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************************** BIB-SECT

EFERENCE   (C,68WASH,2,885,6803) PR
            CONTRIBUTION.
           (P,EANDC(E)-89,37,6802)
           (J,NP/A,118,9,6805) FINA
            MEASUREMENTS.
UTHOR      (H.K.VONACH,F.G.VONACH,H
ITLE       -PRECISION MEASUREMENTS
            OF (N,P),(N,A) AND (N,2
            13.5 - 14.7 MEV NEUTRON
NSTITUTE   (2GERMUN)
-SOURCE    (D-T  ) BOMBARDMENT OF A
            DEUTERONS. A RANGE OF 1
            WERE USED BY VARYING TH
ACILITY    (VDG  ) 400KEV VAN DE GR
            FUR STRAHLENFORSCHUNG.
ETHOD      (ACTIV)  GAMMA PULSES EX
            TA-180M WHERE BETAS WER
ART-DET    (DG   ) DECAY GAMMAS.
AMPLE      .NATURAL MATERIALS. ME
            SAMPLES WERE PLACED A
            CORRESPONDING TO 30
            ENERGY, AND SUBTENDE
            DISTANCE OF 100MM
ORRECTION  .ANGULAR DEPENDENT NE
            ELASTICALLY SCATTERE
            SCATTERING CONTRIBUT
            DECAY CORRECTIONS.
RR-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.
ETECTOR    (NAICR) 5X5INCH WELL CRY
           (PROPC) CH4 FLOW COUNTER
            TA-180M.
TATUS      .FROM TABLES IN CONFERE
ISTORY     (781017C) PDJ. RECOMPILE
           (790219E)
           (800115A) REACTION STRIN
            022 AND 023 CHANGED.
           (800115E)
           (800424A) DATA HEADINGS
           (800603E)

END BIB-SECTION ******************

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EACTION    (23-V-51(N,A)21-SC-48,,S
            RATIO TO THE 14.7 MEV C
TATUS      .PUBLISHED TABLE.
ISTORY     (781018C) PDJ.
           (790219E)
           (800424A) DATA HEADINGS
           (800603E)

END BIB-SECTION ******************

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

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      EN          EN-ERR       DATA
     MEV          MEV         ARB-UNI

   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 *****************
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NNDEN/37

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NEA DATA BANK
BANQUES DE DONNÉES DE L'AEN

JANUARY 1986

NNDEN/37

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NEA DATA BANK
BANQUES DE DONNÉES DE L'AEN

JANUARY 1986

33719

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NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NNDEN/37

The Newsletter reports:

1. Evaluation work on particular nuclides.
2. Development of codes for nuclear model calculations, and other codes needed for nuclear data work.
3. Publications relevant to the neutron data field.

Contributions on evaluation activities and nuclear model codes have been received from:

		Page
BULGARIA	Institute of Nuclear Research and Nuclear Energy, Sofia	6
FEDERAL REP. OF GERMANY	KFK, Karlsruhe	7
FRANCE	CEN, Cadarache	9
	CEN, Bruyères-le-Châtel	10
GERMANY DEMOCRATIC REP.	Technische Universität, Dresden	12
INDIA	Reactor Research Center, Kalpakkam	13
ITALY	ENEA, Bologna	15
JAPAN	Nuclear Data Centre, JAERI	18
NETHERLANDS	ECN, Petten	20
PEOPLE'S REP. OF CHINA	Institute of Atomic Physics, Beijing	22
ROMANIA	Central Institute of Physics, Bucharest	23
UNITED KINGDOM	AERE, Harwell	24
	Nuclear Physics Laboratory, OXFORD	26
	AEE, Winfrith	27
USA	NNDC, Brookhaven	29
IAEA	Nuclear Data Section, Vienna	39
EFF (European Fusion File)	ECN, Petten	40
OECD/NEA	Data Bank, Saclay	
Brief Report on Optical Model Meeting		41
Joint Evaluated File (JEF)		42

The next issue of NNDEN has been scheduled for July 1986 and contributors are asked to send in their reports by 15th June 1986.

NEA Data Bank, December 1985

NEW EVALUATIONS A) COMPLETED
B) IN PROGRESS

NUCLIDE	DATA TYPE	ENERGY RANGE	PAGE A	PAGE B
1-H -1	MANY	10^{-5}eV-20MeV	37	
3-LI-6	MANY	10^{-5}eV-20MeV	18	
3-LI-6	MANY	10^{-5}eV-4MeV	37	
3-LI-7	MANY	10^{-5}eV-20MeV	18	
4-BE-9	MANY	10^{-5}eV-20MeV	18	
4-BE-9	MANY	10^{-5}eV-20MeV	37	
5-B -10	MANY	10^{-5}eV-20MeV		37
5-B -11	MANY			37
7-N -15	MANY			37
14-SI-NAT	MANY		12	
22-TI-48	(N,γ)	FAST	16	
24-CR-	(N,γ)	1KeV-8MeV	16	
24-CR-51	γ DECAY		27	
24-CR-52	MANY	1MeV-20MeV		37
24-CR-53	MANY	1MeV-20MeV		37
24-CR-NAT	(N,γ)	1KeV-8MeV	16	
26-FE-56	MANY	1MeV-20MeV		37
26-FE-NAT	MANY		12	
27-CO-59	MANY		24	
28-NI-	MANY			21
28-NI-58	MANY	1MeV-20MeV		37
28-NI-60	MANY	1MeV-20MeV		37
28-NI-NAT	(N,γ)	FAST	16	
29-CU-63	MANY		37	
29-CU-65	MANY		37	
30-ZN-65	γ DECAY		27	
34-SE-75	γ DECAY		27	
41-NB-93	MANY		12	
41-NB-93	MANY	1MeV-20MeV		26
42-MO-92-100	(N,NP)(N,P)		23	

NUCLIDE	DATA TYPE	ENERGY RANGE	PAGE A	PAGE B
44-RU-101	MANY		20	
44-RU-102	MANY			21
46-PD-107	MANY			21
63-EU-153	(N,γ)		27	
79-AU-197	MANY	10KeV-20MeV	37	
79-AU-197	(N,γ)			37
79-AU-198	DECAY		27	
90-TH-232	(N,2N)		13	
91-PA-231	(N,γ)(N,α)		27	
92-U -234	(N,γ)(N,α)		27	
92-U -235	(N,F)			37
92-U -235	MANY	10^{-5}eV-20MeV	19	
92-U -235	NU		11	
92-U -238	MANY	10^{-5}eV-20MeV	19	
92-U -238	NU		11	
92-U -238	(N,γ)(N,N')	UNRES.RESONANCES		7
92-U -238	(N,γ)(N,F)			37
92-U -239	T1/2(N,γ)		27	
94-PU-239	(N,F)			37
94-PU-239	(N,2N)	5MeV-17MeV		9
94-PU-239	(N,F)	30KeV-20MeV		9
94-PU-239	NU		11	
94-PU-239	(N,2N)		11	
94-PU-239	MANY	10^{-5}eV-20MeV	19	
94-PU-239	RES.PAR.			9
94-PU-240	MANY	10^{-5}eV-20MeV	19	
94-PU-241	RES.PAR.			9
94-PU-241	MANY	10^{-5}eV-20MeV	19	
94-PU-241	MANY	10^{-5}eV-20MeV	19	
95-AM-241	MANY	10^{-5}eV-20MeV	22	
95-AM-242M	T1/2		27	
95-AM-242M	MANY	RES,UNRES RESONNANCES		7
96-CM-248	MANY	10^{-5}eV-20MeV	19	
96-CM-249	MANY	10^{-5}eV-20MeV	19	
97-BK-249	MANY	10^{-5}eV-20MeV	19	
98-CF-249	MANY	10^{-5}eV-20MeV	19	

CONTRIBUTION A NNDEN 37

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Recent Publications

1. N.Janeva, N.Koyumdjieva, A.A.Lukyanov and S.Toshkov; Fluctuat. Factors On Average Cross Sections For Overlapping Resonances, Int. Conf. on Nuclear Data, Santa Fe, USA, May 1985.

2. V.V.Kolesov, A.A.Lukyanov, S.Toshkov and N.Janeva; Multilevel Analysis Of Pu-239 Neutron Cross Sections In The Resolved Resonance Region, Int. Conf. on Nuclear Data, Santa Fe, USA, May 1985.

