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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

IAEA SPECIALISTS' MEETING ON THE "FORMAT FOR THE EXCHANGE OF EVALUATED NEUTRON NUCLEAR DATA"

Vienna, 2 - 4 April 1984

Summary Report

Edited by

O. Schwerer, H.D. Lemmel

April 1984

IAEA NUCLEAR DATA SECTION, WAGRAMERSTRASSE 5, A-1400 VIENNA

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INTRODUCTION

(by H.D. Lemmel)

Recommendation 5 of the 13th INDC Meeting (Rio de Janeiro, 16-20 May 1983) reads,

> "It is recommended that the ENDF/B-V format (with some possible extensions) should be adopted as the format for international exchange of evaluated neutron nuclear data. This proposal should be discussed at the next Nuclear Reaction Data Centres Meeting. Possible extensions or modifications could be the subject of an NDS-sponsored specialists meeting in 1984."
>
> [Report INDC-39, page 35]

This recommendation was endorsed by the 7th IAEA Consultants' Meeting of the Nuclear Reaction Data Centres (Obninsk and Moscow, 17-21 Oct. 1983).

Consequently, a Specialists' Meeting on the "Format for the exchange of evaluated neutron nuclear data" was scheduled on 2-4 April 1984, so that the conclusions could be sumbitted to the May 1984 meeting of the US Cross-Section Evaluation Working Group (CSEWG), which is to decide upon revisions of the ENDF-V format to be adopted for the version VI of the ENDF/B library.

Invitations for submitting proposals related to the ENDF format were sent out by the IAEA in November 1983 to scientists in 30 countries and 2 international organizations, who were known to be major users of the ENDF/B format. Numerous proposals in 29 working papers were received. Part of the proposals was distributed prior to the meeting and reviewed by the ENDF Format experts R.E. MacFarlane and C.L. Dunford, USA.

The following countries and organizations were represented at the meeting (either by participation at no cost to the Agency, by submitting proposals, or both):

China, People's Rep.	Netherlands
German Dem. Rep.	UK
Germany, Fed. Rep.	USA
Hungary	USSR
India	Yugoslavia
Italy	OECD NEA
Libya	IAEA
Japan	

The conclusions of the meeting, which can be appreciated only by experts with detailed knowledge of the ENDF system, are given in this document.

It should be realized that the ENDF system combined two aspects:

- primarily it is a data input format (monitored by CSEWG) to a wealth of computer codes (mostly provided by USA, with hopefully increasing contributions from other countries);

- after adoption of this format by Japan, NEA, IAEA, and USSR, it is an international exchange format for evaluated nuclear data.

Whereas more flexibility of the ENDF format is desirable for the international exchange, the existing computer codes require that format changes are kept to a minimum. It seems that the format changes under discussion represent a good solution to meet both requirements.

IAEA Specialists Meeting on
Format for the exchange of evaluated neutron nuclear data

IAEA, Vienna, 2-4 April 1984

AGENDA

1. Opening, election of chairman, adoption of agenda, announcements

2. Introductory remarks on

   - the purpose of ENDF/B and the boundary conditions to be observed during the discussions

   - the present status of the ENDF/B system and revisions recently adopted and/or planned by CSEWG

3. Brief review of the proposals submitted in order to fix the sequence of items to be discussed

4. Detailed discussions on the items agreed under 3. above

   A. Proposals concerning primarily the ENDF format
   B. Proposals on procedures and processing
   C. Covariances
   D. Documentation and checking
   E. Processing codes
   F. Multigroup formats
   G. Recommendation to evaluators

