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PUBLICATIONS

NAT'L INST OF STANDARDS & TECH R.I.C.



A11100984903

United States. Natlo/Photonuclear reactl
QC100 .U57 V380-81:1978 C.1 NBS-PUB-C 19



NBS SPECIAL PUBLICATION 380

SUPPLEMENT 1

U.S. DEPARTMENT OF COMMERCE / National Bureau of Standards

Photonuclear Data Index 1973-1977

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U57
No. 380-1
1978
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Photonuclear Data Index, 1973-1977

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+special publication

E. G. Fuller, H. M. Gerstenberg

Center for Radiation Research
National Measurement Laboratory
National Bureau of Standards
Washington, D.C. 20234



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Issued August 1978

National Bureau of Standards Special Publication 380 Supplement 1
Nat. Bur. Stand. (U.S.), Spec. Publ. 380, Suppl. 1, 102 pages (Aug. 1978)
CODEN: XNBSAV

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON: 1978

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
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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

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Photonuclear Data Index
1973 through 1977

E. G. Fuller and H. M. Gerstenberg

This index, a supplement to NBS Special Publication 380, Photonuclear Reaction Data, 1973, primarily covers data published in the period from January 1965 through December 1977. 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 in the measurement. Also included is an index to the more than 1000 data sets currently available in the Photonuclear Data Center's digital data library.

Key words: Bibliography, data index, elements, isotopes, nuclear physics, photonuclear reactions.

1. INTRODUCTION

This Photonuclear Data Index is the sixth one published by the Photonuclear Data Center. NBS Special Publication 380, Photonuclear Reaction Data, 1973, the Center's last publication, contained a cumulative, annotated data-index covering articles published from January 1, 1955 through 1972. The present index extends the coverage to include data entered into the Center's file through March 1978. All of these data are published in regular journals or as rather complete reports as contributions to various international conferences. Ten 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 April 1, 1978. The Reaction Index, published regularly as a part of Recent References in Nuclear Data Sheets, is now used to find papers published in those journals not regularly searched.

<u>Journal</u>	<u>Last Issue</u>
Canadian Journal of Physics	Vol. <u>55</u> , #24
Physical Review C	Vol. <u>17</u> , #1
Physical Review Letters	Vol. <u>40</u> , #3
Nuclear Physics	Vol. <u>A293</u>
Physics Letters	Vol. <u>72B</u>
Soviet J. of Nuclear Physics	Vol. <u>25</u> , #4
Il Nuovo Cimento Letters	Vol. <u>17</u>
J. Physical Society Japan	Vol. <u>43</u> , #6
Journal of Physics G	Vol. <u>4</u> , #2
Zeitschrift fur Physik	Vol. <u>A284</u> , #2
Nuclear Data Sheets	Vol. <u>23</u> , #3

In addition to the annotated data index and bibliography this supplement also contains in Section 8 a complete index to data available

in the Center's Digital Data Library and finally an Errata List for SP 380.

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 detector used, and whether angular distribution data were 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, to readily locate the pertinent references without having to go through a large number of irrelevant papers.

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 electro-magnetic 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, papers are indexed which report

30 MeV, the region of the photonuclear giant resonance.

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 isotopic abundances and separation energies given in the index differ slightly from those used previously. The abundances are taken from a new evaluation prepared by N. E. Holden [1]* for inclusion in the seventh edition of the Table of Isotopes [2]. The new separation energies were taken from the tabulation of Wapstra and Bos [3] which are based on their 1977 Atomic Mass Evaluation.

In the data index which follows, eight columns are used to describe a reaction reported in a specific paper. The headings of the eight principal columns used for an index entry are: REF (Bibliographic Reference Code), NUCLIDE, REACTION, RES (Result), EXCIT (Excitation Energy), SOURCE, DETECTOR, and REMARKS. These headings are described more completely in the following section.

Within the index, the main grouping of the entries is by element. Under a given element measurements made on samples with naturally occurring mixed isotope abundances are listed first. Following this, measurements pertaining to the various isotopes of the element are listed together. The entries for a given elemental or isotopic sample 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.

4. DESCRIPTION OF COLUMN HEADINGS

An alphabetical list of the symbols used under the eight main columns of the data index is given in Section 10 of this report. The purpose of this section is to describe the meanings of the various column headings.

REF A Bibliographic Reference Code is given here. This is made up of the year and the first two letters of the first author's name, plus an additional serial number.

NUCLIDE The atomic number (Z), chemical symbol, and mass number (A) of the excited nucleus (not necessarily the target nucleus) are 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%.

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.

RES A code is entered that indicates whether the results are given in absolute or relative units and how they are expressed, e.g. a yield, cross section, form factor, etc.

EXCIT Excitation Energy Range. The excitation energy range of the nucleus in which the gamma-ray transition takes place is given. 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. Energies are normally expressed in MeV. Where the energy scale extends above 999 MeV, 999 is entered and the actual energy given under REMARKS. Where an MeV scale is inappropriate for the measurement a * is entered and the appropriate units are defined in REMARKS.

SOURCE Source Type and Energy Range. The source of incident particles is characterized by the letter C or D indicating that it was either continuous or discrete in energy, a

*Figures in brackets indicate the literature references on Page 3.

bremsstrahlung source would be marked C. The source energy is indicated under MIN-MAX. For bremsstrahlung, the range of endpoint energies is given. In general the units are MeV. The same notation described under EXCIT is used when an MeV scale is inappropriate for the measurement.

DETECTOR Detector Type, and Angular Range. The symbols used to indicate the detector used in measurement are defined in the list given in Section 10. The letter D or I under the 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 BF₃ detector (BF3) always integrates over neutron energy (I). The angular range covered by the detector is indicated 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.

REMARKS A short phrase included 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.

5. ACKNOWLEDGEMENT

The authors gratefully acknowledge the many contributions made by Cheryl Campbell to the production of this index. Her careful attention to details and her willingness to take on many of the tedious and exacting aspects of the Center's work are deeply appreciated.

6. REFERENCES FOR TEXT

- (1) N. E. Holden, BNL-NCS 50605 Isotopic Composition of the Elements and their Variation in Nature: A Preliminary Report, March 1977.
- (2) C. M. Lederer, et al. Table of Isotopes (seventh edition), John Wiley and Sons, New York (to be published).
- (3) A. H. Wapstra and K. Bos, Atomic Data and Nuclear Data Tables 19, 177 (1977).

7. PHOTONUCLEAR DATA INDEX 1973 THROUGH 1977

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	8.5	*	*	*	8.5	8.5	*

REF	NUCLIDE Z	REACTION A IN.CUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
72AR9	1H 1	\$ G,PI+	ABX	300-900	C300-900	MAG-D 90	POLARIZED TARGET
72ZD1	1H 1	\$ G,PI+	NOX	150-909	C390-909	MAG-D 135	POLARIZED PHOTONS
74AL13	1H 1	G,PI+	RLX	200-400	C600	MAG-D DST	D(G,PI+)/P(G,PI+)
74CL10	1H 1	G,PI+	ABX	150-450	C250-450	TOF-D DST	TAGGED PHOTONS
74DE3	1H 1	G,PI+	ABX	145-155	C145-154	ACT-I 4PI	
77AR7	1H 1	G,PI+	ABX	500-930	D500-930	MAG-D DST	
72ZD1	1H 1	\$ G,PIO	NOX	150-918	C426-918	MAG-D DST	POLARIZED PHOTONS
74CL10	1H 1	G,PIO	ABX	150-450	C250-450	TEL-D DST	TAGGED PHOTONS
74DE13	1H 1	\$ G,PIO	ABX	980-999	C999	SPK-D UKN	POL P, 999=1.225 GEV
74GE2	1H 1	G,PIO	ABX	400-500	C500	TEL-D DST	
74GD3	1H 1	\$ G,PIO	NOX	150-495	C600,900	MAG-D UKN	POL PROTONS, PHOTONS
74GA9	1H 1	\$ G,PIO	NOX	400-650	C999	UKN-D DST	999=1.4 GEV,POL G
74HI5	1H 1	G,PIO	ABX	340-420	C412,447	CKV-D DST	
74JA3	1H 1	G,PIO	ABX	240-380	C455	TEL-D DST	
75DO1	1H 1	G,PIO	ABX	360-938	C999	TEL-D DST	999=1.2 GEV
76AB7	1H 1	\$ G,PIO	ABX	500-999	D900-999	MAG-D DST	999=1.65 GEV,POL G
76BL9	1H 1	\$ G,PIO	NOX	700-999	C 2*	SPK-D DST	999=1.2 GEV,*GEV,\$P
76BL13	1H 1	\$ G,PIO	NOX	600-999	C 2*	MAG-D DST	999=1.2GEV,*GEV,\$P
76DO6	1H 1	G,PIO	ABX	238-922	C245-922	TEL-D DST	
76DE7	1H 1	\$ G,PIO	NOX	150-640	C540-640	MAG-D DST	\$ RECOIL P
77AR7	1H 1	G,PIO	ABX	500-930	D500-930	MAG-D DST	
77DO5	1H 1	G,PIO	ABX	262-238	C375-475	TEL-D DST	
74BA9	1H 1	G,G	ABX	70-110	C UKN	UKN-D DST	
74BA11	1H 1	G,G	ABX	85-107	C127,148	TEL-D DST	
75BA2	1H 1	G,G	ABX	70-110	C127,148	TEL-D DST	
77AL5	1H 1	G,PIO	ABX	320	C350	CKV-D DST	
76SI11	1H 2	E,E/	ABX	2- 80	D 80-300	MAG-D DST	
73SH18	1H 2	E,E/P	ABX	18. 35	D 38,106	MAG-D DST	COINC E,P
74AN5	1H 2	E,E/P	ABX	95	C999	MAG-D DST	999=1.2 GEV
75AN9	1H 2	E,E/P	ABX	0*185	D216,999	MAG-D DST	999=1.195 GEV,*MEV/C
70HA2	1H 2	E,N	ABX	5- 18	D 5- 18	BF3-I 4PI	
74PH1	1H 2	E,N	NOX	4- 11	D 4- 11	MOD-I 4PI	RATIO (G,N)/(E,N)
73CH4	1H 2	E,P	ABX	5- 24	D 38,107	MAG-D DST	
73SK1	1H 2	E,P	ABX	4- 46	D 38,107	MAG-D DST	
74CH2	1H 2	E,P	ABX	5- 44	D 30-107	MAG-D DST	
74SK1	1H 2	E,P	ABX	17- 28	D 29	MAG-D DST	
74AL13	1H 2	G,PI+	RLX	200-400	C600	MAG-D DST	D(G,PI+)/P(G,PI+)
74CL10	1H 2	G,PI+	RLX	150-450	C250-450	TOF-D DST	TAGGED PHOTONS
77AU4	1H 2	G,PI+	RLX	148-155	C150-155	ACT-I 4PI	RELATIVE SIGMA,H2/H
74CL10	1H 2	G,PIO	RLX	150-450	C250-450	TOF-D DST	TAGGED PHOTONS
74CL10	1H 2	G,PI-	RLX	150-450	C250-450	TEL-D DST	TAGGED PHOTONS
75CH3	1H 2	G,PI-	ABX	200-450	C450	BBL-D 4PI	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74AH9	1H 2		G,MU-T	ABX 15- 25	C UKN	MGC-D	4PI	
73BA3	1H 2		G,P	ABX 17- 25	C 25	SCD-D	DST	
76D05	1H 2		G,P	ABX 139-832	C999	TEL-D	DST	999=1.2GEV
76HU4	1H 2		G,P	ABX 20-120	D 20-120	MAG-D	0	
77D05	1H 2		G,P	ABX 74-241	C UKN	TEL-D	DST	
77K05	1H 2	\$	N,G	NOX 2	D 1	NAI-D	90	POL OF G
73AR11	1H 2		N,2G	ABX 2	C 0	NAI-D	4PI	LIMIT ON SIG
76EA3	1H 2		N,2G	ABX 2	D 0	SCD-D	85	ANG BTW DET. SIG LIM

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
3	1.4(-4)	7.7	5.5	*	*	*	*	7.7	7.7
4	99.99	20.6	19.8	19.8	20.6	*	28.3	26.1	28.3

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
75KA6	2HE3		E,E/	ABX 5- 12	D 60-120	MAG-D	DST	BROAD PEAK AT 6.4 MEV
75KA7	2HE3		E,E/	ABX 0- 40	D 60-120	MAG-D	DST	
76MC2	2HE3		E,E/	ABI 23-263	D500	MAG-D	60	QUASIELAST SCAT
73SH18	2HE3		E,E/P	SPC 18- 30	D100	MAG-D	DST	COINC E,P
72SH8	2HE3		E,D	RLX 19- 30	D100	MAG-D	DST	PROTONS IN COINC
74CH3	2HE3		E,D	ABX 10- 21	D 21, 23	MAG-D	90	
75SK1	2HE3		E,D	ABX 11- 40	D 43-103	MAG-D	DST	
75BA7	2HE3		G,PI+	ABX 227-453	C600	MAG-D	DST	PI-T IN COINC
74BE8	2HE3		G,N	ABX 7- 31	D 7- 31	BF3-I	4PI	
75HE7	2HE3		G,N	RLY 8- 23	C 23	CCH-D	4PI	DALITZ PLOTS
68PI1	2HE3		G,D	ABX 180-550	C800	TEL-D	90	
73TZ2	2HE3		G,D	ABX 160-370	C	MAG-D	DST	P DETECTED IN COINC
73TI4	2HE3		G,D	ABX 11- 65	C 67	MAG-D	DST	
75AR1	2HE3		G,D	ABX 175-370	C405	MAG-D	DST	PROTONS IN COINC
75HE7	2HE3		G,D	FLY 6- 23	C 23	CCH-D	4PI	
76HE2	2HE3		G,A	ABX 200-600	C700	MAG-D	DST	TIME REVERSAL TEST
74MA6	2HE3		P,G	ABX 16	D 16	MAG-D	DST	DETECTED RECOIL
76HE3	2HE3		P,G	ABX 256-390	D377-576	SPK-D	DST	
75DE6	2HE4		E,E/	ABX 0-300	D800-999	MAG-D	DST	999= 1.18 GEV
76MC2	2HE4		E,E/	ABI 32-272	D500	MAG-D	60	QUASIELAST SCAT
74G05	2HE4		E,E/P	ABX 0* 30	D999	MAG-D	20	*SEP E, 999=1.1 GEV
74G08	2HE4		E,E/P	ABX * 17	D999	MAG-D	DST	*SEP E, 999=1.2 GEV
72AR5	2HE4		G,PI-	ABX THR-575	C346-575	TEL-D	DST	
73TZ2	2HE4		G,PI-	ABX 150-950	C	MAG-D	DST	PI- AND P IN COINC
73IR2	2HE4		G,N	ABX 21- 31	D 21- 31	TOF-D	DST	
73IR4	2HE4		G,N	ABX 21- 37	C 35, 39	TOF-D	98	
73MA11	2HE4		G,N	ABX 20-110	C110	TOF-D	DST	
73TZ2	2HE4		G,N	ABX 275-430	C	MAG-D	DST	N AND HE3 IN COINC
73WE5	2HE4		G,N	ABX 25- 75	C 25- 75	TOF-D	DST	
74AR6	2HE4		G,N	ABI 26-120	C120	CCH-D	4PI	ENERGY MOMENTS
75AR1	2HE4		G,N	ABX 274-403	C405	MAG-D	DST	2-BODY COINC
75AR10	2HE4		G,N	ABX 27- 30	CUKN	CCH-D	DST	
75IR1	2HE4		G,N	ABX 22- 32	C 22- 33	TOF-D	DST	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
76AR8	2HE4	G,N	ABX	21-150	CUKN	CCH-D 4PI	
74IR1	2HE4	G,XN	RLY	20- 35	C 35	TOF-I 98	N YLD VS BEAM CURR.
73KI2	2HE4	G,P	ABX	180-320	C320	SPK-D DST	
74AR6	2HE4	G,P	ABI	26-120	C120	CCH-D 4PI	ENERGY MOMENTS
75AR1	2HE4	G,P	ABX	175-370	C405	MAG-D DST	2-BODY COINC
74AR6	2HE4	G,PN	ABI	26-120	C150	CCH-D 4PI	ENERGY MOMENTS
74AR6	2HE4	G,2P2N	ABI	26-120	C150	CCH-D 4PI	ENERGY MOMENTS
73TZ2	2HE4	G,TP	ABX	190-415	C	MAG-D DST	TP DETECTED IN COINC
72AR6	2HE4	G,D	ABX	28- 75	C150	CCH-D DST	
76AR5	2HE4	G,D	ABX	201-359	CUKN	TEL-D DST	D.D COINC
74AR6	2HE4	G,2D	ABI	26-120	C150	CCH-D 4PI	ENERGY MOMENTS
72HA9	2HE4	\$ P,G	NOX	24- 70	D 6- 14	NAI-D DST	POLARIZED PROTONS
73HA15	2HE4	P,G	ABX	26	D 8	NAI-D 90	
71DE1	2HE4	D,G	ABX	24- 30	D 1- 6	NAI-D DST	
73PO2	2HE4	D,G	ABX	25- 28	D 6- 12	NAI-D DST	

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	7.5	5.7	4.6	15.8	15.8	1.5	27.2	3.7	26.4
7	92.5	7.3	10.0	2.5	25.9	2.5	12.9	11.8	33.5

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74AH8	3LI	G,MU-T	ABX	15-220	C300	MGC-D 4PI	
75AH3	3LI	G,MU-T	ABX	10-210	C140-275	MGC-D 4PI	
73DC9	3LI	G,XP	ABY	90-400	C400	TEL-D DST	
73FA1	3LI6	E,E/	SPC	11	D 50	MAG-D 180	
73KU7	3LI6	E,E/	ABX	84-284	D999*	MAG-D DST	*999=1.184 GEV
74WH3	3LI6	E,E/	ABX	0-300	D500	MAG-D 60	QUASIELASTIC SCAT
74YE2	3LI6	E,E/	FMF	2	D 30- 60	MAG-D DST	2.18 MEV, 3+ LEVEL
75BE5	3LI6	E,E/	LFT	3	D 35-125	MAG-D DST	3=3.562 MEV
76BE3	3LI6	E,E/	FMF	1- 8	D 41-125	MAG-D DST	
77BU14	3LI6	E,E/	FMF	UKN	D 82-292	MAG-D DST	
72AN11	3LI6	E,E/P	ABX	0* 20	D999	MAG-D 20	*SEP E, 999=1.18 GEV
72HI8	3LI6	E,E/P	NOX	0* 30	D700	MAG-D DST	*SEP ENERGY RANGE
73HI5	3LI6	E,E/P	SPC	0* 70	D700	MAG-D UKN	*SEP ENERGY RANGE
72GE4	3LI6	E,E/D	ABX	-40* 40	D515	MAG-D DST	*RECOIL P MEV/C
73HE7	3LI6	E,E/D	ABX	200	D999	MAG-D DST	999=2.7 GEV
74GE7	3LI6	E,E/D	ABX	74*	D520	MAG-D DST	*MCM TRANS MEV/C
72GE4	3LI6	E,E/A	ABX	-50* 50	D525	MAG-D DST	*RECOIL P MEV/C
74GE7	3LI6	E,E/A	ABX	78*	D520	MAG-D DST	*MOM TRANS MEV/C
76SK9	3LI6	E,D	ABX	10- 16	D 23	MAG-D DST	
75SH3	3LI6	E,T	ABX	26- 68	D UKN	MAG-D DST	VIRTUAL PHOTON ANAL
74DE3	3LI6	G,PI+	ABX	145-155	C145-154	ACT-I 4PI	
74GO1	3LI6	G,PI+	ABY	150-400	C400	BBL-D 90	
74GO1	3LI6	G,PI-	ABY	150-400	C400	BBL-D 90	
73SA14	3LI6	G,G	LFT	3	C 5	NAI-D 120	3=3.56 MEV
73DE14	3LI6	G,P	ABY	7- 57	C 20- 57	TEL-D 90	COINC MEAS WITH P,D,T
73GA3	3LI6	G,P	ABX	60	D 60	MAG-D 45	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74G01	3LI6	G,P	ABY	4-400	C400	BBL-D 90	
76MA8	3LI6	G,P	ABX	60-100	D 60-100	MAG-D DST	
73DE14	3LI6	G,2PNT	ABI	24- 57	C 20- 57	TEL-D 90	2PNT IS AN ESTIMATE
73DE14	3LI6	G,DP	ABY	6- 57	C 20- 57	TEL-D 90	P,D,T IN COINC
73DE14	3LI6	G,T	ABY	16- 57	C 20- 57	TEL-D 90	
75BA4	3LI6	A,G	ABX	4	D 6- 8	NAI-D 90	4=3.562 LIMIT ON SIG
75BE8	3LI6	A,G	LFT	3	D 3	SCD-D 90	3=3.562,LIMIT ON LFT
73KU7	3LI7	E,E/	ABX	84-284	DS99	MAG-D DST	999=1.184 GEV
72HI8	3LI7	E,E/P	NOX	5* 35	D700	MAG-D DST	*SEP ENERGY RANGE
73HI5	3LI7	E,E/P	SPC	0* 70	D700	MAG-D UKN	*SEP ENERGY RANGE
74G01	3LI7	G,PI+	ABY	150-400	C400	BBL-D 90	
71N01	3LI7	G,PI-	ABY	150-999	C140-999	ACT-I 4PI	999=1.2 GEV
74G01	3LI7	G,PI-	ABY	150-400	C400	BBL-D 90	
73AH4	3LI7	G,MU-T	ABX	10-140	C140	MGC-D 4PI	
73BR11	3LI7	G,N	ABX	7- 31	D 7- 31	BF3-I 4PI	
73BR11	3LI7	G,2N	ABX	11- 31	D 11- 31	BF3-I 4PI	
73GA3	3LI7	G,P	ABX	60	D 60	MAG-D 45	
74DE11	3LI7	G,P	ABX	12- 40	C 15- 40	TEL-D 90	SEP ISOTOPES
74G01	3LI7	G,P	ABY	10-400	C400	BBL-D 90	
75DE7	3LI7	G,P	ABI	10- 51	C 15- 51	TEL-D 90	SEE ALSO 74DE11
76MA8	3LI7	G,P	ABX	60-100	D 60-100	MAG-D DST	
73KC6	3LI7	G,TP	ABX	23- 27	C 27	EMU-D 90	
75DE7	3LI7	G,D	ABX	10- 51	C 15- 51	TEL-D 90	
75DE7	3LI7	G,T	ABI	2- 51	C 15- 51	TEL-D 90	

BERYLLIUM Z=4

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
9	100.	1.7	16.9	17.7	21.2	2.5	20.6	18.9	29.3

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73VE4	4BE6	HE,G	ABX	13- 25	D 1- 28	NAI-D DST	
76FI3	4BE8	P,G	ABX	17- 33	D 0- 18	NAI-D DST	
77UL1	4BE8	\$ P,G	ABX	17- 18	D380*960	SCD-D DST	*ENERGY KEV, POL G
68CL2	4BE9	E,E/	LFT	1- 7	D 25- 58	MAG-D DST	5 LEVELS
73BE4	4BE9	E,E/	FMF	14- 18	D 62-122	MAG-D DST	5 LEVELS
73KU7	4BE9	E,E/	ABX	84-284	DS99	MAG-D DST	999=1.184 GEV
73SL6	4BE9	E,E/	FMF	1- 10	D 60-106	MAG-D DST	1.67, 2.43 CONT.
74EN1	4BE9	E,E/	FMF	2	C 60-120	MAG-D DST	2.429 MEV LEVEL
74TI3	4BE9	E,E/	ABX	0-600	D999	MAG-D DST	999=1.2 GEV
72HI8	4BE9	E,E/P	NOX	10* 35	D700	MAG-D DST	*SEP ENERGY RANGE
73HI5	4BE9	E,E/P	SPC	0* 70	D700	MAG-D UKN	*SEP ENERGY RANGE
74G010	4BE9	E,E/P	ABX	10* 50	D801	MAG-D 30	*SEP ENERGY
74G01	4BE9	G,PI+	ABY	150-400	C400	BBL-D 90	
74G01	4BE9	G,PI-	ABY	150-400	C400	BBL-D 90	
72AH7	4BE9	G,MU-T	ABX	16-140	C140	MGC-D 4PI	
73AH4	4BE9	G,MU-T	ABX	10-140	C140	MGC-D 4PI	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74AH8	48E9	G,MU-T	ABX	15-220	C300	MGC-D 4PI	
75AH3	48E9	G,MU-T	ABX	10-210	C140-275	MGC-D 4PI	
77BU4	48E9	G,N1	ABX	17- 26	C 22- 29	TOF-D DST	
73AN16	48E9	G,N	ABX	1- 17	C 1- 17	BF3-I 4PI	
75SC7	48E9	G,N	ABX	62- 66	D 62- 66	TOF-D DST	62.7-65.7 MEV
71NO1	48E9	G,2N	ABY	21-999	C 80-999	ACT-I 4PI	999=1.2 GEV
75KN5	48E9	G,2N	ABX	20- 38	D 17- 38	MOD-I 4PI	
65CO2	48E9	G,XN	ABX	6- 80	C 6- 80	BF3-I 4PI	
66CO4	48E9	G,XN	ABX	6- 80	C 6- 80	BF3-I 4PI	
73HU11	48E9	G,XN	ABX	1- 28	C 1- 28	MOD-I 4PI	
74KN10	48E9	G,XN	ABX	17- 25	D 17- 25	MOD-I 4PI	
75HU1	48E9	G,XN	ABX	1- 28	C 1- 28	BF3-I 4PI	
75KN5	48E9	G,XN	ABX	17- 38	D 17- 38	MOD-I 4PI	
74GO1	48E9	G,P	ABY	17-400	C400	BBL-D 90	
76MA8	48E9	G,P	ABX	60-100	D 60-100	MAG-D 45	
78DC1	48E9	G,P	ABX	67-600	C100-600	TEL-D DST	PROTONS OVER 50 MEV
73DO9	48E9	G,XP	ABY	97-400	C400	TEL-D DST	
74DC5	48E9	G,XP	ABX	100-999	C125-999	TEL-D DST	999=1 GEV
71SC3	48E9	T,G	ABX	18- 20	D 1- 3	NAI-D 90	
73BL5	48E10	T,G	RLX	17- 20	D 0- 3	NAI-D 90	

BORON Z=5

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HEC	G,A	G,2N	G,NP	G,2P
10	20.	8.4	6.6	18.7	17.8	4.5	27.0	8.3	23.5
11	80.	11.5	11.2	11.2	27.2	8.7	19.9	18.0	30.9

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
71NO1	5B	G,6E7	ABY	25-999	C 80-999	ACT-I 4PI	999=1.2 GEV
76FA5	5B 10	E,E/	ABX	5- 12	D 40- 61	MAG-D 180	6 LEVELS, 5.11-11.56
76KN3	5B 10	G,2N	ABX	16- 35	D 16- 35	MOD-I 4PI	
73HU12	5B 10	G,XN	ABX	8- 28	C 8- 28	MOD-I 4PI	
73HU14	5B 10	G,XN	ABX	8- 28	C 8- 28	BF3-I 4PI	
76KN3	5B 10	G,XN	ABX	10- 35	D 10- 35	MOD-I 4PI	
59ME3	5B 10	P,G	ABX	6- 8	D 0- 2	NAI-D DST	
75AU8	5B 10	P,G	ABX	7- 8	D 0- 1	SCD-D 0	LEVELS 6.88,7.44 MEV
75AU8	5B 10	A,G	ABX	7- 8	D 4- 5	SCD-D 0	LEVELS 6.88,7.44 MEV
73FL3	5B 11	E,E/	SPC	0- 35	D 50- 90	MAG-D DST	
75KA1	5B 11	E,E/	ABX	0- 34	D 52- 90	MAG-D DST	LEVELS 2-13
76EP4	5B 11	G,PI-	ABX	150-400	C180-400	ACT-I 4PI	
76MI7	5B 11	G,PI-	ABX	142-169	C120-170	ACT-I 4PI	
73SA14	5B 11	G,G	LFT	2, 4	C 5	NAI-D 120	2=2.12, 4=4.44
76KN3	5B 11	G,2N	ABX	16- 35	D 16- 35	MOD-I 4PI	
73HU12	5B 11	G,XN	ABX	11- 28	C 11- 28	MOD-I 4PI	
73HU14	5B 11	G,XN	ABX	11- 28	C 11- 28	BF3-I 4PI	
76KN3	5B 11	G,XN	ABX	10- 35	D 10- 35	MOD-I 4PI	
75AD2	5B 11	G,PG	ABY	11-300	C100-800	SCD-D 135	YIELD TO 3.4 MEV 2+
75AF5	5B 11	N,G	NOX	25	D 14	NAI-D DST	
74DE4	5B 11	D,G	ABX	18- 26	D 3- 12	NAI-D DST	

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	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
65DE35	6C 12	E,E/	ABX	14- 25	D 65	MAG-D	180	
71NA1	6C 12	E,E/	FMF	4- 17	D250	MAG-D	DST	LEVELS 14.1, 4.43
72BE10	6C 12	E,E/	SPC	48- 88	D213	MAG-D	60	
72BE12	6C 12	E,E/	ABX	30-140	D200-350	MAG-D	DST	
72SP9	6C 12	E,E/	NOX	15	D 35- 71	MAG-D	DST	15=15.109
73CH1	6C 12	E,E/	LFT	15	D 35- 56	MAG-D	DST	15.109 MEV LEVEL
74CE4	6C 12	E,E/	ABX	12- 15	C 50	MAG-D	180	G-WIDTH OF 12.71 EV
74WH3	6C 12	E,E/	ABX	0-300	D500	MAG-D	60	QUASIELASTIC SCAT
76V11	6C 12	E,E/	ABX	100-600	D812-999	MAG-D	14	999=1.396 GEV
72HI8	6C 12	E,E/P	ABX	0* 70	D700	MAG-D	DST	*SEP ENERGY RANGE
73HI5	6C 12	E,E/P	SPC	0* 70	D700	MAG-D	UKN	*SEP ENERGY RANGE
73HE8	6C 12	E,E/P	ABX	1*	D 2* 3	MAG-D	15	*E,GEV
74BE1	6C 12	E,E/P	ABX	10* 60	D497	MAG-D	DST	*MISSING ENERGY MEV
76MO5	6C 12	E,E/P	ABX	20* 57	D497	MAG-D	53	*MISSING ENERGY
76NA2	6C 12	E,E/P	ABX	0* 60	D700	MAG-D	DST	*SEPARATION ENERGIES
73EN4	6C 12	E,PI+	ABX	319-819	C300-850	MAG-D	28	
77BO12	6C 12	E,PI+	RLX	150-280	D280	MAG-D	DST	SIG PI-/SIG PI+
77SH6	6C 12	E,PI+	ABX	0- 1	D195	MAG-D	DST	
73EN4	6C 12	E,PI-	ABX	319-819	C300-850	MAG-D	28	
77BO12	6C 12	E,PI-	ABX	150-280	D280	MAG-D	DST	SIG PI-/SIG PI+
73MO9	6C 12	E,N	RLY	18- 39	C 18- 39	ACT-I	4PI	YIELD (G,N)/(E,N)
74SC8	6C 12	E,N	ABX	50-150	D 63-150	TOF-D	DST	PHOTON DIFF.
77KN2	6C 12	E,N	ABX	19- 32	D 26- 32	ACT-I	4PI	
71EG1	6C 12	E,XP	ABY	56-130	D130	MAG-D	DST	
71EG2	6C 12	E,XP	ABY	56-250	C100-250	MAG-D	30	
77KN2	6C 12	E+,N	ABX	19- 32	D 26- 32	ACT-I	4PI	
73AN10	6C 12	\$ G,PI	NOX	140-900	C800-900	TEL-D	90	PI-P COINC, P POL
73GO5	6C 12	G,PI+	ABY	170-400	C400	BBL-D	90	
74BO14	6C 12	G,PI+	SPC	150-345	C345	EMU-D	DST	
75TO4	6C 12	G,PI+	ABY	150-400	C300,400	BBL-D	90	
76WA3	6C 12	G,PI+	ABY	140-250	C250	MAG-D	90	
73AN6	6C 12	G,PI-	ABX	140-824	D223-824	MAG-D	28	
73GO5	6C 12	G,PI-	ABY	170-400	C400	BBL-D	90	
74BO14	6C 12	G,PI-	SPC	150-345	C345	EMU-D	DST	
74EP2	6C 12	G,PI-	ABX	140-375	C120-375	ACT-I	4PI	
75TO4	6C 12	G,PI-	ABY	150-400	C300,400	BBL-D	90	
76BE6	6C 12	G,PI-	ABX	150-191	C150-191	ACT-I	4PI	B+ ACTIV-NITROGEN 12
76WA3	6C 12	G,PI-	ABY	140-250	C250	MAG-D	90	
77BA8	6C 12	G,PI-	ABX	300-900	C300-900	MAG-D	44	
70WU3	6C 12	G,MU-T	ABX	20- 30	C 50	RSP-D	4PI	
72AH7	6C 12	G,MU-T	ABX	16-140	C140	MGC-D	4PI	
73AH4	6C 12	G,MU-T	ABX	10-140	C140	MGC-D	4PI	
75AH3	6C 12	G,MU-T	ABX	10-160	C140-275	MGC-D	4PI	
77BE3	6C 12	G,G	ABX	5- 8	D 5- 8	SCD-D	140	5.5-7.2 MEV
72AN8	6C 12	G,N	ABX	1- 7	C 1- 7	ACT-I	4PI	ENERGIES GEV
73EY2	6C 12	G,N	ABX	64-123	D 64-123	TOF-D	DST	
73JU2	6C 12	G,N	SPC	18- 28	C 23- 31	TOF-I	DST	GND STATE NEUTRONS
73MO9	6C 12	G,N	RLY	18- 39	C 18- 39	ACT-I	4PI	YIELD/PHOTO/ELECTRO
73NA5	6C 12	\$ G,N	NOX	22- 31	C 30, 64	TOF-I	DST	GS NEUTRONS

