20 December 1985

To: Distriburion

From: H.D. Lemmel *Hans Lemmel*

Subject: NRDC Meeting October 1985
         Draft of Conclusions, Recommendations, Actions

Please, find attached the draft of the Conclusions, Recommendations and Actions of the NRDC Meeting, Saclay, 9 - 11 Oct. 1985. The draft for the remaining parts of the Minutes of the Meeting will follow in another CP-D Memo.

I would like to take this opportunity to thank the staff of the NEA Data Bank for hosting the Meeting in such an excellent manner and the participants for making the Meeting successful. We are looking forward to a continuing good co-operation in 1986 and wish you plenty of blossoming nuclear data.

Clearance: J.J. Schmidt

Distribution:

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2. N. Tubbs, NEA Data Bank
4. V.N. Manokhin, CJD
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     3 spare copies

Conclusions, Recommendations, Actions

Contents

1. General conclusions and recommendations

1.1. CAJaD (in agreement with observations of other centers) encounters increased data needs for stopping-power data. Existing compilations are probably not sufficiently reliable. An IAEA Consultants' Meeting on "Stopping Power Data for Medical Radiotherapy" will be desirable.

1.2. It is appreciated that NNDC continues to publish the Bibliography of Integral CPND. This will continue not to include EXFOR entry-numbers. CAJaD plans to publish an index to the CPND and PhND contents of EXFOR.

1.3. The "Berman library" of photonuclear data is not obtainable on tape. It is regretted that the Moscow Photonuclear Data Center continues not to have a counterpart in another country for compiling photonuclear data in EXFOR. In particular, it would be most desirable if the Photonuclear Data Center at NBS Washington would provide regular EXFOR input.

1.4. RIKEN plans to publish a handbook on excitation functions for radioisotopes for biomedical applications. An IAEA meeting in this field would be desirable.

1.5. Centers are invited to circulate drafts of their publications (labelled as preliminary!) to the other centers in order to obtain their comments before the publication goes to print. Co-operation of centers for such publications is encouraged. For example, NNDC has excellent graphical plotting facilities and could provide plotting, if another center assumes the responsibility for cheking the corrections of the data files to be plotted. It should be considered whether such work could be supported by fellowships or visits of center-staff to another center.

1.6. Data center activities should be advertised at Conferences, in particular at the regular Nuclear Data Conferences (next in Kiev, May 1987).

1.7. For the next data center meetings the following dates are envisaged:

- technical meeting: Vienna, 23-25 September 1986
- full meeting with center heads: Brookhaven, October 1987

2. General actions

2.1. NDS to distribute regularlay (e.g. in March and September) a list of planned meetings in the field of nuclear data. This should include not only NDS meetings but all nuclear data meetings that NDS knows of. (= continuing action 1.9 from 1983 NRDC Meeting)

Note: CJD plans meeting participation in March
US fiscal year ends in October
NDS and NEA-DB have the calender year as fiscal year

2.2. all   to inform NDS about planned meetings

2.3. all   to send to the other centers conference materials
               (preprints of papers, proceedings, etc) whenever it
               becomes available (= continuing action 1.11 from 1983 NRDC
               Meeting)

3. Conclusions about CINDA

3.1.   The re-organization of the CINDA network towards a decentralized
       network with four symmetric centers is well in progress.

3.2.   The publication schedule is to continue as before with two
       publications per year.

3.3.   NEA-DB requires less than 500 copies (e.g. 400 to 450). NDS
       should investigate whether such a reduction would affect the sales
       price per copy. NDS should also try to promote the sales of CINDA.

3.4.   Technical details of CINDA seem to be well under control and are
       clarified by correspondence. (If necessary, visits of CINDA staff
       to the other centers should be envisaged.) Only some technical
       details were mentioned:

       a. reminder for correct usage of underscores (indicating blanks
          within author names)

       b. leading zeros in ZA must be dropped in the CINDA
          transmission format

       c. the range of serial-numbers for NDS entries is 900 000 to
          989999; the range 990 000 to 999 999 is reserved for
          internal temporary storage

       d. for IAEA conferences in a country outside area 3 (and
          similar cases), the responsibility of CINDA coverage should
          be agreed by mutual consultation

          - to ensure coverage
          - and to avoid duplicate coverage.

