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**INTERNATIONAL NUCLEAR DATA COMMITTEE**

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W R E N D A 73

**World Request List for Neutron Data Measurements  
for Nuclear Reactors**

March 1973

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Published on behalf of  
NEA Neutron Data Compilation Centre  
IAEA Nuclear Data Section

By the  
International Atomic Energy Agency

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**IAEA NUCLEAR DATA SECTION, KÄRNTNER RING 11, A-1010 VIENNA**

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Preface

The RENDA system [1], developed at the Saclay Neutron Data Compilation Centre (CCDN) of the OECD's Nuclear Energy Agency (NEA), is a computerized storage and retrieval system for nuclear data requests. This system was used for filing and handling the official Requests for Neutron Data Measurements submitted to the European-American Nuclear Data Committee (EANDC). Computer-printed RENDA lists have been published periodically since 1968 by the CCDN and were soon accepted as a useful guide to the needs for nuclear data by measurers, evaluators and users.

Upon recommendation of the International Nuclear Data Committee in 1971, the request list was expanded to give world-wide coverage, and responsibility for publication of this World Requests For Nuclear Data Measurements (WRENDA) was transferred to the Nuclear Data Section of the International Atomic Energy Agency (IAEA).

Until the necessary systems are developed at the IAEA, the CCDN will maintain the computerized system for WRENDA. With their cooperation, a first WRENDA was issued in October 1972 as INDC(SEC)-27/L. This current edition of WRENDA was necessitated by recent major revisions to the United States official request list. At the same time, numerous small errors have been corrected and all fusion data requests removed.

This list will be the final request list published in this format as a joint operation of the IAEA and NEA. The WRENDA list in the future will be a joint venture of the Four Neutron Data Centers (Brookhaven, Obninsk, Saclay and Vienna) with the IAEA having responsibility for maintenance of the file and publication. The first edition of the new WRENDA is planned for the spring of 1974 with hopefully annual publication thereafter.

[1] Schwartz, S. EANDC 77"U", (November 1968).

Note to Users of WRENDA

Measurers, when initiating an experiment that will provide data requested in this document, are asked to inform the requestors of the measurement.

## DESCRIPTION OF THE REQUESTS

In this listing each request is defined by the following quantities :

from left to right

### 1. Reference number

A serial number, the REFERENCE number, is attached to each entry of the listing sorted in ZAQ order. This number identifies an entry in one specific issue of RENDA only. (The number given in brackets below the reference number is of no use to the reader).

### 2. Target material

- (a) elements (natural isotopic mixture) are described by the chemical symbol according to Table 1;
- (b) separated isotopes are described by the chemical symbol and, for a specific nuclide, the atomic mass number;
- (c) molecules or mixtures are described by a five-symbol abbreviation for the chemical composition, located in the columns usually reserved for the element symbol and the mass number.

The entries for these compound nuclei are given at the end of the listing.

### 3. Type of microscopic data (quantity)

All the quantities presently used, along with brief descriptions of the physical notion they represent, are listed in Table 2. The system for quantities follows the scheme used in CINDA, with a few additions to include neutron-producing reactions and information on nuclear structure.

### 4. Descriptive modifier to the quantity (Table 3)

Some of the quantities are rather comprehensive, and a specification of the request is needed in the "comment" section. The supplementary information is normally given on the line below the standard quantity assignment; in special cases this information is given in the "comment" section.

## 5. Energy Range

This section is intended primarily to display the minimum and the maximum value of the incident particle or photon energy. Each of the extreme limits is recorded in units of eV as a two-digit number (between 1.0 and 9.9) along with the exponent for the corresponding positive or negative power of 10 (positive exponent if energy is above 1 eV and negative if it is below). Thus:

2.4 + 6 is to be read  $2.4 \times 10^6$  eV = 2.4 MeV

2.5 - 2 is to be read  $2.5 \times 10^{-2}$  eV = 0.025 eV

Where only one energy is involved, such as the energy of a resonance, it is put in the  $E_{min}$  columns, and the  $E_{max}$  space is left blank. Where, as in resonance integrals, there is no upper bound,  $E_{min}$  gives the low energy limits of the integral. (If, on the contrary,  $E_{min}$  is left blank, the  $E_{max}$  notation should be interpreted as "up to the  $E_{max}$  value given".) An exponent with a mantissa left blank indicated the order of magnitude of energy, e.g. .. + 3 is to be read "keV energies" or the "keV region".

A limited number of alphabetic abbreviations can be used in special cases, for example for a continuous spectrum of incident neutron energies. The only presently accepted abbreviations are:

<u>Printout</u>	<u>Description</u>
COLD	below thermal
THR	thermal, normally when measured or corrected to a Maxwellian distribution characteristic of 293°K. Variations may be indicated in the "comments" section
PILE	pile spectrum (depends on source)
RES	resonance region
FISS	fission spectrum, normally U235 fissioned by thermal neutrons
TR	threshold or from threshold up to some energy specified in the $E_{max}$ column or the comments section
SPON	spontaneous (or fission)

## 6. Accuracy Requirements

The accuracy is given in per cent and tenths of per cent relative to the value measured. Thus:

10 is to be read 10%

1.5 is to be read 1.5%

< 5 is to be read "better than 5%"

In the entries made up to the December 1968 edition of RENDA, the following special cases should be noted.

- (1) If the original request quotes a range of desired accuracy, e.g. 5 to 10%, the notation "better than" the highest figure is given in the "Accuracy" column (e.g. < 10%) and the range given in the "Comments" section.
- (2) If the original request gives many indications of the desired accuracy, e.g. for different parts of the energy range covered, no figure is given in this section and the details are given in the "Comments" section.
- (3) The accuracy requirements for U.K. requests are given in §12. A specific notation used in UK requests should be noted, viz. ( $E - \kappa E$ ) where  $\kappa$  in general equals 1.5 or 2, quoted along with a percentage error. For these requests the uncertainty represents the mean error over the range indicated (from  $E$  to  $\kappa E$ ).

In the new programmes the feature of supplementary information in the "accuracy" column has been included and up to five extra "words" of eight characters can be introduced. This gives the possibility to state precisely the information on accuracy that defines the request, and in most practical cases should be sufficient for the above three situations.

## 7. Priority Assignment

Three priorities, noted 1, 2 and 3 (1 being the highest), can be attributed to the requests. The priorities are defined as follows:

### Priority 1

Nuclear data which satisfy the criteria of Priority 2 and which have been selected for maximum practicable attention, taking into account the urgency of nuclear energy programme requirements.

For example, the European American Committee for Reactor Physics assigns its highest priorities for reactor measurements as follows:

"The highest priority should be given to requests for nuclear data for reactors to be built in the near future if:

- a. These data are still necessary to predict the different reactor properties after all information from integral experiments and operating reactors has been used;  
or
- b. information on an important reactor parameter is in principle attainable through mathematical calculation from nuclear data only;  
or
- c. these data are needed for materials required in reactor physics measurements."

Priority 2

Nuclear data which will be required during the next few years in the applied nuclear energy programme (e.g. the design of a reactor or fuel processing plant; data needed for optimum use of reactor fuel and construction materials such as neutron moderators, absorbers and radiation shields; space application and biomedical studies; data required for better understanding of some significant aspect of reactor behaviour).

Priority 3

Nuclear data of more general interest and data required to fill out the body of information needed for nuclear technology.

Note: The priority quoted in the "Priority" column is that of the original request (see list of sources in the present compilation). In some cases, comments give further information on priority assignment.

8. Laboratory, institution (Table 4)

On the first line of a request, the laboratory or institution of the requester(s) is given in the LAB column. The abbreviations are explained in Table 4 (alphabetic order of abbreviations). The name of the requester is given in the "Comments" section immediately following the abbreviation of his laboratory or institution.

The separation between requesters' and measurers' comments (see "Comments" section) is indicated in the LAB column by the sign ---. Laboratory indications below this sign refer to work completed, in progress or planned according to the comment text following.

9. Requesters, measurers

The names of requesters are printed at the beginning of the comments section and adjacent to the corresponding laboratory abbreviation in the LAB column. The names of experimentalists are similarly entered in the comment field in connection to LAB entries below the separation line --- (see section 8) in the LAB column. This procedure makes the names form part of the fixed format information, which can subsequently be retrieved.

10. Date of request

The year of origin of a request is indicated (when given) at the end of the first line of a request.

## 11. Comments

This section includes :

- I. (a) comments and specifications on the quantity requested;  
(b) comments and specifications on the accuracy requested;  
(c) comments on the experimental conditions, e.g. calibration, resolution of incident particle and in method of detection, etc.;  
(d) the motivation of the request;  
(e) other comments from requesters (for instance, modifications of request in relation to latest issue of the list).
- II. (a) remarks on existing work;  
(b) remarks on forthcoming work;  
(c) remarks on the status of the request.

(The laboratory indications are given in the associated LAB column space).

Sections I and II are separated by the indication ~~--~~ in the LAB column. The laboratory abbreviations are listed in Table 4. The reference abbreviations (journals, reports) are in general those commonly used for citation in scientific literature. The CINDA reference abbreviations are given in Table 6. A few frequently-used references to conferences on nuclear data might, however, be mentioned :

3rd Conference, Geneva 1964	Proceedings of the 3rd International Conference on the Peaceful Uses of Atomic Energy, Geneva, May 1964
Symposium, Salzburg 1965, or SM/ (contribution number)	Proceedings of the IAEA Symposium on the Physics and Chemistry of Fission, Salzburg, March 1965
Conference, Antwerp 1965	Proceedings of the International Conference on the Study of Nuclear Structure with Neutrons, Antwerp, July 1965
Conference, Washington 1966 or Conference 660303	Proceedings of the Conference on Neutron Cross Sections and Technology, Washington, March 1966
Conference, Paris 1966, or CN/(contribution number)	Proceedings of the IAEA Conference on Nuclear Data - Microscopic Cross Sections and Other Data Basic for Reactors, Paris, October 1966
Conference, Washington 1968	Proceedings of the Conference on Neutron Cross Sections and Technology, Washington, March 1968

## 12. Comments on the accuracy requirements for U.K. data requests

As a general rule the uncertainty associated with each request should be regarded as the standard error for a single direct measurement of the parameter named. For some requests the uncertainty quoted represents the mean error over a range; between E and 2E, for example. It is difficult to present in a compact way the accuracy requirements for functions of two or more parameters, such as angular distributions of scattered neutrons, or energy spectra of secondary neutrons. It is hoped that the following commentaries may shed some light on these questions.

### Accuracy requirements for secondary neutron distributions

The scattering cross-sections determine the transport and moderating properties of the medium; these properties affect the reactivity and the neutron spectrum in a reactor: however, the transport cross-section affects the reactivity more directly, while moderation plays the important role in determining the neutron spectrum. The accuracy requested in the tables for data on  $\sigma_{n,n}(E, \theta)$ ,  $\sigma_{n,n}(E, E')$  and  $\sigma_{n,n}(E, E', \theta)$  might be taken as applying to measurements at each energy and each angle, but the following comments may help to show where there is most need for accuracy and where the requirements can be relaxed.

(a) Angular distributions: The measurement of angular distributions is not likely to prove very onerous, for several reasons which are given below :

- (i) It is not necessary to explore the scattering angular distribution in detail at each resonance; usually a poor resolution is quite adequate, as was pointed out earlier by Goldstein.
- (ii) At low energies the angular distribution is approximately linear; that is to say it is approximately proportional to  $1 + \mu' \cdot b(E)$  where  $\mu'$  is the cosine of the scattering angle in the centre of mass frame of reference. The elastic contributions to neutron transport and neutron moderation will both be adequately determined if

$$\sigma_{n,n}(E) \cdot [1 - \mu' \{ 1 + 2/(3A) \}]$$

can be calculated from the data to the requested accuracy. In addition, the information available should suffice to determine  $\sigma_{n,n}(E)$  to the same degree of accuracy and to confirm the approximate linearity of the angular distribution.

- (iii) At higher energies the elastic angular distribution may be sharply peaked in the forward direction, so that more detailed information becomes necessary. However, it is probable that the optical model can be used for interpolation if measurements are made at a few energies.
- (iv) The contribution of inelastic scattering to the transport cross-section is usually smaller than the elastic component and the anisotropy of inelastic scattering is usually small, and so the contribution to neutron transport will certainly be adequately determined if

$$\sigma_{n,n'}(E) \cdot [1 - \bar{\mu}' \{1 + 2/3A\}]$$

can be calculated from the data to the accuracy which has been requested for the elastic cross-section. Moderation by inelastic scattering is determined mainly by the reaction Q value and is nearly independent of the angular distribution.

(b) Spectrum of inelastic neutrons: The neutron spectrum in a fast reactor depends very strongly on the inelastic scattering  $\sigma_{n,n'}(E, E')$ , and very extensive measurements would be needed if it were not usually possible to extend the experimental information sufficiently accurately by using optical model and statistical theories. At present it is not clear what energy resolution will ultimately be needed: current limitations of computing power suggest a resolution of about 20 per cent in  $E$  and  $E^*$ . However, for many materials it is quite practicable to resolve the inelastic scattering components to the discrete energy levels of the target nucleus, and this would provide a firmer basis for theoretical extrapolations.

A minimum requirement on the cross-section data is that

$$\int_0^E \sigma_{n,n'}(E, E') \ln(E/E') dE'$$

should be determined to the requested accuracy. The accuracy required for the component cross-sections for scattering to individual levels depends on the relative contribution of each component to this integral. This expression shows that the partial cross-section is relatively more important when the energy change  $E/E'$  is large: however, it may be noted that the percentage accuracy requirement may be relaxed close to the threshold, because the cross-section is small when  $E-E_T$  is small, where  $E_T$  is the threshold energy.

(c) Accuracy requirements for fission neutron spectra: In reactor calculations the spectrum of secondary neutrons from all reactions (elastic and inelastic scattering, fission, etc.) need not be resolved into its components. However, it is very convenient to resolve it into the component spectra of the individual reactions, because separately they have simpler properties and interpolation is then simpler and more reliable. The spectrum of fission neutrons varies little with the energy of the incident neutron and the secondary neutrons may have higher energies than the incident neutron: the opposite is true for scattering spectra. The secondary neutrons from fission and inelastic scattering are distributed approximately isotropically, whereas elastic scattering is strongly anisotropic at the higher energies.

When it is difficult to separate the spectra of neutrons from fission and inelastic scattering the set of accuracy requirements should be understood as applying to the combined spectrum. For fissile nuclides the fission neutron spectrum assumed in obtaining an inelastic scattering spectrum should be specified.

The requirements on the fission spectrum were first considered in terms of the fraction of neutrons emitted per unit lethargy interval, since the neutron importance varies more smoothly with lethargy than with energy. The requirement for Pu239, for example, is that the fraction of fission neutrons emitted in any unit lethargy interval should be determined to 1 per cent of the total spectrum.

Currently it is believed that a good measurement of the spectrum at one incident energy  $E$  (about 100 keV) will suffice, and that theory will then be adequate for extrapolation to other values of  $E$ . With regard to the secondary neutrons, it is felt that the fission spectrum can be adequately characterized if the mean energy  $E^*$  of the spectrum of neutrons emitted from fission is known to 2% and the integrated tails of the spectrum above 5 MeV and below 0.25 MeV are both known to 10%. These tails are each believed to contain about 5% of the total spectrum.

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV) MIN MAX	ACCURACY P (%)	LAB JAE	REQUESTER , COMMENTS	YEAR	
1 [2593+]	<sup>1</sup> H	DIFF ELASTIC	8. +6	2. +7	2	1 NBS JAE	Caswell, R.S. For use as standard, 2 percent accuracy. Tanaka: J.Phys.Soc.Japan 28,11, At 14 Mev.	72
2 [2443]	<sup>1</sup> H	THRMELSCATLAW	0. +0	1.0-1	2	HLT	Tunkelo, E. Scattering law for solid and liquid hydrogen wanted, both for ortho and para. For design of refrigerated neutron source.	69
3 [2442]	<sup>1</sup> H	N,GAMMA	THR	0.3	2	IAE	Lemmel, H.D. Absolute measurement of cross section required in context of 2200 m/s fission constants evaluation. Recent existing data are discrepant by 3.5%, although better accuracy is claimed for individual data.	69
4 [2594+]	<sup>2</sup> D	ELASTIC	1. +0	1. +3 < 2	1	BET	Bayard, R.T.	72
5 [2180#]	<sup>3</sup> He	TOTAL XSECT	1. +3	3. +6	1	2 GRT	Russell, J. As a standard for He <sup>3</sup> detectors. Absolute values are required. No data exist which cover this energy range.	69
6 [2181#]	<sup>3</sup> He	DIFF ELASTIC	1. +3	3. +6	7	2 GRT	Russell, J. As a standard for He <sup>3</sup> detectors. Absolute values are required. No data exist which cover this energy range.	69
7 [2182]	<sup>3</sup> He	DIFF ELASTIC	1.4+7		10	3 LAS	Motz, H.T. Absolute values are required. Needed to establish limit on non-elastic. No data exist which cover this energy range	69
8 [1531]	<sup>3</sup> He	N,PROTON	1. +3	1.5+7	10	2 VNV	Vidal, J.C.	69
						---	Probably fulfilled 1 keV- a few 100 keV.	
9 [2184#]	<sup>3</sup> He	N,PROTON	1. +3	3. +6	3	1 GRT	Russell, J. For use as a secondary standard. Intermediate accuracy useful. Absolute values required.	69
						GRT	Costello+: NSE 39 409, 0.3 to 1.1 MeV.	
10 [2595+]	<sup>3</sup> He	N,PROTON	1. +3	3. +6	3	2 NBS	Caswell, R.S. For use as a secondary standard. Intermediate accuracy useful. Absolute values required.	72
						GRT	Costello+: NSE 39 409, 0.3 to 1.1 MeV.	
11 [2183#]	<sup>3</sup> He	N,PROTON	1. +4	3. +6	1	2 GGA LMB	Nordheim, L.W. Hennig, P.B. For use as a secondary standard. Intermediate accuracy useful. Absolute values required.	69
						GRT	Costello+: NSE 39 409, 0.3 to 1.1 MeV.	
12 [1576]	<sup>3</sup> He	N,PROTON	1. +5	1. 6	2	2 HAR	Rose, B. Used as a standard in cross-section measurements. Energy dependence needed more accurately	69
						NDC GA	Alo-Nielsen, CCDN-NW/6(1967). Costello+: NCSAC-33(1970)78.	
13 [2185]	<sup>3</sup> He	N,PROTON	1.0+5	3.0+6	3.0	2 LAS	Diven, B.C. For use as secondary standard. Intermediate accuracy useful. Absolute values required.	69
						GA	Costello+: NSE 39 409(3/70), 0.3 to 1.1 MeV.	
14 [2444]	<sup>3</sup> He	N,PROTON	1.0+5	1.0+7 < 5.0	1	TRM GA	Navalkar, H. P. For neutron spectrum measurements with sandwiched He <sup>3</sup> spectrometer. Present knowledge is about 10% and worse. Costello reviewed status at EANDC Standards Sympo- sium, Argonne, October 1970, Proc. p.74.	71

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
15 [2186]	<sup>3</sup> He	N, PROTON	3.0+6	1.0+7	5.0	2	Diven, B.C. For use as secondary standard. Intermediate accuracy useful. Absolute values required. --- Costello+: NSE 39 409(3/70), 0.3 to 1.1 MeV.	69
16 [2598+]	<sup>6</sup> Li	ELASTIC	1. +3	1. +5	< 5 1 TO 5 %	1	NBS Caswell, R.S. Accuracy to obtain N, ALPHA to 2 percent. Differential elastic may be required at upper end. --- HAR Asami+: EANDC(JAP)-13L 1-10 keV, 4%.	69
17 [2596+]	<sup>6</sup> Li	NONEI GAMMAS energy dist	2.5+5	2.7+5	15 OR 5 MB	2	SNP Fleishman, M.R. Absolute $\sigma(E\gamma)$ required for all $E\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E\gamma)$ . --- Gamma-energy resolution required 10 percent.	69
18 [2597+]	<sup>6</sup> Li	NONEI GAMMAS energy dist	4. +6	1. +7	15 OR 5 MB	1	SNP Fleishman, M.R. Absolute $\sigma(E\gamma)$ required for all $E\gamma > 200$ keV. Neutron energy interval required : 500 keV. --- TNC Gamma-energy resolution required, 250 keV. Tucker: ORO-2791-28, 90° data at 1.4 and 14. MeV.	69
20 [1592]	<sup>6</sup> Li	N, ALPHA	5. +2	3. +6	3 1 to 3%	1	LAS Hansen, G. For use as standard below 3 MeV . Accuracy of 3% useful E-resolution must reproduce true shape. --- HAR Absolute $\sigma$ 's required standard below 150 keV . Sowerby+: 70 HELSINKI P/26(6/70), to 80 keV. HAR Uttley: 70 ANL (0/70), infers from total. KTY Gabbard+: new data over 250 keV res. POA Condet+: EANDC(OR) 83L(1969), new work under way.	69
21 [1591#]	<sup>6</sup> Li	N, ALPHA	1. +3	3. +6	1	1	ANL LMB Avery, R. Hemming, P.B. For use as a standard below 3 MeV. Accuracy of 3 percent useful. --- Energy resolution must reproduce true shape. Status: See REG 1592 above.	69
22 [1639#]	<sup>6</sup> Li	N, ALPHA	1. +3	3. +6	3	1	GRT Russell, J. For use as a standard below 3 MeV. Accuracy of 3 percent useful. --- Energy resolution must reproduce true shape. Status: See REG 1592 above.	69
23 [1569#]	<sup>6</sup> Li	N, ALPHA see comment	1. +3	1.8+7	10	2	HED Mc Elroy, W.W. Quantity: Total alpha production. For use as fluence monitor. Total helium production for mass spectrometer.	69
24 [1418]	<sup>6</sup> Li	N, ALPHA angular dist	5. +3	5. +5	5	1	MOL Motte, F. Determination of n-spectra from triton energy distributions. Ang.resol.10° , neutron energy resol 5keV up to 150 keV and 10keV up to 500 keV.	68
25 [ 23 ]	<sup>6</sup> Li	N, ALPHA	5. +3	1.5+7	5	1	KPK MOL Kuechle, M. Motte, F. --- Discussion on data from thermal to 1 MeV by Spaepen (conf. Paris 1966). See also discussion of experimental discrepancies by Bergstroem et al. in CCDN-NW/3 (0/66)	69

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
26 [ 1593 ]	<sup>6</sup> Li	N,ALPHA	5. +3 1.3+7	<5 3 to 5%	1 LAS	Motz, H.T. For use as standard below 3 MeV .Accuracy of 3% useful E-resolution must reproduce true shape. Absolute $\sigma$ 's required standard below 150 keV . Sowerby+: 70 HELSINKI P/26(6/70), to 80 keV . Uttley: 70 ANL (0/70), infers from total. Gabbard+: new data over 250 keV res. Condet: EANDC(OR) 83L(1969), new work under way.	69
27 [ 1594# ]	<sup>6</sup> Li	N,ALPHA	1. +4 1.4+7	< 3 1 TO 3 %	1 NBS	Caswell, R.S. For use as standard below 3 MeV . Accuracy of 3 percent useful. Energy resolution must reproduce true shape. Status: See REG 1592 above.	69
28 [ 2327# ]	<sup>6</sup> Li	N,ALPHA	1. +4 3. +6	5	1 LLL	Howerton, R.J. For use as standard. Energy resolution must reproduce true shape. Status: See REG 1592 above.	70
29 [ 26 ]	<sup>6</sup> Li	N,ALPHA angular dist	1. +5 5. +6	5	3 HAR WIN	Wright, S.B. Campbell, C.G. Note reduced energy range. Flux monitor for neutron spectrum measurements. Discrepancies are particularly large above 350keV.	
30 [ 2445 ]	<sup>6</sup> Li	N,ALPHA	1.0+5 1.0+7	< 5.0	1 TRM	Navalkar, M.P. For neutron spectrum measurements with sandwiched Li <sup>6</sup> spectrometer. Present knowledge is about 10% and worse. Uttley et al. reviewed status at EANDC Standards Symposium, Argonne, October 1970, Proc. p.80.	71
31 [ 2289 ]	<sup>6</sup> Li	N,ALPHA	1. +5 5. +6	5	2 HAR WIN	Rose, B. Campbell, C.G. Standard for cross-section measurements and for neutron spectrum measurements.	71
32 [ 2599+ ]	<sup>7</sup> Li	ALPHA,N	4. +6 6. +6	2	2 NBS	Caswell, R.S. Accuracy 2 percent for inverse reaction. Energy corresponds to 10 keV to 1 MeV for inverse reaction B-10(N, ALPHAN) . Macklin+: PHYS.REV. 165,1147.	72
33 [ 1534 ]	<sup>7</sup> Be	DISAPP EANC THR	3.0+5	10	2 VNV	Vidal, J.C. Half-life is 53.6 days.	69
34 [ 1600# ]	<sup>9</sup> Be	EMISS XSBCT energy,angle	1.8+6 1.5+7	15	2 LMB	Hemming, P.B. For Be moderated fast spectrum reactors. For thermal breeders or convertors, Neutron economy calculations. Resolution, 5 percent incident energy, 500 keV in outgoing energy. Accuracy 50 mb at 2-3 MeV.	62
35 [ 40 ]	<sup>9</sup> Be	N2N XSECTION TR	1.4+7	10	2 BBC JUL	Gieszer, W. Gerwin, H.	
					FOA	Holmberg, Hansen: NP/A 129 305 (1969), 2 to 6.4 MeV.	
36 [ 1312 ]	<sup>9</sup> Be	N2N XSECTION	2.6+6 2.0+7	<10	2 JAE	Japanese Nuclear Data Committee (JNDC). For neutron age calculations.	68
					FOA	Holmberg, Hansen: NP/A 129 305(1969): 2 to 6.4 MeV.	
37 [ 1603# ]	<sup>9</sup> Be	N,GAMMA	1. +0 1. +5	10	2 GRT	Preskitt, C. A. To resolve discrepancies in thermionic reactor worths.	69
					ORL	Macklin+ NCSAC-33, no capture levels < 600 keV.	

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
[ 38 ]	<sup>9</sup> Be	N, GAMMA	1.0+2	1. +6	50	2 JUL Gerwin, H. --- No activity known.	
[ 39 ]	<sup>9</sup> Be	N, ALPHA	TR	1.0+7	10	2 JUL Gerwin, H. KPK Cierjacks has measured between 10 and 30 MeV.	
[ 40 ]	<sup>10</sup> B	TOTAL XSECT	1. +4	1. +6	1	2 NBS Caswell, R.S. Desired for assessing B-10(N,ALPHA) standard. HAR Diment+: AERE R5224, to 900 keV.	72
[ 41 ]	<sup>10</sup> B	DIFF ELASTIC	5. +2	1. +6	5	2 CAD Barre, J-Y. And sigma scattering for small angles. Accuracy over <1-cos>. For fast reactor calculations.	70
[ 42 ]	<sup>10</sup> B	DIFF ELASTIC	1. +3	1. +5	< 5 1 TO 5 %	2 NBS Caswell, R.S. Desired for assessing B-10(N,ALPHA) standard. HAR Asami+: JNE 24,85(1970), to 120 keV.	72
[ 43 ]	<sup>10</sup> B	DIFF ELASTIC	1. +5	1. +6	< 3 1 TO 3 %	2 NBS Caswell, R.S. Desired for assessing B-10(N,ALPHA) standard. HAR Asami+: JNE 24,85(1970), to 120 keV.	69
[ 44 ]	<sup>10</sup> B	DIFF INELAST TR energy dist	5. +6	10	2	2 CAD Barre, J-Y. Energy (E and E') resolution : 500 keV . For fast reactor calculations.	70
[ 45 ]	<sup>10</sup> B	ABSORPTION	1.0+2	1.0+7	10	1 JAE Japanese nuclear data committee (JNDC). For fast reactor calculations.	68
[ 46 ]	<sup>10</sup> B	ABSORPTION	1. +4	1. +6	2	1 CAD Barre, J-Y. Needed as a standard for measurements. Also need of value relative to fission ( U <sup>235</sup> ) or capture ( U <sup>238</sup> ), accuracy 2%. For fast reactor calculations.	69
[ 47 ]	<sup>10</sup> B	ABSORPTION	2. +5	1. +6	5	3 WIN Campbell, C.G. For fast reactors.	
[ 48 ]	<sup>10</sup> B	ABSORPTION	1. +6	5. +6	10	3 WIN Campbell, C.G. For fast reactors.	
[ 49 ]	<sup>10</sup> B	N, ALPHA	1. +3	1. +7	< 5 1 TO 5 %	1 ANL Avery, R. LMB Heming, P.B. ORL Maienschein, F.C. 1-100keV ,accuracy 1%; 3% useful. 100-300 keV ,accuracy 3%; 10% useful. 0.3-10 MeV ,accuracy 5%; 10% useful. Needed as standard; absolute 's required. Alpha(0)/alpha(1) ratio needed for both alpha and gamma detection. HAR Sowerby+: 70HELSINKI P/26(6/70) , to 80 keV. TNC Hellis+: PR/C 1 847(3/70) , gives alpha(0)/alpha(1).	69
[ 50 ]	<sup>10</sup> B	N, ALPHA	1. +3	1. +6	2	1 NBS Caswell, R.S. Alpha(0)/alpha(1) ratio needed for both alpha and gamma detection. --- Status: See REG 1609 above.	72
[ 51 ]	<sup>10</sup> B	N, ALPHA	1. +3	1. +6	5	1 LLL Howerton, R.J. Alpha(0)/alpha(1) ratio needed for both alpha and gamma detection. --- Status: See REG 1609 above.	70
[ 52 ]	<sup>10</sup> B	N, ALPHA gammaspectra	1. +3	1. +7	< 5	1 ANL Avery, R. LMB Heming, P.B. ORL Maienschein, F.C. Ey=80 keV. 1-100 KeV, accuracy 1%; 3% useful. 100-300 KeV, accuracy 3%; 10% useful. 0.3-10 MeV, accuracy 5%; 10% useful. Need as standard; Absolute 's required. HAR Hellis+: PR/C 1 847(3/70) , 50 keV to 5 MeV. GRT Carlson+: work in progress.	69

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
53 [ 1614# ]	$^{10}\text{B}$	N,ALPHA see comment	1. +3	1.8+7	10	2 HED	Mc Elroy, W.N. Quantity: Total alpha production. For use as a fluence monitor. Total helium production for mass spectrometer.	69
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54 [ 1419 ]	$^{10}\text{B}$	N,ALPHA	1.0+4	1.0+5	1.0	1 MOL GEL	Motte, F. Standard xsection. Calc.of standard neutron spectrum. Evaluation by Gubernator and Moret EUR 3950.e.	68
55 [ 60 ]	$^{10}\text{B}$	N,ALPHA see comment	1. +4	1. +6	2	1 HAR HAR	Rose,B. Used as a standard in category 1 x-sect. measurements Energy dependence needed more accurately. Also (n,alpha gamma). Note increased priority. Evaluation below 200 kev completed by Patrick, Sowerby and Utley: JNE 24 323(1970).	64
56 [ 1613# ]	$^{10}\text{B}$	N,ALPHA gammaspectra	5. +4	1. +6	< 5	1 NBS	Caswell, R.S. $E_\gamma = 480$ keV. 1-100 keV, accuracy 1%; 3% useful. 100-300 keV, accuracy 3%; 10% useful. 0.3-10 MeV, accuracy 5%; 10% useful. Needed as standard; Absolute $\sigma$ 's required. Status: See REG 1612 above.	69
57 [ 1420 ]	$^{10}\text{B}$	N,ALPHA	1.0+5	1.0+6	3.0	1 MOL GEL	Motte, F. Standard xsection. Calc.of standard neutron spectrum. Evaluation by Gubernator and Moret EUR 3950.e.	68
58 [ 2345 ]	$^{11}\text{B}$	DIFF ELASTIC	5. +2	1. +6	5	2 CAD	Barre, J-Y. For fast reactor calculations. Accuracy on $\langle 1-\cos \theta \rangle$	70
59 [ 2346 ]	$^{11}\text{B}$	DIFF INELAST TR energy dist	5. +6	10	2	CAD	Barre, J-Y. For fast reactor calculations.	70
60 [ 1619# ]	C	DIFF ELASTIC	1. +3	2.5+6	1	1 LMB ANL GEL CCP	Hemmig, P.B. Needed as standard for scattering measurements. Accuracy of 3% useful for near-term. Lane has elastic and polarization data from 0.5 to 2 MeV, WASH-1079. Knitter+: 70ANL (0/70), data 0.5 to 2.5 MeV. Nikolaev: 68DUB (6/68), data 0.1 to 15. MeV.	69
61 [ 2321 ]	C	DIFF ELASTIC	1. +5	1.5+7	3	2 AE	Haeggblom, H. For fast critical system.	71
62 [ 1621# ]	C	DIFF ELASTIC	2. +6	1.4+7	10 20%	3 KAP YAL	Ehrlich, R. Energy resolution 50 keV from 7 to 8.2 MeV, 100 keV from 8.2 to 10 MeV, larger from 10 to 14 MeV. Angular resolution 3° from 7 to 8.4 MeV. 10° from 8.4 to 14 MeV. For shielding and resonance or optical model fitting. Firk: Nucl.Inst.Meth, 43, 312, 1.6-10 MeV. See also REG 66 below.	62
63 [ 66 ]	C	DIFF ELASTIC	6. +6	1.6+7	<20 $\langle 1-\cos\theta \rangle$ desired: 10%	1 PAR PAD NDL CSE KTY ORL	Rastoin, J. Angular resolution: 5° to 10°. For high temperature graphite reactor calculation. Measurements from 2.2 to 8.5 MeV by Fasoli + are in progress. Preliminary results reported in EANDC(E)-127 U,78(1970). Likely C though given $\text{C}^{12}$ . Bucher et al.: EANDC(US)-143(4/70), 7-14MeV, small $\theta$ . Boschung et al.: EANDC(US)-143(4/70), around 5 MeV. Galati+, 3-7 MeV, TBP Perey+, ORNL-4441, 4.5-8.0 MeV.	71

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
64 [1511]	C	NONE GAMMAS	8. +6	1.3+7	10	3 BRC Laubuge, M. LAS Neutron monitor and threshold detector. CAS Drake, (n,n'γ) at 6.5 MeV. Boschung (Case) et al., about 5.0 MeV, E A N D C-143 ( U S )	69
65 [1627]	<sup>12</sup> C	MISCELLANEOUS	4.0+6	5.5+6	15	2 KAP Ehrlich, R. Quantity : polarization P(θn) E-resol about 50 keV . Needed to resolve discrepancy between theory and experiment. KAP Reynolds, Phys.Rev. 176, 103, has calculated to 5 MeV. PAD Fasoli+ : see EUR-countries Progress Report 1971	69
66 [ 80 ]	N	DIFF ELASTIC	1. +6	1.6+6	<20 <1-cos > desired: 10%	2 VNV Cardot, M. Angular resolution: 2.5 degrees up to 20 degrees 5 degrees from 20 to 180 degrees. For air scattering calculation. TNC New evaluation to be done if new experimental data. Williams et al., 9-11 MeV , E A N D C -143 ( US ). See also: Bauer: NP/A 93,673(3/67); Anderson: WASH 1068,64(3/66).	69
67 [ 81 ]	N	DIFF ELASTIC	8. +6	1.4+7	10	2 FOA Zetterstroem, H.O. Energy resolution 0.2 MeV. Shielding. NDL Bucher et al.: EANDC(US)-143(4/70), 7-14MeV, small θ. TNC Williams et al.: EANDC(US)-143 (5/70), 9 to 11 MeV. See also: Bauer: NP/A 93,673(3/67); Anderson: WASH 1068,64(3/66).	69
68 [ 84 ]	N	EMISS XSECT	4. +6	1.6+7	<20 <1-cos > desired:	2 VNV Cardot, M. For air scattering calculation. New evaluation to be done if new experimental data.	69
69 [ 83 ]	N	EMISS XSECT	8. +6	1.4+7	10	2 FOA Zetterstroem, H.O. Energy resolution 0.2MeV. Shielding.	69
70 [ 87 ]	N	NONE GAMMAS	4. +6	1.6+7	<20 energy,angle <1-cos > desired: 10%	2 VNV Cardot, M. Energy resolution for n and photons: 0.5MeV. For air scattering calculation. Angular distribution only if significant anisotropy. New evaluation to be done if new experimental data.	69
71 [1535 ]	N	N,PROTON	1.0+2	1.5+7	10	1 VNV Cardot, M. Evaluation may be sufficient. No measurements exist from 4.25 to 15MeV.	69
72 [2446 ]	<sup>14</sup> N	N2N XSECTION	1.4+7	10.0	3 KOS Csikai, J. Needed for neutron activation analysis and cross sec- tion systematics. Incident energy resolution 200 keV. For reference see At.En.Rev.7(1969),93.	69	
73 [1640#]	O	DIFF ELASTIC	1. +4	1. +6	5	2 GRT Preskitt, G.A. Needed for fast reactor reflector worths. TNC Buchanan : NCSAC-33(1971) , scattering 9 to 11 MeV. NEL Buchanan+ : NCSAC-33(1971) ,small angles 7 to 14 MeV.	69
74 [2322 ]	O	DIFF ELASTIC	1. +5	1.5+7	5	2 AE Haeggblom, H. For fast reactor calculations.	71
75 [1641#]	O	DIFF ELASTIC	1. +6	4. +6	< 9 4 TO 9 %	1 KAP Ehrlich, R. Needed for fast reactor reflector worths. Dθ = ±1° every 5° (<20° ),±1.5° every 10° (>20° ). Status: See REG 1640 above.	69
76 [ 96 ]	O	DIFF ELASTIC	1.7+6	2.2+6	10	2 KPK Schmidt, J.J. Experimental data available in this range not sufficiently detailed to account for resonance structure. Check of theoretical work of Joanou, Penech ( Reactor Sci.Techn. 17,425(1963)) on diff. elastic cross section in this range desirable.	69

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
77 [ 1642# ]	0	DIFF ELASTIC	4. +6	1.6+7	< 5 3 TO 5 %	1	LMB Hemmig, P.B. ORL Clifford, C.E. Needed for fast reactor reflector worths. Dθ = ±1° every 5° (<20°), ±1.5° every 10° (>20°). Status: See REG 1640 above.	66
78 [ 99 ]	0	DIFF ELASTIC	4.7+6	1.4+7	10	2	KPK Schmidt, J.J. Only few measurement points available. Measurements desired in energy steps increasing from 30 keV to 100 keV and angular resol. between 5° and 10°. Measurements at 14 MeV is reported in EANDC(OR)-90,27.	
79 [ 1644# ]	0	DIFF ELASTIC	7. +6	1.5+7	5	1	NEL Eccleshall, D. Dθ = ±2.5° (<30°), ±5° (>30°). DE = 100 keV or 10% (every 500 keV). Status: See REG 1640 above.	69
80 [ 100 ]	0	DIFF ELASTIC	8. +6	1.4+7	10	2	POA Zetterstroem, H.O. Energy resolution 0.2 MeV. Shielding. Measurements at 14 MeV is reported in EANDC(OR)-90,27.	
81 [ 1643# ]	0	DIFF ELASTIC	8. +6	1.5+7	5	1	APW Enz, R. Dθ = ±2.5° (<30°), ±5° (>30°). DE = 100 keV or 10% (every 500 keV). Status: See REG 1640 above.	69
82 [ 1947# ]	0	DIFF ELASTIC	8. +6	1.6+7	5	1	LAS Biggers, W. Dθ = ±1° every 5° (<20°), ±1.5° every 10° (>20°). Status: See REG 1640 above.	62
83 [ 1646# ]	0	EMISS XSECT		1.4+7	5	3	GRT Preskitt, C.A. TNC Needed for fast reactor reflector worths. Buchanan+: NCSAC-33(1971), scattering 9 to 11 MeV.	69
84 [ 103 ]	0	EMISS XSECT	6. +6	1.6+7	<20 <1-cos > desired: 10%	2	FAR Devillers, C. Resolution for En, En': 0.5 MeV. Angular resolution <10 degrees if significant anisotropy. For dosimetry calc. in tissue and shielding calc. Evaluation may be sufficient.	69
85 [ 1647# ]	0	EMISS XSECT	7. +6	1.5+7	10	1	NEL Eccleshall, D. 200-keV intervals or as dictated by structure. Resolution: DE = 100 keV or 10%. Low energy (<1 MeV) neutrons must be included. Status: See REG 1646 above.	69
86 [ 102 ]	0	EMISS XSECT	8. +6	1.4+7	10	2	POA Zetterstroem, H.O. Energy resolution 0.2 MeV. Shielding.	
87 [ 1645# ]	0	EMISS XSECT	8. +6	1.5+7	10	1	APW Enz, R. 200 keV intervals or as dictated by structure. Resolution: DE = 100 keV or 10%. Low energy (<1 MeV) neutrons must be included. Status: See REG 1646 above.	69
88 [ 104 ]	0	EMISS XSECT	1. +7	1.6+7	<20 <1-cos > desired: 10%	1	FAR Rastoin, J. Resolution for En, En': 0.5 MeV. Angular resolution <10° if significant anisotropy. For dosimetry calc. in tissue and shielding calc.	
89 [ 106 ]	0	NONEL GAMMAS	4. +6	1.6+7	<20 energy,angle desired: 10%	2	FAR Devillers, C. Resolution for En: 1 MeV, for Eg: 0.5 MeV. Angular distribution only if significant anisotropy. For dosimetry calc. in tissue and shielding calc. Evaluation may be sufficient.	69
90 [ 113 ]	0	N, ALPHA	8.8+6	1.1+7	20	2	FAR Devillers, C. For damage calc. and dosimetry calc. in tissue. Evaluation may be sufficient.	69

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REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN MAX	(%)				
91 [2447]	<sup>160</sup> N,PROTON	1.4+7		10.0	3	KOS Csikai, J. Needed for neutron activation analysis and cross section systematics. Incident energy resolution 200 keV. For reference see At.En.Rev.](1969),93.	69	
92 [1314]	<sup>160</sup> N,ALPHA	TR	1.0+7	3	1	JAE Japanese Nuclear Data Committee (JNDC). Precise standardization of emission rate of neutron source. No available data.	68	
93 [115]	<sup>170</sup> N,GAMMA	THR		0.2 b.	2	CRC Hanna, G.C. --- For understanding absorption in D <sup>2</sup> O. Difficulty in sample preparation. See Hanna EANDC(CAN)-33 (1967).		
94 [1652]	<sup>170</sup> ALPHA,N	THR	7.0+6	20	2	KAP Ehrlich, R. Alpha E-resolution 0.1MeV . For calculation of neutron source strengths.	66	
95 [1653]	<sup>180</sup> ALPHA,N	THR	7.0+6	10	3	BET Bayard, R.T. Alpha E-resol 0.2MeV .To resolve discrepancies between cross section and neutron yield data.	66	
96 [1521]	<sup>180</sup> ALPHA,N energy dist	4. +6 7.5+6		30	2	Devillers, C. Resolution for E and E':1 MeV. For shielding of alpha emitting samples. New evaluation to be done if new experimental data.	69	
97 [124]	<sup>19</sup> F	RESON PARAMS	1.5+4		10	1	KPK Kuechle, M. Reson.params.for resonance at 15.3keV. Total and gamma width; L and J.	
98 [2448]	<sup>19</sup> F	N2N XSECTION	1.4+7		10.0	3	KOS Csikai, J. Needed for neutron activation analysis and cross section systematics. Incident energy resolution 200 keV. For reference see At.En.Rev.](1969),93.	69
99 [1656]	<sup>19</sup> F	N,GAMMA	1.0+3 1.0+6		10	2	ORL Perry, A.M. --- To calculate neutron loss in Molten Salt Breeder. FOA Nystroem+, EANDC(OR)99L (1970), have TOF data between 20 and 80 keV. ORL Macklin: experiment in progress.	66
100 [1658#]	<sup>23</sup> Na	TOTAL XSECT	1. +4 5. +6 < 5 3 TO 5 %		1	ORL Clifford, C.E. --- Fast reactor deep penetration; 1% in valley. KPK Cierjacks: EANDC(E)1270 (4/70), unpublished data. RPI Clement+: NCSAC-33(1971), 0.5 to 40 MeV .	69	
101 [1468]	<sup>23</sup> Na	RESON PARAMS	2.9+3		10	2	CAD Barre,J.Y. --- For resonance at 2.95keV. For activation detectors and fast reactor calculations. I'm known to better than 10%; $\gamma$ data discrepant. New experimental approach required for $\gamma$ -spectra. COL Camarda et al.: WASH-1136 28 (9/69), analysis t.b.c. COL Garg reports work above 20 keV (Albany Conf.,1971) RPI Yamamuro (NSE 41,445 1970) gives $\Gamma\gamma=0.47 \pm .045$ in sharp disagreement with Harwell (0.6), GGA (0.35) and inconsistent with ther. capt.cross-sect. from which 0.32 would be inferred.	69
102 [2451]	<sup>23</sup> Na	RESON PARAMS	2.9+3 1.0+5 see comment		1	FEI Nikolaev, M. N. --- For fast reactor calculation. Neutron widths wanted for 2.9 keV resonance with 5% accuracy, for other 5 resonances with 10% accuracy, capture widths with 10% accuracy. IAE Available data do not satisfy accuracy requirements. COL Camarda et al.,analysis to be done, WASH-1136, 28.	71	
103 [1663#]	<sup>23</sup> Na	RESON PARAMS	3. +3 gamma width neutronwidth		10	1	ANL Avery, R. LMB Heming, P.B. --- I'm and $\gamma$ desired for 3 keV resonance. RPI Yamamuro: (NSE 41,445 1970) to 10 percent. Discrepancies still exist.	62

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
104 [ 129 ]	<sup>23</sup> Na	DIFF ELASTIC	2.2+6	1.0+7	<10	2	KFK Schmidt, J.J. Towle and Gilboy (Nucl.Phys.32, 610, 1962) measured at 4 energies between 1 and 4 MeV. Fasoli et al. (EANDC(E)-89"U", page 112) measured at 2.5, 4.0 and 6.5 MeV. Because of resonance fluct. in total xsect, fluctuations in DEL expected. Therefore, more experimental data needed. Separation of elastic and inelastic angular dependences desired. Primary neutron resolution 100 keV, measurements in steps of several 100 keV, angular resolution 5°-10°. ALD Porter: 5 MeV data. ORL Perey et al.: ORNL-4518 (8/70), 5.4 to 8.5 MeV.		
105 [ 1469 ]	<sup>23</sup> Na	DIFF ELASTIC	4. +6	1.0+7	10	2	CAD Barre, J.Y. Energy resolution: 100 keV, angular resolution: 10°. For fast reactor calculations. ALD Porter, AWRE-O-3/71, 5.0 MeV data. ORL Perey et al., 5.4 - 8.5 MeV results ORNL-4518 Cierjacks+, 71KNOX.	69	
106 [ 2323 ]	<sup>23</sup> Na	DIFF INELAST TR energy,angle	1.5+7	10	2	AE Haeggblom, H. For fast reactor calculations.		71	
107 [ 1660# ]	<sup>23</sup> Na	DIFF INELAST energy dist	2. +6	1. +7	10	2	AI Alter, H. ANL Avery, R. LMB Heming, P.B. NEW Pitterle, T.A. Total integral over 4 Pi required. Spectra at several angles if significantly anisotropic. Energy resolution <10% incident and final energies. ORL Perey+: ORNL-4518(1970); results 5.4-8.5 MeV. ALD Porter: 5 MeV data.		62
108 [ 134 ]	<sup>23</sup> Na	DIFF INELAST energy dist	4. +6	1.0+7	10	2	BOL Pierantoni, F. PAD Results at 4.04 and 6.4 MeV. ALD Porter: 5 MeV data. ORL Perey et al.: ORNL-4518 (8/70), 5.4 to 8.5 MeV. PAD Have data at 8, 10 and 14.5 MeV, TBP		
109 [ 132 ]	<sup>23</sup> Na	DIFF INELAST angular dist	4. +6	1.5+7	10	2	KFK Schmidt, J.J. --- See REG.134 above.		
110 [ 1662# ]	<sup>23</sup> Na	ABSORPTION	1. +3	1. +5	20 OR 5 MB	2	GE Snyder, T. LMB Heming, P.B. NEW Pitterle, T.A. RPI Intermediate accuracy useful. Hockenbury: PR 178 1746 (2/69), res. params. and capture areas for 4 resonances.		69
111 [ 137 ]	<sup>23</sup> Na	N,GAMMA	THR	1	3	AMS Aten, A.H.W. For calibration of neutron sources; cf. P.W.F. Louwrier, Thesis, Univ. of Amsterdam, 1966. NPL Ryves, JNE 24, 35 1970 Request apparently satisfied by old data.			
112 [ 2450 ]	<sup>23</sup> Na	N,GAMMA see comment	THR	4.0+3	<10	1	FEI Nikolaev, M.N. For fast reactor Keff and BR calculation and evaluation of Na activation. Capture width of 2.9 keV resonance should be measured in three different experiments, results should coincide within limits of 5-7%. If high RPI capture width confirmed, energy dependence of capture CS should be measured from thermal to resonance region to investigate interference between direct and resonance capture. Measurements of gamma ray spectra in thermal and first resonance regions desirable for decision about existence of interference effects. RPI Hockenbury et al. give revised capture width value of 0.45 eV in PR 178(1969), 1746. GA Priesenhahn et al. report capture width of 0.34 eV at Washington Conference 1968 compatible with thermal cross section and resonance integral. COL Casarda et al., analysis to be done, WASH-1136, 28.		71

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
113 [ 140 ]	$^{23}\text{Na}$	N,GAMMA (res.param)	1. +2	1. +4	10	1	KPK ---	Kuechle, M. Reson. parameters; neutron-and gamma-width, J at 2.8 keV. Needed for intermediate and fast reactors and for activation detectors. Status: see REG 1441 below.	
114 [ 138 ]	$^{23}\text{Na}$	N,GAMMA	1. +2	1. +5	<20 10 to 10keV	2	WIN ---	Campbell,C.G. For fast reactors. Note extended energy range. Discrepancy in $\Gamma\gamma$ data at 3keV resonance. Status: see REG 1441 below.	64
115 [ 2449 ]	$^{23}\text{Na}$	N,GAMMA (res.param)	1.0+2	6.5+4	10.0	2	AUA RPI GA COL	Symonds, J.L. Neutron and capture widths and J for 2.85 keV resonance wanted. Available information on capture width inconsistent. Also parameters for 35 keV resonance wanted. Hockenbury et al. give revised capture width value of 0.45 eV in PR 178(1969), 1746. Friesenhahn et al. report capture width of 0.34 eV at Washington Conference 1968 compatible with thermal cross section and resonance integral. Camarda et al., analysis to be done, WASH-1136, 28.	69
116 [ 1441 ]	$^{23}\text{Na}$	N,GAMMA	1.0+2	5.0+4	10	1	JAE CAD HAR RPI GA AUL COL	Japanese Nuclear Data Committee (JNDC). For fast reactors. Resonance parameters needed. Discrepancies in resonance parameters exist. WASH 1074(1967) 97. Measurements between 10 and 140 keV, (EANDC(E)57). Measurements from 200 eV to 50 keV by Moxon and Pattenden (66PARIS), $\Gamma\gamma=6$ eV at 2.85 keV from area analysis, but poor shape. Moxon, new work in progress. Hockenbury+: PR 178(1969) 1746 measured from 100 eV to 200 keV, 10-20% E-resol.; Yamamuro+: $\Gamma\gamma=47\pm 0.05$ eV at 2.85 keV (NSE 41(1970) 445). Friesenhahn+: find $\Gamma\gamma=35\pm 0.4$ eV at 2.85 keV, compatible with thermal $\sigma$ and resonance integral (68WASHINGTON 2 695). Clayton fits total $\sigma$ near 2.85 keV with $\Gamma\gamma=.36$ eV (AUJ 23 (1970) 823). Camarda+ have data, analysis to be done (WASH-1136). Gamma spectra of 2.85 keV reson. have been studied at BNL (BAPS 16 15), Harwell and ORL. Work at latter 2 labs in progress.	69
117 [ 1470 ]	$^{23}\text{Na}$	N,GAMMA	1. +3	8. +5	8	2	CAD	Barre,J.Y. For fast reactor calculations.	69
118 [ 2603+ ]	$^{23}\text{Na}$	SPECT NGAMMA	3. +3		10	1	ANL ---	Avery, R. Capture spectrum at 3 keV required. Sufficient accuracy to compare with thermal. No measurements to required accuracy.	72
119 [ 153 ]	$^{27}\text{Al}$	RESON PARAMS see comment	5.9+3	3.5+4	10	1	KPK RPI COL	Kuechle, M. $\Gamma\gamma$ and J at 5.9keV, $\Gamma\gamma$ at 35keV. Hockenbury et al.: PR 178 1746(1969), $E_0=5.88, 35$ keV. Garg+: 'Statistical properties of nuclei', J.B.Garg, Ed Plenum Press N.Y.1972, give parameters from 5 to 200 keV based on multilevel fits. At 5.9 keV: $\Gamma\gamma=5$ eV, $J=1$ , at 35 keV: $\Gamma\gamma=8.3$ eV. Request apparently satisfied.	
120 [ 144 ]	$^{27}\text{Al}$	EMISS XSECT energy,angle	9. +5	1.6+7	<20 desired: 10%	2	FAR	Rastoin, J. Resolution for E and $E':0.5$ MeV. Angular distribution only if significant anisotropy. For shielding calculation.	
121 [ 2454 ]	$^{27}\text{Al}$	NONEI GAMMAS TR energy,angle	5.0+6	10.0	2	PEL GA	De Beer, G.P. For shielding calculations. Orphan et al. measured at 0.85-16 MeV, WASH-1155 , p.66.	69	

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REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR
			MIN	MAX	(%)				
122 [2605+]	<sup>27</sup> Al	NONE GAMMAS energy dist	5. +3	2. +5	15	2	SNP	Pleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_\gamma)$ . $\gamma$ -Energy resolution: 10%.	69
123 [2606+]	<sup>27</sup> Al	NONE GAMMAS energy dist	1. +6	1. +7	15	1	SNP	Pleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required : 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. TNC Tucker+: ORO-2791-28 data 3-5 and 14 MeV. LAS Drake: NSE 40,294, data 4.4-7 MeV. GRT Orphant: NCSAC-33, data 0.86-16 MeV. KFK Voss+: 71KNOX, data 0.8-13 MeV.	69
124 [147]	<sup>27</sup> Al	NONE GAMMAS energy,angle	4. +6	1.6+7	<20 desired: 10%	1	PAR	Rastoin, J. Resolution for E: 1MeV, for $E_\gamma: 0.5$ MeV. Angular distribution only if significant anisotropy. For shielding calculation. Note priority changed to 1.	69
125 [2453]	<sup>27</sup> Al	DIFF INELAST TR energy,angle	5.0+6	10.0	2	PEL	De Beer, G.P. For shielding calculations. AE Almen et al. measured level excitation CS at 2.0-4.5 MeV, AIEA CN-26/56.	69	
126 [2604+]	<sup>27</sup> Al	SPECT NGAMMA THR		10	1	SNP	Pleishman, M.R. For shielding calculations. Both line and continuum spectra are required. Available data on intensities inconsistent. ORL Maerkter: ORNL-4382 new data.	69	
127 [154]	<sup>27</sup> Al	N,PROTON	TR	8.0+6	4.0	2	GEL	Neutron Dosimetry Group EURATOM. Threshold detector. ARK Husain et al.: PR/C 1 1233 (1970), data at 14.8 MeV. PRK Bass et al.: data from 6 to 9 MeV with 5% relative and 15% absolute accuracy (unpublished, see EUR 11e)	69
128 [156]	<sup>27</sup> Al	N,PROTON	8.0+6	1.4+7	8.0	2	GEL	Neutron Dosimetry Group EURATOM. Threshold detector. NAP Cuzzocrea et al.: NC/B 54 53 (1968), 13.7 to 14.7 MEV with 7% accuracy. TAT Tiwari, Kondaiah: PR 167 1091(1968), 14.2 MeV. BOS Mitra, Ghose: NP 83 157(1968), remeasurement at 14.8 + 0.1 MeV with special attention to uncertainties. ARK Husain et al.: PR/C 1 1233 (1970), data at 14.8 MeV.	69
129 [1315]	<sup>27</sup> Al	N,ALPHA	8.0+6	1.2+7	4	1	JAE	Japanese Nuclear Data Committee (JNDC). For neutron yield monitor. Data available 7 %	68
130 [159]	Si	DIFF ELASTIC	2. +6	1.6+7	<20 desired: 10%	2	PAR	Rastoin, J. $\langle 1-\cos \theta \rangle$ and $\sigma$ needed. Energy resolution: 1 MeV. For shielding calculation.	69
131 [1522]	Si	EMISS XSECT	5. +6	1.6+7	<20 desired: 10%	2	PAR	Rastoin, J. Resolution on E and $E_\gamma: 0.5$ MeV. Angular distribution only if significant anisotropy. For shielding calculation.	69
132 [160]	Si	NONE GAMMAS energy,angle	1. +6	3. +6	<20 desired: 10%	2	PAR	Rastoin, J. Resolution on E and $E_\gamma: 0.5$ MeV. Angular distribution only if significant anisotropy. For shielding calculation.	69
133 [170]	<sup>31</sup> P	N,PROTON	TR	1.4+7	5.0	1	GEL	Neutron Dosimetry Group EURATOM. Threshold detector. Disagreement between different measurements of insufficient accuracy. No data between 10 and 14 MeV.	69

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
[ 134 [ 171 ]	<sup>31</sup> P	N,PROTON	TR	6. +6	5 2	WUR Brunner, J. Fast flux measurements.	
[ 135 [ 173 ]	<sup>31</sup> P	N,PROTON	6. +6 1.5+7	10	2	WUR Brunner, J. Fast flux measurements in shields. Disagreement between different measurements of insufficient accuracy. No data between 10 and 14 MeV.	
[ 136 [ 175 ]	<sup>32</sup> S	N,PROTON	TR	6.0+6	2.0 1	GEL Neutron Dosimetry Group EURATOM. Threshold detector. Existing data are far from requested accuracy. Most recent measurement: Rago+ HP <u>14</u> (1968) 595.	
[ 137 [ 177 ]	<sup>32</sup> S	N,PROTON	TR	6. +6	5 1	WUR Brunner, J. Standard for flux measurements. Existing data have not the requested accuracy. GEL CBMM is measuring between TR and 2.2 MeV.	
[ 138 [ 178 ]	<sup>32</sup> S	N,PROTON	6. +6 1.5+7	10	2	WUR Brunner, J. Standard for flux measurements. TUR Pasquarelli (Politecnico di Torino) has measured at 14.7±0.1MeV by absolute methods: 215±6mb (Nucl. Phys. <u>93</u> ,218 (1967)).	
[ 139 [ 182 ]	Cl	N,PROTON	1. +4 2. +6	10	3	WIN Smith, J. For fused salt reactors. --- No work planned.	
[ 140 [ 2455 ]	<sup>36</sup> Cl	NONEL GAMMAS see comment			3	IEN Aghina, L.O.B. Gamma spectra between resonances wanted. Special interest on interference and direct capture.	69
[ 141 [ 2196 ]	<sup>40</sup> Ar	N,GAMMA	1.0+7	<20.0	2	JAE Japanese Nuclear Data Committee (JNDC). For reactor hazard calculation.	71
[ 142 [ 2456 ]	<sup>40</sup> Ar	N,PROTON	1.4+7		10.0 3	KOS Csikai, J. Needed for neutron activation analysis and cross section systematics. Incident energy resolution 200 keV. For reference see At.En.Rev. <u>7</u> (1969),93.	69
[ 143 [ 183 ]	K	N,GAMMA	1. +3 2. +6	20	2	BN Tavernier, G. Activation in fast reactors. --- No activity known.	
[ 144 [ 184 ]	K	N,GAMMA	3. +4 2. +6	25	3	BN Tavernier, G. Activation in fast reactors. Accuracy 10mb. --- No activity known.	
[ 145 [ 185 ]	<sup>41</sup> K	N,GAMMA	1. +3 1. +6	20	2	BN Tavernier, G. Accuracy 20% or 2 mb, act xsect for the 12.5 h period. 25% energy resol. D.C. Stupegia et al. (D.C. Stupegia et al., CN 23/51, IAEA Paris Conf. 1966) measured between 150 keV and 2.5 MeV. MUA Chaubey+, PR <u>152</u> (1966)1055, * (act) = 30±5 mb at 24keV. ANL Stupegia+, JNE <u>22</u> (1968)267, .16-2.5 MeV, accuracy better than 10%. INC Schuman reports .31±.10b at 2keV, WASH-1127(1969) 73.	
[ 146 [ 2457 ]	<sup>41</sup> K	N,PROTON	1.4+7		10.0 3	KOS Csikai, J. Needed for neutron activation analysis and cross section systematics. Incident energy resolution 200 keV. For reference see At.En.Rev. <u>7</u> (1969),93.	69
[ 147 [ 188 ]	Ca	DIFF ELASTIC	1. +6 1.4+7	10	2	PAR Rastoin, J. For shielding calculation.	
[ 148 [ 192 ]	Ca	NONEL GAMMAS energy,angle	3. +6 1.6+7	20 desired: 10%	2	PAR Rastoin, J. For Eγ>3.3MeV. Resolution for En and Eγ:0.5MeV. Angular distribution only if significant anisotropy. For shielding calculation.	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
149 [ 1367 ]	Ca	DIFF INELAST energy dist	6. +6	1.6+7	<20 desired: 10%	2 FAR ALD	Rastoin, J. <1-cos > and $\sigma$ needed. Energy resolution: 1 MeV. For shielding calculation.	
150 [ 1512 ]	$^{45}\text{Sc}$	N2N XSECTION TR		1.5+7	5	1 BRC	Laubuge, M. Dosimetry ( $^{44}\text{Sc}(2.4\text{d})$ , $^{44}\text{Sc}(3.9\text{h})$ ). Mather plans a measurement of total( $n, 2n$ ) at 12.3 MeV.	69
151 [ 1515 ]	$^{45}\text{Sc}$	N, GAMMA	1.0+2	1.5+7	10	1 BRC	Laubuge, M. Dosimetry. ( $\text{Sc}^{46}(84\text{d})$ ).	69
152 [ 1685 ]	$^{45}\text{Sc}$	N, GAMMA	1.0+3	1.8+7	10	2 BNW	Mc Elroy, W.N. For use as fluence monitor.	69
153 [ 1685# ]	$^{45}\text{Sc}$	N, GAMMA	1. +3	1.8+7	10	2 HED	Mc Elroy, W.N. For use as a fluence monitor.	69
154 [ 1514 ]	$^{45}\text{Sc}$	N, PROTON	TR	1.5+7	10	2 BRC	Laubuge, M. Dosimetry. ( $\text{Co}^{45}(165\text{d})$ ).	69
155 [ 1513 ]	$^{45}\text{Sc}$	N, ALPHA	TR	1.5+7	10	2 BRC	Laubuge, M. Dosimetry. ( $\text{K}^{42}(12.4\text{h})$ ).	69
156 [ 2607+ ]	Ti	NONEI GAMMAS energy dist	1. +3	1. +5	15 OR 5 MB	2 SNP	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_\gamma)$ . $\gamma$ -Energy resolution: 10%.	69
157 [ 1688 ]	Ti	NONEI GAMMAS energy, angle	1.0+4	1.6+7	20	1 ORL NRD	Clifford, C.E. Needed for space reactor shielding. Engesser: USNRDL-TR-68-78( /68), data at 2.8 MeV.	69
158 [ 2608+ ]	Ti	NONEI GAMMAS energy dist	1. +6	1. +7	15 OR 5 MB	1 SNP NRD	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required : 500 keV. $\gamma$ -Energy resolution : <2.5 MeV, 10%, >2.5 MeV, 250 keV. Engesser: USNRDL-TR-68-78, data at 2.8 MeV.	69
159 [ 2347 ]	Ti	ABSORPTION	5. +2	1.5+7	10	3 CAD	Barre, J-Y. For fast reactor calculations.	71
160 [ 1577 ]	Ti	N, GAMMA	1. +2	1. +5	20	1 WIN HAR	Campbell, C.G. For fast reactors. Coates: measurements planned. Evaluation needed.	69
161 [ 2348 ]	Ti	N, GAMMA	1. +2	1. +6	20	3 CAD	Barre, J-Y. For fast reactor calculations.	70
162 [ 2458 ]	Ti	N, GAMMA	1.0+4	1.0+5	20	2 AUA ORL	Symonds, J.L. Available data not satisfactory. Bird, AAEC, is studying this. Allen et al. measured at 30 keV - 3 MeV, analysis to be completed, NCSAC-33, 171.	69
163 [ 2349 ]	Ti	N, PROTON	TR	1.5+7	20	3 CAD	Barre, J-Y. For fast reactor calculations.	71
164 [ 2350 ]	Ti	N, ALPHA	TR	1.5+7	20	3 CAD	Barre, J-Y. For fast reactor calculations.	71
165 [ 201 ]	$^{46}\text{Ti}$	N, PROTON	TR	9.0+6	5.0	1 GEL FLA	Neutron Dosimetry Group EURATOM. Threshold detector. Lukic: ANS 12 283 (6/69), 4.9 - 7 MeV (15% accuracy).	
166 [ 1536 ]	$^{46}\text{Ti}$	N, PROTON	TR	1.5+7	10	1 VNV KAZ TOR	Cardot, M. Activation detector. Production of $^{46}\text{Sc}(85\text{d})$ . Levkovskii has measured at 14.8 MeV : Y F 10, 44 (1969). Pai has data between 13.6 and 19.5 MeV ( C J P 44, 2337 (1966))	69