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
75SC7	6C 12	G,N	ABX	62- 66	D 62- 66	TOF-D DST	62.7-65.7 MEV
75W02	6C 12	G,N	RLY	19- 40	C 19- 40	ACT-I 4PI	RATIO (G,N)/(E,N)
77J03	6C 12	G,2N	ABX	100-600	C100-800	ACT-I 4PI	
71G03	6C 12	G,XN	ABX	19- 24	C 19- 24	MOD-I 4PI	
73EY3	6C 12	G,XN	SPC	31-234	C234	TOF-D 90	NEUTS E ABV 12 MEV
75KN8	6C 12	G,XN	ABX	19- 32	D 19- 32	MOD-I 4PI	
72T09	6C 12	G,P	ABX	86-240	C250-999	BBL-D 90	999=1.2 GEV
73G05	6C 12	G,P	ABY	86-400	C400	BBL-D 90	
74B014	6C 12	G,P	SPC	46-345	C345	EMU-D DST	
75T04	6C 12	G,P	ABY	96-400	C300,400	BBL-D 90	
76CA5	6C 12	G,P	ABX	18- 30	C 19- 30	SCD-D DST	
76MA8	6C 12	G,P	ABX	60-100	D 60-100	MAG-D DST	
76TU3	6C 12	G,AP	ABX	25- 42	C 42	EMU-D 4PI	
73DC9	6C 12	G,XP	ABY	96-400	C400	TEL-D DST	
74D05	6C 12	G,XP	ABX	100-999	C125-999	TEL-D DST	999=1 GEV
74FI6	6C 12	G,XP	ABX	60-100	D 60-100	MAG-D DST	
74WI4	6C 12	G,XP	NOX	20- 29	C 31	SCD-D 90	P SPECTRUM
76TU3	6C 12	G,DA	ABX	30- 42	C 42	EMU-D 4PI	
76TU3	6C 12	G,3A	AEX	7- 42	C 42	EMU-D 4PI	
71ND1	6C 12	G,BE7	ABY	26-999	C 80-999	ACT-I 4PI	999=1.2 GEV
73DI4	6C 12	G,BE7	ABY	THR-999	C999	ACT-I 4PI	999=1 GEV
74DI7	6C 12	G,BE7	ABY	26-999	C300-999	ACT-I 4PI	999=1 GEV
74BA15	6C 12	G,F	RLY	THR-999	C800-999	TRK-D DST	999=1GEV FRG A,6-11
72HA9	6C 12	\$ P,G	NOX	22- 29	D 6- 14	NAI-D DST	POLARIZED PHOTONS
73HA15	6C 12	P,G	ABX	22	D 7	NAI-D 90	
74AN7	6C 12	P,G	LFT	16	D220*	NAI-D 90	*ENERGY, KEV
77SN3	6C 12	P,G	ABX	21- 37	D 6- 23	NAI-D DST	
72LI4	6C 12	HE,G	ABX	27- 35	D 1- 11	NAI-D 90	HE=HE3
73LI1	6C 12	HE,G	ABX	27- 35	D 1- 11	NAI-D DST	
74SH3	6C 12	HE,G	ABX	28- 45	D 3- 24	NAI-D DST	HE=HE3, 4 LEVELS
75PA2	6C 13	G,NG	ABX	10- 36	C 15- 44	SCD-D 112	
75PA2	6C 13	G,2N	RLY	24- 40	C 35, 40	ACT-I 4PI	
75PA2	6C 13	G,PG	ABX	19- 37	C 15- 44	SCD-D 112	
75AR5	6C 13	N,G	NOX	18	D 14	NAI-D DST	
73WE3	6C 13	D,G	ABX	19- 22	D 1- 4	NAI-D DST	
72CR5	6C 14	E,E/	FMF	7, 8	D 60-120	MAG-D DST	7=7.01, 8=8.32 MEV
73FA5	6C 14	E,E/	SPC	0- 16	D 50	MAG-D 180	PEAKS 7.3,7.9,9.3
74KL2	6C 14	E,E/	SPC	20- 24	D 61, 81	MAG-D 146	UPPER LIMIT MEAS
77CR1	6C 14	E,E/	ABX	7- 16	D 37- 60	MAG-D 180	8 STATES

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	0.36	10.8	10.2	14.8	28.2	11.0	21.4	18.4	31.0

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73ME3	7N 13	P,G	ABX	9, 24	D 9- 24	NAI-D 90	
74RC2	7N 13	P,G	ABX	2- 4	D 0- 3	SCD-D DST	
75MA6	7N 13	P,G	LFT	15	D 14- 15	NAI-D 125	LEVEL AT 15.07 MEV
76FE7	7N 13	P,G	ABX	15- 37	D 16- 40	NAI-D 90	
77MA7	7N 13	P,G	ABY	15	D 14	NAI-D DST	15=15.066

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74EN1	7N 14	E,E/	FMF	2- 6	C 60-120	MAG-D DST 6 LEVELS	
75RA1	7N 14	G,G	LFT	2	C UKN	SCD-D DST	LEVEL AT 2.31 MEV
72CA4	7N 14	G,P	ABX	17- 25	C 20- 25	SCD-D DST	
73BA8	7N 14	G,P	ABX	16- 25	C 7- 25	SCD-D DST	(G,P0),(G,P2)
74BA4	7N 14	G,P	ABX	16- 25	C 20- 26	SCD-D DST	
76TU3	7N 14	G,N	ABX	29- 42	C 42	EMU-D 4PI	
76TU3	7N 14	G,2A	ABX	16- 42	C 42	EMU-D 4PI	
75PA1	7N 14	P,G	ABX	22- 34	D 16- 28	NAI-D 90	
76SI6	7N 14	P,G	LFT	9	D 1	SCD-D DST	9=9.17
78KE1	7N 14	P,G	LFT	9	D 1	SCD-D DST	9.13
73MA5	7N 14	HE,G	ABX	22- 26	D 1- 6	NAI-D 90	
75KI2	7N 15	E,E/	LFT	5- 8	D 84-122	MAG-D DST	4 LEVELS 5.27-7.56
75KI10	7N 15	E,E/	FMF	6, 9	D 0* 1	MAG-D UKN	*Q=0.5-1.1 FM-1
76MA1	7N 15	E,E/	FMF	6	D 60-120	MAG-D DST	6=6.32 MEV
77AN6	7N 15	E,E/	LFT	9- 15	D 60-194	MAG-D DST	5 LEVELS,9-15 MEV
75MU3	7N 15	E,P	ABX	14- 28	D 19- 30	MAG-D DST	GROUND STATE
75M08	7N 15	\$ G,G	LFT	6	D 6	SCD-D DST	6=6.324,PCL SCAT G
73DE13	7N 15	G,D	ABX	19- 25	C 19- 30	TEL-D 90	
73WE2	7N 15	P,G	ABX	13- 22	D 3- 12	NAI-D DST	
74WE1	7N 15	\$ P,G	ABX	19- 26	D 9- 17	NAI-D UKN	POLARIZED PROTONS
75HA6	7N 15	P,G	ABX	13- 38	D 2- 30	NAI-D DST	
75HA6	7N 15	P,G	ABX	13- 38	D 2- 30	NAI-D DST	
76KU2	7N 15	P,G	LFT	13	D 2- 4	SCD-D DST	LEVEL 13.42 MEV
76SN8	7N 15	\$ P,G	ABX	20- 28	D 10- 18	NAI-D DST	POLARIZED PROTONS
76WE1	7N 15	\$ P,G	ABX	13- 26	D 4- 17	NAI-D DST	POL PROTONS
73WE3	7N 15	D,G	ABX	17- 20	D 1- 4	NAI-D DST	
73WE4	7N 15	D,G	RLX	17- 20	D 1- 4	NAI-D 90	
76DE3	7N 15	D,G	ABX	19- 23	D 3- 10	NAI-D DST	
77SCI	7N 15	T,G	ABX	15- 18	D 1- 4	NAI-D DST	

OXYGEN Z=8

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
16	99.75	15.7	12.1	25.0	22.8	7.2	28.9	23.0	22.3
17	0.03	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	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
75HA6	80 15	P,G	ABX	24- 34	D 17- 29	NAI-D 90	
75HA6	80 15	P,G	ABX	24- 34	D 17- 29	NAI-D 90	
68ST2	80 16	E,E/	LFT	6- 14	D 33- 60	MAG-D DST	10 LEVS 6.-13.1 MEV
73BE16	80 16	E,E/	FMF	11, 12	D101-126	MAG-D DST	11=11.52,12=12.05
73BE17	80 16	E,E/	FMF	9, 10	D100-126	MAG-D DST	9=9.85,10=10.34
74HO3	80 16	E,E/	FMF	9- 42	D 70-250	MAG-D DST	LONG,TRANS FMF B(E2)
75MI2	80 16	E,E/	LFT	6- 7	D 38- 60	MAG-D DST	6.0,6.1,6.9,7.1 MEV
75MI7	80 16	E,E/	FMF	7	D 38- 60	MAG-D DST	7=7.12
77BO12	80 16	E,PI+	RLX	150-280	D280	MAG-D DST	SIG PI-/SIG PI+
77BO12	80 16	E,PI-	ABX	150-280	D280	MAG-D DST	SIG PI-/SIG PI+

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74SC8	80 16	E,N	ABX	50-150	D 63-150	TOF-D	DST	PHOTON DIFF.
75SK10	80 16	E,A	ABX	17- 26	D UKN	MAG-D	DST	GND STATE SIGMA
65ME4	80 16	G,PI+	ABX	150-300	C150-300	ACT-I	4PI	
72AH7	80 16	G,MU-T	ABX	12-140	C140	MGC-D	4PI	
73AH4	80 16	G,MU-T	ABX	10-140	C140	MGC-D	4PI	
75AH3	80 16	G,MU-T	ABX	10-160	C140-275	MGC-D	4PI	
77LA3	80 16	G,G	G.G	7	D 7	SCD-D	DST	7.12,6.92 MEV
73BE10	80 16	G,N	ABX	16- 37	D 16- 37	BF3-I	4PI	
73NA6	80 16	\$ G,N	NOX	15- 28	D 30, 64	TOF-D	DST	GS NEUTRONS
74VE1	80 16	G,N	ABX	15- 37	D 15- 37	BF3-I	4PI	
75J02	80 16	G,N	ABX	16- 28	C 22- 31	TOF-D	98	
75SC7	80 16	G,N	ABX	62- 66	D 62- 66	TOF-D	DST	62.7-65.7 MEV
65MA1	80 16	G,NG	SPC	19- 30	C 21- 31	NAI-D	140	
70H01	80 16	G,NG	RLY	21- 27	C 27, 36	SCD-D	DST	
73BE10	80 16	G,2N	ABX	28- 38	D 28- 38	BF3-I	4PI	
74VE1	80 16	G,2N	ABX	29- 37	D 29- 37	BF3-I	4PI	
77J03	80 16	G,2N	ABX	100-600	C100-600	ACT-I	4PI	
71G03	80 16	G,XN	ABX	16- 25	C 16- 25	MOD-I	4PI	
75KN8	80 16	G,XN	ABX	17- 37	D 17- 37	MOD-I	4PI	
73HE10	80 16	G,P	SPC	12- 30	C 30	TEL-D	90	
76FI4	80 16	G,P	NOX	60-100	D 40-105	UKN	DST	
77FI3	80 16	G,P	ABX	40-105	C 40-105	MAG-D	DST	
77MA1	80 16	G,P	ABX	95-280	C110-300	MAG-D	DST	GROUND STATE PROTCNS
65MA1	80 16	G,PG	SPC	19- 30	C 21- 31	NAI-D	140	
70H01	80 16	G,PG	RLY	17- 27	C 27, 36	SCD-D	DST	
73BE10	80 16	G,PN	ABX	26- 37	D 26- 37	BF3-I	4PI	
73HA9	80 16	G,PN	ABX	100-350	C500	TEL-D	63	PN COINC
74VE1	80 16	G,PN	ABX	23- 37	D 23- 37	BF3-I	4PI	
73HA9	80 16	G,2P	ABX	100-350	C500	TEL-D	63	PP COINC
73HA9	80 16	G,DP	ABX	100-350	C500	TEL-D	63	PD COINC
73D09	80 16	G,XP	ABY	92-400	C400	TEL-D	DST	
74DI7	80 16	G,C11	ABY	26-999	C300-999	ACT-I	4PI	999=1 GEV
76MA10	80 16	G,N13	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
73DI4	80 16	G,SPL	ABY	THR-999	C999	ACT-I	4PI	999=1GEV YLD,C11,BE7
72HA4	80 16	\$ P,G	NOX	19- 26	D 7- 15	NAI-D	DST	POLARIZED PROTONS
72HA9	80 16	\$ P,G	NOX	19- 27	D 7- 15	NAI-D	DST	POLARIZED PROTONS
73HA15	80 16	P,G	ABX	22	D 11	NAI-D	90	
73DC1	80 16	P,G	ABX	20- 29	D 8- 18	NAI-D	DST	
74CH8	80 16	P,G	RLX	21- 30	D 9- 19	NAI-D	90	
74HA1	80 16	\$ P,G	ABX	20- 28	D 8- 16	NAI-D	DST	POLARIZED PROTONS
74R05	80 16	P,G	ABX	12- 15	D 0- 3	SCD-D	DST	
77CA2	80 16	\$ P,G	ABX	20- 24	D 8- 13	NAI-D	DST	POL P.DOORWAY STATES
77CH4	80 16	P,G	ABX	18- 33	D 6- 22	NAI-D	DST	
71SU1	80 16	D,G	RLX	21- 26	D 1- 7	NAI-D	DST	
74SH3	80 16	HE,G	ABX	28- 45	D 3- 16	NAI-D	DST	HE=HE3, 4 LEVELS
74DY6	80 16	A,G	ABX	8- 10	D 1- 3	NAI-D	DST	
74SN9	80 16	A,G	ABX	12- 28	D 7- 28	NAI-D	DST	
76OP1	80 16	A,G	ABX	13- 16	D 6- 9	NAI-D	90	
75KI11	80 17	E,E/	LFT	3- 8	D 84-122	MAG-D	DST	12 LEVS 3.05-7.75
77N01	80 17	E,E/	FMF	10- 30	D 65-168	MAG-D	75	
71BE5	80 17	G,N	ABX	4- 9	C 4- 9	BF3-I	4PI	
73LI2	80 17	T,G	ABX	19- 22	D 15- 35	NAI-D	DST	
76CH2	80 17	HE,G	ABX	22- 25	D 3- 8	NAI-D	DST	
74HA2	80 18	G,G	LFT	6	D 6	SCD-D	UKN	SELF-ABSORPTION
75AL4	80 18	G,N	ABX	10- 18	C 11- 18	TOF-D	98	GROUND STATE SIGMA
76BA10	80 18	G,NG	ABY	9- 28	C 23, 28	SCD-D	125	.87,3.0,3.8, MEV
76KN4	80 18	G,1N	ABX	8- 33	D 8- 33	MOD-I	4PI	
76KN4	80 18	G,2N	ABX	11- 33	D 11- 33	MOD-I	4PI	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
76BA10	80 18	G,2NG	ABY	18- 28	C 23, 28	SCD-D	125	6.0,6.1 MEV
72DC13	80 18	G,P	ABX	16- 25	C 16- 24	ACT-I	4PI	DELAYED NEUTRONS
76BE4	80 18	G,P	ABX	16- 31	D 16- 31	ACT-I	4PI	DELAYED N FROM N17
76BA10	80 18	G,PG	ABY	17- 28	C 23, 28	SCD-D	125	1.4,1.8,1.9,4.2 MEV
76BA10	80 18	G,AG	ABY	12- 28	C 23, 28	SCD-D	125	6.1,6.6,6.7 MEV

FLUORINE Z=9

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
19	100.	10.4	6.0	11.7	22.1	4.0	19.6	16.0	23.9

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
75CH1	9F 17	P,G	ABX	1- 3	D 0- 2	SCD-D	DST	0.8-2.4 MEV
75HA5	9F 17	P,G	ABX	15- 31	D 15- 32	NAI-D	DST	
73SE3	9F 18	P,G	LFT	6- 7	D 0- 1	NAI-D	DST	6.14 MEV LEVEL
73HA1	9F 19	E,E/	FMF	0- 2	D 61-121	MAG-D	DST	3 LEVELS 0.2-1.6 MEV
75CY1	9F 19	E,E/	FMF	1- 6	D 134-250	MAG-D	DST	B(EL) 7 STATES
73MO9	9F 19	E,N	RLY	10- 39	D 10- 39	ACT-I	4PI	YIELD (G,N)/(E,N)
75TS1	9F 19	E,P	ABX	13- 25	D 13- 26	MAG-D	90	CONVERTS TO PHOTO SIG
74SK4	9F 19	E,T	ABX	18- 23	D UKN	MAG-D	DST	GROUND STATE
52HO1	9F 19	G,N	ABX	10- 25	C 10- 25	ACT-I	4PI	SEE 54TA1-REANALYSIS
54TA1	9F 19	G,N	ABX	10- 17	C 10- 17	ACT-I	4PI	
68CO2	9F 19	G,N	ABI	10- 50	C 10- 50	MOD-I	4PI	
73BE10	9F 19	G,N	ABX	11- 29	D 11- 29	BF3-I	4PI	
73MO9	9F 19	G,N	RLY	10- 39	C 10- 39	ACT-I	4PI	YIELD (G,N),(G,E)
73SH9	9F 19	G,N	ABX	11- 21	C 13- 21	TOF-D	90	GD AND EXCIT STATE
74VE1	9F 19	G,N	ABX	10- 28	D 10- 28	BF3-I	4PI	
75WC2	9F 19	G,N	RLY	16- 40	C 16- 40	ACT-I	4PI	RATIO (G,N)/(E,N)
76SH5	9F 19	G,N	ABX	10- 19	C 13- 21	TOF-D	90	
72TH5	9F 19	G,NG	ABI	10- 25	C 19- 25	SCD-D	DST	GAMMA DST
52HO1	9F 19	G,2N	ABX	19- 26	C 19- 26	ACT-I	4PI	SEE 54TA1-REANALYSIS
68CC2	9F 19	G,2N	ABI	25- 50	C 20- 50	MOD-I	4PI	
73BE10	9F 19	G,2N	ABX	22- 29	D 22- 29	BF3-I	4PI	
74VE1	9F 19	G,2N	ABX	20- 28	D 20- 28	BF3-I	4PI	
76AN2	9F 19	G,2N	ABX	20- 60	C 19- 60	ACT-I	4PI	
72VA3	9F 19	G,XN	ABX	10- 19	C 10- 19	BF3-I	4PI	
73CA5	9F 19	G,XN	ABX	10- 25	C 10- 25	BF3-I	4PI	
72TH5	9F 19	G,PG	ABI	8- 25	C 19- 25	SCD-D	DST	GAMMA DST
72TH5	9F 19	G,AG	ABI	4- 25	C 19- 25	SCD-D	DST	GAMMA DST
76MA10	9F 19	G,N13	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
73DI4	9F 19	G,SPL	ABY	THR-999	C999	ACT-I	4PI	999=1 GEV
72MO6	9F 19	HE,G	RLX	19- 22	D 4- 7	NAI-D	DST	HE=HE3
77DI4	9F 19	A,G	LFT	6- 7	D 2- 4	SCD-D	DST	6.28-7.17 MEV

NEON Z=10

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
20	90.51	16.9	12.8	23.9	21.2	4.7	28.5	23.3	20.8
21	0.27	6.8	13.0	21.6	19.9	7.3	23.6	19.6	23.6
22	9.22	10.4	15.3	21.5	26.3	9.7	17.1	23.4	26.4

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74VE1	10NE	G,N	ABX	16- 20	D 16- 26	BF3-I 4PI	
75WC3	10NE	G,N	ABX	17- 31	C 19- 32	TOF-D 90	NORMALIZED TO D(G,N)
74VE1	10NE	G,2N	ABX	18- 26	D 18- 26	BF3-I 4PI	
57K01	10NE	G,5A	RLY	19- 80	C 80	CCH-D 4PI	
57K01	10NE	G,PN	RLY	23- 80	C 80	CCH-D 4PI	
57K01	10NE	G,2P	RLY	21- 80	C 80	CCH-D 4PI	
57K01	10NE	G,AP	RLY	17- 80	C 80	CCH-D 4PI	
57K01	10NE	G,2A	RLY	12- 80	C 80	CCH-D 4PI	
73SI15	10NE20	E,E/	FMF	1- 8	D 77-115	MAG-D DST	6 LEVELS
75CH4	10NE20	E,E/	SPC	0- 35	D 51,164	MAG-D DST	
75SK10	10NE20	E,A	ABX	15- 24	D UKN	MAG-D DST	GND STATE SIGMA
77FI6	10NE20	A,G	LFT	10	D 6	SCD-D 55	10=10.27 MEV
73SI15	10NE22	E,E/	FMF	1	D 77-115	MAG-D DST	LEVEL AT 1.275 MEV
74MA8	10NE22	E,E/	ABX	0- 19	D 37- 60	MAG-D 180	B(EL),J-PI
74VE1	10NE22	G,2N	ABX	18- 26	D 18- 26	BF3-I 4PI	

SODIUM Z=11

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
23	100.	12.4	8.8	17.4	24.4	10.5	23.5	19.2	24.1

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74R04	11NA21	P,G	ABX	2- 3	D 1- 2	SCD-D 90	
74VE1	11NA23	G,N	ABX	12- 30	D 12- 30	BF3-I 4PI	
74VE1	11NA23	G,2N	ABX	23- 30	D 23- 30	BF3-I 4PI	
74DI7	11NA23	G,F18	ABY	21-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	11NA23	G,F18	ABY	21-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	11NA23	G,NA22	ABY	12-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	11NA23	G,NA24	ABY	150-999	C300-999	ACT-I 4PI	999=1 GEV
73VE2	11NA23	P,G	ABX	14- 26	D 5- 18	NAI-D 90	G=GO+G1

MAGNESIUM Z=12

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
24	78.99	16.5	11.7	26.7	23.1	9.3	29.7	24.1	20.5
25	10.00	7.3	12.1	23.0	20.1	9.9	23.9	19.0	22.6
26	11.01	11.1	14.1	21.6	26.0	10.6	18.4	23.2	24.8

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
77BE3	12MG	G,G	ABX	5-	8 D	5-	8	SCD-D 140 5.5-7.2 MEV
60WA2	12MG	G,F1e	ABX	THR-240	C240	ACT-I	4PI	
74JO4	12MG24	E,E/	LFT	1-	14 D	64-116	MAG-D	DST 19 STATES
74LI2	12MG24	E,E/	FMF	1-	6 C	250,500	MAG-D	DST 4 LEVELS 1.37-6.0
74WH3	12MG24	E,E/	ABX	0-300	D500		MAG-D	60 QUASIELASTIC SCAT
77ZA2	12MG24	E,E/	FMF	15		D108-260	MAG-D	DST 15.045 MEV
74CH9	12MG24	E,C12	NCX	24-	29 D	25-	45	TRK-I DST
75BE1	12MG24	G,G	LFT	9-	11 C	29		SCD-D 125 EX=9.83,9.97,10.73
76BA2	12MG24	G,NG	ABY	17-	30 C	18-	30	SCD-D 125
76BA2	12MG24	G,P	SPC	13-	30 C	18-	30	TEL-D 90
76BA2	12MG24	G,PG	ABY	12-	30 C	18-	30	SCD-D 125
76BA2	12MG24	G,A	ABX	18-	22 C		30	TEL-D 90
75KU4	12MG24	A,G	ABX	11-	26 D	3-	20	NAI-D DST
75LE3	12MG25	E,E/	LFT	0-	4 D	62-119	MAG-D	DST 1.611,3.405 MEV
76LE3	12MG25	E,E/	FMF	1-	4 D	62-119	MAG-D	DST 7 LEVELS .98-4.1 MEV
72BE9	12MG25	G,N	NOX	7		C	UKN	TOF-D 90 SEE 70BE5
76EA2	12MG25	G,NG	ABY	8-	29 C	19-	29	SCD-D 90
76BA2	12MG25	G,P	ABX	14-	18 C	19-	29	TEL-D 90
76BA2	12MG25	G,PG	ABY	13-	29 C	19-	29	SCD-D 90
76BA2	12MG25	G,D	ABX	19-	24 C		29	TEL-D 90
76BA2	12MG25	G,A	ABX	18-	24 C		29	TEL-D 90
73LE6	12MG26	E,E/	LFT	2		D	0*	1 MAG-D UKN *=FM-1, 2=1.809 MEV
74LE4	12MG26	E,E/	LFT	1-	11 D	56-111	MAG-D	DST 26 LEVELS
74WO7	12MG26	G,NG	ABI	19-	23 C	30		SCD-D 90
76BA2	12MG26	G,NG	ABY	12-	30 C	24,	30	SCD-D 90
73VA7	12MG26	G,P	SPC	14-	30 C	32		SCD-D UKN
74AN1	12MG26	G,P	ABX	15-	60 C	15-	60	ACT-I 4PI
74WO5	12MG26	G,P	ABY	16-	23 C	24,	31	TEL-D DST
75VA3	12MG26	G,P	SPC	17-	32 C	32		SCD-D UKN
75VA4	12MG26	G,P	SPC	14-	32 C	19-	32	SCD-I 90
77WI1	12MG26	G,P	ABX	16-	24 C	24		TEL-D DST
76BA2	12MG26	G,PG	ABY	15-	30 C	24,	30	SCD-D 90
74VA2	12MG26	G,XP	ABX	15-	29 C	8-	29	ION-I 4PI
74WO5	12MG26	G,A	ABY	16-	23 C	24,	31	SCD-D 90
75KU4	12MG26	A,G	ABX	14-	24 D	5-	16	NAI-D DST

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.	13.1	6.3	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	REMARKS
75TR3	13AL25	P,G	ABX	2- 4	D 0- 2	SCD-D 90	
74DE9	13AL26	P,G	LFT	6- 8	D 0- 2	SCD-D DST	
76VI1	13AL27	E,E/	ABX	100-500	D812-999	MAG-D 14	999=1.396 GEV
77FA4	13AL27	E,E/	ABX	2- 13	D 37- 61	MAG-D 180	10 LEVELS
77S14	13AL27	E,E/	FMF	2- 3	D 62-112	MAG-D DST	3 LEVELS
72HI8	13AL27	E,E/P	NOX	0* 60	D700	MAG-D DST	*SEP ENERGY RANGE
76NA3	13AL27	E,E/P	SPC	0*130	D700	MAG-D DST	*SEPARATION ENERGY
74TS4	13AL27	E,P	ABX	8- 26	D 16- 26	MAG-D 90	
74NO2	13AL27	E,NA24	RLX	24-999	C300-999	ACT-I 4PI	999=1.2 GEV
76BL12	13AL27	E,SPL	ABY	THR-580	C130-580	ACT-I 4PI	GIVES YLD RATIO G/E
73FR7	13AL27	G,PI+	ABX	150-800	C250-800	ACT-I 4PI	MG27 ACT
76WA3	13AL27	G,PI+	ABY	140-250	C250	MAG-D 90	
77KU3	13AL27	G,PI+	ABX	150-999	C600-999	ACT-I 4PI	999=1.2 GEV
76WA3	13AL27	G,PI-	ABY	140-250	C250	MAG-D 90	
72AH7	13AL27	G,MU-T	ABX	10-140	C140	MGC-D 4PI	
73AH4	13AL27	G,MU-T	ABX	10-140	C140	MGC-D 4PI	
75AH3	13AL27	G,MU-T	ABX	10-160	C140-275	MGC-D 4PI	
73SA14	13AL27	G,G	LFT	3	C 5	NAI-D 120	3=2.98
72KO8	13AL27	G,N	NOX	13- 22	C 22	THR-I DST	
73BE10	13AL27	G,N	ABX	13- 30	D 13- 30	BF3-I 4PI	
74VE1	13AL27	G,N	ABX	13- 31	D 13- 31	BF3-I 4PI	
74VE1	13AL27	G,2N	ABX	24- 31	D 24- 31	BF3-I 4PI	
73EY3	13AL27	G,XN	SPC	25-234	C234	TDF-D 90	NEUTS E ABV 12 MEV
74DA2	13AL27	G,P	ABY	12-450	C450	TEL-D 90	
72AN8	13AL27	G,2PN	ABX	1* 7	C 1* 7	ACT-I 4PI	*ENERGY IN GEV
74NO2	13AL27	G,2PN	RLX	24-999	C300-999	ACT-I 4PI	999=1.2 GEV
76JO1	13AL27	G,2PN	ABX	31-965	C 90-965	ACT-I 4PI	ERRATUM 75JO4
73DO9	13AL27	G,XP	ABY	88-400	C400	TEL-D DST	
74DA2	13AL27	G,T	ABY	23-450	C450	TEL-D 90	
74DA2	13AL27	G,A	ABY	34-450	C450	TEL-D 90	HE=HE3
74DA2	13AL27	G,A	ABY	20-450	C450	TEL-D 90	
73DI12	13AL27	G,F18	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	13AL27	G,F18	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
74DI7	13AL27	G,NA22	ABY	17-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	13AL27	G,NA22	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73JA3	13AL27	G,NA24	ABY	THR-999	C100-999	ACT-I 4PI	999=1 GEV
75DI4	13AL27	G,NA24	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
75JO4	13AL27	G,NA24	ABY	31-965	C 95-965	ACT-I 4PI	
73DI4	13AL27	G,SPL	ABY	THR-999	C999	ACT-I 4PI	999=1 GEV
76BL12	13AL27	G,SPL	ABY	THR-580	C130-580	ACT-I 4PI	GIVES YLD RATIO G/E

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	92.23	17.2	11.6	27.5	23.2	10.0	30.5	24.6	19.9
29	4.67	8.5	12.3	24.6	20.6	11.1	25.7	20.1	21.9
30	3.10	10.6	13.5	22.2	24.8	10.6	19.1	22.9	24.0

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
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76MC5	14SI	E,E/P	ABX	10* 65	D497	MAG-D 53	*MISSING ENERGY
73G05	14SI	G,PI+	ABY	170-400	C400	BBL-D 90	
73G05	14SI	G,PI-	ABY	170-400	C400	BBL-D 90	
72AH7	14SI	G,MU-T	ABX	10-140	C140	MGC-D 4PI	
73AH4	14SI	G,MU-T	ABX	10-140	C140	MGC-D 4PI	
75AH3	14SI	G,MU-T	ABX	10- 30	C140-275	MGC-D 4PI	
73BE10	14SI	G,N	ABX	16- 30	D 16- 30	BF3-I 4PI	
74VE1	14SI	G,N	ABX	17- 30	D 17- 30	BF3-I 4PI	
72TH8	14SI	G,NG	ABI	18- 28	C 28	SCD-D 140	
73G05	14SI	G,P	ABY	82-400	C400	BBL-D 90	
72TH8	14SI	G,PG	ABI	12- 28	C 28	SCD-D 140	
75DI4	14SI	G,F18	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	14SI	G,NA22	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73JA3	14SI	G,NA24	ABY	THR-999	C100-999	ACT-I 4PI	999=1 GEV
75DI4	14SI	G,NA24	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73CH7	14SI28	E,E/	FMF	11- 30	D108-220	MAG-D 135	
74LI2	14SI28	E,E/	FMF	2	C250,500	MAG-D DST	LEVEL 1.778 MEV
75TO4	14SI28	G,PI+	ABY	150-400	C300,400	EBL-D 90	
75TO4	14SI28	G,PI-	ABY	150-400	C300,400	BBL-D 90	
76EP4	14SI28	G,PI-	ABX	150-400	C180-400	ACT-I 4PI	
77TH1	14SI28	G,NG	ABY	18- 28	C 28	SCD-D 140	.8,.95,2.6,2.9 MEV
75TO4	14SI28	G,P	ABY	91-400	C300,400	BBL-D 90	
77TH1	14SI28	G,PG	ABY	13- 28	C 28	SCD-D 140	8 STATES; .8-4. MEV
77TH1	14SI28	G,AG	ABY	11- 28	C 28	SCD-D 140	1.4 MEV
77BR10	14SI29	E,E/	LFT	1- 9	D 63-117	MAG-D DST	13 STATES
72JA2	14SI29	G,N	SPC	8- 11	C 11	TOF-D DST	DOORWAY STATE 750
73FU2	14SI29	G,N	ABX	8- 13	C 8- 13	BF3-I DST	
77BU12	14SI30	G,P	ABX	13-800	C 75-800	ACT-I 4PI	

