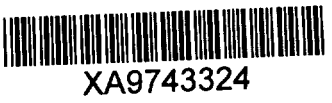

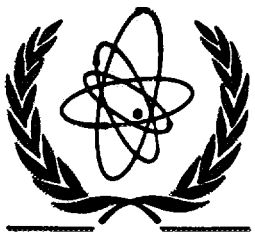

International Atomic Energy Agency

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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

Co-ordination of the Nuclear Reaction Data Centers

Report on an IAEA Advisory Group Meeting

hosted by the U.S. National Nuclear Data Center on behalf of the U.S. Government

Brookhaven, 3-7 June 1996

Edited by

O. Schwerer and H.D. Lemmel

November 1996

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

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Abstract: This report summarizes the 1996 co-ordination meeting in Brookhaven, U.S.A., of the national and regional nuclear reaction data centers, convened by the IAEA at regular intervals. The main topics are

- the international exchange of nuclear reaction data by means of the "EXFOR" system, and the further development of this system,
- the "CINDA" system as an international index and bibliography to neutron reaction data,
- the sharing of the workload for speedy and reliable nuclear data compilation and data center services,
- the exchange and documentation of evaluated data libraries in "ENDF" format,
- the rapid advances of online electronic information technologies,

with the goal of rendering data center services to data users in IAEA Member States by means of computer retrievals, online services and printed materials. The scope of data covers microscopic cross-sections and related parameters of nuclear reactions induced by neutrons, charged-particles and photons.

CONTENTS

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

Past NRDC Meetings

Brookhaven, 3-7 June 1996	Center Heads + Tech. = 13th NRDC Meeting	INDC(NDS)-360
Vienna, 2-4 May 1995	Technical	INDC(NDS)-343
Paris, 25-27 April 1994	Center Heads + Tech. = 12th NRDC Meeting	INDC(NDS)-308
Vienna, 1-3 Sept 1992	Technical	INDC(NDS)-279
Obninsk, 7-11 Oct 1991	Center Heads + Tech. = 11th NRDC Meeting	INDC(NDS)-262
Vienna, 13-15 Nov 1990	Technical	Memo CP-D/210
Vienna, 2-4 Oct 1989	Center Heads + Tech. = 10th NRDC Meeting	Memo CP-D/200
Vienna, 4-6 Oct 1988	Technical	Memo CP-D/190
Brookhaven, 27-29 Oct 1987	Center Heads + Tech. = 9th NRDC Meeting	INDC(NDS)-204
Vienna, 7-9 Oct 1986	Technical	Memo CP-D/159
Saclay, 9-11 Oct 1985	Center Heads + Tech. = 8th NRDC Meeting	INDC(NDS)-178
Vienna, 19-21 Sept 1984	Technical	Memo CP-D/131
Obninsk+ Moscow, 17-21 Oct 1983	7th NRDC Meeting	INDC(NDS)-154
Vienna, 3-7 May 1982	6th NRDC Meeting	INDC(NDS)-141
Brookhaven, 29.9 - 2.10.1980	5th NRDC Meeting	INDC(NDS)-125
Karlsruhe, 8-13 Oct 1979	4th NRDC Meeting	INDC(NDS)-110
Paris, 19-23 June 1978	3rd NRDC Meeting	NEA-NRDC-3 = INDC(NDS)-99
Kiev, 11-16 April 1977	2nd NRDC Meeting = 3rd CPND + 13th 4-C	INDC(NDS)-90
Vienna, 28-30 April 1976	2nd CPND Meeting	INDC(NDS)-77
Vienna, 26-27 April 1976	12th 4C-Meeting	INDC(NDS)-78
Vienna, 8-12 Sept 1975	CPND Meeting	INDC(NDS)-69+71
Brookhaven, 10-14 March 1975	11th 4C-Meeting	INDC(NDS)-68
Paris, 6-10 May 1974	10th 4C Meeting	INDC(NDS)-58
Vienna, 24-26 April 1974	CPND + PhotoND	INDC(NDS)-59+61
Moscow/Obninsk, 4-8 June 1973	9th 4C Meeting	INDC(NDS)-54
Vienna, 16-20 Oct 1972	8th 4C Meeting	INDC(NDS)-51
Brookhaven, 25-29 Oct 1971	7th 4C Meeting	INDC(NDS)-41
Paris, 5-9 Oct 1970	6th 4C Meeting	INDC(NDS)-28
Moscow, 17-21 Nov 1969	5th 4C Meeting	INDC(NDS)-16

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
CSEWG	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
VNIIEF	Russian Federal Nuclear Center, Sarov, Russia
WRENDA	World Request List for Nuclear Data
4C...	Numbering code of memos exchanged among the four Neutron Data Centers

Meeting Summary

1. Introduction

The IAEA Advisory Group Meeting on the Coordination of the Nuclear Reaction Data Centers (NRDC) met in Brookhaven during the week 3-7 June 1996, hosted by the U.S. National Nuclear Data Center (NNDC). The meeting was opened by Dr. R. Bari, Head of the Department of Advanced Technology, Brookhaven National Laboratory, and by H.D. Lemmel (IAEA) as the Scientific Secretary on behalf of the IAEA. C.L. Dunford (NNDC) acted as the Chairman of the plenary sessions. O. Schwerer chaired the technical sessions. V. McLane (NNDC) was the local organizer.

The meeting was attended by 16 participants from 13 Data Centers from China, Hungary, Japan, Russia, Ukraine, USA, and the Centers of NEA and IAEA, plus part-time participants from the U.S. Department of Energy and staff of the NNDC.

The objectives of this Advisory Group Meeting, which was one in a series of biennial Data Centers Coordination Meetings, were to review the status of the cooperation of the NRDC Network for the previous two years, to plan for the forthcoming two years, and to update the nuclear data compilation rules for newly encountered data types.

The Network of eleven nuclear data centers as laid down in the report INDC (NDS)-359, welcomed the meeting attendance, for the first time, of staff of the data center of NIIEF in Sarov (previously Arzamas-16), and of the Institute for Nuclear Research (INR) in Kiev, Ukraine.

The main elements of the Network cooperation cover:

- the work-sharing in the Data Center Services to customers worldwide;
- the compilation and exchange of experimental nuclear data, and the maintenance of the jointly operated systems: EXFOR and CINDA;
- the exchange of evaluated nuclear data libraries;
- the exchange and joint operation of related software.

2. Highlights

A topic of major importance that was discussed at this meeting was the challenge resulting from the rapid advances of electronic information technologies and the impact on the data dissemination methods by the centers, as discussed under item 3 further below. The centers will make major efforts to further expand their online services, specifically under the widely used World Wide Web technology. NNDC and IAEA/NDS confirmed a cooperation effort accompanied by staff exchange in 1996, with the possible inclusion of NEA-DB and CDFE late in 1996.

As the online information can be updated frequently, the archiving of databases and the correct and accurate referencing of data extracted from online services, present new problems which were discussed at the meeting. Citation guidelines will have to be established and publicized in the online systems together with the data files. The meeting discussed and

expressed concern about the further distribution of the Network's data by individuals and organizations outside the Network.

While the development of electronic data center services is essential, it is as essential to devote sufficient efforts on the maintenance and updating of the nuclear databases. Significant progress was reported on the completeness and up-to-datedness of the experimental neutron data files EXFOR, which is basic to all neutron data evaluation work.

In addition to electronic services, handbooks covering the most commonly used data types and nuclear data related textbooks continue to be required. With respect to the CINDA handbook, NDS and NEADB will survey the present needs for a continuing hard-copy publication of CINDA. Attention must be given to the archival function of printed materials such as Nuclear Data Sheets.

The meeting welcomed plans of NNDC to develop a "Super CINDA" file which would incorporate the traditional neutron-data CINDA file, the photonuclear bibliography by CDFE and JAERI, and also a new bibliographic file for charged-particle reaction data including intermediate energy data.

The technical sessions discussed, among other items, the updating of the compilation rules, including updated EXFOR rules covering specific needs for intermediate energy nuclear data. A large list of conclusions and actions resulted from the meeting. The information exchange and data file exchange between the centers were reviewed according to the changing developments of available electronic media.

It was noted that the scope of the jointly maintained databases has widened to cover not only data of practical interest for applications, but also basic nuclear physics.

The meeting reviewed the objectives and requirements for the future Data Center Network Coordination Meetings and requests the IAEA to continue the required funding of these meetings as outlined in the **"Statement"** given further below.

3. Electronic Services

The Nuclear Reaction Data Centers Meeting discussed the future directions in providing customer services. It is clear that in several centers (i.e. US, NEA, Japan) traditional request services are declining in volume and are being replaced by electronic access to the data produced by the network. The meeting noted the special requirements of those data centers servicing customers in countries where electronic networking is primitive or nonexistent. In such cases, traditional services via paper and magnetic media will continue in addition to the fast increasing online services. Requests for services from the IAEA/NDS by developing countries are expected to continue at the present level. Therefore it is expected that NDS will have to maintain the present capability to handle information requests in the traditional manner. The centers also recognize the potential need for information distribution via CD-ROM.

The meeting concluded that the Network as a whole has the goal of developing a common customer interface using the widely available and rapidly developing World Wide

Web technology. A common basis for reporting access statistics from the WWW is important to be developed. The initial steps in this collaboration will be undertaken in June 1996 by NNDC and IAEA/NDS to be followed by a visit by NNDC staff to Vienna in September. At that working meeting, the NEADB and CDFE are expected to participate. Further input for this project is expected from the joint US Nuclear Data Network's workshop on Nuclear Data and the Internet scheduled for August 1996.

The meeting discussed the need to provide access to information about meetings of interest about Nuclear Data. NNDC maintains on their WEB site, a page of pointers to information about meetings of interest. This item should be addressed during the joint WWW development project.

The meeting expressed concern about the widespread "repackaging" of data originally produced by the network. While recognizing that not much can be done to control this problem, the network expressed its desire that such products accurately reflect the data taken from network sources and that those sources receive proper credit and reference as to version and date of the data base from which the information was extracted.

4. Achievements since the last meeting

Since the Paris Meeting in 1994, a new cooperation has been established on photonuclear data, between the CDFE, Moscow, JAERI, and CJD Obninsk, covering a bibliographic file, an EXFOR file with experimental data, and a new evaluated data file.

The cooperation on charged particle nuclear data continued with contributions from Arzamas-16, ATOMKI, CAJaD, CNDC, JCPRG, NEA-DB, NNDC, and RIKEN. Topics of priority were data for medical applications and intermediate energy nuclear data. The agreement on charged-particle data compilation responsibilities was updated.

The four neutron reaction data centers made significant efforts to improve the completeness of the basic neutron data files EXFOR and CINDA.

Important data libraries that have been exchanged during the period since the last meeting include:

- ENDF/B-VI updates and ENDF utility codes by NNDC;
- a large CENDL update by CNDC;
- JENDL-3 updates by JAERI;
- the finalization and release of FENDL by IAEA-NDS;
- the release of EFF by the Data Bank;
- the neutron activation library ADL-3 and the intermediate-energy data library MENDL-2 by CJD;
- a charged-particle data EXFOR compilation by CAJaD and the NEA Data Bank;
- and, last but not least, EXFOR and CINDA transmissions by all centers.

Statement

The meeting took note of the difficulties under the present IAEA rules regarding the conduct of Agency-sponsored meetings, to continue to support the Nuclear Data Center Coordination Meetings in their traditional form. In contrast to other meetings, these Coordination Meetings require the participation of more than one participant per country and, in a few cases, of more than one paid participant from a single country.

The Nuclear Data Centres Networks (as documented in the report INDC(NDS)-359 and the Nuclear Data Newsletter No. 20) include cases with two or three specialized centers in the same country. These centers have, within the Network, specialized functions by which they service the various requirements of the user community worldwide. As all of these centers must be represented at the Network Coordination Meetings, it is vital, under the present economic conditions that, in certain cases, the IAEA provide funding for the meeting attendance of two or three centers from the same country.

For the meetings outside Vienna it is essential that the Nuclear Data Section can continue to be represented by its Section Head and the technical expert of the Section.

The IAEA is requested to continue to provide the umbrella for the Nuclear Data Centers Network including the required funding of meetings as outlined above and, as necessary, to provide exceptions to the usual IAEA meeting rules.

The International Nuclear Data Committee and its Chairman are asked to support this Statement. For further details see the following Appendix.

Appendix

The participants reviewed the objectives and requirements of the Data Center Coordination Meetings. They concluded that the following meetings, each in a two-years cycle, continue to be needed for the functioning of the Nuclear Data Centers Network.

1. Meetings on the Coordination of the Nuclear Reaction Data Centers Network, including policy matters and work planning to be discussed among the Center Heads and technical matters to be discussed by technical staff:

   - so far held as "Advisory Group Meetings"
   - 11 participating centers, thereof 3 in Russia, 3 in Japan, and 5 in other countries.

2. On technical aspects of the cooperation of the Network, to be discussed by technical staff:

   - so far held as "Consultant's Meetings"
   - participating centers the same as under 1 above.

   The meetings under 1. and 2. are alternating.

3. On the Coordination of the Nuclear Structure and Decay Data Evaluator's Network:

   - so far held as "Advisory Group Meetings"
   - 16 participating centers/groups, thereof 2 in China, 2 in Russia, 6 in USA, and 6 in other countries.

These meetings do not require the representation of countries but rather the representation of all of the participating centers. Under the present economic conditions, several of the participants require funding by the IAEA for the meeting attendance, and in certain cases it is required that the IAEA provides funding for two or three centers from the same country. The meeting invitations by the IAEA provide an essential recognition and stimulant for continued support of the Centers by their funding authorities.

The meetings should be hosted, on a rotational basis, by one of the cooperating centers. When feasible they should be held adjacent to other nuclear data meetings and conferences. For the meetings outside Vienna (specifically the meetings under 1 above), it is essential that the Nuclear Data Section can continue to be represented by its Section Head and the technical expert of the Section, in order to cover the full scope of the agenda.

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AGENDA

Plenary session

P.1 Opening, election of chairman
P.2 Adoption of the agenda
P.3 Quick review of the highlights of
the last Technical NRDC meeting (INDC(NDS)-343) and
the last Advisory Group Meeting (INDC(NDS)-308)
P.4 Brief status reports of the centres (reports requested in writing)
P.5 Customer services
- conventional services
- electronic services
  - interactive online systems
  - FTP
  - WWW

P.6 Evaluated data libraries
P.7 Next NRDC meetings
- Technical meeting 1997 in Vienna
- AGM in 1998 in Vienna (or elsewhere?)

Centre heads session, neutron data centres

N.1 general situation, manpower
N.2 customers and role of the centers, future developments

Centre heads session, all data centres

C.1 Report on the U.S. Nuclear Reaction Data Network (M. Bhat)
C.2 Review of data needs and ongoing activities for applications
C.3 CPND compilation responsibilities
C.4 general situation, manpower
C.5 who does what in the next 2 years
C.6 update of the "Network Document" and of the Network summary in the
NRDC Meeting Minutes (see the Actions in INDC(NDS)-343 p.11)

Technical session (all data types)

T.1 Maintenance of EXFOR/CINDA dictionaries
Review of actions INDC(NDS)-308 App. 3 p. 1
T.2 Data exchange between centres
Update of the list of preferred/acceptable media,
see INDC(NDS)-308 App. 5
T.3 Brief EXFOR Guide: for publicity, for online users, for CPND compilers?
T.4 Review of actions on EXFOR from last Technical NRDC meeting,
INDC(NDS)-308 App. 3
T.5 Pending EXFOR matters (dictionary and manual updates, coding rules)
T.6 The "date" field in the computer files beyond the year 2000
T.7 TRANS tapes transmitted since last meeting
T.8 Common graphics software
T.9 Citation guidelines for computer files

Technical session (Photonuclear Data)

TP.1 Review of actions
TP.2 Data compilation and evaluation
TP.3 Cooperations on photonuclear data

Technical session (CPND)

TC.1 Review of actions
TC.2 Compilation responsibilities and mechanisms to avoid duplications
TC.3 Compilation and evaluation
TC.4 Intermediate energy data in EXFOR

Technical session (Neutron data)

TN.1 Sharing of address list information
TN.2 Review of actions from last Technical NRDC meeting
TN.3 CINDA
TN.4 Neutron EXFOR compilation and completeness

Final plenary session

FP1. Summary and conclusion of the Center heads sessions
FP2. Summary and conclusions of the technical sessions
FP3. Summary and conclusions of the plenary session
FP4. Other business
FP5. Closing of the meeting

IAEA Advisory Group Meeting
on the Coordination of the Nuclear Reaction Data Centres
Brookhaven, 3-7 June 1996

hosted by the U.S. National Nuclear Data Center
on behalf of the U.S. Government

ACTIONS and CONCLUSIONS

Network document and general matters

Action	on	
1)	*NDS*	Participants updated the information about their centres in the network document. NDS will prepare the updated document - with an updated preface including the history of the document - with the "Staff and Program" section moved from Annex 2 to Annex 1 - and with the updates as received from the participants.
2)	*NDS*	Send out the draft to the center heads, requesting new signatures when the Annex 2 entry was changed.
3)	*Centre heads*	Send to NDS addresses to whom the Network Document should be sent together with a covering letter by IAEA.
4)	*CONCLUSION*	The summary description of the network centres' activities to be included in the Minutes will remain unchanged (except for an obvious mistake).
5)	*Dunaeva*	Submit the official name of the Sarov data centre to the network.
6)	*CONCLUSION*	The meeting strongly supports the continuation or extension of the IAEA activity on Activation Files.
7)	*NDS*	On continuation of NDS activity on IRDF: prepare for a decision on this issue at the next INDC meeting (Consultants' Meeting possibly followed by CRP).
8)	*All*	Provide feedback to NDS on the paper on the INDC Standards File (invite additional participants).
9)	*Nordborg*	Submit a paper on the network to the Trieste conference.
10)	*CONCLUSION*	The next technical NRDC meeting is planned to be held as a 3 day meeting in Vienna, adjacent to the Trieste Nuclear Data Conference in May 1997.
11)	*CONCLUSION*	The next Centre Heads' Meeting is planned to be in Vienna in spring 1998.

EXFOR/CINDA dictionary system

12)	*McLane Schwerer*	(old #8 cont.) Come up with a list of more sorting flags for dict. 36.
13)	*McLane*	(old #10 cont.) Change title of dict. 19 to old one and remove the word 'codes' from the other titles.
14)	*NDS*	Include Sarov in dictionary distribution list, both for TRANS and DANIEL formats, from September 1996.
15)	*McLane*	Update the program DAN2X4 to have the Dict.27 (and 43, 50)codes left-adjusted and make the other minor corrections requested earlier by NDS.
16)	*CONCLUSION*	On "wildcards" for the "particle considered" field (SF 7) in dictionary 36: the meeting recognizes the need for this new feature in particular for medium and high energy data.
17)	*McLane*	Prepare a version of dictionary 36 including the wildcards but without removing any of the existing codes.
18)	*McLane and volunteers*	Prepare test entries to test the new dictionary 36 and distribute to other centres to test their programs.
19)	*All*	Update all programs concerned so that they can digest the test entries
20)	*McLane*	Submit a revised version of memo CP-C/211 (replacing the wildcards '-' and '*' by '*' and '*FP').
21)	*CONCLUSION*	This proposal will be reviewed at the next technical meeting and be finalized when all centres agree.
22)	*McLane*	Send the Dictionary system Write-up to all centres.
23)	*NDS*	(WP 7, item 8) Remove the heading "For Photonuclear Data only" from all those places in dictionaries where this was agreed at the meeting.
24)	*McLane Schwerer*	(old #32 cont.) To provide the necessary changes in Dict. 24, 32 and 36.

"EXFOR Basics" Manual

25)	*All*	Send comments and corrections on the "EXFOR Basics" Manual to McLane.
26)	*McLane*	Add example entries to the "EXFOR Basics" manual.
27)	*CONCLUSION*	The meeting appreciates V. McLane's efforts to write the EXFOR Basics manual and to update the EXFOR Manual. (The LEXFOR part is not yet finished).

28)	*All*	Proof-read the rewritten EXFOR Manual and send comments to V. MCLANE.
29)	*McLane*	Add instructions on the online system and on the dictionaries to the EXFOR Basics manual.
30)	*McLane*	Update the centres' addresses in the EXFOR Basics manual with the latest ones from the revised Network document.

EXFOR, general

31)	*CJD*	(old #14 cont.) Update lab dictionaries for Russian institutes continuously as necessary.
32)	*McLane*	(old #16 cont.) To provide LEXFOR entry for energy spectra of particle pairs and PAR,SIG,P/T.
33)	*McLane*	If staffing permits, update LEXFOR.
34)	*NNDC*	(old #19 cont.) Send the remaining entries from EXFOR files 6, 7, 8 to the other neutron data centres.
35)	*All*	(old #20 cont.) Go through these entries and decide which entries need conversion to EXFOR.
36)	*All*	(old #21 cont.) Retransmit those entries listed in V. McLane's list of pending retransmissions.
37)	*McLane*	(old #23 cont.) 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.)
38)	*NDS*	(old #25 cont.) Distribute corrected Münzel data after final corrections by CAJaD
39)	*NDS*	(old #27 cont.) Provide NEA-DB with an expanded list of errors in old entries from area 2 needing retransmission.
40)	*NDS*	(old #28 cont.) Retransmit entry 22242 with an EXFOR N-series number.
41)	*CONCLUSION*	A flag for relativistic heavy ion data in EXFOR dictionaries (proposed in Actions 39, 40 of last year's meeting) is not needed because NNDC will not transmit such data for the time being.
42)	*NDS*	Remove the quantities on relativistic heavy ion data already introduced from the dictionaries.
43)	*Lammer*	(old #43 cont.) 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)	*NEA-DB, NDS, NNDC, CDFE*	(related to old #44) Retransmit the "correlation" entries as listed by V. McLane, replacing COR by DA/CRL.
45)	*Lammer*	(old #47 cont.) 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.
46)	*CJD*	(old #48 cont.) Retransmit entry 40420 accordingly, after fulfillment of the previous action.
47)	*CONCLUSION*	WP 7, items 1 and 2 (new dictionary 36 codes ,DA,,COS/RSD and PAR,DA,,SN2) are approved.
48)	*CONCLUSION*	(WP 7, item 3) The dictionary 36 codes SEQ,DA SEQ,DA/DE IND,SIG,G IND/UND,SIG,G are approved.
49)	*CONCLUSION*	(WP 7, item 3) The proposed new dictionary 36 codes ,POL/DA/DE and ,POL/DA/DE,,ANA are not approved. They are not needed because these data should be compiled using the existing codes ,PAR,POL/DA and PAR,POL/DA,,ANA
50)	*CAJaD*	Retransmit the affected entries (O0110 and others) according to Conclusion 49.
51)	*CONCLUSION*	(WP 7, item 4) The proposed new dictionary quantity for differential cross sections integrated over a partial angular range was approved but the proposed new code will be ,DA,,IPA.
52)	*CONCLUSION*	(WP 7, item 5) The N3 flag in the SUBENT record (used e.g. for differential CPND EXFOR entries) is removed..
53)	*Chukreev*	Update TEST-EXF accordingly.
54)	*McLane*	Update the EXFOR Manual accordingly.
55)	*McLane* *Chukreev*	(WP 7, item 6) Update check programs to allow embedded blanks in dictionary 7 codes.
56)	*CONCLUSION*	The new particle code HE2 is not accepted until NNDC provides more information on it.
57)	*McLane*	(WP 7, item 9) Provide more information on the proposed new nuclide code 4-BE-6.
58)	*CONCLUSION*	Redundant coding in REACTION SF5 and SF7 must be avoided for the sake of retrieval and plotting codes. If e.g. the code "IND" in SF5 is needed nevertheless, a tautology could be given: (( ) = ( )).

