NEUTRON NUCLEAR DATA EVALUATION NEWSLETTER

NEA DATA BANK
BANQUES DE DONNÉES DE L'AEN

September 1987

| ENERGY (MEV) | DATA
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15.6</td>
</tr>
<tr>
<td>2</td>
<td>15.9</td>
</tr>
<tr>
<td>3</td>
<td>16.4</td>
</tr>
<tr>
<td>4</td>
<td>16.9</td>
</tr>
<tr>
<td>5</td>
<td>17.4</td>
</tr>
<tr>
<td>6</td>
<td>17.9</td>
</tr>
</tbody>
</table>
NNDEN/40

NEUTRON NUCLEAR DATA
EVALUATION NEWSLETTER

NEA DATA BANK
BANQUES DE DONNÉES DE L’AEN

September 1987
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:

<table>
<thead>
<tr>
<th>Country</th>
<th>Institution</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEDERAL REPUBLIC OF GERMANY</td>
<td>KFK Karlsruhe</td>
<td>7</td>
</tr>
<tr>
<td>FRANCE</td>
<td>CEN, Bruyères-le-Châtel</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>CEN, Cadarache</td>
<td>11</td>
</tr>
<tr>
<td>INDIA</td>
<td>Bhabha Atomic Research Centre, Bombay</td>
<td>13</td>
</tr>
<tr>
<td>ITALY</td>
<td>ENEA, Bologna</td>
<td>15</td>
</tr>
<tr>
<td>JAPAN</td>
<td>Nuclear Data Centre, JAERI</td>
<td>17</td>
</tr>
<tr>
<td>NETHERLANDS</td>
<td>ECN, Petten</td>
<td>18</td>
</tr>
<tr>
<td>PEOPLE'S REPUBLIC OF CHINA</td>
<td>Institute of Atomic Energy, Beijing</td>
<td>19</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>AERE, Harwell</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Nuclear Physics Laboratory, Oxford</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>AEE, Winfrith</td>
<td>23</td>
</tr>
<tr>
<td>USA</td>
<td>ANL, Argonne</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>NNDC, Brookhaven</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>LANL, Los Alamos</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>ORNL, Oak Ridge</td>
<td>33</td>
</tr>
<tr>
<td>EFF (European Fusion File)</td>
<td>ECN, Petten</td>
<td>39</td>
</tr>
<tr>
<td>IAEA</td>
<td>Nuclear Data Section, Vienna</td>
<td>40</td>
</tr>
<tr>
<td>OECD/NEA</td>
<td>Data Bank, Saclay</td>
<td>41</td>
</tr>
</tbody>
</table>

The next issue of NNDE/NEWS has been scheduled for March 1988 and contributors are asked to send in their reports by 15th February 1988.

NEA Data Bank, August 1987
# New Evaluations

A) Completed
B) In Progress
C) Planned in the Near Future

<table>
<thead>
<tr>
<th>Nuclide</th>
<th>Data Type</th>
<th>Energy Range</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>He-3</td>
<td>many</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>He-4</td>
<td>many</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Li-6</td>
<td>many</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>B-10</td>
<td>many</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>B-11</td>
<td>many</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>N-14</td>
<td>many</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Al-nat</td>
<td>many</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Ca-nat</td>
<td>many</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Ti</td>
<td>(n,xγ)</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>V</td>
<td>(n,x)</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Cr-52</td>
<td>many</td>
<td>14,2 MeV</td>
<td>16</td>
</tr>
<tr>
<td>Cr-52</td>
<td>(n,n'γ)</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Cr-53</td>
<td>many</td>
<td>100 KeV-10 MeV</td>
<td>35</td>
</tr>
<tr>
<td>Cr-nat</td>
<td>many</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Mn-nat</td>
<td>many</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Fe-54</td>
<td>(n,tot)(n,γ)</td>
<td>few MeV</td>
<td>24</td>
</tr>
<tr>
<td>Fe-56</td>
<td>many</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Fe-nat</td>
<td>many</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Co</td>
<td>(n,xγ)</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Co</td>
<td>many</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Co-59</td>
<td>(n,tot)</td>
<td>50 KeV-15 MeV</td>
<td>35</td>
</tr>
<tr>
<td>Co-59</td>
<td>(n,α)</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Co-nat</td>
<td>many</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Ni-58</td>
<td>(n,tot)(n,γ)(n,n)</td>
<td>resonance region</td>
<td>35</td>
</tr>
<tr>
<td>Ni-58</td>
<td>many</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Ni-60</td>
<td>many</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Ni-nat</td>
<td>many</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Ni-nat</td>
<td>res. par.</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Ni-isot</td>
<td>many</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>NUCLIDE</td>
<td>DATA TYPE</td>
<td>ENERGY RANGE</td>
<td>PAGE</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
<td>--------------</td>
<td>------</td>
</tr>
<tr>
<td>Zn-64</td>
<td>many</td>
<td>10^{-5}eV-20 MeV</td>
<td>31</td>
</tr>
<tr>
<td>Zr</td>
<td>many</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Zr-90</td>
<td>(n,2n)</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Nb-93</td>
<td>(n,2n)</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Nb-93</td>
<td>many</td>
<td>1-20 MeV</td>
<td>21</td>
</tr>
<tr>
<td>Ru-102</td>
<td>many</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Ag-nat</td>
<td>many</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>In-115</td>
<td>(n,2n)</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>In-115</td>
<td>(n,n')</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>In-nat</td>
<td>many</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Eu-151</td>
<td>many</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>Eu-151</td>
<td>many</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Eu-152</td>
<td>many</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>Eu-153</td>
<td>many</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Eu-153</td>
<td>many</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Eu-154</td>
<td>many</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Eu-155</td>
<td>many</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Eu-nat</td>
<td>(n,γ)</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Gd-152</td>
<td>many</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Gd-153</td>
<td>many</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Gd-nat</td>
<td>(n,γ)</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Ho-165</td>
<td>many</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Ho-nat</td>
<td>(n,γ)</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Tm-169</td>
<td>many</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>Re-185</td>
<td>many</td>
<td>1 KeV-2 MeV</td>
<td>31</td>
</tr>
<tr>
<td>Re-185</td>
<td>(n,γ)</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>Re-187</td>
<td>many</td>
<td>1 KeV-2 MeV</td>
<td>31</td>
</tr>
<tr>
<td>Re-187</td>
<td>(n,γ)</td>
<td>3 KeV-1900 KeV</td>
<td>35</td>
</tr>
<tr>
<td>Re-nat</td>
<td>(n,γ)</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Pb-212</td>
<td>decay data</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Bi</td>
<td>many</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>U-235</td>
<td>res. par.</td>
<td>10^{-2}eV-50 KeV</td>
<td>35</td>
</tr>
<tr>
<td>U-235</td>
<td>(n,tot)</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>U-238</td>
<td>many</td>
<td>10 KeV-500 KeV</td>
<td>20</td>
</tr>
<tr>
<td>U-238</td>
<td>(n,tot)(n,γ)(n,n')</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>U-238</td>
<td>(n,γ)</td>
<td>1 KeV-100 KeV</td>
<td>36</td>
</tr>
<tr>
<td>NUCLIDE</td>
<td>DATA TYPE</td>
<td>ENERGY RANGE</td>
<td>PAGE</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-----------------------</td>
<td>------</td>
</tr>
<tr>
<td>Np-236(6)</td>
<td>decay data</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Np-236(m)</td>
<td>decay data</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Pu-239</td>
<td>many</td>
<td>1KeV-20 MeV</td>
<td>11</td>
</tr>
<tr>
<td>Pu-239</td>
<td>many</td>
<td>up to 1 KeV</td>
<td>11</td>
</tr>
<tr>
<td>Pu-239</td>
<td>ν-spectrum</td>
<td>10⁻⁵ eV to 20 MeV</td>
<td>25</td>
</tr>
<tr>
<td>Pu-240</td>
<td>many</td>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>
1. Evaluation of Neutron Cross Sections for $^{238}\text{U}$ in the Unresolved Resonance Region:

