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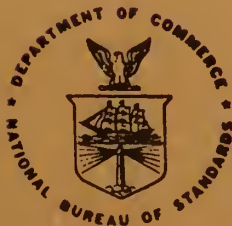
# Photonuclear Data Index, 1973-1981

(Supplement 2 to NBS Special Publication 380)

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U.S. DEPARTMENT OF COMMERCE  
National Bureau of Standards  
National Measurement Laboratory  
Center for Radiation Research  
Washington, DC 20234

August, 1983



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**PHOTONUCLEAR DATA INDEX,  
1973-1981**  
**(Supplement 2 to NBS Special Publication 380)**

E. G. Fuller, Henry Gerstenberg

U.S. DEPARTMENT OF COMMERCE  
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**U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, Secretary**  
**NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director**





## Foreword

The National Standard Reference Data System was established in 1963 for the purpose of promoting the critical evaluation and dissemination of numerical data of the physical sciences. The program is coordinated by the Office of Standard Reference Data of the National Bureau of Standards but involves the efforts of many groups in universities, government laboratories, and private industry. The primary aim of the program is to provide compilations of critically evaluated physical and chemical property data. These tables are published in the Journal of Physical and Chemical Reference Data, in the NSRDS-NBS series of the National Bureau of Standards, and through other appropriate channels.

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 1981

E. G. Fuller and Henry Gerstenberg

This index, a supplement to NBS Special Publication 380, Photonuclear Reaction Data, 1973, primarily covers data published in the period from January 1973 through December 1981. It supersedes the first supplement to Special Publication 380 issued in August 1978. 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 data sets currently available in the Photonuclear Data Group's digital data library.

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

## 1. INTRODUCTION

This Photonuclear Data Index is the seventh one published by the Photonuclear Data Group. NBS Special Publication 380, Photonuclear Reaction Data, 1973, contains a cumulative, annotated data index covering articles published from January 1, 1955 through 1972. The present index includes the entries listed in the first supplement to Special Publication 380 issued in 1978, as well as new ones derived from the literature published for the field for the period from January 1978 through December 1981. In addition it also contains entries based on articles published prior to 1973 that have been added to the data files subsequent to the publication of NBS Special Publication 380. Some of these entries predate the original January 1, 1955 starting date for the data index. No attempt has been made to be either consistent or comprehensive in the selection of pre-1955 papers. Those selected have all been papers referenced in recent data evaluations.

All of the entries in this index are derived from experimental papers that have been published either in scientific journals or as rather complete reports in the proceedings of international conferences. Since 1979, rather than regularly searching a group of core journals for new information, annotated reference lists have been used to locate most of the new publications in the field. These lists were provided first, by the Nuclear Data Project at Oak Ridge National Laboratory and later, by the National Nuclear Data Center at the Brookhaven National Laboratory. The entries in this index cover papers published in the following core journals through the indicated issues.

### Journal

### Last Issue

Canadian Journal of Physics	Vol. <u>59</u> #12
Physical Review C	Vol. <u>24</u> #6
Physical Review Letters	Vol. <u>47</u> #26
Nuclear Physics	Vol. <u>A372</u> #3
Physics Letters	Vol. <u>B107</u> #6
Soviet J. Nuclear Physics	Vol. <u>24</u> #2
Journal of Physics G	Vol. <u>7</u> #12
Zeitschrift fur Physik	Vol. <u>7</u> #12

In addition to the annotated data index and bibliography this supplement also contains, in Section 8, an index to the data available in the Digital Photonuclear Reaction Data Library. This library now contains data for Neptunium, Uranium and Thorium as well as for 74 of the 81 naturally occurring elements from Hydrogen through Bismuth. Data are available for 125 stable nuclides, about half of those existing in nature with abundances greater than two percent. The last section, 11, contains an Errata List for NBS Special Publication 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 a complete description of each measurement 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 to



readily locate a pertinent reference without having to go through a large number 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 a given nucleus. The most common types of reactions included in this index are:  $(e,e')$ ,  $(\gamma,\gamma)$ ,  $(\gamma,n)$ ,  $(\gamma,p)$ , and  $(p,\gamma_0)$ .

Two reactions which fit the matrix element criterion are not included in the compilation because of their rather special nature. These are heavy particle Coulomb excitation and the thermal neutron capture reaction  $(n,\gamma_0)$ . While the energy region of particular interest extends from 0 to 150 Mev, papers are indexed which report measurements in the region from 150 Mev to 4 Gev. Most of the experiments listed are concerned with the excitation energy range from 8 to 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 in NBS Special Publication 380. The abundances are taken from an evaluation prepared by N. E. Holden [1]\*. The separation energies were taken from the tabulation of Wapstra and Bos [2] 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 the 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

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

#### 1) 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 surname, plus an additional left-justified serial number. See note at the start of the bibliography on page 92 regarding the method used to assign these codes.

#### 2) NUCLIDE

This column specifies the nuclide in which the gamma-ray transition takes place. Its atomic number (Z), chemical symbol, and mass number (A) are listed. Note that for ground-state capture reactions this is not the target nuclide. The mass number is listed only if the isotopic assignment is unambiguous. In general, it is assumed that the mass number is unambiguous if, in the target, the abundance of a single isotope is >97%.

#### 3) REACTION

The notation used is based on the usual one for specifying nuclear reactions. See, however, the specific definitions used for the reactions  $(E,N)$ ,  $(E,E/N)$ ,  $(G,N)$ ,  $(G,SN)$  and  $(G,XN)$ . When an unknown reaction results in the production of a specific radioactive nuclide, the chemical symbol and mass number is listed as the reaction product, e.g. a  $(G,NA22)$  reaction in  $^{59}\text{Co}$ .

#### 4) 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.

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

## 5) 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 is given under REMARKS. Where an MeV scale is inappropriate for the measurement a \* or @ is entered and the appropriate units are defined in REMARKS.

## 6) SOURCE

Source Type and Energy Range. The source of the incident particles is characterized by the letter C or D indicating that it was either continuous or discrete in energy. A 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 a MeV scale is inappropriate for the measurement.

## 7) DETECTOR

Detector Type and Angular Range. The symbols used to indicate the type of detector used

in the 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 spectrometer (SCI) is usually used differentially (D) while a BF<sub>3</sub> detector (BF3) generally 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 integrated over all outgoing particle directions.

## 8) REMARKS

A short phrase included to give additional information that will make the 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. ACKNOWLEDGMENT

The authors gratefully acknowledge the co-operation of both the Oak Ridge Data Project and the Brookhaven National Nuclear Data Center in providing us with the annotated reference lists. Without these lists this data index would not be available at this time.

## 6. REFERENCES FOR TEXT

- (1) N. E. Holden, Pure and Appl. Chem. 51, 405 (1979).
- (2) A. H. Wapstra and K. Bos, Atomic Data and Nuclear Data Tables 19, 177 (1977).

7. PHOTONUCLEAR DATA INDEX  
1973 THROUGH 1981

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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
80ST3	1H	1	E,PI+	RLY	175-199	C230	MAG-D	90	TEST VIRTUAL PHOTONS
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	
79AR1	1H	1	G,PI+	ABX	150-156	C152-156	ACT-I	90	
79B01	1H	1	G,PI+	RLY	151-174	C151-174	ACT-I	90	
79GE4	1H	1	\$ G,PI+	NOX	150-340	D340	MAG-D	DST	POL. P, UP/DOWN ASM
79GE7	1H	1	\$ G,PI+	NOX	340	C * 1	MAG-D	DST	*E IN GEV, \$G,\$P
80ST3	1H	1	G,PI+	RLY	175-199	C230	MAG-D	90	TEST VIRTUAL PHOTONS
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	
74G03	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	
75D01	1H	1	G,PIO	ABX	360-938	C999	TEL-D	DST	999=1.2 GEV
76AB7	1H	1	\$ G,PIO	ABX	900-999	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
76D06	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
76GA6	1H	1	\$ G,PIO	RLX	250-650	C 1* 2	TEL-D	DST	1.15*1.4GEV, COH-BRMS
77AL5	1H	1	G,PIO	ABX	320	C350	CKV-D	DST	
77AR7	1H	1	G,PIO	ABX	500-930	D500-930	MAG-D	DST	
77D05	1H	1	G,PIO	ABX	262-238	C375-475	TEL-D	DST	
77G03	1H	1	\$ G,PIO	NOX	500	D500	MSP-D	DST	POL PHOTONS, PROTONS
78AL12	1H	1	G,PIO	ABX	290-360	C350,563	CKV-D	DST	
78DE9	1H	1	\$ G,PIO	NOX	480-800	C UKN	MAG-D	99	POLARIZED PROTONS
78VA5	1H	1	\$ G,PIO	NOX	THR-800	C800	MAG-D	UKN	POLARIZED PROTONS
78ZY5	1H	1	\$ G,PIO	NOX	650,700	C UKN	MAG-D	DST	POL PROTON RECOIL
80AR2	1H	1	G,PIO	ABY	145-153	C146-153	CKV-D	0	THRESHOLD MEASUREMENT
80BR9	1H	1	\$ G,PIO	NOX	500-800	D UKN	TEL-D	DST	POL G, POL RECOIL P
80KA4	1H	1	\$ G,PIO	NOX	400-999	C600-999	TEL-D	DST	999=1142 MEV, \$RCL P
80Y03	1H	1	G,PIO	ABX	390-975	C550-999	TEL-D	DST	999=1 GEV
81AR2	1H	1	G,PIO	ABY	146-153	C146-153	CKV-D	0	REANALYSIS OF 80AR2
81BR8	1H	1	\$ G,PIC	NOX	150-999	C800-999	MAG-D	60	999=1.3GEV, \$P RECOIL



REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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	
80IS7	1H 1	G,G	ABX	375-999	C 1*	TEL-D	DST	999=1.15GEV, 1*1.3GEV
81WA4	1H 1	\$ G,G	NOX	400-999	C400-999	MAG-D	DST	\$H \$P, P-G COIN
76SI11	1H 2	E,E/	ABX	2- 80	D 80-300	MAG-D	DST	
79SI5	1H 2	E,E/	FMF	2- 12	C 80-300	MAG-D	DST	Q=.71-2 FM-1
80J02	1H 2	E,E/	ABX	0- 19	C 56	MAG-D	180	FMF
81BE1	1H 2	E,E/	ABX	0- 15	D280-535	MAG-D	155	DLTQ 6-19 FM-2
73SH18	1H 2	E,E/P	ABX	18, 35	D 38,106	MAG-D	DST	COIN OF E WITH 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	D816,999	MAG-D	DST	999=1.195 GEV, *MEV/C
77AG8	1H 2	E,E/P	SPC	160*300	D999	MAG-D	20	*MEV/C 999=1180 MEV
81BE11	1H 2	E,E/P	ABX	105,147	D500	MAG-D	DST	COINCIDENCE
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	D(G,PI+)/P(G,PI+)
79B01	1H 2	G,PI+	ABX	149-174	C149-174	ACT-I	90	
79GA3	1H 2	G,PI+	RLY	150-560	C150-560	TEL-D	DST	D(G,PI+)/H(G,PI+)
74CL10	1H 2	G,PIO	RLX	150-450	C250-450	TOF-D	DST	TAGGED PHOTONS
78AR2	1H 2	G,PIO	ABY	141-147	C147	TEL-D	DST	
80AR2	1H 2	G,PIO	ABY	140-151	C141-151	CKV-D	0	THRESHOLD MEASUREMENT
81AR2	1H 2	G,PIO	ABY	141-149	C141-149	CKV-D	0	REANALYSIS OF 80AR2
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	
78AR1	1H 2	G,PI-	ABX	365-460	C400,500	MAG-D	DST	(P,PI-,P)COIN
78AR8	1H 2	G,PI-	ABX	150-500	C250-500	MAG-D	DST	PI- IN COIN WITH P
80TA5	1H 2	\$ G,PI-P	NOX	700-999	C999	TEL-D	DST	999=1.2 GEV, POL P
72AR14	1H 2	G,HAD	ABX	265-999	D265-999	TEL-I	4PI	999=4.215 GEV
74AH9	1H 2	G,MU-T	ABX	15- 25	C UKN	MGC-D	4PI	
80DE4	1H 2	\$ G,N	RLY	21	D 21	TOF-D	90	POLARIZED PHOTONS
81DE1	1H 2	\$ G,N	NOX	10- 70	D 10- 70	TOF-D	90	\$G CIRCULAR, LINEAR
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=1.2 GEV
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	
78VA5	1H 2	\$ G,P	NOX	THR-800	C600,800	MAG-D	UKN	POLARIZED PROTONS
79IK1	1H 2	\$ G,P	ABX	400-650	C UKN	MAG-D	DST	POLARIZED PROTONS
80BR6	1H 2	\$ G,P	NOX	375-700	C UKN	MAG-D	DST	POLARIZED PROTONS
80BR7	1H 2	\$ G,P	NOX	375-460	C UKN	MAG-D	90	POLARIZED PROTONS
80BR8	1H 2	\$ G,P	NOX	375-700	C UKN	MAG-D	DST	POLARIZED PROTONS
81UE1	1H 2	G,P	RLX	2-160	C160	TEL-D	90	
82BA1	1H 2	G,P	ABX	180-600	D180-600	MAG-D	DST	
79G08	1H 2	\$ G,NP	NOX	400-600	C 1* 2	MAG-D	DST	*E GEV,\$G, N-P COIN
80G06	1H 2	\$ G,NP	NOX	80-400	C600-999	MAG-D	DST	999=1.2 GEV, COH-BRMS
80IS3	1H 2	\$ G,NP	NOX	400-650	C UKN	MAG-D	DST	POLARIZED PROTONS
77K05	1H 2	\$ N,G	NOX	2	D 1	NAI-D	90	POL OF G
79B010	1H 2	N,G	ABX	20- 39	D 37- 73	TOF-D	4PI	
81GI4	1H 2	N,G	ABX	38	D 72	TEL-D	DST	SIGMA 0 AND 180 DEG
73AR11	1H 2	N,2G	ABX	2	D 0	NAI-D	180	ANG BTW DET, SIG LIM
76EA3	1H 2	N,2G	ABX	2	D 0	SCD-D	85	ANG BTW DET, SIG LIM

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
80FA2	1H 3	G,N	ABX	6- 20	D 6- 20	BF3-I 4PI	
81FA1	1H 3	G,N	ABX	6- 24	D 6- 24	BF3-I 4PI	
80FA2	1H 3	G,2N	ABX	8- 26	D 8- 26	BF3-I 4PI	
81FA1	1H 3	G,2N	ABX	8- 28	D 8- 28	BF3-I 4PI	
31SK4	1H 3	G,D	ABX	15- 36	C100	MAG-D DST	

HELIUM Z=2

A	ABUND.	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	100.	20.6	19.8	19.8	20.6	*	28.3	26.1	28.3

REF	NUCLIDE Z	REACTION A IN,OUT	RES	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	QUASI-ELASTIC
78KU9	2HE3	E,E/	ABX	350*550	D999	MAG-D DST	*Q MEV/C, 999=1211MEV
79J04	2HE3	E,E/	ABX	0- 30	D 40- 61	MAG-D 180	
80MC3	2HE3	E,E/	NOX	23 7	D 3* 11	MAG-D UKN	@FM-1, *GEV
73SH18	2HE3	E,E/P	SPC	18- 30	D100	MAG-D DST	COIN OF E WITH P
78G06	2HE3	E,E/P	ABX	150*	D999	MAG-D 30	*MEV/C, 999=1.2 GEV
79G09	2HE3	E,E/P	ABX	UKN	C999	MAG-D DST	999=1200 MEV
80G03	2HE3	E,E/P	SPC	0*100	C643,806	MAG-D UKN	*MEV/C
81K02	2HE3	E,E/P	ABX	THR-806	D643,806	MAG-D DST	2,3 BODY BRKUP, COIN
78SK6	2HE3	E,PI+	ABX	170-190	D170-190	MAG-D DST	
72SH8	2HE3	E,D	RLX	19- 30	D100	MAG-D DST	PROTONS IN COIN
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	COIN OF T WITH PI+
79AR1	2HE3	G,PI+	ABX	150-156	C152-156	ACT-I 90	
80AR2	2HE3	G,PIO	ABY	138-148	C140-148	CKV-D 0	THRESHOLD MEASUREMENT
81AR2	2HE3	G,PIO	ABY	140-147	C140-147	CKV-D 0	REANALYSIS OF 80AR2
81BE3	2HE3	G,PIO	ABX	280-386	C300-450	MGP-D 0	
74BE3	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
81FA1	2HE3	G,N	ABX	7- 25	D 7- 25	BF3-I 4PI	
81GA5	2HE3	G,P	ABX	200-450	C500	TOF-D DST	P - D COIN
68PI1	2HE3	G,D	ABX	180-550	C800	TEL-D 90	
73T22	2HE3	G,D	ABX	160-370	C	MAG-D DST	P DETECTED IN COIN
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 COIN
75HE7	2HE3	G,D	RLY	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	
79SK4	2HE3	\$ P,G	ABX	7- 15	D 3- 15	NAI-D DST	POLARIZED PROTONS
80NE2	2HE3	P,G	ABX	308,375	D450,550	MAG-D DST	GAMMA-HE3 COIN



REF	NUCLIDE Z	REACTION A IN/OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
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	QUASI-ELASTIC
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
78AL10	2HE4	G,PIO	ABI	1* 5	C 1* 5	TEL-D DST	*ENERGY IN GEV
80AR2	2HE4	G,PIO	ABY	137-148	C139-148	CKV-D 0	THRESHOLD MEASUREMENT
81AR2	2HE4	G,PIO	ABY	139-148	C139-148	CKV-D 0	REANALYSIS OF 80AR2
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 COIN
81AR1	2HE4	G,MU-T	ABX	215-386	D215-386	TOF-D 4PI	DATA ALSO IN 81AR3
81AR3	2HE4	G,MU-T	ABX	215-386	D215-386	TOF-D 4PI	
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 COIN
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 COIN
75AR10	2HE4	G,N	ABX	27- 30	C UKN	CCH-D DST	
75IR1	2HE4	G,N	ABX	22- 32	C 22- 33	TOF-D DST	
76AR8	2HE4	G,N	ABX	21-150	C UKN	CCH-D 4PI	
77BA14	2HE4	G,N	ABX	20- 46	C 85	CCH-D DST	
80AR13	2HE4	G,N	ABI	21-150	C UKN	CCH-D 4PI	
80BE1	2HE4	G,1N	ABX	21- 47	D 21- 47	BF3-I 4PI	
74IR1	2HE4	G,XN	RLY	20- 35	C 35	TOF-I 98	LQD HE,N YLD VS G INT
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 COIN
77BA14	2HE4	G,P	ABX	20- 46	C 85	CCH-D DST	
79AR3	2HE4	G,P	ABX	197-420	C500	TOF-D DST	
80AR13	2HE4	G,P	ABI	19-150	C UKN	CCH-D 4PI	
74AR6	2HE4	G,NP	ABI	26-120	C150	CCH-D 4PI	ENERGY MOMENTS
77BA14	2HE4	G,NP	ABX	28- 75	C 85	CCH-D DST	
79BA5	2HE4	G,NP	ABX	26- 60	C120	CCH-D DST	
80AR12	2HE4	G,NP	SPC	26-150	C150	CCH-D DST	SPC D,P,N REL PD ETC
80AR13	2HE4	G,NP	ABI	26-150	C UKN	CCH-D 4PI	
74AR6	2HE4	G,2N2P	ABI	26-120	C150	CCH-D 4PI	ENERGY MOMENTS
77BA14	2HE4	G,2N2P	ABX	28, 70	C 85	CCH-D 4PI	
79BA5	2HE4	G,2N2P	ABX	28- 60	C120	CCH-D DST	
80AR13	2HE4	G,2N2P	ABI	28-150	C UKN	CCH-D 4PI	
73TZ2	2HE4	G,PT	ABX	190-415	C	MAG-D DST	PT DETECTED IN COIN
76AR5	2HE4	G,D	ABX	201-359	C UKN	TEL-D DST	COIN OF D WITH D
74AR6	2HE4	G,2D	ABI	26-120	C150	CCH-D 4PI	ENERGY MOMENTS
80AR13	2HE4	G,2D	ABI	23-150	C UKN	CCH-D 4PI	
79PH3	2HE4	G,T	RLX	31- 51	D 31- 51	TEL-D 90	SIGMA RATIO G,P/G,N
81UE1	2HE4	G,T	RLY	5-100	C100	TEL-D DST	
79PH3	2HE4	G,HE3	RLX	31- 51	D 31- 51	TEL-D 90	SIGMA RATIO G,P/G,N
81UE1	2HE4	G,HE3	RLY	21-100	C100	TEL-D DST	
79AL6	2HE4	N,G	ABX	20- 22	D 0- 1	NAI-D DST	SIGMA AT THRESHOLD
81WA3	2HE4	N,G	ABX	24- 34	D 1- 17	NAI-D DST	
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	
80DE5	2HE4	P,G	SPC	20- 21	D460*930	NAI-D DST	*KEV, J-PI
80MC2	2HE4	P,G	ABX	26- 44	D 8- 31	NAI-D DST	
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	
78RE5	2HE6	PI,G	SPC	150	D 0	MGP-D UKN	PI IS PI-

## LITHIUM Z=3

A	ABUND.	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
79SK3	3LI	E,T	ABX	5- 50	D 20- 50	MAG-D DST	VIRTUAL PHOTON ANAL
81BE3	3LI	G,PIO	ABX	280-386	C300-450	MGP-D 0	
74AH3	3LI	G,MU-T	ABX	15-220	C300	MGC-D 4PI	
75AH3	3LI	G,MU-T	ABX	10-210	C140-275	MGC-D 4PI	
73D09	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	QUASI-ELASTIC
74YE1	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	
77BU13	3LI6	E,E/	FMF	UKN	D 82-292	MAG-D DST	
79BE6	3LI6	E,E/	FMF	2- 5	D141-330	MAG-D DST	Q=1-3 FM-1, 2+, 0+, 2+
80BE3	3LI6	E,E/	FMF	6	D 76-141	MAG-D DST	6=5.37 MEV
80BE4	3LI6	E,E/	FMF	12- 20	D102,123	MAG-D DST	T, HE3 BREAK UP
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
78NA3	3LI6	E,E/P	SPC	0* 60	D700	MAG-D 53	*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	*DLTQ TRNS 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	*DLTQ TRNS 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	
74G01	3LI6	G,PI+	ABY	150-400	C400	BBL-D 90	
81SH3	3LI6	G,PI+	ABX	100*230	D170-195	MAG-D DST	*MEV/C G,PI FROM E,PI
74G01	3LI6	G,PI-	ABY	150-400	C400	BBL-D 90	
79EP2	3LI6	G,PIOP	ABY	0*520	C450	CKV-D DST	*MEV/C, COIN
73SA14	3LI6	G,G	LFT	3	C 5	NAI-D 120	3=3.56 MEV
73DE14	3LI6	G,PL	ABX	15- 26	C 20- 57	TEL-D 90	L=0, 1, 2
73GA3	3LI6	G,P	ABX	60	D 60	MAG-D 45	
74G01	3LI6	G,P	ABY	4-400	C400	BBL-D 90	
76MA3	3LI6	G,P	ABX	60-100	D 60-100	MAG-D DST	
79JU6	3LI6	G,P	ABX	7- 24	C 35	TEL-D DST	
80KU1	3LI6	G,P	RLY	5- 15	C 10, 15	EMU-D DST	
79SK11	3LI6	G,XP	ABX	13- 19	D 20- 35	MAG-D DST	VIR PHOT, SEE 70W01
73DE14	3LI6	G,ND	ABI	24- 50	C 20- 57	TEL-D 90	
73DE14	3LI6	G,N2P	ABI	23- 50	C 20- 57	TEL-D 90	INC G,2NP
78V04	3LI6	G,PT	ABX	21- 55	C 34- 55	TEL-D DST	COIN T WITH P
73DE14	3LI6	G,PD	ABI	21- 50	C 20- 57	TEL-D 90	
78V04	3LI6	G,DT	ABX	21- 55	C 29- 55	TEL-D DST	COIN T WITH D
79JU6	3LI6	G,D	ABX	4- 14	C 35	TEL-D 90	
73DE14	3LI6	G,T	ABI	25- 51	C 20- 57	TEL-D 90	
78V04	3LI6	G,T	ABX	16- 55	C 38- 55	TEL-D DST	2 BODY BREAKUP ONLY
79JU6	3LI6	G,T	ABX	19- 36	C 30, 35	TEL-D DST	
78V04	3LI6	G,XT	ABX	16- 55	C 29- 55	TEL-D 90	

REF	NUCLIDE		REACTION RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A				IN,OUT	TYPE	
79JU6	3	Li6	G,A	ABX 17- 34	C 35	TEL-D	DST	
75BE3	3	Li6	A,G	LFT 3	D 3	SCD-D	90	3=3.562, LIMIT ON LFT
81R01	3	Li6	A,G	ABX 2- 10	D 0- 8	MAG-D	DST	
73KU7	3	Li7	E,E/	ABX 84-284	D999	MAG-D	DST	999=1.184 GEV
80TI4	3	Li7	E,E/	ABX 100-400	D450-999	MAG-D	DST	999=1096 MEV
72HI8	3	Li7	E,E/P	NOX 5* 35	D700	MAG-D	DST	*SEP ENERGY RANGE
73HI5	3	Li7	E,E/P	SPC 0* 70	D700	MAG-D	UKN	*SEP ENERGY RANGE
78NA3	3	Li7	E,E/P	SPC 0* 60	D700	MAG-D	53	*SEP ENERGY RANGE
79B03	3	Li7	E,PI-	RLX 200-360	D150-360	ACT-I	90	
80AS3	3	Li7	E,HE6	ABX 80-110	D108-198	MAG-D	DST	2 BODY, VIR PHOT ANAL
80AS3	3	Li7	E,BE7	ABX 80-163	D163	MAG-D	DST	2 BODY, VIR PHOT ANAL
74G01	3	Li7	G,PI+	ABY 150-400	C400	BBL-D	90	
71N01	3	Li7	G,PI-	ABY 150-999	C140-999	ACT-I	4PI	999=1.2 GEV
74G01	3	Li7	G,PI-	ABY 150-400	C400	BBL-D	90	
79B03	3	Li7	G,PI-	ABX 150-360	C150-360	ACT-I	90	
73AH4	3	Li7	G,MU-T	ABX 10-140	C140	MGC-D	4PI	
73BR11	3	Li7	G,N	ABX 7- 31	D 7- 31	BF3-I	4PI	
78DE7	3	Li7	G,NG	ABI 7- 55	C 58	SCD-D	125	6LI 3.56 MEV GAMMA
73BR11	3	Li7	G,2N	ABX 11- 31	D 11- 31	BF3-I	4PI	
73GA3	3	Li7	G,P	ABX 60	D 60	MAG-D	45	
74DE11	3	Li7	G,P	ABX 12- 40	C 15- 40	TEL-D	90	SEP ISOTOPES
74G01	3	Li7	G,P	ABY 10-400	C400	BBL-D	90	
75DE7	3	Li7	G,P	ABI 10- 51	C 15- 51	TEL-D	90	SEE ALSO 74DE11
76MA8	3	Li7	G,P	ABX 60-100	D 60-100	MAG-D	DST	
79JU6	3	Li7	G,P	ABX 11- 27	C 28, 50	TEL-D	DST	
73K06	3	Li7	G,PT	ABX 23- 27	C 27	EMU-D	90	
78V04	3	Li7	G,PT	ABX 21- 55	C 40- 55	TEL-D	DST	COIN T WITH P
75DE7	3	Li7	G,D	ABX 10- 51	C 15- 51	TEL-D	90	
79JU6	3	Li7	G,D	ABX 5- 22	C 28, 50	TEL-D	DST	
75DE7	3	Li7	G,T	ABI 2- 51	C 15- 51	TEL-D	90	
78V04	3	Li7	G,T	ABX 3- 55	C 32- 55	TEL-D	DST	2 BODY BREAKUP ONLY
79JU6	3	Li7	G,T	ABX 6- 28	C 28- 50	TEL-D	DST	
78V04	3	Li7	G,2T	ABX 21- 55	C 30- 55	TEL-D	DST	COIN T WITH T
78V04	3	Li7	G,XT	ABX 3- 55	C 30- 55	TEL-D	90	
79JU6	3	Li7	G,HE3	RLY 6- 11	C 50	TEL-D	DST	
79JU6	3	Li7	G,A	ABX 16- 27	C 28	TEL-D	DST	

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		REACTION RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A				IN,OUT	TYPE	
73VE4	4	Be6	HE,G	ABX 13- 25	D 1- 28	NAI-D	DST	HE=HE3
76FI3	4	Be8	P,G	ABX 17- 33	D 0- 18	NAI-D	DST	
77UL1	4	Be8	\$ P,G	ABX 17- 18	D380*960	SCD-D	DST	*ENERGY KEV, POL G
77WI3	4	Be8	P,G	ABX 452*	D360*	ACT-I	4PI	*KEV



REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
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	D999	MAG-D DST	999=1.184 GEV
73SL6	4BE9	E,E/	FMF	1- 10	D 60-106	MAG-D DST	1.67, 2.43 3-10 MEV
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
78DE11	4BE9	E,E/	ABX	50-200	D 1* 2	MAG-D DST	*GEV, QUASI-ELASTIC
79BU12	4BE9	E,E/	FMF	10- 80	C135-237	MAG-D DST	QUASI-ELASTIC
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
74GO10	4BE9	E,E/P	ABX	10* 50	D801	MAG-D 30	*SEP ENERGY RANGE
78NA3	4BE9	E,E/P	SPC	0* 60	D700	MAG-D 52	*SEP ENERGY RANGE
80ST3	4BE9	E,PI+	RLY	182-184	C185	MAG-D 90	TEST VIRTUAL PHOTONS
74G01	4BE9	G,PI+	ABY	150-400	C400	BBL-D 90	
79B02	4BE9	G,PI+	ABX	150-170	C150-170	ACT-I 90	
80NI4	4BE9	G,PI+	ABX	150-300	C100-800	ACT-I 4PI	
80ST3	4BE9	G,PI+	RLY	182-184	C185	MAG-D 90	TEST VIRTUAL PHOTONS
81BE3	4BE9	G,PIO	ABX	280-386	C300-450	MGP-D 0	
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	
74AH3	4BE9	G,MU-T	ABX	15-220	C300	MGC-D 4PI	
75AH3	4BE9	G,MU-T	ABX	10-210	C140-275	MGC-D 4PI	
81AR1	4BE9	G,MU-T	ABX	215-386	D215-386	TOF-D 4PI	DATA ALSO IN 81AR3
81AR3	4BE9	G,MU-T	ABX	215-386	D215-386	TOF-D 4PI	
77BU4	4BE9	G,N1	ABX	17- 26	C 22- 29	TOF-D DST	
73AN16	4BE9	G,N	ABX	1- 17	C 1- 17	BF3-I 4PI	
75SC7	4BE9	G,N	ABX	62- 66	D 62- 66	TOF-D DST	62.7-65.7 MEV
71N01	4BE9	G,2N	ABY	21-999	C 80-999	ACT-I 4PI	999=1.2 GEV
75KN5	4BE9	G,2N	ABX	20- 38	D 17- 38	MOD-I 4PI	
65C02	4BE9	G,XN	ABX	6- 80	C 6- 80	BF3-I 4PI	
66C04	4BE9	G,XN	ABX	6- 80	C 6- 80	BF3-I 4PI	
73HU11	4BE9	G,XN	ABX	1- 28	C 1- 28	MOD-I 4PI	
74KN10	4BE9	G,XN	ABX	17- 25	D 17- 25	MOD-I 4PI	
75HU1	4BE9	G,XN	ABX	1- 28	C 1- 28	BF3-I 4PI	
75KN5	4BE9	G,XN	ABX	17- 38	D 17- 38	MOD-I 4PI	
74G01	4BE9	G,P	ABY	17-400	C400	BBL-D 90	
76MA8	4BE9	G,P	ABX	60-100	D 60-100	MAG-D 45	
78D01	4BE9	G,P	ABX	67-600	C100-600	TEL-D DST	PROTONS OVER 50 MEV
73D09	4BE9	G,XP	ABY	97-400	C400	TEL-D DST	
74D05	4BE9	G,XP	ABX	100-999	C125-999	TEL-D DST	999=1 GEV
80H01	4BE9	G,PXX	ABX	200-400	D200-400	MAG-D 25	COIN P+CHARGED PART
78BU15	4BE9	G,N+A0	ABI	17- 26	C 20- 26	SCD-D 4PI	G,N TO BE8(16.6)
71SC3	4BE9	T,G	ABX	18- 20	D 1- 3	NAI-D 90	
73BL5	4BE10	T,G	RLX	17- 20	D 0- 3	NAI-D 90	
78SU1	4BE10	T,G	LFT	18	D 0- 1	SCD-D DST	18=17.79, 2+, J-PI