PHOSPHORUS Z=15

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
31	100.	12.3	7.3	17.9	22.5	9.7	23.6	17.9	20.8

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
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75KL3	15P 31	E,E/	LFT	1- 4	D 50-250	MAG-D DST	1.27,2.23,3.51 MEV
73TS3	15P 31	E,P	ABX	14- 26	D 16- 26	MAG-D 90	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
72AN12	15P 31	G,N	ABX	14- 60	C 14- 60	ACT-I 4PI	
73BE10	15P 31	G,N	ABX	12- 29	D 12- 29	BF3-I 4PI	
73GE2	15P 31	G,N	ABX	13- 23	C 15- 25	TQF-D 90	GND,EXCIT STATES
74VE1	15P 31	G,N	ABX	12- 29	D 12- 29	BF3-I 4PI	
72TH5	15P 31	G,NG	ABI	12- 22	C 19, 22	SCD-D 150	GAMMA DST
73ZA1	15P 31	G,NG	SPC	12- 30	C 30	SCD-D 125	DE-EXCIT G-RAYS
73BE10	15P 31	G,2N	ABX	27- 29	D 27- 29	BF3-I 4PI	
74VE1	15P 31	G,2N	ABX	24- 29	D 24- 29	BF3-I 4PI	
74DE10	15P 31	G,XN	ABX	12- 25	C 12- 25	BF3-I 4PI	
72TH5	15P 31	G,PG	ABI	7- 22	C 19, 22	SCD-D 150	GAMMA DST
73ZA1	15P 31	G,PG	SPC	7- 30	C 30	SCD-D 125	DE-EXCIT G-RAYS
73BE10	15P 31	G,PN	ABX	19- 29	D 19- 29	BF3-I 4PI	
74VE1	15P 31	G,PN	ABX	19- 29	D 19- 29	BF3-I 4PI	
72TH5	15P 31	G,AG	ABI	10- 22	C 19, 22	SCD-D 150	GAMMA DST
75DI4	15P 31	G,F18	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	15P 31	G,NA22	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73JA3	15P 31	G,NA24	ABY	THR-999	C100-999	ACT-I 4PI	999=1 GEV
75DI4	15P 31	G,NA24	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
75DE3	15P 31	P,G	LFT	9- 10	D 1- 3	SCD-D 55	30 RESONANCES

SULFUR Z=16

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
32	95.02	15.0	8.9	24.0	19.1	6.9	28.1	21.2	16.2
33	0.75	8.6	9.6	21.3	17.1	7.1	23.7	17.5	18.2
34	4.21	11.4	10.9	20.4	21.9	7.9	20.1	21.0	20.4
36	0.01	9.9	13.0	19.3	25.0	9.0	16.9	21.5	25.0

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74VE1	16S	G,N	ABX	15- 32	D 15- 32	BF3-I 4PI	
74VE1	16S	G,2N	ABX	29- 32	D 29- 32	BF3-I 4PI	
74VE1	16S	G,PN	ABX	21- 30	D 21- 30	BF3-I 4PI	
75DI4	16S	G,F18	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	16S	G,NA22	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73JA3	16S	G,NA24	ABY	THR-999	C100-999	ACT-I 4PI	999=1 GEV
75DI4	16S	G,NA24	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
74LI2	16S 32	E,E/	FMF	2, 5	C250,500	MAG-D DST	2 LEVS 2.237,4.96
73BE10	16S 32	G,N	ABX	15- 32	D 15- 32	BF3-I 4PI	
73IS3	16S 32	G,N	FLX	16- 21	C 16- 21	BF3-I 4PI	
73LO4	16S 32	G,N	ABX	16- 32	C 16- 32	TQF-D 90	GD AND EXCIT STATE
72TH7	16S 32	G,NG	ABX	13- 26	C 14- 28	SCD-D 150	1.2 MEV
77TH2	16S 32	G,NG	ABX	17- 27	C 16- 27	SCD-D 150	1.2,2.2,3.1 MEV
73BE10	16S 32	G,2N	ABX	28- 32	D 28- 32	BF3-I 4PI	
72TH7	16S 32	G,PG	ABX	13- 26	C 14- 28	SCD-D 150	13 STATES; 1.3-6.0
77TH2	16S 32	G,PG	ABX	11- 27	C 16- 27	SCD-D 150	13 STATES; 1.3-6.0
73BE10	16S 32	G,PN	ABX	20- 30	D 20- 30	BF3-I 4PI	
73DI4	16S 32	G,SPL	ABY	THR-999	C999	ACT-I 4PI	999=1 GEV
73VE6	16S 32	P,G	LFT	10- 11	D 1- 2	NAI-D DST	
75K013	16S 32	P,G	LFT	10- 12	D 1- 3	SCD-D DST	
74FO5	16S 32	A,G	ABX	12- 18	D 6- 12	NAI-D DST	
77R02	16S 32	A,G	LFT	8- 11	D 2- 4	SCD-D 55	

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	75.77	12.6	6.4	17.9	19.6	7.0	24.2	17.8	17.3
37	24.23	10.3	8.4	16.8	22.1	7.8	18.9	18.3	21.4

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74VE1	17CL	G,N	ABX	10- 28	D 10- 28	BF3-I	4PI	
74VE1	17CL	G,2N	ABX	19- 28	D 17- 28	BF3-I	4PI	
75DI4	17CL	G,F18	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
75DI4	17CL	G,NA22	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
73JA3	17CL	G,NA24	ABY	THR-999	C100-999	ACT-I	4PI	999=1 GEV
75DI4	17CL	G,NA24	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
75WC2	17CL35	G,N	RLY	19- 38	C 19- 38	ACT-I	4PI	RATIO (G,N)/(E,N)
72HU5	17CL35	P,G	ABY	7- 8	D 1- 2	NAI-D	55	
76SP10	17CL35	P,G	LFT	8- 9	D 2- 3	SCD-D	55	
74VE1	17CL37	G,2N	ABX	19- 24	D 18- 24	BF3-I	4PI	

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	0.33	15.3	8.5	24.2	18.6	6.6	28.0	21.2	14.9
38	0.06	11.8	10.2	20.7	20.8	7.2	20.6	20.6	18.6
40	99.60	9.9	12.5	18.2	23.1	6.8	16.5	20.6	22.8

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
77F15	18AR36	E,E/	ABX	2, 4	D 65,115	MAG-D	DST	1.97,4.18 MEV
75CH4	18AR40	E,E/	SPC	0- 35	D151,164	MAG-D	DST	
77F15	18AR40	E,E/	ABX	1- 3	D 65,115	MAG-D	DST	1.46,2.52,3.21,3.68
74VE1	18AR40	G,N	ABX	10- 27	D 10- 27	BF3-I	4PI	
73BE10	18AR40	G,SN	ABX	11- 27	D 11- 27	BF3-I	4PI	
73BE10	18AR40	G,2N	ABX	16- 27	D 16- 27	BF3-I	4PI	
74VE1	18AR40	G,2N	ABX	16- 27	D 16- 27	BF3-I	4PI	
73JU1	18AR40	G,XN	ABX	10- 23	C 13- 23	TOF-D	90	

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	93.25	13.1	6.4	18.5	19.2	7.2	25.2	18.2	16.6
40	0.01	7.8	7.6	17.5	16.7	6.4	20.9	14.2	18.3
41	6.73	10.1	7.8	15.8	20.7	6.2	17.9	17.7	20.3

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74VE1	19K	G,N	ABX	13- 32	D 13- 32	BF3-I 4PI	
74VE1	19K	G,2N	ABX	30- 32	D 30- 32	BF3-I 4PI	
74VE1	19K	G,PN	ABX	18- 29	D 18- 29	BF3-I 4PI	
75DI4	19K	G,F18	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	19K	G,NA22	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73JA3	19K	G,NA24	ABY	THR-999	C100-999	ACT-I 4PI	999=1 GEV
75DI4	19K	G,NA24	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73VL8	19K 39	E,E/	FMF	30-180	D550-999	MAG-D DST	999=1.15 GEV
75WE1	19K 39	E,E/	ABX	2	D 50, 61	MAG-D 180	2.523 LEVEL
73BE10	19K 39	G,N	ABX	12- 31	D 12- 31	BF3-I 4PI	
73BE10	19K 39	G,2N	ABX	31- 32	D 31- 32	BF3-I 4PI	
73BE10	19K 39	G,PN	ABX	19- 29	D 19- 29	BF3-I 4PI	

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	96.94	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	0.13	7.9	10.7	19.8	18.3	7.6	19.4	18.2	19.9
44	2.09	11.1	12.2	20.9	23.3	8.8	19.1	21.8	21.6
46	0.00	10.4	13.8	21.5	26.1	11.1	17.8	22.7	*
48	0.19	9.9	15.8	22.6	29.4	14.4	17.2	24.2	29.1

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
76WA3	20CA	G,PI+	ABY	140-250	C250	MAG-D 90	
76WA3	20CA	G,PI-	ABY	140-250	C250	MAG-D 90	
73HA1	20CA40	E,E/	FMF	3- 4	D 61-121	MAG-D DST	3.74,3.90 MEV
73VL8	20CA40	E,E/	FMF	30-180	D550-999	MAG-D DST	999=1.15 GEV
74WH3	20CA40	E,E/	ABX	0-300	D500	MAG-D 60	QUASIELASTIC SCAT
75TO2	20CA40	E,E/	FMF	10- 35	D150-250	MAG-D DST	B(EL),GDR REGION
76ZI1	20CA40	E,E/	ABX	40-280	D500*	MAG-D 120	*TRANS 3-Q CONST
72HI8	20CA40	E,E/P	ABX	10* 35	D700	MAG-D DST	*SEP ENERGY RANGE
74NA1	20CA40	E,E/P	SPC	0* 80	D700-750	SPK-D UKN	*SEPAFATION ENERGY
76MO5	20CA40	E,E/P	ABX	8* 80	D497	MAG-D 53	*MISSING ENERGY
76NA3	20CA40	E,E/P	SPC	0*130	D700-750	MAG-D DST	*SEPARATION ENERGY
73GR4	20CA40	G,PI+	ABX	140-340	C340	EMU-D DST	RATIO(G,PI+)/(G,PI-)
73GO5	20CA40	G,PI+	ABY	170-400	C400	BBL-D 90	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
75T04	20CA40	G,PI+	ABY	150-400	C300,400	EBL-D 90	
73GR4	20CA40	G,PI-	ABX	140-340	C340	EMU-D DST	RATIO(G,PI+)/(G,PI-)
73G05	20CA40	G,PI-	ABY	170-400	C400	BBL-D 90	
75T04	20CA40	G,PI-	ABY	150-400	C300,400	BBL-D 90	
72AH7	20CA40	G,MU-T	ABX	10-140	C140	MGC-D 4PI	
73AH4	20CA40	G,MU-T	ABX	10-140	C140	MGC-D 4PI	
75AH3	20CA40	G,MU-T	ABX	10-160	C140-275	MGC-D 4PI	
77LA3	20CA40	G,G	G.G	7	D 7	SCD-D DST	6.95,6.91 MEV
73BE10	20CA40	G,N	ABX	12- 31	D 12- 31	BF3-I 4PI	
74VE1	20CA40	G,N	ABX	15- 30	D 15- 30	BF3-I 4PI	
72BR17	20CA40	G,NG	SPC	18- 24	C 30	SCD-D 90	G SPECTRUM
74BR2	20CA40	G,NG	ABX	16- 31	C 15- 25	SCD-D DST	DE-EXCIT G-RAYS
77AD3	20CA40	G,NG	ABY	18-750	C100-750	SCD-D 135	2.5,2.8,3. MEV
71G03	20CA40	G,XN	ABX	16- 26	C 16- 26	MOD-I 4PI	
72BR11	20CA40	G,P	ABX	12- 26	C 15- 25	SCD-D 90	
72BR17	20CA40	G,P	ABX	11- 24	C 12- 30	SCD-D DST	
73BR13	20CA40	G,P	ABX	13- 25	C 15- 25	SCD-D DST	
73G05	20CA40	G,P	ABY	80-400	C400	BBL-D 90	
74BR2	20CA40	G,P	ABX	8- 31	C 15- 25	SCD-D DST	
74DA2	20CA40	G,P	ABY	13-450	C450	TEL-D 90	
74GR6	20CA40	G,P	ABY	38-168	C340	EMU-D DST	
75TC4	20CA40	G,P	ABY	68-400	C300,400	BBL-D 90	
72BR17	20CA40	G,PG	SPC	11- 24	C 30	SCD-D 90	G SPECTRUM
73BR13	20CA40	G,PG	NOX	16- 31	C 31	SCD-D DST	DE-EXCIT G-RAYS
74BR2	20CA40	G,PG	ABX	8- 31	C 15- 25	SCD-D DST	DE-EXCIT G-RAYS
77AD3	20CA40	G,PG	ABY	11-750	C100-750	SCD-D 135	2.5,2.8,3. MEV
76LI7	20CA40	G,PN	ABX	150-800	C 80-800	ACT-I 4PI	
76LI7	20CA40	G,3P3N	ABX	50-800	C 80-800	ACT-I 4PI	
73D09	20CA40	G,XP	ABY	88-400	C400	TEL-D DST	
74DA2	20CA40	G,T	ABY	30-450	C450	TEL-D 90	
74DA2	20CA40	G,A	ABY	29-450	C450	TEL-D DST	HE=HE3
74DA2	20CA40	G,A	ABY	17-450	C450	TEL-D DST	
75DI4	20CA40	G,F18	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
75DI4	20CA40	G,NA22	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73JA3	20CA40	G,NA24	ABY	THR-999	C100-999	ACT-I 4PI	999=1 GEV
75DI4	20CA40	G,NA24	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73DI1	20CA40	P,G	ABX	14- 26	D 6- 18	NAI-D DST	
73WA1	20CA40	A,G	ABX	12- 22	D 6- 17	NAI-D DST	
74FO4	20CA40	A,G	ABX	13- 20	D 6- 14	NAI-D 90	
73BE6	20CA41	N,G	RLY	18- 24	D 10- 15	NAI-D UKN	
74BE7	20CA41	N,G	ABX	15- 27	D 6- 18	NAI-D 90	
75AR5	20CA41	N,G	NOX	22	D 14	NAI-D DST	
73DI2	20CA42	P,G	ABX	14- 23	D 4- 13	NAI-D DST	
70FO4	20CA42	A,G	ABX	11- 19	D 6- 14	NAI-D 90	
76FO2	20CA42	A,G	ABX	11- 21	D 5- 16	NAI-D DST	
73T01	20CA44	E,E/	FMF	7- 35	D124-250	MAG-D DST	FMF 10 TO 28 MEV
77OI1	20CA44	E,P	ABX	15- 25	D 15- 25	MAG-D 90	
77OI1	20CA44	E,A	ABX	14- 17	D 14- 17	MAG-D 90	
74DA2	20CA44	G,P	ABY	12-400	C450	TEL-D 90	
74DA2	20CA44	G,T	ABY	21-400	C450	TEL-D 90	
74DA2	20CA44	G,HE3	ABY	23-400	C450	TEL-D 90	
74DA2	20CA44	G,A	ABY	9-400	C450	TEL-D 90	
70FO4	20CA44	A,G	ABX	14- 19	D 6- 10	NAI-D 90	
73BR7	20CA44	A,G	ABI	UKN	D UKN	NAI-D DST	NO ANG DST DATA
76FO2	20CA44	A,G	ABX	13- 19	D 5- 11	NAI-D DST	
76ZI1	20CA48	E,E/	ABX	20-280	D250*500	MAG-D DST	*TRANS 3-Q CONST

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.	11.3	6.9	17.5	21.0	7.9	21.0	18.0	19.1

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
77K04	21SC41	\$ P,G	LFT	3, 5 D	1, 5	SCD-D DST	FOL SCAT G, 2.8 MEV
770I1	21SC45	E,P	ABX	14- 25 D	14- 25	MAG-D	90
73AR1	21SC45	G,G	LFT	0- 3 C	0- 3	SCD-D	125 13 LEVELS
75ME4	21SC45	G,G	LFT	1- 3 C	0- 3	SCD-D DST	5 LEVS .72-2.09
73ER1	21SC45	G,N	NOX	11-800	C100-800	ACT-I	4PI SC44 ISOMER RATIO
74VE1	21SC45	G,N	ABX	11- 28 D	11- 28	BF3-I	4PI
75ER2	21SC45	G,N	ABY	11-800	C100-800	ACT-I	4PI ISOMER RATIO
74VE1	21SC45	G,2N	ABX	21- 28 D	21- 28	BF3-I	4PI
73SA5	21SC45	G,XN	ABX	11- 25 C	10- 25	BF3-I	4PI
73SA8	21SC45	G,XN	ABX	11- 25 C	11- 25	BF3-I	4PI
75WE4	21SC45	G,P	ABX	18	D 18	SCD-D	90 18=17.6 MEV
76BA7	21SC45	G,JPKN	ABY THR*	2 C	* 2	ACT-I	4PI *GEV,J=1-10,K=1-19
75VI2	21SC47	P,G	LFT	10	D 1-	2 NAI-D	55 PROTON E 1.82-1.90
73AD14	21SC49	P,G	SPC	12	D 2	SCD-D DST	12=11.559 MEV,J-PI
76DI2	21SC49	P,G	LFT	15	D 6-	7 NAI-D DST	EXC 15.55,15.61 MEV

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	8.2	13.2	10.3	22.9	20.6	8.0	22.7	21.7	17.2
47	7.4	8.9	10.5	22.1	18.4	9.0	22.1	19.2	18.7
48	73.7	11.6	11.4	22.4	22.6	9.4	20.5	22.1	19.9
49	5.4	8.1	11.4	21.7	20.4	10.2	19.8	19.6	20.8
50	5.2	10.9	12.2	22.1	24.0	10.7	19.1	22.3	21.8

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
72K08	22TI	G,N	NOX	8- 22 C	22	THR-I DST	
73BA20	22TI	G,N	NOX	8- 27 C	10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
74PE3	22TI44	A,G	ABX	11- 21 D	7- 17	NAI-D DST	
770I1	22TI46	E,P	ABX	13- 25 D	13- 25	MAG-D	90
770I1	22TI46	E,A	ABY	12- 19 D	12- 19	MAG-D	90
76RA1	22TI46	G,G	LFT	3, 4 C	1- 5	SCD-D DST	3168,4316 KEV
76RA1	22TI47	G,G	LFT	2, 2 C	1- 5	SCD-D DST	2162,2297,2548 KEV
76RA1	22TI48	G,G	LFT	2- 4 C	1- 5	SCD-D DST	4 LEV,2421-3739 KEV

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
76RA1	22TI49	G,G	LFT	1, 1	C 1-	5 SCD-D	DST	1623,1763 KEV
73HO4	22TI50	E,E/	FMF	1-	5 D209	MAG-D	DST	1.55, 2.68, 4.40
76RA1	22TI50	G,G	LFT	1, 5	C 1-	5 SCD-D	DST	1554,4311 KEV
74PE3	22TI52	A,G	ABX	13- 20	D 6- 14	NAI-D	90	

VANADIUM Z=23

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
50	0.25	9.3	7.9	19.2	19.8	9.9	20.9	16.1	19.3
51	99.75	11.1	8.1	18.7	22.6	10.3	20.4	19.0	20.2

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	NUM	
72DE9	23V 51	E,E/	FMF	1, 2	D 25- 85	MAG-D	DST	1=1.61,2=2.41	MEV
72PE3	23V 51	E,E/	FMF	0-	4 D183,250	MAG-D	DST	7	LEVELS
73PE1	23V 51	E,E/	FMF	0-	4 D183,250	MAG-D	DST	7	LEVELS
72HI8	23V 51	E,E/P	NOX	0*	60 D700	MAG-D	DST	*SEP ENERGY RANGE	
76NA3	23V 51	E,E/P	SPC	0*130	D700	MAG-D	DST	*SEPARATION ENERGY	
77KU3	23V 51	E,PI+	RLX	150-999	C600-999	ACT-I	4PI	999=1.2	GEV, G/E
76BL12	23V 51	E,SPL	ABY	THR-580	C130-580	ACT-I	4PI	GIVES YLD RATIO G/E	
73BE10	23V 51	G,N	ABX	13- 28	D 13- 28	BF3-I	4PI		
73BA20	23V 51	G,N	NOX	11- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY	
74VE1	23V 51	G,N	ABX	13- 29	D 13- 29	BF3-I	4PI		
73BE10	23V 51	G,2N	ABX	20- 28	D 20- 28	BF3-I	4PI		
74VE1	23V 51	G,2N	ABX	20- 29	D 20- 29	BF3-I	4PI		
77DI6	23V 51	G,3N	ABY	THR-999	C300-999	ACT-I	4PI	999=1	GEV
74DA2	23V 51	G,P	ABY	12-450	C450	TEL-D	90		
75WE4	23V 51	G,P	ABX	18	D 18	SCD-D	90	18=17.6	MEV
76BU11	23V 51	G,JPKN	ABX	THR-800	C 75-800	ACT-I	4PI	J=2-11,K=2-16	
74DA2	23V 51	G,T	ABY	24-450	C450	TEL-D	90		
74DA2	23V 51	G,HE3	ABY	33-450	C450	TEL-D	90		
74DA2	23V 51	G,A	ABY	20-450	C450	TEL-D	90		
73JA3	23V 51	G,NA24	ABY	THR-999	C100-999	ACT-I	4PI	999=1	GEV
76BL12	23V 51	G,SPL	ABY	THR-580	C130-580	ACT-I	4PI	GIVES YLD RATIO G/E	
77DA3	23V 51	G,SPL	ABY	THR*	5 C 2*	5 ACT-I	4PI	*ENEPGY,GEV	

CHROMIUM Z=24

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
50	4.35	13.0	9.6	23.2	20.3	8.6	23.6	21.1	16.3
52	83.79	12.0	10.5	22.4	21.8	9.4	21.3	21.6	18.6
53	9.50	7.9	11.1	21.0	18.8	9.1	20.0	18.4	20.1
54	2.36	9.7	12.4	19.7	22.1	7.9	17.7	20.9	22.0

REF	NUCLIDE Z	REACTION A	IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73BA20	24CR	G,N	NOX	8-	27	C 10-	27 BF3-I	4PI	MEAN NEUTRON ENERGY
77WE2	24CR	G,XN	RLX	12-	28	C 8-	27 BF-3	4PI	
73DE5	24CR50	G,N	ABX	20-	23	D 20-	23 ACT-I	4PI	
73DE8	24CR50	G,N	ABX	20-	22	D 20-	22 ACT-I	4PI	
72DE8	24CR52	E,E/	FMF	1,	3	D 80	MAG-D	DST	1=1.43, 0=3.6 MEV
72PE2	24CR52	E,E/	FMF	1,	3	D 40-110	MAG-D	128	1=1.434, 3.3.16 MEV
73HO4	24CR52	E,E/	FMF	1-	5	D209	MAG-D	DST	1.43, 2.37, 4.56
76LI5	24CR52	E,E/	FMF	1,	3	D 39-111	MAG-D	127	LEVEL 1.43, 3.16
73BR7	24CR52	A,G	ABI	-UKN	DUKN		NAI-D	DST	NO ANG DST DATA
74FO4	24CR52	A,G	ABX	15-	20	D 6-	11 NAI-D	90	
76FC2	24CR52	A,G	ABX	15-	21	D 6-	12 NAI-D	DST	
75RA2	24CR53	G,P	RLY	11-	14	C 12-	14 ACT-I	4PI	

MANGANESE Z=25

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
55	100.	10.2	8.1	17.2	21.2	7.9	19.2	17.8	20.4

REF	NUCLIDE Z	REACTION A	IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74BE13	25MN53	P,G	SPC	6-	11	D 3-	5 SCD-D	DST	
74TE1	25MN55	G,G	LFT	7		D 4-	8 SCD-D	DST	7=7.491
73AL6	25MN55	G,N	ABX	10-	37	D 10-	37 BF3-I	4PI	
73BA20	25MN55	G,N	NOX	10-	27	C 10-	27 BF3-I	4PI	MEAN NEUTRON ENERGY
73DE7	25MN55	G,N	ABY	10-	999	C300-	999 ACT-I	4PI	999=1 GEV
73AL6	25MN55	G,2N	ABX	19-	37	D 17-	37 BF3-I	4PI	
73AL6	25MN55	G,3N	ABX	31-	37	D 29-	37 BF3-I	4PI	
73DE7	25MN55	G,3N	ABY	31-	999	C300-	999 ACT-I	4PI	999=1 GEV
74DI8	25MN55	G,3N	ABY	31-	999	C100-	999 ACT-I	4PI	999=1 GEV
73DE7	25MN55	G,4N	ABY	41-	999	C300-	999 ACT-I	4PI	999=1 GEV
70IS7	25MN55	G,XN	ABX	10-	30	C 7-	30 BF3-I	4PI	
73VA5	25MN55	G,XN	ABX	10-	23	C 10-	23 BF3-I	4PI	
74CA6	25MN55	G,XN	ABX	10-	23	C 10-	23 BF3-I	4PI	
73JA3	25MN55	G,NA24	ABY	THR-	999	C100-	999 ACT-I	4PI	999=1 GEV
75ER2	25MN55	G,SC44	ABY	THR-	800	C250-	800 ACT-I	4PI	ISOMER RATIO
73ER1	25MN55	G,SPL	NOX	0-	800	C100-	800 ACT-I	4PI	SC44 ISOMER RATIO
77DA3	25MN55	G,SPL	ABY	THR*	5	C 2*	5 ACT-I	4PI	*ENERGY, GEV

IRON Z=26

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
54	5.8	13.4	8.9	23.0	19.7	8.4	24.1	20.9	15.4
56	91.7	11.2	10.2	20.9	20.3	7.6	20.5	20.4	18.3
57	2.1	7.6	10.6	19.6	18.2	7.3	18.8	17.8	19.6
58	0.2	10.0	11.9	19.4	22.0	7.6	17.7	20.6	21.5

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73BA20	26FE	G,N	NOX	11- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
74AB11	26FE	G,N	ABX	11- 13	C 11, 13	TOF-D	78	
74AB12	26FE	G,N	ABX	11- 13	C 11, 13	TOF-D	78	
76KI7	26FE	G,N	ABX	10- 11	C 11- 14	TOF-D	78	11.25-13.25 BREMS
75ER2	26FE	G,SC44	ABY	THR-800	C250-800	ACT-I	4PI	ISOMER RATIO
76EM2	26FE	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
72LI3	26FE54	E,E/	FMF	1, 5	D150,225	MAG-D	DST	B(EL)LEV 1.17,3.75
73HO4	26FE54	E,E/	FMF	1, 5	D209	MAG-D	DST	1.41,2.54,4.78
76LA1	26FE54	G,G	LFT	6	D 6	SCD-D	DST	6=6.13
77RA3	26FE54	G,N	SPC	16- 26	C 15- 26	SCI-D	UKN	FAST NEUTS
72LI3	26FE56	E,E/	FMF	1	D150,225	MAG-D	DST	B(EL)LEV .85
72TO6	26FE56	E,E/	SPC	0- 37	D250	MAG-D	35	
73TO1	26FE56	E,E/	FMF	10- 35	D150,250	MAG-D	DST	FMF OF 16.1 MEV LEV
73VE3	26FE56	G,N	ABX	11- 14	C 11, 13	TOF-D	93	
76RI2	26FE56	P,G	ABX	14- 22	D 3- 12	NAI-D	90	
76RI2	26FE56	A,G	ABX	14- 22	D 7- 16	NAI-D	90	
72LI3	26FE58	E,E/	FMF	1, 4	D150,225	MAG-D	DST	B(EL)LEV .81,3.86

COBALT Z=27

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
59	100.	10.5	7.4	16.6	20.3	7.0	19.0	17.4	19.3

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74MA1	27CO55	P,G	ABX	9- 22	D 4- 17	NAI-D	DST	
76CA4	27CO55	\$ P,G	ABX	14- 22	D 8- 15	NAI-D	DST	POLARIZED PROTONS
74ES3	27CO57	P,G	LFT	7- 8	D 1- 2	SCD-D	DST	
74MA1	27CO57	P,G	ABX	10- 24	D 4- 18	NAI-D	DST	
76CA4	27CO57	\$ P,G	ABX	14- 24	D 8- 15	NAI-D	DST	POLARIZED PROTONS
75BO11	27CO59	G,G	LFT	1	C 2	UKN	UKN	1190 KEV
73AL6	27CO59	G,N	ABX	10- 37	D 10- 37	BF3-I	4PI	
73BA20	27CO59	G,N	NOX	10- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
74AB12	27CO59	G,N	ABX	10- 13	C 11, 13	TOF-D	78	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73AL6	27CO59	G,2N	ABX	19- 37	D 17- 37	BF3-I 4PI	
77DI6	27CO59	G,2N	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73AL6	27CO59	G,3N	ABX	29- 37	D 29- 37	BF3-I 4PI	
77DI6	27CO59	G,3N	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
77DI6	27CO59	G,4N	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
74DA2	27CO59	G,P	ABY	10-450	C450	TEL-D 90	
75WE4	27CO59	G,P	ABX	18	D 18	SCD-D 90	18=17.6 MEV
74DA2	27CO59	G,T	ABY	22-450	C450	TEL-D 90	
74DA2	27CO59	G,HE3	ABY	30-450	C450	TEL-D 90	
74DA2	27CO59	G,A	ABY	17-450	C450	TEL-D 90	
73JA3	27CO59	G,NA24	ABY	THR-999	C100-999	ACT-I 4PI	999=1 GEV
75ER2	27CO59	G,SC44	ABY	THR-800	C250-800	ACT-I 4PI	ISOMER RATIO
73ER1	27CO59	G,SPL	NOX	THR-800	C100-800	ACT-I 4PI	SC44 ISOMER RATIO
76CA4	27CO59	\$ P,G	ABX	12- 23	D 5- 15	NAI-D DST	POLARIZED PROTONS

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	68.2	12.2	8.2	21.2	17.7	6.4	22.5	19.6	14.2
60	26.1	11.4	9.5	20.1	19.2	6.3	20.4	20.0	16.9
61	1.1	7.8	9.9	19.3	17.0	6.5	19.2	17.4	18.1
62	3.5	10.6	11.1	19.5	21.0	7.0	18.4	20.5	19.9
64	0.9	9.7	12.5	19.1	23.0	8.1	16.5	20.9	22.7

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74WH3	28NI	E,E/	ABX	0-300	D500	MAG-D 60	QUASIELASTIC SCAT
76VL1	28NI	E,E/	ABX	100-500	D 1* 2	MAG-D DST	*E IN GEV,1.2,1.36
73BA20	28NI	G,N	NOX	11- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
68CO3	28NI	G,XN	ABX	11- 34	C 11- 34	BF3-I 4PI	
76EM2	28NI	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
73IT1	28NI58	E,E/	FMF	0- 7	D183,250	MAG-D 82	LEVEL AT 5.15 MEV
76LI6	28NI58	E,E/	ABX	9- 11	D 40- 75	MAG-D DST	4 M1 STATES
76MO5	28NI58	E,E/P	ABX	8* 80	D497	MAG-D 53	*MISSING ENERGY
73MI7	28NI58	E,P	ABX	14- 26	D 0- 26	MAG-D DST	
73FU4	28NI58	G,N	ABX	12- 34	D 12- 34	BF3-I 4PI	
74FU3	28NI58	G,N	ABX	12- 34	D 12- 34	BF3-I 4PI	SEP ISOTOPES
73FU4	28NI58	G,2N	ABX	22- 34	D 22- 34	BF3-I 4PI	
74FU3	28NI58	G,2N	ABX	22- 34	D 22- 34	BF3-I 4PI	SEP ISOTOPES
72SH10	28NI58	G,P	ABX	13- 24	C 13- 24	MAG-D 90	ISOB ANALOG STATES
75VA1	28NI58	G,P	SPC	8- 22	C 18- 22	SCD-D UKN	
75WE4	28NI58	G,P	ABX	18	D 18	SCD-D 90	18=17.6 MEV
77IS1	28NI58	G,P	NOX	12- 32	C 18- 32	SCD-D 90	DECAY BRANCHING
78ME1	28NI58	A,G	ABX	13- 19	D 7- 14	NAI-D DST	
73GU7	28NI60	E,E/	SPC	10- 30	D198-201	MAG-D DST	FMF/13.0,16.3 MEV
73IT1	28NI60	E,E/	FMF	0- 7	D183,250	MAG-D 82	LEVEL AT 5.53 MEV
74YE1	28NI60	E,E/	FMF	1	D 30- 60	MAG-D DST	1.332 MEV 2+
76LI6	28NI60	E,E/	ABX	11- 14	D 40- 60	MAG-D 180	4 M1 STATES
73MI7	28NI60	E,P	ABX	14- 26	D 0- 26	MAG-D DST	
78FL1	28NI60	E,A	SPC	6-120	D 33-120	MAG-D DST	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73FU6	28NI60	G,N	ABX	11- 34	D 11- 34	BF3-I	4PI	
73VE3	28NI60	G,N	ABX	11- 14	C 12, 13	TOF-D	93	
74FU3	28NI60	G,N	ABX	11- 34	D 11- 34	BF3-I	4PI	SEP ISOTOPES
75KI12	28NI60	G,N	ABX	11- 13	C 11- 13	TOF-D	78	
73FU6	28NI60	G,2N	ABX	19- 34	D 19- 34	BF3-I	4PI	
74FU3	28NI60	G,2N	ABX	20- 34	D 20- 34	BF3-I	4PI	SEP ISOTOPES
72SH10	28NI60	G,P	ABX	15- 25	C 15- 25	MAG-D	90	ISOB ANALOG STATES
77IS1	28NI60	G,P	NOX	13- 28	C 17- 28	SCD-D	90	DECAY BRANCHING
74FO2	28NI60	P,G	ABX	16- 17	D 7- 18	NAI-D	90	
73BR7	28NI60	A,G	ABX	14- 22	D 8- 16	NAI-D	DST	NO ANG DIST DATA
74FO2	28NI60	A,G	ABX	13- 23	D 8- 18	NAI-D	DST	
74FO4	28NI60	A,G	ABX	14- 22	D 8- 17	NAI-D	90	
72LI3	28NI62	E,E/	FMF	1, 4	D150,225	MAG-D	DST	B(EL) LEV 1.17,3.75
73MI7	28NI62	E,P	ABX	16- 29	D 0- 29	MAG-D	DST	
74MO4	28NI62	G,G	LFT	7	D 7	SCD-D	DST	7=7.646 MEV
74MC7	28NI62	G,G	NOX	7	D 7	NAI-D	135	7=7.646 FUNC TEMP
72SH10	28NI62	G,P	ABX	16- 27	C 16- 27	MAG-D	90	ISOB ANALOG STATES
75RA2	28NI62	G,P	FLY	11- 16	C 14- 16	ACT-I	4PI	
75RA2	28NI64	G,P	RLY	12- 17	C 15- 17	ACT-I	4PI	