A joint JEF-2 evaluation effort for $^{238}\text{U}+\text{n}$ is underway at Harwell and Karlsruhe. At KfK the unresolved resonance region between about 10 and 500 keV has been studied extensively with the Hauser-Feshbach program FITACS. This program permits coherent, simultaneous fitting of average total, capture and inelastic scattering cross sections by adjustment of strength functions, distant-level parameters and average radiation widths for all s-, p-, d- and f-wave channels. Width fluctuation corrections, so far calculated by the usual Dresner integral approximation with Moldauer's prescription for the degrees of freedom [1], can now be computed rigorously via the GOE triple integral of Verbaarschot, Weidenmüller and Zirnbauer [2] in a new version of the code. From the fits it appears that the ratio of s-wave radiation width, $23.5 \pm 0.3$ meV, to mean level spacing, $21.5 \pm 1.5$ eV, as inferred from resolved resonance parameters, is several percent too high in view of the average cross section data. It will be interesting to see whether the new resonance parameter set being established at Harwell will yield a higher estimate of the mean level spacing. The influence of direct processes in inelastic scattering is under study. (F.H. Fröhner)


2. Double-differential neutron scattering in the forward direction

Different theoretical models of precompound processes predict quite different angular distributions of the secondary neutrons emitted in inelastic neutron scattering. The statistical model of Agassi, Weidenmüller and Mantzouranis and the exciton model with Kalbach-Mann systematics yield smooth angular distributions, whereas PWBA calculations combined with Blann's geometry-dependent hybrid model yield pronounced diffraction patterns with deep minima in the forward direction [1,2]). Experimental double-differential neutron spectra obtained with incident
neutrons are not good enough yet to judge the various methods because of the limited angular and energy resolution which make it difficult to discriminate between the primary beam and the scattered neutrons at angles below about 40 degrees. In this situation double-differential proton data can help. They show the scattering peaks corresponding to individual excited states of $^{56}$Fe clearly resolved, even at small angles. This allows determination of the strength parameters $\beta$ for incident protons. Since the $\beta$ are roughly the same for incident neutrons and protons, one can take $\beta$ values for protons and calculate double-differential cross sections for incident neutrons, even at small angles where no neutron data exist. We have demonstrated that the angle-integrated PWBA cross section so obtained for $^{56}$Fe(n,n') for incident 14 MeV neutrons must be equated to the n-term of the geometry-dependent hybrid model in order to reproduce measured double-differential data. Recently similar calculations with the approximate DWBA method of McCarthey and Pursey have yielded essentially the same result. (E. Bahm, H. Jahn)


3. On the Fusion of Polarised Deuterons

The reaction $^3$He + $^3$He $\rightarrow$ $\alpha$ + p produces fusion energy without releasing neutrons. Obstacles are: its higher threshold compared to D-T fusion, scarcity of $^3$He, and the parasitic D-D fusion which produces neutrons and radioactive tritons. The recent appearance of high-temperature superconductors and the presence of $^3$He in lunar sands suggest a reevaluation of the fusion cross section of polarised deuterons.

It is well established for D-T fusion that polarisation modifies the effective cross section substantially [1,2]. For the D-D reaction this is not so. Firstly the process is more complicated than D-T as three resonances are involved instead of one. Secondly theoretical predictions are contradictory. R-matrix [3,4] and resonating group [5,6] calculations do not indicate any effect of polarisation whereas DWBA calculations [7] predict a cross section reduction to 8 - 15% of the unpolarised value if all deuterons have parallel spins. Closer scrutiny of the equations in [7] shows, however, that the calculation is questionable, different potentials having been used for the total and the polarised cross sections so that good agreement of the total is not necessarily an indication of the correctness of the polarised cross section. It is concluded that without further experimental or theoretical proof one cannot count on neutron-lean D-$^3$He fusion by polarising deuterons. (B. Goel)

I  Recent publications and reports

- Transformations cinématiques et intégration des sections efficaces
doublement différentielles.
  O. BERSILLON - NEAN DC (E) 243/L - INDC (FR) 71/L

- Optical Model Description of the Neutron Interaction with $^{116}$Sn and
  $^{120}$Sn over a wide Energy range.
  P.P. GUSS et al. (1) Submitted to Phys. Rev. C

- Coupled-channel description of inelastic scattering from soft nuclei.

- The dynamics of collective excitation in $^{194}$Pt from several scattering
  experiments.
  J.P. DELAROCHE et al. (3) accepted for publication in Phys. Rev. C

- Polarized proton scattering from $^{116, 120, 124}$Sn at 16 MeV.

II  Work recently completed

- Energy dependences of the deformed optical potential for neutron
  scattering from $^{54, 56}$Fe and $^{58, 60}$Ni up to 80 MeV.
  R.S. PEDRONI et al., to be submitted to Phys. Rev. C.

- Ground State band deformations of $^{155, 156, 157, 158, 160}$Gd from neutron
  scattering measurements and Hartree-Fock-Bogolyubov calculations.
  J.P. DELAROCHE et al., to be submitted to Phys. Rev. C.
- Search for a Fermi energy anomaly in the nucleon scattering potential for deformed nuclei.
  J.P. DELAROCHE, to be submitted to Phys. Rev. C

III + Work in progress

- Analyse des spectres de neutrons issus de la réaction $^7$Li.
  O. BERSILLON.