BORON Z=5

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	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
71N01	5B	G,BE7	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
78SH8	5B 10	E,E/	SPC	8- 10	D140	MAG-D DST	LV 8.26, 9., 9.7 MEV
79AN5	5B 10	E,E/	FMF	1- 9	D 67-194	MAG-D DST	6 LEVELS 1.74-8.9 MEV
78NA3	5B 10	E,E/P	SPC	0* 60	D700	MAG-D 53	*SEP ENERGY RANGE
80B02	5B 10	G,PI+	ABX	150-360	C220-360	CKV-I DST	
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	
73DI10	5B 10	G,BE7	ABY	18-999	C300-999	ACT-I 4PI	999=1 GEV
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
79P08	5B 11	E,E/	FMF	4- 13	D121-250	MAG-D DST	DEL Q 0.7-1.6 FM-1
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
78KU13	5B 11	G,G	LFT	2- 9	C 15	SCD-D 125	RESONANCE SELF-ABSOR
79KA8	5B 11	G,NG	SPC	THR- 30	C 30	SCD-D 135	
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+
79KA8	5B 11	G,PG	SPC	THR- 30	C 30	SCD-D 135	
78DI10	5B 11	G,BE7	ABY	33-999	C300-999	ACT-I 4PI	999=1 GEV
75AR5	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	

CARBON Z=6

A	ABUND.	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 IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
78KL5	6C 11	E,N	ABX	19- 30	D 30	ACT-I 4PI	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
65DE3	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	QUASI-ELASTIC
76VL1	6C	12	E,E/	ABX	100-600	D812-999	MAG-D	14	999=1.396 GEV
78DE11	6C	12	E,E/	ABX	50-200	D 1* 2	MAG-D	DST	*GEV, QUASI-ELASTIC
78FR2	6C	12	E,E/	LFT	16	D 33- 62	MAG-D	DST	16=16.11 MEV
78FL4	6C	12	E,E/	FMF	4, 16	D 57-215	MAG-D	180	4=4.439, 16=16.107
78M04	6C	12	E,E/	ABX	30-350	D160-520	MAG-D	DST	
78SH3	6C	12	E,E/	SPC	18	D140	MAG-D	DST	LV 18.1 MEV
79FL1	6C	12	E,E/	FMF	12, 15	D 0* 3	MAG-D	DST	*FM-1, 2 LEVELS
79HA2	6C	12	E,E/	RLX	1* 2	D 2* 3	MAG-D	13	*GEV, RLX E+/E-
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
73HE3	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
76M05	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	*SEP ENERGY RANGE
73EN4	6C	12	E,PI+	ABX	319-819	C300-850	MAG-D	28	
77B012	6C	12	E,PI+	RLX	150-280	D280	MAG-D	DST	(G,PI-)/(G,PI+)
77SH6	6C	12	E,PI+	ABX	0- 1	D195	MAG-D	DST	
80MI1	6C	12	E,PI+	ABX	4	D200	MAG-D	DST	VIRTUAL PHOTON ANAL
80SH9	6C	12	E,PI+	ABX	150-195	D195	MAG-D	DST	VIRTUAL PHOTON ANAL
81SE2	6C	12	E,PI+	ABX	6* 13	D200	MAG-D	DST	*PION ENERGY IN MEV
73EN4	6C	12	E,PI-	ABX	319-819	C300-850	MAG-D	28	
77B012	6C	12	E,PI-	ABX	150-280	D280	MAG-D	DST	(G,PI-)/(G,PI+)
79B03	6C	12	E,PI-	RLX	200-360	D150-360	ACT-I	90	
73M09	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 DIFFERENCE
77KN2	6C	12	E,N	ABX	19- 32	D 26- 32	ACT-I	4PI	
80GA8	6C	12	E,N	ABY	18-999	D320-999	ACT-I	4PI	999=1.2 GEV
81L06	6C	12	E,P	ABX	16-200	D200	MAG-D	DST	
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	
73G05	6C	12	G,PI+	ABY	170-400	C400	BBL-D	90	
74B014	6C	12	G,PI+	SPC	150-345	C345	EMU-D	DST	
75T04	6C	12	G,PI+	ABY	150-400	C300,400	BBL-D	90	
76WA3	6C	12	G,PI+	ABY	140-250	C250	MAG-D	90	
78BA4	6C	12	G,PI+	ABX	300-850	D300-850	MAG-D	DST	
78BA12	6C	12	G,PI+	ABX	150-700	D300-850	MAG-D	DST	
79MI1	6C	12	G,PI+	ABX	150-175	C175	TEL-I	4PI	PI+, MU+, E+, DECAY
80AR9	6C	12	G,PI+	RLY	151-159	C153-159	ACT-I	4PI	
73AN8	6C	12	G,PI-	ABX	140-324	D323-824	MAG-D	28	
73G05	6C	12	G,PI-	ABY	170-400	C400	BBL-D	90	
74B014	6C	12	G,PI-	SPC	150-345	C345	EMU-D	DST	
74EP2	6C	12	G,PI-	ABX	140-375	C120-375	ACT-I	4PI	
75T04	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+ ACTIVITY OF N12
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	
78AR7	6C	12	G,PI-	SPC	360-600	D510-750	MAG-D	41	
78BA4	6C	12	G,PI-	ABX	300-850	D300-850	MAG-D	DST	
78BA12	6C	12	G,PI-	ABX	150-700	D300-850	MAG-D	DST	
79B03	6C	12	G,PI-	ABX	150-360	C150-360	ACT-I	90	



REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS	
80AR8	6C	12	G,PIP	ABX	200-385	D200-385	MAG-D	54	PROTON PION COIN
73AN10	6C	12	\$ G,PIOP	NOX	137*235	C800,900	TEL-D	90	\$P, *RECOIL P ENERGY
79EP2	6C	12	G,PIOP	ABY	0*600	C450	CKV-D	DST	*MEV/C, COIN
73AN10	6C	12	\$ G,PI-P	NOX	155*235	C800,900	TEL-D	90	\$P, *RECOIL P ENERGY
79GL5	6C	12	G,PI-P	ABY	150-390	C390	MAG-D	120	
79GL6	6C	12	G,PI-P	ABY	150-390	C340-390	MAG-D	DST	PI-,P COIN
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	
78AR9	6C	12	G,MU-T	ABX	THR* 30	C 12* 30	NAI-D	4PI	*ENERGY IN GEV
81AR1	6C	12	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	DATA ALSO IN 81AR3
81AR3	6C	12	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	
76ME12	6C	12	G,G	ABX	15	C UKN	NAI-D	135	
77BE3	6C	12	G,G	ABX	5- 8	D 5- 8	SCD-D	140	5.5-7.2 MEV
80D01	6C	12	G,G	ABX	23- 39	D 23- 59	NAI-I	DST	
80IS4	6C	12	G,G	ABX	15- 32	C 32	NAI-D	90	
81LE5	6C	12	G,G	RLX	15	D 15	NAI-D	DST	15=15.11 MEV
72AN8	6C	12	G,N	ABX	1* 7	C 1* 7	ACT-I	4PI	*ENERGIES IN 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	
73M09	6C	12	G,N	RLY	18- 39	C 18- 39	ACT-I	4PI	YIELD/(G,N)/(E,N)
73NA5	6C	12	\$ G,N	NOX	22- 31	C 30, 64	TOF-I	DST	
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)
77HI5	6C	12	G,N	ABI	18- 30	C 18- 30	ACT-I	4PI	THICK BRMS TARGET
78MA10	6C	12	G,N	ABY	19- 68	C 30- 68	ACT-I	4PI	
80G07	6C	12	G,N	ABX	60	C 60	TOF-D	DST	BRMS TIP
80GA8	6C	12	G,N	ABY	18-999	D320-999	ACT-I	4PI	999=1.2 GEV
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 ABOVE 12 MEV
75KN8	6C	12	G,XN	ABX	19- 32	D 19- 32	MOD-I	4PI	
80IS5	6C	12	G,PL	ABX	16- 31	C 21- 31	TEL-D	90	L=0, 1, 2
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	
77AL9	6C	12	G,P	ABX	80-999	C 2* 5	TEL-D	DST	*E IN GEV, 999=4.5GEV
77KI11	6C	12	G,P	ABX	40-120	C150	CCH-D	DST	
78KI8	6C	12	G,P	ABX	16-120	C150	CCH-D	DST	
81AL8	6C	12	G,P	ABY	16-999	C999	TEL-D	DST	999=4.5 GEV
80AR8	6C	12	G,PP	ABX	200-385	D200-385	MAG-D	DST	COIN PROTON-PROTON
73D09	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 SPECTRA
79EG3	6C	12	G,XP	RLY	16-250	C130,250	MAG-D	DST	
80AR8	6C	12	G,XP	ABX	200-385	D200-385	MAG-D	DST	
81AV10	6C	12	\$ G,XP	RLX	0* 2	D 0* 2	TEL-D	100	COH-BRMS .69*1.95 GEV
81AV13	6C	12	\$ G,XP	ASM	0* 2	C 0* 2	TEL-D	100	COH-BRMS .69*1.95 GEV
80AR8	6C	12	G,NP	ABX	200-385	D200-385	MAG-D	DST	COIN PROTON-NEUTRON
80KH2	6C	12	G,NP	ABX	34-150	C UKN	CCH-D	4PI	NP PAIRS
78MA10	6C	12	G,NA	ABY	26- 68	C 30- 68	ACT-I	4PI	
79KI2	6C	12	G,NA	ABX	27-120	C120	CCH-D	DST	
76TU3	6C	12	G,PA	ABX	25- 42	C 42	EMU-D	4PI	
79KI2	6C	12	G,PA	ABX	27-120	C120	CCH-D	DST	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
76TU3	6C	12	G,DA	ABX	30- 42	C 42	EMU-D 4PI	
76TU3	6C	12	G,3A	ABX	7- 42	C 42	EMU-D 4PI	
71DI3	6C	12	G,BE7	ABY	26-999	C300-999	ACT-I 4PI	999=1 GEV
71N01	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
743A15	6C	12	G,F	RLY	THR-999	C800-999	TRK-D DST	999=1 GEV, FRG A=6-11
72HA9	6C	12	\$ P,G	NOX	22- 29	D 6- 14	NAI-D DST	POLARIZED PROTONS
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	
79K01	6C	12	P,G	SPC	53- 89	D 40- 80	NAI-D 60	
80C06	6C	12	P,G	ABX	34- 53	D 20- 40	NAI-D 90	
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	HE=HE3
74SH3	6C	12	HE,G	ABX	28- 45	D 3- 24	NAI-D DST	HE=HE3, 4 LEVELS
77W04	6C	13	G,N1	ABX	10- 36	C 11- 38	TOF-D 98	
77W04	6C	13	G,N	ABX	6- 37	C 11- 38	TOF-D 98	
79W02	6C	13	G,N	ABX	7- 24	C 12- 25	TOF-D DST	
80H03	6C	13	G,N	LFT	6- 10	C 10	TOF-D DST	
75PA2	6C	13	G,NG	ABX	10- 36	C 15- 44	SCD-D 112	
79JU3	6C	13	G,1N	ABX	5- 42	D 7- 42	BF3-I 4PI	
75PA2	6C	13	G,2N	RLY	24- 40	C 35, 40	ACT-I 4PI	
79JU3	6C	13	G,2N	ABX	23- 42	D 23- 42	BF3-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	
81KA1	6C	13	D,G	DST	20- 29	D 2- 12	NAI-D 90	
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	NO T=2 STATE FOUND
77CR1	6C	14	E,E/	ABX	7- 16	D 37- 60	MAG-D 180	8 STATES

NITROGEN Z=7

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

REF	NUCLIDE Z	REACTION A	RES IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73ME3	7N	13	P,G	ABX	9, 24	D 9- 24	NAI-D 90	
74R02	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
80HE4	7N	13	\$ P,G	ABX	11- 18	D 10- 17	NAI-D DST	POLARIZED PROTONS
80SN1	7N	13	\$ P,G	RLY	15	D 14- 15	NAI-D DST	POLARIZED PROTONS



REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74EN1	7N 14	E,E/	FMF	2- 6	C 60-120	MAG-D	DST	6 LEVELS
78DE11	7N 14	E,E/	ABX	30-150	D 1* 2	MAG-D	DST	*GEV, QUASI-ELASTIC
79EN1	7N 14	E,E/	ABX	2- 17	D 40- 61	MAG-D	180	7 LEVELS, J-PI, LFT
80TA3	7N 14	E,D	ABX	15- 29	D 18- 29	MAG-D	DST	
31BI13	7N 14	\$ G,MU-T	LFT	9	D 9	NAI-D	DST	PCL G, AZMUTH ANG DST
75RA1	7N 14	G,G	LFT	2	C UKN	SCD-D	DST	LEVEL AT 2.31 MEV
76TU3	7N 14	G,N	ABX	29- 42	C 42	EMU-D	4PI	
80JU1	7N 14	G,N	ABX	17- 26	C 20- 26	TOF-D	DST	
54FE1	7N 14	G,SN	ABX	10- 25	C 12- 25	BF3-I	4PI	
73BA3	7N 14	G,PL	ABX	16- 25	C 7- 25	SCD-D	DST	L=0,2
74BA4	7N 14	G,PL	ABX	16- 25	C 20- 26	SCD-D	DST	L=0,2
72CA4	7N 14	G,P	ABX	17- 25	C 20- 25	SCD-D	DST	
76TU3	7N 14	G,2A	ABX	16- 42	C 42	EMU-D	4PI	
78DI10	7N 14	G,C11	ABY	22-999	C300-999	ACT-I	4PI	999=1 GEV
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
78KE2	7N 14	P,G	LFT	8- 9	D 1- 2	SCD-D	DST	LVS 8.49, 8.96, 9.13
80RA2	7N 14	P,G	LFT	11	D 4	SCD-D	DST	8(EL), J-PI
80TU1	7N 14	\$ P,G	ABX	13- 23	D 6- 14	NAI-D	DST	POLARIZED PROTONS
73MA5	7N 14	HE,G	ABX	22- 26	D 1- 6	NAI-D	90	HE=HE3
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
77MA9	7N 15	E,E/	FMF	5, 6	D 60-120	MAG-D	DST	5.3, 6.32 MEV
78AN3	7N 15	E,E/	FMF	13- 40	D 52-194	MAG-D	DST	
75MU3	7N 15	E,P	ABX	14- 28	D 19- 30	MAG-D	DST	
79SK6	7N 15	E,D	ABX	20- 29	D UKN	MAG-D	DST	
79UE1	7N 15	E,T	ABX	20- 25	D 22- 26	MAG-D	9	VIRTUAL PHOTON ANAL
75M08	7N 15	\$ G,G	LFT	6	D 6	SCD-D	DST	6=6.324, POL SCAT G
80SH2	7N 15	G,G	ABX	6	D 6	NAI-D	UKN	6.324 MEV, F(TEMP)
81M01	7N 15	G,G	LFT	6- 10	C 10, 11	SCD-D	UKN	9 LEVELS
73DE13	7N 15	G,D	ABX	19- 25	C 19- 30	TEL-D	90	
82WE1	7N 15	N,G	ABX	16- 24	C 5- 13	NAI-D	DST	
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
76SN3	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	POLARIZED PROTONS
78WE4	7N 15	\$ P,G	RLX	14- 24	D 4- 14	UKN-D	DST	POLARIZED 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	
78DE8	7N 15	D,G	ABX	11- 15	D 1- 5	NAI-D	95	
79SK6	7N 15	\$ D,G	ABX	20- 24	D 5- 8	NAI-D	DST	POLARIZED D
77SC1	7N 15	T,G	ABX	15- 18	D 1- 4	NAI-D	DST	
78DE2	7N 15	A,G	ABX	16- 20	D 6- 12	NAI-D	DST	J-PI FOR 4 LEVELS
79ST8	7N 16	PI,G	SPC	128	D200*	MGP-D	90	*MEV/C, PI=PI-
79ST8	7N 18	PI,G	SPC	128	D200*	MGP-D	90	*MEV/C, PI=PI-

OXYGEN Z=8

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
16	99.76	15.7	12.1	25.0	22.8	7.2	28.9	23.0	22.3
17	0.04	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		REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					TYPE	ANG	
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	
78DE14	80	15	HE,G	ABX	16- 23	D 5- 14	NAI-D	90	HE=HE3, 5 LEVELS
68ST2	80	16	E,E/	LFT	6- 14	D 33- 60	MAG-D	DST	10 LVS 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, TRNS FMF B(E2)
75MI2	80	16	E,E/	LFT	6- 7	D 38- 60	MAG-D	DST	6.0, 6.1, 6.9, 7.1MEV
75MI7	80	16	E,E/	FMF	7	D 38- 60	MAG-D	DST	7=7.12
78DE11	80	16	E,E/	ABX	50-200	D 1* 2	MAG-D	DST	*GEV, QUASI-ELASTIC
77B012	80	16	E,PI+	RLX	150-280	D280	MAG-D	DST	(G,PI-)/(G,PI+)
80ST3	80	16	E,PI+	RLY	177-180	C180	MAG-D	90	TEST VIRTUAL PHOTONS
77B012	80	16	E,PI-	ABX	150-280	D280	MAG-D	DST	(G,PI-)/(G,PI+)
74SC8	80	16	E,N	ABX	50-150	D 63-150	TOF-D	DST	PHOTON DIFFERENCE
80SC8	80	16	E,P	ABX	80	D 80	MAG-D	DST	VIRTUAL PHOTON ANAL
75SK10	80	16	E,A	ABX	17- 26	D UKN	MAG-D	DST	
65ME4	80	16	G,PI+	ABX	150-300	C150-300	ACT-I	4PI	
79B02	80	16	G,PI+	ABX	150-170	C150-170	ACT-I	90	
80B02	80	16	G,PI+	ABX	150-360	C220-360	CKV-I	DST	
80ST3	80	16	G,PI+	RLY	177-180	C180	MAG-D	90	TEST VIRTUAL PHOTONS
79EP2	80	16	G,PIOP	ABY	60-130	C450	CKV-D	DST	*MEV/C, COIN
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	
81AR1	80	16	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	DATA ALSO IN 81AR3
81AR3	80	16	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	
77LA3	80	16	G,G	G,G	7	D 7	SCD-D	DST	7.12, 6.92 MEV
80IS4	80	16	G,G	ABX	15- 32	C 32	NAI-D	90	
81WI1	80	16	\$ G,G	NOX	7	C UKN	SCD-D	90	\$G SOURCE
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	
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
78HO2	80	16	G,N	ABX	4- 7	C 9	TOF-D	DST	
79PH2	80	16	G,N	ABX	25- 45	C 30- 45	TOF-D	DST	
80G07	80	16	G,N	ABX	60-160	C 60-160	TOF-D	DST	BRMS TIP
65MA1	80	16	G,NG	SPC	19- 30	C 21- 31	NAI-D	140	
67CA3	80	16	G,NG	ABX	17- 29	D 17- 29	NAI-D	4PI	5.2, 6.2, 6.8 MEV LVS
70H01	80	16	G,NG	RLY	21- 27	C 27, 36	SCD-D	DST	
82CA1	80	16	G,1N	ABX	24-133	D 24-133	MOD-I	4PI	
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	C100-800	ACT-I	4PI	
82CA1	80	16	G,2N	ABX	24-133	D 24-133	MOD-I	4PI	
54FE1	80	16	G,SN	ABX	15- 25	C 16- 25	BF3-I	4PI	
82CA1	80	16	G,SN	ABX	24-133	D 24-133	MOD-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	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
65MA1	80 16	G,PG	SPC	19- 30	C 21- 31	NAI-D 140	
67CA3	80 16	G,PG	ABX	20- 29	D 17- 29	NAI-D 4PI	5.3, 6.3, 7.3 MEV LVS
70H01	80 16	G,PG	RLY	17- 27	C 27, 36	SCD-D DST	
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	
81WI2	80 16	G,P	SPC	15- 25	C 22, 30	SCD-D DST	POLARIZED PHOTONS
73HA9	80 16	G,2P	ABX	100-350	C500	TEL-D 63	PP COIN
73D09	80 16	G,XP	ABY	92-400	C400	TEL-D DST	
73BE10	80 16	G,NP	ABX	26- 37	D 26- 37	BF3-I 4PI	
73HA9	80 16	G,NP	ABX	100-350	C500	TEL-D 63	NP COIN
74VE1	80 16	G,NP	ABX	23- 37	D 23- 37	BF3-I 4PI	
73HA9	80 16	G,PD	ABX	100-350	C500	TEL-D 63	PD COIN
74DI7	80 16	G,C11	ABY	26-999	C300-999	ACT-I 4PI	999=1 GEV
78DI10	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	
730C1	80 16	P,G	ABX	20- 29	D 8- 18	NAI-D DST	
74CH3	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	
780C1	80 16	\$ P,G	ABX	20- 29	D 8- 18	NAI-D DST	
780C1	80 16	\$ P,G	ABX	20- 29	D 8- 18	NAI-D DST	
79SN1	80 16	\$ P,G	ABX	16- 21	D 4- 9	NAI-D DST	POLARIZED PROTONS
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
79VE2	80 16	HE,G	ABX	25- 30	D 3- 9	NAI-D DST	HE=HE3
74DY6	80 16	A,G	ABX	3- 10	D 1- 3	NAI-D DST	
74SN9	80 16	A,G	ABX	12- 28	D 7- 28	NAI-D DST	
760P1	80 16	A,G	ABX	13- 16	D 6- 9	NAI-D 90	
78ST5	80 16	A,G	ABX	11	D 8	NAI-D DST	LIFETIME
75KI11	80 17	E,E/	LFT	3- 8	D 84-122	MAG-D DST	12 LVS 3.05-7.75
77N01	80 17	E,E/	FMF	10- 30	D 65-168	MAG-D 75	
78KI3	80 17	E,E/	LFT	1- 9	D 63-125	MAG-D DST	
71BE5	80 17	G,N	ABX	4- 9	C 4- 9	BF3-I 4PI	
79J02	80 17	G,N	ABX	5- 33	C 13- 34	TOF-D 98	J-PI, LFT, ENRICHED
80JU4	80 17	G,1N	ABX	8- 40	D 8- 40	BF3-I 4PI	
80JU4	80 17	G,2N	ABX	20- 40	D 10- 40	BF3-I 4PI	
73LI2	80 17	T,G	ABX	19- 22	D 15- 35	NAI-D DST	
80LI2	80 17	T,G	ABX	19- 22	D 0- 3	NAI-D DST	J-PI, LFT
76CH2	80 17	HE,G	ABX	22- 25	D 3- 8	NAI-D DST	HE=HE3
80AN5	80 18	E,E/	FMF	10- 47	D 80-166	MAG-D DST	
80AN6	80 18	E,E/	SPC	13- 27	D 25- 59	MAG-D DST	J-PI, B(EL),16.4,18.9
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	
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	
79W01	80 18	G,1N	ABX	8- 42	D 8- 42	BF3-I 4PI	
76KN4	80 18	G,2N	ABX	11- 33	D 11- 33	MOD-I 4PI	
79W01	80 18	G,2N	ABX	13- 42	D 8- 42	BF3-I 4PI	
76BA10	80 18	G,2NG	ABY	18- 28	C 23, 28	SCD-D 125	6.0,6.1 MEV



REF	NUCLIDE		REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					TYPE	ANG	
80PY4	80	18	G,XN	ABX	8- 28	C 8- 29	BF3-I	4PI	
76BA10	80	18	G,PG	ABY	17- 28	C 23, 28	SCD-D	125	1.4, 1.8, 1.9, 4.2MEV
72D013	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
79W01	80	18	G,P	ABX	16- 42	D 8- 42	BF3-I	4PI	COUNTED DELAYED NEUT
80PY4	80	18	G,P	ABX	16- 28	C 8- 29	ACT-I	4PI	
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	8.0	11.7	22.1	4.0	19.6	16.0	23.9

REF	NUCLIDE		REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					TYPE	ANG	
75CH1	9F	17	P,G	ABX	1- 3	D 0- 2	SCD-D	DST	.8-2.4 MEV
75HA5	9F	17	P,G	ABX	15- 31	D 15- 32	NAI-D	DST	
79KH7	9F	17	P,G	RLY	12, 15	C 12- 15	NAI-D	90	BRANCHING RATIO, SPIN
73SE3	9F	18	P,G	LFT	6- 7	D 0- 1	NAI-D	DST	6.14 MEV LEVEL
78BE16	9F	18	A,G	LFT	6	D 2	SCD-D	90	UP LIM, WIDTH=.002EV
73HA1	9F	19	E,E/	FMF	0- 2	D 61-121	MAG-D	DST	3 LEVELS .2-1.6 MEV
75OY1	9F	19	E,E/	FMF	1- 6	D134-250	MAG-D	DST	8(EL) 7 STATES
78WI2	9F	19	E,E/	FMF	0- 5	D 1* 3	MAG-D	DST	*Q=0.5-2.5 FM-1
73M09	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 (G,P)
74SK4	9F	19	E,T	ABX	18- 23	D UKN	MAG-D	DST	
68C02	9F	19	G,N	ABI	10- 50	C 10- 50	MOD-I	4PI	
71DI5	9F	19	G,N	ABY	10-999	C300-999	ACT-I	4PI	999=1 GEV
73BE10	9F	19	G,N	ABX	11- 29	D 11- 29	BF3-I	4PI	
73M09	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	GND AND EXCT STATE
74VE1	9F	19	G,N	ABX	10- 28	D 10- 28	BF3-I	4PI	
75W02	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 SPECTRA
79TH1	9F	19	G,NG	ABX	14- 30	C 14- 30	SCD-D	150	
52H01	9F	19	G,2N	ABX	19- 26	C 19- 26	ACT-I	4PI	SEE 54TA1-REANALYSIS
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	
54FE1	9F	19	G,SN	ABX	10- 25	C 11- 25	BF3-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 SPECTRA
79TH1	9F	19	G,PG	ABX	14- 30	C 14- 30	SCD-D	150	
72TH5	9F	19	G,AG	ABI	4- 25	C 19- 25	SCD-D	DST	GAMMA SPECTRA
79TH1	9F	19	G,AG	ABX	14- 30	C 14- 30	SCD-D	150	
78DI10	9F	19	G,BE7	ABY	30-999	C300-999	ACT-I	4PI	999=1 GEV
78DI10	9F	19	G,C11	ABY	33-999	C300-999	ACT-I	4PI	999=1 GEV
76MA10	9F	19	G,N13	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
80YA2	9F	19	G,F18	YLD	THR- 60	C 30- 60	ACT-I	4PI	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73DI4	9F 19	G,SPL	ABY	THR-999	C999	ACT-I 4PI	999=1 GEV
80CA4	9F 19	S P,G	ABX	15- 23	D 3- 10	NAI-D DST	POLARIZED PROTONS
72M06	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
78SY2	9F 19	A,G	LFT	8- 10	D 5- 8	SCD-D 55	

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	6.3	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 A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74VE1	10NE	G,N	ABX	16- 26	D 16- 26	BF3-I 4PI	
75W03	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	
54FE1	10NE	G,SN	ABX	10- 25	C 11- 25	BF3-I 4PI	
57K01	10NE	G,2P	RLY	21- 80	C 80	CCH-D 4PI	
57K01	10NE	G,NP	RLY	23- 80	C 80	CCH-D 4PI	
57K01	10NE	G,PA	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 151,164	MAG-D DST	
78SZ7	10NE20	E,E/	FMF	12- 23	D 59-120	MAG-D DST	Q 0.35-0.9 FM-1
75SK10	10NE20	E,A	ABX	15- 24	D UKN	MAG-D DST	G
81AL5	10NE20	G,1N	ABX	16- 29	C 16- 29	BF3-I 4PI	ENRICHED NEON
80MA5	10NE20	G,A	LFT	7	D 3	SCD-D DST	LFT LIMIT 7.156 MEV
80YA2	10NE20	G,F18	YLD	THR- 60	C 30- 60	ACT-I 4PI	
77FI6	10NE20	A,G	LFT	10	D 6	SCD-D 55	10=10.27 MEV
78DA5	10NE20	A,G	LFT	11	D 8	SCD-D DST	
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
78MA6	10NE22	E,E/	ABX	0- 19	D 37- 60	MAG-D 180	ERRATUM SEE 74MA8
79MA3	10NE22	E,E/	FMF	1- 9	D 60-110	MAG-D DST	14 LVS, J-PI, B(CL)
79BE7	10NE22	G,G	ABI	5- 1.1	CUKN- 18	SCD-D DST	LIFETIME
74VE1	10NE22	G,2N	ABX	18- 26	D 18- 26	BF3-I 4PI	
78TR3	10NE22	A,G	SPC	10- 12	D 0- 3	SCD-D DST	10.2, 10.92, 11.47MEV

## 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	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR		REMARKS
							TYPE	ANG	
74R04	11NA21	P,G	ABX	2-	3 D	1-	2	SCD-D	90
78HE3	11NA22	P,G	LFT	7-	9 D	0-	2	SCD-D	DST J-PI
74VE1	11NA23	G,N	ABX	12-	30 D	12-	30	BF3-I	4PI
78MA10	11NA23	G,N	ABY	12-	68 C	30-	68	ACT-I	4PI
80IS2	11NA23	G,NG	ABI	12-	32 C	13-	32	SCD-D	135 ABI FOR 3 LEVELS
74VE1	11NA23	G,2N	ABX	23-	30 D	23-	30	BF3-I	4PI
80IS2	11NA23	G,PG	ABI	8-	32 C	13-	32	SCD-D	135 ABI FOR 5 LEVELS
81IS3	11NA23	G,P	ABX	8-	30 C	16-	30	TEL-D	90
74DI7	11NA23	G,F18	ABY	21-	999 C	300-	999	ACT-I	4PI 999=1 GEV
75DI4	11NA23	G,F18	ABY	21-	999 C	300-	999	ACT-I	4PI 999=1 GEV
80YA2	11NA23	G,F18	YLD	THR-	60 C	30-	60	ACT-I	4PI
75DI4	11NA23	G,NA22	ABY	12-	999 C	300-	999	ACT-I	4PI 999=1 GEV
73VE2	11NA23	P,G	ABX	14-	26 D	5-	18	NAI-D	90 G=G0+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	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR		REMARKS
							TYPE	ANG	
77BE3	12MG	G,G	ABX	5-	8 D	5-	8	SCD-D	140 5.5-7.2 MEV
60WA2	12MG	G,F18	ABX	THR-	240 C	240		ACT-I	4PI
74J04	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 D	500		MAG-D	60 QUASI-ELASTIC
77ZA2	12MG24	E,E/	FMF	15		D108-	260	MAG-D	DST 15.045 MEV
78ZA2	12MG24	E,E/	FMF	4		D 1*	2	MAG-D	DST .8*2.2 FM-1, SEE 81ZA
81IT1	12MG24	E,E/	ABX	9-	34 D	102-	200	MAG-D	DST
81ZA1	12MG24	E,E/	FMF	4		D 1*	2	MAG-D	DST *GEV ERRATA FOR 78ZA2
74CH9	12MG24	E,C12	NOX	24-	29 D	25-	45	TRK-I	DST
78SA4	12MG24	E,F	ABX	20-	28 D	21-	32	TRK-D	DST
30SA4	12MG24	E,F	ABX	13-	29 D	26-	40	TEL-D	90 F PRODUCTION, COIN
75BE1	12MG24	G,G	LFT	9-	11 C	29		SCD-D	125 EX=9.83, 9.97, 10.73
81CA2	12MG24	G,G	LFT	1		C 0-	2	SCD-D	DST 1.358 MEV
76BA2	12MG24	G,NG	ABY	17-	30 C	18-	30	SCD-D	125
76BA2	12MG24	G,PG	ABY	12-	30 C	18-	30	SCD-D	125
76BA2	12MG24	G,P	SPC	13-	30 C	18-	30	TEL-D	90
79VA3	12MG24	G,P	ABX	11-	30 C	17-	30	SCD-D	90

