```
********** BIB-SECT
*
* REFERENCE   (C,68WASH,2,885,6803) PR
*             CONTRIBUTION.
*             (P,EANDC(E)-89,37,6802)
*             (J,NP/A,118,9,6805) FINA
*             MEASUREMENTS.
* AUTHOR      (H.K.VONACH,F.G.VONACH,H
* TITLE       -PRECISION MEASUREMENTS
*             OF (N,P),(N,A) AND (N,2
*             13.5 - 14.7 MEV NEUTRON
* INSTITUTE   (2GERMUN)
* N-SOURCE    (D-T  ) BOMBARDMENT OF A
*             DEUTERONS. A RANGE OF I
*             WERE USED BY VARYING THE
* FACILITY    (VDG  ) 400KEV VAN DE GR
*             FUR STRAHLENFORSCHUNG.
* METHOD      (ACTIV) GAMMA PULSES EX
*             TA-180M WHERE BETAS WER
* PART-DET    (DG   ) DECAY GAMMAS.
* SAMPLE      .NATURAL MATERIALS. ME
*             SAMPLES WERE PLACED A
*             CORRESPONDING TO 30
*             ENERGY, AND SUBTENDE
*             DISTANCE OF 100MM.
* CORRECTION  .ANGULAR DEPENDENT NE
*             ELASTICALLY SCATTERE
*             SCATTERING CONTRIBUT
*             DECAY CORRECTIONS.
* ERR-ANALYS  .SYSTEMATIC ERRORS, TA
*             ATTENUATION CORRECTION
*             (0.05 PC), DECAY CORRE
*             SHIFTS (0.1 PC). MAXIMU
*             THAN 0.9 PERCENT. STATI
*             IN THE TOTAL ERROR.
* DETECTOR    (NAICR) 5X5INCH WELL CRY
*             (PROPC) CH4 FLOW COUNTER
*             TA-180M.
* STATUS      .FROM TABLES IN CONFERE
* HISTORY     (781017C) PDJ. RECOMPILE
*             (790219E)
*             (800115A) REACTION STRIN
*             022 AND 023 CHANGED.
*             (800115E)
*             (800424A) DATA HEADINGS
*             (800603E)
*
** END BIB-SECTION **********

********** BIB-SECT
*
* REACTION    (23-V-51(N,A)21-SC-48,,S
*             RATIO TO THE 14.7 MEV E
* STATUS      .PUBLISHED TABLE.
* HISTORY     (781018C) PDJ.
*             (790219E)
*             (800424A) DATA HEADINGS
*             (800603F)
*
** END BIB-SECTION **********

** NO COMMON-SECTION **********

          EN          EN-ERR      DATA
          MEV         MEV         ARB-UN

      1   13.6        0.075       0.820
      2   13.7        0.075       0.836
      3   13.8        0.075       0.852
      4   13.9        0.075       0.867
      5   14.0        0.075       0.885
      6   14.1        0.075       0.902

** END DATA-SECTION **********
```

NNDEN/31

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NEA DATA BANK
BANQUES DE DONNÉES DE L'AEN

JANUARY 1982

LEGAL NOTICE

Neither the Organisation for Economic Co-operation and Development, any of its Member countries, or their agencies, nor any person or organisation acting either on behalf of any of them or otherwise in the development, compilation, publication or distribution of the information in this report:

1. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information which it contains, or that the use of any information, apparatus, method, or process disclosed may not infringe privately-owned rights; or

2. Assumes any liabilities with respect to the use of, or for damage resulting from the use of, any information, apparatus, method or process disclosed.

AVERTISSEMENT

L'Organisation de Coopération et de Développement Economiques, ses pays Membres, ou leurs agences, les personnes ou organisation agissant en leurs noms ou pour le développement, la compilation, la publication ou la distribution de l'information dans ce rapport.

1. Ne garantissent, expressément ou implicitement ni que les informations ci-jointes sont exactes et complètes, ni que l'utilisation de ces informations ainsi que des appareils, méthodes ou procédés décrits ne portent pas atteinte à des droits acquis; ou

2. N'assument aucune responsabilité en ce qui concerne l'utilisation des dites informations, appareils, méthodes ou procédés ainsi que les conséquences pouvant en résulter.

- - - - -

The NEA Data Bank is part of the Organisation for Economic Co-operation and Development and is financed by the following sixteen Member countries:

Austria, Belgium, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and the United Kingdom

La Banque de Données de l'AEN fait partie de l'Organisation de Coopération et de Développement Economiques et est financé par les seize pays Membres suivants :

Allemagne, Autriche, Belgique, Danemark, Espagne, Finlande, France, Italie, Japon, Norvège, Pays-Bas, Portugal, Royaume-Uni, Suède, Suisse et Turquie.

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NNDEN/31

This Newsletter summarises evaluation activity in the OECD area. It should be noted that work in progress and future plans cited in this document may be changed without notice: consequently, the Newsletter should neither be quoted as a reference in publications nor be listed in an abstract journal.

The information contained in this newsletter concerns:

1. Evaluation work on particular nuclides;
2. Development of codes for the manipulation of data and for the calculation of cross sections;
3. Publications relevant to the neutron data field.