COPPER Z=29

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
63	69.2	10.9	6.1	16.1	18.9	5.8	19.7	16.7	17.2
65	30.8	9.9	7.4	15.5	20.7	6.8	17.8	17.1	20.0

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74TI3	29CU	E,E/	ABX	0-600	D999	MAG-D	DST	999=1.2 GEV
77MU3	29CU	E,A	ABX	12-100	D100	MAG-D	DST	
74NO2	29CU	E,C058	RLX	THR-999	C300-999	ACT-I	4PI	999=1.2 GEV, E/G
76WA3	29CU	G,PI+	ABY	140-250	C250	MAG-D	90	
76WA3	29CU	G,PI-	ABY	140-250	C250	MAG-D	90	
72KO8	29CU	G,N	NOX	10- 22	C 12- 22	THR-I	DST	
73BA20	29CU	G,N	NOX	10- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
73EY3	29CU	G,XN	SPC	22-243	C234	TOF-D	90	NEUTS E ABV 12 MEV
73DC9	29CU	G,XP	ABY	86-400	C400	TEL-D	DST	
73DO11	29CU	G,XP	ABY	90-400	C400	TEL-D	DST	
76BA7	29CU	G,JPKN	ABY	THR* 2	C * 2	ACT-I	4PI	*GEV,J=1-10,K=1-19
73JA3	29CU	G,NA24	ABY	THR-999	C100-999	ACT-I	4PI	999=1 GEV
77JA2	29CU	G,NA24	ABY	THR-999	C400-999	ACT-I	4PI	999=1 GEV
74NO2	29CU	G,C058	RLX	THR-999	C300-999	ACT-I	4PI	999=1.2 GEV, E/G
77DA3	29CU	G,SPL	ABY	THR* 5	C 2* 5	ACT-I	4PI	*ENERGY,GEV
76EM2	29CU	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
77JA1	29CU	G,F	NOX	THR-800	C800	ACT-I	DST	MEAN FRAGMENT RANGES
74BE12	29CU59	P,G	SPC	8- 9	D 4- 6	SCD-D	DST	
74KF3	29CU61	P,G	LFT	6- 7	D 1- 2	SCD-D	90	B(M1)
75KR15	29CU61	P,G	LFT	6- 7	D 1- 2	NAI-D	90	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
72KL7	29CU63	E,E/	FMF	1	D 25- 85	MAG-D DST	$\lambda=0.96$
77KN2	29CU63	E,N	ABX	11- 32	D 20- 32	ACT-I 4PI	
77KN2	29CU63	E+,N	ABX	11- 32	D 20- 32	ACT-I 4PI	
75B011	29CU63	G,G	LFT	670*962	C 2	UKN UKN	*KEV
76SW7	29CU63	G,G	LFT	1- 5	C 1- 5	SCD-D DST	24 LEV 1.32-4.51 MEV
75WE4	29CU63	G,P	ABX	18	D 18	SCD-D 90	18=17.6 MEV
74WI8	29CU63	P,G	LFT	9	D 2- 3	SCD-D 55	14 LEVS 2.612-2.670
75KR14	29CU63	P,G	SPC	8- 9	D 2- 3	SCD-D UKN	
75KR15	29CU63	P,G	LFT	8- 9	D 2- 3	NAI-D 90	
71OL1	29CU65	G,G	NOX	8	D 8	SCD-D DST	8=8.484 MEV
74W02	29CU65	G,G	LFT	6- 8	D 6- 8	SCD-D DST	6.556
75B011	29CU65	G,G	LFT	0- 1	C 2	UKN UKN	771 AND 1115 KEV
76SW7	29CU65	G,G	LFT	1- 5	C 1- 5	SCD-D DST	30 LEV 1.48-4.53 MEV
75W02	29CU65	G,N	RLY	20- 40	C 20- 40	ACT-I 4PI	RATIO (G,N)/(E,N)
75W02	29CU65	G,2N	RLY	21- 38	C 21- 38	ACT-I 4PI	RATIO (G,2N)/(E,2N)

ZINC Z=30

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
64	49.6	11.9	7.7	19.0	16.7	4.0	21.0	18.6	13.8
66	27.9	11.1	8.9	18.3	18.3	4.6	19.0	18.8	16.4
67	4.1	7.1	6.9	17.4	15.7	4.8	18.1	16.0	17.3
68	18.7	10.2	10.0	17.7	19.8	5.3	17.3	19.1	18.5
70	0.6	9.2	10.9	17.2	21.0	6.0	15.7	19.5	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73BA20	30ZN	G,N	NOX	10- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
76EM2	30ZN	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
73NE4	30ZN64	E,E/	FMF	0- 3	D 150,275	MAG-D DST	
76NE1	30ZN64	E,E/	ABX	1- 3	D 40-112	MAG-D DST	2+,2+,3- STATES
73DE3	30ZN64	G,N	RLX	20- 22	D 20- 22	ACT-I 90	
73DE8	30ZN64	G,N	ABX	20- 22	D 20- 22	ACT-I 4PI	
73YA1	30ZN64	G,N	RLX	11- 30	C 12- 30	ACT-I 4PI	
76CA1	30ZN64	G,N	ABX	12- 30	D 12- 30	MOD-I 4PI	
76CA1	30ZN64	G,2N	ABX	15- 30	D 12- 30	MOD-I 4PI	
74IS3	30ZN64	G,XN	ABX	11- 27	C 11- 27	BF3-I 4PI	SEPERATED ISOTOPES
75G01	30ZN64	G,XN	ABX	12- 25	C 9- 25	BF3-I 4PI	
73YA1	30ZN64	G,PN	RLX	19- 30	C 19- 30	ACT-I 4PI	
73CL6	30ZN64	G,XP	ABX	8- 26	C 15- 26	SCD-D DST	
76NE1	30ZN66	E,E/	ABX	1- 3	D 40-112	MAG-D DST	2+,3- STATES
73SZ2	30ZN66	G,G	LFT	8	D 8	SCD-D DST	8=7.693
75G01	30ZN66	G,XN	ABX	11- 25	C 9- 25	BF3-I 4PI	
73LI5	30ZN68	E,E/	FMF	1, 3	D225	MAG-D DST	LEVELS 1.08,2.8 MEV
76NE1	30ZN68	E,E/	ABX	1- 3	D 40-112	MAG-D DST	2+,3- STATES
74IS3	30ZN68	G,XN	ABX	10- 27	C 10- 27	BF3-I 4PI	SEP ISOTOPES
75G01	30ZN68	G,XN	ABX	10- 25	C 9- 25	BF3-I 4PI	
77BU12	30ZN68	G,P	ABX	10-800	C 75-800	ACT-I 4PI	
76NE1	30ZN70	E,E/	ABX	1- 2	D 40-112	MAG-D DST	2+,2+ STATES

GALLIUM Z=31

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
69	60.1	10.3	6.6	15.4	18.0	4.5	18.6	16.8	16.6
71	39.9	9.3	7.9	15.1	19.7	5.3	17.0	17.1	18.8

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
76CA1	31GA	G,N	ABX	9- 26	D	9- 26	MOD-I 4PI	
76CA1	31GA	G,2N	ABX	17- 26	D	9- 26	MOD-I 4PI	
73AR1	31GA69	G,G	LFT	0- 2	C	0- 2	SCD-D 125	12 LEVELS
73MO2	31GA69	G,G	LFT	6, 8	D	6, 8	SCD-D	DST LEVELS 7.306,6.874
73AR1	31GA71	G,G	LFT	0- 2	C	0- 2	SCD-D 125	6 LEVELS

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	20.5	11.5	8.5	18.6	17.6	4.1	19.7	18.8	15.1
72	27.4	10.7	9.7	18.2	19.1	5.0	18.2	19.0	17.6
73	7.8	6.8	10.0	17.3	16.7	5.3	17.5	16.5	18.5
74	36.5	10.2	11.0	18.2	21.0	6.3	17.0	20.2	19.9
76	7.8	9.4	12.0	18.4	23.1	7.5	15.9	20.6	22.1

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
75KL9	32GE70	E,E/	LFT	1, 2	D	84-120	MAG-D DST	1.04,2.562 MEV
75MC1	32GE70	G,N	ABX	11- 40	C	10- 40	MOD-I 4PI	
76CA1	32GE70	G,N	ABX	11- 26	D	11- 26	MOD-I 4PI	
75MC1	32GE70	G,2N	ABX	20- 40	C	10- 40	MOD-I 4PI	
76CA1	32GE70	G,2N	ABX	20- 26	D	11- 26	MOD-I 4PI	
75GO1	32GE70	G,XN	ABX	11- 25	C	9- 25	BF3-I 4PI	
73MC10	32GE70	G,PN	ABX	19- 40	C	12- 42	ACT-I 4PI	
75MC1	32GE70	G,PN	ABX	19- 40	C	10- 40	ACT-I 4PI	
75KL9	32GE72	E,E/	LFT	1, 2	D	84-120	MAG-D DST	0.835,2.515 MEV
75MC1	32GE72	G,N	ABX	10- 40	C	10- 40	MOD-I 4PI	
76CA1	32GE72	G,N	ABX	10- 26	D	10- 26	MOD-I 4PI	
75MC1	32GE72	G,2N	ABX	18- 40	C	10- 40	MOD-I 4PI	
76CA1	32GE72	G,2N	ABX	18- 26	D	10- 26	MOD-I 4PI	
75GO1	32GE72	G,XN	ABX	11- 25	C	9- 25	BF3-I 4PI	
73MC10	32GE72	G,PN	ABX	19- 40	C	12- 42	ACT-I 4PI	
75MC1	32GE72	G,PN	ABX	19- 40	C	10- 40	ACT-I 4PI	
75MC1	32GE74	G,N	ABX	10- 40	C	10- 40	MOD-I 4PI	
76CA1	32GE74	G,N	ABX	10- 26	D	10- 26	MOD-I 4PI	
75MC1	32GE74	G,2N	ABX	17- 40	C	10- 40	MOD-I 4PI	
76CA1	32GE74	G,2N	ABX	17- 26	D	10- 26	MOD-I 4PI	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
75G01	32GE74	G,XN	ABX	10- 25	C 9- 25	BF3-I 4PI	
73MC10	32GE74	G,P	ABX	11- 40	C 9- 40	ACT-I 4PI	
75MC1	32GE74	G,P	ABI	11- 40	C 10- 40	ACT-I 4PI	
75MC1	32GE74	G,PN	ABI	20- 40	C 10- 40	ACT-I 4PI	
75MC1	32GE76	G,N	ABX	9- 40	C 10- 40	MOD-I 4PI	
76CA1	32GE76	G,N	ABX	9- 26	D 8- 26	MOD-I 4PI	
75MC1	32GE76	G,2N	ABX	16- 40	C 10- 40	MOD-I 4PI	
76CA1	32GE76	G,2N	ABX	16- 26	D 8- 26	MOD-I 4PI	
75G01	32GE76	G,XN	ABX	9- 25	C 9- 25	BF3-I 4PI	
73MC10	32GE76	G,PN	ABX	20- 40	C 12- 42	ACT-I 4PI	
75MC1	32GE76	G,PN	ABI	20- 40	C 10- 40	ACT-I 4PI	

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.	10.2	6.9	15.4	19.4	5.3	18.2	17.1	17.9

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73BA20	33AS75	G,N	NOX	10- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
76CA1	33AS75	G,N	ABX	10- 26	D 10- 26	MOD-I 4PI	
76CA1	33AS75	G,2N	ABX	18- 26	D 10- 26	MOD-I 4PI	
75ER2	33AS75	G,SC44	ABY	THR-800	C250-800	ACT-I 4PI	ISOMER RATIO

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	0.8	12.1	8.5	19.3	17.2	4.1	20.7	19.3	14.2
76	9.0	11.2	9.5	19.3	18.9	5.1	19.2	19.8	16.4
77	7.6	7.4	9.6	18.7	16.1	5.7	18.6	16.9	17.3
78	23.5	10.5	10.4	18.9	20.1	6.0	17.9	20.1	18.4
80	49.8	9.9	11.3	18.8	21.5	7.0	16.9	20.4	20.6
82	9.2	9.3	12.2	18.8	23.0	8.2	16.0	20.2	22.7

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73BA20	34SE	G,N	NOX	10- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
76CA1	34SE76	G,N	ABX	11- 26	D 10- 26	MOD-I 4PI	
76CA1	34SE76	G,2N	ABX	19- 26	D 10- 26	MOD-I 4PI	
75G01	34SE76	G,XN	ABX	11- 25	C 9- 25	BF3-I 4PI	
76CA1	34SE78	G,N	ABX	10- 26	D 10- 26	MOD-I 4PI	
76CA1	34SE78	G,2N	ABX	18- 26	D 10- 26	MOD-I 4PI	
75G01	34SE78	G,XN	ABX	10- 25	C 9- 25	BF3-I 4PI	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73SZ17	34SE80	G,G	LFT	8	D 8	SCD-D DST	8=7.819 MEV
76CA1	34SE80	G,N	ABX	10- 28	D 10- 28	MOD-I 4PI	
76CA1	34SE80	G,2N	ABX	17- 28	D 10- 28	MOD-I 4PI	
75GO1	34SE80	G,XN	ABX	9- 25	C 9- 25	BF3-I 4PI	
76CA1	34SE82	G,N	ABX	9- 26	D 9- 26	MOD-I 4PI	
76CA1	34SE82	G,2N	ABX	16- 26	D 9- 26	MOD-I 4PI	
75GO1	34SE82	G,XN	ABX	9- 25	C 9- 25	BF3-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	59.69	10.7	6.3	15.8	18.7	5.5	19.0	16.8	16.7
81	49.31	10.2	7.5	15.9	20.2	6.5	18.0	17.4	18.8

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73BA20	35BR	G,N	NOX	10- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
77JA2	35BR	G,NA24	ABY	THR-999	C400-999	ACT-I 4PI	999=1 GEV

KRYPTON Z=36

A	ABUND.	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	21.2	19.4	13.5
80	2.25	11.5	9.1	19.6	18.2	5.1	19.9	19.8	15.4
82	11.6	11.0	9.9	19.5	19.6	6.0	18.8	20.1	17.4
83	11.5	7.5	9.8	19.1	17.2	6.5	18.4	17.4	18.2
84	57.0	10.5	10.7	19.4	21.0	7.1	18.0	20.3	19.4
86	17.3	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	REMARKS
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NO DATA

RUBIDIUM Z=37

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
85	72.17	10.5	7.0	16.5	19.6	6.6	19.4	17.5	17.7
87	27.83	9.9	8.6	17.1	21.8	8.0	16.6	18.5	20.5
	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR			
REF	Z A	IN,OUT				TYPE ANG	REMARKS		

NO DATA

STRONTIUM Z=38

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
84	0.5	12.0	9.0	20.2	17.9	5.2	21.2	19.8	14.6
86	9.8	11.5	9.6	20.5	19.5	6.3	20.0	20.1	16.7
87	7.0	8.4	9.4	20.1	17.4	7.3	19.9	18.1	18.0
88	82.6	11.1	10.6	20.7	21.4	7.9	19.5	20.5	19.2

REF	NUCLIDE Z	REACTION A	IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73BA20	38SR	G,N	NOX	11-	27	C 10-	27 BF3-I	4PI	MEAN NEUTRON ENERGY
77JA2	38SR	G,NA24	ABY	THR	-999	C400-999	ACT-I	4PI	999=1 GEV
73WI6	38SR87	G,N	ABX	8-	11	C 9-	12 TOF-D	130	NO PEAK OBSERVED
74FI1	38SR88	E,E/	FMF	1-	3	C 45-	121 MAG-D	DST	LEVELS 1.84,2.74
72SH10	38SR88	E,P	SPC	17		C 16-	18 MAG-D	UKN	ISOB ANALOG STATES
74SH6	38SR88	E,P	ABX	14-	26	D 14-	30 MAG-D	DST	
75SH4	38SR88	E,P	ABX	16-	26	D 14-	25 MAG-D	90	
73DA10	38SR88	G,G	ABX	8-	12	D 8-	12 NAI-D	131	
75ME5	38SR88	G,G	LFT	4		C 4	SCD-D	DST	4=4.744 MEV
77ME5	38SR88	G,G	LFT	1		C 2-	3 SCD-D	DST	1=1.836

YTTRIUM Z=39

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
89	100.	11.5	7.1	16.1	19.9	8.0	20.8	18.2	17.7

REF	NUCLIDE Z	REACTION A	IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74FI1	39Y 89	E,E/	FMF	1-	4	C 45-	121 MAG-D	DST	6 LEVELS
74WH3	39Y 89	E,E/	ABX	0-	300	D500	MAG-D	60	QUASIELASTIC SCAT
77PI1	39Y 89	E,E/	ABX	2-	55	C 93	MAG-D	DST	
74SH6	39Y 89	E,P	ABX	10-	24	D 10-	30 MAG-D	90	
REF	NUCLIDE Z	REACTION A	IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
75SH4	39Y 89	E,P	ABX	15-	24	D 14-	25 MAG-D	90	
73LI3	39Y 89	G,G/	ABX	0-	800	C100-800	ACT-I	4PI	
73BA20	39Y 89	G,N	NOX	11-	27	C 10-	27 BF3-I	4PI	MEAN NEUTRON ENERGY
76BA1	39Y 89	G,N	RLY	11-	UKN	C UKN	SCD-D	4PI	ISOMER RATIO
72WA3	39Y 89	G,2N	NOX	20-	50	D 23-	50 ACT-I	4PI	ISOMERS
70IS8	39Y 89	G,XN	ABX	11-	29	C 11-	29 BF3-I	4PI	
71GO3	39Y 89	G,P	ABX	10-	29	C 10-	29 UKN	4PI	
72PA4	39Y 89	P,G	LFT	13-	15	D 5-	9 NAI-D	DST	
73NI2	39Y 90	N,G	RLY	14-	16	D 6-	9 NAI-D		

ZIRCONIUM Z=40

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
90	51.5	12.0	8.4	20.7	18.8	6.7	21.3	19.8	15.4
91	11.2	7.2	8.7	18.6	14.9	5.5	19.2	15.6	16.3
92	17.1	8.6	9.4	15.7	17.2	3.0	15.8	17.3	17.1
94	17.4	8.2	10.3	15.9	18.5	3.8	14.9	17.8	18.9
96	2.8	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	REMARKS
73BA20	40ZR	G,N	NOX	8- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
72FU6	40ZR90	E,E/	FMF	7- 38	D150-250	MAG-D DST	B(EL)
72TO6	40ZR90	E,E/	FMF	0- 37	D150-250	MAG-D DST	LEVELS 14, 16.65
73CE3	40ZR90	E,E/	LFT	9	D 37- 61	MAG-D 180	
73HO4	40ZR90	E,E/	FMF	2- 3	D209	MAG-D DST	2.19,2.75,3.08
73TC1	40ZR90	E,E/	FMF	5- 37	D150-250	MAG-D DST	
75SI11	40ZR90	E,E/	FMF	2- 6	D 53-112	MAG-D DST	13 STATES, 2.18-5.3
76FU1	40ZR90	E,E/	FMF	6- 30	D150-250	MAG-D DST	ANALYSIS FOR 20
72SH10	40ZR90	E,P	SPC	16- 30	C 16- 30	MAG-D UKN	ISOB ANALOG STATES
73AS9	40ZR90	E,P	SPC	12- 26	D 30	MAG-D DST	
74AS4	40ZR90	E,P	SPC	8- 30	D 20- 30	MAG-D 90	
74SH6	40ZR90	E,P	ABX	12- 24	D 12- 30	MAG-D DST	
75SH4	40ZR90	E,P	ABX	14- 24	D 14- 25	MAG-D 90	
72ME5	40ZR90	G,G	LFT	2	C	SCD-D DST	2=2.186
74ME2	40ZR90	G,G	LFT	2- 6	C 3- 6	SCD-D DST	5 LEVELS 2-6 MEV
76BF5	40ZR90	G,N	ABX	13- 30	C 13- 32	ACT-I 4PI	ISOMER YIELD
73BR12	40ZR90	G,2N	ABX	21- 28	C 20- 28	ACT-I UKN	
76BR5	40ZR90	G,2N	ABX	20- 31	C 13- 32	ACT-I 4PI	
71GO3	40ZR90	G,XN	ABX	12- 28	C 12- 28	MOD-I 4PI	
72AS10	40ZR90	G,XN	ABX	12- 28	C 11- 28	BF3-I 4PI	
72AS10	40ZR90	G,XN	SPC	12- 15	C 20- 24	SCI-D 4PI	
73AS2	40ZR90	G,XN	ABX	12- 28	C 12- 28	BF3-I 4PI	N SPC GIVEN
72AS10	40ZR90	G,P	SPC	13- 30	C 35	SCD-D 90	
73AS2	40ZR90	G,P	SCD	14- 29	C 31	SCD-D 90	
73BR12	40ZR90	G,P	ABX	8- 24	C 14- 24	SCD-D DST	
74AS4	40ZR90	G,P	SPC	8- 30	C 30	SCD-D 90	
76BR5	40ZR90	G,P	ABX	8- 23	C 14- 24	SCD-D DST	TOT AND EXCIT STATE
76BR5	40ZR90	G,P	ABX	14- 31	C 14- 32	ACT-I 4PI	ISOMER YIELD
76BR5	40ZR90	G,P	ABX	13- 23	C 14- 24	SCD-D DST	GROUND STATE
73BR12	40ZR90	G,PN	ABX	19- 28	C 20- 28	ACT-I UKN	
76BR5	40ZR90	G,PN	ABX	20- 31	C 13- 32	ACT-I 4PI	
72HA9	40ZR90	\$ P,G	ABX	13- 25	D 5- 17	NAI-D DST	POLARIZED PROTONS
73HA13	40ZR90	P,G	ABX	13- 25	D 5- 17	NAI-D DST	
74RA3	40ZR90	P,G	ABX	13	D 4	SCD-D 55	4=4.75-4.88 MEV
73AS9	40ZR91	E,P	SPC	THR- 26	D 30	MAG-D DST	
74AS4	40ZR91	E,P	SPC	8- 30	D 20- 30	MAG-D 90	
77ME6	40ZR91	G,G	LFT	1- 5	C 1- 5	SCD-D DST	14 LEVS 1.2-4.7 MEV
73WI6	40ZR91	G,N	ABX	7- 11	C 7- 11	TOF-D 130	PEAK AT 9.1 MEV
74TO2	40ZR91	G,N	LFT	7- 9	C 9	TOF-D 135	
74AS4	40ZR91	G,P	SPC	8- 30	C 30	SCD-D 90	

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.	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	REMARKS
73G05	41NB93	G,PI+	ABY	170-400	C400	BBL-D 90	
75T04	41NB93	G,PI+	ABY	150-400	C300,400	BBL-D 90	
73G05	41NB93	G,PI-	ABY	170-400	C400	BBL-D 90	
75T04	41NB93	G,PI-	ABY	150-400	C300,400	BBL-D 90	
73SU12	41NB93	G,MU-T	ABX	10- 26	C 18, 26	MGP-D 4PI	
73BA20	41NB93	G,N	NOX	9- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
73G05	41NB93	G,P	ABY	76-400	C400	BBL-D 90	
75T04	41NB93	G,P	ABY	86-400	C300,400	BBL-D 90	
74DA2	41NB93	G,A	ABY	10-450	C450	TEL-D 90	

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	14.8	12.7	7.5	20.8	16.9	5.6	22.8	19.5	12.6
94	9.3	9.7	8.5	16.7	15.4	2.1	17.7	17.3	14.5
95	15.9	7.4	8.6	16.2	14.2	2.2	17.0	15.9	15.1
96	16.7	9.2	9.3	16.5	16.6	2.8	16.5	17.8	16.1
97	9.6	6.8	9.2	16.1	15.2	2.8	16.0	16.1	16.5
98	24.1	8.6	9.8	16.3	17.4	3.3	15.5	17.9	17.3
100	9.6	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	REMARKS
76V11	42MO	E,E/	ABX	100-500	D 1*	2 MAG-D DST	*E IN GEV,1.2,1.36
72K08	42MO	G,N	NOX	6- 22	C 22	THR-I DST	
73BA20	42MO	G,N	NOX	THR- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
77JA2	42MO	G,NA24	ABY	THR-999	C400-999	ACT-I 4PI	999=1 GEV
72H06	42MO92	E,E/	ABX	1, 2	D209	MAG-D DST	1=1.51,2=2.85 MEV
72H010	42MO92	E,E/	ABX	1, 2	D209	MAG-D DST	1.5, 2.85 MEV
73H04	42MO92	E,E/	FMF	1- 3	D209	MAG-D DST	1.51,2.28,2.85
75SH4	42MO92	E,P	ABX	14- 26	D 14- 25	MAG-D 90	
74BE3	42MO92	G,N	ABX	12- 30	D 12- 30	BF3-I 4PI	
76BA1	42MO92	G,N	RLY	12-UKN	C UKN	SCD-D 4PI	ISOMER RATIO
73BE10	42MO92	G,SN	ABX	12- 28	D 12- 28	BF3-I 4PI	
74BE3	42MO92	G,2N	ABX	22- 30	D 22- 30	BF3-I 4PI	
74BE3	42MO94	G,N	ABX	9- 28	D 9- 28	BF3-I 4PI	
73BE10	42MO94	G,SN	ABX	9- 28	D 9- 28	BF3-I 4PI	
74BE3	42MO94	G,2N	ABX	15- 28	D 15- 28	BF3-I 4PI	
74BE3	42MO96	G,N	ABX	9- 28	D 9- 28	BF3-I 4PI	
73BE10	42MO96	G,SN	ABX	9- 28	D 9- 28	BF3-I 4PI	
74BE3	42MO96	G,2N	ABX	16- 28	D 16- 28	BF3-I 4PI	
74BE3	42MO96	G,3N	ABX	26- 29	D 26- 29	BF3-I 4PI	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73WI6	42MO97	G,N	ABX	6- 10 C	7- 10	TOF-D 130	PEAK AT 8.1 MEV
74BE3	42MO98	G,N	ABX	8- 28 D	8- 28	BF3-I 4PI	
73BE10	42MO98	G,SN	ABX	8- 28 D	8- 28	BF3-I 4PI	
74BE3	42MO98	G,2N	ABX	15- 28 D	15- 28	BF3-I 4PI	
74BE3	42MO98	G,3N	ABX	24- 29 D	24- 29	BF3-I 4PI	
73MO12	42MO100	G,G	LFT	5- 8 D	5- 8	SCD-D DST	
74WO2	42MO100	G,G	LFT	6- 8 D	6- 8	SCD-D DST	6.418, 7.637
74BE3	42MO100	G,N	ABX	8- 27 D	8- 27	BF3-I 4PI	
76BA1	42MO100	G,N	RLY	THR-UKN	CUKN	SCD-D 4PI	ISOMER RATIO
73BE10	42MO100	G,SN	ABX	8- 28 D	8- 28	BF3-I 4PI	
74BE3	42MO100	G,2N	ABX	14- 27 D	14- 27	BF3-I 4PI	
74BE3	42MO100	G,3N	ABX	21- 28 D	21- 28	BF3-I 4PI	

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	5.5	10.7	7.4	17.4	14.2	1.7	19.6	17.3	12.2
98	1.9	10.3	8.3	17.2	15.4	2.2	18.5	17.7	14.0
99	12.7	7.5	8.4	16.7	13.8	2.3	17.7	15.8	14.7
100	12.6	9.7	9.2	17.0	16.6	2.9	17.1	18.1	15.7
101	17.0	6.8	9.4	16.4	14.8	2.8	16.5	16.0	16.6
102	31.6	9.2	10.1	16.7	18.1	3.4	16.0	18.6	17.5
104	18.7	8.9	10.5	16.7	19.5	4.3	15.1	18.9	19.1

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
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NO DATA

RHODIUM Z=45

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
103	100.	8.1	5.3	14.5	13.3	2.2	18.6	12.7	13.7

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
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72AU13	45RH103	G,N	ABY	8-900	C400-900	ACT-I 4PI	
74LE1	45RH103	G,N	ABX	8- 24 D	9- 24	MOD-I 4PI	
72AU13	45RH103	G,2N	ABY	19-900	C400-900	ACT-I 4PI	
74LE1	45RH103	G,2N	ABX	19- 24 D	9- 24	MOD-I 4PI	
74LA5	45RH103	G,XN	SPC	8- 29 C	29	EMU-D DST	
72AU13	45RH103	G,TP	ABY	THR-900	C400-900	ACT-I 4PI	Y-88 ACTIVITY

PALLADIUM Z=46

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
102	1.0	10.6	7.6	17.3	15.2	2.1	18.9	17.7	13.3
104	11.0	10.0	8.7	17.0	16.4	2.6	17.6	18.0	14.9
105	22.2	7.1	8.8	16.6	14.2	2.9	17.1	15.8	15.7
106	27.3	9.6	9.3	16.8	17.6	3.2	16.6	18.3	16.4
108	26.7	9.2	10.0	16.6	18.5	3.9	15.8	18.5	17.8
110	11.8	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	REMARKS
74LE1	46PD	G,N	ABX	9- 22	D	9- 22 MOD-I 4PI	
74LE1	46PD	G,2N	ABX	15- 22	D	9- 22 MOD-I 4PI	
72H07	46PD106	E,E/	FMF	0, 1	D250	MAG-D DST	0=.51,1=1.13 MEV
72T06	46PD106	E,E/	SPC	0- 37	D183	MAG-D 35	
73H02	46PD106	E,E/	FMF	0- 2	D183,250	MAG-D DST	.5,1.1 COMPLX
76BA1	46PD108	G,N	RLY	9-UKN	C	UKN SCD-D 4PI	ISOMER RATIO
72PE2	46PD110	E,E/	FMF	0, 0	D 40-110	MAG-D 128	0=.374,0=.81 MEV
76LI5	46PD110	E,E/	FMF	0, 1	D 39-111	MAG-D 127	LEVEL .374,.81
76BA1	46PD110	G,N	RLY	9-UKN	C	UKN SCD-D 4PI	ISOMER RATIO