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
79EG3	12MG24	G,XP	RLY	12-250	C130,250	MAG-D DST	
78MA10	12MG24	G,NP	ABY	26- 68	C 30- 68	ACT-I 4PI	
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	
78FI6	12MG24	A,G	LFT	12- 15	C 3- 6	SCD-D DST	8 LEVELS STUDIED
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
76BA2	12MG25	G,NG	ABY	8- 29	C 19- 29	SCD-D 90	
76BA2	12MG25	G,PG	ABY	13- 29	C 19- 29	SCD-D 90	
76BA2	12MG25	G,P	ABX	14- 18	C 19- 29	TEL-D 90	
78MA10	12MG25	G,P	ABY	12- 68	C 30- 68	ACT-I 4PI	
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
74W07	12MG26	G,NG	ABI	19- 23	C 30	SCD-D 90	
76BA2	12MG26	G,NG	ABY	12- 30	C 24, 30	SCD-D 90	
79IS2	12MG26	G,PL	ABX	14- 27	C 19- 27	MAG-D UKN	L=0, 1, 3, 6
76BA2	12MG26	G,PG	ABY	15- 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	
74W05	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	
74VA2	12MG26	G,XP	ABX	15- 29	C 8- 29	ION-I 4PI	
74W05	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	8.3	18.2	23.7	10.1	24.4	19.4	22.4

REF	NUCLIDE Z	REACTION A 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	
76VL1	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
77SI4	13AL27	E,E/	FMF	2- 3	D 62-112	MAG-D DST	3 LEVELS
78DE11	13AL27	E,E/	ABX	50-230	D 1* 2	MAG-D DST	*GEV, QUASI-ELASTIC
79HA2	13AL27	E,E/	RLX	1* 4	D 3* 7	MAG-D 9	*GEV, RLX E+/E-
80HI2	13AL27	E,E/	ABX	4- 8	D 70-340	MAG-D DST	10 LEVELS 8(EL), J-PI
81D03	13AL27	E,E/	ABX	2, 3	D 28- 75	MAG-D DST	LEVELS 2.21, 3.0 MEV
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	*SEP ENERGY RANGE
74TS4	13AL27	E,P	ABX	8- 26	D 16- 26	MAG-D 90	



REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
80KH3	13AL27	E,P	ABX	8-100	D100	MAG-D DST	
81RY2	13AL27	E,P	ABX	8- 28	D 14- 28	MAG-D 90	VIRTUAL PHOTON ANAL
80KH3	13AL27	E,D	ABX	21-100	D100	MAG-D DST	
80KH3	13AL27	E,T	ABX	18-100	D100	MAG-D DST	
30KH3	13AL27	E,HE3	ABX	23-100	D100	MAG-D 20	
79FL2	13AL27	E,A	SPC	25-120	D120	MAG-D 30	PREEQUILIB ALPHAS
80KH3	13AL27	E,A	ABX	10-100	D100	MAG-D DST	
78DI3	13AL27	E,BE7	RLY	THR-800	D800	TRK-D DST	
78DI3	13AL27	E,LI8	RLY	THR-800	D800	TRK-D DST	
78DI3	13AL27	E,BE9	RLY	THR-800	D800	TRK-D DST	
78DI3	13AL27	E,BE9	RLY	THR-800	D800	TRK-D DST	
78DI3	13AL27	E,B10	RLY	THR-800	D800	TRK-D DST	
78DI3	13AL27	E,C12	RLY	THR-800	D800	TRK-D DST	
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 ACTIVITY
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	
80SH10	13AL27	G,MU-T	ABX	3- 30	C 42	TOF-D 4PI	D(G,N) SPECTROMETER
81AR1	13AL27	G,MU-T	ABX	215-386	D215-386	TOF-D 4PI	DATA ALSO IN 81AR3
81AR3	13AL27	G,MU-T	ABX	215-386	D215-386	TOF-D 4PI	
73SA14	13AL27	G,G	LFT	3	C 5	NAI-D 120	3=2.98
81CA2	13AL27	G,G	LFT	1	C 0- 2	SCD-D DST	1.014 MEV
72K08	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	TOF-D 90	NEUTS E ABOVE 12 MEV
74DA2	13AL27	G,P	ABY	12-450	C450	TEL-D 90	
77AL9	13AL27	G,P	ABX	72-999	C 2* 5	TEL-D DST	*E IN GEV, 999=4.5GEV
78FI7	13AL27	G,P	NOX	45- 85	C 60-100	MAG-D DST	
81IS4	13AL27	G,P	ABX	8- 30	C 17- 30	TEL-D 90	
73DO9	13AL27	G,XP	ABY	88-400	C400	TEL-D DST	
78MA10	13AL27	G,NA	ABY	22- 68	C 30- 68	ACT-I 4PI	
74DA2	13AL27	G,T	ABY	23-450	C450	TEL-D 90	
74DA2	13AL27	G,HE3	ABY	34-450	C450	TEL-D 90	
74DA2	13AL27	G,A	ABY	20-450	C450	TEL-D 90	
77AS10	13AL27	G,BE7	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
78DI10	13AL27	G,BE7	ABY	17-999	C300-999	ACT-I 4PI	999=1 GEV
77AS10	13AL27	G,C11	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
78DI10	13AL27	G,C11	ABY	33-999	C300-999	ACT-I 4PI	999=1 GEV
77AS10	13AL27	G,N13	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
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
77AS10	13AL27	G,F18	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 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
77AS10	13AL27	G,NA22	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
71DI5	13AL27	G,NA24	ABY	23-999	C300-999	ACT-I 4PI	999=1 GEV
72AN8	13AL27	G,NA24	ABX	1* 7	C 1* 7	ACT-I 4PI	*ENERGY IN GEV
73JA3	13AL27	G,NA24	ABY	THR-999	C100-999	ACT-I 4PI	999=1 GEV
74NO2	13AL27	G,NA24	RLX	24-999	C300-999	ACT-I 4PI	999=1.2 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	
76JO1	13AL27	G,NA24	ABX	31-965	C 90-965	ACT-I 4PI	ERRATUM 75JO4



REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
77AS10	13AL27	G,NA24	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
78MA10	13AL27	G,NA24	ABY	24- 68	C 30- 68	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
78MA11	13AL27	P,G	NOX	0- 10	D 0- 1	SCD-D DST	J-PI, STRENGTHS

SILICON Z=14

A	ABUND.	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
76M05	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	
80IS6	14SI	G,G	ABX	13- 31	C 13- 31	NAI-D 90	
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	
72TH8	14SI	G,PG	ABI	12- 28	C 28	SCD-D 140	
73G05	14SI	G,P	ABY	82-400	C400	BBL-D 90	
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
75CI4	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
78KN7	14SI28	E,E/	RLY	13- 16	DUKN	MAG-D DST	M2 LEVELS
79PI1	14SI28	E,E/	FMF	4- 50	D 91	MAG-D DST	
79SC7	14SI28	E,E/	LFT	10- 13	D 38- 58	MAG-D DST	5 LEVELS J-PI, B(ML)
80WH2	14SI28	E,E/	FMF	2, 5	D126-293	MAG-D DST	2=1.78, 5=4.62 MEV
80YE1	14SI28	E,E/	FMF	15	D 1* 3	MAG-D DST	*Q IN FM-1
75T04	14SI28	G,PI+	ABY	150-400	C300,400	BBL-D 90	
75T04	14SI28	G,PI-	ABY	150-400	C300,400	BBL-D 90	
76EP4	14SI26	G,PI-	ABX	150-400	C180-400	ACT-I 4PI	
81IS5	14SI28	G,G	ABX	5- 17	C 6- 17	NAI-D 90	
77TH1	14SI28	G,NG	ABY	18- 28	C 28	SCD-D 140	.8, .95, 2.6, 2.9 MEV
77TH1	14SI28	G,PG	ABY	13- 28	C 28	SCD-D 140	8 STATES; .8-4. MEV
75T04	14SI28	G,P	ABY	91-400	C300,400	BBL-D 90	
79VA5	14SI28	G,P	ABX	11- 29	C 18- 29	SCD-D UKN	
77TH1	14SI28	G,AG	ABY	11- 28	C 28	SCD-D 140	1.4 MEV
77AS10	14SI28	G,BE7	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
79DI10	14SI28	G,BE7	ABY	31-999	C300-999	ACT-I 4PI	999=1 GEV
77AS10	14SI28	G,C11	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
78DI10	14SI28	G,C11	ABY	31-999	C300-999	ACT-I 4PI	999=1 GEV
77AS10	14SI28	G,N13	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
77AS10	14SI28	G,F18	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
77AS10	14SI28	G,NA22	ABY	THR*	5 C 2*	5 SCD-D UKN	*GEV 5=4.5 GEV
77AS10	14SI28	G,NA24	ABY	THR*	5 C 2*	5 SCD-D UKN	*GEV 5=4.5 GEV
78MA3	14SI28	P,G	NOX	2- 13	D 1- 2	SCD-D DST	J-PI
79K01	14SI28	P,G	SPC	50- 89	D 40- 80	NAI-D 60	
78MA3	14SI28	A,G	NOX	11- 13	D 2- 4	SCD-D DST	J-PI
778R10	14SI29	E,E/	LFT	1- 9	D 63-117	MAG-D DST	13 STATES
80WH2	14SI29	E,E/	FMF	1, 4	D126-293	MAG-D DST	4 LEVELS 1.27-4.08
72JA2	14SI29	G,N	SPC	8- 11	C 11	TOF-D DST	9.25 MEV DOORWAY
73FU2	14SI29	G,N	ABX	8- 13	C 8- 13	BF3-I DST	
81PY2	14SI29	G,N	ABX	8- 16	C 8- 16	BF3-I 4PI	
31PY2	14SI29	G,XN	ABX	8- 29	C 8- 29	BF3-I 4PI	
80J05	14SI29	N,G	LFT	9, 10	D565*813	SCD-D 100	*KEV
773U11	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 A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
79RI2	15P 29	P,G	NOX	3- 5	D 0- 2	SCD-D DST	STELLAR REACTION RATE
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	
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	
73GE1	15P 31	G,N	ABX	13- 23	C 15- 25	TOF-D 90	GND, EXCT 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 SPECTRA
73ZA1	15P 31	G,NG	SPC	12- 30	C 30	SCD-D 125	GAMMA SPECTRA
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 SPECTRA
73ZA1	15P 31	G,PG	SPC	7- 30	C 30	SCD-D 125	GAMMA SPECTRA
73BE10	15P 31	G,NP	ABX	19- 29	D 19- 29	BF3-I 4PI	
74VE1	15P 31	G,NP	ABX	19- 29	D 19- 29	BF3-I 4PI	
72TH5	15P 31	G,AG	ABI	10- 22	C 19, 22	SCD-D 150	GAMMA SPECTRA
77AS10	15P 31	G,BE7	ABY	THR*	5 C 2*	5 SCD-D UKN	*GEV 5=4.5 GEV
75DI4	15P 31	G,FI8	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
77AS10	15P 31	G,NA22	ABY	THR*	5 C 2*	5 SCD-D UKN	*GEV 5=4.5 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
77AS10	15P 31	G,NA24	ABY	THR*	5 C 2*	5 SCD-D UKN	*GEV 5=4.5 GEV
75DE3	15P 31	P,G	LFT	9- 10	D 1- 3	SCD-D 55	30 RESONANCES
78WE4	15P 31	\$ P,G	RLX	13- 22	D 6- 15	UKN-D DST	POLARIZED PROTONS
79RI2	15P 31	P,G	NOX	7- 9	D 0- 1	SCD-D DST	STELLAR REACTION RATE
80CA5	15P 31	\$ P,G	ABX	12- 35	D 5- 28	NAI-D DST	POLARIZED PROTONS

## SULFUR Z=16

A	ABUND.	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	0.02	9.9	13.0	19.3	25.0	9.0	16.9	21.5	25.0

REF	NUCLIDE Z	REACTION A	RES IN,OUT	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,NP	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 LVS 2.237, 4.96
73LO4	16S 32	G,NL	ABX	16- 32	C 16- 32	TOF-D	90	L=0, LVS AT 3, 7 MEV
73BE10	16S 32	G,N	ABX	15- 32	D 15- 32	BF3-I	4PI	
73IS3	16S 32	G,N	RLX	16- 21	C 16- 21	BF3-I	4PI	
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
78VA3	16S 32	G,P	ABX	11- 30	C 17- 30	SCD-D	90	
73BE10	16S 32	G,NP	ABX	20- 30	D 20- 30	BF3-I	4PI	
77AS10	16S 32	G,BE7	ABY	THR* 5	C 2* 5	SCD-D	UKN	*GEV 5=4.5 GEV
78DI10	16S 32	G,BE7	ABY	28-999	C300-999	ACT-I	4PI	999=1 GEV
77AS10	16S 32	G,C11	ABY	THR* 5	C 2* 5	SCD-D	UKN	*GEV 5=4.5 GEV
78DI10	16S 32	G,C11	ABY	30-999	C300-999	ACT-I	4PI	999=1 GEV
77AS10	16S 32	G,N13	ABY	THR* 5	C 2* 5	SCD-D	UKN	*GEV 5=4.5 GEV
77AS10	16S 32	G,F18	ABY	THR* 5	C 2* 5	SCD-D	UKN	*GEV 5=4.5 GEV
77AS10	16S 32	G,NA22	ABY	THR* 5	C 2* 5	SCD-D	UKN	*GEV 5=4.5 GEV
77AS10	16S 32	G,NA24	ABY	THR* 5	C 2* 5	SCD-D	UKN	*GEV 5=4.5 GEV
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	
77K09	16S 32	P,G	NOX	10	D 1	SCD-D	DST	9.95 MEV
74F05	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	
79KU6	16S 32	A,G	ABX	11- 21	D 5- 16	NAI-D	DST	E2 STRENGTH,SEE 79KU5
780K2	16S 33	A,G	RLY	9- 11	D 3- 4	SCD-D	DST	J-PI, 3 LEVELS
78BE3	16S 34	G,G	LFT	7- 11	C 18	SCD-D	125	
79KU6	16S 34	A,G	ABX	11- 21	D 4- 15	NAI-D	DST	E2 STRENGTH,SEE 79KU5

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	13.3	21.4

REF	NUCLIDE Z	REACTION A	IN/OUT	RES	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
81BI4	17CL35	G,G	LFT	8		D 8	NAI-D 82		RESONANCE ABSORPTION
75W02	17CL35	G,N	RLY	19-	38	C 19-	38	ACT-I 4PI	RATIO (G,N)/(E,N)
78DI10	17CL35	G,C11	ABY	31-999		C300-999	ACT-I 4PI	999=1	GEV
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	
77K08	17CL35	P,G	NOX	7		D 1	SCD-D DST	4	STATES, 7.6-7.7 MEV
77K010	17CL35	P,G	NOX	7		D 1	SCD-D DST		J-PI, B(ML) 7.546
74VE1	17CL37	G,2N	ABX	19-	24	D 18-	24	BF3-I 4PI	
78DI10	17CL37	G,C11	ABY	34-999		C300-999	ACT-I 4PI	999=1	GEV

ARGON Z=18

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
36	0.34	15.3	8.5	24.2	18.6	6.6	28.0	21.2	14.9
38	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	IN/OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
77FI5	18AR36	E,E/	ABX	2,	4	D 65,	115	MAG-D DST	1.97, 4.18 MEV
79SI9	18AR38	A,G	LFT	9-	11	D 2-	4	SCD-D DST	J-PI, G-WIDTH
75CH4	18AR40	E,E/	SPC	0-	35	D151,	164	MAG-D DST	
77FI5	18AR40	E,E/	ABX	1-	3	D 65,	115	MAG-D DST	1.46, 2.52, 3.21, 3.6
74VE1	18AR40	G,N	ABX	10-	27	D 10-	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	
54FE1	18AR40	G,SN	ABX	9-	25	C 10-	25	BF3-I 4PI	
73BE10	18AR40	G,SN	ABX	11-	27	D 11-	27	BF3-I 4PI	
73JU1	18AR40	G,XN	ABX	10-	23	C 13-	23	TOF-D 90	
79YA1	18AR40	G,P	RLY	12-	65	C 25-	65	ACT-I 4PI	
79YA1	18AR40	G,2P	RLY	22-	65	C 25-	65	ACT-I 4PI	



POTASSIUM Z=19

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
39	93.26	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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
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,NP	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
81GR3	19K 39		E,E/	ABX	2	D 40- 66	MAG-D	DST	2=2.523 MEV, B(E2)
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,NP	ABX	19- 29	D 19- 29	BF3-I	4PI	
81GR3	19K 41		E,E/	ABX	1	D 40- 66	MAG-D	DST	1=.980 KEV, B(E2)

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	0.65	11.5	10.3	19.7	20.2	6.2	19.8	20.4	18.1
43	0.14	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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
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	QUASI-ELASTIC
75T02	20CA40		E,E/	FMF	10- 35	D150-250	MAG-D	DST	B(EL), GDR REGION
76Z11	20CA40		E,E/	ABX	40-280	D500*	MAG-D	120	*TRNS 3-Q CONST
77GR2	20CA40		E,E/	ABX	7	D 31- 67	MAG-D	DST	7=6.95 MEV
78GR1	20CA40		E,E/	ABX	3	D 34- 60	MAG-D	DST	3=3.353 MEV
78GR5	20CA40		E,E/	ABX	3	D 31- 67	MAG-D	DST	
78Z13	20CA40		E,E/	RLX	0-250	D150-250	MAG-D	160	QUASI-ELASTIC
79GR2	20CA40		E,E/	ABX	10	D 36- 58	MAG-D	DST	LV 10.319, J-PI, B(ML)
80ST7	20CA40		E,E/	SPC	8- 12	D 30- 50	MAG-D	DST	LVS 8.43, 9.87, 10.322

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
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	*SEP ENERGY RANGE
76M05	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	*SEP ENERGY RANGE
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	
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	
74BR2	20CA40	G,NG	ABX	16- 31	C 15- 25	SCD-D DST	GAMMA SPECTRA
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	
72BR17	20CA40	G,PG	SPC	11- 24	C 30	SCD-D 90	
73BR13	20CA40	G,PG	NOX	16- 31	C 31	SCD-D DST	GAMMA SPECTRA
74BR2	20CA40	G,PG	ABX	8- 31	C 15- 25	SCD-D DST	GAMMA SPECTRA
77AD3	20CA40	G,PG	ABY	11-750	C100-750	SCD-D 135	2.5, 2.8, 3. MEV
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	
75T04	20CA40	G,P	ABY	88-400	C300,400	BBL-D 90	
78FI7	20CA40	G,P	SPC	45- 85	C 60-100	MAG-D DST	
73D09	20CA40	G,XP	ABY	88-400	C400	TEL-D DST	
76LI7	20CA40	G,NP	ABX	150-300	C 80-800	ACT-I 4PI	
76LI7	20CA40	G,3N3P	ABX	50-800	C 80-800	ACT-I 4PI	
74DA2	20CA40	G,T	ABY	30-450	C450	TEL-D 90	
74DA2	20CA40	G,HE3	ABY	29-450	C450	TEL-D DST	
74DA2	20CA40	G,A	ABY	17-450	C450	TEL-D DST	
77AS10	20CA40	G,BE7	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
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
77AS10	20CA40	G,NA22	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 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
77AS10	20CA40	G,NA24	ABY	THR* 5	C 2* 5	SCD-D UKN	*GEV 5=4.5 GEV
73DI1	20CA40	P,G	ABX	14- 26	D 6- 18	NAI-D DST	
81CH1	20CA40	P,G	LFT	9, 11	D 1- 2	SCD-D DST	9.43, 10.32 MEV
73WA1	20CA40	A,G	ABX	12- 22	D 6- 17	NAI-D DST	
74F04	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	
78WE1	20CA41	N,G	ABX	15- 21	D 6- 13	NAI-D DST	
78WE3	20CA41	N,G	NOX	16, 20	D 8, 12	TOF-D DST	
79JE1	20CA41	\$ N,G	ABX	18	D 10	NAI-D DST	POLARIZED NEUTRONS
80LI4	20CA41	N,G	ABX	11- 17	D 3- 9	NAI-D 90	
80NI3	20CA41	P,G	ABX	17- 26	D 8- 17	NAI-D 90	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
78GR1	20CA42	E,E/	ABX	2	D 34- 60	MAG-D DST	2=1.837 MEV
78GR5	20CA42	E,E/	ABX	1	D 31- 67	MAG-D DST	
80ST7	20CA42	E,E/	SPC	8- 12	D 30- 50	MAG-D DST	LEVEL 11.235, B(EL)
81IT2	20CA42	E,E/	FMF	9- 35	D150-250	MAG-D DST	B(CL)
80PY5	20CA42	E,P	ABX	10- 29	D 15- 29	MAG-D 90	
80PY5	20CA42	E,P	ABX	10- 29	D 15- 29	MAG-D 90	
80PY3	20CA42	E,A	ABX	6- 29	D 15- 29	MAG-D 90	
81AS12	20CA42	G,SN	ABX	11- 28	C 10- 28	BF3-I 4PI	STAT MODEL XN TO SN
73DI2	20CA42	P,G	ABX	14- 23	D 4- 13	NAI-D DST	
74FO4	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	
73TO1	20CA44	E,E/	FMF	7- 35	D124-250	MAG-D DST	FMF 10 TO 28 MEV
78GR1	20CA44	E,E/	ABX	2	D 34- 60	MAG-D DST	2.1884 MEV
78GR5	20CA44	E,E/	ABX	1	D 31- 67	MAG-D DST	
80ST7	20CA44	E,E/	SPC	8- 12	D 30- 50	MAG-D DST	NO TRNS 8.2-12.2 MEV
81IT2	20CA44	E,E/	FMF	9- 35	D124-250	MAG-D DST	B(CL)
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	
78MA10	20CA44	G,P	ABY	12- 68	C 30- 68	ACT-I 4PI	
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	
73BR7	20CA44	A,G	ABI	UKN	D UKN	NAI-D DST	NO ANG DST DATA
74FO4	20CA44	A,G	ABX	14- 19	D 6- 10	NAI-D 90	
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	*TRNS 3-Q CONST
78GR1	20CA48	E,E/	ABX	4	D 34- 60	MAG-D DST	4=4.272 MEV
78GR5	20CA48	E,E/	ABX	4	D 31- 67	MAG-D DST	
80ST7	20CA48	E,E/	SPC	8- 12	D 30- 50	MAG-D DST	LEVEL 10.23, B(EL)
78MA10	20CA48	G,N	ABY	10- 68	C 30- 68	ACT-I 4PI	

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
77KD4	21SC41	\$ P,G	LFT	3, 5	D 1, 5	SCD-D DST	POL SCAT G, 2.8 MEV
78VL2	21SC43	P,G	ABX	6- 11	D 1- 6	NAI-D 4PI	
77OI1	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 LVS .72-2.09 MEV
73ER1	21SC45	G,N	NDX	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	



REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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,JNKP	ABY	THR*	2 C *	ACT-I	4PI	*GEV, K=1-10, J=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	8.1	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	73.8	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	5.3	10.9	12.2	22.1	24.0	10.7	19.1	22.3	21.8

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
81AR1	22TI	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	DATA ALSO IN 81AR3
81AR3	22TI	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	
72KOS	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	
77OI1	22TI46	E,P	ABX	13- 25	D 13- 25	MAG-D	90	
77OI1	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
78MA10	22TI46	G,N	ABY	13- 68	C 30- 68	ACT-I	4PI	
79PY5	22TI46	G,N	ABX	12- 25	C 12- 26	ACT-I	4PI	NOT PURE G,N
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 LV 2421-3739 KEV
81CA2	22TI48	G,G	LFT	1	C 0- 2	SCD-D	DST	.984 MEV
30SU6	22TI48	G,XN	ABX	11- 28	C 11- 28	BF3-I	4PI	
78MA10	22TI48	G,P	ABY	11- 68	C 30- 68	ACT-I	4PI	
76RA1	22TI49	G,G	LFT	1, 1	C 1- 5	SCD-D	DST	1623, 1763 KEV
81BE10	22TI49	G,G	NOX	9	D 9	SCD-D	DST	8.884 MEV, J-PI=7/2+
81BE10	22TI49	G,N	SPC	9	D 9	MOD-D	DST	DECAY 8.884 MEV LEVEL
78MA10	22TI49	G,P	ABY	11- 68	C 30- 68	ACT-I	4PI	
73H04	22TI50	E,E/	FMF	1- 5	D209	MAG-D	DST	1.55, 2.68, 4.40 MEV
76RA1	22TI50	G,G	LFT	1, 5	C 1- 5	SCD-D	DST	1554,4311 KEV
79PY6	22TI50	G,N	RLX	10- 26	C 15- 26	SCI-D	90	
79PY6	22TI50	G,XN	ABX	10- 27	C 10- 27	BF3-I	4PI	
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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
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	*SEP ENERGY RANGE
77KU3	23V	51	E,PI+	RLX	150-999	C600-999	ACT-I	4PI	999=1.2 GEV, G/E
78TS1	23V	51	E,XP	ABX	15- 29	D 15- 29	MAG-D	90	VIRTUAL PHOTON ANAL
76BL12	23V	51	E,SPL	ABY	THR-580	C130-580	ACT-I	4PI	GIVES YLD RATIO G/E
71KU5	23V	51	G,PI+	ABY	THR-999	C200-999	ACT-I	4PI	999=2.2 GEV
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
75WE4	23V	51	G,P	ABX	18	D 18	SCD-D	90	18=17.6 MEV
79TS2	23V	51	G,P	ABX	14- 26	C 15- 26	MAG-D	DST	VIRTUAL PHOTON ANAL
78MA10	23V	51	G,NA	ABY	18- 68	C 30- 68	ACT-I	4PI	
76BU11	23V	51	G,JNKP	ABX	THR-800	C 75-800	ACT-I	4PI	K=2-11, J-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	
78MA10	23V	51	G,A	ABY	10- 68	C 30- 68	ACT-I	4PI	
73JA3	23V	51	G,NA24	ABY	THR-999	C100-999	ACT-I	4PI	999=1 GEV
78DA13	23V	51	G,SC44	ABX	THR* 5	C 2* 5	ACT-D	4PI	*GEV, ISOMER YLD
71KU5	23V	51	G,SPL	ABY	THR-999	C 999	ACT-I	4PI	999=1.5 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	*ENERGY IN GEV
78DI12	23V	51	G,SPL	ABY	THR-999	C300-999	ACT-I	4PI	YLDS 24NE TO 49CR

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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
60IS6	24CR		G,G	ABX	14- 31	C 13- 31	NAI-D	90	
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	

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
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	
78MA10	24CR50	G,2N	ABY	24- 68	C 30- 68	ACT-I 4PI	
78MA10	24CR50	G,NP	ABY	23- 68	C 30- 68	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
73H04	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	LEVELS 1.43, 3.16
78P03	24CR52	E,E/	NOX	1	0120,227	MAG-D DST	1.43 MEV LEVEL, B(EL)
79KU4	24CR52	G,G	LFT	7- 10	C 14	SCD-D DST	7 LEVELS
81AH6	24CR52	G,G	LFT	1	D 1	NAI-D 100	B(EL), LEV 1.434 MEV
81BE9	24CR52	G,G	SPC	7- 10	C 20	SCD-D 90	COH-BRMS
81B05	24CR52	G,G	ABX	15- 23	D 15- 23	NAI-D 90	
81IS5	24CR52	G,G	ABX	5- 17	C 6- 17	NAI-D 90	
78MA10	24CR52	G,N	ABY	12- 68	C 30- 68	ACT-I 4PI	
81IS6	24CR52	G,NG	ABX	12- 32	C 10- 32	SCD-D 135	
79TS2	24CR52	G,PL	ABX	15- 26	C 15- 26	MAG-D DST	L=0, 1 VIR PHOT ANAL
81IS6	24CR52	G,PG	ABX	10- 32	C 10- 32	SCD-D 135	
73BR7	24CR52	A,G	ABI	-UKN	DUKN	NAI-D DST	NO ANG DST DATA
74F04	24CR52	A,G	ABX	15- 20	D 6- 11	NAI-D 90	
76F02	24CR52	A,G	ABX	15- 21	D 6- 12	NAI-D DST	
78P03	24CR53	E,E/	FMF	0- 2	D 90,120	MAG-D DST	LVS .56,1.01,1.3,1.97
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
78BE6	25MN55	G,G	ABX	6- 10	D 6- 10	SCD-D 140	
78BE6	25MN55	G,G	ABX	11	D 11	NAI-D 140	
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
73CA8	25MN55	G,N	ABY	10-999	C300-999	ACT-I 4PI	
73DE7	25MN55	G,N	ABY	10-999	C300-999	ACT-I 4PI	999=1 GEV
77HI5	25MN55	G,N	ABI	10- 30	C 18- 30	ACT-I 4PI	THICK BRMS TARGET
73MA10	25MN55	G,N	ABY	10- 68	C 30- 68	ACT-I 4PI	
79AL2	25MN55	G,1N	ABX	10- 37	D 10- 37	BF3-I 4PI	
73AL6	25MN55	G,2N	ABX	19- 37	D 17- 37	BF3-I 4PI	
79AL2	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	
73CA3	25MN55	G,3N	ABY	31-999	C300-999	ACT-I 4PI	ISM YLD, ANAL 79DI1
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
78DA13	25MN55	G,3N	ABY	THR* 5	C 2* 5	ACT-D 4PI	*GEV, ISOMER YLD
79AL2	25MN55	G,3N	ABX	31- 37	D 29- 37	BF3-I 4PI	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
73CA8	25MN55	G,4N	ABY	33-999	C300-999	ACT-I	4PI	
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
78DA13	25MN55	G,SC44	ABY	THR* 5	C 2* 5	ACT-D	4PI	*GEV, ISOMER YLD
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 IN GEV
78DI12	25MN55	G,SPL	ABY	THR-999	C300-999	ACT-I	4PI	YLDS 24NA TO 51CR