Contributions on evaluation activities have been received from:

January 1982

1. NEW EVALUATIONS RECENTLY COMPLETED A), IN PROGRESS B), OR PLANNED IN THE NEAR FUTURE C)

NUCLIDE	DATA TYPE	ENERGY RANGE	PAGE		
			A	B	C
Li-6	many			13	
Li-7	many			13	
Na-22	many				11
Ar-36	many			11	
Ar-38	many			11	
Ar-40	many			11	
Ca-nat	many	<40MeV	13		
Fe-57	many		13		
Fe-58	many		13		
Ni-nat	many			3	
Nb-93	many	1KeV-1MeV	7		
Rh-103	many	1Kev-1MeV	7		
Pd-102	many		11		
Pd-104	many		11		
Pd-105	many		11		
Pd-105	many	reson.	7		
Pd-106	many		11		
Pd-107	many	reson.	7		
Pd-107	many		11		
Pd-108	many		11		
Pd-110	many		11		
Sn-112	many				11
Tm-169	many	10^{-5}eV-20MeV		2	
W-182	many		13		
W-183	many		13		
W-184	many		13		
W-186	many		13		
W-nat	many			13	

NUCLIDE	DATA TYPE	ENERGY RANGE	PAGE		
			A	B	C
Bi-209	many	10^{-5}ev-20MeV		1	
U-233	many			13	
U-233	res.params		9		
U-233	many	10^{-5}eV-20MeV		10	
U-235	res.params		9		
U-238	res.params		9		
Pu-238	many	10^{-2}eV-5MeV	3		
Pu-238	many	5MeV-15MeV		3	
Pu-239	many			13	
Pu-239	res.params		9		
Pu-240	res.params		9		
Pu-241	res.params		9		
Pu-242	many	MeV		13	
Pu-242	res.params		9		
Am-241	many	5MeV-15MeV	3		
Am-241	many	10^{-2}eV-20MeV		10	
Am-241	many			4	
Am-242m	many		4		
Am-243	many		4		
Am-243	many	10^{-2}eV-20MeV		10	
Cm-244	many		4		
Cm-243	many	10^{-5}eV-15MeV	6		
Cm-245	many	10^{-5}eV-15MeV	6		
F.P.	many	10^{-2}eV-15MeV		10	

Service de Physique Neutronique et Nucléaire
Centre d'Etudes de Bruyères-le-Châtel
France

Names : O. BERSILLON, M. COLLIN, J.P. DELAROCHE, J. JARY, Ch. LAGRANGE, R. PERRIER, C. PHILIS, J. SALVY, N. VERGES.

Address : Service de Physique Neutronique et Nucléaire
Centre d'Etudes de Bruyères-le-Châtel
B.P. n° 561, 92542 MONTROUGE CEDEX, France

- *Work completed*

  - Ch. LAGRANGE, "Utilisation du modèle optique en voies couplées pour la prédiction des sections efficaces de neutrons rapides, et plus particulièrement pour les actinides impairs", OECD/NEA Specialists' Meeting on "Fast Neutron Scattering on Actinide Nuclei", 23-25 Nov. 81, PARIS.

  - J. JARY, "NRLY : code de modèle statistique pour le calcul de sections efficaces neutroniques des noyaux fissionables", Note PNN-771/81 (Sept. 81).

- *Work in progress*

  - Coherent optical and statistical model calculations of neutron cross sections for Gd isotopes (J.P. DELAROCHE, Ch. LAGRANGE).

  - Calculation of neutron cross sections for some Pt isotopes (J.P. DELAROCHE).

  - Evaluation of neutron cross sections and γ-ray production data for W isotopes in the energy range 500 keV - 20 MeV (Ed. ARTHUR*, C. PHILIS, A.B. SMITH**).

  - Optical model analysis of elastic and inelastic scattering data for $^{54,56}Fe$, $^{58,60}Ni$ and $^{63,65}Cu$ (J.P. DELAROCHE, in collaboration with TUN Laboratories, USA).

  - Complete evaluation of neutron cross sections and γ-ray production from 10^{-5} eV to 20 MeV for ^{209}Bi (O. BERSILLON, C. PHILIS, N. VERGES)

- Complete reevaluation of ^{169}Tm from 10^{-5} eV to 20 MeV (Ed. ARTHUR*, M. COLLIN, D. GARDNER***, M. GARDNER***, P. NAGEL, C. PHILIS, P.G. YOUNG*).
- Coupled channels calculations of neutron interactions with ^{233}U (Ch. LAGRANGE).

* Los Alamos National Laboratory (USA).

** Argonne National Laboratory (USA).

*** Lawrence Livermore Laboratory (USA).

SECTION DE PHYSIQUE DES NEUTRONS RAPIDES

CENTRE D'ETUDES NUCLEAIRES DE CADARACHE

NAMES : H. DERRIEN, E. FORT, D. LAFOND, J.P. DOAT

ADDRESS : Section de Physique des Neutrons Rapides (SPNR)
Centre d'Etudes Nucléaires de Cadarache
Boîte Postale N°1
13115 - SAINT-PAUL-LEZ-DURANCE - (France)

WORK RECENTLY COMPLETED :

- Complete evaluation of ^{238}Pu from thermal energy to 5 MeV. Preliminary work from 5 to 15 MeV (H. DERRIEN)
- Review of resonance parameters of ^{241}Pu (1), (H. DERRIEN)
- Complete reevaluation of ^{241}Am from 5 MeV to 15 MeV (E. FORT, J.P. DOAT)
- Participation to the NEANDC exercise to intercompare the methods to derive average spacings (E. FORT)

WORK IN PROGRESS :

- Complete evaluation of natural Nickel (H. DERRIEN, D. LAFOND)
- Calculations of ^{238}Pu from 5 MeV to 15 MeV (H. DERRIEN).

REFERENCE :

(1) Review of ^{241}Pu resonance parameters, IAEA-OECD Specialists' Meetings on resonance parameters of important fissile and fertile nuclei (VIENNA, Sept. 1981).

.....

