XA9641005

International Atomic Energy Agency

INDC(NDS)-343
Distr. G, NC

INDC

INTERNATIONAL NUCLEAR DATA COMMITTEE

Report on the Consultants' Meeting on

TECHNICAL ASPECTS OF THE CO-OPERATION OF NUCLEAR REACTION DATA CENTERS

IAEA Headquarters, Vienna, Austria
2-4 May 1995

Edited by

H.D. Lemmel, O. Schwerer, H. Wienke

October 1995

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

Reproduced by the IAEA in Austria
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Contents

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Introduction

The IAEA Nuclear Data Section convenes in annual intervals coordination meetings of the Network of the Nuclear Reaction Data Centers. The last meeting, with center heads and technical staff present, took place in Paris, France, 25 - 27 April 1994. See the report INDC(NDS)-308. The present meeting was attended by technical staff only to discuss technical matters of the nuclear data compilation and exchange by means of the jointly operated computerized systems CINDA, EXFOR, ENDF and others.

The cooperation of the Network of Nuclear Reaction Data Centers is described in the report INDC(NDS)-324 which was finalized at the present meeting. The network includes eleven centers in five countries and two international organizations. A list of the centers and a brief (incomplete) summary of their functions within the network is given on the following pages.

The main problems encountered by most of the centers result from the lack of sufficient manpower and lack of staff continuity. As a result, the main databases, CINDA and EXFOR, are no longer adequately complete for the years after about 1991/1992. Also, a significant number of conclusions and actions that were agreed at the past data centers' meeting, could not be implemented.

The agenda, which is given on page 7, included activity reports by the centers and a large number of technical items on data compilation rules and data exchange procedures.

During the past years the computer operations of several centers could be harmonized due to their migration to VAX computers and due to the provision of a software package from the US National Nuclear Data Center. However, other centers continue to use other computers and software. Consequently, a new "Dictionary" system containing a thesaurus of keywords and codes basic to the compilation and data processing rules of the jointly operated databases, was designed and finalized at the present meeting, in order to serve all participating centers irrespective of their computer environment.

The EXFOR system for the compilation and exchange of experimental nuclear reaction data, requires continuous updating which, at the present meeting, concentrated primarily on new types of experimental data resulting from improved measurement techniques by which multiple differential data can be measured, and resulting from the increasing importance of intermediate energy nuclear data (up to several hundred MeV) and heavy-ion reaction data.

During the past year, noticeable progress has been made in the EXFOR compilation of

- intermediate energy proton reaction data by a cooperative effort of the NEA Data Bank and the center of the Kurchatov Institute, Moscow (CAJaD);

- photonuclear data by the center at the Moscow State University (CDFE);

- charged-particle nuclear data converted from the Japanese NRDF system by the center at the Hokkaido University (JCPRG).

First charged-particle data compilations were received from the new network participant in Hungary (ATOMKI).

An update of the EXFOR checking code TEST-EXF which was provided by CAJaD, Moscow, will now be used by most of the centers.

In the field of neutron data compilation in CINDA (bibliography and data index) and EXFOR (numeric data) a serious backlog has accumulated during the past years, so that many important new data measurements cannot be made available to data users and data evaluators. This is particularly disturbing in the case of the NEA Data Bank where the approach of data compilation by temporary consultants inherently involves a lack of sufficient expertise and work continuity.

Other centers, specifically the Chinese Center (CNDC), encounter the problem that most of the experienced staff will soon retire. It will be most essential that new staff will be employed and trained before the retirement of the experienced staff.

The centers at Obninsk (CJD) and Beijing (CNDC) reported progress in their evaluated data libraries BROND and CENDL. It would be essential to release new and updated data evaluations immediately after testing and completion so that the International Evaluation Cooperation guided by the NEA Data Bank can benefit from this work.

The NEA Data Bank reported on the work for the JEF-3 library which will incorporate JEF-2 and the fusion database EFF. The IAEA Nuclear Data Section announced the finalization and release of the FENDL database that was designed for fusion (ITER) applications but is useful for other applications as well.

The results of the meeting can be found in list of technical conclusions and actions given on page 11.

The Network of Nuclear Reaction Data Centers

National and regional nuclear reaction data centers, coordinated by the International Atomic Energy Agency, cooperate 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	-	Centr Jadernykh Dannykh (= Nuclear Data Centre), Obninsk, Russia
CAJaD	-	Centr po Dannym o Stroenii Atomnogo Jadra i Jadernykh Reakcikh (= Nuclear Structure and Nuclear Reaction Data Centre), Moscow, Russia
CDFE	-	Centr Dannykh Fotojadernykh Eksperimentov (= Centre for Experimental Photonuclear Data), Moscow, Russia
CNDC	-	China Nuclear Data Centre, Beijing, China
ATOMKI	-	ATOMKI Charged-Paritcle Nuclear Reaction Data Group, Debrecen, Hungary
RIKEN	-	Nuclear Data Group, RIKEN Institute of Physical and Chemical Research, Wako-Shi, Japan
JCPRG	-	Japan Charged-Particle Nuclear Reaction Data Group, Hokkaido University, Sapporo, Japan
JAERI	-	Nuclear Data Center of the Japan Atomic Energy Research Institute, Tokai-Mura, Japan
(KACHAPAG)	-	(Karlsruhe Charged Particle Group, Karlsruhe, Germany. Discontinued in 1982, its responsibilities were taken over by CAJaD)

1. Neutron Nuclear Data

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

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

1.c Data Handbooks based on EXFOR
published by NNDC (last issue in 1984)

1.d *Evaluated data exchanged in* ENDF format:
NNDC, NEA-DB, NDS, CJD, CNDC, JAERI and others. Main data libraries:

BROND-2 (Russia)	IRDF-90, Rev. 92(IAEA)
CENDL-2 (China)	JEF-2 (NEA)
ENDF/B-6 (USA)	JENDL-3 (Japan)

Online services by NNDC, NEA-DB and NDS

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

1.f International data evaluation cooperation coordinated by NEA-DB

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

2.a Bibliography NSR published by NNDC
Online services by NNDC, NEA-DB and NDS

2.b Numerical data exchanged in EXFOR format:
Input prepared by CAJaD, RIKEN, CNDC, ATOMKI (from 1992), NDS, NNDC, JCPRG, NEA-DB
Online services by NNDC, NEA-DB and NDS
Coordination of compilation: CAJaD

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

3. **Photonuclear Data**

3.a Numerical data exchanged in EXFOR format:
Input prepared by CDFE, occasional contributions from NNDC, NDS
Online services by NNDC, NEA-DB and NDS

3.b Bibiliography published by CDFE and JAERI

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

LIST OF ACRONYMS

ATOMKI	Nuclear Research Institute, Debrecen, Hungary
BNL	Brookhaven National Laboratory, Upton, N.Y., USA
BROND-2	Russian evaluated neutron reaction data library, version 2
CAJaD	Center for Nuclear Structure and Reaction Data, Kurchatov Institute, Moscow, Russia
CDFE	Centr Dannykh Fotojad. Eksp., Moscow State University, Russia
CENDL-2	Chinese evaluated neutron reaction data library, version 2
CENPL	Chinese evaluated nuclear parameter library
CINDA	A specialized bibliography and data index on neutron nuclear data operated jointly by NNDC, NEA-DB, NDS and CJD
CJD	Russian Nuclear Data Center at F.E.I., Obninsk, Russia
CNDC	Chinese Nuclear Data Center, Beijing, China
CP...	Numbering code for memos exchanged among the NRDC
CPND	Charged-particle nuclear reaction data
CRP	Coordinated Research Programme of the IAEA Nuclear Data Section
CSEW	US Cross-Section Evaluation Working Group
CSISRS	Cross-Section Information Storage and Retrieval System, the EXFOR-compatible internal system of NNDC
EFF	European evaluated nuclear data file for fusion applications
ENDF-6	International format for evaluated data exchange, version 6
ENDF/B-6	US Evaluated Nuclear Data File, version 6
ENSDF	Evaluated Nuclear Structure Data File
EXFOR	Format for the international exchange of nuclear reaction data
FEI	Fiziko-Energeticheskij Institut, Obninsk, Russia
FENDL	Evaluated nuclear data file for fusion applications, developed by IAEA-NDS
IAEA	International Atomic Energy Agency
IFRC	International Fusion Research Council
INDC	International Nuclear Data Committee
INIS	International Nuclear Information System, a bibliographic system
IRDF	The International Reactor Dosimetry File, maintained by the IAEA-NDS
ITER	International Thermonuclear Experimental Reactor

JAERI	Japan Atomic Energy Research Institute
JCPRG	Japan Charged-Particle Nuclear Reaction Data Group, Sapporo, Japan (previously Study Group for Information Processing)
JEF	The Joint Evaluated File of neutron data, a collaboration of European NEA member countries and Japan
JENDL-3	Japanese Evaluated Nuclear Data Library, version 3
LEXFOR	Part of the EXFOR manual containing physics information for compilers
NDS	IAEA Nuclear Data Section, Vienna, Austria
NDS	The journal Nuclear Data Sheets
NEA	Nuclear Energy Agency of the OECD, Paris, France
NEA-DB	NEA Data Bank, Paris, France
NEANDC	NEA Nuclear Data Committee
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
NRDF	Japanese Nuclear Reaction Data File
NSDD	Nuclear structure and decay data
NSC	Nuclear Science Committee of the NEA
NSR	Nuclear structure references, a bibliographic system
OECD	Organization for Economic Cooperation and Development, Paris, France
PC	Personal Computer
PhND	Photonuclear data
RI	Radievyj Institut, Sankt Peterburg, Russia
RIKEN	Nuclear Data Group, RIKEN Inst. of Phys, and Chem. Res., Wako-Shi, Saitama, Japan
TRANS	Name of transmission tapes for data exchange in the EXFOR system
USDOE	U.S. Department of Energy
WRENDA	World Request List for Nuclear Data
4C...	Numbering code of memos exchanged among the four Neutron Data Centers

Nuclear Reaction Data Centers' Meeting
Vienna, 2 - 4 May 1995

AGENDA

1. **General**
1.1 Opening and adoption of the agenda
1.2 Brief status reports of the center
1.3 Review of actions from the 1994 NRDC Meeting
1.4 The Network document
1.5 Conclusions from the 1995 INDC Meeting

2. **New EXFOR/CINDA dictionaries**
2.1 Summary: New archive dictionaries, changes in EXFOR dictionaries and experiences with TRANS 9068, CINDA dictionaries
2.2 Wishes for next transmission
2.3 Further program/format modifications?

3. **Exfor compilation and transmission**
3.1 General compilation situation
3.2 List of last TRANS tapes distributed
3.3 Update distribution list for TRANS tapes (neutron/CPND/photonuclear)
3.4 Pending Exfor matters (dictionary updates, coding rules)

4. **Exfor corrections and checking**
4.1 List of pending retransmissions
4.2 List of important or frequent mistakes in TRANS tapes
4.3 "Bulk" retransmission or resubmission of TRANS tapes or Exfor areas
- L-series
- B-series
- TRANS E012, E013

5. **Exfor compilation and checking on PC**
5.1 Dr. Chukreev's check program TEST-EXF

6. **CPND Exfor compilation**
6.1 ATOMKI compilations
6.2 TRANS O001
6.3 Compilation coordination

7. **Photonuclear Data**

8. **CINDA**
8.1 General compilation situation
8.2 Top priority work plan until book deadline in June 1995
8.3 Cooperation NDS - CNDC
8.4 Manual update for (n,n'f) etc.

9. **Evaluated data libraries**

10. **Communication between the centres**
10.1 Update list of e-mail addresses
10.2 Distribution of CP memos
10.3 Update list of media for data exchange between the centres (memos, CINDA batch, Exfor TRANSmissions, dictionaries)

11. **Online systems and computer matters**

12. **Customer services**

13. **Address lists and document distribution**
13.1 Joint maintenance of mail and electronic addresses
13.2 Document distribution and maintenance of distribution lists

14. **Citation of databases**

15. **Other business**

16. **Closing items**
16.1 Conclusions and actions of this meeting
16.2 Next NRDC meeting: May 1996 in Brookhaven

IAEA Consultants' Meeting on
Technical Aspects of the Cooperation
Nuclear Reaction Data Centres
2-4 May 1995
IAEA Headquarters, Vienna
Meeting Room A2340 (NDS Library)

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CONCLUSIONS and ACTIONS

Network document and communication between centres

1)	*Concl.*	The Network document (to be issued as INDC(NDS)-324) was approved.
2)	*Act. All*	To return to NDS the duly signed pages.
3)	*Act. NDS*	To finalize the network document and send copies to the centres, to INDC and other authorities such as the IAEA missions of the centres' countries.
4)	*Act. NDS*	To produce an e-mail document with the centre addresses and memo distribution lists, highlighting any changes.

EXFOR/CINDA dictionary system

5)	*Act. McLane*	(old action 7 continuing) Send EXFOR checking codes (executables only) plus the accompanying dictionaries (in DANIEL format) to NEA.
6)	*Act. McLane Schwerer*	Draft a new proposal to permit use in REACTION SF7 any combination of codes from dict. 33 or 27, without updating dict. 36.
7)	*Act. McLane*	to update the programs using dictionary 36 accordingly.
8)	*Act. McLane Schwerer*	Come-up with a list of more sorting flags for dict. 36.
9)	*Act. Schwerer*	Remove free text on top of dict. 9 concerning compounds.
10)	*Act. McLane*	Change title of dict. 19 to old one and remove the word 'codes' from the other titles.
11)	*Action NDS*	Dictionary transmissions are, from now on, available in two formats: in the "traditional" TRANS format, or as a DANIEL backup file. NDS will send:

- TRANS only: to CDFE (by FTP), JCPRG, RIKEN, ATOMKI, CAJaD
- both TRANS and DANIEL backup: to CJD, CNDC, NEA-DB, NNDC.

12) *Act. Schwerer* Send dictionary write-up (dict. memos) to Konieczny, Pakhomova, Lammer.

13) *Act. NDS* Send to CNDC and CJD the DANIEL backup file and programs and the CSISRS programs.

EXFOR, general

14) *Act. CJD* (rel. old action 11) Update lab dictionaries for Russian institutes by June 1995 to meet the book deadline, thereafter to continue to update the institute names continuously.

15) *Act. McLane Varlamov* (old action 12 continuing) To update and submit dictionary 36 entries on photonuclear quantities (with expansions) and to make appropriate changes in LEXFOR entry. (See memo CP-C/200 and reply in CP-D/219)

16) *Act. McLane* (old action 13 continuing) To provide LEXFOR entry for energy spectra of particle pairs and PAR,SIG,P/T.

17) *Act. NDS* (old action 14 continuing) To update dictionary 36 accordingly, possibly introducing longer expansions for these quantities.

18) *Act. McLane* (old action 15 continuing) If staffing permits, update the EXFOR manual.

19) *Act. NNDC* (old action 16 continuing) Send the remaining entries from EXFOR files 6,7,8 to the other neutron data centres.

20) *Act. All* (old action 17 continuing) Go through these entries and decide which entries need conversion to EXFOR.

21) *Act. All* (old action 18 continuing) Retransmit those entries listed in V. McLane's list of pending retransmissions.

22) *Act. NNDC* (old action 19 continuing) To update the EXFOR manual Chapter 7 (dictionaries) on dictionary 6: how to invent report codes for annual reports without a report code on the cover. Accepted procedure is A- (3-digit labcode from dict.3, e.g. A-ALB-.).

23) *Act. McLane*	(old action 25 continuing) Clarify wording on free text in the EXFOR manual. (If both coded information and free text are given for a keyword, it is legal and often necessary to start with free text and give the code(s) only in one of the following lines.)
24) *Act. McLane*	(old action 26 continuing) Add a note in the EXFOR manual on the possibility of retransmission of entries belonging to a centre which is no longer active in this type of data.
25) *Act. NDS*	(rel. old action 27) Distribute corrected Münzel data after final corrections by CAJaD.
26) *Act. NDS*	(rel. old action 28) Distribute corrected L-series after final corrections by CDFE.
27) *Act. NDS*	(old action 33 continuing) Provide NEA-DB with an expanded list of errors in old entries from area 2 needing retransmission.
28) *Act. NDS*	(old action 34 continuing) Retransmit entry 22242 with an EXFOR G-series number.
29) *Act. NDS NEA-DB*	Investigate possibility to station NEADB EXFOR consultant at NDS.
30) *Recom. CNDC*	Try to find an EXFOR compiler to be trained by Liang.
31) *Concl.*	Remove the heading "For photonuclear data only" in all dictionaries where it occurs because these headings and quantities are used also for CPND.
32) *Act. McLane Schwerer*	To provide the necessary changes in Dicts. 24, 32 and 36.
33) *Concl.*	The quantities PAR,DA/DA/DE (proposed in memo CP-A/70) and PAR,DA/DA/DE,P/A/P are approved.
34) *Act. Schwerer*	Update Dict. 36 correspondingly.
35) *Act. McLane*	Update EXFOR manual: if more than one angle is given in (double- or triple-)differential data, they should be given in the same order as in SF7.
36) *Concl.*	Radioactive decay data should not be compiled into EXFOR. In case the proposal (Memo CP-A/71, items 1 and 2) is misunderstood and meant for something else, it should be resubmitted with additional information.

37) *Concl.*	Item 3 of memo CP-A/71 is cancelled (withdrawn by author).
38) *Concl.*	The quantities for relativistic heavy-ion collision and electron reaction data are approved as submitted in memo CP-C/208.
39) *Act. McLane*	Introduce a flag for relativistic heavy-ion data for all dictionaries concerned.
40) *Act. Schwerer*	Update dictionaries correspondingly (memo CP-C/208).
41) *Concl.*	The quantities proposed in memo CP-C/209 are approved: Dict.32: CRL correlation Dict.36: IND,FY,CRL independent yield of correlated fragment pairs.
42) *Act. Schwerer*	Update dictionaries accordingly.
43) *Act. Lammer*	Check existing codes for fission quantities for possible overlap with the case of memo CP-C/209 and existing EXFOR entries for necessary revisions.
44) *Act. McLane*	To check whether other correlation quantities can be changed to new formalism.
45) *Concl.*	Subentry 40420.002 should be coded ...(0,F)MASS,PR,NU
46) *Concl.*	Item 3 of memo 4C-4/57 (code DA/DE,N,RSD for Dict.36) is approved.
47) *Act. Lammer*	Reply to items 1, 2 and 4 of memo 4C/57 (codes PR,NU,FF, PRE,FY/DE, and PAR/IND,FY,G for dict.36) and propose solutions for the remaining questions on entry 40420 in a CP memo.
48) *Act. CJD*	Retransmit entry 40420 accordingly, after fulfillment of the previous action.
49) *Concl.*	The quantities ,AKE and ,MLT for dict.36, without a code in SF7, are approved as proposed in memo CP-D/249.
50) *Concl.*	If neutron data and CPND or photonuclear data are present in the same publication, they must be compiled in separate entries. The centre compiling the data should contact the centre responsible for the other data type and both centres should agree on who should compile the other data. The accession number should always be assigned by the centre responsible for the data type compiled in the entry.

51) *Concl.* The code 2GERUH for Univ. Hannover (formerly Techn. Univ. Hannover) is approved. The code 2GERTUH can be obsoleted and later be deleted from dict.3.

52) *Act. CAJaD* Regarding the question whether units BARN/UNIT OF LETHARGY/SR should be introduced, or, alternatively, units SEE TEXT should be allowed for DATA (currently SEE TEXT is allowed only for MISC): CAJaD is requested to contact the authors of the paper concerned, whether the original data are available in 'natural' units.

53) *Concl.* In general every effort should be made to compile data in existing units.

54) *Concl.* Units 'SEE TEXT' for DATA are not approved.

55) *Act. Schwerer* Send updated dictionaries for ANDEX to Tarkanyi.

56) *Act. McLane* To correct the wording in EXFOR manual p. 6.8 on secondary energies to be given with SF5=PAR (item 11).

57) *Concl.* Items 3 and 4 of memo CP/A-72 (new codes for dicts. 20, 27) are agreed.

58) *Concl.* ARZ- should be changed to EPA- in dict. 6.

59) *Act. CAJaD* To change ARZ- into EPA- in the EXFOR entry (entries) where it is used.

60) *Act. CAJaD* To change the REACTION codes in A0527.002,3 to TTY/DA/DE.

61) *Concl.* The dict. 27 update proposed in memo 4C-4/58 is approved.

62) *Act. Schwerer* Send detailed list of old pending retransmissions to NNDC and NEA-DB.

63) *Act. Wienke* Update Working Paper 9 (Frequently encountered errors in TRANS tapes) with collected comments.

64) *Statement* The meeting appreciated that, through comparisons of the NDS and CDFE versions of the EXFOR L-series, an apparent inconsistency in the photoneutron production data was discovered which actually means the presence of two different cross section types. Both types will be available in the revised version of the L-series which was sent to NDS by CDFE and will be distributed soon. This version therefore has considerably more data than the original L-series.

65) *Concl.* This new cross section type is the arithmetical sum of all reactions producing at least one outgoing neutron, NOT weighted by the neutron multiplicity (as opposed to the neutron production cross section coded ...(G,X)0-NN-1,,SIG). Since it is impractical to code this quantity as an explicit sum when more than 2 - 3 reactions contribute, it was concluded to introduce a new sum cross section ...(G,X)0-NN-1,UNW,SIG.

66) *Act. Schwerer* Submit an addition to the LEXFOR page 'Production cross sections' and appropriately update dicts.31 and 36.

67) *Act. Schwerer Varlamov* Introduce UNW,SIG in all subentries of the L-series where appropriate

68) *Act. Chukreev* Regarding B-series: to send to NDS a list of the changes made and/or detailed HISTORY entries.

69) *Act. NDS* To keep a backup copy of the original B-file.

70) *Concl.* CAJaD's version of B0135 is correct in principle but doesn't conform with earlier practice of entering renormalized data. In general, both sets of data should be given either in separate subents or as multiple reactions, distinguished by appropriate status codes.

71) *Act. CAJaD* To correct B0135 subents 8, 9 giving both the old and renormalized data as multiple reactions with status codes 'outdated' and 'renormalized' resp.. Therefore subentry 9 should be split into two subentries.

Fission Product Yield data

72) *Act. NNDC NDS* (old action 38 continuing) EXFOR retrievals by fission-product nuclides should be possible. While the old NDS EXFOR index provided this possibility, it is not yet possible in the VAX EXFOR retrieval system, which should be updated accordingly.

73) *Act. Lammer* (old action 39 continuing) To revise the LEXFOR entry on FP yields.

74) *Act. NDS* (old action 40) To distribute the ASIYAD-MIFI library.

75) *Act. Lammer* (old action 41 continuing) Submit a proposal on the coding of mass yields as a CP memo with information on corresponding measurements.

EXFOR compilation and checking on PC

76) *Act. Chukreev* Compare Working Paper 9 with error check program TEST-EXF.

77) *Act. NDS* To send the latest available version of TEST-EXF to McLane. (Done at meeting)

78) *Act. McLane* To make a benchmark test of TEST-EXF.

79) *Act. NDS* Send TEST-EXF to CNDC and RIKEN.

80) *Act. NDS* Check whether V. Osorio can be hired as a consultant for updating ANDEX.

81) *Recom. All* To consider to take over the updating of the ANDEX code.

82) *Act. Chukreev* Update TEST-EXF to accept blanks instead of zero's in col. 72-78.

83) *Act. NDS* To send the complete charged-particle EXFOR file to ATOMKI.

CPND compilation

84) *Act. NDS* (old action 55 continuing) To contact the authors of the Landolt-Börnstein CPND compilation to obtain a computer file of this database for free distribution, and to find out whether and how this group can contribute to the network in future.

85) *Act. NDS* (rel. old action 57) Check if the evaluated CPND file in ENDF-6 format by CNDC has been received.

86) *Act. Debrecen CNDC* (old action 58 continuing) Evaluations at Debrecen have been completed. They should be put in ENDF-6 format in cooperation with CNDC.

87) *Act. McLane* (old action 60 continuing) Try to find time to compile and distribute, after consultation with F. Chukreev, the EXFOR converted CPND file of R. White (Livermore) on light-element neutron-producing reactions.

88) *Act. CAJaD CNDC RIKEN ATOMKI* (old action 62 continuing) Inform other centres of plans for evaluation compilation of monitor reactions and of medical radioisotope production reactions, through regular consultation.

89) *Act. NEA-DB* To keep the NRDC network and specifically the CPND centres informed about developments for intermediate energy CPND.

90) *Act. NDS*	To distribute trans O001 to all CPND centers.
91) *Act. McLane*	To update the EXFOR manual to include the O series of accession numbers.
92) *Act. all CPND Centres*	To work on the duplications indicated in Memo CP/A-66.
93) *Concl.*	Coordinative function of CAJaD for CPND compilation is confirmed. Special attention will have to be given to high-energy and heavy-ion data where, however, there is at present no risk of duplication of efforts.

Photonuclear Data

94) *Act. CDFE JAERI*	(old action 69 continuing) Find out whether NEA, NDS, NNDC can obtain the data file containing the bibliographic data on photonuclear data.
95) *Recom. CDFE*	- To continue the EXFOR compilation of experimental data. - To continue the cooperation with CJD and JAERI to work towards an evaluated photonuclear data library. - To continue with the bibliographic index and possibly make this available not only in printed form but also as a computer file.