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	91.8	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	0.3	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 BRMS
75ER2	26FE	G,SC44	ABY	THR-800	C250-800	ACT-I	4PI	ISOMER RATIO
78DI12	26FE	G,SPL	ABY	THR-999	C300-999	ACT-I	4PI	YLDS 24NA TO 54MN
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) LV 1.17, 3.75
73HO4	26FE54	E,E/	FMF	1, 5	D209	MAG-D	DST	1.41, 2.54, 4.78
81LI2	26FE54	E,E/	FMF	13	D131-338	MAG-D	DST	5 M8 STATES 8-14 MEV
76LA1	26FE54	G,G	LFT	6	D 6	SCD-D	DST	6=6.13 MEV
76VE3	26FE54	G,N	RLX	13- 27	C 13- 27	SCI-D	UKN	
77HI5	26FE54	G,N	ABI	13- 30	C 18- 30	ACT-I	4PI	THICK BRMS TARGET
77RA3	26FE54	G,N	SPC	16- 26	C 15- 26	SCI-D	UKN	FAST NEUTS
78NO2	26FE54	G,N	ABX	13- 25	C 12- 18	ACT-I	4PI	
78MA10	26FE54	G,2N	ABY	24- 68	C 30- 68	ACT-I	4PI	
78MA10	26FE54	G,NP	ABY	21- 68	C 30- 68	ACT-I	4PI	TO GROUND STATE
72LI3	26FE56	E,E/	FMF	1	D150,225	MAG-D	DST	B(EL) LV .85
72T06	26FE56	E,E/	SPC	0- 37	D250	MAG-D	35	
73T01	26FE56	E,E/	FMF	10- 35	D150,250	MAG-D	DST	FMF OF 16.1 MEV LV
80AL1	26FE56	E,E/	RLX	0- 70	D100-373	MAG-D	DST	Q 210-410 MEV/C
30MC3	26FE56	E,E/	ABX	10*200	D100-999	MAG-D	DST	999=14 GEV, *DLTE
81D02	26FE56	E,P	ABX	10-100	D 16-100	MAG-D	DST	VIRTUAL PHOTON ANAL
80SK5	26FE56	E,A	ABX	7- 50	D 26- 50	MAG-D	DST	VIRTUAL PHOTON ANAL
81D02	26FE56	E,A	ABX	7-100	D 16-100	MAG-D	DST	VIRTUAL PHOTON ANAL
79KU4	26FE56	G,G	LFT	6- 12	C 14	SCD-D	DST	7 LEVELS
81B05	26FE56	G,G	ABX	15- 23	D 15- 23	NAI-D	90	
73VE3	26FE56	G,N	ABX	11- 14	C 11, 13	TOF-D	93	



REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
76AB9	26FE56	G,N	ABX	11- 14	C 11- 14	TOF-D	78	
78MA10	26FE56	G,NP	ABY	20- 68	C 30- 68	ACT-I	4PI	
78MA10	26FE56	G,NA	ABY	20- 68	C 30- 68	ACT-I	4PI	
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) LV .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 IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74MA1	27C055	P,G	ABX	9- 22	D 4- 17	NAI-D	DST	
76CA4	27C055	\$ P,G	ABX	14- 22	D 8- 15	NAI-D	DST	POLARIZED PROTONS
78WE4	27C055	\$ P,G	RLX	13- 20	D 8- 15	UKN-D	DST	POLARIZED PROTONS
80HA5	27C055	P,G	JPI	6- 7	D 1- 2	SCD-D	DST	10 STATES 6.2-7.3 MEV
80UL2	27C055	P,G	RLY	6	D 1	SCD-D	DST	J-PI, 6.754 MEV
74ES3	27C057	P,G	LFT	7- 8	D 1- 2	SCD-D	DST	
74MA1	27C057	P,G	ABX	10- 24	D 4- 18	NAI-D	DST	
76CA4	27C057	\$ P,G	ABX	14- 24	D 8- 15	NAI-D	DST	POLARIZED PROTONS
78F03	27C057	P,G	LFT	9	D 4	SCD-D	DST	9=9.689,9.696
78WE4	27C057	\$ P,G	RLX	14- 31	D 8- 15	UKN-D	DST	POLARIZED PROTONS
81EL1	27C057	P,G	LFT	7	D 1	SCD-D	DST	LEVEL 7.598, J-PI
81D02	27C059	E,P	ABX	7-100	D 16-100	MAG-D	DST	VIRTUAL PHOTON ANAL
78TS1	27C059	E,XP	ABX	15- 29	D 15- 29	MAG-D	90	VIRTUAL PHOTON ANAL
81D02	27C059	E,A	ABX	7-100	D 16-100	MAG-D	DST	VIRTUAL PHOTON ANAL
75B011	27C059	G,G	LFT	1	C 2	UKN	UKN	1190 KEV
81CA2	27C059	G,G	LFT	1- 2	C 0- 2	SCD-D	DST	1.10, 1.46, 1.48 MEV
73AL6	27C059	G,N	ABX	10- 37	D 10- 37	BF3-I	4PI	
73BA20	27C059	G,N	NOX	10- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
74AB12	27C059	G,N	ABX	10- 13	C 11, 13	TOF-D	78	
78MA10	27C059	G,N	ABY	10- 68	C 30- 68	ACT-I	4PI	
79AL2	27C059	G,1N	ABX	10- 37	D 10- 37	BF3-I	4PI	
73AL6	27C059	G,2N	ABX	19- 37	D 17- 37	BF3-I	4PI	
77DI6	27C059	G,2N	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
78MA10	27C059	G,2N	ABY	19- 68	C 30- 68	ACT-I	4PI	
79AL2	27C059	G,2N	ABX	19- 37	D 17- 37	BF3-I	4PI	
73AL6	27C059	G,3N	ABX	29- 37	D 29- 37	BF3-I	4PI	
77DI6	27C059	G,3N	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
79AL2	27C059	G,3N	ABX	30- 37	D 29- 37	BF3-I	4PI	
77DI6	27C059	G,4N	ABY	THR-999	C300-999	ACT-I	4PI	999=1 GEV
74DA2	27C059	G,P	ABY	10-450	C450	TEL-D	90	
75WE4	27C059	G,P	ABX	18	D 18	SCD-D	90	18=17.6 MEV
78FI7	27C059	G,P	NOX	45- 85	C 60-100	MAG-D	DST	
74DA2	27C059	G,T	ABY	22-450	C450	TEL-D	90	
74DA2	27C059	G,HE3	ABY	30-450	C450	TEL-D	90	
74DA2	27C059	G,A	ABY	17-450	C450	TEL-D	90	
73JA3	27C059	G,NA24	ABY	THR-999	C100-999	ACT-I	4PI	999=1 GEV



REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
75ER2	27C059	G,SC44	ABY	THR-800	C250-800	ACT-I	4PI	ISOMER RATIO
73ER1	27C059	G,SPL	NOX	THR-800	C100-800	ACT-I	4PI	SC44 ISOMER RATIO
78DI12	27C059	G,SPL	ABY	THR-999	C300-999	ACT-I	4PI	YLDS 24NA TO 52FE
76CA4	27C059	\$ P,G	ABX	12- 23	D 5- 15	NAI-D	DST	POLARIZED PROTONS
78WE4	27C059	\$ P,G	RLX	14- 23	D 7- 15	UKN-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	68.27	12.2	8.2	21.2	17.7	6.4	22.5	19.6	14.2	
60	26.10	11.4	9.5	20.1	19.2	6.3	20.4	20.0	16.9	
61	1.13	7.8	9.9	19.3	17.0	6.5	19.2	17.4	18.1	
62	3.59	10.6	11.1	19.5	21.0	7.0	18.4	20.5	19.9	
64	0.91	9.7	12.5	19.1	23.0	8.1	16.5	20.9	22.7	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74WH3	28NI	E,E/	ABX	0-300	D500	MAG-D	60	QUASI-ELASTIC
76VL1	28NI	E,E/	ABX	100-500	D 1* 2	MAG-D	DST	*E IN GEV, 1.2, 1.36
79FL2	28NI	E,A	SPC	10-120	D120	MAG-D	DST	PREEQUILIB ALPHAS
80MC6	28NI	E,A	ABX	28-120	D 28-120	MAG-D	DST	
73BA20	28NI	G,N	NOX	11- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
68C03	28NI	G,XN	ABX	11- 34	C 11- 34	BF3-I	4PI	
80MC6	28NI	G,A	ABY	6-120	C 28-120	MAG-D	DST	
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
78LI3	28NI58	E,E/	FMF	5	D120-264	MAG-D	DST	
80PI2	28NI58	E,E/	ABX	7- 40	D102	MAG-D	DST	B(EL)
76M05	28NI58	E,E/P	ABX	8* 80	D497	MAG-D	53	*MISSING ENERGY
81BR2	28NI58	E,N	ABX	40, 80	D 40, 80	ACT-I	4PI	NI57 PRODUCTION RATES
73MI7	28NI58	E,P	ABX	14- 26	D 0- 26	MAG-D	DST	
79V04	28NI58	E,P	ABX	12- 35	D 12- 35	MAG-D	UKN	VIRTUAL PHOTON ANAL
80V02	28NI58	E,P	ABX	8- 35	C 12- 30	TEL-D	DST	VIRTUAL PHOTON ANAL
79W03	28NI58	E,XP	ABX	8- 50	D 16- 50	MAG-D	4PI	VIRTUAL PHOTON ANAL
80W01	28NI58	E,XP	ABX	8- 50	D 16- 50	MAG-D	DST	VIRTUAL PHOTON ANAL
79W03	28NI58	E,XA	ABX	6- 50	D 16- 50	MAG-D	4PI	VIRTUAL PHOTON ANAL
80W01	28NI58	E,XA	ABX	6- 50	D 16- 50	MAG-D	DST	VIRTUAL PHOTON ANAL
79V04	28NI58	E,A	ABX	12- 35	D 12- 35	MAG-D	UKN	VIRTUAL PHOTON ANAL
80V02	28NI58	E,A	ABX	6- 35	C 12- 30	TEL-D	DST	VIRTUAL PHOTON ANAL
81AC11	28NI58	G,G	LFT	6- 10	C 6- 10	SCD-D	DST	10 LEVELS
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
78MA10	28NI58	G,N	ABY	12- 68	C 30- 68	ACT-I	4PI	
81BR2	28NI58	G,N	ABY	12- 80	C 40, 80	ACT-I	4PI	NI57 PRODUCTION RATES
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
78MA10	28NI58	G,2N	ABY	22- 68	C 30- 68	ACT-I	4PI	
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

REF	NUCLIDE Z	REACTION A IN/OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
78MA10	28NI58	G,NP	ABY	20- 68	C 30- 68	ACT-I	4PI	
80AR11	28NI58	G,SPL	ABY	THR-999	C999	ACT-I	4PI	999=4.5 GEV
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
30PI2	28NI60	E,E/	ABX	7- 40	D102	MAG-D	DST	B(EL)
81LI4	28NI60	E,E/	FMF	7- 15	D 1* 3	MAG-D	DST	*DLTQ 1.5-2.7 FM-1
73MI7	28NI60	E,P	ABX	14- 26	D 0- 26	MAG-D	DST	
80VO2	28NI60	E,P	ABX	9- 30	C 12- 35	TEL-D	DST	VIRTUAL PHOTON ANAL
79W03	28NI60	E,XP	ABX	9- 30	D 16- 50	MAG-D	4PI	VIRTUAL PHOTON ANAL
80W01	28NI60	E,XP	ABX	50	D 16- 50	MAG-D	DST	VIRTUAL PHOTON ANAL
79W03	28NI60	E,XA	ABX	6- 30	D 16- 50	MAG-D	4PI	VIRTUAL PHOTON ANAL
80W01	28NI60	E,XA	ABX	6- 50	D 16- 50	MAG-D	DST	VIRTUAL PHOTON ANAL
78FL1	28NI60	E,A	SPC	6-120	D 33-120	MAG-D	DST	
30VO2	28NI60	E,A	ABX	9- 30	C 12- 35	TEL-D	DST	VIRTUAL PHOTON ANAL
81B05	28NI60	G,G	ABX	15- 23	D 15- 23	NAI-D	120	
78B05	28NI60	G,G/	ABX	15- 22	D 15- 22	NAI-D	120	
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
78MA10	28NI60	G,NP	ABY	20- 68	C 30- 68	ACT-I	4PI	
74F02	28NI60	P,G	ABX	16- 17	D 7- 18	NAI-D	90	
78TU2	28NI60	S P,G	ABX	10- 25	D 6- 17	NAI-D	DST	POLARIZED PROTONS
78WE4	28NI60	S P,G	RLX	16- 23	D 6- 13	UKN-D	DST	POLARIZED PROTONS
73BR7	28NI60	A,G	ABX	14- 22	D 8- 16	NAI-D	DST	NO ANG DST DATA
74F02	28NI60	A,G	ABX	13- 23	D 8- 18	NAI-D	DST	
74F04	28NI60	A,G	ABX	14- 22	D 8- 17	NAI-D	90	
81CA2	28NI61	G,G	LFT	1	C 0- 2	SCD-D	DST	1.186 MEV
72LI3	28NI62	E,E/	FMF	1, 4	D150,225	MAG-D	DST	B(EL) LV 1.17, 3.75
73MI7	28NI62	E,P	ABX	16- 29	D 0- 29	MAG-D	DST	
79W03	28NI62	E,XP	ABX	11- 30	D 16- 50	MAG-D	4PI	VIRTUAL PHOTON ANAL
30W01	28NI62	E,XP	ABX	11- 50	D 16- 50	MAG-D	DST	VIRTUAL PHOTON ANAL
79W03	28NI62	E,XA	ABX	7- 30	D 16- 50	MAG-D	4PI	VIRTUAL PHOTON ANAL
30W01	28NI62	E,XA	ABX	7- 50	D 16- 50	MAG-D	DST	VIRTUAL PHOTON ANAL
74M04	28NI62	G,G	LFT	7	D 7	SCD-D	DST	7=7.646 MEV
74M07	28NI62	G,G	NOX	7	D 7	NAI-D	135	7=7.646 F(TEMP)
81CA2	28NI62	G,G	LFT	1	C 0- 2	SCD-D	DST	1.173 MEV
72SH10	28NI62	G,P	ABX	16- 27	C 16- 27	MAG-D	90	ISOB ANALOG STATES
75RA2	28NI62	G,P	RLY	11- 16	C 14- 16	ACT-I	4PI	
75RA2	28NI64	G,P	RLY	12- 17	C 15- 17	ACT-I	4PI	
80AR11	28NI64	G,SPL	ABY	THR-999	C999	ACT-I	4PI	999=4.5 GEV

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	69.17	10.9	6.1	16.1	13.9	5.8	19.7	16.7	17.2
65	30.83	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		REMARKS
						TYPE	ANG	
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	
79BA8	29CU	G,PI+	SPC	568*668	C750	MAG-D	DST	*AVG PHOTON ENERGY
76WA3	29CU	G,PI-	ABY	140-250	C250	MAG-D	90	
79BA8	29CU	G,PI-	SPC	418*718	C750	MAG-D	DST	*AVG PHOTON ENERGY
81AR1	29CU	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	DATA ALSO IN 81AR3
81AR3	29CU	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	
72K08	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
62MI3	29CU	G,XN	ABX	10- 20	D 10- 20	BF3-I	4PI	
73EY3	29CU	G,XN	SPC	22-243	C234	TOF-D	90	NEUTS E ABOVE 12 MEV
80AD10	29CU	G,P	ABY	THR-500	C500	TEL-D	DST	
73D09	29CU	G,XP	ABY	86-400	C400	TEL-D	DST	
73D011	29CU	G,XP	ABY	90-400	C400	TEL-D	DST	
76BA7	29CU	G,JNKP	ABY	THR* 2	C * 2	ACT-I	4PI	*GEV, K=1-10, J=1-19
80AD10	29CU	G,D	ABY	THR-500	C500	TEL-D	DST	
80AD10	29CU	G,T	ABY	THR-500	C500	TEL-D	DST	
80AD10	29CU	G,HE3	RLY	THR-500	C500	TEL-D	DST	
80AD10	29CU	G,A	ABY	THR-500	C500	TEL-D	DST	
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
78DA13	29CU	G,SC44	ABY	THR* 5	C 2* 5	ACT-D	4PI	*GEV, ISOMER YLD
78DA13	29CU	G,MN52	ABY	THR* 5	C 2* 5	ACT-D	4PI	*GEV, ISOMER YLD
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 IN 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	
77KR7	29CU59	P,G	LFT	4- 5	D 1- 2	SCD-D	90	5 STATES, 4.35, 5.31
74KR3	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	
72KL7	29CU63	E,E/	FMF	1	D 25- 85	MAG-D	DST	1=0.96
77KN2	29CU63	E,N	ABX	11- 32	D 20- 32	ACT-I	4PI	
80GA8	29CU63	E,N	ABY	10-999	D320-999	ACT-I	4PI	999=1.2 GEV
78MU9	29CU63	E,A	ABX	5-100	D100	MAG-D	DST	
77KN2	29CU63	E+,N	ABX	11- 32	D 20- 32	ACT-I	4PI	
78AR9	29CU63	G,MU-T	ABX	THR* 30	C 12* 30	NAI-D	4PI	*ENERGY IN GEV
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 LV 1.32-4.51 MEV
81CA2	29CU63	G,G	LFT	1, 1	C 0- 2	SCD-D	DST	1.327, 1.412 MEV
79DZ2	29CU63	G,N	ABX	12- 25	D 12- 25	ACT-D	4PI	
80GA8	29CU63	G,N	ABY	10-999	D320-999	ACT-I	4PI	999=1.2 GEV
78MA10	29CU63	G,2N	ABY	20- 68	C 30- 68	ACT-I	4PI	
75WE4	29CU63	G,P	ABX	18	D 18	SCD-D	90	18=17.6 MEV
77AL9	29CU63	G,P	ABX	70-999	C 2* 5	TEL-D	DST	*E IN GEV, 999=4.5GEV



REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
81AL8	29CU63	G,P	ABY	6-999	C999	TEL-D	DST	999=4.5 GEV
79EG3	29CU63	G,XP	RLY	6-250	C130,250	MAG-D	DST	
78MA10	29CU63	G,NA	ABY	16- 68	C 30- 68	ACT-I	4PI	
74WI8	29CU63	P,G	LFT	9	D 2- 3	SCD-D	55	14 LVS 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	
77KR6	29CU63	P,G	NOX	8- 9	D 2- 3	SCD-D	DST	8.57, 8.74, 8.64 MEV
77P03	29CU65	E,E/	FMF	0- 5	D120	MAG-D	DST	8 STATES .77-4.26 MEV
710L1	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 MEV
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 LV 1.48-4.53 MEV
81CA2	29CU65	G,G	LFT	1	C 0- 2	SCD-D	DST	1.482 MEV
75W02	29CU65	G,N	RLY	20- 40	C 20- 40	ACT-I	4PI	RATIO (G,N)/(E,N)
78MA10	29CU65	G,N	ABY	10- 68	C 30- 68	ACT-I	4PI	
75W02	29CU65	G,2N	RLY	21- 38	C 21- 38	ACT-I	4PI	RATIO (G,2N)/(E,2N)
81AV10	29CU65	\$ G,XP	RLX	0* 2	D 0* 2	TEL-D	100	COH-BRMS .69*1.95 GEV
81AV13	29CU65	\$ G,XP	ASM	0* 2	C 0* 2	TEL-D	100	COH-BRMS .69*1.95 GEV

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	43.6	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	8.9	17.4	15.7	4.8	18.1	16.0	17.3	
68	18.8	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	REACTION A	RES IN,OUT	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	D150,275	MAG-D	DST	
76NE1	30ZN64	E,E/	ABX	1- 3	D 40-112	MAG-D	DST	2+, 2+, 3- STATES
77NE3	30ZN64	E,E/	FMF	1- 3	D100-275	MAG-D	DST	LVS .992, 1.80, 2.305
77NE4	30ZN64	E,E/	FMF	10- 35	C	UKN	MAG-D	UKN B(EL)
81DC2	30ZN64	E,P	ABX	7-100	D 16-100	MAG-D	DST	VIRTUAL PHOTON ANAL
81DC2	30ZN64	E,A	ABX	4-100	D 16-100	MAG-D	DST	VIRTUAL PHOTON ANAL
81CA2	30ZN64	G,G	LFT	0	C 0- 2	SCD-D	DST	.992 MEV
73DE3	30ZN64	G,N	RLX	20- 22	D 20- 22	ACT-I	90	
73DE3	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	
78VE6	30ZN64	G,XN	ABX	16- 26	C 12- 27	SCI-D	4PI	NEUTS ABOVE 3.7 MEV
78VE7	30ZN64	G,XN	SPC	16- 26	C 15- 27	SCI-D	4PI	NEUTS ABOVE 3 MEV
73CL6	30ZN64	G,XP	ABX	8- 26	C 15- 26	SCD-D	DST	
73YA1	30ZN64	G,NP	RLX	19- 30	C 19- 30	ACT-I	4PI	



REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
76NE1	30ZN66	E,E/	ABX	1- 3	D 40-112	MAG-D DST	2+, 3- STATES
77NE3	30ZN66	E,E/	FMF	1- 3	D100-275	MAG-D DST	LEVELS 1.039, 1.873
73S22	30ZN66	G,G	LFT	8	D 8	SCD-D DST	8=7.693
81CA2	30ZN66	G,G	LFT	1	C 0- 2	SCD-D DST	1.040 MEV
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
77NE3	30ZN68	E,E/	FMF	1- 3	D100-275	MAG-D DST	LEVELS 1.077, 1.883
81CA2	30ZN68	G,G	LFT	1	C 0- 2	SCD-D DST	1.077 MEV
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	
77BU11	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 A	REACTION IN,OUT	RES	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
73M02	31GA69	G,G	LFT	6, 8	D 6, 8	SCD-D DST	LEVELS 7.306, 6.874
78RA4	31GA69	P,G	LFT	9	D 3	SCD-D 55	9.858 MEV LEVEL
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	8.8	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 A	REACTION IN,OUT	RES	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	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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	
75G01	32GE70	G,XN	ABX	11- 25	C 9- 25	BF3-I	4PI	
73MC10	32GE70	G,NP	ABX	19- 40	C 12- 42	ACT-I	4PI	
75MC1	32GE70	G,NP	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	
75G01	32GE72	G,XN	ABX	11- 25	C 9- 25	BF3-I	4PI	
73MC10	32GE72	G,NP	ABX	19- 40	C 12- 42	ACT-I	4PI	
75MC1	32GE72	G,NP	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	
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,NP	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,NP	ABX	20- 40	C 12- 42	ACT-I	4PI	
75MC1	32GE76	G,NP	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	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
81CA2	33AS75	G,G	LFT	0- 2	C 0- 2	SCD-D	DST	7 LVS, .57-1.37 MEV
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	0.9	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	49.6	9.9	11.3	18.8	21.5	7.0	16.9	20.4	20.6
82	9.4	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- 20	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	
73S217	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	
75G01	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	
75G01	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	50.69	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	REACTION A 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	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
NO	DATA	-----	NO	DATA	-----	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	18.6	18.5	20.5

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
NO	DATA	-----	NO	DATA	-----	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	9.9	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	RES IN,OUT	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 MEV



REF	NUCLIDE Z	REACTION A IN/OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
80IS1	38SR88	G,G	LFT	6- 8	C 14	SCD-D DST	SIX SPIN 1 STATES
81WI1	38SR88	\$ G,G	NOX	6- 8	C UKN	SCD-D 90	\$G SOURCE
78LI2	38SR89	N,G	RLX	13- 17	D 7- 11	NAI-D DST	

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	18.1	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	QUASI-ELASTIC
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	
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
78MA10	39Y 89	G,N	ABY	12- 68	C 30- 68	ACT-I 4PI	
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	
80VA1	39Y 89	G,P1	ABX	15- 25	C 13- 25	SCD-D DST	
81VA1	39Y 89	G,PL	ABX	7- 25	C 14- 25	SCD-D DST	
71GO3	39Y 89	G,P	ABX	10- 29	C 10- 29	UKN 4PI	
80VA1	39Y 89	G,P	ABX	13- 25	C 13- 25	SCD-D DST	
81VA1	39Y 89	G,P	ABX	7- 25	C 14- 25	SCD-D DST	
72PA4	39Y 89	P,G	LFT	13- 15	D 5- 9	NAI-D DST	
78WE4	39Y 89	\$ P,G	RLX	14- 24	D 6- 16	UKN-D DST	POLARIZED PROTONS
73NI2	39Y 90	N,G	RLY	14- 16	D 6- 9	NAI-D	
78BE1	39Y 90	N,G	ABX	13- 23	D 6- 16	NAI-D 90	
78LI2	39Y 90	N,G	RLX	14- 18	D 7- 11	NAI-D DST	

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	REACTION A 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

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
72FU6	40ZR90	E,E/	FMF	7- 38	D150-250	MAG-D	DST	B(EL)
72T06	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	
73H04	40ZR90	E,E/	FMF	2- 3	D209	MAG-D	DST	2.19, 2.75, 3.08
73T01	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 E0
78KN7	40ZR90	E,E/	RLY	8- 10	DUKN	MAG-D	DST	M2 LEVELS
80ME7	40ZR90	E,E/	FMF	8- 10	D 24- 66	MAG-D	DST	B(ML), 21 LEVELS
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	
80TA2	40ZR90	E,A	ABX	7- 67	D 13- 67	SPK-D	DST	VIRTUAL PHOTON ANAL
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
76BR5	40ZR90	G,N	ABX	13- 30	C 13- 32	ACT-I	4PI	ISOMER YIELD
78MA10	40ZR90	G,N	ABY	12- 68	C 30- 68	ACT-I	4PI	
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	
71G03	40ZR90	G,XN	ABX	12- 28	C 12- 28	MOD-I	4PI	
72AS10	40ZR90	G,XN	SPC	12- 15	C 20- 24	SCI-D	4PI	
72AS10	40ZR90	G,XN	ABX	12- 28	C 11- 28	BF3-I	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	TOTAL AND EXCT STATE
76BR5	40ZR90	G,P	ABX	13- 23	C 14- 24	SCD-D	DST	
76BR5	40ZR90	G,P	ABX	14- 31	C 14- 32	ACT-I	4PI	ISOMER YIELD
73BR12	40ZR90	G,NP	ABX	19- 28	C 20- 28	ACT-I	UKN	
76BR5	40ZR90	G,NP	ABX	20- 31	C 13- 32	ACT-I	4PI	
78MA10	40ZR90	G,NP	ABY	20- 68	C 30- 68	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
80RA3	40ZR90	A,G	ABX	15- 19	D 9- 13	NAI-D	DST	
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 LVS 1.2-4.7 MEV
73WI6	40ZR91	G,N	ABX	7- 11	C 7- 11	TOF-D	130	PEAK AT 9.1 MEV
74T02	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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
73G05	41	NB93	G,PI+	ABY	170-400	C400	BBL-D	90	
75T04	41	NB93	G,PI+	ABY	150-400	C300,400	BBL-D	90	
73G05	41	NB93	G,PI-	ABY	170-400	C400	BBL-D	90	
75T04	41	NB93	G,PI-	ABY	150-400	C300,400	BBL-D	90	
73SU12	41	NB93	G,MU-T	ABX	10- 26	C 18, 26	MGP-D	4PI	
78BE2	41	NB93	G,G	LFT	1- 6	D 4- 6	SCD-D	DST	ALSO G,G/ DATA
73BA20	41	NB93	G,N	NOX	9- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
73MA10	41	NB93	G,N	ABY	9- 68	C 30- 68	ACT-I	4PI	
73G05	41	NB93	G,P	ABY	76-400	C400	BBL-D	90	
75T04	41	NB93	G,P	ABY	36-400	C300,400	BBL-D	90	
78FI7	41	NB93	G,P	NOX	45- 85	C 60-100	MAG-D	DST	
78MA10	41	NB93	G,NA	ABY	13- 68	C 30- 68	ACT-I	4PI	
74DA2	41	NB93	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	14.84	12.7	7.5	20.8	16.9	5.6	22.8	19.5	12.6
94	9.25	9.7	8.5	16.7	15.4	2.1	17.7	17.3	14.5
95	15.92	7.4	8.6	16.2	14.2	2.2	17.0	15.9	15.1
96	16.68	9.2	9.3	16.5	16.6	2.8	16.5	17.8	16.1
97	9.55	6.8	9.2	16.1	15.2	2.8	16.0	16.1	16.5
98	24.13	8.6	9.8	16.3	17.4	3.3	15.5	17.9	17.3
100	9.63	8.3	10.6	15.5	18.2	3.2	14.2	18.0	19.5

REF	NUCLIDE		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
76VL1	42	MO	E,E/	ABX	100-500	D 1* 2	MAG-D	DST	*E IN GEV, 1.2, 1.36
72K08	42	MO	G,N	NOX	6- 22	C 22	THR-I	DST	
73BA20	42	MO	G,N	NOX	THR- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
77JA2	42	MO	G,NA24	ABY	THR-999	C400-999	ACT-I	4PI	999=1 GEV
72H06	42	MO92	E,E/	ABX	1, 2	D209	MAG-D	DST	1=1.51, 2=2.85 MEV
72H010	42	MO92	E,E/	ABX	1, 2	D209	MAG-D	DST	1.5, 2.85 MEV
73H04	42	MO92	E,E/	FMF	1- 3	D209	MAG-D	DST	1.51, 2.28, 2.85
75SH4	42	MO92	E,P	ABX	14- 26	D 14- 25	MAG-D	90	
78MU9	42	MO92	E,A	ABX	5-100	D100	MAG-D	DST	
79FL2	42	MO92	E,A	SPC	32-120	D120	MAG-D	30	PREEQUILIB ALPHAS
81B05	42	MO92	G,G	ABX	15- 23	D 15- 23	NAI-D	90	
74BE3	42	MO92	G,N	ABX	12- 30	D 12- 30	BF3-I	4PI	
76BA1	42	MO92	G,N	RLY	12-UKN	C UKN	SCD-D	4PI	ISOMER RATIO
74BE3	42	MO92	G,2N	ABX	22- 30	D 22- 30	BF3-I	4PI	
78MA10	42	MO92	G,2N	ABY	23- 68	C 30- 68	ACT-I	4PI	
73BE10	42	MO92	G,SN	ABX	12- 28	D 12- 28	BF3-I	4PI	
78BA11	42	MO92	G,NPG	LFT	123*	C 20, 40	SCD-D	135	*KEV, ISOMER LFT