Contribution to NNDEN-31

KFK-KARLSRUHE

GERMANY

Names: F. H. Fröhner, B. Goel, H. Jahn, B. Krieg

Address: Institut für Neutronenphysik und Reaktortechnik
Kernforschungszentrum Karlsruhe
Postfach 3640
D-7500 Karlsruhe, West Germany

Work recently completed

- The KEDAK evaluations of ^{242m}Am, ^{243}Am and ^{244}Cm neutron cross sections were completed and checked against integral data such as resonance integrals and production rates observed in burn-up studies. The cross section formalisms employed in the unresolved resonance region are described in Ref. 1, other recent results in Ref. 2.
(F. H. Fröhner, B. Goel, H. Jahn, B. Krieg)

- The outcome of the first NEA level spacing benchmark (cf. Ref. 3) showed that, apart from Monte Carlo simulation, current level spacing estimation methods suffer from the inability to account for unresolved multiplets. An analytic method was developed to include this resolution effect for samples of s-wave resonances. The statistical resonance analysis code STARA was modified accordingly. The method and revised level spacings for ^{235}U, ^{238}U, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu and ^{241}Am were reported in Ref. 4.
(F. H. Fröhner)

Work in progress

- Final documentation of KEDAK evaluations for ^{241}Am, ^{242m}Am, ^{243}Am and ^{244}Cm.
(F. H. Fröhner, B. Goel, H. Jahn)

- Extension of new level spacing estimation method to mixtures of s- and p-wave resonances.
(F. H. Fröhner)

- Assessment of ^{6}Li and ^{7}Li cross sections in the context of tritium production in fusion devices.
(B. Goel)

- Number-theoretical level density formulae.
(A. Anzaldo, H. Jahn)

References

1. K. Wisshak, F. Käppeler, F. H. Fröhner, B. Goel, "Review of the ^{240}Pu and ^{242}Pu Unresolved Resonance Region", Proc. IAEA Consultants Meeting on Uranium and Plutonium Isotope Resonance Parameters, Vienna, 28 Sept. - 2. Oct. 1981 (in print)

2. U. Fischer, F. H. Fröhner, B. Goel, H. Jahn, "KEDAK Evaluation of ^{241,242m,243}Am and ^{244}Cm Neutron Cross Sections, State 1 May 1981", presented at IAEA CRP on Intercomparison of Evaluations of Actinide Neutron Nuclear Data", Vienna, 12 - 13 Oct. 1981.

3. F. H. Fröhner, "Level Density Estimation with Account of Unrecognised Multiplets Applied to Uranium and Plutonium Resonance Data", Proc. IAEA Consultants Meeting on Uranium and Plutonium Isotope Resonance Data, Vienna, 28 Sept. - 2 Oct. 1981 (in print).

C.N.E.N. - DIVISIONE FISICA E CALCOLO SCIENTIFICO - Via Mazzini, 2
40138 BOLOGNA, ITALY - tel. 307562 - telex 610167 CNENBO I -

Names: V. Benzi, C. Bonifazzi, F. Fabbri, G. Maino, T. Martinelli, E. Menapace, M. Motta, G.C. Panini, G. Reffo, M. Vaccari, A. Ventura.

Publications

1) G. Reffo and F. Fabbri; K. Wisshak and F. Kaeppeler
Fast neutron capture cross sections and related gamma-ray spectra of ^{93}Nb, ^{103}Rh and ^{181}Ta.
Accepted for publication on Nucl. Sc. Eng.

2) G.C. Panini
FISPET: A code for computing fission spectra from ENDF/B.
CNEN report RT/FI(81)2.

3) G.C. Panini
CRESO: A computer code for resonance data handling.
In press as CNEN report.

4) M. Vaccari
Multigroup activation cross sections of structural materials for PEC fast reactor.
Report RIT/FIS/LDN(2).

5) G. Maino, T. Martinelli, E. Menapace, M. Motta, M. Vaccari, A. Ventura
Evaluation of Cm-243 neutron cross sections from 10^{-5} eV to 15 MeV.
Rep. RIT/FIS(81)1 (1981).

6) G. Maino, T. Martinelli, E. Menapace, M. Motta, M. Vaccari
Evaluation of Cm-245 neutron cross sections from 10^{-5} to 15 MeV.
Rep. RIT/FIS(81)2 (1981).

7) C. Bonifazzi, E. Menapace
Estimate of average level spacing and s-wave neutron strenght function for ^{241}Pu.
Contributed paper to the IAEA/NDS Consultants Meeting on U and Pu Isotope Resonance Parameters.

Work in progress and recently completed

1. *Theoretical methods for nuclear data evaluation*

i) Nuclear level densities: the extensive analysis,announced in NNDEN/30, of nuclear level densities at neutron binding energy Bn, in the mass range $90 \leqq A \leqq 250$, including nuclei with odd number of neutrons and/or protons, by means of a microscopic Nilsson-Barcheau-Cooper-Schrieffer formalism has been carried on and the first results submitted for publication.

ii) Nuclear structure of Actinides: a preliminary study of law-lying collective states of even Uranium isotopes has been carried out in the frame of the Interacting Boson Model of Arima and Jachello; this model will be used in 1982 for further applications in the Actinide region.
(V. Benzi, G. Maino, E. Menapace, A. Ventura)