CINDA

96) *Act. NEA-DB NNDC*	(old action 42 continuing) To update the CINDA manual and the EXFOR manual with information about using diskettes (which format and density etc.) for EXFOR/CINDA transmissions.
97) *Act. NEA-DB*	(old action 43 continuing) Update CINDA manual to show that blank E-MIN field is now permitted.
98) *Concl.*	Literature coverage at NEA-DB: up-to-date with respect to major journals (see Working Paper 24) and with respect to EXFOR index lines but a serious backlog exists with respect to some LAB reports.
99) *Act. NEA-DB*	To convert the CINDA entries for JEF.
100) *Act. NDS*	Update coverage of INDC reports for CINDA.
101) *Concl.*	CINDA situation of CJD will be reviewed during the stay of Ms. Pakhomova at IAEA.

102) *Act. NDS* To transmit the recent CJD batch to the other centres.

103) *Concl.* CINDA situation at NNDC: main literature is covered but only for US experimental data and ENDF data. Supplementary coverage is done by NDS and NEA-DB.

104) *Act. all* Update handbook section and list of compilers.

105) *Act. NDS* Cover Gatlinburg conference.

106) *Concl.* Working Paper 10 (Memo 4C-3/74, Rev. 4 of 4 May 1995: CINDA manual revision: Coding of (2n,f), (n,n'f) and (n,2nf) reactions) adopted unless comments are received by 1 July 1995.

107) *Act. Lammer* To distribute the final version of WP 10 to the CINDA centres. *)

108) *Concl.* On CINDA compilation at CNDC and cooperation CNDC/NDS:
As a 1st step, Liang will compile for CINDA only blocks for EXFOR entries made by CNDC. No regular scanning of literature for CINDA will be done yet. Entries will be compiled by Liang in reader format (as far as possible with correct blocking); these entries will be sent to NDS by e-mail; NDS will do the checking and processing of CNDC CINDA entries.

109) *Act.NDS* Send to Liang:

a) A copy of the CINDA manual (current plus updates as continuing action);
b) CINDA entry forms, if any can still be found;
c) A partial CINDA file of Chinese labs, preferably in reader format;
d) A copy of the description of CINDA formats and the exchange system (by Monica Seits, if possible updated).

Evaluated data libraries

110) *Recom.* (old action 45 recommendation) When preparing evaluated data libraries, characteristic values (thermal cross sections, resonance integrals, etc.) should be quoted in the text or in accompanying documents <u>together with their uncertainties</u>; however, these values (and uncertainties) would be better usable if they were in a computer-readable file.

*) **Note added after the meeting:** since no further comments were received, WP10 as reproduced in this meeting report is the final version.

111) *Recom.*	(old action 46 recommendation) To collect lists of known faults in the evaluated data libraries, communicate these lists to the other originators data centres, possibly to include such lists in a forthcoming issue of NNDEN.
112) *Recom. CJD CNDC*	To transmit new BROND and CENDL evaluations as soon as possible after testing and finalization. The procedures adopted by NNDC to release updates in regular intervals (ENDF/B-6.2 and -6.3), are recommended.
113) *Recom. NEA-DB*	To possibly release JEF-PC to the network centres for their internal use costfree.
114) *Act. NEA-DB*	To distribute to the other centres their FTP access recording system for review and possible use.
115) *Recom. NNDC NEA-DB*	To strive at common procedures, methods, formats for obtaining processed data and to include JAERI, CJD and CNDC in the discussion.
116) *Act. all*	To develop a standard for the file transfer access of data files and related documentation.

Online systems and computer matters

117) *Act. NDS*	To take the responsibility for a WWW page on the NRDC network with drop-throughs to the other centres and initiate that the other centers provide drop-throughs to the network pages.
118) *Recom. NEA-DB*	To do the same for the international evaluation cooperation.

Address lists and document distribution

119) *Act. all*	To inform the NDS how they propose to handle the L- and U-document distribution and address list maintenance.

Citation of databases

120) *Act. McLane*	To develop an online EXFOR user manual to be used as a reference for the EXFOR system as a whole.

121) *Concl.* Reference guidelines for databases require further discussion. In the specific case of EXFOR the guideline given in WP 14 should be modified such that the journal article is quoted in the first place and the EXFOR ref. in the second place only. If the data in the journal and in EXFOR are not identical this should be mentioned explicitly.

Next NRDC Meeting

122) *Act. McLane* To finalize the date of the next NRDC meeting.
Note added after the meeting: The next NRDC meeting is scheduled for 3-7 June 1996 at Brookhaven.

Progess Report of the
IAEA Nuclear Data Section

H.D. Lemmel

(Note: This report is an extract taken from the 1993/1994 report to the INDC, see INDC(NDS)-336)

1. STAFF AND BUDGET

The budget for the Nuclear Data Section for 1993 and 1994 was 2,344,000 and 2,487,000 dollars US respectively. Staff costs represent approximately 70% of this amount leaving 30% for programmatic activities.

The Atomic and Molecular Data activity amounts to approximately 25% of the total budget. The remaining 75% is devoted to Nuclear Data activities. At full strength, the the staff consists of 12.0 Professional (P-Staff), 5.5 Support (G-Staff) and 4.5 Secretarial (G-Staff). Of these, 3 Professionals and 1 Secretary are assigned to the Atomic and Molecular Data Unit.

From July 1993 until December 1994 the Section was operating at full strength with 22 staff members. The vacant Section Head position formerly held by J. J. Schmidt was filled by C. L. Dunford who arrived in July 1993.

The Deputy Section Head, P. Obložinský arrived in May 1993 replacing D. Muir. The post vacated by Wang Dahai was placed in the Atomic and Molecular Data Unit and filled by R. Langley. In December 1994, S. Ganesan left the section at the completion of 5 years.

The budget for 1995-1996 was reduced by 250,000 and 350,000 US dollars respectively before inflation. This has resulted in a permanent staff reduction of 3, 2 Professional and 1 Support, by the end of 1996, resulting in an authorized staff level of 19. The reduction also required the elimination or postponement of some tasks. The staff reduction will be accomplished by eliminating the posts vacated by the departure of S. Ganesan and the retirements of N. Kocherov and G. Mundy.

BUDGET AND STAFF SUMMARY 1993 -1996

	1993	1994	1995	1996
Authorized Staff Level	22	22	19.9	19
Actual Staff Level	20.7	21.9	*18.9* *	*18.1* *
Staff Expenses	1,658,000	1,712,000	1,652,000	1,638,000
Programmatic Expenses	686,000	775,000	660,000	662,000
Total Budget US$ *Constant real dollars*	**2,344,000** *2,344,000*	**2,487,000** *2,487,000*	**2,312,000** *2,623,785*	**2,300,000** *2,736,608*

* *Estimates*

In the 1995-1996 period, we anticipate considerable staff turnover in addition to the loss of posts caused by the budget reductions. The Section Head position will be vacated in 1995. In addition, one other staff member will leave the Agency in 1995. In 1996, H. Lemmel will retire. Also in 1996, three contracts will expire which are unlikely to be renewed. Thus we can expect as many as 4 unfilled positions for some period of time in 1996-1997.

One position from the A+M Unit will be transferred to the nuclear data activity to complete the staff and budget reduction for the 1995-1996 period.

2. DATA CENTER OPERATION

A. Data Compilation

Data compilation in CINDA and EXFOR continued on schedule. In the years 1993/1994 eleven EXFOR tapes were transmitted to the other centers containing

54	new entries
297	data tables (= subentries)
2688	data lines,

coming from China (31 entries), Poland (6), India (4), Argentina (3), Bulgaria (3), Hungary (3), Czechia (2), Brazil (1), Pakistan (1). In addition, these EXFOR tapes included revisions of 178 earlier entries.

CINDA93 and CINDA94 were published, though with some delays due to the required reprogramming for the migration from the IBM to the VAX Computer.

The acquisition and documentation of evaluated data files had two peaks in summer 1993 and in summer 1994, as can be seen in the two newsletters

Nuclear Data Newsletter No. 18, Nov. 1993
Nuclear Data Newsletter No. 19, Sept. 1994.

The total catalogue of available nuclear data libraries by H.D. Lemmel is contained in the document

IAEA-NDS-7 Rev. 94/11	(available libraries), and
IAEA-NDS-107 Rev. 9	(joint index to BROND, CENDL, ENDF/B, JEF, JENDL).

The online nuclear data service is now in full operation. A Users' Manual by C.L. Dunford and T.W. Burrows is available as

IAEA-NDS-150 Rev. 94/9

B. Requests Statistics

1. Shipment by mail

Table 1 gives the request statistics for the past decade. For the purpose of the present statistics, any query for one of these categories defines a request. If an incoming letter asks e.g. for both experimental and evaluated data, it is counted as 2 requests. For example, the 831 requests received in 1994 correspond to 702 "incoming letters". On each request, one or more items may be sent out. For example, in Table 2 the notation 86/173 under Eval Data means that 173 evaluated data libraries have been sent out in response to 86 requests.

In the past decade the annual number fluctuated around

~700 incoming letters
with ~800 requests
resulting in ~1700 items sent out.

For the shipment of data files and codes several hundreds of magnetic tapes and PC diskettes are copied and sent each year, see Table 2.

In addition, about 80 tapes are shipped each year for the center-to-center data exchange.

The fluctuations in the statistics depend strongly on the release of new data libraries (e.g. ENDF/B-6 and JENDL-3 in 1990/1991) and on the distribution dates of the Nuclear Data Newsletter which announces the newly available data files and printed materials. The distribution of data files on PC diskettes becomes more and more popular because of the availability of new PC's with large hard disks.

Requestors from more than 80 countries have been served during the past 3 years. The list of countries is not much different from that given in the report 2 years ago, see INDC(NDS)-280 p. 28.

Whereas the conventional request statistics discussed so far is about constant, there was a strong increase in the online services during the past 3 years. It seems that this increased online service has not yet resulted in a significant decrease in the manpower-intensive shipment of magnetic tapes and diskettes.

Table 1. Data Request Statistics 1986 - 1994

	Biblio-graphic info	Docu-ments	Expt Data	Eval Data	Data processing codes	Total
1986	11/25	405/1430	46/56	86/173	40/91	588/1775
1987	21/48	725/2166	27/28	87/147	167/214	1027/2603
1988	5/19	681/1590	34/47	110/191	77/109	907/1956
1989	10/17	564/1418	32/38	96/222	61/94	763/1789
1990	2/3	424/1916	20/32	188/360	26/32	660/2343
1991	0/0	426/?	31/?	260/?	25/?	742/?
1992	0/0	507/?	27/?	237/?	142/?	913/?
1993	0/0	299/801	18/20	190/294	73/100	580/1215
1994	0/0	524/1567	17/23	226/293	64/92	831/1975

The notation, e.g. 86/173 under Eval Data, means that on 86 incoming requests 173 evaluated data libraries have been sent out. A question mark indicates that the detailed records have been corrupted.

Table 2. Shipment of Tapes and Diskettes by Year

Year	Magnetic tapes	PC diskettes
1990	214	(no records)
1991	457	(no records)
1992	143	(no records)
1993	125	367
1994	168	486

2. On-line nuclear data service NDIS

The usage of the online nuclear data service has increased strongly since it was started in 1992. At present, 176 active accounts are registered with 193 users from 38 countries. The number of retrievals made by the customers was

167	in 1992,
590	in 1993, and
3190	in 1994.

The list of countries is given in Table 3.

It should be noted that among the major users there are not only "neighbours" like Austria, Hungary, Czech Republic and Poland, but also remote countries like Australia, Korea, Brazil and USA.

It should also be noted that the increasing usage of the online services is in addition to the continuing services by conventional mail shipment.

NDIS, the online "Nuclear Data Information System" which is the topic of above statistics, offers interactive retrievals from the major systems such as CINDA, EXFOR, NUDAT and the ENDF formatted data libraries BROND, CENDL, ENDF/B, JEF and JENDL. In addition, the "FTP Service" has been started during the past 2 years. This service does not permit selective retrievals but rather electronic transmission of entire data libraries or codes through INTERNET FTP ("file transfer protocol"). For this new service, which has been used heavily for the shipment of FENDL data files to the participants of the FENDL cooperation, a statistical control system has not yet been developed.

Table 3. Online Service Users by Country

Country	Active Accounts	Users ("Names")
Argentina	1	3
Australia	13	15
Austria	17	22
Brazil	8	9
Bulgaria	1	1
Canada	2	2
Chile	1	1
Croatia	4	4
Czech Republic	12	12
Finland	1	1
France	4	5
Germany	6	6
Hungary	18	19
India	1	1
Ireland	1	1
Israel	6	8
Italy	6	6
Korea, Rep.	7	7
Latvia	1	1
Mexico	1	1
Netherlands	3	3
New Zealand	1	1
Norway	1	1
Poland	16	17
Romania	3	4
Russia	9	9
Slovakia	4	4
Slovenia	1	1
South Africa	2	2
Spain	3	3
Sweden	1	1
Switzerland	2	2
Taiwan	1	1
Thailand	1	1
Turkey	1	1
United Kingdom	4	4
U.S.A.	17	18
Venezuela	2	2
38 countries	**176 active accounts**	**193 users**

3. COMPUTER OPERATIONS

In December 1991, a Digital Equipment Corporation VAX cluster was installed with the Nuclear Data Section envisioned as the primary user. The central computer in that cluster is a VAX 4000-200. In the spring of 1992, application software developed by the U.S. National Nuclear Data Center located at Brookhaven National Laboratory was installed for use by NDS staff. The intention was to move all NDS computer usage from the IAEA's central computer, an IBM mainframe, as quickly as possible. However due to lack of staff, essential hardware and software, and training in the use of the NNDC provided application software, little progress was made toward that goal by the time of the last INDC Meeting in March 1993.

In July 1993, a decision was taken to complete the migration of the Section's computing activity from the IBM mainframe to the VAX by the end of 1994. In particular, the maintenance of the CINDA, EXFOR and evaluated data files has been completely performed on VAX since the Fall of 1994. Electronic access to all data bases over the INTERNET is fully operational.

Request services including tape generation have also been transferred. On the whole the migration objective has been successfully met with only a few tasks remaining to be completed before July 1995.

A. *Hardware and System Software Tasks*

The following hardware and system software related actions have been completed:

- All Staff have been supplied with terminals in their offices which connect directly to the VAX 4000 computer. Seven staff members whose work is most computer intensive have X-window terminals.

- The memory installed on the VAX 4000 has been doubled to the maximum possible, 64 Megabytes.

- The DEC D5100 front end (Unix Operating system) whose only purpose was to provide a gateway to external electronic networks was removed. Errors in the gateway software prevented it from completely fulfilling its function. MULTINET networking software was purchased for the VAX 4000 thereby providing full INTERNET access for NDS staff and for users of our online data service.

- Approximately 15 hours of training was supplied to all staff members who would be working on the VAX computer.

- A 4-mm digital-audio tape drive was installed to provide disk backup capability and for exchange of large amounts of data between data centres and in some cases with customers.

- Three CD-ROM drives were installed in order to provide access to VAX online documentation for users having X-window terminals.

- Two HP Laser Jet IV laser printers with 600 dpi resolution were added to provide high quality printed and graphic output.

- Recently, the DEC supplied system and layered-product upgrades have been installed removing a three year backlog.

- From January of this year, the a faster link between the IAEA and the global INTERNET electronic network has been in operation so that transfer of large amounts of data in this manner is practical.

B. *Application Software Improvements*

The following work has been completed or is nearly complete relative to improvement of the application software required to maintain, improve and distribute nuclear information.

- Software to produce the CINDA publication from the VAX data base has been completed and tested except for two tables in the book's appendix.

- A convenient video interface has been developed for updating the CINDA data base.

- The BNL325 computer program used by NNDC to produce the last "Barn Book" has been made operational using a readily available graphics software package. Improvements were incorporated at the same time.

- The NNDC address list and document distribution data base system has been implemented with numerous improvements to meet NDS requirements. Included is a comprehensive update program with a video interface.

- EXFOR dictionary system improvements agreed at the 1994 Data Centre Meeting were made with the help of a consultant from NNDC.

- Development of a VAX-based replacement for the Information Request Logging system written specifically for the IBM has been completed. It is now being tested prior to migrating that activity to the VAX.

- The online data service software is continuously being improved in cooperation with NNDC.

C. *Inter-centre Cooperation*

The major impetus for having similar computing facilities at each of the four core data centres was to be able to share software and expertise. In 1994 the CJD Nuclear Data centre at IPPE Obninsk purchased a DEC ALPHA computer. Now all four centres have DEC computers. Hopefully in the near future all centres will have DEC ALPHA computers. At the present time NDS and NNDC are jointly maintaining most of the application software with corrections and improvements rapidly exchanged via electronic network links. The software commonly used by NDS and NNDC was installed on the new computer at the CJD data centre in November 1994 by staff from both NDS and NNDC.

D. *Planned Computer Upgrade*

It became clear in the fall of 1994 that the NDS VAX 4000 computer usage had saturated. This was indicated by degraded interactive user response and reduced input-output performance. Such a situation was not unanticipated since the computer is relatively slow and outmoded by current computing standards. However, it had been anticipated that the computer would only replaced in 1996 or 1997. After a system analysis by DEC, improvements in operating procedures and reconfiguration of the computer system parameters resulting in an increased capacity of only about 5 percent were recommended. We have managed to put together sufficient funds from the 1995 Budget and the Deferred 1994 Budget to purchase a DEC ALPHA SERVER 2100 4/275 which will satisfy the NDS computing requirements for the next 5 years. We will replace only the central processor and the disk system, preserving our investment in other periferal hardware. The computer will have the memory, speed and input-output capacity to handle the data base maintenance, external online service and system software advances anticipated during that period. We plan installation in June 1995. The migration of NDS usage to the new computer will present little difficulty for our staff who are already familiar with the VMS operating system and for those responsible for migration of application software because of the successful migration already done at NNDC and the recent installation in Obninsk of the software used by NDS.

4. NETWORK COORDINATION ACTIVITIES

The network of eleven nuclear reaction data centers continued its smooth cooperation. There was a significant exchange of evaluated nuclear data files. The compilation and exchange of experimental data (EXFOR) and bibliographic data (CINDA) suffers significantly from lack of compilation manpower, and also lack of programming manpower needed for the updating of EXFOR processing and checking codes.

Status of data compilation

1. Neutron reaction data. The four centers, i.e. NNDC, NEA Data Bank, NDS, and CJD continue the compilation of new data in EXFOR and CINDA, however with serious delays due to lack of staff. This is illustrated in Tables 4 and 5.

   Considering that the delay from publication date to the center-to-center transmission of compiled entries may range from ½ year up to 3 years, the CINDA and EXFOR compilation from 1992 to present is far from satisfactory. This is also illustrated in the following table which shows the contents of the CINDA file by year, where the figures from 1992-1995 show a significant incompleteness of the CINDA file, even though a continuing decrease of neutron data activities must be assumed. The incompleteness of CINDA makes a complete data compilation in EXFOR presently impossible.

   The present situation is particularly disturbing for neutron data evaluators who are, obviously, primarily interested in the most recent data sets.

   In addition to the lack of staff for data compilation, there is a serious lack of staff for programming, specifically for the programming of new features in Exfor.

   On the other hand, the four centers have now reached the goal of using much the same software on VAX computers, so that all centers will benefit from updates made to this software which is programmed by C.L. Dunford and V. McLane.

Table 4. CINDA/EXFOR data transmission
(9 February 1995)

	Last CINDA entries received	Last EXFOR entries received
from NNDC	June 94	June 94
from NEA	May 93	March 94
from NDS	December 94	January 95
	(believed to be up-to-date and complete except for China)	

Table 5. Contents of CINDA by year
(13 February 1995)

Year	"Blocks" for experimental data in CINDA: 1. U.S., Canada	2. NEA	3. NDS	4. former USSR	Total
1980	344	526	167	336	1373
1981	360	433	206	227	1226
1982	332	601	369	160	1462
1983	209	300	153	372	1034
1984	279	429	126	128	962
1985	309	514	206	229	1258
1986	221	447	171	110	949
1987	238	341	91	380	1050
1988	161	495	100	184	940
1989	190	380	136	228	934
1990	118	329	78	224	749
1991	141	283	168	185	777
1992	85	160	70	171	486
1993	91	7	52	41	191
1994	15	0	11	0	26
1995	0	0	0	0	0

(retrieved 95/2/13)

2. Charged-particle reaction data and photonuclear data

For charged-particle reaction data and photonuclear data the EXFOR files have grown. Compilation is done for selected data without aiming at an overall completeness. Contributions were received from the two Japanese centers and the Chinese center. The last regular tape from CAJaD (Kurchatov Institute, Moscow) was received in Dec. 1993. However, in the meantime, F.E. Chukreev worked, on contract with IAEA, on the files compiled many years ago in Karlsruhe, and, on contract with NEA, on intermediate energy data which will be transmitted soon.

Significant amounts of photonuclear data have been compiled by V. Varlamov (Moscow University).

3. Nuclear structure and decay data

After serious discussions in the U.S. about the funding and continuation of the ENSDF project and the publication in the journal Nuclear Data Sheets, the evaluation work for ENSDF continues by cooperation of 16 groups in ten countries. In general, the update of the mass-chain evaluations is in reasonable intervals but available manpower is decreasing. Several new initiatives were started, e.g. on work coordination and priorities, on high-spin data, on improvements in file contents and data entry checking, etc.

ON CAJAD ACTIVITY.

S. Babykina

CAJAD, "KURCHATOV'S INSTITUTE", RUSSIAN NUCLEAR CENTER, MOSCOW.

After a Consultants' Meeting (Vienna, September 1992) significant compilation of Levkovskiy's book was carry out in our Center. It is work, containing more than 500 subentry, was transmitted to Data Centers as TRANS A028.

During to 1994 year our Center together with NEA-DB has collected and compiled experimental data about interaction proton medium energy with iron, nickel, carbon and thorium. First part of this activity has presented as O001 Trans. This TRANS includes 75 entries. Our cooperation is continuing and 100 Entries must be compiled in 1995.

Similar data were not compiled formerly. The majority of differential data have been published as illegible figures of little size. This data presentation does not save the experimental accuracy, as a rule. Sorry, but these data were not saved as data tables. We must acknowledge that some important details of these experiments are lost.

The examination of duplication for EXFOR entries had been executed by our Center. Memo CP-A/66 contains the results of this testing.

According to action # 27 (Paris meeting, 1994, 25-27 April) we have corrected the majority of format errors for B-library. This job have been executed due to financial support of IAEA and friendly atmosphere in NDS. We used CAJAD checking code to find format errors. But this checking code is improving constantly and old version could not find some errors. Improved version finds new errors and after needed corrections these data will be transmitted for Data Centers.

One additional remark regarding to B-library is needed. Checking code can find format errors only, but we do not know checking code to find physical errors. Sorry, but these errors exist in B-library too. Some physical errors were found during to format checking, but the majority is not found yet. We found additional errors in this library and corrected text will be transmitted before end of year. In order to find all physical errors the reading of 180 paper is needed. We have not possibility to check all physical errors. Therefore the evaluators must be attentive.

Let us me to discuss one problem which has been created by B-library correction experience. Our rules permit to use Vector Common Data formalism to compile big data tables. But using of this formalism is rarely. We find only one example of this formalism among 180 Entries of B-library. CAJAD refused to use this formalism as it is complex for preparation and understanding. We would like to propose to our colleagues to forbid Vector Common Data formalism in future. This formalism was needed for the times when the punched cards were used for data exchange. This formalism is not needed today.

According "EXFOR manual" rules, TRANSes must be transmitted on the magnetic tapes. However, collected experience shows the preference the data transmission on the floppy disks. This is quite understandable since this way is more reliable, convenient and cheap. The compressing of data is useful when large memory is needed to transmitted data.

We suggest:

-to legalize transmission of data on IBM compatible floppy disks;

-to accept a code (ZIP, ARJ or another) for data compressing.

Our Center improves quality the text-checking Exfor program constantly. During to the last years some corrections were included in this code aimed at better quality of checking. One version of the EXFOR text-checking code was demonstrated by Mr. Chukreev in Nuclear Data Section in October 1994. I have the last version (April 1995) of EXFOR checking code. The remarks of our colleagues for this checking code will be welcomed.

During to last years we developed four Trans (A028, A029, A030, A031), three of which was submitted earlier to the international network of Data Centers. I am going to transmit TRANS A031 today.

Chinese Nuclear Data Center (CNDC) Status Report in 1995

Zhuang Youxiang Zhao Zhixiang

1. General Situation

(1) Nuclear Data Evaluation

The major event at CNDC in 1994-1995 has been the accomplishment of CENDL-2.1 (Chinese Evaluated Nuclear Data Library, version 2.1), it includes the complete evaluated data for 68 nuclides and elements:

a. The secondary neutrons energy spectra have been modified for O-16, Na-23, Mg, Si, P-31, S, K, Ti, V-51, Zr, Cd, In, Sb, Hf, W, Au-197, Pb, Np-237 and Pu-239;
b. The total cross sections for natural S, K, Ti, Ni, Zr, Sb, Hf and Pb have been updated;
c. The gamma-production data have been supplemented in the data files for Ti, Zn, Zr, Mo, Cd, In, Sn, Sb, Hf, Ta-181, W, Au-197 and pb;
d. The re-evaluations for Ca and U-238 by using new model theory codes have replaced the oid one in CENDL-2.1;
e. The new evaluations for Fe-56, Lu, Hg, Tl and so on have been added in CENDL 2.1.

(2) Nuclear Theory and Calculation

Some progresses on nuclear theory and calculation are as follows:

a. The channel theory of fission with diffusive dynamics;
b. The quantum-mechanical preequilirium theory;
c. Intermediate and high energy reactions;
d. The maximum entropy method of analysis;
e Calculation of angular distribution with two-component exciton model;
f. U-235 and Pu-239,240 neutron induced reactions in En= 0.001-20 MeV;
g. Proton produced medical radioisotope Re-186 on accelerator Cyclone-30;
h. Analyses of p + B-11, p + C-11 and d + C-11 reactions.

