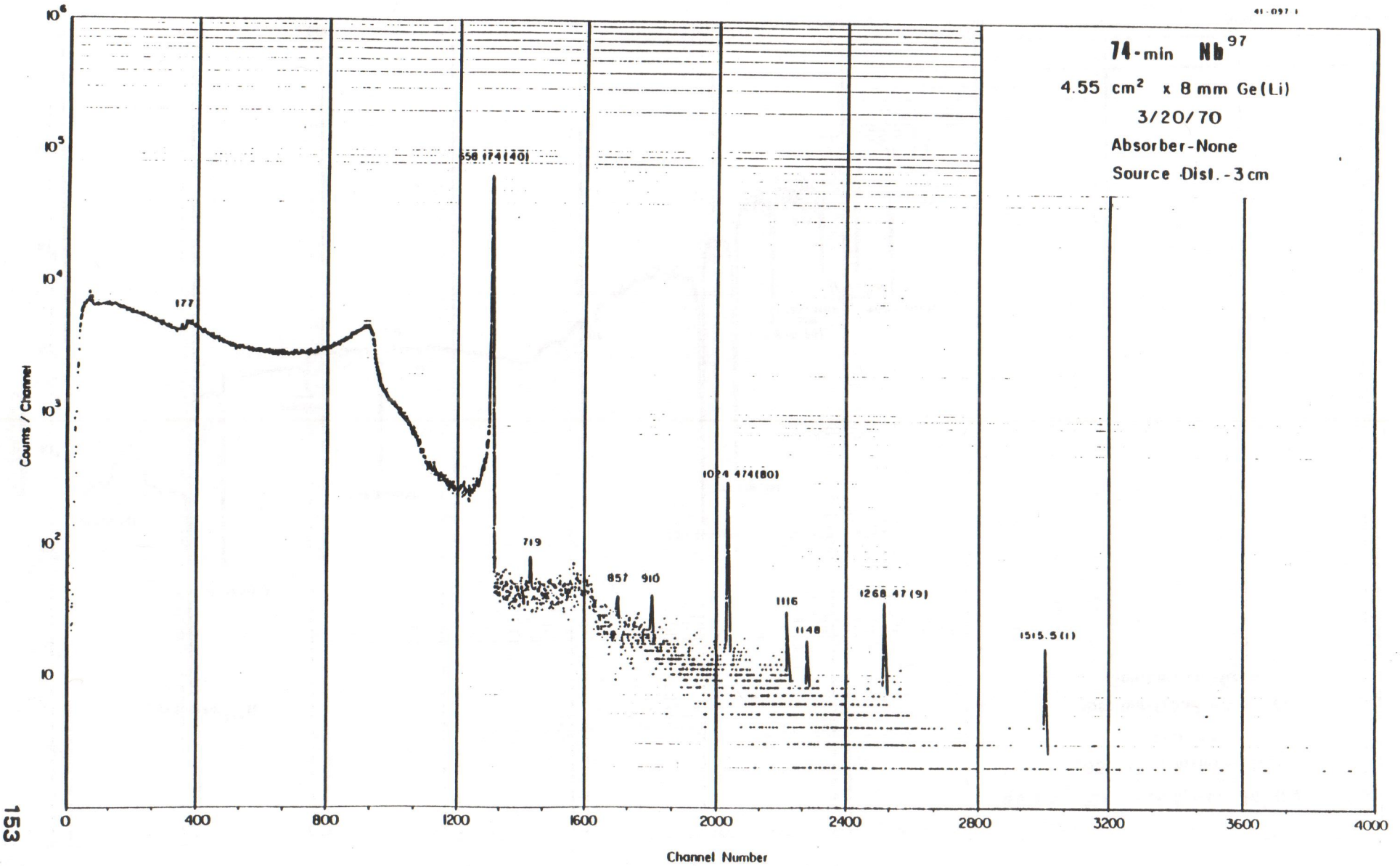

64.6-day Zr95
55 cm3 Coaxial Ge (Li)
1-20-72
Absorber: 1.18 g/cm3 Be
Source Dist. 10 cm
724.164(18)
756.715(19)
765.786(19) Nb95
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

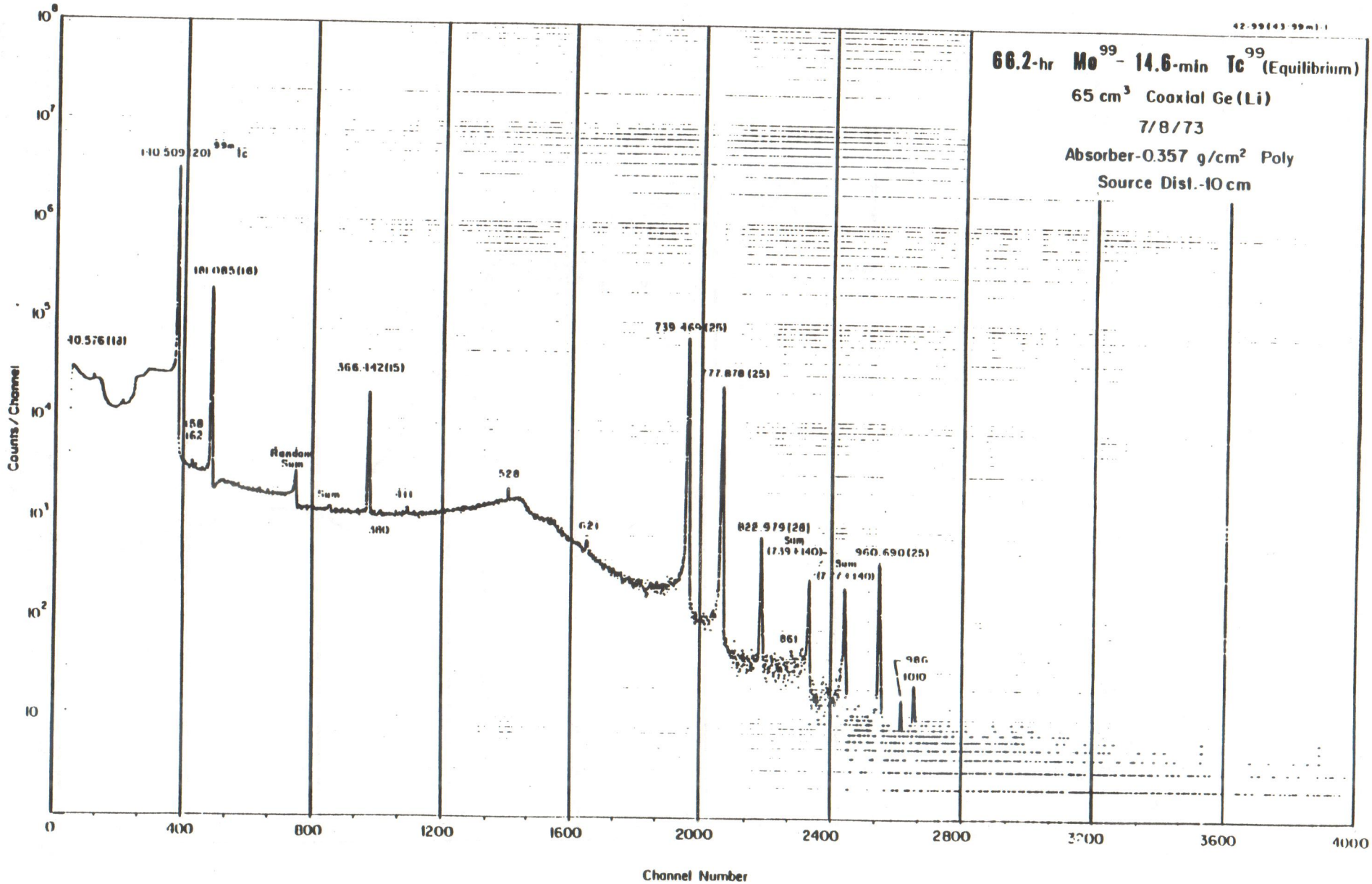

64.6-day Zr95 35.1-day Nb95
(Equilibrium)
65 cm3 Coaxial Ge (Li)
1/20/73
Absorber -0.357 g/cm2 Poly
Source Dist.- 20 cm
235.65(3) 95mNb
765.86(20) 95Nb
724.18(2)
756.72(2)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

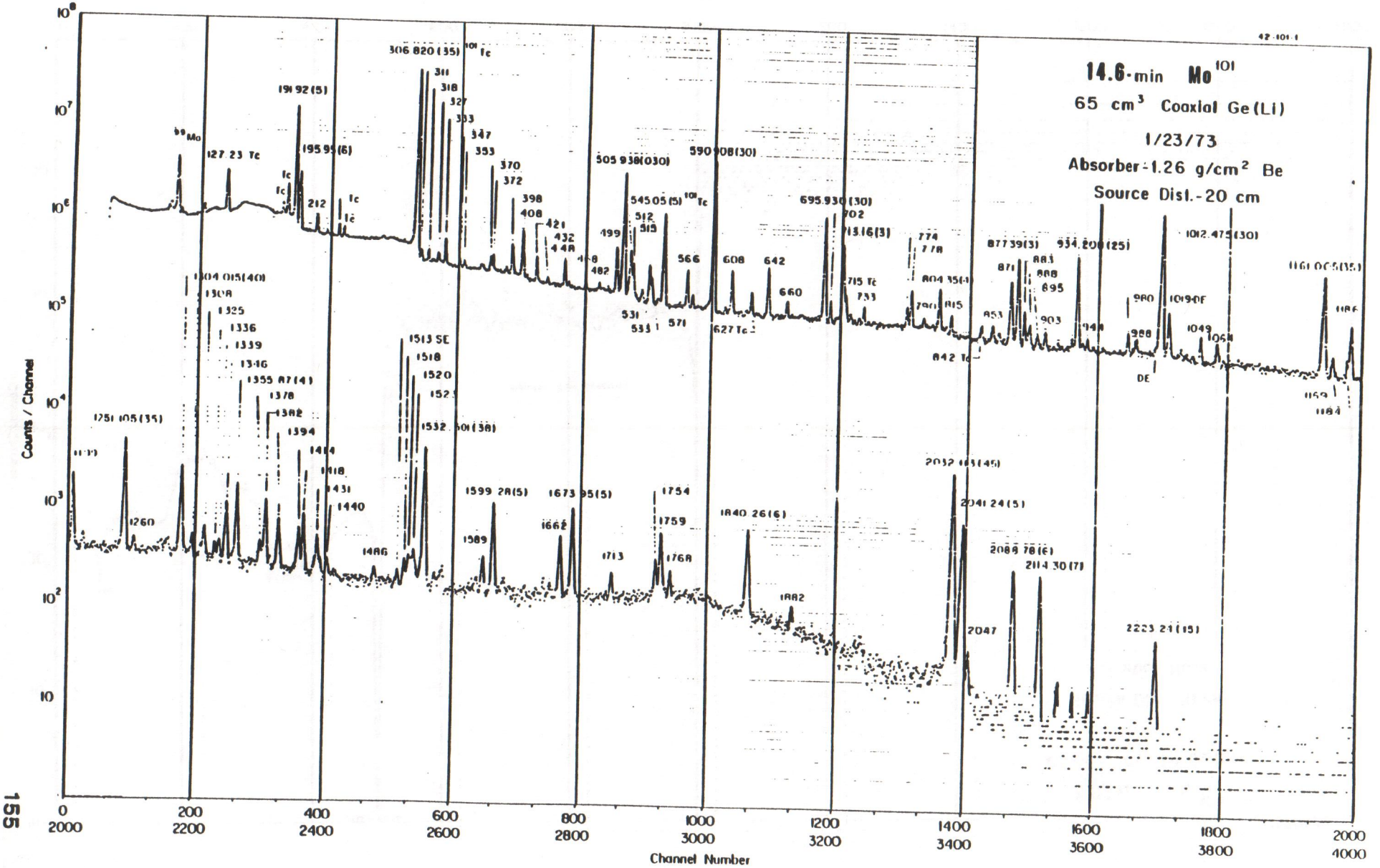

16.85-hr Zr97 - 74-min Nb97
4.55 cm2 x 8 mm Ge(Li)
10/28/70
Absorber - 1 g/cm2 Poly
Source Dist. - 3 cm
Counts / Channel
Channel Number
(x10)
111.95(8)
133
214
254.36(5)
272
330
355.58(5)
40
513
602.49(5)
658.174(35) 97Nb
703.78(4)
690
698
DE
753.407(35)
756
804.55(5)
829.8 DE
854.93(6)
971.39(6)
1024.47(6) 97Nb
1021.44(7)
1148.06(8)
1116.7
1110.3
SF
1268 97Nb
1276.19(8)
SF
1362.66(08)
1515 97Nb
1750.35(9)
1851.28(8)

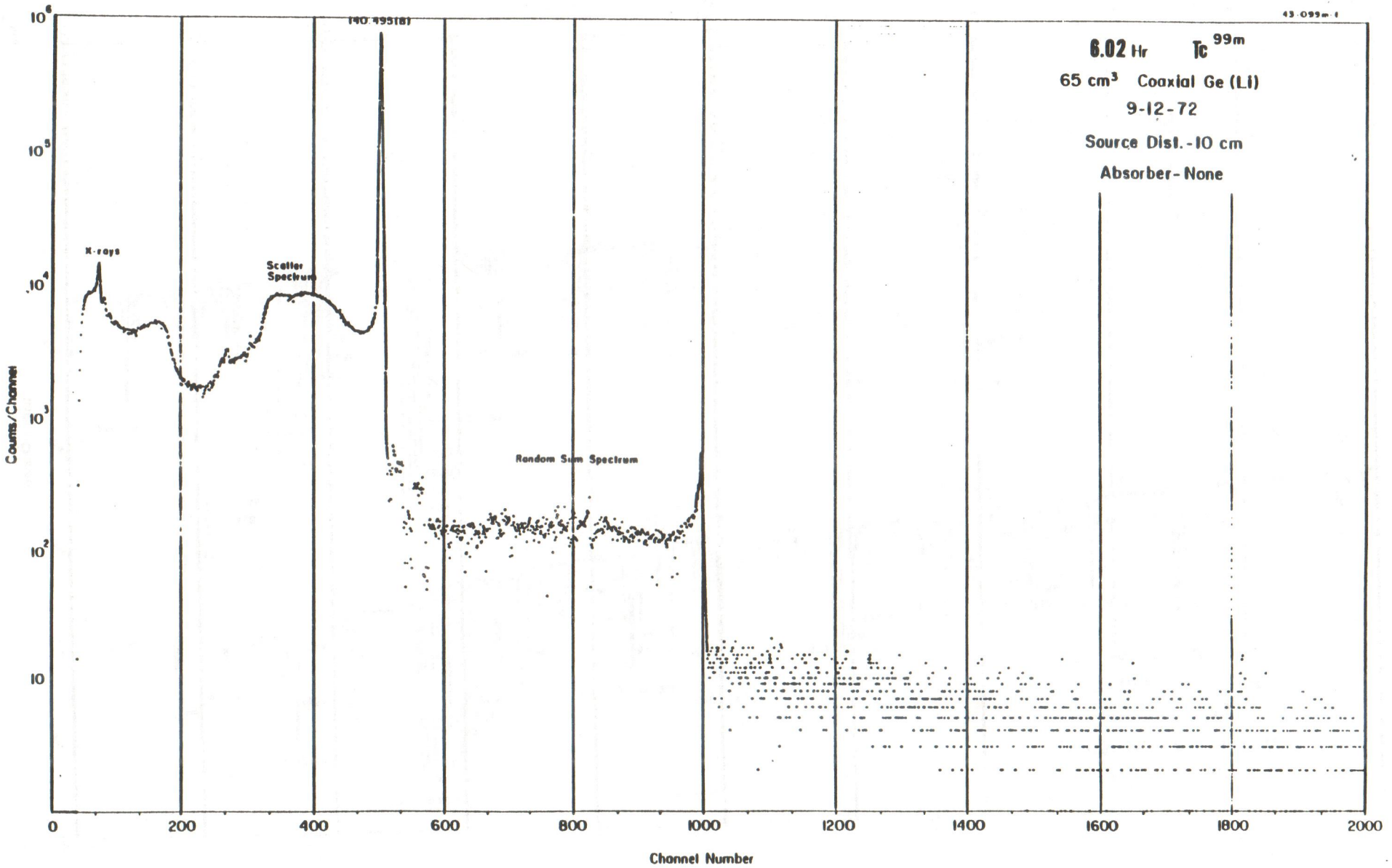

2 x 10^4 - Yr Nb^94
55 cm^3 Coaxial Ge (Li)
11-16-72
Absorber 0.25 g/cm Poly
Source Dist. - 10 cm
702.627 (19)
871.099 (18)
Counts / Channel
Channel Number
10^6
10^5
10^4
10^3
10^2
10
0
400
800
1200
1600
2000
2400
2800
3200
3600

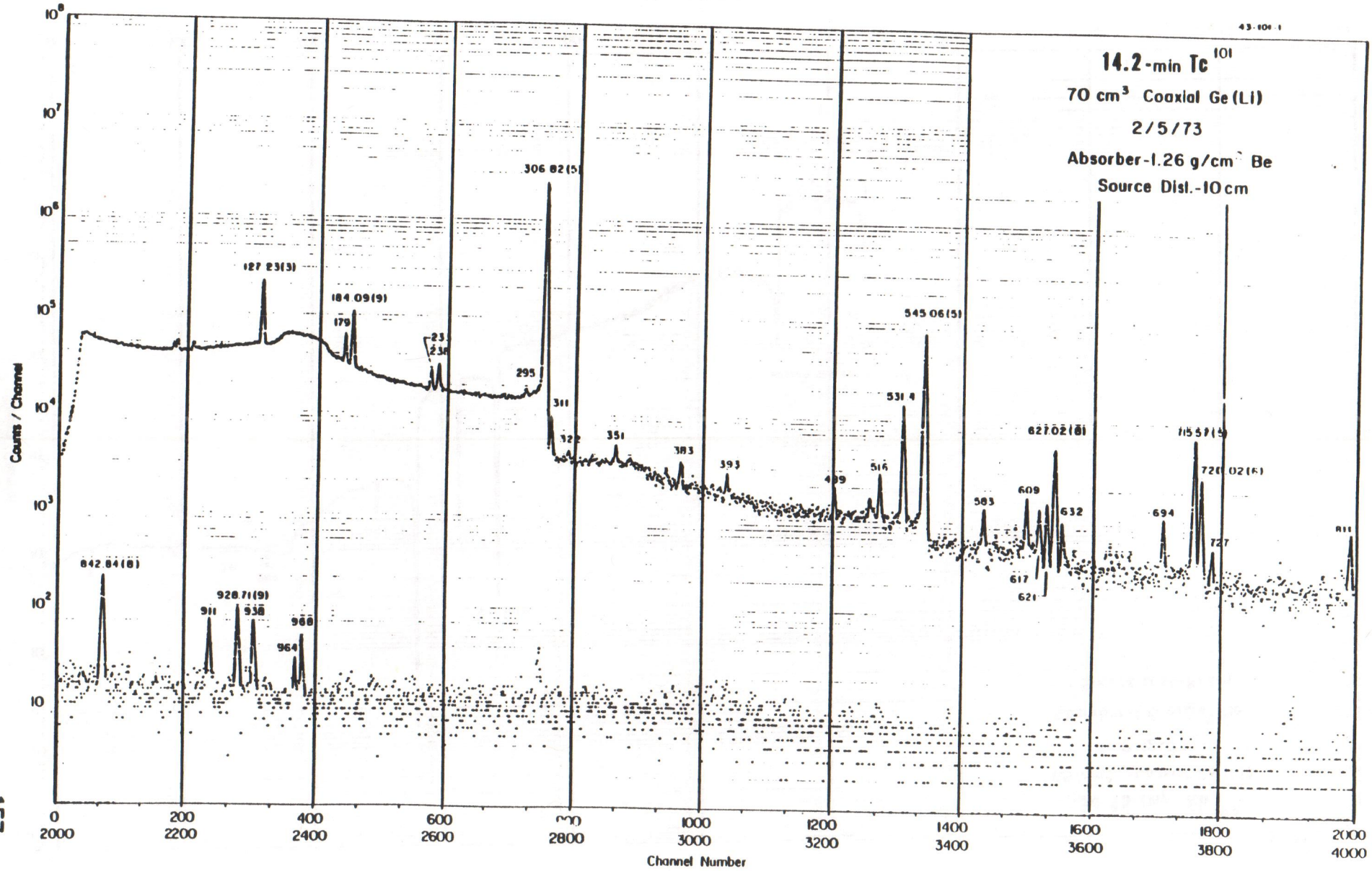

35.1-Day Nb95
65 cm3 Coaxial Ge (Li)
6-20-73
Source Dist. -20 cm
Absorber-None
765 786 (19)
95Zr
95Zr
Counts/Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
200
400
600
800
1000
1200
1400
1600
1800
2000

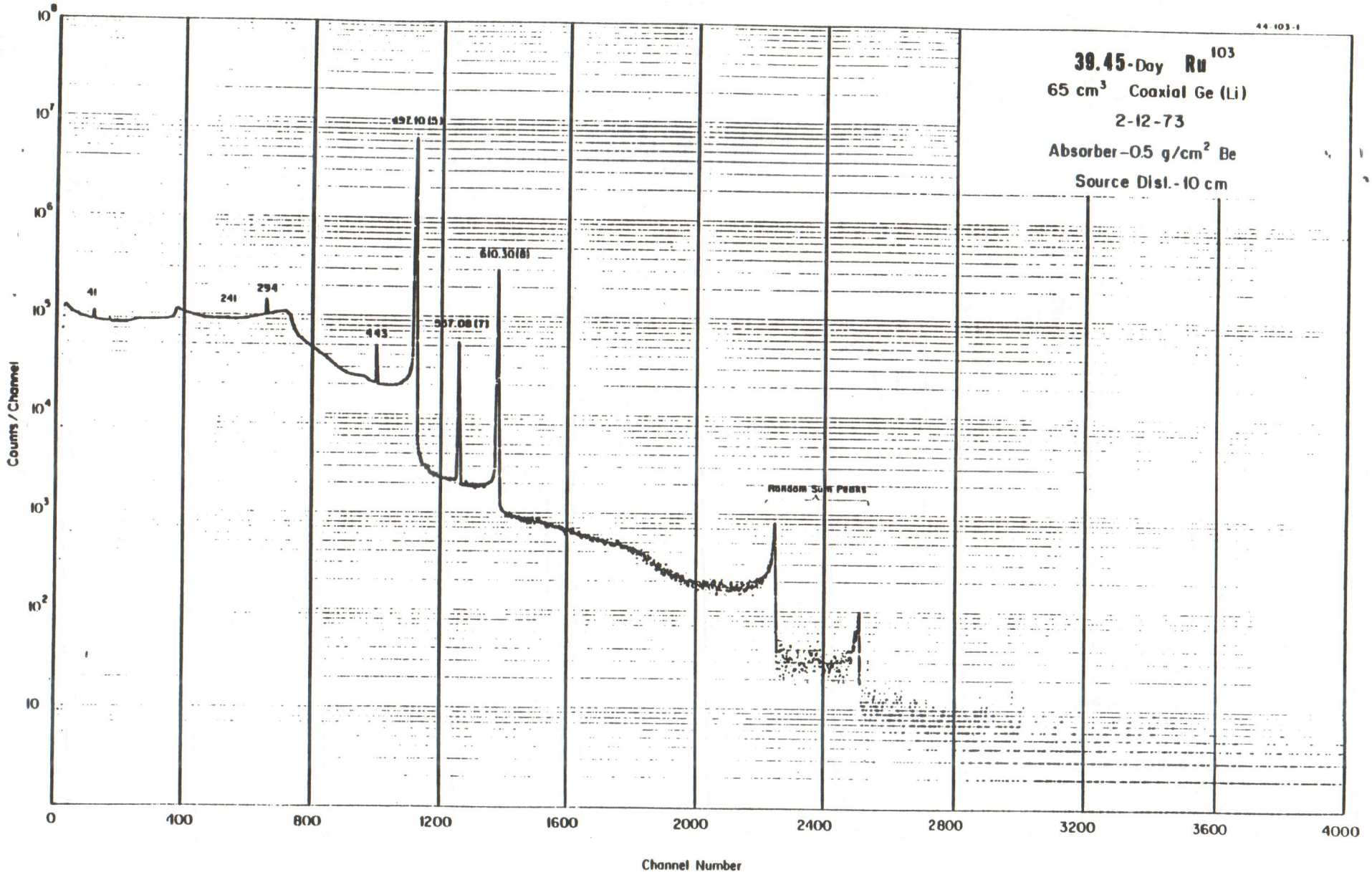

74-min Nb97
4.55 cm2 x 8 mm Ge(Li)
3/20/70
Absorber-None
Source Dist.-3 cm
658 474(40)
177
719
857
910
1074 474(80)
1116
1148
1268 47(9)
1515.5(1)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

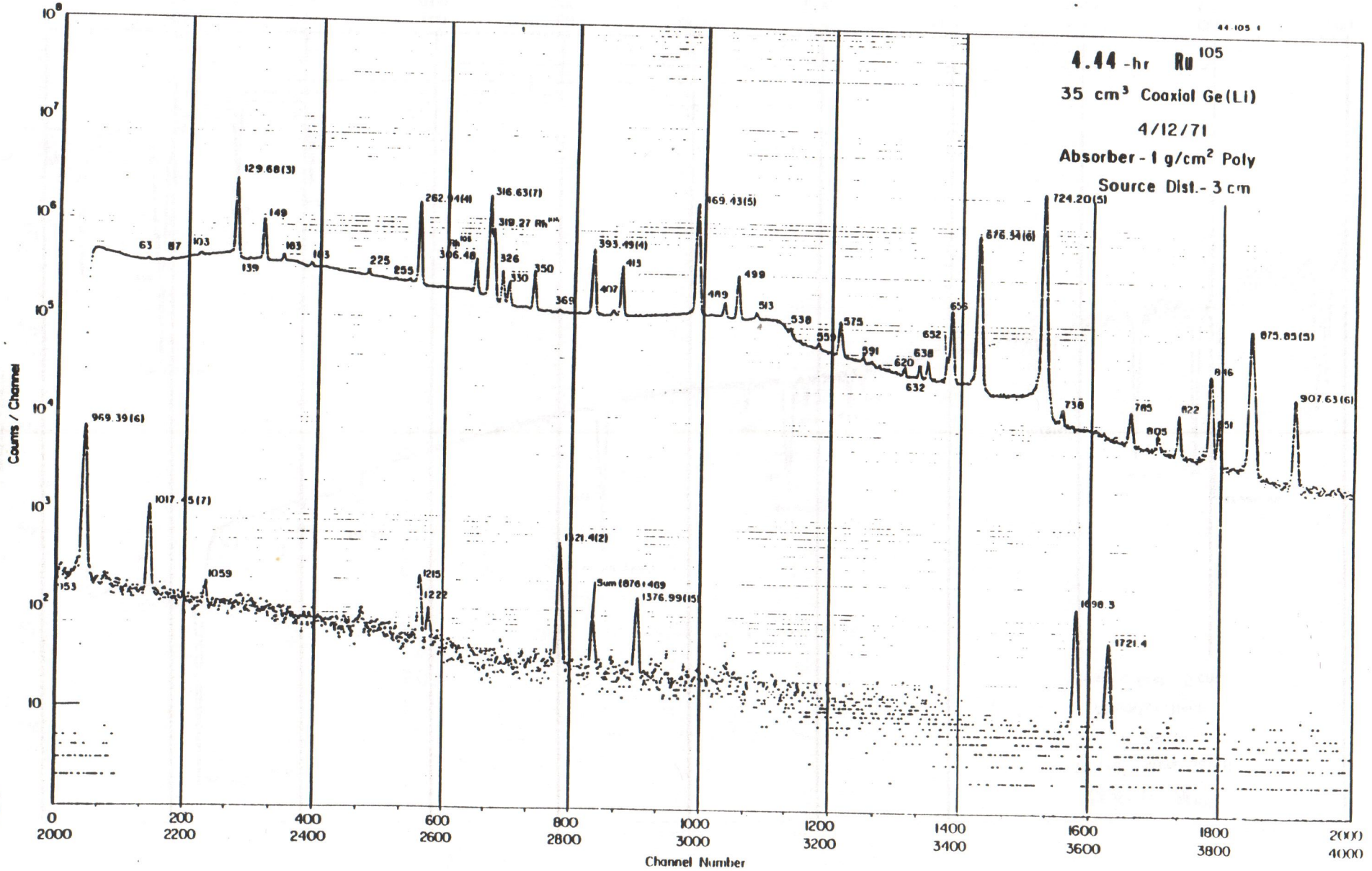

66.2-hr Mo99 - 14.6-min Tc99 (Equilibrium)
65 cm3 Coaxial Ge(Li)
7/8/73
Absorber-0.357 g/cm2 Poly
Source Dist.-10 cm
40.576(18)
140.509(20)
181.085(18)
366.442(15)
Random Sum
Sum
411
380
528
621
739.469(25)
777.878(25)
822.979(28)
Sum (739.469+140)
Sum (777.878+140)
861
960.690(25)
986
1010
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸

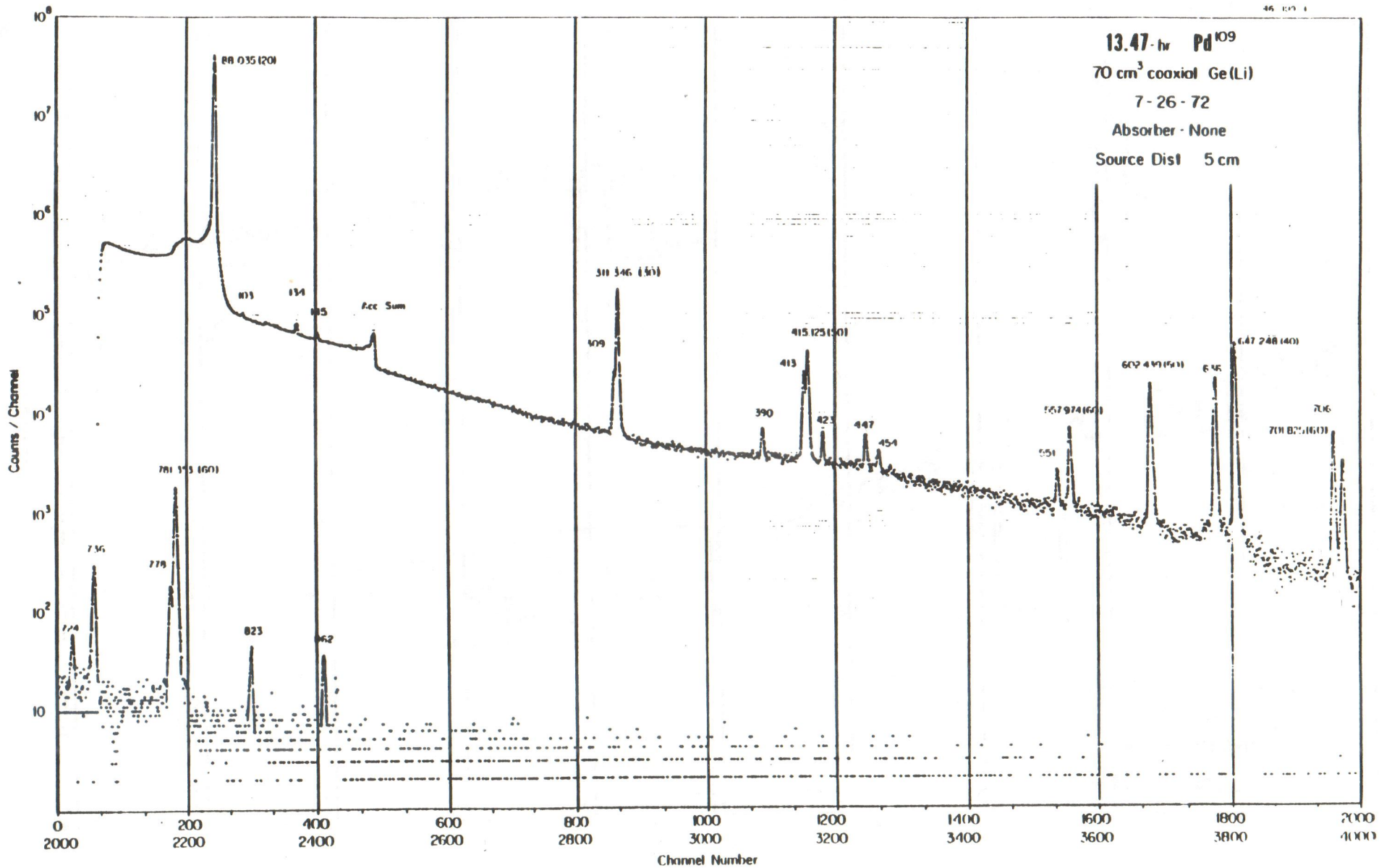

14.6-min Mo101
65 cm3 Coaxial Ge(Li)
1/23/73
Absorber-1.26 g/cm2 Be
Source Dist.-20 cm
Counts / Channel
Channel Number

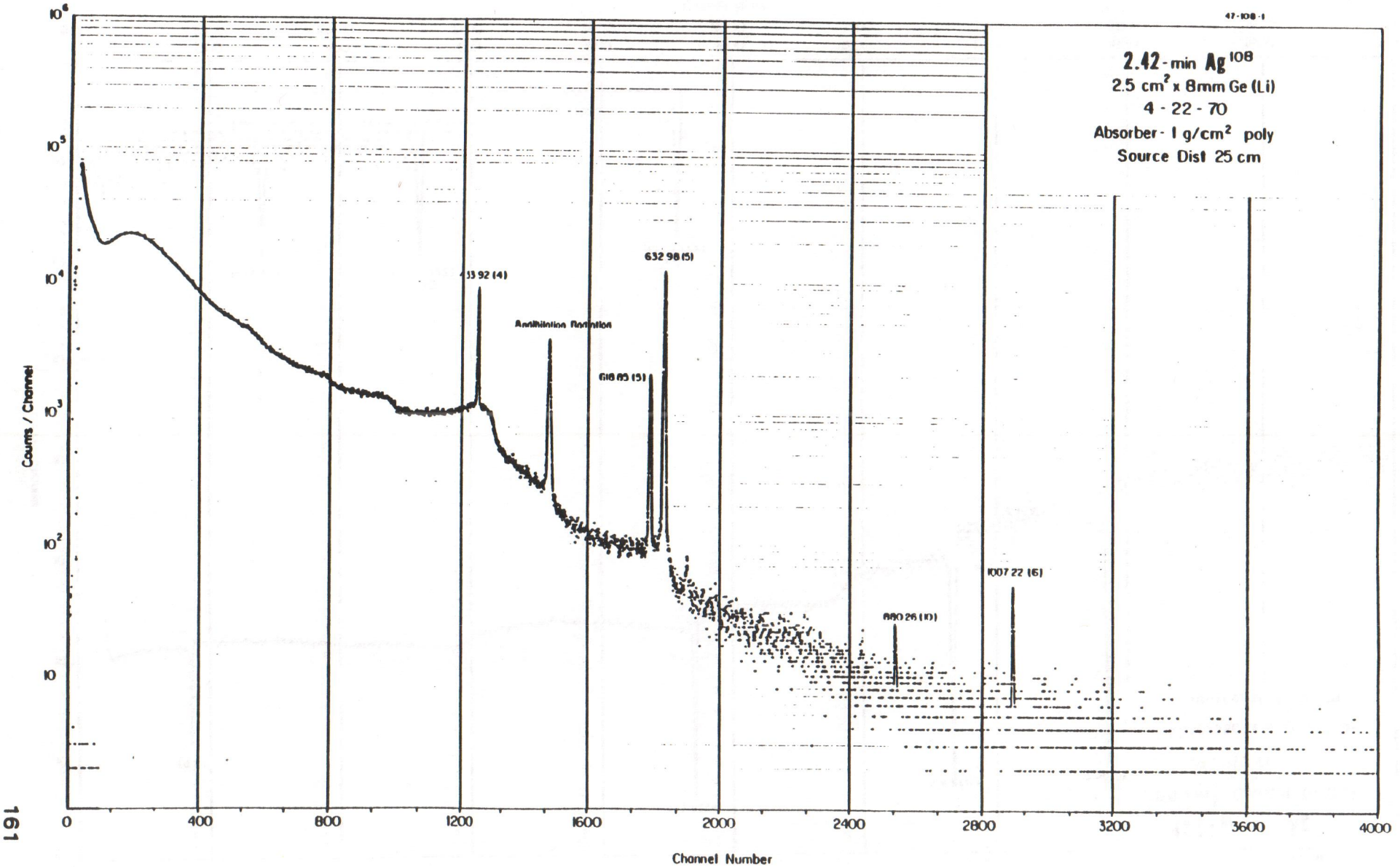

6.02 Hr Tc 99m
65 cm³ Coaxial Ge (Li)
9-12-72
Source Dist.-10 cm
Absorber-None
140.495(8)
X-rays
Scatter Spectrum
Random Sum Spectrum
Counts/Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
200
400
600
800
1000
1200
1400
1600
1800
2000

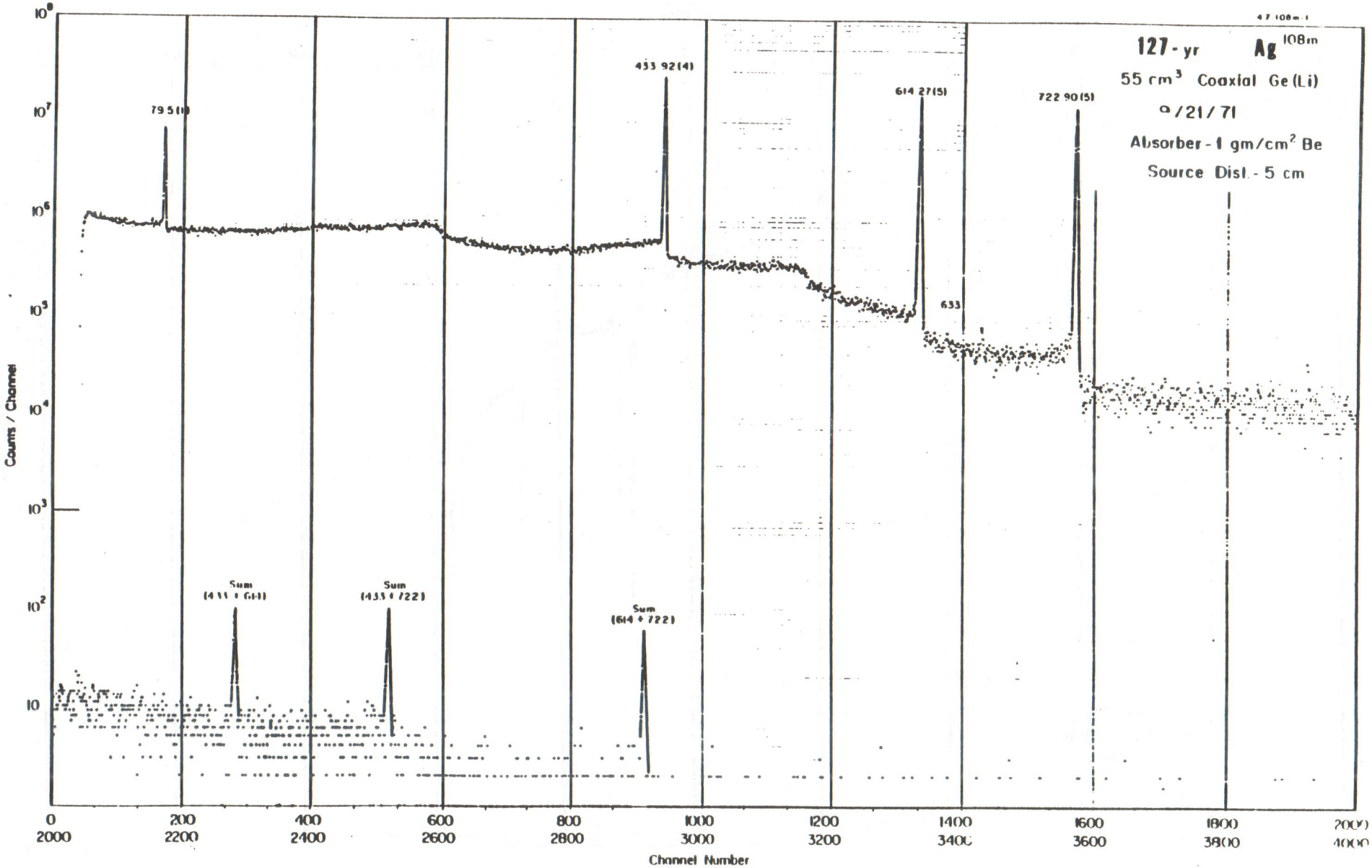

14.2-min Tc101
70 cm3 Coaxial Ge(Li)
2/5/73
Absorber-1.26 g/cm2 Be
Source Dist.-10 cm
Counts / Channel
Channel Number
842.84(8)
911
928.71(9)
938
964
968
127.23(3)
179
184.09(9)
295
306.82(5)
311
322
351
383
393
499
516
531.4
545.06(5)
583
609
617
621
627.02(8)
632
694
727
811

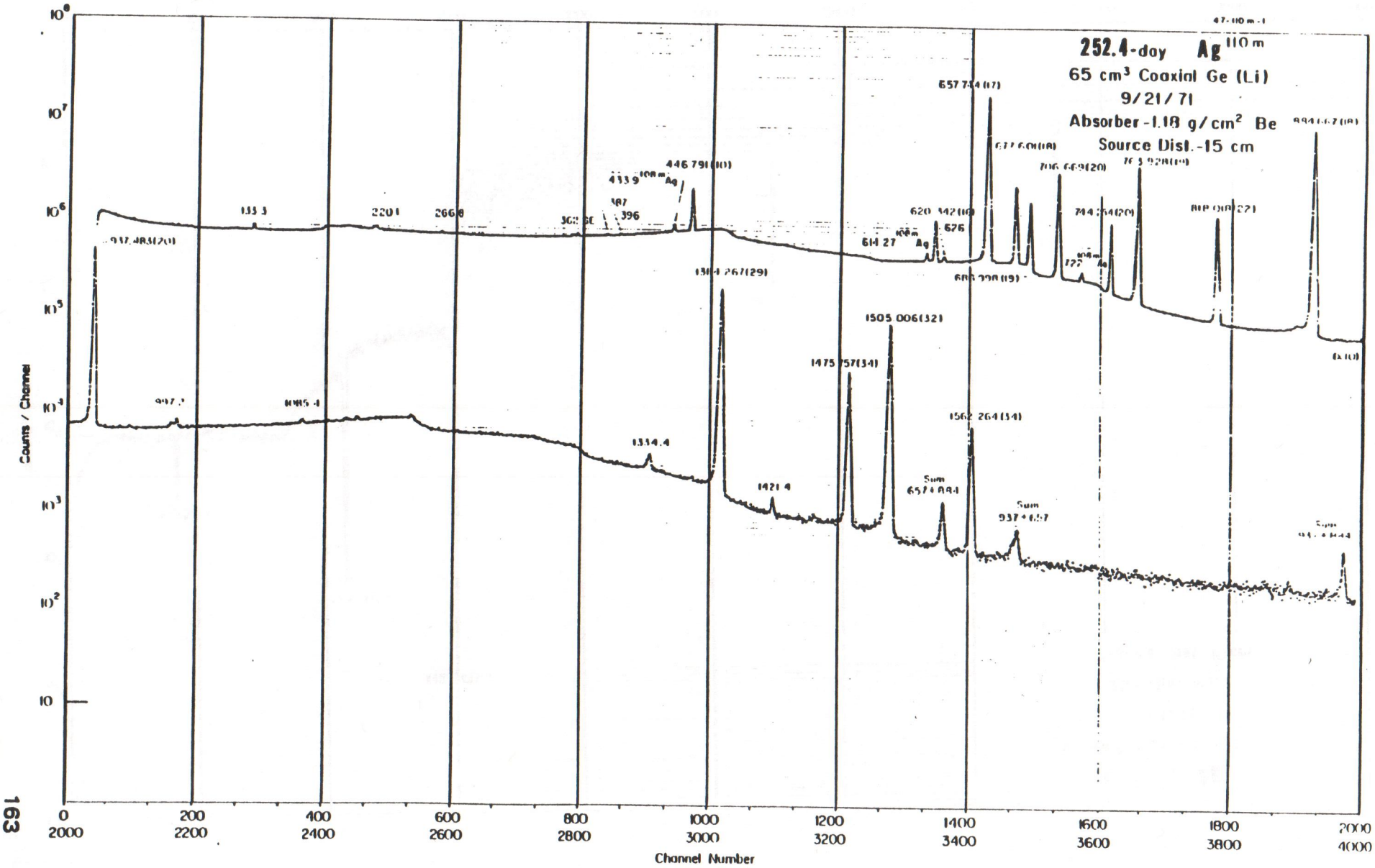

44-103-1
39.45-Day Ru103
65 cm3 Coaxial Ge (Li)
2-12-73
Absorber-0.5 g/cm2 Be
Source Dist.-10 cm
41
241
294
443
497.10 (5)
557.08 (7)
610.30 (8)
Random Sum Peaks
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸

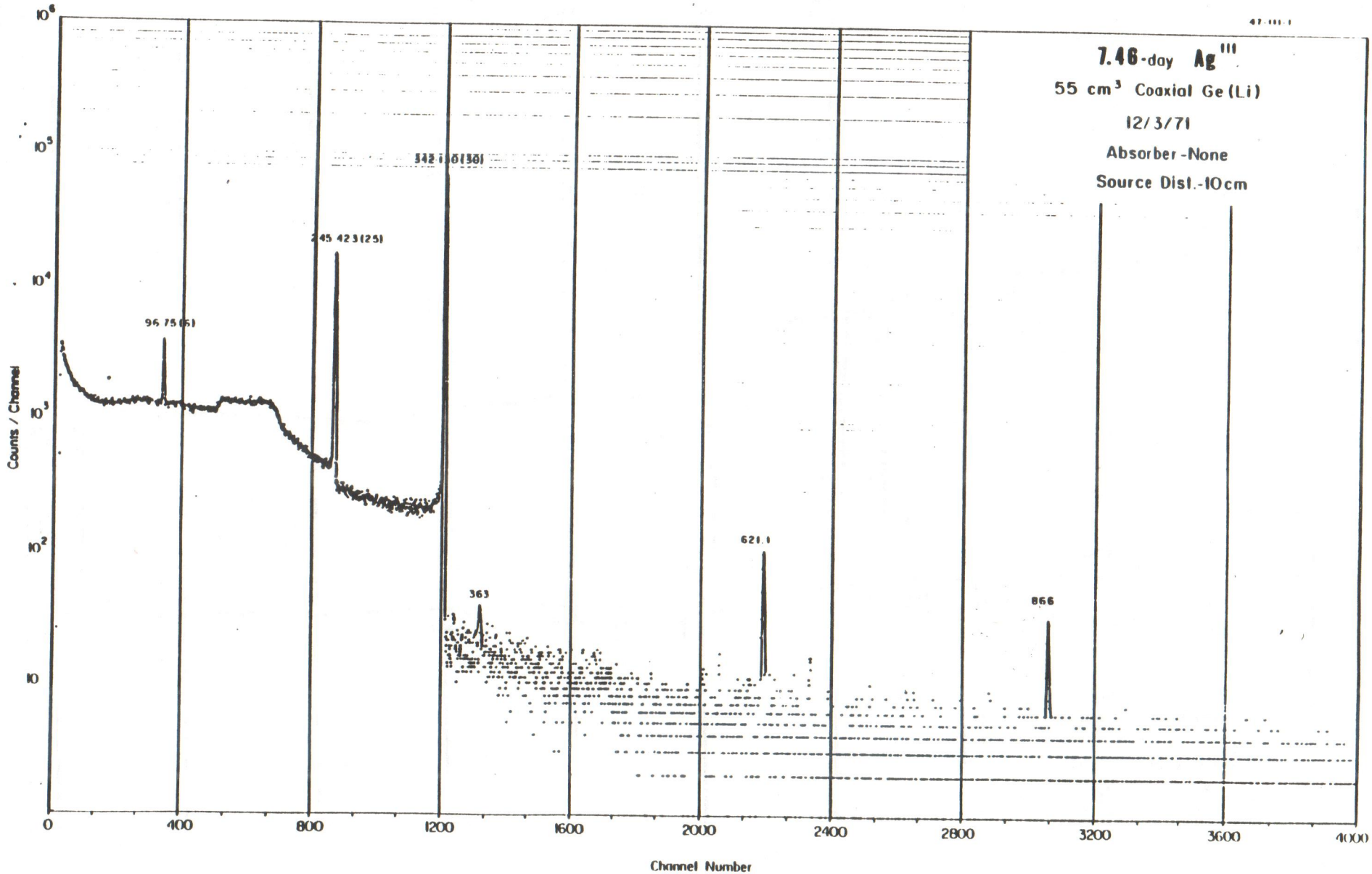

4.44 -hr Ru105
35 cm3 Coaxial Ge(Li)
4/12/71
Absorber - 1 g/cm2 Poly
Source Dist.- 3 cm
Counts / Channel
Channel Number
129.68(3)
316.63(7)
262.94(4)
469.43(5)
724.20(5)
676.54(6)
875.85(5)
907.63(6)
969.39(6)
1017.45(7)
1059
1215
1222
1376.99(15)
1698.3
1721.4

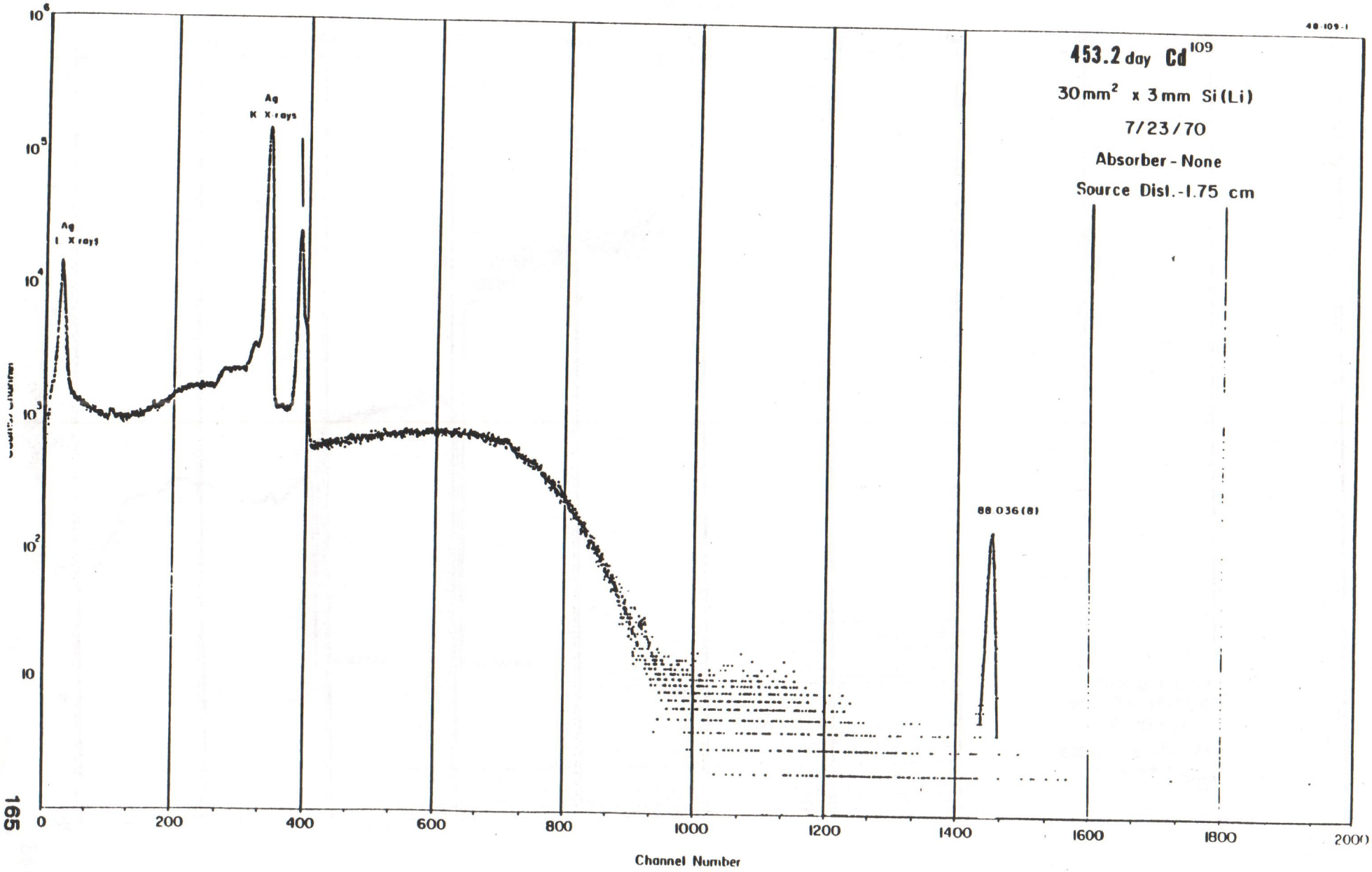

13.47-hr Pd109
70 cm3 coaxial Ge(Li)
7-26-72
Absorber - None
Source Dist 5 cm
Counts / Channel
Channel Number
Acc Sum
309
390
413
423
447
454
551
706
823
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000

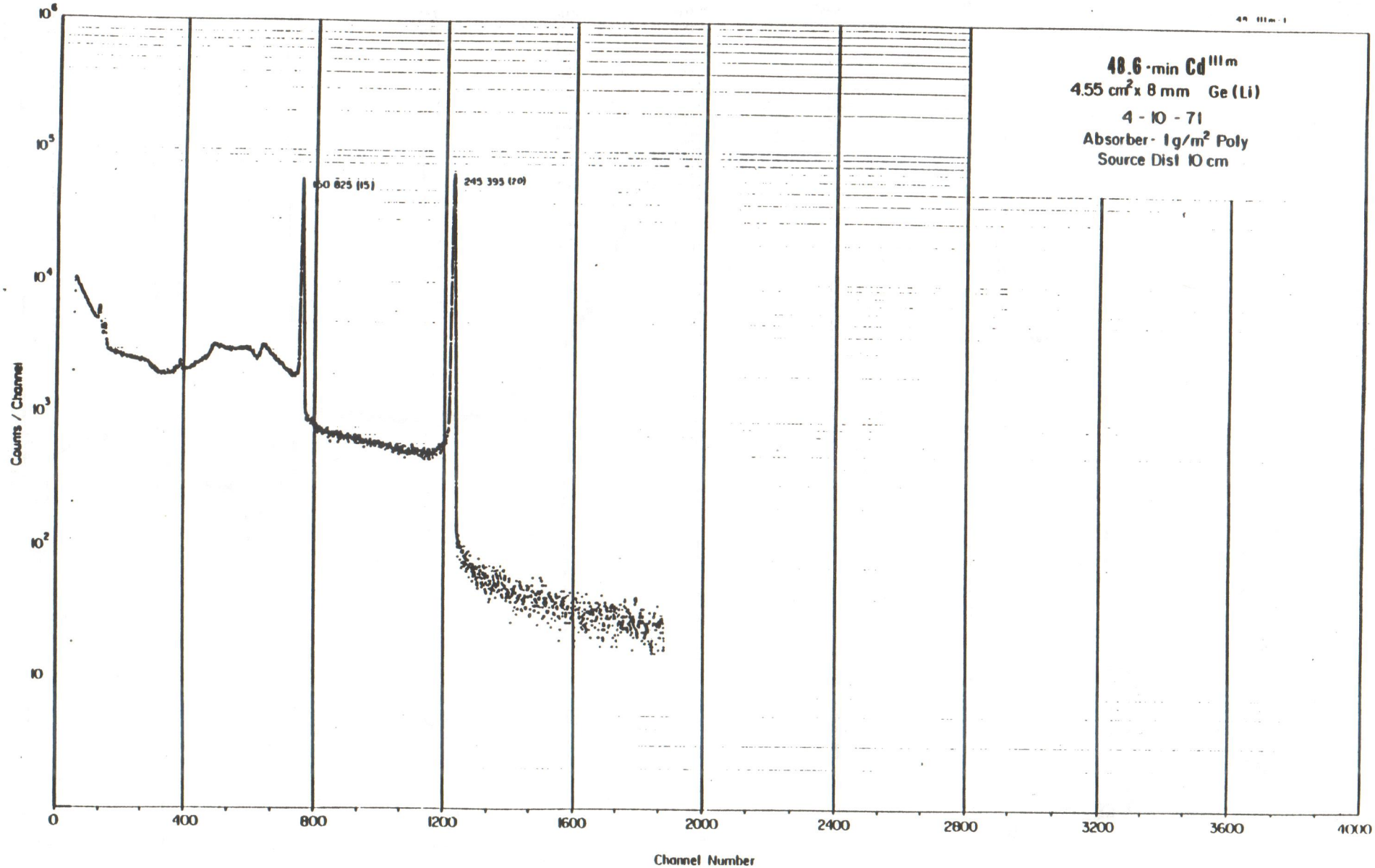

47-108-1
2.42-min Ag 108
2.5 cm² x 8mm Ge (Li)
4 - 22 - 70
Absorber - 1 g/cm² poly
Source Dist 25 cm
433.92 (4)
Annihilation Radiation
618.85 (5)
632.98 (5)
880.26 (10)
1007.22 (6)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

