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International Atomic Energy Agency

INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

Report on the

8th IAEA CONSULTANTS' MEETING OF

THE NUCLEAR REACTION DATA CENTRES

hosted by the NEA Data Bank in Saclay, France
9 - 11 October 1985

Including the 19th FOUR-CENTRES MEETING of the NEUTRON DATA CENTRES

and the 9th MEETING ON CHARGED PARTICLE NUCLEAR DATA COMPILATION

January 1986

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

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Abstract

This report summarizes the 1985 coordination meeting of the national and regional nuclear reaction data centers, convened by the IAEA at regular intervals. The main topics are

- the international exchange of nuclear reaction data by means of the "EXFOR" system,
- the futher development of this system,
- the sharing of the workload for speedy and reliable data compilation,
- the exchange and documentation of ENDF/B-formatted evaluated data libraries,

with the goal of rendering data center services to data users in IAEA Member States by means of computer retrievals and printed materials.

Edited by

H.D. Lemmel

January 1986

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GLOSSARY OF ABBREVIATIONS

BNL	Brookhaven National Laboratory, Upton, N.Y., USA
CAJaD	Center for Nuclear Structure and Reaction Data, Kurchatov Institute, Moscow, USSR
CDFE	Centr Dannykh Fotojad. Eksp., Moscow State University, USSR
CINDA	A specialized bibliography and data index on neutron nuclear data operated jointly by NNDC, NEA-DB, NDS and CJD
CJD	USSR Nuclear Data Center at F.E.I., Obninsk, USSR
CNDC	Chinese Nuclear Data Center, Beijing, P.R. China
CPL	Computer Program Library of NEA-DB
CPND	Charged-particle nuclear reaction data
CRP	Coordinated Research Programme of the IAEA Nuclear Data Section
CSEWG	US Cross-Section Evaluation Working Group
CSISRS	Cross-Section Information Storage and Retrieval System, the EXFOR-compatible internal system of NNDC
DOE	US Department of Energy
DOE-NDC	Nuclear Data Committee of DOE
ENDF-5	International format for evaluated data exchange, version 5
ENDF/B-5	US Evaluated Nuclear Data File, version 5
ENSDF	Evaluated Nuclear Structure Data File
EXFOR	Format for the international exchange of nuclear reaction data
FEI	Fiziko-Energeticheskij Institut, Obninsk, USSR
FIZ	Information Center of the Fed. Rep. of Germany for energy, physics, mathematics, Karlsruhe, Fed. Rep. of Germany
GKAE	UUSR State Committee on the Utilization of Atomic Energy, Moscow, USSR
IAEA	International Atomic Energy Agency
INDC	International Nuclear Data Committee
INDL	The IAEA Nuclear Data Library for evaluated neutron reaction data
INIS	International Nuclear Information System
IRDF	The International Reactor Dosimetry File, maintained by the IAEA/NDS
JEF	The Joint Evaluated File of neutron data, a collaboration of European NEA member countries and Japan
KACHAPAG	Charged Particle Nuclear Data Group, Karlsruhe, Fed. Rep. of Germany
LANL	Los Alamos National Laboratory, Los Alamos, N.M., USA

LEXFOR	Part of the EXFOR manual containing physics information for compilers
LIJaF	Leningrad Nuclear Physics Inst., Gatchina
NDS	IAEA Nuclear Data Section, Vienna, Austria
NEA	Nuclear Energy Agency of the OECD, Paris, France
NEACRP	Nuclear Energy Agency Committee on Reactor Physics
NEA-DB	NEA Data Bank, Saclay, France
NEANDC	Nuclear Data Committee of the OECD Nuclear Energy Agency
NEUDADA	Neutron Data Direct Access. Earlier data file of NEA, now included in EXFOR
NND	Neutron Nuclear Data
NNDC	National Nuclear Data Center, Brookhaven National Laboratory, USA
NNDEN	Neutron Nuclear Data Evaluation Newsletter
NRDC	the Nuclear Reaction Data Centers
NSDD	Nuclear structure and decay data
NSR	Nuclear structure references, a bibliographic system
OECD	Organization for Economic Cooperation and Development, Paris, France
ORNL	Oak Ridge National Laboratory, Oak Ridge, Tenn., USA
PhDC	Photonuclear Data Center, Washington, USA
PhND	Photonuclear data
RIKEN	Nuclear Data Group, RIKEN Inst. of Phys. and Chem. Res., Wako-Shi, Saitama, Japan
SGIP	Study Group for Information Processing, Sapporo, Japan
SOKRATOR	USSR evaluated neutron data library (and format), now included in INDL
TRANS	Name of transmission tapes for data exchange in the EXFOR system
TUD	Technical University, Dresden, German Democratic Republic
WRENDA	World Request List for Nuclear Data

The network of Nuclear Reaction Data Centers

National and regional nuclear reaction data centers, co-ordinated by the International Atomic Energy Agency, co-operate in the compilation, exchange and dissemination of nuclear reaction data, in order to meet the requirements of nuclear data users in all countries. A brief summary of the data centers network is given below.

The nuclear reaction data centers:

NNDC	- US National Nuclear Data Center, Brookhaven, USA
NEA-DB	- OECD/NEA Nuclear Data Bank, Saclay, France
NDS	- IAEA Nuclear Data Section
CJD	- USSR Centr po Jadernym Dannym (= Nuclear Data Centre), Obninsk, USSR
CAJaD	- USSR Centr po Dannym o Stroenii Atomnogo Jadra i Jadernykh Reakcikh (= Nuclear Structure and Nuclear Reaction Data Centre), Moscow, USSR
CDFE	- Centr Dannykh Fotojad. Eksp. (= Centre for Experimental Photonuclear Data), Moscow, USSR
RIKEN	- Nuclear Data Group, RIKEN Inst. of Phys. and Chem. Res., Wako-Shi, Japan
CNDC	- Chinese Nuclear Data Centre, Beijing, P.R. of China
KACHAPAG	- Karlsruhe Charged Particle Group, Karlsruhe, FRG*)
FIZ	- Fachinformationszentrum Karlsruhe, FRG
PhDC	- Photonuclear Data Center, Washington, USA

These data centres cooperate on the following projects:

1. Neutron Nuclear Data

1.a Bibliography and Data Index "CINDA":
Input prepared by NEA-DB, NNDC, NDS, CJD
Handbooks published by IAEA

1.b Experimental data exchanged in EXFOR format:
Input prepared by NNDC, NEA-DB, NDS, CJD

1.c Data Handbooks based on EXFOR published by NNDC

1.d Evaluated data exchanged in ENDF/B format:
NNDC, NEA-DB, NDS, CJD and others

1.e Computer retrieval services upon request of customers:
NNDC, NEA-DB, NDS, CJD

1.f WRENDA: compilation of requested data that are known with insufficient accuracy. Compiled by NNDC, NEA-DB, NDS, CJD, published by IAEA

2. Charged Particle Nuclear Data (including heavy-ion reaction data)

2.a Bibliography published by NNDC

2.b Numerical data exchanged in EXFOR format:
Input prepared by CAJaD, RIKEN, CNDC, NDS, NNDC, KACHAPAG*)

2.c Data Handbooks based on EXFOR published by FIZ/KACHAPAG*)

2.d Computer retrieval services upon request of customers:
NNDC, NEA-DB, NDS, CAJaD

3. Photonuclear Data

3.a Numerical data exchanged in EXFOR format:
Input prepared by CDFE, occasional contributions from NNDC(PhDC), NDS

3.b. Bibliography published by CDFE

3.c Computer retrieval services upon request of customers:
NNDC, NEA-DB, NDS, CAJaD

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*) Discontinued in 1982. Since then CAJaD has increased its compilation activities.

LIST OF PARTICIPANTS

NNDC:	Dr. S. Pearlstein Ms. V. McLane	National Nuclear Data Center Brookhaven National Laboratory Associated Universities Inc. UPTON, Long Island, NY 11973 United States of America
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	Dr. H. Hofer	(EXFOR)
	Dr. P. Nagel	
	Dr. E. Sartori	(Seconded from IAEA)

Agenda

8th NRDC Meeting

Eighth IAEA Consultants' Meeting of the
Nuclear Reaction Data Centres
at the NEA Data Bank, Saclay, 9-11 October 1985

AGENDA

1. Opening (J. Rosén)
   Announcements, election of chairman, etc.

2. Adoption of agenda and schedule

3. Brief status reports of participants

4. Review of actions, recommendations, conclusions
   - from last technical NRDC meeting 1984 (see Memo CP-D/131+132)
   - from 7th NRDC meeting 1983 (see WP NDS-10)
   - from INDC meeting 1984 as far as data Centres are concerned (see WP NDS-9)
   - from Medical Radiotherapy meeting, Delft, September 1985 (see WP NDS-8)
   - from other meetings?

5. Technical EXFOR matters
   - EXFOR statistics (WP NDS-3)
   - review of recent CP- and 4C-Memos (see WP NDS-2)
   - any other proposals
   - experience with TRANS tapes, review of frequent mistakes (see WP NDS-4)
   - status of customer friendly output formats (recom. by INDC)
   - miscellaneous

6. Evaluated data
   - status of ENDF-6 format
   - CPND in ENDF-6 format
   - status and availability of various evaluated data files
   - data processing codes

7. Policy discussions
   - scope, activities, priorities of data centres in light of budgetary restrictions
   - data needs and priorities (Radiotherapy see WP NDS-11)
   - meetings (see WP NDS-7)
   - publications (Nucl. Activation Handbook see WP NDS-6)
   - advertisement of data centre activities at international nuclear data conferences
   - date and place of next NRDC-Meeting

8. Special matters on neutron data
   - CINDA (see Memo 4C-3/282 and WP NDS-5), Translation Journals
   - WRENDA-86/87 (see WP NDS-11)
   - completeness of neutron data in EXFOR (see WP NDS-3)
   - data involving polarized-neutrons

9. Special matters on CPND and PhND
   - co-ordination of CPND centres to avoid duplication of work

10. Conclusions, Recommendations, Actions

List of appendices and working papers

I. Appended to this document are

II. Other working papers and documents which served as basis for discussions and which are not appended to this document:

NEA-DB: User Guide to Numerical Neutron Data Retrievals

NDS-2: Pending EXFOR matters (see the Conclusions of this Meeting)

NDS-6: Handbook of Nuclear Activation Data, Table of Contents (to be published soon by IAEA)

NDS-7: Schedule of planned 1986 IAEA-NDS-Meetings (updated schedule to be issued)

NDS-8: Data needs defined by the Medical Radiotherapy Meeting, Delft, September 1985 (see proceedings to be published soon by IAEA)

NDS-10: Conclusions, Recommendations, Actions by the NRDC Meeting October 1983 (see report INDC(NDS)-154)

Memo CP-A/41	Duplications of CPND EXFOR entries
Memo CP-D/131 and Memo CP-D/132	Actions and Minutes from the Technical NRDC Meeting, Sept. 1984
Memo 4C-3/283	CINDA Exchange System
Memo 4C-3/286	Pending retransmissions of EXFOR entries
IAEA-NDS-0	Index to the IAEA-NDS-Documentation Series
IAEA-NDS-66	The EXFOR-Index System of NDS
NEA-DB Newsletter No.32 (NEANDC-204)	on Pre-Equilibrium Effects, an International Nuclear Model and Code Comparison
BNL-NCS-31470-3	Computope Chart of July 1985, with two microfiches containing a computer produced chart of nuclides

MINUTES

Note: Most of the discussions resulted in Conclusions, Recommendations or Actions, see page 14. These are self-explanatory, and the related discussions will not be mentioned again the minutes below.

1. Opening

J. Rosén opened the meeting and welcomed the participants.
J.J. Schmidt was then asked to act as chairman of the meeting. He thanked the NEA Data-Bank for hosting the meeting.

2. Adoption of agenda and schedule

The proposed agenda was adopted with some modifications, see page 7.

The following matters were treated in subgroups:

1. The centre heads of the neutron data centres met on the second day of the meeting. See under Conclusions, item 14.

In parallel to the centre-heads discussion, two other subgroups met:

2. on the co-ordination of CPND centers. See page 17, EXFOR Conclusion 7.1

3. on technical EXFOR matters, resulting in various conclusions, see page 17.

3. Brief status reports of participants

See the appendices starting on page 27.

In the following, some items are mentioned that supplement the written status reports.

S. Pearlstein, in addition to the NNDC status report, presented the paper "Plans for ENDF/B-VI" see appendix page 121. The schedule for ENDF/B-VI is slowed down due to cuts in budget and staff. The work in EXFOR, CINDA and ENSDF, however, will continue at constant level. C. Dunford is now chairman of CSEWG. S. Pearlstein also presented the new "Computope Chart" (BNL-NCS-31470-3), a computer produced chart of nuclides in microfiche format. It was appreciated that NNDC continued to publish the bibliography for integral CPND. The EXFOR accession-numbers, however, cannot be included, because this bibliography is derived from "Recent References".

N. Tubbs presented the status report by NEA-DB. Although most activities concentrated on JEF, the four-centre commitments on CINDA and EXFOR were receiving full attention. JEF-1 performs well compared to ENDF/B-5. Another activity finding wide recognition was the international comparison of nuclear models and related codes (see NEA-DB Newsletter 32).

H. Lemmel, supplemented by J. Schmidt, presented the status report of NDS. The main activity was concentrating on the reprogramming of the CINDA system.

V. Manokhin presented the status report of CJD. In addition to the CINDA and EXFOR work, the efforts on neutron data evaluation in ENDF format and on the checking of ENDF formatted data, have significantly increased. It was noted that the shipment of EXFOR tapes from CJD to the other centers was still suffering from serious delays, so that customers of the other centers were dissatisfied.

F. Chukreev presented the status report of CAJaD. The increased compilation activities procede with emphasis on the following data types:

- CPND priority list by Okamoto
- (α,n) reactions on light elements, for which evaluations are performed
- data for positron-emitting nuclei, as needed for life sciences
- n-deficient halogen production data
- n-production for fusion problems.

F. Chukreev presented the status report of CDFE. He repeated that it was regrettable that CDFE continues to be the only photonuclear data center within the EXFOR system and emphasized that another PhND center would be most desirable.

A. Hashizume presented the status report of the CPND group at RIKEN. He presented a histogram displaying in a graphical form, for which CPND reactions EXFOR contained data in what energy range (see appendix page 83). RIKEN plans evaluations for about 20 reactions (see the list of reactions on p. 70 in the report of the previous NRDC-Meeting INDC(NDS)-154). The format of the evaluated data was not yet decided.

The bibliographic efforts of RIKEN are more comprehensive than "Recent References", and it was proposed that RIKEN eontributes to Recent References (see action 10.3).

H. Lemmel regretted that the Chinese Nuclear Data Center could not be represented due to sudden sickness of Dr. Zhou Delin. H. Lemmel welcomed the Chinese group as a new member of CPND EXFOR system and reported on the first Chinese EXFOR entries that had been received. A status report on CPND activities in China, which was received after the meeting from Zhuang Youxiang is appended.

H. Lemmel reported that H. Tanaka (Hokkaido University, Japan) had sent a letter regretting that he could not attend the meeting.

Staffing of Centres	
NNDC:	22, incl. 11 scientific, 3 professionals, 8 technical support
NEA-DB:	26, incl. 14 professionals (half CPL, half data), 1 computing assistant, 11 secretaries or junior programmers
NDS:	23, incl. 11 physicists, 3 programmers, 9 secretaries + data processing staff
CAJaD:	9, incl. professional and technical staff

4. Review of actions, recommendations, conclusions

The actions, recommendations and conclusions of the meetings listed in the agenda were reviewed under the respective subject scopes in other parts of the agenda. Some of them were considered as continuing and were included again in the list of Conclusions, Recommendations, Actions starting on page 14.

5. Technical EXFOR matters

The results of the discussions are all included in the EXFOR Conclusions starting on page 17.

Some special topics were:

a. The increasing degree of machine-processing of EXFOR data requires that all centers invest efforts into the improvement of EXFOR check programs. At present, each center has to use significant amounts of manpower into the correction of incoming EXFOR tapes, and this manpower could be used for more fruitful purposes as soon as the technical quality of the EXFOR entries transmitted were according to the rules. Obviously, a format mistake which may be tolerable at the one center, may upset the processing codes at the other center. Centers are therefore urged to respond carefully and speedily to the error messages and requests for retransmissions expressed by the other centers.

b. The INDC had recommended to the data centers to consider creating more user-friendly EXFOR output formats for nuclear data users. As the centers have different computer configurations, and as the interests and computer configurations of the data users in the 4 service areas are different, each center must develop its own output formats. EXFOR output formats, therefore, are not a suitable topic for detailed discussions at the centers' meeting, but it was agreed that the centers should, more than so far, inform and consult each other about their EXFOR output format. NDS will select some examples of EXFOR retrievals and will request identical retrievals from each center in order to compare their output formats (see action 8.10).

6. Evaluated data

a. The main topic of interest was the progress of the ENDF-6 format and the progress of the ENDF/B-6 data library. S. Pearlstein (Compare appendix page 121) announced that the ENDF-6 format manual and related utility codes will be distributed soon. The evaluations for the ENDF/B-6 library will be slower than planned earlier, but there will be no release restrictions. The ENDF/B-6 Standards File will soon be released, but delays may occur due to collecting experiences with the new method of evaluating several nuclides simultaneously.

b. For possible new developments in the international cooperation for data evaluation see the center heads' discussions and Conclusion 14.

c. V. Manokhin reported that the SOKRATOR evaluations will be freely available in ENDF format. He was asked to take care of reducing the mail delays for magnetic tapes. There is high interest to receive Konshin's new evaluations on Pu and U isotopes as soon as possible.

d. N. Tubbs reported on the JEF work (see NEA-DB status report). For the time being, JEF evaluation will not be released, though one would consider to release, after the testing phase, some parts of it, similar to the released parts of ENDF/B-5. For the JEF standards file, however, there should not be any interest, because JEF uses INDC/NEANDC standards which are public and known.

7. Policy discussions

a. The main discussions under this agenda item on the 4 neutron data centers co-operation in light of budgetary restrictions took place in a subgroup, of which the conclusions are summarized in Conclusion 14.

b. Among the data needs that were presently not sufficiently covered, were primarily

- stopping power data (see Conclusion 1.1)

- data for medical radiotherapy (see the data needs defined at the Meeting on this topic, Rijswijk, Netherlands, 16-20 September 1985, proceedings to be published). A preliminary paper on the data needs was available as working paper NDS-8.

- neutron reaction data involving polarized neutrons are desirable to be covered in EXFOR and CINDA; however, due to lack of manpower centers cannot comply (see action 9.8).

8. Special matters on neutron data

a. CINDA, see conclusions 3.1-3.4, actions 4.1 to 4.5. The transition of the CINDA network to symmetric operations between (so far) 3 centers continued smoothly. No details were discussed at the present meeting, because the CINDA experts from NDS and NNDC were not present. V. Manokhin announced that CJD is preparing for taking over full responsibility for the CINDA file of area 4 and a CJD staff member will visit NDS for discussing details in the near future.

At the IAEA the subscription to some of the journals containing English translations from Russian originals had to be discontinued for budgetary reasons, and NDS has approached NNDC whether they could continue to scan such journals.

b. WRENDA. See WRENDA schedule page 17, conclusions 5.1, actions 6.1-6.2.

c. Neutron EXFOR. See actions 9.1 to 9.8.

There was some discussion about the EXFOR statistics (working paper page 75), which is partly reflected in Conclusion 14. The annual number of data points for new experiments in EXFOR is increasing, although the number of subentries is decreasing. But there are different trends in different geographical areas. The completeness of EXFOR continues to appear satisfactory. The main deficiency reported was insufficient speed in the compilation or transmission of newest data, in particular from area 4. CJD was asked to work towards reducing the mail delays of EXFOR TRANS tapes.

9. Special matters on CPND and PhND

The main topic of discussion was the re-organization of the co-ordination of the compilation work of the CPND centers. It is appreciated that CAJaD carries the largest share of CPND compilation and will therefore take a leading role in the co-ordination. For details see Conclusions 7.1.

10. 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, 7-9 October 1986
- full meeting with center heads: Brookhaven, October 1987

Note: The date of the technical meeting was fixed as proposed in CP-D/145 of 28 Jan. 1986.

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, CJD to work towards full responsibility of CJD for the area-4 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, NEA-DB, CJD reminder: to contribute to the CINDA front-pages, to the compilation of nuclear data handbooks, etc.

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, e.g., 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 one data set out of several data sets in a given reference, it shall always compile all 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 differential 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 code 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,B-)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 retransmissions 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, NEA-DB, NDS, CJD — to compile with high priority neutron cross-section data $\sigma(E)$ for inclusion in the NNDC atlas, with special emphasis to

- 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, not 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 Centers — to correct and re-transmit fast those EXFOR entries where retransmission was requested by a receiving center
(= continuing action 6.7 of 1983 NRDC Meeting)

9.5. NDS, NNDC — to retransmit to CJD the TRANS tapes 8006, 8007, 8008.
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 CPND centers — to propose LEXFOR entries, if there continues to be an interest to use the column-headings SPIN, PARITY, MOMENTUM 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 Reich-Moore 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 centers — for the time being evaluated CPND should continue to be 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

National Nuclear Data Center

Status Report

to the

Eighth Nuclear Reaction Data Centers Meeting

October 9 - 11, 1985

I. General

Since the last meeting of the Nuclear Reaction Data Centers in October 1983, our staff has been decreased by five scientific/professional and two support positions. We are training a new programmer as a replacement for a systems programmer that left. In addition, we have two visiting scientists from the People's Republic of China performing A-chain evaluations who will remain until the end of the year.

The VAX 11/780 system has had hardware additions in the following areas: a disk subsystem consisting of an HSC-50 and RA-81 disk unit (456 Mbytes increase); memory has been changed from 2 Mbyte 64K chips to 8 Mbytes 256K chips. The communications subsystem has been augmented with DEUNA, Ethernet, DECserver-100 and DECNET software; a floating point accelerator has also been integrated. These modifications are in preparation for building a proposed VAX Cluster system to replace the DECsystem-10 computer system. Currently approximately 50% of NNDC systems and software has been converted and migrated to the VAX. The Vector Automation graphics system has been integrated to the VAX and has the ability to be switched between the DEC-10 and the VAX.