SILVER Z=47

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
107	51.83	9.6	5.8	13.9	16.4	2.8	17.5	15.4	15.1
109	48.17	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	REMARKS
74TI3	47AG	E,E/	ABX	0-600	D999	MAG-D DST	999=1.2 GEV
77MU3	47AG	E,A	ABX	13-100	D100	MAG-D 50	
73BA20	47AG	G,N	NOX	9- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
74LE1	47AG	G,N	ABX	9- 25	D 9- 25	MOD-I 4PI	
74LE1	47AG	G,2N	ABX	16- 25	D 9- 25	MOD-I 4PI	
74DA2	47AG	G,P	ABY	10-450	C450	TEL-D 90	
73DC9	47AG	G,XP	ABY	89-400	C400	TEL-D DST	
74DA2	47AG	G,T	ABY	19-450	C450	TEL-D 90	
74DA2	47AG	G,HE3	ABY	27-450	C450	TEL-D 90	
74DA2	47AG	G,A	ABY	13-450	C450	TEL-D 90	
77JA1	47AG	G,NA24	NOX	THR-800	C800	ACT-I DST	MEAN FRAGMENT RANGES
77JA2	47AG	G,NA24	ABY	THR-999	C400-999	ACT-I 4PI	999=1 GEV
76EM2	47AG	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
77KN2	47AG107	E,N	ABX	10- 32	D 20- 32	ACT-I 4PI	
77KN2	47AG107	E+,N	ABX	10- 32	D 20- 32	ACT-I 4PI	
76KI6	47AG108	G,F	ABY	THR-580	C580	TRK-D 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	1.3	10.9	7.3	17.3	14.6	1.6	19.3	17.2	12.3
108	0.8	10.3	8.1	17.1	15.8	2.3	18.3	17.7	13.9
110	12.5	9.9	8.9	16.9	16.9	2.9	17.2	18.1	15.4
111	12.8	7.0	9.1	16.6	14.7	3.3	16.9	15.9	16.2
112	24.1	9.4	9.6	16.8	17.9	3.5	16.4	18.5	16.8
113	12.2	6.5	9.8	16.5	15.6	3.9	15.9	16.2	17.6
114	28.7	9.0	10.3	16.7	18.9	4.1	15.6	18.8	18.3
116	7.5	8.7	11.1	16.6	16.6	4.9	14.8	19.1	*

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
77JA4	48CD	G,MU-T	LFT	7	D 7	NAI-D 0	7.28,7.63MEV,RES ABS
72BA16	48CD	\$ G,G	RLX	15	D 15	NAI-D 90	POL G, ALSO G/
73HA3	48CD	\$ G,G	FLY	15	D 15	NAI-D 90	POL INCID PHOTONS
73BA20	48CD	G,N	NOX	7- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
74LE1	48CD	G,N	ABX	9- 25	D 9- 25	MOD-I 4PI	
74LE1	48CD	G,2N	ABX	15- 25	D 9- 25	MOD-I 4PI	
73EY3	48CD	G,XN	SPC	19-234	C234	TOF-D 90	NEUTS E ABV 12 MEV
76EM2	48CD	G,F	ABY	THE-999	C999	TRK-I 4PI	999=1 GEV
77GI1	48CD110	E,E/	LFT	1, 1	D 68,112	MAG-D DST	2+,.657,1.475 MEV
71GC3	48CD110	G,P	ABX	11- 30	C 11- 30	UKN 4PI	
74LA3	48CD111	G,G/	ABY	1	C 1	ACT-I 4PI	1=1.3 MEV
77GI1	48CD112	E,E/	LFT	1, 1	D 68,112	MAG-D DST	2+,.617,1.312 MEV
73WI6	48CD113	G,N	ABX	6- 10	C 7- 10	TOF-D 130	PEAK AT 27 MEV
72HC7	48CD114	E,E/	FMF	0, 1	D250	MAG-D DST	0=.56,1=1.21 MEV
72PE2	48CD114	E,E/	FMF	0, 1	D 40-110	MAG-D 128	0=.558,1=1.208 MEV
72TD6	48CD114	E,E/	SPC	0- 37	D183	MAG-D 35	
73HO2	48CD114	E,E/	FMF	0- 2	D183,250	MAG-D DST	LEV .6,1.2 COMPLEX
74YE1	48CD114	E,E/	FMF	1	D 30- 60	MAG-D DST	0.558 MEV 2+
76GI1	48CD114	E,E/	FMF	0- 3	D 68,112	MAG-D DST	.6-2.4 MEV
76LI5	48CD114	E,E/	FMF	0, 1	D 39-111	MAG-D 127	LEVEL .558,1.208
77GI1	48CD114	E,E/	LFT	1, 1	D 68,112	MAG-D DST	2+,.558,1.209 MEV
77GI1	48CD116	E,E/	LFT	1, 1	D 68,112	MAG-D DST	2+,.513,1.214 MEV

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	4.3	9.4	6.1	13.9	16.8	3.0	17.1	15.5	15.7
115	95.7	9.0	6.8	13.9	17.9	3.7	16.3	15.9	17.1

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74HA4	49IN	\$ G,G	ABX	15	D 15	NAI-D 90	POL PHOTONS
73BA20	49IN	G,N	NOX	9- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73B01	49IN115	G,G	LFT	1- 2	C 2	SCD-D	123	7 LEVELS
75B011	49IN115	G,G	LFT	1	C 2	UKN	UKN	1133 KEV
73LI3	49IN115	G,G/	ABX	0-800	C100-800	ACT-I	4PI	
74LA3	49IN115	G,G/	ABY	1	C 1	ACT-I	4PI	1=1.1 MEV
74LE1	49IN115	G,N	ABX	9- 24	D 9- 24	MOD-I	4PI	
74LE1	49IN115	G,2N	ABX	16- 24	D 9- 24	MOD-I	4PI	

TIN Z=50

A	ASUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
112	1.0	10.8	7.5	17.1	15.0	1.8	19.0	17.6	12.9
114	0.6	10.3	8.5	17.1	16.2	2.6	18.1	17.9	14.6
115	0.3	7.5	8.7	17.0	14.4	3.2	17.9	16.0	15.6
116	14.7	9.6	9.3	17.1	17.4	3.4	17.1	18.3	16.1
117	7.7	6.9	9.4	16.8	15.3	3.8	16.5	16.2	16.9
118	24.3	9.3	10.0	17.1	18.5	4.1	16.3	18.8	17.5
119	8.6	6.5	9.9	16.8	16.3	4.4	15.8	16.5	18.2
120	32.4	9.1	10.7	17.1	19.6	4.8	15.6	19.0	19.0
122	4.6	8.8	11.4	17.2	20.7	5.7	15.0	19.8	*
124	5.6	8.5	12.1	17.4	*	6.7	14.4	20.0	20.5

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74WH3	50SN	E,E/	ABX	0-300	D500	MAG-D	60	QUASIELASTIC SCAT
72BA16	50SN	\$ G,G	RLX	15	D 15	NAI-D	90	POL G, ALSO G/
73HA3	50SN	\$ G,G	RLY	15	D 15	NAI-D	90	POL INCID PHOTONS
73BA20	50SN	G,N	NOX	9- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
77JA2	50SN	G,NA24	ABY	THR-999	C400-999	ACT-I	4PI	999=1 GEV
76EM2	50SN	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
74SO10	50SN112	G,XN	ABX	10- 27	C 10- 28	BF3-I	4PI	
75SO12	50SN112	G,XN	ABI	10- 27	C 10- 27	BF3-I	4PI	SEE 74SO10
72SO11	50SN114	G,XN	ABX	10- 27	C 10- 27	BF3-I	4PI	
75SO12	50SN114	G,XN	ABX	9- 27	C 9- 27	BF3-I	4PI	SEE 72SO11
72HO6	50SN116	E,E/	FMF	1, 2	D209	MAG-D	DST	1=1.29,2=2.27 MEV
72HO7	50SN116	E,E/	FMF	1	D183,250	MAG-D	DST	1=1.29 MEV
72PE2	50SN116	E,E/	FMF	1, 2	D 40-110	MAG-D	128	1=1.293,2=2.109
72TO6	50SN116	E,E/	SPC	0- 37	D183	MAG-D	35	
73HO4	50SN116	E,E/	FMF	1- 3	D209	MAG-D	DST	1.29, 2.27
75HC3	50SN116	E,E/	ABX	0-160	D130-250	MAG-D	DST	
76LI5	50SN116	E,E/	FMF	1- 3	D 39-111	MAG-D	127	1.3,2.1,2.3 MEV
74LE1	50SN116	G,N	ABX	9- 22	D 9- 22	MOD-I	4PI	
73BE10	50SN116	G,SN	ABX	8- 23	D 8- 23	BF3-I	4PI	
74LE1	50SN116	G,2N	ABX	17- 22	D 9- 22	MOD-I	4PI	
72SO11	50SN116	G,XN	ABX	9- 27	C 9- 27	BF3-I	4PI	
75SO12	50SN116	G,XN	ABX	8- 27	C 8- 27	BF3-I	4PI	SEE 72SO11

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74LE1	50SN117	G,N	ABX	9- 22 D	9- 22 D	MOD-I	4PI	
73BE10	50SN117	G,SN	ABX	9- 22 D	9- 22 D	BF3-I	4PI	
74LE1	50SN117	G,2N	ABX	16- 22 D	9- 22 D	MOD-I	4PI	
72SC11	50SN117	G,XN	ABX	7- 27 C	7- 27 C	BF3-I	4PI	
75SO12	50SN117	G,XN	ABX	7- 27 C	7- 27 C	BF3-I	4PI	SEE 72SO11
74WO2	50SN118	\$ G,G	LFT	6- 8 D	6- 8 D	SCD-D	DST	POL SCAT G. 6.988
74LE1	50SN118	G,N	ABX	9- 22 D	9- 22 D	MOD-I	4PI	
73BE10	50SN118	G,SN	ABX	9- 22 D	9- 22 D	BF3-I	4PI	
74LE1	50SN118	G,2N	ABX	16- 22 D	9- 22 D	MOD-I	4PI	
74SO10	50SN118	G,XN	ABX	9- 27 C	10- 28 C	BF3-I	4PI	
75SO12	50SN118	G,XN	ABI	9- 27 C	9- 27 C	BF3-I	4PI	SEE 74SO10
75BU6	50SN118	G,P	ABY	10-800 D	75-800 D	ACT-I	4PI	
75BU6	50SN118	G,PJN	ABY	THR-800 D	75-800 D	ACT-I	4PI	J=1,2,4,6,7,8,9
77BE5	50SN118	\$ N,G	NOX	10	D 1	NAI-D	DST	POL NEUTRONS
72SO11	50SN119	G,XN	ABX	6- 27 C	6- 27 C	BF3-I	4PI	
75SO12	50SN119	G,XN	ABX	7- 27 C	7- 27 C	BF3-I	4PI	SEE 72SO11
72HO6	50SN120	E,E/	FMF	1, 2 D209		MAG-D	DST	1=1.17,2=2.41 MEV
73HO4	50SN120	E,E/	FMF	1- 3 D209		MAG-D	DST	1.17, 2.41
72SH10	50SN120	E,P	SPC	19 C 19		MAG-D	UKN	ISOB ANALOG STATES
73KA4	50SN120	G,G	LFT	6 D 6		SCD-D	UKN	6=6.730
73S22	50SN120	G,G	LFT	8 D 8		SCD-D	DST	8.-7.693
74LE1	50SN120	G,N	ABX	9- 22 D	9- 22 D	MOD-I	4PI	
73BE10	50SN120	G,SN	ABX	9- 23 D	9- 23 D	BF3-I	4PI	
74LE1	50SN120	G,2N	ABX	15- 22 D	9- 22 D	MOD-I	4PI	
74SO13	50SN120	G,XN	ABX	8- 27 C	10- 28 C	BF3-I	4PI	
75SO12	50SN120	G,XN	ABI	9- 27 C	9- 27 C	BF3-I	4PI	SEE 74SO10
72SO11	50SN122	G,XN	ABX	9- 27 C	9- 27 C	BF3-I	4PI	
75SO12	50SN122	G,XN	ABX	8- 27 C	8- 27 C	BF3-I	4PI	SEE 72SO11
72HO6	50SN124	E,E/	FMF	1, 2 D209		MAG-D	DST	1=1.14,2=2.41 MEV
73HO4	50SN124	E,E/	FMF	1- 3 D209		MAG-D	DST	1.14, 2.61
74LE1	50SN124	G,N	ABX	9- 22 D	9- 22 D	MOD-I	4PI	
73BE10	50SN124	G,SN	ABX	9- 23 D	9- 23 D	BF3-I	4PI	
74LE1	50SN124	G,2N	ABX	14- 22 D	9- 22 D	MOD-I	4PI	
72SO11	50SN124	G,XN	ABX	8- 27 C	8- 27 C	BF3-I	4PI	
75SO12	50SN124	G,XN	ABX	8- 27 C	8- 27 C	BF3-I	4PI	SEE 72SO11

ANTIMONY Z=51

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
121	57.3	9.2	5.8	12.9	17.1	3.1	16.3	14.9	16.5
123	42.7	9.0	6.6	13.1	18.7	3.9	15.8	15.4	18.0

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74HA4	51SB	\$ G,G	ABX	15	D 15	NAI-D 90	POL INCID PHOTONS
73BA20	51SB	G,N	NOX	9- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
74LE1	51SB	G,N	ABX	9- 26	D 9- 26	MOD-I 4PI	
74LE1	51SB	G,2N	ABX	16- 26	D 9- 26	MOD-I 4PI	
76EM2	51SB	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
73B02	51SB121	G,G	LFT	0- 3	C 0- 3	SCD-D 125	
73B02	51SB123	G,G	LFT	0- 3	C 0- 3	SCD-D 125	

TELLURIUM Z=52

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
120	0.0	10.3	7.2	15.7	13.9	0.3	17.9	16.8	12.3
122	2.5	9.8	8.0	15.8	15.2	1.1	17.0	17.3	13.8
123	0.8	6.9	8.1	15.7	13.0	1.5	16.7	14.9	14.5
124	4.6	9.4	8.6	15.9	16.2	1.8	16.4	17.5	15.2
125	7.0	6.6	8.7	15.7	14.0	2.2	16.0	15.2	15.8
126	18.7	9.1	9.1	15.8	17.2	2.6	15.7	17.8	16.4
128	31.7	8.8	9.6	15.7	18.0	3.2	15.1	18.0	17.6
130	34.5	8.4	10.0	15.6	18.8	3.8	14.5	18.0	18.5

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73BA20	52TE	G,N	NOX	8- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
74LE1	52TE	G,N	ABX	10- 26	D 10- 26	MOD-I 4PI	
74LE1	52TE	G,2N	ABX	14- 26	D 10- 26	MOD-I 4PI	
76EM2	52TE	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
76LE2	52TE124	G,N	ABX	8- 23	D 8- 26	MOD-I 4PI	
76LE2	52TE124	G,2N	ABX	16- 26	D 8- 26	MOD-I 4PI	
74W02	52TE126	\$ G,G	LFT	6- 8	D 6- 8	SCD-D DST	7.915, POL SCATT G
76LE2	52TE126	G,N	ABX	8- 23	D 8- 26	MOD-I 4PI	
76LE2	52TE126	G,2N	ABX	15- 25	D 8- 26	MOD-I 4PI	
76LE2	52TE128	G,N	ABX	8- 24	D 8- 26	MOD-I 4PI	
76LE2	52TE128	G,2N	ABX	15- 26	D 8- 26	MOD-I 4PI	
76KI6	52TE128	G,F	ABY	THR-580	C580	TRK-D 4PI	
74W02	52TE130	\$ G,G	LFT	6- 8	D 6- 8	SCD-D DST	7.637, POL SCATT G
76LE2	52TE130	G,N	ABX	8- 23	D 8- 26	MOD-I 4PI	
76LE2	52TE130	G,2N	ABX	14- 26	D 8- 26	MOD-I 4PI	
77BU11	52TE130	G,P	ABX	10-800	C 75-800	ACT-I 4PI	

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.	9.1	6.2	13.4	16.3	2.2	16.2	15.3	15.3

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73BA20	53I	127	G,N	NOX THR-	27 C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
72AN8	53I	127	G,JPKN	ABX 1*	7 C 1* 7	ACT-I	4PI	*GEV, I=0-8, J=1-18
77JA2	53I	127	G,N A 24	ABY THR-999	C400-999	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	0.1	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	1.9	9.6	8.2	15.9	15.8	1.8	16.8	17.3	14.4
129	26.4	6.9	8.2	15.7	13.6	2.1	16.5	15.1	15.0
130	4.1	9.3	8.7	15.8	16.5	2.2	16.2	17.5	15.5
131	21.2	6.6	8.8	15.6	14.4	2.6	15.9	15.3	16.0
132	26.9	8.9	9.1	15.7	17.2	2.7	15.5	17.8	16.5
134	10.4	8.5	9.6	15.6	17.9	3.2	15.0	17.8	17.5
136	8.9	8.0	9.9	15.5	18.5	3.7	14.4	17.8	18.4

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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NO DATA

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.	9.0	6.1	13.2	16.1	2.0	16.2	15.0	15.2

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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74LE1	55CS	133	G,N	ABX	9- 24 D	9- 24	MOD-I	4PI	
74LE1	55CS	133	G,2N	ABX	16- 24 D	9- 24	MOD-I	4PI	

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	.1	10.2	7.0	16.0	13.9	0.6	18.2	16.7	12.0
132	.1	9.8	7.7	15.8	14.7	1.0	17.3	17.0	13.1
134	2.4	9.5	8.2	15.9	15.5	1.5	16.7	17.1	14.3
135	6.5	7.0	8.3	15.6	13.5	1.9	16.4	15.1	14.8
136	7.9	9.1	8.5	15.8	16.2	2.1	16.1	17.4	15.4
137	11.2	6.9	8.7	15.8	14.5	2.5	16.0	15.4	15.8
138	71.7	8.6	9.0	15.6	16.7	2.6	15.5	17.3	16.4

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73BA20	56BA	G,N	NOX	THR- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
75HO2	56BA138	G,N	LFT	8	C	UKN	TOF-D	DST

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	0.08	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	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73BU14	57LA139	E,E/	SPC	2- 20	C 50, 65	MAG-D	DST	
73PI3	57LA139	E,E/	ABX	7- 21	D 50	MAG-D	165	
77JA4	57LA139	G,MU-T	LFT	7	D 7	NAI-D	0	7.28,7.63MEV,RES ABS
73BA20	57LA139	G,N	NOX	3- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
77JA2	57LA139	G,NA24	ABY	THR-999	C400-999	ACT-I	4PI	999=1 GEV
76EM2	57LA139	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV

CERIUM Z=58

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
136	0.1	10.0	6.9	15.7	13.8	0.4	17.9	16.6	12.1
138	0.2	9.6	7.6	15.7	14.6	1.0	17.2	16.9	13.2
140	88.4	9.2	8.1	15.8	15.2	1.6	16.7	16.9	14.3
142	11.0	7.2	8.8	12.3	14.5	-1.4	12.6	15.6	15.8

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73BU14	58CE	E,E/	SPC	2- 20	C 50, 65	MAG-D	DST	
73PI3	58CE	E,E/	ABX	7- 21	D 50, 65	MAG-D	DST	
77JA4	58CE	G,MU-T	LFT	7	D 7	NAI-D	0	7.28,7.63MEV,RES ABS
73BA20	58CE	G,N	NOX	7- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
76EM2	58CE	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73PI3	58CE140	E,E/	LFT	1- 3	D 50, 65	MAG-D DST	2+,3-,4+ LEVELS
74TE1	58CE140	G,G	LFT	5	D 4- 8	SCD-D DST	5=5.66
76LE2	58CE140	G,N	ABX	8- 26	D 8- 26	MOD-I 4PI	
76LA4	58CE140	G,N	RLX	9	C 9	TOF-D DST	THRESHOLD MEAS
76LE2	58CE140	G,2N	ABX	16- 26	D 8- 26	MOD-I 4PI	
73PI3	58CE142	E,E/	LFT	0- 2	D 50, 65	MAG-D DST	2+,3-,4+ LEVELS
76LE2	58CE142	G,N	ABX	8- 20	D 8- 26	MOD-I 4PI	
76LE2	58CE142	G,2N	ABX	12- 24	D 8- 26	MOD-I 4PI	

PRASEODYMIUM Z=59

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
141	100.	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	REMARKS
73BU14	59PR141	E,E/	SPC	2- 20	C 50, 65	MAG-D DST	
73PI3	59PR141	E,E/	ABX	7- 21	D 50	MAG-D 165	
74TE1	59PR141	G,G	LFT	6	D 4- 8	SCD-D DST	6=6.877
75JA1	59PR141	G,G	ABX	11	D 11	SCD-D 150	RATIO RAMAN/ELAST
73BA20	59PR141	G,N	NOX	THR- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
72DI7	59PR141	G,P	ABY	THR-300	C1 06-300	ACT-I 4PI	

NEODYMIUM Z=60

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
142	27.2	9.8	7.2	16.1	13.9	0.8	17.9	16.6	12.5
143	12.2	6.1	7.5	14.3	10.9	-0.5	15.9	13.4	13.1
144	23.8	7.8	8.0	12.7	13.2	-1.9	13.9	15.3	13.8
145	8.3	5.8	8.0	12.6	11.8	-1.6	13.6	13.7	14.4
146	17.2	7.6	8.6	12.8	14.2	-1.2	13.3	15.5	15.1
148	5.7	7.3	9.2	12.7	15.2	-0.6	12.6	15.9	16.2
150	5.6	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	REMARKS
74HA4	60ND	G,G	ABX	15	D 15	NAI-D 90	POL INCID PHOTONS
76EM2	60ND	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
75SC2	60ND142	E,E/	NOX	5- 28	D 50, 64	MAG-D 93	E,E/SPECTRUM (E2)
73SA7	60ND142	E,P	ABX	13- 26	C 15- 26	MAG-D UKN	
77SA5	60ND142	E,P	ABX	15- 26	D 15- 26	MAG-D DST	
74TE1	60ND142	G,G	LFT	6	D 4- 8	SCD-D DST	6=6.877
76BA1	60ND142	G,N	RLY	10-UKN	C UKN	SCD-D 4PI	ISOMER RATIO
72SH10	60ND142	G,P	ABX	15- 22	C 15- 22	MAG-D UKN	ISOB ANALOG STATES

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
77BE6	60ND146	G,G	LFT	7	D 7	SCD-D DST 7=7.163 MEV	
75SC2	60ND150	E,E/	NOX	5- 28	D 50, 64	MAG-D 93 E,E/SPECTRUM (E2)	

SAMARIUM Z=62

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
144	3.1	10.6	6.3	16.4	12.7	-0.1	19.0	16.2	10.6
147	15.1	6.4	7.1	12.9	10.5	-2.3	14.8	13.4	12.4
148	11.3	8.1	7.6	13.0	12.8	-2.0	14.5	15.3	13.0
149	13.9	5.9	7.6	12.6	11.2	-1.9	14.0	13.5	13.6
150	7.4	8.0	8.3	13.0	13.8	-1.4	13.9	15.5	14.2
152	26.6	8.3	8.7	13.7	15.3	-0.2	13.9	16.6	15.7
154	22.6	8.0	9.0	14.0	16.5	1.2	13.8	16.5	16.9

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
76EM2	62SM	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
73SZ2	62SM144	G,G	LFT	9	D 9	SCD-D DST	9=8.995
76ME6	62SM144	G,G	LFT	3	C 1- 4	SCD-D DST	POLARIMETER EXPER
74CA5	62SM144	G,N	ABX	10- 21	D 10- 21	BF3-I 4PI	
73BE10	62SM144	G,SN	ABX	10- 21	D 10- 21	BF3-I 4PI	
74CA5	62SM144	G,2N	ABX	18- 21	D 18- 21	BF3-I 4PI	
76ME6	62SM148	G,G	LFT	2	C 1- 4	SCD-D DST	
74CA5	62SM148	G,N	ABX	8- 20	D 8- 20	BF3-I 4PI	
73BE10	62SM148	G,SN	ABX	8- 20	D 8- 20	BF3-I 4PI	
74CA5	62SM148	G,2N	ABX	13- 20	D 13- 20	BF3-I 4PI	
76ME6	62SM150	G,G	LFT	2	C 1- 4	SCD-D DST	
74CA5	62SM150	G,N	ABX	8- 20	D 8- 20	BF3-I 4PI	
73BE10	62SM150	G,SN	ABX	8- 20	D 8- 20	BF3-I 4PI	
74CA5	62SM150	G,2N	ABX	13- 20	D 13- 20	BF3-I 4PI	
72BE13	62SM152	E,E/	FMF	0, 0	D 50-105	MAG-D DST	0=0.122, 0=0.367
72TC6	62SM152	E,E/	SPC	0- 31	D 150-250	MAG-D 35	LEVELS 11.5, 15.5
76CO3	62SM152	E,E/	FMF	1, 1	D 49-106	MAG-D DST	LEVELS .3665, .1218
77NA2	62SM152	E,E/	LFT	0- 1	D 252	MAG-D DST	2+, 4+, 6+ STATES
74CA5	62SM152	G,N	ABX	8- 20	D 8- 20	BF3-I 4PI	
73BE10	62SM152	G,SN	ABX	8- 20	D 8- 20	BF3-I 4PI	
74CA5	62SM152	G,2N	ABX	13- 20	D 13- 20	BF3-I 4PI	
73GD6	62SM152	G,XN	ABX	8- 20	C 8- 20	BF3-I 4PI	
76CO3	62SM154	E,E/	FMF	1, 1	D 44-106	MAG-D DST	LEVELS .082, .267
76ME6	62SM154	G,G	LFT	1	C 1- 4	SCD-D DST	
77BE6	62SM154	G,G	LFT	6	D 6	SCD-D DST	6=6.465 MEV
74CA5	62SM154	G,N	ABX	8- 21	D 8- 21	BF3-I 4PI	
73BE10	62SM154	G,SN	ABX	8- 22	D 8- 22	BF3-I 4PI	
74CA5	62SM154	G,2N	ABX	13- 21	D 13- 21	BF3-I 4PI	

EUROPIUM Z=63

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
151	47.9	8.0	4.9	10.3	12.7	-2.0	14.4	12.9	13.2
153	52.1	8.6	5.9	11.3	14.8	-0.3	14.9	14.2	14.6

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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GADOLINIUM Z=64

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
152	0.2	8.6	7.4	13.3	12.5	-2.2	15.1	15.3	12.2
154	2.1	8.7	7.6	14.0	14.1	-0.9	15.1	16.2	13.5
155	14.8	6.4	7.6	14.2	12.2	-0.1	15.1	14.1	14.1
156	20.6	8.5	8.0	14.1	14.9	0.2	15.0	16.2	14.7
157	15.7	6.4	8.0	14.1	13.3	0.7	14.9	14.4	15.2
158	24.8	7.9	8.5	13.8	15.4	0.7	14.3	16.0	15.9
160	21.8	7.5	9.3	13.4	16.0	1.0	13.4	16.0	*

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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76EM2 64GD G,F ABY THR-999 C999 TRK-I 4PI 999=1 GEV

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	100.	8.1	6.1	11.9	14.4	0.1	14.9	14.0	14.6

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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76SU2 65TB159 E,P ABX 11- 18 D 15- 18 MAG-D 125
 77MU3 65TB159 E,A ABX 12-100 D100 MAG-D 50
 72DA14 65TB159 G,G ABX 364* D364* SCD-D 92 *ENERGY IN KEV
 74JA2 65TB159 G,G ABX 10 D 10 SCD-D 90
 75JA1 65TB159 G,G ABX 11 D 11 SCD-D 150 RATIO RAMAN/ELASTIC
 77BA7 65TB159 G,G ABX 8- 12 D 8- 12 SCD-D DST
 73BA20 65TB159 G,N NOX 8- 27 C 10- 27 BF3-I 4PI MEAN NEUTRON ENERGY
 76EM2 65TB159 G,F ABY THR-999 C999 TRK-I 4PI 999=1 GEV

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	0.0	9.4	6.6	14.1	12.3	-1.8	16.3	15.6	11.4
158	0.1	9.1	6.9	14.1	13.3	-0.9	16.0	15.5	12.4
160	2.3	8.6	7.4	13.8	13.6	-0.5	15.4	15.6	13.5
161	19.0	6.5	7.5	13.5	12.3	-0.4	15.0	13.9	14.1
162	25.5	8.2	8.0	13.6	14.5	-0.1	14.6	15.7	14.8
163	24.9	6.3	8.0	13.5	13.3	0.2	14.5	14.3	15.4
164	28.1	7.7	8.6	13.4	15.4	0.4	13.9	15.6	16.2

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73BA20	66DY	G,N	NOX	8- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
76EM2	66DY	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV

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.	8.0	6.2	11.7	14.1	-0.1	14.7	13.9	14.8

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
76MO11	67HO165	E,E/	ABX	7- 40	D 75,105	MAG-D 75	E2 STRENGTH
76SU2	67HO165	E,P	ABX	11- 18	D 15- 18	MAG-D 125	
77MU3	67HO165	E,A	ABX	14-100	D100	MAG-D 50	
76GU5	67HO165	G,MU-T	ABX	8- 21	C 35	NAI-D 4PI	
73KA8	67HO165	G,G	ABX	95*	D 95*	SCD-D UKN	*ENERGY IN KEV
75JA1	67HO165	G,G	ABX	11	D 11	SCD-D 150	RATIO RAMAN/ELAST
77BA7	67HO165	G,G	ABX	8- 12	D 8- 12	SCD-D DST	
73BA20	67HO165	G,N	NOX	8- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
74CA7	67HO165	G,XN	ABX	8- 23	C 8- 23	BF3-I 4PI	
76EM2	67HO165	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
73MC6	67HO166	N,G	RLX	14- 20	D 7- 14	NAI-D UKN	

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	0.1	9.2	6.4	13.8	12.1	-1.7	16.5	14.9	11.2
164	1.5	8.9	6.9	13.7	12.8	-1.3	15.8	15.3	12.3
166	33.4	8.5	7.3	13.5	13.5	-0.8	15.1	15.3	13.5
167	22.9	6.4	7.5	13.3	12.3	-0.7	14.9	13.8	14.3
168	27.1	7.8	8.0	13.0	14.3	-0.5	14.2	15.3	15.0
170	14.9	7.3	8.6	12.7	*	0.0	13.3	15.3	*

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73BA20	68ER	G,N	NOX	7- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
76CO3	68ER166	E,E/	FMF	1, 1	D 34-111	MAG-D DST	LEVELS .081,.265
73ME4	68ER166	G,G	LFT	2	C 2	SCD-D DST	POL SCATT PHOTONS

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
76ME4	68ER166	G,G	LFT	1- 4 C	2- 4	SCD-D DST	13	STATES, 1.66-3.19
74GD4	68ER166	G,XN	ABX	8- 21 C	8- 21	BF3-I 4PI		
73ME4	68ER168	\$ G,G	LFT	2 C	2	SCD-D DST	POL	SCATT PHOTONS
76ME4	68ER168	G,G	LFT	1- 4 C	1- 4	SCD-D DST	20	STATES, 1.79-3.48
73ME4	68ER170	\$ G,G	LFT	2 C	2	SCD-D DST	POL	SCATT G, 1.824
76ME4	68ER170	G,G	LFT	1- 4 C	1- 4	SCD-D DST	10	STATES, 1.82-3.41

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.	8.1	5.6	11.3	13.1	-1.2	14.9	13.3	13.5

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73SU10	69TM169	E,P	RLY	5- 20 D	15- 20	MAG-D	125	
76SU2	69TM169	E,P	ABX	10- 18 D	15- 18	MAG-D	125	
77MU3	69TM169	E,A	ABX	13-100 D	100	MAG-D DST		
73BA20	69TM169	G,N	NOX	8- 27 C	10- 27	BF3-I 4PI		MEAN NEUTRON ENERGY
76EM2	69TM169	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1	GEV

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	0.1	9.1	6.3	13.6	12.0	-1.9	16.1	15.0	11.2
170	3.1	8.5	6.8	13.2	12.4	-1.7	15.3	14.8	12.4
171	14.4	6.6	6.8	13.0	11.3	-1.6	15.1	13.4	13.0
172	21.9	8.0	7.3	12.9	13.3	-1.3	14.6	14.8	13.7
173	16.2	6.4	7.5	12.7	12.4	-0.9	14.4	13.7	14.4
174	31.6	7.5	8.0	12.7	14.2	-0.7	13.8	14.9	15.0
176	12.6	6.9	8.5	12.2	15.0	-0.6	12.7	15.0	*

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
76EM2	70YB	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1	GEV
76CO3	70YB176	E,E/	FMF	1, 1 D	34-111	MAG-D DST		LEVELS .082,.267

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	97.4	7.7	5.5	10.9	12.7	-1.6	14.4	13.0	13.5
176	2.6	6.3	6.0	10.8	12.1	-1.6	14.0	11.8	14.1

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
69BE6	71LU	G,N	ABX	7- 24 D	7- 28	MOD-I 4PI	
76SU2	71LU175	E,P	ABX	11- 20 D	15- 20	MAG-D 125	
77BA9	71LU175	G,G	ABX	8- 12 D	8- 12	SCD-D 140	

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	0.1	8.6	6.2	12.8	11.4	-2.6	15.6	14.4	11.1
176	5.2	8.1	6.7	12.7	12.0	-2.3	14.9	14.4	12.2
177	18.6	6.4	6.8	12.3	10.9	-2.2	14.5	13.1	12.8
178	27.1	7.6	7.3	12.2	12.7	-2.1	14.0	14.4	13.5
179	13.7	6.1	7.6	12.0	11.9	-1.8	13.7	13.4	14.1
180	35.2	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	REMARKS
76EM2	72HF	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
72DA14	72HF177	G,G	ABX	250*	D250*	SCD-D 92	*ENERGY IN KEV
76GU5	72HF178	G,MU-T	ABX	8- 21 C	35	NAI-D 4PI	
74GO4	72HF178	G,XN	ABX	7- 20 C	7- 20	BF3-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	0.012	6.6	5.7	10.9	11.4	-2.1	14.5	11.8	13.3
181	99.988	7.6	5.9	10.9	13.2	-1.5	14.2	13.3	13.9