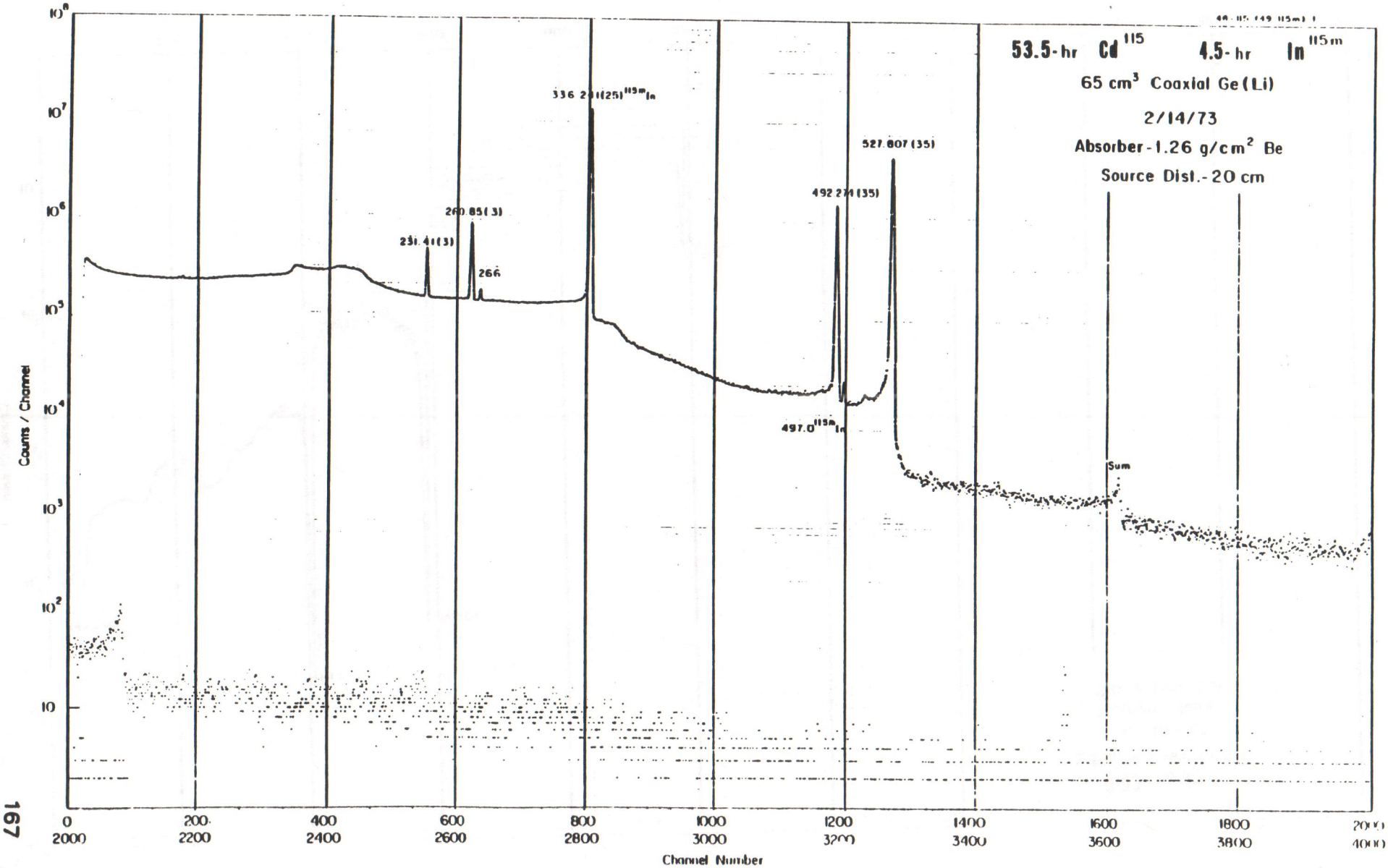

127 - yr
Ag 108m
55 cm³ Coaxial Ge(Li)
9/21/71
Absorber - 1 gm/cm² Be
Source Dist. - 5 cm
79.5(1)
433.92(4)
614.27(5)
722.90(5)
633
Sum (433 + 614)
Sum (433 + 722)
Sum (614 + 722)
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000

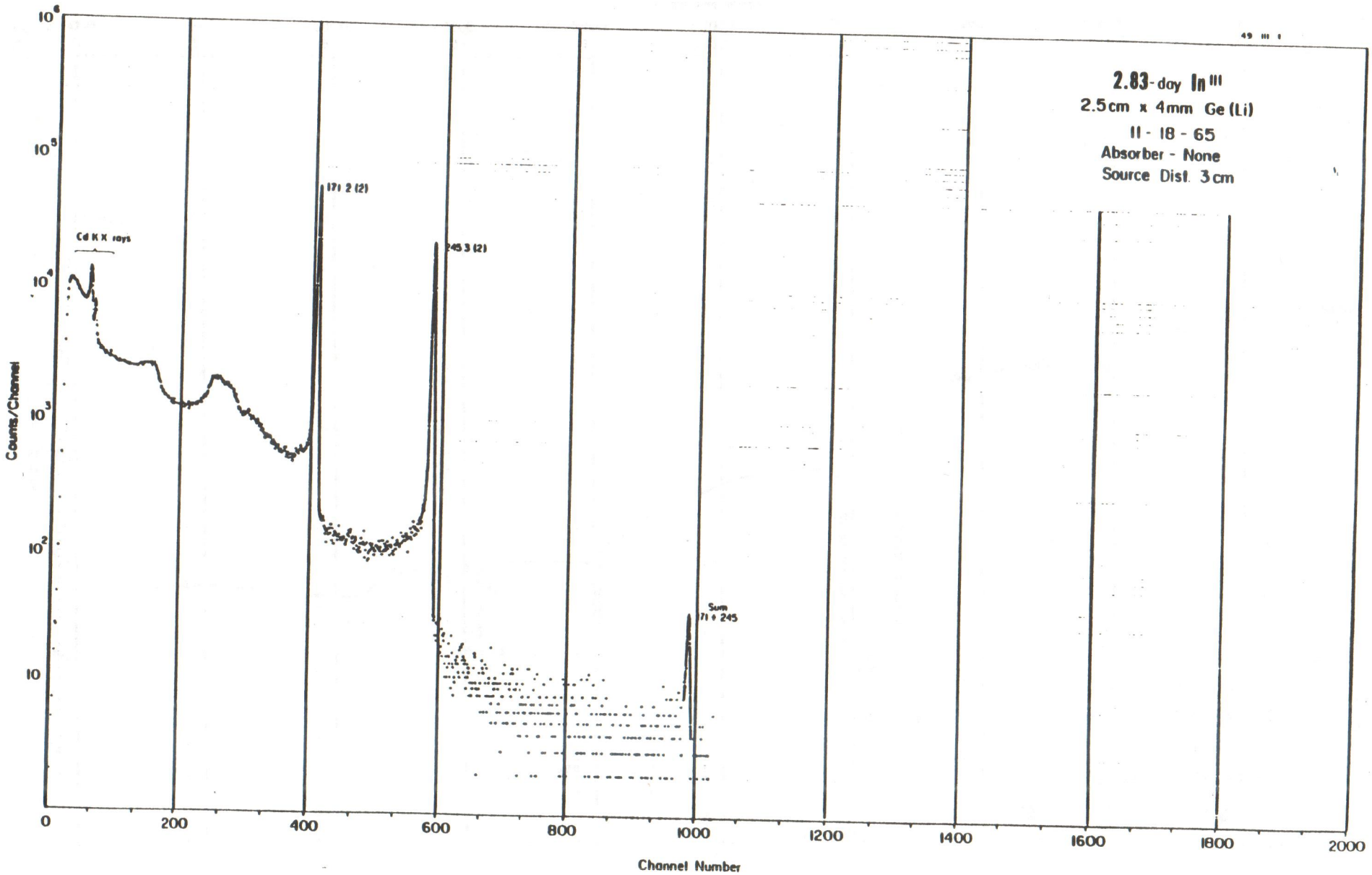

252.4-day Ag 110 m
65 cm³ Coaxial Ge (Li)
9/21/71
Absorber -1.18 g/cm² Be
Source Dist.-15 cm
Counts / Channel
Channel Number
Sum
Sum

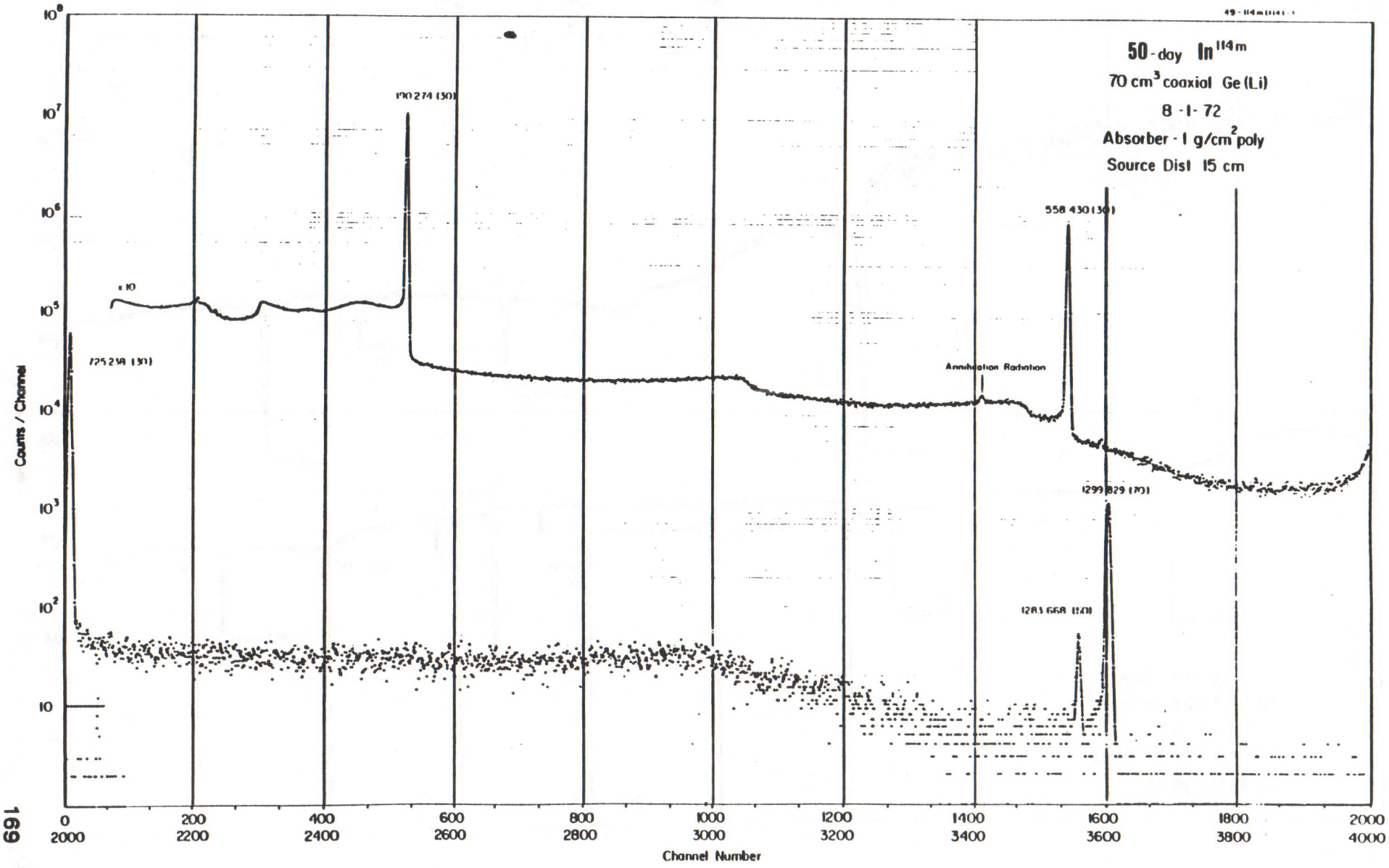

7.46-day Ag111
55 cm3 Coaxial Ge(Li)
12/3/71
Absorber-None
Source Dist.-10cm
96.75(6)
245.423(25)
342.1(5)(30)
363
621.1
866
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

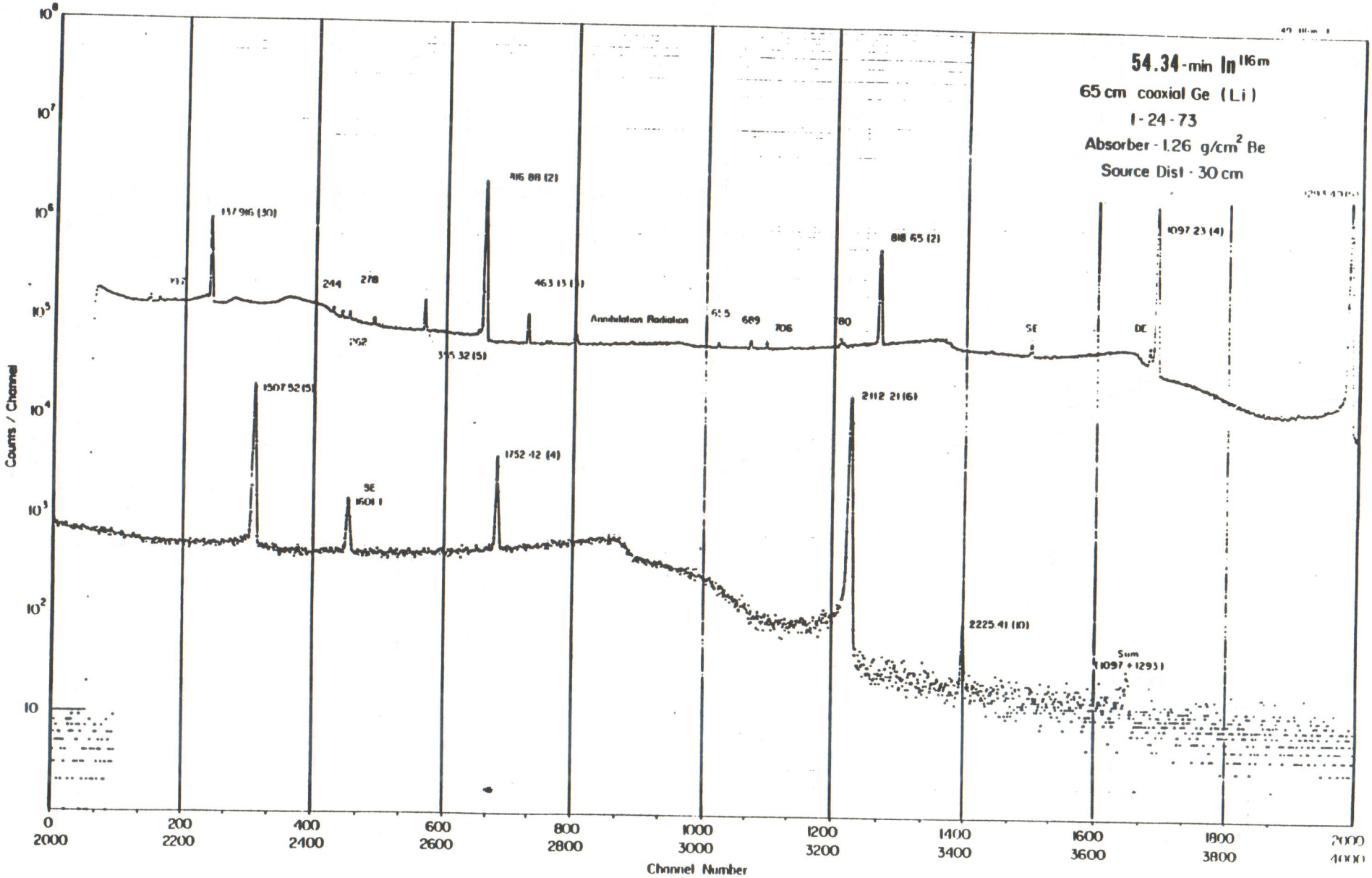

453.2 day Cd109
30 mm2 x 3 mm Si(Li)
7/23/70
Absorber - None
Source Dist.-1.75 cm
Ag
K X-rays
Ag
L X-rays
88.036(8)
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
10
10^2
10^3
10^4
10^5
10^6

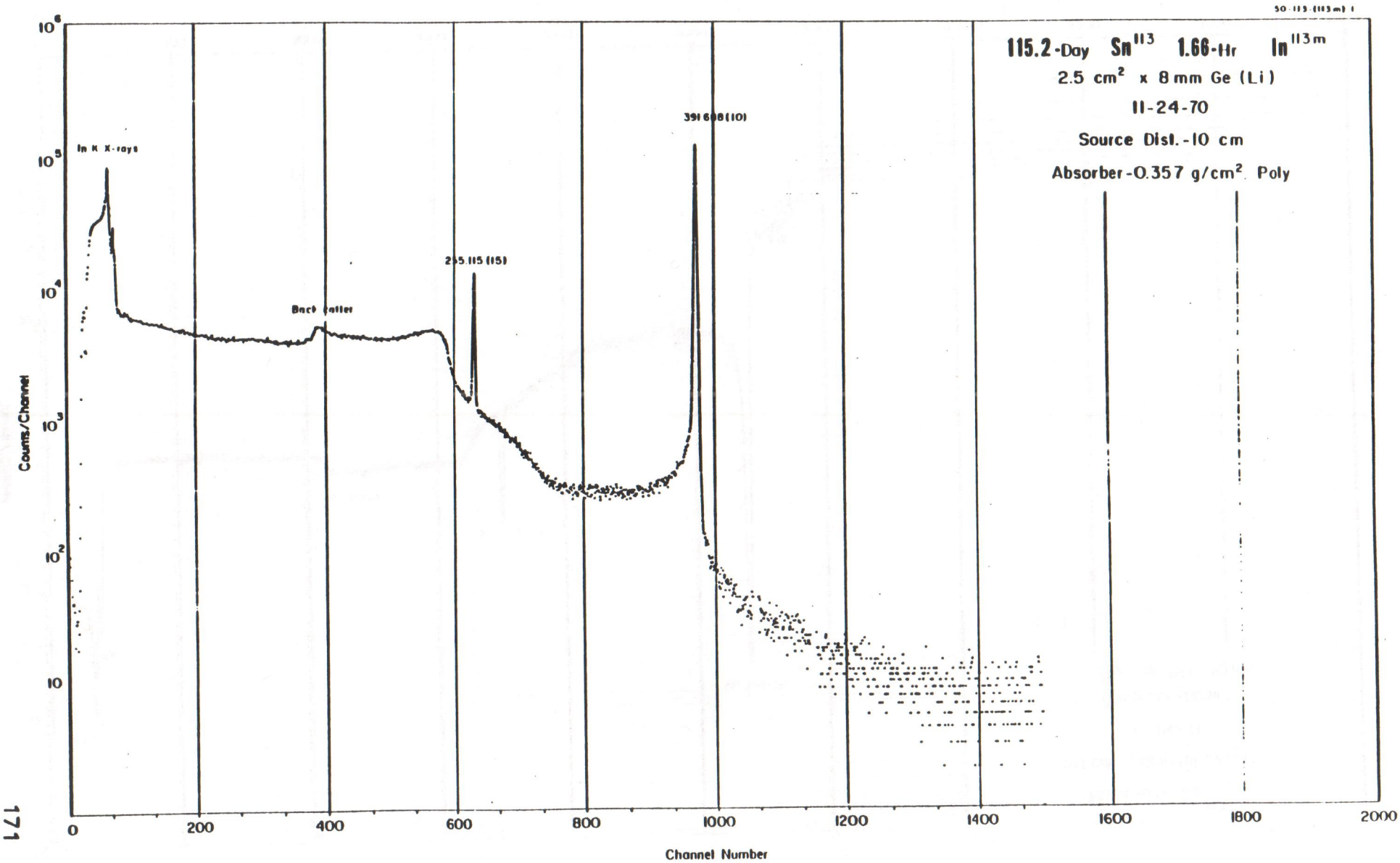

48.6 -min Cd111m
4.55 cm2 x 8 mm Ge (Li)
4 - 10 - 71
Absorber - 1g/m2 Poly
Source Dist 10 cm
150 825 (15)
245 395 (70)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

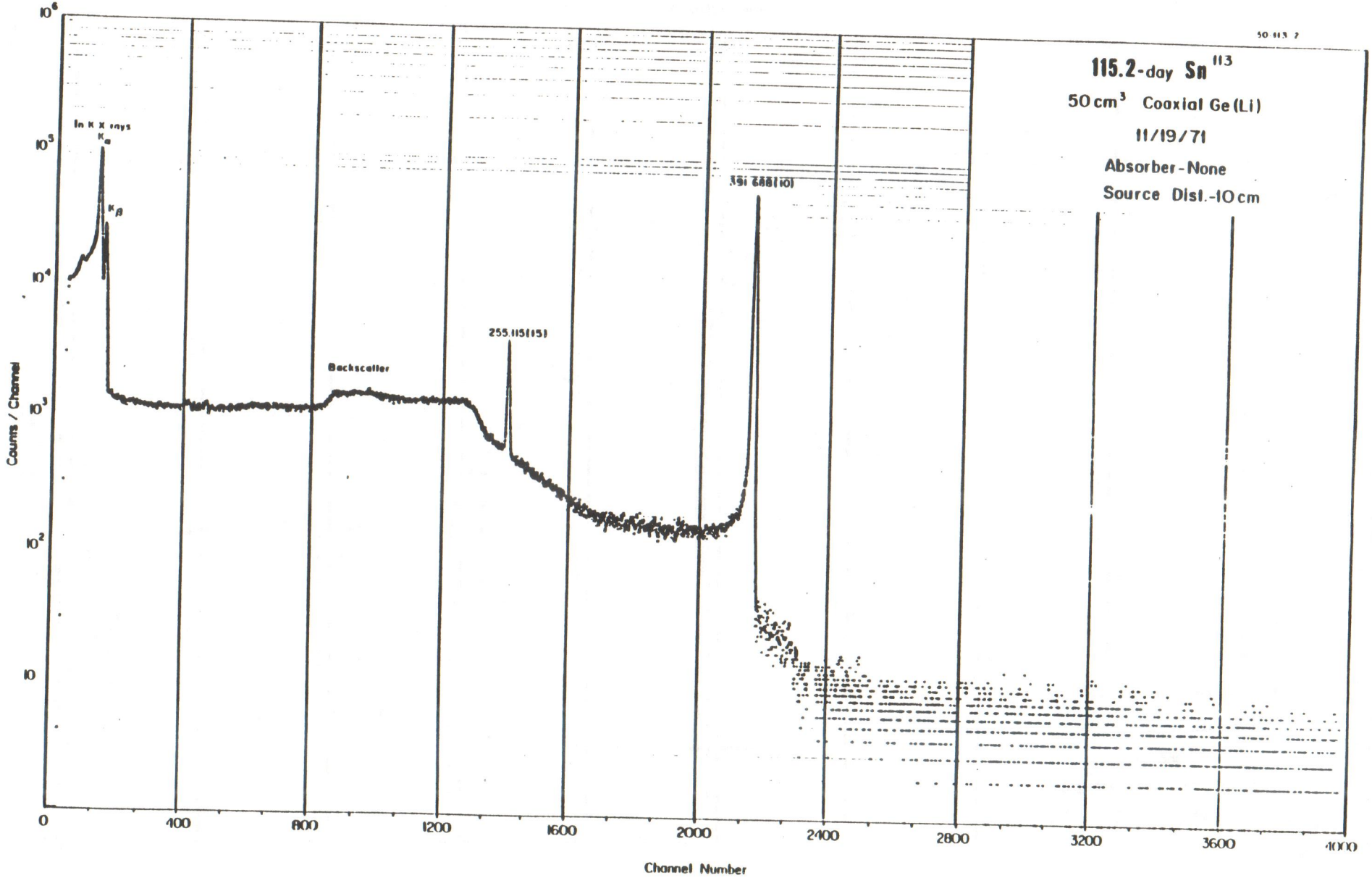

53.5-hr Cd115 4.5-hr In115m
65 cm3 Coaxial Ge(Li)
2/14/73
Absorber-1.26 g/cm2 Be
Source Dist.-20 cm
527.807(35)
492.271(35)
497.0 115mIn
336.24(25) 115mIn
260.85(3)
231.41(3)
266
Sum
Counts / Channel
Channel Number

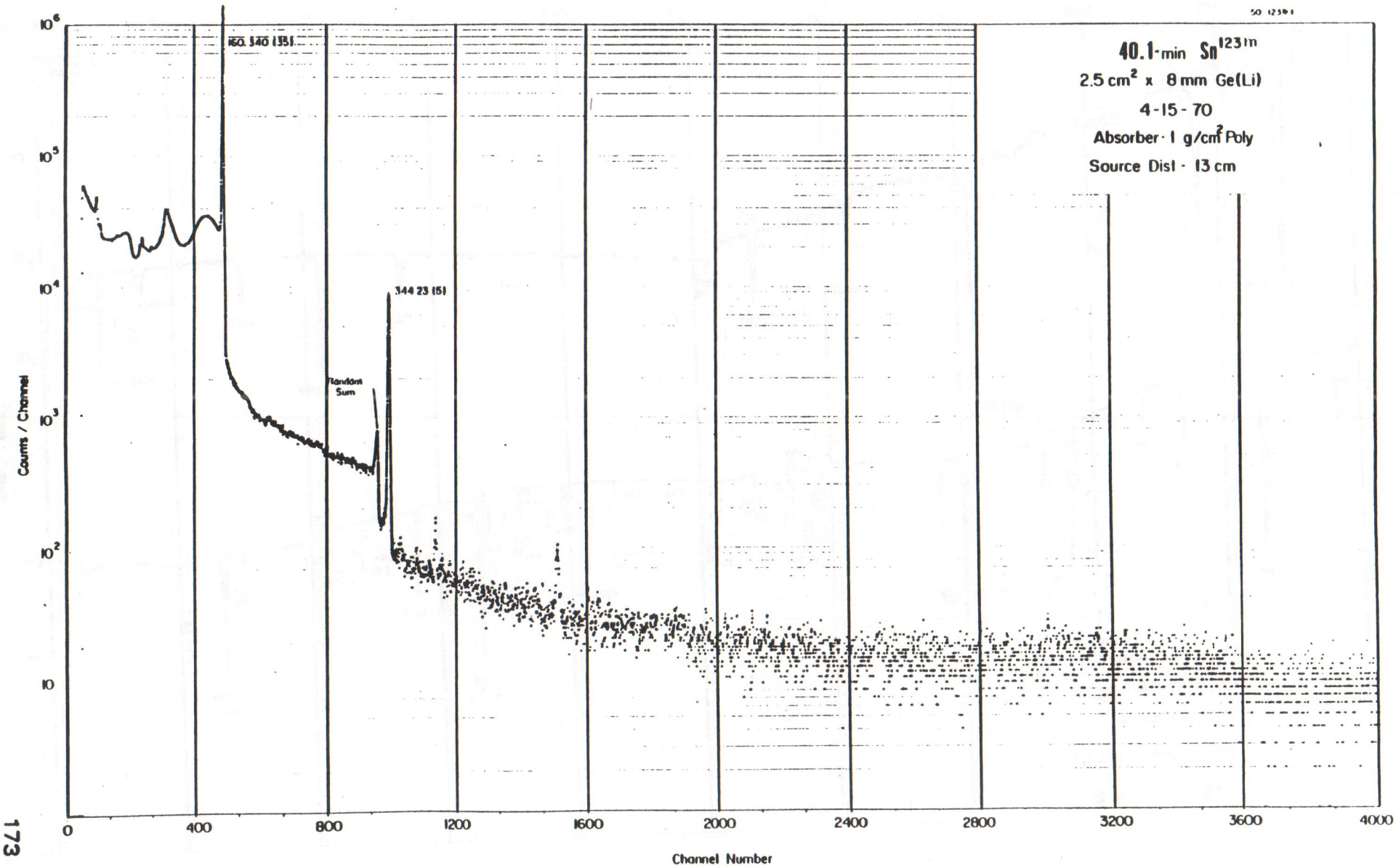

2.83-day In111
2.5cm x 4mm Ge (Li)
11 - 18 - 65
Absorber - None
Source Dist. 3cm
Cd K X rays
171.2 (2)
245.3 (2)
Sum
171 + 245
Counts/Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
200
400
600
800
1000
1200
1400
1600
1800
2000

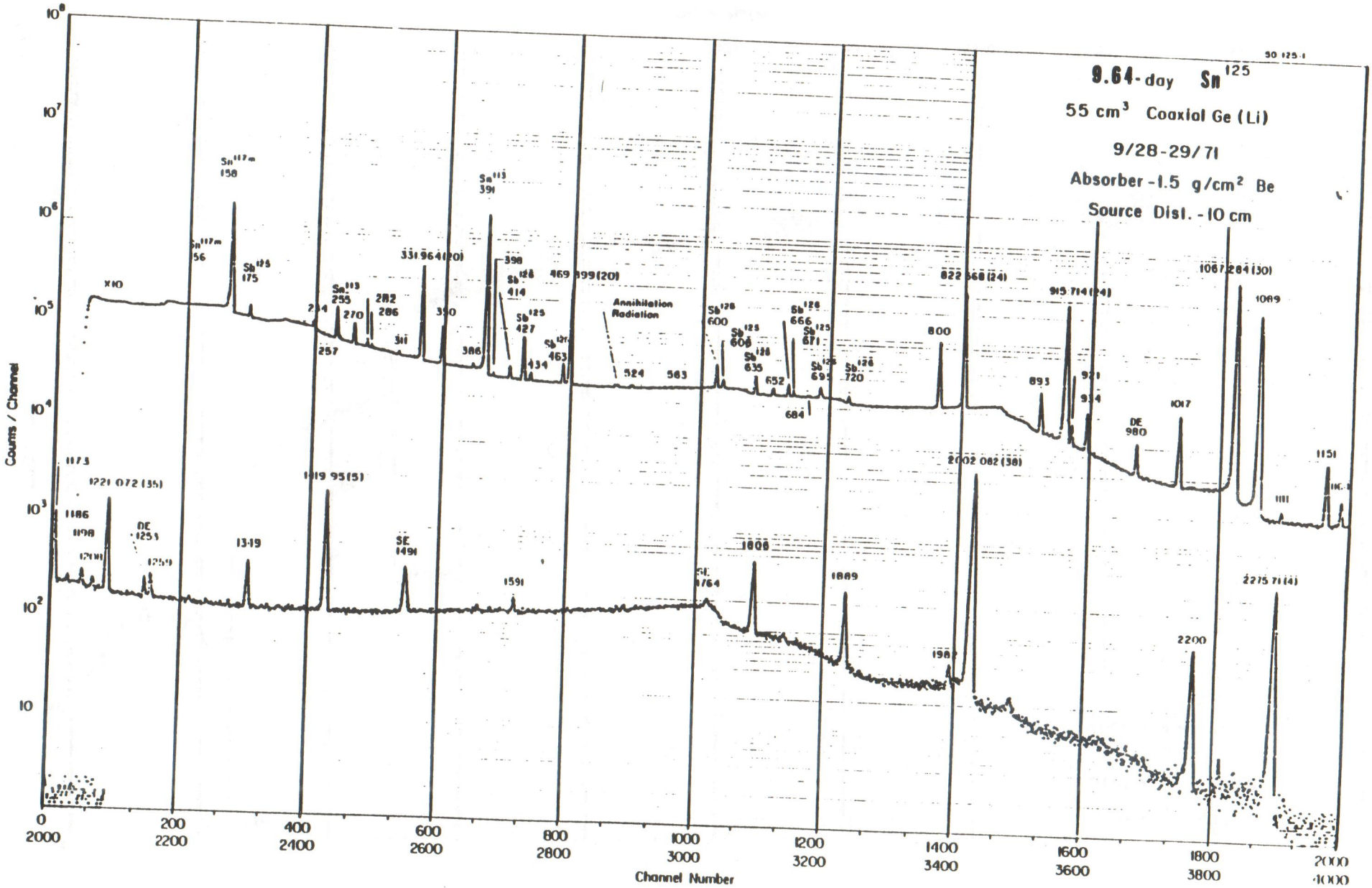

50-day In114m
70 cm3 coaxial Ge(Li)
8-1-72
Absorber - 1 g/cm2 poly
Source Dist 15 cm
190 274 (30)
558 430 (30)
Annihilation Radiation
1299 829 (70)
1283 668 (10)
Counts / Channel
Channel Number

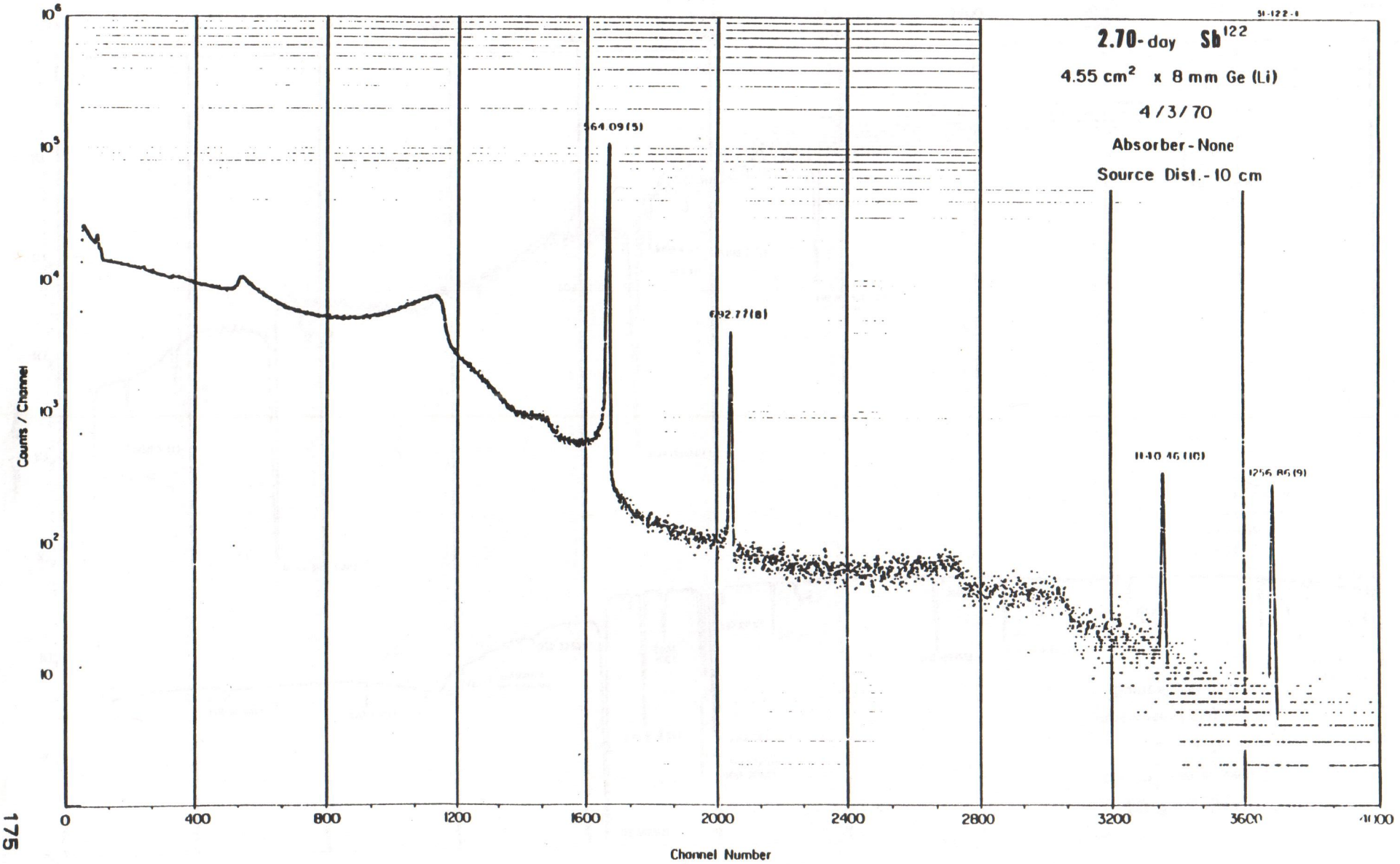

54.34-min In116m
65 cm coaxial Ge (Li)
1-24-73
Absorber - 1.26 g/cm2 Be
Source Dist - 30 cm
Counts / Channel
Channel Number
Annihilation Radiation
SE
DE
Sum
1097 + 1293
2225.41 (10)
2112.21 (6)
1752.42 (4)
1507.52 (5)
1097.23 (4)
818.65 (2)
416.88 (2)
137.96 (30)

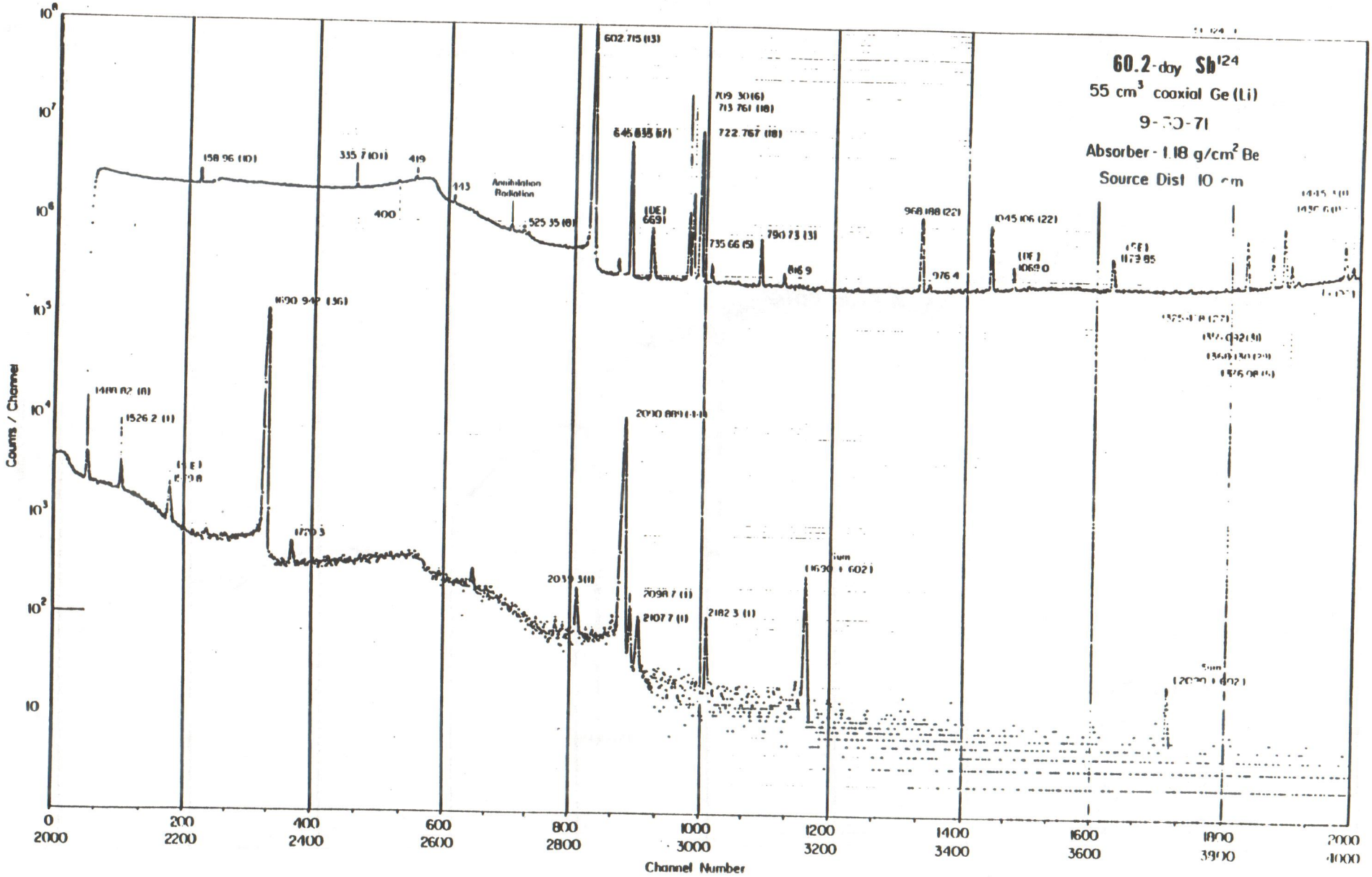

115.2-Day Sn113 1.66-Hr In113m
2.5 cm2 x 8 mm Ge (Li)
11-24-70
Source Dist.-10 cm
Absorber-0.357 g/cm2 Poly
In K X-rays
Back scatter
255.115 (15)
391.698 (10)
Counts/Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
200
400
600
800
1000
1200
1400
1600
1800
2000

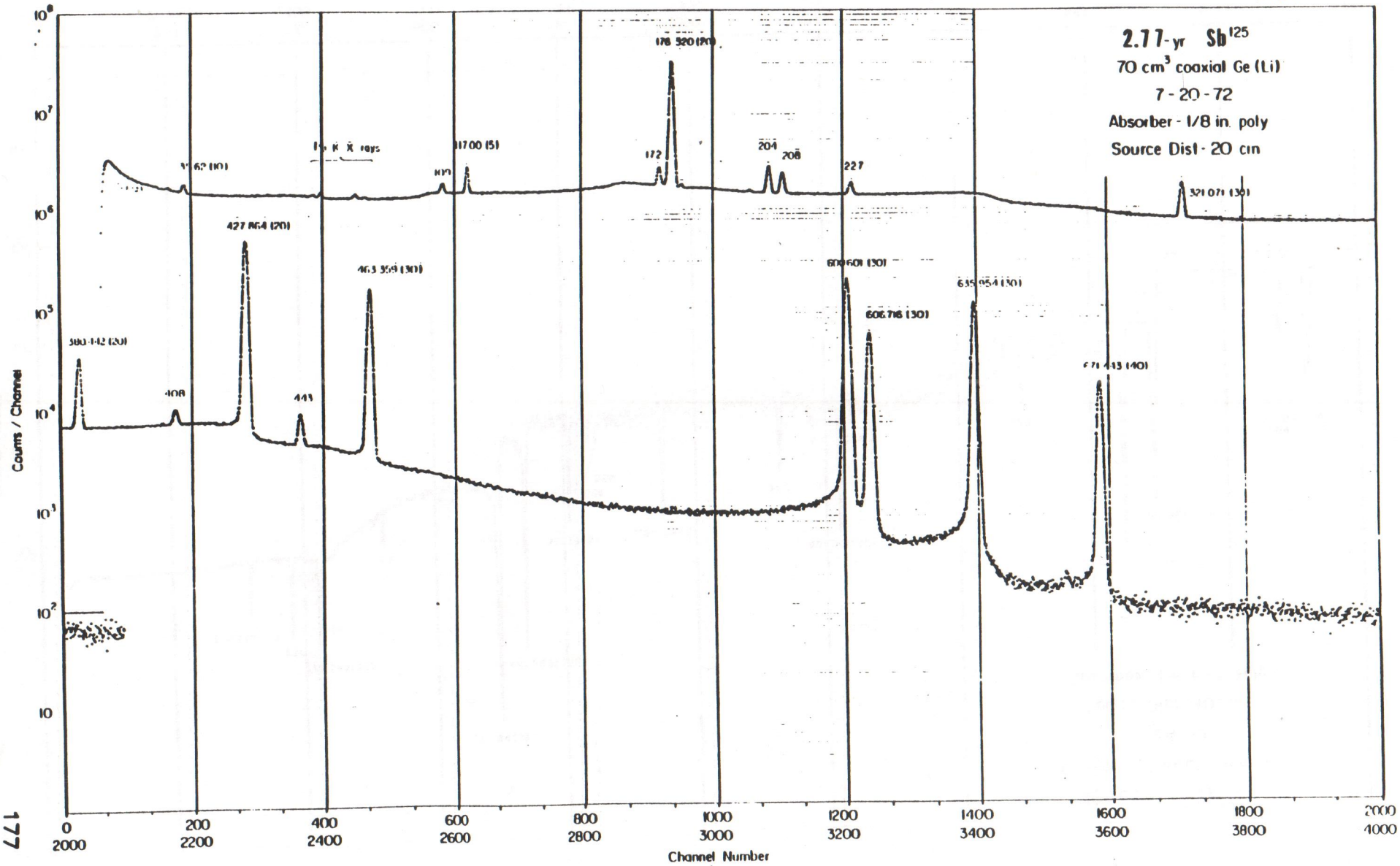

115.2-day Sn 113
50 cm³ Coaxial Ge(Li)
11/19/71
Absorber-None
Source Dist.-10 cm
In K X rays
Kα
Kβ
Backscatter
255.115(15)
391.688(10)
Counts / Channel
Channel Number
10⁶
10⁵
10⁴
10³
10²
10
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

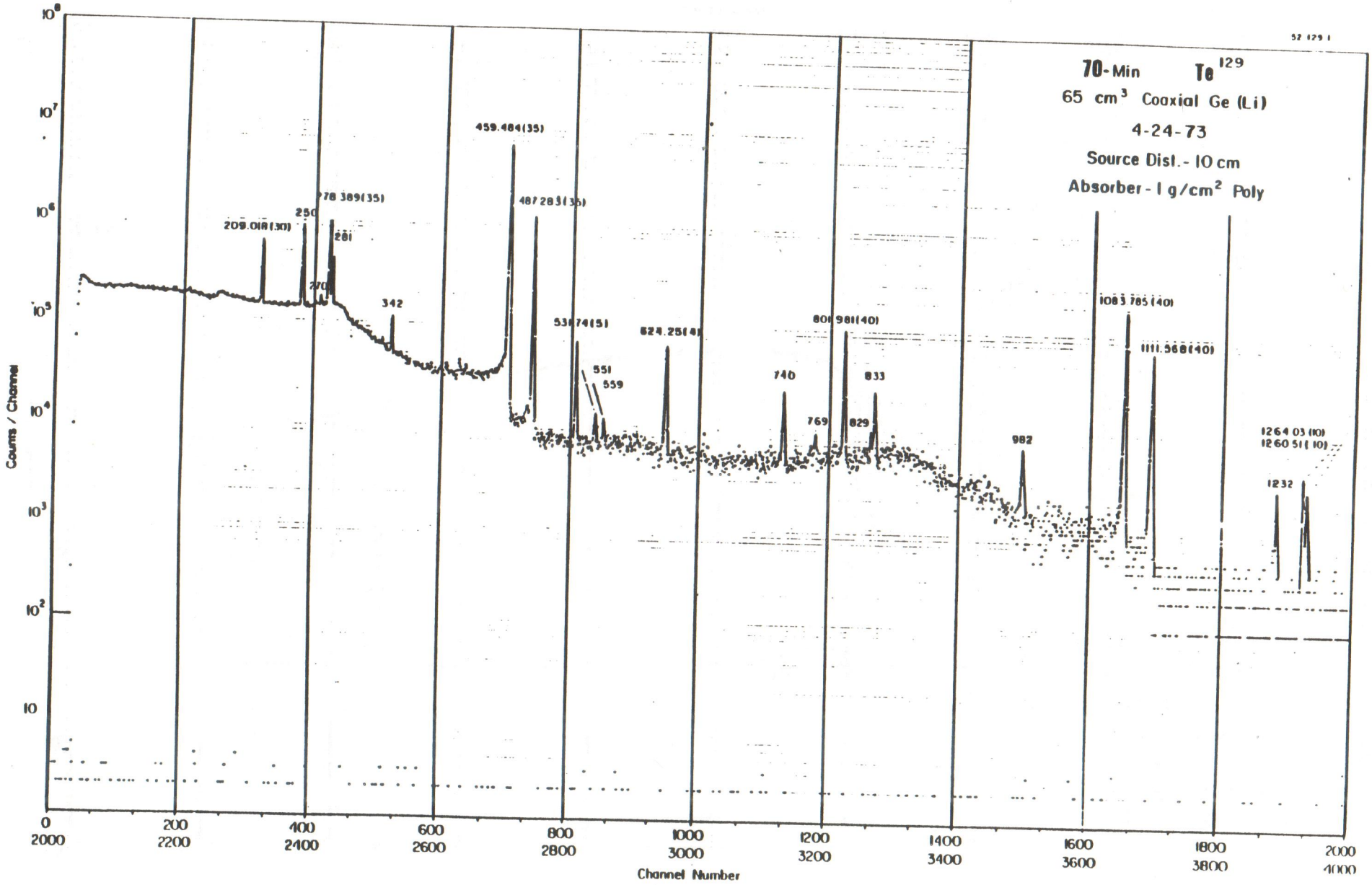

40.1-min Sn123m
2.5 cm2 x 8 mm Ge(Li)
4-15-70
Absorber - 1 g/cm2 Poly
Source Dist - 13 cm
160.340 (35)
344.23 (15)
Random Sum
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

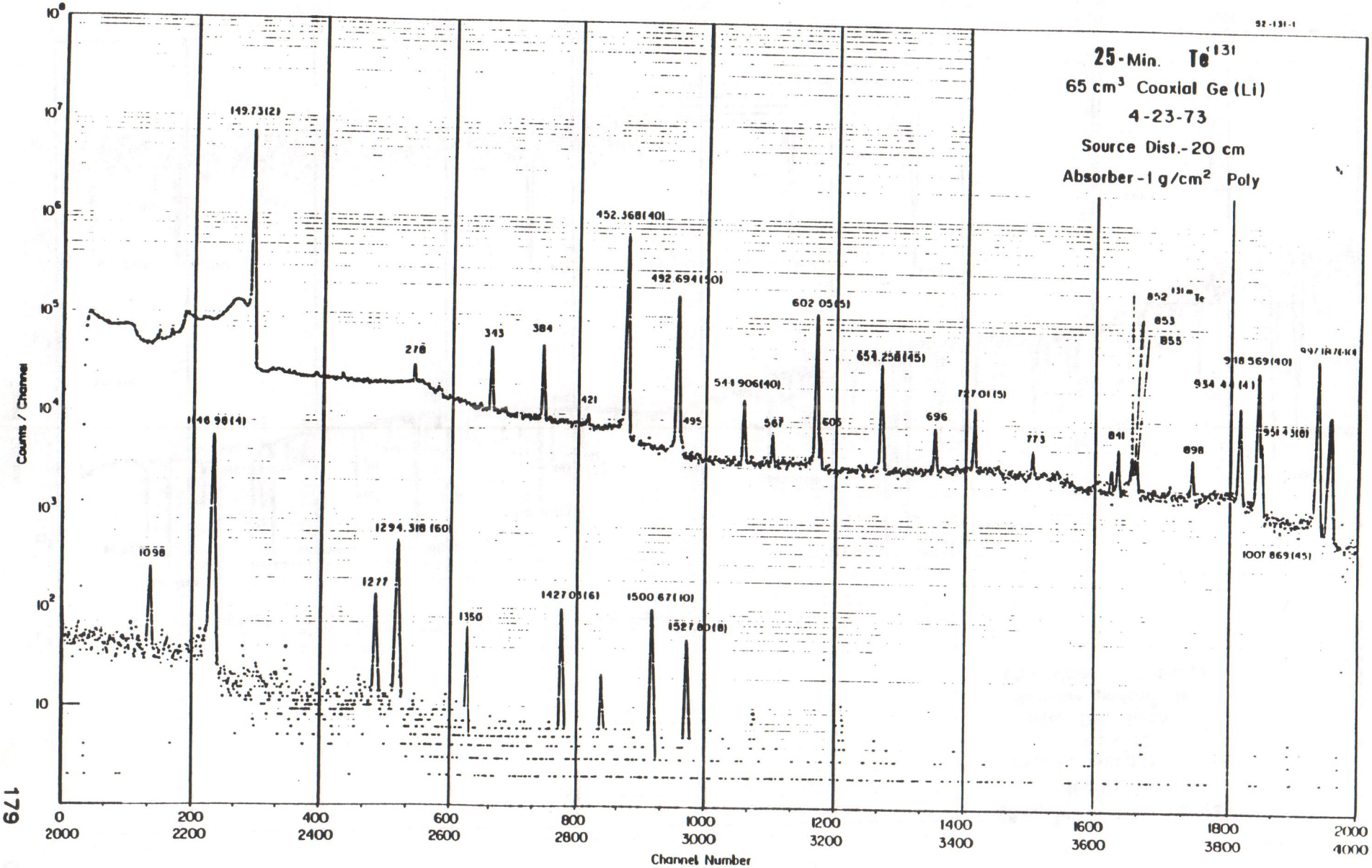

9.64-day Sn125
55 cm3 Coaxial Ge (Li)
9/28-29/71
Absorber - 1.5 g/cm2 Be
Source Dist. - 10 cm
Counts / Channel
Channel Number
Annihilation Radiation
DE
SE

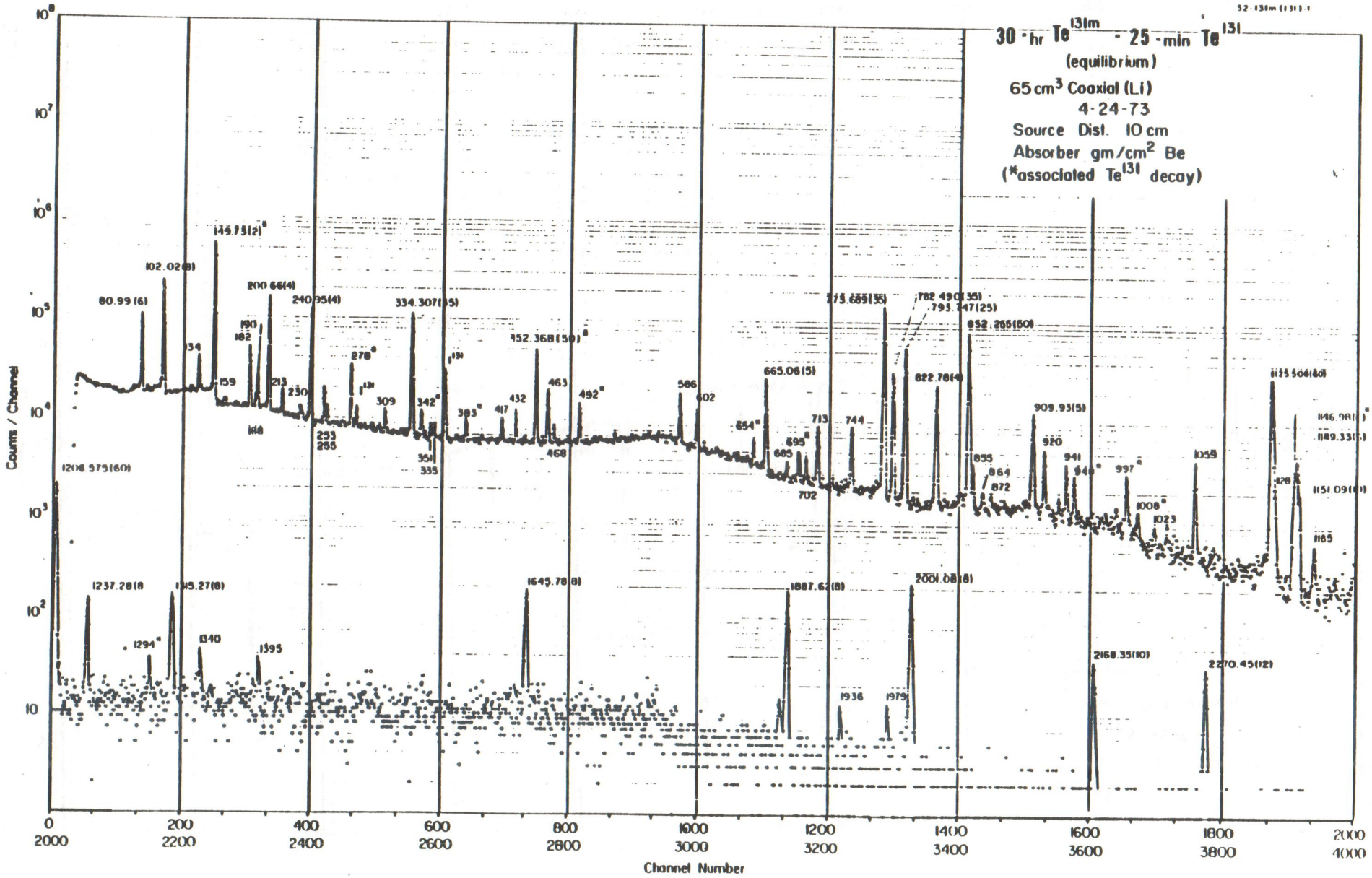

2.70-day Sb122
4.55 cm2 x 8 mm Ge (Li)
4/3/70
Absorber-None
Source Dist.-10 cm
564.09(5)
692.77(8)
1140.46(10)
1256.86(9)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