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
79FL2	42M094	E,A	SPC	29-120	D120	MAG-D	30	PREEQUILIB ALPHAS
74BE3	42M094	G,N	ABX	9- 28	D 9- 28	BF3-I	4PI	
74BE3	42M094	G,2N	ABX	15- 28	D 15- 28	BF3-I	4PI	
73BE10	42M094	G,SN	ABX	9- 28	D 9- 28	BF3-I	4PI	
78MA10	42M094	G,NP	ABY	17- 68	C 30- 68	ACT-I	4PI	TO NB92M
78BA11	42M094	G,NPG	LFT	91*	C 20, 40	SCD-D	135	*KEV, ISOMER LFT
78MA10	42M094	G,NA	ABY	14- 68	C 30- 68	ACT-I	4PI	TO ZR89M
81B05	42M096	G,G	ABX	14- 23	D 14- 23	NAI-D	90	
74BE3	42M096	G,N	ABX	9- 28	D 9- 28	BF3-I	4PI	
74BE3	42M096	G,2N	ABX	16- 28	D 16- 28	BF3-I	4PI	
74BE3	42M096	G,3N	ABX	26- 29	D 26- 29	BF3-I	4PI	
73BE10	42M096	G,SN	ABX	9- 28	D 9- 28	BF3-I	4PI	
78MA10	42M096	G,P	ABY	9- 68	C 30- 68	ACT-I	4PI	TO NB95M
73WI6	42M097	G,N	ABX	6- 10	C 7- 10	TOF-D	130	PEAK AT 8.1 MEV
78MA10	42M097	G,P	ABY	9- 68	C 30- 68	ACT-I	4PI	
74BE3	42M098	G,N	ABX	8- 28	D 8- 28	BF3-I	4PI	
74BE3	42M098	G,2N	ABX	15- 28	D 15- 28	BF3-I	4PI	
74BE3	42M098	G,3N	ABX	24- 29	D 24- 29	BF3-I	4PI	
73BE10	42M098	G,SN	ABX	8- 28	D 8- 28	BF3-I	4PI	
73M012	42M0100	G,G	LFT	5- 8	D 5- 8	SCD-D	DST	
74W02	42M0100	G,G	LFT	6- 8	D 6- 8	SCD-D	DST	6.418, 7.637
74BE3	42M0100	G,N	ABX	8- 27	D 8- 27	BF3-I	4PI	
76BA1	42M0100	G,N	RLY	THR-UKN	C UKN	SCD-D	4PI	ISOMER RATIO
78BA14	42M0100	G,N	RLY	8- 65	C 65	SCD-D	4PI	
78MA10	42M0100	G,N	ABY	8- 68	C 30- 68	ACT-I	4PI	
78BA11	42M0100	G,NG	LFT	98*450	C 20, 40	SCD-D	135	*KEV, ISOMER LFT
74BE3	42M0100	G,2N	ABX	14- 27	D 14- 27	BF3-I	4PI	
74BE3	42M0100	G,3N	ABX	21- 28	D 21- 28	BF3-I	4PI	
73BE10	42M0100	G,SN	ABX	8- 28	D 8- 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	18.3	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	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
78BA11	44RU99	G,PG	LFT	22*	44 C 20, 40	SCD-D	135	*KEV, ISOMER LFT
78BA11	44RU101	G,PG	LFT	29*173	C 20, 40	SCD-D	135	*KEV, ISOMER LFT
78BA11	44RU102	G,NG	LFT	221*307	C 20, 40	SCD-D	135	*KEV, ISOMER LFT
78BA14	44RU102	G,P	RLY	9- 65	C 65	SCD-D	4PI	
78BA11	44RU102	G,PG	LFT	192*	C 20, 40	SCD-D	135	*KEV, ISOMER LFT



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 A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
81CA2	45RH103	G,G	LFT	0, 2 C	0- 2	SCD-D DST	.803, 1.277 MEV
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,Y88	ABY	THR-900	C400-900	ACT-I 4PI	

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	7.8	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 D	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 COMPLEX
78AR4	46PD108	E,E/	FMF	0- 2 D	21-121	MAG-D 140	
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	LEVELS .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	REACTION A	RES IN/OUT	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	
80AD10	47AG	G,P	ABY	THR-500	C500	TEL-D	DST	
73D09	47AG	G,XP	ABY	89-400	C400	TEL-D	DST	
80AD10	47AG	G,D	ABY	THR-500	C500	TEL-D	DST	
74DA2	47AG	G,T	ABY	19-450	C450	TEL-D	90	
80AD10	47AG	G,T	ABY	THR-500	C500	TEL-D	DST	
74DA2	47AG	G,HE3	ABY	27-450	C450	TEL-D	90	
80AD10	47AG	G,HE3	RLY	THR-500	C500	TEL-D	DST	
74DA2	47AG	G,A	ABY	13-450	C450	TEL-D	90	
80AD10	47AG	G,A	ABY	THR-500	C500	TEL-D	DST	
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	0.9	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	RES IN/OUT	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	RLY	15	D 15	NAI-D	90	POLARIZED BEAM
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	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73EY3	48CD	G,XN	SPC	19-234	C234	TOF-D 90	NEUTS E ABOVE 12 MEV
76EM2	48CD	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
77GI1	48CD110	E,E/ G,P	LFT ABX	1, 1 11- 30	D 68,112 C 11- 30	MAG-D DST UKN 4PI	2+, .657, 1.475 MEV
74LA3	43CD111	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
72H07	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
72T06	48CD114	E,E/	SPC	0- 37	D183	MAG-D 35	
73H02	48CD114	E,E/	FMF	0- 2	D183,250	MAG-D DST	LVS .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	LEVELS .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 A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74HA4	49IN	S G,G	ABX	15	D 15	NAI-D 90	POLARIZED PHOTONS
73BA20	49IN	G,N	NOX	9- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
79RI1	49IN111	P,G	ABX	13- 27	D 8- 22	NAI-D DST	
81CA2	49IN113	G,G	LFT	1, 2	C 0- 2	SCD-D DST	1.177, 1.510 MEV
73301	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
81CA2	49IN115	G,G	LFT	1- 2	C 0- 2	SCD-D DST	6 LVS, 1.18-1.61 MEV
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	
77HI5	49IN115	G,N	ABI	9- 30	C 18- 30	ACT-I 4PI	THICK BRMS TARGET
74LE1	49IN115	G,2N	ABX	16- 24	D 9- 24	MOD-I 4PI	

TIN Z=50

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
112	1.0	10.8	7.5	17.1	15.0	1.8	19.0	17.6	12.9
114	0.7	10.3	8.5	17.1	16.2	2.6	18.1	17.9	14.6
115	0.4	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	8.3	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 IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
74WH3	50SN	E,E/	ABX	0-300	D500	MAG-D 60	QUASI-ELASTIC
81AR1	50SN	G,MU-T	ABX	215-386	D215-386	TOF-D 4PI	DATA ALSO IN 81AR3
81AR3	50SN	G,MU-T	ABX	215-386	D215-386	TOF-D 4PI	
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	POLARIZED BEAM
73BA20	50SN	G,N	NOX	9- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
81LE1	50SN	G,SN	ABX	25-140	D 25-140	MOD-I 4PI	NO G,1N IN G,SN
81LE1	50SN	G,XN	ABX	25-140	D 25-140	MOD-I 4PI	
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
74S010	50SN112	G,XN	ABX	10- 27	C 10- 28	BF3-I 4PI	
75S012	50SN112	G,XN	ABI	10- 27	C 10- 27	BF3-I 4PI	SEE 74S010
72S011	50SN114	G,XN	ABX	10- 27	C 10- 27	BF3-I 4PI	
75S012	50SN114	G,XN	ABX	9- 27	C 9- 27	BF3-I 4PI	SEE 72S011
72H06	50SN116	E,E/	FMF	1, 2	D209	MAG-D DST	1=1.29, 2=2.27 MEV
72H07	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
72T06	50SN116	E,E/	SPC	0- 37	D183	MAG-D 35	
73H04	50SN116	E,E/	FMF	1- 3	D209	MAG-D DST	1.29, 2.27
75H03	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
81CA2	50SN116	G,G	LFT	1	C 0- 2	SCD-D DST	1.294 MEV
74LE1	50SN116	G,N	ABX	9- 22	D 9- 22	MOD-I 4PI	
74LE1	50SN116	G,2N	ABX	17- 22	D 9- 22	MOD-I 4PI	
73BE10	50SN116	G,SN	ABX	8- 23	D 8- 23	BF3-I 4PI	
72S011	50SN116	G,XN	ABX	9- 27	C 9- 27	BF3-I 4PI	
75S012	50SN116	G,XN	ABX	8- 27	C 8- 27	BF3-I 4PI	SEE 72S011
79RI1	50SN116	P,G	ABX	17- 30	D 8- 22	NAI-D 90	
78KA11	50SN117	G,G	ABX	6	D 6	SCD-D DST	LV AT 6.517, G-WIDTH
74LE1	50SN117	G,N	ABX	9- 22	D 9- 22	MOD-I 4PI	
74LE1	50SN117	G,2N	ABX	16- 22	D 9- 22	MOD-I 4PI	
73BE10	50SN117	G,SN	ABX	9- 22	D 9- 22	BF3-I 4PI	
72S011	50SN117	G,XN	ABX	7- 27	C 7- 27	BF3-I 4PI	
75S012	50SN117	G,XN	ABX	7- 27	C 7- 27	BF3-I 4PI	SEE 72S011
74W02	50SN118	\$ G,G	LFT	6- 8	D 6- 8	SCD-D DST	POL SCAT G, 6.988
81CA2	50SN118	G,G	LFT	1	C 0- 2	SCD-D DST	1.230 MEV
74LE1	50SN118	G,N	ABX	9- 22	D 9- 22	MOD-I 4PI	



REF	NUCLIDE Z	REACTION A	IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74LE1	50SN118	G,2N		ABX	16- 22	D 9- 22	MOD-I	4PI	
73BE10	50SN118	G,SN		ABX	9- 22	D 9- 22	BF3-I	4PI	
74S010	50SN118	G,XN		ABX	9- 27	C 10- 28	BF3-I	4PI	
75S012	50SN118	G,XN		ABI	9- 27	C 9- 27	BF3-I	4PI	SEE 74S010
75BU6	50SN118	G,P		ABY	10-800	D 75-800	ACT-I	4PI	
77AL9	50SN118	G,P		ABX	74-999	C 2* 5	TEL-D	DST	*E IN GEV, 999=4.5GEV
79EG3	50SN118	G,XP		ABY	10-250	C130,250	MAG-D	DST	
75BU6	50SN118	G,JNP		ABY	THR-800	D 75-800	ACT-I	4PI	J=1, 2, 4, 6, 7, 8, 9
77BE5	50SN118	G,N		NOX	10	D 1	NAI-D	DST	POLARIZED NEUTRONS
72S011	50SN119	G,XN		ABX	6- 27	C 6- 27	BF3-I	4PI	
75S012	50SN119	G,XN		ABX	7- 27	C 7- 27	BF3-I	4PI	SEE 72S011
72H06	50SN120	E,E/		FMF	1, 2	D209	MAG-D	DST	1=1.17, 2=2.41 MEV
73H04	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
78KA10	50SN120	G,G		ABX	6	D 6	SCD-D	DST	LEVEL AT 6.73 MEV
78KA11	50SN120	G,G		ABX	7	D 7	SCD-D	DST	LV AT 7.310, G-WIDTH
81CA2	50SN120	G,G		LFT	1	C 0- 2	SCD-D	DST	1.172 MEV
74LE1	50SN120	G,N		ABX	9- 22	D 9- 22	MOD-I	4PI	
74LE1	50SN120	G,2N		ABX	15- 22	D 9- 22	MOD-I	4PI	
73BE10	50SN120	G,SN		ABX	9- 23	D 9- 23	BF3-I	4PI	
74S010	50SN120	G,XN		ABX	8- 27	C 10- 28	BF3-I	4PI	
75S012	50SN120	G,XN		ABI	9- 27	C 9- 27	BF3-I	4PI	SEE 74S010
72S011	50SN122	G,XN		ABX	9- 27	C 9- 27	BF3-I	4PI	
75S012	50SN122	G,XN		ABX	8- 27	C 8- 27	BF3-I	4PI	SEE 72S011
72H06	50SN124	E,E/		FMF	1, 2	D209	MAG-D	DST	1=1.14, 2=2.41 MEV
73H04	50SN124	E,E/		FMF	1- 3	D209	MAG-D	DST	1.14, 2.61
77NE4	50SN124	E,E/		FMF	0- 30	C UKN	MAG-D	UKN	B(EL)
78NE4	50SN124	E,E/		FMF	0- 30	D150,225	MAG-D	DST	B(EL)
74LE1	50SN124	G,N		ABX	9- 22	D 9- 22	MOD-I	4PI	
74LE1	50SN124	G,2N		ABX	14- 22	D 9- 22	MOD-I	4PI	
73BE10	50SN124	G,SN		ABX	9- 23	D 9- 23	BF3-I	4PI	
72S011	50SN124	G,XN		ABX	8- 27	C 8- 27	BF3-I	4PI	
75S012	50SN124	G,XN		ABX	8- 27	C 8- 27	BF3-I	4PI	SEE 72S011

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	REACTION A	IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
74HA4	51SB	G,G		ABX	15	D 15	NAI-D	90	POLARIZED BEAM
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

REF	NUCLIDE Z	REACTION A IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73B02	51SB121	G,G	LFT	0- 3 C	0- 3	SCD-D 125	
80MU4	51SB121	G,G	ABX	3	0 2-	4 UKN-D DST	LFT, LEVEL AT 3.452
81CA2	51SB121	G,G	LFT	1- 2 C	0- 2	SCD-D DST	4 LVS, 1.023-1.087 MEV
81EN2	51SB121	G,G	LFT	3	0 3	DSA-D UKN	
73B02	51SB123	G,G	LFT	0- 3 C	0- 3	SCD-D 125	
78BE2	51SB123	G,G	LFT	0- 7 D	5- 7	SCD-D DST	ALSO G,G/ DATA
81CA2	51SB123	G,G	LFT	1, 1 C	0- 2	SCD-D DST	1.030, 1.087 MEV

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	0.1	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	0.9	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	REACTION A 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 SCTD 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 SCTD 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
78KA15	53I 127	E,SPL	ABY	THR-999	D	*999	ACT-I 4PI	*999=4 GEV
78KA15	53I 127	E,F	ABY	THR-999	D	*999	ACT-I 4PI	*999=4 GEV
73BA20	53I 127	G,N	NOX	THR- 27	C 10-	27	BF3-I 4PI	MEAN NEUTRON ENERGY
72AN8	53I 127	G,JNKP	ABX	1* 7	C 1*	7	ACT-I 4PI	*GEV, J=1-18, K=0-8
77JA2	53I 127	G,NA24	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	0.1	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
NO DATA	-----			NO DATA	-----			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
74LE1	55CS133	G,N	ABX	9- 24	D	9- 24	MOD-I 4PI	
74LE1	55CS133	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	0.1	10.2	7.0	16.0	13.9	0.6	18.2	16.7	12.0
132	0.1	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	6.6	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 A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73BA20	56BA	G,N	NOX	THR- 27	C 10- 27	BF3-I 4PI	MEAN NEUTRON ENERGY
78ME7	56BA136	G,G	LFT	1- 5	C 1- 5	SCD-D DST	POL SCATTERED PHOTONS
77SW8	56BA138	G,G	LFT	1- 5	C 1- 5	SCD-D DST	POL SCATTERED PHOTONS
78ME7	56BA138	G,G	LFT	2- 6	C 1- 5	SCD-D DST	
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	0.09	7.3	6.0	13.6	13.8	2.0	16.6	12.9	14.7
139	99.91	8.8	6.2	13.2	15.8	2.0	16.1	14.8	15.2

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	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	
78UE1	57LA139	E,P	ABX	14- 17	D 15- 18	MAG-D 125	
80UE1	57LA139	E,P	ABX	11- 25	D 15- 25	MAG-D 125	VIRTUAL PHOTON ANAL
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	0.2	10.0	6.9	15.7	13.8	0.4	17.9	16.6	12.1	
138	0.3	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	11.1	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	
78PI2	58CE	E,E/	FMF	5- 45	D 0*	1 MAG-D	DST	*DLTQ=0.3-0.7 FM-1
79PI4	58CE	E,E/	ABX	6- 38	D 50, 92	MAG-D	DST	ASSUMED TO BE CE140
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
81LE1	58CE	G,SN	ABX	25-140	D 25-140	MOD-I	4PI	NO G,1N IN G,SN
81LE1	58CE	G,XN	ABX	25-140	D 25-140	MOD-I	4PI	
76EM2	58CE	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
73PI3	58CE140	E,E/	LFT	1- 3	D 50, 65	MAG-D	DST	2+, 3-, 4+ LEVELS
81ME2	58CE140	E,E/	ABX	6- 11	D 30- 50	MAG-D	DST	
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 MEASUREMENT
76LE2	58CE140	G,2N	ABX	16- 26	D 8- 26	MOD-I	4PI	
78BE1	58CE141	N,G	ABX	11- 21	D 6- 16	NAI-D	90	
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	REACTION A	RES IN,OUT	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	
78UE1	59PR141	E,P	ABX	12- 15	D 14- 17	MAG-D	125	
80UE1	59PR141	E,P	ABX	10- 25	D 14- 25	MAG-D	125	VIRTUAL PHOTON ANAL
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/ELASTIC
73BA20	59PR141	G,N	NOX	THR- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
72DI7	59PR141	G,P	ABY	THR-300	C106-300	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	27.16	9.8	7.2	16.1	13.9	0.8	17.9	16.6	12.5	
143	12.18	6.1	7.5	14.3	10.9	-0.5	15.9	13.4	13.1	
144	23.80	7.8	8.0	12.7	13.2	-1.9	13.9	15.3	13.8	
145	8.29	5.8	8.0	12.6	11.8	-1.6	13.6	13.7	14.4	
146	17.19	7.6	8.6	12.8	14.2	-1.2	13.3	15.5	15.1	
148	5.75	7.3	9.2	12.7	15.2	-0.6	12.6	15.9	16.2	
150	5.63	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	POLARIZED BEAM
80MU4	60ND	G,G	ABX	2- 4	D 2- 4	UKN-D DST	LVS 2.754,3.205,3.254
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/ E2 SPECTRA
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
78ME8	60ND142	\$ G,G	LFT	1- 5	C 1- 5	SCD-D DST	POL SCATTERED GAMMA
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
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/ E2 SPECTRA
78CR1	60ND150	E,E/	ABX	850*931	D 1@ 2	MAG-D UKN	*KEV, @.8-2., FM-1

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	3.1	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	\$OUTGOING PHOTONS
78ME2	62SM144	G,G	LFT	1- 5	C 5	SCD-D DST	12 LEVELS SELF-ABS
74CA5	62SM144	G,N	ABX	10- 21	D 10- 21	BF3-I 4PI	
74CA5	62SM144	G,2N	ABX	18- 21	D 18- 21	BF3-I 4PI	
73BE10	62SM144	G,SN	ABX	10- 21	D 10- 21	BF3-I 4PI	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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	
74CA5	62SM148	G,2N	ABX	13- 20	D 13- 20	BF3-I	4PI	
73BE10	62SM148	G,SN	ABX	8- 20	D 8- 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	
74CA5	62SM150	G,2N	ABX	13- 20	D 13- 20	BF3-I	4PI	
73BE10	62SM150	G,SN	ABX	8- 20	D 8- 20	BF3-I	4PI	
72BE13	62SM152	E,E/	FMF	0, 0	D 50-105	MAG-D	DST	0=.122, 0=.367
72T06	62SM152	E,E/	SPC	0- 31	D150-250	MAG-D	35	LEVELS 11.5, 15.5
76C03	62SM152	E,E/	FMF	1, 1	D 49-106	MAG-D	DST	LEVELS .3665, .1218
77NA2	62SM152	E,E/	LFT	0- 1	D252	MAG-D	DST	2+, 4+, 6+ STATES
74CA5	62SM152	G,N	ABX	8- 20	D 8- 20	BF3-I	4PI	
74CA5	62SM152	G,2N	ABX	13- 20	D 13- 20	BF3-I	4PI	
73BE10	62SM152	G,SN	ABX	8- 20	D 8- 20	BF3-I	4PI	
73G06	62SM152	G,XN	ABX	8- 20	C 8- 20	BF3-I	4PI	
76C03	62SM154	E,E/	FMF	1, 1	D 44-106	MAG-D	DST	LEVELS .082, .267
78GU7	62SM154	G,MU-T	ABX	THR- 31	C UKN	NAI-D	4PI	
81GU2	62SM154	G,MU-T	ABX	THR- 20	C 27	NAI-D	4PI	
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	
74CA5	62SM154	G,2N	ABX	13- 21	D 13- 21	BF3-I	4PI	
73BE10	62SM154	G,SN	ABX	8- 22	D 8- 22	BF3-I	4PI	

EUROPIUM Z=63

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

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
76EM2	64GD	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
78GU7	64GD156	G,MU-T	ABX	THR- 33	C	UKN	NAI-D	4PI
81GU2	64GD156	G,MU-T	ABX	THR- 20	C 27	NAI-D	4PI	

TERBIUM Z=65

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
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
76SU2	65TB159	E,P	ABX	11- 18	D 15- 18	MAG-D	125	
77MU3	65TB159	E,A	ABX	12-100	D100	MAG-D	50	
78MU9	65TB159	E,A	ABX	5-100	D100	MAG-D	DST	
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	3- 12	D 8- 12	SCD-D	DST	
73BA20	65TB159	G,N	NOX	8- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
81JA1	65TB159	G,NA24	ABY	THR-800	C400-800	ACT-I	4PI	
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	0.06	9.4	6.6	14.1	12.3	-1.8	16.3	15.6	11.4
158	0.10	9.1	6.9	14.1	13.3	-0.9	16.0	15.5	12.4
160	2.34	8.6	7.4	13.8	13.8	-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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
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
78MU9	66DY162		E,A	ABX	8-100	D100	MAG-D	50	

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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
76M011	67H0165		E,E/	ABX	7- 40	D 75,105	MAG-D	75	E2 STRENGTH
76M011	67H0165		E,E/	ABX	7- 40	D 75-105	MAG-D	75	E2 STRENGTH
76SU2	67H0165		E,P	ABX	11- 18	D 15- 18	MAG-D	125	
77MU3	67H0165		E,A	ABX	14-100	D100	MAG-D	50	
76GU5	67H0165		G,MU-T	ABX	8- 21	C 35	NAI-D	4PI	
81GU2	67H0165		G,MU-T	ABX	THR- 20	C 27	NAI-D	4PI	
73KA8	67H0165		G,G	ABX	95*	D 95*	SCD-D	UKN	*ENERGY IN KEV
75JA1	67H0165		G,G	ABX	11	D 11	SCD-D	150	RATIO RAMAN/ELASTICT
77BA7	67H0165		G,G	ABX	3- 12	D 8- 12	SCD-D	DST	
73BA20	67H0165		G,N	NOX	8- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
74CA7	67H0165		G,XN	ABX	8- 23	C 8- 23	BF3-I	4PI	
76EM2	67H0165		G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
73MC6	67H0166		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	1.6	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
76C03	68ER166	E,E/	FMF	1, 1	D 34-111	MAG-D	DST	LEVELS .081, .265
78MU9	68ER166	E,A	ABX	7-100	D100	MAG-D	DST	
73ME4	68ER166	\$ G,G	LFT	2	C 2	SCD-D	DST	POL SCTD PHOTONS
76ME4	68ER166	G,G	LFT	1- 4	C 2- 4	SCD-D	DST	13 STATES, 1.66-3.19
80NA1	68ER166	G,G/	SPC	16	D 14- 17	MAG-D	DST	VIBRATIONAL LEVELS
74G04	68ER166	G,XN	ABX	8- 21	C 8- 21	BF3-I	4PI	
78GU7	68ER168	G,MU-T	ABX	THR- 30	C UKN	NAI-D	4PI	
81GU2	68ER168	G,MU-T	ABX	THR- 20	C 27	NAI-D	4PI	
73ME4	68ER168	\$ G,G	LFT	2	C 2	SCD-D	DST	POL SCTD 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 SCTD 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	D100	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	31.7	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
78GU7	70YB174	G,MU-T	ABX	THR- 31	C UKN	NAI-0	4PI	
81GU2	70YB174	G,MU-T	ABX	THR- 20	C 27	NAI-0	4PI	
76C03	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	97.39	7.7	5.5	10.9	12.7	-1.6	14.4	13.0	13.5
176	2.61	6.3	6.0	10.8	12.1	-1.6	14.0	11.8	14.1

REF	NUCLIDE Z	REACTION A	RES IN,OUT	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-0	125	
77BA9	71LU175	G,G	ABX	8- 12	D 8- 12	SCO-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	0.2	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	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
76EM2	72HF	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
77G04	72HF176	G,XN	ABX	8- 22 C	8- 22	BF3-I 4PI	N MULTIPLICITY MEAS
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	
81GU2	72HF178	G,MU-T	ABX	THR- 20 C	27	NAI-D 4PI	
74G04	72HF178	G,XN	ABX	7- 20 C	7- 20	BF3-I 4PI	
77G04	72HF178	G,XN	ABX	7- 22 C	8- 22	BF3-I 4PI	N MULTIPLICITY MEAS
81GU2	72HF180	G,MU-T	ABX	THR- 20 C	27	NAI-D 4PI	
77G04	72HF180	G,XN	ABX	7- 22 C	8- 22	BF3-I 4PI	N MULTIPLICITY MEAS

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	99.983	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
81LE1	73TA	G,SN	ABX	25-140 D	25-140	MOD-I 4PI	NO G,1N IN G,SN
81LE1	73TA	G,XN	ABX	25-140 D	25-140	MOD-I 4PI	
74WH3	73TA181	E,E/	ABX	0-300	D500	MAG-D 60	QUASI-ELASTIC
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,FM-1
80RA1	73TA181	E,E/	FMF	0- 1 D	0* 3	MAG-D 180	TWO LVS .136,.302 MEV
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	
78MU9	73TA181	E,A	ABX	5-100	D100	MAG-D DST	
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	
80SH10	73TA181	G,MU-T	ABX	3- 30 C	42	TOF-D 4PI	D(G,N) SPECTROMETER
81GU2	73TA181	G,MU-T	ABX	THR- 20 C	27	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	POLARIZED BEAM
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	
78KA6	73TA181	G,G	ABX	6- 12 C	6- 12	SCD-D DST	
78RU3	73TA181	G,G	ABX	3	D 3	SCD-D DST	3=2.754
80MU4	73TA181	G,G	ABX	3	D 2- 4	UKN-D DST	LFT, LEVEL AT 3.010
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



REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
73HI6	73TA131	G,XN	ABX	7- 29	C 7- 29	BF3-I 4PI	
74LA5	73TA181	G,XN	SPC	7- 29	C 29	EMU-D DST	
80HA6	73TA181	G,XN	SPC	7- 60	C 30, 60	TOF-D DST	ANG DST BY ACT
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	
77MI11	73TA181	G,SPL	ABY	THR-999	C600-999	ACT-I 4PI	999=1.3 GEV
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
78BE10	73TA181	G,F	RLX	180-999	C220-999	TRK-D 4PI	COHERENT BRMS

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	12.8	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	30.7	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
76VL1	74W	E,E/	ABX	100-500	D 1* 2	MAG-D DST	*E IN GEV, 1.2, 1.36
77MI11	74W	E,SPL	ABY	THR-999	D999	ACT-I 4PI	999=1.27 GEV
73HA3	74W	\$ G,G	RLY	15	D 15	NAI-D 90	POLARIZED BEAM
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	
77MI11	74W	G,SPL	ABY	THR-999	C600-999	ACT-I 4PI	999=1.3 GEV DST NA24
76EM2	74W	G,F	ABY	THR-999	C999	TRK-I 4PI	999=1 GEV
78BE10	74W	G,F	RLX	180-999	C220-999	TRK-D 4PI	COHERENT BRMS
80GU1	74W 182	E,F	NOX	THR- 55	D 35- 55	TRK-D 4PI	
76GU5	74W 182	G,MU-T	ABX	8- 21	C 35	NAI-D 4PI	
81GU2	74W 182	G,MU-T	ABX	THR- 20	C 27	NAI-D 4PI	
73S016	74W 182	G,XN	ABX	8- 28	C 0- 28	BF3-I 4PI	
75S012	74W 182	G,XN	ABI	8- 27	C 8- 27	BF3-I 4PI	SEE 73S016
80GU1	74W 184	E,F	ABX	THR- 55	D 35- 55	TRK-D 4PI	
78GU7	74W 184	G,MU-T	ABX	THR- 37	C UKN	NAI-D 4PI	
81GU2	74W 184	G,MU-T	ABX	THR- 20	C 27	NAI-D 4PI	
73G06	74W 184	G,XN	ABX	8- 20	C 8- 20	BF3-I 4PI	
73S016	74W 184	G,XN	ABX	8- 28	C 0- 28	BF3-I 4PI	
75S012	74W 184	G,XN	ABI	7- 27	C 7- 27	BF3-I 4PI	SEE 73S016
80GU1	74W 186	E,F	NOX	THR- 55	D 35- 55	TRK-D 4PI	
78GU7	74W 186	G,MU-T	ABX	THR- 28	C UKN	NAI-D 4PI	
81GU2	74W 186	G,MU-T	ABX	THR- 20	C 27	NAI-D 4PI	
74W02	74W 186	\$ G,G	LFT	6- 8	D 6- 8	SCD-D DST	POL SCTD 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
78BE10	75RE	G,F	RLX	180-999	C220-999	TRK-D	4PI	COHERENT BRMS
73G06	75RE185	G,XN	ABX	8- 20	C 8- 20	BF3-I	4PI	
73G06	75RE137	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	0.02	8.9	5.7	12.7	10.9	-3.1	16.1	14.2	10.5
186	1.58	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
77SU10	76OS	G,SN	ABX	6- 27	C 7- 27	BF3-I	4PI	STAT MODEL XN TO SN
79BE4	76OS186	G,1N	ABX	11- 20	D 11- 20	BF3-I	4PI	
79BE4	76OS186	G,2N	ABX	14- 20	D 14- 20	BF3-I	4PI	
79BE4	76OS188	G,1N	ABX	8- 30	D 8- 30	BF3-I	4PI	
79BE4	76OS188	G,2N	ABX	14- 30	D 14- 30	BF3-I	4PI	
79BE4	76OS188	G,3N	ABX	21- 30	D 21- 30	BF3-I	4PI	
79BE4	76OS189	G,1N	ABX	6- 30	D 6- 30	BF3-I	4PI	
79BE4	76OS189	G,2N	ABX	14- 30	D 14- 30	BF3-I	4PI	
79BE4	76OS189	G,3N	ABX	19- 30	D 19- 30	BF3-I	4PI	
79BE4	76OS190	G,1N	ABX	8- 30	D 8- 30	BF3-I	4PI	
79BE4	76OS190	G,2N	ABX	14- 30	D 14- 30	BF3-I	4PI	
79BE4	76OS190	G,3N	ABX	20- 30	D 20- 30	BF3-I	4PI	
73G06	76OS190	G,XN	ABX	8- 20	C 8- 20	BF3-I	4PI	
79BE4	76OS192	G,1N	ABX	7- 30	D 7- 30	BF3-I	4PI	
79BE4	76OS192	G,2N	ABX	13- 30	D 13- 30	BF3-I	4PI	
79BE4	76OS192	G,3N	ABX	20- 30	D 20- 30	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	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR		REMARKS
							TYPE	ANG	
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	
78G03	77IR191		G,XN	ABX	8- 21	C 8- 21	BF3-I	4PI	N. MULTIPLICITY MEAS
78G03	77IR193		G,XN	ABX	7- 21	C 8- 21	BF3-I	4PI	N MULTIPLICITY MEAS

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	0.79	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	8.3	13.0	15.0	-0.1	13.4	15.8	*

REF	NUCLIDE Z	REACTION A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR		REMARKS
							TYPE	ANG	
73HA3	78PT	\$	G,G	RLY	15	D 15	NAI-D	90	POLARIZED BEAM
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	
76B014	78PT		G,F	RLX	220-500	D220-500	TRK-I	4PI	COHERENT BRMS
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
78G03	78PT194		G,XN	ABX	8- 21	C 8- 21	BF3-I	4PI	N MULTIPLICITY MEAS
72SH13	78PT195		G,G	ABX	99*328	D 99*328	SCD-D	UKN	*ENERGY IN KEV
78G03	78PT195		G,XN	ABX	6- 21	C 8- 21	BF3-I	4PI	N MULTIPLICITY MEAS
78G03	78PT196		G,XN	ABX	7- 21	C 8- 21	BF3-I	4PI	N MULTIPLICITY MEAS
78G03	78PT198		G,XN	ABX	7- 21	C 8- 21	BF3-I	4PI	N MULTIPLICITY MEAS