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74WH3	73TA181	E,E/	ABX	0-300	D500	MAG-D 60	QUASIELAST SCAT
77HI2	73TA181	E,E/	LFT	3- 30 D	79-118	MAG-D DST	
77MI8	73TA181	E,E/	FMF	8- 30 D	150-250	MAG-D DST	G-WIDTH, B(EL),J-PI
78RA1	73TA181	E,E/	FMF	0- 1 D	0*	3 MAG-D DST	*EFFECTIVE Q

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73SU10	73TA181	E,P	RLY	5- 20	D 15- 20	MAG-D 125	
73SU11	73TA181	E,P	RLY	5- 22	D 18- 22	MAG-D 90	
76SU2	73TA181	E,P	ABX	12- 23	D 16- 23	MAG-D 125	
76SU3	73TA181	E,P	ABX	16- 28	D 16- 28	MAG-D 90	G,P SIG DERIVED
77MU3	73TA181	E,A	ABX	14-100	D100	MAG-D 50	
73G05	73TA181	G,PI+	ABY	170-400	C400	BBL-D 90	
75T04	73TA181	G,PI+	ABY	150-400	C300,400	BBL-D 90	
73G05	73TA181	G,PI-	ABY	170-400	C400	BBL-D 90	
75T04	73TA181	G,PI-	ABY	150-400	C300,400	BBL-D 90	
76GU5	73TA181	G,MU-T	ABX	8- 21	C 35	NAI-D 4PI	
72BA16	73TA181	\$ G,G	RLX	15	D 15	NAI-D 90	POL G, ALSO G/
73HA3	73TA181	\$ G,G	RLX	15	D 15	NAI-D 90	POL INCID PHOTONS
74JA2	73TA181	G,G	ABX	10	D 10	SCD-D 90	
74KA9	73TA181	G,G	ABX	8	D 8	SCD-D DST	8=7.9 MEV
75JA1	73TA181	G,G	ABX	11	D 11	SCD-D 150	RATIO RAMAN/ELASTIC
77BA9	73TA181	G,G	ABX	8- 12	D 8- 12	SCD-D 140	
73BA20	73TA181	G,N	NOX	7- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
75EV1	73TA181	G,N	SPC	7- 31	C 31	SCI-D 140	
76BA1	73TA181	G,3N	RLY	22-UKN	C UKN	SCD-D 4PI	ISOMER RATIO
73HI6	73TA181	G,XN	ABX	7- 29	C 7- 29	BF3-I 4PI	
74LA5	73TA181	G,XN	SPC	7- 29	C 29	EMU-D DST	
73G05	73TA181	G,P	ABY	76-400	C400	BBL-D 90	
75T04	73TA181	G,P	ABY	86-400	C300,400	BBL-D 90	
74DA2	73TA181	G,A	ABY	10-450	C450	TEL-D 90	
72DE12	73TA181	G,F	NOX THR*	6 C 1*	6	TRK-I DST	*ENERGIES IN GEV
76EM2	73TA181	G,F	ABY THR-999	C999		TRK-I 4PI	999=1 GEV

TUNGSTEN (WOLFRAM) Z=74

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
180	0.1	8.5	6.6	12.9	11.7	-2.5	15.4	14.5	11.8
182	26.3	8.1	7.1	12.6	12.7	-1.8	14.7	14.7	13.0
183	14.3	6.2	7.2	12.4	11.5	-1.7	14.2	13.3	13.5
184	30.6	7.4	7.7	12.2	13.2	-1.7	13.6	14.6	14.3
186	28.6	7.2	8.4	12.2	14.2	-1.0	13.0	15.2	15.6

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
76V11	74W	E,E/	ABX	100-500	D 1*	2 MAG-D DST	*E IN GEV, 1.02, 1.36
73HA3	74W	\$ G,G	RLY	15	D 15	NAI-D 90	POL INCID PHOTONS
72K08	74W	G,N	NOX	6- 22	C 22	THR-I DST	
73BA20	74W	G,N	NOX	6- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
75VE5	74W	G,N	ABX	8- 22	D 8- 22	MOD-I 4PI	
75VE5	74W	G,2N	ABX	13- 22	D 8- 22	MOD-I 4PI	
76EM2	74W	G,F	ABY THR-999	C999		TRK-I 4PI	999=1 GEV
76GU5	74W 182	G,MU-T	ABX	8- 21	C 35	NAI-D 4PI	
73SQ16	74W 182	G,XN	ABX	8- 28	C 0- 28	BF3-I 4PI	
75SQ12	74W 182	G,XN	ABI	8- 27	C 8- 27	BF3-I 4PI	SEE 73SQ16
73G06	74W 184	G,XN	ABX	8- 20	C 8- 20	BF3-I 4PI	
73SQ16	74W 184	G,XN	ABX	8- 28	C 0- 28	BF3-I 4PI	
75SQ12	74W 184	G,XN	ABI	7- 27	C 7- 27	BF3-I 4PI	SEE 73SQ16
74W02	74W 186	\$ G,G	LFT	6- 8	D 6- 8	SCD-D DST	POL SCATT G, 6.418
73G06	74W 186	G,XN	ABX	8- 20	C 8- 20	BF3-I 4PI	

RHENIUM Z=75

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
185	37.40	7.8	5.4	10.5	12.3	-2.2	14.1	12.8	13.1
187	62.60	7.4	6.0	10.5	13.5	-1.7	13.6	13.2	14.4

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
75VE5	75RE	G,N	ABX	8- 22 D	8- 22	MOD-I	4PI	
75VE5	75RE	G,2N	ABX	13- 22 D	8- 22	MOD-I	4PI	
76EM2	75RE	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
73G06	75RE185	G,XN	ABX	8- 20 C	8- 20	BF3-I	4PI	
73G06	75RE187	G,XN	ABX	8- 20 C	8- 20	BF3-I	4PI	

OSMIUM Z=76

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
184	0.01	8.9	5.7	12.7	10.9	-3.1	16.1	14.2	10.5
186	1.5	8.3	6.5	12.1	11.6	-2.8	14.9	14.3	11.9
187	1.6	6.3	6.6	12.1	10.4	-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	12.0	11.4	-2.0	13.9	13.1	13.7
190	26.4	7.8	8.0	12.4	13.7	-1.4	13.7	15.1	14.6
192	41.0	7.6	8.8	12.9	15.3	-0.4	13.3	15.7	16.2

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73G06	76OS190	G,XN	ABX	8- 20 C	8- 20	BF3-I	4PI	

IRIDIUM Z=77

A	ABUND.	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	10.8	13.9	-1.0	14.0	13.5	14.6

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
75VE5	77IR	G,N	ABX	8- 22 D	8- 22	MOD-I	4PI	
75VE5	77IR	G,2N	ABX	13- 22 D	8- 22	MOD-I	4PI	

PLATINUM Z=78

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
190	0.01	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	14.0
196	25.3	7.9	8.1	13.1	14.2	-0.8	14.0	15.5	14.8
198	7.2	7.6	8.8	13.0	15.0	-0.1	13.4	15.8	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A				IN,OUT	TYPE	
73HA3	78PT	\$ G,G	RLY	15	D 15	NAI-D	90	PCL INCID PHOTONS
75VE5	78PT	G,N	ABX	8- 22	D 8- 22	MOD-I	4PI	
75VE5	78PT	G,2N	ABX	13- 21	D 8- 22	MOD-I	4PI	
69RA4	78PT	G,F	ABX	35-140	C 40-140	TRK-I	4PI	
76BO14	78PT	G,F	RLX	220-500	D220-500	TRK-I	4PI	COHERENT BREMS
76EM2	78PT	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
72SH13	78PT194	G,G	ABX	99*328	D 99*328	SCD-D	UKN	*ENERGY IN KEV
72SH13	78PT195	G,G	ABX	99*328	D 99*328	SCD-D	UKN	*ENERGY IN KEV

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.	8.1	5.8	11.4	13.6	-0.9	14.8	13.7	13.9

REF	NUCLIDE Z	REACTION A	IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73BU14	79AU197	E,E/	SPC	2- 20	C 50, 65	MAG-D	DST		
74PI2	79AU197	E,E/	FMF	3- 40	D 90	MAG-D	DST		B(EL)
76GU5	79AU197	G,MU-T	ABX	8- 21	C 35	NAI-D	4PI		
72BA16	79AU197	\$ G,G	RLX	15	D 15	NAI-D	90	POL G, ALSO G/	
73HA3	79AU197	\$ G,G	RLY	15	D 15	NAI-D	90	POL INCID PHOTONS	
73LI3	79AU197	G,G/	ABX	0-800	C100-800	ACT-I	4PI		
73BA20	79AU197	G,N	NOX	8- 27	C 10- 27	BF3-I	4PI		MEAN NEUTRON ENERGY
73SO19	79AU197	G,XN	ABX	8- 28	C 8- 28	BF3-I	4PI		
74LA5	79AU197	G,XN	SPC	8- 29	C 29	EMU-D	DST		
75SC12	79AU197	G,XN	ABI	8- 27	C 8- 27	BF3-I	4PI		SEE 73SO19
73DA6	79AU197	G,P	SPC	10-450	C450	TEL-D	90		
74DA2	79AU197	G,P	ABY	9-450	C450	TEL-D	90		
73DC9	79AU197	G,XP	ABY	86-400	C400	TEL-D	DST		
73DC11	79AU197	G,XP	ABY	90-400	C400	TEL-D	DST		
73DA6	79AU197	G,T	SPC	11-450	C450	TEL-D	90		
74DA2	79AU197	G,T	ABY	16-450	C450	TEL-D	90		
73DA6	79AU197	G,HE3	SPC	14-450	C450	TEL-D	90		
74DA2	79AU197	G,HE3	ABY	24-450	C450	TEL-D	90		
73AD3	79AU197	G,A	SPC	10-500	C500	TEL-D	DST		
73DA6	79AU197	G,A	SPC	10-450	C450	TEL-D	90		
74AD2	79AU197	G,A	ABY	10-500	C500	TEL-D	DST		
74DA2	79AU197	G,A	ABY	10-450	C450	TEL-D	90		

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
77JA1	79AU197	G,NA24	NOX	THR-800	C800	ACT-I DST	MEAN FRAGMENT RANGES
77JA2	79AU197	G,NA24	ABY	THR-999	C400-999	ACT-I 4PI	999=1 GEV
69RA4	79AU197	G,F	ABX	35-140	C 40-140	TRK-I 4PI	
72AN8	79AU197	G,F	ABX	1* 7	C 1* 7	ACT-I 4PI	*ENERGY IN GEV
72DE12	79AU197	G,F	NOX	THR-999	C600-999	TRK-I DST	999=4 GEV
73DA6	79AU197	G,F	ABY	THR-999	C800-999	TRK-I 4PI	999=2.2 GEV
74AR3	79AU197	G,F	NOX	THR-600	C600	ACT-I 4PI	REL FRAG YLDS
74BO10	79AU197	G,F	RLX	200-500	D200-500	TRK-I 4PI	COH BREMS
76BO14	79AU197	G,F	RLX	220-500	D220-500	TRK-I 4PI	COHERENT BREMS
76EM2	79AU197	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
76KI6	79AU197	G,F	ABY	THR-580	C580	TRK-D 4PI	

MERCURY Z=80

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2D
196	0.1	8.8	6.6	13.4	12.3	-2.0	15.8	15.0	11.7
198	10.0	8.3	7.1	13.4	13.1	-1.3	15.3	15.2	12.9
199	16.8	6.6	7.2	13.3	11.8	-0.8	14.9	13.8	13.7
200	23.1	8.0	7.7	13.3	14.0	-0.7	14.7	15.3	14.2
201	13.2	6.2	7.6	13.0	12.7	-0.3	14.3	13.9	14.8
202	29.8	7.8	6.5	13.2	14.9	-0.1	14.0	15.4	15.3
204	6.9	7.5	9.0	13.2	15.9	0.5	13.5	16.2	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73ME1	80HG	G,G	NOX	5	D 5	SCD-D 135	5=4.924
74HA4	80HG	G,G	ABX	15	D 15	NAI-D 90	POL INCID PHOTONS
75VE5	80HG	G,N	ABX	8- 22	D 8- 22	MOD-I 4PI	
75VE5	80HG	G,2N	ABX	13- 22	D 8- 22	MOD-I 4PI	
74TE1	80HG202	G,G	LFT	4	D 4- 8	SCD-D DST	4=4.922

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	REMARKS
76EM2	81TL	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
74AL10	81TL203	G,G	RLY	6	D 6	SCD-D 135	6=6.419 MEV
76EA1	81TL205	G,G	ABX	3- 8	D 3- 8	NAI-D 90	

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
204	1.4	8.4	6.6	12.8	12.4	-2.0	15.2	14.4	12.3
206	24.1	8.1	7.3	13.0	13.4	-1.1	14.8	14.8	13.7
207	22.1	6.7	7.5	13.1	12.7	-0.4	14.8	14.0	14.7
208	52.4	7.4	8.0	12.9	14.4	-0.5	14.1	14.9	15.4

REF	NUCLIDE Z	FEACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73EY3	82PB	E,XN	SPC	20-270	D150-270	TOF-D	90	NEUT E ABV 12 MEV
74HA4	82PB	G,G	ABX	15	D 15	NAI-D	90	PCL INCID PHOTONS
74JA2	82PB	G,G	ABX	10	D 10	SCD-D	DST	
72K08	82PB	G,N	NOX	6, 22	C 22	THR-I	DST	
73BA20	82PB	G,N	NOX	6- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
75EV1	82PB	G,N	SPC	6- 31	C 31	SCI-D	140	
73EY3	82PB	G,XN	SPC	THR-234	C234	TOF-D	90	NEUT E ABV 12 MEV
72AN8	82PB	G,F	ABX	1* 7	C 1* 7	ACT-I	4PI	*ENERGY IN GEV
76BC14	82PB	G,F	FLX	220-500	D220-500	TRK-I	4PI	COHERENT BREMS
76EM2	82PB	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
73SW13	82PB206	G,G	LFT	3- 5	C 5	SCD-D	DST	J-PI, 3 LEVELS
74SW11	82PB206	G,G	LFT	3- 5	C 4- 5	SCD-D	DST	6 LEVS 3744-5038 KEV
77C03	82PB206	G,G	LFT	4- 7	C 6, 10	SCD-D	125	10 LEVELS 5.-6.8 MEV
76MC3	82PB206	G,N	ABX	8- 9	D 8- 9	ICN-D	90	8999,8533,8120 KEV
73S021	82PB206	G,XN	ABX	8- 27	C 8- 27	BF3-I	4PI	SEE ALSO 75S012
75S012	82PB206	G,XN	ABI	8- 27	C 8- 27	BF3-I	4PI	SEE 73S021
72SH10	82PB207	E,P	ABI	19	C 17- 21	MAG-D	UKN	ISOB ANALOG STATES
73SW4	82PB207	G,G	LFT	7	D 7	SCD-D	UKN	7=7.19,7.21
73SW13	82PB207	G,G	LFT	3- 5	C 5	SCD-D	DST	J-PI, 7 LEVELS
74SW11	82PB207	G,G	LFT	3- 5	C 4- 5	SCD-D	DST	7 LEVS 3300-4982
77C03	82PB207	G,G	LFT	4- 7	C 6, 10	SCD-D	125	9 LEVELS 4.8-6.7 MEV
74ME3	82PB207	G,N	SPC	6- 9	C 7, 9	TOF-D	DST	J-PI G-WIDTH
76MC3	82PB207	G,N	ABX	8- 9	D 8- 9	ION-D	90	8999,8533,8120 KEV
72BU14	82PB208	E,E/	FMF	7- 22	D 50, 65	MAG-D	DST	LEVELS 7.3-14.1
72BU19	82PB208	E,E/	ABX	9- 17	D 50, 65	MAG-D	DST	
72T06	82PB208	E,E/	SPC	0- 26	D183	MAG-D	35	
73BU14	82PB208	E,E/	SPC	2- 20	D 50, 65	MAG-D	DST	
73FA5	82PB208	E,E/	ABX	0- 15	D 50	MAG-D	180	PEAKS 7.3,7.9,9.3
73NA1	82PB208	E,E/	FMF	6- 30	D124-250	MAG-D	DST	8 RESON DETECTED
73T01	82PB208	E,E/	FMF	6- 32	D124-250	MAG-D	DST	LEVELS 8.9-14.1
74PI2	82PB208	E,E/	FMF	3- 40	D 90	MAG-D	DST	B(EL)
74WH3	82PB208	E,E/	ABX	0-300	D500	MAG-D	60	QUASIELAST SCAT
75LI1	82PB208	E,E/	ABX	2- 9	D 37- 61	MAG-D	180	LEVS 7.91,6.93
75LI1	82PB208	E,E/	ABX	2- 9	D 37- 61	MAG-D	180	LEVELS AT 7.91, 6.93
75SC8	82PB208	E,E/	ABX	6- 11	D 50	MAG-D	129	BROAD PEAK AT 8.9
76FR6	82PB208	E,E/	FMF	2- 7	D120-290	MAG-D	DST	17 LEVELS
77PI2	82PB208	E,E/	SPC	8- 12	D 50, 65	MAG-D	DST	REANALYSIS OF 75BU19
72SH10	82PB208	E,P	ABI	15- 27	C 24- 27	MAG-D	UKN	ISOB ANALOG STATES
75SH5	82PB208	E,P	NOX	8- 40	D 25, 40	MAG-D	DST	
75SH6	82PB208	E,P	ABX	20- 29	D 19- 29	MAG-D	DST	
76DR1	82PB208	E,F	ABX	25- 45	D 25- 45	TRK-I	DST	
73SW4	82PB208	G,G	LFT	7	D 7	SCD-D	UKN	7=7.07,7.09
73SW13	82PB208	G,G	LFT	4- 5	C 5	SCD-D	DST	J-PI, 2 LEVELS
74MC7	82PB208	G,G	NOX	7	D 7	NAI-D	135	7=7.279 FUNC TEMP
74SC2	82PB208	G,G	LFT	7	D 7	SCD-D	DST	LEVEL 7.084 MEV

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74SW7	82PB208	\$ G,G	LFT	5	C 5	SCD-D DST	4843 KEV POL PHOTON
74SW11	82PB208	G,G	LFT	3- 5	C 4- 5	SCD-D DST	2 LEVS 4087,4843 KEV
76SP1	82PB208	G,G	LFT	7	D 7	SCD-D 90	7=7.064 MEV
76SM4	82PB208	G,G	LFT	7	D 7	NAI-D 90	RESONANCE ABSORPTION
77CO3	82PB208	G,G	LFT	4- 7	C 6, 10	SCD-D 125	11 LEVS 4.1-7.3 MEV
77SW7	82PB208	\$ G,G	LFT	4	C 5	SCD-D 126	POL SCAT 4.843 PHCT
77YE1	82PB208	G,G	LFT	8, 8	D 2	SCD-D 85	LEVEL 7.06,7.08 MEV
77LA2	82PB208	\$ G,NO	LFT	8- 10	D 9- 11	TOF-D 90	POL NEUTRONS, J-PI
73IS3	82PB208	G,N	RLX	7- 14	C 7- 14	BF3-I 4PI	
74JA1	82PB208	G,N	ABX	7- 9	C 7- 9	TOF-D DST	
75HA4	82PB208	G,N	LFT	7- 9	C 10	TOF-D DST	
75JC2	82PB208	G,N	ABX	7- 13	C 11- 16	TOF-D 98	
75SH9	82PB208	G,N	ABX	7- 13	C 8- 13	TOF-D 90	
76HC1	82PB208	\$ G,N	LFT	7- 9	C 7- 9	TOF-D DST	POL N, THRESH MEAS
76MC3	82PB208	G,N	ABX	8- 9	D 8- 9	ION-D 90	8999,8533,8120 KEV
78VA1	82PB208	G,N	ABX	8- 13	C 8- 13	BF3-I 4PI	
71GO3	82PB208	G,XN	ABX	7- 17	C 7- 17	MOD-I 4PI	
73SC21	82PB208	G,XN	ABX	7- 27	C 7- 27	BF3-I 4PI	SEE ALSO 75SO12
75SO12	82PB208	G,XN	ABI	7- 27	C 7- 27	BF3-I 4PI	SEE 73SO21
77RA4	82PB208	N,G	LFT	7- 9	D 16*856	SCI-D UKN	*ENERG IN KILOVOLTS

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.	7.5	3.8	9.4	10.9	-3.1	14.4	11.2	.8

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73KL1	83BI209	E,E/	FMF	0-125	D101-245	MAG-D DST	QUASIELASTIC
72SH10	83BI209	E,P	ABI	10- 20	C 17- 21	MAG-D DST	ISOB ANALOG STATES
73UE1	83BI209	E,P	RLX	3- 40	D 40	MAG-D DST	
74TU5	83BI209	E,F	ABX	THR- 40	D 27- 40	TRK-I 4PI	
76DR1	83BI209	E,F	ABX	25- 45	D 25- 45	TRK-I DST	
76GU5	83BI209	G,MU-T	ABX	8- 21	C 35	NAI-D 4PI	
77JA4	83BI209	G,MU-T	LFT	7	D 7	NAI-D 0	7.28,7.63MEV,FES ABS
72BA16	83BI209	\$ G,G	RLX	15	D 15	NAI-D 90	POL G, ALSO G/
73HA3	83BI209	\$ G,G	RLY	15	D 15	NAI-D 90	POL INCID PHOTONS
73ME1	83BI209	G,G	ABX	5	D 5	SCD-D DST	5=5.609
73SW4	83BI209	G,G	LFT	7	D 7	SCD-D UKN	7=7.18,7.21
73SW13	83BI209	G,G	LFT	2- 5	C 5	SCD-D DST	J-PI,10 LEVELS
74JA2	83BI209	G,G	ABX	10	D 10	SCD-D 90	
74SW11	83BI209	G,G	LFT	2- 5	C 4- 5	SCD-D UKN	10 LEVELS, 2.83-7.64
74TE1	83BI209	G,G	LFT	5	D 4- 8	SCD-D DST	5=5.603
74WO2	83BI209	\$ G,G	LFT	6- 8	D 6- 8	SCD-D DST	POL SCATT PHOTONS
77CO3	83BI209	G,G	LFT	4- 7	C 6, 10	SCD-D 125	11 LEVS 4.2-5.5 MEV
73BA20	83BI209	G,N	NOX	THR- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
73KO3	83BI209	G,N	ABI	7- 30	C 7- 58	MOD-I 4PI	SIG SN GIVEN
75EV1	83BI209	G,N	SPC	7- 31	C 31	SCI-D 140	
72DI10	83BI209	G,2N	ABY	14-999	C999	ACT-D 4PI	
73KO3	83BI209	G,2N	ABI	14- 30	C 7- 58	MOD-I 4PI	SIG SN GIVEN
77DI6	83BI209	G,2N	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
72DI10	83BI209	G,3N	ABY	21-999	C999	ACT-D 4PI	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73K03	83BI209	G,3N	ABI	21- 30	C 7- 58	MOD-I 4PI	SIG SN GIVEN
77DI6	83BI209	G,3N	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
72DI10	83BI209	G,4N	ABY	29-999	C999	ACT-D 4PI	
73K03	83BI209	G,4N	ABI	29- 30	C 7- 58	MOD-I 4PI	SIG SN GIVEN
77DI6	83BI209	G,4N	ABY	THR-999	C300-999	ACT-I 4PI	999=1 GEV
73S019	83BI209	G,XN	ABX	7- 28	C 7- 28	BF3-I 4PI	
74LA5	83BI209	G,XN	SPC	7- 29	C 29	EMU-D DST	
75S012	83BI209	G,XN	ABI	7- 27	C 7- 27	BF3-I 4PI	SEE 73S019
72DI10	83BI209	G,SE75	ABY	THR-999	C999	ACT-D 4PI	999=1 GEV
72DI10	83BI209	G,AU	ABY	THR-999	C999	ACT-D 4PI	999=1GEV 5 AU ISOTOP
69RA4	83BI209	G,F	ABX	35-140	C 40-140	TRK-I 4PI	
72DE12	83BI209	G,F	NOX	THR-999	C700-999	TRK-I DST	999=1.5 GEV
75AR7	83BI209	G,F	ABY	THR-600	C600	ACT-I 4PI	
76B014	83BI209	G,F	RLX	220-500	D220-500	TRK-I 4PI	COHERENT BREMS
76EM2	83BI209	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
74SN5	83BI209	P,G	ABX	13- 29	D 17- 25	NAI-D DST	

RADIUM Z = 88

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
226		6.4	7.4	9.7	*	-4.9	11.3	13.4	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74ZH1	88RA226	G,F	RLY	10- 15	C 11- 15	TRK-I DST	SYM AND ASYM YIELDS
75BA9	88RA226	G,F	RLY	THR- 28	C 11- 28	TRK-I DST	

THORIUM Z=90

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
232	100.	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	REMARKS
76C03	90TH232	E,E/	FMF	1, 1	D 44-101	MAG-D DST	LEVELS .048,.157
74RA1	90TH232	E,F	NOX	THR- 30	D 8- 30	TRK-I DST	
76AS1	90TH232	E,F	NOX	THR- 66	D 7- 66	TRK-I DST	FISSION K.E.
76KN1	90TH232	E,F	RLX	THR- 40	D 10- 40	TRK-I 2PI	SIG(Z-)/SIG(Z+)
74GU11	90TH232	G,MU-T	ABX	7- 19	C 35	NAI-D 4PI	
74BA6	90TH232	G,G	ABX	8- 11	D 8- 11	SCD-D DST	RAMAN SCATTERING
74HA4	90TH232	\$ G,G	ABX	15	D 15	NAI-D 90	POL INCID PHOTONS
74JA2	90TH232	G,G	ABX	10	D 10	SCD-D 90	
75JA1	90TH232	G,G	ABX	11	D 11	SCD-D 150	RATIO RAMAN/ELAST
72BE15	90TH232	G,N	ABX	9- 16	D 9- 16	MOD-I 4PI	
73CA2	90TH232	G,N	NOX	6- 12	C 8- 12	BF3-I 4PI	
73G02	90TH232	G,N	RLY	6- 7	C 5- 7	BF3-I 4PI	
73VE1	90TH232	G,N	ABX	9- 17	D 9- 17	MOD-I 4PI	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74MA9	90TH232	G,N	ABX	6- 11	D 6- 11	ACT-I 4PI	CAPTURE GAMMAS
75EV1	90TH232	G,N	SPC	6- 31	C 31	SCI-D 140	
75JU3	90TH232	G,4N	NOX	23- 55	C 55	ACT-I 4PI	RECOIL RANGE MEAS
75JU3	90TH232	G,6N	NOX	36- 55	C 55	ACT-I 4PI	RECOIL RANGE MEAS
73RU1	90TH232	G,XN	RLY	6- 10	C 5- 10	BF3-I 4PI	
69WA1	90TH232	G,F	RLX	THR-999	C200-999	SCD-D DST	999=1.2 GEV
71MA6	90TH232	G,F	ABX	5- 10	D 5- 10	ION-I 4PI	
72BE15	90TH232	G,F	ABX	9- 16	D 9- 16	MOD-I 4PI	
73CA2	90TH232	G,F	NOX	THR- 12	C 8- 12	BF3-I 4PI	
73VE1	90TH232	G,F	ABX	9- 17	D 9- 17	MOD-I 4PI	
73YE2	90TH232	G,F	ABX	5- 8	D 5- 8	SCD-I 4PI	COMPT SCATT G SOURCE
74IV2	90TH232	G,F	RLY	5- 12	C 5- 12	TRK-I 4PI	YIELD REL U-238
75CA5	90TH232	G,F	NOX	6- 13	C 8- 13	MOD-I 4PI	NEUT. MULTIPLICITIES
75DI2	90TH232	G,F	ABX	THR- 8	C 8, 10	TOF-D 135	
77HO3	90TH232	G,F	RLY	5- 38	C 9- 38	ACT-I UKN	MASS YLD DISTRIB

URANIUM Z=92

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
234	0.005	6.8	6.6	10.2	10.6	-4.9	12.6	13.1	11.9
235	0.720	5.3	6.7	10.0	9.5	-4.7	12.1	11.9	12.4
238	99.274	6.1	7.6	10.0	11.8	-4.3	11.3	13.6	*

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
75CA5	92U 233	G,F	NOX	6- 13	C 8- 13	MOD-I 4PI	NEUT. MULTIPLICITIES
76KO8	92U 233	G,F	RLY	THR- 24	C 10- 24	ACT-I 4PI	
75CA5	92U 234	G,F	NOX	6- 13	C 8- 13	MOD-I 4PI	NEUT. MULTIPLICITIES
74GU11	92U 235	G,MU-T	ABX	7- 24	C 35	NAI-D 4PI	
76GU2	92U 235	G,MU-T	ABX	7- 24	C UKN	NAI-D 4PI	
73CA2	92U 235	G,N	NOX	5- 12	C 8- 12	BF3-I 4PI	
73RU1	92U 235	G,XN	RLY	5- 10	C 5- 10	BF3-I 4PI	
72KO10	92U 235	G,F	RLY	THR- 14	C 14	ACT-I 4PI	FISSION PROD YIELD
73AN13	92U 235	G,F	ABX	5- 8	D 5- 8	SCD-I 4PI	
73CA2	92U 235	G,F	NOX	THR- 12	C 8- 12	BF3-I 4PI	
73IV5	92U 235	G,F	RLX	THR- 15	C 6- 15	TRK-I DST	
74IV2	92U 235	G,F	RLY	THR- 12	C 5- 12	TRK-I 4PI	YIELD REL U-238
75CA5	92U 235	G,F	NOX	6- 13	C 8- 13	MOD-I 4PI	NEUT. MULTIPLICITIES
76TH1	92U 235	G,F	RLY	THR- 25	C 25	ACT-I 4PI	FISSION PROD YIELD
73YE2	92U 236	G,F	ABX	5- 8	D 5- 8	SCD-I 4PI	COMPT SCATT G SOURCE
75CA5	92U 236	G,F	NOX	6- 13	C 8- 13	MOD-I 4PI	NEUT. MULTIPLICITIES
76AL4	92U 236	G,F	FLY	THR- 7	C 5- 7	TRK-I DST	
76CC3	92U 238	E,E/	FMF	1, 1	D 44-106	MAG-D DST	LEVELS .045,.148
78HI1	92U 238	E,E/	LFT	0- 1	D 90-300	MAG-D DST	.68,.732,.827 MEV
77MA4	92U 238	E,N	ABX	6- 25	D 6- 25	ACT-I 4PI	
76WO2	92U 238	E,A	ABX	THR- 24	D 9- 24	ACT-I 4PI	THORIUM 234 ACTIVITY
73NA3	92U 238	E,F	ABX	THR- 50	D 8- 50	TRK-I 4PI	GIVES G,F/E,F RATIO
74KN1	92U 238	E,F	RLX	THR- 40	D 15- 40	TRK-I 90	E+,E- YIELDS

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
76AF3	92U 238	E,F	ABY	THR- 60	C 6- 60	TRK-I 4PI	
76KN1	92U 238	E,F	RLX	THR- 40	D 10- 40	TRK-I 2PI	SIG(E-)/SIG(E+)
74GU11	92U 238	G,MU-T	ABX	8- 24	C 35	NAI-D 4PI	
76GU2	92U 238	G,MU-T	ABX	7- 24	C UKN	NAI-D 4PI	
73BA9	92U 238	G,G	ABX	7- 12	D 7- 12	SCD-D 140	
73MO13	92U 238	G,G	ABX	8	D 8	SCD-D DST	8=7.915
74BA6	92U 238	G,G	ABX	8- 11	D 8- 11	SCD-D DST	RAMAN SCATTERING
74HA4	92U 238	\$ G,G	ABX	15	D 15	NAI-D 90	POL INCID PHOTONS
74JA2	92U 238	G,G	ABX	10	D 10	SCD-D DST	
75JA1	92U 238	G,G	ABX	11	D 11	SCD-D DST	RATIO RAMAN/ELAST
72BE15	92U 238	G,N	ABX	8- 18	D 8- 18	MOD-I 4PI	
73CA2	92U 238	G,N	NOX	6- 12	C 8- 12	BF3-I 4PI	
73GO2	92U 238	G,N	RLY	6- 7	C 5- 7	BF3-I 4PI	
73KN5	92U 238	G,N	ABX	6- 8	C 5- 8	BF3-I 4PI	INCL G,FN NEUTRONS
73MA8	92U 238	G,N	ABX	6- 9	D 6- 9	BF3-I 4PI	
73VE1	92U 238	G,N	ABX	8- 19	D 8- 19	MOD-I 4PI	
72BE15	92U 238	G,2N	ABX	11- 18	D 8- 18	MOD-I 4PI	
73VE1	92U 238	G,2N	ABX	11- 19	D 8- 19	MOD-I 4PI	
73RU1	92U 238	G,XN	RLY	6- 10	C 5- 10	BF3-I 4PI	
77JA2	92U 238	G,NA24	ABY	THR-999	C400-999	ACT-I 4PI	999=1 GEV
71MA6	92U 238	G,F	ABX	5- 10	D 5- 10	ION-I 4PI	
72BE15	92U 238	G,F	ABX	8- 18	D 8- 18	MOD-I 4PI	
72DE12	92U 238	G,F	NOX	THR* 6	C 3* 6	TRK-I DST	*ENERGIES IN GEV
73AL5	92U 238	G,F	RLY	THR- 7	C 4- 7	ACT-I 4PI	
73AL12	92U 238	G,F	RLY	THR- 7	C 4- 7	ACT-I 4PI	
73AN13	92U 238	G,F	ABX	5- 8	D 5- 8	SCD-I 4PI	
73CA2	92U 238	G,F	NOX	THR- 12	C 8- 12	BF3-I 4PI	
73DA6	92U 238	G,F	ABY	THR- 22	C 1- 2	TRK-I 4PI	
73NA3	92U 238	G,F	ABX	THR- 50	C 8- 50	TRK-I 4PI	GIVES G,F/E,F RATIO
73VE1	92U 238	G,F	ABX	8- 19	D 8- 19	MOD-I 4PI	
75BO3	92U 238	G,F	ABX	THR- 6	C 3- 6	TRK-I 2PI	2PI=SOLID ANGLE
75CA5	92U 238	G,F	NOX	6- 13	C 8- 13	MOD-I 4PI	NEUT. MULTIPLICITIES
75DI2	92U 238	G,F	ABX	THR- 8	C 8, 10	TOF-D 135	
76AR3	92U 238	G,F	ABX	THR- 60	C 6- 60	TRK-I DST	
76KI6	92U 238	G,F	ABY	THR-580	C580	TRK-D 4PI	
76TH1	92U 238	G,F	RLY	THR- 25	C 25	ACT-I 4PI	FISSION PROD YIELD
77ZH1	92U 238	G,F	ABX	3- 7	C 3- 7	TRK-I DST	
76KO8	92PU239	G,F	RLY	THR- 24	C 10- 24	ACT-I 4PI	
73MC6	92U 239	N,G	RLX	13- 19	D 7- 14	NAI-D UKN	

NEPTUNIUM Z = 93

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
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	REMARKS
76GU2	93TH232	G,MU-T	ABX	7- 19 C	UKN	NAI-D 4PI	
77BA7	93NP237	G,G	ABX	8- 12 D	8- 12	SCD-D DST	
72BE15	93NP237	G,N	ABX	9- 17 D	9- 17	MOD-I 4PI	
73VE1	93NP237	G,N	ABX	9- 17 D	9- 17	MOD-I 4PI	
72BE15	93NP237	G,2N	ABX	9- 17 D	9- 17	MOD-I 4PI	
73VE1	93NP237	G,2N	ABX	9- 17 D	9- 17	MOD-I 4PI	
72BE15	93NP237	G,F	ABX	9- 17 D	9- 17	MOD-I 4PI	
72K09	93NP237	G,F	RLY THR-	24 C	10- 24	ACT-I 4PI	FISSION PROD YLDS
73VE1	93NP237	G,F	ABX	9- 17 D	9- 17	MOD-I 4PI	
74IV2	93NP237	G,F	RLY THR-	12 C	5- 12	TRK-I 4PI	YIELD REL U-238
75CA5	93NP237	G,F	NOX	6- 13 C	8- 13	MOD-I 4PI	NEUT. MULTIPLICITIES

PLUTONIUM Z = 94

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
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	REMARKS
74GU11	94PU239	G,MU-T	ABX	7- 20 C	35	NAI-D 4PI	
76GU2	94PU239	G,MU-T	ABX	7- 20 C	UKN	NAI-D 4PI	
73CA2	94PU239	G,N	NOX	6- 12 C	8- 12	BF3-I 4PI	
73RU1	94PU239	G,XN	RLY	6- 10 C	5- 10	BF3-I 4PI	
73CA2	94PU239	G,F	NOX THR-	12 C	8- 12	BF3-I 4PI	
74IV2	94PU239	G,F	RLY THR-	12 C	5- 12	TRK-I 4PI	YIELD REL U-238
75CA5	94PU239	G,F	NOX	6- 13 C	8- 13	MOD-I 4PI	NEUT. MULTIPLICITIES

AMERICIUM Z = 95

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
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	REMARKS
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NO DATA

8. DIGITAL DATA LIBRARY INDEX

The following data sets are available from the Photonuclear Data Center.