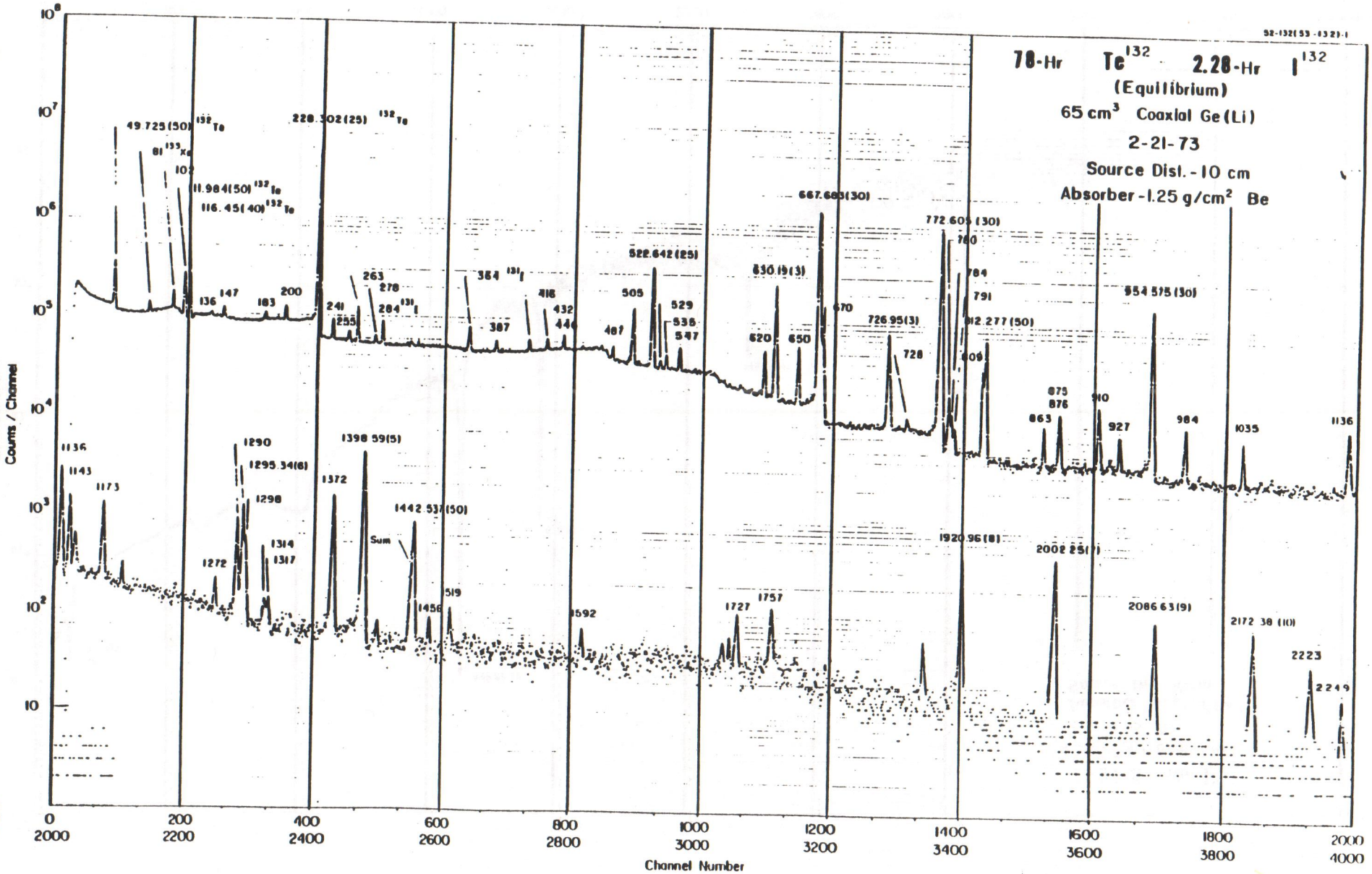

60.2-day Sb124
55 cm3 coaxial Ge(Li)
9-30-71
Absorber - 1.18 g/cm2 Be
Source Dist 10 cm
Counts / Channel
Channel Number
Annihilation Radiation
158.96 (10)
335.7 (10)
419
400
443
525.35 (8)
602.715 (13)
645.835 (7)
709.30 (6)
713.761 (18)
722.767 (18)
735.66 (5)
790.73 (3)
846.9
968.188 (22)
976.4
1045.106 (22)
1069.0
1173.85
1690.947 (36)
1409.82 (8)
1526.2 (1)
2039.3 (1)
2098.7 (1)
2107.7 (1)
2182.3 (1)
Sum
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3900
4000

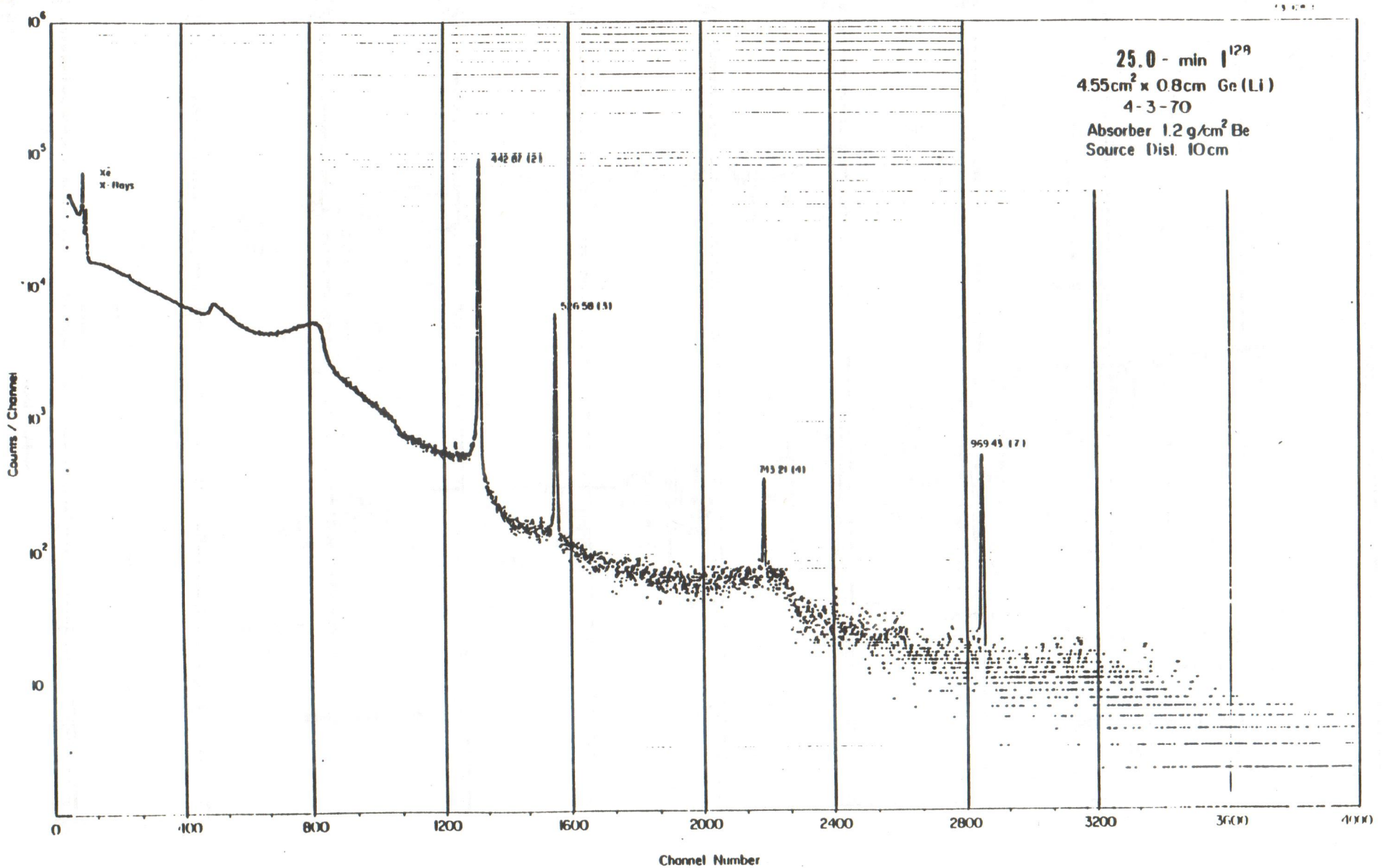

2.77-yr Sb125
70 cm3 coaxial Ge (Li)
7 - 20 - 72
Absorber - 1/8 in. poly
Source Dist - 20 cm
Counts / Channel
Channel Number
408
427 864 (20)
443
463 359 (30)
172
204
208
227
606 718 (30)
635 954 (30)
671 433 (40)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000

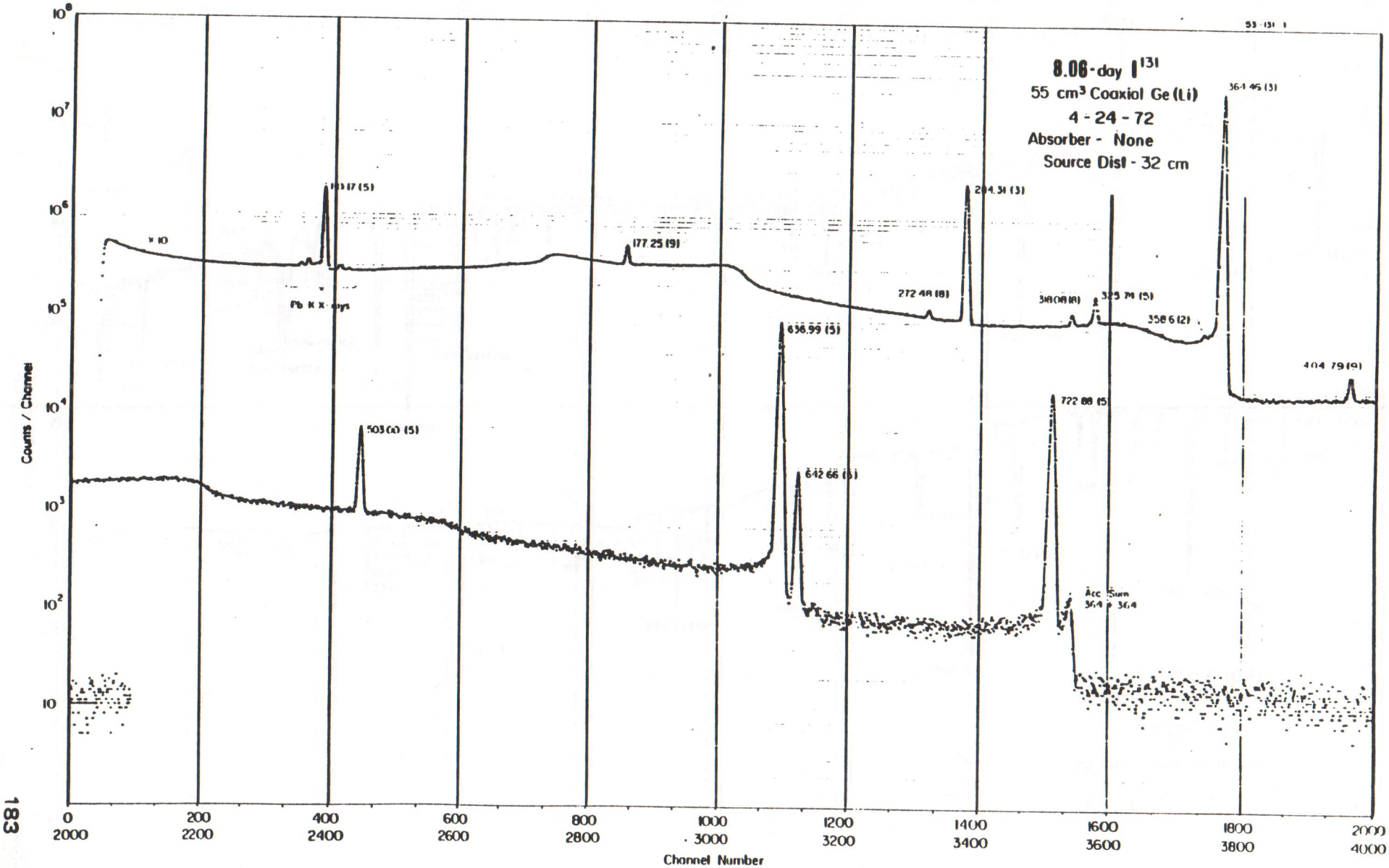

70-Min Te 129
65 cm3 Coaxial Ge (Li)
4-24-73
Source Dist.- 10 cm
Absorber - 1 g/cm2 Poly
Counts / Channel
Channel Number
209.018(30)
250
278.389(35)
281
270
342
459.484(35)
487.283(35)
531.74(5)
551
559
624.25(4)
740
769
801.981(40)
829
833
982
1083.785(40)
1111.568(40)
1232
1264.03(10)
1260.51(10)

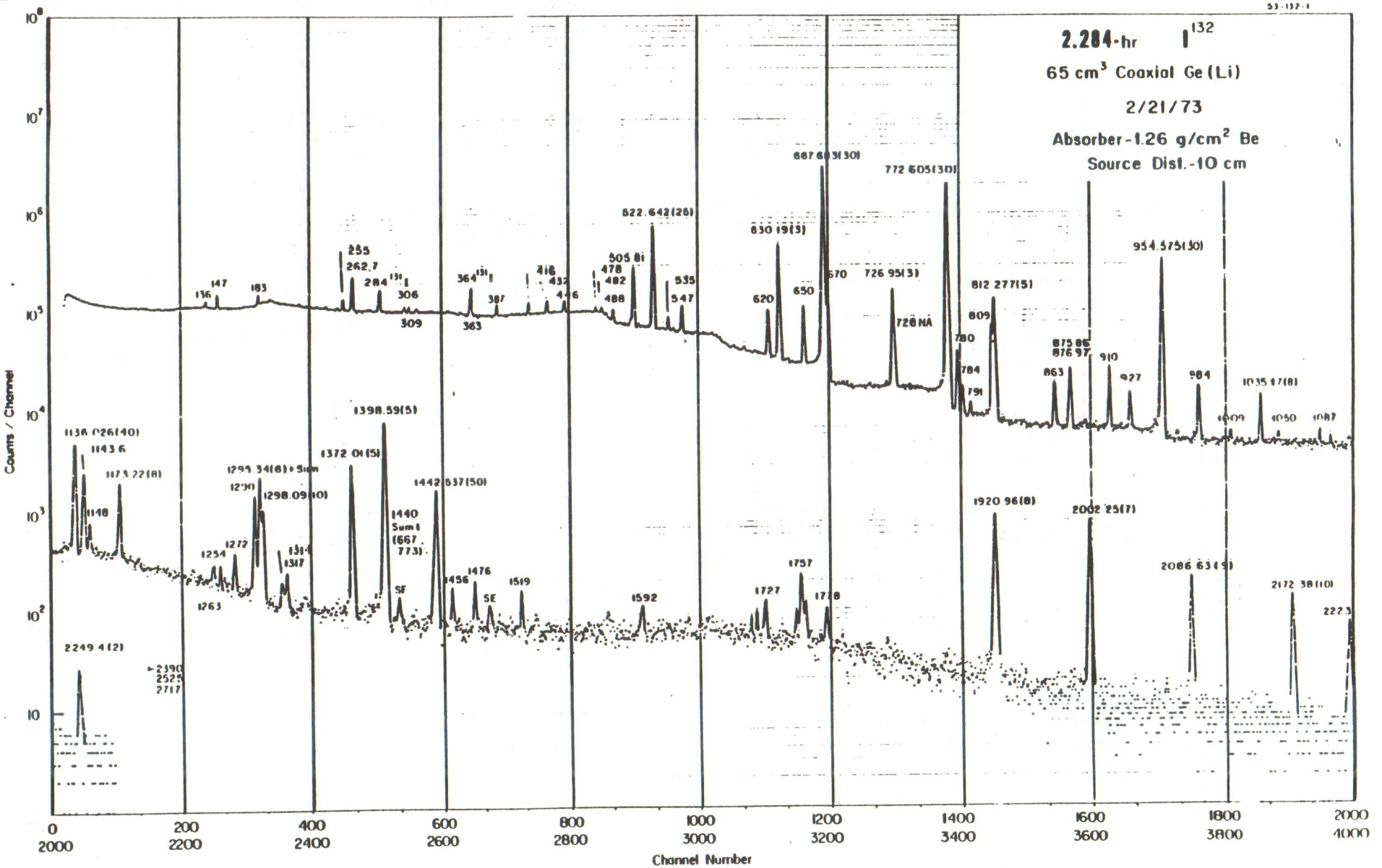

25-Min. Te 131
65 cm³ Coaxial Ge (Li)
4-23-73
Source Dist.-20 cm
Absorber-1 g/cm² Poly
Counts / Channel
Channel Number
149.73(2)
278
343
384
421
452.368(40)
492.694(50)
495
541.906(40)
567
602.05(5)
605
654.258(45)
696
727.01(5)
773
841
852 131m Te
853
855
898
918.569(40)
934.4(4)
951.43(8)
1007.869(45)
1098
1146.98(4)
1277
1294.318(60)
1350
1427.08(6)
1500.67(10)
1527.80(8)

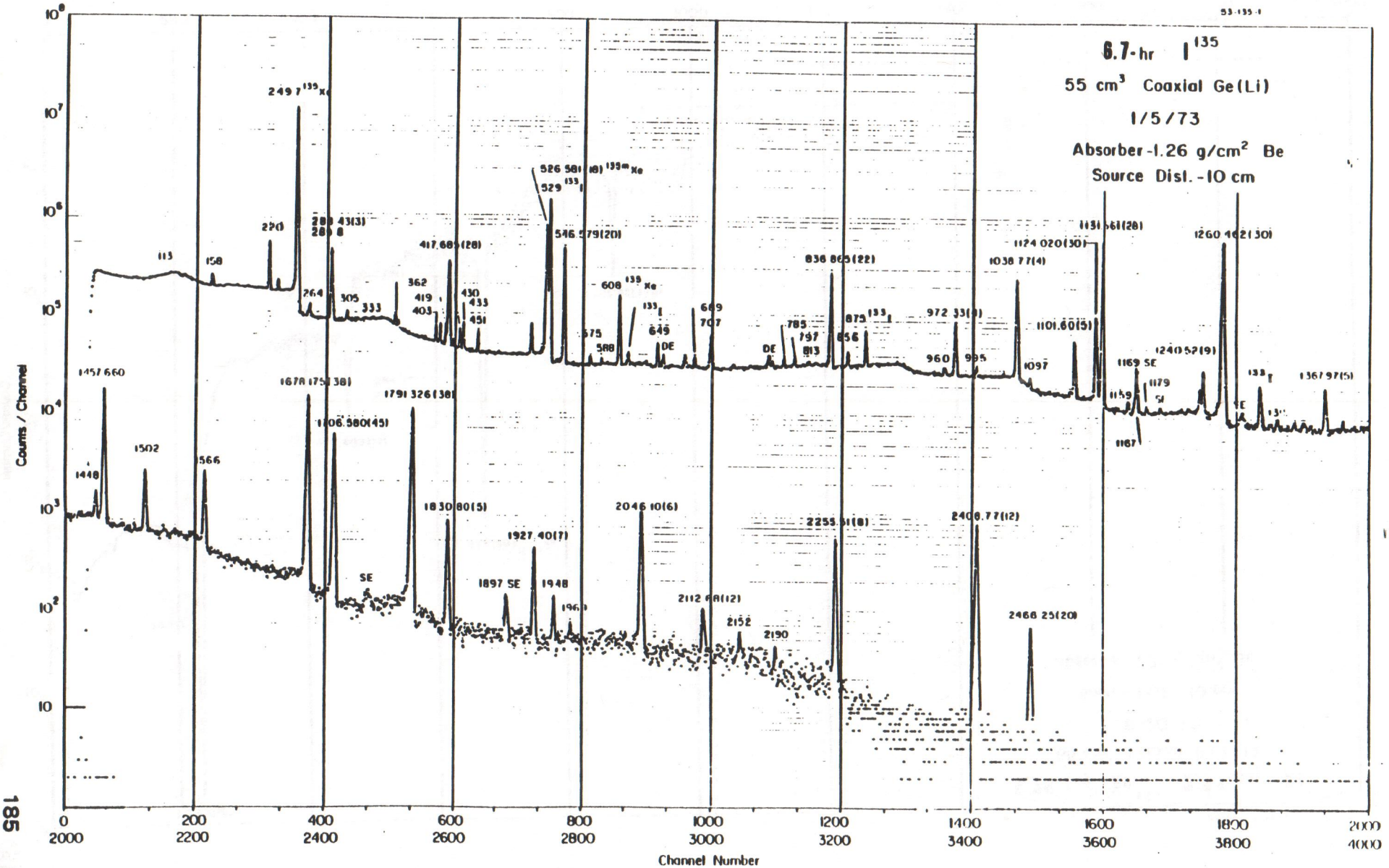

30-hr Te131m - 25-min Te131
(equilibrium)
65 cm3 Coaxial (Li)
4-24-73
Source Dist. 10 cm
Absorber gm/cm2 Be
(*associated Te131 decay)
Counts / Channel
Channel Number
80.99(6)
102.02(8)
149.73(2)*
200.66(4)
240.95(4)
334.307(35)
452.368(59)*
665.06(5)
775.685(35)
782.490(35)
793.247(25)
852.265(60)
822.78(4)
909.93(5)
1125.506(60)
1206.575(60)
1237.28(8)
1295.27(8)
1645.78(8)
1887.62(8)
2001.08(8)
2168.35(10)
2270.45(12)

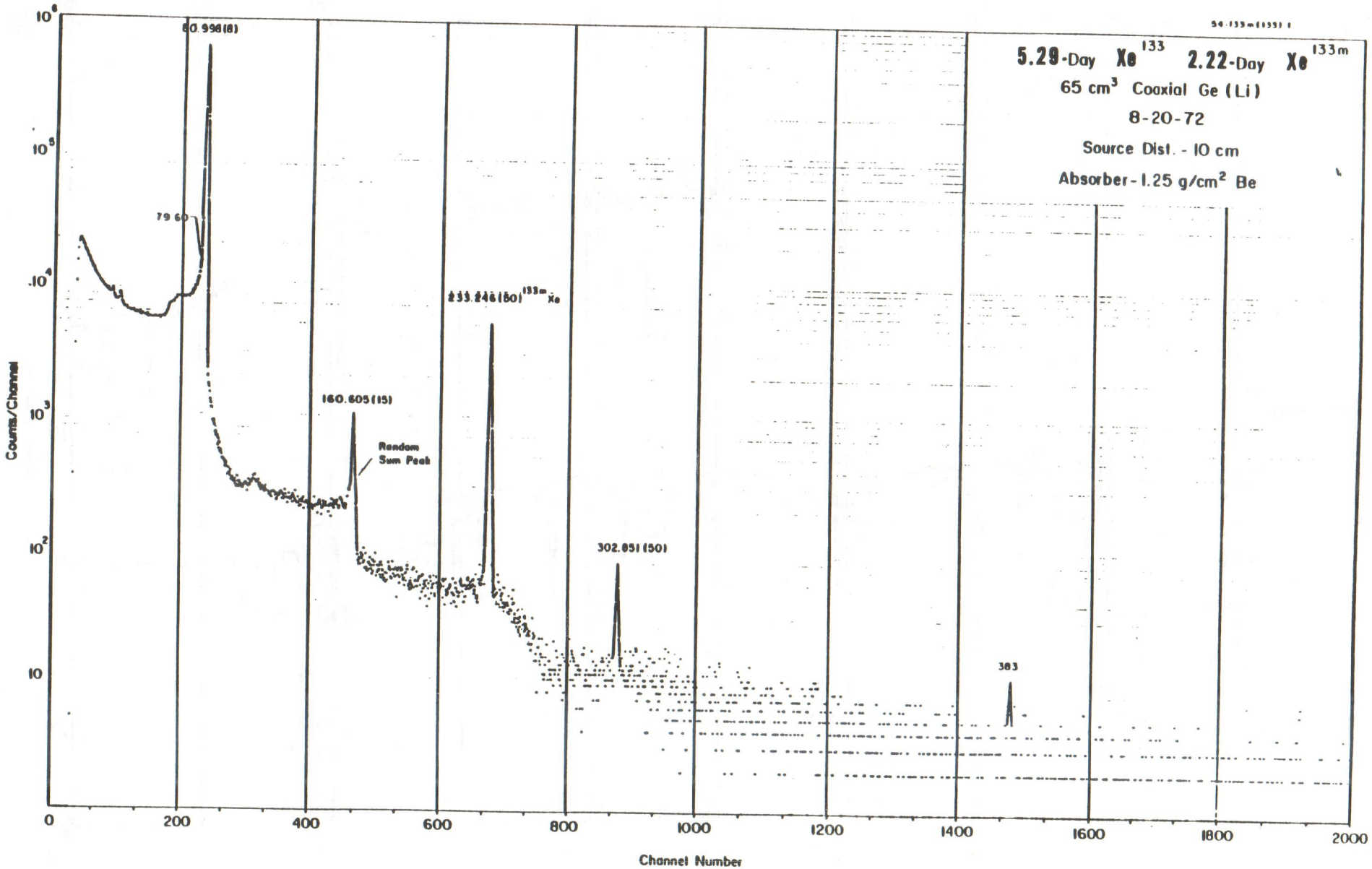

78-Hr Te132 2.28-Hr I132
(Equilibrium)
65 cm3 Coaxial Ge(Li)
2-21-73
Source Dist. - 10 cm
Absorber - 1.25 g/cm2 Be
Counts / Channel
Channel Number
49.725(50) 132Te
81 133Xe
102
11.984(50) 132Te
116.45(40) 132Te
228.302(25) 132Te
136
147
183
200
241
255
263
278
284 131I
354 131I
387
416
432
446
487
505
522.642(25)
529
538
547
620
650
667.683(30)
670
726.95(3)
728
772.605(30)
780
784
791
812.277(50)
830.19(3)
863
875
876
910
927
954.575(30)
984
1035
1136
1136
1143
1173
1272
1290
1295.34(6)
1298
1314
1317
1372
1398.59(5)
Sum
1442.537(50)
1456
519
1592
1727
1757
1920.96(8)
2002.25(7)
2086.63(9)
2172.38(10)
2223
2249
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000

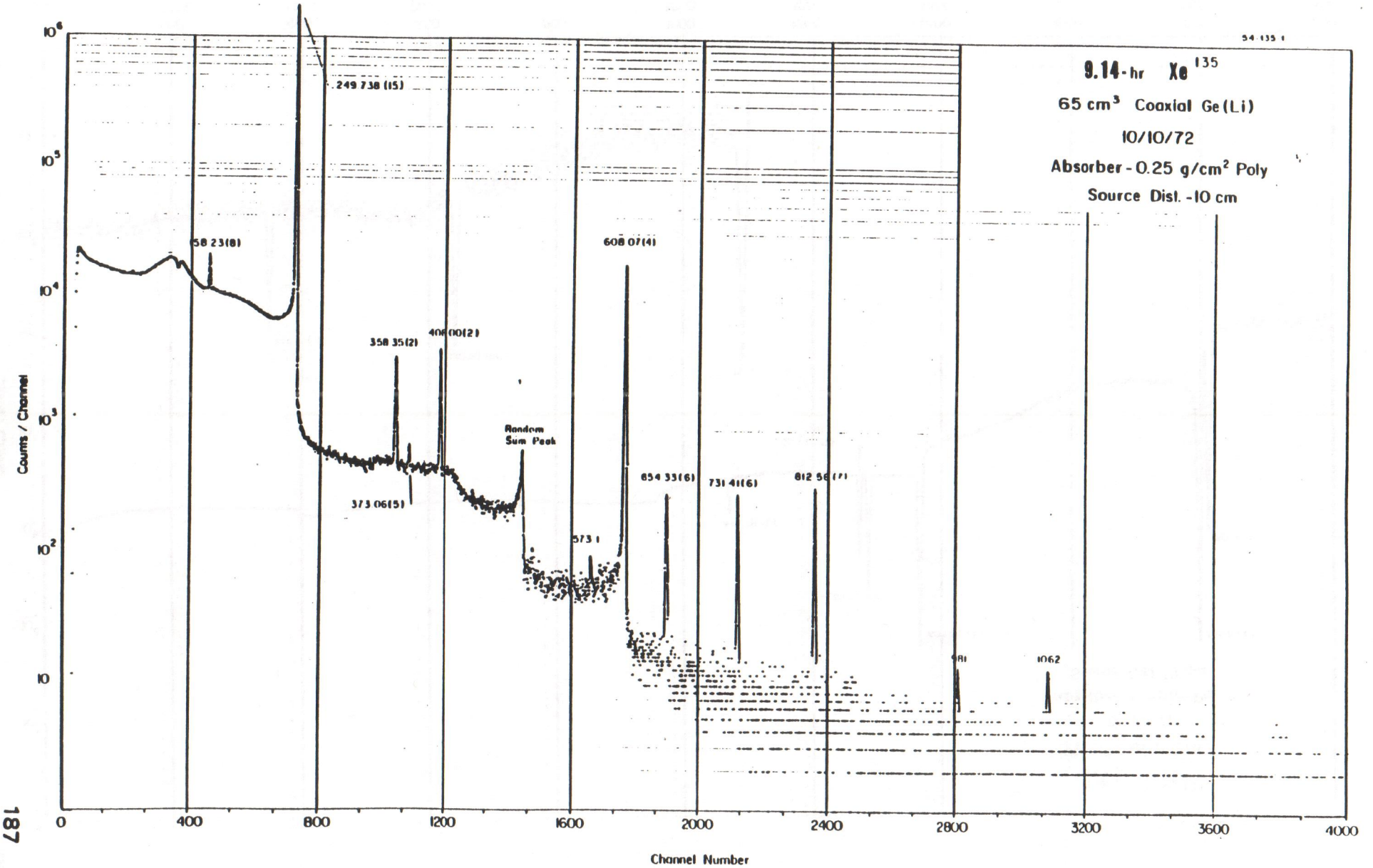

25.0 - min I^129
4.55cm² x 0.8cm Ge(Li)
4-3-70
Absorber 1.2 g/cm² Be
Source Dist. 10cm
Xe
x-Rays
442.87 (2)
526.58 (3)
743.21 (4)
969.45 (7)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

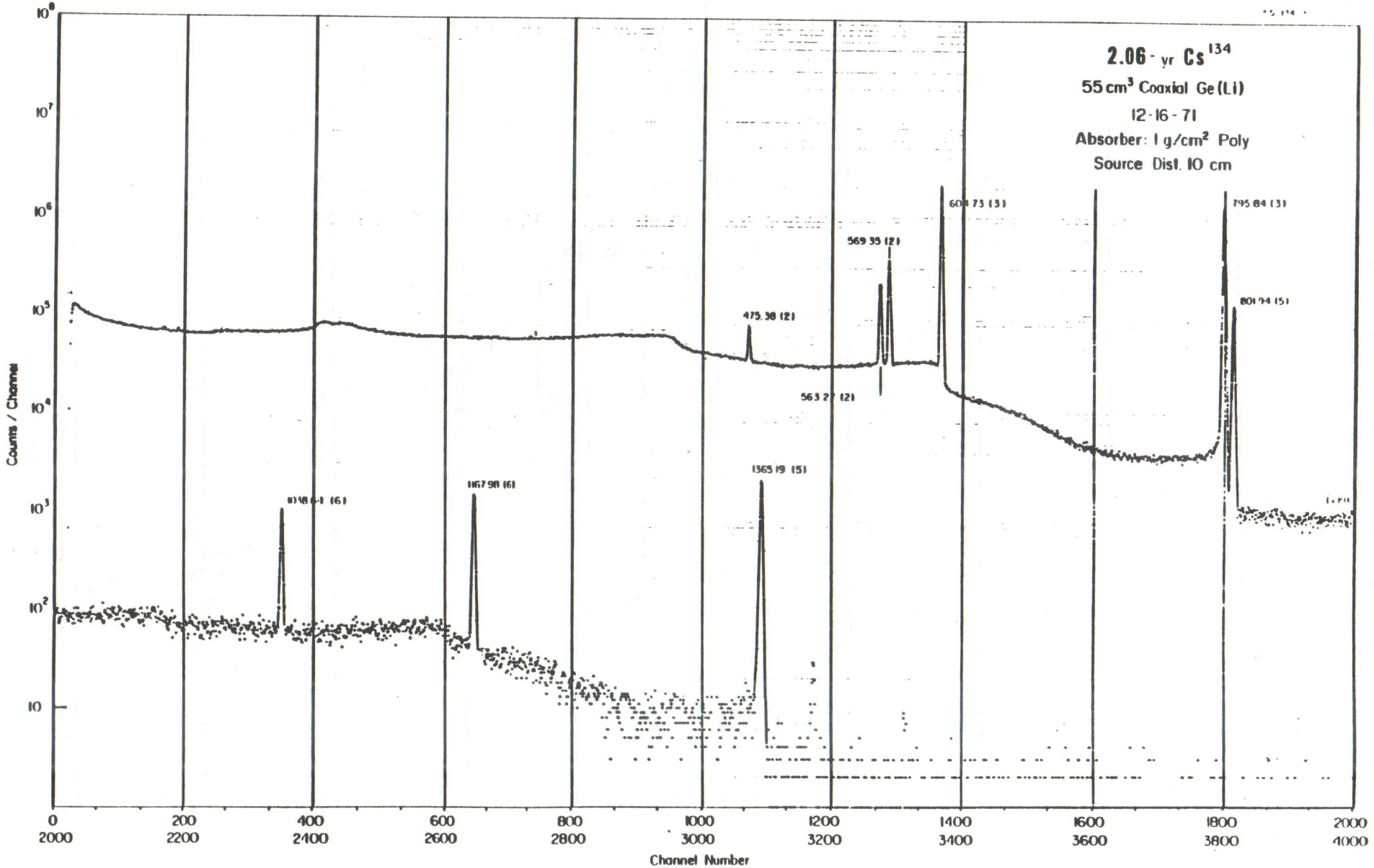

8.06-day I131
55 cm3 Coaxial Ge(Li)
4 - 24 - 72
Absorber - None
Source Dist - 32 cm
Counts / Channel
Channel Number
Pb K X-rays
177.25 (9)
272.48 (8)
294.31 (3)
358.6 (2)
364.46 (3)
404.79 (9)
503.00 (5)
636.99 (5)
642.66 (5)
722.88 (5)
Acc Sum
364 + 364

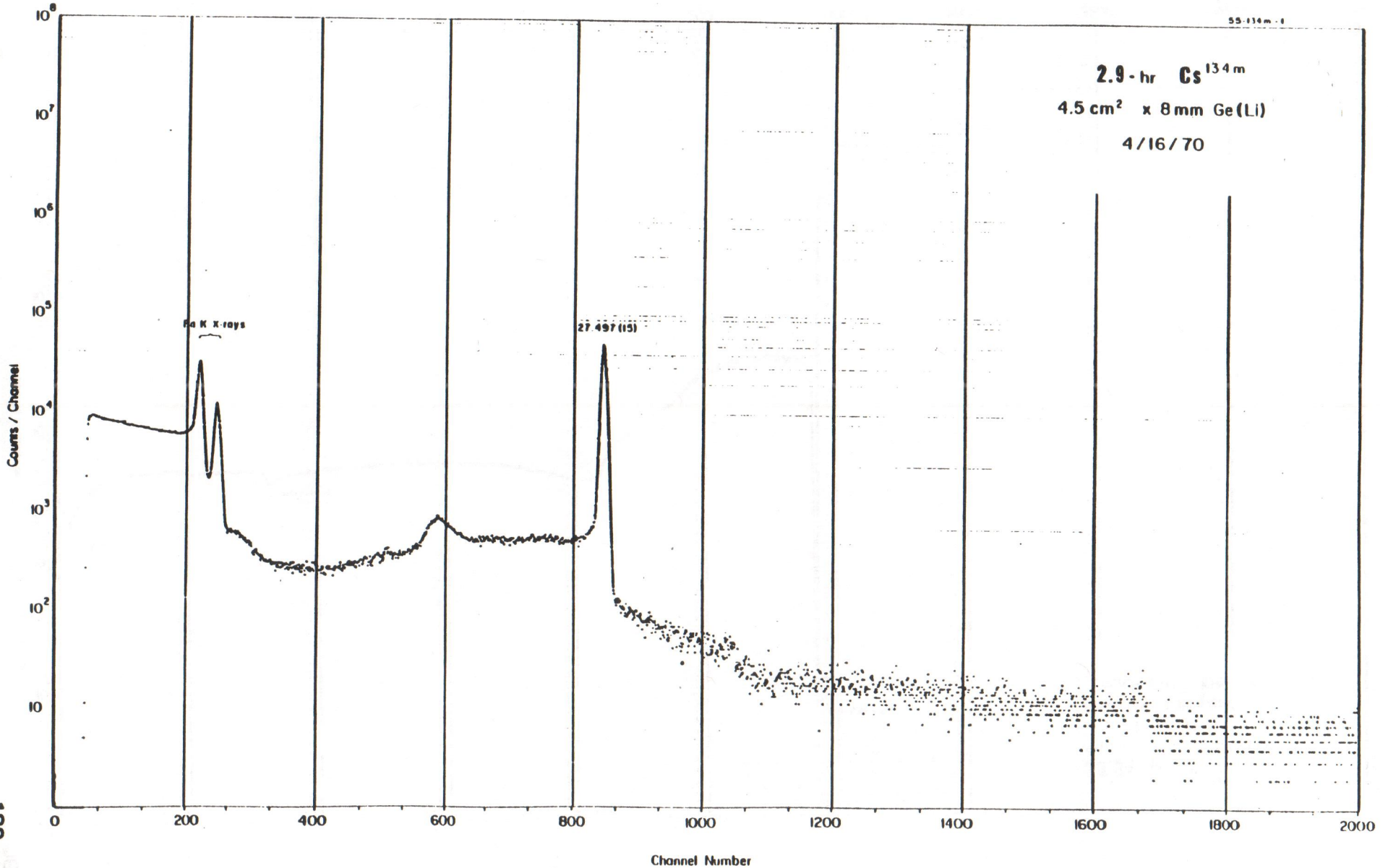

2.284-hr I132
65 cm3 Coaxial Ge(Li)
2/21/73
Absorber-1.26 g/cm2 Be
Source Dist.-10 cm
Counts / Channel
Channel Number
0 2000
200 2200
400 2400
600 2600
800 2800
1000 3000
1200 3200
1400 3400
1600 3600
1800 3800
2000 4000
10
10^2
10^3
10^4
10^5
10^6
10^7
10^8
136
147
183
255
262.7
284
306
309
363
364
387
416
432
446
478
482
488
505.81
522.642(26)
535
547
620
630.19(3)
650
667.63(30)
670
726.95(3)
728 NA
772.605(30)
780
784
791
809
812.277(5)
863
875.85
876.97
910
927
954.575(30)
984
1035.17(8)
1050
1087
1136.026(40)
1143.6
1148
1173.22(8)
1254
1263
1272
1290
1298.09(40)
1317
1372.01(5)
1398.59(5)
1440
Sum I
(667,
773)
SF
1442.637(50)
1456
1476
SE
1519
1592
1727
1757
1920.96(8)
2002.25(7)
2086.63(5)
2172.38(10)
2223
2249.4(2)
2390
2525
2717

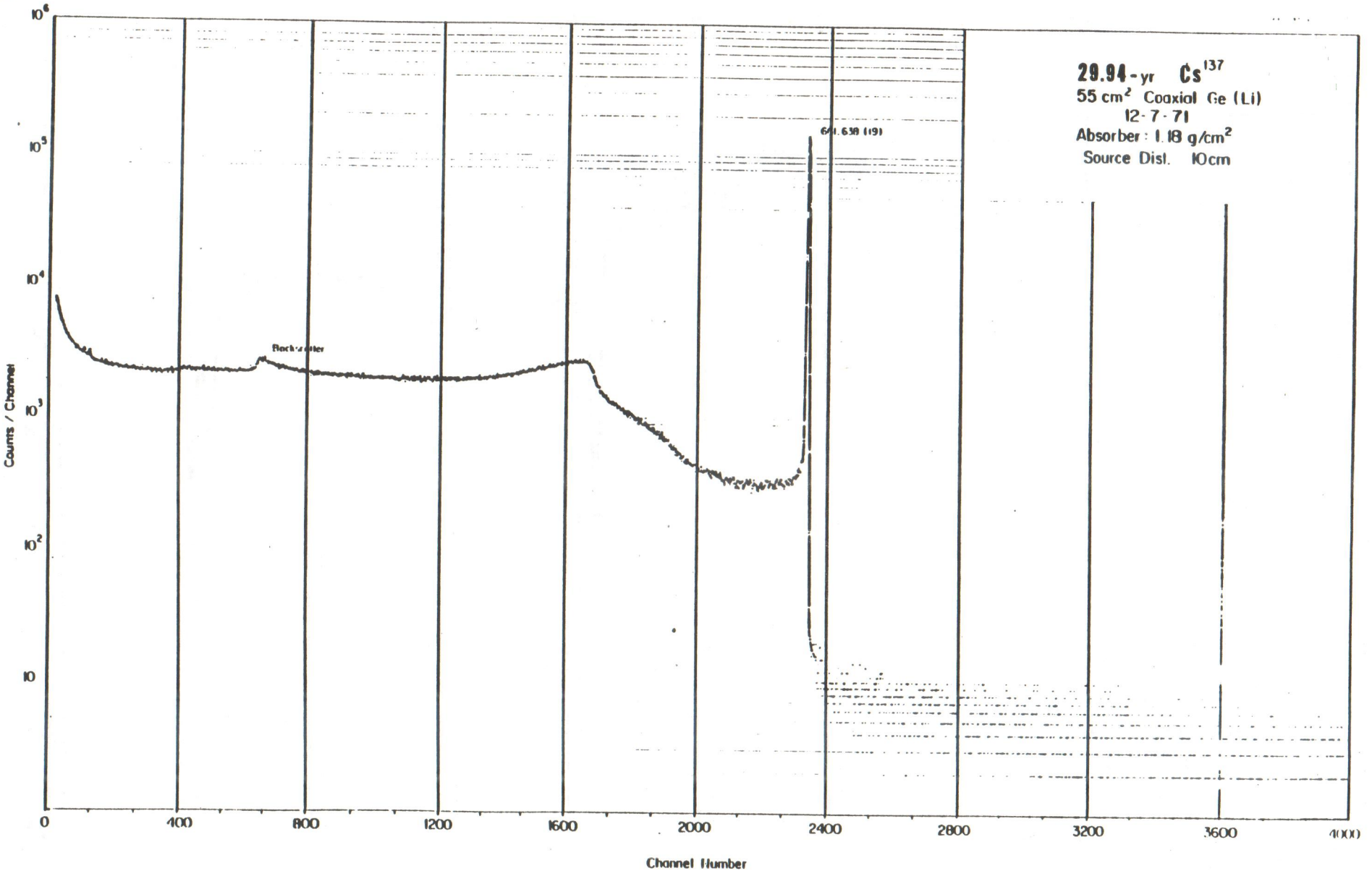

6.7-hr I135
55 cm3 Coaxial Ge(Li)
1/5/73
Absorber-1.26 g/cm2 Be
Source Dist.-10 cm
Counts / Channel
Channel Number

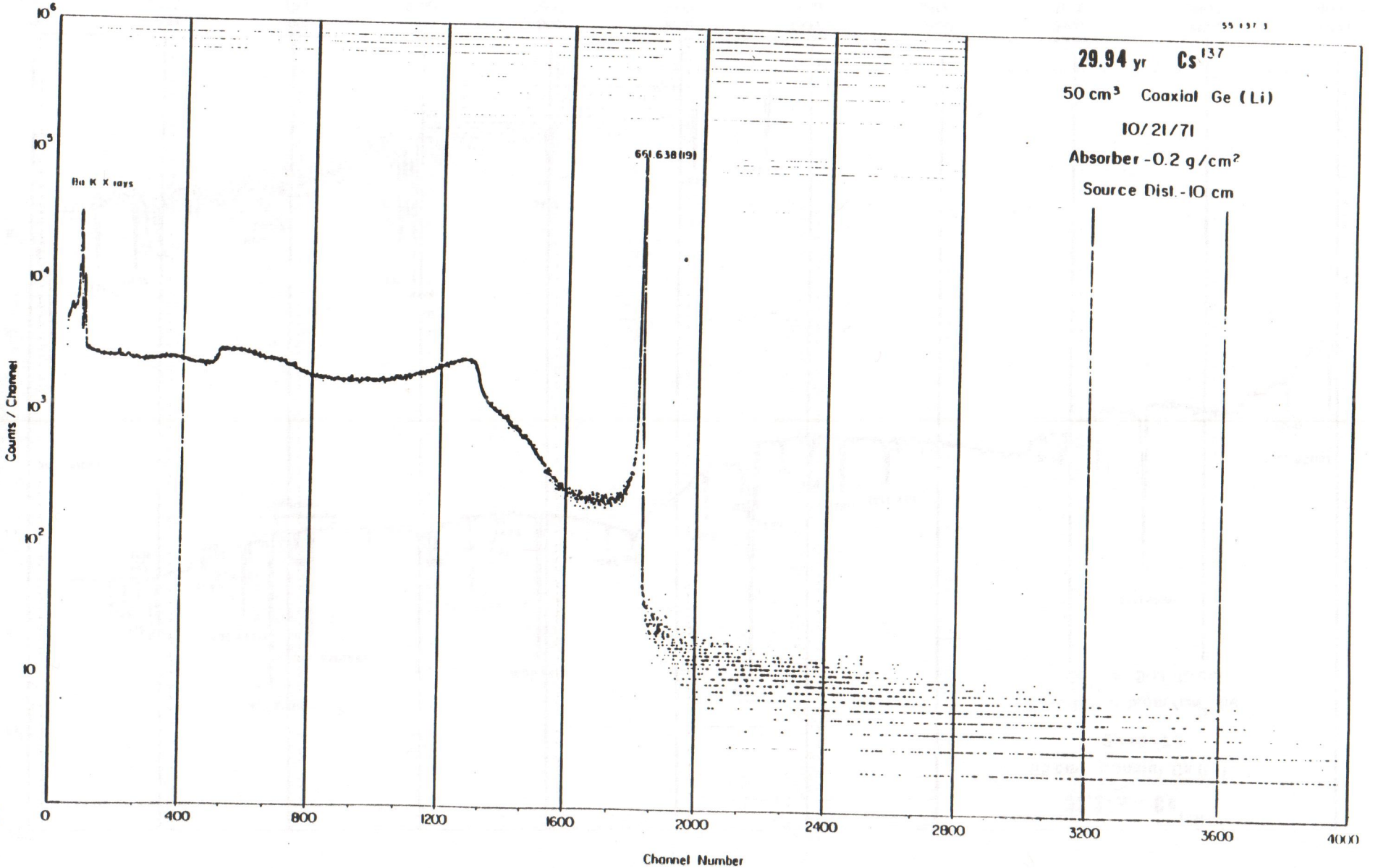

5.29-Day Xe133 2.22-Day Xe133m
65 cm3 Coaxial Ge (Li)
8-20-72
Source Dist. - 10 cm
Absorber - 1.25 g/cm2 Be
80.998(8)
79.60
233.246(80) 133m Xe
160.605(15)
Random Sum Peak
302.851(50)
383
Counts/Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
10
10^2
10^3
10^4
10^5
10^6

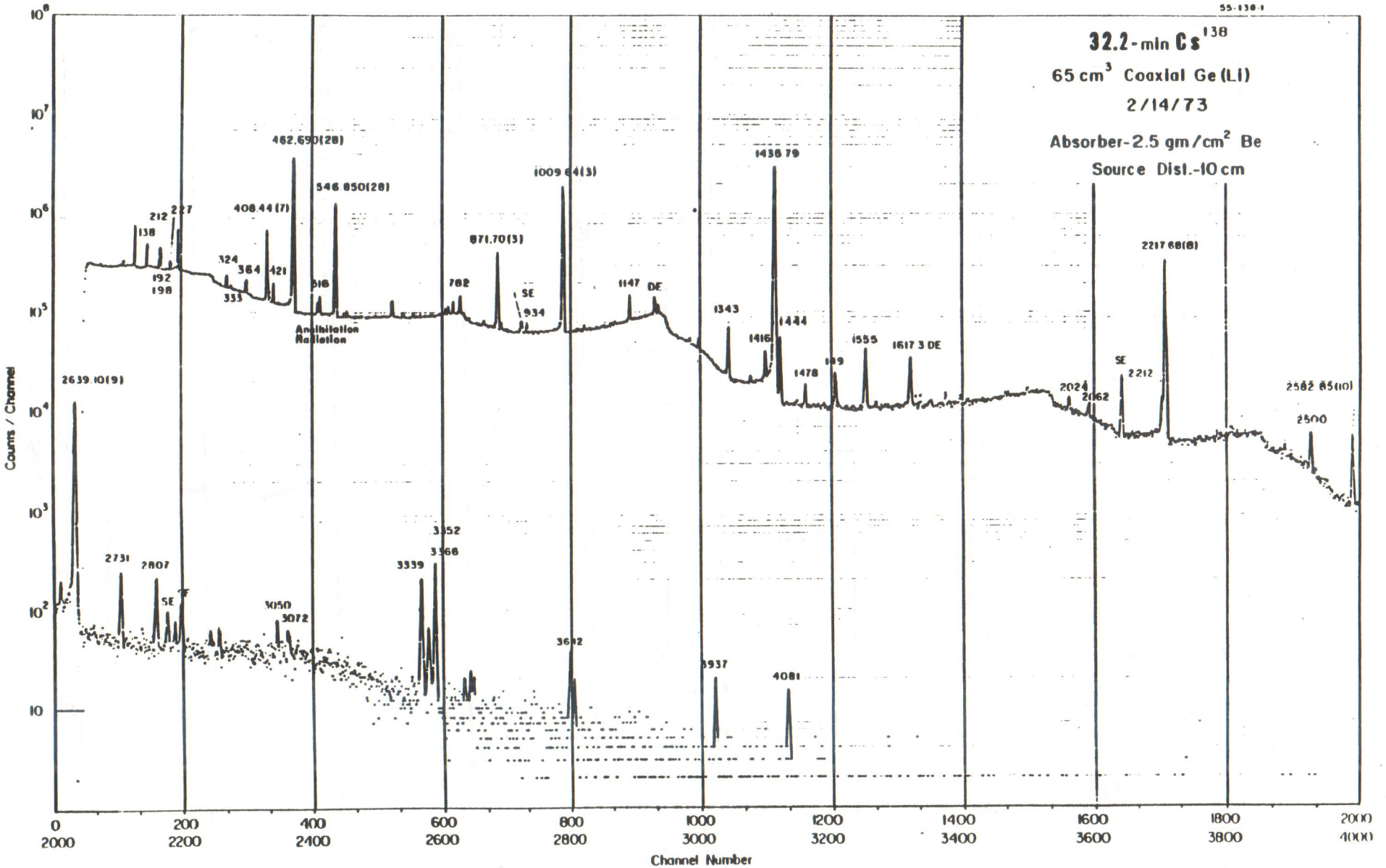

9.14-hr Xe 135
65 cm³ Coaxial Ge(Li)
10/10/72
Absorber - 0.25 g/cm² Poly
Source Dist. - 10 cm
249 738 (15)
58 23(8)
358 35(2)
406 00(2)
373 06(5)
Random Sum Peak
573 1
608 07(4)
654 33(6)
731 4(6)
812 56(7)
1062
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

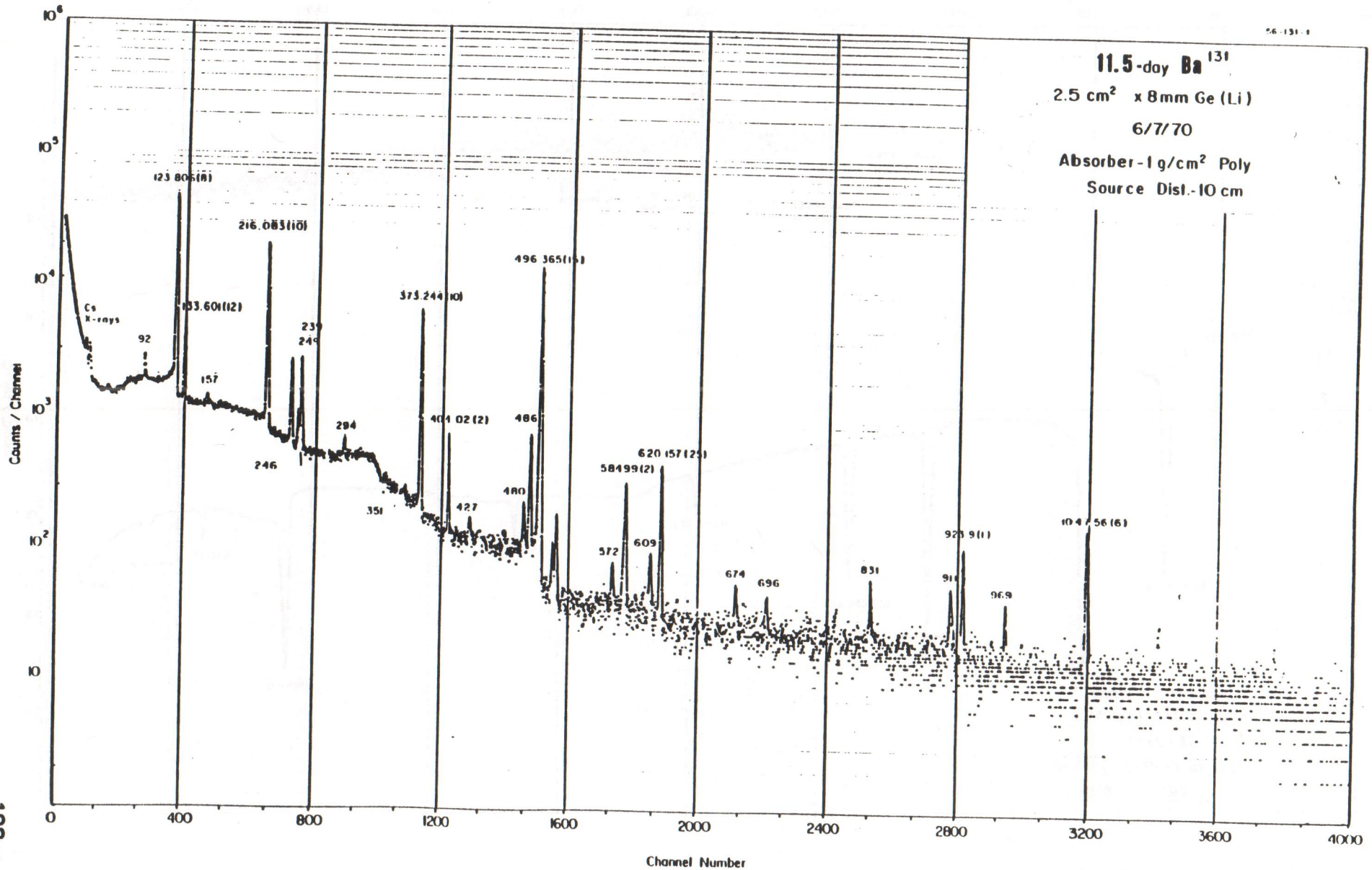

2.06 - yr Cs 134
55 cm³ Coaxial Ge(Li)
12-16-71
Absorber: 1 g/cm² Poly
Source Dist. 10 cm
475.38 (2)
569.35 (2)
563.27 (2)
1365.19 (5)
1167.98 (6)
795.84 (3)
801.94 (5)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000