2. *FP data*

i) The activity, concerning the Fission Product data to be included in the NEA-DB Joint File, has been initiated in cooperation with dr. H. Gruppelaar from ECN-Petten and dr. D. Igarasi from JAERI-Nuclear Data Centre. All recently released Files (ENDF/B-V, CNEN-CEA, JENDL, RCN-3) have been critically considered and compared, even in multigroup representation, for the 22 most important nuclides for fast reactor calculations.
Few of them have been recognized as to be revised according to the recent experimental data.
(E. Menapace)

ii) The previous evaluations of CNEN-CEA library for Pd-105 and Pd-107 have been revised in the resolved and unresolved resonance region on the base of recent experimental data. Particular care has been devoted to the resonance parameter statistics for the estimate of average values
(C. Bonifazzi, E. Menapace, M. Vaccari)

iii) Total, capture, elastic, inelastic cross section and total γ-spectrum calculations have been performed for ^{93}Nb and ^{103}Rh in the energy interval 1 KeV-1 MeV. Capture isomeric ratios have been also estimated.
(F. Fabbri, G. Reffo)

3. *Actinide data*

i) Relevant cross sections (total, fission, capture, elastic, inelastic), total γ-spectrum and capture isomeric ratios for ^{241}Am have been calculated in the energy interval 1 KeV-1 MeV.
Calculations of the same quantities are in progress concerning ^{238}U, ^{240}Pu, ^{242}Pu.
(F. Fabbri, G. Reffo)

ii) Evaluated data of CNEN library concerning ^{241}Pu, ^{242}Pu and $^{242,243,245}Cm$ have been compared with different available Files, in particular ENDF/B-V, in view of their inclusion in the NEA-DB-Joint File. For ^{241}Pu a new estimate of average level spacing and s-wave strenght function has been performed through a maximum likelihood analysis and with correction for doublets (contribution to the IAEA Consultants' Meeting on U-Pu Resonances). Cross section calculations of the remaining Cm isotopes, in the frame of the IAEA-CNEN research agreement, have been extended to the continuum region.
(C. Bonifazzi, G. Maino, T. Martinelli, E. Menapace, M. Motta, G.C. Panini, M. Vaccari, A. Ventura).

4. *Structural material data*

The comparison of different data for Fe-56 (i.e. ENDF/B-IV, Oak Ridge and Geel resonance data) has been carried out, with respect to the indications of integral data measured at RB-2 fast critical facility in Bologna.
The new evaluation for natural Cr isotopes in the resonance region is in progress for a similar comparison with ENDF/B-IV, with reference to the integral experiments on RB-2.
(E. Menapace, M. Motta, G.C. Panini, M. Vaccari).

5. *Data of heavy nuclides other than Actinides*

Calculations of total, capture, elastic, inelastic cross sections and total γ-spectrum have been carried out for Ta-181 and Au-197 in the energy range 1 KeV-1 MeV of incident neutron energy.
(F. Fabbri, G. Reffo).

Contribution to Neutron Nuclear Data Evaluation Newsletter-31

Japanese Nuclear Data Committee
(Nuclear Data Center, JAERI)

Work Recently Completed and Publications:

(i) Evaluation of Resonance Parameters of ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu
Yasuyuki KIKUCHI, Akira ASAMI and Tadashi YOSHIDA
(Submitted to the IAEA Consultants Meeting on U and Pu Isotope Resonance Parameters)

The resonance parameters of ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu were evaluated for Japanese Evaluated Nuclear Data Library Version 2 (JENDL-2). The evaluation was made by two steps. At first, the parameters were evaluated on the basis of the reported measured data with suitable method which depends on the status of measured data. The most reliable parameter set could be found after some simple examinations for ^{233}U, ^{239}Pu and ^{241}Pu, since total number of measured parameter sets is limited for these nuclides. On the other hand, numerous measurements exist for ^{235}U, and the evaluation was made by taking a suitable average, considering the fission and capture areas. Secondly, the cross sections were calculated with the parameters thus obtained, and were compared with the measured cross sections. Then the parameters were so modified that the calculated cross sections well reproduced the measured data. After modifying the resonance parameters, the remaining discrepancies between the calculated and measured cross sections, which are mainly caused by the interference among levels and are inevitable with the single-level Breit-Wigner formula, were corrected by applying slight background cross sections. The resonance integrals calculated from the presently evaluated parameters agree well with the measured data.

The full paper will be published in JAERI-M report.

(ii) Evaluation of Resonance Parameters of ^{238}U, ^{240}Pu and ^{242}Pu
Tsuneo NAKAGAWA, Atsushi ZUKERAN and Masayoshi KAWAI
(Submitted to the IAEA Consultants Meeting on U and Pu Isotope Resonance Parameters)

The evaluation of the resolved resonance parameters of ^{238}U, ^{240}Pu and ^{242}Pu was performed for the second version of Japanese Evaluated Nuclear Data Library JENDL-2. In this work, all the resonance parameters measured so far were compiled and examined. The evaluation was made by mainly using recent measurements for each isotope. The presently evaluated resonances are 183 s-wave and 265 p-wave resonances up to 4.73 keV for ^{238}U, 267 s-wave resonances up to 5.69 keV for ^{240}Pu and 95 s-wave resonances up to 1.89 keV for ^{242}Pu. For ^{238}U and ^{240}Pu, negative resonances were also recommended. The multi-level Breit-Wigner formula was applied, and their resolved resonance regions were chosen from 10^{-5} eV to 4 keV for ^{238}U and ^{240}Pu and from 10^{-5} eV to 1.29 keV for ^{242}Pu. Furthermore, background cross sections were determined to correct the cross sections calculated from the evaluated resonance parameters.

The full paper will be published in JAERI-M report.