5. Conclusions, recommendations, actions

LIST OF PARTICIPANTS

Country	Name	Institute
GERMANY, Fed. Rep.	Ms. M. Mattes	Institut für Kernenergetik der Universität Stuttgart
HUNGARY	P. Vértes	Central Research Institute for Physics
ITALY	G.C. Panini	Centro di Calcolo del E.N.E.A.
	Ms. M. Petilli	E.N.E.A.-Centro Studi Nucleari - Casaccia
LIBYA	E. Aboughalya	Secretariat for Atomic Energy
	Y. Abushady	Secretariat for Atomic Energy
	M. Ramadan	Secretariat for Atomic Energy
NETHERLANDS	H. Gruppelaar	Netherlands Energy Research Foundation (ECN)
U.S.A.	C.L. Dunford	National Nuclear Data Center
	R.E. MacFarlane	Los Alamos National Laboratory
U.S.S.R.	A.I. Blokhin	Fiziko-Energeticheskij Institut
Yugoslavia	A. Trkov	Institut Jozef Stefan
NEA Data Bank	C. Nordborg	Nea Data Bank
I.A.E.A.	D.E. Cullen	
	H.D. Lemmel	
	V.G. Pronyaev	
	J.J. Schmidt	
	O. Schwerer	
	H. Washak	
	M. Yaltirik	

CONCLUSIONS

The Meeting reviewed the working papers listed in App. 1. The working papers will not be included in a publication, but they are available from IAEA-NDS upon request. A summary of the proposals extracted from the working papers is given in App. 2.

The Meeting appreciates the efforts of R.E. MacFarlane and C.L. Dunford who reviewed proposals distributed in advance of the meeting and included some of them in the Draft ENDF-VI Manual revision, LA-UR-84-1026 (WP15 Rev.) The Meeting recommends the adoption of this document with the modifications described below.

A. Nomenclature, identification, specific data types

1. At the IAEA certain evaluations are available in ENDF-IV format or in ENDF-V format as the requestor prefers. It is therefore essential throughout the Manual, to distinguish carefully between the "ENDF/B library" and the "ENDF format".

   The Meeting recommends that an additional integer flag NVER be assigned for library version identification and another integer flag NFOR be assigned to distinguish between the different versions of the ENDF format.

2. IAEA-NDS will maintain a list of NLIB numbers to identify uniquely other libraries in ENDF-VI format. New library identification numbers will be assigned by NDS upon request. (See Appendix 3)

   NLIB=0 should identify explicitly the library ENDF/B.

   As long as ENDF/B-VI is not generally available, there may be ENDF/B-IV or -V evaluations converted to ENDF-VI format, which would be distinguished by different NLIB numbers.

3. Since there will be several libraries in ENDF format, the name and format of the library should be given in a convenient readable form in the hollerith text (MF=1, MT=451).

   For this purpose NDS had used two structured text cards as follow

   ```
   IDENTIFIER = LIBNAME      MAT       NREV
   FORMAT =     ENDF-VI
   ```

   For derived files the FORMAT card may contain information such as RECENT-OUTPUT.

   Such information as given in this example should be included in an appropriate place within MF=1, MT=451.

   Data users should be requested to refer to an evaluation by exactly the contents of the IDENTIFIER card. This information could also be used for captions of graphical plots.

4. It has been discussed whether an evaluated data library tape in ENDF format should be preceded by an index, for the convenience of the user. As such indexes may be required at varying depth (at MAT level or at MF/MT level), the preferred solution is to provide indexing codes, which can generate an index, either printed or as part of the tape.

5. Starting with the ENDF-VI format the MAT number will always be the same for evaluations of the same isotope or material in the ENDF/B library. Other libraries using the ENDF-VI format need not follow this convention for assigning MAT numbers, e.g., INDL will continue to have competing evaluations for the same nuclide.

6. In a prominent place in MF=1, MT=451, information should be given on

   a) the origin of the evaluation, if it has been taken over from an earlier version or another library

   b) any uncommon features of the standard format that may require special processing (e.g. Reich-Moore parameters);

   c) any deviations from the standard definitions or format (e.g. when the ENDF data given represent only an approximation to the author's evaluation).

7. The meeting agreed to the use of the LRP flag as outlined in WP15. Use of the LRU flag in MF=2, MT=151 for a similar purpose was discussed at the meeting. This proposal was deferred until the need arises.