A diagram of the system as of September, 1985, is attached.

II. WRENDA

The review and updating of the U.S. Nuclear Data Request List is beginning and will be completed by January 1987. An addendum to the 1983 list was published in September 1984.

III. Bibliographies

The normal CINDA and NSR activity has continued. Four supplements and two cumulative issues of Recent References have been published since October 1983. Two editions of Charged Particle Nuclear Data Bibliography were published covering the literature from March 1, 1982 through March 31, 1985.

CINDA indices were prepared for the 1985 Santa Fe Conference, the 1983 Specialists Meeting on Yields and Decay Data, and the 1984 and 1985 DOE-NDC Progress Reports.

IV. Data Libraries

In the period from October 1983 through September 1985, 28 neutron data transmission tapes (TRANS 1170-1198) were sent containing new and corrected entries.

The conversion of the Area 1 entries to the REACTION formalism was completed. The data from areas 1-4 was converted and the new library system (based on the REACTION formalism) was implemented. A new set of retrieval codes was written and implemented.

V. Evaluated Nuclear Reaction Data

Drastic reduction in funding for ENDF/B-VI by the U.S. fast breeder reactor program has led to significant changes in the ENDE/B-VI development plans. The major responsibility now lies with the U.S. DOE Office of Basic Energy Sciences. Major evaluation improvements will be made for materials of interest to the fusion and fission reactor programs. However, we also expect to include some evaluated data for incident charged particles, namely protons.

The NNDC will continue to provide the coordination of the program and basic support services but will not be significantly involved in neutron data evaluation.

The release of ENDF/B-VI is expected to be completed by October 1989.

VI. Nuclear Structure Data

NNDC continues to publish the Nuclear Data Sheets. As of September, 1985, issues through Volume 46, issue 3 have been sent to Academic Press. The publication of the Nuclear Data Sheets is on schedule.

A training session for new evaluators is planned for December 2-6, 1985.

VII. Customer Services

The NNDC has had displays with remote computer terminal access to its data bases at a number of professional meetings. The NSR and ENSDF data bases have also been accessed on-line by users at BNL and SUNY Stony Brook.

The request statistics for July 1, 1983 through June 30, 1985 are attached.

VIII. Publications

The fourth edition of "Neutron Cross Sections", Vol. 1, Part B, Resonance Parameters for Z=61-100, was issued by Academic Press in 1984. The production of Volume II (Book of Curves) is uncertain due to the loss of staff.

A new edition of the Nuclear Wallet Cards based on the latest Wapstra mass evaluation was published in January 1985.

A new enlarged edition of the COMPUTOPE CHART, a chart of the nuclides, became available on microfiche in September 1985 and contains information extracted from:

Evaluated Nuclear Structure Data File ENSDF, November 1984.

Evaluated Nuclear Data File ENDF/B-V 1979, revised through 1984.

Neutron Cross Sections, Vol. 1, Academic Press 1981 (A), 1984 (B).

Atomic Masses, A. Wapstra et al., Nucl. Phys. A432 1985.

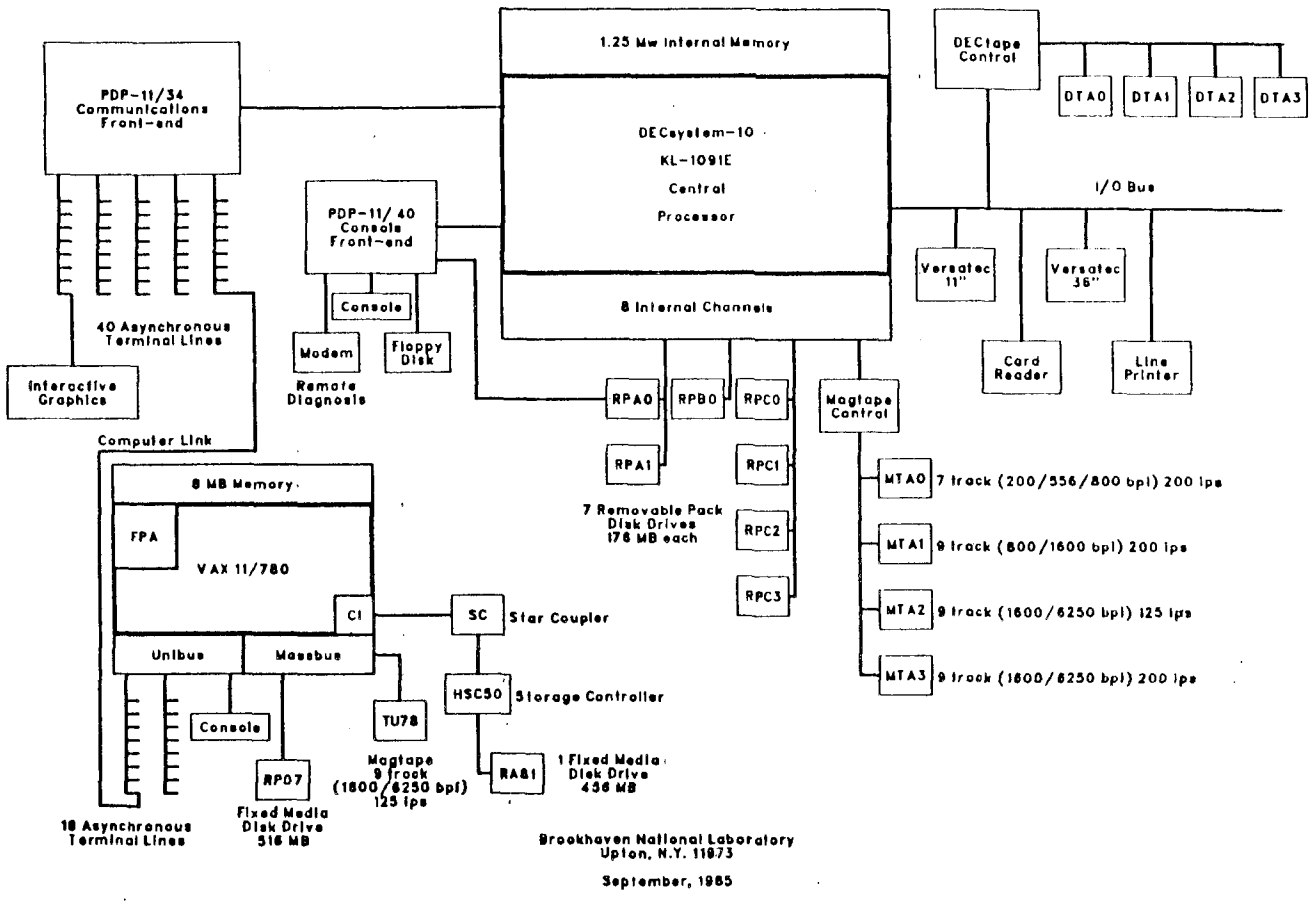
Isotopic Composition of the Elements 1983, Pure Appl. Chem., 56, 675 (1984).

Chart of the Nuclides, General Electric Co., 1984.

Nuclear Wallet Cards, J. Tuli, 1985.

The production of the microfiche from these data bases is an automated push-button operation. On-line searches of the contents of the COMPUTOPE CHART that can satisfy several criteria are also possible.

National Nuclear Data Center
Computer System



Request Statistics

TABLE III

1 Jan. 1983 to 31 Dec. 1983

Area 1

EXPERIMENTAL NEUTRON DATA

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NG)	OTHERS	TOTAL REQUEST
0-NN	1	1	0	0	0	0	0	0	0	2
-H	17	11	0	17	0	19	2	0	7	73
-He	4	3	1	4	5	3	5	0	2	27
3-Li	3	3	4	5	13	8	22	0	6	64
4-Be	2	1	2	2	6	2	8	0	3	26
5-B	3	3	3	5	14	12	19	0	15	74
6-C	3	3	3	5	13	6	14	0	3	50
7-N	4	2	3	3	10	3	20	0	3	48
8-O	3	4	3	4	13	5	20	0	3	55
9-F	1	1	1	2	6	5	8	0	1	25
10-Ne	3	3	0	3	12	5	10	0	1	37
11-Na	1	1	1	2	6	6	18	0	3	38
12-Mg	4	3	6	2	20	5	32	0	2	74
13-Al	5	5	6	7	17	11	35	0	10	96
14-Si	5	6	6	6	30	10	26	0	3	92
15-P	1	2	1	3	1	5	15	0	2	30
16-S	4	7	4	5	20	14	7	0	3	64
17-Cl	4	5	4	3	33	12	31	0	2	94

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NG)	OTHERS	TOTAL REQUEST
18-Ar	3	4	1	5	9	5	17	0	1	45
19-K	4	5	3	4	19	11	33	0	4	83
20-Ca	10	6	3	3	41	15	29	0	2	109
21-Sc	0	0	0	0	0	0	3	0	0	3
22-Ti	6	6	5	7	32	9	31	0	6	102
23-V	3	2	2	5	11	5	25	0	2	55
24-Cr	3	3	3	6	14	9	17	0	2	57
25-Mn	0	0	0	0	0	3	4	0	0	7
26-Fe	0	0	1	0	0	2	16	0	0	19
27-Co	2	1	3	0	0	3	4	0	0	13
28-Ni	6	6	13	10	20	7	36	0	4	102
29-Cu	0	1	3	0	0	7	16	0	1	28
30-Zn	0	0	0	0	0	0	8	0	0	8
31-Ga	0	0	0	0	0	0	2	0	0	2
32-Ge	0	0	0	0	0	0	2	0	0	2
33-As	0	0	0	0	0	0	3	0	0	3
34-Se	0	0	0	0	0	0	1	0	0	1
35-Br	0	0	0	0	0	0	5	0	0	5
36-Kr	0	0	0	0	0	0	0	0	0	0
37-Rb	0	0	0	0	0	0	5	0	0	5
38-Sr	0	0	0	0	0	0	0	0	0	0
39-Y	1	0	0	0	0	2	2	0	0	5
40-Zr	1	0	0	0	0	0	3	0	0	4
41-Nb	1	0	0	0	0	0	4	0	0	5
42-Mo	2	1	1	1	5	2	6	0	2	20
43-Tc	1	1	0	0	2	1	0	0	1	6
44-Ru	1	3	2	1	7	5	5	0	1	25
45-Rh	1	0	0	0	0	0	1	0	0	2
46-Pd	1	0	0	0	0	0	0	0	0	1
47-Ag	1	0	0	0	0	3	3	0	0	7

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NG)	OTHERS	TOTAL REQUEST
48-Cd	6	0	0	0	0	0	0	0	0	6
49-In	1	0	0	0	0	3	2	0	0	6
50-Sn	1	0	0	0	0	0	2	0	0	3
51-Sb	1	0	0	0	0	0	0	0	0	1
52-Te	1	0	0	0	0	0	0	0	0	1
53-I	0	0	0	0	0	1	3	0	0	4
54-Xe	0	0	0	0	0	0	2	0	0	2
55-Cs	0	0	0	0	0	0	3	0	0	3
56-Ba	0	0	0	0	0	0	1	0	0	1
57-La	0	0	0	0	0	1	2	0	0	3
58-Ce	0	0	0	0	0	0	2	0	0	2
59-Pr	0	0	0	0	0	0	0	0	0	0
60-Nd	0	0	0	0	0	0	1	0	0	1
61-Pm	0	0	0	0	0	0	0	0	0	0
62-Sm	1	1	0	0	8	1	8	0	1	20
63-Eu	0	0	0	0	0	0	2	0	0	2
64-Gd	0	0	0	0	0	0	0	0	0	0
65-Tb	0	0	0	0	0	0	1	0	0	1
66-Dy	0	0	0	0	0	0	5	0	0	5
67-Ho	0	0	0	0	0	0	2	0	0	2
68-Er	0	0	0	0	0	0	0	0	0	0
69-Tm	1	1	0	0	6	2	1	0	0	11
70-Yb	0	0	0	0	0	0	2	0	0	2
71-Lu	0	0	0	0	0	0	1	0	0	1
72-Hf	0	0	0	0	0	0	0	0	0	0
73-Ta	1	1	1	0	7	7	6	0	2	25
74-W	0	0	0	0	0	0	2	0	0	2
75-Re	0	0	0	0	0	0	0	0	0	0
76-Os	1	3	1	1	18	10	3	0	0	37
77-Ir	0	0	0	0	0	2	0	0	0	2

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NF)	OTHERS	TOTAL REQUEST
78-Pt	0	0	0	0	0	0	0	0	0	0
79-Au	2	1	1	2	6	13	8	1	3	37
80-Hg	0	0	0	0	0	1	2	0	0	3
81-Te	0	0	0	0	0	0	0	0	0	0
82-Pb	0	0	3	0	0	4	3	0	0	10
83-Bi	0	0	0	0	0	0	0	0	0	0
88-Ra	0	0	0	0	0	0	0	0	0	0
89-Ac	0	0	0	0	0	0	0	0	0	0
90-Th	1	0	0	0	0	1	1	5	1	9
91-Pa	0	0	0	0	0	0	0	0	0	0
92-U-000	5	0	0	0	0	0	0	0	0	5
92-U-230	0	0	0	0	0	0	0	0	0	0
92-U-231	0	0	0	0	0	0	0	0	0	0
92-U-232	0	0	0	0	0	0	0	5	0	5
92-U-233	2	0	0	0	0	0	0	10	3	15
92-U-234	0	0	0	0	0	0	0	2	0	2
92-U-235	1	0	0	0	0	0	0	19	1	21
92-U-236	0	0	0	0	0	0	0	1	0	1
92-U-237	0	0	0	0	0	0	0	0	0	0
92-U-238	5	0	0	0	0	3	0	21	0	29
92-U-oxi	0	0	0	0	0	0	0	0	0	0
92-U-239	0	0	0	0	0	0	0	4	1	5
93-Np	2	1	0	1	3	2	1	7	1	18
94-Pu-000	0	0	0	0	0	0	0	0	0	0
94-Pu-238	0	0	0	0	0	0	0	5	0	5
94-Pu-239	5	3	1	1	15	3	3	12	4	47
94-Pu-240	2	0	0	0	0	0	0	9	0	11
94-Pu-241	0	0	0	0	0	0	0	9	1	10
94-Pu-242	1	0	0	0	0	2	0	2	0	5
94-Pu-243	0	0	0	0	0	0	0	0	0	0

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NF)	OTHERS	TOTAL REQUEST
94-Pu-244	0	0	0	0	0	0	0	0	0	0
94-Pu-245	0	0	0	0	0	0	0	0	0	0
95-Am	0	0	0	0	0	0	0	14	0	14
96-Cm	0	0	0	0	0	0	0	21	0	21
97-Bk	0	0	0	0	0	0	0	2	0	2
98-Cf	0	0	0	0	0	0	0	10	0	10
99-Es	0	0	0	0	0	0	0	1	0	1
100-Fm	0	0	0	0	0	0	0	0	0	0
TOTAL	155	114	95	125	442	276	642	160	113	2,122

Request Statistics

TABLE III

1 January 1984 to 31 December 1984

AREA 1

EXPERIMENTAL NEUTRON DATA

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NF)	OTHERS	TOTAL REQUES
1-H	6	12	0	0	0	2	0	0	0	20
2-He	0	0	0	0	0	0	0	0	0	0
3-Li	2	1	3	1	0	8	36	0	3	54
4-Be	2	1	1	1	3	2	12	1	2	25
5-B	5	5	3	5	6	4	35	0	9	72
6-C	3	4	3	1	0	1	13	0	0	25
7-N	6	7	4	4	10	3	16	0	3	53
8-O	3	3	3	1	0	1	11	0	0	22
9-F	0	0	0	0	0	2	14	0	0	16
10-Ne	0	0	0	0	0	0	5	0	0	5
11-Na	0	0	0	0	0	2	13	0	0	15
12-Mg	0	0	0	0	0	2	18	0	1	21
13-Al	2	3	3	2	6	15	52	0	2	85
14-Si	1	1	2	1	0	2	16	0	0	23
15-P	0	0	0	0	0	0	9	0	0	9
16-S	0	0	0	0	0	0	19	0	0	19
17-Cl	0	0	0	0	0	1	8	0	0	9
18-Ar	0	0	0	0	0	0	6	0	0	6
19-K	0	0	0	0	0	1	10	0	0	11
20-Ca	0	0	0	0	0	0	7	0	0	7
21-Sc	0	0	0	0	0	0	5	0	0	5
22-Ti	0	0	0	0	0	2	33	0	0	35
23-V	3	2	2	1	9	6	28	0	3	54
24-Cr	0	0	0	0	0	4	43	0	0	47
2 Mn	0	0	0	0	0	2	12	0	0	14
26-Fe	14	18	13	6	58	31	125	0	8	273

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NF)	OTHERS	TOTAL REQUEST
27-Co	0	0	0	0	0	5	15	0	0	20
28-Ni	0	0	0	0	0	3	63	0	0	66
29-Cu	4	3	3	1	0	31	26	0	0	68
30-Zn	6	4	4	0	0	8	46	0	0	66
31-Ga	0	0	0	0	0	0	3	0	0	3
32-Ge	0	0	0	0	0	0	6	0	0	6
33-As	0	0	0	0	0	0	6	0	0	6
34-Se	0	0	0	0	0	0	9	0	0	9
35-Br	0	0	0	0	0	2	13	0	0	15
36-Kr	0	0	0	0	0	0	1	0	0	1
37-Rb	0	0	0	0	0	0	8	0	0	8
38-Sr	3	3	2	2	16	5	5	0	0	36
39-Y	1	1	1	0	8	4	8	0	1	24
40-Zr	2	2	2	2	16	8	27	0	0	59
41-Nb	1	1	4	1	7	4	16	0	1	35
42-Mo	0	0	0	0	0	0	10	0	0	10
43-Tc	0	0	0	0	0	0	2	0	0	2
44-Ru	0	0	0	0	0	1	6	0	0	7
45-Rh	0	0	0	0	0	0	2	0	0	2
46-Pd	0	0	0	0	0	0	7	0	0	7
47-Ag	0	0	0	0	0	2	4	0	0	6
48-Cd	0	0	0	0	0	0	9	0	0	9
49-In	0	0	7	0	0	0	5	0	0	12
50-Sn	2	1	0	0	0	0	7	0	0	10
51-Sb	0	0	0	0	0	0	0	0	0	0
52-Te	0	0	0	0	0	0	7	0	0	7
53-I	0	0	0	0	0	0	2	0	0	2
54-Xe	0	0	0	0	0	0	4	0	0	4
55-Cs	0	0	0	0	0	0	6	0	0	6
56-Ba	0	0	0	0	0	0	3	0	0	3
57-La	0	0	0	0	0	1	3	0	0	4
58-Ce	0	0	0	0	0	0	3	0	0	3
59-Pr	0	0	0	0	0	0	2	0	0	2
60-Nd	0	0	0	0	0	0	10	0	0	10

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NF)	OTHERS	TOTAL REQUES
61-Pm	0	0	0	0	0	0	0	0	0	0
62-Sm	0	0	0	0	0	1	11	0	0	12
63-Eu	2	2	0	1	10	5	8	0	2	30
64-Gd	0	0	0	0	0	0	7	0	0	7
65-Td	0	0	0	0	0	0	2	0	0	2
66-Dy	0	0	0	0	0	0	15	0	0	15
67-Ho	0	0	0	0	0	0	4	0	0	4
68-Er	0	0	0	0	0	0	7	0	0	7
60-Tm	1	1	1	0	6	7	4	0	0	20
70-Yb	0	0	0	0	0	0	13	0	0	13
71-Lu	0	2	1	0	6	3	8	0	0	20
72-Hf	0	0	0	0	0	0	5	0	0	5
73-Ta	0	0	0	0	0	0	5	0	0	5
74-W	0	0	0	0	0	1	5	0	0	6
75-Re	0	0	0	0	0	0	2	0	0	2
76-Os	0	0	0	0	0	0	7	0	0	7
77-Ir	0	0	0	0	0	1	3	0	0	4
78-Pt	0	0	0	0	0	0	7	0	0	7
79-Au	0	0	0	0	0	12	3	0	0	15
80-Hg	0	0	0	0	0	1	2	0	0	3
81-Te	0	0	0	0	0	0	4	0	0	4
82-Pb	5	4	3	1	0	7	9	0	0	29
83-Bi	0	0	0	0	0	0	4	0	0	4
86-Rn	0	0	0	0	0	0	0	0	0	0
88-Ra	0	0	0	0	0	0	0	0	0	0
89-Ac	0	0	0	0	0	0	0	0	0	0
90-Th	0	0	0	0	0	3	4	12	0	19
91-Pa	0	0	0	0	0	0	0	1	0	1
92-U-000	0	0	0	0	0	0	0	1	0	1
92-U-230	0	0	0	0	0	0	0	0	0	0
92-U-231	0	0	0	0	0	0	0	0	0	0
92-U-232	0	0	0	0	0	0	0	2	0	2
92-U-233	0	0	0	0	0	1	0	9	0	10

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NF)	OTHERS	TOTAL REQUES
92-U-234	0	0	0	0	0	0	0	2	0	2
92-U-235	0	0	0	1	0	2	2	45	0	50
92-U-236	0	0	0	0	0	0	0	4	0	4
92-U-237	0	0	0	0	0	0	0	0	0	0
92-U-238	0	0	3	0	0	8	6	56	0	73
92-U-oxi	0	0	0	0	0	0	0	0	0	0
92-U-239	0	0	0	0	0	0	0	0	0	0
93-Np	1	1	0	0	4	1	1	15	2	25
94-Pu-000	0	0	0	0	0	0	0	0	0	0
94-Pu-238	0	0	0	0	0	0	0	2	0	2
94-Pu-239	1	1	2	3	5	4	5	14	2	37
94-Pu240	0	0	0	0	0	0	0	4	0	4
94-Pu-241	0	0	0	0	0	0	1	5	0	6
94-Pu-242	0	0	0	0	0	0	0	4	0	4
94-Pu-243	0	0	0	0	0	0	0	0	0	0
94-Pu-244	0	0	0	0	0	0	0	1	0	1
94-Pu-245	0	0	0	0	0	0	0	0	0	0
95-Am	1	1	1	0	5	4	0	6	1	19
96-Cm	0	0	0	0	0	0	0	2	0	2
97-Bk	0	0	0	0	0	0	0	0	0	0
98-Cf	0	0	0	0	0	0	0	4	0	4
99-Es	0	0	0	0	0	0	0	0	0	0
100-Fm	0	0	0	0	0	0	0	1	0	1
TOTAL	77	84	71	35	175	226	1044	191	40	1943

Request Statistics

Table I

1 July 1983 to 1 July 1985

NUMBER OF REQUESTS FOR DATA AND OTHER INFORMATION*

Requestor	Experimental Neutron and Charge Particle Data	Evaluated Neutron and Charge Particle Data	Bibliographic Neutron and Charge Particle Information	All Programs	All Documents	Total
USA-Government Agencies	41	38	5	5	361	450
USA-Educational Institutions	41	20	5	5	188	259
USA-Industry	25	21	5	10	323	384
Canada	2	1	0	3	49	55
Foreign (except Canada)	-	-	-	24	422	446
TOTAL	109	80	15	47	1,343	1,594

Request Statistics

Table II

1 July 1983 to 1 July 1985

Area 1

REGULAR DISTRIBUTION OF DATA AND INFORMATION

A. Experimental Neutron Data: 59 Tapes (TRANS 1137 to 1195)

B.