- Analyse des spectres d' électrons de conversion de la réaction $^{169}$Tm (n,e$^-$).
  O. BERSILLON, S. JOLY

- Etude de problèmes de conservation de l'énergie dans les fichiers ENDF.
  O. BERSILLON.

- Dispersion relation corrections applied to nucleon scattering from $^{40}$Ca.
  J.P. DELAROCHE et al. (1).

IV + Work planned for the future

- Energy dependence of the deformed optical potential and dispersion relation corrections for n + $^{184}$W below 26 MeV.
  J.P. DELAROCHE et al. (5).

REFERENCES

(1) - In collaboration with Duke University, Durham, U.S.A.
(2) - In collaboration with LLNL, Livermore, U.S.A.
(3) - In collaboration with University of Kentucky, Lexington, U.S.A.
(4) - In collaboration with the University of North Carolina, Chapel Hill, U.S.A.
(5) - In collaboration with Ohio University, Athens, U.S.A.
I - RECENT PUBLICATIONS AND REPORTS

- 239Pu neutron cross-section evaluation from the KeV region to 2 MeV
  E. FORT
  JEF/DOC Report 174

- Comments on 239Pu neutron cross-sections evaluation in the resolved and unresolved resonance regions.
  H. DERRIEN
  JEF/DOC Report

II - WORK IN PROGRESS

- Reevaluation of 239Pu cross-section in the region up to 1 KeV.
  H. DERRIEN

- 239Pu neutron cross-section evaluation from the KeV region up to 20 MeV.
  E. FORT

III - WORK PLANNED FOR THE FUTURE

- Contribution to the evaluation of resonance parameters for Ni isotopes and 235U in collaboration with ORNL
  H. DERRIEN

- 240 Pu complete evaluation
  E. FORT
IV - ACTIVITY IN NUCLEAR DATA MANAGEMENT AND PROCESSING

- KERMA factor formalism validation and KERMA factor data production for several nuclei using THEMIS-NJOY code
  N. TSOUFLANIDIS

- Neutron group constant production in 25 group scheme for several secondary actinides, fission products and structural materials using THEMIS-NJOY code.
  N. KAROUBY-COHEN, P. NICOLLE

Compiled by E. FORT - June 1987
GOVERNMENT OF INDIA
BHAIBHA ATOMIC RESEARCH CENTRE
THOMBAY, BOMBAY - 400 085, INDIA.

NAMES: S.B. Garg, Amar Sinha

Address: Neutron Physics Division
Bhabha Atomic Research Centre
Thombay, Bombay - 400 085

RECENT PUBLICATIONS


5. S.B. Garg and R.P. Amand; Neutron Induced Reaction Cross-Sections of $^{56}$Fe in the Energy Range 1 to 20 MeV: A Work Programme, Paper presented at the first C R P Meeting held at Bologna (Italy) during October 1986 and sponsored by IAEA on 'Methods for the Calculation of Fast Neutron Nuclear Data for Structural Elements'.

WORK RECENTLY COMPLETED

1. Generation of Multigroup Cross-Sections of Minor Actinide Elements Using ENDF - 64 Library.

Investigation of neutron reaction Cross - Sections for iron, chromium and nickel based on direct, pre equilibrium and statistical models.

COMPUTER CODES

1. The HETC code system based on Monte Carlo intra nuclear cascade model for the study of spallation physics targets has been adopted.

2. The optical model based code SCAT 2 has been modified to account for the energy dependence in radius parameter to compute reaction cross-sections and transmission coefficients.

3. The multistep Hauser - Feshbach Statistical model based code GNASH having pre equilibrium computation capability of cross-sections has been modified and adopted.

4. The ALICE - 65 code based on Geometry Dependent Hybrid Model has been adopted and applied to study the multiparticle reaction Cross - Sections of several elements.

5. The DWUCK - 4 code making use of the Distorted - Wave Born Approximation for studying the inelastic level excitation cross-sections has been adopted to study the direct reaction contribution to the inelastic cross-sections.

6. The JUOY code to generate multigroup neutron and photon interaction cross-sections for neutronics, safety and shielding studies has been added to our code library.

PUBLICATIONS

2. A. Mengoni, F. Fabbri, G. Maino: "Gamma-ray production cross sections following $^{52}$Cr (n,n' $\gamma$ ) reaction", in Proc. 6$^{th}$ Int. Symp. on Capture Gamma-Ray Spectroscopy, Leuven (1987).
3. F. Fabbri, G. Longo: "Gamma-Ray Spectra and angular distributions of photons following the capture of fast neutrons.
10. G.C. Panini, M. Pescarini: Calcoli di attenuazione neutronica su un materiale per lo schermo biologico di un LWR. RTI/TIB(87) 27.
Work in progress or recently completed

I) Evaluation of microscopic data through model calculations. The Hauser-Feshbach statistical model has been applied to the analysis of discrete gamma-ray production cross sections, in order to check its reliability. Calculations have been performed for $^{52}$Cr (n, n'γ) reaction at incident neutron energy $E_n = 14.2\text{MeV}$, which are in fair agreement with recent experimental data.

II) Activity in Nuclear Data Management Processing and Validation
The ACER module of NJOY for the production of point libraries for the Montecarlo code MCNP, has been implemented into the CRAY version of THEMIS and a first set of 37 materials from JEF-1 has been processed: the validation of the library, which includes both neutron and photon data, is underway.
A 219 group library from JEF-1 has been produced in the AMPX Master Interface Format for criticality safety calculations and is being validated by means of some benchmarks of the OECD-NEACRP Criticality Working Group.
Calculations have been carried out on the effects of the neutron attenuation in materials for LWR sacrificial shields, with reference to the nuclear data libraries validation with respect to integral experiments.
Japanese Nuclear Data Committee  
(Nuclear Data Center, JAERI)

Work Recently Completed and Publications:
(1) Proceedings of the 1986 Seminar on Nuclear Data  
(Ed.) Tsuneo Nakagawa and Tesuo Asami: JAERI-M 87-025

The 1986 Seminar on Nuclear Data was held on November 26 and 27,  
1986 at Tokai Research Establishment of Japan Atomic Energy Research  
Institute. This is an annual meeting which has been held since 1987,  
with the support of Japanese Nuclear Data Committee. The Participants  
were about eighty including two scientists from China and Argentine who  
were just staying in Japan.

The seminar was made mainly focussing at the problems on the  
post-JENDL-3 activities on nuclear data and at the reactor constants and  
their sensitivity analyses. The poster session was carried out with the  
subjects on the post-JENDL-3 activities, recent measurements of neutron  
cross sections and computer codes for theoretical calculations. The  
proceedings contain the papers presented in both the oral and poster  
sessions of the seminar.