8. Madland-Nix fission-neutron spectrum

   The Meeting supported the introduction of the Madland-Nix fission-neutron spectrum, as documented in LA-9285-MS (ENDF-321) (WP29).

9. Resolved resonance region

   The tabular representation of the energy-dependent scattering radius which was derived from the Japanese proposal in WP24, should be adopted, but the polynomial representation should not be adopted.

   For the introduction of additional resonance parameters more substantiation is needed. In principle, the format is flexible enough to allow any number of parameters by increasing the repetition rate within the list record, but substantial investments in computer codes would be required.

10. Unresolved resonance region

    The meeting felt that it is premature to decide on the use of other formats than SLBW in the unresolved resonance region since the need for this has not been demonstrated.

    The decision of CSEWG on the interpolation in the unresolved range (see WP13) was discussed.

An action on the request for more open channels in the unresolved region, was deferred until more evidence for a need from the application side of the data is presented.

11. Resonance region general

The meeting suggests that a Monograph be written on evaluation in the resolved and unresolved resonance region, covering both methods and representations of the data for applied use. (Action on Nordborg to contact Michaudon).

The use of resonance parameters and lumped cross sections was clarified in the proposed manual updates (WP15, 24) as requested.

12. Redundant lumped quantities and revision of currently available MT numbers

Some discussion was devoted to the desirability of having redundant, lumped cross sections in the file, such as the non-elastic (MT=3), neutron absorption (MT=27), neutron-disappearance (MT=101), gas-production (MT=203-207) and neutron production cross section. The last-mentioned quantity is not defined in ENDF (see below). Although these redundant quantities may be very useful, there is the danger that inconsistencies are introduced. Therefore, it was decided to allow only a few redundant cross sections in the original file, with the important exception of the total cross section, the non-elastic cross section (when required for photon production) and the gas-production data (when these cannot be derived entirely from the other quantities). In derived files it is, however, possible to have more redundant data types. For this purpose the following additional data types were recommended for inclusion in the manual:

MT=10 Continuum particle-emission cross section. This cross section lumps all cross sections together which describe the emission of particles with a contiuum distribution, e.g. (n,n_{cont}), (n,2n), (n,3n), (n,p), (n,pn), (n,α), (n,αn), etc. The total particle yields, etc. can be entered in File 6. The MT numbers 50-90, 700-717, 720-737, 740-757, 760-777, 780-797 are not included in MT=10. Also not included are reactions in which a primary γ-ray is emitted.

MT=201 neutron production cross section (total neutron emission, excluding elastic scattering)

MT=202 γ-ray production cross section.

It is recommended to issue a list of MT numbers that are to be used in original files and those that are only available for derived files. Obsolete MT numbers or numbers that should be avoided in new evaluations have to be clearly indicated.

It is noted that in ENDF-IV data types like μ, ξ and γ (MT=251, 252, 253 respectively) are also redundant. The data types MT=6-9 and 46-49 could be entirely removed from the ENDF/B-VI file, because these data will be treated with MT=16 in combination with MF=6.

Other MT assignments that should be removed from the file are MT=25, 120, 113, 719, 739, 759, 779, 799, 465, 466. It was recommended to identify the relations ("sum rules") between the different MT numbers in the manual, e.g.

MT=10 = MT4 + MT103 + MT104 + MT105 + MT106 + MT107
- (MT50 + ... MT90) - (MT700 + ... MT717) +
- (MT720 ... MT737) - (MT740 + ... 757) +
- (MT760 ... MT777) - (Mt780 + ... 797).

or

MT=201 = MT10 * (yield for neutrons in file 6).

B. Procedures and Processing

1. It is required that evaluators do not use undefined J values for multilevel Breit-Wigner resonance parameters, but should provide an estimate of the J value so that the statistics are obeyed. For details see ENDF-102, p. 2.30.

2. In response to the JAERI proposal on modification of restriction of parameters the meeting recommended that:

   The restriction in the number of comment cards should be dropped.

   The restriction in the number (5000) of data points should be dropped.