C. Bibliographic Neutron Information: 48 Tapes - CINDA COVERAGE (C020 TO C067)

*Table I does not include regular distributions, see Table II.

Request Statistics
Table I

1 July 1983 to 1 July 1985

NUMBER OF REQUESTS FOR DATA AND OTHER INFORMATION*

Requestor	Experimental Neutron and Charge Particle Data	Evaluated Neutron and Charge Particle Data	Bibliographic Neutron and Charge Particle Information	All Programs	All Documents	Total
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Canada	2	1	0	3	49	55
Foreign (except Canada)	-	-	-	24	422	446
TOTAL	109	80	15	47	1,343	1,594

Request Statistics
Table II

1 July 1983 to 1 July 1985

Area 1

REGULAR DISTRIBUTION OF DATA AND INFORMATION

A. Experimental Neutron Data: 59 Tapes (TRANS 1137 to 1195)
B. Evaluated Neutron Data: 8 Tapes
   Special Purpose DOSMIETRY FILE (ENDF/B-V Tape 531 (V.2))
   Special Purpose GAS PRODUCTION FILE (ENDF/B-V Tape 533 (V.2))
   Special Purpose ACTINIDE FILE (ENDF/B-V Tape 565 (V.2))
   Special Purpose ACTIVATION FILE (ENDF/B-V Tape 564 (V.2))
   Special Purpose FISSION PRODUCT FILE (ENDF/B-V Tape 566 (V.2))
   General Purpose UPDATE FILE (ENDF/B-V Tape 567 (V.1))
   General Purpose UPDATE FILE (ENDF/B-V Tape 568 (V.2))
   ENDF UTILITY PROGRAMS (ENDF/B-V Tape 8312)
C. Bibliographic Neutron Information: 48 Tapes - CINDA COVERAGE (C020 TO C067)

*Table I does not include regular distributions, see Table II.

Nuclear Data Support Available from NNDC

The National Nuclear Data Center is willing to supply support services to anyone planning to evaluate nuclear data which could be considered for revisions to ENDF/B. These services include:

1. Bibliographic retrievals from CINDA the index to the literature on neutron induced reations, and/or NSR, the index to the literature on nuclear structure and decay data.
2. Experimental data retrievals from CSISRS, the NNDC nuclear reaction data file.
3. Plots of existing evaluations in the ENDF format vs. experimental data.
4. Resonance parameters in ENDF format from the work of S. Mughabghab.
5. Generation of gamma production data for an isotope from cross sections given in File 3 format.
6. Merging of separate complete evaluations into a single one i.e., a natural element from its isotopes or alloy from its constituents.
7. Clerical and physics checking of evaluations, preparation of review kits, plots and listings.
8. Generation of pointwise cross sections from ENDF formatted resonance parameters.
9. ENDF/B-VI format descriptions and utility codes.
10. Dialogue with the Cross Section Evaluation Working Group (CSEWG) community.

Contact: C. Dunford 516-282-2902
S. Pearlstein or 666-2902 FTS
NNDC
Building 197D
Brookhaven National Laboratory
Upton, NY 11973

d/f:10.3.4:CLD/Support

PROGRESS REPORT FROM THE NEA DATA BANK TO THE EIGHTH MEETING OF NUCLEAR REACTION DATA CENTRES

Paris, October 1985

I. INTRODUCTION

1. The past twelve months have seen customer service output at approximately the same levels as in 1983/84: 1257 program packages in 1984 and 9.6 million logical records of nuclear data. Change can be seen most clearly in the effect of the VAX-11/780 computer on the working methods of the data and program groups within the Data Bank. The results appear most clearly in the production of the JEF-1 file, which required the capacity for efficient manipulation and correction of very large masses of data, and in the routine use of the RXVP-80 software tool system for scanning incoming computer programs in order to identify missing material and very basic coding errors before proper testing is launched.

2. Agreement was reached with IAEA Nuclear Data Section for the gradual transfer of responsibility from the Data Bank to IAEA for the detailed preparation work on the CINDA annual publication. This took full effect in October 1985.

II. COMPUTER PROGRAM SERVICES

3. Program testing and masterfiling continued during the year on the same scale as the preceding year. 98 programs were tested and the total volume of material masterfiled in 1984 amounted to 237 Mbytes or 2.4 Mbytes per program on the average. Of the new programs acquired during 1984 by the Data Bank, 60% were of U.S. origin. Not all of the additional 76 programs requested during 1984 by the Data Bank had yet arrived in October 1985.

Waste Management Computer Programs

4. Following the request of the NEA Waste Management Division, the following programs dealing with different aspects of radioactive waste disposal have been collected during 1984 by the Data Bank (T = tested):

CHEMTRN (T)	:	Chemical species transport in groundwater systems.
MINEQL	:	Equilibrium composition/speciation of aqueous systems.
PHREEQUE (T)	:	pH, redox potential, mass transfer in aqueous systems.
SOLUPLOT	:	Calculation and plotting of complex pH diagrams for aqueous chemical systems.
DEIS	:	Impact assessment of low-level radioactive waste.
LISA	:	Hazard analysis due to the nuclear waste disposal in geological formations.

EQ3/6 (T) : Thermodynamic equilibrium models for aqueous solution-mineral systems.

TRIPM : Radionuclide transport in saturated-unsaturated phreatic aquifer.

The SYVAC Codes

5. The System Variability Codes (SYVAC) and several other similarly structured probabilistic codes are used to sample statistical distributions of input parameters, then, by way of a linked set of deterministic submodels, to predict the corresponding distribution of output parameters. This approach has been applied in the SYVAC codes to the prediction of the consequences of radioactive waste disposal in different types of geological environment.

6. Following a meeting in London in December 1984, a Users' Group has been set up in the framework of the NEA Radioactive Waste Management Committee. The Data Bank's initial contribution will be routine testing and distribution of these codes to members of the group.

III. NUCLEAR DATA SERVICES AND CINDA

7. A total of 86 new EXFOR works and about 30 retransmissions were sent out to the other neutron data centers during the past twelve months; checks were made against CINDA, as well as an independent scan of the major journals publishing European data. The number of new works is equal to the number received from NNDC Brookhaven over the same period.

8. Although the overall volume of EXFOR data received from the USSR has been at a respectable level over recent years (79 new "works" on tapes received in the last 12 months, a similar level to the previous year), few of these measurements were recent. However, recently received tapes included an appreciable number of new works and this improvement was welcomed.

9. Following the decision of the May 1983 meeting of the Data Bank Committee, discussions were held with IAEA Nuclear Data Center on the possibility of transferring full responsibility for production of the annual CINDA edition to IAEA. At present this is printed by IAEA, from a magnetic tape produced at the Data Bank. IAEA/NDS have recently set up an independent data base allowing on-line access to entries prepared for USSR and the IAEA service area, and a fully symmetrical exchange procedure is being brought into use, under which NNDC Brookhaven, IAEA/NDS and the Data Bank each take full responsibility for maintenance and updating CINDA entries for publications in their own service area.

Customer Service for Nuclear Data

10. During 1984, 200 requests for nuclear data from 90 requesters were answered and a total of 9.6 million logical data records sent out. A further 70 copies of specific group cross-section libraries were sent out by the computer program service to their customers for use with reactor physics codes. The figure for 1985 was approximately 38 million records, largely due to despatch of the JEF-1 file.

11. Contact with data users was very good, as can be seen from the fact that 60% of requests were received by telephone. Discussion of the user's precise needs, and the better selectivity of the new data base retrieval programs, have made it possible to hold down the number of data records sent out. This is important to the user; on average a reply contains 48,000 logical records, and places appreciable data processing demands on the recipient.

IV. JOINT EVALUATED FILE PROJECT (JEF)

12. The first full version of JEF has been distributed to national laboratories in participating countries. It contains neutron interaction data for some 300 nuclides, with further special files for thermal reactor, fuel management and radiation shielding applications. Following simple validation carried out by NEA Data Bank staff, complex calculations using JEF data in simple geometry critical assemblies and lattices were made by different European national laboratories for the principal reactor fuel isotopes and the structural materials, using group cross-section data prepared by NEA Data Bank staff. The cross-section values for the most important fission products were checked individually against integral measurements. Thermal reactor benchmark calculations were carried out to a very high level of accuracy.

Development of a Reference Version of JEF

13. The Scientific Coordination Group (SCG) concluded that JEF-1 may be seen overall as the best library that can be compiled from neutron data evaluations currently available. As such, it represents a marked improvement on the data files previously available to users in Data Bank Member countries. However, the benchmark studies carried out over the past year show that the current version of JEF does not fully meet the requirements for a reference file, which could be expected to maintain its scientific value for the foreseeable future. The SCG considered that it was essential to raise the file to this standard, and estimated that three years would be required to complete the necessary programme of new evaluations, in parallel with more sophisticated and varied benchmark studies.

14. The SCG recommendation was discussed by the Data Bank Committee at its ninth meeting in April 1985. The Committee applauded the successful completion of the JEF-1 library, and agreed unanimously to request the necessary extension of the JEF project for a further three years. This extension was granted by the Steering Committee for Nuclear Energy at its meeting on 30th October 1985.

V. NUCLEAR MODEL CODE COMPARISONS

15. A common problem in running benchmark comparisons of computer programs in any field is the discrepancy between input parameters, and sometimes even in the values given for physical constants in the different solutions submitted. In the final step of the Charged particle spherical optical model exercise, participants were asked to repeat high precision calculations with a common set, and the results obtained, published in the report NEANDC-198"U", may now be considered as reference data for the performance of the codes.

16. The final results of the International Nuclear Model Code Comparison on Pre-Equilibrium Effects have been analysed and the results have been published in NEWSLETTER No 32 from the NEA Data Bank (NEANDC-204"U"). This exercise consisted in calculating cross-sections of neutron-induced reactions on Nb-93 with an emphasis on predicting emission spectra and angular distributions. Twenty contributions were received in all.

17. The overall results are rather consistent for (n,n') and (n,2n) calculations. Large deviations were found for the much smaller (n,p) and (n) cross-sections. The less sophisticated codes gave similar results at lower energies (up to 10 MeV) to those obtained with the longer-running codes. Deviations were noticeable in the angle-integrated neutron emission at the lowest energies (grid size problems) and at the highest emission energies (direct reaction effects).

VI. NEACRP BENCHMARK ON THE TREATMENT OF RESONANCE SELF-SHIELDING IN THE UNRESOLVED REGION

18. Further analysis of the results presented at the first Specialists' Meeting in January 1984, and some new calculations, were discussed in December 1984 at a second meeting. Improvements have been made to the "ladder" calculation method, and further calculations with the Hwang method were proposed. A third meeting was held in connection with the Santa Fe meeting in May 1985, and the following conclutions were reached:

a. The analythical method of Hwang and the ladder generation technique developed by Ribon seem to be the most attractive methods for treating the unresolved resonance region, though new self-shielding measurements are still needed to verify the absolute accuracy of the calculations.

b. The problem of data representation in the unresolved resonance region was considered to be crucial and a recommendation was formulated to extend the resolved resonance region for U-238 and Pu-239 using existing experimental evidence.

NDS Status Report to the 1985 NRDC Meeting

H.D. Lemmel, September 1985

1. Staff

The staff of the IAEA Nuclear Data Section (NDS) as of October 1985 is shown on the next page. During the past 2 years there were only one change related to the Nuclear Reaction Data Unit: V.G. Pronyaev was replaced by V. Goulo from Minsk, USSR. Two names change by marriage: U. Leidolf/Lückl, M. Okumu/Oshomuwve. One post had to be given up in the Atomic and Molecular Data Unit. This and absence of some staff by travel or illness caused occasional delays in some areas.

2. CINDA (ML)

2.1 CINDA work

The coverage of journals is satisfactory except for a few less important translation series of Russian journals, where co-operation with NNDC is being sought for the future. There is some backlog in the coverage of laboratory and progress reports due to the time consuming testing of the new CINDA system being presently implemented at NDS.

CINDA entries prepared by CJD has considerably improved over the last 2 years with regard to both, the correct coding as well as the completeness of relevant articles and reactions covered. Since also the blocking and modifications/deletions of exisitng area 4 entries is done by CJD now, the workload for NDS is reduced considerably and is now mainly restricted to checks of the coding with occasional checks of the original literature only.

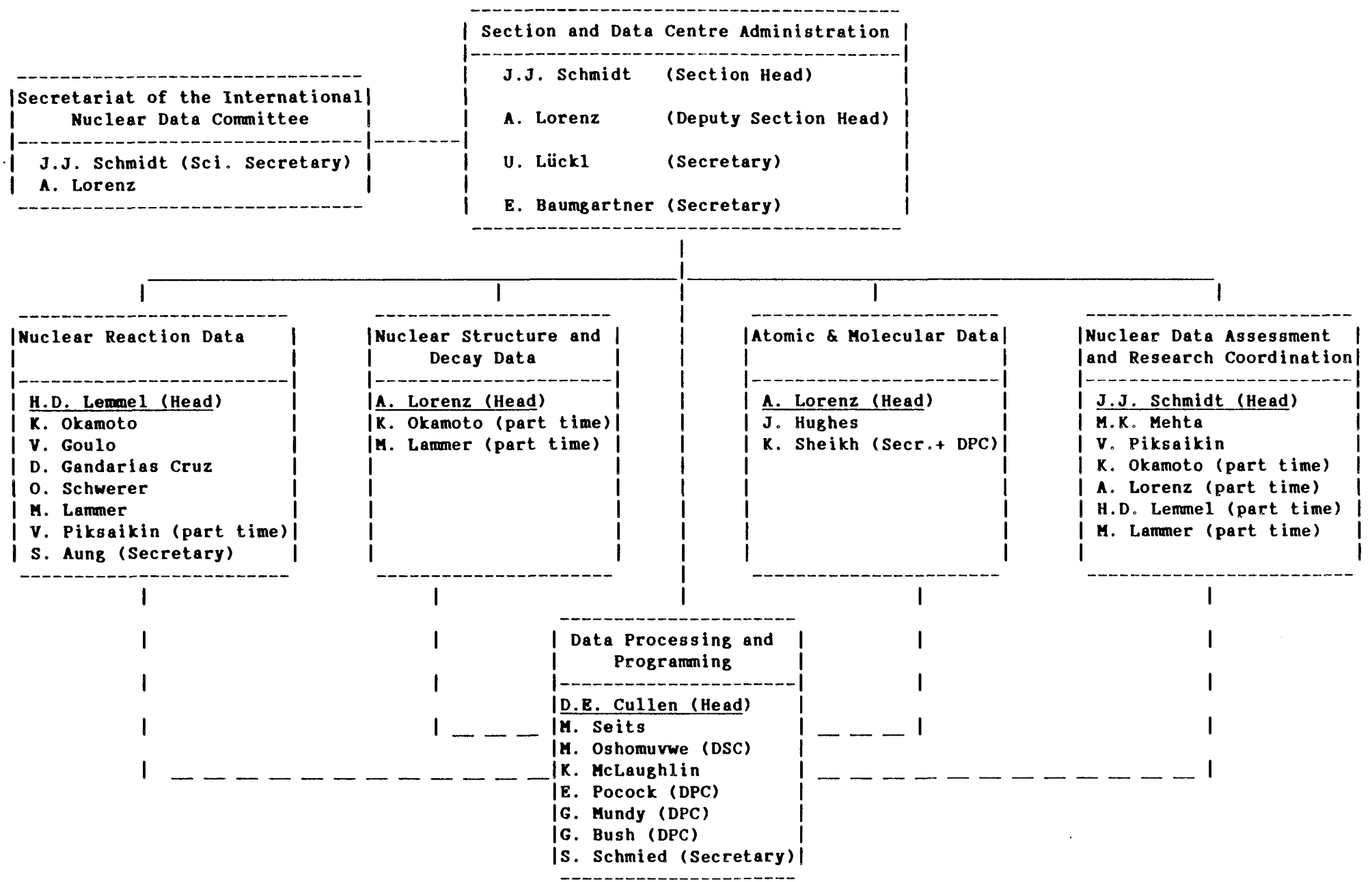
The complete book production via computer (except for a few pages with graphs) is now a routine operation. The compressed book format - i.e.: without leaving the rest of pages blank at the end of elements - has also been introduced for the main volumes in 1984, saving in the number of pages and costs.

3. The EXFOR System

We were very glad that a new EXFOR Center, the Charged-Particle Nuclear Data Group at the Institute of Atomic Energy in Beijing, joined the network of co-operating data centers. Their first EXFOR entries have been distributed recently.

The joining of the Nuclear Data Group at RIKEN, Japan, had been reported already at the last NRDC-Meeting. From both centers we gained some experience on the difficulties of newcomers when studying the EXFOR system, and several useful comments were received on clarifications in the

ORGANIZATION CHART OF THE NUCLEAR DATA SECTION AS OF SEPTEMBER 1985



EXFOR Manual. These were incorporated in the new version of the NDS EXFOR Manual, IAEA-NDS-3, Rev. 85/8. As these changes were of cosmetic nature without affecting EXFOR rules, we did not submit them in form of CP-Memos.

The EXFOR System and its rules were the main topic of the technical NRDC-Meeting 19-21 September 1984, see Memo CP-D/131. Since then, some more new proposals have been submitted by means of CP-Memo. See a separate working paper.

Following requests by customers, NDS offers two new EXFOR services:

- an EXFOR-Index on tape, in a format described in document IAEA-NDS-66. This enables recipients to check, what data exist or how up-to-date their own files are, without having to work from the voluminous EXFOR files themselves. Based on the EXFOR-Index they can request from NDS accurately formulated data retrievals.

- EXFOR-UPDAT tapes by which a customer receives regularly all new or newly revised EXFOR data in a given field. Details are given in chapter 3 of the NDS EXFOR Manual.

3.1 Dictionaries (OS)

Since the 1984 NRDC meeting, 6 updates and 2 dictionary transmissions were made. The conclusions of the 1984 NRDC meeting were reflected in TRANS 9049 (December 1984). The latest update (24 Sept. 1985) was Rev. 2 of TRANS 9050. The next transmission of the entire dictionary file will be done together with the next update including the conclusions of the present meeting. After the changes resulting from the NRDC meeting, most updates concerned routine changes of the institute, reference or nuclide dictionaries and (only a few) new quantities.

3.2 Correction of incoming EXFOR TRANS tapes (OS)

The more important errors found by NDS were communicated in Memos 4C-3/276, 279, 280, 284, 285 and CP-D/135, 141. Some typical errors occurring more frequently are summarized in a working paper for this meeting. Retransmissions requested by NDS (where correction of serious errors is requested from the originating centre) which are still pending, are summarized in Memo 4C-3/286 for areas 1,2,4.

4. EXFOR Compilation (DG)

4.1 Neutron reaction data, EXFOR-3 series

During the period 1 Sept. 1983 to 31 August 1985, 69 new entries were transmitted originating from the following countries:

China, People's Republic	18
Czechoslovakia	6
Hungary	6
India	6
Yugoslavia	5
Australia	3
Morocco	3
Poland	3
Romania	3
Argentina	2
Bulgaria	2
Iraq	2
Pakistan	2
Vietnam	2
Brazil	1
Egypt	1
German Democratic Republic	1
Israel	1
Saudi Arabia	1
South Africa	1
	69

In this list are not included 16 new subentries added to already existing entries. Considerable efforts were devoted to many retransmitted entries, due to corrections as result of EXFOR-CINDA comparison in H, D, T, Li, B, Mn and Au nuclei, and due to additional publications or authors' comments after the first compilation. As result of above mentioned EXFOR-CINDA comparison, several important old data (1965-1974) were compiled or revised.

4.2 EXFOR V-series: evaluated neutron data

Important evaluated neutron data are compiled in the V-series if such data are not convenient for compilation in ENDF/B format. In this period we compiled one entry from Poland and 11 from the People's Republic of China.

4.3 EXFOR D-series: charged-particle nuclear reaction data (CPND)

Within the given limitations of manpower, emphasis was given to neutron-producing reactions. Five new entries were compiled by NDS. Two entries from Argentina, one from U.K. and two from United States. In addition one more entry from Geel with more than 30,000 records was compiled in cooperation with NEA-DB.

4.4 EXFOR S-series: 5 entries were received from IAE/CP, P.R. China. They were checked and finalized at NDS and then distributed as tape TRANS-S001.

4.5 EXFOR G-series: photonuclear data

The third EXFOR-G entry (G0003) was compiled by NDS. This is photoneutron cross section for Pb-206, 207, 208 and Bi-209.

5. Evaluated Data

A new version of the International Reactor Dosimetry File, IRDF-85, was issued and documented in IAEA-NDS-41 Rev. 1. It includes 640-group data derived from ENDF/B-5 Rev. 2 (Dosimetry and gas production file), from INDL/V, two radiation damage files for iron, and 10 benchmark neutron spectra.