Work in Progress:
(1) Evaluation of neutron nuclear data for $^{10}$B.  
Satoshi Chiba (JAERI)

The total, elastic and inelastic scattering, $(n,2n)$, $(n,p)$, $(n,d)$,  
$(n,t)$, $(n,a)$ and $(n,\gamma)$ reaction cross sections will be evaluated based  
mainly on experimental data.

(2) Evaluation of neutron nuclear data for $^{3,4}$He.  
Keiichi Shibata (JAERI)

The experimental data are analyzed by using the R-matrix theory.

Present status of JENDL-3:

As shown in the last issue of NNDEN, JENDL-3 will contain the  
evaluated data for about 300 nuclides. In particular, number of FP  
uclides will be extended from 100 of JENDL-2 to about 170. For some  
important nucleus, gamma-ray production data are also evaluated. So far  
the evaluation work of the data of important nuclides have been  
completed. Their compilation work is in progress. Those data will be  
benchmark-tested in order to check their applicability for thermal and  
fast reactors, for fusion neutronics and shielding problems. After the  
benchmark test, JENDL-3 will be released in March, 1988.

S. Igarasi  
Nuclear Data Center  
Tokai Research Establishment  
Japan Atomic Energy Research Institute  
Tokai-mura, Naka-gun, Ibaraki-ken 319-11  
Japan
Address: Netherlands Energy Research Foundation ECN, P.O. Box 1, 1755 ZG PETTEN, NETHERLANDS
Telephone: 02246-4083, telex: 57211 REACP NL


1. Recent publications and reports


2. Work recently completed

See above-mentioned publications and reports.

3. Work in progress

- Evaluation of Ru-102, Ni isotopes.
- Revision of thermal and resolved-resonance range of 65 fission-product isotopes (cooperation with NEA Data Bank).
- Study of direct inelastic-scattering contribution for fission-product nuclides.
- Update of activation cross-section file for fusion-reactor materials.

4. Work planned for the future

- Update of fission-product cross-sections.
- Work for EFF-2 (European Fusion File).

5. Work on nuclear model codes

See Refs. [1-3].

Compiled by: H. Gruppelaar
Evaluation work recently completed

- Complete evaluations of neutron data for Co and Mn.
- Excitation function of reactions $^{115}\text{In}(n,2n)$, $^{115}\text{In}(n,n')$, $^{90}\text{Zr}(n,2n)$ and $^{93}\text{Nb}(n,2n)$
- $(n,p)$ and $(n,\alpha)$ reaction cross sections for more than 200 nuclides (deficient in measured data) on the bases of systematics.

Evaluation work would be finished by the end of 1986

- Complete evaluation of neutron data for Ag, In, Ca and Al.
- $(n,x)$, $(n,2n)$...reaction cross section for nuclides related to dosimetry and radiation damage, based on measured data.
Recent Publications and Reports

"Systematics of Neutron Induced Threshold Reactions with Charged Products at about 14.5 MeV"
R. A. Forrest, AERE-R 12419

Work in progress

(a) Evaluation of U-238 neutron cross-sections in collaboration with E. Fort (Cadarache), F. H. Fröhner (Karlsruhe) and Y. Nakajima (NEA Data Bank).

(b) Evaluation of cross-sections relevant to fusion activation and incorporation of present fusion activation library into a form that can be used with the FISPIN code. Work includes better treatment of isomers, extension of library so that all nuclei with half lives greater than 1 day are included and assembly of necessary decay data library.

(c) Phase 1 review of ENDF/B-VI standards.
Nuclear Physics Laboratory, Oxford, UK
P.E. HODGSON

I. Recent Publications


II. Work Recently Completed


III. Work in Progress

1. Neutron Scattering and Reactions in $^{98}$NG from 1 to 20MeV. by D.Wilmore and P.E.Hodgson.


A general survey of the contributions of multistep processes to neutron induced reactions from 10 to 20MeV on a range of nuclei.


IV. Work Planned for the Future

1. A study of alpha-emission in multistep reactions.

V. Work on Nuclear Model Codes

1. Intercomparison of Compound Nuclear Reaction Codes. By E. Sartori and P.E. Hodgson. The comparison of codes using the Weisskopf-Ewing and Hauser-Feshbach theories is in progress. Later it is planned to extend this to multistep compound theories.

VI. Other Subjects of Interest


P.E. Hodgson
June 1987
Winfrith Atomic Energy Establishment

United Kingdom Atomic Energy Authority
Dorchester
Dorset

Dr A L Nichols

Heavy Element and Actinide Decay Data

The evaluation of decay data for specific radio-nuclides in the U232 4n decay chain continues. Isotopes being currently studied are Np236(g), Np236(m) and Pb212.
I. Recent Publications and Reports

J.W. MEADOWS, D.L. SMITH, M.M. BRETSCHER AND S.A. COX
Measurement of 14.7-MeV Neutron Activation Cross Sections for Fusion
Submitted to Annals of Nuclear Energy for publication.

D.L. SMITH
On the Relationship Between Micro and Macro Correlations in Nuclear Measurement Uncertainties
Submitted to Nuclear Instruments and Methods for publication.

P.T. GUENTHER, D.L. SMITH, A.B. SMITH AND J.F. WHALEN
Total, Scattering and Gamma-ray-production Cross Sections for Few-MeV Neutrons on Fe-54

R.D. LAWSON AND A.B. SMITH and M. SUGIMOTO
Can the Spherical Optical Model Fit Neutron Scattering Data from Vibrational Nuclei?

D.L. SMITH
Generation of the Covariance Matrix for a Set of Nuclear Data Produced by Collapsing a Larger Parent Set Through the Weighted Averaging of Equivalent Data Points
(to be published in Nuclear Instr. Methods in Phys. Resch.)

J.W. MEADOWS, D.L. SMITH and R.D. LAWSON
Measurement, Model Calculation and Evaluation for the Co-59 (n,α)Mn-56 Reaction
J.W. MEADOWS, D.L. SMITH and Y. WATANABE
Measurement of Several Integral Neutron-Fission
Cross-Section Ratios in a Be(d, n) Spectrum

J.W. MEADOWS
The Fission Cross Section Ratios And Error Analysis For Ten
Thorium, Uranium, Neptunium and Plutonium Isotopes at 14.74
MeV Neutron Energy
ANL/NDM-98 (1987)

D.L.SMITH
Some Comments on the Effects of Long-Range Correlations in
Covariance Matrices for Nuclear Data
ANL/NDM-99 (1987)

Y.WATANABE, J.W. MEADOWS and D.L. SMITH
An Integral Test of Several Neutron-Fission Cross Sections
in the $^9$Be(d, n)$^{10}$B Thick-Target Neutron Spectrum At 7-MeV
Deuteron Energy
Submitted to Annals of Nuclear Energy

M. SUGIMOTO, A.B. SMITH and P.T. GUENTHER
Ratio of the Prompt-Neutron Spectrum of Plutonium 239 to
that of Uranium 235
Accepted for publication in Nuclear Science and Engineering

II. Work Recently Completed (see above publication list)

III. Work in Progress
A. Comprehensive evaluated file of vanadium.
B. Comprehensive evaluated file of cobalt.
C. Comprehensive evaluated file of bismuth.