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV) MIN	ACCURACY P MAX	LAB	REQUESTER , COMMENTS	YEAR		
167 [ 1690# ]	<sup>46</sup> Ti	N,PROTON	1. +6	1.8+7	1.0 2	HED KAZ TOR PLA ANL	Mc Elroy, W.N. Required is activation. Resolution in energy 100 kev , 500 kev intervals. For use as a fluence monitor. Levkovskii: YF 10 44 (1969) , 14.8 MeV measurement. Hsiang: DA/B 28 3189 (2/68) , data 14-20 MeV. Lucic: ANS 12 283(1969) , 4.9 - 7 MeV. Measurement underway.	69	
168 [ 1691# ]	<sup>46</sup> Ti	N,PROTON	1. +6	1.3+7	10	3	NEL Eccleshall, D. Required is activation. Resolution in energy 100 kev , 500 kev intervals. For use as a fluence monitor. Lucic: ANS 12 283(1969) , 4.9 - 7 MeV. Measurement underway.	69	
169 [ 203 ]	<sup>46</sup> Ti	N,PROTON	9.0+6	1.4+7	10.0	1	GEL TOR KAZ	Neutron Dosimetry Group EURATOM. Threshold detector. Pai: CJP 44 2337 (1966) , data 13.6 to 19.5 MeV. Levkovskii: YF 10 44 (1969) , 14.8 MeV measurement.	69
170 [ 204 ]	<sup>47</sup> Ti	N,PROTON	TR	7.0+6	5.0	1	GEL	Neutron Dosimetry Group EURATOM. Threshold detector. Data available only between 2 and 4 MeV with insufficient accuracy	
171 [ 1537 ]	<sup>47</sup> Ti	N,PROTON	TR	1.5+7	10	1	VNV TOR	Cardot, M. Activation detector. Production of <sup>47</sup> Sc (3.43d). Pai has data between 13.6 and 19.5 MeV ( C J P 44 , 2337 (1966) )	69
172 [ 1692# ]	<sup>47</sup> Ti	N,PROTON	1. +6	1.8+7	10	2	HED	Mc Elroy, W.N. Required is activation. Resolution in energy 100 kev , 1 MeV intervals. For use as a fluence monitor. Hsiang: DA/B 28 3189(2/68) , 14-20 MeV. Pai: CJP 44 2337 (1966) , data 13.6 - 19.5 MeV. Measurement underway.	69
173 [ 1693# ]	<sup>47</sup> Ti	N,PROTON	1. +6	1.5+7	SEE COMMENT	3	NEL	Eccleshall, D. Required is activation. For $\sigma > 5$ mb, $\Delta\sigma = 2.5$ mb. Resolution in energy 100 kev , 1 MeV intervals. For use as a fluence monitor. Status: See REG 1692 above.	69
174 [ 206 ]	<sup>48</sup> Ti	N,PROTON	TR	1.4+7	10.0	1	GEL	Neutron Dosimetry Group EURATOM. Threshold detector. Data available only above 12 MeV. Pai: CJP 44 2337 (1966) , data 13.6 to 19.5 MeV. Levkovskii: YF 10 44 (1969) , 14.8 MeV measurement. MUN Vonach, H.V.: 68WASH P/E31 (1968) , 14.7 MeV measurmnt.	69
175 [ 1538 ]	<sup>48</sup> Ti	N,PROTON	TR	1.5+7	10	1	VNV TOR KAZ MUN	Cardot, M. Activation detector. Production of <sup>48</sup> Sc(1.83d). Pai has data between 13.6 and 19.5 MeV ( C J P 44 , 2337 (1966) ) Levkovskii has measured at 14.8 MeV : Y F 10,44 (1969). H.V. Vonach has measured at 14.7 MeV ( W A S H - E 31 (1968) )	69
176 [ 1695# ]	<sup>48</sup> Ti	N,PROTON	1. +6	1.8+7	10	2	HED	Mc Elroy, W.N. Required is activation. Resolution in energy is 100 kev , 500 kev intervals. For use as fluence monitor; activation analysis. Hsiang: DA/B 28 3189(2/68) , 14 - 20 MeV. Work underway.	69

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
177 [1696#]	$^{48}\text{Ti}$	N,PROTON	3. +6	1.3+7	10	3	ANL Eccleshall, D. Required is activation. Resolution in energy 100 keV, 500 keV intervals. Work underway.	69
178 [1694#]	$^{48}\text{Ti}$	N,PROTON	3.2+6	1. +7	20	2	KAP Ehrlich, R. Required is activation. Resolution in energy 100 keV, 500 keV intervals. For use as fluence monitor; activation analysis. Work underway.	69
179 [1697#]	V	DIFF ELASTIC	1.4+6	1. +7	10	3	ANL Avery, R. LMB Hemmig, P.B. Resolution DE = 500 keV, $\Delta\theta=10^\circ$ . ORL Perey: data 4.9 to 8.5 MeV. ANL Smith: data to 3.8 MeV.	62
180 [1698#]	V	DIFF INELAST energy dist	1.5+6	1. +7	10	3	ANL Avery, R. GE Snyder, T. LMB Hemmig, P.B. Total integral over 4Pi required. Spectra at several angles if significantly anisotropic. ALD Porter: $(n,n'\gamma)$ , 0.3 to 4 MeV. ORL Perey: data 4.9 to 8.5 MeV. ANL Smith: data to 3.8 MeV.	62
181 [2351 ]	V	ABSORPTION	5. +2	1.5+7	10	3	CAD Barre, J-Y. For fast reactor calculations.	71
182 [1700#]	V	ABSORPTION	1. +3	1.5+5	10	3	ANL Avery, R. GE Snyder, T. LMB Hemmig, P.B. Energy resolution 10%. Available data inconsistent. RPI Stieglitz: NP/A 163 592(3/71) 1-200 keV. HAR Moxon: data 0.1-100 keV.	62
183 [ 213 ]	V	N,GAMMA	1. +2	1. +5	10	1	WIN Campbell, C.G. For fast reactors. Further eval. needed after measur. now in progress. CCP Zaikint, AE 23(1967)67, .18-2 MeV. RPI Stieglitz+, NP 163(1971)592, high resolution TOP data rel. to gold, 1-200 keV, many fully parametrized s-wave levels, capture areas for p-wave levels. HAR Moxon has capture yields between .1 and 100 keV. HAR Moxon: measurements in progress.	59
184 [2352 ]	V	N,GAMMA	1. +2	1. +6	20	3	CAD Barre, J-Y. For fast reactor calculations.	70
185 [ 211 ]	V	N,GAMMA	1. +3	2. +6	10	3	JUL Gerwin, H. --- Status: see REG 213 above.	71
186 [2353 ]	V	N,PROTON	TR	1.5+7	20	3	CAD Barre, J-Y. For fast reactor calculations.	71
187 [2354 ]	V	N,ALPHA	TR	1.5+7	20	3	CAD Barre, J-Y. For fast reactor calculations.	71
188 [1539 ]	SIV	N,ALPHA	TR	1.5+7	5	1	VNV Cardot, M. Activation. ( $^{48}\text{Sc}$ , 1.83d).	69
189 [2355 ]	Cr	TOTAL XSECT	5. +2	1.5+7	1	2	CAD Barre, J-Y. For fast reactor calculations.	71
190 [2609+]	Cr	TOTAL XSECT	1. +3	2.0+7	3	1	LMB Hemmig, P.B. Energy resolution sufficient to resolve major structure. One percent accuracy in deep minima.	72

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REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
191 [ 218 ]	Cr	DIFF ELASTIC	1.5+6	3. +6	15	2 KPK Schmidt, J.J. About 100 keV energy resol and about 10° angular resolution required. --- ANL Smith, A.B.: data to 1.6 MeV. AE Wiedling, Holmqvist: 70 HELSINKI P/54 (6/70). 1.8-8.1 MeV.	
192 [ 1523 ]	Cr	DIFF ELASTIC	2. +6	1.6+7	<20 desired: 10%	2 PAR Devillers, C. Resolution for E: 0.5 MeV., for theta: 5° to 100°. Evaluation may be sufficient.	69
193 [ 1701# ]	Cr	DIFF ELASTIC	2. +6	1.4+7	< 9 4 TO 9 %	2 KAP Ehrlich, R. Resolution: DE = 100 keV, Dθ = 5°. --- AE Wiedling: 70 HELSINKI P/54 (6/70), 1.8 - 8.1 MeV. ANL Work in progress.	69
194 [ 219 ]	Cr	DIFF ELASTIC	8. +6	1.6+7	20	2 KPK Schmidt, J.J. Energy resol.=0.5 MeV, angular resol.=5-10°. --- AE Holmqvist et al. (FANDC(OR)-73 "L") measured at nine energies between 2.5 and 8.0 MeV.	
195 [ 231 ]	Cr	EMISS XSECT energy dist	2. +6	1.4+7	10	2 PAR Devillers, C. Energy resolution: 10%. For fast reactor shielding calculations. Evaluation may be sufficient.	69
196 [ 1707# ]	Cr	NONEI GAMMAS energy dist	1. +7	10	2 BET Bayard, R.T. LMB Hemmig, P.B. The above accuracy is requested in 0.5 MeV γ-ray resolution intervals for shielding. --- TNC Tucker: WASH-1136 (9/69), 55° data at 5 MeV. NRD Engesser: USNRDL-TR-68-78 (1968), data at 2.8 MeV.	69	
197 [ 2610+ ]	Cr	NONEI GAMMAS	5. +2	2. +4 OR 5 MB	15	1 SNP Fleishman, M.R. Absolute σ(Eγ) required for all Eγ > 200 keV. Energy res.: Reproduce major variations in σ(Eγ). γ-Resolution required: 10%.	69
198 [ 2356 ]	Cr	NONEI GAMMAS	1. +3	1.5+7	10	2 PAR Devillers, C. Energy resolution: 250 keV if E(gamma) < 1 MeV 500 keV if E(gamma) > 1 MeV. Evaluation may be sufficient.	69
199 [ 2611+ ]	Cr	NONEI GAMMAS	1. +6	1. +7 OR 5 MB	15	1 SNP Fleishman, M.R. Absolute σ(Eγ) required for all Eγ > 200 keV. Neutron energy interval required: 500 keV. γ-Energy resolution: < 2.5 MeV, 10%, > 2.5 MeV, 250 keV. --- Status: See REG 1707 above.	69
200 [ 2612+ ]	Cr	NONEI GAMMAS	1. +6	1.4+7 OR 5 MB	15	2 NEL Eccleshall, D. Absolute σ(Eγ) required for all Eγ > 200 keV. Neutron energy interval required: 500 keV. γ-Energy resolution: < 2.5 MeV, 10%, > 2.5 MeV, 250 keV. --- Status: See REG 1707 above.	70
201 [ 232 ]	Cr	NONEI GAMMAS	2. +6	1.4+7	10	2 PAR Rastoin, J. Eγ > .5 MeV. Resolution for En and Eγ: 0.5 MeV (or 10%). For fast reactor shielding calculations. --- TRI Abbondanno : see EUR-countries Progress Report '71	
202 [ 1702# ]	Cr	DIFF INELAST	5. +5	1. +7 angular dist	10	2 GE Snyder, T. LMB Hemmig, P.B. Total integral over 4 Pi required. Spectra at several angles if significantly anisotropic. Required energy resolution not determined.	66
203 [ 2357 ]	Cr	ABSORPTION	5. +3	1.5+7	10	1 CAD Barre, J-Y. For fast reactor calculations.	71

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
204 [ 2197 ]	Cr	ACTIVATION	1.0+7	<20.0	2 JAE ---	Japanese Nuclear Data Committee (JNDC). For fuel cask design and control rod design. Large discrepancy exists between calculated value from resonance parameters and measured value.	71	
205 [ 1704 ]	Cr	RES INT CAPT	0.5+0	15 10-15%	1 KAP RPI	Ehrlich, R. Energies over 0.5 ev. Remove or correct for (n,p) contribution. Stieglitz: 1.6±0.2 b from resonance parameters.	69	
206 [ 1578 ]	Cr	N,GAMMA	1. +2	1. +5	20	WIN SCT RPI KPK HAR HAR	Campbell, C.G. For fast reactors. Evaluation needed. Spitzt, NP <u>A121</u> (1968)655, average data rel. to shell transmission via In secondary standard, 8-120keV. Stieglitzt, NP <u>A163</u> (1971)592, high resolution TOF data rel. to gold, separated isotopes, 1-200 keV, many fully parametrized s-wave levels, capture areas of p-wave levels. Froehnert, resonance measurements on separated isotopes in progress, 7-200 keV. Moxon: measurements in progress. Pattened: measurements in progress.	
207 [ 224 ]	Cr	N,GAMMA (res.param)	1. +3	2.0+5	10	1 KPK KPK	Schmidt, J.J. Isotopes, particularly Cr <sup>57</sup> , Cr <sup>53</sup> . Gy Also wanted in view of large discrepancies between directly measured infinite gamma Res.Int. and those calculated from differential σ(n,γ) measurements, and for confirmation of Kapchigashev's, Popov's (SAE <u>16</u> ,306(1964)) rather inaccurate results. Additional σ(n,γ) measurements and Gy determinations for individual res. desired. Cho +: 70 HELSINKI P/127(6/70), ln for 30 res. of <sup>53</sup> Cr between 20 and 250 keV. Analysis t.b.c. Status: see REG 1578 above.	
208 [ 1471 ]	Cr	N,GAMMA	1. +3	1. +6	10	1 CAD ---	Barre, J-Y. Need of resonance parameters for the main isotopes. Evaluation and experiment needed. Fast reactor calculations. Status: see REG 1578 above.	69
209 [ 1524 ]	Cr	N,GAMMA	1. +3	6. +5	25 or 10 mb	2 PAR ---	Devillers, C. For heating and circuit activation calculation. Evaluation may be sufficient. Status: see REG 1578 above.	69
210 [ 1703# ]	Cr	N,GAMMA	1. +3	1. +6	15	2 GE LMB ORL LLL	Snyder, T. Hemming, P.B. Clifford, C.E. Incident resolution 20%. Resonance parameters needed especially γ widths. Baglant: NCSAC 33(1971), from threshold photoneut. Status: See REG 1578 above.	65
211 [ 227 ]	Cr	N,PROTON	FISS	30	3 WIN ---	Campbell, C.G. For fast reactors. Available estimates differ by factor 5. Main uncer- tainty due to <sup>50</sup> Cr(n,p). NEU Poroughi, Durich: upper limit for 6 MeV measured. No work planned.		
212 [ 2358 ]	Cr	N,PROTON	TR	1.5+7	20	3 CAD	Barre, J-Y. For fast reactor calculations.	71
213 [ 228 ]	Cr	N,ALPHA	FISS	25	2 CAD ALD	Ravier, J. He in structural materials. Freeman et al.: JNE 23 713 (1969). Measurements made.		

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
214 [1368 ]	Cr N,ALPHA	3. +6 1.5+7	20	1	PAR CAD	Devillers, C. Evaluation may be sufficient. Barre, J-Y. For fast reactor calculations. He in structural materials.	68
					NEU	Foroughi and Durisch have measured upper limit for 6 MeV (E A N D C( O R)-90" L").	
					ALD	Freeman et al. have measured average fission neutron cross-section (J N E 23, 713 (1969))	
215 [ 233 ]	<sup>52</sup> Cr N,PROTON	TR	1.4+7 <20	2	KFK	Schmidt, J.J. Accuracy 10-20% desired. Main absorption process in MeV range. Only NP xsect data of Kern (NP 10,226,1959) available between 12.3 and 18.3 Mev. Experimental verification of evaporation theory estimates of Ringle (UCRL-10732, 1963) and Buttner (NP 63,615,1965) desired. See also Eriksson EANDC(CR)-73 "L" page 14f.	68
216 [1708 ]	<sup>53</sup> Cr RESON PARAMS	1.0+3 6.0+5 gamma width	9.0 4 to 9%	2	KAP KPK	Ehrlich, R. Cho et al.: 70 HELSINKI P/127 (6/70), Fn for 30 res. of <sup>53</sup> Cr between 20 and 250 keV. Analysis t.b.c.	69
					RPI	Stieglitz : NP/A 163 592 (3/71), $\sigma(n,\gamma)$ to 200 keV, $\sigma_{tot}$ to 300 keV, $\Gamma_\gamma$ for 9 s-wave res., $\eta^* \Gamma_n \Gamma_\gamma / \Gamma$ for 16 p-wave res. below 70 keV for <sup>53</sup> Cr. Accuracy around 10%. To reach 4% accuracy will require development.	
					KPK	Froehnert: measurements planned 7-200keV, isotopes.	
217 [2613+ ]	Mn NONEL GAMMAS	3. +2 1.2+5 energy dist	15 OR 5 MB	1	SNP	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_\gamma)$ . $\gamma$ -Resolution required: 10%.	69
					BNL	Chrien: WASH-1136, spectra for 4 resonances.	
218 [2614+ ]	Mn NONEL GAMMAS	1. +6 1. +7 energy dist	15 OR 5 MB	1	SNP	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required: 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	69
219 [2615+ ]	Mn NONEL GAMMAS	1. +6 1.4+7 energy dist	15 OR 5 MB	2	NEL	Eccleshall, D. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required: 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	70
220 [2359 ]	Mn ABSORPTION	5. +2 1.5+7	10	3	CAD	Barre, J-Y. For fast reactor calculations.	71
221 [2198 ]	Mn ACTIVATION	1.0+7 <20.0	2	JAE	Japanese Nuclear Data Committee (JNDC). For fuel cask design and control rod design. Large discrepancy exists between calculated value from resonance parameters and measured value.	71	
222 [1316 ]	<sup>55</sup> Mn N,GAMMA	THR	< 0.3	1	JAE	Japanese Nuclear Data Committee (JNDC). Precise standardization of emission rate of neutron source. Data available 0.8 %	68
223 [ 239 ]	<sup>55</sup> Mn N,GAMMA	1. +2 3.0+4	5	2	AE SCT	Raeeggblom, H. Spectrum measurements in fast critical assemblies. Spitz+, NP A121(1968) 655, only graphs of $\sigma(n,\gamma)$ , 8-50 keV, accuracy seems insufficient.	
					ANL	Stupegia+, JNE 22(1968) 267, 9-540 keV, accuracy varies between 6.8 and 10%.	
					COL	Measurement on <sup>55</sup> Mn planned, see WASH-1136, p. 30. WASH-1127 p. 37 (paragr. 3).	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
224 [ 240 ]	<sup>55</sup> Mn	N, <b>GAMMA</b>	1. +3	2.5+4	20	2 CAD ---	Barre,J.Y. Accuracy 20% or 5 mb. Energy resol.sufficient for resolving res.levels. For fast reactor calculations. Status: see REG 239 above.
225 [ 242 ]	<sup>55</sup> Mn	N, <b>GAMMA</b>	2.5+4	5. +6	5	1 CAD	Barre,J.Y. Activation detectors. For fast reactor calculations.
226 [ 2360 ]	Mn	N, <b>PROTON</b>	TR	1.5+7	20	3 CAD	Barre, J-Y. For fast reactor calculations.
227 [ 2361 ]	Mn	N, <b>ALPHA</b>	TR	1.5+7	20	3 CAD	Barre, J-Y. For fast reactor calculations.
228 [ 245 ]	<sup>54</sup> Mn	N, <b>GAMMA</b>	THR		5	2 MOL ---	Motte, P. For burn-up calculation of <sup>54</sup> Fe(n,p) <sup>54</sup> Mn reaction product. Hogg and Weber (IDO 16977, 41, 1964) found upper limit of 10 b. No activity known.
229 [ 2459 ]	<sup>55</sup> Mn	NONEL GAMMAS see comment			3 IEN	Aghina, L.O.B. Gamma spectra between resonances wanted. Special interest on interference and direct capture.	69
230 [ 246 ]	<sup>55</sup> Mn	N2N XSECTION	TR	1.3+7	5.0	1 GEL ---	Neutron Dosimetry Group EURATOM- Threshold detector. Data available only above 12.6 MeV . HAM STF Most recent measurements: Bormann NP A130(1969) 195. Barrall et al.: NP/A 138 387 (1969), 14.8MeV measmnt.
231 [ 1135 ]	<sup>55</sup> Mn	N, <b>GAMMA</b>	1. +2	1. +5	20	1 WIN ---	Campbell, C.G. For fast reactors. Evaluation needed but accuracy requirement probably not met. HAR COL New measurement planned by Coates and Moxon and also at the Nevis cyclotron (see WASH-1136, p.30)
232 [ 2460 ]	<sup>55</sup> Mn	N, <b>GAMMA</b> (res.param)	3.3+2		2.0	2 AUA ---	Symonds, J.L. Capture width with 2% accuracy desired for monitor. Stroud has work in progress to 5%.
233 [ 2616+ ]	Fe	TOTAL XSECT	1. -3	1. +6	5	1 KAP	Ehrlich, R. Accurate values in minima needed for shielding. Shape of resolution function important so meaningful broadening can be applied to theoretical values to compare with experiment. Sample composition should be well known enough to permit isotope synthesis of theoretical cross section.
234 [ 2362 ]	Fe	TOTAL XSECT	5. +2	1.5+7	1	2 CAD	Barre, J-Y. For fast reactor calculations.
235 [ 2463 ]	Fe	TOTAL XSECT	1.0+4	1.0+5	5.0	1 PEI COL	Nikolaev, M.N. For prediction of fast reactor BR with 1.6% accuracy. Careful measurements of interference minima needed. Garg et al. measured total CS up to 200 keV and made multilevel analysis, Bull.Am.Phys.Soc.13(1968), 1389.
236 [ 2621+ ]	Fe	RESON PARAMS neutronwidth gamma width	1. +6	10	2	KAP	Ehrlich, R. Need $f_n$ and $f_g$ for peaks near various minima for theoretical construction of scattering and capture cross sections. A minimum is any total cross section < 1 barn. Sample composition should be known well enough to permit isotope synthesis of theoretical cross section. Potential scattering for resonance analysis also needed.

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
237 [1714#]	Fe	DIFF ELASTIC	1. +3	1. +7	10	1 ANL Avery, R. LMB Hemmig, P.B. --- Resolution at least to resolve intermediate struct. Status: See REG 1713 below.	69
238 [1713 ]	Fe	DIFF ELASTIC	5.0+5	3.0+6	5.0	1 ORL Clifford, C.E. --- Resolution: 1% energy at several peaks and valleys: $\sigma(\theta_n)$ required in valleys for shielding. ANL Smith: NP/A 118 321(1968), to 1.5 MeV. AE Holmqvist: AE-337 (0/68) reviews 3 to 6 MeV. TNC Williams+: NCSAC-33(1971), scattering meas. 9, 11 MeV. ORL Perey: ORNL-4515(1970) 4.19 - 8.56 MeV. ANL Smith+, data in detail, 1.5-3.5 MeV. JAE Tsukada+, JAERI-2948(1968).	69
239 [2336 ]	Fe	DIFF ELASTIC	7. +6	1.4+7	< 9 4 to 9%	1 KAP Ehrlich, R.T. --- Resolution: 100 keV, $D(\theta)$ = 5°. TNC Williams+: NCSAC-33(1970), scattering at 9,11 MeV.	69
240 [ 253 ]	Fe	DIFF ELASTIC	8. +6	1.5+7	10	2 KPK Schmidt,J.J. Note increased priority. For shielding calculations. Existing measurements cover energies below 8 MeV. Measurements desired in energy steps of 1 MeV, and angular steps of 10°. --- ORL Perey et al.: ORNL-4515 (1970). 4.19-8.56 MeV. TNC Buchanan et al.: EANDC (US)-143 (5/70), 11 MeV.	
241 [ 254 ]	Fe	EMISS XSECT	3. +6	1.6+7	<20 desired: 10%	2 PAR Rastoin, J. --- Resolution for E and $E'$ : 1 MeV. For shielding calculations. TRI Abbondanno : see EUR-countries Progress Report '71	
242 [ 1725#]	Fe	NONEL GAMMAS THR	1. +7	<15	1	1 LMB Hemmig, P.B. --- All $E_\gamma$ of interest for fast reactor shielding. KPK Voss+: 71KNOX 218(3/71), 0.8 - 13 MeV. GRT Orphan+: NCSAC-33(1971), 0.86-16 MeV. LAS Drake: NSF 40 294(5/70), 4 - 7.5 MeV.	69
243 [ 2364 ]	Fe	NONEL GAMMAS	1. +3	1.5+7	10	2 FAR Devillers, C. --- Energy resolution: 250 keV if $E(\gamma) < 1$ MeV 500 keV if $E(\gamma) > 1$ MeV. For shielding calculations. Evaluation may be sufficient.	69
244 [ 2617+ ]	Fe	NONEL GAMMAS	1. +3	6.5+5	15 OR 5 MB	2 SNP Fleishman, M.R. --- Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_\gamma)$ . $\gamma$ -Resolution required: 10%.	69
245 [ 2618+ ]	Fe	NONEL GAMMAS	1. +6	1. +7	15 OR 5 MB	1 SNP Fleishman, M.R. --- Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required: 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. --- Status: See REG 1725 above.	69
246 [ 258 ]	Fe	NONEL GAMMAS	4. +6	1.6+7	<20 desired: 10%	2 PAR Rastoin, J. --- Resolution for En and $E_\gamma$ : 0.5 MeV. For shielding calculations. Angular distribution needed if significant anisotropy	
247 [ 265 ]	Fe	DIFF INELAST TR	4.0+6	5	3 WIN Campbell,C.G. HAR Butler, J. --- For fast reactors and shielding. Note relaxed accuracy. --- Evaluation needed but accuracy requirement probably not met. ANL Smith, to 3.5 MeV.		

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
248 [ 2363 ]	Fe	DIFF INELAST TR energy dist	1.4+7	5	2	CAD	Barre, J-Y. For fast reactor calculations.	70
249 [ 1716# ]	Fe	DIFF INELAST 8.5+5 2. +6 energy dist	2. +6	5	1	GE LMB	Snyder, T. Hemmig, P.B. Resolution 20 kev for incident and scattered neuts. Total integral over 4 Pi required. Spectra at several angles if significantly anisotropic. SAF Barnard+: NP/A 118 321(0/68), should satisfy this request with modest extension.	66
250 [ 2464 ]	Fe	DIFF INELAST 1.4+6 1.5+7 energy dist	1.5+7	5.0	1	FEI	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. CS for inelastic removal below fission threshold of U <sup>238</sup> wanted with 5% accuracy. Level excitation CS desired with 10% accuracy. In continuum region energy dependence of nuclear temperature wanted. ORL Perey et al. measured at 4.2-8.6 MeV, ORNL 4515. WRU Lindow et al. measured at 5.1-5.6 MeV, EANDC(US)-1430, p.31. TNC Buchanan et al. have data at 11 MeV, EANDC(US)-1430, p.214. ANL Smith et al., NP A118 , 321.	71
251 [ 2324 ]	Fe	DIFF INELAST 1.5+6 1.5+7	10	2	AE	Haeggblom, H. ---	For fast reactor calculations. See REG 2464 above.	71
252 [ 1717# ]	Fe	DIFF INELAST 2. +6 1. +7 energy dist	1. +7	10	2	GE LMB	Snyder, T. Hemmig, P.B. Resolution 20 kev for incident and scattered neuts. Total integral over 4 Pi required. Spectra at several angles if significantly anisotropic. ORL Dickens: ORNL-4515(1970), 4.19 to 8.56 MeV. CSE Lindow+: NCSAC-33(1971), 5.0 to 5.5 MeV. TNC Williams+: NCSAC-33(1971), scat.meas. 9, 11 MeV. BRC Haouatt: 71KNOX 202(3/71), 2.5 to 14.1 MeV.	66
253 [ 264 ]	Fe	DIFF INELAST 4. +6 1. +7 <10 energy,angle	1. +7	3	WIN HAR	Campbell, C.G. Butler, J. ---	For fast reactors and shielding. Note relaxed accuracy. Evaluation needed but accuracy requirement probably not met. CSE Lindow et al.: EANDC(US)-143 (5/70), 5.0-5.5 MeV. ANL Smith, A.B.: NP/A 118 321(0/68). ORL Perey et al.: ORNL-4515 (1970). 4.19-8.56 MeV. ORL Perey+, 71KNOX. KPK Cierjacks+, 71KNOX, 0.8-13 MeV. GRT Hoot+, 71KNOX, 0.8-16 MeV. ANL Smith, data to 3.5 MeV. BRC Haouatt,(n,n'γ) to 14 MeV.	
254 [ 263 ]	Fe	DIFF INELAST 8. +6 1.4+7 energy dist	1.4+7	2.0	2	KPK	Schmidt, J.J. Energy resol.500 keV (primary) and 200keV (secondary) Energies below 8 MeV covered by measurements dis- cussed extensively in KPK 120/part I, 1966, section V3f, and by recent investigations of Kinney (ORNL-TM-2052 (1968)). TNC Buchanan et al.: EANDC(US)-143 (5/70), 11 MeV. ORL Perey et al.: ORNL-4515 (1970). 4.19-8.56 MeV. CSE Lindow et al.: EANDC(US)-143 (5/70), 5.0-5.5 MeV. ORL Perey+, 71KNOX. KPK Cierjacks+, 71KNOX, 0.8-13 MeV. GRT Hoot+, 71KNOX, 0.8-16 MeV. ANL Smith, data to 3.5 MeV. BRC Haouatt,(n,n'γ) to 14 MeV.	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
255 [ 2365 ]	Fe	ABSORPTION	5. +2	1.4+7	10	1 CAD	Barre, J-Y. For fast reactor calculations.	71	
256 [ 1722# ]	Fe	ABSORPTION	1. +3	1.5+6	<20	1 ANL GE LMB	Avery, R. Snyder, T. Hemmig, P.B. Capture in 1-5 keV range of particular interest. Accuracy 5% below 175 keV, 20% above. Resolution 20%.	69	
					5 TO 20%	—	RPI KPK	Hockenbury+: PR 178 1746(2/69), to 200 keV. Ernst+: 70HELSINKI P/11(6/70), 7 to 200 keV.	
257 [ 1729 ]	Fe	RES INT CAPT	5.0-1		15	1 KAP	Ehrlich, R. Energies over 0.5 eV. Remove or correct for (n,p) contribution.	69	
					10-15%	—	RPI	Hockenbury+: PR 178 1746(2/69), res.params to 100keV.	
258 [ 2619+ ]	Fe	N,GAMMA	1. -3	1. +6	10	2 KAP	Ehrlich, R. Values needed in minima for shielding calc. Shape of resolution function important so meaningful broadening can be applied to theoretical values to compare with experiment. Sample composition should be known well enough to permit isotope synthesis of theoretical cross section.	72	
259 [ 2325 ]	Fe	N,GAMMA	1. +0	1. +6	10	2 AE	Haeggblom, H. For fast reactor calculations.	71	
260 [ 269 ]	Fe	N,GAMMA	1. +2	1. +6	<20	1 WIN —	Campbell, C.G. For fast reactors. Evaluation in progress indicates 20% uncertainty below 100keV.		
					10% to .1Mev	HAR ORL RPI KPK	Coates plans further measurements. Macklin+, PR 159(1967) 1007, 125-182 keV, 25% accuracy. Moxon (65ANTWRP, p.531) measured between 1 and 50keV. Hockenbury+, PR 178(1969) 1746, high resolution TOF data rel. to gold, 1-200 keV, $\gamma$ extracted at 27.8 keV, many capture areas. Ernst+: 70HELSINKI 1 633 gave high resol. TOF $^{56}\text{Fe}$ data rel. to gold, 7-200 keV. Froehner (priv. comm.) has all s-wave parameters and p-wave capture areas. Measurement of $^{54}\text{Fe}$ in progress.		
261 [ 2462 ]	Fe	N,GAMMA ratio x-sect	5.0+2	5.0+5	10	1 PEI	Nikolaev, M.N. For fast reactor BR prediction with 1.6% accuracy. Self-shielding of capture cross section must be known. For this resonance parameters including cap- ture widths of all strong s wave resonances must be determined. Contribution of majority of p wave and narrow s wave resonances to average CS is sufficient to know. All measurements wanted relative to fission CS of $^{235}\text{U}$ . — HAR ORL HAR RPI KPK		71
						Evaluation in progress indicates 20% uncertainty be- low 100 keV. Macklin and Gibbons measured 125-182 keV, PR 159 (1967), 1007, 25% accuracy. Moxon (Antwerp Conf. 1965) measured 1-100keV. Accu- racy should be improved. Hockenbury et al., PR 178(1969), 1746, published high resolution data 1-200 keV, 1 capture width (at 27.8 keV), many capture areas. Ernst et al. have high resolution data 7-200 keV, capture width at 27.8 keV, AIEA CN-26/11. Measure- ment on $\text{Fe}^{54}$ in progress.			
262 [ 1442 ]	Fe	N,GAMMA	1.0+3	2.0+5	10	1 JAE	Japanese Nuclear Data Committee (JNDC). For fast reactors. Discrepancies exist among experimental data. — Status: see REG 269 above.	69	

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
263 [ 270 ]	Fe	N, GAMMA	1. +3	1. +5	10	1 KPK	Schmidt, J.J. Existing data incoherent up to 200%. Strong dis- agreement between 10 and 100 keV. --- Status: see REG 269 above.	
264 [ 1472 ]	Fe	N, GAMMA	1. +3	1. +6	10	1 CAD	Barre, J-Y. Need of resonance parameters for the main isotopes. --- For fast reactor calculations. Status: see REG 269 above.	69
265 [ 2326 ]	Fe	N, PROTON	TR	1.5+7	10	2 AE	Haeggblom, H. For fast reactor calculations.	71
266 [ 2366 ]	Fe	N, PROTON	TR	1.5+7	20	3 CAD	Barre, J-Y. For fast reactor calculations.	71
267 [ 273 ]	Fe	N, ALPHA	THR	1.4+7	20	1 KPK	Schmidt, J.J. No data available. For the thermal value only an upper-limit of 0.01 mb is available: JPR 14,160(1959) ALD Freeman + measured average fission neutron x-sect.: JNE 23,713(1969).	
268 [ 277 ]	Fe	N, ALPHA angular dist	FISS		20	2 AE	Daverhoeg,N. Calculation of He production in fuel cladding. --- No measurements known to exist for natural element. LOK Data for Fe <sup>54</sup> (n,alpha) (Phys.Rev.140B 305(Oct.1965) measured from 2.2 to 6 MeV and 13 to 17 MeV have an uncertainty everywhere far greater than 20%. For the accuracy requested it seems sufficient to combine data for Fe <sup>54</sup> , Fe <sup>56</sup> , Fe <sup>57</sup> .	
269 [ 1369 ]	Fe	N, ALPHA	FISS	25.0	2 CAD	Ravier, J. He in structural materials.	68	
					---	Freeman et al.: JNE 23,713 (1969). Measurements made.		
270 [ 1520 ]	Fe	N, ALPHA	TR	1.5+7	20	1 PAR	Devillers, C. Evaluation may be sufficient.	69
					CAD	Barre, J-Y. For fast reactor calculations.	69	
					---	He in structural materials.		
					ALD	Freeman et al. have measured average fission neutron cross-section ( J N E 23, 713 (1969))		
271 [ 2622+ ]	Fe	NUCL.LEVELS		1. +6		3 KAP	Ehrlich, R. Needed to remove ambiguities in multilevel analysis. The largest resonances and ones near deep minima are most important.	72
272 [ 279 ]	Fe	N, PROTON	TR	1.0+7	4.0	1 GEL	Neutron Dosimetry Group EURATOM. Threshold detector. --- New measurements are needed below 3 MeV and around 4.6 and 8 MeV. No data available 6 to 10 MeV. CCP Nasirov: AE 25 437(1968), 67mb at 1 MeV. GEL Paulsen: measurement in progress 1.5 to 6 MeV.	
273 [ 1540 ]	Fe	N, PROTON	1. +6	1.6+7	10	1 VNV	Cardot, M. Activation detector. Production of Mn(300d). --- GEL Paulsen measures from 2 to 6 MeV and from 12 to 20 MeV. STF Barral and Silbergold have measured at 14.8 MeV ( N P A 138, 387 (1969) A F W L- T R-68-134 (1969) )	69
274 [ 1731# ]	Fe	N, PROTON	1. +6	1.8+7	10	2 HED	Mc Elroy, W.N. Required is activation. E-resolution 250 keV, 500 keV intervals. --- For use as a fluence monitor. GEL Paulsen: measurement in progress 1.5 to 6 MeV, and 12 to 20 MeV. STF Barrall: NP/A 138 387(1969), data at 14.8 MeV. ANL Work in progress.	69

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
275 [2623+]	<sup>54</sup> Fe	N, PROTON	1. +6	1.8+7	15	3 BET	Bayard, R.T. Required is activation. E-resolution 250 keV, 500 keV intervals. For use as a fluence monitor. Status: See REG 1731 above.	72
276 [1732#]	<sup>54</sup> Fe	N, PROTON	6.2+6	1.3+7	10	3 NEL	Eccleshall, D. Required is activation. E-resolution 250 keV, 500 keV intervals. For use as a fluence monitor. Status: See REG 1731 above.	69
277 [2461 ]	<sup>56</sup> Fe	N, NONE GAMMAS see comment				3 IEN	Aghina, L.O.B. Gamma spectra between resonances wanted. Special interest on interference and direct capture.	69
278 [ 285 ]	<sup>56</sup> Fe	N, PROTON	TR	1.3+7	4.0	3 GEL	Neutron Dosimetry Group EURATOM. Threshold detector. Accuracy reached amounts to ±8%. (See compilation EUR 119e). NJS Najzer: 70HELSINKI P/6, measurement over fiss. spect. MOL Fabry: 70HELSINKI P/39, reevaluation performed.	
279 [1541 ]	<sup>56</sup> Fe	N, PROTON	4. +6	1.5+7	5	2 VNV	Cardot, M. Activation. ( <sup>56</sup> Mn, 2.58h).	69
280 [1317 ]	<sup>56</sup> Fe	N, PROTON	8.0+6	1.2+7	4	1 JAE	Japanese Nuclear Data Committee (JNDC). For neutron yield monitor. Data available 5% or 7% : NSE 30, 39, 1967, Can.J.Phys. 42, 1030, 1964.	68
281 [2620+]	<sup>56</sup> Fe	N, ALPHA	TR	1. +7	15	2 GE	Hutchins, B. To determine He production in fast reactors.	72
282 [1734 ]	<sup>57</sup> Fe	RESON PARAMS neutronwidth	1.0+3	6.0+5	9.0 4 to 9%	1 KAP	Ehrlich, R. Needed for evaluations.	69
						ORL	Good. Phys. Rev. 151, 912, 4 to 46keV.	
						KPK	Rohr and Mueller, Z.Physik 227, 1 1969 give neutron and inelastic scattering widths between 30 and 190 keV, typical accuracy 10%.	
						RPI	To reach 4% accuracy will require development. Hockenbury: PR 178, 1746(2/69), capture to 40 keV.	
283 [1735#]	<sup>58</sup> Fe	N, GAMMA	2.5-2	1.5+7	30	2 LLL	Howerton, R.J. Required is cross section for activation of Fe <sup>58</sup> in naturally occurring element. Accuracy 30% if σ > 100mb, 50% if 25mb < σ < 100 mb. Accuracy to a factor 2 if 1mb < σ < 25mb, to a factor 10 if σ < 1mb. RPI Hockenbury: PR 178 1746(2/69), res.par. to 100 keV. Appropriate sample needed.	69
284 [1736#]	<sup>58</sup> Fe	N, GAMMA	1. +3	1.8+7	10	2 HED	Mc Elroy, W.N. Required is activation. For use as a fluence monitor. Status: See REG 1735 above.	69
285 [1354 ]	<sup>58</sup> Co	N, GAMMA (res.integ) see comment	THR		10	2 AE	Daverhoed, N. For dosimetry. Need for a Co <sup>58</sup> (n,γ) precise thermal value and measurements for Co <sup>58</sup> g; also for RI eff. New meas. of Co <sup>58</sup> (n,γ) for THR and corresp. Eff.Res. Int. reported in At.Energia 24 533 (June 1968)-translation BNL-TR-224 (1968), but relative to Co <sup>58</sup> (n,γ) THR which is known with an uncertainty of about 200%. ORL The Halperin meas. of Co <sup>58</sup> (n,γ) THR: ORNL-3679 (Sept. 1964) were said to be preliminary. See perhaps later progress reports of the ORNL Chemistry Division. CRC Chalk River may be able to set a useful limit. See EANDC(Can) 42.	

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR
				MIN	MAX	(%)			
286 [2627+]	<sup>58</sup> Co	N, GAMMA	THR	1. +7	10	2	BET	Bayard, R.T. Thermal cross section most important. RI also needed for interpretation of Ni <sup>58</sup> (n,p) fluence monitor data. Radioactive target, 9 hour isomer and 71.4 day.	72
287 [1465]	<sup>58</sup> Co	N, ALPHA	THR		20	2	AE	Daverhoeg, N. Dosimetry. Cross sect. needed for ground and isomeric states.	
288 [1743]	<sup>58</sup> Co	NUCL. LEVELS	2.5+4	3.0+6		3	KAP	Ehrlich, R. Need spins and parities of excited states for calculation of threshold reaction Ni <sup>58</sup> (n,p). Decowski, Nuclear Physics A112 513, reviews status.	66
289 [1737#]	<sup>59</sup> Co	RESON PARAMS	1.3+2		1	2	ANC	Brugger, R.M. 1% in parameters of this resonance. Needed as flux monitor. Nakajima+: NST 7,7(1970), inconsistent with older work of JAIN(BNL) and MOXON(HAR). Present techniques not capable of 1%.	62
290 [2624+]	<sup>59</sup> Co	NONEI GAMMAS energy dist	1. +2	1. +5	15	1	SNP	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_\gamma)$ . $\gamma$ -Resolution required: 10%.	69
291 [2625+]	<sup>59</sup> Co	NONEI GAMMAS energy dist	1. +6	1. +7	15	1	SNP	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required : 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. Tucker: ORO-2791-28, 90° data 1 to 5 MeV.	69
292 [2626+]	<sup>59</sup> Co	NONEI GAMMAS energy dist	1. +6	1.4+7	15	2	NEL	Eccleshall, D. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required : 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. Tucker: ORO-2791-28, 90° data 1 to 5 MeV.	70
293 [1542]	<sup>59</sup> Co	N2N XSECTION TR	1.5+7	10	1	VNV	Cardot, M. Activation. ( <sup>58</sup> Co, 72d).		69
294 [2367]	<sup>59</sup> Co	ABSORPTION	5. +2	1.5+7	10	3	CAD	Barre, J-Y. For fast reactor calculations.	71
295 [2199]	<sup>59</sup> Co	ACTIVATION		1.0+7	<20.0	2	JAE	Japanese Nuclear Data Committee (JNDC). For fuel cask design and control rod design. Large discrepancy exists between calculated value from resonance parameters and measured value.	71
296 [1739#]	<sup>59</sup> Co	N, GAMMA	2.5-2	1.5+7	30	1	LLL	Howerton, R.J. Required is cross section for activation of Co <sup>60</sup> in ground plus isomeric states. Accuracy 30% if $\sigma > 100$ mb, 50% if $25 \text{mb} < \sigma < 100$ mb. Accuracy to a factor 2 if $1 \text{mb} < \sigma < 25 \text{mb}$ , to a factor 10 if $\sigma < 1 \text{mb}$ . ANC Work in progress.	69
297 [295]	<sup>59</sup> Co	N, GAMMA		1.3+2		5	1	Rastoin, J. Energy resonance at 132eV . Activation for Co <sup>60g</sup> and Co <sup>60m</sup> needed. RPI Resonance $\sigma(n,\gamma)$ being measured( Hockenbury et al.).	
298 [2465]	<sup>59</sup> Co	N, GAMMA (res.param)		1.3+2		2.0	2	Symonds, J. L. AUA Capture width with 2% accuracy desired for monitor. Wall and Stroud - Montreal Conf. August 1969 - give capture width to 10%. Stroud redoing to 5%.	69

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV) MIN MAX	ACCURACY P (%)	LAB	REQUESTER , COMMENTS	YEAR	
299 [1738#]	<sup>59</sup> Co	N,GAMMA	1. 3+2	1	2	ANC ---	Brugger, R.M. 1% in $\gamma$ needed for this resonance. Needed as a flux monitor. Status: See REG 1737 above.	
300 [1474 ]	<sup>59</sup> Co	N,GAMMA	1. +3 2. +5	15	2	CAD	Barre, J-Y. For fast reactor calculations.	
301 [1740#]	<sup>59</sup> Co	N,GAMMA	1. +3 1.8+7	10	2	HED --- ANL	Mc Elroy, W.N. Required is activation. For use as a fluence monitor. Work in progress.	
302 [ 293 ]	<sup>59</sup> Co	N,GAMMA	1. +4 1. +6	20	2	BN RPI	Tavernier, G. Steel activation. Resonance $\sigma(n,\gamma)$ is being measured( Hockenbury et al)	
303 [ 296 ]	<sup>59</sup> Co	N,PROTON	TR	1.3+7	5.0	3	GEL	Neutron Dosimetry Group EURATOM. Threshold detector. No data available
304 [1543 ]	<sup>59</sup> Co	N,PROTON	TR	1.5+7	10	1	VNV	Cardot, M. Activation. ( <sup>59</sup> Fe, 45.1d). Measurements differ by factor 10.
305 [2368 ]	<sup>59</sup> Co	N,PROTON	TR	1.5+7	20	3	CAD	Barre, J-Y. For fast reactor calculations.
306 [2369 ]	<sup>59</sup> Co	N,ALPHA	TR	1.5+7	20	3	CAD	Barre, J-Y. For fast reactor calculations.
307 [2466 ]	<sup>60</sup> Co	NONEI GAMMAS see comment			3	IEN	Aghina, L.O.B. Gamma spectra between resonances wanted. Special interest on interference and direct capture.	
308 [1744#]	Ni	TOTAL XSECT	1. +3 2. +7	3	2	ORL KPK NBS	Clifford, C.E. 1% in deep minima for fast reactor shielding. Energy resolution sufficient to resolve major struct. Cierjacks: EANDC(E)-1270 unpublished data. Schwartz: WASH-1127 unpublished data.	
309 [1745 ]	Ni	DIFF ELASTIC	1.0+4 3.0+6 5 to 10%	10	2	ANL LMB --- AE ANL RPI ANL	Avery, R. Hemmig, P.B. Energy resolution not determined. Resolution of intermediate structure probably adequate. 10-100keV, accuracy 5%; 100keV -3 MeV, accuracy 10%. Wiedling+: 70HELSINKI P/54(6/70), 1.8 - 8.1 MeV. Cox: WASH-1079 4 (0/67), 0.4-1.5MeV, 8 angles. Zuhr: NCSAC-33(1971), 5 angles, keV region, in progr. Smith: to 3.5 MeV.	
310 [ 300 ]	Ni	DIFF ELASTIC	1.5+6 3. +6	15	2	KPK --- ANL AMS AE	Schmidt, J.J. About 100 keV energy resolution and about 5° ang. resolution 10% on $\langle \cos \theta \rangle$ . Smith: to 3.5 MeV. Hall et al.: polarization at 3.0 MeV. Wiedling, Holmqvist: 70HELSINKI P/54(6/70) .1.8-8.1MeV.	
311 [1746 ]	Ni	DIFF ELASTIC	1.5+6 1.4+7 4 to 9%	9.0	1	KAP --- AE ANL AE ANL AMS RPI ORL CSE	Ehrlich, R. Resolution 100keV , $D\theta = 5^\circ$ . Holmqvist, NBS -299, 3-8 MeV . Smith: to 3.5 MeV. Wiedling+: 70HELSINKI P/54(6/70), 1.8 - 8.1 MeV. Cox: WASH-1079 4 (0/67), 0.4-1.5MeV, 8 angles. Hall et al.: polarization at 3.0 MeV. Zuhr: NCSAC-33(1971), 5 angles, keV region, in progr. Perey+: ORNL-4523(4/70), 6.5-8.5 MeV Lindow+: NCSAC-33(1971), 5.0-5.5 MeV.	

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
312 [1475 ]	Ni	DIFF ELASTIC	1.5+6	3. +6 10% on <cos>	2 CAD	Barre, J-Y. Energy resolution:100keV, angular resolution: 5°. Evaluation may be sufficient. For fast reactor calculations	69	
					ANL	Smith: to 3.5 Mev. AE Holmqvist: NBS-299 ( / ), 3 to 8 Mev. CSE Lindow+: NCSAC-33(1971), data 5.0 - 5.5 Mev.		
313 [1745#]	Ni	DIFF ELASTIC	1.5+6	3. +6 5 TO 10%	2 ANL LMB	Avery, R. Hemmig, P.B. Energy resolution not determined. Resolution of intermediate structure probably adequate.	72	
					AE	Holmqvist+: 70HELSINKI P/54(6/70), 1.8-8.1 Mev.		
314 [1326 ]	Ni	DIFF ELASTIC	8. +6	1.5+7	2 KFK	Schmidt,J.J. Note increased priority. For shielding calculations.		
					ORL	Holmqvist et al. (EANDC(OR)-73"LM") measured at ener- gies between 3 and 8 Mev. Measurements desired in energy steps of 1 MeV and angular steps of 10°.		
					AE	Perey et al.: ORNL-4523 (4/70), 6.5-8.5 Mev. Holmqvist: NBS-299 ( / ), 3 to 8 Mev.		
					CSE	Lindow et al.: EANDC(US)-143 (5/70), 5.0-5.5 Mev.		
315 [1476 ]	Ni	DIFF ELASTIC	8. +6	1.6+7 10% desired. 10% on <cos>	2 CAD FAR	Barre, J-Y. Devillers, C. Accuracy:10%, energy resolution:500keV, angular resolution:10°.	69	
					---	For fast reactor shielding calculations.	69	
					ORL	Evaluation may be sufficient.		
					AE	Perey et al.: ORNL-4523 (4/70), 6.5-8.5 Mev.		
					CSE	Holmqvist: NBS-299 ( / ), 3 to 8 Mev. Lindow+: NCSAC-33(1971), data 5.0 - 5.5 Mev.		
316 [ 303 ]	Ni	EMISS XSECT energy dist	2. +6	1.4+7	10	2 FAR	Devillers, C. Resolution on E and E': 10%. For fast reactor shielding calculations.	69
						Evaluation may be sufficient.		
317 [1752 ]	Ni	NONEL GAMMAS THR energy dist	1.0+7	10	2 BET	Bayard, R.T. All gammas are of interest. For shielding and gamma	66	
					LAS	heating calculations. Eγ resolution: 0.5 Mev.		
					TNC	Drake: NSE 40 294(5/70), 4 - 7.5 Mev. Tucker: WASH-1136(9/69), 4.1 and 14.8 Mev.		
318 [1753 ]	Ni	NONEL GAMMAS THR energy dist	3.0+5	20	1 ORL	Clifford, C.E. All gammas are of interest. For shielding and gamma	62	
						heating calculations. Eγ-resol 0.5MeV.		
319 [2629+]	Ni	NONEL GAMMAS THR energy dist	1. +7	20	LMB	Hemmig, P.B. All gammas are of interest.	72	
						For shielding and gamma heating calculations.		
					---	Eγ resolution: 0.5 Mev.		
						Status: See REG 1752 above.		
320 [2370 ]	Ni	NONEL GAMMAS gammaspectra	1. +3	1.5+7	10	2 FAR	Devillers, C. Energy resolution:250keV if E(gamma)<1 Mev 500keV if E(gamma)>1 Mev .	69
						For fast reactor shielding calculations.		
						Evaluation may be sufficient.		
321 [2630+]	Ni	NONEL GAMMAS	1. 2+4	3.4+5 OR 5 MB	15	2 SNP	Fleishman, M.R. Absolute σ(Eγ) required for all Eγ > 200 keV.	69
						Energy res.: Reproduce major variations in σ(Eγ).		
					---	γ-Resolution required: 10%.		
322 [2631+]	Ni	NONEL GAMMAS	1. +6	1. +7 OR 5 MB	15	1 SNP	Fleishman, M.R. Absolute σ(Eγ) required for all Eγ > 200 keV.	69
						Neutron energy interval required : 500 keV.		
					---	γ-Energy resolution: <2.5 Mev, 10%, >2.5 Mev, 250 keV.		
						Status: See REG 1752 above.		

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
323 [2632+]	Ni	NONEL GAMMAS energy dist	1. +6 1.4+7	15 OR 5 MB	2 NEL	Eccleshall, D. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required : 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. --- Status: See REG 1752 above.	70
324 [1754]	Ni	NONEL GAMMAS energy,angle	2. +6 1.4+7	20	2 ORL	Clifford, C.E. All gammas are of interest. For shielding and gamma heating calculations. $E_\gamma$ resolution: 0.5 MeV. --- LAS Drake: NSE 40 294(5/70), 4 - 7.5 MeV. TNC Tucker: WASH-1136(9/69), 4.1 and 14.8 MeV.	63
325 [308 ]	Ni	NONEL GAMMAS desired: 10%	3. +6 1.6+7	<20	2 PAR	Rastoin, J. For fast reactor shielding calculations.	
326 [ 310 ]	Ni	DIFF INELAST TR energy,angle	4. +6	5	3 WIN	Campbell,C.G. For fast reactors. --- Evaluation needed, but uncertain whether requirements met. ANL Smith: to 3.5 MeV. AE Holmqvist: NBS-299 ( / ), 3 to 8 MeV.	64
327 [ 2371 ]	Ni	DIFF INELAST TR energy dist	1.4+7	5	2 CAD	Barre, J-Y. For fast reactor calculations.	70
328 [ 1747# ]	Ni	DIFF INELAST energy dist	1. +6 1. +7	10	2 GE LMB	Snyder, T. Hemming, P.B. Energy resolution: 10% for incident and scattered neutron required to determine major structure. Total integral over 4 Pi required. Spectra at several angles if significantly anisotropic. --- AE Holmqvist+: 70 HELSINKI P/54(6/70) 1.8-8.1 MeV. CSE Lindow+: NCSAC-33(1971), data 5 to 5.5 MeV. ORL Perey+: ORNL-4523(4/70), data 6.5 to 8.5 MeV. ANL Work in progress.	66
329 [ 312 ]	Ni	DIFF INELAST energy,angle	4. +6 7. +6	<10 5 to 10%	3 WIN	Campbell,C.G. For fast reactors. --- Evaluation needed, but uncertain whether requirements met. ORL Perey et al.: ORNL-4523 (4/70), 6.5-8.5 MeV. CSE Lindow et al.: EANDC(US)-143 (5/70), 5.0-5.5 MeV. AE Holmqvist: NBS-299 ( / ), 3 to 8 MeV.	64
330 [ 2441 ]	Ni	ABSORPTION	5. +2 1.4+7	10	1 CAD	Barre, J-Y. For fast reactor calculations.	71
331 [ 1748# ]	Ni	ABSORPTION	1. +3 1. +6	10	2 ANL LMB RPI KPK	Avery, R. Hemming, P.B. Energy resolution 10%. --- RPI Hockenbury+: PR 178 1746(2/69), to 200 keV. KPK Ernst+: 70 HELSINKI P/11(6/70), 7-200 keV.	66
332 [ 1749 ]	Ni	RES INT CAPT 5.0-1	15 10-15%	1	KAP	Ehrlich, R. Energies over 0.5 ev. Remove or correct for n,p contribution.	69
333 [ 315 ]	Ni	N,GAMMA	1. +2 2. +5	<10	1 KPK	Schmidt, J.J. Resonance parameters desired. See extensive discussion in KPK 120/part I, 1966, section III 4. --- RPI Hockenbury+, PR 178(1969)1746, give capture areas for resonances of individual isotopes below 50 keV. SCT Spitz+, NP A121(1968)655, graphs, accuracy seems insufficient. RPI Stieglitz+, NP A163(1971)592, extracted $\Gamma_n$ , $\Gamma_\gamma$ or capture areas for many resonances of $^{60}\text{Ni}$ . KPK Ernst+, 70 HELSINKI, report high-resolution TOP data, 7-200 keV, relative to gold. J, $\Gamma_n$ , $\Gamma_\gamma$ given for many s-wave levels. Froehner has complete parameterization of $\sigma(n,\gamma)$ for $^{58}\text{Ni}$ , $^{60}\text{Ni}$ , $^{61}\text{Ni}$ . Measurements on $^{62}\text{Ni}$ and $^{64}\text{Ni}$ are in progress.	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
334 [ 319 ]	Ni	N,GAMMA	1. +2	1. +6	<20 or 2 mb 10% to .1MeV	1	WIN HAR	Campbell, C.G. For fast reactors. Requirement probably not met below about 100 keV. Moxon: measurements and evaluation in progress. Status: see REG 315 above.	
335 [ 1473 ]	Ni	N,GAMMA	1. +2	1. +6	10	1	CAD	Barre, J-Y. For fast reactor calculations. Status: see REG 315 above.	70
336 [ 1443 ]	Ni	N,GAMMA	1.0+3	2.0+5	10		JAE	Japanese Nuclear Data Committee (JNDC). For fast reactors. Data are not sufficient above 10 keV. Status: see REG 315 above.	69
337 [ 1526 ]	Ni	N,GAMMA (res.param)	1. +3	2. +5	10 or 5 mb	2	FAR CAD	Devillers, C. For heating and circuit activation calculation. Evaluation may be sufficient. Barre, J-Y. For fast reactor calculations. Status: see REG 315 above.	69
338 [ 318 ]	Ni	N,GAMMA	1. +4	3. +5	20	2	KPK	Schmidt, J.J. Resonance parameters desired. See extensive dis- cussion in KFK 120/part I, 1966, section III 4. Status: see REG 315 above.	
339 [ 2372 ]	Ni	N,PROTON	TR	1.5+7	20	3	CAD	Barre, J-Y.	70
340 [ 1373 ]	Ni	N,ALPHA	TR	1.5+7	20	1	FAR CAD	Devillers, C. For fast reactor calculations. Evaluation may be sufficient. Barre, J-Y. <sup>4</sup> He in structural materials. For fast reactor calculations.	69
341 [ 2628+ ]	Ni	N,ALPHA	TR	1. +7	15	2	GE	Hutchins, B. To determine He production in fast reactors.	72
342 [ 1544 ]	<sup>58</sup> Ni	N2N XSECTION	TR	1.5+7	10	2	VNV	Cardot, M. Activation. ( <sup>57</sup> Ni, 36.4h). Evaluation may be sufficient. Disagreement between measurements of Jeronymo et al. (Saclay) and others.	69
343 [ 2301 ]	<sup>58</sup> Ni	N,GAMMA	1.0+3	1.0+4	<20.0	1	JAE KPK	Japanese Nuclear Data Committee (JNDC). For fast reactor calculations. Ernst+: 70 HELSINKI, CN-26/11.	70
344 [ 322 ]	<sup>58</sup> Ni	N,PROTON	TR	1.4+7	4.0	1	GEL	Neutron Dosimetry Group EURATOM. Threshold detector. Three sufficiently accurate mea- surements, each with a broad resolution ( $\pm 250\text{keV}$ ), integrating the c.s. over three bands centered at 2.5, 3.25 and 4 MeV, would be satisfactory. WWA: NP/A 112 513 (1968) data 2 to 18 MeV. NDL: Temperley (Edgewood Arsenal, Md.), data 2 to 15 MeV. AML: Armitage: unpublished data between 2.2 and 3.6 MeV. KAZ: Levkovskii: YF 10 44 (1969), 14.8 MeV measurement. STF: Barrall et al.: NP/A 138 387 (1969), 14.8 MeV measmt. GEL: Paulsen: measurement in progress 1 to 6 MeV, and between 12 and 17 MeV. (BNES Canterbury, Sept. 1971).	
345 [ 2633+ ]	<sup>58</sup> Ni	N,PROTON	1. +7	5	2	BET	Bayard, R.T. For use as fast fluence monitor.	72	
346 [ 324 ]	<sup>58</sup> Ni	N,ALPHA	0. +0	1.4+7	<20	2	KPK	Schmidt, J.J. No data available. Verification of evaporation theory calculations of Battner et al., Nucl.Phys. 63, (1965) 615, desired. See also Eriksson BANDC(OR)73L page 18f.	