4. Actions about CINDA

4.1. NDS   to work towards full responsibility of CJD for the area-4
      CJD   CINDA subfile and, for this goal, to plan suitable visits
              of staff

4.2. NDS   to continue to send to CJD

              - fast feedback on their CINDA entries
              - CINDA checking codes and updates
              - CINDA file (in agreed schedule)

4.3. CJD   to make sure that mail delays are minimized. Full-scale
              CINDA co-operation cannot function without prompt
              transmission of correspondence and magnetic tapes

4.4. NDS   to advertise EXFOR in the front pages of the CINDA books, including, e.g.

- an explanation of EXFOR (making use of the EXFOR user's guide of NEA-DB);
- an example of an EXFOR entry;
- the word EXFOR to show up on the punched card on the cover;

to circulate corresponding drafts and stimulate competitive proposals

4.5 NNDC   reminder: to contribute to the CINDA front-pages, to the
    NEA-DB   compilation of nuclear data handbooks, etc.
    CJD

5. Conclusions about WRENDA

5.1. WRENDA remains a 4-center activity with the next review and publication cycle starting in 1986. Requests should be realistic and carefully reviewed to ensure the credibility of WRENDA. Additional emphasis will be on actinide decay data needs and medical dosimetry. Priorities must be subdivided by application, because "Priority 1" in reactor physics should be distinguished from "Priority 1" in medical applications.

6. Actions about WRENDA

6.1. NDS   to issue draft guidelines for WRENDA including

- guidelines to exclude unrealistic or unreasonable requests (perhaps by giving some examples such as 1% accuracy for fast fission)

- guidelines on how to define priorities and to permit different priority scales for different applications

and to circulate such draft guidelines to INDC and centers.

6.2. NDS   to issue a detailed schedule for the preparation of the next WRENDA issue and to check with the other centers what retrievals from the present WRENDA file they require

7. EXFOR Conclusions

7.1. Work distribution of CPND centers

a. The work distribution by geographical criteria is limited to the following cases:

        CAJaD   compiles all integral CPND from USSR
        RIKEN   compiles all integral CPND from Japan
        CNDC   compiles all integral CPND from China

In addition, each of these centers, plus NDS and NNDC, may compile CPND from all other countries according to their scientific interest. To avoid duplication of compilation, CAJaD, being the CPND center with the widest scope of interest, performs the coordination. Each of the other centers, before starting a compilation, will announce its intention by telex to CAJaD. CAJaD will immediately reply and indicate whether the announced data have been compiled or not yet. In case that they have been compiled but not yet transmitted, they will be transmitted as fast as possible.

If a center wishes to compile <u>one</u> data set out of several data sets in a given reference, it shall always compile <u>all</u> data from that reference.

b. Each compiling CPND center is responsible to keep its entries up-to-date and to retransmit them when appropriate. Suggestions for revisions of EXFOR entries must, therefore, be submitted to the originating center.

c. Revisions to Kachapag entries (B series) that are from USSR, Japan or China, are made by the center responsible for these countries. Revisions to Kachapag entries from other countries, when necessary, can be made and retransmitted by any center, but not without prior consultation with CAJaD in order to avoid simultaneous updates of the same entry by two centers.

7.2. All CPND compiling centers send their TRANS tapes to all other centers (including the CPND distribution centers).

7.3. According to existing data needs (compare conclusions of the IAEA Advisory Group Meeting on Nuclear Data for Medical Radiotherapy, Delft, the Netherlands, 16-20 Sept. 1985) selected <u>differential</u> CPND will have to be compiled in EXFOR in addition to the integral CPND presently compiled with priority.

7.4. Considering new data requirements for higher-energy neutron data (e.g. up to 100 MeV for radiotherapy, even above 100 MeV for accelerator breeding), such data should be compiled in EXFOR. However, the four-center commitment of complete coverage compilation remains limited up to 20 MeV.

7.5. EXFOR data tables remain limited to a maximum of 18 columns.

7.6. The LEXFOR entry on Gamma Spectra is modified under "Partial Radiation Widths":

The independent variable is

- either the gamma-ray energy coded under the data heading 'E'

- or the final level energy coded under the data heading 'E-LVL-FIN'.

The data for both cases may differ by a factor due to gamma-multiplicities.

7.7. The quantity ccode for "Differential Fission Yield Data" is adopted as

IND,FY/DE = Independent fission yield of fragments of a specified kinetic energy

The particle-considered code FF in REACTION subfield 7 is considered as redundant. This example must be added in LEXFOR under "Particles" as an exception to the statement that differential fission data always require a particle-considered code in SF7.

7.8. In LEXFOR under "Nuclear Quantities" a note is added under "Level-Density Parameter" usually coded as (...(0,0),,LDP).