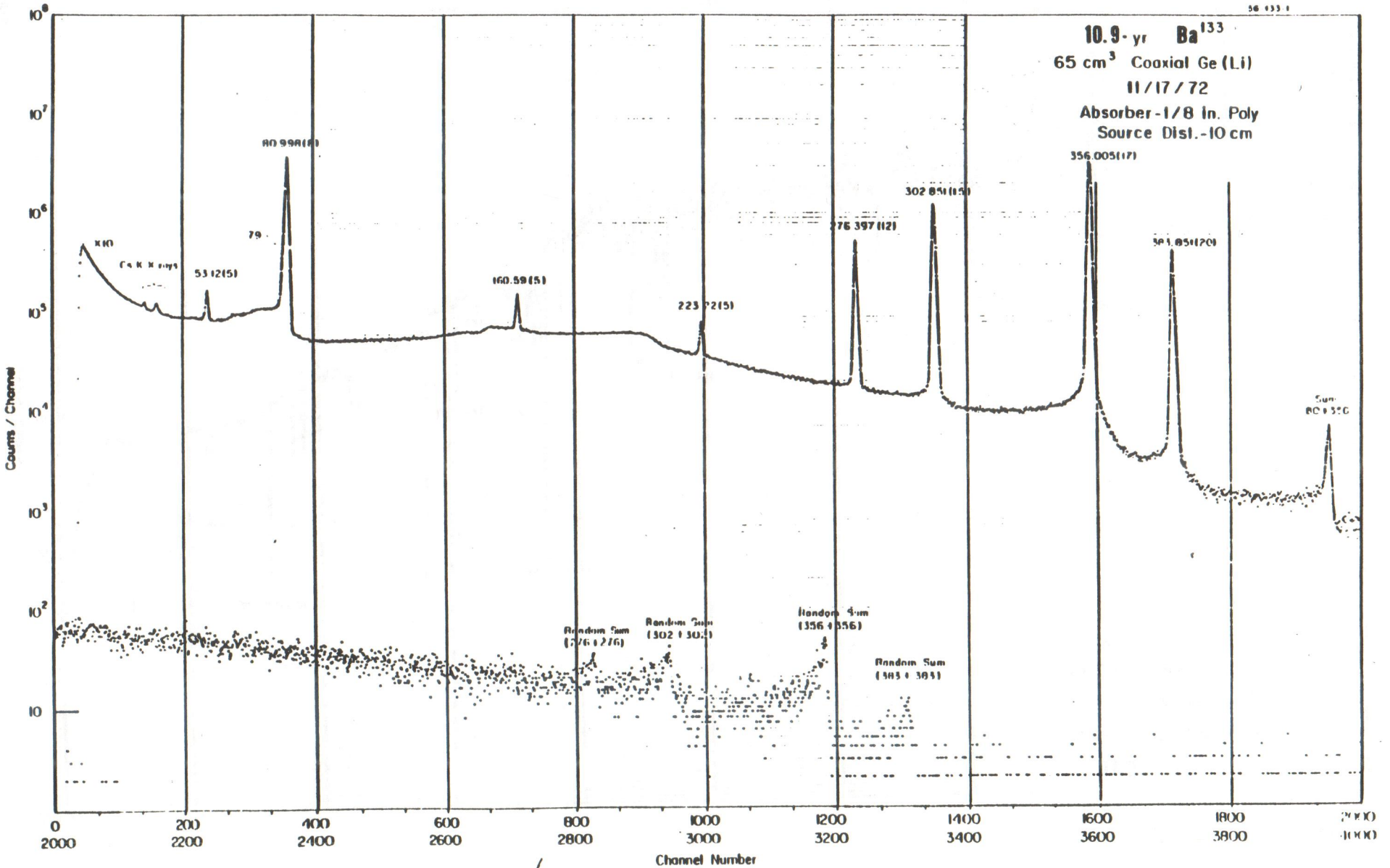

2.9-hr Cs 134m
4.5 cm² x 8 mm Ge(Li)
4/16/70
Ba K X-rays
27.497 (15)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
0
200
400
600
800
1000
1200
1400
1600
1800
2000

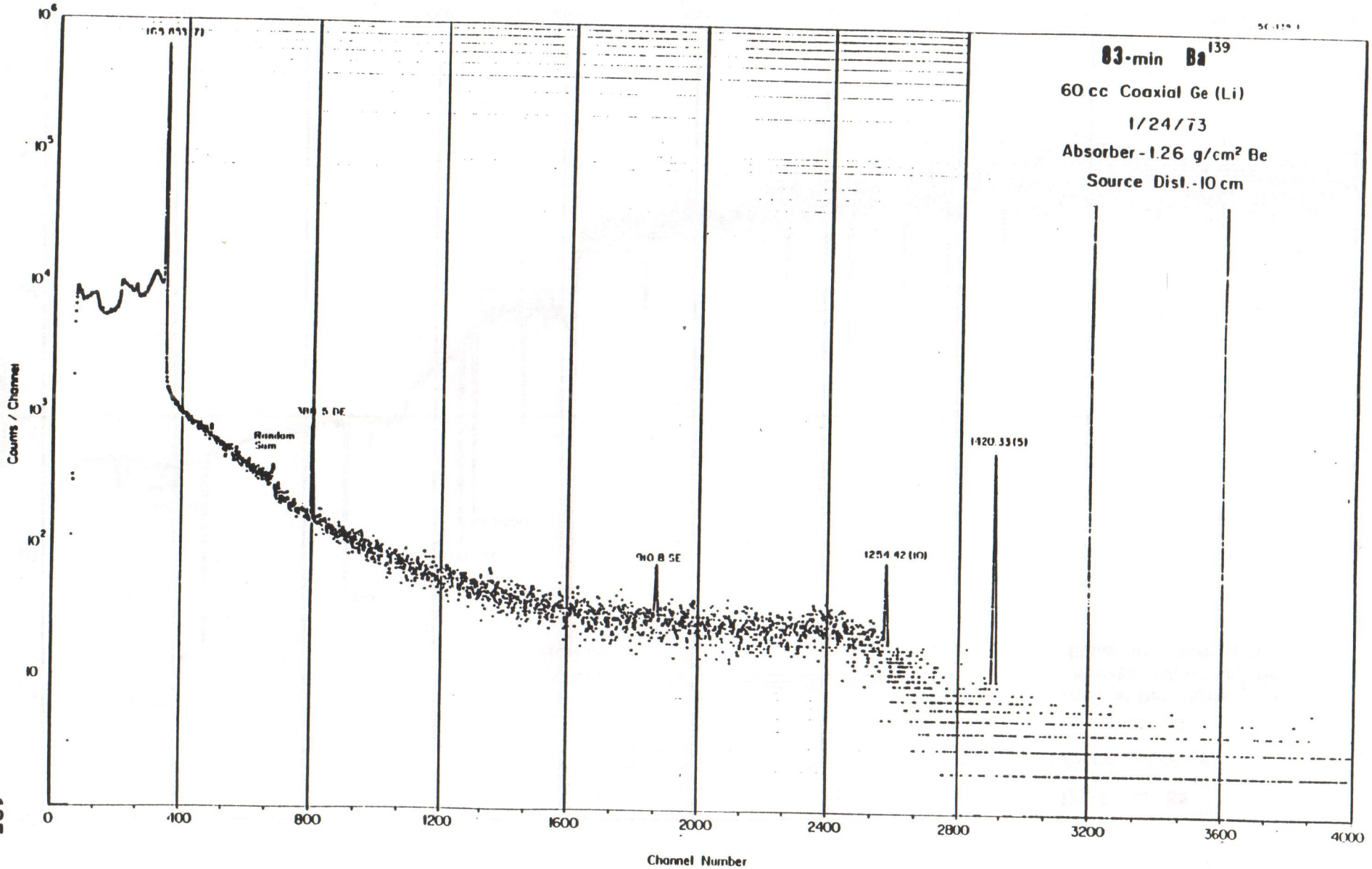

29.94-yr Cs137
55 cm2 Coaxial Ge (Li)
12-7-71
Absorber : 1.18 g/cm2
Source Dist. 10cm
661.638 (19)
Backscatter
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000


29.94 yr Cs137
50 cm3 Coaxial Ge (Li)
10/21/71
Absorber -0.2 g/cm2
Source Dist.-10 cm
661.638(19)
Ba K X rays
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

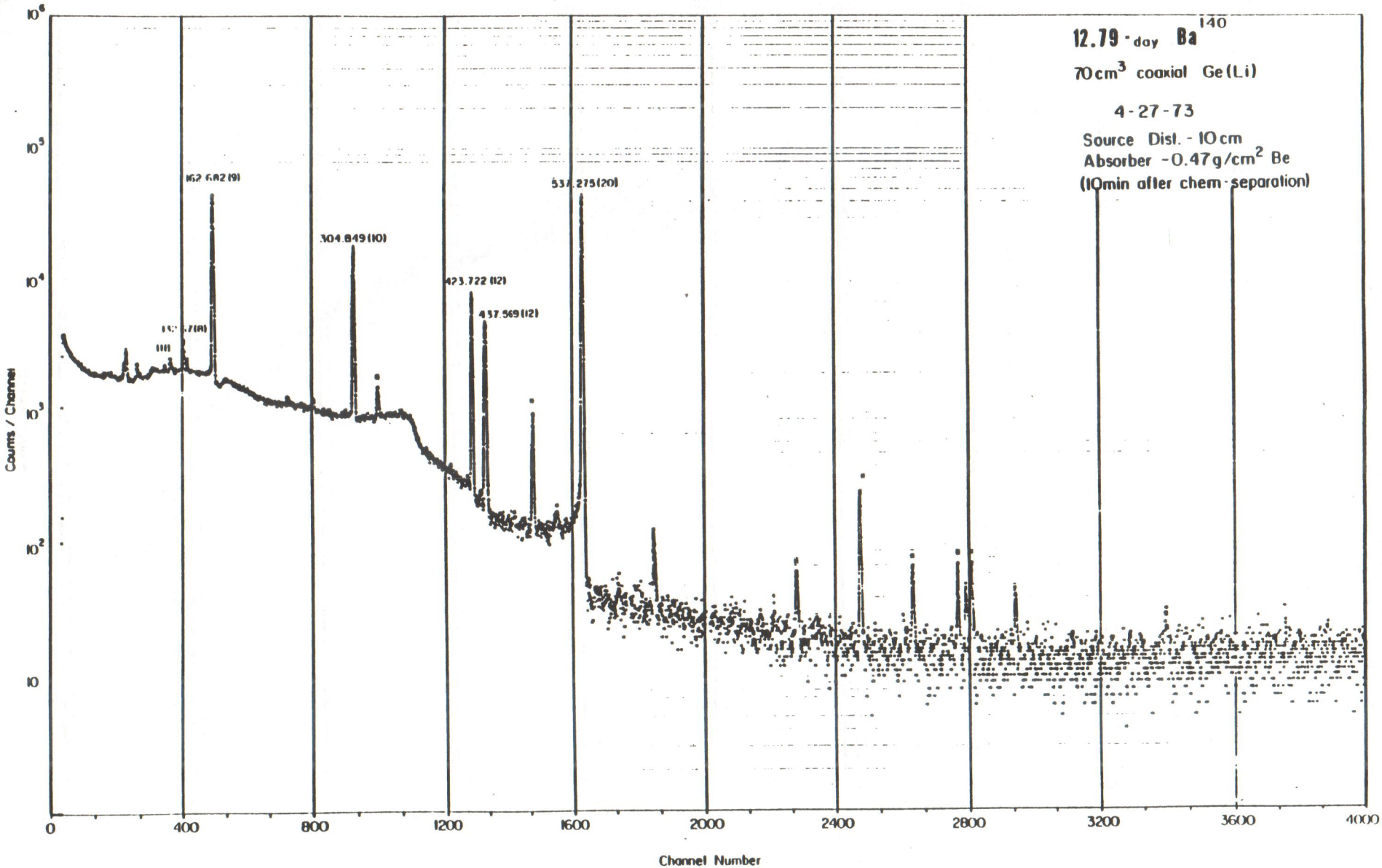

32.2-min Cs138
65 cm3 Coaxial Ge(Li)
2/14/73
Absorber-2.5 gm/cm2 Be
Source Dist.-10 cm
Counts / Channel
Channel Number
Annihilation Radiation
462.690(28)
546.850(28)
408.44(7)
871.70(3)
1009.64(3)
1438.79
2217.68(8)
2639.10(9)
2731
2807
3339
3352
3366
3642
3937
4081
1147
DE
1343
1416
1444
1478
1555
1617.3 DE
2024
2062
2212
2500
2582.85(10)
SE
934
782
516
324
364
421
333
212
227
138
192
198

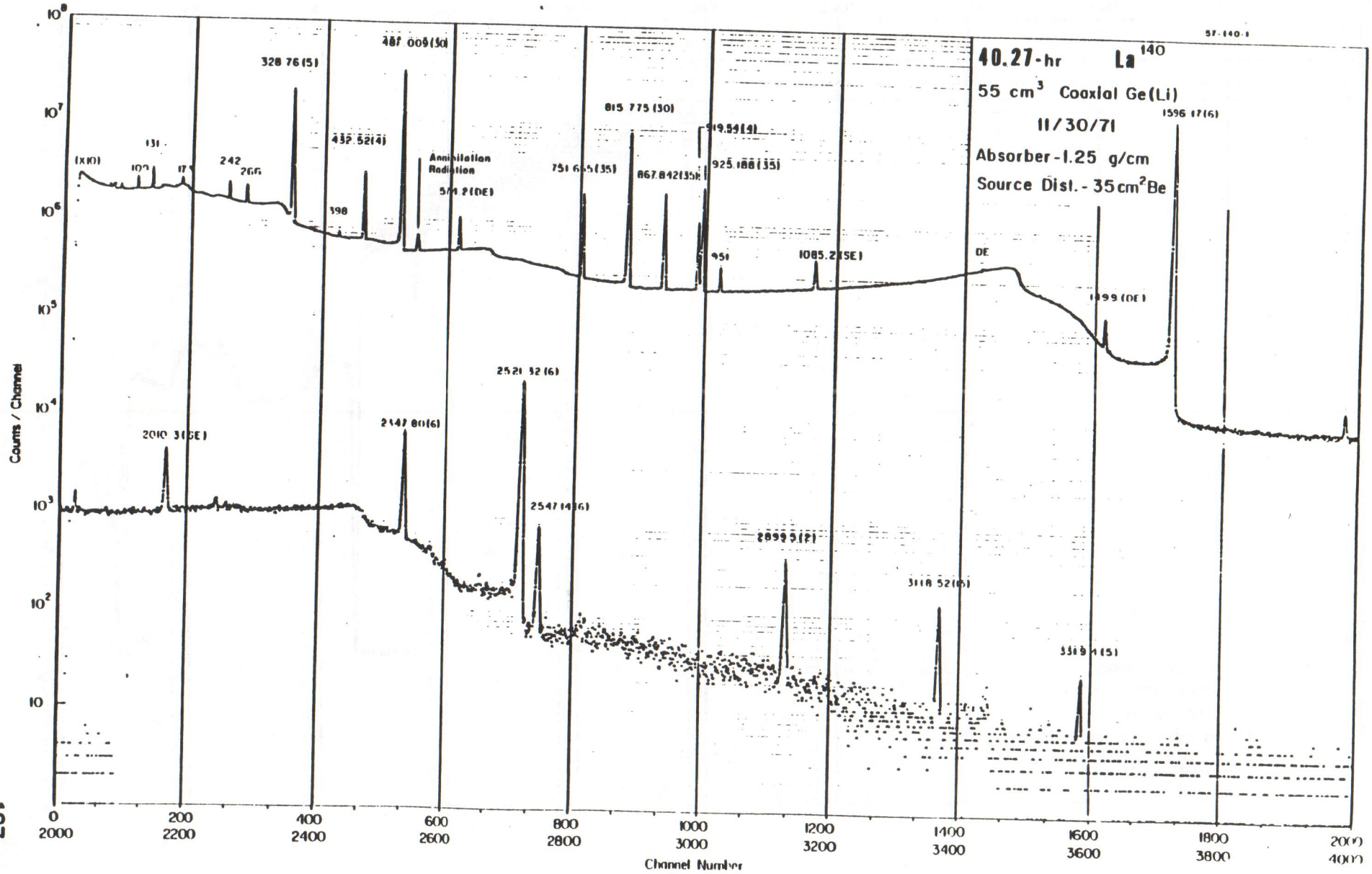

11.5-day Ba 131
2.5 cm² x 8mm Ge (Li)
6/7/70
Absorber-1 g/cm² Poly
Source Dist.-10 cm
Counts / Channel
Channel Number
Cs X-rays
92
123.806(8)
157
216.083(10)
246
239
249
294
351
373.244(10)
404.02(2)
427
480
486
496.365(15)
572
584.99(2)
609
620.57(25)
674
696
831
910
923.9(1)
968
1047.56(6)

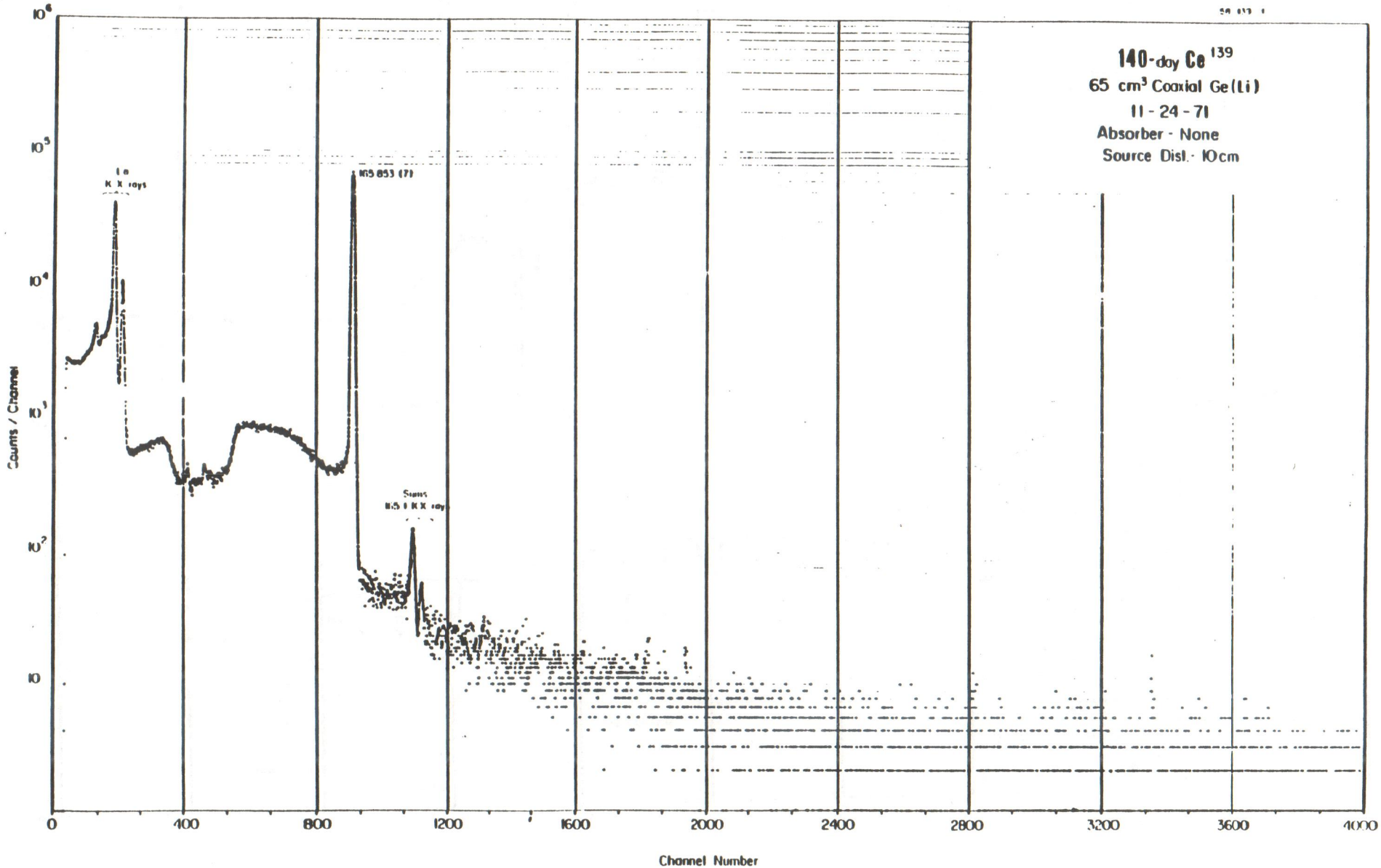

10.9-yr Ba133
65 cm3 Coaxial Ge(Li)
11/17/72
Absorber-1/8 in. Poly
Source Dist.-10 cm
Counts / Channel
Channel Number
356.005(17)
276.397(12)
160.59(5)
Random Sum
Random Sum
Random Sum
Random Sum

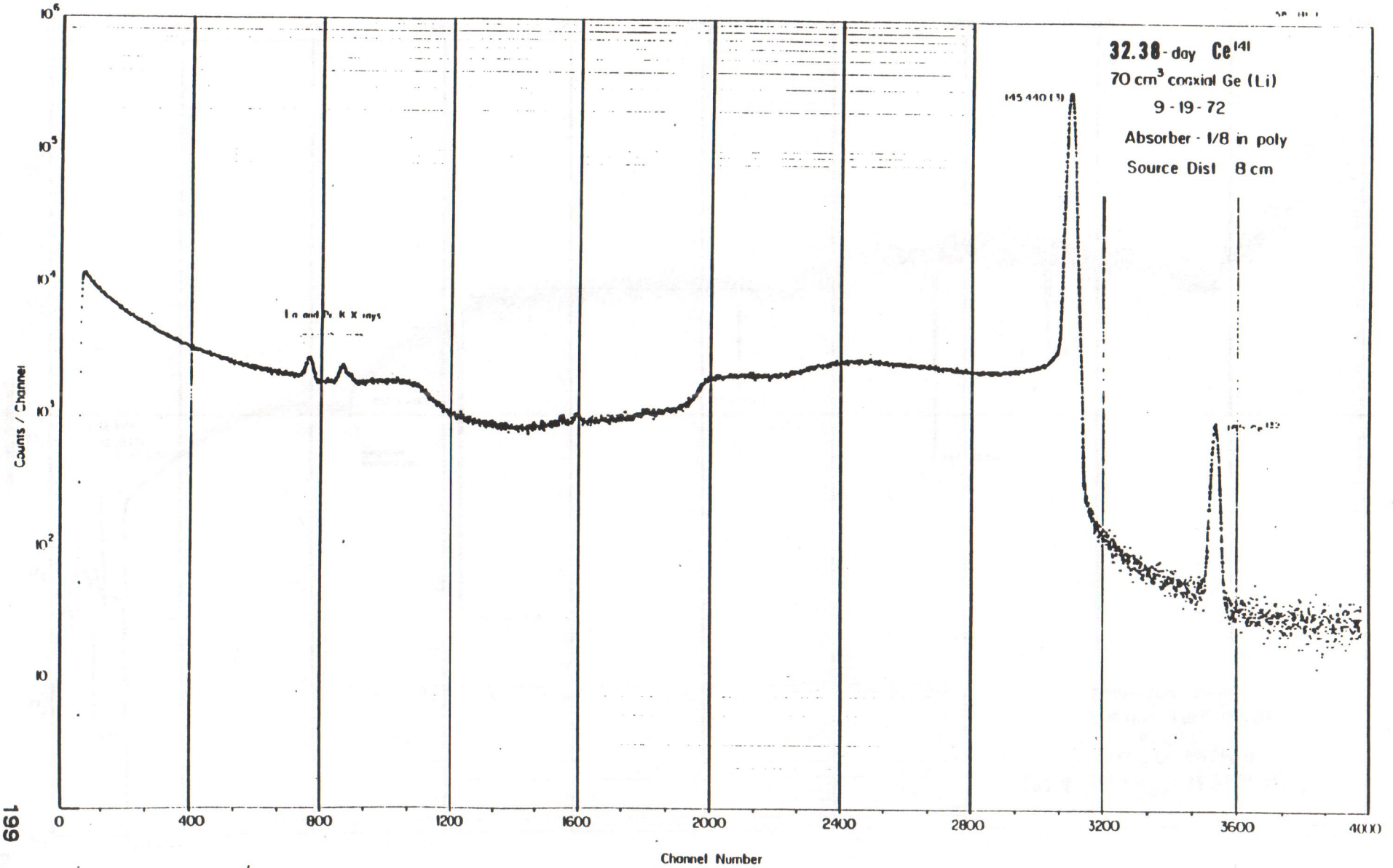

83-min Ba139
60 cc Coaxial Ge (Li)
1/24/73
Absorber - 1.26 g/cm² Be
Source Dist. - 10 cm
Random Sum
1420.33(5)
1254.42(10)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

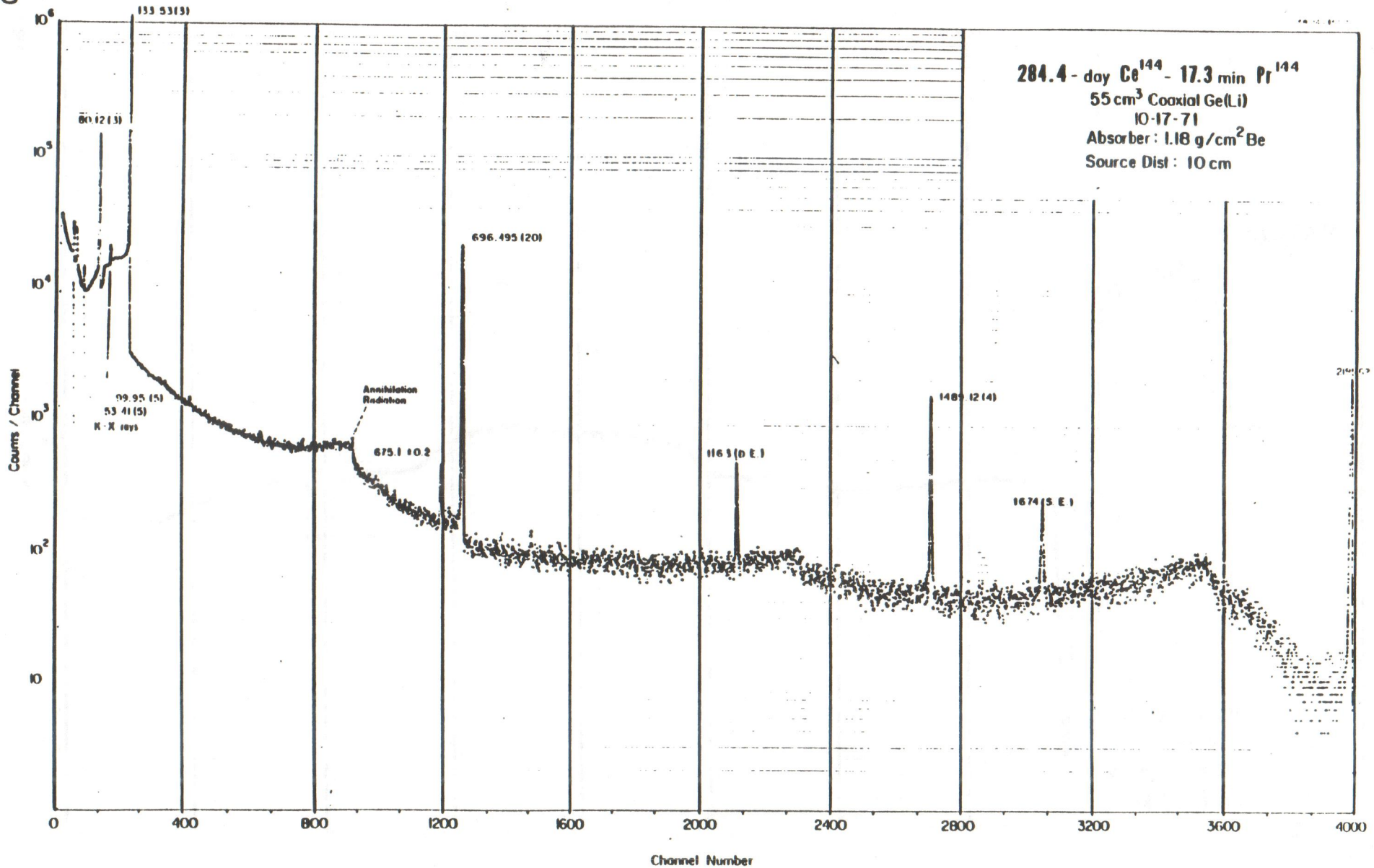
56-140 1

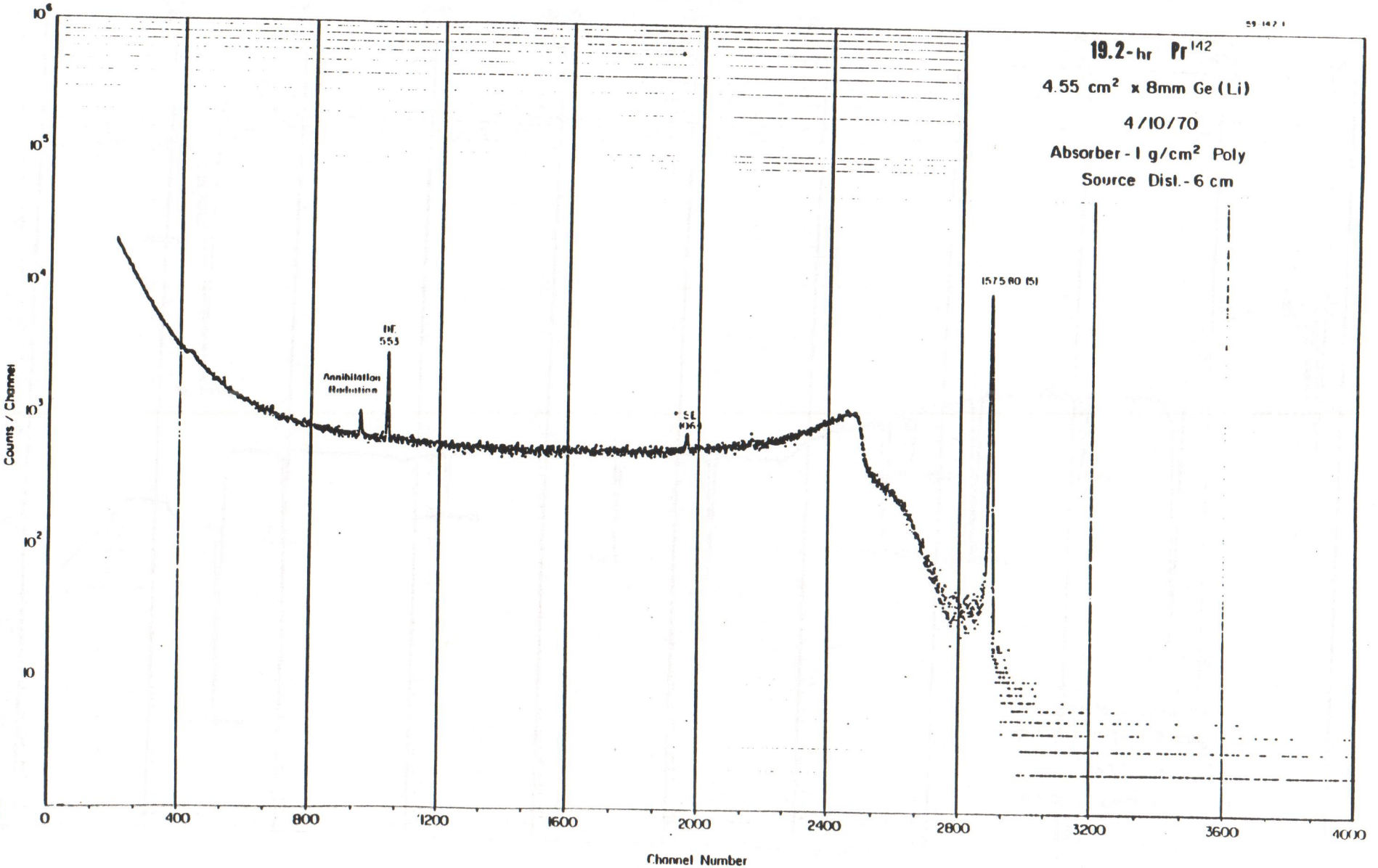

12.79-day Ba140
70cm3 coaxial Ge(Li)
4-27-73
Source Dist. - 10cm
Absorber -0.47g/cm2 Be
(10min after chem-separation)
162.682(9)
304.849(10)
423.722(12)
437.569(12)
537.275(20)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

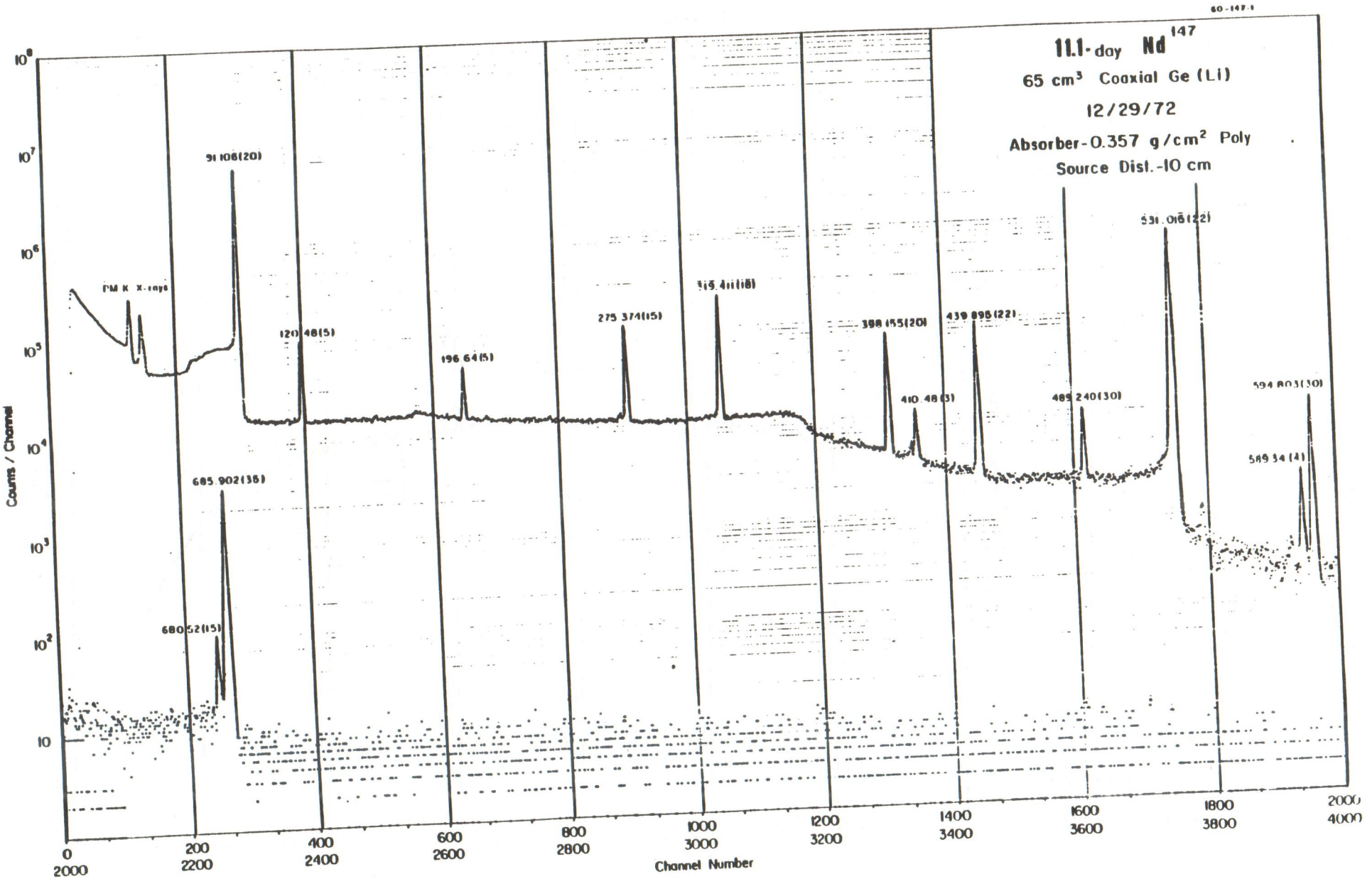

40.27-hr La140
55 cm3 Coaxial Ge(Li)
11/30/71
Absorber-1.25 g/cm
Source Dist.-35cm2Be
Counts / Channel
Channel Number
Annihilation Radiation
DE

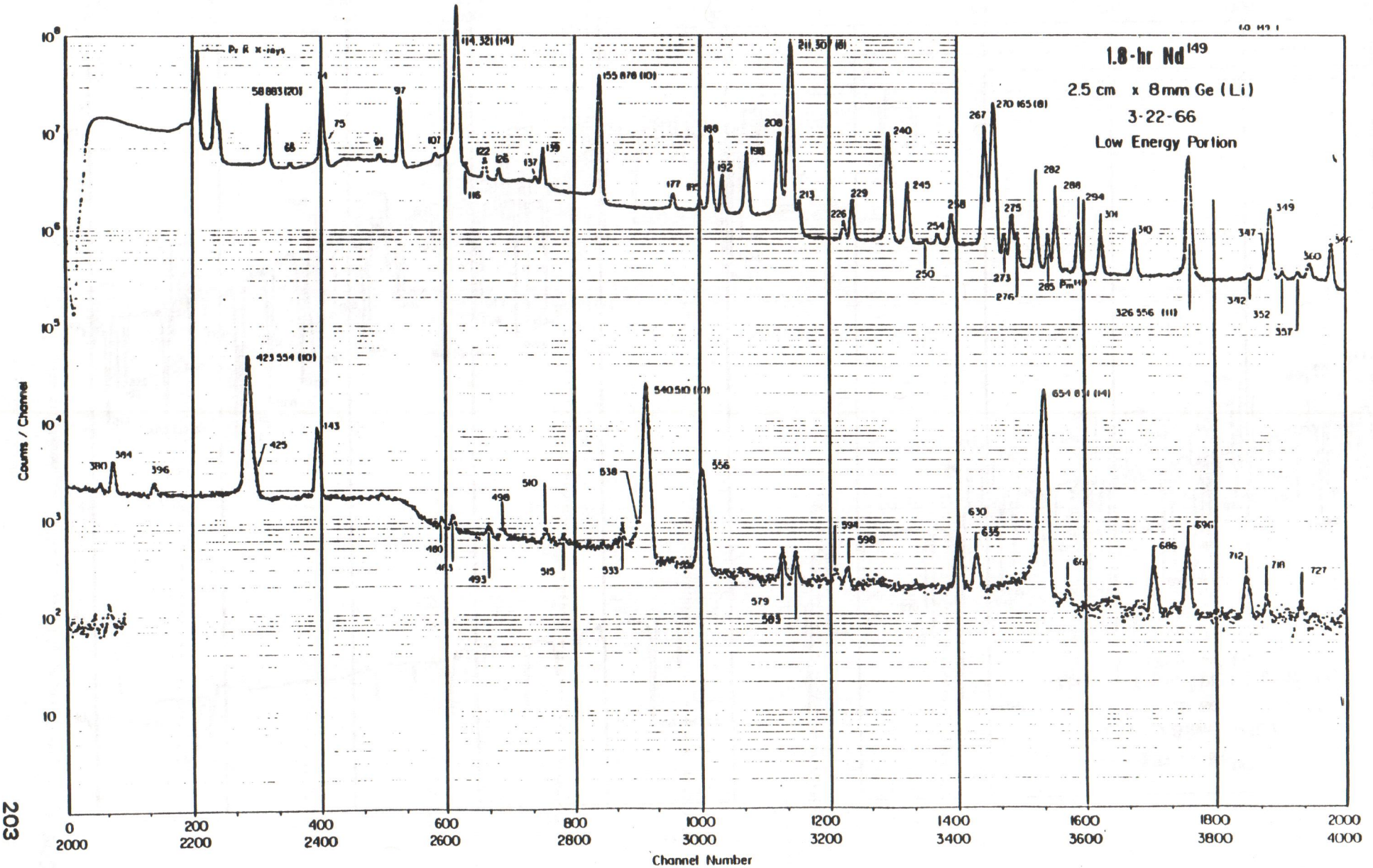

140-day Ce 139
65 cm³ Coaxial Ge(Li)
11 - 24 - 71
Absorber - None
Source Dist. - 10cm
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

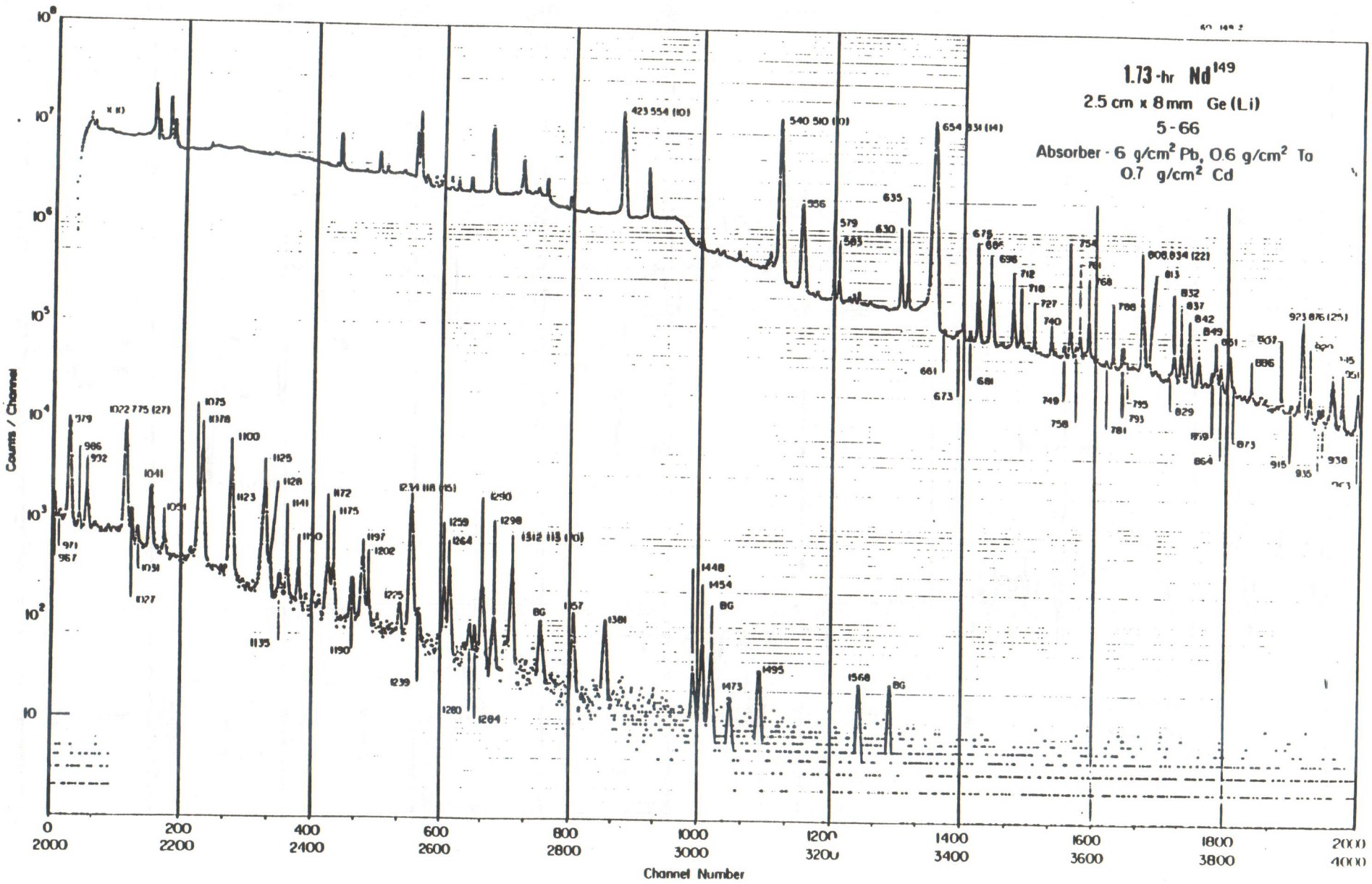

32.38-day Ce141
70 cm3 coaxial Ge (Li)
9-19-72
Absorber - 1/8 in poly
Source Dist 8 cm
145.440 (3)
In and Sn K X rays
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

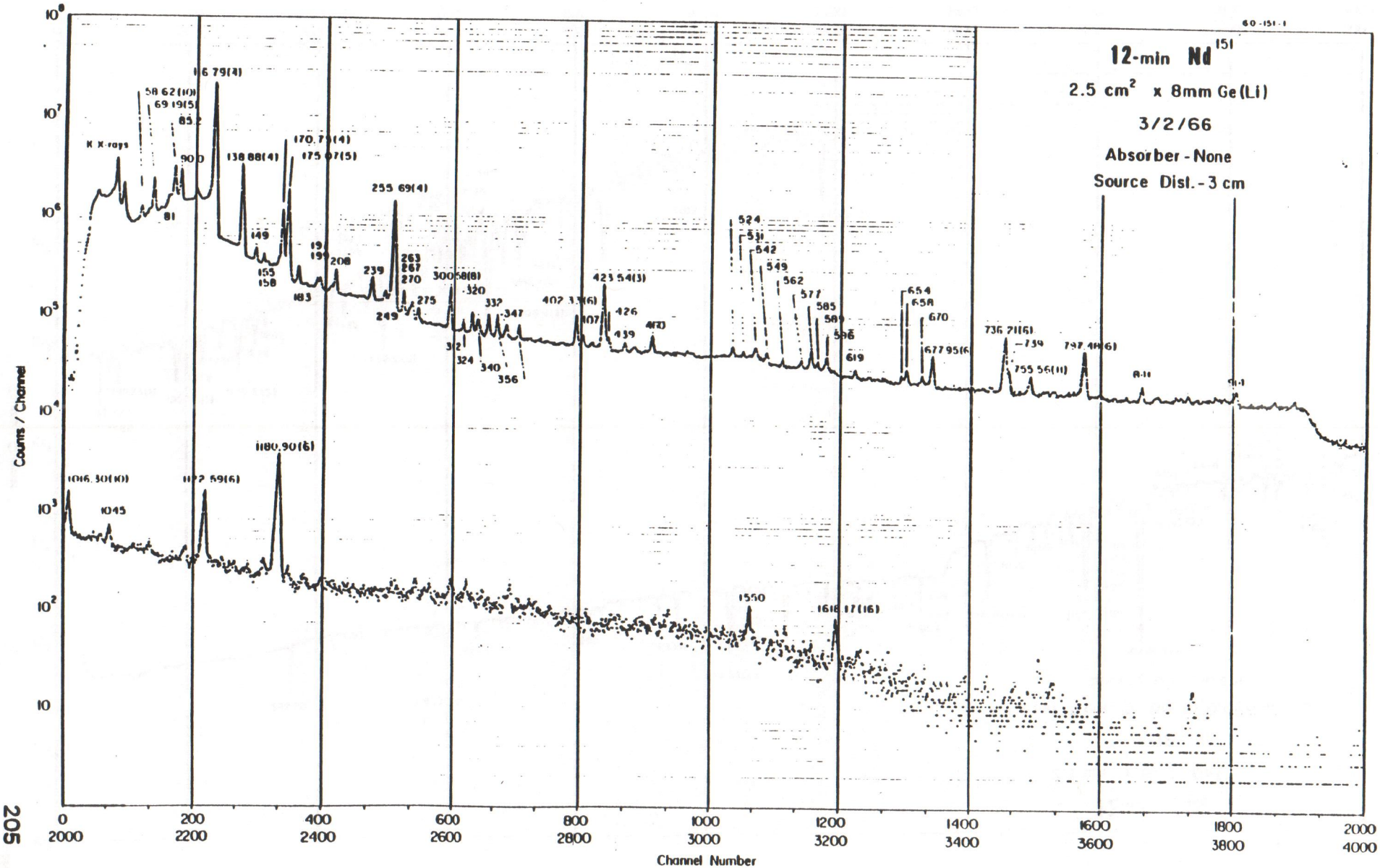

284.4 - day Ce144 - 17.3 min Pr144
55 cm3 Coaxial Ge(Li)
10-17-71
Absorber : 1.18 g/cm2 Be
Source Dist : 10 cm
133.53(3)
80.12(3)
99.95(5)
53.41(5)
K-X rays
Annihilation Radiation
675.1 ±0.2
696.495(20)
116.9(D.E.)
1489.12(4)
1674(S.E.)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

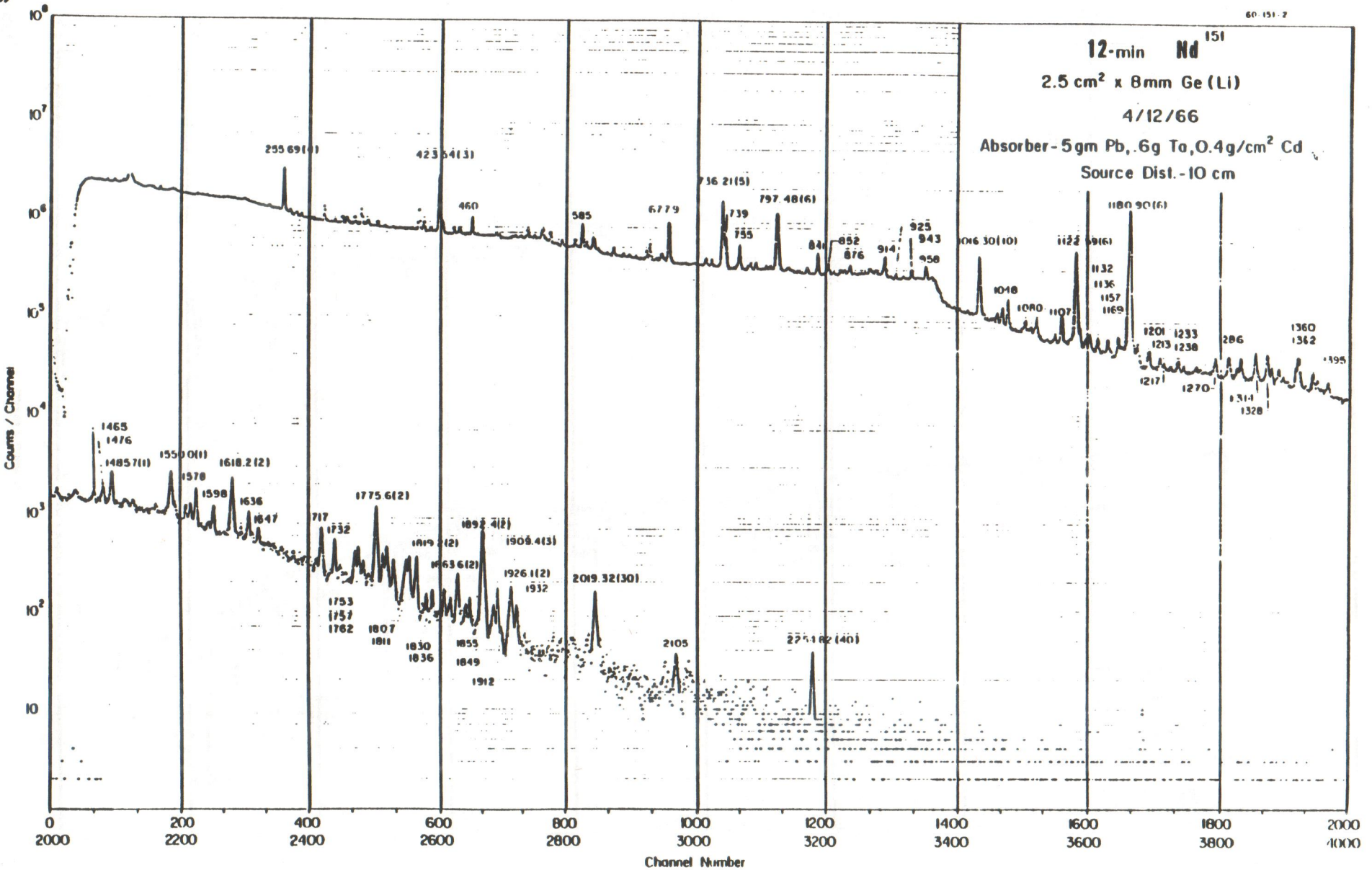

19.2-hr Pr142
4.55 cm2 x 8mm Ge (Li)
4/10/70
Absorber - 1 g/cm2 Poly
Source Dist. - 6 cm
Annihilation Radiation
DF 553
1575.80 (5)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

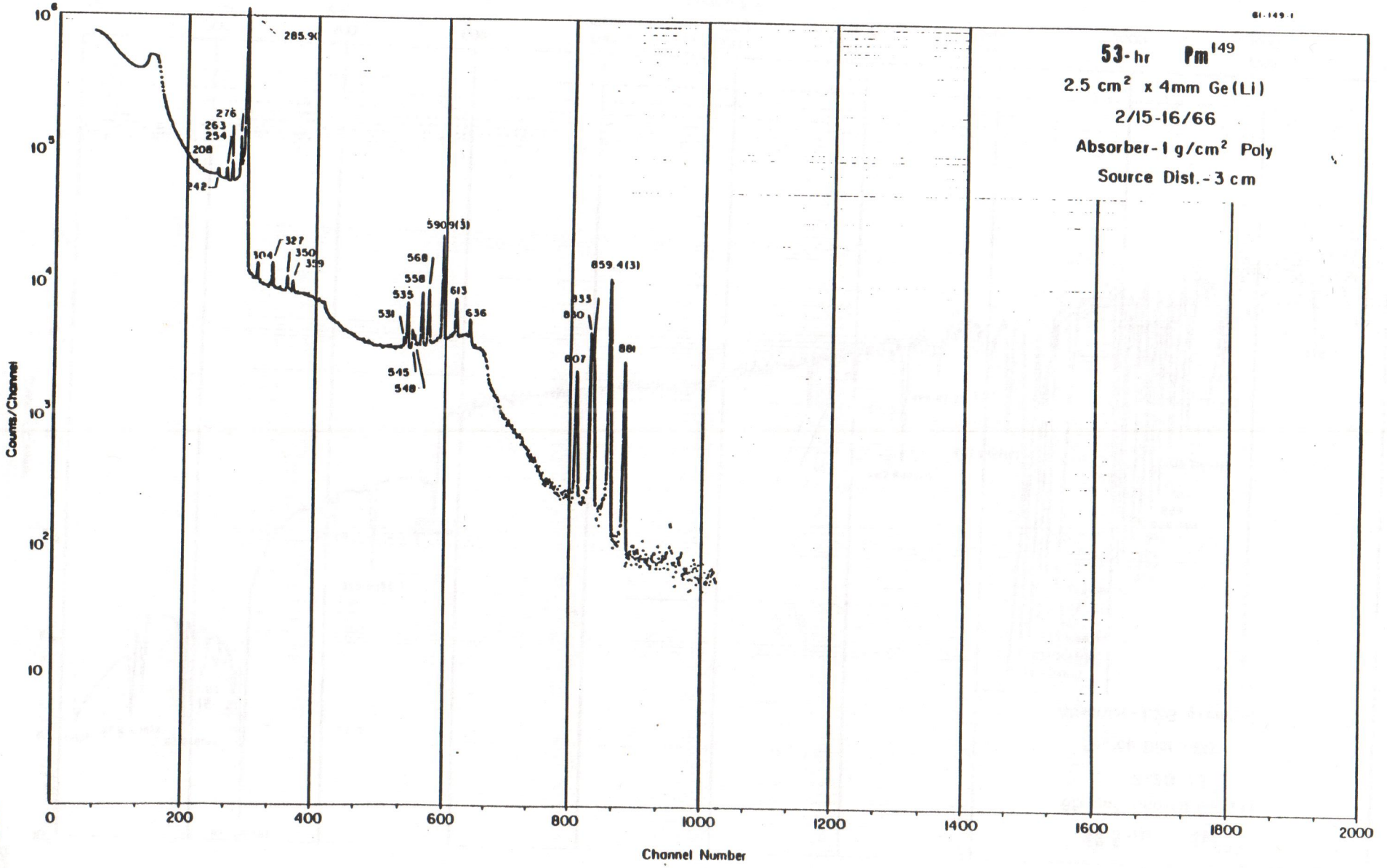

11.1-day Nd147
65 cm3 Coaxial Ge (Li)
12/29/72
Absorber-0.357 g/cm2 Poly
Source Dist.-10 cm
PM K X-rays
91.106(20)
120.48(5)
196.64(5)
275.374(15)
315.41(18)
398.155(20)
410.48(3)
439.895(22)
485.240(30)
531.016(22)
589.34(4)
594.803(30)
680.52(15)
685.902(35)
Counts / Channel
Channel Number