(3) Chinese Evaluated Nuclear Parameter Library (CENPL)

The six sublibraries, atomic masses and characteritic constants, discrete level schemes and gamma radiation branching ratios, giant dipole resonance, level density, fission barrier and optical model parameters, have been set up. The studies of the relevant model parameters are being carried out.

2. Future work, Manpower and Priorities

(1) Future Work

The working plan of nuclear data for 1996-2000 is being worked out. In the next five-year period the CENDL-3 will be set up; it includes about 150 nuclei; the data of the main element will be evaluated according to its isotopes with double differential cross sections, gamma production data and covariance files; the agreement of recommended data with experimental ones will be better than those of CENDL-2; multigroup constant generation and validation will be simultaneously carried out.

(2) Staff

There are 18 senior scientists at CNDC. They are engaged in the following fields:

Neutron data evaluation 4;
Nuclear calculation and theory 5;
Charged particle and photonuclear data 1;
Nuclear Structure and decay data 1;
Fission product yield 1;
Atomic and molecular data 1;
Nuclear model parameter library 1;
Multigroup constant generation 1;
Benchmark testing 1;
EXFOR, CINDA and data format 1;
Data service and library management 1.

(3) Priorities

The top priorities for CNDC are to complete CENDL-3, and enhance the cooperations on neutron, charged particle and photonuclear data with other centers, due to the requirement of international exchanges and financial limit.

The CJD technical progress report to Nuclear Reaction Data Centers Meeting

Vienna 2-4 May 1995.

General

The major event at the CJD in 1994 had been the installation of the new ALPHA VAX computer and some personal computers.

At present we are still in a transitional period. We are exploting both new ALPHA VAX computer and old EC computer and some engineering staff split their time between old and new computers.

Exfor and CINDA

During one year (April 1994 - April 1995) the compiling procedure into EXFOR is continued on a steady level. Four TRANSes (4095-4098) were prepared and transmitted into the 4C network. A total number of compiled entries is 75 (33 new and 42 corrected).

Up to now it was prepared 3 CINDA Batches (CJD011 - 013), which contain 533 records (393 records were new).

All these EXFOR TRANS and CINDA Batches were prepared only on the EC computer. Obsolete EC computer and obsolete technology, which haven't been developed recently, were the reason of some delays and errors in TRANSes and Batches. We are going to prepare next EXFOR TRANS and CINDA Batch both on ALPHA VAX computer and on EC computer. When we are completlly sure of readiness full EXFOR and CINDA technology on ALPHA VAX computer, EC computer will be closed.

Computer matters

In the CJD new computer ALPHA AXP 3600 S with open VMS AXD v. 1.5 was installed and a local network on the base of ALPHA, microVAX terminals and personal computers 486DX was realized.

Ch. Dunford and W. Kropp have helped us greatly to put into operation DBMS 5.1 (which the CJD had on temporary licence) and the NNDC on-line system. At the present time the DBMS 6.0 is in process of testing and we suppose that installation of DBMS 6.1 will finally take place.

Evaluated data

The CJD is engaged strongly in data evaluation activity and formation of data libraries for different applications and in plotting data for handbooks. In this connection much efforts are spent to put into operation and/or develop necessary programs for data processing and plotting on personal and on the ALPHA computer. One of task is to realize transmission of cross sections from EXFOR into computational format and to plot its on PC only or on PC from ALPHA computer. Computational format for differentional cross sections and relevant programs are in process of development.

Evaluated activity

1. The work on preparation of the new versions of the evaluated data files for 56-Fe and 52-Cr was done. This work was based on group averaged evaluation of cross sections and covariance matrices of uncertainties made in IRK.

2. The work on evaluation of general purpose file for 127-I was completed by expansion of existing fission product file from JEF-2 library.

3. The evaluation of neutron data of $^{64,66-68,70}Zn$ isotopes was made for BROND-2 library. The files of Zr-nat and Zr isotopes, Sn-nat, ^{93}Nb were corrected, added and improved for FENDL-1 project. The files of $^{204,206-208}Pb$ and ^{209}Bi have been improved as well.

4. Some work was made to test, correct and improve the Russian Dosimetry File (RDF-94). The evaluations of $^{23}Na(n,2n)$ and $^{75}As(n,2n)$-reactions have been made for the file. The description of the RDF-94 is in progress.

5. Comparison was made of experimental data and evaluated data from all the libraries of general purpose for nuclides which are of interest for FENDL-1 project .

6. An analysis of many threshold reactions from all available evaluated data libraries is in progress. Systematics are used as a criterion for selection. New evaluations are made for the gas production library and some reactions leading to long-lived nuclides.

7. In cooperation with Moscow Institute of Engineering Physics the work is under way to improve and expand the ASIYAD fission product yield library.

8. The testing of some BROND-2 neutron data files has been made using results of integral experiments on spheres.

9. The BOFOD library was expanded due to evaluation of gamma absorption cross sections for many structural materials. At present time the preliminary version of the evaluated photoneutron data library for 66 materials and/or their stable isotopes.

10. Last year the Russian Nuclear Data Commission recommended nuclear data standards from the 1991 NEANDC/INDC Nuclear standard file (see NEANDC-311U) for neutron measurements in Russia. In this connection the CJD prepared the document (in Russian), containing recommended values.

Customer Service

New computer equipment has resulted to the easier retrieval from different data bases and so to higher level of request activity. Traditionly the most of requests are on the EXFOR and ENDF data. One should note that experimental data from EXFOR as rule are requested in the computational format.

In connection to development of specialized data bases and to preparation different handbooks, papers and so the number of requests from other evaluated data bases has increased.

List of main publications of CJD

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K.I.Zolotarev, V.N.Manokhin, A.B.Pashcsenko. Evaluation of the Pr-141(n,2n)Pr-140 reaction cross section in the energy range from threshold up to 20 MeV. J., Yadernye Konstanty, 1994, v.2 (In Russion).

V.N.Manokhin. Evaluation of the Na-23(n,2n)Na-24 reaction cross sections. J., Yadernye Konstanty, 1994, v.3 (In Russion).

V.G.Pronjaev. Evaluation of the I-127 cross section for transport calculations in a large NaI-detectors. J., Yadernye Konstanty, 1994,v.3 (In Russion).

A.I.Blokhin, V.V.Sinitsa. Integral testing of the BROND-2 data files for FENDL-1. Report to the IAEA advisory group meeting on "Improved evaluations and integral data testing for FENDL, Garching, Germany, 12-16 september 1994.

A.I.Blokhin, V.V.Sinitsa. Integral testing of the BROND-2 files for silicon, zirconium and niobium. J., YK,1994, v.2, p.21.

A.I.Blokhin et al Atlas of photon energy-angular distributions produced in neutron interactions. J., Yadernye Konstanty, 1993, v.2, p.3.

A.I.Blokhin, V.V.Sinitsa, A.V.Ignatyuk. Report to the Gatlinburg conference.

Work in progress

Evaluation of cross-sections for Ni-isotopes.

Evaluation of threshold reaction cross-sections for gas production file.

Evaluation of Pa-231 neutron cross-section for Brond-2.

Evaluation of gamma-ray production data for Bi-209 and for the lead isotopes.

NATIONAL NUCLEAR DATA CENTER

Status Report
to the
Consultants' Meeting
on Technical Aspects of Co-operation
of the Nuclear Reaction Data Centers
2 - 4 May 1995

General

Since the last meeting of the Nuclear Reaction Data Centers in April 1994, our staff has been decreased by 1/2 scientific/professional and 1/2 support positions (there are currently 5.3 full-time equivalent scientific/professional and 3.5 support staff). We also have one consultant who is responsible for the coding of Nuclear Structure Reference entries.

Computer Facilities

We have installed 6 new NCD X-Windows terminals which operate through one of the DAT Work Stations on the Compute Server , and allow us access to applications available on this system. A diagram of the Compute Server Setup is attached. We have also acquired 5 additional terminals which are awaiting installation, and 2 IBM-compatible PC's. The VAX 11/780 has been shut down.

Bibliographies

The NSR activity has continued. One supplement of *Recent References* has been published.

The CINDA compilation activity has continued at a reduced level. Only those references associated with the experimental data compiled at the Center have been entered. In the period from April 1994 through April 1995, 1 CINDA transmission has been sent (BNL142).

Data Libraries

In the period from April 1994 through April 1995, 2 neutron data transmission tapes (TRANS 1257-1258) were sent containing new and corrected entries.

Two data sets containing high-energy particle-production data, one for proton-induced and one for Si-induced reactions, have been compiled. Methods for specifying such data are being developed.

Evaluated Nuclear Reaction Data

NNDC continues to coordinate the work of the Cross Section Evaluation Working Group.

Release 3 of ENDF/B-VI has been prepared and will be transmitted shortly. The ENDF-102 Formats and Procedures Manual has been converted to WordPerfect and will soon be available through the Online Service. The ENDF-202 Benchmark Specifications is currently being converted.

Nuclear Structure Data

NNDC continues to publish the ***Nuclear Data Sheets***. As of April 1995, issues through Volume 74, #3, have been sent to Academic Press.

Customer Services

There were 224 requests processed in-house. Of these, 156 were for documents, 27 for ENDF, 19 for CSISRS(EXFOR), 12 for ENSDF, and 9 for bibliographic information.

The use of the online data service has steadily increased. There are nearly 2000 customer accounts which may have more than one user. There are now about 6000 retrievals per month; they average about 35% NSR, ~17% ENSDF, 25% NUDAT, 10% ENDF, and 5% CSISRS.

The NNDC now has a home page on WorldWideWeb. The user may read the NNDC Brochure and Newsletter, and may download selected programs, data files, and manuals. MIRD and a mirror to the Korea Atomic Energy Research Institute Table of Nuclides may be run directly, or the user may select to telnet directly to the NNDC online system. Links to other Web pages of interest to users of nuclear data are also provided.

R #6

OECD - Nuclear Energy Agency Data Bank

Status Report to the

Consultants' Meeting on the

Technical Aspects of the Co-operation of Nuclear Reaction Data Centres

2- 4 May, 1995

General

Over the last few years, staffing levels at the NEA Data Bank have been reduced; current staff levels are 10 professional staff, and 8 support staff. In addition, following a change in position, the role of C. Nordborg is now focused more towards the work of the Nuclear Science Committee. The post formerly occupied by C. Nordborg will be shifted to reactor physics projects, leaving one full time professional staff and 0.25 support staff dedicated to nuclear data activities. This has necessitated increasing use of outsourcing in the form of consultants for traditional 4C activities.

Computer Facilities

The NEA computer facilities have traditionally been upgraded every five years. A study has been commissioned and carried out on the possible evolution of the current system, with a view to upgrading the system in future, on a rolling three year cycle.

As a result of that study, replacement of the current system (Fig 1) by a decentralised system configuration was recommended by an ad hoc Working Group meeting held in February 1995, based on one specialised server per function (e.g., one server for computer program services, one for data services, one for on-line access etc), complemented with X-windows terminals, PC's and a few workstations (Fig. 2).

In parallel to these hardware modification, software development plans include a change in operating system, from VMS to UNIX, and a transfer of the data bases from DBMS to ORACLE. During this migration period, both old and new systems will be fully maintained until the new systems have been rigorously tested. The changes will be performed in a stepwise manner over the period 1995-1998.

To date, the EXFOR database has been migrated to ORACLE, and migration of the evaluated data (EVA) database is nearing completion. The CINDA and TDB (Chemical Thermodynamic Data) will be migrated by the beginning of 1996.

CINDA

The compilation effort in 1994 was again seriously affected by staff shortages. At the beginning of 1995 a consultant was used to compile the backlog, and the coverage is now reasonably complete up to the beginning of 1995 for both major and minor journals. CINDA coverage performed by JAERI has been consistent, but some batches were not transmitted promptly due to an administrative error at NEA - this has now been rectified.

One of the main problems with using consultants for infrequent but intensive compilation, is the irregularity in transmission of CINDA exchange batches. An external consultant has been hired to perform **regular** compilation work for the remainder of 1995, and it is hoped that this will allow future compilation of CINDA to be more homogenous.

EXFOR

Data compilation for EXFOR has suffered as a direct result of the long periods of inactivity between compilation work for CINDA. The backlog of CINDA entries recently compiled will need to be examined to identify suitable entries for EXFOR compilation. One batch of 23 entries has recently been transmitted, together with a batch of about 100 entries in the field of intermediate energy data. It is foreseen that a similar number of entries in both these categories will be compiled in 1995.

Evaluated Data - Joint Evaluated File

The close cooperation which has always existed between the JEF and the European Fusion File (EFF) project, will be further strengthened following the decision taken at the last meeting of the JEF Scientific Coordination Group (SCG) to initiate work on a common JEF/EFF library called JEF-3. Members of the JEF and EFF projects have been selected to form a working group charged with the creation of a starter file JEF-3, based on a selection of evaluations taken predominantly from JEF-2.2 and EFF-2.4, but also from other evaluated libraries currently available.

At the last JEF SCG meeting, Massimo Salvatores stepped-down from his position as chairman of the JEF project; he was succeeded by Phillip Finck (Cadarache).

Two publications related to the JEF project were issued in 1994; JEF Report 13 on radioactive decay and fission yield data, and JEF Report 14 on simple integral neutron cross section data from the main evaluated libraries.

Also released, as an electronic publication was the JEF-PC package for displaying data from the JEF-2.2 library. The package was released in November 1994 and, to date, approximately 200 copies have been distributed. Work is planned for 1995 to include more features including additional data types and search utilities, and an ability to use the program for displaying data from any evaluated library in ENDF format.

The JEF-2.2 general purpose library is also available in pointwise format at 300 K (processed using both NJOY and RECENT). A pointwise library at 0 K has just been generated using NJOY-94, but is still untested. Documentation for the JEF library will be produced during the course of 1995, and work on generating groupwise libraries is expected to commence in the latter half of the year.

Online Services

Work is ongoing to continuously enlarge the scope of the material available via the NEA Online Services. In addition to the traditional data and program services offered, documents from other divisions of the NEA (Nuclear Science, Nuclear Safety, Nuclear Law, Radioactive Waste Management) are now also available. A World Wide Web server is currently under construction.

Migration of the data bases to ORACLE has resulted in the development of new more user-friendly retrieval screens in the online system, permitting greater flexibility in specifying the search criteria and providing more online-help in the form of scroll-down menus of available parameters. The new ORACLE EXFOR database and retrieval interface is currently running in parallel with the existing database. The new evaluated data database should be ready shortly.

The move towards self-service data transmission has been further facilitated through the use of FTP transfer of evaluated data libraries. All the major evaluated libraries are now available in this way.

Request Statistics

In 1994 the Data Bank made 153 "manual" dispatched of nuclear data, to 83 different requesters. These requests were concerned mainly with large volumes of data or complex database retrievals. About 55% of the requests were for evaluated data, 20% experimental data, and about 25% documentation.

The number of access to the on-line data bases double during 1994, from about 1400 in 1993 to over 2800 accesses in 1994 (32% evaluated data, 28% structure data, 23% bibliographic information, 17% experimental data).

1994 On-Line Statistics for Nuclear Data Services

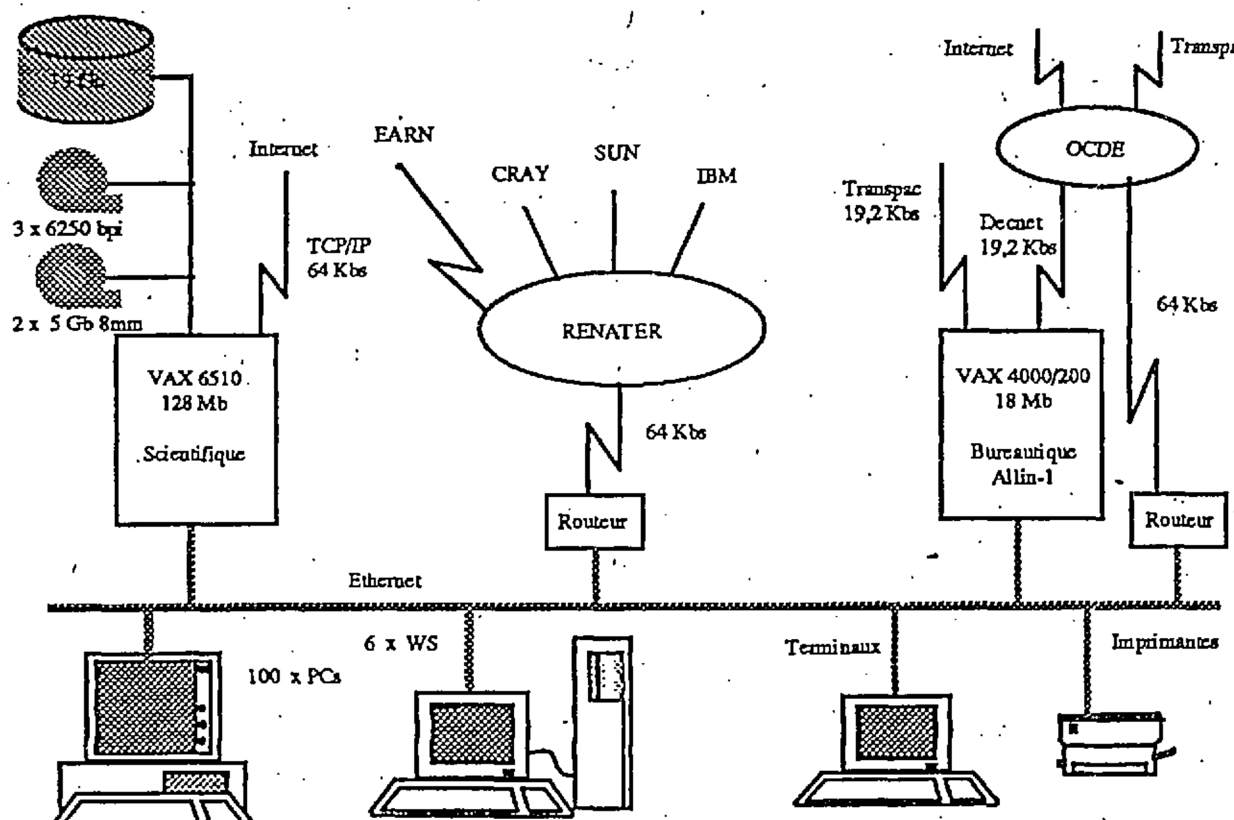
Member Country	Exp	Eva	Str	Bib	Tot
AUSTRIA	19	3	40	23	85
BELGIUM	58	18	62	53	191
CANADA	1	0	2	6	9
FINLAND	10	5	82	26	123
FRANCE	172	152	276	327	927
GERMANY	46	114	72	41	273
GREECE	0	3	1	3	7
ITALY	38	11	36	16	101
JAPAN	19	3	9	6	37
KOREA (REPUBLIC OF)	15	7	20	10	52
NETHERLANDS	4	3	8	4	19
SPAIN	7	3	6	5	21
SWEDEN	17	4	12	15	48
SWITZERLAND	14	527	56	70	667
TURKEY	0	1	0	0	1
UNITED KINGDOM	27	15	105	35	182
UNITED STATES OF AMERICA	10	6	0	14	30
???	17	13	10	4	44
TOTAL :	**474**	**888**	**797**	**658**	**2817**

1994 Manual Request Statistics for Nuclear Data Services

Member Countries		Requesters	Requests
ARGENTINA	ARG	1	2
BELGIUM	BLG	2	5
CANADA	CAN	1	4
U.S.S.R.	CCP	1	2
FRANCE	FR	19	35
FED. REP. OF GERMANY	GER	12	16
GREECE	GRC	1	1
HUNGARY	HUN	3	5
INDIA	IND	1	1
ITALY	ITY	3	10
JAPAN	JPN	2	5
NETHERLANDS	NED	5	8
SOUTH AFRICA	SAF	1	2
FINLAND	SF	2	2
SPAIN	SPN	1	1
SWEDEN	SWD	2	4
SWITZERLAND	SWT	4	7
UNITED KINGDOM	UK	15	28
UNITED STATES	USA	6	7
BELGIUM	ZZ1	1	8
	Total	**83**	**153**

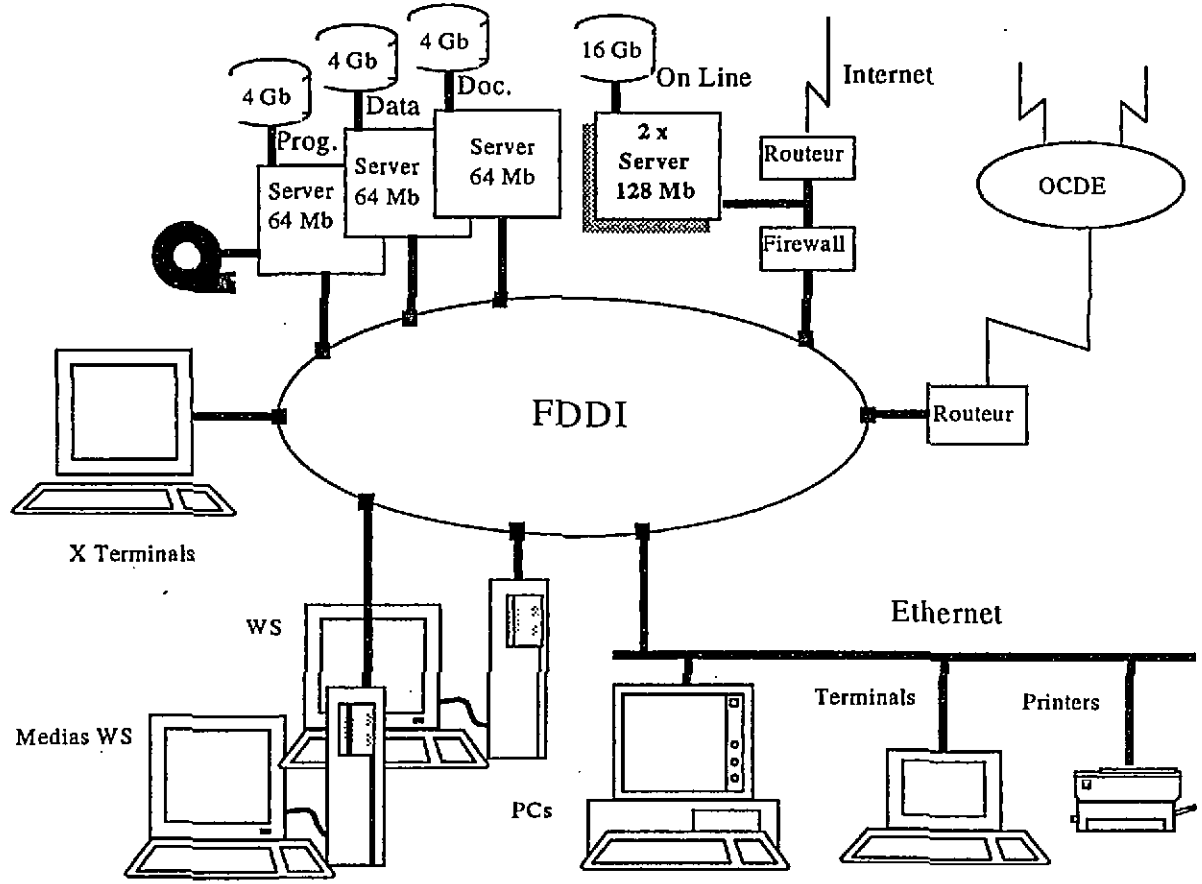
The Existing Computer System

Hardware & network



(figure 1)

Proposed New Computer System



(figure 2)

RIKEN Nuclear Data Group

Consultants' Meeting of the NRDC for Technical Aspects
Vienna, 2-4 May 1995

Y. Tendow

EXFOR

We continue to collect and compile the production cross section data for radioisotopes of medical use and also some other nuclides. This year, our compilation works are rather slowed down due to an entire replacement of the central mainframe computer along with an attached curve reading system. The compilation works are conducted by PC and ANDEX program. The compilation of old data left off the EXFOR as well as new ones is in progress since previous year.

ENSDF, NSR

We continue the mass-chain evaluation as a member of the Japanese ENSDF working group. A = 129, 120, 127 evaluations or updates are now in progress.

NSR file compilation for secondary sources (Annual reports etc.) of Japanese origin published in 1994 shown below has completed and sent to NNDC.

RIKEN Acc. Prog. Rep. 1993	35 (reports)
JAERI-TV Annual Rep. 1993	16
JAERI-TIARA Annual Rep. 1993	4
OULNS Annual Rep.(Osaka Univ.) 1993	23
RCNP Annual Rep.(Osaka Univ.) 1993	34
INS Annual Rep.(Tokyo Univ.) 1993	19
UTTAC Annual Rep.(Univ. Tsukuba) 1993	9
CYRIC Annual Rep.(Tohoku Univ.) 1993	5
KUTL Tandem Acc. Rep.(Kyushu Univ.) 1991-1992	32

The compilation works for 1995 secondary sources are now in progress.

Computers

The central mainframe machine FACOM M1800/10 has been disused and replaced by a new distributed processing system (UNIX) that consists of several server machines DEC7000/740 (2 GB memory, 4 CPU), DEC3000/900 (1 GB memory), DEC3000/700 (256 MB memory) × 8 and workstations. The system is inter-linked through nodes on an FDDI (100 Mbps) network with other local FDDI networks, a super computer FACOM VPP500, many workstations, X-terminals, peripheral devices and PC's throughout RIKEN.

Nuclear data group is at present using PC's for data input and compilation works because of that the EXFOR and ENSDF program packages which so far have been running on the mainframe are not transferred onto the UNIX or VAX system yet.

Staff

3	"professional",	Y. Tendow	(proper).
		A. Hashizume	(part-time).
		K. Kitao	(part-time).
1	"general service",	Y. Kidachi	(part-time).

