INTERNATIONAL ATOMIC ENERGY AGENCY

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I N D C INTERNATIONAL NUCLEAR DATA COMMITTEE

Report on the IAEA Advisory Group Meeting on

Network of Nuclear Reaction Data Centres

Institute of Physics and Power Engineering
249020, Obninsk, Kaluga reg., Russia

15 – 19 May 2000

Prepared by
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Vienna, Austria

August 2000

IAEA NUCLEAR DATA SECTION, WAGRAMER STRASSE 5, A-1400 VIENNA

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Abstract

This report summarizes the IAEA Advisory Group Meeting (AGM) on Network of Nuclear Reaction Data Centres, hold at the Institute of Physics and Power Engineering, Obninsk, Russia, 15 to 19 May 2000. The meeting was attended by 28 participants from 13 co-operating data centres from seven Member States and two International Organizations. The report contains a meeting summary, the conclusions and actions, progress and status reports of the participating data centres and working papers considered at the meeting.

CONTENTS

THE NETWORK OF NUCLEAR REACTION DATA CENTRES

National, regional and specialized nuclear reaction data centres, 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 centres network is given below.

The nuclear reaction data centres:

NNDC	-	US National Nuclear Data Center, Brookhaven, USA
NEA-DB	-	OECD/NEA Nuclear Data Bank, Issy-les-Moulineaux, France
NDS	-	IAEA Nuclear Data Section
CJD	-	Centr Jadernykh Dannykh (= Nuclear Data Centre), Obninsk, Russia
CAJaD	-	Russian Nuclear Structure and Reaction Data Centre, Moscow, Russia
CDFE	-	Centr Dannykh Fotojadernykh Eksperimentov (= Centre for Photonuclear Experiments Data), Moscow, Russia
CNDC	-	China Nuclear Data Center, Beijing, China
JAERI	-	Nuclear Data Center of the Japan Atomic Energy Research Institute, Tokai-Mura, Japan
JCPRG	-	Japan Charged-Particle Nuclear Reaction Data Group, Hokkaido University, Sapporo, Japan
ATOMKI	-	ATOMKI Charged-Particle Nuclear Reaction Data Group, Debrecen, Hungary
UKRNDC	-	Ukrainian Nuclear Data Center, Institute for Nuclear Research, Kyiv, Ukraine
CNPD	-	Center of Nuclear Physics Data, Russian Federal Nuclear Center, RFNC-VNIIEF, Sarov, Russia
KAERI/NDEL	-	Nuclear Data Evaluation Laboratory, Korea Atomic Energy Research Institute, Yusong, Taejon, Republic of Korea
(KACHAPAG)	-	Karlsruhe Charged Particle Group, Karlsruhe, Germany. (Discontinued in 1982, its responsibilities were taken over by CAJaD)
(RIKEN)	-	Nuclear Data Group, RIKEN Institute of Physical and Chemical Research, Wako-Shi, Japan. (Discontinued in 2000)

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, CJD

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

1.c Data Handbooks based on EXFOR
published by NNDC (last issue in 1988)

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

BROND-2 (Russia)	FENDL-2 (IAEA)
CENDL-2 (China)	IRDF-90, Rev. 92(IAEA)
ENDF/B-6 (USA)	JEF-2 (NEA)
	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, 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, NDS and CDFE

3.b Evaluated data:
Online service by NDS, CDFE

3.c Bibiliography published by CDFE and JAERI

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

PAST NRDC MEETINGS

Obninsk, 15-19 May 2000	Centre Heads + Tech. = 15th NRDC Meeting	INDC(NDS)-418
Vienna, 18-20 May 1999	Technical	INDC(NDS)-407
Vienna, 11-15 May 1998	Centre Heads + Tech. = 14th NRDC Meeting	INDC(NDS)-383
Vienna, 26-28 May 1997	Technical	INDC(NDS)-374
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	Centre 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
CNPD	Center of Nuclear Physics Data at RFNC-VNIIEF, Sarov, Russia
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
KAERI	Korea Atomic Energy Research Institute
KINR	Kiev Institute of Nuclear Research
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
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
UKRNDC	Ukrain Nuclear Data Center at KINR, Kyiv, Ukraine
USDOE	U.S. Department of Energy
VNIIEF	Russian Federal Nuclear Center, Sarov, Russia
4C...	Numbering code of memos exchanged among the four Neutron Data Centers

IAEA ADVISORY GROUP MEETING
ON NETWORK OF NUCLEAR REACTION DATA CENTRES
15 - 19 May 2000
Institute of Physics and Power Engineering
Obninsk, Kaluga reg., Russia

AGENDA

P - session with general issues
T - session with technical issues
H - session with organizational issues
L - session with host centres presentations

P.1. Opening, election of chairman

P.2. Adoption of the Agenda

P.3. Brief status reports of the centres

P.4. Brief reports on centre programmes, priorities and new tasks

P.5. Review of the General Actions of the last technical NRDC Meeting ***(WP2000-1)***

P.6. Customer services
- Conventional mail service
- Offline distribution on diskettes and CD-ROMs
- Telnet, FTP and Web access to the databases, data files, computer codes and reports
- Network performance
- Electronic publications of reports
- Retrieval statistics

P.7. CINDA
- CINDA-2001
- CD-ROM CINDA
- Distribution of CD CINDA and future of CINDA distribution/book publication; CINDA 2000 book: publication schedule ***(WP2000-12 and WP2000-13)***
- CINDA retrievals from Web

L.1. Activity on the nuclear cross section evaluation at the CJD

T.1. EXFOR/CINDA technical matter

T.1.1. CINDA
- Review of Actions A6 – A10 ***(WP2000-1)***
- Cinda quantity codes – EXFOR reaction codes ***(WP2000-11)***

T.1.2. Dictionary system

- Review of Actions A11 – A18 ***(WP2000-1)***
- Transformation of Dictionary 27 ***(MEMO CP-A/101, WP2000-14)***

T.1.3. EXFOR, general
- Feedback on new EXFOR Manual , including LEXFOR and EXFOR Basic
- Review of Actions A19 – A27 ***(WP2000-1)***
- TRANS files exchanged ***(WP2000-2)***

T.1.4. EXFOR coding rules and dictionary changes
- Review of Actions A28 – A43 ***(WP2000-1)***
- Pending proposals ***(WP2000-3 – WP2000-10)***

P.8. Compilation of neutron, charged particle and photonuclear data
- Conversion of Ion Beam Analysis data from R33 format in EXFOR format
- INTAS proposal by for data compilation
- Conversion of EXFOR 6,7, 8-series entries in 2 - 4 series

P.9. Future of nuclear databases
- Platform independent database solutions
- Workshop on Relational Databases for Nuclear Data, September 11-15, 2000, Brookhaven

P.10. Co-operation and co-ordination in the database program development work
- Development of new databases and libraries
- Development of new solutions and retrieval programs for “old” databases
- Presentation and demonstration of new program products and their full scale models
- Address lists, their updating and exchange between centres, user’s profiles and electronic distribution of documents

P.11. Session for demonstration of new nuclear data software products

P.12. General EXFOR matters
- Statistics and manpower in the EXFOR compilation
- Links to the databases from journal publications

H.1. Common issues of the data centres
- General situation and manpower
- Data compilation and backlog
- New releases of the evaluated data libraries
- Main tasks and participants of next NRDC meetings

P.13. Approval of Meeting’s Actions, Conclusions and Recommendations

P.14. Next Technical NRDC and full NRDC AGM Meetings

INTERNATIONAL ATOMIC ENERGY AGENCY

334-F4-AG-823.4 **15 May 2000**

IAEA Advisory Group Meeting
on the
"Network of Nuclear Reaction Data Centres"

Institute of Physics and Power Engineering
249 020 Obninsk, Russia

15 to 19 May 2000

Scientific Secretary: Vladimir G. PRONYAEV

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MEETING SUMMARY

Introduction

The IAEA Advisory Group Meeting (AGM) on Network of Nuclear Reaction Data Centres (NRDC) was held at the Institute of Physics and Power Engineering, Obninsk, Russia, from 15 to 19 May 2000. Twenty-eight participants of thirteen co-operating data centres from China, Hungary, Japan, the Republic of Korea, Russia, Ukraine, USA, NEA and IAEA attended the meeting. Holding the AGM in Obninsk gave possibility of wide participation in discussions and software demonstration sessions to physicists and programmers from five nuclear data centres of Russia and the Ukraine.

The meeting was one in a series of biennial NRDC coordinating meetings with the main tasks to consider the results of the data centers cooperation in maintaining, updating and providing full-scale and user-friendly access to the common nuclear databases, to outline the priorities of future work taking into account the interest of each center and to consider the technical matters of data compilation, exchange and dissemination. The main results of the discussions are summarized in the list of conclusions and actions.

Brief Minutes

The meeting was opened by V. Pronyaev, Scientific Secretary of the AGM. A.V. Gulevich, Deputy Director on Fundamental Researches of the hosting Institute of Physics and Power Engineering (IPPE), welcomed the participants. He introduced the main directions and results of the scientific work in the IPPE and stressed the role of nuclear data for fundamental research.

P. Oblozinsky was elected as the meeting chairman.

The Agenda was discussed and adopted with minor changes (see p. 13).

Status reports of the centers were presented (see pp. 33 to 93).

New priorities and tasks were discussed. They include a study of possibility of creation of new platform independent solutions for common nuclear databases with Web access, development of more integrated tools for search and retrieval of bibliographic, experimental and evaluated data with their interactive graphical visualization, and creation of CD-ROM versions of nuclear databases with same functionality as their Web versions.

General actions from 1999 NRDC meeting were reviewed (see report INDC(NDS)-407, pp.21-28). The NEA-DB report on Oracle RDB design for CINDA and EXFOR databases was distributed (see WP2000-28).

The problems in a customer services area were discussed. The statistics of user's access to the databases through Web demonstrates steady growth in all data disseminating centers. At the same time CD-ROMs present the convenient media for distribution of frozen

versions of data files and libraries. With regular updating, they also can be used for distribution of nuclear databases to customers with poor access to the Internet. Electronic publications of reports and porting of documents to the Web was strongly supported. The parameters of statistical account of data retrievals through Web were presented and discussed (see e.g. WP2000-18).

The general problems of the new CINDA-2001 system including new format, codes and data conversion to the new format were briefly discussed and the working plan was agreed (see Conclusion C3). A new improved version of CINDA on CD-ROM developed by NEA Data Bank was presented by M. Kellett. Distribution of CINDA on CD-ROM and the future of CINDA book/CD-ROM distribution was discussed (see WP2000-12 and WP2000-13).

Reports “Nuclear Data and Nuclear Model Development” by A. Ignatyuk and “Evaluation Activity in RNDC” by A. Blokhin were considered on session with presentation of the activity on the nuclear cross section evaluation in the hosting Russia Nuclear Data Center.

A session on technical matters of CINDA and EXFOR databases including coding rules, dictionaries and manuals (see WP2000-3 to WP2000-11 and WP2000-14) was chaired by O. Schwerer. The results of the discussions are summarized in Conclusions and Actions of the meeting (see p. 26).

The procedure of conversion of Ion Beam Analysis (IBA) library prepared by IBA community in EXFOR format was considered and agreed (see WP2000-23 and Actions A45-A48). The co-operation with the communities and networks of data applied users is important. The joint project on development of Web sites in nuclear data centers of Russia, Ukraine and Belarus was endorsed (see Action A6). The conversion of "area 6" and "area 7" entries (old EXFOR entries from NEA-DB and NDS service areas) into proper entries of area 2 and 3 should be finalized by respective centers (see Action A32).

Future of nuclear data bases and needs in migration on new platform independent relational database solutions was discussed. Preliminary results of the study “Relational Database and Java Technology for Nuclear Data” with comparative analysis of using different RDBMS packages for modelled database was presented by P. Oblozinsky (see WP2000-16). The workshop on Relational Databases for Nuclear Data, September 11 – 15, 2000 was endorsed by participants. The necessity in search of non-expensive platform independent solutions for major nuclear databases was discussed.

The work on development of new nuclear databases and libraries was discussed. V. Varlamov presented the database of Giant Dipole Resonance Parameters and I. Boboshin presented the Relational Nuclear Spectroscopy Database NESSY which provides advanced retrievals (see WP2000-27). Both databases have Web access. The computer package SaBa, containing evaluated data on cross sections and S-factors for reactions between light particles with tools for data evaluation was demonstrated by S. Taova (see WP2000-26). A. Grebennikov showed the opportunities of the Nuclear Data Expert’s Studio (NDX) system in processing and visualization of the evaluated nuclear reaction (ENDF) and nuclear structure and decay (ENSDF) data.

The progress in using object oriented IntelligentPad software for retrieval and graphical presentation of charged-particle nuclear reaction data was shown by Y. Ohbayashi. The work on new CD-ROM version of JEF library was presented by M. Kellett. New EXFOR relational database on CD-ROM with advanced retrieval system and interactive graphical visualization of the data developed by V. Zerkin (see WP2000-15) was presented by V. Pronyaev. The problem of updating NDS address list for distribution of reports (ADLIST) was discussed and needed actions are planned (see Actions A8 and A9).

The statistics of data compilation in EXFOR in different data centers was presented by V. McLane (see WP2000-19) and similar statistics on incident particles was presented by V. Pronyaev (see WP2000-22). Since 1990, the number of new EXFOR entries added to the database is at the level 200 – 300 per year with a general tendency of a relative increase of the number of entries for charged-particle induced and photonuclear reactions. It probably reflects the present shift in efforts devoted to measurements of charged-particle and heavy ion induced reaction cross sections.

A report describing a new procedure for archiving experimental data published in *Physical Review C* was presented by V. McLane (see WP2000-17). The co-operating data centers agreed to compile these data in EXFOR with first priority in accordance with the procedure proposed (see Conclusion C6).

Issues common for data centers were discussed. The regional data centers will face a generation shift in near future. Transfer of know-how to the new generation will be needed, probably with simultaneous migration to new database platforms. The EXFOR data compilation activity, a core activity of the co-operating data centers, should be increased, with high priority for the latest published data and the most important data published earlier. Plans on new versions and releases of evaluated data libraries were reported. They will include the release of frozen version of ENDF/B-VI library (with Release 8), freely distributed JEF-3 library, new CENDL-3 and BROND-3 libraries and IRDF2000 file of dosimetry reactions. The processing of evaluated data files in ACE format, most suitable for Monte Carlo transport calculations, is planned in NDS. Because of possible migration of common nuclear databases in future on RDBMS, the task of coordination of this activity through broad participation of programmers can be very important for the network.

The meeting's Conclusions and Actions were reviewed and approved.

The next Technical NRDC meeting (CM) was planned for the second half of May 2001 in Vienna. NEA-DB offered to host the next full network meeting (AGM) in Paris, 4 days, in late April or early May 2002.

CONCLUSIONS

General

C1: All centers now accept documents in Word97 format.

C2: The next Technical NRDC Meeting is planned for the second half of May 2001 in Vienna. NEA-DB offered to host the next full network meeting (AGM) in Paris, which is envisaged to be held on 4 days in late April or early May 2002.

See also General Actions A1 - A14.

CINDA-2001

C3: The steps for implementation of CINDA-2001 are summarized as follows:

1. Extract relevant information from EXFOR and convert it, as well as the present CINDA, to CINDA-2001 format

2. For neutron data, compare this information with CINDA and add the entries not covered by EXFOR

3. Convert Photonuclear Bibliography

4. Convert existing (old) CPND bibliographies

A first version of the file will be released after completion of the first 2 steps.

This phase is expected to be completed by the end of 2002. Thereafter, entries with missing detailed quantities (from old CINDA) will be upgraded gradually.

See also Actions A15 - A17.

EXFOR/CINDA Dictionary System

C4: The decision on a radical reform of dictionary 27 (Nuclides) is postponed to the next full (AGM) meeting.

C5: From now on, only new nuclides need to be communicated by memo for addition to dictionary 27. Use of an existing nuclide in an additional field will be dealt with by NDS without announcement.

See also Actions A18 - A23.

EXFOR, general

C6: On the NNDC project for **archiving experimental data published in Physical Review C:** All compilation centers agree to participate in this pilot project. NNDC, as the contact center for the publisher of Phys. Rev. C, will receive the numerical data and the text of the article from the authors and forward them to the responsible center for compilation which **must compile it within 1 month time** and return the compiled data to NNDC **by private communication.** (In addition, the new entry will be put on

the next regular TRANS file of the compiling center.) The compiling center will inform NNDC of the accession number immediately on receipt of the data. *(Compare also Actions A34 and A35).*

See also Actions A24 - A36 on general EXFOR matters.

EXFOR coding rules and dictionary codes

C7: The proposal to remove the data heading LVL-NUMB was not agreed.

C8: (On WP3) The Dubna conferences will be coded using the appropriate JINR report codes (rather than conference codes such as 95DUBNA), with the title of the conference given in free text.

C9: Units B/ATOM are not needed (proposal withdrawn), existing cases have been converted to ATOMS/B.

C10: **Proposed units B-MEV/SR are changed to B*MEV/SR for consistency with existing units.**

C11: All proposed new quantities (Dictionary 36) of WP6 are adopted:

SEQ,DA/DA/DE,P/P/P
POL,DA/DE
POL,DA/DE,,ANA
,DA/DA,P/A
,DA/DA/DE,P/P/P
NN/PAR,POL/DA,,SF
PAR,DA,,IPA
PRE,AKE,LF/HF
PAR,DA/CRL
PAR,DA/CRL,G/P
EM/PAR,DA/DE
EM,TTY/DA/DE
IND/UND,PY

C12: The new quantities for dictionary 36 proposed in WP8, WP9 and WP10 are adopted:

NN/PAR,DA,,SF
21/PAR,POL/DA,,TAP
22/PAR,POL/DA,,TAP
20,POL/DA,,TAP
21,POL/DA,,TAP
22,POL/DA,,TAP
PAR,POL/DA,,SF
,WID/STR
PAR,WID/STR
,DA/TMP,FF,LEG/RS
,WID/RED,,RMT/AMP
CUM/PAR,DA
CUM/PAR,SIG
PAR,DA,,SFC

C13: The headings for dictionary 24 as proposed in items 2, 3 and 4 of WP7 are approved:

E-LVL-INI1, E-LVL-INI2, E-LVL-FIN1, E-LVL-FIN2
+DATA-ERR1, -DATA-ERR1, +DATA-ERR2, -DATA-ERR2
E-RSL-FW
(For item 1 of WP7 see Action A43).

C14: The units PART/FIS (instead of NO-DIM) are approved for all measurements of nubar. (WP9)

See also Actions A37 - A44.

ACTIONS

General Actions

A1:	**(NDS)**	Remove the RIKEN Data Centre entry from the Network document
A2:	**(NDS)**	Make all of the IAEA-NDS Documentation series available on the WWW in PDF format. This may require scanning of previous paper copies
A3:	**(All)**	Send/give the electronic format (MS-Word or Excel) of their Centre's Progress Report, and any other paper distributed during the meeting which should be included in the meeting report, to NDS before 15 June 2000.
A4:	**(NDS)**	**(Old A2)** Send the ENDF (DBMS and text libraries) to VNIIEF and CJD.
A5:	**(Lammer)**	**(Old A3)** Include the PC program package for calculation of Fission Yield distributions by A. C. Wahl in the NDS data collection
A6:	**(All)**	To support the joint project of Russia, Ukraine (UkrNDC) and Belarus (Minsk-Sosny) on development of Internet site structure and web pages for nuclear databases and related software. This support would include establishment of contacts of project initiators with European, US and other centers and organisations interested in collaboration, cooperation or partnership in this project.
A7:	**(Dunaeva)**	Keep other centers informed on the status of the proposed project.
A8:	**(NDS)**	Distribute respective parts of the ADLIST address database to other centers for review for incorrect or outdated addresses.
A9:	**(All concerned)**	Send ADLIST corrections to NDS.
A10:	**(NEA-DB)**	Update the NRDC web page (kept by NEA-DB) and add a page on Frequently Asked Questions (FAQ).
A11:	**(All)**	Send contributions to the FAQ page to NEA-DB
A12:	**(NEA-DB)**	Provide a link from the NRDC page to the Network document.
A13:	**(All)**	Provide a link from their home page to the NRDC page.
A14:	**(All)**	Add Sophiya Taova's e-mail address to the distribution for CP memos: Taova@expd.vniief.ru

CINDA-2001

A15: (McLane, Kellett, Schwerer, Maev)

To check the Archive-Dictionary 13 codes (Reaction Type) for use in CINDA-2001 and see if the new format in Memo CP-C/266 can then be adopted for CINDA-2001 using these codes as the quantity field.

A16: (**All)** Check the codes in Archive Dictionary 13 and send comments to McLane and Schwerer. *(Note: A listing of Archive Dictionary 13, which is not identical to "Exfor" dictionary 13, was distributed at the meeting; it is also available from the NDS Open Area.)*

A17: (McLane) Update and distribute preliminary CINDA-2001 Manual and include the proposal for cross referencing works with several laboratories

EXFOR/CINDA Dictionary System

A18: (Schwerer) **(Old A11)** Check old actions 7-13 of the 1997 NRDC meeting.

A19: (McLane) **(Old A15)** Send DANIEL dictionary memos to NDS

A20: (Schwerer) **(Old A17)** Make dictionary transmissions four times a year

A21: (Schwerer) Put the archive dictionaries on the NDS Open area

A22: (All) Check the archive dictionaries and send comments to Schwerer

A23: (Chukreev) (On WP14:) Produce a proposal on Dictionary 27 including citing examples and REACTION codes (SF1-4)

EXFOR, general (programs, manual, compilation)

A24: (McLane) Investigate whether the computer program for comparing experimental CINDA works with EXFOR is still available and send it to NDS

A25: (McLane) **(Old A26)** Correct EXFOR processing codes to properly treat cases where KT is given instead of an average incident particle energy (3/2)

A26: (All) **(Old A27)** Check and retransmit all entries included in the list of pending retransmissions by McLane distributed at the 1999 NRDC meeting

A27: (All) Send feedback on the updated EXFOR Basics Manual to McLane.

A28: (Chukreev) Send latest version of TEST-EXF to NDS.

A29: (Dunaeva) **(Old A24 on McLane)** Make a benchmark test of Chukreev's code TEST-EXF vs. CHEX

A30: (Tarkanyi) Distribute updated list of references missing in EXFOR obtained in the framework of the CRP on Medical Radioisotope Production.

A31: (CPND centers) Go through this list and communicate to Tarkanyi which works from their area of responsibility they will compile. Works not covered this way will then be free to be compiled by others.

A32: (NEA-DB,NDS) Convert remaining 60000 and 70000 series entries to proper EXFOR entries of area 2 and 3.

A33: (All) In view of the poor statistics for EXFOR compilation of recent works, all centers should give higher priority to new works.

A34: (McLane) Send a memorandum of understanding about the compilation responsibilities resulting from the agreement with Phys.Rev.C to all participating centers.

A35: (Dunaeva, Chukreev) Establish contact to the publisher of Yadernaya Fizika about an agreement similar to the data archiving agreement between NNDC and Phys.Rev.C.

A36: (Blokhin) Submit his compilation of emission spectra of photonuclear reactions to Varlamov for possible inclusion in EXFOR

EXFOR Coding Rules and Dictionary Codes

A37: (McLane) **(Old A31)** Check existing codes for fission quantities for possible overlap with the case of Memo CP-C/209 and existing EXFOR entries for necessary revisions

A38: (McLane) **(Old A34)** Submit LEXFOR entry on the use of RCL and RSD in SF7

A39: (McLane) **(Old A36)** Provide more information on the proposal containing "PN" (prompt neutrons) in SF7 (Memo CP-C/235)

A40: (All) (On WP4) Propose new, general way of coding cases such as the examples in WP4 (proposed codes PAR/M+,DA,G, etc.)

A41: (McLane) Include LEXFOR entry for POL,DA/DE and POL,DA/DE,,ANA

A42: (McLane, Schwerer) Reply to the proposal on new units for dictionary 25 (P/PTMEVSR etc.) given in memo CP-A/99 (reproduced in WP6, p.7)

A43: (Babykina) Submit a counter-proposal for coding Isobaric analog states (ref. WP7, CP-C/264) within 2 months after the meeting.

A44: (McLane) Update LEXFOR for ,WID/STR and PAR,WID/STR

Ion Beam Analysis Data (WP 23 by NEA-DB)

A45: (Kellett) Obtain quasi-EXFOR files from Vickridge and distribute these to appropriate centers for addition of extra information (e.g. BIB section).

A46: (All relevant centers) Upon receipt of quasi-EXFOR files from NEA-DB, add the required additional information to make them legal EXFOR files to be distributed through the usual process via the NDS open area. As time allows, any missing data which is given in the original reference paper can be added.

A47: (Kellett) Obtain information on "standard" Rutherford cross sections and investigate how these can be used to produce r33 format files as output in the ratio to Rutherford format.

A48: (NNDC, NEA-DB) Allow the r33 format to be one of the standard computational formats for output so that the IBA community can continue to use this format within their simulation codes.

Software Development

A49: (All concerned) (Old A50) All centres using NNDC programmes should check the NNDC open area 'FOURCS' for program updates. (Only important changes will be announced by e-mail, others have to be identified by the version date.)

A50: (NDS) (**Old A53)** Investigate possibility to organize a workshop on nuclear reaction data plotting.

NATIONAL NUCLEAR DATA CENTER

Status Report
to the
Advisory Group Meeting on
Network of Nuclear Reaction Data Centers
15-19 May 2000

General

Since the last meeting of the Nuclear Reaction Data Centers in May 2000, Mulki Bhat and Said Mughabghab have retired. Said remains at the Center as a Guest Scientist. Pavel Oblozhinsky has been hired as the new Deputy Head of the Center. We have also hired a full-time scientific staff member to work on nuclear structure evaluation. There are currently 11 FTE scientific/professional and 4 support staff. See Table I for list of visitors for this period.

Computer Facilities

NNDC is in the process of installing new Gateway Celeron 433 MHz PC's for all staff members. We have also acquired a Dell Poweridge 4300 Pentium III 600 MHz Windows NT server. These are linked to the VAX Alpha using the Exceed software package.

The Alpha system has recently been upgraded to Open VMS 7.2, and the OSU HTTPD Web Server to version 3-6B.

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 June 1999 through May 2000, 4 CINDA transmissions were sent (BNL159-162).

Experimental Nuclear Reaction Data

The NNDC continues to compile neutron and charged-particle reaction data produced in the U.S. and Canada. In the period from June 1999 through May 2000, 13 neutron data transmission tapes (TRANS 1276-1288) and 14 charged-particle transmission tapes (C032-C039, P002, T001-T005) were sent containing new and corrected entries. Work continues with a consultant from Oak Ridge National Laboratory on entering the ORELA total cross section data of Harvey; more than 140 data sets have been received so far in EXFOR format.

Updates to the EXFOR Manual [1] and to EXFOR Basics [2] have been issued in May 2000.

Work on the compilation of relativistic heavy-ion data has been suspended.