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
347 [2467]	<sup>58</sup> Ni	N,ALPHA	0. +0	1.0+6	20	2	ITK Mehta, G.K. No data available.	69
348 [1545]	<sup>58</sup> Ni	N,N PROTON	TR	1.5+7	10	2	VNV Cardot, M. Circuit activation; detector activation. Activation ( <sup>57</sup> Co, 270d) through $\sigma(n,np)+\sigma(n,d)$ . At 14MeV, disagreement between Jeronymo (600mb) and others (Glover:120mb).	69
349 [2302]	<sup>60</sup> Ni	N,GAMMA	1.0+3	1.0+6	<20.0	1	JAE Japanese Nuclear Data Committee (JNDC). For fast reactor calculations. KPK Ernst+: 70HELSINKI, CN-26/11.	70
350 [1546]	<sup>60</sup> Ni	N,PROTON	TR	1.5+7	10	2	VNV Cardot, M. Activation. ( <sup>60</sup> Co, 5.3y). KAZ Levkovskii has measured at 14.8 MeV : $\Gamma_F$ <u>10.44</u> (1969).	69
351 [325]	<sup>60</sup> Ni	N,ALPHA	0. +0	1.4+7	<20	2	KPK Schmidt, J.J. No data available. Verification of evaporation theory calculations of Buttner et al., Nucl. Phys. <u>63</u> , (1965)615, desired. See also Eriksson EANDC (OR) 73L page 14f.	70
352 [1757]	<sup>61</sup> Ni	RESON PARAMS neutronwidth	1.0+3	6.0+5	9.0 4 to 9%	1	KAP Ehrlich, R. KPK Ernst et al.: 70HELSINKI P/11 (6/70), high resol. TOF data on <sup>58/60/61</sup> Ni. $\Gamma_F$ for many s-wave res. with $\Gamma_n$ and J values of Cho et al. (70HELSINKI P/127). ORL Good: PR 151 912(1966), 7-48keV, $\Gamma_n$ accuracy 10-30%. RPI Plans to measure capture and total c.s.+ to analyse. To reach 1% accuracy will require development.	69
353 [1374]	<sup>62</sup> Ni	N,GAMMA	1. +3	1. +6	20	2	VNV Cardot, M. RPI Activation detector. Production of <sup>63</sup> Ni (92y). Hockenbury et al. Phys. Rev. <u>178</u> (1969) 1746, give capture areas( $\sigma*\Gamma_F$ ) for resolved res. below 50keV, (separated isotopes). KPK High resolution transmission and capture measurements in progress, 7-200 keV, in view of obtaining $\Gamma_n$ , $\Gamma_F$ .	68
354 [1547]	<sup>64</sup> Ni	N2N XSECTION	TR	1.5+7	10	2	VNV Cardot, M. Activation. ( <sup>63</sup> Ni, 92y).	69
355 [1375]	<sup>64</sup> Ni	N,GAMMA	1. +3	1. +6	20	3	VNV Cardot, M. RPI Activation detector. Production of <sup>65</sup> Ni (2.56h). Hockenbury et al. Phys. Rev. <u>178</u> (1969) 1746, give capture areas( $\sigma*\Gamma_F$ ) for resolved res. below 50keV (separated isotopes). KPK High resolution transmission and capture measurements in progress, 7-200 keV, in view of obtaining $\Gamma_n$ , $\Gamma_F$ .	68
356 [2634+]	Cu	NONEI GAMMAS energy dist	2. +2	5. +4	15 OR 5 MB	2	SNP Fleishman, M.R. Absolute $\sigma(E_F)$ required for all $E_F > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_F)$ . --- $\gamma$ -Resolution required: 10%.	69
357 [2635+]	Cu	NONEI GAMMAS energy dist	1. +6	1. +7	15 OR 5 MB	1	SNP Fleishman, M.R. Absolute $\sigma(E_F)$ required for all $E_F > 200$ keV. Neutron energy interval required: 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	69
358 [2636+]	Cu	NONEI GAMMAS energy dist	1. +6	1.4+7	15 OR 5 MB	2	NEL Eccleshall, D. Absolute $\sigma(E_F)$ required for all $E_F > 200$ keV. Neutron energy interval required: 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	70

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
359 [ 329 ]	Cu	N,GAMMA	1. +2 2. +5	5	2 AE GEL HAR	Haeggblom, H. Energy resolution 10% or better. Needed for fast reactor calculations. Weigmann, ZP 213(1968)411, .2-17 keV, about 10% error in $\tau_y$ . Moxon has data, 5 eV to 100 keV, 5-10% accuracy. Initial analysis indicates spread of up to a factor 2 in the $\tau_y$ values for the 2 Cu isotopes.	
360 [ 1318 ]	<sup>63</sup> Cu	N2N XSECTION TR	1.2+7	5	1 JAE	Japanese Nuclear Data Committee (JNDC). For neutron yield monitor. A few data available.	68
361 [ 1319 ]	<sup>63</sup> Cu	N2N XSECTION	1.4+7 2.0+7	5	1 JAE	Japanese Nuclear Data Committee (JNDC). For neutron yield monitor. Large discrepancies among data.	68
362 [ 2637+ ]	<sup>63</sup> Cu	N,GAMMA	THR	1. +3 < 5	2 RDT ---	Hannum, W. Accuracy 2% near thermal, 5% above thermal. For detector applications. Status: See REG 329 above.	67
363 [ 1761# ]	<sup>63</sup> Cu	N,GAMMA	2.5-2 1.5+7	30	3 LLL	Howerton, R.J. Required is cross section for activation of Cu <sup>64</sup> in naturally occurring element. Accuracy 30% if $\sigma > 100 \text{mb}$ , 50% if $25 \text{mb} < \sigma < 100 \text{ mb}$ . Accuracy to a factor 2 if $1 \text{mb} < \sigma < 25 \text{mb}$ . Status: See REG 329 above.	69
364 [ 1762# ]	<sup>63</sup> Cu	N,GAMMA	1. +3 1.8+7	10	2 HED ---	Mc Elroy, W.N. Required is activation. For use as a fluence monitor. Status: See REG 329 above.	69
365 [ 332 ]	<sup>63</sup> Cu	N,ALPHA	TR	1.4+7	4.0 1 GEL	Neutron Dosimetry Group EURATOM. Threshold detector. Requested accuracy not reached. A single sufficiently accurate measurement between 8 and 20 MeV (e.g. in the range 14 to 15 MeV) would be all that is needed. The following data answer this request: OTU STF Spira, Robson: NP/A 127 81 (1969), 14.6 MeV measurmnt. Barral et al.: AFWL-TR-68 134 (1969), 14.8 MeV measmt. * Request amended (supported by Fabry and Schepers).	
366 [ 1527 ]	<sup>63</sup> Cu	N,ALPHA	TR	8. +6	5 1 PAR	Rastoin, J. Production of <sup>60</sup> Co(5.26y). Irradiation monitor. Threshold detector.	69
367 [ 1763# ]	<sup>63</sup> Cu	N,ALPHA	6. +6 1.8+7	10	2 HED STF	Mc Elroy, W.N. Required is activation. For use as a fluence monitor. Barral+: NP/A 138 387(D/69), data at 14.8 MeV.	69
368 [ 1528 ]	<sup>63</sup> Cu	N,ALPHA	8. +6 1.5+7	10	2 PAR OTU STF	Rastoin, J. Production of <sup>60</sup> Co(5.26y). Irradiation monitor. Threshold detector. Spira, Robson: NP/A 127 81 (1969), 14.6 MeV measurmnt. Barral et al.: AFWL-TR-68 134 (1969), 14.8 MeV measmt.	69
369 [ 1320 ]	<sup>65</sup> Cu	N2N XSECTION TR	1.2+7	5	1 JAE	Japanese Nuclear Data Committee (JNDC). For neutron yield monitor. Data available % : Can.J.Phys. 44,1183,1966.	68
370 [ 1321 ]	<sup>65</sup> Cu	N2N XSECTION	1.5+7 2.0+7	5	1 JAE HAM	Japanese Nuclear Data Committee (JNDC). For neutron yield monitor. Large discrepancies among data. Bormann, Lammers: NP/A 130 195 (1969), 13 to 18 MeV.	68
371 [ 1764 ]	<sup>65</sup> Cu	N,GAMMA	THR	1.0+3 2 to 5%	5 2 RDT NPL GEL HAR	Hannum, W.H. Accuracy 2% near thermal. Accuracy 5% near above thermal. For detector applications. Ryves, JNE 24,35 1970 Weigmann+: ZP 213 411(7/68), 211 eV - 17 keV. Moxon: data 5 eV - 100 keV in progress. part of request apparently satisfied.	67

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
372 [2639+]	Zn	NONEI GAMMAS energy dist	2. +2 2.5+4 OR 5 MB	15 ---	SNP	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_\gamma)$ . $\gamma$ -Resolution required: 10%.	69
373 [2640+]	Zn	NONEI GAMMAS energy dist	1. +6 1. +7 OR 5 MB	15 ---	SNP	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required : 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	69
374 [2641+]	Zn	NONEI GAMMAS energy dist	1. +6 1.4+7 OR 5 MB	15 ---	NEL	Eccleshall, D. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required : 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	70
375 [2638+]	Zn	SPECT NGAMMA THR		10 ---	SNP	Fleishman, M.R. For shielding calculations. Both line and continuum spectra are required. Bartholomew's spectrum does not give correct B.E. ORL Maerker+: ORNL-4382.	69
376 [2468]	$^{64}\text{Zn}$	N2N XSECTION 1.4+7		10.0 ---	KOS	Csikai, J. Needed for neutron activation analysis and cross section systematics. Incident energy resolution 200 keV. For reference see At.En.Rev. I(1969), 93.	69
377 [2303]	$^{64}\text{Zn}$	N,GAMMA	2.4+4	10.0 ---	JAE	Japanese Nuclear Data Committee (JNDC). For normalization of the calculated cross section curve	70
378 [2589]	$^{64}\text{Zn}$	N,PROTON	THR 5.0+6	5 ---	GEL	Neutron Dosimetry Group EURATOM Activation detector. Existing data strongly discrepant.	71
379 [2590]	$^{64}\text{Zn}$	N,PROTON	5.0+6 1.5+7	10 ---	GEL	Neutron Dosimetry Group EURATOM The following data answer this request: Santry+ : BAP 12 481(1967)	71
380 [2469]	$^{69}\text{Ga}$	N2N XSECTION 1.4+7		10.0 ---	KOS	Csikai, J. Needed for neutron activation analysis and cross section systematics. Incident energy resolution 200 keV. For reference see At.En.Rev. I(1969), 93.	69
381 [336]	$^{71}\text{Ga}$	RESON PARAMS 9.5+1		10 ---	KPK	Kuechle, M. $\Gamma_\gamma$ and $\Gamma_n$ , $J$ and 1 Malecki : JINR-P3-4152(1968) gives $J=2$ , $g^*\Gamma_n=.062\pm.012$ eV, $\Gamma_\gamma=.260\pm.06$	69
382 [1548]	$^{75}\text{As}$	N2N XSECTION TR	1.5+7	10 ---	VNV	Cardot, M. Activation.( $^{74}\text{As}$ , 17.9d).	69
383 [1549]	$^{75}\text{As}$	N,ALPHA	TR 1.5+7	10 ---	VNV	Cardot, M. Activation.( $^{72}\text{Ga}$ , 14.2h).	69
384 [1775]	$^{83}\text{Kr}$	TOTAL XSECT	1.0-3 1.0+3	10 ---	BET KAP	Bayard, R.T. Ehrlich, R. Accuracy 10% thermal. Accuracy 10% in res.integral above 1eV. For fission product absorption calculation	67
385 [1776]	$^{83}\text{Kr}$	N,GAMMA	1.0-3 1.0+3	10 ---	BET KAP	Bayard, R.T. Ehrlich, R. Accuracy 10% thermal. Accuracy 10% in res.integral above 1eV. For fission product absorption calculation. Walker, W.H., AECL-3037(1969) $\sigma$ part of request apparently satisfied by old data.	67
386 [1551]	$^{84}\text{Rb}$	N2N XSECTION 1.0+7 1.5+7		5 ---	VNV ARK	Cardot, M. Activation.( $^{84}\text{Rb}$ , 33d). Husain et al. have measured at 14.8 MeV ( Phys. Rev. 1C, 1233(1970))	69

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV) MIN MAX	ACCURACY P (%)	LAB	REQUESTER , COMMENTS	YEAR
387 [1550 ]	<sup>85</sup> Rb	N,GAMMA	1. +3 3. +6	10	3 VNV	Cardot, M. Activation. ( <sup>86</sup> Rb, 18.6d).	69
388 [1552 ]	<sup>89</sup> Y	N2N XSECTION	1.2+7 1.5+7	10	1 VNV --- ALD	Cardot, M. Activation ( <sup>89</sup> Y, 104d). Mather: AWRE/O-47/69 (8/69), 12.3MeV measmnt planned.	69
389 [1376 ]	<sup>89</sup> Y	N,GAMMA	1. +3 1.5+6	10	2 VNV	Cardot, M. Activation detector. Production of <sup>90</sup> Y (64.2 h).	68
390 [2470 ]	Zr	RESON PARAMS	0. +0 1.0+4	10	2 HLT	Saastamoinen, J. For reactivity effects. --- SAC RPI ORL HAR Morgenstern et al., NP A123 (1969), 561. Bartolome, NSE 37 (1969), 137. Good and Kim, PR 165 (1968), 1329. Rae: neutron widths known to 10-15%, problem lies mainly in capture widths, EANDC (UK)-131.	69
391 [1777# ]	Zr	DIFF ELASTIC	2. +5 1.5+6	10	2 KAP --- ANL	Ehrlich, R. Resolution ±5%. Systematic differences exist in available data. Work reported.	69
392 [1778# ]	Zr	DIFF ELASTIC	7. +6 1.4+7	20	2 KAP --- ANL	Ehrlich, R. Resolution ±2.5%. Work planned.	69
393 [1780# ]	Zr	EMISS XSECT energy,angle	1.5+6 1.5+7	10	1 LAS --- ANL	Streetman, J.R. For design of pressurized water reactors using Zr. Incident and exit energy resolution 10%. Low energy neutrons must be included. Absolute spectra at 30° and 70° may suffice. Smith: work in progress.	69
394 [1779 ]	Zr	EMISS XSECT energy,angle	2.0+6 1.4+7	10	1 KAP --- ANL	Ehrlich, R. Avery, R. For design of pressurized water reactors using Zr. Incident and exit energy resolution 10%. Time scale not yet established for requiring associated gamma-production data. Smith: work in progress.	67
395 [2643+ ]	Zr	NONEL GAMMAS energy dist	1. +2 2. +4 OR 5 MB	15	2 SNP ---	Fleishman, M.R. Absolute σ(Eγ) required for all Eγ > 200 keV. Energy res.: Reproduce major variations in σ(Eγ). γ-Resolution required: 10%.	69
396 [2644+ ]	Zr	NONEL GAMMAS energy dist	1. +6 1. +7 OR 5 MB	15	1 SNP ---	Fleishman, M.R. Absolute σ(Eγ) required for all Eγ > 200 keV. Neutron energy interval required: 500 keV. γ-Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	69
397 [2645+ ]	Zr	NONEL GAMMAS energy dist	1. +6 1.4+7 OR 5 MB	15	2 NEL ---	Eccleshall, D. Absolute σ(Eγ) required for all Eγ > 200 keV. Neutron energy interval required: 500 keV. γ-Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	70
398 [2304 ]	Zr	DIFF INELAST energy dist	4.0+6 7.0+6	<20.0	3 JAE	Japanese Nuclear Data Committee (JNDC). For investigations of the level density parameters	70
399 [2373 ]	Zr	ABSORPTION	5. +2 1.4+7	10	3 CAD	Barre, J-Y. For fast reactor calculations.	71
400 [1783 ]	Zr	RES INT CAPT	0.5+0	5.0	1 KAP --- VNV	Ehrlich, R. Discrepancies in existing measurements. Carre' and Vidal: CN-23/74 1966.	69

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REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
401 [1781#]	Zr	N, <sup>n</sup> GAMMA	THR	1. +3	5	2	BNW GRT	Leonard, B.R. For reactor modernization and reactivity effects. Lopez: NBS Spec. Pub., to 1 eV.
402 [1782 ]	Zr	N, <sup>n</sup> GAMMA	3.0+3	1.0+7	15	2	KAP GA RPI	Ehrlich, R. For reactor modernization and reactivity effects. Need verification for energies <25keV. Discrepancies exist 25keV - 1 MeV. No data > 1 MeV available. Lopez+, 68 WASHINGTON, report resonance parameters including $\Gamma_\gamma$ below 4 keV for <sup>91</sup> Zr Bartolome+, NSE 37(1969)137, measured with separated isotopes from .15 to 100 keV, extracted resonance parameters including $\Gamma_\gamma$ below 17 keV.
403 [2642+]	Zr	SPECT NGAMMA THR			10	1	SNP MIT	Fleishman, M.R. For shielding calculations. Both line and continuum spectra are required. Bartholomew's spectrum does not give correct B.E. Rasmussen: has complete GEII spectrum.
404 [2374 ]	Zr	N,PROTON	TR	1.5+7	20	3	CAD	Barre, J-Y. For fast reactor calculations.
405 [2375 ]	Zr	N,ALPHA	TR	1.5+7	20	3	CAD	Barre, J-Y. For fast reactor calculations.
406 [1787#]	<sup>90</sup> Zr	TOTAL XSECT (res.param)	2. +3	1. +4	3	1	GE BET	Snyder, T. Bayard, R.T. Accuracy 10% in parameters. Design of pressurized water reactors. Individual and average res. parameters desired. To resolve discrepancies in recent measurements. Bartolome+: NSE 37 137(7/69), res.params. from ( $n,\gamma$ ).
407 [1792#]	<sup>90</sup> Zr	RESON PARAMS gamma width neutronwidth	1.5+4	10	2	KAP BET ---	Ehrlich, R. Bayard, R.T. Needed to verify existing measurements. Min. energy to include lowest resolved resonance. Status: See REG 1787 above.	
408 [1758#]	<sup>90</sup> Zr	DIFF ELASTIC	1. +5	1. +7	10	1	BET ANL	Bayard, R.T. Scattering from separated isotopes 90-91,92-94, and 96 is desired. To check the shell effect on the optical potential. To derive useful optical model parameters. Work planned.
409 [1790 ]	<sup>90</sup> Zr	EMISS XSECT energy,angle	1.0+6	1.5+7	10	1	BET ANL	Bayard, R.T. Individual excitation cross sections desired to 20% accuracy. Needed for the design of pressurized water reactors with Zr. Wanted from threshold up Smith: work in progress.
410 [2646+]	<sup>90</sup> Zr	DIFF INELAST energy dist	5. +6	1.5+7	10	1	BET ANL KTY	Bayard, R.T. To determine the split of total Zr cross section between elastic and nonelastic. Smith : work in progress. McEllestrom : work in progress.
411 [1789 ]	<sup>90</sup> Zr	DIFF INELAST angular dist	1.4+7		15	2	KAP	Ehrlich, R. Resolve discrete levels up to 3 MeV excitation. To compute direct inelastic scattering and investigate isotopic spin dependent coupling between ground and excited states.
412 [1792 ]	<sup>90</sup> Zr	RES INT CAPT	0.5+0		20	2	KAP	Ehrlich, R. Needed for evaluating measurements, resonance parameters. No active work.

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV) MIN MAX	ACCURACY P (%)	LAB	REQUESTER , COMMENTS	YEAR
413 [1794 ]	<sup>90</sup> Zr	NUCL.LEVELS	1.8+6 5.0+6		2 KAP	Ehrlich, R. J, Pi of all Zr <sup>90</sup> levels < 5 MeV desired for calculating compound elastic and inelastic and n,p.	69
414 [1802#]	<sup>91</sup> Zr	RESON PARAMS gamma width neutronwidth	1. +5	10	1 BET	Ehrlich, R. Bayard, R.T. Need to resolve serious discrepancies <4 kev and extend resolved resonance data to 10 kev. Energy to include lowest resolved resonance. Discrepancies still exist incl. RPI, GGA, work. RPI Bartolome†: NSE 37 137 has res. par. GRT Lopez: NBS - Spec.Pub. 299.	69
415 [1796#]	<sup>91</sup> Zr	DIFF ELASTIC	1. +5 1. +7	10	1 BET	Bayard, R.T. Scattering from separated isotopes 90-91,92-94, and 96 is desired. To check the shell effect on the optical potential. To derive useful optical model parameters. Work planned.	67
416 [2647+]	<sup>91</sup> Zr	DIFF INELAST energy dist	2.5+6	1. +7	10 ANL	Bayard, R.T. To determine the split of the total Zr cross section between elastic and nonelastic. Work planned.	72
417 [1797 ]	<sup>91</sup> Zr	DIFF INELAST angular dist	1.4+7	15	2 KAP	Ehrlich, R. Resolve discrete levels up to 2 MeV excitation. To compute direct inelastic scattering and investigate isotopic spin dependent coupling between ground and excited states. Sample unavailable.	69
418 [1800 ]	<sup>91</sup> Zr	RES INT CAPT	0.5+0	5.0	1 KAP	Ehrlich, R. Verification of existing data required. No active work.	69
419 [1799 ]	<sup>91</sup> Zr	N,ALPHA	1.4+7	30	3 KAP	Ehrlich, R. --- No data available.	69
420 [1803 ]	<sup>91</sup> Zr	NUCL.LEVELS	1.0+6 4.0+6		2 KAP	Ehrlich, R. J, Pi of all Zr <sup>91</sup> levels < 4 MeV desired for calculating compound elastic and inelastic.	69
421 [1809#]	<sup>92</sup> Zr	RESON PARAMS gamma width neutronwidth	1.5+4	10	1 KAP BET SAC RPI	Ehrlich, R. Bayard, R.T. Verification of existing data required. Min.energy to include lowest resolved resonance. Morgenstern†: NP A123 561(1969). Bartolome†: NSE 37 137(1969).	69
422 [1805#]	<sup>92</sup> Zr	DIFF ELASTIC	1. +5 1. +7	10	1 BET	Bayard, R.T. Scattering from separated isotopes 90-91,92-94, and 96 is desired. To check the shell effect on the optical potential. To derive useful optical model parameters. Work planned.	67
423 [2648+]	<sup>92</sup> Zr	DIFF INELAST energy dist	2.5+6	1. +7	10 ANL KTY	Bayard, R.T. To determine split of total Zr cross section between elastic and nonelastic. Smith : work in progress. McEllestrom : work in progress.	72
424 [1806 ]	<sup>92</sup> Zr	DIFF INELAST angular dist	1.4+7	15	2 KAP	Ehrlich, R. Resolve discrete levels to 2 MeV excitation. To compute direct inelastic scattering and investigate isotopic spin-dependent coupling between ground and excited states.	69

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
425 [1808 ]	<sup>92</sup> Zr	RES INT CAPT	0.5+0	20	2 KAP	Ehrlich, R. Needed for evaluating measurements, res-parameters. --- No active work.	69
426 [1810 ]	<sup>92</sup> Zr	NUCL.LEVELS	1.0+6 4.0+6		2 KAP	Ehrlich, R. J, Pi of all Zr <sup>92</sup> levels < 4 MeV desired for calculating compound elastic and inelastic.	69
427 [358 ]	<sup>93</sup> Zr	RESON PARAMS gamma width neutronwidth	1.0+2 5. +3	10	2 KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available.	
428 [359 ]	<sup>93</sup> Zr	N,GAMMA	5. +3 2. +6	10	2 KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. --- No activity known.	
429 [1816 ]	<sup>94</sup> Zr	RESON PARAMS gamma width neutronwidth	1.5+4	10	2 KAP	Ehrlich, R. Verification required includes recent RPI results. --- Min. energy to include lowest resolved resonance. Fn known to 10-15%. $\Gamma_\gamma$ data uncertain. SAC Morgenstern +, NP/A 123,561 (1969). RPI Bartolome: NSE 37 137(1969), large variations in $\Gamma_\gamma$ . ORL Good+: PR 165 1329(1968), $\pm 25\%$ on Fn. Additional capture measurements needed for 10% on $\Gamma_\gamma$ .	69
430 [361 ]	<sup>94</sup> Zr	RESON PARAMS	2.3+3	10	2 KPK	Kuechle, M. Resonance at 2.265 keV. --- Reson. params: Fn, $\Gamma_\gamma$ , J and L. Fn known to 10-15%. $\Gamma_\gamma$ data uncertain. RPI Bartolome: NSE 37 137(1969), large variations in $\Gamma_\gamma$ . ORL Good+: PR 165 1329(1968), $\pm 15\%$ on Fn. Additional capture measurements needed for 10% on $\Gamma_\gamma$ .	
431 [1812#]	<sup>94</sup> Zr	DIFF ELASTIC	1. +5 1. +7	10	1 BET	Bayard, R.T. Scattering from separated isotopes 90-91,92-94, and 96 is desired. To check the shell effect on the optical potential. To derive useful optical model parameters. --- Work planned.	67
432 [1813 ]	<sup>94</sup> Zr	DIFF INELAST angular dist	1.4+7	15	2 KAP	Ehrlich, R. Resolve discrete levels up to 2 MeV excitation. To compute direct inelastic scatt. and investigate isotopic spin-dependent coupling between ground and excited states. --- ANL Smith: work in progress. KTY McEllistrem, work in progress	69
433 [1815 ]	<sup>94</sup> Zr	RES INT CAPT	0.5+0	20	2 KAP	Ehrlich, R. Needed for evaluating measurements, res-parameters. --- No active work.	69
434 [1817 ]	<sup>94</sup> Zr	NUCL.LEVELS	9.5+5 4.0+6		2 KAP	Ehrlich, R. J, Pi of all Zr <sup>94</sup> levels < 4 MeV desired for calculating compound elastic and inelastic.	69
435 [365 ]	<sup>95</sup> Zr	N,GAMMA	THR	20 b.	2 CRC	Walker, W.H. Fission product, unknown cross section. Note changed accuracy. --- INC Scoville will do integral measurements.	
436 [1818 ]	<sup>95</sup> Zr	N,GAMMA	0.5+0 1.0+4	20 10-20%	2 BET KAP	Bayard, R.T. Ehrlich, R. Radioactive target, 65 day. Accuracy: 10% in $\sigma$ (ABS), if $\sigma > 100$ barns; 20% in $\sigma$ (ABS), if from 10-100 barns. Above 1eV: 10% in resonance integral if $\sigma > 1000$ barns; 20% in resonance integral if from 100-1000 barns. The decay is to an important fission product. --- INC Scoville will do integral measurements.	67

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
437 [1821#]	<sup>96</sup> Zr	DIFF ELASTIC	1. +5	1. +7	10	1	BET Scattering from separated isotopes 90-91,92-94, and 96 is desired. To check the shell effect on the optical potential. To derive useful optical model parameters. Work planned.	67
438 [1823 ]	<sup>96</sup> Zr	RES INT CAPT	0.5+0		15	1	KAP Needed for evaluating measurements res.parameters.	69
439 [1822 ]	<sup>96</sup> Zr	N,GAMMA	THR	5.0	2	KAP	Ehrlich, R. Need to resolve discrepancies in σ's and res-params. Preferably measurements with natural target or other isotopes. Note: Zr <sup>97</sup> half-life is 16.8 hours.	69
440 [2650+]	Nb	NONEI GAMMAS	3. +1	7.5+4	15	2	SNP Absolute σ(Eγ) required for all Eγ > 200 keV. Energy res.: Reproduce major variations in σ(Eγ). γ-resolution required: 10%.	69
441 [2651+]	Nb	NONEI GAMMAS	1. +6	1. +7	15	1	SNP Absolute σ(Eγ) required for all Eγ > 200 keV. Neutron energy interval required : 500 keV. γ-Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. TNC LAS Nellis: WASH-1136, 0.6-1.6 MeV. Drake: NSE 40 294, 4.0-7.5 MeV.	69
442 [2652+]	Nb	NONEI GAMMAS	1. +6	1.4+7	15	2	NEL Absolute σ(Eγ) required for all Eγ > 200 keV. Neutron energy interval required : 500 keV. γ-Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. TNC LAS Nellis: WASH-1136, 0.6-1.6 MeV. Drake: NSE 40 294, 4.0-7.5 MeV.	70
443 [1828#]	Nb	N,GAMMA	1. +3	1. +5	10	2	AI ANL GRT For fast reactor calculations, to resolve discrepancies in thermionic worths. Accuracy 5% in calculated dilute and self-shielded resonance integral. LAS ANL Harlow: NCSAC-33, to 10 keV from Physics-8. Work planned.	62
444 [2649+]	Nb	SPECT NGAMMA	THR		10	1	SNP Pleishman, M.R. For shielding calculations. Both line and continuum spectra are required. Bartholomew's spectrum does not give correct B.E. MIT Rasmussen: complete GELI spectrum.	69
445 [2188 ]	<sup>93</sup> Nb	EMISS XSECT	1.5+6	1.5+7	10	1	LAS Streetman, J.R. Incident and exit energy resolution 10% . Low-energy neutrons must be included. Absolute spectra at 30° and 75° may suffice Time scale requiring associated γ-production data not yet established. ALD Porter: data 1.5 - 5 MeV, DE = 0.5 MeV.	69
446 [ 382 ]	<sup>93</sup> Nb	TOTINELASTIC TR	8.0+6	10.0	1	GEL see comment	Neutron Dosimetry Group EURATOM. Threshold detector. Xsection leading to isomeric state after gamma de-excitation is needed. GA Allen: GA-8133 (8/67), partial evaluation based on level scheme at present superseded. WUR Hegedus: NUK 10 225 (1967), integral measurement. TNC Williams: EANDC (US)-143 (5/70), (n,n'γ) to 5.5 MeV. * Request amended (supported by Fabry and Schepers).	

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REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
447 [ 381 ]	<sup>93</sup> Nb	DIFF INELAST TR see comment	1.5+7	10	2	WUR --- GA	Brunner, J. E'=29 keV. Formation of the 3.7 $\gamma$ isomer. For fast flux measurements. Allen: GA-8133 (8/67), partial evaluation based on level scheme at present superseded. WUR Hegedus: EIR-report-195(71), integral measurement.	
448 [ 2376 ]	<sup>93</sup> Nb	ABSORPTION	5. +2	1.4+7	10	3	CAD	Barre, J-Y. For fast reactor calculations.
449 [ 1137 ]	<sup>93</sup> Nb	N,GAMMA	1. +2	1. +5	20	1	WIN	Campbell, C.G. --- Evaluation needed but accuracy requirement probably not met. HAR New measurements planned by Coates and Moxon.
450 [ 2377 ]	<sup>93</sup> Nb	N,GAMMA	1. +2	1. +6	20	3	CAD	Barre, J-Y. For fast reactor calculations.
451 [ 2378 ]	<sup>93</sup> Nb	N,PROTON	TR	1.5+7	20	3	CAD	Barre, J-Y. For fast reactor calculations.
452 [ 2379 ]	<sup>93</sup> Nb	N,ALPHA	TR	1.5+7	20	3	CAD	Barre, J-Y. For fast reactor calculations.
453 [ 384 ]	<sup>93</sup> Nb	NUCL.LEVELS	TR	8.0+6	1	GEL	Neutron Dosimetry Group EURATOM. Threshold detector. Needed for Hauser- Feshbach calculation of xsection for Nb <sup>93</sup> (n,n') leading to isomeric state after gamma de-excitation. MIT Rogers,V.C. et al.: NP/A 142 100(1970), probably fulfill this request below 1.5 MeV; but see below. BHU Sharma, Nath: NP/A 142 291(1970) , still some difficulties in spin-parity assignments. MUN Gobel: FANDC(E) 127'U'21(4/70) , disagreement with MIT. * Request amended (suggested by Fabry and Schepers).	
454 [ 1835 ]	<sup>95</sup> Nb	N,GAMMA	THR	<20 10-20% see comment.	1	KAP	Ehrlich,R. Radioactive target -35d. Thermal average will be useful. Want 20% accuracy if absorption cross section is 10-100 b, 10% if greater. Decays to an important fission product poison. ORL Halperin: ORNL-3488(0/63), <7b, too low to bother. CRC <7b. See Walker,W.H.,AECL-3037 (1969) Request apparently satisfied by old data.	
455 [ 2653+ ]	Mo	EMISS XSECT energy,angle	1.5+6	1.5+7	10	2	LAS	Streetman, J.R. Low energy neutrons must be included. Absolute spectra at 30° and 75° may suffice. ALD Porter: data 1.5-5.0 MeV, 0.5 MeV intervals.
456 [ 2655+ ]	Mo	NONEI GAMMAS energy dist	1. +1	9. +3	15	1	SNP	Fleishman, M.R. Absolute $\sigma(E\gamma)$ required for all $E\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E\gamma)$ . --- BNL Chrien+: NCSAC-33, spectra in Mo <sup>98</sup> resonances.
457 [ 2656+ ]	Mo	NONEI GAMMAS energy dist	1. +6	1. +7	15	1	SNP	Fleishman, M.R. Absolute $\sigma(E\gamma)$ required for all $E\gamma > 200$ keV. Neutron energy interval required : 500 keV. --- Y-Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.
458 [ 2657+ ]	Mo	NONEI GAMMAS energy dist	1. +6	1.4+7	15	2	NEL	Eccleshall, D. Absolute $\sigma(E\gamma)$ required for all $E\gamma > 200$ keV. Neutron energy interval required : 500 keV. --- Y-Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
459 [ 1837# ]	Mo	DIFF INELAST energy dist	1.5+6	3. +6	20	3 ANL LMB	Avery, R. Hemig, P.B. Resolution incident and secondary neutrons, 20%. Total integral over 4 Pi required. Spectra at several angles if significantly anisotropic. ALD ANL ANL	62
							Porter: data 1.5-5.0 MeV, 0.5 MeV intervals. Lambropoulos: NCSAC-33(1971), even isotopes to 1.6 MeV. Work in progress.	
460 [ 2380 ]	Mo	ABSORPTION	5. +2	1.4+7	10	3 CAD	Barre, J-Y. For fast reactor calculations.	71
461 [ 1579 ]	Mo	N, GAMMA	1. +2	1. +6	<20 10% to .1MeV	1 WIN HAR	Campbell, C.G. For fast reactors. Data available on <sup>100</sup> Mo and measurements planned on natural Mo by Coates and Moxon. See also REG 1839 above. Evaluation needed.	69
462 [ 2381 ]	Mo	N, GAMMA	1. +2	1. +6	20	3 CAD	Barre, J-Y. For fast reactor calculations.	70
463 [ 1839# ]	Mo	N, GAMMA	1. +3	1. +6	10	3 RDT GRT ANL ORL	Hannum, W.T. To resolve discrepancy in reactivity worth measurements. Fricke+: 70 HELSINKI 2 265, 1 keV to 1 MeV. Probably filled, Weigman and Kompe (KFK-635) in good agreement between 10 and 25 keV. Hla Shwe+: PR 179 1148, res.par. to 1.5 keV. Macklin+: NCSAC-33(1971), ORELA measurements planned.	69
464 [ 394 ]	Mo	N, GAMMA	1. +6	1.0 7 or 2mb	10	3 BN BOL	Tavernier, G. No values available Evaluation by Benzi, EANDC(E)-127 U.	
465 [ 2654+ ]	Mo	SPECT NGAMMA THR				1 SNP	Fleishman, M.R. Both line and continuum spectra are required. Bartholomew's spectrum does not give correct B.E. --- Probably filled; ND 3 600(1967).	69
466 [ 395 ]	Mo	N, PROTON	TR	1.4+7	10	2 KFK	Schmidt, J.J. No data available.	
467 [ 2382 ]	Mo	N, PROTON	TR	1.5+7	20	3 CAD	Barre, J-Y. For fast reactor calculations.	71
468 [ 2383 ]	Mo	N, ALPHA	TR	1.5+7	20	3 CAD	Barre, J-Y. For fast reactor calculations.	71
469 [ 1553 ]	<sup>92</sup> Mo	N, PROTON	TR	1.5+7	10	2 VNV GIT	Cardot, M. Threshold detector. (Production of <sup>92</sup> Nb(10.1d)). Wen- Deh- Lu et al. have measured at 14.4 MeV ( Phys.Rev. <u>1C</u> , 358 (1970))	69
470 [ 1554 ]	<sup>92</sup> Mo	N, ALPHA	TR	1.5+7	10	2 VNV GIT	Cardot, M. Activation. ( <sup>99</sup> Zr, 79h). Wen- Deh- Lu et al. have measured at 14.4 MeV ( Phys.Rev. <u>1C</u> , 358 (1970))	69
471 [ 1334 ]	<sup>95</sup> Mo	N, GAMMA	1. +0	1. +7	10	2 AE ANL GEL	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. Measurements above 1.5keV of primary interest. Fast chopper meas. below 1.5keV (WASH-1127 p.12) lead to precision on < $\Sigma\gamma$ > better than 10%. Meas. on natural Mo have been made from 10eV to 25keV (Nucl.Phys. <u>A105</u> , 513(1967)), resonances assigned to different isotopes and $\Gamma$ determined for large res. Meas. on separated isotopes were planned (1967) to ascertain isotopic assignments.	68

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV) MIN MAX	ACCURACY (%)	P	LAB	REQUESTER , COMMENTS	YEAR	
472 [ 401 ]	<sup>95</sup> Mo	N, GAMMA	1. +4 2. +6	10	2	KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available.		
						KPK	Average measurements planned.		
						GEL	High resolution (resonance) measurements planned.		
473 [ 402 ]	<sup>95</sup> Mo	N, PROTON	TR	1.4+7	10.0	2	KPK GEL	Schmidt, J.J. Neutron Dosimetry Group EURATOM. Threshold detector.	
474 [ 1555 ]	<sup>95</sup> Mo	N, PROTON	TR	1.5+7	10	3	VNV	Cardot, M. Activation detector. Production of <sup>95</sup> Nb(35d). 69	
475 [ 2471 ]	<sup>96</sup> Mo	N, GAMMA (res. param)	1.0+4	1.0+5	10.0	2	AUA	Symonds, J. L. P wave strength function for fission product calculations and astrophysics. 69	
476 [ 1335 ]	<sup>97</sup> Mo	N, GAMMA	1. +0	1. +7	10	2	AE	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. Measurements above 1.5 keV of primary interest. Hla Shwet, PR <u>179</u> (1969)1148, chopper measurement below 1.5 keV, extracted $\Gamma_y$ values for s and p wave levels. Weigmann, NP <u>A104</u> (1967)513, high resolution linac data, 10 eV-25 keV, resonance parameters up to 4 keV. 68	
477 [ 403 ]	<sup>97</sup> Mo	N, GAMMA	1. +4	2. +6	10	2	KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. --- Status: see REG 1335 above.	
478 [ 405 ]	<sup>99</sup> Mo	N, GAMMA	THR		600 b.	2	CRC	Walker, W.H. Fission product, unknown cross section. Note changed accuracy. CRC Walker: AECL-3037(1969), 5 b guessed value. 67	
479 [ 1843 ]	<sup>99</sup> Mo	N, GAMMA	1.0-3	1.0+3	<20 10-20% see comment.	2	BET KAP	Bayard, R.T. Ehrlich, R. Radioactive target -67h. Want 20% accuracy if absorption cross section is 10-100 b, 10% if greater. Above 1 eV want 20% in resonance if in range 100 to 1000 barns 10% if larger. The decay is to an important fission product. 67	
480 [ 407 ]	<sup>99</sup> Tc	RESON PARAMS gamma width neutronwidth	4.0+2	5. +3	10	2	KPK INC	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. Wantanabe et al., NSE <u>41</u> , 188 1970, give values for lower energy range 5.6- 280 eV. 68	
481 [ 1444 ]	<sup>99</sup> Tc	N, GAMMA	1.0-3	1.0+1	5.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work. 69	
482 [ 1445 ]	<sup>99</sup> Tc	N, GAMMA	1.0+1	5.0+4	20.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work. 69	
483 [ 1336 ]	<sup>99</sup> Tc	N, GAMMA	1. +1	1. +7	10	2	AE	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. MTR A transmission meas. up to 280eV ( WASH1124 p. 51) lead to values of $f_n$ and $\Gamma_y$ for 13 res. but sufficient accuracy is certainly not reached in area analysis. 68	

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
484 [1138]	<sup>99</sup> Tc	N,GAMMA	1. +2	1. +6	20 (E-2E)	3	WIN ---	Campbell, C.G. For fast reactors. No work planned.	68
485 [408]	<sup>99</sup> Tc	N,GAMMA	5. +3	2. +6	10	2	KPK ---	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. No activity known.	
486 [1446]	<sup>100</sup> Ru	N,GAMMA	1.0-3	1.0+1	10.0	2	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work.	69
487 [1447]	<sup>100</sup> Ru	N,GAMMA	1.0+1	5.0+4	25.0	2	JAE KIL	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work. Priesmeyer+ : 71KNOXVILLE 688, give res.par. from transmission data on separated isotopes.	69
488 [409]	<sup>101</sup> Ru	RESON PARAMS gamma width neutronwidth	2.0+2	5. +3	10	2	KPK KIL KIL	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. Priesmeyer et al., Knoxville Conf. 1971, give parameters to 1.5 keV. Jung +: 70HELSINKI P/14(6/70), transm. data < 1 keV	
489 [1337]	<sup>101</sup> Ru	N,GAMMA	1. +0	1. +7	10	2	AE ---	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. Status: see REG 1447 above.	68
490 [1139]	<sup>101</sup> Ru	N,GAMMA	1. +2	1. +6	20 (E-2E)	3	WIN ---	Campbell, C.G. For fast reactors. No work planned. Status: see REG 1447 above.	68
491 [410]	<sup>101</sup> Ru	N,GAMMA	5. +3	2. +6	10	2	KPK ---	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. Status: see REG 1447 above.	
492 [411]	<sup>102</sup> Ru	RESON PARAMS gamma width neutronwidth	0. +3	1.0+4	10	2	KPK KIL KIL	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. Priesmeyer et al., Knoxville Conf. 1971, give parameters to 1.5 keV. Jung +: 70HELSINKI P/14(6/70), transm. data < 1 keV	
493 [1338]	<sup>102</sup> Ru	N,GAMMA	1. +0	1. +7	10	2	AE ---	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. Status: see REG 1447 above.	68
494 [412]	<sup>102</sup> Ru	N,GAMMA	1. +4	2. +6	10	2	KPK ---	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. No activity known.	
495 [413]	<sup>103</sup> Ru	N,GAMMA	THR		35 b.	2	CRC CRC	Walker, W.H. Fission product, unknown cross section. Note changed accuracy (for fission of Pu). Walker: AECL-3037(1969), 5 b guessed value.	
496 [1844]	<sup>103</sup> Ru	N,GAMMA	1.0-3	1.0+3	<20 10-20% see comment	2	BET KAP	Bayard, R.T. Ehrlich, R.T. Radioactive target -40d. 20% accuracy desired if x-sect. in range 10-100 b, 10% if larger. Above 1eV want 20% in resonance integral if in range 100-1000 b, 10% if larger. Wanted for fission product poison calculations in thermal reactors.	67

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REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
[ 497 ]	$^{104}\text{Ru}$	RESON PARAMS	0.	+3	1.0+4	10	2 KPK Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available.	
[ 415 ]		gamma width					KIL Priesmeyer et al., Knoxville Conf. 1971, give parameters to 1.5 keV.	
		neutronwidth					KIL Jung +: 70HELSINKI P/14(6/70), transm. data < 1 keV	
[ 498 ]	$^{104}\text{Ru}$	N,GAMMA	1.	+4	2.	+6	10.0 2 KPK Schmidt, J.J. Fission product important in fast reactor burnup calculations. Chaubey (PR 152,1055,1966) measured at 24 keV.	
[ 416 ]							--- No activity known.	
[ 499 ]	$^{103}\text{Rh}$	TOTINELASTIC TR	1.0+7		5.0	1 GEL Neutron Dosimetry Group EURATOM.		
[ 419 ]		see comment					Kuechle, M. Threshold detector. Xsection leading to isomeric state after gamma de-excitation is wanted.	
							SAC Ribbon: DRP/SMPNF-714-69 (1969), evaluation made.	
[ 500 ]	$^{103}\text{Rh}$	DIFF INELAST TR	1.5+7		10	2 WUR Brunner, J. $E=40$ keV. Formation of the 57 m isomer. For fast flux measurements.		
[ 420 ]		see comment					--- Ambiguities between measurements. SAC Ribbon: DRP/SMPNF-714-69 (1969), evaluation made.	
[ 501 ]	$^{103}\text{Rh}$	ACTIVATION	FISS		10	2 UKW Whittaker, A. X-sect. for production of 206 d. and 2.9 y. isomers of $^{102}\text{Rh}$ , for dose rate measurements.	71	
[ 2291 ]		see comment					GEL Some data available: Paulsen, ZP 238 23 (1970). ALD Measurement of $\sigma(n,2n)$ total planned by Mather.	
[ 502 ]	$^{103}\text{Rh}$	N,GAMMA	1.	-3	1.	+3	5 RIS Hoejerup, F. at low E Wanted for fission product calculations.	71
[ 2294 ]								
[ 503 ]	$^{103}\text{Rh}$	N,GAMMA	1.0-3	1.0+0	10	2 GE Snyder, T. --- Want to calculate fission product poisons.	67	
[ 1846 ]							GA Carlson: new data above 1eV. CRC See Walker, W.H.,AECL-3037 (1969) Request apparently satisfied by old data.	
[ 504 ]	$^{103}\text{Rh}$	N,GAMMA	0.5+0	1.0+3	10	2 KAP Ehrlich, R. Accuracy 10% in resonance integral. Energies above 1 eV of interest.	67	
[ 1845 ]							--- Want to calculate fission product poisons. GA Fricke+: 70HELSINKI P/43(6/70), 1keV - 1MeV. GA Carlson: new data above 1eV. LAS Glass+: WASH-1136 (9/69), data above 30 eV. Request apparently satisfied by old data.	
[ 505 ]	$^{103}\text{Rh}$	N,GAMMA	1.	+0	1.	+7	10 2 AE Hakansson, R. The requested accuracy is especially important in the resonance region.	68
[ 1339 ]							Energy resolution 10% or better. Needed for fast reactor calculations.	
							RPI Scattering meas. (WASH-1127 p.176) lead to values of $\Gamma, \Gamma_n, J$ for 7 res. between 154.4 and 555eV.	
							LAS Divent+, PR 120 (1960) 556, Vdg, 175-1000 keV	
							ANL Cox, PR 133 (1963) B378, activation, 13-1800 keV.	
							ORL Hacklin+, PR 159 (1967) 1007, Vdg, 30-220 keV.	
							HAR Moxon, thesis HL68/3739 (1968), linac, 1-1000 keV.	
							GA Fricke+, 70HELSINKI, linac, 1-1000 keV. See also: Carlson, p.285 of Neutron Standards and Flux Normalization, ANL (1970). Request may be fulfilled above resonance region.	
[ 506 ]	$^{105}\text{Rh}$	N,GAMMA	THR		10.0	SAC Bussac, J.	68	
[ 1377 ]							--- Glendenin in NSR 29, 147 (1967) gives a total capture cross section of $(19.0 \pm 1.9)$ kb. (resonance integral contribution small, Cd-ratio is 47 for Au). The cross section is composed of: $35h \text{ Rh}^{105}(n,\gamma) \text{ Rh}^{106m}$ (2.2 h): $(5.7 \pm 1.2)$ kb and $35h \text{ Rh}^{105}(n,\gamma) \text{ Rh}^{106g}$ (30sec): $(13.3 \pm 1.5)$ kb. These data fulfill the request. Request probably satisfied, but requester would like data reviewed.	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
507 [ 1448 ]	$^{105}\text{Rh}$	N,GAMMA	1.0-3	1.0+1	5.0	1	JAE Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. TID-11967, 1960, ORNL-3488, 1963, NSE 20 298 1964, 66PARIS 1966, NSE 29 147 1967.	69
508 [ 1847 ]	$^{105}\text{Rh}$	N,GAMMA	1.0-3	1.0+0	10	2	GE Snyder, T. Radioactive target -36h. Fission product. ANL Glendenin+: NSE 29 147(7/67), report 19 ± 1.9 kb. Request apparently satisfied by old data.	67
509 [ 424 ]	$^{105}\text{Rh}$	N,GAMMA	1. -2	1.0+1	5	2	CRC Walker, W.H. Available data suggest large resonance near Cadmium cut-off. Additional data needed to determine depen- dence on neutron temperature and epithermal flux.	
510 [ 1449 ]	$^{105}\text{Rh}$	N,GAMMA	1.0+1	5.0+4	20.0	1	JAE Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work. HAR Request may be met by data in Moxon's M.Sc. thesis HL 68/3739.	69
511 [ 426 ]	$^{105}\text{Rh}$	N,GAMMA	1. +1	5.0+2	20	2	CRC Walker, W.H. Available data suggest large resonance near Cadmium cut-off. Additional data needed to determine depen- dence on neutron temperature and epithermal flux. Status: see REG 1449 above.	
512 [ 1340 ]	$^{105}\text{Pd}$	N,GAMMA	1. +0	1. +7	10	2	AE Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. ISP Needed for fast reactor calculations. Transmission meas. of Coceva et al. (Phys.Let.16 159, May1965) give $\sigma$ values for $\sigma$ res. between 11.78 and 55.8eV with 30 to 10% accuracy. In Nucl.Phys.A117, 586 only res. energies and spins are given.	68
513 [ 427 ]	$^{105}\text{Pd}$	N,GAMMA	2. +3	2. +6	10	2	KPK Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. --- No activity known.	
514 [ 428 ]	$^{107}\text{Pd}$	RESON PARAMS gamma width neutronwidth	0. +3	2. +3	10	2	KPK Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available.	
515 [ 429 ]	$^{107}\text{Pd}$	N,GAMMA	THR		10 b.	2	CRC Walker, W.H. Pu fission product, unknown cross section. Note changed accuracy (for fission of Pu). CRC Walker: AECL-3037 (1969), 5 b guessed value.	
516 [ 1848 ]	$^{107}\text{Pd}$	N,GAMMA	1.0-3	1.0+4	10	2	BET Bayard, R.T. Radioactive target- 7.10 <sup>6</sup> years. For calculation of fission product poisons. Above 1 eV want resonance integral to 10%.	67
517 [ 1341 ]	$^{107}\text{Pd}$	N,GAMMA	1. +0	1. +7	10	2	AE Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. --- Needed for fast reactor calculations. No activity known.	68
518 [ 431 ]	$^{107}\text{Pd}$	N,GAMMA	2. +3	2. +6	10	2	KPK Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. --- No activity known.	

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
519 [ 432 ]	$^{108}\text{Pd}$	RESON PARAMS gamma width neutronwidth	0. +3 1. +3	10 2	KPK ISP	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No recent data beyond Coceva, reported at Antwerp.	
520 [ 433 ]	$^{108}\text{Pd}$	N,GAMMA	6. +5 2. +6	10 3	KPK ---	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. No activity known.	
521 [ 434 ]	$^{109}\text{Pd}$	RESON PARAMS gamma width neutronwidth	4.0+2 2. +3	10 2	KPK BOL	Schmidt, J.J. Benzi, V. Fission product important in fast reactor burnup calculations. No measurements available.	
522 [ 2472 ]	$^{107}\text{Ag}$	N,ALPHA	THR	10.0 3	KOS ---	Csikai, J. For neutron activation analysis and cross section systematics wanted. IAE	69
523 [ 1849 ]	$^{109}\text{Ag}$	N,GAMMA	1.0-3 1.0+0	10 2	GE CRC	Snyder, T. Fission product poison. Walker, W.H., AECL-3037 (1969) Request apparently satisfied by old data.	67
524 [ 437 ]	$^{109}\text{Ag}$	N,GAMMA	7. +2 5. +3	10 2	KPK HAR	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. Moxon has some data between 10 eV and 100 keV, about 10% accuracy, see AEERE-PR/NP10.	
525 [ 1342 ]	$^{109}\text{Ag}$	N,GAMMA	1.5+2 1. +7	10 2	AE HAR	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. Antwerp Conf. 1965 results give $\Gamma_\gamma$ with accuracy often better than 10%. KUR Muradyan has made a capture measurement between 5.2eV and 1keV (Paris Conf. 1966, paper 107). FEI Kononov's results (Paris Conf. 1966, paper 99) have an accuracy of 10 to 15%.	
526 [ 438 ]	$^{109}\text{Ag}$	N,GAMMA	2. +5 2. +6	10 2	KPK ---	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. No activity known.	
527 [ 1167 ]	Cd	ABSORPTION	1. -3 5. -1	1 2	WUR ---	Widder, F. Spectrum measurements in poisoned moderators. The value of $\sigma_\gamma(\text{Cd})$ at 0.0253 eV appears to be established to the desired accuracy (EANDC(OR)-61 (1967), NSR 31 152 (1968)) and there are discrepancies near the peak of the 0.178 eV resonance (EANDC(OR)-61 (1967), EANDC-67 A, 18 (1967) and EANDC-75 A, 11 (1968)).	
528 [ 2473 ]	$^{110}\text{Cd}$	N,GAMMA (res.param)	1.0+4 1.0+5	10.0 2	AUA	Symonds, J.L. P wave strength function for fission product calculations and astrophysics.	69
529 [ 440 ]	In	RESON PARAMS gamma width	0 5. +2 <15	3	BOL CRC GEL	Benzi, V. Single transition. Lone+ : NP/A 156, 113 1970, report individual $\Gamma_\gamma$ to 49 eV. Coceva+ : data given at the Budapest Conf. on 'Nuclear Structure Study with Neutrons' (8/72)	
530 [ 2305 ]	In	DIFF INELAST energy dist	4.0+6 7.0+6 <20.0	3	JAE	Japanese Nuclear Data Committee (JNDC). For investigations of the level density parameters	70

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
[ 441 ]	$^{115}\text{In}$	TOTINELASTIC TR see comment	1.5+7	3.0	1 GEL KFK	Neutron Dosimetry Group EURATOM. Kuechle, M. Threshold detector. X-sect. leading to isomeric state after gamma de-excitation is needed.	
					CAN	Measurements in progress.	
					MOL	Fabry: 70HELSINKI P/39, reevaluation performed.	
					AMS	Pauw: EANDC(E) 127'0'7 (4/70), reevaluation (thesis).	
					NJS	Najzer: 70HELSINKI P/6 (6/70), new data.	
[ 442 ]	$^{115}\text{In}$	DIFF INELAST see comment	5. +6 1.5+7	10	2 WUR	Brunner, J. $E' = 0.335$ MeV. Formation of the 4.5h isomer, for fast flux measurements.	
					MOL	Existing data do not fulfill the present request.	
					AMS	Fabry: 70HELSINKI P/39, reevaluation performed.	
					NJS	Pauw: EANDC(E) 127'0'7 (4/70), reevaluation (thesis).	
						Najzer: 70HELSINKI P/6 (6/70), new data.	
[ 445 ]	$^{126}\text{Sn}$	N,GAMMA	THR	120 b.	2 CRC	Walker, W.H. Fission product, unknown cross section.	
						Note changed accuracy (for fission of Pu). Walker: AECL-3037(1969), 50 b guessed value.	
[ 446 ]	$^{121}\text{Sb}$	N,GAMMA	0 1. +3	20	2 BN	Tavernier, G. Neutron economy and activation in fast reactors.	
						No activity known.	
[ 447 ]	$^{123}\text{Sb}$	N,GAMMA	0 1. +3	20	2 BN	Tavernier, G. Neutron economy and activation in fast reactors.	
						No activity known.	
[ 448 ]	$^{125}\text{Sb}$	N,GAMMA	THR	300 b.	3 CRC	Walker, W.H. Fission product, unknown cross section.	
						Note changed accuracy (for fission of $^{233}\text{U}$ , $^{239}\text{Pu}$ ). Walker: AECL-3037(1969), 10 b guessed value.	
[ 449 ]	$^{127}\text{Sb}$	N,GAMMA	THR	4000 b.	3 CRC	Walker, W.H. Fission product, unknown cross section.	
						Note changed accuracy (for fission of $^{233}\text{U}$ , $^{239}\text{Pu}$ ). Walker: AECL-3037(1969), 10 b guessed value.	
[ 450 ]	$^{127}\text{Te}$	N,GAMMA	THR	900 b.	3 CRC	Walker, W.H. For the isomeric state (105 d). Fission product; unknown cross section.	
						Note changed accuracy (for fission of $^{233}\text{U}$ , $^{239}\text{Pu}$ ). Walker: AECL-3037(1969), 50 b guessed value.	
[ 1850 ]	$^{127}\text{Te}$	N,GAMMA	1.0-3 1.0+0	20	2 KAP	Ehrlich, R. Radioactive target -105 d isomer. 0.025 eV value or thermal average useful. Request pertains to the metastable state. Needed for calculation of fission product poisons.	67
						Walker, W.H., AECL-3037(1969) guess 50 b.	
[ 452 ]	$^{129}\text{Te}$	N,GAMMA	THR	1000 b.	3 CRC	Walker, W.H. For the isomeric state (33 d). Fission product; unknown cross section.	
						Note changed accuracy (for fission of $^{233}\text{U}$ , $^{239}\text{Pu}$ ). Walker, W.H., AECL-3037(1969) guess 50 b.	
[ 1851 ]	$^{132}\text{Te}$	N,GAMMA	1.0-3 1.0+0	20	2 BET	Bayard, R.T. Radioactioe target -78h. Accuracy 10% if X-sec larger than 2500 barns. For calculation of fission product poisons. Above 1 eV resonance integral wanted to 20% if in range 2500-25000 b., 10% if larger.	67
						Walker, W.H., AECL-3037(1969) guess 50 b.	
[ 1852 ]	$^{133}\text{I}$	N,GAMMA	1.0-3 1.0+3	20	2 BET	Bayard, R.T. Radioactive target -21h. Accuracy 10% if X-sec larger than 9000 barns. Wanted for fission product poison calculations. Above 1eV resonance integral wanted to 20% if in range 9000-90000 b., 10% if larger.	67
						Walker, W.H., AECL-3037 (1969) guess 15 b.	

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY MIN MAX (%)	P	LAB	REQUESTER , COMMENTS	YEAR
543 [ 455 ]	$^{131}\text{Xe}$	RESON PARAMS gamma width neutronwidth	5.0+1	5. +3	10	2	KPK --- SAC SAC	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. Ribbon Thesis CEA-N-149 (1969) contains resonance parameters from 5 eV to 4 keV. Ribbon et al.: 66PARIS P/72 (0/66), available < 500eV.
544 [ 459 ]	$^{131}\text{Xe}$	ABSORPTION	THR		10	2	WIN ---	Tyror, J.C. For thermal reactors. No work planned. Existing data give $95 \pm 17$ b.
545 [ 1140 ]	$^{131}\text{Xe}$	RES INT ABS	5.5-1	2.0+6	10	2	WIN ---	Tyror, J.G. For thermal reactors. No work planned.
							SAC	Ribbon : CEA-N1149 (1969) gives res.par. from which RI has $\pm 20\%$ accuracy.
546 [ 1853 ]	$^{131}\text{Xe}$	N,GAMMA	1.0-3	1.0+3	10	2	BET GE --- SAC CRC	Bayard, R.T. Snyder, T. Fission product. Above 1eV want res.integ. to 10% Ribbon: 66PARIS 119 (0/66), to 500 eV. See Walker, W.H., AECL-3037 (1969) Request apparently satisfied by old data.
547 [ 1343 ]	$^{131}\text{Xe}$	N,GAMMA	1. +1	1. +7	10	2	AE	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. No capture data known.
548 [ 458 ]	$^{131}\text{Xe}$	N,GAMMA	5. +3	2. +6	10	2	KPK ---	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. No activity known.
549 [ 1854 ]	$^{133}\text{Xe}$	N,GAMMA	THR		10	2	GE ---	Snyder, T. Radioactive target - 5.3d. Thermal average or 0.025eV value wanted. Wanted for fission product poison calculations. No work in progress.
550 [ 1450 ]	$^{133}\text{Xe}$	N,GAMMA	1.0-3	1.0+1	5.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work.
551 [ 2295 ]	$^{133}\text{Xe}$	N,GAMMA	1. -3	1. +3 at low E	5	1	RIS	Hoejerup, P. Wanted for fission product calculations.
552 [ 1451 ]	$^{133}\text{Xe}$	N,GAMMA	1.0+1	5.0+4	20.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work.
553 [ 1856 ]	$^{135}\text{Xe}$	NONE! GAMMAS THR energy dist		<20 10-20%	2	2	KAP	Ehrlich, R. Radioactive target -9.2h. Accuracy 10 to 20% in spectrum. Spectra distribution of $\gamma$ rays is wanted for energies 1-8 MeV. Incident energy of neutron should be thermal needed for $\gamma$ -shielding and heating calculations $\gamma$ -resolution 10-20%.
554 [ 1855# ]	$^{135}\text{Xe}$	N,GAMMA	1. -3	2. +0	5	2	GGA ---	Nordheim, L.W. Radioactive target 9.3 hours. For design of thorium cycle reactors. Summer: AERE-R-116 (1962).
555 [ 1857 ]	$^{133}\text{Cs}$	N,GAMMA	1.0-3	1.0+0	10	1	GE BET ---	Snyder, T. Bayard, R.T. Thermal average, 0.025eV, and interval 0-1eV useful For fission product poison calculation. BNL-325,CN-23/74 Request apparently satisfied by old data.

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV) MIN	ACCURACY P MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
556 [1858]	$^{133}\text{Cs}$	N,GAMMA	0.5+0	1.0+3	10	1 GE BET BNL	Snyder, T. Bayard, R.T. Accuracy 10% in resonance integral. Energies above 1 eV of interest. For fission product poison calculation. BNL-325,CN-23/74 Request apparently satisfied by old data.	67
557 [1466]	$^{133}\text{Cs}$	N,GAMMA		1.0+3	20	2 AE	Hakansson, R. For energies below 1keV. Energy resolution 10% or better. Needed for fast reactor calculations.	69
558 [1467]	$^{133}\text{Cs}$	N,GAMMA	1. +7		20	2 AE	Hakansson, R. For energies above 1MeV. Energy resolution 10% or better. Needed for fast reactor calculations.	69
559 [1452]	$^{133}\text{Cs}$	N,GAMMA	1.0-3	1.0+1	10.0	2 JAE CRC	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. TID-22165 (1962). See Walker,W.H.,AECL-3037 (1969) part of request apparently satisfied by old data.	69
560 [1453]	$^{134}\text{Cs}$	N,GAMMA	1.0+1	5.0+4	25.0	2 JAE CRC	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work. See Walker,W.H.,AECL-3037 (1969) part of request apparently satisfied by old data.	69
561 [466]	$^{135}\text{Cs}$	RESON PARAMS gamma width neutronwidth	0. +3	5. +3	10	2 KPK KIL	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. Jung et al.: 70HELSINKI P/14(6/70), transm. < 1 keV.	
562 [1345]	$^{135}\text{Cs}$	N,GAMMA	1. +0	1. +7	10	2 AE	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. No activity known.	
563 [467]	$^{135}\text{Cs}$	N,GAMMA	5. +3	2. +6	10	2 KPK ---	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. No activity known.	
564 [468]	Ba	DIFF INELAST energy dist	4. +6	1. +7	5	1 PAR	Devillers, C. For shielding calculation. New evaluation to be done if new experimental data.	69
565 [470]	Ba	N,GAMMA	1. +4	1.0+5	20	2 BN ---	Tavernier, G. Activation of baryte concrete in fast reactors. No data available. No activity known.	
566 [2474]	$^{136}\text{Ba}$	N,GAMMA (res.param)	1.0+4	1.0+5	10.0	2 AUA	Symonds, J.L. P and d wave strength functions for fission product calculations and astrophysics.	69
567 [471]	$^{139}\text{La}$	RESON PARAMS gamma width	7.5+1	1.0+4	10	2 KPK COL SAC	Schmidt, J.J. Fission product important in fast reactor burnup calculations. Neutron widths sufficiently covered by Morgenstern (CEA-R 3609,1968) and by Shve et al. (Phy.Rev.159,1050 (1967)). No $\Gamma\gamma$ available. Camarda et al.,NCSAC-38 (1971) give $\Gamma_n$ . Morgenstern, NP A123,561 (1969). No $\Gamma\gamma$ available.	
568 [1346]	$^{139}\text{La}$	N,GAMMA	1. +0	1. +4	10	2 AE ANL	Hakansson, R. Energy resolution 10% or better. Needed for fast reactor calculations. Data for higher energies: Stupegia,D.C.+,JNE 22, 267(1968).	

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR	
			MIN	MAX	(%)					
569 [ 475 ]	$^{141}\text{Pr}$	RESON PARAMS gamma width	0.5.	+3	<15	3	BOL	Benzi, V. Single transition. BNL Fast Chopper Group has experiments in progress (1971) DUB Becvar reported data for 85-1500 eV (CZJ 19B 1307) BNL Chrien+ : WASH-1136 19(9/69), $\Gamma$ decay 219 and 235eV res		
570 [ 1347 ]	$^{141}\text{Pr}$	N,GAMMA	1.	+0	1.5+5	10	2	AE	Hakansson, R. Energy resolution 10% or better. Needed for fast reactor calculations. Data for higher energies: ANL Stupegia, D.C. +, JNE 22, 267 (1968). DUB Transmission meas. like in ZET 47, 43 (July 1964) (50...940eV) are certainly not accurate to 10%.	
571 [ 1454 ]	$^{143}\text{Pr}$	N,GAMMA	1.0-3	1.0+1	5.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. CJP 37 907 1959.	69	
572 [ 1455 ]	$^{143}\text{Pr}$	N,GAMMA	1.0+1	5.0+4	20.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work.	69	
573 [ 476 ]	$^{143}\text{Nd}$	RESON PARAMS	8.	+2	5. +3	10.0	2	KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available in this range. SAC Tellier, H., CEA-N-1459, EANDC-E 138/L, for 55eV-5.5 keV No values for $\Gamma_\gamma$ available. SAC Tellier+ : 71KNOX. p. 680, give strength function.	
574 [ 1859 ]	$^{143}\text{Nd}$	N,GAMMA	1.0-3	1.0+3	10	1	BET GE	Bayard, R.T. Snyder, T. Accuracy 10% in resonance integral. Energies above 1 eV of interest. Needed for fission product poison calculations. Energy 0-1eV, 10% in x-section. CRC Walker: AECL-3037 (9/68), recommends 325b for thermal, res.integ. = 60 b. GEL Rohrt+ : 71KNOX 743 (3/71), resolved resonance region. Request apparently satisfied.	67	
575 [ 1456 ]	$^{143}\text{Nd}$	N,GAMMA	1.0+0	5.0+4	20.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculations. NP 3 553 (1957).	70	
576 [ 1348 ]	$^{143}\text{Nd}$	N,GAMMA	8.5+2	1. +7	10	2	AE	Hakansson, R. Energy resolution 10% or better. Needed for fast reactor calculations. Several res. parameter sets exist which would give $\sigma(n,\gamma)$ below this energy with sufficient accuracy.		
577 [ 479 ]	$^{143}\text{Nd}$	N,GAMMA	5. +3	2. +6	10	2	KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. No activity known.		
578 [ 480 ]	$^{145}\text{Nd}$	RESON PARAMS	1.	+3	5. +3	10.0	2	KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. SAC Tellier, H., CEA-N-1459, EANDC-E 138/L, for 42.5eV-4.6keV No values for $\Gamma_\gamma$ available.	
579 [ 1860 ]	$^{145}\text{Nd}$	N,GAMMA	1.0-3	1.0+3	10	1	BET GE KAP	Bayard, R.T. Snyder, T. Ehrlich, R. Wanted for fission product calculations. Energies above 1eV of interest. Energy 0-1eV, 10% in x-section. Accuracy 10% in resonance integral. CRC Walker: AECL-3037 (9/68), recommends 40 b for thermal, res.integ. = 250b. GEL Rohrt+ : 71KNOX 743 (3/71), resolved resonance region. DUB Karzhavina JINR-P3-3564. Request apparently satisfied.	67	

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
580 [ 1349 ]	$^{145}\text{Nd}$	N, GAMMA	8.5+2	1. +7	10	2 AE	Hakansson, R. Energy resolution 10% or better. Needed for fast reactor calculations. Several res. parameter sets exist which would give $\sigma(n,\gamma)$ below this energy with sufficient accuracy.	
581 [ 483 ]	$^{145}\text{Nd}$	N, GAMMA	5. +3	2. +6	10	2 KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. KPK Measurements planned. GEL Measurements planned.	
582 [ 486 ]	$^{146}\text{Nd}$	N, GAMMA	5. +3	2. +6	10	2 KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. KPK Measurements planned. GEL Measurements planned.	
583 [ 487 ]	$^{147}\text{Nd}$	N, GAMMA	THR		350 b.	2 CRC	Walker, W.H. Fission product, unknown cross section. Note changed accuracy. Walker: AECL-3037 (1969), 50 b guessed value.	
584 [ 1862 ]	$^{147}\text{Nd}$	N, GAMMA	1.0-3	1.0+3	5-20%	1 KAP BET GE	Ehrlich, R. Bayard, R.T. Snyder, T. Radioactive target, 11 days. Thermal average or 0.025eV value wanted. Accuracy 20% if absorption X-sec in range 10-100 barns; 10% if in range 100-1000 barns 5% if larger. Above 1eV want resonance integral to 20% if in range 100-1000 barns; 10% if in range 1000-10000 barns 5% if larger. Decays to important fission product. Walker, W.H., AECL-3037 (1969) guess 50 b.	67
585 [ 2296 ]	$^{147}\text{Nd}$	N, GAMMA	1. -3	1. +3	5 at low E	RIS	Hoejerup, F. Wanted for fission product calculations.	71
586 [ 489 ]	$^{147}\text{Pm}$	RESON PARAMS gamma width neutronwidth	5.0+1	1. +3	10	2 KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. Petrel data between 20 eV and 100 keV in stage of analysis. MTR Tromp et al.: WASH-1136 50(9/69), fm 65 to 250 eV.	
587 [ 1143 ]	$^{147}\text{Pm}$	ABSORPTION	T. HR		10	2 WIN	Tyror, J.G. For thermal reactors. HAR Cabell: JIN 32 3433 (1970). HAR McMillan: in progress. CRC Howatt, Walker: CJP 49 108(1971). Evaluation needed. CRC See Walker, W.H., AECL-3037 (1969) Cabell, AERE-R6384 (1970). See also WASH-1124, 49 and RPI-328-171, 29. Request apparently satisfied.	68
588 [ 1144 ]	$^{147}\text{Pm}$	RES INT ABS	5.5-1	2. +6	10	2 WIN	Tyror, J.G. For thermal reactors. HAR Cabell: JIN 32 3433 (1970). HAR McMillan: in progress. CRC Howatt, Walker: CJP 49 108(1971). Evaluation needed. CRC See Walker, W.H., AECL-3037 (1969) Cabell, AERE-R6384 (1970). See also WASH-1124, 49 and RPI-328-171, 29. Request apparently satisfied.	
589 [ 1863 ]	$^{147}\text{Pm}$	N, GAMMA	1.0-3	1.0+3	10	1 BET GE	Bayard, R.T. Snyder, T. Radioactive target -2.6 year. Needed for calculation of fission product poisons. Want interval 0-1 eV to 10%. Above 1eV to 10% in resonance integral. Want total and n, $\gamma$ for formation of Pm-148 and Pm-148 M. Eiland, WASH 1079, has res. parameters. Coddington, WASH 1124 has res. parameters. Beery has data above 30 eV.	67

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
					CRC	Walker: AECL-3037 (9/68), possibly satisfies request.	
					HAR	Cabell: AERB-R6384 (1970). See also WASH-1124,49 and RPI-328-171,29. Request apparently satisfied.	
590 [ 2297 ]	1+7PM N,GAMMA	1. -3 1. +3	5	at low E	RIS	Hoejerup,P. Wanted for fission product calculations.	71
591 [ 1457 ]	1+7PM N,GAMMA	1.0+0 5.0+4	20.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculations. WASH 1064 1965, IADC 7864 1966, WASH 1074 68 1967, WASH 1079 98 1967.	70
592 [ 1145 ]	1+7PM N,GAMMA	1. +2 1. +6	20	(E-2E)	3 WIN	Campbell, C.G. For fast reactors.	68
593 [ 1350 ]	1+7PM N,GAMMA	1. +4 1. +7	10	2	AE	Hakansson, R. Energy resolution 10% or better. Needed for fast reactor calculations.	
594 [ 1458 ]	1+8PM N,GAMMA	1.0-3 1.0+1	5.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. IADC(UK)-75S 1966	69
595 [ 1864 ]	1+8PM N,GAMMA	1.0-3 1.0+3	10	1	BET GE	Bayard, R.T. Snyder, T. Calculation of fission product poisons Cross section is wanted for the 41 day isomer. <1 eV, 10% in s; >10 eV, 10% in R.I. Walker :AECL-3037, recommends 24 kb thermal. KAP Eiland, WASH 1071 eT to 2keV. KAP Kirovac G.J., WASH 1127 183 (1969). part of request apparently satisfied.	67
596 [ 1865 ]	1+8PM N,GAMMA	1.0-3 1.0+0	10	1	BET GE KAP	Bayard, R.T. Snyder, T. Ehrlich, R. X-sect. is wanted for the 5.4 d isomer. Value at 0.025 eV or thermal average wanted. Interval 0.001-1eV of interest. For fission product poison calculations. Is x-sect. 1/v above 1 eV? Since s is about 3kb, utility of the request will have to be discussed (Hanna G.C.)	67
597 [ 499 ]	1+8PM N,GAMMA	5. +0 5.0+2	20	3	CRC	Walker, W.H. For the isomeric state (42 d). Additional data needed to determine dependence on neutron temperature and epithermal flux.	
598 [ 1459 ]	1+8PM N,GAMMA	1.0+1 5.0+4	20.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. IADC 7864 1966. KAP Kirovac G.J., WASH 1127 183(1963).	69
599 [ 1866 ]	1+9PM N,GAMMA	1.0-3 1.0+3	20	1	BET GE KAP	Bayard, R.T. Snyder, T. Ehrlich, R. Radioactive target -53 hour. 0.025 eV value or thermal average wanted. For 0-1 eV want 20% if X-sec in range 10-1000 barns 10% if larger. Above 1eV want resonance integral to 20% if in range 1000-10000 barns, 10% if larger. CRC Howatt+:NBS-299 1291(1968), report 1000b. Since s is about 1.4 kb, utility of the request will have to be discussed (Hanna G.C.)	67
600 [ 1867 ]	1+9PM N,GAMMA	1.0-3 1.0+3	10	2	BET GE	Bayard, R.T. Snyder, T. Radioactive target 28 hour. Needed for calculation of fission product poisons 0.025eV or thermal average wanted. Interval 0-1eV of interest. Above 1eV want resonance Integral to 10% CRC Howatt+:NBS-299 1291(1968), report <700b. Since s is about 700 b, utility of the request will have to be discussed (Hanna G.C.)	67

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
601 [ 505 ]	Sm	RESON PARAMS gamma width	2. +2	<15	3 BOL BNL	Benzi, V. Accuracy 10% wanted. Single transition. Fast Chopper data on Sm <sup>149</sup> unpublished.		
602 [ 506 ]	Sm	DIFF ELASTIC	1.5+6	1.0+7	10	3 KFK	Schmidt, J.J. No measurements available.	
603 [ 507 ]	Sm	TOTINELASTIC TR	2. +6	20.0	3 KFK ANL	Schmidt, J.J. Measurements of A.B.Smith between .3 MeV and 1.5 MeV ( WASH-1093, p.1) in progress		
604 [ 508 ]	Sm	TOTINELASTIC	2.0+6	1.0+7	20	3 KFK ALD	Schmidt, J.J. Owens and Towle: Nucl.Phys. A112(1968) 337 measured at 5.6 and 7 MeV at 90°.	
605 [ 509 ]	Sm	DIFF INELAST TR energy dist	2. +6	20.0	3 KFK ANL	Schmidt, J.J. Measurement of A.B.Smith between .3 Mev and 1.5 MeV (WASH -1093,p.1) in progress.		
606 [ 510 ]	Sm	DIFF INELAST energy dist	2.0+6	1.0+7	20	3 KFK ALD	Schmidt, J.J. Owens and Towle: Nucl.Phys. A112(1968) 337 measured at 5.6 and 7 MeV at 90°.	
607 [ 1168 ]	Sm	ABSORPTION	1. -3	2. -1	1	2 WUR ---	Widder,F. Spectrum measurements in poisoned moderators. Measurements in progress in Switzerland.	
608 [ 511 ]	Sm	N,GAMMA	2. +5	2. +6	10.0	2 KFK ---	Schmidt, J.J. Only measurements of n-gamma cross section for <sup>154</sup> Sm by Johnsrud et al. (Phys.Rev.116(1959)927) Between 0.15 and 6.2 MeV available. No activity known..	
609 [ 2475 ]	<sup>144</sup> Sm	N2N XSECTION	1.4+7		10.0	3 KOS	Csikai, J. Needed for neutron activation analysis and cross sec- tion systematics. Incident energy resolution 200 keV. For reference see At.En.Rev.7(1969), 93.	69
610 [ 512 ]	<sup>147</sup> Sm	RESON PARAMS gamma width neutronwidth	1.0+2	5.0+2	10	2 KFK DUB MTR	Schmidt, J.J. Kvitek et al., NP A154, 177(1970) give J exp Pi, F $\gamma$ , f-alpha between 3.4 eV and 180 eV. Tromp et al.: WASH-1136 50(9/69), Fn 65 to 250 eV. Eiland : 71KNOX. gives strength function, measures resonances 0.01 eV to 1.2 keV, 127 resonances.	
611 [ 514 ]	<sup>148</sup> Sm	RESON PARAMS gamma width neutronwidth	1.0+2	5. +3	10	2 KFK AIN	Schmidt, J.J. No measurements available. Musgrove, AAECE-198 (1969), 1-100keV capture measur.	
612 [ 515 ]	<sup>149</sup> Sm	RESON PARAMS gamma width neutronwidth	1.0+2	5.0+2	10	2 KFK DUB	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. Kvitek+ : NP/A_154, 177 1970 give $\Gamma\gamma$ and $\Gamma$ -alpha to 100 eV.	
613 [ 2298 ]	<sup>149</sup> Sm	N,GAMMA	1. -3	1. +3	5 at low E	RIS	Hoejerup,P. Wanted for fission product calculations.	71
614 [ 1351 ]	<sup>149</sup> Sm	N,GAMMA	1. +0	1. +7	10	2 AE ORL	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. Needed for fast reactor calculations. No measurement known above 10eV except Macklin's point at 30keV.	