Work in Progress:

(i) Neutron nuclear data evaluation of ^{233}U is in progress from 10^{-5} eV to 20 MeV. The quantities evaluated are total, fission, capture, elastic and inelastic scattering, (n,2n) and (n,3n) reaction cross sections. The average numbers of prompt and delayed neutrons per fission are also evaluated. (from N. Asano, SAEI)

(ii) Reevaluation of neutron cross sections is in progress for about 80 FP nuclides from thermal to 15 MeV. (from M. Kawai, NAIG)

(iii) Evaluation of neutron nuclear data for ^{241}Am and ^{243}Am is in progress from thermal to 20 MeV. (from Y. Kikuchi, JAERI)

Work about codes:

(i) A computer code "HIKARI" has been developed. It calculates the angular distributions of cross sections and analyzing powers of the gamma-rays produced by the radiative capture of polarized nucleons by unpolarized nuclei. The formalism is based on the direct-semi-direct capture model and takes account of the electric dipole, quadrupole, octupole and magnetic dipole transitions. Special features include the ability to calculate transitions from the isovector (E1, E2, E3, M1) and isoscalar (E2, E3) resonances and to take the isospin-splitting of the electric giant dipole state into account. The use of complex coupling between an incident particle and the target nucleus is optional. Options are also given for the particle-vibration coupling form factor for E2 and E3 transitions and for the form of the optical potential. The program needs the approximate memory size of 130 KB. The user's manual is in preparation. (from H. Kitazawa, TIT)

(ii) A computer code PROFP-Y has been developed to prepare the input data of the DCHAIN and FPGS codes, which analyze buildup and decay of fission products. The PROFP-Y consists of various function modules such as data edition, replacement, addition, retrieval, graphical representation of decay chain diagram, coupling of data with those of JNDC FP Decay Data File, and calculation of fission yields, etc. These are conveniently selected for user's requirement. The code has been used for producing the input data library of DCHAIN, which includes nuclear decay and fission yield data of 1172 nuclides. The nuclear decay data has been taken from JNDC FP Decay Data File compiled by Working Group on Evaluation of Decay Heat in Japanese Nuclear Data Committee. Most of the fission yields of newly added nuclides and newly reported isomers were calculated with the present code. This code can be successfully applied to sensitivity analysis of decay heat for theoretically estimated values and reevaluation work with new experimental data because of the facilities of quick revision and error checking of the library.

Users' manual has been published in JAERI-M 9714.
(from Z. Matumoto, JAERI)

S. Igarasi
Nuclear Data Center
Tokai Research Establishment
Japan Atomic Energy Research Institute
Tokai-mura, Naka-gun, Ibaraki-ken 319-11
Japan
Nov. 10, 1981

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER-31

ECN-Petten - The Netherlands

1. Names

H. Gruppelaar, H.A.J. van der Kamp, R.J. Heijboer and D. Nierop,
Netherlands Energy Research Foundation (ECN), P.O. Box 1,
1755 ZG Petten, The Netherlands.
Telephone: (02246)-6262, telex: 57211 reacp nl.

2. Recent publications and preprints (available upon request)

|1| Gruppelaar, H. and J.B. Dragt, Cross section adjustments using integral data, Proc. of the Conference on Nuclear Data Evaluation Methods and Procedures, Brookhaven, September 22-25, 1980, BNL-NCS-51363, 1981, vol. 1, p. 133.

|2| Akkermans, J.M. and H. Gruppelaar, Random-walk model of pre-compound decay: dynamics and multiparticle emission, Z. für Physik A300 (1981), p. 345.

|3| Van der Kamp, H.A.J. and H. Gruppelaar, Evaluation of neutron cross sections for the Pd isotopes (RCN-3 data library), ECN-report to be publ.

3. Work recently completed

- Evaluation of neutron cross sections for ^{102}Pd, ^{104}Pd, ^{105}Pd, ^{106}Pd, ^{107}Pd, ^{108}Pd, ^{110}Pd using recent experimental data measured at CBNM, RPI, ORNL and integral STEK data |3|.
- Intercomparison of recent fission-product nuclear data evaluations for the 24 most important nuclides in a LMFBR (contr. to NEA Data Bank joint file, meeting in Winfrith, Sept. 1981).

4. Work in progress

- Evaluation of neutron cross sections for cover-gas nuclides ^{36}Ar, ^{38}Ar and ^{40}Ar.
- Work on precompound models |2|.
- Renormalization of UKCTRIIIA activation and transmutation group cross sections.

5. Work planned for the near future

- Continuation of efforts in evaluation and adjustment of capture cross sections for about 15 fission-product nuclides (RCN-3 evaluation).
- Evaluation of neutron cross sections for nuclides in the primary cooling circuit of a LMFBR, i.e. for ^{22}Na, ^{112}Sn.
- Evaluation of neutron cross sections for fusion-design studies.

6. Computer codes

- Benchmark test of code CAVECN (Contr. to Workshop on Intercomparison of methods to determine average parameters from resolved resonance parameters, NEA Data Bank, Saclay, Oct. 1981).
- Improvements to PRANG code system for the calculation of multi-particle precompound and compound continuum emission |2|.

U.S.A. Contribution to NNDEN-31
Via the National Nuclear Data Center

Recent Publications

ANL/NDM-57 1981 January
"The Total, Elastic- and Inelastic-Scattering Fast-Neutron Cross Sections of Natural Chromium"
P. T. Guenther, A. B. Smith and J. F. Whalen.

BNL-NCS-51346 (ENDF-294) 1981 February
"Ni Elemental Neutron Induced Reaction Cross-Section Evaluation"
M. Divadeenam.

BNL-NCS-51360 (ENDF-268) 1981 February
"Evaluation of ^{232}Th for ENDF/B-V"
M. R. Bhat.

BNL-NCS-51363 Vols. I and II 1981 March
"Proceedings of the Conference on Nuclear Data Evaluation Methods and Procedures" Brookhaven National Laboratory September 22-25, 1980
Editors B. A. Magurno and S. Pearlstein.

BNL-NCS-51388 1981 January
"Neutron Capture Cross Section Standards for BNL325 Fourth Edition"
N. E. Holden.