Evaluated Nuclear Reaction Data

NNDC continues to coordinate the work of the Cross Section Evaluation Working Group. ZVView has been installed on the VAX Alpha and is now used to produce the plots overlaying the experimental data with proposed ENDF evaluations that are sent to reviewers.

ENDF/B-VI, Release 7, was distributed in April, 2000, and includes updates to the neutron and proton sublibraries; see Table 2.

Said Mughabghab, in collaboration with S.Y. Oh and J. Chang of KAERI, has updated the thermal and resonance region for 19 fission product nuclei; four of these are included in release 7.

Nuclear Structure Data

NNDC continues to publish the ***Nuclear Data Sheets***. As of May, 2000, issues through Volume 90, #1 have been published by Academic Press.

The Sixth Edition of the Nuclear Wallet Cards [3] was issued in April and has been put up on the NNDC Web page.

Customer Services

The use of the Telnet Online Service is decreasing, primarily due to the availability of most databases on the Web. There are now about 860 active customer accounts with about 1020 users. The number of combined retrievals from the NNDC World Wide Web, Telnet On-line Service, and FTP continues to increase exponentially, there are currently about 18,000 retrievals per month from the combined services. A chart of Online Data Service retrievals is attached.

The following updates have been made to the NNDC Web pages.

1. Links have been established between NSR, CINDA, CSISRS, ENSDF, XUNDL, and the online journals from Europhysics Letters and Annales de Physique (Paris) in addition to the links already existing to American Physical Society journals and European Journal of Physics.

2. A new NSR-SQL Server has been added to the Web server as a test of alternatives to the existing DBMS-based retrieval option.

3. Calculational tools for internal conversion coefficients and *Log ft*'s have been added.

4. An HTML/GIF MIRD output option has been added. In addition to providing HTML tables and GIF images of the data, this option will also provide links to related information in the CSISRS, ENSDF, NSR, and NuDat databases.

Agreement has been reached with the American Physical Society on establishing links with Physical Review C for data given in papers submitted to that journal. Details are given in a separate paper submitted to this meeting.

The exchange of personnel between the NNDC and NDS to collaborate on online services continues; see Table I for details.

References

[1] V. McLane, EXFOR Systems Manual: Nuclear Reaction Data Exchange Format, Brookhaven National Laboratory report **BNL-NCS-63330** (May 2000)

[2] V. McLane, EXFOR Basics: a Short Guide to the Nuclear Reaction Data Exchange Format, Brookhaven National Laboratory report **BNL-NCS-63380** (May 2000)

[3] J.K. Tuli, Nuclear Wallet Cards, 6th edition (Brookhaven National Laboratory, January 2000)

Table I.

Exchange Visits: NNDC with Other Centers
June 1999 to May 2000

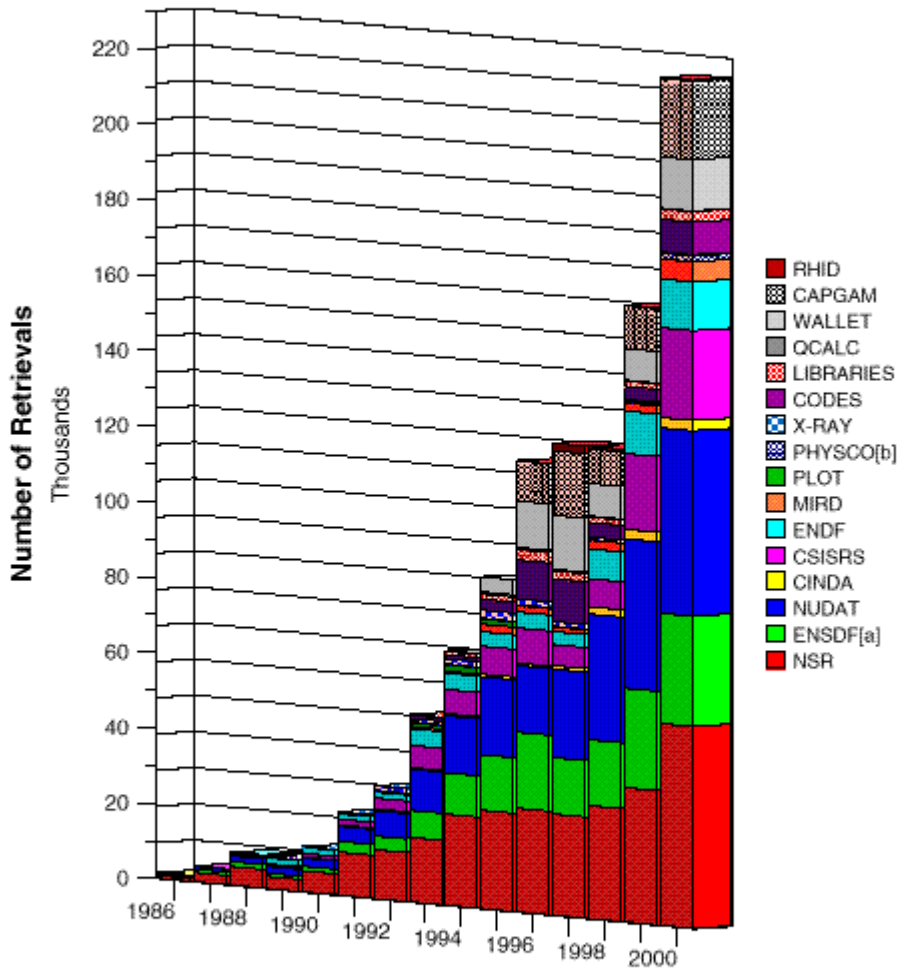
Visitor	Host	Duration	Topic
Viktor Zerkin, NDS	T. Burrows, V. McLane	2 weeks	EXFOR CDRom, ZVView, Web services
S.Y. Oh	S. Mughabghab	1 week	ENDF Evaluation
T.W. Burrows	IAEA/NDS	1 weeks	Web services

Table 2

Contents of ENDF/B-VI Release 7

Sublibrary	Tape	Material	Source	Evaluators
Neutron	154	^{133}Cs	KAERI,BNL	S.Y. Oh, S.F. Mughabghab
		^{134}Cs	ORNL	R.Q. Wright
		^{135}Cs	ORNL	R.Q. Wright
		^{134}Ba	ORNL	R.Q. Wright
		^{141}Pr	KAERI,BNL	S.Y. Oh, S.F. Mughabghab
		^{149}Sm	KAERI,BNL	J. Chang, S.F. Mughabghab
		^{153}Eu	KAERI,BNL	S.Y. Oh, S.F. Mughabghab
		^{154}Eu	ORNL	R.Q. Wright
		^{155}Eu	ORNL	R.Q. Wright
		^{160}Dy	ORNL	R.Q. Wright
		^{161}Dy	ORNL	R.Q. Wright
		^{162}Dy	ORNL	R.Q. Wright
		^{163}Dy	ORNL	R.Q. Wright
		^{164}Dy	ORNL	R.Q. Wright
		^{175}Lu	ORNL	R.Q. Wright
		^{176}Lu	ORNL	R.Q. Wright
	155	^{209}Bi	LANL	M.B. Chadwick, P.G. Young
		^{243}Cm	Belarus	V. Maslov
		^{245}Cm	Belarus	V. Maslov
		^{246}Cm	Belarus	V. Maslov
Proton	309	^{209}Bi	LANL	M.B. Chadwick, P.G. Young

*NNDC On-Line Data Service, World Wide Web (W^3), and FTP Retrievals 1986-2000**



* Extrapolated as of April 30, 2000
[a] Includes XUNDL retrievals since January 1 (OnLine) and January 11 (Web), 1999.
[b] Added to Web August 18, 1999.

NEA Data Bank Report to the NRDC
Obninsk, 15-19 May 2000

Introduction

The Data Bank now has a full complement of staff working on Nuclear Data topics and has currently released the first test version of the JEFF-3 library within the JEFF community for preliminary bench-marking and validation.

Experimental (EXFOR) and Bibliographic (CINDA) data compilation

A total of 99 EXFOR entries for neutron induced experiments, were compiled and transmitted to the other data centres in 1999. Seventy-four (74) of these entries concerned new experiments.

More than 800 new entries were compiled into the CINDA database in 1999.

The CD-ROM version of the CINDA database has now been produced and is currently being circulated to recipients of the IAEA book version. Extensive testing was carried out by both the NEA and the IAEA and this helped to improve the product, but also delayed its original distribution date.

Intermediate Energy Nuclear Data (IEND) for EXFOR

In 1999, the Data Bank received ~150 new data sets from charged particle induced experiments and these are currently undergoing testing before being entered into the EXFOR database.

The Joint Evaluated Fission and Fusion Project (JEFF)

Work is continuing to assemble and correct the JEFF-3.0 starter file taking into account the format and physics errors highlighted by the Quality Assurance (QA) checks. Extensive processing has been done using different versions of NJOY-97. This also enables the proposal of different patches to the processing code and to reveal additional errors in some evaluation files. The situation is now quite stable and the latest version of NJOY (NJOY-97/110) is able to formally process all materials.

The production of application libraries has started, with a full set of ACE format files (for use with MCNP) now being held at the Data Bank.

Validation work of JEFF-3.0 started in summer 1999 with a set of 20 configurations, which covers applications such as fast assemblies as GODIVA and JEZEBEL, arrays of water-moderated fuels, and solutions of uranium and plutonium. This activity has been extended after a limited release of an interim version of JEFF-3.0 to JEFF members, who volunteered to participate to this preliminary bench-marking. A second pre-release, taking into account the results of the above mentioned tests, will be done at the JEFF meeting in May 2000.

The plan for the assembly of the Decay Data and Fission Yields files was agreed upon during the last JEFF meeting in November 1999. The first version (April 2000) is being assembled from the

existing new versions of the UK libraries UKPADD-6.1 and UKHEDD-2.2, complemented with a large number of French evaluations, mainly based on ENSDF and converted to ENDF-6 format using a revised version of RADLIST. Further efforts will be needed to define the QA procedures and to develop the checking codes for the Decay Data files. The Fission Yields section will be based on the UKFY3 library.

The detailed documentation for the JEF-2.2 library is about to be published in time for the JEFF meeting in May 2000. This documentation comprises historical information, the sources of data in the file, a complete report on the accuracy of JEF2.2 for a variety of applications (thermal and fast reactors, criticality, shielding...) and the list of feedback. The required improvements as resulting from benchmarking studies are also be highlighted. The full documentation will also be available on a CD-ROM, with links included to all of the supporting JEF and EFF documents which are referenced therein.

In 2000 work will focus on:
• Bench-marking studies.
• The production and testing of the Decay Data and Fission Yield special purpose library.

Extensions are planned to:
• Incorporate intermediate energy (150 MeV) cross sections for the most important nuclides.
• Finalise on-going evaluation work and update the file; a new version is foreseen for the end of 2000.

JEF-PC program

The JEF-PC program continues to sell moderately well (137 copies in the last year) against the background of competition generated by other programs, many of which are being made available free of charge.

The future development of JEF-PC is now well under way and it is foreseen that a first beta test version will be available in June/July of this year. The work is being carried out by a team of specialised programmers in order that full benefit can be made of the modern architecture available. The new version is being written using Java and so will be platform independent and also closely linked to the WWW allowing for communication with our servers. The user will receive an initial set of data (on CD-ROM or DVD) and yet still have the flexibility to collect newer data from our server. Studies have been made where the actual point-wise data stay on the server and it is only the graphical image which is transmitted, making communication faster. This is interesting for our WWW based plotting facility, which will contain some aspects of the new JEF-PC.

Services to Nuclear Data Users

The Data Bank answered ~50 manual data requests in 1999. The number is diminishing year on year as the online service becomes more readily accessible and complete. Most of the manual requests are now for independently produced CD-ROMs which the Data Bank distribute, currently these include JENDL-3.2, JENDL/D-99 and EAF-99. There are also a number of requests for complete libraries as well as for copies of reports containing data.

The Data Bank also continues to provide specific advice to those members using nuclear data in all areas related mainly to nuclear energy.

The number of on-line accesses registered in 1999 was more than twenty one thousand (21,000), as compared to ten thousand (10,000) in the previous year.

All the JEF and EFF documents have been scanned through a Character Recognition system allowing for an automatic search capability to be performed on the entire body text of the documents. Nearly all new documents are received electronically, which allows direct conversion to PDF format and instant WWW availability, hence avoiding the cost of scanning documents and the final files are also significantly smaller in size than those scanned.

Progress Report of the IAEA Nuclear Data Section

(Note: This report is an extract taken from the 1999 report to the INDC (INDC(NDS)-414))

1. Staff and Budget

Organization chart of the Nuclear Data Section as in May 2000 is given below.

Nuclear Data Centre Unit	Nuclear Data Development Unit	Computer Operations Unit	Atomic & Molecular Data Unit
V.G. Pronyaev (Head) Nuclear Data Physicist (04950-33-P4) (21717)	**A. Trkov** * (Head) Nuclear Data Physicist (04923-33-P5) (21712)	**D.W. Muir** (Head) Section Head (04914-33-P5) (21709)	**R. Clark** (Head) Atomic Physicist (04932-33-P4) (21731)
P.K. McLaughlin Programmer Analyst (06619-33-P3) (21723)	**M. Herman** Nuclear Physicist (04969-33-P4) (21713)	**W. Costello** Systems Analyst (04941-33-P3) (21724)	**J.A. Stephens** Atomic Physicist/ Programmer (04987-33-P3) (21729)
V. Zerkin Nuclear Physicist/ Programmer (05069-33-P2) (21714)	**R. Paviotti de Corcuera** Nuclear Data Information Physicist (05023-33-P3) (21708)	**M. O'Connell** Applications Progr. (05124-33-G5) (21722)	**K. Sheikh** Database Clerk (06499-33-G5) (21730)
M. Lammer Asst. Nucl. Data Phys. (05078-33-G7) (21727)	**A. Scherbaum** Secretary (05115-33-G4) (21711)	**E. Baumgartner** Secretary (05087-33-G4) (21710)	
O. Schwerer Asst. Nucl. Data Phys. (05133-33-G7) (21715)			
G. Bush Production Progr. (05106-33-G5) (21725)			
M. Wirtz Secretary (05050-33-G4) (21716)			

* Andrej Trkov will take up his duties in the Nuclear Data Section on 11 May 2000.

The budget and staffing level of the Nuclear Data Section has been relatively stable during the current reporting period. The authorized staff level for 1999-2000 is 18, consisting of 10 professionals (P-staff) and 8 support staff (G-staff). Of these 18 staff members, 3 (2 P-staff and 1 G-staff) are assigned to the Atomic and Molecular Data Unit.

The previous Deputy Section Head, Pavel Oblozinsky, resigned his position effective 31 March 2000, in order to accept employment with the National Nuclear Data Center, Brookhaven. His

successor, Dr. Andrej Trkov, will take up his duties in the Section on 11 May 2000. The Head of the Atomic and Molecular Data Unit Ratko Janev retired after 11-plus years of outstanding service. His successor, Dr. Robert Clark, arrived in August 1999.

As shown in Table 1, the draft budget for 2001 is nearly unchanged in dollars. There has been some shift of emphasis in the programme of the Section, with more resources devoted to workshops and other user training initiatives than in the past, and there has been increased staff activity in the development of Technical Cooperation projects. The increased dissemination of online documents via direct download from Web has reduced the hard-copy printing expenditures.

TABLE 1. BUDGET AND STAFF SUMMARY 1998-2001

	1998	**1999**	**2000**	**2001**
Authorized Staff Level	18	18	18	18
Actual Staff Level	19	18.1	18	18
Staff Cost Budget	1,600,000	1,600,000	1,550,000	1,643,000
Programmatic Budget	602,000	570,000	636,000	573,000
Total Budget US$	**2,202,000**	**2,170,000**	**2,186,000**	**2,216,000**

In support of the PPAS of the Department of Nuclear Sciences and Applications, the Nuclear Data Section produced briefing materials on several topics of interest to the review panel, including (a) the special role of the Department of Nuclear Sciences and Applications in developing scientific databases which support the development of nuclear technology in Member States, (b) the close working relationship between the nuclear data programs of the IAEA and the OECD Nuclear Energy Agency, (c) an explanation of the important role of the International Nuclear Data Committee in providing programmatic guidance to Agency activities, and (d) the creation of a unified Web site for our parent Division, the Division of Physical and Chemical Sciences (NAPC), on the Agency's central Web server; see http://www.iaea.org/programmes/ripx/nd/. The NDS portion of this site containing programme overviews, staff contact information, details of meetings, project, publications, etc. provides a useful supplement to the Section's nuclear and atomic data dissemination sites, which continue to be developed separately.

2. Data Center Activities

The main objectives of the NDS Nuclear Data Center activity in 1999 were:

- to collect, assess, recommend and disseminate nuclear data required in the application of nuclear technology,
- to promote the international exchange of nuclear data for applications,
- to coordinate worldwide networks of national and regional nuclear reaction and nuclear structure and decay data centers,

- to maintain manuals and software for internationally agreed database formats and exchange procedures, and

- to improve the means by which the data center provides information to its users.

2.1 Nuclear Data Compilation

Nuclear reaction data compilation includes the collection of bibliographic information and primarily experimental numerical data mainly from the NDS Nuclear Data Center's area of responsibility, and their compilation in the computerized formats CINDA and EXFOR.

The general purpose evaluated nuclear reaction data libraries are created under the national or regional programs. After international release, they are placed in the ENDF database by NNDC, Brookhaven. Special purpose nuclear databases, data libraries and files are prepared in the framework of the IAEA Coordinated Research Projects or national and regional programs. They are documented by the IAEA NDS and, after checking and testing, are disseminated via online access or off-line on diskettes and CD-ROM upon requests.

2.1.1 CINDA

There were no activities in the NDS toward the development of the new CINDA format and the new file "CINDA2001". Presently all CINDA operations (compilation, storage, data exchange and retrievals/transmission to customers) continue to be performed using the old CINDA format.

During 1999, the NDS has prepared and transmitted about 900 CINDA entries either as direct input to the CINDA file (work in laboratories belonging to the responsibility of NDS) or for further processing by the responsible data centres.

CD-CINDA, the CD-ROM version of CINDA including a search software developed by the NEA Data Bank was completed in 1999. This was thoroughly tested by M. Lammer. Many suggestion for improvements to the search software were communicated by Lammer to M. Kellett of the Data Bank. Thus the NDS has made a considerable contribution towards the development of the CD-CINDA. The CD-CINDA could be an alternative or a supplement of the hardcopy CINDA book.

CINDA 99 was published again as a supplement to CINDA 97 and superseded CINDA 98. Plans were developed in November 1999 together with M. Kellett (NEA Data Bank) for a joint distribution of CINDA 2000 as a hardcopy book and a CD-ROM.

2.1.2 EXFOR

Since January 1999, two neutron-EXFOR transmissions were distributed containing new works from China (13), Ukraine (4), Argentina (4), Brazil (1) and Australia (1). These included

5 entries compiled at the China Nuclear Data Center which were checked and processed at NDS, and data received from Ukraine and Argentina in a "raw EXFOR" format which were finalized at NDS. In addition, 3 photonuclear entries were received in " raw EXFOR" format from Brazil. These were finalized (with help from CDFE Moscow) and transmitted on a separate EXFOR transmission file.

Considerable time was spent in updating the common CINDA/EXFOR dictionaries and related software originating from NNDC, and in quality control checking of EXFOR transmissions from all participating compilation centers.

2.1.3 Evaluated Data Libraries, Files and Programs

The following Evaluated Data Libraries, Files and Programs have been updated or added to the IAEA NDS collection (listed in chronological order of their inclusion):

- JENDL-3.2 Library. Pointwise data reconstructed by JAERI at 300 K.

- ENDF/B-VI Library, Release 6. It includes revisions up to September 1999. Basic and pointwise data are available online and on CD-ROM. The following materials were added, replaced or updated: 1-H-1, 1-H-2, 6-C-0, 7-N-14, 8-O-16, 13-Al-27, 14-Si Isotopes, 15-P-31, 20-Ca-40, 24-Cr Isotopes, 26-Fe Isotopes, 28-Ni Isotopes, 29-Cu-63, 29-Cu-65, 41-Nb-93, 74-W Isotopes, 82-Pb Isotopes.

- ENDF/B-VI Charged-Particle Sublibraries, Version: September 1999. The 1998 and 1999 updates includes complete presentation of the nuclear data for H-1, H-2, He-3, C-12, N-14, O-16, Al-27, P-31, Ca-40, Nb-93 and isotopes of Si, Cr, Fe, Ni, Cu, W, Pb, needed for transport, damage, heating, radioactivity and shielding applications over the incident proton energy range from 1 to 150 MeV.

- Table of Nuclear Root-Mean-Square Charge Radii, by I. Angely (June 1999), contains bibliographic information, data selection, evaluation procedures and tables with experimental and evaluated data .

- TLAPrfl: Package for Calculation of Depth Profile for Thin Layer Activation, by G. Wallace.

- PCNuDat: a PC Nuclear Data Program, by R.R. Kinsey (Release 2.7, October 1998).

- EXFOR+ENDF retrieval + interactive plotting software by ZVVIEW. A tool for retrieval of integral reaction cross sections from experimental database EXFOR and major evaluated data libraries and their graphical comparison using ZVVIEW (a package specially designed for interactive plotting of nuclear reaction cross sections).

- PHYSCO - Nuclear Structure Calculation Tools – HSICC and LOGFIT. Tools for calculations of internal conversion coefficients and Log-ft values for beta and electron capture decay, average beta energies, and capture fractions.

- JENDL Dosimetry File 99 (JENDL/D-99) on CD-ROM, by JAERI. Data for 67 dosimetry reactions in pointwise and 641-group structure form and figures of comparison between JENDL/D-99 and IRDF-90 are given.

- NMF-90. Neutron Metrology File is an integrated database for performing neutron spectrum adjustment (unfolding) calculations. It contains four different adjustment codes, the group structure version of the dosimetry reaction cross section library IRDF-90/NMF-G with covariance files, six input data sets for reactor benchmark neutron fields and a number of utility codes for processing and plotting of the input and output data.

- DROSG-2000: Neutron Source Reactions. Data files with computer codes for 56 monoenergetic neutron source reactions.

- SaBa: The Library of Evaluated and Experimental Data on Charged Particles for Fusion Applications. Evaluated and experimental data for 52 reactions with a set of data processing procedures which provide a user-friendly interface for presentation and evaluation of cross sections.

All these files, libraries and codes are documented either in the IAEA-NDS Report series (available online) or in INDC Reports.

2.2 Nuclear Data Services: Improvement and Development

The main innovations, development and improvements in the user services in the last year are:

- About 50% of all new INDC reports have been made available on the Internet. This lowered the printing cost by reducing the distribution of hardcopies of these reports. More than 1200 reports were downloaded by users in 1999.

- A new EL series of INDC reports, published and distributed in electronic form only, was introduced. The hardcopies of these reports are available only on special request by the user. Users are informed of the publication of these reports through an announcement in the Nuclear Data Newsletter.

- A new Web statistics system based on the Alpha Web server was developed. The system provides online monitoring and statistics reports of the retrievals from nuclear databases and accesses to data files, programs and documents. The access rate is tabulated for various categories such as data topics, countries and regions and is given in daily, monthly and year time frames. The system provides information on client activity with respect to country, data base accessed, etc. The system is available through the Web from any computer and at any time.

- A new multi platform software package ZVView, designed for interactive graphical display of nuclear reaction cross sections retrieved from experimental and evaluated nuclear reaction cross sections was released to the user community. This software and its documentation are available from the NDS Web page.

- A new Web-based service was developed in collaboration with NNDC, BNL. This combines the EXFOR and ENDF cross section retrievals on Alpha VMS with interactive plotting by ZVView on a client's local computer. This service is now available from the NDS Web page.

- A new NDS Web site content-navigation tool was developed. This provides "explorer" type access to the most important pages, databases, libraries, files and documents. In addition, the NDS pages were enhanced with hyper-links to other sites containing important information on nuclear data and related topics. The tool provides fast overview of NDS Web site, allows to view information and services from various viewpoints depending on the client's interests.

- A new EXFOR CD-ROM retrieval system was developed. This is based on ACCESS-97 and is designed as a relational database. It allows flexible SQL search of information from EXFOR dictionaries. The system is integrated with ZVView interactive plotting program. Test version of the system was sent to the network of Nuclear Reaction Data Centers.

2.3 Nuclear Data Services: Statistics

Due to the variety of requirements from users, different media are used for user services. These include ordinary mail for hardcopies of documents, PC diskettes and CD-ROMs, e-mails with attached retrieved data or electronic documents, and online transfer of data retrieved by the users themselves through the Telnet or Web interfaces.

The general statistics of user services in 1995 - 1999 is shown in Table 2. Figures are given for three different categories. Ordinary mail includes retrievals prepared by the NDS staff upon user requests and sent to them via ordinary mail. Online retrievals from NDS major databases are made directly by users themselves through Telnet or Web access to the databases, libraries, files and reports. One retrieval usually contains one homogenous piece of information. This can represent one report, or a set of different data retrieved from one library or database, or a computer code or codes when they are distributed as a package. Online retrieval corresponds to one user creating output either on hard disk or in screen mode. The number of Web accesses to other important databases, libraries programs and reports is also listed in Table 2.

Fig. 2.1 presents summary report of Web based Nuclear Data Services and includes statistics of accesses to the NDS data and information sources for the last four years starting from 1997. Statistics for year 2000 is given for first three months of the year.

The following trends in the user services can be seen during the last year:

- The total number of offline retrievals shows a slight increase with a wider use of CD-ROM media for distribution.

- In 1999 the number of retrievals by hardcopy decreased by 30% probably due to downloading of online documents by users themselves instead of requesting hardcopy from NDS.

- Most of the users prefer to use Web access because of ease of use compared to Telnet. However the number of retrievals through Telnet is stable at around 2000 per year.

- The number of Web accesses increased by about 30% in 1999 compared to 1998. The geographic breakdown of the increase is, developing countries 14.8%, FSU countries 18.4%, East European region 6.7% and European Union 34.6%.

Table 2. NDS nuclear data retrieval and access [a] statistics by year

Type of Medium					**Year**
	1995	**1996**	**1997**	**1998**	**1999**
Offline retrievals [b] prepared upon request, including:	**1556**	**786**	**1846**	**1995**	**2290**
Documents (hardcopies)	1155	554	1547	1533	1060
Data (diskettes)	373	219	286	115	105
Data (CD-ROM)		-	-	205	420
Online retrievals (Telnet)	**4462**	**5688**	**7350**	**2700**	**2180**
Online retrievals (Web)		-	**40**	**4964**	**9071**
Including retrievals from:					
ENDF		-	-	2618	4820
EXFOR		-	32	784	568
CINDA		-	3	470	498
NUDAT		-	5	1092	3185
Web pages accessed		-	**3690**	**6953**	**7319**
NGAtlas		-	286	613	1074
MIRD		-	257	453	493
Thermal Neutron Capture		-	353	714	514
IRDF90-NMF90		-	259	322	263
Masses		-	337	479	428
Programs		-	1109	1695	1769
FENDL		-	279	580	440
RIPL	-	-	23	841	962
Newsletters and Reports	-	-	787	1256	1376

[a] Data given in Table for Web accesses in 1997 – 1998 differ from what was given in previous reviews because a new statistics program and database for IP addresses of 'real users' was used in the analysis.