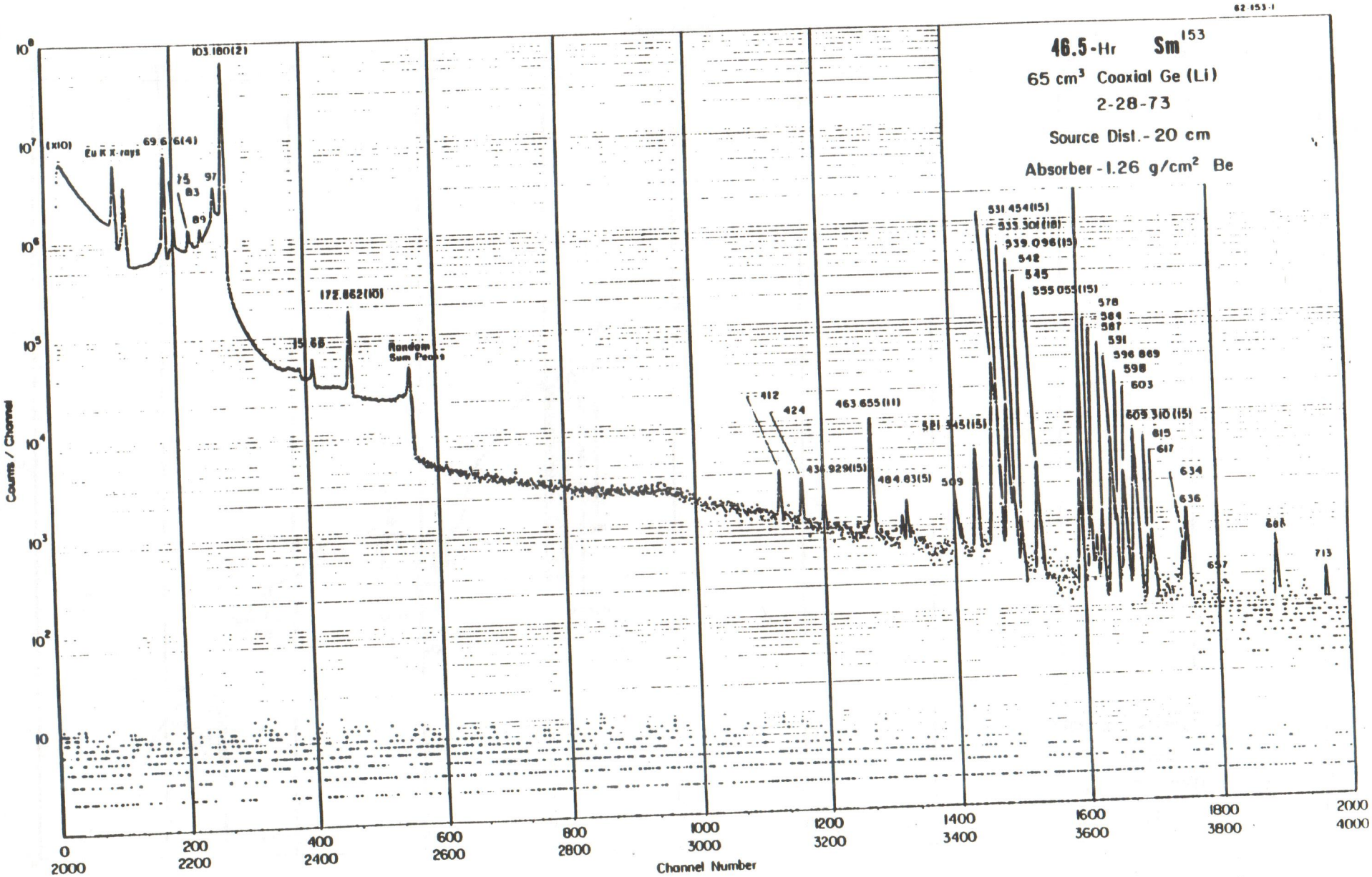

1.8-hr Nd149
2.5 cm x 8mm Ge (Li)
3-22-66
Low Energy Portion
Counts / Channel
Channel Number

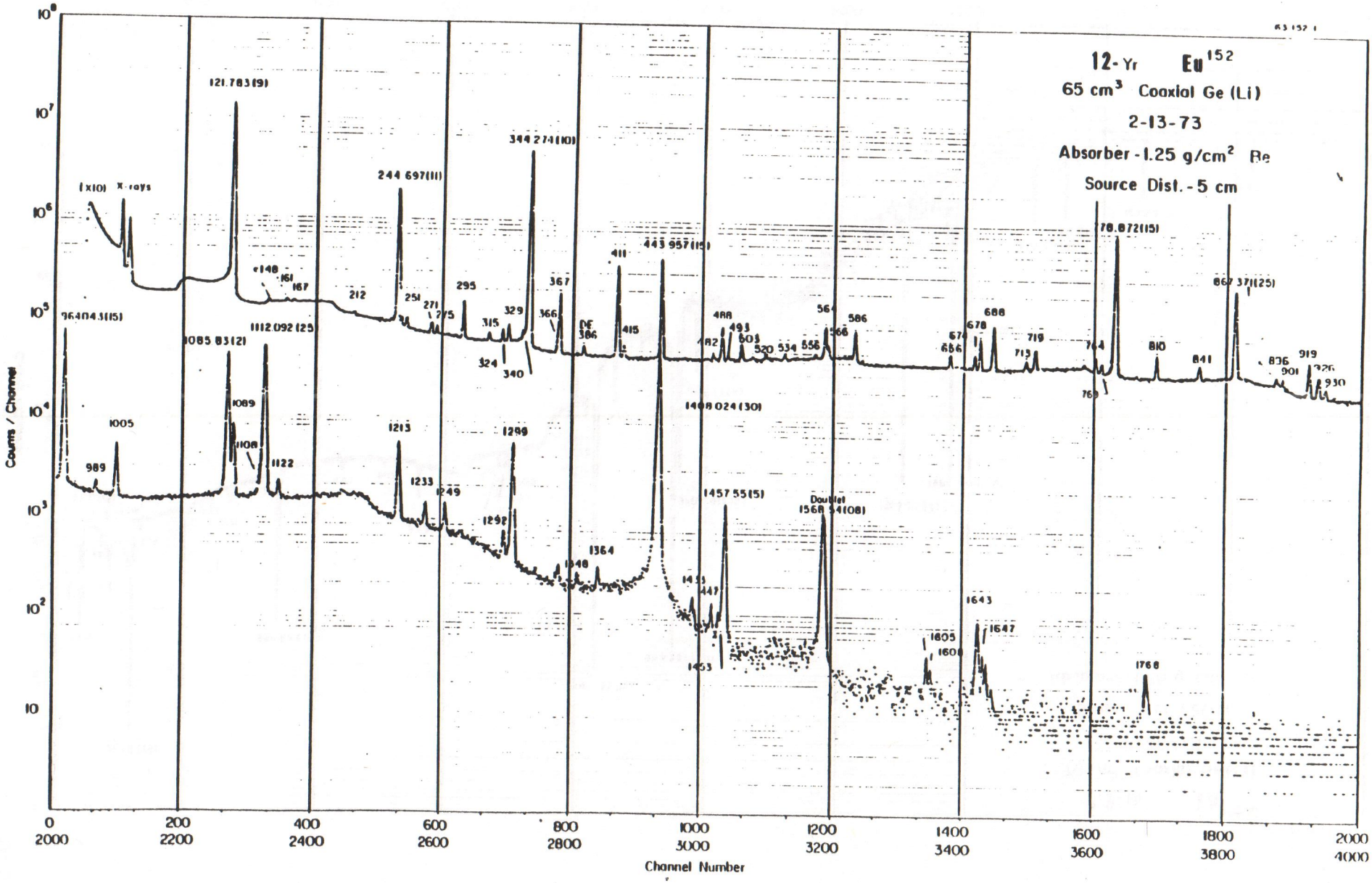

1.73-hr Nd149
2.5 cm x 8 mm Ge(Li)
5-66
Absorber - 6 g/cm2 Pb, 0.6 g/cm2 Ta
0.7 g/cm2 Cd
Counts / Channel
Channel Number

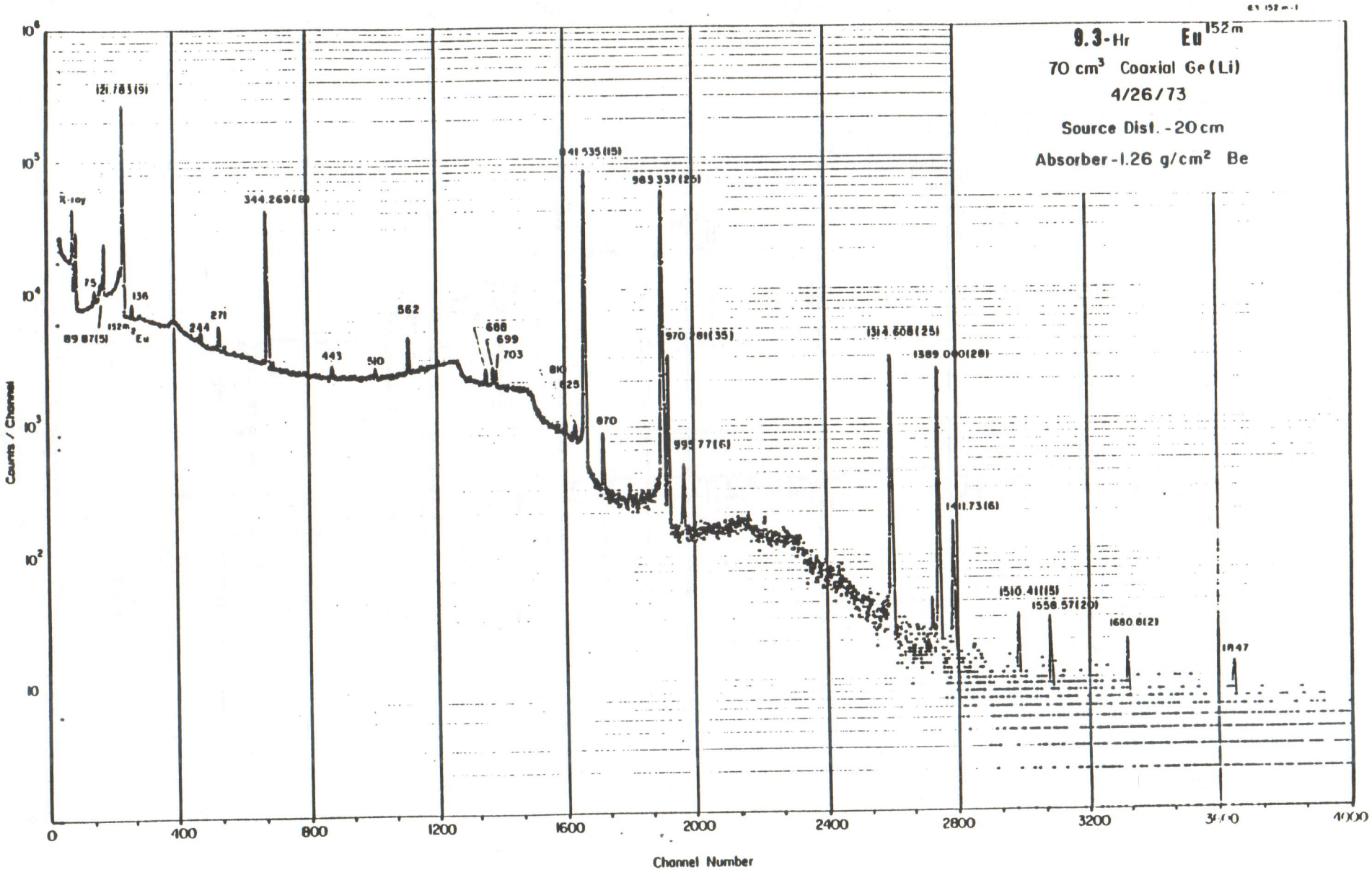

12-min Nd151
2.5 cm2 x 8mm Ge(Li)
3/2/66
Absorber - None
Source Dist. - 3 cm
Counts / Channel
Channel Number
K X-rays
1046.30(10)
1045
1180.90(6)
1550
255.69(4)
423.54(3)
736.71(6)
755.56(11)
797.48(6)

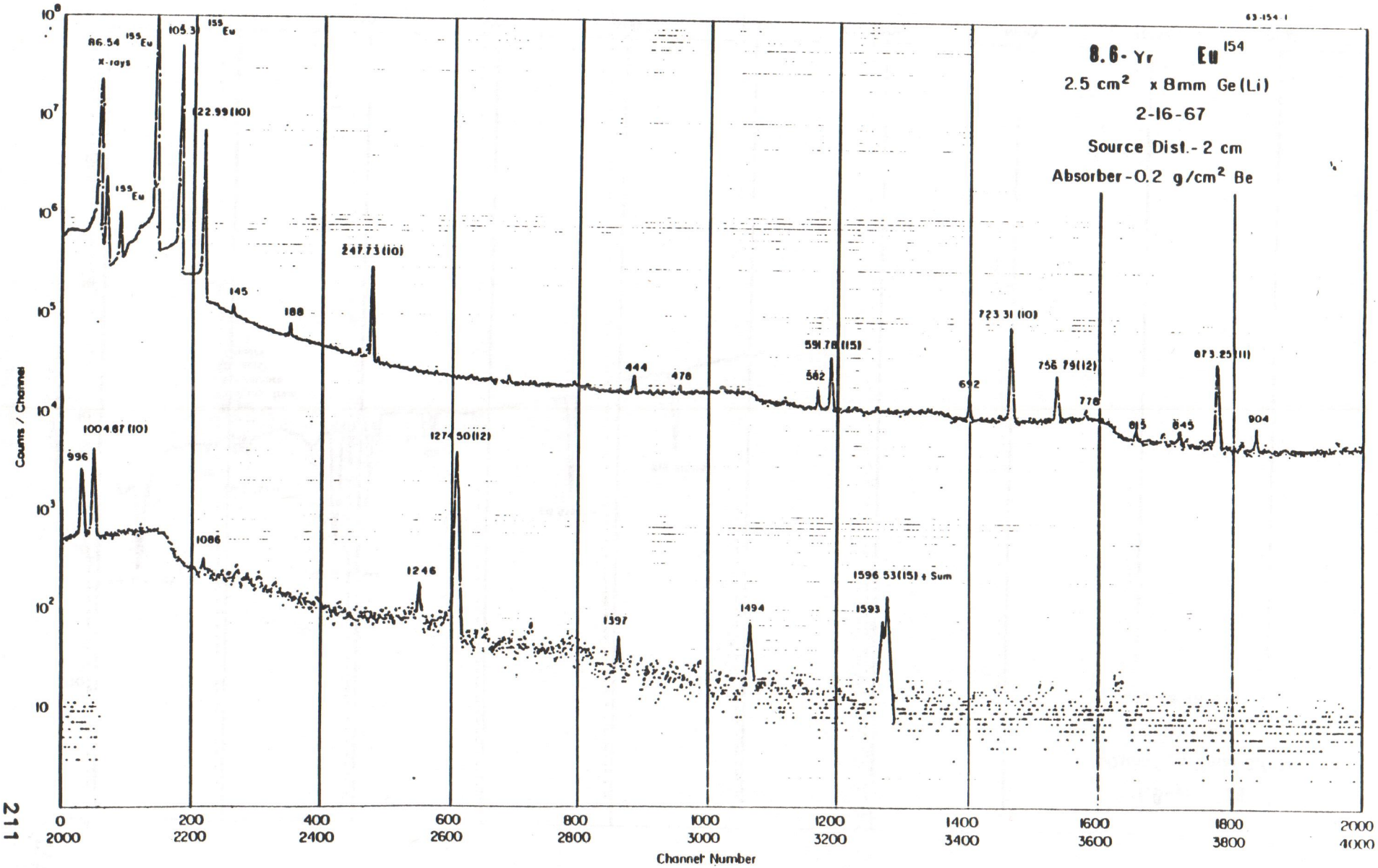

12-min Nd 151
2.5 cm² x 8mm Ge (Li)
4/12/66
Absorber-5gm Pb, .6g Ta, 0.4g/cm² Cd
Source Dist.-10 cm
Counts / Channel
Channel Number

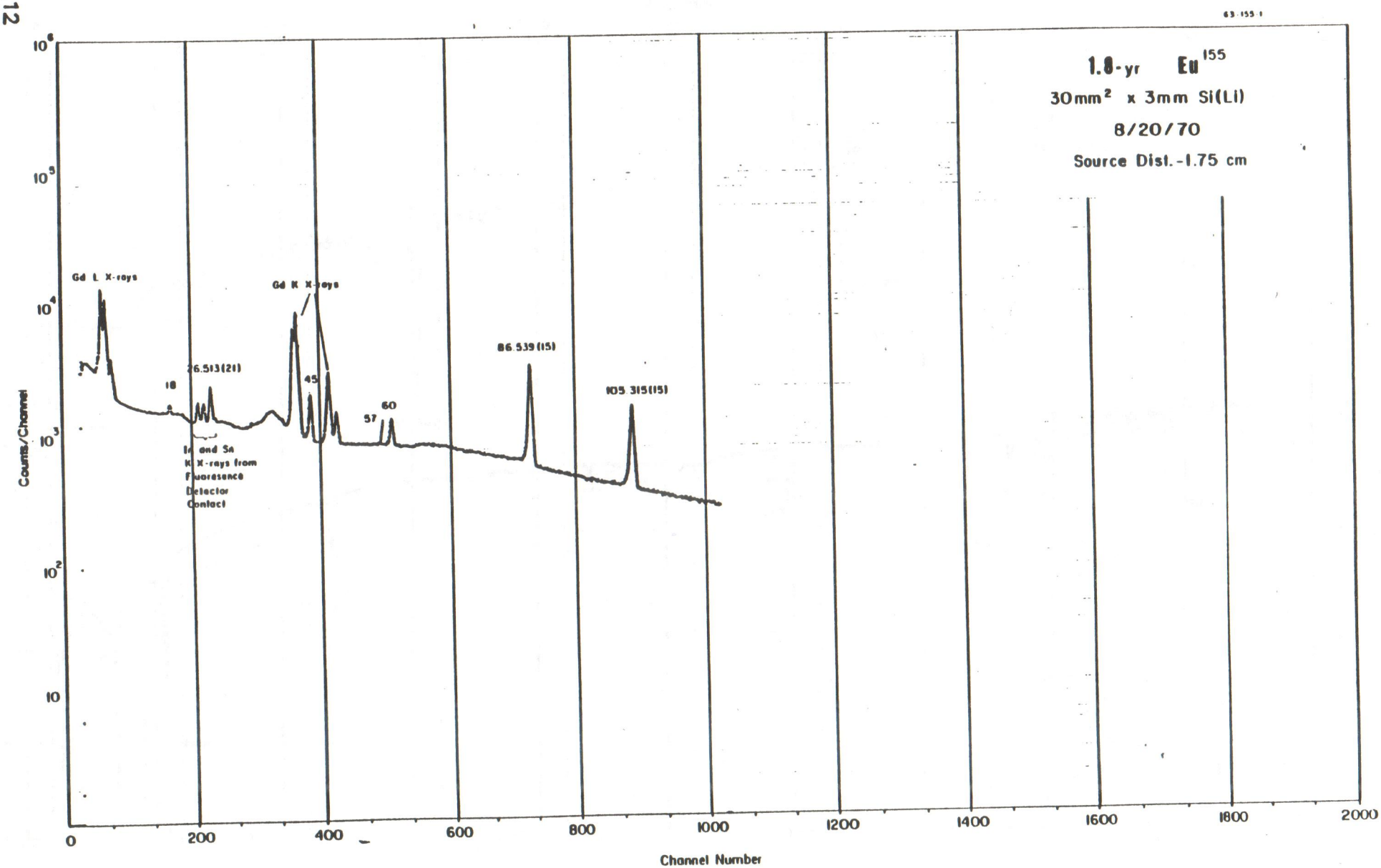

53-hr Pm149
2.5 cm2 x 4mm Ge(Li)
2/15-16/66
Absorber-1 g/cm2 Poly
Source Dist.-3 cm
Counts/Channel
Channel Number
285.9
276
263
254
208
242
104
327
350
359
590.9(3)
568
558
535
531
545
548
613
636
807
830
833
859.4(3)
881
0
200
400
600
800
1000
1200
1400
1600
1800
2000
10
10^2
10^3
10^4
10^5
10^6

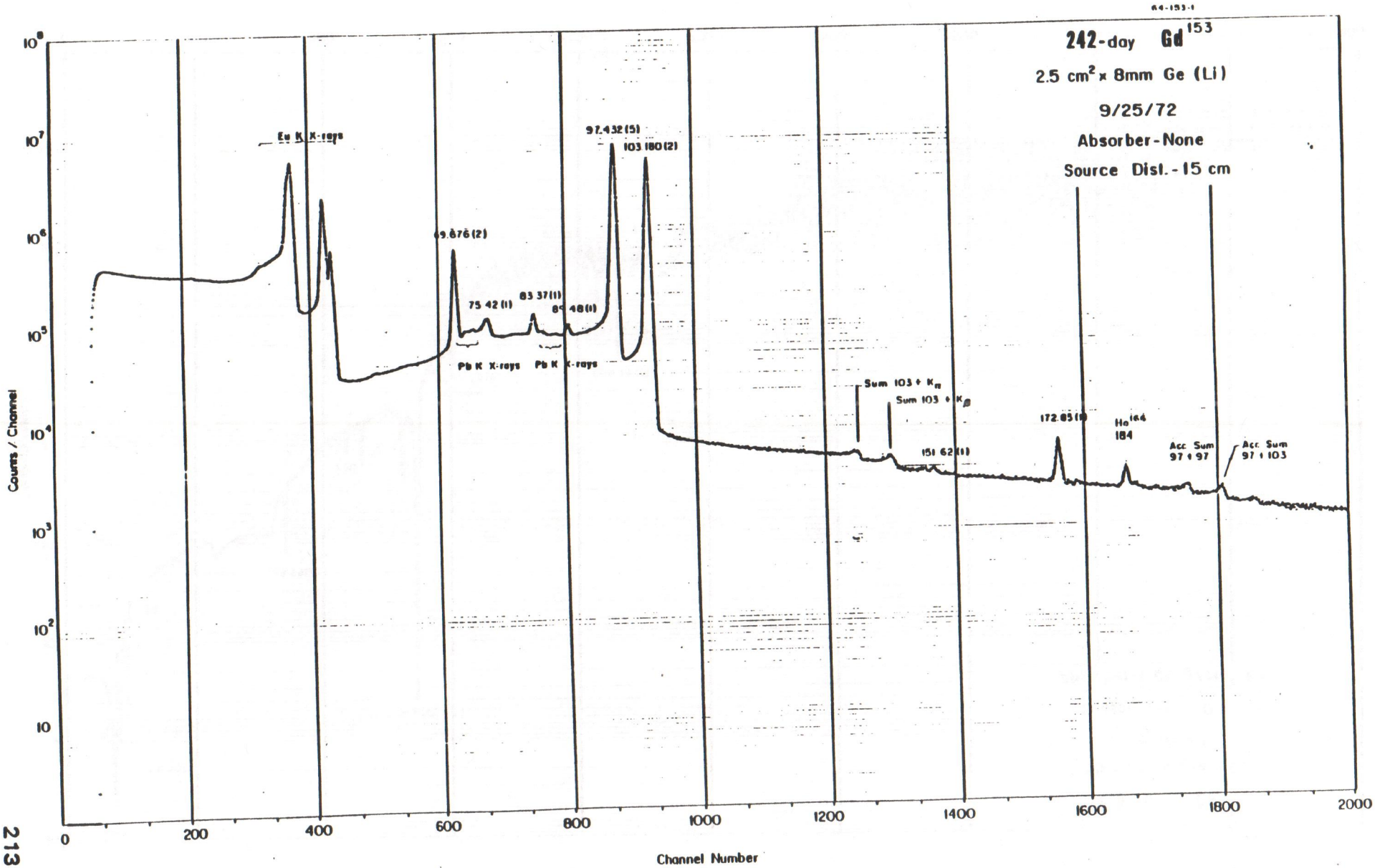

62-153-1
46.5-Hr Sm153
65 cm3 Coaxial Ge (Li)
2-28-73
Source Dist.-20 cm
Absorber-1.26 g/cm2 Be
Counts / Channel
Channel Number
Eu K X-rays
103.180(2)
172.862(10)
Random Sum Peaks
412
424
463.655(11)
484.83(5)
509
531.454(15)
533.301(18)
539.096(15)
542
545
555.055(15)
578
584
587
591
596.869
598
603
605.310(15)
615
617
634
636
657
713

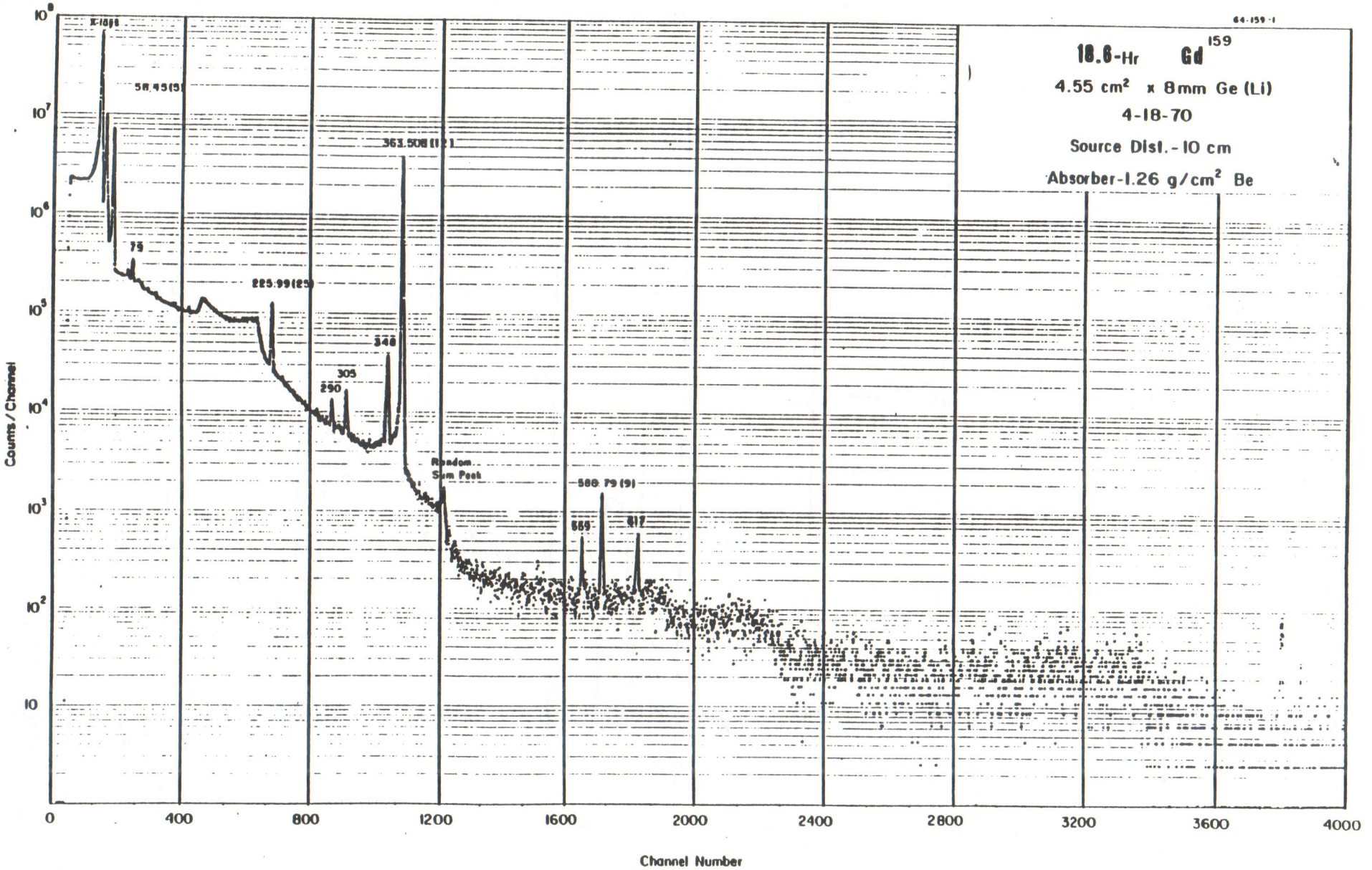

12-Yr Eu152
65 cm3 Coaxial Ge (Li)
2-13-73
Absorber - 1.25 g/cm2 Be
Source Dist. - 5 cm
Counts / Channel
Channel Number
121.783(9)
244.697(11)
344.274(10)
443.957(15)
778.872(15)
867.37(125)
964.043(15)
1085.83(2)
1112.092(25)
1408.024(30)
1457.55(5)
Doublet
1568.54(08)
1768

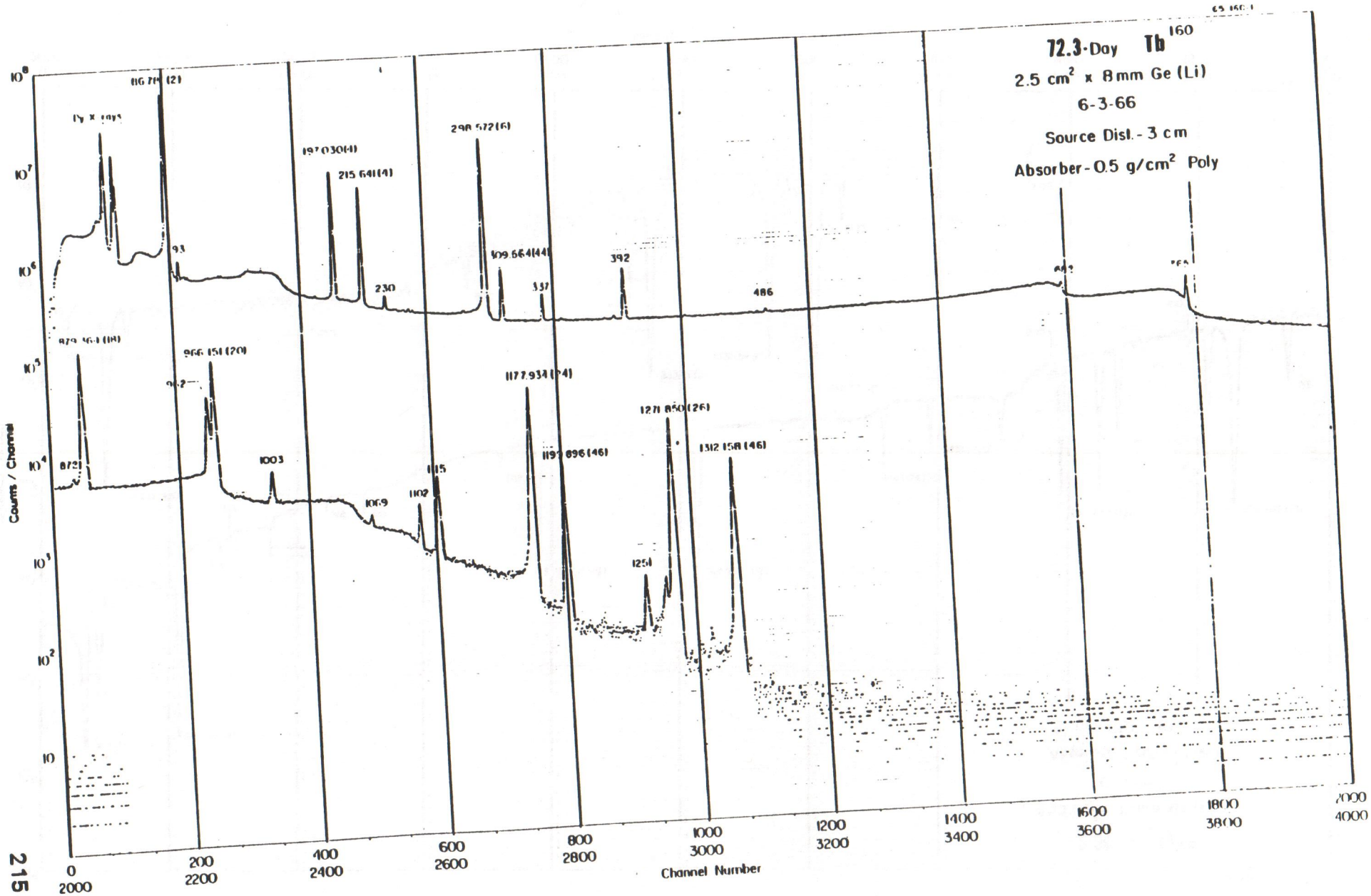

9.3-Hr Eu152m
70 cm3 Coaxial Ge(Li)
4/26/73
Source Dist. - 20 cm
Absorber - 1.26 g/cm2 Be
X-ray
121.783(5)
344.269(8)
841.535(15)
963.337(25)
1314.608(25)
1389.040(28)
1411.73(6)
1510.41(15)
1558.57(20)
1680.8(2)
1847
Counts / Channel
Channel Number

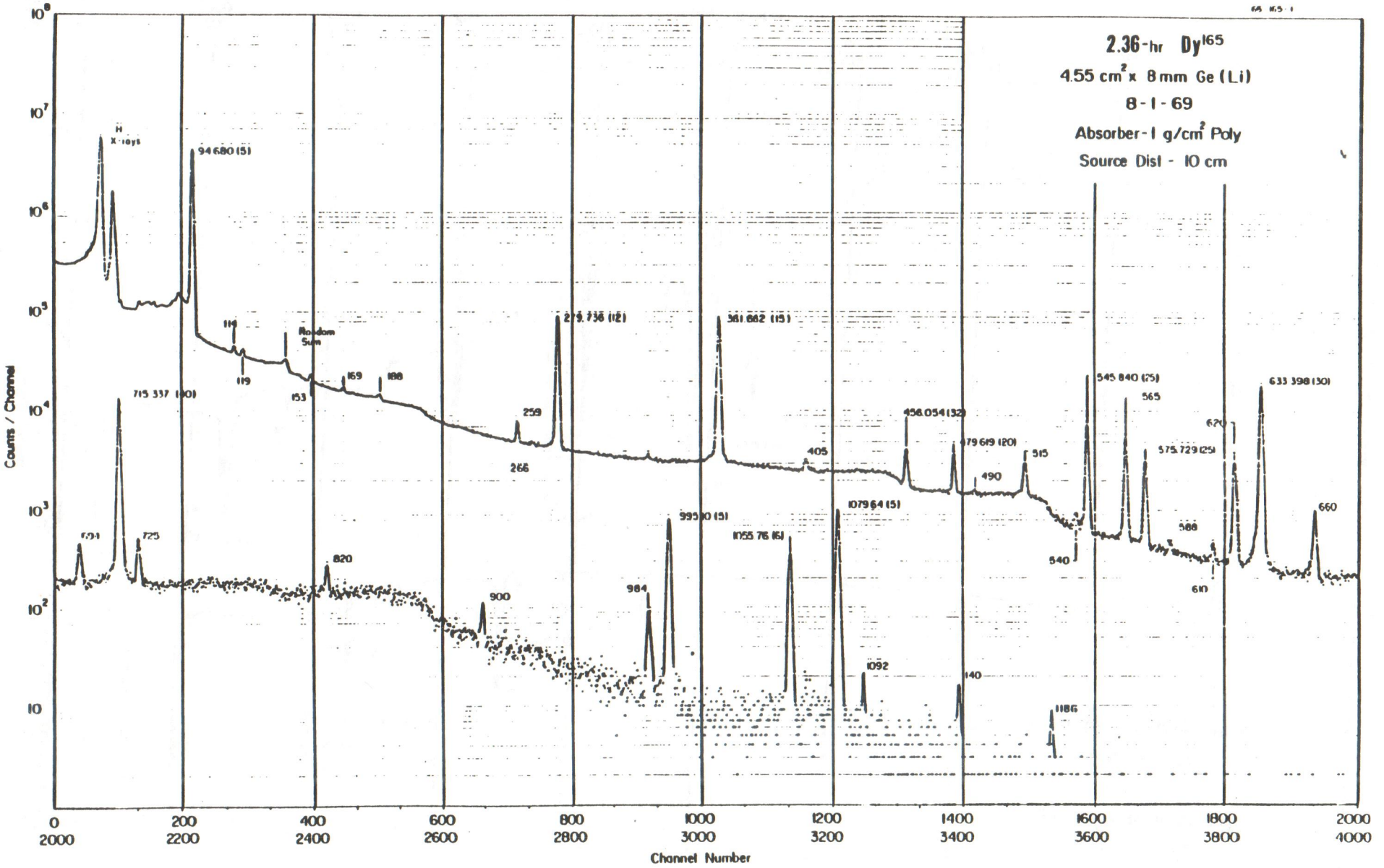

8.6- Yr Eu 154
2.5 cm² x 8mm Ge(Li)
2-16-67
Source Dist.- 2 cm
Absorber-0.2 g/cm² Be
86.54 155Eu
X-rays
105.3 155Eu
122.99(10)
155Eu
145
188
247.73(10)
444
478
591.76(15)
582
692
723.31(10)
756.79(12)
778
873.25(11)
904
1004.87(10)
996
1086
1246
1274.50(12)
1397
1494
1596.53(15) + Sum
1593
Counts / Channel
Channel Number

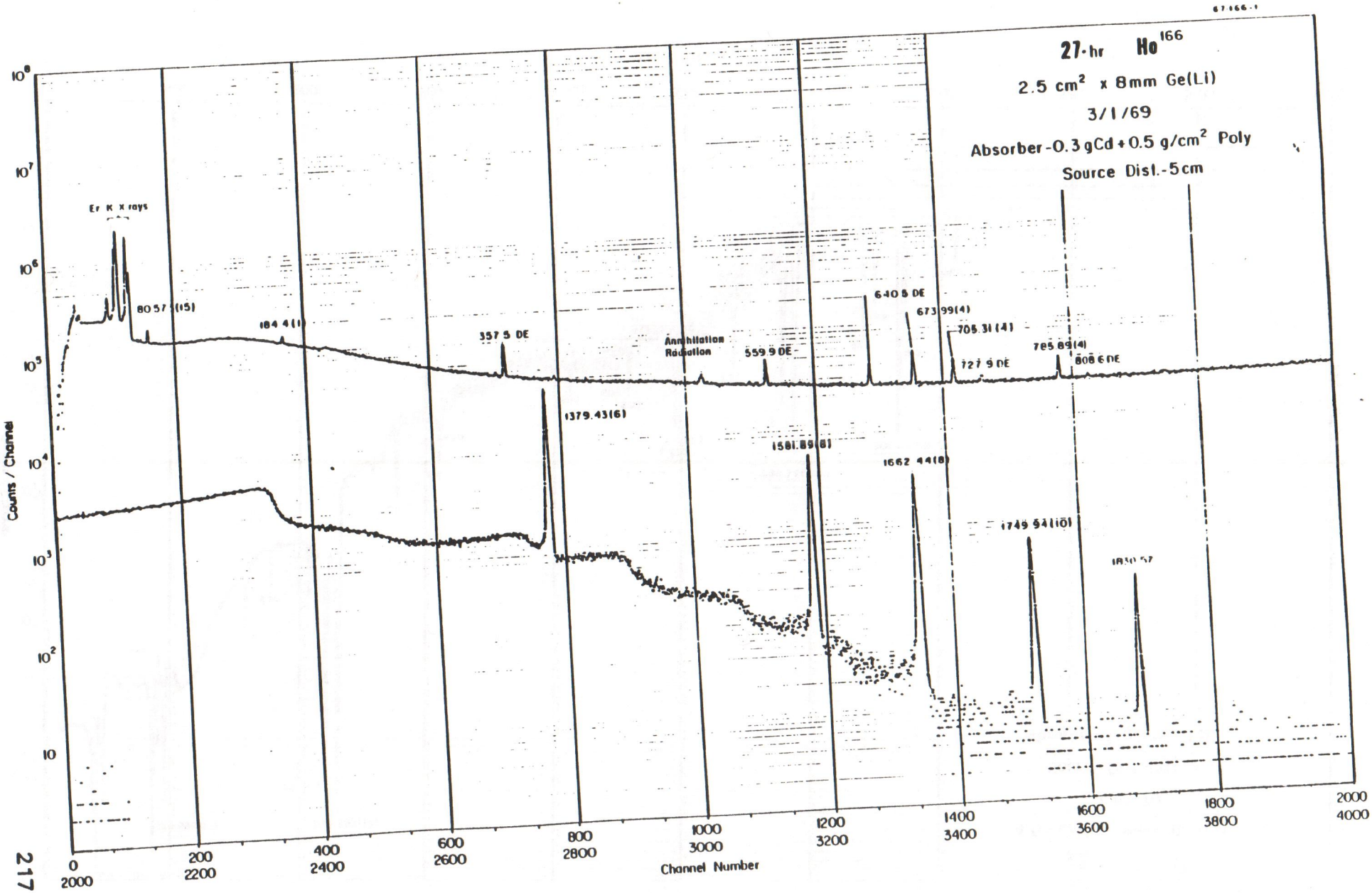

63-155-1
1.8-yr Eu155
30mm2 x 3mm Si(Li)
8/20/70
Source Dist.-1.75 cm
Gd L X-rays
Gd K X-rays
26.513(21)
18
45
57
60
86.539(15)
105.315(15)
In and Sn
K X-rays from
Fluorescence
Detector
Contact
Counts/Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
10
10^2
10^3
10^4
10^5
10^6

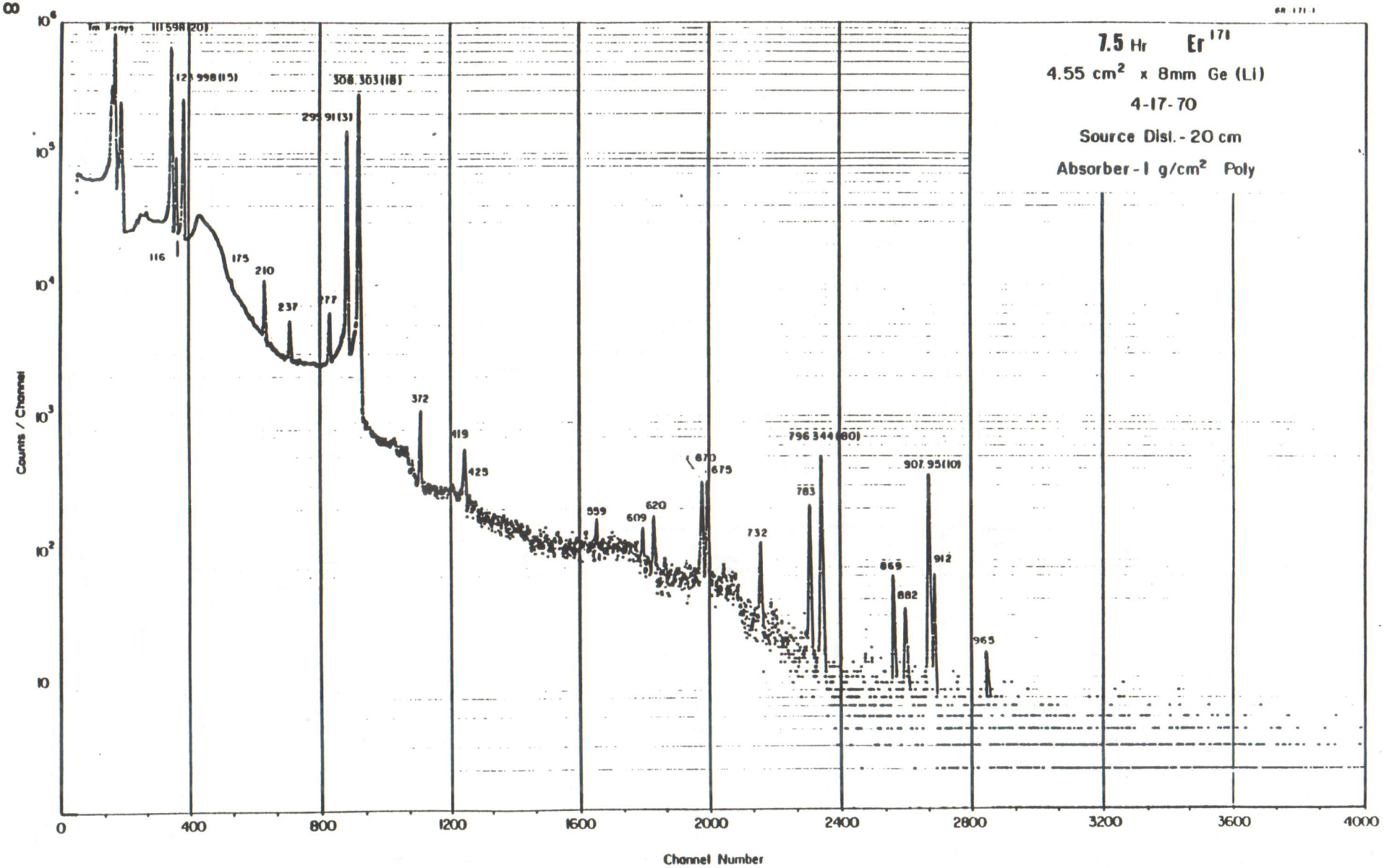

242-day Gd153
2.5 cm2 x 8mm Ge (Li)
9/25/72
Absorber-None
Source Dist.-15 cm
Eu K X-rays
69.676(2)
75.42(1)
83.37(1)
Pb K X-rays
Pb K X-rays
97.432(5)
103.180(2)
Sum 103 + Kα
Sum 103 + Kβ
151.62(1)
172.85(1)
Ho164
184
Acc. Sum 97 + 97
Acc. Sum 97 + 103
Counts / Channel
Channel Number

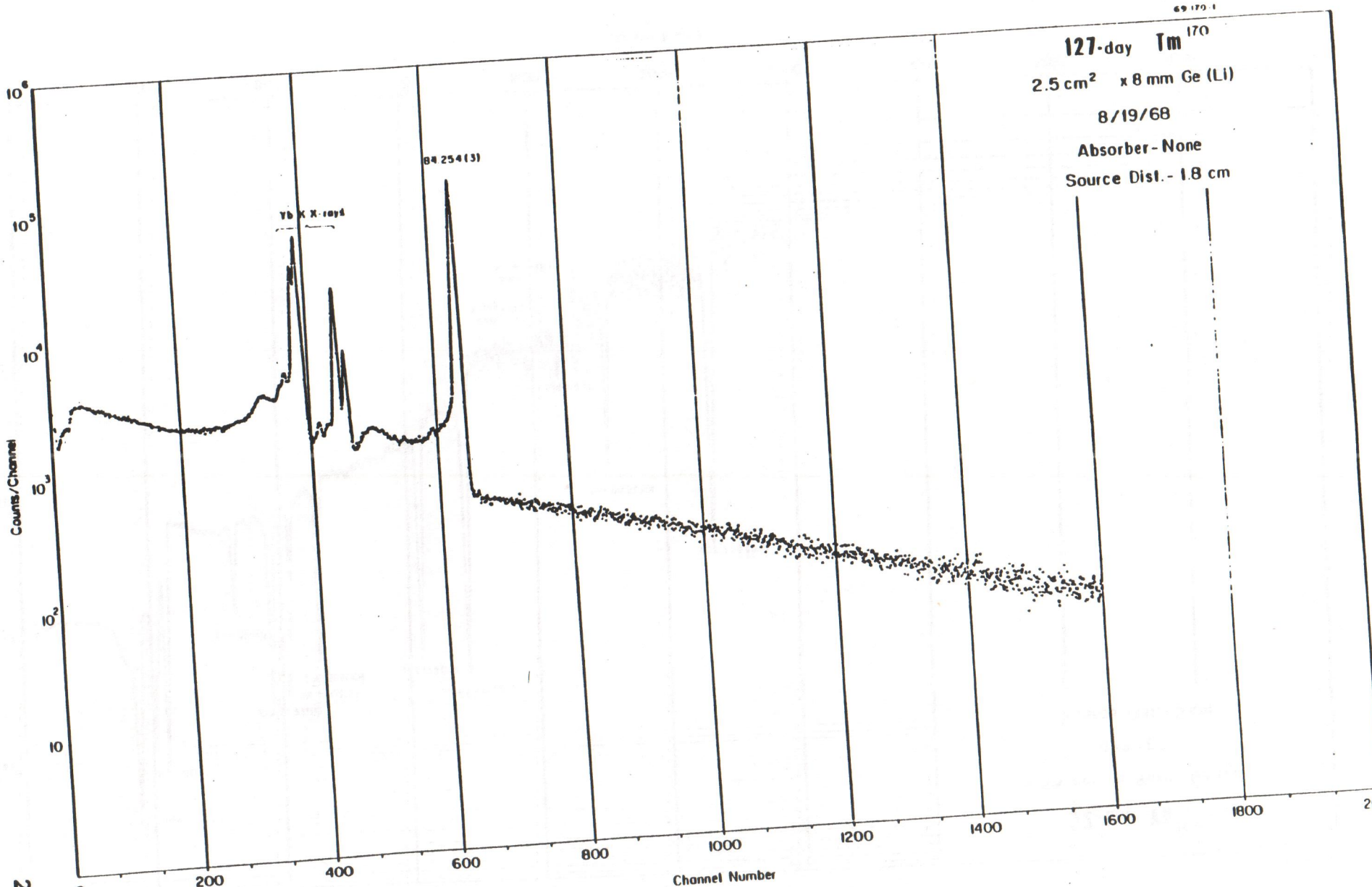

64-159-1
18.6-Hr Gd159
4.55 cm² x 8mm Ge (Li)
4-18-70
Source Dist.-10 cm
Absorber-1.26 g/cm² Be
58.45(5)
363.508(12)
75
225.99(25)
348
305
290
Random Sum Peak
580.79(9)
589
617
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸

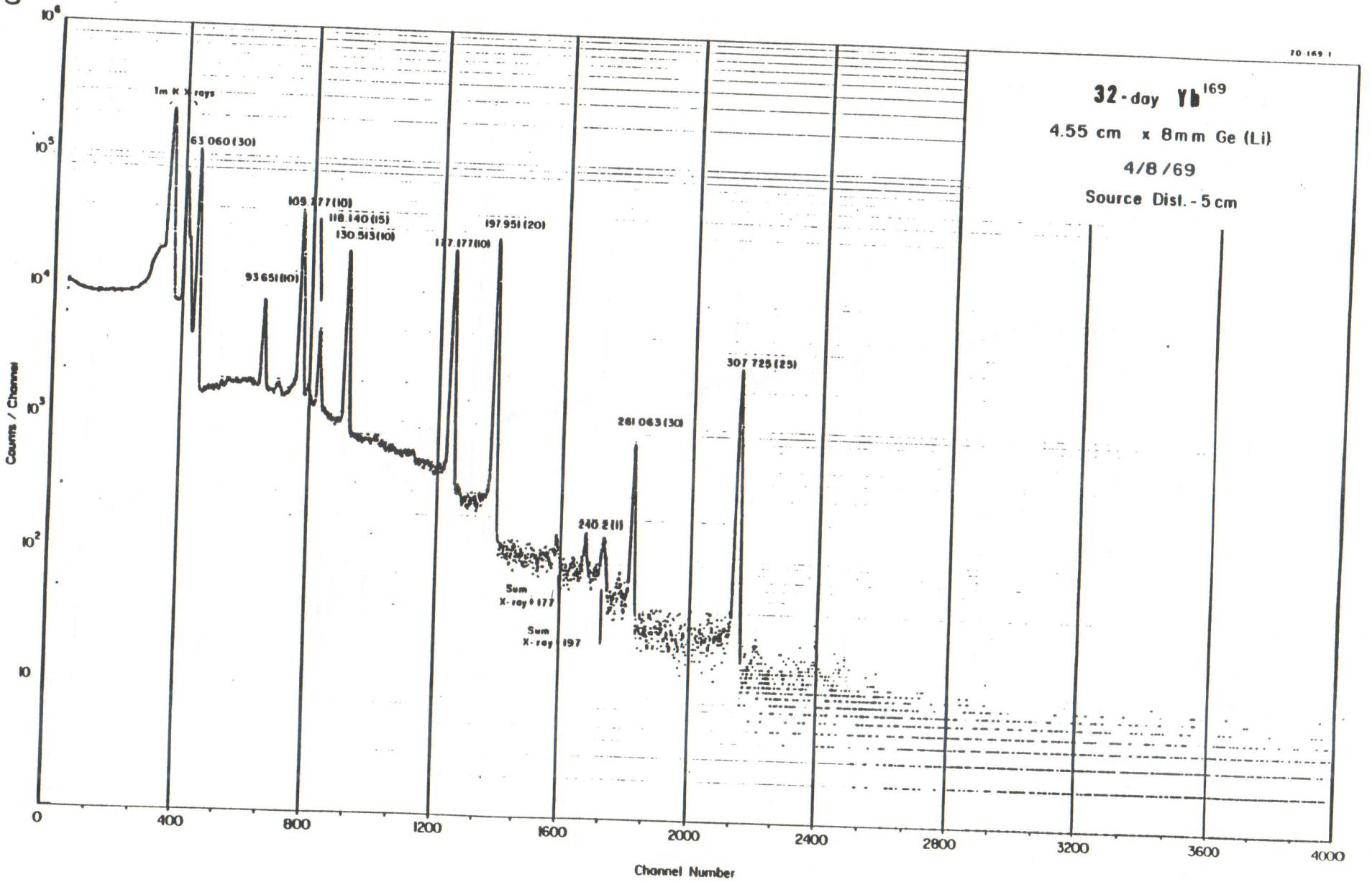

72.3-Day Tb160
2.5 cm2 x 8 mm Ge (Li)
6-3-66
Source Dist. - 3 cm
Absorber - 0.5 g/cm2 Poly
Counts / Channel
Channel Number
0 2000
200 2200
400 2400
600 2600
800 2800
1000 3000
1200 3200
1400 3400
1600 3600
1800 3800
2000 4000
93
230
486
1003
1069
1102
1115
1251