Note: Data sets whose acquisition number, ACQ, are followed by a * were obtained in digital form directly from the source. All other sets were digitized by the Photonuclear Data Center.

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ		
1H	2	G,P	71WE 2	714	3LI	6	G,2N	65BE 1	509*
2HE	3	G,P	65FE 1	65	3LI	6	G,P0	65BA 2	660
2HE	3	G,P	65FE 1	66	3LI	6	G,T	65BA 2	677
2HE	3	G,N	65FE 1	70	3LI	6	G,XN	65HA 1	584*
2HE	3	G,N	65FE 1	75	3LI	6	G,XN	66CO 5	656
2HE	3	G,D	65ST 1	64	3LI	6	G,HE3	66NU 1	668
2HE	3	G,N	66GE 1	63	3LI	6	G,T	66SH 1	676
2HE	3	G,1N	70BE 6	237*	3LI	6	G,P0	67DE 2	659
2HE	3	G,P	72CH 3	610*	3LI	6	G,D	67DE 2	661
2HE	4	G,N	66FE 1	605	3LI	6	G,T	67DE 2	675
2HE	4	G,N	69AR 4	263	3LI	6	G,T	68SH 2	422
2HE	4	G,N	69AR 4	265	3LI	6	G,T	70MU 1	673
2HE	4	G,2P2N	69AR 5	282	3LI	6	G,PD	70MU 1	674
2HE	4	G,1N	69AR 5	283	3LI	6	G,XP	70WO 1	658
2HE	4	G,N	70BU 1	236	3LI	6	G,HE3	70WO 1	671
2HE	4	G,SN	70BE 9	338	3LI	6	G,T	70WO 1	672
2HE	4	G,N	71BU 1	339	3LI	6	HE,G	68BL 1	669*
2HE	4	G,P	71BU 1	340	3LI	6	HE,G	70YO 1	670
2HE	4	G,SN	71BE 3	238*	68BL1 DATA EXTENDED IN ENERGY				
2HE	4	P,G	70ME 2	440*	3LI	6	HE,G	71VE 1	667
3LI		G,XN	60FA 1	1063	3LI	7	E,P	70WO 1	730
FIGURE 7					3LI	7	E,P	70WO 1	731
3LI		G,XN	63CO 3	1064	3LI	7	G,T	55MI 1	289
FIGURE 1					3LI	7	G,XN	59RO 1	293
3LI		G,XN	64AL 1	1062	3LI	7	G,T	61SH 6	287
FIGURE 3					3LI	7	G,P	62GR 2	291
3LI		G,MU-T	75AH 3	912*	3LI	7	G,P	62SH 1	294
2.0 MEV RESOLUTION					3LI	7	G,P	62SH 1	295
3LI		G,MU-T	75AH 3	913*	3LI	7	G,N	64GR 2	729
2.0 PERCENT RESOLUTION					3LI	7	G,XN	65HA 1	575
3LI		G,MU-T	75AH 3	914*	3LI	7	G,T	663LI7	290
0.5 MEV RESOLUTION					3LI	7	G,XN	67BA 2	288
3LI		G,MU-T	75AH 3	915*	3LI	7	G,T	67DE 1	292
1.0 PERCENT RESOLUTION					3LI	7	G,P	67DE 1	727
3LI		G,T	77LE 1	1059	3LI	7	G,T	69SO 3	728
FIGURE 1					3LI	7	G,SN	73BR11	510*
3LI	6	E,P	70WO 1	732	3LI	7	G,1N	73BR11	511*
3LI	6	E,P	70WO 1	733	3LI	7	G,2N	73BR11	512*
3LI	6	E,P	70WO 1	734	3LI	7	G,N0	77FE 1	1060
3LI	6	E,P	70WO 1	735	FIGURE 4, OPEN SQUARES				
3LI	6	G,XN	64BA 2	1058	3LI	7	G,N1	77FE 1	1061
FIGURE 1, HISTOGRAM PLOT					FIGURE 4, CLOSED SQUARES				
3LI	6	G,XN	64GR 2	657	4BE	9	G,XN	53NA 1	554
3LI	6	G,SN	65BE 1	507*	4BE	9	G,N	56ED 1	556
3LI	6	G,1N	65BE 1	508*	4BE	9	G,N	58BA 2	555

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
4BE 9	G,N	59TH 1	553	6C 12	G,N	62DE 1	1052
4BE 9	G,N	60BE 1	557	6C 12	G,MU-T	65WY 1	52
4BE 9	G,N	61JA 1	539	FIG 6A			
4BE 9	G,P	62CL 1	637	6C 12	G,MU-T	65WY 1	53
4BE 9	G,MU-T	62MI 4	838	FIG 6B			
4BE 9	G,P	64KO 5	839	6C 12	G,N	66CO 2	111
4BE 9	G,XN	65CO 2	558	6C 12	G,1N	66FU 1	112*
4BE 9	G,MU-T	65WY 1	54	6C 12	G,N	66LO 1	591
FIG 4				6C 12	G,XN	66MI 2	473
4BE 9	G,XN	66CO 4	842	6C 12	G,N	68WU 1	222
4BE 9	G,P	66DE 6	840	6C 12	G,P/N	68WU 1	223
4BE 9	G,D	66VO 1	843	6C 12	G,XN	69BA 1	314
4BE 9	G,T	66VO 1	844	6C 12	G,MU-T	69BE 2	105
4BE 9	G,MU-T	69DO 3	262	6C 12	G,MU-T	69BE 2	315
4BE 9	G,MU-T	72AH 7	592	6C 12	G,P	69CA 3	316
4BE 9	G,XN	72TH 2	841	6C 12	G,NA	69CW 2	276
4BE 9	G,XN	73HU11	836	6C 12	G,P	69TA 1	317
4BE 9	G,MU-T	75AH 3	916*	6C 12	G,3A	70MU 1	318
2.0 MEV RESOLUTION				6C 12	G,XN	71IS 3	412
4BE 9	G,MU-T	75AH 3	917*	6C 12	G,MU-T	72AH 7	593
2.0 PERCENT RESOLUTION				6C 12	G,MU-T	75AH 3	920*
4BE 9	G,MU-T	75AH 3	918*	2.0 MEV RESOLUTION			
0.5 MEV RESOLUTION				6C 12	G,MU-T	75AH 3	921*
4BE 9	G,MU-T	75AH 3	919*	2.0 PERCENT RESOLUTION			
1.0 PERCENT RESOLUTION				6C 12	G,MU-T	75AH 3	922*
4BE 9	G,N	75HU 1	1035	0.15 MEV RESOLUTION			
4BE 9	G,N	75HU 1	1036	6C 12	G,XN	75KN 8	1038*
4BE 9	G,XN	75HU 1	1037	6C 12	P,G	64AL 2	225
FIG. 3				6C 12	P,G	69KE 1	227
4BE 9	G,XN	75KN 5	1041*	6C 12	P,G	69KE 1	228
4BE 9	G,2N	75KN 5	1042*	6C 12	P,G	70KU 1	243
4BE 9	G,SN	75KN 5	1043	6C 13	E,E/	71BE 2	963
FIGURE 5, DASHED LINE				6C 13	G,P	57CO 1	297
4BE 9	T,G	71SC 3	1045	6C 13	G,XN	57CO 1	561
FIGURE 2				6C 13	G,XP	64DE 2	313
5B 10	G,XN	76KN 3	1048	6C 13	D,G	73WE 3	848
5B 10	G,2N	76KN 3	1049	7N 13	P,G	63FI 1	266
5B 10	G,XN	65HA 1	573	7N 13	P,G2	63FI 1	267
5B 10	G,XN	73HU14	831	7N 13	P,G	72HA 1	546
5B 10	P,G	63FU 3	861	7N 14	G,MU-T	69BE 2	106
5B 10	HE,G	65PA 1	863	7N 14	G,MU-T	69BE 2	250
5B 10	HE,G	68LI 1	862	7N 14	G,SN	70BE 8	513*
5B 11	G,XN	65HA 1	574	7N 14	G,P	72CA 4	586
5B 11	G,P	69SC 2	216	7N 14	G,P	73BA 8	849
5B 11	G,P	70SO 1	279	7N 14	P,G	71RI 1	611
5B 11	G,P0	70SO 1	280	7N 14	P,G	71RI 1	658
5B 11	G,P1	70SO 1	281	7N 15	P,G	72WE 2	547
5B 11	G,XN	73HU14	832	7N 15	P,G	73WE 2	845
5B 11	G,D	74DE 4	868	7N 15	D,G	73WE 3	847
5B 11	G,XN	76KN 3	1050*	80 15	P,G	70KU 1	246
5B 11	G,2N	76KN 3	1051*	80 15	P,G	70KU 1	253
5B 11	P,G	70GO 2	235	80 16	E,P	62DO 1	248
5B 11	P,G	70GO 2	866	80 16	G,N	61FI 2	201
5B 11	D,G	66SU 1	864	80 16	G,XN	62BO 2	215
5B 11	D,G	71BA 4	867	80 16	G,XN	64BA 3	312
5B 11	A,G	67PA 3	865	80 16	G,XN	64FI 1	213
6C 11	P,G	70KU 1	255	NEUT SPEC 25MEV BREMS			
6C 12	E,E/	71BE 2	964	80 16	G,NG	65CA 1	38
6C 12	G,3A	53GO 1	1068	1/2+, 5/2+ STATES			
6C 12	G,MU-T	60TA 2	466				

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
80 16	G,N	65CA 1	39	80 16	G,MU-T	75AH 3	924*
	GROUND STATE				2.0 MEV RESOLUTION		
80 16	G,NG	65CA 1	40	80 16	G,MU-T	75AH 3	925*
	3/2- STATE				2.0 PERCENT RESOLUTION		
80 16	G,N	65CA 1	41	80 16	G,MU-T	75AH 3	926*
80 16	G,1N	65CA 1	42*		0.15 MEV RESOLUTION		
80 16	G,XN	65HA 1	572	80 16	G,MU-T	75AH 3	927*
80 16	G,MU-T	65WY 1	50		1.0 PERCENT RESOLUTION		
	FIG 8A			80 16	G,XN	75KN 8	1039*
80 16	G,MU-T	65WY 1	51	80 16	P,G	64TA 2	80
	FIG 8B				FIGURE 2		
80 16	G,1N	66BA 5	296*	80 16	P,G	67BL 1	78
80 16	G,N	66CD 1	113	80 16	P,G	73DC 1	850
80 16	G,1N	66MI 2	471	80 16	P,G	74RO 5	1053
80 16	G,P	67CA 2	22	80 16	D,G	66SU 1	79
	FIG 34			80 16	D,G	71SU 1	851
80 16	G,NG	67CA 2	23	80 16	HE,G	74SH 3	855
	FIG 27 TOP			80 18	G,2N	76KN 4	1054*
80 16	G,PG	67CA 2	24	80 18	G,XN	76KN 4	1055*
	FIG 27 BOTTOM			80 18	G,N+NP	76KN 4	1056*
80 16	G,MU-T	67CA 2	25	80 18	G,SN	76KN 4	1057*
	FIG 36			98E 4	G,P	62CL 1	1044
80 16	G,PG+NG	67CA 2	26	9F 19	G,N	60KI 4	666
	FIG 35			9F 19	G,N	62DE 1	664
80 16	G,PG	67CA 2	27	9F 19	G,P	62DO 1	803
	FIG 31 TOP			9F 19	G,MU-T	64TE 1	663
80 16	G,PG	67CA 2	28	9F 19	G,MU-T	66DO 2	417
	FIG 31 BOTTOM			9F 19	G,MU-T	69BE 2	107
80 16	G,PG	67CA 2	29	9F 19	G,N	71BA 2	662
	FIG 30 TOP			9F 19	G,1N	72VA 2	665
80 16	G,PG	67CA 2	30	9F 19	G,2N	73BE10	217
	FIG 30 BOTTOM			9F 19	G,XN	73BE10	749
80 16	G,NG	67CA 2	31	9F 19	G,XN	73CA 5	726
	FIG 28 TOP			9F 19	G,2N	74VE 1	880*
80 16	G,PG	67CA 2	32	9F 19	G,SN	74VE 1	881*
	FIG 28 BOTTOM			1 ONE	Z,P	62DO 1	797
80 16	G,NG	67CA 2	33	1 ONE	G,XN	54FE 1	871
	FIG 29 TOP			1 ONE	G,XP	63FI 4	796
80 16	G,PG	67CA 2	34	1 ONE	G,1N	74VE 1	869*
	FIG 29 BOTTOM			1 ONE	G,SN	74VE 1	876*
80 16	G,SN	67CA 2	35	1 ONE	G,2N	74VE 1	882*
	FIG 18			1 ONE 20	G,P	69HO 1	795
80 16	G,N0	67CA 2	36	1 ONE 20	P,G1	60BR 1	873
	FIG 33			1 ONE 20	P,G0	60BR 1	874
80 16	G,AG	67CA 2	37	1 ONE 20	P,G0+G1	64TA 1	940*
	FIG 32			1 ONE 20	P,G	67SE 1	73
80 16	G,P	67TH 1	202	1 ONE 20	P,G1	67SE 1	872
80 16	G,P/N	68WU 1	226	1 ONE 20	P,G0	67SE 1	946
80 16	G,MU-T	69BE 2	108	1 ONE 22	G,2N	74VE 1	870*
80 16	G,P	69ST 1	194	11NA 23	G,1N	63SA 1	781
80 16	G,N	70IS 5	341	11NA 23	G,MU-T	65WY 1	49
80 16	G,N	70JU 1	1046		FIG 11		
	FIG 6 TIMES 4PI			11NA 23	G,1N	71AL 1	347*
80 16	G,MU-T	72AH 7	594	11NA 23	G,2N	71AL 1	350*
80 16	G,XN	72TH 2	852	11NA 23	G,SN	71AL 1	351*
80 16	G,1N	73BE10	857	11NA 23	G,P	73VE 2	777
80 16	G,2N	74VE 1	877*	11NA 23	G,1N	74VE 1	883*
80 16	G,NP	74VE 1	878*	11NA 23	G,2N	74VE 1	884*
80 16	G,1N	74VE 1	879*	11NA 23	G,SN	74VE 1	885*
				12MG	G,XN	58SP 2	328

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
12MG	G,XN	63CO 3	327	13AL 27	G,N	65TH 2	76
12MG	G,XP	64IS 1	326	13AL 27	G,MU-T	65WY 1	45
12MG	G,XN	65MI 1	325	FIG 15A			
12MG	G,MU-T	65WY 1	47	13AL 27	G,MU-T	65WY 1	46
FIG 13A				FIG 15B			
12MG	G,MU-T	65WY 1	48	13AL 27	G,XN	66FU 1	115
FIG 14B				13AL 27	G,2N	66FU 1	116*
12MG	G,MU-T	66DO 2	323	13AL 27	G,SN	66FU 1	516*
12MG	G,N	70WE 1	322	13AL 27	G,1N	66FU 1	517*
FIG 2				13AL 27	G,XN	67AN 2	551
12MG	G,N	70WE 1	355	13AL 27	G,N2P	68ME 4	311
FIG 5				13AL 27	G,XN	69AN 3	860
12MG	G,N	70WE 1	775	13AL 27	G,XN	69CO 2	536
FIG DOTS				13AL 27	G,XN	69IS 3	453
12MG	G,SN	71FU 2	342	13AL 27	G,MU-T	72AH 7	595
12MG 24	E,E/	66AR 2	945	13AL 27	G,P	72OD 1	758
12MG 24	E,E/	67TI 1	944	13AL 27	G,1N	74VE 1	886*
12MG 24	G,N	60KI 1	319	13AL 27	G,2N	74VE 1	887*
12MG 24	G,P	66IS 1	771	13AL 27	G,MU-T	75AH 3	928*
12MG 24	G,1N	66MI 2	324	2.0 MEV RESOLUTION			
12MG 24	G,P	67LE 1	943	13AL 27	G,MU-T	75AH 3	929*
12MG 24	G,XN	69AN 2	321	2.0 PERCENT RESOLUTION			
12MG 24	G,N	71BA 2	941	13AL 27	G,MU-T	75AH 3	930*
12MG 24	G,1N	71FU 2	343*	0.2 MEV RESOLUTION			
12MG 24	G,XN	72IS 1	548	13AL 27	G,MU-T	75AH 3	931*
12MG 24	P,G	63GO 3	942	1.0 PERCENT RESOLUTION			
12MG 24	P,G	68BE 3	798	14SI	G,MU-T	59DU 1	829
12MG 25	G,XN	55NA 1	320	14SI	G,XP	61SH 5	827
12MG 25	G,N	70BE 5	947	14SI	G,P	62SH11	322
POINTS				14SI	G,XN	63BO 1	825
12MG 25	G,N	70BE 5	948	FIG 2 BOTTOM			
12MG 25	G,1N	71AL 1	352*	14SI	G,XN	63BO 1	958
12MG 25	G,2N	71AL 1	353*	FIG 2 TOP			
12MG 25	G,SN	71AL 1	354*	14SI	G,1N	63CA 1	72*
12MG 25	G,N	71BA 2	205	14SI	G,XN	63CO 3	788
12MG 25	G,P	74WO 5	952	14SI	G,N	63SA 1	826
12MG 26	E,E/	70TI 1	953	14SI	G,P	65CA 2	760
12MG 26	G,N	69BE 3	949	14SI	G,A	65CA 2	765
POINTS				14SI	G,MU-T	65WY 1	61
12MG 26	G,1N	71FU 2	344*	FIG 17A			
12MG 26	G,2N	71FU 2	345*	14SI	G,MU-T	65WY 1	62
12MG 26	G,SN	71FU 2	346*	FIG 17B			
12MG 26	G,XN	72IS 1	549	14SI	G,XN	66GO 3	74
12MG 26	G,P	74AN 1	950	14SI	G,P	67GO 1	854
12MG 26	G,XP	74VA 2	951	14SI	G,P	67GO 1	856
13AL 27	G,P	53HA 1	956	14SI	G,MU-T	68BE 4	103
13AL 27	G,2P	58AU 1	770	14SI	G,XN	68GO 6	431
13AL 27	G,2P	58AU 1	955	FIG 2B			
13AL 27	G,MU-T	59DU 1	769	14SI	G,XN	68GO 6	957
13AL 27	G,MU-T	59MI 1	767	FIG 5A			
13AL 27	G,P	60CH 2	751	14SI	G,XN	69AN 3	828
13AL 27	G,1N	60CH 2	752	14SI	G,XN	69CO 1	830
13AL 27	G,NA24	60GO 2	962	14SI	G,N0	70WU 1	819
13AL 27	G,MU-T	60TA 2	467	14SI	G,2P	71SA 2	609
13AL 27	G,MU-T	60ZI 1	846	14SI	G,MU-T	72AH 7	596
13AL 27	G,XN	62BO 2	801	14SI	G,1N	74VE 1	888*
13AL 27	G,P	62DO 1	804	14SI	G,MU-T	75AH 3	932*
13AL 27	G,XN	62MU 1	753	0.15 MEV RESOLUTION			
13AL 27	G,P	62SH11	954	14SI	G,MU-T	75AH 3	933*
13AL 27	G,MU-T	64DO 2	756	1.0 PERCENT RESOLUTION			

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
14SI 28	G,P	61SH 1	853	17CL	G,2N	74VE 1	896*
14SI 28	G,N	70WE 1	356	17CL	G,SN	74VE 1	897*
FIG 1				17CL 35	G,N	55BO 2	218
14SI 28	G,N	70WE 1	776	17CL 35	G,N	62KU 1	219
FIG 1 DOTS				17CL 37	G,2N	74VE 1	898*
14SI 28	P,G1	61GA 1	823	18AR 36	P,G	70KE 1	244
14SI 28	P,G0	61GA 1	824	18AR 38	G,P	70KE 1	245
14SI 28	P,G	61KI 1	821	18AR 40	G,1N	74VE 1	899*
14SI 28	P,G	65SI 1	104	18AR 40	G,2N	74VE 1	900*
14SI 28	A,G	68ME 1	77	18AR 40	G,SN	74VE 1	901*
14SI 29	G,N	73FU 2	802	19K	G,2N	74VE 1	902*
14SI 30	A,G	68ME 1	759	19K	G,NP	74VE 1	903*
14SI 32	A,G	68ME 1	761	19K	G,1N	74VE 1	904*
15P 31	G,MU-T	59DU 1	813	19K 39	G,N	69WE 1	182
15P 31	G,XN	62MU 2	755	19K 39	G,N	71WE 1	713
POINTS				20CA	G,MU-T	72AH 7	597
15P 31	G,XN	62MU 2	812	20CA 40	G,N	63MI 2	252
SCLID LINE				20CA 40	G,N	64BA 1	535
15P 31	G,XN	63BO 1	811	20CA 40	G,MU-T	65WY 1	55
FIG 3B				FIG 21A			
15P 31	G,XN	63CC 3	793	20CA 40	G,MU-T	65WY 1	56
15P 31	G,N	63MC 3	810	FIG 21B			
15P 31	G,XP	64IS 1	809	20CA 40	G,XN	66AN 1	193
15P 31	G,XN	69IS 3	454	20CA 40	G,MU-T	66DO 2	214
15P 31	G,2P	70AN 2	807	20CA 40	G,1N	66MI 2	472
15P 31	G,2PN	70AN 2	808	20CA 40	G,XN	67GO 3	185
15P 31	G,N	72AN12	960	FIG 1A			
15P 31	G,XN	74DE10	961	20CA 40	G,N	67GO 3	186
15P 31	G,2N	74VE 1	889*	FIG 2			
15P 31	G,NP	74VE 1	890*	20CA 40	G,XN	67GO 3	232
15P 31	G,1N	74VE 1	891*	FIG 1B			
16S	G,MU-T	59DU 1	817	20CA 40	G,P	67GO 4	286
16S	G,P	62SH11	966	20CA 40	G,MU-T	68BE 4	102
16S	G,N	63BO 1	967	20CA 40	G,P	68GO 1	187
16S	G,XP	64IS 1	818	20CA 40	G,XN	68GO 6	462
16S	G,MU-T	65WY 1	43	20CA 40	G,P	69WU 1	199
FIG 19A				20CA 40	G,N0	69WU 1	229
16S	G,MU-T	65WY 1	44	FIG 2 CURVE			
FIG 19B				20CA 40	G,P0	69WU 1	230
16S	G,MU-T	68DO 1	859	FIG 2 POINTS			
16S	G,XN	68GO 6	432	20CA 40	G,N0	69WU 1	231
16S	G,N0	70WU 1	820	FIG 1A			
16S 32	G,NP	62BO 3	965	20CA 40	G,N	71IS 1	414
16S 32	G,N	62KU 1	968	20CA 40	G,1N	74VE 1	905*
16S 32	G,N	65TH 1	750	20CA 40	G,MU-T	75AH 3	934*
16S 32	G,N	67AN 2	711	2.0 MEV RESOLUTION			
16S 32	G,N	67AN 2	815	20CA 40	G,MU-T	75AH 3	935*
16S 32	G,N	67WE 1	71	2.0 PERCENT RESOLUTION			
16S 32	G,D+PN+2N	70AN 3	284	20CA 40	G,MU-T	75AH 3	936*
FIG 5				0.15 MEV RESOLUTION			
16S 32	G,N+2N	70AN 3	285	20CA 40	G,MU-T	75AH 3	937*
FIG 4				1.0 PERCENT RESOLUTION			
16S 32	G,NP+D	71BR 1	814	20CA 40	P,G	67FE 1	192
16S 32	G,2N	74VE 1	892*	20CA 40	P,G	68BA 1	196
16S 32	G,NP	74VE 1	893*	20CA 40	P,G	68BA 1	197
16S 32	G,1N	74VE 1	894*	20CA 40	P,G	68BA 1	198
16S 32	P,G	65DE 1	82	20CA 40	P,G	70DI 2	220
16S 32	P,G	65DE 1	83	20CA 40	P,G	73DI 1	587
16S 32	P,G	65DE 1	84	20CA 40	A,G0	73WA 1	590
17CL	G,1N	74VE 1	895*	20CA 42	P,G	73DI 2	585

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
21SC 45	G,SN	73SA 5	589	28NI 60	G,P	71DI 4	349
21SC 45	G,1N	74VE 1	906*	28NI 60	G,XP	73MI 7	744
21SC 45	G,2N	74VE 1	907*	28NI 60	G,P0	73MI 7	746
21SC 45	G,SN	74VE 1	908*	28NI 60	G,SN	74FU 3	529*
22TI	G,XN	67CO 1	434	28NI 60	G,1N	74FU 3	530*
23V 51	G,A	61CA 2	742	28NI 60	G,2N	74FU 3	531*
23V 51	G,1N	62FU 1	433*	28NI 60	P,G	71DI 4	221
23V 51	G,2N	62FU 1	443*	28NI 62	G,XP	73MI 7	745
23V 51	G,SN	62FU 1	464*	28NI 62	G,P0	73MI 7	747
23V 51	G,XN	69GD 3	448	28NI 64	E,E/	69GU 1	748
23V 51	G,1N	74VE 1	909*	29CU	G,XN	56GA 1	570
23V 51	G,2N	74VE 1	910*	29CU	G,XN	61MI 1	468
23V 51	G,SN	74VE 1	911*	29CU	G,SN	64FU 1	532*
24CR 32	G,SP	70IS 4	430	29CU	G,1N	64FU 1	533*
24CR 52	G,XN	69GD 3	449	29CU	G,2N	64FU 1	534*
25MN 55	G,XN	59PA 2	439	29CU	G,MU-T	65WY 1	58
25MN 55	G,SN	73AL 6	518*	FIG 27			
25MN 55	G,1N	73AL 6	519*	29CU	G,XN	70IS 6	487
25MN 55	G,2N	73AL 6	520*	29CU	G,XN	76KN 3	1047*
25MN 55	G,3N	73AL 6	521*	29CU 63	G,1N	64FU 1	18*
26FE	G,SN	67CO 2	436	29CU 63	G,2N	64FU 1	19*
27CO 59	G,1N	62FU 1	435*	29CU 63	G,SN	64FU 1	20*
27CO 59	G,SN	62FU 1	441*	29CU 63	G,N	68OW 1	110
27CO 59	G,2N	62FU 1	444*	29CU 63	G,1N	68SU 1	420*
27CO 59	G,MU-T	65WY 1	60	29CU 63	G,2N	68SU 1	421*
FIG 23				29CU 63	G,N	72DR 2	446
27CO 59	G,XN	69GD 3	450	29CU 65	G,SN	64FU 1	67*
27CO 59	G,SN	71BA 1	247	29CU 65	G,1N	64FU 1	68*
FIG 1 SOLID LINE + POINTS				29CU 65	G,2N	64FU 1	61*
27CO 59	G,XN	71BA 1	251	30ZN	G,XN	56GA 1	569
FIG 1 SOLID LINE				30ZN	G,XN	67CO 1	438
27CO 59	G,SN	73AL 7	525*	30ZN 64	G,N	68OW 1	109
27CO 59	G,1N	73AL 7	526*	30ZN 64	G,1N	76CA 1	969*
27CO 59	G,2N	73AL 7	527*	30ZN 64	G,2N	76CA 1	970*
27CO 59	G,3N	73AL 7	528*	30ZN 64	G,SN	76CA 1	971*
28NI	G,XN	64BA 4	540	31GA	G,1N	76CA 1	972*
28NI	G,MU-T	65WY 1	59	31GA	G,2N	76CA 1	973*
FIG 25				31GA	G,SN	76CA 1	974*
28NI	G,XN	68FI 1	541	32GE 70	G,1N	76CA 1	975*
28NI 58	G,NP+2N	59CA 4	741	32GE 70	G,2N	76CA 1	976*
28NI 58	G,XN	68MI 1	17	32GE 70	G,SN	76CA 1	977*
28NI 58	G,SN	69GD 2	278	32GE 72	G,1N	76CA 1	978*
28NI 58	G,SN	69OW 1	191	32GE 72	G,2N	76CA 1	979*
28NI 58	G,XP	70IS 4	743	32GE 72	G,SN	76CA 1	980*
28NI 58	G,XP	70IS 4	1069	32GE 74	G,XN	70OW 2	271
FIG 2 PROTONS ABOVE 8 MEV				1 MEV ANALYSIS			
28NI 58	G,N	70OW 1	274	32GE 74	G,SN	70OW 2	272
28NI 58	G,XP	73MI 7	736	32GE 74	G,XN	70OW 2	273
28NI 58	G,P0	73MI 7	737	.5 MEV ANALYSIS			
28NI 58	G,SN	74FU 3	522*	32GE 74	G,1N	76CA 1	981*
28NI 58	G,1N	74FU 3	523*	32GE 74	G,2N	76CA 1	982*
28NI 58	G,2N	74FU 3	524*	32GE 74	G,SN	76CA 1	983*
28NI 60	G,N	68MI 1	21	32GE 76	G,1N	76CA 1	984*
28NI 60	G,SN	69GD 2	537	32GE 76	G,2N	76CA 1	985*
28NI 60	G,SN	69OW 1	190	32GE 76	G,SN	76CA 1	986*
28NI 60	G,XP	70IS 4	1070	33AS 75	G,SN	69BE 1	144*
FIG 3 PROTONS ABOVE 1 MEV				33AS 75	G,1N	69BE 1	145*
28NI 60	G,XP	70IS 4	1071	33AS 75	G,2N	69BE 1	146*
FIG 3 PROTONS ABOVE 8 MEV				33AS 75	G,N	70OW 1	268
28NI 60	G,N	70OW 1	275	33AS 75	G,SN	70OW 2	269

