

Photonuclear Activation Analysis with Ge(Li) Detectors Compilation II

M. ELAINE TOMS

*Linac Branch
Nuclear Sciences Division*

May 9, 1973



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INTRODUCTION

Activation analysis by photonuclear reactions is accomplished by observing the radioactive decay of the resulting nucleus left in its ground state or in an isomeric state. The annihilation radiation from positron activity or the direct detection of beta particles can be used to identify a specific activity only by observation of the half-life or by chemical separation. Detection of gamma radiation from the decay of the residual nucleus by a high-resolution Ge(Li) detector usually permits the activity to be identified directly without determining the decay curve or resorting to chemical separation.

This second compilation of photonuclear reactions which are useful for activation analysis with gamma-ray spectrometry has been made for activities with half-lives from 24 hours to 1 year. The first compilation, NRL Report 7554, was made for activities with half-lives from 100 μ sec to 24 hours. With the availability of high-intensity photon beams from linear electron accelerators, reactions can be produced leading to measurable activities with half-lives not only up to 24 hours but also as long as a year or more. An example is the photoneutron production of Mn⁵⁴ (312.5 days), which yields an 834.8-keV gamma ray. This activity has been produced by Kenneth M. Murray in a 50-mg sample of Hawaiian pumice with a 27-MeV bremsstrahlung irradiation for 5 hours with the NRL Linac. The peak for this gamma ray was readily discernible in the spectrum from a large Ge(Li) detector one day after irradiation with a counting time of only 5 minutes. Optimum counting for such long-lived activity would normally be at a time much later after the irradiation.

Mn⁵⁴ can be produced by the γ, n reaction on Mn⁵⁵. Other photonuclear reactions can also produce Mn⁵⁴. The use of this compilation is illustrated by the determination of such reactions. If one looks in Table 2E for the gamma-ray energy, 0.8348 MeV, the reactions Fe⁵⁶(γ, np), Fe⁵⁷(γ, T), and Co⁵⁹(γ, na) are found in addition to Mn⁵⁵(γ, n). The intensity factors show that the Fe⁵⁷(γ, T) reaction is the least important and that the other reactions would have yields nearly proportional to their cross sections. Checking back to Table 1-S for the target nuclei, one sees from the separation energies that with 27-MeV bremsstrahlung all these reactions are possible. One finds that if cobalt is present in the sample, the 0.8106-MeV gamma from the γ, n reaction and the 0.12207-MeV gamma from the $\gamma, 2n$ reaction should be seen in the spectrum. Iron in the sample should be discernible through the γ, np reaction on Fe⁵⁴ which produces gamma rays with energies of 1.4336, 0.935, and 0.744 MeV from the decay of Mn⁵²(5.67d).

Variations of sensitivity with irradiation time are related to the half-lives of the resulting activities. Indications of such variations can be seen in Table II of Lutz's [1] discussion of photon activation analysis. In his table, calculated sensitivities following photoneutron or photoproton emission are given for 10-minute and 4-hour irradiations with 25-, 30-, and 35-MeV bremsstrahlung. The half-lives of the activities range from 2.7 sec to 150 years.

SCOPE AND ORGANIZATION

This second compilation has the same organization and scope, except for half-lives, as the first compilation. The direct excitation of isomers with low-energy bremsstrahlung, below particle thresholds, has not been considered in this compilation. With higher energy bremsstrahlung one can expect such activity to be very small compared to activity induced by photoparticle reactions.

As in the first compilation, the stable isotopes of all the elements through bismuth were considered as targets. Reactions concerned with the photoparticles $n\alpha$, α , He^3 , $2p$, T , np , p , $2n$ and n are considered with γ' included only when a single gamma ray resulted. Included in the compilation are reactions which lead to residual nuclei having half-lives from 24 hours to 1 year and decaying with one or more gamma rays of energy equal to or greater than 50 keV.

This compilation consists of two tables which are intended to be used together. In Table 1-S are listed the target nucleus and its isotopic abundance, the photo-reaction product or products and the separation energy in MeV, the residual nucleus and its half-life, and the decay mode or modes with notations concerning further radioactive decay. The energies of the principal gamma rays are listed in MeV along with their intensities as a percent of the radioactive decay. The last column in this table is the product of the percent intensity and the abundance. When cross sections are known, this intensity factor would be the multiplier to be used for comparing reactions leading to the same activity. A reaction which leads to an intensity factor of less than 0.05 was not included in Table 1-S. It is to be noted that when the decay is from a metastable state, more energy is needed than the separation energy. The relative production of the metastable state compared with that of the ground state has not been considered. Such data for the most part are unknown.

The primary sources of the data in Table 1-S are the "Table of Isotopes," 6th edition, by Lederer, Hollander, and Perlman [2] and the "Chart of the Nuclides," Knolls Atomic Power Laboratory, 10th edition, prepared by Holden and Walker [3]. Gamma-ray energies were corrected to agree with those given by Martin and Blichert-Toft [4]. The half-lives given on the Knolls chart [3] were used when the values differed from those given in the table [2]. The separation energies were derived from the sheet form of the nuclear "Wallet Cards," January 1971, prepared by S. Morse and F. Ajzenberg-Selove. An asterisk is inserted when the energy is not yet able to be determined. For the listing of γ, γ' reactions the multipolarity is given.

The listing of Table 1-S is arranged by target nucleus in order by element and for each element by isotope. For each isotope the reactions are listed in descending order; thus the residual nuclei are in ascending order of Z and A. This ordering keeps the listing of reactions leading to the same residual nucleus in close proximity. Reactions are included for the sake of completeness even when the probability of their observation may be quite small. Photodeuterons and multiple photonucleons from the breakup of, or equivalent to, a triton, 3He , or alpha particle were not listed. Only the separation energy would be different. Also more complex multiple disintegrations were omitted as being less probable and hence less useful for photonuclear activation analysis.

Under each reaction the gamma rays are listed by decreasing percent intensity. When more than one gamma ray have the same percent intensity, they are listed by decreasing

energy. When the percent intensity is not available, the energies of the gamma rays are listed in decreasing order of relative intensities if known.

Tables 2D and 2E, derived from Table 1-S, are designed to be useful for identifying gamma rays from unknown target nuclei. They also serve to show cases where certain reactions cannot be distinguished by gamma-ray energy only. Table 2D is for half-lives from 24 hours to 30 days and Table 2E is for half-lives from 30 days to 1 year. The listing of target nuclei, rather than residual nuclei, permits quick checking back to Table 1-S, and Table 1^t in the first compilation, for other possible reactions with the same target nucleus. In these dual-column listings the order is by gamma-ray energy, given in MeV. All photonuclear reactions which can produce this gamma ray with an intensity factor of at least 0.05 are listed in ascending order of target nucleus together with the resulting photoparticles. The intensity factors, percent intensity times abundance, are rounded to 0.1 percent. Usually the reactions listed under a gamma ray produce the same radioactive nucleus. However, at times the same gamma ray results from the decay of two different residual nuclei or through consecutive decay.

The number of significant figures given for the gamma-ray energy reflects the accuracy of measurement. Errors for these values are not available without extensive literature searches. More recent values for some of these energies may exist. Galatanu and Grecescu [5] list gamma-ray energies from γ, n and γ, p reactions in their Tables I and II. The activities they list have half-lives ranging from 5.3 seconds to 303 days. Another source of gamma-ray energies is the "Catalogue of γ -Rays Emitted by Radionuclides" by M.A. Wakat [6]. This listing is not confined to photo-produced radionuclides. Wakat presents two lists by gamma-ray energies: one for activities with half-lives less than 1 day and the other for activities with half-lives longer than 1 day. Another important compilation of nuclear data is the "Table of Isotopes" by Heath [7]. Information is listed for isotopes of all known elements. For some of the gamma-ray energies the uncertainties are given. The residual nuclei which result from the photonuclear reactions listed in Table 1-S can be found among the isotopes in Heath's table.

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TABLE 1-S

Photonuclear Reactions for Analysis by Gamma-Ray Spectrometry
(by target nucleus)

Table 1-S

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{6}_{\text{C}} \text{C}^{12}$ (98.89)	n α (26.27)	Be ⁷ 53.3d	EC	0.47756	10.3	10.18
$^{20}_{\text{Ca}} \text{Ca}^{48}$ (0.18)	n (9.94)	Ca ⁴⁷ 4.53d	β^- to Sc ⁴⁷ (3.4d)	1.2971 0.1594	75.0 70.0	0.14 0.13
$^{21}_{\text{Sc}} \text{Sc}^{45}$ (100.0)	n (11.32)	Sc ^{44m} 58.6h	IT, EC	1.156 0.271 1.12 1.02	100.0 98.6 1.3 1.3	100.00 98.60 1.30 1.30
$^{22}_{\text{Ti}} \text{Ti}^{46}$ (7.99)	np (21.67)	Sc ^{44m} 58.6h	IT, EC	1.156 0.271 1.12 1.02	100.0 98.6 1.3 1.3	7.99 7.88 0.10 0.10
$^{22}_{\text{Ti}} \text{Ti}^{47}$ (7.82)	T (22.06)	Sc ^{44m} 58.6h	IT, EC	1.156 0.271 1.12 1.02	100.0 98.6 1.3 1.3	7.32 7.22 0.10 0.10
	p (10.46)	Sc ⁴⁶ 83.8d	β^-	1.1205 0.8894	100.0 100.0	7.32 7.32
$^{22}_{\text{Ti}} \text{Ti}^{48}$ (73.99)	np (22.09)	Sc ⁴⁶ 83.8d	β^-	1.1205 0.8894	100.0 100.0	73.99 73.99
	p (11.45)	Sc ⁴⁷ 3.40d	β^-	0.1594	70.0	51.79
$^{22}_{\text{Ti}} \text{Ti}^{49}$ (5.46)	T (21.75)	Sc ⁴⁶ 83.8d	β^-	1.1205 0.8894	100.0 100.0	5.46 5.46
	np (19.59)	Sc ⁴⁷ 3.40d	β^-	0.1594	70.0	3.82
	p (11.34)	Sc ⁴⁸ 1.83d	β^-	1.312 1.040 0.9833 0.178	100.0 100.0 100.0 6.0	5.46 5.46 5.46 0.33

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{22}\text{Ti}^{50}$ (5.25)	He ³ (24.02)	Ca ⁴⁷ 4.53d	β^- to Sc ⁴⁷ (3.4d)	1.2971	75.0	4.00
				0.1594	70.0	3.68
				0.8079	6.8	0.36
	T (21.68)	Sc ⁴⁷ 3.40d		0.4892	6.8	0.36
		β^-	0.1594	70.0	3.68	
			1.312	100.0	5.25	
	np (22.29)	Sc ⁴⁸ 1.83d	β^-	1.040	100.0	5.25
				0.9833	100.0	5.25
				0.178	6.0	0.32
	α (9.88)	Sc ⁴⁶ 83.8d	β^-	1.1205	100.0	0.24
				0.8894	100.0	0.24
				0.1594	70.0	0.17
$^{23}\text{V}^{50}$ (0.24)	He ³ (19.82)	Sc ⁴⁷ 3.40d	β^-	1.312	100.0	0.24
				1.040	100.0	0.24
	2p (19.29)	Sc ⁴⁸ 1.83d	β^-	0.9833	100.0	0.24
				1.312	100.0	0.24
				1.040	100.0	0.24
	2n (20.89)	V ⁴⁸ 16.13d	EC, β^+	0.9833	100.0	0.24
				1.312	97.0	0.23
$^{23}\text{V}^{51}$ (99.76)	n α (20.94)	Sc ⁴⁶ 83.8d	β^-	1.1205	100.0	99.76
				0.8894	100.0	99.76
	α (10.30)	Sc ⁴⁷ 3.40d	β^-	0.1594	70.0	69.83
				1.312	100.0	99.76
				1.040	100.0	99.76
$^{24}\text{Cr}^{50}$ (4.34)	np (21.14)	Sc ⁴⁸ 1.83d	β^-	0.9833	100.0	99.76
				1.040	100.0	99.76
				0.9833	100.0	99.76
				0.178	6.0	5.99
				1.312	97.0	4.21
$^{24}\text{Cr}^{52}$ (83.79)	n (12.04)	Cr ⁵¹ 27.8d	EC	0.945	10.0	0.43
				2.241	3.0	0.13
$^{24}\text{Cr}^{53}$ (9.50)	2n (19.98)	Cr ⁵¹ 27.8d	EC	0.32010	9.9	4.34
				0.32010	9.9	4.21

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{25}\text{Mn}^{55}$ (100.0)	n (10.22)	Mn^{54} 312.5d	EC	0.83481	100.0	100.00
$^{26}\text{Fe}^{54}$ (5.82)	np (20.90)	Mn^{52} 5.67d	EC, β^+	1.4336 0.935 0.744 1.3338 1.247 0.8484	100.0 94.0 85.0 5.1 4.7 3.2	5.82 5.47 4.95 0.30 0.27 0.19
$^{26}\text{Fe}^{56}$ (91.66)	np (20.41)	Mn^{54} 312.5d	EC	0.83481	100.0	91.66
$^{26}\text{Fe}^{57}$ (2.19)	T (19.57)	Mn^{54} 312.5d	EC	0.83481	100.0	2.19
$^{27}\text{Co}^{59}$ (100.0)	n α (17.18)	Mn^{54} 312.5d	EC	0.83481	100.0	100.00
	2n (19.04)	Co^{57} 270d	EC	0.12207 0.13643 0.6921	87.7 12.2 0.15	87.70 12.20 0.15
	n (10.47)	Co^{58} 71.3d	EC, β^+	0.8106 0.8636 1.6748	99.47 0.69 0.53	99.47 0.69 0.53
$^{28}\text{Ni}^{58}$ (67.77)	np (19.56)	Co^{56} 77.3d	EC, β^+	0.84675 1.23830 2.59857 1.77143 1.03790 3.25364 2.03492 1.36025 3.20219 2.01536 1.17513 3.27319	100.0 70.0 16.8 15.6 12.9 7.6 7.4 4.3 3.1 2.9 2.0 1.5	67.77 47.44 11.38 10.57 8.74 5.14 5.01 2.91 2.10 1.96 1.36 1.02
	p (8.18)	Co^{57} 270d	EC	0.12207 0.13643 0.6921	87.7 12.2 0.15	59.44 8.26 0.10

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance		
				Energy (MeV)	Percent			
$^{28}\text{Ni}^{58}$ cont. (67.77)	2n (22.45)	Ni^{56} 6.1d	EC	0.1583	100.0	67.77		
				0.8122	87.0	58.96		
				0.7506	48.0	32.54		
				0.2696	39.0	29.43		
				0.4807	38.0	25.75		
				1.5625	15.0	10.15		
$^{28}\text{Ni}^{60}$ (26.16)	T (20.08)	Co^{57}	EC	0.12207	87.7	22.94		
		270d	EC	0.13643	12.2	3.19		
		Co^{58} 71.3d	EC, β^+	0.8106	99.47	26.02		
	np (19.99)			0.8636	0.69	0.18		
				1.6748	0.53	0.14		
$^{28}\text{Ni}^{61}$ (1.25)	2p (18.14)	Fe^{59}	β^-	1.09227	56.0	0.70		
		44.6d	β^-	1.29158	44.0	0.55		
$^{28}\text{Ni}^{62}$ (3.66)	He ³ (21.02)	Fe^{59}	β^-	1.09227	56.0	2.05		
		44.6d	β^-	1.29158	44.0	1.61		
				0.19223	2.8	0.10		
$^{28}\text{Ni}^{64}$ (1.16)	n α (15.84)	Fe^{59}	β^-	1.09227	56.0	0.65		
		44.6d	β^-	1.29158	44.0	0.51		
$^{30}\text{Zn}^{66}$ (27.81)	n (11.04)	Zn^{65}	EC	1.11545	50.6	14.21		
		243.7d	EC					
$^{30}\text{Zn}^{67}$ (4.11)	2n (18.09)	Zn^{65}	EC	1.11545	50.6	2.08		
		243.7d	EC					
$^{30}\text{Zn}^{68}$ (18.57)	p (9.99)	Cu^{67}	β^-	0.1845	40.95	7.60		
		61.6h	β^-	0.09326	24.51	4.55		
				0.09122	4.05	0.75		
				0.296	0.46	0.09		
$^{30}\text{Zn}^{70}$ (0.62)	T (17.21)	Cu^{67}	β^-	0.1845	40.95	0.25		
		61.6h	β^-	0.09326	24.51	0.15		

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{31}\text{Ga}^{69}$ (60.16)	2n (18.60)	Ga^{67} 78.2h	EC	0.09326	72.12	43.39
				0.296	23.03	13.85
				0.1845	21.95	13.21
				0.388	5.74	3.45
				0.09122	2.20	1.32
				0.206	1.52	0.92
				0.49	0.21	0.13
				0.87	0.19	0.11
				0.78	0.10	0.06
				0.67	0.10	0.06
$^{32}\text{Ge}^{70}$ (20.5)	T (18.64)	Ga^{67} 78.2h	EC	0.09326	72.12	14.78
				0.296	23.03	4.72
				0.1845	21.95	4.50
				0.388	5.74	1.18
				0.0912	2.20	0.45
	2n (20.13)	Ge^{68} 287d	EC to Ga^{68} (68.3m)	0.206	1.52	0.31
				1.078	3.6	0.74
		Ge^{69} 39.2h		0.80	0.42	0.09
		EC, β^+	1.107	28.10	5.76	
			0.573	12.62	2.59	
			0.872	9.41	1.93	
			1.335	3.05	0.63	
			0.320	1.23	0.25	
			0.553	0.50	0.10	
			0.788	0.35	0.07	
			0.237	0.32	0.07	
			1.052	0.30	0.06	
$^{33}\text{As}^{75}$ (100.0)	n (10.25)	As^{74} 17.7d	β^- , β^+ , EC	1.206	0.26	0.05
				0.5960	61.8	61.80
				0.635	14.0	14.00
$^{34}\text{Se}^{74}$ (0.87)	T (19.27)	As^{71} 64h	EC, β^+	0.1750	100.0	0.87
				0.835	69.0	0.60
	np (19.35)	As^{72} 26h	EC, β^+	0.630	6.9	0.06
				0.054	100.0	0.87
	p (8.58)	As^{73} 76d	EC	0.835	69.0	0.60
				0.630	6.9	0.06
	2n (20.74)	Se^{72} 8.5d	EC to As^{72} (26h)	0.835	69.0	0.60
				0.630	6.9	0.06

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance	
				Energy (MeV)	Percent		
³⁴ Se ⁷⁶ (9.02)	T (19.29)	As ⁷³ 76d	EC	0.054	100.0	9.02	
				0.5960	61.8	5.57	
				0.635	14.0	1.26	
	np (19.76)	As ⁷⁴ 17.7d		0.26467	59.5	5.36	
				0.13597	57.3	5.17	
				0.27958	25.2	2.27	
				0.12111	16.9	1.52	
				0.4007	12.4	1.12	
				0.09673	6.5	0.59	
				0.30398	1.42	0.13	
³⁴ Se ⁷⁷ (7.58)	T (18.70)	As ⁷⁴ 17.7d	β^- , β^+ , EC	0.5960	61.8	4.68	
				0.635	14.0	1.06	
	p (9.60)	As ⁷⁶ 26.3h		0.5593	42.0	3.18	
				0.6574	6.4	0.49	
				1.2160	4.0	0.30	
				0.559	4.0	0.30	
				1.213	2.0	0.15	
	2n (18.58)	Se ⁷⁵ 120.4d		0.26467	59.5	4.53	
				0.13597	57.3	4.35	
				0.27958	25.2	1.91	
				0.12111	16.9	1.28	
				0.4007	12.4	0.94	
				0.09673	6.5	0.49	
³⁴ Se ⁷⁸ (23.52)	np (20.10)	As ⁷⁶ 26.3h	β^-	0.30398	1.42	0.11	
				0.19864	1.42	0.11	
				0.5593	42.0	9.88	
				0.6574	6.4	1.51	
				1.2160	4.0	0.94	
				0.559	4.0	0.94	
				1.213	2.0	0.47	
				2.0967	0.6	0.14	
	p (10.39)	As ⁷⁷ 38.8h		1.7884	0.3	0.07	
				1.4376	0.3	0.07	
				2.112	0.24	0.06	
				0.242	2.3	0.53	
				0.522	0.77	0.18	

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{34}\text{Se}^{80}$ (49.80)	T (18.79)	As^{77} 38.8h	β^-	0.242	2.3	1.15
				0.522	0.77	0.38
				0.161	0.11	0.06
				0.086	0.11	0.06
$^{35}\text{Br}^{79}$ (50.69)	2n (18.98)	Br^{77} 56h	EC, β^+	0.522	25.65	13.00
				0.161	20.71	10.50
				0.2393	8.90	4.51
				0.58	6.65	3.37
				0.300	6.08	3.08
				0.48	3.64	1.85
				0.82	2.85	1.45
				0.250	2.79	1.42
				0.57	2.47	1.25
				0.75	2.03	1.03
				0.4398	1.77	0.90
				0.086	1.71	0.87
				1.00	1.33	0.67
				0.203	1.18	0.60
				0.28	1.07	0.54
				0.38	0.95	0.48
$^{36}\text{Kr}^{78}$ (0.35)	p (8.20)	Br^{77} 56h	EC, β^+	0.522	25.65	0.09
				0.161	20.71	0.07
$^{36}\text{Kr}^{80}$ (2.27)	T (19.61)	Br^{77} 56h	EC, β^+	0.522	25.65	0.58
				0.161	20.71	0.47
				0.2393	8.90	0.20
				0.58	6.65	0.15
				0.300	6.08	0.14
				0.48	3.64	0.08
				0.82	2.85	0.07
				0.250	2.79	0.06
				0.57	2.47	0.06
				0.2613	11.0	0.25
	n (11.51)	Kr^{79} 34.9h	EC, β^+	0.6060	8.0	0.18
				0.3976	8.0	0.18

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{36}\text{Kr}^{83}$ (11.55)	p (9.78)	Br^{82} 35.4h	β^-	0.7767	83.0	9.59
				0.5541	72.0	8.32
				0.6191	43.0	4.97
				1.0440	29.0	3.35
				1.3170	28.0	3.23
				0.6984	26.8	3.05
				0.8278	24.0	2.77
				1.4749	17.0	1.96
				0.1008	1.7	0.20
$^{36}\text{Kr}^{84}$ (56.90)	np (20.30)	Br^{82} 35.4h	β^-	0.7767	83.0	47.20
				0.5541	72.0	40.98
				0.6191	43.0	24.47
				1.0440	29.0	16.50
				1.3170	28.0	15.94
				0.6984	26.8	15.25
				0.8278	24.0	13.65
				1.4749	17.0	9.66
				0.1008	1.7	0.97
$^{37}\text{Rb}^{85}$ (72.15)	He ³ (19.59)	Br^{82} 35.4h	β^-	0.7767	83.0	59.82
				0.5541	72.0	51.93
				0.6191	43.0	31.00
				1.0440	29.0	20.92
				1.3170	28.0	20.19
				0.6984	26.8	19.33
				0.8278	24.0	17.31
				1.4749	17.0	12.26
				0.1008	1.7	1.23
2n (18.78)	2n (18.78)	Rb^{83} 83d	EC	0.521	45.9	33.12
				0.530	31.0	22.37
				0.553	16.1	11.61
				0.790	0.9	0.65
n (10.47)	n (10.47)	Rb^{84} 33.0d	EC, β^+	0.88	73.4	52.96
				1.90	0.8	0.58
				1.01	0.4	0.29

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity × Abundance
				Energy (MeV)	Percent	
³⁷ Rb ⁸⁷ (27.85)	^{nα} (17.59)	^{Br⁸²} 35.4h	β^-	0.7767	83.0	23.12
				0.5541	72.0	20.05
				0.6191	43.0	11.98
				1.0440	29.0	8.08
				1.3170	28.0	7.80
	ⁿ (9.94)	^{Rb⁸⁶} 18.66d	β^-	0.6984	26.8	7.46
				0.8278	24.0	6.68
				1.4749	17.0	4.73
				0.1008	1.7	0.47
				1.0770	8.78	2.45
³⁸ Sr ⁸⁴ (0.56)	^p (8.51)	^{Rb⁸³} 83d	EC	0.521	45.9	0.26
				0.530	31.0	0.17
				0.553	16.1	0.09
	²ⁿ (20.76)	^{Sr⁸²} 25d	EC	0.7769	9.73	0.05
				0.75	45.0	0.25
				0.38	35.0	0.20
	ⁿ (11.59)	^{Sr⁸³} 32.4h	EC, β^+ to Rb ⁸³ (83d)	0.88	73.4	7.24
				1.90	0.8	0.08
				0.51397	99.99	9.87
³⁸ Sr ⁸⁶ (9.87)	^{np} (20.11)	^{Rb⁸⁴} 33.0d	EC, β^+	1.0770	8.78	0.62
				0.51397	99.99	7.04
				1.0770	8.78	7.24
	ⁿ (11.52)	^{Sr⁸⁵} 64.5d	EC	0.4835	99.7	99.70
				0.3884	99.3	99.30
				0.2735	0.61	0.61
	^p (9.43)	^{Rb⁸⁶} 18.66d	β^-	0.4835	99.7	99.38
				0.3884	93.4	93.40
				0.2735	0.61	0.61
³⁸ Sr ⁸⁷ (7.04)	²ⁿ (19.96)	^{Sr⁸⁵} 64.5d	EC	1.83613	99.38	99.38
				0.89804	93.4	93.40
				0.2735	0.61	0.61
	^{np} (20.53)	^{Rb⁸⁶} 18.66d	β^-	1.83613	99.38	99.38
				0.89804	93.4	93.40
³⁹ Y ⁸⁹ (100.0)	ⁿ (11.48)	^{Y⁸⁷} 80h	EC, β^+	1.83613	99.38	99.38
				0.89804	93.4	93.40
				0.2735	0.61	0.61