3. A.A.Lukyanov, N.Janeva; Average Neutron Cross Sections in the Region of Interfering Resonances, Sov. Nuclear Physics.

4. A.A.Van'kov, S.Toshkov, V.F.Ukraintzev, N.Janeva; Method for Analysing Transmission Functions and Neutron Cross Sections o: Heavy Nuclides in the Unresolved Resonance Region, JINR, Dubn 3-84-848, 1984.

Work recently completed

1. A Code for Monte-Carlo Modelling of Fissile Nuclei Neutron Cross Sections.

2. Multilevel Parametrization of Fissile Nuclei Resonance Cross Sections.

Work in progress

Precise Measurement of U-235 "alpha" value in the Thermal Neutron Energy Point.

Contribution to NNDEN-37

KfK KARLSRUHE

GERMANY

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Kernforschungszentrum Karlsruhe
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D-7500 Karlsruhe, West Germany

Work recently completed

- The KEDAK-4 documentation has been completed and issued as a KfK report, see Ref. 1.
  (B. Goel, B. Krieg)

- The problem of cross section fluctuations in the context of self-shielding and width fluctuation factors for resonance-averaged cross sections was restudied. The maximum-entropy distributions of S- and R-matrix elements for a given average S-matrix (given transmission coefficients) have been found to be the Poisson kernel in the domain of symmetric unitary matrices (S) and a generalized t-distribution in the space of real symmetric matrices (R). Exact cross sections calculated as averages over these distributions were compared with those from the heuristic approximations deduced by Moldauer and by Hofmann, Richert, Tepel and Weidenmüller from Monte Carlo results. First reports on this work were given in Refs. 2 and 3.
  (F.H. Fröhner)

- The improvements in neutron data for actinides and fission products, achieved in a worldwide effort during the last ten years, has been reviewed with special emphasis on the minor actinides. Remaining discrepancies and data requirements are stated (Ref. 4).
  (H. Küsters)

Work in progress

- The KEDAK evaluation of ^{242m}Am is being updated in the resolved and unresolved region so as to be consistent with recent resonance data from Livermore.
  (F.H. Fröhner, B. Krieg)

- Work is under way on capture and inelastic scattering of ^{238}U in the unresolved resonance region, including self-shielding studies. In this context the new methods recently developped at Karlsruhe and Heidelberg (see Ref. 3) for unresolved resonances are implemented in

computer programs, in particular the GOE triple integral for partial cross sections, the R-matrix distribution for Monte Carlo sampling and the DOBRO method (Refs. 5, 6) for temperature-dependent self-shielding. (F.H. Fröhner, E. Stein)

References

1. B. Goel, B. Krieg, "Status of the Nuclear Data Library KEDAK-4, October 1984", Report KfK 3838 (February 1985)

2. F.H. Fröhner, "Information Theory Applied to Unresolved Resonances", Proc. Internat. Conf. on Nucl. Data for Basic and Applied Sci., Santa Fe, May 1985, to be published in Radiation Effects (preprints available on request)

3. F.H. Fröhner, "Treatment of the Unresolved Resonance Region", Proc. Internat. Seminar on Nucl. Data, Cross Section Libraries and their Application in Nucl. Technol., Bonn, 1-2 Oct., 1985, to be published (preprints available on request)

4. H. Küsters, "Nuclear Data for the Nuclear Fuel Cycle", Proc. Internat. Seminar on Nucl. Data, Cross Section Libraries and their Application in Nucl. Technol., Bonn, 1-2 Oct., 1985, to be published (preprints available on request)

5. F.H. Fröhner, "New Techniques for Multi-Level Cross Section Calculation and Fitting", Proc. Conf. on Nuclear Data Evaluation Methods and Procedures, Brookhaven, 1980, BNL-NCS-51363 (1981) vol. I, p. 375; separately issued as report KfK 3081 (1980)

6. F.H. Fröhner, "Two Fast Methods for Doppler Broadening of Nuclear Cross Sections - SIGMA1 and DOBRO", internal report 01.02.03 P03A (1983), available on request

Contribution to NNDEN 37

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Department of Fast Breeders
Laboratory of Physics Studies
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France

WORK IN PROGRESS

- Re-evaluation of ^{239}Pu resonance parameters by analysis of transmission data obtained by ORNL (H. DERRIEN)
- Evaluation of ^{241}Pu resonance parameters (H. DERRIEN)
- Implantation of BENZI's code to calculate (α,n) intrinsic neutron sources (N. CAUMETTE)
- Analysis of ^{239}Pu fission cross section in the range 30 KeV-20 MeV (E. FORT, M. ANGRAND)
- Improved calculation on ^{239}Pu in the range 5 MeV-17 MeV. Adjustment of (n,2n) calculated cross section on integral datum obtained in PHENIX core (E. FORT, P. LONG)
- Benchmark testing of JEF-1 primary actinides on fundamental mode integral data (E. FORT, J.P. DOAT)
- Modification of S12N version 2 code in view of (n,4n) cross section calculation capability (E. FORT, P. LONG)

WORK PLANNED FOR THE NEAR FUTURE

- Continuing activity of ^{239}Pu, ^{241}Pu resonance parameters evaluation (H. DERRIEN, P. LONG)
- Complete reevaluation of ^{239}Pu from 30 Kev-20 Mev (E. FORT, P. LONG)
- Continuing activity on JEF-1 primary actinides benchmarking (E. FORT, P. LONG)

PUBLICATIONS

- State of Art on ^{239}Pu resonance parameters.
  H. DERRIEN - Review paper, SANTE FE Conference (May 1985).
- A methodology to calculate (n,xn) cross section.
  E. FORT - Contributed paper, SANTE FE Conference (May 1985).

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Centre d'Etudes de Bruyères-le-Châtel
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Work recently completed and publications :

- Cross sections and analyzing powers for fast neutron scattering to the ground and first excited states of ^{58}Ni and ^{60}Ni .
  P.P. GUSS*et al., Nucl. Phys. A438, (1985) 187 .
- Nucleon-induced excitation of collective bands in ^{12}C,
  A.S. MEIGOONI** et al., Nucl. Phys. A455 (1986) 304 .
- Collective excitations of ^{194}Pt in low energy Neutron Scattering,
  M.C. MIRZAA**** et al., accepted for publication in Phys. Rev. C .
- Coupled-channel analysis of nucleon scattering from ^{40}Ca up to 80 MeV,
  G.M. HONORE* et al., accepted for publication in Phys. Rev. C .
- Giant resonance coupling and ℓ - dependent potentials for ^{16}O,
  J.P. DELAROCHE et al., submitted to Phys. Rev.C .
- Partial Kerma factors for neutron interactions with ^{12}C at $20 \leq E_n \leq 65$ MeV,
  R.W. FINLAY** et al., Nucl. Inst. Meth. in Phys. Research B10/11 (1985) 396 .
- Nuclear Deformation of ^{24}Mg, ^{28}Si and ^{32}S from fast neutron scattering,
  G. HAOUAT et al., Phys. rev. C 30 (1984) 1795 .
- Feedback of Dispersion Relations plus giant resonances on Nucleon elastic scattering from ^{40}Ca ,
  J.P. DELAROCHE et al., Osaka Conf. Aug. 1985 .
- Energy Dependence of the Local Optical Potential for neutron - Nucleus Scattering,
  J.P. DELAROCHE et al., Glouster Conf., Sept. 1984 .

.../..

- The Imaginary part of the spin - orbit Interaction for Neutron Nucleus Scattering,
  R.L. WALTER* et al., Glouster Conf. Sept. 1984 .

- Nucleon Induced Excitation of $K^{\pi} = 0_1^+, 0_2^+, 1^-, 3^-$ Bands in ^{12}C .
  A.S. MEIGOONI** et al., Glouster Conf. Sept. 1984 .

- Toward a Theory of Inelastic Scattering from soft Nuclei,
  J.P. DELAROCHE and F.S. DIETRICH***, submitted to Phys. Rev. C .

- Optical Model Description of the Neutron Interaction with ^{116}Sn and ^{120}Sn over a wide energy range,
  P.P. GUSS* et al. , to be submitted to Phys. Rev. C .