   The number of Legendre coefficients should be kept at 20. (If more are needed, they may be used, but there will be no effort to modify related codes.)

   The transformation matrices should be dropped.

3. The JAERI request to accept 7-digit numerical fields should not present a problem when reading the data with a FORTRAN program. At this time it is impractical to increase the width of the field, but any FORTRAN readable value within the present field width is acceptable.

4. In Obninsk it had been noticed that the 0.0253 eV cross-sections calculated from the file did not agree with the values given by the authors in free text. Resonance parameters should only be used for calculating cross sections within the specified resonance range. In particular contributions of negative resonances should only be used within the specified range. If appropriate procedures are used, then a discrepancy between the calculated value and the value stated in free text would indicate a mistake. When such a case is detected it should be brought to the attention of the responsible data center for clarification.

5. In Obninsk difficulties with summing procedures had been encountered. This should not be a problem in ENDF/B-V where evaluations should be done at a fine enough grid. There may be a

problem with older evaluations, in particular ENDF/B-IV.

Evaluations should be done on a fine enough grid so that partial cross sections sum up to the total cross section between the points.

Action on Blokhin (re item B.4). Send to Dunford list of incorrect thermal scattering and capture cross sections listed in the free text parts of the ENDF/B-V Fission Product and Secondary Actinide Files.

Action to Vértes (re item B.5). Send to Dunford, a list of evaluations in the original ENDF/B files in which the energy grid of the total cross section is not the composite of the grids of the partial cross sections.

6. Interpolation schemes

It was felt that it is premature to include cubic spline fits (requested by Rowlands) because this would have major implications on processing codes.

The Meeting felt that linear-linear interpolation is the safest; experience has shown that when linearizing a material evaluation no significant increase in data points was found.

Individual processing codes and derived files may well use other interpolation schemes, such as the interpolation scheme proposed by Cai Dunjiu.

For interpolation near threshold it would be useful to give a typical example in the Manual.

Histogram (binned) representation of data should not be used unless no other representation is possible.

7. Interpolation of emission spectra, represented in file 6

In the MF=6 proposal, two interpolation schemes are allowed for emission spectra: a bin-structure or pointwise (linear-linear). For neutron emission spectra usually a fine mesh is required at low outgoing energies, where the spectrum is determined by an evaporational peak. In view of the important technological applications in neutron-transport calculations the meeting recommends that only pointwise data on the energy grid at low energies be allowed. When these data are calculated with a model code using a (equi-distant) bin structure, it may be required to fit a smooth function through the data, taking into account the evaporational shape of the spectrum at low energies. In no way the use of the new (MF=6) format should lead to a less satisfactory representation of neutron emission spectra than evaluations using MF=5. MacFarlane will write a procedure with the above-mentioned recommendation. It was noted that a bin structure may be sufficient for the representation of charged-particle spectra and for neutron spectra of materials that are not used in neutron-transport calculations.

8. Resolved/unresolved boundary

The boundary between the resolved and unresolved energy ranges in the ENDF format is difficult for an evaluator to define because resonances from sequences with low spin (s) can normally be resolved to higher energies than resonances from sequences with higher spin (p,d). The rule in the current format results in using the lowest possible energy, which can result in omitting known resonances. There were two proposals presented to alternate this problem.

Dr. Blokhin presented Dr. Nikolaev's suggestion that File 2 be reorganized to allow the resolved-unresolved boundary to be different for each spin sequence. This proposal would solve the problem nicely, but it would require extensive changes to formats and utility codes. In addition, current self-shielding codes based on direct integrations over probability distributions (MC^2-II, NJOY/UNRESR, etc.) would be very difficult to adapt to this approach.

Another approach (currently discribed in ENDF-102 p. 2.26) is to raise the upper boundary of the resolved region and to insert fictitious resonances to represent the unresolved components. This method has the advantages of being deterministic and compatible with all existing utility and processing codes. The evaluator should provide a free-text discription of the fictitious resonances.