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity × Abundance
				Energy (MeV)	Percent	
$^{40}\text{Zr}^{90}$ (51.46),	T (20.57)	Y^{87} 80h	EC, β^+	0.4835	99.7	51.26
		80h		0.3884	99.3	51.10
	np (19.86)	Y^{88} 106.6d	EC, β^+	1.83613	99.38	51.14
		106.6d		0.89804	93.4	48.06
				2.735	0.61	0.31
	2n (21.14)	Zr^{88} 85d	EC to Y^{88} (107d)	0.394	100.0	51.46
		85d		1.83613	99.38	51.14
				0.89804	93.4	48.06
				2.735	0.61	0.31
	n (12.00)	Zr^{89} 78.4h	EC, β^+	0.91	100.0	51.46
		78.4h		1.71	1.0	0.51
$^{40}\text{Zr}^{91}$ (11.23)	T (18.57)	Y^{88} 106.6d	EC, β^+	1.83613	99.38	11.16
		106.6d		0.89804	93.4	10.49
				2.735	0.61	0.07
	2n (19.19)	Zr^{89} 78.4h	EC, β^+	0.91	100.0	11.23
		78.4h		1.71	1.0	0.11
$^{40}\text{Zr}^{96}$ (2.80)	n (7.84)	Zr^{95} 65.5d	β^- to Nb^{95} (35d)	0.76584	99.96	2.80
		65.5d		0.75687	54.3	1.52
				0.72424	43.5	1.22
				0.2354	1.8	0.05
	2p (15.43)	Y^{91} 58.8d	β^-	1.21	0.22	0.22
		58.8d				
	2n (16.60)	Nb^{91m} 62d	IT, EC	0.1045	97.0	97.00
		62d		1.21	3.0	3.00
$^{41}\text{Nb}^{93}$ (100.0)	n (8.84)	Nb^{92m} 10.13d	EC	0.934	99.1	99.10
		10.13d		0.90	1.8	1.80
				1.83	0.9	0.90
	α (5.46)	Zr^{88} 85d	EC to Y^{88} (107d)	0.394	100.0	15.84
		85d		1.83613	99.38	15.74
				0.89804	93.4	14.79
				2.735	0.61	0.10
	He^3 (16.89)	Zr^{89} 78.4h	EC, β^+	0.91	100.0	15.84
		78.4h		1.71	1.0	0.16
	p (7.34)	Nb^{91m} 62d	IT, EC	0.1045	97.0	15.86
		62d		1.21	3.0	0.48

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{42}\text{Mo}^{94}$ (9.04)	n α (14.06)	Zr ⁸⁹	EC, β^+	0.91	100.0	9.04
		78.4h		1.71	1.0	0.09
		Nb ^{91m}	IT, EC	0.1045	97.0	8.77
	T (16.61)	62d		1.21	3.0	0.27
		Nb ^{92m}	EC	0.934	99.1	8.96
		10.13d		0.90	1.8	0.16
	np (17.34)			1.83	0.9	0.08
		Nb ^{92m}	EC	0.934	99.1	15.58
		10.13d		0.90	1.8	0.28
				1.83	0.9	0.14
$^{42}\text{Mo}^{95}$ (15.72)	T (16.23)	Nb ^{92m}	EC	0.934	99.1	16.53
		10.13d		0.90	1.8	16.52
$^{42}\text{Mo}^{96}$ (16.53)	p (9.30)	Nb ^{95m}	IT	0.2354	100.0	9.46
		90h				
$^{42}\text{Mo}^{97}$ (9.46)	2p (16.45)	Nb ⁹⁵	β^-	0.76584	99.96	9.46
		35d				
		Zr ⁹⁵	β^- to Nb ⁹⁵	0.76584	99.96	5.14
		65.5d	(35d)	0.75687	54.3	4.11
				0.72424	43.5	0.17
	np (16.16)	Nb ^{95m}	IT	0.2354	100.0	9.46
		90h				
		Nb ⁹⁵	β^-	0.76584	99.96	9.46
		35d				
		Zr ⁹⁵	β^- to Nb ⁹⁵	0.76584	99.96	23.77
$^{42}\text{Mo}^{98}$ (23.78)	He ³ (17.38)	65.5d	(35d)	0.75687	54.3	12.91
				0.72424	43.5	10.34
				0.2354	1.8	0.43
	T (16.28)	Nb ^{95m}	IT	0.2354	100.0	23.78
		90h				
		Nb ⁹⁵	β^-	0.76584	99.96	23.77
$^{42}\text{Mo}^{100}$ (9.63)	n α (11.02)	Zr ⁹⁵	β^- to Nb ⁹⁵	0.76584	99.96	9.63
		65.5d	(35d)	0.75687	54.3	5.23
				0.72424	43.5	4.20
				0.2354	1.8	0.17

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance		
				Energy (MeV)	Percent			
$^{42}\text{Mo}^{100}$ cont. (9.63)	n (8.30)	Mo^{99} 66.2h	β^-	0.14051	91.4	8.80		
				0.7397	13.8	1.33		
				0.18106	7.7	0.74		
				0.7782	4.8	0.46		
				0.3664	1.46	0.14		
$^{44}\text{Ru}^{96}$ (5.51)	p (7.31)	$\text{Tc}^{95\text{m}}$ 61d	EC, β^+	0.2042	40.9	2.25		
				0.788	29.7	1.64		
				0.837	23.2	1.28		
				0.584	8.9	0.49		
				0.822	7.2	0.40		
				1.042	3.2	0.18		
				0.617	1.8	0.10		
$^{44}\text{Ru}^{98}$ (1.87)	T (17.12)	$\text{Tc}^{95\text{m}}$ 61d	EC, β^+	0.2042	40.9	0.76		
				0.788	29.7	0.56		
				0.837	23.2	0.43		
				0.584	8.9	0.17		
				0.822	7.2	0.13		
				1.042	3.2	0.06		
				0.0965	100.0	1.87		
$^{44}\text{Ru}^{99}$ (12.72)	p (8.27)	$\text{Tc}^{97\text{m}}$ 90d	IT	0.2154	93.0	1.74		
				0.3254	7.0	0.13		
	n (10.25)			0.0965	100.0	12.72		
				0.2154	93.0	11.83		
$^{44}\text{Ru}^{99}$ (12.72)	np (15.74)	$\text{Tc}^{97\text{m}}$ 90d	IT	0.3254	7.0	0.89		
				0.1091	2.0	0.25		
	2n (17.72)			0.2154	93.0	15.60		
				0.3254	7.0	2.36		
$^{44}\text{Ru}^{100}$ (12.62)	T (16.93)	$\text{Tc}^{97\text{m}}$ 90d	IT	0.1091	2.0	1.31		
				0.14051	91.4	0.82		
				0.7397	13.8	0.25		
				0.18106	7.7			
				0.7782	4.8			
$^{44}\text{Ru}^{101}$ (17.07)	2p (16.57)	Mo^{99} 66.2h	β^-	0.3664	1.46			

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance		
				Energy (MeV)	Percent			
$^{44}\text{Ru}^{102}$ (31.61)	He ³ (18.07)	Mo ⁹⁹ 66.2h	β^-	0.14051	91.4	28.89		
				0.7397	13.8	4.36		
	n α (12.63)			0.18106	7.7	2.43		
				0.7782	4.8	1.52		
				0.3664	1.46	0.46		
$^{44}\text{Ru}^{104}$ (18.58)	n α (12.63)		β^-	0.14051	91.4	16.98		
				0.7397	13.8	2.56		
				0.18106	7.7	1.43		
				0.7782	4.8	0.89		
				0.3664	1.46	0.27		
	n (8.89)	Ru ¹⁰³ 39.6d	β^-	0.4969	89.0	16.54		
				0.6102	5.4	1.00		
				0.0531	1.13	0.21		
				0.5569	0.80	0.15		
$^{45}\text{Rh}^{103}$ (100.0)	n (9.31)	Rh ¹⁰² 207d	EC, β^+	0.4748	55.5	55.50		
				0.6281	4.1	4.10		
				1.103	2.9	2.90		
$^{46}\text{Pd}^{102}$ (0.96)	T (17.35)	Rh ⁹⁹ 15.0d	EC, β^+	0.53	—			
				0.35	—			
				0.090	—			
	p (7.82)	Rh ^{101m} 4.47d	IC, EC	0.3067	82.8	0.79		
				0.1573	10.0	0.10		
				0.5449	6.0	0.06		
	2n (19.09)	Pd ¹⁰⁰ 3.7d	EC	0.0840	68.68	0.66		
				0.0748	67.20	0.65		
				0.1261	23.54	0.23		
				0.1588	5.88	0.06		
	T (16.97)	Rh ^{101m} 4.47d	IC, EC	0.3067	82.8	9.08		
				0.1573	10.0	1.10		
				0.5449	6.0	0.66		
				0.1794	1.2	0.13		
				0.1272	1.2	0.13		
	np (18.00)	Rh ¹⁰² 207d	EC, β^+	0.4748	55.5	6.09		
				0.6281	4.1	0.45		
				1.103	2.9	0.32		
	n (10.02)	Pd ¹⁰³ 17d	EC	0.053	10.0	1.10		

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
⁴⁶ Pd ¹⁰⁵ (22.23)	2p (15.74)	^{Ru} ¹⁰³ 39.6d	β^-	0.4969	89.0	19.78
				0.6102	5.4	1.20
				0.0531	1.13	0.25
	T (16.61)	^{Rh} ¹⁰² 207d		0.5569	0.80	0.18
		EC, β^+	0.4748	55.5	12.34	
				0.6281	4.1	0.91
	2n (17.11)		^{Pd} ¹⁰³ 17d		1.103	2.9
		EC	0.053	10.0	2.22	
⁴⁶ Pd ¹⁰⁶ (27.33)	He ³ (17.56)		^{Ru} ¹⁰³ 39.6d		0.4969	89.0
		β^-	0.6102	5.4	1.48	
				0.0531	1.13	0.31
	p (9.33)		^{Rh} ¹⁰⁵ 35.5h		0.5569	0.80
		β^-	0.3191	20.0	5.47	
				0.3062	5.0	1.37
⁴⁶ Pd ¹⁰⁸ (26.71)	n α (12.75)	^{Ru} ¹⁰³ 39.6d	β^-	0.4969	89.0	23.77
				0.6102	5.4	1.44
				0.0531	1.13	0.30
	T (16.61)	^{Rh} ¹⁰⁵ 35.5h		0.5568	0.80	0.21
		β^-	0.3191	20.0	5.34	
				0.3062	5.0	1.34
⁴⁷ Ag ¹⁰⁷ (51.82)	n α (12.13)	^{Rh} ¹⁰² 207d	EC, β^+	0.4748	55.5	28.76
				0.6281	4.1	2.12
				1.103	2.9	1.50
	2p (15.12)	^{Rh} ¹⁰⁵ 35.5h		0.3191	20.0	1.036
		EC	0.3062	5.0	2.59	
	2n (17.42)	^{Ag} ¹⁰⁵ 41.0d	EC	0.3444	44.5	23.08
				0.2804	22.8	11.82
				0.06397	11.8	6.12
				0.4433	9.6	4.97
				0.6444	9.1	4.72
				1.0878	2.2	1.14
				0.8076	0.9	0.47
				0.6506	0.5	0.26
				0.3701	0.5	0.26
				0.3314	0.5	0.26
				0.3191	0.5	0.26
				0.3062	0.5	0.26
				0.1828	0.5	0.26
				0.1554	0.5	0.26

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{47}\text{Ag}^{107}$ cont. (51.82)	n (9.53)	$\text{Ag}^{106\text{m}}$ 8.4d	EC	0.5118	89.5	46.38
				1.0457	31.1	16.11
				0.8075	25.0	12.96
				0.7171	23.3	12.07
				0.4060	22.3	11.56
				0.7482	22.1	11.45
				0.6160	20.3	10.52
				1.528	20.2	10.47
				0.4295	18.0	9.33
				0.2215	14.8	7.67
				0.158	14.8	7.67
				1.1991	13.2	6.84
				0.7828	12.4	6.43
				0.4508	11.9	6.16
				1.1278	10.1	5.24
				1.2228	9.8	5.04
				1.83	3.0	1.55
				0.6009	2.9	1.50
				1.338	2.4	1.24
$^{47}\text{Ag}^{109}$ (48.18)	α (3.28)	Rh^{105} 35.5h	β^-	0.3191	20.0	9.64
				0.3062	5.0	2.41
$^{48}\text{Cd}^{106}$ (1.22)	He^3 (14.61)	Pd^{103} 17d	EC	0.053	10.0	0.12
				$^{47}\text{Ag}^{105}$ 41.0d	0.3444	44.5
				0.2804	22.8	0.28
				0.06397	11.8	0.14
				0.4433	9.6	0.12
$^{48}\text{Cd}^{108}$ (0.88)	$n\alpha$ (12.28)	Pd^{103} 17d	EC	0.6444	9.1	0.11
				0.053	10.0	0.09
	T (17.07)	Ag^{105} 41.0d	EC	0.3444	44.5	0.39
				0.2804	22.8	0.20
				0.06397	11.8	0.10
	np (17.67)	$\text{Ag}^{106\text{m}}$ 8.4d	EC	0.4433	9.6	0.08
				0.6444	9.1	0.08
				0.5118	89.5	0.79
				1.0457	31.1	0.27

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{48}\text{Cd}^{108}$ cont. (0.88)	np cont. (17.67)	Ag^{106} cont. 8.4d	EC	0.8075	25.0	0.22
				0.7171	23.3	0.20
				0.4060	22.3	0.20
				0.7482	22.1	0.19
				0.6160	20.3	0.18
				1.528	20.2	0.18
				0.4295	18.0	0.16
				0.2215	14.8	0.13
				0.158	14.8	0.13
				1.1991	13.2	0.12
				0.7828	12.4	0.11
				0.4508	11.9	0.10
				1.1278	10.1	0.09
				1.2228	9.8	0.09
$^{48}\text{Cd}^{111}$ (12.75)	p (9.07)	Ag^{110} 253d	β^-	0.6576	95.6	12.19
				0.8845	72.4	9.24
				0.9374	31.0	3.95
				0.7636	23.5	3.00
				1.3837	21.4	2.73
				0.7064	19.4	2.47
				1.505	12.5	1.59
				0.6773	12.0	1.53
				0.8180	9.3	1.18
				0.6865	7.7	0.98
				0.7439	6.0	0.76
				1.4756	4.4	0.56
				0.6202	3.3	0.42
				0.9374	2.7	0.34
				0.4465	2.7	0.34
$^{48}\text{Cd}^{112}$ (24.07)	np (18.46)	Ag^{110} 253d	β^-	1.565	1.4	0.18
				0.6576	95.6	23.01
				0.8845	72.4	17.41
				0.9374	31.0	7.46
				0.7636	23.5	5.66
				1.3837	21.4	5.15
				0.7064	19.4	4.67
				1.505	12.5	3.01
				0.6773	12.0	2.89
				0.8180	9.3	2.24
				0.6865	7.7	1.85
				0.7439	6.0	1.44
				1.4756	4.4	1.06

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{48}\text{Cd}^{112}$ cont. (24.07)	np cont. (18.46)	Ag^{110} 253d	β^-	0.6202	3.3	0.79
				0.9374	2.7	0.65
				0.4465	2.7	0.65
				1.565	1.4	0.34
				0.3420	8.0	1.93
	p (9.67)	Ag^{111} 7.48d	β^-	0.2459	1.3	0.31
				0.0963	0.4	0.10
				0.6576	95.6	11.72
				0.8845	72.4	8.88
				0.9374	31.0	3.80
$^{48}\text{Cd}^{113}$ (12.26)	T (16.52)	Ag^{110} 253d	β^-	0.7636	23.5	2.88
				1.3837	21.4	2.62
				0.7064	19.4	2.38
				1.505	12.5	1.53
				0.6773	12.0	1.47
				0.8180	9.3	1.14
				0.6865	7.7	0.94
				0.7439	6.0	0.74
				1.4756	4.4	0.54
				0.6202	3.3	0.40
$^{48}\text{Cd}^{114}$ (28.86)	T (16.77)	Ag^{111} 7.48d	β^-	0.9374	2.7	0.33
				0.4465	2.7	0.33
				1.565	1.4	0.17
				0.3420	8.0	0.96
				0.2459	1.3	0.16
				0.3420	8.0	2.31
				0.2459	1.3	0.38
				0.0963	0.4	0.12
$^{48}\text{Cd}^{116}$ (7.58)	n (8.69)	$\left\{ \begin{array}{l} \text{Cd}^{115m} \\ 43d \end{array} \right.$	β^-	0.935	1.6	0.12
				1.29	0.9	0.07
				0.335	95.0	7.20
				0.53	26.5	2.01
				0.49	10.0	0.76
		$\left\{ \begin{array}{l} \text{Cd}^{115} \\ 53.5h \end{array} \right.$	β^-	0.6576	95.6	4.09
				0.8845	72.4	3.10
				0.9374	31.0	1.33
				0.7636	23.5	1.01
				1.3837	21.4	0.92
$^{49}\text{In}^{113}$ (4.28)	He ³ (16.80)	Ag^{110} 253d	β^-	0.7064	19.4	0.83

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{49}\text{In}^{113}$ cont. (4.28)	He ³ cont. (16.80)	Ag ¹¹⁰ cont. 253d	β^-	1.505	12.5	0.54
				0.6773	12.0	0.51
				0.8180	9.3	0.40
				0.6865	7.7	0.33
				0.7439	6.0	0.26
				1.4756	4.4	0.19
				0.6202	3.3	0.14
				0.9374	2.7	0.12
				0.4465	2.7	0.12
				1.565	1.4	0.06
$^{49}\text{In}^{115}$ (95.72)	2p (15.72)	Ag ¹¹¹ 7.48d	β^-	0.3420	8.0	0.34
				0.2459	1.3	0.06
				0.247	100.0	4.28
				0.173	100.0	4.28
				0.6576	95.6	91.51
				0.8845	72.4	69.32
				0.9374	31.0	29.67
				0.7636	23.5	22.49
				1.3837	21.4	20.47
				0.7064	19.4	18.55
$^{50}\text{Sn}^{112}$ (0.96)	$n\alpha$ (12.56)	Ag ¹¹⁰ 253d	β^-	1.505	12.5	11.97
				0.6773	12.0	11.49
				0.8180	9.3	8.90
				0.6865	7.7	7.37
				0.7439	6.0	5.74
				1.4756	4.4	4.21
				0.6202	3.3	3.16
				0.9374	2.7	2.58
				0.4465	2.7	2.58
				1.565	1.4	1.34
$^{50}\text{Sn}^{114}$ (0.66)	α (3.77)	Ag ¹¹¹ 7.48d	β^-	0.3420	8.0	7.66
				0.2459	1.3	1.24
				0.0963	0.4	0.38
$^{50}\text{Sn}^{112}$ (0.96)	p (7.77)	In ¹¹¹ 2.82d	EC	0.247	100.0	0.96
				0.173	100.0	0.96
$^{50}\text{Sn}^{114}$ (0.66)	n (10.32)	Sn ¹¹³ 115d	EC	0.3917	100.0	0.66
$^{50}\text{Sn}^{115}$ (0.35)	2n (17.86)	Sn ¹¹³ 115d	EC	0.3917	100.0	0.35

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{50}_{\Lambda}\text{Sn}^{117}$ (7.61)	2p (16.88)	$\left. \begin{array}{l} \text{Cd}^{115m} \\ 43d \\ \text{Cd}^{115} \\ 53.5h \end{array} \right\}$	β^-	0.935	1.6	0.12
				1.29	0.9	0.07
				0.335	95.0	7.23
				0.53	26.5	2.02
				0.49	10.0	0.76
	He ³ (18.49)	$\left. \begin{array}{l} \text{Cd}^{115m} \\ 43d \\ \text{Cd}^{115} \\ 53.5h \end{array} \right\}$	β^-	0.935	1.6	0.38
				1.29	0.9	0.22
				0.485	0.4	0.10
				0.335	95.0	22.83
				0.53	26.5	6.37
$^{50}_{\Lambda}\text{Sn}^{118}$ (24.03)		$\left. \begin{array}{l} \text{Cd}^{115} \\ 53.5h \end{array} \right\}$	β^-	0.49	10.0	2.40
				0.262	0.5	0.12
				0.230	0.5	0.12
	n (9.33)	Sn^{117m} 14.0d	IT	0.159	100.0	24.03
				0.158	100.0	24.03
	α (4.40)	$\left. \begin{array}{l} \text{Cd}^{115m} \\ 43d \end{array} \right\}$	β^-	0.935	1.6	0.14
				1.29	0.9	0.08
		$\left. \begin{array}{l} \text{Cd}^{115} \\ 53.5h \end{array} \right\}$	β^-	0.335	95.0	8.15
				0.53	26.5	2.27
				0.49	10.0	0.86
$^{50}_{\Lambda}\text{Sn}^{119}$ (8.58)	2n (15.81)	Sn^{117m} 14.0d	IT	0.159	100.0	8.58
				0.158	100.0	8.58
	$n\alpha$ (13.51)	$\left. \begin{array}{l} \text{Cd}^{115m} \\ 43d \end{array} \right\}$	β^-	0.935	1.6	0.53
				1.29	0.9	0.30
		$\left. \begin{array}{l} \text{Cd}^{115} \\ 53.3h \end{array} \right\}$	β^-	0.485	0.4	0.13
				0.335	95.0	31.21
				0.53	26.5	8.70
	n (9.11)	Sn^{119m} 245d	IT	0.49	10.0	3.29
				0.262	0.5	0.16
$^{50}_{\Lambda}\text{Sn}^{120}$ (32.85)				0.230	0.5	0.16
np (14.89)	Sn^{119m} 245d	IT	0.065	100.0	32.85	
			0.065	100.0	57.25	
	Sb^{120} 5.76d	EC	1.171	100.0	57.25	
			0.200	100.0	57.25	

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{51}\text{Sb}^{121}$ cont. (57.25)	np cont. (9.25)	$\left. \begin{array}{l} \text{Sb}^{120} \\ \text{cont.} \\ 5.76\text{d} \end{array} \right\}$	EC cont.	1.03 0.09 1.12	99.0 99.0 1.0	56.68 56.68 0.57
$^{51}\text{Sb}^{123}$ (42.75)	n (8.98)	$\left. \begin{array}{l} \text{Sb}^{122} \\ 2.74\text{d} \end{array} \right\}$	EC, β^-	0.564 0.686 1.26 1.140	66.3 3.3 0.7 0.7	28.34 1.41 0.30 0.30
$^{52}\text{Te}^{120}$ (0.089)	He ³ (13.94)	$\left. \begin{array}{l} \text{Sn}^{117m} \\ 14.0\text{d} \end{array} \right\}$	IT	0.159 0.158	100.0 100.0	0.09 0.09
	n (10.28)	$\left. \begin{array}{l} \text{Te}^{119m} \\ 4.7\text{d} \end{array} \right\}$	EC	1.2221 0.1530	69.7 67.3	0.06 0.06
$^{52}\text{Te}^{122}$ (2.46)	n α (10.40)	$\left. \begin{array}{l} \text{Sn}^{117m} \\ 14.0\text{d} \end{array} \right\}$	IT	0.159 0.158	100.0 100.0	2.46 2.46
	He ³ (15.16)	$\left. \begin{array}{l} \text{Sn}^{119m} \\ 245\text{d} \end{array} \right\}$	IT	0.065	100.0	2.46
	np (17.24)	$\left. \begin{array}{l} \text{Sb}^{120} \\ 5.76\text{d} \end{array} \right\}$	EC	1.171 0.200 1.03 0.09	100.0 100.0 99.0 99.0	2.46 2.46 2.44 2.44
	n (10.06)	$\left. \begin{array}{l} \text{Te}^{121m} \\ 150\text{d} \end{array} \right\}$	EC	0.8178 0.2122 1.11	90.0 90.0 2.6	2.21 2.21 0.06
		$\left. \begin{array}{l} \text{Te}^{121} \\ 17\text{d} \end{array} \right\}$	EC	0.5731 0.5075	80.6 17.7	1.98 0.43
$^{52}\text{Te}^{123}$ (0.87)	α (1.53)	$\left. \begin{array}{l} \text{Sn}^{119m} \\ 245\text{d} \end{array} \right\}$	IT	0.065	100.0	0.87
	T (15.70)	$\left. \begin{array}{l} \text{Sb}^{120} \\ 5.76\text{d} \end{array} \right\}$	EC	1.171 0.200 1.03 0.09	100.0 100.0 99.0 99.0	0.87 0.87 0.86 0.86
	p (8.13)	$\left. \begin{array}{l} \text{Sb}^{122} \\ 2.74\text{d} \end{array} \right\}$	β^-	0.564	66.3	0.58
	2n (17.00)	$\left. \begin{array}{l} \text{Te}^{121m} \\ 150\text{d} \end{array} \right\}$	EC	0.8178 0.2122	90.0 90.0	0.79 0.79
		$\left. \begin{array}{l} \text{Te}^{121} \\ 17\text{d} \end{array} \right\}$	EC	0.5731 0.5075	80.6 17.7	0.70 0.15

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{52}_{\Lambda}\text{Te}^{124}$ (4.61)	n α (10.93)	Sn^{119m} 245d	IT	0.065	100.0	4.61
				0.564	66.3	3.06
		Sb^{122} 2.74d	β^-	0.686	3.3	0.15
	np (17.54)	Te^{123m} 117d	IT	0.1590	100.0	4.61
				0.0885	100.0	4.61
	n (9.41)	Te^{123m} 117d	IT	0.564	66.3	4.63
				0.686	3.3	0.23
$^{52}_{\Lambda}\text{Te}^{125}$ (6.99)	T (15.66)	Sb^{122} 2.74d	β^- , EC	0.60271	98.6	6.89
				1.69104	48.3	3.38
	p (8.74)	Sb^{124} 60.2d	β^-	0.72278	11.1	0.78
				0.64584	7.3	0.51
				2.09100	5.7	0.40
				0.71382	2.5	0.17
				1.36821	2.43	0.17
				0.96822	1.86	0.13
				1.04512	1.85	0.13
				0.70934	1.37	0.10
				1.43660	1.05	0.07
				1.35521	0.97	0.07
				0.79076	0.74	0.05
	2n (16.01)	Te^{123m} 117d	IT	0.1590	100.0	6.99
				0.0885	100.0	6.99
$^{52}_{\Lambda}\text{Te}^{126}$ (18.71)	np (17.83)	Sb^{124} 60.2d	β^-	0.60271	98.6	18.45
				1.69104	48.3	9.04
				0.72278	11.1	2.08
				0.64584	7.3	1.37
				2.09100	5.7	1.07
				0.71382	2.5	0.47
				1.36821	2.43	0.45
				0.96822	1.86	0.35
				1.04512	1.85	0.35
				0.70934	1.37	0.26
				1.43660	1.05	0.20
				1.35521	0.97	0.18
				0.79076	0.74	0.14
				1.48906	0.59	0.11
	n (9.09)	Te^{125m} 58d	IT	0.10927	100.0	18.71

