A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

PUBLICATIONS NBS SPECIAL PUBLICATION 380

Photonuclear Reaction Data, 1973

U.S. DEPARTMENT OF COMMERCE
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E. G. Fuller, H. M. Gerstenberg,
H. Vander Molen, and T. C. Dunn

Center for Radiation Research
Institute for Basic Standards
National Bureau of Standards
Washington, D.C. 20234

U.S. DEPARTMENT OF COMMERCE, Frederick B. Dent, *Secretary*
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, *Director*

Issued March 1973

Library of Congress Catalog Card Number: 72-600057

National Bureau of Standards Special Publication 380

Nat. Bur. Stand. (U.S.), Spec. Publ. 380, 131 pages (Mar. 1973)

CODEN: XNBSAV

(This publication supersedes NBS Miscellaneous Publication 277 and NBS Special Publication 322 which also embraced Supplement 1 to Misc Publ. 277. All information contained in these publications has been combined and merged with new data to form the Photonuclear Data Index and Bibliography contained in this publication.)

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Foreword

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The task of critical evaluation is carried out in various data centers, each with a well-defined technical scope. A necessary preliminary step to the critical evaluation process is the retrieval from the world scientific literature of all papers falling within the scope of the center. Each center, therefore, builds up a comprehensive well-indexed bibliographical file which forms the base for the evaluation task. Bibliographies derived from these files are published when they appear to be of value to research workers and others interested in the particular technical area.

Further information on NSRDS and the publications which form the primary output of the program may be obtained by writing to the Office of Standard Reference Data, National Bureau of Standards, Washington, DC 20234.

David R. Lide, Jr., Chief
Office of Standard Reference Data

Contents

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E. G. Fuller, H. M. Gerstenberg, H. Vander Molen,* and T. C. Dunn

A brief summary is given of the available data on the gross features of the photonuclear giant resonance. Data are presented in tabular form for all nuclei where measurements have been made. In addition, a comprehensive, annotated data index and bibliography are given which cover experimental data for the field of photonuclear reactions published in scientific and technical journals in the period from 1955 through 1972. Organized by element and isotope, each entry in the index is for a specific reaction reported in a given reference. Information is given on the type of measurement, excitation energies studied, source type and energies, detector type and angular ranges covered for each reaction entry.

Key words: Bibliography; data index; data summary; elements; isotopes; nuclear physics; photonuclear giant resonance; photonuclear reaction.

1. Introduction

The field of Photonuclear Reactions is concerned with the interaction of electromagnetic radiation with nuclei. The interactions can take place through the intermediary of either "real" or "virtual" photons. The field was first opened for study forty years ago when Chadwick and Goldhaber [1][1] observed protons in an ionization chamber containing deuterium gas that was bombarded with the 2.61 MeV γ-rays from ^{208}Tl. This most elementary photonuclear reaction is still the subject of considerable study both experimentally as well as theoretically.

During the first ten years of its history, the study of the field was limited to the use of real photons obtained from radioactive sources or from the γ-decay of highly excited states formed in nuclear reactions. The range of photon energies at which studies could be made was of necessity very limited. Only after the development of the betatron [2] was it possible to study the photonuclear interaction as a function of photon energy. In the late forties, Baldwin and Klaiber [3] were able to obtain the first evidence for the existence of the photonuclear giant resonance in spite of the fact that the bremsstrahlung beam produced by the betatron was a continuous energy spectrum of photons with only a well-defined upper energy limit. This phenomenon, i.e., the concentration of most of the strength of the photonuclear reaction over a relatively narrow energy band, has been studied extensively over the last 25 years. During the decade of the fifties, improvements in accelerator technology, data analysis techniques, and radiation detectors resulted in a number of significant measurements being made of the cross sections for total photon absorption, quasi-elastic photon scattering, and specific reaction yields. These experiments established the systematics of the photonuclear interaction and showed the dependence of the general features of the giant resonance on nuclear structure, e.g., the ground-state deformation and the tensor polarizability of the nucleus. Further developments in accelerator and detector technologies in the decade of the sixties provided data that confirmed the general features indicated by the earlier bremsstrahlung data and also permitted measurements to be made in greater detail and with higher precision. To a large extent, the improved data resulted from the development of "quasi-monoenergetic" photon beams using the annihilation-in-flight of positrons generated by electron beams from linear accelerators [4]. Up through the sixties the great majority of data obtained on the photonuclear interaction was "one-dimensional", i.e., a particular reaction was studied as a

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*A Nuclear Information Research Associate (NIRA) at the National Bureau of Standards.

[1] Figures in brackets indicate the literature references at the end of this publication.

function of excitation energy only. It had long been realized that studies of inelastic electron scattering could lead to "two-dimensional" data [5]. These experiments could give information not only as a function of excitation energy but also for a fixed excitation energy, as a function of the momentum transferred to the nucleus, i.e., the wavelength of the probe used to study the interaction could be made arbitrarily shorter than that associated with the energy transfer. Only during the last few years have developments in accelerator facilities, detection systems, and data analysis techniques permitted reliable data of this type to be obtained. Measurements in this area should have a considerable impact on the field of photonuclear reactions during the decade of the seventies.

The objective of this report is twofold. First, to present a brief summary of what is known about the gross features of the giant resonance in such a form that the data may be useful both for individuals interested in the basic interaction as well as those interested in obtaining the yield of a particular reaction under specified conditions; second, to present a cumulative, comprehensive, annotated index and bibliography covering the data on photonuclear reactions that have been published in the world's scientific and technical literature in the period from 1955 through 1972. The report is organized as follows: Section 2 discusses the gross features of the giant resonance and presents data in both graphical as well as tabular form; Section 3 gives a description of the annotated index and bibliography; Section 4 consists of the data index; Section 5, the bibliography; and Section 6 lists the abbreviations used in the various tables and their definitions. the final section, 7, is a reference list to citations made in the textual parts of this report which are not included in the bibliography given in Section 5.

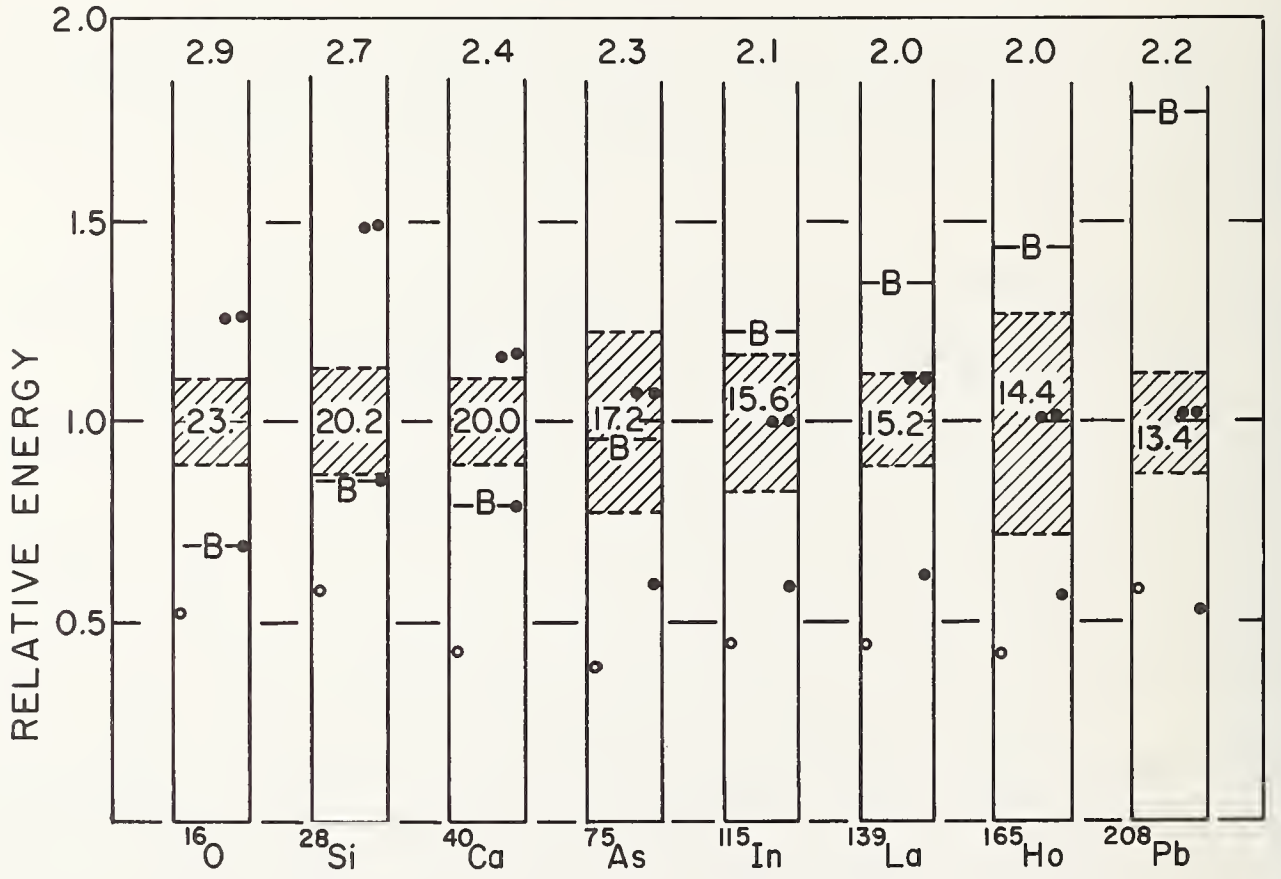

Figure 1. Giant resonance summary. The energy scale for each nucleus has been normalized so that the giant resonance is at one. The width of the giant resonance on this scale is indicated by the shaded regions. Separation energies are indicated by circles, open for protons and closed for neutrons. See text for complete description.

2. Gross Features of the Giant Resonance

2.1. General Description

The giant resonance of the photonuclear interaction is an empirical phenomenon exhibited by all nuclei. It is the large peak seen in the plot of the nuclear photon absorption cross section as a function of photon energy. The area under this peak is always found to be approximately that given by the dipole sum-rule result [6]:

$$\int_0^\infty \sigma(E)dE = \frac{2\pi^2 e^2 \hbar}{Mc} \frac{NZ}{A} = 0.06\ NZ/A\ \text{(MeV-barns)} \qquad (1)$$

Figure 1 gives a rough "bird's-eye" picture of the giant resonance for nuclei ranging from oxygen to lead. In this figure the energy scale for each nucleus has been normalized so that the mean energy for photon absorption below 30 MeV has been set equal to one. The actual mean energies for the specific nuclei are given in MeV by the figures in the center of the shaded region indicated for each nucleus. These shaded regions indicate the extent of the giant resonance, i.e., they indicate roughly the region between the half maximum points on the absorption cross section curve. Note that in this figure the overall widths of the giant resonance vary by about a factor of two. The narrowest resonances are for those nuclei with closed shells while the broadest are for those (e.g., ^{165}Ho) having large permanent deformations. The overall extent of the giant resonance for the deformed nuclei is determined to a large extent by the splitting of the giant resonance resulting from the deformation. In this respect, the large width indicated for ^{75}As is interesting in that it can probably be associated with a dynamic deformation of this nucleus resulting from the zero-point vibrations of the nuclear surface.

The black dots and open circles shown in Figure 1 represent, respectively, the neutron and proton separation energies. The lines designated by the letter "B" in each diagram indicate the top of the Coulomb barrier for protons. In the light nuclei this barrier compensates for the difference in the separation energy for neutrons and protons. The total (γ,p) yield might then be expected to equal the total (γ,n) yield were it not for the fact that the high neutron separation energy results in there being a paucity of states available for neutron decay. In the heavy nuclei the top of the Coulomb barrier comes well above the giant resonance and the decay is predominantly by neutron emission. The two black dots indicate the threshold for the $(\gamma,2n)$ reaction. In the light nuclei this threshold is well above the giant resonance while in the heavier ones it comes at about its center. For these nuclei the $(\gamma,2n)$ reaction can contribute appreciably to the total absorption cross section.

The numbers given across the top of Figure 1 give the energies, in units of the giant resonance energy, at which the ratio of the nuclear radius to the photon wavelength divided by 2π is equal to one. This is the energy at which retardation effects might be expected to set in and where the usual multipole expansion of the electromagnetic operator might be expected to lead to difficulties.

Good resolution experiments have shown that for the light nuclei, atomic number $A<40$, the giant resonance has considerable fine structure. While some such structure has been shown to exist for the heavier nuclei, this is in general not a significant feature of the shape of the absorption curve for nuclei with $A>100$. In any event, all such structure is going to be smoothed over in this discussion. The only structure that will be indicated is that associated with nuclei having permanently deformed nuclear ground states. The giant resonance for these nuclei is very well described by the superposition of two Lorentz shape resonance curves in which the area under the higher energy peak is twice that under the lower energy peak, i.e.,

$$\sigma(E) = \frac{\sigma_a(\Gamma_a E)}{(E^2-E_a^{\,2})^2 + (\Gamma_a E)^2} + \frac{\sigma_b(\Gamma_b E)}{(E^2-E_b^{\,2})^2 + (\Gamma_b E)^2} \qquad (2)$$

and $\sigma_b \Gamma_b = 2\ \sigma_a \Gamma_a$. Except for the normalizations used to present the data in some of the figures, little or no attempt will be made to correlate any of the data presented with theory. This aspect of the field is covered in a number of recent reviews [7].

2.2. Experimental Data

The gross features of the giant resonance are summarized in Table 1 and Figures 2 and 3. Table 1 presents data for all nuclei for which measurements have been made. No attempt has been made to indicate the fine structure often observed in the giant resonance for the lighter nuclei. The data presented for a given nucleus and reaction are the energy at which the giant resonance peaks, E; the magnitude of the cross section at E, SIG; and the full width of the cross section curve at half maximum, DEL.

Where authors have fit a cross section curve by either one or the superposition of two Lorentz lines, the resulting parameters are listed and a letter L is entered under REMARKS. Also listed are the integrated cross section up to some upper energy limit $\sigma_o(E_m)$, SIG-0, and the bremsstrahlung weighted cross section $\sigma_{-1}(E_m)$, SIG-1. These quantities are defined by

$$\sigma_o(E_m) = \int_o^{E_m} \sigma(E)dE$$

$$\sigma_{-1}(E_m) = \int_o^{E_m} \frac{\sigma(E)}{E}\, dE \qquad (3)$$

When these integrals have been evaluated from the Lorentz line parameters used to fit the cross section, E_m is given as L. For the lighter nuclei these quantities are given where possible both for the total cross section as well as for one or more of the partial reaction cross sections which make a major contribution to the total. For the heavier nuclei the data pertain almost exclusively to neutron-producing cross sections. The various reactions listed are indicated by the symbols given in the second column of the table, (INT). These symbols are defined as follows:

TOT	the total nuclear absorption cross section for photons
N	the (γ,n) cross section
XN	the neutron yield cross section $\sigma(xn)$ $\sigma(xn) = \sigma(\gamma,n) + \sigma(\gamma,np) + 2\sigma(\gamma,2n) + \eta\sigma(\gamma,f)$
SN	the sum of the neutron-producing cross sections $\sigma(SN)$; $\sigma(SN) = \sigma(\gamma,n) + \sigma(\gamma,np) + \sigma(\sigma,2n) + \ldots$
P	the (γ,p) cross section
T	the (γ,t) cross section (t = triton)
D	the (γ,d) cross section (d = deuteron)
F	the photofission cross section
N+P	$\sigma(\gamma,n) + \sigma(\gamma,p)$
SNF	$\sigma(SN) + \sigma(\gamma,f)$

Where a number of measurements of a particular cross section are available in the literature, the parameters given in Table 1 are taken from a single measurement which has been selected as being the most representative of the data for a particular nucleus. This measurement is identified by the bibliographic reference given for each entry in the table. The notes referred to in the final column (REMARKS) are listed at the end of the table. These are used to expand on the information given in the table, to indicate the need for

possible renormalizations of the values quoted, and to give the source of data listed where no bibliographic reference number is available.

The general trends with mass number A of the integrated absorption cross section and the bremsstrahlung weighted cross section are indicated in Figures 2 and 3, respectively. On these figures the data for nuclei having mass numbers less than 70 all come from direct measurements of the total photon absorption cross section. For the lightest nuclei two values are given, one where the upper limit to the integration is 140 MeV (i.e., approximately the meson production threshold) and a second value where the limit is 30 MeV for σ_0 and 35 MeV for σ_1. The data for the heavier nuclei are all taken from measurements of the neutron-producting cross section, $\sigma(SN)$, that have been fit with Lorentz shape resonance curves. In general, the measurements have extended up to about 25 MeV. The values listed all result from carrying out the appropriate analytical integrations ($0 < E < \infty$) over the resonance curves. None of the data presented in these figures were derived from $\sigma(SN)$ curves that had been obtained by making statistical model corrections to measurements of $\sigma(XN)$. The integrated cross section values have been normalized in terms of the value given by the classical dipole sum rule (see Equation (1)). The bremsstrahlung weighted cross section values have been normalized by dividing by $A^{4/3}$, the mass number dependence given by most elementary models of the nuclear photoeffect [8].

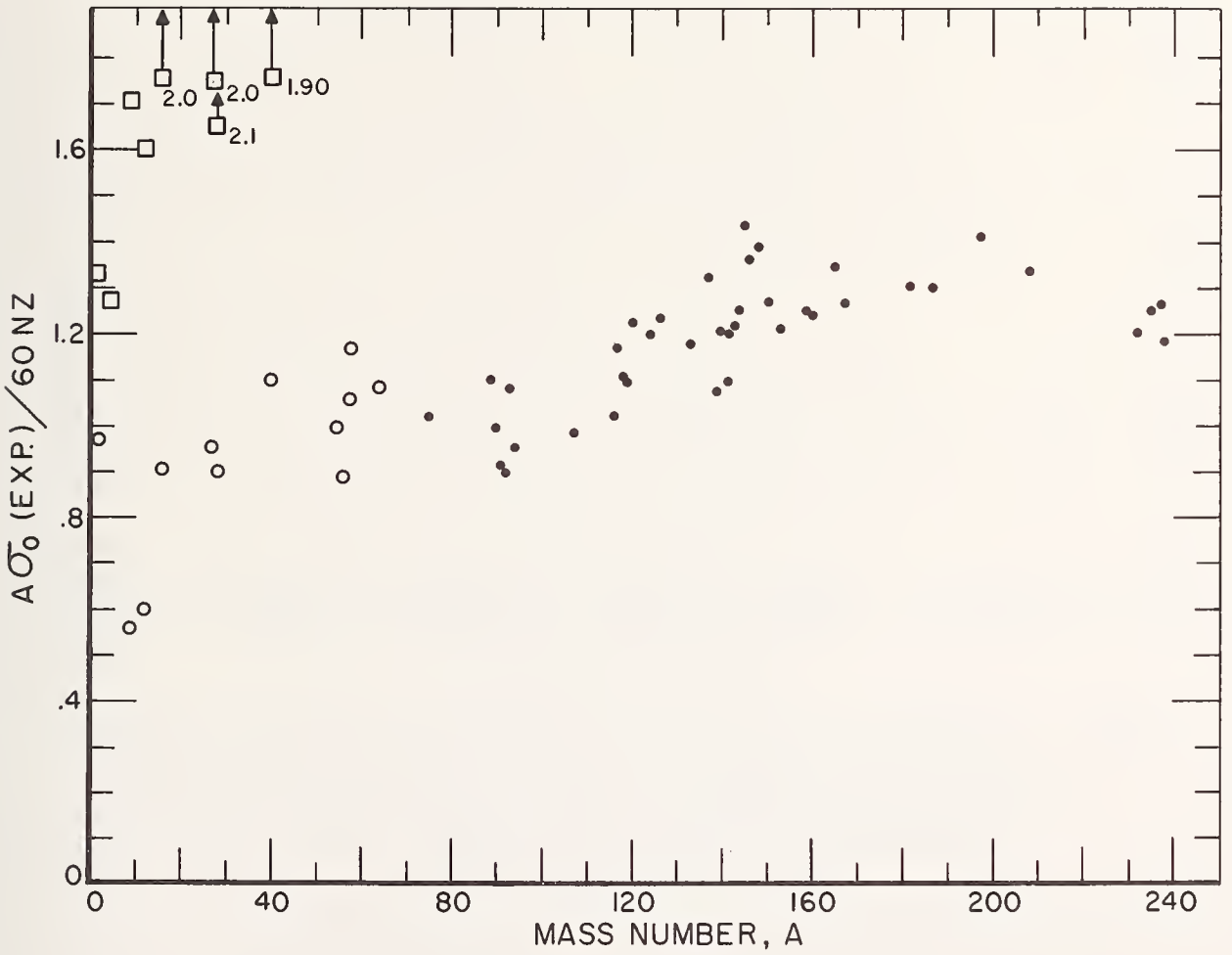

Figure 2. Integrated absorption cross sections normalized to the classical dipole sum rule value. All points are from data selected from those listed in Table 1. Solid dots were obtained from integrating Lorentz line fits to $\sigma(SN)$ data. Open circles and squares are from total absorption cross section measurements. For open circles integration is taken to 30 MeV, for the squares it goes to 140 MeV.

Except for some fluctuations associated with the lightest nuclei, the normalized values of both σ_0 and σ_1 are relatively independent of the mass number. Note that for the light nuclei ($A < 40$), where data are available, that there is a rather large contribution to $\sigma_0(140)$ coming from energies above 30 MeV. The contribution of the cross section at these ranges to $\sigma_1(140)$, however, is relatively small. The total cross section for these nuclei indicates that $\sigma_0(140)$ is about twice the classical sum-rule result. Unfortunately, only very sketchy data are available to give an indication of what this limit might be for the heavier nuclei. The data which do exist are not inconsistent with $\sigma_0(140)$ being twice the dipole sum-rule value for these nuclei also (see Equation (1)).

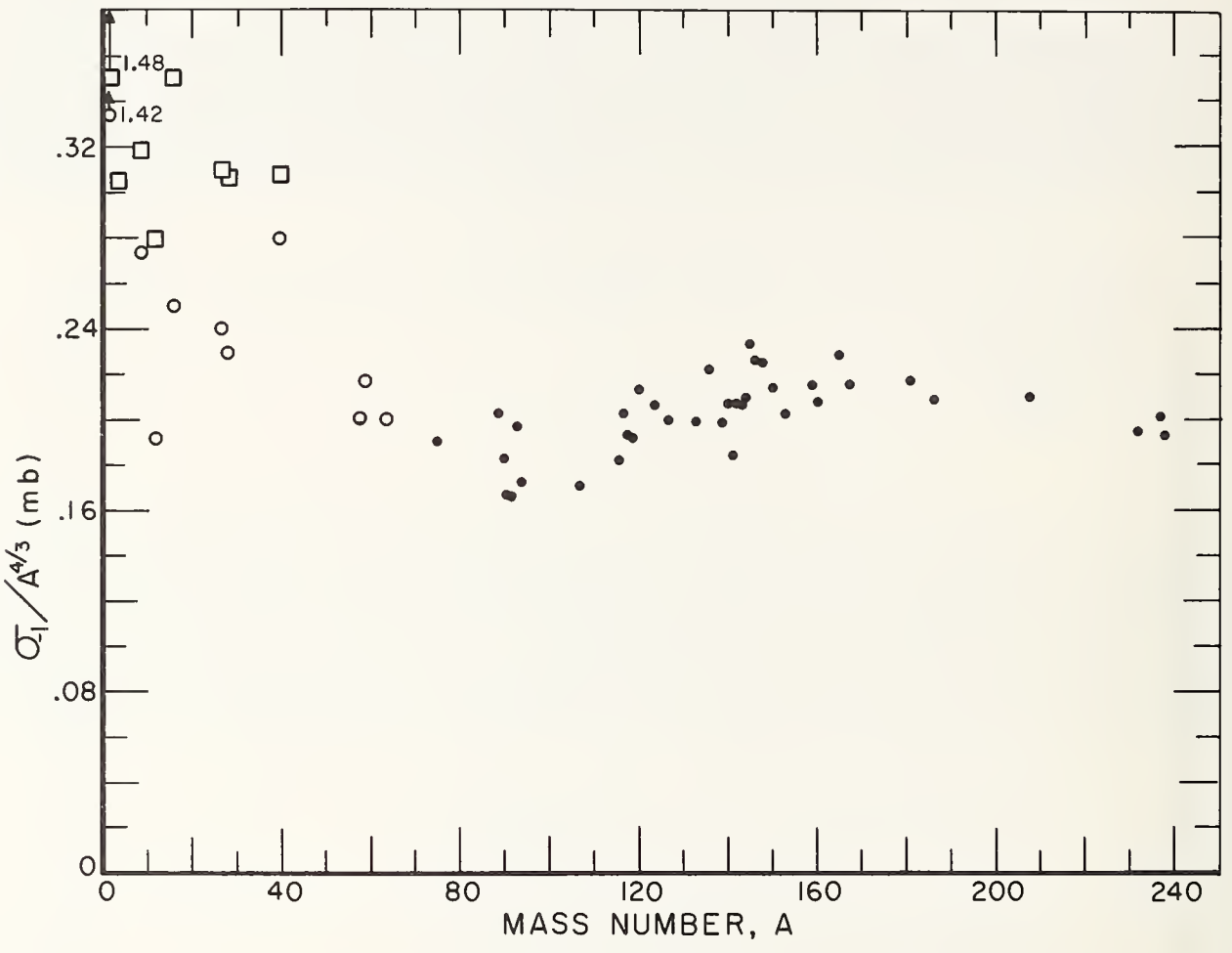

Figure 3. Normalized bremsstrahlung weighted cross sections. Solid dots obtained from integrating Lorentz line fits to σ(SN) data. Open circles and squares from total absorption cross section measurements. For open circles integration is to 35 MeV, while for squares it goes to 140 MeV.

TABLE 1. GROSS FEATURES OF THE GIANT RESONANCE

NUCLEUS Z A	INT	E MEV	SIG MB	DEL MEV	SIG-0 MEV-MB(MEV)	SIG-1 MB(MEV)	REF	REMARKS
1H 2	TOT	4.48	2.5	18.1	40(140)	3.7(140)		*1,*2
					29(30)	3.6(30)		
1H 3	D	12.	.72	12.	12(33)	.78(33)	68PF1	
2HE3	D	12.5	.75	18.	16(40)	1.1(40)	65ST1	
2HE3	N	15.	.90	13.	13(30)	.77(30)	70BE6	
2HE4	P	26.5	1.7	14.	40(170)	1.1(170)	68GO5	*2
2HE4	N	26.5	1.7	14.	42(170)	1.1(170)	68GO5	*2
3LI6	T	18.5	.59	11.	5.6(35)	.22(35)	71VE1	68SH2
3LI6	SN	12.	1.7	16.	27(32)	1.9(32)	65BE1	*3
3LI7	T	17.	0.2	20.	4.9(35)		67DE1	55MI1
3LI7	XN	16+	3.0	13+	50(29)		65HA1	
4BE9	TOT	24.	5.2	28.	228(140)	7.4(140)	71AH1	*4
4BE9					75(30)	5.1(35)	71AH1	*4
4BE9	XN	28.	4.7	26.	220(70)	7.8(70)	66CO4	
5B 10	XN	24.	6.5	10.5	67(29)		65HA1	
5B 11	XN	26.	7.5	11.	69(29)		65HA1	
5B 11	P	25.	15.	10.	98(31)		69SO2	
6C 12	TOT	23.	20.	5.2	288(140)	7.7(140)	71AH1	
					108(30)	5.1(35)	71AH1	
6C 12	SN	23.	7.	4.8	36(30)		66FU1	*5
7N 14	TOT	22.5	27.	7.0	195(30)	8.4(30)	69BE2	
7N 14	SN	23.2	14.	5.1	98(30)		70BE8	
8O 16	TOT	23.5	30.	5.5	280(140)	14(140)	71AH1	
					216(30)	10(35)	71AH1	
8O 16	SN	23.	7.	5.5	46(30)		64BR1	*5
9F 19	TOT	24.	18.	14+	271(30)		69BE2	
10NE								NO DATA
11NA23	TOT	23.	15.	16.	200(30)	11(35)	65WY1	
11NA23	SN	23.	10.	15+	119(27)		71AL1	
12MG	TOT	19.	24.	13.	225(30)	12(35)	65WY1	
12MG24	SN	19.5	7.5	11.	50(28)	2.8(28)	71FU2	
12MG25	SN	23.	28.	9	249(29)	12(29)	71AL1	
12MG26	SN	17.5	20.	7.5	294(28)	12(28)	71FU2	
13AL27	TOT	21.	40.	10.	408(140)	26(140)	71AH1	
					384(30)	20(35)	71AH1	
13AL27	SN	21.	15.	11.	172(37)		66FU1	
14SI	TOT	20.2	52.	5.	882(140)	26(140)	71AH1	
					378(30)	20(35)	71AH1	
14SI28	N	21.	15.	5.	93(31)		70WE1	
15P 31	XN	22.	13.	11.5	127(28)		63BO1	*5
15P 31	XP	21.	43.	9.	350(32)		64IS1	
16S	TOT	20.	50.	7.	400(30)	22(35)	65WY1	
16S 32	XN	21.	16.	11.	137(32)		70AN3	
17CL35	N	20.	14.	6.5	93(27)		62KU1	
18AR40	TOT	19.	42.	10.	450(32)		65EH1	
18AR40	N	19.	37.	5.	200(32)		65EH1	
19K 39	N	20.	16.	7.	102(30)		71WE1	*6
20CA	TOT	20.	92.	4.8	1140(140)	42(140)	71AH1	
					660(30)	38(35)	71AH1	
20CA	SN	20.	15.	3.8	73(26)		66MI2	
21SC45								NO DATA
22TI	XN	17.0	60	7+			67CO1	
22TI46	SN	20.5	31	8.5	269(31)		62SH5	
22TI	A= 47, 48, 49, 50							NO DATA
23V 51	SN	17.5	41	3.60	680(28)	33(L)	62FU1	L
		20.3	46	6.5			62FU1	L
24CR	XN	18.5	97		1628(80)	62(80)	64CO2	
24CR	A= 50, 52, 53, 54							NO DATA
25MN55	TOT	17.5	100	7.5	816(29)		69DO1	
26FE	TOT	17.5	90	9.0	735(27)		69DO2	
26FE54	N	19.2	38	6.9	290(31)		57CA2	
26FE	A= 56, 57, 58							NO DATA
27CO59	TOT	18.6	92	9.3	1030(35)	50(35)	65WY1	
28NI	TOT	18.7	89	7.5	920(35)	44(35)	65WY1	
28NI58	N+P	19.5	125	4.8	840(32)		59CA4	
28NI60	N+P	19.0	90	5.5	940(30)		69GU2	70IS4
28NI	A= 61, 62, 64							NO DATA
29CU	TOT	17.5	94	11.5	1036(35)	51(35)	65WY1	
29CU63	SN	16.5	63	5.0	764(28)	38(L)	64FU1	L
		21.3	22	7.1			64FU1	L
29CU65	SN	16.8	88	5.0	766(28)	53(L)	64FU1	L
		20.5	36	6.0			64FU1	L
30ZN	XN	16.7	91	4.6	1607(80)	66(80)	67CO1	64CO2
30ZN64	N	17.2	48	7.0	330(23)		60RO4	
30ZN	A= 66, 67, 68, 70							NO DATA
31GA	XN	16.5	115	18	947(28)	94(80)	65BA3	64CO2
31GA	A= 69, 71							NO DATA
32GE	XN	17.5	158		2495(80)	102(80)	64CO2	
32GE70	N	17.5	158	8.6			60FE1	
32GE76	N	18.9	243	7+	1500(21)		55BO1	
32GE	A= 72, 73, 74							NO DATA
33AS75	SN	15.0	39	3.63	910(30)	51(30)	69BE1	L
		17.5	78	7.41			69BE1	L
34SE	XN	15.5	118	5.2			67CO2	
34SE82	N	16.0	190	4.6	870(22)		56SI2	
34SE	A= 74, 76, 77, 78, 80							NO DATA
35BR								NO DATA
36KR								NO DATA
37RB	SN	16.8	192	4.1	1140(24)	67(24)	71LE1	L
37RB	A= 85, 87							NO DATA
38SR	SN	16.7	207	4.2	1420(27)	80(27)	71LE1	L
38SR84								NO DATA
38SR86	XN	15.9	160	5.0	920(23)		56YE2	
38SR87	XN	15.8	146	5.3	1000(23)		56YE2	
38SR88	XN	16.3	201	4.0	1050(23)		56YE2	
39Y 89	SN	16.7	225	4.1	1360(27)	77(27)	71LE1	L
40ZR90	SN	16.7	211	4.0	1260(26)	71(26)	71LE1	L
40ZR91	SN	16.6	184	4.23	1080(30)	66(30)	67BE2	L
40ZR92	SN	16.3	165	4.73	1100(28)	65(28)	67BE2	L
40ZR94	SN	16.2	161	5.20	1010(30)	69(31)	67BE2	L
40ZR96								NO DATA
41NB93	SN	16.5	202	4.70	1330(24)	79(24)	71LF1	L
42MO92	XN	16.4	170	5.0	1290(30)		70IS1	
42MO98	XN	16.8	280	5.0	2000(30)		70IS1	
42MO100	N+P	15.0	180	5.6	1110(20)		64GE1	
42MO	A= 94, 95, 96, 97							NO DATA
44RU								NO DATA
45RH103	SN	14.3	150	3.0	2130(L)	123(L)	62BO1	*7L
		17.5	240	3.8			62BO1	*7L
46PD108	SN	15.7	210	5.0	1725(25)	104(25)	69DE5	
	NO DATA PD 102, 104, 105, 106, 110							
47AG	TOT	15.8	218	7.5	2568(35)	130(35)	65WY1	
47AG107	SN	15.0	62	4.81	1350(30)	79(30)	69BE1	L
		16.6	99	7.01			69BE1	L
47AG109	XN	15.9	175	5.5	1210(29)		69IS2	
48CD	XN	15.6	263	5.1	1760(27)	111(27)	56GA1	
48CD	A= 106, 108, 110, 111, 112, 113, 114, 116							NO DATA
49IN	SN	15.6	266	5.24	1901(31)	113(31)	69FU1	L
49IN113								NO DATA
49IN115	SN	14.0	116	3.0	2210(L)	119(L)	62BO1	*7L
		16.3	240	3.8			62BO1	*7L

NUCLEUS Z	A	INT	E MEV	SIG MB	DEL MEV	SIG-0 MEV-MB(MEV)	SIG-1 MB(MEV)	REF	REMARKS
50SN		XN	16.0	300	5.0	1640(40)	134(L)	58FU1	
50SN112		N	16.0	340	5.0	1820(21)	152(L)	61KU1	
50SN116		SN	15.7	266	4.19	1667(29)	94(29)	69FU1	L
50SN117		SN	15.7	254	5.02	1939(31)	114(31)	69FU1	L
50SN118		SN	15.6	255	4.76	1898(30)	110(30)	69FU1	L
50SN119		SN	15.5	253	4.81	2078(31)	119(31)	69FU1	L
50SN120		SN	15.4	280	4.88	2090(30)	124(30)	69FU1	L
50SN124		SN	15.2	283	4.81	2077(31)	123(31)	69FU1	L
50SN	A= 114, 115, 122							NO DATA	
51SB								NO DATA	
52TE								NO DATA	
53I	127	SN	14.5	255	3.78	2020(25)	129(25)	69BE6	L
			16.8	130	3.87			69BE6	L
54XE								NO DATA	
55CS	133	SN	15.3	287	5.05	2000(30)	124(30)	69BE1	L
56BA		SN	15.3	356	4.70	2600(L)	157(L)	71BE4	L
56BA	138	SN	15.3	327	4.61	2040(27)	131(27)	70BE8	
56BA	A=134,135,136,137							NO DATA	
57LA	139	SN	15.2	340	4.45	2320(28)	146(28)	71BE468BE5	L
58CE		SN	15.0	360	4.35	2130(25)	140(25)	71BE469BE6	L
58CE	A=140,142							NO DATA	
59PR	141	SN	15.2	320	4.49	2100(30)	136(L)	66BR1	L
60ND	142	SN	14.9	359	4.43	2500(L)	153(L)	71CA1	L
60ND	143	SN	15.0	360	4.5	2540(L)	155(L)	71CA1	L
60ND	144	SN	15.1	317	5.3	2600(L)	158(L)	71CA1	L
60ND	145	SN	15.0	297	6.5	3000(L)	178(L)	71CA1	L
60ND	146	SN	14.8	308	6.0	2900(L)	174(L)	71CA1	L
60ND	148	SN	14.7	263	7.2	3000(L)	176(L)	71CA1	L
60ND	150	SN	12.3	174	3.3	2700(L)	171(L)	71CA1	L
			16.0	223	5.2			71CA1	L
62SM		SN	12.8	155	4.25	2480(25)	167(25)	69BE6	L
			15.5	260	4.6			69BE6	L
62SM	148	SN	14.1	335	4.0	2080(22)	137(L)	71VA2	*7L
62SM	150	SN	13.6	360	5.50	2213(23)	203(L)	69VA3	*7L
62SM	152	SN	11.6	400	2.4	3079(23)	264(L)	69VA3	*7L
			14.7	420	3.4			69VA3	*7L
62SM	154	SN	11.0	204	3.0	2478(23)	202(L)	69VA3	*7L
			15.3	320	4.0			69VA3	*7L
62SM	A=144,147,149							NO DATA	
63EU	151	SN	14.0	285	4.5	2020(22)	131(L)	71VA2	*7L
63EU	153	SN	12.3	155	2.75	2310(29)	166(L)	69BE8	L
			15.8	222	5.83			69BE8	L
64GD	152	SN	12.0	147	3.0	1990(22)	135(L)	71VA2	*7L
			15.	259	3.2			71VA2	*7L
64GD	154	SN	11.9	161	2.4	2000(22)	133(L)	71VA2	*7L
			15.0	250	3.5			71VA2	*7L
64GD	156	SN	11.9	180	2.6	2110(22)	142(L)	71VA2	*7L
			15.2	243	3.6			71VA2	*7L
64GD	158	SN	11.7	165	2.6	2160(22)	146(L)	71VA2	*7L
			14.9	249	3.8			71VA2	*7L
64GD	160	SN	12.2	215	2.77	2560(29)	181(L)	69BE8	L
			16.0	233	5.28			69BE8	L
64GD	A=155,157							NO DATA	
65TB	159	SN	12.1	205	3.25	2500(27)	172(27)	68BE5	L
			16.0	240	4.87			68BE5	L
66DY								NO DATA	
67HO	165	SN	12.1	250	2.70	2790(25)	194(25)	68BE5	L
			15.6	285	4.80			68BE5	L
68ER		SN	12.1	225	2.90	2700(25)	186(25)	69BE6	L
			15.5	260	5.0			69BE6	L
68ER	A=166,167,168,170							NO DATA	
69TM	169	SN	13.8	235	6.3	1480(22)	148(L)	58KA1	
70YB								NO DATA	
71LU	175	SN	12.4	230	2.70	2650(25)	182(25)	69BE6	
72HA								NO DATA	
73TA	181	SN	12.4	270	2.57	2900(25)	206(25)	68BE5	L
			15.3	330	4.47			68BE5	L
73TA	181	P				60(40)		60BA5	
74W	186	SN	12.6	211	2.29	3975(29)	222(L)	69BE8	L
			14.9	334	5.18			69BE8	L
74W	A= 182, 183, 184							NO DATA	
75RE								NO DATA	
76OS								NO DATA	
77IR								NO DATA	
78PT								NO DATA	
79AU	197	SN	13.7	540	4.75	3480(25)	238(25)	70VE1	L
80HG								NO DATA	
81TL		TOT	14.0	648	4.6	3770(27)	266(27)	56GA1	
81TL	203	SN	14.2	490	3.7	2610(20)	185	69AN10	
81TL	205	SN	14.1	490	3.7	2780(20)	187(L)	69AN10	
81TL	205	P	20.	.1				57EL2	
	YIELD OF A/P/N=1/100/10000								
82PB	206	SN	13.7	525	3.75	2780(28)	208(L)	64HA2	*5L
82PB	207	SN	13.6	485	3.87	2650(28)	199(L)	64HA2	*5L
82PB	208	SN	13.4	640	4.05	3480(25)	251(25)	70VE1	L
82PB	208	P				27(33)		71DA1	
83BI	209	SN	13.5	520	3.83	2930(28)	213(L)	64HA2	*5 L
88RA								NO DATA	
90TH	232	SNF	11.1	268	3.37	2500(16)	198(16)		*8L
			14.1	349	4.62				*8L
90TH	A= 228, 230							NO DATA	
91PA	231							NO DATA	
92U	233	XN	14.0	1670	6.0	11200(22)		57KA1	58KA2
92U	235	SNF	10.9	364	2.45	3560(19)	303(L)	64BO3	L
			14.1	446	4.00			64BO3	L
92U	238	SNF	11.0	301	2.90	2980(18)	235(18)		*8L
			14.0	369	4.53				*8L
92U	A= 234, 236							NO DATA	
93NP	237	SNF	11.1	251	3.16	2600(16)	204(16)		*8L
			14.2	380	5.12				*8L
94PU	239	XN	1396	1580	6.3	11600(22)		57KA1	58KA2

Notes for Table 1

*1 E. G. Fuller and Evans Hayward, "The Giant Resonance of the Nuclear Photoeffect" in Nuclear Reactions II, Eds. P. M. Endt and P. B. Smith (North-Holland Publishing Co., Amsterdam, 1962); F. Partovi, Ann. Phys. 27, 79 (1964).

*2 See also - J. S. O'Connell, "Electromagnetic Interactions of the Few-Nucleon Systems," to be published in the Proceedings of the International Conference on Electromagnetic Interactions of Nuclei at Low and Medium Energies, Moscow, December 1972.

*3 Cross section given is total neutron yield. This includes all reaction cross sections except the $^{6}Li(\gamma,t)^{3}He$. Lowest threshold for 2-neutron emissions is 24.2 MeV. Other data indicate cross section magnitudes may be 1.2 × those quoted. (66Ge3)

*4 Measurement does not extend below 16 MeV. The σ_0 and σ_1 values quoted have been corrected to include $\sigma(\gamma,n)$ in energy region from 1.6-16 MeV.

*5 Cross sections may be low by 20-30%. See 66Ge2, 70Ve1, and other measurements of n-production cross sections.

*6 Cross section for production of .95 isomer. This represents about 0.6 of total (γ,n) cross section (see 62Go3, 65Co3).

*7 Statistical model used to correct for neutron multiplicity.

*8 R. Bergère, H. Beil, P. Carlos, A. Veyssière, A. Leprete, Nuclear Structure Studies Using Electron Scattering and Photoreaction, Eds. K. Shoda and H. Vi, p. 273 (Tohoku University, Sendai, Japan, 1972).

2.3. Estimating Yield

Figures 4 and 5, when used in conjunction with the data listed in Table 1 can be used to estimate bremsstrahlung-induced photonuclear reaction yields. The estimate is based on the assumption that the cross sections can be described by Lorentz resonance curves. This is a very good approximation for the heavier nuclei ($A > 100$). It is not a good approximation for light nuclei, particularly those for $A \leq 16$. For these nuclei, ($A < 40$) if yields are required with an accuracy better than a factor of three, detailed calculations should be carried out making use of the best available cross-section data. For the heavier nuclei, yields can usually be estimated to within $\pm$ 30% by making use of the Lorentz-line approximation.

It can be readily shown that for a Lorentz-shaped resonance curve

$$\sigma_0(L) = \int_0^\infty \frac{\sigma_i(E\,\Gamma_i)}{(E^2-E_i^2)^2 + (E\,\Gamma_i)^2}\,dE = \frac{\pi}{2}\,\sigma_i\Gamma_i \tag{4}$$

$$\sigma_{-1}(L) = \int_0^\infty \frac{\sigma_i(E\,\Gamma_i)}{(E^2-E_i^2)^2 + (E\,\Gamma_i)^2}\,\frac{dE}{E} = \frac{\pi}{2}\,\frac{\sigma_i\Gamma_i}{E_i}\,\frac{1}{(1-(2\alpha)^{-2})^{\frac{1}{2}}}\left[\tfrac{1}{2} + \frac{1}{\pi}\tan^{-1}(\alpha)\,\frac{(1-2(2\alpha)^{-2})}{(1-(2\alpha)^{-2})^{\frac{1}{2}}}\right]$$

where $\alpha = E_i/\Gamma_i$. Note that only for $\alpha \gg 1$ does $\sigma_1(L) \rightarrow \pi\sigma_i\Gamma_i/(2E_i)$. For values of α typical of most giant resonance curves $\sigma_1(L)$ is approximately 0.8 to 0.9 times the sharp resonance limit. The quantities plotted in Figures 4 and 5 are $\sigma_0(x)/\sigma_0(L)$ and $\sigma_1(x)/\sigma_1(L)$ as a function of $x = E/E_i$ for various values of α.

If $N(E,E_m) = I(E,E_m)/E$ represents the bremsstrahlung spectrum (number of photons per MeV), $\sigma(E)$ the cross section for a reaction, and n the effective number of nuclei per cm^2 in the bremsstrahlung beam, then, $Y(E_m)$, the reaction yield per MeV in the bremsstrahlung beam, is given by

$$Y(E_m) = n\int_0^{E_m} \frac{I(E,E_m)\;\sigma(E)}{E}\,dE \Big/ \int_0^{E_m} I(E,E_m)dE. \tag{5}$$

For estimating yields the thin target bremsstrahlung spectrum can be approximated by assuming that $I(E,E_m)$ is independent of E so that

$$Y(E_m) \simeq \frac{n}{E_m}\int_0^{E_m} \frac{\sigma(E)}{E}\,dE = \frac{n}{E_m}\,\sigma_{-1}(E_m). \tag{6}$$

For any particular cross section, values of $\sigma_1(E_m)$ can be obtained by making use of Fig. 5 and the data listed in Table 1. With the approximations indicated here, thick target bremsstrahlung spectra can be assumed to be an appropriately weighted superposition of thin target spectra. Note that the "cross section per equivalent quantum" $\sigma_q(E_m)$ is equal to σ_1 when $I(E,E_m)$ is assumed to be constant, i.e.,

$$\sigma_q(E_m) = \frac{E_m Y(E_m)}{n} = \frac{E_m}{\int_0^{E_m} I(E,E_m)dE}\int_0^{E_n} \frac{I(E,E_m)\;\sigma(E)}{E}\,dE \simeq \sigma_{-1}(E_m). \tag{7}$$

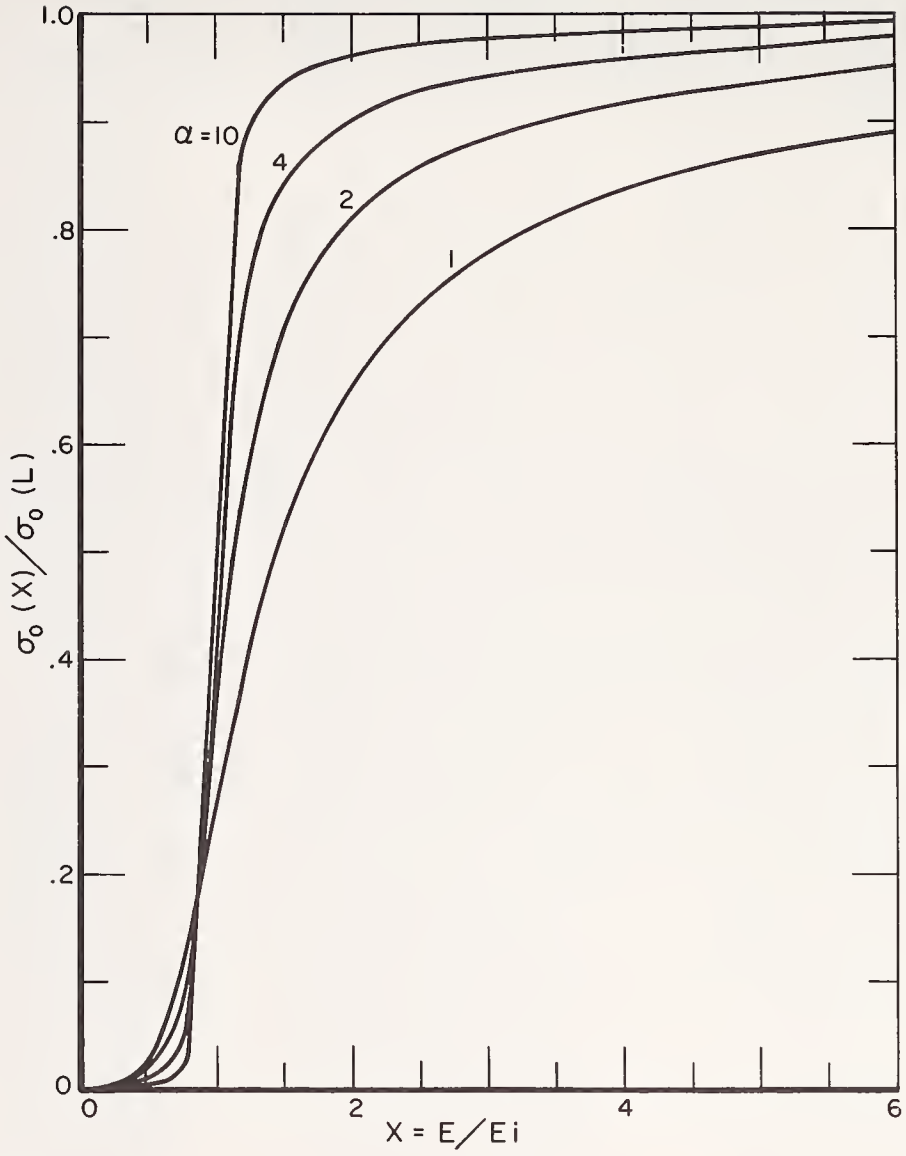

Figure 4. Absorption cross section integrals for a Lorentz line, $\alpha = E_i/\Gamma_i$, $x = E/E_i$.

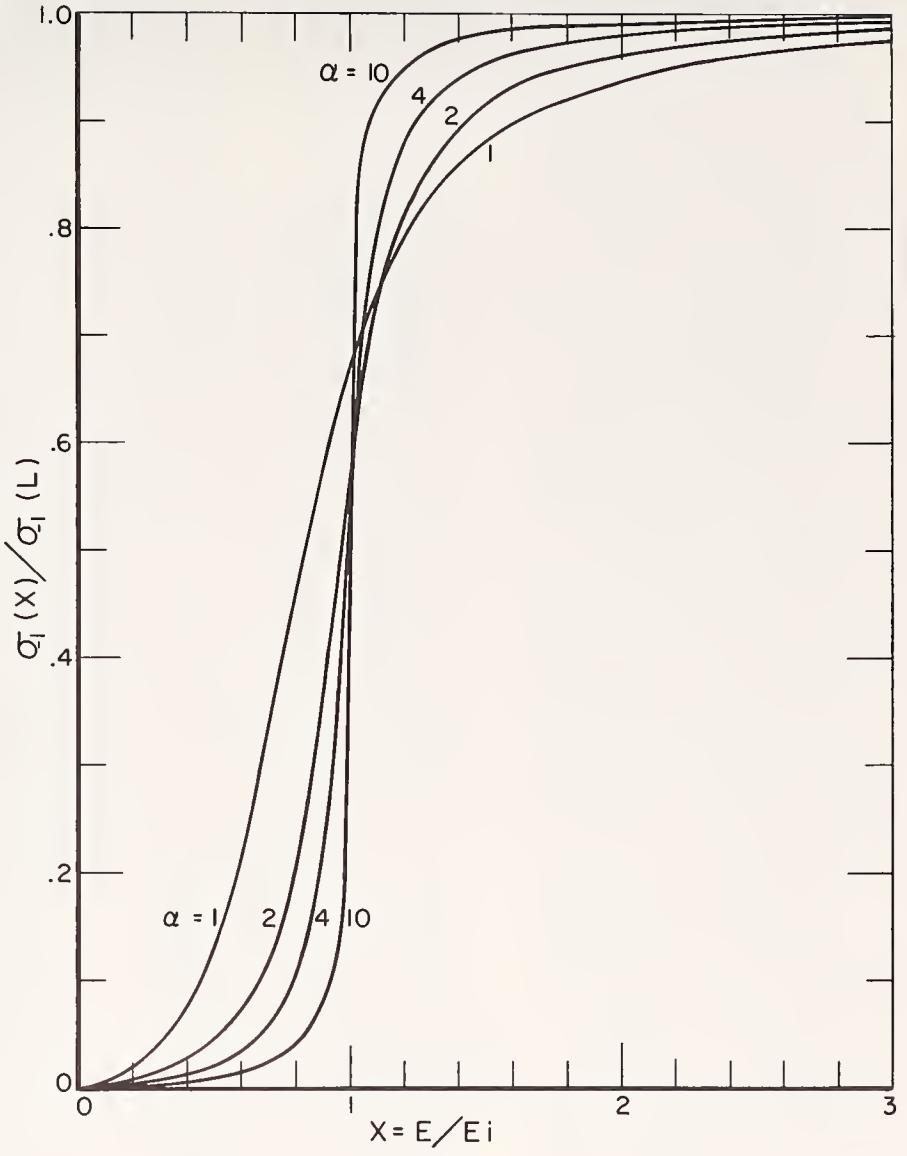

Figure 5. Bremsstrahlung weighted cross section integrals for a Lorentz line, $\alpha = E_i/\Gamma_i$, $x = E/E_i$.

3. Description of the Photonuclear Data Index and Bibliography

3.1. Introduction

This Photonuclear Data Index is the fourth one published by the Photonuclear Data Center. It is a cumulative index and as such supersedes all previous publications of the Center [9]. It is an index to all the experimental data published in the field of photonuclear reactions and entered into the Center's files in the period from January 1, 1955 through January 15, 1973. All of these data are published in regular journals or as rather complete reports as contributions to various international conferences. Nine journals are searched regularly for data. These are listed below along with an indication of the last issue searched for data included in this index. These are the issues that had been received in the National Bureau of Standards Library by January 15, 1973. Nuclear Science Abstracts is used to find papers published in those journals not regularly searched.

Journal	Last Issue
Physical Review, The	Vol. 6, #6
Physical Review Letters	Vol. 30, #2
Nuclear Physics	Vol. A198
Physics Letters	Vol. 42B, #3
Soviet J. of Nuclear Physics	Vol. 15, #4
Il Nuovo Cimento	Vol. 12B, #1
Il Nuovo Cimento Letters	Vol. 5, #2
J. Physical Society Japan	Vol. 33, #5
Zeitschrift für Physik	Vol. 255
Nuclear Science Abstracts	Vol. 26, #23

3.2. Scope of the Data Index

The function of this data index is to furnish a means of readily locating experimental data in the field of photonuclear reactions. This index differs from a bibliography in that it supplies quantitative information about the content of a paper. Each entry in the index corresponds to the measurement of a specific photonuclear reaction for a specific nuclide or group of nuclides. An attempt is made to give as complete a description of each measurement as is possible in a single line. The type of measurement is indicated as well as the range of excitation energies covered, the type of detector used and its energy response, and the type of angular distribution data obtained. The object has been to give a description of each measurement that is complete enough to permit an individual looking for specific types of data in the field to locate the pertinent references without having to go through a large number of irrelevant papers as might be the case if only the title of the paper or the reaction studied were listed for each entry.

For the purposes of this index, the general criterion as to what constitutes a measurement of photonuclear data is that the measurement must give information on the electromagnetic matrix element between the ground state and excited states of some nucleus. The most common type of reactions are: (e,e'), (γ,γ), (γ,n), (γ,p), and (p,γ_0). Two reactions which fit the matrix element criterion, but which were not included in the compilation because of their rather special nature are heavy particle Coulomb excitation and the thermal neutron capture reaction (n,γ_0). While the energy region of particular interest extends from 0 to 150 MeV, some papers are indexed which report measurements in the region from 150 MeV to 1 GeV. Most of the experiments listed are concerned with the excitation energy range 8 to 30 MeV, the region of the photonuclear giant resonance.

3.3. Description of the Index

The data index for each element begins with the isotopic abundances for that element and a list of separation energies for each isotope. The abundances were taken from a compilation by Gladys Fuller [10]. This reference should be consulted for remarks concerning the accuracy of these values and possible variations with the source of the sample. The separation energies were taken from the tabulation of Wapstra and Gove [11] which were based on their 1971 Atomic Mass Evaluation. The values given in Ref. [11] have been arbitrarily rounded off to the nearest 0.1 MeV except for those cases where the uncertainties

quoted are of the order of 1 MeV. In these cases, thresholds are given to the nearest MeV.

In the data index which follows, eight columns are used to describe a reaction reported in a specific paper. Where for clarification purposes a brief remark has been included in the index entry for a specific reaction, this remark is listed on the line immediately below the line giving the main index entry. The purpose of this remark is to give additional information that will make the index entry more useful. For example, pertinent energies are more exactly defined, additional information is given on polarization or alignment experiments, residual nuclei are identified, etc. The additional information is selected in a fairly unsystematic way and is limited by the available space. The entries should not be regarded as exhaustive or consistent. The headings of the eight principal columns used for an index entry are: REF (Bibliographic Reference Number), NUCLIDE, REACTION, RES (Result), EXCIT (Excitation Energy), SOURCE, DETECTOR, and NUM (Acquisition Number). These headings are described more completely in the following section.

Under a given element, the index entries are grouped so that those listed first are for measurements made on the element, i.e., on samples with naturally occurring isotopic abundances. Following this, measurements pertaining to the various isotopes of an element are listed together. The entries for a given element or isotope are ordered by reaction according to a priority listing of, first, the incoming particle, and second, the outgoing particle. All entries for a given reaction are listed chronologically.

3.4. Description of Column Headings

An alphabetical list of the symbols used under the various columns of the data index is given in Section 6 of this report. The purpose of this section is to describe the meanings of the various column headings.

Column 1	REF	Bibliographic Reference Number. This number is made up of the year and the first two letters of the first author's name, plus an additional serial number.
Column 2	NUCLIDE	The atomic number (Z), chemical symbol, and mass number (A) of the excited nucleus (not necessarily the target nucleus) is given. The mass number is listed only if the isotopic assignment is unambiguous. In general, it was assumed that the mass number was unambiguous if in the target the abundance of a single isotope was > 97%.
Column 3	REACTION	The notation used is the usual one. Where necessary, a remark is often used to more fully define some of the more esoteric reactions. The notation E,E/P means the inelastically scattered electron and proton were detected in coincidence in a reaction of the type: $A + e \rightarrow (A - 1) + e' + p$, while E,P means that only the proton was detected. Where the measurement involved the polarization or alignment of either the incoming beam, the target nucleus, or the outgoing particle, a $ is listed to the left of the column.
Column 4	RES	Result, i.e., the type of information given in the paper.
Column 5	EXCIT	Excitation Energy Range. The excitation energy range of the nucleus involved in the gamma-ray transition is given in MeV. For reactions initiated by gamma rays, the excitation energy is taken as the gamma-ray energy; for reactions initiated by particles, the binding energy and kinematic corrections are made. The abbreviation THR stands for threshold. Where the

Column 5 (continued)	EXCIT	scale 1-999 MeV is inappropriate for a measurement, 999 is entered and the actual energy given under REMARKS.
Column 6	SOURCE	Source Type and Energy Range. The source of incident particles is characterized by the letter C or D indicating that the source was continuous or discrete in energy. The source energy is indicated under MIN-MAX. The usual source of photons is bremsstrahlung which would be marked C. The range of endpoint energies is given.
Column 7	DETECTOR	Detector Type, Energy, and Angular Range. The symbols used to indicate the detector used in measurement are defined in the list given in Section 6. The letter D or I under TYPE means that the reaction product was detected differentially or integrally in energy. For example, a scintillator (SCI) is usually used differentially (D) while a BF_3 detector (BF3) always integrates over neutron energy (I). The range of detected particle angular distribution is shown under ANG. A single number in the column means the measurement was made at this angle (given in degrees) only. DST means that the measurement was made at two or more angles and 4PI indicates that the detector used essentially integrated over all outgoing particle directions.
Column 8	NUM	Acquisition Number. This is the number used to identify cross section data that are available in digital form from the Photonuclear Data Center's library. When an acquisition number is followed by a +, digitized data from the paper in question are available for quantities which are normally not indexed, e.g., a σ(SN) cross section curve.