59)	*CONCLUSION*	(WP 7, item 13) The proposed new heading TRMOM is not introduced. Instead, such data should be compiled using the author's representation, for which the new heading WVE-NM for wave number, and the units 1/FM (1/fermi) are introduced.
60)	*Chukreev*	(WP 7, item 13) Draft LEXFOR entry on this data representation, including the formula for converting wave-numbers to angles.
61)	*All*	(WP 7, item 10) Send feedback to V. McLane on the Polarization proposals.
62)	*CONCLUSION*	On the problem with dates beyond 2000: In EXFOR, all date fields will be converted to 4-digit years. In addition, a program will be needed to convert all existing entries to the new date format.
63)	*McLane*	Send to NDS all entries where retransmission had been requested, for NDS to check once more what corrections are requested.
64)	*All*	Review the list of pending retransmissions as produced in last year's report and amended in WP 10.
65)	*McLane*	(related to old #96 on data exchange by diskette) Remove information on medium of exchange from the EXFOR manual, referring to the relevant working paper in the NRDC meeting reports.
66)	*CONCLUSION*	It is legal to have entries from different areas on the same TRANS (e.g. A and B). This is however not the case for combining e.g. neutron data and CPND.
67)	*McLane*	Change the EXFOR Manual on the TRANS and ENDTRANS sequence numbers.

EXFOR checking and compilation on PC

68)	*Chukreev* *NDS*	Send to NDS new version of TEST-EXF allowing lower case characters in free text. NDS to distribute to other centres.
69)	*NDS*	(old #80 cont.) Check whether V. Osorio can be hired as a consultant for updating ANDEX.
70)	*McLane*	(old #78 cont.) To make a benchmark test of TEST-EXF.

Fission-Product Yield data

71)	*NNDC* *NDS*	(old #72 cont.) 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.
72)	*Lammer*	(old #73 cont.) To revise the LEXFOR entry on FP yields.

73)	*NDS*	(old #74 cont.) To distribute the ASIYAD-MIFI library.
74)	*Lammer*	(old #75 cont.) Submit a proposal on the coding of mass yields as a CP memo with information on corresponding measurements.

CINDA

75)	*Nordborg*	Review distribution list of CINDA book to reduce the number of printed copies.
76)	*Hasegawa*	Check CINDA book distribution for Japan.
77)	*CONCLUSION*	(WP 8) The problem with dates beyond 2000 will be solved for CINDA by integrating it into a new bibliography for all types of reaction data.
78)	*Nordborg*	(related to old #96 on data exchange by diskette) Remove information on medium of exchange from the CINDA manual, referring to the relevant working paper in the NRDC meeting reports.
79)	*CJD*	Send CINDA batches by e-mail not encoded.
80)	*NDS*	Discontinue sending CJD CINDA batches to NEA-DB and NNDC through Vienna.
81)	*All*	(old #104 cont.) Update handbook section and list of compilers.
82)	*NDS* *NEA-DB*	Contact the other centres about the handbook section (NDS) and list of compilers (NEA-DB).
83)	*Lammer*	Distribute the list on who is covering what for CINDA to other centres.
84)	*NDS*	Issue a supplement to the meeting report (as a separate document) covering technical information such as CINDA coverage and media for data exchange.

Photonuclear Data

85)	*CDFE* *JAERI*	(related to old #94) The photonuclear data bibliographic file was made available to the centres at the meeting.
86)	*Recomm.* *CDFE*	(old #95 cont.) - 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.
87)	*Recomm.* *CDFE*	Study the possibility of making a WWW homepage on photonuclear data files.

CPND compilation

88)	*NDS*	(old #84 cont.) 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.
89)	*NDS*	(old#83 cont.) To send the complete charged-particle EXFOR file to ATOMKI.
90)	*NDS*	Obtain the Chinese data that were sent to T. Benson/IAEA.
91)	*CONCLUSION*	The summary on CPND compilation responsibilities (see Appendix 1) is approved.
92)	*JCPRG*	Check with their institute whether they can do the clearing for Japanese CPND.
93)	*CONCLUSION*	The meeting discussed and expressed interest in the project of a CPND barn-book which would be useful to the network.
94)	*CAJaD*	Create a FINAL version of the EXFOR area B file, using - CAJaD master file - NDS master file - TRANS B012 through B015 in the versions modified by NDS.
95)	*NDS*	Send to CAJaD - the NDS area B master file - TRANS B012 through B015 as modified by NDS, merged into 1 file.
96)	*McLane*	Update EXFOR Manual saying that - CAJaD is responsible for area B - NNDC is responsible for area P.
97)	*Debrecen CNDC*	(old #86 cont.) Evaluations at Debrecen have been completed. They should be put in ENDF-6 format in cooperation with CNDC.
98)	*NEA-DB*	(old #89 cont.) To keep the NRDC network and specifically the CPND centres informed about developments for intermediate energy CPND.
99)	*All CPND Centres*	(old #92 modified) Work on the duplications indicated in several memos by CAJaD.
100)	*Chukreev*	Check O. Schwerer's e-mail on duplications with ATOMKI compilations (April 1996) and decide on the proposed deletion of entry A0488.
101)	*CONCLUSION*	The meeting supports the continued participation of VNIIEF in project #145 "Development of the library of evaluated nuclear data on charged particles for International Thermonuclear Reactor (ITER) and other applications of thermonuclear fusion".

Evaluated data libraries

102)	*Recomm.*	(old #110 cont.) When preparing evaluated data libraries, characteristic values (thermal cross sections, resonance integrals, etc.) should be quoted in the text or in accompanying documents together with their uncertainties; however, these values (and uncertainties) would be better usable if they were in a computer-readable file.
103)	*NEA-DB*	(old #113 modified) Possibly release a version of JEF-PC to the network centres for their internal use free of charge.
104)	*All*	(old #116 cont.) To develop a standard for the file transfer access of data files and related documentation.
105)	*NDS*	Distribute the CENDL update (where not yet done).

Citation Guidelines

106)	*CONCLUSION*	The meeting agrees with the proposals concerning Citation Guidelines for Databases worked out by the subgroup on this topic (see following items 108-115). Any conclusions or actions concerning the future will be reviewed at the next NRDC meeting.
107)	*CONCLUSION*	(old #121 cont.) Anyway, reference guidelines for databases require further discussion.
108)	*NNDC*	Publish EXFOR Manual (as BNL-NCS report).
109)	*NEA-DB*	Publish CINDA Manual (as NEA/NSC report).
110)	*NDS*	To put guidelines for contents of data library documentation on the agenda for the next NRDC meeting.
111)	*Recomm. NNDC*	Write and publish a NUDAT Manual (as BNL-NCS report).
112)	*Recomm. NNDC*	Update ad publish the Jülich paper on ENSDF by M. Bhat (as BNL-NCS report).
113)	*Recomm. All*	For the online services, the keyword "citation" should be clearly visible within each database.
114)	*Recomm. All*	For ftp servers, a file AAACITE.TXT should be created for each data file type.

115) *CONCLUSION* Guidelines for contents of data library documentations:
Future documentations should include:
- A good abstract.
- Uses/applications of library.
- Procedures used for generating and/or maintaining the library.
- Description of network responsible for contributing to and/or for maintaining the library.
- Quality control procedures, and reference to codes, benchmarks, etc., used.
- Contents, or reference to contents.
- Citations for other databases or computer codes used in producing the library.
- How to obtain data contained in library.

Computer matters

116) *CONCLUSION* For the present, PostScript, being the most widely used language for Laser printers, is recommended for the transmission of documents.

117) *NDS* Investigate the possibility of a research contract for V. Zerkin to document his graphics software and make it available to the centres.

118) *CONCLUSION* The centres recognize the potential need for information distribution by CD-ROM.

World-Wide-Web matters

119) *Recomm.* The data centres will look into the development of a common WWW page on the network, in coordination with the NEA's evaluation cooperation.

120) *NDS*
NEA-DB
CDFE Arrange that Pierre Nagel and a WWW expert from CDFE come to Vienna at the same time when T. Burrows is there.

121) *All* Develop data retrieval statistics under WWW and keep each other informed.

Appendix 1

Agreement on Charged-Particle Data Compilation Responsibility

Compilation Centers

NNDC	NEADB
Sapporo	RIKEN
CAJaD	CNDC
Atomki	

Area of Responsibility

New Data (1989→)

NNDC will be responsible for data from the U.S. and Canada.
ATOMKI will be responsible for data from Hungary and Jülich.
CAJaD will be responsible for the rest of the world.

Old Data (→1988)

Sapporo will be responsible for data from Japan.
CAJaD will be responsible for all other data.

Data Compilation

New Data (1989→)

A center wishing to compile data (C1) will contact the center in whose area of responsibility the data were produced (c2) with a list of the data sets to be compiled. C2 will inform C1, as quickly as possible, whether the data either have been compiled or are in the process of being compiled by another center.

If the data are not compiled or being compiled, C2 will either agree to compile them with priority, or ask that C1 compile the data and send them to C2 to be included in the next regular C2 transmission file.

Old Data (→1988)

A center wishing to compile data (C1) will contact all other centers with a list of the data sets to be compiled. The center responsible for the data (Sapporo or CAJaD) will inform C1, as quickly as possible, whether the data either have been compiled or are in the process of being compiled by another center.

If the data are not compiled or being compiled, C1 will compile the data and include in the next regular C1 transmission file.

NATIONAL NUCLEAR DATA CENTER

Status Report
to the
Advisory Group Meeting
on the Co-ordination
of the Nuclear Reaction Data Centers
3 - 7 June 1996

General

Since the last meeting of the Nuclear Reaction Data Centers in April 1994, our staff has been increased by two scientific/professional (there are currently 8 FTE scientific/professional and 4 support staff). C.L. Dunford has returned as head of the NNDC; Mulki Bhat has been named deputy head. During this period we have also had consultants from the Khlopin Radium Institute, St. Petersburg, from the Federal Research Center IPPE, Obninsk, and from the Institute for Nuclear Research, Kiev.

Computer Facilities

In the past two years the NNDC has acquired X-Window terminals for the entire staff, three new PC's, a 4-mm DAT tape drive. The Alpha system has recently been upgraded to Open VMS 6.2, and the memory has been upgraded. The VAX 11/780 was shut down in 1994.

Bibliographies

The NSR activity has continued.

The CINDA compilation activity continues with respect to those references associated with the experimental data compiled at the Center. In the period from May 1994 through May 1996, 4 CINDA transmissions were sent (BNL142-145).

Experimental Nuclear Reaction Data

The NNDC has begun compiling charged-particle reaction data produced in the U. S. and Canada for incident projectiles with $Z \leq 2$. A consultant from Khlopin Radium Institute has done a preliminary compilation of 13 high-energy data sets for data from that institute.

In the period from May 1994 through May 1996, 4 neutron data transmission tapes (TRANS 1257-1260) and 2 charged-particle transmission tapes (C014, C015) were sent containing new and corrected entries.

Evaluated Nuclear Reaction Data

NNDC continues to coordinate the work of the Cross Section Evaluation Working Group. ENDF/B-VI, Release 3, was distributed in June, 1995, and includes updates to the neutron, neutron fission product yield, and thermal scattering law sublibraries.

Version 6.10 of the ENDF Utility codes was distributed in November, 1995.

The revised ENDF-102 Formats and Procedures Manual and the ENDF-201 ENDF-B-VI Summary Documentation, Supplement 1, were produced and will be added to the Online Service DOCUMENT option.

Nuclear Structure Data

NNDC continues to publish the ***Nuclear Data Sheets***. As of March, 1996, issues through Volume 78, #1 have been sent to Academic Press.

Customer Services

The WorldWide Web home page has been established, and allows access to the Online Service documents and codes, and to some of the databases.

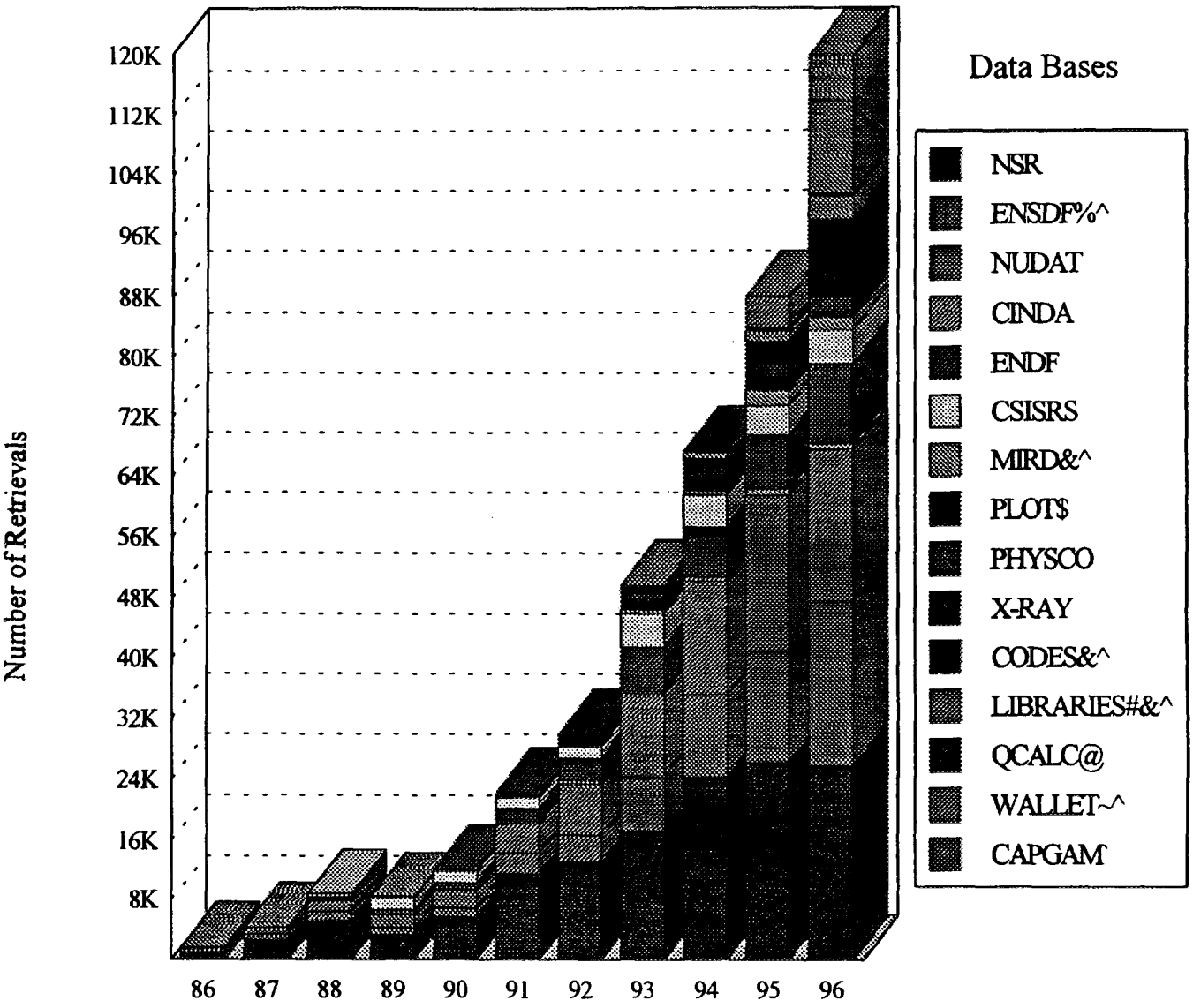
The use of the Online Service has steadily increased. There are now almost 2000 customer accounts with about 2400 users. There have been more than 7000 retrievals per month for the past 3 months. A chart of Online Data Service retrievals is attached.

DRAFT versions of EXFOR Basics and ENDF Basics, short guides to the EXFOR and ENDF formats has been completed and are under review.

Publications

The **Nuclear Wallet Cards**, Fifth Edition, was issued in July 1995.

*NNDC On-Line Data Service, World Wide Web (W^3), and FTP Retrievals 1986-1996**



* Extrapolated as of April 30, 1996.

\# Update to the Atomic Mass Evaluation - Added November 28, 1995.

@ Added July 27, 1994

& Includes W^3 retrievals since January 1, 1995.

$ Removed from the Online September 14, 1995.

~ 1995 Nuclear Wallet Cards - Added to W^3 May 17, 1995.

% Added to W^3 December 1, 1995.

^ Includes FTP retrievals since November 1, 1995

` Thermal Neutron Capture γ's added to W^3 March 4, 1996

NEA DATA BANK Progress Report

to the NRDC Meeting at Brookhaven National Laboratory, USA

3 - 7 June 1996

1. INTRODUCTION

The NEA Data Bank has, since more than a year, been involved in a migration of the data bases from a DBMS to an ORACLE based system. At the same time, the Data Bank is also changing computer system from the central DEC 6000 computer running VMS to a system of DEC alpha workstations running UNIX. These changes have meant that the progress in data compilation has been somewhat slower than initially expected.

The data and computer program services of the Data Bank remained at a similar level as the previous year, concerning the direct requests and the accesses to the on-line data bases via TELNET. The Data Bank's World Wide Web server continued to expand during last year, but it is difficult to give any comparable numbers to the TELNET accesses, as the concept of a retrieval is somewhat different.

During 1995 it was decided to start working on a new version of the JEF library. This new version will be developed jointly with the EFF (European Fusion File) project. A starter file, called the JEFF-3.0 library (Joint Evaluated Fission and Fusion library), will be compiled in the summer of 1996. The Data Bank will then use its new data base system, which has been designed and developed according to agreed Quality Assurance procedures.

2. NUCLEAR DATA SERVICES

2.1. CINDA

During 1995 the Data Bank made a special effort and compiled more than 1,500 new lines to the CINDA data base of bibliographic information. This made it possible to be up-to-date with the CINDA compilations at the end of 1995. The effort was done with the purpose to identify all articles containing nuclear data for compilation into the EXFOR data base.

A new batch of CINDA entries is being prepared for distribution for the publication deadline of beginning of June 1996, bringing area 2 up-to-date for this year's CINDA book.

2.2. EXFOR

Thirty-four new experiments containing neutron induced data for the EXFOR data base were compiled and exchanged during 1995. A few more compilations had been prepared, but the numerical data had not been received from the authors. It is envisaged that the number of compilations will increase, as additional efforts will be devoted to this task in 1996.

In addition to the 34 neutron data compilations, the Data Bank also exchanged 100 compilations in the field of proton-induced intermediate energy data. The reaction compiled were determined by subgroup 13 of the NEA Working Party on International Evaluation Cooperation. The compilations were financed by a voluntary contribution from Japan, and were compiled by the Kuchatov Institute.

2.3. Data Services

The service to data users is now very largely carried out on-line. The only requests that remain for the Data Bank staff to handle are: those for very large data volumes, those where the networks are not fast enough to allow direct transmission of large data sets, and those where the requester has no access to a computer network. One hundred and fourteen requests for searches by Data Bank staff were answered in 1995. These data were mainly distributed on CD-ROMS or DC6150 cartridges.

The on-line services via TELNET increased somewhat during 1995. Two thousand three hundred on-line interrogations of the data bases resulted in the transfer of 2 Gbytes of nuclear data information. The most important part of these transfers (85 percent) concerned evaluated data files, whereas the largest number of accesses (close to 1100) was registered for the nuclear structure data bases (ENSDF, NSR and NUDAT).

2.4. Joint Evaluated File (JEF)

A formal agreement was taken in 1995 by the JEF and EFF projects to create a joint nuclear data library, JEFF. While the JEF and EFF evaluation efforts will maintain their separate identity, it was agreed to compile a common starter file in 1996. The selection of data sets for this JEFF-3.0 "starter file" is largely completed, and compilation will begin as soon as the new evaluation data base has been tested.

The new EVA/JEFF data base using the ORACLE relational data base system under UNIX, was completed and tested as the storage and service support of the current generation of evaluated data bases in ENDF-6 format. Its JEFF Quality Assurance module will enforce the agreed file assembly and maintenance procedures, and record all changes. A first Quality Plan was developed by Data Bank staff in consultation with AEA Technology, and presented for comments at the December 1995 UK Nuclear Science Forum and later approved at the JEF meeting in January 1996.

The JEF-PC package, providing easy access to evaluated data files for users unfamiliar with the complex ENDF-6 format, was acquired by more than 400 users in 1995, and was thus among the 10 most popular electronic publications within the OECD.

2.5. International Evaluation Co-operation

The NEA Working Party on International Evaluation Cooperation (WPEC) met in Paris, France in May 1995 and will hold its next meeting at Argonne National Laboratory, USA, on 13-14 June 1996. The meeting will be held in conjunction with the NEA Working party on Nuclear Data Measurement Activities (WPMA), and a joint session to discuss the "High Priority Request List for Nuclear Data" will be arranged.

Final reports from five WPEC subgroups were recently published and it is envisaged that three more subgroups (^{238}U capture and inelastic data, Fission product inelastic data and KERMA data)

would soon complete their work. This could open the possibility for new cooperative actions. Among the proposals mention so far could be cited: fission neutron spectra, actinide uncertainty information, and data for ^{232}Th and ^{233}U.

3. COMPUTER PROGRAM SERVICES

The level of computer program services has been rather stable relative to earlier years, as concerns the acquisition, testing and distribution of programs. During 1995, efforts continued to ensure an appropriate response to changes in technology; for example CD-ROM was introduced as a medium for program distribution.

3.1. Testing and Master-filing

Computer programs are exchanged with the United States code centres in Oak Ridge, ESTSC and RSIC under an arrangement between US DoE and the NEA, as well as user feedback and information gained in testing and validation. Over the period 1991-95, the Data Bank has requested 250 programs from US centres, and responded to 123 US requests.

During 1995, a total of 115 programs were master filed: 99 received standard testing (80 expected), while a further 16 were screened only. While most programs were tested in-house on PCs, UNIX stations or the DEC 6000, outside testing work was done in RUS Stuttgart (CRAY, IBM RISC stations) and the University of Orsay (Sun), all as planned in 1994, and offering experience of UNIX use on DEC, CRAY and IBM.

3.2. Program Distribution.

During 1995, the total number of computer codes and associated data libraries sent out was 1,587, corresponding to more than 28 Gigabytes of information. One third of the requests concerned aspects of interest to safety, another third the field of radiation transport, shielding, cell, lattice and design calculations, whereas the last third covered mainly the field related to nuclear data processing and libraries as well as codes related to radioactive waste management and environmental impact.

Concerning customer profile, it was found that about half of the users were from government funded laboratories and international centres, one quarter from universities, while the remaining quarter was equally shared among industry and engineering companies.

Diskettes were by far the most frequent medium (67 percent) for dispatch of programs in 1995. They were followed by tape cartridges (18 percent) and the network (13 percent). Magnetic reel tapes were finally discontinued in 1995 (2 percent of dispatches). It is anticipated that in the future CD-ROM and higher capacity diskettes will play a major role in the storage and dispatch of information.

Distribution of computer programs via the Internet was lower than. Transmission rates were often annoyingly slow. This has discouraged some users from transferring larger files on the net (on average a computer program package dispatch contains about 10 Mbytes of information). Another reason is that at present only a few codes have their documentation stored on-line ready for dispatch, so that once users have retrieved their program, they still need to wait for the documentation to arrive by mail before they can use it.

4. IN-HOUSE COMPUTER INSTALLATION

4.1. New computer system

The Data Bank's new computer system will be based on DEC alpha workstations, most of them running on UNIX operating system. One of the workstations will run Open VMS for compatibility with the other core data centres and for running an on-line service for the nuclear structural data bases. The local area network will be divided into three segments: one external, containing an Internet server and the open VMS workstation, one internal composed of workstations for the master data bases and for application development, and one area linked to the OECD computer network. Gatekeepers will be installed between the different segments. (See fig.)