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
33AS 75	G,N	700W 2	270	42MO 92	G,2N	74BE 3	694*
33AS 75	G,1N	76CA 1	987*	42MO 92	G,SN	74BE 3	695*
33AS 75	G,2N	76CA 1	988*	42MO 94	G,1N	74BE 3	696*
33AS 75	G,SN	76CA 1	989*	42MO 94	G,2N	74BE 3	697*
34SE	G,XN	67CO 2	437	42MO 94	G,SN	74BE 3	698*
34SE 76	G,1N	76CA 1	990*	42MO 96	G,1N	74BE 3	699*
34SE 76	G,2N	76CA 1	991*	42MO 96	G,2N	74BE 3	700*
34SE 76	G,SN	76CA 1	992*	42MO 96	G,3N	74BE 3	701*
34SE 78	G,1N	76CA 1	993*	42MO 96	G,SN	74BE 3	702*
34SE 78	G,2N	76CA 1	994*	42MO 98	G,XN	70IS 1	445
34SE 78	G,SN	76CA 1	995*	42MO 98	G,1N	74BE 3	703*
34SE 80	G,1N	76CA 1	996*	42MO 98	G,2N	74BE 3	704*
34SE 80	G,2N	76CA 1	997*	42MO 98	G,3N	74BE 3	705*
34SE 80	G,SN	76CA 1	998*	42MO 98	G,SN	74BE 3	706*
34SE 82	G,1N	76CA 1	999*	42MO100	G,1N	74BE 3	707*
34SE 82	G,2N	76CA 1	1000*	42MO100	G,2N	74BE 3	708*
34SE 82	G,SN	76CA 1	1001*	42MO100	G,3N	74BE 3	709*
37RB	G,1N	71LE 1	375*	42MO100	G,SN	74BE 3	710*
37RB	G,2N	71LE 1	376*	45RH103	G,SN	59PA 2	465
37RB	G,SN	71LE 1	377*	XN CORRECTED FOR N-MULT			
38SR	G,2N	70HI 1	233	45RH103	G,XN	62BO 1	428
38SR	G,XN	70HI 1	329	45RH103	G,1N	74LE 1	617*
38SR	G,1N	71LE 1	378*	45RH103	G,2N	74LE 1	618*
38SR	G,2N	71LE 1	379*	45RH103	G,SN	74LE 1	619*
38SR	G,SN	71LE 1	380*	46PD	G,1N	74LE 1	620*
38SR 88	P,G	69HA 1	258	46PD	G,2N	74LE 1	621*
39Y 89	G,SN	67BE 2	1*	46PD	G,SN	74LE 1	622*
39Y 89	G,2N	67BE 2	2*	46PD108	G,P	69DE 2	183
39Y 89	G,1N	67BE 2	3*	46PD108	G,SN	69DE 2	184
39Y 89	G,N	69BE 4	188	46PD108	G,P	69DE 5	738
39Y 89	G,2N	69BE 4	189	46PD108	G,SN	69DE 5	739
39Y 89	G,1N	71LE 1	381*	46PD110	G,NG/	69DE 5	740
39Y 89	G,2N	71LE 1	382*	47AG	G,MU-T	65WY 1	57
39Y 89	G,SN	71LE 1	383*	FIG 29			
40ZR 90	G,SN	67BE 2	4*	47AG	G,1N	74LE 1	623*
40ZR 90	G,2N	67BE 2	5*	47AG	G,2N	74LE 1	624*
40ZR 90	G,1N	67BE 2	6*	47AG	G,SN	74LE 1	625*
40ZR 90	G,SN	71IS 2	413	47AG107	G,1N	69BE 1	147*
40ZR 90	G,1N	71LE 1	384*	47AG107	G,1N	69BE 1	148*
40ZR 90	G,2N	71LE 1	385*	47AG107	G,2N	69BE 1	149*
40ZR 90	G,SN	71LE 1	386*	47AG107	G,SN	69IS 2	455
40ZR 90	G,SN	73AS 2	588	XN CORRECTED FOR N-MULT			
40ZR 90	P,G	69HA 1	206	47AG109	G,SN	69IS 2	456
40ZR 90	P,G0	69HA 1	257	XN CORRECTED FOR N-MULT			
FIG 1				48CD	G,1N	74LE 1	626*
40ZR 91	G,SN	67BE 2	7*	48CD	G,2N	74LE 1	627*
40ZR 91	G,2N	67BE 2	8*	48CD	G,SN	74LE 1	628*
40ZR 91	G,1N	67BE 2	9*	48CD127	G,XN	56GA 1	564
40ZR 92	G,2N	67BE 2	10*	49IN	G,1N	69FU 1	140*
40ZR 92	G,1N	67BE 2	11*	49IN	G,2N	69FU 1	141*
40ZR 92	G,SN	67BE 2	13*	49IN	G,3N	69FU 1	142*
40ZR 94	G,SN	67BE 2	12*	49IN	G,SN	69FU 1	143*
40ZR 94	G,2N	67BE 2	14*	49IN	G,1N	74LE 1	629*
40ZR 94	G,3N	67BE 2	15*	49IN	G,2N	74LE 1	630*
40ZR 94	G,1N	67BE 2	16*	49IN	G,SN	74LE 1	631*
41NB 93	G,1N	71LE 1	369*	49IN115	G,XN	62BO 1	457
41NB 93	G,2N	71LE 1	370*	50SN116	G,1N	69FU 1	117*
41NB 93	G,SN	71LE 1	371*	50SN116	G,2N	69FU 1	118*
42MO 92	G,XN	70IS 1	429	50SN116	G,SN	69FU 1	119*
42MO 92	G,1N	74BE 3	693*	50SN116	G,1N	74LE 1	641*

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
50SN116	G,2N	74LE 1	642*	53I 127	G,2N	69BE 6	475*
50SN116	G,SN	74LE 1	643*	53I 127	G,3N	69BE 6	476*
50SN117	G,1N	69FU 1	120*	53I 127	G,SN	69BE 6	602*
50SN117	G,2N	69FU 1	121*	55CS133	G,SN	69BE 1	150*
50SN117	G,3N	69FU 1	122*	55CS133	G,1N	69BE 1	151*
50SN117	G,SN	69FU 1	123*	55CS133	G,2N	69BE 1	152*
50SN117	G,N	70WI 2	717	55CS133	G,3N	69BE 1	153*
50SN117	G,1N	74LE 1	644*	55CS133	G,1N	74LE 1	638*
50SN117	G,2N	74LE 1	645*	55CS133	G,2N	74LE 1	639*
50SN117	G,SN	74LE 1	646*	55CS133	G,SN	74LE 1	640*
50SN118	G,1N	69FU 1	124*	56BA	G,1N	71BE 4	372*
50SN118	G,2N	69FU 1	125*	56BA	G,2N	71BE 4	373*
50SN118	G,3N	69FU 1	126*	56BA	G,SN	71BE 4	374*
50SN118	G,SN	69FU 1	127*	56BA138	G,2N	70BE 8	426*
50SN118	G,1N	74LE 1	647*	56BA138	G,SN	70BE 8	427*
50SN118	G,2N	74LE 1	648*	56BA138	G,3N	70BE 8	459*
50SN118	G,SN	74LE 1	649*	56BA138	G,1N	70BE 8	494*
50SN119	G,1N	69FU 1	128*	57LA139	G,1N	68BE 5	98*
50SN119	G,2N	69FU 1	129*	57LA139	G,2N	68BE 5	99*
50SN119	G,3N	69FU 1	130*	57LA139	G,3N	68BE 5	100*
50SN119	G,SN	69FU 1	131*	57LA139	G,SN	68BE 5	101*
50SN119	G,N	70WI 2	716	57LA139	G,1N	71BE 4	366*
50SN120	G,1N	69FU 1	132*	57LA139	G,2N	71BE 4	367*
50SN120	G,2N	69FU 1	133*	57LA139	G,SN	71BE 4	368*
50SN120	G,3N	69FU 1	134*	57LA139	G,XN	72DE 3	559
50SN120	G,SN	69FU 1	135*	58CE	G,3N	69BE 6	477*
50SN120	G,1N	74LE 1	650*	58CE	G,1N	69BE 6	603*
50SN120	G,2N	74LE 1	651*	58CE	G,2N	69BE 6	604*
50SN120	G,SN	74LE 1	652*	58CE	G,SN	69BE 6	616*
50SN124	G,1N	69FU 1	136*	58CE	G,1N	71BE 4	363*
50SN124	G,2N	69FU 1	137*	58CE	G,2N	71BE 4	364*
50SN124	G,3N	69FU 1	138*	58CE	G,SN	71BE 4	365*
50SN124	G,SN	69FU 1	139*	58CE140	G,1N	76LE 2	1014*
50SN124	G,1N	74LE 1	653*	58CE140	G,2N	76LE 2	1015*
50SN124	G,2N	74LE 1	654*	58CE140	G,SN	76LE 2	1016*
50SN124	G,SN	74LE 1	655*	58CE142	G,1N	76LE 2	1017*
51SB	G,1N	74LE 1	632*	58CE142	G,2N	76LE 2	1018*
51SB	G,2N	74LE 1	633*	58CE142	G,SN	76LE 2	1019*
51SB	G,SN	74LE 1	634*	59PR140	G,N	72DR 2	447
52TE	G,XN	56GA 1	566	59PR141	G,XN	58KA 1	301
52TE	G,1N	74LE 1	635*	59PR141	G,N	59CA 2	299
52TE	G,2N	74LE 1	636*	59PR141	G,2N	59CA 2	300
52TE	G,SN	74LE 1	637*	59PR141	G,N	59CA 3	298
52TE124	G,1N	76LE 2	1002*	59PR141	G,XN	60TH 1	302
52TE124	G,2N	76LE 2	1003*	59PR141	G,XN	64RI 1	580
52TE124	G,SN	76LE 2	1004*	59PR141	G,1N	66BR 1	304*
52TE126	G,1N	76LE 2	1005*	59PR141	G,2N	66ER 1	305*
52TE126	G,2N	76LE 2	1006*	59PR141	G,3N	66BR 1	306*
52TE126	G,SN	76LE 2	1007*	59PR141	G,SN	66BR 1	601*
52TE128	G,1N	76LE 2	1008*	59PR141	G,N	66CO 3	114
52TE128	G,2N	76LE 2	1009*	59PR141	G,N	66CO 3	308
52TE128	G,SN	76LE 2	1010*	59PR141	G,XN	67CA 1	576
52TE130	G,1N	76LE 2	1011*	59PR141	G,N	68CA 1	69
52TE130	G,2N	76LE 2	1012*	59PR141	G,1N	70SU 1	277*
52TE130	G,SN	76LE 2	1013*	59PR141	G,MU-T	71AH 1	579
53I 127	G,XN	56GA 1	563	59PR141	G,1N	71BE 4	390*
53I 127	G,SN	66BR 1	598*	59PR141	G,XN	72DE 3	560
53I 127	G,1N	66BR 1	599*	59PR141	G,N	72DE 3	577
53I 127	G,2N	66BR 1	600*	59PR141	G,XN	72DE 3	578
53I 127	G,1N	69BE 6	474*	60ND	G,1N	71BE 4	387*

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
60ND	G,2N	71BE 4	388*	64GD160	G,1N	69BE 8	159*
60ND	G,SN	71BE 4	389*	64GD160	G,2N	69BE 8	160*
60ND142	G,1N	71CA 1	391*	64GD160	G,3N	69BE 8	161*
60ND142	G,2N	71CA 1	392*	65TB159	G,1N	64BR 1	361*
60ND142	G,SN	71CA 1	393*	65TB159	G,2N	64BR 1	362*
60ND143	G,1N	71CA 1	394*	65TB159	G,SN	64FU 1	607*
60ND143	G,2N	71CA 1	395*	65TB159	G,1N	68BE 5	94*
60ND143	G,SN	71CA 1	396*	65TB159	G,2N	68BE 5	95*
60ND144	G,1N	71CA 1	397*	65TB159	G,3N	68BE 5	96*
60ND144	G,2N	71CA 1	398*	65TB159	G,SN	68BE 5	97*
60ND144	G,SN	71CA 1	399*	67HO165	G,XN	62FU 3	515*
60ND145	G,1N	71CA 1	400*	67HO165	G,1N	63BR 1	722
60ND145	G,2N	71CA 1	401*	67HO165	G,2N	63BR 1	723
60ND145	G,SN	71CA 1	402*	67HO165	G,SN	63BR 1	724
60ND146	G,1N	71CA 1	403*	67HO165	G,XN	63BR 1	725
60ND146	G,2N	71CA 1	404*	67HO165	G,SN	66AX 1	719
60ND146	G,SN	71CA 1	405*	67HO165	G,2N	66AX 1	720
60ND148	G,SN	69VA 2	208	67HO165	G,XN	66AX 1	721
60ND148	G,1N	71CA 1	406*	67HO165	G,1N	68BE 5	90*
60ND148	G,2N	71CA 1	407*	67HO165	G,2N	68BE 5	91*
60ND148	G,SN	71CA 1	408*	67HO165	G,3N	68BE 5	92*
60ND150	G,SN	69VA 2	209	67HO165	G,SN	68BE 5	93*
60ND150	G,1N	71CA 1	409*	67HO165	G,SN	69BE 8	162*
60ND150	G,2N	71CA 1	410*	67HO165	G,1N	69BE 8	163*
60ND150	G,SN	71CA 1	411*	67HO165	G,2N	69BE 8	164*
62SM	G,1N	69BE 6	478*	67HO165	G,3N	69BE 8	165*
62SM	G,2N	69BE 6	479*	68ER	G,1N	69BE 6	481*
62SM	G,3N	69BE 6	480*	68ER	G,2N	69BE 6	482*
62SM	G,SN	69BE 6	614*	68ER	G,3N	69BE 6	483*
62SM144	G,1N	74CA 5	678*	68ER	G,SN	69BE 6	615*
62SM144	G,2N	74CA 5	679*	71LU	G,SN	69BE 6	612*
62SM144	G,SN	74CA 5	680*	71LU175	G,1N	69BE 6	484*
62SM148	G,1N	74CA 5	681*	71LU175	G,2N	69BE 6	485*
62SM148	G,2N	74CA 5	682*	71LU175	G,3N	69BE 6	486*
62SM148	G,SN	74CA 5	683*	73TA181	G,XN	56GA 1	568
62SM150	G,SN	69VA 2	210	73TA181	G,XN	62BO 1	458
62SM150	G,SN	69VA 3	240	73TA181	G,1N	63BR 1	359*
62SM150	G,1N	74CA 5	684*	73TA181	G,2N+3N	63BR 1	360*
62SM150	G,2N	74CA 5	685*	73TA181	G,SN	63BR 1	544*
62SM150	G,SN	74CA 5	686*	73TA181	G,XN	67AN 2	552
62SM152	G,SN	69VA 2	211	73TA181	G,1N	68BE 5	85*
62SM152	G,1N	74CA 5	687*	73TA181	G,2N	68BE 5	86*
62SM152	G,2N	74CA 5	688*	73TA181	G,3N	68BE 5	87*
62SM152	G,SN	74CA 5	689*	73TA181	G,4N	68BE 5	88
62SM154	G,SN	69VA 2	212	73TA181	G,SN	68BE 5	89*
62SM154	G,SN	69VA 3	242	74W	G,1N	75VE 5	1020*
62SM154	G,1N	74CA 5	690*	74W	G,2N	75VE 5	1021*
62SM154	G,2N	74CA 5	691*	74W	G,SN	75VE 5	1022*
62SM154	G,SN	74CA 5	692*	74W 186	G,SN	69BE 8	166*
63EU151	G,SN	70VA 1	488	74W 186	G,1N	69BE 8	167*
63EU153	G,SN	69BE 8	154*	74W 186	G,2N	69BE 8	168*
63EU153	G,1N	69BE 8	155*	74W 186	G,3N	69BE 8	169*
63EU153	G,2N	69BE 8	156*	75RE	G,1N	75VE 5	1023*
63EU153	G,3N	69BE 8	157*	75RE	G,2N	75VE 5	1024*
63EU153	G,XN	70VA 1	489	75RE	G,SN	75VE 5	1025*
64GD152	G,XN	70VA 1	490	77IR	G,1N	75VE 5	1026*
64GD154	G,XN	70VA 1	491	77IR	G,2N	75VE 5	1027*
64GD156	G,XN	70VA 1	492	77IR	G,SN	75VE 5	1028*
64GD158	G,XN	70VA 1	493	78PT	G,2N	75VE 5	1030*
64GD160	G,SN	69BE 8	158*	78PT	G,SN	75VE 5	1031*

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
78PT	G,1N	75VE59	1029*	82PB208	G,SN	70VE 1	613*
79AU197	G,XN	56GA 1	567	83BI	G,XN	61MI 1	469
79AU197	G,XN	58FU 2	583*	83BI209	G,XN	56GA 1	565
79AU197	G,N	61NA 1	581	83BI209	G,1N	64HA 2	179*
79AU197	G,2N	61NA 1	582	83BI209	G,2N	64HA 2	180*
79AU197	G,1N	62FU 2	357*	83BI209	G,SN	64HA 2	181*
79AU197	G,2N+3N	62FU 2	358*	83BI209	G,XN	67AN 2	712
79AU197	G,SN	62FU 2	608*	90TH232	G,XN	56GA 1	562
79AU197	G,1N	70VE 1	334*	90TH232	G,F	71WA 1	460
79AU197	G,2N	70VE 1	335*	90TH232	G,1N	73VE 1	503*
79AU197	G,3N	70VE 1	336*	90TH232	G,2N	73VE 1	504*
79AU197	G,SN	70VE 1	337*	90TH232	G,F	73VE 1	505*
80HG	G,1N	75VE 5	1032*	90TH232	G,SN	73VE 1	506*
80HG	G,2N	75VE 5	1033*	90TH232	G,F	75DI 2	1066
80HG	G,SN	75VE 5	1034*	FIGURE 2A			
81TL203	G,SN	69AN10	451	92U	G,XN	56GA 1	550
XN CORRECTED FOR N-MULT				92U 235	G,N+F+...	64BO 3	423
81TL205	G,SN	69AN10	452	92U 235	G,1N	64BO 3	424
XN CORRECTED FOR N-MULT				92U 235	G,F	64BO 3	425
82PB	G,XN	61MI 1	470	92U 235	G,2N	64BO 3	442
82PB206	G,1N	64HA 2	170*	92U 235	G,N	64BO 3	538
82PB206	G,2N	64HA 2	171*	92U 235	G,F	72KH 1	543
82PB206	G,SN	64HA 2	172*	92U 235	G,F	73AN13	834
82PB207	G,1N	64HA 2	173*	92U 238	G,F	71WA 1	461
82PB207	G,2N	64HA 2	174*	92U 238	G,F	72KH 1	542
82PB207	G,SN	64HA 2	175*	92U 238	G,F	73AN13	833
82PB207	G,2N	64HA 2	463	92U 238	G,1N	73VE 1	495*
82PB207	G,N	71BA 2	415	92U 238	G,2N	73VE 1	496*
82PB208	G,XN	62FU 4	571*	92U 238	G,F	73VE 1	497*
82PB208	G,1N	64HA 2	176*	92U 238	G,SN	73VE 1	498*
82PB208	G,2N	64HA 2	177*	92U 238	G,F	75DI 2	1067
82PB208	G,SN	64HA 2	178*	FIGURE 1A			
82PB208	G,XN	70IS 3	264	93NP237	G,1N	73VE 1	499*
82PB208	G,1N	70VE 1	330*	93NP237	G,2N	73VE 1	500*
82PB208	G,2N	70VE 1	331*	93NP237	G,F	73VE 1	501*
82PB208	G,3N	70VE 1	332*	93NP237	G,SN	73VE 1	502*
82PB208	G,4N	70VE 1	333*				

9. PHOTONUCLEAR REACTION DATA BIBLIOGRAPHY 1973 THROUGH 1977

Note that starting with 1972 the method used to assign bibliographic reference codes was changed. Previous to 1972 both the first and second letter of the first author's name on each paper was used to order references. Starting with 1972 only the first letter is used. The Second letter is carried along simply as a dummy index to help the user identify a reference without having to go to the actual bibliographic list. Within the bibliography, papers are ordered first by year, second by the first letter of the first author's surname and finally by a serial number that can run from 1 to 99.

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10. DEFINITIONS OF ABBREVIATIONS AND SYMBOLS

10.1 Symbols Used to Define Incoming Beam and Reaction Products (Column 3)

Note: Where unknown reactions result in the production of a specific radio-nuclides, the chemical symbol and mass number is listed as the reaction product, e.g. a G,NA22 reaction in ^{59}Co .

A	alpha particle
D	deuteron
E	electron
E/	inelastically scattered electron
E+	positron
E/N	used only to indicate a coincidence experiment. N stands for any outgoing particle measured in coincidence with an inelastically scattered electron. Distinguish from eg. (E,N) which is used to represent an electron induced reaction when only the outgoing particle N is detected.
F	fission
G	photon
G/	inelastically scattered photon
HE	^3He particle
MU-T	used only in combination with G to indicate a total photon absorption cross section measurement, i.e. (G,MU-T)
N	neutron
P	proton
PI	pion, usually written as PI^+ , PI^0 , PI^- to indicate charge
SN	sum of neutron-producing reactions, $\sigma(\gamma, \text{SN}) = \sigma(\gamma, \text{N}) + \sigma(\gamma, \text{NP}) + \sigma(\gamma, 2\text{N}) + \sigma(\gamma, 3\text{N}) + \text{etc.}$
SPL	spallation
T	triton
XN	all neutrons, total neutron yield, $\sigma(\gamma, \text{XN}) = \sigma(\gamma, \text{N}) + 2\sigma(\gamma, 2\text{N}) + 3\sigma(\gamma, 3\text{N}) + (\text{x}, \text{NP}) + \text{etc.}$

XP all protons, total proton yield, $\sigma(\gamma, \text{XP}) = \sigma(\gamma, \text{P}) + \sigma(\gamma, \text{NP}) + 2\sigma(\gamma, 2\text{P}) + \text{etc.}$

XXX reaction products defined in REMARKS

10.2 Symbols and Abbreviations (Columns 2 and 4 through 8)

A	nuclear mass number
ABI	absolute integrated cross-section data
ABX	absolute cross-section data
ABY	absolute yield data. Often means cross-section per equivalent quantum is listed.
ACT	measurement of induced radio-activity 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	discrete. Used to describe a photon source or a detector response function. Contrast with C = continuous.
DST	an angular distribution i.e. measurements were made at two or more angles
DT BAL	detail balance

10.2 Symbols and Abbreviations (Columns 2 and 4 through 8) (continued)

EMU	emulsions (photographic plates)	RES	result. Symbols listed under RES indicate type of measurement made for a given reaction.
EXCIT	excitation. Usually the excitation energy of the nucleus in which a gamma-ray transition is made.	RLI	relative integrated cross-section data
FM-1	inverse femtometers	RLX	relative cross-section data
FMF	form factor	RSP	reaction spectrometer
G-WIDTH	Γ_γ , gamma-ray transition width	RLY	relative yield data
INT	interaction or type of reaction	SCD	semiconductor (solid state) detector
ION	ionization chamber	SCI	scintillator detector other than NaI, e.g., CsI, KI, organic (liquid or solid), stilbene, He
J	multiplicity of particle defined by following symbol e.g. (G,PJN) with remark J = 2,3,5,7	SEP ISOTP	separated isotope used
J-PI	spin and parity assignments of levels are made	SPC	photon or particle energy spectrum
K	second multiplicity index, e.g. (G,JPKN) with both J & K positive integers greater than 1	SPK	spark chamber
LFT	excited state lifetime	TEL	counter telescope
MAG	magnetic spectrometer	THR	threshold detector, e.g., $^{29}\text{Si}(n,p)^{29}\text{Al}$.
MGC	magnetic Compton spectrometer	TOF	time-of-flight detector
MGP	magnetic pair spectrometer	TRK	tracks of particles or fragments observed in solid materials (glass, mylar, etc.)
MOD	moderated neutron detector <u>not</u> employing a BF_3 counter, e.g., rhodium foil, Szilard-Chalmers reaction, ^3He , ^6Li reactions, GD loaded liquid scintillator, etc.	XN	all neutrons. See Section 10.1 $\sigma(\text{XN}) \equiv \sigma(\gamma, \text{XN})$
MSP	mass spectrometer	UNK	unknown
NAI	NaI(Tl) spectrometer	Z	atomic number (number of protons)
NOX	no cross-section data	4PI	a 4π geometry was used or a method like radioactivity or a total absorption measurement
POL	polarization	999	energy defined in REMARKS
Q-SQUARE	momentum transfer squared (q^2)	\$	indicates the measurement involved either beams or targets that were polarized/aligned, or that the polarization of the reactions products was determined. Polarized quantity indicated in REMARKS.
REF	reference. The bibliographic reference code assigned to a paper by the Photonuclear Data Center.	*	units defined in REMARKS
REL	relative		

ERRATA FOR
NBS SP-380 Photonuclear Reaction Data, 1973

- p.3, eq.(2) and p.10, eq.(4): In the numerator of all expressions where it appears replace $(E\Gamma_i)$ by $(E\Gamma_i)^2$
- p.7, Table 1: For oxygen total cross section, entry for SIG-0 should read 480(140)
- p.16 In Abundance and Separation Energy Table for Helium remove listing for A=2
- p.40 In Abundance and Separation Energy Table for Rhodium change the value for A listed to 103
- p.72 Change the line starting 62Fil to read
62Fil F.W.K. Firk, K. H. Lokan; Phys. Rev. Lett. 8, 321 (1962).
- p.101 Change the line starting 68Wu1 to read
68Wu1 C.P. Wu, F.W.K. Firk, T.W. Phillips; Phys. Rev. Lett. 20, 1182 (1968).

DATA INDEX ENTRIES

The following list of data index entries are the correct version of the corresponding ones given in SP-380. In each line, the expression that has been corrected is underlined.

71VE1	3LI6	<u>HE,G</u>	ABX	20- 28 D	9- 26	NAI-D	DST	HE3 BEAM
67BA2	3LI7	G, <u>XN</u>	ABX	THR- 50 C	7- 50	BF3-I	4PI	
65CD2	4BE9	G,XN	<u>ABX</u>	6- 80 C	6- 80	BF3-I	4PI	
66CD4	4BE9	G, <u>XN</u>	ABX	6- 80 C	6- 80	BF3-I	4PI	
71NA1	6C 12	E,E/	FMF	<u>4- 17</u> D250		MAG-D	DST	LEVELS 14.1,4.43
64DE2	6C 13	G, <u>P</u>	ABX	<u>18- 50</u> C	18- 50	ACT-I	4PI	
67FE2	80 16	G,XN	ABX	<u>19-150</u>	<u>C100-150</u>	BF3-I	4PI	
65MA1	80 16	G, <u>NG</u>	SPC	<u>19- 30</u> C	<u>21- 31</u>	NAI-D	140	
70HC1	80 16	G,NG	RLY	21- 27 C	27, 36	<u>SCD-D</u>	DST	
65MA1	80 16	G, <u>PG</u>	SPC	<u>19- 30</u> C	<u>21- 31</u>	NAI-D	140	
70HO1	80 16	G,PG	RLY	17- 27 C	27, 36	<u>SCD-D</u>	DST	
63SU2	80 16	D,G	ABX	21- 25 D	1- 5	NAI-D	DST	
64SU1	80 16	D,G	ABX	<u>21- 25</u> D	1- 5	NAI-D	DST	
66SU1	80 16	D,G	ABX	21- <u>25</u> D	1- 5	NAI-D	DST	
69AN3	13AL27	G, <u>N</u>	RLX	13- 65 C	13- 65	ACT-I	4PI	
69FU2	13AL27	G, <u>SPL</u>	RLY	THR-999	D999	<u>ACT-I</u>	DST	999=3 GEV
66GD3	14SI	G,XN	ABX	17- 30 C	17- 30	BF3-I	4PI	
61SH1	14SI	G,P	SPC	14- 24 C	24	EMU-D	UKN	
62BI1	14SI	G,P	SPC	18	D 18	SCD-D	DST	
64UL3	14SI	G,P	SPC	<u>13- 23</u> C	<u>24</u>	SCD-D	4PI	
69AN6	14SI	G,P	ABY	<u>109-999</u>	<u>C700,999</u>	TEL-D	DST	999=1.2 GEV
69AN6	14SI	G,D	ABY	120-999	C700,999	TEL-D	DST	999=1.2 GEV
62BI1	14SI	G,A	SPC	18	D 18	SCD-D	DST	

CORRECTED INDEX ENTRIES (CORRECTIONS UNDERLINED)

66MI2	20CA40	G,N	ABX	15- <u>26</u>	D 15- <u>26</u>	BF3-I	4PI	
67BE8	23V 51	G,3N	ABY	30- 37	C <u> </u>	37	ACT-I	4PI
69FU2	26FE	G,SPL	RLY	THR-999	D999		<u>ACT-I</u>	DST 999=3 GEV
70CD1	30ZN <u>64</u>	G,N	RLX	12- 40	C 10- 40		ACT-I	4PI
57EL1	30ZN <u>64</u>	G,2N	<u>ABI</u>	THR- 30	C 32		ACT-I	4PI
70CD1	30ZN <u>64</u>	G,2N	RLX	21- 40	C 10- 40		ACT-I	4PI
70CD1	30ZN <u>64</u>	G,NP	RLX	19- 40	C 10- 40		ACT-I	4PI
57EL1	30ZN68	G,P	<u>ABX</u>	10- 30	C 14- 32		ACT-I	4PI
62MI3	57LA139	G, <u>XN</u>	ABX	10- 21	D 10- 21		BF3-I	4PI
62MI3	58CE	G, <u>XN</u>	ABX	10- 21	D 10- 21		BF3-I	4PI
71SH3	58CE140	E,P	ABX	15- 22	D <u>23</u>		MAG-D	90 ISCBARIC ANALOGS
71SH3	60ND142	E,P	ABX	15- 22	D <u>23</u>		MAG-D	90 ISCBARIC ANALOGS
71SH3	62SM144	E,P	ABX	15- 22	D <u>22</u>		MAG-D	90 ISCBARIC ANALOGS
62MI3	73TA181	G, <u>XN</u>	ABX	7- 22	D 7- 22		BF3-I	4PI
62MI3	79AU197	G, <u>XN</u>	ABX	6- 22	D 6- 22		BF3-I	4PI
62MI3	82PB	G, <u>XN</u>	ABX	6- 22	D 6- 22		BF3-I	4PI

OMITTED INDEX ENTRIES

71KU5	23V 51	G,SPL	ABY	THR-999	C	999	ACT-I	4PI	999=1.5 GEV
71KU5	23V 51	G,PI+	ABY	THR-999	C200-999		ACT-I	4PI	999=2.2 GEV
62MI3	29CU	G,XN	ABX	10- 20	D 10- 20		BF3-I	4PI	
60TH1	67HO165	G,N	ABX	8- 18	C 11- 18		ACT-I	4PI	

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET		1. PUBLICATION OR REPORT NO. NBS SP-380, Suppl. 1	2. Gov't Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE Photonuclear Data Index, 1973-1977			5. Publication Date August 1978	
			6. Performing Organization Code	
7. AUTHOR(S) E. G. Fuller and H. M. Gerstenberg			8. Performing Organ. Report No.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234			10. Project/Task/Work Unit No. 5322232	
			11. Contract/Grant No.	
12. Sponsoring Organization Name and Complete Address (Street, City, State, ZIP) Same as No. 9			13. Type of Report & Period Covered Jan. 1973-Jan. 1978	
			14. Sponsoring Agency Code	
15. SUPPLEMENTARY NOTES				
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.) This index, a supplement to NBS Special Publication 380, Photonuclear Reaction Data, 1973, primarily covers data published in the period from January 1965 through December 1977. 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 in the measurement. Also included is an index to the more than 100 ⁿ data sets currently available in the Photonuclear Data Center's digital data library.				
17. KEY WORDS (six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons) Bibliography, data index, elements, isotopes, nuclear physics, photonuclear reactions				
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