4. Photonuclear Data Index
1955-1972

HYDROGEN Z=1

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
1	99.99	*	*	*	*	*	*	*	*
2	1.5(-2)	2.2	2.2	*	*	*	*	2.2	*
3	*	6.3	B.5	*	*	*	B.5	B.5	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
72TI4	1H	1	E,E/	SPC	0-550	D999	MAG-D	DST	
						999=1.1B	GEV		
60WY1	1H	1	G,MU-T	ABX		C 90	NAI-D	4PI	
55OX1	1H	1	G,G	ABX	20- 9B	C 9B	TEL-D	DST	
5BOX1	1H	1	G,G	ABX		C B7	TEL-D	DST	
60GD1	1H	1	G,G	ABX		C 75	TEL-D	DST	
61BA3	1H	1	G,G	ABX	247	C260	TEL-D	DST	
63ST1	1H	1	G,G	ABX		C900	TEL-D	90	
70IT1	1H	1	G,PI+	RLY	600-999	C600-999	SPK-I	4PI	
						999=1700	MEV		
71KU4	1H	1	$ G,PI+	NOX	210-270	D210-270	TEL-D	DST	
						N,PI+CDIN	POL G		
72BA5	1H	1	G,PI0	RLX	400-B00	C999	TEL-D	DST	
						999= 1.1	GEV		
59FR1	1H	2	E,E/	SPC	0- 95	D175	MAG-D	DST	
						D = 206	MEV/C		
61KE3	1H	2	E,E/	RLX	0- 20	D204-500	MAG-D	145	
61PE2	1H	2	E,E/	ABX	0- 12	D 41	MAG-D	DST	
62BA1	1H	2	E,E/	ABX	0- 10	D 42	MAG-D	1B0	
						GAS	TARGET		
62PE1	1H	2	E,E/	ABX	0- 20	D 42	MAG-D	1B0	
						SDLID	TARGET		
63BA1	1H	2	E,E/	SPC	0- 14	D 42	MAG-D	1B0	
64YE2	1H	2	E,E/	ABX	0- 40	D150	MAG-D	135	
66GD1	1H	2	E,E/	ABX	0- 6	D 54, 70	MAG-D	1B0	
66GR2	1H	2	E,E/	ABX	0- 60	D219-447	MAG-D	DST	
66HU1	1H	2	E,E/	FMF	0- 70	D146-475	MAG-D	DST	
67RA1	1H	2	E,E/	ABX	0- B	D250-370	MAG-D	1B0	
6BKA2	1H	2	E,E/	ABX	2- 4	D 3B- 90	MAG-D	155	
70RI1	1H	2	E,E/	ABX	0- 4	D 3B- 9D	MAG-D	DST	
72GA2	1H	2	E,E/	ABX	0- B0	D 70-2B0	MAG-D	1B0	
658D1	1H	2	E,E/P	ABX	0-100	D350	MAG-D	DST	
65BD3	1H	2	E,E/P	ABX	50-100	D235-3DD	MAG-D	DST	
						P IN	COINC		
57BA1	1H	2	G,N	ABY	30-260	C120-26D	THR-I	DST	
						REL YLDS,	D/C		
5BBA1	1H	2	G,N	ABX	THR-255	C170,255	THR-I	DST	
60GE3	1H	2	G,N	NDX	THR	CTHR	BF3-I	4PI	
						THRESHDLD			
61JD1	1H	2	$ G,N	NDX	0- 1	D 3	BF3-I	DST	
						NEUTRONS	POLARIZED		
61TA1	1H	2	G,N	RLX		C 22	THR-I	DST	
63BE7	1H	2	$ G,N	NDX	12- 30	C 30	SCI-D	DST	
						NEUTRONS	POLARIZED		
63BO4	1H	2	$ G,N	SPC	3- 9	C 3-	SCI-D	DST	
						NEUTRONS	POLARIZED		
63FR1	1H	2	$ G,N	NOX	11- 23	C 24	CCH-D	14B	
						NEUTRONS	POLARIZED		
64BEB	1H	2	$ G,N	NOX	THR- 32	C 32	SCI-D	DST	
						NEUT	POLARIZATION		
65JE1	1H	2	$ G,N	NDX	2- 3	D 3	BF3-I	DST	
						POL NEUT	ASYMM		
67BA1	1H	2	$ G,N	NDX	200-400	C999	TEL-D	90	
						999=1	GEV		
69SO1	1H	2	G,N	ABX	230-330	C350,450	SPK-D	DST	
70JU1	1H	2	G,N	NOX	17- 30	C 23- 30	TDF-D	DST	
70SH3	1H	2	G,N	NDX	10- 95	C125	TDF-D	DST	
72MA1	1H	2	G,N	ABX	5- 9	D 5- 9	BF3-I	4PI	
72NA2	1H	2	$ G,N	NDX	7- 3D	C 65	TDF-D	DST	
						N	POLARIZATION		
55AL1	1H	2	G,P	ABX	20- 65	C 20- 65	EMU-I	DST	
56DI1	1H	2	G,P	ABX	136-293	C342	TEL-D	DST	
56KE1	1H	2	G,P	ABX	75-450	C150-450	TEL-D	DST	
56WH1	1H	2	G,P	ABX	60-250	C 60-250	EMU-D	DST	
57AL1	1H	2	G,P	ABX	50-150	CI70,264	TEL-D	DST	
5BTA2	1H	2	G,P	ABX	146-23B	C146-23B	TEL-D	DST	
5BWH1	1H	2	G,P	ABX	9- 23	C 9- 23	NAI-I	DST	
60FE2	1H	2	$ G,P	ABX	15D-30D	C150-300	EMU-D	44	
						PROTONS	POLARIZED		
60GA1	1H	2	G,P	ABX	50- 90	C 94	TEL-D	DST	
61MY1	1H	2	G,P	ABX	350-900	C500-900	TEL-D	DST	
63LD1	1H	2	$ G,P	NOX	2-294	C294	SPK-D	5B	
64LI1	1H	2	$ G,P	RLX	B0-140	C400-5D0	MAG-D	90	
						PHOTONS	POLARIZED		
65LI1	1H	2	$ G,P	NDX	75-250	C 75-250	MAG-D	DST	
						PDL	PHOTON		
67KO3	1H	2	G,P	ABX	100-420	C500	TEL-D	DST	
						N IN	CDINC		
67TU2	1H	2	G,P	NOX	9	D 9	EMU-I	DST	
6BBU2	1H	2	G,P	ABX	140-400	C400	MAG-D	DST	
6BSM1	1H	2	G,P	ABX	100-320	C210-330	TEL-D	DST	
69AN1	1H	2	G,P	ABX	THR-342	C222-342	MAG-D	DST	
71TI1	1H	2	G,P	ABX	20- 35	C 6D	TEL-D	90	
71WE2	1H	2	G,P	ABX	25- 55	C 60	SCD-D	DST	
69KO1	1H	2	$ G,P	NOX	2B2-405	C500	TEL-D	DST	
						PROT	PDLARIZATION		
70IT1	1H	2	G,PI-	RLX	600-999	C600-999	SPK-I	4PI	
						999=1700	MEV		
70SC2	1H	2	G,PI-	ABX	600-999	C600-999	MAG-D	DST	
						999=1.2	GEV,PI	DET	
71FU3	1H	2	G,PI-	ABX	200-999	C200-999	MAG-D	1B0	
						999 = 1.2	GEV		
72FU2	1H	2	G,PI-	NDX	260-B00	C999	MAG-D	DST	
						REL PI+,999=1.3	GEV		
70ITI	1H	2	G,PI+	RLX	600-999	C600-999	SPK-I	4PI	
						999=1700	MEV		
71FU3	1H	2	G,PI+	ABX	200-999	C200-999	MAG-D	1B0	
						999 = 1.2	GEV		
72BA5	1H	2	G,PI0	RLX	400-B00	C999	TEL-D	DST	
						999= 1.1	GEV		
66GR1	1H	2	N,G	SPC	2	D 1	SCD-D		
						BINDING	ENERGY		
67TU1	1H	2	N,G	ABX	9	D 14	TEL-D	D	
71BA3	1H	2	N,G	DST	239-37B	D475-750	SPK-I	DST	
						D AND C	CDINC		
71SC1	1H	2	N,G	NDX	300-7D0	D300-720	SPK-D	DST	
						TIME-REVERSAL	TEST		
69DI2	1H	2	P,G	ABX	77	D156	MAG-D	DST	
						DUASI-FREE	N		
66HU2	1H	3	E,E/	FMF	0-160	D250-370	MAG-D	DST	
64JD1	1H	3	E,E/P	ABX	0 16	D550	MAG-D	DST	
64BO2	1H	3	G,N	ABX	7- 9	D 7-	BF3-I	4PI	
65BO2	1H	3	G,N	ABX	6- 11	D 6- 11	BF3-I	DST	
66KO2	1H	3	G,P	SPC	THR- 33	C 33	TEL-D	90	
6BPFI	1H	3	G,P	ABX	11- 33	C 33	TEL-D	90	
66KO2	1H	3	G,D	ABX	THR- 33	C 33	TEL-D	90	
6BPF1	1H	3	G,D	ABX	IB- 31	C 33	TEL-D	90	
61CE2	1H	3	N,G	ABX	16	D 14	TEL-D	4PI	
64IM1	1H	4	N,G	ABY		D 0-	ACT-I	4PI	
						ND H4	FOUND		
65AJ1	1H	4	N,G	ABX	11	D 14	SCD-D	0	
						UPPER LIMIT	ABX		

HELIUM Z=2

A	ABUND.(1)	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
2	1.5(-2)	2.2	2.2	*	*	*	*	2.2	*
3	1.4(-4)	7.7	5.5	*	*	*	*	7.7	7.7
4	99.99	20.6	19.B	19.8	20.6	*	2B.3	26.1	2B.3

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
66HU2	2HE3		E,E/	ABX	0-150	D250-670	SCI-D	DST	
67FR1	2HE3		E,E/	ABX	0- 17	D200	MAG-D	60	
69CH1	2HE3		E,E/	ABX	5- 20	D 57	MAG-D	1B0	
69CH2	2HE3		E,E/	SPC	0- 14	D 56	MAG-D	1B0	
64JO1	2HE3		E,E/P	ABX	0- 12	D550	MAG-D	DST	
71KU3	2HE3		E,D	ABX	13- 45	D B6	MAG-D	DST	
72SK1	2HE3		E,D	RLX	16- 27	D 43- B7	MAG-D	DST	
						DETECTED D	AND P		
64GO4	2HE3		G,N	ABX	5-170	C170	CCH-D	DST	
65FE1	2HE3		G,N	ABX	THR-170	C170	CCH-D	DST	70+
66GE1	2HE3		G,N	ABX	THR- 30	CTHR- 30	BF3-I	4PI	63
66VA3	2HE3		G,N	ABX	THR-170	C170	CCH-D	4PI	
70BE6	2HE3		G,N	ABX	B- 30	D B- 30	MOD-I	4PI	237
64BE5	2HE3		G,2P	ABX	B 22	C B- 22	SCI-D	90	
						FORM	FACTOR		
65ST1	2HE3		G,2P	SPC	9- 40	C 40	SCD-D	90	
65VA1	2HE3		G,2P	ABX	THR-170	C170	CCH-D	DST	
63BE1	2HE3		G,D	ABX	B- 20	C 22	SCI-D	90	
63FI2	2HE3		G,D	ABX	13- 27	C 31	SCI-D	9D	
63GO2	2HE3		G,D	ABX	5- 90	C170	CCH-D	4PI	
						ALSO	G,N		
64BE2	2HE3		G,D	ABX	THR- 3D	C 34	SCD-D	90	
						SPECTRUM			
64GO1	2HE3		G,D	ABX	THR-120	C175	CCH-D	DST	
65ST1	2HE3		G,D	ABX	9- 46	C 40, 55	SCD-D	90	64
63WA1	2HE3		G,D	ABX	6, 7	D 6, 7	IDN-D	4PI	
64BE5	2HE3		G,D	ABX	B- 22	C B- 22	SCI-D	90	
						FORM	FACTOR		
64GO4	2HE3		G,D	ABX	5-170	C170	CCH-D	DST	
65FE1	2HE3		G,D	ABX	THR-170	C170	CCH-D	DST	65+
65VA1	2HE3		G,D	ABX	THR-170	C170	CCH-D	DST	
66VA3	2HE3		G,D	ABX	THR-170	C170	CCH-D	4PI	
69PI3	2HE3		G,D	ABX	200-500	C999	TEL-D	90	
						999=1	GEV		
70BD3	2HE3		G,D	NOX	I6- 26	C 33	SPK-I	DST	
72FA3	2HE3		$ G,D	NOX	170-290	D170-290	TEL-D	90	
						PDL ASYM	PARAM	G,	
72DF2	2HE3		G,D	ABX	40-150	C250	TEL-D	DST	
						P AND D	COINC		

REF	NUCLIDE Z	A	REACTION IN,OUT		RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
55GR1	2HE3		P,G		ABX	5- 8	D 0- 2	NAI-D	DST	
62GR1	2HE3		P,G		ABX	5- 7	D 0- 2	NAI-D	DST	
63GR1	2HE3		P,G		ABX	5- 6	C D-	NAI-D	DST	
							S AND P WAVE PARTS			
66BA2	2HE3		P,G		ABX	110	D156	SCI-D	DST	
66WO1	2HE3		P,G		ABX	7- 14	D 2- 12	NAI-D	DST	
67GE1	2HE3		P,G		ABX	7- 9	D 2- 4	NAI-D	90	
67WD1	2HE3		P,G		ABX	7- 14	D 2- 12	NAI-D	DST	
70BA2	2HE3		P,G		ABX	5- 7	D 0- 2	NAI-D	DST	
7DDI1	2HE3		P,G		ABX	106	D156	MAG-D	DST	
72CH3	2HE3		P,G		ABX	12- 17	D 1D- 18	NAI-D	90	
72HA2	2HE3		P,G		RLX	14- 23	D 14- 26	NAI-D	DST	
							CORRECTS 71VA1			
70BE4	2HE3		D,G		ABX	12, 15	D 19, 29	MAG-D	DST	
							DEUT. BEAM			
71VA1	2HE3		D,G		ABX	12- 21	D 20- 45	MAG-D	DST	
							SEE 72HA2			
618U2	2HE4		E,E/		ABX	0-325	D400,500	MAG-D	DST	
65FR1	2HE4		E,E/		ABX	0- 30	D200	MAG-D	DST	
68FR1	2HE4		E,E/		ABX	20- 30	D150-4D0	MAG-D	DST	
70WA4	2HE4		E,E/		LFT	19- 31	D 56- 65	MAG-D	DST	
							20.1 MEV LEVEL			
70WA5	2HE4		E,E/		FMF	19- 31	D 65	MAG-D	DST	
72SK3	2HE4		E,D		ABX	35- 5D	D 35- 50	MAG-D	DST	
72DO1	2HE4		E,HE		ABX	30- 52	D 90	MAG-D	90	
							HE=HE3,RATIO G,P/G,N			
72DD1	2HE4		E,T		ABX	30- 52	D 90	MAG-D	90	
							RATID G,P/G,N			
58GO1	2HE4		G,N		ABX	20-160	C170	CCH-D	DST	
58LI1	2HE4		G,N		ABI	40- 60	C 70	EMU-I	DST	
							DETECTED HE3			
66FE1	2HE4		G,N		ABX	20- 80	C 20- 80	BF3-I	4PI	
68GO2	2HE4		G,N		ABX	THR-260	C260	CCH-D	DST	
68GD5	2HE4		G,N		ABX	26-150	C170,26D	CCH-D	DST	
69AR3	2HE4	$	G,N		NOX	22- 64	C300	CCH-D	DST	
							POL OF HE3			
69AR4	2HE4		G,N		ABX	21-12D	C120	CCH-D	DST	263+
70WA2	2HE4		G,N		ABX	50- 85	D 91	MAG-D	DST	
71BU1	2HE4		G,N		ABX	25- 80	C 80	CCH-D	DST	339
72BE2	2HE4		G,N		ABX	22- 32	C 35	TOF-D	9D	
70BE9	2HE4		G,XN		ABX	21- 32	D 21- 32	BF3-I	4PI	338
71BE3	2HE4		G,XN		ABX	2D- 31	D 20- 31	BF3-I	DST	
57GD1	2HE4		G,P		ABX	20-160	C170	CCH-D	DST	
60MI1	2HE4		G,P		ABX	23- 32	D 32	EMU-D	90	
62MA1	2HE4		G,P		NOX	23- 32	C 70	EMU-D	DST	
65AR1	2HE4		G,P		ABX	THR-999	C999	CCH-D	4PI	
							999=1 GEV			
65CL1	2HE4		G,P		ABX	24- 56	C 40- 60	SCD-D	90	
67BU1	2HE4		G,P		RLY	THR- 54	C 44, 54	ACT-I	4PI	
67DE3	2HE4		G,P		ABX	24- 50	C 52	TEL-D	90	
68GO2	2HE4		G,P		ABX	THR-260	C260	CCH-D	DST	
67GO5	2HE4		G,P		ABX	20-170	C170	CCH-D	DST	
68GD5	2HE4		G,P		ABX	20-20D	C170,260	CCH-D	DST	
68MU1	2HE4		G,P		ABX	23- 32	C 28, 33	SCI-D	90	
69AR2	2HE4		G,P		ABX	23- 32	C300	CCH-D	4PI	
69AR3	2HE4	$	G,P		NDX	22- 64	C300	CCH-D	DST	
							PDL OF P AND T			
69PI2	2HE4		G,P		ABX	180-480	C	TEL-D	9D	
							P AND D COINC			
69SA1	2HE4		G,P		ABX	22- 30	C 32	EMU-D	DST	
70AR2	2HE4		G,P		ABX	20-12D	C 20-120	CCH-D	DST	
							SEE 71AR1			
70SA1	2HE4		G,P		ABX	23- 32	C 32	EMU-D	DST	
70WA2	2HE4		G,P		ABX	22- 70	D 91	MAG-D	DST	
71BU1	2HE4		G,P		ABX	24- 80	C 80	CCH-D	DST	340
70RE2	2HE4		G,XP		NOX	THR-33D	C330	CCH-D	4PI	
65AS1	2HE4		G,XP		ABX	78-300	C250,300	TEL-D	DST	
69PI3	2HE4		G,XP		ABX	200-500	C999	TEL-D	90	
							999=1 GEV			
71AR1	2HE4		G,XP		NOX	20- 50	C 20- 50	CCH-D	DST	
							NEW ANAL OF 70AR2			
65AR1	2HE4		G,D		ABY	THR-999	C999	CCH-D	4PI	
							999=1 GEV			
65AS1	2HE4		G,2D		ABX	24-300	C250,300	TEL-D	DST	
							COINCIDENCE			
57GO1	2HE4		G,NP		ABI	20-160	C170	CCH-D	4PI	
58BA3	2HE4		G,NP		RLX	150-280	C280	TEL-D	DST	
							PAIR SPC, NP COIN			
58GO2	2HE4		G,NP		ABX	25-170	C170	CCH-D	4PI	
69AR1	2HE4		G,NP		ABX	26-120	C120	CCH-D	4PI	
69AR5	2HE4		G,NP		ABX	26-120	C120	EMU-D	DST	283
69AR5	2HE4		G,2P2N		ABX	28-120	C120	EMU-D	4PI	282
69GO1	2HE4		G,2P2N		ABX	28-160	C170	CCH-D	4PI	
71GO2	2HE4		G,PI+		RLY	150-5D0	C5D0	CCH-D	DST	
							PI-/PI+ YIELD RATIO			
63ZU1	2HE4		N,G		ABX	24	D 4	NAI	DST	
55PE2	2HE4		P,G		ABX	2D- 36	D 0-	NAI-D	DST	
62GA1	2HE4		P,G		ABX	24- 27	D 6- 10	NAI-D	DST	
62GE1	2HE4		P,G		ABX	23- 28	D 4- 11	NAI-D	DST	
65SC1	2HE4		P,G		ABX	20- 23	D 0- 4	NAI-D	0	
70ME2	2HE4		P,G		RLY	22- 33	D 3- 18	NAI-D	DST	44D
63ZU1	2HE4		D,G		ABX	24	D 1	NAI	45	
							1=1.35 MEV			
69DE3	2HE4		D,G		ABX	26- 30	D 4- 10	NAI-D	13D	
69ME1	2HE4		D,G		ABX	26- 34	D 6- 19	NAI-D	135	
							ANG DIST AT 10 MEV			
63BU2	2HE5		D,G		RLY	17- 18	D 0-	NAI-D		
69BE1D	2HE5		D,G		ABX	17	D999	NAI-D		
							999=25-1D0 KEV			
7DKO1	2HE5		D,G		ABX	1B	D 1	SCI-I	9D	
							1=1D25 KEV			

LITHIUM Z=3

A	ABUND.(1)	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
6	7.42	5.7	4.6	15.8	15.8	1.5	27.2	3.7	26.4
7	92.58	7.3	10.0	2.5	26.0	2.5	12.9	11.8	33.5

REF	NUCLIDE Z	A	REACTION IN,OUT		RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
64GD3	3LI		E,E/		ABX	4	D 40- 70	MAG-D	18D	
									FMF	
69AN8	3LI		E,P		RLY	THR-999	C999	MAG-D	DST	
							999=1 GEV, REL		D/T	
69AN8	3LI		E,D		RLY	THR-999	C999	MAG-D	DST	
							1.3 GEV REL P/D,D/T			
69AN8	3LI		E,T		RLY	THR-999	C999	MAG-D	DST	
							999=1 GEV, REL		D/T	
60KU2	3LI		G,N		ABX	THR- 90	C 90	TEL-D	DST	
68KA1	3LI		G,N		ABX	50- 85	C 55, 85	TOF-D	67	
							NEUT ENGY SPEC			
55HE1	3LI		G,XN		RLX	13- 32	C 13- 32	BF3-I	4PI	
							ENRICHED LI7			
58RY1	3LI		G,XN		ABX	5- 24	C 5- 24	BF3-I	4PI	
60FA1	3LI		G,XN		ABX	11- 56	C 11- 57	BF3-I	4PI	
63CD3	3LI		G,XN		ABX	8- 75	C 8-100	BF3-I	4PI	
64AL1	3LI		G,XN		ABX	THR- 19	C - 19	BF3-I	4PI	
63KI1	3LI		G,P		ABX	150-335	C335	TEL-D	DST	
63KU2	3LI		G,P		ABX	10- 30	C 30		DST	
									G-WIDTH	
66MA1	3LI		G,P		SPC	10- 28	C 32	TEL-D	90	
71AN1	3LI		G,P		SPC	41-999	C700,999	TEL-D	DST	
							999=1.2 GEV, REL		D/P	
72AN3	3LI		G,P		RLY	34-999	C999	MAG-D	DST	
							999=1.1 GEV			
58WH2	3LI		G,XP		ABX	40-10D	C 45-110	TEL-D	DST	
61MA2	3LI		G,XP		NDX	10- 21	C 21	SCI-D	DST	
62BE1	3LI		G,D		RLY	THR-260	C160-260	MAG-D	DST	
							YLD REL TO PROTONS			
66MA1	3LI		G,D		SPC	10- 28	C 32	TEL-D	90	
71AN1	3LI		G,D		SPC	46-999	C700,999	TEL-D	DST	
							999=1.2 GEV, REL		D/P	
72AN3	3LI		G,D		RLY	100-999	C999	MAG-D	DST	
							999=1.1 GEV			
63KU2	3LI		G,T		ABX	12- 27	C 30		DST	
									G-WIDTH	
66MA1	3LI		G,T		ABX	10- 28	C 32	TEL-D	90	290
72AN3	3LI		G,T		RLY	83-999	C999	MAG-D	DST	
							999=1.1 GEV			
58BA3	3LI		G,NP		RLX	150-280	C280	TEL-D	DST	
							PAIR SPC,NP,COIN			
64IM1	3LI4		P,G		ABY		D 0-	NAI-D	90	
							ND LI4 FOUND			
68BU1	3LI5		D,G		ABX	16- 17	D 0- 1	NAI-D	DST	
68KR1	3LI5		D,G		ABX	16- 19	D 2- 6	NAI-D	DST	
								J-PI, 3/2+		
68DE2	3LI5		HE,G		ABX	17- 21	D 2- 12	NAI-D	90	
									HE=HE3	
70SC3	3LI5		HE,G		ABX	18- 21	D 4- 12	NAI-D	DST	
									HE=HE3	
72KI2	3LI5		HE,G		ABX	17- 26	D 2- 26	NAI-D	DST	
									HE=HE3	
60BA4	3LI6		E,E/		ABI	4	D 40	MAG-D	DST	
63BA1	3LI6		E,E/		ABI	3- 16	D 42	MAG-D	180	
								4 LEVELS		
63BE2	3LI6		E,E/		FMF	2- 8	D101	MAG-D	DST	
								5 LEVELS		
638E8	3LI6		E,E/		FMF	0- 7	D100-180	MAG-D	DST	
								J-PI, B(E2)		
63BI1	3LI6		E,E/		ABX	5- 40	D101	MAG-D	60	
66AR2	3LI6		E,E/		LFT	2- 4	D	MAG-D	DST	
							2=2.18, 4=3.56 MEV			
68EI1	3LI6		E,E/		LFT	2, 4	D 30- 58	MAG-D	DST	
							2=2.184, 4=3.562			
68HU1	3LI6		E,E/		FMF	4	D 63-127	MAG-D	DST	
69EI1	3LI6		E,E/		LFT	2- 5	D 30- 60	MAG-D	DST	
							4 LEVELS O .2-.6			
69HU1	3LI6		E,E/		FMF	0- 42	D 55-127	MAG-D	DST	
69NE1	3LI6		E,E/		FMF	2, 3	D109-282	MAG-D	DST	
							2=2.184,3=3.562			
70HU1	3LI6		E,E/		FMF	5	D 5U-16D	MAG-D	DST	
							5.36 MEV LEVEL			
71LI1	3LI6		E,E/		FMF	2	D200,5D0	MAG-D	DST	
									2=2.18	
71MO3	3LI6		E,E/		ABX	0-240	D50D	MAG-D	6D	
71NE1	3LI6		E,E/		FMF	3, 5	D 8D-19D	MAG-D	DST	
							3=3.56, 5=5.36			
72TI4	3LI6		E,E/		SPC	0-55D	D999	MAG-D	DST	
							999=1.18 GEV			
64CH1	3LI6		E,P		ABX	THR-999	D999	MAG-D	DST	
							999=1 GEV			
64ER2	3LI6		G,MU-T		ABX	5- 4D	C 5- 4D	NAI-D	4PI	
59CO4	3LI6		G,G		LFT	4	C 6	NAI-D	130	
62BO6	3LI6		G,G		LFT	4	C 4	NAI-D	110	
									J-PI	
62SE1	3LI6		G,G		NOX	4	C 17	NAI-D	90	
63SK1	3LI6		G,G		LFT	4	C 4	NAI-D	105	
69RA3	3LI6		G,G		LFT	3	C 3	NAI-D	DST	
								3=3.56 MEV		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
56ED2	3LI6		G,N	A8X	6	D 6	MOD-I	4PI	
60PR1	3LI6		G,N	RLI	5- 17	C 17	SCI-I	90	
						CDINC WITH PRDTONS			
64GR2	3LI6		G,N	ABX	5- 9	D 5-	8F3-I	4PI	
66CO5	3LI6		G,N	ABX	5- 97	C 5- 97	BF3-I	4PI	
66PA1	3LI6		G,N	SPC	THR- 30	C 30	EMU-D	90	
59RO1	3LI6		G,XN	A8X	5- 20	C 4- 20	BF3-I	4PI	
63CO1	3LI6		G,XN	ABX	5- 50	C 5- 50	8F3-I	4PI	
648A2	3LI6		G,XN	ABX	5- 60	C 5- 60	8F3-I	4PI	
658A2	3LI6		G,XN	ABX	THR- 60	C 5- 60	BF3-I	4PI	
658E1	3LI6		G,XN	ABX	6- 32	D 6- 32	BF3-I	4PI	
65HA1	3LI6		G,XN	ABX	THR- 30	C 6- 30	8F3-I	4PI	
608A3	3LI6		G,P	A8Y	30- B0	C 35- 87	TEL-D	DST	
60KO3	3LI6		G,P	SPC	5- 23	C 28	EMU-D	60	
						SEPARATED ISOTOPES			
60KO5	3LI6		G,P	SPC	6- 28	C 28	EMU-O	60	
60PR1	3LI6		G,P	SPC	5- 17	C 17	SCI-D	90	
						RLI, COINC WITH N			
62VO1	3LI6		G,P	ABY	11- 90	C 30- 90	TEL-D	90	
64MA3	3LI6		G,P	SPC	THR- 20	C 20	EMU-D	DST	
64SH2	3LI6		G,P	ABX	8- 10	C 10	EMU-D	DST	
65MA5	3LI6		G,P	SPC	THR- 31	C 31	SCD-O	90	
66MA4	3LI6		G,P	SPC	THR-102	C 95,102	TEL-D	DST	
67DE2	3LI6		G,P	ABX	9- 55	C 3D- 55	TEL-D	90	
68MA1	3LI6		G,P	A8X	100	C 95-102	TEL-D	DST	
60CH1	3LI6		G,XP	RLY	20- 90	C 90	TEL-I	DST	
62CH2	3LI6		G,XP	RLY	20- 90	C 30- 90	TEL-O	DST	
						REL TO OEUTERONS			
658A2	3LI6		G,XP	RLY	THR- 30	C 20, 28	EMU-D	DST	
67OD1	3LI6		G,XP	NOX	5- 16	C 16	EMU-D	45	
						16=15.7 MEV			
69SO3	3LI6		G,XP	ABX	5- 12	C 32	EMU-D	4PI	
70WD1	3LI6		G,XP	A8X	7- 19	C 22, 27	MAG-D	90	
62VO1	3LI6		G,D	ABY	B- 90	C 30- 90	TEL-D	90	
64KO4	3LI6		G,D	RLY	THR- 35	C 35	EMU-D	DST	
							REL TO T		
65DA1	3LI6		G,D	A8Y	THR- 4	C 4	SCD-D	90	
65MA5	3LI6		G,D	SPC	THR- 31	C 31	SCD-O	90	
66AL1	3LI6		G,D	A8Y	100-700	C200-800	MAG-O	35	
67DE2	3LI6		G,D	ABX	7- 55	C 30- 55	TEL-D	90	
60CH1	3LI6		G,XD	RLY	17- 90	C 90	TEL-O	DST	
						REL TO PROTONS,SPC			
62CH2	3LI6		G,XD	RLY	16- 90	C 30- 90	TEL-D	DST	
						REL TO PROTONS			
62VO1	3LI6		G,T	ABY	23- 90	C 30- 90	TEL-O	90	
64KO4	3LI6		G,T	SPC	THR- 35	C 35	EMU-D	DST	
						YLD REL TO D			
65BA2	3LI6		G,T	ABX	19- 25	C 35	EMU-D	DST	
65MA5	3LI6		G,T	SPC	THR- 31	C 31	SCD-D	90	
66SH1	3LI6		G,T	ABX	19- 24	C 40	SCD-D	9D	
67DE2	3LI6		G,T	A8X	21- 55	C 30- 55	TEL-D	9D	
68MU2	3LI6		G,T	A8X	THR- 32	C 32	EMU-D	DST	
68SH2	3LI6		G,T	ABX	24- 35	C 40	MAG-D	90	
70MU1	3LI6		G,T	A8X	1B- 28	C 32	EMU-O	DST	
70WO1	3LI6		G,T	ABX	20- 52	C 9D	MAG-D	90	
60CH1	3LI6		G,XT	RLY	31- 90	C 9D	TEL-I	DST	
						REL TO PROTONS			
60PR1	3LI6		G,NP	RLI	7- 17	C 17	SCI-I	90	
6BMU2	3LI6		G,PD	A8X	THR- 32	C 32	EMU-D	4PI	
70MU1	3LI6		G,PD	A8X	22- 32	C 32	EMU-D	4PI	
64NE1	3LI6		G,H4	ABY	24-250	C250	ACT-I	4PI	
						NO H4 FOUND			
70WO1	3LI6		G,HE3	A8X	20- 52	C 90	MAG-D	90	
71VE1	3LI6		T,G	ABX	2D- 2B	D 9- 26	NAI-D	DST	
						HE3 BEAM			
66NU1	3LI6		HE,G	A8X	16- 25	D 5- 20	NAI-D	DST	
						HE=HE3			
6BBL1	3LI6		HE,G	ABX	16- 2B	D D- 11	NAI-D	DST	
						HE=HE3			
7DYO1	3LI6		HE,G	ABX	16- 36	D 0- 2D	NAI-D	DST	
						HE=HE3, SEE 688L1			
638A1	3LI7		E,E/	ABI	7- 14	D 42	MAG-D	18D	
63BE3	3LI7		E,E/	FMF	4- 8	D1D0-1BD	MAG-D	DST	
63BE8	3LI7		E,E/	FMF	D- 7	D100-180	MAG-O	DST	
						J-PI, B(E2)			
64BI4	3LI7		E,E/	ABX	1- 6	D150	MAG-D	DST	
65CH1	3LI7		E,E/	A8X	1	D 2- 4	MAG-D	162	
66AR2	3LI7		E,E/	LFT	11	D 3D- 60	MAG-D	DST	
						11=11.2B MEV			
69HU1	3LI7		E,E/	FMF	0- 26	D 55-127	MAG-D	DST	
71VA3	3LI7		E,E/	LFT	1	D 25- 90	MAG-O	DST	
						1=478 KEV			
70WO1	3LI7		E,P	A8X	6- 20	C 21- 90	MAG-D	9D	
5BBE3	3LI7		G,G	LFT	1	C 1	NAI-D	12D	
							WIDTH		
59SW1	3LI7		G,G	LFT	1	D 1	NAI-D	DST	
6DBO3	3LI7		G,G	LFT	D	C 2	NAI-D	10D	
63MO1	3LI7		G,G	LFT	0	D D	NAI-D	135	
62MO1	3LI7		G,G	LFT	0	C U	NAI-D	13D	
648O1	3LI7		G,G	LFT	1- 3	C 1-	NAI-O	1DD	
							ABI		
64GR2	3LI7		G,N	A8X	THR- 11	DTHR- 11	BF3-I	4PI	
							WIDTH		
67BA2	3LI7		G,N	ABX	THR- 5D	C 7- 50	8F3-I	4PI	288
59RO1	3LI7		G,XN	ABX	B- 2D	C 4- 2D	8F3-D	4PI	
65HA1	3LI7		G,XN	A8X	THR- 30	C 6- 30	BF3-I	4PI	
65WA1	3LI7		G,XN	SPC	THR- 25	C 25	EMU-D	9D	
69GA1	3LI7	$	G,XN	SPC	2- B5	C 85	CCH-D	DST	
						N POLARIZATION			
69GA3	3LI7		G,XN	SPC	8- 85	C 85	CCH-D	DST	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
62GR2	3LI7		G,P	ABX	10- 30	C 10- 30	ACT-I	4PI	291
62LI1	3LI7	$	G,P	NDX	165-	C355	TEL-D	DST	
						PLR P BY C SCT			
62SH1	3LI7		G,P	ABX	12- 16	C 12- 16	EMU-D	DST	
							G-WDTH		
62VO1	3LI7		G,P	ABY	17- 90	C 25- 90	TEL-D	DST	
63KU1	3LI7		G,P	ABY	3- 10	D 20- 30	TEL-D	DST	
67DE1	3LI7		G,P	ABX	14- 50	C 21- 52	TEL-D	90	
68MA1	3LI7		G,P	A8X	100	C 95-102	TEL-D	DST	
69AN4	3LI7	$	G,P	RLY	320	D32D	MAG-O	33	
						COHERENT BREMS			
69AN6	3LI7		G,P	ABY	107-999	C70D,999	TEL-D	DST	
						999=1.2 GEV			
70TO2	3LI7	$	G,P	NOX	650-B40	C70D,810	MAG-D	41	
						P-POLARIZATION			
63NE1	3LI7		G,2P	A8Y	THR-320	C320	ACT-I	4PI	
64SH1	3LI7		G,2P	ABX	THR-210	C210	ACT-I	90	
							H5 LIMIT		
65AR2	3LI7		G,2P	ABY	THR-999	DTHR-999	ACT-I	4PI	
						NO H5, 999=1 GEV			
60CH1	3LI7		G,XP	ABX	25- 9D	C 90	TEL-I	DST	
62CH2	3LI7		G,XP	RLY	25- 90	C 25- 90	TEL-D	DST	
						REL TO DEUTERONS			
70AN4	3LI7		G,XP	ABX	10-999	C620,999	TEL-D	DST	
						999=1115 MEV			
70SA2	3LI7		G,XP	ABX	50- 84	D 50- 84	TEL-D	45	
62VD1	3LI7		G,D	A8Y	17- 90	C 25- 90	TEL-D	DST	
67DE1	3LI7		G,D	ABX	15- 50	C 21- 52	TEL-D	90	
69AN6	3LI7		G,D	ABY	107-999	C700,999	TEL-O	DST	
						999=1.2 GEV			
60CH1	3LI7		G,XD	RLX	25- 90	C 90	TEL-D	DST	
						REL TO PROTONS,SPC			
62CH2	3LI7		G,XD	RLY	25- 90	C 25- 90	TEL-D	DST	
						REL TO PROTONS			
71AN2	3LI7		G,XD	ABX	100-620	C62D	MAG-D	DST	
55MI1	3LI7		G,T	A8X	6- 21	C 10, 21	EMU-D	4PI	289
60MI2	3LI7		G,T	ABX	6- 15	C 11- 20	EMU-D	DST	
							J-PI		
61SH6	3LI7		G,T	A8X	5- 9	C 1D	EMU-O	DST	287
62VO1	3LI7		G,T	A8Y	14- 9D	C 25- 90	TEL-D	DST	
63KU1	3LI7		G,T	ABY	14- 25	C 30	TEL-O	DST	
65DA1	3LI7		G,T	ABY	THR- 4	C 4	SCD-D	90	
67DE1	3LI7		G,T	ABX	B- 50	C 21- 52	TEL-D	90	292
69SO3	3LI7		G,T	A8X	5- 11	C 12	EMU-O	4PI	
69DE7	3LI7		G,TG/	ABX	23- 32	C 18- 32	TEL-D	90	
6DCH1	3LI7		G,XT	RLX	19- 9D	C 90	TEL-D	DST	
						REL TO PROTONS,SPC			
60ST1	3LI7		G,NP	RLY	142-320	C320	TEL-D	76	293
						REL TO H2 CROS SEC			
67SM1	3LI7		G,NP	ABX	15D-250	C250	TOF-D	DST	
64NE1	3LI7		G,H4	A8Y	23-250	C250	ACT-I	4PI	
							NO H4 FOUND		
71GD2	3LI7		G,PI+	RLY	150-500	C5D0	CCH-D	DST	
						PI-/PI+ YIELD RATIO			

8ERYLLIUM Z=4

A	A8UND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
9	1D0.D0	1.7	16.9	17.7	21.2	2.5	20.6	18.9	29.3

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69NA2	4BE7		A,G	A8X	1- 2	D D- 1	NAI-D	90	
						SOURCE 164-245 KEV			
59GE1	4BE8		P,G	ABX	21- 25	D 4-	NAI-D	90	
6DMA2	4BE8		P,G	RLY	17- 1B	D C-	NAI-D	DST	
61ME1	4BE8		P,G	NDX	18	D 0	NAI-D	DST	
62CA3	48E8		P,G	RLX	18- 20	D D-	NAI-D	DST	
63MI1	4BE8		P,G	RLX	19- 26	D 2-	NAI-D	DST	
63PE1	48E8		P,G	RLX	18- 27	D 1- 11	NAI-O	DST	
63RE1	4BE8		P,G	ABX	19- 26	D 4-	NAI-D	DST	
63RI1	48E8		P,G	LFT	1B	D 0-	NAI-D	90	
64SC2	48E8		P,G	RLX	17- 19	D 0-	NAI-D	DST	
							J-PI		
64TA1	4BE8		P,G	ABX	21- 25	D 4-	NAI-D	90	
67BL2	48E8		P,G	RLX	17- 34	D 1- 1B	NAI-D	90	
67NI1	4BE8		P,G	RLY	1B- 19	D 1- 3	NAI-D	DST	
6D8A4	48E9		E,E/	ABI	2	D 42	MAG-D	16D	
62ED1	48E9		E,E/	SPC	D- 20	D 42	TEL-D	180	
							G-WDTH, A8X		
63NG1	4BE9		E,E/	LFT	1- 6	D 60-25D	MAG-D	DST	
63NG2	4BE9		E,E/	FMF	4- 47	D100-180	MAG-D	135	
65NG1	48E9		E,E/	FMF	2- 47	D 5D-25D	MAG-D	DST	
							2.47,6.4 MEV,CONT		
66AR2	48E9		E,E/	LFT	16	D	MAG-D	OST	
							16=15.97 MEV		
66CL1	4BE9		E,E/	LFT	14- 17	D 40- 60	MAG-D	DST	
67BE1	4BE9		E,E/	FMF	2	D340	MAG-D	DST	
							2=2.43 MEV		
6BVA1	48E9		E,E/	ABX	0- 26	D 42- 6B	MAG-D	18D	
65AM3	4BE9		E,E/P	RLY	B- 6D	D510-590	MAG-D	51	
						10D MEV P COINC			

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58BA2	4BE9		E,N	A8X	2- 16 C 2- 16	BF3-I	4PI		
					COMPARED WITH G,N				
598A3	4BE9		E,N	ABY	THR- 36 D 10- 36	BF3-I	4PI		
68B02	4BE9		E,XXX	RLY	THR-119 D119	MAG-D		76	
					XXX=MASS SPECTRUM				
62MI4	4BE9		G,MU-T	ABX	15- 27 C 31	MGC-D	4PI		
64TE1	4BE9		G,MU-T	A8X	2D- 21 D 20- 21	NAI-D	4PI		
65WY1	4BE9		G,MU-T	ABX	10- 35 C 90	SCI-D	4PI		54
69DO3	4BE9		G,MU-T	A8X	10- 30 C250	MGP-D	4PI		262
71AH1	4BE9		G,MU-T	ABX	THR-150 C 10-150	MGC-D	4PI		
64LO3	4BE9		G,G	ABX	10- 30 C 1D- 30	NAI-D	140		
67LO1	4BE9		G,G/	A8X	12- 30 C 34	NAI-D	DST		
55JO1	4BE9		G,N	RLY	12- 65 C 65	SCI-D	DST		
56ED1	4BE9		G,N	A8X	2- 8 D 2-	MOD-I	4PI		
56FA1	4BE9		G,N	NOX	THR- 18 C 18	SCI-I	DST		
58AS1	4BE9		G,N	NOX	2- 17 C 17	SCI-I	DST		
588A2	4BE9		G,N	ABX	2- 16 C 2- 16	8F3-I	4PI		
					COMPARED WITH E,N				
59GI1	4BE9		G,N	A8X	1 D 1,	BF3-I	4PI		
59TH1	4BE9		G,N	ABX	6- 18 C 6- 18	BF3-1	4PI		
60KU2	4BE9		G,N	RLY	12- 90 C 90	TEL-I	DST		
61JA1	4BE9		G,N	ABX	THR- 5 CTHR-	8F3-I	4PI		
62B04	4BE9	$	G,N	NOX	3 D 3	8F3-I	DST		
					NEUTRONS POLARIZED				
6280 7	4BE9		G,N	NOX	5- 9 D 5-	SCI-I	DST		
62CU1	4BE9		G,N	ABX	4- 32 C 32	EMU-D	DST		
62JO2	4BE9		G,N	ABX	1- 1 D 1-	MOD-I	4PI		
63B04	4BE9	$	G,N	ABX	3- 9 D 5-	SCI-D	DST		
					NEUTRONS POLARIZED				
64CO1	4BE9	$	G,N	NOX	3 D 3		DST		
					NEUTRONS POLARIZED				
64KO5	4BE9		G,N	RLY	15- 32 C 35	MAG-D	DST		
66CO4	4BE9		G,N	ABI	6- 80 C 6- 80	BF3-I	4PI		
66DE3	4BE9		G,N	SPC	THR- B5 C 85	CCH-D	135		
66TH1	4BE9		G,N	SPC	THR- 17 C 17	SCI-D	90		
67BE6	4BE9		G,N	A8X	2- 4 C 2- 4	TOF-D	135		
68KA1	4BE9		G,N	ABX	50- B5 C 55, B5	TOF-D	67		
					NEUT ENGY SPEC				
57LO1	4BE9		G,2N	A8Y	20- 3D C 20- 30	ACT-I	4PI		
64AR2	4BE9		G,2N	RLY	21- 57 C 44, 57	ACT-I	4PI		
					REL TO C12(G,N)				
67GA1	4BE9		G,2N	ABY	THR- 23 C 23	ACT-I	4PI		
55BA5	4BE9		G,XN	A8Y	30-200 C150-250	THR-I	DST		
55DI1	4BE9		G,XN	NOX	2- 70 C 70	SCI-I	DST		
59KU1	4BE9		G,XN	NOX	12- 88 C 8B	TEL-I	DST		
60BE1	4BE9		G,XN	A8X	2- 17 C 5- 17	TOF-D	DST		
64AL5	4BE9		G,XN	NOX	THR- 34 C 34	THR-I	DST		
65CO2	4BE9		G,XN	AB!	6- B0 C 6- B0	8F3-I	4PI		
69GA1	4BE9	$	G,XN	SPC	2- B5 C 85	CCH-D	DST		
					N POLARIZATION				
69GA3	4BE9		G,XN	SPC	3- B5 C 85	CCH-D	DST		
72TH2	4BE9		G,XN	A8X	6- 28 C 7- 28	BF3-I	4PI		
56CO1	4BE9		G,P	ABY	19- 24 C 24	EMU-D	90		
58CH1	4BE9		G,P	SPC	THR- 44 C 44	EMU-D	DST		
					6 ENERGY GROUPS				
62CL1	4BE9		G,P	ABX	16- 54 C 16- 54	ACT-I	4PI		
62CU1	4BE9		G,P	ABX	16- 28 C 32	EMU-D	DST		
62LI1	4BE9	$	G,P	NOX	190 C355	TEL-D	DST		
					PROTONS POLARIZED				
62VO2	4BE9		G,P	A8X	40- 90 C 40- 90	TEL-I	90		
63KI1	4BE9		G,P	NOX	THR-335 C335	TEL-D	DST		
64KO5	4BE9		G,P	A8X	15- 32 C 35	MAG-D	DST		
65KO2	4BE9		G,P	A8X	18- 31 C 35	EMU-D	DST		
66DE6	4BE9		G,P	ABX	THR- 50 C 20- 50	ACT-I	4PI		
66DE6	4BE9		G,P	A8X	THR- 50 C 20- 50	TEL-D	90		
66VO1	4BE9		G,P	ABX	THR- 81 C 21- 81	TEL-D	9D		
69AN6	4BE9		G,P	ABY	114-999 C700,999	TEL-D	DST		
					999=1.2 GEV				
71AN1	4BE9		G,P	SPC	51-999 C700,999	TEL-D	DST		
					999=1.2 GEV, REL D/P				
57CH1	4BE9		G,XP	SPC	THR- 84 C 68, 84	EMU-D	DST		
5BWH2	4BE9		G,XP	ABX	40-100 C 45-110	TEL-D	90		
59CH1	4BE9		G,XP	RLY	THR- B0 C 90	TEL-D	DST		
					REL D TO P YLD				
60CH1	4BE9		G,XP	RLY	30- 90 C 90	TEL-I	DST		
					REL TO DEUTERONS				
62CH2	4BE9		G,XP	ABX	4D- 90 C 40- 90	MAG-D	DST		
68AD1	4BE9		G,XP	RLY	17- 28 C 28	MAG-D	4PI		
					FORWARD YIELDS				
71CO1	4BE9		G,XP	ABY	17- 9D C 5D- 9D	TEL-D	60		
62BA1	4BE9		G,D	ABY	4D- 60 C 45- 62	ACT-I	4PI		
64KO5	4BE9		G,D	RLY	15- 32 C 35	MAG-D	DST		
66DE6	4BE9		G,D	ABX	THR- 5D C 20- 50	TEL-D	90		
66VO1	4BE9		G,D	ABX	THR- 81 C 21- 81	TEL-D	9D		
69AN6	4BE9		G,D	ABY	114-999 C7D0,999	TEL-D	DST		
					999=1.2 GEV				
71AN1	4BE9		G,D	SPC	55-999 C7D0,999	TEL-D	DST		
					999=1.2 GEV, REL D/P				
59CH1	4BE9		G,XD	RLY	THR- B0 C 9D	TEL-D	DST		
					REL D TO P YLD				
60CH1	4BE9		G,XD	RLY	19- 9D C 90	TEL-I	DST		
					REL TO PROTONS				
62CH2	4BE9		G,XD	ABX	40- 90 C 4D- 90	MAG-D	DST		
68AD1	4BE9		G,XD	RLY	17- 28 C 28	MAG-D	4PI		
					FORWARD YIELDS				
71AN2	4BE9		G,XD	ABX	1D7-620 C620	MAG-D	DST		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
66DE6	4BE9		G,T	ABX	THR- 50 C 20- 50	TEL-D	90		
66VO1	4BE9		G,T	ABX	THR- B1 C 21- 81	TEL-D	90		
68AD1	4BE9		G,T	RLY	18- 28 C 28	MAG-D	4PI		
					FORWARD YIELDS				
6DCH1	4BE9		G,XT	RLY	32- 90 C 90	TEL-1			
					REL TO DEUTERONS				
648E1	4BE9		G,A	SPC	THR- 34 C 34	SCD-D	DST		
					J-PI				
68AD1	4BE9		G,A	RLY	3- 28 C 28	MAG-D	4PI		
					FORWARD YIELDS				
648E1	4BE9		G,2A	SPC	THR- 34 C 18- 34	SCD-D	90		
					J-PI				
60ST1	4BE9		G,NP	RLX	149-320 C320	TEL-D	76		
					REL TO H2 CROS SEC				
65LA1	4BE9		P,G	ABX	160 D155	SCD-D	DST		
71SC2	4BE9		D,G	SPC	17 D 0	NAI-D	135		
					17=16.97,0=.361 MEV				

BORON Z=5

A	ABUND.(1)	SEPARATION ENERGIES (MEV)								
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
10	19.61	8.4	6.6	18.7	17.8	4.5	27.0	8.3	23.5
11	80.39	11.5	11.2	11.2	27.2	8.7	19.9	18.0	30.9

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
62DO1	5B		E,P	RLY	30 C 30	MAG-D			
59CO5	5B		G,G	ABI	5, 7 C 5,	NAI-D	130		
60RE1	5B		G,G	A8X	7 D 7	NAI-D	90		
62SE1	5B		G,G	RLY	0- 13 C 13	NAI-D	90		
6480 1	5B		G,G	LFT	1- 3 C 1-	NAI-D	100		
							ABI		
68KA1	5B		G,N	ABX	50- B5 C 55, 85	TOF-D	67		
					NEUT ENGY SPEC				
63CO3	5B		G,XN	ABX	THR- B0 CTHR- 80	BF3-I	4PI		
71CO2	5B		G,XN	ABI	36- 64 C 10- 64	BF3-I	4PI		
					FAST N YIELD				
60CH1	5B		G,XP	RLY	THR- 90 C 90	TEL-I	90		
					REL TO DEUTERONS				
63KI1	5B		G,XP	ABX	THR-355 C335	TEL-D	DST		
60CH1	5B		G,XD	RLY	THR- 90 C 90	TEL-1	90		
					REL TO PROTONS				
60CH1	5B		G,XT	RLY	THR- 90 C 90	TEL-I	90		
					REL TO DEUTERONS				
67GA1	5B		G,BE7	RLY	THR- 23 C 23	ACT-I	4PI		
66PA4	5B	B	P,G	ABX	1- 2 D 1- 2	SCD-D	2PI		
62ED1	5B	1D	E,E/	ABX	0- 20 D 42	MAG-D	180		
65FR2	5B	10	E,E/	FMF	6 D100-220	MAG-D	DST		
						6=6.02 MEV			
65SP1	5B	10	E,E/	FMF	7 D 55	MAG-D	DST		
					WIDTH, 7.4B MEV				
66KO1	5B	10	E,E/	ABX	0- 18 D 50, 60	MAG-D	180		
					8 LEVELS				
66SP1	5B	10	E,E/	ABX	6, 7 D 32- 57	MAG-D	DST		
					6,7=6.01,7.47 MEV				
64LO3	5B	10	G,G	ABX	10- 30 C 10- 30	NAI-D	140		
67LO1	5B	10	G,G/	ABX	12- 30 C 34	NAI-D	DST		
64GR2	5B	10	G,N	ABX	9- 11 D 9- 11	BF3-I	4PI		
						WIDTH			
65HA1	5B	10	G,XN	ABX	THR- 30 C 6- 30	BF3-I	4PI		
62VO2	5B	10	G,P	A8X	23- 9D C 90	SCI-D	90		
68SH6	5B	1D	G,P	ABX	6- 13 C 13	EMU-D	DST		
					13=12.5 MEV				
62CH2	5B	1D	G,XP	ABX	23- 90 C 30- 90	TEL-D	9D		
62VO2	5B	10	G,D	A8X	25- 90 C 90	SCI-D	90		
62CH2	5B	10	G,XD	A8X	22- 90 C 30- 90	TEL-D	90		
62EL1	5B	10	P,G	NOX	7- B D 1	NAI-D	90		
							J-PI		
63FU3	5B	10	P,G	ABX	7- 9 D 1-	NAI-D	DST		
					G-WDTH, J-PI, T				
71LI3	5B	1D	T,G	LFT	1B, 19 D 1- 2	SCD-D	DST		
					J-PI, 1B.4,19.3 MEV				
65PA1	5B	1D	HE,G	ABX	18- 19 D- 3	NAI-D	DST		
							HE=HE3		
6BLI1	5B	10	HE,G	ABX	21- 27 D 3- 6	NAI-D	DST		
							HE=HE3		
66FO2	5B	1D	A,G	SPC	5- 7 D 1- 3	NAI-D	9D		
62ED1	5B	11	E,E/	ABX	0- 20 D 42	MAG-D	18D		
64BR2	5B	11	E,E/	SPC	8- 9 D 54	MAG-D	141		
66AR2	5B	11	E,E/	LFT	4, 5 D 3D- 60	MAG-D	DST		
					4=4.46, 5=5.04 MEV				
66KO1	5B	11	E,E/	ABX	0- 19 D 50, 60	MAG-D	18D		
					7 LEVELS				
66RI1	5B	11	E,E/	FMF	2, 4 D	MAG-D	DST		
					2,4=2.13,4.46 MEV				
66SP1	5B	11	E,E/	ABX	2- 9 D 32- 57	MAG-D	DST		
					2.12,8.56,8.93 MEV				
67SP1	5B	11	E,E/	FMF	4, 5 D 35- 57	MAG-D	DST		
					4,5=4.46,5.D4 MEV				
71VL1	5B	11	E,E/	FMF	D-3D0 D592-999	MAG-D	DST		
					999=1143 MEV				

REF	NUCLIDE Z	A	REACTION IN,OUT		RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
72NO3	5B	11	E,PI-		RLY	150-999	C150-999 ACT-I 4PI 999=1.2 GEV RLY TD G			
58ME1	5B	11	G,G		LFT	2	D 2	NAI-D	90	
58RA1	5B	11	G,G		LFT	4	D 4	NAI-D DST		
60BD3	5B	11	G,G		LFT	2	C 1-	NAI-D	110	
628D6	5B	11	G,G		LFT	2	C 1-	NAI-D J-PI	110	
63VA1	5B	11	G,G		NDX	0- 3	C 3	NAI-D	60	
64LO3	5B	11	G,G		ABX	10- 30	C 10- 30	NAI-D	140	
65KE1	5B	11	G,G		LFT	2	C 5	NAI-D 2=2.13 MEV	135	
67LO1	5B	11	G,G/		ABX	12- 30	C 34	NAI-D DST		
69MU2	5B	11	G,NG		SPC	11- 35	C 24, 35 SCD-D GAMMA SPECTRUM	UKN		
65HA1	5B	11	G,XN		ABX	THR- 30	C 6- 30 8F3-I 4PI			215+
62LI1	5B	11	$ G,P		NOX	THR-355	C355 POLARIZED PROTONS	TEL-D DST		
62VO1	5B	11	G,P		RLY	THR- 40	C 40	TEL-D	90	
69SO2	5B	11	G,P		ABX	15- 32	C 15- 32	SCD-D 4PI		216
70SD1	5B	11	G,P		ABX	11- 19	C 17, 19	EMU-O DST		279+
69MU2	5B	11	G,PG		SPC	11- 35	C 24, 35 SCD-D GAMMA SPECTRUM	UKN		
58TA1	5B	11	G,2P		ABX	THR-320	C100-320 BF3-I 4PI DELAYED NEUTRONS			
63NE2	5B	11	G,3P		ABY	THR-320	C320	ACT-I 4PI		
66NE1	5B	11	G,3P		ABY	45-250	C250	ACT-I 4PI		
62CH2	5B	11	G,XP		RLY	19- 40	C 40 REL TO PROTONS	TEL-D	90	
71PA1	5B	11	G,NG		ABX	10- 35	C 20- 35	SCD-D	90	
71PA1	5B	11	G,PG		A8X	10- 35	C 20- 35	SCD-D	90	
62VO1	5B	11	G,D		RLY	THR- 40	C 40	TEL-D	90	
62CH2	5B	11	G,XD		RLY	24- 40	C 40 REL TO PROTONS	TEL-D	90	
62VD1	5B	11	G,T		RLY	THR- 40	C 40	TEL-D	90	
68NY1	5B	11	G,PI-		ABX	140-700	C140-700 ACT-I C-11 ACT	4PI		
72NO3	5B	11	G,PI-		ABX	150-999	C150-999 ACT-I 999=1.2 GEV	4PI		
70GO2	5B	11	P,G		ABX	12- 16	D 0- 7 NAI-D J-PI,G-WIDTH	DST		235
61KN1	5B	11	D,G		ABX	16- 18	D 0- 2	THR-I 4PI		
62SU2	5B	11	D,G		RLX	16- 20	D 1- 5	NAI-O	90	
63SU2	5B	11	D,G		ABX	16- 20	D I-	NAI-D DST		
64SU1	5B	11	D,G		ABX	18- 23	D 0- 5	NAI-D DST		
66SU1	5B	11	D,G		ABX	16- 21	D 1- 6	NAI-D DST		
66ZI1	5B	11	D,G		ABX	16- 18	D 1- 2	NAI-D DST		
71BA4	5B	11	D,G		ABX	16- 20	D 0- 4	NAI-O DST		
67PA3	5B	11	A,G		ABX	9- 11	D 1- 4	NAI-D	90	

CARBDN Z=6

A	ABUND.(1)	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
12	98.89	18.7	16.0	27.4	26.3	7.4	31.8	27.4	27.2
13	1.11	4.9	17.5	23.9	24.4	10.6	23.7	20.9	31.6

REF	NUCLIDE Z	A	REACTION IN,OUT		RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
61JA2	6C	11	P,G		NOX	10	O O- J-PI, G-WIDTH	NAI-D	90	
62DP2	6C	11	P,G		ABX	11- 14	D 2-	NAI-O	0	
70KU1	6C	11	P,G		ABX	11- 24	D 2- 17	NAI-O DST		255
55FR1	6C	12	E,E/		ABX	4- 10	O 80-187 LEVELS 4.4,7.7,9.6	MAG-O DST		
56FR1	6C	12	E,E/		ABX	0- 35	O187 J-PI	MAG-D DST		
598A1	6C	12	E,E/		A8I	0- 30	O 43	MAG-O	160	
60BA4	6C	12	E,E/		SPC	0- 30	O 42 ABI, MULTIPOLARITY	MAG-O OST		
61BD4	6C	12	E,E/		SPC	0-164	D194	MAG-D	135	
61OU1	6C	12	E,E/		ABX	13- 18	O 46-154	MAG-O	135	
62EO1	6C	12	E,E/		ABI	15	O 42 G WIDTH,J-PI	MAG-O	180	
63BO3	6C	12	E,E/		ABX	4- 25	O200	MAG-D	135	
63GO4	6C	12	E,E/		ABX	0- 30	O 42	MAG-O	180	
63LE1	6C	12	E,E/		FMF	0- 35	O 55 D-RANGE 0-1	MAG-O	180	
64BR2	6C	12	E,E/		SPC	0- 20	O 54	MAG-D	141	
64CR1	6C	12	E,E/		ABX	4- 10	O250 WIDTHS	MAG-D OST		
64GD2	6C	12	E,E/		ABX	10- 32	D 40- 70 FMF	MAG-O OST		
64GD3	6C	12	E,E/		ABX	15	O 40- 70 FMF	MAG-D	180	
64GU1	6C	12	E,E/		FMF	15	D D=0.2-0.5, WIOTH	NAI-D OST		
66AR2	6C	12	E,E/		LFT	4	O 4=4.43 MEV	MAG-O	4PI	
66CR1	6C	12	E,E/		FMF	4, 10	D600-800 4,10=4.43,9.6	MAG-O OST		MEV
66PR1	6C	12	E,E/		NDX	14- 21	O100-200	MAG-D	180	
67AF1	6C	12	E,E/		RLX	0-100	O846	MAG-O DST		
67BE3	6C	12	E,E/		ABX	4	D113-390 4=4.43 MEV	MAG-O OST		