RIKEN Nuclear Data Group is expecting a considerable change in the staff next year. Proper member Y. T. is to retire from regular position and to be a non-regular member (the title in EIKEN is Collaborative Scientist) by the end of this fiscal year. We have to search a measure to maintain or enhance present activities, such as acquisition of new member and/or making close cooperation with other domestic data centers. In any case, we are to continue the works we are doing now.

DEBRECEN CHARGED PARTICLE NUCLEAR DATA GROUP STATUS REPORT 1995

IAEA NRDC Meeting, Vienna 1995

EXFOR

In 1994, we compiled 20 new entries with EXFOR format. Total of 35 entries were sent to IAEA NDS for EXFOR cheking. Corrections and compilations of new entries are under progress. According to the previous agreement our group is continuing his effort to compile new CP data measured in Julich and in Debrecen and compile old data from all over the word used in our evaluation work.

COSTUMER SERVICES

The main items requested were evaluated data for some important reactions used for isotope production and monitoring charged particle beams and EXFOR data for several other special reactions used in cyclotron application.

COMPILATION AND EVALUATION OF SELECTED REACTIONS

We continued the compilation and the critical comparison of several selected reactions used for production of medically important radioisotopes, for monitoring charged particle beams and for wear measurements. Compilation and evaluation of cross sections for production of ^{11}C, ^{67}Ga, ^{111}In, ^{123}I and ^{201}Tl PET and SPECT isotopes and p, d, alpha and ^{3}He induced monitor reactions on Cu, Ti, Ni and Fe are in progress. The results were already published or will be published in international journals.

NEW CROSS SECTION DATA

Measurement of cross sections for monitoring beam performance for isotope production and for Thin Layer Activation technique have been continued. The aim of the studies was to complete the available data sets used in the most important applications and to clear the discrepancies arising during evaluation of these data.

Monitor reactions

Measurement and data evaluation for *proton induced reactions* on ^{nat}Au have been completed. Cross sections were measured over the energy range from 2 to 36 MeV for *^{3}He induced reactions* on natural Nickel. New experiments were done to measure and to check the excitation functions of ^{3}He induced reactionson ^{nat}Cu and ^{nat}Ni. Remeasurement of excitation functions of *alpha induced nuclear reactions* on natural Nickel was performed to investigate their potencial use as monitor reactions. New irradiations were done to determine the excitation functions of *deuteron induced reactions* on ^{nat}Ti and ^{nat}Cu.

Reactions for isotope production

Excitation functions of $^{124}Te(p,xn)^{124,123}I$, $^{40}Ar(\alpha,p)^{43}K$, $^{67,68}Zn(p,xn)^{67}Ga$, $^{nat}Sb(\alpha,x)^{123,124}I$ and $^{nat}Sb(^{3}He,x)^{123,124}I$ have been measured to complete the data base for production of the isotopes for medical and ecological purposes.

Reactions for Thin Layer Activation technique

^{7}Be isotope is a good tracer for measurement of wear and erosion with nuclear activation technique. Experimental cross sections of of $^{nat}B(p,x)^{7}Be$, $^{nat}C(^{3}He,2\alpha)^{7}Be$ and $^{nat}Be(^{3}He,\alpha n)^{7}Be$ reactions have been measured and their application for wear have been studied.

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Applied Radiation and Isotopes **46**, 249(1995)

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Investigation of the charged particle nuclear reactions on natural Boron for the purposes of thin layer activation(TLA)
Nuclear Instruments and Methods in Physics Research "B", submitted

F. Ditrói, S. Takács, F. Tárkányi and I. Mahunka;
Study of the $^{nat}C(^{3}He,2\alpha)^{7}Be$ *and* $^{9}Be(^{3}He,\alpha n)^{7}Be$ *nuclear reactions and their applications for wear measurements*
Nuclear Instruments and Methods in Physics Research "B", submitted

A. Fenyvesi, F. Tárkányi, F. Szelecsényi, S. Takács, Z. Szücs, T. Molnár and S. Takács;
Measurement of excitation function and thick target yield of the $^{40}Ar(\alpha,p)^{43}K$ *reaction.*
Applied Radiation and Isotopes, submitted

Japan Charged-Particle Nuclear Reaction Data Group
— Status Report to the NRDC Meeting from 2 to 4 May 1995 —

Hajime TANAKA
Chairman of the Executive Committee of JCPRG

1. A general view of JCPRG activities in 1994

In one year from April, 1994 to March, 1995, we have compiled 3 MB CPND newly produced in Japan. Our goal is to completely compile and store all the Japanese CPND produced each year to NRDF, and seems to have been accomplished these 2 or 3 years. Our activities largely owe to the support from the cooperation with nuclear experimentalist. The JCPRG consists of theoretical nuclear physicists and information scientists. So it is indispensable for pursuing our work smoothly to secure the cooperation with experimental nuclear physicists.

We gratefully welcome the reconstruction of the international nuclear data centers' network. To fulfil our responsibilities in the network, we must have a steady domestic organization in Japan. Throughout this year, we have had many discussions on this issue and constructed a firmer basis of our JCPRG activities in cooperation with a community of nuclear experimental physicists.

In the meeting of the NRDF advisory committee, which was held on 28 March, 1995, we had conclusions on our responsibilities and remarks on the international nuclear data centers' network. We have confirmed our responsibilities;

(1) Compiling all CPND produced in Japan with NRDF;

(2) Translating data in NRDF into EXFOR format;

(3) Making a combined index database for the CPND in both of NRDF and EXFOR for the convenience of the customers in Japan;

(4) Distributing CPND and Promoting utilization within Japan.

The remarks discussed on the network in the meeting of the NRDF advisory committee are as follows:

- We support the nuclear data centers network for a world-wide cooperation of nuclear data centers.

- It is expected that nuclear data will be more and more important in many fields of nuclear science and technology. At present, our NRDF is aimed at an academic-oriented database, though it can of course be utilized for application purposes.

- In "The Nuclear Data Centers Network"(pp.1 $\sim$ 2) of the Network Document, we cannot find no expressions of importance and scope of nuclear data in academic or scientific usage. We hope that academic or scientific purposes of nuclear data should be mentioned in the document.

- Many centers other than four "Core Nuclear Data Centers" are included in "Other Nuclear Data Centers." Explanation of "Other Nuclear Data Centers" seems to be too brief. For further developments of regional and national activities of "Other Nuclear Data Centers", we hope that "the Network Document" gives more explicit and detailed explanation of present and further roles of " Other Nuclear Data Centers" with appreciation.

2. Organization and members of JCPRG

Since the organization and members of JCPRG in a period from April, 1994 to March, 1995 have been reported in the previous NRDC meeting on 25-27 April, 1994, we here report a new organization and members from April, 1995 to March, 1996.

The JCPRG is organized by two committees and secretariat in order to accomplish above four duties.

Advisory committee:

Yasuhisa ABE (Research Institute for Fundamental Physics, Kyoto Univ.)

Yoshinori AKAISHI (Institute for Nuclear Study, Tokyo Univ.)

Yasuo AOKI (Tsukuba Univ.)

Junsei CHIBA (National Institute for High Energy Physics)

Masayasu ISHIHARA (Tokyo Univ.)

Ichiro KATAYAMA (Institute for Nuclear Study, Tokyo Univ.)

Mituji KAWAI (Kyushu Univ.)

Yasuyuki KIKUCHI (Japan Atomic Energy Research Institute)

Tetsuo NORO (Research Center for Nuclear Physics, Osaka Univ.)

Shunpei MORINOBU (Kyushu Univ.)

Hajime OHNUMA (Tokyo Institute of Technology)

Hikonojo ORIHARA (Cyclotron and Radioisotope Center, Tohoku Univ.)

Teijiro SAITHO (Tohoku Univ.)

Hajime TANAKA (Sapporo-Gakuin Univ.)

Yoshihiko TENDO (Institute of Physical and Chemical Research)

Executive committee:

Hajime TANAKA (Chairman, Sapporo-Gakuin Univ.)

Kiyoshi KATO (Vice-Chairman, Hokkaido Univ.)

Akira OHNISHI(Hokkaido Univ.)

Shigeto OKABE (Hokkaido Univ.)

Toshiyuki KATAYAMA(Hokusei-Gakuen Univ.)

Yoshuharu HIRABAYASHI (Hokkaido Univ.)

Hiroshi NOTO (Hokusei-Gakuen Univ.)

Masaki CHIBA (Sapporo-Gakuin Univ.)

Hitomi YOSHIDA (Assistant, Hokkaido Univ.)

Shigeo MUKAI (Assistant, Hokkaido Univ.)

Secretariat:

Hitomi YOSHIDA (Hokkaido Univ.)

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Working Staff:

(1) Data compiling:
Hirokazu TEZUKA(Tokyo Univ.)
Takahisa KOIKE(Institute for Nuclear Study, Tokyo Univ.)
Yuka AOKI(Tohoku Univ.)
Yasushi NARA(Hokkaido Univ.)
Shigeyoshi AOYAMA(Hokkaido Univ.)
Naoyuki ITAGAKI(Hokkaido Univ.)

(2) Data input:
Takako ASHIZAWA

NRDF System Maintenance:

Shigeo MUKAI(Hokkaido Univ.)

Working Staff of Transformation from NRDF to EXFOR:

Masaki CHIBA(Sapporo-Gakuin Univ.)
Toshiyuki KATAYAMA(Hokusei-Gakuen Univ.)

3. Recent progress

(1) Compiling CPND produced in Japan

We have been compiling CPND produced in Japan with the NRDF format since 1987 constantly. In 1994, we have newly added 56 entries and 1,328 sub-entries (3.0 MB) in the NRDF library. These newly added entries are the ones that were all produced by accelerators in Japan.

Main institutes are

- Tohoku Univ.(CYRIC)
- Tsukuba Univ.(UTTAC)
- Institute or Nuclear Study, Tokyo Univ. (INS)
- Tandem Accelerator Labo., Kyushu Univ.
- Research Center for Nuclear Physics, Osaka Univ. (RCNP)
- JAERI Tandem, LINAC & V.D.G.
- RIKEN Accelerator.

Almost all CPND produced from these institutes have been stored in NRDF. By March 1995, amount of the data compiled have reached 22,933 entries of about 63 MB.

(2) EXFOR translation

In 1994 we submitted to NDS TRANS E012 and E013. These are re-transmissions of TRANS E010 and E011. The TRANS E012 contains 25 entries. These entries were re-translated from NRDF so as to satisfy the "Comment on TRANS E010 by, O.Schwerer, 1992-08-25" except E1315, E1350, E1357 and E1358 entries. The TRANS E013 contains 25 entries, which were also re-translated in accordance with the "Comment on TRANS E011 by O.Schwerer" except E1428 entry. The Entries included in TRANS E010 or E012 but not in E012 or E013 have not yet been successfully re-translated. When corrections for the entries are successfully done, we will re-transmit.

(3) Index information system of CPND

A retrieval system for the index information of CPND has been installed in Hokkaido University Computing Center. The ORION Information Retrieval System is employed for the installation. The purpose of this retrieval system is to open the way for the researchers in Japan to get benefits from utilizing the Charged-Particle Nuclear Reaction Data which are complied and stored in EXFOR libraries.

(4) Customer service

We are realizing that Customer services should be emphasized. Our activities have been reported by "NRDF ANNUAL REPORT" to almost all nuclear physicists and some nuclear engineers in Japan since 1988. Each one contains regular reports such as NRDF data compiling, the EXFOR translation and other relating matters, and some topics which may direct our activities in advance.

Some topics in the recent report, "NRDF ANNUAL REPORT 94" are

- Validating Versions of 'Hierarchical Index Classified by Terms for NRDF Codes Dictionary' and 'Field-Codes to Value-Codes Correspondence Dictionary' and Their Evaluations
- NRDF Coding Manual
- NRDF Quick Retrieval Manual
- A Plan for Developing 'NRDF Coding Editor'
- Charged Particle Nuclear Reaction Database NRDF - Present status and its usage -

4. Computer Facility

We utilize the Hokkaido University Computing Center for the storage and retrieval of NRDF and EXFOR information. The Hokkaido University Computing Center installs with Hitachi M-880H and S-820/80 computers. These computers are running by MVS or UNIX compatible operating systems. They are also connected to the National Academic Information Network. Therefore researchers of the universities or institutes in Japan can access our NRDF or EXFOR information through the Network.

There are personal-computers or workstations available at our laboratory. They are also connected to a local and the National Academic Information Network. We are able to communicate with each other and others overseas through computer networks.

5. Future of activities

The activity and organization of JCPRG is based on Nuclear Research Laboratory, Department of Physics, Hokkaido University, which is supported with the regular working budget and administered by the Ministry of Education and Hokkaido University. The organization of JCPRG has got acknowledgement of the Nuclear Research Community in Japan.

(1) CPND Compiling

We estimate the amount of data produced in Japan per year to be about 3 MB. Almost all CPND produced ever year in Japan are compiled. Especially, recent data of unstable nuclear beams at RIKEN and of high-energy experiments at KEK should completely be stored in NRDF.

(2) EXFOR translation

We are now translating only the parts of the NRDF data which can be translated. The EXFOR translation will be continued in this way. As NRDF contains various kind of physical quantities, we will try to increase the NRDF data translatable into the EXFOR.

(3) Information system of CPND

The current version of the Index Information System include only EXFOR index information. We are also planning to add NRDF index information to this system. We are intending to install the Index Information System on a workstation, and to develop a new customer service through computer network.

(5) Others

We are studying CPND in NRDF in several aspects for evaluation:

1) What physical quantities really exist?;

2) In the case of choosing Total-Cross-Section, is it feasible to evaluate?, are there sufficient data or energy range?; 3) As NRDF data includes also optical potential, are there any data evaluation model, simulation method or code?

We are also planning to make an evaluation system of the nucleosysthesis by using very low-energy data in NRDF.

Hajime Tanaka

The MSU INP CDFE Progress Report

Technical NRDC Meeting (2 - 4 May 1995, Vienna)

V.V.Varlamov

This report contains the review of the works carried out by the CDFE after the 12-th Consultants' Meeting of the Nuclear Reaction Data Centers (25 - 27 April 1994, Paris).

The main directions of the CDFE activity in this period of time were the continuation of development of experimental and evaluated photonuclear data sets in the EXFOR and of informational CDFE publications, the improvement of the CDFE relational PC database NESSY for nuclear structure and decay data, and also since the fall of 1994, the beginning of the works in the frame of the IAEA Recearch Project "Development of the EPNDL-1 (Evaluated Photonuclear Data Library) for the FENDL and ITER Projects".

In accordance with the Actions 28) and 70) (Appendix 6) of the Conclusions and Actions of the 12-th NRDC Consultants' Meeting the CDFE carried out the correction of all L series ENTRIES (L0001-L0059) of Berman's Photonuclear Data Library. The number of new data sets primarily for the reaction (G,X)0-NN-1 has been added, several REACTION lines have been substituted, and the needed comments on the thresholds of appropriate reactions and the information about what the reaction namely is given under REACTION key-word have been added to the majority of data sets.

The corrected data library was transmitted to the IAEA NDS.

In accordance with the Actions and Conclusions of the 12-th NRDC Consultants' Meeting and the program of the IAEA Research Project the CDFE started the preparation of new photonuclear reaction cross section experimental data EXFOR ENTRIES in accordance with the prioritiees of the FENDL and ITER projects. The new CDFE EXFOR trans M019 is now in processing.

Sticking the photonuclear data evaluation program the CDFE has analysed and evaluated the number of cross sections for reactions (G,XN), (G,N), (G,2N), (G,NP), and (G,P) for O-16, Al-27, and copper isotopes Cu-63,65. These data are now in processing as EXFOR entries for the CDFE TRANS M019 and will be processed for the ENDF format.

In accordance with the Action 70) (Appendix 6) of the Conclusions of the 12-th NRDC Consultants' Meeting the CDFE started the work on the photonuclear data evaluation program for the Coordination Research Program "Photonuclear Data: Compilation and Evaluation".

The agreement between the CDFE and the JAERI is achieved about the joint photonuclear data evaluation activity program. The working group seminar is planned to take place in the JAERI on the 1995 middle of November.

Sticking the program of photonuclear data information publications the CDFE is working on the continuation of the series of Photonuclear Data Bulletins and Indecis which contain the systematized information about the experimental works on photo- and electronuclear reactions and inverse reactions of radiative capture. Now the Index for 1991 - 1995 is in preparation.

In accorfance with the Conclusions and Actions of the 12-th NRDC Consultants' Meeting the CDFE plans to do this job together with the JAERI also.

The new equipment for E-MAIL & TELNET & FTP was installed in the CDFE.

To contact the CDFE now one must use the new E-MAIL address:

Varlamov@CDFE.NPI.MSU.SU

Selected Working Papers

WP #3

1995 INDC Meeting

Attached are summaries of the conclusions of the meeting of the International Nuclear Data Committee (INDC), Vienna, 3-7 April 1995.

Relevant to the NRDC Network are, specifically the following items:

- the recommedations of Subcommitte 1 on Nuclear Data Center Operations and Data Exchange
  - high priority to the coordination of data centers
  - emphasis on standards and reference data
  - no charging for data center services
  - publication of CINDA to continue
  - translation of "Jadernye Konstanty" to continue
- the recommendations of Subcommittee 2 on Nuclear Data Needs for Applications.
  - recommended coordinated research programs
  - recommended meetings
- the recommendations of Subcommittee 4 on Standards
  - to updated the INDC/NEANDC Standards file; see the list of Standards and Reviewers

INDC Executive Summary

The IAEA's International Nuclear Data Committee (INDC) met at the Agency Headquarters in Vienna from 3 to 7 April 1995. In response to the charge from the senior management of the Agency, the INDC has focused on the programme and performance of the IAEA's Nuclear Data Section (NDS). The INDC is now organized into four oversight sub-committees. Highlights of each subcommittee's deliberations and findings are attached to this summary. During the INDC's five day meeting, presentations were made by the NDS concerning its mission, goals and on going modus operandi. This executive summary of the INDC's findings and recommendations has been prepared for the IAEA management. A more detailed report will be forthcoming.

The INDC emphasizes that nuclear data information is at the core of the development, implementation, and utilization of all nuclear technologies. At present, the effort required to provide the needed information far exceeds available worldwide resources. The IAEA's NDS serves in a unique and preeminent position bringing together the worldwide nuclear data effort. This coordination ensures that the information is made available at a minimum cost and without duplication. The NDS represents an irreplaceable international resource which has successfully performed this coordinating function. Without the Agency's program of work, the coordinated international nuclear data activities would collapse causing a crisis in the development and application of nuclear data technology.

As a result of its deliberations, the INDC concludes that

- The Agency has a unique capability, not reproduceable anywhere else, and that the Nuclear Data Section
  - is operated in a highly professional and cost-effective manner
  - is essential to satisfy the nuclear data needs of ALL Member States
  - is the only focal point for meeting the nuclear data needs of the developing countries

- Impressive progress has been made by the Agency's Nuclear Data Section, in the past 2 years, in particular:
  - Modernizaton of its computer operations
  - Implementation of computer networks for data dissemination
  - Completion of a nuclear design data base for ITER (FENDL-1)
  - Successful completion of an IAEA/ICTP workshop on nuclear data and reactor physics applications
  - Initiation of several international coordinated research programs (CRPs) on data for developing technologies.

- The effective use of limited international nuclear data resources is essential and is accomplished through
  - the coordination of the nuclear data centre networks
  - CRPs and other data improvement projects such as FENDL

- Budget reductions for 1995 and beyond and the high rate of staff turnover in the next 2 years have serious negative long term consequences especially
    - the loss of two senior level scientific positions (P-4)
    - the loss of critical long-term staff especially in computing and information services
    - the loss of a nuclear data processing activity

The INDC recommends that

- The present funding level should be reconsidered as it is inadequate to meet the basic requirements.

- A higher proportion of long-term staff be achieved in order to ensure continuity of the programme.

- The Agency Management should recognize the basically technical nature (as opposed to administrative) of the Agency's nuclear data programme.

- The focus of the nuclear data program should expand to include to the newly emerging applications of nuclear technology.

- The data center's services must continue to satisfy the changing user requirements.

- Training courses and fellowships in nuclear data should be expanded in order to build the necessary infrastructure in developing countries.

Executive Summary Report of Subcommittee 1

Nuclear Data Center Operations and Data Exchange

Rationale

The Subcommittee reviewed the Data Centre activities and the coordination of Data Centre Networks. The objectives of NDS include the maintenance of a broad spectrum of nuclear databases, the provision of data centre services to a wide spectrum of countries and nuclear technology applications, and the international coordination of nuclear data centres.

Conclusions and Recommendations

NDS must maintain a fundamental base of data activities to address the everchanging challenges presented to it.

Particularly, continuous update and maintenance of CINDA and EXFOR and a variety of general and special-purpose databases are indispensable. Because of the subcritical size of any single data center, it is mandatory that NDS continues the coordination of the International Nuclear Data Centre Networks as an ongoing endeavour.

Continuation of the present computerization of NDS activities is essential for its efficient and successful operation in the future.

The planned upgrade of the computer system is a step in the right direction. The centre must keep up with the rapid developments in computer technology, especially with regard to the fast development of information dissemination over computer networks.

NDS and the data centre networks must give support to the new developments addressed in Subcommittee 2.

Extended types of nuclear data, in particular higher energy data, are needed for traditional and new applications. Requirements for processed data increase rapidly in developing countries with nuclear energy option as a result of recent development of computational devices. The data needs have increased world-wide for non-energy applications.

In addition the SC finds that:

- To accomplish above activities a core of experienced long-term staff is needed.
- It is essential to continue the NDS policy of not charging for its services or distributions.
- NDS must play a key role with regard to international nuclear data standards and reference data.

Subcommittee 1

Nuclear Data Center Operations and Data Exchange

Members: Y. Kikuchi (Chairman), M. Bhat (Secretary), H. Condé, B. Fursov, Liu Tingjin, R. Meyer, C. Nordborg, H.D. Lemmel, O. Schwerer

The objectives of the NDS include the maintenance of a broad spectrum of nuclear data bases, the provision of data services to a wide spectrum of countries and nuclear technology applications, and the international coordination of nuclear data centers. This subcommittee has come to the following conclusions and recommendations:

Data Center Operations:

(1) The scope of information covered by the NDS must respond to the full spectrum of world nuclear data requirements. Extended types of nuclear data (including high energy neutron, charged particle, heavy ion, and photo reaction data) are needed for traditional and new applications (such as single event upsets in electronic systems, and radioactive waste burning by spallation reactions). Requirements for processed data increase rapidly in developing countries with nuclear energy option as a result of recent development of computational devices such as cheap and powerful engineering work stations. The data needs have increased world-wide for non-energy applications.

(2) The NDS must maintain a fundamental base of data activities to address the everchanging challenges presented to it. Particularly, continuous update and maintenance of CINDA and EXFOR and a variety of general and special-purpose databases are indispensible. Maintenance of such activities needs a core of experienced long term staff. Because of the subcritical size of any single data center, it is mandatory that NDS continues the close coordination of the activities among them as an ongoing endeavour. The nuclear data information services must continue to respond to the growing needs of nuclear data for applications which are demonstrated by the centers' data request statistics, specifically by the steeply increasing usage of the online services.

(3) The Subcommittee notes with satisfaction the computerization of data center activities. The Subcommittee believes that continuation of this trend with the NDS is essential for its efficient and successful operation in the future. The planned upgrade of the computer system is a step in the right direction. Information dissemination in future will be largely accomplished over computer networks. The center must keep up with the rapid developments in computer technology, especially with regard to information dissemination over computer networks. To accomplish this goal, the Section must maintain qualified, experienced and long term staff.

Specific recommendations:

(1) The NDS should explore and use new developments in electronic information distribution to replace the present system of hard copy distribution of Committee related documents. The bulk distribution of hard copy documents (of L & U type) be reduced, for example by the distribution of a catalogue from which documents can be requested.

(2) The discontinuation of WRENDA (World Request List for Nuclear Data measurements) is recommended in view of the forthcoming publication of the high priority request list for nuclear data by the NEA Data Bank.

(3) Revitalization of the NDS contacts with countries having a significant amount of nuclear data activities is recommended.

The Subcommittee supports the following ongoing NDS activities:

- The continuing coordination by the NDS of the International Nuclear Data Centers Network (including reaction and structure data), specifically through network coordination meetings at regular intervals, is most essential.

- It is essential to continue the NDS policy of not charging for its services or distributions.

- NDS must play a key role in coordinating data evaluation activities as regards standards and reference data. However, the requirements of the developing countries in this context should be taken into account.

- The publication of the yearly updates of the CINDA compilation should continue.

- The translation of Russian language nuclear data reports should continue.

This Subcommittee is concerned about the relative balance between the base of fundamental data centre activities versus data improvement activities.

Executive Summary Report of Subcommittee 2

Nuclear Data Needs for Applied Technologies

Priorities for Nuclear Data Section Activities

The Subcommittee discussed the priorities for Nuclear Data Section activities and recommended strongly that the highest priority is to concentrate on providing nuclear information services. Development of nuclear data through CRPs and meetings is the next in priority.

Important Conclusions and Recommendations

Keeping in view the continuing and changing trends in nuclear data needs (in nuclear reactor safety and safeguards, nuclear transmutation for waste reduction, accelerator shielding, fusion, spallation neutron sources, medical applications, radioanalytics including AMS, medium energy data, as well as more fundamentally related topics like astrophysics and cosmology) in Member States and the limited resources available to the Nuclear Data Section, the Subcommittee recommends the following:

(1) Nuclear Data Section activities concerning general purpose files CINDA and EXFOR should be strongly supported.

(2) The completed FENDL-1 should be available on-line.

(3) Evaluation co-operation and co-ordination activities should continue.

(4) In view of the progress of the on-going CRPs, these should be carried to completion.