Note: For nuclei around A=208, neutron emission spectra can be interpreted only by assuming a variable level-density parameter (increasing density with increasing excitation energy). In this case the level-density parameter is a function of the incident neutron energy. Therefore, the incident projectile in SF2 and its energy must be coded, e.g.

(Z-S-A(N,INL),,LDP)

with the target nucleus Z-S-A and with the neutron energy coded as usual under EN.

7.9. The coding of P_n values (delayed fission-neutron emission probabilities) proposed in CP-C/143 is modified.

A P_n value for a single nucleus is coded as

REACTION (Z-S-A(0,$\beta-$)Z'-S'-A,,PN)

If P_n values are given for a series of delayed-neutron emitting fission fragments ("precursor nuclei"), the formalism of the "Variable Product Nucleus" is extended to the target nucleus field SF1 in the following formalism:

REACTION (ELEM/MASS(0,B-),,PN)

with the "precursor nuclei" specified in the DATA table under the headings ELEMENT and MASS.

This is to be entered in LEXFOR under "Delayed Fission Neutrons".

Notes with reference to this LEXFOR entry must be added also in Chapter 6, in Chapter 8 under REACTION SF1, and in LEXFOR under "Target Nucleus". The ELEMENT and MASS entries in Dictionary 24 will be modified accordingly.

Data with this formalism can be transmitted immediately, although all centers will have to modify their computer codes for the processing of such data.

7.10. The BIB Keywords EMS-SEC and MOM-SEC are adopted and included in Dictionary 2 and in the Manual in Chapter 8. However, it is added that these keywords are presently used for Photonuclear Data only. Corresponding LEXFOR entries giving examples and physics explanations should be prepared by CDFE (compare under Actions about Photonuclear Data).

7.11. The exponents of E-formatted numerical data are limited. In the EXFOR Manual on page 5.2 the following sentence is added to paragraph 3:

> ...Formats). The values given must be either zero or have absolute values between 1.0000E-38 and 9.9999E+38. If...

EXFOR check programs should be updated accordingly. (Usually, very large negative exponents will occur only for machine processed data.)

7.12. Reminder. If new quantity codes are proposed or introduced, this should be communicated to the other centers timely so that they know about these codes before they are encountered in TRANS tapes.

7.13. The "Family Flags" for column-heading keywords are presently used by NNDC only. Therefore, NNDC may submit changes according to their requirements.

7.14. Endorsed by a recommendation of the INDC, all centers should make efforts to provide to their customers user-friendly EXFOR output formats (e.g. computation format with uniform units). See related actions.

8. Actions about the EXFOR system

8.1. all — reminder: to contribute to the cleanup of Dictionary 3 (laboratory) and of the reference Dictionaries 5,6,7 and to keep them up-to-date (= continuing action 5.3 of 1983 NRDC Meeting)

8.2. NDS — to send to CJD information and codes on the EXFOR computational format, even if still incomplete (= continuing action 5.15 of 1983 NRDC Meeting)

8.3. all — to update, where required, the EXFOR processing codes for the formalism of ELEM/MASS in REACTION SF1 (compare under EXFOR Conclusions)

8.4. all — to update EXFOR check programs to avoid the mistakes in TRANS tapes as pointed out in various memos, and to check each TRANS tape again before sending it out

8.5 all — to update EXFOR check programs to the effect that exponents of E-formatted numerical data must not exceed the value of +38 or -38

8.6. NDS CJD — to verify that CJD has the last version of the EXFOR checking code and that CJD automatically recieves updates.

8.7. all   to review previous (and future) memos containing requests for <u>retransmissions</u> of erroneous EXFOR entries and to correct and retransmit them speedily (otherwise these entries will not be available to customers and the reputation of EXFOR with respect to completeness will be damaged)

8.8. all   to inform each other about their customers' format resp. computation format of EXFOR and circulate relevant documentation

8.9. NDS   to send to CJD the last version of its EXFOR computation format, with documentation, and updates

8.10 NDS   to select some typical EXFOR entries and to request from all centers retrievals of these entries in order to compare the different EXFOR output formats and evaluate the differences

9. Actions about EXFOR neutron data

9.1. NNDC   to compile with high priority neutron cross-section data
       NEA-DB $\sigma(E)$ for inclusion in the NNDC atlas, with special empha-
       NDS   sis to
       CJD

            - best experimental data
            - most recent experimental data even when old
            - the only existing data for a specific reaction or energy range
        (= continuing action 6.1 of 1983 NRDC Meeting)