REF	NUCLIDE Z	A	REACTION 1N,OUT		RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67CR1	6C	12	E,E/		FMF	0- 10	D100-200 4.43,7.66,9.4	MAG-D DST		MEV
67CR2	6C	12	E,E/		FMF	19	D400-800 19=19.5 MEV	MAG-O DST		
67PE1	6C	12	E,E/		LFT	15	D 40- 65 15=15.1 MEV	D DST		
68BE6	6C	12	E,E/		FMF	18- 20	D 63-128 19.4 MEV LEVEL	MAG-D DST		
68DE3	6C	12	E,E/		FMF	55-202	D580-968	MAG-O DST		
68DR1	6C	12	E,E/		FMF	19	D140 19=19.4 MEV	MAG-D DST		
68PR1	6C	12	E,E/		FMF	14- 21	D100-200 6 LEVELS	D	180	
68RI1	6C	12	E,E/		FMF	26- 35	D 60-100	MAG-D DST		
69BE5	6C	12	E,E/		FMF	20-180	D200-300	MAG-D	60	
69DE6	6C	12	E,E/		A8X	300	D580-968	MAG-D DST		
69GU2	6C	12	E,E/		ABX	0- 35	D115,200	MAG-D DST		
69TI2	6C	12	E,E/		ABX	0-700	D999 999= 1.126 GEV	MAG-D	25	
69TD2	6C	12	E,E/		FMF	11	D183,250 11=10.8 MEV	MAG-O DST		
69TO4	6C	12	E,E/		A8X	18- 39	D177,250	MAG-D DST		
69VA1	6C	12	E,E/		ABX	13- 22	D 50- 70 15.1,19.2 MEV	MAG-O	180	
70AN1	6C	12	E,E/		A8X	16- 30	D 55	MAG-D	141	
70DE1	6C	12	E,E/		ABX	400-999	D690,999 999=1115 MEV	MAG-D DST		
70LI1	6C	12	E,E/		FMF	22- 37	D 52-102 RED.MATRIX ELEMNTS	MAG-D DST		
70LI2	6C	12	E,E/		ABI	17- 37	D 52-102 SEE 70LI1	MAG-O DST		
70ST2	6C	12	E,E/		ABX	7	D 31- 59 7=7.65 0+	MAG-O DST		
70TD1	6C	12	E,E/		FMF	15- 30	D250	MAG-D DST		
71BE2	6C	12	E,E/		FMF	3- 44	D 77-106	MAG-D DST		
71MD3	6C	12	E,E/		ABX	0-240	D500	MAG-O	60	
71NA1	6C	12	E,E/		FMF	9- 17	D250 LEVELS 14.1,4.43	MAG-D DST		
71NA1	6C	12	E,E/		FMF	9- 17	D250 ERRATUM 71NA1	MAG-D DST		
71YA2	6C	12	E,E/		ABX	15-100	D 88-250 J-PI,FMF,10 LEVELS	MAG-O DST		
64AM1	6C	12	E,E/P		RLX	THR-150	D550	MAG-D	51	
67AM1	6C	12	E,E/P		RLX	130,160	D635	MAG-D	51	
71BU2	6C	12	E,E/P		ABX	5- 85	D500 PROT P=25 100 MEV/C	MAG-O	51	
58BA2	6C	12	E,N		RLY	24-145	C 24-145 ACT-I 4PI COMPARED WITH G,N			
59BA3	6C	12	E,N		ABY	THR- 36	D 10- 36	8F3-I 4PI		
65HE1	6C	12	E,N		RLY	THR- 32	D 14- 32	ACT-I 4PI		
71VO1	6C	12	E,N		ABX	THR-266	C150-266	TOF-D	90	
72KU6	6C	12	E,N		ABX	19- 30	D 20- 30 E+/E- YIELD RATIO	ACT-I 4PI		
65HE1	6C	12	E+,N		RLY	THR- 32	O 14- 32	ACT-I 4PI		
61VA1	6C	12	E,P		NDX	20- 40	C 24, 40	MAG-O DST		
64CH1	6C	12	E,P		A8X		D999 999=4 GEV	MAG-D DST		
69AN8	6C	12	E,P		RLY	THR-999	C400-999 999=1 GEV, REL O/T	MAG-O DST		
70AN5	6C	12	E,P		RLY	96-999	C620,999 999=1140 MEV	TEL-D DST		
62DO1	6C	12	E,XP		SPC	25- 30	C 25- 30	MAG-D OST		
70VY1	6C	12	E,XP		ABX	31-200	O100-200	MAG-O OST		
71SH1	6C	12	E,XP		SPC	16- 29	O 43	MAG-O OST		
69AN8	6C	12	E,D		RLY	THR-999	C400-999 1.3 GEV REL P/O,D/T	MAG-D DST		
72SK7	6C	12	E,D		ABX	40- 60	D 40- 60	MAG-D DST		
69AN8	6C	12	E,T		RLY	THR-999	C400-999 999=1 GEV, REL D/T	MAG-D OST		
68BO2	6C	12	E,XXX		RLY	THR-110	O110 XXX=MASS SPECTRUM	MAG-O	76	
56TZ2	6C	12	G,MU-T		LFT	23	C 22- 23	ACT-I 4PI		
59KO1	6C	12	G,MU-T		ABX	15- 30	C 31	NAI-D 4PI		
60TA2	6C	12	G,MU-T		ABX	11- 32	C 11- 32	MAG-O 4PI		
60WY1	6C	12	G,MU-T		ABX	13- 83	C 35- 90	NAI-O 4PI		
60ZI1	6C	12	G,MU-T		A8X	10- 30	C 32	MGP-O 4PI		
63BU1	6C	12	G,MU-T		A8X	13- 27	C 13- 27	MGP-O 4PI		
638U3	6C	12	G,MU-T		ABX	13- 27	C220	MGP-O 4PI		
65WY1	6C	12	G,MU-T		ABX	10- 35	C 90	SCI-O 4PI		52+
698E2	6C	12	G,MU-T		ABX	10- 30	C 35	MGC-D 4PI		105+
71AH1	6C	12	G,MU-T		ABX	THR-150	C 10-150	MGC-O 4PI		
57HA1	6C	12	G,G		A8X	0- 19	C 19	NA1-O	120	
58RA1	6C	12	G,G		LFT	4	D 4	NA1-D DST		
59GA1	6C	12	G,G		LFT	15	C 19- 42 15.1 MEV LEVEL	NAI-D DST		
59PA3	6C	12	G,G		ABX	17	O 15, 18	NA1-O	90	
59PE5	6C	12	G,G		ABX	19- 61	C 19- 61	NAI-O	135	
60BU3	6C	12	G,G		LFT	15	C 23 15=15.1 MEV	NA1-D DST		
60HA2	6C	12	G,G		ABX	15	D 15, 17	NAI-D	90	
60JA1	6C	12	$ G,G		NDX	0- 15	C 25 J-PI, MULTIPOLARITY	NAI-D DST		
61BU3	6C	12	G,G		ABX	19- 36	C 32 SEE 61BU4	NAI-O	140	
61W11	6C	12	G,G		ABX	40-120	C132	SCI-O DST		
62SE1	6C	12	G,G		SPC	0- 19	C 19	NA1-D	90	
63SC3	6C	12	G,G		ABX	15	D 15, 18 G-WOTH	NAI-O OST		
67KU2	6C	12	G,G		LFT	15	O 15 15=15.1 MEV	NAI-O	135	
70AH1	6C	12	G,G		ABX	15- 80	C108	NAI-O	135	
67LD1	6C	12	G,G/		ABX	18- 34	C 34	NAI-O DST		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
55BA1	6C	12	G,N	A8X	18- 36	C 18-260	ACT-I	4PI	
55SP2	6C	12	G,N	RLY	THR- 20	C 17- 20	ACT-I	4PI	
							8REAKS		
56TZ1	6C	12	G,N	RLY	22- 24	C 22- 24	ACT-I	4PI	
57BA1	6C	12	G,N	ABY	30-260	C120-260	THR-I	DST	
57CA2	6C	12	G,N	A8X	20- 31	C 20- 31	ACT-I	4PI	
58BA2	6C	12	G,N	RLY	24-145	D 24-145	ACT-I	4PI	
						CDMPARED WITH E,N			
59CD1	6C	12	G,N	ABX	20- 21	D 20- 21	ACT-I	4PI	
59SA1	6C	12	G,N	NDX	19- 21	C 18- 21	MDD-I	4PI	
							8REAKS		
59SA1	6C	12	G,N	NDX	THR- 19	C 18- 19	ACT-I	4PI	
							8REAKS		
60EM2	6C	12	G,N	SPC	20- 30	C 30	EMU-D	DST	
60GE2	6C	12	G,N	RLY	19- 20	C 19, 20	ACT-I	4PI	
							THRESHDLD		
60GE3	6C	12	G,N	NDX	THR	CTHR	8F3-I	4PI	
							THRESHDLD		
61RD2	6C	12	G,N	A8X	19- 23	C 19- 23	ACT-I	4PI	
62BD3	6C	12	G,N	A8X	18- 90	C 18- 90	ACT-I	4PI	
62DE1	6C	12	G,N	ABX	20- 21	D 20- 21	ACT-I	4PI	
62FI2	6C	12	G,N	RLX	21- 29	C 25- 32	TOF-D	UKN	
62FU5	6C	12	G,N	A8X	21- 31	C 31	SCI-D	90	
62MI2	6C	12	G,N	A8X	18- 26	D 18- 26	8F3-I	4PI	
64BE8	6C	12	$ G,N	NDX	THR- 32	C 32	SCI-D	DST	
						NEUT POLARIZATION			
65VE1	6C	12	G,N	SPC	THR- 33	C 34	TOF-D	DST	
66BA4	6C	12	G,N	A8X	THR- 52	C 18- 52	8F3-I	4PI	
66CD2	6C	12	G,N	A8X	THR- 65	CTHR- 70	ACT-I	4PI	111
66FD1	6C	12	G,N	A8X	18- 70	C 18- 70	ACT-I	4PI	
66FU1	6C	12	G,N	8X	18- 37	D 18- 37	8F3-I	4PI	112
66LD1	6C	12	G,N	A8X	21- 27	D 21- 27	ACT-I	4PI	
66MI2	6C	12	G,N	A8X	18- 26	D 18- 26	8F3-I	4PI	
67AN1	6C	12	G,N	RLY	THR-999	CTHR-999	ACT-I	4PI	
67DI2	6C	12	G,N	ABY	18-999	C300-999	ACT-I	4PI	
							999=1 GEV		
67DI3	6C	12	G,N	A8X	300-999	C300-999	ACT-I	4PI	
							999=1 GEV		
67GE2	6C	12	G,N	A8Y	THR- 27	C 22, 27	8F3-I	4PI	
67JD1	6C	12	G,N	A8X	19- 20	D 19- 20	ACT-I	4PI	
67TA1	6C	12	G,N	A8I	THR-170	C170	CCH-I	4PI	
68KA1	6C	12	G,N	A8X	50- 85	C 55, 85	TOF-D	67	
						NEUT ENGY SPEC			
68WU1	6C	12	G,N	ABX	THR- 40	C 20- 40	TOF-D	90	222+
69DE1	6C	12	G,N	A8Y	THR-999	C 1- 6	ACT-I	4PI	
							999=5.5 GEV		
69DE4	6C	12	G,N	NDX	19-260	C260	ACT-I	DST	
							C11 RECOIL DST		
70HY1	6C	12	G,N	A8X	200-999	C100-999	ACT-I	4PI	
							999=1050 MEV		
70KA2	6C	12	G,N	A8X	18-100	C 20,140	ACT-I	4PI	
71IS3	6C	12	G,N	A8X	19- 25	C 19- 25	8F3-I	4PI	412
71SA1	6C	12	G,N	A8Y	18- 68	C 10- 68	ACT-I	4PI	
66MA2	6C	12	G,NG/	RLX	21- 31	C 21- 31	NAI-D	UKN	
70ME4	6C	12	G,NG/	ABY	21- 42	C 24- 42	SCD-D	112	
59OC1	6C	12	G,2N	RLI	THR-100	CTHR-100	ACT-I	4PI	
							REL TO G,N		
70KA2	6C	12	G,2N	ABX	30-556	C 35-130	ACT-I	4PI	
55BA5	6C	12	G,XN	A8Y	30-200	C150-250	THR-I	DST	
55DI1	6C	12	G,XN	NDX	THR- 70	C 70	SCI-I	DST	
56FA1	6C	12	G,XN	NDX	THR- 23	C 23	SCI-I	DST	
57CD1	6C	12	G,XN	ABX	19- 41	C 19- 40	8F3-I	4PI	
58BA1	6C	12	G,XN	A8Y	THR-255	C170,255	THR-I	DST	
58BA5	6C	12	G,XN	RLY	THR- 23	C 18- 23	BF3-I	4PI	
							BREAKS		
59KU1	6C	12	G,XN	ABY	THR- 88	C 88	TEL-D	DST	
61PR1	6C	12	G,XN	RLY	30- 85	C 30- 85	THR-I	4PI	
62MI2	6C	12	G,XN	ABX	18- 26	D 18- 26	BF3-I	4PI	
63CD3	6C	12	G,XN	A8X	THR- 80	CTHR- 80	BF3-I	4PI	
63FU1	6C	12	G,XN	A8X	20- 29	C 31	SCI-D	90	
							SPECTRUM		
64AL5	6C	12	G,XN	NDX	THR- 34	C 34	THR-I	DST	
65BA1	6C	12	G,XN	A8X	THR- 52	C 18- 52	8F3-I	4PI	
65MI1	6C	12	G,XN	A8X	THR- 30	CTHR- 30	8F3-I	4PI	
66BI1	6C	12	G,XN	ABX	20-200	C 20-200	8F3-I	4PI	
66FI2	6C	12	G,XN	SPC	THR- 65	C 65	TOF-D	90	
67FE2	6C	12	G,XN	ABX	100-150	C150	BF3-I	4PI	
6BRA2	6C	12	G,XN	SPC	THR-103	C103	TOF-D	DST	
698A1	6C	12	G,XN	ABX	19- 25	C 19- 25	BF3-I	4PI	314
71CD2	6C	12	G,XN	ABI	36- 64	C 10- 64	BF3-I	4PI	
							FAST N YIELD		
71MI1	6C	12	G,XN	A8X	70- 90	C 64-128	TOF-D	DST	
72VA2	6C	12	G,XN	A8X	18- 32	C 18- 32	BF3-I	4PI	
55JD1	6C	12	G,P	RLY	THR- 65	C 65	SCI-D	DST	
56MA1	6C	12	G,P	ABX	18	D 18	EMU-D	4PI	
59BA2	6C	12	G,P	SPC	34- 89	C 82, 89	SCI-D	90	
61TH1	6C	12	G,P	ABI	18- 23	C 18- 23	ACT-I	4PI	
							18 8REAKS		
64SH4	6C	12	G,P	ABX	20- 23	D 20- 23	SCI-D	4PI	
							WIDTHS		
64TA3	6C	12	G,P	SPC	THR-100	C170	CCH-D	4PI	
65KI2	6C	12	G,P	A8Y	88-720	D400-720	MAG-D	57	
66KE1	6C	12	$ G,P	ABX	21- 22	D 21- 22	EMU-D	DST	
66PA2	6C	12	G,P	SPC	THR- 55	C 55	SCI-D	DST	
67TA1	6C	12	G,P	ABX	THR-170	C170	CCH-I	DST	
68FR2	6C	12	G,P	RLX	THR- 32	C 30, 32	TEL-D	DST	
68MA1	6C	12	G,P	ABX	100	C 95-102	TEL-D	DST	
68MA2	6C	12	G,P	RLX	50- 80	C 50- 80	TEL-I	45	
69AN5	6C	12	G,P	ABY	113-999	C400 999	MAG-D	30	
							999=1.4 GEV		
69AN6	6C	12	G,P	ABY	114-999	C700,999	TEL-D	DST	
							999=1.2 GEV		
69CA3	6C	12	G,P	A8X	70- 27	D 32	TEL-D	DST	316
							GRDUND STATE		
69MA3	6C	12	G,P	A8X	36- 80	C 50- 80	TEL-D	45	
69TA1	6C	12	G,P	ABX	16- 60	C170	CCH-D	DST	317
							XXX=CHRGD PARTCLES		
70TD2	6C	12	$ G,P	NDX	680-840	C700-930	MAG-D	41	
							P-POLARIZATION		
71AN1	6C	12	G,P	SPC	49-999	C700,999	TEL-D	DST	
							999=1.2 GEV, REL D/P		
71GD1	6C	12	$ G,P	NDX	16-800	C650-800	MAG-D	UKN	
							POLARIZED PRDTONS		
66MA2	6C	12	G,PG/	RLX	21- 31	C 21- 31	NAI-D	UKN	
70ME4	6C	12	G,PG/	A8Y	18- 42	C 24- 42	SCD-D	112	
67TA1	6C	12	G,2P	A8I	THR-170	C170	CCH-I	4PI	
58TA1	6C	12	G,3P	A8X	100-320	C100-320	ACT-I	4PI	
							LI-9 N 8Y BF3		
56CD1	6C	12	G,XP	ABY	THR- 24	C 24	EMU-D	90	
57CH1	6C	12	G,XP	SPC	THR- 84	C 64, 84	EMU-D	DST	
57LI1	6C	12	G,XP	SPC	THR- 35	C 35	EMU-D	DST	
58CH1	6C	12	G,XP	SPC	THR- 44	C 30, 44	EMU-D	DST	
598A2	6C	12	G,XP	SPC	THR- 89	C 82, 89	TEL-D	90	
59CH1	6C	12	G,XP	RLY	THR- 80	C 80	TEL-D	90	
							REL D TO P YLD		
59PE4	6C	12	G,XP	A8X	22- 62	C 22- 90	SCI-D	DST	
608A1	6C	12	G,XP	A8Y	THR- 90	C 30, 90	TEL-D	58	
60CH1	6C	12	G,XP	RLY	THR- 90	C 90	TEL-I	DST	
							REL TO DEUTERONS		
61CE1	6C	12	G,XP	A8X	THR-342	D245-342	TEL-D	60	
61VA1	6C	12	G,XP	NDX	20- 40	C 24, 40	MAG-D	DST	
62CH2	6C	12	G,XP	RLY	THR- 90	C 90	TEL-D	DST	
							REL TO DEUTERONS		
62HE1	6C	12	G,XP	SPC	19- 27	C 31	SCD-D	UKN	
62LI1	6C	12	$ G,XP	RLY	THR-335	C335	TEL-D	DST	
							PRDTONS POLARIZED		
62PA1	6C	12	G,XP	A8Y	THR-150	C150	SCI-D	60	
63FI4	6C	12	G,XP	SPC	19- 30	C 31	SCI-D	90	
							SPECTRUM		
63KI1	6C	12	G,XP	A8Y	THR-335	C335	TEL-D	DST	
63MU1	6C	12	G,XP	ABY	THR- 24	C 24	SCD-D	120	
63WA2	6C	12	G,XP	RLY	THR- 65	C 65	SCI-D	DST	
64SE1	6C	12	G,XP	SPC	THR- 24	C 24	EMU-D	DST	
68FR3	6C	12	G,XP	RLX	20- 38	C 38	TEL-D	90	
							38=37.7 MEV		
64KI1	6C	12	G,D	A8Y	80-800	C400-800	TOF-D	57	
65KI2	6C	12	G,D	ABY	70-720	D400-720	MAG-D	57	
69AN5	6C	12	G,D	A8Y	219-999	C400,999	MAG-D	30	
							999=1.4 GEV		
69AN6	6C	12	G,D	ABY	116-999	C700,999	TEL-D	DST	
							999=1.2 GEV		
71AN1	6C	12	G,D	SPC	55-999	C700,999	TEL-D	DST	
							999=1.2 GEV, REL D/P		
72AN3	6C	12	G,D	RLY	105-999	C700,999	MAG-D	DST	
							999=1.2 GEV		
59CH1	6C	12	G,XD	RLY	THR- 80	C 80	TEL-D	90	
							REL D TO P YLD		
60CH1	6C	12	G,XD	RLX	THR- 90	C 90	TEL-I	DST	
							REL TO PRDTONS		
62CH2	6C	12	G,XD	RLY	THR- 90	C 90	TEL-D	DST	
							REL TO PRDTONS		
71AN2	6C	12	G,XD	A8X	115-999	C620,999	MAG-D	DST	
							999=1.14 GEV		
67KR2	6C	12	G,T	RLX	THR- 55	C 30- 55	ACT-I	4PI	
72AN3	6C	12	G,T	SPC	107-999	C700,999	MAG-D	DST	
							999=1.2 GEV		
67TA1	6C	12	G,HE3	A8I	THR-170	C170	CCH-I	4PI	
55GL1	6C	12	G,A	SPC	17	D 14, 17	EMU-D	4PI	
70MU1	6C	12	G,A	A8X	12- 32	C 32	EMU-D	4PI	31B
55CA2	6C	12	G,3A	ABX	12- 18	D 15, 18	EMU-D	4PI	
55CA2	6C	12	G,3A	A8X	12- 18	D 15, 18	IDN-D	4PI	
55GD1	6C	12	G,3A	SPC	THR- 60	C 60	EMU-D	DST	
55HA1	6C	12	G,3A	RLY	9- 33	C 27, 33	EMU-D	DST	
57MU1	6C	12	G,3A	SPC	15, 18	D 15, 18	EMU-D	DST	
58MA1	6C	12	G,3A	ABX	12- 40	C150,250	EMU-D	4PI	
60GA2	6C	12	G,3A	A8X	15, 18	D 15, 18	EMU-I	UKN	
61SE3	6C	12	G,3A	RLY	18	D 18	EMU-D	4PI	
63SH2	6C	12	G,3A	NDX	8- 70	C 70	EMU-D	4PI	
							Q-VALUE DISTRIB		
64GR1	6C	12	G,3A	ABY	7- 24	C 17- 24	EMU-I	4PI	
64TD1	6C	12	G,3A	A8X	9- 22	C 22	EMU-D	DST	
							SPECTRUM		
64WA1	6C	12	G,3A	ABX	18	D 17	SCI-D	4PI	
							18=17.6 MEV		
65RO1	6C	12	G,3A	A8X	12- 17	C 12- 17	EMU-D	4PI	
58WH2	6C	12	G,NP	A8X	THR-110	C 40-110	TEL-D	DST	
							CDINC WITH BF3		
60ST1	6C	12	G,NP	RLX	157-320	C320	TEL-D	76	
							REL TO H2 CRDS SEC		
64TA3	6C	12	G,NP	SPC	THR-100	C170	CCH-D	4PI	
67SM1	6C	12	G,NP	ABX	150-250	C250	TOF-D	DST	
67TA1	6C	12	G,NP	A8I	THR-170	C170	CCH-I	4PI	
68TA1	6C	12	G,NP	ABX	THR-170	C170	CCH-I	DST	
68TA1	6C	12	G,NPA	ABX	THR-170	C170	CCH-I	DST	
67TA1	6C	12	G,NHE3	A8I	THR-170	C170	CCH-I	4PI	
68TA1	6C	12	G,NHE3	ABX	THR-170	C170	CCH-I	DST	
67TA1	6C	12	G,NA	A8I	THR-170	C170	CCH-I	4PI	
68TA1	6C	12	G,NA	ABX	THR-170	C170	CCH-I	DST	
69DW2	6C	12	G,NA	ABX	26- 31	C 26- 71	ACT-I	4PI	276
58MA1	6C	12	G,PT	ABX	27- 70	C150,250	EMU-D	4PI	
68TA1	6C	12	G,PT	ABX	THR-170	C170	CCH-I	DST	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
56LI1	6C	12	G,PA	ABX	30- 50	C 25- 70	EMU-I	UKN	
58MA1	6C	12	G,PA	ABX	25- 80	C150,250	EMU-D	4PI	
62MO2	6C	12	G,PA	ABI	25-12D	C120	EMU-D	4PI	
67TA1	6C	12	G,PA	ABI	THR-170	C170	CCH-I	4PI	
68TA1	6C	12	G,PA	ABX	THR-170	C170	CCH-I	DST	
66AR1	6C	12	G,BE7	ABX	30- 57	C 30- 57	ACT-I	4PI	
67DI2	6C	12	G,BE7	ABY	THR-999	C300-999	ACT-I	4PI	
							999=1	GEV	
67DI3	6C	12	G,BE7	ABX	300-999	C300-999	ACT-I	4PI	
							999=1	GEV	
67TA1	6C	12	G,SPL	ABI	THR-170	C170	CCH-I	4PI	
64MA4	6C	12	G,XXX	ABY	150-720	C150-720	ACT-I	4PI	
							XXX=C11 FINAL		
69TA1	6C	12	G,XXX	ABX	16- 60	C170	CCH-D	4PI	
							XXX=CHRGD PARTCLES		
71GR2	6C	12	G,PI-	ABY	150-560	C560	EMU-D	DST	
							PI-/PI+ YIELD RATIO		
71GO2	6C	12	G,PI+	RLY	150-500	C50D	CCH-D	DST	
							PI-/PI+ YIELD RATIO		
71GR2	6C	12	G,PI+	ABY	150-560	C560	EMU-D	DST	
							PI-/PI+ YIELD RATIO		
59GE1	6C	12	P,G	ABX	19- 23	C 4-	NAI-D	90	
59GO1	6C	12	P,G	RLX	19- 26	D 3- 11	NAI-D	DST	
61GO1	6C	12	P,G	ABX	19- 27	D 3- 11	NAI-D	DST	
							G,P AB1 BY DT BAL		
61SE2	6C	12	P,G	RLY	16	D 0	NAI-I	90	
							G-WDTH, MULTIPOLAR		
63BE5	6C	12	P,G	RLY	21- 28	D 6- 13	NA1-I	90	
63RE1	6C	12	P,G	ABX	30- 39	D 15- 25	NAI-D	90	
							ABI BY DETA1L BAL		
64AL2	6C	12	P,G	ABX	19- 29	D 4- 14	NAI-D	DST	225
64AL3	6C	12	P,G	NOX	20- 30	D 4- 14	NAI-D	DST	
64HA3	6C	12	P,G	ABX	17- 20	D 1- 4	NAI-I	DST	
65SE1	6C	12	P,G	ABX	16- 20	D 0- 4	NAI-D	DST	
67FE1	6C	12	P,G	ABX	25- 30	D 10- 15	NAI-D	90	
69KE1	6C	12	P,G	ABX	28- 37	D 13- 21	NAI-D	DST	227+
72BR4	6C	12	P,G	ABX	29- 35	D 14- 24	NAI-O	DST	
72GL1	6C	12	$ P,G	ABX	16- 30	D 6- 14	NAI-O	DST	
							POLARIZED PROTONS		
64BL1	6C	12	HE,G	ABX	28	D 2-	NAI-D	90	
							HE=HE3		
72BL6	6C	12	HE,G	ABX	26- 32	D 1- 6	NAI-D	DST	
						HE=HE3, G-WIDTH, J-P			
67PE1	6C	13	E,E/	LFT	15	D 40- 65	MAG-D	DST	
							15=15.11	MEV	
69CA1	6C	13	E,E/	SPC	0- 20	D140	MAG-D	OST	
69TO1	6C	13	E,E/	FMF	3	D 34- 65	MAG-D	DST	
							3=3.08	MEV	
69WI2	6C	13	E,E/	LFT	3- 15	D 36- 65	MAG-D	DST	
							7 LEVELS		
70WI1	6C	13	E,E/	LFT	3- 15	D 36- 65	MAG-D	DST	
							9 LEVELS		
71BE2	6C	13	E,E/	FMF	8- 44	D 77-106	MAG-O	DST	
71YA1	6C	13	E,E/	FMF	3- 20	D 40-125	MAG-D	DST	
							10 LEVELS		
71SH1	6C	13	E,P	SPC	18- 31	D 43	MAG-D	DST	
69RA3	6C	13	G,G	LFT	3	C 3	NAI-D	DST	
							3=3.68	MEV	
60ED1	6C	13	G,N	ABX	6- 7	D 6-	BF3-I	4PI	
64GR2	6C	13	G,N	ABX	6- 11	D 6- 11	BF3-I	4PI	
65BE2	6C	13	G,N	ABX	6- 14	C 8- 14	TOF-D	DST	
66FU3	6C	13	G,N	RLY	THR- 15	C 5- 15	BF3-1	4PI	
							NSA 13943 BREAKS		
70FU2	6C	13	G,N	ABX	6- 14	C 5- 14	BF3-I	90	
70FU3	6C	13	G,N	ABX	6- 14	C 5- 14	BF3-1	DST	
71MU1	6C	13	G,NG	ABY	9- 28	C 21, 28	SCD-D	90	
57CO1	6C	13	G,XN	ABX	6- 41	C 6- 4D	BF3-I	4PI	297
61SA2	6C	13	G,XN	SPC	7- 14	C 14	TOF-D	79	
57CO1	6C	13	G,P	ABX	17- 45	C 17- 4D	ACT-I	4PI	
64KO2	6C	13	G,P	SPC	20- 32	C 32	SCI-D	90	
							SEPARATED ISOTOPES		
64DE2	6C	13	G,XP	ABX	18- 50	C 18- 50	ACT-I	4PI	313

NITROGEN Z=7

A	ABUND.(1)	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
14	99.63	10.6	7.6	22.7	20.7	11.6	30.6	12.5	25.1
15	0.37	10.8	10.2	14.8	28.2	11.0	21.4	18.4	31.0

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60HE2	7N	13	P,G	ABX	2- 3	D D-	NAI-O	DST	
62PA2	7N	13	P,G	ABX	8- 11	D 6-	NAI-D	90	
62WA1	7N	13	P,G	ABX	15- 20	D 14- 20	NAI-O	90	
63FI1	7N	13	P,G	ABX	11- 41	D 10- 49	NAI-D	90	266+
63YO2	7N	13	P,G	ABX	2- 4	D 1-	NAI-D	DST	
68DI1	7N	13	P,G	LFT	15	D 14- 15	NAI-D	DST	
							15.07	MEV	
68RI2	7N	13	P,G	LFT	2	D 1	NAI-D	4PI	
							2=2.37	MEV	
72HA1	7N	13	P,G	ABX	10- 17	D 8- 17	NAI-D	90	546
72BE1	7N	13	HE,G	ABX	25- 33	D 5- 15	NAI-D	90	
							HE=HE3		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
62ED1	7N	14	E,E/	ABX	0- 10	D 42	TEL-D	180	
63BA1	7N	14	E,E/	ABX	0- 18	D 42	MAG-D	180	
							G-WDTH		
64BI1	7N	14	E,E/	ABX	0- 8	D120,180	MAG-D	DST	
							FORM FACTORS		
66KO1	7N	14	E,E/	ABX	8- 14	D 50, 60	MAG-D	180	
							5 LEVELS		
68CL1	7N	14	E,E/	LFT	8- 12	D 35- 58	MAG-D	DST	
							9.17, 10.43	MEV	
60CA1	7N	14	G,MU-T	ABX	7- 21	D 20- 21	NAI-D	4PI	
62GO1	7N	14	G,MU-T	ABI	0-170	C170	CCH-D	4PI	
69BE2	7N	14	G,MU-T	ABX	10- 30	C 35	MGC-D	4PI	106+
61SW1	7N	14	G,G	LFT	2	D 2	NAI-D	DST	
64BO1	7N	14	G,G	LFT	1- 3	C 1-	NAI-D	100	
							ABI		
66SW1	7N	14	G,G	LFT	7	D 7	NAI-D	DST	
							7=7.11	MEV	
67LO1	7N	14	G,G/	ABX	18- 32	C 34	NAI-D	DST	
70TH1	7N	14	G,XG	ABX	THR- 29	C 29	SCD-D	125	
59MU1	7N	14	G,N	RLY	11- 17	C 11- 17	ACT-I	4PI	
60FA1	7N	14	G,N	ABX	11- 61	C 13- 61	BF3-I	4PI	
60GE1	7N	14	G,N	RLX	10- 12	C 10- 12	ACT-I	4PI	
60GE2	7N	14	G,N	RLY	10- 11	C 10- 11	ACT-I	4PI	
							E-THRESHOLD		
60KI2	7N	14	G,N	ABX	10- 25	C 10- 25	ACT-I	4PI	
60MU1	7N	14	G,N	RLY	THR- 20	C 15- 20	ACT-I	4PI	
							BREAKS		
60SA2	7N	14	G,N	RLY	10- 13	C 10- 13	ACT-I	4PI	
62GO1	7N	14	G,N	ABI	11-17D	C170	CCH-D	4PI	
62KO2	7N	14	G,N	ABX	11- 90	C 90	CCH-D	DST	
68KA1	7N	14	G,N	ABX	50- 85	C 55, 85	TOF-D	67	
							NEUT ENGY SPEC		
71FR1	7N	14	G,N	ABY	10-800	C10D-800	ACT-1	4PI	
71SA1	7N	14	G,N	ABY	10- 68	C 10- 68	ACT-I	4PI	
72GE3	7N	14	G,N	ABX	10- 30	C 15- 30	TOF-D	90	
59OC1	7N	14	G,2N	RLI	THR-100	CTHR-100	ACT-I	4PI	
							REL TO G,N		
60BA7	7N	14	G,XN	RLX	THR-20D	C200	CCH-D	DST	
63FU2	7N	14	G,XN	SPC	10- 3D	C 31	SCI-D	90	
70BEB	7N	14	G,XN	ABX	10- 30	D 10- 30	BF3-I	4PI	
56WR1	7N	14	G,P	ABX	7- 23	C 19- 23	CCH-D	4PI	
57LI1	7N	14	G,P	SPC	THR- 70	C 30, 70	EMU-D		
									*
58CO2	7N	14	G,P	NOX	7- 30	C 18- 30	EMU-D	90	
58GR1	7N	14	G,P	LFT	8	D 8	ION-D	4PI	
60BA7	7N	14	G,P	RLX	THR-200	C200	CCH-D	DST	
60KO1	7N	14	G,P	ABI	THR- 90	C 90	CCH-D	DST	
60WA1	7N	14	G,P	SPC	8- 16	C 12, 16	EMU-D	DST	
62GO1	7N	14	G,P	ABI	7-170	C170	CCH-D	4PI	
57LI1	7N	14	G,XP	SPC	THR- 70	C 30, 70	EMU-D	DST	
60RE2	7N	14	G,XP			C330	CCH-D	4PI	
63FI4	7N	14	G,XP	SPC	0- 31	C 31	SCI-D	90	
64KO1	7N	14	G,XP	SPC	THR- 31	C 15- 31	SCI-D	90	
							ABX		
56WR1	7N	14	G,A	ABX	12- 23	C 19- 23	CCH-D	4PI	
62GO1	7N	14	G,A	ABI	12-170	C170	CCH-D	4PI	
64TO2	7N	14	G,A	ABX	THR- 22	C 22	EMU-D	DST	
56WR1	7N	14	G,2A	ABX	16- 23	C 19- 23	CCH-D	4PI	
56WR1	7N	14	G,NP	ABX	12- 23	C 19- 23	CCH-O	4PI	
60BA7	7N	14	G,NP	RLI	THR-2D0	C200	CCH-O	DST	
60KO1	7N	14	G,NP	SPC	THR- 90	C 90	CCH-D	DST	
							PROTON SPECTRUM		
62GO1	7N	14	G,NP	ABI	12-170	C170	CCH-D	4PI	
62KO2	7N	14	G,NP	ABX	16- 90	C 90	CCH-D	DST	
62GO1	7N	14	G,NA	ABI	20-170	C17D	CCH-D	4PI	
70SH1	7N	14	G,PN	SPC	15- 30	C 15- 30	TOF-D	90	
							DE-EXCIT. NEUTS		
56LI1	7N	14	G,PA	ABX	25- 50	C 25- 70	EMU-I	UKN	
56WR1	7N	14	G,PA	ABX	17- 23	C 19- 23	CCH-D	4PI	
62MO2	7N	14	G,PA	ABI	18-120	C120	EMU-D	4PI	
62KO2	7N	14	G,NP3A	RLY	20- 90	C 90	CCH-D	4PI	
60HE2	7N	14	P,G	ABX	8	D 0-	NAI-D	DST	
							G-WDTH		
60RO1	7N	14	P,G	NOX	9	D 2	NAI-D	DST	
							J-PI		
60RO2	7N	14	P,G	ABY	10	D 2-	NAI-O	DST	
							J-PI		
61HE1	7N	14	P,G	ABX	8	D D-	NAI-D	0	
61SE1	7N	14	P,G	RLY	6, 9	D 2	MGP-O	DST	
							J-PI		
63PR1	7N	14	P,G	NOX	9	D 2	NAI-D	DST	
							G-WDTH, AMPL RATIO		
65DE2	7N	14	P,G	LFT	9	D 2	NAI-D	DST	
71RI1	7N	14	P,G	ABX	1D- 24	D 3- 18	NAI-D	DST	
							J-PI		
61KN1	7N	14	D,G	ABX	1D- 12	D D- 2	THR-1	4PI	
7DBL1	7N	14	HE,G	ABX	21- 24	D 1- 3	NAI-D	DST	
							HE=HE3		
68BE1	7N	15	E,E/	LFT	6	D 50- 57	MAG-D	DST	
							6=6.32	MEV	
7DDA1	7N	15	E,E/	ABX	5- 8	D250,4DD	MAG-O	DST	
						LEVELS 5.3-7.56	FMF		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58RH1	7N	15	G,P	ABX	11- 25	C 19, 25 EMU-D	DST		
64KO3	7N	15	G,P	SPC	12- 31	C 19- 31 SCI-D	90		
							A8X		
72DE4	7N	15	G,P	A8X	19- 39	C 19- 39 TEL-D	90		
63FI3	7N	15	G,XP	SPC	13- 31	C 25, 31 SCI-D	90		
						ABI, SEP ISOTOPES			
69SI1	7N	15	P,G	ABX	10	D 0- 1 NAI-D	DST		
						SOURCE 250-670 KEV			
71KU1	7N	15	P,G	A8X	11- 13	D 1- 3 SCD-D	DST		
72RA2	7N	15	P,G	RLY	14	D 4 NAI-D	60		
						J-PI,13.42 MEV LEVEL			
72WE2	7N	15	P,G	A8X	13- 17	D 3- 8 NAI-D	DST		547
							J-PI		

OXYGEN Z=8

A	A8UND.(1)	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
16	99.76	15.7	12.1	25.0	22.8	7.2	28.9	23.0	22.3
17	3.7(-2)	4.1	13.8	18.6	18.8	6.4	19.8	16.3	25.3
18	0.20	8.0	15.9	15.8	25.6	6.2	12.2	21.8	29.1

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
59CO2	8O	15	P,G	ABX	19- 25	D 14- 20 NAI-D	90		
61CO1	8O	15	P,G	A8X	19- 25	D 14- 20 NAI-D	90		
63BA2	8O	15	P,G	NOX	8	D 1 NAI-D	DST		
63HE1	8O	15	P,G	LFT	8	D 0- NAI-D	55		
66EV1	8O	15	P,G	SPC	5- 9	D 1- 2 NAI-D	DST		
67EV1	8O	15	P,G	LFT	9- 10	D 1- 3 NAI-D	DST		
70KU1	8O	15	P,G	A8X	11- 24	D 2- 19 NAI-D	DST		246+
72PH1	8O	15	P,G	ABX	10- 13	D 3- 6 NAI-D	90		
60IS1	8O	16	E,E/	RLX	20- 30	D 60-150 MAG-D	DST		
61IS1	8O	16	E,E/	FMF	0-115	D 90-215 MAG-D	DST		
6281I3	8O	16	E,E/	FMF	44, 49	D150 MAG-D	UKN		
62BI2	8O	16	E,E/	FMF	19	D140-215 MAG-D	DST		
						J-PI, MULTIPOLE			
62ED1	8O	16	E,E/	NOX	0- 16	D 41 MAG-D	180		
638A1	8O	16	E,E/	A8X	19	D 41 MAG-D	180		
63BI2	8O	16	E,E/	FMF	11- 14	D MAG-D	DST		
63IS1	8O	16	E,E/	NOX	22- 26	C100-215 MAG-D	DST		
6481I2	8O	16	E,E/	ABX	0-150	D 90-215 MAG-D	DST		
						SUM RULES			
6481I3	8O	16	E,E/	A8X	6- 14	D100-218 MAG-D	DST		
						FORM FACTORS			
64GO2	8O	16	E,E/	ABX	17- 32	D 40- 70 MAG-D	180		
							FMF		
65VA4	8O	16	E,E/	ABX	10- 30	D 43- 69 MAG-D	180		
66AR2	8O	16	E,E/	LFT	7, 12	D 30- 60 MAG-D	DST		
						7=6.92, 12=11.52			
66CR1	8O	16	E,E/	FMF	6	D600-800 MAG-D	DST		
						6=6.1 MEV			
66ST2	8O	16	E,E/	FMF	5- 14	D 60 MAG-D	117		
						6.92,11.52 MEV			
66VA1	8O	16	E,E/	FMF	10- 30	D 43- 69 MAG-D	180		
67DR1	8O	16	E,E/	FMF	19-	D128- MAG-D	DST		
						J-PI, 19.08 MEV			
68DR1	8O	16	E,E/	FMF	19, 20	D140 MAG-D	DST		
						19=19.1,20=20.5			
69SI2	8O	16	E,E/	FMF	10- 30	D100-400 MAG-D	DST		
69TO2	8O	16	E,E/	FMF	7	D183,250 MAG-D	DST		
						7=7.12 MEV			
708E1	8O	16	E,E/	FMF	6- 8	D 51-105 MAG-D	DST		
						6.05,6.13,6.91,7.1			
70GO1	8O	16	E,E/	LFT	19, 20	D 46, 54 MAG-D	DST		
						19.04,20.36 MEV			
70GO4	8O	16	E,E/	FMF	21- 26	D 43- 58 MAG-D	DST		
70KI1	8O	16	E,E/	FMF	11- 14	D 40-105 MAG-D	DST		
						FMF 11.5-13.1 MEV			
70ST1	8O	16	E,E/	LFT	14- 21	D 34- 58 MAG-D	DST		
6281I4	8O	16	E,N	ABY	60-150	C 60-150 ACT-I	4PI		
						MULTIPOLARITY			
62DO1	8O	16	E,P	A8X	16- 27	C 30 MAG-D	DST		249+
58SI3	8O	16	G,MU-T	RLX	16- 25	C 15- 25 ACT-I	4PI		
59PE2	8O	16	G,MU-T	ABX	THR- 30	C 31 ACT-I	4PI		
60CA1	8O	16	G,MU-T	A8X	20- 21	D 20- 21 NAI-D	4PI		
60WY1	8O	16	G,MU-T	A8X	18- 35	C 90 NAI-D	4PI		
60ZI1	8O	16	G,MU-T	A8X	12- 26	C 30 MGP-D	4PI		
62BU1	8O	16	G,MU-T	A8X	19- 27	C250 MGP-D	4PI		
638U1	8O	16	G,MU-T	A8X	12- 26	C250 MGP-D	4PI		
64TE1	8O	16	G,MU-T	ABX	20- 22	D 20- 22 NAI-D	4PI		
						WATER TARGET			
65DO3	8O	16	G,MU-T	A8X	13- 22	C MGC-D	4PI		
65WY1	8O	16	G,MU-T	ABX	10- 35	C 90 SCI-D	4PI		50+
69BE2	8O	16	G,MU-T	A8X	10- 30	C 35 MGC-D	4PI		108
71AH1	8O	16	G,MU-T	A8X	THR-150	C 10-150 MGC-D	4PI		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
57SW1	8O	16	G,G	LFT	7, 7	D 7,	NAI-D	DST	
59PA3	8O	16	G,G	ABX	17	D 15, 18	NAI-D	90	
59PE5	8O	16	G,G	A8X	19- 61	C 19- 61	NAI-D	135	
60RE1	8O	16	G,G	ABX	7	D 7	NAI-D	DST	
62SE1	8O	16	G,G	NOX	7	C 16	NAI-D	90	
64LA5	8O	16	G,G	RLX	THR- 32	C 24, 32	NAI-D	DST	
64LO3	8O	16	G,G	ABX	10- 30	C 10- 30	NAI-D	140	
68EV1	8O	16	G,G	LFT	6, 8	D 6, 8	SCD-D	UKN	
						LEVELS 6.92, 7.12			
70AH1	8O	16	G,G	ABX	15- 80	C108	NAI-D	135	
59PE5	8O	16	G,G/	ABX	19- 61	C 19- 61	NAI-D	135	
65MA1	8O	16	G,G/	SPC	19- 30	C 21- 31	NAI-D	140	
67LO1	8O	16	G,G/	A8X	18- 32	C 34	NAI-D	DST	
55CA1	8O	16	G,N	ABX	17	D 0	ACT-I	4PI	
55PE1	8O	16	G,N	A8I	15- 23	C 16- 23	ACT-I	4PI	
57BA3	8O	16	G,N	A8Y	15- 18	C 15- 18	ACT-I	4PI	
							BREAKS		
57CA2	8O	16	G,N	A8X	16- 31	C 15- 30	ACT-I	4PI	
57ER1	8O	16	G,N	ABX	16- 32	C 16- 32	ACT-I	4PI	
57SP2	8O	16	G,N	RLX	16- 25	C 14- 25	ACT-I	4PI	
58BE1	8O	16	G,N	RLY	15- 17	C 15- 17	ACT-I	4PI	
							THRESHOLD, BREAK		
59KI1	8O	16	G,N	ABI	15- 18	C 15- 19	ACT-I	4PI	
							BRKS		
59MI2	8O	16	G,N	NOX	THR- 30	C 30	EMU-D	90	
59MI3	8O	16	G,N	NOX	16- 31	C 31	EMU-D	DST	
59PE3	8O	16	G,N	NOX	16- 17	C 16- 18	ACT-I	4PI	
							8RKS		
59SA2	8O	16	G,N	NOX	THR- 22	C 15- 22	ACT-I	4PI	
							8REAKS		
60GE1	8O	16	G,N	A8X	15- 17	C 15- 17	ACT-I	4PI	
60GE2	8O	16	G,N	NOX	15- 17	C 15- 17	ACT-I	4PI	
60KU2	8O	16	G,N	RLY	THR- 90	C 90	TEL-I	DST	
60SA1	8O	16	G,N	NOX	15- 16	C 15- 16	ACT-I	4PI	
							8RKS		
618R1	8O	16	G,N	ABI	0- 34	C 34	ACT-I	4PI	
61KE1	8O	16	G,N	A8X	17- 18	D 17- 18	ACT-I	4PI	
61RO2	8O	16	G,N	A8Y	16- 22	C 22	ACT-I	4PI	
62BI4	8O	16	G,N	A8I	60-150	C 60-150	ACT-I	4PI	
							MULTIPOLARITY		
62BO2	8O	16	G,N	ABX	15, 30	C 15- 30	BF3-I	4PI	
628R1	8O	16	G,N	A8I	THR- 32	C 32	ACT-I	4PI	
62DE1	8O	16	G,N	A8X	20	D 20	ACT-I	4PI	
62FI1	8O	16	G,N	RLX	18- 29	C 31	TOF-D	90	
62FI2	8O	16	G,N	RLX	18- 29	C 26- 32	TOF-D	UKN	
62FU5	8O	16	G,N	A8X	21- 31	C 31	SCI-D	90	
62GO1	8O	16	G,N	A8I	THR-170	C170	CCH-D	4PI	
62GO2	8O	16	G,N	A8X	12- 75	C170	CCH-D	DST	
63AN1	8O	16	G,N	A8X	15- 60	C 15- 60	ACT-I	4PI	
63CA1	8O	16	G,N	A8X	16- 30	D 16- 30	BF3-I	4PI	
63GE2	8O	16	G,N	A8X	15- 23	C 15- 23	ACT-I	4PI	
64BE8	8O	16	$ G,N	NOX	17- 32	C 32	SCI-D	DST	
64BR1	8O	16	G,N	A8X	15- 30	D 15- 30	BF3-I	4PI	
64DE3	8O	16	G,N	A8X	17- 18	D 17- 18	ACT-I	4PI	
64TA4	8O	16	G,N	SPC	16- 26	D 34	TOF-D	90	
65GR1	8O	16	G,N	A8X	THR- 54	C 10- 66	ACT-I	4PI	
65VE1	8O	16	G,N	SPC	THR- 33	C 34	TOF-D	DST	
66BA5	8O	16	G,N	A8X	15- 25	C 15- 25	ACT-I	4PI	296+
66CO1	8O	16	G,N	A8X	THR- 65	CTHR- 70	ACT-I	4PI	113
66FI1	8O	16	$ G,N	NOX	THR- 70	C 10- 70	TOF-D	DST	
66MI2	8O	16	G,N	A8X	16- 27	D 16- 27	8F3-I	4PI	
67GE2	8O	16	G,N	A8Y	THR- 27	C 22, 27	8F3-I	4PI	
68KA1	8O	16	G,N	A8X	50- 85	C 55, 85	TOF-D	67	
							NEUT ENGY SPEC		
68WU1	8O	16	G,N	A8X	THR- 40	C 20- 40	TOF-D	90	226
69CO3	8O	16	$ G,N	NOX	20- 33	C 30, 60	TOF-D	DST	
							N POLARIZATION		
69IV1	8O	16	G,N	RLX	16- 22	C 16- 30	ACT-I	4PI	
69KH1	8O	16	G,N	A8X	16- 33	C 22- 33	TOF-D	98	
69NA1	8O	16	G,N	A8X	35- 65	C 35- 65	TOF-D	68	
70FI1	8O	16	G,N	A8X	16- 34	C 15-120	ACT-I	4PI	
70JU1	8O	16	G,N	A8X	17- 30	C 23- 30	TOF-D	DST	
71FR1	8O	16	G,N	A8Y	16-800	C100-800	ACT-I	4PI	
71SA1	8O	16	G,N	A8Y	15- 68	C 10- 68	ACT-I	4PI	
57SV1	8O	16	G,NG	A8X	20- 25	C 16- 30	NAI-D	120	
							INCL (G,PG)		
66FU2	8O	16	G,NG	RLY	20- 26	D 20- 26	BF3-I	4PI	
							COINC		
66OW1	8O	16	G,NG	RLY	THR- 29	C 20- 29	SCD-D	135	
66OW2	8O	16	G,NG	RLX	THR- 29	C 20- 29	SCD-D	135	
67BA5	8O	16	G,NG	SPC	21- 26	C 26	SCD-D	135	
							G-SPECTRUM		
67MU1	8O	16	G,NG	SPC	21- 30	C 28, 30	SCD-D	90	
							G-SPECTRUM		
69MU1	8O	16	G,NG	SPC	16- 30	C 21- 30	SCD-D	90	
							G-SPECTRUM		
69UL1	8O	16	G,NG	ABY	THR- 32	C 32	SCD-D	120	
70HO1	8O	16	G,NG	RLY	21- 27	C 27, 36	NAI-D	DST	
71AD1	8O	16	G,NG	ABY	22-800	C100-800	SCD-D	135	
590C1	8O	16	G,2N	RLI	THR-100	CTHR-100	ACT-I	4PI	
							REL TO G,N		
628R1	8O	16	G,2N	ABI	THR- 32	C 32	ACT-I	4PI	
68ME4	8O	16	G,2N	A8X	THR-300	C 20-300	ACT-I	4PI	
70FI1	8O	16	G,2N	ABX	30-115	30-120	ACT-I	4PI	

REF	NUCLIDE Z	A	REACTION IN,DUT	RES	EXCIT	SDURCE	DETECTDR TYPE	ANG	NUM
62MI2	8D	16	G,XN	ABX	15- 25	D 15- 25	BF3-I	4PI	
63AU1	8O	16	G,XN	SPC	20- 56	C 46, 56	TDF-D	90	
63CD3	8D	16	G,XN	ABX	16- 75	C 16-100	BF3-I	4PI	
63FU1	8D	16	G,XN	SPC	THR- 31	C 31	SCI-D	90	
64FI1	8D	16	G,XN	SPC	THR- 32	C 25- 32	TDF-D	70	
64YE1	8D	16	G,XN	SPC	THR- 35	C 34	TDF-D	90	
							BRANCHING RATIOS		
648A3	8D	16	G,XN	ABX	15- 28	C 15- 28	BF3-I	4PI	312
							D/C YLD=1.7(22MEV)		
64BA5	8O	16	G,XN	ABX	15- 28	C 15- 28	BF3-I	4PI	
65CA1	8D	16	G,XN	ABX	17- 28	D 17- 28	BF3-I	4PI	38+
							BRANCH RATIOS		
65HA1	8D	16	G,XN	ABX	THR- 30	C 6- 30	BF3-I	4PI	
66FI2	8D	16	G,XN	SPC	THR- 65	C 65	TOF-D	90	
67FE2	8O	16	G,XN	ABX	100-150	C150	BF3-I	4PI	
67MI2	8O	16	G,XN	SPC	THR- 20	C 23- 27	TDF-D	100	
70IS5	8O	16	G,XN	ABX	16- 25	C 16- 25	BF3-I	4PI	341
72TH2	8D	16	G,XN	ABX	16- 24	C 15- 24	BF3-I	4PI	
55SP1	8O	16	G,P	ABX	14- 18	C 19	EMU-D	DST	
55ST1	8D	16	G,P	ABX	14- 25	C 25	EMU-D	DST	
56CD1	8O	16	G,P	ABX	18- 25	C 25	EMU-D	90	
56LI2	8D	16	G,P	SPC	17- 7D	C 30- 70	EMU-D	DST	
57JO1	8D	16	G,P	ABX	12- 26	C 20- 26	EMU-D	DST	
57SV1	8D	16	G,P	ABX	2D- 25	C 16- 30	NAI-D	120	
							G,PG		
58MI1	8D	16	G,P	ABX	15- 30	C 15- 30	EMU-D	100	
59BR2	8D	16	G,P	NDX	23- 30	C 32	EMU-D	DST	
61FI1	8D	16	G,P	ABI	THR- 35	C 35	SCI-D	90	
61SH3	8D	16	$ G,P	SPC	THR- 21	C 21	EMU-D	DST	
							POLARIZED PHDTONS		
62GD1	8D	16	G,P	ABI	THR-170	C170	CCH-D	4PI	
62GD2	8D	16	G,P	ABX	12- 75	C170	CCH-D	DST	
63SC1	8O	16	G,P	NDX	THR- 31	C 31	SCD-D	UKN	
65MO1	8O	16	G,P	SPC	15- 29	C 22, 40	SCD-D	90	
							BRANCH RATIDS		
65ST2	8D	16	G,P	ABX	14- 16	C 14- 16	SCD-D	90	
66DE4	8D	16	G,P	ABI	THR- 44	C 21- 44	TEL-D	90	
67KD1	8D	16	G,P	ABX	THR- 55	C 21- 55	TEL-D	90	
67TH1	8O	16	G,P	RLX	19- 26	C 20- 26	SCD-D	DST	202
67TH2	8O	16	G,P	RLX	20- 25	C 26	SCD-D	135	
67TU3	8O	16	G,P	SPC	THR- 22	D 22	EMU-D	DST	
68DE1	8O	16	G,P	ABX	16- 55	C 21- 55	TEL-D	90	
68ST1	8O	16	G,P	SPC	20- 26	C 26	SCD-D	DST	
							26=25.6 MEV		
68TU1	8D	16	G,P	SPC	21, 22	D 21, 22	EMU-D	DST	
							21=21.71,22=22.16		
698A2	8O	16	G,P	ABX	20- 30	C 26, 31	SCD-D	DST	
69FR1	8D	16	G,P	ABX	12- 33	C 12- 33	SCD-D	DST	
69KE3	8O	16	G,P	SPC	16- 26	C 26	SCD-D	90	
69SH3	8O	16	G,P	RLX	12- 27	C 23, 27	EMU-D	DST	
69ST1	8O	16	G,P	ABX	21- 33	C 33	SCD-D	DST	194
66FU2	8O	16	G,PG	RLY	20- 26	D 20- 26	BF3-I	4PI	
							CDINC		
66OW1	8D	16	G,PG	RLY	THR- 29	C 20- 29	SCD-D	135	
66DW2	8D	16	G,PG	RLX	THR- 29	C 20- 29	SCD-D	135	
67BA5	8D	16	G,PG	SPC	17- 26	C 26	SCD-D	135	
							G-SPECTRUM		
67MU1	8D	16	G,PG	SPC	17- 30	C 28, 30	SCD-D	90	
							G-SPECTRUM		
69MU1	8D	16	G,PG	SPC	12- 30	C 21- 30	SCD-D	90	
							G-SPECTRUM		
69UL1	8D	16	G,PG	ABY	THR- 32	C 32	SCD-D	12D	
70HD1	8D	16	G,PG	RLY	17- 27	C 27, 36	NAI-D	DST	
71AD1	8D	16	G,PG	ABY	18-800	C100-8D0	SCD-D	135	
57BR1	8D	16	G,XP	SPC	10- 19	C 28	EMU-D	UKN	
57MI1	8O	16	G,XP	NOX	THR- 3D	C 30	EMU-D	DST	
61HE2	8D	16	G,XP	SPC	0- 35	C 35	SCI-D	90	
63FI4	8D	16	G,XP	SPC	14- 30	C 31	SCI-D	90	
66VO1	8O	16	G,D	ABX	THR- 50	C 20- 50	TEL-D	90	
62BI4	8D	16	G,T	ABY	60-150	C 60-150	ACT-I	4PI	
							MULTIPOLARITY		
65BU1	8O	16	G,T	THR	50	C 50	ACT-I	4PI	
55SC2	8O	16	G,T	ABY	THR- 32	C 32	ACT-I	4PI	
66GO2	8D	16	G,T	ABX	THR- 55	CTHR- 55	ACT-I	4PI	
67KR2	8O	16	G,T	RLX	THR- 55	C 30- 55	ACT-I	4PI	
57JD1	8O	16	G,A	SPC	7- 19	C 19-	EMU-D	DST	
62GO1	8D	16	G,A	ABI	THR-170	C170	CCH-D	4PI	
64GR1	8O	16	G,A	ABY	7- 14	C 17, 24	EMU-D	4PI	
							SPC		
64TD2	8D	16	G,A	ABX	THR- 22	C 22	EMU-D	DST	
64TO3	8D	16	G,A	ABX	9- 21	C 22	EMU-D	DST	
65RO1	8D	16	G,A	ABX	12- 17	C 12- 17	EMU-D	4PI	
65RO2	8D	16	G,A	RLY	17	C 17	EMU-D	DST	
70VD1	8O	16	G,A	NDX	13	D 13	IDN-D	DST	
							13=13.1 MEV		
55HA1	8D	16	G,4A	NOX	2D- 32	C 27, 33	EMU-D	DST	
56DA1	8D	16	G,4A	ABI	22- 25	C 70	EMU-D	UKN	
58MA1	8O	16	G,4A	ABX	20- 40	C150,250	EMU-D	4PI	
64GR1	8O	16	G,4A	ABY	14- 24	C 24	EMU-I	4PI	
64TD2	8D	16	G,4A	ABX	THR- 22	C 22	EMU-D	DST	
64TD3	8D	16	G,4A	ABX	9- 21	C 22	EMU-D	DST	
65RD1	8O	16	G,4A	ABX	12- 17	C 12- 17	EMU-D	4PI	
56DD1	8D	16	G,NP	RLX	140-26D	C340	TEL-		
							D NP COINCIDENCE		
60ST1	8O	16	G,NP	RLY	153-320	C320	TEL-D	76	
							REL TO H2 CROS SEC		
62GD1	8D	16	G,NP	ABI	THR-170	C170	CCH-D	4PI	
65GA1	8D	16	G,NP	ABX	250	C300	TEL-D	DST	
58MA1	8D	16	G,PA	ABY	27- 80	C150,250	EMU-D	4PI	
62MO2	8D	16	G,PA	ABI	23-120	C120	EMU-D	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTDR TYPE	ANG	NUM
55SC2	8D	16	G,NA	ABY	THR- 32	C 32	ACT-I	4PI	
62GO1	8D	16	G,NA	ABI	THR-170	C170	CCH-D	4PI	
62KO1	8O	16	G,PD	RLY	THR- 90	C 90	CCH-I	4PI	
62KO1	8D	16	G,ND	RLY	THR- 90	C 90	CCH-I	4PI	
65AR3	8O	16	G,BE7	RLY	32- 57	C 57	ACT-I	4PI	
66AR1	8D	16	G,BE7	ABX	30- 57	C 30- 57	ACT-I	4PI	
67KR2	8D	16	G,C11	RLX	THR- 55	C 30- 55	ACT-I	4PI	
67KR2	8O	16	G,N13	RLX	THR- 55	C 30- 55	ACT-I	4PI	
59CD2	8D	16	P,G	ABX	21- 26	D 14- 19	NAI-D	90	
59TA1	8D	16	P,G	ABX	16- 20	D 4-	NAI-D	90	
60HE1	8O	16	P,G	ABX	12	D 0-	NAI-D	UKN	
61CD1	8O	16	P,G	ABX	21- 26	D 10- 15	NAI-D	90	
61TA3	8D	16	P,G	ABX	12- 26	D 0- 14	NAI-D	90	
63GO5	8D	16	P,G	RLY	13- 17	D 1-	NAI-D	UKN	
64EA1	8D	16	P,G	NOX	13- 25	D 1- 13	NAI-D	DST	
64TA2	8D	16	P,G	ABX	16- 26	D 4- 14	NAI-D	DST	80
67BL2	8O	16	P,G	RLX	21- 22	D 9- 12	NAI-D	45	
67BL1	8O	16	P,G	RLX	20- 30	D 10- 18	NAI-D	DST	78+
67EA1	8O	16	P,G	ABX	13- 25	D 1- 14	NAI-D	DST	
70BA1	8D	16	P,G	ABY	16- 24	D 4- 13	NAI-D	90	
62SU2	8O	16	D,G	RLX	21- 25	D 1- 5	NAI-D	90	9
63SU2	8D	16	D,G	ABX	21- 25	D 1- 11	NAI-D	DST	
63SU2	8O	16	D,G	ABX	21- 25	D 1- 4	NAI-D	DST	
64SU1	8D	16	D,G	ABX	24- 28	D 1- 5	NAI-D	DST	
66SU1	8D	16	D,G	ABX	21- 26	D 1- 6	NAI-D	DST	79
72WE1	8O	16	D,G	RLY	22- 24	D 2- 3	NAI-D	90	
66PU1	8D	16	HE,G	RLX	23- 26	D 1- 5	NAI-D	90	
							HE=HE3		
64LA2	8O	16	A,G	ABX	10- 13	D 3-	NAI-D	DST	
							J-PI, WIDTHS		
64MI1	8O	16	A,G	RLX	13	D 7-	NAI-D	DST	
							J-PI, WIDTHS		
67SU1	8D	16	A,G	RLX	14- 25	D 8- 24	NAI-D	DST	
70JA2	8O	16	A,G	ABX	8- 11	D 1- 5	NAI-D	UKN	
70JA1	8D	16	A,G	ABX	9- 11	D 1- 4	NAI-D	84	
70VO1	8D	16	A,G	NOX	13	D 8	NAI-D	DST	
							13=13.1 MEV		
71KE1	8O	16	A,G	ABX	12- 14	D 7-	9 NAI-D	DST	
61LA1	8D	18	E,E/	FMF	2- 6	D150	MAG-D	DST	
65VA2	8D	18	E,E/	ABX	2- 27	D 69	MAG-D	180	
71GR1	8O	18	E,E/	FMF	2- 6	D 92,106	MAG-D	DST	
							7 LEVELS, B(EL)		
64MU1	8O	18	G,N	SPC	10- 2D	C 20	EMU-D	DST	
							J'PI, 2189 TRACKS		
63FU2	8D	18	G,XN	SPC	11- 31	C 31	SCI-D	90	
55RE1	8D	18	G,P	ABI	THR-40D	C 50-40D	ACT-I	4PI	
64KO2	8O	18	G,P	SPC	18- 32	C 32	SCI-D	90	
							SEPARATED ISDTOPES		
69HO1	8O	18	G,XP	ABY	THR- 33	C 24- 33	SCD-D	90	

FLUORINE Z=9

A	ABUND.	SEPARATIDN ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
19	100.00	10.4	8.0	11.7	22.1	4.0	19.6	16.0	23.9

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTDR TYPE	ANG	NUM
63SE1	9F	17	P,G	RLY	4	D 3	NAI-D	DST	
							J-PI, WIDTH		
71CD3	9F	18	A,G	ABX	4- 5	D 0- 2	ACT-I	4PI	
63BA1	9F	19	E,E/	SPC	0- 16	D 42	MAG-D	180	
70WA1	9F	19	E,E/	LFT	1- 2	D 30- 60	MAG-D	DST	
							1.56,1.35 MEV		
62DD1	9F	19	E,P	SPC	10- 19	C 18- 3D	MAG-D	DST	
66DD2	9F	19	G,MU-T	ABX	8- 30	C260	MGP-D	4PI	
64TE1	9F	19	G,MU-T	ABX	2D- 21	D 20- 21	NAI-D	4PI	
69BE2	9F	19	G,MU-T	ABX	10- 30	C 35	MGC-D	4PI	107
60BO3	9F	19	G,G	LFT	1	C 0-	NAI-D	100	
							J-PI		
60RE1	9F	19	G,G	ABX	7	D 7	NAI-D	90	
62BO6	9F	19	G,G	LFT	0- 4	C 0-	NAI-D	DST	
64BD1	9F	19	G,G	LFT	1- 3	C 1-	NAI-D	10D	
							ABI		
64LD3	9F	19	G,G	ABX	10- 30	C 10- 30	NAI-D	140	
67LO1	9F	19	G,G/	ABX	14- 32	C 34	NAI-D	DST	
72SH2	9F	19	G,G/	SPC	0- 14	C 14	SCD-D	87	
58BE1	9F	19	G,N	NOX	10- 11	C 10- 11	ACT-I	4PI	
							THRESHOLD		
60GE2	9F	19	G,N	NOX	10- 11	C 10- 11	ACT-I	4PI	
							THRESHOLD		
6DKI4	9F	19	G,N	ABX	1D- 23	C 10- 23	ACT-I	4P1	
60SA2	9F	19	G,N	RLY	10- 12	C 10- 12	ACT-I	4PI	
60WA2	9F	19	G,N	ABX	10-240	C120-240	ACT-I	4PI	
62DE1	9F	19	G,N	ABX	20- 21	D 20- 21	ACT-I	4PI	
66DE5	9F	19	G,N	NOX	THR-260	C260	ACT-I	DST	
678A3	9F	19	G,N	ABX	THR- 25	CTHR- 25	ACT-I	4PI	
							NSA 35223 BREAKS		
718A2	9F	19	G,N	ABX	12- 15	C 15	TOF-D	135	
71FR1	9F	19	G,N	ABY	10-800	C100-8D0	ACT-I	4PI	
590C1	9F	19	G,2N	RLI	THR-100	CTHR-100	ACT-I	4PI	
							REL TO G,N		
72VA2	9F	19	G,XN	ABX	10- 19	C 10- 19	BF3-I	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
55LA1	9F	19	G,P	SPC	10- 17	C 17	EMU-D	DST	
60FO2	9F	19	G,P	RLX	10- 18	C 16, 19	EMU-D	DST	
628R3	9F	19	G,P	SPC	18	D 18	EMU-D	DST	
63MU1	9F	19	G,P	SPC	11- 24	C 24	SCD-D	120	
72SH2	9F	19	G,PG	SPC	0- 14	C 14	SCD-D	87	
55RE1	9F	19	G,2P	A8I	THR-40D	C 80-400	ACT-I	4PI	
64SE1	9F	19	G,XP	SPC	THR- 24	C 14- 24	EMU-D	DST	
68A81	9F	19	G,XP	SPC	THR- 22	C 22	SCD-D	90	
65HA2	9F	19	G,A	SPC	THR- 31	C 31	EMU-D	DST	
68ME4	9F	19	G,2NP	A8X	THR-300	C 20-300	ACT-I	4PI	
72SH2	9F	19	G,AG	SPC	D- 14	C 14	SCD-D	87	
71WD1	9F	19	P,G	ABI	10	D 2	SCD-D	DST	
							1D=1D.129 MEV		
72RO3	9F	19	A,G	LFT	5- 7	D 1- 3	SCD-D	DST	
							J-PI, 4 LEVELS		
678E7	9F	20	N,G	LFT	6- 7	D 0- 1	NAI-D	90	
							SDURCE 27,50 KEV		

NEON Z=10

A	A8UND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
20	90.92	16.9	12.8	23.9	21.2	4.7	28.5	23.3	20.8
21	0.26	6.8	13.0	21.6	19.9	7.3	23.6	19.6	23.6
22	8.82	10.4	15.3	21.5	26.3	9.7	17.1	23.4	26.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
62GD1	10NE		G,MU-T	A8I	0-170	C170	CCH-D	4PI	
62GO1	10NE		G,N	A8I	THR-170	C170	CCH-I	4PI	
							INCLUDES G,2N		
57KD1	10NE		G,P	A8Y	THR- 80	C 80	CCH-D	DST	
								A8I	
62GO1	10NE		G,P	A8I	THR-170	C170	CCH-I	4PI	
							INCLUDES G,D		
57KD1	10NE		G,2P	A8Y	THR- 80	C 80	CCH-D	4PI	
62SU1	10NE		G,XP	SPC	16- 23	C 23	EMU-D	90	
63F14	10NE		G,XP	SPC	15- 29	C 31	SCI-D	90	
62GD1	10NE		G,A	A8I	THR-170	C170	CCH-I		
57KD1	10NE		G,2A	A8Y	THR- 80	C 80	CCH-D	4PI	
57KD1	10NE		G,5A	A8Y	THR- 80	C 80	CCH-D	4PI	
57KO1	10NE		G,NP	A8Y	THR- 80	C 80	CCH-D	4PI	
62GO1	10NE		G,NP	A8I	THR-170	C170	CCH-I	4PI	
62GD1	10NE		G,NA	A8I	THR-170	C170	CCH-I	4PI	
57KD1	10NE		G,PA	A8Y	THR- 8D	C 80	CCH-D	4PI	
55RE1	10NE		G,N17	A8I	THR-400	C 90-400	ACT-I	4PI	
638A1	10NE	20	E,E/	SPC	0- 16	D 42	MAG-D	180	
							J-PI, WIDTHS, A8X		
71BE1	10NE	20	E,E/	A8X	11	D 39, 56	MAG-D	180	
							11.23,11.58 MEV		
71HD1	10NE	20	E,E/	FMF	1, 4	D183,250	MAG-D	DST	
							1.63,4.25 MEV		
72MI4	10NE	20	E,E/	FMF	6- 8	D120-250	MAG-D	DST	
							6.72-7.84 MEV LEVELS		
62DD1	10NE	20	E,P	SPC	3- 11	C 18- 30	MAG-D	DST	
								A8I	
61CL1	10NE	20	G,G	LFT	1- 3	D 1- 3	NAI-D	0	
							1.63,2.62,3.34 MEV		
59HA1	10NE	20	G,N	A8X	15, 18	D 15, 18	IDN-D	4PI	
59HA1	10NE	20	G,P	A8X	15, 18	D 15, 18	ION-D	4PI	
60RE2	10NE	20	G,XP	RLY	1D0-240	C240	CCH-D	4PI	
69HD1	10NE	20	G,XP	A8Y	THR- 33	C 24- 33	SCI-D	90	
59HA1	10NE	20	G,A	A8X	15, 18	D 15, 18	IDN-D	4PI	
59HA1	10NE	20	G,2A	A8X	15, 18	D 15, 18	ION-D	4PI	
59HA1	10NE	20	G,PA	A8X	15, 18	D 15, 18	IDN-D	4PI	
60BR1	10NE	20	P,G	RLY	17- 23	D 4- 11	NAI-D	UKN	
64AL3	10NE	20	P,G	NOX	17- 22	D 4-	NAI-D	DST	
64TA1	10NE	20	P,G	A8X	17- 24	D 4- 11	NAI-D	90	
66PA3	10NE	20	P,G	NDX	18	D 5	SCI-D	DST	
67SE1	10NE	20	P,G	A8X	16- 25	D 3- 13	NAI-D	DST	73+
72AL4	10NE	20	A,G	LFT	7- 9	D 3- 5	SCD-D	DST	
							4 LEVELS		
60KD2	10NE	22	G,P	SPC	THR- 90	C 90	CCH-D	DST	
							SEPARATED ISDTOPES		
69HD1	10NE	22	G,XP	A8Y	THR- 33	C 24- 33	SCI-D	90	
59HA1	10NE	22	G,A	A8X	15, 18	D 15, 18	IDN-D	4PI	
60KD2	10NE	22	G,NP	SPC	THR- 90	C 90	CCH-D	DST	
							SEPARATED ISDTOPES		
68GR1	10NE	22	A,G	LFT	12, 13	D 2, 3	NAI-D	DST	
							12,13=11.89,12.28		

SODIUM Z=11

A	A8UND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
23	100.00	12.4	8.8	17.4	24.4	10.5	23.5	19.2	24.1

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
618E2	11NA	21	P,G	SPC	4	D 1	NAI-D	DST	
7D8E3	11NA	21	P,G	LFT	8- 10	D 6- 8	SCD-D	90	
							8.973,9.216 MEV		
60KR1	11NA	22	P,G	SPC	7- 9	D 0-	NAI-D	1PI	
65TA1	11NA	22	P,G	NOX	7	D 0- 1	NAI-D	9D	
							LEVELS, J-PI		
66WE1	11NA	22	P,G	SPC	9- 10	D 1- 2	NAI-D	DST	
638A1	11NA	23	E,E/	SPC	0- 20	D 42	MAG-D	180	
								A8X	
658A4	11NA	23	E,E/	A8X	4	D 59	MAG-D	180	
							4=4.431 MEV		
69SA3	11NA	23	E,E/	FMF	2	D 99-227	MAG-D	DST	
							8(EL)2.08 MEV		
68SA3	11NA	23	E,E/	FMF	2, 7	D225	MAG-D	DST	
							2=2.08,7=6.27+7.10		
65WY1	11NA	23	G,MU-T	A8X	1D- 35	C 90	SCI-D	4PI	49
72TD3	11NA	23	G,MU-T	LFT	9	D 9	NAI-D	4PI	
							9.404, 9.700 MEV		
56FU1	11NA	23	G,G	A8X	4- 40	C 4- 40	NAI-D	120	
59RA1	11NA	23	G,G	LFT	1	D 1	NAI-D	DST	
60MD1	11NA	23	G,G	NOX	9	D 9	NAI-D	DST	
								WIDTH	
61AM1	11NA	23	G,G	LFT	1	D	NAI-D	120	
							1=.438 MEV		
62BO6	11NA	23	G,G	LFT	0- 4	C 0-	NAI-D	110	
62MO1	11NA	23	G,G	LFT	1	C 1	NAI-D	130	
64LO3	11NA	23	G,G	A8X	10- 30	C 1D- 30	NAI-D	14D	
64ME1	11NA	23	G,G	LFT	4	D 4	NAI-D	DST	
							J-PI, WIDTH		
64ME2	11NA	23	G,G	LFT	4	D 4	NAI-D	DST	
							4=4.431 MEV		
645W1	11NA	23	G,G	NDX	7	D 7,	NAI-D	DST	
							J-PI, WIDTH		
70SH2	11NA	23	G,G	LFT	7	C 14	SCD-D	UKN	
							7=7.895 MEV		
71SW1	11NA	23	G,G	LFT	7	D 7	SCD-D	DST	
							5 LEVELS		
72FR4	11NA	23	G,G	LFT	3- 6	C 3- 6	NAI-D	130	
							5 LEVELS, G-WIDTH		
67LD1	11NA	23	G,G/	A8X	15- 30	C 34	NAI-D	DST	
72SH2	11NA	23	G,G/	SPC	D- 14	C 14	SCD-D	87	
58CH2	11NA	23	G,N	RLY	THR	CTHR	8F3-I	4PI	
							THRESHOLD		
71AL1	11NA	23	G,N	A8X	12- 27	D 12- 27	BF3-1	4PI	347
							INCLUDES G,NP		
71SA1	11NA	23	G,N	A8Y	12- 68	C 10- 68	ACT-I	4PI	
59DC1	11NA	23	G,2N	RLI	THR-10D	CTHR-1D0	ACT-I	4PI	
							REL TO G,N		
71AL1	11NA	23	G,2N	ABX	23- 27	D 23- 27	8F3-1	4PI	350
63CD3	11NA	23	G,XN	A8Y	13- 80	C 13- 80	8F3-1	4PI	
63SA1	11NA	23	G,XN	A8X	12- 24	C 12- 24	8F3-I	4PI	
58KE1	11NA	23	G,P	SPC	18	D 18	NAI-D	4PI	
								A8X	
58DP1	11NA	23	G,P	SPC	18	D 18	NAI-D	4PI	
								A8X	
62OD1	11NA	23	G,P	SPC	11- 18	C 18	EMU-D	DST	
								A8Y	
68SH3	11NA	23	G,XP	SPC	20- 24	D 20, 24	EMU-D	DST	
69HO1	11NA	23	G,XP	A8Y	THR- 33	C 24- 33	SCI-D	9D	
55RE1	11NA	23	G,N17	A8I	THR-40D	C 90-4D0	ACT-I	4PI	
60WA2	11NA	23	G,2N2P	A8X	THR-240	C120-240	ACT-I	4PI	
628R2	11NA	23	P,G	NOX	9- 1D	D U-	NAI-D	DST	
								J-PI	
71PI2	11NA	23	P,G	RLX	9- 10	D 0- 2	SCD-D	DST	
							9.61 MEV LEVEL J-PI		
72V11	11NA	23	P,G	NOX	9- 10	D 0- 1	SCD-D	DST	
							4 LEVELS, J-PI		
67FE3	11NA	23	O,G	A8X	23- 29	D 12- 31	NAI-D	90	
							LI7+016		

MAGNESIUM Z=12

A	A8UND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
24	78.70	16.5	11.7	26.7	23.1	9.3	29.7	24.1	2D.5
25	10.13	7.3	12.1	23.D	20.1	9.9	23.9	19.0	22.6
26	11.17	11.1	14.1	21.6	26.0	10.6	18.4	23.2	24.8