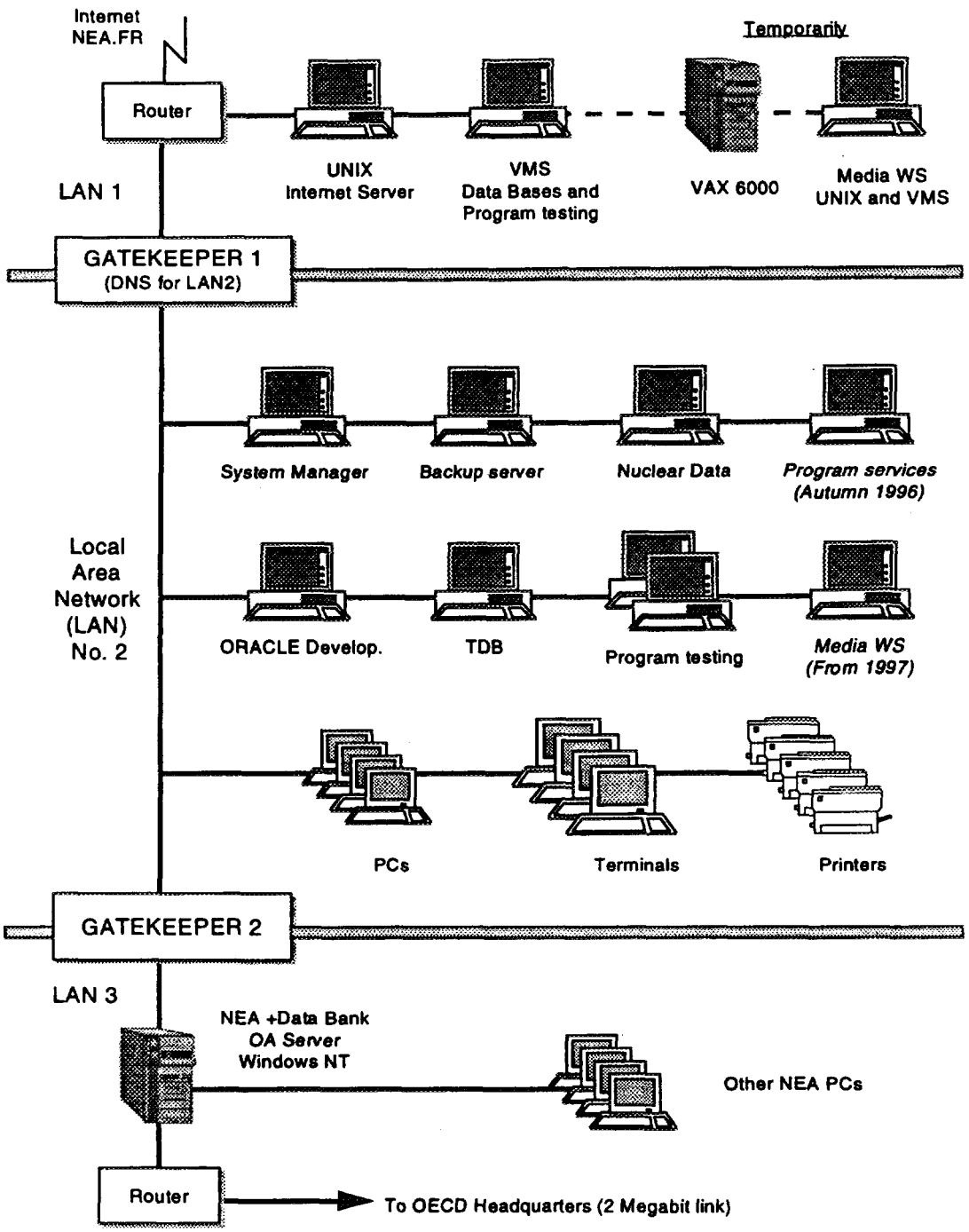
As of April 1996, the core stations for the system were being configured: two gatekeepers, the Internet server and a backup workstation (to be used normally for development of Internet applications), plus workstations for the JEFF-3 development and for the Thermochemical Data Base. Central management software will be installed, and supplemented as necessary by in-house procedures, to allow centralised updating of software and systems on the workstations, centralised backups, access control and security logging. Stations will be allotted by function, so that in practice each will be shared by two or three people only.

4.2. World Wide Web server

The Data Bank's World Wide Web server (*http://www.nea.fr*) was in operation throughout 1995. It gives access to general information about the Data Bank, and to text information displayed in agreement with other NEA divisions. Access to the service data bases remains pass-word protected. A monthly electronic newsletter is distributed to some 800 subscribers, giving information on new material available (computer programs, publications, conferences, etc.).

The number of registered users of the Data Bank on-line services rose to 500 during 1995. Web accesses were 67,000 out of a total of 79,000 sessions, and the total information retrieved rose to 4.8 Gbytes, twice the 1994 figure. However, the bulk of this information was distributed via FTP (3.8 Gbytes, equally divided between programs and data retrievals).

DATA BANK SCIENTIFIC COMPUTING SYSTEM FROM 1996



IAEA Nuclear Data Section

PROGRESS REPORT

May 1996

1. Staff and Budget

The position of the Section Head is being filled by D.W. Muir as of June 1996. C.L. Dunford was the Section Head from July 1993 to June 1995. In the one year's vacancy 1995/96 P. Obložinský was the Acting Section Head.

The total staff of 22 in 1993/94 had to be reduced in 1995 to 19 due to budget cuts.

In the Nuclear Data part of the Section S. Ganesan left and N. Kocherov retired without replacement and one clerical post (G. Mundy) was given up.

In the Atomic and Molecular Data Unit J. Botero left and was replaced by J. Stephens. Also R.A. Langley left, and his post will be filled with a nuclear physicist.

At present 2 P-4 posts and 1 P-3 post are advertised to be filled with nuclear physicists with programming skills. This includes the posts by H.D. Lemmel (retirement end of 1996) and A. Pashchenko (end of contract end of 1996).

2 retirees are presently working part-time: N. Kocherov (nuclear) and Wang Dahai (atomic data).

End of 1995 the programme of the Nuclear Data Section had a Peer Review by an external panel of experts chaired by Prof. Arima, Japan. The outcome was most positive, but it did not bring us back the three lost posts.

	1993	**1994**	**1995**	**1996**	**1997**	**1998**
Authourized Staff Level	22	22	19.9	19	19	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	1,616,000	1,616,000
Programmatic Expenses	686,000	775,000	660,000	662,000	635,000	617,000
Total Budget US$ *1993 dollars times inflation rate*	**2,344,000** *2,344,000*	**2,487,000** *2,487,000*	**2,312,000** *2,623,785*	**2,300,300** *2,736,608*	**2,251,000**	**2,233,000**

* ***Estimates***

Source: 1993-96 from the 1995 NDS report to INDC
1997-98 from the Dec. 95 Draft Budget (not yet approved)

2. Data Center Operation: Data Acquisition

In the one-year period since the last NRDC meeting (May 95 to May 96) 4 EXFOR TRANS tapes have been transmitted containing 36 new **neutron EXFOR** entries including 144 new data sets (subentries), and various revised entries. That is about the same rate as in the preceding two years. It should be noted that in our service area 80% of the data is measured in China (29 entries). Others came from Bangladesh (1 entry), Brazil (2), Hungary (1). Slovakia (1) and Thailand (1). Other countries, who continue to have neutron data measurements (though not in the year of this report) are Poland, Czechia, Bulgaria, India, and Argentina.

CINDA compilation continues routinely. The CINDA95 book was published, though again with some delay due to the changeover to the new VAX Computer. The programs (including those for the main part of CINDA, the introductory text, and the Dictionaries) should now be well functioning so that no problems for CINDA96 are expected. However, due to cuts in the printing budget, the 96 issue is likely to be printed not as a cumulative issue (1988-1996) but only as a supplement to CINDA95.

The acquisition and documentation of evaluated data files continued as publicized in

Nuclear Data Newsletter No. 19, Sept. 1994,
Nuclear Data Newsletter No. 21, July 1995,
Nuclear Data Newsletter No. 22, in preparation.

Issue No. 20 was published as a special issue to advertise ENSDF and the Nuclear Structure Data Network.

Summaries of available nuclear data libraries are contained in the updated reports

IAEA-NDS-7 Rev. 96/4 - catalogue of available data libraries

IAEA-NDS-107 Rev. 10 (95/6) - joint index to
BROND, CENDL, ENDF/B, JEFF, JENDL.
IRDF, EFF, and FENDL/E.

IAEA-NDS-150 Rev. 95/10 - Online Service,
Users' Manual by C.L. Dunford and T.W. Burrows.

Important NDS products were

- the Neutron Metrology File NMF-90, which presents the updated International Reactor Dosimetry File IRDF integrated with PC codes; see IAEA-NDS171;
- a handbook on "Atomic and molecular data for radiotherapy and radiation research"; see IAEA-TECDOC-799;
- and the finalization of FENDL, the evaluated nuclear data library for fusion applications; see the following pages for a summary of FENDL, and the customer service options for different media.

FENDL SUMMARY

FENDL is the evaluated nuclear database for fusion applications. Its present version consists of the following sublibraries for which the documentation and the FTP subdirectory for online service are given below. At the ITER neutronics coordination meeting in San Diego, Feb. 1995, the ITER participants agreed to use FENDL in all design calculations.

1. **FENDL/A-1.1** (April 93): neutron activation cross-sections, selected from different available sources, for 636 nuclides, given in four representations:
   - FENDL/A: "point data", i.e. cross-sections as function of energy in ENDF-6 format (see IAEA-NDS-148, Rev. 2, Feb. 1995). FTP subdirectory: ACTIVATION.FENDLA
   - "MCNP": processed into the format for input to the MCNP Monte-Carlo transport code (see IAEA-NDS-168, Rev. 3, Feb. 1996). FTP subdirectory: ACTIVATION.PROCESSED.MCNP
   - "VITJ_E": VITAMIN-J 175 group data, processed for input to the code REAC*2/3 using the VITAMIN-E weighting spectrum (see IAEA-NDS-168, Rev. 3, Feb. 1996). FTP subdirectory: ACTIVATION.PROCESSED.VITJ_E
   - "VITJ-FLAT": VITAMIN-J 175 group data, processed using a flat weighting spectrum (see IAEA-NDS-148, Rev. 2, Feb. 1995). FTP subdirectory: ACTIVATION.PROCESSED.VITJ_FLAT
2. **FENDL/D-1.0** (Jan. 92): nuclear decay data for 2900 nuclides in ENDF-6 format, extracted from ENDF/B-6 and ENSDF (see IAEA-NDS-167, Jan. 1995). FTP subdirectory: DECAY.FENDLD
3. **FENDL/DS-1.0** (Oct. 93): neutron activation data for dosimetry by foil activation. This is identical with file 1 (neutron activation cross-sections) of the International Reactor Dosimetry File IRDF-90 version 2 of Oct. 1993 (see IAEA-NDS-141, Rev. 2, Oct. 1993), given as multigroup data in 640 group extended SAND-2 format, without covariance data. FTP subdirectory: DOSIMETRY.FENDLDS
4. **FENDL/C-1.0** (Nov. 91): data for the fusion reactions D(d,n), D(d,p), T(d,n), T(t,2n), He-3(d,p) extracted from ENDF/B-6 and processed (see IAEA-NDS-166, Jan. 1995). FTP subdirectories: FUSION.FENDLC and FUSION.PROCESSED
5. **FENDL/E-1.1** (Nov. 94): data for coupled neutron-photon transport calculations, including
   - a data library for neutron interaction and photon production for 63 elements or isotopes, selected from ENDF/B-6, JENDL-3, or BROND-2 (see IAEA-NDS-128, Rev. 2, Feb. 1996)
   - a photon-atom interaction data library for 34 elements taken from ENDF/B-6 (see IAEA-NDS-58, Rev. 4, Sept. 1994)

   These are available in three representations:
   - original ENDF-6 format, as above, with resonance-parameters where applicable. FTP subdirectory: TRANSPORT.FENDLE
   - "FENDL/MG" (March 95): VITAMIN-J 175 group data in GENDF and MATXSR format processed by NJOY using the VITAMIN-E weighting spectrum (see IAEA-NDS-129, Rev. 3, Feb. 1996). FTP subdirectory: TRANSPORT.PROCESSED.FENDLMG
   - "FENDL/MC" (March 95): processed into the ACE format needed for input to the Monte Carlo code MCNP4A (see IAEA-NDS-169, Rev. 3, Feb. 1996). FTP subdirectory: TRANSPORT.PROCESSED.FENDLMC

FENDL BENCHMARKS

The FENDL/BENCHMARKS subdirectory contains compiled fusion benchmark descriptions and data, provided by the international community of benchmark specialists, for validation of the above mentioned FENDL libraries.

INTERNET/FTP online access to FENDL files

The FENDL data files can be electronically transferred to users from the IAEA Nuclear Data Section online system through INTERNET. In the NDS open area 'FENDL', a subdirectory was created for each sublibrary. The subdirectory names are given above. The file transfer via INTERNET (unix system) can be performed by 'ftp' command to the address 'iaeand.iaea.or.at' or '161.5.17.5'. The user should logon to the foreign user name 'FENDL'. No password is required. After having logged on, the user can set the definition to any required subdirectory and transfer files as desired. A grand total of 47 (sub)directories with 810 files with total size of nearly 2 million blocks or about 1 Gigabyte (1 block = 512 bytes) of numerical data is currently available on-line.

(96/11; app. to 7, 128, 129, 148, 166, 167, 168, 169)

FENDL CUSTOMER SERVICE OPTIONS

MEDIA	FORMAT	By WHOM
Electronic	FTP	IAEA, NEADB, NNDC
4 mm tape	UNIX TAR	CJD, IAEA, NEADB, NNDC, RSIC
	VAX BACKUP	CJD, IAEA, NEADB, NNDC
	ASCII	NEADB
6 mm tape	UNIX TAR	NEADB
	VAX BACKUP	NEADB
	ASCII	NEADB
8 mm tape	UNIX TAR	NEADB, NNDC, RSIC
	VAX BACKUP	NEADB, NNDC
	ASCII	NEADB
9 track	ASCII	CJD, IAEA
	EBCDIC	CJD, IAEA
CD-ROM	UNIX TAR	RSIC
	ASCII	NEADB

Table notes
1) NNDC will distribute FENDL unprocessed data
2) RSIC will distribute FENDL processed data
3) RSIC offers cost free service to ITER customers

3. Data Center Operation: Services

The request statistics for mail shipment remain constant (with fluctuations), whereas the online request statistics show a steep increase. The online statistics include only "NDIS", the interactive Nuclear Data Information System jointly operated with NNDC. The online File Transfer Service (FTP) is not included in the statistics because we do not yet have a statistical control system for FTP.

The request statistics for **mail services** is given in Tables 1 and 2. In 1995 there were about 700 requests resulting in 1600 dispatched items, including the shipment of 1200 documents and 600 tapes/diskettes. (Note: 1 data library may require several diskettes; and 1 tape may contain several data libraries.)

In 1995 there were 4400 **online retrievals** from users in 41 countries; see Table 3.

The distribution by countries and geographical region is shown in Table 4.

One can draw the following conclusions:

The use of the online services is seriously limited by the facts

- that many of the potential users do not yet have access to Internet,
- and that for many of those who have access to Internet, the transmission quality (speed and reliability) is not yet adequate.

For this reason the conventional services by mail will have to continue in the foreseeable future at about constant level.

The online services bring additional customers but they do not reduce the number of traditional mail service customers.

While many traditional mail service customers will change over to online services, there will always be newcomers without online facilities requiring conventional services by mail.

Table 1. Data Request Statistics 1986 - 1994 for services by mail

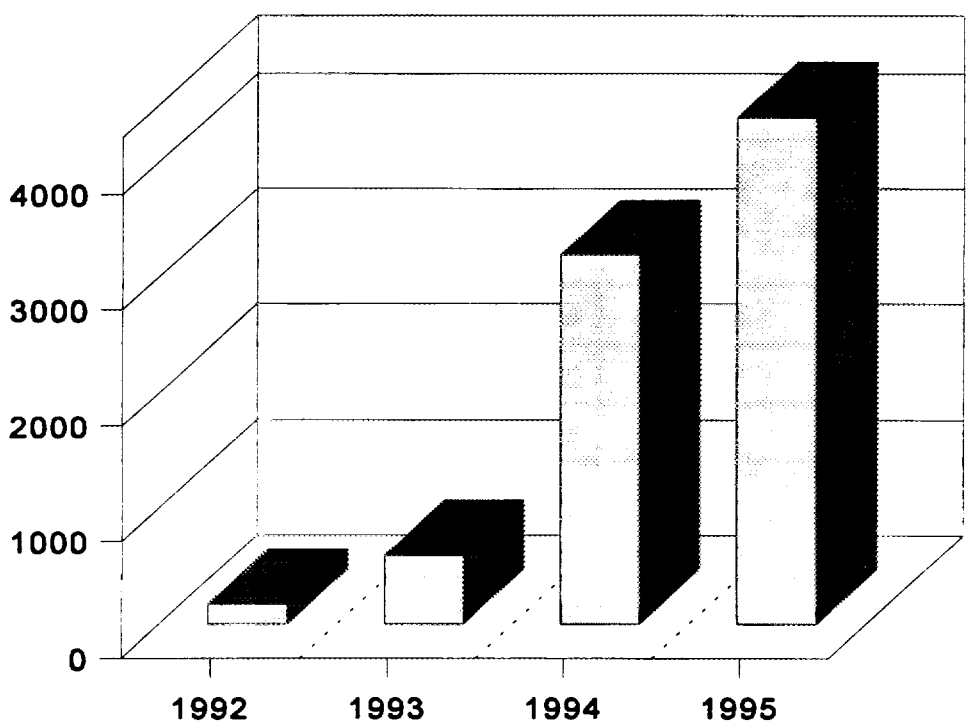
	Biblio-graphic info	Docu-ments	Expt Data	Eval Data	Data processing codes	Total
1986	11/25	405/1430	46/56	86/173	40/91	588/1775
1987	21/48	725/2166	27/28	87/147	167/214	1027/2603
1988	5/19	681/1590	34/47	110/191	77/109	907/1956
1989	10/17	564/1418	32/38	96/222	61/94	763/1789
1990	2/3	424/1916	20/32	188/360	26/32	660/2343
1991	0/0	426/1324	31/41	260/435	25/44	742/1844
1992	0/0	507/1422	27/32	237/303	142/161	913/1918
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
1995	0/0	452/1155	8/16	228/357	18/28	706/1556

The notation, e.g. 86/173 under Eval Data, means that on 86 incoming requests 173 evaluated data libraries have been sent out.

Table 2. Shipment of Tapes and Diskettes by Year

Year	Magnetic tapes	DAT tapes	PC diskettes
1990	214		(no records)
1991	457		(no records)
1992	143		(no records)
1993	125	(no records)	367
1994	168	(no records)	486
1995	126	14	463

Table 3



NDIS - the Nuclear Data Information System

Development of the nuclear data Online Services, which are presently used by 41 Member States.

Table 4

Nuclear Data Services in 1990 - 1995 by Geographical Region

Region	Services by Mail		Online Services	
	# of countries	percentage of requests	# of countries	percentage of requests
OECD countries	22	24%	17	36%
former USSR	6	7%	2	17%
East Europe	9	18%	8	40%
Asia, Australia	15	24%	6	1%
Africa and Near East	26	13%	2	3%
Latin America	15	14%	6	3%
	93	100%	41	100%
	Annual average: 700 requests resulting in the shipment of 300 data files and 2000 copies of printed materials.		4400 retrievals in 1995	
	Main users in 1995:	1. India 2. USA 3. China 4. Germany 5. Romania 6. Brazil 7. Hungary 8. Algeria 9. Argentina 10. Japan 11. UK 12. Israel	Main users in 1995:	1. Austria 2. Russia 3. Poland 4. Hungary 5. Netherlands 6. Slovakia 7. Czech Rep. 8. Italy 9. Israel 10. Germany 11. UK 12. Croatia

4. Computer Operations

End of 1995 the VAX 4000-200 computer was upgraded to a DEC-ALFA system. Details are given in the attachment.

During the past months the entire computer configuration and policy of the IAEA was reviewed, with two essential conclusions.

1. For safety reasons a **"Firewall"** is being established controlling the links between the IAEA computer network and the outside world. After various considerations it has been decided that the DEC-ALFA computer of the Nuclear Data Section will remain outside this Firewall, so that the Online Services and our links to external computers will remain unchanged. Only our electronic addresses will change.

2. The IAEA is establishing an **internal network** using the World-Wide-Web software. This requires Windows 95, and that again requires more powerful PC's than we have at present. Consequently, new PC's will have to be bought for the entire Section thus blocking the funds which had been allocated for additional upgrading of the DEC-ALFA system. This IAEA internal Web will provide for the IAEA internal communication including confidential information such as budget and personnel. It will be inside the "Firewall" to protect it against the outside, and essentially only e-mail and faxes will get through the "Firewall". We expect difficulties when transferring data files from the DEC computer which is outside the Firewall to the PC's which are inside the Firewall. Therefore, we shall need additional PC's that are outside the Firewall and linked to the DEC-ALFA.

5. Network Coordination

The network of eleven Nuclear Reaction Data **Centers** continued its smooth cooperation, with four main elements:

- compilation of experimental data in EXFOR and CINDA;
- exchange of evaluated nuclear data files;
- exchange and joint operation of related software.
- and the work-sharing in the Data Center Services to customers worldwide.

In all of these elements there is lack of manpower, so that we must seriously consider the priorities and the work distribution for our joint tasks.

I would like to appreciate the work done by all of the centers. Despite of the reduced manpower available significant amount of valuable new data have been exchanged.

Specifically I wish to mention

- ENDF/B-6 updates and ENDF utility codes by NNDC;
- the update of CENDL by CNDC;
- the JENDL-3 updates by JAERI;
- the release of EFF by the Data Bank;
- the release of the neutron activation library ADL-3 and the intermediate energy data library MENDL-2 by CJD;
- the charged-particle data EXFOR compilation by CAJaD and the Data Bank;
- and, last but not least, EXFOR TRANS tapes by all centers.

Judging from the viewpoint of the data center customers, I see primarily the following deficiencies:

- the insufficient speed in keeping the CINDA and EXFOR files up-to-date; this is particularly disturbing for the neutron data evaluators;

- the fact that the ENDF system and the Online Service do not provide uncertainties for some of the most frequently requested data such as thermal cross-sections, 14 MeV cross-sections, and some other data; as a consequence the old NUDAT cross-section data from the NNDC barn-book from the early 1980's are still being used although there exist more recent evaluations;

- the insufficient user-friendliness of the Online Service; we realize that the lack of programming manpower requires compromises between the desirable and the possible;

- the lack of recommended evaluated data for the more important charged-particle reactions;

- the lack of agreed recommended values and uncertainties of the half-lives of radionuclides.

These are some of the items where additional work of the Data Center Network is required. We must see how it can be done with the limited manpower available.

In the past years we had the following Network meetings:

Paris, 25-27 April 1994:	Reaction Data, report INDC(NDS)-308
Berkeley, 16-20 May 1994	Structure Data
Vienna, 31 Oct. - 1 Nov. 1994:	Special Center Heads' Meeting, report INDC(NDS)-324
Vienna, 2-4 May 1995:	Reaction Data, technical meeting, report INDC(NDS)-343
Brookhaven, 3-7 June 1996:	Reaction Data
Budapest, 14-18 October 1996:	Structure Data

Due to IAEA internal matters the organization of these Network Meetings will have to be reviewed. The meetings are presently organized under the heading of an IAEA Advisory Group Meeting which, as the title suggests, are meant to advise the Agency on a specific topic. This is not really the case for our Network meetings which serve the coordination of the Network. The essential difference is that an Advisory Group Meeting requires only a single participant per country (with perhaps, advisers), whereas our Network meetings require one representative per Data Center, which may mean two or three participants per country. We will have to discuss that in the Center Heads' Session.

COMPUTING FACILITIES AT THE IAEA/NUCLEAR DATA SECTION

Ramon E. Arcilla Jr.
Nuclear Data Section
International Atomic Energy Agency

The IAEA/Nuclear Data Section (hereinafter referred to as 'the Section') had been experiencing very slow response times after it completed in October 1994 the upgrade of the system software and the associated applications software running on its VAXcluster. This was exacerbated by an increase in the Section's computing activities. The central VAX 4000 Model 200 computer, the backbone of the VAXcluster, could no longer be upgraded beyond its 64-Megabyte main memory limit and thus had reached its saturation point. In October 1995 the Section finally retired its aging VAXcluster and replaced it by a single-processor AlphaServer 2100 computer system to function as the server of its local area network (LAN).

Figure 1 depicts the Section's current Ethernet LAN configuration. It includes peripheral devices migrated from the previous VAXcluster environment to protect the investments made on this devices, and new systems added to the LAN since October 1995. The AlphaServer 2100 computer and most of its peripheral devices are now located on the Section's office floor for easier access and operation. The old central VAX was used to be housed in the IAEA's central computing facility which has naturally tightly-controlled physical access for non-data-centre staff members.

Hardware Configuration

The AlphaServer computer system has been providing the Section more than ten times the processing power of the previous VAXcluster. It currently has 256 Megabytes of main memory and 10 Gigabytes of in-cabinet, Fast SCSI-2 disk storage. An additional 9 Gigabytes of external disk storage (housed in a BA400 expansion box) is provided by DSSI disk drives which were migrated from the previous VAXcluster environment. A built-in CD-ROM drive and a floppy diskette drive provide the system the capability to read software and data stored on these inexpensive media.