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	RES IN,OUT	EXCIT	SOURCE	DETECTOR		REMARKS
						TYPE	ANG	
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)
79PR7	79AU197	E,NL	ABX	THR-147	D 37,147	ACT-I	4PI	L=1-12, VIR PHOTONS
81DZ5	79AU197	E,N	RLY	8- 90	C 10- 90	ACT-I	4PI	ISOMERIC YIELDS
78MU9	79AU197	E,A	ABX	6-100	D100	MAG-D	50	
79FL2	79AU197	E,A	SPC	20-120	D120	MAG-D	DST	PREEQUILIB ALPHAS
79BU9	79AU197	G,PI2N	ABY	THR-750	C100-750	ACT-I	4PI	PI IS PI-, ISOMER YLD
79BU9	79AU197	G,PI4N	ABY	THR-750	C100-750	ACT-I	4PI	PI IS PI-, ISOMER YLD
79BU9	79AU197	G,PI5N	ABY	THR-750	C100-750	ACT-I	4PI	PI IS PI-
78BL7	79AU197	G,PI-	ABY	100-750	C100-750	ACT-I	UKN	
76GU5	79AU197	G,MU-T	ABX	8- 21	C 35	NAI-D	4PI	
81GU2	79AU197	G,MU-T	ABX	THR- 20	C 27	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	POLARIZED BEAM
73LI3	79AU197	G,G/	ABX	0-800	C100-800	ACT-I	4PI	
71DI5	79AU197	G,N	ABY	8-999	C300-999	ACT-I	4PI	999=1 GEV
73BA20	79AU197	G,N	NOX	8- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
77HI5	79AU197	G,N	ABI	8- 30	C 18- 30	ACT-I	4PI	THICK BRMS TARGET
81DZ5	79AU197	G,N	RLY	8- 90	C 10- 90	ACT-I	4PI	ISOMERIC YIELDS
73S019	79AU197	G,XN	ABX	8- 28	C 8- 28	BF3-I	4PI	
74LA5	79AU197	G,XN	SPC	8- 29	C 29	EMU-D	DST	
75S012	79AU197	G,XN	ABI	8- 27	C 8- 27	BF3-I	4PI	SEE 73S019
73DA6	79AU197	G,P	SPC	10-450	C450	TEL-D	90	
74DA2	79AU197	G,P	ABY	9-450	C450	TEL-D	90	
80AD10	79AU197	G,P	ABY	5-500	C500	TEL-D	DST	
73D09	79AU197	G,XP	ABY	86-400	C400	TEL-D	DST	
73D011	79AU197	G,XP	ABY	90-400	C400	TEL-D	DST	
80AD10	79AU197	G,D	ABY	11-500	C500	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	
80AD10	79AU197	G,T	ABY	11-500	C500	TEL-D	DST	
73DA6	79AU197	G,HE3	SPC	14-450	C450	TEL-D	90	
74DA2	79AU197	G,HE3	ABY	24-450	C450	TEL-D	90	
80AD10	79AU197	G,HE3	RLY	13-500	C500	TEL-D	DST	
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	
80AD10	79AU197	G,A	ABY	0-500	C500	TEL-D	DST	
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
74B010	79AU197	G,F	RLX	200-500	D200-500	TRK-I	4PI	COHERENT BRMS
76B014	79AU197	G,F	RLX	220-500	D220-500	TRK-I	4PI	COHERENT BRMS
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,2P	
196	0.2	8.8	6.6	13.4	12.3	-2.0	15.8	15.0	11.7	
198	10.1	8.3	7.1	13.4	13.1	-1.3	15.3	15.2	12.9	
199	17.0	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	29.6	7.8	8.5	13.2	14.9	-0.1	14.0	15.4	15.3	
204	6.8	7.5	9.0	13.2	15.9	0.5	13.5	16.2	*	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	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	POLARIZED BEAM
79LA1	80HG	G,G	ABX	4- 7	D 4- 7	NAI-D	135	
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	
78MA10	80HG198	G,N	ABY	8- 68	C 30- 68	ACT-I	4PI	TO HG197M
78MA10	80HG199	G,P	ABY	7- 68	C 30- 68	ACT-I	4PI	
74TE1	80HG202	G,G	LFT	4	D 4- 8	SCD-D	DST	4=4.922
78MA10	80HG204	G,N	ABY	8- 68	C 30- 68	ACT-I	4PI	

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	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
79LA1	81TL	G,G	ABX	4- 7	D 4- 8	NAI-D	135	
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
78MA10	81TL203	G,N	ABY	8- 68	C 30- 68	ACT-I	4PI	
78MA10	81TL203	G,2N	ABY	15- 68	C 30- 68	ACT-I	4PI	
78MA10	81TL203	G,3N	ABY	23- 68	C 30- 68	ACT-I	4PI	
76EA1	81TL205	G,G	ABX	3- 8	D 3- 8	NAI-D	90	

## LEAD Z=82

A	ABUND.	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	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
79N02	82PB	E,N	RLY	6-999	D230-999	ACT-D	4PI	999=1.2 GEV
73EY3	82PB	E,XN	SPC	20-270	D150-270	TOF-D	90	NEUTS ABOVE 12 MEV
79BA8	82PB	G,PI+	SPC	668*	C700	MAG-D	44	*AVG PHOTON ENERGY
79BA8	82PB	G,PI-	SPC	668*	C700	MAG-D	44	*AVG PHOTON ENERGY
81AR1	82PB	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	DATA ALSO IN 81AR3
81AR3	82PB	G,MU-T	ABX	215-386	D215-386	TOF-D	4PI	
74HA4	82PB	\$ G,G	ABX	15	D 15	NAI-D	90	POLARIZED BEAM
74JA2	82PB	G,G	ABX	10	D 10	SCD-D	DST	
78KA6	82PB	G,G	ABX	6- 12	C 6- 12	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	
81LE1	82PB	G,SN	ABX	25-140	D 25-140	MOD-I	4PI	NO G,1N IN G,SN
73EY3	82PB	G,XN	SPC	THR-234	C234	TOF-D	90	NEUTS ABOVE 12 MEV
80HA6	82PB	G,XN	SPC	7- 60	C 30, 60	TOF-D	DST	ANG DST BY ACT
81LE1	82PB	G,XN	ABX	25-140	D 25-140	MOD-I	4PI	
72AN8	82PB	G,F	ABX	1* 7	C 1* 7	ACT-I	4PI	*ENERGY IN GEV
76B014	82PB	G,F	RLX	220-500	D220-500	TRK-I	4PI	COHERENT BRMS
76EM2	82PB	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
78MA10	82PB204	G,N	ABY	8- 68	C 30- 68	ACT-I	4PI	
78MA10	82PB204	G,2N	ABY	15- 68	C 30- 68	ACT-I	4PI	TO PB202M
78MA10	82PB204	G,3N	ABY	24- 68	C 30- 68	ACT-I	4PI	
81PA1	82PB206	E,E/	ABX	4- 5	D 0* 3	MAG-D	DST	*FM-1, 2 E10 LVS
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 LVS 3744-5038 KEV
77C03	82PB206	G,G	LFT	4- 7	C 6, 10	SCD-D	125	10 LEVELS 5.-6.8 MEV
79LA1	82PB206	G,G	ABX	4- 8	D 5- 8	NAI-D	135	
80CH3	82PB206	G,G	SPC	4- 8	C 9	SCD-D	DST	
82ST1	82PB206	G,G	ABX	9- 12	D 9- 12	NAI-D	DST	
76MC3	82PB206	G,N	ABX	8- 9	D 8- 9	ION-D	90	8999,8533,8120 KEV
79BI13	82PB206	G,N	RLY	3- 12	D 8- 12	SCI-D	DST	
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
78PA1	82PB207	E,E/	FMF	1- 4	D 50-320	MAG-D	90	
80PA1	82PB207	E,E/	ABX	0- 4	D 0* 3	MAG-D	DST	*Q .5-3 FM-1, 6 LEVELS
81PA1	82PB207	E,E/	ABX	4- 6	D 0* 3	MAG-D	DST	*FM-1, 4 E10 LVS
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 LVS 3300-4982
77C03	82PB207	G,G	LFT	4- 7	C 6, 10	SCD-D	125	9 LEVELS 4.8-6.7 MEV
79LA1	82PB207	G,G	ABX	4- 7	D 4- 7	NAI-D	135	
80CH3	82PB207	G,G	SPC	4- 8	C 7, 8	SCD-D	127	
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

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
81BI6	82PB207	G,N	RLY	6- 11 D	7- 12	SCI-D	DST	
81AV10	82PB207	\$ G,XP	RLX	0* 2 D	0* 2	TEL-D	100	COH-BRMS .69*1.95 GEV
81AV13	82PB207	\$ G,XP	ASM	0* 2 C	0* 2	TEL-D	100	COH-BRMS .69*1.95 GEV
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 D	183	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 D	124-250	MAG-D	DST	8 LEVELS DETECTED
73T01	82PB208	E,E/	FMF	6- 32 D	124-250	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 D	500	MAG-D	60	QUASI-ELASTIC
75LI1	82PB208	E,E/	ABX	2- 9 D	37- 61	MAG-D	180	LVS 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 D	120-290	MAG-D	DST	17 LEVELS
77PI2	82PB208	E,E/	SPC	8- 12 D	50, 65	MAG-D	DST	REANALYSIS OF 75BU19
78FR5	82PB208	E,E/	ABX	6- 8 D	50, 64	MAG-D	DST	
78KN7	82PB208	E,E/	RLY	7- 9 D	24- 64	MAG-D	DST	M2 LEVELS
78LI4	82PB208	E,E/	ABX	5- 7 D	50-335	MAG-D	DST	M12, M14 TRANSITIONS
79LI2	82PB208	E,E/	ABX	6- 7 D	50-335	MAG-D	DST	6.43, 6.74, 7.06 MEV
79W04	82PB208	E,E/	SPC	19- 26 D	60	MAG-D	180	SEARCH FOR M1 EXCT
80G02	82PB208	E,E/	ABX	2 D	52-502	MAG-D	DST	B(EL) 2.615 MEV
80LI1	82PB208	E,E/	ABX	4- 7 D	70-335	MAG-D	DST	4 HI-SPIN, 4.9-6.1MEV
81KU3	82PB208	E,E/	SPC	8- 12 D	30- 50	MAG-I	DST	E1, E2 STRENGTH
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	
78AR9	82PB208	G,MU-T	ABX	THR* 30 C	12* 30	NAI-D	4PI	*ENERGY IN GEV
81BI7	82PB208	\$ G,MU-T	LFT	4- 7 D	4- 7	NAI-D	DST	POL G, AZMUTH ANG 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
74M07	82PB208	G,G	NOX	7 D	7	NAI-D	135	7=7.279 F(TEMP)
74SC2	82PB208	G,G	LFT	7 D	7	SCD-D	DST	LEVEL 7.084 MEV
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 LVS 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
77C03	82PB208	G,G	LFT	4- 7 C	6, 10	SCD-D	125	11 LVS 4.1-7.3 MEV
77SW7	82PB208	\$ G,G	LFT	4 C	5	SCD-D	126	POL SCAT 4.843 PHOT
77YE1	82PB208	G,G	LFT	8, 8 D	2	SCD-D	85	LEVEL 7.06, 7.08 MEV
78KN14	82PB208	G,G	RLX	5- 9 D	4- 9	SCD-D	DST	
79LA1	82PB208	G,G	ABX	4- 8 D	4- 8	NAI-D	135	
79NA1	82PB208	\$ G,G	NOX	5- 8 C	14	NAI-D	DST	POL PHOT IN,OUT J-PI
80CH3	82PB208	G,G	SPC	4- 8 C	7- 11	SCD-D	DST	
81AC11	82PB208	G,G	LFT	5- 8 C	10	SCD-D	DST	7 LEVELS
81LE3	82PB208	G,G	ABX	10-100 D	10-100	NAI-D	DST	
82ST1	82PB208	G,G	ABX	9- 12 D	9- 12	NAI-D	DST	
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	
75J02	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	
76H01	82PB208	\$ G,N	LFT	7- 9 C	7- 9	TOF-D	DST	POL N, THR MEASUREMENT
76MC3	82PB208	G,N	ABX	8- 9 D	8- 9	ION-D	90	8999,8533,8120 KEV
77LA2	82PB208	\$ G,N	LFT	8- 10 D	9- 11	TOF-D	90	POL NEUTRONS, J-PI
78VA1	82PB208	G,N	ABX	8- 13 C	8- 13	BF3-I	4PI	



REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE ANG		REMARKS
79H01	82PB208	G,N	ABX	7- 11	C 8- 11	TOF-D	DST	7.99 MEV, 1-, J-PI
81BI6	82PB208	G,N	RLY	7- 11	D 7- 12	SCI-D	DST	
82BE2	82PB208	G,N	ABX	9- 12	D 9- 12	TOF-D	DST	
71G03	82PB208	G,XN	ABX	7- 17	C 7- 17	MOD-I	4PI	
73S021	82PB208	G,XN	ABX	7- 27	C 7- 27	BF3-I	4PI	SEE ALSO 75S012
75S012	82PB208	G,XN	ABI	7- 27	C 7- 27	BF3-I	4PI	SEE 73S021
78LE5	82PB208	G,XN	ABX	25-106	D 25-106	MOD-I	4PI	
77AL9	82PB208	G,P	ABX	72-999	C 2* 5	TEL-D	DST	*E IN GEV, 999=4.5GEV
81AL8	82PB208	G,P	ABY	8-999	C999	TEL-D	DST	999=4.5 GEV
79EG3	82PB208	G,XP	RLY	8-250	C130,250	MAG-D	DST	
77RA4	82PB208	N,G	LFT	7- 9	D 16*856	SCI-D	UKN	*ENERG IN KILOVOLTS
78RA2	82PB208	N,G	LFT	7- 8	D 0- 1	SCD-D	UKN	
81DR4	82PB209	N,G	RLY	11- 24	D 7- 20	NAI-D	DST	MEASURED FORE-AFT ASM

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	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE ANG		REMARKS
73KL1	83BI209	E,E/	FMF	0-125	D101-245	MAG-D	DST	QUASI-ELASTIC
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	
31UE2	83BI209	E,P	ABX	4- 23	D 17- 23	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	
79MC2	83BI209	E,F	NOX	THR-110	D110	SCD-D	90	MASS AND EDST
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 RES ABS
80SH10	83BI209	G,MU-T	ABX	3- 30	C 42	TOF-D	4PI	D(G,N) SPECTROMETER
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	POLARIZED BEAM
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=7.13, 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
74W02	83BI209	\$ G,G	LFT	6- 8	D 6- 8	SCD-D	DST	POL SCTD PHOTONS
77C03	83BI209	G,G	LFT	4- 7	C 6, 10	SCD-D	125	11 LVS 4.2-5.5 MEV
79LA1	83BI209	G,G	ABX	4- 8	D 4- 8	NAI-D	135	
80CH3	83BI209	G,G	SPC	4- 8	C 8	SCD-D	127	
73BA20	83BI209	G,N	NOX	THR- 27	C 10- 27	BF3-I	4PI	MEAN NEUTRON ENERGY
75EV1	83BI209	G,N	SPC	7- 31	C 31	SCI-D	140	
73K03	83BI209	G,1N	ABI	7- 30	C 7- 58	MOD-I	4PI	SIG SN GIVEN
72DI10	83BI209	G,2N	ABY	14-999	C999	ACT-D	4PI	
73K03	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	
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



REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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
81UE2	83BI209	G,P	RLX	4- 21	C 18- 21	MAG-D	DST	
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 ISOTOPE
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 BRMS
76EM2	83BI209	G,F	ABY	THR-999	C999	TRK-I	4PI	999=1 GEV
80LE3	83BI209	G,F	ABX	40- 65	D 40- 65	ION-I	4PI	
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	REACTION A	RES IN,OUT	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	

ACTINIUM Z=89

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
227	---	6.7	4.5	9.4	7.9	-5.0	11.9	11.5	12.5
78ZH4	89AC227	G,F	ABX	THR- 17	C 7- 16	TRK-I	2PI		

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	REACTION A	RES IN,OUT	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 KE
76KN1	90TH232	E,F	RLX	THR- 40	D 10- 40	TRK-I	2PI	SIG(E-)/SIG(E+)
79AS4	90TH232	E,F	ABX	THR- 65	D 7- 65	TRK-D	DST	
79MC2	90TH232	E,F	NOX	THR-110	D110	SCD-D	90	MASS AND EDST
74GU11	90TH232	G,MU-T	ABX	7- 19	C 35	NAI-D	4PI	
76GU2	90TH232	G,MU-T	ABX	7- 19	C UKN	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	POLARIZED BEAM
74JA2	90TH232	G,G	ABX	10	D 10	SCD-D	90	
75JA1	90TH232	G,G	ABX	11	D 11	SCD-D	150	RATIO RAMAN/ELASTICT
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	
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	
80CA1	90TH232	G,1N	ABX	6- 18	D 5- 18	BF3-I	4PI	SEE ALSO 80CA2
80CA1	90TH232	G,2N	ABX	10- 18	D 5- 18	BF3-I	4PI	SEE ALSO 80CA2
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	
80GU5	90TH232	G,XN	RLY	THR-	C	SPK-I	90	YLD FISSION ISOMERS
79VI1	90TH232	G,SPL	ABY	THR-350	C250-350	ACT-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	CMPT SCTD G SOURCE
74IV2	90TH232	G,F	RLY	5- 12	C 5- 12	TRK-I	4PI	YIELD REL U238
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	
77H03	90TH232	G,F	RLY	5- 38	C 9- 38	ACT-I	UKN	MASS YLD DISTRIBUTION
77ZH3	90TH232	G,F	ABY	THR- 7	C 5- 7	TRK-D	DST	
78B08	90TH232	G,F	ABX	THR- 6	C 3- 6	TRK-I	4PI	
78ZH6	90TH232	G,F	RLY	THR- 5	C 3- 5	TRK-D	4PI	
78ZH7	90TH232	G,F	ABX	THR- 7	C 4- 7	TRK-D	4PI	
79VI1	90TH232	G,F	RLY	THR-350	C250,350	ACT-I	4PI	
79ZH3	90TH232	G,F	YLD	THR- 7	C 5- 7	TRK-D	DST	
80CA1	90TH232	G,F	ABX	5- 18	D 5- 18	BF3-I	4PI	SEE ALSO 80CA2
80CA2	90TH232	G,F	NOX	11, 17	D 5- 18	BF3-I	4PI	DELAYED N YLD
80CA2	90TH232	G,F	NOX	5- 18	D 5- 18	BF3-I	4PI	PROMPT N MULT
80GU4	90TH232	G,F	RLY	THR- 55	C 15- 55	SCD-D	90	M,E DST, SYM/ASM YLD
81BE12	90TH232	G,F	ABX	THR- 7	C 5- 7	TRK-I	DST	
81YE1	90TH232	G,F	ABX	5- 11	D 5- 11	TRK-I	4PI	PHOTONS FROM P,G

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	99.275	6.1	7.6	10.0	11.8	-4.3	11.3	13.6	*

REF	NUCLIDE		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
75CA5	92U	233	G,F	NOX	6- 13 C	8- 13	MOD-I	4PI	NEUT MULTIPLICITIES
76K08	92U	233	G,F	RLY THR-	24 C	10- 24	ACT-I	4PI	
78ZH7	92U	233	G,F	ABX THR-	7 C	4- 7	TRK-D	4PI	
81AR4	92U	234	E,F	ABX	5- 25 D	5- 25	TRK-I	4PI	VIRTUAL PHOTON ANAL
75CA5	92U	234	G,F	NOX	6- 13 C	8- 13	MOD-I	4PI	NEUT MULTIPLICITIES
78B08	92U	234	G,F	ABX THR-	4 C	4	TRK-I	4PI	UPPER LIMIT FOR SIGMA
78LI1	92U	234	G,F	RLX	5- 6 C	0- 6	TRK-D	DST	
80LI5	92U	234	G,F	ABX THR-	6.5 C	4- 6	TRK-I	DST	
76SH12	92U	235	E,F	RLY THR-	120 D	30-120	SCD-D	90	
79MC2	92U	235	E,F	NOX THR-	110 D	110	SCD-D	90	MASS AND EDST
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	
80CA1	92U	235	G,1N	ABX	5- 18 D	5- 18	BF3-I	4PI	SEE ALSO 80CA2
80CA1	92U	235	G,2N	ABX	5- 18 D	5- 18	BF3-I	4PI	SEE ALSO 80CA2
73RU1	92U	235	G,XN	RLY	5- 10 C	5- 10	BF3-I	4PI	
80GU5	92U	235	G,XN	RLY THR-	45 C	45	SPK-I	90	YLD FISSION ISOMERS
80DH3	92U	235	G,A	SPC THR-	20 C	20	TEL-D	UKN	LONG-RANGE ALPHAS
72K010	92U	235	G,F	RLY THR-	14 C	14	ACT-I	4PI	F PRODUCT 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 U238
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	F PRODUCT YIELD
76ZH2	92U	235	G,F	ABX THR-	7 C	3- 7	TRK-D	90	YLD CURVE ANAL TEST
78AL5	92U	235	G,F	RLY THR-	999 C	100-999	TRK-D	4PI	999=1.2 GEV
78B08	92U	235	G,F	ABX THR-	6 C	3- 6	TRK-I	4PI	
78ZH6	92U	235	G,F	RLY THR-	5 C	3- 5	TRK-D	4PI	
78ZH7	92U	235	G,F	ABX THR-	7 C	4- 7	TRK-D	4PI	
80CA1	92U	235	G,F	ABX	5- 18 D	5- 18	BF3-I	4PI	SEE ALSO 80CA2
80CA2	92U	235	G,F	NOX	5- 18 D	5- 18	BF3-I	4PI	PROMPT N MULT
80CA2	92U	235	G,F	NOX	11, 17 D	5- 18	BF3-I	4PI	DELAYED N YLD
80GU4	92U	235	G,F	RLY THR-	55 C	15- 55	SCD-D	90	M,E DST, SYM/ASM YLD
80JA3	92U	235	G,F	RLY THR-	70 C	12- 70	ACT-I	4PI	MASS YLDS, ISM RATIOS
81JA2	92U	235	G,F	NOX THR-	70 C	12- 70	SCD-D	90	MASS, ENERGY DST
78MC5	92U	236	E,AG	SPC	43 D	43	SCD-D	UKN	
80AR7	92U	236	E,F	ABX	6- 33 D	6- 33	TRK-D	DST	SEE ALSO 78AR11,79AR7
80CA1	92U	236	G,1N	ABX	5- 18 D	5- 18	BF3-I	4PI	SEE ALSO 80CA2
80CA1	92U	236	G,2N	ABX	11- 18 D	5- 18	BF3-I	4PI	SEE ALSO 80CA2
73YE2	92U	236	G,F	ABX	5- 8 D	5- 8	SCD-I	4PI	CMPT SCTD G SOURCE
75CA5	92U	236	G,F	NOX	6- 13 C	8- 13	MOD-I	4PI	NEUT MULTIPLICITIES
76AL4	92U	236	G,F	RLY THR-	7 C	5- 7	TRK-I	DST	
78B08	92U	236	G,F	ABX THR-	4 C	4	TRK-I	4PI	UPPER LIMIT FOR SIGMA
78ZH6	92U	236	G,F	ABX THR-	5 C	3- 5	TRK-D	4PI	
78ZH7	92U	236	G,F	ABX THR-	7 C	4- 7	TRK-D	4PI	



REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE ANG	REMARKS
79AR7	92U 236	G,F	ABX	THR- 7 C	11- 19	TRK-D 4PI	VIRTUAL PHOTONS, GQR
79ZH3	92U 236	G,F	YLD	THR- 7 C	4- 7	TRK-D DST	
80AR7	92U 236	G,F	ABX	THR- 19 C	9- 19	TRK-D 2PI	SEE ALSO 78AR11,79AR7
80CA1	92U 236	G,F	ABX	5- 18 D	5- 18	BF3-I 4PI	SEE ALSO 80CA2
80CA2	92U 236	G,F	NOX	5- 18 D	5- 18	BF3-I 4PI	PROMPT N MULT
80CA2	92U 236	G,F	NOX	11, 17 D	5- 18	BF3-I 4PI	DELAYED N YLD
80CA2	92U 236	G,F	RLX	5- 17 D	5- 18	BF3-I 4PI	RATIO 1-/2- CHANCE F
76C03	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
80PI3	92U 238	E,E/	ABX	5- 40 D	87	MAG-D DST	J-PI B(EL) LFT
77SH9	92U 238	E,G	ABX	C-120 D	20-120	SCD-I DST	
78NE1	92U 238	E,G	ABX	THR- 29 D	5- 29	TRK-I DST	
77MA4	92U 238	E,N	ABX	6- 25 D	6- 25	ACT-I 4PI	
79SH10	92U 238	E,N	ABX	6-120 C	20-120	ACT-D 4PI	VIRTUAL PHOTON ANAL
78D06	92U 238	E,P	SPC	7- 40 D	40	MAG-D 48	
76W02	92U 238	E,A	ABX	THR- 24 D	9- 24	ACT-I 4PI	THORIUM 234 ACTIVITY
78DC4	92U 238	E,A	ABX	THR- 13 D	13	ACT-I 4PI	UPPER LIMIT FOR SIGMA
78DC6	92U 238	E,A	SPC	THR- 40 D	40	MAG-D 48	
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
76AR3	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+)
76SH12	92U 238	E,F	RLY	THR-120 D	30-120	SCD-D 90	
78AR11	92U 238	E,F	ABX	THR- 29 D	5- 29	TRK-I DST	
79AS4	92U 238	E,F	ABX	THR- 65 D	7- 65	TRK-D DST	
79MC2	92U 238	E,F	NOX	THR-110 D	110	SCD-D 90	MASS AND EDST
80AR4	92U 238	E,F	ABX	THR- 9 D	5- 9	TRK-D DST	
81AN9	92U 238	E,F	RLY	THR-999 C	600-999	TRK-I DST	999=1.6 GEV, COH-BRMS
81ST5	92U 238	E,F	ABX	THR- 35 D	10- 35	SPK-I 90	ALSO RATIO E,F/E+,F
81ST5	92U 238	E+,F	ABX	THR- 27 D	10- 27	SPK-I 90	ALSO RATIO E,F/E+,F
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	
73M013	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	POLARIZED BEAM
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/ELASTICT
78KA4	92U 238	G,G	ABX	8, 9 D	8, 9	SCD-D DST	
78KA6	92U 238	G,G	ABX	6- 12 C	6- 12	SCD-D DST	
80MU4	92U 238	G,G	ABX	2, 4 D	2- 4	UKN-D DST	LFT 2 LVS 2.254,3.254
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	
73G02	92U 238	G,N	RLY	6- 7 C	5- 7	BF3-I 4PI	
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	
80CA1	92U 238	G,1N	ABX	5- 18 D	5- 18	BF3-I 4PI	SEE ALSO 80CA2
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	
80CA1	92U 238	G,2N	ABX	9- 18 D	5- 18	BF3-I 4PI	SEE ALSO 80CA2
80GU5	92U 238	G,2N	RLY	THR- 45 C	45	SPK-I 90	YLD FISSION ISOMERS
81LE1	92U 238	G,SN	ABX	25-140 D	25-140	MOD-I 4PI	NO G,1N IN G,SN
73KN5	92U 238	G,XN	ABX	6- 8 D	5- 8	BF3-I 4PI	INCL G,FN NEUTRONS
73RU1	92U 238	G,XN	RLY	6- 10 C	5- 10	BF3-I 4PI	
81LE1	92U 238	G,XN	ABX	25-140 D	25-140	MOD-I 4PI	
77JA2	92U 238	G,NA24	ABY	THR-999 C	400-999	ACT-I 4PI	999=1 GEV
79VI1	92U 238	G,SPL	ABY	THR-300 C	300	ACT-I 4PI	
71MA0	92U 238	G,F	ABX	5- 10 D	5- 10	ION-I 4PI	



REF	NUCLIDE Z	REACTION A	RES IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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	
75B03	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	F PRODUCT YIELD
76ZH2	92U	238	G,F	ABX	THR- 7 C	3- 7	TRK-D	90	YLD CURVE ANAL TEST
76ZH3	92U	238	G,F	RLY	THR- 5 C	3- 5	TRK-D	DST	SEE ALSO 71IG1
77ZH1	92U	238	G,F	ABX	3- 7 C	3- 7	TRK-I	DST	
78AL5	92U	238	G,F	RLY	THR-999 C100-999		TRK-D	4PI	999=1.2 GEV
78BE13	92U	238	G,F	RLY	THR- 6 C	3- 6	TRK-I	4PI	
78GA4	92U	238	G,F	RLY	5- 31 C 31		ACT-I	4PI	YIELDS 136CS, 150PM
78ZH6	92U	238	G,F	ABX	THR- 5 C	3- 5	TRK-D	4PI	
78ZH7	92U	238	G,F	ABX	THR- 7 C	4- 7	TRK-D	4PI	
79BE11	92U	238	G,F	ABY	3- 6 C	3- 6	UKN	4PI	FISSION BARRIER ANAL
79JA5	92U	238	G,F	NOX	THR- 70 C	12- 70	SCD-D	90	ENERGY, MASS FRAG DST
79JA7	92U	238	G,F	RLY	THR- 70 C	12- 70	ACT-I	4PI	MASS CHAIN YIELDS
79K09	92U	238	G,F	ABX	THR- 26 C	7- 26	SPK-D	0	
79ZH3	92U	238	G,F	YLD	THR- 7 C	5- 7	TRK-D	DST	
80BE5	92U	238	G,F	ABX	100-999 C100-999		TRK-D	4PI	
80BE5	92U	238	G,F	ABX	100-999 C100-999		TRK-D	4PI	
80CA1	92U	238	G,F	ABX	5- 18 D	5- 18	BF3-I	4PI	SEE ALSO 80CA2
80CA2	92U	238	G,F	NOX	5- 18 D	5- 18	BF3-I	4PI	PROMPT N MULT
80CA2	92U	238	G,F	RLX	5- 17 D	5- 18	BF3-I	4PI	RATIO 1-12- CHANCE F
80CA2	92U	238	G,F	NOX	11, 17 D	5- 18	BF3-I	4PI	DELAYED N YLD
80DE2	92U	238	G,F	RLY	THR- 20 C 20		ACT-I	4PI	MASS YLD 88 TO 139
80GU4	92U	238	G,F	RLY	THR- 55 C 15- 55		SCD-D	90	M,E DST, SYM/ASM YLD
81AL7	92U	238	G,F	RLY	THR- 6 C	5- 6	TRK-I	DST	
81YE1	92U	238	G,F	ABX	5- 11 D	5- 11	TRK-I	4PI	PHOTONS FROM P,G
78GU2	92U	238	G,F2N	LFT	THR- 45 C 45		TOF-D	4PI	ISOMER/PROMPT F YLDS
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	REACTION A	RES IN,OUT	RES	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
77SH9	93NP	237	E,G	ABX	C-120 D	20-120	SCD-I	DST	
79MC2	93NP	237	E,F	NOX	THR-110 D	110	SCD-D	90	MASS AND EDST
77BA7	93NP	237	G,G	ABX	8- 12 D	8- 12	SCD-D	DST	
72BE15	93NP	237	G,N	ABX	9- 17 D	9- 17	MOD-I	4PI	

REF	NUCLIDE Z	REACTION A	RES IN,OUT	EXCIT	SOURCE	DETECTOR TYPE	ANG	REMARKS
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	F PRODUCT YIELDS
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 U238
75CA5	93NP237	G,F	NOX	6- 13 C	8- 13	MOD-I	4PI	NEUT MULTIPLICITIES
78AL5	93NP237	G,F	RLY THR-	999 C	100-999	TRK-D	4PI	999=1.2 GEV
78ZH6	93NP237	G,F	RLY THR-	5 C	3- 5	TRK-D	4PI	
78ZH7	93NP237	G,F	ABX THR-	7 C	4- 7	TRK-D	4PI	

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	REACTION A	RES IN,OUT	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	
79GU1	94PU239	G,2N	RLY	12- 45 C	45	SCD-I	4PI	ISOMERIC/PROMPT YLD
80GU5	94PU239	G,2N	RLY THR-	45 C	45	SPK-I	90	YLD FISSION ISOMERS
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 U238
75CA5	94PU239	G,F	NOX	6- 13 C	8- 13	MOD-I	4PI	NEUT MULTIPLICITIES
76K03	94PU239	G,F	RLY THR-	24 C	10- 24	ACT-I	4PI	
78AL5	94PU239	G,F	RLY THR-	999 C	100-999	TRK-D	4PI	999=1.2 GEV
78ZH7	94PU239	G,F	ABX THR-	7 C	4- 7	TRK-D	4PI	
80GU4	94PU239	G,F	RLY THR-	55 C	15- 55	SCD-D	90	M,E DST, SYM/ASM YLD
81K04	94PU239	G,F	RLY THR-	28 C	28	ACT-D	4PI	MASS, ENERGY DST
80GU5	94PU240	G,XN	RLY THR-	45 C	45	SPK-I	4PI	YLD FISSION ISOMERS
31TH1	94PU240	G,F	ABX THR-	30 C	12- 30	SCD-D	4PI	ENERGY, MASS DST
78ZH7	94PU241	G,F	ABX THR-	7 C	4- 7	TRK-D	4PI	
80GU5	94PU242	G,N	RLY THR-	48 C	40, 48	SPK-I	4PI	YLD FISSION ISOMERS
81GU1	94PU242	G,FN	RLY THR-	80 C	40, 48	SPK-I	4PI	ISOMER YIELD RATIO

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		REACTION	RES	EXCIT	SOURCE	DETECTOR		REMARKS
	Z	A					IN,OUT	TYPE	
78AL5	95	AM241	G,F	RLY	THR-999	C100-999	TRK-D	4PI	999=1.2 GEV
78ZH7	95	AM241	G,F	ABX	THR- 7	C 4- 7	TRK-D	4PI	
79KU3	95	AM241	G,F	ABY	THR- 80	C 10- 80	SPK-I	4PI	DELAYED/PROMPT F YLD
79K09	95	AM241	G,F	ABX	THR- 26	C 7- 26	SPK-D	0	
78AL5	95	AM243	G,F	RLY	THR-999	C100-999	TRK-D	4PI	999=1.2 GEV
79KU3	95	AM243	G,F	ABY	THR- 80	C 10- 80	SPK-I	4PI	DELAYED/PROMPT F YLD
79K09	95	AM243	G,F	ABX	THR- 26	C 7- 26	SPK-D	0	

## 8. DIGITAL DATA LIBRARY INDEX

In the following list, data sets whose acquisition numbers, ACQ, are followed by a \* were either prepared from published tabular data or were obtained in digital form directly from the source. All other sets were obtained by digitizing published graphical data. The references associated with these data sets are all included in the bibliography given in Section 9 starting on page 92.