A new version of the IAEA Nuclear Data Library for Various neutron data evaluations, INDL/V(85), was issued and documented in IAEA-NDS-31 Rev. 3. It includes revisions to nearly all evaluations included in the previous version of this library, and 67 new materials, including evaluations from USSR, P.R. China, GDR, Austria, Poland, Romania and others. The total is now 196 materials. The ENDF checking procedures were significantly improved, so that the reliability of INDL/V data should now be satisfactory.

The 1984 version of the Livermore Library ENDL-84 was converted to ENDF-5 format and released by R.J. Howerton. The contents of 95 materials is summarized in IAEA-NDS-11 Rev. 4. It should be noted that some information contained in the "Transmission Format" of ENDL cannot be included in the ENDF-5 format. (In the ENDF-6, all information can be included.)

The start of a Chinese Library, CENDL, in ENDF-4 format was finalized during the stay of Liang Qichang and Shen Linxing at NDS, documented in IAEA-NDS-61. The same data converted to ENDF-5 format were included in INDL/V.

6. WRENDA

WRENDA 83/84 was published in Nov. 1983. The preparations for WRENDA 86/87 will start early 1986.

7. Publications

The routine publications continued, such as

- INDC reports
- Nuclear Data Newsletter
- CINDA
- Atomic + Molecular Data Bulletin
- IAEA-NDS-documents

and some more. Of special importance were:

- IAEA Tech. Repr. 227: Nuclear Data Standards
  = INDC/NEANDC nuclear standards file

- IAEA-TECDOC-336 on Transactinium Isotope Nuclear Data
  (meeting Uppsala 21-25 May 1984)

- IAEA-TECDOC-335 on Nuclear Standard Reference Data (meeting Geel 12-16 November 1984)

- Handbook on Nuclear Activation Data. After several delays this has gone to print now. See separate paper with table of contents.

7.1 Fission Product Nuclear Data (FPND) (ML

Issue 10 of the annually published serie "Progress in Fission Product Nuclear Data" was distributed as INDC(NDS)-155 (1984), this years issue no. 11 (INDC(NDS)-168) is presently being printed.

The number of contributions has - after a maximum in issues 8 and 9 - decreased again over the last 2 years. Therefore a memorandum to recipients of this series urging the completeness of contributions for future issues will be sent together with issue 11.

7.2 Handbook on Nuclear Data for Safeguards (ML)

Replies to the questionaire on nuclear data needed for safeguards techniques have been collected resulting in a list of data to be included in the handbook.

INDC members and liaison officiers have, upon request, sent me list of experts in the various data fields for recommending the best available data sets for inclusion in the handbook and for reviewing a draft version of the handbook.

Since data collections and experts in these fields could not be found for all the data requested, it was decided to issue a first version of the handbook with a limited number of data sets and to add further data sets and requested presentations as they will become available. A loose-leave format of the handbook will ease the update of the handbook.

The first edition of the handbook is envisaged to be issued in 1986.

8. Customer Services

The number of requests received depends strongly on the amount of advertisement made.

The distribution of the "IAEA Nuclear Data Newsletter" is now over 3000, most of them to area 3, 300 to areas 1, 2, 4 upon individual requests.

Data retrievals sent out to customers are accompanied by "IAEA-NDS-documents" summarizing contents and/or format of the data files.

Various format conversions ("standard", "edited", "RECENT-output", graphical plotting) are provided upon request.

9. Data Request and Dissemination Statistics

The tables below show the request statistics by year and by country.

The statistics by year indicate

- that we have reached a fairly constant level of 700 requests per year, and
- that the number of countries in area 3, that requested nuclear data information, increased to 45.

There is a noticeable decrease of the demand for experimental data, but a significant increase in the number of requests for evaluated data. This is a logical consequence of the fact that more evaluated data became available (in particular ENDL-84, JENDL-2, and some others).

It should be realized that the data request statistics do not reflect correctly the actual usage of data. Several countries have national data centers from where data files are copied and distributed. Consequently, when there were previously 3 requests from one country for a given ENDF/B file, there is probably only a single request now.

Number of requests, requesting:	1983	1984	1985/1-8	(1985) (extrapol.)
evaluated data	115	113	133	(200)
experimental data	52	53	13	(20)
biblio. info.	11	18	6	(10)
codes	45	38	12	(18)
total involving computer operations	223	222	164	(248)
requests for documents	490	444	301	(450)
total	713	666	465	(700)

Note: A request corresponds to an incoming letter, irrespective of the amount of data/documents requested. However, an incoming letter requesting evaluated data, experimental data, and documents, is logged as 3 requests.

Number of requests
received in 1984 - 8/1985
from

areas 1,2,4

Canada	10
USA	40
Austria	21
Belgium	12
Denmark	1
Ireland	1
France	28
F.R. Germany	34
Italy	8
Japan	12
Luxembourg	1
Netherlands	7
Portugal	3
Finland	1
Spain	8
Sweden	4
Switzerland	2
Turkey	1
Britain	45
OECD/CEC	20
USSR	47
Dubna	6

Note: The requests from areas 1,2,4 include primarily documents and data requests from the data centers NNDC, DB, CJD, plus individual requests for INDC documents.

area 3

Algeria	3
Argentina	12
Australia	16
Bangladesh	5
Bolivia	1
Bulgaria	15
Brazil	54
Taiwan	3
Chile	5
P.R. China	43
Colombia	1
CSSR	55
Cuba	3
GDR	40
Egypt	23
Ghana	2
Hongkong	3
Hungary	41
India	143
Indonesia	16
Iran	16
Ivory Coast	3
Rep. Korea	7
Libya	9
Mali	7
Mexico	9
Morocco	10
Nigeria	8
New Zealand	3
Pakistan	19
Peru	9
Philippines	4
Poland	53
Romania	38
South Africa	10
Saudi Arabia	9
Sierra Leone	2
Singapore	1
Sudan	1
Thailand	11
Vietnam	4
Yugoslavia	23
Zambia	5
IAEA	26

10. Programming and System Development (MS)

10.1 General

This period has been a time of consolidation and improvement under the present Agency policy of "zero growth" budget, coupled with the ever increasing size of the nuclear data libraries and number of requests from users of nuclear data. The only way in which it will be possible to maintain the quality of the data libraries and promptly respond to data requests will be by increased efficiency in the utilization of computer equipment.

In line with the above remarks, in an attempt to minimize the amount of manual data checking by NDS physicists, the data checking programs for evaluated data (in the ENDF/B format), EXFOR, CINDA and WRENDA have been significantly updated to improve automatic error detection. In addition, graphic output has been extensively used to detect errors in evaluated data. Work on the computation format for experimental data has continued and graphic data is available for experimental data. Also available is a program to interactively plot evaluated cross sections from the ENDF/B format and to optionally allow the evaluated data to be compared to experimentally measured cross sections.

10.2 EXFOR Programming

The current EXFOR file maintenance programs, used to update the library and retrieve data from the library, maybe considered up-to-date and require only a minimum of maintenance. The EXFOR checking program has been significantly improved to automate error detection. Work on the computation format has continued with the aim of developing a program support package to allow tabular and graphical presentation of a variety of experimental data, all in a common, comparable set of units.

10.3 Request and Dissemination Log System

The Request Log is designed to monitor the arrival of requests at NDS and the processing of requests through NDS, in order to insure that each request is answered promptly. The Dissemination Log is designed to monitor the flow of information out of NDS. Together, the request and dissemination logs allow us to determine what types of information are required by our users, and to quantify the output from our centre.

10.4 WRENDA

The WRENDA program system is essentially complete.

10.5 The Data Index System

Instead of searching the large numerical data files maintained by NDS, many requests can be more economically satisfied by searching a

relatively small online data index file in order to determine which data satisfy a given request. At present entries into the Data Index System are performed automatically for all EXFOR data when a TRANS tape is merged into our EXFOR master file. Considerable work has been done to automatically create data index entries for all of NDS's (non-EXFOR) data files. Currently programs to produce index listings of 46 data files have been completed.

For EXFOR data it is possible to retrieve data by reaction, author, institute, energy range, etc. In the case of evaluated data, retrievals are currently performed in two steps: retrieval of whole evaluations using the Data Index System, and selective retrieval by reaction using specially designed retrieval programmes. The index system is currently being extended to automate the handling of evaluated data, particularly those evaluations in the ENDF/B format.

10.6 Profile System

NDS maintains a PROFILE system, consisting of a computerized file of the names, addresses and the areas of interest for each of the centre's correspondents. Areas of interest are described by the use of one or more distribution/interest codes. this file is used routinely to produce reports, to selectively retrieve address lists, or print address labels for the mailing of publications and correspondence. The programming effort for the PROFILE System can be considered complete.

There are currently 6230 names and addresses stored in the PROFILE system master file; (area 1 = 1,258; area 2 = 2,028; area 3 = 2,671; area 4 = 273). Since October 1983, 6,679 individual updates to the data base have been performed.

10.7 CINDA Programming

During this period, the CINDA System has been completely rewritten. Currently the new System is in the final test stages. The purpose of the new system is twofold. First, it is designed to allow NDS to assume full responsibility for maintaining area 3+4 entries and an own copy of the CINDA Master file. Previously NDS sent input records to NNDC + NEA/DB where they were loaded into the CINDA Master file. NDS then periodically received a tape from NEA/DB containing the complete updated CINDA master file. This will no longer be necessary. A trilateral CINDA Exchange System has been defined where only update records to the CINDA Master file will be exchanged between the centres: NDS, NNDC + NEA/DB. The second purpose of the new NDS CINDA System is to allow NDS to assume full responsibility of the CINDA Book production. Previously, NDS received a "Book Tape" from NEA/DB containing all CINDA entries for the book to be published. Now NDS creates the "Book Tape" from the NDS CINDA Master file. The programs and phototypesetting procedures for the remaining book production have remained the same as in the past.

10.8 Evaluated Data Processing

The growing number of evaluated data libraries (e.g. UKNDL, KEDAK,

ENDF/B etc.) requires that a growing number of programs be maintained and operated at NDS in order to allow for file maintenance, retrieval, checking, and correction of evaluated data. In addition, in order to allow the evaluated data to be used by our customers, the data handling programs are distributed with the data.

In order to avoid duplication of effort, programs developed at other data centres are adopted for use at NDS whenever possible. At present NDS maintains and distributes to customers only elementary file handling programs. All requests for more complex programs, such as multigroup processors, are referred to the IAEA Liaison Officer at the NEA Data Bank.

During this period additional computer programs were implemented at NDS in order to allow the introduction of procedures to improve the reliability of the evaluated data which are disseminated by NDS. In particular, format and physics checking codes in conjuction with graphic output have been used to significantly improve the evaluated data files. When minor problems are encountered, the format or data can be corrected on line. When major problems are encountered, they are reported to the originating evaluator or data center.

A major effort to convert ENDF/B pre-processing codes to run on an IBM PC (PC=Personal Computer) is underway. The main purpose of installing this code, as well as other nuclear data processing codes, on a PC is to give Member States the capabilities to perform these calculations themselves. Due to the ever decreasing cost and increasing capabilities of personal computers, this is a very cost effective approach to provide local calculational capabilities within even small Member States. The codes are converted and tested at NDS and then made available to Member States.

CJD activities in 1983-1985

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S.A.Kaev, G.I.Timukhin

This report gives a brief review of CJD activities from August 1983 to August 1985.

EXFOR and CINDA.

1. During the period after the 7 th Meeting of NRDC the CJD transmetted into other centres the magnetic tapes with TRANS 4049-4059, which contain 259 new works, 149 works converted from 30000 series and 80 corrected works.

2. In CJD the work on creation of computer index of the EXFOR library has been completed. The index consist of two data sets. The first set consist of the records of varying length, which contain bibliografic information and characteristics of data table from relevant EXFOR Subentry. The second set is formed on the base of the first one and contains the records of fixed length, every of which describes one reaction. These data sets logically form two levels of the index.

The search programs can test any subfield of the REACTION field, institute, name of the first author, energy range, year of experiment etc in the second level index. The result of search can be narrowed, when required, using the first level index, where any bibliografic data can be tested without limitation. The programs give accesion number, subaccession number and pointer.

3. The work on linking CINDA-entries with EXFOR subentries has been made for TRANS 4050-4054. In process of this work the errors were corrected and differencies in referencies for CINDA and EXFOR were eliminated.

In the nearest future the CJD's attention will be directed to technology of formation of the exchange tapes for CINDA. This allows during more short time to correct 4 area CINDA errors (more often in authors name) and replace considerable part of CCP - codes by relevant LAB - codes.

4. We looked through all the preprints of 10 Institutes, published since 1980 and all the gaps were eliminated.

5. For TRANS 4056 - 4059 the CINDA - entries has been made simulteneously with preparation of these TRANS's and the differencies in referencies were eliminated at once.

6. Preliminary work was conducted for changing CINDA - entries on magnetic tape. In this connection the existing CINDA - formats were studied and several programs has been written, which allow to retrieve information from any CINDA - field and transmit information from Transmission Format into Edited Format and from Edited Format into Exchange Format.

Nuclear Data Evaluation and the Work with Evaluated Data.

1. The recent version of ENDF/B service programs has been adapted in CJD. The program is written which allow to retrieve and transform data from KEDAK library.

2. The reevaluation of the files for structural materials chromium, iron and nickel has been done in CJD. The discrepancies of different evaluations and experimental data have been analysed. Besides the file for natural elements the files for separate isotopes has been formed also.

Considerable attention in new evaluations has been paid to cross section resonance structure. To take into account this structure in the neutron energy range from thermal to $\sim$ 1 MeV together with single resonance parameters for the resolved s - resonancies the repre - sentation of isolated unresolved p, d - resonancies has been used in the files. In this case the averaged parameters has been determined from statistical analysis of neutron capture cross sections.

In the new version the evaluation of inelastic scattering cross sections on low levels was essentially made more precise. For this purpose the oplical-statistical description was used, parameters for which has been determined from consistent analysis of neutron total, elastic cross sections and excitation cross sections for low collective levels of even-even nuclei. Such approach gave possibility to take into account the contribution of direct processes to neutron scattering in the whole energy range and besides to evaluate correctly the excitation functions for the low levels of odd isotopes for which the experimental data are absent. Taking into account direct transitions is also important in principle for the consistent description of the neutron spectra and excitation functions for threshold reaction (n,2n), (n,p), (n,α).

The analysis was also made of the neutron capture and inelastic scattering cross sections for isotopes of Zr, Nb and Mo. The results of a such analysis are of interest for systematics of generalized optical model parameters and for consistent describtion of all the neutron cross sections.

3. CJD and TU Dresden have been carried out the joint reevaluation of the total and capture cross sections in the resolved energy region for natural silicon and lead which were evaluated in TU some time ago. Taking into account the reevaluation mentioned and the evaluation of (n,p) - reaction cross section by Marcinkovskij et al. the new version of full file for silicon have been formed. The file for lead is in processing of forming and testing.

4. Recent years in FEI the analysis of the neutron radiative capture cross section for important fission products have been carried out (Belanova et al., Atomnaja Energija, v. 57, (4), p.243,1984). This analysis showed that there is no necessity in new evaluations for the isotopes ^{95,97,98}Mo, ^{104}Ru, ^{133}Cs, ^{139}La and ^{141}Pr because the recommendations of JENDL-1 or ENDF/B-V are optimal for these isotopes. For the isotopes ^{99}Te, ^{101,102}Ru, ^{103}Rh, ^{105}Pd, ^{109}Ag, ^{143,145}Nd, ^{147,149}Sm, ^{151,153}Eu the new evaluations have been made of the average capture cross sections in the neutron energy range above 1 keV. On the base of statistical description of capture cross section and analysis average resonance parameters the neutron and radiative strength function have been determined which were used for parametrization of cross sections in the resolved resonance region. These data have been added with resonance parametrization of cross section for resolved resonances. The evaluations of fission products radiative capture cross sections are based on empirical systematics of radiative strength functions for the isotopes, for which there are no experimental data on fast neutron capture cross section and there is only information on averaged resonance parameters, and for the isotopes, for which there is no information on cross sections and resonance parameters.

In CJD on the base of the evaluations mentioned the files for important fission products are formed and put on magnetic tapes in ENDF format.

5. At the present time CJD writes on magnetic tape in ENDF format the full files for Lithium-6 and Lithium-7, evaluation of which is made in FEI (Bondarenko I.N., Petrov E.E., VANT, series Yadernye Konstanty, issue 3(57), 1984).

6. Specialists from CJD and Kon'shins laboratory (Minsk) have been carried out together considerable volume of work on proving and correction of the files for Plutonium isotopes evaluated in Minsk.

7. CJD took part together with a number of other institutes in the analysis threshold reaction cross sections, which are of interest for reactor dosimetry.

8. Some physicists from CJD took an active part in the prepa - ration of the Handbook "Radiative capture of neutrons", which editi- on will be in the nearest future.

86-10147
Translated from Russian

THE WORK OF CAJaD (USSR STATE COMMITTEE ON ATOMIC ENERGY) ON DATA PREPARATION FOR NUCLEAR REACTIONS INDUCED BY CHARGED PARTICLES

F.E. Chukreev

Since the last conference in Obninsk, our Centre has been particularly concerned with three areas of data compilation:

1. Data on the formation of radioactive nuclides required by medicine and for research into vital processes;
2. Thermonuclear reactions;
3. Evaluated data on neutron yield in (α, n) reactions.

During this period we prepared three magnetic tapes of compilations for the system used by the Centres.

I definitely want to mention the part played by the IAEA Nuclear Data Section in preparing the list of priorities to be observed when compiling data on nuclear reactions induced by charged particles. This list, based on the opinions of specialists in the field, was drawn up to regulate the selection of publications to be recorded in the EXFOR system.

I must also thank the Nuclear Data Section for its help in verifying data in publications by foreign scientists.

However, as we have already noted in the relevant memorandum, in the work done on data collection there is still a problem of unnecessary duplication. In order, therefore, to resolve this situation, we must make one of the Centres, our own for example, responsible for receiving compilation plans.

In our opinion, the jointly-established "Generalized EXFOR" system already contains much information of practical value on nuclear reactions

induced by charged particles. I suggest that a useful purpose would be served by publishing thematic data selections, for example, on the production of medical isotopes. Such a publication, appearing, let us say, in the "Physics Data" series, and prepared under the auspices of the Nuclear Data Section, would undoubtedly be of use to scientists from many participating States.

In the future we intend to go on with the compilation of data not only from Soviet publications, but also on the basis of results obtained by foreign scientists. Using data already collected, we intend to prepare evaluated data for the cross-sections of a number of particle beam monitor-reactions.

In the course of our conferences it is customary to mention the number of requests for data received. In this regard, I can say that while the number of requests for data on reactions induced by charged particles remains more or less steady (approximately 70 per year), the volume of data involved in each individual request is continually on the increase.

C D F E PHOTONUCLEAR DATA PROCESSING

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Within the framework of the activity of the Centre for Photonuclear Experiments Data, Institute of Nuclear Physics, Moscow State University, the following has been done in the mid-1983 to mid-1985 year period:

1. The CDFE regular exchange magnetic tape (M 004) is prepared and handed over to the IAEA. The tape includes the soviet experimental EXFOR-format data on the photo- and electrofission of atomic nuclei (46 entries, 439 subentries, 10102 data points, 16402 records).

2. The annual CDFE Information bulletins No.6 "Photonuclear Data - 1982" and No.7 "Photonuclear Data - 1983" are published and sent to the users. The Information bulletin No.8 "Photonuclear Data - 1984" is made ready for publication. The bulletins contain the systematical experimental photonuclear data from the soviet and foreign scientific periodicals published during the corresponding years.

3. The CDFE thematic reviews "Fission of Heavy Nuclei" and "Photodisintegration of Lithium. Atlas of Cross Sections" are published and sent to the physicists concerned.

The "Fission of Heavy Nuclei" review makes a reader acquainted with the present-day researches of the nuclear photo- and electrofission yields and cross sections, the angular, energy, mass and charge distributions of fission fragments, the fission neutron characteristics, the properties of spontaneously fissioning isomers. The review contains digital data from 165 papers published during the 1952-1982 year period.

"Photodisintegration of Lithium. Atlas of Cross Sections" contains the chart and graphical digital data on the cross sections of various photonuclear reactions on lithium isotopes from 57 papers published in 1955-1983 years.

The EXFOR-format digital data from the two reviews were partially loaded on the CDFE M004 exchange magnetic tape and will in part be put on the next exchange tapes.

4. The CDFE digital data arrays are used to evaluate photonuclear data. The data evaluation algorithms and special software are developed. Preliminary evaluation of the photoneutron cross sections for lithium isotopes is made.

5. With the aid of the verification procedure of the EXFOR, NSR and BIB (CDFE inner format) nuclear-physics data array, the automatized scientific nuclear-data system is created which satisfies the requirements of the maximum completness of storage, the complete description of individual publication, the high-recording density in the system, the convenient, reliable and simple information retrieval from storage. The system is based on the principles of united data from different files. The most complete records of the system contain a detailed bibliography of the paper (including the codes of references from all formats used), a brief, yet, detailed digital data on the experimental conditions, the digital data on the experimental physical characteristics of the reactions, the authors' abstract or the CDFE summary of the published paper. The system permits the data output in a brief (cataloque) or detailed from with the chart and/or graphical digital data.

6. The special software to process the ENSDF-format data on the Unified Series computer is developed which is characterized by the maximum completeness of the data extracted from the file, the clear and convenient read-out and the possibility of effective rearrangement of the software complex for an individual request. The software is used for a systematic analysis of the spectroscopic properties of photonuclear reactions final nuclei.

7. In the mid-1983 to mid-1985 year period the CDFE has received and processed nearly 500 requests for bibliographical data and nearly 150 requests for digital data on nuclear reactions and atomic-nucleus structure.

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RIKEN Status Report to the 8th NRDC Meeting

A. Hashizume

Since the last Meeting of the Nuclear Data Centers in October 1983 in Obninsk and Moscow, RIKEN Nuclear Data Group has begun to compile charged particle reaction data concerning radioisotope productions for medical uses. Because this period is the time of foundation and consolidation of our group, the effort was made for two directions, policy and technics.

A nation-wide advisory committee consisted of 4 physicians, 5 physicists and 4 chemists has been organized to keep close relation with other data groups in Japan and with experts in each field. The first meeting was held in February in 1984. The committee meeting is to be held once a year. In the second meeting, some concerns on nuclides other than 1st group (twenty nuclides announced officially) were expressed. And also opinions on the kind of journals to be covered were deliberated.