NP-1763 1981 March
"Evaluation of the Thermal Cross Sections of ^{239}Pu and ^{241}Pu"
B. R. Leonard, Jr. and J. K. Thompson.

ORNL/TM-7752 (ENDF-308) 1981 June
"A Calculation of Neutron and Gamma-Ray Production Cross Sections for Calcium from 8 to 20 MeV"
D. M. Hetrick and C. Y. Fu.

EVALUATIONS RECENTLY COMPLETED OR IN PROGRESS

Material	Laboratory	Status
^{6}Li	Los Alamos	In progress-planned for ENDF/B-VI
^{7}Li	Los Alamos	In progress-planned for Revision 2, ENDF/B-V
Ca	ORNL	Extension up to 40 MeV is complete
^{57}Fe, ^{58}Fe	ORNL	Contribution to Natural Iron is complete
$^{182-186}W$	Los Alamos	Completed-will be included in Revision 2, ENDF/B-V
Natural W	Los Alamos	In progress-will be included Revision 2, ENDF/B-V
^{233}U	Los Alamos	In progress-planned for ENDF/B-VI
$^{239,242}Pu$	Los Alamos	New evaluation of MeV region in progress for ENDF/B-VI
Dosimetry	ORNL	Relating twelve reactions by ratios is in progress

NORMAN E. HOLDEN

National Nuclear Data Center
Brookhaven National Laboratory
Upton, New York 11973
November 1981

I. NEANDC workshop meeting on Average Resonance Parameters (NEA Data Bank, October 1981) coordinated by Dr. P. Ribon of CEN Saclay

A first postal intercomparison had shown wide discrepancies between calculated solutions to a test problem generated by Dr. Ribon. The problem and the different solutions were presented in the two-part report NEANDC-(E)213 "AL", and discussed at the April 1981 meeting of NEANDC in Aix-en-Provence. The discrepancies could not be adequately explained, and the Committee recommended that a second exercise should be held, followed by a workshop in October 1981 to compare the results.

Results of the second calculation exercise

Seven sets of results were compared: the spread in results was less than in the earlier exercise, probably due to the elimination of misunderstandings about the input data and some modifications to the codes, but was still as large as 20 per cent for some parameters where s- and p- wave resonances were mixed in the input data.

A few codes stood out as giving results much closer to the "true" values, and it was agreed that these codes should be implemented at NEA Data Bank and after some further testing, be made generally available. Dr. M. Moore's code BAYESX used the method of moments applied to successive truncated Porter-Thomas distributions,while some other codes applied a Maximum Likelihood Analysis to a single distribution truncated at a neutron width threshold just high enough to exclude p-waves; correct choice of this threshold was very much a matter of the user's judgement.

Several of the codes, either sent in advance by the authors, or brought on tape to the Workshop, were implemented on the IBM and CDC computers on the Saclay site from the Data Bank by Dr. Ribon and Dr. Sartori, and this made it possible to check the effect of changes in the codes or the imput parameters.

Conclusions of the Workshop

After detailed discussion of the results and the way in which the input parameters were adjusted in successive iterations to obtain them, the following interim conclusions could be formulated:

1. All programs discussed start from the assumption that resonance widths conform to a Porter-Thomas distribution. Where the observed distribution shows a marked divergence from the Porter-Thomas form, greater discrepancies between calculated and "true" values of the average parameters may be expected.

2. In the Maximum Likelihood Analysis method, the choice of threshold values for Γ_n is critical. In order to obtain good statistics for this analysis, and hence results close to the "true" values, it is essential to set the threshold as low as possible consistent with the exclusion of p-wave resonances.

3. For all the codes, identification of a reasonable number of medium-strength resonances as s- or p-wave significantly improves the results, even though the codes will run with no prior information. Experimenters are requested to bear this in mind and to make available, where possible, information about the corresponding ℓ-values.

4. Given a certain element of subjective judgement in selecting the input data, particularly the cut-off value on the neutron width distribution above which resonances are assumed to be s-wave, programs must be accompanied by very explicit documentation showing how such judgement should be applied. This physics documentation may be considered as much a part of the program as the computer code itself.

Actions agreed by participants

1. Four of the codes used in this exercise would be sent in, with documentation, for implementation at the Data Bank. The codes concerned are BAYESX now revised as BAYESZ and which was received in December 1981 (Moore),plus the Maximum Likelihood Analysis codes of Fort and Fröhner, and MISDO (Rohr, received in January 1982).

2. In order to verify the correctness of this installation and to check the documentation these codes will then be rerun using the data of the two exercises in this study by a physicist unfamiliar with their use, and if possible by a person who does not know the results of the two calculation exercises.

3. A report would be produced on the results of the two calculation exercises, with contributions coordinated by Dr. Ribon and NEA Data Bank. This should contain a general introduction to the problem (possibly by Dr. Fröhner), descriptions of the codes in the exercise, a presentation of the results of the two sets of calculations and conclusions (by Dr. Ribon). Participants would contribute by post to this report.

4. The few programs "packaged" by NEA-DB and the data for the two exercises would be available for distribution from the Data Bank.

II. The NEA Data Bank Joint Neutron Data Evaluation project

An initial one-year programme to set up a first joint evaluated data file was approved at the May 1981 meeting of the Data Bank Committee. A detailed proposal was then prepared and submitted for approval to the Steering Committee for Nuclear Energy at its meeting in October 1981, where this initial programme was approved.

The final meeting of the NEACRP ad-hoc working group on coordination of evaluations was held meanwhile at Winfrith in September, to review existing recommendations for the initial content of the file, and to nominate reviewers for other materials to be covered. Proposals were circulated in January 1982 for the constitution of a Scientific Coordination Group to takeover from the ad-hoc group, and a first meeting will be held in Paris in late March 1982, probably on March 31st.