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P%	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
615 [516]	$^{149}\text{Sm}$	N,GAMMA	5. +2	2. +6	10	2 KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. KPK Measurements planned (20...200keV.)	
616 [517]	$^{150}\text{Sm}$	RESON PARAMS gamma width neutronwidth	1.0+2	5. +3	10	2 KPK	Schmidt, J.J.	
						AIN	Musgrove, AEFC/E-198 (1969), 1-100keV capture measur. Biland: 71KNOX gives strength function, measures 22 resonances to 1.6 keV.	
617 [1460]	$^{150}\text{Sm}$	N,GAMMA	1.0-3	1.0+1	5.0	1 JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work. CRC See Walker, W.H., AECL-3037 (1969) * part of request apparently satisfied by old data.	69
618 [1869]	$^{150}\text{Sm}$	N,GAMMA	1.0-3	1.0+3	5.0	1 BET GE	Bayard, R.T. Snyder, T. For calculation of fission product poisons. Above 1 eV want resonance integral to 2-5%. CRC Walker: AECL-3037(9/68), recommends 100b for thermal, res.integ. = 240b. KAP Biland+: 71KNOX 673 (3/71), strength function. * part of request apparently satisfied by old data.	67
619 [1461]	$^{150}\text{Sm}$	N,GAMMA	1.0+1	5.0+4	20.0	1 JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. NAT 197 370 1963, INDC 187E. CRC See Walker, W.H., AECL-3037 (1969) * part of request apparently satisfied by old data.	69
620 [520]	$^{151}\text{Sm}$	RESON PARAMS gamma width neutronwidth	5. +0	2.0+2	10	2 KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available.	
621 [1870]	$^{151}\text{Sm}$	N,GAMMA	1.0-3	1.0+3	5.0	1 BET GE KAP	Bayard, R.T. Snyder, T. Bhrlich, R. Radioactive target 90 year. Desired energy resolution 5%. Wanted for calculation of fission product poisons. Energies above 2eV of interest. Want resonance integral to 10%.	67
622 [1352]	$^{151}\text{Sm}$	N,GAMMA	1. +0	1. +7	10	2 AE	Hakansson, R. The requested accuracy is especially important in the resonance region. Energy resolution 10% or better. --- Needed for fast reactor calculations. No measurement known.	
623 [1146]	$^{151}\text{Sm}$	N,GAMMA	1. +2	1. +6	20 (E-2E)	3 WIN	Campbell, C.G. For fast reactors. --- No work planned.	68
624 [522]	$^{151}\text{Sm}$	N,GAMMA	2. +2	2. +6	10	2 KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available. --- No activity known.	
625 [523]	$^{152}\text{Sm}$	RESON PARAMS gamma width neutronwidth	1.0+2	5. +3	10	2 KPK COL	Schmidt, J.J. Fission product important in fast reactor burnup calculations. Camarda NCSAC-38 (1971) gives set on fm for $^{151}/^{153}\text{Eu}$ , to 100 ev. No by listed.	
626 [1462]	$^{152}\text{Sm}$	N,GAMMA	1.0-3	1.0+1	5.0	1 JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work. CRC See Walker, W.H., AECL-3037 (1969) Request apparently satisfied by old data.	69

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
627 [ 1872 ]	$^{152}\text{Sm}$	N, GAMMA	1.0-3	1.0+3	10	2 BET GE	Bayard, R.T. Snyder, T. Fission product poison. Above 1 ev want resonance integral to 10%. Below 1 ev want to 10%. Walker: AECL-3037 (9/68), recommends 206b for thermal, res.integ. = 3000b. Request apparently satisfied by old data.	67
628 [ 525 ]	$^{152}\text{Sm}$	N, GAMMA	5. +3	2. +6	10.0	2 KFK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. Chaubey (PR <u>152</u> , 1055, 1966) measured at 24kev. Measurements planned 20...200kev.	
629 [ 2306 ]	$^{152}\text{Sm}$	N, PROTON	1.6+7		10.0	3 JAE	Japanese Nuclear Data Committee (JNDC). For activation analysis. No measurements except at 14 Mev.	70
630 [ 526 ]	$^{153}\text{Sm}$	N, GAMMA	THB		10000 b.	3 CRC ---	Walker, W.H. Fission prod., unknown x-sect. Accuracy is for fission of Pu. Walker: AECL-3037 (1969), 50kb guessed value.	
631 [ 1873 ]	$^{153}\text{Sm}$	N, GAMMA	1.0-3	1.0+3	20	2 BET KAP	Bayard, R.T. Ehrlich, R. Radioactive target -47 h. For calculation of fission product poison, 10% error if X-sec is above 30.000 barns. Above 1 ev want resonance integral to 20% if in range 30-300 barns, 10% if larger.	67
632 [ 528 ]	$^{154}\text{Sm}$	RESON PARAMS gamma width neutronwidth	1.0+2	5. +3	10	2 KFK COL	Schmidt, J.J. Measurements of Karzhavina (INDC-260E; YFI-6, 135 (1968) cover only resonance energies below 1.9 keV. Casarda NCSAC-38 (1971) gives set on $\Gamma_n$ for $^{151}/^{153}\text{Eu}$ , to 100 eV. No $\Gamma_\gamma$ listed.	
633 [ 529 ]	Eu	TOTAL XSECT	1. +4	2. +6	5	2 KFK	Schmidt, J.J. No measurements available.	
634 [ 532 ]	Eu	DIFF ELASTIC	1. +5	1.0+7	10	3 KFK	Schmidt, J.J.	
635 [ 534 ]	Eu	TOTINELASTIC	3.0+4	2. +6	20	3 KFK	Schmidt, J.J.	
636 [ 535 ]	Eu	TOTINELASTIC	2. +6	1.0+7	20	3 KFK	Schmidt, J.J. No measurements available.	
637 [ 536 ]	Eu	DIFF INELAST energy dist	3.0+4	2. +6	20	3 KFK	Schmidt, J.J. No measurements available. Measurement of inelastic scattering to groups of levels desired.	
638 [ 537 ]	Eu	DIFF INELAST energy dist	2.0+6	1.0+7	20	3 KFK	Schmidt, J.J. No measurements available.	
639 [ 2384 ]	Eu	ABSORPTION	5. +2	1.5+7	5	3 CAD	Barre, J-Y. For fast reactor calculations. Evaluation may be sufficient.	71
640 [ 539 ]	Eu	N, GAMMA	2. +5	2. +6	10.0	2 KFK	Schmidt, J.J. Only measurements of activation cross-section for $^{151}\text{Eu}$ by Johnsrud et al. (Phys.Rev. <u>116</u> (1959) 927) Between 0.15 and 2.5 MeV available. No activity known.	
641 [ 540 ]	$^{151}\text{Eu}$	RESON PARAMS gamma width neutronwidth	2.0+1	2.0+2	10	2 KFK COL	Schmidt, J.J. No measurements available. Casarda NCSAC-38 (1971) gives set on $\Gamma_n$ for $^{151}/^{153}\text{Eu}$ , to 100 eV. No $\Gamma_\gamma$ listed.	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR		
642 [ 2478 ]	<sup>151</sup> Eu	ACTIVATION	1.0-3 1.0+1	5.0 2	ROS	Albert, D. Cross section data needed for evaluation of measured activation rates by means of foils (especially spectral indices) for thermal neutron fluxes.	69		
					MOL	Poortmans measured: expected accuracy of shape <3%; absolute accuracy of 5% at 20 meV - 0.6 eV. Isomeric ratio of bound level (and parameters) and of first two resonances determined, EANDC(E)-1150, 188. When analysis complete, request probably fulfilled.			
643 [ 541 ]	<sup>151</sup> Eu	ACTIVATION	5. -3 1. +1 < 5	1	MOL	Hotte, F. Accuracy 2%(thermal), 5% above. New measurements by Poortmans, Mol: Expected accuracy of shape better than 3%; absolute accuracy of 5% in the energy range from 20 meV to 0.6 eV. Isomeric ratio of bound-level (and parameters) and of the two first resonances are determined.( EANDC(E) 1150,188 ). When the analysis is complete, the request will probably be fulfilled.	66		
644 [ 1503 ]	<sup>151</sup> Eu	ACTIVATION	5. -3 1. +1 < 5	2	SAC	Bussac, J. Accuracy 2%(thermal), 5% above. New measurements by Poortmans, Mol: Expected accuracy of shape better than 3%; absolute accuracy of 5% in the energy range from 20 meV to 0.6 eV. Isomeric ratio of bound-level (and parameters) and of the two first resonances are determined.( EANDC(E) 1150,188 ). When the analysis is complete, the request will probably be fulfilled.	69		
645 [ 2476 ]	<sup>151</sup> Eu	ACTIVATION	0. +0 1.0+0	5.0 2	BUL	Christov, V. For activation detectors for thermal neutron flux determination.	69		
					MOL	Poortmans measured: expected accuracy of shape <3%; absolute accuracy of 5% at 20 meV - 0.6 eV. Isomeric ratio of bound level (and parameters) and of first two resonances determined, EANDC(E)-1150, 188. When analysis complete, request probably fulfilled.			
646 [ 2479 ]	<sup>151</sup> Eu	RES INT ACT	THR	1.0+4	5.0 2	ROS	Albert, D. Cross section data needed for evaluation of measured activation rates by means of foils (especially spectral indices) for thermal neutron fluxes.	69	
647 [ 2477 ]	<sup>151</sup> Eu	RES INT ACT	0. +0 1.0+0	5.0 2	BUL	Christov, V. For activation detectors for thermal neutron flux determination.	69		
648 [ 1874 ]	<sup>151</sup> Eu	N, GAMMA	1.0-3 1.0+3	< 5.0 2-5%	2	SRL	Dessauer, G. Accuracy 2% near thermal. Accuracy 5% in resonance region. For calculation of fission product poison. Energies greater than 1eV of interest to give resonance integral to 10%. LAS Glass has data above 40 eV WASH -1124. LRL Czirr: WASH-1124, reports data 0.1 - 15 keV.	67	
649 [ 542 ]	<sup>151</sup> Eu	N, GAMMA	1. -1 1. +3	1	2	SAC	Bussac, J.		
					KPK	KPK-352 gives graphs from 1eV to 50keV, and values at discrete energies from THR to 30keV ( J.J.Schmidt ) The experimental data are from Shapiro et.al., Bulletin des Informations, Zentrums fur Kerndaten, 1. Auflage, 1964 p 61. (No accuracy is given).			
					LAS	H.V.Harlow et.al. (68WASH,II,837) give graphs from 25 eV to 10 keV. (No accuracy given).			
650 [ 545 ]	<sup>153</sup> Eu	RESON PARAMS	2.5+1	2.0+2	10	2	KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available.	
		gamma width					COL	Canarda NCSAC-38 (1971) gives set on $\Gamma_n$ for <sup>151</sup> / <sup>153</sup> Eu, to 100 eV. No $\Gamma_\gamma$ listed.	

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REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
651 [1875]	$^{153}\text{Eu}$	N,GAMMA	1.0-3	1.0+3	< 5.0 2-5%	2	GE SRL LAS	Snyder, T. Dessauer, G. 2% Near thermal, 5% accuracy in resonance region. For calculation of fission product poison. Energies above 1eV of interest to give resonance integral to 10%. Glass has data above 40eV WASH -1124.	67
652 [546]	$^{153}\text{Eu}$	N,GAMMA	1. -1	1. +3	1	2	SAC KPK LAS	Bussac, J. KPK-352 gives graphs from 1eV to 50keV and values at discrete energies from THR to 30keV (J.J.Schmidt) The experimental data are from Shapiro et.al., Bulletin des Informations; Zentrums fur Kerndaten, 1.Auflage, 1964 p 61.(No accuracy is given). M.V.Barrow et.al. (68WASH,II,837) give graphs from 25eV to 10keV .(no accuracy given).	
653 [1353]	$^{153}\text{Eu}$	N,GAMMA	1. +4	1. +7	10	2	AE COL DUB LAS	Hakansson, R. Energy resolution 10% or better. Needed for fast reactor calculations. Nevis Cyclotron meas. from 1ev to 50keV is being analysed for res. params. Preliminary values of $\Gamma$ and $g_{fn}$ are given in WASH-1127 p.35 from 0.5 to 100ev. The capture meas. reported in Yad.Piz.7,493 (Feb.1968) is in good agreement with others. Bomb meas. results given at Washington Conf.1968 have a relative precision of at least 8%.	
654 [1463]	$^{154}\text{Eu}$	N,GAMMA	1.0-3	1.0+1	10.0	2	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work.	69
655 [1877]	$^{154}\text{Eu}$	N,GAMMA	1.0-3	1.0+3	10	2	BET GE	Bayard, R.T. Snyder, T. Radioactive target -16y. Resonance parameters wanted for the calculation of fission product poisons. Resonance integral wanted to 10%. Interval above 1eV of interest.	67
656 [1464]	$^{154}\text{Eu}$	N,GAMMA	1.0+1	5.0+4	25.0	2	JAE	Japanese Nuclear Data Committee (JNDC). Fission product in burnup calculation. No active work.	69
657 [1424]	$^{155}\text{Eu}$	RESON PARAMS	0. +0	2. +2	10.0	2	KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available.	
658 [1879]	$^{155}\text{Eu}$	N,GAMMA	1.0-3	1.0+3	10	2	BET GE HMG	Bayard, R.T. Snyder, T. Radioactive target -1.8y. Res.param, needed to calculate fission product poisons Resonance integral wanted to 10%. Carpenter+: plans for thermal and resonance integral. See FANDC(Can)-42 + part of request apparently satisfied.	67
659 [2299]	$^{155}\text{Eu}$	N,GAMMA	1. -3	1. +3	5 at low E	RIS	Hoejerup,F. Wanted for fission product calculations.	71	
660 [1425]	$^{155}\text{Eu}$	N,GAMMA	2. +2	2. +6	10	2	KPK	Schmidt, J.J. Fission product important in fast reactor burnup calculations. No measurements available.	
661 [554]	$^{156}\text{Eu}$	N,GAMMA	THR		700 b	3	CRC CRC	Walker, W.H. Fission product, unknown cross section. Note changed accuracy (for fission of Pu). Walker: AECL-3037(1969), 2kb guessed value.	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
662 [ 556 ]	Gd	RESON PARAMS gamma width see comment	0 2.	+2	<15	3 BOL ---	Benzi, V. Partial widths for single gamma rays are requested. Several laboratories are obtaining partial widths: BNL (Fast Chopper), Dubna, Kurchatov. For specific references see the Neutron Capture $\gamma$ -Ray Newsletter (last issue CGN/11 July 1971, edited by Earle and Lane of Chalk River). Data obtainable by private communication if unpublished. CCP Danelyan et al.: ZET 54 401(2/68), gamma spectra for 10 res. of $^{155}\text{Gd}$ between 6 and 43 eV. GEL Cocev + : measurements under way.
663 [ 557 ]	Gd	DIFF ELASTIC	1.5+6	1.0+7	10	3 KPK ---	Schmidt, J.J. Desired error in $\langle 1-\cos\theta \rangle$ .
664 [ 1880# ]	Gd	DIFF ELASTIC	1.5+6	1. +7	10	1 GE ANL	Snyder, T. Desired error in $\langle 1-\cos\theta \rangle$ . Sherwood +: NSE 39 67(1/70), to 1.5 MeV.
665 [ 1881# ]	Gd	EMISS XSECT energy,angle	1.5+6	1. +7	15	1 GE ---	Snyder, T. For design of thermal reactors having appreciable quantities of Gd. Incident and exit resolution 15%. Status: See REG 1880 above.
666 [ 560 ]	Gd	TOTINELASTIC THR	2. +6	20.0	3	KPK ANL	Schmidt, J.J. Measurements of A.B.Smith between .3 and 1.5 MeV Sherwood et al.: NSE 39 67 (1/70).
667 [ 561 ]	Gd	TOTINELASTIC	2. +6	1. +7	20.0	3 KPK	Schmidt, J.J. Measurements available for some energies between 4 and 7 MeV from Hollandsworth and from Owens and Towle (NP A112, 337, 1968) for 5.6 and 7 MeV at 90°
668 [ 562 ]	Gd	DIFF INELAST THR energy dist	2. +6			3 KPK ANL	Schmidt, J.J. Sherwood et al.: NSE 39 67 (1/70).
669 [ 563 ]	Gd	DIFF INELAST energy dist	2. +6	1. +7	20.0	3 KPK ALD	Schmidt, J.J. Measurements available for some energies between 4 and 7 MeV from Hollandsworth and from Owens and Towle (NP A112, 337, 1968) for 5.6 and 7 MeV at 90°.
670 [ 1884 ]	Gd	RES INT CAPT	0.5+0		5.0	1 GE GA	Snyder, T. For evaluating resonance parameters. See BANDC(US)-143 63 (1970). Request apparently satisfied.
671 [ 566 ]	Gd	N,GAMMA	1. +5	2. +6	10	2 KPK GA	Schmidt, J.J. Friesenhahn +, NP A146 (1970) 337, report $\sigma(n,\gamma)$ , individual and average res. params. for $^{155}/^{157}\text{Gd}$ and natural Gd between 3 eV and 750 keV. Fricke: NCSAC-31, average x-sect.
672 [ 1885 ]	$^{154}\text{Gd}$	RESON PARAMS gamma width neutronwidth	2.0+3	10	1	GE COL DUB GA IFU	Snyder, T. Min.energy to include lowest resolved resonance. Want resolved region extended to higher energy. Required to verify existing measurements. Columbia has data, 304 levels to 2 keV. No $\Gamma_n$ listed: NCSAC-33. Karzhavina et al.: DUB-P3-3882(6/68) (transl: INDC- 260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 180eV; errors > requested. Friesenhahn et al.: NP/A 146 337(5/70), res.params. derived below 200eV. Vertebny +: UPZ 13 2085(D/68). This request may be satisfied for $\Gamma_n$ up to 200 eV.
673 [ 1888 ]	$^{155}\text{Gd}$	RESON PARAMS gamma width neutronwidth	5.0+2	10	1	GE ---	Snyder, T. Required to verify existing measurements. Min. must include lowest resolved resonance. This request may be satisfied by recent GA, BNL data. BNL Mughabghab: PR 180 1131(1969). GA Friesenhahn et al.: NP/A 146 337(5/70), res.params. derived below 200eV. SAC Julien +: NP/A 132 129 (1969). SAC Ribon: CEA-N-1149(1969). DUB Karzhavina et al.: DUB-P3-3882(6/68) (transl: INDC-

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV) MIN	ACCURACY P MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
674 [ 567 ]	$^{155}\text{Gd}$	RESON PARAMS gamma width neutronwidth	5.0+1	2.0+2	10 2	KPK Schmidt, J.J. --- BNL Mughabghab+: PR 180 1131(1969). SAC Julien+: NP/A 132 129 (1969). SAC Ribon: CEA-N-1149 (1969). DUB Karzhavina et al.: DUB-P3-3882 (6/68) (transl: INDC-260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 180eV; errors > requested. GA Friesenhahn et al.: NP/A 146 337(5/70), res.params. derived below 200eV.	
675 [ 1887 ]	$^{155}\text{Gd}$	RES INT CAPT	0.5+0	5.0	1 GE	Snyder, T. For evaluating resonance parameters. See FANDC(US)-143 63 (1970). Request apparently satisfied.	69
676 [ 1886 ]	$^{155}\text{Gd}$	N,GAMMA	0.5+0	1.0+3	5.0 1	GE Snyder, T. Accuracy 5% in resonance integral. Energies above 1 ev of interest. GA Friesenhahn+: WASH-1136 33(9/69), res.par. to 200 eV. GA See EANDC(US)-143 63 (1970). Request apparently satisfied.	67
677 [ 1891 ]	$^{156}\text{Gd}$	RESON PARAMS gamma width neutronwidth	2.0+3	5.0	1 GE	Snyder, T. Min.energy to include lowest resolved resonance. Required to verify existing measurements. --- To reach 5% accuracy will require developement. BNL Mughabghab+: PR 180 1131(1969). DUB Karzhavina et al.: DUB-P3-3882 (6/68) (transl: INDC-260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 300 eV; error > requested.	69
678 [ 569 ]	$^{156}\text{Gd}$	RESON PARAMS gamma width neutronwidth	1.5+3	5. +3	10 2	KPK Schmidt, J.J. Res.params. published by Karzhavina et al. (YFI-6 135 (1968); DUB-03-3882, english transl: INDC-260E/69) cover most resonances below 1.5keV, but with errors much larger than the requested accuracy. --- To reach 5% accuracy will require developement. BNL Mughabghab+: PR 180 1131(1969). DUB Karzhavina et al.: DUB-P3-3882 (6/68) (transl: INDC-260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 300 eV; error > requested.	
679 [ 1890 ]	$^{156}\text{Gd}$	RES INT CAPT	0.5+0	5.0	1 GE	Snyder, T. For evaluating resonance parameters. DUB See JINR-P3-3882.	69
680 [ 1889 ]	$^{156}\text{Gd}$	N,GAMMA	1.0-3	1.0+3	5.0 1	GE Snyder, T. In range 0.001-1 ev 5% accuracy is wanted. Above 1ev want to calculate resonance integral to 5% DUB For calculating of burn up in thermal reactors. See JINR-P3-3882.	67
681 [ 571 ]	$^{157}\text{Gd}$	RESON PARAMS	0. +0	2.	10 2	KPK Schmidt, J.J. --- This request may be satisfied by recent GA, BNL data. BNL Mughabghab+: PR 180 1131(1969). GA Friesenhahn et al.: NP/A 146 337(5/70), res.params. derived below 200eV. SAC Julien+: NP/A 132 129 (1969). SAC Ribon: CEA-N-1149 (1969). DUB Karzhavina et al.: DUB-P3-3882 (6/68) (transl: INDC-260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 300eV; errors > requested.	
682 [ 1894 ]	$^{157}\text{Gd}$	RESON PARAMS gamma width neutronwidth	1.0+3	10	1 GE	Snyder, T. Min.energy to include lowest resolved resonance. Required to verify existing measurements. --- This request may be satisfied by recent GA, BNL data. BNL Mughabghab+: PR 180 1131(1969). GA Friesenhahn et al.: NP/A 146 337(5/70), res.params. derived below 200eV. SAC Julien+: NP/A 132 129 (1969). SAC Ribon: CEA-N-1149 (1969). DUB Karzhavina et al.: DUB-P3-3882 (6/68) (transl: INDC-260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 300eV; errors > requested.	69

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REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
683 [1893]	$^{157}\text{Gd}$	RES INT CAPT 0.5+0			1	GE	Snyder, T. For evaluating resonance parameters. See EANDC(US)-143 63 (1970). Request apparently satisfied.	69	
						GA			
684 [2300]	$^{157}\text{Gd}$	N, GAMMA	1. - 3	1. +3	5	RIS	Hoejerup, F. Wanted for fission product calculations.	71	
			at low E						
685 [1892]	$^{157}\text{Gd}$	N, GAMMA	0.5+0	1.0+3	5.0	1	GE	Snyder, T. To yield 5% in calculated resonance integral. For calculation of burn up in thermal reactors. Energies above 1 eV of interest. Friesenhahn+: WASH-1136 33 (9/69), res.par. to 200 eV. Sherwood+: NSE 39 67 (1/70), to 1.5 MeV. See EANDC(US)-143 63 (1970). Request apparently satisfied.	67
						GA			
						ANL			
						DUB			
686 [1897]	$^{158}\text{Gd}$	RESON PARAMS gamma width neutronwidth	2.0+3	10	1	GE	Snyder, T. Min.energy to include lowest resolved resonance. Required to verify existing measurements. This request may be satisfied by recent GA, BNL data. Mughabghab+: PR 180 1131(1969). Karzhavina et al.: DUB-P3-3882 (6/68) (transl: INDC- 260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 300 eV; error > requested. Camarda et al.: WASH-1136 28 (9/69), analysis t.b.c. measurements up to 50keV. Rahn+: NCSAC-33(1970), new data.	69	
						BNL			
						DUB			
						COL			
687 [573]	$^{158}\text{Gd}$	RESON PARAMS gamma width neutronwidth	2.4+3	5. +3	10	2	KPK	Schmidt, J.J. Res.params. published by Karzhavina et al. (YPI-6 135 (1968); DUB-03-3882, english transl: INDC-260E/69) cover most resonances below 2.4keV, but with errors much larger than the requested accuracy. Note nevertheless that Emin is now 2.4 keV. This request may be satisfied by recent GA, BNL data. Mughabghab+: PR 180 1131(1969). Karzhavina et al.: DUB-P3-3882 (6/68) (transl: INDC- 260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 300 eV; error > requested. Camarda et al.: WASH-1136 28 (9/69), analysis t.b.c. measurements up to 50keV.	67
						BNL			
						DUB			
688 [1896]	$^{158}\text{Gd}$	RES INT CAPT 0.5+0			5.0	1	GE	Snyder, T. For evaluating resonance parameters. See JINR-P3-3882.	69
						DUB			
689 [1895]	$^{158}\text{Gd}$	N, GAMMA	1.0-3	1.0+0	5.0	1	GE	Snyder, T. In range 0.001-1 eV 5% accuracy is wanted. Above 1 eV want R.I. to 5%. For calculation of burnup in reactors. Rahn+: NCSAC-33(1970), new data.	67
						COL			
						DUB			
690 [2307]	$^{158}\text{Gd}$	N, PROTON	1.6+7	10.0	3	JAE	Japanese Nuclear Data Committee (JNDC). For activation analysis. No measurements except at 14 MeV.	70	
						---			
691 [1899]	$^{160}\text{Gd}$	RESON PARAMS gamma width neutronwidth	2.0+3	10	1	GE	Snyder, T. Min.energy to include lowest resolved resonance. Required to verify existing measurements. Mughabghab+: PR 180 1131(1969). Karzhavina et al.: DUB-P3-3882 (6/68) (transl: INDC- 260E/69), $\Gamma$ , $\Gamma_n$ , $\Gamma_\gamma$ below 300 eV; error > requested.	69	
						BNL			
						DUB			
692 [575]	$^{160}\text{Gd}$	RESON PARAMS gamma width neutronwidth	2.7+3	5. +3	10	2	KPK	Schmidt, J.J. Res.params. published by Karzhavina et al. (YPI-6 135 (1968); DUB-03-3882, english transl: INDC-260E/69) cover most resonances below 2.7keV, but with errors much larger than the requested accuracy. Mughabghab+: PR 180 1131(1969).	69
						BNL			

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
693 [ 1898 ]	$^{160}\text{Gd}$	RES INT CAPT	0.5+0	5.0	1 GE	Snyder, T. For evaluating resonance parameters.	69	
694 [ 576 ]	$^{159}\text{Tb}$	RESON PARAMS gamma width	0 2. +2 <15	3 BOL BNL	Benzi, V. Partial gamma widths. Chrien has unpublished data.			
695 [ 579 ]	$^{161}\text{Dy}$	RESON PARAMS gamma width	0 2. +2 <15	3 BOL BNL	Benzi, V. Partial gamma widths. Chrien has unpublished data.			
696 [ 2480 ]	$^{164}\text{Dy}$	N,GAMMA	1.0-3 1.0+1	5.0	2 ROS IFU	Albert, D. Cross section data needed for evaluation of measured activation rates by means of foils (especially spectral indices) for thermal neutron fluxes. Vertebny measured 0.01 - 10 eV, AIEA CN-26/87.	69	
697 [ 580 ]	$^{164}\text{Dy}$	N,GAMMA	2. +0 2.5+2	5	2 WUR ---	Brunner, J. Formation of 139 min $^{165}\text{Dy}$ for thermal flux measurements. Between thermal and 10 eV measurements are planned in Switzerland.		
698 [ 582 ]	$^{165}\text{Ho}$	RESON PARAMS gamma width	0 2. +2 <15	3 BOL RPI BNL	Benzi, V. Partial gamma widths. Tatarczuk et al.: WASH-1136 118 (9/69). Chrien et al.: WASH-1136 16 (9/69).			
699 [ 583 ]	Er	RESON PARAMS gamma width	0 2. +2 <15	3 BOL BNL GEL	Benzi, V. Partial gamma widths. Chrien has unpublished data. Coceva+ : has data TBP			
700 [ 2308 ]	$^{166}\text{Er}$	N,PROTON	1.6+7	10.0	3 JAE ---	Japanese Nuclear Data Committee (JNDC). For activation analysis. No measurements except at 14 MeV.	70	
701 [ 2309 ]	$^{166}\text{Er}$	N,PROTON	1.6+7	10.0	3 JAE ---	Japanese Nuclear Data Committee (JNDC). For activation analysis. No measurements except at 14 MeV.	70	
702 [ 2481 ]	$^{166}\text{Er}$	N,ALPHA	THR	10.0	3 KOS CCP	Csikai, J. For neutron activation analysis and cross section systematics wanted. Ionisation chamber measurement available from Andreev, IF 1(1965), 252.	69	
703 [ 587 ]	$^{169}\text{Tb}$	RESON PARAMS gamma width	1.3+2 2. +2 <15	3 BOL BNL GEL	Benzi, V. Partial gamma widths given by Lonet, PR 174 1512 (1968) cover region up to 136 eV. More data are needed to improve statistical accuracy. Chrien has new data. See Albany Conf. 1971. See also: WASH-1136 16 (9/69). Coceva+ : has data TBP			
704 [ 1516 ]	$^{169}\text{Tb}$	N2N XSECTION TR	1.5+7	5	1 BRC ALD IRK	Laubuge, M. Activation detector. ( $\text{Tm}^{168}(85d)$ ). Mather measured at 14 MeV. Measurements planned at 9 and 12.3 MeV. Winkler has measured between 14 and 15 MeV (O A W S 177, 323 (1969))	69	
705 [ 1903# ]	$^{169}\text{Tb}$	N,GAMMA	THR	1. +3	5	1 BNW SAC SAC COL	Leonard, B.R. For production and burnup of thulium. Julien: CEA-R-3385, gives res.param. to 760 eV. Tellier+: 71KNOX 680(3/71), analysis of $\sigma$ total. Rahn+: NCSAC-33 (1970), new data.	67
706 [ 1519 ]	$^{169}\text{Tb}$	N,GAMMA	1. +2 1.5+7	10	1 BRC	Laubuge, M. Activation detector. ( $\text{Tm}^{170}(130d)$ ).	69	

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
707 [1517]	$^{169}\text{Tm}$	N,PROTON	TR	1.5+7	10	2	BRC Laubuge, M. Activation detector. ( $\text{Er}^{169}(9.4\text{d})$ ).	69
708 [1518]	$^{169}\text{Tm}$	N,ALPHA	TR	1.5+7	10	2	BRC Laubuge, M. Activation detector. ( $\text{Ho}^{166}(27\text{h})$ ).	69
709 [1904#]	$^{170}\text{Tm}$	N,GAMMA	THR	1. +3	10	1	BNW Leonard, B.R. SRL Dessauer, G. Radioactive target 125 day. For production and burnup of thulium. ANC Stokes: has totals to 1 keV, res.pars. to 100 eV. RIS Sees four lines from neutron capture on $\text{Tm}^{170}$ at thermal. PR 143 857.	67
710 [1905#]	$^{171}\text{Tm}$	N,GAMMA	THR	1. +3	10	1	BNW Leonard, B.R. SRL Dessauer, G. Radioactive target 1.9 year. For production and burnup of thulium. ANC Simpson: has some res.pars. to 60 eV.	67
711 [2482]	$^{168}\text{Yb}$	ACTIVATION	0. +0	1.0+0	5.0	2	BUL Christov, V. For activation detectors for thermal neutron flux determination.	69
712 [2483]	$^{168}\text{Yb}$	RES INT ACT	0. +0	1.0+0	5.0	2	BUL Christov, V. For activation detectors for thermal neutron flux determination. CNE Ricabarra measured, AIEA CN-26/1.	69
713 [2310]	$^{174}\text{Yb}$	N,PROTON		1.6+7	10.0	3	JAE Japanese Nuclear Data Committee (JNDC). For activation analysis. No measurements except at 14 MeV.	70
714 [591]	$^{175}\text{Lu}$	RESON PARAMS total width gamma width	4.0+0	2.0+1	2	2	MOL Motte, F. Needed for hard thermal neutron spectra studies by the dilute foil. 2% at 5.2 and 14.1 eV. and 10% elsewhere. COL Camarda et al.: WASH-1136 28 (9/69), analysis t.b.c. No new data in the requested range. Columbia has data at higher energies, but not published (NCSAC-31). Preliminary data at Sigma Center.	
715 [1385]	$^{175}\text{Lu}$	N2N XSECTION TR	1.5+7	10	1	VNV Cardot, M. Activation detector. Production of $^{174}\text{Lu}(165\text{d})$ . ALD Coles plans measurements between 9 and 12.3 MeV .	68	
716 [592]	$^{175}\text{Lu}$	ACTIVATION	5. -3	1.0+1	< 5	1	MOL Motte, F. Accuracy 2% thermal, 5% above, needed for hard thermal neutron studies by dilute foil activation. Thermal value ( $16.4 \pm 0.9$ ) b reported by Fabry: (EANDC(E) 1150, 195 (1969)).	
717 [593]	$^{175}\text{Lu}$	ACTIVATION	5. -3	2.5+2	< 5	2	WUR Brunner, J. Accuracy 2% thermal; 5% above. Neutron "thermometer" Measurements planned in Switzerland between 0.005 and 10eV.	
718 [1504]	$^{175}\text{Lu}$	ACTIVATION	5. -3	1.0+1	< 5	1	SAC Bussac, J. Accuracy 2% thermal, 5% above. MOL Thermal value ( $16.4 \pm 0.9$ ) b reported by Fabry: (EANDC(E) 1150, 195 (1969)).	
719 [1386]	$^{175}\text{Lu}$	N,GAMMA	1. +3	1. +6	20	2	VNV Cardot, M. Activation detector. Production of $\text{Lu}^{176}(3.10 \pm 0 \text{ Y.})$ and $\text{Lu}^{176m}(3.7\text{h})$ . Discrepancy at 10keV (2.5 and 7b).	68
720 [1387]	$^{176}\text{Lu}$	N2N XSECTION TR	1.5+7	10	3	VNV Cardot, M. ALD Coles plans measurements between 9 and 12.3 MeV .	68	

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
721 [ 594 ]	$^{176}\text{Lu}$	ACTIVATION	5. -3	2.5+2	< 5	2 WUR	Brunner, J. Accuracy 2% thermal; 5% above. Neutron "thermometer" Measurements planned in Switzerland between 0.005 and 10eV.
722 [ 2486 ]	$^{176}\text{Lu}$	ACTIVATION	0. +0	1.0+0	5.0	2 BUL	Christov, V. For activation detectors for thermal neutron flux determination.
723 [ 2485 ]	$^{176}\text{Lu}$	RES INT ACT	THR	1.0+4	5.0	2 ROS	Albert, D. Cross section data needed for evaluation of measured activation rates by means of foils (especially spec- tral indices) for thermal neutron fluxes.
724 [ 2487 ]	$^{176}\text{Lu}$	RES INT ACT	0. +0	1.0+0	5.0	2 BUL	Christov, V. For activation detectors for thermal neutron flux determination.
725 [ 2484 ]	$^{176}\text{Lu}$	N,GAMMA	1.0-3	1.0+1	5.0	2 ROS	Albert, D. Cross section data needed for evaluation of measured activation rates by means of foils (especially spec- tral indices) for thermal neutron fluxes.
726 [ 1388 ]	$^{176}\text{Lu}$	N,GAMMA	1. +3	1. +6	20	3 VNV	Cardot, M. Production of $^{177}\text{Lu}$ (6.2d).
727 [ 595 ]	Hf	TOTAL XSECT	3. +3	5.0+4	5	2 KFK	Schmidt, J.J. No measurements available.
728 [ 1906# ]	Hf	DIFF ELASTIC	1.5+6	1. +7	10	2 BET	Bayard, R.T. E-resolution: 10%. Accuracy 10% in $(1-\cos\theta)$ . Wanted for thermal reactor design. ANL Sherwood+: NSE 39 67(1/70), data to 1.5 Mev.
729 [ 1907# ]	Hf	EMISS XSECT energy dist	1.5+6	1. +7	15	2 BET	Bayard, R.T. For design of thermal reactors having appreciable quantities of Hf. Incident and exit energy resolutions 15%. Status: See REG 1906 above.
730 [ 600 ]	Hf	TOTINELASTIC	2. +6	1.0+7	20	3 KFK	Schmidt, J.J. No measurements available.
731 [ 603 ]	Hf	DIFF INELAST	2. +6	1.0+7	20	3 KFK	Schmidt, J.J. No measurements available.
732 [ 1908# ]	Hf	N,GAMMA	1. -3	1. +0	2	1 BET KAP PAR	Bayard, R.T. Ehrlich, R. Needed for monte carlo calculations of burnup in thermal reactors. Carre' and Vidal CN-23/74 (1966).
733 [ 2189 ]	Hf	N,GAMMA	2.0+2	5.0+4	20	2 BET	Bayard, R.T. Needed for Monte Carlo calculations of burn up in thermal reactors,<1 eV .S-wave strength functions are wanted to 20%,< 1 eV .For fast reactor calculations including burn-up > 200 eV.
734 [ 607 ]	Hf	N,GAMMA	2. +5	2. +6	10.0	2 KFK BN	Schmidt, J.J. Tavernier, G. Only measurements of ACT xsect of $^{180}\text{Hf}$ by Miskel et al. (UCRL-5454, 1959; UCRL-6690, 1961) between 30 kev and 4MeV available. Tavernier requests 20% accuracy and priority 3 for fast reactor calculations. No activity known.
735 [ 1909 ]	$^{174}\text{Hf}$	N,GAMMA	1.0-3	5.0+3	<20 also see comment.	1 KAP	Ehrlich, R. Thermal value wanted to 20%. 10-100 eV , $\Gamma_{tot}, \Gamma_n$ and $\Gamma_\gamma$ to 10%. 0.1-5 keV , $\Gamma_{tot}, \Gamma_n$ and $\Gamma_\gamma$ to 20%. Needed for Monte Carlo burn up calculations. See BNL-325. * part of request apparently satisfied by old data.

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB REQUESTER	COMMENTS	YEAR
736 [610]	$^{176}\text{Hf}$	RESON PARAMS	1. +3 5. +3	10.0 2	KPK	Schmidt, J.J. RPI measurements cover range below 1keV.	
737 [1910]	$^{176}\text{Hf}$	N,GAMMA	1.0-3 5.0+3	20 also see comment.	BET KAP	Bayard, R.T. Ehrlich, R. Detailed accuracies as stated below: thermal value wanted to 20%. 10-100 eV, $\Gamma_{tot}, \Gamma_n$ and $\Gamma_y$ to 10%. 0.1-5 keV, $\Gamma_{tot}, \Gamma_n$ and $\Gamma_y$ to 20%. P-wave $\Gamma_y$ average, to 20%. S-wave strength function to 40%. Needed for Monte Carlo burn up calculations. RPI Kirouac et al, data to 100 eV . WASH -1127.	62
738 [1911]	$^{177}\text{Hf}$	N,GAMMA	1.0-3 5.0+3	<20 also see comment.	BET KAP	Bayard, R.T. Ehrlich, R. Detailed accuracies as stated below: less than 1 eV to 4%. 10-100eV , $\Gamma_{tot}, \Gamma_n$ , and $\Gamma_y$ to 10%. 0.1-5keV , $\Gamma_{tot}, \Gamma_n$ , and $\Gamma_y$ to 20%. 5.89, 6.57, and 8.87 eV resonance widths to 5% 1.099 and 2.385 eV resonance widths to 3%. S-wave strength function to 20%. Needed for Monte Carlo burn up calculations. Need average P-wave capture width to 20%. RPI Kirouac et al, data to 100 eV . WASH -1127.	62
739 [613]	$^{177}\text{Hf}$	N,GAMMA	1. -1 1. +3	1 for thr. 5%: res.int.	SAC KAP	Reuss, P. Evaluation may suffice if it explains discrepancies.	69
						J.T.Reynolds et.al. give graphs and tables of evaluated cross-sections from 0.001eV to 15 MeV (KAPL-3327)	
740 [615]	$^{178}\text{Hf}$	RESON PARAMS	1. +3 5. +3	10.0 2	KPK	Schmidt, J.J. RPI measurements cover range below 1keV.	
741 [1912]	$^{178}\text{Hf}$	N,GAMMA	1.0-3 5.0+3	see comment.	BET KAP	Bayard, R.T. Ehrlich, R. Detailed accuracies as stated below: less than 1eV to 5%. 10-100 eV, $\Gamma_{tot}, \Gamma_n$ , and $\Gamma_y$ to 10%. 0.1-5keV , $\Gamma_{tot}, \Gamma_n$ , and $\Gamma_y$ to 20%. P-wave $\langle\Gamma_y\rangle$ to 20%. 7.78-eV resonance width to 3%. S-wave strength function to 20%. Needed for Monte Carlo burn up calculations. RPI Kirouac et al,data to 100 eV WASH -1127.	62
742 [616]	$^{178}\text{Hf}$	N,GAMMA	1. -1 1. +3	1 for thr. 5%: res.int.	SAC KAP	Reuss, P. Evaluation may suffice if it explains discrepancies.	69
						J.T.Reynolds et.al. give graphs and tables of evaluated cross-sections from 0.001eV to 15 MeV (KAPL-3327)	
743 [2488]	$^{179}\text{Hf}$	N,GAMMA	THR	1.0+1 5.0	2 CHF	Chien, J.P. Capture reaction leading to $\text{Hf}^{180}$ metastable state at 1.143 MeV with 5.5 h half life required. No measurements available. Needed for reactor control rod design.	69
744 [1913]	$^{179}\text{Hf}$	N,GAMMA	1.0-3 5.0+3	see comment.	1 BET KAP	Bayard, R.T. Ehrlich, R. Detailed accuracies as stated below: less than 1eV to 5%. 10-100eV , $\Gamma_{tot}, \Gamma_n$ , and $\Gamma_y$ to 10%. 0.1-5keV , $\Gamma_{tot}, \Gamma_n$ and $\Gamma_y$ to 20%. P-wave $\Gamma_y$ wanted to 20%. 5.68-eV resonance widths to 5%. S-wave strength function to 20%. Needed for Monte Carlo burn up calculations. RPI Kirouac et al, data to 100eV WASH -1127.	62

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR
			MIN	MAX	(%)				
745 [ 619 ]	$^{179}\text{Hf}$	N, GAMMA	1. -1	1. +3	1	2	SAC KAP	Reuss, P. Evaluation may suffice if it explains discrepancies. for thr. 5%: res.int.	69
746 [ 621 ]	$^{180}\text{Hf}$	RESON PARAMS	1. +3	5. +3	10.0	2	KPF	Schmidt, J.J. RPI measurements cover range below 1keV.	
747 [ 2489 ]	$^{180}\text{Hf}$	DIFF INELAST angular dist see comment	1.0+5	2.0+6	20	2	CHF	Chien, J.P. Diff. inelastic scattering CS of $\text{Hf}^{180}$ metastable ( $n, n'$ ) as function of energy of scattered neutron wanted. No measurements available. Needed for neutron conversion experiment (to convert thermal into fast neutrons). 10-30% Accuracy required.	
748 [ 2490 ]	$^{180}\text{Hf}$	DIFF INELAST energy dist	1.0+5	2.0+6	20	2	CHF	Chien, J.P. No measurements available. Wanted for reactor design. 10-30% Accuracy required.	
749 [ 1914 ]	$^{180}\text{Hf}$	N, GAMMA	1.0-3	5.0+3	see comment.	1	BET KAP	Bayard, R.T. Ehrlich, R. Detailed accuracies as stated below: less than 1eV: to 4% 10-100eV, $\Gamma_{tot}, \Gamma_n$ , and $\Gamma_\gamma$ to 10% 0.1-5keV, $\Gamma_{tot}, \Gamma_n$ and $\Gamma_\gamma$ to 20%. $\Gamma$ -wave $\Gamma_\gamma$ wanted to 20%. S-wave strength function to 20%. Needed for Monte Carlo burn up calculations. Kirouac et al., data to 100eV, WASH-1127.	67
750 [ 2385 ]	$^{181}\text{Ta}$	ABSORPTION	5. +2	1. +6	3	2	CAD	Barre, J-Y. Control rods. Resonance parameters for radiative capture for fast reactor calculations. Evaluation may be sufficient.	71
751 [ 1477 ]	$^{181}\text{Ta}$	N, GAMMA	1. +3	5. +5	10	2	CAD	Barre, J-Y. Control rods. Status: see REG 1917 above. Request may be met.	69
752 [ 1916 ]	$^{181}\text{Ta}$	N, GAMMA	1.0+3	1.0+7	<10 5 to 10% see comment	1	AI	Alter, H. 1-150KeV, accuracy 5%, 10% useful. 150-500keV, accuracy 10%, 20% useful. For fast breeder control and burn up calculation. Status: see REG 1917 below.	69
753 [ 2658+ ]	$^{181}\text{Ta}$	EMISS XSECT energy,angle	1.5+6	1.5+7	10	3	LAS	Streetman, J.R. Low energy neutrons must be included. Absolute spectra at 30° and 75° may suffice.	69
754 [ 2659+ ]	$^{181}\text{Ta}$	NONEL GAMMAS energy dist	4. +0	1.4+3	15 OR 5 MB	1	SNP	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_\gamma)$ . $\gamma$ -Resolution required: 10%.	69
755 [ 2660+ ]	$^{181}\text{Ta}$	NONEL GAMMAS energy dist	1. +6	1. +7	15 OR 5 MB	1	SNP ANL	Fleishman, M.R. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required: 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. Bollinger: resonance averaged spectra measurements.	69
756 [ 1917# ]	$^{181}\text{Ta}$	N, GAMMA	1. +0	5. +5	<10	2	KAP LMB GRT KPK HAR RPI	Ehrlich, R. Hemmig, P.B. Accuracy 1 eV to 1 keV 10%; 20% useful, 1 keV to 150 keV 5%; 10% useful, 150 keV to 500 keV 10%; 20% useful. For fast reactor control and burnup calculations. Fricke+: 70 HELSINKI P/43, 1 keV to 1 MeV. Kompe: MP A133 513(1969), 10-170 keV. Riehs+: in progress below 100 eV. Block+: 71 KNOX (3/71), transm., self indication.	69

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
757 [1924#]	W	EMISS XSECT energy,angle	1.5+6	1.5+7	10	3 LAS	Streetman, J.R. DE=10° ; spectra at a few angles may suffice. DE (incident and exit) = 500 keV. 500 keV increments or as required by structure. Low energy neutrons must be included. Absolute σ's required for shielding. ANL Work planned.	69	
758 [1925#]	W	EMISS XSECT energy,angle	2.	+6	1.5+7	10	2 NEL	Eccleshall, D. DE=10° ; spectra at a few angles may suffice. DE (incident and exit) = 500 keV. 500 keV increments or as required by structure. Low energy neutrons must be included. Absolute σ's required for shielding. ANL Work planned.	69
759 [1922#]	W	EMISS XSECT energy,angle	4.	+6	1.4+7	10	1 APW	Enz, R. DE=10° ; spectra at a few angles may suffice. DE (incident and exit) = 500 keV. 500 keV increments or as required by structure. Low energy neutrons must be included. Absolute σ's required for shielding. ANL Work planned.	69
760 [1923#]	W	EMISS XSECT energy,angle	4.	+6	1.4+7	10	2 GDT	Western, G.T. DE=10° ; spectra at a few angles may suffice. DE (incident and exit) = 500 keV. 500 keV increments or as required by structure. Low energy neutrons must be included. Absolute σ's required for shielding. ANL Work planned.	66
761 [1926#]	W	EMISS XSECT energy,angle	4.	+6	1.6+7	5	1 ORL	Clifford, C.E. DE=10° ; spectra at a few angles may suffice. DE (incident and exit) = 500 keV. 500 keV increments or as required by structure. Low energy neutrons must be included. Absolute σ's required for shielding. ANL Work planned.	66
762 [2661+]	W	NONEI GAMMAS energy dist	2.	+0	2.5+3	15 OR 5 MB	1 SNP	Fleishman, M.R. Absolute σ(Eγ) required for all Eγ > 200 keV. Energy res.: Reproduce major variations in σ(Eγ). γ-Resolution required: 10%. GRIT ANL Orphant: WASH-1127, have spectra 2 eV to 100 keV. Bollinger: doing resonance averaged spectra.	69
763 [1927#]	W	NONEI GAMMAS energy,angle	1.	+5	1.6+7	20	1 ORL	Clifford, C.E. For space reactor shielding. All gamma energies of interest. ANL Work planned.	63
764 [2662+]	W	NONEI GAMMAS energy dist	1.	+6	1.	+7 OR 5 MB	1 SNP TNC LAS	Fleishman, M.R. Absolute σ(Eγ) required for all Eγ > 200 keV. Neutron energy interval required : 500 keV. γ-Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. Nellis: WASH-1136, 0.3-11. MeV. Drake: NSE #0 294, 4.-7.5 MeV.	69
765 [2663+]	W	NONEI GAMMAS energy dist	1.	+6	1.4+7	15 OR 5 MB	2 NEL	Eccleshall, D. Absolute σ(Eγ) required for all Eγ > 200 keV. Neutron energy interval required : 500 keV. γ-Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV. TNC LAS Nellis: WASH-1136, 0.3-11. MeV. Drake: NSE #0 294, 4.-7.5 MeV.	70
766 [1556 ]	W2W	N2N XSECTION TR	1.5+7	20	1	VNV MUN IRK	Cardot, H. Activation. ( 101W, 140d ). W.Dilg et al. (Munich and Vienna) ( N P 118 A, 9 (1968)) have measured at 14.7 MeV (6% accuracy). Winkler has measured between 14 and 15 MeV ( O A W S 177, 323 (1969) )	69	

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
767 [1930#]	$^{182}\text{W}$	N,GAMMA	1. +3	1. +7	10	1 AI RPI ANL	Alter, H. Fast breeder control and burnup calculations. Bartolome†: NSE 37 137(1969), 1-100 keV. Work planned.	69
768 [2491 ]	$^{182}\text{W}$	N,ALPHA	THR		10.0	3 KOS	Csikai, J. For neutron activation analysis and cross section systematics wanted. No measurements available.	69
769 [1931 ]	$^{183}\text{W}$	N,GAMMA	1.0+3	1.0+7	10	1 AI ---	Alter, H. Fast breeder control and burn up calculations. Status: see REG 1930 above.	69
770 [1931#]	$^{183}\text{W}$	N,GAMMA	1. +3	1. +7	10	1 AI RPI ANL	Alter, H. Fast breeder control and burnup calculations. Bartolome†: NSE 37 137(1969), 1-100 keV. Work planned.	69
771 [1557 ]	$^{184}\text{W}$	N,GAMMA	1. +3	5. +6	10	2 VNV ---	Cardot, M. Activation. ( $^{185}\text{W}$ , 74d). Status: see REG 1930 above.	69
772 [1932#]	$^{184}\text{W}$	N,GAMMA	1. +3	1. +7	10	1 AI RPI ANL	Alter, H. Fast breeder control and burnup calculations. Bartolome†: NSE 37 137(1969), 1-100 keV. Work planned.	69
773 [ 635 ]	$^{186}\text{W}$	RESON PARAMS gamma width	1.9+1		5	2 AE LRC RPI	Haeggblom,H. For 18.84eV resonance. Spectrum measurements in fast critical assemblies. Recent eval. by Pierce, Nucl.Sc.Eng. 31,431 (March 68) deduced from an infinite dilute resonance integral: $\Gamma_y=0.041\text{eV}$ . Estimated error 7.3%. Capture and transmission meas. on separate W iso- topes from 150eV to 100keV may help to better define the sub-thermal part in the capture res.int. and thus give better precision on above mentioned result.	69
774 [ 636 ]	$^{186}\text{W}$	RESON PARAMS	1.9+1		2	2 MOL	Motte, F. Total and/or gamma width at 18.8 eV resonance. Needed for measurements of hard thermal neutron spectra by dilute foil activation.	69
775 [1558 ]	$^{186}\text{W}$	N2N XSECTION TR	1.5+7		20	1 VNV SAH	Cardot, M. Activation. ( $^{185}\text{W}$ , 74d). Pathak et al. have measured at 15 MeV ( B A R C-401, 23 (1969))	69
776 [1559 ]	$^{186}\text{W}$	N,GAMMA	1. +3	5. +6	10	2 VNV DEB	Cardot, M. Activation. ( $^{187}\text{W}$ , 24h). Diksict, AHP 28 (1970) 257, measured $s(n,\gamma)$ at 3 MeV. See also REG 1930 above.	69
777 [1935#]	$^{186}\text{W}$	N,GAMMA	1. +3	1. +7	10	1 AI RPI ANL	Alter, H. Fast breeder control and burnup calculations. Bartolome†: NSE 37 137(1969), 1-100 keV. Work planned.	69
778 [2494 ]	$^{197}\text{Au}$	RESON PARAMS	2.0+3		3 IEN SAC	Aghina, L.O.B. Special interest in the ratio of s wave strength functions $S(J=1)/S(J=2)$ and its variation as a func- tion of the energy interval. Extensive results available from Saclay LINAC measure- ments up to 3 keV, CEA-R-3385, 1968; NP A 131(1969), 450.	69	
779 [ 637 ]	$^{197}\text{Au}$	RESON PARAMS gamma width neutronwidth	4.9+0	< 1	2 FAR	Vidal, R. Standard for resonance integral measurements. Recent measurements in Saclay give 2% on $\Gamma_y$ . No new data. See Alves (Saclay) for latest Saclay analysis.	69	

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
780 [2493]	$^{197}\text{Au}$	NONEL GAMMAS see comment			3	IEN	Aghina, I.O.B. Gamma spectra between resonances wanted. Special interest on interference and direct capture.	69	
781 [638]	$^{197}\text{Au}$	N2N SECTION TB	1.5+7	10	1	VNV	Cardot, M. Activation detector. Production of $\text{Au}^{196m}$ (9.7 h) and $\text{Au}^{196}$ (6.18d). Recent measurements: KPK Poenitz+, JNE 22(1968)505, 25-480keV, 5-10% accuracy; SCT Spitz+, NP A121(1968)655, 8-120keV, rel. to In. SAC Alvest, NP A131(1969)450, individual and average resonance parameters for most resonances <2.2keV. KPK Kompe: NP A133(1969)513, 10-170keV, rel. to $^{10}\text{B}$ , $^6\text{Li}$ and grey detector, 3-8% accuracy. HAR Moxon, MS thesis, London U. HL68/3739 (1968), <100keV, rel. to $^{10}\text{B}$ , black resonance normalization, 10% acc. GA Fricke+, 70HELSINKI, 2eV-1MeV, TOF, rel. to $^{10}\text{B}$ and H(n,p), black resonance normalization, 10% accuracy. See also reviews by Vaughn+, NCSAC-33 (1970), and Carlson, 70ANL (EANDC symposium).	69	
782 [1322]	$^{197}\text{Au}$	N,GAMMA	THR		0.1	1	JAE	Japanese Nuclear Data Committee (JNDC). Precise standardization of thermal neutron flux density. Some data available 0.2 %	68
783 [1936]	$^{197}\text{Au}$	N,GAMMA	0.5+0	1.0+3	1.0	2	BET	Bayard, R.T. Energies above 0.5 ev wanted so as to give infinite dilution resonance integral to 1%. Individual and average resonance parameters required as primary standard. HAR Moxon: data relative to $^{10}\text{B}$ . GA Fricke+: 70HELSINKI P/43(6/70), 1keV - 1MeV. KPK Froehner: measurement relative to H in progress.	67
784 [643]	$^{197}\text{Au}$	N,GAMMA	1. +3	2. +6	<10	2	ISP	Railevski, V. ORL Macklint, PR 159(1967)1007, rel. to Ta, 125-182 keV. NPL Robertson+, JNE 23(1969)205, shell transmission, result $96 \pm 2$ mb at 966 keV. See also REG 1937 above. Status: see REG 1560 below.	
785 [1560]	$^{197}\text{Au}$	N,GAMMA	1. +3	7. +6	10	1	VNV	Cardot, M. Activation. ( $^{198}\text{Au}$ , 2.70d). ORL Macklint, PR 159(1967)1007, rel. to Ta, 125-182 keV. NPL Robertson+, JNE 23(1969)205, shell transmission, result $96 \pm 2$ mb at 966 keV. See also REG 1937 below.	69
786 [2329#]	$^{197}\text{Au}$	N,GAMMA	1. +3	1. +6	5	1	LLL	Howerton, R.J. Individual and average resonance parameters required as primary standard. Status: See REG 1937 below.	70
787 [1421]	$^{197}\text{Au}$	N,GAMMA	1. +4	2. +5	5	1	MOL	Hottel, F. Detector applications. Request may be met, see REG 1937 below	68
788 [1937#]	$^{197}\text{Au}$	N,GAMMA	1. +4	1. +6	2	2	NBS	Caswell, R.S. Individual and average resonance parameters required as primary standard. KPK Kompe: NP/A 133 513(8/69), 10-170 keV. HAR Moxon: data relative to $^{10}\text{B}$ . GRT Fricke+: 70HELSINKI P/43(6/70), 1 keV to 1 MeV. LOK Vaughn+: 71KNOX 430(3/71), best fit 10 keV to 5.4 MeV.	69
789 [1422]	$^{197}\text{Au}$	N,GAMMA	2. +5	3. +6	2	1	MOL	Hottel, F. Detector applications. Accuracy at present unobtainable, see REG 1560 and 1937.	68

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
790 [2495]	$^{198}\text{Hg}$	NONEL GAMMAS see comment			3 IEN	Aghina, L.O.B. Gamma spectra between resonances wanted. Special interest on interference and direct capture.	69
791 [2496]	$^{200}\text{Hg}$	NONEL GAMMAS see comment			3 IEN	Aghina, L.O.B. Gamma spectra between resonances wanted. Special interest on interference and direct capture.	69
792 [2497]	$^{201}\text{Hg}$	NONEL GAMMAS see comment			3 IEN	Aghina, L.O.B. Gamma spectra between resonances wanted. Special interest on interference and direct capture.	69
793 [1389]	$^{203}\text{Tl}$	N2N XSECTION TR	1.5+7	10	1 VNV IRK	Cardot, M. Activation detector. Production of $^{202}\text{Tl}(12d)$ . Threshold about 8 MeV. Winkler has measured between 14 and 15 MeV (O A W S 177, 323 (1969))	68
794 [1390]	$^{203}\text{Tl}$	N,GAMMA	1. +2 5. +6	10	2 VNV KPK	Cardot, M. Activation detector. Production of $^{204}\text{Tl}(3y)$ . Natural Tl has been measured from 10 to 200 keV. No other activity is known.	68
795 [1938#]	$^{204}\text{Tl}$	N,GAMMA	THR	10	2 BNW ANC	Leonard, B.R. Wanted to test feasibility of Tl <sup>204</sup> production. Radioactive target - 3.8 year. Total and res.param. 0.2-1000 EV, WASH-1093 . Request apparently satisfied.	65
796 [1391]	$^{205}\text{Tl}$	N2N XSECTION TR	1.5+7	10	2 VNV	Cardot, M. Activation detector. Production of $^{204}\text{Tl}(3y)$ .	68
797 [1392]	$^{205}\text{Tl}$	N,GAMMA	1. +2 5. +6	10	2 VNV KPK	Cardot, M. Activation detector. Production of $^{206}\text{Tl}(8.2m)$ . Natural Tl has been measured from 10 to 200 keV. No other activity is known.	68
798 [1323]	Pb	TOTAL XSECT	0.0+ 1.0+4	2.0	1 JAE	Japanese Nuclear Data Committee (JNDC). For standard cross section.	68
799 [646]	Pb	EMISS XSECT energy,angle	5. +5 1.6+7	10	2 PAR	Devillers, C. For shielding calculation. New evaluation to be done if new experimental data. Energy step : 500kev(incident neutrons). Energy resolution: 250kev(emitted neutrons)	69
800 [1941]	Pb	EMISS XSECT energy,angle	2.0+6 1.6+7	5.0	2 ORL	Clifford, C.E. Energy intervals 500 keV ; DE (res.)=250 keV . $\sigma(\theta)$ only if significantly anisotropic; then $\Delta(\theta)=\pm 3^\circ$ at 10°-intervals.	63
801 [1940#]	Pb	EMISS XSECT energy,angle	3. +6 1.5+7	10	2 NEL	Eccleshall, D. Energy resolution 250 keV in 500 keV intervals. $\sigma(\theta)$ only if significantly anisotropic, then $\Delta\theta = \pm 3^\circ$ at 10° intervals.	69
802 [2664+]	Pb	NONEL GAMMAS energy dist	8. +1 8. +5	15 OR 5 MB	2 SWP CCP	Fleishman, M.A. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Energy res.: Reproduce major variations in $\sigma(E_\gamma)$ . $\gamma$ -Resolution required: 10%. Muradian+: 70 HELSINKI VOL I, 357, to 30 keV.	69
803 [649]	Pb	NONEL GAMMAS gammaspectra	1. +3 1.6+7	10	2 PAR	Devillers, C. Resolution for En and Eg: 0.5 MeV. For shielding calculation. New evaluation to be done if new experimental data.	69
804 [2665+]	Pb	NONEL GAMMAS energy dist	1. +6 1. +7	15 OR 5 MB	1 SNP ---	Fleishman, M.A. Absolute $\sigma(E_\gamma)$ required for all $E_\gamma > 200$ keV. Neutron energy interval required : 500 keV. $\gamma$ -Energy resolution: <2.5 MeV, 10%, >2.5 MeV, 250 keV.	69

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV) MIN MAX	ACCURACY P %	LAB	REQUESTER , COMMENTS	YEAR
805 [ 653 ]	Pb	ABSORPTION	1. +3 1.0+4	20	2 BN	Tavernier, G. Fast reactor calculation Macklin and Gibbons measured between 30 and 160 keV.	
806 [ 1324 ]	$^{226}\text{Ra}$	N,GAMMA	THR	3	3 JAE	Japanese Nuclear Data Committee (JNDC). Precise standardization of emission rate of neutron source. PR <u>91</u> 1219 (1953) does not disagree with JNE <u>4</u> 366 (1957) when resonance neutrons are allowed for.	68
807 [ 656 ]	$^{226}\text{Ra}$	N,GAMMA	THR	20	2 BLG	De Troyer, A. Production of $^{227}\text{Ac}$ via $^{226}\text{Ra}$ . Absolute thermal value poorly known. Action planned by CEN,MOL. No activity known. PR <u>91</u> 1219 (1953) does not disagree with JNE <u>4</u> 366 (1957) when resonance neutrons are allowed for. Request apparently satisfied by old data.	
808 [ 657 ]	$^{227}\text{Ac}$	RESON PARAMS gamma width neutronwidth	2.0+1	20	2 BLG	De Troyer, A. Isotope contemplated as power source for satellites. Data needed for evaluation of burn-up during production by reactor irradiation of $^{226}\text{Ra}$ . No data available. MOL Action planned by CEN MOL.	
809 [ 664 ]	$^{232}\text{Th}$	RESON PARAMS gamma width	0 4. +3	10	1 JUL	Gerwin, H. Accuracy of BNL-325 Supp.2 data not high enough. ANL Bollinger: WASH-1093 12 (4/68) = EANDC(US)105. LAS Forman et al.: EANDC(US) 134 'U' (1969), data 20eV-10keV; plans to extract parameters. SAC Ribon: CEA-N-1149 (1969), $\Gamma_n$ data up to 3keV, $\Gamma_\gamma$ data for 15 res. $\langle \Gamma_\gamma \rangle = 21.8 \pm 1$ meV. LAS Harlow et al.: WASH-1136 114 (9/69), capture anal t.b.c COL Rahm+: analysis of new experiment in progress (EANDC(US)-156 U).	
810 [ 2386 ]	$^{232}\text{Th}$	RESON PARAMS	1. +1 1. +4	5	3 CAD	Barre, J-Y. For fast reactor calculations. SAC Reuss, P. Accuracy: 5% on $\langle g * \Gamma_n * \Gamma_\gamma / \Gamma \rangle$ and $\langle g * \Gamma_n * \Gamma_f / \Gamma \rangle$	71
811 [ 665 ]	$^{232}\text{Th}$	DIFF ELASTIC	1.0+5 1.0+7	10	2 BOL	Pierantoni, F. Accuracy 10% on $\langle 1 - \cos \theta \rangle$ . ALD Measurements from 2 to 7 MeV by Batchelor et al. (EANDC(US) 34 "L" (1964), and Nucl.Phys.65, 236(1965)). ANL Smith has data satisfying request to 1.5 MeV.	
812 [ 1946# ]	$^{232}\text{Th}$	DIFF ELASTIC	1. +6 5. +6	10	3 ANL	Avery, R. ANL Kuchnir: PR 176 1405, 600 keV to 1.6 MeV. ANL Smith: data to 1.7 MeV.	69
813 [ 1953 ]	$^{232}\text{Th}$	NONEL GAMMAS energy,angle	0.5+0 1.0+7	10	2 BET	Bayard, R.T. Need gamma spectrum at intervals of 0.5 MeV. Gamma of all energies of interest. Data needed for shielding and gamma heating calculations. BNL Wasson+: 71KNOX 799 (3/71), spectra at resonances.	67
814 [ 666 ]	$^{232}\text{Th}$	DIFF INELAST TR energy dist	1.0+7	10	3 JUL BOL	Gerwin, H. Pierantoni, F. ALD Measurements from 2 to 7 MeV by Batchelor et al. Nucl.Phys.65, 236(1965)	
815 [ 1325 ]	$^{232}\text{Th}$	DIFF INELAST energy dist	1.0+4 1.0+7	10	1 JAE	Japanese Nuclear Data Committee (JNDC). For fast reactor. Sections for excitation of individual levels desired. ANL Smith has new data to 1.7 MeV.	68

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
816 [1948#]	$^{232}\text{Th}$	DIFP INELAST energy dist	1. +6 4. +6	5 3	ANL	Avery, R. Accuracy 20% in $(1-\cos\theta)$ if anisotropic. Incident and exit energy resolution 20%. POA Holmberg: BANDC(OR) 59L, 1.-2. MeV. ANL Smith: new data to 1.7 MeV.	69	
817 [670]	$^{232}\text{Th}$	N2N XSECTION THR energy dist	1. +7	20.0	3 JUL	Gerwin, H.		
818 [671]	$^{232}\text{Th}$	N2N XSECTION TR	1.0+7	10	2 JUL BN	Gerwin, H. Tavernier, G. Neutron economy of Th - $^{233}\text{U}$ breeder reactors. Schuman et al.: WASH-1136 55(9/69), activation measurements in progress.		
819 [1949]	$^{232}\text{Th}$	N2N XSECTION TR	1.0+7	10	1 GE	Snyder, T. Needed for control of $\text{U}^{232}$ production. INC Schuman: WASH-1136(9/69), 10mb for AFPSR spectrum.	67	
820 [673]	$^{232}\text{Th}$	FISSION	THR	1. +7	5.0	2 JUL MOL	Gerwin, H. AE 9,399 (1960) spectrum index. Thermal value of $(39 \pm 4)$ microb., Neve de Meervignies, EANDC(B) 1150, 191 (1969)	
821 [1951#]	$^{232}\text{Th}$	ABSORPTION	1. +2 1. +6	< 5 3 TO 5%	2 BET	Bayard, R.T. Accuracy 5% below 10 keV and 3% above. Intermediate accuracy would be useful. LAS Formant: NCSAC-33(1970), capture data, res.params.	69	
822 [1950]	$^{232}\text{Th}$	N,GAMMA	5. -1 2.0+3	<10 5 to 10%	1 BET	Bayard, R.T. Need < 5% in resonance integral; 10% useful. For thermal breeder calculations. COL Camarda: NCSAC-33(1970), new data to 5 kev. LAS Formant: NCSAC-33(1970), new data.	62	
823 [677]	$^{232}\text{Th}$	N,GAMMA	1. +3	1. +6	3	3 WIN	Campbell, C.G. For fast reactors. No work planned.	
824 [676]	$^{232}\text{Th}$	N,GAMMA	4. +3	2. +6	5	1 JUL	Gerwin, H. Accuracy of existing measurements (WASH-1046, 689, 1964; AE10, 508, 1961; J. Inorg. Nucl. Chem. 25, 627, 1963; Moxon thesis, London U., HL68/3739(1968)) insuff.	
825 [679]	$^{232}\text{Th}$	N,GAMMA	2. +6	1.0+7	10	2 JUL BOL	Gerwin, H. Pierantoni, F. No activity known.	
826 [1958]	$^{231}\text{Pa}$	N,GAMMA	THR	1.0+7	10	2 GE	Snyder, T. Needed for control of $\text{U}^{232}$ production. See NSE 12 243 (1962). Request apparently satisfied by old data. KPK Hinkelmann, 70 HELSINKI, CN-26/15: $\sigma(n,\gamma)=200$ b at THR.	69
827 [682]	$^{233}\text{Pa}$	RESON PARAMS gamma width neutronwidth	1.0+2	10	2 NED	Went, J.J. INC Simpson: NSE 28 133(1967), $\Gamma\gamma$ , 2g fm data below 17 eV.		
828 [684]	$^{233}\text{Pa}$	ABSORPTION	THR	5. +2	5	1 SRE NED	Maerkli. Went, J.J. BET Connor WAPD-TM-837 (1970) gives $\sigma=38.3 \pm 1.1$ b and RI=857±35 b.	
829 [685]	$^{233}\text{Pa}$	RES INT ACT	5. -1	10	1 SRE	Maerkli. Energy range : above 0.5 eV. Connor WAPD-TM-837 (1970) gives $\sigma=38.3 \pm 1.1$ b and RI=857±35 b. Request apparently satisfied by old data.		