The following peripheral devices were also migrated from the VAXcluster to the AlphaServer environment:

- Seven X-Window terminals provide a Windowing environment for the Section's staff members performing multi-tasking, multi-platform computing activities. They are connected to the LAN via Digital Ethernet multiport repeaters (DEMPR).

- Five 386-based PCS are connected to the AlphaServer via the PATHWORKS network operating system which enables them to avail of file and print services on the AlphaServer.

- Thirteen VT-420 terminals provide text-based access to the rest of the LAN users. They are connected to the LAN via a DECserver 300 terminal server.

- An industry standard 9-track magnetic tape drive and two Digital Audio Tape (DAT) drives are used for the exchange and distribution of data and programs.

- One DEClaser 2250 and two HP LaserJet-4M printers provide both ASCII and PostScript printing capabilities to all LAN users.

- One SZ12X 95-MB SCSI tape drive provides the capability to read TK50 tape cartridges.

A DEC Multia multi-client desktop device running under Windows NT was added to the LAN in February 1996. The said device has been used by Dr. Otto Schwerer, the ONLINE SERVICES system manager, to meet his special computing requirements which involve running applications under different platforms (e.g. under Microsoft Windows/DOS, on the IAEA's IBM mainframe and on the Section's AlphaServer). For example, Dr. Schwerer has been using the DEC Multia to test extensively the Section's WWW home page under different computing environments to find any incompatibilities.

At the time being, the Section is awaiting the delivery of its new Digital Linear Tape (DLT) drive which is intended for backup purposes. The DLT drive has a maximum capacity of 20 Gigabytes when using its native format; the capacity goes up to 40 Gigabytes in compressed format. With the DLT drive, the Section can perform unattended backup and restore of its current 10 Gigabytes of data and programs in just one hour, with still enough room for future growth. The existing DAT drives could only back up and restore a total of 6 Gigabytes in compressed format at 1.3 Gigabytes per hour.

Software Configuration

The OpenVMS was retained as the operating system of choice on the Section's AlphaServer for the obvious reason that the migration would be the fastest, smoothest and least costly. The current OpenVMS/Alpha operating system license supports a maximum of 32 interactive users and, if necessary, can be upgraded to accommodate more users in the future.

Most of the software products (compilers, database management software and

applications) especially those required by the ONLINE SERVICES system were migrated from the previous VAXcluster to the AlphaServer environment. These included DEC FORTRAN, DEC C, Oracle CDD/Repository, Oracle DBMS, Oracle Rdb, and DEC DATATRIEVE.

The software products for IBM mainframe connectivity, DECnet/SNA 3270 Terminal Emulator and DECnet/SNA Remote Job Entry, were also migrated. By doing so, the Section retained the capability: 1) to perform 3270 terminal emulation on the AlphaServer while running applications on the IAEA's IBM mainframe, 2) to submit IBM batch jobs while logged on to the AlphaServer and the output to be routed back to the AlphaServer user.

The PATHWORKS network operating system was also migrated. Currently, PATHWORKS provides connectivity to the AlphaServer for five PCS running MS Windows/DOS. Users on these PCS could use the AlphaServer's disk drives as their virtual DOS drives. They could route as well Windows/DOS print jobs to the AlphaServer's printers.

In November 1995, Dr. Charles Dunford (Brookhaven National Laboratory) performed the migration of the ONLINE SERVICES system and all its associated utility programs from the OpenVMS/VAX to the OpenVMS/Alpha environment. The nuclear databases under the ONLINE SERVICES system included: CINDA, ENDF, ENSDF, EXFOR/CSISRS, NUDAT and X-RAY.

Various freeware downloaded from the Internet were also installed on the AlphaServer to enhance it functionality to the Section's users. Among them are:

- Mosaic - a very popular World Wide Web browser
- GNU ZIP, ZIP/UNZIP, COMPRESS/UNCOMPRESS - compression/ decompression utility programs to handle different compression algorithms, especially files compressed under UNIX-based computer systems.
- VMSTAR - used in the exchange and distribution of data and programs to UNIX-based installations.
- XV - used to preview graphics documents in different formats except PostScript, e.g. GIF, TIFF, BMP, etc.
- GhostScript/GhostView-VMS - a PostScript document previewer

FORTRAN-lint (FLINT), a commercial FORTRAN Source Code Analyzer, was installed in March 1996. As in the previous VAXcluster environment, it has greatly aided the Section's programmers in debugging large and complex FORTRAN codes.

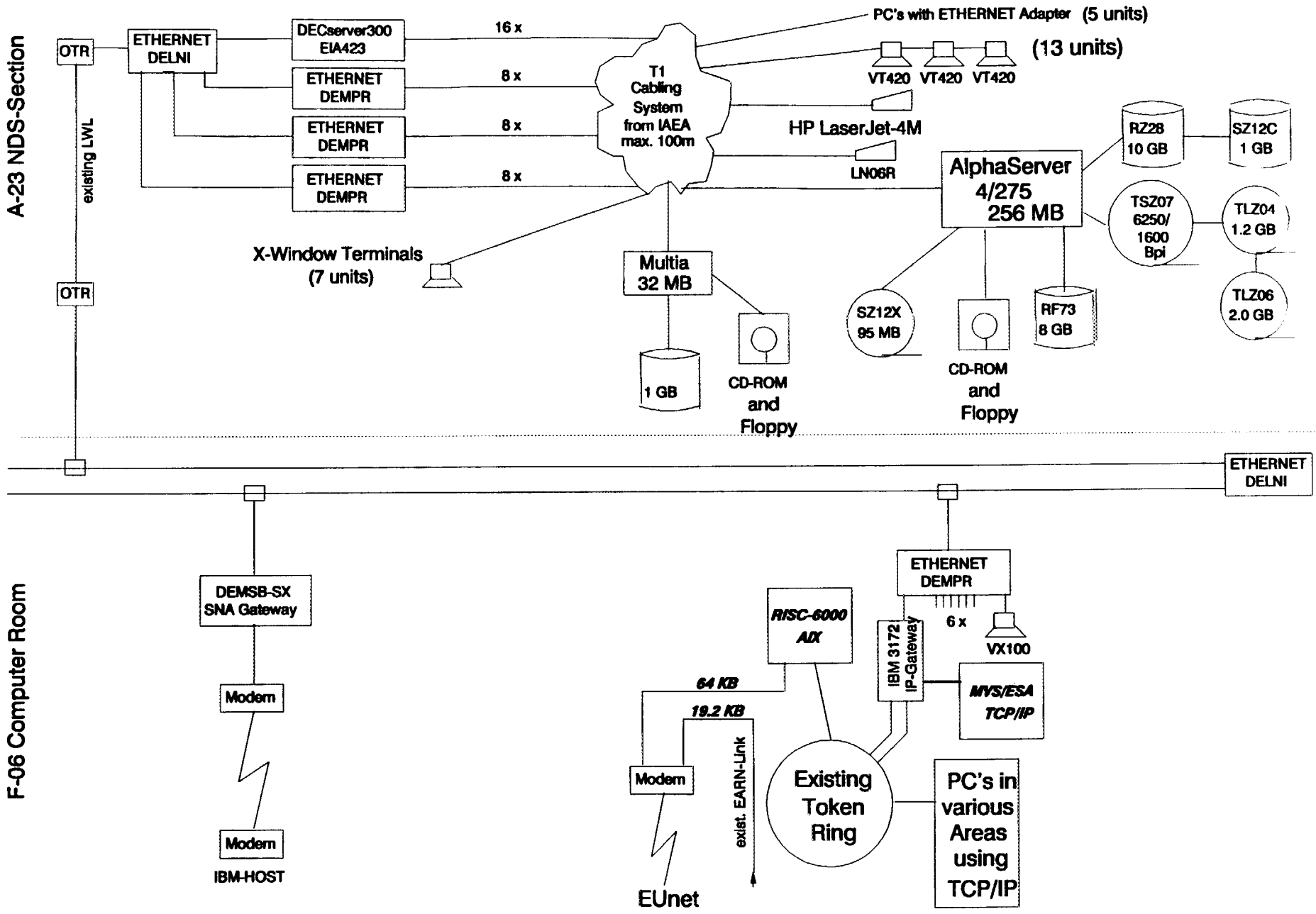


Fig. 1: IAEA/NDS LAN Configuration

The Russian Nuclear Data Center(CJD)

Progress Report
to the IAEA Advisory Group Meeting on the Coordination of the Nuclear Reaction Data Centers.
Brookhaven, 2-7 June 1996

V.N.Manokhin.

1. CINDA and EXFOR.

Since January 1995 up to May 1996 the CJD has transmitted 7 CINDA batches (011 - 017) with 3954 entries in exchange format.

During the same period the CJD has compiled data from 27 publications and transmetted TRANS 4098, 4099, 4100, which contained 50 entries (19 - new). The number of subentries is 523 (181 - new). The data from 27 works has been corrected.

2. COMPUTER MATTERS.

In 1994 the ALPHA AXP 3600s computer with OPEN VMS 1.5 was installed in the CJD. In 1995 the local network was created on the base of this computer and 10 AT 486 DX. The NNDC online system was adopted on ALPHA computer. All this changed greatly the computer situation in the CJD, required some efforts and time to learn new software and gain experience in operation with nuclear data libraries in new computer situation.

The CJD thanks Ch.Dunford and B.Kropp, who helped greately to put into operation DBMS and NNDC online system and train the CJD computer staff. This year N.Kulagin visited the NNDC and during one month improved his knowledge of new software.

This year new DBMS 6.1 was installed and all the data libraries were transferred to this DBMS. Ch.Dunford helps us to update programs for the NNDC online system. V.McLane helped to solve some problems concerning transformation of EXFOR data to computational data.

At the present time the CJD is connected with INTERNET. But because of technical reasons it is not possible to transmeet through the CJD line great amount of information (no more ~ 1 Mbites).

3. EVALUATED DATA.

3.1 Last two years a great efforts were made in the CJD to analyze the experimental and calculated cross sections of neutron induced threshold reactions. The objective of this activity is to evaluate the data for specialized libraries (dosimetry, gas production, activation data libraries).

The existing evaluated data are calculated using theoretical models and in many cases are very discrepant in spite of evident progress in the development of model description of cross sectionas.

A great attention was paid to development of systematics and search of criteria for selection of more reliable data from numerous calculated data. As a result some systematics were developped, more than 2000 threshold reactions were analyzed and about 450 excitation functions evaluated. On the base of these evaluated data several specialized data libraries are planned to create.

3.2 Some people from the CJD took part in international expertize of neutron cross sections for FENDL-1 library and FENDL-2 library.

3.3 During last two years for the BROND-2 library the following files were evaluated: Cr-52, Fe-56, I-127, Zn-64,-66,-67,-68,-70 and Pa-231. In connection with FENDL project the files for D-2, N-14, -15, Zr isotopes, Nb-93, Sn-nat, Si-nat were essentionally revized.

The work is in progress to process all these files by recent version of NJOY code.

3.4. The CJD and CDFE are engaged in the joint work on development of the photonuclear data library

3.5 The CJD has received from Moscow Institute of Physics and Engineering the new evaluated data on fission product yields for Pu-238, Cm isotopes and Cf isotopes. The four articles concerning the evaluation activity in this Institute are published in Voprosy Atomnoi Nauki I Techniki, Series Yadernye Konstanty, issues 1-2(1995).

3.6. The new version LIPAR-5 library was received from L.Abagyan (Kurchatov's Institute). The library contains data for 94 isotopes(from Mn-55 to Cm-248).The data are presented in the ENDF-6 format and used for Monte-Carlo calculations. A description of LIPAR-5 is also published in Voprosy Atomnoi Nauki I Techniki, Series Yadernye Konstanty, issues 1-2(1995),p.19.

4.0. CUSTOMER SERVICE.

Last time in connection with the more wide use of the codes such as MCNP, ORIGEN and others the CJD are requested to update nuclear data libraries used in these codes for calculations. Sometimes there are requests to evaluate data because of its absence in available data libraries (I-127 and Hg, for example). The CJD tries to meet these requests.

Tha ALPHA computer is used widely for the calculations of cross section excitation functions on the base of theoretical models.

The CAJAD progress report to Nuclear Reaction Data Centers Meeting

Brookhaven,USA 3-7 June 1996

Staff and budjet.

Authorized staff level of CAJAD is 7 permanent collaborators. Active staff is 6 only. The staff is formed by 4 physicist, 1 mathematic and 1 technical support.

CAJAD budjet is formed by salary only. We have a little financial support from Department of Science and Technology of Russia for astrophysical and solid state investigations. This support gave possibility to buy some addititional equipment as a scaner and new PC.

EXFOR activity.

After our last meeting CAJAD activity had two main problems:

1. Updating of B-Library.
2. Together NEA Data Bank we collect and compile data about medium energy (up to 1 GeV) protons interactions with the most important construction materials.

Munzel's Library (B-library) updating was possible thanks to financial support of Nuclear Data Section. We estimate this job as successfully. Although this job was planned as format errors excluding, some physical errors were found, which have been created by incorrect decay data of produced nuclei.

Nuclear Reaction Data Centers must be assimilate useful lessons from updating of Munzel's library. In first the difference between CAJAD and NDS versions of this library were observed. It is mean that our exchange system has some defects. This difference is large for some ENTRIES. For example, CAJAD version

of B0085 contains ELEM/MASS formalism, but NDS version does not contain this formalism. Therefore number of SUBENT of CAJAD version is less.

As another Centers have an another versions of B-library I would like to propose do not include the corrections in old library (or libraries) but to change old library by new one. If additional corrections will be recommended then CAJAD will be include its.

In second, I would like to take your attention to need for our network additional problem - we must have a set of rules for including a correction in Entries which were created by "dead" Centers. Special attention is needed for the rules to exclude obsolete Entries from these libraries. I have not sure that needed rule could be accepted during to this meeting because this problem is not simple.

Second our job is the collection and compilation CPND for medium energy protons interaction with the most important materials. We prepared 175 ENTRIES (end of 1995) and have plans to compile 100 ENTRIES additionally to end 1996. These ENTRIES contain very much differential data for elastic and inelastic scattering. The length of O-Library (175 entries) is 12 Mbytes approximately.

Dr. O.Schwerer pay attention to elaborate analysis of this library very much and prepared long index of remarks. Some his remarks are correct and needed correction will be included of course. But different understanding of some EXFOR rules is present too. We have hope to discuss these misunderstanding at suitable time of our meeting.

Dr. O.Schwerer and CAJAD staff have one principal disagreement. Dr. O.Schwerer took our attention for redundant information in our ENTRIES. He is right. We are including this information to help the users. We believe we must not force our users t o study additional sources of nuclear data information if we can include it in our compilations.

Therefore, we write REACTION for Sc-48 production with IND in 5-th subfield. Well, this is redundant information but our users must not see Chart of Nuclides to understand it. Dr. O.Schwerer argument is "The including of redundant information will hinder the job of searching codes". I would like to say that our search code does not request similar determination.

Our meeting must decide - to forbid redundant information or to correct searching codes.

Let us me additional remark regarding to P-library. The data from this library are suitable to some problems of nuclear physics applications. My opinion we must recommend Nuclear Data Section to find possibility to update this library. This job will not simple, it will demand to study all publications again. But update this library is needed.

Evaluated data.

We have attempt to find optical potential for "ALICE" code to describe our evaluated data for monitor reactions on copper target. This attempt was unsuccessful. This result is consenting with results from NEA Data Bank Benchmark for protons induced reactions on zirconium and lead targets.

Software.

To improve data reading from journal papers the code to produce COMMON and DATA sections has been written. This code uses HP ScanJet 3P and 486 PC. This code is processing the figures with linear and logarithmic scales.

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. I have the last version (May 1996) of EXFOR checking code. The remarks of our colleagues for this checking code will be welcomed.

Transes.

After Techical Meeting in last year we transmitted two Transes (A032, A033). A033 contains data from Arzamas collection for light nuclei interections. These data were compiled in Arzamas and checked CAJAD. TRANS A034 is ready now and I have it. Additional data from Arzamas collection will be checked and transmitted after my return at home.

The MSU INP CDFE Photonuclear Data Compilation and Evaluation Activities

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The MSU INP CDFE Progress Report
to the
IAEA Advisory Group Meeting on the
Coordination of the Nuclear Reaction Data Centers
3 - 7 June 1996 (Brookhaven, USA)

This report contains the review of the works carried out by the CDFE after the previous IAEA Consultants' Meeting of the Nuclear Reaction Data Centers (IAEA Advisory Group Meeting hosted by the NEA Data Bank, France, Paris, 1994) /1/.

The breaf description of actions have been carried out in the CDFE for the 1994 - 1995 period of time in accordance with the Conclusions and Actions of the 12-th IAEA Consultants' Meeting /1/ follows. This is the part of the CDFE Status Report (R # 10) to the Technical NRDC Meeting (Austria, Vienna, 1995) /2/.

- The CDFE carried out the correction of all L-series ENTRIES (L0001-L0059) of Berman's Photonuclear Data Library. The corrected data library was transmitted to the IAEA NDS.
- The development of new photonuclear data EXFOR ENTRIES (the new CDFE EXFOR TRANS M019) started.
- In the frame of 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,p), and (g,np) for O-16, Al-27, and copper isotopes Cu-63,65 (the CDFE TRANS M019).
- The new computer equipment for E-MAIL & TELNET & FTP was installed in the CDFE.
- The agreement between the CDFE and the JAERI NDC was achieved about the joint photonuclear data evaluation activity program. The working group seminar was planned to take place in the JAERI on the 1995 middle of November.

The following actions have been carried out in the CDFE for the 1995 - 1996 period of time in accordance with the conclusions, recommendations, and actions of the 1995 Technical NRDC Meeting /2/.

1. The new CDFE TRANS M019 was prepared. It includes the data (ENTRYs M0369, M0371 - M0385) from 16 papers. The TRANS M019 was prepared on the diskette as the supplement to this Progress Report.

2. The new CDFE Photonuclear Data Index "Photonuclear Data 1976 - 1995" was prepared to publication in Moscow State University Publishing Company /3/. It combines the corrected and added information from two previously published CDFE Photonuclear Data Indecis for the 1976 - 1985 /4/ and 1986 - 1990 /5/ periods of time and includes the new information for the 1991 - 1995 years also. In addition to the traditional bibliography and data tables this issue contains the table of the main parameters of the giant dipole

resonance (basic photonuclear reactions cross section maximum positions, cross section maximum values, full widths at half maximum (FWHM), integrated cross sections and first moments of the integrated cross sections values).

3. The bibliography and data tables of the new CDFE "Photonuclear Data 1976 - 1995" Index data file were prepared on the diskette as the supplement to this Progress Report.

4. The photonuclear reaction bibliographic data file which has been used as the base for the JAERI Index publication /6/ was obtained by the CDFE from JAERI by FTP.

5. The activity for development of the CDFE Photonuclear Data Bank online data http - server for WWW browsers has been started using the RS/6000 computer.

6. The advanced version of the IBM/PC universal relational nuclear spectroscopy database NESSY (New ENSDF Search SYstem) has been developed /7/ on the base of the ENSDF and the data management system (DMS) PARADOX 4.0. The demonstrational NESSY's fragment was transmitted to the NNDC by FTP.

7. In the frame of the IAEA Research Contract N 8206/RB the Evaluated Photonuclear Data Library EPNDL-1 was prepared. The preliminary version of library EPNDL-1 was developed in ENDF format and transmitted to the IAEA NDS. It contains the (g,n), (g,2n), (g,p), (g,np), and (g,abs) reactions data for the 15 nuclei from H to Zr (See ANNEX). The EPNDL-1 data file was transmitted to the IAEA NDS on a diskette.

8. The new IAEA Research Contract N 8839/RB started for the development of the Reference Evaluated Photonuclear Data Library (the same reactions for the various isotopes of N, Ne, Fe, Cr, Ni, Zr, and Pb) in the ENDF format for the Nuclear Physics and Technology.

9. The Photonuclear Data Workshop for compilation and evaluation problems discussions has been organized together with the JAERI on 14 - 15 November 1995 (Japan, Tokai-mura, JAERI, Prof. Y.Kikuchi). The Workshop papers will be published in JAERI.

10. The Proposal for Photonuclear Data Coordinated Research Program "Compilation and Evaluation of Selected Photonuclear Data for Applications" has been developed together with the IAEA NDS, Russia Institute of Physics & Power Ingineering Nuclear Data Center, the JAERI Nuclear Data Cener, the China Nuclear Data Center, and the Brazil University of Sao Paolo Institute of Physics.

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ANNEX

The contents
of the evaluated photonuclear data library EPNDL-1.

ENDF/B FORMAT	MAT	MF	MT	CARDS	MOD	REACTION
H-2	102	1	451	19	0	
	102	3	3	36	0	g, abs
Li-6	306	1	451	19	0	
	306	3	3	26	0	g, abs
Li-7	307	1	451	19	0	
	307	3	3	48	0	g, abs
Be-9	409	1	451	19	0	
	409	3	3	51	0	g, abs
C-0	600	1	451	19	0	
	600	3	3	49	0	g, abs
O-0	800	1	451	19	0	
	800	3	3	35	0	g, abs
O-16	816	1	451	19	0	
	816	3	4	70	0	g, n
Al-27	1327	1	451	19	0	
	1327	3	3	51	0	g, abs
Si-28	1428	1	451	19	0	
	1428	3	4	66	0	g, n
Ca-0	2000	1	451	19	0	
	2000	3	3	36	0	g, abs
Cr-52	2452	1	451	16	0	
	2452	3	4	15	0	g, n
Ni-0	2800	1	451	16	0	
	2800	3	4	12	0	g, n
Cu-63	2963	1	451	88	0	
	2963	3	4	28	0	g, n
	2963	3	28	9	0	g, np
	2963	3	103	11	0	g, p
Cu-65	2965	1	451	70	0	
	2965	3	4	34	0	g, n
	2965	3	28	14	0	g, np
	2965	3	103	27	0	g, p
Zr-0	4000	1	451	20	0	
	4000	3	4	13	0	g, n
	4000	3	10	16	0	g, n+g, 2n
	4000	3	16	8	0	g, 2n

The Status Report of the CNDC

Zhuang Youxiang
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I General Situation

1. The supplement and Improvement on CENDL—2.1

A modified version of CENDL—2, i.e. CENDL—2.1 was completed and released in 1995.

The library contains evaluations of neutron reaction data for 68 elements or isotopes from ^{1}H to ^{249}Cf in the neutron energy range from 10^{-5} eV to 20 MeV. Compared to CENDL—2, the size of the library has been increased significantly, the modifications have been made to most materials, so the accuracy of the data have been improved. For example,

(1). 14 new evaluations completed by Chinese or Chinese/Japanese cooperation have been added, they are: Cl, $^{50,52,53,54}Cr$, $^{54,56,57,58}Fe$, $^{63,65}Cu$, Lu, Hg, and Ti.

(2). 9 evaluations have been updated or re-evaluated, which were done by Chinese or Chinese/Japanese cooperation. They are: ^{27}Al, ^{nat}Ca, ^{nat}Cr, ^{55}Mn, ^{nat}Fe, ^{nat}Cu, ^{93}Nb, ^{nat}Ag and ^{238}U.

(3). The secondary neutron energy spectra have been modified for 20 nuclides. They are: ^{16}O, ^{23}Na, Mg, Si, P, S, K, Ti, ^{51}V, Ni, Zr, Cd, In, Sb, Hf, W, ^{197}Au, Pb, ^{237}Np and ^{239}Pu.

(4). The total cross section and elastic scattering cross section have been updated for 8 elements. They are: S, K, Ti, Ni, Zr, Sb, Hf, and Pb.

(5). The double differential cross section, gamma production data and covariance data have been added for many nuclides.

The comparison of the CENDL—2.1 with CENDL—2 is as follows:

	Nuclides	MF6	MF12-15	MF31-33
CENDL-2	54	4	10	7
CENDL-2.1	68	25	38	10
Increment	14	21	28	3

2. Benchmark Test of CENDL—2.1

CENDL—2.1 has been tested for ten homogeneous, eight heterogeneous thermal and nine homogeneous fast assemblies, which were recommended by CSEWG of America. 123—group(for thermal) and 175—group(for fast) cross sections were generated with code system NJOY91.91/NSLINK, MILER, the effective multiplication factors and reaction rate ratios were calculated with code system PASC—1.