The meeting is expected to discuss progress at the Data Bank in assembling and translating the first evaluations for inclusion in the Joint file, further selections and recommendations for data to be included, and comparisons with integral data. In particular, it was decided in September 1981 that the NEA Data Bank should calculate the following values for the adopted evaluated files: 1) the Maxwellian average thermal cross sections; 2) the 2200 m/s cross sections; 3) the resonance integral values; and 4) the fission spectrum average cross section.

GENERAL RECOMMENDATIONS TO CONTRIBUTORS

Contents and Presentation

These newsletters are meant to be informal : nevertheless, we think it useful to give some recommendations concerning the contents, presentation, distribution, etc.

The Newsletters are concerned with evaluation activities - with evaluation work itself and with computer programs useful for evaluation.

Experimenters should be careful to distinguish between "evaluating" all the good data and the more customary process of simply analysing their own measurements.

When compiling your contribution, the following headings may serve as a guide :

1. Names, address, telephone number, telex code.

2. Work recently completed and publications.

3. Work in progress - please give names of physicists doing each evaluation.

4. Work planned for near future, i.e., work expected to start within six months (before publication of the next newsletter).

5. Computer programs for : nuclear data file operations - nuclear data analysis - nuclear model calculations.

Any note or report mentioned should be available on request to another evaluator for his own use but not necessarily for widespread copying and re-distribution. The distribution list of each newsletter will be attached to it.

Contributions should be forwarded typewritten in single spacing, as the newsletters will be produced directly from this typescript.

IMPORTANT NOTE

Future Neutron Nuclear Data Evaluation Newsletters will be distributed in January and July each year.

Evaluators are requested to send their contributions by :

1st June and 1st December

to : NEA DATA BANK
91191 GIF SUR YVETTE CEDEX
France

DISTRIBUTION LIST

AUSTRALIA	W. Gemmell
AUSTRIA	F. Putz
BELGIUM	H. Ceulemans, F. Motte
CANADA	G.C. Hanna, C. Keating, W.B. Lewis, W.H. Walker
DENMARK	N. Neltrup
EURATOM	K.H. Boeckhoff, H. Liskien, H. Rief, G. Rohr, E. Wattecamps, H. Weigmann
FINLAND	P. Silvennoinen
FRANCE	J. Bouchard, C. Cardot, C. Devillers, H. Derrien, E. Fort, R. Joly, J. Legrand, A. Michaudon, V.C. Philis, P. Ribon, M. Salvatores, J. Salvy, H. Tellier, R. Vidal
GERMANY	S. Cierjacks, F.H. Froehner, B. Goel, E. Kiefhaber, H. Kuesters, M. Mattes, M. Rittberger
GREECE	M. Dritsa
ICELAND	M. Magnusson
IRELAND	T.A. Nevin
ITALY	V. Benzi, U. Farinelli, E. Menapace
JAPAN	N. Yamamuro, S. Igarasi, S. Iijima, Y. Kanda, I. Kimura, H. Matsunobu, K. Sugiyama, R. Nakasima, M. Yamamoto, Y. Seki
NEA	J.A.G. Rosen, N. Tubbs
NETHERLANDS	M. Bustraan, H. Gruppelaar, H. Van Dam
NORWAY	E. Andersen, J.O. Berg
PORTUGAL	F. Gama Carvalho
SPAIN	A. Carbo, R. Caro Manso, M. Gomez Alonso, C. Sanchez del Rio, G. Velarde
SWEDEN	G. Apelquist, H. Conde, E. Hellstrand, L. Wallin, T. Wiedling
SWITZERLAND	J. Hadermann, R. Richmond, W. Seifritz, F. Widder
TURKEY	Ç. Ertek
UNITED KINGDOM	J.R. Askew, C.G. Campbell, P. Christmas, J.C. Cuninghame, A.C. Douglas, M.C. Moxon, A.L. Nichols, B.H. Patrick, E.D. Pendlebury, J.L. Rowlands, M.G. Sowerby, J.S. Story, J.C. Tyror, C.A. Uttley
UNITED STATES	J.E. Baublitz, R.C. Block, C. Bowman, C.L. Cowan, H. Goldstein, J. Hardy, P. Hemmig, W.B. Henderson, N. Holden, R. Howerton, D.C. Larson, B.R. Leonard, C.R. Lubitz, B. Maskewitz, D. Mathews, C.W. Maynard, NNDC Library, E.H. Ottewitte, O. Ozer, N.G. Paik, R.W. Peelle, E.R. Pennington, R.E. Schenter, A.B. Smith, S.L. Whetstone, W.A. Wittkopf, P. Young