The RIKEN Nuclear Data Group is consisted of seven members; 2 physicists, 1 physicist(part-time), 2 nuclear chemists(part-time), 1 secretary(part-time) and 1 assistant. Among the above members, 1 physicist and 1 nuclear chemist has been newly joined in our group to make EXFOR files.

Technical Activities

1) Computer: We use the Center Computer (FACOM M380; 32 MB memory) for the compilation of Data in EXFOR format. The simplified block diagram of this system is shown in Fig.1. Recently a new Graphic Display has been installed. This machine will help to edit the cross section data in figures.

2) Data Processing: Curve reading technique for data compilation from the figures in reports has been established using a curve digitizer and a programmable graph generator(Tektronix 4051). A hard copy instrument and a digital plotter are also available as shown in Fig.1. The data can be transmitted to the host computer by which data is treated. Several supporting programmes were made to obtain data in EXFOR format.

By using this system, the amounts of data of total cross sections, differential cross sections, polarizations, and theoretical curves concerning the nuclide production became 1.1 MB.

3) Programmes Related to EXFOR: Some programmes in the EXFOR and Dictionary system which have been kindly offered from the Nuclear Data Section; such as the Check New Entries Run, Generate Dictionary Files Run and Prepare Various kind of Listings Run are now being conveniently utilized in the compilation of new EXFOR entries. Some delay on implantation of programmes is caused because we were not accustomed to PL/I programme and its operation. Second transtape was only treated by Book-Keeping programme and third transtape which was consisted of corrections of 1st and 2nd transfiles was treated by Check New Entry Run programme. By the operations of these programmes, the correction of EXFOR files and editing itself has became much easier and faster.

4) Trans of EXFOR Files: Four transtapes have been transmitted to NDS. The numbers of subentries are 274. The first trans-tape contains the data of excitation functions in the region of about A=130 and the second contains mainly those of about A=11. The latter contains mostly differential cross sections, because in this region we found relatively few total cross section data. As these files contained much errors, we replaced these files by TransR003 file after the operation of the Check Run programm. This caused a delay.

5) Bibliography: The lists of references which concern our subject are being accumulated continuously and checked on the coverage of the existing EXFOR files.

6) Miscellaneous: To get a perspective view of EXFOR files, we have tried to express some of the contents in the form of figures. The abscissa shows the incident energies of charged particles of which data are edited, and ordinate shows the kind of reactions. By these figures, it become clear at a glance what energy regions the experimental data have covered.

For evaluation purpose, programmes treating charged particle reactions would be indispensable. The codes on optical model coupled channel calculations including the fitting to polarization data, on two nucleon transfer reaction analysis and Alice code have been operated at the center computer. About evaluation, we are in preparational stage.

RIKEN COMPUTER CENTER: SYSTEM

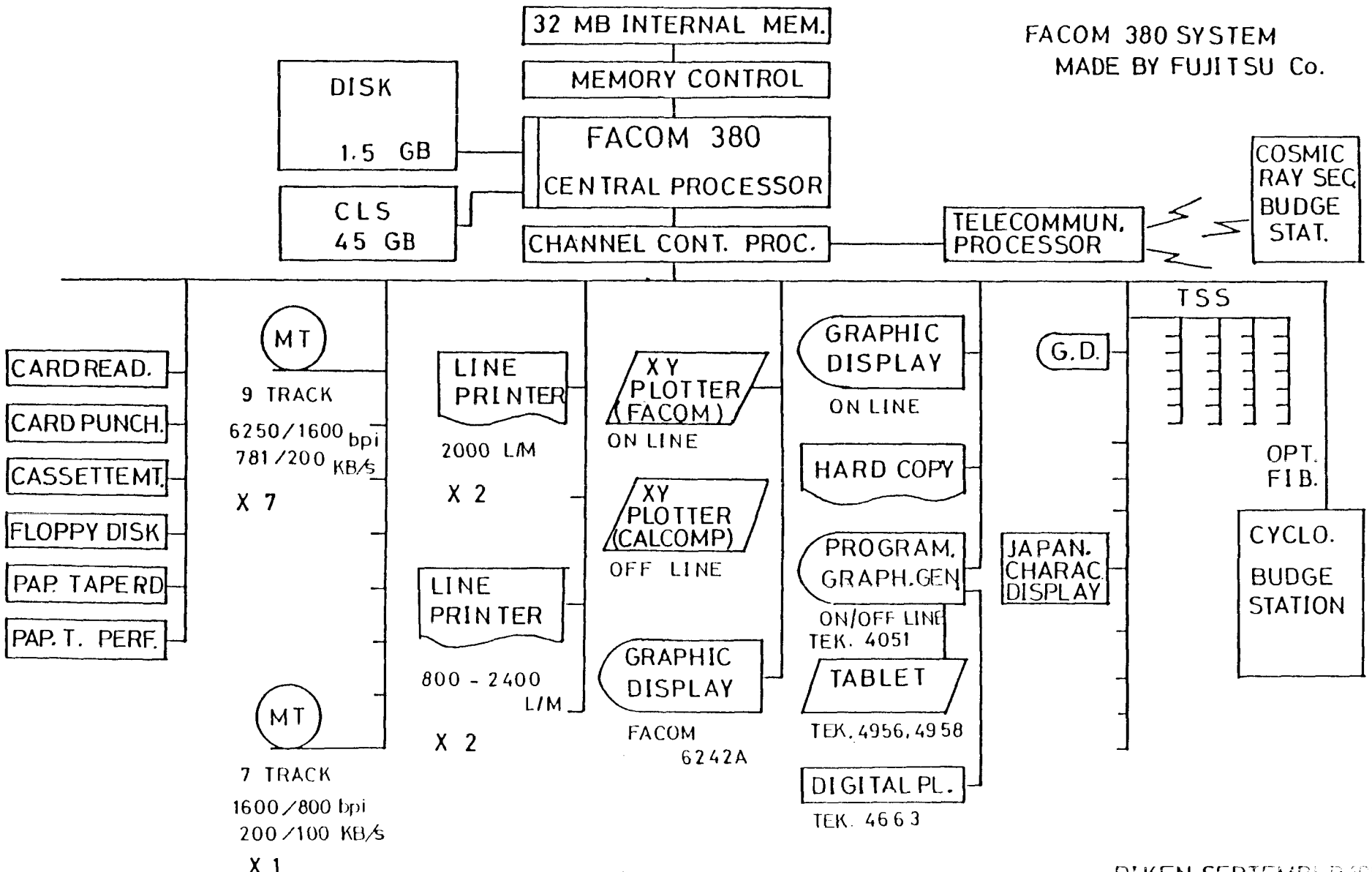

FIG. 1

RIKEN SEPTEMBER 1985

RIKEN

Charged Particle Nuclear Data (CPND) Activities in China

By the end of fifties the measurements of CPND with light particle incident were started in the Institute of Atomic Energy. About ten years later, the studies of nuclear reaction induced by heavy ion have been performed. From 1975 on, the some evaluations of CPND on light and intermediate nuclei have been carried out. Up to now above one hundred measurements and several tens evaluations have been accomplished.

In onr conntry, there are four Institutes and Universities which are engaged in measurement of CPND. They are as follows:

(1) Institute of Atomic Energy, Beijing (IAE).
(2) Institute of Modern Physics, Lanzhou (IMP).
(3) Institute of Nuclear Research, Shanghai (NRS).
(4) Institute of Nuclear Science and Technology, Sichuan University, Chengdu (SIU).

The following accelerators have been used for CPND measurement: Cockcroft-Walton accelerator, Van de Graaff accelerator, Cyclotron, Sector Focused Cyclotron, Heavy Ion Cyclotron.

Some new accelerators will be put into operation: A HI-13 Tandem, which is being installed and adjusted and will be put into operation in 1986; A Large Separated Sector Cyclotron for heavy ion, which will be built in 1987, energy constant K=450; A VDG with terminal voltage 4MV and a 2*6 MV Tandem, which will be set up.

The CPND measured and evaluated in China have been carried out on various research topics, such as:

1. Study of cluster structure of light nuclei using quasi-free scattering, reaction, spectra and angular correlation measurements.
2. Study of intermediate structure using excitation function measurements.
3. Study of pre-equilibrum emission using energy spectra and angnlar distribution measurements.
4. Study of law that cross section vary with energies.
5. Study of transfer reaction with heavy ions.
6. Study of depth inelastic collision.

7. Study of all merging reaction with heavy ions.

In oct. 1984, the first CPND group meeting was taken place in shanghai. The participants were from CNDC, SIU and NRS. According to the suggestion of IAEA/NDS, the working plan for the coming days has been worked out.

We plan to do the following things:

1. To compile all CPND measured in China in EXFOR and transmit them to NDS.
2. To compile all evaluations on CPND finished in China in EXFOR and transmit them to NDS.
3. To do some compilations and evaluations in the CPND of producing neutron on some nuclei, including (α,n) reaction and neutron source research, irrespective of origin of the data.

Of course, this plan has already been confirmed by NDS.

In May 1985, the CPND Group at the Institute of Atomic Energy (IAE-CP) held a working meeting about compilation in EXFOR in Huangshan Mountains. At this meeting we have discussed and checked EXFOR entries S0001-S0015, some of which have been transmited to NDS and the others will be transmited, too.

Sept. 4, 1985

Reported by

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China

EXFOR - STATISTICS

Attached are EXFOR statistics derived from NDS files as of September 1985. They are organised

- by "year of experiment" (i.e. by EXP-YEAR or, if this is not given, by the year of the first reference). Note that this "year of experiment" often undergoes changes: An entry may be compiled from a private communication dated 1983 - then it will show up under this year. When the final publication comes out in 1985, then the same entry will no longer show up under 1983 but under 1985. This "year-uncertainty" is significant for the last 4 years 1981 - 1985.

  by center-identification, in one table for neutron data (1,2,3,4,V) and another table for CPND and PhND.

- by either "subentries" (not counting subentry 001)
  or "index-lines"
  or "number of DATA-records".

  Note that a subentry with 3 reactions under the "Multiple REACTION" formalism will produce 3 Index lines, so that the number of index lines looks more significant than the number of subentrues. However, a subentry with fission-yield data for 50 product nuclei will produce, in the NDS system, 50 index lines, so that this number may be somewhat exaggerated.

Some conclusions derived from these statistics:

Neutron data:

1. The neutron data measurement activities do not go down. For several years it had been reported that in areas 1 and 2 the measurement activities were being reduced. Such statements are not correct. the number of subentries per year has decreased, but the number of data lines produced in areas 1 and 2 in 1984 has not been as high ever since 1978. For the data measurement activities of area 3 we noticed, for the first time, a decrease that seems to exceed significantly the annual fluctuation. For area 4, I would not like to state a trend, because the transmission of newest data continues to be much slower than the data transmission from the other centers.

2. The speed of transmission of newest data still requires improvement. By September 1985 the transmission of data from 1985 appears still too low (even zero in area 4). It is true that journals dated 1985 may become available not earlier than March or April which is a significant source of delay. However it seems that there should be more data compiled and transmitted from private communication prior to publication. Among the few negative comments received about EXFOR, there is primarily the concern that newest data become available with too long delays.

SUBENTRIES BY AREA AND YEAR AFTER 1960

TABLE OF YEAR BY AREA

YEAR	AREA				
FREQ	V	1	2	3	4	TOTAL
61	0	663	289	106	58	1116
62	0	375	236	145	86	842
63	0	560	336	134	165	1195
64	0	381	129	99	161	770
65	0	387	473	119	386	1365
66	0	522	516	230	142	1410
67	0	450	465	221	278	1414
68	0	586	640	309	487	2022
69	0	457	775	205	230	1667
70	0	823	839	313	303	2278
71	0	648	625	101	254	1628
72	18	458	592	248	247	1563
73	0	463	447	140	211	1261
74	1	489	591	153	263	1497
75	44	581	415	190	346	1576
76	17	341	463	189	260	1270
77	43	309	394	265	302	1313
78	346	505	500	198	64	1613
79	8	277	459	216	131	1091
80	91	215	408	195	178	1087
81	39	172	312	150	104	777
82	1	231	352	210	51	845
83	0	148	276	107	118	649
84	15	155	243	59	17	489
85	0	7	18	20	0	45
TOT	623	10203	10793	4322	4842	30783

INDEX LINES BY AREA AND YEAR AFTER 1960

TABLE OF YEAR BY AREA

YEAR	AREA				
FREQ	V	1	2	3	4	TOTAL
61	0	780	319	107	71	1277
62	0	480	280	157	90	1007
63	0	668	415	148	176	1407
64	0	530	140	106	179	955
65	0	434	565	128	432	1559
66	0	659	561	259	154	1633
67	0	530	534	231	291	1586
68	0	700	732	368	547	2347
69	0	594	1174	255	272	2295
70	0	984	903	372	316	2575
71	0	786	692	145	296	1919
72	18	574	776	279	475	2122
73	0	615	505	248	286	1654
74	1	621	907	175	475	2179
75	44	832	770	312	452	2410
76	18	511	1178	424	303	2434
77	253	1054	691	547	1148	3693
78	432	1188	747	319	212	2898
79	8	668	884	298	594	2252
80	154	436	3049	224	280	4143
81	39	1059	1404	178	123	2803
82	1	358	460	293	70	1182
83	0	765	364	176	238	1543
84	28	341	1718	81	30	2198
85	0	16	25	28	0	69
TOT	998	16183	19593	5858	7510	50140

DATA LINES BY AREA AND YEAR AFTER 1960

TABLE OF YEAR BY AREA

YEAR	AREA				
FREQ	V	1	2	3	4	TOTAL
61	0	25424	2206	522	795	28947
62	0	11334	6373	578	1700	19985
63	0	11545	6528	312	1686	20063
64	0	70126	12724	1147	3343	87340
65	0	37166	29673	467	3619	70925
66	0	78327	31808	1029	5032	114196
67	0	21736	11118	2744	2088	37686
68	0	75925	132964	5356	9772	224017
69	0	21525	57070	3480	2554	84629
70	0	68961	114958	2769	6732	193420
71	0	194576	156584	951	4199	356310
72	976	56252	71287	2181	5819	136515
73	0	125718	52162	1730	3348	182958
74	58	111619	39580	2568	6194	160019
75	2802	46130	49318	18426	10316	126992
76	1626	126373	15516	3232	25394	172141
77	1886	27139	72440	3283	13717	118465
78	26812	55221	26535	2297	1722	112587
79	384	39089	9067	1983	17023	67546
80	955	16334	58337	4073	8220	87919
81	229	19712	9540	2602	1318	33401
82	157	35786	11232	2676	1110	50961
83	0	29717	19624	1353	1644	52338
84	205	40842	43988	340	137	85512
85	0	308	273	107	0	688
TOT	36090	1344885	1040897	66206	137482	2625560

neutron data 1961-1985

SUBENTRIES BY AREA AND YEAR UNTIL 1960

TABLE OF YEAR BY AREA

YEAR / FREQUENCY	1	2	3	4	TOTAL
	0	0	0	1	1
35	73	0	0	0	73
36	3	0	0	0	3
37	0	2	0	0	2
38	1	0	0	0	1
39	25	0	0	0	25
40	2	0	0	0	2
41	26	7	0	0	33
42	1	0	0	0	1
44	19	5	0	0	24
45	17	1	0	0	18
46	76	6	0	0	82
47	261	10	0	0	271
48	26	1	0	0	27
49	155	4	0	0	159
50	288	57	0	0	345
51	431	32	0	0	463
52	368	55	0	47	470
53	336	63	0	3	402
54	330	34	0	24	388
55	378	87	15	73	553
56	417	92	0	97	606
57	470	143	2	241	856
58	595	235	3	168	1001
59	471	188	18	31	708
60	579	189	47	60	875
TOTAL	5348	1211	85	745	7389

INDEX LINES BY AREA AND YEAR UNTIL 1960

TABLE OF YEAR BY AREA

YEAR / FREQUENCY	1	2	3	4	TOTAL
	0	0	0	1	1
35	73	0	0	0	73
36	3	0	0	0	3
37	0	2	0	0	2
38	1	0	0	0	1
39	26	0	0	0	26
40	2	0	0	0	2
41	26	7	0	0	33
42	1	0	0	0	1
44	20	6	0	0	26
45	20	1	0	0	21
46	88	7	0	0	95
47	292	10	0	0	302
48	28	1	0	0	29
49	163	4	0	0	167
50	300	57	0	0	357
51	474	37	0	0	511
52	378	67	0	47	492
53	375	63	0	7	445
54	385	40	0	24	449
55	505	112	15	77	709
56	574	100	0	100	774
57	570	174	2	255	1001
58	719	294	4	181	1198
59	661	230	20	31	942
60	689	198	47	64	998
TOTAL	6373	1410	88	787	8658

DATA LINES BY AREA AND YEAR UNTIL 1960

TABLE OF YEAR BY AREA

YEAR / FREQUENCY	1	2	3	4	TOTAL
	0	0	0	1722	1722
35	90	0	0	0	90
36	3	0	0	0	3
37	0	2	0	0	2
38	1	0	0	0	1
39	41	0	0	0	41
40	2	0	0	0	2
41	29	49	0	0	78
42	1	0	0	0	1
44	166	23	0	0	189
45	55	5	0	0	60
46	326	18	0	0	344
47	1336	21	0	0	1357
48	344	1	0	0	345
49	1244	4	0	0	1248
50	2645	259	0	0	2904
51	3349	439	0	0	3788
52	3348	565	0	47	3960
53	5783	728	0	227	6738
54	5632	600	0	60	6292
55	11339	2161	87	3358	16945
56	9183	1777	0	308	11268
57	14780	1409	2	562	16753
58	16200	2883	8	359	19450
59	14023	1482	40	321	15886
60	11712	1531	134	573	13950
TOTAL	101632	13957	271	7537	123397

neutron data pre 1960

CPND 1961 - 1984

INDEX LINES BY AREA AND YEAR AFTER 1960 17:54 FRIDAY, SEPTEMBER 27, 1985

TABLE OF YEAR BY AREA

YEAR FREQUENCY	AREA A	B	C	D	G	L	M	P	R	S	TOTAL
61	0	36	5	0	0	0	0	42	0	0	83
62	1	43	15	3	0	15	0	61	0	0	138
63	0	35	38	0	0	6	0	65	0	0	144
64	0	0	44	3	0	41	0	97	0	0	185
65	0	5	22	0	0	5	0	51	0	0	83
66	0	19	21	0	0	19	0	66	0	0	125
67	0	40	27	1	0	26	0	56	0	5	155
68	0	25	31	2	0	20	0	47	0	0	125
69	37	58	104	3	0	101	0	1	0	0	304
70	0	85	30	6	0	20	0	0	0	0	141
71	8	234	61	1	0	61	0	0	0	0	365
72	12	95	21	48	0	0	0	0	0	34	210
73	47	187	38	2	0	29	0	0	12	0	315
74	39	120	82	5	0	82	0	0	14	3	345
75	37	0	6	6	0	0	0	0	0	1	50
76	161	264	30	17	0	0	0	0	12	0	484
77	284	349	32	8	0	0	10	0	20	0	703
78	273	459	0	39	0	0	93	0	56	0	920
79	270	134	4	16	2	0	83	0	51	5	565
80	346	24	0	22	0	0	149	0	58	0	599
81	105	0	0	23	5	0	44	0	1	0	178
82	306	0	0	232	4	0	0	0	4	0	546
83	0	0	0	55	3	0	0	0	0	0	58
84	14	0	0	16	0	0	0	0	0	0	30
TOTAL	1940	2212	611	508	14	425	379	486	228	48	6851

CPND 1961-1984

SUBENTRIES BY AREA AND YEAR AFTER 1960 17:54 FRIDAY, SEPTEMBER 27, 1985

TABLE OF YEAR BY AREA

YEAR FREQUENCY	A	B	C	D	G	L	M	P	R	S	TOTAL
61	0	18	5	0	0	0	0	38	0	0	61
62	1	35	9	3	0	9	0	61	0	0	118
63	0	34	35	0	0	4	0	65	0	0	138
64	0	0	28	3	0	25	0	97	0	0	153
65	0	5	20	0	0	3	0	51	0	0	79
66	0	10	14	0	0	12	0	66	0	0	102
67	0	28	17	1	0	16	0	56	0	5	123
68	0	13	28	2	0	18	0	47	0	0	108
69	5	50	76	3	0	73	0	1	0	0	208
70	0	80	23	6	0	16	0	0	0	0	125
71	7	140	55	1	0	55	0	0	0	0	258
72	11	87	19	44	0	0	0	0	0	34	195
73	34	151	32	2	0	23	0	0	4	0	246
74	9	112	78	5	0	78	0	0	14	3	299
75	35	0	6	3	0	0	0	0	0	1	45
76	52	106	2	15	0	0	0	0	5	0	180
77	83	164	29	5	0	0	7	0	20	0	308
78	60	190	0	35	0	0	81	0	56	0	422
79	120	65	4	9	2	0	80	0	15	5	300
80	269	18	0	12	0	0	149	0	50	0	498
81	40	0	0	9	5	0	44	0	1	0	99
82	242	0	0	207	4	0	0	0	4	0	457
83	0	0	0	46	3	0	0	0	0	0	49
84	10	0	0	11	0	0	0	0	0	0	21
TOTAL	978	1306	480	422	14	332	361	482	169	48	4592