The alternative of representing the resolved s-wave resonances in the unresolved range as unphysical fluctuations in the average resonance parameters or pointwise as resonances in the File 3 background are not recommended.

C. Covariances

There are proposals for Files 32, 34 and 35. No proposal for covariances for File 6 is foreseen. Since no detailed discussion of WP25 is possible at the meeting, comments may be sent to Dunford after the meeting.

WP27 (Petilli) will be given to covariance experts for consideration.

A flag in File 33 is requested indicating whether or not the resonance contribution from File 32 is included.

For dosimetry purposes, a covariance file for File 10 may be required or a flag in File 3 to indicate an isomer. The meeting refers further discussion of this to CSEWG.

Action on Gruppelaar to ask Zijp about this matter.

D. Documentation and Checking

BNL will continue updating and distributing the manual ENDF-102. No shorthand manual will be produced in the US, but cooperation may be offered if someone else wants to produce one. The manual will not be an

evaluators' handbook; such a handbook (or collection of review papers) would be very useful.

In the list of MT numbers in Appendix B of the Manual a flag will be desirable indicating such items as

- MT's newly introduced for ENDF-VI
- MT's to be used only in derived files.

MT's from ENDF-V that are obsolete in ENDF-VI could be dropped.

It is understood that the new Manual will describe ENDF-VI only. An Appendix will be desirable to summarize the differences from ENDF-V. The old ENDF-V Manual will be kept for those who continue to use ENDF-V formatted libraries.

Action on NDS to distribute WP15 to interested people not represented at the meeting.

Appendix I describing existing ENDF processing codes is not complete and difficult to keep up-to-date. Perhaps it should be dropped from the manual and be replaced by a separate document which can be updated more frequently. (Action to Nordborg to check the feasibility to do this job.)

A summary table of data types and options used should be produced by a utility program rather than by the evaluator. An existing code (DICTION or SUMRIZE) could be extended to do this job, which includes producing a readable summary and a sortable output for statistics purposes. (Action to Vértes to check the feasibility to do this job.)

The meeting agreed that no special ENDF tape for testing of codes should be prepared. However, a table recommending existing ENDF/B materials suitable for testing should be made up (Action to a volunteer).

E. Processing Codes

Action on BNL to investigate the feasibility of making the ENDF-VI utility codes operate on ENDF-V format files.

Action: Nordborg will check status of POLLA.

The current US utility codes will be updated by NNDC to handle new ENDF-VI formats. A conversion code ENDF-V - ENDF-VI will be written by NNDC. For conversion of File 6 to Files 4,5 a new code will be written by MacFarlane. FEDGROUP will be updated by Vertes to process ENDF-VI format data (File 40).

Action on Dunford: send to data centers a summary of the results of the CSEWG meeting; send in summer a summary of all approved format changes.

Action on NDS to collect a list of people to whom this package should be distributed.

Action on Cullen to start a cooperative effort to the goal of providing well tested modules for processing Adler-Adler and Reich-Moore parameters and RM to AA conversion.

F. Group constants

It is desirable to reach an agreement of representing group constants in a format close to ENDF. Such specifications will not be included in ENDF-102. Action on Cullen, Trkov and Vertes to issue a separate document on this topic.

G. Recommendation for evaluators

It is in the evaluator's interest to make his own work useful to other people. He should be aware that any deviation from ENDF formats and procedures will cause that his evaluation will be rejected or misinterpreted by ENDF computer codes. Therefore, he should do his best in order to fit the evaluation to the existing formats. If this turns out to be impossible the evaluator should issue the best approximation to his evaluation in strict ENDF format. In addition, he may construct his own format based on the ENDF conventions. In this case the author should document the newly introduced format in the style used in ENDF-102. In the case of dissemination of such evaluations, it is recommended that the format description be disseminated on the same tape along with any existing processing code for this new format. If, besides the format, a new reaction type number assignment is required, the evaluator should be aware of the possibility of overriding his newly introduced convention. The ENDF maintenance people will be the sole arbiters for new reaction type assignments.