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
64GD3	12MG		E,E/	A8X	11	D 40- 70	MAG-D	180	
								FMF	
68SA1	12MG		E,E/	FMF	1- 8	D100-260	MAG-D	UKN	
							3 PEAKS 1.4-6.0		
69SA2	12MG		E,E/	FMF	1- 8	D 99-229	MAG-D	DST	
							8(EL) 1-8 MEV		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM	
64DD2	12MG		G,MU-T	A8X	12- 30	C250	MGP-D	4PI		
65DO2	12MG		G,MU-T	A8X	11- 30	C260	MGP-D	4PI		
65WY1	12MG		G,MU-T	ABX	10- 70	C 90	SCI-D	4PI	47+	
66DO2	12MG		G,MU-T	ABX	8- 30	C260	MGP-D	4PI	323	
56FU1	12MG		G,G	A8X	4- 40	C 4- 40	NAI-D	120		
						ERRATUM PR 106,993				
59LA1	12MG		G,G	LFT	10	C 13	NAI-D	135		
						10=10.3 MEV				
618U4	12MG		G,G	A8X	15- 30	C 27, 32	NAI-D	140		
61SU1	12MG		G,G	RLY	7- 14	C 7- 14	NAI-D	120		
62SE1	12MG		G,G	NDX	0- 16	C 16	NAI-D	90		
63SU1	12MG		G,G	ABX	4- 14	C 4- 14	NAI-D	120		
67LD1	12MG		G,G/	A8X	16- 32	C 34	NAI-D	DST		
58SP2	12MG		G,N	A8X	8- 17	C 8- 17	BF3-I	4PI	328	
64FI2	12MG		G,N	RLY	18- 26	C 27- 32	TOF-D	UKN		
70WE1	12MG		G,N	A8X	17- 32	C 17- 32	ACT-I	4PI		
56YE1	12MG		G,XN	ABY	7- 23	C 7- 23	BF3-I	4PI		
63CD3	12MG		G,XN	A8X	10- 80	C 10- 80	BF3-I	4PI	327	
65MI1	12MG		G,XN	A8X	THR- 30	CTHR- 30	8F3-I	4PI	325	
66FI2	12MG		G,XN	SPC	THR- 65	C 65	TDF-D	90		
71FU2	12MG		G,XN	ABX	THR- 29	D 10- 29	8F3-I	4PI	342	
						14 LEVEL FIT				
62SH11	12MG		G,P	ABX	15- 24	CTHR- 24	SCI-D	DST		
64FD1	12MG		G,P	SPC	THR- 40	C 20- 40	EMU-D	DST		
								RLX		
71SA2	12MG		G,P	A8X	THR-250	C 20-250	ACT-I	4PI		
64IS1	12MG		G,XP	A8X	THR- 32	C 15- 32	SCI-D	UKN	326	
65MA4	12MG		G,XP	SPC	THR- 31	C 31	SCD-D	UKN		
66HD3	12MG		G,A	SPC	THR- 31	C 31	SCD-D	130		
55RE1	12MG		G,N17	ABI	THR-400	C 80-400	ACT-I	4PI		
56HE3	12MG24		E,E/	FMF	1- 7	D187	MAG-D	DST		
638A1	12MG24		E,E/	SPC	0- 16	D 42	MAG-D	180		
						J-PI, WIDTHS				
66AR2	12MG24		E,E/	LFT	9- 22	D 52	MAG-D	141		
						5 LEVELS				
66TI1	12MG24		E,E/	LFT	7- 15	D 51	MAG-D	DST		
						DST CONST D				
67TI1	12MG24		E,E/	SPC	15- 26	D 45- 54	MAG-D	DST		
68FA1	12MG24		E,E/	LFT	7- 28	D 39, 56	MAG-D	180		
						DETAILS 9.9, 10.7				
69TI1	12MG24		E,E/	FMF	1- 12	D 37- 51	MAG-D	DST		
						TABULAR DATA				
70FA1	12MG24		E,E/	LFT	9- 14	D 39, 56	MAG-D	180		
						REANALYSIS 68FA11				
70GD3	12MG24		E,E/	ABX	15- 26	D 45- 55	MAG-O	DST		
70KH1	12MG24		E,E/	FMF	1	D225	MAG-O	DST		
								1=1.37		
70ST2	12MG24		E,E/	A8X	6	D 31- 59	MAG-O	DST		
								6=6.44 0+		
71HD1	12MG24		E,E/	FMF	1, 4	D183,250	MAG-D	DST		
						1.37,4.12 MEV				
71MD3	12MG24		E,E/	A8X	0-240	D500	MAG-D	60		
72NA1	12MG24		E,E/	LFT	1- 6	D183-250	MAG-D	DST		
						1.37,4.23,6.00 MEV				
588U1	12MG24		G,G	LFT	1	D 1	SCI-D	4PI		
						1=1.38 MEV				
608U2	12MG24		G,G	LFT	11	C	NAI-D	DST		
608U3	12MG24		G,G	LFT	10	C 23	NAI-D	DST		
60ME1	12MG24		G,G	NOX	1	D 1	NAI-O	DST		
						J-PI, WIDTH				
60TO1	12MG24		G,G	NDX	9- 11	C 13	NAI-D	118		
						THRESHOLD				
62806	12MG24		G,G	LFT	0- 4	C 0-	NAI-D	DST		
648D1	12MG24		G,G	LFT	1- 3	C 1-	NAI-O	100		
								A8I		
67KU2	12MG24		G,G	LFT	9- 11	D 9- 11	NAI-D	135		
						9.92, 10.66 MEV				
71SW2	12MG24		G,G	LFT	1	D 1	SCD-D	127		
						1.368MEV,2+ STATE				
60KI1	12MG24		G,N	ABX	16- 25	C 16- 25	ACT-I	4PI	319	
66MI2	12MG24		G,N	A8X	16- 27	D 16- 27	8F3-I	4PI	324	
68CO1	12MG24		G,N	RLX	THR- 65	C 13- 65	ACT-I	4PI		
68DK2	12MG24		G,N	ABY	THR- 20	C 20	ACT-I	4PI		
						ISOMERIC YIELD				
718A2	12MG24		G,N	A8X	16- 20	C 17, 20	TDF-D	135		
71FU2	12MG24		G,N	A8X	16- 29	D 16- 30	BF3-I	4PI	343	
						14 LEVEL FIT				
55NA1	12MG24		G,XN	A8X	16- 24	C 9- 24	8F3-I	4PI		
69AN2	12MG24		G,XN	A8X	THR- 65	C 16- 64	ACT-I	4PI	321	
						MEAS TOTAL ACT				
72IS1	12MG24		G,XN	A8X	16- 30	C 16- 30	8F3-I	4PI	548	
63YA1	12MG24		G,P	SPC	15- 22	C 22	EMU-D	DST		
								RLY		
66IS1	12MG24		G,P	ABX	THR- 34	C 15 30	EMU-D	DST		
60WA2	12MG24		G,2N3P	ABX	THR-240	C240	ACT-I	4PI		
63SH3	12MG24		G,C12	RLY	THR- 70	C 70	EMU-D	4PI		
64SH6	12MG24		G,F	A8Y	THR-100	C100	ACT-I	4PI		
61GO1	12MG24		P,G	RLY	15- 23	D 3- 11	NAI-D	90		
62GL1	12MG24		P,G	NDX	12	D 0-	NAI-D	55		
62PR1	12MG24		P,G	NOX	12 13	D 0-	NAI-D	55		
								WIDTHS		
63GD3	12MG24		P,G	RLY	15- 23	D 4- 12	NAI-D	90		
67LE1	12MG24		P,G	A8X	16- 25	D 5- 14	MGP-D	90		
6BBE3	12MG24		P,G	A8X	16- 24	D 4- 13	NAI-D	DST		
68HI1	12MG24		A,G	RLX	11- 14	D 3- 6	NAI-D	DST		
						J-PI,G-WIDTH				
69FA2	12MG25		E,E/	ABX	0- 27	D 39, 56	MAG-D	180	203+	
						J-PI, B(ML)				

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM	
60ME1	12MG25		G,G	NDX	2	D 2	NAI-D	DST		
							J-PI, WIDTH			
61RA1	12MG25		G,G	LFT	2	D 2	NAI-D	DST		
								J-PI		
62806	12MG25		G,G	LFT	0- 4	C 0-	NAI-D	DST		
64801	12MG25		G,G	LFT	1- 3	C 1-	NAI-D	100		
								A8I		
70BE5	12MG25		G,N	ABX	7- 10	C 11	TOF-D	135		
71AL1	12MG25		G,N	A8X	7- 29	D 7- 29	8F3-I	4PI	352	
						INCLUDES G,NP				
71BA2	12MG25		G,N	A8X	7- 11	C 8, 11	TOF-D	135	205	
71AL1	12MG25		G,2N	A8X	23- 29	D 23- 29	8F3-I	4PI	353	
55NA1	12MG25		G,XN	A8X	7- 24	C 9- 24	8F3-I	4PI	320	
680K3	12MG25		G,P	ABY	THR- 20	C 20	ACT-I	4PI		
67BE7	12MG25		N,G	LFT	7	D 1	NAI-D	90		
						SOURCE 84 KEV				
66TI1	12MG26		E,E/	LFT	7- 15	D 51	MAG-D	DST		
						DST CONST D				
68BE2	12MG26		E,E/	A8X	8- 14	D 39, 56	MAG-D	180		
70GD3	12MG26		E,E/	A8X	15- 26	D 45- 55	MAG-D	DST		
70KH1	12MG26		E,E/	FMF	1	D225	MAG-D	DST		
								1=1.81		
70TI1	12MG26		E,E/	SPC	12- 28	D 50- 54	MAG-D	DST		
						CONST Q=.41 FM-1				
61RA1	12MG26		G,G	LFT	2	D 2	NAI-D	DST		
64801	12MG26		G,G	LFT	1- 3	C 1-	NAI-D	100		
								A8I		
67KU2	12MG26		G,G	LFT	10-	D	NAI-D	135		
						10=10.07 MEV				
69BE3	12MG26		G,N	A8X	11- 13	C 13	TOF-D	135		
						0=10 TO 1200 KEV				
71BA2	12MG26		G,N	ABX	11- 14	C 11, 14	TOF-D	135		
71FU2	12MG26		G,N	ABX	10- 29	D 10- 29	BF3-I	4PI	344+	
						32 LEVEL FIT				
71FU2	12MG26		G,2N	ABX	18- 29	D 18- 29	8F3-I	4PI	345	
						32 LEVEL FIT				
70WU2	12MG26		G,XN	SPC	11- 23	C 19, 23	TOF-O	UKN		
72IS1	12MG26		G,XN	A8X	11- 30	C 11- 30	8F3-I	4PI	549	

ALUMINUM Z=13

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
27	100.00	13.1	8.3	18.2	23.7	10.1	24.4	19.4	22.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM	
63GA1	13AL25		P,G	LFT	1	D 1	SCI-D	UKN		
68MD2	13AL25		P,G	LFT	8	D 6	SCD-I	DST		
							G-WIDTH			
62NE2	13AL26		P,G	NDX	7- 8	D 1-	NAI-D	0		
63GA1	13AL26		P,G	LFT	1	D 1	SCD-D	UKN		
638A1	13AL27		E,E/	SPC	0- 18	D 42	MAG-D	180		
								ABX		
63GD4	13AL27		E,E/	ABX		D 41	MAG-O	180		
67LD2	13AL27		E,E/	FMF	0- 3	D 90-190	MAG-D	DST		
						5 LEVELS .84-3 MEV				
71VL1	13AL27		E,E/	FMF	0-300	D592-999	MAG-O	DST		
						999=1143 DUAELSCTG				
64AM1	13AL27		E,E/P	RLX	THR-150	D550	MAG-D	51		
59BA3	13AL27		E,N	A8Y	THR- 36	D 10- 36	BF3-I	4PI		
71VD1	13AL27		E,N	A8X	THR-266	C150-266	TOF-D	90		
64CH1	13AL27		E,P	ABX		D999	MAG-D	DST		
							999=8 GEV			
62DD1	13AL27		E,P	SPC	17- 29	C 18- 30	MAG-D	DST		
						VIRTUAL PHOTONS				
70AN5	13AL27		E,P	RLY	88-999	C999	TEL-D	DST		
						999=1140 MEV				
70FU1	13AL27		E,F	RLY	999	D999	ACT-D	4PI		
						999=1.5-16.0 GEV				
72ND3	13AL27		E,PI+	RLY	150-999	C150-999	ACT-I	4PI		
							999=1.2 GEV			
58ZI1	13AL27		G,MU-T	A8X	17- 25	C 17- 30	MGP-D	4PI		
59DU1	13AL27		G,MU-T	ABX	13- 30	C 29, 30	MGC-D	4PI		
59KD1	13AL27		G,MU-T	ABX	13- 30	C 30	NAI-D	4PI		
59MI1	13AL27		G,MU-T	A8X	13- 30	C 30	MGC-O	4PI		
60CA1	13AL27		G,MU-T	A8X	13- 21	D 20- 21	NAI-D	4PI		
60TA2	13AL27		G,MU-T	ABX	7- 28	C 28	MAG-O	4PI		
60WY1	13AL27		G,MU-T	A8X	13- 55	C 35- 90	NAI-D	4PI		
60ZI1	13AL27		G,MU-T	ABX	13- 30	C 10- 30	MGP-D	4PI		
64DO2	13AL27		G,MU-T	ABX	9- 29	C250	MGP-O	4PI		
64TE1	13AL27		G,MU-T	A8X	20- 21	D 20- 21	NAI-D	96		
65WY1	13AL27		G,MU-T	A8X	10- 70	C 90	SCI-O	4PI	45+	
71AH1	13AL27		G,MU-T	ABX	THR-150	C 10-150	MGC-D	4PI		
56FU1	13AL27		G,G	A8X	4- 40	C 4- 40	NAI-O	120		
59PA3	13AL27		G,G	ABX	17	D 15, 18	NAI-D	90		
60ME1	13AL27		G,G	NDX	1, 2	D 1,	NAI-D	DST		
60RE1	13AL27		G,G	ABX	7	D 7	NAI-D	90		
60VA1	13AL27		G,G	LFT	1	C 3	NAI-D	120		
61BU3	13AL27		G,G	A8X	14- 32	C 32	NAI-D	DST		
							SEE 61BU4			
618U4	13AL27		G,G	A8X	15- 30	C 27, 32	NAI-D	140		
61TO1	13AL27		G,G	ABX	3- 15	C 4- 15	NAI-D	120		
628D6	13AL27		G,G	LFT	3	C 0-	NAI-D	DST		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
63VA3	13AL27		G,G	NOX	2	C 3	NAI-D	DST	
								WIDTH	
63VA4	13AL27		G,G	NOX	2, 3	C 4	NAI-D	120	
								WIDTH	
64BO1	13AL27		G,G	LFT	1- 3	C 1-	NAI-D	100	
								ABI	
64ME2	13AL27		G,G	LFT	4	D 4	NAI-D	DST	
							4=4.403	MEV	
65KH1	13AL27		G,G	LFT	2, 3	D 2, 3	NAI-D	DST	
							2,3=2.21,2.98	MEV	
65ME3	13AL27		G,G	LFT	4	D 4	NAI-D	DST	
							4=4.403	MEV	
66HO2	13AL27		G,G	LFT	1	C 1	NAI-D	117	
							1=1.01	MEV	
66VA4	13AL27		G,G	ABI	10	D 10	NAI-D	80	
							10=10.1	MEV	
6BRO1	13AL27		G,G	LFT	3	C 3	NAI-I	113	
							2.21,2.98,3.0	MEV	
72SH2	13AL27		G,G/	SPC	0- 14	C 14	SCD-D	87	
55JO1	13AL27		G,N	RLY	15- 65	C 65	SCI-D	DST	
57FE1	13AL27		G,N	RLY	22- 31	C 31	THR-I	DST	
5BAS1	13AL27		G,N	NOX	13- 17	C 17	SCI-I	DST	
5BCH2	13AL27		G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
5BFE1	13AL27		G,N	ABX	13- 30	C 13- 30	ACT-I	4PI	
59KU1	13AL27		G,N	NOX	23- 88	C 88	SCI-I	DST	
							QUASI-DEUTERON		
60CH2	13AL27		G,N	ABX	13- 21	D 12- 21	BF3-I	4PI	
60GE3	13AL27		G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
60KU2	13AL27		G,N	RLY	23- 90	C 90	TEL-I	DST	
61BA1	13AL27		G,N	ABX	13- 19	C 12- 19	BF3-I	4PI	
61PR1	13AL27		G,N	RLX	13- 85	C 25- 85	THR-D		
62BO2	13AL27		G,N	ABX	13- 30	C 14- 30	BF3-I	4PI	
62MU1	13AL27		G,N	ABX	13- 24	C 13- 24	BF3-I	4PI	
63MI4	13AL27		G,N	SPC	15- 30	C 24, 30	EMU-D	90	
64TH1	13AL27		G,N	ABX	15- 24	C 15- 24	ACT-I	4PI	
65TH2	13AL27		G,N	ABX	13- 24	C 13- 25	ACT-I	4PI	76
							THRESHOLD		
66BI1	13AL27		G,N	ABX	20-200	C 20-200	BF3-I	4PI	
66FU1	13AL27		G,N	ABX	13- 37	D 13- 37	BF3-I	4PI	115
67GE2	13AL27		G,N	ABY	THR- 27	C 22, 27	BF3-I	4PI	
6BCO1	13AL27		G,N	RLX	THR- 65	C 13- 65	ACT-I	4PI	
6BKA1	13AL27		G,N	ABX	50- 85	C 55, 85	TOF-D	67	
							NEUT ENGY SPEC		
66FU1	13AL27		G,2N	ABX	25- 37	D 25- 37	BF3-I	4PI	116
55BA5	13AL27		G,XN	ABY	30-200	C150-250	THR-I	DST	
55DI1	13AL27		G,XN	NOX	13- 70	C 70	SCI-I	DST	
5BBA5	13AL27		G,XN	RLY	THR- 15	C 12- 15	BF3-I	4PI	
							BREAKS		
5BFE1	13AL27		G,XN	ABX	13- 30	C 13- 30	THR-I		
							FAST NEUTRONS		
59CO3	13AL27		G,XN	SPC	15- 30	C 24, 30	EMU-D	90	
63CO3	13AL27		G,XN	ABX	12- 80	C 80	BF3-I	4PI	
64AL5	13AL27		G,XN	NOX	THR- 34	C 34	THR-I	DST	
66FI2	13AL27		G,XN	SPC	THR- 65	C 65	TOF-D	90	
67AN2	13AL27		G,XN	ABX	THR- 26	C 13- 26	BF3-I	4PI	
69AN3	13AL27		G,XN	RLX	13- 65	C 13- 65	ACT-I	4PI	
69CO2	13AL27		G,XN	ABX	15- 35	D 15- 35	BF3-I	4PI	
69IS3	13AL27		G,XN	ABX	13- 30	C 5- 30	BF3-I	4PI	453
69VE1	13AL27		G,XN	SPC	THR- 33	C 33	TOF-D	DST	
71CO2	13AL27		G,XN	ABI	36- 64	C 10- 64	BF3-I	4PI	
							FAST N YIELD		
55JO1	13AL27		G,P	RLY	THR- 65	C 65	SCI-D	DST	
59BA2	13AL27		G,P	SPC	25- 52	C 18- 52	TEL-D	90	
60CH2	13AL27		G,P	ABX	12- 21	C 12- 21	ION-I	4PI	
61MA1	13AL27		G,P	RLY	11- 35	C 35	MGP-D	UKN	
62BR3	13AL27		G,P	SPC	18	D 18	EMU-D	DST	
62SE2	13AL27		G,P	ABX	15, 18	D 15, 18	SCI-D		
62SH8	13AL27		G,P	SPC	10- 24	C 24	EMU-D	DST	
62SH11	13AL27		G,P	ABX	10- 24	C 24	SCI-I	4PI	
630D1	13AL27		G,P	ABY	10- 22	C 22	EMU-D	DST	
66LI1	13AL27		G,P	SPC	THR- 32	C 32	SCI-D	90	
69CO4	13AL27		G,P	ABY	8- 85	C 85	CCH-D	180	
70CO2	13AL27		G,P	RLY	8- 34	C 85	TEL-D	DST	
720D1	13AL27		G,P	ABX	12- 22	C 15- 22	SCD-I	90	
5BAU1	13AL27		G,2P	ABX	20- 63	C 20- 63	ACT-I	4PI	
56DA2	13AL27		G,XP	SPC	11- 70	C 70	EMU-D	DST	
							ABY		
57BA2	13AL27		G,XP	SPC	THR- 85	C 85	TEL-D	DST	
5BBA6	13AL27		G,XP	SPC	THR- 85	C 85, 90	TEL-D	DST	
60CH1	13AL27		G,XP	RLX	24- 90	C 90	TEL-I	90	
							REL TO DEUTERONS		
61MA2	13AL27		G,XP	NOX	8- 21	C 21	SCI-D	DST	
62CH2	13AL27		G,XP	RLY	23- 35	C 35	MAG-D	DST	
							REL TO DEUTERONS		
63MI5	13AL27		G,XP	ABY	12- 22	C 22	SCI-D	DST	
64MA2	13AL27		G,XP	SPC	THR- 20	C 20	SCD-D		
6BAB3	13AL27		G,XP	SPC	THR- 27	C 22, 27	SCD-D	90	
61MA1	13AL27		G,D	RLY	20- 35	C 35	MGP-D	DST	
60CH1	13AL27		G,XD	RLX	32- 90	C 90	TEL-I	90	
							REL TO PROTONS		
62CH2	13AL27		G,XD	RLY	32- 35	C 35	MAG-D	DST	
							REL TO PROTONS		
71AN2	13AL27		G,XD	ABX	107-999	C999	MAG-D	DST	
							999=1.14	GEV	
56HE1	13AL27		G,T	RLY	THR- 31	C 31	ACT-I	4PI	
56WA1	13AL27		G,T	RLY	THR- 31	C 31	ACT-I	4PI	
70CU1	13AL27		G,T	ABY	THR- 90	C 90	ACT-I	4PI	
60GO2	13AL27		G,HE3	ABX	30-260	C 30-260	ACT-I	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
57BO1	13AL27		G,A	SPC	THR- 30	C 31	EMU-D	DST	
5BTO2	13AL27		G,A	ABY	10- 22	C 22	EMU-I	4PI	
61MA1	13AL27		G,A	RLY	19- 35	C 35	MGP-D	DST	
62BE3	13AL27		G,A	SPC	16- 30	C 30	SCD-D	DST	
							ASYMMETRY SPECTRUM		
65HA2	13AL27		G,A	SPC	THR- 31	C 31	EMU-D	DST	
66HO3	13AL27		G,A	SPC	THR- 31	C 31	SCD-D	130	
66WE2	13AL27		G,A	ABX	10- 33	C 33-	SCD-D	90	
60ST1	13AL27		G,NP	RLX	149-320	C320	TEL-D	76	
							REL TO H2 CROS SEC		
60GO2	13AL27		G,N2P	ABX	30-260	C 30-260	ACT-I	4PI	
67AN1	13AL27		G,N2P	RLX	THR-999	CTHR-999	ACT-I	4PI	
60GO2	13AL27		G,PD	ABX	30-260	C 30-260	ACT-I	4PI	
6BME4	13AL27		G,2NP	ABX	THR-300	C 20-300	ACT-I	4PI	
60WA2	13AL27		G,4N4P	ABX	THR-240	C120-240	ACT-I	4PI	
55RE1	13AL27		G,N17	ABI	THR-400	C 80-400	ACT-I	4PI	
64MA4	13AL27		G,F18	ABY	150-720	C150-720	ACT-I	4PI	
71DI3	13AL27		G,NA22	ABY	THR-999	C300-999	ACT-I	4PI	
							999= 1	GEV	
64MA4	13AL27		G,NA24	ABY	150-720	C150-720	ACT-I	4PI	
69NO1	13AL27		G,NA24	ABY	31-999	C100-999	ACT-I	4PI	
							999=1.2	GEV	
71DI3	13AL27		G,NA24	ABY	THR-999	C300-999	ACT-I	4PI	
							999= 1	GEV	
71SA2	13AL27		G,NA24	ABX	THR-250	C 20-250	ACT-I	4PI	
69FU2	13AL27		G,SPL	RLY	THR-999	D999	SCD-D	DST	
							999=3	GEV	
71FU4	13AL27		G,SPL	RLX	THR-999	D999	ACT-I	4PI	
							999=5	GEV	
71KU2	13AL27		G,SPL	ABY	THR-999	CB00-999	ACT-I	4PI	
							999 = 2.1	GEV	
71GR2	13AL27		G,PI-	ABY	150-560	C560	EMU-D	DST	
							PI-/PI+ YIELD RATIO		
64MA4	13AL27		G,PI+	ABY	150-720	C150-720	ACT-I	4PI	
6BNY1	13AL27		G,PI+	ABX	140-700	C140-700	ACT-I	4PI	
							MG-27 ACT		
71GR2	13AL27		G,PI+	ABY	150-560	C560	EMU-D	DST	
							PI-/PI+ YIELD RATIO		
72NO3	13AL27		G,PI+	ABX	150-999	C150-999	ACT-I	4PI	
							999=1.2	GEV	
61NO1	13AL27		P,G	NOX	9	D 1		UKN	
							J-PI, WIDTH		
62LA1	13AL27		P,G	NOX	11	D 3	NAI-D	DST	
								J-PI	
620P1	13AL27		P,G	NOX	9	D 0-	NAI-D	DST	
								J-PI	
63VA5	13AL27		P,G	RLY	9- 10	D 1-	NAI-D	DST	
							SEPARATED ISOTOPES		
64VA1	13AL27		P,G	NOX	10- 11	D 2-	NAI-D	DST	
								J-PI	
64VA2	13AL27		P,G	NOX	10	D 2	NAI-D	UKN	
								J-PI	
65VA5	13AL27		P,G	SPC	10	D 2	NAI-D	DST	
67SH2	13AL27		P,G	LFT	8- 11	D 0- 3	SCD-D	DST	
67VA1	13AL27		P,G	NOX	8- 11	D 0- 3	SCD-D	45	
63CV1	13AL28		N,G	ABX	12- 22	D 14	TEL-D	4PI	
67BE7	13AL28		N,G	LFT	7- 8	D 0- 1	NAI-D	90	
							SOURCE 35,89	KEV	

SILICON Z=14

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
28	92.21	17.2	11.6	27.5	23.2	10.0	30.5	24.6	19.9
29	4.70	8.5	12.3	24.6	20.6	11.1	25.7	20.1	21.9
30	3.09	10.6	13.5	22.2	24.8	10.6	19.1	22.9	24.0

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
64GO3	14SI		E,E/	ABX	12	D 40- 70	MAG-D	180	
								FMF	
6BSA2	14SI		E,E/	FMF	1- 13	D114-260	MAG-D	DST	
						5 LEVELS	1.78-12.7		
59DU1	14SI		G,MU-T	ABX	15- 25	C 29, 30	MGC-D	4PI	
65WY1	14SI		G,MU-T	ABX	10- 35	C 90	SCI-D	4PI	61+
6BBE4	14SI		G,MU-T	ABX	10- 30	C 35	MGC-D	4PI	103
71AH1	14SI		G,MU-T	ABX	THR-150	C 10-150	MGC-D	4PI	
60RE1	14SI		G,G	ABX	7	D 7	NAI-D	90	
61SU1	14SI		G,G	RLY	11	C 6- 13	NAI-D	120	
61TO1	14SI		G,G	ABX	4- 14	C 5- 14	NAI-D	120	
62SE1	14SI		G,G	NOX	11	C 16	NAI-D	90	
63BO1	14SI		G,N	ABX	15- 25	C 10- 30	BF3-I	4PI	
63SA1	14SI		G,N	ABX	10- 24	C 10- 24	BF3-I	4PI	
66GO3	14SI		G,N	ABX	17- 30	C 17- 30	BF3-I	4PI	74
70WU1	14SI		G,N	ABX	18- 21	C 16- 22	TOF-D	90	
							GROUND STATE		
63CO3	14SI		G,XN	ABX	13- 80	C 13- 80	BF3-I	4PI	
66FI2	14SI		G,XN	SPC	THR- 60	C 60	TOF-D	90	
6BG06	14SI		G,XN	ABX	17- 30	C 17- 30	BF3-I	4PI	431
69AN3	14SI		G,XN	RLX	THR- 65	C 16- 65	ACT-I	4PI	
69CO1	14SI		G,XN	ABX	14- 38	C 14- 38	BF3-I	4PI	
71CO2	14SI		G,XN	ABI	36- 64	C 10- 64	BF3-I	4PI	
							FAST N YIELD		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58EM1	14SI		G,P	NDX	THR- 30	C 30	EMU-D	DST	
62SH11	14SI		G,P	A8X	THR- 24	CTHR- 24	SCI-I	DST	
64MA1	14SI		G,P	A8X	17- 22	D 17- 22	SCD-D	4PI	
							8RANCHING RATIOS		
64UL1	14SI		G,P	SPC	14- 20	C 17- 20	SCO-D	4PI	
							SCD TARGET		
65GD1	14SI		G,P	SPC	THR- 27	C 23- 27	SCO-D	90	
66LI1	14SI		G,P	SPC	THR- 32	C 21, 32	SC1-D	90	
67GD1	14SI		G,P	A8X	THR- 29	C 11- 29	SCD-D	4PI	
71AN1	14SI		G,P	SPC	45-999	C700,999	TEL-0	DST	
							999=1.2 GEV, REL D/P		
71SA2	14SI		G,2P	A8X	THR-250	C 20-250	ACT-I	4PI	
60CH1	14SI		G,XP	RLX	THR- 90	C 90	TEL-I	90	
							REL TD DEUTERONS		
61SH4	14SI		G,XP	SPC	THR- 24	C 24	EMU-D	DST	
							A8SOLUTE YIELD		
61SH5	14SI		G,XP	SPC	14- 24	C 24	EMU-D	UKN	
64LD2	14SI		G,XP	SPC	THR- 21	C 21	SCI-D	4PI	
							SCD TARGET		
64UL2	14SI		G,XP	SPC	THR- 30	C 15- 30	SCD-D	4PI	
71AN1	14SI		G,D	SPC	55-999	C700,999	TEL-D	DST	
							999=1.2 GEV, REL D/P		
60CH1	14SI		G,XD	RLX	THR- 90	C 90	TEL-I	90	
							REL TO PRODUCTS		
60CH1	14SI		G,XT	RLY	THR- 90	C 90	TEL-I	90	
							REL TO DEUTERONS		
64MA1	14SI		G,A	A8X	17- 22	D 17- 22	SCD-D	4PI	
							8RANCHING RATIOS		
64UL1	14SI		G,A	SPC	14- 20	C 17- 20	SCD-D	4PI	
							SCD TARGET		
65HA2	14SI		G,A	SPC	THR- 31	C 31	EMU-D	DST	
67AN1	14SI		G,NA24	RLX	THR-999	CTHR-999	ACT-I	4PI	
69ND1	14SI		G,NA24	A8Y	43-999	C100-999	ACT-I	4PI	
							999=1.2 GEV		
71SA2	14SI		G,NA24	A8X	THR-250	C 20-250	ACT-I	4PI	
56HE3	14SI28		E,E/	FMF	1- 7	D187	MAG-D	DST	
60BA4	14SI28		E,E/	SPC	0- 30	D 43	MAG-D	160	
							A8I		
62ED1	14SI28		E,E/	A8I	0- 12	D 42	TEL-D	180	
							G-WDTH		
648R2	14SI28		E,E/	SPC	0- 12	D 41	MAG-D	152	
66AR2	14SI28		E,E/	LFT	5	D	MAG-D	DST	
							5=4.97 MEV		
66LI2	14SI28		E,E/	LFT	2- 12	D 30- 56	MAG-D	DST	
							4 LEVELS		
67SA1	14SI28		E,E/	FMF	1- 10	D100-260	MAG-D	DST	
							4 LEVELS		
68AF1	14SI28		E,E/	FMF	10- 30	D150-225	MAG-D	DST	
							8(EL)		
68DR1	14SI28		E,E/	FMF	11	D14D	MAG-D	DST	
							11=11.4 MEV		
68GU1	14SI28		E,E/	A8X	10- 30	D150-225	MAG-D	DST	
69FA1	14SI28		E,E/	A8X	9- 16	D 39, 56	MAG-D	180	
							J-PI, 8(ML)		
70DE1	14SI28		E,E/	A8X	400-999	D690-999	MAG-D	DST	
							ND DATA, SEE C12		
70D0D1	14SI28		E,E/	FMF	11- 24	D100-300	MAG-D	145	
70ST2	14SI28		E,E/	A8X	5, 6	D 30- 58	MAG-D	DST	
							5=4.98,6=6.69 0+		
71HD1	14SI28		E,E/	FMF	2, 5	D183,250	MAG-D	DST	
							1.78,4.61 MEV		
71VL1	14SI28		E,E/	FMF	0-300	D592-999	MAG-D	DST	
							999=1143 MEV		
72NA1	14SI28		E,E/	LFT	1- 10	D183-250	MAG-D	OST	
							1.78,4.6,6.9,9.7 MEV		
60TD1	14SI28		G,G	RLY	THR- 13	C 13	NAI-D	120	
							THRESHOLD		
618U4	14SI28		G,G	A8X	11	C 11- 16	NAI-D	UKN	
							WIDTHS		
618U4	14SI28		G,G	A8X	15- 30	C 32	NAI-D	140	
628D6	14SI28		G,G	LFT	2	C 0-	NAI-D	11D	
							J-PI, WIDTH		
648D1	14SI28		G,G	LFT	1- 3	C 1-	NAI-D	100	
							ABI		
65SW1	14SI28		G,G	LFT	7	D 7	NAI-D	DST	
							J 7=6.88 MEV		
67BE5	14SI28		G,G	LFT	2	D 2	NAI-D	120	
							2=1.78 MEV		
67KU2	14SI28		G,G	LFT	12	D 11- 13	NAI-D	135	
							12=11.42 MEV		
67LD1	14SI28		G,G/	A8X	15- 32	C 34	NAI-D	DST	
618E1	14SI28		G,N	RLY	THR	CTHR	ACT-I	4PI	
							THRESHOLD		
63CA1	14SI28		G,N	ABX	17- 30	D 15- 30	8F3-I	4PI	72
68CD1	14SI28		G,N	RLX	THR- 65	C 13- 65	ACT-I	4PI	
70WE1	14SI28		G,N	ABX	17- 32	C 17- 32	ACT-I	4PI	356
61SH1	14SI28		G,P	SPC	14- 24	C 24	EMU-D	UKN	
62BI1	14SI28		G,P	SPC	18	D 18	SCD-D	DST	
64UL3	14SI28		G,P	SPC	13- 23	C 24	SCD-D	4PI	
658I1	14SI28		G,P	RLX	18	0 18	SCD-D	4PI	
65CA2	14SI28		G,P	A8X	THR- 23	C 16- 23	SCD-D	4PI	
65MA6	14SI28		G,P	ABX	17- 22	D 17- 22	SCD-D	4PI	
69AN6	14SI28		G,P	A8Y	109-999	C700,999	TEL-D	DST	
							999=1.2 GEV		
69AN6	14SI28		G,D	A8Y	120-999	C700,999	TEL-D	DST	
							999=1.2 GEV		
628I1	14SI28		G,A	SPC	18	D 18	SCD-D	DST	
658I1	14SI28		G,A	RLX	18	D 18	SCD-D	4PI	
65CA2	14SI28		G,A	ABX	THR- 23	C 16- 23	SCD-D	4PI	
65MA6	14SI28		G,A	ABX	17- 22	D 17- 22	SCD-D	4PI	
68ME1	14SI28		G,A	A8X	15- 22	D 5- 14	NAI-D	DST	77+
60WA2	14SI28		G,4N5P	A8X	THR-240	C240	ACT-I	4PI	
71GD2	14SI28		G,PI+	RLY	150-500	C500	CCH-D	DST	
							PI-/PI+ YIELD RATIO		
60KI3	14SI28		P,G	RLX	19- 26	D 8- 15	NAI-D	90	
61GA1	14SI28		P,G	A8X	16- 25	D 5- 13	NAI-D	90	
61GD1	14SI28		P,G	RLY	15- 22	0 3- 11	NAI-D	OST	
61KI1	14SI28		P,G	A8X	7- 15	D 7- 15	NAI-D	90	
63AN2	14SI28		P,G	NDX	13	D 1-	NAI-D	90	
63SI1	14SI28		P,G	NDX	12	0 1	NAI-D	OST	
							J-PI		
64AL3	14SI28		P,G	A8X	15- 24	0 4- 13	NAI-D	DST	
64RA1	14SI28		P,G	RLX	16- 18	0 5-	NAI-D	90	
							FLUCTUATIONS		
65PA2	14SI28		P,G	A8X	19- 22	D 8- 11	NAI-D	90	
65SI1	14SI28		P,G	A8X	16- 24	D 4- 13	NAI-D	90	104
70ME1	14SI28		P,G	RLY	12- 13	D 1- 2	SCD-D	55	
71DA2	14SI28		HE,G	A8X	27- 31	D 4- 8	NAI-D	DST	
							HE = HE3		
62SM1	14SI28		A,G	ABY	11- 13	D 1-	NAI-D	DST	
							J-PI, SEP ISOTOPES		
64WE1	14SI28		A,G	NDX	12- 14	D 3-	NAI-D	DST	
							WIDTHS		
628D6	14SI29		G,G	LFT	1, 2	C 0-	NAI-D	DST	
							J-PI, WIDTHS		
64RE1	14SI29		G,G	LFT	1	0 1	NAI-D	90	
							1=1.277 MEV		
618E1	14SI29		G,N	RLY	THR	CTHR	ACT-I	4PI	
							THRESHOLD		
68DK3	14SI29		G,P	A8Y	THR- 20	C 20	ACT-I	4PI	
618E1	14SI30		G,N	RLY	THR	CTHR	ACT-I	4PI	
							THRESHOLD		
68DK3	14SI30		G,P	A8Y	THR- 20	C 20	ACT-I	4PI	
71FR1	14SI30		G,P	A8X	14-800	C100-800	ACT-I	4PI	
68ME1	14SI30		G,A	A8X	14- 22	D 4- 14	NAI-D	DST	
72RU1	14SI30		A,G	A8Y	13- 14	D 3- 4	NAI-D	DST	
							J-PI,LFT		
68ME1	14SI32		A,G	A8X	13- 18	D 7- 12	NAI-D	DST	

PHOSPHORUS Z=15

A	A8UND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
31	100.00	12.3	7.3	17.9	22.5	9.7	23.6	17.9	20.8

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69IS3	15P		G,XN	A8X	12- 30	C 5- 30	8F3-I	4PI	454
60NE1	15P	29	P,G	NDX	4- 5	D 1-	NAI-D	DST	
							J-PI, WIDTH		
61VA3	15P	29	P,G	NDX	3- 5	D 0-	NAI-D	DST	
							J-PI, WIDTHS		
66YD1	15P	29	P,G	SPC	8- 9	D 5- 6	ACT-I	4PI	
61VA2	15P	30	P,G	NDX	7	0 1	NAI-D	DST	
							J-PI		
62AN2	15P	30	P,G	NDX	7- 8	D 1-	NAI-D	90	
							J-PI		
63VA2	15P	30	P,G	NDX	7	D 1	NAI-D	UKN	
							J-PI		
64EJ1	15P	30	P,G	NDX	7	D 1	NAI-D	DST	
							J-PI, WIDTHS		
69HA2	15P	30	P,G	LFT	6- 8	D 0- 2	SCD-D	45	
							J-PI		
638A1	15P	31	E,E/	SPC	D- 15	D 42	MAG-D	180	
							A8X		
63LD2	15P	31	E,E/	FMF	1- 6	D13D,180	MAG-D	DST	
65KD1	15P	31	E,E/	FMF	1- 6	D130-180	MAG-D	DST	
							8 LEVELS		
59DU1	15P	31	G,MU-T	ABX	10- 30	C 29, 30	MGC-D	4PI	
608D3	15P	31	G,G	LFT	1	C D-	NAI-D	1DD	
							J-PI		
618D3	15P	31	G,MU-T	ABX	11- 20	C 11- 20	ACT-I	4PI	
618U4	15P	31	G,G	A8X	15- 30	C 32	NAI-D	140	
62BD6	15P	31	G,G	LFT	1	C 0-	NAI-D	110	
							J-PI, WIDTH		
64BD1	15P	31	G,G	LFT	1- 3	C 1-	NAI-D	1D0	
							ABI		
66HD2	15P	31	G,G	LFT	1	C 1	NAI-D	117	
							1=1.26 MEV		
68CR1	15P	31	G,G	LFT	3	C 3	ANI-D	135	
							3=3.13 MEV		
68HD1	15P	31	G,G	LFT	7- 8	D 7- 8	NAI-D	0	
							7,8=7.90,8.201 MEV		
68RD1	15P	31	G,G	LFT	3	C 3	NAI-I	113	
							SELF-ABSORPTION		
69RA3	15P	31	G,G	LFT	3	C 3	NAI-D	DST	
							3=3.51 MEV		
70SH2	15P	31	G,G	LFT	6	C 14	SCD-D	UKN	
							6=6.381 MEV		
72SH2	15P	31	G,G/	SPC	0- 14	C 14	SCD-D	87	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
55BA2	15P	31	G,N	RLY	12- 13 C	12- 13	ACT-I	4PI	
							THRESHOLD		
57BA3	15P	31	G,N	ABY	11- 14 C	11- 14	ACT-I	4PI	
							BREAKS		
5BCH2	15P	31	G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
60GE3	15P	31	G,N	NOX	THR	CTHR	ACT-I	4PI	
							THRESHOLD		
61SA1	15P	31	G,N	RLY	12- 14 C	12- 14	ACT-I	4PI	
							THRESHOLD		
62EM1	15P	31	G,N	SPC	10- 30 C	30	EMU-D	DST	
63MC3	15P	31	G,N	ABX	12- 24 C	12- 24	ACT-I	4PI	
67GE2	15P	31	G,N	ABY	THR- 27 C	22, 27	BF3-I	4PI	
71FR1	15P	31	G,N	ABY	12-B00 C	100-B00	ACT-1	4PI	
62MU2	15P	31	G,XN	ABX	12- 24 C	24	BF3-I	4PI	
63BO1	15P	31	G,XN	ABX	13- 2B C	10- 30	BF3-I	4PI	
63CO3	15P	31	G,XN	ABX	13- B0 C	B0	BF3-I	4PI	
67M12	15P	31	G,XN	SPC	THR- 20 C	23- 27	TOF-D	100	
62SH12	15P	31	G,P	SPC	10- 19 C	19	EMU-D	4PI	
661S2	15P	31	G,P	SPC	THR- 34 C	1B, 34	EMU-D	30	
59OC1	15P	31	G,2P	RLI	THR-100	CTHR-100	ACT-I	4PI	
							REL TO G,N		
70AN2	15P	31	G,2P	ABX	23- 63 C	23- 63	ACT-I	4PI	
71SA2	15P	31	G,3P	ABX	THR-250 C	20-250	ACT-I	4PI	
61SH4	15P	31	G,XP	SPC	9- 24 C	24	EMU-D	DST	
							ABSOLUTE YIELD		
64IS1	15P	31	G,XP	ABX	THR- 32 C	15- 32	SCI-D	UKN	
6BAB4	15P	31	G,XP	SPC	THR- 27 C	22, 27	SCD-D	90	
6BSH3	15P	31	G,XP	SPC	THR- 19 D	19	EMU-D	DST	
59OC1	15P	31	G,N2P	RLI	THR-100	CTHR-100	ACT-1	4PI	
							REL TO G,N		
70AN2	15P	31	G,2PN	ABX	23- 63 C	23- 63	ACT-I	4PI	
60WA2	15P	31	G,6N6P	ABX	THR-240	C240	ACT-I	4PI	
60GO2	15P	31	G,NA24	ABX	30-260 C	30-260	ACT-I	4PI	
							INCLUDES G,HE4N2P		
69NO1	15P	31	G,NA24	ABY	69-999	C100-999	ACT-I	4PI	
							999=1.2 GEV		
71SA2	15P	31	G,NA24	ABX	THR-250 C	20-250	ACT-I	4PI	
62TU1	15P	31	P,G	NOX	B- 9 D	1-	EMU-D	DST	
							J-PI		
64TU1	15P	31	% P,G	NOX	10 D	3	EMU-D	90	
							J-PI, POL OF G		
66VA2	15P	31	P,G	SPC	B- 10 D	1- 2	NAI-D	DST	
67BO1	15P	31	P,G	NOX	9- 10 D	2- 3	NAI-D	55	
6BWO1	15P	31	P,G	SPC	0- 9 D	1- 2	SCD-D	90	
69W11	15P	31	P,G	LFT	10- 11 D	3- 4	NAI-I	55	
							G-G CORRELATION		

SULFUR Z=16

A	ABUND.(1)	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
32	95.00	15.1	B.9	24.0	19.1	6.9	28.1	21.2	16.2
33	0.76	B.6	9.6	21.3	17.1	7.1	23.7	17.5	1B.2
34	4.22	11.4	I0.9	20.4	21.9	7.9	20.1	21.0	20.4
36	1.4(-2)	9.9	*	19.3	*	9.0	16.9	21.2	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71FA1	16S		E,E/	ABX	B- 12 D	39, 56	MAG-D	1B0	
							5 LEVELS		
59KO1	16S		G,MU-T	ABX	12- 30 C	31	NAI-D	4PI	
59DU1	16S		G,MU-T	ABX	11- 30 C	29, 30	MGC-D	4PI	
65WY1	16S		G,MU-T	ABX	10- 35 C	90	SCI-D	4PI	43+
6BDO1	16S		G,MU-T	ABX	10- 30	C260	MGP-D	4PI	
56FU1	16S		G,G	ABX	4- 40 C	4- 40	NAI-D	120	
60RE1	16S		G,G	ABX	7 D	7	NAI-D	90	
61TO1	16S		G,G	ABX	4- 13 C	5- 13	NAI-D	120	
64BO1	16S		G,G	LFT	1- 3 C	1-	NAI-D	100	
							ABI		
63BO1	16S		G,N	ABX	12- 2B C	10- 30	BF3-I	4PI	
6BKA1	16S		G,N	ABX	50- B5 C	55, B5	TOF-D	67	
							NEUT ENGY SPEC		
70WU1	16S		G,N	ABX	16- 19 C	16- 22	TOF-D	90	
							GROUND STATE		
63CO3	16S		G,XN	ABX	14- B0 C	0- B0	BF3-I	4PI	
63MU2	16S		G,XN	ABX	15- 22 C	15- 22	SCI-D	90	
							SPECTRUM		
64F11	16S		G,XN	SPC	THR- 25 C	23, 25	TOF-D	70	
6BG06	16S		G,XN	ABX	14- 30 C	14- 30	BF3-I	4PI	432
71CO2	16S		G,XN	ABI	36- 64 C	10- 64	BF3-I	4PI	
							FAST N YIELD		
62SH11	16S		G,P	ABX	9- 24 C	9- 24	SCI-I	DST	
66L11	16S		G,P	SPC	THR- 32 C	32	SCI-D	90	
67IS1	16S		G,P	ABX	THR- 35 C	22- 35	EMU-D	DST	
71SA2	16S		G,4P	ABX	THR-250 C	20-250	ACT-I	4PI	
60CH1	16S		G,XP	RLX	THR- 90 C	90	TEL-I	90	
							REL TO DEUTERONS		
61MA2	16S		G,XP	NOX	9- 21 C	21	SCI-D	DST	
63SH4	16S		G,XP	SPC	11- 24 C	24	EMU-D	UKN	
64IS1	16S		G,XP	ABX	THR- 32 C	15- 32	SCI-D	UKN	
6BAB5	16S		G,XP	SPC	THR- 24 C	21- 24	SCD-D	90	
69AB1	16S		G,XP	SPC	THR- 26 C	26	SCD-D	90	
55R11	16S		G,D	RLY	THR- 65 C	65	CCH-I	4PI	
							RLY TO PROTONS		
60CH1	16S		G,XD	RLX	THR- 90 C	90	TEL-I	90	
							REL TO PROTONS		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60CH1	16S		G,XT	RLY	THR- 90 C	90	TEL-I	90	
							REL TO DEUTERONS		
66HO3	16S		G,A	SPC	THR- 31 C	31	SCD-D	130	
69NO1	16S		G,NA24	ABY	7B-999	C100-999	ACT-I	4PI	
							999=1.2 GEV		
71SA2	16S		G,NA24	ABX	THR-250 C	20-250	ACT-I	4PI	
56HE3	16S	32	E,E/	FMF	1- 7	D1B7	MAG-D	DST	
61B11	16S	32	E,E/	FMF	0- 4	D150	MAG-D	135	
							MULTIPOLARITY		
63BA1	16S	32	E,E/	SPC	0- 22 D	42	MAG-D	1B0	
							G-WIDTH		
64LO1	16S	32	E,E/	FMF	0- 9	D120-1B0	MAG-D	DST	
							J-PI		
69DEB	16S	32	E,E/	ABX	0-200	D999	MAG-D	DST	V
							QUASI-EL, 999=1.11 G		
69GU3	16S	32	E,E/	FMF	13- 31	D120-200	MAG-D	DST	
70ST2	16S	32	E,E/	ABX	4	D 5B, 59	MAG-D	105	
							4=3.7B 0+		
65AM2	16S	32	E,E/P	RLY	0-120	D500-630	MAG-D	51	
							100 MEV P COINC		
62BO6	16S	32	G,G	LFT	0- 4 C	0-	NAI-D	110	
							J-PI		
67LO1	16S	32	G,G/	ABX	14- 32 C	34	NAI-D	DST	
59FA1	16S	32	G,N	ABX	16- 30 C	30	ACT-I	4PI	
60FE1	16S	32	G,N	ABX	15- 30 C	31	ACT-I	4PI	
62FI3	16S	32	G,N	RLY	16- 2B C	32	TOF-D	UKN	
62KU1	16S	32	G,N	ABX	15- 25 C	12- 27	ACT-I	4PI	
62MI5	16S	32	G,N	SPC	15- 30 C	30	EMU-D	DST	
62MU2	16S	32	G,N	ABX	15- 22 C	12- 24	BF3-I	4PI	
65TH1	16S	32	G,N	ABX	THR- 22 C	15- 22	ACT-I	4PI	
66B11	16S	32	G,N	ABX	20-200 C	20-200	BF3-I	4PI	
67WE1	16S	32	G,N	ABX	THR- 32 C	20- 32	ACT-I	4PI	71
67WE2	16S	32	G,N	ABX	20- 32 C	20- 32	ACT-I	4PI	
6BCO1	16S	32	G,N	RLX	THR- 65 C	13- 65	ACT-I	4PI	
70IS2	16S	32	G,NG	SPC	THR- 32 C	32	SCD-D	135	
							LEVELS 1.26,2.23		
70TH1	16S	32	G,NG	ABX	THR- 29 C	29	SCD-D	125	
60FE1	16S	32	G,XN	ABX	12- 31 C	31	MOD-I	4PI	
62BO3	16S	32	G,XN	ABX	16- 90 C	30- 90	BF3-I	4PI	
67AN2	16S	32	G,XN	ABX	THR- 26 C	13- 26	BF3-I	4PI	
70AN3	16S	32	G,XN	ABX	15- 62 C	16- 62	ACT-I	4PI	284+
							(G,N)+(G,2N)		
61FO1	16S		G,P	SPC	10- 30 C	30	EMU-D	UKN	
70IS2	16S	32	G,PG	SPC	THR- 32 C	32	SCD-D	135	
							LEVELS 1.26,2.23		
70TH1	16S	32	G,PG	ABX	THR- 29 C	29	SCD-D	125	
6BSH3	16S	32	G,XP	SPC	17- 20 D	17, 20	EMU-D	DST	
55V11	16S	32	G,D	ABX	19- 22 C	17- 22	ACT-1	4PI	
							INCLUDES G,NP		
5BGO3	16S	32	G,D	RLY	19- 22 C	16- 22	ACT-I	4PI	
							REACTION UNCERTAIN		
55DE1	16S	32	G,NP	ABX	1B- 22 C	1B- 22	ACT-I	4PI	
5BGO3	16S	32	G,NP	RLY	21- 22 C	16- 22	ACT-I	4PI	
							REACTION UNCERTAIN		
59FA1	16S	32	G,NP	ABX	20- 30 C	30	THR-I		
59FA1	16S	32	G,NP	ABX	21- 30 C	30	ACT-I	4PI	
60FE1	16S	32	G,NP	ABX	21- 31 C	31	ACT-I	4PI	
62BO3	16S	32	G,NP	ABX	20- 90 C	30- 90	ACT-1	4PI	
65VA3	16S	32	G,NP	ABX	50-300 C	50-300	ACT-I	4PI	
710R1	16S	32	G,NP	ABX	19- 30 C	19- 30	ACT-I	4PI	
60WA2	16S	32	G,6N7P	ABX	THR-240	C240	ACT-I	4PI	
71GO2	16S	32	G,PI+	RLY	150-500	C500	CCH-D	DST	
							PI-/PI+ YIELD RATIO		
62BE4	16S	32	P,G	ABY	9- 10 D	0-	NAI-D	DST	
							J-PI		
62NE1	16S	32	P,G	RLY	9- 10 D	0-	NAI-I	90	
							J-PI		
63CH1	16S	32	P,G	SPC	9- 10 D	0-	NAI-D	DST	
							J-PI		
63KI2	16S	32	P,G	ABX	17- 22 D	B- 14	NAI-I	DST	
63SP1	16S	32	P,G	NOX	9- 10 D	0-	NAI-D	DST	
							J-PI, G-WDTH		
64SM1	16S	32	P,G	ABY	9- 10 D	0-	NAI-D	DST	
							J-PI, WIDTHS		
65DE1	16S	32	P,G	ABX	10- 21 D	2- 12	NAI-D	DST	B2+
66HO1	16S	32	P,G	SPC	10 D	1	NAI-D	55	
69MA5	16S	32	P,G	ABX	1B- 21 D	9- 12	NAI-D	DST	
69PI1	16S	32	P,G	LFT	4- 11 D	1- 2	SCD-D	DST	
72CO2	16S	32	P,G	LFT	9- 11 D	0- 2	SCD-D	55	
							J-PI		
72ES1	16S	32	P,G	LFT	6- B D	3- 6	SCD-D	UKN	
							LEVEL IS 5.550 MEV		
64SM1	16S	32	A,G	ABY	9- 10 D	2-	NAI-D	DST	
							J-PI, WIDTHS		
71CH1	16S	32	A,G	LFT	10- 12 D	4- 6	SCD-D	DST	
							J-PI		
67BE7	16S	33	N,G	LFT	B- 9 D	0- 1	NAI-D	90	
							SOURCE 30,111 KEV		
62BO6	16S	34	G,G	LFT	0- 4 C	0-	NAI-D	110	
							J-PI		
65MC2	16S	34	A,G	RLY	11- 12 D	3- 4	NAI-D	DST	
67WI1	16S	34	A,G	LFT	11- 12 D	4- 5	NAI-D	DST	
66KO4	16S	36	P,G	NOX	10- 11 D	1- 2	NAI-I	DST	
							SPINS		

CHLORINE Z=17

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
35	75.53	12.6	6.4	17.9	19.6	7.0	24.2	17.8	17.3
37	24.47	10.3	8.4	16.8	21.9	7.8	18.9	18.3	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
66BE3	17CL		G,G	RLX	5- 10 D 5- 10		NAI-D		135
55ER1	17CL		G,A	ABY	THR- 31 C 32		EMU-I	4PI	
69NO1	17CL		G,NA24	ABY	104-999 C100-999		ACT-I	4PI	
							999=1.2 GEV		
69GR1	17CL34		P,G	LFT	6- 7 D 1		SCD-D	DST	
							6 LEVELS		
62BD6	17CL35		G,G	LFT	0- 4 C 0-		NAI-D		110
							J-PI		
66HO2	17CL35		G,G	LFT	1 C 1		NAI-D		117
							1=1.22 MEV		
55BA3	17CL35		G,N	RLY	12- 22 C 22		ACT-I	4PI	
							THRESHOLD		
55BD2	17CL35		G,N	ABX	13- 21 C 13- 21		ACT-I	4PI	
55DE1	17CL35		G,N	ABX	13- 21 C 13- 21		ACT-I	4PI	
							THRESHOLD		
57BA3	17CL35		G,N	RLY	12- 14 C 12- 14		ACT-I	4PI	
							BREAKS		
59FE1	17CL35		G,N	ABX	12- 31 C 31		ACT-I	4PI	
59FE1	17CL35		G,N	ABX	16- 31 C 31		THR-I	4PI	
61SA1	17CL35		G,N	RLY	12- 14 C 12- 14		ACT-I	4PI	
							THRESHOLD		
62KU1	17CL35		G,N	ABX	12- 25 C 27		ACT-I	4PI	
67KO2	17CL35		P,G	LFT	B D 2		NAI-D	DST	
							J-PI		
67WA1	17CL35		P,G	LFT	B D 2-		SCD-D	4PI	
59SE1	17CL36		N,G	SPC	9 C 0		NAI-D		90
							G-WIDTH		
67BE7	17CL36		N,G	LFT	B- 9 D 0- 1		NAI-D		90
							SOURCE 25,50 KEV		
62BO6	17CL37		G,G	LFT	0- 4 C 0-		NAI-D		110
							J-PI		
60GE3	17CL37		G,N	NOX	THR CTHR		BF3-I	4PI	
							THRESHOLD		
67IE1	17CL37		P,G	LFT	9- 10 D 1- 2		NAI-D		55

ARGON Z=18

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
36	0.34	15.3	8.5	24.2	18.6	6.6	28.0	21.2	14.9
38	6.3(-2)	11.8	10.2	20.7	20.8	7.2	20.6	20.6	18.6
40	99.6	9.9	12.5	18.2	23.1	6.8	16.5	20.6	22.8

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
72FA1	18AR36		E,E/	ABX	7- 13 D 39, 56		MAG-D		180
					J-PI, G-WIDTH,8 LEVS				
69HO1	18AR36		G,XP	ABY	THR- 33 C 24- 33		SCI-D		90
64ER1	18AR36		P,G	RLY	B- 10 D 2-		NAI-D	DST	
							J-PI, WIDTHS		
67ME3	18AR36		P,G	RLX	12- 19 D 4- 12		NAI-D	DST	
70KE1	18AR36		P,G	RLX	14- 20 D 6- 12		NAI-D	90	244
64ER1	18AR36		A,G	RLY	8- 10 D 2-		NAI-D	DST	
							J-PI, WIDTHS		
65EH1	18AR38		G,N	ABY	THR- 31 C 18- 31		ACT-I	4PI	
70KE1	18AR38		P,G	RLX	14- 22 D 4- 12		NAI-D	90	245
64ER1	18AR38		A,G	RLY	9- 10 D 2-		NAI-D	DST	
							J-PI, WIDTHS		
64PH1	18AR38		A,G	RLY	99- 11 D 3-		NAI-D	DST	
							J-PI, WIDTHS		
72CH1	18AR38		A,G	ABX	10- 12 D 4- 5		NAI-D	DST	
							12 LEVELS, J-PI		
56HE3	18AR40		E,E/	FMF	1- 7 D1B7		MAG-D	DST	
63BA1	18AR40		E,E/	SPC	0- 24 D 42		MAG-D	180	
62DO1	18AR40		E,P	SPC	13- 30 C 30		MAG-D		76
							SEPARATED ISOTOPE		
59PE1	18AR40		G,N	ABX	10- 23 C 14- 44		ACT-I	4PI	
							SYNTHESIS		
60FA1	18AR40		G,N	ABX	13- 49 C 10- 50		BF3-I	4PI	
72LO2	18AR40		G,N	ABX	10- 13 D 13		TDF-D		90
59PE1	18AR40		G,2N	ABX	17- 23 C 14- 44		ACT-I	4PI	
							SYNTHESIS		
55SP3	18AR40		G,P	SPC	THR- 23 C 23		EMU-D	DST	
56KD1	18AR40		G,P	NDX	12- 90 C 90		CCH-I	DST	
58GU1	18AR40		G,P	SPC	13- 15 C 15		CCH-D	DST	
59BR1	18AR40		G,P	ABI	12- 34 C 34		ACT-I	4PI	
59EM2	18AR40		G,P	SPC	10- 30 C 23- 30		EMU-D		90
59PE1	18AR40		G,P	ABX	13- 33 C 14- 44		ACT-I	4PI	
							SYNTHESIS		
60DO1	18AR40		G,P	ABI	12- 33 C 30, 34		ACT-I	4PI	
61FI1	18AR40		G,P	RLY	0- 35 C 35		SCI-D		90
65RE1	18AR40		G,P	ABX	9 D 9		CCH-D	4PI	
57KD2	18AR40		G,XP	NDX	THR- 90 C 90		CCH-D	DST	
58IA1	18AR40		G,XP	ABI	12- 70 C 70		CCH-D	DST	
69HO1	18AR40		G,XP	ABY	THR- 33 C 24- 33		SCI-D		90
59EM2	18AR40		G,A	ABX	6- 12 C 23- 30		EMU-D		90
61KD1	18AR40		G,A	SPC	10- 17 C 70		ION-D		90
65RE1	18AR40		G,A	ABX	9 D 9		CCH-D	4PI	
66WE2	18AR40		G,A	ABX	7- 33 C 33		SCD-D		90
59BR1	18AR40		G,NP	ABI	21- 34 C 34		ACT-I	4PI	
59PE1	18AR40		G,NP	ABX	19- 40 C 14- 44		ACT-I	4PI	
							SYNTHESIS		
60DD1	18AR40		G,NP	ABI	21- 33 C 30, 34		ACT-I	4PI	
65EH1	18AR40		G,NP	ABY	THR- 31 C 18- 31		ACT-I	4PI	

POTASSIUM Z=19

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
39	93.10	13.1	6.4	18.5	19.2	7.2	25.2	18.2	16.6
40	.21(-2)	7.8	7.6	17.5	16.7	6.4	20.9	14.2	18.3
41	6.88	10.1	7.8	15.8	20.7	6.2	17.9	17.7	20.3

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69SA3	19K		E,E/	FMF	3, 7 D 99-227		MAG-D	DST	
							B(EL),3.6,6.5		
61TO1	19K		G,G	ABX	6- 12 C 6- 12		NAI-D		120
59EM1	19K		G,XN	SPC	7- 31 C 31		EMU-D	DST	
63CD3	19K		G,XN	ABX	12- 80 C 0- 80		BF3-I	4PI	
69ND1	19K		G,NA24	ABY	140-999 C100-999		ACT-I	4PI	
							999=1.2 GEV		
67GO2	19K	37	P,G	LFT	2- 4 D 0- 6		SCD-D	DST	
							J-PI		
63BA1	19K	39	E,E/	SPC	0- 16 D 42		MAG-D		180
70PE1	19K	39	E,E/	ABX	0, 6 D 60		MAG-D	DST	
							7 LEVELS		
62BO6	19K	39	G,G	LFT	0- 4 C 0-		NAI-D		110
							J-PI		
67LO1	19K	39	G,G/	ABX	14- 32 C 34		NAI-D	DST	
55BD2	19K	39	G,N	ABX	13- 21 C 13- 21		ACT-I	4PI	
55DE1	19K	39	G,N	ABX	13- 21 C 13- 21		ACT-I	4PI	
							THRESHOLD		
60GE3	19K	39	G,N	NDX	THR CTHR		ACT-I	4PI	
							THRESHOLD		
62GO3	19K	39	G,N	ABX	14- 24 C 14- 24		ACT-I	4PI	
65CD1	19K	39	G,N	ABX	THR- 70 C 12- 70		ACT-I	4PI	
							ISOMER RATIO		
65CO3	19K	39	G,N	ABX	THR- 80 C 80		ACT-I	4PI	
69WE1	19K	39	G,N	RLX	13- 29 C 13- 29		ACT-I	4PI	182
							TD 123 KEV ISOMER		
70KA2	19K	39	G,N	ABX	15-120 C 15-140		ACT-I	4PI	
71WE1	19K	39	G,N	ABX	13- 30 C 13- 30		ACT-I	4PI	
							G,N TO ISOMER		
58KE1	19K	39	G,P	ABX	18 D 18		SCI-D	4PI	
58OP2	19K	39	G,P	ABX	18 D 18		SCI-D	4PI	
62SH9	19K	39	G,P	SPC	6- 24 C 24		EMU-D	4PI	
69HO1	19K	39	G,XP	ABY	THR- 33 C 24- 33		SCI-D		90
60HO1	19K	39	G,D	ABY	20- 25 C 20- 25		ACT-I	4PI	
							REACTION UNCERTAIN		
60HO1	19K	39	G,NP	ABY	20- 25 C 20- 25		ACT-I	4PI	
							REACTION UNCERTAIN		
65CD3	19K	39	G,NP	ABX	THR- 80 C 80		ACT-I	4PI	
55SC2	19K	39	G,NA	ABY	THR- 32 C 32		ACT-I	4PI	
57ER1	19K	39	G,NA	ABI	13- 32 C 32		ACT-I	4PI	
71BL1	19K	41	G,PI+	ABY	150-700 C150-700		ACT-I	4PI	
							SEE 6B NY 1		
63KD2	19K	41	P,G	RLY	9 D 0-		NAI-D	DST	
							SEPARATED ISDTOPES		

CALCIUM Z=20

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
40	96.97	15.6	8.3	25.0	18.8	7.0	29.0	21.4	14.7
42	0.64	11.5	10.3	19.7	20.2	6.2	19.8	20.4	18.1
43	0.15	7.9	10.7	19.8	18.3	7.6	19.4	18.2	19.9
44	2.06	11.1	12.2	20.9	23.3	8.8	19.1	21.8	21.6
46	3.3(-3)	10.4	13.8	21.5	*	11.1	17.8	22.7	*
48	0.19	10.0	15.8	22.6	*	*	17.2	24.2	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
61PE1	20CA40		E,E/	ABX	11- 26 D120-180		MAG-D	DST	
62BL1	20CA40		E,E/	FMF	0- 9 D120-220		MAG-D	DST	
							7 LEVELS		
62ED1	20CA40		E,E/	NOX	0- D 42		TEL-D		160
							ND EXCITATION OBS		