The calculated K_{eff} are shown in Figs.1-2 for homogeneous and heterogeneous thermal assemblies. It can be seen that the K_{eff} are much close to 1.0 for first five

homogeneous (Fig.1) and eight heterogeneous(Fig.2) uranium assemblies, ranging from 0.9944 to 0.9995 and from 0.9965 to 1.0027, respectively; but they are considerably overestimated (maximum2.44%) for last five homogeneous plutonium assemblies(Fig.1). The K_{eff} for homogeneous fast assemblies are shown in Fig.3. It can be seen that they are very close to 1.0 (ranging from 0.9994 to 1.0014) for first three ^{235}U assemblies with different spectra. They are overestimated by about 0.4% for two plutonium metal bare sphere assemblies(JEZEBEL and JEZEBEL—Pu), but it becomes better for plutonium assembly with natural uranium reflector (FLATTOP—Pu). They are changed from 0.9946 to 1.0093 for three different ^{233}U assemblies without, with natutal U and ^{233}Th reflector.

In conclusion, the agreements of the calculated Keff with expermental ones are quite well for U fast, thermal(homogenous and heterogeneous) assemblies, but the K_{eff} are overestimated for Pu thermal, fast assemblies. This means that the data of ^{235}U, ^{238}U(O,H) in CENDL—2.1 are reliable, but the data of Pu need to be improved. The similar conclusion also obtained from analysis of the calculated reaction rate ratio data for above assemblies.

To compare, the calculations have also been done with ENDF/B—6 data for above assemblies and the Keff are shown in Figs.1—3.

3. Nuclear Parameter Library, Photonuclear and Charged Particle Data

(1). China Evaluated Nuclear Parameter Library (CENPL)

The six sublibraries, atomic masses and characteristic 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). Charged—Particle Nuclear Data(CPND)

The evalnation and calculation of $^{11}B(p,n)^{11}C$, $^{13}C(p,n)^{13}N$, $^{16}O(p,\alpha)^{13}C$, $^{77}Se(p,n)^{77}Br$ and $^{186}W(p,n)^{186}Re$ reaction cross sections have been accomplished for medical radioisotope procluction under IAEA research contract No. 8600/RB.

The 5 EXFOR Entries of experimental data measured in P.R.China have been compiled and will be submitted to NDS/IAEA.

(3). Photonuclear Data

The collections and evaluations of experimantal photonuclear data and complete theoretical calculations on $^{54,56,57,58,nat}Fe$ and $^{63,65,nat}Cu$ for photons up to 30 MeV are being carried out under IAEA Research contract No.8833/RB.

II Future work, Manpower

1. CENDL—3

A five year plan(1996-2000) for nuclear data have been made and endorsed by the First Plenary Session of the Second China Committee of Nuclear Data held in

Beijing in June, 1995. To make the plan in detail and workable, follow after, the joint meeting of Nuclear Data Evaluation and Nuclear Theory Working Groups, the meetings of Nuclear Data Measurement and Macroscopic Data Working Groups were held in Oct., Dec.1995 and May 1996, respectively.

According to the plan , CENDL—3 will be completed by 2000, and will contain 200 nuclides. Among them, the data of following nuclides will be newly or reevaluated: fissile nuclides 15, structure materials 18, light nuclides 7, fission products 91. It will contain consistent data between natural element and its isotopes for structure material, newly evaluated data for fission products, and more $_{\gamma}$ - production data(files 12-15), double differential cross section(file 6), covariance mateix(files 31-35).

According to the plan, also the special files for fission yield, activation cross section, decay data and intermediate data will be developed. An expert system for nuclear data evaluation will be established. CENPL will be improved and revised.

To complete the plan, many subgroups on different subjects have been organized at CNDC and China Nuclear Data Network, and a detail plan for 1996 has been made. The works are underway smoothly.

2. Staff

There are 16 senior scientists at CNDC. They are engaged in the following fields:

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

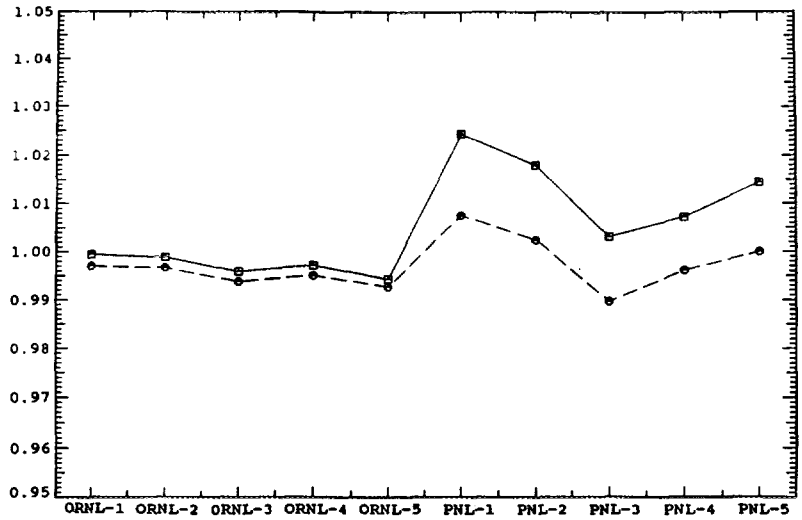

Fig.1 Keff for thermal homogeneous assemblies

CENDL-2 ENDF/B-6

CENDL-2 ENDF/B-6

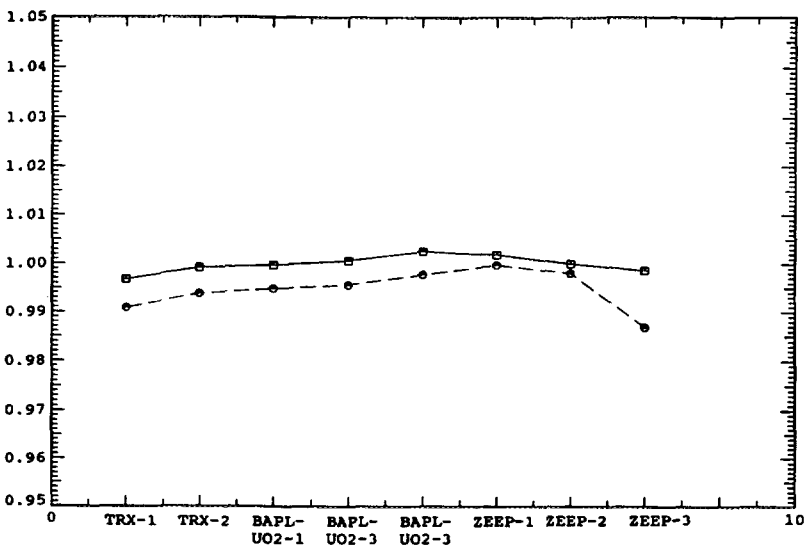

Fig.2 Keff for thermal heterogeneous assemblies

CENDL-2 ENDF/B-6

CENDL-2 ENDF/B-6

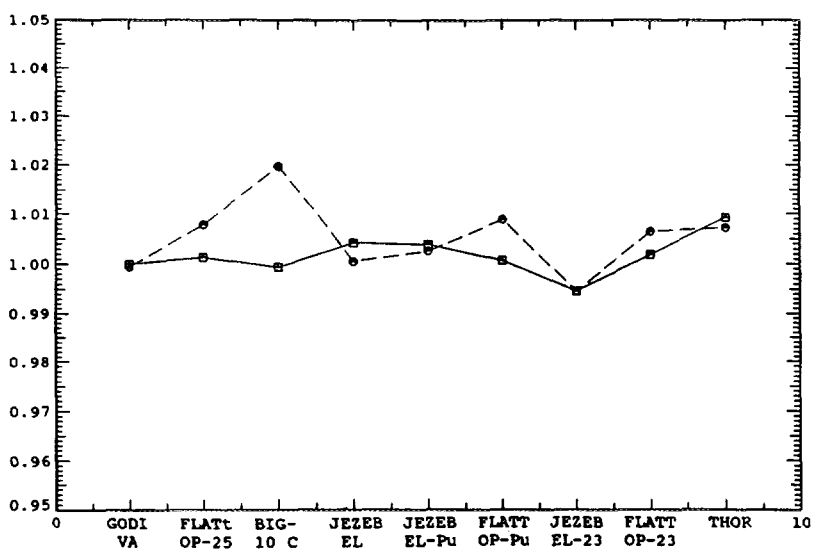

Fig.3 Keff for homogeneous fast assemblies

CENDL-2 ENDF/B-6

CENDL-2 ENDF/B-6

The Compilation and Evaluation of Charged Particle Cross Sections for Medical Radioisotope Production at CNDC

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1. Introduction

Radioisotopes and their corresponding radiopharmaceuticals have already demonstrated their applicability in basic medical research and the clinical practice of modern nuclear medicine.

Nuclear data relevant to medically important radioisotopes can be divided into two major groups: the decay data and nuclear reaction cross section data. The decay data are of prime importance in deciding upon the suitability of a radioisotope for medical application, and the reaction cross section data are of great significance regarding the prodnction and radionuclidic quality control of the desired radioisotope. In general, the decay data are known with sufficient accuracies, however the reaction cross section data need more attention.

Now I would like to report the status of work on CPND compilation and evaluation at China Institute of Atomic Energy (CIAE).

2. Compilation

CNDC–CP Group has compiled the experimental data measured in China and submitted to NDS / IAEA. They are as follows:

S0012: ^{197}Au(d,p),(d,2n),(d,t);
S0013: ^{55}Mn(α,n),(α,2n),(α,nα);
S0014: ^{186}W(d,p)(d,2n), ^{182,183,184}W(d,2n);
S0015: ^{54,56}Fe(d,n),(d,α), ^{56,57}Fe(d,2n), ^{57}Fe(d,nα);
S0016: ^{58}Ni(d,α),(d,nα),(d,t);
S0018: ^{197}Au(d,p),(d,2n),(d,2np);
S0019: ^{209}Bi(p,3n),(p,4n);
S0020: ^{109}Ag(d,2n),(d,p);
S0023: Mo(d,x) ^{95m,96g,97m}Tc;
S0024: ^{107,109}Ag(d,2n);
S0034: ^{107,109}Ag(α,n), ^{107}Ag(α,2n);
S0035: ^{60}Ni, ^{63}Cu, ^{64}Zn(α,p);
S0036: ^{55}Mn, ^{58}Ni(α,p);

S0037: ^{54}Fe, ^{59}Co, $^{63}Cu(\alpha,p)$;
S0038: $^{59}Co(\alpha,p)$;
S0039: $^{51}V(d,2n)$;
S0040: $^{89}Y(p,n),(p,2n),(p,np)$;
S0041: $^{56}Fe(p,n),(p,2n),(p,\gamma),(p,x)$ ^{54}Mn;
S0042: $^{51}V(p,n)$.

3. Evaluation

In general, neutron experimental data have more data and higher accuracy than charged particle ones. Therefore the research on evaluation methodology for charged particle nuclear data is especially important. Closely combining evaluation with measurement and theoretical calculation is an advanced method.

Through many years, CNDC–CP Group at CIAE has developed a series of calculational code system for charged particle nuclear data, such as CMUP2, CFUP1; CUNF; SPEC, DDCS; evalnated some activation cross sections as well as complate sets of CPND, and sumarized "Techniques Used for Charged Particle Nuclear Data Evaluations at CNDC " which is published in the Proceedings of Intern. Symposium on Nuclear Data Evaluation Methodology, BNL, USA, 1992, P.575–584.

CNDC–CP has made three CPND Research Contracts with IAEA.

Contract No. 7289 / RB and 7289 / R1 / RB: The Evaluations and Calculations of Intermediate Energy Nuclear Data for Proton Monitor Reactions. They were finished in 1994. "The Evaluation and Calculation of Intermediate Energy Nuclear Data for $^{56}Fe(p,n)$, $^{63}Cu(p,n)$, and $^{65}Cu(p,n)$ Monitor Reactions" is carried in Health Physics, 67(6), 650–656(1994).

Contract No. 8600 / RB: Evaluations and Calculations of Charged Particle Reaction Data for Medical Radioisotope Production. It starts from 1995. The reactions included in the contract are as follows :

$^{11}B(p,n)^{11}C$, $^{13}C(p,n)^{13}N$, $^{16}O(p,\alpha)^{13}N$, $^{77}Se(p,n)^{77}Br$, $^{186}W(p,n)^{186}Re$.

The final report and request for renewal of research contract were sent to IAEA in May 1996. It belongs to the Co–ordinated Research Programme on "Development of Reference Charged Particle Cross Section Data Base for Medical Radioisotope Production."

Activities and Cooperation on Nuclear Data in China During 1995

Zhuang Youxiang

(China Nuclear Data Center, CIAE)

1. The Activities and Meetings in Nuclear Data Field in 1995.

1) "The lst plenary session of the second China Committee of Nuclear Data ", June 20~ 21, China Institute of Atomic Energy, Beijing. Summarized the achievements and experiences of nuclear data work during the 8th five–year plan, reviewed and endorsed the 9th five–year plan of nuclear data;
2) "The celebration activities of the 20th anniversary of the founding of China Nuclear Data Center", June 22, China Institute of Atomic Energy Beijing. this is a grand gathering of the staff members in nuclear data field in China;
3) "The Combined Meeting of Nuclear Data Evaluation Working Group and Nuclear Theory Working Group" , Oct. 23~ 27, Taian City, Shandong Province;
4) "The Meeting of Nuclear Data Measurement Working Group", Dec. 18~ 22, Nanning City, Guangxi Province;

During the mentioned–above meetings, the detailed plans were made to accomplish the third version of the Chinese Evaluated Nuclear Data Library (CENDL–3).

2. The International Meetings and Workshops in Nuclear Data Field Attended by Staff Members of CNDC in 1995.

1) "The 20th Meeting of International Nuclear Data Committee", April 3~ 7, Vienna, Austria;
2) "The IAEA Consultants' Meeting on Technical Aspects of the Cooperation of Nuclear Reaction Data Center", May 2~ 5, Vienna, Austria;
3) "The 7th Meeting of NEANSC Working Party on International Evaluation Cooperation", May 16~ 18, Paris, France;
4) "The Meeting on Technical Aspects of Atomic and Molecular Data Processing and Exchange", July 10~ 11, Vienna, Austria;

5) "The CRP Meeting on Improvement of Measurement, Computations and Evaluations on Helium Production Cross Section", Sept. 25～29, Japan;
6) "The CRP Meeting on Development of Reference Input Parameter Library (RIPL) for Nuclear Model Calculations of Nuclear Data", Oct. 30～Nov. 3, Vienna, Austria;
7) "The 1st CRP Meeting on Development of Reference Charged Particle Cross Section Data Base for Medical Radioisotope Production", Nov. 15～17, Vienna, Austria;
8) "Workshop on Condensed Matter Physics and Physics of the Living State Program", Oct. 25～Nov. 25, ICTP, Italy.

3. The Foreign Scientists in Nuclear Data Field Visited CNDC / CIAE in 1995:

Drs. J. Katakura and A. Ichihara, NDC / JAERI, Japan, March 18～22;
Dr. Robert Russian, RSIC / ORNL, USA, and
Dr. Edward T. Cheng, USA, November.

4. Two staff members of CNDC as visiting scientist worked at NDC / JAERI, Japan and ECN, Netherlands, for one year, respectively.

June 1996

Status Report of JAERI/NDC and JNDC

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1.JAERI/NDC Activities

Nuclear data Center at Japan Atomic Energy Research Institute(JAERI/NDC) plays a role of Japanese nuclear data center. The international collaboration and data exchange are made basically through JAERI/NDC. JAERI/NDC serves as the secretariat of Japanese Nuclear Data Committee (JNDC).

Evaluation and compilation of Japanese Nuclear Data Library (JENDL) is made in cooperation with JNDC. The second revised version of JENDL-3 (JENDL-3.2) was released in June 1994. JENDL-3.2 provides the neutron induced reaction data for 340 nuclei/elements in the energy range from 10^{-5} eV to 20MeV. Pointwise files at 0 k and 300 k are also available. These pointwise files are produced using RESEND-D, RECENT, LINEAR and SIGMA-1.

We are now developing several JENDL Special Purpose Files in cooperation with JNDC. Recently, we almost completed the compilation of JENDL Fusion File and JENDL Activation Cross Section File. JENDL Fusion File contains the data for 83 nuclei/elements important for fusion neutronics. Special care was paid for double differential cross sections in the MeV region. JENDL Activation Cross Section File stores the cross section data for 233 nuclei and 1246 reactions. Work is in progress for Photonuclear Data File, Actinide File (17 nuclides from Cm, Bk, Cf are evaluated), PKA Spectrum File, (α ,n) Reaction Data File and High Energy Files. Revision of JENDL Dosimetry File is also in progress.

The nuclear structure and decay data are evaluated under the international collaboration. Japan is in charge of the mass numbers from 118 to 129. Now the evaluation A=118,127,128 and 129 is finished. The data A=118 and 127 was published in the Nuclear Data Sheet.

JAERI/NDC has experimental activities by itself and collaboration with universities and laboratories in Japan. Measurements of nuclear data, such as activation cross sections and double differential alpha-particle emission spectrum for neutron induced reactions of structural materials, and cross sections and double differential particle emission spectra for charged particle induced reactions were performed.

Atomic and molecular data for fusion reactor applications are also evaluated and compiled. The 4-th issue of Japanese Evaluated Atomic and Molecular Data Library(JAEMDL-4) is under compilation. Fourth issue will be completed within this fiscal year.

We are providing a WWW server from which nuclear data users can take information on nuclear data as well as numerical data themselves such as JENDL-3.2, JENDL-3.2 pointwise file, JENDL special purpose files(Dosimetry Files, Gas-Production Cross Section Files, Fusion Files etc.),JNDC FP Decay Data File. Down-loading of numerical data allowed only to the domestic users having a password given by NDC/JAERI because of JAERI security system. We hope this limitation will be removed soon. From this WWW servers, you can get several Tables: Tables of Nuclear Data, Chart of Nuclides; Graphs: three types of graphs are available for 340 nuclides of JENDL-3.2.

2.JNDC Activities

Japanese Nuclear Data Committee (JNDC) has about 150 members from universities, national laboratories, industries and software houses etc. as well as JAERI and Japan Atomic Energy Society. JNDC consists of three subcommittees, which are on nuclear data, on reactor constants and on fuel cycle, six standing groups, steering and counseling committees. Each subcommittees has several working groups(WGs).

"The First INTERNET Symposium on Nuclear Data, ISND-1" is being held just now. This is a new type of symposium on nuclear data using WWW as Media. This symposium started at 8 April and will end at 15 June. Total of 26 papers are registered and shown. This is open for all the world but the discussions are only limited to the persons registered.

2.1 Subcommittee on Nuclear Data

(1) *High Energy Nuclear Data Evaluation WG*

JENDL High Energy Files are being made by this WG. The evaluation is made in two phases. In the phase-I, the data up to 50 MeV will be evaluated for neutron and proton induced reactions. Evaluation work of the phase-I is at the final stage for the neutron induced reaction data of H,C,Cr,Fe,Ni,Be,N,O,Co, and proton-induced reaction data of C,Fe,Ni and Cu for protons. The energy range will be extended up to a few GeV in the phase-II. Some evaluation of Phase-II has already started for Si, Cr, Ni and Cu.

(2) *Covariance Data Evaluation WG*

Methods of covariance matrix evaluation have been investigated, in particular the methods

based on experimental data and on uncertainties of parameters used in theoretical calculations. A computer program KALMAN based on the uncertainties of parameters has been developed by Kawano et al. at Kyusyu University. The covariance data will be provided for important reaction data of JENDL-3.2. Eight most important nuclides for fast reactor applications will be finished in this fiscal year.

(3) *Evaluation and Calculation System WG*

Investigation on optical model parameters, level density parameters were made. A system for fission spectrum calculation was developed on the basis of two temperature Madland-Nix model. Integrated Nuclear Data Evaluation System (INDES) is now being developed.

(4) *Fission Product Nuclear Data WG*

Re-evaluation of nuclear data for about 60 fission products has been finished and the results were stored in JENDL-3.2. Benchmark calculation of the reevaluated data has been made. It was confirmed that the FP nuclear data in JENDL-3.2 reproduce the integral experimental data within discrepancies of 15%.

(5) *Activation-Cross-Section Data WG*

This WG has done evaluation, compilation and benchmark tests of JENDL Activation Cross Section File. The first version of Activation Cross Section File has been completed. This library is named as JENDL Activation cross section file 96.

(6) *PKA Spectrum WG*

A code system of ESPERANT for making PKA/KERMA files was modified. A PKA/KERMA file for 69 nuclei from F to Bi was constructed on the basis of JENDL Fusion File. This file will be used for testing of the data.

(7) *Charged Particle Nuclear Data File*

This WG is responsible to JENDL (α ,n) Reaction File.

(8) *Photonuclear Data WG*

Evaluation of photonuclear data for 48 nuclei has been made in the energy range below 140MeV. The first version of JENDL Photonuclear Data File will have data for isotopes of H,C,N,O,Na,Mg,Al,Si,Ca,Ti,V,Cr,Mn,Fe,Co,Ni,Cu,Zn,Zr,Nb,Mo,Cs,Gd,Au.Ta,W,Pb,Bi

and U. The compilation of the file is completed in 1995.

2.2 Subcommittee on Reactor Constants

(1) *Reactor Integral Test WG*

Benchmark test of JENDL-3.2 for fast and thermal reactors has been made. The cross section library for use of SRAC, JOINT, MVP and VIM was created and distributed in the domestic users. Comparison between JENDL-3.2 and ENDF/B-VI was performed.

For U-cores, Keff is more reactive(0.6%) for JENDL than ENDF/B-VI in the case of TCA(Thermal system). This difference comes from U-238, and U-235 ν. No big differences are found for Pu cores.

For fast reactor applications: relatively large differences in Keff are observed between JENDL-3.2 and ENDF/B-VI, i.e., 1% difference for large cores, 2% for small cores respectively. This difference might be attributed to U-238 in-elastic scattering cross section second neutron energy distributions.

(2) *Shielding Integral Test WG*

Integral test of JENDL-3.2 with shielding benchmark has been made for iron, sodium and oxygen. Comparison of gamma-ray production data of iron between JENDL-3.2 and FENDL-1 was also made.

(3) *Dosimetry Integral Test WG*

Reevaluation of dosimetry reaction cross section data in JENDL Dosimetry File is in progress.

(4) *Fusion Neutronics Integral Test WG*

Integtral test of JENDL-3.2 for fusion applications has been made for Li, Be, C, O, Al, Ti, Mn, Cr, Fe, Co, Cu, Nb, W, Pb. Comparison between JENDL-3.2 and FENDL-1 was also made. Specialist meeting for Fusion Neutronics Data was held.

(5) *Standard Group Constants WG*

No activities in the last year.

2.3 Subcommittee on Fuel Cycle

The subcommittee on fuel cycle consists of two WGs. Generation of an ORIGEN-2/JNDC library based on JENDL-3.2 is in progress as a joint effort of the two WGs. Other activities

are as follows:

(1) *Decay Heat Evaluation WG*

Energy spectrum of the β-ray component of decay heat has been studied on the basis of GRoss Theory of β-decay. Recent improvement of the theory was fully adopted and the calculated results agreed fairly well with the experiments in the literatures.

(2) *WG on Evaluation of Nuclide Generation and Depletion*

Experimental data on nuclide inventories in spent fuels were collected and compiled. The results were stored in SFCOMP data management system, which had been developed for the present purpose.

2.4 Standing Groups

(1) *CINDA Group*

Papers on neutron induced reaction data published in Japanese journals and reports are surveyed. Entries were sent to NEA Data Bank.

(2) *ENSDF Group*

The evaluation of nuclear structure data is performed for nuclei with mass numbers from 118 to 129.

(3) *Group on Atomic, Molecular and Nuclear Data for Medical Use*

Survey work has been made for the radiopharmaceutical data needed in the field of nuclear medicine.

(4) *JENDL Compilation Group*

Compilation of Major JENDL-file.

(5) *Editorial Group of "Nuclear Data News"*

Three issues of "Nuclear Data News" which is a periodic informal journal in Japanese were published in a year.