CROSS SECTION COMPUTATIONAL FORMAT

1 — INDEX — 34 — DATA COLUMNS — 132

ATOMIC No. Z	MASS No. A	REACTION CODE	STANDARD	METHOD	FLAGS	LABORATORY	DATE	EXFOR No.	NEUTRON ENERGY	ERROR	LEVEL ENERGY	ANGLE	ERROR	CROSS SECTION	ERROR	STANDARD	ERROR
023051	NA3	LAC				HAM	6120904003		1.6000E+07	4.0000E+05				3.1700E-02	6.9740E-03		
023051	NA3	LAC				HAM	6120904003		1.7100E+07	4.0000E+05				3.7000E-02	7.7700E-03		
023051	NA3	LAC				HAM	6120904003		1.8000E+07	4.0000E+05				3.0900E-02	6.4890E-03		
023051	NA3	LAC				HAM	6120904003		1.9400E+07	3.0000E+05				2.4200E-02	4.8400E-03		
023051	NA3	LAC				HAM	6120904003		1.9600E+07	3.0000E+05				2.6000E-02	5.9800E-03		
023051	NA3	LAC				AEP	7930523006		1.7970E+07	2.7000E+05				1.9700E-02	1.3000E-03	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.7160E+07	3.8000E+05				2.0300E-02	1.3000E-03	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.6050E+07	4.3000E+05				1.9300E-02	1.2000E-03	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.4770E+07	2.5000E+05				1.7400E-02	9.0000E-04	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.4610E+07	2.1000E+05				1.6900E-02	9.0000E-04	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.4360E+07	1.5000E+05				1.6000E-02	8.0000E-04	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.3680E+07	3.5000E+05				1.4100E-02	7.0000E-04	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.3410E+07	1.6000E+05				1.3200E-02	7.0000E-04	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.2790E+07	2.9000E+05				1.1500E-02	7.0000E-04	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.2230E+07	1.4000E+05				1.0100E-02	6.0000E-04	1.1750E-01	3.0000E-03
023051	NA3	LAC				AEP	7930523006		1.1400E+07	8.0000E+05				5.3000E-03	7.0000E-04	1.1750E-01	3.0000E-03

NEUTRON DATA SERVICES FROM NEA DATA BANK

This cover illustrates the three formats now in use for answering user requests for experimental neutron data. These data are compiled and exchanged with the three other neutron data centres in "EXFOR" format, and stored at the Data Bank together with the CINDA bibliography in an integrated data base.

NEA Data Bank makes selective searches in this data base for users in its member countries, and supplies either listings structured as in EXFOR of data and associated comments (experiment description and bibliography) or data on tape in one of the computational formats shown on this cover, accompanied by a listing of comment information. NNDC (Brookhaven) supplies data in similar formats to its customers in USA and Canada.

Users are asked to specify their requests in as precise and selective a form as possible : this avoids the delay and expense of sending out quantities of data much larger than the requester really wants. Data sent out to users are accompanied by documentation or other explanation of the formats used, and a list will be sent on request of all the other files of neutron and non-neutron nuclear data, experimental or evaluated, available from the Data Bank.

RESONANCE PARAMETERS COMPUTATIONAL FORMAT

1 — INDEX — 22 — DATA COLUMNS — 132

ATOMIC No. Z	MASS No. A	LABORATORY	DATE	EXFOR No.	RESONANCE ENERGY	ERROR	PARITY	SPIN	MOMENTUM	TOTAL WIDTH Γ	ERROR $\Delta\Gamma$	FLAG	NEUTRON WIDTH Γ_n	ERROR $\Delta\Gamma_n$	FLAG	FISSION WIDTH Γ_f	ERROR $\Delta\Gamma_f$	FLAG	GAMMA WIDTH Γ_γ	ERROR $\Delta\Gamma_\gamma$	FLAG
026056	KFK	700	6203700	08	1.6900E+05	1.0000E+03			0				8.70E+02	7.00E+01							*
026056	KFK	700	6203700	08	1.9800E+05	1.0000E+03			0				3.43E+03	2.70E+02							*
026056	KFK	700	6203700	08	2.2000E+05	1.0000E+03			0				1.47E+03	8.50E+01							*
026056	KFK	700	6203700	09	2.2790E+04	7.0000E+01			1						G						*
026056	KFK	700	6203700	09	3.4250E+04	1.0000E+02			1						G						*
026056	KFK	700	6203700	09	3.6690E+04	1.1000E+02			1						G						*
026056	KFK	700	6203700	09	3.8360E+04	1.2000E+02			1						G						*
026056	KFK	700	6203700	09	4.6040E+04	1.4000E+02			1						G						*
026056	KFK	700	6203700	09	5.2260E+04	1.6000E+02			1						G						*
026056	KFK	700	6203700	09	5.3600E+04	1.6000E+02			1						G						*
026056	KFK	700	6203700	09	5.5300E+04	2.0000E+02			1						G						*
026056	KFK	700	6203700	09	5.9250E+04	1.8000E+02			1						G						*
026056	KFK	700	6203700	09	6.3450E+04	1.9000E+02			1						G						*
026056	KFK	700	6203700	09	7.2500E+04	5.0000E+02			1						G						*
026056	KFK	700	6203700	09	7.6900E+04	5.0000E+02			1				8.60E+00	6.00E-01	G						*
026056	KFK	700	6203700	09	8.0800E+04	3.0000E+02			1				1.80E+01	4.00E+00	G						*
026056	KFK	700	6203700	09	9.2600E+04	3.0000E+02			1				6.00E+00	2.00E+00	G						*
026056	KFK	700	6203700	09	9.6100E+04	3.0000E+02			1				5.00E+01	8.00E+00	G						*
026056	KFK	700	6203700	09	1.0240E+05	3.0000E+02			1				7.00E+01	1.20E+01	G						*
026056	KFK	700	6203700	09	1.0580E+05	3.0000E+02			1						G						*
026056	KFK	700	6203700	09	1.1260E+05	3.0000E+02			1						G						*
026056	KFK	700	6203700	09	1.5100E+05	1.0000E+03			1						G						*
026056	KFK	700	6203700	09	1.5300E+05	1.0000E+03			1						G						*
026056	KFK	700	6203700	09	1.6300E+05	1.0000E+03			1						G						*
026056	KFK	700	6203700	09	1.7940E+05	1.2000E+03			1						G						*
026056	KFK	700	6203700	09	1.8070E+05	1.2000E+03			1						G						*
026056	KFK	700	6203700	09	1.9510E+05	1.0000E+03			1				1.00E+02	2.40E+01	G						*