- Mesure et évaluation de la section efficace ^{239}Pu (n,2n) , Santa Fé, New Mexico, USA , Nuclear Data for Basic and Applied Science, 13,17/5/85
  J. FREHAUT, C.A. PHILIS, A. BERTIN, R. BOIS .

- Evaluation de $\bar{\nu}_p$ pour ^{235}, ^{238}U et ^{239}Pu,
  J. FREHAUT, Note PTN-647/85 du 24.10.85 .

<u>Work in Progress</u> :

- Energy dependences of the optical model for $\vec{n}^+ + {}^{54,56}Fe$ and $\vec{n}^+ + {}^{58,60}Ni$ up to 30 MeV ,
  J.P. DELAROCHE et al.

- Spectres des particules émises dans une réaction à trois corps en voie de sortie ,
  O. BERSILLON .

- Transformation cinématique des spectres continus ,
  O. BERSILLON .

* Duke University USA
** Ohio University USA
*** Lawrence Livermore National Laboratory USA
**** Phys. Depart. Yarmok Univ. IRBID Jordanie

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The following evaluations were recently included in INDL/V(85) of the IAEA Nuclear Data Section:

MAT/Rev.	nuclide	documentation
INDL/V-1415 Rev.1	14-Si-nat	INDC(GDR)-20 (1982)
INDL/V-2640 Rev.1	26-Fe-nat	in coop. with FEI Obninsk, YK 36(1) (1980)
INDL/V-4110 Rev.1	41-Nb-93	KE 20 166 (1977)
INDL/V-4111 Rev.2	same, supplemented by V. Goulo	

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Work recently completed and main results:

- Integral validation of capture and fission cross section by analyses of THOR assembly, in fission source energy range. The analyses showed that JENDL-1, ENDF/B-IV, ENDL/84, ENDF/B-V, INDL/A-83,and FRENCH(1969) overpredict capture by about 10 to 50%. The INDIAN and JENDL-2 files are consistent, within error bars. Based on this analyses it was also decided that fission cross sections of Meadows(1983) will be adapted in Indian file.

- Integral validation of (n,2n) cross sections for Th-232 was carried out using analyses of central spectral indices measured in center of THOR assembly. The preliminary indication is that JENDL-2 file is consistent whereas all other files overpredict $\sigma_{n,2n} / \sigma_f$ ratio for Th-232 corresponding to the flux at core center of THOR assembly.

- Calculations of displacement damage cross sections were successfully made for the flux spectrum of a small fast reactor for axial and radial locattions in the core.

- A compilation of details of specific integral experiments and measured integral values of parameters including uncertainties for benchmark testing for Th-232 and U-233 has been made.

- Effective one group cross sections for various actinides have been calculated using core-centre and core-boundary flux spectra of a small fast reactor assembly.

Work in Progress:

- The program EVGRP for processing photonic production data under ENDF/B format is being commissioned.

- The possible use of available experimental information in the blanket region of THOR assembly is being explored for validation of capture and fission cross sections in the energy region which are appropriate to the spectrum in the blanket region. Errors in U-238 cross sections and fluxes in blanket will influence the interpretation by additional errors as compared to the more definite validation using measurements at core center.

Publications:

1. S. Ganesan et al.,
   "Problems and Experiences in Nuclear Data Processing in Developing Countries,"
   Progress in Nuclear Energy, 14, 301 (1984).

2. S. Ganesan et al.,
   "Effect of Interpolation Error in Pre-processing On Self Shielding Factors and Their Temperature Derivatives," Paper presented in the International Conference on Nuclear Data for Basic and Applied Science during May 12-17, 1985 at Santa Fe, New Mexico, U. S. A. (To appear in RADIATION EFFECTS

3. S. Ganesan et al.,
   "A Programme of Evaluation, Processing and Testing Of Nuclear Data for Th-232 and U-233," Paper presented in the International Conference on Nuclear Data for Basic and Applied Science during May 12-17, 1985 at Santa Fe, New Mexico, U. S. A. (To appear in RADIATION EFFECTS)

4. S. Ganesan,
   "Status Report", Paper presented at the Research Coordination Meeting of IAEA held in Varna, Bulgaria, during 14-16 October, 1985.

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Divisione Fisica e Calcolo Scientifico
Dipartimento Tecnologie Intersettoriali di Base
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Names: V. Benzi, C. Costa, F. Fabbri, G. Longo, G. Maino, E. Menapace, A. Mengoni, G.C. Panini, M. Pescarini, G. Reffo, M. Rosetti, F. Saporetti, M. Vaccari.

Publications

1) G. Longo, F. Fabbri, "Production of High-Energy Photons in Fast Neutron Radiative Capture", Int. Conf. on "Nuclear Data for Basic and Applied Science", S. Fe, N.M.(USA), May 13-17, 1985, to be published.

2) G. Reffo, "Summary Talk on Evaluation and Theory", Int. Conf. on "Nuclear Data for Basic and Applied Science", S. Fe, N.M.(USA), May 13-17, 1985, to be published.

3) G. Reffo, F. Fabbri, "Neutron Capture in the Frame of the Unified Exciton Model", 4th Int. Conf. on Nuclear Reaction Mechanisms, Varenna, June 10-15, 1985, to be published.

4) G. Maino, E. Menapace, "Energy and Parity Dependence on Nuclear Level Densities for Structural Materials", Proceed. of Int. Conf. on Nuclear Data for Basic and Applied Science, S. Fe, N.M.(USA), May 13-17, 1985, and Radiation Effects, to be published.

5) G. Maino, "BCSTO: un codice FORTRAN per calcoli Nilsson-Bardeen-Cooper-Schrieffer", ENEA report RT/TIB(85)3, February 1985.

6) A. Mengoni, F. Fabbri, G. Maino, "Evaluation of Gamma-Ray Production Cross Sections and Spectra for Neutron-Induced Reactions on Chromium", to be published.

7) M.G. Borgia, G.C. Panini, M. Pescarini, "Comparison between EURLIB-4 and VITAMIN-C Libraries with respect to a Shielding Reference Problem",to be published.

8) F. Fabbri, M. Pescarini, "MESHDOSE: un programma per il calcolo di dose a partire dal processamento di dati nucleari col sistema AMPX-II", RTI/TIB(85)29.

9) G.C. Panini, "Highlights of the ENDF-6 Format", to be published.

WORK IN PROGRESS OR RECENTLY COMPLETED

I. Models and Methods

Nuclear Structure Models

a) Particle-hole configurations have been counted by combinatorial calculation method. Single particle orbitals are calculated in the frame of Nilsson model and total configuration energy are deduced from BCS calculations. The method seems to cast some light on the problems of determining spin and parity distribution on yrast lines as well as on the problem of exciton dependent pairing correction.

b) Energy and parity distributions of nuclear excited states have been investigated in the framework of the Nilsson-BCS formalism for nuclei in the mass range $48 \leq A \leq 65$.

II. Nuclear Reactions

a) Preequilibrium

The neutron capture problem has been investigated in the frame of the unified exciton model with the inclusion of total angular momentum conservation.
Results have been compared with the ones from direct semidirect model. The more general validity of the pre-equilibrium picture as well as the necessity of refinements clearly appear.

b) Direct Semidirect Capture Model

The differential cross sections for the production of high-energy gamma-rays (10-50 MeV) due to radiative capture of fast neutron by Ti-48 and Ni are calculated by means of DSD model.

III. Evaluation

Gamma-ray production cross sections and spectra are estimated for the Chromium isotopes and the elemental Chromium in the energy range between 1 keV-8 MeV.

IV. Activity in Nuclear Data Management and Processing

a) The THEMIS code for nuclear data processing has been successfully implemented at Bologna Center and used to process some JEF-1 materials in view of group data libraries for fast reactor project and benchmark purposes.

b) A part of the VITAMIN-J library is being processed by THEMIS in the framework of the GEFF-1 project for fusion group libraries.
The processing will deal with the neutron data of 12 materials and the photon data of all materials of interest in the fusion field. The sources of the data are EFF-1 and JEF-1.

c) Work is in progress to implement the ACER module of NJOY for the production of libraries for the MCNP Montecarlo code.

d) The following group libraries have been prepared:

1 - For the KIM Montecarlo code, using the code systems FOURACES+PROKIM, in order to check the efficiency of the neutron counters of the experimental assembly at Medicina ENEA Laboratory.