Summary of ISTC Workshop on Nuclear Data for Minor Actinide

27-31 May 1996, JAERI, Tokai-mura, Ibaraki-ken, Japan

Improvement of minor actinide data is very important for transmutation projects using actinide burner reactors. The data needed are for ^{237,238}Np, ^{238,242}Pu, $^{241, 242g, 242m, 243}$Am and $^{242, 243, 244, 245, 246}$Cm. The corresponding data for most important cross sections should be obtained on the basis of ISTC projects: "Measurements of the fission neutron spectra for minor actinides" (St.Petersburg, N 183-p), "Measurements and analysis of basic nuclear data for minor actinides"(Obninsk, N304-p), "Evaluation of actinide nuclear data" (Minsk, N b-03). The results obtained during the first year of projects were discussed on the Workshop. Some results of JAERI activity on improvement of nuclear data for minor actinides were considered too.

The following results should be noted:

i) The measurements of the fission neutron spectra for spontaneous fission of Cm-244 and -246 are performed in KRI;

ii) The preliminary results of precise measurements of the fission cross sections of Cm-244, -245, -246, -247 and Am-242m by neutrons with energies from 0.15 to 7 MeV were obtained in IPPE;

iii) The experimental equipment for measurements of the secondary neutron spectra, fission product yields and delayed neutron yields for the Np-237 target were developed and tested in IPPE. The first measurements of corresponding data were performed.

iv) The improved evaluations of most important neutron cross sections for Np-237 were obtained in IPPE;

v) New evaluations of neutron cross sections for Cm-243, -245 , -246 and Am-241 were performed in RPCPI. The complete files of evaluated data in ENDF-VI format were prepared;

All participants have agreed that the activity on projects is developing in accordance with original schedules and the final results of projects will improve essentially the basic neutron data for minor actinides that are important for future progress in technology of nuclear waste transmutation.

Possibilities of further measurements and evaluations for JENDL Actinide File have been discussed. Priorities for data requests should be set up by considering the present status of experimental and evaluated data.

RIKEN Nuclear Data Group

IAEA Advisory Group Meeting
On the Coordination of the Nuclear Reaction Data Centers
Brookhaven, 3-7 June 1996

Y. Tendow

EXFOR

The subject of our group has been to collect and compile the new cross section data for the production of radioisotopes of medical use and to incorporate the missing old works into the EXFOR data base. Considerable number of papers to be compiled had been found and collected, however, the transmission of new EXFOR files has discontinued for a while since the last TRANS R009 because of the transfer of the computer system and some other reasons. The compilation work itself has been progressing up to the present. New entries R0051 through R0055 with a total of 122 subentries are now completed and just to be transmitted under the TRANS R010. Entries R0056 through R0060 of 46 entries are under the final stage of compilation. As for the entries up to R0070, only the DATA and a part of the BIB sections have been prepared at present.

ENSDF, NSR

We continue the mass chain evaluation as a member of the Japanese ENSDF working group. A = 129 and 127 evaluations have been published in Nuclear Data Sheets Vol. 77, and the A = 120 evaluation has been sent to NNDC for review. Hereafter we are continually to update these mass chains by necessity.

NSR file compilation for secondary sources (Annual reports etc.) of Japanese origin shown below has been accomplished and sent to NNDC.

RIKEN Acc. Prog. Rep. 1994	50 (reports)
JAERI-TV Annual Rep. 1994	17
JAERI-TIARA Annual Rep. 1994	6
OULNS Annual Rep. (Osaka Univ.) 1994	23

RCNP Annual Rep. (Osaka Univ.) 1994	29 (reports)
INS Annual Rep. (Tokyo Univ.) 1994	23
UTTAC Annual Rep. (Univ. Tsukuba) 1994	11
CYRIC Annual Rep. (Tohoku Univ.) 1994	8
KUTL Tandem Acc. Rep. (Kyushu Univ.) 1993-1994	23

Compilation works for the sources published in this 1996 are started and now in progress.

Computers

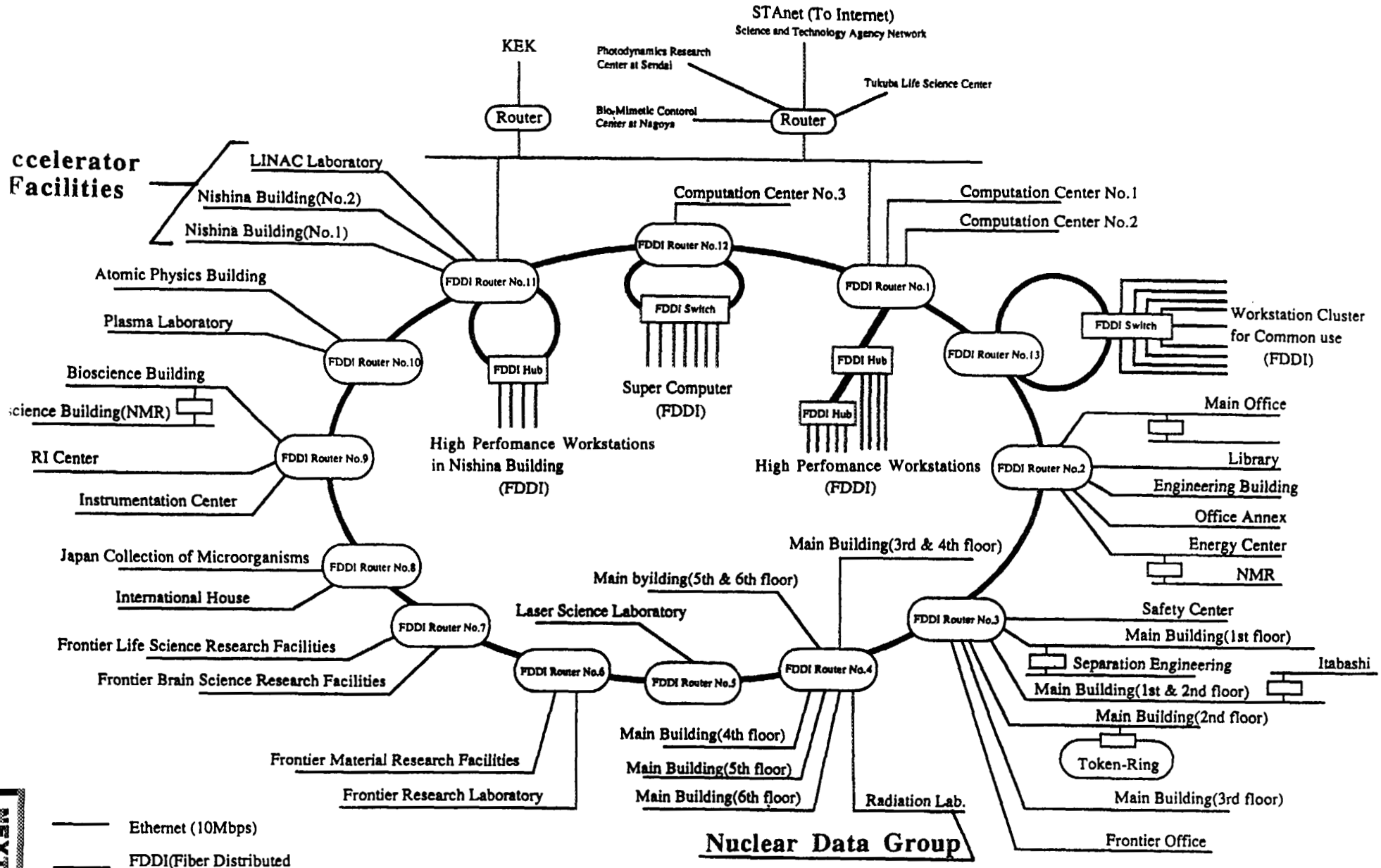
The whole computer system in RIKEN is shown in fig.1, which had been switched over from the central mainframe system previous year. Nuclear Data Group is using X-terminals and PC's of Windows and Macintosh platforms connected to the network. The processing codes such as ANDEX, ENSDF package are also implemented on the PC's of the Windows environment .

Staff

Members at present are practically the same as before except a new member, a young experimental physicist, joined to help a small part of the compilation works:

4	"professional",	Y. Tendow,	EXFOR, ENSDF, NSR,
		A. Hashizume,	ENSDF, EXFOR,
		K. Kitao,	ENSDF, (EXFOR),
		A. Yoshida,	NSR.
1	"general service",	Y. Kidachi,	Secretary, data preparation, maintenance.

Our group is of rather small scale, however, we are thinking that we can make steady contributions to the nuclear data activities of the network from now on for several years at least. Long-pending man-power problem have to be overcome for greater advances in our activities.



Computer Network in Wako Campus

RIKEN

T.Suzuki 96/05/15

Japan Charged-Particle Nuclear Reaction Data Group (JCPRG)

Status Report to
the IAEA Advisory Group Meeting
June 3-7, 1996

The Executive Committee of JCPRG

General

In the meeting of the NRDF advisory committee, which was held on 28 March, 1995, we had conclusions on our responsibilities in the international nuclear data centers' network;

(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 JCPRG is organized by two committees and secretariat in order to accomplish above four duties. The members of both committees were reported at the NRDF consultants' meeting on the technical aspects in May 2-4, 1995, and we have no change.

NRDF Data Compiling Activity

We newly compiled 56 entries (1,328 tables) in 1994 and 41 entries (200 tables) in 1995, whose all data have been produced by the accelerators in Japan. By March of 1996, amount of the data compiled have reached 23,133 tables of about 66.4 MB. Our aim is to store all data produced by Japanese accelerators in the NRDF database. The amount of data to be compiled is approximately 1,000 tables and 3 MB in every year.

EXFOR Translation form NRDF

In 1994, TRANS E012 and E013 were made as update versions of TRANS E010 and E011, respectively. For the TRANS E012 and E013, We received from IAEA further useful comments pointing out some errors remained in the entries. In 1994, we made corrections according to the comments from IAEA and edited TRANS E014 which contained only the entries requested re-transmission in the two TRANS tapes. We also submitted TRANS E015. The TRANS E015 contained 6 new entries which were translated from the NRDF entries compiled in 1993. Translation of the NRDF data compiled in 1994 and 1995 has

been started from this April.

Customer Services

To disseminate the use of Charged-Particle Reaction Data in EXFOR Library to researchers in Japan, we are planning to install the index information retrieval service on the National Center for Science Information Systems (NACSIS). The same index information retrieval system has already been installed and opened to users of the Hokkaido University Computing Center, where the retrieval service of NRDF data are performed.

For the purpose to extend the NRDF data service to more general users, we are investigating feasibility to apply the IntelligentPad system to nuclear data. This study is expected to provide a new retrieval system working on a worksatation with object oriented graphical user interface.

Evaluated Data: Nucleosynthesis

New data evaluation activity for charged-particle data has been discussed to make nucleosynthesis database in Japan. Recently, the working group was organized.

STATUS REPORT OF THE DEBRECEN NUCLEAR DATA GROUP

IAEA Advisory Group Meeting on the
Coordination of the Nuclear Reaction Data Centers
Brookhaven, 3-7 June 1996

EXFOR

We are continuing to compile the cross section data of charged particle induced nuclear reactions for production of medically important isotopes, for monitoring beam performance and for use in Thin Layer Activation Technique (TLA). We compile EXFOR files using the ANDEX PC software, specifically with the goal of producing evaluated Charged Particle Nuclear Data Base (CPNDB) for applications of beam monitoring and radioisotopes production. As agreed previously our group continue his effort to compile new charged particle (CP) data measured in Germany and in Hungary and compile old data used in evaluation all over the world. We have prepared about 50 EXFOR entries, out of them 70 percent was reviewed and corrected. New compilations are in progress.

COMPILATION AND EVALUATION OF SELECTED REACTIONS

We have 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. The results of compilation and evaluation of cross sections for production of ^{67}Ga and ^{111}In and p, d, alpha and ^{3}He induced monitor reactions on Cu, Ti, Ni and Fe are already published or to be published in referred journals, separately.

The Debrecen Group is participating in a Coordinated Research Program on Development of Reference Charged Particle Cross Section Data Base for Medical Radioisotope Production coordinated by IAEA. The CRP focuses on beam monitor reactions and production reactions for main important gamma- and positron emitters induced by light charged particles with incident energy up to 100 MeV. The work programme contains compilation and evaluation work and some experimental measurements. All the source data used in the program and not included in the EXFOR Library will be compiled in EXFOR format by the Debrecen Group.

NEW CROSS SECTION DATA

Measurements of the cross sections for monitoring the 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 arisen during evaluation of the data.

Monitor reactions

Systematic investigations of charged particle induced nuclear reactions on metals are in progress for their use as monitors for measuring the energy and intensity of the bombarding beam. A general philosophy of our study is to try to use the same target material to monitor all light particles. Measurement and data evaluation for *proton, deuteron, ^{3}He and alpha particle induced reactions* (have started earlier) on ^{nat}Ti, ^{nat}Ni, ^{nat}Fe, ^{nat}Cu, ^{nat}Mo and ^{nat}W are in progress in collaboration with Institut fur Nuklearchemie, KFA Julich and with VUB Cyclotron Laboratory, Brussels.

Reactions for medical isotope production

New measurements have been performed to determine excitation functions for production of ^{67}Ga, ^{123}I, ^{124}I, ^{22,24}Na and ^{18}F isotopes with light charged particles have been performed for use in medicine and in plant physiology.

Reaction for Thin Layer Activation technique

Excitation function of light ion induced nuclear reactions have been measured on most important metals for application in Thin Layer Application technique. Investigation of proton, deuteron, ^{3}He and alpha induced reactions on light elements (Be, B, C, N ...) has been performed for production of ^{7}Be used in TLA.

STAFF and COMPUTERS

Staff: Three persons are working on the project in part-time.

Computers: IBM compatible PC-s.
Indy Silicon Graphics workstation terminal connected to a Silicon Graphics Power Challenge and to a WAX trough network.

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COMPILATION AND ESTIMATION NUCLEAR DATA OF CHARGED PARTICLES ON LIGHT NUCLEI

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THE INTRODUCTION

Nowadays several libraries of evaluated nuclear data exist in the world for reactions caused by neutrons. These libraries are intended for works on constructing thermal and fast fission reactors, calculation of shielding, improvement of nuclear weapon, choice of construction materials, creation of medical facilities and other applications. On the other hand, evaluations over reaction cross sections, generated by charged particles, have an extremely limited character and deal first of all with calculations of nuclear-physical processes in hot plasma, taking place in weapon thermonuclear devices. These evaluations enclose mainly thermonuclear reactions of hydrogen and helium isotopes between each other.

At the same time the thermonuclear energetic development, creation of testing facilities with both magnetic and inertial plasma confinement demand an expanding of a scope of reactions that could be used during thermonuclear burning. In particular, this is a permanent interest to the application of heavy ions beams such as $^{6,7}Li$, $^{10,11}B$. The other examples of importance of the data on charged particle interaction with light nuclei are the diagnostics of hot plasma, as well as the consideration of a secondary activity, being developed during a sequential process (charged particle, neutron). Also astrophysical and medical applications demand the expanding of a scope of the evaluated data.

Whereas the usefulness of nuclear data in various aspects of astrophysics have been extensively illustrated in review articles and monograph (see, example Caughlan G., Fowler A., Harries A., ea., Tables of thermonuclear reaction rates for low mass nuclei //At. Data and Nucl. Data Tables, 1985, Vol.36, p.177-233), their "terrestrial" application to problem in the field of nuclear fusion have not been fully exploited. Nuclear physics data characterising the interaction of light nuclei are published in numerous scientific journals and publications which are not readily accessible to most potential data users. In addition, experimental cross-section data are often not suitable for direct use in calculation as they are presented in the form of discrete energy points for incoming particles, or as angles of emission escape for outgoing reaction products. In most cases nuclear physics data can be

recommended for unambiguous use only after they had gone through the process of evaluation, that is, after all the available experimental cross-section data complemented by data calculated on the basis proven nuclear reaction models have been rigorously analysed. The evaluation of nuclear physics data requires not only availability of complete sets of originally measured data, but also a thorough knowledge of the experimental and theoretical methods used in their determination, that are in full measure peculiar to specialists of VNIIEF, Arzamas-16, earlier having been occupied in nuclear scientific and weapon programs. Therefore it is no wonder, that the proposals on creation of evaluated nuclear data library for charged particles on light nuclei have found support from party ISTC and were realised in project *145 " Development of the library of evaluated nuclear data on charged particles for International Thermonuclear Reactor (ITER) and other applications thermonuclear fusion.

The works within the framework of this project are supported by Section of Nuclear Data IAEA, and are directed to the International Thermonuclear Reactor project (ITER) maintenance of thermonuclear constants, first of all. Collaborators under project #145 are Roger Wait's group from Livermor National laboratory USA, and group of Doctor Panini, institute of nuclear Physics, Boloni, Italy.

The purpose of the offered work - creation of evaluated data library on charged particles interaction with light nuclei up to oxygen inclusive. Received during the given project execution the evaluated nuclear data library on charged particles will be good contribution to creation of International Thermonuclear Reactor, and good example of different countries scientific cooperation (the evaluation work are conducted in VNIIEF in close coordination with scientists from Livermor, Los-Angeles, European Nuclear Agency).

As a result of the works carried out according to the project the following information will be presented in the form of reports, articles and reviews:

- The detailed description of experimental data library in EXFOR format of cross sections interaction on p, d, t, ^{3}He, α-particles with light nuclei in the energy range lower 30 MeV.
- The ENDF-6 format files of evaluated data on charged particles interaction cross sections with light nuclei, beginning from hydrogen and finishing oxygen in energy range lower 30 MeV
- which are all important from point of view of thermonuclear energetic and other applications.
- Description of techniques of evaluation and calculation of cross sections on nuclear-physical models.

- For international cooperation, similar to the ITER-project, the evaluated data will be made out in kind of a standard database, with which various groups of the thermonuclear systems users can work.

To perform the project it is proposed to use the libraries of experimental and evaluated data existing in VNIIEF and LLNL, having been created over the last years, as well as techniques of nuclear data evaluation and the new data, obtained in experimental investigations at the facilities of VNIIEF.

1. Experimental Data Compilation.

The following reference collections served as a bibliographical basis:

N	Titles of sources	Editor Publisher	Years included
1	Nuclear Physics. Energy levels of light nuclei:	A. Ajzenberg-Selove G.North-Holland, Amsterdam	1962-1995
2	Nuclear Data Sheets Reaction Index	W.B. Ewbank et.al. Academic Press New York and London	1966-1995
3	Nuclear Data Tables. Reaction list for charge-particle-induced nuclear reactions.	F.K. McGowan, W.T. Milner Academic Press New York and London	1965-1973
4	Nuclear Data and Nuclear Data Tables. Reaction list for charged-particle-induced reactions.	F.K. McGowan, W.T. Milner Academic Press New York and London	1973-1995
5	Referral Journal, sec.Physics.,18B. Nuclear Physics.	Ch.Ed.. Yu.M. Arskij RAN, VINITI, Moscow	1954-1995

The compilation process contains the following approaches:

a) All the works in the form of open reports and including the data on interaction of hydrogen and helium isotopes between each other, as well as with lithium-6,7, beginning with 1948 are to be compiled, it also concerns experimental works made in VNIIEF Laboratory for Nuclear Constants;
b) The works are compiled containing the data on integral, differential cross-sections of reactions selected, or their angle or energy distributions;
c) The works found during the bibliographical search are introduced in the data library in format EXFOR;
d) In addition to a computer representation a xerocopy and a registration form are made, i.e. a library of impressions (back-up works) with experimental data.

Now the library of experimental data contains more than 1500 work. Each work represents brief information of authors list, article title, data source, together with reference to journal, where data are published. These unique works make a substantial contribution to existing international experimental data library. Whole saved information recorded out in files of internal format, which is of the EXFOR type. The withdrawal from standard data exchange format (EXFOR) was a forced measure at that time. Due to the necessity of operative information exchange and having a modern computers, it is decided to translate saved data from our internal format to EXFOR format /1/, and to organize received data in EXFOR format. The following problems were to be solved In this purpose:

- replacement the existing software and creation means for work with library in graphics viewing mode (for user convenience);

- analysis and translation all saved data from internal format to the EXFOR format and also organization their viewing in graphic and tabular forms.

For supporting on experimental data compilation into the EXFOR format the existed software and hardware /2/ was replaced.

The hardware-software interaction structure of input, processing and writing data into computer is shown on fig. 1 (see. Appendix 1.).

The approximate algorithm of data processing, and the subsequent work with them is shown on fig. 2 (Appendix 1).

Proceeding from stated above principals of compilation, the data can be submitted either in tabular form, or pictures, or it can be data from international library of experimental data EXFOR.

For modern organization of graphic data input were purchased the scanner (HP ScanJet 3p), software to it and PC IBM486, and also to transform graphical data obtained from the scanner to the format EXFOR file a special program was created (CRW) /3/.

The program allows to:

- Read a picture and store it in the computer memory in a white/black form in a file of .DMP type using a standard program package.
- Treat the received file by program CRW in a dialogue regime jointly with the window one.
- Transform the digitized curve points from input device coordinates to those physical during dialogue.
- Monitor the digitization precision for a present graphical image and define the process errors.
- Read the obtained data in the EXFOR format file.

The program ANDEX /4/ is used for input tables.

The developed software package that enables to execute the following procedures.

- The S-factor calculation from given reaction cross-section table:
- Cross- section calculation from given S-factor table (the procedure reversible too previous).
- The data sorting, recording associated information, which agrees EXFOR format requirements;
- Data viewing in graphic way;
- Creation of catalogues, which provide sorting and search for the information according to the reaction or author in the library. In tables 1 and 2 (see Appendix 2) are given examples of the experimental data works lists with sorting to (over) reactions and by authors, respectively.
- The data choice and record in format of transfer between programs.

The appropriate programs were received from international nuclear data centres and were adapted for work with our library for control of data recordings in accordance with EXFOR format.

At present the experimental data library in format EXFOR for the interaction cross-section of p,d,t,α and ^{3}He with ^{1,2,3}H and ^{3,4}He isotopes involves 394 works (ENTRY) and encloses the wide range of reactions (Table 3 in Appendix 2)

Just the same for charged particle interaction reactions with lithium isotopes. The experimental data library in EXFOR format for interaction cross-sections of p,d,t,α and ^{3}He with Li isotopes contains .299. works (ENTRY). A list of the appropriate reactions is given in table 4, (see Appendix 2).

The data estimation was organized on the basis of created experimental data library. The data estimation actively proceed, and software of estimation is much changed in connection with arriving computer facilities,.

Now the estimated data library consists of 100 files /5/, total volume of 2,5 Mbytes. The list of files is indicated in tables 5,6 (see. Appendix 2).

For energy function approximation at experimental data estimation is used a cubic spline method with regard to statistical and systematic errors. It is created the program SADPOLY for the personal computer, enabling to execute the description of experimental data with the help of a spline functions set, during dialogue. Graphic representation of described data, opportunity easily to change modes of processing make convenient and clear the use of the program SADPOLY. To extrapolate cross-sections into the range of low energies where experimental data are absent, analytic approaches will be used such as R-matrix method, or extrapolation by Gamov formula. The program is constructed to modular principle. The programm modules are written in C language.

THE CONCLUSION

During project fulfilment the significant experience is obtained on interaction of various international groups of the experimenters and estimators

in business of reception estimated data on charged particles interaction with light nuclei.

During the development of real thermonuclear systems design, the questions of protection dictate necessity of isolation from created library of estimated nuclear data the specialized databases (such as, database for maintenance of accounts of secondary activity, caused by consecutive reactions and other). Therefore it is meaningful to continue work on given project with the purpose of creation on the basis of existing experimental and estimated data libraries to create specialized on various applications and fields of knowledge, libraries with expansion of nucleui - targets.