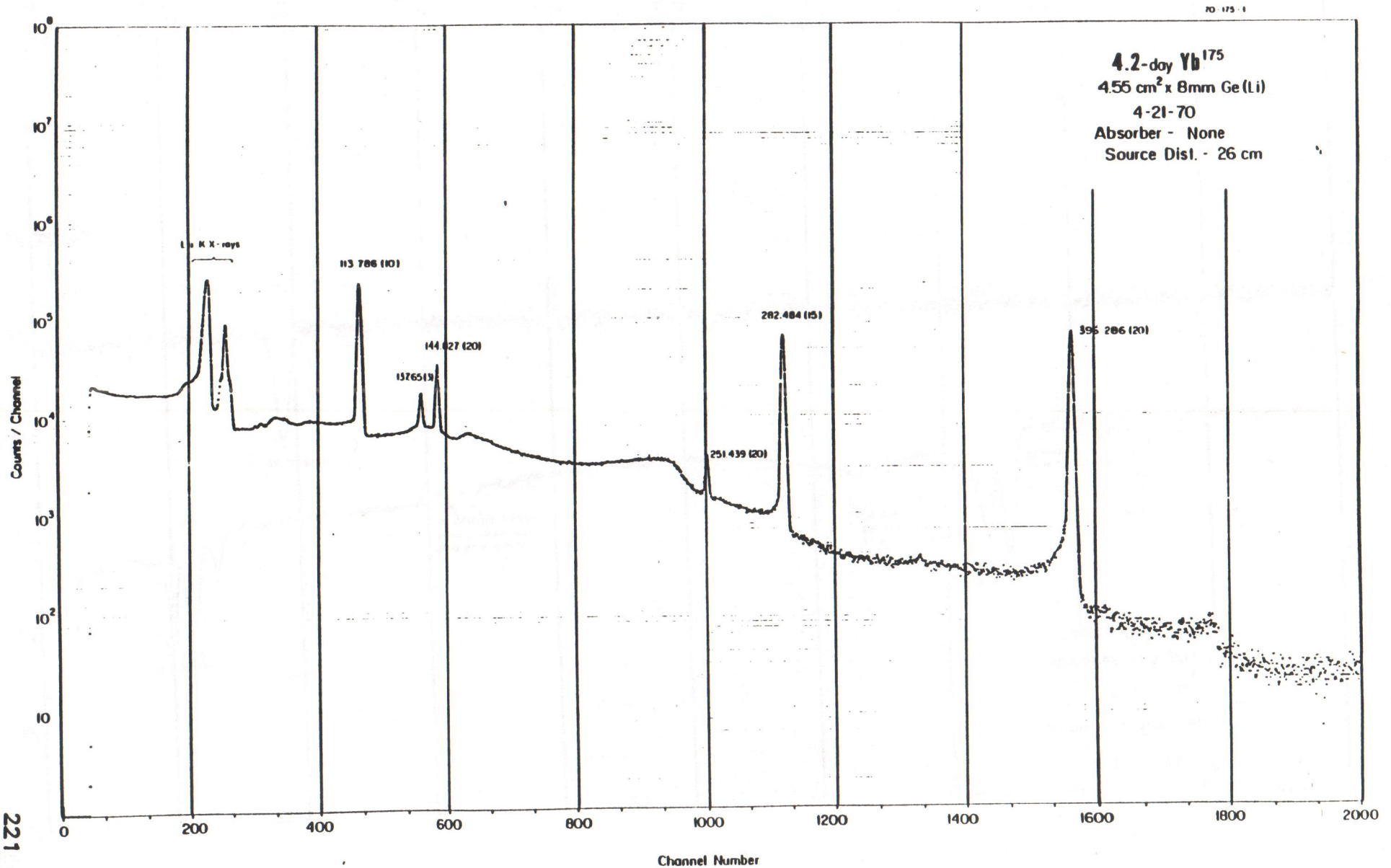

2.36-hr Dy165
4.55 cm2 x 8 mm Ge (Li)
8-1-69
Absorber-1 g/cm2 Poly
Source Dist - 10 cm
Counts / Channel
Channel Number
K X-rays
94.680 (5)
Random Sum
715.337 (100)
279.736 (12)
361.662 (15)
456.054 (32)
545.840 (25)
633.398 (30)
575.729 (25)
1079.64 (5)
1055.76 (6)
995.10 (5)

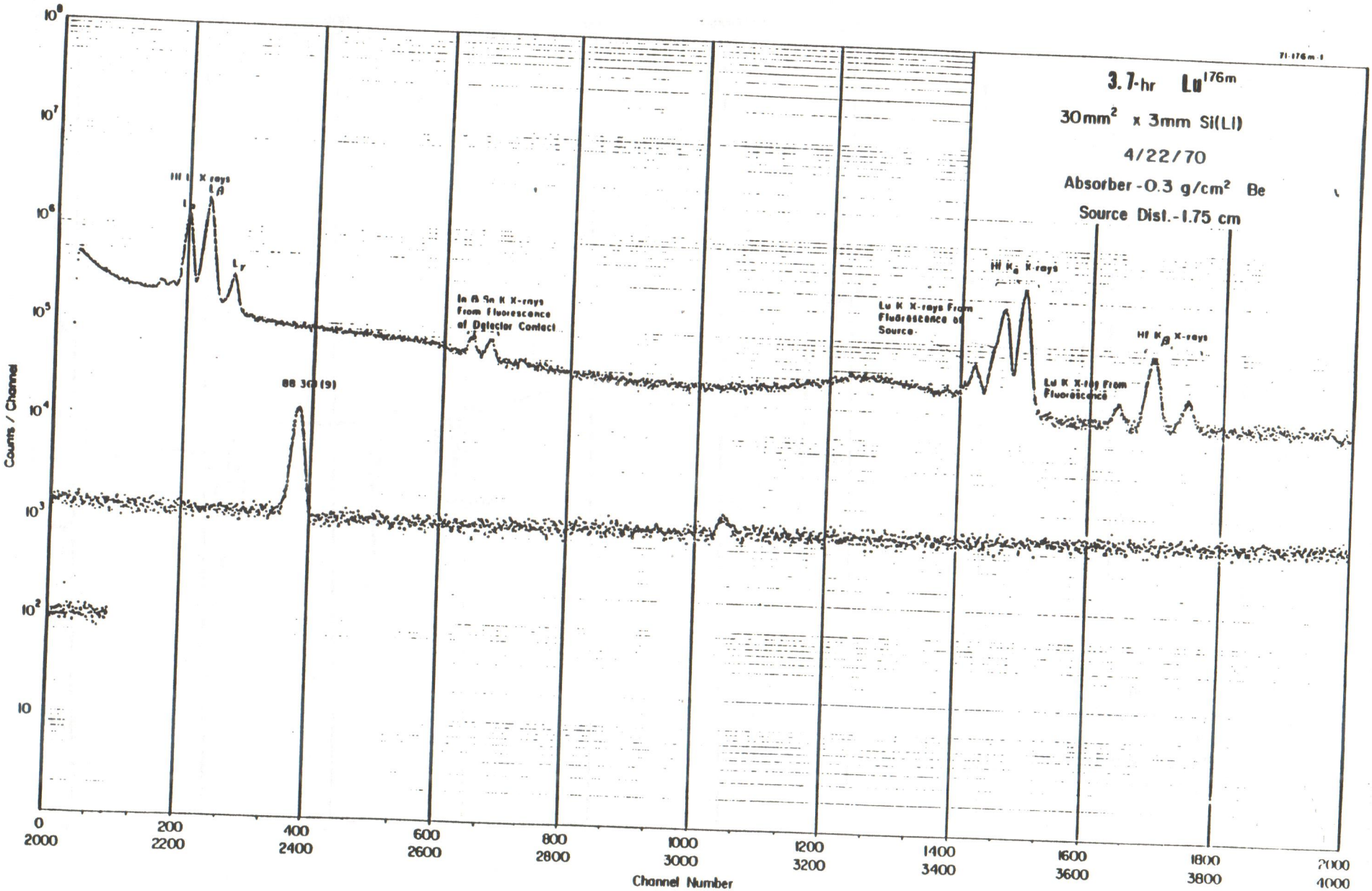

27-hr Ho166
2.5 cm2 x 8mm Ge(Li)
3/1/69
Absorber-0.3 gCd+0.5 g/cm2 Poly
Source Dist.-5cm
Er K X rays
80.57 (15)
184.4(1)
357.5 DE
Annihilation Radiation
559.9 DE
640.5 DE
673.99(4)
705.31(4)
727.9 DE
785.89(4)
808.6 DE
1379.43(6)
1581.89(8)
1662.44(8)
1749.54(10)
1850.57
Counts / Channel
Channel Number
0
2000
200
2200
400
2400
600
2600
800
2800
1000
3000
1200
3200
1400
3400
1600
3600
1800
3800
2000
4000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸

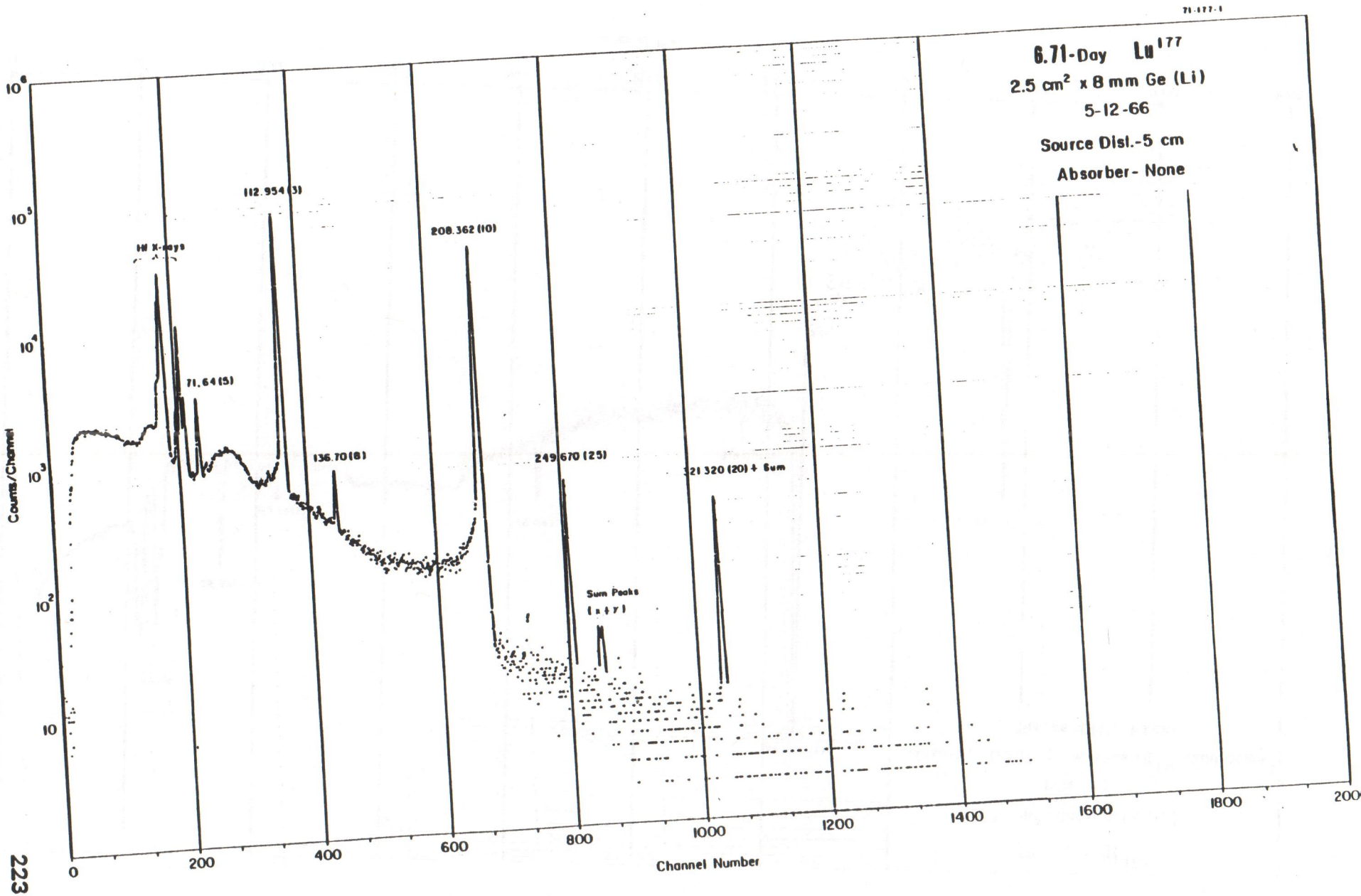

7.5 Hr Er 171
4.55 cm² x 8mm Ge (Li)
4-17-70
Source Dist. - 20 cm
Absorber - 1 g/cm² Poly
Counts / Channel
Channel Number
116
175
210
237
277
372
419
425
559
609
620
670
675
732
783
796.344(80)
869
882
907.95(10)
912
965
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

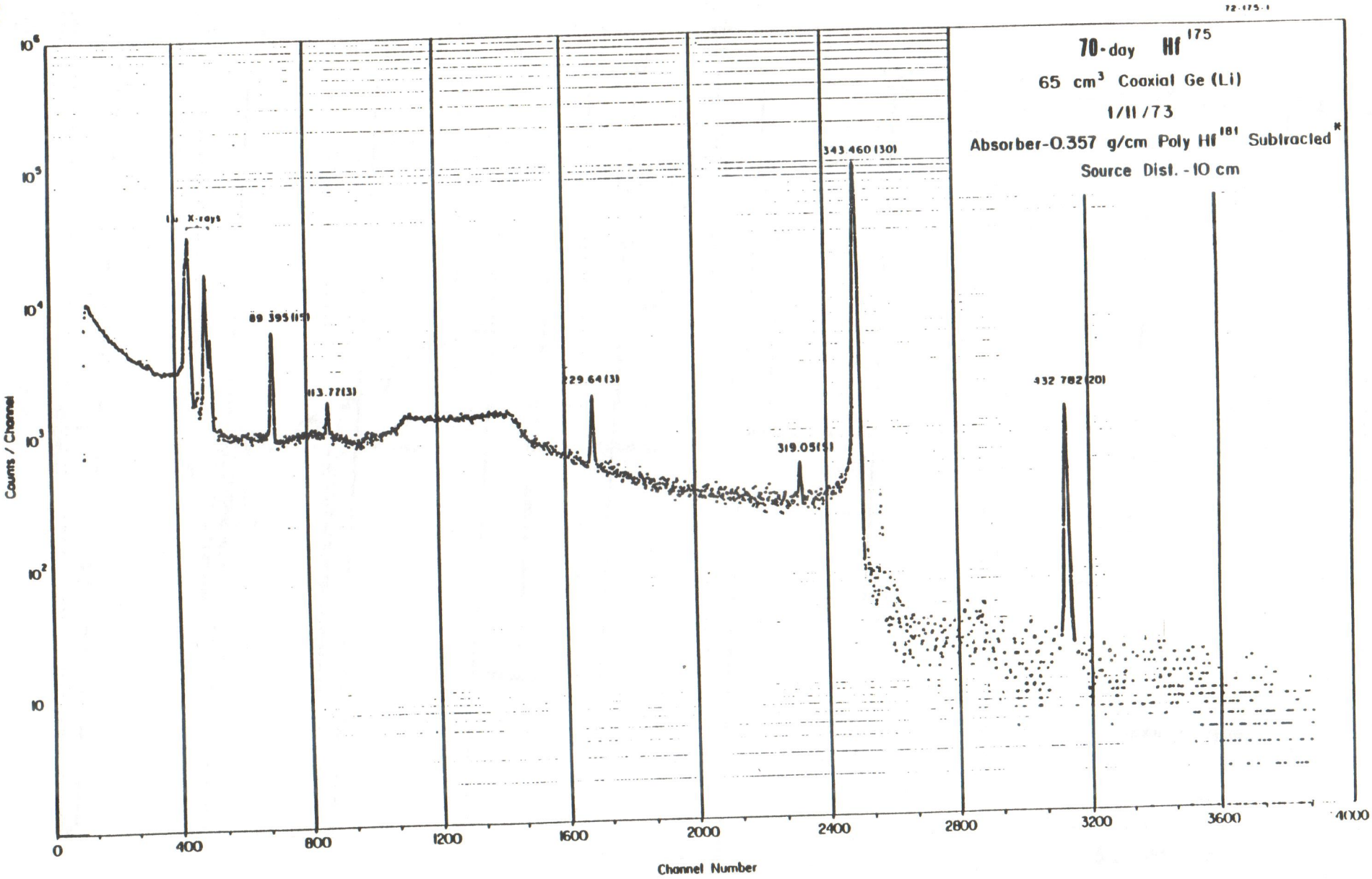

127-day Tm 170
2.5 cm2 x 8 mm Ge (Li)
8/19/68
Absorber - None
Source Dist. - 1.8 cm
84.254(3)
Yb K X-rays
Counts/Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
200
400
600
800
1000
1200
1400
1600
1800

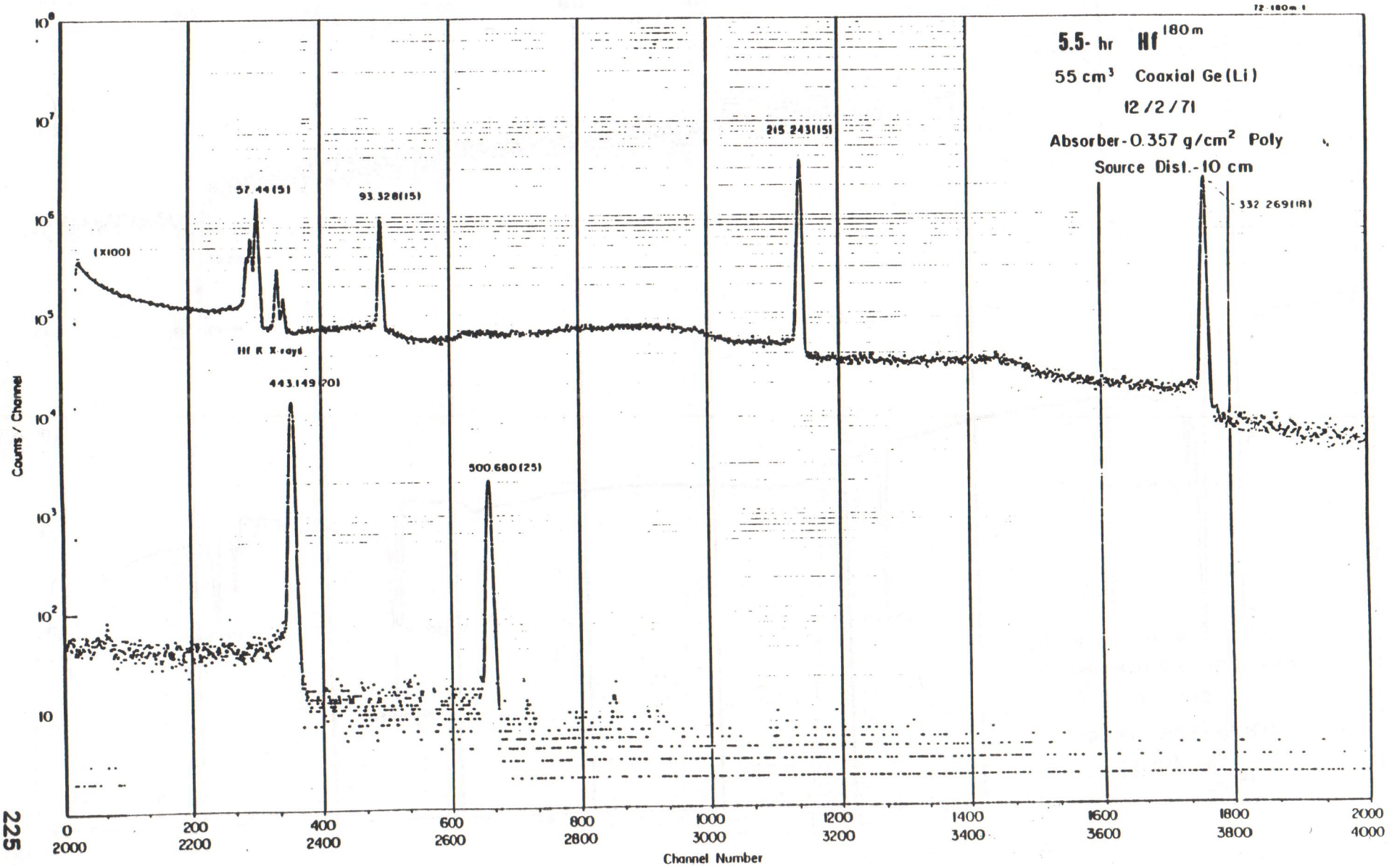

70-169 I
32-day Yb169
4.55 cm x 8mm Ge (Li)
4/8/69
Source Dist. - 5 cm
Tm K X-rays
63.060(30)
93.65(10)
109.177(10)
118.140(15)
130.513(10)
177.177(10)
197.951(20)
Sum X-ray + 177
Sum X-ray + 197
240.2(1)
261.063(30)
307.725(25)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

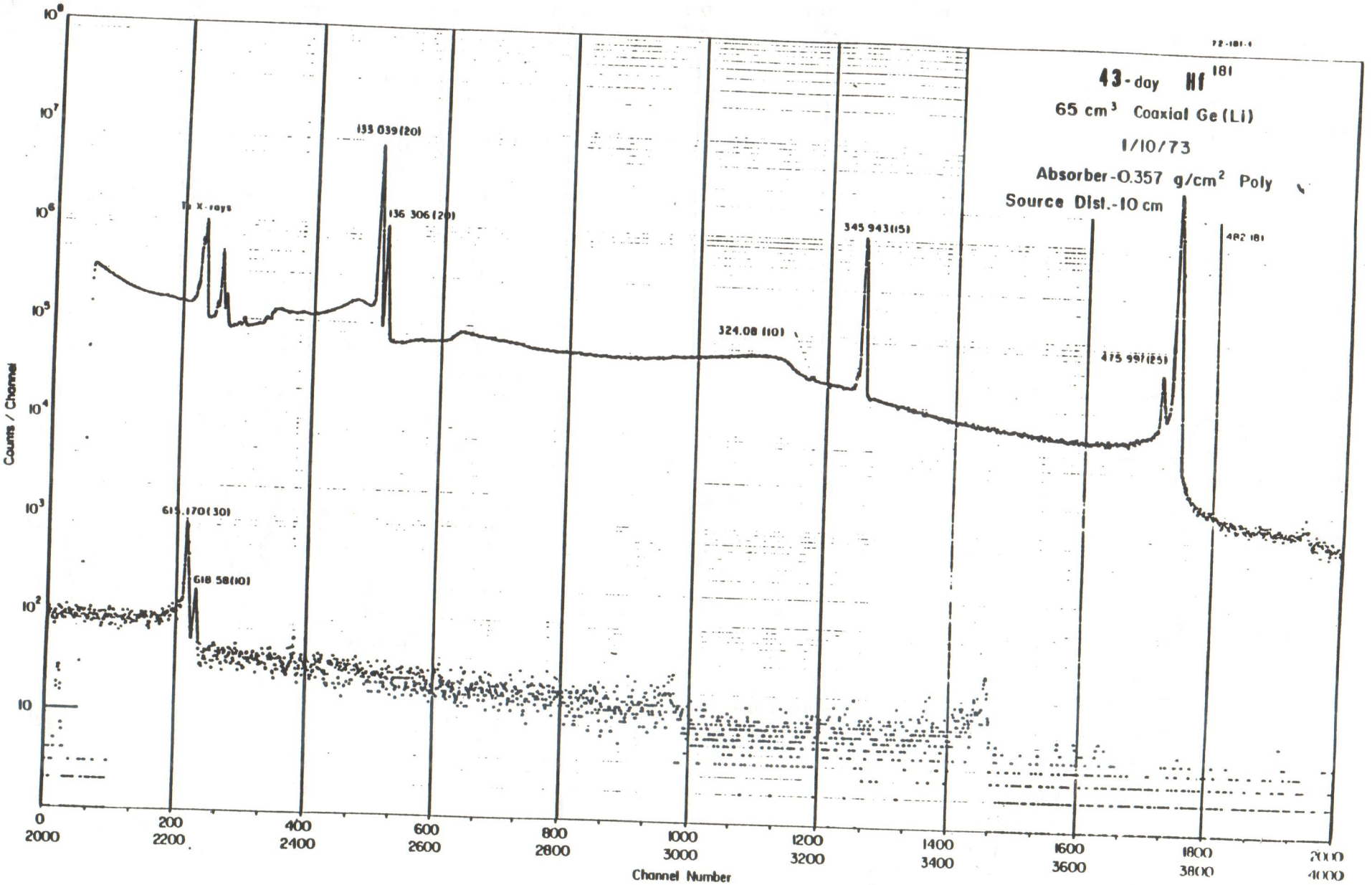

70-175-1
4.2-day Yb175
4.55 cm2 x 8mm Ge(Li)
4-21-70
Absorber - None
Source Dist. - 26 cm
Lu K X-rays
113.786 (10)
137.65 (3)
144.027 (20)
251.439 (20)
282.484 (15)
396.286 (20)
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
10^7
10^8
0
200
400
600
800
1000
1200
1400
1600
1800
2000

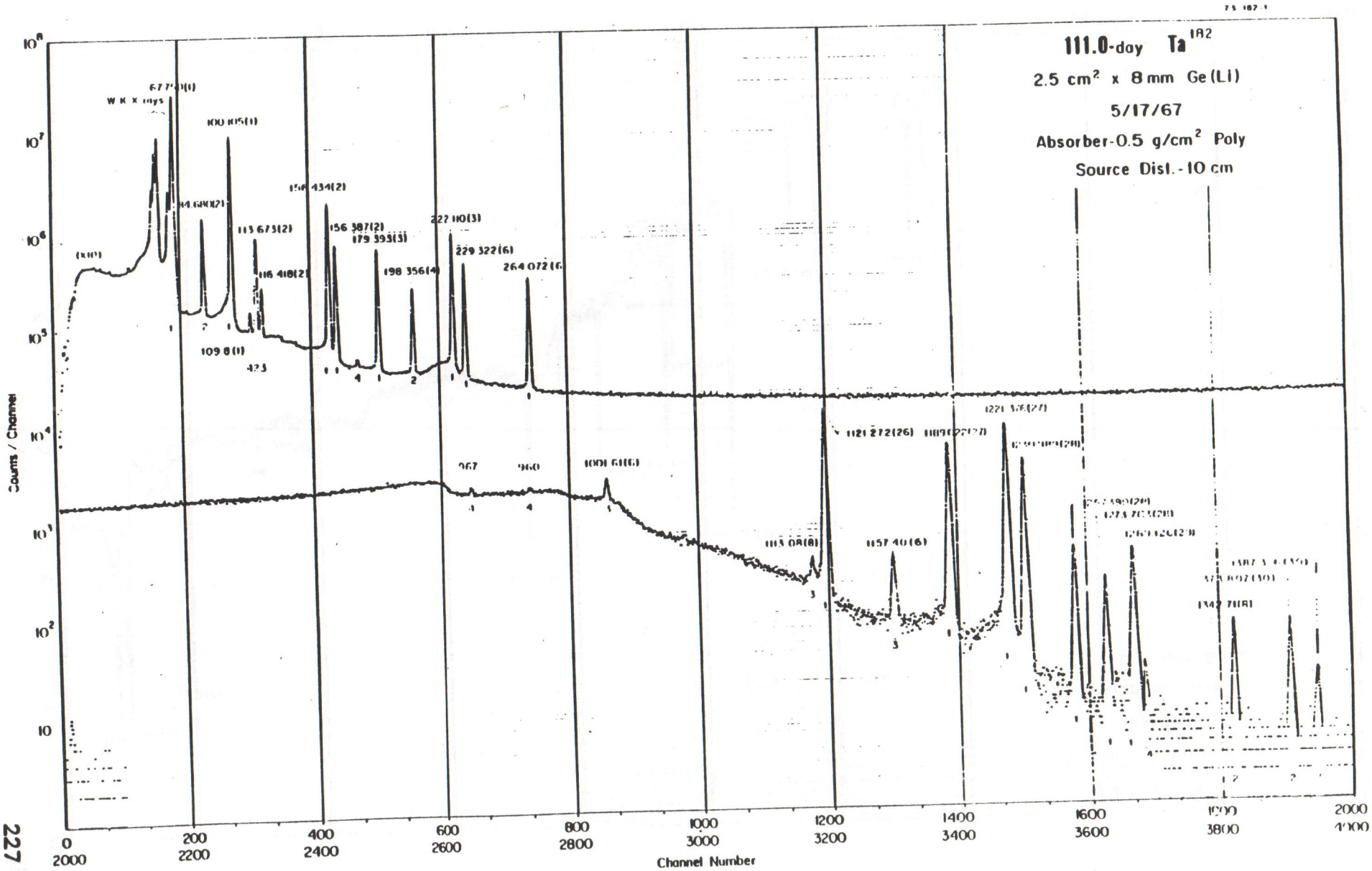

3.7-hr Lu176m
30mm2 x 3mm Si(Li)
4/22/70
Absorber -0.3 g/cm2 Be
Source Dist.-1.75 cm
Hf Kα X-rays
Hf Kβ X-rays
Lu K X-rays From Fluorescence of Source
Lu K X-rays From Fluorescence
In & Sn K X-rays from Fluorescence of Detector Contact
Counts / Channel
Channel Number

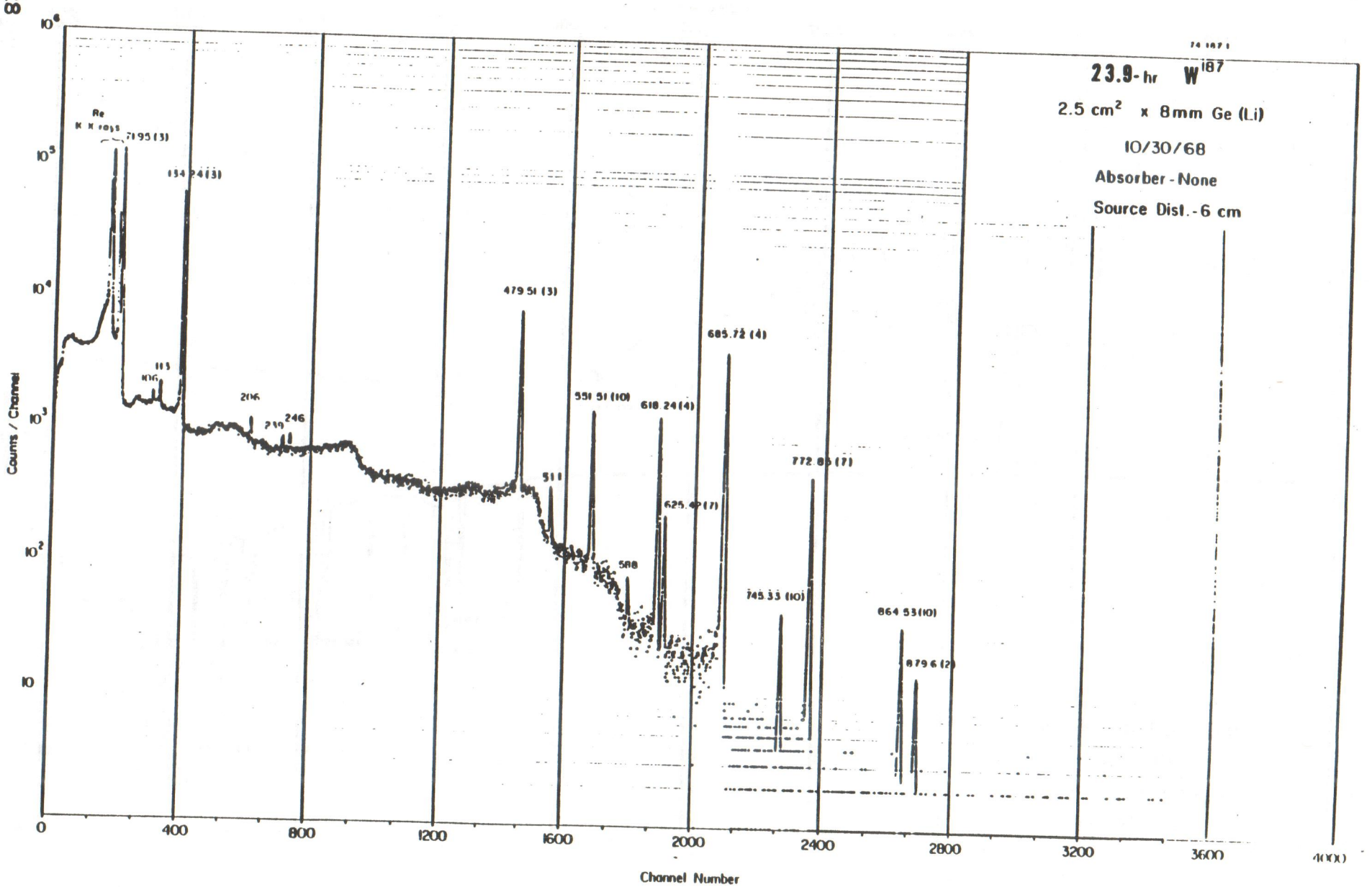

71-177-1
6.71-Day Lu177
2.5 cm² x 8 mm Ge (Li)
5-12-66
Source Dist.-5 cm
Absorber- None
Hf X-rays
71.64 (5)
112.954 (3)
136.70 (8)
208.362 (10)
249.670 (25)
321.320 (20) + Sum
Sum Peaks
(x + γ)
Counts/Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
200
400
600
800
1000
1200
1400
1600
1800
200

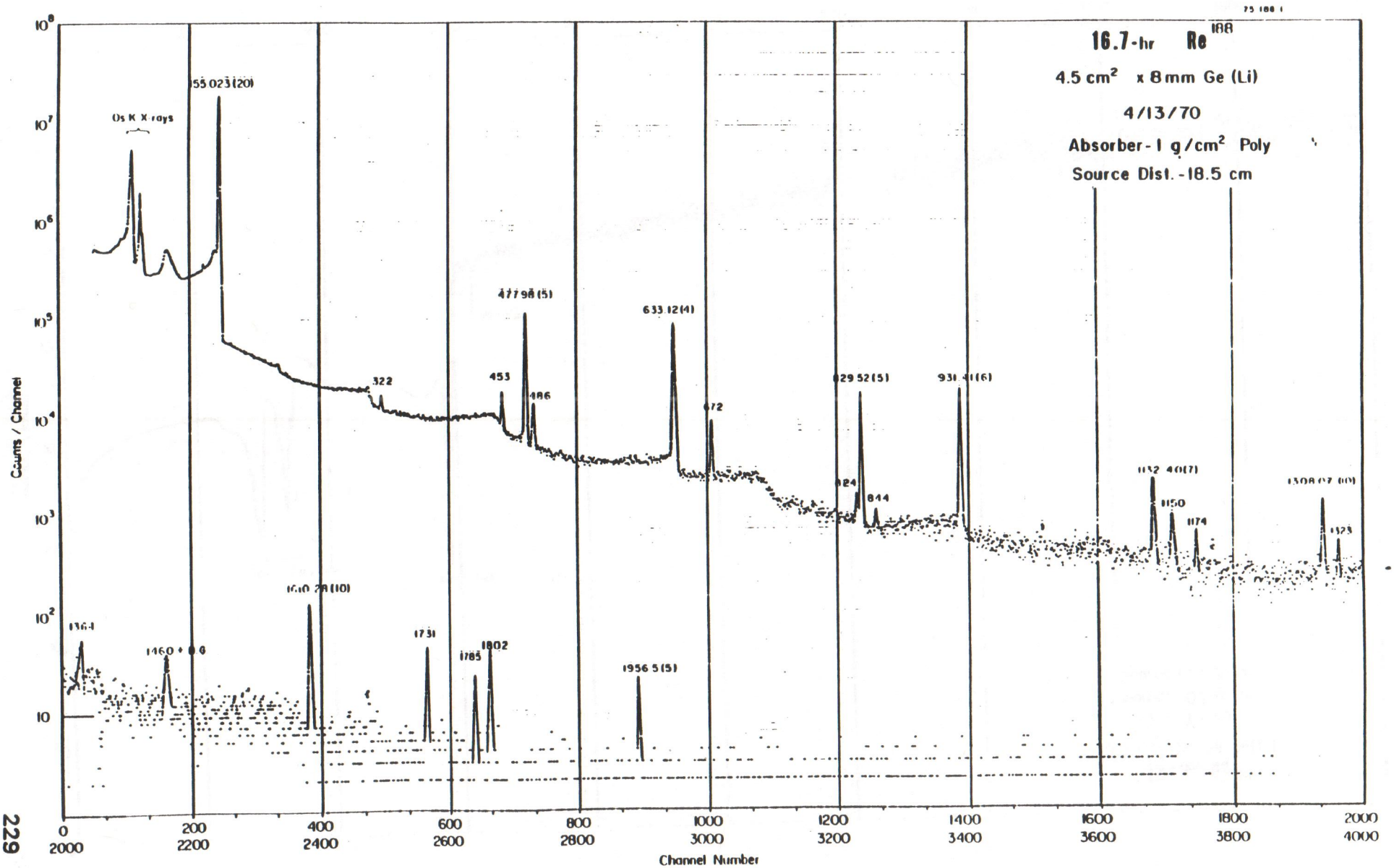

72-175-1
70-day Hf 175
65 cm3 Coaxial Ge (Li)
1/11/73
Absorber-0.357 g/cm Poly Hf 181 Subtracted*
Source Dist. - 10 cm
Lu X-rays
89.395(15)
113.77(3)
229.64(3)
319.05(5)
343.460(30)
432.782(20)
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

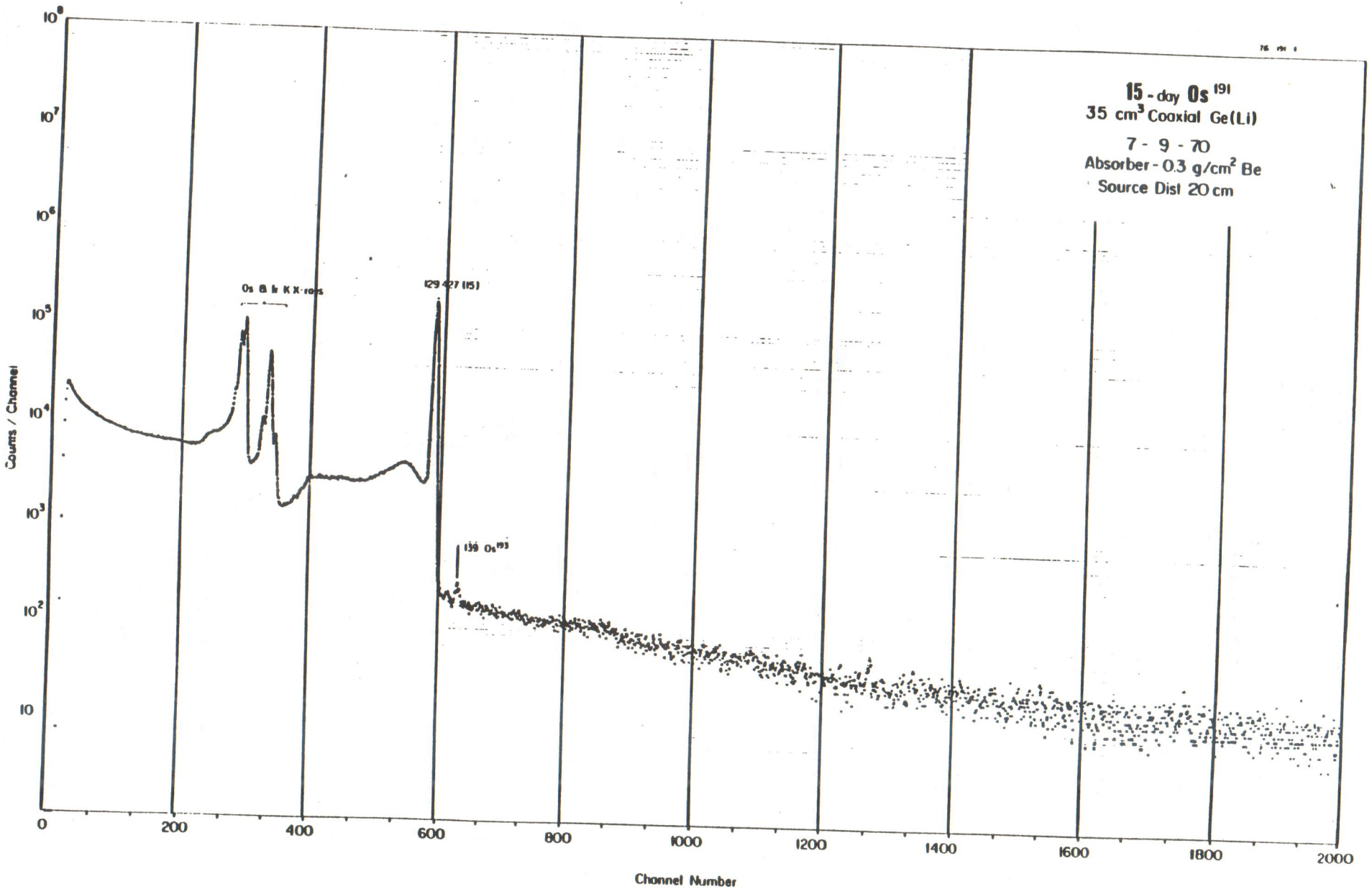

5.5- hr Hf 180m
55 cm³ Coaxial Ge(Li)
12/2/71
Absorber-0.357 g/cm² Poly
Source Dist.-10 cm
57.44(5)
93.328(15)
215.243(15)
332.269(18)
(x100)
443.149(20)
500.680(25)
Counts / Channel
Channel Number

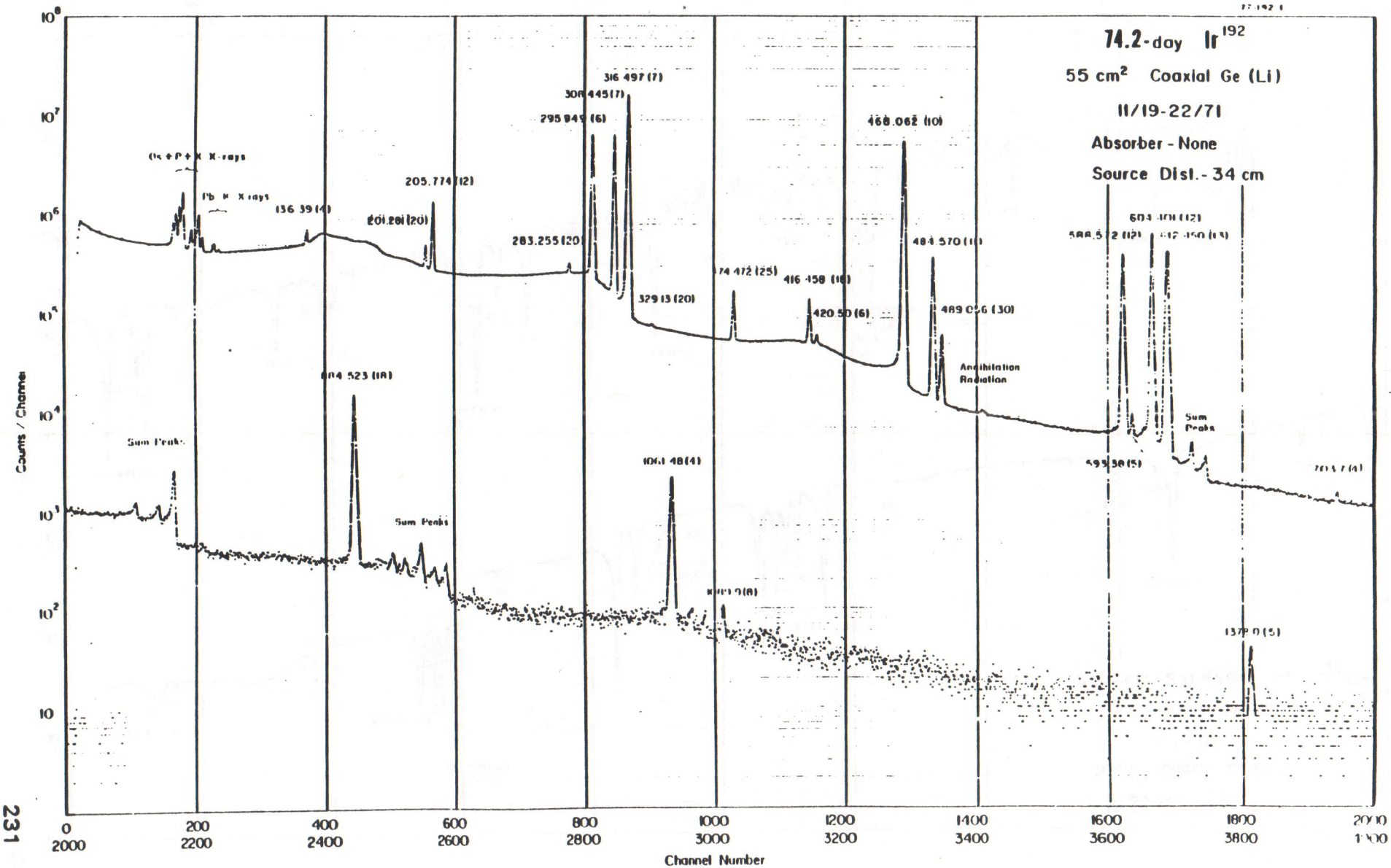

43-day Hf 181
65 cm³ Coaxial Ge (Li)
1/10/73
Absorber-0.357 g/cm² Poly
Source Dist.-10 cm
133 039 (20)
136 306 (20)
345 943 (15)
324.08 (10)
482 181
475 997 (25)
618 58 (10)
Counts / Channel
Channel Number

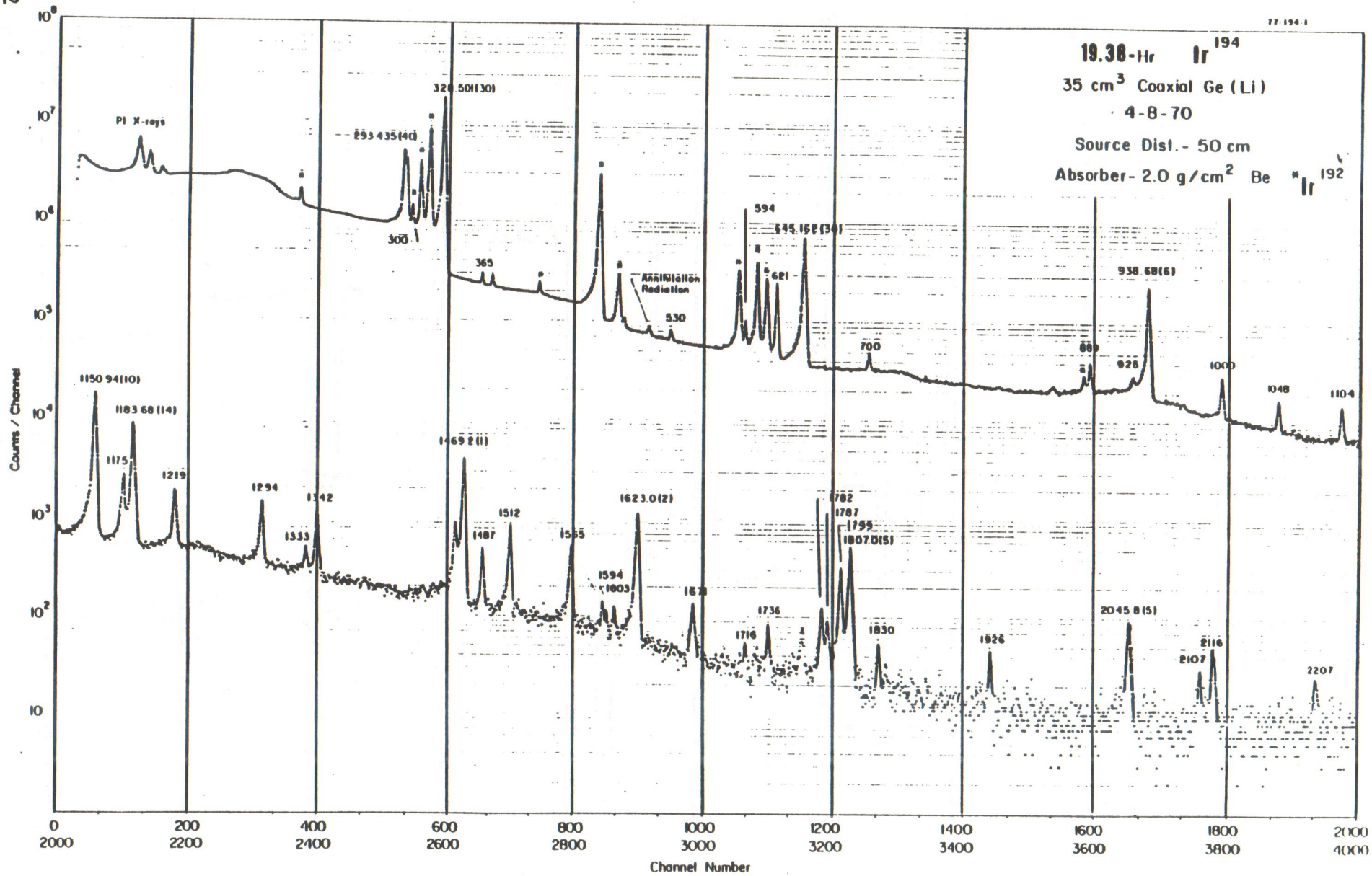

111.0-day Ta182
2.5 cm² x 8 mm Ge(Li)
5/17/67
Absorber-0.5 g/cm² Poly
Source Dist.-10 cm
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸

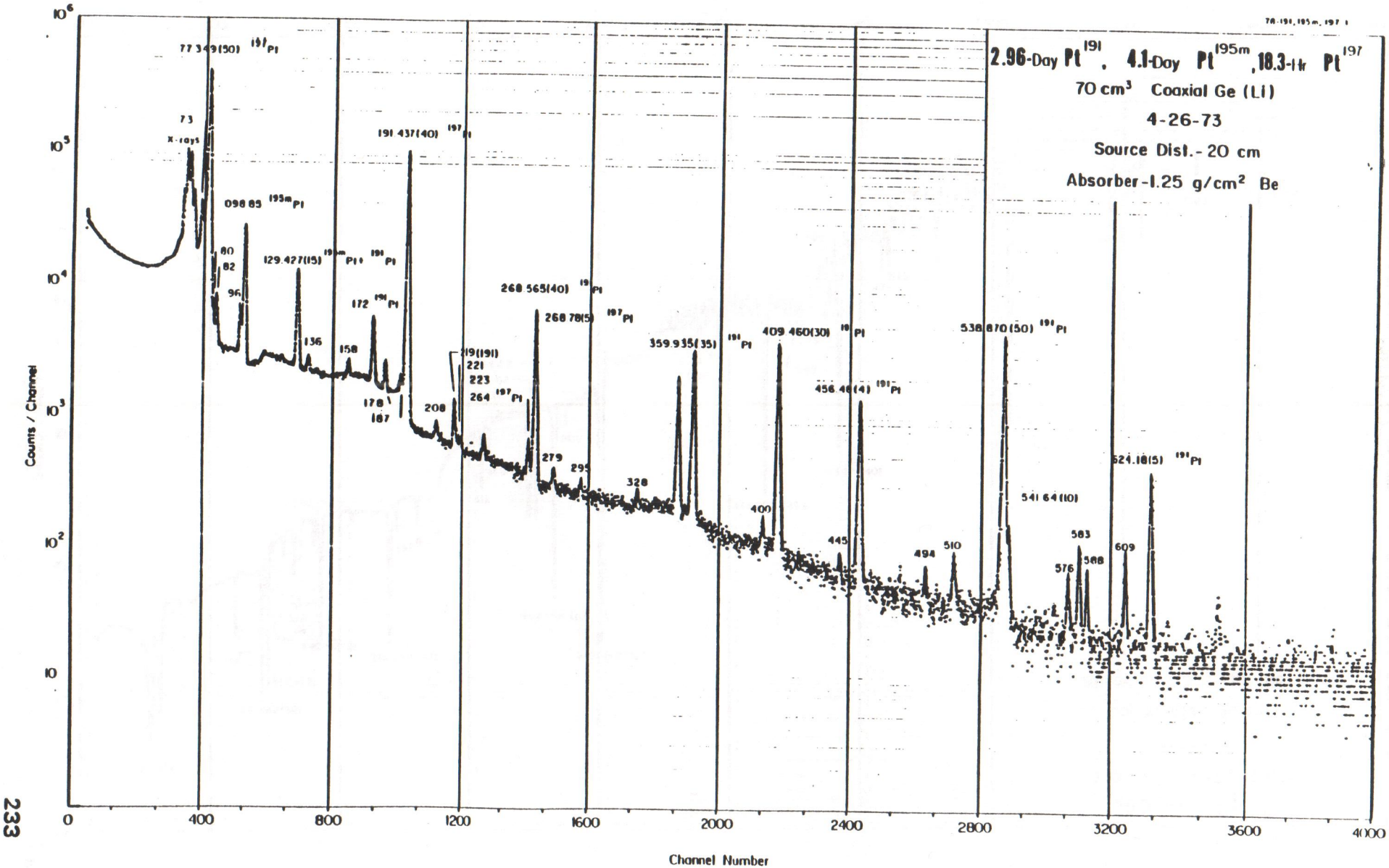

23.9-hr W187
2.5 cm2 x 8mm Ge (Li)
10/30/68
Absorber - None
Source Dist. - 6 cm
Re
479.51 (3)
551.51 (10)
618.24 (4)
685.72 (4)
745.33 (10)
864.53 (10)
879.6 (2)
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

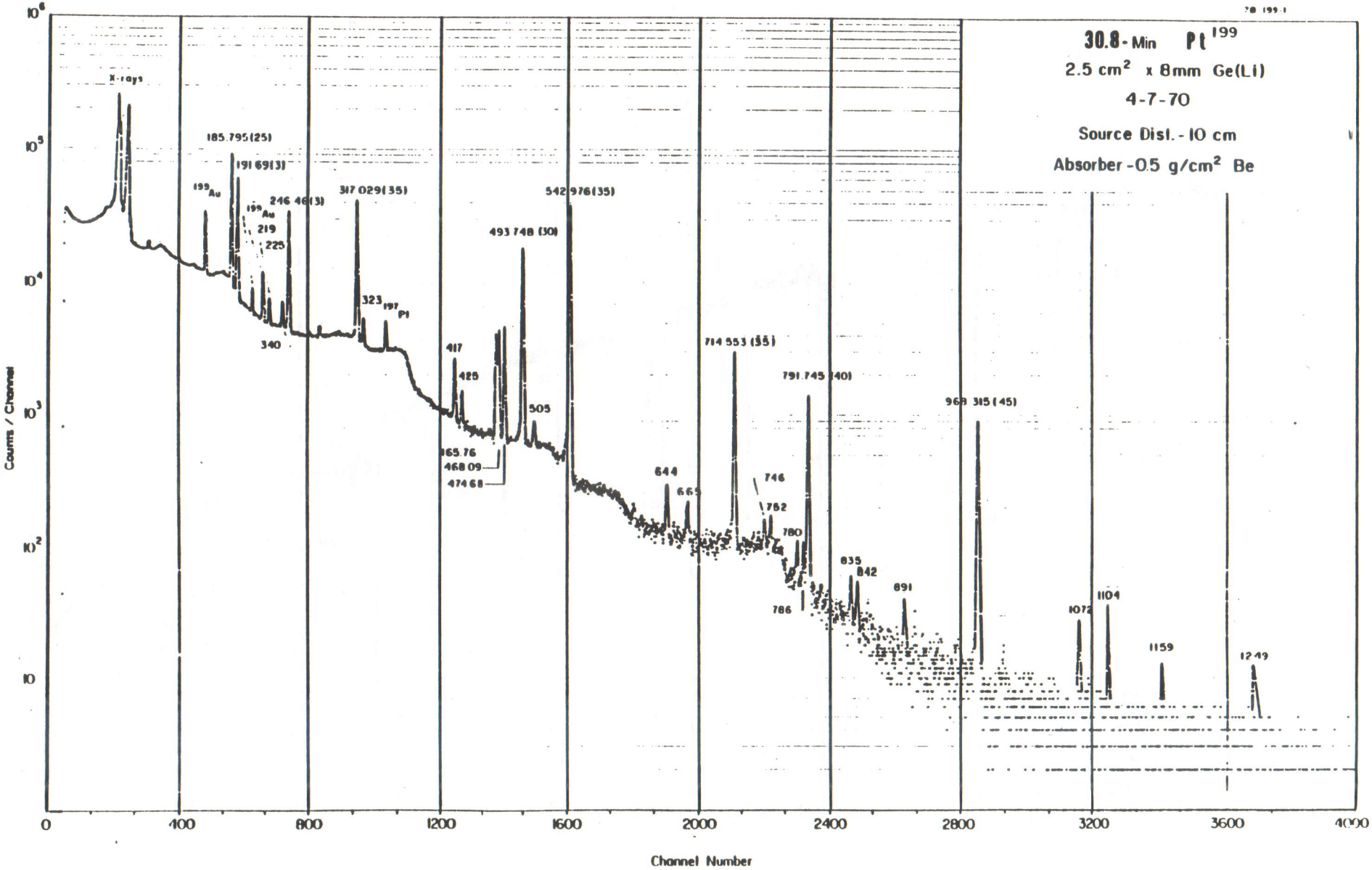

16.7-hr Re188
4.5 cm2 x 8mm Ge (Li)
4/13/70
Absorber - 1 g/cm2 Poly
Source Dist. - 18.5 cm
Os K X rays
55.023(20)
322
453
477.98(5)
486
633.12(4)
672
829.52(5)
844
931.41(6)
1152.40(7)
1150
1174
1308.07(10)
1323
1364
1460.+0.0
1731
1785
1802
1956.5(5)
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000
10
10^2
10^3
10^4
10^5
10^6
10^7
10^8