2 - Fissile data in the 620 group SAND-II structure for activation calculations.

3 - Activation cross sections for shielding calculation in the concrete of the PEC facility.

Japanese Nuclear Data Committee
(Nuclear Data Center, JAERI)

Work Recently Completed and Publications:

(i) Neutron Nuclear Data of ^{7}Li Adopted in JENDL-2
Keiichi SHIBATA

(JAERI-M 84-163(1984))

Neutron nuclear data of ^{7}Li were evaluated for JENDL-2 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, (n,γ), (n,n')αt reaction cross sections and the angular distributions of neutrons. The present evaluation was completely based on available experimental data.

(ii) Neutron Nuclear Data of ^{9}Be Adopted in JENDL-2
Keiichi SHIBATA and Kimihiro IOKI

(JAERI-M 84-165(1984))

Neutron nuclear data of ^{9}Be were evaluated for JENDL-2 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic scattering, (n,2n), (n,γ), (n,p), (n,d), (n,t) and (n,α) reaction cross sections and the angular and energy distributions of emitted neutrons. The present evaluation was completely based on available experimental data.

(iii) Evaluation of Neutron Nuclear Data of ^{6}Li for JENDL-3
Keiichi SHIBATA

(JAERI-M 84-198(1984))

Neutron nuclear data of ^{6}Li have been evaluated for JENDL-3 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, radiative capture, photon-production, (n,2n), (n,p) and (n,α) reaction cross sections and the angular and energy distributions of secondary neutrons. The total, elastic scattering and (n,α) cross sections below 1 MeV have been calculated on the basis of the R-matrix theory. Two discrete levels were taken into account for the inelastic scattering. The double-differential cross sections for the (n,2n) reaction and the inelastic scattering to the continuous levels were obtained from the phase-space model calculations.

(iv) Evaluation of Neutron Nuclear Data of ^{7}Li for JENDL-3
Keiichi SHIBATA

(JAERI-M 84-204(1984))

Neutron nuclear data of ^{7}Li have been evaluated for JENDL-3 in the energy range from 10^{-5} eV to 20 MeV. Evaluated quantities are the total, elastic and inelastic scattering, radiative capture, photon-production, (n,2n), (n,d) and (n,n')αt reaction cross sections and the angular and energy distributions of secondary neutrons. For the inelastic scattering two discrete levels were taken into consideration. The energy-angle distributions of neutrons from the

inelastic scattering to continuum and the (n,2n) reaction were calculated with the three-body phase-space model.

(v) Evaluation of Neutron Nuclear Data of ^{241}Pu for JENDL-2
Yasuyuki KIKUCHI and Nobuo SEKINE

(JAERI-M 84-111(1984))

Neutron nuclear data of ^{241}Pu were newly evaluated for JENDL-2. Evaluated quantities are the total, elastic and inelastic scattering, fission, capture, (n,2n), (n,3n) and (n,4n) reaction cross sections, the resolved and unresolved resonance parameters, the angular and energy distributions of emitted neutrons, and the average number of neutrons emitted per fission. The simultaneous evaluation method was adopted for the fission cross section so as to keep the consistency among the main fissile and fertile material nuclides. The theoretical calculations based on the spherical optical model and the statistical model were also used, when the experimental data were not sufficient. Discussion is given on the evaluation method.

(vi) Evaluation of Neutron Nuclear Data for ^{248}Cm and ^{249}Cm
Yasuyuki KIKUCHI and Tsuneo NAKAGAWA

(JAERI-M 84-116(1984))

Neutron nuclear data of ^{248}Cm and ^{249}Cm have been evaluated. Evaluated quantities are the total, elastic and inelastic scattering, fission, capture, (n,2n), (n,3n) and (n,4n) reaction cross sections, the resolved and unresolved resonance parameters, the angular and energy distributions of the emitted neutrons, and the average number of neutrons emitted per fission. The fission cross section of ^{248}Cm was evaluated mainly on the basis of measured data and that of ^{249}Cm was estimated from the systematic trends. The other cross sections were calculated with the optical and statistical models because of scarce measured data.

Work in Progress:

(i) Evaluation of neutron nuclear data for ^{249}Bk and ^{249}Cf is in progress in the energy range from 10^{-5} eV to 20 MeV.

(from Y. Kikuchi, JAERI)

(ii) Simultaneous evaluation of ^{235}U, ^{238}U, ^{239}Pu, ^{240}Pu and ^{241}Pu is in progress. The covariance data were estimated from the partial errors given by the experimenters.

(from T. NAKAGAWA, JAERI)

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December 10, 1984

NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

ECN-PETTEN, THE NETHERLANDS

1. Names

H. Gruppelaar, H.A.J. van der Kamp, A.J. Janssen, R.J. Heijboer, J.M. Akkermans, D. Nierop and Shi Xiangjun (visiting scientist), Netherlands Energy Research Foundation (ECN), P.O. Box 1, 1755 ZG Petten, The Netherlands. Telephone: 02246-4083, telex: 57211 REACP NL.

2. Recent publications and reports

[1] H. Gruppelaar and J.M. Akkermans, The GRAPE Code System for the Calculation of Precompound and Compound Nuclear Reactions - GRYPHON code description and manual, ECN-164 (1985).

[2] H. Gruppelaar and J.M. Akkermans, A New Code System for the Calculation of Double Differential Reaction Cross Sections, Invited talk at the Int. Conf. on Nuclear Data for Basic and Applied Science, May 1985, Santa Fe, NM.

[3] J.M. Akkermans and H. Gruppelaar, Analysis of Continuum Gamma-Ray Emission in Precompound-Decay Reactions, Phys. Lett. 157B (1985) p. 95.

[4] J.M. Akkermans and H. Gruppelaar, Comments on the State Densities and the Transition Rates in the Pre-Equilibrium Exciton Model, Z. Phys. A - Atoms and Nuclei 321 (1985) p. 605.

[5] J.M. Akkermans, The Pre-Equilibrium Hybrid and Exciton Models Revisited, Contr. Int. Conf. on Nuclear Data for Basic and Applied Science, May 1985, Santa Fe, NM.

[6] H. Gruppelaar, Present Status of the European Fusion File, Inv. paper Int. Semi. on Nuclear Data, Cross Section Libraries and their Applications in Nuclear Technology, Bonn, Oct. 1985.

[7] H. Gruppelaar, R.J. Heijboer, A.J. Janssen, H.A.J. van der Kamp, N. Karouby-Cohen, L. Martin-Deidier, G. Rimpault and M. Salvatores, Integral Test of Fission-Product Cross Sections, Contr. Int. Conf. on Nuclear Data for Basic and Applied Science, May 1985, Santa Fe, NM; extended ECN-report in press.

[8] H. Gruppelaar, D. Nierop and J.M. Akkermans, Processing of double-differential cross sections in the new ENDF-VI format - GROUPXS code description and users' manual -, ECN-report in press.

[9] P.E. Hodgson, G.M. Field, H. Gruppelaar and P. Nagel, Pre-Equilibrium Processes in Nuclear Reactions, Inv. paper Int. Conf. on Nuclear Data for Basic and Applied Science, May 1985, Santa Fe, NM, extended review paper has been submitted to Rev. Nuovo Cim.

[10] H.A.J. van der Kamp and H. Gruppelaar, Evaluation of neutron cross sections for ^{101}Ru (RCN-4 data library), ECN-85-129, available upon request.

3. Work recently completed

- Precompound-model studies: [1-5,9,10].
- Preliminary release of EFF-1 file [6].
- Revision of lead continuum cross sections [6].
- Third phase of integral-data test JEF-1 fission-product file (cooperation CEA-Cadarache) [7].
- Documentation Ru-101 evaluation [10].
- Investigation of spin effects in exciton models.

4. Work in progress

- Unified precompound and compound-model study.
- Fourth phase of integral-data test JEF-1 fission product file (cooperation CEA-Cadarache).
- Evaluations of Pd-107, Ru-102, Ni-isotopes.
- Activation cross sections for fusion reactors.