[b] Data for total offline retrievals in 1998 and for number of documents distributed are corrected. Number of physical media used for distribution (hardcopies, diskettes and CD-ROMs) may not coincide with the number retrievals.

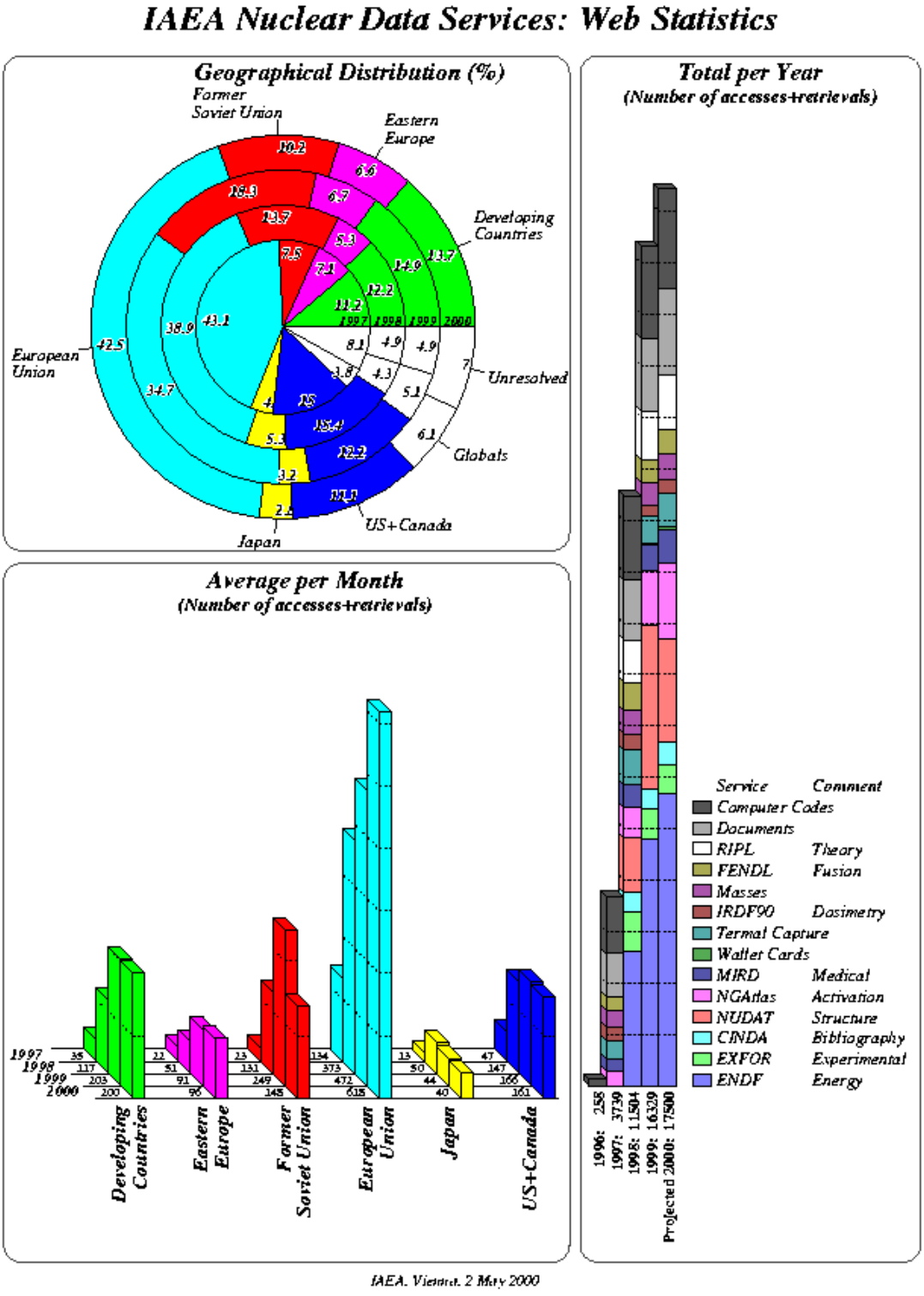


Fig. 2.1 Summary statistics of the user accesses at the NDS Web server.

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RUSSIAN NUCLEAR DATA CENTRE (CJD)

Progress Report
to IAEA Advisory Group Meeting on the "Network of Nuclear Reaction Data Centres"
15-19 May 2000
Obninsk

1. The compilation into EXFOR is on steady level. Since June 1999 to March 2000 five TRANS 4114-4118 were prepared and sent to other Network centres. The tapes contained 79 ENTRY (30 new and 49 old).

2. Last year the RNDC WWW-site was created with information about RNDC publications and national evaluated data libraries. Unfortunately we have lost some information on WWW-site because of failure of the computer disk with WWW-pages. Now the work is in progress to restore the information. At the present time the abstracts of Voprosy Atomnoi Nauki i Tekhniki (VANT), series Yadernye Konstanty (Nuclear Constants), catalogues of the libraries BROND-2 and ADL-3 are placed on the RNDC WWW-site. In the nearest future the catalogue of MENDL-2 library will be placed.

However, sometimes it is difficult to provide steady access to our WWW-site. It is a technical problem and connected with the present structure of IPPE local network. Some work is made to change the situation to the better.

3. Main efforts of the RNDC is directed on analysis and evaluation of the nuclear data for different applications. We take into account practical requirements in the nuclear data for reactor and accelerator transmutation of actinides, for activation and radiation damage of materials for the fission and fusion reactors.

The work on comparison and analysis of the evaluated nuclear data from available libraries are continued. As a result of this comparison we inform nuclear data community through report publication or directly the responsible Nuclear Data Centres. For example, together with Japanese Nuclear Data Center we analysed the threshold reaction data from JDOS/D-99 and JENDL-3.2, agreed the methods of selection of more reliable data, discussed the results and in many cases came to agreed conclusion about discrepancies revealed and the way to improve the data. As far as the foreign evaluated data libraries are used in our country for some applications we have a great interest that the data from these libraries would be improved.

4. Last time the (n,2n) and (n,3n) reactions for 150 fission products were evaluated and included in the group constant system BNAB. The evaluation was made also of the threshold reactions leading to production of the long-lived radioactive isotopes as a result irradiation of the steel containing V, Ti, Cr, Fe, Ni.

5. The specialists of our Theoretical Division together with specialists from VNIIEF (Sarov) continue the work in the frame of the ISTC project, the objective of which is measurement, analysis, calculation and evaluation of the production cross sections and spectra of gamma-rays for set of the structural and technological materials such as C, Al, Na, isotopes of Si, Cr, Fe, Nb, Zr, Pb, Bi. Simultaneously the calculation and consistent evaluation of all other neutron reactions for the same isotopes are made. These evaluated data are used for formation

of the full files for the isotopes mentioned.

Together with the full files for minor actinides (Np-237, Am-241, Am-243, Cm-242, Cm-243, Cm-244) evaluated three years ago we intend to include all the files for the isotopes mentioned (about 25) into version 3 of BROND library.

Having in mind that the work of formation of many files does not completed and some time is needed for the testing of all these files on the basis of integral experiments and model calculations we can not fix the exact date of release of the new BROND library version.

6. The work on improvement of specialised libraries is continued. Atlas on fission product yields was prepared. The new version of the photonuclear data library BOFOD-99 library was made.

7. In 1999 the following works on nuclear data evaluations were published:

V.N.Manokhin, Some considerations concerning 58-Ni(n,a) reaction. In: Voprosy Atomnoi Nauki i Tekhniki, ser. Yadernye Konstanty, 1, 1999, p.39.

A.V.Ignatyuk, A.I.Blokhin, V.P.Lunev, V.N.Manokhin, G.Ya.Tertychnyj, V.A.Tolstikov, K.I.Zolotarev, Evaluation of neutron cross sections for 241,-243 Am. In: Voprosy Atomnoi Nauki i Tekhniki, ser. Yadernye Konstanty, 1, 1999, p.25.

V.N.Manokhin, N.Odano, A.Hasegava, Consistent evaluation of (n,2n) and (n,np) reaction excitation functions for some even-even isotopes using empirical systematics. Report JAERI (in press).

A.I.Blokhin, A.S.Badikov, A.V.Ignatyuk, V.P.Lunev, V.N.Manokhin, G.Ya.Tertychnyj, K.I.Zolotarev, Evaluation on neutron cross sections for 242-244 Cm. In: Voprosy Atomnoi Nauki i Tekhniki, ser. Yadernye Konstanty, 2,1999, p.53.

A.I.Blokhin, N.N.Buleeva, V.V.Vozyakov, M.V.Mikhailyukova, S.M.Nasyrova, BOFOD-99: Recent status of evaluated photonuclear data. In: Voprosy Atomnoi Nauki i Tekhniki, ser. Yadernye Konstanty, 2,1999, p.95.

Nuclear Structure and Reaction Data Center

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Progress Report
to IAEA Advisory Group Meeting on Network of Nuclear Reaction Data Centers

15-19 May 2000, Obninsk, Russia

Our EXFOR activity had two main directions:

Compilation for A-library.

After Vienna-99 Technical meeting A046 and A047 TRANSes were prepared. The TRANes contains monitor reaction data, astrophysical data and corrections of some old entries. Astrophysical data compilation will be continued in this year. We would like to compile Bochum's group publications. The group published very many papers regarding to stellar energy sources. The measurements of Bochum's group are well grounded.

Team work with the NEA Data Bank.

New 180 entries were prepared after Vienna-99 Technical Meeting. Some entries we transmitted for T-Library, but majority of prepared entries will be included in O-library. The entries contain differential and integral data oriented for nuclear waste transformation and medical applications.

B-Library correction is finished, but we are waiting very many remarks because EXFOR rules are changing constantly. The library will be put in PRELIM after the meeting, if our meeting will not adopted new essential changing for EXFOR.

WEB access to catalogue of ICPND was created on CDFE site (depni.npi.msu.su) by combined efforts of CAJAD and CDFE. More detail information on the item can be found in CDFE's progress report. We have plan to include another partial catalogues (may be, neutron production cross-section or isomeric ratios) with suitable data. The content of the site is discussed now. At the site we plan to put calculated internal conversion probabilities for isomer transitions of low energies, less than 3 KeV. The data were not published. Only short report, which contains calculation method, was published. The data are needed to analyze conversion electron spectra on outer atomic shells. Similar spectra are very useful to understanding interatomic interactions in solid states.

About some difficulties of our users:

These difficulties can be divided into two groups.

First group. We constantly have questions from our users on type of the data, which are presented in EXFOR. They arise at the people, which try to build models of nuclear reactions, which produced by particles with intermediate energies, when the products are far from a valley

of stability. Lack of the exact information about a type of the measured cross section and details of experiment create these questions, in many cases.

Moreover, there are cases, when the authors of the publication incorrectly specify type of measured cross section (CUM or IND) or incorrect sequence of isomeric states are presented. These mistakes are connected, as to incompleteness of information about radioactive processes on the moment of the publication of research, or with direct mistakes of the authors. It is valid, when in an experiment the cross sections of formation of several tens nuclides are determined, the authors not always have an opportunity in details to analyze genetic connections of obtained products. This task is not always simple. It is enough to mention, for example, Tb-150, which formation in the ground state can be only CUM/M-, and in isomeric state is IND only. In our practice there are some cases, when the authors, not only Russian, asked to check up correctness them IND and CUM before the publication of results.

The second source of similar difficulties is unwillingness of the users to study LEXFOR. They have enough work without it. Therefore they require the "redundant" information. From our colleagues, we have remarks constantly, that the redundant information complicates work of the search programs. It is certainly correct, but the absence of the redundant information complicates work of the users.

Whose interests to us are more important? My opinion, that interests of our users.

Second group. The experimentalists have another problems. The development of experimental technique of measurements of cross-sections short-lived nuclides has given rises new difficulties. In many cases from measurements of gamma-spectra to determine cross section is impossible, as decay scheme is unknown.

It especially frequently meets for odd nuclides. Let’s consider, for example, 188-Au. Its half-life is 8.8 minutes, and product of its decay is 188Pt. Now in ITEP, where the measurements of production cross sections short-lived nuclides are adjusted, the measurements for 188-Au and lot of other isotopes are made. But the determination of cross-section is impossible, because the relative probability gamma radiation is known only. It, in turn, is connected with absence of measurements of probability of decay to ground state of a daughter nucleus. Sometimes we manage to help the experimentalists, but in most cases it appears impossible.

The experimentalists, who study radioactive transformations, similar problems do not disturb. Their efforts are directed on search of bands, superdeformation and other interesting characteristics. And such "trivial" characteristic, as probability of transitions between the ground states remains outside of a field of their interests.

Therefore we address to our colleagues, which can influence on financial distribution for radioactive processes investigations, to take into account needs of modern experiment and theories of nuclear reactions. They could ask the experimenters to not neglect definition of the "trivial" characteristics of radioactive decays.

The IAEA NRDC Network MSU INP CDFE Nuclear Data Activities

I.N.Boboshin, A.V.Varlamov, V.V.Varlamov, E.M.Ivanov, N.S.Markov,
M.E.Stepanov, V.V.Chesnokov

Progress Report
to the IAEA Advisory Group Meeting (15 - 19 May 2000, Obninsk, Russia)
on the “Network of Nuclear Reaction Data Centres”

This report contains the **short review** of the works carried out by the CDFE concern the IAEA NRDC Network activities for the about **one year** period of time from the IAEA Technical NRDC Meeting (18 - 20 May 1999, Vienna, Austria) till now and the description of the main results obtained.

1. The **new CDFE EXFOR TRANS M029** has been produced and transmitted to the IAEA NDS. The TRANS contains 2 retransmitted (M0067 and M0431) and 17 new (Annex 1) ENTRYs (M0596 - M0612) with 73 data SUBENTs.

2. The third version of **Evaluated Photonuclear Data Library EPNDL3** included (Annex 2) altogether 21 evaluated photonuclear reaction cross sections for 6 (^{20,22}Ne, ^{54,56}Fe, ^{58,60}Ni) materials has been produced /1, 2/ in addition to 2 previously developed libraries EPNDL1 and EPNDL2 in accordance with the program of work of the IAEA Research Contract N 8839/R2 and transmitted to the IAEA NDS.

As a whole the CDFE EPNDL (EPNDL1 - EPNDL3) library includes now altogether 61 evaluated photonuclear reaction cross sections for 26 materials.

The new simple phenomenological model (SPM) developed for calculation of giant dipole resonance decay channels competition has been used /2/ for iron and nickel various photonuclear reaction cross section evaluation.

The three year Contract N 8839 has been completely finished, the Final Report has been sent to the IAEA.

3. The CDFE photonuclear data bases put upon the Web-site (**http://depni.npi.msu.su/cdfe**) before have been upgraded significantly by adding a new data to existed data bases and software improvement:

- in addition to the data collection of the CDFE data base **"Giant Dipole Resonance Parameters"** published before /3/ as the Table "Parameters of the giant dipole resonances" **213 new entries** and **234 new** reaction **cross sections** have been added; the last data base version includes now altogether **1530 entries and 1080** various photonuclear reaction cross section EXFOR data sets are available now in forms of both table and graph;
- the new CDFE Web-site **Search Engine** has been produced for the data base **"Giant Dipole Resonance Parameters"** using the MySQL data base management system (DBMS) instead of former hypertext data presentation: the search for reaction target nucleus Z and A parameters, reaction designation (combination of initial and outgoing particles), GDR position energy, absolute cross section value and integrated cross section value, reference and/or year, first author name, and correspondent EXFOR SUBENT number is possible now for this data base;
- the new CDFE Web-site Search Engine is now under construction (MySQL data base

management system (DBMS)) for complete **Photonuclear Data Index** for period of time 1955 - 1998 in accordance with the Actions and Recommendations of the IAEA Advisory Group /4/: the search for reaction target nucleus Z and A parameters, reaction, incident particle energy, measured or deduced quantity, reference, year, and first author name would be possible for this data base;

- a new **charge-particle integral reaction cross sections catalogue** produced in accordance with Actions and Recommendations of the IAEA Advisory Group /5/ in co-operation with the CAJAD (Dr. F.E.Chukreev) has been put upon the CDFE Web-site using the hypertext data presentation; the first version of the Search Engine (MySQL DBMS) has been realised: the search for reaction target and product nucleus Z and A parameters, reaction designation (combination of initial and outgoing particles), initial particle energy range, and correspondent EXFOR SUBENT number is possible now for this data base.

4. The **relational nuclear spectroscopy data base NESSY** (New ENSDF Search SYstem) produced before /6/ for PC and compatible computers has been put upon the CDFE Web-site using the MySQL DBMS:

- configuration on both search conditions and output information is not limited;
- automatic formation of tables containing the search parameters can be included into the common query configuration:
  - Query_1 (ENSDF) $\Rightarrow$ Result_1,
  - Query_2 (Result_1) $\Rightarrow$ Result_2,
  - and so on;
- requests are posed by means of both values and the relations between them;
- arithmetical and other operations over searched values are possible.

5. All needed /7, 8/ CDFE contribution texts and correspondent data sets for the IAEA **Handbook on Photonuclear Data** have been prepared in accordance with the program of work of the IAEA Co-ordinated Research Program "Compilation and Evaluation of Photonuclear Data for Applications".

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Annex 1. CDFE EXFOR TRANS M029 contents (new ENTRYs)

ENTRY's Number	*Amount of DATA TABLEs*
M0596	5
M0597	12
M0598	4
M0599	16
M0600	2
M0601	4
M0602	2
M0603	4
M0604	2
M0605	3
M0606	2
M0607	4
M0608	2
M0609	3
M0610	2
M0611	4
M0612	2
Total: 17	**Total: 73**

Annex 2. Evaluated Photonuclear Data Library EPNDL3 contents

ENDF/B FORMAT	MAT	MF	MT	LINES	MOD	REACTION
^{20}Ne	1020	1	451	108	0	
	1020	3	4	45	0	γ,n
	1020	3	28	23	0	γ,np
	1020	3	103	34	0	γ,p
^{22}Ne	1022	1	451	87	0	
	1022	3	4	20	0	γ,n
	1022	3	103	30	0	γ,p
^{54}Fe	2654	1	451	74	0	
	2654	3	4	12	0	γ,n
	2654	3	16	9	0	γ,2n
	2654	3	28	10	0	γ,np
	2654	3	103	14	0	γ,p
^{56}Fe	2656	1	451	75	0	
	2656	3	4	13	0	γ,n
	2656	3	16	10	0	γ,2n
	2656	3	28	10	0	γ,np
	2656	3	103	13	0	γ,p
^{58}Ni	2858	1	451	72	0	
	2858	3	4	13	0	γ,n
	2858	3	16	9	0	γ,2n
	2858	3	28	10	0	γ,np
	2858	3	103	14	0	γ,p
^{60}Ni	2860	1	451	72	0	
	2860	3	4	13	0	γ,n
	2860	3	16	10	0	γ,2n
	2860	3	28	10	0	γ,np
	2860	3	103	14	0	γ,p
ORIGINAL LINE COUNT				**871**		
FINAL LINE COUNT				**871**		

The MSU INP CDFE
Programme, Priorities and Tasks
for 2000 - 2001

The MSU INP CDFE main **tasks** for the 2000 - 2001 period of time remain the following:

- photonuclear data compilation (using EXFOR) and evaluation (using ENDF);
- Photonuclear data Index appropriate annual additions;
- relational nuclear structure data base NESSY upgrade and improvement;
- charge particle reaction data cooperation with CAJaD.

The new nuclear data processing tasks are concerned to putting upon the CDFE Web-site some new charge particle reaction data bases in accordance with CDFE - CAJaD cooperation.

The main priority for 2000 - 2001 is the CDFE Web-site improving.

The 2000 - 2001 programme of work is the following:

- Photonuclear Data Index addition for 1999 - 2000 production and adding to the appropriate Web-site data base;
- Photonuclear Data Index Search Engine switching on;
- new photonuclear data EXFOR TRANS M030 production;
- increasing the data base “Parameters of Giant Dipole Resonances” amount of entries and correspondent EXFOR data sets;
- switching on the appropriate EXFOR data sets to the CDFE - CAJaD charge particle reaction cross section catalogue;
- relational nuclear structure data base NESSY upgrade using the new ENSDF version;
- Web-site relational data base NESSY Search Engine improvement (realization of all (majority at least) NESSY’s availabilities in Web);
- put upon the CDFE Web-site some new charge particle reaction data in accordance with CDFE - CAJaD cooperation.

China Nuclear Data Center (CNDC) Status Report

Zhuang Youxiang

1. General Situation

1.1 Evaluation

The major work at CNDC during 1996~2000 is the accomplishment of CENDL-3 (China Evaluated Nuclear Data Library, version 3).

In order to set up CENDL-3, the calculating codes for fissile, structure material and fission product nuclides, and calculating method and code have been established and improved; systematics research on input parameters of fission product nuclei has been done; some evaluated method and codes have also established and improved, including adjustment of consistency between natural element and its isotopes, plot and process of double differential cross sections and so on; adjustment method and code for energy balance of a complete data set have been researched and compiled.

CENDL-3 contains about 200 nuclides. Among them, the data of 157 nuclei will be newly or reevaluated: fissile nuclei 15 ($^{233\sim239}$U, ^{237}Np, $^{238\sim242}$Pu, ^{241,242}Am), structure material nuclei 34 (natural elements Ni, Cu, Zr, Hf, Pb and their isotopes, ^{23}Na, ^{Nat}Si), light nuclei 3 (^{6,7}Li, ^{9}Be), and fission product nuclei 105 (for example, ^{85,87,Nat}Rb, $^{136,138,140\sim144}$Ce). Most evaluations of them have been finished. The remainder will be done by the end of 2000.

1.2 Calculation

The UNF program system has been established. This code system includes UNF, SUNF, NUNF, CUNF, FUNF and GUNF. With the useful tools mentioned above the nuclides calculated are about 160 for the CENDL-3.

In the theoretical model the nuclear structure effect is taken into account for multi-particle emission processes. The calculated data include the discrete levels not only for the neutron emission but also for the charged particle emission. The gamma production data can also be calculated. Since the recoil effect is taken into account exactly to maintain the energy balance both in C.M.S. and L.S. in the model, so the energy balance is fully satisfied in the output files. The recoil effect can expanse the spectra of the outgoing secondary particle. If the recoil effect were not taken into account, the spectra would have unreasonable shapes.

Since the method of the double differential cross sections have been developed, so that the file-6 data for all of kind composed particle emissions can be obtained.

A new model has been developed for calculating all kind of reaction cross sections and double differential cross sections for neutron induced reactions on light nuclei. Therefore the file-6 can given in CENDL-3. The LUNF code is developed, in which the reaction mechanisms of processes and three-body breakup processes are involved.

2. Future work, manpower and priorities

2.1 Future work

The CENDL-3 will be accomplished by the end of 2000. Therefore the future work is multi-group constant generating and validation of CENDL-3, and much improvements will be made in microscopic data.

2.2 Staff

There are 17 senior scientists at CNDC. They are engaged in various work:
Neutron data evaluation - 5;
Nuclear theory and calculation - 4;
Charged particle and photonuclear data - 1;
Nuclear structure and decay data - 1;
Fission product yield - 1;
Parameter library - 1;
EXFOR, CINDA, Data format - 1;
Data service, library management - 1;
Group constant generating - 1;
Validation - 1.

2.3 Priorities

Due to the requirement of the international exchanges and financial limit, CNDC would like to enhance the co-operations on neutron, charged particle and photonuclear data with IAEA nuclear data section and other centers. This is the top priority for CNDC.

3. Publications

"Communication of Nuclear Data Progress" (CNDP) has been published for 22 issues by CNDC and Atomic Energy Press science 1989, and it has also been distributed by IAEA Nuclear Data Section as an INDC document.

Progress Report

NRDC Meeting (15 - 19 May 2000 Obninsk, Russia)
Charged Particle Nuclear Data Group, ATOMKI, Debrecen
F. Tárkányi, S. Takács, F. Szelecsényi, F. Ditrói, A. Fenyvesi. L. Andó

General

The Debrecen Nuclear Data Group is working in the Institute of Nuclear Research of the Hungarian Academy of Sciences (ATOMKI) in Debrecen (Hungary). Main field of the activity is the measurement, compilation and application of the low and medium energy charged particle induced nuclear reaction cross section data. The group is dealing with the all aspects of the CP cross section data i. e. measurement, compilation, evaluation and practical application. Direct experiences collected during the applications help in selection of the important tasks and complex investigation of the problems. The measurements and the compilations are carried out in broad range of international collaborations with cyclotron laboratories in Germany (INC, FZ Jülich), in Belgium (VUB Brussels), in Finland (Turku PET Center), in Japan (Tohoku University) and with theoretical groups in Russia (IPPE, Obninsk), China (CNDC, Bejing) to obtain recommended data.

Reference Charged Particle Cross Section Data Base for Medical Radioisotope Production

In the last period most of the nuclear data activity was connected to preparation of the Reference Data Base for medical isotope production. The data base contains 22 monitor reactions to monitor beam parameters of light bombarding particles, 16 reactions to produce single gamma diagnostic radioisotopes and 10 reactions for production of most commonly used PET isotopes. The Debrecen group took a significant part in the CRP, regarding the compilation of the nuclear data, the connected new experiments (see list of references), and finally the preparation of the technical document and in the electronic version of the database on the IAEA Web server.

A significant part of the results of the new measurements is already have been published (see references) or under publication. From our point of view the following conclusions and remarks can be deduced on the whole program, on the present status and on the future improvement of the data base:

- There are already numerous request for the data base, which underline the importance of the work.
- According to our knowledge it was the first attempt to produce a CP cross section data base for medical applications, which resulted in slower evaluating procedure.
- There was a fairly good collaboration between different contributors.
- It was repeatedly stated, that the status of the experimental data base of the charged particle induced reactions is poor.
- It was found, that a significant part of the experimental data still not compiled into the EXFOR.
- A very significant effort was done to produce the database, but the “quality” of the result is still far from the ideal one (and from the possibilities).

- The program, and the number of the evaluated reactions were too ambitious for the available limited time.
- It was practically impossible to use the results of the model codes to produce recommended data.
- In case of several reactions no recommended data can be given without new experiments.

For the future work the following recommendations can be given on the basis of the collected experiences and conclusions:

- Further experimental data are necessary in case of several important reactions.
- The quality of the database can be significantly improved by continuation of the evaluation process with fewer contributors.
- According to our opinion the evaluation process need to be continue immediately, because on the basis of the present results better quality data can be obtained , even with moderate additional effort. After one or two year nobody can remember the details, and the original data files can be cleared. Finally, due to the improved performance, better and more uniform evaluation can be done.
- The correction process requires about one- or two year works from one experimental and one theoretical group.
- The missing works have to be compiled into the EXFOR base.