(5) The following CRPs should be initiated:

- (i) Charged-particle data for medical radioisotope production - **1995**
- (ii) Fission product yield data relevant to waste handling - **1997**
- (iii) Activation cross sections for fusion technology - **1997**
- (iv) Reference input parameters for nuclear model calculations (Phase II) - **1998**
- (v) Photonuclear data - **1996**

(6) The Subcommittee proposes meetings on the following topics:

- (i) Nuclear data for radiation therapy - **1996**
- (ii) Assessment of needs and scope of a CRP on fission and capture cross sections
- (iii) Nuclear data for techniques in elemental analysis

(7) The Subcommittee emphasizes the importance of continuing co-operation with the NEANSC. Duplication should be avoided.

Subcommittee 2

Nuclear Data Needs for Applied Technologies

Members: S. Qaim (Chairman), J. Boldeman, H. Condé, A. Deruytter, R. Garcia, R. Haight (Secretary), S. Kapoor, B. Kuzminov, A. Lone, G. Molnár, N. Olsson, G. Reffo, P. Obložinský (Scientific Secretary), A. Pashchenko, N. Kocherov

1. Summary

1.1. Priorities for NDS Activities:

The Subcommittee discussed at length the priorities for NDS activities and recommended strongly that the highest priority is for the NDS to concentrate on providing nuclear information services of the hightest quality, especially in the CINDA and EXFOR areas. Development of nuclear data through the CRPs and other meetings is the next in priority.

1.2. New Trends in Nuclear Data Needs

New trends in nuclear data needs were discussed broadly and as starting points for evaluating the program of the NDS and prioritizing future directions. Data needs in following areas were considered:

- Nuclear Reactor Safety and Safeguards
- Nuclear Transmutation for Waste Reduction
- Accelerator Shielding
- Fusion
- Medium Energy Data
- Spallation Neutron Sources
- Medical Applications
- Nuclear Structure and Decay Data
- Radioanalytics
- Astrophysics
- Cosmology

1.3. Important Conclusions and Recommendations:

Keeping in view the changing trends in nuclear data needs in Member States and the limited resources available to the NDS, the Subcommittee concluded and recommends the following:

(1) NDS activities in CINDA and EXFOR should be strongly supported.

(2) Evaluation cooperation and coordination activities are recommended to continue.

(3) The Subcommittee reviewed the on-going CRPs. Good progress has been made in all of them.

(4) The Subcommittee recommended the initiation of the following CRPs:

(i) Charged-particle data for medical radioisotope production - **1995**
(ii) Fission product yield data relevant to waste handling - **1997**
(iii) Activation cross sections for fusion technology - **1997**
(iv) Reference input parameters for nuclear model calculations (Phase II) - **1998**
(v) Photonuclear data - **1996**

(5) The Subcommittee proposed meetings on the following topics:

(i) Nuclear data for radiation therapy - **1996**
(ii) Assessment of needs and scope of a CRP on fission and capture cross sections
(iii) Nuclear data for technqiues in elemental analysis

(6) The Subcommittee stressed the need of cooperation of development work with the NEANSC. Duplication should be avoided.

2. New Trends in Nuclear Data Needs

New trends in nuclear data needs were discussed broadly and as starting points for evaluating the program of the Nuclear Data Section and prioritizing future directions.

2.1. Nuclear Reactor Safety and Safeguards

A continuing need for nuclear data for the nuclear electric power industry was voiced by many members. It is documented for example in "Nuclear Data, Situation and Future Prospects", by P. Bioux, Electricité de France report No. 95 NB00040, Ref. ISSN 1161-0611 (January 1995). Requirements include data of better accuracy to improve design economics and new data for advanced fuel cycles. For the latter, fission and capture cross sections on the "minor actinides" as well as values of $\bar{\nu}$ are desired. For reactor decommissioning, better data might also be required to explain a large discrepancy (one order of magnitude) in the measured and calculated activation of the biological shield as a function of penetration depth in the shield, although it is not yet clear if the discrepancy results from inaccuracies in the data or in the calculational model.

The preliminary version of the NDS handbook of "Nuclear Data for Safeguards" (INDC(NDS)-248) was distributed in 1991. These data are significant updates of data used previously by safeguards inspectors. To complete this handbook and prepare a final version (hardcopy and PC), an estimated effort of 3-4 months of an NDS staff member would be required.

2.2. Nuclear Transmutation for Waste Reduction

Nuclear transmutation ideas are being developed in many countries. Whether these ideas are based on reactors or accelerator drivers, new and better data will be required. Delayed neutron emission fractions, cross sections for fission and capture, and values of $\bar{\nu}$ will be required. More emphasis will be placed on the "minor actinides" as well as on fission products. It was noted that NEANSC also is interested in this area. Cooperation and coordination among the international organizations as well as among the participating laboratories is necessary.

Accelerator transmutation approaches will also require charged-particle-induced reaction data. Actinides, structural materials and long-lived fission products will be the principal materials of interest. Charged-particle energies up to 1.6 GeV protons are included in current concepts. It should be noted that most transmutation schemes also involve partitioning of elements (and occasionally isotopes as well), but only the transmutation aspects were discussed by this Subcommittee.

2.3. Accelerator Shielding

Effective shielding is required for a vast array of accelerators, from those for transmutation of waste to relatively small accelerators used in hospitals to produce radioisotopes. Demands on nuclear data are not proportional to the size of the accelerator, however: small hospital-based cyclotrons routinely accelerate intense beams and produce many neutrons in collimators, targets and beam stops, and these facilities are often placed in small, existing rooms in hospitals. The demands on accurate nuclear data for shielding these facilities can therefore be as great as for shielding much higher energy research accelerators. Successful shield designs also must take into account the energy and angular distribution of radiation from the source locations, and therefore charged-particle-induced reaction data to characterize the source terms are also of great importance.

2.4. Fusion

The FENDL activity is creating an evaluated data library for use in fusion reactor development and, in particular, for the ITER project. The effort, coordinated by the NDS, has very high visibility and great progress has been made already. In addition to preparing this useful library, the process of FENDL has allowed, for the first time, an in-depth comparison of evaluated data libraries from around the world.

The Subcommittee also noted very significant progress in the quality of neutron-induced helium production data and long-lived activation product data made possible by NDS-sponsored Coordinated Research Programmes.

To follow through with its effort in nuclear data for fusion and to widen the participation, the IAEA-NDS twas encouraged to try to find support for attendance at the December 1995 Workshop in Del Mar, California, by some researchers who otherwise would not be able to attend.

The Subcommittee noted the sentiment of the plenary that the NDS has directed a significant fraction of its resources in recent years to nuclear data for fusion. Because of the rapid progress and the greater maturity of the data for this application and because of limited resources, the Subcommittee realizes that fusion nuclear data activities of the NDS will probably decrease in the future.

2.5. Medium-Energy Data

Applications of medium energy radiations are increasing rapidly and the NDS could play an increasing role in this area where both new experimental measurements and improvements in nuclear models will be necessary. Account needs to be taken of data compilation by the NEA Data Bank and by the NEA Working Group, SG13 on Intermediate Energy Nuclear Data. One role the IAEA-NDS could play would be to increase the involvement of researchers from non-OECD countries, some of which have had extensive programs in the medium energy field. Applications are to space-radiation effects, radiation-induced effects in computers including those used in airplanes, accelerator-driven transmutation, spallation neutron sources for research, and radiation therapy.

2.6. Spallation Neutron Sources

Accelerator-based spallation neutron sources are enjoying increased demand for materials research and other investigations. New facilities are being planned in Europe, Japan and the USA. Charged-particle and neutron data are required to optimize source performance and to indicate new research opportunities. The energy range extends from intermediate energies of 1 GeV or somewhat higher down to ultra-cold energies. Many of the data requirements for the accelerator shielding and the neutron-production target overlap with those of the medium-energy application. At the experimental stations, thermal and neutron-resonance data will be emphasized.

2.7. Medical Applications

Nuclear data are needed for the production of isotopes and for therapy. To produce isotopes of better quality, data are needed to assess the effects of reactions, those that are unwanted as well as the principal, desired reaction. These data are needed over incident energies that now should be considered to extend to 60-80 MeV.

For therapy by neutrons, photons, or charged-particle beams, there is a great demand for nuclear data. An effort by Lawrence Livermore National Laboratory in code development is underway to predict radiation dose to specific target volumes in individual patients, as one example of progress in the field. However these predictions will only be as good as the data used by the code. Already two CRPs have addressed and improved data for these applications, but much remains to be done. For therapy with energetic photon beams, the (γ,n) reaction could be important.

The Subcommittee noted that the NEA has no activities in the medical field, either for isotope production or for therapy, and therefore the NDS could take on the lead role in coordinating research in this area.

It was recommended that representatives of the medical community be included in NDS-sponsored medical activities to help set priorities and to assure relevance of the activities to this user community.

2.8. Nuclear Structure and Decay Data

The NSDD Network is functioning well. In certain areas, such as half-lives of radioactive isotopes and other high-priority data, several international organizations have overlapping interests. Coordination of these activities is desirable, but it is not clear which organization is best suited for this role, E.G. IAEA-NDS, ICRM, ICRU, etc.

2.9. Radioanalytics

Nuclear and non-nuclear techniques complement and compete with each other for modern, high-sensitivity analysis of materials. Neutron activation analysis now also includes prompt capture gamma-ray analysis and the use of cold neutrons. Although some new data are desired, often the measurements are made relative to standard samples.

Particle-induced X-ray and gamma-ray emission (PIXE and PIGE) are popular approaches. No new requirements for nuclear data were reported.

Accelerator Mass Spectrometry (AMS) is an increasingly used method with very high sensitivity. It can be used to produce nuclear data in the area of activation of very long half-life isotopes where the amount of residual isotopes produced is analyzed by AMS. This is not a strictly nuclear technique (for there need not be any nuclear interactions). Data on charge-state distribution of energetic ions passing through foil and gas strippers are desired to improve the design and accuracy of AMS approaches.

2.10. Astrophysics

The calculation of nuclear astrophysical processes requires a huge amount of nuclear data. Many of these data cannot be measured in the laboratory, and consequently improvements in nuclear theory and modelling are necessary.

A compilation of nuclear data for astrophysics by F. Kaeppeler (KfK Karlsruhe) was brought to the attention of the Subcommittee.

Nuclear data for astrophysics overlap with (terrestrial) energy applications, for example in nuclear cross sections of fission products. The INDC needs to keep aware of the joint applications.

2.11. Cosmology

Intermediate energy charged-particle interactions of cosmic rays relate both to cosmological studies as well as to accelerator data needs. Measurements are in progress at several laboratories. An action was placed on M.A. Lone to keep the INDC informed on progress in this area.

3. Specials Nuclear Data Needs of Member States

Nuclear data needs are generally common to all Member States. However, a few states have in addition some specials needs. Brazil reported nuclear data needs for fast reactors and for systems with liquid lead coolant. India reported data needs for thorium cycle reactors. Sweden has nuclear data needs for diagnostics of fusion plasmas, especially DDX data below $E_n = 14$ MeV.

4. Review of NDS Activities

4.1. Data Centre Activities

The Subcommittee recommended strong NDS activities in CINDA and EXFOR. These files form a resource on which all other neutron activities of the NDS are based.

Evaluation cooperation and coordination activities of the NDS were recommended to continue. The FENDL activity creating an evaluated data library for use in fusion reactor development should continue.

Requests for nuclear data are compiled in the NDS publication, World Request List of Nuclear Data (WRENDA). This list is not used as much as in previous years according to the Subcommittee members. Therefore an update of WRENDA was viewed as not urgent. It was recommended to defer this activity and review it again at the next INDC meeting.

An action was placed on the NDS to contact Lawrence Livermore National Laboratory for data needs for the all-particle transport code for radiation oncology.

4.2. Coordinated Research Programmes

The Subcommittee reviewed Coordinated Research Programmes of the NDS, both those that are well under way as well as proposed programmes and other NDS-sponsored meetings.

The Atomic and Molecular Data for Radiotherapy has been completed and an IAEA TECDOC is in press.

The CRP on Activation Cross Sections for Generation of Long-lived Radionuclides of Importance in Fusion Reactor Technology has its last meeting in 1995. Much progress has been made, but there are still some needed data on cross sections of importance.

The CRP on Compilation and Evaluation of Fission Yield Nuclear Data has been extended to 1995-1996 to take advantage of improved models for the yields as function of mass, charge and incident neutron energy.

The CRP on Improvement of Measurements, Theoretical Computations and Evaluations of Neutron-Induced Helium Production Cross Sections has its last RCM in 1995. It has made great progress on these cross sections for structural materials for fission and fusion reactors.

The CRP on Establishment of an International Reference Data Library of Nuclear Activation Cross Sections has had its first RCM to agree on the scope and procedures. This CRP has had a good start and is projected to run through 1996.

The CRP on Development of Reference Input Parameter Library of Nuclear Model Calculations of Nuclear Data (Phase I: Starter File) began in 1994 and has made progress in a large and difficult subject. It is planned to continue to 1997.

The CRP on Measurement, Calculation and Evaluation of Photon Production Data conducted its first RCM in 1994. Tasks were specified and actions and deadlines agreed upon. This CRP will continue to 1997.

4.3. Proposals for New CRPs

A CRP on Development of Reference Charged-Particle Cross Sections for Medical Radioisotope Production had been discussed favorably at past INDC meetings. Now it is endorsed for 1995 with high priority. Evaluation, experiment and calculation will be included in this CRP.

A CRP on Fission Product Yield Data Required for Transmutation of Actinide Nuclear Waste is endorsed for 1997 with high priority pending an action on S. Qaim to contact the NEANSC to find out about NEA activities and report then to the NDS by end of June, 1995. This is a high priority area for accurate nuclear data.

The proposals on CRPs on activation cross sections were combined into Activation Cross Sections for Fusion Technology because many of the participants would be the same for improvements of cross sections to produce short- and long-lived radionuclides. It appears that more emphasis now needs to be placed on the short-lived products for consideration of reactor afterheat and transport of dose. This CRP has more emphasis on experimental and calculations and is quite different from the CRP on International Reference Data Library of Nuclear Activation Cross Sections mentioned above.This CRP is endorsed for initiation in 1997.

A CRP on Development of Reference Input Parameter Library for Nuclear Model Calculations of Nuclear Data (Phase II: Final File) is proposed to take advantage of the present CRP on the "Starter File". The proposed CRP would begin in 1998. If successful, these two CRPs would be of great benefit to nearly all applications of nuclear cross section data. The Subcommittee recommends that a progress report on the "Starter File" be given at the 1997 INDC meeting.

A CRP on Compilation and Evaluation of Photonuclear Data would have relevance to shielding, safeguards, inspection technologies, radiotherapy and selected cases of isotope production. It is endorsed for 1996.

4.4. Proposed Meetings

A Meeting to assess needs of Nuclear Data for Radiation Therapy is proposed for 1996. Proton, neutron and photon therapy needs would be included. This meeting is recommended.

A Consultants' Meeting to assess the need and scope of a CRP on Neutron Induced Fission and Capture Cross Sections for Actinides and Capture Cross Sections for Long-Lived Fission Products could be combined with the CRP on Fission Yields to emphasize priorities of each. An action on S. Qaim is to contact the NEANSC to find out possible areas of overlap in capture and fission cross sections on actinides and to discuss the possibility of cooperative activities.

A Specialists' Meeting on Nuclear Data for Techniques in Elemental Analysis was proposed by G. Molnár. An action was placed on G. Molnár to prepare a draft agenda for this meeting and include possible participants. Topics of emphasis could include activation analysis with epithermal neutrons and prompt capture gamma-ray analysis. Pending receipt of the agenda, the Subcommittee endorses the concept of the meeting for 1996.

4.5. Other Meetings

A Consultants' Meeting on the Update of the INDC Nuclear Standards Library recommended by the Subcommittee on Standards. It should be held in the Fall of 1996.

5. Priorities for NDS Activities

The Subcommittee discussed at length the priorities for NDS activities and recommended strongly that the highest priority is for the NDS to concentrate on providing nuclear information services of the highest quality especially in the CINDA and EXFOR areas. Development of nuclear data through the above mentioned CRPs and other meetings is next in priority.

Actions

Subcommittee 2

Nuclear Data Needs for Applied Technologies

No.	Respondent	Action
1.	M.A. Lone	Keep NDS informed on intermediate-energy nuclear data, kespecially for charged-particle-induced interactions, relevant to cosmological and accelerator applications
2.	NDS	Contact Lawrence Livermore National Laboratory and obtain list of nuclear data needs for radiation oncology
3.	G. Molnár	Prepare a draft agenda for a Specialists' Meeting on Nuclear Data for Techniques in Elemental Analysis
4.	S. Qaim	Contact the NEANSC to find out possible areas of overlap in capture and fission cross sections on actinides and to discuss possibility of cooperative activities

Executive Summary Report of Subcommittee 3

Nuclear Data Technology Transfer

Rationale

The Subcommittee was charged to discuss and recommend programs towards nuclear data related manpower training and technology transfer to the developing countries to enhance their capability for both energy and non-energy type applications.

Important Conculsions and Recommendations

- The NDS should encourage nuclear data activities in the developing countries also through the award of individual research contracts to accomplish some of its identified thrust area programs particularly in the newly emerging areas.
- The proposal on the Interregional Training Course (ITC) on Nuclear Data Evaluation Methodology at Beijing in 1997 be finally approved by the Agency.
- A proper mechanism within the Agency should be found to organize one training course every two years in the field pertaining to nuclear data with emphasis on the emerging areas.
- NDS should continue attachment of fellows from developing countries to NDS and/or to scientists in developed countries working in nuclear data related projects.
- NDS should continue its association and involvement in the ICTP courses.
- Data processing activities in the NDS need to be reinforced.

Subcommittee 3

Nuclear Data Technology Transfer

Members: S. Kapoor (Chairman), M. Bhat, B. Fursov, R. Garcia, Liu Tingjin, G. Molnár, G. Reffo, N. Kocherov, A. Pashchenko

(1) The Subcommittee reviewed the implementation of the recommendations arising from the 19th Meeting of the INDC with regard to technical co-operation projects, training courses, ICTP/IAEA Workshops and fellowship programmes which were initiated to help manpower training and nuclear data technology transfer to the developing countries.

(a) Technical Cooperation (TC) Projects. As can be seen from the report of the NDS about the activities in 1993-94, NDS has been involved in three TC projects. These projects are in Ethiopia, Nigeria and Tanzania and have involved setting up of experimental facilities for applications of nuclear techniques such as XRF and neutron activation analysis. Presently, these projects have either been closed or are about to be concluded. It was noted that at present no new TC projects of this nature are proposed or planned to be run by NDS staff.

The Subcommittee discussed future NDS involvement in the TC projects. It recommends that in future NDS need not involve itself with the projects entailing training in applications of nuclear techniques, as such projects can be best handled by Physics or other Sections of the Agency. However, it will be extremely useful to idenify nuclear projects in the area of its main mandate leading to generation of new nuclear data or processing and dissemination of such data, also ensuring that the participating country has the necessary facilities and expertise so that the nuclear data output is not compromised.

The NDS should encourage nuclear data activities in the developing countries also through the award of research contracts to accomplish some of its identified thrust area programs in the newly emerging areas pertaining to nuclear data.

(b) Training Courses. The 19th INDC meeting had recommended two interregional training courses (ITC); one in Obninsk, Russia, on Applications of Nuclear Data and Measurement Techniques in Nuclear Reactor Dosimetry" in 1994, and the other in Beijing, China, on "Methodology of Nuclear Data Evaluation and Evaluated Nuclear Data Library Management for Reactor Technology" in 1995.

The TC Department responsible for implemention of the training courses, had first postponed the Obninsk course to 1995 asking NDS to ascertain interest of the Member States in such a course. While the response received by NDS was very favourable, the course was still assigned a low priority and later did not appear in the list of accepted courses.

The training course at Beijing is at present listed in the tentative plan of 1997, but is subject to further review by the special TC panel, as stated in INDC/P(95)-5.

The Subcommittee strongly recommends that the proposal on the ITC on Nuclear Data Evaluation Methodology at Beijing in 1997 (INDC/P(95)-30) should be finally approved by the Agency, particularly as this is the only ITC on the list pertaining to nuclear data, and the subject matter of this ITC is very important to generate necessary expertise and manpower in the field of nuclear data for fission reactors including safety aspects.

After detailed discussions, the Subcommittee also recommends that a proper mechanism within the Agency should be found to organize one training course every two years in the field pertaining to nuclear data with emphasis on the emerging areas of nuclear data needed for new applications in energy and non-energy related problems.

(c) Training of Fellows. It was noted that two persons from developing countries have received training as fellows in the NDS for 1 year and 6 months respectively. After detailed discussions, the Subcommittee reinforced the Action 46 of the 18th INDC meeting and recommended the following as standing action:

"NDS to continue further attachment of fellows from developing countries to NDS and/or to scientists working in developed countries in advanced fields for collaboration in nuclear data related projects to generate new technical competence and manpower particularly in the newly emerging areas pertainingto the nuclear data field."

Attachment of fellows to NDS is highly recommended, particularly because NDS, which is engaged in technical work relating to nuclear data, can impart valuable training to develop indigeneous capability in the computer processing of available nuclear data files to the fellows for various applications in nuclear research, energy and other areas such as radiation therapy, isotope production etc.

(d) ICTP Trieste Courses

It was noted that the 1994 ICTP/IAEA Workshop was successfully conducted as planned. The 1996 ICTP Workshop will be on the subject of "Nuclear Data and Nuclear Reactors -Physics, Design and Safety", from 15 April to 17 May, 1996. It was noted that a member from NDS and another member from Nuclear Power Technology Section, and also a member of the INDC are among the four course directors.

The Subcommittee is of the opinion that these Workshops have been serving a very useful purpose towards nuclear data technology transfer. The Subcommittee therefore strongly recommends continued association and involvement of NDS in these courses. NDS should also ensure through its participation in the selection process that participants from those laboratories which have active programs to utilize their skills on return, should have a higher priority in selection for these courses.

(2) Data Processing Activities by the NDS

Some developing countries have active programs for energy applications which may also involve in future advanced fuel cycles, and their programs require processed nuclear data files. NDS have been providing in the past a very useful support to the nuclear data processing activities. It is recommended that this processing activity should be continued in the NDS, if necessary, by suitably strengthening the Section's manpower.

For Discussion in the Plenary Session

(3) The Subcommittee has found that on the whole over the years the involvement of the NDS in the activities leading to technological transfer and technical cooperation has considerably weekened. This may be due to a shift in the priorities, and also because of the constraints imposed by a zero growth of the Section. Taking into account the programs in the Member States and the projected manpower and expertise needs required for the newly emerging areas of nuclear data applications, the Subcommittee proposes that INDC may deliberate on this issue and make suitable recommendations on the subject.

Executive Summary Report of Subcommittee 4

The INDC Standards Sub-Committee

1. The IAEA Role in Nuclear Data Standards

- The majority of basic and applied nuclear data measurements for various nuclear processes are made relative to reference standards. Collection of these data, and the associated documentation, is herein refered to as a standards library. Therefore, the quality of all other measured data depends on the quality of the standards. It is essential that these standards are well defined, clearly referenceable, easily available and internationally accepted.

- The IAEA, being an international organization promoting development in nuclear energy and other related applied nuclear fields, is the appropriate body to give an international acceptance, recognition and dissemination of a nuclear reference standards library.

- The subcommittee recognizes that for the technical input to the standards library the correspondence with the NEA/NSC, in particular the newly formed Working Party on Experimental Activities, is essential.

2. Conclusions and Recommendations

To fulfill the demands on a useful nuclear reference standards library, it is essential that it contains the best and most modern information available. To that end the subcommittee has appointed responsible reviewers for each entry of the library.

- The Nuclear Data Section should co-ordinate the work on maintaining and updating the standards library.

- For those cases where considerable updates are needed, the Nuclear Data Section should organize a consultants' meeting with the responsible reviewers during 1996.

- During the consultants' meeting, the need for a CRP on New High-energy Standards should be considered.

To facilitate the international distributions and recognition of the nuclear reference standards library,

- The Nuclear Data Section should make the library available as an on-line service.

Furthermore,

- The Nuclear Data Section should, in due time, investigate the possibility of publishing the updated and revised version of the library in a refereed journal ("Atomic Data and Nuclear Data Tables").

Subcommittee 4

Standards Subcommittee

Members: J. Boldeman, H. Condé (Chairman), A.J. Deruytter, R.S. Haight, B.D. Kuzminov, M.A. Lone, N. Olsson (Secretary), H.D. Lemmel

1. General Statements and Recommendations:

The S.C. agreed on the following general statements concerning the need for and the required quality of a nuclear data standards library, the IAEA involvement in the creation and handling of the library and the technical correspondence with the NEA/NSC.

1. The majority of basic and applied nuclear data measurements are made relative to reference standards. Therefore, the quality of all other measured data depends on the quality of the standards. It is essential that these standards are well defined, clearly referenceable, easily available and internationally accepted.

2. It is appropriate that IAEA, as being an international organization promoting development in the nuclear energy and other related applied nuclear fields, is well suited to give an international acceptance, recognition, spread and use of a nuclear reference standards library.

3. The S.C. recognizes that for the technical input to the standards library the correspondance with the NEA/NSC, in particular with the newly formed Working Party on Experimental Activities associated with the International Evaluation Co-operation Working Party is essential.

The general statements were summarized in the following recommendation:

"Because of the ultimate importance of nuclear standards reference data for the quality of all nuclear data, the maintenance of an international nuclear data standards reference file should have high priority within the activities of the Nuclear Data Section".

Furthermore, the following action was put on the Nuclear Data Section:
"Specifically, the Nuclear Data Section should include the standards file in the on-line services".