5. Computer codes

- GRAPE system [1]: available from NDB.
- GROUPXS code [8]: available for EFF users.

PEOPLE'S REPUBLIC OF CHINA

Names: Gu Fuhua, Yu Baosheng, Shi Xiangjun, Zhuang Jingshang, Liu Guisheng, Zhou Delin

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Within the IAEA Co-ordinated Research Programme on the Validation and Benchmark Testing of Actinide Nuclear Data, a new evaluation of Am-241 in ENDF/B-4 format was sent to the IAEA Nuclear Data Section.

The following partial evaluations from CENDL (Chinese ENDL) were included in INDL/V of the IAEA Nuclear Data Section.

CENDL MAT-Nr.	Nuclide	No. of records	Lab. **)	Year	Author	E-min (up to 20MeV)	INDL/V MAT-Nr.
1000	5-B-10	2445	Qinghua	1982	Qi H.C. et al	0.0253eV	0540
1060	12-Mg-nat	5118	BJG	1983	Taug Guo-You	0.0253eV	1210
1070	14-Si-nat	4118	BJG	1983	Shi Zhao-Min	0.0025eV	1415
1200	40-Zr-nat	4598	Se-Chuan	1983	Zhou Yi Ming et al	1 keV	4010
1600	79-Au-197	1696	LNZ	1983	Feng Gia-Zhen	5 keV	7910
1800	73-Ta-181	1316	LNZ	1982	Yao Li-Shan	1 keV	7310
1900	42-Mo-nat	865	Nanjing	1983	Liu Sheng-Kang	1 keV	4210
7809	82-Pb-nat	1116	Se-Chuan	1978	Cao Jian-Hua et al	1 keV	8209
7810	74-W-nat	366	Se-Chuan	1978	Ma Gong-Gui et al	1 keV	7410
7813	92-U-235	805	CNDC	1978	Yu-Bao-Sheng et al	1 keV	9220
7814	92-U-238	1312	CNDC	1978	Chou You-Pu et al	10^{-5} eV	9290
7815	94-Pu-239	625	CNDC	1978	Liang Qi-Chang et al	1 keV	9415

**) BJG — Peking University, Beijing
CNDC — Chinese Nuclear Data Centre, Beijing
LNZ — Lanzhou University
Nanjing — Nanking University
Qinghua — Qinghua University
Se-Chuan — Se-Chuan University

ROMANIA

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The reactions (n,np), (n,p), (n,d) on 42-Mo-92, 94, 95, 96, 97, 98, 100 were evaluated and included in INDL/V of the IAEA Nuclear Data Section under the MAT-numbers 4222 to 4229. (Report NP-28-1983).

Contribution to Neutron Nuclear Data Evaluation Newsletter from Nuclear Physics Division, AERE, Harwell

Calculation of ^{59}Co Cross Sections using GNASH and Comparisons with Previously Published Results

(D. W. Muir)*

The pre-equilibrium, statistical nuclear-model code GNASH[1] was obtained from the code authors and implemented on the CRAY-1 at AERE Harwell. Also obtained were files containing the Wapstra-Audi-Bos 1982 ground-state mass tables and a special nuclear-structure table (level energies, spins, gamma-ray branching ratios) in the format required by the GNASH code. Also implemented was the small code TCCALS[2], which calculates particle transmission coefficients from input nuclear optical-model parameters and stores them in the GNASH format. Several test problems were executed to verify that GNASH and TCCALS were operating correctly. GNASH and TCCALS were then combined into a single program[5] to facilitate calculations with a variety of different optical-model parameter sets. TCCALS was generalized slightly to allow the code user to include terms of the form

$$aA + bA^2 + cA^3 + d(N - Z)A^{-1} + eZA^{-1/3}$$

in the specification of either well depths or geometrical parameters (i.e., nuclear radius and diffuseness), by simply giving the associated coefficients a through e. This new feature should be very helpful in applying global optical-model sets over a range of nuclei. An existing feature of TCCALS which permits the specification of well depths which are functions of the centre-of-mass energy ε,

$$V(\varepsilon) = V_0 + a\varepsilon + b\varepsilon^2 + c \log(\varepsilon)$$

was changed to allow the code user alternatively to supply a set of coefficients which apply to the laboratory energy E. (Most published coefficients apply to E).

After the completion of the implementation and these minor improvements, GNASH was applied to the calculation of the cross sections of all energetically possible neutron-induced reactions on ^{59}Co, for incident neutron energies from 6 to 18 MeV. These results were compared with a similar calculation[3] using an earlier version of GNASH by E. Arthur, P. Young and W. Matthes (AYM). Also included in the comparison were the recent calculations[4] on this same target nucleus performed by D. Wilmore and P. E. Hodgson (WH). Both the AYM and the WH optical-model parameter sets were employed at various stages of the present calculations.

In the calculations using AYM parameters, not surprisingly, good agreement is obtained with the earlier AYM results. There is a slight tendency for the earlier results to show a stronger pre-equilibrium effect than the present calculations. This trend is presently being examined in more detail. The present calculations with the WH parameters are generally quite similar to those with the AYM parameters. As expected, the GNASH calculations with the WH optical parameters are different from the results in Ref. (4) at high energies (above about 12 MeV), because the GNASH calculations include a pre-equilibrium correction, and those in Ref. (4) do not.

*On attachment from Los Alamos National Laboratory

References

(1) E. D. Arthur and P. G. Young, "GNASH: A Pre-equilibrium, Statistical Nuclear-Model Code for Calculation of Cross Sections and Emission Spectra", Los Alamos National Laboratory report LA-6947 (1977).

(2) P. G. Young, private communication. TCCALS basically consists of the optical-model portion of the COMNUC program, adapted to the needs of GNASH.

(3) E. D. Arthur, P. G. Young and W. K. Matthes, "Calculation of ^{59}Co Neutron Cross Sections between 3 and 50 MeV", Symp. on Neutron Cross Sections from 10 to 50 MeV, Upton, N.Y. USA U.S. Department of Energy report DOE/NDC-21/L (1980), pp.751-768.

(4) D. Wilmore and P. E. Hodgson, "Neutron Scattering and Reactions from 1 to 20 MeV", Atomic Energy Research Establishment, Harwell, report AERE-R 11439. A shortened version of this work will be published in Journal of Physics G.

(5) D.W. Muir, "Implementation of GNASH..." AERE R 11877 (July 1985).

Neutron Nuclear Data Evaluation Newsletter
December 1985

NUCLEAR PHYSICS LABORATORY, OXFORD U.K.
P.E. HODGSON

Publications

1. **The Neutron Optical Potential.** By P.E. Hodgson. Reports in Progress in Physics **47**, 613, 1984. A comprehensive review of present knowledge.
2. **The Phenomenological Neutron Optical Potential: Fine Structure Aspects** By P.E. Hodgson. Proceedings of the AIP Conference 124 on Neutron-Nucleon Collisions (Ohio 1984), 1, 1985.
3. **The Inelastic Scattering of Neutrons by ^{238}U.** By P.E. Hodgson and A.M. Kobos. Nuclear Science and Engineering, **89**, 111, 1985.
4. **The Inelastic Scattering of Neutrons by ^{232}Th.** By A.M. Street and P.E. Hodgson. To be published in Nuclear Science and Engineering.
5. **Neutron Scattering and Reactions on ^{59}Co from 1–20 MeV.** By D. Wilmore and P.E. Hodgson. J.Phys.G. **11**, 1007, 1985.
6. **Pre-Equilibrium Processes in the Reactions of Neutrons on ^{59}Co and ^{93}Nb.** By G.M. Field, R. Bonetti and P.E. Hodgson. To be published in J.Phys.G.
7. **Pre-Equilibrium Processes in Nuclear Reactions.** By P.E. Hodgson, G.M. Field, H. Gruppelaar and P. Nagel. Invited paper to Santa Fe Conference (May 1985). This reviews both the exciton and the quantum-mechanical theories.
8. **The Interactions of Neutrons with ^{59}Co.** By P.E. Hodgson. Invited paper presented to the 4th Intenational Conference on Nuclear Reaction Mechanisms, Varenna, 1985.
9. International Nuclear Model Code Comparison Study of the Spherical Optical Model for Charged Particles. By P.E. Hodgson and E. Sartori. Nuclear Data Bank Publication NEANDC-198-U. INDC (NEA) 5, 1985. This work includes a neutron comparison.