Appendix 1

IAEA Specialists' Meeting on

Format for the exchange of evaluated neutron nuclear data

IAEA, Vienna, 2-4 April 1984

LIST OF WORKING PAPERS

1. D. Hermsdorf (Tech. Univ. Dresden, GDR):
   Recommendations for the use of formatting rules in ENDF/B. (Distributed as 4C-3/269)

2. D. Hermsdorf:
   Remarks on data of nuclear reactions induced by fast neutrons and their representation in the format ENDF/B.
   (Distributed as 4C-3/270)

3. H. Gruppelaar (ECN, Petten, Netherlands):
   Storage of double-differential cross-sections in the new MF6 format of ENDF/B. (Report ECN-83-194)

4. H. Gruppelaar:
   Letter of 8 Dec. 1983

5. S. Igarasi (JAERI, Japan):
   Letter of 27 Dec. 1983, with appendix:
   Effective Scattering Radius

6. S. Ganesan (Reactor Research Centre, Kalpakkam, India):
   Remarks on improving the existing ENDF formats and procedures

7. S. Ganesan:
   On the need for changing the ENDF/B convention for the representation of cross-sections in the unresolved resonance region of fertile and fissile nuclei. (Report BARC-1138 p. 46+47)

8. Cai Dunjiu (Nucl. Data Center, Beijing, P.R. China):
   The proposals about the format of ENDF/B-V

9. A. Trkov (Inst. J. Stefan, Ljubljana, Yugoslavia):
   Extension of the ENDF/B format for group-constant representation

10. P. Vértes (KFKI, Budapest, Hungary):
    Proposals concerning the ENDF/B international exchange format

11. ENDF proposals from USSR

12. ENDF proposals from NDS

13. Correspondence D.E. Cullen, incl. 1983 Minutes of the ENDF/B Formats Subcommittee

Above working papers were included in a package distributed prior to the meeting. Additional working papers see following page.

14. O. Schwerer (IAEA-NDS):
    Representation of isomeric activation cross-sections in ENDF/B-5 format

15. R.E. MacFarlane (Los Alamos, USA):
    Preliminary draft for the key sections of a new ENDF/B-VI format manual. Slightly revised version, see WP15 Rev.

16. R.E. MacFarlane:
    Some light-target reactions

15. Rev: Working papers 15 and 16 are superseded by WP15 Rev. which is identical to the report LA-UR-84-1026 by R.E. MacFarlane et al: Preliminary proposals for extending the ENDF format to allow incident charged particles and energy-angle correlation for emitted particles.

17. R.E. MacFarlane:
    Possible impact of new format proposals on neutron evaluations and processing codes

18. R.E. MacFarlane:
    Letters

19. M.A. Khalil, H.D. Lemmel (IAEA-NDS):
    IAEA-NDS-10, ENDF/B Format, user's description.

20. J. Rowlands (AEE, Winfrith, UK):
    Telex of 29.3.84

21. G. Panini:
    More compact representation of MF=6

22. G. Panini:
    Table of contents at beginning of ENDF/B tape

23. C.L. Dunford, R.E. MacFarlane:
    Revisions to ENDF Formats and Procedures

24. D. Larson (ORNL, USA), C.L. Dunford (BNL, USA):
    Proposed revisions to resonance region formats (file 2) for ENDF/B-VI

25. Misc. on Covariances

26. Y. Kikuchi (JAERI, Japan):
    Proposal of Energy Dependent Effective Scattering Radius in the Resonance Region of Structural Materials

27. M. Petilli (Italy):
    About file 33 of ENDF/B-V

28. D.E. Cullen (NDS):
    Comments on inclusion of ENDF/B format version number in all future evaluations.

29. D.G. Madland (Los Alamos, USA):
    New fission neutron spectrum representation for ENDF.
    Report LA-9285

Appendix 2

IAEA Specialists' Meeting on

Format for the exchange of evaluated neutron nuclear data

IAEA, Vienna, 2-4 April 1984

SUMMARY OF PROPOSALS

Note: This list served merely as an aide-memoire for the discussions of the detailed proposals given in the working papers.