Activity for development of other CP nuclear data base

Nearly thousand CP accelerators are working on different applications using activation method. On the basis of the broad range application of the cyclotron on industrial and medical field - in agreement with other groups- we came to the conclusion, that there are several other, non energy related, application fields, where the direct or indirect application of CP cross section data are important. It seems to be worthwhile to develop new dedicated CP data bases and to improve the existing ones:

- Extension and improvement of the database to monitor beam parameters is needed, and to put into WEB as separate database would be necessary.
- Extension and improvement of the existing data base for production of diagnostic radioisotopes (SPECT, PET), and putting into WEB as separate data base together with therapeutic radioisotopes(see next).
- Development of new data base for production of therapeutic radioisotopes and putting into WEB in common file with diagnostic radioisotopes. The application of the radioisotopes for radiation therapy is becoming more and more important. According to the last prognoses it will be one of the most prosperous field of the application of the radioisotopes in nuclear medicine. No attempt was made to compile and to evaluate the existing experimental data base, to see the status of the data, to propose new measurements and to produce recommended data base.
- Development of a new data base for standard cross section, and activation curve for wear, erosion and corrosion measurement using Thin Layer Activation technique(TLA). The data base can accelerate and make more easier and economic the calibration process. From other side it can help significantly in the planing phase for optimization of the irradiation circumstances. The list of the possible nuclear reaction is very numerous, but in the practice only limited nuclear reaction are used. Taking into account, that the most widely used

equipments are based on metals and on plastics, out of them the metals can be easily labeled with radioisotopes of acceptable half life. The status of the cross section data on metals are not so bad, therefore both the necessity, and the possibility underline the real development of the data base. Some preliminary attempts already was made to develop standard data on this field as a part a IAEA CRP, but the published results contain contradictory data with other earlier experimental results

- The existing data base for production of diagnostic radioisotopes contains the main production reaction, and the disturbing reactions on the same target isotope. No compilation and recommendation exist for the disturbing reactions on other stable isotopes of the same element. This side reactions are especially important when the target element is not mono-isotopic and/or the enrichment of the target is not satisfactory. The price of the enriched isotopes is strongly depended on the enrichment and on the real composition of the target material. The reliable cross sections allows to calculate with high accuracy of the yields both for the main reaction and for the unnecessary side reactions. Therefore the extension of the existing data base for production of medical radioisotopes with the contributing reactions on other stable isotopes of the same target element is also very important.

Regarding the above mentioned fields the compilation of the existing data has been started, in spite of the well known fact, that they are projects for more manpower and for broader cooperation.

Activity to prepare a "user guide" for measurement and application of integral charged particle cross section data

There is a broad range of the methods for measurement and application of charged particle cross section data in practice. The methods of measurements and the possible error sources are published mainly in old volumes of journals of basic sciences, usually unavailable for the users. The precise descriptions of a method of applications of cross section data are even in worst situation, because the definition of the quantities is not so strict, and different groups have different "habits" for application of the nuclear data. It was recognized during the preparation of the TECDOC of the Medical Isotope Production File, that there is disagreement even between the contributing compilators, in the question of the type of data to propose. The long list of reactions and the limited time did not allow us to prepare a user guide for the field of medical isotope production and CP beam monitoring. Our group has made already some steps in this direction. We have started drafting such a guide in the field of isotope production for medicine, CP activation analysis and Thin Layer Activation corrosion studies, but the task is not simple.

New measurements to complete CP data bases

In collaboration with other international laboratories we are participating in a systematic study of low and medium energy range cross sections in the field of:

- Production of radioisotopes for medical diagnostic.
- Production of radioisotopes for therapy.
- Commonly used reactions for thin layer activation technique.

- Commonly used monitor reactions and intercomparisions.
- Confirmation of experimental data base measured by Levkovski.

The list of the investigated reactions is based on the requirement of every day practice of the collaborating institutes, and on the problems obtained during compilations and data evaluations. The most of the new data are published in international journals (see references).

Compilation in EXFOR

The Debrecen CP Nuclear Data Group are collecting and compiling the CP cross section data measured in Debrecen and Jülich. In the last year this activity was temporary suspended, due to the overload by the evaluation program. With finishing the "first version" of the Medical Isotope Data base, the compilation process was restarted in this May. We hope that the missing work from Debrecen and Jülich will be compiled to the end of this year.

Nuclear data services

The Group continue to distribute compiled experimental charged particle data at low a medium energies for special request, needed mainly on non-energy related applications (medical isotope production, TLA, etc).

Staff

The staff consist of six "professional" physicist, working in different applications at the Debrecen cyclotron, and only in-part time (and with different intensities) on data compilations and other data oriented work. The main problem is, the lack of programmer and/or technician support , to put and to check the compiled data.

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Radiochemica Acta (in print)

RIKEN Nuclear Data Group

IAEA Advisory Group Meeting
on Network of Nuclear Reaction Data Centers
Obninsk, Kaluga reg., Russia,
15-19 May 2000

Y. Tendow

First of all, to our regret, we have to inform you all the member of NRDC network that our RIKEN Nuclear Data Group cannot be helped to discontinue its main activities as a group from this fiscal year (from April) on. Our group belongs to the Radiation Laboratory in RIKEN. Since last year the Radiation Laboratory had been receiving a review on its activities and organization on the occasion of the retirement of the laboratory head. As a conclusion, our Nuclear Data Group could not keep up adequate budget and manpower. We think we cannot be helped to withdraw from the membership of NRDC network. It is a great pleasure for us we could do a little contribution to the enrichment of the EXFOR database for this long term. We would like to express our great thanks to many people in IAEA NDS and all of the NRDC members for their constant support and encouragement.

RIKEN Nuclear Data Group has joined the NRDC network in 1983 in charge of collecting and compiling the charged particle nuclear reaction cross section data. In the first place, we limited our objectives to the production cross sections for twenty typical radioisotopes of medical use: ^{11}C, ^{13}N, ^{15}O, ^{18}F, ^{28}Mg, ^{52}Fe, ^{67}Ga, ^{68}Ge, ^{74}As, ^{77}Br, ^{82}Br, ^{77}Kr, ^{81}Rb, ^{82m}Rb, ^{111}In, ^{123}Xe, ^{127}Xe, ^{123}I, ^{124}I, and ^{125}I. Afterwards, we have a little widened the scope of collection to other important nuclides left off the EXFOR master file. Since our first TRANS had been transmitted in 1984, we have continued to compile EXFOR entries R001 through R053 containing a total of 479 subentries as shown in Table 1.

We also have continued the mass-chain evaluation and compilation of ENSDF for a long term. A part of this work (A = 129 evaluation) will be continued personally from this time on.

NSR compilation of Japanese secondary sources will also be continued only for this fiscal year.

Compilation of 1999 secondary sources published in Japan has been carried out last year. A total of 97 works from seven Annual Reports has been compiled into NSR files and will be sent to the NNDC.

RIKEN Accelerator Progress Report 1998	32 (reports)
JAERI-TANDEM, & V.D.C. Annual Report 1998	18
JAERI-TIARA Annual Report 1998	2
RCNP Annual Report (Osaka Univ.) 1998	18
OULNS Annual Report (Osaka Univ.) 1998	16
UTTAC Annual Report (Univ. Tsukuba) 1998	5
CYRIC Annual Report (Tohoku Univ.) 1998	6

Table 1

Entry Number	Subentries	Comment
R001	16	Mass dependence of production σ for Xe isotopes
R002	2	Excitation func.for I-123
R003	2	Yield for Xe-123
R004	5	Excitation func.for (α, n), (α, 2n) reactions
R005	5	Production σ for Xe isotopes
R006	2	Yield for I-123
R007	5	Yield curves for I-121,123,125 production
R008	2	Yield for I-123
R009	4	Yield curves for Cs-123, Xe-123, I-123
R010	2	Excitation func.for C-11
R011	10	σ(θ) for C-12(He-3, α)C-11
R012	24	σ(θ) for C-12(p, d)C-11
R013	20	σ(θ) for N-14 levels
R014	24	σ(θ) for C-11,12, Mg-23,24, Si-27,28, Ca-39,40, Cr-49,50 levels
R015	47	σ(θ) for (He-3, α) reactions
R016	15	σ(θ) for (He-3, α) reactions
R017	4	Relative yields for Be-7, B-10 production
R018	3	Excitation func.for C-11, Be-7
R019	37	σ(θ) for B-11, C-11,13, N-13,15, O-15,16,17, F-17 levels
R020	17	σ(θ) for (p,d) reaction residuals C-11, N-13, O-15, Ca-39, Zr-89 levels
R021	14	Excitation func.for C-11, O-15, Si-27, Ni-57
R022	10	σ(θ) for (He-3, d) , (He-3, α) reactions
R023	4	Excitation func.for F-18 production
R024	3	Excitation func.and yields for I-123
R025	11	Excitation func.for C-11, Be-7, Li-6
R026	3	Excitation func.for C11
R027	2	Yields for N-13
R028	22	σ(θ) for O-15 levels through (α, n) reaction
R029	5	Excitation func.for Rb-81, Kr-81m
R030	3	Yields for Br-76,77
R031	2	Yields for Rb-81g, m production
R032	4	Yields for Br-75,77 production
R033	9	Yields for Br-75,77 production
R034	5	Yields for Ge-68,69, Zn-65, Co-57 production
R035	void	Deleted
R036	10	Excitation func.for As-71,72,73,74, Ge-68,69, Ga-66,67, Zn-65
R037	9	Excitation func.for Ge-66,67,68, Ga-66,67
R038	9	Excitation func.and yields for Cl-38, Cu-61,64,67, Ga-66
R039	13	Excitation func.for Ga-65,66,67,68, In-109,110,111, Cd-109
R040	3	Relative yields for Ga-66,67 production
R041	14	Excitation func.for Zn-64(He-3, X) reactions
R042	9	Excitation func.for (d, p), (d, 2n) reactions
R043	2	Excitation func.and absolute σ for O-16(p, α)N-13 reaction
R044	4	Excitation func.for B-10, O-16, F-19(He-3, X) reactions
R045	7	Excitation func.for Ca-40,42,43,48(d, X) reactions
R046	2	Excitation func.for As-75(d, X) reactions
R047	2	Excitation func.for Zn-68(p, 2p) reaction
R048	5	Excitation func.for Mo-92,100(α, p), (α, n) reactions
R049	5	Excitation func.for Cd-116(α, X), (He-3, X) reactions
R050	4	Excitation func.for Au-197(d, xnyp) reactions
R051	void	Deleted
R052	10	Excitation func.for Ho-165, Er-164,167(α, X) reactions
R053	28	Excitation func.for (he-3, X), (α, X) reactions
Total	479	

Japan Charged-Particle Nuclear Reaction Data Group (JCPRG)

Progress Report to the NRDC Meeting
May 15-19, 2000

The Executive Committee of JCPRG

General

In 1999, we have carried out the following businesses:

1. Compiling the CPND(Charged Particle Nuclear Reaction Data) produced In Japan with the NRDF(Nuclear Reaction Data File) format,

2. Translating the NRDF data into the EXFOR data,

3. Making retrieval systems using internet and the InteligentPad for the CPND in both of NRDF and EXFOR,

4. Distributing the CPND and promoting utilization in Japan.

5. Shift of the NRDF system from computer of the Hokkaido University Computer Center to UNIX system of the Laboratory Workstation.

In 1999 much of our effort was concentrated on the third and fifth subjects mentioned above. The details of the work will he reported later. This year (2000), we will complete a new electric editor system for compiling and inputting the NRDF data and a revised version of the EXFOR translation system.

NRDF Data Compiling Activity

In 1998 we newly compiled l4 entries (457 tables, 1.2 MB) based on the data obtained with the accelerators in Japan. Their data were produced in the following institutes:

• Tohoku Univ.(CYRIC)-1 entry

• KEK(Tanashi Accelerator)-4 entries

• Research Center for Nuclear Physics, Osaka Univ. (RCNP)-6 entries

• RIKEN Accelerator-3 entries

By March of 2000 the amount of the compiled data has reached 25,567 tables of about 72.66 MB. Our aim is to store all data produced with Japanese accelerators in the NRDF database.

EXFOR Translation from NRDF

In 1999, we made the TRANS E018 file which included 8 entries translated from NRDF data. For these entries sent to IAEA on May of 1999, we received some comments on June. After studying the comments, we had the conclusion that it is necessary to update the translation system based on the EXFOR archival dictionary and the new compilation rules of EXFOR. However, a new version of the transition system has not yet completed. Therefore, the E018 entries including some troubles are still in a pending stage.

In 2000 we plan to complete the revised translation system on the workstation. By using the new translation system, we are expecting to make EXFOR data files from NRDF data smoothly.

Customer Services

Retrieval services of NRDF and EXFOR data are available by using computers in the Hokkaido University Computing Center. In addition to these services, the WWW homepage (http://nucl.sci.hokudai.ac.jp/~nrdf/index.html) has been opened to public. In order to extend the NRDF data service, we have started to make a developed retrieval system based on the IntelligentPad.

ANNEX: Organization and members of JCPRG

Advisory committee:

Yasuhisa ABE (Research Institute for Fundamental Physics, Kyoto Univ.)
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NRDF System Maintenance:

Akira OHNISHI (HokkaidoUniv.)

Working Staff of Making a Data-base based on IntelligentPad:

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Hiroshi MASUI (Hokkaido Univ.)

Working Staff of Making a Compiling Editer System:

Hirokazu OHMI (Hiokkaido Univ.)

Present Status of JENDL Project

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1. JENDL-3 revision 3 (JENDL-3.3: General Purpose File)

The second revised version of JENDL-3 (JENDL-3.2) was released in June 1994. It contains the data for 340 nuclides in the energy range from 10^{-5} eV to 20 MeV. The ENDF-6 format was adopted. The pointwise files were also constructed at 0 K and 300 K by using RESENDD, RECENT, LINEAR and SIGMA1.

Though JENDL-3.2 gives much better evaluated data than JENDL-3.1, JENDL-3.2 has no covariance matrices. We recognize importance of the covariance matrices. A new working group has been organized in Japanese Nuclear Data Committee (JNDC) for studying of evaluation method of the covariance matrices. To meet the requests from FBR reactor projects, several materials have being compiled by this group.

The benchmark tests have shown that JENDL-3.2 gave much better prediction of various reactor characteristics than JENDL-3.1, though some problems have been pointed out. Up to now a lot of experiences has been piled up. To reflect these feedback information to JENDL-3.3, a new task force was organized to summarize the problems of JENDL-3.2 at April 1996. A report indicating the direction of revision for JENDL-3.2 was submitted to JNDC by the group after one year survey. It was approved by the steering committee of JNDC at March 1997.

The data improvement of JENDL-3.2 has been started at April 1997. JENDL3.3 will be published as a consolidated new version of JENDL by JAERI NDC (Nuclear Data center) with the cooperation of JNDC (Japanese Nuclear Data Committee) in FY2001. It's main features are followings:

1) Covariance data supplemented for major elements such as major actinides, structural materials and main coolants for the applications of FBR, LWR and Fusion reactors, to enable the estimation of quantitative contribution of nuclear data uncertainty to design accuracy or safety margin. No covariance data were supplied up to the JENDL-3.2.

2) New material evaluations such as Er for burnable poisons in LWR high burn-up applications.

3) Adoption of isotope evaluation policy rather than natural element evaluation policy. Up to JENDL-3.2 for natural elements JENDL was prepared by natural element evaluation policy, i.e., for the transport calculations in nuclear reactors, natural elements data are recommended to use and for the dosimetry or activation applications isotope evaluations are recommended to use. We want to keep this isotope evaluation policy as far as possible, for some elements, however, we have to make natural element file due to maintaining the evaluation accuracy.

4) Among others, addition of gamma-ray production data for the materials needed in Fusion applications.

5) Individual Evaluation

a. Heavy Nuclides (Modified Cross-sections)

A simultaneous evaluation of fission cross-section of U-233, U-235, U-238, Pu-239, Pu-240 and Pu-241 was made. A least squares method was applied to selected absolute and relative measurements on the fission cross sections. Covariance matrices of the experimental data were constructed from the uncertainty information reported in the references.

U-233: URR(Un-Resolved Resonance), (n,2n), (n,3n) and nu.

U-235: RR(Resolved Resonance) (Leal new evaluation), URR, (n,2n), (n,3n), (n,4n), nu and fission spectrum evaluated by multi-mode fission model.

U-238: (n,2n),(n,3n),(n,4n), capture in MeV range, partial level inelastic scattering.

Pu-240:RR, URR, (n,2n),(n,3n),(n,4n) and partial level inelastic scattering.

Pu-242:RR(fission width), (n,2n),(n,3n) and partial level inelastic scattering.

Problem of neutron emission spectrum is solved by GNASH+GAMFIL calculation.

Capture cross section in MeV rage is calculated by newly developed code DSD calculating of Direct/Semi-Direct Capture cross-sections.

b. Medium Mass Nuclides

Na: inelastic cross section (Geel + TNG code calculation).

Ti-46,47,48,49,50: threshold reaction, gamma production, elastic scattering angular distributions.

V: RR, total cross section above 100 keV by Geel data and gamma production data.

Cr-50,52,53,54: RR and gamma production data.

Fe-54,56,57,58: RR, total, capture in MeV range calculated by TNG including pre-equilibrium capture.

Co-59: RR, total, gamma-production.

Ni-58,60,61,62,64: inelastic, threshold reaction, neutron emission spectra using SINCROS code.

Nb-93: capture gamma reflecting pre-equilibrium.

W-182,183,184,186: RR, threshold reaction, gamma production data.

Er-162,164,166,167,168,170: Complete new evaluation reflecting newly obtained measured data by TIT.

The data will be released after the review including vast range benchmarks for all of the reevaluated nuclides.

2. JENDL Special Purpose Files

The following special purpose files other than JENDL-3.3 general purpose file are being developed in Japan. Their status is given below.

JENDL Fusion File

JENDL Fusion File(JFF) was released at March 1996 to provide precise double-differential neutron and charged particle emission data by using MF6 representation of the ENDF-6 format. The evaluation was made for the data of H, D, Li, Be, C, N, O, ^{19}F, ^{27}Al, Si, Ca, Ti, Cr, ^{55}Mn, Fe, ^{59}Co, Ni, Cu, ^{75}As, Zr, ^{93}Nb, Mo, Sn, Sb, W, Pb and ^{209}Bi. For H, D, Li, N and O, the data of JENDL-3.2 are directly adopted. The revision works for the nuclides excepting the light mass ones have been performed by the SINCROS-II code system which consists of GNASH, DWUCK, CASTHY and several auxiliary programs. Those results are examined by comparing with DDX measured at Tohoku and Osaka Universities. For the data of light mass nuclei, individual evaluation has been done. A lot of nuclides are adopted as FENDL-2 from this file. Complete version of JFF96 was released in the FY98.

JENDL Actinide File

This file will provide the data of about 90 nuclei in the actinide region from 10^{-5} eV to 20 MeV. Data for about 60 nuclei will be taken from JENDL-3.2 with some modification. We need complete new evaluation work for about 30 nuclei. Up to now the evaluations have been completed for U-235, U-236, U-238, Np-235, Pu-237, Pu-238, Pu-239, Pu-240, Pu-241, Pu-244, Pu-246, Am-242, Am-242m, Am-243, Cm-240, Cm-241, Cm-242, Cm-243, Cm-244, Cm-245, Cm-246, Cm-247, Cm-248, Cm-249, Cm-250, Bk-247.

Since 1994, International Science and Technology Center (ISTC) project for Measurements and Evaluation of miner actinide nuclei has been started at Institute of Physics and Power Engineering (IPPE, Obninsk Russia, #304), V.I. Khlopin Radium Institute (KRI, St.Petersburg Russia, #183) and Radiation Physics and Chemistry Problem Institute (RPCPI, Minsk Belarus, #b-03). After that the forth project started to measure fission cross-sections of minor actinides in medium energy range, i.e.,1 to 200 MeV by .St.Petersburg Nuclear Physics Institute (PNPI St.Petersburg, #609) And a new project of actinide nuclear data evaluation for Th cycle started this April (RPCPI, Minsk Belarus, #B-404). The results obtained by these projects will be reflected in JENDL Actinide File. The file release will be envisaged in FY2001 material-by-material bases. Summary record about ISTC is given in Appendix A.

JENDL Dosimetry File

The working group on dosimetry in JNDC which is working for JENDL Dosimetry File has been published a new file. The cross section data for more than 20 reactions was revised and their covariance matrices were replaced with new ones. Integral tests were also made. The file was released in FY99 as JENDL-D99 and the data are also released with a CD-ROM. Contents are 67 reactions with pointwise and 641 group structures data.

JENDL Activation Cross Section File

Evaluation and compilation work for JENDL Activation Cross Section File has been completed and released in March 1996 as JENDL-A96. This first version stores the data for 233 nuclei and 1246 reactions. Final report is under preparation. Revision of the files is foreseen near future for the feedback information from the ad hoc group for threshold reaction evaluation working group.

JENDL High Energy Files

The evaluation of data for high energy neutrons and protons has been initiated in JNDC. They will make data files for neutrons and protons up to 50 MeV and about 3 GeV.

The former files will be used for the IFMIF project which JAERI participates. The evaluation of neutron data up to 50 MeV has been made for almost all necessary nuclides. The evaluation results for neutron are being reviewed. After review, the data will be combined with JENDL Fusion File or JENDL-3.2 below 20 MeV. The file release will be envisaged in FY2000.

The latter files will be used for design of accelerators, transmutation systems of high-level waste, medical applications and so on. The evaluations of Al, Si, Cr, Ni, Cu, Pb and Bi isotopes were made for neutron and proton induced reactions up to 3 GeV. The neutron nuclear data for hydrogen are also completed. These data will be reviewed. The file release will be envisaged starting at FY2000.

JENDL PKA/KERMA File

This file stores the spectra of primary knock-on atoms (PKA) and KERMA factors. The data to be stored are created from the data files(JENDL High Energy File) up to 50 MeV made for the IFMIF project. A couple of processing codes to create the file from evaluated nuclear data file, by using the effective single particle emission approximation, have been developed and tested.

The test compilation has been performed from JENDL Fusion File for the 69 isotope data except light mass nuclei below 20 MeV. The file release will be made in FY2000.

JENDL Photonuclear Data File

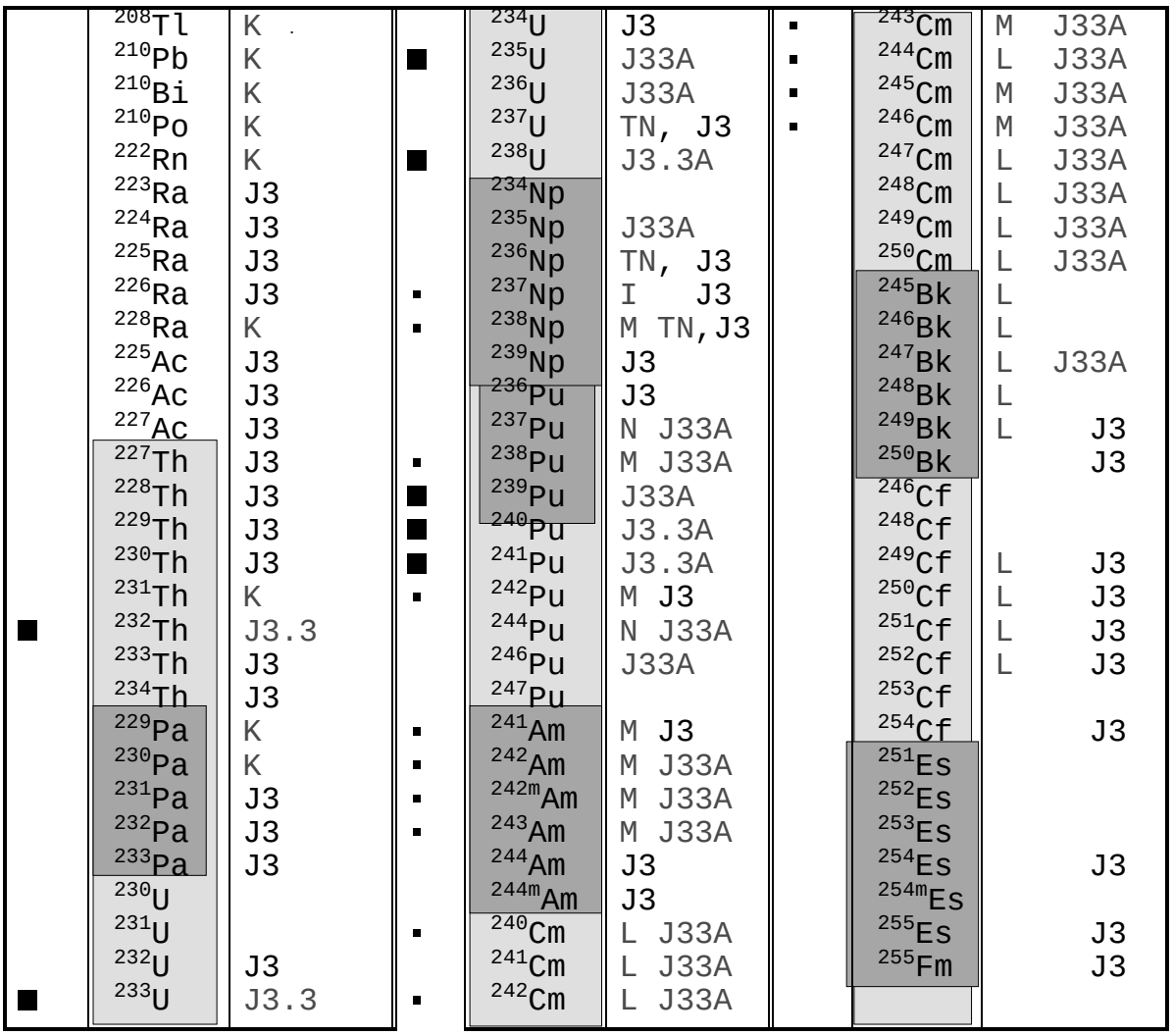
The evaluation has been finished for 46 isotopes; ^{2}D, ^{12}C, ^{14}N, ^{16}O, ^{23}Na, ^{24,25,26}Mg, ^{27}Al, ^{28,29,30}Si, ^{40,48}Ca, ^{46}Ti, ^{51}V, ^{52}Cr, ^{55}Mn, ^{54,56}Fe, ^{59}Co, ^{58,60}Ni, ^{63,65}Cu, ^{90}Zr, ^{93}Nb, ^{92,94,96,98,100}Mo, ^{133}Cs, ^{160}Gd, ^{182,183,184,186}W, ^{197}Au, ^{206,207,208}Pb, ^{209}Bi and ^{235,238}U in the gamma-ray energy range up to 140 MeV. Their compilation in the ENDF-6 format and the critical review are in progress. The file will be released in FY2000.

3. Other Activity Relating to Nuclear Data

1) The 1999 Symposium on Nuclear Data

The 1999 Symposium on Nuclear Data was held at Tokai Research Establishment, Japan Atomic Energy Research Institute (JAERI), on 18th and 19th of November 1999. Japanese Nuclear Data Committee and Nuclear Data Center, JAERI organized this symposium. In the oral sessions, presented were 18 papers on keynote address, nuclear data measurement for long-lived RI and in medium energy region, status of JENDL, international session and other topics. In the poster session, presented were 46 papers concerning experiments, evaluations, benchmark tests and on-line database on nuclear data. Those presented papers are compiled in the proceedings published as JAERI-conf 2000-005, INDC(JPN)-183/U (2000). Total of 157 attendees including 17 foreigners, 102 outside JAERI were gathered.