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
DEUTERIUM Z=1				3LI	G, MU-T	75AH3	914*
1H 2	G, PI-	75CH3	1141*	0.5 MEV RESOLUTION			
1H 2	G, HAD	72AR14	1081*	3LI	G, MU-T	75AH3	915*
1H 2	G, P	55AL1	1143	1.0 PERCENT RESOLUTION			
1H 2	G, P	68BU2	1144*	3LI	G, XN	64AL1	1062
1H 2	G, P	57HU80	1146*	3LI	G, XN	63C03	1064
COMPILATION EXPT DATA TABLE 4				3LI	G, XN	60FA1	1063
1H 2	G, P	74SK1	1145*	3LI	G, T	77LE1	1059
1H 2	G, P	56WH1	1142*	FIG 1			
1H 2	G, P	71WE2	714	3LI6	E, P	70W01	732
HELIUM Z=2				3LI6	E, P	70W01	733
2HE3	G, N	65FE1	70	3LI6	E, P	70W01	734
2HE3	G, N	65FE1	75	3LI6	E, P	70W01	735
2HE3	G, N	66GE1	63	3LI6	G, 1N	65BE1	508*
2HE3	G, 1N	70BE6	237*	3LI6	G, 2N	65BE1	509*
2HE3	G, P	72CH3	610*	3LI6	G, SN	65BE1	507*
2HE3	G, P	65FE1	65	3LI6	G, XN	64BA2	1058
2HE3	G, P	65FE1	66	FIG 1, HISTOGRAM PLOT			
2HE3	G, D	65ST1	64	3LI6	G, XN	66C05	656
2HE4	G, N	69AR4	263	3LI6	G, XN	64GR2	657
2HE4	G, N	69AR4	265	3LI6	G, XN	65HA1	584*
2HE4	G, N	70BU1	236	3LI6	G, P	65BA2	660
2HE4	G, N	71BU1	339	3LI6	G, P	67DE2	659
2HE4	G, N	66FE1	605	3LI6	G, XP	70W01	658
2HE4	G, 1N	69AR5	283	3LI6	G, PD	70MU1	674
2HE4	G, SN	71BE3	238*	3LI6	G, D	67DE2	661
2HE4	G, SN	70BE9	338	3LI6	G, T	65BA2	677
2HE4	G, P	71BU1	340	3LI6	G, T	67DE2	675
2HE4	G, 2N2P	69AR5	282	3LI6	G, T	70MU1	673
2HE4	P, G	70ME2	440*	3LI6	G, T	66SH1	676
LITHIUM Z=3				3LI6	G, T	68SH2	422
3LI	G, MU-T	75AH3	912*	3LI6	G, T	70W01	672
3LI	G, MU-T	75AH3	913*	3LI6	G, HE3	66NU1	668
2.0 MEV RESOLUTION				3LI6	G, HE3	70W01	671
2.0 PERCENT RESOLUTION				3LI6	HE, G	68BL1	669*
				HE=HE3			
				667			
				HE=HE3			
				670			
				68BL1 DATA EXTENDED, HE=HE3			
3LI7	E, P	70W01	730	3LI7	E, P	70W01	730
3LI7	E, P	70W01	731	3LI7	E, P	70W01	731







NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
80 16	G,NG	67CA2	23	80 16	P,G	730C1	850
	FIG 27 TOP	5.21 MEV STATE		80 16	P,G	74R05	1053
80 16	G,NG	67CA2	31	80 16	P,G	79SN1	1080
	FIG 28 TOP	6.18 MEV STATE			FROM SNOVER LTR	5/79	
80 16	G,NG	67CA2	33	80 16	P,G	64TA2	80
	FIG 29 TOP	6.79 MEV STATE					FIG 2
80 16	G,1N	66BA5	296*	80 16	D,G	66SU1	79
80 16	G,1N	73BE10	857		FIG 9,90 DEG DIFF SIG		
80 16	G,1N	75BE13	42*	80 16	D,G	71SU1	851
80 16	G,1N	82CA1	1139*	80 16	HE,G	74SH3	855
		FIG 3B					HE=HE3
80 16	G,1N	66MI2	471	80 16	A,G	74SN9	1075*
80 16	G,1N	74VE1	879*		FIG 1B E1 POINTS		
80 16	G,2N	82CA1	1140*	80 16	A,G	74SN9	1076*
		FIG 3C			FIG 1B E2 POINTS, CURVE	51076000	
80 16	G,2N	74VE1	877*	80 16	A,G	74SN9	1077*
80 16	G,SN	82CA1	1138*		FIG 1A POINTS		
		FIG 3A		80 16	A,G	74SN9	1078
80 16	G,SN	67CA2	35		FIG 1C E1/E2 PHASE SHIFT		
		FIG 18		80 18	G,1N	76KN4	1056*
80 16	G,XN	62B02	215	80 18	G,2N	76KN4	1054*
80 16	G,XN	64BA3	312	80 18	G,SN	76KN4	1057*
80 16	G,XN	64FI1	213	80 18	G,XN	76KN4	1055*
	NEUT SPEC 25MEV BREMS						
80 16	G,XN	65HA1	572		FLUORINE Z=9		
80 16	G,XN	75KN8	1039*	9F 19	G,MU-T	69BE2	107
80 16	G,XN	72TH2	852	9F 19	G,MU-T	66D02	417
80 16	G,P	67CA2	22	9F 19	G,MU-T	64TE1	663
		FIG 34		9F 19	G,N	71BA2	662
80 16	G,P	69ST1	194	9F 19	G,N	62DE1	664
80 16	G,P	67TH1	202	9F 19	G,N	60KI4	666
80 16	G,P0/N0	68VU1	226	9F 19	G,1N	72VA2	665
80 16	G,PG	67CA2	24	9F 19	G,2N	73BE10	217
	FIG 27 BOTTOM	5.28 MEV STATE		9F 19	G,2N	74VE1	880*
80 16	G,PG	67CA2	27	9F 19	G,SN	74VE1	881*
	FIG 31 TOP	9.9 MEV STATE		9F 19	G,XN	73BE10	749
80 16	G,PG	67CA2	28	9F 19	G,XN	73CA5	726
	FIG 31 BOTTOM	10.84 MEV STATE		9F 19	G,P	62D01	803
80 16	G,PG	67CA2	29				
	FIG 30 TOP	9.23 MEV STATE			NEON Z=10		
80 16	G,PG	67CA2	30	10NE	E,P	62D01	797
	FIG 30 BOTTOM	9.1 MEV STATES		10NE	G,1N	74VE1	869*
80 16	G,PG	67CA2	32	10NE	G,2N	74VE1	882*
	FIG 28 BOTTOM	6.32 MEV STATE		10NE	G,SN	74VE1	876*
80 16	G,PG	67CA2	34	10NE	G,XN	54FE1	871
	FIG 29 BOTTOM	7.3 MEV STATE		10NE	G,XP	63FI4	796
80 16	G,NP	74VE1	878*				
80 16	G,AG	67CA2	37				
		FIG 32		10NE20	G,P	69H01	795
80 16	G,2A	53MI1	1073	10NE20	P,G	60BR1	874
	SMOOTH CURVE			10NE20	P,G	67SE1	73
80 16	G,4A	52G01	1074	10NE20	P,G	67SE1	946
	FIG ON P 671			10NE20	P,G1	60BR1	873
80 16	G,4A	53MI1	1072	10NE20	P,G1	67SE1	872
	SMOOTH CURVE			10NE20	P,G0+G1	64TA1	940*
80 16	G,NG+PG	67CA2	26				
		FIG 35		10NE22	G,2N	74VE1	870*
80 16	P,G	67BL1	78				
80 16	P,G	67EA1	1083				
	FIG 6 PAGE	252,253					



NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
	SODIUM Z=11						
11NA23	G, MU-T	65WY1	49	12MG26	G, SN	71FU2	346*
			FIG 11	12MG26	G, XN	72IS1	549
11NA23	G, 1N	71AL1	347*	12MG26	G, P	74AN1	950
11NA23	G, 1N	63SA1	781	12MG26	G, XP	74VA2	951
11NA23	G, 1N	74VE1	883*		ALUMINUM Z=13		
11NA23	G, 2N	71AL1	350*	13AL27	G, MU-T	75AH3	928*
11NA23	G, 2N	74VE1	884*		2.0 MEV RESOLUTION		
11NA23	G, SN	71AL1	351*	13AL27	G, MU-T	75AH3	929*
11NA23	G, SN	74VE1	885*		2.0 PERCENT RESOLUTION		
11NA23	G, P	73VE2	777	13AL27	G, MU-T	75AH3	930*
	MAGNESIUM Z=12				0.2 MEV RESOLUTION		
12MG	G, MU-T	66D02	323	13AL27	G, MU-T	75AH3	931*
12MG	G, MU-T	65WY1	47		1.0 PERCENT RESOLUTION		
			FIG 13A	13AL27	G, MU-T	72AH7	595
12MG	G, MU-T	65WY1	48	13AL27	G, MU-T	59DU1	769
			FIG 14B	13AL27	G, MU-T	64D02	756
12MG	G, N	70WE1	322	13AL27	G, MU-T	59MI1	767
			FIG 2	13AL27	G, MU-T	60TA2	467
12MG	G, N	70WE1	355		FIG 15A		
			FIG 5	13AL27	G, MU-T	65WY1	46
12MG	G, N	70WE1	775		FIG 15B		
			FIG DOTS	13AL27	G, MU-T	60ZI1	846
12MG	G, SN	71FU2	342	13AL27	G, N	65TH2	76
12MG	G, XN	63C03	327	13AL27	G, 1N	60CH2	752
12MG	G, XN	65MI1	325	13AL27	G, 1N	66FU1	517*
12MG	G, XN	58SP2	328	13AL27	G, 1N	74VE1	886*
12MG	G, XP	64IS1	326	13AL27	G, 2N	66FU1	116*
				13AL27	G, 2N	74VE1	887*
12MG24	E, E/	66AR2	945	13AL27	G, SN	66FU1	516*
12MG24	E, E/	67TI1	944	13AL27	G, XN	67AN2	551
12MG24	G, N	71BA2	941	13AL27	G, XN	69AN3	860
12MG24	G, N	60KI1	319	13AL27	G, XN	62B02	801
12MG24	G, 1N	71FU2	343*	13AL27	G, XN	69C02	536
12MG24	G, 1N	66MI2	324	13AL27	G, XN	66FU1	115
12MG24	G, XN	69AN2	321	13AL27	G, XN	69IS3	453
12MG24	G, XN	72IS1	548	13AL27	G, XN	53J01	1107
12MG24	G, P	66IS1	771	13AL27	G, XN	62MU1	753
12MG24	G, P	67LE1	943	13AL27	G, P	60CH2	751
12MG24	P, G	68BE3	798	13AL27	G, P	62D01	804
12MG24	P, G	63G03	942	13AL27	G, P	720D1	758
				13AL27	G, P	62SH11	954
12MG25	G, N	71BA2	205	13AL27	G, 2P	58AU1	770
12MG25	G, N	70BE5	947	13AL27	G, 2P	58AU1	955
			POINTS	13AL27	G, N2P	68ME4	311
12MG25	G, N	70BE5	948	13AL27	G, NA24	60G02	962
12MG25	G, 1N	71AL1	352*		SILICON Z=14		
12MG25	G, 2N	71AL1	353*	14SI	G, MU-T	75AH3	932*
12MG25	G, SN	71AL1	354*		0.15 MEV RESOLUTION		
12MG25	G, XN	55NA1	320	14SI	G, MU-T	75AH3	933*
12MG25	G, P	74W05	952		1.0 PERCENT RESOLUTION		
				14SI	G, MU-T	72AH7	596
12MG26	E, E/	70TI1	953	14SI	G, MU-T	68BE4	103
12MG26	G, N	69BE3	949	14SI	G, MU-T	59DU1	829
			POINTS				
12MG26	G, 1N	71FU2	344*				
12MG26	G, 2N	71FU2	345*				



NUCLIDE	REACTION	REF	ACC	NUCLIDE	REACTION	REF	ACC
14SI	G, MU-T	65WY1	61	15P 31	G, XN	63CO3	793
			FIG 17A	15P 31	G, XN	74DE10	961
14SI	G, MU-T	65WY1	62	15P 31	G, XN	69IS3	454
			FIG 17B	15P 31	G, XN	62MU2	755
14SI	G, N	63SA1	826				POINTS
14SI	G, N	70WU1	819	15P 31	G, XN	62MU2	812
14SI	G, 1N	63CA1	72*				SOLID LINE
14SI	G, 1N	74VE1	888*	15P 31	G, 2P	70AN2	807
14SI	G, XN	69AN3	828	15P 31	G, XP	64IS1	809
14SI	G, XN	63B01	825	15P 31	G, NP	74VE1	890*
		FIG 2 BOTTOM		15P 31	G, N2P	70AN2	808
14SI	G, XN	63B01	958				
		FIG 2 TOP					
14SI	G, XN	69CO1	830		SULPHUR Z=16		
14SI	G, XN	63CO3	788				
14SI	G, XN	66G03	74	16S	G, MU-T	59DU1	817
14SI	G, XN	68G06	431	16S	G, MU-T	68DO1	859
		FIG 2B		16S	G, MU-T	65WY1	43
14SI	G, XN	68G06	957				FIG 19A
		FIG 5A		16S	G, MU-T	65WY1	44
14SI	G, P	65CA2	760				FIG 19B
14SI	G, P	67G01	854	16S	G, N	63B01	967
14SI	G, P	67G01	856	16S	G, N	70WU1	820
14SI	G, P	62SH11	822	16S	G, XN	68G06	432
14SI	G, 2P	71SA2	609	16S	G, P	62SH11	966
14SI	G, XP	61SH5	827	16S	G, XP	64IS1	818
14SI	G, A	65CA2	765				
				16S 32	G, N	67AN2	711
14SI28	G, N	70WE1	356	16S 32	G, N	67AN2	815
			FIG 1	16S 32	G, N	62KU1	968
14SI28	G, N	70WE1	776	16S 32	G, N	65TH1	750
		FIG 1 DOTS		16S 32	G, N	67VE1	71
14SI28	G, P	61SH1	853	16S 32	G, 1N	74VE1	894*
14SI28	P, G	61GA1	824	16S 32	G, 2N	74VE1	892*
14SI28	P, G	61KI1	821	16S 32	G, NP	62B03	965
14SI28	P, G	65SI1	104	16S 32	G, NP	74VE1	893*
14SI28	P, G1	61GA1	823	16S 32	G, N+2N	70AN3	285
14SI28	A, G	68ME1	77				FIG 4
				16S 32	G, NP+D	71BR1	814
14SI29	G, N	73FU2	802	16S 32	G, NP+2N+D	70AN3	284
							FIG 5
14SI30	A, G	68ME1	759	16S 32	P, G	65DE1	82
				16S 32	P, G	65DE1	83
14SI32	A, G	68ME1	761	16S 32	P, G	65DE1	84
	PHOSPHORUS Z=15				CHLORINE Z=17		
15P 31	G, MU-T	59DU1	813	17CL	G, 1N	74VE1	895*
15P 31	G, N	72AN12	960	17CL	G, 2N	74VE1	896*
15P 31	G, N	63MC3	810	17CL	G, SN	74VE1	897*
15P 31	G, 1N	74VE1	891*				
15P 31	G, 2N	74VE1	889*	17CL 35	G, N	55B02	218
15P 31	G, XN	63B01	811	17CL 35	G, N	62KU1	219
		FIG 3B					
15P 31	G, XN	63B01	959	17CL 37	G, 2N	74VE1	898*
		FIG 3, 1MEV BINS					

NUCLIDE	REACTION	REF	ACO	NUCLIDE	REACTION	REF	ACO
	ARGON Z=18						
18AR36	P,G	70KE1	244	20CA40	P,G	68BA1	196
18AR38	G,P	70KE1	245	20CA40	P,G	68BA1	197
18AR40	G,1N	74VE1	899*	20CA40	P,G	68BA1	198
18AR40	G,2N	74VE1	900*	20CA40	P,G	73DI1	587
18AR40	G,SN	74VE1	901*	20CA40	P,G	73DI1	220
	POTASSIUM Z=19						
19K	G,1N	74VE1	904*	20CA40	P,G	67FE1	192
19K	G,2N	74VE1	902*	20CA40	A,G	73WA1	590
19K	G,NP	74VE1	903*	20CA42	P,G	73DI2	585
19K 39	G,N	69WE1	182				
19K 39	G,N	71WE1	713				
	CALCIUM Z=20				SCANDIUM Z=21		
20CA40	G,MU-T	75AH3	934*	21SC45	G,1N	74VE1	906*
	2.0 MEV RESOLUTION			21SC45	G,2N	74VE1	907*
20CA40	G,MU-T	75AH3	935*	21SC45	G,SN	73SA5	589
	2.0 PERCENT RESOLUTION			21SC45	G,SN	74VE1	908*
20CA40	G,MU-T	75AH3	936*				
	0.15 MEV RESOLUTION				TITANIUM Z=22		
20CA40	G,MU-T	75AH3	937*	22TI	G,XN	67C01	434
	1.0 PERCENT RESOLUTION						
20CA40	G,MU-T	72AH7	597		VANADIUM Z=23		
20CA40	G,MU-T	68BE4	102	23V 51	G,1N	62FU1	433*
20CA40	G,MU-T	66D02	214	23V 51	G,1N	74VE1	909*
20CA40	G,MU-T	65WY1	55	23V 51	G,2N	62FU1	443*
	FIG 21A			23V 51	G,2N	74VE1	910*
20CA40	G,MU-T	65WY1	56	23V 51	G,SN	62FU1	464*
	FIG 21B			23V 51	G,SN	74VE1	911*
20CA40	G,N	64BA1	535	23V 51	G,XN	69G03	448
20CA40	G,N	67G03	186	23V 51	G,A	61CA2	742
	FIG 2						
20CA40	G,N	71IS1	414		CHROMIUM Z=24		
20CA40	G,N	63MI2	252	24CR52	G,XN	69G03	449
20CA40	G,N	69WU1	229	24CR52	G,SP	70IS4	430
	FIG 2 CURVE						
20CA40	G,N	69WU1	231		MANGANESE Z=25		
	FIG 1A			25MN55	G,1N	73AL6	519*
20CA40	G,1N	66MI2	472	25MN55	G,2N	73AL6	520*
20CA40	G,1N	74VE1	905*	25MN55	G,3N	73AL6	521*
20CA40	G,XN	66AN1	193	25MN55	G,SN	73AL6	518*
20CA40	G,XN	67G03	185	25MN55	G,XN	59PA2	439
	FIG 1A						
20CA40	G,XN	67G03	232		IRON Z=26		
	FIG 1B			26FE	G,SN	67C02	436
20CA40	G,XN	68G06	462	26FE	G,XN	53J01	1108
20CA40	G,P	68G01	187				
20CA40	G,P	67G04	286				
20CA40	G,P	69WU1	199				
20CA40	G,P	69WU1	230				
	FIG 2 POINTS						

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
COBALT Z=27				28NI62	G,P	73MI7	747
27CO59	G,MU-T	65WY1	60	28NI62	G,XP	73MI7 FROM	E,P0 745
			FIG 23			73MI7 FROM	E,XP
27CO59	G,1N	73AL7	526*	28NI64	E,E/	69GU1	748
27CO59	G,1N	62FU1	435*	COPPER Z=29			
27CO59	G,2N	73AL7	527*	29CU	G,MU-T	65WY1	58
27CO59	G,2N	62FU1	444*				FIG 27
27CO59	G,3N	73AL7	528*	29CU	G,1N	64FU1	533*
27CO59	G,SN	73AL7	525*	29CU	G,2N	64FU1	534*
27CO59	G,SN	71BA1	247	29CU	G,SN	64FU1	532*
	FIG 1: SOLID LINE + POINTS			29CU	G,XN	56GA1	570
27CO59	G,SN	62FU1	441*	29CU	G,XN	70IS6	487
27CO59	G,XN	71BA1	251	29CU	G,XN	53JO1	1109
	FIG 1 SOLID LINE			29CU	G,XN	76KN3	1047*
27CO59	G,XN	69G03	450	29CU	G,XN	61MI1	468
NICKEL Z=28				29CU63	G,N	72DR2	446
28NI	G,MU-T	65WY1	59	29CU63	G,N	68OW1	110
			FIG 25	29CU63	G,N	68SU1	420*
28NI	G,XN	64BA4	540	29CU63	G,1N	64FU1	18*
28NI	G,XN	68FI1	541	29CU63	G,2N	64FU1	19*
28NI58	G,N	700W1	274	29CU63	G,2N	68SU1	421*
28NI58	G,1N	74FU3	523*	29CU63	G,SN	64FU1	20*
28NI58	G,2N	74FU3	524*	29CU65	G,1N	64FU1	68*
28NI58	G,SN	74FU3	522*	29CU65	G,2N	64FU1	81*
28NI58	G,SN	69G02	278	29CU65	G,SN	64FU1	67*
28NI58	G,SN	690W1	191	ZINC Z=30			
28NI58	G,XN	68MI1	17	30ZN	G,XN	67CO1	438
28NI58	G,P	73MI7	737	30ZN	G,XN	56GA1	569
			FROM E,P0	30ZN64	G,N	68OW1	109
28NI58	G,XP	70IS4	743	30ZN64	G,1N	76CA1	969*
28NI58	G,XP	70IS4	1069	30ZN64	G,2N	76CA1	970*
	FIG 2 PROTONS ABOVE 8 MEV			30ZN64	G,SN	76CA1	971*
28NI58	G,XP	73MI7	736	GALLIUM Z=31			
			FROM E,P0	31GA	G,1N	76CA1	972*
28NI58	G,NP+2N	59CA4	741	31GA	G,2N	76CA1	973*
28NI60	G,N	68MI1	21	31GA	G,SN	76CA1	974*
28NI60	G,N	700W1	275	GERMANIUM Z=32			
28NI60	G,1N	74FU3	530*	32GE70	G,1N	76CA1	975*
28NI60	G,2N	74FU3	531*	32GE70	G,2N	76CA1	976*
28NI60	G,SN	74FU3	529*	32GE70	G,SN	76CA1	977*
28NI60	G,SN	69E02	537				
28NI60	G,SN	690W1	190	32GE72	G,1N	76CA1	978*
28NI60	G,P	71DI4	349	32GE72	G,2N	76CA1	979*
28NI60	G,P	73MI7	746				
			FROM E,P0				
28NI60	G,XP	70IS4	1070				
	FIG 3 PROTONS ABOVE 1 MEV						
28NI60	G,XP	70IS4	1071				
	FIG 3 PROTONS ABOVE 8 MEV						
28NI60	G,XP	73MI7	744				
			FROM E,XP				
28NI60	P,G	71DI4	221				
			FIG 2				

NUCLIDE	REACTION	REF	ACO	NUCLIDE	REACTION	REF	ACO
32GE72	G,SN	76CA1	980*	38SR	G,2N	71LE1	379*
32GE74	G,1N	76CA1	981*	38SR	G,SN	71LE1	380*
32GE74	G,2N	76CA1	982*	38SR	G,XN	70HI1	329
32GE74	G,SN	76CA1	983*	38SR88	P,G	69HA1	258
32GE74	G,SN	700W2	272				
32GE74	G,XN	700W2	271				
32GE74	G,XN	1 MEV ANALYSIS 700W2	273		YTRIUM Z=39		
		0.5 MEV ANALYSIS		39Y 89	G,N	69BE4	188
32GE76	G,1N	76CA1	984*	39Y 89	G,1N	67BE2	3*
32GE76	G,2N	76CA1	985*	39Y 89	G,1N	71LE1	381*
32GE76	G,SN	76CA1	986*	39Y 89	G,2N	67BE2	2*
				39Y 89	G,2N	69BE4	189
				39Y 89	G,2N	71LE1	382*
				39Y 89	G,SN	67BE2	1*
				39Y 89	G,SN	71LE1	383*
	ARSENIC Z=33						
33AS75	G,N	700W1	268				
33AS75	G,N	700W2	270		ZIRCONIUM Z=40		
33AS75	G,1N	69BE1	145*	40ZR90	G,1N	67BE2	6*
33AS75	G,1N	76CA1	987*	40ZR90	G,1N	71LE1	384*
33AS75	G,2N	69BE1	146*	40ZR90	G,2N	67BE2	5*
33AS75	G,2N	76CA1	988*	40ZR90	G,2N	71LE1	385*
33AS75	G,SN	69BE1	144*	40ZR90	G,SN	73AS2	588
33AS75	G,SN	76CA1	989*	40ZR90	G,SN	67BE2	4*
33AS75	G,SN	700W2	269	40ZR90	G,SN	71IS2	413
				40ZR90	G,SN	71LE1	386*
	SELENIUM Z=34			40ZR90	P,G	69HA1	206
34SE	G,XN	67C02	437	40ZR90	P,G	69HA1	257
34SE76	G,1N	76CA1	990*				FIG 1
34SE76	G,2N	76CA1	991*	40ZR91	G,1N	67BE2	9*
34SE76	G,SN	76CA1	992*	40ZR91	G,2N	67BE2	8*
				40ZR91	G,SN	67BE2	7*
34SE78	G,1N	76CA1	993*	40ZR92	G,1N	67BE2	11*
34SE78	G,2N	76CA1	994*	40ZR92	G,2N	67BE2	10*
34SE78	G,SN	76CA1	995*	40ZR92	G,SN	67BE2	13*
34SE80	G,1N	76CA1	996*	40ZR94	G,1N	67BE2	16*
34SE80	G,2N	76CA1	997*	40ZR94	G,2N	67BE2	14*
34SE80	G,SN	76CA1	998*	40ZR94	G,3N	67BE2	15*
				40ZR94	G,SN	67BE2	12*
34SE82	G,1N	76CA1	999*				
34SE82	G,2N	76CA1	1000*		NIObIUM Z=41		
34SE82	G,SN	76CA1	1001*	41NB93	G,1N	71LE1	369*
				41NB93	G,2N	71LE1	370*
	RUBIDIUM Z=37			41NB93	G,SN	71LE1	371*
37RB	G,1N	71LE1	375*				
37RB	G,2N	71LE1	376*				
37RB	G,SN	71LE1	377*		MOLYBDENUM Z=42		
				42MO	G,XN	53J01	1114
	STRONTIUM Z=38			42MO92	G,1N	74BE3	693*
38SR	G,1N	71LE1	378*	42MO92	G,2N	74BE3	694*
38SR	G,2N	70HI1	233				



NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
42M092	G,SN	74BE3	695*	47AG109	G,SN	69IS2	456
42M092	G,XN	70IS1	429		XN CORRECTED FOR N-MULT		
42M094	G,1N	74BE3	696*		CADMIUM Z=48		
42M094	G,2N	74BE3	697*				
42M094	G,SN	74BE3	698*	48CD	G,1N	74LE1	626*
42M096	G,1N	74BE3	699*	48CD	G,2N	74LE1	627*
42M096	G,2N	74BE3	700*	48CD	G,SN	74LE1	628*
42M096	G,3N	74BE3	701*				
42M096	G,SN	74BE3	702*	48CD127	G,XN	56GA1	564
42M098	G,1N	74BE3	703*		INDIUM Z=49		
42M098	G,2N	74BE3	704*				
42M098	G,3N	74BE3	705*	49IN	G,1N	69FU1	140*
42M098	G,SN	74BE3	706*	49IN	G,1N	74LE1	629*
42M098	G,XN	70IS1	445	49IN	G,2N	69FU1	141*
42M0100	G,1N	74BE3	707*	49IN	G,2N	74LE1	630*
42M0100	G,2N	74BE3	708*	49IN	G,3N	69FU1	142*
42M0100	G,3N	74BE3	709*	49IN	G,SN	69FU1	143*
42M0100	G,SN	74BE3	710*	49IN	G,SN	74LE1	631*
				49IN115	G,XN	62B01	457
	RHODIUM Z=45				TIN Z=50		
45RH103	G,1N	74LE1	617*	50SN	G,SN	81LE1	1119
45RH103	G,2N	74LE1	618*				
45RH103	G,SN	74LE1	619*	50SN116	G,1N	69FU1	117*
45RH103	G,SN	59PA2	465	50SN116	G,1N	74LE1	641*
45RH103	G,XN	62B01	428	50SN116	G,2N	69FU1	118*
				50SN116	G,2N	74LE1	642*
				50SN116	G,SN	69FU1	119*
				50SN116	G,SN	74LE1	643*
	PALLADIUM Z=46			50SN117	G,N	70WI2	717
46PD	G,1N	74LE1	620*	50SN117	G,1N	69FU1	120*
46PD	G,2N	74LE1	621*	50SN117	G,1N	74LE1	644*
46PD	G,SN	74LE1	622*	50SN117	G,2N	69FU1	121*
46PD108	G,SN	69DE2	184	50SN117	G,2N	74LE1	645*
46PD108	G,SN	69DE5	739	50SN117	G,3N	69FU1	122*
46PD108	G,P	69DE2	183	50SN117	G,SN	69FU1	123*
46PD108	G,P	69DE5	738	50SN117	G,SN	74LE1	646*
46PD110	G,NG	69DE5	740	50SN118	G,1N	69FU1	124*
				50SN118	G,1N	74LE1	647*
				50SN118	G,2N	69FU1	125*
				50SN118	G,2N	74LE1	648*
				50SN118	G,3N	69FU1	126*
				50SN118	G,SN	69FU1	127*
				50SN118	G,SN	74LE1	649*
47AG	G,MU-T	65WY1	57	50SN119	G,N	70WI2	716
			FIG 29	50SN119	G,1N	69FU1	128*
47AG	G,1N	74LE1	623*	50SN119	G,2N	69FU1	129*
47AG	G,2N	74LE1	624*	50SN119	G,3N	69FU1	130*
47AG	G,SN	74LE1	625*	50SN119	G,SN	69FU1	131*
47AG107	G,1N	69BE1	148*	50SN120	G,1N	69FU1	132*
47AG107	G,2N	69BE1	149*	50SN120	G,1N	74LE1	650*
47AC107	G,SN	69BE1	147*				
47AG107	G,SN	69IS2	455				
	XN CORRECTED FOR N-MULT						