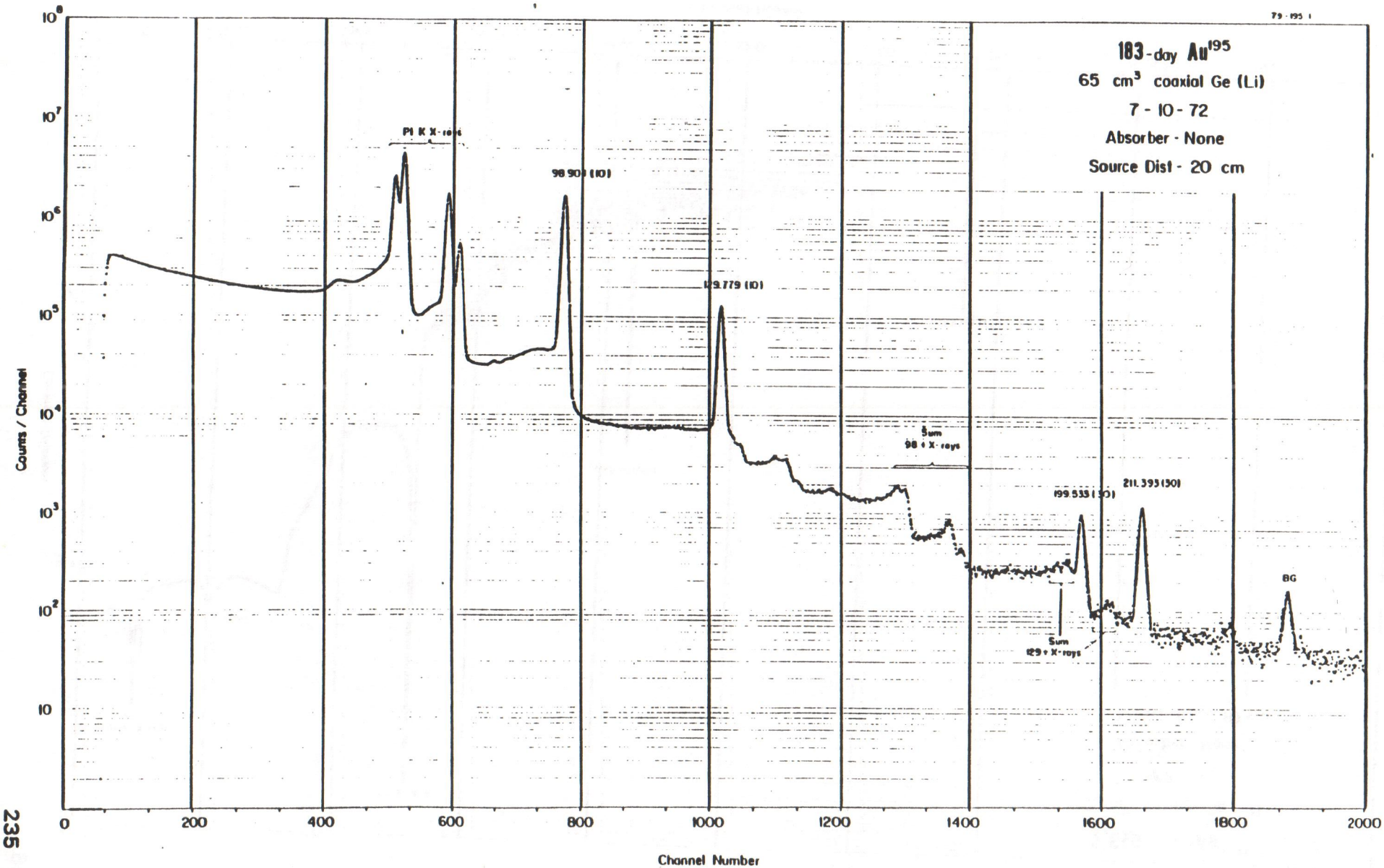

15 - day Os 191
35 cm³ Coaxial Ge(Li)
7 - 9 - 70
Absorber - 0.3 g/cm² Be
Source Dist 20 cm
Os & Ir K X-rays
129.427 (15)
139 Os 193
Counts / Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
0
200
400
600
800
1000
1200
1400
1600
1800
2000

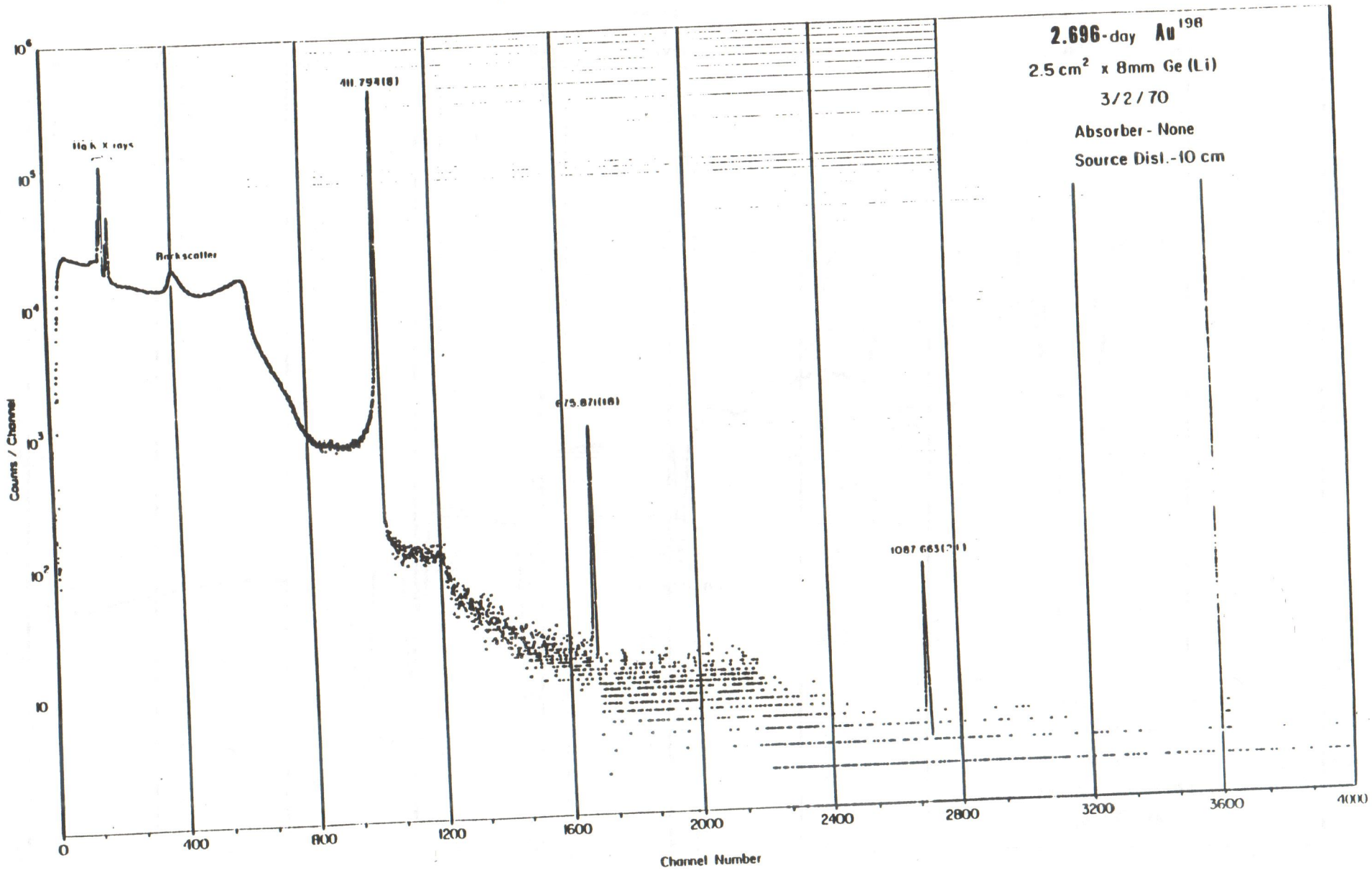

74.2-day Ir192
55 cm2 Coaxial Ge (Li)
11/19-22/71
Absorber - None
Source Dist.- 34 cm
Os + P + X X-rays
Pb K X-rays
136.39 (4)
201.281 (20)
205.774 (2)
283.255 (20)
295.949 (6)
308.445 (7)
316.497 (7)
329.13 (20)
374.472 (25)
416.458 (10)
420.50 (6)
468.062 (10)
484.570 (11)
489.056 (30)
Annihilation Radiation
Sum Peaks
Sum Peaks
Sum Peaks
604.523 (18)
1061.48 (4)
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800

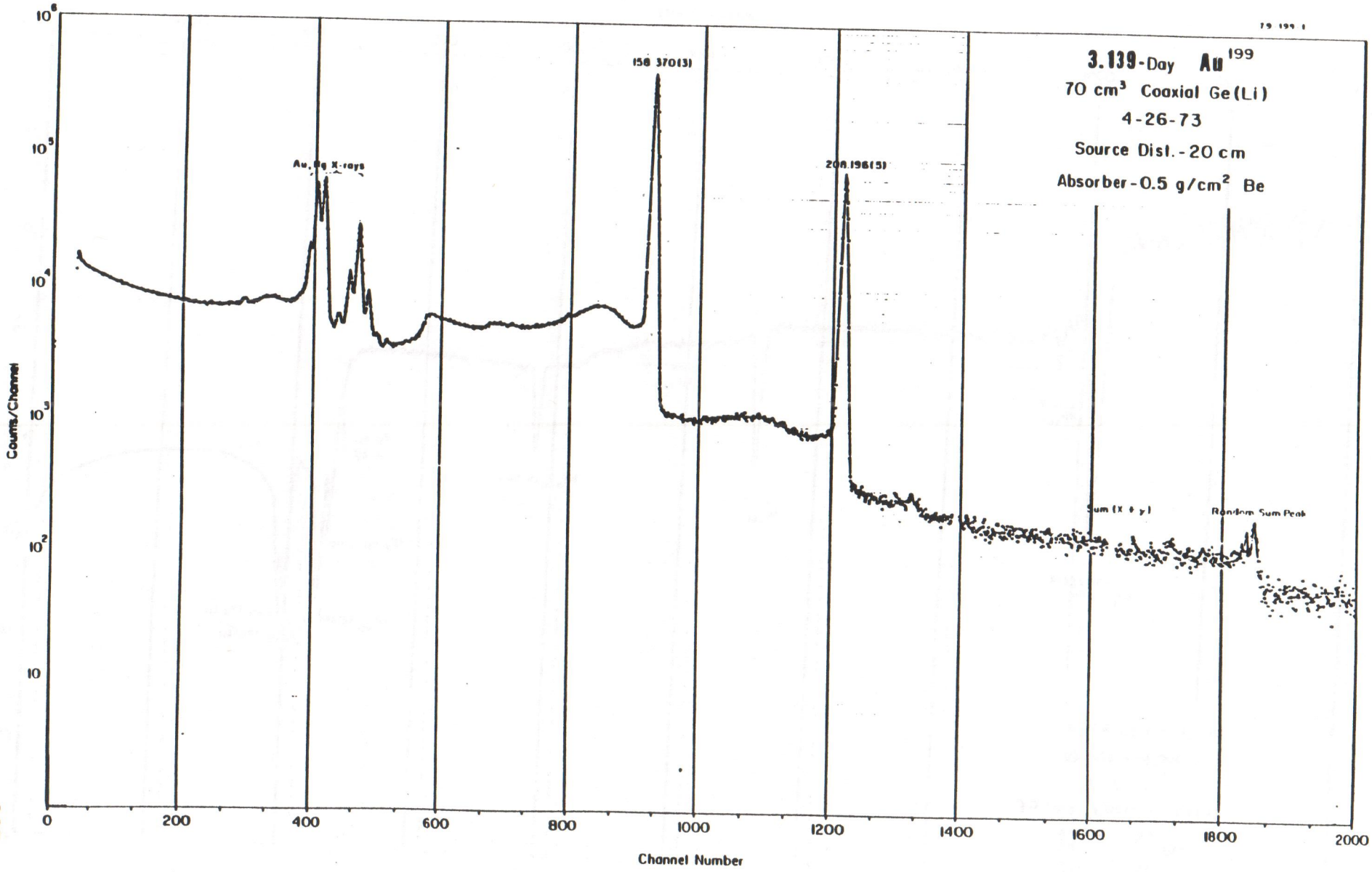

19.38-Hr Ir194
35 cm3 Coaxial Ge (Li)
4-8-70
Source Dist.- 50 cm
Absorber- 2.0 g/cm2 Be
Ir192
Pt X-rays
Annihilation Radiation
Counts / Channel
Channel Number

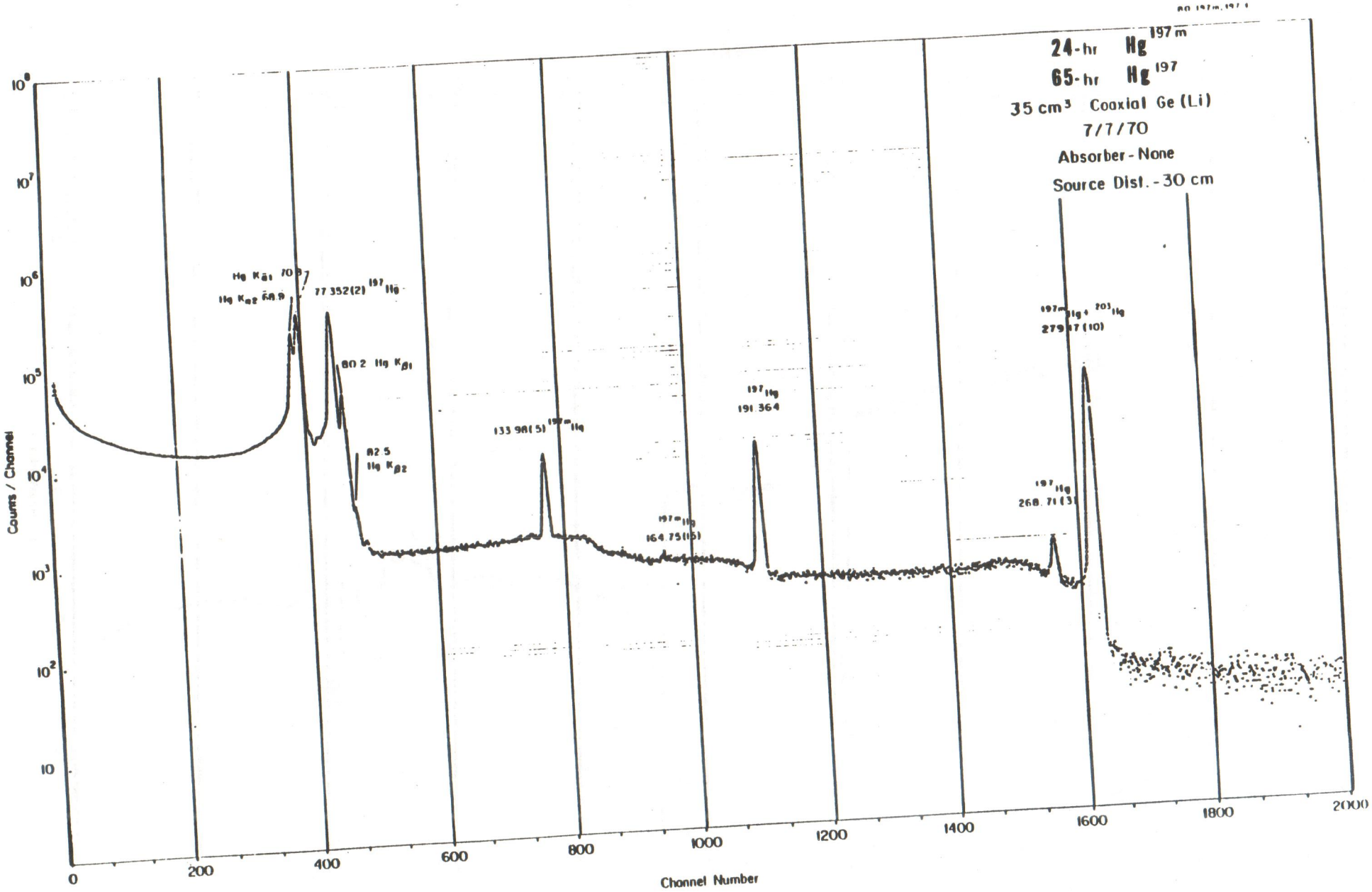

2.96-Day Pt191, 4.1-Day Pt195m, 18.3-Hr Pt197
70 cm3 Coaxial Ge (Li)
4-26-73
Source Dist.- 20 cm
Absorber-1.25 g/cm2 Be
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10^2
10^3
10^4
10^5
10^6
73 X-rays
77.349(50) 191Pt
098.85 195mPt
129.427(15) 195mPt, 191Pt
191.437(40) 197Pt
268.565(40) 197Pt
268.78(5) 197Pt
359.935(35) 191Pt
409.460(30) 191Pt
456.48(4) 191Pt
538.870(50) 191Pt
624.18(5) 191Pt
80
82
96
136
158
172 191Pt
178
187
208
219(191)
221
223
264 197Pt
279
295
328
400
445
494
510
541.64(10)
576
583
588
609

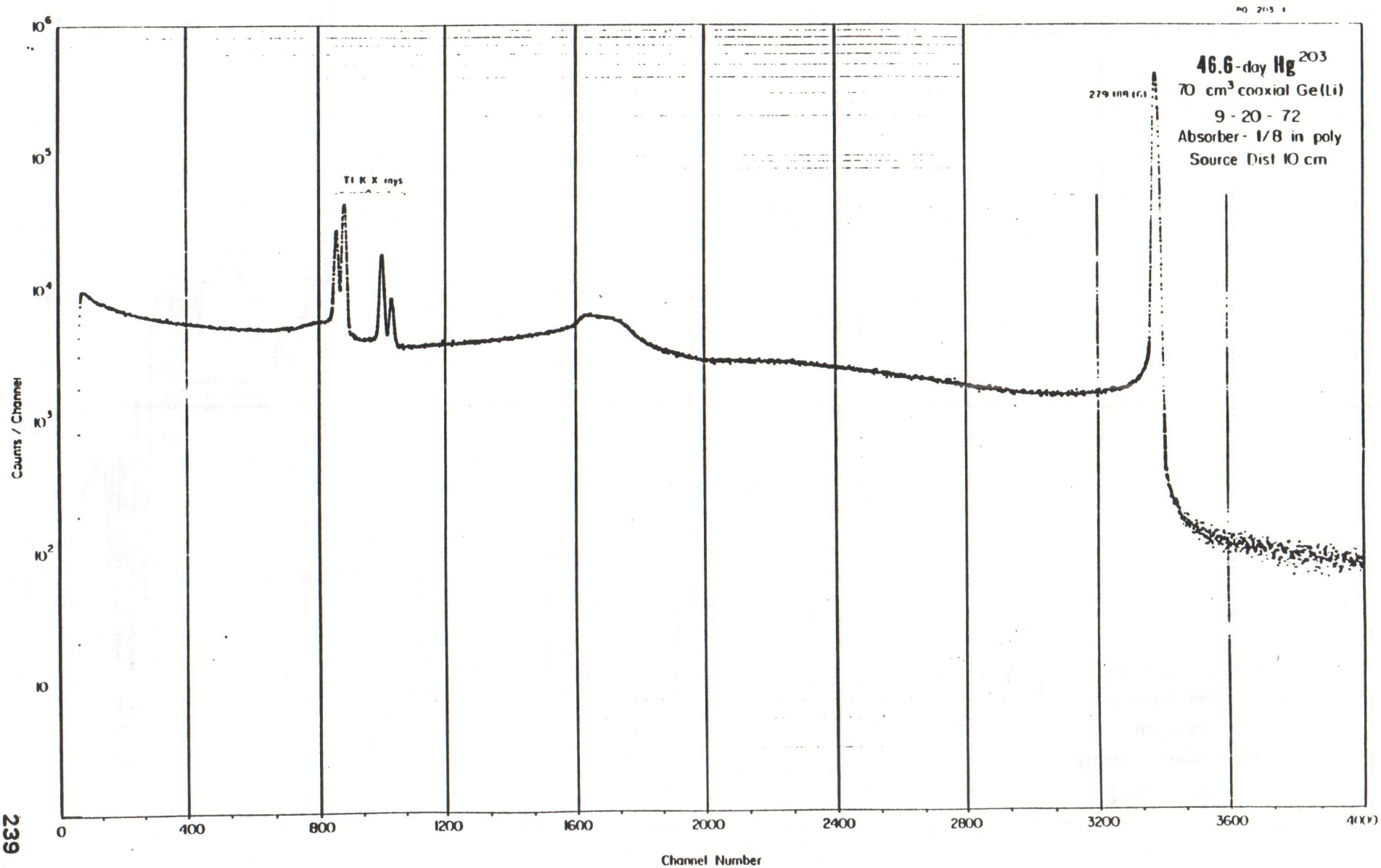

30.8-Min Pt 199
2.5 cm² x 8mm Ge(Li)
4-7-70
Source Dist.-10 cm
Absorber-0.5 g/cm² Be
X-rays
185.795(25)
191.69(3)
199 Au
199 Au
219
225
246.46(3)
317.029(35)
323
197 Pt
340
417
425
465.76
468.09
474.68
493.748(30)
505
542.976(35)
644
665
714.553(35)
746
762
780
786
791.745(40)
835
842
891
968.315(45)
1072
1104
1159
1249
Counts / Channel
Channel Number
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
10
10²
10³
10⁴
10⁵
10⁶

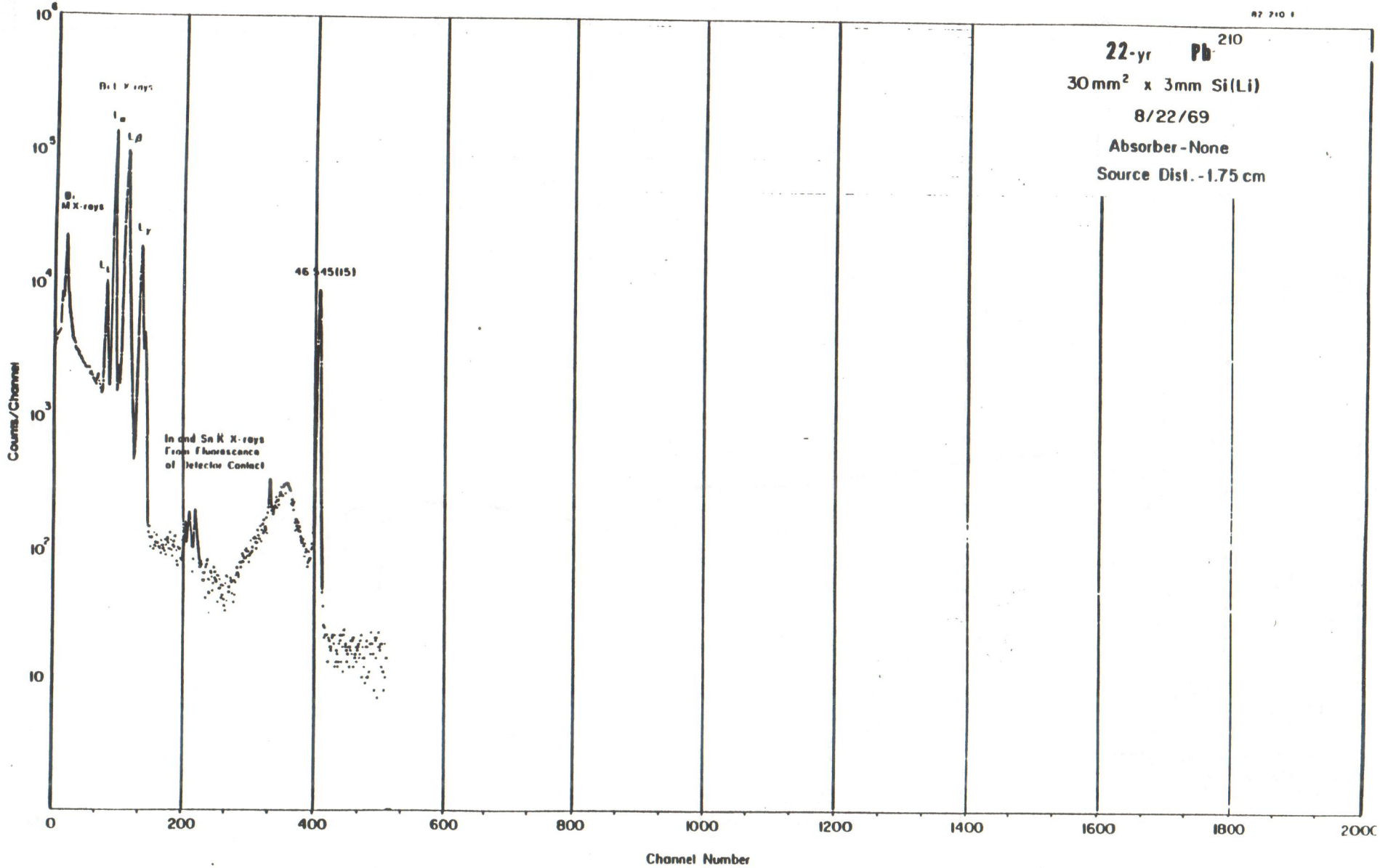

183-day Au195
65 cm3 coaxial Ge (Li)
7 - 10 - 72
Absorber - None
Source Dist - 20 cm
Pt K X-rays
98.90 (10)
129.779 (10)
Sum
98 + X-rays
199.535 (50)
211.393 (50)
Sum
129 + X-rays
BG
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
10^7
10^8
0
200
400
600
800
1000
1200
1400
1600
1800
2000

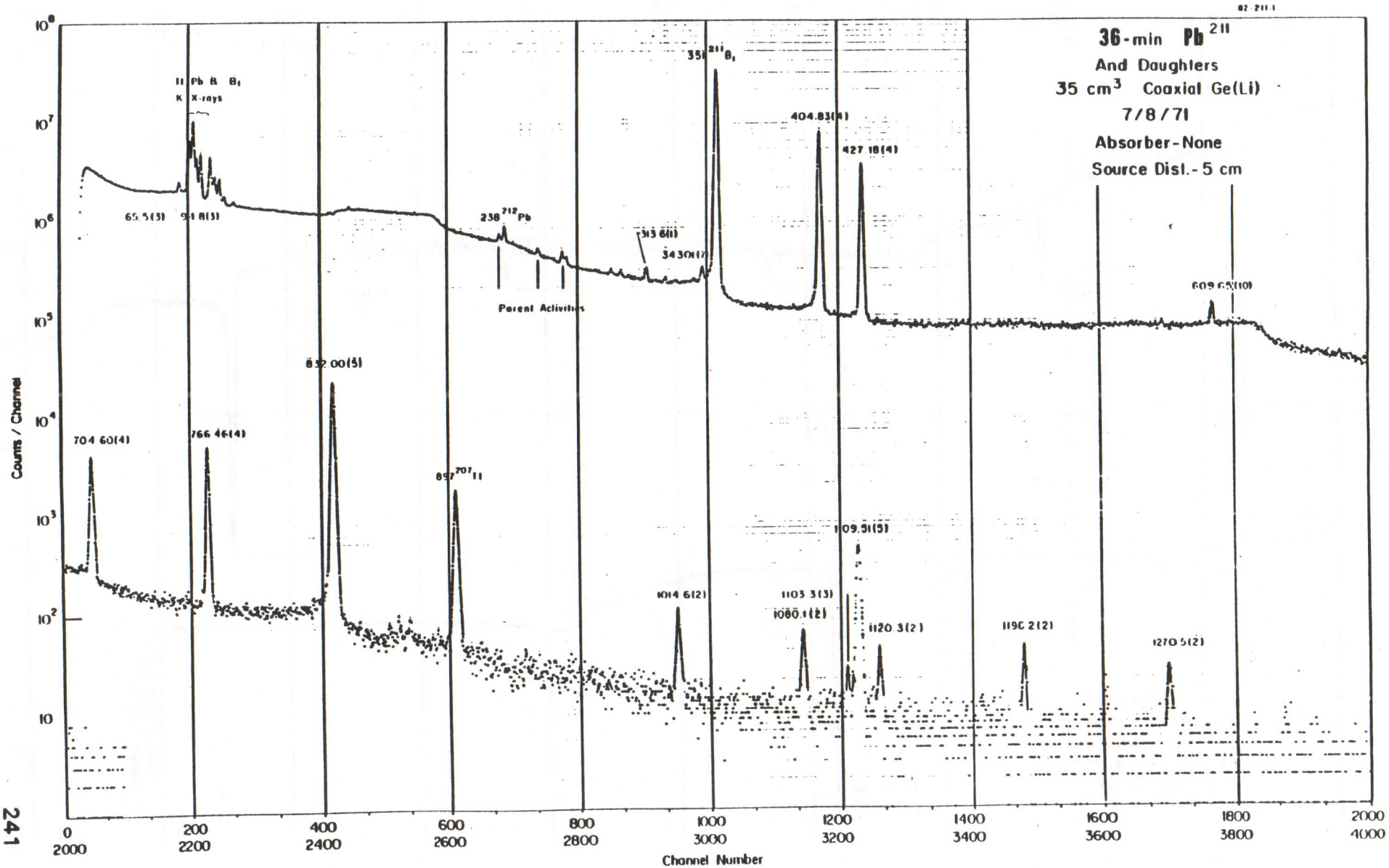

2.696-day Au198
2.5 cm2 x 8mm Ge (Li)
3/2/70
Absorber - None
Source Dist.-10 cm
411.794(8)
675.87(16)
1087.663(?11)
Backscatter
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

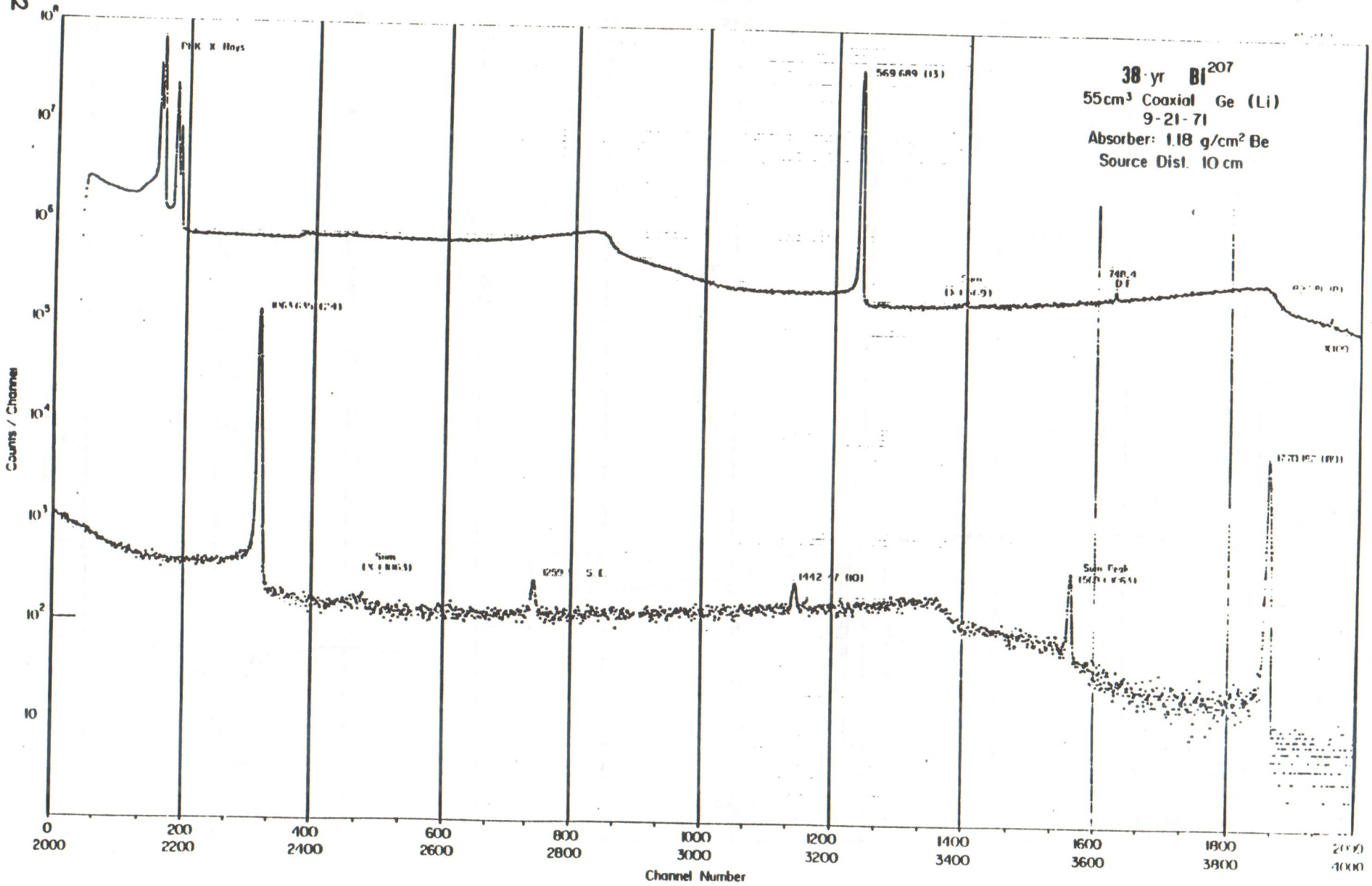

3.139-Day Au 199
70 cm³ Coaxial Ge(Li)
4-26-73
Source Dist.-20 cm
Absorber-0.5 g/cm² Be
158.370(3)
208.196(5)
Au, Hg X-rays
Sum (X + γ)
Random Sum Peak
Counts/Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
200
400
600
800
1000
1200
1400
1600
1800
2000

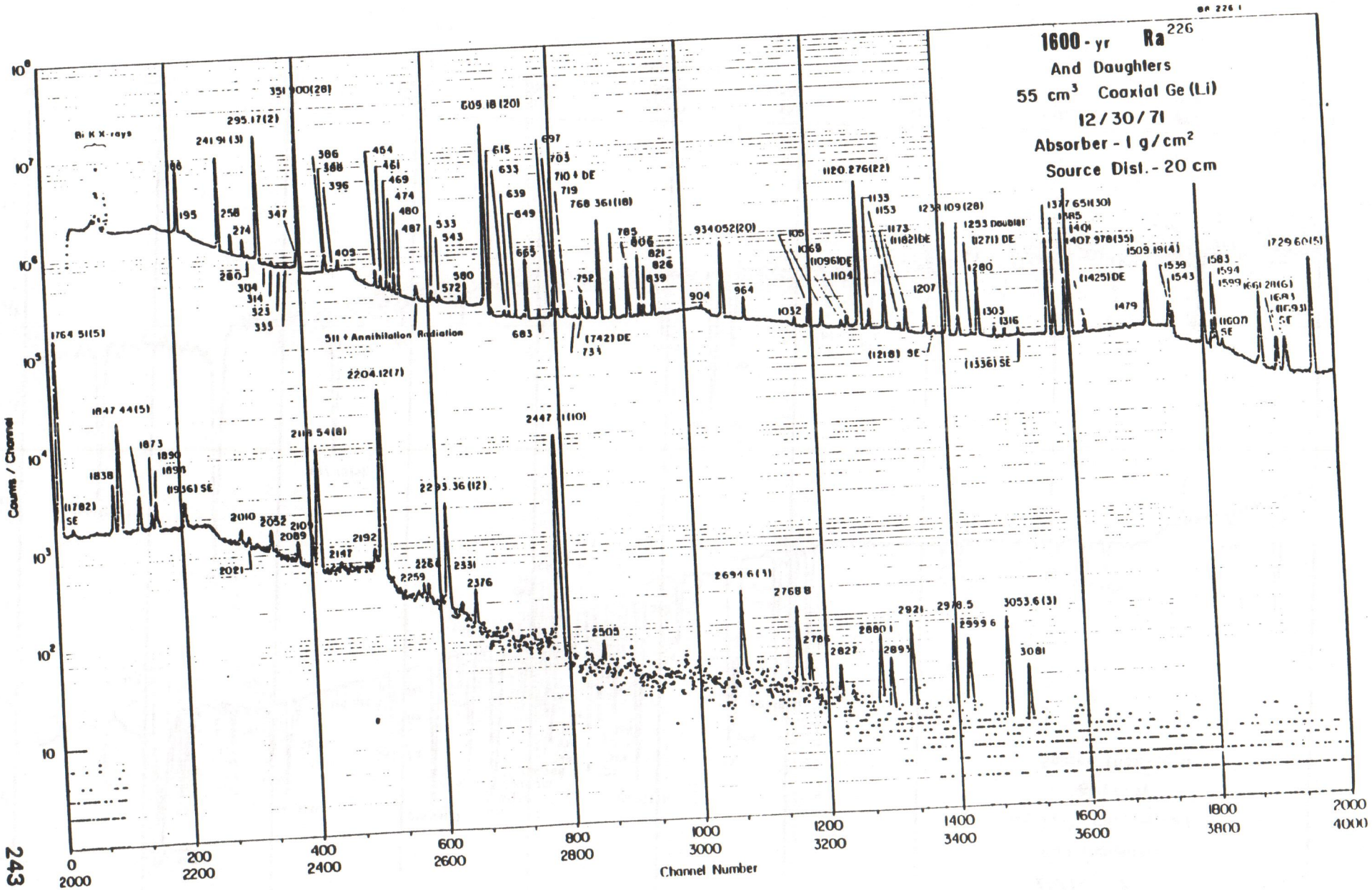

24-hr Hg 197m
65-hr Hg 197
35 cm³ Coaxial Ge (Li)
7/7/70
Absorber - None
Source Dist. - 30 cm
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸
77.352(2) 197 Hg
80.2 Hg Kβ1
82.5 Hg Kβ2
133.98(5) 197m Hg
164.75(15) 197m Hg
191.364 197 Hg
268.71(3) 197 Hg
279.47(10) 203 Hg

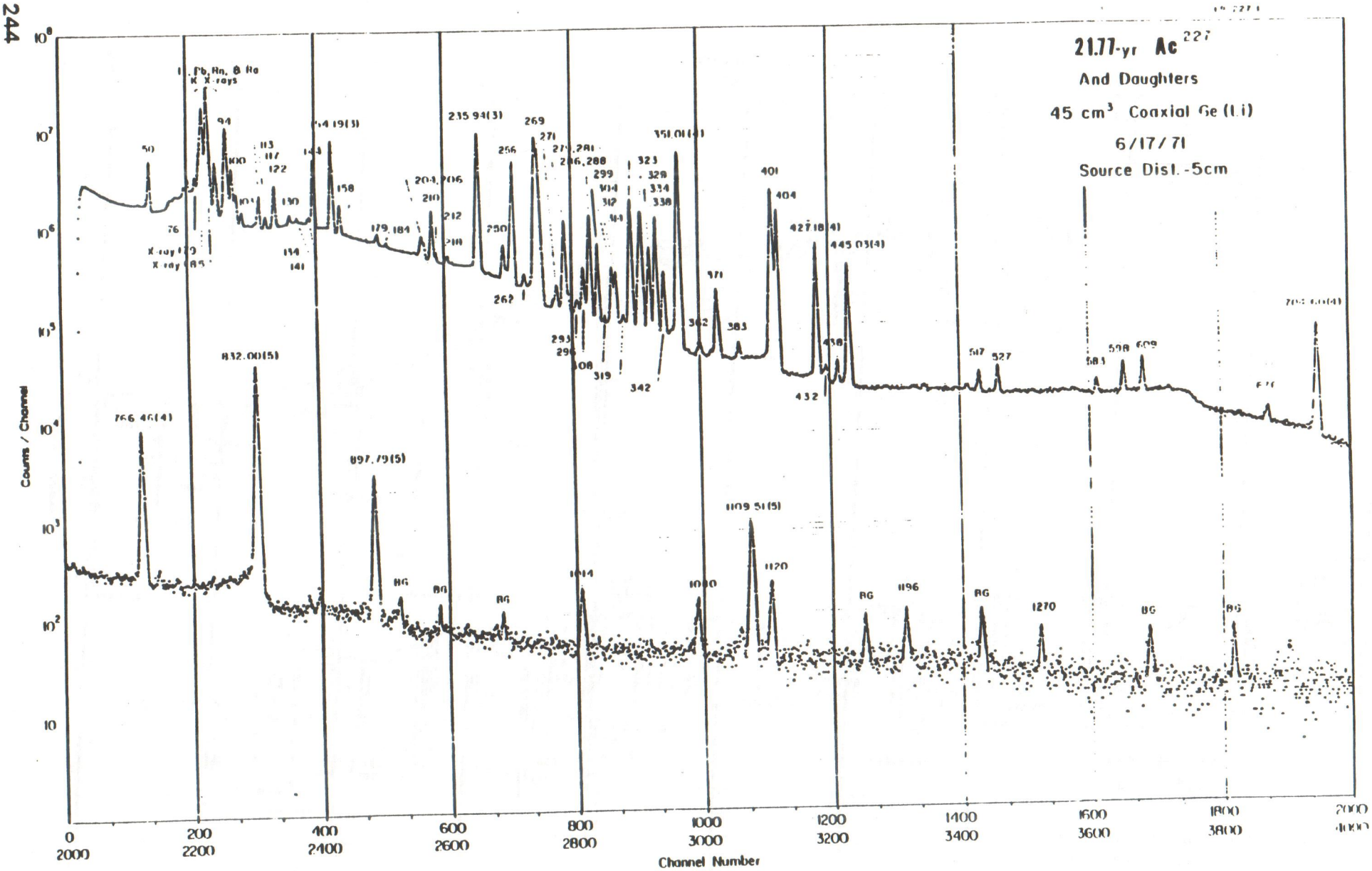

46.6-day Hg203
70 cm3 coaxial Ge(Li)
9 - 20 - 72
Absorber - 1/8 in poly
Source Dist 10 cm
Tl K X rays
Counts / Channel
Channel Number
10
10^2
10^3
10^4
10^5
10^6
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000

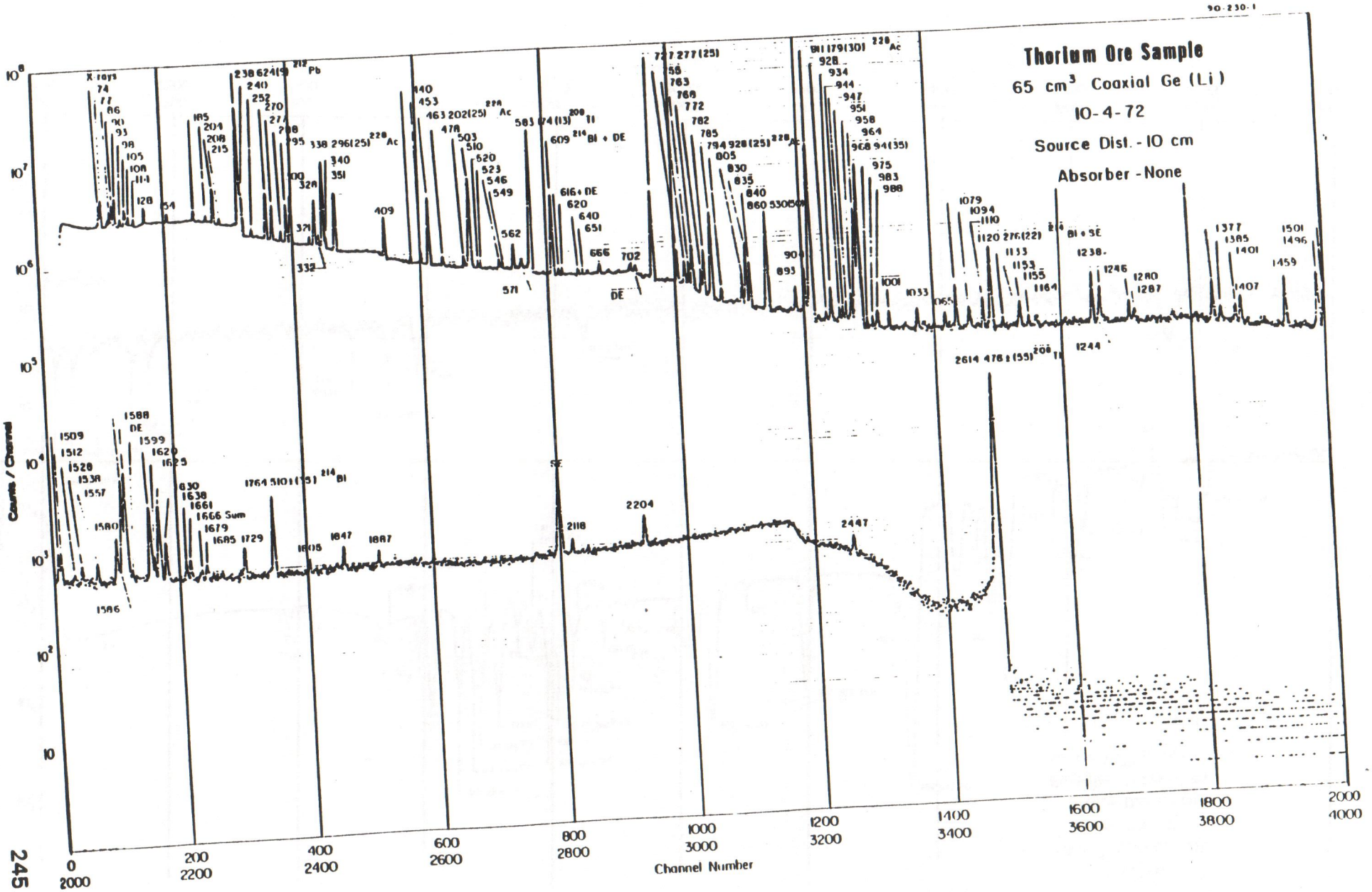

22-yr Pb 210
30 mm² x 3mm Si(Li)
8/22/69
Absorber - None
Source Dist. - 1.75 cm
Bi M X-rays
Lα
Lβ
Lγ
L1
46.545(15)
In and Sn K X-rays
From Fluorescence
of Detector Contact
Counts/Channel
Channel Number
10
10²
10³
10⁴
10⁵
10⁶
0
200
400
600
800
1000
1200
1400
1600
1800
2000

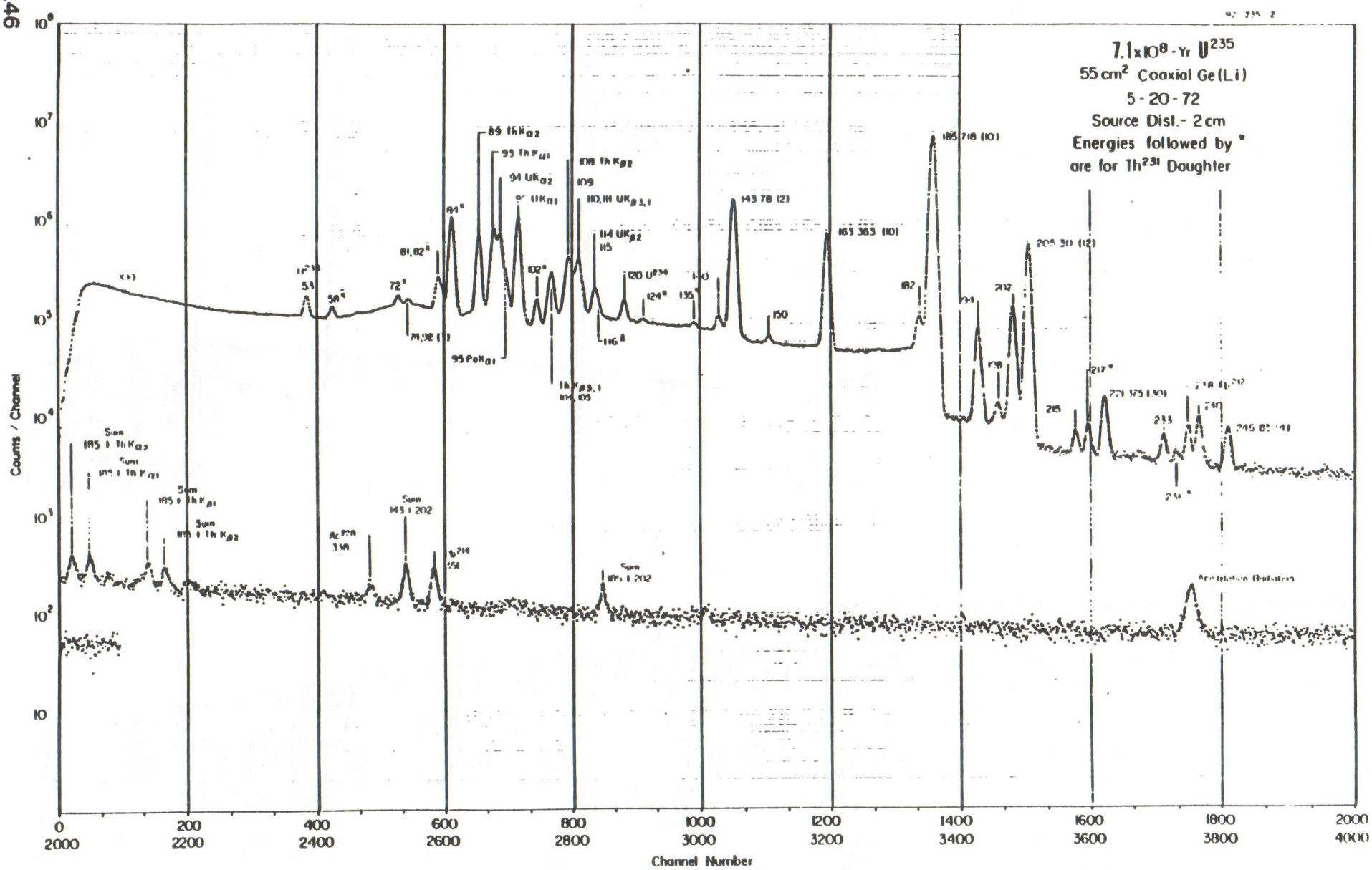

36-min Pb 211
And Daughters
35 cm3 Coaxial Ge(Li)
7/8/71
Absorber-None
Source Dist.-5 cm
Counts / Channel
Channel Number
Parent Activities
404.83(4)
427.18(4)
704.60(4)
766.46(4)
1014.6(2)
1103.3(3)
1120.3(2)
1190.2(2)
1270.5(2)

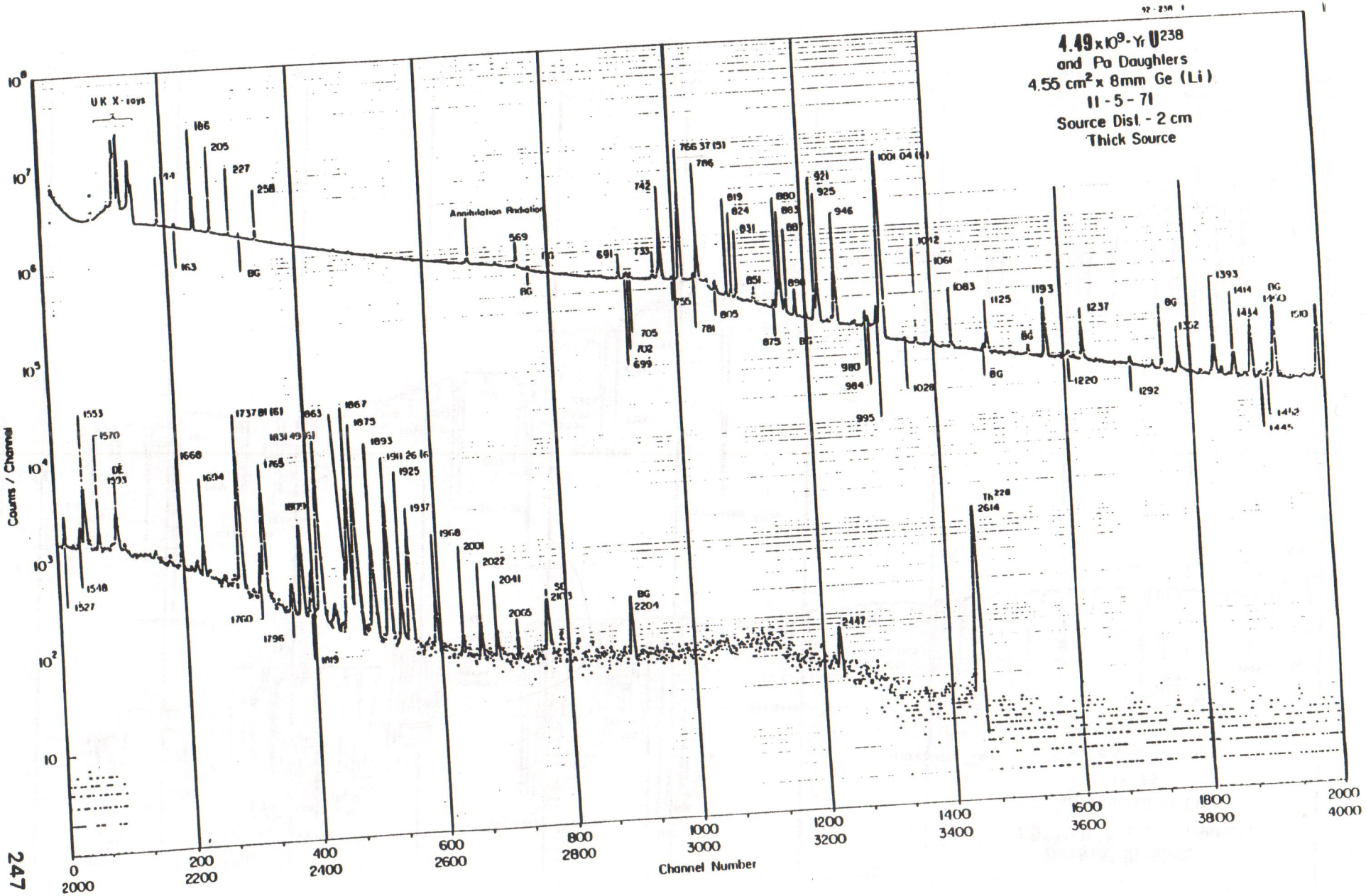

38 yr Bi207
55cm3 Coaxial Ge (Li)
9-21-71
Absorber: 1.18 g/cm2 Be
Source Dist. 10 cm
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000
10
10^2
10^3
10^4
10^5
10^6
10^7
10^8

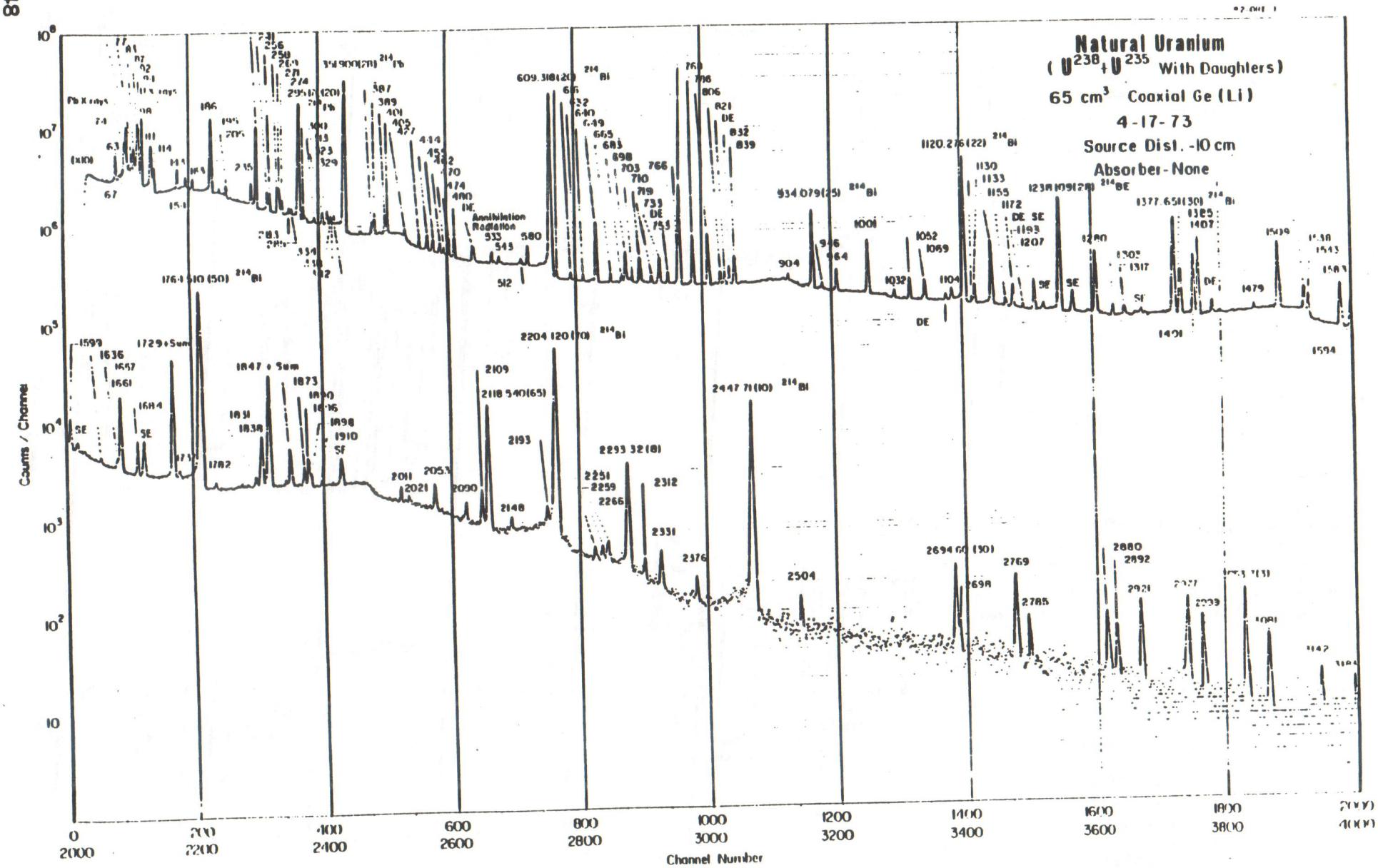

1600 - yr Ra226
And Daughters
55 cm3 Coaxial Ge (Li)
12/30/71
Absorber - 1 g/cm2
Source Dist. - 20 cm
Counts / Channel
Channel Number
511 + Annihilation Radiation
Bi K X-rays


21.77-yr Ac 227
And Daughters
45 cm³ Coaxial Ge (Li)
6/17/71
Source Dist.-5cm
Counts / Channel
Channel Number
766.46(4)
832.00(5)
897.79(5)
1109.51(5)
235.94(3)
351.01(4)
445.03(4)
BG


90-230-1
Thorium Ore Sample
65 cm³ Coaxial Ge (Li)
10-4-72
Source Dist. - 10 cm
Absorber - None
Counts / Channel
Channel Number
X rays
212 Pb
228 Ac
208 Tl
214 Bi + DE
Bi + SE
DE
SE
1588 DE
1666 Sum
2614
2204
2118
2447
1244
1586
1580
1509
1512
1520
1538
1557
1599
1620
1625
1630
1638
1661
1679
1685
1729
1764
1847
1887
1605
1033
1065
1001
1377
1385
1401
1407
1459
1501
1496
1280
1287
1246
1238
1164
1155
1153
1133
1120
1110
1094
1079
276(22)
478±(55)
583
702
666
571
562
332
409
1079
1094
1110
1120
1133
1153
1155
1164
1238
1244
1246
1280
1287
1377
1385
1401
1407
1459
1501
1496


7.1x10⁸-Yr U²³⁵
55 cm² Coaxial Ge(Li)
5-20-72
Source Dist.- 2cm
Energies followed by *
are for Th²³¹ Daughter
Counts / Channel
Channel Number
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000
10
10²
10³
10⁴
10⁵
10⁶
10⁷
10⁸


4.49 x 10^9 - Yr U238
and Pa Daughters
4.55 cm² x 8mm Ge (Li)
11 - 5 - 71
Source Dist. - 2 cm
Thick Source
UK X-rays
Annihilation Radiation
Counts / Channel
Channel Number


Natural Uranium
(U238 + U235 With Daughters)
65 cm3 Coaxial Ge (Li)
4-17-73
Source Dist. -10 cm
Absorber-None
Counts / Channel
Channel Number
Annihilation Radiation

IV. APPENDIX

APPENDIX

This appendix contains three sections:

Actinium Series

Thorium Series

Uranium Series

In each of the sections there is a pictorial chart of the decay scheme for the series and a listing of gamma ray energies emitted in the chain of decays. The chart, showing the more probable decay scheme for that particular series, indicates the prominent decay modes and energies for each of the radionuclides in the decay chain. The listing includes all gamma ray energies whose intensities are .005 or greater (fractional unit per disentegration). The gamma ray energies listed are included in Part II. of this catalog.