Fig.1 Expected Contents of JENDL Actinoid File



	^{208}Tl	K		^{234}U	J3	▪	^{243}Cm	M	J33A
	^{210}Pb	K	■	^{235}U	J33A	▪	^{244}Cm	L	J33A
	^{210}Bi	K		^{236}U	J33A	▪	^{245}Cm	M	J33A
	^{210}Po	K		^{237}U	TN, J3	▪	^{246}Cm	M	J33A
	^{222}Rn	K	■	^{238}U	J3.3A		^{247}Cm	L	J33A
	^{223}Ra	J3		^{234}Np			^{248}Cm	L	J33A
	^{224}Ra	J3		^{235}Np	J33A		^{249}Cm	L	J33A
	^{225}Ra	J3		^{236}Np	TN, J3		^{250}Cm	L	J33A
	^{226}Ra	J3	▪	^{237}Np	I J3		^{245}Bk	L	
	^{228}Ra	K	▪	^{238}Np	M TN,J3		^{246}Bk	L	
	^{225}Ac	J3		^{239}Np	J3		^{247}Bk	L	J33A
	^{226}Ac	J3		^{236}Pu	J3		^{248}Bk	L	
	^{227}Ac	J3		^{237}Pu	N J33A		^{249}Bk	L	J3
	^{227}Th	J3	▪	^{238}Pu	M J33A		^{250}Bk		J3
	^{228}Th	J3	■	^{239}Pu	J33A		^{246}Cf		
	^{229}Th	J3	■	^{240}Pu	J3.3A		^{248}Cf		
	^{230}Th	J3	■	^{241}Pu	J3.3A		^{249}Cf	L	J3
	^{231}Th	K	▪	^{242}Pu	M J3		^{250}Cf	L	J3
■	^{232}Th	J3.3		^{244}Pu	N J33A		^{251}Cf	L	J3
	^{233}Th	J3		^{246}Pu	J33A		^{252}Cf	L	J3
	^{234}Th	J3		^{247}Pu			^{253}Cf		
	^{229}Pa	K	▪	^{241}Am	M J3		^{254}Cf		J3
	^{230}Pa	K	▪	^{242}Am	M J33A		^{251}Es		
	^{231}Pa	J3	▪	^{242m}Am	M J33A		^{252}Es		
	^{232}Pa	J3	▪	^{243}Am	M J33A		^{253}Es		
	^{233}Pa	J3		^{244}Am	J3		^{254}Es		J3
	^{230}U			^{244m}Am	J3		^{254m}Es		
	^{231}U		▪	^{240}Cm	L J33A		^{255}Es		J3
	^{232}U	J3		^{241}Cm	L J33A		^{255}Fm		J3
■	^{233}U	J3.3	▪	^{242}Cm	L J33A				

■ most important nuclide;
▪ important nuclide;
J3 JENDL-3.2 data available;
J3.3 JENDL-3.3;
J33A JENDL-3.3 & Actinide File (Evaluation completed);
M Maslov's evaluation;
I Ignatyuk's evaluation;
TN Nakagawa's evaluation;
K Nakajima's evaluation;
L Liu Tong and Nakagawa's evaluation.

Appendix A. Summary of ISTC project that JAERI participated with some funds, relating to the JENDL Actinide File

Objective: Improvement of minor actinide data for transmutation projects using actinide burner reactors or accelerator driven spallation neutron sources. 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.

ISTC projects:

- "Measurements of the fission neutron spectra for minor actinides". V.I.Khlopin Radium Institute (KRI St.Petersburg Russia, # 183-p), 1995-1997.

High precision measurements of the fission neutron spectra for spontaneous fission of Cm-244, -246, Pu-240 -242, and that for thermal induced fission of Cm-243, -245

- "Measurements and analysis of basic nuclear data for minor actinides". Institute of Physics and Power Engineering (IPPE Obninsk, #304-p), 1995-1996.

Precise measurements of the fission cross sections of Cm-243, -244, -245, -246, -247, -248m, Am-242m, Pu-238.
Measurements of fission product yields for Np-237.
Measurements of inelastic scattering and prompt fission neutron spectra for Np-237.
Measurements of delayed neutron yields and it's 6-group constants for Np-237 fast neutron fission.
Critical comparison between evaluated data for BROND-2, JENDL-3 and ENDF/B-VI and deduction of recommended values.

- "Evaluation of actinide nuclear data". Radiation Physics and Chemistry Problems Institute (RPCPIMinsk Belarus, # b-03), 1995-1998.

Complete new evaluations of neutron cross sections for Cm-243, -245 -246, Am-241, 242, 242m, 243, Np-238, Pu-238, -242.

- "Neutron induced fission cross-sections of some actinides heavy nuclei in energy region 1-200 MeV. Petersburg Nuclear Physics Institute (PNPI St.Petersburg, #609), 1996-1999.

Measurements of neutron fission cross-section of U-233, U-238, Np-237, Th-232, Pu-239, Pb and Bi in the energy range up to 200 MeV.
Relative measurements to U-235 fission with accuracy 3-10%.
Evaluation of above listed cross section for neutron and proton induced fissions in the energy range 20-200 MeV.

Other ISTC Project relating to Nuclear Data:

- "Benchmark Data on Gamma-ray Production For Fusion Application", Institute of Physics and Power Engineering (IPPE Obninsk, #731), 1997-2000

Measurements and evaluations of the benchmark data on gamma-ray production cross section in the fast neutron induced reactions for materials that are most important for fusion power applications.

Measurements anticipated are 32 structure materials at 14 MeV. (For 1st year: Li-6,-7, B-10,-11, C, N, O, Al, Si, Fe, Cu, Mo,W, Pb were measured.). The data will be available in EXFOR

Format.
Evaluations in ENDF-6 Format will be made for most important 20 nuclides.

- "Experimental and Theoretical Study of the Yields of Residual Product Nuclei Produced In thin Targets Irradiated by 100-2600 MeV protons", Federal Scientific Center of Russia Institute for Theoretical and Experimental Physics (ITEP Moscow, #839), 1997-2000.

Residual product nuclei measurements from spalation by high energy proton beam for thin targets of ^{182}W, ^{183}W, ^{184}W, ^{186}W, ^{232}Th, ^{nat}U, ^{99}Tc, ^{59}Co, ^{63}Cu and ^{65}Cu . The proton energies are 100, 150, 200, 800, 1000, 1200, 1400, 1600 and 2600 MeV.
To get the reference data to check the simulation code such as LAHET, ALICE, QMD, etc.

- "Nuclear Physics Investigation Aimed at the Solution of Weapon Plutonium Conversion and Long-lived Radioactive Wastes Transmutation Problems ", Russia Federal Nuclear Center All-Russia Scientific Research of Experimental Physics (VNIIFF Sarov, #1145), 1998-2000.

Measurements of the cross sections necessary for the transmutation technologies and electro-nuclear energy production system on the basis of high-current proton accelerator.
Cross sections of a wide range of isotopes for minor actinides of Np, Pu, Am and Cm in the fast and intermediate neutron spectra.
Thermal cross section for neutron induced fission and radioactive capture of Np-238(T1/2 = 2.12 d).
Spectra of fast fission neutrons from Th, U, Np and Pu by 40-200 MeV protons.

- "Evaluation of actinide nuclear data", Radiation Physics and Chemistry Problems Institute (RPCPI Minsk Belarus, # B-404), 2000-2002.

Complete new evaluations of neutron cross sections for Th-232, Pa-231,Pa-233, U-232, U-233, U-234 up to 20MeV.
New evaluations of neutron cross sections for U-238 and Pu-239 up to 150 MeV.

Center of Nuclear-Physics Data (CNPD) RFNC-VNIIEF

Status report on the IAEA Advisory Group Meeting, May 15-19,2000

S.A. Dunaeva

Russian Federal Nuclear Center - VNIIEF
Russia, 607190, Sarov, Nizhnij Novgorod region, pr. Mira 37

The tasks of the center are:

- compilation of the experimental nuclear data;
- cross section estimation of the nuclear reactions;
- upgrade and establish software for operation with nuclear data;
- distribution of the nuclear data;
- creation of the task-oriented databases.

Compilation.

At the last year we are still correcting and transferring data from our library to EXFOR format and compiling new experimental works.

Data compilation and correction have been made using VMS operating system with the help of the NNDC software.

A total of 89 EXFOR entries for charged particle induced experiments were compiled and transmitted to the other data centers at 1999. Unfortunately we could not make last TRANS with corrections. We continue work up all corrections and new entries.

Also we work in collaboration with NNDC at the T series data compilation.

We continue neutron data compilation in collaboration with CJD. Now we compile γ-total cross sections of the inelastic interaction of the 14 MeV neutrons with C, O, Mg, Al, Fe, Cu, Zr, Mo, W and Pb nuclei according to the ISTC project #731.

Evaluation.

The γ-total cross section evaluation of the 14 MeV neutrons of the inelastic interaction with Al, Fe, Cu, ^{11}B, ^{10}B and Pb nuclei was done according to the ISTC project #731. The results were discussed on the International Conference on Radiation Shielding in Japan.

Also the cross section adoption of the charged particles interaction with Be, B and O nuclei was done. The results we re published in the "Nuclear Constants" series, VANT.

Data distribution.

Nuclear data were distributed in the other institutes. Most of them are from Russia or Former Soviet Union.

Software.

At the last year a new version of the EXFOR and NSR software were installed. Previously the NSR software used only for the whole data exchange. In this situation the exchange is available only by DEC-tape. But this way is the old one. In the age of Internet we may transmit data by it and add databases in time. But it is difficult to transmit the whole database and it isn't need. We discussed this problem with David Winchell from NNDC, who is developer of this software. We reached the agreement with David, about transmission of the new software. New version of the NSR software supports partly addition of the database only by new data. We

appreciate David for help, supporting and submitting new software to our Center. Now we haven't problems with the current updating NSR database.

We continue developing the software for supporting evaluated databases in the Windows NT. About this software we discuss separately with it demonstration on the computer.

Task-oriented databases

At The December 1999 electronic version of the experimental and evaluated data on charged particles for fusion application (SaBa) was submitted to IAEA. Sohpia Taova will demonstrate it on the computer and tell about it developing in details.

At the November 1999 database for Customs application was developed in our Center. It contains the most important information that customers need for checking of the radioactive and fissionable materials that go across the state border. Customs documentation and control for radioactive fission materials are the objects of this database.

The data from ENSDF about radioactive nuclei energy levels were included in the database as a part of information that is needed to customers in their work.

We plan to organize section on our institute site for these databases.

Staff

Five persons are working on the tasks in part-time. Next year ISTC project 1145 will be finish and our main problem now is to continue it.

1. Yu.Ya. Nefedov, V.I.Nagornyj, V.I.Semenov. R.A.Orlov, A.E.Shmarov. Results of measurements of gamma-production cross-sections and spectra inelastic interaction of 14 MeV neutrons with nuclei C, O, Mg, Al, Fe, Cu, Zr, Mo, W и Pb. Report abstract of Ninth International Conference on Radiation Shielding, October 17-22,1999,Tsukuba, Japan, p.230.
2. A.G.Zvenigorodskij, M.S. Shvetsov, A.M. Shvetsov, M.V. Savin, Yu.Ya. Nefedov. Evaluation of gamma production cross-section for inelastic neutron interactions with Al and Pb nuclei. Report abstract of Ninth International Conference on Radiation Shielding, October 17-22,1999,Tsukuba, Japan, p.228.
3. A.G.Zvenigorodskij, A.Livke, M.S. Shvetsov, M.V. Savin, Yu.Ya. Nefedov. Evaluation of gamma production cross-section for inelastic neutron interactions with iron nuclei. Report abstract of Ninth International Conference on Radiation Shielding, October 17-22,1999,Tsukuba, Japan, p.234.
4. L.M. Lazarev, B.M.Dzjuba, A.G. Zvenigorodskij, S.Skidan. Evaluated data and astrophysical S-factor of the p,γ reaction on the C, N, O nuclei. VANT, ser. Nuclear Constants, 1999, iss.1, p.71-96.
5. L.M. Lazarev, B.M.Dzjuba. Phase analysis of the pt, p^3He elastic scattering in the 0-20 MeV range. VANT, ser.Nuclear Constants, 1999, iss.1, p. 56-70.
6. A.G. Zvenigorodskij, V.A. Zherebtsov, L.M. Lazarev, S.A. Dunaeva, L.N. Generalov, S.M. Taova, E.V. Kamskaya, R.I. Marshalkina. The library of evaluated and experimental data on charged particles for fusion application. IAEA-NDS-191, December 1999.

The Status of Nuclear Data Activities in Ukrainian Nuclear Data Center

O. Gritzay

IAEA Advisory Group Meeting
on the
"Network of Nuclear Reaction Data Centers"
15-19 May, 2000, Obninsk, Russia

Introduction

UKRNDC was established in 1996. At the end of 1998 UKRNDC and Neutron Physics Department at Research Reactor (Institute for Nuclear Research, Kyiv) were merged together. The amount of neutron research works at reactor now is rather small, but we are sure that the raise of neutron work is in near future. Soon, we hope, our reactor will operate regularly and systematically. Tandem accelerator is close to its physical parameters and regular work. So, we see the future for our inputs in a world bank of experimental results.

Computer Network in UKRNDC

In the framework of STCU Project we developed the computer environment in our Center. Now it includes the Web-server (PC Pentium II, 400 MHz, 20 Gb) with the nuclear data bases for customers in our Institute and other organizations of Ukraine. This network includes also Unix Workstation ESCALA S120 (375 MHz, 4.5 Gb - fast and power European analog of RISK 6000, model 240) and 6 PC Pentiums connected into the local net. This local network is connected to the INR Server and is available to the assigned users in the Institute and others having the access to Internet (see the Figure).

This year we opened Web-site of our Center. One of the main aims of this site is the desire to facilitate the access to the basic nuclear databases for Ukrainian users, especially for beginners, as the proposed databases are located in our Web-server and this is the most short, fast and friendly way to necessary data (see Appendix 1).

By October 1999 we finished our contract with Slavutych Laboratory, where we helped to develop Nuclear Data Bank. Now, in practice, this is the mirror database of NNDC, USA. The last visit of NNDC representative (C.L. Dunford) for revision and updating was in December 1999. Now two Dec Alpha computers operate there (Open VMS, v.7.1 with databases and Dec Unix Workstation with RSICC codes). Now this Data Bank is under service of Slavutych Laboratory staff. The part of this staff was trained by our specialists during 1998-1999.

Work with Nuclear Data

Compilation of neutron experimental data from publications in Ukrainian editions started in 1998, after the training visit to NNDC (M. Vlasov). Now we prepared 5 entries (19 subentries) in EXFOR format to be included into CSISRS. This work continues. Two persons of our staff are engaged in this activity (see Appendix 2).

Activation Data Analysis

The special interest to activation data in our Center is connected as with the development

of Reactor Dosimetry in our Institute, so as with the experimental abilities to measure some important cross sections, for example reaction ^{93}Nb(n,n') ^{93m}Nb.

Using ZVView code (ver.9.0) the comparative analysis of IRDF files and the files from ENDF and CSISRS libraries for reactions ^{19}F(n,2n)^{18}F, ^{24}Mg(n,p)^{24}Na, ^{31}P(n,p)^{31}Si, ^{27}Al(n,p)^{27}Mg, ^{32}S(n,p)^{32}P, ^{45}Sc(n,gamma)^{46}Sc, ^{46}Ti(n,p)^{46}Sc, ^{47}Ti(n,p)^{47}Sc, ^{47}Ti(n,np)^{46}Sc, ^{48}Ti(n,p)^{48}Sc, ^{48}Ti(n,np)^{47}Sc, ^{52}Cr(n,2n)^{51}Cr, ^{54}Fe(n,p)^{54}Mn and ^{56}Fe(n,p)^{56}Mn was fulfilled. In the process we noticed 2 errata in EXFOR data (entry22312) and in BROND-2 library in ^{52}Cr (n,2n). Now we continue analysis of IRDF reactions. We hope to finish this work as an Atlas of cross sections for the most important dosimetry reactions with our comments and recommendations.

One recent result of this activity - Report on INR Annual Scientific Conference, January 2000: "Reactions of isotope cobalt-60 formation at interaction of neutrons with cobalt-59, nickel-60 and copper-63 (state of the art of neutron cross sections)" by M.F.Vlasov, O.O.Gritzay, L.E.Chervonna, V.V.Zerkin.

We consider as very important isotope in Nuclear Power practice – Co-60 and in this paper we examined the main reactions of it's production.

This paper is now placed at our Web-site.

Multigroup calculations

Using GRUCON code we calculated the first turn of multigroup (51) library for neutron transport calculations of neutron fluences on the outer surface of reactor vessel and it is now in practice on operating NPPs.

After 3 months training in RSICC (O.Gritzay) we started the work on new multigroup library for Reactor Dosimetry using our Unix Workstation and the obtained experience on NJOY code. This work is going now under the contract with our Ministry of Power and in contact with the INR Laboratory engaged in fluence measurements.

Our plans for future include the calculations of multigroup library for RBMK reactor, as in accordance with the international and national decisions, Ukraine has to shut down the last unit of Chornobyl NPP and to start the process of decommissioning. Namely for this purpose US DOE financed the development of Slavutych Nuclear Data Bank and now we plan (together with the specialists from ChNPP and Slavutych Laboratory) to iniciate this very large work. We hope for the contract with STCU on this subject (this or next year).

Computer codes dissemination

Since 1996 we have the stable contacts with NEA Data Bank Computer Program Services (Liaison Officer A.Kaltchenko) and during these years we received on our requests 28 computer codes, mainly for nuclear data, Monte-Carlo and nuclear model calculations in the sphere of basic and applied physics. Among them such codes as STAPRE-H, ECIS, WIMSD-5, RADHEAT-V4 and so on. We are very much thankful to Mr. Enrico Sartori and his staff for kind attention.

We also have received from RSICC two lisenced codes NJOY 94.61 and SCAMPI. This year IAEA NDS supplied us with NJOY 97. All these codes were installed and may be used at SC "INR".

It is necessary to add that owing to our recommendations Slavutych DEC Unix Workstation is equipped with a set of RSICC codes (NJOY, TSANSX, MCNP etc) for use at

Slavutych Laboratory mainly for Chornobyl NPP needs.

Our customers

Now we see four main groups of our customers.

- Service for operating NPPs (multigroup calculations): reactor dosimetry, reactor safety, fuel management.
- Decommissioning activity: RBMK libraries, waste management, 4^{th} unit safety.
- Non power applications: medicine(NCT, BNCT therapy), medicine radioisotopes, industry radionuclides, Monte Carlo calculations.
- Fundamental investigations: nuclear physics, nuclear modelling, nuclear data evaluation, etc..

Appendix 1. UKRNDC Web-site

This year, year 2000, we started the operation of our Web-site. One of the main aims of this site is the desire to facilitate the access to the basic nuclear databases for Ukrainian users, especially for beginners, as the proposed databases are located in our Web-server and this is the most short, fast and friendly way to necessary data. We use PC Pentium II, 400 MHz, 20 Gb hard disk memory and Windows 98 system with server sub-shell. This is also the server for our center local network of 8 computers.

Now the problem is not in the access to nuclear databases, but in the practice of skilled handling with these data. The most important and scarce part of nuclear data work is now the people who know how, where and what data are needed for definite task and can do this work in a short time. Another our problem is the low speed of our communication lines. To transport the file of 5-10 Mb from any of 4 basic Centers is mostly very long time work.

So we create for our users the most simple and friendly system for data access and handling with our comments and helps outgoing of the beginners level of our customers. For those, who have good experience and may use satellite communication, we recommend to refer to NDC IAEA, NNDC USA or NEA Data Bank.

Some details of our local database:

1. It includes the map of Nuclides – we recommend the Map of Nuclides from Los Alamos Laboratory.
2. The set of general purpose ENDF libraries using IAEA NDC WINENDF CD ROM.
3. EXFOR library in the version of EXFOR II.
4. IRDF with our Supplement on Nb-93(n,n') cross section and neutron fission spectra for U-235 and Pu-239.
5. Access to ENSDF using Isotope Explorer with local database.
6. PCNUDAT from IAEA NDC CD-ROM.
7. CINDA from CD-ROM, which is available now.
8. Atomic Masses file.
9. The most necessary codes – Utility Codes and PREPRO with additional our version of PREPRO – CULLENFREE, which we consider more convenient for preparation of the input files, especially for beginners.

We give the addresses of the most popular Nuclear Data Centers and separately the access to their Newsletters. We greet any other addresses and recommendations for the content of our site.

Our addresses are those: http://www.kinr.kiev.ua/ukrndc
http://www.ukrndc.kiev.ua

Appendix 2. UKRNDC EXFOR Activity

To improve the coverage of the Ukrainian publications, containing experimental nuclear data information, obtained in the organizations of Ukraine, it was decided to start compilation and preparation of the EXFOR entries directly in the UKRNDC.

Participation in the EXFOR activity began after the IAEA AGM coordination meeting, May 1998, where it was recommended to start with neutron experimental data, as the most important one. The accession numbers 32201 – 32500 were selected for input of this data to the CSISRS system. The format was studied in Kyiv, using BNL-NCS-6330 and -6380 documents and in the NNDC, BNL (training, M.Vlasov). Up to now the entries 32201-32205 (5 entries, 19 subentries) with the experimental data obtained in the INR, Kyiv and Kyiv State University have been prepared and sent to the IAEA NDS.

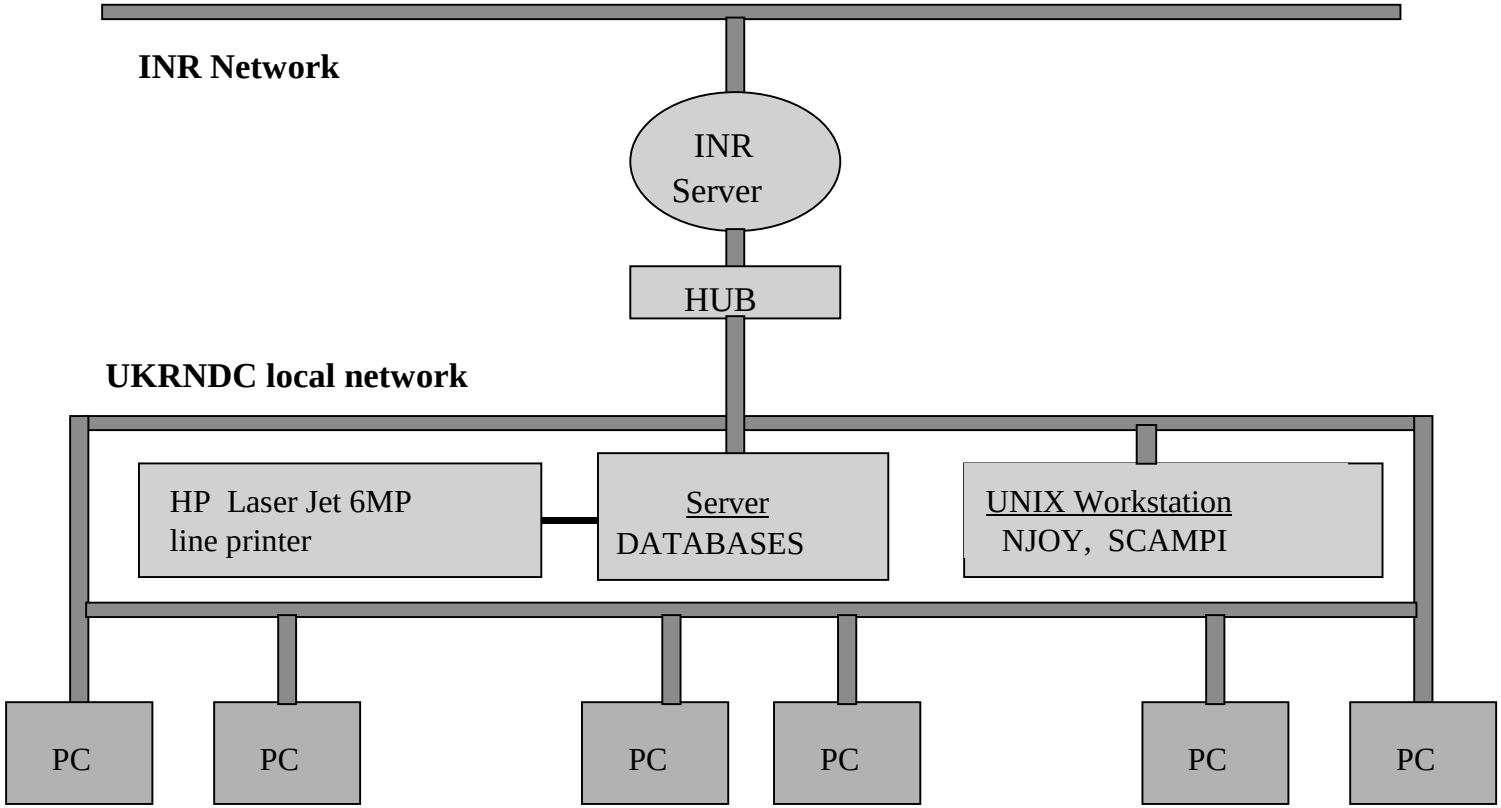
The detailed search for the ukrainian nuclear data, using scientific journals published in Ukraine, preprints of the Ukrainian institutes and INIS system, has shown that the number of publications containing neutron data is decreasing for the last years due to temporary suspension of the large facilities (research reactor, isochronous cyclotron, some other accelerators) operation though situation is changing for the better now.

At present, there is sufficient number of non neutron data, which has not been yet converted to EXFOR, and the UKRNDC is planning to start its input to CSISRS. It relates mainly to photonuclear data and in less degree to data of charged particle induced reactions.

With the help of the EXFOR —II/ACCESS-97 system recently developed at the IAEA NDS (V.Zerkin) and our search of the Ukrainian scientific publications we have analyzed

- The number of publications in Ukraine and abroad containing experimental nuclear data, obtained in Ukrainian organizations and their ratio for the last ten years: 5.5% in 1991-92, 20% in 1993-94 and 25% in 1995-2000. The ratio is increasing.
- Completeness of the coverage of the experimental results obtained in Ukraine with EXFOR for the years 1990-2000.

The results indicate very good coverage of the neutron data information. Only one work dated 1994 has been found and will be converted in the nearest future. The charged particle induced reaction data are covered also reasonably well by Kurchatov Institute group, however, there are some works which should be converted to EXFOR. We have found 13 such type experimental results (in the energy range up to 200 MeV). In the field of photonuclear data 17 papers are not covered (energy range of gamma-rays is up to 1.2 GeV) and we are planning to start converting of this data to EXFOR soon, especially in view of the development of photonuclear research at the institutes of Ukraine.