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
	[REG]		MIN	MAX	(%)			
830 [1959#]	$^{233}\text{Pa}$	N,GAMMA	1. - 3	1. +3	<10 5 TO 10%	2	GRT Preskitt, C.A. Accuracy 5% below 2 eV, 10% above. Thorium cycle designs. BET Connor: WAPD-TM-837(1970), gives & thermal and RI.	69
831 [1961#]	$^{233}\text{Pa}$	N,GAMMA	1. - 3	1. +2	10	2	ORL Perry, A.M. Thorium cycle designs. --- Status: See REG 1959 above.	69
832 [688]	$^{233}\text{Pa}$	N,GAMMA	5. +2	1.0	7	10	2 BOL Pierantoni, F. The experimental effort in this region is very small and restricted in energy range. --- No work in progress.	
833 [1561]	$^{232}\text{U}$	ABSORPTION see comment	1. +3	1.5	+7	20	2 VNV Cardot, M. Destruction of $^{232}\text{U}$ by all reactions with incident neutrons, ( $0^{232}$ , 73.6y). --- Farrell has fission data below 30kev. LA-4420.	69
834 [1978]	$^{233}\text{U}$	RESON PARAMS THR	5.0+3	<30 10-30%	see comment.	2	ANL Avery, R. BET Bayard, R.T. LMB Hemmig,P.B. For thermal breeder calculations. Multilevel parameters,statistical distribution in eV range. Want 10% accuracy to 100eV, 20-30% to 5 keV. --- LAS Bergen: PR 166 1178(1969), 2g $\Gamma_{nff}$ from f up to 63eV. GEL Cao: 70HELSINKI P/19(6/70), multilevel parameters (Adler formalism) up to 65 eV for fission. GEL Kolar: 70HELSINKI P/16(6/70), multilevel parameters (Adler formalism) up to 94 eV for transmission. ORL De Saussure: 70HELSINKI P/94(6/70), multilevel params (Adler formalism) to 50 eV for fission and capture. COL Felvincit: EANDC(US)143055, tentative spin determina- tion from kinetic E distribution of fiss. fragments. See also EANDC(US)-156 U. SAC Blons+: give values for $\Gamma$ and $\sigma^0 * \Gamma_{ff}$ up to 52 eV (EANDC(E)-156 U ).	67
835 [2387]	$^{233}\text{U}$	RESON PARAMS	5. +2	5	3	CAD Barre, J-Y. SAC Reuss, P. Accuracy: 5% on $\langle g^* \Gamma_n * \Gamma_f / \Gamma \rangle$ and $\langle g^* \Gamma_n * \Gamma_f / \Gamma \rangle$	71 71	
836 [692]	$^{233}\text{U}$	ELASTIC THR		10	3	WIN Tyror,J.G. --- For long-term improvement of $\sigma$ (abs). No work planned.	64	
837 [1147]	$^{233}\text{U}$	NONEL GAMMAS spectrum	1.2+5		20	3 WIN Campbell,C.G. Low resolution for En adequate. For study of activation and heat release in core.		
838 [693]	$^{233}\text{U}$	DIFF INELAST TR energy dist	1.0+7	10	2	BOL Benzi, V.		
839 [695]	$^{233}\text{U}$	DIFF INELAST TR energy,angle	5. +6	20	3	WIN Campbell, C.G. --- For fast reactors. No experimental data available. No work planned.		
840 [1962#]	$^{233}\text{U}$	DIFF INELAST 4. +4 energy dist	7. +6	<20 5 TO 20%	3	ANL Avery, R. --- Need energy dependence to 5-10% above 0.5 MeV.	67	
841 [696]	$^{233}\text{U}$	N2N XSECTION TR	1.0+7	10	2	BOL Benzi, V. BN Tavernier, G. Neutron economy in Th- $^{233}\text{U}$ breeder reactors.		
842 [1963]	$^{233}\text{U}$	N2N XSECTION TR	1.5+7	10	2	LAS Barr, D.W. --- For contamination of $^{233}\text{U}$ by $^{232}\text{U}$ . Barr, activation data at 14 MeV .	67	

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REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
843 [1964]	$^{233}\text{U}$	N2N XSECTION TR	1.5+7	10	3	RDT Hannum, W.H. LAS For contamination of $^{233}\text{U}$ by $^{232}\text{U}$ . Barr, activation data at 14 MeV.	67
844 [1563]	$^{233}\text{U}$	N2N XSECTION TR	1.5+7	10	2	VNV Cardot, M. LAS Barr has activation data at 14 MeV.	69
845 [698]	$^{233}\text{U}$	FISSION	THR	5.0+1	2	JUL Gerwin, H. ORE Weston et.al.: NSE 34,1(1968) from 0.4eV to 2keV. GEL Migneco et.al. (to be published) from THR to 1.5 keV. ALD Keith et.al.: JNE 22,477 give 534.6±5.3b for THR. IAE IAEA review of thermal values (to be published).	
846 [1965#]	$^{233}\text{U}$	FISSION	1. -3 1. +3 < 5 .5 TO 5%	1	BET Bayard, R.T. --- Want eta to 1/4% below 1 eV. IAE Want integral eta to 1% below 1 keV. SAC Hanna+: REA 7(4) 3(D/69), lsg evaluation 2200m/sec. COL Blons+: 71KNOX 829(3/71), to 30 keV. Felvinci+: 71KNOX 855(3/71) .	62	
847 [1966#]	$^{233}\text{U}$	FISSION	1. -3 1. +3	10	1	GGA Nordheim, L.W. ORL Perry, A.M. --- Want eta to 1/4% below 1 eV. Want integral eta to 1% below 1 keV. Status: See REG 1965 above.	62
848 [708]	$^{233}\text{U}$	FISSION	5. +1 1. +7 <10.0	2	JUL Gerwin, H. BOL Benzi, V. --- Spectrum index, At.Energ 14,177 (1963); At.Energ 13, 366 (1962). Accuracy of recent LAS bomb results still not sufficient. Final results of measurements of fission ratio $^{233}\text{U} / ^{235}\text{U}$ by Pfletschinger and Kaeppeler between 5 keV and 1 MeV are shortly to be published in NSE KPK Pfletschinger et al. have measured ratio $^{233}\text{U}/^{239}\text{Pu}$ between 5 keV and 1MeV (acc.2 to 3%). EANDC(E)-127.		
849 [1478]	$^{233}\text{U}$	FISSION	1.0+2 1.5+7 < 5	3	CAD Barre, J-Y. --- Accuracy: 0.1-10 keV: 5% .01- 1 MeV: 2%. This accuracy concerns the fission ratio $^{233}\text{U}/^{235}\text{U}$ . For spectrum index in fast reactors. Evaluation probably sufficient. KPK Pfletschinger et al. have measured ratio $^{233}\text{U}/^{239}\text{Pu}$ between 5 keV and 1MeV (acc.2 to 3%). EANDC(E)-127.	69	
850 [1967#]	$^{233}\text{U}$	FISSION	1. +3 3. +4	5	3	ANL Avery, R. BET Bayard, R.W. GGA Nordheim, L.W. LMB Hemmig, P.B. ORL Perry, A.M. --- Want 2% in eta and integral data. ORE Weston: WASH-1124, has data to 2 keV. SAC Blons+: 71KNOX 829(3/71), to 30 keV.	62
851 [1969#]	$^{233}\text{U}$	FISSION ratio x-sect	1. +3 1. +7	1	2	LMB Hemmig, P.B. --- Relative to $^{235}\text{U}$ . Calibration in energy 1%, resolution 3%. Accuracy of 2 to 3% would be useful. Status: See REG 1968 below.	69
852 [1968]	$^{233}\text{U}$	FISSION ratio x-sect	1.0+4 1.5+7	1.0	1	LAS Hansen, G. --- Relative to $^{235}\text{U}$ . Calibration in energy 1%, resolution 3%. Accuracy of 2 to 3% would be useful. KPK Pfletschinger+: NSE 40 375( ), 5 keV - 1 MeV. ANL Meadows: NCSC-31(1970), meas. in progress, E<1.5MeV. See also: EANDC(US)-143 U.	67

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR
			MIN	MAX	(%)				
853 [2500]	<sup>233</sup> U	FISSION	2.0+4	2.0+6	3.0	2	ITK	Mehta, G.K. Cross section required at 60, 150, 200, 500 keV and 1 MeV with energy resolution of 5%.	69
						KFK	Pfletschinger and Kaeppeler measured fission CS ratio $\Sigma 2^{33} / \Sigma 2^{35}$ at 5 keV - 1 MeV with 2-3% accuracy.		
854 [1581]	<sup>233</sup> U	ETA see comment	1. -2	2. -1	0.5 (.02 ev steps)	3	WIN	Tyror, J.G. Requested: eta(E) /eta (E <sub>0</sub> ), E <sub>0</sub> =0.0253eV. For thermal reactors. Requirement probably not met, evaluation needed.	69
855 [1972#]	<sup>233</sup> U	ALPHA	1. -3	1. +3	< 8 2 TO 8%	1	BET GGA ORL	Bayard, R.T. Nordheim, L.W. Perry, A.M. 1/4% in eta below 1 eV, 1% useful. 1/4% in eta to 3 eV. 1% in eta 30 eV to 1 keV, 5% useful. Capture cross section equally useful. Weston+: NSE 34 1 (0/68), 0.4 eV to 2 keV. Weston+: NSE 42 143 (N/70), below 1 eV. Smith+: NCSAC-33(1970), absolute eta below 1 eV. Hanna+: REA 7 (4) 3 (D/69), 1sq evaluation 2200m/s.	62
856 [740]	<sup>233</sup> U	ALPHA	1. +3	1. +5	5	3	WIN	Campbell, C.G. For fast reactors.	
						ORL	Weston, NSE 34, 1 1968 published fission and capture data from 0.4eV to 2keV. Plans to extend ALPHA measurements to 30keV.		
857 [1973#]	<sup>233</sup> U	ALPHA	1. +3	3. +6	<20 10-20%	2	ANL BET GGA LMB ORL	Avery, R. Bayard, R.T. Nordheim, L.W. Hemmig, P.B. Perry, A.M. Want 2% in eta and integral data. Capture cross section equally useful. Weston+: NSE 34 1 (0/68), to 2 keV.	62
858 [2502]	<sup>233</sup> U	NU	THR	1.0+7	1.0	2	AUA	Symonds, J.L. Available data not satisfactory.	69
						ANL	Evaluation by Davey, NSE 44 (1971), 345.		
						IAE	Manero and Konshin, evaluation in progress.		
859 [1970]	<sup>233</sup> U	NU	1.0-3	3.0+4	< 0.2	1	BET GGA ORL IAE BET ANL IAE RPI	Bayard, R.T. Nordheim, L.W. Perry, A.M. Need 1/4% to 30 eV, 1% 30 eV-1 keV. Need 2% 1-30 keV. Intermediate accuracy of 1.5% useful. Hanna +, At. Energy Rev. VII (1969), No 4 Least sq. fit of 2200 m/s data gives 0.3% acc. for thr. value. Steen, 71 KNOX 566, adj. thr. value. De Volpi, Reactor Techn. to be published., 71 KNOX 560, Eval. gives 1% lower thr. value than IAE-69. Konshin +, INDC(NDS)-19/N (1970) Review, work being continued Weinstein +, IAE-SM-112/113 (1969) Expt to 5 eV and Reed +, BNL 50298 (1971), Expt. prog. in res. region. More work required on standard NU and energy dependence to get 0.25% acc. More work required in 30 eV-1 keV range to get 1% acc.	69
860 [722]	<sup>233</sup> U	NU	3. +4	1. +7	1.0	2	BOL JUL	Benzi, V. Gerwin, H.	
						IAE	Konshin +, INDC(NDS)-19/N (1970), Review, work being continued		
						ANL	Davey, NSE 44, 345 (1971), Eval.		
						AUA	Walsh +, JWE 25, 321 (1971), Expt to 2 MeV, Eval. to 5 MeV. Energy dep. 2 lines intercepting at 0.4 MeV. Below 4 MeV more work required for acc. of better than 2%. No exper. data between 4.5 and 14 MeV.		

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
861 [ 1971# ]	$^{233}\text{U}$	NU	3. +4	3. +6	< 3 1 TO 3%	2	BET GGA ORL ---	Bayard, R.T. Nordheim, L.W. Perry, A.M. Is there structure below 1 MeV? . Status: See REG 722 above.	69
862 [ 723 ]	$^{233}\text{U}$	NU	4. +4	5. +6	1	3	WIN IAE ANL AUA	Campbell, C.G. For fast reactors. Konshin +, INDC(NDS)-19/N (1970) Review, work being continued Davey, NSE 44, 345 (1971), Eval. Walsh +, JNE 25, 321 (1971), Expt to 2 MeV, Eval. to 5 MeV. Energy dep. 2 lines intercepting at 0.4 MeV. Below 4 MeV more work required for acc. of better than 2%. No expt. data between 4.5 and 14 MeV.	69
863 [ 2501 ]	$^{233}\text{U}$	FRAG NEUTRNS see comment	5.0+4	1.0+6	10.0	2	ITK	Mehta, G.K. Prompt neutrons as function of fprod mass wanted.	69
864 [ 2499 ]	$^{233}\text{U}$	SPECT FISSION THR see comment			1.0	1	IAE	Lemmel, H.D. Mean spectrum energy with 1% accuracy plus spectrum shape requested for calibration of nu-bar measurements. Absolute or relative to other fissile isotopes wanted.	69
865 [ 1983 ]	$^{233}\text{U}$	FISS YIELD THR see comment			3.0	2	BET	Bayard, R.T. Yield of $\text{Xe}^{133}$ . For calculation of fission product poisons. Cumulative and direct yields required, inclusive of 15 minute isomer.	67
866 [ 1984 ]	$^{233}\text{U}$	FISS YIELD THR see comment			1.0	2	BET	Bayard, R.T. Yield of $\text{Cs}^{137}$ . For burn up indicator standards.	67
867 [ 1985 ]	$^{233}\text{U}$	FISS YIELD THR see comment			3.0	2	BET	Bayard, R.T. Yield of $\text{Nd}^{147}$ . For calculation of fission product poisons.	67
868 [ 1986 ]	$^{233}\text{U}$	FISS YIELD THR see comment			3.0	2	BET	Bayard, R.T. Yield of $\text{Sm}^{149}$ . For calculation of fission product poisons.	67
869 [ 2270 ]	$^{233}\text{U}$	FISS YIELD THR			1	2	CRC	Walker, W.H. Yield of $\text{Xe}^{135}$ . For calculation of fission product absorption.	71
870 [ 1562 ]	$^{233}\text{U}$	ABSORPTION see comment	1. +3	1.5+7	10	2	VNV ORL	Cardot, M. Destruction of $^{233}\text{U}$ by all reactions with incident neutrons. Weston, NSE 34, 1 1968 published fission and capture data from 0.4ev to 2kev. Plans to extend ALPHA measurements to 30kev.	69
871 [ 734 ]	$^{233}\text{U}$	$\text{N}_\gamma\text{GAMMA}$ (alpha)	THR	1. +6	20.0	1	JUL NED BOL ---	Gerwin, H. Went, J.J. Benzi, V. Accuracy insufficient. JNE 5, 186(1957) ; NSE 9, 105 1961; NSE 12, 169(1962). Weston+, NSE 34(1968) 1,.4-2000 ev, shape analysis by DeSaussure+, 70HELSINKI II 773, up to 60 ev. Alpha measurement up to 30 kev is planned, eta is being measured below 10 ev, see EANDC(US)1430. FAR Vidal+, 70HELSINKI I 295, THR +( $n,\gamma$ ) and alpha given. GEL Caot+, JNE 24(1970) 111, .018-1.2 keV. CRC Lounsbury+, 70HELSINKI I 287, measured THR alpha. IAE See also IAEA evaluation of THR values, At. En. Rev.	
872 [ 1564 ]	$^{233}\text{U}$	$\text{N}_\gamma\text{GAMMA}$	1. +3	2. +6	20	2	VNV ORL GEL	Cardot, M. Weston+, NSE 34(1968) 1,.4-2000 ev, plan to measure up to 30 kev, see EANDC(US)1340. Caot+, JNE 24(1970) 111, 18-1200 ev.	69

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR
			MIN	MAX	(%)				
873 [ 743 ]	$^{233}\text{U}$	N,GAMMA	1.	+6	1.0+7	20	2 JUL BOL	Gerwin, H. Benzi, V. Accuracy insufficient. The experimental effort in this region is very small and restricted in energy range. --- No activity known.	
874 [ 1979 ]	$^{233}\text{U}$	SPECT NGAMMA	1.0-2	1.5+7	15	2 BET	Bayard, R.T. Quantity: $P(E_\gamma)$ . $\Delta N(E)/N(E)$ needed to 15% every 50keV in $E_\gamma$ Gammas of 100 keV and above desired, for shielding. Are thermal and resonance spectra the same. COL Felvinci: NCSAC-31(1970), measurements planned.	67	
875 [ 2498 ]	$^{233}\text{U}$	MISCELLANEOUS			0.2	2 IAE	Lemmel, H.D. Alpha half-life required for 2200 m/s fission constants. Recent data are discrepant by 4.5%, although better accuracy is claimed for individual data.	69	
876 [ 1393 ]	$^{234}\text{U}$	N2N XSECTION TR		1.5+7	10	2 VNV	Cardot, M.		68
877 [ 1394 ]	$^{234}\text{U}$	N3N XSECTION TR		1.5+7	15	1 VNV	Cardot, M.		68
878 [ 748 ]	$^{234}\text{U}$	FISSION	4.	+6	1.0+7	15	2 JUL	Gerwin, H. Spectrum index. BNL-732.2 (above 13 MeV). Nucl. Phys. 38 (1962), 561 (50 KeV - 4 MeV). P.H. White, Aldermaston (40 keV - 500 keV).	
879 [ 1566 ]	$^{234}\text{U}$	FISSION	4.	+6	1.5	7	2 VNV	Cardot, M.	
880 [ 1565 ]	$^{234}\text{U}$	ABSORPTION	1.	+3	1.5+7	15	2 VNV	Cardot, M. Destruction of $^{234}\text{U}$ by all reactions with incident neutrons.	69
881 [ 1989 ]	$^{234}\text{U}$	N,GAMMA	1.0-3	1.0+7	<10	2 AI ANL	Alter, H. Avery, R. To evaluate isotope buildup in thermal reactors. Accuracy 3% below 2eV, 6% below 10 Kev. See CN-26/2. --- KPK part of request apparently satisfied. Hinkelmann, 70HELSINKI, CN-26/15, evaluation. CRC Lounsbury: BANDC(CAN) 38L(1970), thermal, to 1%. HAR James: NP/A 139 471(9/69), res.params. to 687 eV.		69
882 [ 754 ]	$^{234}\text{U}$	N,GAMMA	1.	+0	1.0+7	15	2 JUL BOL	Gerwin, H. Benzi, V. The experimental effort in this region is very small and restricted in energy range. KPK Hinkelmann, 70HELSINKI, CN-26/15, evaluation.	
883 [ 1567 ]	$^{234}\text{U}$	N,GAMMA	1.	+3	3.	+6	2 VNV	Cardot, M. KPK Hinkelmann, 70HELSINKI, CN-26/15, evaluation.	69
884 [ 2017 ]	$^{235}\text{U}$	RESON PARAMS THB	2.0+2	10	1	ANL BET GE LMB	Avery, R. Bayard, R.T. Snyder, T. Hemmig, P.B. Needed for extrapolation to unresolved resonance region. Multilevel fit wanted where feasible. Need 10% accuracy below 100 eV. --- ORL De Saussure: ORNL-1804(1969), res.params. to 100 eV. MOL Poortmans+: 70HELSINKI P/20 (6/70), scattering, spins. SAC Ribon: 70HELSINKI P/208 (6/70), eval. in progress. SAC Krebs+: 71KNOX 410 (3/71), to 100 eV. SAC Blons: 70HELSINKI P/60 (6/70), of 17eV-30keV, no anal. See also 71KNOX 829 (3/71) and BANDC(E)-150 U. INC Smith+: evaluation of res.par. up to 87 eV (ANCR 1044). COL Felvinci+: BANDC(US)-156 U; analysis in progress.	69	

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
885 [2388]	<sup>235</sup> U	RESON PARAMS	1. +0	2. +2	3	1 SAC Reuss, P. For resonances self shielding. Evaluation may suffice if it explains discrepancies. Accuracy: 3% on $\langle g^* \Gamma_n * \Gamma_f / \Gamma \rangle$ and $\langle g^* \Gamma_n * \Gamma_f / \Gamma \rangle$	70
886 [1479]	<sup>235</sup> U	RESON PARAMS	1. +2	2. +2	10	2 CAD Barre, J.Y. Fast reactor calculations (Doppler effect and resonance self shielding) 5% on $g^* \Gamma_n$ , 10% on $\Gamma$ and on the product $g^* \Gamma_n * \Gamma_f$ for great resonances. Status: see REG 2017 above.	69
887 [758]	<sup>235</sup> U	RESON PARAMS	1.5+2	2. +2	10.0	2 KPK Schmidt, J.J. Available res. parameters analyzed cover energies up to 150 eV. --- Status: see REG 2017 above.	
888 [763]	<sup>235</sup> U	ELASTIC	THR		10	3 WIN Tyror, J.G. --- For long-term improvement of $\sigma(\text{abs})$ . No work planned.	
889 [1994]	<sup>235</sup> U	DIFF ELASTIC	1.0+6	7.0+6	10	2 LAS Diven, B.C. --- ANL Needed for analysing fast critical experiments. Energy resolution at least 0.5 MeV. Smith, WASH 1068, 400-600 keV, and further data to 1.5 MeV. Work in progress to 4.0 MeV.	66
890 [1993#]	<sup>235</sup> U	DIFF ELASTIC	1. +6	5. +6	20	2 ANL Avery, R. LMB Needed for analyzing fast critical experiments. Energy resolution at least 0.5 MeV. --- ANL Smith: data to 1.5 MeV.	69
891 [764]	<sup>235</sup> U	NONELASTIC	TR	1.5+7	<20	2 KPK Schmidt, J.J. Accuracy 10% for threshold - 1.5 MeV. 20% for 1.5 - 15 MeV. Energy resol about 100 keV. Ferguson's data have to be completed.	
892 [2507]	<sup>235</sup> U	NONELASTIC	1.0+5	1.0+7	10	2 RAM IAE Islam, M.M. For fast reactors. --- No recent measurements.	69
893 [816]	<sup>235</sup> U	NONEL GAMMAS	1.2+5	spectrum	20	3 WIN Campbell, C.G. Whittaker, A. --- HAR Low resolution for E in adequate. For study of activation and heat release in core. Ferguson: planned.	
894 [769]	<sup>235</sup> U	TOTINELASTIC	TR	1. +7	<10	2 AE Haeggblom, H. --- ALD For fast reactor calc. Note energy range changed. $\sigma(n,n')$ values deduced from Drake et al. ( $n, n\gamma$ ) meas. at 4.6 and 7.5 MeV (see WASH-1127 p.144) are uncertain by 20% to 40%. Data at 2.3 and 4 MeV by Batchelor (AWRE-055/69) have 15-20% accuracy. However measurements of $\sigma(n,n')$ have been attempted from observations on total nonelastic spectra which could give values accurate to 5%.	
895 [771]	<sup>235</sup> U	DIFF INELAST TR	energy dist	1.5+7	<20	2 KPK Schmidt, J.J. Energy resolution about 100 keV. Ferguson's data have to be completed.	
				10%		CAD Barre, J.Y. Resolution for E and E' about 100 keV. For fast reactor calculations.	
				to 1.5 MeV		HAR ANL GEL Ferguson: 0.13-1.5 MeV, IAEA Paris Conf.(CN 23/22). Smith, A.B.: to 1.5 MeV. Coppola, Knitter: 1.5, 1.9, 2.3 MeV in progress.	
896 [2513]	<sup>235</sup> U	DIFF INELAST TR	energy dist	1.5+7	1	PEI Nikolaev, M. N. For 1.0 % accuracy in Keff of U <sup>235</sup> fuelled fast converters. CS for inelastic removal below fission thresholds of U <sup>238</sup> (7% acc.y) and of Pu <sup>240</sup> (or Np <sup>237</sup> (10% acc.y) wanted. Excitation CS for low lying levels requested with 15% accuracy.	71
						GEL Coppola and Knitter have data at 1.5, 1.9 and 2.3 MeV.	
						ANL Smith has data to 1.5 MeV. HAR Ferguson measured 0.13-1.5 MeV, IAEA CN-23/22.	

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
897 [1995#]	$^{235}\text{U}$	DIFF INELAST energy dist	5. +4	6. +6	10	2	ANL LMB ---	Avery, R. Hemmig, P.B. Incident and exit energy resolutions 10%. Low energy neutrons must be included. Absolute spectra at 30° and 75° may suffice. Status: See REG 1326 below.	69
898 [1326 ]	$^{235}\text{U}$	DIFF INELAST energy dist	3.0+5	1.0+7	10	1	JAE HAR GEL	Japanese Nuclear Data Committee (JNDC). For fast reactor. Available data insufficient. Xsections for excitation of individual levels desired. Ferguson: 0.13-1.5 MeV, IAEA Paris Conf.(CN 23/22). Coppola, Knitter: 1.5, 1.9, 2.3 MeV in progress.	68
899 [2505 ]	$^{235}\text{U}$	DIFF INELAST energy,angle	3.0+5	1.0+7	10	1	RAM GEL ANL HAR	Islam, M.M. For fast reactors. Coppola and Knitter have data at 1.5, 1.9 and 2.3 MeV. Smith has data to 1.5 MeV. Ferguson measured 0.13-1.5 MeV, AIEA CN-23/22.	69
900 [1998 ]	$^{235}\text{U}$	DIFF INELAST energy dist	1.5+6	6.0+6	5.0	1	LLL	Howerton, R.J. Discrimination between inelastic and fission neutrons required. Low energy neutrons must be included (<300 keV). Absolute spectra at 30° and 75° may suffice. Coppola: at 1.5, 1.9, 2.3 MeV, in progress. Smith: data to 1.5 MeV.	69
901 [2506 ]	$^{235}\text{U}$	INELASTGAMMA energy,angle	3.0+5	4.0+6	10	1	RAM	Islam, M.M. For fast reactors.	69
902 [1400 ]	$^{235}\text{U}$	N2N XSECTION TR	1.5+7	10	2	VNV	Cardot, M. ALD	Mather plans measurements at 7, 8, 9, 12.3 and 14 MeV. He plans preliminary results at 7 and 8 MeV .	68
903 [2508 ]	$^{235}\text{U}$	FISSION THR	1.5+7	5.0	1	RAM ANL LRL LRL LAS LAS SAC CAD HAR	Islam, M.M. For fast reactors. Poenitz reports new results 500 - 700 keV using $\text{V}^{\text{st}}$ (p,n), EANDC(US)-143-U. Czirr is measuring fission and capture 50 eV - 28 keV, EANDC(US)-143-U. Bowman has relative measurements 1.5 - 500 keV, EANDC(US)-143-U. Keyworth has data from Physics 8 event 30 eV to 100 keV. Barton et al. are planning measurements relative to hydrogen 2 - 20 MeV. Blons et al. have data 17 eV to 30 keV, AIEA CN-26/60. Szabo et al. have data 25 keV to 1 MeV, absolute accuracy ±3%. AIEA CN-26/69. Evaluation of existing data in progress above 100 eV. See Sowerby and Patrick AIEA CN-26/34.	69	
904 [2667+]	$^{235}\text{U}$	FISSION THR	1. +3	< 5 3 TO 5 %	2	SNP SAC SAC	Fleishman, M.R. Required are simultaneous measurements of capture and fission cross sections at 77°K. To validate doppler broadening calculations. Blons: total and fission at 77°K. Derrien: 70 HELSINKI P/60, multilevel fit.	69	
905 [2389 ]	$^{235}\text{U}$	FISSION	2.5-2	0.3	1	SAC CAD	Reuss, P. Barre, J-Y. For fast reactor calculations.	71 71	
906 [1505 ]	$^{235}\text{U}$	FISSION	0. +0	5. +0	1	1	SAC	Reuss, P. Relative to $\sigma(\text{n},\text{f})$ (0.0253 eV). For calculation of temperature coefficient . Evaluation may suffice if it explains discrepancies.	69

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
907 [ 2000 ]	$^{235}\text{U}$	FISSION	1.0+0	1.0+3	3.0	2 GE --- HAR LRL SAC ORL	Snyder, T. Used as standard at higher energies. James: AERE-2157 REV(1969), review of data. Czirr: NCSAC-31(1970), fission, capture to 28 keV. Blons: 70HELSINKI P/60(6/70), to 30 keV. De Saussure: NCSAC-33(1970) , to 100 keV, in progress.	69
908 [ 2333 ]	$^{235}\text{U}$	FISSION	1. +0	1. +7	3	2 KAP --- GEL	Ehrlich, R. Isolated values needed for normalization purposes; choice of E influenced by experimental requirements, but values for every power of 10 in E-range useful. Where cross-section has structure, E-average over carefully specified range is desired. Deruytter+: 70HELSINKI P/100(6/70), see work on res.	69
909 [ 2504 ]	$^{235}\text{U}$	FISSION	1.0+0	5.0+6	5.0	2 UPR --- ANL LRL LAS SAC CAD HAR	Koen, J. For calculations of pulsed heterogeneous systems. Poenitz reports new results 500 - 700 keV using $\nu^{\text{s}}(p,n)$ , EANDC(US)-143-U. Czirr is measuring fission and capture 50 eV - 28 keV , EANDC(US)-143-U. Bowman has relative measurements 1.5 - 500 keV. EANDC(US)-143-U. Keyworth has data from Physics 8 event 30 eV to 100 keV. Barton et al. are planning measurements relative to hydrogen 2 - 20 MeV. Blons et al. have data 17 eV to 30 keV. AIEA CN-26/60. Szabo et al. have data 25 keV to 1 MeV, absolute accuracy $\pm 3\%$ . AIEA CN-26/69. Evaluation of existing data in progress above 100 eV. See Sowerby and Patrick AIEA CN-26/34.	69
910 [ 2390 ]	$^{235}\text{U}$	FISSION	5. +0	2. +6	3	1 SAC	Reuss, P. Relative to $\sigma(n,f)(0.0253\text{eV})$ . Smooth cross section accuracy for 0.5 lethargy interval Evaluation may suffice if it explains discrepancies. High temperature reactors calculations	70
911 [ 781 ]	$^{235}\text{U}$	FISSION	1. +2	1. +7	< 5.0	1 JUL --- ANL LRL LAS SAC CAD HAR	Gerwin, H. Accuracy 5% for 100eV -10keV, 2% for 10keV - 1 MeV and 5% for 1-10MeV. Spectrum Index,standard x-sect. Poenitz reports new results 500-700keV using $\nu^{\text{s}}(p,n)$ EANDC(US)-143-U. Czirr is measuring fission and capture 50eV-28keV. EANDC(US)-143-U. Bowman has relative measurements 1.5-500keV. EANDC(US)-143-U. Keyworth has data from Physics 8 Event 30eV to 100keV Barton et al. are planning measurements relative to hydrogen 2-20MeV. Blons has data from 17eV to 30keV. AIEA CN-26/60. Szabo et al. have data from 25 keV to 1 MeV. Absolute accuracy $\pm 3\%$ . AIEA CN-26/69. Evaluation of existing data in progress above 100 eV: Sowerby and Patrick (1970) Helsinki CN-26/34. *** Sowerby suggests modifying lower limit of request to 10 keV: probably met.	70
912 [ 781 ]	$^{235}\text{U}$	FISSION	1. +2	1.5+7	< 5 .01-1MeV :2%	1 CAD --- ANL LRL LAS SAC CAD	Barre, J-Y. Spectrum index. Standard cross section. Fast reactor calculations and fast critical experiments. New fission experiment done in Saclay. Experiment in progress in Cadarache in the energy range 30-500keV. Accuracy 3% expected. Poenitz reports new results 500-700keV using $\nu^{\text{s}}(p,n)$ EANDC(US)-143-U. Czirr is measuring fission and capture 50eV-28keV. EANDC(US)-143-U. Bowman has relative measurements 1.5-500keV. EANDC(US)-143-U. Keyworth has data from Physics 8 Event 30eV to 100keV Barton et al. are planning measurements relative to hydrogen 2-20MeV. Blons has data from 17eV to 30keV. AIEA CN-26/60. Szabo et al. have data from 25 keV to 1 MeV. Absolute accuracy $\pm 3\%$ . AIEA CN-26/69.	70

W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
913 [ 787 ]	$^{235}\text{U}$	FISSION	1. +2 5. +6 (E-2E)	3	1	HAR WIN --- ANL LRL LRL LAS LAS SAC CAD HAR	Evaluation of existing data in progress above 100 eV: Sowerby and Patrick (1970) Helsinki CN-26/34. *** Sowerby suggests modifying lower limit of request to 30 keV: probably met.  Campbell, C.G. For fast reactors. Standard for Pu cross-sections. Note increased priority. Accuracy requirement not met by available data. Poenitz reports new results 500-700keV using $\text{V}^{\text{s}}(\text{p},\text{n})$ EANDC(US)-143-U. Czirr is measuring fission and capture 50eV-28keV. EANDC(US)-143-U. Bowman has relative measurements 1.5-500keV. EANDC(US)-143-U. Keyworth has data from Physics 8 Event 30eV to 100keV Barton et al. are planning measurements relative to hydrogen 2-20MeV. Blons has data from 17 eV to 50 eV, 71KNOXVILLE 829, and to 30 keV, 70HELSINKI 1 469. Szabo+ have data from 11 to 200 keV, 71KNOXVILLE 573, and from 18 keV to 1 MeV, 70HELSINKI 1 229. Sowerby+, 70HELSINKI 2 703, report simultaneous fit to $^{235}\text{U}$ , $^{238}\text{U}$ and $^{239}\text{Pu}$ .	
914 [ 2391 ]	$^{235}\text{U}$	FISSION	1. +2 1.5+7	2	1	CAD --- GE LMB	Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy.	69
915 [ 2001 ]	$^{235}\text{U}$	FISSION	1.0+3 1.4+7 1 to 2%	1	1	GE LMB ANL LRL LRL LAS LAS CAD HAR MHG ANL SAC KPK	Snyder, T. Hemming, P.B. Of highest priority for fast reactor calculations and as standard. From 1-20 keV, accuracy 2%, 5% useful. From 20 keV - 3 MeV, accuracy 1%, 3% useful. From 3-14 MeV, accuracy 2%, 5% useful resolution needed below 20 keV not yet determined. Absolute values required. Poenitz reports new results 500-700keV using $\text{V}^{\text{s}}(\text{p},\text{n})$ EANDC(US)-143-U. Czirr is measuring fission and capture 50eV-28keV. EANDC(US)-143-U. Bowman has relative measurements 1.5-500keV. EANDC(US)-143-U. Keyworth has data from Physics 8 Event 30eV to 100keV Barton et al. are planning measurements relative to hydrogen 2-20MeV. Szabo et al. have data from 25 keV to 1 MeV. Absolute accuracy ±3%. AIEA CN-26/69. Evaluation of existing data in progress above 100 eV: Sowerby and Patrick (1970) Helsinki CN-26/34. Knoll+: absolute measurement, 24, 140, 261, 966 keV. Poenitz: NCSC-31 (1970), 500-700keV using $\text{V}(\text{p},\text{n})$ . Blons+: 71KNOX 829(3/71), to 30 keV. Kappeler+: 71KNOX (3/71), 300 - 1200 keV.	69
916 [ 2002* ]	$^{235}\text{U}$	FISSION ratio x-sect	1. +3 1.4+7	1	1	ANL LMB ORL --- ANL	Avery, R. Hemming, P.B. Maienschein, F.C. Required is ratio of $\text{U}^{235}(\text{n},\text{f})$ to $\text{Bi}^{10}(\text{n},\alpha)$ , and to $\text{H}^1(\text{n},\text{p})$ to 1%. Intermediate accuracy of 3% useful. Needed to compare standards. Status: See REG 787 above. Work in progress.	69
917 [ 2515 ]	$^{235}\text{U}$	FISSION see comment	5.0+3 7.0+6	3.0	1	FEI	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Accuracy determined by use of this CS as standard in fission and capture measure- ments for other isotopes. If capture CS would be measured absolutely and fission CS for $\text{Pu}^{239}$ and $\text{U}^{238}$ relative to the fission CS of $\text{U}^{235}$ , then re- quested accuracy for the latter would be about 2 %. Below 20 keV measurements of transmission curves by flat response detector and by self detection me- thod with fission detector wanted for selfshielding evaluation. These curves must be measured with atte-	71

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY(eV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
				MIN	MAX	(%)		
						nuations of the primary beam down to 1 %. Best accuracy of 1.5 % desirable in 1.2 to 2.5 MeV region because of $U^{238}$ fission CS normalisation. Request considered fulfilled, when at least three measurements with different methods agree within requested accuracy.		
					ANL	Poenitz reports new results 500 - 700 keV using $V_{51}^1(p,n)$ , EANDC(US)-143-U.		
					LRL	Czirr is measuring fission and capture 50 eV - 28 keV , EANDC(US)-143-U.		
					LRL	Bowman has relative measurements 1.5 - 500 keV.		
					LAS	Keyworth has data from Physics 8 event 30 eV to 100 keV.		
					LAS	Barton et al. are planning measurements relative to hydrogen 2 - 20 MeV.		
					SAC	Blons et al. have data 17 eV to 30 keV. AIEA CN-26/60.		
					CAD	Szabo et al. have data 25 keV to 1 MeV, absolute accuracy $\pm 3\%$ . AIEA CN-26/69.		
					HAR	Evaluation of existing data in progress above 100 eV. See Soverby and Patrick AIEA CN-26/34.		
918	$^{235}U$	FISSION	1.0+4	1.0+6	1.0	1 JAE	Japanese Nuclear Data Committee (JNDC). Spectrum index in fast reactors. Poenitz: 68 WASH vol.I 503 (1968).	70
[2208]					---			
919	$^{235}U$	FISSION	1.0+4	2.0+7	< 2.0	1 JAE	Japanese Nuclear Data Committee (JNDC). For standard cross section and for radiation dosimetry. Discrepancy exists between evaluated value and measured data in the energy region from 0.2 MeV to 1.5 MeV.	71
[2201]					---			
920	$^{235}U$	FISSION	1. +4	1.4+6	1	1 NBS	Caswell, R.S. Excitation cross sections at many energies required. Absolute calibration at several energies. Energy resolution 3%, energy calibration 1%. MHG LAS Knoll+: abs. measurements at 24,140,261,966 keV. Barton+: planning relative to H, 2 to 20 MeV.	69
[2666+]					---			
921	$^{235}U$	FISSION	2.0+4	2.0+6	3.0	2 ITK	Mehta, G.K. Cross section required at 60, 150, 200, 500 keV and 1 MeV with energy resolution of 5%. ANL Poenitz reports new results 500 - 700 keV using $V_{51}^1(p,n)$ , EANDC(US)-143-U. LRL Czirr is measuring fission and capture 50 eV - 28 keV , EANDC(US)-143-U. LRL Bowman has relative measurements 1.5 - 500 keV. EANDC(US)-143-U. LAS Keyworth has data from Physics 8 event 30 eV to 100 keV. LAS Barton et al. are planning measurements relative to hydrogen 2 - 20 MeV. SAC Blons et al. have data 17 eV to 30 keV. AIEA CN-26/60. CAD Szabo et al. have data 25 keV to 1 MeV, absolute accuracy $\pm 3\%$ . AIEA CN-26/69. HAR Evaluation of existing data in progress above 100 eV. See Soverby and Patrick AIEA CN-26/34.	69
[2510]					---			
922	$^{235}U$	ETA	THR	5. +4	< 2	2 ANL	Avery, R. GE Snyder, T. LMB Heming, P.B. Accuracy 1/2% at thermal, 2% elsewhere.	67
[2003#]					---	ANC Smith+: NCSAC-33(1970), absolute eta below 1 eV. IAE Hanna+: REA 7(4) 3(D/69), Lsg evaluation 2200m/s.		
923	$^{235}U$	ETA	1. -2	2. -1	0.5	1 WIN	Tyror,J.G. Requested: $\eta(E)/\eta(\text{E}_0)$ , $\text{E}_0=0.0253\text{eV}$ . For temperature coefficient work. Note increased priority.	69
[792]		see comment				---	Soverby, Pattenden: feasibility assessment in progr.	

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
924 [1574]	$^{235}\text{U}$	ETA	2.5-2	0.1	1	SAC Bussac, J. For thermal reactor calculations.	69	
925 [793]	$^{235}\text{U}$	ETA see comment	2. -1 4. -1 (.05 ev steps)	0.5	1	WIN Tyror, J.G. Requested: eta(E) /eta (E <sub>0</sub> ), E <sub>0</sub> =0.0253eV. For temperature coefficient work. Note increased priority. HAR Sowerby, Pattenden: feasibility assessment in progr.	69	
926 [2004#]	$^{235}\text{U}$	ALPHA	1. -3 7. +6 3 TO 10%	<10	2	ANL Avery, R. GE Snyder, T. LMB Hemmig, P.B. Capture cross section equally useful. ORL De Saussure: NCSAC-33(1970), in progress to 100 keV. IAE Hannat: REA 7(4) 3(D/69), lsg evaluation 2200m/s. LRL Czirr: NCSAC-31(1970), n,f and n, $\gamma$ to 28 keV. KPK Bandl+: 71KNOX 273(3/71), 15 - 60 keV.	69	
927 [2668+]	$^{235}\text{U}$	ALPHA	1. -3 1. +0	1	1	BET Bayard, R.T. --- Capture cross section equally useful. Status: See REG 2004 above.	72	
928 [795]	$^{235}\text{U}$	ALPHA	1. +2 1. +6 (E-2E)	5	2	WIN Campbell, C.G. Note increased energy range. For fast reactors. --- Current data file needs improvement, but accuracy requirement probably not met by available data. Evaluation needed.		
929 [2514]	$^{235}\text{U}$	ALPHA	1.0+2 8.0+5	7.0	1	FEI Nikolaev, M.N. For accuracy of 1.5 % in conversion ratio for $^{235}\text{U}$ -oxide fuelled fast converters. Also needed for comparison with alpha- Pu <sup>239</sup> for test of measurement methods. In region 1-100 keV better accuracy desirable (about 5%). For evaluation of differences in capture and fission resonance selfshielding, measurements of transmission curves by self-detection method with capture or absorption detectors very desirable. Beam attenuation down to 1% wanted. At least three different results must coincide within requested accuracy. LRL Czirr is measuring alpha 50 eV - 28 keV, ENDAC(US)-143U.	71	
930 [1481]	$^{235}\text{U}$	ALPHA	5. +2 5. +5	<10	1	CAD Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy.	71	
931 [2006]	$^{235}\text{U}$	NU	THR	3.0+6	1.0	1	ANL Avery, R. GE Snyder, T. LMB Needed as a cross check with other isotopes. Accuracy of 1.5 to 2% would be useful. IAE Hanna +, At. Energy Rev. VII (1969), No 4 Least sq. fit of 2200 m/s data gives 0.3% acc. for thr. value. ANL De Volpi, Reactor Techn. to be published., 71 KNOX 560, Eval. gives 1% lower thr. value than IAE-69. ALD Mather +, AWRE O-55/71, Eval. IAE Konshin +, INDC(NDS)-19/N (1970) Review, work being continued AUA Walsh +, JNE 25, 321 (1971) Eval. ANL Davey, NSB 44, 345 (1971), Eval. Expt. res. region see Weinstein +, 69 Vienna 477 and Ryabov +, JINR-D3893, 88 (1968) also Reed +, BNL 50298, 174 (1971) and Conde +, 70 HELS 2, 139. Expt. MeV region see Savin +, 70 HELS 2, 157 and Nesterov + 70 Hels 2, 167, also Soleihac +, JNE 23, 257 (1969), 70 Hels 2, 145 and Boldeman +, JNE 24, 191 (1970) Still discussions about structure in energy region below 2 MeV of the order of 1 - 1.5%.	69

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
932 [2512]	$^{235}\text{U}$	NU	THR	1.0+7	1.0 2	AUA Symonds, J.L. HAR Still inconsistencies in available data. Colvin reviewed status before Helsinki Conference, AIEA CN-26/99. ANL Evaluation by Davey, NSE 44(1971), 345. IAE Manero and Konshin, evaluation in progress.	69
933 [2516]	$^{235}\text{U}$	NU see comment	THR	2.5+6	0.5 1	FEI Nikolaev, M.N. HAR For accuracies of 1.0 % in Keff and 1.5 % in conversion ratio for fast $^{235}\text{U}$ fuelled converters. 0.5 % accuracy required for measurement of ratio nu $^{235}\text{U}$ to nu $\text{Cf}^{252}$ . Energy dependence of nu is wanted with 0.7 % accuracy and 10 % energy resolution in the region below 2.5 MeV. Colvin reviewed status before Helsinki Conference, AIEA CN-26/99. ANL Evaluation by Davey, NSE 44(1971), 345. IAE Manero and Konshin, evaluation in progress.	71
934 [2517]	$^{235}\text{U}$	NU see comment	THR	2.5+6	0.1 2	FEI Nikolaev, M.N. HAR For accuracies of 1.0 % in Keff and 1.5 % in conversion ratio for fast $^{235}\text{U}$ fuelled converters. 0.1 % accuracy required for measurement of ratio nu $^{235}\text{U}$ to nu $\text{Cf}^{252}$ , evaluated from optimum distribution of uncertainties over uncorrelated nuclear data. Colvin reviewed status before Helsinki Conference, AIEA CN-26/99. ANL Evaluation by Davey, NSE 44(1971), 345. IAE Manero and Konshin, evaluation in progress.	71
935 [2392]	$^{235}\text{U}$	NU	2.5-2		0.2 1	SAC Reuss, P. IAE Hannat, At. Energy Rev.VII (1969), N.4, least sq. fit of 2200m/s data gives 0.3% acc. for thr. value. ANL De Volpi, React. Techn. to be published, 71KNOX 560, eval. gives 1% lower value than IAE-69.	71
936 [1395]	$^{235}\text{U}$	NU	1. +4 1.4+7	0.5 2	CAD Barre, J-Y. ANL For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy. Accuracy relative to nu $\text{Cf}^{252}$ . Davey, NSE 44, 345 (1971), Eval. ALD Mather +, AWRE O-55/71, Eval. AUA Walsh +, JNE 25, 321 (1971), Eval. IAE Konshin +, INDC(NDS)-19/N (1970) Review, work being continued. Expt. see Savin +, 70 HELS 2, 157 and Nesterov +, 70 HELS 2, 167. Also Soleilhac +, 70 HELS 2, 155 and Boldeman +, JNE 24, 191 (1970) Still discussions about structure in energy region below 2 MeV of the order of 1 - 1.5%.	69	
937 [2335]	$^{235}\text{U}$	F NEUT DELAY THR spectrum see comment		15	2	KAP Ehrlich, R. Quantity: P (En'). Yield, half-life and energy needed. Needed for analysis of fast criticals, and to check existing data.	69
938 [2008#]	$^{235}\text{U}$	F NEUT DELAY THR spectrum	5. +6	5	2	LMB Hennig, P.B. Needed for analysis of fast criticals and to check existing data. Yield, half-life, and energy needed. LAS Krick: NCSAC-33(1970) . ANL Work planned.	69
939 [2511]	$^{235}\text{U}$	FRAG NEUTRNS see comment	5.0+4 1.0+6	10.0	2	ITK Mehta, G.K. Prompt neutrons as function of fprod mass wanted.	69
940 [2334]	$^{235}\text{U}$	SPECT FISSION THR spectrum		10	2	KAP Ehrlich, R. Quantity: P (En'). Verification of fission spectrum needed. D En' = 5% for En' < 0.3 MeV and 10% En' < 20 MeV. ANL Smith : NCSAC-33 (1970), in progress below 1.5 MeV.	69

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REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR
			MIN	MAX	(%)				
941 [2503]	<sup>235</sup> U	SPECT FISSION THRESHOLD see comment		1.0	1	IAE	Lemmel, H.D.		69
							Mean spectrum energy with 1% accuracy plus spectrum shape requested for calibration of nu-bar measurements. Absolute or relative to other fissile isotopes wanted.		
942 [2007#]	<sup>235</sup> U	SPECT FISSION THRESHOLD spectrum	3. +6	5	2	ANL LMB ANL	Avery, R. Hemmig, P.B. Smith: has data <1.6 MeV.	Verification of fission spectrum needed.	69
943 [2669+]	<sup>235</sup> U	SPECT FISSION THRESHOLD spectrum		1	1	BET	Bayard, R.T.		72
							ANL	Verification of fission spectrum needed.	
944 [1398]	<sup>235</sup> U	SPECT FISSION THRESHOLD 0. +0 1. +5	10.0	2	VNV	Vidal, J.C.			68
						LAS MOL	Low energy fission spectrum. At thermal energy meas. by Grundl (NSE 31, 191) and by Fabry (in progress)		
945 [1480]	<sup>235</sup> U	SPECT FISSION THRESHOLD 0. +0 1.4+7		5	1	CAD	Barre, J-Y.		69
						SAC	For fast reactor calculations. Accuracy 2% for averaged E'.		
						VNV	Reuss, P. Accuracy 2% for averaged E'.		71
						Cardot, M.	Low energy fission spectrum.		68
946 [799]	<sup>235</sup> U	SPECT FISSION THRESHOLD 1. +5	on <E'> 10% on DN1, DN2.	2	2	WIN	Campbell, C.G.		
						UKW HAR	For fast reactors. Whittaker, A. Wright, S.B.		
						LOW	For reaction rate analysis. DN1 =no.of neutrons above 5 MeV, DN2 =no.of neutrons below .25 MeV. Rose J., South Bank Polytechnic; in progress at Harwell.		
947 [2018]	<sup>235</sup> U	FISSION YIELD THRESHOLD		3.0	2	BET	Bayard, R.T.		67
							Yield of Xe <sup>135</sup> .		
							For calculation of fission product poisons. Cumulative and direct (inclusive of 15 m isomer) yields wanted.		
948 [2019]	<sup>235</sup> U	FISSION YIELD THRESHOLD		1.0	2	BET	Bayard, R.T.		67
							Yield of Cs <sup>137</sup> .		
							For burn up indicator standards.		
949 [2020]	<sup>235</sup> U	FISSION YIELD THRESHOLD		3.0	2	BET	Bayard, R.T.		67
							Yield of Sm <sup>149</sup> .		
							For calculation of fission product poisons		
950 [2021]	<sup>235</sup> U	FISSION YIELD THRESHOLD		3.0	2	BET	Bayard, R.T.		67
							Yield of Nd <sup>147</sup> .		
							For calculation of fission product poisons		
951 [2271]	<sup>235</sup> U	FISSION YIELD THRESHOLD		1	2	CRC	Walker, W.H.		71
							Yield of Xe <sup>135</sup> . For calculation of fission product absorption.		
952 [2393]	<sup>235</sup> U	FISSION YIELD	5. +2 1. +6	10	2	CAD	Barre, J-Y.		71
							For fast reactor calculations.		
							For an aver. fission neutron energy around 200 keV.		
953 [2509]	<sup>235</sup> U	N, GAMMA	THRESHOLD	3.0+4	3.0	2	RAM LRL	Islam, M.M. Czirr is measuring alpha 50 eV - 28 keV, BANDC (US)-1430.	69
954 [2394]	<sup>235</sup> U	N, GAMMA	2.5-2		1	1	SAC	Reuss, P.	71

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REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
955 [ 1506 ]	$^{235}\text{U}$	N,GAMMA	0. +0	5. +0	1 1	SAC Reuss, P. Relative to $\sigma(n,f)$ (0.0253 eV). Evaluation may suffice if it explains discrepancies. For calculation of temperature coefficient	69
956 [ 2395 ]	$^{235}\text{U}$	N,GAMMA	5. +0	2. +6	3 1	SAC Reuss, P. Relative to $\sigma(n,f)$ (0.0253 eV). Smooth cross section accuracy for 0.5 lethargy interval. Evaluation may suffice if it explains discrepancies. High temperature reactors calculations	70
957 [ 1327 ]	$^{235}\text{U}$	N,GAMMA (alpha)	1.0+3	1.0+5	10 1	JAE Japanese Nuclear Data Committee (JNDC). For fast reactor. Large discrepancies exist among measurements by DeSaussure, Wang Shi-Di, Ryabov. --- ORL Weston+, NSE 20(1964) 80, 12-690 keV. DUB Van Shi-Di+, 65 SALZBURG I 287, .1-30 keV. ORL DeSaussure, 66 PARIS II 233, 17-600 keV. KUR Muradyan+, 70 HELSINKI I 357, .3-5000 eV. LRL Czirr+, 70 HELSINKI I 331, .1-30 keV. LRL Czirr is measuring ALPHA 50 eV-28 keV. EANDC(US)-143 U. KUR Vorotnikov+, 71 KNOXVILLE 591, 5-130 keV. DUB Kurov+, AE 30 (1971) 251, .1-30 keV. ORL Silver+, 71 KNOXVILLE 728, .1-100 keV. KPK Bandt+, 71 KNOXVILLE 273, 8-60 keV, renormalized since.	68
958 [ 810 ]	$^{235}\text{U}$	N,GAMMA	1. +4	1.0+7	1x for alpha	JUL Gerwin, H. Analysis of critical experiments. The experimental effort in this region is very small and restricted in energy range. --- IPU Zaikin+, YFI-4(1967) 34 (report, to be publ. in AE), give table for .18-2.6 MeV. See also REG 1327 above. LRL Czirr is measuring ALPHA 50 eV-28 keV. EANDC(US)-143 U. Requested accuracy unrealistic.	67
959 [ 2012 ]	$^{235}\text{U}$	SPECT N GAMMA THR	1.5+1	10	2	BET Bayard, R.T. En 0.001 to 15 eV, $d\sigma(E)/n(E) = 10\%$ at 50 keV intervals for $E$ above 100 keV. Does spectrum change for thermal and resonances. COL Felvinci: NCSAC-31(1970), measurements planned. BNL Chrien+: NCSAC-33(1970), data 2-34 eV. BNL Kane: NCSAC-33(1970), also PRL 25 953(1970), 1-6 eV. Jurney: NCSAC-33(1970), high energy spect, thermal n.	67
960 [ 2013 ]	$^{235}\text{U}$	SPECT N GAMMA THR		20	2	KAP Ehrlich, R. En thermal, gamma resolution $d\sigma(E)/n(E) = 20\%$ . Does spectrum change for thermal and resonances. COL Felvinci: NCSAC-31(1970), measurements planned. Jurney: NCSAC-33(1970), high energy spect, thermal n.	67
961 [ 818 ]	$^{235}\text{U}$	NUCL.LEVELS	5.0+5	1. +6	2	KFK Schmidt, J.J. Quantity E, J, I, P. Almost no data available.	
962 [ 2200 ]	$^{235}\text{U}$	MISCELLANEOUS	< 3.0	1	JAE Japanese Nuclear Data Committee (JNDC). Delayed neutron fraction (BETA). For fast reactor measurements. --- LAS LA-3527 (1968) Hunter et al.	71	
963 [ 2023 ]	$^{236}\text{U}$	TOTAL XSECT THR	1. +3	10 5 to 10%	1 GE	Snyder, T. Accuracy 5% in neutron width. For isotope build up in thermal reactors and production of Np-237. Want 10% in capture width. Carlson, WASH 1124, has complete data and resonance parameters to 420 eV. See also NP A141 577 (1970). See also Harlan WASH-1127, 60. part of request apparently satisfied.	67
964 [ 2521 ]	$^{236}\text{U}$	RESON PARAMS see comment	1.0+1	5.0+3	1 FEI Nikolaev, M.N. For calculation of fast $^{235}\text{U}$ fuelled converters. Neutron and capture widths wanted for evaluation of selfshielding in resolved resonance region. Average s and p wave resonance parameters should be derived. --- KFK Statistical analysis of measured res. par. wanted. Hinkelmann evaluated average resonance parameters, AIEA CN-26/15, and KFK 1186 (EANDC(E)-128U), 1970. MTR Harlan measured total CS 5.5-380 eV and gives neutron widths for 13 resonances, WASH 1127, p.60.	71	