IV. Future Plans
A. Completion of A, B and C of Section III, above.
B. Comprehensive evaluation of zirconium
C. Partial evaluation of beryllium.

D. Integral tests of evaluated files for niobium and beryllium.

V. Physical Studies and Model Codes

Continuing attention is being given to the fundamental physical nature of the optical-statistical model. In particular, the effort is focused on the $A = 208$ region and the $A = 50-60$ structural nuclei. A detailed study of the former area is reported in a manuscript now in press.

Correspondent: Alan Bowen Smith
Laboratory: Brookhaven National Laboratory
National Nuclear Data Center

Address: Building 197D, Upton, NY 11973 USA

Names: S. Pearlstein, N. Holden, T. Burrows,
V. McLane, P. F. Rose, and J. R. Stehn

Compiler: P. F. Rose

I. Recent Publications and Reports

BNL-NCS-38906 Nov. 1986
"Nuclear Data for Gd-153 Production,"
N. E. Holden, Brookhaven National Laboratory.

BNL-NCS-38907 Jan. 1987
"Uncertainties in Scientific Measurements,"
N. E. Holden, Brookhaven National Laboratory

NUREG/CP 80, 1179 1986
"Average Prompt Neutron Emission Multiplicity (Nubar) Values
at 2200 Meters Per Second for the Fissile Nuclides,"
N. E. Holden and M. S. Zucker, Brookhaven National Laboratory

IAEA-SM-293/122 1986
"Neutron Multiplicity for Neutron Induced Fission of $^{235}$U,
$^{238}$U, and $^{239}$Pu as a Function of Neutron Energy,"
M. Zucker and N. E. Holden, Brookhaven National Laboratory

Trans. Am. Nucl. Soc. 52, 636 1986
"Energy Dependence of the Neutron Multiplicity $P_{\text{avin}}$
Fast Neutron Induced Fission for $^{235}$U, $^{238}$U and $^{239}$Pu,"
M. S. Zucker and N. E. Holden, Brookhaven National Laboratory

Radiation Effects 96, 289 1986
"Prompt Neutron Multiplicities for the Transplutonium Nuclides,"
N. E. Holden and M. S. Zucker, Brookhaven National Laboratory.

"Nuclear Data for Gd-153 Production,"
N. E. Holden, Brookhaven National Laboratory
Radiation Effects 96, 125 1986
"Mean Fission Neutron Spectrum Energies for 252Cf and
Fissile Nuclides 233U, 235U, 239Pu and 241Pu,"
N. E. Holden, Brookhaven National Laboratory.

BNL-NCS-52028 Jan. 1987
"Compilation of Requests for Nuclear Data,"
National Nuclear Data Center, Ed., Brookhaven National Laboratory.

EPRI NP-5058 Electric Power Research Institute Feb. 1987
"Testing of the ENDF/B-V Nuclear Data Library in
Thermal Benchmark Experiments,"
E. Schmidt and P. F. Rose, Brookhaven National Laboratory.

INDC(NDS)-184/GM March 1987
"An Example of Nuclear Data Center Services for Geophysics Applications,"
IAEA Consultants Meeting held in Vienna 7-9 April 1986, p. 119
P. Rose, T. Burrows, and J. Tuli, Brookhaven National Laboratory.

Nucl. Sci. Eng. 95, 116 1987
"Systematics of Neutron Emission Spectra from High
Energy Proton Bombardment,"
S. Pearlstein, Brookhaven National Laboratory.

II. Work in Progress or Recently Completed

1. Neutron Data Atlas.

The new edition of Neutron Cross Sections: Curves (formerly BNL-325)
has been completed and will be issued by Academic Press, probably in the
fall. The experimental data have been plotted with the evaluated curves
taken from ENDF/B-V where they exist. The price is expected to be about
US $65 for hard bound and US $40 for soft bound editions.

2. RADLST.

The program RADLST has been written. This program produces atomic
and radiation decay data from information in the ENSDF format. One of
the output options is for the data to be presented in the ENDF/B-VI
format. There are options to calculate the continuum spectra for
the \( \beta^- \) and \( \beta^+ \) radiations and for the internal Bremstrahlung associated
with \( \beta^+ \) decay and \( \gamma \) decay. The program is based, in part, on the earlier
code MEDLIST written at the Nuclear Data Project, Oak Ridge National
Laboratory. RADLST is written in ANSI-standard FORTRAN-77.

Gd-153, which has medical applications, is produced by irradiation of natural europium-oxide. Neutron cross-section data for the rare earth nuclides $^{151}\text{Eu}$, $^{152}\text{Eu}$, $^{153}\text{Eu}$, $^{154}\text{Eu}$, $^{155}\text{Eu}$, $^{152}\text{Gd}$, and $^{153}\text{Gd}$ have recently been reassessed and thermal cross-section and resonance integral values have been recommended to assist in the determination of $^{153}\text{Gd}$ production.

4. Charged Particle Reaction Data.

The systematics of emission neutron spectra from proton induced spallation reactions has been investigated and reported (Nucl. Sci. Eng. 95, 116 (1987). This work, together with extensions of the nuclear model code ALICE to higher energies, are being used to produce evaluated data for medium energy applications.

The NNDC continues to produce annually a bibliography of charged particle cross-sections and thick target yields.

In the past year, the NNDC has organized a Medium Energy Nuclear Data Working Group for the purpose of bringing together a group of scientists from many diverse research specialties with a common need for improved charge particle data.

5. Neutron Multiplicity Distributions and Nubar.

The prompt neutron multiplicity distributions and average values for nubar have been reevaluated for the heavy elements. Renormalized values of the distribution for spontaneous fission and thermal neutron energies have been obtained. The uncertainty analysis and the energy dependence are being investigated further.

III. Other Subjects of Interest

A few years ago an intensive effort was made to evaluate the half-lives of about three dozen long lived nuclides as well as two dozen nuclides of uranium, plutonium, americium and curium. An effort will soon be made to conclude this project and provide recommended values for these half-lives.