CPND 1961-A84

DATA LINES BY AREA AND YEAR AFTER 1960 17:54 FRIDAY, SEPTEMBER 27, 1985

TABLE OF YEAR BY AREA

YEAR / AREA FREQUENCY	A	B	C	D	G	L	M	P	R	S	TOTAL
61	0	43	174	0	0	0	0	461	0	0	678
62	31	397	392	190	0	392	0	826	0	0	2228
63	0	319	260	0	0	225	0	973	0	0	1777
64	0	0	1910	8	0	1877	0	1347	0	0	5142
65	0	32	254	0	0	231	0	1457	0	0	1974
66	0	132	1205	0	0	1110	0	821	0	0	3268
67	0	371	1262	133	0	1202	0	873	0	51	3892
68	0	23	1021	13	0	911	0	907	0	0	2875
69	5	806	4576	59	0	4557	0	401	0	0	10404
70	0	1869	882	180	0	860	0	0	0	0	3791
71	31	374	3555	39	0	3555	0	0	0	0	7554
72	43	539	1273	2626	0	0	0	0	0	503	4984
73	163	522	1650	17	0	1331	0	0	98	0	3781
74	317	1076	4751	962	0	4751	0	0	151	6	12014
75	927	0	218	52	0	0	0	0	0	32	1229
76	1014	1188	30	1708	0	0	0	0	34	0	3974
77	1753	2458	1294	69	0	0	447	0	252	0	6273
78	1169	2654	0	737	0	0	5589	0	915	0	11064
79	2538	695	161	262	9	0	6010	0	55	96	9826
80	8645	250	0	153	0	0	4204	0	1016	0	14268
81	383	0	0	160	18	0	4068	0	12	0	4641
82	2310	0	0	1102	4	0	0	0	137	0	3553
83	0	0	0	35819	34	0	0	0	0	0	35853
84	108	0	0	125	0	0	0	0	0	0	233
TOTAL	19437	13748	24868	44414	65	21002	20318	8066	2670	688	155276

SUBENTRIES BY AREA AND YEAR UNTIL 1960

TABLE OF YEAR BY AREA

YEAR / AREA	A	B	C	D	P	TOTAL
49	0	0	3	0	0	3
50	0	6	0	0	14	20
51	1	14	10	0	20	45
52	0	8	13	0	0	21
53	0	9	0	0	9	18
54	0	6	9	0	32	47
55	2	54	7	0	2	65
56	0	12	12	0	42	66
57	2	0	12	0	6	20
58	0	17	5	2	6	30
59	0	37	1	0	42	80
60	2	78	8	0	53	141
TOTAL	7	241	80	2	226	556

INDEX LINES BY AREA AND YEAR UNTIL 1960

TABLE OF YEAR BY AREA

YEAR / AREA	A	B	C	D	P	TOTAL
49	0	0	3	0	0	3
50	0	6	0	0	14	20
51	1	14	15	0	20	50
52	0	8	13	0	0	21
53	0	9	0	0	9	18
54	0	6	14	0	32	52
55	2	61	7	0	2	72
56	0	15	15	0	42	72
57	3	0	12	0	6	21
58	0	17	5	2	6	30
59	0	38	2	0	42	82
60	2	88	8	0	53	151
TOTAL	8	262	94	2	226	592

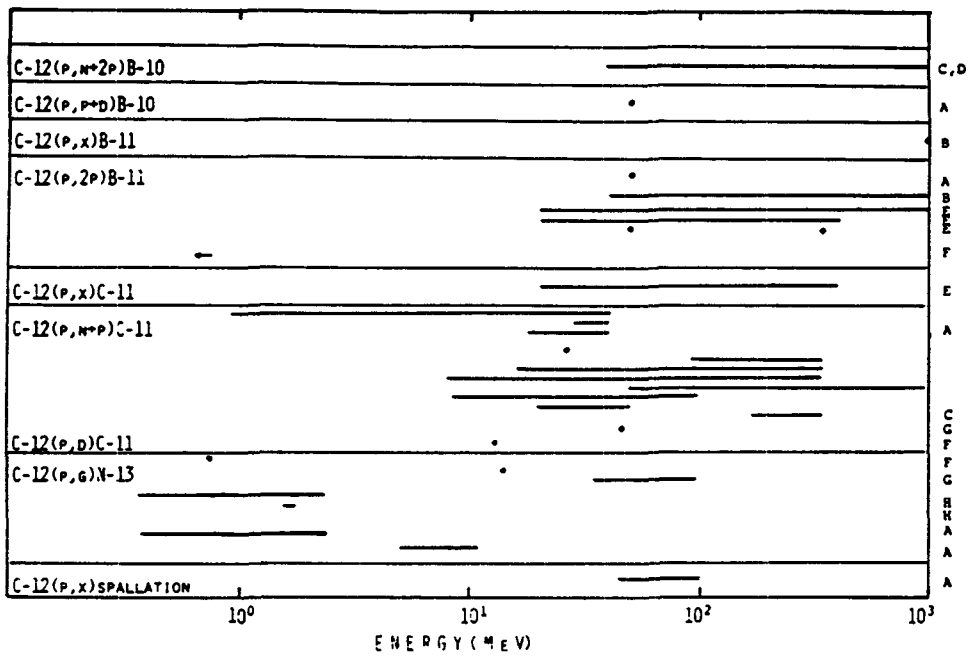
DATA LINES BY AREA AND YEAR UNTIL 1960

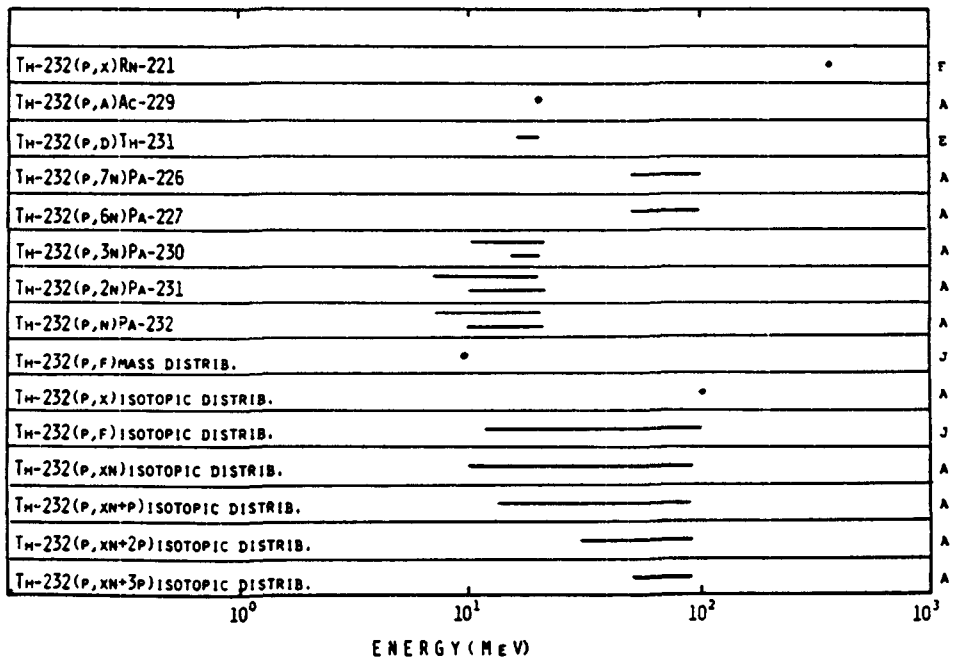
TABLE OF YEAR BY AREA

YEAR / AREA	A	B	C	D	P	TOTAL
49	0	0	62	0	0	62
50	0	65	0	0	155	220
51	31	191	166	0	272	660
52	0	243	331	0	0	574
53	0	139	0	0	129	268
54	0	79	199	0	229	507
55	91	59	69	0	57	276
56	0	54	163	0	831	1048
57	13	0	570	0	136	719
58	0	558	16	14	166	754
59	0	320	2	0	932	1254
60	92	1400	360	0	646	2498
TOTAL	227	3108	1938	14	3553	8840

CPND
pre 1960

RIKEN: Graphical display of CPND reactions and energy-ranges available in EXFOR





Disturbing mistakes in TRANS tapes found by NDS (OS)

All relevant mistakes found at NDS were communicated to the other centres by memos or sometimes by letter. The followng is a summary of "typical" errors which occurred several times. Singular errors, even serious ones, are not repeated here.

Area 1

No typical errors

Area 2

- Error headings given under ERR-ANALYS sometimes do not correspond to the headings in the data section, or are given in subentry 1 but are not used in all subentries
- SF4 of REACTION or MONITOR: sometimes missing, sometimes given when it should not (resonance parameters)
- Use of sum of metastable states when total reaction is given
- Missing parentheses in the issue-number subfield under REFERENCES
- In private communications and theses there should be the author's name without initials under REFERENCE

Area 4

- REACTION SF4 not blank for resonance parameters
- EN missing for whole entries or subentries
- use of illegal characters
- illegal use of multiple reactions (e.g. combining resonance parameters with cross sections or Legendre coefficients in same subentry)
- Mistakes with pointers
- Under PAR the levels should be specified by an energy (and not by spin and parity which are reserved for resonance-parameters)
- max. and min. DATA values should not be marked by flags but given under DATA-MAX or DATA-MIN

General:

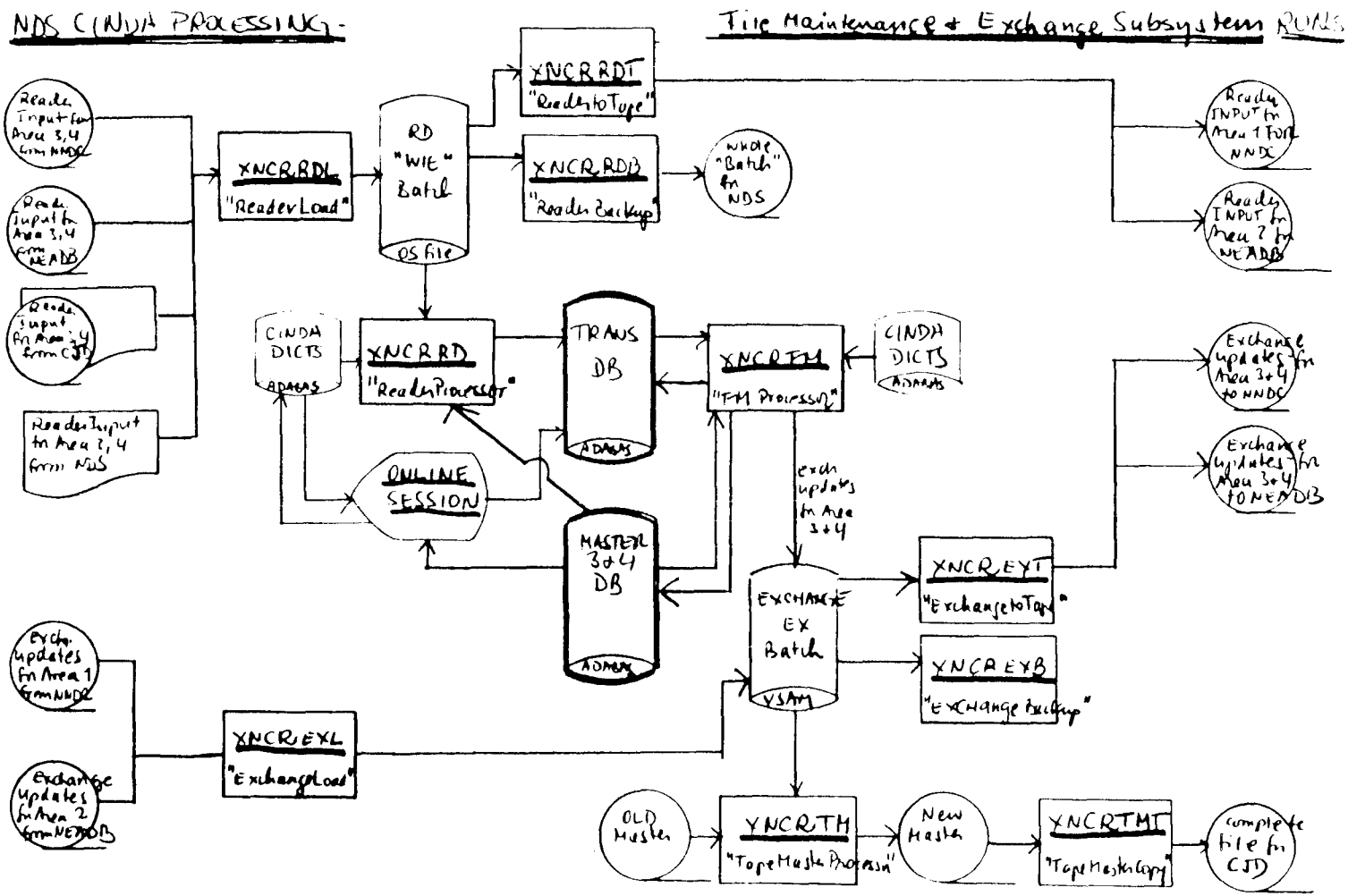
- Only particles detected from the REACTION to be determined should be coded under PART-DET; not particles from the source reaction
- reminder: additions of new quantity-codes to Dictionary 36 should be communicated at latest at the date when the TRANS tape is sent out. Most often it also requires a LEXFOR entry so that all centres make uniform use of the quantity-codes.
- reminder: a BIB keyword must not occur twice in the same subentry (processing at NNDC will be disturbed)

Conclusions: Centres are asked to amend their EXFOR checking codes accordingly.

NDS CINDA System

Summary of Subsystems, Runs, Programs, Options

IAEA, NDS
86-01-15
M.M.Seits


NDS CINDA PROCESSING -
File Maintenance & Exchange Subsystem RUNS
Reader Input for Area 3,4 from NNDC
Reader Input fm Area 3,4 from NEADB
Reader Input fm Area 3,4 from CJD
Reader Input fm Area 2,4 from NDS
XNCRRDL "ReaderLoad"
RD "WIE" Batch
OS file
XNCRRDT "ReaderToTape"
XNCRRDB "Reader BackUp"
NNDC "Batch" fm NDS
Reader INPUT fm Area 1 for NNDC
Reader INPUT fm Area 2 fm NEADB
CINDA DICTS
ADAMS
XNCRRD "ReaderProcessor"
TRANS DB
ADAMS
XNCRTFM "FM Processor"
CINDA DICTS
ADAMS
Exchange updates fm Area 3+4 to NNDC
Exchange updates fm Area 3+4 to NEADB
ONLINE SESSION
exch updates fm Area 3+4
MASTER 3+4 DB
ADAMS
EXCHANGE EX Batch
VSAM
XNCREXT "ExchangeToTape"
XNCREXB "Exchange BackUp"
Exch updates fm Area 1 from NNDC
Exchange Updates fm Area 2 from NEADB
XNCREXL "ExchangLoad"
OLD Master
XNCRTH "TapeMaster Process"
New Master
XNCRTMT "TapeMasterCopy"
complete file fm CJD

CINDA - File Maintenance Subsystem

Data Base (Area 3 and 4) Maintenance

XNCRRD - "Reader Input Processor"
OPTIONS: CHECK mode, LOAD mode
STEPS: 1. XNCNDFM: get dictionaries for tables
2. XNCGENT: get batch from LIBRARIAN
3. XNCSRD: perform checks and load into DB

XNCRFM - "File Maintenance Processor"
OPTIONS: CHECK mode, UPDATE mode, UPDATE/RERUN mode
STEPS: 1. XNCNDFM: get dictionaries for tables
2. XNCSFM: perform checks, update MASTER DB
3. XNCSEXS: list exchange file statistics

Tape Master (Areas 1-4) Maintenance

XNCRTM - "Tape Master Processor"
OPTIONS: CHECK mode, UPDATE mode
STEPS: 1. XNCSTM: Update tape master from Exchange file input
2. XNCSEXS: list exchange file statistics

XNCRTMB - "Tape Master Backup"
OPTIONS: none
STEPS: 1. IEBGENER: Copy current CINDA master to XNCM.CINDA.ALAB (= working copy)

CINDA - Exchange Subsystem

Incoming

XNCRRDL - "Reader Input Loader"
OPTIONS: new batch, add to batch; from tape, from disk
STEPS: 1. LIBRARIAN: load incoming data
Input Data from: tapes from areas 1, 2, 4;
sheets from areas 3, 4 (put on disk)

XNCREXL - "Load Exchange File"
OPTIONS: none
STEPS: 1. XNCSDEX: get dictionaries for tables
2. XNCSEXL: edit, load incoming exchange data
3. XNCSEXS: list exchange file statistics
Input Data from: tapes from areas 1, 2;
from NDS FM run for areas 3, 4

Outgoing

XNCROT - "Create Tapes for NNDC and NEA-DB"
OPTIONS: dummy run (listings only); create tapes
STEPS: 1. XNCNDRDT: read dictionaries, create
2. XNCGENT: get batch from LIBRARIAN
3. XNCXCKLK: create READER records files
4. XNCSEXT: create EXCHANGE records files
5.-10. XNCSLTP: reread files and list
11. XNCSEXS: exchange file statistics

XNCRTM4 - "Create tapes for CJD and CAJAD"
OPTIONS: none
STEPS: 1. XNCSTM4: copy area 1 for CJD
2. XNCSTM4: copy area 2 for CJD
3. XNCSTM4: copy area 3 for CJD
4. XNCSTM4: copy area 4 for CJD
5. IEBGENER: copy whole file for CAJAD

Data Maintenance

XNCRRDB - "Reader Input Backup"
OPTIONS: none
STEPS: none, automatically backed up by system

XNCREXB - "Exchange File Backup"
OPTIONS: none
STEPS: 1. IDCAMS: copy to backup tape
2. XNCSEXB: check flags if all operations
performed, delete records if yes
3. XNCSEXS: list exchange file statistics

XNCREXS - "List Exchange File"
OPTIONS: FULL (list all individual records plus stats),
STATS (summary statistics of contents onlly)
STEPS: 1. XNCSEXS: list exchange file statistics

CINDA - ONLINE Update and Query Subsystem

NATURAL - TSO command

signon procedure:

1. SIGNON NDS NDSNZ
2. %1 (for lower case capability, required for dictionaries, otherwise, all characters translated into upper case)
3. CINDA
4. select options from menues

OPTIONS:

- A - Add single line or lines of a new block
- B - Block = add line to existing block
- D - Delete records
- M - Modify records
- K - Kill - delete a whole block
- L - Link two blocks
- X - Special Update Functions
  - 1 - Copy Block from MASTER to TRANSACTION (to create a new block)
  - 2 - Copy Block from TRANSACTION to TRANSACTION (to create a new block)
  - 3 - Modify a record in TRANSACTION file (e.g. remove "D" operation code)
  - 4 - Delete a record from TRANSACTION file (NOTE: can only delete "ADDED" records)
  - 5 - Delete a whole block from TRANSACTION (cancel changes to be applied to MASTER)
- Y - Display Functions and Special Retrievals
  - 1 - Display block in MASTER
  - 2 - Display block in TRANSACTION
  - 3 - get any S-A-Q-LAB to find block numbers
  - 4 - perform specialized retrievals
- Z - CINDA Dictionaries
  - 1 - Display dictionary record
  - 2 - Add new record to dictionary
  - 3 - Modify record in dictionary
  - 4 - Delete record from dictionary

CINDA - User Retrieval Subsystem

XNCRSEL - "Select records from the tape master file"
OPTIONS: Parameters as required by SELECT System
STEPS: 1. SELECT02: select records
2. SELECT: further select, sort, edit, get table expansions, print, etc.
3-5 (optionally) extract labs and refs, list expansions (see below)

XNCREX - "Extract and list lab and reference expansions"
OPTIONS: none
STEPS: 1. XNCNDBTL: read dictionaries for Lab table
2. XNCNDBTR: read dictionaries for Ref table
3. XNCXEX: extract lab and reference codes of any subset of CINDA master file and print expansions (subset of CINDA file can be created by run XNCRSEL)

XNCRLR - "List CINDA records from ONLINE Data Base retrieval"
OPTIONS: none
STEPS: 1. IEBGENER: print utility

CINDA - Book Production Subsystem
==========

Book Proper

XNCRBP0 - "Sort Master File for Book Creation"
OPTIONS: execute this job, or activate SORT option in Run XNCRBP1
STEPS: 1. SORT: sort file for Book Production

XNCRBP1 - "Create Book Tape"
OPTIONS: identify required selection criterea
Sort Master file (alternately separate run)
STEPS: 1. XNCNDBP: read dictionaries to create table
2. SORT: sort tape master
3. XNCSBP: create book tape, write lab and reference files for Book Tables

XNCRBP2 - "Convert to Book Intermediate Format"
OPTIONS: none
STEPS: 1. XNCXCN: convert file, add control flags

XNCRBP3 - "List Book Intermediate Format"
OPTIONS: execution of this job is NOT essential for Book Production
STEPS: 1. XNCXBL: list intermediate book file

XNCRBP4 - "Photocomposition"
OPTIONS: dummy run (list only), create photocomp tape
STEPS: 1. XNCXPHC: prepare photocomp file (markup)
2. XINMP41: create photocomp tape

Book Tables

XNCRBT1 - "Extract lab and reference expansions for Book Tables"
OPTIONS: none
STEPS: 1. XNCNDBTL: read dictionaries for Lab table
2. XNCNDBTR: read dictionaries for Ref table
3. XNCXTE: table extract, get expansions of codes as created by Run XNCRBT1

XNCRBT2 - "Photocomposition"
OPTIONS: dummy run (list only), create photocomp tape
STEPS: 1. XNCXPHT: prepare photocomp file (markup)
2. XINMP41: create photocomp tape

Book Text

XNCRBTX - "Photocomposition of Book Text pages"
OPTIONS: dummy run (list only), create photocomp tape
STEPS: 1. XNCXATMS: prepare photocomp file (markup)
2. XINMP41: create photocomp tape
INPUT: XNCS.BOOK.TEXT

CINDA - Miscellaneous Programs

XNCRDL - "List CINDA Dictionaries"
OPTIONS: list ALL dictionaries, or only the ones updated since YY-MM-DD
STEPS: 1. XNCNDL: read and produce edited lists

XNCRL01 - "List CINDA Transaction File by DB Key"
OPTIONS: none
STEPS: 1. XNCNL01: read and produce edited list

XNCRL02 - "List CINDA Transaction File by 'Reader Format' Key"
OPTIONS: none
STEPS: 1. XNCNL02: read and produce edited list

XNCRCD - "Compare CINDA with EXFOR Dictionaries"
OPTIONS: none
STEPS: 1. XNCSCD: list both dictionaries in parallel

XNCRMLL - "Extract area 3 and 4, Edit, List"
OPTIONS: none
STEPS: 1. XNCSMLL: produce "Lab Sort" list

XNCRPRL - "Print RULES from NDS CINDE Check programs"
OPTIONS: Reader Processor, File Maintenance processor, or Book Production System Rules
STEPS: 1. XNCSPRL: read program source code and extract RULES of program execution, e.g. checks performed, etc.