9.2. NNDC   to inform the other neutron data centers about "gaps" encountered in EXFOR
        (= continuing action 6.2 of 1983 NRDC Meeting)

9.3. all   to observe the correct use of the Multiple Reaction formalism; in particular, <u>not</u> to code average resonance parameters in the same subentry together with energy dependent resonance parameters
        (= continuing action 6.5 of 1983 NRDC Meeting)

9.4. NND   to correct and re-transmit fast those EXFOR entries where
       Centers retransmission was requested by a receiving center
        (= continuing action 6.7 of 1983 NRDC Meeting)

9.5. NDS   to retransmit to CJD the TRANS tapes 8006, 8007, 8008.
       NNDC   Note by editor: Not available any more at NDS. NDS forwarded request to NNDC

9.6. CJD   to continue to convert the EXFOR-8 series into EXFOR-4 series (though with lower priority than the compilation and transmission of new data)
        (= continuing action 6.8 of 1983 NRDC Meeting)

9.7. NNDC   to check the EXFOR entry containing the quantity code PR/PRE,AP as proposed in CP-C/139 and questioned in CP-D/136 and either to revise it or to propose a supporting LEXFOR entry

9.8. NND Centers   in view of continuing interest in polarized-neutron data, centers are requested to compile such data in EXFOR (although it is realized that, due to lack of manpower, not all centers can comply)

10. Actions about CPND

10.1 CAJaD
- to study those entries which have been compiled in duplicate by two centers,

- to communicate to the other centers which of the duplicates should be deleted (possibly by "retransmitting" them as deleted entries according to page 9.3 of the EXFOR Manual)

- and to retransmit, if necessary, the valid entries with updates (even if these were not compiled by CAJaD)

10.2. NNDC   to send to RIKEN information about input into Recent References

10.3. RIKEN   to study the system of Recent References and, possibly, provide input to Recent References within RIKEN's data scope

10.4 NDS   to retransmit those B-entries where errors were found in TRANS-C005

10.5. NNDC   to retransmit of TRANS-C004 that entry where beam and target (Ne-22 and C-12) were inverted with unchanged incident energy, and to revise the corresponding computer code which may have produced this mistake

10.6. CAJaD   when requesting data from US or Europe send copies of letters to NNDC or NDS who will assist in obtaining the data (= continuing action 7.1 from 1983 NRDC Meeting)

10.7. all   to review references for those charged-particle reactions that have equivalent neutron fission reactions such as (d,pf) and (t,df) and to compile them in EXFOR (or send it to a CPND center for compilation)
(= continuing action 7.2 from 1983 NRDC Meeting)

11. Actions about Photonuclear Data

11.1 NDS NNDC   to continue to find PhND groups in countries outside USSR and establish contacts with CDFE, and to establish a distribution list for the PhND Bibliography by CDFE
(= continuing action 8.8 from 1983 NRDC Meeting)

11.2. CDFE   to propose LEXFOR entries describing the use of the BIB Keywords EMS-SEC and MOM-SEC and of the quantity-parameters ECO, MCO, EMC
(= continuing action D.2, D.7 from 1984 NRDC Meeting)

11.3. CDFE   to propose LEXFOR entries, if there continues to be an
      CPND   interest to use the column-headings SPIN, PARITY, MOMENTUM
     centers   L in a wider sense than their present use for resonance-parameters only.
(= continuing action D.9 of the 1984 NRDC Meeting)

12. Recommendations about evaluated data and codes

12.1. There should be more input from non-OECD countries to the Computer Program Library (CPL) of the NEA Data Bank.
(= continuing recommendation 10.2 from 1983 NRDC Meeting)

12.2. CJD is requested to take appropriate actions to release the GRUKON code system

12.3. Evaluated data should be accompanied by appropriate documentation such as the ENDF/B-5 Summary Documentation.

12.4. NEA-DB and NDS are encouraged to continue their code validation projects. They should keep each other informed in order to avoid overlap. NDS will concentrate on the processing of Reichmoore   -M
parameters. NEA-DB (under auspices of NEACRP) will concentrate on the unresolved region. CJD is encouraged to participate in both (in the case of the NEACRP exercise through NDS).

13. Actions about evaluated data

13.1. CJD   to inform other centers about USSR proposals for additional changes to the ENDF-6 format

13.2. NDS   to translate from Jedernye Konstanty the article by Nikolaev on additional requirements in ENDF-6 in the resonance region

13.3. all   ENDF-formatted data should conform strictly to ENDF rules. However, when data do contain deviations from strict ENDF rules, corresponding documentation must be sent together with the data tape.