An effort will be made to understand the reason for the significant difference between maxwellian averaged thermal cross sections and the 2200 meter per second values for the fissile nuclides $^{235}\text{U}$ and $^{239}\text{Pu}$.
I. Recent Publications and Reports


II. Work recently completed

1. Preliminary evaluations of neutron data for \(^{11}\text{B}, ^{151,153}\text{Eu}, ^{165}\text{Ho},\) and \(^{169}\text{Tm}\).

2. Theoretical analysis of \(^{185,187}\text{Re}(n,\gamma)\) cross sections from 1 keV to 2 MeV and all neutron-induced cross sections to 20 MeV for \(^{64}\text{Zn}\).

3. Completed delayed neutron spectra library for 270 precursors and emission probabilities.

4. Calculated \(\nu_d\) and spectra for 28 fissioning nuclides at one or more neutron incident energies.

5. Made preliminary fits for six time groups and corresponding multigroup spectra for delayed neutron calculations, and stored resulting parameters in an ENDF format.

6. Updated libraries of fission product yields measured thru 1986 for 34 fissioning systems.

7. Produced data libraries for \(^{27}\text{Al}, ^{54,56}\text{Fe}, ^{58,60,62}\text{Ni}, ^{63,65}\text{Cu},\) and \(^{182,183,184,186}\text{W}\) up to \(E_n = 50\) MeV in ENDF-6 formats.

8. Developed a method for performing cross section uncertainty analyses without using first-order perturbation theory.

9. Collected results for primary neutron-producing charged-particle reactions from various R-matrix analyses and compared with measurements and evaluations.
III. Work in progress

1. Revision of ENDF/B-V.2 n+7Li covariance analysis for ENDF/B-VI.
2. Finalization of evaluations of 11B, 151,153Eu, 165Ho, and 169Tm.
3. Continued production of higher energy ENDF libraries up to $E_n = 100$ MeV for n, $\gamma$, and charged particle emission.
5. Improve yield distribution parameters.
6. Continue evaluation of fission product yields for ENDF/B-VI.
7. Evaluation of standard cross sections for ENDF/B-VI in final stages.

IV. Work planned for the future

1. Theoretical analysis of neutron reactions with 191,193Ir.
2. Data evaluations of 6Li, 10B, 14N, 185,187Re.
3. Improvement of 235U inelastic scattering data and incorporation into a new ENDF/B-VI evaluation.
4. Improve beta and gamma spectra for fission products.
5. Make further improvement in delayed neutron spectra and model codes.
6. Expand fission product yield data to include additional actinides and continue updating basic libraries.

V. Work on nuclear model codes.

1. Released code FISPEK to friendly users. FISPEK calculates prompt fission neutron spectra for neutron-induced as well as spontaneous fission using the formalism of Madland and Nix, in the constant cross section approximation. This formalism in the constant cross section approximation constitutes the LF=12 law used in ENDF-6, as documented in LA-9285-MS(ENDF-321).
2. New GNASH version produced that includes multistage pre-equilibrium particle emission, includes a detailed $\gamma$-ray competition model, and can handle up to 350 reaction paths in one calculation. Also within this GNASH version, a level density model based on the formalism of Ignaytuk has been implemented.

Compiled by R. J. LaBauve and E. D. Arthur
1. Recent publications and reports

R. L. Bywater, Jr., *Gamma-Ray Production Cross Sections for 0.9 to 20 MeV Neutron Interactions with 10-B*, ORNL/TM-10191 (October 1986).


H. Derrien, N. M. Larson, G. de Saussure, and R. B. Perez, "R-Matrix Analysis of the $^{241}$Pu Cross Sections up to 100 eV," Accepted by Nuclear Science and Engineering.


J. K. Dickens, "Fission-Product Yields for Fast Neutron Fission of $^{243,244,246,248}$Cm," Accepted for publication in Nuclear Science and Engineering.


2. Work recently completed

   a. A comprehensive analysis of $^{58}\text{Ni}$ transmission, capture, and differential elastic-scattering data in the resonance region has been completed. Three ORELA transmission measurements were analyzed from 20 eV to 810 keV using the R-matrix code SAMMY, an ORELA capture measurement was analyzed from 2.5 to 450 keV, and an ORELA differential elastic-scattering measurement at six angles was analyzed from 3 to 810 keV. All energy scales were normalized. The analyses were done separately, and the results combined interactively to provide one set of resonance parameters which yielded the best simultaneous fit to all the data. Sixty-two 1=0 and 420 $1>0$ resonances were analyzed. The work is being prepared for publication.

   b. A measurement of the $^{53}\text{Cr}(n,\gamma)$ reaction was completed from $E_n=100$ keV to 10 MeV, using a Ge detector and the 20-m flight path at ORELA. Sixty-five gamma rays were observed and fifty were placed in a decay scheme. This measurement is part of a series to provide high-resolution gamma-ray production cross sections for structural materials over a wide incident neutron-energy range. The results have been submitted for publication.

   c. The total cross section for $^{59}\text{Co}$ has been measured from 80 keV to 15 MeV using the 200-m flight path at ORELA. A 5-ns pulse width and a NE110 plastic scintillator detector was used. The measurement was performed at the request of the ENDF/B-V1 evaluator for Co to improve the cross-section knowledge in the resonance region.

   d. The total and capture cross sections have been measured for $^{144}\text{Sm}$ starting at 0.5 eV and going to 50 keV for the total and 500 keV for the capture cross section. A paper is being prepared describing the work.

   e. The capture cross section of rhenium has been measured from 3 to 1900 keV and a paper has been submitted describing this work.

   f. Capture cross section spectra have been obtained in collaboration with LANL for Ho, Eu, and Gd. Nineteen time-of-flight bins covering the neutron energy range from 400 eV to 3 MeV were used to study the energy dependence of the pulse height spectra. A BGO detector was used at the 20-m flight path of ORELA as the gamma ray detector. A report describing this work is being written.

   g. A transmission measurement for $^{235}\text{U}$ has been completed from 0.01 eV to 50 keV, using the 18-m and 80-m flight paths at ORELA. The data are being used in a SAMMY analysis of the transmission and fission cross-section data.
h. A high-resolution capture measurement on $^{238}$U has been completed from 1 to 100 keV, using the 150-m flight path at ORELA. Three separate sample thicknesses were used, and the data are presently being analyzed in cooperation with Harwell.

i. A transmission measurement on $^{239}$Pu has been completed, using the 80-m flight path and three sample thicknesses, cooled to liquid nitrogen temperatures. The energy region covered was 0.01 eV to 50 keV. The data are being utilized in a SAMMY analysis of the total and fission cross-section data.