Work in Progress

1. **Neutron Scattering and Reactions on ^{93}Nb from 1–20 MeV.** By D. Wilmore and P.E. Hodgson.
2. **Weisskopf-Ewing Calculations of Neutron Reactions.** By S. Ait-Tahar and P.E. Hodgson. The cross-sections of neutron reactions on ^{56}Fe and ^{208}Pb are being compared with Weisskopf-Ewing calculations. The aim is to find a simple yet accurate way of calculating many neutron cross-sections.
3. **Intercomparison of THRES-F and Weisskopf-Ewing Codes** By P.E. Hodgson. Neutron cross-sections calculated with the THRES-P codes of L. Giancarli and H. Gruppelaar and the CADE (Weisskopf-Ewing) code of D. Wilmore are being compared with each other and with experimental data. The preliminary comparisons are being made for neutron reactions on ^{59}Co and ^{93}Nb from 1–20 MeV.
4. **Pre-Equilibrium Processes in Nuclear Reaction Theory: State of the Art and Beyond.** By H. Gruppelaar, P. Nagel and P.E. Hodgson. This is a more detailed version of the paper presented to the Santa Fe conference.

P.E. Hodgson
October 1985

AEE Winfrith

Compiled by R W Smith

1 Nuclear Data Evaluation and Validation

1.1 Fission Product Yields (M F James, P S Whitworth, J Banai)

The new libraries of fission yields, C4U and C4A, have been tested and compared with other sets in decay heat calculations, and a draft report issued on the results. Yields for 14 MeV fission have been added, and some errors found and corrected.

1.2 IAEA Co-ordinated Research Program on Transactinium Decay Data (A L Nichols)

The published data for specific actinides have been critically evaluated. The nuclides and evaluated decay parameters are as follows:

Pa-231:	gamma-ray emission probabilities and alpha-particle emission probabilities
U-234:	half-life, gamma-ray emission probabilities and alpha-particle emission probabilities.
U-239:	half-life and gamma-ray emission probabilities
Am-242m:	half-lives

Extensive and complex decay schemes were produced during the evaluation of the data for Pa-231 and U-239. This work will be published as part of an international programme in the form of an IAEA report.

1.3 Other Gamma Decay Data (A L Nichols)

The gamma-ray decay data for Cr-51, Zn-65, Se-75 and Au-198 are being assessed. These evaluations will assist the IAEA in establishing data files on x-ray and gamma-ray standards for detector calibration.

1.4 Few Group Capture Cross Sections of Eu-153 in FISPIN (R W Smith)

An in-depth review of the three group (thermal, resonance and fast) capture cross sections of Eu-153 as used in FISPIN, has been completed for MAGNOX and PWR fuels. Error estimates have been derived by comparing calculated values with an evaluation of all available experimental data.

1.5 **Benchmark Testing of the JEF-1 Library** (Mrs C R Eaton, C J Dean and M J Grimstone).

Benchmark testing of this library has continued. The 71-group version of the library provided by the NEA Data Bank has been used in calculations with the MURAL code for a number of zero leakage systems. These included the Zebra 8 series of plate cells and a series of PROTEUS pin lattices containing PuO_2 + UO_2 fuel and steel. Some intermediate spectrum systems have been examined as possible benchmarks, and have been calculated with the 71 group data, although it is recognised that this data set is not suitable for the treatment of these systems in its present form. Further benchmark tests of this data set have also been carried out on spherical homogeneous representations of fast critical assemblies.

1.6 **Cross Section Processing Codes**

1.6.1 **REMO** (R W Smith)

The code REMO (a version of SIGAR7 with a multi-channel fission Reich Moore option) has been used to process resonance parameter data (for Ni60 and Pu241) supplied by the IAEA. The results in the form of σ/E files at 0^0A have been forwarded to Vienna as the UK contribution to this IAEA International Intercomparison Exercise.

1.6.2 **NJOY** (C J Dean and Mrs C R Eaton)

The latest version of NJOY has been successfully implemented on the CRAY computer at AERE Harwell. By using the Update facility Fortran and other changes to the reference version of the program (in this case 6/83) originating from Los Alamos, NEA, AERE Harwell and AEE Winfrith have been included. The Update System provides a convenient means of cataloging and exchanging information on modifications and improvements and the UK would like to see its universal adoption by all NJOY users.

1.7 **New Data Files** (C J Dean and P S Whitworth)

The ENDL file for P31 has been converted into ENDF/B-5 format.

AEE Winfrith

November, 1985

USA Contribution to NNDEN-37
via The National Nuclear Data Center

Recent Publications

ANL/NDM-88 1985
"An Evaluated Nuclear-Data File for Niobium," Argonne National Laboratory.
A. Smith, D. Smith and R. Howerton

ANL/NDM-91 1985
"On the Energy Dependence of the Optical-Model of Neutron Scattering from Niobium," Argonne National Laboratory.
A. Smith, P. Guenther and R. Lawson

ANL/NDM-89 1985
"Compilation and Evaluation of 14-MeV Neutron-Activation Cross Sections for Nuclear Technology Applications--Set-1," Argonne National Laboratory.
B. Evain, D. Smith and P. Lucchese

J. Phys G11, p. 125 1985
Fast-neutron Scattering from Indium," Argonne National Laboratory.
A. Smith et al.

ANL/NDM-90 1985
"Fast-Neutron Spectrum Measurements for the Thick-Target Be-9(d,n)B-10 Reaction at 7 MeV," Argonne National Laboratory.
D. Smith, J. Meadows and P. Guenther

Santa Fe, New Mexico, May 13-17, 1985, International Conference on Nuclear Data for Basic and Applied Science
"Measurement and Evaluation of Selected 14-MeV Cross Sections for Fusion"
D. Smith, J. Meadows and S. Cox

BNL/NCS-17541 3rd Edition, Suppl I (ENDF-201) January 1985
"ENDF-201 Supplement I ENDF/B-V.2 Summary Documentation"
Compiled and edited by B. A. Magurno and P. G. Young

BNL/NCS-31470-3 April 1985
"COMPUTOPE Chart," Brookhaven National Laboratory.
S. Pearlstein

BNL/NCS-51771 1st Edition, Suppl. I April 1985
"Integral Charged Particle Nuclear Data Bibliography. Literature scanned from April 1, 1984 - March 31, 1985," Brookhaven National Laboratory
N. E. Holden, S. Ramavataram and C. L. Dunford

BNL/NCS-35513-R November 1984
"A Reevaluation of the Average Prompt Neutron Emission Multiplicity (Nubar) Values from Fission of Uranium and Transuranium Nuclides," Brookhaven National Laboratory.
N. E. Holden and M. Zucker

BNL/NCS-35514-R November 1984
"Total and Spontaneous Fission Half-Lives of the Uranium and Plutonium Nuclides," Brookhaven National Laboratory.
N. E. Holden

BNL/NCS-35521-R November 1984
"Total and Spontaneous Fission Half-Lives of the Americium and Curium Nuclides," Brookhaven National Laboratory.
N. E. Holden

BNL/NCS-35808 January 1985
"Evidence for a Nucleon-Nucleus Spin-Spin Interaction in ^{9}Be," Brookhaven National Laboratory.
S. F. Mughabghab

BNL-35794 June 1985
"The International Scope of Data Evaluation," presented at ANS Meeting, held at Boston, MA, June 1985.
S. Pearlstein

BNL-35829 June 1985
"A Methodology for Evaluating $P\nu$ Distributions; Results to Date," presented at ANS Meeting, held at Boston, MA, June 1985.
M. S. Zucker and N. E. Holden

BNL-36467 May 1985
"Neutron Multiplicities for the Transplutonium Nuclides", 7th ESARDA Meeting, held at Liege, Belgium.
N. E. Holden and M. S. Zucker

BNL-NCS-35522 March 1984
"A Least Squares Fit of Thermal Data for Fissile Nuclei", IAEA Meeting held at Geel, Belgium.
M. Divadeenam and J. R. Stehn