REF	NUCLIDE Z	A	REACTION,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
63BA1	20CA40		E,E/	SPC	0- 23	D 42	MAG-D	18D	
							J-PI		
63BL1	20CA40		E,E/	FMF	0- 11	D120-220	MAG-D	10D	
64HD1	20CA40		E,E/	ABX	10- 17	D 80-200	MAG-D	DST	
65CR1	20CA40		E,E/	ABX	3- 5	D250	MAG-D	DST	
							SUM 4 LEVELS		
66AR2	20CA40		E,E/	LFT	7	D	MAG-D	DST	
							7=6.89 MEV		
68ZI2	20CA40		E,E/	ABX	2- 25	D283	MAG-D	88	
69EI1	20CA4D		E,E/	FMF	3- 5	D 42, 61	MAG-D	DST	
							B(EL),3.7-4.5		
70GD3	20CA40		E,E/	A8X	15- 26	D 45- 55	MAG-D	DST	
70IT2	20CA40		E,E/	FMF	0- 25	D183,250	MAG-D	DST	
							LEVELS 3-9 MEV		
70ST2	20CA40		E,E/	A8X	3	D 54, 59	MAG-D	141	
							3=3.35 0+		
71FA1	20CA4D		E,E/	ABX	5- 11	D 39, 56	MAG-D	180	
							4 LEVELS		
71HE1	20CA40		E,E/	FMF	3- 4	D198-300	MAG-D	DST	
							3 LEVELS		
71MD3	20CA40		E,E/	A8X	0-240	D500	MAG-D	60	
66AM1	20CA40		E,E/P	SPC	0-120	D560-760	MAG-D	51	
71BU2	20CA40		E,E/P	A8X	5- 85	D500	MAG-D	51	
						PRDT P=25,	100 MEV/C		
59DU1	20CA40		G,MU-T	A8X	11- 30	C 29, 30	MGC-D	4PI	
65DD1	20CA40		G,MU-T	ABX	10- 28	C260	MGP-D	4PI	
65WY1	20CA40		G,MU-T	A8X	10- 70	C 90	SCI-D	4PI	55+
66DD2	20CA40		G,MU-T	ABX	8- 30	C26J	MGP-D	4PI	
68BE4	20CA40		G,MU-T	A8X	10- 30	C 35	MGC-D	4PI	102+
56FU1	20CA40		G,G	A8X	4- 40	C 4- 40	NAI-D	120	
61BU3	20CA40		G,G	A8X	15- 32	C 32	NAI-D	DST	
							SEE 618U4		
61BU4	20CA40		G,G	ABX	15- 30	C 27, 32	NAI-D	DST	
61EC1	20CA40		G,G	NDX	10	D 10	NAI-D	DST	
							J-PI, G-WIDTH		
61TD1	20CA40		G,G	ABX	6- 12	C 6- 12	NAI-D	120	
62BD6	20CA40		G,G	LFT	0- 4	C 0-	NAI-D	110	
							J-PI		
68ME2	20CA40		G,G	LFT	7	D 7	SCD-D	DST	
							J-PI 6.91,6.95 MEV		
67LD1	20CA40		G,G/	ABX	14- 30	C 34	NAI-D	DST	
60KU2	20CA40		G,N	RLY	15- 90	C 90	TEL-I	DST	
62FI3	20CA40		G,N	RLY	16- 28	C 32	TOF-D	UKN	
62MI2	20CA40		G,N	ABX	15- 23	D 15- 25	BF3-I	4PI	
63MI2	20CA40		G,N	A8X	15- 26	C 15- 30	BF3-I	4PI	
64BA1	20CA40		G,N	A8X	15- 30	C 15- 30	ACT-I	4PI	
66MI2	20CA40		G,N	ABX	15- 26	D 15- 26	BF3-I	4PI	
69WU1	20CA40		G,N	ABX	17- 24	D 15- 24	TOF-D	90	200+
70WU1	20CA40		G,N	ABX	18- 20	C 16- 22	TOF-D	90	
							GROUND STATE		
69UL1	20CA40		G,NG	A8Y	THR- 32	C 32	SCD-D	120	
59EM1	20CA40		G,XN	SPC	7- 31	C 31	EMU-D	90	
60FE1	20CA40		G,XN	ABX	12- 31	C 31	ACT-I	4PI	
60LI2	20CA40		G,XN	ABI	THR- 34	C 34	NAI-I	4PI	
63CD3	20CA40		G,XN	ABX	15- 80	C 0- 80	BF3-I	4PI	
64FI1	20CA40		G,XN	SPC	THR- 32	C 25, 32	TOF-D	70	
66AN1	20CA40		G,XN	RLX	16- 62	C 16- 62	ACT-I	4PI	193
66BA1	20CA40		G,XN	ABX	15- 50	C 15- 50	BF3-I	4PI	
66FI2	20CA40		G,XN	SPC	THR- 65	C 65	TOF-D	90	
67FE2	20CA40		G,XN	ABY	100-150	C150	BF3-I	4PI	
67GE2	20CA40		G,XN	A8Y	THR- 27	C 22, 27	BF3-I	4PI	
67GD3	20CA40		G,XN	ABX	15- 30	C 15- 30	BF3-I	4PI	185+
67MI2	20CA40		G,XN	SPC	THR- 20	C 23- 27	TOF-D	100	
68GD6	20CA40		G,XN	A8X	15- 30	C 15- 30	BF3-I	4PI	
71IS1	20CA40		G,XN	A8X	15- 26	C 16- 26	BF3-I	4PI	414
59KD2	20CA40		G,P	SPC	THR- 85	C 85	EMU-D	DST	
62DR1	20CA40		G,P	SPC	8- 22	C 22	EMU-D	DST	
62JD1	20CA40		G,P	SPC	8- 21	C 20, 21	EMU-D	DST	
62SH12	20CA40		G,P	SPC	10- 21	C 21	EMU-D	UKN	
64IS2	20CA40		G,P	ABX	14- 32	C 14- 32	EMU-D	DST	
								SPC	
64IS3	20CA4D		G,P	ABX	THR- 34	C 18- 34	EMU-D	DST	
64RA2	20CA40		G,P	ABX	14- 27	C 30	SCI-I	DST	
							INCLUDES G,NP		
65IS1	20CA4D		G,P	SPC	THR- 25	C 18- 25	EMU-D	DST	
67DR2	20CA40		G,P	SPC	THR- 19	C 16- 19	EMU-D	DST	
67GD4	20CA40		G,P	ABX	THR- 30	C 12- 30	SCD-D	UKN	
68GD1	20CA40		G,P	ABX	THR- 30	C 12- 30	SCD-D	1D	187
69WU1	20CA4D		G,P	ABX	17- 24	D 15- 24	SCD-D	90	199+
71SH5	20CA4D		G,P	SPC	12- 25	C 18- 26	EMU-D	DST	
69UL1	20DA4D		G,PG	A8Y	THR- 32	C 32	SCD-D	120	
62CH2	20CA40		G,XP	RLY	8- 35	C 35	MAG-D	DST	
							REL TO DEUTERONS		
63MI5	20DA4D		G,XP	A8Y	6- 22	C 22	SCI-I	DST	
68SH3	20DA40		G,XP	SPC	THR- 20	D 20	EMU-D	DST	
62CH2	20CA40		G,XD	RLY	19- 35	C 35	MAG-D	DST	
							REL TO PROTONS		
58HD1	20DA4D		G,NP	ABX	26- 32	C 26- 32	ACT-I	4PI	
							THRESHOLD		
6DFE1	20DA4D		G,NP	ABX	21- 31	C 31	ACT-I	4PI	
65VA3	20CA40		G,NP	ABI	50-300	C 50-30D	ACT-I	4PI	
67SM1	20CA4D		G,NP	ABX	150-250	C250	TOF-D	DST	
7DKA2	20CA40		G,NP	ABX	20-140	C 20-140	ACT-I	4PI	
71BR1	20DA40		G,NP	ABX	19- 30	C 19- 30	ACT-I	4PI	
57SC1	20DA4D		G,3N3P	ABX	35- 70	C 35- 70	ACT-I	4PI	
69ND1	20CA40		G,NA24	ABY	140-999	C100-999	ACT-I	4PI	
							999=1.2 GEV		
71GD2	20DA40		G,PI+	RLY	150-500	C500	CCH-D	DST	
							PI-/PI+ YIELD RATIO		

REF	NUCLIDE Z	A	REACTION,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
61PD1	20CA40		P,G	RLY	9- 10	D 1-	NAI-D	UKN	
61TA2	20CA40		P,G	RLY	18- 22	D 9- 15	NAI-D	100	
62RA1	20CA40		P,G	SPC	9- 10	D 1-	NAI-D	DST	
							J-PI, G-WIDTH		
64HA1	20CA40		P,G	ABX	14- 23	D 6- 15	SC1-D	90	
							DETAILED BALANCE		
64S11	20CA40		P,G	NDX	9- 10	D 1-	NAI-D	DST	
							J-PI		
64TA1	20CA40		P,G	ABX		D 9- 14	NA1-D	100	
66LE1	20CA40		P,G	SPC	9- 11	D 1- 3	NAI-D	55	
67FE1	20CA40		P,G	ABX	18- 23	D 10- 15	NAI-D	90	192+
68BA1	20CA40		P,G	RLX	11- 14	D 3- 6	NAI-D	0	196+
							3=2.88,6=6.03 MEV		
70HE1	20CA40		P,G	A8X	11- 14	D 2- 6	NAI-D	DST	
71HE1	20CA42		E,E/	FMF	1- 4	D198-300	MAG-D	DST	
							3 LEVELS		
66ME3	20CA42		G,G	LFT	2	D 2	NAI-D	90	
							2=1.52 MEV		
63S12	20CA42		P,G	RLY	11- 12	D 1-	NAI-D	UKN	
							SEPARATED ISOTOPES		
71HE1	20CA44		E,E/	FMF	1- 4	D198-300	MAG-D	DST	
							5 LEVELS		
58BR1	20CA44		G,P	ABI	12- 31	C 31	ACT-I	4PI	
68DK3	20CA44		G,P	ABY	THR- 20	C 20	ACT-I	4PI	
68ZI2	20CA4B		E,E/	ABX	2- 25	D283	MAG-D	88	
69EI1	20CA4B		E,E/	FMF	3- 5	D 42, 61	MAG-D	DST	
							B(EL),3.7-4.5		
69LA3	20CA4B		G,N	ABY	10- 55	C 39- 55	ACT-I	4PI	
							ABY UPPER LIMIT		

SCANDIUM Z=21

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
45	100.0D	11.3	6.9	17.5	21.0	7.9	21.0	18.0	19.1

REF	NUCLIDE Z	A	REACTION,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
61BU1	21SC41		P,G	ABI	1- 3	D 0-	ACT-I	4PI	
66TA1	21SC45		G,N	RLY	THR- 48	C 24- 48	ACT-I	4PI	
66WA1	21SC45		G,N	RLY	THR-300	C 50-300	ACT-I	4PI	
							ISOMER RATIO SC44		
67BE8	21SC45		G,N	ABY	11- 48	C 48	ACT-I	4PI	
67BE8	21SC45		G,2N	ABY	21- 48	C 48	ACT-I	4PI	
67BE8	21SC45		G,2P	ABY	19- 48	C 48	ACT-I	4PI	
66DU2	21SC49		P,G	SPC	10- 11	D 1	NAI-D	DST	
67CH1	21SC49		P,G	LFT	12	D 2	SCD-D	90	
71PA3	21SC49		P,G	REL	13- 27	D 4- 18	NAI-D	105	

TITANIUM Z=22

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
46	7.93	13.2	10.4	22.9	20.7	8.0	22.7	21.7	17.2
47	7.28	8.9	10.5	22.1	18.4	9.0	22.1	19.2	18.7
48	73.94	11.6	11.4	22.4	22.6	9.4	20.5	22.1	19.9
49	5.51	8.1	11.4	21.7	20.4	10.2	19.8	19.6	20.8
50	5.34	10.9	12.2	22.1	24.0	10.7	19.1	22.2	21.8

REF	NUCLIDE Z	A	REACTION,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
66BE3	22TI		G,G	RLX	5- 10	D 5- 10	NA1-D	135	
7DAR1	22TI		G,G	ABX	12- 30	C 32	NAI-D	DST	
							RATIO G,G/TOT 2+		
64AL5	22TI		G,XN	NDX	THR- 34	C 34	THR-I	DST	
67CD1	22TI		G,XN	ABX	12- 24	C 24	BF3-I	4PI	434
71CD2	22TI		G,XN	ABI	36- 64	C 10- 64	BF3-I	4PI	
							FAST N YIELD		
69DK1	22TI		G,P	RLY	THR- 60	C 30- 60	NAI-D	4PI	
							YLD REL 12C(G,N)		
63MI5	22TI		G,XP	ABY	8- 22	C 22	SCI-I	DST	
64SC1	22TI		G,A	SPC	THR- 33	C 33	SCD-D	90	
							ABS YIELD		
72KE4	22TI		G,A	RLY	7- 32	C 32	SCD-D	DST	
69DK1	22TI		G,SC44	RLY	THR- 60	C 30- 60	NAI-D	4PI	
							YLD REL 12C(G,N)		
69DK1	22TI		G,TI45	RLY	THR- 60	C 30- 60	NAI-D	4PI	
							YLD REL 12C(G,N)		
69DK1	22TI		G,CA47	RLY	THR- 60	C 30- 60	NAI-D	4PI	
							YLD REL 12C(G,N)		
71SI1	22TI44		A,G	LFT	8- 9	D 4- 5	SCD-D	DST	
							4 LEVELS		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71HE1	22	TI46	E,E/	FMF	1, 2	0198-300	MAG-D	OST	
						1=0.885, 2=2.0			
63KA1	22	TI46	G,G	A8X	1	0 1	NAI-D	108	
58SI4	22	TI46	G,N	RLX	13- 22	CTHR- 22	ACT-I	4PI	
62SH5	22	TI46	G,N	A8X	14- 31	C 14- 31	ACT-I	4PI	
69GA2	22	TI46	G,2N	A8X	30, 34	C 31- 39	ACT-I	4PI	
62SH5	22	TI46	G,NP	A8X	22- 31	C 14- 31	ACT-I	4PI	
66TA1	22	TI46	G,NP	RLY	THR- 48	C 24- 48	ACT-I	4PI	
69GA2	22	TI46	G,NP	A8X	30, 34	C 31- 39	ACT-I	4PI	
64BD1	22	TI47	G,G	LFT	1- 3	C 1-	NAI-O	100	
								A8I	
62SH5	22	TI47	G,P	A8X	14- 31	C 14- 31	ACT-I	4PI	
67PA2	22	TI47	G,P	RLY	THR- 30	C 22, 30	ACT-I	4PI	
68DK3	22	TI47	G,P	A8Y	THR- 20	C 20	ACT-I	4PI	
69DK1	22	TI47	G,P	RLY	THR- 60	C 30- 60	NAI-O	4PI	
						YLO REL 12C(G,N)			
62SH5	22	TI47	G,2P	A8X	14- 31	C 14- 31	ACT-I	4PI	
67PA2	22	TI47	G,NP	RLY	THR- 30	C 22, 30	ACT-I	4PI	
71HE1	22	TI48	E,E/	FMF	1- 3	0198-300	MAG-D	DST	
							3 LEVELS		
72LI1	22	TI48	E,E/	FMF	0- 3	O 60-120	MAG-D	DST	
						.99,2.44 MEV			
63AK1	22	TI48	G,G	LFT	2	0 2	NAI-O	150	
64BD1	22	TI48	G,G	LFT	1- 3	C 1-	NAI-O	100	
								A8I	
62SH5	22	TI48	G,P	A8X	14- 31	C 14- 31	ACT-I	4PI	
68OK3	22	TI48	G,P	A8Y	THR- 20	C 20	ACT-I	4PI	
67PA2	22	TI48	G,P	RLY	THR- 30	C 22, 30	ACT-I	4PI	
69DK1	22	TI48	G,P	RLY	THR- 60	C 30- 60	NAI-D	4PI	
						YLO REL 12C(G,N)			
60ST1	22	TI48	G,NP	RLX	152-320	C320	TEL-O	76	
						REL TO H2 CRDS	SEC		
62SH5	22	TI48	G,NP	A8X	14- 31	C 14- 31	ACT-I	4PI	
67PA2	22	TI48	G,NP	RLY	THR- 30	C 22, 30	ACT-I	4PI	
62SH5	22	TI49	G,P	A8X	14- 31	C 14- 31	ACT-I	4PI	
67PA2	22	TI49	G,P	RLY	THR- 30	C 22, 30	ACT-I	4PI	
68DK3	22	TI49	G,P	A8Y	THR- 20	C 20	ACT-I	4PI	
69DK1	22	TI49	G,P	RLY	THR- 60	C 30- 60	NAI-D	4PI	
						YLD REL 12C(G,N)			
62SH5	22	TI49	G,NP	A8X	14- 31	C 14- 31	ACT-I	4PI	
67PA2	22	TI49	G,NP	RLY	THR- 30	C 22, 30	ACT-I	4PI	
71HE1	22	TI50	E,E/	FMF	1- 5	0198-300	MAG-O	OST	
							5 LEVELS		
58SI4	22	TI50	G,P	RLX	12- 22	CTHR- 22	ACT-I	4PI	
62SH5	22	TI50	G,P	A8X	14- 31	C 14- 31	ACT-I	4PI	
67PA2	22	TI50	G,P	RLY	THR- 30	C 22, 30	ACT-I	4PI	
62SH5	22	TI50	G,NP	A8X	14- 31	C 14- 31	ACT-I	4PI	
67PA2	22	TI50	G,NP	RLY	THR- 30	C 22, 30	ACT-I	4PI	

VANADIUM Z=23

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
50	0.24	9.3	7.9	19.2	19.8	9.9	20.9	16.1	19.3
51	99.76	11.1	8.1	18.7	22.6	10.3	20.4	19.0	20.2

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71KU5	23V		G,SPL	A8Y	THR-999	C 999	ACT-I	4PI	
						999=1.5	GEV		
71KU5	23V		G,PI+	A8Y	THR-999	C200-999	ACT-I	4PI	
						999=2.2	GEV		
68FD1	23V	49	P,G	LFT	8	0 1	SCD-O	OST	
						ANALDG	STATES		
69LE1	23V	49	P,G	LFT	7- 8	D 1- 2	SCO-O	DST	
							4 LEVELS		
62KE1	23V	51	E,E/	SPC	0- 17	0183-600	TEL-O	OST	
						SOURCE 183,300,600			
60RE1	23V	51	G,G	A8X	7	D 7	NAI-O	90	
70AR1	23V	51	G,G	A8X	12- 30	C 32	NAI-O	DST	
						RATIO G,G/TO 2+			
58CH2	23V	51	G,N	RLY	THR	CTHR	8F3-I	4PI	
							THRESHOLD		
60GE3	23V	51	G,N	NDX	THR	CTHR	8F3-I	4PI	
							THRESHOLD		
62FU1	23V	51	G,N	A8X	11- 28	D 8- 28	8F3-I	4PI	433
						DUAORUPDLE MOMENT			
68JU1	23V	51	G,N	NDX	THR- 32	C 32	THR-I	OST	
62FU1	23V	51	G,2N	A8X	20- 28	O 8- 28	8F3-I	4PI	443
						DUAORUPDLE MOMENT			
67BE8	23V	51	G,2N	A8Y	20- 37	C 25- 37	ACT-I	4PI	
678E8	23V	51	G,3N		30- 37	C 37	ACT-I	4PI	
69OK1	23V	51	G,3N	RLY	THR- 60	C 30- 60	NAI-O	4PI	
						YLO REL 12C(G,N)			
58KA1	23V	51	G,XN	A8X	12- 22	C 12- 22	8F3-I	4PI	
618A2	23V	51	G,XN	A8Y	THR- 22	C 22	THR-I	OST	
68GA1	23V	51 $	G,XN	SPC	THR- 85	C 85	CCH	135	
						NEUT PDLARIZATION			
69GA3	23V	51	G,XN	SPC	12- 85	C 85	CCH-O	135	
69GO3	23V	51	G,XN	A8X	11- 30	C 11- 30	8F3-I	4PI	448

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
56HE2	23V	51	G,2P	RLY	THR- 31	C 31	ACT-I	4PI	
							REL G,A		
678E8	23V	51	G,2P	A8Y	20- 37	C 25- 37	ACT-I	4PI	
69AB2	23V	51	G,XP	SPC	8- 27	C 27	SCD-D	90	
58HA1	23V	51	G,XP	SPC	THR- 30	C 30	EMU-D	DST	
63MI5	23V	51	G,XP	A8Y	5- 22	C 22	SCI-I	OST	
56HE2	23V	51	G,A	RLY	THR- 31	C 31	ACT-I	4PI	
							REL CU 63		
57ER1	23V	51	G,A	A8I	8- 32	C 32	ACT-I	4PI	
58TO2	23V	51	G,A	A8Y	8- 22	C 22	EMU-I	OST	
59OY1	23V	51	G,A	A8X	14- 25	C 25	ACT-I	4PI	
61CA2	23V	51	G,A	A8X	THR- 32	CTHR- 32	ACT-I	4PI	
62KR1	23V	51	G,A	A8I	10- 30	C 21, 30	SCD-O	90	
63KR1	23V	51	G,A	RLY	8- 30	C 21, 30	SCO-I	90	
678E8	23V	51	G,A	A8Y	10- 37	C 25- 37	ACT-I	4PI	
68ME4	23V	51	G,A	A8X	THR-300	C 20-300	ACT-I	4PI	
68DK1	23V	51	G,A	A8Y	THR- 20	C 20	ACT-I	4PI	
72KE4	23V	51	G,A	RLY	10- 32	C 32	SCO-O	OST	
62FU1	23V	51	G,NP	A8X	20- 28	O 8- 28	8F3-I	4PI	
						DUAORUPDLE	MOMENT		
67BE8	23V	51	G,NA	A8Y	21- 37	C 25- 37	ACT-I	4PI	
68ME4	23V	51	G,A3N	A8X	THR-300	C 20-300	ACT-I	4PI	
69OK1	23V	51	G,SC46	RLY	THR- 60	C 30- 60	NAI-D	4PI	
						YLD REL 12C(G,N)			
69OK1	23V	51	G,SC47	RLY	THR- 60	C 30- 60	NAI-D	4PI	
						YLO REL 12C(G,N)			
69OK1	23V	51	G,SC48	RLY	THR- 60	C 30- 60	NAI-O	4PI	
						YLO REL 12C(G,N)			
71KU2	23V	51	G,SPL	A8Y	THR-999	C800-999	ACT-I	4PI	
						999 = 2.1	GEV		
68NY1	23V	51	G,PI+	A8X	140-700	C140-700	ACT-I	4PI	
							TI-51	ACT	
68NY1	23V	51	G,PI2N	A8X	140-700	C140-700	ACT-I	4PI	
							CR-49	ACT	

CHROMIUM Z=24

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
50	4.31	12.9	9.6	23.2	20.3	8.6	23.6	21.1	16.3
52	83.76	12.0	10.5	22.4	21.8	9.4	21.3	21.6	18.6
53	9.55	7.9	11.1	21.0	18.8	9.2	20.0	18.4	20.1
54	2.38	9.7	12.4	19.7	22.1	7.9	17.7	20.9	22.0

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	24CR		G,G	A8X	7	D 7	NAI-D	90	
70AR1	24CR		G,G	A8X	12- 30	C 32	NAI-D	OST	
						RATIO G,G/TO 2+			
57FE2	24CR		G,N	A8Y	15- 30	C 14- 30	THR-I	90	
58CD1	24CR		G,N	SPC	6- 30	C 20, 30	EMU-D	90	
							THRESHOLD		
64CD3	24CR		G,N	A8I	THR- 80	C 10- 80	8F3-I	4PI	
68JU1	24CR		G,N	NDX	THR- 22	C 22	THR-I	OST	
618A2	24CR		G,XN	A8Y	THR- 22	C 22	THR-I	DST	
64AL5	24CR		G,XN	NDX	THR- 34	C 34	THR-I	OST	
64CD2	24CR		G,XN	A8Y	THR- 80	C 80	8F3-I	4PI	
68MC1	24CR		G,XN	SPC	THR- 32	C 22- 32	THR-I	OST	
70MD2	24CR	50	G,G	A8X	9	O 9	SCO-O	OST	
							9=8.888,LFT		
62OE1	24CR	50	G,N	A8X	20	O 20	ACT-I	4PI	
648E3	24CR	52	E,E/	FMF	0- 9	0150,180	MAG-O	OST	
							J-PI		
64801	24CR	52	G,G	LFT	1- 3	C 1-	NAI-D	100	
							A8I		
60GE3	24CR	52	G,N	NOX	THR	CTHR	8F3-I	4PI	
							THRESHDLO		
718A2	24CR	52	G,N	A8X	12- 14	C 12, 14	TDF-O	135	
70WA3	24CR	52	G,2N	RLY	THR-305	C150-305	ACT-I	4PI	
69GO3	24CR	52	G,XN	A8X	12- 30	C 12- 30	8F3-I	4PI	449
70IS4	24CR	52	G,XP	A8X	10- 30	C 10- 30	SCD-O	UKN	
						PROB 90	DEGREES		
70WA3	24CR	52	G,PN	RLY	THR-305	C150-305	ACT-I	4PI	
64801	24CR	53	G,G	LFT	1- 3	C 1-	NAI-D	100	
							A8I		
60GE3	24CR	53	G,N	NDX	THR	CTHR	8F3-I	4PI	
							THRESHDLO		
718A2	24CR	53	G,N	A8X	9- 12	C 9, 12	TDF-D	135	
71JA1	24CR	53	G,N	RLX	7- 9	C 7- 9	TOF-D	DST	
68DK3	24CR	53	G,P	A8Y	THR- 20	C 20	ACT-I	4PI	
71RA1	24CR	53	G,P	RLY	11- 14	C 11- 14	ACT-I	4PI	

MANGANESE Z=25

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
55	100.00	10.2	B.1	17.2	21.2	7.9	19.2	17.8	20.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67ER1	25MN51		P,G	NOX	6- 7 P 1- 2		SCO-O	OST	
66VU1	25MN53		P,G	RLY	7- 9 O 1- 2		NAI-D	90	
69TH1	25MN55		E,E/	ABX	0- 4 O 51- 61		MAG-D	DST	
								8(EL)	
57HI1	25MN55		E,3N	ABX	30- 60 D 64, B2		ACT-I	4PI	
69DO1	25MN55		G,MU-T	ABX	10- 30 C 10-260		MAG-O	4PI	
56FU1	25MN55		G,G	ABX	4- 40 C 4- 40		NAI-O	120	
60RE1	25MN55		G,G	ABX	7 D 7		NAI-D	90	
64BO1	25MN55		G,G	LFT	1- 3 C 1-		NAI-D	100	
								A8I	
6BAL1	25MN55		G,G	LFT	0- 3 C 4		SCO-D	130	
							7 LEVELS		
67LO1	25MN55		G,G/	ABX	14- 32 C 34		NAI-D	DST	
58CH2	25MN55		G,N	RLY	THR CTHR		BF3-I	4PI	
							THRESHOLD		
59PA2	25MN55		G,N	A8X	10- 24 C 10- 24		BF3-I	4PI	439
60GE3	25MN55		G,N	NOX	THR CTHR		BF3-I	4PI	
							THRESHOLO		
61TA1	25MN55		G,N	NOX	16- 22 C 22		THR-I	90	
64CO3	25MN55		G,N	ABI	THR- 80 C 10- 80		BF3-I	4PI	
6BJU1	25MN55		G,N	NOX	THR- 22 C 22		THR-I	DST	
69DE1	25MN55		G,N	A8Y	THR-999 C 2- 6		ACT-I	4PI	
							999=5.5	GEV	
71SA1	25MN55		G,N	ABY	10- 6B C 10- 6B		ACT-I	4PI	
66WA1	25MN55		G,3N	RLY	THR-300 C100-300		ACT-I	4PI	
							ISOMER RATIO	MN52	
69OE1	25MN55		G,3N	ABY	THR-999 C 2- 6		ACT-I	4PI	
							999=5.5	GEV	
5BKA1	25MN55		G,XN	A8X	11- 22 C 11- 22		8F3-I	4PI	
60FL1	25MN55		G,XN	ABX	11- 27 C 12- 30		8F3-I	4PI	
							QUADRUPOLE	MOMENT	
618A2	25MN55		G,XN	A8Y	THR- 22 C 22		THR-I	DST	
64CO2	25MN55		G,XN	A8Y	THR- 80 C 80		8F3-I	4PI	
6BGA1	25MN55	$	G,XN	SPC	THR- 85 C B5		CCH-D	135	
							NEUT POLARIZATION		
69GA3	25MN55		G,XN	SPC	11- 85 C 85		CCH-O	135	
6BSH3	25MN55		G,XP	A8X	THR- 23 C 13- 23		SCI-I	OST	
							SPECTRA ALSO GIVEN		
66WA1	25MN55		G,7N4P	RLY	THR-300 C100-300		ACT-I	4PI	
							ISOMER RATIO	SC44	
71KU2	25MN55		G,SPL	ABY	THR-999 C999		ACT-I	4PI	
							999 = 1.5	GEV	
61CA1	25MN56		O,G	ABX	16- 1B D 3-		ACT-I	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69FU2	26FE		G,SPL	RLY	THR-999 D999		SCO-D	DST	
							999=3	GEV	
71FU4	26FE		G,SPL	RLX	THR-999 D999		ACT-I	4PI	
							999=5	GEV	
71KU2	26FE		G,SPL	A8Y	THR-999 C999		ACT-I	4PI	
							999 = 1.5	GEV	
71KU5	26FE		G,SPL	A8Y	THR-999 C 999		ACT-I	4PI	
							999=1.5	GEV	
67FU1	26FE		G,F	ABY	THR-999 D999		ACT-I	4PI	
							999=3	GEV	
71KU5	26FE		G,PI+	A8Y	THR-999 C200-999		ACT-I	4PI	
							999=2.2	GEV	
668E1	26FE		N,G	SPC	15 D 7		NAI-O	UKN	
55OE1	26FE53		G,N	ABX	11- 24 C 11- 24		ACT-I	4PI	
55OE1	26FE54		G,N	A8X	11- 24 C 11- 24		ACT-I	4PI	
57CA2	26FE54		G,N	ABX	12- 30 C 13- 30		ACT-I	4PI	
62DE1	26FE54		G,N	A8X	20 O 20		ACT-I	4PI	
70WA3	26FE54		G,2N	RLY	THR-305 C150-305		ACT-I	4PI	
70WA3	26FE54		G,PN	RLY	THR-305 C150-305		ACT-I	4PI	
58GO3	26FE54		G,D	RLY	19- 22 C 16- 22		ACT-I	4PI	
							REACTION	UNCERTAIN	
5BGO3	26FE54		G,NP	RLY	19- 22 C 16- 22		ACT-I	4PI	
							REACTION	UNCERTAIN	
70PE2	26FE56		E,E/	FMF	0- 5 O 60		MAG-D	DST	
							7 2+, 1 3-	STATES	
71HE1	26FE56		E,E/	FMF	1	0198-300	MAG-D	OST	
							1 = .BB0		
61KE2	26FE56		G,G	NOX	1 D 1		NAI-D	100	
							G-WIOTH		
67LO1	26FE56		G,G/	ABX	14- 32 C 34		NAI-O	OST	
58TO1	26FE56		G,N	RLY	12- 22 C 22		BF3-I	4PI	
							THRESHOLD		
60GE3	26FE56		G,N	NOX	THR CTHR		8F3-I	4PI	
							THRESHOLD		
66BE4	26FE56		G,N	A8X	11 C 13		TOF-D	135	
67BO2	26FE56		G,N	A8X	12, 13 C 12, 13		TOF-O	135	
							J-PI		
718A2	26FE56		G,N	A8X	11- 13 C 11, 13		TOF-O	135	
68SH3	26FE56		G,XP	A8X	THR- 23 C 13- 23		SCI-I	OST	
							SPECTRA ALSO	GIVEN	
6BOK3	26FE56		G,NP	A8Y	THR- 20 C 20		ACT-I	4PI	
58TO1	26FE57		G,N	RLY	12- 22 C 22		8F3-I	4PI	
							THRESHOLD		
60GE3	26FE57		G,N	NOX	THR CTHR		BF3-I	4PI	
							THRESHOLD		
71BA2	26FE57		G,N	A8X	7- 12 C B- 12		TOF-D	135	
71JA1	26FE57		G,N	RLX	7- 8 C 7- B		TOF-D	DST	
71JA2	26FE57		G,N	RLX	B- 9 C B		TOF-O	DST	
							G-WIDTH, 7.6-B.4	MEV	
6BOK3	26FE57		G,P	A8Y	THR- 20 C 20		ACT-I	4PI	

IRON Z=26

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
54	5.B2	13.4	8.9	23.0	19.7	B.4	24.1	20.9	15.4
56	91.66	11.2	10.2	20.9	20.3	7.6	20.5	20.4	18.3
57	2.19	7.6	10.6	19.6	18.2	7.3	1B.B	17.B	19.6
5B	0.33	10.0	I1.8	19.4	22.0	7.6	17.7	20.6	21.5

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	OETECTOR TYPE	ANG	NUM
71FU1	26FE		E,SPL	A8I	THR-999 O 40-999		SCO-O	4PI	
							999= 16	GEV	
70FU1	26FE		E,F	RLY	999 O999		ACT-D	4PI	
							999=1.5-16.0	GEV	
59KO1	26FE		G,MU-T	ABX	10- 27 C 31		NAI-D		
69DO2	26FE		G,MU-T	A8X	10- 27 CTHR-260		MGP-D	4PI	
60RE1	26FE		G,G	ABX	7 O 7		NAI-O	DST	
63SU1	26FE		G,G	ABX	4- 14 C 4- 14		NAI-O	120	
648O1	26FE		G,G	LFT	1- 3 C 1-		NAI-O	100	
								A8I	
64CO3	26FE		G,N	ABI	THR- B0 C 10- 80		8F3-I	4PI	
6BKA1	26FE		G,N	A8X	50- B5 C 55, B5		TOF-O	67	
							NEUT ENGY	SPEC	
55OI1	26FE		G,XN	NOX	THR- 70 C 70		SCI-I	OST	
56HA1	26FE		G,XN	ABX	15, 1B D 15, 18		BF3-I	4PI	
618A2	26FE		G,XN	A8Y	THR- 22 C 22		THR-I	DST	
64CO2	26FE		G,XN	ABY	THR- B0 C B0		8F3-I	4PI	
67CO2	26FE		G,XN	ABX	THR- 24 C 11- 24		BF3-I	4PI	436
71CO2	26FE		G,XN	ABI	36- 64 C 10- 64		BF3-I	4PI	
							FAST N	YIELO	
66WA1	26FE		G,XNP	RLY	THR-250 C100-250		ACT-I	4PI	
							ISOMER RATIO	MN52	
66WA1	26FE		G,XN5P	RLY	THR-250 C100-250		ACT-I	4PI	
							ISOMER RATIO	SC44	
63MI5	26FE		G,XP	A8Y	8- 22 C 22		SCI-I	OST	
58TO2	26FE		G,A	A8Y	7- 22 C 22		EMU-I	OST	
63KR1	26FE		G,A	RLY	7- 30 C 21, 30		SCO-I	90	
72KE4	26FE		G,A	RLY	7- 32 C 32		SCD-D	DST	

CO8ALT Z=27

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
59	100.00	10.5	7.4	16.6	20.3	7.0	19.0	17.4	19.2

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
72MA2	27CO55		P,G	LFT	7 O 2 ·		SCD-D	DST	
								J-PI	
70ER1	27CO58		P,G	SPC	8- 9 D 1- 2		SCD-O	45	
							OETAILS	4 LEVELS	
61CR1	27CO59		E,E/	NOX	0- 4 O1B3		MAG-I	OST	
							G-WDTH,	MULTIPOLES	
65WY1	27CO59		G,MU-T	ABX	10- 35 C 90		SCI-O	4PI	60
60RE1	27CO59		G,G	A8X	7 O 7		NAI-D	90	
648O1	27CO59		G,G	LFT	1- 3 C 1-		NAI-O	100	
								A8I	
6BAL1	27CO59		G,G	LFT	1 C 4		SCO-O	130	
							1=1.1B7	MEV	
71SW3	27CO59		G,G	LFT	1- 5 C 5		SCD-D	OST	
							15 LEVELS,	J-PI	
67LO1	27CO59		G,G/	A8X	14- 32 C 34		NAI-D	OST	
58CH2	27CO59		G,N	RLY	THR CTHR		BF3-I	4PI	
							THRESHOLD		
60GE3	27CO59		G,N	NOX	THR CTHR		BF3-I	4PI	
							THRESHOLD		
62CA1	27CO59		G,N	NOX	11- 30 C 30		ACT-I	4PI	
							ISOMER	RATIO	
62FU1	27CO59		G,N	A8X	11- 28 C 9- 28		BF3-I	4PI	435
64CO3	27CO59		G,N	ABI	THR- B0 C 10- B0		8F3-I	4PI	
67GE2	27CO59		G,N	ABY	THR- 27 C 22, 27		8F3-I	4PI	
67HU1	27CO59		G,N	A8X	11 D 11		8F3-I	4PI	
67LI1	27CO59		G,N	RLY	THR- 54 C 35, 54		ACT-I	4PI	
							REL C11,	ISM RATIO	
71SA1	27CO59		G,N	ABY	10- 6B C 10- 68		ACT-I	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
62FU1	27CD59		G,2N	ABX	19- 28 C 9- 28		BF3-I 4PI		444
67LI1	27CO59		G,2N	RLY	THR- 54 C 35, 54		ACT-I 4PI		
							REL G,N		
67LI1	27CD59		G,3N	RLY	THR- 54 C 35, 54		ACT-I 4PI		
							REL G,N		
67LI1	27CO59		G,4N	RLY	THR- 54 C 35, 54		ACT-I 4PI		
							REL (G,N)		
56HA1	27CO59		G,XN	ABX	15, 18 D 15, 18		BF3-I 4PI		
58KA1	27CD59		G,XN	ABX	10- 22 C 10- 22		BF3-I 4PI		
60FL1	27CD59		G,XN	ABX	11- 24 C 12- 30		BF3-I 4PI		
						OUADRUPOLE MOMENT			
61BA2	27CD59		G,XN	ABY	THR- 22 C 22		THR-I DST		
61EM1	27CO59		G,XN	SPC	13- 30 C 30		EMU-D 9D		
64BA2	27CD59		G,XN	ABX	1D- 30 C 10- 30		BF3-I 4PI		
64BA4	27CD59		G,XN	ABX	10- 27 C 10- 27		BF3-I 4PI		
						65BA3 SAME DATA			
64CD2	27CD59		G,XN	ABY	THR- 80 C 80		BF3-I 4PI		
65BA3	27CD59		G,XN	ABX	THR- 28 C 10- 30		BF3-I 4PI		
66FI2	27CD59		G,XN	SPC	THR- 60 C 60		TDF-D 90		
68GA1	27CD59	$	G,XN	SPC	THR- 85 C 85		CCH-D 135		
						NEUT POLARIZATIDN			
68RH1	27CO59		G,XN	NOX	THR- 48 C 48		ACT-I 4PI		
69GA3	27CO59		G,XN	SPC	11- 85 C 85		CCH-D 135		
69GD3	27CD59		G,XN	ABX	10- 30 C 10- 30		BF3-I 4PI		450
71BA1	27CO59		G,XN	ABX	10- 22 C 10- 22		BF3-I 4PI		247+
56FD1	27CD59		G,P	RLY	7- 3D C 3D		EMU-D 90		
						YLD REL TO G,D			
57RD1	27CO59		G,P	SPC	15, 18 D 15, 18		EMU-D DST		
60CH1	27CD59		G,XP	RLX	22- 90 C 90		TEL-I 90		
						REL TD DEUTERDNS			
63MI5	27CO59		G,XP	ABY	7- 22 C 22		SCI-I DST		
56FD1	27CD59		G,D	RLY	15- 30 C 30		EMU-D 90		
						YLD REL TD G,P			
61FO1	27CD59		G,D	SPC	7- 30 C 30		EMU-D UKN		
61FD1	27CO59		G,D	RLY	15- 3D C 30		EMU-D DST		
						NO DEUTERONS FOUND			
60CH1	27CO59		G,XD	RLX	30- 90 C 90		TEL-I 90		
						REL TD PROTONS			
56HE1	27CD59		G,T	RLY	THR- 31 C 31		ACT-I 4PI		
56WA1	27CD59		G,T	RLY	THR- 31 C 31		ACT-I 4PI		
60CH1	27CD59		G,XT	RLY	32- 90 C 90		TEL-I 90		
						REL TO DEUTERONS			
5BTD2	27CO59		G,A	ABY	7- 22 C 22		EMU-I DST		
61FD1	27CD59		G,A	SPC	9- 30 C 30		EMU-D UKN		
72KE4	27CD59		G,A	RLY	7- 32 C 32		SCD-D DST		
62FU1	27CD59		G,NP	ABX	18- 28 C 9- 28		BF3-I 4PI		441
60GD2	27CO59		G,PD	ABX	30-26D C 30-26D		ACT-I 4PI		
						ALSO G,N2P, G,HE3			
60GD2	27CD59		G,HE3	ABX	30-260 C 30-260		ACT-I 4PI		
						ALSO G,N2P, G,PD			
60GD2	27CO59		G,N2P	ABX	30-260 C 30-26D		ACT-I 4PI		
						ALSD G,PD, G,HE3			
66WA1	27CO59		G,5N2P	RLY	THR-150 C15D		ACT-I 4PI		
						ISOMER RATID MN52			
67LI1	27CO59		G,MN56	RLY	THR- 54 C 35, 54		ACT-I 4PI		
							REL (G,N)		
71KU2	27CD59		G,SPL	ABY	THR-999 C999		ACT-I 4PI		
						999 = 1.5 GEV			
66WA2	27CO60		N,G	RLY	7 D 0		SCD-D 45		

NICKEL Z=28

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
58	67.88	12.2	8.2	21.2	17.7	6.4	22.5	19.6	14.2
60	26.23	11.4	9.5	20.1	19.2	6.3	2D.4	20.D	16.9
61	1.19	7.8	9.9	19.3	17.0	6.5	19.2	17.4	18.1
62	3.66	10.6	11.1	19.5	21.0	7.D	18.4	2D.5	19.9
64	1.D8	9.7	12.5	19.1	23.0	8.1	16.5	2D.9	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SDURCE	DETECTDR TYPE	ANG	NUM
71MD3	28NI		E,E/	ABX	D-240 D5DD		MAG-D 6D		
65WY1	28NI		G,MU-T	ABX	10- 35 C 9D		SCI-D 4PI		59
56FU1	28NI		G,G	ABX	4- 40 C 4- 40		NAI-D 120		
6DRE1	28NI		G,G	ABX	7 D 7		NAI-D 9D		
61MI1	28NI		G,G	ABX	8- 15 D 8- 15		NAI-I DST		
61TD1	28NI		G,G	ABX	4- 14 C 4- 14		NAI-D 12D		
628E2	28NI		G,G	ABX	5- 9 D 5-		NAI-D 135		
64AR1	28NI		G,G	ABX	8 D 8		NAI-D DST		
							J, WIDTH		
64GI1	28NI		G,G	NOX	8 D 8		NAI-D 135		
							WIDTH		
66BE3	28NI		G,G	RLX	5- 10 D 5- 1D		NAI-D 135		
69CE1	28NI		G,G	NOX	6- 8 D 6- 8		SCD-D DST		
65GI1	28NI		G,G/	RLY	8 D 8		NAI-D 135		
64CO3	28NI		G,N	ABI	THR- 80 C 10- 8D		BF3-I 4PI		
67HU2	28NI		G,N	ABY	THR- 22 C 22		THR-I DST		

REF	NUCLIDE Z	A	REACTION IN,DUT	RES	EXCIT	SOURCE	DETECTDR TYPE	ANG	NUM
56HA1	28NI		G,XN	ABX	15, 18 D 15, 18		BF3-I 4PI		
61BA2	28NI		G,XN	ABY	THR- 22 C 22		THR-I DST		
64BA4	28NI		G,XN	ABX	10- 27 C 10- 27		BF3-I 4PI		
						65BA3 SAME DATA			
64BA5	28NI		G,XN	ABX	12- 28 C 12- 28		BF3-I 4PI		
64CD2	28NI		G,XN	ABY	THR- 80 C 80		BF3-I 4PI		
65BA3	28NI		G,XN	ABX	THR- 28 C 1D- 30		BF3-I 4PI		
68FI1	28NI		G,XN	ABX	11- 25 C 11- 25		BF3-I 4PI		
68GA1	28NI	$	G,XN	SPC	THR- 85 C 85		CCH-I 135		
						NEUT PDLARIZATIDN			
69GA3	28NI		G,XN	SPC	11- 85 C 85		CCH-D 135		
55DL1	28NI		G,P	SPC	18 D 18		EMU-D 4PI		
55JO1	28NI		G,P	RLY	THR- 65 C 65		SCI-D DST		
56LE1	28NI		G,P	ABX	8- 28 C 21- 28		EMU-I DST		
57SP1	28NI		G,P	SPC	9- 18 C 18		EMU-D DST		
62SE2	28NI		G,P	ABX	15, 18 D 15, 18		SCI-I 0		
57BA2	28NI		G,XP	SPC	THR- 85 C 85		TEL-D DST		
58BA6	28NI		G,XP	SPC	THR- 85 C 85		TEL-D DST		
6DCH1	28NI		G,XP	RLX	THR- 90 C 90		TEL-I 90		
						REL TD DEUTERONS			
61MA2	28NI		G,XP	NOX	8- 21 C 18, 21		SCI-D DST		
63MI5	28NI		G,XP	ABY	8- 22 C 22		SCI-I DST		
63YA2	28NI		G,D	RLY	15- 26 C 26		EMU-D 90		
						REL TO PRDTONS			
60CH1	28NI		G,XD	RLX	THR- 90 C 90		TEL-I 90		
						REL TO PROTONS			
67KN1	28NI		G,T	RLY	THR- 49 C 36, 49		ACT-I 4PI		
60CH1	28NI		G,XT	RLY	THR- 90 C 90		TEL-I 9D		
						REL TD DEUTERDNS			
57BO1	28NI		G,A	SPC	THR- 30 C 31		EMU-D DST		
58TD2	28NI		G,A	ABY	6- 22 C 22		EMU-I DST		
63KR1	28NI		G,A	SPC	6- 30 C 21, 3D		SCD-D 90		
						RELATIVE YIELDS			
64SC1	28NI		G,A	SPC	THR- 33 C 33		SCD-D 90		
						ABS YIELD			
66HD3	28NI		G,A	SPC	THR- 31 C 31		SCD-D 13D		
72KE4	28NI		G,A	RLY	6- 32 C 32		SCD-D DST		
71ME1	28NI		G,F	ABY	THR-900 C300-9D0		TRK-I 4PI		
66BE1	28NI		N,G	SPC	16 D 7		NAI-D UKN		
61CR1	28NI58		E,E/	NOX	0- 8 D183		MAG-D DST		
						G-WDTH, MULTIPOLES			
66DU1	28NI58		E,E/	FMF	1 D 45- 65		MAG-D DST		
						1=1.452			
67DU1	28NI58		E,E/	FMF	1- 5 D 45- 65		MAG-D DST		
						B(EL), 4 LEVELS			
69AF1	28NI58		E,E/	FMF	1, 4 D150,225		MAG-D DST		
						1,4=1.45,4.45 MEV			
69GU1	28NI58		E,E/	ABX	10- 30 D199		MAG-D 40		
							FMF		
64BO1	28NI58		G,G	LFT	1- 3 C 1-		NAI-D 100		
							ABI		
70ME3	28NI58		G,G	LFT	1- 4 C 4		SCD-D DST		
							6 LEVELS		
59CA4	28NI58		G,N	ABX	12- 32 C 12- 32		ACT-I 4PI		
59RO2	28NI58		G,N	ABX	12- 24 C 24		ACT-I 4PI		
68MI1	28NI58		G,N	ABX	THR- 25 C 10- 25		BF3-I 4PI		17
68GO4	28NI58		G,XN	ABX	THR- 3D C 7- 30		BF3-I 4PI		
69GO2	28NI58		G,XN	ABX	12- 3D C 12- 3D		BF3-I 4PI		278
69OW1	28NI58		G,XN	ABX	12- 25 C 12- 25		BF3-I 4PI		191
70DW1	28NI58		G,XN	ABX	11- 24 C 10- 24		BF3-I 4PI		274
59CA4	28NI58		G,P	ABX	12- 32 C 12- 32		ACT-I 4PI		
64MA2	28NI58		G,XP	SPC	THR- 22 C 22		SCD-D UKN		
70IS4	28NI58		G,XP	ABX	8- 30 C 8- 3D		SCD-D UKN		
						PRDB 90 DEGREES			
59CA4	28NI58		G,NP	ABX	12- 32 C 12- 32		ACT-I 4PI		
71AN2	28NI58		G,XD	ABX	107-999 C999		MAG-D DST		
						999=1.14 GEV			
70AN5	28NI59		E,P	RLY	90-999 C999		TEL-D DST		
						999= 1140 MEV			
61CR1	28NI6D		E,E/	NOX	0- 5 D183		MAG-D DST		
						G-WDTH, MULTIPOLES			
66DU1	28NI6D		E,E/	FMF	1 D 45- 65		MAG-D DST		
						1=1.332 MEV			
67DU1	28NI60		E,E/	FMF	1, 4 D 45- 65		MAG-D		
						B(EL)1.33,4.D3 MEV			
69AF1	28NI60		E,E/	FMF	1, 4 D150,225		MAG-D DST		
						1,4=1.33,4.04 MEV			
69GU1	28NI60		E,E/	ABX	1D- 30 D199		MAG-D DST		
							FMF		
69TO3	28NI6D		E,E/	FMF	0- 8 D183,25D		MAG-D DST		
							B(EL),J-PI		
72LI1	28NI6D		E,E/	FMF	1- 3 D 60-120		MAG-D DST		
						1.33,2.16 MEV			
56ME2	28NI60		G,G	LFT	1 D 1		NAI-D DST		
							J-PI		
67BE5	28NI60		G,G	LFT	1 D 1		NAI-D 12D		
70ME3	28NI60		G,G	LFT	1- 4 C 4		SCD-D DST		
							6 LEVELS		
68MI1	28NI6D		G,N	ABX	THR- 25 C 1D- 25		BF3-I 4PI		21
68GO4	28NI6D		G,XN	ABX	THR- 3D C 7- 3D		BF3-I 4PI		
69GO2	28NI60		G,XN	ABX	11- 30 C 11- 3D		BF3-I 4PI		278
69OW1	28NI60		G,XN	ABX	12- 25 C 12- 25		BF3-I 4PI		190
70OW1	28NI6D		G,XN	ABX	11- 24 C 10- 24		BF3-I 4PI		275
70TI2	28NI6D		G,XN	RLY	12- 3D C 12- 3D		BF3-I 4PI		
70IS4	28NI60		G,XP	ABX	9- 30 C 9- 3D		SCD-D UKN		
						PRDB 90 DEGREES			
71DI4	28NI60		P,G	ABX	13- 23 D 4- 14		NAI-D DST		254+
71JA1	28NI61		G,N	RLX	7- 9 C 7- 9		TOF-D DST		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
66DU1	28	NI62	E,E/	FMF	1	D 45- 65	MAG-D	DST	
						1=1.172 MEV			
67DU1	28	NI62	E,E/	FMF	1, 4	D 45- 65	MAG-D	DST	
						B(EL)1.17,3.75 MEV			
68MO1	28	NI62	$ G,G	NOX	7	D 7	NAI-D	90	
						POLARIMETER 7.646			
67ST1	28	NI62	G,G	LFT	7	D 7	NAI-D	135	
						7=7.64 MEV			
70ES1	28	NI62	G,G	NOX	7	D 7	SCD-D	DST	
						7=7.64			
70MO2	28	NI62	G,G	ABX	8	D 8	SCD-D	DST	
						8=7.646,LFT			
67ESI	28	NI62	G,G/	ABX	8	D 8	NAI-D	DST	
59CA4	28	NI62	G,P	ABX	12- 32	C 12- 32	ACT-I	4PI	
69AF1	28	NI64	E,E/	FMF	1, 4	D150,225	MAG-D	DST	
						1,4=1.32,3.55 MEV			
69GU1	28	NI64	E,E/	ABX	10- 30	D150	MAG-D	55	
								FMF	
71RA1	28	NI64	G,P	RLY	12- 17	C 12- 17	ACT-I	4PI	

COPPER Z=29

A	A8UND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
63	69.09	10.9	6.1	16.1	18.9	5.8	19.7	16.7	17.2
65	30.91	9.9	7.4	15.5	20.7	6.8	17.8	17.1	20.0

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
59BA3	29	CU	E,N	ABY	THR- 36	D 10- 36	BF3-I	4PI	
71VO1	29	CU	E,N	ABX	THR-266	C150-266	TOF-D	90	
64CH1	29	CU	E,P	ABX		D999	MAG-D	DST	
							999=1 GEV		
58ZI1	29	CU	G,MU-T	ABX	15- 21	C 15- 30	MGP-D	4PI	
65WY1	29	CU	G,MU-T	ABX	10- 35	C 90	SCI-D	4PI	58
55BU1	29	CU	G,G	RLX	0- 3	C 3	NAI-D	90	
56FU1	29	CU	G,G	ABX	4- 40	C 4- 40	NAI-D	120	
57BE1	29	CU	G,G	ABX	13- 21	C 18- 22	ACT-I	90	
59PE5	29	CU	G,G	ABX	19- 61	C 19- 61	NAI-D	135	
60RE1	29	CU	G,G	ABX	6- 7	D 6-	NAI-D	DST	
							G-WDTH		
61TO1	29	CU	G,G	ABX	3- 16	C 3- 16	NAI-D	120	
62BE2	29	CU	G,G	ABX	5- 9	D 5-	NAI-D	135	
63KA3	29	CU	G,G	ABX	1, 1	D 1,	NAI-D	120	
66BE3	29	CU	G,G	RLX	5- 10	D 5- 10	NAI-D	135	
67GI1	29	CU	G,G	LFT	6, 8	D 6- 8	NAI-D	DST	
						6,8=6.07,8.50 MEV			
67TU4	29	CU	G,G	ABX	6	D 6	NAI-D	UKN	
57FE1	29	CU	G,N	RLY	17- 31	C 15- 31	THR-I	DST	
58AS1	29	CU	G,N	NOX	8- 17	C 17	SCI-I	DST	
60CH2	29	CU	G,N	RLX	8- 21	C 8- 21	BF3-I	4PI	
						REL TO PROTONS			
60KU2	29	CU	G,N	RLY	18- 90	C 90	TEL-I	DST	
61TA1	29	CU	G,N	NOX	12- 22	C 22	THR-I	DST	
62MI3	29	CU	G,N	ABX	10- 20	D 10- 20	BF3-I	4PI	
64CO3	29	CU	G,N	ABI	THR- 80	C 10- 80	BF3-I	4PI	
64FU1	29	CU	G,N	ABX	9- 28	D 9- 28	BF3-I	4PI	
67GE2	29	CU	G,N	ABY	THR- 27	C 22, 27	BF3-I	4PI	
68KA1	29	CU	G,N	ABX	50- 85	C 55, 85	TOF-D	67	
						NEUT ENGY SPEC			
64FU1	29	CU	G,2N	ABX	18- 28	D 18- 28	BF3-I	4PI	
55DI1	29	CU	G,XN	SPC	THR- 70	C 70	EMU-D	DST	
						USED SCI FOR DST			
55LI1	29	CU	G,XN	SPC	8- 70	C 70	EMU-D	UKN	
55MC1	29	CU	G,XN	RLY	THR- 22	C 22	NAI-I	90	
56GA1	29	CU	G,XN	ABX	11- 27	C 18- 27	BF3-I	4PI	
56HA1	29	CU	G,XN	ABX	15, 18	D 15, 18	BF3-I	4PI	
61BA2	29	CU	G,XN	ABY	THR- 22	C 22	THR-I	DST	
61MI1	29	CU	G,XN	ABX	10- 20	D 10- 20	BF3-I	4PI	
64AL5	29	CU	G,XN	NOX	THR- 34	C 34	THR-I	DST	
64BA4	29	CU	G,XN	ABX	10- 27	C 10- 27	BF3-I	4PI	
						65BA3 SAME DATA			
64CO2	29	CU	G,XN	ABY	THR- 80	C 80	BF3-I	4PI	
65BA3	29	CU	G,XN	ABX	THR- 28	C 10- 30	BF3-I	4PI	
68TO1	29	CU	G,XN	ABX	10- 24	C 10- 24	BF3-I	4PI	
						MONTR CALIBRATION			
70IS6	29	CU	G,XN	ABX	10- 30	C 10- 30	BF3-I	4PI	487
55DL1	29	CU	G,P	SPC	18	D 18	EMU-D	4PI	
56CH1	29	CU	G,P	SPC	15, 18	D 15, 18	EMU-D	UKN	
56FO1	29	CU	G,P	RLY	THR- 30	C 30	EMU-D	90	
						YLD REL TO G,D			
56LE1	29	CU	G,P	RLX	3- 31	C 19- 31	EMU-I	DST	
60CH2	29	CU	G,P	ABX	9- 21	C 8- 21	ION-I	4PI	
61FO1	29	CU	G,P	SPC	5- 30	C 30	EMU-D	UKN	
						YIELD REL TO ALPHA			
61HO1	29	CU	G,P	RLY	3- 45	C 45	EMU-I	DST	
						REL TO DEUTERONS			
62SE2	29	CU	G,P	ABX	15, 18	D 15, 18	SCI-I	UKN	
62VO1	29	CU	G,P	RLY	6- 90	C 34, 90	TEL-D	90	
63OD1	29	CU	G,P	ABY	5- 22	C 22	EMU-I	DST	
64RA3	29	CU	G,P	ABX	THR- 27	C 30	SCI-I	DST	
66VO1	29	CU	G,P	ABX	THR- 52	C 23- 52	TEL-D	90	
71AN1	29	CU	G,P	SPC	37-999	C700,999	TEL-D	DST	
						999=1.2 GEV, REL D/P			

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
56DA2	29	CU	G,XP	SPC	6- 70	C 70	EMU-D	DST	
60CH1	29	CU	G,XP	RLX	THR- 90	C 90	TEL-I	90	
						REL TO DEUTERONS			
61MA2	29	CU	G,XP	NOX	6- 21	C 21	SCI-D	DST	
63MI5	29	CU	G,XP	ABY	7- 22	C 22	SCI-I	DST	
56FO1	29	CU	G,D	RLY	THR- 30	C 30	EMU-D	90	
						YLD REL TO G,P			
60KO4	29	CU	G,D	RLY	15- 35	C 70	EMU-D	DST	
61HO1	29	CU	G,D	RLY	11- 45	C 45	EMU-I	DST	
						REL TO PROTONS			
62VO1	29	CU	G,D	RLY	11- 90	C 34, 90	TEL-D	90	
63YA2	29	CU	G,D	RLY	14- 26	C 26	EMU-D	DST	
						YIELD REL TO PROTN			
64SH3	29	CU	G,D	RLY	15- 40	C 24- 40	MSP-I	4PI	
66VO1	29	CU	G,D	ABX	THR- 52	C 23- 52	TEL-D	90	
71AN1	29	CU	G,D	SPC	45-999	C700,999	TEL-D	DST	
						999=1.2 GEV, REL D/P			
60CH1	29	CU	G,XD	RLX	THR- 90	C 90	TEL-I	90	
						REL TO PROTONS			
56HE1	29	CU	G,T	RLY	THR- 31	C 31	ACT-I	4PI	
56WA1	29	CU	G,T	RLY	THR- 31	C 31	ACT-I	4PI	
62VO1	29	CU	G,T	RLY	15- 90	C 34, 90	TEL-D	90	
60CH1	29	CU	G,XT	RLY	THR- 90	C 90	TEL-I	90	
						REL TO DEUTERONS			
57BO1	29	CU	G,A	SPC	THR- 30	C 31	EMU-D	DST	
58TO2	29	CU	G,A	SPC	7- 22	C 22	EMU-D	DST	
61FO1	29	CU	G,A	RLY	7- 22	C 30	EMU-I	UKN	
						REL TO PROTONS			
63KR1	29	CU	G,A	SPC	9- 30	C 21, 30	SCD-D	90	
						RELATIVE YIELD			
64SC1	29	CU	G,A	SPC	THR- 33	C 33	SCD-D	90	
							ABS YIELD		
65ME2	29	CU	G,A	SPC	THR- 35	C 35	SCD-D	90	
72KE4	29	CU	G,A	RLY	5- 32	C 32	SCD-D	DST	
60ST1	29	CU	G,NP	RLX	144-320	C320	TEL-D	76	
						REL TO H2 CROS SEC			
64MA4	29	CU	G,CU62	ABY	150-720	C150-720	ACT-I	4PI	
69DI3	29	CU	G,SPL	RLY	THR-600	C600	ACT-I	4PI	
71ME1	29	CU	G,F	ABY	THR-900	C300-900	TRK-I	4PI	
71GR2	29	CU	G,PI+	ABY	150-560	C560	EMU-D	DST	
						PI-/PI+ YIELD RATIO			
71GR2	29	CU	G,PI-	ABY	150-560	C560	EMU-D	DST	
						PI-/PI+ YIELD RATIO			
61CA1	29	CU60	D,G	ABX	14- 16	D 3-	ACT-I	4PI	
57HI1	29	CU63	E,N	ABX	10- B2	D 30- 82	ACT-I	4PI	
						MULTIPOLARITIES			
65HE1	29	CU63	E,N	RLY	THR- 32	D 14- 32	ACT-I	4PI	
72KU6	29	CU63	E,N	ABX	11- 30	D 20- 30	ACT-I	4PI	
						E+/E- YIELD RATIO			
65HE1	29	CU63	E+,N	RLY	THR- 32	D 14- 32	ACT-I	4PI	
60BO3	29	CU63	G,G	LFT	0- 2	C 0-	NAI-D	100	
								J	
61RO1	29	CU63	G,G	ABX	0- 1	D 0-	NAI-D	DST	
							LIFETIMES		
62BO6	29	CU63	G,G	LFT	0- 4	C 0-	NAI-D	110	
								J-PI	
63MC1	29	CU63	G,G	LFT	1	D 1	NAI-D	90	
64BO1	29	CU63	G,G	LFT	1- 3	C 1-	NAI-D	100	
								ABI	
68AL1	29	CU63	G,G	LFT	0- 2	C 4	SCD-D	130	
							1.414,1.551 MEV		
68TA2	29	CU63	G,G	LFT	1	D 1	NAI-D	90	
							1=.963 MEV		
69BE7	29	CU63	G,G	LFT	6, 8	D 6, 8	UKN-D	DST	
						6.07, 8.50 MEV			
55CA1	29	CU63	G,N	RLY	18	D 18	ACT-I	4PI	
55SC1	29	CU63	G,N	ABX	10- 20	C 12- 20	ACT-I	4PI	
58BE1	29	CU63	G,N	RLY	10- 11	C 10- 11	ACT-I	4PI	
							THRESHOLD		
59NA1	29	CU63	G,N	ABX	18	D 18	BF3-I	4PI	
59PE3	29	CU63	G,N	RLY	10- 11	C 10- 11	ACT-I	4PI	
							THRESHOLD		
60GE3	29	CU63	G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
61CO2	29	CU63	G,N	ABX	12- 18	D 12- 18	ACT-I	4PI	
62DE1	29	CU63	G,N	ABX	21	D 21	ACT-I	4PI	
64FU1	29	CU63	G,N	ABX	10- 28	D 10- 28	BF3-I	4PI	20
65GR1	29	CU63	G,N	ABX	THR- 44	C 10- 66	ACT-I	4PI	
68OW1	29	CU63	G,N	RLX	12- 24	C 10- 24	ACT-I	4PI	110
68SU1	29	CU63	G,N	ABX	THR- 25	D 10- 25	ACT-I	4PI	
72DR2	29	CU63	G,N	ABX	11- 26	C 11- 26	ACT-I	4PI	446
64FU1	29	CU63	G,2N	ABX	19- 28	D 10- 28	BF3-I	4PI	19
68SU1	29	CU63	G,2N	ABX	THR- 26	D 10- 26	ACT-I	4PI	
60YA1	29	CU63	G,P	ABX	15, 18	D 15, 18	ACT-I	4PI	
69AN6	29	CU63	G,P	ABY	103-999	C700,999	TEL-D	DST	
							999=1.2 GEV		
62CH2	29	CU63	G,XP	RLY	6- 90	C 34- 90	TEL-D	DST	
							REL TO DEUTERONS		
64MA2	29	CU63	G,XP	SPC	THR- 17	C 17	SCD-D	UKN	
68AB2	29	CU63	G,XP	SPC	THR- 27	C 27	SCD-D	90	
63GO8	29	CU63	G,D	RLY	14- 22	C 22	EMU-I	DST	
							REL TO PROTONS		
69AN6	29	CU63	G,D	ABY	112-999	C700,999	TEL-D	DST	
							999=1.2 GEV		
62CH2	29	CU63	G,XD	RLY	11- 90	C 34- 90	TEL-D	DST	
							REL TO PROTONS		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58TO2	29CU63		G,A	A8Y	6- 22 C 22		EMU-I DST		
						SEPARATED ISOTOPE			
63GO8	29CU63		G,A	RLY	THR- 22 C 22		EMU-I DST		
						REL TO PROTONS			
66HD3	29CU63		G,A	A8Y	THR- 31 C 31		SCD-D 130		
68OK1	29CU63		G,A	A8Y	THR- 20 C 20		ACT-I 4PI		
68RI3	29CU63		G,NA	RLY	THR- 50 C 30- 50		ACT-I 4PI		
							RLY G,2N		
68RI3	29CU63		G,2NA	RLY	THR- 50 C 30- 50		ACT-I 4PI		
							RLY G,2N		
60BO3	29CU65		G,G	LFT	0- 2 C 0-		NAI-D 100		
63KA1	29CU65		G,G	LFT	1 D 1		NAI-D 108		
						MEAN A8S CROSS SEC			
648E6	29CU65		G,G	LFT	1 D 1		NAI-O DST		
						MIXING RATIO			
648D1	29CU65		G,G	LFT	1- 3 C 1-		NAI-D 100		
							A8I		
68ME3	29CU65		G,G	LFT	1 D 1		NAI-D DST		
							1=1.116 MEV		
698E7	29CU65		G,G	LFT	6, 8 D 6, 8		UKN-D DST		
							6.07, 8.50 MEV		
588E1	29CU65		G,N	RLY	9- 11 C 9- 11		ACT-I 4PI		
							THRESHOLD		
60GE3	29CU65		G,N	NOX	THR CTHR		8F3-I 4PI		
							THRESHOLD		
61CD2	29CU65		G,N	RLX	15, 18 D 15, 18		ACT-I 4PI		
							REL TO CU63		
64FU1	29CU65		G,N	A8X	10- 28 D 10- 28		8F3-I 4PI		
67DE4	29CU65		G,N	NOX	THR-260 C260		ACT-I DST		
64FU1	29CU65		G,2N	A8X	16- 28 O 10- 28		8F3-I 4PI		
60AI1	29CU65		G,3N	ABI	29-110 C 29-110		ACT-I 4PI		
60LI1	29CU65		G,P	A8X	12- 28 C 12- 28		EMU-D DST		
							SPECTRUM		
62CH2	29CU65		G,XP	RLY	7- 90 C 34- 90		TEL-D OST		
						REL TO DEUTERONS			
68AB2	29CU65		G,XP	SPC	THR- 27 C 27		SCO-D 90		
62CH2	29CU65		G,XD	RLY	15- 90 C 34- 90		TEL-O DST		
						REL TO PROTONS			
57ER1	29CU65		G,A	A8I	4- 32 C 32		ACT-I 4PI		
718L1	29CU65		G,PI+	A8Y	150-700 C150-700		ACT-I 4PI		
							SEE 68NY1		