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{52}\text{Te}^{128}$ (31.79)	He^3 (17.98)	Sn^{125} 9.65d	β^-	1.07	4.0	1.27
				0.81	1.5	0.48
				0.91	1.3	0.41
				1.99	0.6	0.19
				0.47	0.4	0.13
				0.34	0.3	0.10
	np (18.01)	Sb^{126} 12.4d	β^-	0.99	—	
				0.85	—	
				0.69	—	
				0.58	—	
				0.41	—	
				0.29	—	
	p (9.57)	Sb^{127} 3.80d	β^-	0.77	40.0	12.72
				0.46	40.0	12.72
				0.0887	30.0	9.54
				0.31	10.0	3.18
	n (8.77)	Te^{127m} 109d	IT	0.0887	99.2	31.54
				0.05760	0.8	0.25
$^{52}\text{Te}^{130}$ (34.48)	$\text{n}\alpha$ (11.90)	Sn^{125} 9.65d	β^-	1.07	4.0	1.38
				0.81	1.5	0.52
				0.91	1.3	0.45
				1.99	0.6	0.21
				0.47	0.4	0.14
				0.34	0.3	0.10
				1.16	0.15	0.05
	T (15.59)	Sb^{127} 3.80d	β^-	0.77	40.0	12.79
				0.46	40.0	13.79
				0.0887	30.0	10.34
				0.31	10.0	3.45
	n (8.39)	Te^{129m} 34.1d	IT, β^-	0.1056	64.0	22.07
				0.697	6.0	2.07
$^{53}\text{I}^{127}$ (100.0)	$\text{n}\alpha$ (11.16)	Sb^{122} 2.74d	β^- , EC	0.564	66.3	66.30
				0.686	3.3	3.30
				1.26	0.7	0.70
				1.140	0.7	0.70
				0.60271	98.6	98.60
	He^3 (16.33)	Sb^{124} 60.2d	β^-	1.69104	48.3	48.30
				0.72278	11.1	11.10
				0.64584	7.3	7.30
				2.09100	5.7	5.70

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance			
				Energy (MeV)	Percent				
$^{53}\text{I}^{127}$ cont. (100.0)	He ³ cont. (16.33)	Sb ¹²⁴ cont. 60.2d	β^-	0.71382	2.5	2.50			
				1.36821	2.43	2.43			
				0.96822	1.86	1.86			
				1.04512	1.85	1.85			
				0.70934	1.37	1.37			
				1.43660	1.05	1.05			
				1.35521	0.97	0.97			
				0.79076	0.74	0.74			
				1.48906	0.59	0.59			
				np (15.31)	Te ^{125m} 58d	IT	0.10927	100.0	100.0
$^{54}\text{Xe}^{124}$ (0.096)	n α (10.76)	I ¹²⁶ 13d	EC, β^+ , β^-	0.386	34.2	34.20			
				0.677	32.9	32.90			
				0.48	4.2	4.20			
				0.75	3.6	3.60			
				0.86	0.8	0.80			
				1.43	0.4	0.40			
				He ³ (14.07)	Te ^{119m} 4.7d	EC	1.2221	69.7	0.07
					Te ^{121m} 150d	EC	0.1530	67.3	0.06
					Te ¹²¹ 17d	EC	0.8178	90.0	0.09
							0.2122	90.0	0.09
$^{54}\text{Xe}^{126}$ (0.090)	n α (11.35)	Te ^{121m} 150d	EC	0.5731	80.6	0.08			
				Te ¹²¹ 17d	EC	0.8178	90.0	0.08	
						0.2122	90.0	0.08	
				He ³ (14.94)	Te ^{123m} 117d	IT	0.5731	80.6	0.07
						0.1590	100.0	0.09	
				np (17.18)	I ¹²⁴ 4.17d	EC, β^+	0.0885	100.0	0.09
						0.603	67.0	0.06	
				n α (11.18)	Te ^{123m} 117d	IT	0.1590	100.0	1.92
						0.0885	100.0	1.92	
				He ³ (15.75)	Te ^{125m} 58d	IT	0.10927	100.0	1.92
$^{54}\text{Xe}^{128}$ (1.92)	np (17.31)	I ¹²⁶ 13d	EC, β^+, β^-	0.386	34.2	0.66			
				0.667	32.9	0.63			

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{54}\text{Xe}^{128}$ cont. (1.92)	np cont. (17.31) n (9.64)	I^{126} cont. 13d Xe^{127} 36.4d	EC, β^+ , β^- EC	0.48	4.2	0.08
				0.75	3.6	0.07
				0.20284	73.2	1.41
				0.17210	24.9	0.48
				0.37496	22.1	0.42
	α (2.09) 2p (14.98) 2n (16.56)	Te^{125m} 58d Te^{127m} 109d Xe^{127} 36.4d	IT IT EC	0.14522	4.7	0.09
				0.05760	4.7	0.09
				0.10927	100.0	26.44
				0.0887	99.2	26.23
				0.5760	0.8	0.21
$^{54}\text{Xe}^{129}$ (26.44)	$n\alpha$ (11.34) He ³ (16.52) n (9.26)	Te^{125m} 58d Te^{127m} 109d Xe^{129m} 8.0d	IT IT IT	0.20284	73.2	19.35
				0.17210	24.9	6.58
				0.37496	22.1	5.82
				0.14522	4.7	1.24
				0.05760	4.7	1.24
	α (2.54) 2p (15.97) 2n (15.86)	Te^{127m} 109d Te^{129m} 34.1d Xe^{129m} 8.0d	IT IT, β^- IT	0.19656	100.0	4.08
				0.0887	99.2	4.05
				0.05760	0.8	0.17
				0.1056	64.0	13.55
				0.697	6.0	1.27
$^{54}\text{Xe}^{130}$ (4.08)	$n\alpha$ (11.34) He ³ (16.52) n (9.26)	Te^{127m} 109d Te^{129m} 34.1d Xe^{129m} 8.0d	IT IT, β^- IT	0.19656	100.0	21.18
				0.0887	99.2	21.01
				0.05760	0.8	0.17
				0.1056	64.0	17.21
				0.697	6.0	1.61
	$n\alpha$ (11.47) He ³ (17.18) p (9.12)	Te^{127m} 109d Te^{129m} 34.1d I^{131} 8.06d	IT IT, β^- β^-	0.0887	99.2	26.67
				0.05760	0.8	0.22
				0.1056	64.0	22.64
				0.697	6.0	1.86
				0.36449	84.2	1.64

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{54}\text{Xe}^{132}$ cont. (26.89)	p cont. (9.12)	I^{131} cont. 8.06d	β^-	0.72291	1.63	0.44
				0.16398	1.35	0.36
				0.50294	0.33	0.09
				0.17723	0.32	0.09
				0.32575	0.28	0.08
	n (8.93)	Xe^{131m} 11.96d	IT	0.16398	100.0	26.89
				0.1056	64.0	6.68
				0.697	6.0	0.63
				0.775	49.7	5.19
				0.854	27.5	2.87
$^{54}\text{Xe}^{134}$ (10.44)	$n\alpha$ (11.59)	Te^{129m} 34.1d	IT, β^-	0.1817	18.0	1.88
				1.127	13.0	1.36
				0.797	12.5	1.31
				0.336	12.3	1.28
				1.206	8.6	0.90
	He^3 (17.89)	Te^{131m} 30h	β^-	0.1021	8.3	0.87
				0.241	7.5	0.78
				0.200	7.2	0.75
				0.831	6.7	0.70
				0.786	5.9	0.62
	$2p$ (17.49)	Te^{132} 78h	β^-	0.0811	5.3	0.55
				0.150	4.7	0.49
				0.915	3.8	0.40
				0.278	3.5	0.37
				1.965	3.2	0.33
	T (15.63)	I^{131} 8.06d	β^-	1.860	2.6	0.27
				0.869	2.1	0.22
				1.583	1.7	0.18
				0.050	100.0	10.44
				0.22816	93.0	9.71

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{54}\text{Xe}^{134}$ Cont. (10.44)	n (8.46)	$\begin{cases} \text{Xe}^{133m} \\ 2.26\text{d} \\ \text{Xe}^{133} \\ 5.27\text{d} \end{cases}$	IT	0.2828	100.0	10.44
				0.08100	99.95	10.43
			β^-	0.07955	0.9	0.09
				0.775	49.7	4.41
				0.854	27.5	2.44
				0.1817	18.0	1.60
				1.127	13.0	1.15
				0.797	12.5	1.11
				0.336	12.3	1.09
				1.206	8.6	0.76
				0.1021	8.3	0.74
				0.241	7.5	0.67
				0.200	7.2	0.64
				0.831	6.7	0.59
				0.786	5.9	0.52
				0.0811	5.3	0.47
				0.150	4.7	0.42
$^{54}\text{Xe}^{136}$ (8.87)	$n\alpha$ (11.76)	$\begin{cases} \text{Te}^{131m} \\ 30\text{h} \end{math} $	β^-	0.915	3.8	0.34
				0.278	3.5	0.31
				1.965	3.2	0.28
				1.860	2.6	0.23
				0.869	2.1	0.19
				1.583	1.7	0.15
				0.050	100.0	8.87
				0.22816	93.0	8.26
				0.1163	3.0	0.27
				0.11176	3.0	0.27
$^{55}\text{Cs}^{133}$ (100.0)	2p (15.30)	$\begin{cases} \text{I}^{131} \\ 8.06\text{d} \end{math} $	β^-	0.36449	84.2	84.20
				0.6369	6.9	6.90
				0.28431	6.1	6.10
				0.08016	6.0	6.00
				0.72291	1.63	1.63
				0.16398	1.35	1.35
				0.50294	0.33	0.33
				0.17723	0.32	0.32
				0.32575	0.28	0.28
				0.16398	100.0	100.0
np (15.11)	Xe^{131m} 11.96d	IT				

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{55}\text{Cs}^{133}$ Cont. (100.0)	n (9.04)	Cs^{132} 6.58d	EC, β^+, β^-	0.6678	96.90	96.90
				0.464	2.05	2.05
				1.320	0.64	0.64
				1.138	0.5	0.50
				0.508	0.5	0.50
				0.57	0.25	0.25
				1.037	0.15	0.15
				0.7729	0.1	0.10
				0.6303	0.09	0.09
				1.9850	0.06	0.06
$^{56}\text{Ba}^{130}$ (0.101)	He ³ (13.98)	Xe ¹²⁷ 36.4d	EC	0.20284	73.2	0.07
$^{56}\text{Ba}^{132}$ (0.097)	n α (10.60)	Xe ¹²⁷ 36.4d	EC	0.20284	73.2	0.07
	He ³ (14.62)	Xe ^{129m} 8.0d	IT	0.19656	100.0	0.10
	n α (10.66)	Xe ^{129m} 8.0d	IT	0.19656	100.0	2.42
	He ³ (15.37)	Xe ^{131m} 11.96d	IT	0.16398	100.0	2.42
$^{56}\text{Ba}^{134}$ (2.42)	np (17.02)	Cs ¹³² 6.58d	EC, β^+, β^-	0.6678	96.90	2.34
	n (9.25)	Ba ^{133m} 38.9h	IT	0.2757	100.0	2.42
	α (1.99)	Xe ^{131m} 11.96d	IT	0.16398	100.0	6.59
	2p (14.83)	Xe ^{133m} 2.26d	IT	0.2328	100.0	6.59
		Xe ¹³³ 5.27d	β^-	0.08100 0.07955	99.95 0.9	6.59 0.06
	T (15.74)	Cs ¹³² 6.58d	EC, β^+, β^-	0.6678 0.464	96.90 2.05	6.39 0.14
	2n (16.45)	Ba ^{133m} 38.9h	IT	0.2757	100.0	6.59
	γ^1 (M4)	Ba ^{135m} 28.7h	IT	0.268	100.0	6.59

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{56}\text{Ba}^{136}$ (7.81)	n α (11.23)	Xe ^{131m} 11.96d	IT	0.16398	100.0	7.81
		{ Xe ^{133m} 2.26d	IT	0.2328	100.0	7.81
	He ³ (16.34)	{ Xe ¹³³ 5.27d	β^-	0.08100	99.95	7.81
				0.07955	0.9	0.07
	n (9.23)	Ba ^{135m} 28.7h	IT	0.268	100.0	7.81
		{ Ba ¹³⁵ 28.7h				
	α (2.71)	{ Xe ^{133m} 2.26d	IT	0.2328	100.0	11.31
		{ Xe ¹³³ 5.27d	β^-	0.08100	99.95	11.30
	p (9.00)	{ Cs ¹³⁶ 13d	β^-	0.07955	0.9	0.10
				0.818	100.0	11.31
				1.05	90.7	10.26
				0.3402	55.5	6.28
				0.1637	19.2	2.17
				0.1762	16.4	1.85
				0.0667	11.8	1.34
				1.25	9.3	1.05
				0.273	9.0	1.02
				0.1530	7.3	0.83
$^{56}\text{Ba}^{137}$ (11.31)	2n (16.18)	Ba ^{135m} 28.7h	IT	0.268	100.0	11.31
		{ Ba ¹³⁵ 28.7h				
	n α (11.25)	{ Xe ^{133m} 2.26d	IT	0.2328	100.0	71.66
		{ Xe ¹³³ 5.27d	β^-	0.08100	99.95	71.62
	np (17.54)	{ Cs ¹³⁶ 13d	β^-	0.07955	0.9	0.64
				0.818	100.0	71.66
				1.05	90.7	65.00
				0.3402	55.5	39.77
				0.1637	19.2	13.75
				0.1762	16.4	11.75
				0.0667	11.8	8.46
				1.25	9.3	6.66
				0.273	9.0	6.45
				0.1530	7.3	5.23
				0.862	2.8	2.72
$^{56}\text{Ba}^{138}$ (71.66)	n α (11.25)	{ Xe ^{133m} 2.26d	IT	0.2328	100.0	71.66
		{ Xe ¹³³ 5.27d	β^-	0.08100	99.95	71.62
	np (17.54)	{ Cs ¹³⁶ 13d	β^-	0.07955	0.9	0.64
				0.818	100.0	71.66
				1.05	90.7	65.00
				0.3402	55.5	39.77
				0.1637	19.2	13.75
				0.1762	16.4	11.75
				0.0667	11.8	8.46
				1.25	9.3	6.66
				0.273	9.0	6.45
				0.1530	7.3	5.23
				0.862	2.8	2.72

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{57}\text{La}^{138}$ (0.089)	2p (14.98)	Cs^{136} 13d	β^-	0.818	100.0	0.09
				1.05	90.7	0.08
$^{57}\text{La}^{139}$ (99.91)	T (13.68)	Ba^{135m} 28.7h	IT	0.268	100.0	0.09
				0.818	100.0	99.91
				1.05	90.7	90.62
				0.3402	55.5	55.46
				0.1637	19.2	19.18
				0.1762	16.4	16.39
				0.0667	11.8	11.79
				1.25	9.3	9.29
				0.273	9.0	8.99
				0.1530	7.3	7.29
$^{58}\text{Ce}^{136}$ (0.139)	n α (10.16)	Ba^{131} 11.7d	EC	0.12373	46.0	0.06
				0.4963	45.0	0.06
	He ³ (13.81)	Ba^{133} 38.9h	IT	0.2757	100.0	0.14
				0.268	100.0	0.25
$^{58}\text{Ce}^{138}$ (0.250)	He ³ (14.67)	Ba^{135m} 28.7h	IT	0.255	99.4	0.25
				0.268	100.0	88.48
$^{58}\text{Ce}^{140}$ (88.48)	n α (10.64)	Ce^{137m} 34.4h	IT	0.16584	100.0	88.48
				0.268	100.0	10.58
$^{58}\text{Ce}^{142}$ (11.07)	2p (15.90)	Ba^{140} 12.8d	β^- to La^{140} 40.3h	0.48703	45.0	4.98
				0.53738	24.0	2.66
				0.81583	23.1	2.56
				0.32877	22.0	2.44
				0.92523	6.9	0.76
				0.1629	6.9	0.76
				0.86784	5.5	0.61
				0.30482	4.8	0.53
				0.75194	4.4	0.49
				2.5220	3.3	0.37

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{58}\text{Ce}^{142}$ cont. (11.07)	2p cont. (15.90)	Ba^{140} cont. 12.8d	β^- to La^{140} 40.3h	0.43255	3.3	0.37
				0.42369	3.2	0.35
				0.9196	2.5	0.28
				0.43755	2.1	0.23
	np (15.63)	La^{140} 40.27h	β^-	1.5966	95.6	10.58
				0.48703	45.0	4.98
				0.81583	23.1	2.56
				0.32877	22.0	2.44
				0.92523	6.9	0.76
				0.86784	5.5	0.61
$^{59}\text{Pr}^{141}$ (100.0)	n (7.21)	Ce^{141} 32.53d	β^-	0.75194	4.4	0.49
				2.5220	3.3	0.37
$^{60}\text{Nd}^{142}$ (27.11)	np (14.27)	Ce^{139} 137.5d	EC	0.43255	3.3	0.37
				0.14545	70.6	7.82
				0.16584	100.0	100.00
	He ³ (13.78)	Ce^{137m} 34.4h	IT	0.255	99.4	26.95
				0.168	0.4	0.11
				0.825	0.3	0.08
	α (-0.59)	Ce^{139} 137.5d	EC	0.16584	100.0	27.11
				0.14545	70.6	8.59
				0.16584	100.0	12.17
$^{60}\text{Nd}^{143}$ (12.17)	2p (13.13)	Ce^{141} 32.53d	β^-	0.16584	100.0	23.85
				0.14545	70.6	16.84
	n α (7.14)	Ce^{139} 137.5d	EC	0.16584	100.0	5.86
				0.14545	70.6	7.22
				0.2933	41.0	3.40
	He ³ (13.23)	Ce^{141} 32.53d	β^-	0.725	6.7	0.56
				0.668	6.1	0.51
				0.05737	87.0	

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity × Abundance			
				Energy (MeV)	Percent				
$^{60}\text{Nd}^{145}$ cont. (8.30)	2p cont. (14.38)	Ce^{143} cont. 33.0h	β^-	0.3507	3.6	0.30			
				0.232	2.7	0.22			
				0.493	2.4	0.20			
				0.88	1.3	0.11			
				0.591	1.3	0.11			
				1.10	0.7	0.06			
				0.14545	70.6	12.15			
				0.05737	87.0	14.98			
				0.2933	41.0	7.06			
				0.725	6.7	1.17			
$^{60}\text{Nd}^{146}$ (17.22)	n α (5.96) He ³ (14.23)	Ce^{141} 32.53d Ce^{143} 33.0h	β^-	0.668	6.1	1.05			
				0.3507	3.6	0.62			
				0.232	2.7	0.46			
				0.493	2.4	0.41			
				0.88	1.3	0.22			
				0.591	1.3	0.22			
				1.10	0.7	0.12			
				0.13353	17.0	2.93			
				0.08012	5.4	0.93			
				0.69648	1.51	0.26			
$^{60}\text{Nd}^{148}$ (5.73)	n α (6.27) α (-0.57) n (7.33)	Ce^{143} 33.0h Ce^{144} 284.4d Ce^{144} 284.4d Nd^{147} 11.06d	β^-	0.05341	1.2	0.21			
				0.05903	1.17	0.20			
				2.18572	0.74	0.13			
				0.05737	87.0	4.99			
				0.2933	41.0	2.35			
				0.725	6.7	0.38			
				0.668	6.1	0.35			
				0.3507	3.6	0.21			
				0.232	2.7	0.15			
				0.493	2.4	0.14			
				0.88	1.3	0.07			
				0.591	1.3	0.07			
				0.13353	17.0	0.97			
				0.08012	5.4	0.31			
				0.69648	1.51	0.09			
				0.05341	1.2	0.07			
				0.05903	1.17	0.07			
				0.09106	83.6	4.79			
				0.5310	14.1	0.80			

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{60}\text{Nd}^{148}$ cont. (5.73)	n cont. (7.33)	Nd^{147} cont. 11.06d	β^-	0.3194	2.5	0.14
				0.4398	2.2	0.13
				0.2754	1.8	0.10
				0.400	1.4	0.08
				0.688	1.0	0.06
$^{62}\text{Sm}^{144}$ (3.09)	p (6.36)	Pm^{143} 265d	EC	0.742	47.0	1.45
$^{65}\text{Sm}^{147}$ (14.97)	T (12.75)	Pm^{144} 363d	EC	0.695	100.0	14.97
				0.615	100.0	14.97
				0.474	46.0	6.88
$^{62}\text{Sm}^{149}$ (13.83)	2n (14.78)	Sm^{145} 340d	EC	0.061	92.0	13.77
				0.09106	83.6	11.56
	2p (13.55)	Nd^{147} 11.06d	β^-	0.5310	14.1	1.95
				0.3194	2.5	0.35
				0.4398	2.2	0.30
				0.2754	1.8	0.25
				0.400	1.4	0.19
				0.688	1.0	0.14
				0.1966	0.7	0.10
				0.12047	0.7	0.10
				0.415	0.6	0.08
				0.31	0.6	0.08
				0.599	0.5	0.07
		$\text{Pm}^{148\text{m}}$ 42d	β^- , IT	0.551	93.0	12.86
				0.630	88.5	12.24
				0.727	36.8	5.09
				1.015	22.5	3.11
				0.916	15.8	2.18
				0.289	14.5	2.01
				0.413	13.4	1.85
				0.602	9.0	1.24
				0.1372	7.0	0.97
				0.0615	7.0	0.97
				0.502	5.1	0.70
				0.611	4.5	0.62
				0.433	4.5	0.62
				0.099	4.0	0.55
				0.312	2.8	0.39
				0.189	1.1	0.15

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{62}\text{Sm}^{149}$ cont. (13.83)	p cont. (7.51)	$\left\{ \begin{array}{l} \text{Pm}^{148} \\ 5.4\text{d} \end{array} \right.$	β^-	0.551	25.6	3.54
				1.465	24.4	3.37
				0.914	15.6	2.16
$^{62}\text{Sm}^{150}$ (7.44)	He ³ (13.81)	$\left\{ \begin{array}{l} \text{Nd}^{147} \\ 11.06\text{d} \end{array} \right.$	β^-	0.09106	83.6	6.22
				0.5310	14.1	1.05
				0.3194	2.5	0.19
	np (15.50)	$\left\{ \begin{array}{l} \text{Pm}^{148m} \\ 42\text{d} \end{array} \right.$	β^-, IT	0.4398	2.2	0.16
				0.2754	1.8	0.13
				0.400	1.4	0.10
				0.688	1.0	0.07
				0.1966	0.7	0.05
				0.12047	0.7	0.05
				0.551	93.0	6.92
$^{62}\text{Sm}^{152}$ (26.72)	p (8.27)	$\left\{ \begin{array}{l} \text{Pm}^{149} \\ 53.1\text{h} \end{array} \right.$	β^-	0.630	88.5	6.58
				0.727	36.8	2.74
				1.015	22.5	1.67
	n α (7.07)	$\left\{ \begin{array}{l} \text{Nd}^{147} \\ 11.06\text{d} \end{array} \right.$	β^-	0.916	15.8	1.18
				0.289	14.5	1.08
				0.413	13.4	1.00
				0.602	9.0	0.67
				0.1372	7.0	0.52
				0.0615	7.0	0.52
				0.502	5.1	0.38

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{62}\text{Sm}^{152}$ cont. (26.72)	n α cont. (7.07)	Nd^{147} cont. 11.06d	β^-	0.12047	0.7	0.19
				0.415	0.6	0.16
				0.31	0.6	0.16
				0.599	0.5	0.13
				0.2857	3.0	0.80
	T (13.62)	Pm^{149} 53.1h	β^-	0.10318	77.6	17.62
				0.06968	29.6	6.72
				0.07543	1.1	0.25
				0.09743	1.0	0.23
				0.08948	1.0	0.23
$^{62}\text{Sm}^{154}$ (22.71)	n (7.90)	Sm^{153} 46.8h	β^-	0.08337	1.0	0.23
				0.17285	0.35	0.08
				0.551	93.0	44.47
				0.630	88.5	42.32
				0.727	36.8	17.60
				1.015	22.5	10.76
				0.916	15.8	7.56
				0.289	14.5	6.94
				0.413	13.4	6.41
				0.602	9.0	4.30
$^{63}\text{Eu}^{151}$ (47.82)	He ³ (12.68)	$\text{Pm}^{148\text{m}}$ 42d	β^- , IT	0.1372	7.0	3.35
				0.0615	7.0	3.35
				0.502	5.1	2.44
				0.611	4.5	2.15
				0.433	4.5	2.15
				0.099	4.0	1.91
				0.312	2.8	1.34
				0.189	1.1	0.53
				0.551	25.6	12.25
				1.465	24.4	11.67
2p (13.17)	2p (13.17)	Pm^{148} 5.4d	β^-	0.914	15.6	7.46
				0.2857	3.0	1.43
				0.85	0.18	0.09
				0.58	0.15	0.07
				0.2772	—	
2n (14.42)	2n (14.42)	Eu^{149} 93d	EC	0.3277	—	
				0.2547	—	

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{63}\text{Eu}^{153}$ (52.18)	$n\alpha$ (6.94)	Pm^{148m} 42d Pm^{148} 5.4d Pm^{149} 53.1h	β^- , IT β^- β^-	0.551	93.0	48.53
				0.630	88.5	46.18
				0.727	36.8	19.20
				1.015	22.5	11.74
				0.916	15.8	8.24
				0.289	14.5	7.56
				0.413	13.4	6.99
				0.602	9.0	4.70
				0.1372	7.0	3.65
				0.0615	7.0	3.65
$^{64}\text{Gd}^{152}$ (0.20)	α (-0.29)	Pm^{149} 53.1h	β^-	0.502	5.1	2.66
				0.611	4.5	2.35
				0.433	4.5	2.35
				0.099	4.0	2.09
				0.312	2.8	1.46
				0.189	1.1	0.57
$^{64}\text{Gd}^{154}$ (2.15)	n (8.61)	Gd^{153} 242d	β^-	0.551	25.6	13.85
				1.465	24.4	12.73
				0.914	15.6	8.14
$^{64}\text{Gd}^{155}$ (14.73)	$2p$ (14.06)	Eu^{149} 93d	β^-	0.2857	3.0	1.57
				0.85	0.18	0.09
				0.58	0.15	0.08
$^{64}\text{Gd}^{155}$ (14.73)	$2n$ (15.06)	Sm^{153} 46.8h	β^-	0.2772	—	—
				0.3277	—	—
				0.2547	—	—
$^{64}\text{Gd}^{153}$ 242d		Gd^{153} 242d	β^-	0.10318	54.0	1.16
				0.09743	36.5	0.78
				0.06968	13.0	0.28
$^{64}\text{Gd}^{153}$ 242d		EC	β^-	0.10318	77.6	11.43
				0.06968	29.6	4.36
				0.07543	1.1	0.16
$^{64}\text{Gd}^{153}$ 242d		EC	β^-	0.09743	1.0	0.15
				0.08948	1.0	0.15
				0.08337	1.0	0.15
$^{64}\text{Gd}^{153}$ 242d		EC	β^-	0.17285	0.35	0.05
				0.10318	54.0	7.96
				0.09743	36.5	5.38
				0.06968	13.0	1.92