BNL-NCS-35912 May 1985
"Investigation of the Nuclear Spin-Spin Interaction," Int. Conf. on Nuclear Data for Basic and Applied Science, held at Santa Fe New Mexico, May 13-17, 1985.
S. Mughabghab

BNL-NCS-35913 May 1985
"Spin Dependence of the Coherent Scattering Lengths and Admixture of S- and D- Partial Wave", Int. Conf. on Nuclear Data for Basic and Applied Science, held at Santa Fe New Mexico, May 13-17, 1985.
S. Mughabghab

BNL-NCS-36380 May 1985
"Mean Fission Neutron Spectrum Energies for ^{252}Cf and Fissile Nuclides, ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu", Int. Conf. on Nuclear Data for Basic and Applied Science, held at Santa Fe New Mexico, May 13-17, 1985.
N. E. Holden

BNL-NCS-36379 May 1985
"Prompt Neutron Multiplicities for the Transplutonium Nuclides", Int. Conf. on Nuclear Data for Basic and Applied Science, held at Santa Fe New Mexico, May 13-17, 1985.
N. E. Holden and M. S. Zucker

BNL-NCS-36550 June 1985
"Uranium and Plutonium Total Half-Lives and for the Spontaneous Fission Branch," ICRM Meeting held at Grenoble, France, June 1985.
N. E. Holden

BNL-NCS-36551 June 1985
"Americium and Curium Total Half-Lives and for Spontaneous Fission Branch," ICRM Meeting held at Grenoble, France, June 1985.
N. E. Holden

BNL-NCS-36552 June 1985
"Prompt Neutron Fission Spectrum Mean Energies for the Fissile Nuclides and ^{252}Cf," ICRM Meeting held at Grenoble, France, June 1985.
N. E. Holden

BNL-NCS-36553 June 1985
"Light Mass Elements Total Half-Lives for Selected Long-Lived Nuclides," ICRM Meeting held at Grenoble, France, June 1985.
N. E. Holden

BNL-NCS-36554 June 1985
"Heavy Mass Elements Total Half-Lives for Selected Long-Lived Nuclides," ICRM Meeting held at Grenoble, France, June 1985.
N. E. Holden

Nucl. Sci. Eng. 88, pp. 56-70 1984
"Evaluation and Testing of n + ^{239}Pu Nuclear Data for Revision 2 of ENDF/B-V," Los Alamos National Laboratory.
E. Arthur, P. Young, D. Madland, and R. MacFarlane

Phys. Rev. C 32, 92 1985
"Coincident Neutron-Proton Emission from Proton Bombardment of ^{87}Sr and ^{91}Zr," Los Alamos National Laboratory.
J. C. Dousse, E. D. Arthur, D. M. Drake, J. Gursky, J. D. Moses, N. Stein and J. W. Sunier

Journal of Nucl. Mat 122, 1058 1984
"Improved Activation Cross Sections for Vanadium and Titanium," Los Alamos National Laboratory.
D. W. Muir and Edward D. Arthur

Trans. Am. Nucl. Soc. 46, 759 1984
"Improved (n,f) Cross Sections Using Measured Fission Probabilities," Los Alamos National Laboratory.
E. D. Arthur

Proc. 5th Int. Symp. on Capture Gamma-Ray Spectroscopy and Related Topics, Oak Ridge Nat. Lab., Knoxville, Tenn., Sept. 9-14, 1984
"Analysis of n + ^{197}Au Cross Sections for E_n = 0.01-20 MeV"
P. G. Young and E. Arthur

Trans. Am. Nucl. Soc. 49, 198 1985 (to be issued)
"Nuclear Theory and Nuclear Data Evaluation," Los Alamos National Laboratory.
E. D. Arthur

LA-UR 85-2255 November 1985
"Calculation of Al(p,xn) and Cu(p,xn) Thick-Target Neutron Angular Yields and Spectra for $E_p \leq 50$ MeV," presented at ANS Meeting, San Francisco, Nov. 10-14, 1985.
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Trans. Am. Nucl. Soc. 46, p. 725 June 1984
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C. Y. Fu

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N. M. Larson

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"Calculated Neutron-Induced Cross Sections for ^{63,65}Cu, ^{58,60}Ni, and ^{52}Cr from 1 to 20 MeV and Comparisons with Experiments"
D. M. Hetrick, C. Y. Fu, and D. C. Larson

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"Status of the Parameters of the 1.15-keV Resonance of 56-Fe"
F. G. Perey

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"^{58}Ni + n Transmission, Capture and Differential Elastic Scattering Data Analysis in the Resonance Region"
C. M. Perey, F. G. Perey, J. A. Harvey, N. W. Hill, and R. L. Macklin

Evaluations Recently Completed or in Progress

Material	Laboratory	Status
^{1}H	LANL	Analysis complete for ENDF/B-VI.
^{3}H	LANL	R-matrix analysis complete to 20 MeV.
^{3}He	LANL	R-matrix analysis complete to 10 MeV.
^{6}Li	LANL	Analysis complete to 4 MeV for ENDF/B-VI.
^{6}Li	ANL	Simultaneous evaluation-(n,t),(n,n) reactions.
^{9}Be	LLNL	Completed.
^{10}B	LANL	Analysis nearly complete for ENDF/B-VI.
^{10}B	ANL	Simultaneous evaluation-(n,α_0), $(n,\alpha_1\gamma)$ (n,n) reactions.
^{11}B	LANL	New evaluation in progress.
^{15}N	LANL	New evaluation in progress.
^{165}Ho	LANL	New theoretical analysis in progress.
^{197}Au	LANL	New theoretical evaluation complete 10 keV to 20 MeV
$^{52,53}Cr$	ORNL	All reactions 1-20 MeV in progress.
^{56}Fe	ORNL	All reactions 1-20 MeV in progress.
Co	ANL/LLNL	In progress.
$^{58,60}Ni$	ORNL	All reactions 1-20 MeV in progress.
Ni	ANL/LLNL	Evaluation of high energy portion in progress.
$^{63,65}Cu$	ORNL	Recently completed.
^{197}Au	ANL	Simultaneous evaluation-(n,γ) reaction.
^{235}U	ANL	Simultaneous evaluation-(n,f) reaction.
^{238}U	ANL/LLNL	Simultaneous evaluation-(n,γ),(n,f) reactions. Reactions for E>45 keV in progress.
^{238}U	ORNL	Resonance region. In progress.
^{239}Pu	ANL	Simultaneous evaluation-(n,f) reaction.

Evaluations Recently Completed or in Progress

Material	Laboratory	Status
^{239}Pu	ORNL	Resonance region. Well underway and will be completed early in 1986.
^{240}Pu	ORNL	In progress.
FP Yields	LANL	Preliminary eval. for 50 sets each of independent and cumulative yields. (ENDF/B Format)
ν_d Precursor spectra	LANL	Preliminary evaluation of 30 precursor spectra.
ν_d Precursor Pn	HEDL/LANL	~ 70 Precursor emission probabilities. reevaluated

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Names: D.E. Cullen, V. Goulo, H.D. Lemmel, P.K. McLaughlin, K. Okamoto, O. Schwerer

New evaluated data files:

1. ENDL-84: The 1984 version of the Evaluated Nuclear Data Library of LLNL (R.J. Howerton) has been issued in ENDF-5 format. For summary of contents (95 materials) see document IAEA-NDS-11 Rev.4.

2. IRDF-85: The 1985 version of the International Reactor Dosimetry File has been issued in 640 group structure, containing 54 materials and benchmark neutron spectra. For summary of contents see document IAEA-NDS-41 Rev.1.

3. INDL/V: The 1985 version of the IAEA Nuclear Data Library for Various evaluations in ENDF-5 format was issued. This library is a collection of evaluations of different origin; most of them are partial evaluations only (either for specific reactions or for a limited energy range). For summary of contents see document IAEA-NDS-31 Rev.3. The library includes now 196 materials (67 new, 115 revised from previous version, 14 unchanged from previous version). - The niobium evaluation from Hermsdorf (Dresden, GDR), INDL/V-4110 Rev.1, was supplemented by V. Goulo to a "complete" evaluation, INDL/V-4111 Rev.2., by calculating energy spectra with STAPRE and adding the resonance region from JENDL-2.