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REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
[REG]								
965 [2522]	$^{236}\text{U}$	DIFF INELAST TR energy dist	5.0+6	10	1	FEI Nikolaev, M.N. For calculation of fast $^{235}\text{U}$ fuelled converters. CS for inelastic removal below fission thresholds of $^{236}\text{U}$ and $^{238}\text{U}$ wanted with 10% accuracy. --- IAE No experimental data available.	71	
966 [1404]	$^{236}\text{U}$	$\text{n}^2\text{n}$ XSECTION TR	1.5+7	20	2	VNV Cardot, M.	68	
967 [1405]	$^{236}\text{U}$	$\text{n}^3\text{n}$ XSECTION TR	1.5+7	20	2	VNV Cardot, M.	68	
968 [2396]	$^{236}\text{U}$	FISSION	5. +2 1.5+7	3	2	CAD Barre, J-Y. For fast reactor calculations.	71	
969 [1403]	$^{236}\text{U}$	FISSION	1. +3 1.5+7	10	2	VNV Cardot, M. Evaluation may be sufficient. LAS Auchampaugh has fission data from Physics-8 Event.	68	
970 [2519]	$^{236}\text{U}$	FISSION ratio x-sect	1.0+5 5.0+6	5.0	1	FEI Nikolaev, M.N. For calculation of fast $^{235}\text{U}$ fuelled converters. --- Relative to $^{235}\text{U}$ fission CS wanted. LAS Auchampaugh has fission data from Physics 8 event. LAS Mc Nally has fission data from Physics 7 event at 0.1 to 2 MeV, EANDC(US)-1430. KPK Hinkelmann evaluation, AIEA CN-26/15, and KFK 1186 (EANDC(E)-128U), 1970.	71	
971 [823]	$^{236}\text{U}$	FISSION	4. +6 1.0+7	5	2	JUL Gerwin, H. --- Proc. Phys. Soc. 78 (1961), 801 (0.3-4 MeV). ALD White. (0.1-0.5 MeV.) ALD White, Warner: JNE 21,671 (1967). (1;2.25;5.4 MeV.)		
972 [2518]	$^{236}\text{U}$	NU	TR	5.0+6	1.0	1	FEI Nikolaev, M.N. For calculation of fast $^{235}\text{U}$ fuelled converters. --- ANL Evaluation by Davey, NSE 44 (1971), 345. FOA Conde'+, JNE 25,331 (1971), exp. data between 0.8 and 6.5 Mev. IAE Manero and Konshin, evaluation in progress.	71
973 [2397]	$^{236}\text{U}$	NU	5. +2 1.4+7	3	2	CAD Barre, J-Y. Accuracy relative to nu Cf <sup>252</sup> . For fast reactor calculations. --- ANL Davey, NSE 44,345 (1971), data calculated from (n,2n'f)-reactions in $^{236}\text{U}$ . KPK Hinkelmann, KFK-1186 (1970). Eval. data from (n,2n'f)-reactions. FOA Conde'+, JNE 25,331 (1971), exp. data between 0.8 and 6.5 MeV.	71	
974 [1406]	$^{236}\text{U}$	ABSORPTION see comment	1. +3 1.5+7	10	1	VNV Cardot, M. Destruction of $^{236}\text{U}$ by all reactions with incident neutrons. --- LAS Auchampaugh has fission data from Physics-8 Event.	68	
975 [2025]	$^{236}\text{U}$	RES INT CAPT	0.5+0	10	2	GE Snyder, T. Needed for control of $^{232}\text{U}$ production. --- GA Carlson: NP/A 141 577 (1/70), res.params, res.integr. calculated to 20 keV. SRL Baumann N.Sci.Eng. 32 265 gets 417,419 b by 2 methods. See also Harlan WASH-1127, 60. INC Schumann: IN-1296 (1969), res.integr. = 381 ± 20 b. Request apparently satisfied.	69	
976 [2026]	$^{236}\text{U}$	$\text{n},\text{GAMMA}$	THR	1. +3	10	1	GE Snyder, T. Needed for control of $^{232}\text{U}$ production GE. Needed for isotope build up in thermal and fast reactors and for $\text{Np}^{237}$ production. --- GA Required 10% accuracy in capture widths. Carlson: NP/A 141 577 (1/70), res.params, res.integr. See also Harlan WASH-1127, 60. Request apparently satisfied.	69

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REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
977 [1427]	$^{236}\text{U}$	N, GAMMA	1. +0	5.0+2	5	2 CRC GA	Walker, W.H. Disagreement between integral and differential measurements. See Baumann NSE 32,265 (1968) also Carlson ENDNC(US)105, page 54. Carlson NP A141 577 (1970). See also Harlan WASH-1127, 60.	68
978 [829]	$^{236}\text{U}$	N, GAMMA	1. +0	1.0 7	20	2 JUL BOL GA	Gerwin, H. Pierantoni, F. The experimental effort in this region is very small and restricted in energy range. Carlson+, NP A141 (1970) 577, TOF, .01- 20 keV, individual and average resonance parameters extracted. Request met below 20 keV.	71
979 [2398]	$^{236}\text{U}$	N, GAMMA	5. +2	1.5+7	3	2 CAD	Barre, J-Y. For fast reactor calculations.	71
980 [2520]	$^{236}\text{U}$	N, GAMMA ratio x-sect	5.0+2	1.4+6	7.0	1 PEI GA	Nikolaev, M.N. For calculation of fast $^{235}\text{U}$ fuelled converters. Relative to $^{235}\text{U}$ fission CS wanted. Carlson et al. measured at 0-20 keV, NP A141, 577.	71
981 [1402]	$^{236}\text{U}$	N, GAMMA	1. +3	1. +6	10	1 VNV	Cardot, M. Status: see REG 829 above. Request may be met <20 keV.	68
982 [1568]	$^{237}\text{U}$	ABSORPTION see comment	1. +3	1.5+7	10	2 VNV LAS	Cardot, M. Destruction of $^{237}\text{U}$ by all reactions with incident neutrons. McNally has fission data from Physics-7 Event, 0.1 to 2MeV. ENDNC(US)-143 U.	69
983 [2399]	$^{238}\text{U}$	TOTAL XSECT	5. +2	1.5+7	1	2 CAD	Barre, J-Y. For fast reactor calculations.	71
984 [834]	$^{238}\text{U}$	TOTAL XSECT	1. +6	2.5+6	8	1 CAD	Barre, J-Y. For fast reactor calculations.	71
985 [2044]	$^{238}\text{U}$	RESON PARAMS see comment			10	1 AI ANL GE LMB BNL	Alter, H. Avery, R. Snyder, T. Hemmig, P.B. Needed for Doppler effect on fast reactors,to as high energy as can be measured. Need answers to questions of missing P-wave levels and uncertainty of gamma-widths. Accuracy of 20% would be useful. Wasson+: PR/C 4,900(1971), gives partial $\Gamma_\gamma$ and p-wave assignments. ANL: Bollinger: PR 171 1293(1968), 16 p-wave below 170 eV. GA: Fricke: ENDNC(US) 143'U'63(5/70), ( $\gamma\gamma$ ) 1keV to 1MeV. WAL: Gibson, WANL-TME-1228, evaluates 6-2000 ev. RPI: Plans for $\langle(\gamma\gamma)\rangle, \langle\delta\Gamma\rangle$ versus temp.,sample thickness. GEL: Rohr: 70HELSINKI P/18(6/70), $\Gamma_\gamma$ for 28res.below 1keV. HAR: Moxon: AERE-PR-16(1969), below 300eV from $\sigma T$ , ( $\gamma\gamma$ ). Carraro et al.: 70HELSINKI P/17(6/70), 270 $\Gamma_\gamma$ 6eV-6keV COL: Arbo et al.: ENDNC(US) 143'U'50(5/70), plan ( $\gamma\gamma$ ) meas. ORL: De Saussure+: ENDNC(US) 143'U'171(5/70), ( $\gamma\gamma$ ) in prog. COL: Rahn+: ENDNC(US)-156 U; $g\Gamma_n$ and $\Gamma_\gamma$ for 321 levels below 5 keV. Above 1 keV,give $g\Gamma_n$ values greater than those of Garg+ (64). But there still exist a discrepancy greater than 10% on $\langle \Gamma_n (l=0) \rangle$ with data of Carraro+ (70).	69
986 [2529]	$^{238}\text{U}$	RESON PARAMS energy dist		5.0+3	1	1 PEI GEL	Nikolaev, M.N. Careful identification of s and p wave resonances needed for determination of p wave strength function. Attention to be paid to distribution of reduced neutron widths of p wave resonances and its agreement with the Porter- Thomas distribution. Request connected with problem of selfshielding evaluation in unresolved resonance region. Carraro et al. measured neutron widths up to 5.7 keV AIEA CN-26/17. See also Knoxville Conference, 1971. Rohr et al. measured capture widths for 28 resonances below 1 keV, AIEA CN-26/18. COL: Rahn et al. measured neutron widths up to 5 keV, Knoxville Conference, 1971.	71

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
987 [2400]	$^{238}\text{U}$	RESON PARAMS	5. +0	4. +3	3	1	SAC Reuss, P. For resonances self shielding and doppler effect accuracy: 3% on $\langle g^*\Gamma_n^*\Gamma_\gamma/\Gamma \rangle$ and $\langle g^*\Gamma_n^*\Gamma_f/\Gamma \rangle$	70
988 [836]	$^{238}\text{U}$	RESON PARAMS	1. +2	8. +3	5	2	CAD Barre, J-Y. Evaluation may suffice if it explains discrepancies. Fast reactor calculations (Doppler effect and resonance self shielding) 5% on $g^*\Gamma_n$ , 10% on $\Gamma$ and on the product $g^*\Gamma_n\Gamma_\gamma$ for great resonances. --- Status: see REG 2044 above.	69
989 [1356]	$^{238}\text{U}$	RESON PARAMS	2. +3	5. +3	3	2	AE Haeggblom, H. Needed for fast reactor calculations. --- Status: see REG 2044 above.	
990 [2028#]	$^{238}\text{U}$	DIFF ELASTIC	1. +3	1. +7	<10 5 TO 10%	1	ANL GE LMB ORL Avery, R. Snyder, T. Hemmig, P.B. Perry, A.M. Accuracy 10% from 1 to 300 keV. 5% From 300 keV to 2 MeV. 10% From 2 to 10 MeV. Factors of 2 lower accuracy would be useful on short term. --- ANL Smith: data to 1.7 MeV. ANL Lambropoulos+: NC SAC-33(1970), analysis of total, elastic, and inelastic, .1-10. MeV reported. GEL Ahmed: data at 1.5, 1.9, 2.3 MeV.	69
991 [837]	$^{238}\text{U}$	DIFF ELASTIC	1. +5	2.5+6 on $\langle \cos \theta \rangle$	5	1	CAD Barre, J-Y. For fast reactor calculations. --- ANL Smith, new data to 4.0 MeV. GEL Ahmed et al., results at 1.5, 1.9 and 2.3 MeV	69
992 [2533]	$^{238}\text{U}$	NONELASTIC	1.0+4	1.5+7 see comment		1	FEI Nikolaev, M.N. For evaluation of inelastic scattering CS for fast reactors. Direct measurements by shell transmission desirable with 3-5% accuracy.	71
993 [2528#]	$^{238}\text{U}$	NONELASTIC	1.0+5	1.0+7	10	2	RAM Islam, M.M. For fast reactors. --- BNL Prince made most recent optical model calculations, AIEA CN-26/91. WEW Pitterle, most recent evaluation, AIEA CN-26/83.	69
994 [2038#]	$^{238}\text{U}$	NONEL GAMMAS	1. -3	1. +7 energy,angle	10	2	LMB Hemmig, P.B. Accuracy 10% in spectrum. $\gamma$ -ray spectrum desired at .5 MeV intervals $\gamma$ -energy. Gammas of all energies wanted. --- GRT John+: NC SAC-33(1970) capture spectra at 100 keV. BNL Chrien+: NC SAC-33(1970), spectra 6-600 eV. TNC Tucker+: ORO-2791-17(1969), data at 1.09, 2.1, 3, 4, 5, And 14.8 MeV. ANL Bollinger: resonance average spectra in progress.	67
995 [2293]	$^{238}\text{U}$	NONEL GAMMAS	2.0+5 spectrum		15	2	WIN Campbell, C.G. For study of activation and heat release in core.	71
996 [1569]	$^{238}\text{U}$	TOTINELASTIC TR	1.5+7 see comment		5	2	VNV Vidal, J.C. Or $\sigma$ (nonelastic). For fast reactor calculations.	69
997 [842]	$^{238}\text{U}$	TOTINELASTIC TR	1.5+7 see comment		5	2	CAD Barre, J-Y. VNV Cardot, M. Or $\sigma$ (nonelastic). For fast reactor calculations.	69
998 [843]	$^{238}\text{U}$	TOTINELASTIC	7. +4	2. +5	10	2	AE Haeggblom, H. Needed for fast reactor calculations. --- HAR Meas. published in Nucl.Phys. 80 46 (1966) has requested accuracy only above 140keV. ANL Smith, new data to 4.0 MeV.	

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REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
999 [ 845 ]	$^{238}\text{U}$	DIFF INELAST TR	2. +6	10	2	KPK	Schmidt, J.J. Available data insufficient. See extensive discussion in KFK-120 part I. For $1.2 \text{ MeV} < E' < 2 \text{ MeV}$ . GEL ANL Ahmed et al.: results at 1.5, 1.9, 2.3 MeV. Smith, new data to 4.0 MeV.	
1000 [ 844 ]	$^{238}\text{U}$	DIFF INELAST TR energy dist	1.5+7	5	2	CAD	Barre, J-Y. Separation of levels up to 2 MeV, accuracy on nuclear temperature over 2 MeV. For fast reactor calculations.	69
1001 [ 2531 ]	$^{238}\text{U}$	DIFF INELAST 5.0+4 energy dist	1.5+7		1	PEI	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in RR for fast breeders. CS for inelastic removal below fission thresholds of $\text{U}^{238}$ (1.5-2.0% acc.y) and of $\text{Pu}^{240}$ (or $\text{Np}^{237}$ ) (3-5% acc.y) wanted. Precision meas. of these integral parameters in shell transmission experiments with $\text{Cf}^{252}$ neutron source and $\text{U}^{238}$ and $\text{Np}^{237}$ fission threshold detectors seems very important. Level exc. CS to be remeasured esp.y in region 1-2 MeV with highest possible resolution and 5% accuracy. For judgment of importance of direct interaction meas. of exc. CS for 44 keV level at 1.5-2.5 MeV of great interest. Decision about tot. inel. CS at 1.0-2.5 MeV wanted. T for calc. of inel. scatt. neutron spectra to be measured with 5% acc.y at 2.5-15 MeV. Spectra and CS for direct inel. scatt. processes to be investigated in MeV region. ANL Smith has new data to 1.7 MeV, to be publ. in NSE. GEL Ahmed et al. have results at 1.5, 1.9 and 2.3 MeV. HAR Barnard et al. measured to 1.5 MeV, NP 80 (1966), 46. ALD Cookson measured at 9.7 MeV, AWRE CNR/PR/10.	71
1002 [ 1328 ]	$^{238}\text{U}$	DIFF INELAST 1.0+5 energy dist	1.0+7	10.0	1	JAE	Japanese Nuclear Data Committee (JNDC). For fast reactors. Cross sections for excitation of individual levels desired. Smith, new data to 4.0 MeV.	70
1003 [ 2190# ]	$^{238}\text{U}$	DIFF INELAST 1. +5 energy dist	1. +7	5	1	ANL	Avery, R.T. Snyder, T. LMB Heming, P.B. Energy resolution 5%. Emission instead of inelastic and $n,2n$ might be useful. Accuracy of 20% would be useful. ANL Smith+: data to 1.7 MeV. GEL Ahmed: data at 1.5, 1.9, 2.3 MeV. HAR Barnard: NP 80 46, to 1.5 MeV. ALD Cookson: AWRE CNR/PR/10, 9.7 MeV.	69
1004 [ 2526 ]	$^{238}\text{U}$	DIFF INELAST 3.0+5 energy,angle	1.0+7	10	1	RAM	Islam, M.M. For fast reactors. HAR Armitage, in progress. ANL Smith has new data to 1.7 MeV, to be publ. in NSE.	69
1005 [ 850 ]	$^{238}\text{U}$	DIFF INELAST 1. +6 energy,angle	2.5+6	5	1	WIN	Campbell, C.G. For fast reactors. Evaluation shows requirement not met by currently available data. HAR Armitage: in progress. ANL Smith, new data to 4.0 MeV.	
1006 [ 847 ]	$^{238}\text{U}$	DIFF INELAST 1.2+6 energy,angle	2. +6	10	2	KPK	Schmidt, J.J. $E' = 0.045 \text{ MeV}, E' = 0.148 \text{ MeV}$ . No data available. See extensive discussion in KFK-120 part I. ANL Smith, new data to 4.0 MeV.	
1007 [ 849 ]	$^{238}\text{U}$	DIFF INELAST 7. +6 energy dist	1.8+7	5.0	2	KPK	Schmidt, J.J. Former xsect measurements at 2.5;4;6 and 7 MeV (Hughes, Geneva conf. 1958, P/2483, Beyster, LA-2099, 1957), diff inelas xsect measurements and T assignments at 2.45 MeV (Cranberg et al., Phys. Rev. 103, 343, 1956) and at 2.5 and 3.5 MeV (see Mandeville, Kavanagh, CWR-4028, 1958). New measurements of total and diff inelast xsect and T available from Batchelor et al. (ENDC (UK) 48 "S", 1964) at 2;3;4 and 7 MeV and from Buccino et al. (ENDC (US) 38, 1963) at 4;5;6	

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REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR
			MIN	MAX	(%)				
1008 [2527]	<sup>238</sup> U	INELASTGAMMA energy,angle	3.0+5	4.0+6	10	1	RAM	Islam, M.M. For fast reactors.	69
							CCP	Bakov has data to 10 MeV, AE 29(1970), 338.	
							ANL	Poenitz measured at 0.8-1.6 MeV, WASH-1155,6 ; AIEA CN-26/111.	
							SUN	Mc Murray et al. measured at 0.75-1.5 MeV, INDC(SAP)-2/G.	
1009 [852]	<sup>238</sup> U	N2N XSECTION TR	1.0+7	10	2	BN	Tavernier, G. ---	Neutron economy of fast reactors.	
							SCISRS	references available.	
							WEW	Pitterle: 70HELSINKI P/83 (6/70).	
							BRG	Frehaut: 70HELSINKI P/66 (6/70).	
							JAP	Sakanoue M. et al.: NST 5 265 (6/68), σ(FISS spectr).	
1010 [1570]	<sup>238</sup> U	N2N XSECTION TR	1.5+7	10	1	VNV	Cardot, M.		69
							WES	Pitterle (Helsinki Nucl. Data Conf. C N 26/83).	
							BRG	Frehaut (Helsinki Nucl. Data Conf. C N 26/66)	
							JAP	Sakanoue Masanobu et al. (Kanazawa U) have a sigma-value for fission neutrons (J. Nucl. Sci. Technol. (Tokyo) 5, 265 (1968))	
							VNV	Voignier has a σ-value at 14 MeV (CEA-R-3503)	
							ALD	Mather plans measurements between 12 and 15 MeV	
1011 [2534]	<sup>238</sup> U	N2N XSECTION TR energy dist	1.5+7	<10	1	FEI	Nikolaev, M.N. For fast breeder reactors. 5-10% accuracy wanted.		71
								Energy spectra of secondary neutrons desirable with 5% accuracy and 0.2 resolution in lethargy.	
							WEW	Pitterle evaluation reported at Helsinki Conference, AIEA CN-26/83.	
							BRG	Frehaut has data, AIEA CN-26/66.	
							FR	Voignier measured value at 14 MeV, CEA-R-3503.	
							ALD	Mather has data below 10 MeV and plans measurements at 12-15 MeV.	
							JAP	Masanobu et al. measured CS value for fission neu- trons, J. Nucl. Sci. Technol. (Tokyo) 5 (1968), 265.	
1012 [2029#]	<sup>238</sup> U	N2N XSECTION TR	1. +7	10	2	GE	Snyder, T. Needed for control of $U^{232}$ in $Pu^{238}$ production.		69
							BRG	Frehaut+: 70HELSINKI P/66(6/70) .	
1013 [2292]	<sup>238</sup> U	FISSION	FISS	2	2	WIN	Campbell, C.G. WIN		71
							TYROR	J.G. For fast and thermal reactors.	
1014 [1407]	<sup>238</sup> U	FISSION	TR	1.5+7	3	1	CAD	Barre, J-Y. For fast reactor calculations.	68
								Absolute values useful but request concerns mainly relative values versus energy or relative values to $U^{235}$ (accuracy 1% on this ratio).	
							HAR	Evaluation of existing data in progress above 100 eV: Sowerby and Patrick (1970) Helsinki CN-26/34.	
							ANL	Accuracy available 5% or better above 1.4 MeV. Meadows has results below 1.5 MeV. EANDC(US)-143 U.	
1015 [2523]	<sup>238</sup> U	FISSION	TR	6.0+6	5.0	2	UPR	Koen, J. For calculations of pulsed heterogeneous systems.	69
							ANL	Meadows has results below 1.5 MeV, EANDC(US)-143U.	
1016 [2524]	<sup>238</sup> U	FISSION	TR	1.5+7	5.0	1	RAM	Islam, M.M. For fast reactors.	69
							ANL	Meadows has results below 1.5 MeV, EANDC(US)-143U.	

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
1017 [2202]	$^{238}\text{U}$	FISSION	TR	2.0+7 < 5.0	1	JAE Japanese Nuclear Data Committee (JNDC). For fast reactor and for radiation dosimetry.	71
1018 [2031#]	$^{238}\text{U}$	FISSION ratio x-sect	5. +5 1.4+6	< 4 2 TO 4%	1	LMB Heming, P.B. Accuracy 4% below 1.3 MeV, 2% 1.3 to 5. MeV, 3% above 5. MeV. Energy resolution 3%, energy calibration 1%. Intermediate accuracy useful. ANL Work planned.	72
1019 [2532]	$^{238}\text{U}$	FISSION see comment	8.0+5	1.5+7	1	FEI Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Ratio of $^{238}\text{U}$ to $^{235}\text{U}$ fission CS wanted. Requested accuracies: 5% below 1.3 MeV; 2% at 1.3-6.5 MeV; 5% above 6.5 MeV. At least three different measurements with these accuracies wanted. Absolute fission CS measurements with 2-3% accuracy also desirable. ANL Meadows has results below 1.5 MeV, EANDC (US)-1430.	71
1020 [1483]	$^{238}\text{U}$	NU	TR	1.4+7	1 2	CAD Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy. Accuracy relative to nu Cf <sup>252</sup> . ANL Soleilhac et al., JNE 22(1968), 79, 1.4-15 MeV ALD Davey, NSE 44, 345 (1971), Eval. Mather +, AWRE O-44/71 (1971) Eval. 3 lines fit. BRG Soleilhac+, JNE 23 257(69), expt. 1.3-15 MeV More expt needed to reach 1% acc.	70
1021 [2535]	$^{238}\text{U}$	NU	TR	5. +6 < 0.7	1	FEI Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Ratio to nu of Cf <sup>252</sup> must be measured with 0.7 % accuracy. Energy dependence must be known with 0.7 % accuracy and about 10 % energy resolution. BRC Soleilhac et al., JNE A/B 22(1968), 79, 1.4-15 MeV accuracy < 1%. ANL See also evaluation by Davey, NSE 44(1971), 345. IAE Manero and Konshin, evaluation in progress.	71
1022 [2032#]	$^{238}\text{U}$	NU	1. +6 1. +7	1 1	ANL Avery, R. LMB Heming, P.B. BRC Confirmation of Soleilhac data requested. Need ratio to Cf Nu Bar. BRC Soleilhac: JNE 22 79, 1.4-15. MeV, 1%. BRC Soleilhac: JNE 23 257 .	69	
1023 [2670+]	$^{238}\text{U}$	F NEUT DELAY THR spectrum	5. +6	5	1	LMB Heming, P.B. Available data discrepant.	72
1024 [1583]	$^{238}\text{U}$	F NEUT DELAY 2. +6		5	2	WIN Campbell, C.G. WIN Tyror, J.G. IST For fast and thermal reactors. En approximate. Clifford: preliminary data available.	69
1025 [858]	$^{238}\text{U}$	SPECT FISS N 0. +0 1. +5	10	2	VNV Vidal, J.C. Fast reactor calculations. Recent measurements by Fabry and Grundl showed that the average energy of the fission spectrum is increased by 20%.		
1026 [1482]	$^{238}\text{U}$	SPECT FISS N 0. +0 1.4+7	2	2	CAD Barre, J-Y. For fast reactor calculations. VNV Accuracy 2% for aver. $E'(^{238}\text{U})/\text{aver. } E'(^{235}\text{U})$ . Cardot, H. Low energy fission spectrum.	69	
1027 [1582]	$^{238}\text{U}$	SPECT FISS N 2. +6	on $\langle E' \rangle$ . 10% on DN1,DN2.	2 3	WIN Campbell, C.G. For fast reactors. DN1 = no.of neutrons above 5 MeV, DN2 = no.of neutrons below .25 MeV. Low energy resolution adequate.	69	

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(eV) MIN MAX	ACCURACY (%)	P	LAB	REQUESTER , COMMENTS	YEAR
1028 [860]	$^{238}\text{U}$	N,GAMMA	THR	< 1 0.5-1%	2	CRC	Hanna, G.C. For accurate alpha of natural uranium. Recent values agree fairly well but older (1951) U.S. values unexplained. See EANDC(CAN) 38. NPL Hunt+: JNE 23 705 (D/69). See also CJP 47 1317(1969). Request apparently satisfied.	
1029 [2525]	$^{238}\text{U}$	N,GAMMA	THR	3.0+4	3.0	2 RAM	Islam, M.M. For fast reactors. ANL Davey, NSE 39 (1970), 337, reviews status before Helsinki Conference above resonance range. Several relevant papers at Hels. Conf. (CN-26/18, 43, 77, 78, 111). COL Arbo et al. plan low keV TOF measurement (EANDC (US)-1430, p.50). HAR Moxon (AERE-R 6074) estimates accuracy of data between 0.5 and 100 keV to 3-7%. ORL De Saussure et al., capture work in progress. NPL Ryves et al. plan activation meas. 120-600 keV. KPK Froehner et al. plan meas. rel. to $(n,p)$ , 100-500keV. IAE Konshin, evaluation in progress.	69
1030 [859]	$^{238}\text{U}$	N,GAMMA	5. -3 6. +0	.03 b.	1	WIN	Tyror, J.G. For thermal reactors. Note increased priority. HAR In progress, Moxon.	
1031 [2401]	$^{238}\text{U}$	N,GAMMA	2.5-2	0.5	1 CAD	Barre, J-Y. Accuracy relative to fission( $^{235}\text{U}$ ). For fast reactor calculations.	71	
1032 [2402]	$^{238}\text{U}$	N,GAMMA	4. +0 5. +2	3	1 SAC	Reuss, P. Relative to $\sigma(n,g)$ (0.0253eV). For calculation of Ieff. Evaluation may suffice if it explains discrepancies.	69	
1033 [865]	$^{238}\text{U}$	N,GAMMA	5.0+2 8.0+5	< 5 2% 10 to 400keV 3% else-where	1 JUL	Gerwin, H. Fast reactor calculations. Incoherence in existing data up to 25%. Moxon (priv.comm.) will measure 1 to 100keV. With 5% accuracy.		
					ANL	Davey, NSE 39 (1970) 337, and Abagyan+, 70HELSINKI II 667, review status before Helsinki conference. More recent activities: LEB Stavissky+, 70HELSINKI II 51, lead pile data <100 keV uncorrected for self-shielding and multiple scatter. GEL Rohr+, 70HELSINKI I 413, 50-1000 eV, 28 $\gamma$ values extracted, no intermediate structure in $\gamma$ seen. GA Fricke+, 70HELSINKI II 265, 1-1000 keV, TOF, black resonance normalization. FEI Panitkin+, 70HELSINKI II 57, 24-145 keV, VdG, shape measurement. COL Rahn+, NCSAC-33(1970)44, have TOF data, low keV region, resonance analysis in progress. HAR Moxon, AERE-R 6074, estimates accuracy of TOF data between .5 and 100 keV as 3-7%. ORL Silver+, NCSAC-38(1971)162, TOF data below 100 keV, resonance analysis in progress, $\langle \sigma(n,\gamma) \rangle$ plotted. ANL Poenitz, NSE 40 (1970) 383, reports ratio values for $\sigma\gamma(^{238}\text{U})/\sigma\gamma(^{235}\text{U})$ and $\sigma\gamma(^{238}\text{U})/\sigma\gamma(^{239}\text{Pu})$ , 130-1400keV. NPL Ryves+ plan activation measurement, 120-600 keV. Beer+: measur. planned rel.to $\text{H}(n,p)$ , 100-500 keV. Requested accuracy unrealistic.		
1034 [1484]	$^{238}\text{U}$	N,GAMMA	5.0+2 1.0+6	3 1% 10 to 400keV	1 CAD	Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy or relative values to $^{235}\text{U}$ (accuracy 1% on this ratio).	69	
					SAC	Reuss, P. Relative to $\sigma(n,g)$ (0.0253eV). Evaluation may suffice if it explains discrepancies. --- For calcalations of Ieff. Status: see REG 865 above.	70	

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REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER	COMMENTS	YEAR	
				MIN	MAX	(%)			
1035 [2530]	$^{238}\text{U}$	$\text{n},\text{GAMMA}$	$5.0 \pm 2$	$1.4 \pm 6$	3.0	1	FEI see comment	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Between 1 and 100 keV information on resonance self-shielding factors (see book by Abagyan et al., Consultants Bureau, New York, 1964) with 2% accuracy and averaged over 0.2 lethargy intervals desired. Ratios of capture CS of $^{238}\text{U}$ to fission CS of $^{235}\text{U}$ wanted. For selfshielding evaluation transmission measurements requested with flat response and capture detectors and with attenuations of primary beam down to 1 and 0.1%. Experiments wanted at different temperatures from 70 to 2500°K. Temperature differences of selfshielding factors must be known with 7% accuracy.	71
							ANL Davey, NSE 39(1970), 337, reviews status before HELSINKI conference above resonance range. Several relevant papers at HELS. conf. (CN-26/18, 43, 77, 78, 111).		
							COL Arbo et al. plan low keV TOF measurement (EANDC(US)-1430, p.50).		
							HAR Moxon (AERE-R 6074) estimates accuracy of data between 0.5 and 100 keV to 3-7%.		
							ORL De Saussure et al., capture work in progress.		
							NPL Ryves et al. plan activation meas. 120-600 keV.		
							KPK Froehner et al. plan meas. rel. to $(n,p)$ , 100-500keV.		
							IAE Konshin, evaluation in progress.		
1036 [2036#]	$^{238}\text{U}$	$\text{n},\text{GAMMA}$	$5. +2$	$1. +7$	$< 10$	1	AI ANL GE LMB	Alter, H. Avery, R. Snyder, T. Hemming, P.B. Highest priority need for fast reactor calculations. Accuracy 6% from 500 ev to 1 keV, 4% from 1 keV to 300 keV, 6% from 300 keV to 500 keV, 10% from 500 keV to 10 MeV. --- Accuracy of 10% from 1 keV to 10 MeV, useful. Status: See REG 865 above.	69
					$2 \text{ TO } 10\%$				
1037 [2209]	$^{238}\text{U}$	$\text{n},\text{GAMMA}$	$1.0 \pm 3$	$1.0 \pm 6$	$< 5.0$	1	JAE ---	Japanese Nuclear Data Committee (JNDC). For fast reactor calculations. Poenitz: NSE 40 383 (1970). Menlove and Poenitz: NSE 33 24 (1968). Moxon: AERE-R 6074 (1969). Barry et al.: JNB A/B 18 481 (1964).	70
1038 [867]	$^{238}\text{U}$	$\text{n},\text{GAMMA}$	$2. +3$	$2. +6$	3	1	WIN ---	Campbell, C.G. For fast reactors. Note changed energy range. HAR Moxon: data available below 100 keV. NPL Axton: activation measur. in progress. HAR Coates: scint. tank measur. in progress. Evaluation shows that acc. requirement not met. Status: see REG 865 above.	
					(E-2E)				
1039 [866]	$^{238}\text{U}$	$\text{n},\text{GAMMA}$	$1. +4$	$1. +6$	$< 3$	2	AE ---	Haeggblom, H. Needed for fast reactor calculations. Status: see REG 865 above. Requested accuracy difficult to obtain.	
1040 [2039#]	$^{238}\text{U}$	$\text{n},\text{GAMMA}$	$1. +4$	$1. +7$	$< 7$	1	ANL GE LMB ORL	Avery, R.T. Snyder, T. Hemming, P.B. Perry, I.M. Needed is ratio of capture cross section $^{238}\text{U}$ to fission cross section of $^{239}\text{Pu}$ or $^{235}\text{U}$ . Direct ratio needed to supplement separate measure. Accuracy 1.5% below 300 keV, 7% above. Intermediate accuracy useful near term. Poenitz: NSE 40 383 (1970), 400 keV to 1.4 MeV. De Saussure: measurements in progress.	69
		ratio x-sect			$1.5 - 7\%$				

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
1041 [ 2203 ]	$^{238}\text{U}$	MISCELLANEOUS		< 5.0	1	JAE	Japanese Nuclear Data Committee (JNDC). Delayed neutron fraction (BETA). For fast reactor measurements.	71	
						LAS	LA-3527 (1968) Hunter et al.		
1042 [ 1571 ]	$^{239}\text{U}$	ABSORPTION see comment	1. +3	1.5+7	10	2	VNV	Vidal, J.C. Destruction of $^{239}\text{U}$ by all reactions with incident neutrons.	69
						LAS	Cramer et al. report fission x-sect. 0.5 to 2.25 MeV EANDC (US)-122 U.		
1043 [ 2046 ]	$^{237}\text{Np}$	N2N XSECTION TR	1.0+7	10	2	GE	Snyder, T. To evaluate contamination of $\text{Pu}^{238}$ by $\text{Pu}^{236}$ . Also needed for control of $\text{U}^{232}$ production.	69	
						ALD	Perkin: J.Nucl.Em. AB14 69, 0.39± 0.07 barns by activation.		
						HTR	Smith, Grimesey: IN-1182 (5/69), evaluation.		
						KPK	Hinkelmann: 70HELSINKI P/15 (6/70), evaluation.		
1044 [ 2403 ]	$^{237}\text{Np}$	N2N XSECTION TR	1. +7	10	2	PAR	Devillers, C. Contamination by $^{236}\text{Pu}$ in $^{238}\text{Pu}$ production.	71	
1045 [ 2330# ]	$^{237}\text{Np}$	N2N XSECTION TR	1.5+7	< 5	1	LLL	Hoverton, R.J. Activation required. --- Measurements of lower accuracy not helpful. No active work.	70	
1046 [ 2671+ ]	$^{237}\text{Np}$	N2N XSECTION TR	1.5+7	10	2	SRL	Dessauer, G. To evaluate contamination of $\text{Pu}^{238}$ by $\text{Pu}^{236}$ . Also needed for control of $\text{U}^{232}$ production. Status: See REG 2046 above.	67	
1047 [ 877 ]	$^{237}\text{Np}$	FISSION	TR	1.5+7	2	CAD	Barre, J-Y. For spectrum index analysis it is necessary to obtain 2% accuracy on the fission ratio $^{237}\text{Np}/^{235}\text{U}$ .	69	
		see comment.				LAS	Brown et al. have new data from Physics 7,8. EANDC (US)-143 U.		
						LAS	Hoffman et al. have data from Physics 8.EANDC (US)-143		
1048 [ 2047 ]	$^{237}\text{Np}$	FISSION	1.0+3	5.0+6	10	2	SRL	Dessauer, G. Subthreshold to several MeV, for $\text{Pu}^{238}$ production.	67
						SAC	Paya: total and fission x-sect., res. params to 2 keV.		
						LAS	Brown et al. have new data from Physics 7,8. EANDC (US)-143 U.		
						LAS	Hoffman et al. have data from Physics 8.EANDC (US)-143		
1049 [ 2204 ]	$^{237}\text{Np}$	FISSION	1.0+5	2.0+7	< 5.0	2	JAE	Japanese Nuclear Data Committee (JNDC). For monitor reaction and for radiation dosimetry	71
1050 [ 2404 ]	$^{237}\text{Np}$	N,GAMMA	TR	1. +6	10	2	PAR	Devillers, C. For production of $^{238}\text{Pu}$ .	71
1051 [ 2051# ]	$^{237}\text{Np}$	N,GAMMA	1. -3	1. +3	<10	1	BNW	Leonard, B.R.	67
					3 TO 10%	GE	Snyder, T. Accuracy 3% to 10 eV. Accuracy 5% in average $\Gamma_n$ . Accuracy 10% in average $\Gamma_F$ to 1 keV. For thermal reactor calculations and $\text{Pu}^{238}$ prod.		
						SAC	Paya: ANS 10 259(1967), RI, snT, snf to 2 keV. Status: See REG 2052 below.		
1052 [ 2052 ]	$^{237}\text{Np}$	N,GAMMA	1.0+3	5.0+6	<10	2	SRL	Dessauer, G. Accuracy 3% interval Thermal-10 eV.	67
			3 to 10%			COL	Accuracy 5% $\gamma$ -D. Accuracy 10% $\gamma$ - $\gamma$ interval Thermal-1 keV.		
		see comment.				LAS	For thermal reactor calculation and $\text{Pu}^{238}$ production. Camarda+: NCSAC-33(1970), total, capture to 5 keV. Hoffman+: NCSAC-31(1970), from Physics-8 event. See also: EANDC (US)-143 U.		
						HOL	Poortmans+: 71KNOX 667 (3/71), res.params. to 70 eV.		

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
1053 [ 2405 ]	$^{237}\text{Np}$	GAMMA,N	TR	1. +7	10	2 FAR	Devillers, C. Contamination by $^{236}\text{Pu}$ in $^{238}\text{Pu}$ production.
1054 [ 1586 ]	$^{237}\text{Np}$	GAMMA,N see comment			20	2 UKW	Whittaker,A. Quantity: production of $^{236}\text{Pu}$ via the 22 h $^{236}\text{Np}$ isomer Cross-section for $E\gamma=TR$ to 10 MeV.
1055 [ 1428 ]	$^{238}\text{Np}$	N,GAMMA	THR		100 b.	2 CRC ---	Walker, W.H. Unknown cross section. Estimated to be about 43 b in CN-26/15.
1056 [ 1117# ]	$^{238}\text{Np}$	N,GAMMA	THR	1. +3	10	2 BNW	Leonard, B.R. Needed to evaluate $\text{Pu}^{238}$ production. Radioactive sample 2.1 days.
1057 [ 2313 ]	$^{239}\text{Np}$	N,GAMMA	3. +4	1. +6	20.0	3 JAE	Japanese Nuclear Data Committee (JNDC). For correction of calculated inelastic scattering cross section.
1058 [ 2582 ]	$^{236}\text{Pu}$	FISSION	THR	1.0+7	10	2 KFK	Schatz, B. For burnup calculations.
1059 [ 1572 ]	$^{237}\text{Pu}$	N2N XSECTION TR		1.5+7	20	2 VNV	Cardot, M.
1060 [ 1573 ]	$^{237}\text{Pu}$	FISSION	1. +3	1.5+7	20	2 VNV	Cardot, M.
1061 [ 1408 ]	$^{238}\text{Pu}$	N2N XSECTION TR		1.5+7	10	2 VNV	Cardot, M.
1062 [ 1409 ]	$^{238}\text{Pu}$	N3N XSECTION TR		1.5+7	20	2 VNV	Cardot, M.
1063 [ 1410 ]	$^{238}\text{Pu}$	FISSION	TR	1.5+7	20	2 VNV	Cardot, M. Evaluation probably sufficient. Measurements done at Los Alamos may satisfy this request up to 1MeV. Data still unknown. LAS Preliminary 'Persimmon' bomb shot data of Silbert et al. (WASH-1124 p. 99 f.) cover energies between 18ev and 3MeV ( $\pm 6\%$ systematic error). LAS Silbert ALD Moat INC Young Report fission and capture data from Physics 6, resonance parameters to 200eV. EANDC(US)143 U.
1064 [ 2054# ]	$^{238}\text{Pu}$	FISSION	1. +6	1. +7	10	3 AI	Alter, H. Neutron source in startup and reprocessing. Silbert+: LA-4108-MS, gives tabulation. Drake: data from Pommard.
1065 [ 1411 ]	$^{238}\text{Pu}$	ABSORPTION see comment	1. +3	1.5+7	10	1 VNV	Cardot, M. Destruction of $^{238}\text{Pu}$ by all reactions with incident neutrons. LAS Silbert ALD Moat INC Young Report fission and capture data from Physics 6, resonance parameters to 200eV. EANDC(US)143 U.
1066 [ 1429 ]	$^{238}\text{Pu}$	N,GAMMA	THR		5	2 CRC	Walker, W.H. Disagreement between integral (approx 450 b) and differential (approx 530 b) measurements.
1067 [ 2058# ]	$^{238}\text{Pu}$	N,GAMMA	THR	1. +3	10	1 BNW LAS ANC	Leonard, B.R. $\text{Pu-238}$ production. Silbert+: MCSAC-33, res.param. to 200 ev. Young: WSE 30 365, res.param. to 190 ev.

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
1068 [2191#]	$^{239}\text{Pu}$	N,GAMMA	1. +3	1. +7	10	3 AI ---	Alter, H. Neutron source in reprocessing.	72
1069 [898]	$^{239}\text{Pu}$	TOTAL XSECT	1. +5	1. +6	10	2 CAD	Barre, J-Y. For fast reactor calculations. Measurements planned at BRC .	69
1070 [2081#]	$^{239}\text{Pu}$	RESON PARAMS THR	5. +2	10	2 ANL LMB GE	Avery, R. Hennig, P.B. Snyder, T. For thermal reactors. To determine statistical parameters for extrapolation to higher energies for fast reactors. Exact requirements on accuracy not established. ANL Lambropoulos: NSE 40 342 (1970), adler parameters from Lsg fit 40 to 100 eV. BNL Chrien: spins inferred from $(n,\gamma)$ spectrum. SAC Blons: 70HELSINKI P/63(6/70), to 660 eV. SAC Trochon: 70HELSINKI P/61(6/70), J to 660 eV. SAC Derrien: 70HELSINKI P/61(6/70), multilevel analysis to 160 eV. SAC Ribon+: BNND(E)-135 AL, evaluation of resonance parameters up to 650 eV.	69	
1071 [2579]	$^{239}\text{Pu}$	RESON PARAMS	5. +0	2.5+2	3	1 SAC	Reuss, P. Evaluation may suffice if it explains discrepancies. Accuracy: 3% on $\langle g*\Gamma_n*\Gamma_\gamma/\Gamma \rangle$ and $\langle g*\Gamma_n*\Gamma_f/\Gamma \rangle$	70
1072 [902]	$^{239}\text{Pu}$	RESON PARAMS	2. +2	1. +3	10.0	1 KFK BN ---	Schmidt, J.J. Tavernier, G. Fission-neutron-and gamma-width.Doppler effect in fast reactors. From Russian, Saclay and Harwell work reson params, mostly also J, available for resonances below 300 eV. SAC Joly: 10% request accuracy is probably satisfied up to 600 eV, with a single level formalism by recent eval. Status: see REG 2081 above.	
1073 [1485]	$^{239}\text{Pu}$	RESON PARAMS	2. +2	1. +3	10	1 CAD	Barre, J-Y. 5% On $\Gamma_n$ and $\Gamma_\gamma$ and on the product $g\Gamma_n*\Gamma_\gamma$ for great resonances. Fast reactor calculations, (Doppler effect and reso- nance self shielding) Status: see REG 902 above.	69
1074 [1357]	$^{239}\text{Pu}$	RESON PARAMS	2.5+2	1. +3	5	2 AE RPT HAR	Haeggblom, H. Needed for fast reactor calculations. $\Gamma_n$ and J for 8 res. between 41.7 and 117.9 eV : WASH-1127 p. 176 (4/69) : no error given. Meas. of $\sigma(n,f)$ from 100eV to 30keV by Patrick and from 50eV to 30keV by James are probably more oriented towards deduction of $\langle \sigma(n,f) \rangle$ . Status: see REG 902 above.	
1075 [908]	$^{239}\text{Pu}$	ELASTIC	THR		10	3 WIN ---	Tyror,J.G. For long-term improvement of $\sigma(\text{abs})$ . No work planned.	
1076 [1486]	$^{239}\text{Pu}$	DIFF ELASTIC	1. +5	1. +6	5	2 CAD GEL ANL GEL GEL	Barre, J-Y. For fast reactor calculations. Knitter and Coppola, 0.19-0.38MeV , Zeit.Phys.228 286. Smith+, data to 1.5 MeV, submitted to JNE. Knitter, 70HELS, CN-26/22. Coppola+, ZP 232 286 (1970)	69
1077 [2061]	$^{239}\text{Pu}$	DIFF ELASTIC	1.0+6	7.0+6	10	2 LAS ---	Diven, B.C. Energy resolution 500 keV or better. Smith+, data to 1.5 MeV, submitted to JNE. Knitter, 70HELS, CN-26/22. Coppola+, ZP 232 286 (1970)	67

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
1078 [2060#]	$^{239}\text{Pu}$	DIFF ELASTIC	1. +6 3. +6	10	2 ANL LMB ANL	Avery, R. Hemig, P.B. Energy resolution 500 keV or better. Smith: data to 1.5 MeV, work continuing above 1.5.	69
1079 [2542 ]	$^{239}\text{Pu}$	NONELASTIC	1.0+5 1.0+7	10	2 RAM BNL	Islam, M.M. For fast reactors. Prince made most recent optical model calculations, AIEA CN-26/91.	69
1080 [ 978 ]	$^{239}\text{Pu}$	NONEL GAMMAS spectrum	1.2+5	20	3 WIN	Campbell,C.G. Low resolution for En adequate. For study of activation and heat release in core.	
1081 [ 903 ]	$^{239}\text{Pu}$	TOTINELASTIC TR	1.0+7	25	1 KFK	Schmidt, J.J. Total inelastic or nonelastic cross section. Smith+, data to 1.5 MeV, submitted to JNE. Knitter +: ZP 228 286(0/69), TR-380 keV. Knitter, 70HELS, CN-26/22. Coppola+, ZP 232 286(1970)	
1082 [1487 ]	$^{239}\text{Pu}$	TOTINELASTIC see comment	1.4+6 1.5+7	25	1 CAD	Barre, J-Y. Total inelastic or nonelastic cross section. For fast reactor calculations.	69
1083 [ 914 ]	$^{239}\text{Pu}$	DIFF INELAST TR energy dist	1.0+7 <20	2	KFK HAR	Schmidt, J.J. Accuracy 20% for threshold to 1.4 MeV, 10% for 1-10 MeV. Nuclear temp.10%. Separation of levels up to 1 MeV. Above 1 MeV $\delta(E) = \delta(E') = 100$ keV. Between 1.5 and 5.5 MeV in progress. Measurements of Caranagh + (AERE-R 5972, EANDC(UK)101) cover level excitation cross sections for energies between 150 and 1550 keV. Smith+, data to 1.5 MeV, submitted to JNE. Knitter +: ZP 228 286(0/69), TR-380 keV. Knitter, 70HELS, CN-26/22. Coppola+, ZP 232 286(1970)	
1084 [1488 ]	$^{239}\text{Pu}$	DIFF INELAST TR energy dist	1.5+7 <20 see comment.	1	CAD	Barre, J-Y. Accuracy 20% for threshold to 1.4 MeV, . Nuclear temp.10% above. Separation of levels up to 1 MeV. Above 1 MeV $\delta(E) = \delta(E') = 100$ keV. For fast reactor calculations. Smith+, data to 1.5 MeV, submitted to JNE. Knitter and Coppola, Zeit.Phys. 228 286, to 380 keV . HAR Between 1.5 and 5.5 MeV in progress. Measurements of Caranagh et al. (A E R E - R 5972, E A N D C ( U K 101) cover level excitation x-section for energies between 150 and 1550 keV . GEL Knitter, 70HELS, CN-26/22. GEL Coppola+, ZP 232 286(1970)	69
1085 [2553 ]	$^{239}\text{Pu}$	DIFF INELAST TR energy dist	1.5+7	1	FEI	Nikolaev, M.N. For 1.0 % accuracy in Keff of fast breeders. CS for inelastic removal below fission thresholds of $\text{U}^{238}$ and of $\text{Pu}^{240}$ (or $\text{Np}^{237}$ ) desired with 10% accuracy. Excitation CS for low lying levels requested with 15% accuracy. HAR Measurements 1.5-5.5 MeV in progress. Measurements of Cavanagh et al. (AERE-R 5972,EANDC(UK)-101) cover level exc. CS for energies of 150-1550 keV.	71
1086 [ 915 ]	$^{239}\text{Pu}$	DIFF INELAST energy dist	1.0+4 1.0+7	10	1 JAE	Japanese Nuclear Data Committee (JNDC). For fast reactor. Xsections for excitation of individual levels desired. Available data insufficient. ANL Smith+, data to 1.5 MeV, submitted to JNE. GEL Knitter +: ZP 228 286(0/69), TR-380 keV. HAR Between 1.5 and 5.5 MeV in progress. Measurements of Caranagh + (AERE-R 5972, EANDC(UK)101) cover level excitation x-sect. for energies 150-1550 keV. GEL Knitter, 70HELS, CN-26/22. GEL Coppola+, ZP 232 286(1970)	68

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
1087 [2062#]	$^{239}\text{Pu}$	DIFF INELAST energy dist	1. +4	1. +7	20	1	KAP Ehrlich, R. LMB Heming, P.B.	67	
						ANL	Smith: data to 1.5 MeV, work continuing above.		
						GEL	Knitter+: ZP 228 286(0/69), TR - 380 keV.		
						HAR	Cavanaugh: AERE-R 5972, 1.5 to 5.5 MeV in progress.		
1088 [2543 ]	$^{239}\text{Pu}$	DIFF INELAST energy,angle	3.0+5	1.0+7	10	1	RAM Islam, M.M. For fast reactors.	69	
1089 [2544 ]	$^{239}\text{Pu}$	INELASTGAMMA energy,angle	3.0+5	4.0+6	10	1	RAM Islam, M.M. For fast reactors. TNC Neill et al., in progress, WASH-1155, 214. LAS Drake et al. measured at 4.0-7.7 MeV, NSE 40 (1970), 294.	69	
1090 [2063 ]	$^{239}\text{Pu}$	N2N XSECTION TR	1.5+7	10	1	LAS Barr, D.W. LAS	Barr has found $\sigma = 150\text{mb} \pm 20\%$ at 14 MeV.	67	
1091 [1412 ]	$^{239}\text{Pu}$	N2N XSECTION TR	1.5+7	10	1	VNV Cardot, M.	ALD Experiment by Mather (Aldermaston) AWRE-CNR/PR10 . (April 1968). LAS Barr: private comm., 150 mb $\pm 20\%$ at 14 MeV.	68	
1092 [2331 ]	$^{239}\text{Pu}$	N2N XSECTION TR see comment	1.5+7	< 5	1	LLL Howerton, R.J. Quantity: activation. LAS Measurements with lower accuracy not helpful. Barr: priv.comm., 150mb $\pm 20\%$ at 14 MeV.		70	
1093 [2064#]	$^{239}\text{Pu}$	N2N XSECTION	6. +6	1. +7	10	2	LMB Heming, P.B. Needed to predict buildup of $\text{Pu}^{236}$ . --- Status: See REG 2331 above.	69	
1094 [1413 ]	$^{239}\text{Pu}$	N3N XSECTION TR	1.5+7	20	1	VNV Cardot, M. BRC Experiment in progress in BRC		68	
1095 [2540 ]	$^{239}\text{Pu}$	FISSION	THR	1.5+7	5.0	1	RAM Islam, M.M. For fast reactors. LAS Farrell et al. have data from Physics 8 above 20 eV. AIEA CN-26/46. ANL Poenitz measured fission ratio to $\text{U}^{235}$ 130 keV to 1.4 MeV, EANDC(US)-143-U. LRL Czirr et al. measured 0.1-30 keV, EANDC(US)-122-U. SAC Blons et al. have data up to 30 keV. AIEA CN-26/63. CAD Szabo et al. have data 25 keV to 1 MeV, absolute accuracy $\pm 3\%$ . HAR Evaluation of existing data in progress above 100 eV. See Soverby and Patrick, AIEA CN-26/34. CS probably known to about 3-5% below 10 keV when consistently normalized. Data available below 20 keV summarized by James, AIEA CN-26/107. IAE Byer, evaluation in progress.		69
1096 [2065#]	$^{239}\text{Pu}$	FISSION	THR	1. +3	1	1	GE Snyder, T. Standard parameter for Pu-fueled reactor. Direct measurements disagree. Improved precision needed for thermal reactors. $\text{U}$ and $\text{Pu}$ half lives should be confirmed as they affect this measurement. IAE Hanna+: REA 7(4) 3(D/69), Lsq evaluation 2200m/s.	67	
1097 [ 922 ]	$^{239}\text{Pu}$	FISSION	2.5-2		1	2	CRC Hanna, G.C. Note changed energy specification. Serious discrepancies between available direct measurements.		

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
1098 [ 920 ]	$^{239}\text{Pu}$	FISSION	THR	0.5	1	SAC	Bussac, J. The latest evaluation by Hanna and Westcott may satisfy this request when the discrepancies on the half-life of $^{234}\text{U}$ will be resolved.	
						ALD	Keith et.al.: JNE 22,477 give a value of $(742.0 \pm 6.7)$ b.	
						GEL	Measurements to the required precision are under way by direct comparison to $\sigma(n,\alpha)$ of standard boron layers.	
						IAE	Review of thermal data to be published.	
1099 [ 2406 ]	$^{239}\text{Pu}$	FISSION	2.5-2	0.5	1	CAD	Barre, J-Y. For fast reactor calculations. Relative to $\sigma(n,f)$ (0.0253eV) $^{235}\text{U}$ .	71
1100 [ 2407 ]	$^{239}\text{Pu}$	FISSION	2.5-2	0.3	1	SAC	Reuss, P.	69
1101 [ 1414 ]	$^{239}\text{Pu}$	FISSION	0. +0 5. +0	1	1	SAC	Reuss, P. Relative to $\sigma(n,f)$ (0.0253eV). Evaluation may suffice if it explains discrepancies. For calculation of temperature coeff.	69
1102 [ 2066# ]	$^{239}\text{Pu}$	FISSION	1. +0 1. +7 < 5 2 TO 5%	1	ANL GE LMB	Avery, R. Snyder, T. Hemming, P.B. Highest priority for fast reactor calculations. Accuracy 3% below 20 keV, 2%, 20 keV to 3 MeV, 5%, 3 MeV to 10 MeV. Verification of current accuracy or intermediate improvement useful. Need related accuracy for 5-10% energy bins. Status: See REG 926 below.		69
1103 [ 2408 ]	$^{239}\text{Pu}$	FISSION	5. +0 2. +6	5	1	SAC	Reuss, P. Relative to $\sigma(n,f)$ (0.0253eV). Smooth cross section accuracy for 0.5 lethargy interval evaluation may suffice if it explains discrepancies. High temperature reactors calculations	70
1104 [ 926 ]	$^{239}\text{Pu}$	FISSION	1. +2 5. +6 (E-2E)	3	1	WIN	Campbell, C.G. For fast reactors. Note increased priority. Accuracy requirement not met by available data.	
						LAS	Farrel et al., Physics 8, above 20eV. Helsinki CN-26/46.	
						ANL	Poenitz, fission ratio to $^{235}\text{U}$ , between 130 and 1400keV	
						LRL	Czirr et al., 0.1-30keV, EANDC(US)-122 U.	
						SAC	Blons, 40 eV - 30 keV, 70HELSINKI 1 513.	
						CAD	Szabot, 11-200 keV, 71KNOXVILLE 573, and from 35-972 keV, 70HELSINKI 1 229, to $\pm$ 3%.	
						HAR	Sowerby+, 70HELSINKI 2 703, report x-sect. probably known to 3-5% below 10 keV when consistently normalised. Data available below 20 keV summarised by James, 70HELSINKI 1 267. Also values by Schomberg, 70HELSINKI 1 315.	
1105 [ 2409 ]	$^{239}\text{Pu}$	FISSION	1.0+2 1.4+7	2	1	CAD	Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy or relative values to $^{235}\text{U}$ (accuracy 1% on this ratio). Measurements done by Blons at Saclay up to 25keV.	69
1106 [ 1331 ]	$^{239}\text{Pu}$	FISSION	4.4+2 8.0+2	10	1	JAE	Japanese Nuclear Data Committee (JNDC). For fast reactor. Discrepancies exist among measurements : "PETREL", UK, Ryabov.	68
1107 [ 928 ]	$^{239}\text{Pu}$	FISSION	5. +2 1.5+7 < 5 .5-50keV :4% 50keV -2.5MeV :2%	1	CAD	Barre, J-Y. For spectrum index analysis it is necessary to obtain 1% accuracy on the fission ratio $^{239}\text{Pu} / ^{235}\text{U}$ . For fast reactor calculations. Measurements done by Blons at Saclay up to 25keV.		
						LAS	Farrel et al., Physics 8, above 20eV. Helsinki CN-26/46.	
						ANL	Poenitz, fission ratio to $^{235}\text{U}$ , between 130 and 1400keV	
						LRL	Czirr et al., 0.1-30keV, EANDC(US)-122 U.	
						SAC	Blons et al., up to 30keV, AIEA-CN-26/63.	
						CAD	Szabo et al., from 25keV to 1MeV, abs.acc. $\pm$ 3% (to be published).	

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
						Evaluation of existing data in progress above 100 eV: Sowerby and Patrick (1970) Helsinki CN-26/34. X-sect probably known to 3-5% below 10keV when consistently normalized. Data available below 20keV summarized by James 70HELSINKI, CN-26/107.	
						Also values by Schomberg (1970) Helsinki CN-26/33.	
1108 [2549]	$^{239}\text{Pu}$	FISSION ratio x-sect	1.0+3 5.0+4	3.0	1	IAE Byer, T.A. Relative to $^{235}\text{U}$ fission CS. Upper energy limit about 50 keV to give overlap with data of Pfletschinger (NSE 40 (1970), 375) and of Allen and Ferguson (Proc. Phys. Soc. 70A (1957), 573). Thick target should be used to produce continuous "white" spectrum of neutrons. --- Byer, recent evaluation (INDC(NDS)-33/G) indicates that Lehto data (NSE 39 (1970), 361) are inadequate below 10 keV.	71
1109 [2557]	$^{239}\text{Pu}$	FISSION see comment	1.0+3 4.0+6 < 2.0	1	FEI	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Measurements mainly wanted relative to fission CS of $^{235}\text{U}$ . Optimum precision of 1.5 % desired in region 20 keV to 1 MeV. Below 30 keV measurements of transmission curves by flat response detector and by self detection me- thod with fission detector wanted for selfshielding evaluation. These curves must be measured with atte- nuations of the primary beam down to 1 %. Lethargy resolution of about 0.2 considered suffi- cient for such measurements. Request considered fulfilled, when at least three measurements with different methods agree within requested accuracy. --- Farrell et al. have data from Physics 8 above 20 eV. AIEA CN-26/46. ANL Poenitz measured fission ratio to $^{235}\text{U}$ , 130 keV to 1.4 MeV, EANDC(US)-143-U. LRL Czirr et al. measured 0.1-30 KeV, EANDC(US)-122-U. SAC Blons et al. have data up to 30 KeV. AIEA CN-26/63. CAD Szabo et al. have data 25 keV to 1 MeV, absolute accuracy $\pm 3\%$ . HAR Evaluation of existing data in progress above 100 ev. See Sowerby and Patrick, AIEA CN-26/34. CS pro- bably known to about 3-5% below 10 keV when consi- stently normalized. Data available below 20 keV summarized by James, AIEA CN-26/107. IAE Byer, evaluation in progress.	71
1110 [2070]	$^{239}\text{Pu}$	FISSION ratio x-sect	1.0+4 1.5+7	1.0	1	LAS Hansen, G. Relative to $^{235}\text{U}$ . --- Energy resolution 3%, energy calibration 1%. None which satisfy accuracy requirements. LAS Farrel et al., Physics 8, above 20eV. Helsinki CN-26/46. ANL Poenitz, fission ratio to $^{235}\text{U}$ , between 130 and 1400keV LRL Czirr et al., 0.1-30keV, EANDC(US)-122 U. SAC Blons et al., up to 30keV, AIEA-CN-26/63. CAD Szabo et al., from 25keV to 1MeV, abs. acc. $\pm 3\%$ (to be published). HAR Evaluation of existing data in progress above 100 eV: Sowerby and Patrick (1970) Helsinki CN-26/34. X-sect probably known to 3-5% below 10keV when consistently normalized. Data available below 20keV summarized by James 70HELSINKI, CN-26/107. HAR Also values by Schomberg (1970) Helsinki CN-26/33.	66
1111 [2069#]	$^{239}\text{Pu}$	FISSION ratio x-sect	1. +4 1.4+7	2	1	LMB Heming, P.B. Relative to $^{235}\text{U}$ . Energy resolution 3%, energy calibration 1%. Need 2% for average over 5-10% energy bins. --- LAS Smith: WASH-1124, to be published. HAR James: AERE-M 2065, gives least squares fit. Status: See REG 928 above.	69

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER	COMMENTS	YEAR
			MIN	MAX	(%)				
1112	$^{239}\text{Pu}$	FISSION	2.0+4	2.0+6	3.0	2	ITK	Mehta, G.K. Cross section required at 60, 150, 200, 500 keV and 1 MeV with energy resolution of 5%.	69
[2545]							LAS	Farrell et al. have data from Physics 8 above 20 ev.	
							ANL	Poenitz measured fission ratio to $^{235}\text{U}$ 130 keV to 1.4 MeV, EANDC(US)-143-U.	
							LRL	Czirr et al. measured 0.1-30 keV, EANDC(US)-122-U.	
							SAC	Blons et al. have data up to 30 keV. AIEA CN-26/63.	
							CAD	Szabo et al. have data 25 keV to 1 MeV, absolute accuracy $\pm 3\%$ .	
							HAR	Evaluation of existing data in progress above 100 ev. See Sowerby and Patrick, AIEA CN-26/34. CS prob- ably known to about 3-5% below 10 keV when consis- tently normalized. Data available below 20 keV summarized by James, AIEA CN-26/107.	
							IAE	Byer, evaluation in progress.	
1113	$^{239}\text{Pu}$	FISSION	2.0+4	1.0+6	< 3.0	1	IAE	Byer, T.A. Absolute measurement required to 2-3% accuracy over entire energy range to confirm data of Szabo et al.	71
[2550]								(71KNOX 2,573, and EANDC Standards Symposium, Ar- gonne, 1971, Proc. p.257). Confirmation of Szabo data very important since they play the most prominent role in all $^{239}\text{Pu}$ fission CS evaluations.	
1114	$^{239}\text{Pu}$	FISSION	5.0+5	8.0+6	1.0	1	NBS	Caswell, R.S. Highest priority for fast reactor calculations. Accuracy: 2% from 20 keV to 3 MeV, 5% from 3 to 6 MeV Verification of current accuracy or intermediate improvement would be useful.	69
[2067]							HAR	Even higher accuracy may be needed, long term. James AERE-M 2157 reviews 1 to 20 keV. See Cabe, Pfletschinger, Deruyter EANDC(E) 1150 .	
							ANL	Poenitz, WASH 1124, 30keV to 1.5MeV.	
							LRL	Czirr, WASH 1124, 100 ev to 15 keV.	
							ORL	Gwin, WASH 1093, Thermal to 30keV.	
							LAS	Farrel et al., Physics 8, above 20ev. Helsinki CN-26/46.	
							ANL	Poenitz, fission ratio to $^{235}\text{U}$ , between 130 and 1400keV	
							LRL	Czirr et al., 0.1-30keV, EANDC(US)-122 U.	
							SAC	Blons et al., up to 30keV, AIEA-CN-26/63.	
							CAD	Szabo et al., from 25keV to 1MeV, abs.acc. $\pm 3\%$ (to be published).	
							HAR	Evaluation of existing data in progress above 100 ev: Sowerby and Patrick (1970) Helsinki CN-26/34. X-sect probably known to 3-5% below 10keV when consistently normalized. Data available below 20keV summarized by James 70HELSINKI, CN-26/107.	
							HAR	Also values by Schomberg (1970) Helsinki CN-26/33.	
1115	$^{239}\text{Pu}$	FISSION	6.0+5	2.0+6	2.0	2	IAE	Byer, T.A. Relative to $^{235}\text{U}$ fission CS.	71
[2551]		ratio x-sect						To confirm strong dip in Pfletschinger ratios (NSR 40(1970),375) between 0.8 and 1.0 MeV. Between 1 and 2 MeV to better establish shape and magnitude of ratio, since Savin (AE29(1970),218) and Soleilhac (AIEA CN-26/67) ratios inconsistent with other ratio data.	
							ANL	Poenitz performing measurements.	
1116	$^{239}\text{Pu}$	FISSION	1.0+6	1.0+7	< 5.0	2	IAE	Byer, T.A. Absolute measurement required to 4-5% accuracy from 1-10 MeV. No absolute $^{239}\text{Pu}$ fission CS data available extending over this energy range.	71
[2552]									
1117	$^{239}\text{Pu}$	ETA	THR		0.5	1	SAC	Bussac, J. The latest evaluation by Hanna and Westcott may satisfy this request when the discrepancies on the half-life of $^{234}\text{U}$ will be resolved.	
[937]							ANL	De Volpi: measurement in progress.	
							IAE	Review of thermal data to be published.	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(eV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
1118 [ 2075 ]	$^{239}\text{Pu}$	ETA	THR	1. +0	1	Snyder, T. For Pu-fueled reactor calculations. Desire accuracy to 0.5%, Thermal to 1eV. Standard parameter, want value at 0.025 eV. IAE Hanna+: REA 7(4) 3(D/69), least sq. eval., 2200m/sec. ANL De Volpi has unpublished data at thermal.	67
1119 [ 940 ]	$^{239}\text{Pu}$	ETA	1. -2	1. +0	0.5	CRC Hanna, G.C. ORNL Mn bath measurement (Macklin et al. N.Sci. Eng. 14, 101, 1962) has important uncertainty associated with neutron spectrum, and value is higher than recent monokinetic measurement at MTR (Smith et al. IDO-17083, 1966).	
1120 [ 942 ]	$^{239}\text{Pu}$	ETA see comment	1. -2	5. -1	0.8 (.02 ev steps)	WIN Tyror, J.G. Requested: eta(E) /eta (E0), E0=0.0253eV. For temperature coefficient work. HAR Note increased priority, increased energy range. Sowerby, Pattenden: feasibility assessment in progr.	64
1121 [ 2537 ]	$^{239}\text{Pu}$	ETA	1.0-2	1.0+0	0.5	IAE Lemmel, H.D. Discrepancy between Macklin Mn bath (NSE 14(1969) 101) and Smith monokinetic measurements (IDO-17083, 1966).	69
1122 [ 946 ]	$^{239}\text{Pu}$	ALPHA	1. +2	1. +5	10 (E-2E)	WIN Campbell,C.G. For fast reactors. HAR Sowerby: evaluation completed; available experimental data are not adequate.	71
1123 [ 2539 ]	$^{239}\text{Pu}$	ALPHA	1.0+2	1.0+7	5.0	PEL Van der Walt, R. For fast reactor calculations. LAS Farrell et al. have data above 20 eV from Physics 8, AIEA CN-26/46. LRL Czirr has data 0.1-30 keV, EANDC(US)-122U. ITE Sukhoruchkin, review of avail. data, AIEA CN-26/127. IAE Sowerby and Konshin, evaluation in progress.	69
1124 [ 2548 ]	$^{239}\text{Pu}$	ALPHA	1.0+2	1.0+5	5.0	AUA Symonds, J.L. Available data do not satisfy request. LAS Farrell et al. have data above 20 eV from Physics 8, AIEA CN-26/46. LRL Czirr has data 0.1-30 keV, EANDC(US)-122U. ITE Sukhoruchkin, review of avail. data, AIEA CN-26/127. IAE Sowerby and Konshin, evaluation in progress.	69
1125 [ 2554 ]	$^{239}\text{Pu}$	ALPHA	1.0+2	8.0+5	7.0	FEI Nikolaev, H.N. For accuracy of 1.6 % in BR for fast breeders. In region 1-100 keV better accuracy desirable (4-5%). For evaluation of differences in capture and fission resonance selfshielding, measurements of transmission curves by self-detection method with fission and absorption detectors very desirable. Beam attenuation down to 1% wanted. Lethargy resolution of 0.2 sufficient for region 0.1-30 keV. At least three different results must coincide within requested accuracy. LAS Farrell et al. have data above 20 eV from Physics 8, AIEA CN-26/46. LRL Czirr has data 0.1-30 keV, EANDC(US)-122U. ITE Sukhoruchkin, review of avail. data, AIEA CN-26/127. IAE Sowerby and Konshin, evaluation in progress.	71
1126 [ 2077# ]	$^{239}\text{Pu}$	ALPHA	1. +2	1. +7	<10 4 TO 10%	ANL Avery, R. GE Snyder, T. LMB Hemmig, P.B. ORL Maienschein, F.C. Accuracy 100 eV to 1 keV, 8% 1 keV to 50 keV, 4% 50 keV to 600 keV, 6% 600 keV to 10 MeV, 10%. Energy resolution to be determined. Capture cross section equally useful. HAR Sowerby+: 70 HELSINKI P/33(6/70), 100 eV - 30 keV. DUB Ryabov: 70 HELSINKI P/47(6/70), to 30 keV. SAC Blons+: measurements in progress. ORL Gwin+: NSE 40 306(5/70), data below 30 keV. LLL Czirr+: NSE 41 56(7/70), 100 eV to 30 keV. LAS Farrell+: NCSAC-33(1970), to 10 keV. KPK Bandl: measuring 15 - 60 keV.	69

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)			
1127 [1490]	$^{239}\text{Pu}$	ALPHA	2. +2	5. +2	10	2 CAD	Barre, J-Y. Absolute values useful but request concerns mainly relative values versus energy. For fast reactor calculations.	70
1128 [2410]	$^{239}\text{Pu}$	ALPHA	5. +2	4. +6	<10	1 CAD	Barre, J-Y. Absolute values useful but request concerns mainly relative values versus energy. For fast reactor calculations.	70
1129 [2555]	$^{239}\text{Pu}$	NU see comment	THR	2.5+6	0.5	1 PEI	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. 0.5 % accuracy required for measurement of ratio nu $\text{Pu}^{239}$ to nu $\text{Cf}^{252}$ . Energy dependence of nu is wanted with 0.7 % accuracy and 10 % energy resolution in the region below 2.5 MeV. HAR Colvin reviewed status before Helsinki Conference, AIEA CN-26/99. ANL Evaluation by Davey, NSE 44 (1971), 345. IAE Manero and Konshin, evaluation in progress.	71
1130 [2556]	$^{239}\text{Pu}$	NU see comment	THR	2.5+6	0.1	2 PEI	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. 0.1 % accuracy required for measurement of ratio nu $\text{U}^{235}$ to nu $\text{Cf}^{252}$ , evaluated from optimum distribution of uncertainties over uncorrelated nuclear data. HAR Colvin reviewed status before Helsinki Conference, AIEA CN-26/99. ANL Evaluation by Davey, NSE 44 (1971), 345. IAE Manero and Konshin, evaluation in progress.	71
1131 [2192#]	$^{239}\text{Pu}$	NU	THR	1. +7	< 1	1 AI ANL GE LMB ORL Perry, A.M.	Alter, H. Avery, R. Snyder, T. Hemig, P.B. Perry, A.M. Accuracy 1 keV to 3 MeV, 0.5%, otherwise 1%. Accuracy of 1.5% would be useful. Highest priority for fast reactor calculations. Require resolution of significant structure up to 500 keV.	66
				0.5 - 1%		ALD BRG ORL IAE IAE	Mather+: EANDC(UK) 121/L, 40 keV to 1.2 MeV. Soleilhac: planning resonance measurements at Saclay. Weston: NCSAC-33 in progress over resonances. Hanna+: RAE 4(7) (D/69), lsq evaluation 2200m/s. Manero+: review in progress.	
1132 [2411]	$^{239}\text{Pu}$	NU	2.5-2		0.2	1 SAC	Reuss, P.	71
						IAE	Hanna+, At. Energy Rev.VII (1969), N.4, least sq. fit of 2200m/s data gives 0.3% acc. for thr. value. ANL De Volpi, React. Techn. to be published, 71KNOX 560, eval. gives 1% lower value than IAE-69.	
1133 [2314]	$^{239}\text{Pu}$	NU		1.5+7	< 0.5	1 JAE	Japanese Nuclear Data Committee (JNDC). For fast reactors calculations. Mather et al.: NP 66 149 (1965). Conde et al.: JNE 22 53 (1968). Soleilhac et al.: JNE 23 257 (1969).	70
1134 [1415]	$^{239}\text{Pu}$	NU	1.0+4	1.4+7	0.5	2 CAD	Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy. Accuracy relative to nu $\text{Cf}^{252}$ .	69
						ALD AUA ANL IAE	Mather +, AWRE O-86/70 (1970), Eval. 4 lines fit Walsh +, JNE 25, 321 (1971) Eval. 2 lines fit Davey, NSE 44, 345 (1971), Eval. Konshin +, INDC(NDS)-19/N (1970) Review, work being continued. Expt. see Savin +, 70 HELS 2, 157, and Soleilhac +, JNE 23, 257 (1969) 70 HELS 2, 145, also Mather AWRE O-42/70 (1970).	