ZINC Z=30

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
64	48.89	11.9	7.7	19.0	16.7	4.0	21.0	18.6	13.8
66	27.81	11.1	8.9	18.3	18.3	4.6	19.0	18.8	16.4
67	4.11	7.1	8.9	17.4	15.7	4.8	18.1	16.0	17.3
68	18.57	10.2	10.0	17.7	19.8	5.3	17.3	19.1	18.5
70	0.62	9.2	10.9	17.2	21.3	5.9	15.7	19.5	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	30ZN		G,G	ABX	7 D 7		NAI-D 90		
63SU1	30ZN		G,G	A8X	4- 14 C 4- 14		NAI-D 120		
668E3	30ZN		G,G	RLX	5- 10 O 5- 10		NAI-D 135		
61TA1	30ZN		G,N	NOX	12- 22 C 22		THR-I DST		
67HU2	30ZN		G,N	A8Y	THR- 22 C 22		THR-I OST		
68KA1	30ZN		G,N	ABX	50- 85 C 55, 85		TOF-D 67		
							NEUT ENGY SPEC		
70CO1	30ZN		G,N	RLX	12- 40 C 10- 40		ACT-I 4PI		
70CO1	30ZN		G,2N	RLX	21- 40 C 10- 40		ACT-I 4PI		
56GA1	30ZN		G,XN	ABX	7- 27 C 9- 27		8F3-I 4PI		
56HA1	30ZN		G,XN	A8X	15, 18 D 15, 18		8F3-I 4PI		
64CO2	30ZN		G,XN	A8Y	THR- 80 C 80		8F3-I 4PI		
67CO1	30ZN		G,XN	A8X	12- 24 C 24		8F3-I 4PI		438
71CO2	30ZN		G,XN	A8I	36- 64 C 10- 64		8F3-I 4PI		
							FAST N YIELD		
55DL1	30ZN		G,P	A8X	18 O 18		EMU-D 4PI		
57OS1	30ZN		G,P	A8X	THR- 31 C 20- 31		EMU-D DST		
63MI5	30ZN		G,XP	A8Y	10- 22 C 22		SCI-I OST		
66AC1	30ZN		G,D	YLD	16- 22 C 22		MAG-O 4PI		
							YIELD UPPER LIMIT		
70CU1	30ZN		G,T	A8Y	THR- 90 C 90		ACT-I 4PI		
58TO2	30ZN		G,A	A8Y	2- 22 C 22		EMU-I OST		
66HO3	30ZN		G,A	SPC	THR- 31 C 31		SCD-D 130		
72KE4	30ZN		G,A	RLY	4- 32 C 16- 32		SCD-D DST		
70CO1	30ZN		G,NP	RLX	19- 40 C 10- 40		ACT-I 4PI		
65VA3	30ZN		G,CU64	ABI	50-300 C 50-300		ACT-I 4PI		
70AF1	30ZN64		E,E/	FMF	0- 3 D150,225		MAG-O DST		
							.99,3.0 MEV, B(EL)		
72LI1	30ZN64		E,E/	FMF	0- 2 D 60-120		MAG-D OST		
							.99,1.80 MEV		
698E7	30ZN64		G,G	LFT	7 O 7		UKN-D DST		
							7.38 MEV		
72ME3	30ZN64		G,G	LFT	3- 5 C 5		SCD-O DST		
							J-PI		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
55DE1	30ZN64		G,N	A8X	12- 23 C 12- 23		ACT-1 4PI		
55VI1	30ZN64		G,N	A8X	12- 22 C 12- 22		ACT-I 4PI		
59NA1	30ZN64		G,N	A8X	18 D 18		8F3-I 4PI		
60RO4	30ZN64		G,N	A8X	12- 23 C 12- 23		ACT-I 4PI		
61CO2	30ZN64		G,N	RLX	15, 18 D 15, 18		ACT-I 4PI		
							REL TO CU63(G,N)		
62DE1	30ZN64		G,N	A8X	21 D 21		ACT-I 4PI		
67CA1	30ZN64		G,N	RLX	12- 22 C 12- 22		ACT-I 4PI		
680W1	30ZN64		G,N	RLX	12- 24 C 10- 24		ACT-1 4PI		109
55DE1	30ZN64		G,2N	ABY	20- 23 C 20- 23		ACT-I 4PI		
							THRESHOLD		
55VI1	30ZN64		G,2N	A8Y	15- 22 C 12- 22		ACT-I 4PI		
57EL1	30ZN64		G,2N	RLY	THR- 30 C 32		ACT-I 4PI		
58HO1	30ZN64		G,2N	A8I	20- 28 C 28		ACT-I 4PI		
							THRESHOLD		
58GO3	30ZN64		G,D	A8X	16- 22 C 16- 22		ACT-I 4PI		
							REACTION UNCERTAIN		
58GO3	30ZN64		G,NP	A8X	16- 22 C 16- 22		ACT-I 4PI		
							REACTION UNCERTAIN		
58HO1	30ZN64		G,NP	A8I	18- 28 C 28		ACT-I 4PI		
							THRESHOLD		
71PA3	30ZN64		P,G	A8X	10- 26 D 2- 18		NAI-D 90		
70AF1	30ZN66		E,E/	FMF	0- 3 D150,225		MAG-D DST		
							1.04,2.8 MEV,B(EL)		
678E5	30ZN66		G,G	LFT	1 D 1		NAI-D 120		
							1=1.064 MEV		
68SH5	30ZN66		G,G	NOX	7 D 7		SCD-O DST		
							7=7.368 MEV		
69SH1	30ZN66		G,G	LFT	7 D 7		SCD-O 135		
							7=7.368 MEV		
72ME3	30ZN66		G,G	LFT	3- 5 C 5		SCD-D OST		
							J-PI		
64CO3	30ZN66		G,N	A8I	THR- 80 C 10- 80		8F3-I 4PI		
55VI1	30ZN66		G,D	A8X	20- 22 C 20- 22		ACT-I 4PI		
							INCLUDES G,NP		
58GO3	30ZN66		G,D	A8X	16- 22 C 16- 22		ACT-I 4PI		
							REACTION UNCERTAIN		
55DE1	30ZN66		G,NP	A8X	19- 23 C 19- 23		ACT-I 4PI		
57EL1	30ZN66		G,NP	A8X	22- 30 C 32		ACT-I 4PI		
58GO3	30ZN66		G,NP	A8X	16- 22 C 16- 22		ACT-I 4PI		
							REACTION UNCERTAIN		
58HO1	30ZN66		G,NP	A8X	21- 32 C 15- 32		ACT-I 4PI		
							THRESHOLD		
68OK3	30ZN66		G,NP	A8Y	THR- 20 C 20		ACT-I 4PI		
66IV1	30ZN67		G,P	A8X	THR- 28 C 12- 28		ACT-I 4PI		
72ME3	30ZN68		G,G	LFT	3- 5 C 5		SCD-D OST		
							J-PI		
57EL1	30ZN68		G,P	A8X	13- 30 C 32		ACT-I 4PI		
58HO1	30ZN68		G,P	RLY	10- 32 C 15- 32		ACT-I 4PI		
							THRESHOLD		

GALLIUM Z=31

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
69	60.4	10.3	6.6	15.4	18.0	4.5	18.6	16.8	16.6
71	39.6	9.3	7.9	15.1	19.7	5.3	17.0	17.1	18.8

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
64CO3	31GA		G,N	A8I	THR- 80 C 10- 80		8F3-I 4PI		
648A4	31GA		G,XN	A8X	10- 27 C 10- 27		8F3-I 4PI		
						658A3	SAME DATA		
648A5	31GA		G,XN	ABX	11- 26 C 11- 26		8F3-I 4PI		
64CO2	31GA		G,XN	ABY	THR- 80 C 80		8F3-I 4PI		
658A3	31GA		G,XN	A8X	THR- 28 C 10- 30		8F3-I 4PI		
59CA1	31GA66		O,G	ABX	14- 16 D 3-		ACT-I 4PI		
68AL1	31GA69		G,G	LFT	0- 1 C 4		SCD-O 130		
							0.872,1.107 MEV		
68LA1	31GA69		G,G	LFT	0- 1 D 0- 1		NAI-O 130		
							4 LEVELS TO 1.337		
60GE3	31GA71		G,N	NOX	THR CTHR		8F3-I 4PI		
							THRESHOLD		
68OK1	31GA71		G,A	ABY	THR- 20 C 20		ACT-I 4PI		

GERMANIUM Z=32

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
70	20.52	11.5	8.5	18.6	17.6	4.1	20.0	18.8	15.1
72	27.43	10.7	9.7	18.2	19.1	5.0	18.2	19.0	17.6
73	7.76	6.8	10.0	17.3	16.7	5.3	17.5	16.5	18.5
74	36.54	10.2	11.0	18.2	21.0	6.3	17.0	20.2	19.9
76	7.76	9.4	12.0	18.4	*	7.5	15.9	20.7	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
64CO3	32GE		G,N	ABI	THR- 80 C 10- 80		BF3-I	4PI	
64CO2	32GE		G,XN	ABY	THR- 80 C 80		BF3-I	4PI	
6BKR2	32GE		G,A	ABX	THR- 33 C 33		SCD-D	90	
70MO4	32GE	70	G,G	LFT	6 D 6		SCD-D	DST	
						6.018,J-PI,LFT			
55BO1	32GE	70	G,N	ABX	12- 21 C 12- 21		ACT-I	4PI	
55DE1	32GE	70	G,N	ABX	9- 21 C 9- 21		ACT-I	4PI	
						THRESHOLD			
60FE1	32GE	70	G,N	ABX	11- 31 C 31		ACT-I	4PI	
60FE1	32GE	70	G,NP	ABX	18- 31 C 31		ACT-I	4PI	
56ME1	32GE	72	G,G	LFT	1 D 1		NAI-D	DST	
								J	
58TO1	32GE	73	G,N	RLY	7- 22 C 22		BF3-I	4PI	
						THRESHOLD			
56HE2	32GE	73	G,A	RLY	THR- 31 C 31		ACT-I	4PI	
						REL CU 63			
6BOK1	32GE	73	G,A	ABY	THR- 20 C 20		ACT-I	4PI	
56ME1	32GE	74	G,G	LFT	1 D 1		NAI-D	DST	
								J	
70MO2	32GE	74	G,G	ABX	6 D 6		SCD-D	DST	
						6=6.018,LFT			
71MO2	32GE	74	G,G/	LFT	6, 8 D 6, 8		SCD-D	DST	
						6.018, 7.632 MEV			
68OK3	32GE	74	G,P	ABY	THR- 20 C 20		ACT-I	4PI	
55BO1	32GE	76	G,N	ABX	9- 21 C 9- 21		ACT-I	4PI	
55DE1	32GE	76	G,N	ABX	9- 21 C 9- 21		ACT-I	4PI	
62CA1	32GE	76	G,N	NOX	10- 30 C 30		ACT-I	4PI	
						ISOMERIC RATIO			
68OK2	32GE	76	G,N	ABY	THR- 20 C 20		ACT-I	4PI	
						ISOMERIC YIELD			

ARSENIC Z=33

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
75	100.00	10.2	6.9	15.4	19.4	5.3	18.2	17.1	17.9

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
66AM2	33AS75		E,E/P	SPC	105-365 D560-880	MAG-D	62		
						ANGLE OF E/ IS 51			
62ME2	33AS75		G,G	LFT	1 D 1		NAI-D	0	
63SU1	33AS75		G,G	ABX	4- 14 C 4- 14		NAI-D	120	
64SH5	33AS75		G,G	LFT	1 D 1		NAI-D	122	
						1=.265 MEV			
67LA1	33AS75		G,G	LFT	1 D 1		NAI-D	DST	
						1=.265,.280 MEV			
68AL1	33AS75		G,G	LFT	0- 1 C 4		SCD-D	DST	
						0.86,1.07,1.35 MEV			
69MO3	33AS75		G,G	ABX	8 D 8		SCD-D	DST	
						J-PI,G-WIDTH,7.646			
70AR1	33AS75		G,G	ABX	12- 30 C 32		NAI-D	DST	
						GETS G,G/TO 2+			
70MO2	33AS75		G,G	ABX	8 D 8		SCD-D	DST	
						8=7.646,LFT			
56SU1	33AS75		G,N	RLY	THR-320 C140,320		ACT-I	4PI	
57FE2	33AS75		G,N	ABY	14- 30 C 14- 30		THR-I	4PI	
58CH2	33AS75		G,N	RLY	THR CTHR		BF3-I	4PI	
						THRESHOLD			
60GE3	33AS75		G,N	NOX	THR CTHR		BF3-I	4PI	
						THRESHOLD			
61TA1	33AS75		G,N	NOX	7- 22 C 22		THR-I	DST	
64CO3	33AS75		G,N	ABI	THR- 80 C 10- 80		BF3-I	4PI	
67HU1	33AS75		G,N	A8X	11 D 11		BF3-I	4PI	
71SA1	33AS75		G,N	A8Y	10- 68 C 10- 68		ACT-I	4PI	
69BE1	33AS75		G,2N	ABX	THR- 30 D 18- 30		8F3-I	4PI	
56SU1	33AS75		G,3N	RLY	THR-320 C140,320		ACT-I	4PI	
5BKA1	33AS75		G,XN	ABX	10- 22 C 10- 22		BF3-I	4PI	
618A2	33AS75		G,XN	ABY	THR- 22 C 22		THR-I	DST	
64CO2	33AS75		G,XN	ABY	THR- 80 C 80		BF3-I	4PI	
65FI1	33AS75		G,XN	ABX	10- 25 C 10- 25		8F3-I	4PI	
698E1	33AS75		G,XN	ABX	THR- 30 D 10- 30		BF3-I	4PI	144+
56SU1	33AS75		G,2P	RLY	THR-320 C140,320		ACT-I	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
56SU1	33AS75		G,N2P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,3N2P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,3N4P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,4N5P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,5N2P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,5N5P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,7N2P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,7N4P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,BN6P	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,CU61	RLY	THR-320 C140,320		ACT-I	4PI	
56SU1	33AS75		G,CU65	RLY	THR-320 C140,320		ACT-I	4PI	
71KU2	33AS75		G,SPL	A8Y	THR-999 C900		ACT-I	4PI	
						999 = 1.5 GEV			

SELENIUM Z=34

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
74	0.87	12.1	8.5	19.3	17.2	4.1	20.7	19.3	14.2
76	9.02	11.2	9.5	19.3	18.9	5.1	19.2	19.8	16.4
77	7.58	7.4	9.6	18.7	16.1	5.7	18.6	16.9	17.3
78	23.52	10.5	10.4	18.9	20.1	6.0	17.9	20.1	18.4
80	49.82	9.9	11.4	18.8	21.5	7.0	16.9	20.4	20.6
82	9.19	9.3	12.3	18.8	23.1	8.2	16.0	21.2	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
66BE3	34SE		G,G	RLX	5- 10 D 5- 10		NAI-D	135	
70AR1	34SE		G,G	ABX	12- 30 C 32		NAI-D	DST	
						RATIO G,G/TO 2+			
63KA2	34SE		G,G/	RLY	1 C 5		ACT-I	4PI	
67HU2	34SE		G,N	ABY	THR- 22 C 22		THR-I	DST	
67CO2	34SE		G,XN	ABX	THR- 24 C 11- 24		BF3-I	4PI	437
71CO2	34SE		G,XN	ABI	36- 64 C 10- 64		BF3-I	4PI	437
						FAST N YIELD			
66WE2	34SE		G,A	ABX	6- 33 C 33		SCD-D	90	
60DE2	34SE	76	G,G	LFT	1 D 1		NAI-D	UKN	
63PR2	34SE	76	G,G	LFT	1 D 1		NAI-D	DST	
69BO3	34SE	77	G,G	ABX	0- 2 C 0- 2		ACT-I	4PI	
63VE2	34SE	77	G,G/	ABX	0- 1 D 1		ACT-I	4PI	
						ISOMERS 1=1.33 MEV			
6BOK3	34SE	77	G,P	ABY	THR- 20 C 20		ACT-I	4PI	
6BOK2	34SE	78	G,N	ABY	THR- 20 C 20		ACT-I	4PI	
						ISOMERIC YIELD			
58HO1	34SE	80	G,NP	RLY	20- 32 C 32		ACT-I	4PI	
						THRESHOLD			
56SI2	34SE	82	G,N	ABX	9- 22 C 9- 22		ACT-I	4PI	

BROMINE Z=35

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
79	50.54	10.7	6.3	15.8	18.7	5.5	19.0	16.8	16.7
81	49.46	10.2	7.5	15.9	20.2	6.5	18.0	17.4	18.9

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
63KA2	35BR		G,G/	RLY	1 C 4		ACT-I	4PI	
68JU1	35BR		G,N	NOX	THR- 27 C 27		THR-I	DST	
66LA1	35BR	79	G,G	LFT	0- 1 D 0- 1		NAI-D	123	
						1=.834 MEV			
57KI1	35BR	81	G,N	RLY	10- 70 C 15- 70		BF3-I	4PI	
60GE3	35BR	81	G,N	NOX	THR CTHR		BF3-I	4PI	
						THRESHOLD			
62CA1	35BR	81	G,N	NOX	10- 30 C 30		ACT-I	4PI	
						ISOMERIC RATIO			
55SC2	35BR	81	G,A	ABY	THR- 32 C 32		ACT-I	4PI	
57ER1	35BR	81	G,A	A8I	6- 32 C 32		ACT-I	4PI	
6BOK1	35BR	81	G,A	A8Y	THR- 20 C 20		ACT-I	4PI	

KRYPTDN Z=36

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
78	0.35	12.0	8.2	19.9	16.9	4.4	21.1	19.4	13.5
80	2.27	11.5	9.1	19.6	18.2	5.1	19.9	19.8	15.4
82	11.56	11.0	9.9	19.5	19.6	6.0	18.8	20.1	17.4
83	11.55	7.5	9.8	19.1	17.2	6.5	18.5	17.4	18.2
84	56.90	10.5	10.7	19.4	21.0	7.1	18.0	20.3	19.4
86	17.37	9.9	11.9	19.2	22.8	8.1	17.0	20.9	21.9

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69HD1	36KR		G,XP	ABY	THR- 33 C 24- 33		SCI-D	90	
66BE2	36KR82		G,G	LFT	1 C 1		NAI-D	113	
							1=.777 MEV		
69HD1	36KR84		G,XP	ABY	THR- 33 C 24- 33		SCI-D	90	

RU8IDIUM Z=37

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
85	72.15	10.5	7.0	16.5	19.6	6.6	19.4	17.5	17.7
87	27.85	9.9	8.6	17.1	21.8	8.0	18.6	18.5	20.5

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71LE1	37R8		G,N	ABX	11- 24 D 11- 24		MOD-I 4PI	375	
71LE1	37R8		G,2N	A8X	17- 24 D 11- 24		MDD-I 4PI	376	
618A2	37R8		G,XN	A8Y	THR- 22 C 22		THR-I DST		
58TD1	37R885		G,N	RLY	10- 11 C 22		ACT-I 4PI		
							THRESHDLD		
60GE3	37R885		G,N	NDX	THR	CTHR	8F3-I 4PI		
							THRESHDLD		
69KN1	37R885		G,N	RLY	10- 45 C 45		ACT-I 4PI		
							ISOMER YIELD		
58TD1	37R887		G,N	RLY	9- 11 C 22		8F3-I 4PI		
							THRESHOLD		
60GE3	37R887		G,N	NOX	THR	CTHR	8F3-I 4PI		
							THRESHOLD		
57ER1	37R887		G,A	A8I	8- 32 C 32		ACT-I 4PI		
57ER1	37R887		G,NA	A8I	17- 32 C 32		ACT-I 4PI		

STRONTIUM Z=38

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
84	0.56	12.0	9.0	20.2	17.9	5.2	21.2	19.8	14.6
86	9.86	11.5	9.6	20.5	19.5	6.3	20.0	20.1	16.7
87	7.02	8.4	9.4	20.1	17.4	7.3	19.9	18.1	18.0
88	82.56	11.1	10.6	20.7	21.4	7.9	19.5	20.5	19.2

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
63KA2	38SR		G,G/	RLY	1 C 6		ACT-I 4PI		
71LE1	38SR		G,N	ABX	11- 27 D 11- 27		MOD-I 4PI	378	
71LE1	38SR		G,2N	ABX	19- 27 D 11- 27		MDD-I 4PI	379	
618A2	38SR		G,XN	ABY	THR- 22 C 22		THR-I DST		
70HI1	38SR		G,XN	A8X	10- 27 C 10- 27		8F3-I 4PI	329	
62CA1	38SR86		G,N	NDX	12- 30 C 30		ACT-I 4PI		
							ISOMER RATID		
56YE2	38SR86		G,XN	A8X	11- 23 C 24		8F3-I 4PI		
63VE2	38SR87		G,G/	A8X	0- 1 D 1		ACT-I 4PI		
							ISDMERS 1=1.33 MEV		
56YE2	38SR87		G,XN	A8X	9- 23 C 24		8F3-I 4PI		
68DK3	38SR87		G,P	ABY	THR- 20 C 20		ACT-I 4PI		
56HE3	38SR88		E,E/	FMF	1- 7 D187		MAG-D DST		
68PE1	38SR88		E,E/	RLY	1- 7 D 65, 70		MAG-D DST		
							B(EL), 4 LEVELS		
69SH5	38SR88		E,P	A8X	14- 25 D 16- 30		MAG-D UKN		
69SH6	38SR88		E,P	SPC	14- 30 D 30		MAG-D UKN		
648E7	38SR88		G,G	LFT	2 D 2		UKN-D UKN		
							2=1.85 MEV		
56YE2	38SR88		G,XN	A8X	11- 23 C 24		8F3-I 4PI		
718L1	38SR88		G,PI+	A8Y	150-700 C150-700		ACT-I 4PI		
							SEE 68NY1		
69HA1	38SR88		P,G	RLX	15- 22 D 4- 12		NAI-D	90	207+

YTTRIUM Z=39

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
89	100.00	11.5	7.1	18.1	19.9	8.0	20.8	18.2	17.7

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67SH1	39Y	89	E,E/	FMF	2- 3 D225		MAG-D DST		
							2.5 MEV		
68PE1	39Y	89	E,E/	RLY	1- 3 D 65, 70		MAG-D DST		
							5 LEVELS		
71MO3	39Y	89	E,E/	A8X	0-240 D500		MAG-D	60	
69SH6	39Y	89	E,P	SPC	10- 26 D 20		MAG-D UKN		
68AL1	39Y	89	G,G	LFT	2 C 4		SCD-D	130	
							2=1.51 MEV		
70AR1	39Y	89	G,G	A8X	12- 30 C 32		NAI-D DST		
							RATID G,G/TO 2+		
58SI1	39Y	89	G,G/	A8Y	2- 21 C 22		ACT-I 4PI		
63KA2	39Y	89	G,G/	RLY	1 C 5		ACT-I 4PI		
63VE2	39Y	89	G,G/	A8X	0- 1 D 1		ACT-I 4PI		
							ISDMERS 1=1.33 MEV		
58CH2	39Y	89	G,N	RLY	THR	CTHR	8F3-I 4PI		
							THRESHDLD		
60GE3	39Y	89	G,N	NOX	THR	CTHR	8F3-I 4PI		
							THRESHDLD		
62RE1	39Y	89	G,N	NOX	6- 55 C 55		THR-I DST		
63GE1	39Y	89	G,N	RLY	11- 12 C 11- 12		8F3-I 4PI		
							THRESHOLD		
678E2	39Y	89	G,N	A8X	THR- 28 DTHR- 28		8F3-I 4PI		
698E4	39Y	89	G,N	A8X	11- 25 D 11- 26		MOD-I 4PI	188	
71LE1	39Y	89	G,N	A8X	11- 27 D 11- 27		MDD-I 4PI	381	
71SA1	39Y	89	G,N	A8Y	11- 68 C 10- 68		ACT-I 4PI		
66FU2	39Y	89	G,2N	A8I	THR- 28 DTHR- 28		8F3-I 4PI		
66WA1	39Y	89	G,2N	RLY	THR-280 C150,280		ACT-I 4PI		
							ISOMER RATIO Y 87		
678E2	39Y	89	G,2N	A8X	THR- 28 DTHR- 28		8F3-I 4PI		1+
698E4	39Y	89	G,2N	A8X	21- 27 D 19- 28		MDD-I 4PI	189	
70WA3	39Y	89	G,2N	RLY	THR-305 C150-305		ACT-I 4PI		
71LE1	39Y	89	G,2N	A8X	21- 27 D 11- 27		MDD-I 4PI	382	
56YE2	39Y	89	G,XN	A8X	12- 23 C 24		8F3-I 4PI		
58KA1	39Y	89	G,XN	A8X	12- 22 C 12- 22		8F3-I 4PI		
618A2	39Y	89	G,XN	A8Y	THR- 22 C 22		THR-I DST		
66FU2	39Y	89	G,XN	A8I	THR- 28 DTHR- 28		8F3-I 4PI		
69SH4	39Y	89	G,P	A8X	7- 24 C 17- 24		EMU-D DST		
67TA2	39Y	89	G,XP	SPC	THR- 24 C 17, 24		EMU-D 4PI		
70WA3	39Y	89	G,PN	RLY	THR-305 C150-305		ACT-I 4PI		
68SH1	39Y	89	P,G	A8X	13- 15 D 5- 9		NAI-D DST		
69RI1	39Y	89	P,G	A8X	12 D 5		SCD-D	90	
							5=4.97-5.15 MEV		
71UM1	39Y	89	P,G	A8X	10- 11 D 2- 3		NAI-D	0	

ZIRCONIUM Z=40

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
90	51.46	12.0	8.4	20.7	18.8	6.7	21.3	19.8	15.4
91	11.23	7.2	8.7	18.6	14.9	5.5	19.2	15.6	16.3
92	17.11	8.6	9.4	15.7	17.2	3.0	15.8	17.3	17.1
94	17.40	8.2	10.3	15.9	18.5	3.8	14.9	17.8	18.9
96	2.80	7.8	11.5	16.1	20.4	4.9	14.3	18.5	21.3

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	40ZR		G,G	ABX	7 D 7		NAI-D	90	
66BE3	40ZR		G,G	RLX	5- 10 D 5- 10		NAI-D	135	
70AX1	40ZR		G,G	ABX	8- 13 D 8- 13		NAI-D	22	
67HU2	40ZR		G,N	A8Y	THR- 22		THR-I DST		
64DU1	40ZR		G,P	A8X	THR- 34 C 22- 34		MAG-D DST		
							A8X		
65DU1	40ZR		G,P	A8X	18- 26 D 17- 24		EMU-D DST		
69SH4	40ZR		G,P	A8X	8- 24 C 20, 24		EMU-D DST		
63MI5	40ZR		G,XP	A8Y	8- 22 C 22		SCI-I DST		
698D2	40ZR90		E,E/	FMF	2- 4 D 58		MAG-D DST		
							2.18 TD 3.84 MEV		
708E2	40ZR90		E,E/	A8X	0- 4 D 42- 61		MAG-D DST		
							2.18,2.74,3.84		
68SH4	40ZR90		E,P	SPC	11- 20 D 20		MAG-D	90	
							ANALDG STATES		
69SH5	40ZR90		E,P	ABX	12- 23 D 16- 24		MAG-D UKN		
69SH6	40ZR90		E,P	SPC	12- 22 D 16- 23		MAG-D DST		
63AX1	40ZR90		G,G	A8X	8- 13 D 8- 13		NAI-D	135	
69RA1	40ZR90		G,G	LFT	9 D 9		NAI-D DST		
							9=8.496 MEV		
56AX1	40ZR90		G,N	RLX	12- 23 C 12- 23		ACT-I 4PI		
							THRESHDLD		
59MU2	40ZR90		G,N	RLX	12- 24 C 12- 25		ACT-I 4PI		
62CA1	40ZR90		G,N	NOX	12- 30 C 30		ACT-I 4PI		
							ISDMERIC RATID		
65CD1	40ZR90		G,N	A8X	THR- 70 C 12- 70		ACT-I 4PI		
678E2	40ZR90		G,N	A8X	THR- 28 DTHR- 28		8F3-I 4PI		10+
71LE1	40ZR90		G,N	A8X	12- 26 D 12- 26		MDD-I 4PI	384	
66FU2	40ZR90		G,2N	A8I	THR- 28 DTHR- 28		8F3-I 4PI		
678E2	40ZR90		G,2N	A8X	THR- 28 DTHR- 28		8F3-I 4PI		10+
71LE1	40ZR90		G,2N	A8X	21- 26 D 12- 26		MOD-I 4PI	385	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
56YE2	40ZR90		G,XN	ABX	12- 23	C 24	BF3-I 4PI		
59NA1	40ZR90		G,XN	ABX	12- 24	C 5- 24	BF3-I 4PI		
							THRESHOLD		
66FU2	40ZR90		G,XN	ABI	THR- 28	DTHR- 28	BF3-I 4PI		
69AN7	40ZR90		G,XN	ABX	12- 23	C 12- 23	BF3-I 4PI		
71IS2	40ZR90		G,XN	ABX	12- 28	C 12- 28	BF3-I 4PI		413
64BL2	40ZR90		P,G	RLX	13- 17	D 5-	NAI-D DST		
							ANALOGUE T = 6		
66OB1	40ZR90		P,G	RLX	11- 14	D 2- 6	NAI-D	90	
67AX1	40ZR90		P,G	ABX	14- 25	D 5- 17	NAI-D	90	
67OB1	40ZR90		P,G	ABX	12- 13	D 4- 5	NAI-D	0	
69HA1	40ZR90		P,G	RLX	16- 22	D 7- 14	NAI-D	DST	
69MA4	40ZR90		P,G	ABX	10- 27	D 2- 19	NAI-D	DST	
71UM1	40ZR90		P,G	ABX	9- 10	D 2- 3	SCD-D	0	
67BE2	40ZR91		G,N	ABX	THR- 30	DTHR- 30	BF3-I 4PI		
66FU2	40ZR91		G,2N	ABI	THR- 30	DTHR- 30	BF3-I 4PI		
67BE2	40ZR91		G,2N	ABX	THR- 30	DTHR- 30	BF3-I 4PI		
55NA1	40ZR91		G,XN	ABX	7- 24	C 5- 24	BF3-I 4PI		
							THRESHOLD		
56YE2	40ZR91		G,XN	ABX	7- 23	C 24	BF3-I 4PI		
66FU2	40ZR91		G,XN	ABI	THR- 30	DTHR- 30	BF3-I 4PI		
69AN7	40ZR91		G,XN	ABX	12- 23	C 12- 23	BF3-I 4PI		
67BE2	40ZR92		G,N	ABX	THR- 28	DTHR- 28	BF3-I 4PI		10+
66FU2	40ZR92		G,2N	ABI	THR- 28	DTHR 28	BF3-I 4PI		
67BE2	40ZR92		G,2N	ABX	THR- 28	DTHR- 28	BF3-I 4PI		10+
56YE2	40ZR92		G,XN	ABX	9- 23	C 24	BF3-I 4PI		
66FU2	40ZR92		G,XN	ABI	THR- 28	DTHR 28	BF3-I 4PI		
67BE2	40ZR94		G,N	ABX	THR- 30	DTHR- 30	BF3-I 4PI		
66FU2	40ZR94		G,2N	ABI	THR- 30	DTHR 30	BF3-I 4PI		
67BE2	40ZR94		G,2N	ABX	THR- 30	DTHR- 30	BF3-I 4PI		12+
66FU2	40ZR94		G,XN	ABI	THR- 30	DTHR 30	BF3-I 4PI		

NIOBIUM Z=41

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
93	100.00	8.8	6.0	13.4	15.7	1.9	16.7	14.7	15.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67SH1	41NB93		E,E/	FMF	2- 3	D225	MAG-D DST		
							2.2 MEV		
58CH2	41NB93		G,N	RLY	THR	CTHR	BF3-I 4PI		
							THRESHOLD		
58SI2	41NB93		G,N	ABX	8- 22	C 8- 22	ACT-I 4PI		
60GE3	41NB93		G,N	NOX	THR	CTHR	BF3-I 4PI		
							THRESHOLD		
61WE1	41NB93		G,N	ABX	9- 10	D 9- 11	ACT-I 4PI		
67HU1	41NB93		G,N	ABX	9- 11	D 9- 11	BF3-I 4PI		
67HU2	41NB93		G,N	ABY	THR- 22	C 22	THR-I DST		
71LE1	41NB93		G,N	ABX	9- 24	D 9- 24	MOD-I 4PI		369
71SA1	41NB93		G,N	ABY	8- 68	C 10- 68	ACT-I 4PI		
71LE1	41NB93		G,2N	ABX	16- 24	D 9- 24	MOD-I 4PI		370
58KA1	41NB93		G,XN	ABX	9- 22	C 9- 22	BF3-I 4PI		
60BA5	41NB93		G,P	ABX	14- 40	C 40	MAG-D DST		
							SPECTRUM		
60BA6	41NB93		G,P	SPC	17- 40	C 10- 40	MAG-D DST		
63OS1	41NB93		G,P	RLY	10- 28	C 19- 28	EMU-D DST		
							SPECTRUM		
63MI5	41NB93		G,XP	ABY	10- 22	C 22	SCI-I DST		
64SC3	41NB93		G,XP	SPC	THR- 32	C 32	SCI-D	90	
								ABY	
58TO2	41NB93		G,A	ABY	2- 22	C 22	EMU-I DST		
64SC1	41NB93		G,A	SPC	THR- 33	C 33	SCD-D	90	
							ABS YIELD		
67KR1	41NB93		G,A	SPC	2- 31	C 31	SCD-D	90	
68KR2	41NB93		G,A	ABX	THR- 33	C 33	SCD-D	90	
66WA1	41NB93		G,4N2P	RLY	THR-280	C150,280	ACT-I 4PI		
							ISOMER RATIO Y 87		
71GO2	41NB93		G,PI+	RLY	150-500	C500	CCH-D DST		
							PI-/PI+ YIELD RATIO		

MOLYBDENUM Z=42

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
92	15.84	12.7	7.5	20.8	16.9	5.6	22.8	19.5	12.6
94	9.04	9.7	8.5	16.7	15.4	2.1	17.7	17.3	14.5
95	15.72	7.4	8.6	16.2	14.2	2.2	17.0	15.9	15.1
96	16.53	9.2	9.3	16.5	16.6	2.8	16.5	17.8	16.1
97	9.46	6.8	9.2	16.1	15.2	2.8	16.0	16.1	16.5
98	23.78	8.6	9.8	16.3	17.4	3.3	15.5	17.9	17.3
100	9.63	8.3	10.6	15.5	18.2	3.2	14.2	18.0	19.5

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	42MO		G,G	ABX	7	D 7	NAI-D	90	
66BE3	42MO		G,G	RLX	5- 10	D 5- 10	NAI-D	135	
67HU2	42MO		G,N	ABY	THR- 22	C 22	THR-I DST		
68JU1	42MO		G,N	NOX	THR- 22	C 22	THR-I DST		
71CO2	42MO		G,XN	ABI	36- 64	C 10- 64	BF3-I 4PI		
							FAST N YIELD		
55JO1	42MO		G,P	RLY	THR- 65	C 65	SCI-D DST		
63MI5	42MO		G,XP	ABY	10- 22	C 22	SCI-I DST		
69SH6	42MO92		E,P	SPC	11- 18	D 20	MAG-D	UKN	
59MU2	42MO92		G,N	ABX	13- 24	C 0- 25	ACT-I 4PI		
62CA1	42MO92		G,N	NOX	7- 30	C 30	ACT-I 4PI		
							ISOMERIC RATIO		
62DE1	42MO92		G,N	ABX	21	D 21	ACT-I 4PI		
64GE1	42MO92		G,N	ABX	THR- 22	CTHR- 33	ACT-I 4PI		
65CO1	42MO92		G,N	RLX	THR- 70	C 12- 70	ACT-I 4PI		
68GE1	42MO92		G,N	ABX	12- 26	CTHR- 26	ACT-I 4PI		
68OK2	42MO92		G,N	ABY	THR- 20	C 20	ACT-I 4PI		
							ISOMERIC YIELD		
71HA2	42MO92		G,N	RLY	13- 70	C 70	ACT-I 4PI		
							ISOMER RATIO		
64GE1	42MO92		G,2N	ABX	THR- 33	CTHR- 33	ACT-I 4PI		
							MIXED WITH G,NP		
70WA3	42MO92		G,2N	RLY	THR-305	C150-305	ACT-I 4PI		
70IS1	42MO92		G,XN	ABX	THR- 30	CTHR- 30	BF3-I 4PI		429
57EL1	42MO92		G,P	RLY	THR- 32	C 32	ACT-I 4PI		
57EL1	42MO92		G,NP	RLY	THR- 32	C 32	ACT-I 4PI		
58HO1	42MO92		G,NP	RLY	19- 32	C 32	ACT-I 4PI		
							THRESHOLD		
64GE1	42MO92		G,NP	ABX	THR- 33	CTHR- 33	ACT-I 4PI		
							MIXED WITH G,2N		
70WA3	42MO92		G,PN	RLY	THR-305	C150-305	ACT-I 4PI		
71HA2	42MO94		G,3N	RLY	31- 70	C 70	ACT-I 4PI		
							ISOMER RATIO		
67LA3	42MO95		G,G	LFT	1	D 1	NAI-D DST		
							1=0.766 MEV		
69BE7	42MO96		G,G	LFT	6	D 6	D DST		
							6.41, 6.44 MEV		
69AN6	42MO96		G,P	ABY	106-999	C700,999	TEL-D DST		
							999=1.2 GEV		
69AN6	42MO96		G,D	ABY	113-999	C700,999	TEL-O DST		
							999=1.2 GEV		
62JA1	42MO96		N,G	SPC	9	D 0-	NAI-D	90	
64GE1	42MO97		G,P	ABX	THR- 26	CTHR- 33	ACT-I 4PI		
68GE1	42MO97		G,P	ABX	13- 26	CTHR- 26	ACT-I 4PI		
70IS1	42MO98		G,XN	ABX	THR- 30	CTHR- 30	BF3-I 4PI		445
64GE1	42MO98		G,P	ABX	THR- 26	CTHR- 33	ACT-I 4PI		
68GE1	42MO98		G,P	ABX	13- 26	CTHR- 26	ACT-I 4PI		
64GE1	42MO98		G,NP	ABX	THR- 32	CTHR- 33	ACT-I 4PI		
71MO2	42MO100		G,G/	LFT	6	D 6, 8	SCD-D DST		
							6.418 MEV		
64GE1	42MO100		G,N	ABX	THR- 20	CTHR- 33	ACT-I 4PI		
							MIXED WITH G,P		
57FE3	42MO100		G,P	ABX	14- 31	C 14- 31	ACT-I 4PI		
64GE1	42MO100		G,P	ABX	THR- 20	CTHR- 33	ACT-I 4PI		
							MIXED WITH G,N		
68GE1	42MO100		G,N+P	ABX	7- 26	CTHR- 26	ACT-I 4PI		

TECHNETIUM Z=43

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
93		12.8	4.1	18.4	15.9	5.1	23.2	16.8	11.6

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69EJ2	43TC93		P,G	ABX	9, 10	D 6, 7	SCD-O DST		
							5.75-6.05,6.5-6.63		

RUTHENIUM Z=44

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
96	5.51	10.7	7.4	17.4	14.2	1.7	19.6	17.3	12.2
98	1.87	10.3	8.3	17.2	15.4	2.2	18.3	17.7	14.0
99	12.72	7.5	8.4	16.7	13.8	2.3	17.7	15.8	14.7
100	12.62	9.7	9.2	17.0	16.6	2.9	17.1	18.1	15.7
101	17.07	6.8	9.4	16.4	14.8	2.8	16.5	16.0	16.6
102	31.61	9.2	10.1	16.7	18.1	3.4	16.0	18.6	17.5
104	18.58	8.9	10.5	16.7	19.5	4.3	15.1	18.9	19.1

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
68JU1	44RU		G,N	NOX	THR- 27 C 27		THR-I	OST	

RHODIUM Z=45

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
100	100.00	8.1	5.3	14.5	13.3	2.2	18.6	12.7	13.7

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
65KR1	45RH103		E,E/	RLY	7- 18 D 7- 18		ACT-I 4PI		
							ISOMER YIELD		
59IK1	45RH1D3		G,G/	ABX	1 D 1		ACT-I 4PI		
60BO2	45RH103		G,G/	ABX	6- 26 C 6- 26		ACT-I 4PI		
63VE2	45RH103		G,G/	A8X	0- 1 0 1		ACT-I 4PI		
							ISOMERS 1=1.33 MEV		
65KR1	45RH103		G,G/	RLY	7- 18 C 7- 18		ACT-I 4PI		
							ISOMER YIELD		
58CH2	45RH103		G,N	RLY	THR	CTHR	BF3-I 4PI		
							THRESHOLD		
59PA2	45RH103		G,N	A8X	9- 24 C 9- 24		BF3-I 4PI		
							QUADRUPOLE MOMENT		
60GE3	45RH103		G,N	NDX	THR	CTHR	BF3-I 4PI		
							THRESHOLD		
62BO1	45RH103		G,N	ABX	10- 23 C 10- 23		BF3-I 4PI		428
67HU1	45RH103		G,N	ABX	10, 11 D 10, 11		BF3-I 4PI		
68JU1	45RH103		G,N	NDX	THR- 27 C 27		THR-I	OST	
69DE1	45RH103		G,N	ABY	THR-999 C 1- 6		ACT-1 4PI		
							999=5.5 GEV		
69DE1	45RH103		G,2N	ABY	THR-999 C 1- 6		ACT-1 4PI		
							999=5.5 GEV		
58KA1	45RH103		G,XN	ABX	9- 22 C 9- 22		BF3-I 4PI		
62SH2	45RH103		G,P	ABY	9- 34 C 23, 34		EMU-0	OST	
							SPECTRUM		
62SH4	45RH103		G,P	ABY	9- 34 C 23, 34		EMU-0	OST	
							SPECTRUM		
65KR1	45RH1D3		G,2P	ABX	15- 40 C 15- 40		ACT-I 4PI		
560A2	45RH1D3		G,XP	ABY	10- 70 C 70		EMU-D	OST	
							SPECTRUM		
63IS2	45RH103		G,XP	ABX	13- 32 C 14- 32		SCI-0	DST	
58TD2	45RH103		G,A	A8Y	THR- 22 C 22		EMU-I	OST	

PALLADIUM Z=46

A	ABUNO.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
102	0.96	10.6	7.8	17.3	15.2	2.1	18.9	17.7	13.3
104	10.97	10.0	8.7	17.0	16.4	2.6	17.6	18.0	14.9
105	22.23	7.1	8.8	16.6	14.2	2.9	17.1	15.8	15.7
106	27.33	9.6	9.3	16.8	17.6	3.2	16.6	18.3	16.4
108	26.71	9.2	10.0	16.6	18.5	3.9	15.8	18.5	17.8
110	11.81	8.8	10.5	16.4	19.6	4.4	15.0	18.7	19.2

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
68JU1	46PD		G,N	NDX	THR- 27 C 27		THR-I	OST	
67KN1	46PD		G,T	RLY	THR- 49 C 36, 49		ACT-I 4PI		
68DK3	46PD104		G,NP	ABY	THR- 20 C 20		ACT-I 4PI		
62ME1	46P0105		G,G	NDX	1 D 1		NAI-0	OST	
							J-PI,TRANS PRD8ABL		
71SH6	46P0105		G,G	LFT	1 0 1		NAI-0	UKN	
							1=.319 MEV		
690A1	46P01D6		G,G	ABY	1 0 1		NAI-0	120	
							1=.5117 MEV		
690E2	46P0108		G,XN	ABX	9- 25 C 9- 25		BF3-I 4PI		184
69DE5	46P010B		G,XN	ABX	8- 25 C 8- 25		BF3-I 4PI		
69DE2	46P0108		G,P	ABX	9- 25 C 9- 25		ACT-I 4PI		183
690E5	46P010B		G,P	ABX	15- 28 C 8- 28		ACT-I 4PI		
69DE5	46P0110		G,N	A8X	8- 28 C 8- 28		ACT-I 4PI		
							ISOMER YIELD ONLY		

SILVER Z=47

A	ABUNO.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
107	51.35	9.6	5.8	13.9	16.4	2.8	17.5	15.4	15.1
109	48.65	9.2	6.5	13.8	17.3	3.3	16.5	15.7	16.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
65WY1	47AG		G,MU-T	ABX	10- 35 C 90		SCI-0 4PI		57
60RE1	47AG		G,G	ABX	7 0 7		NAI-0	DST	
							G-WOTH		
5BBO1	47AG		G,G/	ABX	6- 28 C 6- 28		ACT-I 4PI		
							ISOMER YIELD		
63KA2	47AG		G,G/	RLY	1 C 5		ACT-I 4PI		
57FE1	47AG		G,N	RLY	17- 31 C 15- 31		THR-I	OST	
61TA1	47AG		G,N	NDX	7- 22 C 22		THR-I	OST	
67GE2	47AG		G,N	ABY	THR- 27 C 22, 27		BF3-I 4PI		
67HU1	47AG		G,N	A8X	10, 11 0 10, 11		BF3-I 4PI		
56HA1	47AG		G,XN	A8X	15, 18 0 15, 18		BF3-I 4PI		
618A2	47AG		G,XN	ABY	THR- 22 C 22		THR-I	OST	
6BFI1	47AG		G,XN	ABX	9- 25 C 9- 25		BF3-I 4PI		
59LO1	47AG		G,P	ABX	17- 31 C 16- 32		SCI-0	OST	
							SPECTRUM		
62SE2	47AG		G,P	ABX	15, 18 0 15, 18		SCI-I	0	
63MI5	47AG		G,XP	A8Y	4- 22 C 22		SCI-I	OST	
5BTO2	47AG		G,A	ABY	2- 22 C 22		EMU-I	OST	
65ME2	47AG		G,A	SPC	THR- 35 C 35		SCD-D	90	
66WE2	47AG		G,A	A8X	3- 33 C 33		SCD-D	90	
72KE4	47AG		G,A	RLY	2- 32 C 32		SCD-D	DST	
56WA1	47AG		G,T	RLY	THR- 31 C 31		ACT-I 4PI		
64DE4	47AG		G,F	ABX	300-999 C300-999		EMU-0 4PI		
							999=1 GEV		
71ME1	47AG		G,F	ABY	THR-900 C300-900		TRK-I 4PI		
65HE1	47AG107		E,N	RLY	THR- 32 D 14- 32		ACT-I 4PI		
72KU6	47AG107		E,N	A8X	10- 30 0 20- 30		ACT-I 4PI		
							(E+,N)/(E-,N)		
65HE1	47AG107		E+,N	RLY	THR- 32 D 14- 32		ACT-I 4PI		
63BI3	47AG107		G,G	A8X	1 D 1		ACT-I 4PI		
							MOSSBAUER		
69BD3	47AG107		G,G	A8X	0- 2 C 0- 2		ACT-I 4PI		
63BO5	47AG107		G,G/	A8X	6- 26 C 6- 26		ACT-I 4PI		
							SEPARATED ISOTOPES		
63VE2	47AG107		G,G/	ABX	0- 1 D 1		ACT-I 4PI		
							ISOMERS 1=1.33 MEV		
66CA1	47AG107		G,G/	AB1	0- 2 C 0- 2		ACT-I 4PI		
							5 LEVELS		
58BE1	47AG107		G,N	RLY	9- 10 C 9- 10		ACT-I 4PI		
							THRESHOLD		
59MU2	47AG107		G,N	A8X	9- 21 C 9- 25		ACT-I 4PI		
60GE3	47AG107		G,N	NDX	THR	CTHR	BF3-I 4PI		
							THRESHOLD		
61WE1	47AG107		G,N	ABX	9- 11 D 9- 11		ACT-I 4PI		
							THRESHOLD		
62BO1	47AG107		G,N	A8X	10- 22 C 10- 22		BF3-I 4PI		
62CA1	47AG107		G,N	NOX	9- 30 C 30		ACT-I 4PI		
							ISOMERIC RATIO		
62FU6	47AG107		G,N	RLY	9- 34 C 34		ACT-I 4PI		
							YLO REL TO CU62		
69BE1	47AG107		G,N	A8X	THR- 30 D 9- 30		BF3-I 4PI		147+
							SEP ISOTOPES		
69BE1	47AG107		G,2N	ABX	THR- 30 D 17- 30		BF3-I 4PI		
							SEP ISOTOPES		
69IS2	47AG107		G,XN	ABX	9- 29 C 7- 30		BF3-I 4PI		455
66WI1	47AG107		G,T	ABX	THR- 56 C 31- 56		ACT-I 4PI		
69BO3	47AG109		G,G	ABX	D- 2 C 0- 2		ACT-I 4PI		
70MO2	47AG109		G,G	ABX	B D 8		SCD-D	DST	
							8=7.632,LFT		
66CA1	47AG109		G,G/	AB1	0- 2 C D- 2		ACT-I 4PI		
							6 LEVELS		
5B8E1	47AG109		G,N	RLY	9- 1D C 9- 10		ACT-I 4PI		
							THRESHOLD		
59NA1	47AG109		G,N	ABX	18 0 1B		BF3-I 4PI		
60GE3	47AG109		G,N	NOX	THR	CTHR	BF3-I 4PI		
							THRESHOLD		
69IS2	47AG109		G,XN	ABX	9- 29 C 7- 30		BF3-I 4PI		456
55ER1	47AG109		G,A	ABY	THR- 31 C 32		ACT-I 4PI		
55SC2	47AG109		G,A	ABY	THR- 32 C 32		ACT-I 4PI		
57ER1	47AG109		G,A	AB1	THR- 32 C 32		ACT-I 4PI		
59RD3	47AG109		G,A	ABX	15- 25 C 15- 25		ACT-I 4PI		
68DK1	47AG109		G,A	ABY	THR- 20 C 20		ACT-I 4PI		

CADMIUM Z=48

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
106	1.22	10.9	7.3	17.3	14.6	1.6	19.3	17.2	12.3
108	0.88	10.3	8.1	17.1	15.8	2.3	18.3	17.7	13.9
110	12.39	9.9	8.9	16.9	16.9	2.9	17.2	18.1	15.4
111	12.75	7.0	9.1	16.6	14.7	3.3	16.9	15.9	16.2
112	24.07	9.4	9.6	16.8	17.9	3.5	16.4	18.5	16.8
113	12.26	6.5	9.8	16.5	15.6	3.9	15.9	16.2	17.6
114	28.86	9.0	10.3	16.7	18.9	4.1	15.6	18.8	18.3
116	7.58	8.7	11.1	16.6	16.6	4.9	14.8	19.1	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
71VO1	48CD		E,N	A8X	THR-266	C	150-266	TOF-D	90	
55BU1	48CD		G,G	RLX	0- 3	C	3	NAI-D	90	
60RE1	48CD		G,G	A8X	7	D	7	NAI-D	90	
61TO1	48CD		G,G	A8X	4- 14	C	4- 14	NAI-D	120	
63SU1	48CD		G,G	ABX	4- 14	C	4- 14	NAI-D	12D	
64GI1	48CD		G,G	NOX	8	D	8	NAI-D	135	
								WIDTH		
668E3	48CD		G,G	RLX	5- 10	D	5- 10	NAI-D	135	
69RA1	48CD		G,G	NOX	7	D	7	NAI-D	DST	
								7=6.485	MEV	
70AR1	48CD		G,G	ABX	12- 30	C	32	NAI-D	DST	
								RATIO G,G/TO 2+		
63KA2	48CD		G,G/	RLY	1	C	6	ACT-I	4PI	
65GI1	48CD		G,G/	RLY	8	D	8	NAI-D	135	
								8=7.64	MEV	
60KU2	48CD		G,N	RLY	16- 90	C	90	TEL-I	DST	
67HU2	48CD		G,N	ABY	THR- 22	C	22	THR-I	DST	
55MC1	48CD		G,XN	RLY	THR- 22	C	22	NAI-I	90	
56GA1	48CD		G,XN	ABX	6- 27	C	6- 27	BF3-I	4PI	
61BA2	48CD		G,XN	ABY	THR- 22	C	22	THR-I	DST	
60RO3	48CD		G,P	SPC	18	D	18	EMU-D	DST	
63MI5	48CD		G,XP	ABY	11- 22	C	22	SCI-I	DST	
63KR1	48CD		G,A	SPC	3- 21	C	21	SCD-D	90	
								RELATIVE YIELD		
69MI1	48CD110		G,G	SPC	6- 8	D	6- 8	SCD-D	DST	
65CH1	48CD111		E,E/	ABX	1	D	1- 2	ACT-I	4PI	
								1=1.34	MEV	
69BO3	48CD111		G,G	A8X	0- 2	C	0- 2	ACT-I	4PI	
71SH6	48CD111		G,G	LFT	1	D	1	NAI-D	UKN	
								1=.342	MEV	
62HU2	48CD111		G,G/	ABX	7	D	7	ACT-I	4PI	
								ISOMERIC RATIO		
63VE1	48CD111		G,G/	NOX	1- 2	D	1-	NAI-D	90	
66CA1	48CD111		G,G/	ABI	0- 2	C	0- 2	ACT-I	4PI	
								.76, 1.12, 1.3	MEV	
66MI1	48CD112		G,G	ABX	8	D	8	NAI-D	DST	
								8=7.64	MEV	
68MO1	48CD112	$	G,G	NOX	7	D		NAI-D	90	
								POLARIMETER 7.63		
69CE1	48CD112		G,G	NOX	6- 8	D	6- 8	SCD-D	DST	
69MI1	48CD112		G,G	SPC	6- 8	D	6- 8	SCD-D	DST	
70ES1	48CD112		G,G	NOX	7	D	7	SCD-D	DST	
								7=7.64		
70MO2	48CD112		G,G	ABX	8	D	8	SCD-D	DST	
								8=7.632,LFT		
71MO4	48CD112	$	G,G	LFT	7	D	7	SCD-D	DST	
								J,PI,POL 7=7.632		
71MO2	48CD112		G,G/	LFT	6, 8	D	6, 8	SCD-D	DST	
								6.018, 7.632	MEV	
59KU2	48CD112		G,P	ABX	THR- 28	C	15- 28	ACT-I	4PI	
60KU1	48CD112		G,P	ABX	10- 30	C	10- 30	ACT-I	4PI	
59KU2	48CD113		G,P	A8X	THR- 28	C	15- 28	ACT-I	4PI	
60KU1	48CD113		G,P	ABX	10- 30	C	10- 30	ACT-I	4PI	
68OK3	48CD113		G,P	A8Y	THR- 20	C	20	ACT-I	4PI	
67ST1	48CD114		G,G	LFT	7	D	7	NAI-D	135	
								7=7.64	MEV	
59KU2	48CD114		G,P	ABX	THR- 28	C	15- 28	ACT-I	4PI	
60KU1	48CD114		G,P	ABX	10- 30	C	10- 30	ACT-I	4PI	
62CA1	48CD116		G,N	NOX	9- 30	C	30	ACT-I	4PI	
								ISOMERIC RATIO		
59KU2	48CD116		G,P	ABX	THR- 28	C	15- 28	ACT-I	4PI	
60KU1	48CD116		G,P	A8X	11- 30	C	11- 30	ACT-I	4PI	

INDIUM Z=49

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
113	4.28	9.4	6.1	13.9	16.8	3.0	17.1	15.5	15.7
115	95.72	9.0	6.8	13.9	17.9	3.7	16.3	15.9	17.1

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
55BU1	49IN		G,G	RLX	0- 3	C	3	NAI-D	90	
70AR1	49IN		G,G	ABX	12- 30	C	32	NAI-D	DST	
								RATIO G,G/TO 2+		
558U2	49IN		G,G/	ABX	D- 14	C	1- 14	ACT-I	4PI	
63KA2	49IN		G,G/	RLY	1	C	6	ACT-I	4PI	
68KA1	49IN		G,N	ABX	5D- 85	C	55, 85	TOF-D	67	
								NEUT ENGY SPEC		
69FU1	49IN		G,N	ABX	9- 31	D	9- 31	BF3-I	4PI	140
69FU1	49IN		G,2N	ABX	16- 31	D	16- 31	BF3-I	4PI	141
69FU1	49IN		G,3N	ABX	25- 31	D	25- 31	BF3-I	4PI	142+
57RO2	49IN		G,P	SPC	15, 18	D	15, 18	EMU-D	DST	
60BA5	49IN		G,P	ABX	16- 40	C	16- 40	MAG-D	DST	
6DCH1	49IN		G,XP	RLX	THR- 9D	C	90	TEL-I	90	
								REL TO DEUTERONS		
63MI5	49IN		G,XP	ABY	8- 22	C	22	SCI-I	DST	
60CH1	49IN		G,XD	RLX	THR- 90	C	90	TEL-I	90	
								REL TO PROTONS		
60CH1	49IN		G,XT	RLY	THR- 90	C	90	TEL-I	90	
								REL TO DEUTERONS		
58TO2	49IN		G,A	ABY	1- 22	C	22	EMU-I	DST	
65ME2	49IN		G,A	SPC	THR- 35	C	35	SCD-D	90	
66VE1	49IN113		G,G/	ABX	1	D	D- 1	ACT-I	4PI	
								1=.392	MEV	
62CA1	49IN113		G,N	NOX	6- 30	C	30	ACT-I	4PI	
								ISOMERIC RATIO		
65CH1	49IN115		E,E/	A8X	1	D	1- 2	ACT-I	4PI	
								1=1.07	MEV	
65KR1	49IN115		E,E/	RLY	7- 18	D	7- 18	ACT-I	4PI	
								ISOMER YIELD		
68803	49IN115		G,G	ABI	1, 1	C	0- 1	ACT-I	4PI	
								1,1=60D,830	KEV	
69AL1	49IN115		G,G	SPC	0- 3	C	1- 3	SCD-D	70	
								10 LEVELS		
69803	49IN115		G,G	ABX	0- 2	C	0- 2	ACT-I	4PI	
56BO1	49IN115		G,G/	ABX	5- 27	C	5- 27	ACT-I	4PI	
62HU2	49IN115		G,G/	NOX	7	D	7	ACT-I	4PI	
								ISOMERIC RATIO		
63VE1	49IN115		G,G/	NOX	1- 2	D	1-	NAI-D	90	
65KR1	49IN115		G,G/	RLY	7- 18	C	7- 18	ACT-I	4PI	
								ISOMER YIELD		
66VE1	49IN115		G,G/	A8X	1	D	0- 1	ACT-I	4PI	
								1=1.04	MEV	
71BO1	49IN115		G,G/	ABX	0- 2	C	0- 2	ACT-I	4PI	
								9 LEVS,.6-1.6	MEV	
56BO1	49IN115		G,N	ABX	9- 27	C	9- 27	BF3-I	4PI	
588E1	49IN115		G,N	RLY	9- 10	C	9- 10	ACT-I	4PI	
								THRESHOLD		
60GE3	49IN115		G,N	NOX	THR		CTHR	BF3-I	4PI	
								THRESHOLD		
62AN1	49IN115		G,N	SPC	9- 28	C	28	EMU-D	DST	
62BO1	49IN115		G,N	ABX	10- 23	C	10- 23	BF3-I	4PI	457
67HU1	49IN115		G,N	ABX	10, 11	D	10, 11	BF3-I	4PI	
56HE2	49IN115		G,2P	RLY	THR- 31	C	31	ACT-I	4PI	
								REL G,A		
56HE2	49IN115		G,A	RLY	THR- 31	C	31	ACT-I	4PI	
								REL NEUTRONS		
68OK1	49IN115		G,A	ABY	THR- 20	C		20 ACT-I	4PI	

TIN Z=50

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
112	0.96	10.8	7.5	17.1	15.0	1.8	19.0	17.6	12.9
114	0.66	1D.3	8.5	17.1	16.2	2.6	18.1	17.9	14.6
115	0.35	7.5	8.7	17.0	14.4	3.2	17.9	16.0	15.6
116	14.30	9.6	9.3	17.1	17.4	3.4	17.1	18.3	16.1
117	7.61	6.9	9.4	16.8	15.3	3.8	16.5	16.2	16.9
118	24.03	9.3	10.D	17.1	18.5	4.1	16.3	18.8	17.5
119	8.58	6.5	9.9	16.8	16.3	4.4	15.8	16.5	18.2
120	32.85	9.1	10.7	17.1	19.6	4.8	15.6	19.0	19.0
122	4.72	8.8	11.4	17.2	20.7	5.7	15.0	19.8	*
124	5.94	8.5	12.1	17.4	*	*	14.4	20.4	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
71MO3	50SN		E,E/	ABX	0-24D	D	500	MAG-D	60	
56FU1	50SN		G,G	ABX	4- 4D	C	4- 4D	NAI-D	12D	
6DRE1	50SN		G,G	ABX	7	D	7	NAI-D	DST	
								G-WDTH		
61TO1	5DSN		G,G	ABX	3- 15	C	3- 15	NAI-D	12D	
62BE2	5DSN		G,G	ABX	5- 9	D	5-	NAI-D	135	
63AX1	5DSN		G,G	ABX	6- 1D	D	6- 1D	NAI-D	135	
63KA3	5DSN		G,G	ABX	1, 1	D	1,	NAI-D	120	
64AR1	5DSN		G,G	ABX	6, 7	D	6,	NAI-D	135	
66BE3	5DSN		G,G	RLX	5- 10	D	5- 1D	NAI-D	135	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
69RA1	50SN		G,G	NOX	7	D	7	NAI-D	DST	
							7=6.988 MEV			
69SH2	50SN		G,G	SPC	6, 7	D	6, 7	SCD-D	UKN	
							6=6.736,7=7.36B			
70AR1	50SN		G,G	ABX	12- 30	C	32	NAI-D	DST	
							RATIO G,G/TO 2+			
70AX1	50SN		G,G	ABX	6- 10	D	6- 10	NAI-D	45	
63KA2	50SN		G,G/	RLY	1	C	6	ACT-I	4PI	
67HU2	50SN		G,N	ABY	THR- 22	C	22	THR-I	DST	
68KA1	50SN		G,N	ABX	50- B5	C	55, 85	TOF-D	67	
							NEUT ENGY SPEC			
55DI1	50SN		G,XN	NOX	THR- 70	C	70	SCI-I	DST	
56HA1	50SN		G,XN	ABX	15, 18	D	15, 18	BF3-I	4PI	
5BFU1	50SN		G,XN	ABX	7- 40	C	7- 40	BF3-I	4PI	
64AL5	50SN		G,XN	NOX	THR- 34	C	34	THR-I	OST	
60RO3	50SN		G,P	SPC	1B	D	18	EMU-D	OST	
63MI5	50SN		G,XP	ABY	10- 22	C	22	SCI-I	DST	
63YA2	50SN		G,D	RLY	12- 24	C	24	EMU-D	OST	
							SPC, YLD REL TO P			
70CU1	50SN		G,T	ABY	THR- 90	C	90	ACT-I	4PI	
71ME1	50SN		G,F	ABY	THR-900	D	300-900	TRK-I	4PI	
61KU1	50SN	112	G,N	ABX	10- 21	C	10- 21	ACT-I	4PI	
71SO1	50SN	112	G,XP	ABX	10- 29	C	8- 29	SCO-D	4PI	
70BR1	50SN	114	G,P	RLY	12- 22	C	14- 23	ACT-I	4PI	
67BA4	50SN	116	E,E/	FMF	1, 2	D	150	MAG-D	DST	
							1.27,2.24 MEV			
69CU1	50SN	116	E,E/	FMF	1- 12	D	55, 60	MAG-D	DST	
69SH7	50SN	116	E,P	ABY	14- 19	O	19	MAG-O	DST	
72SU4	50SN	116	E,P	ABI	13- 19	D	16- 21	MAG-D	4PI	
62KA1	50SN	116	G,G	LFT	1	D	1	NAI-D	UKN	
62LI2	50SN	116	G,G	LFT	1	D	1	NAI-D	132	
63BE6	50SN	116	G,G	LFT	1	D	1	NAI-D	100	
69FU1	50SN	116	G,N	ABX	9- 29	D	9- 29	BF3-I	4PI	117
69FU1	50SN	116	G,2N	ABX	17- 29	D	17- 29	BF3-I	4PI	118
69FU1	50SN	116	G,3N	ABX	27- 29	D	27- 29	BF3-I	4PI	119
72SU4	50SN	117	E,P	ABI	9- 20	O	16- 21	MAG-O	90	
60ME2	50SN	117	G,G	LFT	1	D	1	NAI-D	125	
67GI1	50SN	117	G,G	LFT	7	D	6- 7	NAI-D	OST	
							7=7.01 MEV			
69BE7	50SN	117	G,G	LFT	7	D	7	O	DST	
							7.01	MEV		
69FU1	50SN	117	G,N	ABX	6- 31	D	6- 31	BF3-I	4PI	120
70WI2	50SN	117	G,N	ABX	7- 9	C	7- 9	TOF-D	130	
69FU1	50SN	117	G,2N	ABX	16- 31	D	16- 31	BF3-I	4PI	121
69FU1	50SN	117	G,3N	ABX	24- 31	D	24- 31	BF3-I	4PI	122+
68OK3	50SN	117	G,P	ABY	THR- 20	C	20	ACT-I	4PI	
69CU1	50SN	118	E,E/	FMF	1- 4	D	55, 60	MAG-O	DST	
69SH7	50SN	118	E,P	ABY	15- 20	D	20	MAG-D	DST	
72SU4	50SN	118	E,P	ABI	14- 20	D	16- 21	MAG-D	4PI	
66HR1	50SN	118	G,G	LFT	1	D	1	NAI-D	90	
							1=1.22 MEV			
69CE1	50SN	118	G,G	NOX	6- 8	D	6- B	SCO-O	DST	
69FU1	50SN	118	G,N	ABX	9- 30	D	9- 30	BF3-I	4PI	124
69FU1	50SN	118	G,2N	ABX	16- 30	D	16- 30	BF3-I	4PI	125
69FU1	50SN	118	G,3N	ABX	25- 30	D	25- 30	BF3-I	4PI	126+
61HU1	50SN	118	G,P	RLY	6- 24	C	24	ACT-I	4PI	
							THRESHOLD			
69FU1	50SN	119	G,N	ABX	6- 31	O	6- 31	BF3-I	4PI	128
70WI2	50SN	119	G,N	ABX	7- 9	C	6- 9	TOF-D	130	
69FU1	50SN	119	G,2N	ABX	15- 31	D	15- 31	BF3-I	4PI	129
69FU1	50SN	119	G,3N	ABX	22- 31	D	22- 31	BF3-I	4PI	130+
60ST1	50SN	119	G,NP	RLX	146-320	C	320	TEL-O	76	
							REL TO H2 CROS SEC			
67BA4	50SN	120	E,E/	FMF	1, 2	D	150	MAG-O	OST	
							1.18,2.40 MEV			
69CU1	50SN	120	E,E/	FMF	1- 4	O	55, 60	MAG-O	OST	
69SH7	50SN	120	E,P	ABY	15- 20	D	21	MAG-D	OST	
72SU4	50SN	120	E,P	ABI	15- 21	O	17- 22	MAG-D	4PI	
66HR1	50SN	120	G,G	LFT	1	O	1	NAI-D	90	
							1=1.18 MEV			
69FU1	50SN	120	G,N	ABX	9- 29	O	9- 29	BF3-I	4PI	132
69FU1	50SN	120	G,2N	ABX	15- 29	D	15- 29	BF3-I	4PI	133
69FU1	50SN	120	G,3N	ABX	24- 29	D	24- 29	BF3-I	4PI	134+
60KU1	50SN	120	G,P	ABX	16- 27	C	16- 27	ACT-I	4PI	
60KU1	50SN	120	G,NP	ABX	23- 27	C	23- 27	ACT-I	4PI	
72SU4	50SN	122	E,P	ABI	15- 21	D	17- 22	MAG-D	125	
67BA4	50SN	124	E,E/	FMF	1, 2	D	150	MAG-D	DST	
							1.13,2.59 MEV			
69CU1	50SN	124	E,E/	FMF	1- 4	D	55, 60	MAG-O	OST	
69SH7	50SN	124	E,P	ABY	16- 22	D	22	MAG-D	90	
72SU4	50SN	124	E,P	ABI	16- 22	D	19- 24	MAG-D	90	
61KU1	50SN	124	G,N	ABX	B- 20	C	8- 20	ACT-I	4PI	
69FU1	50SN	124	G,N	ABX	8- 31	D	B- 31	BF3-I	4PI	136
69FU1	50SN	124	G,2N	ABX	14- 31	O	14- 31	BF3-I	4PI	137
69FU1	50SN	124	G,3N	ABX	23- 31	O	23- 31	BF3-I	4PI	138+
71SO1	50SN	124	G,XP	ABX	14- 29	C	12- 29	SCO-D	4PI	

ANTIMONY Z=51

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
121	57.25	9.2	5.8	12.9	17.1	3.1	16.3	14.9	16.5
123	42.75	9.0	6.6	13.1	18.7	3.9	15.B	15.4	18.0

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	51SB		G,G	ABX	7	O	7	NAI-D	90	
63SU1	51SB		G,G	ABX	4- 14	C	4- 14	NAI-O	120	
66BE3	51SB		G,G	RLX	5- 10	O	5- 10	NAI-D	135	
67HU1	51SB		G,N	ABX	10, 11	D	10, 11	BF3-I	4PI	
6BJU1	51SB		G,N	NOX	THR- 27	C	27	THR-I	OST	
63YA2	51SB		G,D	RLY	10- 24	C	24	EMU-D	126	
							SPC,YLD REL TO P			
63ME1	51SB	121	G,G	LFT	1	D	1	NAI-D	DST	
								J-PI		
60GE3	51SB	121	G,N	NOX	THR		CTHR	BF3-I	4PI	
								THRESHOLD		
61CO2	51SB	121	G,N	RLX	15, 18	D	15, 18	ACT-I	4PI	
							REL TO CU63 SIGMA			
62DE1	51SB	121	G,N	ABX	20	O	20	ACT-I	4PI	
57ER1	51SB	121	G,D	ABX	18- 32	C	18- 32	ACT-I	4PI	
55ER1	51SB	121	G,A	ABY	THR- 31	C	32	ACT-I	4PI	
56HE2	51SB	121	G,A	RLY	THR- 31	C	31	ACT-I	4PI	
								REL NEUTRONS		
61WO1	51SB	121	G,A	ABX	15- 24	C	15- 24	ACT-I	4PI	
64SH5	51SB	123	G,G	LFT	1	D	1	NAI-D	122	
								1=0.161 MEV		
60GE3	51SB	123	G,N	NOX	THR		CTHR	BF3-I	4PI	
								THRESHOLD		
5BHO1	51SB	123	G,NP	RLY	18- 32	C	32	ACT-I	4PI	
								THRESHOLO		