Other work completed in the past year is covered in the Publications section.

3. Work in progress

a. A measurement of the $^{10}$B(n,α)/$^{10}$B(n,α0) ratio from 50 keV to 1 MeV is underway at ORELA. A gridded ionization chamber with a coating of 20 micrograms per square centimeter of $^{10}$B on the center plate is being used for the detector. Completion of the data taking is expected early this summer.

b. Calculated results from TNG for $^{58,60}$Ni are being combined with experimental cross-section data and resonance parameters to form new, isotopic evaluations for ENDF/B-VI. Special attention is being paid to ensure energy balance. The new File 6 formats are being used extensively to include energy-angle correlations. The new Reich-Moore formats are being used for the resonance parameters.

c. The status of the $^{52,53}$Cr evaluations is similar to the Ni work described above, except for the resonance region where the parameters will be obtained from the literature.

d. The calculations for the $^{58}$Fe evaluation are nearly complete, but the new simultaneous total, capture and scattering resonance parameter analysis may not be completed in time for ENDF/B-VI.

e. SAMMY resonance parameter analyses are currently underway for transmission and fission data for $^{235}$U and $^{239}$Pu. The goal is to extend the resolved resonance region from 83 eV to 2 keV for $^{235}$U and from 300 eV to 1 keV for $^{239}$Pu for inclusion in ENDF/B-VI.

f. The standards evaluation in which the results of the R-matrix and simultaneous evaluations are combined in a final step is essentially complete. Input data uncertainties and correlations for particular data sets are being reviewed.

g. A SAMMY analysis of a recent ORELA transmission measurement on $^{54}$Fe is underway, with resonance parameters being obtained to 800 keV.
4. Work planned for the future

a. A measurement of the differential elastic-scattering cross section for $^{56}$Fe is planned for this fall, with the objective of providing data similar to that obtained earlier for $^{58}$Ni. The 200-m flight path at ORELA will be used, and six detectors in the 1.8-m scattering chamber will obtain data at scattering angles of $39^\circ, 55^\circ, 90^\circ, 120^\circ, 140^\circ$ and $160^\circ$. The data will be used in a simultaneous analysis of total, capture, and scattering data for the resonance region of $^{56}$Fe.

b. A measurement of the transmission through several samples of $^{238}$U will be initiated this summer, using the 200-m flight path at ORELA. A new two phototube NE110 detector has been developed which can be biased below the single photoelectron level for each tube and measure neutron energies to less than 1 keV. This, along with a detailed study of the resolution function associated with the ORELA target, should provide significantly improved data and allow the resolved resonance energy range to be extended to 15 keV or higher.

c. A new high-resolution measurement of the $^{233}$U and $^{235}$Pu fission cross sections is being planned for later this year. The resonance parameter analyses discussed above were limited by the energy resolution of the fission cross sections, and the new measurements at the 85-m flight path should remove this problem.

d. A new multicrystal spectrometer containing 36 BaF$_2$ crystals is under construction. Monte-Carlo tests show an efficiency of >90% for a capture cascade with a multiplicity of 3.5 and sum energy of 6 MeV, with a 400 keV bias.

e. Development work has started on a system to measure neutron and gamma-ray emission cross sections from 1-20 MeV. Monitor detectors have been developed, and calibration work for the NE213 scintillator is underway.

f. The high-resolution (n,xy) production cross-section measurements will continue, with the next scheduled samples being Co and Ti.

5. Work on nuclear model codes

a. The TNG code, a multistep Hauser-Feshbach code including precompound emission, now has the additional capability to calculate capture gamma-ray spectra, include the precompound mode of the (n,γ) reaction, and calculate fission cross sections. This work is documented in a report listed in Section 1.

b. SAMMY, a R-matrix code using Bayes' equation, has been implemented on a FPS164 array processor attached to a VAX785. A typical problem of fitting 4000 data points and varying 600 parameters now takes less than one hour CPU time. Recent additions to the code include allowing different radii for different spin groups, including data-reduction parameters such
as backgrounds as varied parameters, and a sophisticated Doppler-broadening routine. A detailed resolution function tailored to the ORELA target will soon be implemented.
EUROPEAN FUSION FILE (EFF)

Address: Netherlands Energy Research Foundation ECN, P.O. Box 1, 1755 ZG PETTEN, NETHERLANDS
Telephone: 02246-4083, telex: 57211 REACP NL
Names: H. Gruppelaar, D. Nierop (file management)

The EFF project is part of the European Fusion Technology Programme of the European Community (EC). 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 directed 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), IKE (Stuttgart) and EIR (Würenlingen). Furthermore, technical support is received from the NEA Data Bank.

1. Recent publications and reports


2. Work recently completed

- Distribution of EFF-1 file to European users.
- Compilation of GEFF-1 multi-group constant library (VITAMIN-J format).

3. Work in progress

Revision of cross-sections for $^7$Li, Be, Al, Fe, Cr, Ni by various laboratories. Work on systematics of isomeric cross-section ratios.

4. Work planned for the future

- Compilation of EFF-2 data library.
- Compilation of a European Activation File (EAF) for fusion technology.

5. Work on codes

The GROUPXS code for file-handling and multi-group constant calculations of double-differential cross-sections stored in MF6 of ENDF-VI is available for the NEA Data Bank.

6. Distribution

Since a large part of EFF-1 consists of evaluations taken from JEF-1, the same distribution policy as for JEF-1 (NEA Data Bank Member countries) is followed. Different evaluations in EFF-1 are given for $^7$Li, $^7$Be, Al, Si and Pb. The lead evaluation has been made available for general distribution and can be requested from the NEA Data Bank. The package consists of the EFF-1 evaluation with MF6 data, an equivalent ENDF-V version (without angle-energy correlations for continuum reactions) and a version with isotropic angular distributions for continuum reactions. The GEFF-1 data file for lead has also been included.

Compiled by: H. Gruppelaar
Names: D.E. Cullen, H.D. Lemmel, P.K. McLaughlin, K. Okamoto, O. Schwerer

New evaluated data files:

Chinese library of fission-product yield data
by Wang Dao and Zhang Dongming of the Chinese Nuclear Data Center,
Institute of Atomic Energy, Beijing.

Publications:


- Element and isotope index to the major evaluated neutron data libraries. IAEA-NDS-70 (Rev.2), P.K. McLaughlin.


ENDF/B Preprocessing Codes:

The new version by D.E. Cullen is now available on tape with a summary document IAEA-NDS-39 Rev.3 (Feb. 1987). It is also available on a set of diskettes for a Personal Computer (IBM PC AT or compatible) with a summary document IAEA-NDS-69 (May 1987) by P.K. McLaughlin.