2. Actions from the 19th INDC Meeting and Recommendations from the S.C. ad-hoc Meeting at Gatlinburg, U.S.A., 10 May 1994:

Action 41

The S.C. strongly endorsed the action put in the plenary session of the committee on the Head of the NNDC to examine the possibility, maybe via a consultant contract, to restore and document the experimental data base compiled by W.P. Poenitz and used in the ENDF/B-VI standards evaluation.

Action 43

The S.C. recommended that the Nuclear Data Section should approach, in due time, the Atomic Data and Nuclear Data Tables for a wide publication of the revised and updated Nuclear Standards File.

The S.C. was informed that the file had been translated to Russian and that the recommended numerical data (mostly from the ENDF/B-VI standards library) had been accepted as standards in the JEF, JENDL and ENDF/B libraries.

Actions 45 and 46

These actions were discussed under the agenda item which was devoted to "The future development of the INDC Nuclear Standards File".

The recommendations and actions from the Ad-hoc INDC Standards Subcommittee Meeting held in conjunction with the Nuclear Data Conference in Gatlinburg, U.S.A., on 10 May 1995 were discussed. It was concluded that the actions were fulfilled with the exception of an action on the chairman to contact the reviewers of each entry in the Standards File regarding a possible revision. This action was renewed at the present meeting of the Subcommittee. Furthermore, it was agreed by the S.C. to refer to the proposed Consultants' Meeting on the up-date of the INDC standards file to take a stand towards the recommendation from the Ad-hoc meeting in Gatlinburg, U.S.A., to have a CRP to produce new high energy standards.

3. The INDC Nuclear Standards File

3.1 Collaboration with NEA/NSC

A working party on Experimental Activities has been formed by NEA/NSC. It will have its first meeting on 16 May 1995. The subcommittee put an action on H. Condé/A.J. Deruytter to inform the working party about the SC conclusions and the status of the INDC Standards File.

3.2 Content - New Entries

The content of the Nuclear Standards File was reviewed by the SC.

Two new entries, related to medium energies, were added to the list: 1) The H(n,n)H reaction in the energy range 20-350 MeV, and, 2) the ^{235,238}U(n,f) reactions for E_n > 20 MeV. Concerning the second new entry it was also noted that the ^{232}Th(n,f) and ^{209}Bi(n,f) were possible candidates.

3.3 Review Responsibilities

The list of review responsibilities was reviewed and updated by the SC. An Action was put on B.D. Kuzminov to investigate the availability of reviewers for the ^{238}U(n,f) reaction in Russia. Possible reviewers for the H(n,n)H reaction at 20-350 MeV has to be investigated. The updated list of review responsibilities is as follows:

	Responsibility	
Standard	National	Provisional Assignments
H(n,n)H < 20 MeV	U.S.A.	G. Hale/P. Young
H(n,n)H 20-350 MeV	China/?	S. Qingbiao/?
^{6}Li(n,t)^{4}He	U.S.A.	P. Young/G. Hale
^{10}B(n,α)^{7}Li	IRMM/U.S.A.	E. Wattecamps/A.D. Carlson
C(n,n)C	U.S.A.	Y. Fu
^{197}Au(n,γ)^{198}Au	IRMM	F. Corvi
^{235}U(n,f)	U.S.A.	R.C. Haight
^{235}U Fiss Fragm Anisotropy	IRMM	F.J. Hambsch
^{238}U(n,f) < 20 MeV	Japan	Y. Nakayama/Y. Kanda
^{235,238}U(n,f) > 20 MeV	U.S.A./Russia	P. Lisowski/?
^{27}Al(n,α)	Austria	H. Vonach
^{59}Co(n,2n)^{58}Co	Austria	H. Vonach
^{93}Nb(n,2n)^{92}Nb	Austria	H. Vonach
Neutron Energy Standards	Italy	C. Coceva
Actinide half-lives	Germany/UK/USA	Libertin/S. Woods/ A. Nichols/R. Helmer
Thermal parameters	Belgium	C. Wagemans
Low energy Cross Section dependence	Belgium	C. Wagemans
^{252}Cf Fission spectrum	Germany	W. Mannhart
^{252}Cf nu-bar	Australia	J.W. Boldeman
Gamma-ray standards	France/Germany	J. Legrand/Libertin
Neutron Flux Comparison	U.K.	Lewis

3.4 IAEA Consultants' Meeting on the Update of the INDC Nuclear Standards File

The SC recommended that a Consultants' meeting on the above topic should be held late 1996. To this meeting, responsible reviewers for the reactions where updates are required should be invited. The following items were proposed to be included:

1)	H(n,n)H at 20-350 MeV	2 reviewers
2)	$^{10}B(n,\alpha)$	2 reviewers
3)	$^{235,238}U(n,f)$ at En > 20 MeV	2 reviewers
4)	Actinide half-lives	2 reviewers

In addition, two members of the SC should be invited. It would also be of great value if H. Vonach could contribute regarding dosimetry cross sections, and W. Mannhart concerning ^{252}Cf fission spectrum. An Action was put on H. Condé to prepare a list of participants.

4. CRP on "High-priority Decay Data and Thermal Reaction Data":

The SC considers the activity being important. However, more information on the goals for the proposed CRP on "High-priority Decay Data and Thermal Reaction Data" are needed before a decision can be taken.

In particular, the situation concerning the thermal reaction data was discussed.

In accordance with the recommendations from the Specialists' Meeting on the Development of an International Nuclear Decay Data and Cross-Section Database, A. Lone was charged to contact V.F. Sears, Chalk River about evaluated thermal reaction data for stable nuclei and Y. Kikuchi to nominate an evaluator and reviewer of the same type of data for fission products.

5. Conclusions and Recommendations:

The SC agreed upon the following conclusions and recommendations: Because of the ultimate importance of nuclear standards reference data for the quality of all nuclear data, the maintenance of an international nuclear data standards reference file should have high priority within the activities of the IAEA/Nuclear Data Section. Furthermore, the SC recognize that for the technical input to the standards library the correspondance with the NEA/NSC, in particular the newly formed Working Party on Experimental Activities, associated with the International Evaluation Co-operation Working Party, is essential.

It is recommended that a Consultants' Meeting on the Update of the INDC Nuclear Standards File is being held during 1996.

**Actions
from
the INDC Standards Sub-committee Meeting
Vienna, 5 April 1995**

Respondent		Action
1.	NDS	Include the Standards File in the on-line services.
2.	NDS	Investigate, in due time, the possibilities to publish the revised Standards File in Atomic Data and Nuclear Data Tables.
3.	NDS	Raise the question of a CRP on High Energy Standards during the Consultants' Meeting in 1996.
4.	H. Condé/A. Deruytter	Inform the NEA/NSC Working Party on experimental activities about the SC conclusions and status of the INDC Standards File.
5.	B. Kuzminov	Investigate the availability of a reviewer for the $^{238}U(n,f)$ reaction in Russia.
6.	H. Condé	Prepare a list of proposed participants of the Consultants' Meeting on the up-date of the Standards File.
7.	A. Lone	Contact V.F. Sears, Chalk River, about evaluated thermal reaction data for stable nuclei as a contriburtion to the Nuclear Decay Data and Cross-section Database.
8.	Y. Kikuchi	Nominate an evaluator and reviewer of thermal reaction data for fission products as a contribution to the Nucler Decay Data and Cross-section Database.

New Exfor/CINDA dictionaries and Feedback to TRANS 9068

Contents:

I.Introduction

Memo CP-D/252

7 December 1994
(distr.: 19 December)

From: V.McLane and O.Schwerer
Subject: New archive dictionary database and
dictionary TRANS 9068

Following the conclusions and actions on the EXFOR/CINDA dictionaries approved at the Paris NRDC meeting, the new "super-dictionary" (now called **ARCHIVE** dictionary) was created. It contains both, the codes and numerical equivalents needed in the DANIEL dictionary database (used for EXFOR/CSISRS on VAX/VMS computers) and the additional free text information contained in the current EXFOR/CINDA dictionaries. An EXFOR dictionary TRANS file in the traditional format, as well as an exchange file containing update records for updating the DANIEL database, can be produced automatically from the new archive database. Dictionary TRANS 9068, which is being distributed, was produced this way.

NDS will, as before, do all requested and approved dictionary updates on behalf of all data centres and continue to distribute dictionary transmissions in the traditional format to all centres, except for those centres who explicitly request to receive the dictionary transmissions in another format (i.e. DANIEL update records, or a complete updated DANIEL library).

Following conclusion 8 of the Paris NRDC meeting, **lower case** characters were introduced for expansions and free text throughout all dictionaries. Some of the text was retyped or slightly reworded. Although everything was checked several times, some (hopefully only typographical) errors might have been overlooked. NDS will appreciate any requests for corrections.

In dictionaries **5** and **6**, many **extinct** codes which had the "extinct" information only in free text (or not at all) were given the extinct flag ('X' in col.80).

Dictionary **36** now contains, similar to dictionary 7, **2 expansions** for many (but not all) codes: a short one on the first record(in DANIEL style), and, if needed, a longer one corresponding to the expansion in the "old" EXFOR dictionary 36.

Please let us know if this disturbs you, or if there is any other problem with the modified dictionaries.

II. Possible transmission formats

- TRANS 9...: traditional way
- DANIEL backup files: for those centers using the DANIEL dictionary system, to reload the database using the program DAN_LOAD
- "Interim updates" still wanted, and in which format?

III. Feedback after TRANS 9068

The new system was designed with the intention that the basic format of the dictionary transmissions in TRANS format will not change so that all existing programs will continue to work.

There are however some intended changes, as mentioned in the introduction (e.g. the lower case characters) and other changes due to the automatic production of the TRANS file from the archive dictionaries (e.g. different sorting of codes within a dictionary).

Any wishes for cosmetic or other changes, as well as corrections of any remaining mistakes introduced in the change-over, should be collected at the meeting.

Feedback by H.D.Lemmel

Dict.9(Compounds): It seems that all cases of -CMP occurring in Exfor are now included in the dictionary. If this is the case, the text on top should be omitted. (Is there an Exfor entry with 2-HE-CMP?)

Dict.19 was called "Source of Incident Particles", should be kept

- The term "Codes" in dictionary headings is not needed, should be omitted throughout (low priority)
- In some dictionaries the alphabetic sort is **not** good, e.g. Dict.31 Branch (SF5). It is an **essential** help to the compiler to see, e.g., all branch codes for FPY in a group together. Similar in several other dictionaries. In Dict.36 it is "crazy" to have (CUM),SIG far away from CUM,SIG etc. Alphabetic sort is good for the Exfor **user** but not at all for the compiler.

List of last TRANS tapes by 25 April 1995

Series	coming from	number	dated	Notes
1	NNDC	1258	94-06-02	(2134 received at meeting)
2	NEA-DB	2133	94-03-07	
3	NDS	3095	94-12-12	
4	CJD	4097	94-11-17	(4098 received at meeting)
V	NDS	V025	92-07-29	
A	CAJaD	A030	95-03-13	(A031 received at meeting)
B	KaChaPaG	B011	(1981)	/1/
C	NNDC	C012	88-12-27	
D	NDS	D018	93-09-30	
E	JCPRG	E013	94-10-28	/2/ (E014,E015 received at meeting)
O	NEA-DB(CAJaD)	O001	95-01-11	
R	RIKEN	R009	94-04-20	
S	IAE-CP	S008	94-06-14	(S009 received at meeting)
G	NDS	G007	92-02-14	
L	NNDC	L004	91-06-13	/1/
M	CDFE	M018	94-03-22	

Notes:

/1/ TRANS B012, a retransmission of the complete area B file containing corrections made by CAJaD, and TRANS L005, a retransmission of the complete area L file containing corrections made by CDFE, are in preparation resp. were received at NDS.

/2/ The last E-tape processed before E012 was E009. TRANS E012 and E013, containing retransmissions of most entries from E010 and E011, were distributed earlier this year.

WP #6

DISTRIBUTION OF TRANS TAPES

The distribution pattern of EXFOR TRANS tapes is the following:

- Each of the 4 centres producing neutron EXFOR TRANS tapes (NNDC, NEA-DB, NDS, CJD) will continue to send their tapes to each of the other 3 centres.

- All other centres (CAJAD, CDFE, CNDC, RIKEN, Sapporo Debrecen) will send their "non-neutron' TRANS tapes only to NDS.

- NDS will, after checking them, send these "non-neutron" tapes to all centres needing the particular data type:

NNDC:	all data types
NEA-DB:	all data types
CJD:	(only receives neutron data)
CAJaD:	CPND only
CDFE:	PhotoND only
CNDC:	receives from NDS all data types (including neutron data) in CSISRS backup format
RIKEN:	none
Sapporo:	CPND only
Debrecen:	CPND only

WP #7

Pending EXFOR Items

1. CP-A/68	Remove (in Dict. 24 and/or 36?) the group heading "For photonuclear data only" because these codes (all?) are used for CPND also.
2. CP-A/70	New triple-diff.cs type
3. CP-A/71	Additions to Dicts. 29, 30, 36
4. CP-C/208	Dict. additions for relativistic heavy ion and electron reactions
5. CP-C/209	Additions to Dicts. 32 and 36
6. 4C-4/57	Additions to Dict. 36; Entry 40420
7. CP-D/249	Additions to Dict. 36: ,AKE and ,MLT without part.code in SF7
8. -	Question by CAJaD: How to compile publications containing both neutron data and CPND (Present rule: 2 separate entries)
9. Msg.21 Feb.	Dict. 3: 2GERUH Univ. Hannover (previously 2GERTUH)
10.Msg. 4 April	Units "SEE TEXT" also for DATA? (Presently for MISC only)
11.Msg. 13 Jan	PAR in SF5 without secondary energy (exceptions from rule)
12.Msg. 3 Mar	Dict. 6: ARZ- actual report code?
13.Note by OS	Units of dimension 1/AE (not DAE) for double-diff. cross.sect.

Only this index of pending items is reproduced here. For full details please refer to the respective memos or contact the Nuclear Data Section.

WP #8

LIST OF PENDING RETRANSMISSIONS

O.Schwerer, 1995-04-24

Please find below a reminder as for which EXFOR entries are still pending for retransmission as requested by NNDC and NDS from NNDC, NEA-DB, NDS, CJD, CAJaD, JCPRG and CDFE.

When mistakes are found in TRANS tapes, retransmission is requested for those cases where the correction to be done is not obvious or so important that it is considered vital that all centres receive an identical corrected version by the originating centre. Therefore, each centre is asked to review this list, update the entries and retransmit them. In all cases, the detailed explanation or reason for the retransmission requested was communicated earlier in a memo or in a communication to the originating center.

At the 1994 NRDC meeting, some of the very old entries which have been pending for retransmission for several years were reviewed in more detail to help the originating centre in locating and correcting the mistakes. Since none of these entries were retransmitted (yet) afterwards, we did not repeat this exercise this time. NDS is however still prepared to assist if any of the centers is prepared to take action. It is also realized that there are possibly some cases listed which are rather misunderstandings or differences of opinion than true mistakes. In checking the list, those cases should be clarified also so that they can be removed from the list.

Special notes:

- If subentry 1 is listed, this usually means that ALL subentries of this entry are requested for retransmission. Otherwise, only the particular subentry/ies need be retransmitted.

- The entries of TRANS E010 and E011 (which were not processed because they are superseded by TRANS E012 and E013) are reminders for those entries which were not included in TRANS E012 and E013 (i.e., they do not yet exist in our master files).

TRANS	ACCESSION #
1101	12627002
1119	11281010
1136	12355002
1136	12355006
1136	12355007
1217	10142002
1229	13119002
1230	12991002
1230	12991003
1232	11010001
1232	13132001
1232	13156001
1233	13066003
1233	13066004
1233	13073002
1233	13092002
1233	13092003
1242	13195002
1242	13195003

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TRANS	ACCESSION #
C007	C0295001
C010	C0328007
C011	C0306004
C011	C0316002
C011	C0333002
C011	C0345001
C011	C0412012
C013	C0373001
C013	C0399001

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TRANS	ACCESSION #
2081	20775003
2089	20742005
2100	21904002
2100	21904003
2100	21904004
2100	21904005
2100	21914003
2102	21944002
2110	21993002
2110	22000001
2110	22001021
2110	22001022
2117	22027005
2117	22031151
2117	22031152
2117	22031153
2117	22031154
2117	22031155
2117	22031156
2117	22031157
2117	22031158
2117	22031159

2118	22050001
2118	22039002
2122	22032002
2122	22032003
2122	22052004
2122	22057003

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TRANS	ACCESSION #
2128	22156015
2128	22157055
2128	22157057
2128	22157073
2128	22157087
2129	21928001
2129	22116002
2129	22116003
2129	22116004
2129	22129001
2129	22130001
2129	22143002
2129	22143003
2129	22161002
2132	22200003
2132	22205002
2132	22205003
2132	22205004
2132	22218002
2132	22218003
2132	22218004
2132	22218005
2132	22223002
2132	22225002
2132	22225003
2132	22225004
2132	22228002
2133	22228002

24 APR 95

TRANS	ACCESSION #
2133	22228003
2133	22228004
2133	22228005
2133	22228006
2133	22228007
2133	22228008
2133	22232002
2133	22233002
2133	22234001
2133	22234002
2133	22234003
2133	22234004
2133	22234005
2133	22234006
2133	22234007
2133	22238001
2133	22238002
2133	22238003
2133	22238004
2133	22238005
2133	22238006
2133	22238007
2133	22238002
2133	22239002
2133	22239003
2133	22241002
2133	22241003
2133	22241004

24 APR 95

TRANS	ACCESSION #
2133	22241005
2133	22241006
2133	22241007
2133	22241008
2133	22241009
2133	22245002
2133	22245003
2133	22245004
2133	22245005
2133	22245006
2133	22245007
2133	22245008
2133	22246002
2133	22246003
2133	22246004
2133	22246005
2133	22246006
2133	22247002
2133	22247003
2133	22249002
2133	22250002
2133	22250003
2133	22250004
2133	22250005
2133	22250006
2133	22250007
2133	22251002
2133	22251003

24 APR 95

TRANS	ACCESSION #
2133	22251004
2133	22251005
2133	22251006
2133	22251007
2133	22251008
2133	22251009
2133	22251010
2133	22252002
2133	22252003

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TRANS	ACCESSION #
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3061	30755010
3078	30218002
3084	30986005
3084	30991003
3084	30991004
3087	30739004
3087	30739005
3087	30739006
3087	30808003
3088	32591001
3088	32591002
3088	32591003
3088	32591004
3088	32592001
3088	32593001

24 APR 95

TRANS	ACCESSION #
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4043	40580002
4053	40577001
4055	40788001
4055	40792001
4055	40793001
4056	40576003
4060	40528009
4060	40611003
4060	40611004
4060	40611005
4060	40611006
4066	40915003
4069	40930001
4075	40965001
4075	40974003
4082	40541001
4084	40776002
4084	40877002
4084	40877003
4084	40877004
4084	40877005
4084	40877006
4084	40894002
4084	40894003
4084	40894005
4085	40083002
4085	40083003
4085	40083006

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TRANS	ACCESSION #
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4085	40083007
4085	40083009
4085	40145003
4085	40173008
4085	40173014
4085	41055002
4085	41055003
4085	41055004
4085	41055005
4085	41055006
4085	41055007
4085	41056003
4085	41059003
4087	41086002
4087	41086003
4087	41086004
4087	41086005
4087	41086006
4087	41086007
4087	41086008
4087	41086009
4087	41086010
4087	41086011
4087	41086012
4087	41086013
4088	40245007
4088	40346013
4088	40346014

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TRANS	ACCESSION #
=====	===========
4088	40346018
4088	40449002
4088	40539001
4088	40936001
4088	41063002
4088	41065003
4088	41067002
4088	41067003
4088	41067004
4088	41074002
4088	41077002
4088	41088009
4088	41088011
4088	41088014
4088	41089002
4089	20551001
4089	40602002
4089	40655002

4089	40655003
4089	40667007
4089	40667008
4089	40667009
4089	40728005
4089	40728006
4089	40728007
4089	40728008
4089	40728009
4089	40728010

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TRANS	ACCESSION #
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4089	40728014
4089	40891002
4089	41095002
4090	40329003
4090	40329004
4090	40916002
4090	41047001
4090	41100004
4090	41100005
4090	41100006
4090	41100007
4091	40938001
4091	40944001
4091	40956007
4091	41084001
4091	41084002
4091	41084003
4091	41084004
4091	41084005
4091	41084006
4091	41084007
4091	41101002
4091	41104002
4091	41104003
4091	41104004
4092	40963002
4092	40972002
4092	41110001

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TRANS	ACCESSION #
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4094	41103001
4094	41103007
4094	41109002
4094	41109003
4094	41109004
4094	41109005
4094	41109006
4094	41109008
4094	41109009
4094	41109010
4094	41120002
4094	41120003
4094	41120004
4095	40389002
4095	40389003
4095	40389019
4095	40551002
4095	40551004
4095	40551006
4095	41085002
4095	41087004
4095	41138001
4095	41139002
4095	41139003
4095	41141002
4096	40420001
4097	41155014
4097	41155015

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TRANS	ACCESSION #
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A017	A0229004
A017	A0317004
A017	A0329002
A018	A0320002
A019	A0178001
A019	A0198001
A019	A0202002
A019	A0202003
A019	A0202004
A019	A0345003
A019	A0345010
A020	A0319023
A020	A0319030
A020	A0322005
A020	A0347004
A020	A0352004
A020	A0363001
A020	A0364001
A020	A0365001
A021	A0387007
A021	A0388001
A021	A0393002
A021	A0393004
A022	A0399001
A027	A0366001
A027	A0497008
A029	A0340006
A030	A0308002

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TRANS	ACCESSION #
A030	A0308003
A030	A0527002
A030	A0527003

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TRANS	ACCESSION #
E010	E1315001
E010	E1350001
E010	E1357001
E010	E1358001
E011	E1399001
E011	E1404001
E011	E1405001
E011	E1409001
E011	E1414001
E011	E1418001
E011	E1421001
E011	E1428001
E011	E1434001
E012	E1311001
E012	E1317001
E012	E1343001
E012	E1363001
E012	E1366001
E012	E1372001
E013	E1378001

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TRANS	ACCESSION #
M011	M0028006
M011	M0028007
M011	M0035020
M011	M0046002
M011	M0046003
M012	M0080001
M012	M0098002
M012	M0140011
M012	M0140012
M013	M0152006
M013	M0244002
M013	M0291002
M013	M0291003
M013	M0293002
M013	M0293003
M014	M0327016
M014	M0333001
M014	M0340001

WP #9

List of frequently encountered errors in EXFOR transtapes received at NDS.

H. Wienke

SPA, MXW, FST, FIS, EPI, BRA, BRS in REACTION Sf8 should always be used in combination with INC-SPECT in the BIB section and EN-MEAN or EN-DUMMY in the COMMON section. When INC-SPECT and EN-MEAN/DUMMY are not given and the headings EN-MIN/MAX are present in COMMON or DATA section, use AV.

Fitting coefficients:
In the cases where the first coefficient is equal to the cross section, like in ',DA,,COS' and ',DA,,LEG', it should be coded in a separate subentry and each subentry should have a cross reference under the STATUS code COREL to the other subentry.

DATA-ERR should only be given if no error analysis is present.

/T should be used rather than /M+G in implicit ratios.

In DECAY-DATA and -MON the reaction product in Sf4 of respectively REACTION and
MONITOR should be entered as decaying nuclide, even if gamma-rays of its daughter nuclides are measured.

Total particle production cross section should be coded (N,X)particle code,,SIG where particle code is 0-G-0, 1-H-1, 0-NN-1, etc.

Don't use PAR in Sf5 when Sf3 is 'EL'.

When more than one secondary-energy headings are given in the COMMON or DATA section they should be explained under the BIB keyword EN-SEC.

When 'PAR' is present in Sf5, secondary energies should be coded in COMMON or DATA section (and also explained occasionally under EN-SEC in BIB section).

Use ARB-UNITS as data-unit heading in the DATA section when quantity modifier 'REL' is present in REACTION Sf8.

Memo 4C-3/374 (Rev.4)

revised **WP #10**

4 May 1995

To: Distribution

From: M. Lammer

Subject: CINDA manual revision: coding of (2n,f), (n,n'f) and (n,2nf) reactions

CINDA Action no. 59 from the 1992 NRDC meeting was to draft coding hints for reactions (2n,f) and (n,n'f) as proposed manual revision for pages II.2.8 (hints for coding such cases) and II.2.17 (note under the heading "fission quantities"). Action 44 from the 1994 NRDC meeting was to review the original memo; the revised wording is given below:

Addition to Page II.2.8:

(2n,f) reaction

In this process, 2 neutrons are captured almost simultaneously before the compund nucleus (Z,A+2) undergoes fission.

Cross sections for this process as well as "eta" and "alpha" should be entered for the target nucleus and the quantity NF with an appropriate comment, e.g.: "(2N,F)" or "(2N,F) REAC".

Other fission quantities (NU,NFY,FRS,etc.) are determined by the compound nucleus which is the same as after (n,f) reaction for the target nucleus (Z,A+1). Therefore entries should be made for the "target nucleus" (Z,A+1) with the corresponding quantity. The comment should contain the real target nucleus and "(2N,F)" or "(2N,F) REAC" or "YLD FROM U235(2N,F)" etc.

(n,n'f) and (n,2nf) reactions: instant fission

In the (n,n'f) resp. (n,2nf) reaction, 1 resp. 2 neutrons are emitted, leading to an excited level with negligible lifetime which undergoes instant fission (second resp. third chance fission). These processes can experimentally not be separated from the (n,f) reaction and are considered as part of it. Therefore entries for all quantities should be made as for (n,f) reactions.