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REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
1135 [2071#]	$^{239}\text{Pu}$	F NEUT DELAY THR spectrum	5. +6	5	2	ANL LMB	Avery, R. Hemmig, P.B. Needed for analysis of fast criticals and fast reactor calculations. Yield, half life, and energy needed. --- LAS Krick+: NCSAC-33(1970) .	69	
1136 [951]	$^{239}\text{Pu}$	F NEUT DELAY energy dist	see comment	10	1	PAR	Rastoin, J. Accuracy given for the number of neutrons in 0.2 MeV intervals between 0 and 2 MeV.		
1137 [2547]	$^{239}\text{Pu}$	FRAG NEUTRNS see comment	5.0+4	1.0+6	10.0	2	ITK	Mehta, G.K. Prompt neutrons as function of fprod mass wanted.	69
1138 [2538]	$^{239}\text{Pu}$	SPECT FISSION THR see comment		1.0	1	IAE	Lemmel, H.D. Mean spectrum energy with 1% accuracy plus spectrum shape requested for calibration of nu-bar measurements. Absolute or relative to other fissile isotopes wanted.	69	
1139 [2206]	$^{239}\text{Pu}$	SPECT FISSION THR			2	JAE	Japanese Nuclear Data Committee (JNDC) . For fast reactors. Accuracy of nuclear temperature for Maxwell distribution is required within 30 KeV.	71	
1140 [1489]	$^{239}\text{Pu}$	SPECT FISSION 0. +0	1.4+7	1	1	CAD	Barre, J-Y. Accuracy 2% for aver. E'. Accuracy 2% for aver. $E'(\text{Pu}^{239})/\text{aver. } E'(\text{U}^{235})$ . For fast reactor calculations. Evaluation may be sufficient. SAC Reuss, P. Accuracy 2% for aver. E'.	71	
1141 [1150]	$^{239}\text{Pu}$	SPECT FISSION 1. +5	on $\langle E' \rangle$ .	2	2	WIN	Campbell, C.G. For fast reactors.		
			10%			UKW	Whittaker, A.		
			on			HAR	Wright, S.B.		
			DN1, DN2.				For reaction rate analysis. DN1 = no.of neutrons above 5 MeV, DN2 = no.of neutrons below .25 MeV. --- LON Rose +, South Bank Polytechnic; in progress at Harwell.		
1142 [2082]	$^{239}\text{Pu}$	FISS YIELD THR		3.0	2	BET	Bayard, R.T. Fission product yield of $\text{Xe}^{135}$ . For calculation of fission product poisons. Cumulative and direct (inclusive of 15 m isomer) is wanted.	67	
1143 [2083]	$^{239}\text{Pu}$	FISS YIELD THR		1.0	2	BET SRL	Bayard, R.T. Dessauer, G. Fission product yield of $\text{Cs}^{137}$ . For burnup indicator standard.	67	
1144 [2084]	$^{239}\text{Pu}$	FISS YIELD THR		3.0	2	BET	Bayard, R.T. Fission product yield of $\text{Nd}^{147}$ . For calculation of fission product poisons.	67	
1145 [2085]	$^{239}\text{Pu}$	FISS YIELD THR		3.0	2	BET	Bayard, R.T. Fission product yield of $\text{Sm}^{149}$ . For calculation of fission product poisons.	67	
1146 [2272]	$^{239}\text{Pu}$	FISS YIELD THR		1	2	CRC	Walker, W.H. Yield of $\text{Xe}^{135}$ . For calculation of fission product absorption.	71	
1147 [2412]	$^{239}\text{Pu}$	FISS YIELD	5. +2	1. +6	10	2	CAD	Barre, J-Y. For fast reactor calculations. For an aver. fission neutron energy around 200 keV .	71

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
1148 [ 2581 ]	$^{239}\text{Pu}$	N,GAMMA	THR	1.0+7	10	2	KFK Schatz, B. For burnup calculations.	71
1149 [ 2536 ]	$^{239}\text{Pu}$	N,GAMMA	THR		1.0	2	IAE Lemmel, H.-D. Confirmation of existing alpha values desirable.	69
1150 [ 2541 ]	$^{239}\text{Pu}$	N,GAMMA	THR	3.0+4	3.0	2	RAM Islam, M. M. For fast reactors. LAS Farrell et al. have data above 20 eV from Physics 8, AIEA CN-26/46. LRL Czirr has data 0.1-30 keV, EANDC(US)-122U. ITE Sukhoruchkin, review of avail. data, AIEA CN-26/127. IAE Sowerby and Konshin, evaluation in progress.	69
1151 [ 967 ]	$^{239}\text{Pu}$	N,GAMMA	2.5-2		1	2	CRC Hanna, G.C. Note changed energy specification. Confirmation of existing alpha values desirable.	
1152 [ 1507 ]	$^{239}\text{Pu}$	N,GAMMA	2.5-2		0.5	1	SAC Bussac, J. The latest evaluation by Hanna and Westcott may satisfy this request when the discrepancies on the half-life of $^{239}\text{U}$ will be resolved.	69
1153 [ 2413 ]	$^{239}\text{Pu}$	N,GAMMA	2.5-2		1	1	SAC Reuss, P.	71
1154 [ 963 ]	$^{239}\text{Pu}$	N,GAMMA	0. +0 5. +0		1	1	SAC Reuss, P. Relative to $\sigma(n,g)$ (0.0253eV). Evaluation may suffice if it explains discrepancies. For calculation of temperature coeff.	69
1155 [ 968 ]	$^{239}\text{Pu}$	N,GAMMA reson.integr	1. +0 5. +2		5	2	CRC Hanna, G.C. For capture resonance integral.	
1156 [ 2414 ]	$^{239}\text{Pu}$	N,GAMMA	5. +0 2. +6		5	1	SAC Reuss, P. Relative to $\sigma(n,g)$ (0.0253eV). Smooth cross section accuracy for 0.5 lethargy interv evaluation may suffice if it explains discrepancies. High temperature reactors calculations	70
1157 [ 2546 ]	$^{239}\text{Pu}$	N,GAMMA	1.0+2 1.0+6		5.0	2	ITK Mehta, G.K. Energy dependence required. LAS Farrell et al. have data above 20 eV from Physics 8, AIEA CN-26/46. LRL Czirr has data 0.1-30 keV, EANDC(US)-122U. ITE Sukhoruchkin, review of avail. data, AIEA CN-26/127. IAE Sowerby and Konshin, evaluation in progress.	69
1158 [ 969 ]	$^{239}\text{Pu}$	N,GAMMA (alpha)	2. +2 1. +5	<10 .2-.5keV :10% 5% above	1	KFK Schmidt, J.J. Large inconsistencies between several measurements still not removed. ITE Sukhoruchkin, 70HELSINKI I 307, reviews status 1970. ITE Belyaev+, 70HELSINKI I 339, THR-10 keV. LRL Czirr, 70HELSINKI I 331, .1-30 keV. HAR Schomberg+, 70HELSINKI I 315, .1-30 keV. LAS Farrel+, 70HELSINKI I 543, 14 eV-1 MeV, Low accuracy. DUB Kurov+, AE 30(1971)258, .1-20 keV. KFK Bandt+, 71KNOXVILLE 273, 8-60keV, renormalized since. IAE Konshin+Sowerby work on new evaluation (1971). SAC Blons+ are measuring (1971).		
1159 [ 971 ]	$^{239}\text{Pu}$	N,GAMMA (alpha)	5. +2 2. +4		3	1	AE Haeggblom, H. Alternative quantity alpha(E). Needed for fast reactor calculations. Status: see REG 969 above.	
1160 [ 1491 ]	$^{239}\text{Pu}$	N,GAMMA (alpha)	5. +2 4. +6	<10 5% to 100keV	1	CAD Barre, J-Y. For fast reactor calculations. Status: see REG 969 above.		

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
1161 [ 1330 ]	$^{239}\text{Pu}$	N, GAMMA (alpha)	1.0±3	2.0±5	5.0	1 JAE ---	Japanese Nuclear Data Committee (JNDC). For fast reactors. Large discrepancies exist among measurements by Schomberg, Gwin, Ryabov.	70
1162 [ 2205 ]	$^{239}\text{Pu}$	MISCELLANEOUS		< 5.0	1 JAE LAS	Japanese Nuclear Data Committee (JNDC). For fast reactor measurements. Delayed neutron fraction (BETA). LA-3528 (1968) Hunter et al.	71	
1163 [ 2315 ]	$^{240}\text{Pu}$	TOTAL XSECT	1. +3	1. +7	10.0	1 JAE ---	Japanese Nuclear Data Committee (JNDC). For fast reactors. No experimental data above 6.0 keV.	71
1164 [ 981 ]	$^{240}\text{Pu}$	TOTAL XSECT	1. +4	1.0±6	10	1 KPK	Schmidt, J.J. Between 10 and 100 keV at 1 ns/m resolution.	
1165 [ 1492 ]	$^{240}\text{Pu}$	TOTAL XSECT	1.0±4	2.5±6	10	2 CAD	Barre, J-Y. For fast reactor calculations.	69
1166 [ 2415 ]	$^{240}\text{Pu}$	RESON PARAMS	5. +0	2. +3	3	1 SAC	Reuss, P. Evaluation may suffice if it explains discrepancies. Accuracy: 3% on $\langle g^*\Gamma_n^*\Gamma_f/\Gamma \rangle$ and $\langle g^*\Gamma_n^*\Gamma_f/\Gamma \rangle$	70
1167 [ 2561 ]	$^{240}\text{Pu}$	RESON PARAMS	1.0±1	5.0±3	1	1 FEI GEL	Nikolaev, M. N. Neutron and capture widths wanted for evaluation of selfshielding in resolved resonance region. Average s and p wave resonance parameters should be derived. Statistical analysis of measured res. par. wanted. Comprehensive Geel measurements reported at Washington Conference 1968 yielded neutron widths up to 5.7 keV, capture widths up to 820 eV and fission widths up to 750 eV.	71
1168 [ 1493 ]	$^{240}\text{Pu}$	RESON PARAMS	8. +1	2. +3	10	1 CAD GEL GEL GEL RPI HAR TRM SAC	Barre, J-Y. 10% On $\Gamma$ and on the product $g\Gamma_n^*\Gamma_f$ for great reson. Fast reactor calculations, (Doppler effect and resonance self shielding). Recent experiments at Geel and Harwell. Cao : 68WASH 513; $\Gamma_n$ for 14 levels below 300 eV. Weigman et al.: JNE 22 317(1968), 38 to 820 eV. Kolar + : JNE 22 299(1968), 20 eV to 5.7 keV. Migneco et al.: NP/A 112 603(1968), $\Gamma_f$ to 750 eV. Hockenbury et al.: EANDC(US) 143 192(5/70), $\sigma_T, \sigma_f$ 25eV-30 keV; analysis to be completed; also ( $\infty$ ) t.b.done. Asghar: EANDC(UK) 103 (1968), $\Gamma_n$ up to 1.5 keV. Ramakrishna: 70HELSINKI P/48(6/70), params for 1 eV. Joly: the important discrepancy on $\langle \Gamma_f \rangle$ according Geel, Harwell and RPI has to be solved.	69
1169 [ 2096# ]	$^{240}\text{Pu}$	RESON PARAMS	1. +2	5. +3	10	2 ANL LMB	Avery, R. Hemming, P.B. Needed for fast reactor calculations including doppler effect. Status: See REG 1493 above. Discrepancy between GEL and RPI may be resolved.	69
1170 [ 986 ]	$^{240}\text{Pu}$	NONEL GAMMAS spectrum	1.2±5		20	3 WIN	Campbell,C.G. Low resolution for $\Gamma_n$ adequate. For study of activation and heat release in core.	
1171 [ 2193# ]	$^{240}\text{Pu}$	TOTINELASTIC	1.5±6	1. +7	20	2 GE LMB ANL	Snyder, T. Hemming, P.B. Emission $\sigma$ 's might be equally useful at the higher energies. Lambropoulos+: NCAC-33, data to 1.5 MeV.	69
1172 [ 992 ]	$^{240}\text{Pu}$	DIFF INELAST TR energy,angle	4. +6	40	2 WIN ANL	Campbell, C.G. For fast reactors. Smith+, NSE 47 19(1972) Evaluation needed.		

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
1173 [989]	$^{240}\text{Pu}$	DIFF INELAST TR energy dist	4. +6	25	2 CAD --- ANL	Barre, J-Y. For fast reactor calculations. Smith+, NSE 47 19 (1972)	69	
1174 [2562]	$^{240}\text{Pu}$	DIFF INELAST TR energy dist	5.0+6	10	1 FEI --- ANL	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. CS for inelastic removal below fis- sion thresholds of $^{238}\text{U}$ and $^{240}\text{Pu}$ (or $\text{Np}^{237}$ ) wanted with 10% accuracy. Smith has results to 1.5 MeV.	71	
1175 [993]	$^{240}\text{Pu}$	DIFF INELAST energy dist	1.0+4	1.0+7	10	1 JAE --- ANL	Japanese Nuclear Data Committee (JNDC). For fast reactor. Xsections for excitation of individual levels desired. Smith+, NSE 47 19 (1972)	68
1176 [2316]	$^{240}\text{Pu}$	FISSION	1.0+2	1.0+7	< 5.0	1 JAE ---	Japanese Nuclear Data Committee (JNDC). For fast reactor calculations. Ruddick et al.: JNE 18 561 (1964). Gilboy and Knoll: KFK-450 (1966). Byers et al.: CONF-660303 903 (1966), LA-3586. Migneco and Theobald: NP A112 603 (1968).	71
1177 [2088]	$^{240}\text{Pu}$	FISSION ratio x-sect	1.0+3	1.5+7	2.0	2 LAS ---	Hansen, G. Relative to $^{235}\text{U}$ . < 100kev : En(res)=6%; En(calib)=2% > 100 kev : En(res)= 3%; En(calib) = 2%. None which satisfy accuracy requirements.	67
1178 [1494]	$^{240}\text{Pu}$	FISSION	1. +3	1.5+7	3	1 CAD	Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy or relative values to $^{235}\text{U}$ (accuracy 1% on this ratio).	69
1179 [2087#]	$^{240}\text{Pu}$	FISSION ratio x-sect	1. +3	1. +5	5	3 RDT ---	Hannum, W.H. Relative to $^{235}\text{U}$ . Energy resolution 6%, energy calibration 2%. None which satisfy accuracy requirements.	72
1180 [2559]	$^{240}\text{Pu}$	FISSION ratio x-sect	1.0+5	5.0+6	5.0	1 FEI	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Measurements wanted relative to $^{235}\text{U}$ fission CS.	71
1181 [2672+]	$^{240}\text{Pu}$	FISSION ratio x-sect	1. +5	5. +6	3	2 LMB ---	Hennig, P.B. Relative to $^{235}\text{U}$ . Energy resolution 3%, energy calibration 2%. Accuracy 5% useful.	72
1182 [2194#]	$^{240}\text{Pu}$	FISSION	5. +5	1. +7	5	2 GE LMB ---	Snyder, T. Hennig, P.B. Important for fast reactor calculations. None to 5% accuracy.	72
1183 [2089#]	$^{240}\text{Pu}$	NU	THR	1. +7	3	2 ANL LMB ---	Avery, R. Hennig, P.B. Accuracy of 5% would be useful. Status: See REG 1000 below	69
1184 [1000]	$^{240}\text{Pu}$	NU	TR	5. +6	2	3 WIN ---	Campbell, C.G. For fast reactors. --- ANL Davey, NSE 44, 345 (1971), Eval. IAE Konshin +, IINDC(NDS)-19/N (1970) Review, work being continued HAR De Vroy +, JNE A/B 20, 191 (1966) NU prompt at 3 ES rel. $^{235}\text{U}$ SCU Savin +, 70 HELS 2, 157, 3-5% acc. in energy region 1-4 MeV. Accuracy requirement not met. Soleilhac et al. are planning experiments in energy region 1-14 MeV	71

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR		
			MIN	MAX	(%)					
1185 [ 2558 ]	$^{240}\text{Pu}$	NU	TR	5.0+6	1.0	1	FEI KUR IAE	Nikolaev, M. N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Savin et al. measured at 1-4 MeV with 3-5% accuracy, AIEA CN-26/40. Manero and Konshin, evaluation in progress.	71	
1186 [ 1416 ]	$^{240}\text{Pu}$	NU		1.0+4	1.5+7	1	2	CAD ANL IAE HAR SCU	Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy. Accuracy relative to nu $\text{Cf}^{252}$ . Davey, NSE 44, 345 (1971), Eval. Konshin +, INDC(NDS)-19/N (1970) Review, work being continued De Vroy +, JNE A/B 20, 191 (1966) NU prompt at 3 ES rel. $^{235}\text{U}$ Savin +, 70 HELS 2, 157, 3-5% acc. in energy region 1-4 MeV. Accuracy requirement not met. Soleilhac et al. are planning experiments in energy region 1-14 MeV	70
1187 [ 1495 ]	$^{240}\text{Pu}$	NU		5. +4	4. +6	5	1	CAD ANL IAE HAR SCU	Barre, J-Y. For fast reactor calculations. Davey, NSE 44, 345 (1971), Eval. Konshin +, INDC(NDS)-19/N (1970) Review, work being continued De Vroy +, JNE A/B 20, 191 (1966) NU prompt at 3 ES rel. $^{235}\text{U}$ Savin +, 70 HELS 2, 157, 3-5% acc. in energy region 1-4 MeV. Accuracy requirement not met. Soleilhac et al. are planning experiments in energy region 1-14 MeV	69
1188 [ 1002 ]	$^{240}\text{Pu}$	NU		5. +5	1.5+7	5	1	KPK BN	Schmidt, J. J. Tavernier, G.	
							ANL IAE HAR SCU	Davey, NSE 44, 345 (1971), Eval. Konshin +, INDC(NDS)-19/N (1970) Review, work being continued De Vroy +, JNE A/B 20, 191 (1966) NU prompt at 3 ES rel. $^{235}\text{U}$ Savin +, 70 HELS 2, 157, 3-5% acc. in energy region 1-4 MeV. Accuracy requirement not met. Soleilhac et al. are planning experiments in energy region 1-14 MeV		
1189 [ 1004 ]	$^{240}\text{Pu}$	N,GAMMA (res.param)	THR	5.7+3	10	1	JAE	Japanese Nuclear Data Committee (JNDC). For fast reactor. EANDC(UK) 103'AL' for data from 20 eV to 1.45 kev. Inconsistency exists.	68	
1190 [ 2093 ]	$^{240}\text{Pu}$	N,GAMMA	THR	1.0+2	3.0	1	GE RPI GEL HAR BAR	Snyder, T. Improved precision needed for thermal reactors. Hochenbury+: NCSAC-33, 60 eV-90 keV, res. parms. Weigmann, J. Nucl. Energ. 22 317, 38 to 820 eV. Asghar, Paris conference INDC-156, 20 to 95 eV. AERE-5874, CN-26/2. part of request apparently satisfied.	67	
1191 [ 2816 ]	$^{240}\text{Pu}$	N,GAMMA		2.5-2		0.3	1	SAC	Reuss, P.	71
1192 [ 1496 ]	$^{240}\text{Pu}$	N,GAMMA see comment		0. +0	5. +0	< 1	1	SAC HAR	Bussac, J. Thermal region and resonance integral. Several older measurements at thermal energy are available, but do not have the required precision. Cabeill's latest value is $273.7 \pm 13.1$ b at 2200 m/s: AERE R/5874; see also JIN 28(1966) 2467 and CN-26/2. part of request probably satisfied by CN-26/2.	
1193 [ 1007 ]	$^{240}\text{Pu}$	N,GAMMA		1. +2	4. +4	8 (E-2E)	2	WIN HAR GEL RPI HAR	Campbell, C.G. For fast reactors. Asghar+, INDC-156 (1966), 20-950 eV. Weigmann+, JNE 22(1968) 317, res. param. up to 820 eV. Hockenbury+, NCSAC-33(1970) 203, capture data 4-60keV; 71 KNOXVILLE 721, resonance parameters up to 500 eV. Also transmission data to 1 keV, EANDC(US)-143 U. Moxon+: AERE-R 5945, data from .5 to 100 keV, accuracy 30%, 30-40% lower than RPI data. Discrepancy being investigated.	

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REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
1194 [1497]	$^{240}\text{Pu}$	N,GAMMA	1. +2	1. +6	10	1 CAD	Barre, J-Y. Absolute values useful but request concerns mainly relative values versus energy or relative values to $^{235}\text{U}$ (accuracy 1% on this ratio). Discrepancies between most recent results. --- For fast reactor calculations. Status: see REG 1007 above.	69
1195 [2317]	$^{240}\text{Pu}$	N,GAMMA	1.0+2	1.0+6	<10.0	1 JAE	Japanese Nuclear Data Committee (JNDC). --- For fast reactor calculations. Weigmann and Schmid (JNE 22 317 (1968)) measured below 1.0 KeV.	71
1196 [2560]	$^{240}\text{Pu}$	N,GAMMA ratio x-sect	5.0+2	1.4+6	7.0	1 FEI	Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Measurements wanted relative to $^{235}\text{U}$ fission CS. --- Hockenbury et al. report new capture data at 4-60 keV 30-40% higher than Harwell data, EANDC(US)-143U.	71
1197 [2094#]	$^{240}\text{Pu}$	N,GAMMA	5. +2	1.5+5	5	1 ANL LMB	Avery, R. Hemig, P.B. Accuracy of 15% useful. --- High priority for fast reactor calculations. Status: See REG 1007 above.	69
1198 [1358]	$^{240}\text{Pu}$	N,GAMMA	6. +1	5. +5	20	2 AE	Jirlow, K. Energy dependance within 10%. Note energy range changed. --- Needed for fast reactor calculations. Status: see REG 1007 above.	
1199 [1010]	$^{240}\text{Pu}$	N,GAMMA	5. +3	1. +6	10	1 KPK BN	Schmidt, J.J. Tavernier, G. 1 ns/m resolution needed. Rae plans measurements in resonance region. Presently only available nuclear explosion measurements of Diven et al. between 20 ev and 3 MeV still being analyzed. (Washington, Cross Section Technology Conf., March 1966). --- Status: see REG 1007 above.	
1200 [1011]	$^{240}\text{Pu}$	N,GAMMA (alpha)	4. +4	1. +6	10	3 WIN	Campbell, C.G. --- For fast reactors. Evaluation shows accuracy is not met. Status: see REG 1007 above.	
1201 [2673#]	$^{240}\text{Pu}$	N,GAMMA	1.5+5	1. +6	10	1 GE	Snyder, T. Accuracy of 15% useful. --- High priority for fast reactor calculations.	72
1202 [2318]	$^{240}\text{Pu}$	N,GAMMA	1. +6	1. +7	20.0	1 JAE	Japanese Nuclear Data Committee (JNDC). For fast reactors.	71
1203 [2207]	$^{240}\text{Pu}$	MISCELLANEOUS		<10.0	1 JAE	Japanese Nuclear Data Committee (JNDC). For fast reactor measurements. Delayed neutron fraction (BETA). --- LA-3528 (1968) Hunter et al.	71	
1204 [2319]	$^{241}\text{Pu}$	TOTAL XSECT	1. +7	<10.0	1 JAE	Japanese Nuclear Data Committee (JNDC). For fast reactors. No experimental data above 5.0 KeV.	71	
1205 [1014]	$^{241}\text{Pu}$	TOTAL XSECT	1. +3	1. +6	10.0	2 KPK MTR	Schmidt, J.J. --- Simpson et al., MTR have completed measurements.	
1206 [1498]	$^{241}\text{Pu}$	TOTAL XSECT	1. +3	1.5+7	10	3 CAD	Barre, J-Y. For fast reactor calculations.	69

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
1207 [ 1016 ]	$^{241}\text{Pu}$	TOTAL XSECT	1. +6	1.5+7	10	3	KPK Schmidt, J.J. No measurements available.	
1208 [ 2107 ]	$^{241}\text{Pu}$	RESON PARAMS THR	4.0+2	10	2	KAP ANL	Ehrlich, R. Avery, R. Accuracy 5% from thermal to 100 eV. Accuracy 10% from 100 eV to 400 eV. 20% Would be useful for thermal and fast reactor calculations. SAC Blons: 70HELSINKI P/60(6/70), of 1eV to 3keV, gTon, T and If up to 50 eV (single level). See also EANDC(E)-150 U. GEL Kolar: 70HELSINKI P/95(6/70), of 2eV-2keV, no analys. INC Smith: WASH-1136(9/69), eval.in prog. for ENDF/B. GEL Kolar: EANDC(E) 127 (4/70), anal of transm. in progr.	67
1209 [ 1499 ]	$^{241}\text{Pu}$	RESON PARAMS	2. +1	2. +2	10	2	CAD Barre, J-Y. ---	69
1210 [ 1019 ]	$^{241}\text{Pu}$	RESON PARAMS	3.5+1	2. +2	10.0	2	KPK BN Schmidt, J.J. Tavernier, G. ---	
		fissionwidth gamma width neutronwidth					Status: see REG 2107 above.	
1211 [ 1060 ]	$^{241}\text{Pu}$	NONREL GAMMAS	1.2+5		20	3	WIN Campbell,C.G. Low resolution for En adequate. For study of activation and heat release in core.	
1212 [ 1332 ]	$^{241}\text{Pu}$	FISSION	THR	1.0+2	10	1	JAE Japanese Nuclear Data Committee (JNDC). For fast reactor. Above 50eV levels missing.	68
1213 [ 1508 ]	$^{241}\text{Pu}$	FISSION	THR		1	2	SAC Bussac, J. For thermal reactor calculations.	69
1214 [ 2101# ]	$^{241}\text{Pu}$	FISSION	THR	3. +4	<10	1	ANL GE Avery, R. Snyder, T. Accuracy 3% below 10 eV , 10% above 10 eV. Ratio to $\text{U}^{235}$ or $\text{Pu}^{239}$ useful. IAE Hanna+: REA 7(4) 3(D/69) , lsq evaluation 2200m/s. MHG Knoll+: absolute measurements at 24 keV. GEL Mignecot+: 70HELSINKI P/95(6/70) , to 2 keV. SAC Blons: 70HELSINKI P/60(6/70) , to 30 keV. ALD Moat+: data from Physics-7.	69
1215 [ 2417 ]	$^{241}\text{Pu}$	FISSION	2.5-2		1	1	CAD Barre, J-Y. Relative to sigma(n,f) (0.0253eV) ( $\text{U}^{235}$ ).	71
1216 [ 1575 ]	$^{241}\text{Pu}$	FISSION	2.0-2	(eta) (alpha)	1	3	CRC Hanna, G.C. Below .020eV, relative to .025eV value to establish shape of cross section versus energy curve.	
1217 [ 2588 ]	$^{241}\text{Pu}$	FISSION	1. +2	1.5+5	5	2	WIN Campbell, C.G. Accuracy: 5% (E-2E). For fast reactors. ALD White: JNE 21,671 (1967). HAR James: ANL7320,16 and further available up to 40keV. GEL Measurement planned. SAC Measurement planned. See Diven: LA-3586 P3W8(D/66) , Gilboy: EANDC(E) 66U (2/66), and Perkin: JNE AB19,423 (6/65). SAC Ribon evaluation (DFN 403) may suffice.	
1218 [ 1028 ]	$^{241}\text{Pu}$	FISSION	1. +2	1.5+7	3	1	CAD Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy or relative values to $\text{Z}^{235}\text{U}$ (accuracy 1% on this ratio). Evaluation may be sufficient. ALD Moat et al. have some data on capture and fission from Physics 7. CAD Szabo have data from 35 keV to 1 MeV in progress.	70

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REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
	[REG]		MIN	MAX	(%)			
1219 [2674+]	$^{241}\text{Pu}$	FISSION ratio x-sect	1. +3	1. +7	5	1 LMB --- CAD	Hennig, P.B. Ratio to $^{235}\text{U}$ . Szabo: 35 keV to 1 MeV in progress.	72
1220 [1359]	$^{241}\text{Pu}$	FISSION	2. +6	1. +7	<10	2 AE --- LAS	Haeggblom, H. Needed for fast reactor calculations. Smith's ratio measurements combined to others' define $\sigma(n,f)$ to about 10%.	
						ALD	Moat et al. have some data on capture and fission from Physics 7.	
						CAD	Szabo have data from 35 keV to 1 MeV in progress.	
1221 [1032]	$^{241}\text{Pu}$	ETA	THR		1.5	2 CRC	Hanna, G.C. For thermal reactors.	
1222 [2565]	$^{241}\text{Pu}$	ETA	THR		1.5	2 IAE	Lemmel, H.D. For thermal reactors.	69
1223 [1036]	$^{241}\text{Pu}$	ETA see comment	1. -2	1. +0	2	2 WIN --- HAR	Tyror, J.G. Requested: $\eta(\text{E}) / \eta(\text{E}_0)$ , $\text{E}_0 = 0.0253\text{eV}$ . For thermal reactors. Evaluation shows accuracy is not met. Feasibility study in progress, by Sowerby.	64
1224 [1509]	$^{241}\text{Pu}$	ETA	2.5-2		1	1 SAC	Reuss, P. Evaluation may suffice if it explains discrepancies. For thermal reactor calculations.	69
1225 [1038]	$^{241}\text{Pu}$	ETA (alpha)	1. +0	5. +2	5.5	2 CRC	Hanna, G.C. For thermal reactors. Alternatively, alpha measur. would be acceptable.	
1226 [1039]	$^{241}\text{Pu}$	ETA see comment	1. +0	1.5+1	6	2 WIN --- HAR	Tyror, J.G. Requested: $\eta(\text{E}) / \eta(\text{E}_0)$ , $\text{E}_0 = 0.0253\text{eV}$ . For thermal reactors. Evaluation shows accuracy is not met. Feasibility study in progress, by Sowerby.	64
1227 [2418]	$^{241}\text{Pu}$	ALPHA	2.5-2		1	1 SAC	Reuss, P. Evaluation may suffice if it explains discrepancies.	70
1228 [1043]	$^{241}\text{Pu}$	ALPHA	1. +2	1. +6	20 (E-2E)	3 WIN	Campbell, C.G. For fast reactors.	
1229 [1501]	$^{241}\text{Pu}$	ALPHA	1. +2	1. +6	10	2 CAD	Barre, J-Y. For fast reactor calculations. Absolute values useful but request concerns mainly relative values versus energy. No activity known.	70
1230 [2564]	$^{241}\text{Pu}$	ALPHA	1.0+2	1.0+6	10.0	2 AUA --- ALD INC	Symonds, J.L. No experimental data available. Moat et al. have some data from Physics 7 event. Smith is evaluating for ENDF/B.	69
1231 [2106#]	$^{241}\text{Pu}$	ALPHA	1. +3	2. +6	20	2 GE LMB --- ALD	Snyder, T. Hennig, P.B. Capture cross section equally useful. Moat+: data on capture and fission from Physics-7.	69
1232 [2563]	$^{241}\text{Pu}$	NU	THR	1.0+7	1.0	1 AUA --- FOA ANL IAE	Symonds, J.L. Available data do not satisfy request. Conde and Holmberg measured five values from 0.52 to 15 MeV, J. Nucl. En. 22(1968), 53. Evaluation by Davey, NSE 44 (1971), 345. Manero and Konshin, evaluation in progress.	69
1233 [1046]	$^{241}\text{Pu}$	NU	1. +3	1.4+7	5.0	2 KPK BN --- ANL IAE FOA	Schmidt, J.J. Tavernier, G. Davey, NSE 44, 345 (1971), Eval. Konshin +, INDC(NDS)-19/N (1970) Review, work being continued Conde +, JNE 22, 53 (1968), 0.52 - 15 MeV 5 values	

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV) MIN MAX	ACCURACY P (%)	LAB	REQUESTER , COMMENTS	YEAR	
1234 [ 2675+ ]	$^{241}\text{Pu}$	NU	1. +3 1. +6	4	2	LMB Hemmig, P.B. --- Status: See REG 2103 below	72	
1235 [ 1500 ]	$^{241}\text{Pu}$	NU	1.0+4 1.4+7	1	2	CAD Barre, J-Y. Absolute values useful but request concerns mainly relative values versus energy. For fast reactor calculations. Accuracy relative to nu $\text{Cf}^{252}$ . ANL Davey, NSE 44, 345 (1971), Eval. IAE Konshin +, INDC(NDS)-19/N (1970) Review, work being continued POA Conde +, JNE 22, 53 (1968), 0.52 - 15 MeV 5 values	70	
1236 [ 2103# ]	$^{241}\text{Pu}$	NU	1. +6 1. +7	6	2	AI Alter, H. ANL Avery, R. --- FOA Conde+: JNE 22 53(1968), 5 values 0.52-15 MeV. IAE Manerot+: review continuing.	72	
1237 [ 2566 ]	$^{241}\text{Pu}$	SPECT FISSION THR see comment		1.0	1	IAE Lemmel, H.D. Mean spectrum energy with 1% accuracy plus spectrum shape requested for calibration of nu-bar measurements. Absolute or relative to other fissile isotopes wanted.	69	
1238 [ 2419 ]	$^{241}\text{Pu}$	SPECT FISSION NO. +0	1.4+7	2	2	CAD Barre, J-Y. Accuracy 2% for aver. $E'(\text{Pu}^{241})/\text{aver. } E'(\text{U}^{235})$ . For fast reactor calculations.	71	
1239 [ 2273 ]	$^{241}\text{Pu}$	FISSION YIELD	THR	1	2	CRC Walker, W.H. Yield of $^{135}\text{Xe}$ . For calculation of fission product absorption.	71	
1240 [ 2420 ]	$^{241}\text{Pu}$	RES INT FISSION		5	1	SAC Reuss, P.	71	
1241 [ 2421 ]	$^{241}\text{Pu}$	ABSORPTION	2.5-2	1	1	SAC Reuss, P. Evaluation may suffice if it explains discrepancies.	70	
1242 [ 2591 ]	$^{241}\text{Pu}$	ABSORPTION	1.5+1 3.0+2 (E-2E)	8	3	WIN Tyror, J.G. --- SAC Ribon's evaluation (DPN 403) may suffice.	71	
1243 [ 2592 ]	$^{241}\text{Pu}$	ABSORPTION	1.0+3 2.0+3 (E-2E)	20	3	WIN Tyror, J.G. --- SAC Ribon's evaluation (DPN 403) may suffice.	71	
1244 [ 2422 ]	$^{241}\text{Pu}$	RES INT ABS		5	1	SAC Reuss, P.	71	
1245 [ 1052 ]	$^{241}\text{Pu}$	N, GAMMA	THR	3	2	BN Tavernier, G. --- HAR A value of Cabell, JIN 28,246 (1966) at 2200m/s is $359 \pm 16$ b which approaches the required precision. REA 7(4) 3 (1969) satisfies. part of request apparently satisfied.		
1246 [ 1510 ]	$^{241}\text{Pu}$	N, GAMMA	THR	1	2	SAC Bussac, J. --- For thermal reactor calculation. REA 7(4) 3 (1969). Request not satisfied.	69	
1247 [ 2105 ]	$^{241}\text{Pu}$	N, GAMMA	THR	3.0+4	3.0	1	GE Snyder, T. Accuracy to 3% in Eta. Improved precision needed for thermal reactors. Also wanted for fast reactors. X-sec, or Alpha wanted. ALD Moat+ have some data from Physics 7 event. INC Smith is evaluating for ENDF/B.	67

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REF [ REG ]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
1248 [ 2320 ]	$^{241}\text{Pu}$	N, GAMMA	1. +7	<10.0	1 JAE	Japanese Nuclear Data Committee (JNDC). For fast reactors.	71
1249 [ 1056 ]	$^{241}\text{Pu}$	N, GAMMA	1.0+0	1.0+2	5 2 BN	Tavernier, G. Thermal reactor calculations. See Weigmann.	
					GEL ALD	Moat et al. have some data on capture and fission from Physics 7. REA 7(4) 3 (1969) satisfies. part of request apparently satisfied.	
1250 [ 1360 ]	$^{241}\text{Pu}$	N, GAMMA	1. +1	1. +7	10 2 AE	Haegglom, H. Fast reactor calculations. Status: see REG 2105 above.	
					---		
1251 [ 1057 ]	$^{241}\text{Pu}$	N, GAMMA (alpha)	2.0+2	1. +6	10 2 KPK	Schmidt, J.J. No measurements available. No action in EURATOM community. Status: see REG 2105 above.	
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1252 [ 1059 ]	$^{241}\text{Pu}$	N, GAMMA	1. +6	1. +7	20 2 BN	Tavernier, G. Thermal reactor calculations. Moat et al. have some data on capture and fission from Physics 7.	
					ALD		
1253 [ 2567 ]	$^{241}\text{Pu}$	MISCELLANEOUS see comment		0.2	1 IAE	Lemmel, H.D. Beta decay half-life required for 2200 m/s fission constant evaluation. Recent data are discrepant by 6% although better acc.y is claimed for individual data.	69
1254 [ 2111 ]	$^{242}\text{Pu}$	FISSION	THR		2.0 1 SRL	Dessauer, G. To evaluate Cm and Cf production.	67
1255 [ 2423 ]	$^{242}\text{Pu}$	FISSION	5. +2	1.5+7	3 1 CAD	Barre, J-Y. Absolute values useful but request concerns mainly relative values versus energy or relative values to $^{235}\text{U}$ (accuracy 1% on this ratio). For fast reactor calculations.	71
1256 [ 2424 ]	$^{242}\text{Pu}$	NU	5.0+2	1.4+7	3 1 CAD	Barre, J-Y. Accuracy relative to nu ( $\text{Cf}^{252}$ ). For fast reactor calculations. No work reported or in progress. Difficult because of high spontaneous fission rate.	71
1257 [ 2112* ]	$^{242}\text{Pu}$	NU	5. +5	1. +7	5 2 LMB	Hemmig, P.B. No work due to high spontaneous fission rate.	69
1258 [ 2428 ]	$^{242}\text{Pu}$	RES INT CAPT		10	1 SAC	Reuss, P.	71
1259 [ 2115* ]	$^{242}\text{Pu}$	N, GAMMA	THR	7. +6	<20 3 TO 20%	1 BNW Leonard, B.R. Dessauer, G. For Cm and Cf production. Accuracy 3% to 100 eV, 10% 100 eV to 1 keV, 15-20% 1 keV to 7 MeV. Res.par. to 10-20% below 10 keV. HAR James: NP 123 24(1/69), data to 29 keV. ANC Young: IN-1132(6/68), res.par. to 150 eV.	67
1260 [ 2676* ]	$^{242}\text{Pu}$	N, GAMMA	THR	7. +6	<20	2 GE Hutchins, B. For fast breeder calculations, Cm and Cf production. Accuracy 3% to 100 eV, 10% 100 eV to 1 keV, 15-20% 1 keV to 7 MeV. Res.par. to 10-20% below 10 keV. HAR James: NP 123 24(1/69), data to 29 keV. ANC Young: IN-1132(6/68), res.par. to 150 eV.	72

## W R E N D A 1 9 7 3

REF [ REG ]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR
1261 [2425]	$^{242}\text{Pu}$	N,GAMMA	2.5-2	5	1 SAC	Reuss, P. Evaluation may suffice if it explains discrepancies.	70
1262 [2426]	$^{242}\text{Pu}$	N,GAMMA	0. + 5. +0	5	2 SAC	Reuss, P. Accuracy on ratio to sigma 0.0253 ev . Evaluation may suffice if it explains discrepancies.	70
1263 [2427]	$^{242}\text{Pu}$	N,GAMMA	5. +2 1.5+7	3	1 CAD	Barre, J-Y. For fast reactor calculations.	71
1264 [2677+]	$^{242}\text{Pu}$	N,GAMMA	1. +3 7. +6 <20	1 LMB	Hemmig, P.B. Accuracy 15-20%.	72	
				200 b.	---	For fast breeder calculations, Cm and Cf production.	
1265 [1430]	$^{245}\text{Pu}$	FISSION	THR		2 CRC	Walker, W.H. Unknown cross section.	68
1266 [2120#]	$^{241}\text{Am}$	TOTAL XSECT	THR	< 3 2 TO 3%	2 BNW	Leonard, B.R. --- No active work.	69
1267 [2429]	$^{241}\text{Am}$	FISSION	5. +2 1.5+7	3	1 CAD	Barre, J-Y. For fast reactor calculations.	71
1268 [2584]	$^{241}\text{Am}$	NU	THR 1.0+7	5	1 KPK	Schatz,B. For fast reactor design.	71
1269 [2430]	$^{241}\text{Am}$	NU	5.0+2 1.4+7	3	1 CAD	Barre, J-Y. Accuracy relative to nu( Cf <sup>252</sup> ). For fast reactor calculations.	71
1270 [1431]	$^{241}\text{Am}$	ABSORPTION	THR	5	2 CRC	Walker, W.H. Wide spread of available values.	68
1271 [2431]	$^{241}\text{Am}$	ABSORPTION	2.5-2	5	1 SAC	Reuss, P.	71
1272 [1432]	$^{241}\text{Am}$	ABSORPTION	1. +0 5.0 2	10	2 CRC	Walker, W.H. Desire confirmation of resonance integral measurement of Bak (A.E. 23(1967)316)	68
1273 [2432]	$^{241}\text{Am}$	RES INT ABS		10	1 SAC	Reuss, P.	71
1274 [1433]	$^{241}\text{Am}$	ACTIVATION	THR	5	2 CRC	Walker, W.H. To both $^{242}\text{Am}$ isomers.	68
1275 [1434]	$^{241}\text{Am}$	ACTIVATION	1. +0 5.0 2	10	2 CRC	Walker, W.H. Desire confirmation of resonance integral measurement of Bak, A.E. 23(1967)316.	68
1276 [1333]	$^{241}\text{Am}$	N,GAMMA	THR	3	3 JAE	Japanese Nuclear Data Committee (JNDC). Precise standardization of emission rate of neutron source.	68
1277 [2332]	$^{241}\text{Am}$	N,GAMMA	THR 1. +3	10	1 LLL	Howerton, R.J. Production of both Am <sup>242</sup> Am <sup>242m</sup> wanted. Needed for Pu <sup>238</sup> program, and production of Cm <sup>244</sup> .	70
1278 [2583]	$^{241}\text{Am}$	N,GAMMA	THR 1.0+7	10	1 KPK	Schatz,B. For burnup calculations.	71
1279 [2122#]	$^{241}\text{Am}$	N,GAMMA	THR 1. +3	10	1 SRL BNW	Dessauer, G. Leonard, B.R. Production of Am <sup>242</sup> and Am <sup>242m</sup> wanted. Needed for Pu <sup>238</sup> program, and production of Cm <sup>244</sup> . BNW needs values at thermal, priority 2.	67
					ANC	Schuman: WASH-1136, RI measurement.	

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
1280 [2678+]	$^{241}\text{Am}$	N,GAMMA	THR	1. +7	15	2 GE	Hutchins, B. For spent fuel shielding. Status: See REG 2122 above.	72
1281 [2290]	$^{241}\text{Am}$	N,GAMMA	1. +2	1. +5	20	1 WIN	Campbell,C.G. For fast reactors.	71
1282 [2433]	$^{241}\text{Am}$	N,GAMMA	5. +2	1.5+7	3	1 CAD	Barre, J-Y. For fast reactor calculations.	71
1283 [2124]	$^{242}\text{Am}$	TOTAL XSECT	THR	1.0+4	10	2 SRL	Dessauer, G. Resonance energies needed to determine $\text{Cm}^{244}$ production. No active work. Probably satisfied by existing fission data.	67
1284 [2125]	$^{242}\text{Am}$	FISSION	THR	1.0+4	20	2 SRL	Dessauer, G. Cross section needed for 150 year isomer. Require accuracy 10% in thermal value and resonance integral. Needed to determine $\text{Cm}^{244}$ production. Schuman: WASH-1136 53(9/69), reports new res.integ.	69
1285 [2126]	$^{242}\text{Am}$	N,GAMMA	THR	5.0+6	<10	1 LLL	Howerton, R.J. Needed for evaluation.	69
						INC	Schuman: WASH-1136 53(9/69), reports new res.integ.	
						LRL	Bowman: PR 166 1219(2/68), gives res.params. to 4 eV.	
1286 [2127]	$^{242}\text{Am}$	N,GAMMA	THR	1.0+4	20	2 SRL	Dessauer, G. Cross section wanted for 152 year isomer. Need resonance integral and thermal value to 10%, to evaluate $\text{Cm}^{244}$ production. Schuman: WASH-1136 53(9/69), reports new res.integ. Bowman: PR 166 1219(2/68), gives res.params. to 4 eV.	69
1287 [1435]	$^{242}\text{Am}$	N,GAMMA	THR			2 CRC	Walker, W.H. Accuracy 200 b. For 16 hour isomer. Unknown x-section.	68
1288 [1435]	$^{242}\text{Am}$	N,GAMMA see comment	THR		200 b	2 CRC	Walker, W.H. For 16 hour isomer. Unknown cross-section.	71
1289 [2679+]	$^{242}\text{Am}$	N,GAMMA	THR	1. +7	15	2 GE	Hutchins, B. For spent fuel shielding. Status: See REG 2127 above.	72
1290 [2128]	$^{243}\text{Am}$	TOTAL XSECT	THR	1.0+4	10	1 SRL	Dessauer, G. Resonance integral wanted, for $\text{Cm}^{244}$ production. Needed for long term reactivity calculations. Harvey+: NCSAC-33(1970), total to 1keV; res.params. EANDC(US)-143,70 gives tot.(2200) to 5%, ibid 69 gives data above 0.5 eV. Request apparently satisfied.	67
1291 [2129#]	$^{243}\text{Am}$	TOTAL XSECT	THR	1. +4	2	1 BNW	Leonard, B.R. Resonance integral needed for $\text{Cm}^{244}$ production. Needed for long term reactivity calculations. Status: See REG 2128 above.	67
1292 [2434]	$^{243}\text{Am}$	FISSION	5. +2	1.5+7	3	2 CAD	Barre, J-Y. For fast reactor calculations.	71
1293 [2435]	$^{243}\text{Am}$	NU	5.0+2	1.4+7	3	2 CAD	Barre, J-Y. Accuracy relative to nu( $\text{Cf}^{252}$ ). For fast reactor calculations.	71
1294 [2436]	$^{243}\text{Am}$	ABSORPTION	2.5-2		5	1 SAC	Reuss, P.	71
1295 [2437]	$^{243}\text{Am}$	RES INT ABS			10	1 SAC	Reuss, P.	71

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REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
1296 [1436 ]	$^{243}\text{Am}$	N,GAMMA	THR		5	2	CRC Walker, W.H. Disagreement between integral (approx 90 b) and differential measurements (approx 180 b).	68
1297 [1436 ]	$^{243}\text{Am}$	N,GAMMA	THR		5	2	CRC Walker, W.H. Disagreement between integral (90 B) and differential measurements (180 B).	71
1298 [2130#]	$^{243}\text{Am}$	N,GAMMA	THR	1. +4	10	1	SRL Dessauer, G. Resonance integral to determine $\text{Cm}^{244}$ production. Require 5-10% in thermal value and R.I. ORL Harvey+: NCSAC-33, total to 1 keV, res.params.	67
1299 [2680+]	$^{243}\text{Am}$	N,GAMMA	THR	1. +7	15	2	GE Snyder, T. Needed for long term reactivity calculations and for spent fuel shielding. Status: See REG 2130 above.	72
1300 [2438 ]	$^{243}\text{Am}$	N,GAMMA	5. +2	1.5+7	3	2	CAD Barre, J-Y. For fast reactor calculations.	71
1301 [2132#]	$^{242}\text{Cm}$	RESON PARAMS	THR	1. +3	20	2	BNW Leonard, B.R. Radiative capture and neutron widths wanted for $\text{Pu}^{238}$ production. Target half life 163 days.	67
1302 [2586 ]	$^{242}\text{Cm}$	FISSION	THR	1.0+7	10	1	KPK Schatz,B. For calculations of spontaneous fission in fast reactors.	71
1303 [2587 ]	$^{242}\text{Cm}$	NU	SPON		5	1	KPK Schatz,B. For calculations of spontaneous fission in fast reactors.	71
1304 [2131 ]	$^{242}\text{Cm}$	N,GAMMA	THR		20	2	SRL Dessauer, G. Needed to evaluate production of $\text{Cm}^{244}$ . Target half-life 163 d.	67
1305 [2585 ]	$^{242}\text{Cm}$	N,GAMMA	THR	1.0+7	10	1	KPK Schatz,B. For calculations of spontaneous fission in fast reactors.	71
1306 [2133 ]	$^{243}\text{Cm}$	TOTAL XSECT	THR	1.0+4	10	2	SRL Dessauer, G. Resonance energies wanted to evaluate $\text{Cm}^{244}$ production. Accuracy 10% in resonance integral. INC Berreth+: AINS 12 280(1969), res.params. INC Simpson, chopper, to 1 keV.	67
1307 [2134 ]	$^{243}\text{Cm}$	FISSION	THR	1.0+4	10	2	SRL Dessauer, G. Needed to evaluate production of $\text{Cm}^{244}$ . Accuracy 10% in resonance integral. INC Simpson has resonance parameters to 6eV. LAS Fullwood has data from 30 ev up.	67
1308 [2135 ]	$^{243}\text{Cm}$	FISSION	1.0+4	1.0+5	10	1	LAS Cowan, G.A. Needed to evaluate production of $\text{Cm}^{244}$ . Accuracy 10% in resonance integral. INC Simpson has resonance parameters to 6eV. LAS Fullwood has data from 30 ev up.	69
1309 [1437 ]	$^{243}\text{Cm}$	N,GAMMA	THR	50 b.		2	CRC Walker, W.H. Unknown cross section.	68
1310 [2136 ]	$^{243}\text{Cm}$	N,GAMMA	THR	1.0+4	10	2	SRL Dessauer, G. Require alpha to 10%. Accuracy 5 to 10% in thermal value and resonance integral. INC Simpson, WASH-1136, has res.params to 6eV.	69

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REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX	(%)				
1311 [2137]	$^{244}\text{Cm}$	TOTAL XSECT	THR	1.0+4	5.0	2	SRL INC INC LAS INC	Dessauer, G. Need 5% in resonance integral to evaluate $\text{Cm}^{244}$ , $\text{Cf}^{252}$ production. Berreth+: ANS 12 280(1969), res.params. Simpson, chopper, to 1 keV. Moore et al. report fission and capture data above 20eV from Physics 8, Helsinki CN-26/45. Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals, EANDC(US)-122 U.	67
1312 [2141]	$^{244}\text{Cm}$	H,GAMMA	THR	1.0+4	10	2	SRL LAS INC INC	Dessauer, G. For criticality of isotopic heat sources. Accuracy 5 to 10% in resonance integral. Needed to evaluate Cf production. Moore et al. report fission and capture data above 20eV from Physics 8, Helsinki CN-26/45. Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals, EANDC(US)-122 U. WASH-1136,55 gives $650 \pm 50$ b. R.I. part of request apparently satisfied.	69
1313 [2138#]	$^{244}\text{Cm}$	H,GAMMA	1. +4	1. +7	10	2	AI GE ---	Alter, H. Snyder, T. For spent fuel shielding. Status: See REG 2141 above.	72
1314 [2143]	$^{245}\text{Cm}$	TOTAL XSECT	THR	1.0+4	10	1	SRL INC	Dessauer, G. Need 10% in res.integral to evaluate Cf production. Simpson, chopper, $\omega$ MT, res.parameters to 10eV .	67
1315 [2144]	$^{245}\text{Cm}$	FISSION	THR	1.0+4	10	1	SRL INC LAS INC	Dessauer, G. Need 10% in $\epsilon$ and res.integral to evaluate Cf production. Need integral alpha to 10% thermal and resonance. Simpson, WASH-1127, has data to 10 eV. Moore et al. report fission and capture data above 20eV from Physics 8, Helsinki CN-26/45. Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals, EANDC(US)-122 U.	67
1316 [2145]	$^{245}\text{Cm}$	FISSION	1.0+4	1.0+5	10	1	LAS INC LAS INC	Cowan, G.A. Need 10% in $\epsilon$ and res.integral to evaluate Cf production. Need integral alpha to 10% thermal and resonance. Simpson, WASH-1127, has data to 10 eV. Moore et al. report fission and capture data above 20eV from Physics 8, Helsinki CN-26/45. Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals, EANDC(US)-122 U.	69
1317 [2146]	$^{245}\text{Cm}$	H,GAMMA	THR	1.0+4	10	1	SRL LAS INC	Dessauer, G. Need 10% in res.integral to evaluate Cf production. Need integral alpha to 10% thermal and resonance. Moore et al. report fission and capture data above 20eV from Physics 8, Helsinki CN-26/45. Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals, EANDC(US)-122 U.	69
1318 [2148]	$^{246}\text{Cm}$	TOTAL XSECT	THR	1.0+4	10	1	SRL INC LAS INC	Dessauer, G. Resonance structure desired to evaluate Cf production Accuracy 10% in resonance integral. Berreth+: ANS 12 280(1969), res.params. Keyworth+: NCSAC-33(1970), res.params. above 20 eV. Simpson, chopper, to 1 keV.	67
1319 [2150]	$^{246}\text{Cm}$	H,GAMMA	THR	1.0+4	10	1	SRL LAS INC	Dessauer, G. Need accuracy 10% in resonance integral. Resonance structure desired to evaluate Cf production Moore et al. report fission and capture data above 20eV from Physics 8, Helsinki CN-26/45. Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals, EANDC(US)-122 U.	69

## W R E N D A 1 9 7 3

REF [REG]	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)			
1320 [2151]	$^{247}\text{Cm}$	TOTAL XSECT	THR	1.0+4	20	1	SRL Dessauer, G. LAS Need 20% in res.integral to evaluate Cf production. Keyworth+: NCSAC-33(1970), res.params. above 20 eV.	67
1321 [2152]	$^{247}\text{Cm}$	FISSION	THR	1.0+4	10	1	SRL Dessauer, G. LAS Need 5 to 10% in thermal value and R.I. Moore et al. report fission and capture data above 20eV from Physics 8,Helsinki CN-26/45. INC Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals,EANDC(US)-122 U.	67
1322 [2153]	$^{247}\text{Cm}$	FISSION	1.0+4	1.0+5	10	1	LAS Cowan, G.A. LAS Need 10% in $\sigma$ to evaluate Cf production by R-process. Moore et al. report fission and capture data above 20eV from Physics 8,Helsinki CN-26/45. INC Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals,EANDC (US)-122 U.	69
1323 [2154]	$^{247}\text{Cm}$	N,GAMMA	THR	1.0+4	10	1	SRL Dessauer, G. LAS Need 5 to 10% in resonance integral and thermal value Needed to evaluate Cf production. Moore et al. report fission and capture data above 20eV from Physics 8,Helsinki CN-26/45. INC Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals,EANDC(US)-122 U.	69
1324 [2156]	$^{248}\text{Cm}$	TOTAL XSECT	THR	1.0+4	20	1	SRL Dessauer, G. LAS Need 50% accuracy at thermal. Need 20% in resonance integral to evaluate Cf production. Keyworth+: NCSAC-33(1970), res.params. above 20 eV.	67
1325 [2158]	$^{248}\text{Cm}$	N,GAMMA	THR	1.0+4	10	1	SRL Dessauer, G. LAS Need 10% at thermal and resonance integral to Needed to evaluate Cf production. Moore et al. report fission and capture data above 20eV from Physics 8,Helsinki CN-26/45. INC Schuman reports $^{244}\text{Cm}$ , $^{245}\text{Cm}$ and $^{246}\text{Cm}$ resonance integrals,EANDC (US)-122 U.	69
1326 [2159]	$^{249}\text{Bk}$	TOTAL XSECT	THR	1.0+4	20	1	SRL Dessauer, G. Resonance desired to evaluate Cf production. Need 20% in resonance integral.	67
1327 [2160]	$^{249}\text{Bk}$	N,GAMMA	THR	1.0+4	10	1	SRL Dessauer, G. For Cf production, 10% thermal and resonance integral.	69
1328 [2162]	$^{250}\text{Cf}$	TOTAL XSECT	THR	1.0+4	20	1	SRL Dessauer, G. Resonances desired to evaluate Cf production. Need 20% in resonance,to evaluate $\text{Cf}^{252}$ production.	67
1329 [2163]	$^{250}\text{Cf}$	FISSION	THR	1.0+4	10	1	SRL Dessauer, G. To evaluate Cf production. Accuracy 10% in resonance integral.	67
1330 [2164]	$^{250}\text{Cf}$	FISSION	1.0+4	1.0+5	10	1	LAS Cowan, G.A. To evaluate Cf production. Accuracy 10% in resonance integral.	69
1331 [2165]	$^{250}\text{Cf}$	N,GAMMA	THR	1.0+4	10	1	SRL Dessauer, G. Need 10% in resonance integral to evaluate $\text{Cf}^{252}$ production.	69
1332 [2166]	$^{251}\text{Cf}$	N,GAMMA	THR	1.0+4	10	1	SRL Dessauer, G. To evaluate Cf production. Accuracy 10% in resonance integral.	67
1333 [1099]	$^{252}\text{Cf}$	NU	SPON		0.5	1	KPK Schmidt, J.J. TAE Standard. Incoherence of 1.7% in existing data. Hanna +, At Energy Rev. VII (1969), No 4 give total NU 3.765 ± 0.012, evaluation ANL De Volpi, Reactor Techn. to be publ., 71 KNOX 560, Revised ETA-values and $^{233}\text{Np}$ and $^{234}\text{U}$ half-lives give total NU 3.730 ± 0.008, evaluation. ANL De Volpi +, PR C1, 683 (1970) expt give total NU 3.725±0.015 NPL Arton, work in progress AUL Boldeman, liqu.scint. work in progress.	