TELLURIUM Z=52

A	ABUNO.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
120	8.9(-2)	10.3	7.2	15.7	13.9	0.3	17.9	16.B	12.3
122	2.46	9.B	8.0	15.8	15.2	1.1	17.0	17.3	13.8
123	0.B7	6.9	8.1	15.7	13.0	1.5	16.7	14.9	14.5
124	4.61	9.4	8.6	15.9	16.2	1.B	16.4	17.5	15.2
125	6.99	6.6	8.7	15.7	14.0	2.2	16.0	15.2	15.B
126	18.71	9.1	9.1	15.8	17.2	2.6	15.7	17.B	16.4
12B	31.79	8.B	9.6	15.7	18.0	3.2	15.1	18.0	17.6
130	34.4B	8.4	10.0	15.6	18.8	3.B	14.5	18.0	18.5

REF	NUCLIOE Z	A	REACTION IN,OUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	52TE		G,G	ABX	7	D	7	NAI-D	DST	
64PA1	52TE		G,G	LFT	1	O	1	NAI-O	90	
66BE3	52TE		G,G	RLX	5- 10	O	5- 10	NAI-O	135	
60HA1	52TE		G,A	SPC	B- 33	C	33	EMU-O	DST	
63SH5	52TE	122	G,G	LFT	1	O	1	NAI-D	105	
61AK1	52TE	124	G,G	LFT	1	O	1			
65AK1	52TE	124	G,G	LFT	1	D	1	NAI-D	100	
								1=.603	MEV	
68SC1	52TE	124	G,G	LFT	1	D	1	NAI-O	105	
								1=603	KEV	
66ME1	52TE	125	G,G	LFT	1	O	1	SCD-O	DST	
								1=.463	MEV	
60GE3	52TE	125	G,N	NOX	THR		CTHR	BF3-I	4PI	
								THRESHOLD		
60GE3	52TE	126	G,N	NOX	THR		CTHR	BF3-I	4PI	
								THRESHOLO		
60GE3	52TE	128	G,N	NOX	THR		CTHR	BF3-I	4PI	
							THRESHOLD,ALSO		130	
60GE3	52TE	130	G,N	NOX	THR		CTHR	BF3-I	4PI	
							THRESHOLD,ALSO		128	

IODINE Z=53

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
127	100.00	9.1	6.2	13.4	16.3	2.2	16.2	15.3	15.3

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
56FU1	53I	127	G,G	ABX	4- 40	C 4- 40	NAI-D	120	
60RE1	53I	127	G,G	ABX	7	D 7	NAI-D	90	
66FR1	53I	127	G,G	LFT	1	D 1	SCD-D	140	
							1=.203 MEV		
69LA1	53I	127	G,G	LFT	1	D 1	NAI-D	130	
							1=375 KEV		
56ER1	53I	127	G,N	ABX	15, 18	D 15, 18	ACT-I	4PI	
57FE2	53I	127	G,N	RLY	14- 30	C 14- 30	THR-I	90	
58CH2	53I	127	G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
60GE3	53I	127	G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
60KU2	53I	127	G,N	RLY	16- 90	C 90	TEL-I	DST	
60RE1	53I	127	G,N	ABX	7	D 7	NAI-I	90	
61NA1	53I	127	G,N	ABX	8- 22	C 10- 20	ACT-I	4PI	
61TA1	53I	127	G,N	NOX	12- 22	C 22	THR-I	DST	
668R1	53I	127	G,N	ABX	THR- 33	D 8- 33	BF3-I	4PI	
67DI1	53I	127	G,N	ABX	300-100	C100	ACT-I	4PI	
							999=1	GEV	
67HU1	53I	127	G,N	A8X	10, 11	D 10, 11	BF3-I	4PI	
68JO1	53I	127	G,N	ABY	THR-800	C 50-800	ACT-I	4PI	
69BE6	53I	127	G,N	ABX	9- 21	D 9- 31	MOD-I	4PI	
69DE1	53I	127	G,N	ABY	THR-999	C 1- 6	ACT-I	4PI	
							999=5.5	GEV	
69VE2	53I	127	G,N	ABX	9- 32	D 9- 32	MOD-I	4PI	
71SA1	53I	127	G,N	ABY	9- 68	C 10- 68	ACT-I	4PI	
56ER1	53I	127	G,2N	ABX	15, 18	D 15, 18	ACT-I	4PI	
61NA1	53I	127	G,2N	ABX	16- 22	C 10- 20	BF3-I	4PI	
							ALSO ACTIVATION		
66BR1	53I	127	G,2N	A8X	THR- 33	D 8- 33	BF3-I	4PI	
67DI1	53I	127	G,2N	ABX	300-999	C999	ACT-I	4PI	
							999=1	GEV	
68JO1	53I	127	G,2N	ABY	THR-800	C 50-800	ACT-I	4PI	
69BE6	53I	127	G,2N	ABX	16- 31	D 9- 31	MOD-I	4PI	
69VE2	53I	127	G,2N	ABX	16- 32	D 16- 32	MOD-I	4PI	
67DI1	53I	127	G,3N	ABX	300-999	C999	ACT-I	4PI	
							999=1	GEV	
68JO1	53I	127	G,3N	ABY	THR-800	C 50-800	ACT-I	4PI	
69BE6	53I	127	G,3N	ABX	27- 31	D 9- 31	MOD-I	4PI	
69DE1	53I	127	G,3N	ABY	THR-999	C 2- 6	ACT-I	4PI	
							999=5.5	GEV	
69VE2	53I	127	G,3N	ABX	26- 32	D 26- 32	MOD-I	4PI	
6BJO1	53I	127	G,4N	ABY	THR-800	C 50-800	ACT-I	4PI	
68JO1	53I	127	G,6N	ABY	THR-800	C 50-800	ACT-I	4PI	
70JO1	53I	127	G,6N	ABY	THR-900	C 75-900	ACT-I	4PI	
68JO1	53I	127	G,7N	ABY	THR-800	C 50-800	ACT-I	4PI	
70JO1	53I	127	G,7N	ABY	THR-900	C 75-900	ACT-I	4PI	
70JO1	53I	127	G,8N	ABY	THR-900	C 75-900	ACT-I	4PI	
70JO1	53I	127	G,9N	ABY	THR-900	C 75-900	ACT-I	4PI	
56GA1	53I	127	G,XN	ABX	9- 27	C 9- 27	BF3-I	4PI	
58FU1	53I	127	G,XN	ABX	7- 40	C 7- 40	BF3-I	4PI	
58KA1	53I	127	G,XN	ABX	9- 22	C 9- 22	BF3-I	4PI	
61BA2	53I	127	G,XN	ABY	THR- 22	C 22	THR-I	DST	
68JO2	53I	127	G,XN	ABX	THR-800	C150-800	ACT-I	4PI	
58KE1	53I	127	G,P	ABX	18	D 18	SCI-D	0	
							SPECTRUM		
59BO1	53I	127	G,P	ABX	15, 18	D 15, 18	SCI-D	4PI	
60TA1	53I	127	G,P	ABX	14- 32	C 14- 32	SCI-D	4PI	
							SPC, CSI TARGET		
61SE4	53I	127	G,P	ABX	15, 18	D 15, 18	SCI-D	4PI	
							CSI TARGET, SPC		
70JO2	53I	127	G,SPL	ABY	THR-999	C100-999	ACT-I	4PI	
							999=1	GEV	

XENON Z=54

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
124	0.10	10.2	6.8	16.2	13.8	0.5	18.5	16.6	11.7
126	0.09	10.1	7.6	16.2	14.9	1.3	17.9	17.2	13.2
128	1.92	9.6	8.2	15.9	15.8	1.8	16.8	17.3	14.4
129	26.44	6.9	8.2	15.7	13.6	2.1	16.5	15.1	15.0
130	4.08	9.3	8.7	15.8	16.5	2.2	16.2	17.5	15.5
131	21.18	6.6	8.8	15.6	14.4	2.6	15.9	15.3	16.0
132	26.89	8.9	9.1	15.7	17.2	2.7	15.5	17.8	16.5
134	10.44	8.5	9.6	15.6	17.9	3.2	15.0	17.8	17.5
136	8.87	8.0	9.9	15.5	18.5	3.7	14.4	17.8	18.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69HO1	54XE		G,XP	ABY	THR- 33	C 24- 33	SCI-D	90	
70KE2	54XE130		G,G	ABX	1	D 1	SCD-D	45	
						LFT,.536	MEV LEVEL		
70BE7	54XE131		G,G	LFT	0- 1	D 0- 1	NAI-D	DST	
						J-PI,.637,.723	MEV		

CESIUM Z=55

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
133	100.00	9.0	6.1	13.2	16.1	2.0	16.2	15.0	15.2

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58CH2	55CS133		G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
60GE3	55CS133		G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
67HU1	55CS133		G,N	A8X	10, 11	D 10, 11	BF3-I	4PI	
698E1	55CS133		G,N	ABX	THR- 30	D 9- 30	BF3-I	4PI	150+
698E1	55CS133		G,2N	ABX	THR- 30	D 16- 30	BF3-I	4PI	152
698E1	55CS133		G,3N	ABX	THR- 30	D 26- 30	BF3-I	4PI	153
70KA3	55CS133		G,4N	RLY	THR-250	C150-250	ACT-I	4PI	
							REL(G,N)		
70KA3	55CS133		G,6N	RLY	THR-250	C150-250	ACT-I	4PI	
							REL(G,N)		
58KA1	55CS133		G,XN	A8X	9- 22	C 9- 22	BF3-I	4PI	
58KE1	55CS133		G,P	ABX	18	D 18	SCI-D	0	
							SPECTRUM		
59801	55CS133		G,P	ABX	15, 18	D 15, 18	SCI-D	4PI	
60TA1	55CS133		G,P	ABX	14- 32	C 14- 32	SCI-D	4PI	
							SPC, CSI TARGET		
61SE4	55CS133		G,P	A8X	15, 18	D 15, 18	SCI-D	4PI	
							CSI TARGET, SPC		
70KA3	55CS133		G,2P	RLY	THR-250	C150-250	ACT-I	4PI	
							REL(G,N)		
70KA3	55CS133		G,2PN	RLY	THR-250	C150-250	ACT-I	4PI	
							REL(G,N)		
70KA3	55CS133		G,JN	RLY	THR-250	C150-250	ACT-I	4PI	1
							REL(G,N),J=5,7,8,10,		

BARIUM Z=56

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
130	0.10	10.2	7.0	16.0	13.9	0.6	18.2	16.7	12.0
132	9.7(-2)	9.8	7.7	15.8	14.7	1.0	17.3	17.0	13.1
134	2.42	9.5	8.2	15.9	15.5	1.5	16.7	17.1	14.3
135	6.59	7.0	8.3	15.6	13.5	1.9	16.4	15.1	14.8
136	7.81	9.1	8.5	15.8	16.2	2.1	16.1	17.4	15.4
137	11.32	6.9	8.7	15.8	14.5	2.5	16.0	15.4	15.8
138	71.66	8.6	9.0	15.6	16.7	2.6	15.5	17.3	16.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	56BA		G,G	ABX	7	D 7	NAI-D	90	
63KA2	56BA		G,G/	RLY	1	C 5	ACT-I	4PI	
57FE1	56BA		G,N	RLY	17- 31	C 15- 31	THR-I	DST	
							SPECTRUM		
71BE4	56BA		G,N	ABX	9- 24	D 9- 24	MOD-I	4PI	372
718E4	56BA		G,2N	ABX	15- 24	D 15- 24	MOD-I	4PI	373
61BA2	56BA		G,XN	ABY	THR- 22	C 22	THR-I	DST	
64AL5	56BA		G,XN	NOX	THR- 34	C 34	THR-I	DST	
59HA2	56BA		G,A	SPC	THR- 30	C 30	EMU-D	DST	
60GE3	56BA137		G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
68UK3	56BA137		G,P	ABY	THR- 20	C 20	ACT-I	4PI	
71SH3	56BA13B		E,P	ABX	15- 22	D150	MAG-D	90	
							ISOBARIC ANALOGS		
71BL1	56BA13B		G,PI+	ABY	150-700	C150-700	ACT-I	4PI	
							SEE 6B NY 1		
70BE8	56BA138		G,N	ABX	8- 28	D 8- 28	BF3-I	4PI	494
70BE8	56BA138		G,2N	ABX	15- 28	D 15- 28	BF3-I	4PI	426
70BE8	56BA138		G,3N	ABX	25- 29	D 25- 29	BF3-I	4PI	459

LANTHANUM Z=57

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
138	8.9(-2)	7.3	6.0	13.6	13.8	2.0	16.6	12.9	14.7
139	99.91	8.8	6.2	13.2	15.8	2.0	16.1	14.8	15.2

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71PI1	57LA139		E,E/	SPC	4- 18	D 50, 65	MAG-D	DST	
69SH8	57LA139		E,P	SPC	11- 22	D 30	MAG-D	UKN	
66BE3	57LA139		G,G	RLX	5- 10	D 5- 10	NAI-D	135	
69BE7	57LA139		G,G	LFT	6	D 6	UKN-D	DST	
							6.413	MEV	
70MO2	57LA139		G,G	ABX	6	D 6	SCD-D	DST	
							6=6.018,LFT		
70MO3	57LA139		G,G	LFT	6	D 6	NAI-D	DST	
							J-PI,6.018,6.418		
70SZ1	57LA139		G,G	LFT	6- 9	D 6- 9	SCD-D	DST	
							6 LEVELS		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58CH2	57	LA139	G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
58SP1	57	LA139	G,N	RLX	8- 18 C	8- 18	BF3-I	4PI	
60GE3	57	LA139	G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLO		
61TA1	57	LA139	G,N	NOX	11- 22 C	22	THR-I	DST	
62MI3	57	LA139	G,N	ABX	10- 21 D	10- 21	BF3-1	4PI	
62RE1	57	LA139	G,N	NOX	11- 55 C	55	THR-I	OST	
67HU1	57	LA139	G,N	ABX	9- 11 D	9- 11	BF3-I	4PI	
68BE5	57	LA139	G,N	ABX	THR- 30 D	7- 30	MOD-I	4PI	98
68JU1	57	LA139	G,N	NOX	THR- 27 C	27	THR-I	DST	
68BE5	57	LA139	G,2N	ABX	THR- 30 D	7- 30	MOD-I	4PI	99
68BE5	57	LA139	G,2N	ABX	THR- 30 D	7- 3D	MOD-I	4PI	100+
58FU1	57	LA139	G,XN	ABY	7- 40 C	7- 40	BF3-I	4PI	
58KA1	57	LA139	G,XN	ABX	9- 22 C	9- 22	BF3-I	4PI	
61BA2	57	LA139	G,XN	ABY	THR- 22 C	22	THR-I	DST	
61MI1	57	LA139	G,XN	ABX	10- 22 D	10- 22	BF3-I	4PI	
64RI1	57	LA139	G,XN	ABX	8- 30 C	8- 30	BF3-I	4PI	
72DE3	57	LA139	G,XN	ABX	9- 24 C	8- 24	BF3-I	4PI	559
72TH2	57	LA139	G,XN	ABX	9- 17 C	8- 16	BF3-I	4PI	
71BE4	57	LA139	G,SN	ABX	8- 18 D	8- 18	MOD-I	4PI	
71ME1	57	LA139	G,F	ABY	THR-900 C	300-90D	TRK-I	4PI	

CERIUM Z=58

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
136	0.19	10.0	6.9	15.7	13.8	0.4	17.9	16.6	12.1
138	0.25	9.6	7.6	15.7	14.6	1.0	17.2	16.9	13.2
140	88.48	9.2	8.1	15.8	15.2	1.6	16.7	16.9	14.3
142	11.07	7.2	8.8	12.3	14.5	-1.4	12.6	15.6	15.8

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71PI1	58	CE	E,E/	SPC	4- 18 D	50, 65	MAG-D	DST	
64BE4	58	CE	G,G	LFT	2 D	2	NAI-O	120	
66BE3	58	CE	G,G	RLX	5- 10 D	5- 10	NAI-D	135	
62MI3	58	CE	G,N	ABX	10- 21 D	10- 21	BF3-I	4PI	
69BE6	58	CE	G,N	ABX	8- 23 D	8- 30	MOD-1	4PI	363
69BE6	58	CE	G,2N	ABX	12- 30 D	8- 30	MOD-I	4PI	364
69BE6	58	CE	G,3N	ABX	24- 30 D	8- 30	MOD-I	4PI	
58FU1	58	CE	G,XN	ABY	7- 40 C	7- 40	BF3-I	4PI	
61BA2	58	CE	G,XN	ABY	THR- 22 C	22	THR-I	DST	
61MI1	58	CE	G,XN	ABX	8- 21 D	8- 21	BF3-I	4PI	
71BE4	58	CE	G,SN	ABX	9- 18 O	9- 18	MOD-I	4PI	
59HA2	58	CE	G,A	SPC	THR- 30 C	30	EMU-D	DST	
71HA2	58	CE138	G,N	RLY	10- 70 C	7ᴗ	ACT-I	4PI	
							ISOMER RATIO		
70PI1	58	CE140	E,E/	LFT	1- 4 D	5D, 60	MAG-D	141	
						6 LEVELS, J-PI			
68SH4	58	CE140	E,P	SPC	13- 30 D	30	MAG-D	9D	
						ANALOG STATES			
69SH8	58	CE140	E,P	SPC	13- 22 D	20, 22	MAG-D	DST	
71SH3	58	CE140	E,P	ABX	15- 22 D	150	MAG-O	90	
						ISOBARIC ANALOGS			
62CA1	58	CE140	G,N	NOX	5- 30 C	30	ACT-I	4PI	
						ISOMERIC RATIO			
62FU6	58	CE140	G,N	RLY	5- 31 C	31	ACT-I	4PI	
68OK2	58	CE140	G,N	ABY	THR- 20 C	20	ACT-I	4PI	
						ISOMERIC YIELD			
71HA2	58	CE140	G,3N	RLY	26- 70 C	70	ACT-I	4PI	
						ISOMER RATIO			
60GE3	58	CE142	G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		

PRASEODYMIUM Z=59

A	ABUNO.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
141	100.D0	9.4	5.2	13.4	14.4	1.2	17.3	14.4	13.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71PI1	59	PR141	E,E/	SPC	4- 18 D	5D, 65	MAG-D	DST	
69SH8	59	PR141	E,P	SPC	10- 19 D	20	MAG-O	OST	
61BO3	59	PR141	G,MU-T	ABX	11- 20 C	11- 20	ACT-I	4PI	
71AH1	59	PR141	G,MU-T	ABX	THR-150 C	1D-150	MGC-O	4PI	
62BE2	59	PR141	G,G	ABX	5- 9 D	5-	NAI-D	135	
64AR1	59	PR141	G,G	ABX	6- 9 O	6-	NAI-O	135	
66BE3	59	PR141	G,G	RLX	5- 1D O	5- 10	NAI-D	135	
68MO1	59	PR141 ᵴ	G,G	NOX	7 D	7	NAI-O	9D	
						POLARIMETER 7.632			
69MI1	59	PR141	G,G	SPC	6- 8 D	6- 8	SCD-D	OST	
70MO2	59	PR141	G,G	ABX	86 O	8	SCD-D	DST	
						8=7.632,LFT			
71PA2	59	PR141	G,G	LFT	6- 9 D	6- 9	SCD-D	OST	
						5 LEVELS			

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58CH2	59	PR141	G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
59CA2	59	PR141	G,N	ABX	10- 32 C	33	ACT-I	4PI	
59CA3	59	PR141	G,N	ABX	10- 32 C	10- 32	ACT-I	4PI	
59DI1	59	PR141	G,N	RLY	9- 30 C	30	ACT-I	4PI	
						REL CU63 (G,N)			
59FE2	59	PR141	G,N	ABX	9- 30 C	30	ACT-I	4PI	
							THRESHOLD		
60GE3	59	PR141	G,N	NOX	THR	CTHR	ACT-I	4PI	
							THRESHOLD		
61BO1	59	PR141	G,N	ABX	9- 29 C	1D- 29	ACT-I	4PI	
61CO2	59	PR141	G,N	ABX	15, 18 D	15, 18	ACT-I	4PI	
61TA1	59	PR141	G,N	NOX	12- 22 C	22	THR-I	DST	
62DE1	59	PR141	G,N	ABX	20 D	21	ACT-I	4PI	
62RE1	59	PR141	G,N	NOX	6- 55 C	55	THR-I	DST	
66BR1	59	PR141	G,N	ABX	THR- 33 D	8- 33	BF3-I	4PI	304
66CO3	59	PR141	G,N	ABX	THR- 65 C	THR- 70	ACT-I	4PI	114+
67CA1	59	PR141	G,N	RLX	9- 17 C	9- 17	ACT-I	4PI	
67HU1	59	PR141	G,N	ABX	10, 11 D	10, 11	BF3-I	4PI	
68CA1	59	PR141	G,N	ABX	9- 17 C	9- 17	ACT-I	4PI	69+
68JU1	59	PR141	G,N	NOX	THR- 30 C	30-	THR-I	DST	
70SU1	59	PR141	G,N	ABX	9- 24 D	9- 24	ACT-I	4PI	277
71BE4	59	PR141	G,N	ABX	9- 17 D	9- 17	MOD-I	4PI	390
72DR2	59	PR141	G,N	ABX	9- 20 C	9- 20	ACT-I	4PI	447
59CA2	59	PR141	G,2N	ABX	18- 32 C	33	ACT-I	4PI	
							THRESHOLO		
59FE2	59	PR141	G,2N	ABX	16- 30 C	30	ACT-I	4PI	
							THRESHOLD		
61BO1	59	PR141	G,2N	ABX	16- 29 C	10- 29	ACT-I	4PI	
66BR1	59	PR141	G,2N	ABX	THR- 30 D	8- 33	BF3-I	4PI	305
61MO1	59	PR141	G,3N	ABI	27- 33 C	27- 33	ACT-I	4PI	
							THRESHOLD		
66BR1	59	PR141	G,3N	ABX	THR- 30 D	8- 33	BF3-I	4PI	306+
58KA1	59	PR141	G,XN	ABX	10- 22 C	10- 22	BF3-I	4PI	
60TH1	59	PR141	G,XN	ABX	9- 18 C	7- 18	BF3-I	4PI	
64RI1	59	PR141	G,XN	ABX	9- 30 C	9- 30	BF3-I	4PI	
70MC1	59	PR141	G,XN	SPC	11- 28 C	28	TOF-D	98	
72DE3	59	PR141	G,XN	ABX	9- 22 C	9- 22	BF3-I	4PI	560
61SH2	59	PR141	G,P	ABY	5- 34 C	23, 34	EMU-D	DST	
62SH4	59	PR141	G,P	SPC	5- 34 C	23, 34	EMU-D	DST	
69EJ1	59	PR141	P,G	ABX	15 D	9- 11	SCI-O	DST	
						15=14.95 MEV			

NEODYMIUM Z=6D

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
142	27.11	9.8	7.2	16.1	13.9	0.8	17.9	16.6	12.5
143	12.17	6.1	7.5	14.3	10.9	-0.5	15.9	13.4	13.1
144	23.85	7.8	8.0	12.7	13.2	-1.9	13.9	15.3	13.8
145	8.30	5.8	8.0	12.6	11.8	-1.6	13.6	13.7	14.4
146	17.22	7.6	8.6	12.8	14.2	-1.2	13.3	15.5	15.1
148	5.73	7.3	9.2	12.7	15.2	-0.6	12.6	15.9	16.2
150	5.62	7.4	9.6	13.2	16.4	0.4	12.4	16.5	17.6

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
64AR1	60	ND	G,G	ABX	7 D	7	NAI-D	135	
66BE3	60	ND	G,G	RLX	5- 10 D	5- 10	NAI-D	135	
71BE4	60	ND	G,SN	ABX	10- 18 D	9- 18	MOO-I	4PI	
59HA2	60	ND	G,A	SPC	THR- 30 C	30	EMU-D	DST	
71ME1	60	ND	G,F	ABY	THR-900 C	300-90D	TRK-I	4PI	
71MA1	60	ND142	E,E/	FMF	1, 2 D	60	MAG-D	DST	
						1=1.57, 2=2.09			
71SH3	60	ND142	E,P	ABX	15- 22 D	150	MAG-D	90	
						ISOBARIC ANALOGS			
59CA3	60	ND142	G,N	ABX	1D- 32 C	10- 32	ACT-I	4PI	
68OK2	60	ND142	G,N	ABY	THR- 20 C	20	ACT-1	4PI	
						ISOMERIC YIELD			
71CA1	60	ND142	G,N	ABX	10- 20 D	8- 20	MOD-I	4PI	391
71HA2	60	ND142	G,N	RLY	10- 70 C	70	ACT-I	4PI	
						ISOMER RATIO			
71CA1	60	NO142	G,2N	ABX	10- 20 D	8- 20	MOD-I	4PI	392
72HA3	60	ND142	P,G	ABX	14- 24 D	6- 17	NAI-D	DST	
71CA1	60	ND143	G,N	ABX	9- 2D O	8- 20	MOO-I	4PI	394
71CA1	60	NO143	G,2N	ABX	9- 2D O	8- 2D	MOD-I	4PI	395
63BL2	6D	ND144	G,G	ABX	2 O	2	UKN-O	UKN	
63RI2	6D	NO144	G,G	LFT	2 D	2	NA1-D	9D	
						G-WDTH, SEP ISOTPS			
69ME3	60	NO144	G,G	LFT	2, 2 C	2, 2	SCD-O	DST	
						B(EL),2.074, 2.186			
71CA1	6D	ND144	G,N	ABX	8- 20 D	8- 20	MOO-I	4PI	397
71CA1	60	ND144	G,2N	ABX	8- 2D O	8- 2D	MOD-1	4PI	398
71HA2	6D	ND144	G,3N	RLY	24- 7D C	70	ACT-I	4PI	
							ISOMER RATIO		
60GE3	6D	ND145	G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLO		
71CA1	60	ND145	G,N	ABX	10- 20 O	8- 2D	MOO-I	4PI	400
71CA1	6D	ND145	G,2N	ABX	10- 20 D	8- 20	MOD-I	4PI	401

REF	NUCLIDE Z	A	REACTION IN,DUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
71MA1	60ND146		E,E/	FMF	0	D	41	MAG-D DST 0 = 0.45		
71CA1	60ND146		G,N	ABX	8- 20	D	8- 20	MOD-I 4PI		403
71CA1	60ND146		G,2N	A8X	8- 20	D	8- 20	MOD-I 4PI		404
71VA2	60ND146		G,XN	A8X	7- 24	C	7- 24	8F3-I 4PI		
71CA1	60ND148		G,N	ABX	8- 20	D	8- 20	MDD-I 4PI		406
71CA1	60ND148		G,2N	ABX	8- 20	D	8- 20	MDD-I 4PI		407
69VA2	60ND148		G,XN	ABX	8- 23	C	8- 23	BF3-I 4PI		208
69VA3	60ND148		G,XN	ABX	8- 22	C	8- 22	BF3-I 4PI SEE 69VA2		238
71MA1	60ND150		E,E/	FMF	0	D	60	MAG-D DST 0 = 0.13		
59CA3	60ND150		G,N	RLX	8- 32	C	8- 32	ACT-I 4PI		
71CA1	60ND150		G,N	ABX	10- 20	D	8- 20	MDD-I 4PI		409
71CA1	60ND150		G,2N	ABX	10- 20	D	8- 20	MDD-I 4PI		410
69VA2	60ND150		G,XN	ABX	8- 23	C	8- 23	BF3-I 4PI		209+
69VA3	60ND150		G,XN	ABX	8- 22	C	8- 22	BF3-I 4PI SEE 69VA2		239+

SAMARIUM Z=62

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
144	3.09	10.6	6.3	16.4	12.7	-0.1	19.0	16.2	10.6
147	14.97	6.4	7.1	12.9	10.5	-2.3	14.8	13.4	12.4
148	11.24	8.1	7.6	13.0	12.8	-2.0	14.5	15.3	13.0
149	13.83	5.9	7.6	12.6	11.2	-1.9	14.0	13.5	13.6
150	7.44	8.0	8.3	13.0	13.8	-1.4	13.9	15.5	14.2
152	26.72	8.3	8.7	13.7	15.3	-0.2	13.9	16.6	15.7
154	22.71	8.0	9.0	14.0	16.5	1.2	13.8	16.5	16.9

REF	NUCLIDE Z	A	REACTION IN,DUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	62SM		G,G	A8X	7	D	7	NAI-D	90	
62BE2	62SM		G,G	ABX	5- 9	D	5-	NAI-D	135	
64AR1	62SM		G,G	ABX	9	D	9	NAI-D	135	
698E6	62SM		G,N	ABX	7- 21	D	7- 27	MDD-I 4PI		
69BE6	62SM		G,2N	A8X	13- 25	D	7- 27	MDD-I 4PI		
69BE6	62SM		G,3N	ABX	23- 27	D	7- 27	MDD-I 4PI		
58FU1	62SM		G,XN	A8X	7- 40	C	7- 40	8F3-I 4PI		
59HA2	62SM		G,A	SPC	THR- 30	C	3D	EMU-D DST		
69SH8	62SM144		E,P	SPC	11- 2D	D	20	MAG-D UKN		
71SH3	62SM144		E,P	ABX	15- 22	D	150 ISOBARIC ANALDGS	MAG-D	90	
66BE3	62SM144		G,G	RLX	5- 10	D	5- 10	NAI-D	135	
72AR1	62SM144		G,G	LFT	9	D	9 SEE 66BE3, 9=8.998	SCD-D	135	
55DE1	62SM144		G,N	ABX	9- 23	C	9- 23	ACT-I 4PI		
56SI1	62SM144		G,N	A8X	9- 22	C	22	ACT-I 4PI THRESHDLD		
59CA3	62SM144		G,N	ABX	10- 32	C	10- 32	ACT-I 4PI		
59DI1	62SM144		G,N	RLY	11- 30	C	22, 30 REL CU63 (G,N)	ACT-I 4PI		
65ME1	62SM148		G,G	LFT	1	D	1	NAI-D DST 1=1.46 MEV		
71VA2	62SM148		G,XN	ABX	8- 24	C	8- 24	BF3-I 4PI		
60GE3	62SM149		G,N	NOX	THR		CTHR	BF3-I 4PI THRESHDLD		
69VA2	62SM150		G,XN	ABX	8- 23	C	8- 23	BF3-I 4PI		
728E3	62SM152		E,E/	FMF	0- 1	D	50-105 .122,.367 MEV LEVELS	MAG-D DST		
65ME1	62SM152		G,G	LFT	1	D	1	NAI-D 105 1=0.96 MEV		
67BE4	62SM152		G,G	LFT	1	D	1	NAI-D 120 1=0.963 MEV		
68TA2	62SM152		G,G	LFT	1	D	1	NAI-D 90 1=0.963 MEV		
69VA2	62SM152		G,XN	ABX	8- 23	C	8- 23	BF3-I 4PI		211
69VA3	62SM152		G,XN	ABX	8- 22	C	8- 22 SEE 69VA2	8F3-I 4PI		241+
69MO1	62SM154		E,F	ABX	THR-999	D	60-999	TRK-1 DST 999=1 GEV		
59CA3	62SM154		G,N	ABX	8- 32	C	8- 32	ACT-I 4PI		
69VA2	62SM154		G,XN	ABX	8- 23	C	8- 23	BF3-I 4PI		212
69VA3	62SM154		G,XN	ABX	8- 22	C	8- 22 SEE 69VA2	BF3-I 4PI		212
62KD3	62SM154		G,P	RLX	THR- 20	C	20 REL TO NEUTRONS	ACT-I 4PI		
69MD1	62SM154		G,F	ABX	THR-999	C	60-999	TRK-1 DST 999=1 GEV		

EURDPIUM Z=63

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
151	47.82	8.0	4.9	10.3	12.7	-2.0	14.4	12.9	13.2
153	52.18	8.6	5.9	11.3	14.8	-0.3	14.9	14.2	14.6

REF	NUCLIDE Z	A	REACTION IN,DUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
67HU1	63EU		G,N	ABX	9- 11	D	9- 11	BF3-I 4PI		
60GE3	63EU151		G,N	NDX	THR		CTHR	8F3-I 4PI THRESHOLD		
70SE1	63EU151		G,XN	ABX	8- 24	C	8- 24	8F3-1 4PI		
70VA1	63EU151		G,XN	A8X	8- 22	C	8- 22	BF3-I 4PI		488
71VA2	63EU151		G,XN	ABX	7- 24	C	7- 24	BF3-I 4PI		
66AT1	63EU153		G,G	LFT	1	D	1	SCD-D UKN 1=97 KEV		
60GE3	63EU153		G,N	NDX	THR		CTHR	BF3-I 4PI THRESHDLD		
69BE8	63EU153		G,N	A8X	8- 29	D	8- 29 INCLUDES NP	BF3-I 4PI		154+
698E8	63EU153		G,2N	ABX	8- 29	D	8- 29 INCLUDES 2NP	BF3-I 4PI		156
698E8	63EU153		G,3N	ABX	8- 29	D	8- 29	BF3-I 4PI		157
70SE1	63EU153		G,XN	ABX	8- 24	C	8- 24	BF3-I 4PI		
70VA1	63EU153		G,XN	ABX	8- 22	C	8- 22	BF3-I 4PI		489
71VA2	63EU153		G,XN	ABX	8- 24	C	8- 24	8F3-I 4PI		

GADOLINIUM Z=64

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
152	0.20	8.6	7.4	13.3	12.5	-2.2	15.1	15.3	12.2
154	2.15	8.7	7.6	14.0	14.1	-0.9	15.1	16.2	13.5
155	14.73	6.4	7.6	14.2	12.2	-0.1	15.1	14.1	14.1
156	20.47	8.5	8.0	14.1	14.9	0.2	15.0	16.2	14.7
157	15.68	6.4	8.0	14.1	13.3	0.7	14.9	14.4	15.2
158	24.87	7.9	8.5	13.8	15.4	0.7	14.3	16.0	15.9
160	21.90	7.5	9.3	13.4	*	1.0	13.4	16.0	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT		SOURCE	DETECTOR TYPE	ANG	NUM
71ME1	64GD		G,F	ABY	THR-900	C	300-900	TRK-I 4PI		
70SE1	64GD152		G,XN	ABX	8- 24	C	8- 24	BF3-I 4PI		
70VA1	64GD152		G,XN	ABX	8- 22	C	8- 22	BF3-I 4PI		490
71VA2	64GD152		G,XN	ABX	8- 24	C	8- 24	BF3-I 4PI		
70SE1	64GD154		G,XN	ABX	8- 24	C	8- 24	BF3-I 4PI		
7DVA1	64GD154		G,XN	ABX	8- 22	C	8- 22	BF3-I 4PI		491
71VA2	64GD154		G,XN	ABX	8- 24	C	8- 24	BF3-I 4PI		
60DE1	64GD155		G,G	LFT	1	D	1 SEPARATED ISOTOPES	NAI-D	125	
66BA3	64GD155		G,G	LFT	1	D	1 60, 86.5 KEV	NAI-D UKN		
66ST1	64GD155		G,G	LFT	1	D	1 1=60 KEV	NAI-D UKN		
7DSE1	64GD156		G,XN	ABX	8- 24	C	8- 24	BF3-I 4PI		
70VA1	64GD156		G,XN	ABX	8- 22	C	8- 22	BF3-I 4PI		492
71VA2	64GD156		G,XN	ABX	8- 24	C	8- 24	BF3-I 4PI		
60GE3	64GD157		G,N	NOX	THR		CTHR	BF3-I 4PI THRESHDLD		
70VA1	64GD158		G,XN	ABX	8- 22	C	8- 22	BF3-1 4PI		493
71VA2	64GD158		G,XN	ABX	7- 24	C	7- 24	BF3-I 4PI		
59CA3	64GD160		G,N	A8X	8- 32	C	8- 32	ACT-I 4PI		
69BE8	64GD160		G,N	ABX	8- 29	D	8- 29 INCLUDES NP	BF3-I 4PI		158+
72DR5	64GD160		G,N	ABX	6- 33	C	6- 33	ACT-I 4PI		
69BE8	64GD160		G,2N	ABX	8- 29	D	8- 29 INCLUDES 2NP	BF3-I 4PI		160
69BE8	64GD160		G,3N	ABX	8- 29	D	8- 29	BF3-I 4PI		161
72DR5	64GD160		G,XP	A8X	15- 33	C	14- 33 XP=P+NP	ACT-I 4PI		

TERBIUM Z=65

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
156	5.2(-2)	7.1	5.5	12.1	11.8	-0.2	16.1	11.9	13.1
159	99.95	8.1	6.1	11.9	14.4	0.1	14.9	14.0	14.6

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
59ME1	65TB159		G,G	LFT	1	D 1	NAI-D	DST	
							MULTIPOLARITY		
64LA1	65TB159		G,G	ABX	10- 25	C 30	NAI-D	DST	
66AT2	65TB159		G,G	LFT	1	D 1	SCD-D	DST	
							1=58 KEV		
66RA1	65TB159		G,G	LFT	1	D 1	NAI-D	DST	
							1=363, 580 KEV		
58CH2	65TB159		G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
60GE3	65TB159		G,N	NDX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
62BO1	65TB159		G,N	ABX	8- 21	CTHR- 21	BF3-I	4PI	
64BR1	65TB159		G,N	ABX	8- 28	D B- 28	BF3-I	4PI	
68BE5	65TB159		G,N	ABX	THR- 30	D 7- 30	MDD-I	4PI	94
68OK2	65TB159		G,N	ABY	THR- 20	C 20	ACT-I	4PI	
							ISOMERIC YIELD		
64BR1	65TB159		G,2N	ABX	14- 28	D 8- 28	BF3-I	4PI	
68BE5	65TB159		G,2N	ABX	THR- 30	D 7- 30	MOD-I	4PI	95
68BE5	65TB159		G,3N	ABX	THR- 30	D 7- 30	MDD-I	4PI	96+
58FU1	65TB159		G,XN	ABY	7- 40	C 7- 40	8F3-I	4PI	
58FU2	65TB159		G,XN	ABX	8- 23	CTHR- 25	BF3-I	4PI	
58KA1	65TB159		G,XN	ABX	9- 22	C 9- 22	BF3-I	4PI	
60TH1	65TB159		G,XN	ABX	B- 18	C 7- 18	BF3-I	4PI	

DYSPROSIUM Z=66

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
156	5.2(-2)	9.4	6.6	14.1	12.3	-1.8	16.3	15.6	11.4
158	9.0(-2)	9.1	6.9	14.1	13.3	-0.9	16.0	15.5	12.4
160	2.29	8.6	7.4	13.8	13.8	-0.5	15.4	15.6	13.5
161	18.88	6.5	7.5	13.5	12.3	-0.4	15.0	13.9	14.1
162	25.53	8.2	8.0	13.6	14.5	-0.1	14.6	15.7	14.8
163	24.97	6.3	8.0	13.5	13.3	0.2	14.5	14.3	15.4
164	28.18	7.7	8.6	13.4	15.4	0.4	13.9	15.6	16.2

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
61BA2	66DY		G,XN	ABY	THR- 22	C 22	THR-I	DST	
60GE3	66DY163		G,N	NDX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		

HOLMIUM Z=67

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
165	100.00	8.0	6.2	11.7	14.1	-0.1	14.7	13.9	14.8

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
62FU3	67HO165		G,G	ABX	8- 28	C 8- 28	NAI-D	90	
							TENSOR POLARIZATION		
63LA1	67HO165		G,G	ABX	9- 26	C 9- 27	NAI-D	DST	
64LA1	67HO165		G,G	ABX	10- 25	C 27	NAI-D	DST	
66AX1	67HD165		G,G	ABX	13, 16	D 13, 16	NAI-D	DST	
63TI1	67HO165		G,G/	A8X	10- 19	D 10- 19	NAI-D	135	
58CH2	67HD165		G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
60GE3	67HD165		G,N	NDX	THR	CTHR	8F3-I	4PI	
							THRESHOLD		
61WE1	67HD165		G,N	ABX	8- 11	D B- 11	ACT-I	4PI	
62RE1	67HO165		G,N	NOX	11- 55	C 55	THR-I	DST	
63BR1	67HD165		G,N	ABX	8- 28	C 8- 28	BF3-I	4PI	
							QUADRUPOLE MOMENT		
66AX1	67HD165		G,N	ABX	B- 20	D B- 20	8F3-I	4PI	
67GE2	67HD165		G,N	A8Y	THR- 27	C 22, 27	BF3-I	4PI	
67HU1	67HD165		G,N	ABX	9- 11	D 9- 11	8F3-I	4PI	
68BE5	67HO165		G,N	ABX	THR- 30	D 7- 30	MDD-I	4PI	90
69BE8	67HD165		G,N	ABX	8- 29	D B- 29	BF3-I	4PI	163
							INCLUDES NP		
63BR1	67HD165		G,2N	ABX	14- 28	C 14- 28	BF3-I	4PI	
							QUADRUPOLE MOMENT		
66AX1	67HD165		G,2N	ABX	8- 20	D 8- 20	BF3-I	4PI	
67HA1	67HO165		G,2N	RLX	14- 29	C 14- 29	ACT-I	4PI	
							YIELD TO ISOMERE		
68BE5	67HD165		G,2N	ABX	THR- 30	D 7- 30	MDD-I	4PI	91
69BE8	67HD165		G,2N	ABX	8- 29	D 8- 29	BF3-I	4PI	164
							INCLUDES 2NP		
68BE5	67HO165		G,3N	ABX	THR- 30	D 7- 30	MDD-I	4PI	92+
69BE8	67HO165		G,3N	ABX	8- 29	D 8- 29	BF3-I	4PI	162+

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58FU1	67HO165		G,XN	ABX	7- 40	C 7- 40	8F3-I	4PI	
58KA1	67HO165		G,XN	A8X	9- 22	C 9- 22	BF3-I	4PI	
60TH1	67HO165		G,XN	A8X	B- 18	C 7- 18	ACT-I	4PI	
62FU3	67HO165		G,XN	ABX	8- 24	C B- 24	8F3-I	4PI	
							DUADRUPOLE MOMENT		
65AM1	67HO165	$	G,XN	ABY	10- 20	C 10- 20	BF3-I	4PI	
							ORIENTED TARGET		
69KE2	67HD165	$	G,XN	ABX	10- 21	D 10- 21	BF3-I	4PI	
							ORIENTED TARGET		
66SC1	67HO165		G,P	SPC	THR- 70	C 70	TEL-D	DST	
66SC1	67HO165		G,D	RLY	THR- 70	C 70	TEL-D	DST	
66SC1	67HO165		G,T	RLY	THR- 70	C 70	TEL-D	DST	
638R1	67HO165		G,NP	ABX	13- 28	C 13- 28	BF3-I	4PI	
							DUADRUPOLE MOMENT		
71ME1	67HD165		G,F	ABY	THR-900	C300-900	TRK-I	4PI	

ERBIUM Z=68

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
162	0.14	9.2	6.4	13.8	12.1	-1.7	16.5	14.9	11.2
164	1.56	8.9	6.9	13.7	12.8	-1.3	15.8	15.3	12.3
166	33.41	8.5	7.3	13.5	13.5	-0.8	15.1	15.3	13.5
167	22.94	6.4	7.5	13.3	12.3	-0.7	14.9	13.8	14.3
168	27.07	7.8	8.0	13.0	14.3	-0.5	14.2	15.3	15.0
170	14.88	7.3	8.6	12.7	*	0.0	13.3	15.3	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
62FU3	6BER		G,G	A8X	B- 28	C 8- 28	NAI-D	90	
							TENSOR POLARIZABIL		
63LA1	6BER		G,G	ABX	9- 26	C 9- 27	NAI-D	DST	
63KA2	68ER		G,G/	RLY	1	C 4	ACT-I	4PI	
64LA1	68ER		G,G	A8X	10- 25	C 30	NAI-D	DST	
69BE6	6BER		G,N	ABX	7- 21	D 7- 28	MOD-I	4PI	
698E6	68ER		G,2N	A8X	13- 27	D 7- 28	MDD-I	4PI	
69BE6	6BER		G,3N	ABX	23- 28	D 7- 28	MOD-I	4PI	
58FU1	6BER		G,XN	ABX	7- 40	C 7- 40	BF3-I	4PI	
62FU3	68ER		G,XN	A8X	8- 24	C 8- 24	BF3-I	4PI	
							DUADRUPOLE MOMENT		
60GE3	68ER167		G,N	NDX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
63MI3	68ER170		G,P	NOX	THR- 21	C 21	ACT-I	4PI	

THULIUM Z=69

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
169	100.00	8.1	5.6	11.3	13.1	-1.2	14.9	13.3	13.5

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
5BCH2	69TM169		G,N	RLY	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
60GE3	69TM169		G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
58KA1	69TM169		G,XN	ABX	B- 22	C 8- 22	BF3-I	4PI	

YTTERBIUM Z=70

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
168	0.14	9.1	6.3	13.6	12.0	-1.9	16.1	15.0	11.2
170	3.03	8.5	6.8	13.2	12.4	-1.7	15.3	14.8	12.4
171	14.31	6.6	6.8	13.0	11.3	-1.6	15.1	13.4	13.0
172	21.82	8.0	7.3	12.9	13.3	-1.3	14.6	14.8	13.7
173	16.13	6.4	7.5	12.7	12.4	-0.9	14.4	13.7	14.4
174	31.84	7.5	8.0	12.7	14.2	-0.7	13.8	14.9	15.0
176	12.73	6.9	8.5	12.2	15.0	-0.6	12.7	15.0	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
5BFU1	70YB		G,XN	ABY	7- 40	C 7- 40	BF3-I	4PI	
71ME1	70YB		G,F	ABY	THR-900	C300-900	TRK-I	4PI	
60GE3	70YB173		G,N	NOX	THR	CTHR	BF3-I	4PI	
							THRESHOLD		
69MD1	70YB174		E,F	ABX	THR-999	D 60-999	TRK-I	DST	
							999=1 GEV		
69MD1	70YB174		G,F	ABX	THR-999	C 60-999	TRK-I	DST	
							999=1 GEV		

LUTETIUM Z=71

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
175	97.41	7.7	5.5	10.9	12.7	-1.6	14.4	13.D	13.5
176	2.59	6.3	6.0	1D.8	12.1	-1.6	14.9	11.8	14.1

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69BE6	71LU		G,N	ABX	7- 24	D 7- 28	MOD-I	4PI	
69BE6	71LU		G,2N	ABX	14- 28	D 7- 28	MOD-I	4PI	
69BE6	71LU		G,3N	ABX	24- 28	D 7- 28	MOD-I	4PI	
62DE2	71LU175		G,G	LFT	1	D 1 J-PI, MULTIPOLARIT	NAI-D	DST	
58KI1	71LU175		G,N	ABX	8- 23	C 8- 23 THRESHDLD	BF3-I	4PI	
6DGE3	71LU175		G,N	NOX	THR	CTHR THRESHDLD	BF3-I	4PI	
58KA1	71LU175		G,XN	A8X	8- 22	C 8- 22	BF3-1	4PI	

HAFNIUM Z=72

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
174	D.18	8.6	6.2	12.8	11.4	-2.6	15.6	14.4	11.1
176	5.2D	8.1	6.7	12.7	12.0	-2.3	14.9	14.4	12.2
177	18.50	6.4	6.8	12.3	10.9	-2.2	14.5	13.1	12.8
178	27.14	7.6	7.3	12.2	12.7	-2.1	14.0	14.4	13.5
179	13.75	6.1	7.6	12.0	11.9	-1.8	13.7	13.4	14.1
18D	35.24	7.4	8.0	12.3	13.7	-1.3	13.5	15.0	14.9

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
63KA2	72HF		G,G/	RLY	1	C 5	ACT-I	4PI	
67MI1	72HF		G,F	A8X	30D-999	D300-999 999=160D MEV	TRK-I	DST	
67RA2	72HF		G,F	A8X	THR-26D	C200-260	EMU-I	4PI	
61HA1	72HF177		G,G	LFT	D- 1	D 0- 1 113, 321 KEV	NAI-D	11D	
58TD1	72HF177		G,N	RLY	6- 7	C 6-	8F3-I	4PI	
60GE3	72HF177		G,N	NDX	THR	CTHR THRESHOLD	8F3-I	4PI	
7D8D4	72HF179		G,G	ABI	0- 2	C 0- 2 6 LEVELS	ACT-I	4PI	
63VE2	72HF179		G,G/	ABX	0- 1	D 1 ISOMERS 1=1.33 MEV	ACT-I	4PI	
58TD1	72HF179		G,N	RLY	6- 7	C 6-	BF3-I	4PI	
60GE3	72HF179		G,N	NOX	THR	CTHR THRESHOLD	8F3-I	4PI	
6DGE3	72HF180		G,N	NOX	THR	CTHR THRESHOLD	8F3-I	4PI	

TANTALUM Z=73

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
180	1.2(-2)	6.6	5.7	10.9	11.4	-2.1	14.5	11.8	13.3
181	99.99	7.6	5.9	1D.9	13.2	-1.5	14.2	13.3	13.9

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71MD3	73TA181		E,E/	A8X	D-240	D500	MAG-D	60	
59BA3	73TA181		E,N	A8Y	THR- 36	D 10- 36	BF3-I	4PI	
65HE1	73TA181		E,N	RLY	THR- 32	D 14- 32	ACT-I	4PI	
69GR2	73TA181		E,N	RLY	THR-999	C 70-999 999=1 GEV	ACT-I	4PI	E-,N/E+,N
608A2	73TA181		E,3N	RLY	22- 42	D 22- 42 REL TO G,3N	ACT-I	4PI	
70BU2	73TA181		E,XN	SPC	7-140	C14D THICK TARGET	TOF-D	165	
69AN8	73TA181		E,P	RLY	THR-999	C999 999=1 GEV, REL D/T	MAG-D	DST	
70AN5	73TA181		E,P	RLY	86-999	C999 999=1140 MEV	TEL-D	DST	
69AN8	73TA181		E,D	RLY	THR-999	C999 999=1.3 GEV	MAG-D	DST	
69AN8	73TA181		E,T	RLY	THR-999	C999 999=1 GEV, REL D/T	MAG-D	DST	
65HE1	73TA181		E+,N	RLY	THR- 32	D 14- 32	ACT-I	4PI	
68BD1	73TA181		E,F	A8I		D250,5D0	EMU-I	4PI	
58FU3	73TA181		G,G	ABX	5- 27	C 5- 27	NAI-D	120	
61BU4	73TA181		G,G	ABX	10- 25	C 20	NAI-D	DST	
63LA1	73TA181		G,G	NDX	11- 22	C 27	NAI-D	DST	
63YO1	73TA181		G,G	ABX	6- 8	D 6-	NAI-D	120	
64LA1	73TA181		G,G	ABX	10- 25	C 32	NAI-D	DST	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67SH3	73TA181		G,G/	ABX	18	D 18 RAMAN SCATTERING	NAI-D	9D	
55JD1	73TA181		G,N	RLY	THR- 65	C 65	SCI-D	DST	
55JO1	73TA181		G,N	RLY	THR- 65	C 65	SCI-D	DST	
57CA1	73TA181		G,N	RLX	8- 31	C 8- 31	ACT-I	4PI	
57FE2	73TA181		G,N	RLY	14- 30	C 14- 30	THR-I	9D	
58BE2	73TA181		G,N	SPC	8- 16	C 14, 16	TOF-D	12D	
58CA1	73TA181		G,N	ABX	7- 32	C 7- 32 THRESHOLD	ACT-I	4PI	
58CH2	73TA181		G,N	RLY	THR	CTHR THRESHDLD	BF3-1	4PI	
58CO1	73TA181		G,N	SPC	9- 30	C 20, 3D THRESHOLD	EMU-D	90	
58SP1	73TA181		G,N	ABX	8- 18	C 8- 18	BF3-I	4PI	
59AU1	73TA181		G,N	A8X	18- 65	C 18- 65	THR-1	4PI	
59CA3	73TA181		G,N	ABX	8- 33	C 8- 33	ACT-I	DST	
59PA1	73TA181		G,N	ABX	8- 22	C 8- 22 THRESHOLD	BF3-I	4PI	
6DBA2	73TA181		G,N	RLX	8- 32	C 8- 32	ACT-I	4PI	
6DGE3	73TA181		G,N	NDX	THR	CTHR THRESHOLD	ACT-I	4PI	
61WE1	73TA181		G,N	ABX	7- 11	D 7- 11 THRESHDLD	ACT-I	4PI	
62BD1	73TA181		G,N	ABX	9- 23	C 9- 23	8F3-1	4PI	458
62MI3	73TA181		G,N	A8X	7- 22	D 7- 22	8F3-I	4PI	
63BR1	73TA181		G,N	A8X	8- 28	D 8- 28 QUADRUPOLE MDMENT	8F3-I	4PI	
63ZA1	73TA181		G,N	SPC	9- 19	C 14, 19	EMU-D	DST	
64GR2	73TA181		G,N	ABX	THR- 11	DTHR- 11	BF3-I	4PI	
67GE2	73TA181		G,N	ABY	THR- 27	C 22, 27	BF3-I	4PI	
67HU1	73TA181		G,N	ABX	8- 11	D 8- 11	BF3-I	4PI	
68BE5	73TA181		G,N	ABX	THR- 30	D 7- 30	MOD-I	4PI	85+
68KA1	73TA181		G,N	ABX	50- 85	C 55, 85 NEUT ENGY SPEC	TOF-D	67	
68VE1	73TA181		G,N	A8X	THR- 36	D 7- 36	MOD-I	4PI	
69TS1	73TA181		G,N	NOX	15- 26	C 26	SCI-D	DST	
57CA1	73TA181		G,2N	RLX	14- 31	C 8- 31 MIXED WITH G,3N	MOD-I	4PI	
58CA1	73TA181		G,2N	ABX	14- 32	C 7- 32 THRESHOLD	ACT-I	4PI	
63BR1	73TA181		G,2N	ABX	13- 28	D 8- 28 OUDRPL MOM, THRESH	8F3-I	4PI	
688E5	73TA181		G,2N	A8X	THR- 30	D 7- 3D	MOD-I	4PI	86
68VE1	73TA181		G,2N	ABX	THR- 36	D 7- 36	MOD-I	4PI	
57CA1	73TA181		G,3N	RLX	14- 31	C 8- 31 MIXED WITH G,2N	MOD-I	4PI	
58CA1	73TA181		G,3N	ABX	22- 32	C 7- 32 THRESHDLD	ACT-I	4PI	
60BA2	73TA181		G,3N	RLX	22- 32	C 22- 32	ACT-I	4PI	
68BE5	73TA181		G,3N	ABX	THR- 30	D 7- 30	MOD-I	4PI	87
68VE1	73TA181		G,3N	ABX	THR- 36	D 7- 36	MOD-I	4PI	
68BE5	73TA181		G,4N	ABX	THR- 36	D 7- 36	MOD-I	4PI	88
68VE1	73TA181		G,4N	ABX	THR- 36	D 7- 36	MOD-I	4PI	
56GA1	73TA181		G,XN	ABX	8- 27	C 8- 27	BF3-I	4PI	
56HA1	73TA181		G,XN	A8X	15, 18	D 15, 18	BF3-I	4PI	
57CA1	73TA181		G,XN	RLX	8- 31	C 8- 31	MOD-I	4PI	
58FU1	73TA181		G,XN	ABY	7- 4D	C 7- 40	BF3-I	4PI	
58FU2	73TA181		G,XN	ABX	8- 23	CTHR- 25	BF3-I	4PI	
58KA1	73TA181		G,XN	A8X	9- 22	C 9- 22	8F3-I	4PI	
618A2	73TA181		G,XN	ABY	THR- 22	C 22	THR-I	DST	
61BA2	73TA181		G,XN	ABY	THR- 22	C 22	THR-I	DST	
61MI1	73TA181		G,XN	ABX	8- 22	D 8- 22	BF3-I	4PI	
64AL5	73TA181		G,XN	NDX	THR- 34	C 34	THR-I	DST	
66FI2	73TA181		G,XN	SPC	THR- 60	C 60	TOF-D	90	
67AN2	73TA181		G,XN	A8X	THR- 2D	C 8- 20	8F3-I	4PI	
69IS1	73TA181		G,XN	ABX	7- 3D	C 7- 30	MOD-I	4PI	
59SE2	73TA181		G,P	A8X	15, 18	D 15, 18	EMU-I	4PI	
6D8A5	73TA181		G,P	A8X	17- 39	C 17- 39 . SPECTRUM	MAG-D	DST	
60CA2	73TA181		G,P	ABX	15- 32	C 15- 32 THRESHDLD	ACT-I	4PI	
69AN6	73TA181		G,P	ABY	103-999	C700,999 999=1.2 GEV	TEL-D	DST	
71AN1	73TA181		G,P	SPC	36-999	C700,999 999=1.2 GEV, REL D/P	TEL-D	DST	
55TO1	73TA181		G,XP	SPC	11- 23	C 23 ABSOLUTE YIELD	EMU-D	DST	
60CH1	73TA181		G,XP	RLX	22- 90	C 90 REL TO DEUTERONS	TEL-I	9D	
69AN6	73TA181		G,D	ABY	109-999	C7D0,999 999=1.2 GEV	TEL-D	DST	
71AN1	73TA181		G,D	SPC	43-999	C700,999 999=1.2 GEV, GEV D/P	TEL-D	DST	
6DCH1	73TA181		G,XD	RLX	27- 90	C 90 REL TO PROTONS	TEL-I	90	
71AN2	73TA181		G,XD	ABX	101-999	C999 999=1.14 GEV	MAG-D	DST	
60CH1	73TA181		G,XT	RLY	27- 90	C 9D REL TD DEUTERONS	TEL-I	90	
57ER1	73TA181		G,A	A8I	1- 32	C 32	ACT-I	4PI	
63BR1	73TA181		G,NP	ABX	14- 28	D 8- 28	8F3-1	4PI	
71FU4	73TA181		G,SPL	RLY	THR-999	C999 999=5 GEV	ACT-1	4PI	
72KA5	73TA181		G,SPL	RLY	THR-999	C6D0-999 999=1.7 GEV	TRK-1	DST	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67MI1	73TA181		G,F	A8X	3D0-999	C300-999	TRK-I	DST	
						999=160D	MEV		
67RA2	73TA181		G,F	A8X	THR-26D	C2DD-260	EMU-I	4PI	
71ME1	73TA181		G,F	A8Y	THR-9D0	C3DD-9DD	TRK-I	4PI	
71VA4	73TA181		G,F	A8X	1DD-999	C1D0-999	TRK-I	4PI	
						999= 5	GEV		
72KA5	73TA181		G,F	RLY	THR-999	C6D0-999	TRK-I	DST	
						999=1.7	GEV		
72KR3	73TA181		G,F	A8Y	THR-999	C35D-999	TRK-I	DST	
						999= 1	GEV		
72SK6	73TA181		G,F	LFT	THR-999	C999	TRK-I	DST	
						999=1.45	GEV		

TUNGSTEN (WOLFRAM) Z=74

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
18D	D.14	8.5	6.6	12.9	11.7	-2.5	15.4	14.5	11.8
182	26.41	8.1	7.1	12.8	12.7	-1.8	14.7	14.7	13.D
183	14.40	6.2	7.2	12.4	11.5	-1.7	14.2	13.3	13.5
184	3D.64	7.4	7.7	12.2	13.2	-1.7	13.6	14.6	14.3
186	28.41	7.2	8.4	12.2	14.2	-1.0	13.0	15.2	*

REF	NUCLIOE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71MA2	74W		E,F	SPC	THR-999	D5DD,999	TRK-I	4PI	
						999=1.3	GEV		
60RE1	74W		G,G	A8X	7	D 7	NAI-D	90	
668E3	74W		G,G	RLX	5- 10	D 5- 10	NAI-D	135	
63KA2	74W		G,G/	RLY	1	C 5	ACT-I	4PI	
56HA1	74W		G,XN	A8X	15, 18	D 15, 18	8F3-I	4PI	
618A2	74W		G,XN	A8Y	THR- 22	C 22	THR-I	DST	
62SH4	74W		G,P	SPC	7- 34	C 23, 34	EMU-D	DST	
						ABSOLUTE YIELD			
62SH6	74W		G,P	SPC	7- 34	C 23, 34	EMU-D	DST	
63SH1	74W		G,P	A8X	15- 34	C 15- 34	SCI-I	DST	
						MULTIPOLARITIES			
64DE4	74W		G,F	A8X	3DD-999	C3D0-999	EMU-D	4PI	
						999=1	GEV		
66SH2	74W	183	G,G	LFT	1	D 1	NAI-D	4PI	
						1=46,48	KEV		
6DGE3	74W	183	G,N	NOX	THR	CTHR	8F3-I	4PI	
						THRESHOLD			
62CA2	74W	184	G,P	A8X	15- 32	C 32	ACT-I	4PI	
71MO2	74W	186	G,G/	LFT	6	D 6, 8	SCD-D	DST	
						6.418	MEV		
6DGE3	74W	186	G,N	NOX	THR	CTHR	8F3-I	4PI	
						THRESHOLD			
62CA2	74W	186	G,N	A8X	9- 32	C 32	ACT-I	4PI	
698E8	74W	186	G,N	A8X	8- 29	D 8- 29	8F3-I	4PI	166
						INCLUDES NP			
698E8	74W	186	G,2N	A8X	8- 29	D 8- 29	8F3-I	4PI	168
						INCLUDES 2NP			
698E8	74W	186	G,3N	A8X	8- 29	D 8- 29	8F3-I	4PI	169
62CA2	74W	186	G,P	A8X	15- 32	C 32	ACT-I	4PI	

RHENIUM Z=75

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
185	37.07	7.8	5.4	10.5	12.3	-2.2	14.1	12.8	13.1
187	62.93	7.4	6.0	10.5	13.5	-1.7	13.6	13.2	14.4

REF	NUCLIOE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67MI1	75RE		G,F	A8X	300-999	C300-999	TRK-I	OST	
						999=1600	MEV		
67RA2	75RE		G,F	A8X	THR-26D	C200-26D	EMU-I	4PI	
67ME1	75RE185		G,G	LFT	D- 1	D D- 1	SCO-D	OST	
						646,718,874	KEV		
64LA3	75RE187		G,G	LFT	D- 1	O 0- 1	NAI-D	DST	
						5 LEVELS			
64SH5	75RE187		G,G	LFT	1	O 1	NAI-D	122	
						1=686	KEV		
67LA2	75RE187		G,G	LFT	D- 1	O D- 1	SCD-D	115	
						8 LEVELS			
6DGE3	75RE187		G,N	NOX	THR	CTHR	8F3-I	4PI	
						THRESHOLD			

OSMIUM Z=76

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
184	0.D2	8.9	5.7	12.7	1D.9	-3.1	16.1	14.2	1D.5
186	1.59	8.3	6.5	12.1	11.6	-2.8	14.9	14.3	11.9
187	1.64	6.3	6.6	12.1	1D.4	-2.7	14.6	12.8	12.4
188	13.3	8.0	7.2	12.3	12.7	-2.1	14.3	14.6	13.2
189	16.1	5.9	7.3	12.D	11.4	-2.D	13.9	13.1	13.7
190	26.4	7.8	8.D	12.4	13.7	-1.4	13.7	15.1	14.6
192	41.0	7.6	8.7	12.9	15.3	-D.4	13.3	15.7	*

REF	NUCLIOE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67MI1	76OS		G,F	A8X	300-999	C300-999	TRK-I	DST	
						999=16D0	MEV		
67RA2	76OS		G,F	A8X	THR-26D	C2D0-26D	EMU-I	4PI	

IRIDIUM Z=77

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
191	37.3	8.1	5.3	10.5	12.6	-2.1	14.4	13.1	13.3
193	62.7	7.8	5.9	1D.8	13.9	-1.0	14.0	13.5	14.6

REF	NUCLIOE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
63KA2	77IR		G,G/	RLY	1	C 5	ACT-I	4PI	
67SC1	77IR191		G,G	LFT	0- 1	D 0- 1	SCD-D	125	
						539,588	KEV		
68DA1	77IR191	%	G,G	NOX	1	D 1	NAI-O	DST	
						MAG MOMENT,129	KEV		
64LA4	77IR191		G,G	LFT	0- 1	D 0-	NAI-D	125	
63VE2	77IR191		G,G/	A8X	D- 1	D 1	ACT-I	4PI	
						ISOMERS 1=1.33	MEV		
67ME2	77IR193		G,G	LFT	0- 1	D D- 1	SCD-D	1D5	
						46D,557,559	KEV		
70ME6	77IR193		G,G	LFT	0- 1	D 0- 1	SCD-D	1D5	
						SEE 67ME2			
60GE3	77IR193		G,N	NOX	THR	CTHR	8F3-I	4PI	
						THRESHOLD			

PLATINUM Z=78

A	A8UND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
190	1.3(-2)	8.8	6.1	12.6	11.0	-3.2	15.7	14.4	10.8
192	0.78	8.7	6.9	12.8	12.2	-2.4	15.1	15.0	12.2
194	32.9	8.4	7.5	13.0	13.3	-1.5	14.6	15.3	13.5
195	33.8	6.1	7.6	12.9	11.9	-1.2	14.5	13.6	14.D
196	25.3	7.9	8.1	13.1	14.2	-D.8	14.0	15.5	14.8
198	7.21	7.6	8.8	13.0	15.0	-D.1	13.4	15.8	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
668E3	78PT		G,G	RLX	5- 1D	D 5- 10	NAI-D	135	
63KA2	78PT		G,G/	RLY	1	C 5	ACT-I	4PI	
64GL1	78PT		G,N	SPC	16	D 16	TOF-D	9D	
68JU1	78PT		G,N	NOX	THR- 27	C 27	THR-I	DST	
62SH2	78PT		G,P	SPC	7- 34	C 23, 34	EMU-D	DST	
						ABSOLUTE YIELD			
62SH4	78PT		G,P	SPC	7- 34	C 23, 34	EMU-O	DST	
						ABSOLUTE YIELD			
67MI1	78PT		G,F	A8X	30D-999	C3D0-999	TRK-I	DST	
						999=160D	MEV		
67RA2	78PT		G,F	A8X	THR-26D	C1D0-260	EMU-I	OST	
63VE2	78PT195		G,G/	A8X	D- 1	D 1	ACT-I	4PI	
						ISOMERS 1=1.33	MEV		
60GE3	78PT195		G,N	NOX	THR	CTHR	8F3-I	4PI	
						THRESHOLD			
60GE3	78PT196		G,N	NOX	THR	CTHR	8F3-I	4PI	
						THRESHOLD			
62CH1	78PT196		N,G	NOX	8	O 0-	NAI-D	9D	
						REL TRANS PROBABIL			

GOLD Z=79

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
197	100.00	8.1	5.8	11.4	13.6	-0.9	14.8	13.7	13.9