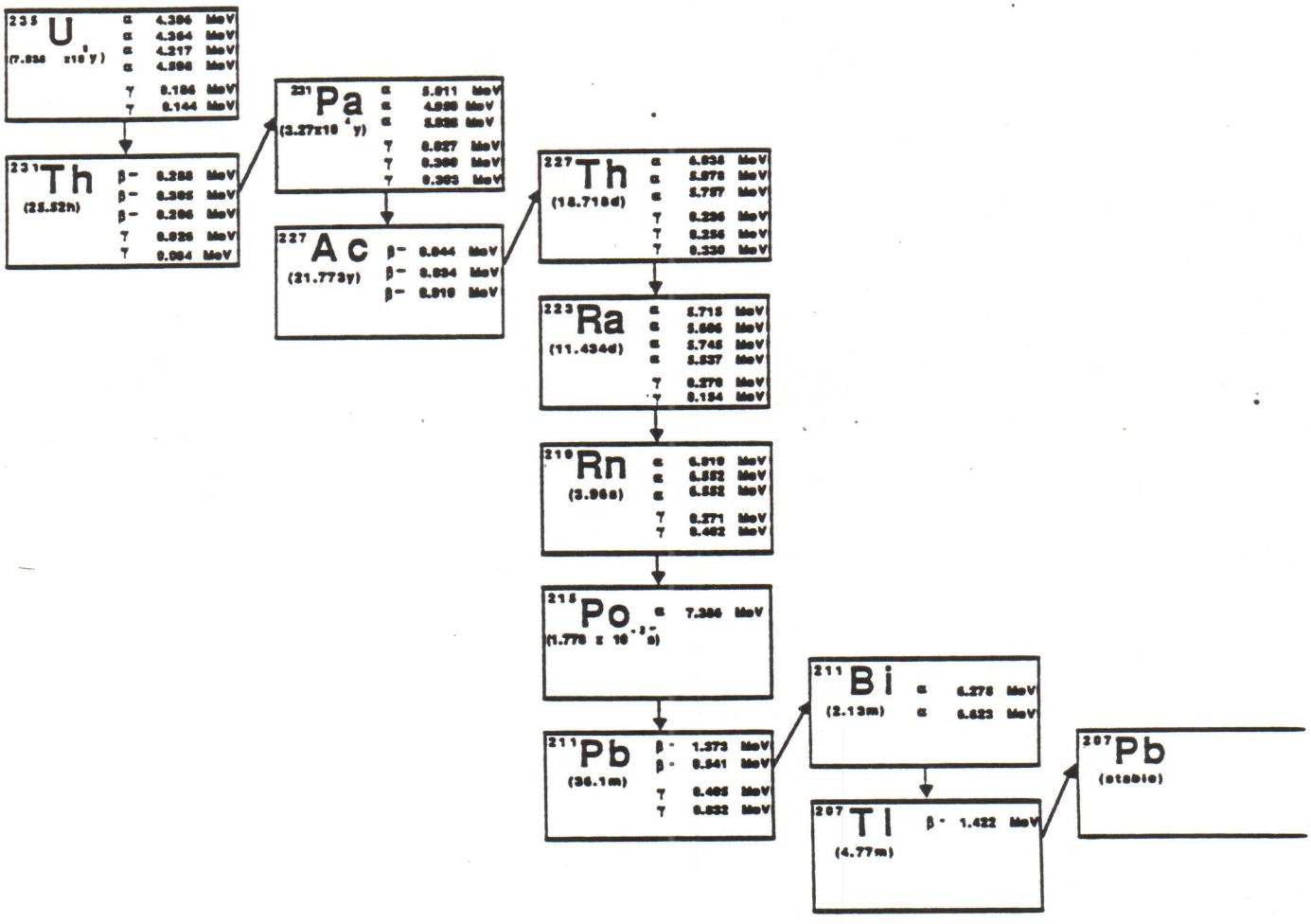
ACTINIUM SERIES

ACTINIUM SERIES GAMMA LISTING

NUCLIDE	ENERGY (keV)	INTENSITY
U-235	109.1	(.015)
	143.8	(.015)
	163.4	(.047)
	185.7	(.540)
	194.9	(.059)
	202.1	(.010)
	205.3	(.047)
Th-231	25.6	(.147)
	58.6	(.005)
	81.2	(.009)
	84.2	(.064)
	90.0	(.009)
Pa-231	27.4	(.093)
	90.9	(.010)
	102.0	(.005)
	283.7	(.016)
	300.1	(.023)
	302.7	(.023)
	330.0	(.013)
Ac-227	No Gamma Listing	
Th-227	50.1	(.084)
	79.8	(.020)
	94.0	(.014)
	113.1	(.005)
	210.6	(.113)
	234.9	(.005)
	236.0	(.115)
	250.1	(.005)
	254.7	(.009)
	256.2	(.063)
	273.0	(.005)
	286.1	(.016)
	299.8	(.018)
	304.4	(.014)
	329.7	(.029)
	334.2	(.012)

NUCLIDE	ENERGY (keV)	INTENSITY
Ra-223	122.3	(.012)
	144.2	(.032)
	154.2	(.056)
	158.6	(.007)
	269.5	(.136)
	323.9	(.039)
	338.3	(.027)
	445.0	(.012)
Rn-219	271.2	(.106)
	401.8	(.065)
Po-215	No Gamma Listing	
Pb-211	404.8	(.029)
	427.1	(.013)
	766.5	(.005)
	832.0	(.029)
Bi-211	351.1	(.129)
Tl-207	No Gamma Listing	
Pb-207	Stable	

ACTINIUM DECAY SERIES



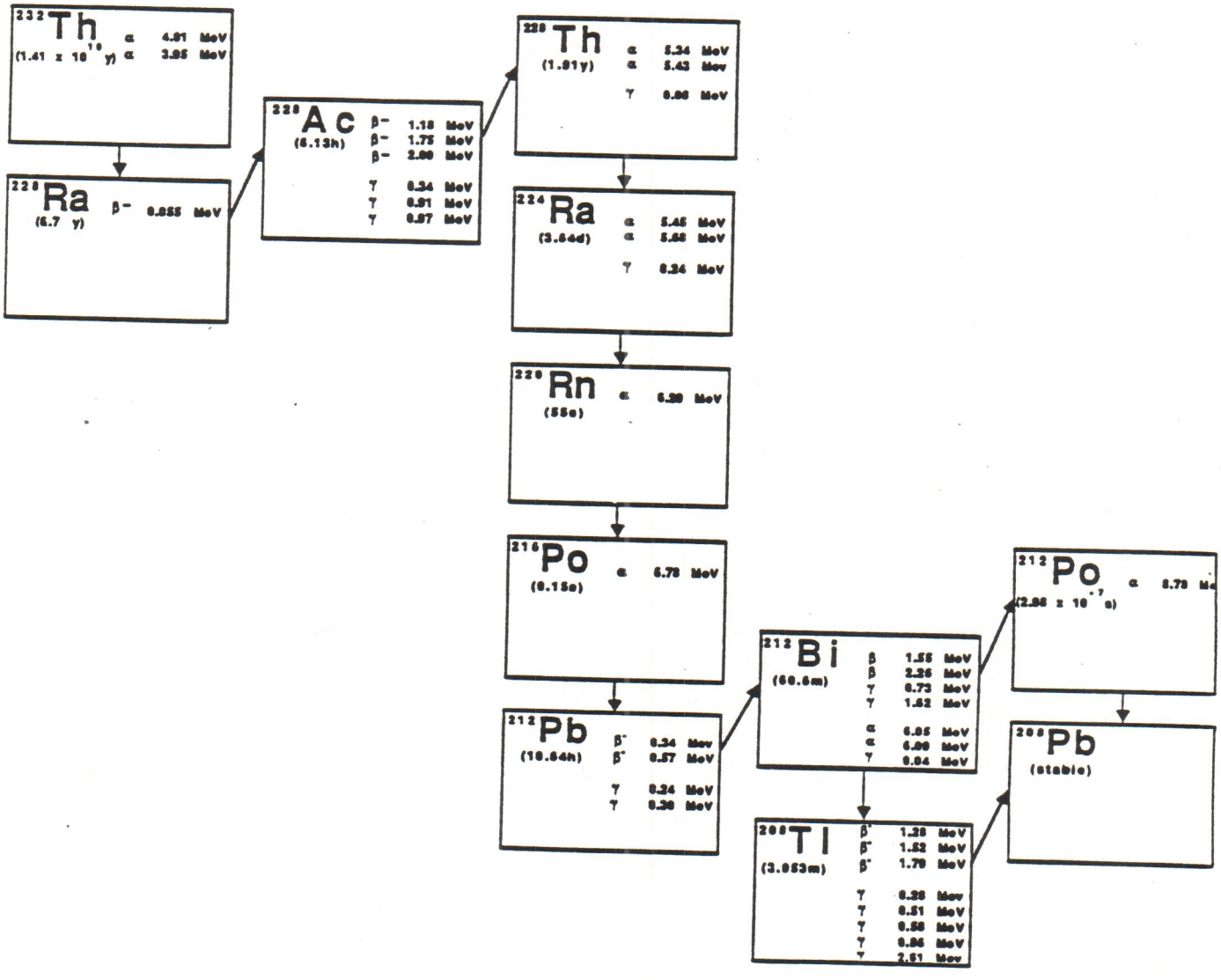
THORIUM SERIES

THORIUM SERIES GAMMA LISTING

NUCLIDE	ENERGY (keV)	INTENSITY
Th-232	No gamma Listing	
Ra-228	No Gamma Emitted	
Ac-228	57.8	(.005)
	99.5	(.013)
	129.1	(.028)
	154.2	(.009)
	209.3	(.044)
	270.2	(.036)
	327.6	(.032)
	338.3	(.114)
	409.5	(.021)
	463.0	(.044)
	509.6	(.005)
	562.3	(.009)
	727.0	(.008)
	755.2	(.011)
	772.2	(.016)
	782.0	(.005)
	794.7	(.046)
	830.5	(.006)
	835.5	(.018)
	840.0	(.009)
	904.5	(.008)
	911.1	(.277)
	964.6	(.052)
	969.1	(.166)
	1264.4	(.005)
	1459.3	(.010)
	1495.8	(.010)
	1501.5	(.006)
	1580.2	(.007)
	1588.0	(.035)
	1630.4	(.019)
	1638.0	(.005)
Th-228	84.4	(.012)
Ra-224	241.0	(.040)
Rn-220	No Gamma Listing	
Po-216	No Gamma Emitted	
Pb-212	115.2	(.006)
	238.6	(.450)
	300.1	(.034)

NUCLIDE	ENERGY	INTENSITY (keV)
Bi-212	727.2	(.118)
	785.5	(.020)
	893.4	(.007)
	1078.6	(.010)
	1512.8	(.006)
	1620.6	(.028)
Po-212	No Gamma Emitted	
Tl-208	252.6	(.008)
	277.4	(.068)
	510.8	(.216)
	583.1	(.842)
	763.1	(.016)
	860.4	(.125)
	2614.7	(1.00)
Pb-208	Stable	

THORIUM DECAY SERIES



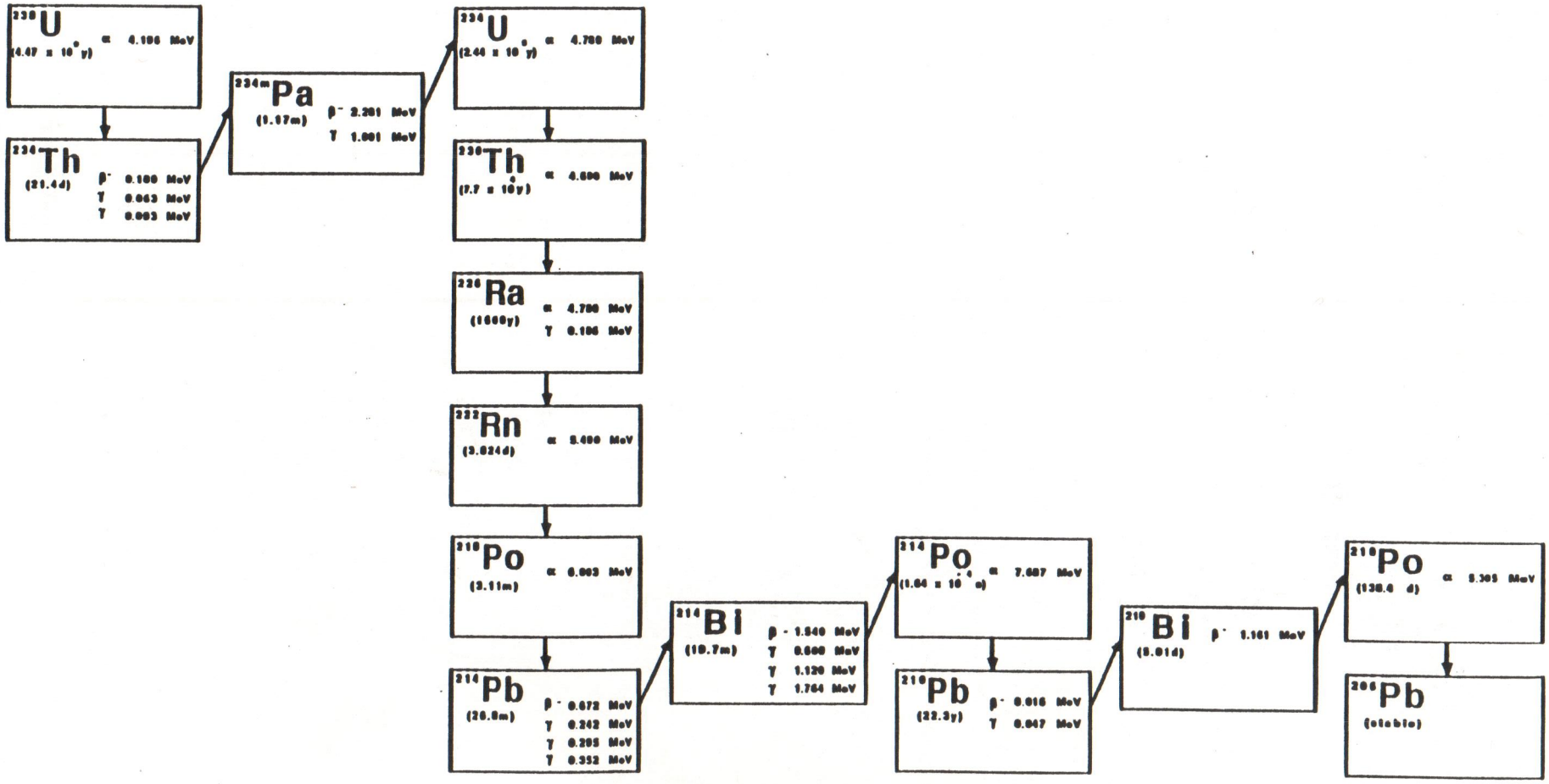
URANIUM SERIES

URANIUM SERIES GAMMA LISTING

NUCLIDE	ENERGY (keV)	INTENSITY
U-238	No Gamma Emitted	
Th-234	63.3	(.038)
	92.6	(.054)
Pa-234m	1001.0	(.006)
U-234	No Gamma Listing	
Th-230	No Gamma Listing	
Ra-226	186.2	(.033)
Rn-222	No Gamma Listing	
Po-218	No Gamma Emitted	
Pb-214	53.2	(.011)
	242.0	(.075)
	258.8	(.006)
	295.2	(.192)
	351.9	(.372)
	785.9	(.011)
Bi-214	609.3	(.463)
	665.5	(.016)
	703.1	(.005)
	768.4	(.050)
	806.2	(.012)
	934.1	(.032)
	1120.3	(.151)
	1155.2	(.017)
	1207.7	(.005)
	1238.1	(.059)
	1281.0	(.015)
	1377.7	(.041)
	1385.3	(.008)
	1401.5	(.014)
	1509.2	(.022)
	1583.2	(.007)
	1661.3	(.012)
	1729.6	(.030)
	1764.5	(.158)
	1847.4	(.021)
	2118.6	(.012)
	2204.2	(.050)
	2447.9	(.016)

NUCLIDE	ENERGY (keV)	INTENSITY
Po-214	No Gamma Listing	
Pb-210	46.5	(.041)
Bi-210	No Gamma Emitted	
Po-210	No Gamma Emitted	
Pb-206	Stable	

URANIUM DECAY SERIES



V. ALPHA NUCLIDE INDEX

ELEMENT - AT. NO.	NUCLIDE	KEY ALPHA
Actinium-89	Ac-222	7.000
	Ac-223	6.650
	Ac-224	6.139
	Ac-225	5.829
	Ac-227	4.951
Americium-95	Am-241	5.486
	Am-242m	5.207
	Am-243	5.275
Astatine-85	At-202	6.230
	At-206	5.703
	At-209	5.647
	At-211	5.867
	At-212	7.679
	At-212m	7.837
	At-215	8.000
	At-216	7.805
	At-217	7.066
	At-218	6.694
	At-219	6.270
Berkelium-97	Bk-247	5.530
	Bk-249	5.412
Bismuth-83	Bi-210	4.654
	Bi-210m	4.950
	Bi-211	6.623
	Bi-212	6.051
	Bi-213	5.870
	Bi-214	5.447
Californium-98	Cf-248	6.260
	Cf-249	5.814
	Cf-250	6.031
	Cf-251	5.677
	Cf-252	6.118
Curium-96	Cm-242	6.113
	Cm-243	5.785
	Cm-244	5.805
	Cm-245	5.362
	Cm-246	5.386
	Cm-247	4.868
	Cm-248	5.079
Einsteinium-99	Es-253	6.633
	Es-254	6.429
	Es-255	6.300

ELEMENT - AT. NO.	NUCLIDE	KEY ALPHA
Fermium-100	Fm-254	7.189
	Fm-255	7.022
	Fm-256	6.915
Francium-87	Fr-212	6.383
	Fr-220	6.686
	Fr-221	6.340
Gadolinium-64	Gd-148	3.183
	Gd-150	2.730
	Gd-152	2.150
Hafnium-72	Hf-174	2.500
Neodymium-60	Nd-144	1.830
Neptunium-93	Np-237	4.788
Platinum-78	Pt-190	3.170
Plutonium-94	Pu-234	6.200
	Pu-236	5.770
	Pu-237	5.340
	Pu-238	5.499
	Pu-239	5.155
	Pu-240	5.168
	Pu-241	4.896
	Pu-242	4.901
	Pu-244	4.589
Polonium-84	Po-206	5.223
	Po-209	4.882
	Po-210	5.305
	Po-211	7.450
	Po-211m	7.270
	Po-212	8.785
	Po-212m	11.650
	Po-213	8.377
	Po-214	7.688
	Po-215	7.384
	Po-216	6.779
	Po-217	6.540
	Po-218	6.003
Protactinium-91	Pa-226	6.860
	Pa-227	6.470
	Pa-228	6.105
	Pa-231	5.011

ELEMENT - AT. NO.	NUCLIDE	KEY ALPHA
Radium-88	Ra-221	6.610
	Ra-222	6.556
	Ra-223	5.715
	Ra-224	5.686
	Ra-226	4.785
Radon-86	Rn-211	5.783
	Rn-218	7.140
	Rn-219	6.819
	Rn-220	6.288
	Rn-222	5.490
Samarium-62	Sm-146	2.500
	Sm-147	2.230

ELEMENT - AT. NO.	NUCLIDE	KEY ALPHA
Thorium-90	Th-224	7.170
	Th-225	6.480
	Th-226	6.338
	Th-227	6.038
	Th-228	5.423
	Th-229	4.845
	Th-230	4.688
	Th-232	4.010
Uranium-92	U-228	6.680
	U-229	6.360
	U-230	5.889
	U-232	5.320
	U-233	4.824
	U-234	4.776
	U-235	4.395
	U-236	4.494
	U-238	4.196

VI. SEARCH ALPHAS FOR NUCLIDE IDENTIFICATION

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
1.830	Nd-144	2.1E15y	1.830 (1.000)			
2.150	Gd-152	1.1E14y	2.150 (1.000)			
2.230	Sm-147	1.08E11y	2.230 (1.000)			
2.500	Sm-146	1.03E8y	2.500 (1.000)			
2.500	Hf-174	2E15y	2.500 (1.000)			
2.703	Gd-150	1.8E6y	2.730 (1.000)			P. Sm-146 [2.500]
3.170	Pt-190	7E11y	3.170 (1.000)			
3.183	Gd-148	75y	3.183 (1.000)			
3.953	Th-232	1.405E10y	4.010 (.770)	3.953 (.230)		
4.010	Th-232	1.405E10y	4.010 (.770)	3.953 (.230)		P. Ra-228
4.147	U-238	4.468E9y	4.196 (.770)	4.147 (.230)		
4.196	U-238	4.468E9y	4.196 (.770)	4.147 (.230)		P. Th-234
4.217	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	
4.325	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
4.344	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	
4.364	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	
4.370	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	
4.395	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	P. Th-231
4.414	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	
4.445	U-236	2.342E7y	4.494 (.740)	4.445 (.260)		
4.494	U-236	2.342E7y	4.494 (.740)	4.445 (.260)		P. Th-232 [4.010]
4.502	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	
4.546	Pu-244	8.26E7y	4.589 (.805)	4.546 (.194)		
4.556	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
4.570	Bi-210m	3.5E6y	4.950 (.580)	4.910 (.360)	4.570 (.060)	
4.589	Pu-244	8.26E7y	4.589 (.805)	4.546 (.194)		P. U-240
4.598	U-235	7.038E8y	4.395 (.550)	4.364 (.110) 4.217 (.057) 4.325 (.046) 4.414 (.021) 4.344 (.015)	4.370 (.060) 4.598 (.050) 4.556 (.042) 4.502 (.017)	
4.602	Ra-226	1600y	4.785 (.945)	4.602 (.056)		
4.621	Th-230	7.7E4y	4.688 (.763)	4.621 (.234)		
4.640	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	
4.654	Bi-210	5.01d	4.654 (.580)	4.691 (.420)		P. Tl-206 *Po-210 [5.305]
4.664	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	
4.680	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	
4.688	Th-230	7.7E4y	4.688 (.763)	4.621 (.234)		P. Ra-226 [4.785]
4.691	Bi-210	5.01d	4.654 (.580)	4.691 (.420)		
4.708	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
4.712	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	
4.724	U-234	2.445E5y	4.776 (.724)	4.724 (.274)		
4.729	U-233	1.592E5y	4.824 (.844)	4.783 (.132)	4.729 (.016)	
4.736	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	
4.766	Ac-227	21.8y	4.951 (.480)	4.938 (.380) 4.853 (.040)	4.870 (.065) 4.766 (.016)	
4.766	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	
4.771	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	
4.776	U-234	2.445E5y	4.776 (.724)	4.724 (.274)		P. Th-230 [4.688]
4.783	U-233	1.592E5y	4.824 (.844)	4.783 (.132)	4.729 (.016)	
4.785	Ra-226	1600y	4.785 (.945)	4.602 (.056)		P. Rn-222 [5.490]
4.788	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	P. Pa-233
4.798	Pu-241	13.2y	4.896 (.830)	4.853 (.120) 4.971 (.011)	4.798 (.012) 5.041 (.010)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
4.798	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	
4.803	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	
4.815	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	
4.817	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	
4.818	Cm-247	1.56E7y	4.868 (.710)	5.265 (.138) 4.818 (.047) 4.941 (.016)	5.210 (.057) 4.983 (.020) 5.145 (.012)	
4.824	U-233	1.592E5y	4.824 (.844)	4.783 (.132)	4.729 (.016)	P. Th-229 [4.845]
4.837	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	
4.845	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	P. Ra-225
4.851	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	
4.853	Ac-227	21.8y	4.951 (.480)	4.938 (.380) 4.853 (.040)	4.870 (.065) 4.766 (.016)	
4.853	Pu-241	13.2y	4.896 (.830)	4.853 (.120) 4.971 (.011)	4.798 (.012) 5.041 (.010)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
4.856	Pu-242	3.758E5y	4.901 (.780)	4.856 (.224)		
4.868	Cm-247	1.56E7y	4.868 (.710)	5.265 (.138) 4.818 (.047) 4.941 (.016)	5.210 (.057) 4.983 (.020) 5.145 (.012)	P. Pu-243
4.870	Ac-227	21.8y	4.951 (.480)	4.938 (.380) 4.853 (.040)	4.870 (.065) 4.766 (.016)	
4.873	Np-237	2.14E6y	4.788 (.470)	4.771 (.250) 4.640 (.062) 4.873 (.026) 4.803 (.016)	4.766 (.080) 4.664 (.033) 4.817 (.025) 4.708 (.010)	
4.882	Po-209	102y	4.882 (.992)			P. Pb-205
4.896	Pu-241	13.2y	4.896 (.830)	4.853 (.120) 4.971 (.011)	4.798 (.012) 5.041 (.010)	P. *Am-241 [5.486] U-239
4.901	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	
4.901	Pu-242	3.758E5y	4.901 (.780)	4.856 (.224)		P. U-238 [4.196]
4.910	Bi-210m	3.5E6y	4.950 (.580)	4.910 (.360)	4.570 (.060)	
4.933	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	
4.938	Ac-227	21.8y	4.951 (.480)	4.938 (.380) 4.853 (.040)	4.870 (.065) 4.766 (.016)	
4.941	Cm-247	1.56E7y	4.868 (.710)	5.265 (.138) 4.818 (.047) 4.941 (.016)	5.210 (.057) 4.983 (.020) 5.145 (.012)	
4.950	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030)	5.028 (.200) 4.736 (.084) 5.031 (.025)	

(cont.)

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
4.950 (cont.)	Pa-231	3.276E4y	5.011 (.254)	4.680 (.015) 4.851 (.014)	4.984 (.014) 4.712 (.010)	
4.950	Bi-210m	3.5E6y	4.950 (.580)	4.910 (.360)	4.570 (.060)	P. Tl-206 *Po-210 [5.305]
4.951	Ac-227	21.8y	4.951 (.480)	4.938 (.380) 4.853 (.040)	4.870 (.065) 4.766 (.016)	P. Fr-223
4.968	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	
4.971	Pu-241	13.2y	4.896 (.830)	4.853 (.120) 4.971 (.011)	4.798 (.012) 5.041 (.010)	
4.979	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	
4.983	Cm-247	1.56E7y	4.868 (.710)	5.265 (.138) 4.818 (.047) 4.941 (.016)	5.210 (.057) 4.983 (.020) 5.145 (.012)	
4.984	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	
5.011	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	P. Ac-227
5.028	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	
5.031 (cont.)	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030)	5.028 (.200) 4.736 (.084) 5.031 (.025)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.031 (cont.)	Pa-231	3.276E4y	5.011 (.254)	4.680 (.015) 4.851 (.014)	4.984 (.014) 4.712 (.010)	
5.035	Cm-248	3.39E5y	5.079 (.751)	5.035 (.165)		
5.041	Pu-241	13.2y	4.896 (.830)	4.853 (.120) 4.971 (.011)	4.798 (.012) 5.041 (.010)	
5.050	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	
5.052	Th-229	7340y	4.845 (.562)	4.901 (.102) 4.968 (.060) 4.837 (.048) 5.052 (.016)	4.815 (.093) 5.050 (.052) 4.979 (.032) 4.798 (.013)	
5.057	Pa-231	3.276E4y	5.011 (.254)	4.950 (.228) 5.057 (.110) 4.933 (.030) 4.680 (.015) 4.851 (.014)	5.028 (.200) 4.736 (.084) 5.031 (.025) 4.984 (.014) 4.712 (.010)	
5.079	Cm-248	3.39E5y	5.079 (.751)	5.035 (.165)		P. Pu-244 [4.589]
5.105	Pu-239	2.413E4y	5.155 (.733)	5.143 (.151)	5.105 (.115)	
5.109	Bk-249	314d	5.412 (.690)	5.384 (.180) 5.345 (.026)	5.431 (.067) 5.109 (.027)	
5.123	Pu-240	6569y	5.168 (.735)	5.123 (.264)		
5.142	Am-242m	152y	5.207 (.890)	5.142 (.061) 5.411 (.012)	5.367 (.015)	
5.143	Pu-239	2.413E4y	5.155 (.733)	5.143 (.151)	5.105 (.115)	
5.145	Cm-247	1.56E7y	4.868 (.710)	5.265 (.138) 4.818 (.047) 4.941 (.016)	5.210 (.057) 4.983 (.020) 5.145 (.012)	
5.155	Pu-239	2.413E4y	5.155 (.733)	5.143 (.151)	5.105 (.115)	P. U-235 [4.395]

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.168	Pu-240	6569y	5.168 (.735)	5.123 (.264)		P. U-236 [4.494]
5.181	Am-243	7380y	5.275 (.879)	5.234 (.106)	5.181 (.010)	
5.207	Am-242m	152y	5.207 (.890)	5.142 (.061) 5.411 (.012)	5.367 (.015)	P. Np-238
5.210	Cm-247	1.56E7y	4.868 (.710)	5.265 (.138) 4.818 (.047) 4.941 (.016)	5.210 (.057) 4.983 (.020) 5.145 (.012)	
5.223	Po-206	8.8d	5.223 (.050)			P. Pb-202 Bi-206
5.234	Am-243	7380y	5.275 (.879)	5.234 (.106)	5.181 (.010)	
5.264	U-232	72y	5.320 (.686)	5.264 (.312)		
5.265	Cm-247	1.56E7y	4.868 (.710)	5.265 (.138) 4.818 (.047) 4.941 (.016)	5.210 (.057) 4.983 (.020) 5.145 (.012)	
5.267	Bi-214	19.8m	5.447 (.539)	5.511 (.392)	5.267 (.058)	
5.275	Am-243	7380y	5.275 (.879)	5.234 (.106)	5.181 (.010)	P. Np-239
5.304	Cm-245	8.5E3y	5.362 (.932)	5.304 (.050)		
5.305	Po-210	138.38d	5.305 (1.000)			
5.310	Bk-247	1.4E3y	5.530 (.580)	5.690 (.370)	5.310 (.050)	
5.320	U-232	72y	5.320 (.686)	5.264 (.312)		P. Th-228 [5.432]
5.340	Pu-237	45.3d	5.340 (.790)	5.650 (.215)		P. U-233 [4.824] *Np-237 [4.788]

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.341	Th-228	1.913y	5.423 (.727)	5.341 (.267)		
5.343	Cm-246	4.75E3y	5.386 (.790)	5.343 (.210)		
5.345	Bk-249	314d	5.412 (.690)	5.384 (.180) 5.345 (.026)	5.431 (.067) 5.109 (.027)	
5.362	Cm-245	8.5E3y	5.362 (.932)	5.304 (.050)		P. Pu-241
5.367	Am-242m	152y	5.207 (.890)	5.142 (.061) 5.411 (.012)	5.367 (.015)	
5.384	Bk-249	314d	5.412 (.690)	5.384 (.180) 5.345 (.026)	5.431 (.067) 5.109 (.027)	
5.386	Cm-246	4.75E3y	5.386 (.790)	5.343 (.210)		P. Pu-2.2 [4.901]
5.388	Am-241	432.2y	5.486 (.852)	5.443 (.128)	5.388 (.014)	
5.411	Am-242m	152y	5.207 (.890)	5.142 (.061) 5.411 (.012)	5.367 (.015)	
5.412	Bk-249	314d	5.412 (.690)	5.384 (.180) 5.345 (.026)	5.431 (.067) 5.109 (.027)	P. Am-245 *Cf-249 [5.814]
5.423	Th-228	1.913y	5.423 (.727)	5.341 (.267)		P. Ra-224 [5.686]
5.431	Bk-249	314d	5.412 (.690)	5.384 (.180) 5.345 (.026)	5.431 (.067) 5.109 (.027)	
5.435	Ra-223	11.434d	5.715 (.525)	5.606 (.242) 5.537 (.092) 5.501 (.010)	5.745 (.095) 5.435 (.023)	
5.443	Am-241	432.2y	5.486 (.852)	5.443 (.128)	5.388 (.014)	
5.447	Bi-214	19.8m	5.447 (.539)	5.511 (.392)	5.267 (.058)	P. *Po-214 [7.688] Tl-210

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.449	Ra-224	3.62d	5.686 (.951)	5.449 (.049)		
5.457	Pu-238	87.75y	5.499 (.716)	5.457 (.283)		
5.486	Am-241	432.2y	5.486 (.852)	5.443 (.128)	5.388 (.014)	P. Np-237 [4.788]
5.490	Rn-222	3.824d	5.490 (.999)			P. Po-218 [6.003]
5.499	Pu-238	87.75y	5.499 (.716)	5.457 (.283)		P. U-234 [4.776]
5.501	Ra-223	11.434d	5.715 (.525)	5.606 (.242) 5.537 (.092) 5.501 (.010)	5.745 (.095) 5.435 (.023)	
5.511	Bi-214	19.8m	5.447 (.539)	5.511 (.392)	5.267 (.058)	
5.530	Bk-247	1.4E3y	5.530 (.580)	5.690 (.370)	5.310 (.050)	P. Am-243 [5.275]
5.537	Ra-223	11.434d	5.715 (.525)	5.606 (.242) 5.537 (.092) 5.501 (.010)	5.745 (.095) 5.435 (.023)	
5.566	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
5.579	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086) 5.723 (.029) 5.579 (.012)	5.731 (.100) 5.636 (.044) 5.681 (.014) 5.608 (.011)	
5.597	Bi-212	60.55m	6.051 (.699)	6.090 (.272) 5.597 (.011)	5.762 (.017)	
5.606	Ra-223	11.434d	5.715 (.525)	5.606 (.242) 5.537 (.092) 5.501 (.010)	5.745 (.095) 5.435 (.023)	
5.608	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086)	5.731 (.100) 5.636 (.044)	

cont.)

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.608 (cont.)	Ac-225	10.0d	5.829 (.516)	5.723 (.029) 5.579 (.012)	5.681 (.014) 5.608 (.011)	
5.632	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
5.636	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086) 5.723 (.029) 5.579 (.012)	5.731 (.100) 5.636 (.044) 5.681 (.014) 5.608 (.011)	
5.647	At-209	5.4h	5.647 (.050)			P. Bi-205 *Po-209 [4.882]
5.648	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
5.650	Pu-237	45.3d	5.340 (.790)	5.650 (.215)		
5.668	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.677	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	P. Cm-247 [4.868]
5.681	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086) 5.723 (.029) 5.579 (.012)	5.731 (.100) 5.636 (.044) 5.681 (.014) 5.608 (.011)	
5.686	Ra-224	3.62d	5.686 (.951)	5.449 (.049)		P. Rn-220 [6.288]

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.686	Cm-243	28.5y	5.785 (.733)	5.742 (.115) 6.057 (.047) 6.067 (.015)	5.993 (.056) 5.686 (.016) 6.010 (.010)	
5.690	Bk-247	1.4E3y	5.530 (.580)	5.690 (.370)	5.310 (.050)	
5.693	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.701	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.703	At-206	31.4m	5.703 (.880)			P. Bi-202 *Po-206 [5.223]
5.709	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.713	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.715	Ra-223	11.434d	5.715 (.525)	5.606 (.242) 5.537 (.092) 5.501 (.010)	5.745 (.095) 5.435 (.023)	P. Rn-219 [6.819]
5.722	Pu-236	2.851y	5.770 (.690)	5.722 (.310)		
5.723	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086) 5.723 (.029) 5.579 (.012)	5.731 (.100) 5.636 (.044) 5.681 (.014) 5.608 (.011)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.731	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086) 5.723 (.029) 5.579 (.012)	5.731 (.100) 5.636 (.044) 5.681 (.014) 5.608 (.011)	
5.738	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
5.742	Cm-243	28.5y	5.785 (.733)	5.742 (.115) 6.057 (.047) 6.067 (.015)	5.993 (.056) 5.686 (.016) 6.010 (.010)	
5.745	Ra-223	11.434d	5.715 (.525)	5.606 (.242) 5.537 (.092) 5.501 (.010)	5.745 (.095) 5.435 (.023)	
5.757	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.759	Cf-249	350.6y	5.814 (.844)	5.946 (.040) 5.903 (.028) 6.140 (.011)	5.759 (.037) 6.194 (.022) 5.850 (.010)	
5.762	Bi-212	60.55m	6.051 (.699)	6.090 (.272) 5.597 (.011)	5.762 (.017)	
5.762	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
5.763	Cm-244	18.11y	5.805 (.764)	5.763 (.236)		
5.770	Pu-236	2.851y	5.770 (.690)	5.722 (.310)		P. U-232 [5.320]
5.783	Rn-211	14.7h	5.783 (.170)	5.851 (.090)		P. Po-207 *At-211 [5.867]

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.785	Cm-243	28.5y	5.785 (.733)	5.742 (.115) 6.057 (.047) 6.067 (.015)	5.993 (.056) 5.686 (.016) 6.010 (.010)	P. Pu-239 [5.155]
5.792	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086) 5.723 (.029) 5.579 (.012)	5.731 (.100) 5.636 (.044) 5.681 (.014) 5.608 (.011)	
5.793	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
5.794	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086) 5.723 (.029) 5.579 (.012)	5.731 (.100) 5.636 (.044) 5.681 (.014) 5.608 (.011)	
5.805	Cm-244	18.11y	5.805 (.764)	5.763 (.236)		P. Pu-240 [5.168]
5.808	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.814	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
5.814	Cf-249	350.6y	5.814 (.844)	5.946 (.040) 5.903 (.028) 6.140 (.011)	5.759 (.037) 6.194 (.022) 5.850 (.010)	P. Cm-245 [5.362]
5.818	U-230	20.8d	5.889 (.674)	5.818 (.320)		
5.829	Ac-225	10.0d	5.829 (.516)	5.794 (.181) 5.792 (.086) 5.723 (.029) 5.579 (.012)	5.731 (.100) 5.636 (.044) 5.681 (.014) 5.608 (.011)	P. Fr-221 [6.340]

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.850	Cf-249	350.6y	5.814 (.844)	5.946 (.040) 5.903 (.028) 6.140 (.011)	5.759 (.037) 6.194 (.022) 5.850 (.010)	
5.851	Rn-211	14.7h	5.783 (.170)	5.851 (.090)		
5.852	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
5.867	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.867	At-211	7.214h	5.867 (.417)			P. Bi-207 *Po-211 [7.450]
5.870	Bi-213	45.6m	5.870 (.020)			P. Tl-209 Po-213 [8.377]
5.889	U-230	20.8d	5.889 (.674)	5.818 (.320)		P. Th-226 [6.338]
5.903	Cf-249	350.6y	5.814 (.844)	5.946 (.040) 5.903 (.028) 6.140 (.011)	5.759 (.037) 6.194 (.022) 5.850 (.010)	
5.946	Cf-249	350.6y	5.814 (.844)	5.946 (.040) 5.903 (.028) 6.140 (.011)	5.759 (.037) 6.194 (.022) 5.850 (.010)	
5.960	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
5.978 (cont.)	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036)	5.757 (.203) 5.713 (.049) 5.960 (.030)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
5.978 (cont.)	Th-227	18.718d	6.038 (.245)	6.009 (.029) 5.668 (.021) 5.808 (.013)	5.867 (.024) 5.693 (.015)	
5.989	Cf-250	13.08y	6.031 (.834)	5.989 (.162)		
5.993	Cm-243	28.5y	5.785 (.733)	5.742 (.115) 6.057 (.047) 6.067 (.015)	5.993 (.056) 5.686 (.016) 6.010 (.010)	
6.003	Po-218	3.05m	6.003 (1.000)			P. Pb-214
6.009	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	
6.010	Cm-243	28.5y	5.785 (.733)	5.742 (.115) 6.057 (.047) 6.067 (.015)	5.993 (.056) 5.686 (.016) 6.010 (.010)	
6.014	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
6.031	Cf-250	13.08y	6.031 (.834)	5.989 (.162)		P. Cm-246 [5.386]
6.038	Th-227	18.718d	6.038 (.245)	5.978 (.234) 5.709 (.082) 5.701 (.036) 6.009 (.029) 5.668 (.021) 5.808 (.013)	5.757 (.203) 5.713 (.049) 5.960 (.030) 5.867 (.024) 5.693 (.015)	P. Ra-223 [5.715]
6.051	Bi-212	60.55m	6.051 (.699)	6.090 (.272) 5.597 (.011)	5.762 (.017)	P. Tl-208 *Po-212 [11.650]
6.057	Ac-224	2.9h	6.139 (.030)	6.057 (.030)	6.211 (.030)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
6.057	Cm-243	28.5y	5.785 (.733)	5.742 (.115) 6.057 (.047) 6.067 (.015)	5.993 (.056) 5.686 (.016) 6.010 (.010)	
6.067	Cm-243	28.5y	5.785 (.733)	5.742 (.115) 6.057 (.047) 6.067 (.015)	5.993 (.056) 5.686 (.016) 6.010 (.010)	
6.070	Cm-242	163.2d	6.113 (.741)	6.070 (.259)		
6.074	Cf-251	900y	5.677 (.350)	5.852 (.270) 5.632 (.045) 5.762 (.038) 6.074 (.027) 5.566 (.015)	6.014 (.116) 5.814 (.042) 5.648 (.035) 5.793 (.020) 5.738 (.010)	
6.076	Cf-252	2.639y	6.118 (.816)	6.076 (.152)		
6.090	Bi-212	60.55m	6.051 (.699)	6.090 (.272) 5.597 (.011)	5.762 (.017)	
6.100	Th-226	30.9m	6.338 (.755)	6.234 (.228)	6.100 (.013)	
6.105	Pa-228	22h	6.105 (.010)			P. Ac-224 [6.139] *Th-228 [5.423]
6.113	Cm-242	163.2d	6.113 (.741)	6.070 (.259)		P. Pu-238 [5.499]
6.118	Cf-252	2.639y	6.118 (.816)	6.076 (.152)		P. Cm-248 [5.079]
6.126	Fr-221	4.8m	6.340 (.834)	6.126 (.151)	6.242 (.014)	
6.136	At-202	3.0m	6.230 (.077)	6.136 (.077)		
6.139	Ac-224	2.9h	6.139 (.030)	6.057 (.030)	6.211 (.030)	P. Fr-220 [6.686] *Ra-224 [5.686]

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
6.140	Cf-249	350.6y	5.814 (.844)	5.946 (.040) 5.903 (.028) 6.140 (.011)	5.759 (.037) 6.194 (.022) 5.850 (.010)	
6.150	Pu-234	8.8h	6.200 (.040)	6.150 (.019)		
6.194	Cf-249	350.6y	5.814 (.844)	5.946 (.040) 5.903 (.028) 6.140 (.011)	5.759 (.037) 6.194 (.022) 5.850 (.010)	
6.200	Pu-234	8.8h	6.200 (.040)	6.150 (.019)		P. U-230 [5.889] *Np-234
6.211	Ac-224	2.9h	6.139 (.030)	6.057 (.030)	6.211 (.030)	
6.220	Cf-248	333.5d	6.260 (.830)	6.220 (.170)		
6.230	At-202	3.0m	6.230 (.077)			
6.234	Th-226	30.9m	6.338 (.755)	6.234 (.228)	6.100 (.013)	
6.235	Ra-222	38.0s	6.556 (.969)	6.235 (.031)		
6.242	Fr-221	4.8m	6.340 (.834)	6.126 (.151)	6.242 (.014)	
6.260	Cf-248	333.5d	6.260 (.830)	6.220 (.170)		P. Cm-244 [5.805]
6.261	Fr-212	19m	6.383 (.170)	6.407 (.160)	6.261 (.110)	
6.270	At-219	0.9m	6.270 (1.000)			P. Bi-215 *Rn-219 [6.819]
6.279	Bi-211	2.13m	6.623 (.835)	6.279 (.162)		
6.288	Rn-220	55.61s	6.288 (.999)			P. Po-216 [6.779]

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
6.297	U-229	58m	6.360 (.130)	6.332 (.040)	6.297 (.030)	
6.300	Es-255	39.8d	6.300 (.070)			P. Bk-251 *Fm-255 [7.022]
6.332	U-229	58m	6.360 (.130)	6.332 (.040)	6.297 (.030)	
6.338	Th-226	30.9m	6.338 (.755)	6.234 (.228)	6.100 (.013)	P. Ra-222 [6.556]
6.340	Fr-221	4.8m	6.340 (.834)	6.126 (.151)	6.242 (.014)	P. At-217 [7.066]
6.359	Es-254	275.7d	6.429 (.931)	6.359 (.026)	6.416 (.018)	
6.360	U-229	58m	6.360 (.130)	6.332 (.040)	6.297 (.030)	P. Th-225 [6.480] *Pa-229
6.360	Pa-227	38.3m	6.470 (.430)	6.424 (.230) 6.360 (.070)	6.416 (.080)	
6.383	Fr-212	19m	6.383 (.170)	6.407 (.160)	6.261 (.110)	P. At-208 Rn-212 [6.270]
6.407	Fr-212	19m	6.383 (.170)	6.407 (.160)	6.261 (.110)	
6.416	Es-254	275.7d	6.429 (.931)	6.359 (.026)	6.416 (.018)	
6.416	Pa-227	38.3m	6.470 (.430)	6.424 (.230) 6.360 (.070)	6.416 (.080)	
6.424	Pa-227	38.3m	6.470 (.430)	6.424 (.230) 6.360 (.070)	6.416 (.080)	
6.425	Rn-219	3.96s	6.819 (.796)	6.553 (.129)	6.425 (.075)	
6.429	Es-254	275.7d	6.429 (.931)	6.359 (.026)	6.416 (.018)	P. Bk-250

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
6.440	Th-225	8m	6.480 (.390)	6.440 (.130) 6.800 (.080)	6.500 (.120) 6.750 (.060)	
6.470	Pa-227	38.3m	6.470 (.430)	6.424 (.230) 6.360 (.070)	6.416 (.080)	P. Ac-223 [6.650] *Th-227 [6.038]
6.480	Th-225	8m	6.480 (.390)	6.440 (.130) 6.800 (.080)	6.500 (.120) 6.750 (.060)	P. Ra-221 [6.610] *Ac-225 [5.829]
6.500	Th-225	8m	6.480 (.390)	6.440 (.130) 6.800 (.080)	6.500 (.120) 6.750 (.060)	
6.540	Po-217		6.540 (1.000)			
6.553	Rn-219	3.96s	6.819 (.796)	6.553 (.129)	6.425 (.075)	
6.556	Ra-222	38.0s	6.556 (.969)	6.235 (.031)		P. Rn-218 [7.140]
6.590	Ra-221	29s	6.610 (.340)	6.760 (.300) 6.590 (.080)	6.670 (.200)	
6.590	U-228	9.1m	6.680 (.700)	6.590 (.290)		
6.592	Es-253	20.467d	6.633 (.898)	6.592 (.066)		
6.610	Ra-221	29s	6.610 (.340)	6.760 (.300) 6.590 (.080)	6.670 (.200)	P. Rn-217 [7.740]
6.623	Bi-211	2.13m	6.623 (.835)	6.279 (.162)		P. Tl-207
6.633	Es-253	20.467d	6.633 (.898)	6.592 (.066)		P. Bk-249
6.642	Fr-220	27.4s	6.686 (.850)	6.642 (.130)		
6.647	Ac-223	2.2m	6.650 (.420)	6.662 (.380)	6.647 (.130)	

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
6.650	At-218	2.0s	6.694 (.940)	6.650 (.060)		
6.650	Ac-223	2.2m	6.650 (.420)	6.662 (.380)	6.647 (.130)	P. Fr-219 [7.310] *Ra-223 [5.715]
6.662	Ac-223	2.2m	6.650 (.420)	6.662 (.380)	6.647 (.130)	
6.670	Ra-221	29s	6.610 (.340)	6.760 (.300) 6.590 (.080)	6.670 (.200)	
6.680	U-228	9.1m	6.680 (.700)	6.590 (.290)		P. Th-224 [7.710] *Pa-228 [6.105]
6.686	Fr-220	27.4s	6.686 (.850)	6.642 (.130)		P. At-216
6.694	At-218	2.0s	6.694 (.940)	6.650 (.060)		P. Bi-214 Rn-218
6.750	Th-225	8m	6.480 (.390)	6.440 (.130) 6.800 (.080)	6.500 (.120) 6.750 (.060)	
6.760	Ra-221	29s	6.610 (.340)	6.760 (.300) 6.590 (.080)	6.670 (.200)	
6.779	Po-216	0.146s	6.779 (1.000)			P. Pb-212
6.800	Th-225	8m	6.480 (.390)	6.440 (.130) 6.800 (.080)	6.500 (.120) 6.750 (.060)	
6.819	Rn-219	3.96s	6.819 (.796)	6.553 (.129)	6.425 (.075)	P. Po-215
6.820	Pa-226	1.8m	6.860 (.380)	6.820 (.340)		
6.860	Pa-226	1.8m	6.860 (.380)	6.820 (.340)		P. Ac-222 [7.000] *Th-226 [6.338]

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
6.915	Fm-256	157.6m	6.915 (.081)			P. Cf-252 [6.118]
6.963	Fm-255	20.07h	7.022 (.934)	6.963 (.050)		
7.000	Th-224	1.04s	7.170 (.790)	7.000 (.190)		P. Fr-218
7.000	Ac-222	5s	7.000 (.930)			P. Fr-218
7.022	Fm-255	20.07h	7.022 (.934)	6.963 (.050)		P. Cf-251 [5.677]
7.066	At-217	0.030s	7.066 (.999)			
.140	Rn-218	.035s	7.140 (.998)			P. Po-214 [7.688]
47	Fm-254	3.240h	7.189 (.849)	7.147 (.140)		
	Th-224	1.04s	7.170 (.790)	7.000 (.190)		P. Ra-220 [7.460]
	Fm-254	3.240h	7.189 (.849)	7.147 (.140)		P. Cf-250 [6.031]
	-211m	25.2s	7.270 (.910)	8.870 (.070)		P. Pb-207m
	5	1.78E-3s	7.384 (.999)			P. Pb-211 *At-215 [8.000]
		6s	7.450 (.989)			
			7.679 (.800)	7.616 (.200)		
			9	7.616 (.200)		P. Bi-208
						P. Pb-210

SEARCH	NUCLIDE	HALF-LIFE	KEY ALPHA	ASSOCIATED ALPHAS		FEED
7.707	At-216	3E-4s	7.805 (.970)	7.707 (.021)		
7.805	At-216	3E-4s	7.805 (.970)	7.707 (.021)		P. Bi-212 [6.051]
7.837	At-212m	0.12s	7.837 (.800)	7.900 (.200)		P. Bi-208
7.900	At-212m	0.12s	7.837 (.800)	7.900 (.200)		
8.000	At-215		8.000 (.999)			P. Bi-211 [6.623]
8.377	Po-213	4.2E-6s	8.377 (1.000)			P. Pb-209
8.785	Po-212	3.04E-7s	8.785 (1.000)			
8.870	Po-211m	25.2s	7.270 (.910)	8.870 (.070)		
11.650	Po-212m	45s	11.650 (.970)			