1. General items

1.1 Special record to mark the beginning of a section
WP6 (Ganesan) item 6.0

1.2 A special integer characterizing unambiguously the format of the data
WP10 (Vértes) Appendix page 6

1.3 ENDF/B format version number
Cullen (WP28), compare WP13 (Format Subcom) item (4)
compare WP18 (MacFarlane to Cullen)

1.4 Restrictions in number of comment cards, number of data points, etc.
WP5 (Igarasi)
reply: WP18 (MacFarlane to Igarasi) item (5)

1.5 7-digit format for energies
WP5 (Igarasi)
agreed, WP18 (MacFarlane to Igarasi)

1.6 Accuracy and minimum number of energy points
see WP8 (Cai Dunjiu), item 2

1.7 Additional interpolation schemes
WP8 (Cai Dunjiu), item 4

Cubic spline for generating cross-sections from resonance parameters
WP20 (Rowlands), item (c)

1.8 More precise procedures for summing partial cross-sections to lump cross-sections
WP11 (USSR), item 3

1.9 More precise rules for calculating thermal cross-sections from resonance-parameters
WP11 (USSR), item 4

1.10 Insertion of a table of contents at the beginning of ENDF/B tapes
WP22 (Panini)

2. Resolved resonance region

2.1 Coexistence of pointwise cross-sections and resonance parameters
WP5 (Igarasi)

2.2 Flag whether file 3 does or does not include resonance contribution
Cullen, compare WP13 (Format Subcom) item (4)

2.3 Resonance parameters (file 2) and lumped quantities
WP4 (Gruppelaar)
see WP18 (MacFarlane to Gruppelaar)

2.4 Additional resonance parameters:
(n,α), (n,n') WP5 (Igarasi)
(n,n'f), (n,γf) WP11 (Konshin)

2.5 Unified rule for calculating Multilevel Breit-Wigner data with undefined J-values
WP5 (Igarasi)

2.6 Adler-Adler parameters
see WP8 (Cai Dunjiu) item 3

2.7 Reich-Moore parameters
see WP11 (Konshin) item 7
related question: processing codes, see below

limited to structural materials:
WP13 (Formats Subcom) item (3)

requested for all nuclides
WP20 (Rowlands) item 1.

2.8 Resolved resonance region: to abandon the "J* method" for self shielding factors
WP6 (Ganesan)

Compare also WP13 (Formats Subcom) item (4)

3. Unresolved resonance region

3.1 Boundary between resolved and unresolved resonance region different for different -states
WP11 (USSR), item 1

Similar problem, different proposal:
WP20 (Rowlands), item 4

3.2 The unresolved region should not be restricted to single-level Breit-Wigner
WP20 (Rowlands), item 2

3.3 Improved data representation in unresolved region
details see WP20 (Rowlands), item 3

3.4 Unresolved resonance region for fertile and fissile nuclei, improved procedures
WP6 and WP7 (Ganesan)

3.5 Interpolation in the unresolved range
see WP13

4. Misc. specific data types

4.1 Energy dependent effective scattering radius
WP5 (Igarasi)
WP26 (Kikuchi)

4.2 (n,n')m and (n,2n)m in dosimetry file
WP14 (Schwerer)

4.3 Madland-Nix fission-neutron spectrum
WP13 (Formats Subcommittee) item (1)

5. Multiple-particle emitting reactions, energy spectra and angular distributions

5.1 Double differential cross-sections in MF6 for fusion
WP3 (Gruppelaar)

related problems:
- processing codes (see separate item)
- energy mesh fine enough = WP4 (Gruppelaar)

5.2 Energy spectra of emitted particles
Chapter 4.2 of WP2 (Hermsdorf)

5.3 Multiple-particle emitting cross-sections, emission cross-sections for specific particles
p. 8-16 of WP2 (Hermsdorf)

5.4 More open channels in the unresolved energy region needed
WP11 (USSR) item 2

5.5 The need for MT = 6-9, 46-49 (n,2n) is questioned
WP8 (Cai Dunjiu) item 1
WP2 (Hermsdorf) p. 7
see WP17 (MacFarlane) item 4.