INR Network
INR
Server
HUB
UKRNDC local network
HP Laser Jet 6MP
line printer
Server
DATABASES
UNIX Workstation
NJOY, SCAMPI
PC
PC
PC
PC
PC
PC

Status of Nuclear Data Activity in Korea

Jonghwa Chang
Nuclear Data Evaluation Laboratory,
Korea Atomic Energy Research Institute

Introduction

As Korea decided to take the nuclear power plant option for supportting its economic growth, it has proceeded in the localization of the nuclear fuel and power plant design technology since 1983. After ten years of the localization efforts, Korea launched a long- and mid-term nuclear development plan in 1994.

The nuclear data activity has been included in the long- and mid-term nuclear development plan since 1997. The main efforts before this time were to generate the multi-group libraries for the lattice neutronics codes such as WIMS-D or CASMO, and the MCNP library from the available evaluated libraries to support the design of a test reactor HANARO, and partially to support the developments of the PWR technology.

Since 1997, the activity includes evaluation and measurement. Since there is no practical nuclear data measurement facility yet, we are supporting people at Korean universities to develop the measurement techniques using foreign facilities.

The NDEL(Nuclear Data Evaluation Laboratory) of KAERI(Korea Atomic Energy Research Institute) has 8 regular staff members and 4 temporal staff members in 2000. Among them, 7 are working for the evaluation, 4 for processing, and 1 for computer maintenance. The main computer facility is a Linux cluster composed of 12 Pentium PCs and three HP-700 series.

Evaluation

Since Korea is experiencing difficulties with the spent fuels produced from 12 pressurized water reactors and 3 CANDU reactors, 13 GW in total, many nuclear development efforts are concerned with the spent fuel. The burnup credit for the spent fuel criticality is a favorite aspect for the transportation and the depository. Current safety regulations permit the partial credit for the minor actinides. So it is necessary to understand the fission product property accurately to receive the credit which is responsible for the 20 - 30 percent of the criticality.

KAERI NDEL has started a re-evaluation of the long-lived fission product nuclides with BNL NNDC. We have re-evaluated the resolved resonance parameters and the average resonance parameters for the unresolved energy region for 19 selected nuclides [1]. We will extend the evaluation up to 20 MeV with a model calculation using ABAREX, ECIS, GNASH, and SUNF.

Intermediate energy data needs in Korea are mainly to support the design of a proton accelerator driven nuclide transmutation system [2]. We have developed a computer code system, ECISPLOT, based on ECIS and GNASH, jointly with JNDC. And we have finished initial work with ECISPLOT [3]. We will continue this work under collaboration with JNDC.

There are several hospitals in Korea which have the medical cyclotron ranging from 30 to 50 MeV. To support the activity in producing the nuclear medicine, and the research in the industry such as thin layer analysis (TLA), we have invited a scientist from CNDC to start evaluation of the charged particle induced reaction cross section [4,5]. After evaluating the production cross section, we are doing a model calculation to estimate the subsidiary unwanted isotope production cross sections [6].

For the feasibility study of constructing a pulsed neutron facility based on an electron linac, we have studied the photoneutron production cross section [7]. We have joined the IAEA CRP on "Compilation and evaluation of photonuclear data for application". This CRP was finished in this year. A TECDOC will be published by IAEA.

Processing

During the design and the construction of a test reactor HANARO, KAERI has developed the libraries for MCNP and WIMS-D based on the evaluated libraries such as ENDF/B-6 and JENDL-3 [8]. KAERI NDEL has been providing various libraries for the lattice neutronics codes WIMS-D, CASMO-3, and HELIOS, to support the nuclear fuel design and development activity in Korea. Also, an ORIGEN-2 library was developed for the test reactor.

Recent efforts in KAERI NDEL processing are focused on the shielding and the material damage calculation of the PWR vessel surveillance problem and the material testing. We are using DOORS and DANTSYS for the analysis [9].

Service

KAERI NDEL is supporting the nuclear data requests inside of the institute as well as in Korea. To supply the data, we are collecting the nuclear data from various sources, such as IAEA/NDS, OECD Databank, etc. Many times we need to interpret the collected data to make it understandable to and usable by the final users who are usually not accustomed with the standard exchange format. A KAERI nuclear data web service(*http://atom.kaeri.re.kr*) was designed to provide the nuclear data for those who need the data but do not have time to study various conventions in the nuclear data society.

The web service is known as "Table of Nuclides" on internet. The table of nuclides provides nuclide-wise information about the mass based on Audi and Wapstra [10], decay property based on NUDAT [11], capture cross section graph based on NGATLAS [12], fission yield table based on ENDF/B-6, and summary of neutron interaction cross section based on JENDL-3.2 [13]. For easy access, we have provided the hypertext link to other nuclides in the decay chain and between natural elements and nuclides. References to the sources of data are provided. A link to the decay diagram is provided based on ENSDF. The decay diagram displays a level diagram and radiation intensity. Another popular feature is the ENDF plot service. The ENDF plot gives interactive plot of the cross section graphs in GIF, EPS, and text form.

To know the usage of the service, we introduced a concept of the valid statistics. Since the web page consists of introductory pages, such as a picture of the nuclides boxes or a form to fill-in user requests for plot, and result pages which display data. We only count the number of the result pages excluding access by the service provider. Last year, the server had a 468,358 hit count, and among them, 72,650 valid ones(about 15.5 %).

Figure 1 displays the valid statistics for the table of nuclides, the ENDF graphs, the decay diagram, the capture cross section and the number of users (or IP addresses). The web service started in 1994, but we did not keep the web log before August 1996. The figure displays a large spread, but it shows an obvious increasing trend. There may be two reason for the increase in users. First is the increase due to the increase in the people who uses the web (netizen). This increase is a natural one. The second is the increase by the introduction of new feature. The rapid increase since 1998 is due to new features, the decay diagram and the neutron capture cross section graph.

Among the 31,020 visitors (based on the number of IP addresses) last year, 9,442 visitors contributed to the valid statistics. The total number of valid statistics was 72,650. So, the average access counts of each user was 7.7. As displayed in Figure 2, the number of users who have accessed many times to get information is inversely proportional to the number of accesses. If we consider the user who accessed more times than the average user access count, as a regular user, we had 1656 regular users last year. (cf. 986 in 1999)

Summary

KAERI NDEL is a user of NRDC for domestic and internet services, evaluation and processing. And KAERI/NDEL will be a potential contributor to international nuclear data by ongoing measurement using either domestic or foreign facilities.

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[2] CHANG, J. and T.Y. Song, "Nuclear Design Aspect of the Korean High Intensity Proton Accelerator Project," in Proc. of *The Third Specialists' Meeting on High Energy Nuclear Data*, March 30-31, 1998, JAERI, Tokai, Japan," p.91.

[3] Lee, Y.O., et al., "Optical Model Potential Search for Neutron- and Proton- Induced Reactions of C-12, O-16, Al-27, Fe-56,Z-90, and Pb-208 up to 250 MeV," presented at PHYSOR 2000, May 8–12, 2000, Pittsburg.

[4] Zhuang, Y.X., "The Evaluations and Calculations of Medical Isotope Production Reaction Excitation Functions," KAERI internal report NDL-3, 8, 14, 17, 19, 22/98, 1998.

[5] Chang, J., "Proton reaction cross section evaluation for TLA," KAERI internal report NDL-31/98, 1998.

[6] Kim, D.H., "Calcuation and Evlauation of proton induced reactions," KAERI internal report NDL-32/98, NDL-2, 8/99,

[7] Lee, Y.O., and Y. Han, "KAERI Photonuclear Data Library," KAERI/TR-1512/2000, *Korea Atomic Enegy Research Institute*, March 2000.

[8] Gil, C-S et al., "Development and Validation of WIMS-D5 Library Based on JENDL-3.2," to be presented at *Korean Nuclear Society String Meeting*, May 26-27, 2000, Kori, Korea.

[9] Gil, C-S et al., "Analysis of Pressure Vessel Surveillance Dosimetry inserted in to Korean PWR," presented at *10th Intern. Symposium on Reactor Dosimetry*, Sept. 2000, Osaka, Japan.

[10] Audi, G. and A.H.Wapsta, "The 1995 update to the atomic mass evaluation," *Nuclear Physics* A 595(4) 409-480, 1995.

[11] R.R.Kinsey, et al., "The NUDAT/PCNUDAT Program for Nuclear Data," paper submitted to the *9 th International Symposium of Capture-Gamma ray Spectroscopy and Related Topics*, Budapest, Hungary, Octover 1996.

[12] NGATLAS - Atlas of Neutron Capture Cross Sections (Courtesy of IAEA NDS)

[13] XS averaged from JENDL3.2 (Courtesey of T. Nakagawa at JAERI)

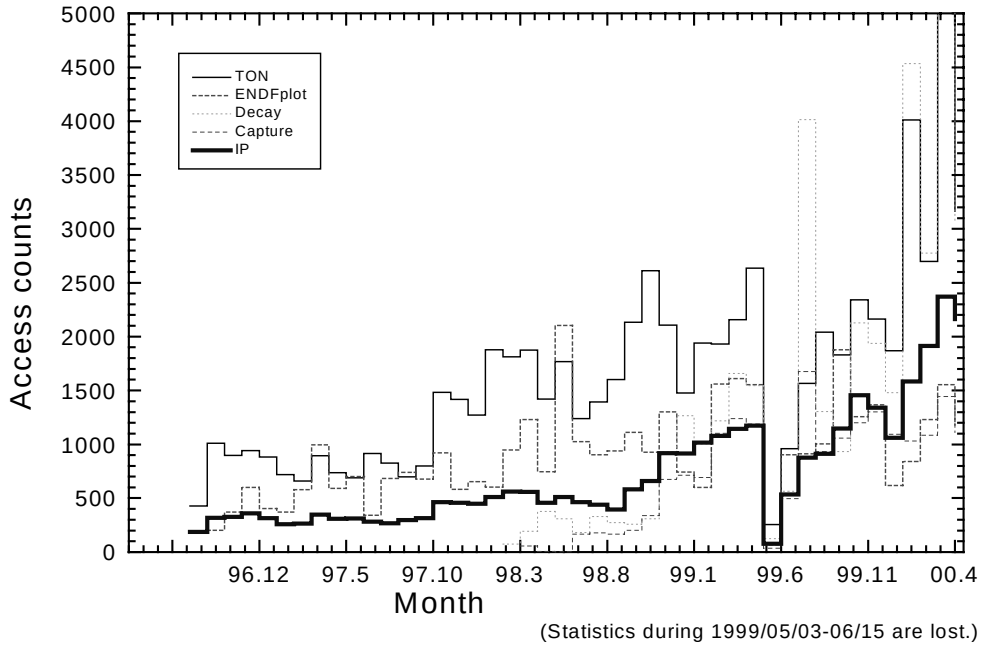

Figure 1. Monthly Usage of KAERI/NDEL web server

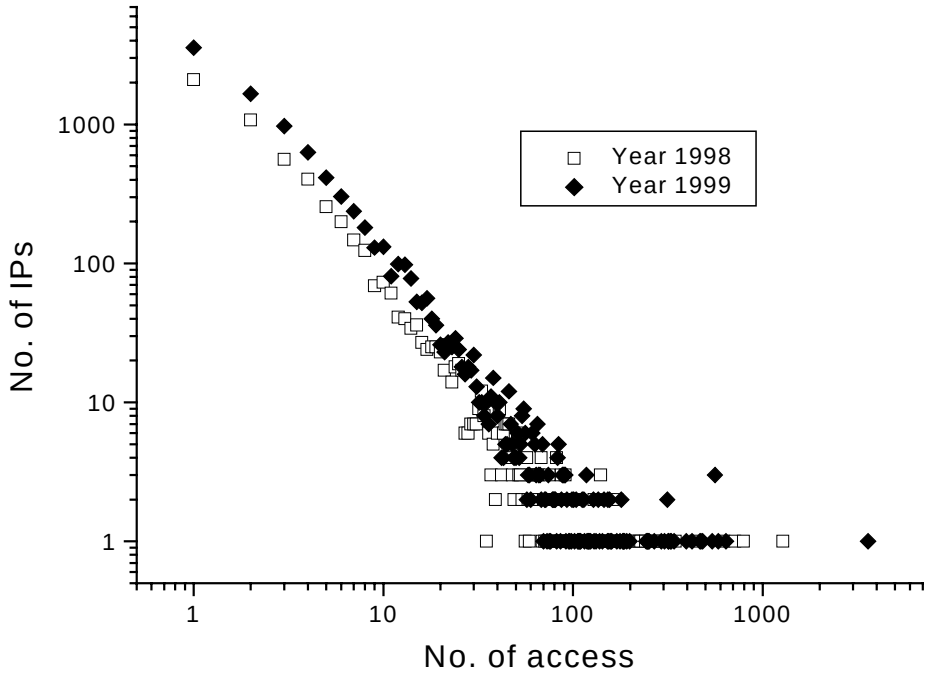

Figure 2. Valid User Statistics

List of Working Papers

The working papers whose numbers are listed below in **bold** *are included in this report on the following pages. The other papers, or the memos of which they consist, are available from the IAEA Nuclear Data Section.*

WP2000-1	Actions and Conclusions of the 1999 NRDC Meeting see INDC(NDS)-407, pp.21-28
WP2000-2	Inventory of EXFOR TRANS files exchanged
WP2000-3	Dictionary 7 codes for conferences published as Dubna reports see memos CP-D/309, 4C-4/98, 4C-4/100
WP2000-4	Quantities PAR/M-,DA,G; PAR/M+,DA,G; PAR/M-,SIG,G and PAR/M+,SIG,G: see memos CP-D/311, CP-D/301, 4C-4/83
WP2000-5	Proposed units B/ATOM and B-MEV/SR for dictionary 25 see memos CP-D/307, CP-C/258, CP-C/250 p.1
WP2000-6	Various double-(triple) differential data and related units
WP2000-7	Proposed new data headings for dictionary 24: IAS-NUMB, E-LVL-INI1, E-LVL-INI2, E-LVL-FIN1, E-LVL-FIN2, +DATA-ERR1, -DATA-ERR1, +DATA-ERR2, -DATA-ERR2, E-RSL-FW: see memos CP-C/264,263,251, CP-D/312
WP2000-8	Proposed quantities for Tensor analysing power and spin-flip probability: see memos CP-C/261 and CP-C/257
WP2000-9	Proposals on resonance quantities, Temperature-dependent ang. distr. for fission fragments, and units for Nubar
WP2000-10	Proposed new partial data types: CUM/PAR,DA; CUM/PAR,SIG; PAR,DA,,SFC: see memos CP-C/252 and CP-C/250
WP2000-11	CINDA quantity codes versus EXFOR reaction codes
WP2000-12	Distribution of CD-CINDA and future of CINDA distribution/book publication
WP2000-13	CINDA 2000 book: publication schedule
WP2000-14	Memo CP-A/101: Transformation of Dictionary 27

WP2000-15 EXFOR retrieval software on the PC (V. Zerkin)

WP2000-16 Relational Database and Java Technologies for Nuclear Data
R. Arcilla, D. Winchell, Y. Sanborn

WP2000-17 Archiving experimental data published in Physical Review. (NNDC + APS)

WP2000-18 NNDC Web and FTP Statistics

WP2000-19 CSISRS Library Statistics (NNDC)

WP2000-20 Covering letter for CD-CINDA (M.A. Kellett)

WP2000-21 NDS Web Statistics System (V. Zerkin)

WP2000-22 EXFOR Statistics in Numbers and Figures (V.G. Pronyaev, V. Zerkin)

WP2000-23 Summary of the meeting held at the NEA to discuss Sigmabase
A. Nouri et al.

WP2000-24 Nuclear Data Information - Reference System NDX
A.N. Grebennikov et al.

WP2000-25 Development of a charged-particle nuclear reaction data retrieval system on IntelligentPad: CONTIP
See Y. Ohbayashi et al., J. Information Science, 26(1) 2000, 29-37

WP2000-26 The SaBa Database (S.A. Dunaeava et al., RFNC-VNIIEF)

WP2000-27 The CDFE Relational Nuclear Spectroscopy Database NESSY in Internet

WP2000-28 The ORACLE Design for EXFOR and CINDA (M.A.Kellett, NEA-DB)

WP2000-2

Inventory of EXFOR TRANS files exchanged since the 1999 NRDC Meeting

Prelim. = "Preliminary" TRANS files still in the "PRELIM" subdirectory of the NDS Open Area (~4 weeks for checking by other centers)

Area 1: 1275 through 1287; Prelim.: 1288

Area 2: 2146, 2147, 2148, 2149; Prelim.: 2150, 2151, 2152, 2153, 2154

Area 3: 3105; Prelim.: 3106

Area 4: 4114, 4115, 4116, 4117, 4118

Area A: Prelim.: A046, A047

Area C: C032 through C038; Prelim.: C039

Area D: none

Area E: Prelim.: E018

Area F: F011; Prelim.: F012 (to be moved to "final" area)

Area G: G010

Area M: M029

Area O: none

Area P: P002

Area R: none

Area S: S010

Area T: T001, T002, T003, T004

Area V: V026

WP2000-6

Various double-(triple) differential data and related units

For details, see the following memos which are available from NDS:

1. **CP-C/262**
2. **CP-D/308**
3. **CP-C/249**
4. **CP-A/100**
5. **CP-A/99**
6. **CP-A/98**

Proposed new codes needing discussion or LEXFOR entry:

Dictionary 36

SEQ,DA/DA/DE,P/P/P	CP-C/262, CP-D/308, CP-C/249
POL,DA/DE	CP-D/308, CP-A/99, CP-A/98
POL,DA/DE,,ANA	CP-A/99

Dictionary 25

P/PT/MEVSR (or alternative solution)	CP-A/99
P/PART/SR	
P/PART/MEV	

"Straightforward" (?) new quantities proposed in these memos:

,DA/DA,P/A	CP-A/100
,DA/DA/DE,P/P/P	
NN/PAR,POL/DA,,SF	
PAR,DA,,IPA	
PRE,AKE,LF/HF	
PAR,DA/CRL (possible without SF7?)	CP-A/100
PAR,DA/CRL,G/P	
EM/PAR,DA/DE	
EM,TTY/DA/DE	CP-A/99
IND/UND,PY	CP-A/98

WP2000-9

Proposals on resonance quantities, Temperature-dependent ang.distr. for fiss.fragm., and units for Nubar

The respective memos are available from NDS.

1. CP-C/254	,WID/STR	Resonance strength
2. 4C-4/103	PAR,WID/STR ,DA/TMP,FF/LEG/RS	Partial strength of resonance Temp.-dep.ang.distr. for fiss.frag., Leg.coeff.
	(For both items, 4C-4/103 supersedes 4C-4/101)	
3. CP-C/255	Dimension for R-matrix reduced width Use units PART/FIS for all measurements of Nubar (replacing NO-DIM)	
4. CP-C/256	,WID/RED,,RMT/AMP	R-matrix reduced width amplitude

CINDA quantity codes - EXFOR reaction codes

Meinhart Lammer, NDS

Action A9 from the 1999 NRDC meeting

Generally the CINDA codes have a more global definition which is in several cases given separately.For some EXFOR reactions only the basic code is given, but further subfields may still be coded. A 1:1 correspondence between CINDA and EXFOR is indicated by a double arrow: ↔

CINDA		EXFOR reaction	further specification/comments
EVL		not applicable	
TOT	↔	(N,TOT),,SIG	total reaction cross section, no residual nucleus, no differential data
SEL		(N,EL)Z-S-A,,SIG	integral total elastic scattering cross section, no -G or -M in SF4
		(N,EL)Z-S-A,,AMP	elastic scattering amplitude
DEL		(N,EL)Z-S-A,,DA	angular distribution of outgoing neutrons
POL			polarization data for neutron in the exit channel
		(N,EL)Z-S-A,,POL	spin polarization probability of outgoing neutrons
		(N,EL)Z-S-A,,POL/DA,,SF8	differential spin polarization probability with respect to emission angle
		SF8=ANA,ASY,COS, …	analyzing power, angular asymmetry, cosine coefficient,
POT		(N,EL)Z-S-A,POT,SIG	potential scattering cross section
		(N,EL)Z-S-A,POT,RAD	potential scattering radius
SIN	↔	(N,INL)Z-S-A,,SIG	integral inelastic scattering cross section, no -G or -M in SF4
DIN		(N,INL)Z-S-A(-X),	partial cross section to isomeric state, or to specified level
		(N,INL)Z-S-A,,DA (DE, DA/DE)	(double) differential inelastic neutron scattering data
TSL			'thermal scattering law': if data depend on structure of target material
		(N,THS)Z-S-A,SF5,SF6	thermal neutron scattering (molecular and crystalline binding)
		SF6=SIG, AMP	cross section, scattering amplitude
		SF5=FA, BA, COH, INC	free atom, bound atom, coherent, incoherent scattering
		FA/COH, FA/INC, ….	free atom coherent scattering, free atom incoherent scattering, ….
SCT		(N,SCT)Z-S-A,	total scattering, below the (n,2n) threshold, integral and differential data
SNE	↔	(N,NON),,SIG	neutron nonelastic cross section
ABS	↔	(N,ABS),,SIG	neutron absorption cross section
RIA		(N,ABS),,RI	neutron absorption resonance integral (with all allowed SF combinations),

	(N,G)Z-S-A-X,,RI	for non-fissionable targets identical to the neutron capture integral
NG	(N,G)Z-S-A-X	neutron capture: all quantities except outgoing gammas considered
RIG	(N,G)Z-S-A-X,,RI	neutron capture resonance integral for fissionable targets
SNG		spectrum of gammas or conversion electrons following neutron capture
	(N,G)Z-S-A,,DE,G	neutron capture: energy spectrum of gammas
	(N,G)Z-S-A,,SPC	neutron capture: gamma spectrum
	(N,G)Z-S-A,PAR,SIG,G	neutron capture: partial gamma production cross section
	combinations with SF6=DA	angular distributions of outgoing gammas
DNG	(N,INL)Z-S-A,,DE,G	neutron inelastic scattering: energy spectrum of gammas
	(N,INL)Z-S-A,(PAR),SPC	neutron inelastic scattering: gamma spectrum
	(N,INL)Z-S-A,PAR,SIG,G	neutron inelastic scattering: partial gamma production cross section
	combinations with SF6=DA	angular distributions of outgoing gammas
NEG	(N,X)0-G-0	nonelastic gammas: SF5 + combinations with SF6 as DNG; no 'G' in SF7
N2N	(N,2N)Z-S-A	(n,2n) reaction with all permitted quantities from dictionary 36
NXN		(n,xn) reaction (x=3,4,...): integral and differential data
	(N,3N), (N,4N), …..	with all permitted quantities from dictionary 36
NEM		sum sigma for all nonelastic processes, weighted for number of neutrons
	(N,X)0-N-1 or (N,N+X)0-N-1	neutron emission from all nonelastic processes
	(N,XN)	variable number of emitted neutrons
		can be combined with all permitted quantities from dictionary 36
NX	(N,X)Z-S-A	sum of all (unspecified) processes in a given target leading to a given product; can be combined with all permitted quantities from dictionary 36
NP	(N,P)Z-S-A	(n,p) reaction with all permitted quantities from dictionary 36
NNP	(N,N+P)Z-S-A	(n,np) reaction with all permitted quantities from dictionary 36
PEM	(N,X)1-H-1 or (N,P+X)1-H-1	proton emission with all permitted quantities from dictionary 36
	(N,YP)	variable number of emitted protons
ND	(N,D)Z-S-A	(n,d) reaction with all permitted quantities from dictionary 36
NND	(N,N+D)Z-S-A	(n,nd) reaction with all permitted quantities from dictionary 36
DEM	N,X)1-H-2 or (N,D+X)1-H-2	deuteron emission with all permitted quantities from dictionary 36
NT	(N,T)Z-S-A	(n,t) reaction with all permitted quantities from dictionary 36
NNT	(N,N+T)Z-S-A	(n,nt) reaction with all permitted quantities from dictionary 36
TEM	(N,X)1-H-3 or (N,T+X)1-H-3	triton emission with all permitted quantities from dictionary 36

NHE	(N,HE3)Z-S-A	(n,He-3) reaction with all permitted quantities from dictionary 36
NA	(N,A)Z-S-A	(n,α) reaction with all permitted quantities from dictionary 36
NNA	(N,N+A)Z-S-A	(n,nα) reaction with all permitted quantities from dictionary 36
AEM	(N,X)2-HE-4 or (N,A+X)2-HE-4	alpha emission with all permitted quantities from dictionary 36
NF ↔	(N,F),,SIG	neutron induced fission cross section
RIF ↔	(N,F),,RI	resonance integral for neutron induced fission
ALF ↔	(N,F),,ALF	alpha = capture to fission cross section ratio
ETA ↔	(N,F),, ETA	number of neutrons emitted per absorption

NU to	**(0,F) or (N,F)**	*these CINDA codes are valid for spontaneous or neutron induced fission;*
CHG	**replaced by (…,F)**	*therefore (0,F) or (N,F) is replaced by (…,F) under EXFOR*
NU	(…,F),…,NU,…	all prompt neutron data or average total neutron yield per fission (nu-bar)
	(…,F),,NU or (…,F),PR,NU	total nu-bar or prompt nu-bar
	SF5 <u>not</u> DL	can be combined with codes as given in dictionary 36 except SF5=DL
	SF5=PAR	partial yield, to be used for probability/multiplicity distribution
	(…,F+XN),…,NU	probability for the emission of X (prompt or total) neutrons in fission
	(…,F),,DA,N or (…,F),PR,DA,N	angular distribution of total or prompt fission neutrons
NUD		delayed neutrons from fission: total or group yields, energies, etc.
	(…,F),DL,NU,…	delayed neutron yield
	SF5=DL/CUM,DL/IND,DL/PAR	possible to express cumulative, independent or partial dn yield
	(…,F),DL,DA,N	angular distribution of delayed neutrons
	(…,F),DL,DE,N	energy spectrum of delayed neutrons
NUF	(…,F)ELEM/MASS,,NU	prompt neutrons emitted from fission fragments
SFN	(…,F),(PR),DE,N	energy spectrum of (prompt) fission neutrons
SFG	(…,F),,DE,G	energy spectrum of fission gammas
	(…,F),…,SPC	intensity of fission gammas, also with SF5=PAR, PR or PR/TER, <u>not DL</u>
	(…,F),PR or PAR/IND,FY,G	yield of prompt fission gammas (of defined energies)
FPG	(…,F),DL,DE,G or DL,SPC	spectrum of delayed gammas emitted from unseparated fission fragments
	(…,F),DL,FY,G	yield of delayed gammas emitted from unseparated fission fragments
FPB	not yet foreseen	spectra, mean energies, etc. of betas from unseparated fission fragments

NFY	all (…,F) with SF6=FY except …	all yield types of fission fragments or products (indep., cumul., chain, etc.)
	… except FY/DA or FY/DE	… except energy or angular distribution (FRS in CINDA)
	… except if SF7=G	total yield of prompt fission gammas (SFG in CINDA)
	… except CHG,FY	total element yield in fission to be coded as CHG in CINDA
	… except certain reaction ratios	for coding of fractional (indep. or cumul.) yields: CHG in CINDA
	all with SF6,SF7=AP,HF or AP,LF	most probable mass for different kinds of mass distributions
FRS	all with SF6=KE,AKE,DE,DA	energy or angular distribution of fission products or fragments
	… except if SF7=G,N	
CHG		charge distribution of fission fragments with A or Z constant
	(…)…,IND,FY/(…)…,CHN,FY	fractional independent yield for fragment A=constant
	(…)…,CUM,FY/(…)…,CHN,FY	fractional cumulative yields for fragment A=constant
	(…)ELEM,CHG,FY	total element yield of fission fragments/products
	(…)….,IND,FY/(...)…,CHG,FY	fractional independent yields for fragment Z=constant
	all with SF6=AP and SF7=blank	most probable mass for fragment mass distribution with Z=constant
	all with SF6=ZP and SF7=blank	most probable charge for fragment charge distribution with A=constant

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RES	all under Res.Pars. in Dict. 36	individual and averaged neutron resonance parameters
	except SF6=STF	strength function; to be coded as STF in CINDA
	except all with SF8=RES	quantities at resonance: to be coded for quantity according to SF5,SF6
STF ↔	(N,EL),(PAR),STF	(partial) neutron strength function
LDL		level density law: parameters for density of levels in the continuum
	Z-S-A(0,0),,(LDP or TEM or SCO)	level density parameter, nuclear temperature, spin cut-off factor in CINDA and EXFOR coded for the compound nucleus
GN	all (G,N) data	pure (γ,n) reaction (no other outgoing particle), integral or differential
GF	all (G,F) data	photofission: all cross sections or data for fragments, gammas and neutrons from fission

Memo CP-D/313

To: Distribution

From: M. Lammer and M. Kellett

Date: 2000-05-10

Subject: Distribution of CD-CINDA and future of CINDA distribution and book production.