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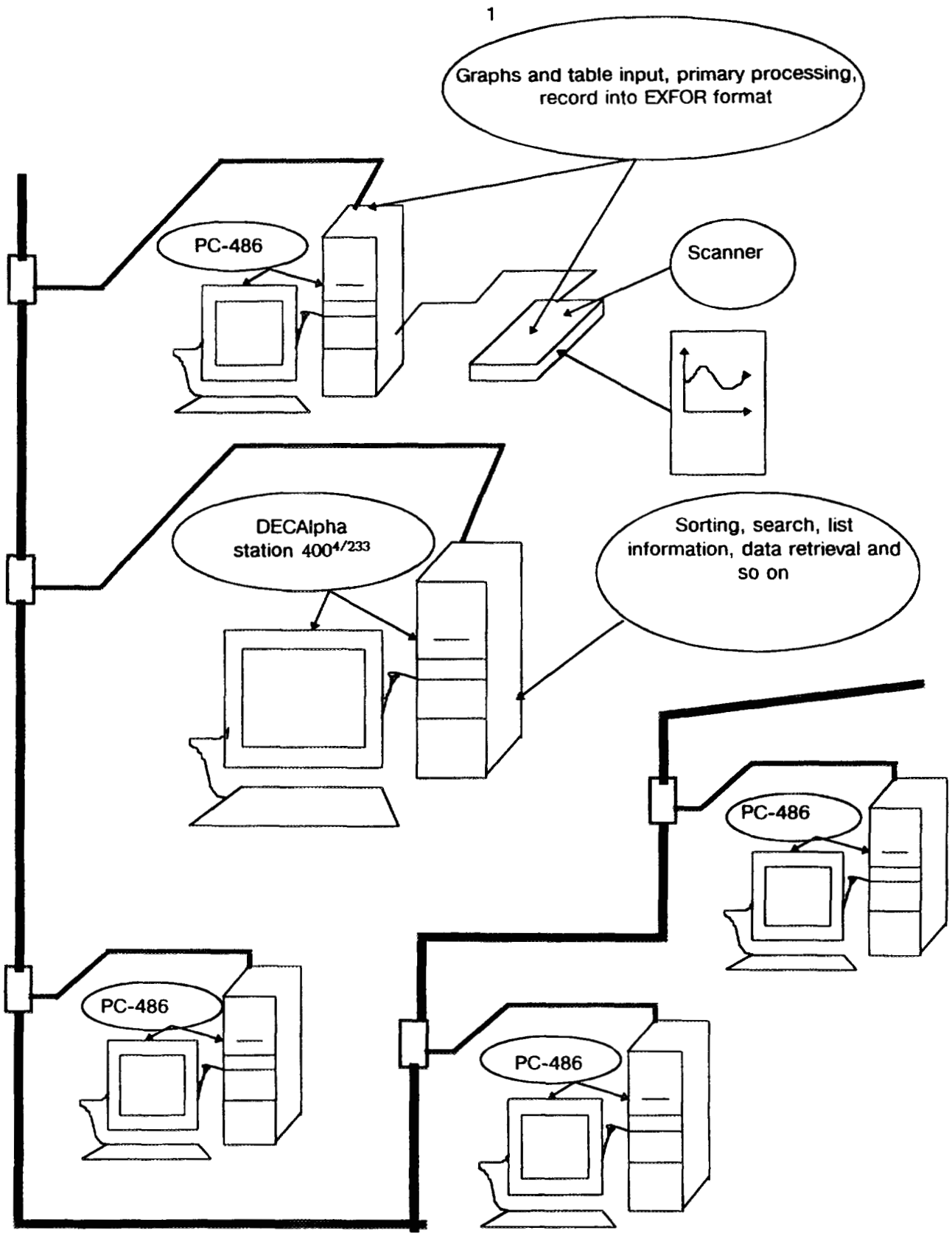


Fig.1 **SOFTWARE STRUCTURE**

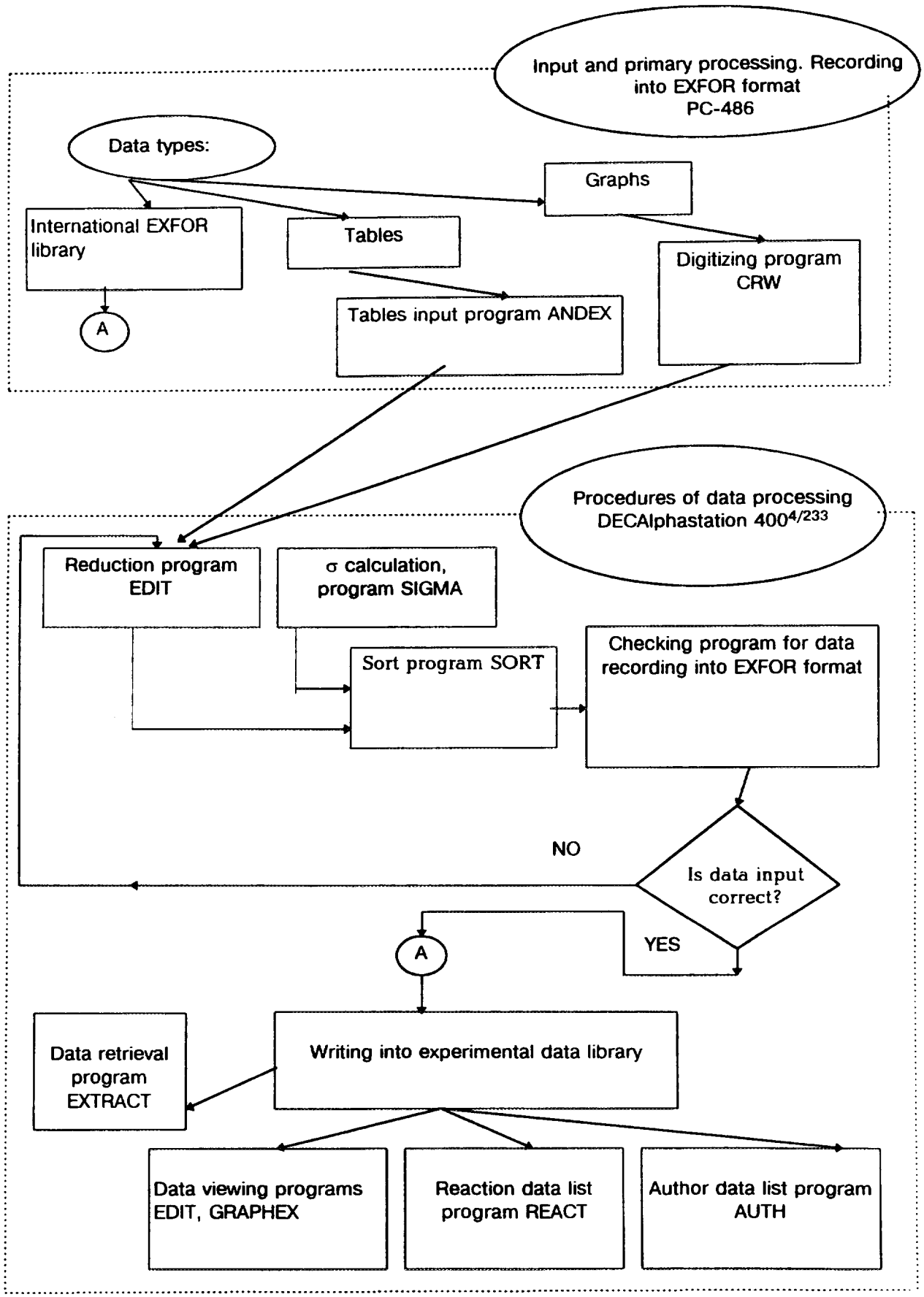


Fig 2. PROCESSING STRUCTURE

Appendix 2
Table 1

The example a reaction catalogue.

N work	Energy interval, MeV	Angle interval (adeg)	Reference	Data type
Reaction	**(1-H-1(A,P)2-HE-4**			
A1331003		10.0 – 40.0	(J,NIM/B,34,(2),145,8808)	EXP
A1331002	1.300 – 2.1	20.0 – 30.00	(J,NIM/B,34,(2),145,8808)	EXP
Reaction	**(1-H-1(D,EL)1-H-1**			
A1312002	0.8956 – 5.96	98. – 128.0	(J,UFZ,30,(11),1630,8511)	EXP
A1213002	0.799 – 1.44	98. – 128.0	(J,IZV,42,(7),1549,7807)	EXP
A1230002	0.9600 – 3.22	67.40 – 126.4	(J,PR,88,(2),253,5210)	EXP
A1231002		28.00 – 161.2	(J,PR,82,(6),777,5106)	EXP
Reaction	**(1-H-1(D,G)2-HE-3**			
A1323003	19.80 – 29.6		(J,PRL,24,(20),1120,7005)	EXP
A1296002	19.80 – 45.2		(J,PRL,26,(15),909,7104)	EXP
A1133002	18.60	0.0000E+00	(J,NP,23,(3),491,6103)	EXP
Reaction	**(1-H-1(D,N+P)1-H-1**			
A1103005	7.830 – 10.89	0.0 – 20.00	(J,PR,129,(2),733,6301)	EXP
A1241002		20.00 – 150.0	(J,JPJ,16,(11),2097,6111)	EXP
A1229002	6.50 – 95.		(J,NP/A,92,(3),561,6702)	EVAL
Reaction	**(1-H-1(P,EL)1-H-1**			
A1322002	4.21	18.65 – 47.13	(J,NIM,136,(3),525,76)	EXP
A1052002	9.690 – 13.6	13.00 – 55.00	(J,PRL,25,(1),34,7007)	EXP
A1131002	2.420 – 3.53	8.000 – 45.00	(J,PR,74,(5),553,4809)	EXP
A1245002	9.690 – 13.6	26.06 – 110.2	(J,PR/C,3,(1),10,7101)	EXP
A1238002	1.397 – 3.037	12.00 – 90.00	(J,PR,148,(3),1031,6608)	EXP
A1243002	6.141 – 9.918	6.000 – 50.00	(J,PR,174,(4),1122,6810)	EXP
A1025003	9.700 – 9.85	29.00 – 121.00	(J,PR,82,(3),433,5211)	EXP

Table 2

The example author catalogue.

AUTHOR	INS-TE	REFERENCE	N work
ABBONDANNO+	TRI	(J,NC/A,29,(2),187,7509)	A1062
AGNEW+	LAS	(J,PR,84,(4),862,5111)	A1102
AJZENBERG-SELOVE+	PEN	(J,PR/C,17,(4),1283,7804)	A1272
ALEXANDER+	CRC	(J,NP/A,427,(3),526,8410)	A1278
ALLAB+	UAG	(J,NC/A,36,(01),95,7611)	A1111
ALLAS+	GWU	(J,PR/C,9,(2),787,7402)	A1136
ALLRED+	LAS	(J,PR,76,(10),1430,4911)	A1008
ALLRED+	LAS	(J,PR,82,(3),433,5211)	A1025
ALLRED+	LAS	(J,PR,82,(6),786,5106)	A1029

Table 3

List reactions for charged particle interaction with $^{1,2,3}H$ and $^{3,4}He$.

Input channel	Output channel	Q, MeV	Numb. works	Input channel	Output channel	Q, MeV	Numb. works
$^{1}H+p$	$^{1}H+p$	0	15	$^{3}He+d$	$^{3}He+d$	0	18
$^{2}H+p$	$^{2}H+p$	0	29	$^{3}He+d$	$^{5}Li+\gamma$	16,39	4
$^{2}H+p$	$^{3}He+\gamma$	5,494	11	$^{3}He+d$	$^{4}He+p$	18,353	31
$^{2}H+d$	$^{2}H+d$	0	23	$^{3}He+d$	$^{3}He+p+n$	−2,225	5
$^{2}H+d$	$^{4}He+\gamma$	23,847	18	$^{3}He+p$	$^{3}He+p$	0	15
$^{2}H+d$	$^{3}He+n$	3,269	89	$^{3}He+t$	$^{3}He+t$	0	5
$^{2}H+d$	$t+p$	4,033	58	$^{3}He+t$	$^{4}He+d$	14,321	7
$^{2}H+d$	$d+p+n$	−2,225	8	$^{3}He+t$	$^{4}He+p+n$	12,096	2
$^{3}H+p$	$^{3}H+p$	0	17	$^{3}He+t$	$^{5}He+p$	11,21	2
$^{3}H+p$	$^{4}He+\gamma$	19,814	18	$^{3}He+\tau$	$^{6}He+\gamma$	11,489	1
$^{3}H+p$	$^{3}He+n$	−0,764	57	$^{3}He+\tau$	$^{4}He+2p$	12,860	13
$^{3}H+d$	$^{3}H+d$	0	11	$^{3}He+\tau$	$^{5}Li+p$	10,90	2
$^{3}H+d$	$^{5}He+\gamma$	16,700	9	$^{4}He+\alpha$	$^{4}He+\alpha$	0	5
$^{3}H+d$	$^{4}He+n$	17,589	55	$^{4}He+d$	$^{4}He+d$	0	29
$^{3}H+d$	$t+p+n$	−2,225	2	$^{4}He+p$	$^{4}He+p$	0	26
$^{3}H+t$	$^{3}H+t$	0	1	$^{4}He+t$	$^{4}He+t$	0	9
$^{3}H+t$	$^{4}He+2n$	11,332	13	$^{4}He+t$	$^{7}Li+\gamma$	2,468	1
$^{3}He+^{3}He$	$^{3}He+^{3}He$	0	6	$^{4}He+\tau$	$^{4}He+\tau$	0	11

Table 4

List reactions for charged particle interaction with $^{6,7}Li$

Input channel	Output channel	Q, MeV	Numb. works	Input channel	Output channel	Q, MeV	Numb. works
$^{6}Li+p$	$^{6}Li+p$	0	12	$^{7}Li+p$	$^{8}Be+\gamma$	17,254	42
$^{6}Li+p$	$^{7}Be+\gamma$	5,6064	3	$^{7}Li+p$	$^{7}Be+n$	−1,644	69
$^{6}Li+p$	$^{6}Be+n$	−5,070	4	$^{7}Li+p$	$^{5}Li+t$	−4,43	1
$^{6}Li+p$	$^{4}He+^{3}He$	4,020	58	$^{7}Li+p$	$^{4}He+\alpha$	17,346	42
$^{6}Li+d$	$^{6}Li+d$	0	7	$^{7}Li+d$	$^{7}Li+d$	0	7
$^{6}Li+d$	$^{8}Be+\gamma$	22,282	1	$^{7}Li+d$	$^{9}Be+\gamma$	16,695	5
$^{6}Li+d$	$^{7}Be+n$	3,3818	38	$^{7}Li+d$	$^{8}Be+n$	15,030	17
$^{6}Li+d$	$^{7}Li+p$	5,026	76	$^{7}Li+d$	$^{7}Be+2n$	−3,869	2
$^{6}Li+d$	$^{4}He+t+p$	2,559	7	$^{7}Li+d$	$^{8}Li+p$	−0,192	31
$^{6}Li+d$	$t+^{5}Li$	0,59	4	$^{7}Li+d$	$^{6}Li+t$	−0,993	7
$^{6}Li+d$	$^{3}He+^{5}He$	0,90	2	$^{7}Li+t$	$^{7}Li+t$	0	1
$^{6}Li+t$	$^{6}Li+t$	0	1	$^{7}Li+t$	$^{10}Be+\gamma$	17,250	4
$^{6}Li+t$	$n+^{8}Be$	16,024	2	$^{7}Li+t$	$^{9}Be+n$	10,438	9
$^{6}Li+t$	$p+^{8}Li$	0,801	4	$^{7}Li+t$	$^{6}He+\alpha$	9,839	14
$^{6}Li+t$	$2n+^{7}Be$	−2,876	2	$^{7}Li+t$	$^{9}Li+p$	−2,386	4
$^{6}Li+\tau$	$^{9}B+\gamma$	16,601	1	$^{7}Li+t$	$^{8}Li+d$	−4,225	1
$^{6}Li+\tau$	$^{8}B+n$	−1,975	4	$^{7}Li+\tau$	$^{10}B+\gamma$	17,788	2
$^{6}Li+\tau$	$^{8}Be+p$	16,786	25	$^{7}Li+\tau$	$^{9}B+n$	9,351	11
$^{6}Li+\tau$	$^{7}Be+d$	0,112	6	$^{7}Li+\tau$	$^{9}Be+p$	11,201	13
$^{6}Li+\alpha$	$^{6}Li+\alpha$	0	8	$^{7}Li+\tau$	$^{8}Be+d$	11,761	2
$^{6}Li+\alpha$	$^{10}B+\gamma$	4,460	3	$^{7}Li+\tau$	$^{7}Be+t$	−0,881	5
$^{6}Li+\alpha$	$n+^{9}B$	−3,977	3	$^{7}Li+\tau$	$^{6}Li+\alpha$	13,321	19
$^{6}Li+^{3}He$	$^{6}Li+^{3}He$	0	2	$^{7}Li+\alpha$	$^{7}Li+\alpha$	0	18
$^{7}Li+p$	$^{7}Li+p$	0	12	$^{7}Li+\alpha$	$^{10}B+n$	−2,790	19

Table 5

List of evaluated data files for charged particle interaction with $^{1,2,3}H$ and $^{3,4}He$.

Reaction	Energy, MeV	Filename	Reaction	Energy, MeV	Filename
$^{2}H(p,g)^{3}He$	.024÷22.6	h2pg.evl	$^{2}H(p,p+n)^{1}H$	3.4÷40.0	h2ppn.evl
$^{2}H(d,g)^{4}He$	.03÷18.9	h2dg.evl	$^{2}H(d,n)^{3}He$	.005÷20.0	h2dn.evl
$^{2}H(d,p)^{3}H$	.005÷14.0	h2dp.evl	$^{3}H(p,g)^{4}He$	.1÷17.8	h3pg.evl
$^{3}H(p,n)^{3}He$	1.2÷20.0	h3pn.evl	$^{3}H(d,g)^{5}He$	.04÷5.0	h3dg.evl
$^{3}H(d,n)^{4}He$	.005÷19.0	h3dn.evl	$^{3}H(t,2n)^{4}He$	.01÷4.0	h3t2n.evl
$^{3}He(d,g)^{5}Li$	.05÷16.8	he3dg.evl	$^{3}He(d,p)^{4}He$	.01÷20.0	he3dp.evl
$^{3}He(\tau,2p)^{4}He$	.04÷24.0	he32p.evl	$^{4}He(d,g)^{6}Li$	.001÷13.5	he4dg.evl
$^{4}He(t,g)^{7}Li$	.25÷6.0		$^{4}He(\tau,g)^{7}Be$	.25÷6.0	

Table 6

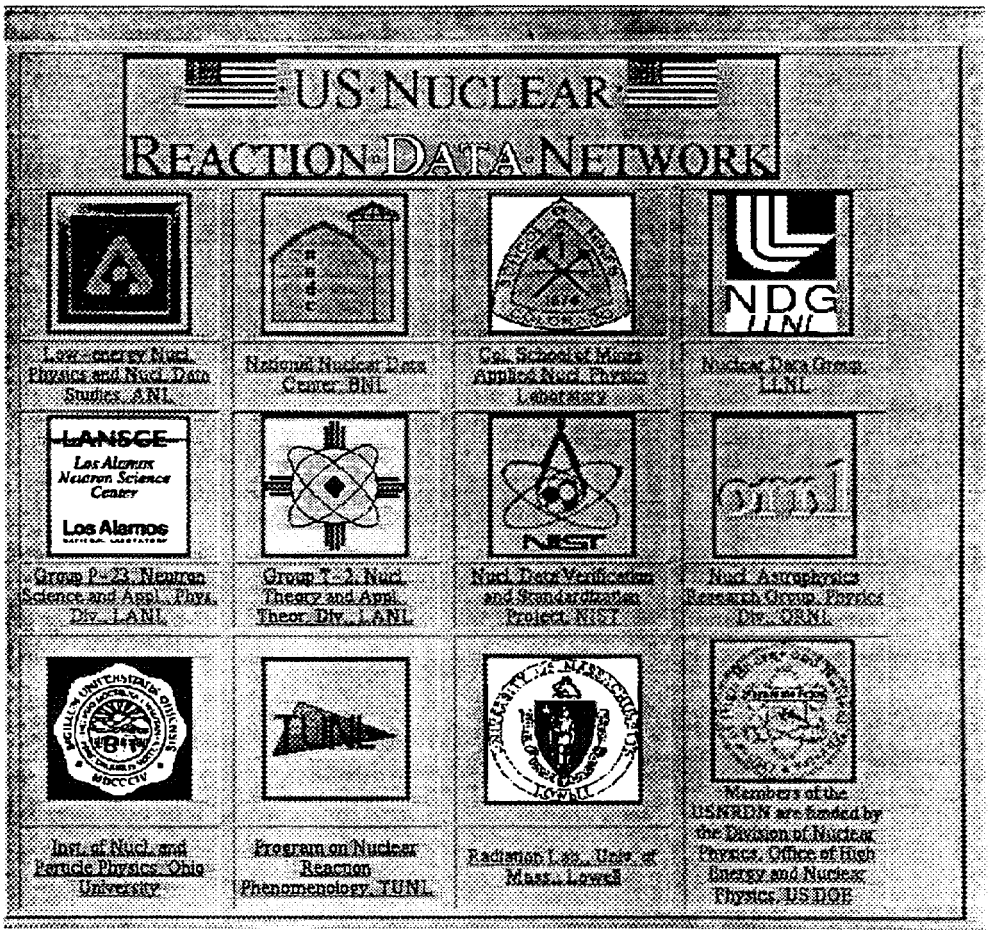
List of evaluated data files for charged particle interaction with $^{6,7}Li$

Reaction	E, MeV	Filename	Reaction	E, MeV	Filename
$^{6}Li(p,g)^{7}Be$	.16÷1.17	li6pg.evl	$^{6}Li(p,x)n$	5.7÷13.4	li6pxn.evl
$^{6}Li(p,\alpha)^{3}He$	.01÷18.5	li6pa.evl	$^{6}Li(d,n)^{7}Be$	.016÷17.0	li6dn.evl
$^{6}Li(d,p)^{7}Li$	.027÷12.0	li6dp.evl	$^{6}Li(d,t)^{5}Li$	.11÷3.9	li6dt.evl
$^{6}Li(d,\alpha)^{4}He$	.03÷14.8	li6da.evl	$^{6}Li(t,2n)^{7}Be$	4.8÷12.0	li6t2n.evl
$^{6}Li(t,d)^{7}Li$	.09÷10.0	li6td.evl	$^{6}Li(t,p)^{8}Li$	.1÷20.0	li6tp.evl
$^{6}Li(\tau,x)n$	3÷21.7	li6he3n.evl	$^{6}Li(\tau,p)^{8}Be$	.5÷10.0	li6he3p.evl
$^{6}Li(\tau,p)^{8}Be$	0.5÷10.0	li6he3p.evl	$^{6}Li(\tau,d)^{7}Be$	.4÷6.9	li6he3d.evl
$^{7}Li(p,g)^{8}Be$	.09÷18.0	li7pg.evl	$^{7}Li(p,n)^{7}Be$	1.9÷20.0	li7pn.evl
$^{7}Li(p,\alpha)^{4}He$	.02÷11.9	li7pa.evl	$^{7}Li(p,x)^{3}H$	2.0÷12.5	li7pt.evl
$^{7}Li(d,2n)^{7}Be$	5.4÷12.	li7d2n.eevl	$^{7}Li(d,x)n$	.13÷11.	li7dxn.evl
$^{7}Li(d,p)^{8}Li$	.4÷7.1	li7dp.evl	$^{7}Li(d,t)^{6}Li$	1.4÷12.	li7dt.evl
$^{7}Li(t,p)^{9}Li$	.5÷14.9	li7tp.evl	$^{7}Li(t,d)^{8}Li$	6.1÷10.2	li7td.evl
$^{7}Li(t,\alpha)^{6}He$	.06÷22.0	li7ta.evl	$^{7}Li(t,x)n$	.013÷12.1	li7txn.evl
$^{7}Li(\tau,t)^{7}Be$	1.7÷7.93	li7he3t.evl	$^{7}Li(\tau,\alpha)^{6}Li$	.8÷9.0	li7he3a.evl

U.S.NUCLEAR REACTION DATA NETWORK (USNRDN): STATUS REPORT

Mulki R.Bhat, BNL

IAEA Advisory Group Meeting on the Coordination of the Nuclear Reaction Data Centers, June 3-7 1996, Brookhaven



USNRDN MISSION

A. Provide Nuclear Reaction Data Support to Basic Research:

1. Nuclear Astrophysics
2. Radioactive Ion Beam (RIB) Studies (ATLAS, HRIBF)
3. High Energy Heavy-ion Interactions (AGS, RHIC, SPS)
4. High Energy Electron Interactions (Bates, CEBAF)
5. High-spin Physics (GAMMASPHERE, EUROGAM)