13.4. NNDC   to publish and distribute as soon as possible the ENDF-6 format manual

13.5. NDS   when need arises, to publish an appendix to the official ENDF manual about any deviations encountered in ENDF-formatted data files of different origin.

13.6. NNDC   to distribute as soon as possible ENDF-6 utility codes

13.7. CPND   for the time being evaluated CPND should continue to be
     centers   included in EXFOR; but centers should try out to code the same data also in ENDF-6 format

13.8.   all   to advise customers that UKNDL-2 should no longer be used

13.9.   NEA-DB   to distribute as soon as possible UKNDL-85

13.10. NDS   to make an inventory of available evaluated data files
                  and inform the other centers

13.11. NEA-DB   to distribute to the other centers the "preliminary
                  JENDL-3" library as soon as this is released

13.12. all   to advertise to evaluators that NNDC offers Mughabghab's
                  file of resonance parameters in ENDF format to
                  individuals who want to contribute evaluations

13.13. NDS   to find out codes used for format conversions of
                  evaluated data files

13.14. NNDC   to inform NDS what places and tasks would be available
                  for IAEA fellows in the field of nuclear data evaluation

13.15. NDS   based on previous action to initiate applications from
                  appropriate laboratories for fellowships in the field of
                  nuclear data evaluation

13.16. NDS   to enquire whether P. Vertes, Budapest, will still
                  participate in the code verification projects despite of
                  his 2-years stay in Dubna

14. Conclusions on Four-Neutron Data Centre Co-operation

Present: Messrs. Manokhin, Pearlstein, Rosén, Tubbs, Schmidt

1. Possibilities for international co-operation in neutron cross-section evaluation

There are currently strong activities in neutron data evaluation in many countries. The release of ENDF/B-6 and JEF-2 can be expected only about 1988/89, whereas SOKRATOR, JENDL and other national or individual laboratory files are fully available. Some international co-operation has been initiated recently through the adoption of the ENDF format as international exchange format for evaluated neutron cross-section files and through the extension of the NNDEN Evaluation Newsletter to full international scale. The following additional measures of co-operation are recommended for evaluated nuclear data:

(1) Exchange of at least summary documentations of evaluated files of the type of the ENDF/B-5 Summary Documentation;

(2) Intercomparison of different available evaluated data files for the same nuclides/reactions (could be a task for NDS);

(3) Stimulation of appropriate IAEA fellowships in neutron data evaluation to major evaluation groups to alleviate evaluation manpower problems and to transfer expertise;

(4) Bi-/multilaterial co-operation and/or exchanges on individual nuclide evaluations (Li evaluations going on between Geel, Petten, Karlsruhe and Argonne and completed at Obninsk were mentioned as an example);

(5) Development of evaluation methods through IAEA Co-ordinated Research Programs (CRP) (example: the new CRP on methods of calculation of fast structural material neutron cross sections):

(6) Continued co-ordination and adoption of common international neutron standard reference data as contained in the NEANDC/INDC Standard File;

(7) Further co-ordinated development of the standard ENDF format for the exchange of evaluated neutron data.

NDS and NEADB are asked to bring these recommendations to the attention of INDC and NEANDC respectively.

The future of neutron data evaluation beyond the end of the 80's is found difficult to predict. The global number of neutron data experiments and thus EXFOR entries is currently decreasing, and it can be expected that particularly ENDF/B-6 and JEF-2 will satisfy most of the requirements for bulk neutron data evaluation for fission reactors now planned. New application areas are coming in sight such as safety problems connected with radiation damage and decommissioning of fission reactors, accelerator breeding, space reactors, industrial applications,

such as applied geophysics, medical radiotherapy, and higher energy neutron dosimetry, spallation neutron sources, fusion reactors and advanced fission reactors, etc., which widen the needs for nuclear data both in energy range and number of reactions and may thus lead to another increase in experimental research and subsequent nuclear data compilation and evaluation.

2. Scope of neutron data centre co-operation

The classical basic scope of the four-centre co-operation covering CINDA, EXFOR and WRENDA, can be expected to be maintained for the foreseeable future. The number of WRENDA requests for fission and fusion reactors and for safeguards would be expected to continue to decrease in future issues, with growing fulfilment of the accuracy requirements, while actinide decay data and medical radiotherapy nuclear data needs should be more comprehensively covered in future WRENDA issues.

NEA Data Bank
11th October 1985

FOUR-CENTRES MEETING

NEA Data Bank, Saclay, 9th to 11th October 1985.

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