(n,n'f) reaction: delayed fission

In this case, the (n,n') reaction leads to the formation of a spontaneously fissioning (shape) isomer of non-negligible lifetime with the same (Z,A) as the target nucleus. Therefore the target nucleus is always entered.

Cross sections for the whole process: entries should be made for the quantities NF and DIN (since it is a partial inelastic scattering cross section) with the incident neutron energy and appropriate comments, e.g.: "(N,N'F)" or "(N,N'F) REAC" or "SIG FOR (N,N'F)".

Other fission quantities: entries should be made for the quantity measured using "SPON" for the energy. An appropriate comment is required, e.g.: "SPONT FISS ISOMER" or "FROM ISOMER AFTER (N,N')" or "FROM U235(N,N')U235M(SF)". If no information on the (n,n') reaction is given, no corresponding entry for DIN should be made.

<u>Note</u>: If the inelastic scattering cross section for the formation of the spontaneously fissioning isomer is given together with other fission quantities, entries should be made for the the target nucleus and the (n,n') reaction as well as for the reported quantities for the spontaneously fissioning isomer as above, with appropriate comments.

<u>(n,2nf) reaction: delayed fission</u>

This case is similar to the (n,n'f) reaction except that 2 neutrons are emitted before formation of the spontaneously fissioning isomer (Z,A-1). The considerations of the processes and coding rules for CINDA follow those of the (n,n'f) reaction except that for the <u>cross section</u> for the whole process, N2N replaces DIN, and for the <u>other fission quantities</u> the target nucleus is the spontaneously fissiong isomer (Z,A-1).

<u>Revision of Page II.2.11:</u>

under DIN Diff Inelast: Definition: Angular distributions or energy spectra of inelastically scattered neutrons, or partial cross-sections.

Examples of use:

....

4) cross-section for (n,n'f) reaction (see also pages II.2.8 and II.2.17)

<u>Revision of Page II.2.13:</u>

under N2N (N,2N) Definition: ... no change

Use: For cross sections .... emitted.
Include: cross-section for (n,2nf) reaction (see also pages II.2.8 and II.2.17)
Exclude: (n,f) and (n,3n) reaction.

<u>Revision of Page II.2.17</u> (at top of page before NF):

<u>Fission quantities</u>

Summary table of coding rules for (2n,f), (n,n'f) and (n,2nf) reactions (for details and coding hints see page II.2.8):

quantities/ what to be coded		(2n,f)	delayed (n,n'f)	delayed (n,2nf)
whole process: NF RIF ALF ETA	target nucleus +)	(Z,A)	(Z,A)	(Z,A)
	neutron energy	incident	incident	incident
	additional quantity *)	-	DIN	N2N
other quantities: NU NUD NUF SFN SFG FPG FPB NFY FRS CHG	target nucleus +)	(Z,A+1)	(Z,A)	(Z,A-1)
	neutron energy	incident	SPON	SPON

+) target nucleus for CINDA, where (Z,A) is the published target nucleus
*) only if information on the cross section is given

Media for data exchange between Centres

Please indicate which center can accept what media for the various types of data. If more than one medium is acceptable, the preferred one is in **bold**.

B = e-mail (Bitnet)	T = conventional magnetic tape	H = hardcopy
I = e-mail (Internet)	D5 = PC diskette 5¼ inch	
F = FTP (Internet File Transfer)	D3 = PC diskette 3½ inch	

	NNDC	**NEA-DB**	**NDS**	**CJD**	**CAJaD**	**CDFE**	**CNDC**	**RIKEN**	**Sapporo**	**Debrecen**
Cinda batch	I, F	I, F, D3, D5	(B), **I** (F, D3, D5)	B, (D3, D5)	-	-	I, T, (D3, D5)	-	-	-
Interim Dict. update	I, F	any (not T, B)	-	(H, D3, D5)	**D3, D5**, I	D3	I, D5	H, I, B, T, **D3**	B, I, **F**, H	-
EXFOR TRANS	I, **F**, D5, D3	I, **F**, D3, D5	T, F, D3, D5	D3, D5	**D3, D5**	D3, F	I, T	T, **D3**, F	**T, F**, (D3)	D3, D5, (T)
CP-Memos and 4C-Memos	**I**, F, D5, D3	H, **I**	H, B, I	H, B	**I**, (H)	I, F, (H)	H, D5, I	H, **I**, B	**H, I**, B	H, B, I

Notes:

1) If data are sent in zipped (compressed) mode on diskette, the unzipping code should be included on the diskette.

2) For memos, H (hardcopy) should be acceptable at least as a secondary choice (for receiving).
   Centres are free to send their own memos always electronically.

WP #12

WP #13

Distribution of CP Memos

e-mail:

BHAT@BNLND2.DNE.BNL.GOV
MCLANE@BNLND2.DNE.BNL.GOV
TUBBS@NEA.FR
KONIECZNY@NEA.FR
MANOKHIN@CJD.OBNINSK.SU
OLGA@CJD.OBNINSK.SU (O. Pakhomova)
CHUKREEV@CAJAD.KIAE.SU
CBETA@CAJAD.KIAE.SU (S. Babykina)
VARLAMOV@CDFE.NPI.MSU.SU
CHIBA@NUCL.PHYS.HOKUDAI.AC.JP
KATO@NUCL.PHYS.HOKUDAI.AC.JP
TENDOW@POSTMAN.RIKEN.GO.JP
CIAEDNP@BEPC2.IHEP.AC.CN (Liang Qichang)
TARKANYI@ATOMKI.HU
LEMMEL@IAEAND.IAEA.OR.AT
SCHWERER@IAEAND.IAEA.OR.AT
KIKUCHI@CRACKER.TOKAI.JAERI.GO.JP

Hardcopy:

M.R. Bhat, NNDC
N. Tubbs, NEA-DB
V.N. Manokhin, CJD
F.E. Chukreev, CAJaD
V.V. Varlamov, CDFE
Zhang Jingshang, IAE-CNDC
Y. Kikuchi, JAERI
T. Tendow, RIKEN
K. Kato, JCPRG
F. Tárkányi, ATOMKI
V. McLane, NNDC
H.D. Lemmel, NDS
M. Konieczny, NEA-DB
Zhuang Youxiang, CNDC

WP #14

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)
WAGRAMERSTRASSE 5, P.O. BOX 100, A-1400 VIENNA (AUSTRIA)
Telephone: +43 1 2360-0 Telex: 112645 ATOM A Facsimile: +43 1 23 45 64 E-MAIL: IAEO@IAEA1.IAEA.OR.AT

MESSAGE

In case of incomplete transmission, please call +43 1 2360 ext. 1716 or ext.1195

DIVISION PHYSICAL AND CHEMICAL SCIENCES

ADDRESSEE(S)

Page 1 of 4 total pages

Dr. Mulki R. Bhat
National Nuclear Data Center
Brookhaven National Laboratory
Upton, NY 11973, USA

FAX: 1-516-282-2806

EXTERNAL INFORMATION
COPIE(S):

FILE REF: 334-F4-01

March 21, 1995

Dear Mulki,

Referring to your e-mail to Charlie, I have some information on how to cite databases. But further discussion is needed.

1. In 1979 we received instructions from NNDC on this question. See attachment 1. For some time we had included this page in our IAEA-NDS-document. But it needs some updating and we have not produced a more up-to-date version.

2. For EXFOR we have a page of reference guidelines, which is attached (2). It was submitted to a NRDC Meeting long ago. We always enclosed this page when an EXFOR retrieval was sent by mail. But we do not have a solution for online retrievals.

3. All IAEA-NDS-documents (which are sent out with tapes and diskettes) include, as of last year, a Note which is attached (3). It includes a short hint for citations, and also a disclaimer. We do not yet have anything similar in the online system. The IAEA-NDS-document always includes the bibliographic reference that could be used for citations. Some of the IAEA-NDS-documents are now online available as README texts in the open area.

4. In the CINDA book the four centers are corporate authors. In practice, I never saw the corporate authors mentioned in citations, because it would be too bulky.

Conclusion: The matter is pending. If you come to a solution, it would be good if Vicky would bring it along to the NRDC Meeting.

Best regards, Hans

Hans

1

REFERENCE GUIDELINES FOR ENDF/B

When quoting ENDF/B data in a publication, the US National Nuclear Data Center has advised to do this in the following way:

Case I: Use of ENDF/B evaluations in a secondary manner, where many elements are used together, or other cases where NO CONCLUSIONS ARE DRAWN CONCERNING QUALITY OF EVALUATIONS. In this case we propose the following form for ENDF/B-V.

> "ENDF/B Summary Documentation, BNL-NCS-17541 (ENDF-201), 3rd Edition (ENDF/B-V), edited by R. Kinsey, available from the National Nuclear Data Center, Brookhaven National Laboratory, Upton, N.Y. (July 1979)."

Case II: Use of ENDF/B evaluations in a direct manner, for example comparing measured results with evaluated results, or ANY CASE WHERE CONCLUSIONS ARE DRAWN ABOUT AN EVALUATION FOR A PARTICULAR MATERIAL. We propose, for ^{12}C from ENDF/B-V as an example:

> "ENDF/B data file for ^{12}C (MAT 1306, MOD 1), evaluation by C.Y. Fu and F.G. Perey (ORNL), BNL-NCS-17541 (ENDF-201), 3rd Edition (ENDF/B-V), edited by R. Kinsey, available from the Brookhaven National Laboratory, Upton, N.Y. (July 1979)."

Case III: Use of ENDF/B evaluations to generate a multigroup library. In this case we propose that the report describing the library contain a table which includes the following information for each evaluation:

Material	MAT,MOD	Authors	Institution

This table may contain in additon other useful information concerning the multigroup library. Finally, a general reference should be given of the type described in Case I.

As shown in Cases II and III, a correct reference would contain the material name, MAT number, author list and institution(s), along with a reference to the Summary Documentaion. In addition, for ENDF/B-Version V, updates will be allowed to the evaluations prior to the release of ENDF/B-VI. Thus, references to ENDF/B-V evaluations should also contain the appropriate MOD number, which serves to define the current status of an evaluation. All of this information is readily available in File 1 of each evaluation. The only exception to the above cases would be where a published document, prepared by the authors of the evaluation, is available. This document should then be referenced directly.

2

REFERENCE GUIDELINES FOR EXFOR

When quoting EXFOR data in a publication this should be done in the following way:

"A.B. Author et al: Data file EXFOR-12345.002 dated 1980-04-05,
compare J. Nucl. Phys. 12, 345, (1979). EXFOR data received
from IAEA Nuclear Data Section, Vienna."

Explanations

1. The **author(s)** of an EXFOR entry can always be found under the keyword 'AUTHOR'.

2. EXFOR data are identified by the Data Library Name (i.e. EXFOR) plus the **accession-number** of the EXFOR entry (e.g. 12345. or 12345.002). It should be realized that authors receive proof-copies of the EXFOR data.

3. Data in EXFOR are often more uptodate than published data. For unique identification of the data used it is therefore necessary to refer primarily to the **EXFOR data**. However, a **related publication** should also be quoted. Publications pertinent to an EXFOR entry are always given under the keyword REFERENCE. If more than one reference is given, only the first one needs to be quoted.

4. **Many EXFOR entries are updated, sometimes even repeatedly**, when the author revises his data or when the EXFOR compiler receives additional information about the data. It is therefore essential to quote also the date which can always be found behind the accession-number of an EXFOR entry or subentry. This is the date of entry or the last revision of the EXFOR data.

Do not use old EXFOR retrievals. In case of doubt check back with the IAEA Nuclear Data Section whether your EXFOR data are still up-to-date and request a new retrieval.

Note:

The IAEA-NDS-documents should not be considered as publications or reports. When a nuclear data library is sent out by the IAEA Nuclear Data Section, it will be accompanied by an IAEA-NDS-document which should give the data user all necessary information on contents, format and origin of the data library.

IAEA-NDS-documents are updated whenever there is additional information of relevance to the users of the data library.

For citations care should be taken that credit is given to the author of the data library and/or to the data center which issued the data library. The editor of the IAEA-NDS-document is usually not the author of the data library.

Neither the originator of the data libraries nor the IAEA assume any liability for their correctness or for any damages resulting from their use.

94/11

MEMO 4C - 4 / 58

Centr po Jadernym Dannym - CJD

Nuclear Data Centre, Obninsk, Russia

Institute of Physics and Power Engineering

249020 Obninsk, Kaluga region Russia

DATE : April 26, 1995

To: Distribution

From: S. Mayev

Subject: Modification of nuclide parameters in Diction 27.
New REACTION Quantity codes for Diction 36.

Diction 27:

For nuclide 71-LU-177 we propose introduce code "1" in the field FLAGS, col. 13, for this nuclide might be used in the REACTION SF1. This nuclide then would look like

```
71-LU-177   (1 3      C  1)
```

```
REFERENCE: (C,87KIEV,2,204,8704)
           EXFOR 41011.004
```

- - - - - - - - - - - - - - - - -

Stanislav A. Mayev

Clearance: Vassily N. Manokhin.

Distribution:

V.McLane	M.Bhat
H.Lemmel	V.Varlamov
C.Nordborg	F.Chukreev

Memo CP/A-66

To:Distribution
From:F.E.Chukreev
Subject:Some dublication in CPND (and PHOTO) EXFOR.

During to paris meeting (1994) I promised to check CPND EXFOR libraries for possible duplication.A-,B-,C-,D-,S-,R-,P-,M- libraries have been studied.

Enclosed is the index of repeating ENTRIES.

The criteria to find duplications-first papers in REFERENCE must be identical. I must remark that some ENTRIES which have identical REFERENCE have not indentical contein.The example is P0001 and P0055.

Therefore the continuation of possible duplication will be continued.

F.E.Chukreev

Distribution:

C.Dunford,IAEA
N.Tubbs,NEA-DB
F.E.Chukreev,CAJaD
V.Varlamov,CDFE
M.R.Bhat,NNDC
K.Chiba,JCPRG
Zhang Jingshang,IAE-CP
T.Tendow,RIKEN

ENTRY-1	COMPILATION DATA	ENTRY-2	COMPILATION DATA	REFERENCE
B0003	750204	C0321	871218	(J,JIN,33,3627,71)
B0019	760318	C0334	871213	(J,JIN,30,2017,68)
B0041	750604	C0577	871214	(J,JIN,32,1419,70)
B0094	780413	C0209	870324	(J,NP,24,28,61)
B0096	790115	A0135	820628	(J,JIN,38,13,76)
B0149	800623	C0058	800213	(J,NP,78,476,66)
B0160	800728	A0140	860723	(J,ARI,28,561,77)
B0180	810215	R0001	840131	(J,ARI,30,631,79)
C0027	771121	M0219		(J,NP/A,112,47,68)
C0032	781211	M0012	790121	(J,AE,16,141,64)
C0061	800214	C0382	871002	(J,PL,7,163,63)
C0062	800215	F0026	850620	(J,NP,62,81,65)
C0207	870319	P0052	830620	(J,NP,18,638,60)
C0366	880115	A0384	880503	(J,PR/C,34,60,86)
C0411	880205	A0352	871216	(J,PR/C,34,899,86)
P0001		P0055		(J,PR,114,571,59)
P0081		P0122		(J,PR,128,1281,62)
R0002	840131	A0161	830103	(J,ARI,27,465,76)
R0005	840131	A0062	800602	(J,ARI,31,163,80)
R0023	850918	A0175	830107	(J,RCA,29,1,81)
R0024	850918	A0265	850828	(J,ARI,26,279,75)

WP #17

Memo-CP/A-72 18 April 1995

To:Distribution
From:F.E.Chukreev,S.Babykina
Subject:1.Some remarks regarding to Dictionary 36.
2.The modification of Dictionaries 34 and 36.
3.Additions to dictionary 26.
4.Addition to dictionary 27.

1.The development of experimental possibilities permit to execute complex correlation experiments.Therefore the subfield 7 of REACTION is increasing.Some time ago we compiled the triple correlation "p-alpha-p" for EXFOR system.When the compilation have been finished the length of subfields 5-8 was greater then 17 columns.This combination could not be included in 36th dictionary without a changing of its structure. EXFOR community,this is our opinion only,must elect between two possibilities to solve this problem:

1.1 to increase line length in Dictionary 36

or

1.2 to permit use in Subfield 7 of REACTION any combination code from Dictionary 33 or 27.

The preference of the path 1.2 is obvious.This solving to help us to exclude the modification of 36th Dictionary for very much cases and this path will not create new difficulties for the understanding EXFOR texts.

2.Some time ago we met unusual measurement unit for neutron spectra from (p,n) reaction.

This unit is "neutron/unit of lethargy/steradian". After little confusion we understood that this unit is double differential cross section multiplyed by energy of neutron. Therefore we should like to include the code-

LTH

in dictionary 34 and combination

DA/DE,,LTH

with comments-Double differential cross section multiplyed by energy of outgoing particles.

3.Additions to dictionary 26.

P-SPC (proton spectra)
N-SPC (neutron spectra)

4.Additions to dic.27

46-PD-98 (3)

Distribution:

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Activities and Cooperations on Nuclear Data in China During 1994

Zhuang Youxiang

(Chinese Nuclear Data Center, IAE)

1 The Meetings were Held by CNDC in 1994 :

1) "The Third Meeting for Reviewing Codes Related to Nuclear Data", July 15~16, Chengde city, Hebei province; 12 codes were reviewed and accepted into the computer program library at CNDC. They are related to nuclear model calculation, experimental data compilation and evaluation, plotting, management codes of computer program library and Chinese evaluated nuclear parameter library.

2) "The Second Working Meeting of Chinese Evaluated Nuclear Parameter Library (CENPL)", July 17~18, Chengde city, Hebei province; exchanged and reviewed the progress on CENPL as well as CRP, discussed some technical problems and possible international cooperation, arranged the future work for recent three years (1995~1997).

3) "The Meeting of Chinese Nuclear Data Evaluation Working Group", July 19~21, Chengde city, Hebei province; exchanged the progress on CENDL–2.1, reviewed the evaluations of 8 nuclides completed newly, and discussed the future work.

4) " The Symposium on Nuclear Data Measurement, Evaluation and Benchmark Testing", Oct. 6~11, Huangshan city, Anhui province; some great progresses on nuclear data measurements were made, such as fission product yield, double differential cross section of secondary neutron and (n,α), (n,xp) reactions, and activation cross section of long–lived nuclides; interchanged the progresses on CENDL–2.1, charged particle and decay data, nuclear model parameter library, medium–high energy, four bodies and fission mechanism researches, communicated the progress on integral fusion experiment, discussed the benchmark testing work in the future.

2 The International Meetings and Workshops in Nuclear Data Field Attended by Staff Members of CNDC in 1994 :

1) "13th Advisory Group Meeting on the Coordination of Nuclear Reaction Data Center", April 25~27, Paris, France.

2) "Workshop on Nuclear Reactor — Physics, Design and Safety", April 7 ~ May 7, ICTP, Italy.

3) " Meeting of NEA Working Party on International Evaluation Cooperation", May 4~6, Oak Ridge, USA.

4) "International Conference on Nuclear Data for Science and Technology ", May 9~13, Gatlinburg, USA.

5) " IAEA Advisory Group Meeting on the Coordination of the Nuclear Structure and Decay Data Evaluation Network" , May 16~ 20, Lawrence Berkeley Lab., USA.

6) "First Research Coordination Meeting on Development of Reference Input Parameter Library for Nuclear Model Calculations of Nuclear Data", Sept. 19 ~23, Cervia, Italy.

7) "IAEA Research Coordination Meeting on Establishment of an International Reference Data Library of Nuclear Activation Cross Sections", Oct. 4 ~ 7, Debrecen, Hungary.

8) " Research Coordination Meeting on Compilation and Evaluation of Fission Yield Nuclear Data", Oct. 17~20, Vienna, Austria.

3 The Foreign Scientists in Nuclear Data Field Visited CNDC / CIAE in 1994 :

Dr. E. T. Cheng, San Diego, USA, June 1~2;
Dr. H. Takano, JAERI / NDC, Japan, Sept. 8~11;
Dr. C. Y. Fu, ORNL, USA, Oct. 24~29.

4 One staff member of CNDC as a visiting scientist is working at Kentucky University, USA, for one year.

The Activities in CENDL-2 and EXFOR Compilation for Neutron Reaction Data at CNDC

Liang Qichang

Chinese Nuclear Data Center
China Institute of Atomic Energy
P.O.Box 275(41), Beijing 102413
P.R.China

1. CENDL-2

During the last year, the following modification and improvement for CENDL-2 have been made.

(1). The characteristic values(thermal cross section, resonance integrals,etc.) have been added in the text in MF1 MT451 for all evaluations of CENDL-2.

(2). The secondary neutrons energy spectra for O-16,Na-23,Mg-0, Si-0,P-31,S-0,K-0,Ti-0,V-51,Zr-0,Cd-0,In-0,Sb-0,Hf-0,W-0, Au-197,Pb-0,Np-237,Pu-239 have been modified.

(3). The total cross section for natural S,K,Ti,Ni,Zr,Sb,Hf,Pb have been updated.

(4). The gamma-production data for Ti-0,Zn-0,Zr-0,Mo-0,Cd-0, In-0,Sn-0,Sb-0,Hf-0,Ta-181,W-0,Au-197,Pb-0 have been supplemented in the data files.

(5). The re-evaluations for Ca-0 and U-238 by using new model theory codes have replaced the old one in CENDL-2.

(6). The new evaluations for Fe-56 and natural Lu,Hg,Tl have been added in CENDL-2.

Work in progress

(1). The re-evaluation for Be-9 and new evaluations for natural Ga and Cl will be completed and added in CENDL-2 in 1995.

(2). The evaluations for Ag-nat,Al-27,Co-59,Fe-nat,54,57,58

Mn-55,Cr-nat,50,52,53,54,Cu-nat,63,65 and Nb-93 will be contained in CENDL-2 in 1995, they are the joint Chinese/Japanese evaluations completed in NDC/JAERI in 1992, among them,the Fe-54,57,58,Cr-50,52,53,54 and Cu-63,65 are new evaluations for CENDL-2, and the others will supersed the old one in CENDL-2.

Besides, the new version of main evaluated nuclear data libraries, i.e. ENDF/B-6.2, JENDL-3.2, JEF-2.2 and BROND-2.2 have been loaded in disks of micro-VAX-2 and can be accessed on computer directly.

2. EXFOR

The EXFOR compilation for neutron reaction data was discontinued in 1994 in CNDC for many reasons, fortunately it has been continued in the beginning of 1995, up to now, 10 EXFOR entries(from 32617 to 32626) containing 43 data sets for neutron reaction data in total have been compiled and sent to NDS/IAEA, and more new entries are expected to be compiled in this year.

3. CINDA

CNDC wants to start the CINDA compilation in 1995, for this purpose we hope NDS/IAEA send CNDC the CHECK code for CINDA entries.

BOFOD: Present Status of the Evaluated Photonuclear Data File of CJD

A.I.Blokhin
Institute of Physics and Power Engineering, Obninsk, Russia

BOFOD-90 is one of various kinds of BROND special purpose files. The present status of the BOFOD-90 library is described briefly.

Russian Nuclear Data Committee (RNDC) organized in 1989 two working groups to evaluate the photonuclear cross-sections for stable nuclides ("WG-1" - Working group 1) and for the fission-products ("WG-2" - working group 2).

At present time the WG-1 group constructed the preliminary version of the evaluated photoneutron data library for 66 materials and/or their stable isotopes: Be-009, Na-023, Cr-50,52-54, Mn-55, Fe-54,56-58, Ni-000, Ni-58,60-62,64, Sr-88, Zr-000, Zr-90-92,94,96, Nb-93, Mo-000, Mo-92,94-98,100, Sn-112,114-120,122,124, Te-120,122-126,128,130, W-182,184,186, Pb-000, Bi-209, Th-232, U-233-236,238, Np-237, Pu-239,241, Am-241,243. For the description of the photo-absorption cross-section we used Soloviev's model [1]. In the frame-work of the quasiparticle-phonon and one-phonon nuclear models [1] we investigated the fragmentation of the phonon states over many nuclear levels. It allows one to calculate the reduced $E\lambda$ - transition probabilities and the total photo-absorption cross-section [2]. The results of calculation of the photo-absorption cross-section for zirconium-isotopes in the comparision with the experimental data are given in fig. With this model we obtained the evaluated photo-absorption cross-sections for the stable isotopes of chromium, iron, nickel, strontium, zirconium, niobium, molybdenum, tin and tellurium. These results were presented on the FENDL Meeting [2].

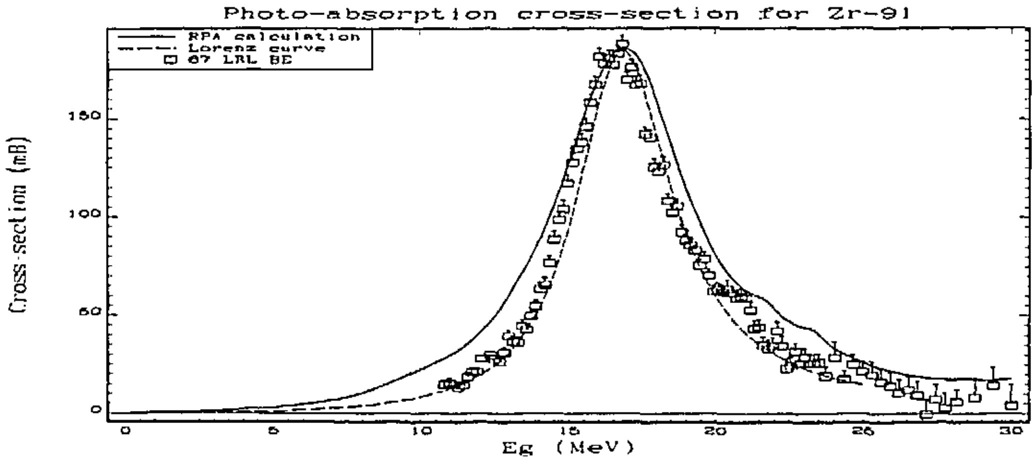
In 1993 the WG-2 group performed the evaluation of the photoneutron cross-sections for the fission-products and in 1994 we are going to include these data in the BOFOD library for the following fission-products: Sr-90, Zr-93, Zr-96, Nb-94, Tc-99, Sn-121, Sn-126, Pd-107, Ag-108, Cs-135, Cs-137, I-129, Ho-166, Sm-147, Sm-148, Sm-151, Tb-158. Description of this activity will be given in ref.[5].