B. Stewardship of Data: Compilation, Evaluation, Data Testing, & Dissemination

PLANS TO ACCOMPLISH THIS MISSION

1. Establish Task Forces to do Specific Projects
2. Interact with the Research Community to Determine their Data Needs & Gain Their Acceptance of the Work of USNRDN
3. Open Channel of Communication to Users: Data Needs, Methods of Data Dissemination, End-User Tools
4. Establish International Cooperation & Joint Projects
5. Monitor Progress & Plan for New Directions Based on the Changing Needs of the Research/User Community

TASK FORCES

1. Astrophysics: M.S.Smith (chairman), F.E.Cecil, R.B.Firestone, G.M.Hale, V.L.McLane, D.A.Resler, R.G.Stokstad

2. Radioactive Ion Beams: M.B.Chadwick (chairman), C.N.Davids, T.A.Gabriel, J.D.Garrett, S.M.Grimes, C.K.Walker, P.G.Young

3. WWW Homepage: M.R.Bhat(chairman), T.W.Burrows, R.MacFarlane, D.A.Resler

INTERACTION WITH THE RESEARCH COMMUNITY

1. Nuclear Astrophysics Data Organizing/Steering Committee

2. North American Steering Committee for the Isospin Laboratory

3. AGS/RHIC Users Group

4. Bates, CEBAF Users Groups

5. Participation in Joint Projects with the Research Community

CHANNEL OF COMMUNICATION TO USERS

WWW Homepage: http://www.dne.bnl.gov/~burrows/usnrdn

1. Mission
2. Products & Services; How to Access Them
3. Work in Progress
4. Other Nuclear Data; Other Nuclear Data Networks
5. Meetings/Summaries: Network & Task Forces
6. Members
7. Network Organization /Contacts

INTERNATIONAL COOPERATION & JOINT PROJECTS

1. European Union Compilation of Nuclear Reaction Data for Astrophysics

2. Encourage Participation of non-U.S. Basic Research Community in Nuclear Data Activities

3. Invite Participation in Compilation of High Energy Heavy-Ion Interaction Data

4. Participate in Nuclear Model Code Development and Their Extension to Higher Energies; Nuclear Level Density, Input Parameter Studies; and Related Work

ASTROPHYSICS TASK FORCE WORK IN PROGRESS

1. Data Measurements (ANL,CSM,ORNL)

2. Compilation of CP Experimental Data into CSISRS (BNL)

3. Modeling: d+9Be, 10B, 11B for Big Bang Be, B production (CSM)
   12C(α,γ)16O, R-Matrix Analysis (LANL)

4. Evaluations: Proposed collaboration ANL, Notre Dame, Chicago
   134,136Ba,142,144Nd(n,γ) (ORNL)

5. Calculations: s-Process Heavy Element Nucleosynthesis
   Heavy Element Nucleosynthesis (ORNL)

6.Dissemination: USNRDN Homepage, Task Force Summary (BNL)
   Nuclear AP Data Webpage (LANL)
   Astro Data Webpage (LBNL,INPA)
   A=3-20 Data (TUNL), LLNL,ORNL

RIB TASK FORCE WORK IN PROGRESS

1. Modeling: Benchmarking of Modeling Codes for p Reaction Yields

2. Model Calculations: Yields of Proton-rich Products from (p,xn) on
   64Zn, 70Ge; 58Ni is Done
   Yield Distributions of Fission Fragments
   in p & n Reactions on 238U for Producing
   Neutron-rich Nuclei
   Induced Radioactivity on 238U Targets

3. Basic Physics: Studies on the Impact of Large Isospin on
   Level Densities, Optical Potentials, &
   Preequilibrium Reactions

4. Dissemination: USNRDN Homepage, Task Force Summary (BNL)
   RIB Data Webpage (LANL)

HIGH ENERGY HEAVY-ION DATA COMPILATION WORK IN PROGRESS

1. Compilation of AGS Data Begun as a Demonstration Project
2. Online Access, Plots are Possible
3. WWW Homepage (under development)
4. Approval of Project by 1995 AGS/RHIC Users Group
5. Meeting with Experimenters at 1996 AGS/RHIC Users Group
6. Future Plans: Implement WWW Access, Code More Data

HIGH ENERGY ELECTRON INTERACTION DATA COMPILATION

1. Presentation to Bates, CEBAF Users Groups
2. Bates is Planning on Data Compilation
3. CEBAF Management has Shown Interest
4. Fall Visit to CEBAF Planned

FUTURE PLANS FOR USNRDN

1. Develop & Maintain Closer Working Relationship with the Structure Network (USNDN)

2. Use Network Expertise to Contribute to Astrophysics, Radioactive Ion Beam Databases

3. Use Developments in Technology for a More Efficient Information Distribution System

4. Plan for Changing User Needs in Basic Research

5. Keep Publicizing USNRDN Activities

AN ASSESSMENT OF USNRDN

1. Coordination Mechanism Is In Place

2. Substantive Goals Remain To Be Achieved

3. Acceptance of USNRDN Projects/Products by the Basic Research Community Is Essential

4. Outreach To Users Is A Continuing Project

List of Working Papers

Scientific Papers distributed at the meeting

I.N. Boboshin, V.V. Varlamov, The new ENSDF search system NESSY: IBM/PC nuclear spectroscopy database, Nucl. Instrum. Meth. Phys. Res. A369 (1996) 113-119

V.N. Manokhin, Some criteria for selection of evaluated threshold reaction excitation functions

Maintenance of EXFOR/CINDA dictionaries (Agenda T.1)
==========

1. In Dict.27 (and also 43 and 50), the codes in columns 1 - 11
   are not left adjusted.
   Compare however Manual p.7.2.

2. Particle designators in Dictionary 36: see below.

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Telephone: (516)282-2902
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Memo CP-C/211

DATE: September 28, 1995
TO: Distribution
FROM: V.McLane
SUBJECT: Particle designator codes in Dictionary 36.

This is a followup to Memo CP-C/201 to finalize the proposal for removing explicit particle codes from Dictionary 36, as per action item 6 from 1995 NRDC Meeting.

We propose that all explicit particle codes be removed from Dictionary 36. The following particle designator inclusion codes would be added in their place.

Code	Allowed particles
-	All codes from Dictionary 33 and those from dictionary 27 which have a "3" or a "Z" in column 15.
*	Fission fragment codes only, *i.e.*, FF, LF, HF.

If no particle designator inclusion code is given in the quantity string, a particle designator field is not allowed.

In order to keep the size of the dictionary to a minimum, specific particles are not included in the REACTION SF7 (particle designator). Instead, this field contains a code indicating that a particle designator (or designators) is legal for this quantity.

Code	Allowed particles
-	All codes from Dictionary 33, and nuclides from Dictionary 27 which have a "3" or a "Z" in column 15.
*	Fission fragment paricle codes only, *i.e.*, FF, LF, HF.

If no particle designator inclusion code is given in the quantity string, a particle designator field is not allowed.

If more than one particle designator must be given (*e.g.*, for correlations), the codes are given for each particle, separated by slashes.

Examples:
```
PAR,TTY,-
TER,COR,*/*
```

Distribution:
M. Chiba, Sapporo
F. E. Chukreev, CaJaD
K. Kato, JCPDG
H. D. Lemmel, NDS
V. N. Manokhin, CJD
NNDC (3)
F. T. Tárkányi, Debrecen
N. Tubbs, NEADB
Y. Tendow, RIKEN
V. Varlamov, CDFE
Zhang Zingshang, CNDC

From a discussion by e-mail:

NDS (Schwerer):

- Basic problem: the expansions in dictionary 36 were intended to be used (and were used extensively in our old IBM system) for edited pretty listings of Exfor retrievals, where the particle considered should also be expanded. I would not like the expansion to be something like "double-differential cross section with respect to the particles given in SF7". The user does not know what SF7 is.

- Probably not all particle / nuclide codes make sense in combination with all SF6 codes. If this is true, some checking accuracy would be lost.

- Probably some quantities always need a code in SF7 (e.g. the SF5-SF6 combinations PR,DE and TER,DE), while others may or may not have a code in SF7. Some double-differential quantities might occur with zero, one or two particles considered. How will such cases be distinguished? I find it useful that all meaningful combinations that actually occur in EXFOR are listed in the dictionary.

- On the other hand we appreciate that requesting explicitly a dictionary update whenever a new particle occurs in SF7 is a burden. Therefore we volunteered at an earlier meeting to automatically update dictionary 36 every time we find a new combination. To guarantee proper processing of a new TRANS tape, it would however still be necessary to update dict.36 beforehand - I admit this is a disadvantage, which however occurs with other new quantity combinations as well.

NNDC (McLane):

The proposal suggests using different codes for different classes of particles. If only one or two particles would go with a quantity, we can leave only those codes. An editing program can pick up the particle from the particle dictionary if we wish. As for wording in dictionary, I have used " for particle specified" in the EXFOR Basics, not mentioning the subfield. The editied version read as follows....

"..... for particle specified. Particle specified: proton"

So far, I suggested the code '*' for any particle; the '-' for fission product; a better code might be '*FP' for fission product. Perhaps, we could identify which products fit which classes in the particle dictionary, e.g., *FP might include FF, LF, HF, LCP.

We might also want other codes if we see other restrictions on which particles may be used.

I'll look over and send you an editied dictionary.

Vicki

Media for data exchange between Centres

Please indicate which centre 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)
I = e-mail (Internet)
F = FTP (Internet File Transfer)
T = conventional magnetic tape
D5 = PC diskette 5½ inch
D3 = PC diskette 3½ inch
H = hardcopy or fax

	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**	**F,D3**	**D3,I,D5**	**H,I,B,T,D3**	**F,I**	-
EXFOR TRANS	**I,F,D5,D3**	**I,F,D3,D5**	T,F,D3,D5	D3,D5	**D3,D5**	**F,D3**	**D3,I,T,D5**	**F,D3**	**F**	D3,D5,(T), F
CP-Memos and 4C-Memos	**I,F,D5,D3**	**H,I**	H,B,I	H,I	I,(H)	I,F	H,D5,I,D3	H,I,B	I,H	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.

DISTRIBUTION OF TRANS TAPES

The distribution pattern of EXFOR TRANS tapes is the following:

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

- All centres 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:	all data types
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

Working Paper 7 (Summary)

Copies of the respective CP memos are available on request from the IAEA Nuclear Data Section.

Pending EXFOR matters (Agenda T.5)

1.	Dict.36 codes (transmitted on TRANS 9071) ,DA,,COS/RSD PAR,DA,,SN2	CP-D/270 and CP-C/215
2.	Dict.36 code (transmitted on TRANS 9071) ,DA,,RS0	CP-D/267
3.	Dict.36 codes SEQ,DA and SEQ,DA/DE POL/DA/DE and POL/DA/DE,,ANA IND,SIG,G and IND/UND,SIG,G	CP-A/74 and CP-D/262 p.2
4.	Dict.36 and 34 ,DA,,PAI or similar	CP-D/263
5.	Col.42-44 flags in SUBENT record of CPND entries compulsory?	Manual p. 3.5
6.	Change Dict.7 code FAST N.PH. ? (only code with embedded blank)	Msg. Chukreev 96-03-11
7.	Expansion of permitted character set	CP-C/210
8.	Remove heading "For Photonuclear Data only" from ALL (?) dictionaries where it occurs (Actions 31/32 of last meeting)	Dict. listing extract
9.	Dict.27 4-BE-6	CP-C/216
10.	Dicts.34 and 36: New Polarization quantities	CP-C/217, 218 See also Action 15 of 1995 meeting
11.	Dict.29 and 33 HE2	CP-C/214 Msg. Chukreev 96-05-29
12.	Redundant coding (REACTION SFS,7)	
13.	"One new kind of data in medium energy EXFOR"	next page

(WP7, item 13)

One new kind of data in medium energy EXFOR.

MEMO CP-D/261 (Comments on TRANS O003) contains very important remark for ENTRY O0147 and some another. This ENTRY regarding to angular distribution of reaction products, when residual nucleus has certain final state. The peculiarity of this ENTRY is data representation. Y axle is MB/SR, but X-axle is linear momentum of residual product. Unambiguous connection between linear momentum of residual nucleus and angle of outgoing light particle is present of course. Measurement units for transferred linear moment is "reverse fermi".

To compile similar angular distribution we used MOM-SEC as independent variable and calculated it as MEV/C from authors "reverse fermi". We would like to avoid new measurement unit.

Therefore we propose to include in LEXFOR ***Secondary-Particle Angle*** additional data-heading keyword "TRMOM" (transferred linear momentum) with MEV/C (or GEV/C) as measurement unit.

This section of LEXFOR may be added by formulae for the transition from TRMOM to ANG and ANG-CM data-headings. This new data-heading keyword must be include in Dictionary 24 also.

Transferred linear momentum is equal in laboratory and center of mass systems.

If our proposal will be assumed we are ready to write new version of ***Secondary-Particle Angle*** section of LEXFOR.

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Memo CP-C/213

DATE: March 6, 1996
TO: Distribution
FROM: V.McLane
SUBJECT: Dates for the year 2000

It is probably not too soon to start thinking about how we will handle dates beginning in the year 2000. As dates are stored in present in EXFOR and in CINDA using only the last two digits, dates in the year 2000 will sort before dates in the years to 1999. If we are still using the system in the 2035, the dates will begin to overlap.

I suggest we begin discussions on this at the NRDC meeting in June.

cc. Arcilla
Lammer
Lemmel
Occhiuzzi
Pashchenko
Schwerer
Wienke

Distribution:
M. Chiba, Sapporo
F. E. Chukreev, CaJaD
K. Kato, JCPDG
H. D. Lemmel, NDS
V. N. Manokhin, CJD
NNDC (3)
F. T. Tárkányi, Debrecen
N. Tubbs, NEADB
Y. Tendow, RIKEN
V. Varlamov, CDFE
Zhang Zingshang, CNDC

EXFOR and CINDA exchange since the 1995 NRDC meeting

1. List of TRANS tapes exchanged since the 1995 NRDC meeting

NEUTRON DATA

Center	TRANS	Dated
NNDC	1259	95-12-08
	1260	96-03-19
	1261	96-05-13
NEA-DB	2134	95-04-20
	2135	95-12-13
NDS+CNDC	3096	95-07-11
	3097	95-09-26
	3098	96-02-21
	3099	96-05-29
CJD	4098	95-04-25
	4099	95-11-23
	4100	96-02-16
NDS	(V025	92-07-29)

CPND

CAJaD	A031	95-04-25
	A032	95-12-29
	A033	96-02-21
KaChaPaG	(B011	1981; B012 through B015 waiting for final processing/1/)
NNDC	C014	96-03-01
	C015	96-03-01
	C016	96-04-22
NDS+ATOMKI	D019	96-04-15
JCPRG	E014	95-04-28
	E015	95-04-28
NEA-DB(CAJaD)	O001	95-01-11 (processed Jan.1996)
	O002	95-11-08
	O003	95-11-08
RIKEN	(R009	94-04-20)
CNDC	S009	95-11-17

Photonuclear Data

NDC	(G007	92-02-14)
NNDC+CDFE	L005	95-04-18
CDFE	(M018	94-03-22)

Note:
/1/ TRANS B012 through B015 containing corrections done by CAJaD were received and checked by NDS but not yet distributed to other centres because of differences in the area B master files kept at CAJaD and NDS.

2. INCOMING CINDA BATCHES; RECEIVED AND PROCESSED

	batch	dated	records	stored	reader
Area 1	BNL142	95-04-17	208	95-05-17	
	BNL143	95-06-22	348	95-07-13	
	BNL144	95-12-12	385	96-05-02	
	BNL145	95-12-12	121		
	total area 1:		1035		
Area 2:	NEA035	95-04-18	116	95-05-17	
	NEA036	95-04-19	141	95-05-17	
	NEA037	95-04-19	79	95-05-17	
	NEA038	95-04-19	343	95-05-17	
	NEA039	95-05-30	35	95-07-13	
	NEA040	95-06-06	102	95-07-13	
	NEA041	95-12-15	69	96-05-15	
	total area 2:		885		
Area 3:	NDS011		350	95-05-17	547
	NDS012		743	95-07-13	126
	NDS013		146	96-05-15	771
	total area 3:		1239		
Area 4:	CJD011	95-06-26	250	95-07-13	
	CJD012	95-06-15	89	95-07-13	
	CJD013	95-06-27	203	95-07-13	
	CJD014	95-10-09	319	96-04-30	
	CJD015	95-12-05	929	96-04-30	
	CJD016	96-01-30	932	96-04-30	
	CJD017	96-04-03	1233		
	total area 4:		3955		

SUMMARY ON PENDING RETRANSMISSIONS

O.Schwerer, 1996-05-16

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 update those 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.

Since the last NRDC meeting only very few retransmissions were made. Therefore we do not reproduce the list of pending entries to be retransmitted here but give only a summary of the status for all centres concerned. The detailed list of accession numbers given in INDC(NDS)-343, pages 111 - 116 is mostly still valid.

Areas 1 and 3: 1995 status still valid

Area 2: see 1995 status, plus additional entries as given in memos 4C-3/377 and 4C-3/378.

Area 4: some retransmissions were made (in particular following memo 4C-3/373 which was not included in the 1995 summary), but most of the 1995 status is still valid.

Area A: see 1995 status, plus additional entries as given in memos CP-D/259 and CP-D/266 (except entry A0532).

Area E: All entries from the 1995 status can be deleted because
- the entries listed for retransmission from TRANS E010 and E011 are withdrawn (ref.: message by Dr.Chiba of 25 April 1996).
- the entries from TRANS E012 and E013 were retransmitted on TRANS E014.

Area M: 1995 status still valid.

Summary of some typical mistakes in recent TRANS tapes
==========

O.Schwerer, 1996-05-17

- Incorrect use of isomer extensions, e.g. -M+G or -T
  -M+G, representing the integral cross section, should not be used:
  for the integral cross section no isomer extension should be used

- Isomeric ratios and (partial) isomeric sums must be coded as
  implicit ratios or sums, e.g. -M/G or -M2/T or -M1+M2,
  but not as explicit ratios (sums) of 2 REACTIONs.

- Incident particle energy missing or specified twice

- Incorrect use of heading MISC (may be used only as "additional information"
  but not as an idependent variable or in place of DATA)

- SPA (Spectrum Average) in REACTION SF8: missing, or used in place of AV

- Retransmissions: missing alter flags in col.80
  Although missing alter flags are not reflected in the master file
  and therefore are not important for the end-user, it is important
  for the data centers to see in detail what changes were made.

- Redundant codes in REACTION SF5 and SF7: make retrievals more difficult.
  SF5: e.g. IND when no CUM branch exists
  SF7: a "particle considered" is coded when there is no ambiguity
  without it.

- PAR missing in REACTION SF5 for partial cross sections
  When a secondary energy is given, either PAR in SF5 or DE in SF6
  must be coded.

Examples of Citation Guidelines

1. General Guidelines

Index to the IAEA-NDS-Documentation Series

Citation guidelines:

When quoting a computer-based data library in a publication it is recommended

- to give first the print reference in which the author(s) desribe(s) the generation of the data,
- to give thereafter the database reference which contains the numerical data, including the version of the database,
- and then to mention the data center or the online service from which the data were received.

2. Specific Guidelines

see following pages.

ENDF/B-6

The U.S. Evaluated Nuclear Data Library for Neutron Reaction Data

by the US National Nuclear Data Center
- 1990 including revisions up to May 1995 -

Citation guideline:

a) *citing the evaluation of one material*

Author(s), "Neutron reaction data evaluation of ...", report ... (place, year) [or, if no report is available: Undocumented]. Data file ENDF/B-VI MAT 1234 Rev. 2 (date) by the U.S. National Nuclear Data Center on behalf of the Cross-Section Evaluation Working Group. Data received on tape (or retrieved online) from the IAEA Nuclear Data Section.

b) *citing the entire library*

P.F. Rose (ed.), "ENDF/B-VI Summary Documentation", report BNL-NCS-17541 (ENDF-201), (Brookhaven National Laboratory 1991). Data Library ENDF/B-VI, update 1995, by the U.S. National Nuclear Data Center ... etc. as above.

c) *citing the format*

P.F. Rose, C.L. Dunford (ed.), "Data formats and procedures for the Evaluated Nuclear Data File ENDF-6", report BNL-NCS-44945 (ENDF-102) Rev. 10/91 (Brookhaven National Laboratory 1991).

ENDF/B-6 FPY

The ENDF/B-6 fission-product yield sublibraries

by T.R. England and B.F. Rider

released by the U.S. National Nuclear Data Center
in 1991, including revisions upto May 1995

Citation Guideline:

The data library should be cited as follows:

T.R. England, B.F. Rider, "Evaluation and compilation of fission product yields", report LA-UR-94-3106, (Los Alamos National Laboratory, 1994). ENDF/B-6 fission product yield sublibraries, released 1991, updated 1995, by the U.S. National Nuclear Data Center. Data received on tape from the IAEA Nuclear Data Section.

ENSDF

The Evaluated Nuclear Structure Data File

maintaned by the U.S. National Nuclear Data Center on behalf of the International Nuclear Structure and Decay Data Network, sponsored by the International Atomic Energy Agency

Citation guideline:

The ENSDF database or data retrieved from it should be cited as follows:

> M.R. Bhat, "Evaluated Nuclear Structure Data File (ENSDF)", Int. Conf. on Nuclear Data for Science and Technology, Jülich 1991, Proceedings p. 817. ENSDF data retrieved on .... (date!) from the Online Service of .... (US National Nuclear Data Center or IAEA Nuclear Data Section).

JEF-2.2

The Evaluated Neutron Nuclear Data Library of the NEA Data Bank

Citation guideline:

a) Citing the evaluation of one material

> Author(s), "Neutron reaction data evaluation of (nuclide)", report ... (as quoted in the file) [or if no printed reference is known: Undocumented]. Data file JEF-2 MT 1234 Rev. 2 (date) by the Nuclear Energy Agency Data Bank. Data received on tape (or retrieved online) from the IAEA Nuclear Data Section (date).

b) Citing the entire library

> Nuclear Energy Agency Data Bank, JEF-2, Joint Evaluated File version 2 (1992). See C. Nordborg, M. Salvatores, "Status of the JEF Evaluated Data Library", International Conference on Nuclear Data for Science and Technology, Gatlinburg, USA, 9-13 May 1994, Proc. American Nuclear Society (1994) p. 680. Data received on tape (or retrieved online) from the IAEA Nuclear Data Section (date).

c) Citing the format

> P.F. Rose, C.L. Dunford (ed.), "Data formats and procedures for the Evaluated Nuclear Data File ENDF-6", report BNL-NCS-44945 (ENDF-102) Rev. 10/91 (Brookhaven National Laboratory 1991).

CENDL-2 update 95

The Chinese Evaluated Nuclear Data Library
for Neutron Reaction Data

by the Chinese Nuclear Data Center

1991/1995

Citation guideline:

The present data library should be cited as follows:

> Chinese Nuclear Data Centre, "A brief description of the second version of the Chinese Evaluated Nuclear Data Library CENDL-2", Communication of Nuclear Data Progress No. 6 [same as report INDC(CPR)-25] Beijing, China, 1991. Data library CENDL-2.1, including 1995 updates, received on tape [or retrieved online] from the IAEA Nuclear Data Section (date). Summary documentation by Liang Qichang, H.D. Lemmel (ed.), report IAEA-NDS-61 Rev. 3, 1996.

ADL-3

Neutron activation data library

by O.T. Grudzevich, A.V. Zelenetskij,
A.V. Ignatyuk, A.B. Pashchenko

Citation guideline:

This data library should be cited as follows:

> O.T. Grudzevich, A.V. Zeleneckij, A.V. Ignatjuk, A.B. Pashchenko, "ADL-3: Nuclear data library for activation and transmutation calculations", Atomnaja Energija vol. 76 (1994) p. 127-130; English translation report INDC(CCP)-386 (International Atomic Energy Agency, 1995). Data library ADL-3 received [on tape, or: online, date] from the IAEA Nuclear Data Section.

Similar for MENDL-2
WIND

ATOMIC MASSES 1995

The 1995 atomic mass evaluation
by G. Audi and A.H. Wapstra

Citation guideline:

This database should be quoted in publications as follows:

> G. Audi, A.H. Wapstra, "The 1995 update to the atomic mass evaluation", Nucl. Phys. A595 (Dec. 1995) p.409-480. Data file of Recommended Masses (mass_rmd.mas95) retrieved by ftp (or received on tape) from ..... (date). [or correspondingly]

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For users with web-browsers: http://www-nds.iaea.or.at