XNCRP1 - "Produce NDS CINDA SYSTEM Documentation"
OPTIONS: ALL produce all manuals,
SMnnnn produce System Specifications Manual or sections or pages thereof,
RMnnnn produce Run Manual or sections or pages thereof,
STEPS: 1. XNCSP1: get XNCS.CINDA.TEXT member list, read required library members, create XNCRP0 wich produces the actual desired document

XNCRP2 - "Produce NDS CINDA SYSTEM Run Request Forms"
OPTIONS: number of copies of desired Sub-system
STEPS: 1. XNCSP2: print desired forms

XNCRCC - "List Coverage Control"
OPTIONS: none
STEPS: 1. XNCSCC: list CINDA Coverage Control file

XNCRZZ - "Create Coverage Control"
OPTIONS: none
STEPS: 1. XNCSZZ: create Coverage Control file

INDC Conclusions relevant to Data Centres

Extracts, concerning the data centres, from conclusions and recommendations "Minutes of the 14th INDC Meeting, Vienna, 1-5 Oct. 1984", document wihtout report code, August 1985. (printed IAEA, Oct. 1985)

CINDA

29. The Committee recognised the extremely high value of CINDA as a source of bibilographic information for neutron nuclear data, noted that the mechanics of its production are the responsibility of the nuclear reaction data centres, stressed that any changes in the production arrangements must not be allowed to affect the quality, content and publication schedule and emphasised that no changes should take place until satisfactory agreement has been reached by all interested parties.

Mass chain evaluations

30. The Committee reviewed the serious problem which has arisen in maintaining the production schedule of mass chain evaluations and strongly recommended the IAEA to use all ways and means at its disposal to eliminate the problem.

31. The Committee welcomed the efforts of the NDS in dealing with the problem of errors in nuclear cross-section processing codes and encouraged further work in this area, using caution and judgment on the extent of the investigations.

Evaluated data and exchange format

32. The Committee endorsed the use of ENDF as the international evaluation exchange format and noted the constructive suggestions for changes to the format which had arisen from the Specialists' Meeting, arranged by NDS, on the subject. The INDC reiterated its encouragement of the interchange of evaluated data.

TND

33. The Committee noted that, with some exceptions, it was widely believed that the TND Newsletter was a valuable service, enabling measurers and evaluators to keep informed to work in progress;

34. Recommended that a TND decay data request list be maintained in a special section of WRENDA.

V.B CINDA

Tubbs presented a proposal (INDC/P(84)-23) to transfer the responsibility for CINDA from NEA to NDS. At present, the NEA Data Bank carried out the work to produce the CINDA master tape, from material supplied by the other data centres, and this was sent to Vienna for production of the printed volumes. It was now proposed that each of the four neutron data centres would be responsible for adding entries from its service area to the master tape. This would reduce errors and minimise the amount of work on CINDA required to be done at the NDS. The

NDS believed that the proposed changes were technically feasible and sound. They were prepared to agree to take over this work so long as the USSR were able to take responsibility for CINDA entries from their service area.

ACTION 9 NDS/CJD

INDC members were agreeable to the proposed arrangements on the clear understanding expressed in the following two recommendations.

Recommendation 2

CINDA is recognized to be an extremely valuable source of bibliographic information for neutron nuclear data. While the mechanics of producing CINDA are the responsibility of the nuclear reaction data centres, any changes in the system must not be allowed to affect the quality, content and publication schedule of CINDA.

Recommendation 3

No changes in the production arrangements for CINDA should be allowed to take place until satisfactory agreements between interested parties are reached on a revised scheme.

V Nuclear Data Centres

V.A Progress Reports of Nuclear Reaction Data Centres

Tubbs noted that the NEA Data Bank had experienced a large increase in user demand for both computer programs and nuclear data. A change in working methods can be expected as a result of the switch from the PDP 11/70 to a VAX 780. Staff vacancies had been filled in Autumn 1983 and it was hoped to have the JEF-1 file ready for release to Data Bank member countries by the end of this year. A check on the completeness of the EXFOR file by comparing it with CINDA entries had produced very encouraging results. Multiple references in CINDA had been cleaned up. A number of benchmarking exercises on optical model, coupled channel model and pre-equilibrium model codes had been carried out. A meeting of the Task Forces on U-238 and Fe-56 was due to be held in the week following the present INDC meeting.

Smith observed that some data sets which had appeared in Zeitschrift für Physik were missing from the EXFOR file although they were referenced in CINDA. Froehner was asked to check on the coverage of the FRG literature.

ACTION 2 Froehner

It was suggested that all neutron data centres should carry out checks on their files with a view to identifying gaps.

ACTION 3 NDS

All INDC participants were asked to notify their area data centre of any gaps observed in EXFOR file.

ACTION 4 All participants

Smith drew attention to two NBS publications, one on photon attenuation coefficients by Berger (the data being available on magnetic tape) and one of photonuclear abstracts (NBSIR-83-2742).

Kuzminov reported on the Obninsk Data Centre activities. About 200 requests for nuclear data were handled last year. A service on computer codes for processing evaluated ENDF/B-V format files was introduced. Checks were carried out on the Pu-239 and -240 evaluated files. Tubbs asked if the results of USSR measurements could be entered into EXFOR and transmitted to other data centres more quickly.

ACTION 5 Kuzminov

Reported that the National Nuclear Data Center at Brookhaven was now attempting to allow the use of updated standards at EXFOR retrieval time. The question of the importance of data types not presently covered in CINDA/EXFOR (e.g. polarized particle reactions) was raised. INDC participants were asked to consider the question and forward their views to the NDS.

ACTION 6 All participants

Smith expressed concern that some problems with the EXFOR system had existed for a long time and were apparently not yet resolved. In particular he noted a lack of uniformity in input (e.g. use of different units) and he urged data centres to compile data as measured or, at least, with a clear specificatiion of the standard involved.

ACTION 7 NDS

Smith felt that the code systems used to provide the services to customers were being changed too often and that a period of stability would be beneficial. He was also concerned that some evaluations produced by the NDS had failed to pass through processing codes at Argonne and although such problems could be dealt with at major laboratories, they might be much more serious in developing countries where there was less experience. The problem with the evaluations in question probably arose because they were only partial evaluations and therefore not a complete file as required by the processing code.

Zhou presented two papers (INDC/P(84)-46 and -47) on nuclear data activities in the People's Republic of China. He noted in particular work on charged particle reactions, photonuclear studies and participation in nuclear structure and decay data, with 10 mass chain evaluations assigned to that country. There was also an active evaluation programme.

V.D Status of mass chain data evaluation (Nuclear Structure and Decay Data network

There was considerable concern regarding the severe delay in the production of mass chain evaluations, as reported in INDC/P(84)-19. This appeared to have been caused by a loss of good quality evaluators; the

result was a reduction in the quality of the ENSDF file. In addition, this was of concern to the publisher who needed assurance on the flow of evaluations for publication.

It was decided to take the following course of action. Firstly, NDS was asked to provide INDC participants with a summary of the problems being encountered.

ACTION 10 NDS

INDC members were asked to bring the delays to the attention of their national nuclear data committees and to ask them to do all they could to try to alleviate the problem.

ACTION 11 All members

NDS was invited to request the publisher of Nuclear Data Sheets to include a statement in an issue pointing out that the service was provided by only a few evaluators, and asking users to provide comments on the usefulness of the evaluations.

The seriousness of the problem prompted the INDC to make the following recommendation.

Recommendation 3

The IAEA should use all ways and means at its disposal to try to eliminate the serious problem which has arisen in maintaining the target production schedule of mass chain evaluations. The steps to be taken should include bringing the problem to the attention of governments and national nuclear energy organs, and sending of letters of appreciation to evaluators when their work is accepted for publication.

No.	Session	Person	Action
3	V.A	NDS	Check EXFOR data file contents against CINDA for NDS area to identify gaps in the coverage. Urge other data centres to carry out similar checks in their areas.
4	V.A	All INDC Participants	Notify their area data centre of any gaps which they observe in EXFOR files.
5	V.A	B. Kuzminov	Attempt to find ways of speeding up entry of new USSR measurements into EXFOR.
6	V.A	All INDC Participants	Communicate to NDS and/or data centres any needs which are presently not covered in CINDA/EXFOR (e.g. polarized particle reactions).
7	V.A	NDS	Urge all reaction data centres to compile and provide EXFOR data in a uniform (e.g. uniform units, representation of error information and differential data, etc.). Also ensure that data are compiled as measured (e.g. ratios!) or, at least, with a clear specification of the standards involved.
8	V.A	All INDC Participants	Provide NDS with guidance as to which Russion and Chinese reports should be translated into English.
9	V.B	NDS/CJD	Discuss possibility of CJD taking full responsibility for maintaining the CINDA file from their area.
10	V.D	NDS	Provide all INDC participants with summary of the problems being encountered in the production cycle of mass-chain evaluations.
11	V.D	All INDC Members	Bring problem of delays in mass chain evaluation to the attention of their national nuclear data committees and ask them to do all they can to alleviate the problem.
12	V.D	NDS	Ask the publisher of Nuclear Data Sheets to include a statement in an issue pointing out that the service is provided by only a few evaluators, and requesting users to provide comments on the usefulness of the evaluations.

13	St.S.C.	All INDC Members	Advertise the IAEA Technical Report on Nuclear Data Standards for Nuclear Measurements (No. 227) and encourage purchases.
24	D.S.C.	NDS	Make results of Konshin's multilevel analysis of ^{235}U resonance parameters available to S.C.
25	D.S.C.	H. Derrien	Communicate results of NEANDC ^{238}U Task Force to SC Chairman.
26	D.S.C.	J.J. Schmidt	Assign NDS staff responsible for support of Discr. Publ. in 1986.
32	S.C.B.	S. Kapoor	Prepare a review paper on the status of data and data needs for X-ray and PIXE analysis before the next INDC meeting.
33.	S.C.B.	NDS	Distribute Kapoor's paper to INDC members in time for discussion at the next INDC meeting.
34	S.C.B.	J.J. Schmidt	Put on agenda for next INDC meeting the discussion of isotopic nuclear decay data for the analysis of rock materials.
35	S.C.B.	J.J. Schmidt	Discuss at the next INDC meeting proposed NDS activities in the compilation for geophysical application of a catalogue of all available data on neutron-induced gamma-ray production cross-sections and spectra from thermal energy to 20 MeV, computer file and handbook.

International Exchange of Evaluated Data (ref. INDC-156)

The subcommittee again endorsed ENDF as the international evaluation exchange format and felt the NDS Specialists' Meeting had made constructive format suggestions to CSEWG. Many of the latter were consistent with ENDF-VI, with emphasis on double-differential neutron data and charged-particle emission. The explicit details were not discussed but, generally, the modifications will allow KERMA calculations (e.g. for fusion and bio-medical needs) and provide a much improved description of continuum neutron emission.

JEF and ENDF/B as entities remain restricted but the subcommittee noted that many portions of them are freely available in the open literature. A long-term goal remains the free interchange of evaluated nuclear data with the resulting improvement of evaluated files, reduction of inconsistencies, less proliferation of files, and, generally, improved technical performance. It was pointed out that the present situation, though not ideal, does permit effective cooperation in many aspects of evaluation that should be exploited.

A. The subcommittee felt that the TND newsletter was valuable and should continue, though there was a minority with a negative view. Perhaps an assessment of merit is warranted, such as an inquiry as to whether the recipient wishes to remain on the distribution.

B. The subcommittee recommended that a TND-decay-data request list be maintained. WRENDA is a proper vehicle, particularly if these requests are highlighted in a special section in such a manner as to encourage continued work in this important area.

Verification of Nuclear-Cross-Section Processing COdes (refs. P(83)-40 and P(84)-41)

This work illustrates the type of serious problem that has long been known to exist. It is unlikely that any major computational program is free of error. The Subcommittee welcomed the efforts at the NDS and elsewhere to identify these errors and correct them. It is noted that the NDS illustrations may well be conservative as the differences will likely become greater as temperature increases (the first round of NDS comparisons was made at zero degrees). The Subcommittee encouraged such comparisons in concert with similar efforts in the US, within the NEA, and elsewhere. However, a degree of caution is necessary as it is extremely costly to assure that any major code is absolutely error free there will always remain a matter of judgment in its use.

INTEROFFICE MEMORANDUM

International Atomic Energy Agency

To: 7 October 1985

From: V. Piksaikin
Nuclear Data Section

cl: J.J. Schmidt, Head
Nuclear Data Section

Subject: WRENDA 87/90

In November 1983 the IAEA published the 1983-84 version of the World Request List for Nuclear Data - WRENDA 83/84 (distributed as INDC(SEC)-88/URSF).

Following the recommendation of the 13th INDC meeting, the next issue of the WRENDA request list is planned to be published in 1987 according to the following schedule.

August 1986:

Country request retrievals from Request and Status Files. Information letter (sending the tape to the NNDC and NEA/DB, list of country's request to the INDC Liaison Officers).

September 1986 - January 1987

Receiving updated tapes from the NNDC and NEA/DB and Filled Request Update Forms from the INDC Liaison Officers.

February 1987 - September 1987

- Producing the listing from tapes. Checking and reviewing the requests and status.
- Updating Request and Status Files.
- WRENDA Book Report Run (updating the Cross-Reference-File - temporary copy).
- Publishing WRENDA using the Request, Cross-Reference and Status Files.

October 1987

Distribution

cc. J.J. Schmidt
H.D. Lemmel
V. Piksaikin

V. Piksaikin/eb 1711

CSISRS Binary Library Format

CSISRS Library MEMO # 1

From: V. McLane

Subject: CSISRS Binary Library Format

Date: June 6, 1985

OVERVIEW: The CSISRS Binary Library is organized into data volumes, each containing a range of accession numbers. These volumes are organized according to the "area code" for the entries (see EXFOR Manual, Section 2). There are two index files associated with each area: a retrieval index (RED) and a random access index (GREEN). There is also a master index to the entire library (SUPER.LIB).
The entire library resides on DSKA: [110,77].

I. LIBRARY Index (SUPER.LIB)

The file is ASCII.

Column	Format	Contents
1- 6	I6	Lower limit of accession #
6-12	I6	Upper limit of accession #
14-16	A3	File extension for RED and GREEN indices
18-21	A4	Disk area
23-28	I6	Project #
29-34	I6	Programmer #
35-36	I2	Data type: 1 = neutron 2 = charged particle 3 = photonuclear
37-60	A24	Comment

II. Random Access Index (GREEN.ext)

The file is packed binary.

Word	Format	Contents
1	I6	Accession #
2	I5	Volume #
3	I5	Starting block for entry
4	I5	# of blocks in entry

III. Retrieval Index (RED.ext)

The file is packed binary.

Word	Format	Contents
1- 6	I9	Reaction subfield 1-4 equivalents (3 words allowed for SF3).
7-10	I8	Reaction subfield 5-8 equivalents*.
11	A5	Reaction pointer, data type*, dimension code*.
12	E11.4	Minimum energy of data set
13	E11.4	Maximun energy of data set
14	I6	Date of entry (YYMMDD)
15	I9	AN/SAN (I6,I3)
16	I8	Block #, word # of start of SAN (I5,I3)

IV. Library Data Volumes

The file is packed binary.

The file structure is based on the EXFOR format and contains the basic logical record types:

1. System identifiers
2. BIB records
3. Title and unit heading records
4. Data records

See the EXFOR Manual for basic structure.

1. System Identifiers

Word	Format	Contents
1	I6	Accession #
2	I3	Subaccession #
3	I2	System identifier equivalent (see Dictionary 1).
4	I11	N1 (see EXFOR Manual, Chapt. III).
5	I11	N2 (see EXFOR Manual, Chapt. III).

* see EXFOR Dictionary 36

2. BIB records

N records, where N is defined by N1 of the BIB record.

Word	Format	Contents
1	I2	Information identifier equivalent (see Dictionary 2).
2	I3	Pointer
3-13	12A5	BIB text

3. Title and unit heading records

N headings, where N is defined by N1 of the COMMON or DATA record

Word	Format	Contents
1-3	2A4,A2	Heading code
4	A1	pointer

4. Data records

N2 sets of N1 floating point numbers, defined by N1 and N2 of the COMMON or DATA record.

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.RU BATCHR[110,75]

RETRIEVAL BATCH INPUT PROGRAM (VERSION 85-1) - RUN ON  3-Oct-85
---------------------------------------------------------------

STANDARD INDEX: SUPER.LIB[110,77]
  TYPE NEW INDEX SPECS OR CR:

ENTER REQUEST NUMBER (RETURN FOR DEFAULT):

 DEFAULT REQUEST #: 10009

 ENTER USER NAME: V.MCLANE

 ENTER USER ADDRESS: NNDC

 ENTER USER ADDRESS:

ENTER INQUIRY # FOR RETRIEVAL  1 (BLANK=END OF JOB): 1

 ENTERING ANSAN, PHYS-CRIT OR ENERGY (A/P/E): ?

  RETRIEVAL CRITERIA INPUT IS:
     A: retrieve by AN/SAN or range, and energy
     P: retrieve by REACTION criteria, date and energy
     E: retrieve by date and energy

 ENTERING ANSAN, PHYS-CRIT OR ENERGY (A/P/E): P

 ENTER REACTION FIELD (BLANK TO TERMINATE): ?

   REACTION FIELD INPUT FORMAT IS:

         f:code   where f = REACTION field
         f:code1,code2    code1 and code2
         f:code1>code2    code1 thru code2

    field 1 (target)
    field 2 (incident projectile)
    field 3 (process)
    field 4 (reaction product)
    field 5 (branch)
    field 6 (parameter)
    field 7 (particle considered)
    field 8 (modifier))

    Type f:? for information about each field

 ENTER REACTION FIELD (BLANK TO TERMINATE): 1:?

   FIELD 1 (TARGET) INPUT FORMAT IS :

         f:a=m
              where a = nuclide code Z (integer ZZZ)
                                     S (element symbol SS)
                                     A (integer AAA)
                                     I (integer ZZZAAA-M)
                                        M is optional
```

```
                m = code, as above
      f:a=m;b=n
           where a = Z or S, as above
                 b = A, as above
               m,n = code, as above
      f:a=m1,m2;b=n1,n2      m1 and m2, n1 and n2
      f:a=m1>m2;b=n1>n2      m1 thru m2, n1 thru n2

ENTER REACTION FIELD (BLANK TO TERMINATE): 2:?

  FIELD 2 (INCIDENT PROJECTILE) INPUT FORMAT IS :

   1.) f:code     (code from Dictionary 33 or CHP)
       f:code1,code2     code1 and code2
       f:code1>code2     code1 thru code2
   2.) f:a=m
           where a = nuclide code Z (integer ZZZ)
                                  S (element symbol SS)
                                  A (integer AAA)
                                  I (integer ZZZAAA-M)
                                     M is optional
                 m = code, as above
       f:a=m;b=n
           where a = Z or S, as above
                 b = A, as above
               m,n = code, as above
       f:a=m1,m2;b=n1,n2      m1 and m2, n1 and n2
       f:a=m1>m2;b=n1>n2      m1 thru m2, n1 thru n2

ENTER REACTION FIELD (BLANK TO TERMINATE): 3:?

  FIELD 3 (PROCESS) INPUT FORMAT IS :

   1.) f:code     (code from Dictionary 30 or 33, or CHP)
       f:code1,code2     code1 and code2
       f:code1>code2     code1 thru code2
   2.) f:a=m
           where a = nuclide code Z (integer ZZZ)
                                  S (element symbol SS)
                                  A (integer AAA)
                                  I (integer ZZZAAA-M)
                                     M is optional
                 m = code, as above
       f:a=m;b=n
           where a = Z or S, as above
                 b = A, as above
               m,n = code, as above
       f:a=m1,m2;b=n1,n2      m1 and m2, n1 and n2
       f:a=m1>m2;b=n1>n2      m1 thru m2, n1 thru n2
       f:a=m1+m2              m1+m2 (used for I or code only)
   3.) wild card: code (1) or isotope (2), preceeded by *

ENTER REACTION FIELD (BLANK TO TERMINATE): 4:?

  FIELD 4 (REACTION PRODUCT) INPUT FORMAT IS :

       f:a=m
           where a = nuclide code Z (integer ZZZ)
                                  S (element symbol SS)
```

```
                                    A (integer AAA)
                                    I (integer ZZZAAA-M)
                                       M is optional
                  m = code, as above
        f:a=m;b=n
             where a = Z or S, as above
                   b = A, as above
                 m,n = code, as above
        f:a=m1,m2;b=n1,n2      m1 and m2, n1 and n2
        f:a=m1>m2;b=n1>n2      m1 thru m2, n1 thru n2

ENTER REACTION FIELD (BLANK TO TERMINATE): 5:?

  FIELD 5 (BRANCH) INPUT FORMAT IS :

    1.) f:code   (code from Dictionary 31 or blank)
        f:code1,code2    code1 and code2
        f:code1>code2    code1 thru code2
    2.) wild card: code (1), preceeded by *


ENTER REACTION FIELD (BLANK TO TERMINATE): 6:?

  FIELD 6 (PARAMETER) INPUT FORMAT IS :

    1.) f:code   (code from Dictionary 32 or RP)
        f:code1,code2    code1 and code2
        f:code1>code2    code1 thru code2
    2.) wild card: code (1), preceeded by *


ENTER REACTION FIELD (BLANK TO TERMINATE): 7:?

  FIELD 7 (BRANCH) INPUT FORMAT IS :

    1.) f:code   (code from Dictionary 33 or blank)
        f:code1,code2    code1 and code2
        f:code1>code2    code1 thru code2
    2.) wild card: code (1), preceeded by *


ENTER REACTION FIELD (BLANK TO TERMINATE): 8:?

  FIELD 8 (MODIFIER) INPUT FORMAT IS :

    1.) f:code   (code from Dictionary 34 or blank)
        f:code1,code2    code1 and code2
        f:code1>code2    code1 thru code2
    2.) wild card: code (1), preceeded by *


ENTER REACTION FIELD (BLANK TO TERMINATE): 1:Z=3>6;A=6>12

ENTER REACTION FIELD (BLANK TO TERMINATE): 2:G

ENTER REACTION FIELD (BLANK TO TERMINATE): 3:*N

ENTER REACTION FIELD (BLANK TO TERMINATE):

ENTER DATE RANGE (BLANK=ALL DATES): ?
```

```
   DATE FIELD INPUT FORMAT IS:
      D1>D2     where D1 and D2 are integers (YYMMDD)
        >D1     all dates up to and including D1
        D1>     all dates after and including D1

  ENTER DATE RANGE (BLANK=ALL DATES): 750000>

  ENTER ENERGY RANGE (BLANK=ALL ENERGIES): ?