4. CENDL: The start of a Chinese Evaluated Nuclear Data Library in ENDF-4 format, containing partial evaluations for 12 nuclides, was issued and documented in IAEA-NDS-61. The same evaluations converted to ENDF-5 format were included in INDL/V.

Publications:

IAEA-TECDOC-336. Transactinium Isotope Nuclear Data, Proceedings of the third IAEA meeting on this topic, Uppsala, Sweden, 21-25 May 1984.

INDC(NDS)-158. A. Lorenz (ed.), Summary Report of the same Meeting on Transactinium Isotope Nuclear Data, Uppsala, 21-25 May 1984.

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INDC(NDS)-170. D.E. Cullen: Report on the IAEA Cross-Section Processing Code Verification Project, by which ENDF/B-5 processing codes were tested, intercompared and corrected. A summary will appear also in the proceedings of the Seminar on Nuclear Data Cross-Section Libraries and their Application in Nuclear Technology, Bonn, 1-2 Oct. 1985.

INDC(NDS)-175. K. Okamoto (ed.), Summary Report of the IAEA Meeting on Nuclear and Atomic Data for Radiotherapy and related Radiobiology, Rijswijk, the Netherlands, 16-20 September 1985.

Handbook on Nuclear Activation Data, K. Okamoto (ed.), IAEA Technical Report, to be published.

Decay Data of the Transactinium Nuclides, A. Lorenz (ed.), IAEA Technical Report, to be published.

NEUTRON NUCLEAR DATA NEWSLETTER-37

EUROPEAN FUSION FILE (EFF)

(file management: ECN, Petten)

The European Fusion File (EFF) is a nuclear-data file for application in fusion-reactor blanket design calculations, in particular for neutron-transport calculations of the Next European Torus (NET). The EFF-project is part of the European Fusion Technology Programme of the European Community (EC). More specifically, it belongs to the so-called B2 task on the development of "tools" for neutronics calculations. The following laboratories are contractors in the EFF-project: CEA (Saclay), ECN (Petten), ENEA (Bologna) and KfK (Karlsruhe). Moreover, JRC (Ispra) and CBNM (Geel) are involved as EC institutes. The project is conducted by the NET-team at Garching and by EC-Brussels; the file maintenance and management is performed at ECN (Petten). Other European laboratories are also involved: SCK/CEN (Mol) with an experimental programme performed at CBNM, the UK laboratories Harwell, Birmingham and Culham (JET), ENEA (Frascati), KFA (Jülich) and EIR (Würenlingen). Furthermore, technical support is received from the NEA Data Bank at Gif-sur-Yvette.

This summer a first version of EFF has been assembled [1]. It consists of a file with 24 important fusion materials. The format of EFF-1 is that of ENDF/B-V, with the addition of file MF6 of ENDF-VI for the reaction types MT 10, 16, 17 and 91. Furthermore, gas-production cross sections (MT 203-207) and the neutron-disappearance cross sections (MT101) have been added. The file contains 16 evaluations that are different from ENDF/B-IV, which is still frequently used for neutronics calculations. In addition to the evaluations that were taken from the Joint Evaluated File (JEF-1) of from other sources (e.g. for Be) the following activities were made by the EFF-evaluators:

(1) A modification of the Li-7(n,n')T tritium production cross section by KfK, Karlsruhe.
(2) A revision of the evaluations for Al and Si by ENEA, Bologna.
(3) A revision of the double-differential continuum neutron emission cross sections for lead by ECN, Petten.

At present the EFF-1 file is used for the production of group constants and transfer matrices for application in neutron-transport calculations [2] of NET fusion reactor concepts. A recent report on the status of this project is given in Ref. [1].

References

[1] H. Gruppelaar, Present Status of the European Fusion File, Int. Sem. on Nuclear Data Cross Section Libraries and their Applications in Nuclear Technology, Bonn, Oct. 1985.

[2] H. Gruppelaar, D. Nierop and J.M. Akkermans, Processing of double-differential cross sections in the new ENDF-Vi format - GROUPXS code description and users' manual -, ECN-report, in press.

NEA DATA BANK

BRIEF REPORT ON OPTICAL MODEL MEETING

From 13th to 15th November 1985, a specialists' meeting on the use of the optical model for the calculation of neutron cross sections below 20 MeV was held at OECD Headquarters, with forty participants from both the basic and applied physics communities.

On the first two days, nineteen talks were given in the framework of four main sessions with the headings:

- Fundamental aspects of the optical model
- Conventional models and calculational tools
- Parameterisation of the optical model
- Calculations of neutron-induced cross section with special emphasis on the role of the optical model.

The last day was devoted to short contributions and also to two workshops with very lively and interesting discussion.

The problems of the opticl model parameterisation were developed in three main regions of the periodic table: structural materials, fission products and actinide nuclei. The availability of the data to obtain the optical model parameters was also discussed.

The interest of the participants was also directed to the calculational tools (code development and intercomparison) and the physics necessary to test and improve the results of practical calculations.

The proceedings will be published early in 1986 as NEANDC-222-U.

Recent publications available at NEA Data Bank related to the optical model

- International nuclear model and code comparison on pre-equilibrium effects, NEANDC-204-U, H. Gruppelaar, P. Nagel.

- International nuclear model code comparison study of the special optical model for charged particles, NEANDC-198-U, P.E. Hodgson, E. Sartori.

- Report on the international nuclear model code intercomparison coupled-channel model study, NEANDC-182-A, E. Sartori.

- Report on the international nuclear model code intercomparison spherical optical and statistical model study, NEANDC-152-A, A. Prince, G. Reffo, E. Sartori.

- Proceedings of the specialists' meeting on the use of the optical model (November 1985, Paris) to be published early in 1986 as NEANDC-222-U.

JOINT EVALUATED FILE (JEF)

NEA Data Bank

Introduction

The first version of the Joint Evaluated File (JEF-1) has now been distributed to the main laboratories participating in the project. The General Purpose Files had been available already in April 1985, whereas the Special Purpose Files (thermal scattering law data, decay data, fission yield data, and photon interaction data) were compiled during the summer of 1985 and were ready for distribution in September 1985.

Content of JEF-1

The General Purpose library, which is available only to scientists in NEA Data Bank member countries, has for size reasons been split into nine different files, and contains neutron cross section data, angular and energy distributions for more that 300 isotopes and elements. It is available in two forms: one with resonance parameters and one where the pointwise data are given in the resonance region.

The Special Purpose library contains thermal scattering law data for: hydrogen in water and polyethylene, deuterium in heavy water, and graphite. The radioactive decay data file consists of more that 1100 special selected isotopes, whereas the fission yield file has data for about 700 isotopes from seven different actinides. The photon interaction file gives data for about 110 elements.

JEF Working Group Meeting

A JEF Working Group Meeting was held at the NEA Data Bank on 22nd to 25th October 1985, covering one special subject each day. The first day was devoted to radioactive decay and fission yield data, the second to evaluated formats and processing codes, the third to benchmark testing and finally the fourth to new evaluations.

The Working Group on radioactive decay and fission yield data reviewed the JEF-1 files and agreed on future benchmark testing of the data and a procedure for the revision and updating of the data for JEF-2.

The format for the JEF-2 file was discussed on the second day. A special working group had been formed and a report on the findings of this group was presented. It was generally felt that it would be advantageous to adopt the new ENDF-6 format for JEF-2, under the condition that the translation from ENDF-5 to ENDF-6 would be possible without a too large effort. Concerning computer codes, it was agreed that the NJOY based code THEMIS would be used for data processing.

The first phase of the benchmark testing of the JEF-1 library had been finished and the second phase of more sophisticated calculations was well under way. From the results so far it could be deduced that the quality of the JEF-1 library was at least as good as or better that all recent evaluated data libraries for most applications (fast and thermal systems, shielding calculations and fuel cycle studies).

The last day of the meeting was devoted to the evaluation effort going on for the JEF-2 library. The major structural materials (Fe, Cr, and Ni) and actinides (U-238, Pu-239, Pu-240, and Pu-241), together with some of the most important fission products and the Zr- and the Hf-isotopes would be re-evaluated. The evaluations should be ready by the end of 1987, allowing the NEA Data Bank to assemble the JEF-2 library by the end of 1988.

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