Plotting programs by D.E. Cullen:
Program PLOTTAB — General plotting program, documented in IAEA-NDS-82 and -83.

Program PLOTC4 — plots ENDF/B data and/or EXFOR data, documented in IAEA-NDS-79.

Program X4TOC4 — Converts EXFOR data to C4 format for input to PLOTC4, documented in IAEA-NDS-80.

Programs PLOTC4 and X4TOC4 for a personal computer, documented by P.K. McLaughlin in IAEA-NDS-81.
Recent JEF Meetings

1. A JEF Working Group Meeting on Benchmark Testing and Processing Codes was held on 12th at the NEA Data Bank.

Results of burn-up and fuel cycle calculations of different benchmark specifications, using the JEF-1 library, were reported from Karlsruhe and Cadarache, as well as analysis of LWHCR experiments from Würenlingen. The possible inconsistency between the evaluated thermal values by Axton and the results from the benchmark testing of the JEF-1 library was discussed and a small subgroup was formed to investigate this problem and to report back to the JEF and CSEWG communities.

It is planned to issue a complete report on the benchmark testing of the JEF-1 file, and intermediate summaries for different categories of benchmarks were presented.

The discussion on the processing codes concentrated on the question of the status of the new version of NJOY and the maintenance of this code and the code THEMIS.

2. A JEF Working Group Meeting on Evaluation Work for JEF-2 was held on 13th May 1987 at the NEA Data Bank.

The status of the new evaluations planned for JEF-2 were reviewed. The U-235 and Pu-239 evaluations and the resonance part of the Pu-241 evaluation would be ready at the end of 1987. The U-238 file was scheduled for the middle of 1988 and work on Pu-240 would start in the beginning of that year.

The Chromium evaluation was very near completion, whereas the work on the Nickel file was somewhat delayed, but a preliminary version should be ready in the first half of 1988. There were no news on the status of the Iron evaluation.

Most of the fission product evaluations was being updated in the resonance region and the calculation of the revised inelastic cross sections would be performed according to the deadline of 1988. Updating of the Oxygen and Sodium evaluations were also planned.

3. The JEF Scientific Coordination Group met on 14th May 1987 in Paris. Review papers from the different areas of the JEF project were presented and the future of the project was discussed. It was generally felt that the aim to release the JEF-2 file at the end of 1988 could be
Three type of files could be envisaged: 1) major isotopes (actinides and structural materials), 2) minor actinides, and 3) fission products. File type 2) and 3) could already be released at the end of 1988 in the final form, whereas file type 1) should first be benchmark tested before the final version could be released in the middle of 1990.

Collaboration with Geel concerning request for experimental data were discussed and reports from the JEF Working Groups on Radioactive Decay Data and Fission Yields and on Standard Cross Sections were presented. The latter group was formed to review the proposed preliminary Standard Cross Sections from the ENDF/B-VI library.

The adoption of the ENDF-6 format for the JEF-2 file was discussed and a decision could not be taken until the new version of NJOY had been received and tested.

It was generally felt that the inclusion of covariance data in the JEF-2 library was of vital importance, but considering the work involved, it was concluded that only in the most important isotopes could this information be given.

Recent JEF publications

JEF Report 8  Graphical Comparison of JEF-1 with EXFOR Cross Section Data; November 1986, Y. Nakajima, NEA Data Bank (Confidential)

JEF Report 9  Table of the Main Radioactive Decay Data Parameters from JEF-1, ENDF/B-V, ENSDF, French, Japanese and UK Libraries; June 1987, NEA Data Bank
### DISTRIBUTION LIST FOR OECD AND IAEA MEMBER COUNTRIES

<table>
<thead>
<tr>
<th>Country</th>
<th>Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>J. Boldeman</td>
</tr>
<tr>
<td>Austria</td>
<td>F. Putz, H. Vonach</td>
</tr>
<tr>
<td>Belgium</td>
<td>H. Ceulemans, F. Motte</td>
</tr>
<tr>
<td>Brazil</td>
<td>L.T. Auler, K.R.P. Nair, R. Paviotti Corcuera</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>N. Janeva</td>
</tr>
<tr>
<td>Canada</td>
<td>W.B. Lewis</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>R. Filip, I. Ribansky</td>
</tr>
<tr>
<td>Denmark</td>
<td>E. Nonböl</td>
</tr>
<tr>
<td>Euratom</td>
<td>K.H. Boeckhoff, H. Liskien, H. Rief, G. Rohr, E. Watte camps, H. Weigmann</td>
</tr>
<tr>
<td>Federal Republic of Germany</td>
<td>S. Cierjacks, F.H. Froehner, B. Goel, E. Kieffhaber, H. Kuesters, M. Mattes, M. Rittberger</td>
</tr>
<tr>
<td>Finland</td>
<td>F. Wasastjerna</td>
</tr>
<tr>
<td>German Democratic Republic</td>
<td>D. Hermesdorf, D. Seeliger</td>
</tr>
<tr>
<td>Greece</td>
<td>M. Dritsa</td>
</tr>
<tr>
<td>Hungary</td>
<td>Z.T. Body, J. Csikai, P. Vertes</td>
</tr>
<tr>
<td>IAEA</td>
<td>D.E. Cullen, H.D. Lom mel, V. Goulo, J.J. Schmidt</td>
</tr>
<tr>
<td>Iceland</td>
<td>M. Magnusson</td>
</tr>
<tr>
<td>India</td>
<td>S. Ganesan, S.R. Garg, S.S. Kapoor</td>
</tr>
<tr>
<td>Ireland</td>
<td>T.A. Nevin</td>
</tr>
</tbody>
</table>
ISRAEL
S. Yiftah

ITALY
V. Benzi, U. Farinelli, E. Menapace, G.C. Panini

JAPAN

NEA
J.A.G. Rosón, N. Tubbs

NETHERLANDS
M. Bustraan, H. Gruppelaar, H. van Dam

NORWAY
E. Andersen, J.O. Berg

PAKISTAN
K. Gul

POLAND
A. Marcinkowski

PORTUGAL
F. Gama Carvalho

ROMANIA
G. Vasiliu

SPAIN
R. Caro Manso, M. Gomez Alonso, C. Sanchez del Rio, G. Velarde

SWEDEN
H. Condé, E. Hellstrand

SWITZERLAND
J. Hadermann, R. Richmond, W. Seifritz, F. Widder

TURKEY
C. Ertek

UNION OF SOVIET SOCIALIST REPUBLICS

UNITED KINGDOM

UNITED STATES OF AMERICA

YUGOSLAVIA
A. Trkov