## WRENDA 1973

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
				MIN	MAX	(%)	
						Still discrepancies between "manganese bath" and "boron pile" values contra liquid scintillator values. Correction for the "French effect" small. See Conde +, CONF-701002, 481 and Hopkins +, CONF-701002, 514 also Mather +, 70 HELS 2 195 and Signarbieux +, NIM 95, 585 (1971). Expt. of NU $^{252}\text{Cf}$ planned by Soleilhac	
1334	$^{252}\text{Cf}$	NU		SPCN	0.5 2	CRC Hanna, G.C. Serious discrepancies between available direct measurements.  IAE Hanna +, At Energy Rev. VII (1969), No 4 give total NU $3.765 \pm 0.012$ , evaluation ANL De Volpi, Reactor Techn. to be publ., 71 KNOX 560, Revised ETA-values and $^{233}\text{U}$ and $^{234}\text{U}$ half-lives give total NU $3.730 \pm 0.008$ , evaluation. ANL De Volpi +, PR C1, 683 (1970) expt give total NU $3.725 \pm 0.015$ NPL Axton, work in progress AUL Boldeman, liqu.scint. work in progress. Still discrepancies between "manganese bath" and "boron pile" values contra liquid scintillator values. correction for the "French effect" small. See Conde +, CONF-701002, 481 and Hopkins +, CONF-701002, 514 also Mather +, 70 Hels 2 195 and Signarbieux +, NIM 95, 585 (1971). Expt. of NU $^{252}\text{Cf}$ planned by Soleilhac	
1335	$^{252}\text{Cf}$	NU		SPON	0.3 1	SAC Ribon,P. Standard. Incoherence of 1.7% in existing data.  IAE Hanna +, At Energy Rev. VII (1969), No 4 give total NU $3.765 \pm 0.012$ , evaluation ANL De Volpi, Reactor Techn. to be publ., 71 KNOX 560, Revised ETA-values and $^{233}\text{U}$ and $^{234}\text{U}$ half-lives give total NU $3.730 \pm 0.008$ , evaluation. ANL De Volpi +, PR C1, 683 (1970) expt give total NU $3.725 \pm 0.015$ NPL Axton, work in progress AUL Boldeman, liqu.scint. work in progress. Still discrepancies between "manganese bath" and "boron pile" values contra liquid scintillator values. correction for the "French effect" small. See Conde +, CONF-701002, 481 and Hopkins +, CONF-701002, 514 also Mather +, 70 Hels 2 195 and Signarbieux +, NIM 95, 585 (1971). Expt. of NU $^{252}\text{Cf}$ planned by Soleilhac	71
1336	$^{252}\text{Cf}$	NU		SPON	0.5 1	IAE Lemmel, H.D. Serious discrepancies between available direct measurements.  IAE Hanna et al. evaluation, At. En. Rev. 7(1969) No. 4, gives nu(tot) = $3.765 \pm 0.012$ . ANL De Volpi and Porges, Phys. Rev. C1(1970), 683, evaluate NU(tot) = $3.725 \pm 0.015$ . NPL Axton, work in progress. AUL Boldeman, liqu. scint. work in progress.	69
1337	$^{252}\text{Cf}$	NU		SPON	0.5 2	AUA Symonds, J. L. For obtaining nu from relative measurements on $\text{U}^{233}$ , $\text{U}^{235}$ , $\text{Pu}^{239}$ and $\text{Pu}^{241}$ .  IAE Hanna et al. evaluation, At. En. Rev. 7(1969) No. 4, gives nu(tot) = $3.765 \pm 0.012$ . ANL De Volpi and Porges, Phys. Rev. C1(1970), 683, evaluate NU(tot) = $3.725 \pm 0.015$ . NPL Axton, work in progress. AUL Boldeman, liqu. scint. work in progress.	69
1338	$^{252}\text{Cf}$	NU		SPON	< 0.5 1	FEI Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders.  IAE Hanna et al. evaluation, At. En. Rev. 7(1969) No. 4, gives nu(tot) = $3.765 \pm 0.012$ . ANL De Volpi and Porges, Phys. Rev. C1(1970), 683, evaluate NU(tot) = $3.725 \pm 0.015$ . NPL Axton, work in progress. AUL Boldeman, liqu. scint. work in progress.	71

## WRENDA 1973

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
1339	$^{252}\text{Cf}$	NU		SPON	0.1	2 FEI Nikolaev, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Evaluated from optimum distribution of uncertainties over uncorrelated nuclear data.	71
[2573]						IAE Hanna et al. evaluation, At. En. Rev. 7(1969) No. 4, gives nu(tot) = 3.765 ± 0.012.	
						ANL De Volpi and Porges, Phys. Rev. C1(1970), 683, evaluate NU(tot) = 3.725 ± 0.015.	
						NPL Axton, work in progress.	
						AUL Boldeman, liqu. scint. work in progress.	
1340	$^{252}\text{Cf}$	NU		SPON	0.25%	1 AI BET NBS --- Required as primary standard.	72
[2168#]						Status: See REG 1099 above.	
1341	$^{252}\text{Cf}$	F NEUT DELAY	SPON		20	2 AUA Symonds, J.L. Delayed gamma yield wanted. Required for correcting $\text{Cf}^{252}$ nu calibrations. Refer Hanna et al. evaluation At. En. Rev. 7(1969), 3.	69
[2571+]		see comment				AUA Boldeman planning measurements to 20%.	
1342	$^{252}\text{Cf}$	SPECT FISSION	SPON		1.0	1 IAE Lemmel, H.D. Mean spectrum energy with 1% accuracy plus spectrum shape requested for calibration of nu-bar measure- ments. Absolute or relative to other fissile isotopes wanted.	69
[2569]		see comment					
1343	$^{252}\text{Cf}$	SPECT FISSION	SPON		1	1 BET --- 1% in mean spectrum energy required.	72
[2681+]		spectrum					
1344	$^{252}\text{Cf}$	SPECT FISSION	N	0. +0 1.4+7	2	1 CAD Barre, J-Y. Accuracy 2% for aver. $E'(\text{Cf}^{252})/\text{aver. } E'(\text{U}^{235})$ . For fast reactor calculations.	71
[2439]						SAC Ribon, P. Standard	71
1345	$^{252}\text{Cf}$	N, GAMMA	THR	1.0+4	10	1 SRL Dessauer, G. To evaluate Cf production. Accuracy 10% in resonance integral.	67
[2170]							
1346	$^{253}\text{Cf}$	N, GAMMA	THR	1.0+4	20	2 SRL Dessauer, G. To evaluate Cf production. Accuracy 20% in resonance integral. Target half-life 18 d. WAS Want to confirm that thermal cross section < 3 b. Bemis, NSE 41 146 (1970) reports 17.6±1.8 b. for pile neutrons. * part of request apparently satisfied.	67
[2171]							
1347	$^{253}\text{Es}$	FISSION		1.0+4 1.0+5	10	1 LAS Cowan, G.A. Target half-life 20 d. LAS Silbert WASH-1136 has data 30 eV up.	69
[2172]							
1348	$^{254}\text{Es}$	ALPHA	THR	2.0+4	20	2 LAS Bell, G.I. Needed to plan for production of $\text{Fm}^{257}$ . Target half-life #80 d.	67
[2173]							
1349	R20	THRMSCATLAW	0. +0 2.0-1		2 RLT Jauho, P. Scattering law for water at higher temperature (100°C) wanted for calculation of reactivity ef- fects as function of temperature.	69	
[2574]						RPI Esch et al. measured at 0.04-0.63 eV and at 27, 170 and 270°C, RPI-328-210.	
1350	METAN	THRMSCATLAW	0. +0 1.0-1		2 RLT Tunkelo, E. Scattering law for solid and liquid methan wanted. For design of refrigerated neutron source.	69	
[2575]							

## W R E N D A 1 9 7 3

REF	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY	P	LAB	REQUESTER , COMMENTS	YEAR
	[REG]			MIN	MAX	(%)		
1351 [2576]	SS	N,GAMMA ratio x-sect	5.0+2	5.0+5	10	1	PEI Nikolaeve, M.N. For fast reactor BR prediction with 1.6% accuracy. Analysis of fast critical assemblies indicates, that capture CS of stainless steel much greater than evaluated from microscopic data. Measurement wanted relative to fission CS of U <sup>235</sup> .	71
1352 [2577]	FPROD	N,GAMMA	1.0+2	1.0+5	20	1	PEI Nikolaeve, M.N. For accuracies of 1.0 % in Keff and 1.6 % in BR for fast breeders. Average capture CS for gross fission products (stable and long-lived as well as equilibrium fiss. prod. for fast reactors) wanted. Data for fiss. prod. of U <sup>235</sup> , U <sup>238</sup> , Pu <sup>239</sup> and Pu <sup>240</sup> are of great interest.	71
1353 [2578]	FPROD	N,GAMMA (res.param)	THR	1.0+5		2	AUA Symonds, J.L. Capture CS and s, p and d wave strength functions desired for theoretical predictions of cross sections for masses 80-160. AUA Bird et al. working in keV region using capture gamma rays. BOL Benzi et al., extensive evaluation, CEC(70)-2, 1970.	69
1354 [2440]	FPROD	N,GAMMA	5. +2	1. +6	10	2	CAD Barre, J-Y. See also the requests 'fission yield' of U <sup>235</sup> and Pu <sup>239</sup> . Fission products from U <sup>235</sup> and Pu <sup>239</sup> . Capture of an 'averaged' fission product(relative to capture U <sup>238</sup> ). Capture for the main fiss. Products (which contribute to 90% of averaged capture for spectrum of a 1000 MW fast reactor). The averaged fission energy of spectrum is 200 keV .	71
1355 [1130]	FPROD	ABSORPTION	THR		5	2	WIN Tyror, J.G. For thermal reactors.	
1356 [1169]	FPROD	RES INT ABS	5.5-1	2. +6	10	2	WIN Tyror, J.G. For thermal reactors.	

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FULFILLED REQUESTS

REF	NUCLIDE	QUANTITY	ENERGY (EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR
			MIN	MAX	(%)		
1 [ 2176 ]	<sup>1</sup> H	TOTAL XSECT	1.0+5	1.0+7	0.5	1 ANL Avery, R. ANL Hemmig, P.B. ORL Maienschein, F.C. --- For use as standard, accuracy of 1% useful. Langsford+: AERE-PR/NP 16, 0.57-7 MeV. Recent evaluations by Hopkins and Breit (LA-DC-11153 (1970) and Story (70 HELSINKI CM-26/110) suggest that existing data define tot of H to 0.5% or better up to 9 MeV. Further measurements desirable for confirmation, though not necessarily in category 1. Measurements are in progress at RPI by Clement +, WASH-1155,197 (1970). Probably fulfilled.	69
2 [ 2177 ]	<sup>1</sup> H	TOTAL XSECT	1.0+5	2.0+7	0.5	1 NBS Caswell, R.S. --- For use as standard, accuracy of 1% useful. Langsford+: AERE-PR/NP 16, 0.57-7 MeV. Recent evaluations by Hopkins and Breit (LA-DC-11153 (1970) and Story (70 HELSINKI CM-26/110) suggest that existing data define tot of H to 0.5% or better up to 9 MeV. Further measurements desirable for confirmation, though not necessarily in category 1. Measurements are in progress at RPI by Clement +, WASH-1155,197 (1970). WIS Davis+, PB/C4 1061(1971) LAS Seagrave, INDC(US)-7R Probably fulfilled.	69
66 [ 1610 ]	<sup>10</sup> B	N,ALPHA	THR	1.0+5	1.0	1 NBS Caswell, R.S. --- (Alpha)0/(alpha)1 ratio needed for both alpha and gamma detection. ANL Meadows+: NSE 40 12(8/70), thermal, .6% accuracy. HAR Sowerby+: 70 HELSINKI P/26(6/70), to 80 keV. TNC Nellis+: PR/C 1 847(3/70), give alpha(0)/alpha(1).	69
80 [ 1620 ]	C	DIFF ELASTIC	1.0+3	2.0+6	1.0	1 NBS Caswell, R.S. --- Need as standard for scattering measurements. Accuracy of 3% useful for near-term. ANL Smith, data from 1.0 to 3.5 MeV. GEL Knitter+: 70 ANL (0/70), data 0.5 to 2.5 MeV. CCP Nikolaev: 68 DUBNA (6/68), data 100keV - 15MeV.	69
139 [ 130 ]	<sup>23</sup> Na	DIFF ELASTIC	4. +6	1. +7	10	3 HAB Butler, J. WIN Campbell, C.G. --- Fast reactor shielding. ALD Porter: 5 MeV data. ORL Perey et al.: ORNL-4518 (8/70), 5.4 to 8.5 MeV.	
143 [ 135 ]	<sup>23</sup> Na	DIFF INELAST	4. +6	1. +7	5	3 HAR Butler, J. --- For reactor shielding. ALD Porter: 5 MeV data. ORL Perey et al.: ORNL-4518 (8/70), 5.4 to 8.5 MeV.	
257 [ 229 ]	Cr	N,ALPHA <energy>	FISS	30	3 WIN Campbell, C.G. --- For fast reactors. ALD Freeman et al.: JHE 23 713 (1969). Measurements made.		
311 [ 276 ]	Fe	N,ALPHA <energy>	FISS	30	1 WIN Campbell, C.G. --- For fast reactors. ALD Freeman et al.: JHE 23 713 (1969). Measurements made.		
377 [ 320 ]	Ni	N,ALPHA	FISS	30	2 WIN Campbell, C.G. --- For fast reactors. GES See Rochlin: Nucljz 1,54 (1/59), also EANDC(OR) 19L (1/63). ALD Freeman et al.: JHE 23 713 (1969). Measurements made.		

## FULFILLED REQUESTS

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P MIN MAX (%)	LAB	REQUESTER , COMMENTS	YEAR	
437 [1791]	$^{90}\text{Zr}$	N,GAMMA	0.5+0	1.0+4	10	1	GE BET Snyder, T. Bayard, R.T. Accuracy 10% in parameters. Design of pressurized water reactors. Individual and average resonance parameters wanted. Is $\Gamma$ the same for s and p waves? Status: see REG 1782 above. Request may be met.	67
439 [1795]	$^{91}\text{Zr}$	TOTAL XSECT	0.5+0	1.0+4	10	1	BET RPI GA Bayard, R.T. Accuracy 10% in parameters. Design of pressurized water reactors. Attention to resonances at 180, 291, 675, 1518 eV. Individual and average parameters of interest. $\Gamma$ results disagree by 10%. Bartolome+: NSE 37 137(7/69), res.params. Lopez, NBS -299 has resonance parameters.	67
445 [1798]	$^{91}\text{Zr}$	N,GAMMA	0.5+0	1.0+4	10	1	BET Bayard, R.T. Accuracy 10% in parameters. Design of pressurized water reactors. Attention to resonances at 180, 291, 675, 1518 eV. Individual and average resonances of interest. Is $\Gamma$ the same for s and p waves? Status: see REG 1782 above. Request may be met.	67
448 [1804]	$^{92}\text{Zr}$	TOTAL XSECT	0.5+0	1.0+4	10	1	BET RPI Bayard, R.T. Accuracy 10% in parameters. Design of pressurized water reactors. Individual and average resonances needed. Bartolome+, NSE 37(1969)137, measured with separated isotopes from .15 to 100 keV, extracted resonance parameters including $\Gamma_\gamma$ below 17 keV.	67
453 [1807]	$^{92}\text{Zr}$	N,GAMMA	0.5+0	1.0+4	10	1	BET Bayard, R.T. Accuracy 10% in parameters Design of pressurized water reactor. Individual and average resonances needed. Is $\Gamma$ the same for s and p waves? Status: see REG 1804 above. Request may be met.	67
457 [1811]	$^{93}\text{Zr}$	TOTAL XSECT	0.5+0	1.0+4	10	1	BET RPI Bayard, R.T. Accuracy 10% in parameters. Design of pressurized water reactors. Individual and average resonances wanted. Bartolome+: NSE 37 137(7/69), res.params.	67
463 [1814]	$^{93}\text{Zr}$	N,GAMMA	0.5+0	1.0+4	10	1	BET Bayard, R.T. Accuracy 10% in parameters. Design of pressurized water reactors. Individual and average resonances wanted. Is capture width the same for s and p wave levels? Status: see REG 1804 above.	67
467 [1819]	$^{96}\text{Zr}$	TOTAL XSECT	0.5+0	1.0+4	10	1	BET ORL Bayard, R.T. Accuracy 10% in parameters. Design of pressurized water reactors. Individual and average parameters wanted. Good : PR 165,1326 has data 2.5 - 70 keV.	67

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FULFILLED REQUESTS

REF [REG]	NUCLIDE	QUANTITY	ENERGY(EV)	ACCURACY P	LAB	REQUESTER , COMMENTS	YEAR	
			MIN	MAX (%)				
468 [1824]	<sup>96</sup> Zr	RESON PARAMS	3.0±2	10	1	BET Bayard, R.T. KAP Ehrlich, R.  Accuracy 10% in $\Gamma_n$ and $\Gamma_\gamma$ for 300-eV resonance Needed to verify previous measurements and remove discrepancies.	67	
		gamma width				SAC Morgenstern et al., NP A123, 561 1969 give $l=0, \Gamma_\gamma=220\pm50$ meV, $\Gamma_n=231\pm15$ meV. Situation is not at all clear. Measurements on the Resonance Integral (Ricabarra, Can.J. Phys. 48, 2362 1970) show it to have extremely high ratio $I'/e^0$ . The resonance is almost certainly not an s-wave res.		
		neutronwidth				ORL Block: ORNL-3425(1963), $\Gamma_n = .22 \pm .02$ eV. KUR Moskalev+: NP 53 667(1963), $\Gamma_n = .17 \pm .02$ eV. Additional capture measurements needed for 10% on $\Gamma_\gamma$ .		
472 [1820]	<sup>96</sup> Zr	N,GAMMA	0.5±0	1.0±4	10	1	BET Bayard, R.T.  Accuracy 10% in parameters. Design of pressurized water reactors. Individual and average parameters wanted. Is $\Gamma$ the same for s and p waves?	67
475 [1826]	<sup>93</sup> Nb	DIFF ELASTIC	1.0±6	5.0±6	10	2	BET Bayard, R.T.  Error is in average of $(1-\cos\theta)$ LAS Hopkins, Drake: WASH-1093 90 (4/68). 6 and 7.5 MeV. ALD Porter, AWRE-O-66 (71), data 1.5-5 MeV, DE=0.5 MeV. ANL Smith, data to 4.0 MeV.	67
476 [1827]	<sup>93</sup> Nb	EMISS XSECT	1.0±6	1.0±7	10	2	BET Bayard, R.T.  Incident and exit energy resolution 10%. Low-energy neutrons must be included. Absolute spectra at 30° and 75° may suffice Time scale requiring associated $\gamma$ -production data not yet established. ALD Porter: data 1.5 - 5 MeV, DE = 0.5 MeV.	67
496 [1834]	<sup>94</sup> Nb	N,GAMMA (res.integ)	1.0-3	1.0±4	10	1	BET Bayard, R.T.  * Note higher priority. Radioactive target (2.10 * Year). For thermal reactor calculations. INC Resonance integral wanted to 10% accuracy. INC Schusman: WASH-1136(9/69), R.I.= 122±10 b. Simpson: total cross section to 100 eV. Request apparently satisfied.	67
498 [1836]	<sup>95</sup> Nb	RES INT CAPT	0.5±0	<20 10-20%	10-20%	1	BET Bayard, R.T.  Desire resonance integral to: 20% if 100-1000 barns 10% if > 1000 barns. Radioactive target (35d). INC Scoville: integral measurements planned.	69
666 [1868]	<sup>147</sup> Sm	N,GAMMA	1.0-3	1.0±3	10	2	BET Bayard, R.T. GE Snyder, T. KAP Ehrlich, R.  0.025 eV and thermal average of interest. Interval 0.001-1eV of interest. For calculation of fission product poisons. Above 1eV want resonance integral to 10%. CRC Walker: AECL-3037 (9/68), recommends 55 b for thermal, res.integ. = 600b. KAP Eiland+: 71KNOX 673 (3/71), strength function.	67

WRENDA 1973 WITHDRAWN REQUESTS

The following requests which were listed in RENDA 1972 have been withdrawn. The reference numbers (REF.NO.) and registration numbers (REG.NO.) are as they appear in RENDA 1972.

REF.NO.	REG.NO.
441	1801
485	1829
486	1830
636	1861
676	1871
711	1872
715	1878
759	1901
760	1900
762	1902
942	1991

TABLE 1LIST OF REQUESTERS

AGHINA, L.O.B.  
 Director, Div. de Reatores  
 Instituto de Engenharia Nuclear  
 Cidade Universitaria  
 Ilha do Fundao  
 Rio de Janeiro-GB-ZC-32  
 Brazil

ALBERT, D.  
 Zentralinstitut für Kernphysik  
 Rossendorf bei Dresden  
 Postfach 19  
 Dresden-Bad Weisser Hirsch  
 D-X 8051, German Dem. Rep.

ALTER, H.  
 Atomics International  
 P.O. Box 309  
 Canoga Park  
 California 91305  
 U.S.A.

ATEN, A.H.W.  
 Commission des Communautés  
 Européennes  
 Bureau Central de Mesures  
 Nucléaires  
 Steenweg naar Retie  
 Geel  
 Belgium

AVERY, R.  
 Director, Reactor Physics Division  
 Argonne National Laboratory  
 9700 South Cass Avenue  
 Argonne, Illinois 60439  
 U.S.A.

BARR, D.W.  
 Los Alamos Scientific Laboratory  
 P.O. Box 1663  
 Los Alamos, New Mexico 87544  
 U.S.A.

BARRE, J.Y.  
 DPRMA-SECPR-Centre d'Etudes  
 Nucléaires de Cadarache, C.E.A.  
 B.P. no 1  
 F-13115 Saint-Paul-lez-Durance  
 France

BAYARD, R.T.  
 Westinghouse Electric Corporation  
 Bettis Atomic Power Laboratory  
 P.O. Box 79  
 West Mifflin, Pa. 15122  
 U.S.A.

BELL, G.I.  
 Los Alamos Scientific Laboratory  
 P.O. Box 1663  
 Los Alamos, New Mexico 87544  
 U.S.A.

BENZI, V.  
 Director, Nuclear Data and  
 Calculations Laboratory  
 Centro di Calcolo del C.N.E.N.  
 Via Mazzini 2  
 I-40138 Bologna  
 Italy

BIGGERS, W.A.  
 Los Alamos Scientific Laboratory  
 P.O. Box 1663  
 Los Alamos, New Mexico 87544  
 U.S.A.

BLOW, S.  
 Atomic Energy Research Establishment  
 Harwell, Didcot, Berks  
 United Kingdom

BRUGGER, R.M.  
 Aerojet Nuclear Corporation  
 P.O. Box 1845  
 Idaho Falls, Idaho 83401  
 U.S.A.

BRUNNER, J.  
Physik-Abteilung  
Eidg. Institut fuer Reaktorforschung  
Ch-5303 Wuerenlingen  
Switzerland

BUSSAC, J.  
Chef du Service de Physique  
Mathématique  
Centre d'Etudes Nucléaires de Saclay  
B.P. no 2  
F-91190 Gif-sur-Yvette  
France

BUTLER, J.  
F.R.P.D. Shielding Group  
Building 510/T  
Atomic Energy Research Establishment  
Harwell, Didcot, Berkshire  
United Kingdom

BYER, T.A.  
International Atomic Energy Agency  
Nuclear Data Section  
Division of Research & Laboratories  
P.O. Box 590  
A-1011 Vienna  
Austria

CAMPBELL, C.G.  
Head, Fast Reactor Physics Division  
Atomic Energy Research Establishment  
Winfirth, Dorchester, Dorset  
United Kingdom

CARDOT, M.  
Direction Scientifique  
Service Evaluation des engins  
Section Neutronique  
Centre d'Etudes de Limeil  
B.P. no 27  
94 - Villeneuve - St - Georges  
France

CASWELL, R.S.  
Radiation Physics Division  
National Bureau of Standards  
Washington, D.C. 20234  
U.S.A.

CHIEN, J.P.  
Atomic Energy Council  
1-1, Lane 20  
Sin-Yi Road Section 1  
Taipei, Taiwan

CHRISTOV, V.  
Institut Physique de l'Académie  
Bulgare des Sciences  
Sofia  
Bulgaria

CLIFFORD, C.E.  
Oak Ridge National Laboratory  
P.O. Box X  
Oak Ridge, Tennessee 37830  
U.S.A.

COWAN, G.A.  
Los Alamos Scientific Laboratory  
P.O. Box 1663  
Los Alamos, New Mexico 87544  
U.S.A.

CSIKAI, J.  
Kiserleti Fizikai Intezet  
Bem ter 18/A  
Debrecen  
Hungary

DAVERHÖG, N.  
AB Atomenergi  
Studsvik  
S-611 01 Nyköping  
Sweden

DE BEER, G.P.  
Atomic Energy Board  
Private Bag 256  
Pretoria  
South Africa

DESSAUER, G.  
Director, Physics Section  
E.I. du Pont de Nemours & Co. Inc.  
Savannah River Laboratory  
P.O. Box 117  
Aiken, South Carolina 29801  
U.S.A.

DE TROYER, A.  
Union Minière du Haut Katanga  
6, rue Montagne du Parc  
Brussels, Belgium

DEVILLERS, C.  
Commissariat à l'Energie Atomique  
Centre d'Etudes Nucléaires de  
Fontenay-aux-Roses  
SEPP  
B.P. no 6  
92 - Fontenay-aux-Roses  
France

DIVEN, B.C.  
P-3  
Los Alamos Scientific Laboratory  
P.O. Box 1663  
Los Alamos, New Mexico 87544  
U.S.A.

ECCLESHALL, D.  
Nuclear Effects Laboratory  
U.S. Army Ballistic Research Lab.  
Aberdeen Proving Ground, Maryland  
21005 U.S.A.

EHRLICH, R.T.  
Manager, Advanced Development  
Activity  
Knolls Atomic Power Laboratory  
P.O. Box 1072  
Schenectady, N.Y. 12301  
U.S.A.

ENZ, R.  
USAF (SRUGT)  
Department of the Air Force  
Air Force Weapons Laboratory  
Kirtland Air Force Base,  
New Mexico 87117, U.S.A.

FLEISHMAN, M.R.  
Space Nuclear Propulsion Office  
Cleveland Extension  
National Aeronautics and Space  
Administration  
21000 Brookpark Road  
Cleveland, Ohio 44135  
U.S.A.

GERWIN, H.  
Institut für Reaktorentwicklung  
Kernforschungsanlage Juelich GmbH  
D-517 Juelich  
Postfach 365  
Federal Republic of Germany

GIESZER, W.  
BBC/Krupp Reaktorbau GmbH  
3 Kniebisstrasse  
Mannheim  
Federal Republic of Germany

HÄGGBLOM, H.  
Section for Reactor Physics  
AB Atomenergi  
P.O. Box 43041  
S-100 72 Stockholm 43  
Sweden

HAKANSSON, R.  
AB Atomenergi  
Studsvik  
S-611 01 Nyköping 1  
Sweden

HANNA, G.C.  
Physics Division  
Chalk River Nuclear Laboratories  
Atomic Energy of Canada Limited  
Chalk River, Ontario  
Canada

HANNUM, W.H.  
Division of Reactor Development  
Reactor Physics Branch  
U.S. Atomic Energy Commission  
Washington, D.C. 20545  
U.S.A.

HANSEN, G.E.  
Los Alamos Scientific Laboratory  
P.O. Box 1663  
Los Alamos, New Mexico 87544  
U.S.A.

HEMMIG, P.B.  
Division of Reactor Development  
and Technology  
U.S. Atomic Energy Commission  
Washington, D.C. 20545  
U.S.A.

HOJERUP, C.F.  
Reactor Physics Department  
Research Establishment Risoe  
DK-4000 Roskilde  
Denmark

HOWERTON, R.J.  
L-71  
Lawrence Livermore Laboratory  
University of California  
P.O. Box 808  
Livermore, California 94550  
U.S.A.

HUTCHINS, B.  
General Electric Co. BRDO  
310 De Guigne Drive  
Sunnyvale, California 94086  
U.S.A.

ISLAM, M.M.  
Atomic Energy Centre  
P.O. Box 164  
Ramna, Dacca  
Bangla Desh

JAPAN NUCLEAR DATA COMMITTEE  
Japan Atomic Energy Research  
Institute  
Tokai Research Establishment  
Tokai-mura, Naka-gun, Ibaraki-ken  
Japan

JAUHO, P.  
Technical University of Helsinki  
Otaniemi, Helsinki  
Finland

JIRLOW, K.  
Section for Reactor Physics  
AB Atomenergi  
Studsvik  
S-611 01 Nyköping  
Sweden

KINCHIN, G.H.  
Chief Scientist  
Dounreay Experimental Reactor  
Establishment  
Thurso, Caithness, Scotland  
United Kingdom

KOEN, J.  
University of Pretoria  
Hatfield, Pretoria  
South Africa

KUECHLE, M.  
Institut für Neutronenphysik  
und Reaktortechnik  
Kernforschungszentrum Karlsruhe  
Postfach 3640  
D-75 Karlsruhe  
Federal Republic of Germany

LAUBUGE, M.  
DAM/CEV-T  
Centre d'Etudes Nucléaires  
CEA/Vaujours  
B.P. no 7  
93 - Sevran  
France

LEMMEL, H.D.  
International Atomic Energy Agency  
Nuclear Data Section  
Division of Research & Laboratories  
P.O. Box 590  
A-1011 Vienna  
Austria

LEONARD, B.W., Jr.  
Battelle Northwest  
P.O. Box 999  
Richland, Washington 99352  
U.S.A.

MAERKL,  
Siemens Reaktorentwicklung  
Guenther-Scharowsky-Strasse 2  
D-852 Erlangen 2  
Federal Republic of Germany

MAIENSCHEN, F.C.  
Director, Neutron Physics Division  
Oak Ridge National Laboratory  
P.O. Box X  
Oak Ridge, Tennessee 37830  
U.S.A.

MC ELROY, W.N.  
Hanford Engineering Development  
Laboratory  
Westinghouse Hanford Company  
P.O. Box 1970  
Richland, Washington 99352  
U.S.A.

MEHTA, G.K.  
Physics Department  
Indian Institute of Technology  
I.I.T. Post Office  
Kanpur, U.P.  
India

MOTTE, F.  
Centre de l'Energie Nucléaire  
Boeretang 200  
Mol  
Belgium

MOTZ, H.T.  
Physics Division Leader  
Los Alamos Scientific Laboratory  
P.O. Box 1663  
Los Alamos, New Mexico 87544  
U.S.A.

NAVALKAR, M.P.  
Nuclear Physics Division  
Bhabha Atomic Research Centre  
Trombay, Bombay - 85  
India

NEUTRON DOSIMETRY GROUP  
Commission of the European  
Communities  
C.B.N.M.  
Steenweg naar Retie  
Geel  
Belgium

NIKOLAEV, M.N.  
Institute of Physics and Energetics  
Obninsk, Kaluga region  
USSR

NORDHEIM, L.W.  
Gulf General Atomic  
P.O. Box 608  
San Diego, California 92112  
U.S.A.

PERRY, A.M.  
Oak Ridge National Laboratory  
P.O. Box X  
Oak Ridge, Tennessee 37830  
U.S.A.

PIERANTONI, F.  
Head, Laboratory for Experimental  
Control  
Centro di Calcolo del C.N.E.N.  
Via Mazzini 2  
I-41038 Bologna  
Italy

PITTERLE, T.A.  
Westinghouse Electric Corp.  
Advanced Reactor Division  
Waltz Mill Site  
P.O. Box 158  
Madison, Pennsylvania 15663  
U.S.A.

PRESKITT, C.A.  
Gulf Radiation Technology  
P.O. Box 608  
San Diego, California 92112  
U.S.A.

RAIEVSKI, V.  
Chef du Département de la Physique  
des Réacteurs  
C.C.E.  
Centre Commun de Recherches  
B.P. no 1  
I-21020 Ispra (Varese)  
Italy

RASTOIN, J.  
Centre d'Etudes Nucléaires des  
Fontenay-aux-Roses  
B.P. no 6  
92 Fontenay-aux-Roses  
France

RAVIER, J.  
Service d'Etudes Théoriques à  
Neutrons Rapides  
Département de Recherche Physique  
Centre d'Etudes Nucléaires de  
Cadarache  
B.P. no 1  
13 - Saint-Paul-lez-Durance  
France

REUSS, P.  
SERMA  
Centre d'Etudes Nucléaires de Saclay  
B.P. no 2  
F-91190 Gif-sur-Yvette  
France

SNYDER, T.M.  
General Electric Company  
Nuclear Energy Division  
Mail Code 581  
175 Curtner Avenue  
San Jose, Calif. 95125  
U.S.A.

RIBON, P.  
Service de la Métrologie et de la  
Physique Neutroniques Fondamentales  
Centre d'Etudes Nucléaires de Saclay  
B.P. no 2  
F-91190 Gif-sur-Yvette  
France

STREETMAN, J.R.  
Los Alamos Scientific Laboratory  
P.O. Box 1663  
Los Alamos, New Mexico 87544  
U.S.A.

ROSE, B.  
Chairman  
United Kingdom Nuclear Data Committee  
Atomic Energy Research Establishment  
Harwell, Didcot, Berkshire  
United Kingdom

SYMONDS, J.L.  
AAEC Research Establishment  
The Director's Office  
Private Mail Bag  
Sutherland, N.S.W.  
Australia

RUSSELL, J.  
Accelerator Physics Department  
Gulf Radiation Technology  
P.O. Box 608  
San Diego, California 92112  
U.S.A.

TAVERNIER, G.  
Administrateur-Directeur  
Belgo-Nucléaire  
35, rue des Colonies  
Brussels 1  
Belgium

SAASTAMOINEN, J.  
Department of Technical Physics  
Technical University of Helsinki  
Otaniemi, Helsinki  
Finland

TUNKELO, E.  
Technical University of Helsinki  
Otaniemi, Helsinki  
Finland

SCHATZ, B.  
Institut für Neutronenphysik  
und Reaktortechnik  
Kernforschungszentrum Karlsruhe  
Postfach 3640  
D-75 Karlsruhe  
Federal Republic of Germany

TYROR, J.G.  
Head, General Reactor Physics  
Division  
Atomic Energy Establishment  
Winfirth, Dorchester, Dorset  
United Kingdom

SCHMIDT, J.J.  
Head, Nuclear Data Section  
Division of Research & Laboratories  
International Atomic Energy Agency  
P.O. Box 590  
A-1011 Vienna  
Austria

VIDAL, J.C.  
Commissariat à l'Energie Atomique  
Centre d'Etudes Nucléaires de Limeil  
B.P. no 27  
94 - Villeneuve-St-Georges  
France

VIDAL, R.  
Service des Expériences Neutroniques  
Centre d'Etudes Nucléaires de  
Fontenay-aux-Roses  
B.P. no 6  
92 - Fontenay-aux-Roses  
France

VAN DER WALT, R.  
Atomic Energy Board  
Private Bag 256  
Pretoria  
South Africa

WALKER, W.H.  
Reactor Physics Branch  
Chalk River Nuclear Laboratories  
Atomic Energy of Canada Limited  
Chalk River, Ontario  
Canada

WENT, J.J.  
Director  
Central Bureau der V.D.E.N.  
Utrechtseweg 310  
Arnhem  
Netherlands

WESTERN, G.T.  
Nuclear Radiation Transport & Safety  
General Dynamics - Fort Worth Division  
P.O. Box 748  
Fort Worth, Texas 76101  
U.S.A.

WHITTAKER, A.  
Windscale Reactor Development  
Laboratories  
Windscale Works  
Sellafield, Calderbridge, Cumberland  
United Kingdom

WIDDER, F.  
Eidg. Institut für Reaktorforschung  
Ch-5303 Wuerenlingen  
Switzerland

WRIGHT, S.B.  
Atomic Energy Establishment  
Harwell, Didcot, Berkshire  
United Kingdom

ZETTERSTROEM, H.O.  
Research Institute of National Defence  
Department 4  
S-104 50 Stockholm 80  
Sweden

TABLE 2QUANTITIES (CROSS SECTIONS AND PARAMETERS)

(Notation used is that of H. Goldstein: "Nomenclature Scheme for Experimental Monoenergetic Nuclear Cross Sections", Fast Neutron Physics, Vol. II, p. 2227, Interscience, New York (1963).)

<u>Printout</u>	<u>Symbolic notation</u>	<u>Description</u>
TOTAL XSECT	$\sigma_{nT}(E)$	Total neutron cross section
RESON PARAMS	$r, r_n, r_p, r_Y, \text{etc.}$	Parameters characterizing a resonance or derived from properties of sets of resonances
ELASTIC	$\sigma_{n,n}(E)$	Total elastic scattering cross section
DIFF ELASTIC	$\sigma_{n,n}(E, \theta)$	Differential elastic scattering cross section
SCATTERING	$\sigma_{nS}(E)$ $\sigma_{nS}(E, \theta)$	Information on the total scattering cross section; $\sigma_{nS} = \sigma_{n,n} + \sigma_{n,n'}$
N PRODUCTION	$\sigma_{nP}(E)$ $\sigma_{nP}(E, \theta)$ $\sigma_{nP}(E, E')$ $\sigma_{nP}(E; E', \theta)$	Information on the collection of all processes in which one or more neutrons are produced; $\sigma_{nP} = \sigma_{n,n} + \sigma_{nM} = \sigma_{n,n} + \sigma_{n,n'} + 2\sigma_{n,2n} + 3\sigma_{n,3n} + \bar{v}\sigma_{n,f} + \sigma_{n,np} + \dots$
NONELASTIC	$\sigma_{nX}(E)$ $\sigma_{nX}(E, \theta)$ $\sigma_{nX}(E, E')$ $\sigma_{nX}(E; E', \theta)$	Information on the cross section for nonelastic processes: $\sigma_{nX}(E) = \sigma_T(E) - \sigma_{n,n}(E)$
EMISS XSECT	$\sigma_{nM}(E)$ $\sigma_{nM}(E, \theta)$ $\sigma_{nM}(E, E')$ $\sigma_{nM}(E; E', \theta)$	Information on neutron emission, i.e. on the collection of all processes in which one or more neutrons are emitted; $\sigma_{nM} = \sigma_{nP} - \sigma_{n,n}$
NONEI GAMMAS	$\sigma_{nG}(E)$ $\sigma_{nG}(E; E_\gamma)$ $\sigma_{nG}(E; E_\gamma, \psi)$	Information on the production of gamma rays by neutron interactions
TOT INELASTIC	$\sigma_{n,n}(E)$	Total neutron inelastic scattering cross section
DIFF INELAST	$\sigma_{n,n}(E, \theta)$ $\sigma_{n,n}(E, E')$ $\sigma_{n,n}(E; E', \theta)$	Cross section for inelastic scattering of neutrons represented as a function of angle, energy (or both) for the scattered neutron

<u>Printout</u>	<u>Symbolic notation</u>	<u>Description</u>
INELST GAMMA	$\sigma_{n,n'\gamma}(E,\psi)$ $\sigma_{n,n'\gamma}(E, E_\gamma)$ $\sigma_{n,n'\gamma}(E; E_\gamma, \psi)$	Information on photons emitted in inelastic neutron scattering processes
N2N XSECTION	$\sigma_{n,2n}(E)$ $\sigma_{n,2n}(E, E')$ $\sigma_{n,2n}(E; E', \theta)$	All information on the (n,2n) cross section, whether or not accompanied by other particles
N3N XSECTION	$\sigma_{n,3n}(E)$	All information on the (n,3n) cross section, whether or not accompanied by other particles
THRMLSCATLAW		All information on the thermal scattering law, on the scattering, both elastic and inelastic, of neutrons of thermal energies from molecules, liquids, crystals, etc.
FISSION	$\sigma_{n,f}(E)$	Cross section for neutron induced fission
ETA	$\eta$	Number of neutrons emitted per neutron absorption; $\eta = \bar{v} \cdot \frac{\sigma_{n,f}}{\sigma_{n,\gamma} + \sigma_{n,f}}$
ALPHA	$\alpha$	The capture to fission ratio; $\alpha = \frac{\sigma_{n,\gamma}}{\sigma_{n,f}}$
NU	$v$	All information on the number of neutrons emitted per fission, chiefly as $\bar{v}$ total, where not otherwise specified, but <u>not</u> delayed yields
F NEUT DELAY		All information, yields, energies, etc., on delayed neutrons from fission
FRAG NEUTS		Information on neutrons emitted by a given fission fragment
SPECT FISS N	$N_f(E, E')$	Spectrum of neutrons emitted in fission
SPECT FISS G	$N_f(E, E_\gamma)$	Spectrum of prompt photons emitted in fission
FISS YIELD		Yields of fission products or fission fragments
FRAG SPECTRA		Information on the energy, angle or velocity distribution of the fission fragments as a function of each other or of the fragment mass
FRAG CHARGE		Information on the charge distribution of fission fragments

<u>Printout</u>	<u>Symbolic notation</u>	<u>Description</u>
PHOTO-FISSION		Information on photon induced fission
FISS PROD GS		Information on gamma rays from fission products
RES INT FISS	$\int \frac{\sigma_{n,f}(E)}{E} dE$	Resonance integral for fission
ABSORPTION	$\sigma_{nA}(E)$	Absorption cross section; $\sigma_{nA} = \sigma_{nT} - \sigma_{nS}$
RES INT ABS	$\int \frac{\sigma_{nA}(E)}{E} dE$	Resonance integral for absorption (For fissionable nuclei includes RES INT FISS and RES INT CAPT)
DISAPPEARANCE	$\sigma_{nD}(E)$	Neutron disappearance (or removal) cross sections; $\sigma_{nD}(E) = \sigma_{n,\gamma} + \sigma_{nC}$ (C = charged particle)
ACTIVATION	$\sigma_{act}(E)   {}^A_Z$	Activation cross section for nuclide ${}^A_Z$
RES INT ACT	$\int \frac{\sigma_{act}(E)}{E} dE$	Resonance integral for activation
RES INT CAPT	$\int \frac{\sigma_{n,\gamma}(E)}{E} dE$	Resonance integral for capture. Restricted in principle to fissionable nuclides - for non-fissionable nuclides see RES INT ABS
N, GAMMA	$\sigma_{n,\gamma}(E)$	Radiative capture cross section
SPECT NGAMMA	$N_\gamma(E; E_\gamma)$	Spectrum of gamma rays from radiative neutron capture
N, PROTON	$\sigma_{n,p}(E)$ $\sigma_{n,p}(E, \theta)$	Information on reactions emitting one or more protons only
N, DEUTERON	$\sigma_{n,d}(E)$ $\sigma_{n,d}(E, \theta)$	Information on reactions emitting one or more deuterons only
N, TRITON	$\sigma_{n,t}(E)$ $\sigma_{n,t}(E, \theta)$	Information on reactions emitting one or more tritons only
N, HELIUM3	$\sigma_{n,{}^3He}(E)$ $\sigma_{n,{}^3He}(E, \theta)$	Information on reactions emitting one or more helium-3 particles only
N, ALPHA	$\sigma_{n,\alpha}(E)$ $\sigma_{n,\alpha}(E, \theta)$	Information on reactions emitting one or more alpha-particles only
N, N PROTON	$\sigma_{n,np}(E)$	Information on the (n,np) reactions
PROTON, N	$\sigma_{p,n}(E)$	Information on the (p,n) reactions

<u>Printout</u>	<u>Symbolic notation</u>	<u>Description</u>
GAMMA,N	$\sigma_{\gamma,n}(E_\gamma)$	Cross sections of photoneutron reactions
NUCL. LEVELS		Information on details of nuclear structure: levels, spins and parities, etc.
LVL DEN LAW		All information on the density of levels in the continuum range: temperature, functional forms, etc.
MISCELLANEOUS		Information on various quantities defined in the associated comment, which are not naturally included in any one of the quantities listed

A few of the "collective" cross sections might be unfamiliar, and some "sum rules" for these cross sections may be helpful.

$$\begin{aligned} \text{Total} &= \sigma_{nT} = \sigma_{n,n} + \sigma_{nX} = \text{Elastic} + \text{Nonelastic} \\ &= \sigma_{nS} + \sigma_{nA} = \text{Scattering and Absorption} \end{aligned}$$

$$\text{Scattering} = \sigma_{nS} = \sigma_{n,n} + \sigma_{n,n'} = \text{Elastic} + \text{Inelastic}$$

$$\text{Nonelastic} = \sigma_{nX} = \sigma_{nT} - \sigma_{n,n}$$

$$N \text{ Production} = \sigma_{nP} = \sigma_{n,n} + \sigma_{n,n'} + 2\sigma_{n,2n} + 3\sigma_{n,3n} + \bar{\nu}\gamma_{n,f} + \dots$$

$$Emission = \sigma_{nM} = \sigma_{n,n'} + 2\sigma_{n,2n} + 3\sigma_{n,3n} + \bar{\nu}\gamma_{n,f} + \dots$$

$$\text{Absorption} = \sigma_{nA} = \sigma_{nT} - \sigma_{nS}$$

$$\text{Disappearance} = \sigma_{nD} = \sigma_{n,\gamma} + \sigma_{nC} \quad (C = \text{charged particle})$$

TABLE 3QUANTITY MODIFIERS

<u>Printout</u>	<u>Description</u>
energy dist	energy distribution (spectrum) of emitted particles or photons
(energy)	energy distribution requested as a secondary or alternative quantity
<energy >	average over the energy interval stated is requested as a supplementary or alternative quantity
angular dist	angular distribution of emitted particles or photons
expans.coeff	coefficients for expansion in orthogonal polynomials
energy, angle	energy distributions requested as a function of angle
(averaged)	a specified average (see comment) of the principal quantity is requested as secondary or alternative quantity
spectrum	(specified in comment)
ratio xsect	ratio of cross sections or cross section measured relative to standard specified in comment
relative	quantity other than cross section measured relative to standard specified in comment
(alpha)	capture to fission ratio
(eta)	the number of neutrons emitted per absorption
reson.integ	resonance integral of principal quantity
(res. int)	resonance integral requested as secondary or alternative quantity
( ) res. int	resonance integral requested for region above energy range stated for principal request
(res. param)	resonance parameters requested as secondary or alternative quantity
see comment	more extensive explanation given in comment
gammaspectra	energy spectra of emitted gamma rays
absolute	an absolute measurement (i.e. not directly or indirectly related to a standard)
yield	yield of emitted particles is requested as secondary or alternative quantity
res.energy	For requests on resonance parameters the Quantity "Resonance Parameters" is used and the request is specified by supplementary modifiers or in the comment
alpha width	
fissionwidth	
gamma width	
neutronwidth	
protonwidth	
total width	
absorpwidth	

TABLE 4LABORATORIES (ALPHABETIC BY ABBREVIATION)

AE	AB ATOMENERGI, STUDSVIK + STOCKHOLM	SWEDEN
AFW	AIR FORCE WEAPONS LABORATORY, KIRTLAND, NEW MEXICO	USA
AI	ATOMICS INTERNATIONAL, CANOGA PARK, CALIF.	USA
AIN	A.I.N.S.E., LUCAS HEIGHTS, NSW	AUSTRALIA
ALD	AWRE, ALDERMASTON	UNITED KINGDOM
AML	U. OF MELBOURNE	AUSTRALIA
AMS	U. OF AMSTERDAM + IKO	NETHERLANDS
ANC	AEROJET NUCLEAR CORP., IDAHO FALLS, IDAHO	USA
ANL	ARGONNE NATIONAL LAB., LEMONT, ILLINOIS	USA
ARK	U. OF ARKANSAS, FAYETTEVILLE	USA
AUA	A.A.E.C. RESEARCH ESTABLISHMENT, N.S.W.	AUSTRALIA
AUL	AUSTRALIA	AUSTRALIA
BBC	BROWN-BOVERI/KRUPP, MANNHEIM	GERMANY
BET	WESTINGHOUSE, BETTIS ATOMIC POWER LAB., PITTSBURGH	USA
BHU	BANARAS HINDU UNIV. VARANASI	INDIA
BLG	BELGIUM	BELGIUM
BN	BELGONUCLEAIRE	BELGIUM
BNL	BROOKHAVEN NATIONAL LAB., UPTON, N.Y.	USA
BNW	BATTELLE-NORTHWEST, RICHLAND, WASH. (FORM.HANF.AT.PROD.)	USA
BOL	BOLOGNA	ITALY
BOS	BOSE INST., CALCUTTA	INDIA
BRG	CEN BRUYERE LE CHATEL	FRANCE
BUL	BULGARIA	BULGARIA
CAD	CADARACHE, BOUCHES DU RHONE	FRANCE
CAN	CANADA	CANADA
CAS	CENTRO DI STUDI NUCLEARI DELLA 'CASACCIA', ROME	ITALY
CCP	USSR	USSR
CHF	FORMOSA	FORMOSA
CNE	COM. NACIONAL DE ENERG. ATOM., BUENOS AIRES	ARGENTINA

COL	COLUMBIA U., NEW YORK CITY, N.Y.	USA
CRC	CHALK RIVER, ONTARIO	CANADA
CSE	CASE INSTITUTE OF TECH., CLEVELAND, OHIO	USA
DEB	ATOMMAG KUTATO INTEZETE, DEBRECEN	HUNGARY
DUB	JOINT INSTITUTE FOR NUCLEAR RESEARCH, DUBNA	USSR
FAR	FONTENAY-AUX-ROSES, SEINE	FRANCE
FEI	FIZIKO-ENERGETICHESKIJ INSTITUT, OBNINSK	USSR
FLA	U. OF FLORIDA, GAINESVILLE, FLORIDA	USA
FOA	RESEARCH INSTITUTE OF NAT'L DEFENSE, STOCKHOLM	SWEDEN
FR	FRANCE	FRANCE
FRK	J.W.GOETHE UNIVERSITY, FRANKFURT	GERMANY
GA	GENERAL ATOMIC, SAN DIEGO, CALIFORNIA (OBSOLETE, SEE GGA AND GRT)	USA
GDT	GENERAL DYNAMICS, FORT WORTH, TEXAS	USA
GGA	GULF GENERAL ATOMIC, SAN DIEGO, CALIFORNIA	USA
GE	GENERAL ELECTRIC - NUCLEAR MATERIALS	USA
GEL	B.C.M.N. EURATOM, GEEL	BELGIUM
GIT	GEORGIA INST. OF TECHNOLOGY, ATLANTA	USA
GRT	GULF RADIATION TECHNOLOGY, SAN DIEGO, CALIFORNIA	USA
HAM	INST. FUR EXPERIMENTALPHYSIK, HAMBURG	GERMANY
HAR	AERE, HARWELL	UNITED KINGDOM
HED	HANFORD ENGINEERING DEVELOPMENT LAB., HANFORD, WASHINGTON	USA
HLT	TECH.UNIV. OF HELSINKI, OTANIEMI	FINLAND
IAE	INTERN. ATOMIC ENERGY AGENCY, VIENNA	AUSTRIA
IEN	INSTITUTO DE ENGENHARIA NUCLEAR, RIO DE JANEIRO	BRAZIL
IFU	INSTITUT FIZIKI AN UKRAINSKOI SSR, KIEV	USSR
INC	IDAHO NUCLEAR CORPORATION, IDAHO FALLS, IDAHO (OBSOLETE, SEE ANC)	USA
IRK	INSTITUT FUR RADIUMFORSCHUNG UND KERNPHYSIK, VIENNA	AUSTRIA
ISP	EURATOM, ISPRA	ITALY
IST	IMP. COLL. OF SCI. + TECHN., LONDON	UK
ITE	INST. TEORETICHESKOI I EXPERIMENTALNOI FIZIKI MOSCOW	USSR
ITK	INDIAN INST. OF TECHNOLOGY, KANPUR	INDIA
JAE	JAPAN ATOMIC ENERGY RESEARCH INST. TOKAI	JAPAN
JAP	JAPAN	JAPAN

JUL	KERNFORSCHUNGSSANLAGE JUELICH	GERMANY
KAP	KNOLLS ATOMIC POWER LAB., SCHENECTADY, NEW YORK	USA
KAZ	INST. JAD. FIZIKI, KAZAKHSTAN	USSR
KFK	KERNFORSCHUNGSZENTRUM KARLSRUHE	GERMANY
KIL	U. OF KIEL	GERMANY
KOS	KOSSUTH UNIV., INST. FOR EXP. PHYSICS, DEBRECEN	HUNGARY
KTY	U. OF KENTUCKY, LEXINGTON, KENTUCKY	USA
KUR	I.V. KURCHATOV ATOMIC ENERGY INST., MOSCOW	USSR
LAS	LOS ALAMOS SCIENTIFIC LAB., NEW MEXICO	USA
LEB	FIZIKO-INSTITUTE LEBEDEV, MOSCOW	USSR
LLL	LAWRENCE LIVERMORE LABORATORY, LIVERMORE, CALIFORNIA	USA
LMB	LIQUID METAL FAST BREEDER PROGRAM, USAEC, GERMANTOWN, MARYLAND	USA
LOK	LOCKHEED AIRCRAFT, SUNNYVALE, CALIF.	USA
LON	U. OF LONDON	UNITED KINGDOM
LCR	NASA LEWIS RES. CENTRE, CLEVELAND, OHIO	USA
RLR	LAWRENCE RADIATION LAB., LIVERMORE, CALIFORNIA (OBSOLETE, SEE LLL)	USA
MHG	U. OF MICHIGAN	USA
MIT	MIT. CAMBRIDGE, MASSACHUSETTS	USA
MOL	CEN MOL	BELGIUM
MTR	PHILLIPS PETROLEUM CO.-MTR., IDAHO FALLS, IDAHO (OBSOLETE, SEE ANC)	USA
MUA	MUSLIM UNIVERSITY, ALIGARH	INDIA
MUN	TECHNISCHE HOCHSCHULE MUENCHEN, MUNICH	GERMANY
NAP	U. OF NAPLES	ITALY
NBS	NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.	USA
NDC	NUCLEAR DATA COMPILATION CENTER, NEA, SACLAY	FRANCE
NDL	U.S. ARMY NUCLEAR DEFENCE LAB. (OBSOLETE, SEE NEL)	USA
NED	NETHERLANDS	NETHERLANDS
NEL	U.S. ARMY NUCLEAR EFFECTS LABORATORY, ABERDEEN, MARYLAND	USA
NEU	U. OF NEUCHATEL	SWITZERLAND
NJS	NUK.INST.JOZEF STEFAN, LJUBLJANA	YUGOSLAVIA
NPL	NATIONAL PHYSICAL LABORATORY, TEDDINGTON	UNITED KINGDOM
NRD	U.S. NAVAL RADIOLOGICAL DEFENSE LAB., SAN FRANCISCO	USA
ORL	OAK RIDGE NATIONAL LAB., TENNESSEE	USA

OTU	U. OF OTTAWA, ONTARIO	CANADA
PAD	U. OF PADUA	ITALY
PEL	AE BOARD, PELINDABA, PRETORIA	SOUTH AFRICA
RAM	ATOMIC ENERGY CENTRE, RAMNA, DACCA	PAKISTAN
RDT	DIV. OF REACTOR DEV. + TECH., USAEC, GERMANTOWN, MARYLAND	USA
RIS	RISO, ROSKILDE	DENMARK
ROS	ROSSENDORF BEI DRESDEN	GERMANY
RPI	RENSSELAER POLYTECHNIC INST., TROY, NEW YORK	USA
SAC	CEN SACLAY, (91) GIF-sur-YVETTE	FRANCE
SAF	SOUTH AFRICA	SOUTH AFRICA
SAH	SAHA INSTITUTE, CALCUTTA	INDIA
SCT	U. OF CAPE TOWN	SOUTH AFRICA
SCU	USSR STATE COMM. FOR ATOMIC ENERGY, MOSCOW	USSR
SNP	SPACE NUCLEAR PROPULSION OFFICE, CLEVELAND, OHIO	USA
SRE	SIEMENS REAKTORENTWICKLUNG, ERLANGEN	GERMANY
SRL	SAVANNAH RIVER LAB., AIKEN, S.C.	USA
STF	STANFORD U., MENLO PARK, CALIFORNIA	USA
SUN	SOUTHERN UNIVERSITIES NUC. INST., FAURE, C.P.	SOUTH AFRICA
TAT	TATA INSTITUTE, BOMBAY	INDIA
TNC	TEXAS NUCLEAR CORP., AUSTIN, TEXAS	USA
TOR	U. OF TORONTO	CANADA
TRI	U. OF TRIESTE, TRIESTE	ITALY
TRM	ATOMIC ENERGY EST. TROMBAY, BOMBAY, NOW BHABHA AT. RES.C.	INDIA
TUR	U. OF TORINO	ITALY
UKW	WINDSCALE REACTOR DEVELOPMENT LABS. UKAEA	UNITED KINGDOM
UPR	UNIVERSITY OF PRETORIA	SOUTH AFRICA
VNV	CEN VILLENEUVE	FRANCE
WAL	WESTINGHOUSE ASTRONUCLEAR LAB., PITTSBURGH	USA
WAS	WASHINGTON U., ST.LOUIS, MISSOURI	USA
WES	WESTINGHOUSE RESEARCH, PITTSBURGH, PENNSYLVANIA	USA
WEW	WESTINGHOUSE ADVANCED REACTORS DIV., MADISON, PENN.	USA
WIN	AAE, WINFRITH	UNITED KINGDOM
WRU	CASE WESTERN RESERVE UNIVERSITY	USA
WUR	EIDG. INSTITUT FUER REAKTORFORSCHUNG, WUERENLINGEN	SWITZERLAND
WWA	U. OF WARSAW + PAN.	POLAND
YAL	YALE U., NEW HAVEN, CONNECTICUT	USA

TABLE 5REFERENCES

65ANTWRP	INT. CONF. ON THE STUDY OF NUCLEAR STRUCTURE WITH NEUTRONS, ANTWERP 19-23 JULY 1965. PROCEEDINGS GIVE FOR SOME PAPERS ABSTRACT ONLY. FOR FULL PAPERS SEE EANDC-50. FOR TECHNICAL MINUTES SEE EANDC-44	BELGIUM
65SALZBG	IAEA SYMPOSIUM ON PHYSICS AND CHEMISTRY OF FISSION, SALZBURG, AUSTRIA, 22-26 MARCH 1965. PREPRINT-CODE = SM-60/... PUBLISHED BY IAEA, VIENNA, JULY 1965 (STI/PUB/101)	IAEA
66PARIS	FIRST IAEA CONFERENCE ON NUCLEAR DATA FOR REACTORS PARIS, 17-21 OCT. 1966. PREPRINT-CODE = CN-23/... PROCEEDINGS PUBL. BY IAEA, VIENNA, 1967 (STI/PUB/140) SUPPLEMENT WITH ADDITIONAL PAPERS SEE INDC-156	IAEA
66WASH	CONFERENCE ON NEUTRON CROSS-SECTION TECHNOLOGY, WASHINGTON D.C. 22-24 MAR 1966, PUBL. AS AEC REPORT CONF-660303	USA
68DUBNA	UK-USSR SEMINAR ON NUCLEAR DATA FOR REACTOR COMPUTATIONS, DUBNA JUNE 1968	USSR
68WASH	2ND CONFERENCE ON NUCLEAR CROSS-SECTIONS AND TECH. WASHINGTON D.C. 4-7 MARCH 1968, PUBLISHED AS NBS SPECIAL PUBLICATION 299	USA
69VIENNA	IAEA SYMPOSIUM ON PHYSICS AND CHEMISTRY OF FISSION VIENNA JULY-AUGUST 1969, PUBLISHED 1969 AS STI/PUB/234	IAEA
70HELS	SECOND IAEA CONFERENCE ON NUCLEAR DATA FOR REACTORS HELSINKI, 15-19 JUNE 1970. PREPRINT-CODE = SM-122/.. PROCEEDINGS PUBL. BY IAEA, VIENNA, 1970 (STI/PUB/259)	IAEA
71ALBANY	INTERNATIONAL CONF. ON STATISTICAL PROPERTIES OF NUCLEI ALBANY 23-27 AUGUST, 1971	USA
71KNOX	3RD CONFERENCE ON NEUTRON CROSS-SECTIONS AND TECHNOLOGY. UNIVERSITY OF TENNESSEE. KNOXVILLE. 15-17 MARCH 1971	USA
AAEC/E-	AUSTRALIAN AEC REPORT SERIES	AUSTRALIA
AE	ATOMNAYA ENERGIYA /SJA/EAF/(JNF/)	USSR
AE-	AKTIEBOLAGET ATOMENERGI, STOCKHOLM, REPORT SERIES	SWEDEN
AECL	ATOMIC EN. OF CAN. LIM., CHALK RIVER, REPORT SERIES	CANADA
AEEW	AEEW-WINFRITH REPORT SERIES	UK
AERE	AERE-HARWELL REPORT SERIES	UK
AF	ARKIV FOR FYSIK	SWEDEN
AFWL	AIR FORCE WEAPONS LAB., KIRTLAND, NEW MEXICO	USA
AHP	ACTA PHYS. ACAD. SCI. HUNG.	HUNGARY
AI	ATOMICS INTERNATIONAL, CANOGA PARK, CALIF. REPORTS.	USA
ANCR	AEROJET NUCLEAR COMPANY, IDAHO FALLS.	USA
ANL	ARGONNE NAT'L LABORATORY, REPORT SERIES	USA
ANS	TRANS. AMER. NUCL. SOC.	USA

AT.EM.REV.	SEE REA	
AWRE	AWRE-ALDERMASTON REPORT SERIES	UK
BAP	BULL. AM. PHYS. SOC.	USA
BARC	TROMBAY REPORT SERIES, FORMERLY AEET	INDIA
BNES	BRITISH NUCL. EN. SOC.- CONF. ON CHEMICAL NUCLEAR DATA-CANTERBURY	UK
BNL	BROOKHAVEN NATIONAL LABORATORY, REPORT SERIES	USA
C CDN	NEUTRON DATA COMP. CENTRE, SACLAY. REPORTS	FRANCE
CEA	CENTRE D'ETUDES NUCLEAIRES, SACLAY, REPORT SERIES	FRANCE
CEC	COM. NAZ. EN. NUCLEARE, INT'L REPORT SERIES	ITALY
CJP	CAN. J. PHYS. (FORMERLY CAN J. OF RESEARCH VOL I-28)	CANADA
CWR	CURTISS-WRIGHT CORP. REPORT SERIES. EXTINCT	USA
CZJ	CZECHOSLOVAK JOURNAL OF PHYSICS	CZECHOSLOVAKIA
DA	DISSERTATION ABSTRACTS	USA
DRP	C.E.A. CENTRE D'ETUDES NUCLEAIRES. FONTENAY-AUX-ROSES	FRANCE
DUB	DUBNA REPORT SERIES, ALSO KNOWN AS JINR-REPORTS	USSR
EANDC(CAN)	EUROPEAN-AMERICAN NUCL. DATA COMMITTEE DOCUMENTS	CANADA
EANDC(E)	EUROPEAN-AMERICAN NUCL. DATA COMMITTEE DOCUMENTS	EUROPE (6)
EANDC(J)	EUROPEAN-AMERICAN NUCL. DATA COMMITTEE DOCUMENTS	JAPAN
EANDC(OR)	EUROPEAN-AMERICAN NUCL. DATA COMMITTEE DOCUMENTS	OUTER REGION
EANDC(UK)	EUROPEAN-AMERICAN NUCL. DATA COMMITTEE DOCUMENTS	UK
EANDC(US)	EUROPEAN-AMERICAN NUCL. DATA COMMITTEE DOCUMENTS	USA
EUR	EURATOM REPORTS (FROM BCMN)	EURATOM
GA	GENERAL ATOMIC DIV. GEN. DYN.CORP., REPORT SERIES	USA
HN DC	UNKNOW	UK
HP	HEALTH PHYSICS	UK-USA
HPA	HELV. PHYS. ACTA	SWITZERLAND
IAE	REPORTS FROM INST. ATOMNOJ ENERGII, KURCHATOV, MOSKVA	USSR
IDO	IDAHO OPERATIONS OFFICE, AEC, REPORT SERIES	USA
IN	REPORTS IDAHO OP-OFFICE, AEC	USA
INDC	REPORTS IAEA NUCL. DATA UNIT, INT.NUCL.DATA COMMITTEE	IAEA
JAERI	ATOMIC ENERGY RESEARCH INST., TOKYO	JAPAN
JIN	J. INORG. NUCL. CHEM.	UK
JINR	DUBNA REPORT SERIES	USSR
JNE	J. NUCL. ENRG.	UK
KAPL	KNOLLS ATOMIC POWER LAB. REPORT SERIES	USA
KFK	KERNFORSCHUNGZENTRUM KARLSRUHE REPORT SERIES	GERMANY

LA	LOS ALAMOS SCIENTIFIC LAB., REPORT SERIES	USA
LA-DC	LOS ALAMOS SCIENTIFIC LAB., REPORT SERIES	USA
NAT	NATURE	UK
NBS	NATIONAL BUREAU OF STANDARDS, WASHINGTON	USA
NC	NUOVO CIMENTO	ITALY
NCSAC	AEC NUCL., CROSS SECTION ADVISORY COMM.	USA
NIM	NUCLEAR INSTRUMENTS AND METHODS	NETHERLANDS
NP	NUCLEAR PHYSICS	NETHERLANDS
NSE	NUCL. SCI. ENG.	USA
NST	NUCLEAR SCIENCE AND TECHNOLOGY	JAPAN
NUCL	(OBSOLETE) NUCLEONICS	USA
NUCL.DATA	NUCLEAR-DATA - ACADEMIC PRESS	UK-USA
NUK	NUKLEONIK	GERMANY
OAWS	(PRFV.OAW) OESTERR.AKAD.WISS., MATA + NATURW, SITZBER	AUSTRIA
ORNL	OAK RIDGE NAT'L LAB., REPORT SERIES	USA
ORO	REPORTS OAK RIDGE OPERATIONS OFFICE, AEC	USA
PL	PHYSICS LETTERS	NETHERLANDS
PPS	PROC. PHYS. SOC. (LONDON)	UK
PR	PHYS. REV.	USA
PRL	PHYS. REV. LETTERS	USA
REA	ATOMIC ENERGY REVIEW	IAEA
RPI	RENNESLAER POLYTECHNIC INST. REPORTS	USA
SAE	UNKNOWN	USSR
TID	DIV. OF TECH. INFORM. EXT., AEC REPORT SERIES	USA
UCRL	CALIFORNIA U. REPORT SERIES	USA
UFZ	UKRAINSKIJ FIZICHNII ZHURNAL	USSR
USNRDL	NAVAL RADIOLOG. DEF.LAB., SAN FRANCISCO REP.SERIES	USA
WANL-TME	WESTINGHOUSE ASTRO-NUCLEAR LAB., PITTSBURG	USA
WAPD	WESTINGHOUSE, ATOMIC POWER DIV., REPORT SERIES	USA
WASH	AEC, WASHINGTON REPORTS TO THE NCSAG	USA
YF	YADERNAYA FIZIKA /SNP/	USSR
YFI	JADERNO-FIZICHESKIE ISSLEDOVANIJA (PROGRESS REPORTS)	USSR
ZET	ZH. EKSPERIM. I TEOR. FIZ. /JET/	USSR
ZP	Z. PHYSIK	GERMANY

LIST OF ELEMENTS

H	1	hydrogen	Kr	36	krypton	Lu	71	lutetium
He	2	helium	Rb	37	rubidium	Hf	72	hafnium
Li	3	lithium	Sr	38	strontium	Ta	73	tantalum
Be	4	beryllium	Y	39	yttrium	W	74	tungsten
B	5	boron	Zr	40	zirconium	Re	75	rhenium
C	6	carbon	Nb	41	niobium	Os	76	osmium
N	7	nitrogen	Mo	42	molybdenum	Ir	77	iridium
O	8	oxygen	Tc	43	technetium	Pt	78	platinum
F	9	fluorine	Ru	44	ruthenium	Au	79	gold
Ne	10	neon	Rh	45	rhodium	Hg	80	mercury
Na	11	sodium	Pd	46	palladium	Tl	81	thallium
Mg	12	magnesium	Ag	47	silver	Pb	82	lead
Al	13	aluminium	Cd	48	cadmium	Bi	83	bismuth
Si	14	silicon	In	49	indium	Po	84	polonium
P	15	phosphorus	Sn	50	tin	At	85	astatine
S	16	sulphur	Sb	51	antimony	Rn	86	radon
Cl	17	chlorine	Te	52	tellurium	Fr	87	francium
Ar	18	argon	I	53	iodine	Ra	88	radium
K	19	potassium	Xe	54	zenon	Ac	89	actinium
Ca	20	calcium	Cs	55	cesium	Th	90	thorium
Sc	21	scandium	Ba	56	barium	Pa	91	protactinium
Ti	22	titanium	La	57	lanthanum	U	92	uranium
V	23	vanadium	Ce	58	cerium	Np	93	neptunium
Cr	24	chromium	Pr	59	praseodymium	Pu	94	plutonium
Mn	25	manganese	Nd	60	neodymium	Am	95	americium
Fe	26	iron	Pm	61	promethium	Cm	96	curium
Co	27	cobalt	Sm	62	samarium	Bk	97	berkelium
Ni	28	nickel	Eu	63	europerium	Cf	98	californium
Cu	29	copper	Gd	64	gadolinium	Es	99	einsteinium
Zn	30	zinc	Tb	65	terbium	Fm	100	fermium
Ga	31	gallium	Dy	66	dysprosium	Md	101	mendelevium
Ge	32	germanium	Ho	67	holmium	No	102	nobelium
As	33	arsenic	Er	68	erbium	Lw	103	lawrencium
Se	34	selenium	Tm	69	thulium	Ku	104	kurchatovium
Br	35	bromine	Yb	70	ytterbium			