5.6 High-energy cross-sections for tissue materials require many additional multiple-particle emitting cross-sections
WP12 (NDS) item 2

5.7 To add the lumped quantity MT = 27
(= neutron absorption cross-section) to file 3.
WP4 (Gruppelaar)

5.8 More compact respresentation of MF=6
WP21 (Panini)

6. Charged-particle induced reactions

6.1 Charged-particle induced reactions
WP11 (USSR) item 5

6.2 Examples for light-target reactions induced by neutrons and charged particles
WP16 (MacFarlane)

7. Miscellaneous

7.1 Miscellaneous questions requiring clarification:
WP8 (Cai Dunjiu) item 5

7.2 Any consequences emerging from the IAEA code verification project?
WP6 (Ganesan) item 5.0
Compare improved energy mesh in unresolved region, WP13 (Formats Subcom) item (3) page 2

7.3 Covariances
Miscellaneous proposals on covariances (WP25);
Comments on File 33
WP27 (Petilli)

8. Documentation

8.1 Improved ENDF Manual for evaluators and users (or guide resp. introduction to ENDF-102)
WP1 (Hermsdorf)
WP19 (IAEA-NDS-10)

8.2 See new Draft Introduction WP15 (MacFarlane)

8.3 Improved terminology
Chapter 3 of WP2 (Hermsdorf)

8.4 Removal of the binary format
WP5 (Igarasi)
agreed, WP18 (MacFarlane to Igarasi)
see WP17 (MacFarlane) item 1.

9. Codes

9.1 Summary tables for each ENDF/B processing code, listing the data types it can (or cannot) process
WP10 (Vértes)
compare WP18 (MacFarlane to Vértes)

9.2 A special ENDF/B tape should be issued for the testing of codes
WP10 (Vértes) p. 3
compare WP18 (MacFarlane to Vértes)

9.3 Status of codes for Reich-Moore parameters, e.g. conversion to Adler-Adler parameters
WP11 (Konshin) item 7

9.4 Impact of specific proposals on existing evaluations and processing codes
WP17 (MacFarlane)

9.5 Processing codes for MF6 (double-diff data)
WP3 (Gruppelaar)

10. Special data files

10.1 More separate application and problem oriented ENDF/B files without modifying the basic ENDF/B files
WP6 (Ganesan)

10.2 Additional specifications for group constants in ENDF/B format
WP9 (Trkov)
WP10 (Vértes) middle of p. 4
see WP18 (MacFarlane to Trkov)

11. Recommendations to evaluators:

11.1 How to avoid or co-ordinate "private extensions" of ENDF WP10 (Vértes) bottom of p. 4.

NLIB Numbers

NLIB numbers identify different data libraries in ENDF-VI format. This list is maintained by the IAEA Nuclear Data Section. Proposed additions should be addressed to H.D. Lemmel.

NLIB	Library name	Explanation, responsible data center
0	ENDF/B	Evaluated Nuclear Data File B, US Cross-Section Evaluation Working Group (CSEWG), US National Nuclear Data Center (NNDC)
1	ENDF/A	Evaluated Nuclear Data file A, US NNDC
2	JEF	Joint Evaluated File, OECD NEA Data Bank
3	EFF	European Fusion File, OECD NEA Data Bank
31	INDL/V	IAEA Nuclear Data Library for various evaluations, IAEA Nuclear Data Section (NDS)
32	INDL/A	IAEA Nuclear Data Library for actinides, IAEA NDS
33	INDL/F	Evaluated Neutron Reaction Data Library for INTOR Fusion Neutronics Calculations, IAEA NDS
34	IRDF	International Reactor Dosimetry File, IAEA NDS