   ENERGY FIELD INPUT FORMAT IS:
      E1>E2     where E1 and E2 are floating point numbers
        >E1     all energies less than and including E1
        E1>     all energies greater than and including E1

  ENTER ENERGY RANGE (BLANK=ALL ENERGIES): >20.+6

 ENTER INQUIRY # FOR RETRIEVAL  2 (BLANK=END OF JOB): 2

  ENTERING ANSAN, PHYS-CRIT OR ENERGY (A/P/E): A

  ENTER ANSAN(S)(BLANK=END OF ANSAN INPUT): ?

   ANSAN FIELD INPUT FORMAT IS:
      A1>A2     where 1 and A2 are integers (AAAAASSS)
                input may be either 5-character AN
                                or 8-character AN,SAN

  ENTER ANSAN(S)(BLANK=END OF ANSAN INPUT): 10220,10300

  ***** ILLEGAL INPUT SYNTAX, TYPE ? FOR HELP

  ENTER ANSAN(S)(BLANK=END OF ANSAN INPUT): 10220

  ENTER ANSAN(S)(BLANK=END OF ANSAN INPUT): 10300

  ENTER ANSAN(S)(BLANK=END OF ANSAN INPUT):

  ENTER ENERGY RANGE (BLANK=ALL ENERGIES):

 ENTER INQUIRY # FOR RETRIEVAL  3 (BLANK=END OF JOB):

 REQUEST ID  10009 - INQUIRY ID  1

  OUTPUT FORMAT (E/F/L/R/T): E

  OUTPUT FORMAT (E/F/L/R/T): T

  OUTPUT FORMAT (E/F/L/R/T):

 REQUEST ID  10009 - INQUIRY ID  2

  OUTPUT FORMAT (E/F/L/R/T): E

  OUTPUT FORMAT (E/F/L/R/T):

 END OF EXECUTION
 CPU TIME: 1.18   ELAPSED TIME: 5:40.23
 EXIT
```

```
.TYPE 10009.CTL
.RU RETREV[110,75]

10009
V.MCLANE
NNDC

1
P
1:Z=3>6;A=6>12
2:G
3:*N

750000>
>20.+6
Z
A
10220
10300



.RU COFFEE[110,75]
E

SCR
SCR:10009.1
.AS SCR:STEMP
.RU COFFEE[110,75]
T

SCR
SCR:10009.1
.RU COFFEE[110,75]
E

SCR
SCR:10009.2
.DIR SCR:10009

.
```

```
.DO 10009.CTL

.RU RETREV[110,75]

EXPERIMENTAL DATA RETRIEVAL (VERSION 85-1) - RUN ON  3-Oct-85
------------------------------------------------------------

STANDARD INDEX: SUPER.LIB[110,77]
  TYPE NEW INDEX SPECS OR CR:

ENTER REQUEST NUMBER (RETURN FOR DEFAULT): 10009

 ENTER USER NAME: V.MCLANE

 ENTER USER ADDRESS: NNDC

 ENTER USER ADDRESS:

ENTER INQUIRY # FOR RETRIEVAL  1 (BLANK=END OF JOB): 1

 ENTERING ANSAN, PHYS-CRIT OR ENERGY (A/P/E): P

 ENTER REACTION FIELD (BLANK TO TERMINATE): 1:Z=3>6;A=6>12

 ENTER REACTION FIELD (BLANK TO TERMINATE): 2:G

 ENTER REACTION FIELD (BLANK TO TERMINATE): 3:*N

 ENTER REACTION FIELD (BLANK TO TERMINATE):

 ENTER DATE RANGE (BLANK=ALL DATES): 750000>

 ENTER ENERGY RANGE (BLANK=ALL ENERGIES): >20.+6

REQUEST ID  10009 - INQUIRY ID  1

 REACTION FIELD INQUIRY IS:

   1:Z=3>6;A=6>12

   2:G

   3:*N

 ENERGY RANGE   0.0000E+00 TO  2.0000E+07 EV

 DATE RANGE   750000 TO  999999

ENTER INQUIRY # FOR RETRIEVAL  2 (BLANK=END OF JOB): 2

 ENTERING ANSAN, PHYS-CRIT OR ENERGY (A/P/E): A

 ENTER ANSAN(S)(BLANK=END OF ANSAN INPUT): 10220

 ENTER ANSAN(S)(BLANK=END OF ANSAN INPUT): 10300
```

```
 ENTER ANSAN(S)(BLANK=END OF ANSAN INPUT):
 ENTER ENERGY RANGE (BLANK=ALL ENERGIES):
REQUEST ID  10009 - INQUIRY ID  2
 ANSAN INQUIRY IS:

   10220
   10300

 ENERGY RANGE   0.0000E+00 TO  9.9999E+10 EV
ENTER INQUIRY # FOR RETRIEVAL  3 (BLANK=END OF JOB):
FILE RED.LBG    NOT FOUND
FILE RED.LBM    NOT FOUND

      2 INQUIRIES FOR THIS REQUEST
THE FOLLOWING OUTPUT FILES HAVE BEEN WRITTEN
  MINI RED INDEX:
   SCR:10009 .1          8 RED LINE(S)
   SCR:10009 .2          3 RED LINE(S)

END OF EXECUTION
CPU TIME: 15.67  ELAPSED TIME: 1:42.97
EXIT

.RU COFFEE[110,75]

COFFEE (VERSION 85-1) RUN ON  3-Oct-85
--------------------------------------

FORMAT TYPE (E/F/L/R/T) - - - - - - -> E

STANDARD INDEX: SUPER.LIB[110,77]

  TYPE NEW INDEX SPECS OR CR- - - - ->

OUTPUT DEVICE - - - - - - - - - - - -> SCR

REQUEST INDEX FILE SPECS- - - - - - -> SCR:10009.1

END OF EXECUTION
CPU TIME: 3.75   ELAPSED TIME: 23.63
EXIT

.AS SCR:STEMP
SCR assigned
```

```
.RU COFFEE[110,75]

COFFEE (VERSION 85-1) RUN ON  3-Oct-85
--------------------------------------

FORMAT TYPE (E/F/L/R/T) - - - - - - - -> T

STANDARD INDEX: SUPER.LIB[110,77]

  TYPE NEW INDEX SPECS OR CR- - - - ->

OUTPUT DEVICE - - - - - - - - - - - - -> SCR

REQUEST INDEX FILE SPECS- - - - - - - -> SCR:10009.1

END OF EXECUTION
CPU TIME: 1.28   ELAPSED TIME: 12.62
EXIT

.RU COFFEE[110,75]

COFFEE (VERSION 85-1) RUN ON  3-Oct-85
--------------------------------------

FORMAT TYPE (E/F/L/R/T) - - - - - - - -> E

STANDARD INDEX: SUPER.LIB[110,77]

  TYPE NEW INDEX SPECS OR CR- - - - ->

OUTPUT DEVICE - - - - - - - - - - - - -> SCR

REQUEST INDEX FILE SPECS- - - - - - - -> SCR:10009.2

END OF EXECUTION
CPU TIME: 4:17.02        ELAPSED TIME: 14:28.08
EXIT

.DIR SCR:10009


10009    2      66  <000>    3-Oct-85    DSKA:   [5,5]
10009    1       2  <000>    3-Oct-85
10009    E1     32  <000>    3-Oct-85
10009    I1      1  <000>    3-Oct-85
10009    P1      1  <000>    3-Oct-85
10009    B1      1  <000>    3-Oct-85
10009    E2   3550  <000>    3-Oct-85
  Total of 3653 blocks in 7 files on DSKA: [5,5]

.
```

```
.TYPE 10009.BKR[110,76]
 10009 0V.MCLANE
 10009 0NNDC
 10009 1 2 851003 -9.9000E+03  2.0000E+07 750000 999999
 10009 1 1  10030060  10030120
 10009 1 1  10040060  10040120
 10009 1 1  10050060  10050120
 10009 1 1  10060060  10060120
 10009 1 2  10000000  10000000
 10009 1 3          10         10          0          0          0          0
 10009 2 1 851003 -9.9000E+03  9.9999E+10
 10009 2    10220000  10220999
 10009 2    10300000  10300999
 10009 1 851003       8 INDEX LINES FOR THIS INQUIRY
 10009 2 851003       3 INDEX LINES FOR THIS INQUIRY
 10009 1 851003     322 DATA LINES RETRIEVED IN EXFOR FORMAT
 10009 1 851003       0 DATA LINES RETRIEVED IN COMPUTATION FORMAT
 10009 2 851003   46583 DATA LINES RETRIEVED IN EXFOR FORMAT
```

Plans for ENDF/B-VI

by

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presented at the

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Nuclear Data, Cross Section Libraries and
Their Application in Nuclear Technology

at Bonn, Germany
October 1-2, 1985

Plans for ENDF/B-VI

S. Pearlstein and C. L. Dunford

I. Assessment of ENDF/B-V

The Evaluated Nuclear Data File (ENDF/B) system, whose formats[1] are in wide use, places emphasis on assessing the adequacies and deficiencies of each completed version. The primary assessment method is the comparison between calculation and experiment for selected integral benchmarks.[2] The Cross Section Evaluation Working Group (CSEWG), which helps develop ENDF/B, has developed benchmark specifications in several areas; fast reactors, thermal reactors, shielding for fast, thermal, and fusion reactors, fission products and actinides, and dosimetry. Some of the adequacies and deficiencies that have been observed for ENDF/B-V[3] are summarized here.

For fast reactors the criticality for both uranium and plutonium field assemblies is generally within experimental uncertainty and the dispersion in calculated values from independent analyses of the same assembly. There does not appear to be any bias related to spectral hardness. The fission ratios $^{49}f/^{25}f$ and $^{28}f/^{25}f$ are well predicted in large assemblies, but the $^{28}f/^{25}f$ for smaller harder spectrum assemblies is underpredicted in JEZEBEL and overpredicted in GODIVA. The ^{238}U capture rate relative to ^{235}U or ^{239}Pu fission is overpredicted in large assemblies.

For thermal reactors the criticality for light water highly enriched uranium assemblies is calculated quite well. For slightly enriched assemblies criticality is also calculated well, and the long standing discrepancy in calculating ^{238}U resonance capture has been substantially removed. The calculated criticalities for light water plutonium assemblies average high when compared to experiment and the discrepancy cannot be explained on the basis of obvious data deficiencies.

The shielding parameters that receive the most attention are the total neutron cross-section via transmission measurements and secondary spectra of gamma-rays and neutrons from neutron capture, inelastic

scattering and (n,2n) reactions. Integral benchmark experiments to test shielding data have inherently larger uncertainties than criticality and spectrum averaged cross-section ratio measurements. Total cross sections are adequate for shielding materials tested except for C in the 5-8 MeV and Cr and Ni in the 1-3 MeV region. There are adequate thermal neutron gamma-ray production data for the shielding materials tested except for Cl and Cu below 6 and 4.5 MeV respectively. Pulsed sphere studies of neutron spectra from 14 MeV neutron reactions indicate that 15-30% discrepancies exist for Mg, Ca, Ti, V, Cr, Ni, Cu, and Nb.

Of the 196 materials for which fission product and actinide cross-section data are represented in ENDF/B-V, calculated integral reaction cross-sections for 43 have been compared with measurements in reference spectra. The average ratio of calculation to experiment is about 1.1 with a standard deviation of about 0.2. Decay data for 750 unstable nuclides is used to compare calculated gamma and beta-ray decay energies with experiment. In general, for cooling times less than 100 seconds, calculated gamma decay energies are higher than measured for low energy gammas and lower than measured for high energy gammas. In general, for all cooling times, the reverse is true for betas. As a consequence, when summed, the agreement between calculation and experiment for total decay heat is better than for the individual components.

Reaction cross-sections for 26 materials are chosen for dosimetry applications and testing in reference spectra. Most of the calculated reaction rates are consistent with integral measurements, but the reaction rates for $^{10}B(n,\text{total-alpha})$, $^{47}Ti(n,p)$, $^{58}Fe(n,\gamma)$, and $^{127}I(n,2n)$ differ by 10% or greater.

II. ENDF/B-VI Objectives

Drastic reduction in funding for ENDF/B-VI by the United States fast breeder reactor program has led to significant changes in the ENDF/B-VI development plans. The major responsibility now lies with the U.S. Department of Energy, Office of Basic Energy Sciences (BES). Major evaluation improvements will be made for materials of interest to the fusion and fission reactor programs. However, we also expect to include some evaluated data for incident charged particles, namely protons.

At present, data evaluation activity will be carried out at Argonne National Laboratory (ANL), Idaho National Engineering Laboratory (INEL), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), National Bureau of Standards (NBS) and Oak Ridge National Laboratory (ORNL). In addition, we hope to have some contributions from Hanford Engineering Development Laboratory (HEDL). The National Nuclear Data Center (NNDC) at Brookhaven National Laboratory will continue to provide the coordination of the program and basic support services but will not be significantly involved in neutron data evaluation.

A. Formats

Most of the format revisions for ENDF-6 have been adopted. Some minor revisions will occur as a result of testing of the new formats. The significant changes adopted are:

1. Sublibraries - in order to include charged particle data in ENDF/B-VI, the concept of separate sublibraries for different data types has been introduced. An evaluation will be identified by the target material (MAT) and the sublibrary (NSUB). So far sublibraries have been identified for neutron reaction data, neutron fission yields, thermal neutron data, decay data, atomic interaction data and proton reaction data.

2. Resonance representation - an R-matrix representation for non-fissile, non-fertile materials has been approved for ENDF/B-VI. Energy dependent potential scattering is now permitted and a revised format for a Reich-Moore parameterization has been adopted. The Reich-Moore format has been adopted but will not be permitted in the ENDF/B-VI library although discussions are now underway concerning the removal of this restriction.

3. Outgoing particle distributions - a new format for file 6 permitting the represention of correlated energy-angle distribution of products of a nuclear reaction has been adopted. With this charge the ENDF-6 format will be useful to

higher incident particle energies and for non-neutron incident particles.

4. Thermal scattering law - changes in the file 7 format were made to permit inclusion of some nuclear data now built into processing codes.

5. Covariance files - data covariance files for angular distributions (file 34) and energy distributions (file 35) have been adopted. However, no format for correlated outgoing particle distributions (file 36) has been proposed. Format for covariances of isomer production cross sections (files 39 and 40) were also approved.

B. Processing codes

Work has begun on the improvement of processing codes to handle the new ENDF-6 formats. The utility codes maintained by the NNDC have been upgraded to handle all formats approved except for the covariance file revisions. The codes have been released in version 6.0. Changes to the NJOY maintained by Los Alamos are currently in progress and upgrades to MC^2 at Argonne and MINX-SPHINX at Oak Ridge are planned. The resonance region processing codes are presently being revised by D. Cullen at the IAEA.

C. Data

To date, priority has been given to the evaluation of the "standards" data. This is characterized by a simultaneous evaluation of the traditional standard cross sections for $^{6}Li(n,t)$, $^{10}B(n,\alpha)$, $^{197}Au(n,\gamma)$ and $^{235}U(n,f)$. However, due to the experimental data linkages, evaluations of $^{238}U(n,f)$, $^{238}U(n,\gamma)$ $^{239}Pu(n,f)$ and others have been obtained. Presently, this evaluation is in its final stage where the Hale (LLNL) R-matrix evaluation of ^{6}Li and ^{10}B will be combined with the Poenitz (ANL) evaluation by R. Peelle (ORNL). Evaluation for data not closely linked to the standards is also underway. Evaluations for ^{93}Nb (ANL) and the copper isotopes (ORNL) have been completed. The

Cu evaluations use the new file 6 format for outgoing particle energy-angle distributions.

III. Development of ENDF/B-VI

A. Organization

The National Nuclear Data Center at Brookhaven National Laboratory has responsibility for the organization and development of the ENDF/B system. The NNDC accomplishes its objectives through CSEWG, a group of working level representatives from national laboratories, industrial organizations, and academic institutions. Since its inception, CSEWG has provided a forum where data problems can be discussed, and evaluations performed. The objectives of CSEWG are:

1. to formulate the scope and contents of the reference library (ENDF/B) and establish formats and procedures for its use,

2. to develop the necessary evaluations and perform differential and integral testing of data as part of a continual review directed toward the upgrading of evaluations, and

3. to provide recommendations for new evaluations, experiments, and computer codes needed to improve the accuracy of analyses using nuclear data. These objectives are directed toward the widespeard availability of nuclear data reviewed and revised on a regular basis.

The NNDC administers the activities of CSEWG, acting as secretariat and providing meeting facilities, personnel, preparation and distribution of material, as well as other required services. The present CSEWG structure consists of an Evaluation Committee, a Data Testing Committee and a Methods and Formats Committee, reporting to CSEWG and the Executive Committee. The Executive Committee provides

overall guidance to the CSEWG activities and includes representative of funding agents and CSEWG Committee chairmen. CSEWG meetings are held once a year at Brookhaven National Laboratory. In addition to general CSEWG meetings, there are subcommittee meetings organized by subcommittee chairmen which are held when CSEWG meets, and at other times during the year. In addition to the administration of CSEWG, NNDC supplies bibliographic and experimental data retrieval services to the CSEWG evaluators. The NNDC has the responsibility of maintaining and upgrading, when necessary, utility processing codes for the ENDF system. The NNDC also is responsible for processing and correcting incoming data evaluations including preparation of review lists for each material. The NNDC assembles and distributes complete versions of the ENDF/B library.

B. Distribution Policy

The ENDF/B system was developed for direct use in nuclear applications. Because the developers of ENDF/B included thermal, fast, and fusion reactor and shielding physicists there was much interest in related benchmark testing but not in adjusted data that would be application dependent. At first mixed success was obtained for the agreement between calculations and experiments, e.g. the agreement for fast reactor benchmarks was better than for thermal reactor benchmarks. The continued use of feedback from the calculation of benchmark experiments spurred selected measurements of differential data and revised evaluations for successive versions of ENDF/B. With ENDF/B-V, issued in 1979, the results in most applications were comparable with those using adjusted data. Special purpose ENDF/B-V files were released, but a limited distribution policy similar to that followed by some countries for adjusted group sets was applied to the general purpose ENDF/B-V data. With the comparitively recent growth in team efforts to evaluate data for a wide range of applications, there are increased opportunities for collaboration and reciprocity. No limitation on the release of ENDF/B-VI data is planned.

C. International Cooperation

Current requirements for evaluated nuclear data files are very ambitious; extended energy range and reaction types, non-neutron libraries, double differential data, covariances, etc. The extensive resources necessary to accomplish these objectives are not available in today's budgets. It is clear that the reduction in available evaluation manpower will require a stretch out in the schedule for release of ENDF/B-VI and reduce the number of materials which can be reevaluated. In order to alleviate these problems, CSEWG is enlisting support from others. Specifically, 1) U.S. evaluators are encouraged to cooperate with non-U.S. evaluators in reevaluating materials for which they are responsible; 2) freely available non-U.S. evaluations will be reviewed for inclusion in ENDF/B-VI; 3) foreign experts will be asked to review evaluations proposed for ENDF/B-VI and 4) ENDF/B-VI will be available for release without restrictions. Some initiatives in international collaboration between U.S. and non-U.S. evaluators have taken place as a result of a meeting at the May 1985 International Conference on Nuclear Data for Science and Technology held in Santa Fe, New Mexico.

IV.

D. ENDF/B-VI Schedule

The projected schedule for ENDF/B-VI is currently:

1.	Completion of format revisions	June 85
2.	Standards evaluation completion	February 86
3.	Begin processing and review of evaluations	September 86
4.	Begin release of materials not requiring data testing	June 87
5.	Last evaluation completed	June 88
6.	Phase I reviews complete	January 89
7.	Phase II testing complete	June 89
8.	ENDF/B-VI release complete	October 89
9.	Summary documentation	March 90

A list of specific evaluations that are completed, in progress or planned is the following:

Material	Evaluator	Target Date	Material	Evaluator	Target Date
1-H	Dodder/LANL +Standards	done	55-Mn	Muir/LANL, Shibata/ORNL	FY86
6-Li	Standards/LANL	4/86	Fe	Fu/ORNL	FY88
7-Li	P. Young/LANL	FY88	59-Co		
9-Be	S. T. Perkins/LLNL	done	Ni	Hetrick/ORNL	FY86
10-B	Standards/LANL	4/86	63,65-Cu	Hetrick,Fu, Larson/ORNL	done
11-B	P. Young/LANL	6/86	Nb	Smith/ANL	done
16-O	NNDC find one		Au	Standards/LANL	FY86
19-F	NNDC find one		Pb	Fu/ORNL	FY87
27-Al	NNDC find one		235-U	Standards/ANL	FY88
Si	Hetrick,Larson/ORNL	FY87	238-U	ANL	FY88
Ti	Smith/ANL	FY86	239-Pu	Arthur/LANL	FY88
V	Smith/ANL	FY87	240-Pu	Weston/ORNL	FY86
Cr	Hetrick,Fu, Larson/ORNL	FY87			

IV. Summary

A new edition, ENDF/B-VI, is planned that contains several extensions to existing data and formats as well as some changes in procedures. The plans include opportunities for increased international cooperation and reciprocity in the exchange of data.

References

1. Kinsey, R. Editor. Data Formats and Procedures for the Evaluated Nuclear Data File, BNL-NCS-50496 (ENDF-102), 2nd Edition (ENDF/B-V), Revised October 1979, Revised November 1983.

2. Kinsey, R., compiled by ENDF/B Summary Documentation BNL-NCS-17541 (ENDF-201), 3rd Edition (ENDF/B-V) July 1979. See also 3rd Edition (ENDF/B-V) Supplement I, January 1985.

3. Weisbin, C. R., et. al., Editors. Benchmark Data Testing of ENDF/B-V BNL-NCS-31531 (ENDF-311), August 1982, Informal Report.