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{64}\text{Gd}^{155}$ cont. (14.73)	2n cont. (15.06)	Gd^{153} cont. 242d	EC	0.07543 0.08948	0.5 0.4	0.07 0.06
$^{64}\text{Gd}^{156}$ (20.47)	He^3 (14.86)	Sm^{153} 46.8h	β^-	0.10318 0.06968 0.07543 0.09743 0.08948 0.08337 0.17285	77.6 29.6 1.1 1.0 1.0 1.0 0.35	15.88 6.06 0.23 0.20 0.20 0.20 0.07
$^{64}\text{Gd}^{157}$ (15.68)	α (0.63)	Sm^{153} 46.8h	β^-	0.10318 0.06968 0.07543 0.09743 0.08948 0.08337 0.17285	77.6 29.6 1.1 1.0 1.0 1.0 0.35	12.17 4.64 0.17 0.16 0.16 0.16 0.05
	p (8.01)	Eu^{156} 15.2d	β^-	0.08897 0.8117 1.2306 0.7234 1.0650 1.2423 0.6463 1.1540 1.1534 2.0263 1.9656 1.0494 0.9696 2.0975 2.1866 1.9374 1.1682 1.0791 2.1807 1.3663 1.2773 1.8767 0.8671 0.5995	36.2 10.3 8.5 8.3 7.3 7.0 6.9 6.7 6.5 4.9 4.0 4.0 4.0 3.9 3.5 3.1 3.0 3.0 2.2 2.0 1.9 1.6 1.6 1.6	2.31 1.62 1.33 1.30 1.15 1.10 1.08 1.05 1.02 0.77 0.63 0.63 0.63 0.61 0.55 0.49 0.47 0.47 0.35 0.31 0.30 0.25 0.25 0.25

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{64}\text{Gd}^{158}$ (24.87)	$n\alpha$ (8.56)	Sm^{153} 46.8h	β^-	0.10318	77.6	19.30
				0.06968	29.6	7.36
				0.07543	1.1	0.27
				0.09743	1.0	0.25
				0.08948	1.0	0.25
				0.08337	1.0	0.25
				0.17285	0.35	0.09
	np (15.94)	Eu^{156} 15.2d	β^-	0.08897	36.2	9.00
				0.8117	10.3	2.56
				1.2306	8.5	2.11
				0.7234	8.3	2.06
				1.0650	7.3	1.82
				1.2423	7.0	1.74
				0.6463	6.9	1.72
				1.1540	6.7	1.67
				1.1534	6.5	1.62
				2.0263	4.9	1.22
				1.9656	4.0	0.99
				1.0494	4.0	0.99
				0.9606	4.0	0.99
				2.0975	3.9	0.97
				2.1866	3.5	0.87
				1.9374	3.1	0.77
				1.1682	3.0	0.75
				1.0791	3.0	0.75
$^{65}\text{Tb}^{159}$ (100.0)	He^3 (14.42)	Eu^{156} 15.2d	β^-	2.1807	2.2	0.55
				1.3663	2.0	0.50
				1.2773	1.9	0.47
				1.8767	1.6	0.40
				0.8671	1.6	0.40
				0.5995	1.6	0.40
				0.08897	36.2	36.20
				0.8117	10.3	10.30
				1.2306	8.5	8.50
				0.7234	8.3	8.30
				1.0650	7.3	7.30
				1.2423	7.0	7.00

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity × Abundance
				Energy (MeV)	Percent	
$^{65}\text{Tb}^{159}$ cont. (100.0)	He^3 cont. (14.42)	Eu^{156} cont. 15.2d	β^-	0.9606	4.0	4.00
				2.0975	3.9	3.90
				2.1866	3.5	3.50
				1.9374	3.1	3.10
				1.1682	3.0	3.00
				1.0791	3.0	3.00
				2.1807	2.2	2.20
				1.3663	2.0	2.00
				1.2773	1.9	1.90
				1.8767	1.6	1.60
				0.8671	1.6	1.60
				0.5995	1.6	1.60
$^{66}\text{Dy}^{158}$ (0.090)	np (15.64)	Tb^{156} 5.1d	EC	0.08897	100.0	0.09
$^{66}\text{Dy}^{160}$ (2.29)	n (8.59)	Dy^{159} 144d	EC	0.0580	26.0	0.60
$^{66}\text{Dy}^{161}$ (18.88)	p (7.48)	Tb^{160} 72.4d	β^-	0.08679	75.4	14.24
				0.8793	33.2	6.25
				0.2985	26.8	5.06
				0.9961	23.5	4.44
				1.1781	13.2	2.49
				0.9625	9.2	1.74
				1.2720	7.5	1.42
				0.19702	6.5	1.23
				0.21564	4.0	0.76
				1.200	3.0	0.57
				1.312	2.8	0.53
				0.7653	2.7	0.51
				1.115	2.2	0.42
				0.3924	1.5	0.28
				1.003	1.0	0.19
				0.3096	0.9	0.17
				0.6822	0.6	0.11
$^{66}\text{Dy}^{162}$ (25.53)	2n (15.04)	Dy^{159} 144d	EC	0.0580	26.0	4.81

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity × Abundance
				Energy (MeV)	Percent	
$^{66}\text{Dy}^{162}$ cont. (25.53)	np cont. (15.68)	Tb^{160} cont. 72.4d	β^-	0.9625	9.2	2.35
				1.2720	7.5	1.91
				0.19702	6.5	1.66
				0.21564	4.0	1.02
				1.200	3.0	0.77
				1.312	2.8	0.71
				0.7653	2.7	0.69
				1.115	2.2	0.56
				0.3924	1.5	0.38
				1.003	1.0	0.26
				0.3096	0.9	0.23
				0.6822	0.6	0.15
				0.07457	32.5	8.30
				0.05720	21.6	5.52
				0.08793	2.6	0.66
$^{66}\text{Dy}^{163}$ (24.97)	p (8.01)	Tb^{161} 7.0d	β^-	0.10610	1.3	0.33
				0.13175	0.5	0.13
				0.08679	75.4	18.83
				0.8793	33.2	8.27
				0.2985	26.8	6.70
				0.9961	23.5	5.87
				1.1781	13.2	3.30
				0.9625	9.2	2.30
				1.2720	7.5	1.87
				0.19702	6.5	1.62
				0.21564	4.0	1.00
				1.200	3.0	0.75
				1.312	2.8	0.70
				0.7653	2.7	0.67
				1.115	2.2	0.55
$^{66}\text{Dy}^{164}$ (28.18)	T (13.45)	Tb^{160} 72.4d	β^-	0.3924	1.5	0.37
				1.003	1.0	0.25
				0.3096	0.9	0.22
				0.6822	0.6	0.15
				0.07457	32.5	8.12
				0.05720	21.6	5.40
				0.08793	2.6	0.65
				0.10610	1.3	0.32
				0.13175	0.5	0.12
				0.07457	32.5	9.16
				0.05720	21.6	6.09

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{66}\text{Dy}^{164}$ cont. (28.18)	T cont. (13.43)	Tb^{161} cont. 7.0d	β^-	0.08793	2.6	0.73
				0.10610	1.3	0.37
				0.13175	0.5	0.14
				0.08679	75.4	75.40
				0.8793	33.2	33.20
				0.2985	26.8	26.80
				0.9961	23.5	23.50
				1.1781	13.2	13.20
				0.9625	9.2	9.20
				1.2720	7.5	7.50
$^{67}\text{Ho}^{165}$ (100.0)	n α (7.45)	Tb^{160} 72.4d	β^-	0.19702	6.5	6.50
				0.21564	4.0	4.00
				1.200	3.0	3.00
				1.312	2.8	2.80
				0.7653	2.7	2.70
				1.115	2.2	2.20
				0.3924	1.5	1.50
				1.003	1.0	1.00
				0.3096	0.9	0.90
				0.6822	0.6	0.60
$^{68}\text{Er}^{162}$ (0.136)	2n (*)	Er^{160} 29h	β^-	0.07457	32.5	32.50
				0.05720	21.6	21.60
				0.08793	2.6	2.60
				0.10610	1.3	1.30
				0.13175	0.5	0.50
$^{68}\text{Er}^{164}$ (1.56)	n α (7.18)	Dy^{159} 144d	EC	0.0580	26.0	0.41
				0.08056	48.0	11.01
$^{68}\text{Er}^{167}$ (22.94)	p (7.50)	Ho^{166} 26.8h	β^-	1.3798	0.9	0.21
				0.08245	94.0	25.45
$^{68}\text{Er}^{168}$ (27.07)	2p (14.97)	Dy^{166} 81.5h	β^-	0.08056	48.0	12.99
				1.3798	0.9	0.24
$^{68}\text{Er}^{170}$ (14.88)	α (-0.14)	Dy^{166} 81.5h	β^-	0.08245	94.0	13.99

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance	
				Energy (MeV)	Percent		
$^{69}\text{Tm}^{169}$ (100.0)	He^3 (13.11)	Ho^{166} 26.8h	β^-	0.08056	48.0	48.00	
				1.3798	0.9	0.90	
		Tm^{167} 9.3d	EC	0.20780	98.0	98.00	
	2n (15.01)			0.0571	25.0	25.00	
				0.5315	2.0	2.00	
	Tm^{168} 93.1d			0.831	—	—	
				0.1984	—	—	
				0.743	—	—	
				0.4477	—	—	
				0.6462	—	—	
				0.0798	—	—	
$^{70}\text{Yb}^{168}$ (0.135)	T (13.44)	Tm^{165} 30h	EC, β^+	0.0545	—	—	
				0.2972	—	—	
				0.1136	—	—	
	p (6.24)	Tm^{167} 9.3d	EC	0.20780	98.0	0.13	
				0.0820	100.0	0.14	
				0.0571	25.0	—	
	2n (15.85)	Yb^{166} 57.5h	EC	0.20780	98.0	2.97	
				0.0571	25.0	0.76	
				0.831	—	—	
				0.1984	—	—	
				0.743	—	—	
				0.4477	—	—	
				0.6462	—	—	
$^{70}\text{Yb}^{170}$ (3.03)	T (13.10)	Tm^{167} 9.3d	EC	0.0798	—	—	
				0.06312	93.1	2.82	
				0.10977	63.2	1.91	
	np (14.62)	Tm^{168} 93.1d	EC	0.19797	51.5	1.56	
				0.17718	30.1	0.91	
				0.30768	15.5	0.47	
				0.13051	15.0	0.45	
				0.09362	12.0	0.36	
				0.11817	6.3	0.19	
				0.26104	2.9	0.09	

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{70}\text{Yb}^{171}$ (14.31)	T (12.90)	Tm^{168} 93.1d	EC	0.831	—	
				0.1984	—	
				0.743	—	
				0.4477	—	
				0.6462	—	
	p (6.95)	Tm^{170} 129d	β^-	0.08426	23.0	3.29
				0.06312	93.1	13.32
				0.10977	63.2	9.04
				0.19797	51.5	7.37
				0.17718	30.1	4.31
$^{70}\text{Yb}^{172}$ (21.82)	np (15.08)	Tm^{170} 129d	β^-	0.30768	15.5	2.22
				0.13051	15.0	2.15
				0.09362	12.0	1.72
				0.11817	6.3	0.90
				0.26104	2.9	0.41
				0.08426	23.0	5.02
				0.07874	65.0	10.48
				1.468	7.0	1.13
				1.389	7.0	1.13
				1.095	6.5	1.05
$^{70}\text{Yb}^{173}$ (16.13)	T (13.08)	Tm^{170} 129d	β^-	1.61	5.0	0.81
				1.53	5.0	0.81
				0.407	69.0	21.97
				0.610	40.4	12.86
				0.0679	27.9	8.88
	p (7.58)	Tm^{172} 63.6h	β^-	0.0599	22.9	7.29
				0.128	18.5	5.89
				0.475	7.0	2.23
				0.539	2.6	0.83
				0.061	1.1	0.35
$^{70}\text{Yb}^{174}$ (31.84)	2p (15.13)	Er^{172} 49h	β^-	0.203	0.8	0.25
				0.164	0.8	0.25
				0.346	0.7	0.22
				0.446	0.4	0.13
				0.384	0.4	0.13

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{70}\text{Yb}^{174}$ cont. (31.84)	np (15.02)	Tm^{172} 63.6h	β^-	0.07874	65.0	20.70
				1.468	7.0	2.23
				1.389	7.0	2.23
				1.095	6.5	2.07
				1.61	5.0	1.59
				1.53	5.0	1.59
				0.407	69.0	8.78
				0.610	40.4	5.14
				0.0679	27.9	3.55
				0.0599	22.9	2.92
$^{70}\text{Yb}^{176}$ (12.73)	α (-0.69)	Er^{172} 49h	β^-	0.128	18.5	2.36
				0.475	7.0	0.89
				0.539	2.6	0.33
				0.061	1.1	0.14
				0.203	0.8	0.10
				0.164	0.8	0.10
				0.346	0.7	0.09
				0.446	0.4	0.05
				0.384	0.4	0.05
				0.3963	6.5	0.83
$^{71}\text{Lu}^{175}$ (97.41)	n (6.64)	Yb^{175} 4.19d	β^-	0.11381	6.3	0.80
				0.2826	4.1	0.52
				0.14483	0.4	0.05
				0.273	100.0	97.41
				0.176	100.0	97.41
				0.0765	100.0	97.41
				0.994	98.0	95.46
				0.63	2.0	1.95
				0.365	2.0	1.95
				0.0765	62.0	60.39
$^{71}\text{Lu}^{176}$ (2.59)	p (5.88)	$\text{Lu}^{174\text{m}}$ 156d	EC	1.243	9.0	8.76
				0.3963	6.5	0.17
				0.11381	6.3	0.16
$^{72}\text{Hf}^{174}$ (0.17)	n α (6.00)	Yb^{175} 4.19d	β^-	0.2826	4.1	0.10
				0.06312	93.1	0.16
				0.10977	63.2	0.11
				0.19797	51.5	0.09
				0.17718	30.1	0.05
$^{72}\text{Hf}^{174}$ (0.17)	n α (6.00)	Yb^{169} 31d	EC	0.06312	93.1	0.16
				0.10977	63.2	0.11

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance		
				Energy (MeV)	Percent			
$^{72}\text{Hf}^{174}$ cont. (0.17)	T (12.88)	Lu^{171} 8.2d	EC	0.07589 0.741	81.5 52.7	0.14 0.09		
	np (14.33)	Lu^{172} 6.70d	EC	0.07874	100.0	0.17		
$^{72}\text{Hf}^{176}$ (5.20)	np (14.23)	$\text{Lu}^{174\text{m}}$ 156d	EC	0.273 0.176 0.0765 0.994 0.63	100.0 100.0 100.0 98.0 2.0	5.20 5.20 5.20 5.10 0.10		
				0.365	2.0	0.10		
				Lu^{174} 300d	0.0765 1.243	3.22 0.47		
				Hf ¹⁷⁵ 70d	0.3434 0.08936 0.4330	4.96 0.51 0.21		
				$\text{Lu}^{174\text{m}}$ 156d	0.273 0.176 0.0765 0.994 0.63	18.50 18.50 18.50 18.13 0.37		
	n (8.11)			Lu^{174} 300d	0.365 0.0765 1.243	0.37 11.47 1.67		
				Lu^{174} 300d	0.3434 0.08936 0.4330 0.2996	17.63 1.83 0.76 0.11		
				Hf ¹⁷⁵ 70d	0.3434 0.08936 0.4330 0.2996	17.63 1.83 0.76 0.11		
				$\text{Lu}^{174\text{m}}$ 156d	0.273 0.176 0.0765 0.994 0.63	18.50 18.50 18.50 18.13 0.37		
				Lu^{174} 300d	0.365 0.0765 1.243	0.37 11.47 1.67		
$^{72}\text{Hf}^{177}$ (18.5)	T (12.11)	$\text{Lu}^{174\text{m}}$ 156d	EC	0.3434 0.08936 0.4330	95.3 9.9 4.1	4.96 0.51 0.21		
				0.2996	0.6	0.11		
				$\text{Lu}^{174\text{m}}$ 156d	0.273 0.176 0.0765 0.994 0.63	18.50 18.50 18.50 18.13 0.37		
				Lu^{174} 300d	0.365 0.0765 1.243	0.37 11.47 1.67		
				Hf ¹⁷⁵ 70d	0.3434 0.08936 0.4330 0.2996	17.63 1.83 0.76 0.11		
	2n (14.47)			$\text{Lu}^{174\text{m}}$ 156d	0.273 0.176 0.0765 0.994 0.63	18.50 18.50 18.50 18.13 0.37		
				Lu^{174} 300d	0.365 0.0765 1.243	0.37 11.47 1.67		
				$\text{Lu}^{174\text{m}}$ 156d	0.3434 0.08936 0.4330 0.2996	17.63 1.83 0.76 0.11		
				Lu^{174} 300d	0.365 0.0765 1.243	0.37 11.47 1.67		
				Hf ¹⁷⁵ 70d	0.3434 0.08936 0.4330 0.2996	17.63 1.83 0.76 0.11		
$^{72}\text{Hf}^{178}$ (27.14)	He ³ (12.38)	Yb ¹⁷⁵ 4.19d	β^-	0.3963 0.11381 0.2826 0.14483 0.2514	6.5 6.3 4.1 0.4 0.3	1.76 1.71 1.11 0.11 0.08		
				0.13765	0.2	0.05		
				Lu^{177} 6.71d	0.11297 0.2083	13.6 6.6		
				Lu^{177} 6.71d	0.11297 0.2083	3.69 1.79		
				Lu^{177} 6.71d	0.11297 0.2083	3.69 1.79		

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance	
				Energy (MeV)	Percent		
$^{72}\text{Hf}^{179}$ (13.75)	α (-2.13)	Yb^{175} 4.19d	β^-	0.3963	6.5	0.89	
				0.11381	6.3	0.87	
		Lu^{177} 6.71d		0.2826	4.1	0.56	
				0.14483	0.4	0.06	
	np (13.40)	Lu^{177} 6.71d	β^-	0.11297	13.6	1.87	
				0.2083	6.6	0.91	
		Yb^{175} 4.19d		0.3963	6.5	2.29	
				0.11381	6.3	2.22	
				0.2826	4.1	1.44	
				0.14483	0.4	0.14	
$^{72}\text{Hf}^{180}$ (35.24)	$n\alpha$ (5.21)	Yb^{175} 4.19d	β^-	0.2514	0.3	0.11	
				0.13765	0.2	0.07	
				0.11297	13.6	4.79	
				0.2083	6.6	2.83	
		Lu^{177} 6.71d		0.11297	13.6	13.59	
				0.2083	6.6	6.59	
$^{74}\text{W}^{180}$ (0.14)	$n\alpha$ (5.47)	Hf^{175} 70d	EC	0.3434	95.3	0.13	
$^{74}\text{W}^{183}$ (14.40)	$2p$ (13.44)	Hf^{181} 42.4d	β^-	0.13302	95.0	13.68	
				0.4820	80.8	11.64	
				0.3459	13.3	1.93	
				0.13625	13.3	1.93	
				0.619	3.0	0.43	
				0.13686	2.0	0.29	
				0.476	1.9	0.27	
	p (7.14)	Ta^{182} 115d	β^-	0.10010	57.1	8.22	
				0.06775	36.3	5.22	
				1.122	25.0	3.60	
				1.222	20.5	2.95	
				1.231	14.4	2.07	
				1.189	13.5	1.94	
				0.22210	13.1	1.89	
				0.15243	8.3	1.20	
				0.26407	6.1	0.88	
				0.17939	5.2	0.75	
				0.1264	4.6	0.66	
				0.06572	4.6	0.66	
				0.08468	3.1	0.45	
				1.002	2.8	0.33	
				0.15639	1.4	0.20	

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
⁷⁴ W ¹⁸⁴ (30.64)	He ³ (13.14)	Hf ¹⁸¹ 42.4d	β^-	0.13302	95.0	29.11
				0.4820	80.8	24.76
				0.3459	13.3	4.08
				0.13625	13.3	4.08
				0.619	3.0	0.92
				0.13686	2.0	0.61
				0.476	1.9	0.58
				0.10010	57.1	17.50
				0.06775	36.3	11.12
				1.122	25.0	7.66
				1.222	20.5	6.28
				1.231	14.4	4.41
				1.189	13.5	4.14
				0.22210	13.1	4.01
				0.15243	8.3	2.54
				0.26407	6.1	1.87
				0.17939	5.2	1.59
				0.1264	4.6	1.41
				0.06572	4.6	1.41
				0.08468	3.1	0.95
				1.002	2.3	0.70
				1.15639	1.4	0.43
⁷⁴ W ¹⁸³ (7.70)	np (14.56)	Ta ¹⁸² 115d	β^-	0.24606	37.8	11.58
				0.09908	37.5	11.49
				0.10793	33.8	10.36
				0.05259	29.4	9.01
				0.35399	15.9	4.87
				0.24426	12.6	3.86
				0.16134	12.6	3.86
				0.16232	11.2	3.43
				0.29172	9.5	2.91
				0.16053	9.0	2.76
				0.2103	6.7	2.05
				0.31300	5.4	1.65
				0.13302	95.0	26.99
				0.4820	80.8	22.95
				0.3459	13.3	3.78
⁷⁴ W ¹⁸⁶ (28.41)	n α (5.53)	Hf ¹⁸¹ 42.4d	β^-	0.13625	13.3	3.78
				0.619	3.0	0.85
				0.13686	2.0	0.56
				0.476	1.9	0.54
				.95	—	
				.093	—	
⁷⁴ W ¹⁸³ (14.37)	He ³ (14.37)	Hf ¹⁸³ 91d	β^-			

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity × Abundance
				Energy (MeV)	Percent	
$^{74}_{\Lambda}\text{W}^{186}$ Cont. (28.41)	T (12.18)	Ta^{183} 5.0d	β^-	0.24606	37.8	10.74
				0.09908	37.5	10.65
				0.10793	33.8	9.60
				0.05259	29.4	8.36
				0.35399	15.9	4.52
				0.24426	12.6	3.78
				0.16134	12.6	3.78
				0.16232	11.2	3.18
				0.29172	9.5	2.70
				0.16053	9.0	2.56
				0.2103	6.2	1.76
				0.31300	5.4	1.53
$^{75}_{\Lambda}\text{Re}^{185}$ (37.07)	He ³ (12.24)	Ta^{182} 115d	β^-	0.10010	57.1	21.17
				0.06775	36.3	13.45
				1.122	25.0	9.26
				1.222	20.5	7.60
				1.231	14.4	5.34
				1.189	13.5	5.00
				0.22210	13.1	4.86
				0.15243	8.3	3.11
				0.26407	6.1	2.26
				0.17939	5.2	1.93
				0.1264	4.6	1.71
				0.06572	4.6	1.71
				0.08468	3.1	1.15
				1.002	2.3	0.85
				0.15639	1.4	0.52
$^{75}_{\Lambda}\text{Re}^{185}$ (37.07)	2p (13.10)	Ta^{183} 5.0d	β^-	0.24606	37.8	14.01
				0.09908	37.5	13.90
				0.10793	33.8	12.53
				0.05259	29.4	10.90
				0.35399	15.9	5.89
				0.24426	12.6	4.67
				0.16134	12.6	4.67
				0.16232	11.2	4.15
				0.29172	9.5	3.52
				0.16053	9.0	3.34
				0.2103	6.2	2.30
				0.31300	5.4	2.00

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{75}\text{Re}^{185}$ Cont. (37.07)	2n (14.47) n (7.81)	Re^{183} 70d $\left\{ \begin{array}{l} \text{Re}^{184m} \\ 169d \end{array} \right.$ $\left\{ \begin{array}{l} \text{Re}^{184} \\ 38d \end{array} \right.$ Ta^{182} 115d	EC IT, EC EC β^-	0.16053	44.7	16.57
				0.09908	15.4	5.71
				0.05259	12.1	4.49
				0.29172	10.8	4.00
				0.20881	5.6	2.08
				0.10973	5.6	2.08
				0.10793	4.4	1.63
				0.08471	3.7	1.37
				0.24606	1.8	0.67
				0.16053	1.2	0.44
				0.08292	1.2	0.44
				0.24524	1.1	0.41
				0.1047	70.0	25.95
				0.0834	70.0	25.95
				0.1112	41.8	15.50
				0.904	28.2	10.45
$^{75}\text{Re}^{187}$ (62.93)	n α (5.22)	Re^{184} 38d β^-	IT, EC EC β^-	0.793	26.5	9.82
				0.896	12.6	4.67
				0.1112	59.7	22.13
				0.904	40.3	14.94
				0.793	37.9	14.05
				0.896	17.8	6.60
				0.643	2.2	0.81
				0.540	0.8	0.30
				0.770	0.6	0.22
				1.024	0.4	0.15
				0.10010	57.1	35.93
				0.06775	36.3	22.84
				1.122	25.0	15.73
				1.222	20.5	12.90
				1.231	14.4	9.06

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{75}\text{Re}^{187}$ Cont. (62.93)	α (-1.64)	Ta^{183} 5.0d	β^-	0.24606	37.8	23.79
				0.09908	37.5	23.61
				0.10793	33.8	21.27
				0.05259	29.4	18.50
				0.35399	15.9	10.01
				0.24426	12.6	7.93
				0.16134	12.6	7.93
				0.16232	11.2	7.05
				0.29172	9.5	5.98
				0.16053	9.0	5.66
$^{76}\text{Os}^{186}$ (1.59)	n (7.31)	Re^{186} 91h	β^-	0.13716	23.0	14.47
				0.16053	44.7	0.71
				0.09908	15.4	0.24
				0.05259	12.1	0.19
				0.29172	10.8	0.17
				0.20881	5.6	0.09
				0.10973	5.6	0.09
				0.10793	4.4	0.07
				0.08471	3.7	0.06
				0.1047	70.0	1.11
n (14.34)	np (14.34)	$\left\{ \begin{array}{l} \text{Re}^{184m} \\ 169d \end{array} \right.$	IT, EC	0.0834	70.0	1.11
				0.1112	41.8	0.67
				0.904	28.2	0.45
				0.793	26.5	0.42
				0.896	12.6	0.20
				0.1112	59.7	0.95
				0.904	40.3	0.64
				0.793	37.9	0.60
				0.896	17.8	0.28
				0.6458	79.3	1.26
n (8.30)	n (8.30)	Os^{185} 94d	EC	0.879	8.0	0.13
				0.872	7.0	0.11
				0.7141	4.6	0.07