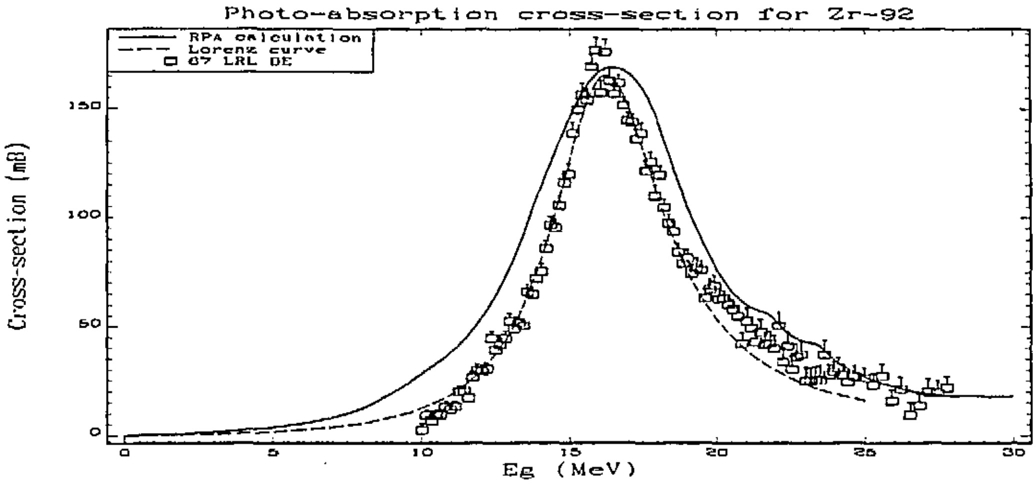
The BOFOD-90 library is in "ENDF-6" format and has N-LIB=42 for identifying the library.

A part of summary description of the evaluations in the BOFOD-90 library is given in ref.[3]. Plots of experimental and evaluated data are published in the ref.[4]. The complete data tables are contained on 1 PC diskette and available from the authors.

References:

1. Soloviev V.G. et al. Nucl. Phys., 1977, v.A288, p.376-396.
2. Blokhin A.I., Storozhenko A.N. Description of the Structure of Photonuclear Cross-sections in the Frame-work of One-Phonon Microscopic Model. A paper on this subject was presented at the IAEA Specialist's Meeting on "Charged particle and photonuclear data evaluations for FENDL", Slovakia, Smolenice, 18-21 april 1994.
3. Blokhin A.I., Buleeva N.N., Nasyrova S.M., Pakhomova O.A., Zabrodskaya S.V., Tsibulya A.M. Formation and application of evaluated photoneutron data library "BOFOD". J., YK.,1992,v.3-4,p.3-54
4. Blokhin A.I., Nasyrova S.M. Plots of experimental and evaluated photoneutron cross-section. R., INDC(CCP)-337(1991),IAEA,Vienna
5. Rabotnov N.S., Shubin Yu.N. et al. J., YK,1994,v.3-4.





WP #22

CSISRS Library Statistics

April 25, 1995

Area	# subentries	# data points	Last tape added
Neutron			
1	17 343	1 859 364	1258
2	14 656	1 182 853	2133
3	5 200	57 003	3095
4	7 176	176 682	4095
Charged Particle			
A	3 520	64 969	A028
B	1 538	16 845	B011
C	1 472	25 933	C013
D	392	8 846	D018
E	1 890	31 434	E013
P	708	11 619	P001
R	392	5 659	R009
S	332	4 696	S008
Photonuclear			
G	29	455	G007
L	651	32 772	L004
M	2 791	80 513	M018
Q			
Evaluation			
V	618	36 380	V025
Total			

CSISRS LIBRARY STATISTICS FOR AREA 1 LISTED BY REFERENCE April 25, 1995

Year	# Subentries	# Data points	Last Transmission 1258
1988	115	92127	
1989	118	10068	
1990	74	55345	
1991	90	18221	
1992	29	55789	
1993	41	15594	
1994	7	1390	
Total	474	248,534	

CSISRS LIBRARY STATISTICS FOR AREA 2 LISTED BY REFERENCE

Year	# Subentries	# Data points	Last Transmission 2133
1988	500	15628	
1989	268	14984	
1990	324	15773	
1991	88	3783	
1992	7	1271	
1993	6	12	
Total	1,193	51,451	

CSISRS LIBRARY STATISTICS FOR AREA 3 LISTED BY REFERENCE

Year	# Subentries	# Data points	Last Transmission 3095
1988	110	1182	
1989	198	1647	
1990	75	508	
1991	115	692	
1992	78	890	
1993	49	785	
1994	15	199	
Total	640	5,903	

CSISRS LIBRARY STATISTICS FOR AREA 4 LISTED BY REFERENCE

Year	# Subentries	# Data points	Last Transmission 4095
1988	188	3961	
1989	99	3224	
1990	219	1800	
1991	39	1701	
1992	87	2009	
1993	39	529	
Total	671	13,224	

```
ENTRY            B0135      941102                                     B013500000001C
SUBENT        B0135001      941102                                     B013500100001C
BIB                 11          30                                     B013500100002
TITLE       PRODUCTION OF GA-67 BY ALPHA BOMBARDMENT OF NATURAL        B013500100003
            ZINC                                                       B013500100004
AUTHOR      (Y.NAGAME, M.UNNO, H.NAKAHARA, Y.MURAKAMI)                 B013500100005
INSTITUTE   (2JPNTOK) DEPARTMENT OF CHEMISTRY                          B013500100006
REFERENCE   (J,ARI,29,615,78)                                          B013500100007
FACILITY    (CYCLO,2JPNTOK)                                            B013500100008
METHOD      (STTA,EDEG,CHSEP)                                          B013500100009
            ENERGY DEGRADATION IN THE STACK WAS CALCULATED             B013500100010
            ACCORDING TO C.F.WILLIAMSON ET AL., CEA-R3042(1966).       B013500100011
            TWO KINDS OF IRRADIATIONS WERE PERFORMED. FOR THE          B013500100012
            LONG-LIVED PRODUCTS A STACK OF 13-15 ZN-FOILS WAS          B013500100013
            IRRADIATED FOR 20-30 MINUTES. FOR THE SHORT-LIVED          B013500100014
            PRODUCTS AL-FOILS OF 4.3 MG/CM**2 SERVING AS ENERGY        B013500100015
            DEGRADERS WERE INSERTED BETWEEN  ZN-FOILS AND THESE        B013500100016
            STACKS WERE IRRADIATED FOR 5 MINUTES.                      B013500100017
            NO INFORMATION ON THE PARTICLE FLUX DETERMINATION          B013500100018
            IS GIVEN IN THE PAPER.                                     B013500100019
SAMPLE      FOILS OF NATURAL ZN, THICKNESS ABOUT 13 MG/CM**2,          B013500100020
            PURITY 99.9 PER CENT                                       B013500100021
DETECTOR    (GELI)                                                     B013500100022
ERR-ANALYS THE ERRORS OF THE CROSS SECTIONS WERE ESTIMATED TO BE       B013500100023
            AT LEAST 15 PER CENT. THE ERROR ASSOCIATED WITH THE        B013500100024
            PHOTON INTENSITIES IS NOT INCLUDED. THE ERROR IN THE       B013500100025
            ALPHA PARTICLE ENERGY WAS AS LARGE AS +-1 MEV IN THE       B013500100026
            REGION WHERE THE EXCITATION FUNCTIONS STEEPLY RISE OR      B013500100027
            FALL.                                                      B013500100028
STATUS      (CURVE)                                                    B013500100029
HISTORY     (800428C)LAKW                                              B013500100030
            (941102U)                                                  B013500100031
            (940719A) SOME CORRECTIONS HAVE BEEN INCLUDED BY CAJAD     B013500100032
ENDBIB            .     30                                             B013500100033
NOCOMMON                                                               B013500100034
ENDSUBENT               33                                             B013500199999
SUBENT        B0135008      941102                                     B013500800001C
BIB                  7          13                                     B013500800002
REACTION    (30-ZN-0(A,X)32-GE-67,,SIG,,,EXP)                          B013500800003
RAD-DET     (32-GE-67,DG)                                              B013500800004
DECAY-DATA (32-GE-67,19.MIN,DG,167.,0.84)                              B013500800005
CRITIQUE    /BY CAJAD/ VALUE OF 167 KEV G-RAY INTENSITY IN             B013500800006
            ORIGINAL  PAPER  (1.05) IS ERRONEOUS.  ENSDF DATA ( SEEB013500800007
            TABLE OF RADIOACTIVE ISOTOPES) IS 0.84.  ORIGINAL PAPERB013500800008
            DOES  NOT CONTAIN ANY INFORMATION ABOUT THE SOURCE THISB013500800009
            DATUM.                                                     B013500800010
COMMENT     /BY COMPILER F.C/. AUTHOR'S DATA HAVE BEEN RECALCULATEDB013500800011
            BY MULTILYING ON 1.05/0.84 = 1.25 .                        B013500800012
MISC-COL    (MISC). AUTHOR'S INCORRECTED DATA.                         B013500800013
HISTORY     (941020A). CAJAD CRITIQUE IS INCLUDED.                     B013500800014
            (941102U)                                                  B013500800015
ENDBIB                  13                                             B013500800016
NOCOMMON                                                               B013500800017
DATA                     3           6                                 B013500800018
EN          DATA       MISC                                            B013500800019
MEV         MB         MB                                              B013500800020
       15.7      182.5       146.                                      B013500800021
       19.2      191.2       153.                                      B013500800022
       23.4       63.8        51.                                      B013500800023
       26.7       26.2        21.                                      B013500800024
```

```
       30.6          10.5          8.4                                   B013500800025
       37.1          11.5          9.2                                   B013500800026
ENDDATA                 8                                                B013500800027
ENDSUBENT              26                                                B013500899999
SUBENT          B0135009         941102                                  B013500900001C
BIB                     7            15                                  B013500900002
REACTION   1(30-ZN-0(A,X)32-GE-66,,SIG,,,EXP)                            B013500900003
           2(30-ZN-0(A,X)32-GE-66,,TTY,,,EXP)                            B013500900004
RAD-DET    (32-GE-66,DG)                                                 B013500900005
DECAY-DATA (32-GE-66,2.27HR,DG,382.,0.282)                               B013500900006
CRITIQUE   /BY CAJAD/ VALUE OF 382 KEV G-RAY INTENSITY IN                B013500900007
           ORIGINAL  PAPER (0.480) IS ERRONEOUS.  ENSDF DATA ( SEEB013500900008
           TABLE OF RADIOACTIVE ISOTOPES) IS 0.282. ORIGINAL PAPERB013500900009
           DOES  NOT CONTAIN ANY INFORMATION ABOUT THE SOURCE THISB013500900010
           DATUM.                                                        B013500900011
COMMENT    /BY COMPILER F.C/. AUTHOR'S DATA HAVE BEEN RECALCULATEDB013500900012
           BY MULTILYING ON 0.480/0.282 = 1.70                           B013500900013
MISC-COL   (MISC1). AUTHOR'S INCORRECTED DATA FOR CROSS SECTION.         B013500900014
           (MISC2). AUTHOR'S INCORRECTED DATA FOR TTY.                   B013500900015
HISTORY    (941020A). CAJAD CRITIQUE IS INCLUDED.                        B013500900016
           (941102U)                                                     B013500900017
ENDBIB                 15                                                B013500900018
NOCOMMON                                                                 B013500900019
DATA                    5            20                                  B013500900020
EN         DATA        1DATA       2MISC1        MISC2                   B013500900021
MEV        MB          MUCI/MUAHR  MB            MUCI/MUAHR              B013500900022
       21.9          3.6                       2.1                       B013500900023
       22.5                        6.3                       3.7         B013500900024
       22.9          6.3                       3.7                       B013500900025
       23.9          10.0                      5.9                       B013500900026
       24.6                        27.2                      16.         B013500900027
       26.3                        63.0                      37.         B013500900028
       26.4          18.7                      11.                       B013500900029
       28.1                        121.                      71.         B013500900030
       29.2          25.5                      15.                       B013500900031
       29.9                        191.                      112.        B013500900032
       30.7          30.6                      18.                       B013500900033
       31.7                        279.                      164.        B013500900034
       32.6          35.7                      21.                       B013500900035
       33.2                        374.                      220.        B013500900036
       34.7                        480.                      282.        B013500900037
       35.8          32.3                      19.                       B013500900038
       36.3                        577.                      339.        B013500900039
       37.1          32.3                      19.                       B013500900040
       37.7                        602.                      401.        B013500900041
       38.7          28.9                      17.                       B013500900042
ENDDATA                22                                                B013500900043
ENDENTRY               11                                                B013599999999
```

COVERAGE SURVEY OF IMPORTANT JOURNALS BY THE CINDA CENTRES

coverage:

NEADB:
- all .... scanned+entries for all areas
- area 1+2.......... scanned+entries for area 1 and 2 labs
- area 2 .... only scanned+entries for area 2 labs
- ? .... coverage (by external reader?) unknown

NDS: make regularly entries for area 1, occasionally also for areas 2+4
- journal code ..... covered by translation journal
- circ .... circulated to reader and covered regularly
- CCOD .... covered via "Current Contents on Diskette" with delays
- stopped .... not circulated any more (not yet from CCOD)

CJD: only area 4 publications
- reg .... covered regularly
- occ .... covered occasionally (not available at library)

JNDC: only Japanese literature
- cov .... covered regularly + entries made

journal code	published in area	NEADB	coverage by NDS	CJD	JNDC
AE	4		AE/T	reg	
AEJ	2	?	CCOD		
AE/T	3		circ		
AND	1	area 2	circ		
ANE	2	all	CCOD		
ANS	1		-		
AP	1		CCOD		
APH	2	?	CCOD		
APPB	3		CCOD		
ARI	2	area 2	stopped		
ARN	1		circ		
ASI	3		CP/stopped		
ASL	3		stopped		
AUJ	3		circ		
BAP	1		-		
BAS	3		circ		
CJC	1		-		
CJP	1		circ		
CNP	3		circ		
CP	3		stopped		
CST	3		circ		
CZJ	3		circ		
DA/B	1		-		
DOK	4		-	reg	
EUL	2	?	CCOD		
FBS	2	area 2			
FIZB	3		circ		
HEN	3		CCOD		
HFH	3		circ		
IJPA	3		circ		
IPA	3		circ		
IRE	1		CCOD		
IZV	4		BAS	reg	
JEL	3		CCOD		
JP/G	2	all	circ		
JPJ	2		CCOD		cov

journal code	published in area	coverage by NEADB	NDS	CJD	JNDC
JRN	3		CCOD		
JRNL	3		CCOD		
KSF	4		-	reg	
KT	2	?	circ		
LEB	4		-	occ	
NC/A	2		CCOD		
NIMA	2	area 2	CCOD		
NIMB	2	area 2	CCOD		
NP/A	2	all	CCOD		
NSE	1	area 2	CCOD		
NST	2		circ		cov
NT	1		CCOD		
NTC	3		circ		
PAN	3		circ		
PHE	3		circ		
PL/B	2	area 2	circ		
PNE	2	?	circ		
PNP	2	?	circ		
PR/C	1	area 2	circ		
PRL	1	area 1+2	circ		
PRM	3		CCOD		
RAK	4		SRA	reg	
RCA	2	area 2	CCOD		
RJP	3		circ		
SCS	3		CCOD		
SJPN	3		-		
SRA	3		CCOD		
UFZ	4		-	reg	
VBF	4		-	reg	
VMU	4		-	reg	
YF	4		PAN	reg	
YK	4		INDC	reg	
ZEP	4		JEL	reg	
ZET	4		-	reg	
ZN/A	2	?	CCOD		
ZP/A	2	all	CCOD		

Citing Data Retrieved from the NNDC Online Data Service

May 4, 1995

Contents

1 Introduction

Data obtained from the NNDC Online Data Service should be properly cited. In general there should be a citation of the database or program used and more specific information as to the source(s) of the data.

Note: Since the databases resident at the NNDC are periodically updated, it is important to include the date of the database. In most instances, this is indicated when the database is first accessed. The output of many of the programs also give specific dates for the data retrieved.

2 CSISRS

The data in this database are in the EXFOR format and are the result of the compilation and exchange of information by the international Nuclear Data Centers Network. When quoting data from CSISRS in a publication, it should be done in the following way:

> "A.B. Author *et al.*: Data file EXFOR 12345.002 dated April 5, 1980, compare J. Nuclear Phys. **12**, 345 (1979). EXFOR data retrieved from the NNDC Online Data Service."

Notes:

1. The author(s) of an EXFOR entry can always be found under the keyword 'AUTHOR'.

2. EXFOR data are identified by the Data Library Name (*i.e.*, EXFOR) plus an accession-number of the EXFOR entry (*e.g.*, 12345. or 12345.002). It should be noted that the authors receive proof-copies of the EXFOR data.

3. Data in EXFOR are often more up to date than the published data. For unique identification of the data used it is, therefore, necessary to refer primarily to the EXFOR data. However, a related publication should also be quoted. publications pertinent to an EXFOR entry are always given under the keyword 'REFERENCE'. If more than one reference is given, only the first one needs to be cited.

4. Many EXFOR entries are updated, sometimes even repeatedly, when the author revises his data or when the EXFOR compiler receives additional information about the data. It is, therefor, essential to quote also the date which can always be found behind the accession-number of an EXFOR entry or subentry. This is the date of the entry or the last revision of the EXFOR data.

Do not use old EXFOR retrievals. In case of doubt, check the NNDC Online Data Service.

3 ENDF

As shown in the second two cases, a correct reference would contain the library name, material name, MAT number, author list and institution(s), along with a reference to the appropriate summary documentation. In addition, for ENDF/B-VI and other libraries, there will also be MOD and revision numbers. Thus, the references to these evaluations should contain the appropriate MOD or revision numbers, which define the current status of an evaluation. All these data are readily available in File 1 of each evaluation. The only exception to the above is where a published document, prepared by the authors of the evaluation is available. This document should then be cited directly.

3.1 General Retrievals

If the use of the evaluations is in a secondary manner, where many elements are used together, or other cases where **no conclusions are drawn concerning the quality of the evaluations**, the following citations are proposed for the specific evaluated data libraries (These citations should have appended to them "*Library name* data retrieved from the NNDC Online Data Service."):

3.1.1 BROND

3.1.2 CENDL

3.1.3 ENDF/B-VI

"ENDF/B-VI Summary Documentation, BNL-NCS-17541 (ENDF-201), edited by P.F. Rose, available from the National Nuclear Data Center, Brookhaven National Laboratory, Upton, NY (1991)."

3.1.4 ENDF/HE-VI

3.1.5 FENDL

3.1.6 JEF

3.1.7 JENDL

3.2 Specific Retrievals

If the use of the evaluations is in a direct manner (*e.g.* comparing measured results with evaluated results), or **any case where conclusions are drawn about an evaluation for any particular material**, the following is proposed, using natural C from ENDF/B-VI as an example:

> "ENDF/B-VI data file for C (MAT 600, Revision 1), evaluation by C.Y. Fu, E.J. Axton and F.G. Perey (ORNL), BNL-NCS-17541 (ENDF-201), edited by P.F. Rose, available from the National Nuclear Data Center, Brookhaven National Laboratory, Upton, NY (1991). ENDF/B-VI data retrieved from the NNDC Online Data Service."

Note that for other libraries the library name and general documentation would differ.

3.3 Multigroup Libraries

If the evaluations are used to generate a multigroup library, the report describing the library should contain a table which includes the following information for each evaluation:

```
Library  Material  MAT,MOD,REV  Authors  Institution
-------  --------  -----------  -------  -----------
```

This table may contain in addition other useful information concerning the multigroup library. Finally, general reference(s) should be given of the type described in General Retrievals.

4 ENSDF

4.1 General Retrievals

If the retrieval spans several mass chains (*e.g.*, a study of systematics), the citation should be to the Evaluated Nuclear Structure Data File (ENSDF) as a whole, including the revision date of the database. Suggested wording is "The Evaluated Nuclear Structure Data File (ENSDF) maintained by the National Nuclear Data Center, Brookhaven National Laboratory on behalf of the International Nuclear Structure and Decay Data Network under the auspices of the International Atomic Energy Agency. ENSDF data revised as of MMM-DD-YYYY retrieved from the NNDC On-Line Data Service."

4.2 Specific Retrievals

Retrievals covering only a few mass chains or parts of mass chains should cite the published version of the evaluation. This will be found under MASS_STATUS or in the COMMENTS dataset of the mass chain. The citation will also automatically be generated in PLOTS.

Note: Many mass chains are periodically updated between published evaluations. This is indicated in the first record of the data set. An evaluation published in the Nuclear Data Sheets in 1992 will have 92NDS on this record. If the data set were revised based on new data in 1994, 92NDS+94 will appear on this record. The COMMENTS data set will contain information on the revision and there should also be documentation in the data set.

4.3 PREPUBLICATION

Data obtained from the prepublication data base should be treated as a preprint. It should not be cited without express permission of the authors.

4.4 PLOTS

If the tables and drawings produced by the PLOT option of the NNDC Online Data Service are used directly or with minor modifications, the program ENSDAT written by R.R. Kinsey, National Nuclear Data Center, Brookhaven National Laboratory should be cited.

5 MIRD

"Data extracted from the Evaluated Nuclear Structure Data File (ENSDF) by the MIRD program of the NNDC Online Data Service. ENSDF is maintained by the National Nuclear Data Center, Brookhaven National Laboratory on behalf of the International Nuclear Structure and Decay Data Network under the auspices of the International Atomic Energy Agency. Additional calculations performed by the program RADLST (T.W. Burrows. The Program RADLST. Brookhaven National Laboratory Report BNL-NCS-52142 (1988))."

6 NUDAT

The following specific citations should have "Data retrieved from the NUDAT database (MMM-DD-YYYY) of the NNDC Online Data Service." attached.

6.1 Adopted Levels, Gammas

"The Evaluated Nuclear Structure Data File (ENSDF) maintained by the National Nuclear Data Center, Brookhaven National Laboratory on behalf of the International Nuclear Structure and Decay Data Network under the auspices of the International Atomic Energy Agency."

6.2 Ground and Metastable State Properties

"Nuclear Wallet Cards (J.K. Tuli. July, 1990) and subsequent updates by J.K. Tuli from the Evaluated Nuclear Structure Data File (ENSDF) and "The 1993 Atomic Mass Evaluation. (I). Atomic Mass Table." (G. Audi, A.H. Wapstra. Nucl.Phys. **A565**, 1 (1993))."

6.3 Decay Radiations

"Data extracted from the Evaluated Nuclear Structure Data File (ENSDF). ENSDF is maintained by the National Nuclear Data Center, Brookhaven National Laboratory on behalf of the International Nuclear Structure and Decay Data Network under the auspices of the International Atomic Energy Agency. Additional calculations performed by the program RADLST (T.W. Burrows. The Program RADLST. Brookhaven National Laboratory Report BNL-NCS-52142 (1988))."

6.4 Thermal Neutron Data and Resonance Integrals

S.F. Mughabghab, M. Divadeenam, N.E. Holden. Neutron Cross Sections, Vol. 1. "Neutron Resonance Parameters and Thermal Cross Sections. Part A: Z=1-60". Academic Press (New York. 1981).

S.F. Mughabghab. Neutron Cross Sections, Vol. 1. "Neutron Resonance Parameters and Thermal Cross Sections. Part B: Z=61-100". Academic Press (New York. 1984).

7 QCALC

"Calculations performed by the program QCALC of the NNDC Online Data Service using the data of G. Audi and A.H. Wapstra ("The 1993 Atomic Mass Evaluation. (I). Atomic Mass Table." Nucl.Phys. **A565**, 1 (1993) and "The 1993 Atomic Mass Evaluation. (II). Nuclear-Reaction and Separation Energies." Nucl.Phys. **A565**, 66 (1993).)."

8 XRAY

The general reference for calculations from the XRAY program should be the NNDC Online Data Service. A specific citation to the data or theory should also be made depending on the calculations performed.

8.1 ATTENUATION

The attenuation calculations are a modification of the program XCOM. The supporting document which should be cited is M.J. Berger and J.H. Hubbell, "XCOM: Photon Cross Sections on a Personal Computer", NIST Report NBSIR 87-3597 (1987).

8.2 Polarized Scattering

The photon-interaction data are from the ENDF/B-VI library and the supporting documentation is: D.E. Cullen, M.H. Chen, J.H. Hubbell, S.T. Perkins, E.F. Plechaty, J.A. Rathkopf and J.F. Scofield, "Tables and Graphs of Photon-Interaction Cross Sections from 10 eV to 100 GeV Derived from the LLNL Evaluated Photon Data Library (EPDL)", UCRL-50400, Vol. 6, Parts A+B (1989).

The polarized scattering calculations are based on work by A.L. Hanson; Nucl. Instr. Meth. **A290** 167-171 (1990), Nucl. Instr. Meth. **A264** 471-483 (1988), Nucl. Instr. Meth. **A264** 484-487 (1988).

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username: NDSOPEN for FTP file transfer