CD-CINDA has been developed by the NEA Data Bank as a complement to the CINDA book. This means it will have the same status as the book and will be distributed at the same time. The merits of the book are known. The CD enables excellent retrievals with all kinds of specifications. Whereas the online versions of CINDA are always up-to-date their access can be slow or intermittent, but the CD always gives the same response, which is generally quicker than the online version for most users.

Originally, the CD-CINDA version with the same status as the CINDA-99 book was planned for joint distribution . It was to be accompanied by a questionnaire to find out the demand for just the CD instead of the book, and accordingly this may have lead to a possible reduction in the book production. However, thorough testing and checking of CD-CINDA resulted in its major revision and further development. Additional production problems of CD-CINDA delayed its distribution so much that it became too late to evaluate expected responses to the questionnaire timely enough for a change in the CINDA-2000 book production. Therefore we decided to proceed as follows:

CD-CINDA-1999 is currently being distributed to all recipients of the CINDA book. This will enable the recipients to familiarize themselves with its use and the retrieval possibilities. The **CINDA-2000 book** will be produced in 900 copies as in previous years. **CD-CINDA-2000** will again be sent to all recipients of the CINDA book and at the same time a questionnaire requesting feedback and an indication of their preference for receipt of future issues. Thereafter, only either the book or the CD will be sent to any one recipient. However, we have not yet finally decided whether to offer the option to receive both, the book and the CD.

WP2000-13

Memo 4C-3/393

To: Distribution

From: M. Lammer

Date: 2000-05-10

Subject: CINDA 2000 book: publication schedule

First of all I want to apologize for the late distribution of CINDA 99, which was out of my control: Liam Costello and I had finalized the book and submitted it for publication around June 20 1999. However, in spite of my repeated inquiries and urging from August onwards (after my return from a long vacation) there was silence from the publisher until we finally got the printed copies in October 1999.

CINDA 2000 will again be published as cumulative issue for publications between January 1988 and May/June 2000. As detailed in Memo CP-C/313, we will again produce 900 copies, and a joint distribution with CD-CINDA-2000 is planned.

The proposed publication schedule displayed in the attached APPENDIX is only tentative for the following reason: The IAEA discontinues the production of publications in the format and size of the old CINDA book (same as the conference proceedings and technical report series). All publications will be in the DIN-A4 format. However, I could convince our publisher that it is now too late for any programming changes from our side, if we want to publish the CINDA book at the usual time of the year. I also argued that, in particular, it was not worthwhile to invest a large amount of programming effort for an interim solution, as the new CINDA-2001 format will require major changes anyway. This was accepted: we will produce the book file as usual, and the publishers will blow it up to A4 format.

The attached publication schedule relies on the publisher's promise that no problems with or delays in the publication are to be expected from their side. however, one never knows ….!

APPENDIX

Tentative publication schedule for CINDA 2000

26 June 2000	final deadline for CINDA entries and information for the introductory and Annex pages to reach NDS
7 July 2000	NDS master file processing completed
21 July 2000	NDS book processing completed (including update of CINDA tables)
28 July 2000	CINDA book master completed
18/25 August 2000	printing and binding completed
September 2000	completion of CD-CINDA-2000, distribution of CINDA 2000 as book and CD

MEMO CP-A/101
(10 May 2000)

To: Distribution
From: F.E.Chukreev
Subject: **Transformation of Dictionary #27**

The modern experiment allows to accelerate (to create) and to use as a target photons, leptons, mesons and any bound set of nucleons. In this connection role of the Dictionary 27 should be changed.

It would be probably possible to accept the following rules:

1. The fields 1 and 2 **REACTION** can contain:
1.1 photon,
1.2 lepton,
1.3 long-lived meson,
1.4 any bound combination baryons, which can not be destroyed by strong interaction.

2. The fields 3 and 4 **REACTION** can contain:
Any combination
2.1 photons,
2.2 leptons,
2.3 mesons and
2.4 baryons,
allowed by the laws of conservation (Energy, Strangeness, Electrical, Baryon and Lepton charges)

3. **PART-DET**, **RAD-DET** and **DECAY-DATA** (DECAY-MON) can contain only photon, lepton, meson or bound combination nucleons

For example, it is possible to write:
3-LI-6 (P, N) 4-BE-6, IND, SIG, but in **PART-DET** there should be (**A**), or (**N**), as **Be-6** - unbound nucleus, its time of life about nuclear.

It is simultaneously necessary to consider and field **ISOMER** in 27-th Dictionary. The concept isomer continuously extends. Now isomer is the exited state with time of life > 10.E-11 seconds.
In this connection it would be expedient to establish the following rule:

Isomer is any exited state of a nucleus. For Isomer should be necessarily specified or half-life or (and) its excitation energy, or other quantum characteristic. To specify Isomer number unessential. This number can be any.

Thus, the dictionary 27 should give the compiler only items of information on the bound state of baryon systems. A possible view of a line of this dictionary:

Atomic number (Z)	Suitable atomic masses
1	1-3
2	3,4
.....	....
28	50-78
....	.....
94	232,234,236-247

It is necessary to exclude such keyword, as **LVL-NUMB**. The reason of it - if today a level, for example, second, tomorrow it can become third. For investigated nuclear levels a quantum characteristic always is known what. If for a level the energy of excitation or other quantum characteristic is unknown, its identification should be given by the free text. If, for example, in reaction the condition is raised which the author names as second analog and energy of this state is unknown, the compiler should write:

EN-SEC (E-LVL, Z-Sym-A) and free text to specify the appropriate quantum characteristic. For this purpose it is possible to use also existing keyword **LEVEL-PROP**, having permitted to leave empty some fields.

For example, if there is a speech about a level **Si-31**, which is analogue of the basic condition **P-31**, it can be written down:

EN-SEC (E-LVL,14-SI-31)

LEVEL-PROP (14-SI-31, E-LVL =, SPIN=0.5, PARITY=1.) It is analog state of P-31 ground state.

We believe that the offered changes will not cause a long tail of changes in existing entries.

Our offers do not cover important cases, in which one or several nucleons are in the exited states, as, for example, He-4 (Λ) system (strangeness of this system =1) and antinucleus. The problem requires additional consideration.

Distribution:

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KELLETT@NEA.FR
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FELIKS@POLYN.KIAE.SU
CHUKREEV@POLYN.KIAE.SU
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WP2000-15

EXFOR retrieval software on PC: development and integration with other products

V. Zerkin, NDS-IAEA

Introduction

The EXFOR database is basically placed on Alpha/VMS. The software includes utilities for checking of input data, updating, retrieval systems (for Telnet and Web), maintenance of dictionaries, etc. The programs are written in FORTRAN using VMS Text Libraries tools.

In order to meet requirements of users who do not have fast access to Internet, EXFOR-CD retrieval system was developed by NDS in 1997. This was based on MS-Windows and runs as a standalone application. Both VMS and Windows based retrieval systems use the same index files that are generated with EXFOR/VMS software. In other words, they are strongly dependent from Alpha/VMS.

At the same time due to many reasons there is strong and urgent need of migration of nuclear databases from VMS to other platforms and/or to build platform independent software. Also important fact is that modern relational database software become more and more powerful, available and popular.

This project was initiated to develop platform independent software for organization of EXFOR as a relational database, to develop EXFOR retrieval system distributed on CD-ROM with advanced features and to develop a tool for using EXFOR data together with other products.

1. Objectives of the new EXFOR retrieval system

The objectives of software development for porting the EXFOR database to the PC and other platforms were to provide:

1. Maximum platform independence of porting EXFOR to a database environment
2. All coded EXFOR information available as criteria of data search
3. User access to information from EXFOR Dictionaries during interactive sessions for data retrieval (as on-line help, codes explanation, etc.)
4. Easy to call graphic presentation of retrieved data.
5. Tool for analysis of the full contents of EXFOR database.
6. Reduction in programming efforts that are needed for production of user copies of the database and further development of the retrieval software.

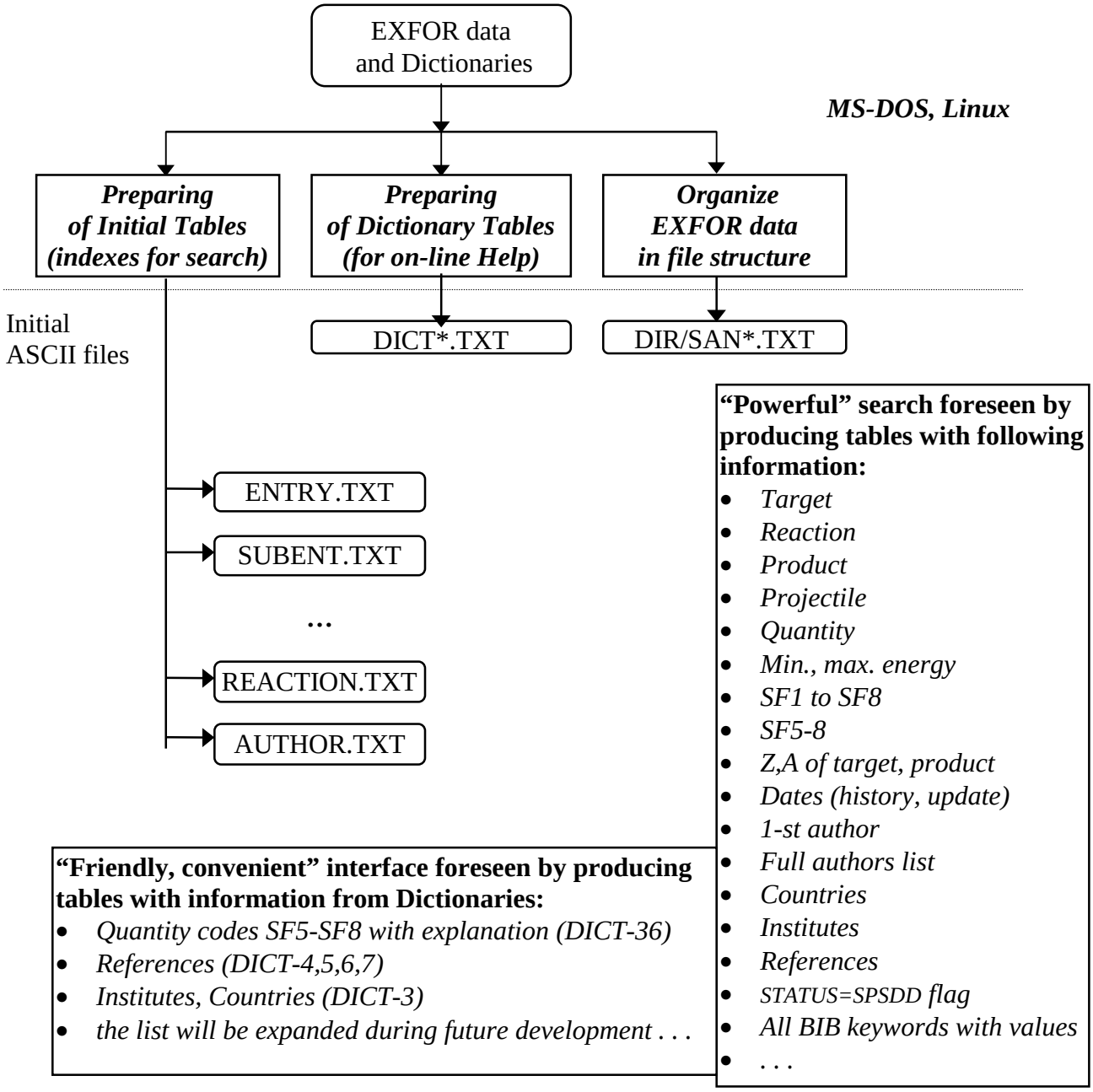
To meet these objectives an EX-II retrieval system (temporary name) was developed in 1999-2000.

2. EX-II development

2.1. EX-II Utilities. Preparation of data and tables

The first part of EX-II is a set of platform independent utilities preparing initial tables and EXFOR data to be managed by a database system. The utilities read EXFOR data and Dictionaries, extract information foreseen as a search criteria and on-line help (see Fig.1) and put it into the set of ASCII files. These files will be imported to a relational database to initiate tables. The utilities also split all EXFOR data to a set of text files (single file for each subentry) and put them into a directory structure using appropriate naming convention for easy search by database software.

Fig.1 EX-II Utilities



2.2. EX-II Retrieval System based on ACCESS-97

Second part of EX-II has to present EXFOR as a relational database using various appropriate database management systems with the data retrieval as the main user oriented function.

First implementation of the EX-II Retrieval System, based on ACCESS-97 relational database management PC program, was developed in 2000 (see Fig.2). It has following advantages:

- **for Users:**
  1) powerful search with many criteria;
  2) advanced criteria (based on SQL-SELECT): variety of criteria, wildcards, various combinations of criteria, on-line help and input of criteria based on Dictionaries;
  3) plotting of cross section data by ZVView (converter of EXFOR-Computational format may be extended with NNDC help);
  4) MS-Access gives non-professional programmers a large variety of tools, allowing them to manipulate information and create their own retrievals without large efforts;

- **for Data Centers Programmers:**
  1) development of the retrieval system requires much less effort in programming;
  2) SQL based search is very flexible, universal and fast (optimized by manufacturers);
  3) simple programming of user interface as Access-Forms;
  4) using of SQL queries in combo-boxes of Access-Forms provides advanced on-line help, simplifies input of search parameters (see Fig.3), reduces number of user's errors;
  5) using of External Viewers (Netscape, Notepad, ZVView) significantly simplify programming of many operations, such as viewing, printing, Internet connection, etc.

The EX-II/ACCESS-97 Retrieval System was distributed to the Network of Nuclear Data Centers for testing and getting feedback in April-2000.

2.3. Resume

Main benefits of EX-II development:
- initialization of database became platform independent;
- EX-II/ACCESS-97 can be considered as a Windows replica of EXFOR developed in short time without large programming efforts;
- EX-II/ACCESS-97 provides new advanced retrieval tool for PC users.

EX-II development plans:
- to continue development of the Access version;
- to investigate the possibility of implementation of EX-II in other environment;
- to integrate the system with evaluated libraries.

Fig.2 EX-II Retrieval System based on ACCESS-97

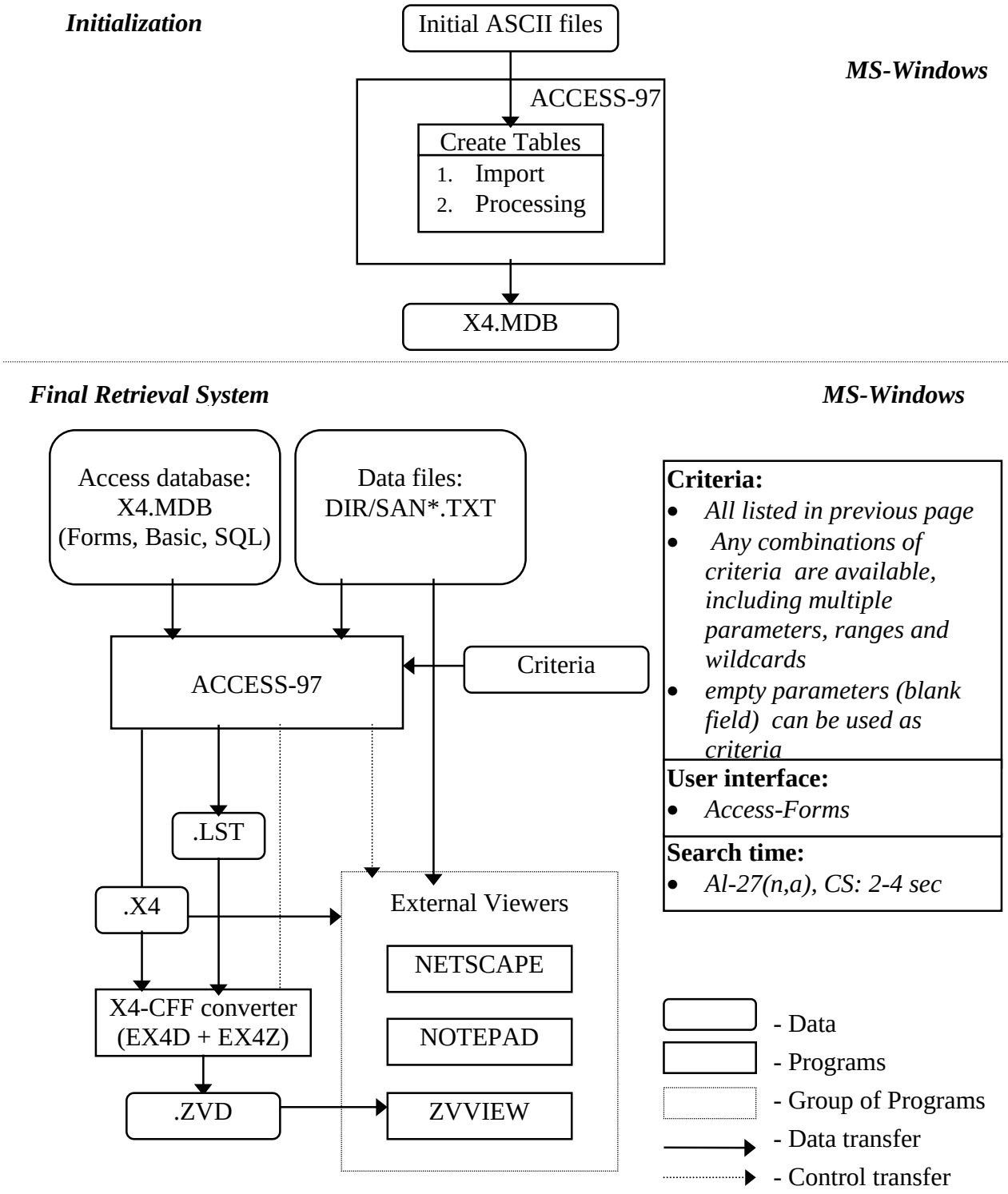
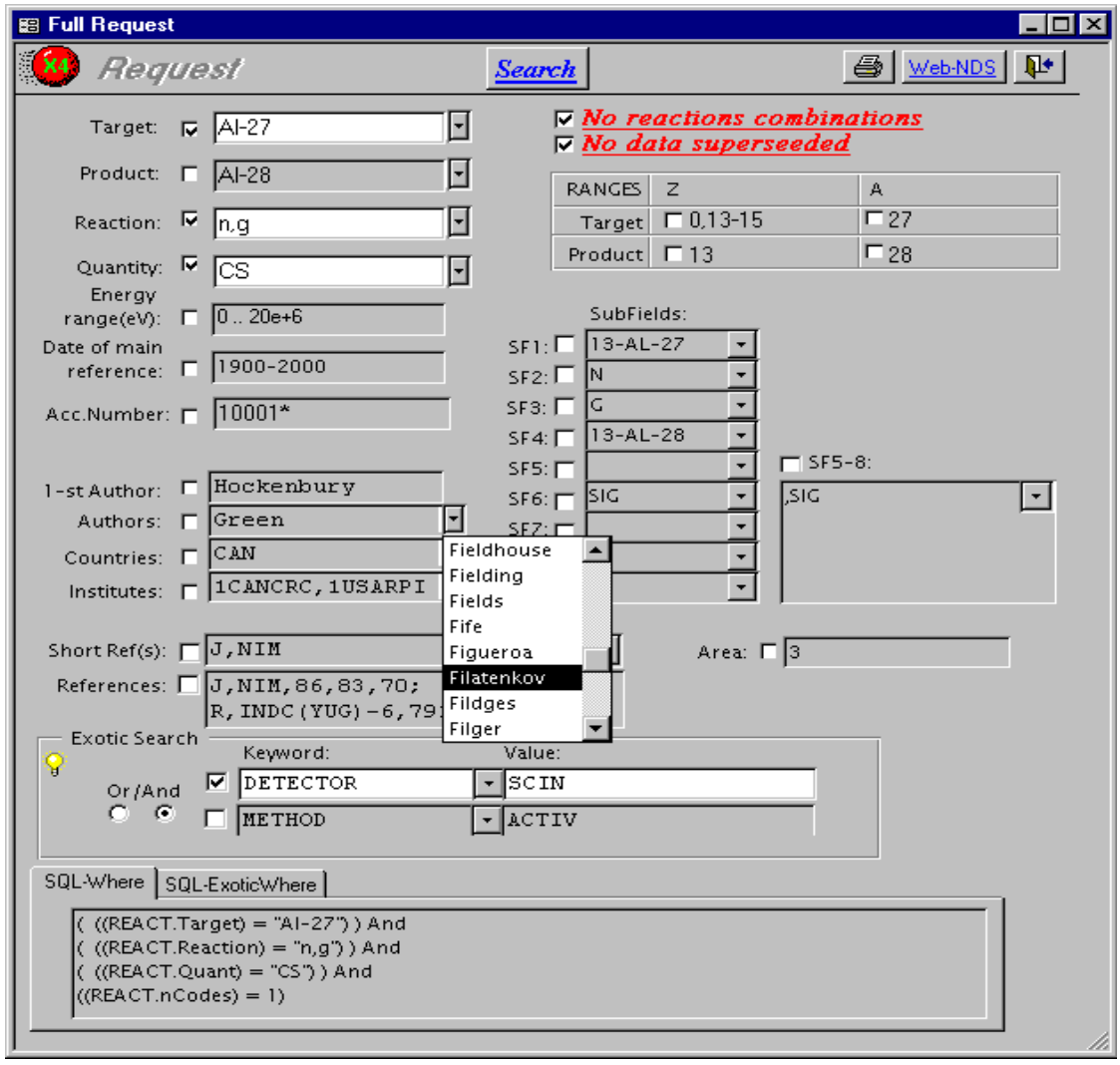
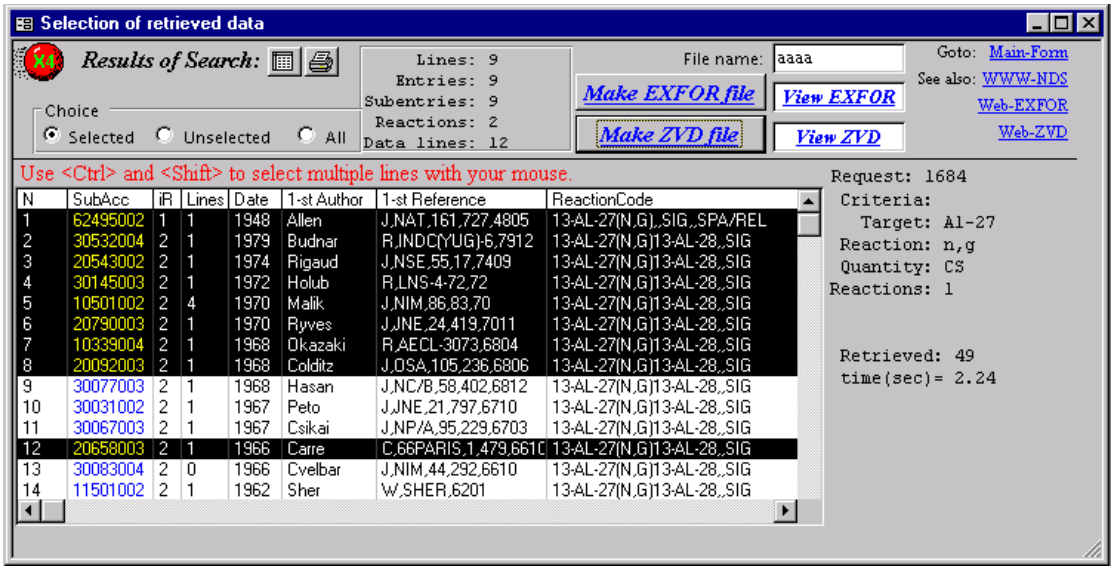


Fig.3 EX-II / ACCESS-97 Forms: Data Request and Choice





3. "FENDL in Pictures"

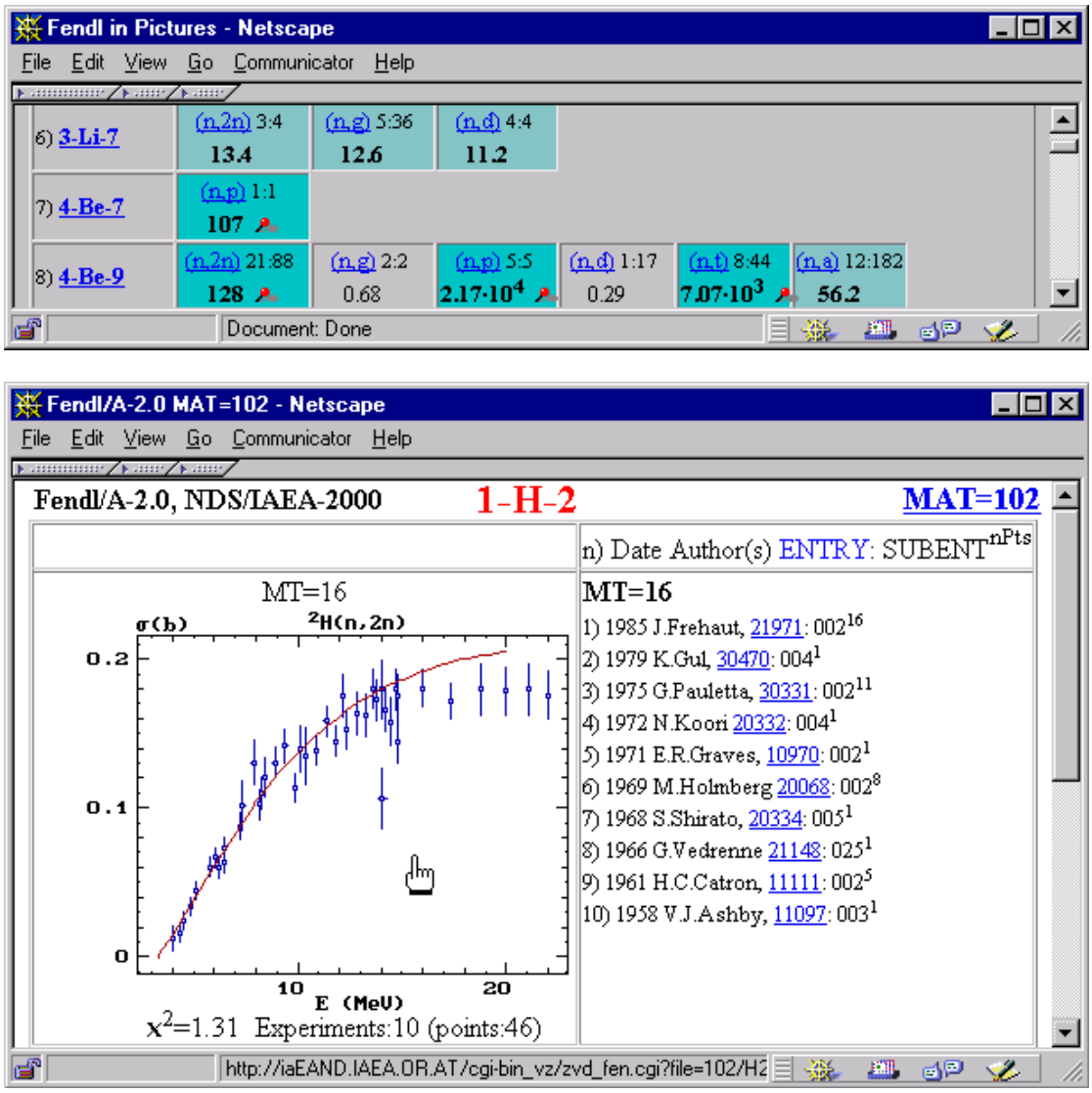
"FENDL in Pictures" is a pictorial representation of the technical quality of the data contained in the Fusion Evaluated Nuclear Data Library. This product is an example of integration of EXFOR retrieval system based on ACCESS-97 with the ZVVIEW graphics utility for production of an interactive Web Atlas of nuclear data.