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{76}\text{Os}^{187}$ (1.64)	T (12.10)	Re^{184m} 169d	IT, EC	0.1047	70.0	1.15
				0.0834	70.0	1.15
				0.1112	41.8	0.68
				0.904	28.2	0.46
				0.793	26.5	0.43
	p (6.53)	Re^{184} 38d	EC	0.896	12.6	0.21
				0.1112	59.7	0.98
				0.904	40.3	0.66
				0.793	37.9	0.62
				0.896	17.8	0.29
$^{76}\text{Os}^{188}$ (13.3)	2n (14.54)	Re^{186} 91h	β^-	0.13716	23.0	0.38
				0.6458	79.3	1.30
				0.879	8.0	0.13
				0.872	7.0	0.11
				0.7142	4.6	0.08
	np (14.37)	Re^{186} 91h	β^-	0.13716	23.0	3.06
				0.13716	23.0	3.70
				0.13716	23.0	—
				0.13716	23.0	—
				0.13716	23.0	—
$^{76}\text{Os}^{189}$ (16.1)	2p (14.76)	W^{188} 69d	β^-	0.06358	0.9	0.24
				0.290	0.4	0.11
				0.227	0.4	0.11
	p (7.99)	Re^{189} 130d	β^-	0.211	—	—
				0.57	—	—
				0.67	—	—
				0.211	—	—
				0.57	—	—
$^{76}\text{Os}^{190}$ (26.4)	α (-0.03)	W^{188} 69d	β^-	0.06358	0.9	0.37
				0.290	0.4	0.16
				0.227	0.4	0.16
	T (13.02)	Re^{189} 130d	β^-	0.211	—	—
				0.57	—	—
				0.67	—	—
				0.211	—	—
				0.57	—	—
$^{76}\text{Os}^{192}$ (41.0)	n (7.62)	Os^{191} 15.5d	β^-	0.08233	—	—
				0.12939	—	—
				0.09645	—	—
				0.1789	—	—
				0.08233	—	—

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{77}\text{Ir}^{191}$ (37.3)	n α (5.27)	Re^{186} 91h	β^-	0.13716	23.0	8.58
				0.0696	—	
				0.0591	—	
				0.2450	—	
				0.0953	—	
	2n (14.54)	Ir^{189} 13.3d	EC	0.0593	—	
				0.0565	—	
				0.952	—	
				0.1867	—	
				0.1968	—	
$^{77}\text{Ir}^{193}$ (62.7)	np (13.45)	Os^{191} 15.5d	β^-	0.4072	—	51.29
				0.3711	—	
				0.6053	—	
				0.5578	—	
				0.2946	—	
	n (7.79)	Ir^{192} 74.3d	EC, β^-	0.5693	—	
				0.3612	—	
				0.08233	—	
				0.12939	—	
				0.09645	—	
	γ^1 (M4)	Ir^{193m} 12d	IT	0.1789	—	45.02
				0.31649	81.8	
				0.29594	71.8	
				0.30843	32.4	
				0.61243	13.7	
				0.60438	9.2	
				0.58856	4.1	
				0.20579	4.1	
				0.4846	3.4	
				0.3746	0.5	
				0.20128	0.5	
				0.8846	0.4	
				0.46805	0.4	
				0.13634	0.4	
				0.0802	100.0	
						62.70

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy . (MeV)	Percent	
⁷⁸ Pt ¹⁹² (0.78)	T (12.87)	Ir ¹⁸⁹ 13.3d	EC	0.0696	—	
				0.0591	—	
				0.2450	—	
	np (15.06)	Ir ¹⁹⁰ 12d	EC	0.0953	—	
				0.0593	—	
				0.0565	—	
				0.952	—	
				0.1867	—	
				0.1968	—	
⁷⁸ Pt ¹⁹⁴ (32.9)	n (8.35)	Pt ¹⁹¹ 3.0d	EC	0.4072	—	
				0.3711	—	
				0.6053	—	
				0.5578	—	
	He ³ (13.29)	Os ¹⁹¹ 15.5d	β^-	0.2946	—	
				0.5693	—	
				0.3612	—	
				0.08233	—	
				0.12939	—	
				0.1722	—	
				0.09645	—	
				0.08233	—	
⁷⁸ Pt ¹⁹⁴ (32.9)	np (15.34)	Ir ¹⁹² 74.3d	EC, β^-	0.12939	—	
				0.09645	—	
				0.1789	—	
				0.31649	81.8	26.91
				0.29594	71.8	23.62
				0.30843	32.4	10.66
				0.61243	13.7	4.51
				0.60438	9.2	3.03
				0.58856	4.1	1.35
				0.20579	4.1	1.35
				0.4846	3.4	1.12
				0.3746	0.5	0.16
				0.20128	0.5	0.16
				0.8846	0.4	0.13
⁷⁸ Pt ¹⁹⁴ (32.9)	p (7.56)	Ir ^{193m} 12d	IT	0.46805	0.4	0.13
				0.13634	0.4	0.13
	n (8.34)	Pt ^{193m} 4.3d	IT	0.0802	100.0	32.90
				0.1354	100.0	32.90

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{78}\text{Pt}^{195}$ (33.8)	α (-1.16) 2p (14.03) T (12.99) np (13.68) 2n (14.51) $n\alpha$ (6.77) He ³ (14.24)	Os^{191} 15.5d Os^{193} 31h Ir^{192} 74.3d Ir^{193m} 12d Pt^{193m} 4.3d Os^{191} 15.5d Os^{193} 31h	β^- β^- EC, β^- IT IT β^- β^-	0.08233 0.12939 0.09645 0.1789 0.139 0.460 0.559 0.0730 0.281 0.388 0.322 0.248 0.278 0.362 0.31649 0.29594 0.30843 0.61243 0.60438 0.58856 0.20579 0.4846 0.3746 0.20128 0.8846 0.46805 0.13634 0.0802 0.1354 0.08233 0.12939 0.09645 0.1789 0.139 0.460 0.559 0.0730 0.281 0.388	— — — — 11.1 4.1 2.3 2.2 1.6 1.5 1.4 0.7 0.6 0.5 81.8 71.8 32.4 13.7 9.2 4.1 4.1 3.4 0.5 0.5 0.4 0.4 0.4 100.0 100.0 — — — — 11.1 4.1 2.3 2.2 1.6 1.5	— — — — 3.75 1.39 0.78 0.74 0.64 0.51 0.47 0.24 0.20 0.17 27.65 24.27 10.95 4.63 3.11 1.39 1.39 1.15 0.17 0.17 0.14 0.14 0.14 33.80 33.80 — — — — 2.81 1.04 0.58 0.56 0.40 0.38
				0.139 0.460 0.559 0.0730 0.281 0.388	11.1 4.1 2.3 2.2 1.6 1.5	
				0.139 0.460 0.559 0.0730 0.281 0.388	4.1 2.3 2.2 1.6 1.5	
				0.139 0.460 0.559 0.0730 0.281 0.388	2.3 2.2 2.2 1.6 1.5	
				0.139 0.460 0.559 0.0730 0.281 0.388	2.2 2.2 2.2 1.6 1.5	
				0.139 0.460 0.559 0.0730 0.281 0.388	1.6 1.6 1.6 1.5	
				0.139 0.460 0.559 0.0730 0.281 0.388	0.6 0.6 0.6 0.5	
				0.139 0.460 0.559 0.0730 0.281 0.388	0.5 0.5 0.5 0.5	
				0.139 0.460 0.559 0.0730 0.281 0.388	0.4 0.4 0.4 0.4	
				0.139 0.460 0.559 0.0730 0.281 0.388	0.4 0.4 0.4 0.4	

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{78}\text{Pt}^{196}$ cont. (25.3)	He^3 cont. (14.24)	Os^{193} cont. 31h	β^-	0.322	1.4	0.35
				0.248	0.7	0.18
				0.278	0.6	0.15
				0.362	0.5	0.13
	T (13.13)	$\text{Ir}^{193\text{m}}$ 12d	IT	0.0802	100.0	25.30
	n (7.93)	$\text{Pt}^{195\text{m}}$ 4.1d	IT	0.1299	100.0	25.30
				0.0985	53.0	13.41
				0.1294	47.0	11.89
$^{78}\text{Pt}^{198}$ (7.21)	$n\alpha$ (7.08)	Os^{193} 31h	β^-	0.139	11.1	0.80
				0.460	4.1	0.30
				0.559	2.3	0.17
				0.0730	2.2	0.16
				0.281	1.6	0.12
				0.388	1.5	0.11
				0.322	1.4	0.10
				0.248	0.7	0.05
$^{79}\text{Au}^{197}$ (100.0)	$n\alpha$ (6.92)	Ir^{192} 74.3d	EC, β^-	0.31649	81.8	81.80
				0.29594	71.8	71.80
				0.30843	32.4	32.40
				0.61243	13.7	13.70
				0.60438	9.2	9.20
				0.58856	4.1	4.10
				0.20579	4.1	4.10
				0.4846	3.4	3.40
				0.3746	0.5	0.50
				0.20128	0.5	0.50
				0.8846	0.4	0.40
				0.46805	0.4	0.40
				0.13634	0.4	0.40
	α (-0.86)	$\text{Ir}^{193\text{m}}$ 12d	IT	0.0802	100.0	100.00
	np (13.75)	$\text{Pt}^{195\text{m}}$ 4.1d	IT	0.1299	100.0	100.00
				0.0985	53.0	53.00
				0.1294	47.0	47.00
	$2n$ (14.75)	Au^{195} 184d	EC	0.0988	79.7	79.70
				0.1294	19.3	19.30
				0.2112	1.0	1.00

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{79}\text{Au}^{197}$ cont. (100.0)	n (8.08)	Au^{196} 6.18d	EC, β^+, β^-	0.3557 0.6887 0.4261	67.0 26.0 6.0	67.00 26.00 6.00
$^{80}\text{Hg}^{196}$ (0.146)	n α (6.42)	Pt^{191} 3.0d	EC	0.08233 0.12939 0.1722 0.09645	— — — —	
	He ³ (12.36)	Pt^{193m} 4.3d	IT	0.1354	100.0	0.15
	np (14.99)	Au^{194} 39.5h	EC, β^+	0.32850 0.29355 0.16394	— — —	
	p (6.57)	Au^{195} 184d	EC	0.0988	79.7	0.12
	n (8.82)	Hg^{195m} 40h	IT, EC	0.1230 0.0567	50.0 —	0.07
$^{80}\text{Hg}^{198}$ (10.02)	n α (7.05)	Pt^{193m} 4.3d	IT	0.1354	100.0	10.02
	He ³ (13.12)	Pt^{195m} 4.1d	IT	0.1299 0.0985 0.1294	100.0 53.0 47.0	10.02 5.31 4.71
	T (13.36)	Au^{195} 184d	EC	0.0988 0.1294 0.2112	79.7 19.3 1.0	7.99 0.19 0.10
	np (15.17)	Au^{196} 6.18d	EC, β^+, β^-	0.3557 0.6887 0.4261	67.0 26.0 6.0	6.71 2.61 0.60
	n (8.63)	Hg^{197} 64.1h	EC	0.07734 0.1915	99.95 1.22	10.01 0.12
$^{80}\text{Hg}^{199}$ (16.84)	α (-0.80)	Pt^{195m} 4.1d	IT	0.1299 0.0985 0.1294	100.0 53.0 47.0	16.84 8.92 7.92
	T (13.34)	Au^{196} 6.18d	EC, β^+, β^-	0.3557 0.6887 0.4261	67.0 26.0 6.0	11.28 4.38 1.01

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction (Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{80}\text{Hg}^{199}$ cont. (16.84)	p (7.24)	Au^{198} 2.697d	β^-	0.41180 0.67588	99.8 0.8	16.81 0.13
	2n (15.29)	Hg^{197} 64.1h	EC	0.07734 0.1915	99.95 1.22	16.83 0.21
	$n\alpha$ (7.22)	Pt^{195m} 4.1d	IT	0.1299 0.0985 0.1294	100.0 53.0 47.0	23.13 12.26 10.87
		Au^{198} 2.697d	β^-	0.41180 0.67588	99.8 0.8	23.08 0.19
$^{80}\text{Hg}^{200}$ (23.13)		Au^{199} 3.15d	β^-	0.15837 0.20820	73.6 20.4	17.02 4.72
T (13.02)	Au^{198} 2.697d	β^-	0.41180 0.67588	99.8 0.8	13.19 0.11	
	Au^{199} 3.15d	β^-	0.15837 0.20820	73.6 20.4	9.73 2.70	
T (13.21)	Au^{199} 3.15d	β^-	0.15837 0.20820	73.6 20.4	21.93 6.08	
$^{80}\text{Hg}^{204}$ (6.85)	n (7.50)	Hg^{203} 46.56d	β^-	0.27917	100.0	6.85
$^{81}\text{Tl}^{203}$ (29.50)	$n\alpha$ (6.66)	Au^{198} 2.697d	β^-	0.41180 0.67588 1.08769	99.8 0.8 0.2	29.44 0.24 0.06
		Au^{199} 3.15d	β^-	0.15837 0.20820	73.6 20.4	21.71 6.02
	2n (14.65)	Tl^{201} 73h	EC	0.1674 0.13534 0.1659	26.5 7.2 0.3	7.82 2.12 0.09
		Tl^{202} 12.2d	EC	0.439	95.0	28.03
		Hg^{203} 46.56d	β^-	0.27917	100.0	70.50
$^{82}\text{Pb}^{204}$ (1.48)	T (12.81)	Tl^{201} 73h	EC	0.1674 0.13534	26.5 7.2	0.39 0.11

Table 1-S (Continued)

Target Nucleus (Abundance)	Photo-reaction Separation Energy)	Residual Nucleus 1/2 Life	Decay Mode	Principal Gammas		Percentage Intensity X Abundance
				Energy (MeV)	Percent	
$^{82}\text{Pb}^{204}$ cont. (1.48)	np (14.34)	Tl ²⁰² 12.2d	EC	0.439	95.0	1.41
	n (8.24)	Pb ²⁰³ 52.1h	EC	0.27917	99.2	1.47
$^{82}\text{Pb}^{206}$ (23.6)	He ³ (13.45)	Hg ²⁰³ 46.56d	β^-	0.27917	100.0	23.60
$^{82}\text{Pb}^{207}$ (22.6)	α (-0.39)	Hg ²⁰³ 46.56d	β^-	0.27917	100.0	22.60
$^{82}\text{Pb}^{208}$ (52.3)	n α (6.98)	Hg ²⁰³ 46.56d	β^-	0.27917	100.0	52.30

TABLE 2

Gamma Rays Produced by Photonuclear Reactions —
(by gamma-ray energy)

Part D — Half-lives from 24 hours to 30 days

Part E — Half-lives from 30 days to 1 year

Table 2, Part D
Half-Lives From 24 Hours to 30 Days

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.050	Xe ¹³⁴	2p	10.4	0.0667	Ba ¹³⁷	p	1.3
	Xe ¹³⁶	α	8.9		Ba ¹³⁸	np	8.5
0.05259	W ¹⁸⁴	p	9.0	0.0679	La ¹³⁹	He ³	11.8
	W ¹⁸⁶	T	8.4		Yb ¹⁷⁴	2p	8.9
	Re ¹⁸⁵	2p	10.9		Yb ¹⁷⁶	α	3.6
	Re ¹⁸⁷	α	18.5		Ir ¹⁹¹	2n	—
0.053	Pd ¹⁰⁴	n	1.1	0.0696	Pt ¹⁹²	T	—
	Pd ¹⁰⁵	2n	2.2		Sm ¹⁵⁴	n	6.7
	Cd ¹⁰⁶	He ³	0.1		Gd ¹⁵⁵	2p	4.4
	Cd ¹⁰⁸	n α	0.1		Gd ¹⁵⁶	He ³	6.1
0.0545	Yb ¹⁶⁸	T	—	0.06968	Gd ¹⁵⁷	α	4.6
0.0565	Ir ¹⁹¹	2n	—		Gd ¹⁵⁸	n α	7.4
0.0567	Pt ¹⁹²	T	—		Pt ¹⁹⁵	2p	0.7
	Hg ¹⁹⁶	n	—		Pt ¹⁹⁶	He ³	0.6
	Tm ¹⁶⁹	2n	25.0	0.0730	Pt ¹⁹⁸	n α	0.2
0.0571	Yb ¹⁷⁰	T	0.8		Dy ¹⁶²	p	8.3
	Dy ¹⁶²	2n	5.5		Dy ¹⁶³	np	8.1
0.0572	Dy ¹⁶³	np	5.4	0.07457	Dy ¹⁶⁴	T	9.2
	Dy ¹⁶⁴	T	6.1		Ho ¹⁶⁵	α	32.5
	Ho ¹⁶⁵	α	21.6		Pd ¹⁰²	2n	0.7
	Nd ¹⁴⁵	2p	7.2		Sm ¹⁵⁴	n	0.3
0.05737	Nd ¹⁴⁶	He ³	15.0	0.07543	Gd ¹⁵⁵	2p	0.2
	Nd ¹⁴⁸	n α	5.0		Gd ¹⁵⁶	He ³	0.2
	Ir ¹⁹¹	2n	—		Gd ¹⁵⁷	α	0.2
0.0591	Pt ¹⁹²	T	—	0.07589	Gd ¹⁵⁸	n α	0.3
	Ir ¹⁹¹	2n	—		Hf ¹⁷⁴	T	0.1
0.0593	Pt ¹⁹²	T	—	0.07734	Hg ¹⁹⁸	n	10.0
	Ir ¹⁹¹	2n	—		Hg ¹⁹⁹	2n	16.8
0.0599	Yb ¹⁷⁴	2p	7.3	0.07874	Yb ¹⁷³	p	10.5
	Yb ¹⁷⁶	α	2.9		Yb ¹⁷⁴	np	20.7
0.0601	Er ¹⁶²	2n	0.1	0.07955	Hf ¹⁷⁴	np	0.2
0.061	Yb ¹⁷⁴	2p	0.4		Xe ¹³⁴	n	0.1
	Yb ¹⁷⁶	α	0.1		Ba ¹³⁵	2p	0.1
					Ba ¹³⁶	He ³	0.1

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.07955 cont.	Ba ¹³⁷	α	0.1	0.0840	Pd ¹⁰²	2n	0.7
	Ba ¹³⁸	n α	0.6				
0.08016	Xe ¹³²	p	1.6	0.086	Br ⁷⁹	2n	0.9
	Xe ¹³⁴	T	0.6		Se ⁸⁰	T	0.1
	Cs ¹³³	2p	6.0		Dy ¹⁶²	p	0.7
0.0802	Pt ¹⁹⁴	p	32.9	0.08793	Dy ¹⁶³	np	0.7
	Pt ¹⁹⁴	np	33.8		Dy ¹⁶⁴	T	0.7
	Pt ¹⁹⁶	T	25.3		Ho ¹⁶⁵	α	2.6
	Au ¹⁹⁷	α	100.0		Te ¹²⁸	p	9.5
0.08056	Er ¹⁶⁷	p	11.0	0.08897	Te ¹³⁰	T	10.3
	Er ¹⁶⁸	np	13.0		Gd ¹⁵⁷	p	2.3
	Tm ¹⁶⁹	He ³	48.0		Gd ¹⁵⁸	np	9.0
0.08100	Xe ¹³⁴	n	10.4	0.08948	Dy ¹⁵⁸	np	0.1
	Ba ¹³⁵	2p	6.6		Tb ¹⁵⁹	He ³	36.2
	Ba ¹³⁶	He ³	7.8		Sm ¹⁵⁴	n	0.2
	Ba ¹³⁷	α	11.3		Gd ¹⁵⁵	2p	0.2
	Ba ¹³⁸	n α	71.6		Gd ¹⁵⁶	He ³	0.2
0.0811	Xe ¹³⁴	He ³	0.6	0.09	Gd ¹⁵⁷	α	0.2
	Xe ¹³⁶	n α	0.5		Gd ¹⁵⁸	n α	0.3
0.0820	Yb ¹⁶⁸	2n	0.1	0.09	Sb ¹²¹	n	56.7
					Te ¹²²	np	2.4
					Te ¹²³	T	0.9
0.08233	Os ¹⁹²	n	—	0.090	Pd ¹⁰²	T	—
	Pt ¹⁹²	n	—				
	Ir ¹⁹³	np	—				
	Pt ¹⁹⁴	He ³	—		Nd ¹⁴⁸	n	4.8
	Pt ¹⁹⁵	α	—		Sm ¹⁴⁹	2p	11.6
	Pt ¹⁹⁶	n α	—		Sm ¹⁵⁰	He ³	6.2
	Hg ¹⁹⁶	n α	—		Sm ¹⁵²	n α	22.4
0.08245	Er ¹⁶⁸	2p	25.5	0.09122	Zn ⁶⁸	p	0.8
	Er ¹⁷⁰	α	14.0		Ga ⁶⁹	2n	1.3
0.08337	Sm ¹⁵⁴	n	0.2	0.09326	Ge ⁷⁰	T	0.5
	Gd ¹⁵⁵	2p	0.2		Zn ⁶⁸	p	4.6
	Gd ¹⁵⁶	He ³	0.2		Ga ⁶⁹	2n	43.4
	Gd ¹⁵⁷	α	0.2		Zn ⁷⁰	T	0.2
	Gd ¹⁵⁸	n α	0.3		Ge ⁷⁰	T	14.8

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.0953	Ir ¹⁹¹ Pt ¹⁹²	2n T	— —	0.10318 cont.	Gd ¹⁵⁸	nα	19.3
0.0963	Cd ¹¹² Cd ¹¹⁴ In ¹¹⁵	p T α	0.1 0.1 0.4	0.10610	Dy ¹⁶² Dy ¹⁶³ Dy ¹⁶⁴ Ho ¹⁶⁵	p np T α	0.3 0.3 0.4 1.3
0.09645	Os ¹⁹² Pt ¹⁹² Ir ¹⁹³ Pt ¹⁹⁴ Pt ¹⁹⁵ Pt ¹⁹⁶ Hg ¹⁹⁶	n n np He ³ α nα nα	— — — — — — —	0.10793	W ¹⁸⁴ W ¹⁸⁶ Re ¹⁸⁵ Re ¹⁸⁷	p T 2p α	10.4 9.6 12.5 21.3
0.09743	Sm ¹⁵⁴ Gd ¹⁵⁵ Gd ¹⁵⁶ Gd ¹⁵⁷ Gd ¹⁵⁸	n 2p He ³ α nα	0.2 0.2 0.2 0.2 0.3	0.11176	Xe ¹³⁴ Xe ¹³⁶	2p α	0.3 0.3
0.0985	Pt ¹⁹⁶ Au ¹⁹⁷ Hg ¹⁹⁸ Hg ¹⁹⁹ Hg ²⁰⁰	n np He ³ α nα	13.4 53.0 5.3 8.9 12.3	0.11297	Hf ¹⁷⁸ Hf ¹⁷⁹ Hf ¹⁸⁰ Ta ¹⁸¹	p np T α	3.7 1.9 4.8 13.6
0.09908	W ¹⁸⁴ W ¹⁸⁶ Re ¹⁸⁵ Re ¹⁸⁷	p T 2p α	11.5 10.7 13.9 23.6	0.1136 0.11381	Yb ¹⁶⁸ Yb ¹⁷⁶ Lu ¹⁷⁶ Hf ¹⁷⁸ Hf ¹⁷⁹ Hf ¹⁸⁰	T n p He ³ α nα	— 0.8 0.2 1.7 0.9 2.2
0.1008	Kr ⁸³ Kr ⁸⁴ Rb ⁸⁵ Rb ⁸⁷	p np He ³ nα	0.2 1.0 1.2 0.5	0.1163	Xe ¹³⁴ Xe ¹³⁶	2p α	0.3 0.3
0.1021	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	0.9 0.7	0.12047	Sm ¹⁴⁹ Sm ¹⁵⁰ Sm ¹⁵²	2p He ³ nα	0.1 0.1 0.2
0.10318	Sm ¹⁵⁴ Gd ¹⁵⁵ Gd ¹⁵⁶ Gd ¹⁵⁷	n 2p He ³ α	17.6 11.4 15.9 12.2	0.12373 0.1261	Ce ¹³⁶ Pd ¹⁰²	nα 2n	0.1 0.2

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.1272	Pd ¹⁰⁴	T	0.1	0.13765	Hf ¹⁷⁸ Hf ¹⁸⁰	He ³ nα	0.1 0.1
0.128	Yb ¹⁷⁴ Yb ¹⁷⁶	2p α	5.9 2.4	0.139	Pt ¹⁹⁵ Pt ¹⁹⁶ Pt ¹⁹⁸	2p He ³ nα	3.8 2.8 0.8
0.12939	Os ¹⁹² Pt ¹⁹² Ir ¹⁹³ Pt ¹⁹⁴ Pt ¹⁹⁵ Pt ¹⁹⁶ Hg ¹⁹⁶	n n np He ³ α nα nα	— — — — — — —	0.14051	Mo ¹⁰⁰ Ru ¹⁰¹ Ru ¹⁰² Ru ¹⁰⁴	n 2p He ³ nα	8.8 15.6 28.9 17.0
0.1294	Pt ¹⁹⁶ Au ¹⁹⁷ Hg ¹⁹⁸ Hg ¹⁹⁹ Hg ²⁰⁰	n np He ³ α nα	11.9 47.0 4.7 7.9 10.9	0.14483	Yb ¹⁷⁶ Hf ¹⁷⁸ Hf ¹⁷⁹ Hf ¹⁸⁰	n He ³ α nα	0.1 0.1 0.1 0.1
0.1299	Pt ¹⁹⁶ Au ¹⁹⁷ Hg ¹⁹⁸ Hg ¹⁹⁹ Hg ²⁰⁰	n np He ³ α nα	25.3 100.0 10.0 16.8 23.1	0.1530	Te ¹²⁰ Xe ¹²⁴	n nα	0.1 0.1
0.13175	Dy ¹⁶² Dy ¹⁶³ Dy ¹⁶⁴ Ho ¹⁶⁵	p np T α	0.1 0.1 0.1 0.5	0.1530	Ba ¹³⁷ Ba ¹³⁸ La ¹³⁹	p np He ³	0.8 5.2 7.3
0.13534	Tl ²⁰³ Pb ²⁰⁴	2n T	2.1 0.1	0.158	Pd ¹⁰² Pd ¹⁰⁴	p T	0.1 1.1
0.1354	Pt ¹⁹⁴ Pt ¹⁹⁵ Hg ¹⁹⁶ Hg ¹⁹⁸	n 2n He ³ nα	32.9 33.8 0.2 10.0	0.158	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	7.7 0.1
0.13716	Re ¹⁸⁷ Os ¹⁸⁷ Os ¹⁸⁸ Os ¹⁸⁹ Ir ¹⁹¹	n p np T nα	14.5 0.4 3.1 3.7 8.6	0.1583	Ni ⁵⁸	2n	67.8
				0.15837	Hg ²⁰⁰ Hg ²⁰¹	p np	17.0 9.7