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
6D8A2	79AU197		E,N	RLY	14- 38 D 14- 38	ACT-I	4PI		
					REL TO G,N				
608A2	79AU197		E,2N	RLY	17- 38 D 17- 38	ACT-I	4PI		
					REL TO G,2N				
58ZI1	79AU197		G,MU-T	A8X	9- 20 C 9- 3D	MGP-D	UKN		
56FU1	79AU197		G,G	ABX	4- 40 C 4- 4D	NAI-D	120		
60RE1	79AU197		G,G	ABX	7 D 7	NAI-D	90		
62OC1	79AU197		G,G	ABX	11- 18 D 11- 1B	NAI-D	135		
63LA1	79AU197		G,G	ABX	9- 26 C 9- 32	NAI-D	DST		
64LA1	79AU197		G,G	ABX	10- 25 C 32	NAI-D	DST		
63KA2	79AU197		G,G/	RLY	1 C 4	ACT-I	4PI		
63VE2	79AU197		G,G/	A8X	0- 1 D 1	ACT-I	4PI		
					ISOMERS 1=1.33 MEV				
57FE1	79AU197		G,N	RLY	15- 31 C 15- 31	THR-I	DST		
58BE2	79AU197		G,N	SPC	7- 16 C 14, 16	TOF-D	120		
58CA2	79AU197		G,N	SPC	10- 19 C 3D	EMU-D	90		
						THRESHOLD			
58CH2	79AU197		G,N	RLY	THR CTHR	BF3-I	4PI		
						THRESHOLD			
59AU1	79AU197		G,N	A8X	18- 65 C 1B- 65	THR-I	4PI		
					YLD REL TO CU63				
60AS1	79AU197		G,N	SPC	6- 55 C 55	EMU-D	90		
60BA2	79AU197		G,N	RLX	10- 20 C 10- 3B	ACT-I	4PI		
60BA8	79AU197		G,N	A8X	14, 18 D 14, 18	ACT-I	4PI		
60GE3	79AU197		G,N	NOX	THR CTHR	BF3-I	4PI		
						THRESHOLD			
61NA1	79AU197		G,N	ABX	1D- 22 C 10- 22	ACT-I	4PI		
61TA1	79AU197		G,N	NOX	12- 22 C 22	THR-I	DST		
61WE1	79AU197		G,N	ABX	8- 10 D 8- 10	ACT-I	4PI		
62FU2	79AU197		G,N	ABX	8- 25 D 7- 25	BF3-I	4PI		
					MIXED WITH G,NP				
62MI3	79AU197		G,N	A8X	6- 22 D 6- 22	BF3-I	4PI		
62RE1	79AU197		G,N	NOX	11- 55 C 55	THR-I	DST		
63ZA1	79AU197		G,N	SPC	7- 19 C 14, 19	EMU-D	DST		
67GE2	79AU197		G,N	ABY	THR- 27 C 22, 27	BF3-I	4PI		
67HU1	79AU197		G,N	ABX	9- 11 D 9- 11	BF3-I	4PI		
69DE1	79AU197		G,N	ABY	THR-999 C 1- 6	ACT-I	4PI		
					999=5.5	GEV			
69DI1	79AU197		G,N	ABY	THR-9D0 C400-900	ACT-I	4PI		
7DVE1	79AU197		G,N	A8X	8- 26 D 7- 36	BF3-I	4PI	334	
71DI1	79AU197		G,N	ABY	8-999 C300-999	ACT-I	4PI		
					999= 1	GEV			
71LI2	79AU197		G,N	ABY	THR-90D C 75-900	ACT-I	4PI		
71SA1	79AU197		G,N	ABY	8- 68 C 10- 6B	ACT-I	4PI		
60BA2	79AU197		G,2N	RLX	15- 26 C 15- 38	ACT-I	4PI		
61NA1	79AU197		G,2N	ABX	15- 22 C 10- 22	ACT-I	4PI		
62FU2	79AU197		G,2N	ABX	14- 25 D 7- 25	BF3-I	4PI		
7OVE1	79AU197		G,2N	ABX	14- 27 D 7- 36	BF3-I	4PI	335	
71DI1	79AU197		G,2N	ABY	15-999 C300-999	ACT-I	4PI		
					999= 1	GEV			
71LI2	79AU197		G,2N	ABY	THR-900 C 75-900	ACT-I	4PI		
70VE1	79AU197		G,3N	ABX	24- 27 D 7- 36	BF3-I	4PI	336+	
71LI2	79AU197		G,3N	ABY	THR-900 C 75-90D	ACT-I	4PI		
71LI2	79AU197		G,4N	ABY	THR-9D0 C 75-9DD	ACT-I	4PI		
71LI2	79AU197		G,5N	ABY	THR-900 C 75-9DD	ACT-I	4PI		
71LI2	79AU197		G,7N	ABY	THR-9D0 C 75-9DD	ACT-I	4PI		
71LI2	79AU197		G,9N	ABY	THR-900 C 75-9DD	ACT-I	4PI		
71LI2	79AU197		G,11N	ABY	THR-90D C 75-9D0	ACT-I	4PI		
71LI2	79AU197		G,13N	ABY	THR-9D0 C 75-90D	ACT-I	4PI		
71LI2	79AU197		G,15N	ABY	THR-9DD C 75-9DD	ACT-I	4PI		
56GA1	79AU197		G,XN	ABX	7- 27 C 7- 27	BF3-I	4PI		
56HA1	79AU197		G,XN	ABX	15, 18 D 15, 1B	BF3-I	4PI		
58FU1	79AU197		G,XN	ABY	7- 40 C 7- 4D	BF3-I	4PI		
5BFU2	79AU197		G,XN	ABX	8- 23 CTHR- 25	BF3-I	4PI		
58KA1	79AU197		G,XN	ABX	8- 22 C 8- 22	BF3-I	4PI		
61MI1	79AU197		G,XN	ABX	8- 2D D 8- 2D	BF3-I	4PI		
59MA1	79AU197		G,P	RLY	THR- 7D C 70	EMU-D	9D		
						(G,D)/(G,P)			
6DBA5	79AU197		G,P	SPC	9- 40 C 40	MAG-D	DST		
					ABS INTEG CROS SEC				
60MA1	79AU197		G,P	SPC	13- 23 C 23	EMU-D	DST		
					ABSOLUTE YIELD				
56DA2	79AU197		G,XP	SPC	11- 7D C 7D	EMU-D	DST		
					ABSOLUTE YIELD				
6DCH1	79AU197		G,XP	RLX	21- 90 C 90	TEL-I	9D		
					REL TO DEUTERONS				
59MA1	79AU197		G,D	RLY	THR- 7D C 70	EMU-D	90		
						(G,D)/(G,P)			
6DCH1	79AU197		G,XD	RLY	27- 9D C 90	TEL-I	90		
					REL TO PROTONS				
6DCH1	79AU197		G,XT	RLY	26- 9D C 90	TEL-I	90		
					REL TO DEUTERONS				
65HA2	79AU197		G,A	SPC	THR- 31 C 31	EMU-D	DST		
65ME2	79AU197		G,A	SPC	THR- 35 C 35	SCD-D	9D		
62FU2	79AU197		G,NP	ABX	14- 25 D 7- 25	BF3-I	4PI		
					MIXED WITH G,N				

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67MI1	79AU197		G,F	ABX	30D-999 C300-999	TRK-I	DST		
					999=16D0	MEV			
67RA2	79AU197		G,F	ABX	THR-26D C100-260	EMU-I	DST		
69KO2	79AU197		G,F	SPC	THR-999 C250-999	SCD-D	DST		
					999=1000	MEV			
71EM2	79AU197		G,F	ABY	THR-999 C300-999	TRK-I	4PI		
					999=10D0	MEV			
71ME1	79AU197		G,F	ABY	THR-900 C300-9D0	TRK-I	4PI		
71VA4	79AU197		G,F	ABX	10D-999 C100-999	TRK-I	4PI		
					999= 5	GEV			
72DA6	79AU197		G,F	ABY	THR-999 C800-999	TRK-I	DST		
					999=2.2	GEV			
72KR3	79AU197		G,F	ABY	THR-999 C350-999	TRK-I	DST		
					999= 1	GEV			

MERCURY Z=80

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
196	0.15	8.8	6.6	13.4	12.3	-2.0	15.8	15.0	11.7
198	10.02	8.3	7.1	13.4	13.1	-1.3	15.3	15.2	12.9
199	16.84	6.6	7.2	13.3	11.8	-0.8	14.9	13.8	13.7
200	23.13	8.0	7.7	13.3	14.0	-0.7	14.7	15.3	14.2
201	13.22	6.2	7.6	13.0	12.7	-0.3	14.3	13.9	14.8
202	29.80	7.8	8.5	13.2	14.9	-0.1	14.0	15.4	15.3
204	6.85	7.5	9.2	13.5	16.1	0.5	13.5	16.2	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	B0HG		G,G	ABX	7 D 7	NAI-D	DST		
						G-WDTH			
62BE2	80HG		G,G	ABX	5- 9 D 5-	NAI-D	135		
63FL1	80HG		G,G	LFT	2- 6 D 2-	NAI-D	130		
						G-WIDTH			
63YO1	BDHG		G,G	ABX	6- 8 D 6-	NAI-D	DST		
64AR1	80HG		G,G	ABX	5 D 5	NAI-D	135		
66BE3	80HG		G,G	RLX	5- 10 D 5- 10	NAI-D	135		
69RA1	B0HG		G,G	NOX	5 D 5	NAI-D	DST		
					5=4.906	MEV			
63KA2	80HG		G,G/	RLY	1 C 6	ACT-I	4PI		
55MC1	B0HG		G,XN	RLY	THR- 22 C 22	NAI-I	90		
56HA1	8DHG		G,XN	ABX	15, 1B D 15, 1B	BF3-I	4PI		
61BA2	8DHG		G,XN	ABY	THR- 22 C 22	THR-I	DST		
71EM2	B0HG		G,F	ABY	THR-999 C300-999	TRK-I	4PI		
					999=100D	MEV			
63FR2	BDHG198		G,G	ABX	1 D 1	NAI-D	DST		
						LIFETIME, J-PI			
62CA1	B0HG198		G,N	NOX	THR- 3D C 30	ACT-I	4PI		
						ISOMERIC RATIO			
57KN1	80HG199		G,G	LFT	1 D 1	SCI-D	9D		
69BO3	BDHG199		G,G	ABX	D- 2 C 0- 2	ACT-I	4PI		
63VE2	BDHG199		G,G/	ABX	0- 1 D 1	ACT-I	4PI		
					ISOMERS 1=1.33	MEV			
60GE3	8DHG199		G,N	NOX	THR CTHR	BF3-I	4PI		
						THRESHOLD			
68OK3	8DHG199		G,P	ABY	THR- 2D C 20	ACT-I	4PI		
69CA2	8DHG2D1		G,MU-T	ABX	0 D D	SCI-D	4PI		
					D=32.2	KEV, J-PI			
60GE3	8DHG2D1		G,N	NOX	THR CTHR	BF3-I	4PI		
						THRESHOLD			
62EU1	8DHG201		G,N	ABI	9- 23 C 9- 23	ACT-I	4PI		
					RELATIVE	YIELD			
62CA2	B0HG2D1		G,P	ABX	16- 32 C 16- 32	ACT-I	4PI		
55ME1	80HG202		G,G	LFT	1 D 1		DST		
6DGE3	BDHG202		G,N	NOX	THR CTHR	BF3-I	4PI		
						THRESHOLD			

THALLIUM Z=81

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
203	29.5	7.7	5.7	11.2	13.4	-0.9	14.7	13.5	14.2
205	70.5	7.5	6.4	11.4	14.9	0.1	14.2	13.9	15.6

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60RE1	B1TL		G,G	ABX	7 D 7	NAI-D	9D		
66BE3	B1TL		G,G	RLX	5- 1D D 5- 1D	NAI-D	135		
68KA1	B1TL		G,N	ABX	5D- B5 C 55, 85	TOF-D	67		
						NEUT ENGY SPEC			
56GA1	B1TL		G,XN	ABX	7- 27 C 7- 27	BF3-I	4PI		
65MO2	B1TL		G,XN	ABX	10-110 C 16-11D	ACT-I	4PI		
71EM2	B1TL		G,F	ABY	THR-999 C3D0-999	TRK-I	4PI		
					999=1DD0	MEV			
67MI1	BITL		G,F	ABX	30D-999 C3DD-999	TRK-I	DST		
					999=160D	MEV			

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
61DE3	81	TL203	G,G	LFT	1	D 1	NAI-D DST		
						REL CROSS SECTION			
67PA1	81	TL203	G,G	LFT	1	D 1	NAI-D 110		
						1=279 KEV			
70MO1	81	TL203	G,G	LFT	6	D 6	SCD-D DST		
						J=1/2,E=6.418 MEV			
56HE2	81	TL203	G,N	RLY	THR- 31	C 31	ACT-I 4PI		
						REL CU63			
71SA1	81	TL203	G,N	A8Y	7- 68	C 10- 68	ACT-I 4PI		
69AN10	81	TL203	G,XN	ABX	7- 20	C 7- 30	BF3-I 4PI		451
56HE2	81	TL203	G,A	RLY	THR- 31	C 31	ACT-I 4PI		
						REL NEUTRONS			
57ER1	81	TL203	G,A	ABI	0- 32	C 32	ACT-I 4PI		
						MIXED WITH G,NA			
57ER1	81	TL203	G,NA	A8I	11- 32	C 32	ACT-I 4PI		
						MIXED WITH G,A			
69MO2	81	TL205	G,G	LFT	7	D 7	SCD-D DST		
						7=7.646			
69RA1	81	TL205	G,G	LFT	8	D 8	NAI-D DST		
						8=7.647 MEV			
70CE1	81	TL205	G,G	SPC	8	D 8	SCD-D 145		
						8=7.646 MEV			
70MO2	81	TL205	G,G	A8X	8	D 8	SCD-D DST		
						8=7.646,LFT			
60GE3	81	TL205	G,N	NOX	THR	CTHR	BF3-I 4PI		
						THRESHOLD			
69AN10	81	TL205	G,XN	A8X	7- 20	C 7- 30	BF3-I 4PI		452
57EL2	81	TL205	G,A	A8X	THR- 32	C 32	ACT-I 4PI		
57ER1	81	TL205	G,A	ABX	18- 32	C 18- 32	ACT-I 4PI		
57ER1	81	TL205	G,NA	A8X	29- 32	C 18- 32	ACT-I 4PI		

LEAD Z=82

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
204	1.48	8.4	6.6	12.8	12.4	-2.0	15.2	14.4	12.3
206	23.6	8.1	7.3	13.0	13.4	-1.1	14.8	14.8	13.7
207	22.6	6.7	7.5	13.1	12.7	-0.4	14.8	14.0	14.7
208	52.3	7.4	8.0	12.9	14.4	-0.5	14.1	14.9	15.4

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
59BA3	82	P8	E,N	A8Y	THR- 36	D 10- 36	8F3-I 4PI		
71VO1	82	P8	E,N	A8X	THR-266	C150-266	TOF-D 90		
71MA2	82	P8	E,F	SPC	THR-999	D500,999	TRK-I 4PI		
						999=1.3 GEV			
558U1	82	PB	G,G	RLX	0- 3	C 3	NAI-D 90		
56FU1	82	P8	G,G	A8X	4- 40	C 4- 40	NAI-D 120		
59CO6	82	P8	G,G	A8X	6, 7	D 6, 7	NAI-D 30		
59PA3	82	P8	G,G	A8X	17	D 15, 18	NAI-D 90		
60RE1	82	PB	G,G	A8X	7	D 7	NAI-D DST		
						G-WDTH			
61MI1	82	P8	G,G	A8X	10- 22	D 10- 22	NAI-D DST		
61TO1	82	PB	G,G	A8X	3- 16	C 3- 16	NAI-D 120		
628E2	82	PB	G,G	A8X	5- 9	D 5-	NAI-D 135		
62FU4	82	P8	G,G	A8X	4- 9	C 4-	NAI-D 120		
6380 2	82	PB	G,G	A8X	9	D 9	NAI-D DST		
63FL1	82	PB	G,G	LFT	2- 6	D 2-	NAI-D 30		
						G-WIDTH			
63YO1	82	P8	G,G	A8X	5- 8	D 5-	NAI-D DST		
64AR1	82	PB	G,G	A8X	7, 7	D 7,	NAI-D 135		
64GI1	82	P8	G,G	NOX	7, 8	D 7,	NAI-D 135		
						WIDTH			
65GI1	82	PB	G,G	LFT	8	D 5- 8	NAI-D 135		
						8=7.28 MEV			
66DE1	82	PB	G,G	RLX	12- 17	D 12- 17	NAI-D DST		
55JO1	82	P8	G,N	RLY	THR- 65	C 65	SCI-D DST		
55JO1	82	P8	G,N	RLY	THR- 65	C 65	SCI-D DST		
5BAS1	B2	P8	G,N	NOX	THR- 17	C 17	SCI-I DST		
60GR1	82	PB	G,N	ABI	10- 21	C 10- 21	8F3-I 4PI		
61TA1	82	P8	G,N	NOX	10- 22	C 22	THR-I DST		
628R4	B2	P8	G,N	SPC	8- 33	C 33	SCI-D 90		
62MI3	B2	PB	G,N	ABX	6- 22	D 6- 22	8F3-I 4PI		
64AL4	82	P8	G,N	NOX	THR- 18	C 18	SCI-I DST		
64DO1	82	P8	G,N	ABX	8- 20	C 8- 20	BF3-I 4PI		
64GL1	B2	PB	G,N	SPC	16	D 16	TOF-D 90		
67GE2	82	PB	G,N	ABY	THR- 27	C 22, 27	8F3-I 4PI		
67HU2	B2	P8	G,N	ABY	THR- 22	C 22	THR-I DST		
6BJU1	B2	PB	G,N	NOX	THR- 22	C 22	THR-I DST		
68KA1	82	P8	G,N	ABX	50- 85	C 55, 85	TOF-D 67		
						NEUT ENGY SPEC			
69TS1	82	P8	G,N	NOX	14- 26	C 26	SCD-D DST		

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
55BA5	82	PB	G,XN	ABY	30-200	C150-250	THR-I DST		
55DI1	82	PB	G,XN	SPC	THR- 70	C 70	EMU-D DST		
55MC1	82	P8	G,XN	RLY	THR- 22	C 22	NAI-I 90		
56HA1	82	P8	G,XN	ABX	15, 18	D 15, 18	BF3-I 4PI		
57TO1	82	PB	G,XN	A8X	8- 22	C 8- 22	BF3-I 4PI		
						SPECTRUM WITH EMUL			
58FU1	82	P8	G,XN	RLX	7- 40	C 7- 40	8F3-I 4PI		
61BA2	82	PB	G,XN	A8Y	THR- 22	C 22	THR-I DST		
61BA2	82	P8	G,XN	A8Y	THR- 22	C 22	THR-I DST		
61MI1	82	PB	G,XN	A8X	8- 20	D 8- 20	8F3-I 4PI		
64AL5	82	P8	G,XN	NOX	THR- 34	C 34	THR-I DST		
68MC1	82	P8	G,XN	NOX	THR- 32	C 22- 32	THR-I DST		
68TO1	82	P8	G,XN	ABX	10- 24	C 10- 24	BF3-I 4PI		
						MONTR CALIBRATION			
69GA3	82	P8	G,XN	SPC	8- 85	C 85	CCH-D 135		
70KI2	82	P8	G,XN	SPC	7- 18	C 15- 18	TOF-D DST		
						THICK TARGETS			
70MC1	82	PB	G,XN	SPC	8- 31	C 31	TOF-D 98		
62SH2	82	P8	G,P	SPC	10- 34	C 23, 34	EMU-D DST		
62SH4	82	PB	G,P	SPC	9- 34	C 23, 34	EMU-D DST		
71AN1	82	P8	G,P	SPC	37-999	C700,999	TEL-D DST		
						999=1.2 GEV, REL D/P			
71AN1	82	P8	G,D	SPC	42-999	C700,999	TEL-D DST		
						999=1.2 GEV, REL D/P			
67MI1	82	PB	G,F	ABX	300-999	C300-999	TRK-I DST		
						999=1600 MEV			
67RA2	82	PB	G,F	ABX	THR-260	C100-260	EMU-I DST		
71EM1	82	P8	G,F	ABY	THR-999	C300-999	TRK-I 4PI		
						999=1000 MEV			
71EM2	82	P8	G,F	A8Y	THR-999	C300-999	TRK-I 4PI		
						999=1000 MEV			
71ME1	82	PB	G,F	ABY	THR-900	C300-900	TRK-I 4PI		
72KR3	82	PB	G,F	ABY	THR-999	C350-999	TRK-I DST		
						999= 1 GEV			
71GR2	82	P8	G,PI+	ABY	150-560	C560	EMU-D DST		
						PI-/PI+ YIELD RATIO			
71GR2	82	P8	G,PI-	ABY	150-560	C560	EMU-D DST		
						PI-/PI+ YIELD RATIO			
66BE1	82	PB	N,G	SPC	14	D 7	NAI-D UKN		
66ZI2	82	P8206	E,E/	RLX	3	D 28- 70	MAG-D DST		
						B(EL) 3=2.6 MEV			
68ZI1	82	P8206	E,E/	FMF	2- 5	D 28- 73	MAG-D 100		
						B(EL) 3 LEVELS			
60RE1	82	P8206	G,G	ABX	7	D 7	NAI-D DST		
						G-WDTH, RADIOLEAD			
62FU4	82	PB206	G,G	A8X	4- 9	C 4-	NAI-D 120		
						RADIOLEAD			
63AX1	82	P8206	G,G	ABX	6- 8	D 6-	NAI-D 135		
66BE3	82	PB206	G,G	RLX	5- 10	D 5- 10	NAI-D 135		
71ME2	82	P8206	G,G	LFT	2	D 2	SCD-D DST		
						2=1.704 MEV			
60GE3	82	P8206	G,N	NOX	THR	CTHR	BF3-I 4PI		
						THRESHOLD			
64HA2	82	P8206	G,N	ABX	6- 27	D 6- 26	8F3-I 4PI		170
67HU1	82	PB206	G,N	ABX	9- 11	D 9- 11	8F3-I 4PI		
69BO1	82	PB206	G,N	SPC	THR- 10	C 8- 10	TOF-D 135		
						G-WIDTH			
718A2	82	P8206	G,N	ABX	8- 10	C 9, 10	TOF-D 135		
64HA2	82	PB206	G,2N	A8X	12- 27	D 12- 26	8F3-I 4PI		171+
62FU4	82	PB206	G,XN	ADX	8- 19	C 8- 19	BF3-I 4PI		
69VE1	82	PB206	G,XN	SPC	THR- 33	C 33	TOF-D DST		
						ENRICHED P8206			
66ZI2	82	PB207	E,E/	RLX	3	D 28- 70	MAG-D DST		
						8(EL) 3=2.62,2.66			
68ZI1	82	PB207	E,E/	FMF	2- 5	D 28- 73	MAG-D 100		
						5 LEVELS			
71SH2	82	PB207	E,P	ABX	12- 14	D 19- 21	MAG-D 125		
60GE3	82	PB207	G,N	NOX	THR	CTHR	8F3-I 4PI		
						THRESHOLD			
638E4	82	PB207	G,N	SPC	7- 9	C 9	TOF-D UKN		
64HA2	82	PB207	G,N	ABX	6- 27	D 6- 26	8F3-I 4PI		173
66DE2	82	PB207	G,N	SPC	THR- 80	C 80	CCH-D 135		
69BO1	B2	P8207	G,N	SPC	THR- 9	C 7- 9	TOF-D 135		
						G-WIDTH			
69BO4	82	P8207	G,N	ABX	THR- 8	C 9	TOF-D 135		
						25-350 KEV NEUTS			
70BO1	82	PB207	G,N	A8X	THR- 8	C 9	TOF-D 135		
						ERRATUM FOR 69BO4			
718A2	82	P8207	G,N	A8X	6- 10	C 7- 10	TOF-D 135		
64HA2	82	PB207	G,2N	A8X	12- 27	D 12- 26	8F3-I 4PI		174+
62FU4	82	P8207	G,XN	ABX	6- 19	C 6- 19	BF3-I 4PI		
55DE1	B2	PB207	G,P	ABX	11- 21	C 11- 21	ACT-I 4PI		
						MIXED WITH P8208			
62SO1	82	PB207	G,P	A8X	15- 33	C 15- 33	ACT-I 4PI		
						MIXED WITH P8208			
60ST1	82	P8207	G,NP	RLX	144-320	C320	TEL-D 76		
						REL TO H2 CROS SEC			

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
60BA4	82PB208		E,E/	SPC	0- 23	D 43	MAG-D	160	
						ABS INTEGR CROSSEC			
61CR1	82PB208		E,E/	NOX	0- 8	D183	MAG-D	DST	
						J-PI, TRANS RATE			
66PE1	82PB208		E,E/	FMF	0- 6	D 70	MAG-D	130	
66ZI2	82PB208		E,E/	RLX	3	D 28- 70	MAG-D	DST	
						B(EL) 3=2.615 MEV			
68ZI1	82PB208		E,E/	FMF	2- 7	D 28- 73	MAG-D	100	
						7 LEVELS			
70HE2	82PB208		E,E/		3	D248,502	MAG-D	DST	
						3=2.6 MEV			
71MO3	82PB208		E,E/	ABX	0-240	D500	MAG-D	60	
71NA2	82PB208		E,E/	LFT	2- 4	D183,248	MAG-D	DST	
						6 LEVELS			
72FR5	82PB208		E,E/	ABX	2- 4	D124,167	MAG-D	DST	
						3 LEVELS TAB DATA			
69MO1	82PB208		E,F	ABX	THR-999	D 60-999	TRK-I	DST	
						999=1 GEV			
68KA3	82PB208		G,MU-T	LFT	7	D 7	NAI-D	4PI	
						7=7.277 MEV			
63AX1	82PB208		G,G	ABX	6- 8	D 6-	NAI-D	135	
63FL2	82PB208		G,G	LFT	3- 8	D 7	SCI-D	4PI	
						G-WDTH			
64AR1	82PB208		G,G	ABX	7- 8	D 7-	NAI-D	135	
						WIDTH			
65MC1	82PB208		G,G	LFT	7	D 7	NAI-D	DST	
						7=7.28 MEV			
66BE3	82PB208		G,G	RLX	7	D 5- 10	NAI-D	135	
						7=7.28 MEV			
66DO1	82PB208		G,G	LFT	7	D 7	NAI-D	DST	
						7=7.297 MEV			
67DO1	82PB208		G,G	LFT	7	D 7	NAI-D	DST	
						ERRATUM FOR 66DO1			
67GI1	82PB208		G,G	LFT	7	D 6- 8	NAI-D	DST	
						7=7.28 MEV			
67STI	82PB208		G,G	LFT	7	D 7	NAI-D	135	
						7=7.28 MEV			
68MO1	82PB208	$	G,G	NOX	7	D 7	NAI-D	90	
						POLARIMETER 7.28			
69RA1	82PB208		G,G	LFT	8	D 8	NAI-D	DST	
						8=7.277 MEV			
70MO2	82PB208		G,G	ABX	7	D 7	SCD-D	DST	
						7=7.279,LFT			
56PR1	82PB208		G,N	RLY	7- 22	C 22	NAI-I	90	
						SEPARATED ISOTOPES			
58FA1	82PB208		G,N	ABX	11- 18	C 10- 20	ACT-I	4PI	
						ISOMERIC PRODUCT			
60GE3	82PB208		G,N	NOX	THR	CTHR	BF3-I	4PI	
						THRESHOLD			
63BE4	82PB208		G,N	SPC	7- 10	C 9, 10	TOF-D		
64HA2	82PB208		G,N	ABX	6- 27	D 6- 26	BF3-I	4PI	176
67HUI	82PB208		G,N	ABX	9- 11	D 9- 11	BF3-I	4PI	
69BO1	82PB208		G,N	SPC	THR- 10	C 7- 10	TOF-D	135	
						G-WIDTH			
69BO4	82PB208		G,N	ABX	THR- 8	C 9	TOF-D	135	
						25-350 KEV NEUTS			
70BO1	82PB208		G,N	ABX	THR- 8	C 9	TOF-D	135	
						ERRATUM FOR 69BO4			
70BO2	82PB208		G,N	ABX	7- 9	C 10	TOF-D	DST	
						SEVEN 1+ LEVELS			
70VE1	82PB208		G,N	ABX	7- 31	D 7- 36	BF3-I	4PI	330
71BA2	82PB208		G,N	ABX	7- 10	C 7- 10	TOF-D	135	
72TO1	82PB208		G,N	LFT	7- 9	C 9	TOF-D	DST	
						G-WIDTH, J-PI			
64HA2	82PB208		G,2N	ABX	12- 27	D 12- 26	BF3-I	4PI	177+
70VE1	82PB208		G,2N	ABX	14- 31	D 7- 36	BF3-I	4PI	331
70VE1	82PB208		G,3N	ABX	23- 31	D 7- 36	BF3-I	4PI	332
70VE1	82PB208		G,4N	ABX	30- 36	D 7- 36	BF3-I	4PI	333
62FU4	82PB208		G,XN	ABX	7- 19	C 7- 19	BF3-I	4PI	
68GO3	82PB208		G,XN	ABX	THR- 22	CTHR- 22	BF3-I	4PI	
69BE9	82PB208		G,XN	ABX	7- 19	D 7- 19	MOD-I	4PI	234
69VE1	82PB208		G,XN	SPC	THR- 33	C 33	TOF-D	DST	
						ENRICHED PB208			
70IS3	82PB208		G,XN	ABX	7- 18	C 7- 18	BF3-I	4PI	264
55DE1	82PB208		G,P	ABX	11- 21	C 11- 21	ACT-I	4PI	
						MIXED WITH PB207			
62SO1	82PB208		G,P	ABX	15- 33	C 15- 33	ACT-I	4PI	
						MIXED WITH PB207			
71DA1	82PB208		G,P	ABX	15- 33	C 12- 33	ACT-I	4PI	
						INCLUDES (G,PN)			
55TO1	82PB208		G,XP	SPC	13- 23	C 23	EMU-D	DST	
						SEPARATED ISOTOPES			
62SOI	82PB208		G,D	ABX	15- 33	C 15- 33	ACT-I	4PI	
						ALSO G,NP,PB207G,P			
62SO1	82PB208		G,NP	ABX	15- 33	C 15- 33	ACT-I	4PI	
						ALSO(G,D),PB207G,P			
69MO1	82PB208		G,F	ABX	THR-999	C 60-999	TRK-I	DST	
						999=1 GEV			
72BE7	82PB209		N,G	ABX	10- 19	D 6- 15	NAI-D	90	

BISMUTH Z=83

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
209	100.00	7.5	3.8	9.4	10.9	-3.1	14.4	11.2	11.8

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
61CR1	83BI209		E,E/	NOX	0- 5	C183	TEL-I	DST	
						J-PI, G-WDTH			
63BA1	83BI209		E,E/	SPC	0- 23	D 42	MAG-D	180	
						J-PI			
66ZI2	83BI209		E,E/	RLX	2- 3	D 28- 70	MAG-D	DST	
						B(EL) 2.58, 2.73			
68ZI1	83BI209		E,E/	FMF	2	D 28- 73	MAG-D	100	
						B(EL) 2.6 MEV			
71SH2	83BI209		E,P	ABX	10- 14	D 17- 21	MAG-D	125	
68BA2	83BI209		E,F	ABX	THR-999	D200-999	TRK-I	4PI	
						999=1.5 GEV			
68BO1	83BI209		E,F	ABI	THR-500	D250,500	EMU-I	4PI	
69MO1	83BI209		E,F	ABX	THR-999	D 60-999	TRK-I	DST	
						999=1 GEV			
56FU1	83BI209		G,G	ABX	4- 40	C 4- 40	NAI-D	120	
60RE1	83BI209		G,G	ABX	7	D 7	NAI-D	DST	
						G-WDTH			
61BU4	83BI209		G,G	ABX	10- 25	C 22	NAI-D	DST	
61MI1	83BI209		G,G	ABX	10- 21	D 10- 21	NAI-D	DST	
61TO1	83BI209		G,G	ABX	3- 16	C 3- 16	NAI-D	120	
62FU4	83BI209		G,G	ABX	4- 9	C 4-	NAI-D	120	
63AX1	83BI209		G,G	ABX	5- 8	D 5-	NAI-D	135	
63SU1	83BI209		G,G	ABX	4- 14	C 4- 14	NAI-D	120	
63YO1	83BI209		G,G	ABX	6- 8	D 6-	NAI-D	DST	
64AR1	83BI209		G,G	ABX	7	D 7	NAI-D	135	
66BE3	83BI209		G,G	RLX	5- 10	D 5- 10	NAI-D	135	
66DE1	83BI209		G,G	RLX	12- 17	D 12- 17	NAI-D	DST	
67GI1	83BI209		G,G	LFT	7	D 6- 8	NAI-D	DST	
						7=7.15 MEV			
69BE7	83BI209		G,G	LFT	7	D 7	D	DST	
						7.15 MEV			
69CE1	83BI209		G,G	NOX	6- 8	D 6- 8	SCD-D	DST	
69ME2	83BI209		G,G	LFT	2- 3	C 3	SCD-D	127	
						2.563, 2.581,2.598			
69RA1	83BI209		G,G	LFT	8, 8	D 8, 8	NAI-D	DST	
						8,8=7.416, 7.149			
72JA1	83BI209		G,G	RLX	10	D 10	SCD-D	90	
						RATIO-RAMAN/ELASTIC			
56FE1	83BI209		G,N	RLX	7- 20	C 7- 30	THR-D	DST	
57DE1	83BI209		G,N	RLY	10- 30	C 10- 30	ACT-I	4PI	
						ISOMER			
57FE1	83BI209		G,N	RLY	10- 30	C 20, 30	THR-I	DST	
57ZA1	83BI209		G,N	SPC	8- 19	C 19	EMU-D	DST	
						REL YIELD			
58BE2	83BI209		G,N	SPC	8- 16	C 14, 16	TOF-D	120	
60EM1	83BI209		G,N	SPC	8- 30	C 30	EMU-D	DST	
60GE3	83BI209		G,N	NOX	THR	CTHR	BF3-I	4PI	
						THRESHOLD			
60KU2	83BI209		G,N	RLY	17- 90	C 90	TEL-I	DST	
61TA1	83BI209		G,N	NOX	13- 22	C 22	THR-I	DST	
62BO5	83BI209		G,N	ABX	8- 22	D 8- 22	NAI-I	DST	
62MI3	83BI209		G,N	ABX	8- 22	D 8- 22	BF3-I	4PI	
62RE1	83BI209		G,N	NOX	11- 55	C 55	THR-I	DST	
63ZA1	83BI209		G,N	SPC	8- 19	C 14, 19	EMU-D	DST	
64AL4	83BI209		G,N	NOX	THR- 18	C 18	SCI-I	DST	
64DE1	83BI209	$	G,N	NOX	THR- 80	C 80	CCH-D	135	
						NEUTRONS POLARIZED			
64GL1	83BI209		G,N	SPC	16	D 16	TOF-D	90	
64HA2	83BI209		G,N	ABX	6- 27	D 6- 26	BF3-I	4PI	179
66BE4	83BI209		G,N	ABX	7	C 11	TOF-D	135	
66DE2	83BI209		G,N	SPC	THR- 80	CTHR- 80	CCH-D	135	
67HU1	83BI209		G,N	ABX	9- 11	D 9- 11	BF3-I	4PI	
67KU1	83BI209		G,N	SPC	12- 16	D 12- 16	TOF-D	115	
68KA1	83BI209		G,N	ABX	50- 85	C 55, 85	TOF-D	67	
						NEUT ENGY SPEC			
68LE1	83BI209		G,N	SPC	7- 20	C 20	EMU-D	DST	
69TS1	83BI209		G,N	NOX	15- 26	C 26	SCI-D	DST	
64HA2	83BI209		G,2N	ABX	12- 27	D 12- 26	BF3-I	4PI	180+
67WY1	83BI209		G,3N	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,4N	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,5N	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,6N	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,7N	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,8N	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,9N	RLI	THR-137	C137	ACT-I	4PI	
56GA1	83BI209		G,XN	ABX	7- 27	C 7- 27	BF3-I	4PI	
56HA1	83BI209		G,XN	ABX	15, 18	D 15, 18	BF3-I	4PI	
58KA1	83BI209		G,XN	ABX	8- 22	C 8- 22	BF3-I	4PI	
61BA2	83BI209		G,XN	ABY	10- 22	C 22	THR-I	DST	
61BA2	83BI209		G,XN	ABY	12- 22	C 22	THR-I	DST	
61MI1	83BI209		G,XN	ABX	8- 22	D 8- 22	BF3-I	4PI	
61WA1	83BI209		G,XN	SPC	10- 22	C 22	EMU-D	DST	
62FU4	83BI209		G,XN	ABX	7- 10	C 7- 10	BF3-I	4PI	
63AN3	83BI209		G,XN	ABY	9- 85	C 85	EMU-D	DST	
64AL5	83BI209		G,XN	NOX	THR- 34	C 34	THR-I	DST	
67AN2	83BI209		G,XN	ABX	THR- 20	C 8- 20	BF3-I	4PI	
69VE1	83BI209		G,XN	SPC	THR- 33	C 33	TOF-D	DST	
69GA3	83BI209		G,XN	SPC	8- 85	C 85	CCH-D	135	
69LA2	83BI209		G,XN	SPC	29	C 29	EMU-D	DST	
72TH2	83BI209		G,XN	ABX	7- 20	C 6- 19	BF3-I	4PI	
70CU1	83BI209		G,T	ABY	THR- 90	C 90	ACT-I	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
67WY1	83BI209		G,4NP	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,5NP	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,6NP	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,7NP	RLI	THR-137	C137	ACT-I	4PI	
67WY1	83BI209		G,8NP	RLI	THR-137	C137	ACT-I	4PI	
61DE2	83BI209		G,F	ABX	300-999	C300-999	EMU-I	4PI	
64DE4	83BI209		G,F	ABX	300-999	C300-999	EMU-O	4PI	
							999=1	GEV	
67MI1	83BI209		G,F	ABX	300-999	C300-999	TRK-I	DST	
							999=1600	MEV	
67RA2	83BI209		G,F	ABX	THR-260	C100-260	EMU-I	DST	
68WA1	83BI209		G,F	ABX	30- 40	C 30- 40	ACT-I	4PI	
							FRAGMENT YIELDS		
69KO2	83BI209		G,F	SPC	THR-999	C250-999	SCD-D	DST	
							999=1000	MEV	
69MO1	83BI209		G,F	ABX	THR-999	C 60-999	TRK-I	DST	
							999=1	GEV	
70SC1	83BI209		G,F	RLY	THR-700	C700	ACT-I	4PI	
71EM1	83BI209		G,F	ABY	THR-999	C300-999	TRK-I	4PI	
							999=1000	MEV	
71VA4	83BI209		G,F	ABX	100-999	C100-999	TRK-I	4PI	
							999= 5	GEV	
71SN2	83BI209		P,G	ABX	13- 22	D 9- 18	NAI-D	90	
66BE1	83BI210		N,G	SPC	11	D 7	NAI-D	UKN	

RADIUM Z = 88

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
226		6.4	6.9	9.7	*	-4.9	11.3	13.4	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
68ZH1	88RA226		G,F	RLY	THR- 25	C 9- 25	TRK-I	DST	
71ZH1	88RA226		G,F	ABX	9- 20	C 9- 20	TRK-I	4PI	
							N/F EMISSION WIOTH		

THORIUM Z=90

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
232	100.00	6.4	7.8	10.2	12.2	-4.1	11.6	13.7	13.7

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69WA1	90TH		G,F	RLX	0-999	C200-999	SCD-D	DST	
							999=1.2	GEV	
60RE1	90TH232		G,G	ABX	7	D 7	NAI-D	DST	
64LA1	90TH232		G,G	ABX	10- 25	C 30	NAI-D	OST	
71HA1	90TH232		G,G	ABX	B- 9	O B- 9	SCO-O	140	
72JA1	90TH232		G,G	RLX	10	D 10	SCD-D	90	
							RATIO-RAMAN/ELASTIC		
56GI1	90TH232		G,N	ABX	B- 16	C 8- 20	ACT-I	4PI	
72MA1	90TH232		G,N	ABX	5- 9	O 5- 9	BF3-I	4PI	
55BA4	90TH232		G,XN	ABY	12	C 19	BF3-I	4PI	
56GA1	90TH232		G,XN	ABX	5- 27	C 5- 27	BF3-I	4PI	
57KA1	90TH232		G,XN	ABX	6- 23	C 6- 23	BF3-I	4PI	
61BA2	90TH232		G,XN	ABY	THR- 22	C 22	THR-I	OST	
728RB	90TH232		G,XN	RLY	THR- 11	C 5- 11	BF3-I	4PI	
558A4	90TH232		G,F	ABY	12	C 19	ION-I	4PI	
55LA2	90TH232		G,F	RLY	THR- 19	C 19	BF3-I	4PI	
							OELAYED NEUT		
56GI1	90TH232		G,F	ABX	8- 20	C B- 20	ACT-I	4PI	
56KO2	90TH232		G,F	ABX	8- 24	C B- 24	ION-I		
56KO3	90TH232		G,F	SPC	THR- 18	C 18	ION-O	4PI	
57SC2	90TH232		G,F	RLY	THR- 15	C 4- 16	ACT-I	4PI	
58FA2	90TH232		G,F	NOX	THR- 16	C 16	EMU-I	DST	
58KA2	90TH232		G,F	ABX	5- 18	C 5- 18	ION-I	DST	
59BA4	90TH232		G,F	RLY	THR- 20	C 6- 20	ION-I	OST	
60PR2	90TH232		G,F	NOX	6	D 6	BF3-I	4PI	
61BO2	90TH232		G,F	SPC	THR- 70	C 70	EMU-O		
61OE2	90TH232		G,F	ABX	300-999	C300-999	EMU-I	4PI	
62DE3	90TH232		G,F	ABX	7	O 7	EMU-I	DST	
62HU1	90TH232		G,F	ABX	6, 7	D 6,	ION-I	4PI	
62MO3	90TH232		G,F	ABY	THR- 20	C 12, 20	BF3-I	4PI	
							DELAYED N YIELOS		
638A3	90TH232		G,F	RLY	0- 12	C 12	EMU-I	DST	
63DE1	90TH232		G,F	ABX	6	O 6	EMU-I	DST	
63KO1	90TH232		G,F	SPC	THR- 90	C 90	ION-O	DST	
65AL1	90TH232		G,F	RLX	2- 7	D 6- 7	EMU-O	DST	
65CA3	90TH232		G,F	ABY	300-1000	C 1	EMU-I	4PI	
65SA1	90TH232		G,F	SPC	THR- B	C 8	TOF-O	DST	
65SO1	90TH232		G,F	RLX	6, 7	O 6, 7	TRK-I	DST	
66NI1	90TH232		G,F	RLY	THR- 15	C 10- 15	TRK-O	4PI	
							OELAYED N YIELOS		
68RA1	90TH232		G,F	NOX	THR- B	C 5- B	TRK-I	DST	
69KA1	90TH232		G,F	ABX	THR- B	C 5- 8	TRK-I	OST	
69MA2	90TH232		G,F	ABX	5- 9	O 5- 9	EMU-I	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
70AU1	90TH232		G,F	RLY	THR- 17	C 14- 17	ACT-I	4PI	
							ISOMER YIELDS		
70ME5	90TH232		G,F	ABY	THR-900	C200-900	TRK-I	4PI	
7DRA1	90TH232		G,F	ABX	THR- 9	C 5- 10	TRK-D	DST	
							SEE 68RA1, 69KA1		
70SC1	90TH232		G,F	RLY	THR-999	C300-999	ACT-I	4PI	
							999=1100	MEV	
71IG1	90TH232		G,F	ABX	5- 7	C 5- 7	TRK-I	DST	
71MA3	90TH232		G,F	NOX	5- 9	D 5- 9	EMU-I	DST	
71VA4	90TH232		G,F	ABX	100-999	C100-999	TRK-I	4PI	
							999= 5	GEV	
71WA1	90TH232		G,F	ABX	THR-999	C200-999	SCD-I	DST	460
							999=1150	MEV	
72BRB	90TH232		G,F	RLY	THR- 11	C 5- 11	TRK-I	4PI	
72KH1	90TH232		G,F	ABX	THR- 9	D 5- 9	ION-I	4PI	
72MA1	90TH232		G,F	ABX	5- 9	D 5- 9	ION-I	4PI	
62MI1	90TH232		N,G	ABX		D 0-	ACT-I	4PI	

URANIUM Z=92

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
234	5.6(-3)	6.8	6.6	10.2	10.6	-4.9	12.6	13.1	11.9
235	0.72	5.3	6.7	10.0	9.5	-4.7	12.1	11.9	12.4
238	99.27	6.1	7.7	10.0	*	-4.3	11.3	13.6	*

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
71MA2	92U		E,F	SPC	THR-999	D500,999	TRK-I	4PI	
							999=1.3	GEV	
71KI1	92U		G,XN	SPC	5- 23	C 15- 23	TOF-O	90	
57KA1	92U	233	G,XN	ABX	6- 23	C 6- 23	BF3-I	4PI	
58KA2	92U	233	G,F	ABX	5- 18	C 5- 18	ION-I	DST	
59BA4	92U	233	G,F	RLY	THR- 20	C 6- 20	ION-I	DST	
62HU1	92U	233	G,F	ABX	6, 7	D 6,	ION-I	4PI	
70AU1	92U	233	G,F	RLY	THR- 17	C 14- 17	ACT-I	4PI	
							ISOMER YIELDS		
59BA4	92U	234	G,F	RLY	THR- 20	C 6- 20	ION-I	DST	
62HU1	92U	234	G,F	ABX	6, 7	D 6,	ION-I	4PI	
70AU1	92U	234	G,F	RLY	THR- 17	C 14- 17	ACT-I	4PI	
							ISOMER YIELDS		
64BO3	92U	235	G,N	ABX	B- 21	D 8- 21	BF3-I	4PI	424
64BO3	92U	235	G,2N	ABX	B- 21	D 8- 21	BF3-I	4PI	442
64BO3	92U	235	G,TN	ABX	8- 21	D B- 21	BF3-I	4PI	423
728RB	92U	235	G,XN	RLY	THR- 11	C 5- 11	BF3-I	4PI	
59BA4	92U	235	G,F	RLY	THR- 20	C 6- 20	ION-I	DST	
62HU1	92U	235	G,F	ABX	6, 7	D 6,	ION-I	4PI	
64BO3	92U	235	G,F	ABX	6- 19	D 6- 19	ION-I	4PI	425
66KO3	92U	235	G,F	RLY	THR- 25	C 10- 25	ACT-I	4PI	
66NI1	92U	235	G,F	RLY	THR- 15	C 10- 15	TRK-O	4PI	
							DELAYED N YIELDS		
6BPE2	92U	235	G,F	NOX	THR- 25	C 25	ION-D	4PI	
69PE1	92U	235	G,F	SPC	THR- 12	C 12	ION-D	4PI	
							MASS,ENERGY SPC		
70KU2	92U	235	G,F	NOX	5- 10	C 8, 10	8F3-I	4PI	
							OELAYEO NEUT YLDS		
70AU1	92U	235	G,F	RLY	THR- 17	C 14- 17	ACT-I	4PI	
							ISOMER YIELOS		
71VA4	92U	235	G,F	ABX	100-999	C100-999	TRK-I	4PI	
							999= 5	GEV	
72BR8	92U	235	G,F	RLY	THR- 11	C 5- 11	TRK-I	4PI	
72KH1	92U	235	G,F	ABX	THR- 9	D 5- 9	ION-I	4PI	
59BA4	92U	236	G,F	RLY	THR- 20	C 6- 20	ION-I	DST	
62HU1	92U	236	G,F	ABX	6, 7	O 6,	ION-I	4PI	
70AU1	92U	236	G,F	RLY	THR- 17	C 14- 17	ACT-I	4PI	
							ISOMER YIELDS		
59BA3	92U	238	E,N	ABY	THR- 36	D 10- 36	BF3-I	4PI	
67RA3	92U	238	E,F	RLX	THR-260	O 25-260	EMU-I	4PI	
68BO1	92U	238	E,F	ABI	THR- 40	D250,500	EMU-I	DST	
69GR2	92U	238	E,F	RLY	THR-999	C 70-999	ACT-I	4PI	
							RLY E-/E+, 999= 1 GE		
69MO1	92U	238	E,F	ABX	THR-999	D 60-999	TRK-I	DST	
							999=1	GEV	
70KA1	92U	238	E,F	ABX	THR-500	C 25-500	TRK-D	4PI	
56FU1	92U	238	G,G	ABX	4- 40	C 4- 40	NAI-O	120	
63BO2	92U	238	G,G	ABX	9	O 9	NAI-O	DST	
71HA1	92U	238	G,G	ABX	8- 9	D 8- 9	SCD-D	90	
72JA1	92U	238	G,G	RLX	10	D 10	SCO-D	OST	
							RATIO-RAMAN/ELASTIC		
56GI1	92U	238	G,N	ABX	8- 16	C 8- 20	ACT-I	4PI	
61TA1	92U	238	G,N	NOX	THR- 22	C 22	THR-I	OST	
64GL1	92U	238	G,N	SPC	16	O 16	TOF-D	90	
6BKA1	92U	238	G,N	ABX	50- 85	C 55, 85	TOF-O	67	
							NEUT ENGY SPEC		
69DE1	92U	238	G,N	ABY	THR-999	C 1- 6	ACT-I	4PI	
							999=5.5	GEV	
71OI2	92U	238	G,N	ABY	7-999	C30D-999	ACT-I	4PI	
							999= 1	GEV	
72MA1	92U	238	G,N	ABX	5- 9	D 5- 9	BF3-I	4PI	
72SC5	92U	238	G,N	ABY	THR-700	C150-700	ACT-O	4PI	

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
55BA4	92U	238	G,XN	ABY	12	C 19	8F3-I	4PI	
56GA1	92U	238	G,XN	A8X	5- 27	C 5- 27	8F3-I	4PI	
57KA1	92U	238	G,XN	A8X	6- 23	C 6- 23	8F3-I	4PI	
61BA2	92U	238	G,XN	A8Y	THR- 22	C 22	THR-I	DST	
72BR8	92U	238	G,XN	RLY	THR- 11	C 5- 11	8F3-I	4PI	
55BA4	92U	238	G,F	A8Y	12	C 19	IDN-I	4PI	
55KA1	92U	238	G,F	A8X	THR- 26	C 12- 26	ACT-I	4PI	
55LA2	92U	238	G,F	RLY	THR- 19	C 19	8F3-I	4PI	
							DELAYED NEUT		
56GI1	92U	238	G,F	A8X	8- 20	C 8- 20	ACT-I	4PI	
56KD2	92U	238	G,F	A8X	8- 24	C 8- 24	IDN-I	4PI	
56KD3	92U	238	G,F	SPC	THR- 18	C 18	IDN-D	4PI	
57BA4	92U	238	G,F	NDX	THR- 27	C 9- 27	EMU-D	DST	
57SC2	92U	238	G,F	RLY	THR- 15	C 4- 16	ACT-I	4PI	
58BA7	92U	238	G,F	NDX	THR- 27	C 6- 27	EMU-I	DST	
58KA2	92U	238	G,F	A8X	5- 18	C 5- 18	IDN-I	DST	
59BA4	92U	238	G,F	RLY	THR- 20	C 6- 20	IDN-I	DST	
60BD1	92U	238	G,F	SPC	THR- 70	C 70	IDN-D	4PI	
60FD1	92U	238	G,F	NDX	6- 20	C 6- 20	EMU-I	DST	
60PR2	92U	238	G,F	NDX	7	D 7	BF3-I	4PI	
							SOURCE F19(P,AG)		
60TA3	92U	238	G,F	SPC	6	D 6	EMU-D	DST	
61DE1	92U	238	G,F	NDX	6- 20	C 6- 20	EMU-I	DST	
61DE2	92U	238	G,F	A8X	300-999	C300-999	EMU-I	4PI	
62BD8	92U	238	G,F	SPC	THR- 50	C 17- 50	IDN-D	90	
62DE3	92U	238	G,F	A8X	7	D 7	EMU-I	DST	
62HU1	92U	238	G,F	A8X	6, 7	D 6,	IDN-I	4PI	
62KD4	92U	238	G,F	NDX	THR- 35	C 35	IDN-D	DST	
							MASS DISTRIBUTION		
62MD3	92U	238	G,F	A8Y	THR- 20	C 12, 20	BF3-I	4PI	
							DELAYED N YIELDS		
63BD6	92U	238	G,F	NDX	THR- 35	C 35	IDN-D	DST	
63DE1	92U	238	G,F	A8X	7	D 7	EMU-I	DST	
63PE2	92U	238	G,F	RLY	THR- 14	C 14	ACT-I	4PI	
65AL1	92U	238	G,F	RLX	6- 7	D 6- 7	EMU-D	DST	
65CA3	92U	238	G,F	A8Y	300-999	C999	EMU-I	4PI	
							999=1	GEV	
65HD1	92U	238	G,F	RLY	THR- 33	C 33	SCD-D	90	
							MASS SPC		
65HD2	92U	238	G,F	NDX	7	D 7	SCI-I	4PI	
							SOURCE F19(P,AG)		
65KI1	92U	238	G,F	A8Y	6- 7	C 5- 7	ACT-I	4PI	
65MA3	92U	238	G,F	A8X	5- 8	D 5- 8	EMU-D	4PI	
65NI1	92U	238	G,F	RLY	THR- 15	C 10- 15	BF3-I	4PI	
65SD1	92U	238	G,F	RLX	6, 7	D 6, 7	TRK-I	DST	
65SD2	92U	238	G,F	NDX	THR- 9	C 5- 9	EMU-I	DST	
66BD1	92U	238	G,F	NDX	THR- 9	C 5- 9	TRK-I	DST	
66MA3	92U	238	G,F	A8X	5- 9	D 5- 9	EMU-I	DST	
66ME2	92U	238	G,F	A8Y	17	D 17	ACT-I	4PI	
							SOURCE LI7(P,G)		
66NI1	92U	238	G,F	RLY	THR- 15	C 10- 15	TRK-D	4PI	
							DELAYED N YIELDS		
66SA1	92U	238	G,F	RLY	THR-650	C650	ACT-I	4PI	
67KA1	92U	238	G,F	RLY	THR- 7	C 5- 7	ACT-I	4PI	
67RA3	92U	238	G,F	RLX	THR-260	C 25-260	EMU-I	4PI	
68KU1	92U	238	G,F	A8Y	THR- 7	C 4- 7	ACT-I	4PI	
68RA1	92U	238	G,F	NDX	THR- 8	C 5- 8	TRK-I	DST	
69KA1	92U	238	G,F	A8X	THR- 8	C 5- 8	TRK-I	DST	
69KD2	92U	238	G,F	SPC	THR-999	C250-999	SCD-D	DST	
							999=1000	MEV	
69MA1	92U	238	G,F	A8X	5- 9	D 5- 9	EMU-I	DST	
							N-CAPTURE G'S		
69MD1	92U	238	G,F	A8X	THR-999	C 60-999	TRK-I	DST	
							999=1	GEV	
69WA1	92U	238	G,F	RLX	0-999	C200-999	SCD-D	DST	
							999=1.2	GEV	
70AU1	92U	238	G,F	RLY	THR- 17	C 14- 17	ACT-I	4PI	
							ISOMER YIELDS		
70KA1	92U	238	G,F	A8Y	THR-500	C 25-500	TRK-D	4PI	
70KU2	92U	238	G,F	NDX	5- 10	C 8, 10	8F3-I	4PI	
							DELAYED NEUT YLDS		
70ME5	92U	238	G,F	A8Y	THR-900	C200-900	TRK-I	4PI	
70RA1	92U	238	G,F	A8X	THR- 9	C 5- 10	TRK-D	DST	
							SEE 68RA1, 69KA1		
70SC1	92U	238	G,F	RLY	THR-999	C300-999	ACT-I	4PI	
							999=1100	MEV	
71DD1	92U	238	G,F	NDX	6- 9	D 6- 9	TRK-I	DST	
71IG1	92U	238	G,F	A8X	5- 8	C 5- 8	TRK-I	DST	
71PE1	92U	238	G,F	RLY	THR- 25	C 15, 25	MSP-I	4PI	
							XE 131-136 YIELDS		
71TA1	92U	238	G,F	LFT	THR- 53	C 53	SCD-I	90	
							DELAYED FISSION		
71VA4	92U	238	G,F	A8X	100-999	C100-999	TRK-I	4PI	
							999= 5	GEV	
71WA1	92U	238	G,F	A8X	THR-999	C200-999	SCD-I	DST	461
							999=1150	MEV	
72AN2	92U	238	G,F	RLX	5- 8	D 5- 8	SCD-I	4PI	
72BR8	92U	238	G,F	RLY	THR- 11	C 5- 11	TRK-I	4PI	
72DA6	92U	238	G,F	A8Y	THR-999	C800-999	TRK-I	DST	
							999=2.2	GEV	
72KH1	92U	238	G,F	A8X	THR- 9	D 5- 9	IDN-I	4PI	
72MA1	92U	238	G,F	A8X	5- 9	D 5- 9	IDN-I	4PI	
72SC5	92U	238	G,F	A8Y	THR-700	C150-700	ACT-D	4PI	
							FISSION PRODUCTS		

NEPTUNIUM Z = 93

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
237		6.6	4.9	8.2	10.4	-5.0	12.3	11.4	12.0

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58KA2	93NP	237	G,F	A8X	5- 18	C 5- 18	IDN-I	DST	
59BA4	93NP	237	G,F	RLY	THR- 20	C 6- 20	IDN-I	DST	
62HU1	93NP	237	G,F	A8X	6, 7	D 6,	IDN-I	4PI	

PLUTONIUM Z = 94

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
238		7.0	6.0	9.8	9.7	-5.6	12.9	12.6	10.9
239		5.7	6.2	9.8	8.8	-5.2	12.7	11.6	11.4
240		6.5	6.5	9.7	10.2	-5.3	12.2	12.7	11.8
242		6.3	6.9	9.5	10.8	-5.0	11.5	12.9	12.6

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
69KA1	94PU	238	G,F	A8X	THR- 8	C 5- 8	TRK-I	DST	
71SH4	94PU	238	G,F	A8X	7- 11	C 4- 12	SPK-I	2PI	
70RA1	94PU	238	G,F	A8X	THR- 9	C 5- 10	TRK-D	DST	
							SEE 68RA1, 69KA1		
57KA1	94PU	239	G,XN	A8X	6- 23	C 6- 23	8F3-I	4PI	
72BR8	94PU	239	G,XN	RLY	THR- 11	C 5- 11	8F3-I	4PI	
58KA2	94PU	239	G,F	A8X	5- 18	C 5- 18	IDN-I	DST	
59BA4	94PU	239	G,F	RLY	THR- 20	C 6- 20	IDN-I	DST	
66NI1	94PU	239	G,F	RLY	THR- 15	C 10- 15	TRK-D	4PI	
							DELAYED N YIELDS		
66RA2	94PU	239	G,F	NDX	5- 7	C 5- 8	UKN-I	DST	
68RA1	94PU	239	G,F	NDX	THR- 8	C 5, 8	TRK-I	DST	
70SD2	94PU	239	G,F	A8X	5- 8	C 5- 8	TRK-D	DST	
71SH4	94PU	239	G,F	A8X	7- 11	C 4- 12	SPK-I	4PI	
71TA1	94PU	239	G,F	LFT	THR- 53	C 53	SCD-I	90	
							DELAYED FISSION		
59BA4	94PU	240	G,F	RLY	THR- 20	C 6- 20	IDN-I	DST	
68RA1	94PU	240	G,F	NDX	THR- 8	C 5, 8	TRK-I	DST	
69KA1	94PU	240	G,F	A8X	THR- 8	C 5- 8	TRK-I	DST	
70RA1	94PU	240	G,F	A8X	THR- 9	C 5- 10	TRK-D	DST	
							SEE 68RA1, 69KA1		
68RA1	94PU	242	G,F	NDX	THR- 8	C 5, 8	TRK-I	DST	
69KA1	94PU	242	G,F	A8X	THR- 8	C 5- 8	TRK-I	DST	

AMERICIUM Z = 95

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
241		6.7	4.5	8.2	9.5	-5.6	12.6	11.0	11.0

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM
58KA2	95AM	241	G,F	A8X	5- 18	C 5- 18	IDN-I	DST	
59BA4	95AM	241	G,F	RLY	THR- 20	C 6- 20	IDN-I	DST	
70GA1	95AM	241	G,NF	THR	THR- 14	C 10- 13	SPK-D	4PI	
							PROMPT-DELAYED F		
70GA1	95AM	243	G,NF	THR	THR- 14	C 10- 13	SPK-D	4PI	
							PROMPT-DELAYED F		

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6. Definitions of Abbreviations and Symbols

6.1. Symbols Used to Define Incoming Beam and Reaction Products

A	alpha particle
D	deuteron
E	electron
E/	inelastically scattered electron
E+	positron
F	fission
G	photon
G/	inelastically scattered photon
HE	^{3}He particle
MU-T	used only in combination G,MU-T to indicate a total photon absorption cross section measurement
N	neutron
P	proton
PI	pion
SN	sum of neutron-producing reactions
SPL	spallation
T	triton
XN	all neutrons, total neutron yield
XP	all protons, total proton yield
XXX	reaction products defined in REMARKS

6.2. Symbols and Abbreviations (Table 1 and Data Index - Columns 4-7 and REMARKS

A	nuclear mass number
ABI	absolute integrated cross-section data $\int \sigma dE_\gamma$
ABX	absolute cross-section data
ABY	absolute yield data
ACT	measurement of radioactivity of the target
ANG	angle. Symbols listed under ANG indicate type of angular distribution data available for a reaction.
BBL	bubble chamber
B(EL)	reduced radiative transition probability
BF3	BF_3 neutron counter with moderator, e.g., Halpern detector, long counter
BREAKS	levels located by "breaks" in the yield curve
C	continuous. Used to describe a photon source or a detector response function. Contrast with D = discrete.
CCH	cloud chamber
CF	compared with
COINC	coincidence
D	deuteron

6.2. Symbols and Abbreviations (Continued)

D	discrete. Used to describe a photon source or a detector response function. Contrast with C = continuous.
DEL	delta, full width of cross-section curve at half maximum. May also be width of Lorentz line fit to cross-section curve.
DST	an angular distribution was measured
DT BAL	detail balance
E	energy. Usually energy at which cross-section curve peaks or resonance energy of Lorentz line fit.
EMU	emulsions (photographic plates)
EXCIT	excitation. Usually the excitation energy of the nucleus in which a gamma-ray transition is made.
F	fission
FMF	form factor
G-WIDTH	Γ_γ, gamma-ray transition width
INT	interaction or type of reaction
ION	ionization chamber
J-PI	spin and parity assignments of levels are made
LFT	excited state lifetime
MAG	magnetic spectrometer
MGC	magnetic Compton spectrometer
MGP	magnetic pair spectrometer
MOD	moderated neutron detector not employing a BF_3 counter, e.g., rhodium foil, Szilard-Chalmers reaction, ^3He, ^6Li reactions, Gd loaded liquid scintillator, etc.
MSP	mass spectrometer
N	neutron
N+P	neutron plus proton. Usually means the sum of the (γ,n) and (γ,p) reactions.
NAI	NaI(Tl) spectrometer
NOX	no cross-section data
NUM	number. The acquisition number for data available in the digitized cross-section library of the Photonuclear Data Center.
P	proton
PI	pion
POL	polarization
Q-SQUARE	momentum transfer squared (q^2)
REF	reference. The bibliographic reference number assigned to a paper by the Photonuclear Data Center.
REL	relative
RES	result. Symbols listed under RES indicate type of measurement made for a given reaction.
RLI	relative integrated cross-section data
RLX	relative cross-section data

6.2. Symbols and Abbreviations (Continued)

RLY	relative yield data
SCD	semiconductor (solid state) detector
SCI	scintillator detector other than NaI, e.g., CsI, KI, organic (liquid or solid), stilbene, He
SEP ISOTP	separated isotope used
SIG	cross section. The maximum value of the cross section as a function of photon energy.
SIG-0	σ_0
SIG-1	σ_{-1}
SN	used alone or as $\sigma(SN)/\sigma(\gamma,SN)$ $\sigma(SN) = \sigma(\gamma,n) + \sigma(\gamma,np) + \sigma(\gamma,2n) + \sigma(\gamma,3n) + \ldots$
SNF	used alone or as $\sigma(SNF)/\sigma(\gamma,SNF)$ $\sigma(SNF) = \sigma(SN) + \sigma(\gamma,f)$
SPC	photon or particle energy spectrum
SPK	spark chamber
T	triton
TEL	counter telescope
THR	threshold detector, e.g., $^{29}Si(n,p)^{29}Al$
TOF	time-of-flight detector
TOT	total nuclear absorption cross section for photons
TRK	tracks of particles or fragments observed in solid materials (glass, mylar, etc.)
XN	all neutrons. Used alone or as $\sigma(XN)/\sigma(\gamma,XN)$ $\sigma(XN) = \sigma(\gamma,n) + \sigma(\gamma,np) + 2\sigma(\gamma,n) \ldots + \eta\sigma(\gamma,f) + \ldots$
XP	all photons. Used alone or as $\sigma(XP)/\sigma(\gamma,XP)$ $\sigma(XP) = \sigma(\gamma,p) + \sigma(\gamma,np) + 2\sigma(\gamma,p) + \ldots$
Z	atomic number (number of protons)
4PI	a 4π geometry was used or a method like radioactivity or a total absorption measurement
999	energy defined in REMARKS
$	indicates the measurement involved either beams or targets that were polarized/aligned, or that the polarization of the reaction products was determined

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☆ U. S. GOVERNMENT PRINTING OFFICE : 1973—511-323

FORM NBS-114A (1-71)

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBS SP-380	2. Gov't Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE

Photonuclear Reaction Data, 1973.

5. Publication Date: March 1973

6. Performing Organization Code

7. AUTHOR(S) E. G. Fuller, H. M. Gerstenberg, H. Vander Molen, T. C. Dunn

8. Performing Organization

9. PERFORMING ORGANIZATION NAME AND ADDRESS

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

10. Project/Task/Work Unit No. 2410232

11. Contract/Grant No.

12. Sponsoring Organization Name and Address

Same as No. 9.

13. Type of Report & Period Covered: Final

14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

This publication supersedes NBS Miscellaneous Publication 277 and NBS Special Publication 322 which also embraced Supplement 1 to Misc. Publ. 277.

16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

A brief summary is given of the available data on the gross features of the photonuclear giant resonance. Data are presented in tabular form for all nuclei where measurements have been made. In addition, a comprehensive, annotated data index and bibliography are given which cover experimental data for the field of photonuclear reactions published in scientific and technical journals in the period from 1955 through 1972. Organized by element and isotope, each entry in the index is for a specific reaction reported in a given reference. Information is given on the type of measurement, excitation energies studied, source type and energies, detector type and angular ranges covered for each reaction entry.

17. KEY WORDS (Alphabetical order, separated by semicolons) Bibliography; data index; data summary; elements; isotopes; nuclear physics; photonuclear giant resonance; photonuclear reaction.

18. AVAILABILITY STATEMENT

[X] UNLIMITED.

[ ] FOR OFFICIAL DISTRIBUTION. DO NOT RELEASE TO NTIS.

19. SECURITY CLASS (THIS REPORT): UNCLASSIFIED

21. NO. OF PAGES: 131

20. SECURITY CLASS (THIS PAGE): UNCLASSIFIED

22. Price: $2.10 Domestic Postpaid
$1.75 GPO Bookstore

USCOMM-DC 66244-P71

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