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
50SN120	G,2N	69FU1	133*				
50SN120	G,2N	74LE1	651*		CESIUM	Z=55	
50SN120	G,3N	69FU1	134*				
50SN120	G,SN	69FU1	135*	55CS133	G,1N	69BE1	151*
50SN120	G,SN	74LE1	652*	55CS133	G,1N	74LE1	638*
				55CS133	G,2N	69BE1	152*
50SN124	G,1N	69FU1	136*	55CS133	G,2N	74LE1	639*
50SN124	G,1N	74LE1	653*	55CS133	G,3N	69BE1	153*
50SN124	G,2N	69FU1	137*	55CS133	G,SN	69BE1	150*
50SN124	G,2N	74LE1	654*	55CS133	G,SN	74LE1	640*
50SN124	G,3N	69FU1	138*				
50SN124	G,SN	69FU1	139*		BARIUM	Z=56	
50SN124	G,SN	74LE1	655*				
	ANTIMONY	Z=51		56BA	G,1N	71BE4	372*
				56BA	G,2N	71BE4	373*
				56BA	G,SN	71BE4	374*
51SB	G,1N	74LE1	632*	56BA138	G,1N	70BE8	494*
51SB	G,2N	74LE1	633*	56BA138	G,2N	70BE8	426*
51SB	G,SN	74LE1	634*	56BA138	G,3N	70BE8	459*
				56BA138	G,SN	70BE8	427*
	TELLURIUM	Z=52			LANTHANUM	Z=57	
52TE	G,1N	74LE1	635*				
52TE	G,2N	74LE1	636*	57LA139	G,1N	71BE4	366*
52TE	G,SN	74LE1	637*	57LA139	G,1N	68BE5	98*
52TE	G,XN	56GA1	566	57LA139	G,2N	71BE4	367*
				57LA139	G,2N	68BE5	99*
52TE124	G,1N	76LE2	1002*	57LA139	G,3N	68BE5	100*
52TE124	G,2N	76LE2	1003*	57LA139	G,SN	71BE4	368*
52TE124	G,SN	76LE2	1004*	57LA139	G,SN	68BE5	101*
				57LA139	G,XN	72DE3	559
52TE126	G,1N	76LE2	1005*				
52TE126	G,2N	76LE2	1006*		CERIUM	Z=58	
52TE126	G,SN	76LE2	1007*				
				58CE	G,1N	71BE4	363*
52TE128	G,1N	76LE2	1008*	58CE	G,1N	69BE6	603*
52TE128	G,2N	76LE2	1009*	58CE	G,2N	71BE4	364*
52TE128	G,SN	76LE2	1010*	58CE	G,2N	69BE6	604*
				58CE	G,3N	69BE6	477*
52TE130	G,1N	76LE2	1011*	58CE	G,SN	71BE4	365*
52TE130	G,2N	76LE2	1012*	58CE	G,SN	69BE6	616*
52TE130	G,SN	76LE2	1013*	58CE	G,SN	81LE1	1118
	IODINE	Z=53					
				58CE140	G,1N	76LE2	1014*
53I 127	G,1N	66BR1	599*	58CE140	G,2N	76LE2	1015*
53I 127	G,1N	69BE6	474*	58CE140	G,SN	76LE2	1016*
53I 127	G,2N	66BR1	600*				
53I 127	G,2N	69BE6	475*	58CE142	G,1N	76LE2	1017*
53I 127	G,3N	69BE6	476*	58CE142	G,2N	76LE2	1018*
53I 127	G,SN	66BR1	598*	58CE142	G,SN	76LE2	1019*
53I 127	G,SN	69BE6	602*				
53I 127	G,XN	56GA1	563		PRASEDDYMIUM	Z=59	
53I 127	G,XN	68J02	1121				
				59PR141	G,MU-T	71AH1	579
				59PR141	G,N	68CA1	69
				59PR141	G,N	59CA2	299

FIG 2, LINEAR SCALES IN 31121

NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
59PR141	G,N	66C03	114	62SM	G,3N	69BE6	480*
59PR141	G,N	59CA3	298	62SM	G,SN	69BE6	614*
59PR141	G,N	66C03	308				
59PR141	G,N	72DR2	447	62SM144	G,1N	74CA5	678*
59PR141	G,N	72DE3	577	62SM144	G,2N	74CA5	679*
59PR141	G,1N	66BR1	304*	62SM144	G,SN	74CA5	680*
59PR141	G,1N	71BE4	390*				
59PR141	G,1N	70SU1	277*	62SM148	G,1N	74CA5	681*
59PR141	G,2N	66BR1	305*	62SM148	G,2N	74CA5	682*
59PR141	G,2N	59CA2	300	62SM148	G,SN	74CA5	683*
59PR141	G,3N	66BR1	306*				
59PR141	G,SN	66BR1	601*	62SM150	G,1N	74CA5	684*
59PR141	G,XN	67CA1	576	62SM150	G,2N	74CA5	685*
59PR141	G,XN	72DE3	560	62SM150	G,SN	74CA5	686*
59PR141	G,XN	72DE3	578	62SM150	G,SN	69VA2	210
59PR141	G,XN	58KA1	301	62SM150	G,SN	69VA3	240
59PR141	G,XN	64RI1	580				
59PR141	G,XN	60TH1	302	62SM152	G,1N	74CA5	687*
				62SM152	G,2N	74CA5	688*
				62SM152	G,SN	74CA5	689*
				62SM152	G,SN	69VA2	211
	NEODYMIUM	Z=60					
60ND	G,1N	71BE4	387*	62SM154	G,1N	74CA5	690*
60ND	G,2N	71BE4	388*	62SM154	G,2N	74CA5	691*
60ND	G,SN	71BE4	389*	62SM154	G,SN	74CA5	692*
				62SM154	G,SN	69VA2	212
60ND142	G,1N	71CA1	391*	62SM154	G,SN	69VA3	242
60ND142	G,2N	71CA1	392*				
60ND142	G,SN	71CA1	393*				
					EUROPIUM	Z=63	
60ND143	G,1N	71CA1	394*	63EU151	G,SN	70VA1	488
60ND143	G,2N	71CA1	395*				
60ND143	G,SN	71CA1	396*	63EU153	G,1N	69BE8	155*
				63EU153	G,2N	69BE8	156*
60ND144	G,1N	71CA1	397*	63EU153	G,3N	69BE8	157*
60ND144	G,2N	71CA1	398*	63EU153	G,SN	69BE8	154*
60ND144	G,SN	71CA1	399*	63EU153	G,XN	70VA1	489
60ND145	G,1N	71CA1	400*				
60ND145	G,2N	71CA1	401*				
60ND145	G,SN	71CA1	402*		GADOLINIUM	Z=64	
60ND146	G,1N	71CA1	403*	64GD152	G,XN	70VA1	490
60ND146	G,2N	71CA1	404*				
60ND146	G,SN	71CA1	405*	64GD154	G,XN	70VA1	491
60ND148	G,1N	71CA1	406*	64GD156	G,XN	70VA1	492
60ND148	G,2N	71CA1	407*				
60ND148	G,SN	71CA1	408*	64GD158	G,XN	70VA1	493
60ND148	G,SN	69VA2	208				
				64GD160	G,1N	69BE8	159*
60ND150	G,1N	71CA1	409*	64GD160	G,2N	69BE8	160*
60ND150	G,2N	71CA1	410*	64GD160	G,3N	69BE8	161*
60ND150	G,SN	71CA1	411*	64GD160	G,SN	69BE8	158*
60ND150	G,SN	69VA2	209				
	SAMARIUM	Z=62			TERBIUM	Z=65	
				65TB159	G,1N	64BR1	361*
62SM	G,1N	69BE6	478*	65TB159	G,1N	68BE5	94*
62SM	G,2N	69BE6	479*				



NUCLIDE	REACTION	REF	ACC	NUCLIDE	REACTION	REF	ACC
65TB159	G,2N	64BR1	362*				
65TB159	G,2N	68BE5	95*				
65TB159	G,3N	68BE5	96*				
65TB159	G,SN	68BE5	97*				
65TB159	G,SN	64FU1	607*				
	HOLMIUM Z=67				TUNGSTEN (WOLFRAM) Z=74		
67HO165	G,1N	63BR1	722	74W	G,1N	75VE5	1020*
67HO165	G,1N	68BE5	90*	74W	G,2N	75VE5	1021*
67HO165	G,1N	69BE8	163*	74W	G,SN	75VE5	1022*
67HO165	G,2N	66AX1	720	74W	G,XN	53J01	1110
67HO165	G,2N	63BR1	723				
67HO165	G,2N	68BE5	91*				
67HO165	G,2N	69BE8	164*				
67HO165	G,3N	68BE5	92*	74W 186	G,1N	69BE8	167*
67HO165	G,3N	69BE8	165*	74W 186	G,2N	69BE8	168*
67HO165	G,SN	66AX1	719	74W 186	G,3N	69BE8	169*
67HO165	G,SN	63BR1	724	74W 186	G,SN	69BE8	166*
67HO165	G,SN	68BE5	93*				
67HO165	G,SN	69BE8	162*				
67HO165	G,XN	66AX1	721				
67HO165	G,XN	63BR1	725				
67HO165	G,XN	62FU3	515*				
	ERBIUM Z=68				RHENIUM Z=75		
68ER	G,1N	69BE6	481*	75RE	G,1N	75VE5	1023*
68ER	G,2N	69BE6	482*	75RE	G,2N	75VE5	1024*
68ER	G,3N	69BE6	483*	75RE	G,SN	75VE5	1025*
68ER	G,SN	69BE6	615*				
	LUTETIUM Z=71				IRIDIUM Z=77		
71LU	G,SN	69BE6	612*	77IR	G,1N	75VE5	1026*
71LU175	G,1N	69BE6	484*	77IR	G,2N	75VE5	1027*
71LU175	G,2N	69BE6	485*	77IR	G,SN	75VE5	1028*
71LU175	G,3N	69BE6	486*				
	TANTALUM Z=73				PLATINUM Z=78		
73TA181	G,1N	63BR1	359*	78PT	G,1N	75VE5	1029*
73TA181	G,1N	68BE5	85*	78PT	G,2N	75VE5	1030*
73TA181	G,2N	68BE5	86*	78PT	G,SN	75VE5	1031*
73TA181	G,3N	68BE5	87*				
73TA181	G,4N	68BE5	88				
73TA181	G,SN	63BR1	544*				
73TA181	G,SN	68BE5	89*				
73TA181	G,SN	81LE1	1117				
73TA181	G,XN	67AN2	552				
73TA181	G,XN	62B01	458				
73TA181	G,XN	56GA1	568				
73TA181	G,XN	53J01	1113				
73TA181	G,2N+3N	63BR1	360*				
					COLD Z=79		
				79AU197	G,N	61NA1	581
				79AU197	G,1N	62FU2	357*
				79AU197	G,1N	70VE1	334*
				79AU197	G,2N	61NA1	582
				79AU197	G,2N	70VE1	335*
				79AU197	G,3N	70VE1	336*
				79AU197	G,SN	62FU2	608*
				79AU197	G,SN	71LI2	1122
					FIG 8 SMOOTH CURVE		
				79AU197	G,SN	70VE1	337*
				79AU197	G,XN	58FU2	583*
				79AU197	G,XN	56GA1	567
				79AU197	G,2N+3N	62FU2	358*
					MERCURY Z=80		
				80HG	G,1N	75VE5	1032*
				80HG	G,2N	75VE5	1033*
				80HG	G,SN	75VE5	1034*



NUCLIDE	REACTION	REF	ACQ	NUCLIDE	REACTION	REF	ACQ
THALLIUM Z=81				90TH232	G,F	75DI2	1066
81TL203	G,SN	69AN10	451	90TH232	G,F	73VE1	505*
	XN CORRECTED FOR N-MULT			90TH232	G,F	71WA1	460
81TL205	G,SN	69AN10	452	URANIUM Z=92			
	XN CORRECTED FOR N-MULT			92U 235	G,SN+F	64B03	423
LEAD Z=82				92U 235	G,SN+F	80CA1	1124*
82PB	G,SN	81LE1	1116	92U 235	G,N	64B03	538
82PB	G,XN	53J01	1111	92U 235	G,1N	64B03	424
82PB	G,XN	61MI1	470	92U 235	G,1N	80CA1	1125*
82PB206	G,1N	64HA2	170*	92U 235	G,2N	64B03	442
82PB206	G,2N	64HA2	171*	92U 235	G,2N	80CA1	1126*
82PB206	G,SN	64HA2	172*	92U 235	G,XN	80CA1	1123*
82PB207	G,N	71BA2	415	92U 235	G,F	73AN13	834
82PB207	G,1N	64HA2	173*	92U 235	G,F	64B03	425
82PB207	G,2N	64HA2	174*	92U 235	G,F	80CA1	1127*
82PB207	G,2N	64HA2	463	SEE ALSO 80CA2			
82PB207	G,SN	64HA2	175*	92U 235	G,F	72KH1	543
82PB208	G,1N	64HA2	176*	92U 236	G,SN+F	80CA1	1129*
82PB208	G,1N	70VE1	330*	92U 236	G,1N	80CA1	1130*
82PB208	G,2N	64HA2	177*	92U 236	G,2N	80CA1	1131*
82PB208	G,2N	70VE1	331*	92U 236	G,XN	80CA1	1128*
82PB208	G,3N	70VE1	332*	92U 236	G,F	80CA1	1132*
82PB208	G,4N	70VE1	333*	SEE ALSO 80CA2			
82PB208	G,SN	64HA2	178*	92U 238	G,SN+F	73VE1	498*
82PB208	G,SN	70VE1	613*	92U 238	G,1N	80CA1	1101*
82PB208	G,XN	62FU4	571*	92U 238	G,1N	73VE1	495*
82PB208	G,XN	70IS3	264	92U 238	G,2N	80CA1	1102*
BISMUTH Z=83				92U 238	G,2N	73VE1	496*
83BI209	G,1N	64HA2	179*	92U 238	G,SN	80CA1	1100
83BI209	G,2N	64HA2	180*	92U 238	G,SN	81LE1	1115
83BI209	G,SN	64HA2	181*	92U 238	G,XN	80CA1	1099*
83BI209	G,XN	67AN2	712	92U 238	G,XN	56GA1	550
83BI209	G,XN	61MI1	469	92U 238	G,XN	53J01	1112
83BI209	G,XN	56GA1	565	92U 238	G,F	73AN13	833
THORIUM Z=90				92U 238	G,F	80CA1	1103*
90TH232	G,SN+F	80CA1	1134*	SEE ALSO 80CA2			
90TH232	G,1N	80CA1	1135*	92U 238	G,F	75DI2	1067
90TH232	G,1N	73VE1	503*	FIG 1A			
90TH232	G,2N	80CA1	1136*	92U 238	G,F	72KH1	542
90TH232	G,2N	73VE1	504*	92U 238	G,F	73VE1	497*
90TH232	G,SN	73VE1	506*	92U 238	G,F	71WA1	461
90TH232	G,XN	80CA1	1133*	NEPTUNIUM Z=93			
90TH232	G,XN	56GA1	562	93NP237	G,SN+F	73VE1	502*
90TH232	G,F	80CA1	1137*	93NP237	G,1N	73VE1	499*
SEE ALSO 80CA2				93NP237	G,2N	73VE1	500*
				93NP237	G,F	73VE1	501*

## 9. PHOTONUCLEAR REACTION DATA BIBLIOGRAPHY 1973 THROUGH 1981

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 surname 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 still ordered first by year, second by the first and second letter of the first author's surname and finally by a left-justified serial number that can run from 1 to 99.

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## 10. DEFINITIONS OF ABBREVIATIONS AND SYMBOLS

Note: In this list definitions are given for various photoneutron reactions in which the following symbols are used: N, NL, nN, SN and XN. Corresponding definitions apply for reactions involving other nuclear particles where the symbols N (neutron) is replaced by, e.g. P, D, T, HE, A etc. Where unknown reactions result in the production of a specific radionuclide, the chemical symbol and mass number is listed as the reaction product, e.g. a G,NA22 reaction in  $^{59}\text{Co}$ .

A	alpha particle	CMPT	Compton
ANAL	analysis	COIN	coincidence, coincide
ABI	absolute integrated cross-section data	COH	coherent
ABX	absolute cross-section data	CK	Cerenkov
ABY	absolute yield data. Often means cross-section per equivalent quantum is listed.	D	deuteron or discrete. When discrete, it is used to describe a photon source or a detector response function. Contrast with C = continuous.
ACT	measurement of induced radioactivity of the target	DLTE	energy loss
ASM	asymmetric, asymmetry	DLTQ	momentum transfer
AVG	average	DST	distribution
BBL	bubble chamber	DT BAL	detailed balance
BEL	reduced electric radiative transition probability, B(EL)	E	electron
BF3	BF <sub>3</sub> neutron counter with moderator e.g., Halpern detector, long counter	E/	inelastically scattered electron
BML	reduced magnetic radiative transition probability, B(ML)	E+	positron
BREAKS	levels located by "breaks" in the yield curve	EDST	energy distribution or spectrum
BRKUP	break up	E/N	used only to indicate a coincidence experiment as in (E,E/N). 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.
BRMS	bremsstrahlung	EMU	emulsions (photographic plates)
BTW	between	EXCIT	excited
C	continuous. Used to describe a photon source or a detector response function. Contrast with D = discrete.	F	fission
CCH	cloud chamber	FMF	form factor
CF	compared with	FM-1	inverse femtometers
CHRGD	charged		



FRAG	fragment	MOD	moderated neutron detector <u>not</u> employing a BF <sub>3</sub> counter, e.g. rhodium foil, Szilard-Chalmers reaction, <sup>3</sup> He, <sup>6</sup> Li reactions, GD loaded liquid scintillator, etc.
G	photon		
G/	inelastically scattered photon		
G-WIDTH	gamma-ray transition width		
HAD	hadrons, hadron production	MSP	mass spectrometer
HE	<sup>3</sup> He particle	MULT	multiple, multipole, multiplicity
INT	interaction, integral, intensity	MU-T	used only in combination with G to indicate a total photon absorption cross section measurement, i.e. (G,MU-T)
INC	includes		
ION	ionization chamber	N	neutron (see also XN and SN). The notation (G,N) is used to indicate a reaction in which only a single neutron is emitted, i.e. the reaction that can, in many cases, be measured by observing the radioactive decay of the residual nuclide.
ISOB	isobaric	nN	where n is any integer. (G,nN) indicates the sum over all reaction cross sections in which n neutrons are emitted.
ISM	isomer	NAI	NaI(Tl) spectrometer
J	multiplicity of particle defined by following symbol e.g. (G,PJN) with remark J = 2,3,5,7	NEUT	neutron(s)
JPI	spin and parity of a nuclear state	NOX	no cross-section data
K	second multiplicity index, e.g. (G,JPKN) with both J & K positive integers greater than 1	P	proton (see also XP)
KE	kinetic energy	PART	particle(s)
L	may be an integer or zero that always follows a reaction product symbol. This is used to indicate transitions to specific states in the residual nuclide. When the letter is used as in (G,NL) the cross section given is that for the sum of transitions to two or more specific final states.	PHOT	photon(s)
LFT	excited state lifetime	PI	pion, usually written as PI+, PI-, PIO to indicate charge
LIM	limit	POL	polarized or polarization
LV,LVS	level, levels	Q-SQUAR	momentum transfer squared (q <sup>2</sup> )
LQD	liquid	RCL	recoil
MAG	magnetic spectrometer	REL	relative
MEAS	measurement(s)	RLI	relative integrated cross-section data
MGC	magnetic Compton spectrometer	RLX	relative cross-section data
MGP	magnetic pair spectrometer	RSP	reaction spectrometer
		RLY	relative yield data
		SCTD	scattered

SCD	semiconductor (solid state) detector	TRNS	transition
SCI	scintillator detector other than NaI, e.g., CsI, KI, organic (liquid or solid), stilbene, He	UKN	unknown
SEP	separation	VIB	vibrational
SEP ISOTP	separated isotope used	VIR PHOT	virtual photon(s)
SIG	SIGMA cross section	XN	all neutrons, total neutron yield, $\sigma(\gamma, XN) = \sigma(\gamma, N) + 2\sigma(\gamma, 2N) + 3\sigma(\gamma, 3N) + \sigma(\gamma, NP) + \text{etc.}$
SN	sum of neutron producing reactions, $\sigma(\gamma, SN) = \sigma(\gamma, N) + \sigma(\gamma, NP) + \sigma(\gamma, 2N) + \sigma(\gamma, 3N) + \text{etc.}$	XP	all protons, total proton yield $\sigma(\gamma, XP) = \sigma(\gamma, P) + \sigma(\gamma, NP) + 2\sigma(\gamma, 2P) + \text{etc.}$
SPC	photon or particle energy spectrum	XX	reaction products defined in REMARKS
SPK	spark chamber	YLD	yield
SPL	spallation	4PI	a $4\pi$ geometry was used or a method like radioactivity or a total absorption measurement
STAT	statistical	999	energy defined in REMARKS
SYM	symetric, symmetry	\$	indicates the measurement involved beams or targets that were either polarized or aligned, or that the polarization of the reaction products was determined. The polarized particle is indicated in REMARKS.
T	triton	* or @	symbols used to indicate that the units associated with the numerals on one or both sides of the symbol in a specific column are not MeV. The units are defined in REMARKS.
TEL	counter telescope		
THR	threshold for reaction or threshold detector, e.g., $^{29}\text{Si}(n,p)^{29}\text{Al}$ .		
TOF	time-of-flight detector		
TRK	tracks of particles or fragments observed in solid materials (glass, mylar, etc.)		

# 11. ERRATA

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  $(E_i)$  by  $(E_i)^2$
- p.7 Table 1: For oxygen total cross section, entry for SIG-0 should read 480(140)
- p.16 Change the line starting 62Ba1 1H 2 E,E/ to read 63Ba1 1H 2 E,E/  
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 62Fi1 to read  
62Fi1 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.

63L01	1H 2	\$ G,P	NOX	<u>294-</u>	<u>D294</u>	SPK-D	58
<u>63BA1</u>	1H 2	E,E/	ABX	0- 10	D 42	MAG-D	180 GAS TARGET
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
60BE1	4BE9	G, <u>N</u>	ABX	2- 17	C 5- 17	TOF-D	DST
65C02	4BE9	G, <u>XN</u>	<u>ABX</u>	6- 80	C 6- 80	BF3-I	4PI
66C04	4BE9	G, <u>XN</u>	<u>ABX</u>	6- 80	C 6- 80	BF3-I	4PI
71NA1	6C 12	E,E/	FMF	<u>4-</u> 17	D250	MAG-D	DST LEVELS 14.1,4.43
57HA1	6C 12	G,G	ABX	<u>15-</u>	C 19	NAI-D	120
59PE4	6C 12	G, <u>P</u>	ABX	22- 62	C 22- 90	SCI-D	DST
72GL1	6C 12	\$ P,G	ABX	<u>22-</u> 30	D 6- 14	NAI-D	DST POLARIZED PROTONS
64DE2	6C 13	G, <u>P</u>	ABX	18- 50	C 18- 50	ACT-I	4PI
65MA1	80 16	G, <u>NG</u>	SPC	19- 30	C 21- 31	NAI-D	140
65MA1	80 16	G, <u>PG</u>	SPC	19- 30	C 21- 31	NAI-D	140
70H01	80 16	G, <u>NG</u>	RLY	21- 27	C 27, 36	<u>SCD-D</u>	DST
70H01	80 16	G, <u>PG</u>	RLY	17- 27	C 27, 36	<u>SCD-D</u>	DST



64YE1	80 16	G,XN	SPC	THR-	<u>35</u>	C 35	TOF-D	90	BRANCHING RATIOS
67FE2	80 16	G,XN	ABX	<u>19-150</u>	<u>C100-150</u>		BF3-I	4PI	
72TH2	80 16	G,XN	<u>RLX</u>	16- 24	C 15- 24		BF3-I	4PI	
63SU2	80 16	D,G	ABX	21- 25	D 1- <u>5</u>		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	
57K01	10NE	G,2P	<u>RLY</u>	THR-	80	C 80	CCH-D	4PI	
57K01	10NE	G,2A	<u>RLY</u>	THR-	80	C 80	CCH-D	4PI	
57K01	10NE	G,5A	<u>RLY</u>	THR-	80	C 80	CCH-D	4PI	
57K01	10NE	G,NP	<u>RLY</u>	THR-	80	C 80	CCH-D	4PI	
57K01	10NE	G,PA	<u>RLY</u>	THR-	80	C 80	CCH-D	4PI	
62D01	10NE__	E,P	SPC	3- 11	C 18- 30		MAG-D	DST	
66WE1	11NA <u>23</u>	P,G	SPC	9- 10	D 1- 2		NAI-D	DST	
60WA2	11NA23	G, <u>3N2P</u>	ABX	THR-240	C120-240		ACT-I	4PI	
70WE1	12MG <u>24</u>	G,N	ABX	17- 32	C 17- 32		ACT-I	4PI	
60WA2	12MG__	G,2N3P	ABX	THR-240	C240		ACT-I	4PI	
57B01	13AL27	G,A	SPC	THR-	30	C 31	EMU-D	__	
61MA1	13AL27	G,A	RLY	19- 35	C 35		MGP-D	__	
65HA2	13AL27	G,A	SPC	THR-	31	C 31	EMU-D	<u>4PI</u>	
60WA2	13AL27	<u>G,F18</u>	ABX	THR-240	C120-240		ACT-I	4PI	
69AN3	13AL27	G, <u>N</u>	RLX	13- 65	C 13- 65		ACT-I	4PI	
69FU2	13AL27	G,SPL	RLY	THR-999	D999		<u>ACT-I</u>	999=3 GEV	
63CA1	14SI__	G,XN	ABX	17- 30	D 15- 30		BF3-I	4PI	
66G03	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	109-999	C700,999		TEL-D	DST 999=1.2 GEV	
65CA2	14SI__	G,P	ABX	THR-	23	C 16- 23	SCD-D	4PI	
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	
65CA2	14SI__	G,A	ABX	THR-	23	C 16- 23	SCD-D	4PI	
69IS3	15P <u>31</u>	G,XN	ABX	12- 30	C 5- 30		BF3-I	4PI	
68ME1	<u>16S 32</u>	A,G	ABX	13- 18	D 7- 12		NAI-D	DST	

59FE1	17CL35	G,N	ABX	<u>10- 30</u> C <u>12- 30</u>	ACT-I	4PI	<u>ISOMER RATIO</u>
66MI2	20CA40	G,N	ABX	15- <u>26</u> D 15- <u>26</u>	BF3-I	4PI	
67G03	20CA40	G, <u>1N</u>	ABX	15- 30 C 15- 30	BF3-I	4PI	
71KU5	23V <u>51</u>	G,SPL	ABY	THR-999 C 999	ACT-I	4PI	999=1.5 GEV
71KU5	23V <u>51</u>	G,PI+	ABY	THR-999 C200-999	ACT-I	4PI	999=2.2 GEV
67BE8	23V 51	G,3N	<u>ABY</u>	30- 37 C 37	ACT-I	4PI	
69FU2	26FE	G,SPL	RLY	THR-999 D999	<u>ACT-I</u>	DST	999=3 GEV
64C03	29CU	G, <u>XN</u>	ABI	THR- 80 C 10- 80	BF3-I	4PI	
70C01	30ZN <u>64</u>	G,N	RLX	12- 40 C 10- 40	ACT-I	4PI	
70C01	30ZN <u>64</u>	G,2N	RLX	21- 40 C 10- 40	ACT-I	4PI	
67C01	30ZN <u>64</u>	G,XN	ABX	12- 24 C 24	BF3-I	4PI	
70C01	30ZN <u>64</u>	G,NP	RLX	19- 40 C 10- 40	ACT-I	DST	
57EL1	30ZN64	G,2N	<u>ABI</u>	<u>20- 30</u> C 32	ACT-I	4PI	
58H01	30ZN64	G,NP	ABI	18- <u>32</u> C <u>32</u>	ACT-I	4PI	
57EL1	30ZN66	G,NP	ABX	<u>18- 30</u> C <u>18- 32</u>	ACT-I	4PI	
57EL1	30ZN68	G,P	ABX	<u>10- 30</u> C <u>14- 32</u>	ACT-I	4PI	
58H01	30ZN68	G,P	<u>ABX</u>	10- 32 C 15- 32	ACT-I	4PI	
58H01	34SE80	G,NP	<u>ABI</u>	20- 32 C 32	ACT-I	4PI	
57EL1	42M092	G,NP	<u>ABI</u>	<u>19- 30</u> C 32	ACT-I	4PI	
58H01	42M092	G,NP	<u>ABI</u>	19- 32 C 32	ACT-I	4PI	
58H01	51SB123	G,NP	<u>ABI</u>	<u>15- 32</u> C 32	ACT-I	4PI	
71SH3	56BA138	E,P	ABX	15- 22 D <u>23</u>	MAG-D	90	ISOBARIC ANALOGS
62MI3	57LA139	G, <u>XN</u>	ABX	10- 21 D 10- 21	BF3-I	4PI	
72TH2	57LA139	G,XN	<u>RLY</u>	9- 17 C 8- 16	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	ISOBARIC ANALOGS
71AH1	59PR141	G,MU-T	ABX	<u>9- 18</u> C <u>150</u>	MGC-D	4PI	
71SH3	60ND142	E,P	ABX	15- 22 D <u>23</u>	MAG-D	90	ISOBARIC ANALOGS

71SH3	62SM144	E,P	ABX	15- 22 D <u>22</u>	MAG-D 90	ISOBARIC ANALOGS
60TH1	67H0165	G, <u>N</u>	ABX	8- 18 C 11- 18	ACT-I	4PI
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
62MI3	83BI209	G, <u>XN</u>	ABX	8- 22 D 8- 22	BF3-I	4PI
72TH2	83BI209	G, <u>XN</u>	<u>RLX</u>	7- 20 C 6- 19	BF3-I	4PI
69WA1	90TH <u>232</u>	G,F	RLX	0-999 C200-999	SCD-D DST	999=1.2 GEV
64B03	92U 235	G, <u>SN</u>	ABX	8- 21 D 8- 21	BF3-I	4PI



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