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.15837 cont.	Hg ²⁰² Tl ²⁰³	T α	21.9 21.7	0.16394	Hg ¹⁹⁶	np	—
0.1588	Pd ¹⁰²	2n	0.1	0.16398	Xe ¹³² Xe ¹³² Cs ¹³³	n p np	26.9 0.4 100.0
0.159	Sn ¹¹⁸ Sn ¹¹⁹ Te ¹²⁰ Te ¹²²	n 2n He ³ n α	24.0 8.6 0.1 2.5		Xe ¹³⁴ Cs ¹³³ Ba ¹³⁴ Ba ¹³⁵ Ba ¹³⁶	T 2p He ³ α n α	0.1 1.4 2.4 6.6 7.8
0.1594	Ca ⁴⁸ Ti ⁴⁸ Ti ⁴⁹ Ti ⁵⁰ Ti ⁵⁰ V ⁵⁰ V ⁵¹	n p np T He ³ He ³ α	0.1 51.8 3.8 3.7 3.7 0.2 69.8	0.164	Yb ¹⁷⁴ Yb ¹⁷⁶	2p α	0.3 0.1
0.16053	W ¹⁸⁴ W ¹⁸⁶ Re ¹⁸⁵ Re ¹⁸⁷	p T 2p α	2.8 2.6 3.3 5.7	0.168	Tl ²⁰³ Pb ²⁰⁴	2n T	0.1 7.8 0.4
0.161	Br ⁷⁹ Kr ⁷⁸ Se ⁸⁰ Kr ⁸⁰	2n p T T	10.5 0.1 0.1 0.5	0.17285	Pt ¹⁹² Hg ¹⁹⁶	n n α	— —
0.16134	W ¹⁸⁴ W ¹⁸⁶ Re ¹⁸⁵ Re ¹⁸⁷	p T 2p α	3.9 3.8 4.7 7.9	0.173	In ¹¹³ Sn ¹¹²	2n p	4.3 1.0
0.16232	W ¹⁸⁴ W ¹⁸⁶ Re ¹⁸⁵ Re ¹⁸⁷	p T 2p α	3.4 3.2 4.2 7.1	0.1750	Se ⁷⁴	T	0.9
0.1629	Ce ¹⁴²	2p	0.8	0.1762	Ba ¹³⁷ Ba ¹³⁸ La ¹³⁹	p np He ³	1.9 8.5 16.4
0.1637	Ba ¹³⁷ Ba ¹³⁸ La ¹³⁹	p np He ³	2.2 13.8 19.2	0.17723	Xe ¹³² Cs ¹³³	p 2p p	0.1 0.3 0.3
				0.178	Ti ⁴⁹		

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.178 cont.	Ti ⁵⁰ V ⁵¹	np He ³	0.3 6.0	0.200	Sb ¹²¹ Te ¹²² Te ¹²³	n np T	57.3 2.5 0.9
0.1789	Os ¹⁹² Ir ¹⁹³ Pt ¹⁹⁴ Pt ¹⁹⁵ Pt ¹⁹⁶	n np He ³ α $n\alpha$	— — — — —	0.200	Xe ¹³⁴ Xe ¹³⁶	He ³ $n\alpha$	0.8 0.6
0.1794	Pd ¹⁰⁴	T	0.1	0.203	Br ⁷⁹	2n	0.6
0.18106	Mo ¹⁰⁰ Ru ¹⁰¹ Ru ¹⁰² Ru ¹⁰⁴	n 2p He ³ $n\alpha$	0.7 1.3 2.4 1.4	0.206	Ga ⁶⁹ Ge ⁷⁰	2n T	0.9 0.3
0.1817	Xe ¹³⁴ Xe ¹³⁶	He ³ $n\alpha$	1.9 1.6	0.20780	Tm ¹⁶⁹ Yb ¹⁶⁸ Yb ¹⁷⁰	2n p T	98.0 0.1 3.0
0.1845	Zn ⁶⁸ Ga ⁶⁹ Zn ⁷⁰ Ge ⁷⁰	p 2n T T	7.6 13.2 0.3 4.5	0.20820	Hg ²⁰⁰ Hg ²⁰¹ Hg ²⁰² Tl ²⁰³	p np T α	4.7 2.7 6.1 6.0
0.1867	Ir ¹⁹¹ Pt ¹⁹²	n np	— —	0.2803	Hf ¹⁷⁸ Hf ¹⁷⁹ Hf ¹⁸⁰	p np T	1.8 0.9 2.3
0.1915	Hg ¹⁹⁸ Hg ¹⁹⁹	n 2n	0.1 0.2		Ta ¹⁸¹	α	6.6
0.1949	Ag ¹⁰⁷	n	0.9	0.2103	W ¹⁸⁴ W ¹⁸⁶ Re ¹⁸⁵	p T 2p	2.1 1.8 2.3
0.19656	Xe ¹³⁰ Xe ¹³¹ Ba ¹³² Ba ¹³⁴	n 2n He ³ $n\alpha$	4.1 21.2 0.1 2.4	0.2154	Re ¹⁸⁷ Ru ⁹⁸ Ru ⁹⁹	α n 2n	3.9 1.7 11.8
0.1966	Sm ¹⁴⁹ Sm ¹⁵⁰ Sm ¹⁵²	2p He ³ $n\alpha$	0.1 0.1 0.2	0.2215	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	7.7 0.1
0.1968	Ir ¹⁹¹ Pt ¹⁹²	n np	— —	0.22816	Xe ¹³⁴ Xe ¹³⁶	2p α	9.7 8.3

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.230	Sn ¹¹⁸ Sn ¹²⁰	He nα	0.1 0.2	0.24606 cont.	Re ¹⁸⁵ Re ¹⁸⁷	2p α	14.0 23.8
0.232	Nd ¹⁴⁵ Nd ¹⁴⁶ Nd ¹⁴⁸	2p He ³ nα	0.2 0.5 0.2	0.247	In ¹¹³ Sn ¹¹²	2n p	4.3 1.0
0.2328	Xe ¹³⁴ Ba ¹³⁵ Ba ¹³⁶ Ba ¹³⁷ Ba ¹³⁸	n 2p He ³ α nα	10.4 6.6 7.8 11.3 71.7	0.248	Pt ¹⁹⁵ Pt ¹⁹⁶ Pt ¹⁹⁸	2p He ³ nα	0.2 0.2 0.1
0.2354	Mo ⁹⁶ Mo ⁹⁷ Mo ⁹⁸	p np T	16.5 9.5 23.8	0.2514	Br ⁷⁹ Kr ⁸⁰	2n T	1.4 0.1
0.237	Ge ⁷⁰	n	0.1	0.255	Ce ¹³⁸ Nd ¹⁴²	n nα	0.3 27.0
0.2393	Br ⁷⁹ Kr ⁸⁰	2n T	4.5 0.2	0.2613	Kr ⁸⁰	n	0.3
0.241	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	0.8 0.7	0.262	Sn ¹¹⁸ Sn ¹²⁰	He ³ nα	0.1 0.2
0.242	Se ⁷⁸ Se ⁸⁰	p T	0.5 1.2	0.268	Ba ¹³⁶ Ba ¹³⁷ La ¹³⁸ Ce ¹³⁸ Ce ¹⁴⁰	n 2n T He ³ nα	7.8 11.3 0.1 0.3 88.5
0.24426	W ¹⁸⁴ W ¹⁸⁶ Re ¹⁸⁵ Re ¹⁸⁷	p T 2p α	3.9 3.8 4.7 7.9	0.2696	Ni ⁵⁸	2n	29.4
0.2450	Ir ¹⁹¹ Pt ¹⁹²	2n T	— —	0.271	Sc ⁴⁵ Ti ⁴⁶ Ti ⁴⁷	n np T	98.6 7.9 7.2
0.2459	Cd ¹¹² Cd ¹¹³ Cd ¹¹⁴ In ¹¹³ In ¹¹⁵	p np T 2p α	0.3 0.2 0.4 0.1 1.2	0.273	Ba ¹³⁷ Ba ¹³⁸ La ¹³⁹	p np He ³	1.0 6.5 9.0
0.24606	W ¹⁸⁴ W ¹⁸⁶	p T	11.6 10.7	0.2754	Nd ¹⁴⁸ Sm ¹⁴⁹ Sm ¹⁵⁰ Sm ¹⁵²	2p He ³ nα	0.1 0.3 0.1 0.5

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.2757	Ba ¹³⁴	n	2.4	0.2946	Ir ¹⁹¹	n	—
	Ba ¹³⁵	2n	6.6		Pt ¹⁹²	np	—
	Ce ¹³⁶	He ³	0.1		Zn ⁶⁸	p	0.1
0.278	Xe ¹³⁴	He ³	0.4	0.296	Ga ⁶⁹	2n	13.9
	Xe ¹³⁶	n α	0.3		Ge ⁷⁰	T	4.7
0.278	Pt ¹⁹⁵	2p	0.2		Yb ¹⁶⁸	T	—
	Pt ¹⁹⁶	He ³	0.2				
0.27917	Pb ²⁰⁴	n	1.5	0.300	Br ⁷⁹	2n	3.1
0.28	Br ⁷⁹	2n	0.5	0.30482	Kr ⁸⁰	T	0.1
0.281	Pt ¹⁹⁵	2p	0.6		Ce ¹⁴²	2p	0.5
	Pt ¹⁹⁶	He ³	0.4		Pd ¹⁰⁶	p	1.4
	Pt ¹⁹⁸	n α	0.1		Pd ¹⁰⁸	T	1.3
0.2826	Yb ¹⁷⁶	n	0.5	0.3062	Ag ¹⁰⁷	2p	2.6
	Lu ¹⁷⁶	p	0.1		Ag ¹⁰⁹	α	2.4
	Hf ¹⁷⁸	He ³	1.1		Pd ¹⁰²	p	0.8
	Hf ¹⁷⁹	α	0.6		Pd ¹⁰⁴	T	9.1
	Hf ¹⁸⁰	n α	1.4				
0.28431	Xe ¹³²	p	1.6	0.31	Te ¹²⁸	p	3.2
	Xe ¹³⁴	T	0.6		Te ¹³⁰	T	3.5
	Cs ¹³³	2p	6.1		Sm ¹⁴⁹	2p	0.1
0.2857	Sm ¹⁵⁰	p	0.2	0.31300	Sm ¹⁵²	n α	0.2
	Sm ¹⁵²	T	0.8		W ¹⁸⁴	p	1.7
	Eu ¹⁵¹	2p	1.4		W ¹⁸⁶	T	1.5
	Eu ¹⁵³	α	1.6		Re ¹⁸⁵	2p	2.0
0.29	Te ¹²⁸	np	—	0.3191	Re ¹⁸⁷	α	3.4
0.29172	W ¹⁸⁴	p	2.9		Pd ¹⁰⁶	p	5.5
	W ¹⁸⁶	T	2.7		Pd ¹⁰⁸	T	5.3
	Re ¹⁸⁵	2p	3.5		Ag ¹⁰⁷	2p	10.4
	Re ¹⁸⁷	α	6.0		Ag ¹⁰⁸	α	9.6
0.2933	Nd ¹⁴⁵	2p	3.4	0.3194	Nd ¹⁴⁸	n	0.1
	Nd ¹⁴⁶	He ³	7.1		Sm ¹⁴⁹	2p	0.4
	Nd ¹⁴⁸	n α	2.4		Sm ¹⁵⁰	He ³	0.2
					Sm ¹⁵²	n α	0.7
0.29355	Hg ¹⁹⁶	np	—	0.320	Ge ⁷⁰	n	0.3

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.32010	Cr ⁵²	n	8.3	0.3507	Nd ¹⁴⁵	2p	0.3
	Cr ⁵³	2n	0.9		Nd ¹⁴⁶	He ³	0.6
0.322	Pt ¹⁹⁵	2p	0.5	0.35399	Nd ¹⁴⁸	n α	0.2
	Pt ¹⁹⁶	He ³	0.4		W ¹⁸⁴	p	4.9
	Pt ¹⁹⁸	n α	0.1		W ¹⁸⁶	T	4.5
0.3254	Ru ⁹⁸	n	0.1	0.3557	Re ¹⁸⁵	2p	5.9
	Ru ⁹⁹	2n	0.9		Re ¹⁸⁷	α	10.0
0.32575	Xe ¹³²	p	0.1	0.3557	Au ¹⁹⁷	n	67.0
	Cs ¹³³	2p	0.3		Hg ¹⁹⁸	np	6.7
0.32850	Hg ¹⁹⁶	np	—		Hg ¹⁹⁹	T	11.3
					Ir ¹⁹¹	n	—
0.32877	Ce ¹⁴²	np	2.4	0.362	Pt ¹⁹⁵	2p	0.2
	Ce ¹⁴²	2p	2.4		Pt ¹⁹⁶	He ³	0.1
0.335	Cd ¹¹⁶	n	7.2	0.36449	Xe ¹³²	p	22.6
	Sn ¹¹⁷	2p	7.2		Xe ¹³⁴	T	8.8
	Sn ¹¹⁸	He ³	22.8		Cs ¹³³	2p	84.2
	Sn ¹¹⁹	α	8.2				
	Sn ¹²⁰	n α	31.2				
0.336	Xe ¹³⁴	He ³	1.3	0.3664	Mo ¹⁰⁰	n	0.1
	Xe ¹³⁶	n α	1.1		Ru ¹⁰¹	2p	0.3
0.34	Te ¹²⁸	He ³	0.1		Ru ¹⁰²	He ³	0.5
	Te ¹³⁰	n α	0.1		Ru ¹⁰⁴	n α	0.3
0.3402	Ba ¹³⁷	p	6.3	0.3711	Ir ¹⁹¹	n	—
	Ba ¹³⁸	np	39.8		Pt ¹⁹²	np	—
	La ¹³⁹	He ³	55.5				
0.3420	Cd ¹¹²	p	1.9	0.38	Sr ⁸⁴	n	0.2
	Cd ¹¹³	np	1.0		Yb ¹⁷⁴	2p	0.1
	Cd ¹¹⁴	T	2.3		Yb ¹⁷⁶	α	0.1
	In ¹¹³	2p	0.3		I ¹²⁷	n	34.2
	In ¹¹⁵	α	7.7		Xe ¹²⁸	np	0.7
0.346	Yb ¹⁷⁴	2p	0.2	0.388	Ga ⁶⁹	2n	3.5
	Yb ¹⁷⁶	α	0.1		Ge ⁷⁰	T	1.2
0.35	Pd ¹⁰²	T	—				

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.388	Pt ¹⁹⁵	2p	0.5	0.4295	Ag ¹⁰⁷	n	9.3
	Pt ¹⁹⁶	He ³	0.4		Cd ¹⁰⁸	np	0.2
	Pt ¹⁹⁸	n α	0.1				
0.3884	Y ⁸⁹	2n	99.3	0.43255	Ce ¹⁴²	np	0.4
	Zr ⁹⁰	T	51.1		Ce ¹⁴²	2p	0.4
0.3963	Yb ¹⁷⁶	n	0.8	0.43755	Ce ¹⁴²	2p	0.2
	Lu ¹⁷⁶	p	0.2		Tl ²⁰³	n	28.0
	Hf ¹⁷⁸	He ³	1.8		Pb ²⁰⁴	np	1.4
	Hf ¹⁷⁹	α	0.9				
	Hf ¹⁸⁰	n α	2.3		Br ⁷⁹	2n	0.9
0.3976	Kr ⁸⁰	n	0.2	0.4398	Nd ¹⁴⁸	n	0.1
0.400	Nd ¹⁴⁸	n	0.1		Sm ¹⁴⁹	2p	0.3
	Sm ¹⁴⁹	2p	0.2		Sm ¹⁵⁰	He ³	0.2
	Sm ¹⁵⁰	He ³	0.1		Sm ¹⁵²	n α	0.6
	Sm ¹⁵²	n α	0.4	0.446	Yb ¹⁷⁴	2p	0.1
0.4060	Ag ¹⁰⁷	n	11.6		Yb ¹⁷⁶	α	0.1
	Cd ¹⁰⁸	np	0.2	0.4508	Ag ¹⁰⁷	n	6.2
0.407	Yb ¹⁷⁴	2p	22.0		Cd ¹⁰⁸	np	0.1
	Yb ¹⁷⁶	α	8.8	0.46	Te ¹²⁸	p	12.7
0.4072	Ir ¹⁹¹	n	—		Te ¹³⁰	T	13.8
	Pt ¹⁹²	np	—	0.460	Pt ¹⁹⁵	2p	1.0
0.41	Te ¹²⁸	np	—		Pt ¹⁹⁶	He ³	1.4
0.41180	Hg ¹⁹⁹	p	16.8	0.464	Pt ¹⁹⁸	n α	0.3
	Hg ²⁰⁰	np	23.1		Cs ¹³³	n	2.1
	Hg ²⁰¹	T	13.2		Ba ¹³⁵	T	0.1
	Tl ²⁰³	n α	29.4	0.47	Te ¹²⁸	He ³	0.1
0.415	Sm ¹⁴⁹	2p	0.1		Te ¹³⁰	n α	0.1
	Sm ¹⁵²	n α	0.2	0.475	Yb ¹⁷⁴	2p	2.2
0.42369	Ce ¹⁴²	2p	0.4		Yb ¹⁷⁶	α	0.9
0.4261	Au ¹⁹⁷	n	6.0	0.48	Br ⁷⁹	2n	1.9
	Hg ¹⁹⁸	np	0.6		Kr ⁸⁰	T	0.1
	Hg ¹⁹⁹	T	1.0				

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.48	I ¹²⁷ Xe ¹²⁸	n np	4.2 0.1	0.53	Pd ¹⁰²	T	—
0.4807	Ni ⁵⁸	2n	25.8	0.53	Cd ¹¹⁶ Sn ¹¹⁷ Sn ¹¹⁸ Sn ¹¹⁹ Sn ¹²⁰	n 2p He ³ α n α	2.0 2.0 6.4 2.3 8.7
0.4835	Y ⁸⁹ Zr ⁹⁰	2n T	99.3 47.5				
0.48703	Ce ¹⁴² Ce ¹⁴²	np 2p	5.0 5.0	0.5310	Nd ¹⁴⁸ Sm ¹⁴⁹ Sm ¹⁵⁰ Sm ¹⁵²	n 2p He ³ n α	0.8 2.0 1.1 3.8
0.4892	Ti ⁵⁰	He ³	0.4				
0.49	Ga ⁶⁹	2n	0.1	0.5315	Tm ¹⁶⁹	2n	2.0
0.49	Cd ¹¹⁶ Sn ¹¹⁷ Sn ¹¹⁸ Sn ¹¹⁹ Sn ¹²⁰	n 2p He ³ α n α	0.8 0.7 2.4 0.9 3.3	0.53738	Ce ¹⁴² Yb ¹⁷⁴ Yb ¹⁷⁶	2p 2p α	2.7 0.8 0.3
0.493	Nd ¹⁴⁵ Nd ¹⁴⁶ Nd ¹⁴⁸	2p He ³ n α	0.2 0.4 0.1	0.5449	Pd ¹⁰² Pd ¹⁰⁴	p T	0.1 0.7
0.4963	Ce ¹³⁶	n α	0.1	0.551	Sm ¹⁴⁹ Sm ¹⁵⁰ Eu ¹⁵¹ Eu ¹⁵³	p np He ³ n α	3.5 1.9 12.3 13.4
0.50294	Xe ¹³² Cs ¹³³	p 2p	0.1 0.3	0.553	Ge ⁷⁰	n	0.1
0.5075	Te ¹²² Te ¹²³	n 2n	0.4 0.2	0.5541	Kr ⁸³ Kr ⁸⁴ Rb ⁸⁵ Rb ⁸⁷	p np He ³ n α	8.3 41.0 51.9 20.1
0.508	Cs ¹³³	n	0.5				
0.5118	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	46.4 0.8	0.5578	Ir ¹⁹¹ Pt ¹⁹²	n np	— —
0.522	Br ⁷⁹ Se ⁷⁸ Kr ⁷⁸ Se ⁸⁰ Kr ⁸⁰	2n p p T T	13.0 0.5 0.1 0.4 0.6	0.559	Se ⁷⁷ Se ⁷⁸ Pt ¹⁹⁵ Pt ¹⁹⁶ Pt ¹⁹⁸	p np 2p He ³ n α	0.3 0.9 0.8 0.6 0.2

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.5593	Se ⁷⁷ Se ⁷⁸	p np	3.2 9.9	0.5995	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.3 0.4 1.6
0.564	Sb ¹²³ Te ¹²³ Te ¹²⁴ Te ¹²⁵ I ¹²⁷	n p np T nα	28.3 0.6 3.1 4.6 66.3	0.6009 0.603	Ag ¹⁰⁷ Xe ¹²⁶	n np	1.5 0.1
0.5693	Ir ¹⁹¹ Pt ¹⁹²	n np	— —	0.6053 0.6060	Ir ¹⁹¹ Pt ¹⁹² Kr ⁸⁰	n np n	— — 0.2
0.57	Br ⁷⁹ Kr ⁸⁰	2n T	1.3 0.1	0.610	Yb ¹⁷⁴ Yb ¹⁷⁶	2p α	12.9 5.1
0.57	Cs ¹³³	n	0.3	0.6160	Ag ¹⁰⁷	n	10.5
0.573	Ge ⁷⁰	n	2.6	0.6160	Cd ¹⁰⁸	np	0.2
0.5731	Te ¹²² Te ¹²³ Xe ¹²⁴ Xe ¹²⁶	n 2n He ³ nα	2.0 0.7 0.1 0.1	0.6191	Kr ⁸³ Kr ⁸⁴ Rb ⁸⁵ Rb ⁸⁷	p np He ³ nα	5.0 24.5 31.0 12.0
0.58	Br ⁷⁹ Kr ⁸⁰	2n T	3.4 0.2	0.630	Se ⁷⁴ Se ⁷⁴	2n np	0.1 0.1
0.58	Te ¹²⁸	np	—	0.6303	Cs ¹³³	n	0.1
0.58	Eu ¹⁵¹ Eu ¹⁵³	2p α	0.1 0.1	0.635	As ⁷⁵	n np T	14.0 1.3 1.1
0.591	Nd ¹⁴⁵ Nd ¹⁴⁶ Nd ¹⁴⁸	2p He ³ nα	0.1 0.2 0.1	0.6369	Xe ¹³² Xe ¹³⁴ Cs ¹³³	p T 2p	1.9 0.7 6.9
0.5960	As ⁷⁵ Se ⁷⁶ Se ⁷⁷	n np T	61.8 5.6 4.7	0.6463	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	1.1 1.7 6.9
0.599	Sm ¹⁴⁹ Sm ¹⁵²	2p nα	0.1 0.1	0.6574	Se ⁷⁷ Se ⁷⁸	p np	0.5 1.5

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.6678	Cs ¹³³	n	96.9	0.72291	Xe ¹³²	p	0.4
	Ba ¹³⁴	np	2.3		Xe ¹³⁴	T	0.2
	Ba ¹³⁵	T	6.4		Cs ¹³³	2p	1.6
0.668	Nd ¹⁴⁵	2p	0.5	0.7234	Gd ¹⁵⁷	p	1.3
	Nd ¹⁴⁶	He ³	1.1		Gd ¹⁵⁸	np	2.1
	Nd ¹⁴⁸	n α	0.4		Tb ¹⁵⁹	He ³	8.3
0.67	Ga ⁶⁹	2n	0.1	0.725	Nd ¹⁴⁵	2p	0.6
0.67588	Hg ¹⁹⁹	p	0.1		Nd ¹⁴⁶	He ³	1.2
	Hg ²⁰⁰	np	0.2		Nd ¹⁴⁸	n α	0.4
	Hg ²⁰¹	T	0.1	0.7397	Mo ¹⁰⁰	n	1.3
	Tl ²⁰³	n α	0.2		Ru ¹⁰¹	2p	2.4
0.667	I ¹²⁷	n	32.9		Ru ¹⁰²	He ³	4.4
	Xe ¹²⁸	np	0.6		Ru ¹⁰⁴	n α	2.6
0.6803	Ag ¹⁰⁷	n	1.1	0.741	Hf ¹⁷⁴	T	0.1
0.686	Sb ¹²³	n	1.4		Fe ⁵⁴	np	5.0
	Te ¹²⁴	np	0.2		Ag ¹⁰⁷	n	11.5
	Te ¹²⁵	T	0.2		Cd ¹⁰⁸	np	0.2
	I ¹²⁷	n α	3.3		Br ⁷⁹	2n	1.0
0.688	Nd ¹⁴⁸	n	0.1	0.75	Sr ⁸⁴	2n	0.3
	Sm ¹⁴⁹	2p	0.1		I ¹²⁷	n	3.6
	Sm ¹⁵⁰	He ³	0.1		Xe ¹²⁸	np	0.1
	Sm ¹⁵²	n α	0.3		Ni ⁵⁸	2n	32.5
0.6887	Au ¹⁹⁷	n	26.0	0.7506	Ce ¹⁴²	np	0.5
	Hg ¹⁹⁸	np	2.6		Ce ¹⁴²	2p	0.5
	Hg ¹⁹⁹	T	4.4		Te ¹²⁸	n	12.7
0.69	Te ¹²⁸	np	—	0.75194	Te ¹³⁰	T	13.8
0.6984	Kr ⁸³	p	3.1		Cs ¹³³	n	0.1
	Kr ⁸⁴	np	15.3		Xe ¹³⁴	He ³	5.2
	Rb ⁸⁵	He ³	19.3		Xe ¹³⁶	n α	4.4
	Rb ⁸⁷	n α	7.5				
0.7171	Ag ¹⁰⁷	n	12.1	0.775			
	Cd ¹⁰⁸	np	0.2				

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.7767	Kr ⁸³ Kr ⁸⁴ Rb ⁸⁵ Rb ⁸⁷	p np He ³ n α	9.6 47.2 59.8 23.1	0.818 cont.	La ¹³⁸ La ¹³⁹	2p He ³	0.1 99.9
0.7769	Sr ⁸⁴	2n	0.1	0.825	Br ⁷⁹ Br ⁸⁰	2n T	1.5 0.1
0.7782	Mo ¹⁰⁰ Ru ¹⁰¹ Ru ¹⁰² Ru ¹⁰⁴	n 2p He ³ n α	0.5 0.8 1.5 0.9	0.8278	Nd ¹⁴²	n α	0.1
0.78	Ga ⁶⁹	2n	0.1	0.831	Kr ⁸³ Kr ⁸⁴ Rb ⁸⁵ Rb ⁸⁷	p np He ³ n α	2.8 13.7 17.3 6.7
0.7828	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	6.4 0.1	0.835	Xe ¹³⁴ Xe ¹³⁶	He ³ n α	0.7 0.6
0.786	Xe ¹³⁴ Xe ¹³⁶	He ³ n α	0.6 0.5	0.8475	Se ⁷⁴ Se ⁷⁴	2n np	0.6 0.6
0.788	Ge ⁷⁰	n	0.1	0.8484	Ag ¹⁰⁷	n	1.1
0.797	Xe ¹³⁴ Xe ¹³⁶	He ³ n α	1.3 1.1	0.85	Fe ⁵⁴ Te ¹²⁸	np	0.2 —
0.8075	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	13.0 0.2	0.85	Eu ¹⁵¹ Eu ¹⁵³	2p α	0.1 0.1
0.8079	Ti ⁵⁰	He ³	0.4	0.854	Xe ¹³⁴ Xe ¹³⁶	He ³ n α	2.9 2.4
0.81	Te ¹²⁸ Te ¹³⁰	He ³ n α	0.5 0.5	0.86	I ¹²⁷	n	0.8
0.8117	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	1.6 2.6 10.3	0.862	Ba ¹³⁸ La ¹³⁹	np He ³	2.7 2.8
0.8122	Ni ⁵⁸	2n	59.0	0.8671	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.3 0.4 1.6
0.81583	Ce ¹⁴² Ce ¹⁴²	np 2p	2.6 2.6	0.86784	Ce ¹⁴² Ce ¹⁴²	np 2p	0.6 0.6
0.818	Ba ¹³⁷ Ba ¹³⁸	p np	11.3 71.7				

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.869	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	0.2 0.2	0.952	Ir ¹⁹¹ Pt ¹⁹²	2n T	— —
0.87	Ga ⁶⁹	2n	0.1	0.9606	Gd ¹⁵⁷ Gd ¹⁵⁸	p np	0.6 1.0
0.872	Ge ⁷⁰	n	1.9		Tb ¹⁵⁹	He ³	4.0
0.88	Nd ¹⁴⁵ Nd ¹⁴⁶ Nd ¹⁴⁸	2p He ³ nα	0.1 0.2 0.1	0.9833	Ti ⁴⁹ Ti ⁵⁰ V ⁵⁰ V ⁵⁰ V ⁵¹	p np 2n 2p He ³	5.5 5.3 0.2 0.2 99.8
0.90	Nb ⁹³ Mo ⁹⁴ Mo ⁹⁵	n np T	1.8 0.2 0.3		Cr ⁵⁰	np	4.3
0.91	Zr ⁹⁰ Zr ⁹¹ Mo ⁹² Mo ⁹⁴	n 2n He ³ nα	51.5 11.2 15.8 9.0	0.99	Te ¹²⁸	np	—
0.91	Te ¹²⁸ Te ¹³⁰	He ³ nα	0.4 0.5	1.00	Br ⁷⁹	2n	0.7
0.914	Sm ¹⁴⁹ Sm ¹⁵⁰ Eu ¹⁵¹ Eu ¹⁵³	p np He ³ nα	2.2 1.2 7.5 8.1	1.02	Sc ⁴⁵ Ti ⁴⁶ Ti ⁴⁷	n np T	1.3 0.1 0.1
0.915	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	0.4 0.3	1.03	Sb ¹²¹ Te ¹²² Te ¹²³	n np T	56.7 2.4 0.9
0.9196	Ce ¹⁴²	2p	0.3	1.040	Cs ¹³³	n	0.2
0.92523	Ce ¹⁴² Ce ¹⁴²	np 2p	0.8 0.8	1.0440	Kr ⁸³ Kr ⁸⁴ Rb ⁸⁵ Rb ⁸⁷	p np He ³ nα	3.4 16.5 20.9 8.1
0.934	Nb ⁹³ Mo ⁹⁴ Mo ⁹⁵	n np T	99.1 9.0 15.6	1.0457	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	16.1 0.3
0.935	Fe ⁵⁴	np	5.5	1.0494	Gd ¹⁵⁷ Gd ¹⁵⁸	p np	0.6 1.0
0.945	Cr ⁵⁰	np	0.4		Tb ¹⁵⁹	He ³	4.0

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
1.05	Ba ¹³⁷ Ba ¹³⁸ La ¹³⁸ La ¹³⁹	p np 2p He ³	10.3 65.0 0.1 90.6	1.138 1.140	Cs ¹³³ Sb ¹²³ I ¹²⁷	n n	0.5 0.3 0.7
1.052	Ge ⁷⁰	n	0.1	1.1534	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	1.0 1.6 6.5
1.0650	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	1.2 1.8 7.3	1.1540	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	1.1 1.7 6.7
1.07	Te ¹²⁸ Te ¹³⁰	He ³ nα	1.3 1.4	1.156	Sc ⁴⁵ Ti ⁴⁶ Ti ⁴⁷	n np T	100.0 8.0 7.3
1.0770	Rb ⁸⁷ Sr ⁸⁷ Sr ⁸⁸	n p np	2.5 0.6 7.2	1.16	Te ¹³⁰	nα	0.1
1.0791	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.5 0.8 3.0	1.1682	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.5 0.8 3.0
1.08769	Tl ²⁰³	nα	0.1	1.171	Sb ¹²¹ Te ¹²² Te ¹²³	n np T	57.3 2.5 0.9
1.095	Yb ¹⁷³ Yb ¹⁷⁴	p np	1.1 2.1				
1.10	Nd ¹⁴⁵ Nd ¹⁴⁶	2p He ³	0.1 0.1	1.1991	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	6.8 0.1
1.107	Ge ⁷⁰	n	5.8	1.206	Ge ⁷⁰	n	0.1
1.12	Sc ⁴⁵ Ti ⁴⁶ Ti ⁴⁷	n np T	1.3 0.1 0.1	1.206	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	0.9 0.8
1.12	Sb ¹²¹	n	0.6	1.213	Se ⁷⁷ Se ⁷⁸	p np	0.2 0.5
1.127	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	1.4 1.2	1.2160	Se ⁷⁷ Se ⁷⁸	p np	0.3 0.9
1.1278	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	5.2 0.1	1.2221	Te ¹²⁰ Xe ¹²⁴	n nα	0.1 0.1

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
1.2228	Ag ¹⁰⁷ Cd ¹⁰⁸	n np	5.0 0.1	1.338	Ag ¹⁰⁷	n	1.2
1.2306	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	1.3 2.1 8.5	1.3663	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.3 0.5 2.0
1.2423	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	1.1 1.7 7.0	1.3798	Er ¹⁶⁷ Er ¹⁶⁸ Tm ¹⁶⁹	p np He ³	0.2 0.2 0.9
1.247	Fe ⁵⁴	np	0.3	1.389	Yb ¹⁷³ Yb ¹⁷⁴	p np	1.1 2.2
1.25	Ba ¹³⁷ Ba ¹³⁸ La ¹³⁹	p np He ³	1.1 6.7 9.3	1.43	I ¹²⁷	n	0.4
1.26	Sb ¹²³ I ¹²⁷	n nα	0.3 0.7	1.4336	Fe ⁵⁴	np	5.8
1.2773	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.3 0.5 1.9	1.465	Sm ¹⁴⁹ Sm ¹⁵⁰ Eu ¹⁵¹ Eu ¹⁵³	p np He ³ nα	3.4 1.8 11.7 12.7
1.2971	Ca ⁴⁸ Ti ⁵⁰	n He ³	0.1 4.0	1.468	Yb ¹⁷³ Yb ¹⁷⁴	p np	1.1 2.2
1.312	Ti ⁴⁹ Ti ⁵⁰ V ⁵⁰ V ⁵⁰ V ⁵¹ Cr ⁵⁰	p np 2n 2p He ³ np	5.5 5.3 0.2 0.2 99.8 4.2	1.4749	Kr ⁸³ Kr ⁸⁴ Rb ⁸⁵ Rb ⁸⁷	p np He ³ nα	2.0 9.7 12.3 4.7
1.317	Kr ⁸³ Kr ⁸⁴ Rb ⁸⁵ Rb ⁸⁷	p np He ³ nα	3.2 15.9 20.2 7.8	1.53	Ag ¹⁰⁷ Cd ¹⁰⁸ Yb ¹⁷³ Yb ¹⁷⁴	n np	10.5 0.2
1.320	Cs ¹³³	n	0.6	1.5625	Ni ⁵⁸	2n	10.2
1.3338	Fe ⁵⁴	np	0.3	1.583	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	0.2 0.2
1.335	Ge ⁷⁰	n	0.6				

Table 2, Part D (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
1.5966	Ce ¹⁴² Ce ¹⁴²	np 2p	10.6 10.6	2.0263 cont.	Gd ¹⁵⁸ Tb ¹⁵⁹	np He ³	1.2 4.9
1.61	Yb ¹⁷³ Yb ¹⁷⁴	p np	0.8 1.6	2.0967 2.0975	Se ⁷⁸ Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	np	0.1 0.6 1.0 3.9
1.71	Zr ⁹⁰ Zr ⁹¹ Mo ⁹² Mo ⁹⁴	n 2n He ³ nα	0.5 0.1 0.2 0.1	2.112	Se ⁷⁸	p np He ³	0.6 1.0 3.9
1.7884	Se ⁷⁸	np	0.1	2.1807	Gd ¹⁵⁷ Gd ¹⁵⁸	p np	0.4 0.6
1.83	Nb ⁹³ Mo ⁹⁴ Mo ⁹⁵	n np T	0.9 0.1 0.1	2.1866	Tb ¹⁵⁹ Gd ¹⁵⁷ Gd ¹⁵⁸	He ³	2.2 0.6 0.9
1.83	Ag ¹⁰⁷	n	1.6		Tb ¹⁵⁹	He ³	3.5
1.860	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	0.3 0.2	2.241	Cr ⁵⁰	np	0.1
1.8767	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.3 0.4 1.6	2.5220	Ce ¹⁴² Ce ¹⁴²	np 2p	0.4 0.4
1.9374	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.5 0.8 3.1				
1.965	Xe ¹³⁴ Xe ¹³⁶	He ³ nα	0.3 0.3				
1.9656	Gd ¹⁵⁷ Gd ¹⁵⁸ Tb ¹⁵⁹	p np He ³	0.6 1.0 4.0				
1.9850	Cs ¹³³	n	0.1				
1.99	Te ¹²⁸ Te ¹³⁰	He ³ nα	0.2 0.2				
2.0263	Gd ¹⁵⁷	p	0.8				

Table 2, Part E
Half-Lives From 30 Days to 1 Year

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.05259	Re ¹⁸⁵ Os ¹⁸⁶	2n T	4.5 0.2	0.06397 cont.	Cd ¹⁰⁶ Cd ¹⁰⁸	p T	0.1 0.1
0.0531	Ru ¹⁰⁴ Pd ¹⁰⁵ Pd ¹⁰⁶ Pd ¹⁰⁸	n 2p He ³ nα	0.2 0.3 0.3 0.3	0.065	Sn ¹²⁰ Sb ¹²¹ Te ¹²² Te ¹²³ Te ¹²⁴	n np He ³ α nα	32.9 57.3 2.5 0.9 4.6
0.05341	Nd ¹⁴⁶ Nd ¹⁴⁸	2p α	0.2 0.1	0.06572	W ¹⁸³ W ¹⁸⁴ Re ¹⁸⁵ Re ¹⁸⁷	p np He ³ nα	0.7 1.4 1.7 2.9
0.054	Se ⁷⁴ Se ⁷⁶	p T	0.9 9.0		Re ¹⁸⁵ Re ¹⁸⁷		
0.05760	Te ¹²⁸ Xe ¹²⁸ Xe ¹²⁹ Xe ¹²⁹ Xe ¹³¹ Xe ¹³²	n n 2n 2p α nα	0.3 0.1 1.2 0.2 0.2 0.2	0.06775	W ¹⁸³ W ¹⁸⁴ Re ¹⁸⁵ Re ¹⁸⁷ Gd ¹⁵⁴ Gd ¹⁵⁵	p np He ³ nα n 2n	5.2 11.1 13.5 22.8 0.3 1.9
0.0580	Dy ¹⁶⁰ Dy ¹⁶¹ Er ¹⁶⁴	n 2n nα	0.6 4.8 0.4	0.07543	Gd ¹⁵⁵	2n	0.1
0.05903	Nd ¹⁴⁶ Nd ¹⁴⁸	2p α	0.2 0.1	0.0765	Lu ¹⁷⁵ Hf ¹⁷⁶ Hf ¹⁷⁷	n np T	97.4 5.2 18.5
0.061	Sm ¹⁴⁷	2n	13.8	0.0798	Tm ¹⁶⁹ Yb ¹⁷⁰ Yb ¹⁷¹	n np T	— — —
0.0615	Sm ¹⁴⁹ Sm ¹⁵⁰ Eu ¹⁵¹ Eu ¹⁵³	p np He ³ nα	1.0 0.5 3.4 3.7	0.08012	Nd ¹⁴⁶ Nd ¹⁴⁸	2p α	0.9 0.3
0.06312	Yb ¹⁷⁰ Yb ¹⁷¹ Hf ¹⁷⁴	n 2n nα	2.8 13.3 0.2	0.08292 0.0834	Re ¹⁸⁵ Re ¹⁸⁵ Os ¹⁸⁶ Os ¹⁸⁷	2n n np T	0.4 26.0 1.1 1.2
0.06358	Os ¹⁹⁰ Os ¹⁹²	2p α	0.2 0.4	0.08426	Yb ¹⁷¹ Yb ¹⁷² Yb ¹⁷³	p np T	3.3 5.0 3.7
0.06397	Ag ¹⁰⁷	2n	6.1				

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.08468	W ¹⁸³	p	0.5	0.0988	Au ¹⁹⁷	2n	79.7
	W ¹⁸⁴	np	1.0		Hg ¹⁹⁶	p	0.1
	Re ¹⁸⁵	He ³	1.2		Hg ¹⁹⁸	T	8.0
	Re ¹⁸⁷	nα	2.0				
0.08471	Re ¹⁸⁵	2n	1.4	0.099	Sm ¹⁴⁹	p	0.6
	Os ¹⁸⁶	T	0.1		Sm ¹⁵⁰	np	0.3
					Eu ¹⁵¹	He ³	1.9
					Eu ¹⁵³	nα	2.1
0.08679	Dy ¹⁶¹	p	14.2	0.09908	Re ¹⁸⁵	2n	5.7
	Dy ¹⁶²	np	19.3		Os ¹⁸⁶	T	0.2
	Dy ¹⁶³	T	18.8				
	Ho ¹⁶⁵	nα	75.4				
0.0885	Te ¹²⁴	n	4.6	0.10010	W ¹⁸³	p	8.2
	Te ¹²⁵	2n	7.0		W ¹⁸⁴	np	17.5
	Xe ¹²⁶	He ³	0.1		Re ¹⁸⁵	He ³	21.2
	Xe ¹²⁸	nα	1.9		Re ¹⁸⁷	nα	35.9
0.0887	Te ¹²⁸	n	31.5	0.10318	Gd ¹⁵⁴	n	1.2
	Xe ¹²⁹	2p	26.2		Gd ¹⁵⁵	2n	8.0
	Xe ¹³⁰	He ³	4.1		Nb ⁹³	2n	97.0
	Xe ¹³¹	α	21.0		Mo ⁹²	p	15.4
	Xe ¹³²	nα	26.7		Mo ⁹⁴	T	8.8
0.08936	Hf ¹⁷⁶	n	0.5	0.1047	Re ¹⁸⁵	n	26.0
	Hf ¹⁷⁷	2n	1.8		Os ¹⁸⁶	np	1.1
					Os ¹⁸⁷	T	1.2
0.08948	Gd ¹⁵⁵	2n	0.1	0.1056	Te ¹³⁰	n	22.1
0.093	W ¹⁸⁶	He ³	—		Xe ¹³¹	2p	13.6
0.09362	Yb ¹⁷⁰	n	0.4		Xe ¹³²	He ³	17.2
	Yb ¹⁷¹	2n	1.7		Xe ¹³⁴	nα	6.7
0.0965	Ru ⁹⁸	p	1.9	0.10793	Re ¹⁸⁵	2n	1.6
	Ru ⁹⁹	np	12.7		Os ¹⁸⁶	T	0.1
	Ru ¹⁰⁰	T	12.6				
0.09673	Se ⁷⁶	n	0.6	0.10927	Te ¹²⁶	n	18.7
	Se ⁷⁷	2n	0.5		I ¹²⁷	np	100.0
					Xe ¹²⁸	He ³	1.9
					Xe ¹²⁹	α	26.4
0.09743	Gd ¹⁵⁴	n	0.8	0.10973	Xe ¹³⁰	nα	4.1
	Gd ¹⁵⁵	2n	5.4		Re ¹⁸⁵	2n	2.1
					Os ¹⁸⁶	T	0.1

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.10977	Yb ¹⁷⁰	n	1.9	0.13634	Ir ¹⁹³	n	0.3
	Yb ¹⁷¹	2n	9.0		Pt ¹⁹⁴	np	0.1
	Hf ¹⁷⁴	nα	0.1		Pt ¹⁹⁵	T	0.1
0.1112	Re ¹⁸⁵	n	22.1		Au ¹⁹⁷	nα	0.4
	Os ¹⁸⁶	np	1.0	0.13643	Co ⁵⁹	2n	12.2
	Os ¹⁸⁷	T	1.0		Ni ⁵⁸	p	8.3
0.11817	Yb ¹⁷⁰	n	0.2		Ni ⁶⁰	T	3.2
	Yb ¹⁷¹	2n	0.9	0.13686	W ¹⁸³	2p	0.3
0.12111	Se ⁷⁶	n	1.5		W ¹⁸⁴	He ³	0.6
	Se ⁷⁷	2n	1.3		W ¹⁸⁶	nα	0.6
0.12207	Co ⁵⁹	2n	87.7	0.1372	Sm ¹⁴⁹	p	1.0
	Ni ⁵⁸	p	59.4		Sm ¹⁵⁰	np	0.5
	Ni ⁶⁰	T	22.9		Eu ¹⁵¹	He ³	3.4
0.1264	W ¹⁸³	p	0.7		Eu ¹⁵³	nα	3.7
	W ¹⁸⁴	np	1.4	0.14522	Xe ¹²⁸	n	0.1
	Re ¹⁸⁵	He ³	1.7		Xe ¹²⁹	2n	1.2
	Re ¹⁸⁷	nα	2.9		Ce ¹⁴²	n	7.8
0.1294	Au ¹⁹⁷	2n	19.3		Nd ¹⁴³	2p	8.6
	Hg ¹⁹⁸	T	0.2		Nd ¹⁴⁴	He ³	16.8
					Nd ¹⁴⁵	α	5.9
					Nd ¹⁴⁶	nα	12.2
0.13051	Yb ¹⁷⁰	n	0.5	0.15243	W ¹⁸³	p	1.2
	Yb ¹⁷¹	2n	2.2		W ¹⁸⁴	np	2.5
0.13302	W ¹⁸³	2p	13.7		Re ¹⁸⁵	He ³	3.1
	W ¹⁸⁴	He ³	29.1		Re ¹⁸⁷	nα	5.2
	W ¹⁸⁶	nα	27.0				
0.13353	Nd ¹⁴⁶	2p	2.9	0.1554	Ag ¹⁰⁷	2n	0.3
	Nd ¹⁴⁸	α	1.0				
0.13597	Se ⁷⁶	n	5.2	0.15639	W ¹⁸³	p	0.2
	Se ⁷⁷	2n	4.4		W ¹⁸⁴	np	0.4
0.13625	W ¹⁸³	2p	1.9		Re ¹⁸⁵	He ³	0.5
	W ¹⁸⁴	He ³	4.1		Re ¹⁸⁷	nα	0.9
	W ¹⁸⁶	nα	3.8		Te ¹²⁴	n	4.6
					Te ¹²⁵	2n	7.0
					Xe ¹²⁶	He ³	0.1
					Xe ¹²⁸	nα	1.9

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.16053	Re ¹⁸⁵ Os ¹⁸⁶	2n T	16.6 0.7	0.1984	Tm ¹⁶⁹ Yb ¹⁷⁰ Yb ¹⁷¹	n np T	— — —
0.16584	Ce ¹⁴⁰ Pr ¹⁴¹ Nd ¹⁴² Nd ¹⁴³ Nd ¹⁴⁴	n np He ³ α n α	88.5 100.0 27.1 12.2 23.9	0.19864	Se ⁷⁶ Se ⁷⁷	n 2n	0.1 0.1
0.17210	Xe ¹²⁸ Xe ¹²⁹	n 2n	0.5 6.6	0.20128	Ir ¹⁹³ Pt ¹⁹⁴ Pt ¹⁹⁵ Au ¹⁹⁷	n np T n α	0.3 0.2 0.2 0.5
0.176	Lu ¹⁷⁵ Hf ¹⁷⁶ Hf ¹⁷⁷	n np T	97.4 5.2 18.5	0.20284	Xe ¹²⁸ Xe ¹²⁹ Ba ¹³⁰ Ba ¹³²	n 2n He ³ n α	1.4 19.4 0.1 0.1
0.17718	Yb ¹⁷⁰ Yb ¹⁷¹ Hf ¹⁷⁴	n 2n n α	0.9 4.3 0.1	0.2042	Ru ⁹⁶ Ru ⁹⁸	p T	2.3 0.8
0.17939	W ¹⁸³ W ¹⁸⁴ Re ¹⁸⁵ Re ¹⁸⁷	p np He ³ n α	0.8 1.6 1.9 3.3	0.20579	Ir ¹⁹³ Pt ¹⁹⁴ Pt ¹⁹⁵ Au ¹⁹⁷	n np T n α	2.6 1.4 1.4 4.1
0.1828	Ag ¹⁰⁷	2n	0.3	0.20881	Re ¹⁸⁵ Os ¹⁸⁶	2n T	2.1 0.1
0.189	Sm ¹⁴⁹ Sm ¹⁵⁰ Eu ¹⁵¹ Eu ¹⁵³	p np He ³ n α	0.2 0.1 0.5 0.6	0.211	Os ¹⁹⁰ Os ¹⁹²	p T	— —
0.19223	Ni ⁶²	He ³	0.1	0.2112	Au ¹⁹⁷ Hg ¹⁹⁸	2n T	1.0 0.1
0.19702	Dy ¹⁶¹ Dy ¹⁶² Dy ¹⁶³ Ho ¹⁶⁵	p np T n α	1.2 1.7 1.6 6.5	0.2122	Te ¹²² Te ¹²³ Xe ¹²⁴ Xe ¹²⁶	n 2n He ³ n α	2.2 0.8 0.1 0.1
0.19797	Yb ¹⁷⁰ Yb ¹⁷¹ Hf ¹⁷⁴	n 2n n α	1.6 7.4 0.1	0.21564	Dy ¹⁶¹ Dy ¹⁶² Dy ¹⁶³ Ho ¹⁶⁵	p np T n α	0.8 1.0 1.0 4.0

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.22210	W ¹⁸³	p	1.9	0.27958	Se ⁷⁶	n	2.3
	W ¹⁸⁴	np	4.0		Se ⁷⁷	2n	1.9
	Re ¹⁸⁵	He ³	4.9		Ag ¹⁰⁷	2n	11.8
	Re ¹⁸⁷	nα	8.2		Cd ¹⁰⁶	p	0.3
0.227	Os ¹⁹⁰	2p	0.1	0.2804	Cd ¹⁰⁸	T	0.2
	Os ¹⁹²	α	0.2		Sm ¹⁴⁹	p	2.0
0.2354	Zr ⁹⁶	n	0.1	0.289	Sm ¹⁵⁰	np	1.1
	Mo ⁹⁷	2p	0.2		Eu ¹⁵¹	He ³	6.9
	Mo ⁹⁸	He ³	0.4		Eu ¹⁵³	nα	7.6
	Mo ¹⁰⁰	nα	0.2		Os ¹⁹⁰	2p	0.1
0.24524	Re ¹⁸⁵	2n	0.4	0.290	Os ¹⁹²	α	0.2
	Re ¹⁸⁵	2n	0.7		Re ¹⁸⁵	2n	4.0
0.2547	Eu ¹⁵¹	2n	—	0.29172	Os ¹⁸⁶	T	0.2
	Gd ¹⁵²	T	—		Ir ¹⁹³	n	45.0
0.26104	Yb ¹⁷⁰	n	0.1	0.29594	Pt ¹⁹⁴	np	23.6
	Yb ¹⁷¹	2n	0.4		Pt ¹⁹⁵	T	24.3
	Yb ¹⁷⁰	n	0.1		Au ¹⁹⁷	nα	71.8
	Yb ¹⁷¹	2n	0.4		Dy ¹⁶¹	p	5.1
0.26407	W ¹⁸³	p	0.9	0.2985	Dy ¹⁶²	np	6.8
	W ¹⁸⁴	np	1.9		Dy ¹⁶³	T	6.7
	Re ¹⁸⁵	He ³	2.3		Ho ¹⁶⁵	nα	26.8
	Re ¹⁸⁷	nα	3.8		Hf ¹⁷⁷	2n	0.1
0.26467	Se ⁷⁶	n	5.4	0.2996	Se ⁷⁶	n	0.1
	Se ⁷⁷	2n	4.5		Se ⁷⁷	2n	0.1
0.273	Lu ¹⁷⁵	n	97.4	0.30398	Ag ¹⁰⁷	2n	0.3
	Hf ¹⁷⁶	np	5.2		Yb ¹⁷⁰	n	0.5
	Hf ¹⁷⁷	T	18.6		Yb ¹⁷¹	2n	2.2
0.2772	Eu ¹⁵¹	2n	—	0.30768	Ir ¹⁹³	n	20.3
	Gd ¹⁵²	T	—		Pt ¹⁹⁴	np	10.7
0.27917	Hg ²⁰⁴	n	6.9	0.30843	Pt ¹⁹⁵	T	11.0
	Pb ²⁰⁶	He ³	23.6		Au ¹⁹⁷	nα	32.4
	Pb ²⁰⁷	α	22.6				
	Pb ²⁰⁸	nα	52.3				

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.3096	Dy ¹⁶¹	p	0.2	0.37496	Xe ¹²⁸	n	0.4
	Dy ¹⁶²	np	0.2		Xe ¹²⁹	2n	5.8
	Dy ¹⁶³	T	0.2		Sn ¹¹⁴	n	0.7
	Ho ¹⁶⁵	n α	0.9		Sn ¹¹⁵	2n	0.4
0.312	Sm ¹⁴⁹	p	0.4	0.3924	Dy ¹⁶¹	p	0.3
	Sm ¹⁵⁰	np	0.2		Dy ¹⁶²	np	0.4
	Eu ¹⁵¹	He ³	1.3		Dy ¹⁶³	T	0.4
	Eu ¹⁵³	n α	1.5		Ho ¹⁶⁵	n α	1.5
0.31649	Ir ¹⁹³	n	51.3	0.394	Zr ⁹⁰	2n	51.5
	Pt ¹⁹⁴	np	26.9		Mo ⁹²	α	15.8
	Pt ¹⁹⁵	T	27.7				
	Au ¹⁹⁷	n α	81.8				
0.3191	Ag ¹⁰⁷	2n	0.3	0.4007	Se ⁷⁶	n	1.1
					Se ⁷⁷	2n	0.9
0.3277	Eu ¹⁵¹	2n	—	0.413	Sm ¹⁴⁹	p	1.9
	Gd ¹⁵²	T	—		Sm ¹⁵⁰	np	1.0
0.3314	Ag ¹⁰⁷	2n	0.3		Eu ¹⁵¹	He ³	6.4
					Eu ¹⁵³	n α	7.0
0.3434	Hf ¹⁷⁶	n	5.0	0.433	Sm ¹⁴⁹	p	0.6
	Hf ¹⁷⁷	2n	17.6		Sm ¹⁵⁰	np	0.3
	W ¹⁸⁰	n α	0.1		Eu ¹⁵¹	He ³	2.2
0.3444	Ag ¹⁰⁷	2n	23.1	0.4330	Eu ¹⁵³	n α	2.4
	Cd ¹⁰⁶	p	0.5		Hf ¹⁷⁶	n	0.2
	Cd ¹⁰⁸	T	0.4		Hf ¹⁷⁷	2n	0.8
0.3459	W ¹⁸³	2p	1.9	0.4433	Ag ¹⁰⁷	2n	5.0
	W ¹⁸⁴	He ³	4.1		Cd ¹⁰⁶	p	0.1
	W ¹⁸⁶	n α	3.8		Cd ¹⁰⁸	T	0.1
0.365	Lu ¹⁷⁵	n	2.0	0.4465	Cd ¹¹¹	p	0.3
	Hf ¹⁷⁶	np	0.1		Cd ¹¹²	np	0.7
	Hf ¹⁷⁷	T	0.4		Cd ¹¹³	T	0.3
0.3701	Ag ¹⁰⁷	2n	0.3		In ¹¹³	He ³	0.1
					In ¹¹⁵	n α	2.6
0.3746	Ir ¹⁹³	n	0.3	0.4477	Tm ¹⁶⁹	n	—
	Pt ¹⁹⁴	np	0.2		Yb ¹⁷⁰	np	—
	Pt ¹⁹⁵	T	0.2		Yb ¹⁷¹	T	—
	Au ¹⁹⁷	n α	0.5				

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.46805	Ir ¹⁹³	n	0.3	0.521	Rb ⁸⁵	2n	33.1
	Pt ¹⁹⁴	np	0.1		Sr ⁸⁴	p	0.3
	Pt ¹⁹⁵	T	0.1				
	Au ¹⁹⁷	nα	0.4		Rb ⁸⁵	2n	22.4
0.474	Sm ¹⁴⁷	T	6.9	0.540	Sr ⁸⁴	p	0.2
0.4748	Rh ¹⁰³	n	55.5		Re ¹⁸⁵	n	0.3
	Pd ¹⁰⁴	np	6.1		Sm ¹⁴⁹	p	12.9
	Pd ¹⁰⁵	T	12.3		Sm ¹⁵⁰	np	6.9
	Ag ¹⁰⁷	nα	28.8		Eu ¹⁵¹	He ³	44.5
0.476	W ¹⁸³	2p	0.3	0.558	Eu ¹⁵³	nα	48.5
	W ¹⁸⁴	He ³	0.6		Rb ⁸⁵	2n	11.6
	W ¹⁸⁶	nα	0.5		Sr ⁸⁴	p	0.1
0.47756	C ¹²	nα	10.2	0.5569	Ru ¹⁰⁴	n	0.2
0.4820	W ¹⁸³	2p	11.6		Pd ¹⁰⁵	2p	0.2
	W ¹⁸⁴	He ³	24.8		Pd ¹⁰⁶	He ³	0.2
	W ¹⁸⁶	nα	23.0		Pd ¹⁰⁸	nα	0.2
0.4846	Ir ¹⁹³	n	2.2	0.57	Os ¹⁹⁰	p	—
	Pt ¹⁹⁴	np	1.1		Os ¹⁹²	T	—
	Pt ¹⁹⁵	T	1.2		Ru ⁹⁶	p	0.5
	Au ¹⁹⁷	nα	3.4		Ru ⁹⁸	T	0.2
0.485	Sn ¹¹⁸	He ³	0.1	0.58856	Ir ¹⁹³	n	2.6
	Sn ¹²⁰	nα	0.1		Pt ¹⁹⁴	np	1.4
0.4969	Ru ¹⁰⁴	n	16.5	0.602	Pt ¹⁹⁵	T	1.4
	Pd ¹⁰⁵	2p	19.8		Au ¹⁹⁷	nα	4.1
	Pd ¹⁰⁶	He ³	24.3		Sm ¹⁴⁹	p	1.2
	Pd ¹⁰⁸	nα	23.8		Sm ¹⁵⁰	np	0.7
0.501	Sm ¹⁴⁹	p	0.7	0.60271	Eu ¹⁵¹	He ³	4.3
	Sm ¹⁵⁰	np	0.4		Eu ¹⁵³	nα	4.7
	Eu ¹⁵¹	He ³	2.4		Te ¹²⁵	p	6.9
	Eu ¹⁵³	nα	2.7		Te ¹²⁶	np	18.5
0.51397	Sr ⁸⁶	n	9.9	0.60438	I ¹²⁷	He ³	98.6
	Sr ⁸⁷	2n	7.0		Ir ¹⁹³	n	5.8

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.60438 cont.	Pt ¹⁹⁴	np	3.0	0.630 cont.	Eu ¹⁵¹	He ³	42.3
	Pt ¹⁹⁵	T	3.1		Eu ¹⁵³	nα	46.2
	Au ¹⁹⁷	nα	9.2				
0.6102	Ru ¹⁰⁴	n	1.0	0.643 0.6444	Re ¹⁸⁵	n	0.8
	Pd ¹⁰⁵	2p	1.2		Ag ¹⁰⁷	2n	4.7
	Pd ¹⁰⁶	He ³	1.5		Cd ¹⁰⁶	p	0.1
	Pd ¹⁰⁸	nα	1.4		Cd ¹⁰⁸	T	0.1
0.611	Sm ¹⁴⁹	p	0.6	0.6458 0.64584	Os ¹⁸⁶	n	1.3
	Sm ¹⁵⁰	np	0.3		Os ¹⁸⁷	2n	1.3
	Eu ¹⁵¹	He ³	2.2		Te ¹²⁵	p	0.5
	Eu ¹⁵³	nα	2.4		Te ¹²⁶	np	1.4
0.61243	Ir ¹⁹³	n	8.6	0.6462	I ¹²⁷	He ³	7.3
	Pt ¹⁹⁴	np	4.5		Tm ¹⁶⁹	n	—
	Pt ¹⁹⁵	T	4.6		Yb ¹⁷⁰	np	—
	Au ¹⁹⁷	nα	13.7		Yb ¹⁷¹	T	—
0.615	Sm ¹⁴⁷	T	15.0	0.6506	Ag ¹⁰⁷	2n	0.3
0.617	Ru ⁹⁶	p	0.1				
0.619	W ¹⁸³	2p	0.4	0.6576	Cd ¹¹¹	p	12.2
	W ¹⁸⁴	He ³	0.9		Cd ¹¹²	np	23.0
	W ¹⁸⁶	nα	0.9		Cd ¹¹³	T	11.7
					In ¹¹³	He ³	4.1
0.6202	Cd ¹¹¹	p	0.4	0.67	In ¹¹⁵	nα	91.5
	Cd ¹¹²	np	0.8		Os ¹⁹⁰	p	—
	Cd ¹¹³	T	0.4		Os ¹⁹²	T	—
	In ¹¹³	He ³	0.1				
	In ¹¹⁵	nα	3.2				
0.6281				0.6773	Cd ¹¹¹	p	1.5
	Rh ¹⁰³	n	4.1		Cd ¹¹²	np	2.9
	Pd ¹⁰⁴	np	0.5		Cd ¹¹³	T	1.5
	Pd ¹⁰⁵	T	0.9		In ¹¹³	He ³	0.5
	Ag ¹⁰⁷	nα	2.1		In ¹¹⁵	nα	11.5
0.63	Lu ¹⁷⁵	n	2.0	0.6822	Dy ¹⁶¹	p	0.1
	Hf ¹⁷⁶	np	0.1		Dy ¹⁶²	np	0.2
	Hf ¹⁷⁷	T	0.4		Dy ¹⁶³	T	0.2
					Ho ¹⁶⁵	nα	0.6
0.630	Sm ¹⁴⁹	p	12.2	0.6865	Cd ¹¹¹	p	1.0
	Sm ¹⁵⁰	np	6.6		Cd ¹¹²	np	1.9

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.6865 cont.	Cd ¹¹³	T	0.9	0.727	Sm ¹⁴⁹	p	5.1
	In ¹¹³	He ³	0.3		Sm ¹⁵⁰	np	2.7
	In ¹¹⁵	n α	7.4		Eu ¹⁵¹	He ³	17.6
0.6921	Co ⁵⁹	2n	0.2		Eu ¹⁵³	n α	19.2
	Ni ⁵⁸	p	0.1	0.742	Sm ¹⁴⁴	p	1.5
0.695	Sm ¹⁴⁷	T	15.0		Tm ¹⁶⁹	n	—
0.69648	Nd ¹⁴⁶	2p	0.3		Yb ¹⁷⁰	np	—
	Nd ¹⁴⁸	α	0.1		Yb ¹⁷¹	T	—
0.697	Te ¹³⁰	n	2.1	0.7439	Cd ¹¹¹	p	0.8
	Xe ¹³¹	2p	1.3		Cd ¹¹²	np	1.4
	Xe ¹³²	He ³	1.6		Cd ¹¹³	T	0.7
	Xe ¹³⁴	n α	0.6		In ¹¹³	He ³	0.3
					In ¹¹⁵	n α	5.7
0.7064	Cd ¹¹¹	p	2.5	0.75687	Zr ⁹⁶	n	1.5
	Cd ¹¹²	np	4.7		Mo ⁹⁷	2p	5.1
	Cd ¹¹³	T	2.4		Mo ⁹⁸	He ³	12.9
	In ¹¹³	He ³	0.8		Mo ¹⁰⁰	n α	5.2
	In ¹¹⁵	n α	18.6				
0.70934	Te ¹²⁵	p	0.1	0.7636	Cd ¹¹¹	p	3.0
	Te ¹²⁶	np	0.3		Cd ¹¹²	np	5.7
	I ¹²⁷	He ³	1.4		Cd ¹¹³	T	2.9
					In ¹¹³	He ³	1.0
					In ¹¹⁵	n α	22.5
0.71382	Te ¹²⁵	p	0.2	0.7653	Dy ¹⁶¹	p	0.5
	Te ¹²⁶	np	0.5		Dy ¹⁶²	np	0.7
	I ¹²⁷	He ³	2.5		Dy ¹⁶³	T	0.7
0.7141	Os ¹⁸⁶	n	0.1		Ho ¹⁶⁵	n α	2.7
	Os ¹⁸⁷	2n	0.1				
0.72278	Te ¹²⁵	p	0.8	0.76584	Zr ⁹⁶	n	2.8
	Te ¹²⁶	np	2.1		Mo ⁹⁶	p	16.5
	I ¹²⁷	He ³	11.1		Mo ⁹⁷	np	9.5
					Mo ⁹⁷	2p	9.5
0.72424	Zr ⁹⁶	n	1.2	0.770	Mo ⁹⁸	T	23.8
	Mo ⁹⁷	2p	4.1		Mo ¹⁰⁰	He ³	23.8
	Mo ⁹⁸	He ³	10.3			n α	9.6
	Mo ¹⁰⁰	n α	4.2		Re ¹⁸⁵	n	0.2

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
0.788	Ru ⁹⁶ Ru ⁹⁸	p T	1.6 0.6	0.837	Ru ⁹⁶ Ru ⁹⁸	p T	1.3 0.4
0.790	Rb ⁸⁵	2n	0.7	0.84675	Ni ⁵⁸	np	67.8
0.79076	Te ¹²⁵ Te ¹²⁶ I ¹²⁷	p np He ³	0.1 0.1 0.7	0.8636	Co ⁵⁹ Ni ⁶⁰	n np	0.7 0.2
0.793	Re ¹⁸⁵ Os ¹⁸⁶ Os ¹⁸⁷	n np T	14.1 0.6 0.6	0.872	Os ¹⁸⁶ Os ¹⁸⁷	n 2n	0.1 0.1
0.80	Ge ⁷⁰	2n	0.1	0.8793	Dy ¹⁶¹	p	6.3
0.8076	Ag ¹⁰⁷	2n	0.5		Dy ¹⁶²	np	8.5
0.8106	Co ⁵⁹ Ni ⁶⁰	n np	99.5 26.0		Dy ¹⁶³	T	8.3
0.8178	Te ¹²² Te ¹²³ Xe ¹²⁴ Xe ¹²⁶	n 2n He ³ nα	2.2 0.8 0.1 0.1	0.88	Rb ⁸⁵ Sr ⁸⁶	n np	53.0 7.2
0.8180	Cd ¹¹¹ Cd ¹¹² Cd ¹¹³ In ¹¹³ In ¹¹⁵	p np T He ³ nα	1.2 2.2 1.1 0.4 8.9	0.8845	Cd ¹¹¹ Cd ¹¹² Cd ¹¹³ In ¹¹³ In ¹¹⁵	p np T He ³ nα	9.2 17.4 8.9 3.1 69.3
0.822	Ru ⁹⁶ Ru ⁹⁸	p T	0.4 0.1	0.8846	Ir ¹⁹³ Pt ¹⁹⁴ Pt ¹⁹⁵ Au ¹⁹⁷	n np T nα	0.3 0.1 0.1 0.4
0.831	Tm ¹⁶⁹ Yb ¹⁷⁰ Yb ¹⁷¹	n np T	— — —	0.8894	Ti ⁴⁷ Ti ⁴⁸ Ti ⁴⁹ V ⁵⁰ V ⁵¹	p np T α nα	7.3 74.0 5.5 0.2 99.8
0.83481	Mn ⁵⁵ Fe ⁵⁶ Fe ⁵⁷ Co ⁵⁹	n np T nα	100.0 91.7 2.2 100.0	0.896	Re ¹⁸⁵ Os ¹⁸⁶ Os ¹⁸⁷	n np T	6.6 0.3 0.3

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity X Abundance
0.89804	Y ⁸⁹	n	93.4	0.9961 cont.	Dy ¹⁶³	T	5.9
	Zr ⁹⁰	2n	48.1		Ho ¹⁶⁵	nα	23.5
	Zr ⁹⁰	np	48.1				
	Zr ⁹¹	T	10.5		W ¹⁸³	p	0.3
	Mo ⁹²	α	14.8		W ¹⁸⁴	np	0.7
0.904	Re ¹⁸⁵	n	14.9	1.002	Re ¹⁸⁵	He ³	0.9
	Os ¹⁸⁶	np	0.6		Re ¹⁸⁷	nα	1.5
	Os ¹⁸⁷	T	0.7		Dy ¹⁶¹	p	0.2
0.916	Sm ¹⁴⁹	p	2.2	1.003	Dy ¹⁶²	np	0.3
	Sm ¹⁵⁰	np	1.2		Dy ¹⁶³	T	0.3
	Eu ¹⁵¹	He ³	7.6		Ho ¹⁶⁵	nα	1.0
	Eu ¹⁵³	nα	8.2		Rb ⁸⁵	n	0.3
0.935	Cd ¹¹⁶	n	0.1	1.015	Sm ¹⁴⁹	p	3.1
	Sn ¹¹⁷	2p	0.1		Sm ¹⁵⁰	np	1.7
	Sn ¹¹⁸	He ³	0.4		Eu ¹⁵¹	He ³	10.8
	Sn ¹¹⁹	α	0.1		Eu ¹⁵³	nα	11.7
	Sn ¹²⁰	nα	0.5				
0.9374	Cd ¹¹¹	p	4.0	1.024	Re ¹⁸⁵	n	0.2
	Cd ¹¹²	np	7.5		Ni ⁵⁸	np	8.7
	Cd ¹¹³	T	3.8				
	In ¹¹³	He ³	1.3		Ru ⁹⁶	p	0.2
	In ¹¹⁵	nα	29.7		Ru ⁹⁸	T	0.1
0.95	W ¹⁸⁶	He ³	—	1.04512	Te ¹²⁵	p	0.1
0.9625	Dy ¹⁶¹	p	1.7		Te ¹²⁶	np	0.4
	Dy ¹⁶²	np	2.4	1.078	I ¹²⁷	He ³	1.9
	Dy ¹⁶³	T	2.3		Ge ⁷⁰	2n	0.7
	Ho ¹⁶⁵	nα	9.2				
0.96822	Te ¹²⁵	p	0.1	1.0878	Ag ¹⁰⁷	2n	1.1
	Te ¹²⁶	np	0.4				
	I ¹²⁷	He ³	1.9		Ni ⁶¹	2p	0.7
					Ni ⁶²	He ³	2.1
0.994	Lu ¹⁷⁵	n	95.5	1.103	Ni ⁶⁴	nα	0.7
	Hf ¹⁷⁶	np	5.1		Rh ¹⁰³	n	2.9
	Hf ¹⁷⁷	T	18.1		Pd ¹⁰⁴	np	0.3
0.9961	Dy ¹⁶¹	p	4.4		Pd ¹⁰⁵	T	0.6
	Dy ¹⁶²	np	6.0		Ag ¹⁰⁷	nα	1.5

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance
1.11	Te ¹²²	n	0.1	1.222	W ¹⁸³ W ¹⁸⁴	p np	3.0 6.3
1.115	Dy ¹⁶¹	p	0.4	1.231	Re ¹⁸⁵	He ³	7.6
	Dy ¹⁶²	np	0.6		Re ¹⁸⁷	nα	12.9
	Dy ¹⁶³	T	0.6		W ¹⁸³ W ¹⁸⁴	p np	2.1 4.4
	Ho ¹⁶⁵	nα	2.2		Re ¹⁸⁵ Re ¹⁸⁷	He ³ nα	5.3 9.1
1.11545	Zn ⁶⁶	n	14.2		W ¹⁸³ W ¹⁸⁴	p np	2.1 4.4
	Zn ⁶⁷	2n	2.1		Re ¹⁸⁵ Re ¹⁸⁷	He ³ nα	5.3 9.1
1.1205	Ti ⁴⁷	p	7.3	1.23830	Ni ⁵⁸	np	47.4
	Ti ⁴⁸	np	74.0		Lu ¹⁷⁵	n	8.8
	Ti ⁴⁹	T	5.5		Hf ¹⁷⁶	np	0.5
	V ⁵⁰	α	0.2		Hf ¹⁷⁷	T	1.7
	V ⁵¹	nα	99.8				
1.122	W ¹⁸³	p	3.6	1.2720	Dy ¹⁶¹	p	1.4
	W ¹⁸⁴	np	7.7		Dy ¹⁶²	np	1.9
	Re ¹⁸⁵	He ³	9.3		Dy ¹⁶³	T	1.9
	Re ¹⁸⁷	nα	15.7		Ho ¹⁶⁵	nα	7.5
1.17513	Ni ⁵⁸	np	1.4	1.29	Cd ¹¹⁶	n	0.1
1.1781	Dy ¹⁶¹	p	2.5		Sn ¹¹⁷	2p	0.1
	Dy ¹⁶²	np	3.4		Sn ¹¹⁸	He ³	0.2
	Dy ¹⁶³	T	3.3		Sn ¹¹⁹	α	0.1
	Ho ¹⁶⁵	nα	13.2		Sn ¹²⁰	nα	0.3
1.189	W ¹⁸³	p	1.9	1.29158	Ni ⁶¹	2p	0.6
	W ¹⁸⁴	np	4.1		Ni ⁶²	He ³	1.6
	Re ¹⁸⁵	He ³	5.0		Ni ⁶⁴	nα	0.5
	Re ¹⁸⁷	nα	8.5				
1.200	Dy ¹⁶¹	p	0.6	1.312	Dy ¹⁶¹	p	0.5
	Dy ¹⁶²	np	0.8		Dy ¹⁶²	np	0.7
	Dy ¹⁶³	T	0.8		Dy ¹⁶³	T	0.7
	Ho ¹⁶⁵	nα	3.0		Ho ¹⁶⁵	nα	2.8
1.21	Nb ⁹³	2n	3.0	1.35521	Te ¹²⁵	p	0.1
	Mo ⁹²	p	0.5		Te ¹²⁶	np	0.2
	Mo ⁹⁴	T	0.3		I ¹²⁷	He ³	1.0
	Nb ⁹³	2p	0.2		Ni ⁵⁸	np	2.9

Table 2, Part E (Continued)

Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	Gamma Energy (MeV)	Target Nucleus	Photo-Reaction	Percent Intensity × Abundance	
1.36821	Te ¹²⁵	p	0.2	1.83613	Y ⁸⁹	n	99.4	
	Te ¹²⁶	np	0.5		Zr ⁹⁰	2n	51.1	
	I ¹²⁷	He ³	2.4		Zr ⁹⁰	np	51.1	
1.3837	Cd ¹¹¹	p	2.7	1.90	Zr ⁹¹	T	11.2	
	Cd ¹¹²	np	5.2		Mo ⁹²	α	15.7	
	Cd ¹¹³	T	2.6		Rb ⁸⁵	n	0.6	
	In ¹¹³	He ³	0.9		Sr ⁸⁶	np	0.1	
	In ¹¹⁵	nα	20.5		2.01536	Ni ⁵⁸	np	2.0
1.43660	Te ¹²⁵	p	0.1	2.03492	Ni ⁵⁸	np	5.0	
	Te ¹²⁶	np	0.2		Ni ⁵⁸	np	5.0	
	I ¹²⁷	He ³	1.1		2.09100	Te ¹²⁵	p	0.4
1.4756	Cd ¹¹¹	p	0.6	2.18572	Te ¹²⁶	np	1.1	
	Cd ¹¹²	np	1.1		I ¹²⁷	He ³	5.7	
	Cd ¹¹³	T	0.5		Nd ¹⁴⁶	2p	0.1	
	In ¹¹³	He ³	0.2		2.59857	Ni ⁵⁸	np	11.4
	In ¹¹⁵	nα	4.2		2.735	Y ⁸⁹	n	0.6
1.48906	Te ¹²⁶	np	0.1		Zr ⁹⁰	2n	0.3	
	I ¹²⁷	He ³	0.6		Zr ⁹⁰	np	0.3	
1.505	Cd ¹¹¹	p	1.6	3.20219	Zr ⁹¹	T	0.1	
	Cd ¹¹²	np	3.0		Mo ⁹²	α	0.1	
	Cd ¹¹³	T	1.5		Ni ⁵⁸	np	2.1	
	In ¹¹³	He ³	0.5		Ni ⁵⁸	np	5.1	
	In ¹¹⁵	nα	12.0		3.25364	Ni ⁵⁸	np	1.0
1.565	Cd ¹¹¹	p	0.2	3.27319	Ni ⁵⁸	np	5.1	
	Cd ¹¹²	np	0.3		Ni ⁵⁸	np	1.0	
	Cd ¹¹³	T	0.2		Ni ⁵⁸	np	5.1	
	In ¹¹³	He ³	0.1		Ni ⁵⁸	np	1.0	
	In ¹¹⁵	nα	1.3		Ni ⁵⁸	np	5.1	
1.6748	Co ⁵⁹	n	0.5		Ni ⁵⁸	np	5.1	
	Ni ⁶⁰	np	0.1		Ni ⁵⁸	np	5.1	
1.69104	Te ¹²⁵	p	3.4		Ni ⁵⁸	np	5.1	
	Te ¹²⁶	np	9.0		Ni ⁵⁸	np	5.1	
	I ¹²⁷	He ³	48.3		Ni ⁵⁸	np	5.1	
1.77143	Ni ⁵⁸	np	10.6					

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Naval Research Laboratory Washington, D. C. 20375	2a. REPORT SECURITY CLASSIFICATION Unclassified
	2b. GROUP

3. REPORT TITLE

Photonuclear Activation Analysis with Ge(Li) Detectors - Compilation II

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

This is an interim report on photonuclear activation analysis

5. AUTHOR(S) (First name, middle initial, last name)

M. Elaine Toms

6. REPORT DATE May 9, 1973	7a. TOTAL NO. OF PAGES 98	7b. NO. OF REFS 7
8a. CONTRACT OR GRANT NO. NRL Problem HO1-09	9a. ORIGINATOR'S REPORT NUMBER(S) NRL Report 7591	
b. PROJECT NO. RR 002-06-41-5005	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
c.		
d.		

10. DISTRIBUTION STATEMENT

Approved for public release; distribution unlimited

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY Department of the Navy Office of Naval Research Arlington, Virginia 22217
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13. ABSTRACT

High-energy bremsstrahlung, variable up to about 60 MeV, from high-intensity electron linacs can produce activation through a variety of photonuclear reactions. A great range of activities by half-lives can be used. Some discrimination between target elements can be obtained through the choice of bremsstrahlung endpoint energy. The high resolution of Ge(Li) gamma-ray spectrometers permits much of the analysis to be accomplished without chemical separation of resulting nuclei; hence nondestructive analysis can be applied to many materials. To facilitate the use of such analysis, a compilation of photonuclear reactions with their resulting gamma-rays has been prepared, supplementing the compilation for activities with half-lives from 100 μ sec to 24 hours given in NRL Report 7554. This second compilation is for activities with half-lives from 24 hours to 1 year and again consists of two tabulations. Table 1-S lists the photonuclear reactions by target nuclei. Tables 2D and 2E, the final two parts of Table 2, list the reactions by gamma-ray energies: Table 2D is for half-lives from 24 hours to 30 days, and Table 2E is for half-lives from 30 days to 1 year.

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Activation analysis Photonuclear reactions Trace elements Ge(Li) spectrometry Tables (data)						