FENDL-2.0 Activation file including more than ten thousand reactions is made into Web pages with summary table of materials, reaction codes, values of the χ^2 deviation between evaluations and experiments, and plots of evaluated curves in comparison with experimental data points.

All HTML pages and GIF pictures were generated automatically on a PC. These were then transferred to the NDS Web Server and could be copied to a CD-ROM for distribution. User can call interactive plotting program ZVVIEW with chosen data on local computer and retrieve original experimental data from NDS Web EXFOR Service by clicking the appropriate hyperlinks .

Total number of materials is 667, reactions (plots): 11805, experiments found: 4688.

Fig.4 Example of Web pages from "FENDL in Pictures"



WP2000-16

RELATIONAL DATABASE AND JAVA TECHNOLOGIES FOR NUCLEAR DATA – Preliminary Report

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August 4, 2000

Introduction

The National Nuclear Data Center (NNDC), in cooperation with Clark University, has been investigating the use of relational database and Java technologies for the administration and dissemination of nuclear data.

Commercial relational database management systems (RDBMS) using the Structured Query Language (SQL) are widely used in the business world. As a result, the technology is mature and well supported, and a wide variety of auxiliary tools are available. Because of this, an RDBMS approach to nuclear databases might afford several advantages over the software used presently. Furthermore, the automatic replication and synchronization capabilities of these systems promise to improve the efficiency and reliability of data exchange among the cooperating data centers.

This report presents the preliminary results of the evaluation of SQL-compliant relational database management systems and the Java platform. Criteria considered include speed, ease of use, cross-platform capability, support, and cost. The ability to re-use legacy programs was also investigated. Both commonly used database programs such as Microsoft Access and pure Java-based database systems were tested. The report concludes with a recommendation on the best migration strategy for existing nuclear databases. A final, detailed report will be completed in July 2000.

Methods of Evaluation

Database systems

An initial investigation of RDBMS technology was made by porting the entire Nuclear Science References (NSR) database to the Microsoft SQL-Server RDBMS. A web interface to this instance of NSR was developed and is publicly available via the NNDC homepage. Other databases, notably the NNDC Adlist database, were also ported to RDBMS systems for testing purposes.

In order to evaluate several database products using the same underlying data, a subset of NSR was used. In particular, three complete tables from the database were used. Details are given in the "Results" section and the appendices.

The following RDBMS packages were tested:

- Microsoft SQL-Server V7.0
- Sybase Adaptive Server Anywhere V7.0
- Microsoft Access 2000
- PointBase V3.1GA
- Cloudscape V3.0

The last two of these are based on the Java programming language and are platform-independent; the first three were run under the Windows NT operating system. A set of identical queries in SQL format was performed on each of the databases.

Java Optimizing Compilers

Computer industry studies show that a Java application compiled into native code will run 10 to 50 times faster than the interpreted Java byte code. At present, Compaq is developing an optimizing compiler for Java that should run under OpenVMS. This compiler will not be available until after July 2000. In order to test the concept, the compiler TowerJ from Tower Technology Corporation was used to compile parts of the Cloudscape database program on Windows NT.

Legacy Codes

There is a large body of legacy software associated with the databases maintained at the NNDC, and duplicating all of the functionality of these codes by writing new software would make the cost of migration prohibitive. However, it should be possible to re-use most legacy code, replacing only database calls. To test this, software routines were written to replace Fortran database access subroutines with calls to external Java programs. These Java programs can then access remote databases using a Java Database Connectivity (JDBC) package. The concept was tested by converting the NSR retrieval program NSRRET, running on OpenVMS, to access a remote RDBMS version of NSR running on a Windows machine. A figure illustrating this process is shown in Appendix A.

Results

Database systems

Details of the benchmark tests and results are given in Appendix B. In summary, the non-Java databases were found to be comparable in speed and size, while the Java-native software was much slower. In and of itself this result is not surprising, as Java is known to sacrifice some speed and power in order to be platform-independent. However, the degree to which the Java software is slower makes it unusable for our purposes, as it stands.

Java Optimizing Compilers

At the time of this writing, only about two-thirds of the required Java classes had been compiled using TowerJ. Because key classes were still interpreted and dynamically loaded at run time, the results for the "semi-compiled" database were no better than for the pure interpreted Java.

Legacy Codes

The converted program NSRRET was found to run somewhat more slowly than the original version, but not excessively so. Several bugs remain in the converted program, but it has been demonstrated that the underlying technology is a viable method for converting legacy software.

Conclusion and Recommendations (preliminary)

Before the completion of the final report in July, we will continue to test evaluation copies of the database software, in preparation for making a final purchasing recommendation. We will test the replication and synchronization technology in one or more of the database programs. Compilation of the Cloudscape database will be completed, and tested against an interpreted version on the same machine.

RDBMS and Java technologies can help the nuclear data community in both the efficiency of database administration and the flexibility of dissemination. Our preliminary recommendation is to adopt one of the commercial database products as a standard and begin converting the nuclear databases and legacy programs. The databases will reside on Windows NT or Linux machines, and will be accessed from legacy programs on OpenVMS via JDBC. We also recommend continued investigation of Java-native database software used in conjunction with optimizing compilers, in order to take advantage of Java's platform independence.

Appendix A

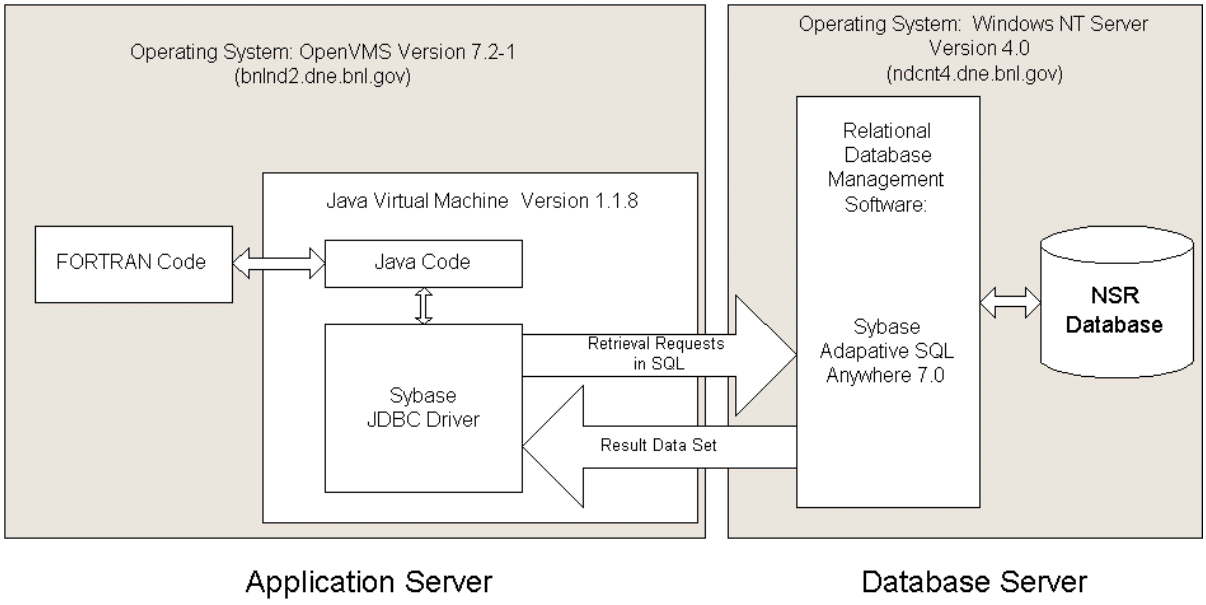


Fig. 1 Linking FORTRAN legacy code with Java code to access a remote database

Appendix B

Software	OS	host	db size (MB)	log size (MB)	load time (approx)	Qry1 (sec)	Qry2(sec)	Qry3(sec)	Qry4(sec)
Pointbase	Linux	ndcnt2	144	550	3 days	32	26	176	N/A (c)
Pointbase	OpenVMS	bnlnd2	144	420	36 hours	21	17	126	N/A (c)
Cloudscape - interpreted	OpenVMS	bnlnd2	180	N/A (a)	4 hours	6	3	5	285
Cloudscape - semicompiled	Win NT	ndcnt4	180	N/A (a)	N/A (b)	7	2	6	356
MS SQL Server	Win NT	ndcnt3	74	354	5 minutes	1	3	1	15
MS Access	Win NT	ndcnt3	90	N/A (a)	10 minutes	1	2	1	8
Sybase ASA	Win NT	ndcnt4	89	84	10 minutes	1	1	1	5

notes:

three tables from NSR: (same indices defined in each database)

ref_tbl	157533 lines
auth_tbl	603235 lines
auth_dic	56652 lines

hosts:	ndcnt2	200 MHz pentium
	bnlnd2	533 MHz Alpha
	ndcnt3	450 MHz pentium
	ndcnt4	dual 600 MHz pentium

Qry1: SELECT keyno,type,info
FROM ref_tbl
WHERE pubyear=1998 and coden='JPGPE'; (116 lines out)

Qry2: SELECT auth_tbl.keyno,auth_tbl.ord
FROM auth_tbl JOIN auth_dic ON auth_tbl.akey=auth_dic.akey
WHERE auth_dic.aname='SMITH' and auth_dic.ainit='A'; (306 lines out)

Qry3: SELECT ref_tbl.keyno
FROM ref_tbl JOIN auth_tbl ON ref_tbl.keyno=auth_tbl.keyno
WHERE auth_tbl.akey=44916 and ref_tbl.pubyear=1997; (12 lines out)

Qry4: SELECT ref_tbl.keyno,ref_tbl.type,ref_tbl.coden,ref_tbl.info
FROM ref_tbl JOIN (auth_dic JOIN auth_tbl ON auth_dic.akey=auth_tbl.akey) ON ref_tbl.keyno=auth_tbl.keyno
WHERE auth_dic.aname='SMITH' and ref_tbl.pubyear=1992; (37 lines out)

(a) no log file
(b) copied directly from VMS
(c) unable to perform query

WP2000-17

Archiving at the NNDC of experimental nuclear physics data published in Physical Review: Summary report, Deborah Brodbar (APS), David Winchell (NNDC), Christopher Wesselborg (APS)

Summary

Pending approval by the American Physical Society (APS), a system that links published Phys. Rev. C (PRC) articles to data sets at the NNDC can be established with a minimum of effort on the APS side, and as soon as a few requirements have been met:

- An information sheet should explain to authors how to submit their data to the NNDC, how to reference it in the manuscript text and how to keep the NNDC informed about the editorial process. (This has been done: Attachment A)
- Information for referees should include information on how to access the additional data.
- Appropriate update of the data set reference must be made by APS editorial staff when a manuscript is accepted.
- Information must be provided to the composition vendors (AIP) about the amended reference style including tagging information.

Identification

Data sets are identified with a unique identifier at the NNDC. Manuscripts are identified with a unique identified at the Editorial Office. At the APS Editorial Office, a field in the database should indicate that a data set is in preparation at the NNDC. The identifiers could be the APS manuscript accession code on both ends.

Coordination

The data set preparation process and the manuscript review process need to be coordinated at two points, *i.e.*, at initial submission and at final publication. Authors as well as the NNDC staff can track the manuscript review process via the APS status server (ASIS). NNDC is contemplating a similar server for the data preparation process. A link from ASIS is desirable.

The NNDC must insure that their data link manager can handle both volume/article ID information and manuscript/data set information without giving away the confidential APS manuscript code.

Workflow

Eventually, many steps in the coordination process can be handled automatically. Initially, a simplified model would suffice:

1) Authors submit manuscript to APS.

2) Authors receive acknowledgment of receipt; a flyer is added informing the authors of the option to submit their data to the NNDC; flyer includes submission and resubmission procedures and instructions on how to include reference to data set in manuscript text; info on notifying the NNDC when the manuscript has been accepted.
3) NNDC sends correspondence (misc., 'CFX') to APS with data set ID.
4) When manuscript is accepted, APS editorial staff checks if reference to data set is in text; adds reference as appropriate.
5) Volume/article ID (VP) is entered in APS database.
6) APS informs NNDC about volume/article ID ('CTX').
7) When manuscript is ready, either:
    a) editorial staff informs NNDC
    b) NNDC polls ASIS frequently

Implementation

The system can be implemented in steps, each building upon the previous system. The following is a possible scenario:

Phase I (minimal impact)

Requirements for APS: initial flyer, manual 'flags,' reference link

1) APS and NNDC prepare information for authors, to be sent with acknowledgment of receipt.
2) APS editorial staff keeps track of data link manually; in manuscript folder and/or as note in manuscript database.
3) APS editorial staff attaches info about data sets to referrals.
4) APS editorial staff updates reference to data set when manuscript is accepted.
5) NNDC uses ASIS to check on manuscript status and relies on authors' input.

Phase II (database support)

Additional requirements for APS: identifier in database; further: support on the web submission server, cross link on ASIS, action trigger at VP time

1) Enhanced web submission informs authors of options to deposit data sets.
2) Flag in APS manuscript database used to trigger various actions.
3) Enhanced ASIS cross-links to NNDC.
4) Link to data sets handled by composition vendor (AIP) similar to EPAPS links (references).

Phase III (mostly automatic)

Requires reliable triggers and appropriate handlers to ensure necessary update of information and notification to APS/NNDC of significant events.

WP2000-18

NNDC Web and FTP Statistics

Thomas W. Burrows

May 2000

The NNDC Web and anonymous FTP statistics generation emulates, as closely as possible, the TELNET statistics. This allows the NNDC to maintain a consistent set of statistics back to the beginning in 1986 and to compare the usage of the three services.

For most of the CGI-based retrievals, a successful retrieval is logged in the file WEBSTATS.DAT which resides in the root directory of the OSU Web Server. A successful retrieval is defined as one in which one or more datum is returned for the request.

For other Web retrievals and anonymous FTP retrievals, the access logs generated by the respective servers are analyzed, as follows.

1. All non-responsive accesses *(e.g.,* status codes 302, 304, and 404 for the Web) are excluded.

2. All navigational or image files are excluded.

3. Multiple retrievals of the same file by the same IP address are counted as only one retrieval if done within a one-hour period and with no intervening access of another NNDC subdirectory.

4. For program subdirectories *(e.g.,* http://www.nndc.bnl.gov/nndcscr/ensdf_pgm/analysis/radlst/), all retrievals of files within that subdirectory by the same IP address are counted as one retrieval only if done within a one hour period and with no intervening access of another NNDC subdirectory.

CSISRS Library Statistics

05/11/2000

Area	#entries	#subentries	#data points	Last tape
Neutron				
1	3,619	17,511	2,876,637	1288
2	2,280	14,824	1,567,578	2149
3	1,020	5,374	59,716	3105
4	1.262	8,321	197,277	4117
Total neutron	8,181	46,030	4,701,208	
Charged particle				
A	890	6,162	170,182	A045
B	177	1,500	16,791	B011
C	594	2,944	132,494	C040
D	123	805	15,894	D022
E	124	1,923	31,948	E015
F	399	1,188	102,148	F011
O	377	7,970	214,287	O008
P	126	622	9,707	P002
R	51	431	5,933	R012
S	44	349	5,091	S010
T	57	162	11,349	T005
Total charged particle	2,962	24,056	715,824	
Photonuclear				
G	17	44	703	G010
L	59	726	39,619	L005
M	594	3,411	92,577	M028
Q				
Total photonuclear	670	4,181	132,899	
Evaluation				
V	41	618	36,380	V025
Grand total	11854	74,885	5,568,311	

CSISRS Library Statistics by Area and Reference Date

AREA 1

Year	#entries	#subentries	#data points	Last tape
1995	8	25	8,304	
1996	21	77	57,219	
1997	10	29	2,257	
1998	10	64	51,025	
1999	3	18	13,893	
2000				
Total	52	213	132,698	1288

AREA 2

Year	#entries	#subentries	#data points	Last tape
1995	18	79	182,400	
1996	16	93	4,594	
1997	17	91	1,666	
1998	1	9	3,109	
1999				
2000				
Total	52	272	191,769	2149

AREA 3

Year	#entries	#subentries	#data points	Last tape
1995	13	45	311	
1996	3	58	233	
1997	11	82	266	
1998	5	75	130	
1999	3	7	97	
2000				
Total	35	267	1,037	3105

AREA 4

Year	#entries	#subentries	#data points	Last tape
1995	16	54	683	
1996	8	65	1,629	
1997	14	61	2,489	
1998	8	19	1,085	
1999	5	298	1,269	
2000				
Total	51	497	7,155	4117

AREA A

Year	#entries	#subentries	#data points	Last tape
1995	12	100	1,724	
1996	8	227	625	
1997	3	44	2,152	
1998	3	204	412	
1999				
2000				
Total	26	575	4,913	A045

AREA C

Year	#entries	#subentries	#data points	Last tape
1995	14	138	1,313	
1996	25	78	5,563	
1997	18	117	3,393	
1998	17	57	1,642	
1999	8	18	852	
2000	4	17	990	
Total		425	13,753	C040

AREA D

Year	#entries	#subentries	#data points	Last tape
1995	6	30	516	
1996	4	10	223	
1997	9	45	999	
1998				
1999				
2000				
Total	19	85	1,738	D022

AREA E

Year	#entries	#subentries	#data points	Last tape
1995				
1996				
1997				
1998				
1999				
2000				
Total	0	0	0	E015

AREA F

Year	#entries	#subentries	#data points	Last tape
1995	1	3	115	
1996				
1997	1	5	62	
1998	1	12	180	
1999				
2000				
Total	3	20	357	F011

AREA G

Year	#entries	#subentries	#data points	Last tape
1995	1	6	67	
1996				
1997				
1998				
1999				
2000				
Total	1	6	67	G010

AREA L

Year	#entries	#subentries	#data points	Last tape
1995				
1996				
1997				
1998				
1999				
2000				
Total	0	0	0	L005

AREA M

Year	#entries	#subentries	#data points	Last tape
1995	13	77	1,530	
1996	8	107	1,359	
1997	5	12	708	
1998	2	26	54	
1999				
2000				
Total	28	222	3,624	M028

AREA O

Year	#entries	#subentries	#data points	Last tape
1995	5	283	1,575	
1996	9	552	2,121	
1997	4	490	10,086	
1998				
1999				
2000				
Total	18	1,325	13,782	

AREA R

Year	#entries	#subentries	#data points	Last tape
1995				
1996				
1997				
1998				
1999				
2000				
Total	0	0	0	R012

AREA S

Year	#entries	#subentries	#data points	Last tape
1995	2	7	137	
1996				
1997				
1998				
1999				
2000				
Total	2	7	137	S010

AREA T

Year	#entries	#subentries	#data points	Last tape
1995				
1996				
1997				
1998	1	6	31	
1999				
2000				
Total	1	6	31	T005

AEN
NEA

AGENCE DE L'OCDE POUR L'ENERGIE NUCLEAIRE

OECD NUCLEAR ENERGY AGENCY

Ref: NDB/O/00/0325/cem Issy-les-Moulineaux, 10th May 2000

Dear CINDA user,

I am pleased to inform you of the publication of the new CINDA CD-ROM by the OECD Nuclear Energy Agency on behalf of the co-operating network of Nuclear Data Centres.

As in previous years, the book version has been produced by the IAEA and this year's volume, entitled "CINDA-99", is a second supplement to previous issues and so should be used in conjunction with CINDA-97 (a review volume from 1988-1997) and CMDA-98 the first supplement. This should have already been distributed to you.

The new interactive CD of the CINDA database contains the full contents of the database and gives access to all bibliographic entries published in the various volumes of the IAEA book. The interface is similar to that found on the NEA web-site (http://www.nea.fr/cinda), but has slightly more features including allowing the search results to be exported to a delimited text file for importing into a spreadsheet program for further manipulation/sorting and a slightly more advanced search facility. The CD-ROM is likely to be faster for most users as compared to using the WWW.

Instructions on installing CD-CINDA are given on the CD in the file "readme.txt", but users should note the choice of copying the database onto a local hard drive or not. It is recommended that the database be copied in this way during installation as it is of a moderately small size (~40MB) and improves the performance by approximately a factor of three. In this case the "setup.exe" file in the "DBonHD" directory should be used. If the "setup.exe" in the root directory of the CD is used, the database will remain on the CD-ROM and this will need to be inserted each time the program is used. Please note that there is a possibility to copy the database at a later stage as explained in the "readme.txt" file.

A PDF version Help file is included on the CD but should further help be required then please do not hesitate to contact the NEA as detailed on the CD.

I hope you find the new CD version helpful and look forward to hearing comments from you in order that we may improve our services.

Yours sincerely,

Mark A. Kellett

WP2000-22

EXFOR Statistics in Numbers and Figures

V.G. Pronyaev, V. Zerkin
NDS, IAEA

The statistics for Entries and Sub-entries was prepared using retrieval software developed on PC with EXFOR data loaded in relational database (see WP2000-15 for more details). The year shown in Table and Figures is the year of first input of data into EXFOR.

Table shows the number of entries and sub-entries compiled per year and for reactions with different incident particles: gamma quanta and electrons (g,e), neutrons(N), charged particles (Z), nuclear quantities and spontaneous fission (0). The statistics for 1999 is still not final. Figures show these data in different presentations convenient for analysis.

The following conclusions can be drawn:

1. The number of entries compiled in last ten years is 260 per year in the average. It is below what had been done in previous ten years, but the number of compiled sub-entries is rather stable at the level 2400 per year for last 20 years.

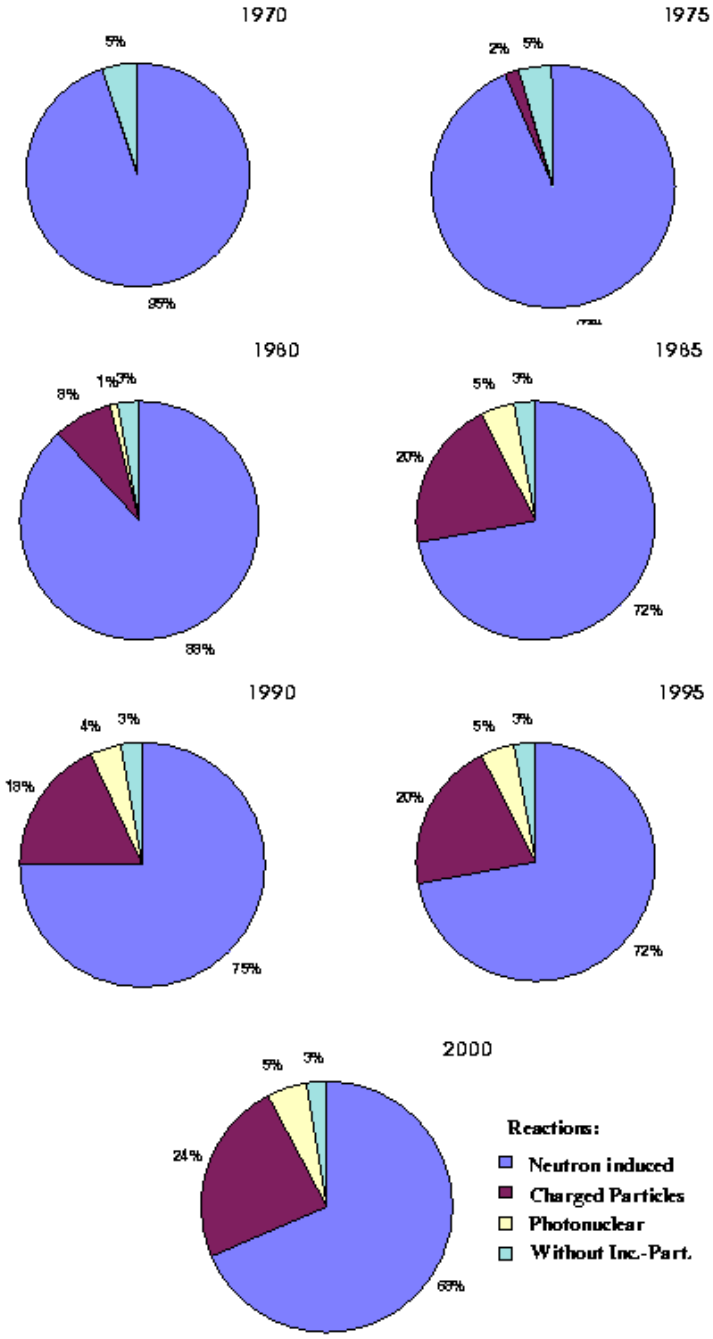
2. The number of entries and sub-entries with data for charged particle induced reactions had substantial growth after 1993 and constitutes 50 - 80% of all entries in last 6 years.

Year: g+e, N, Z, 0; Entry, Subentry;

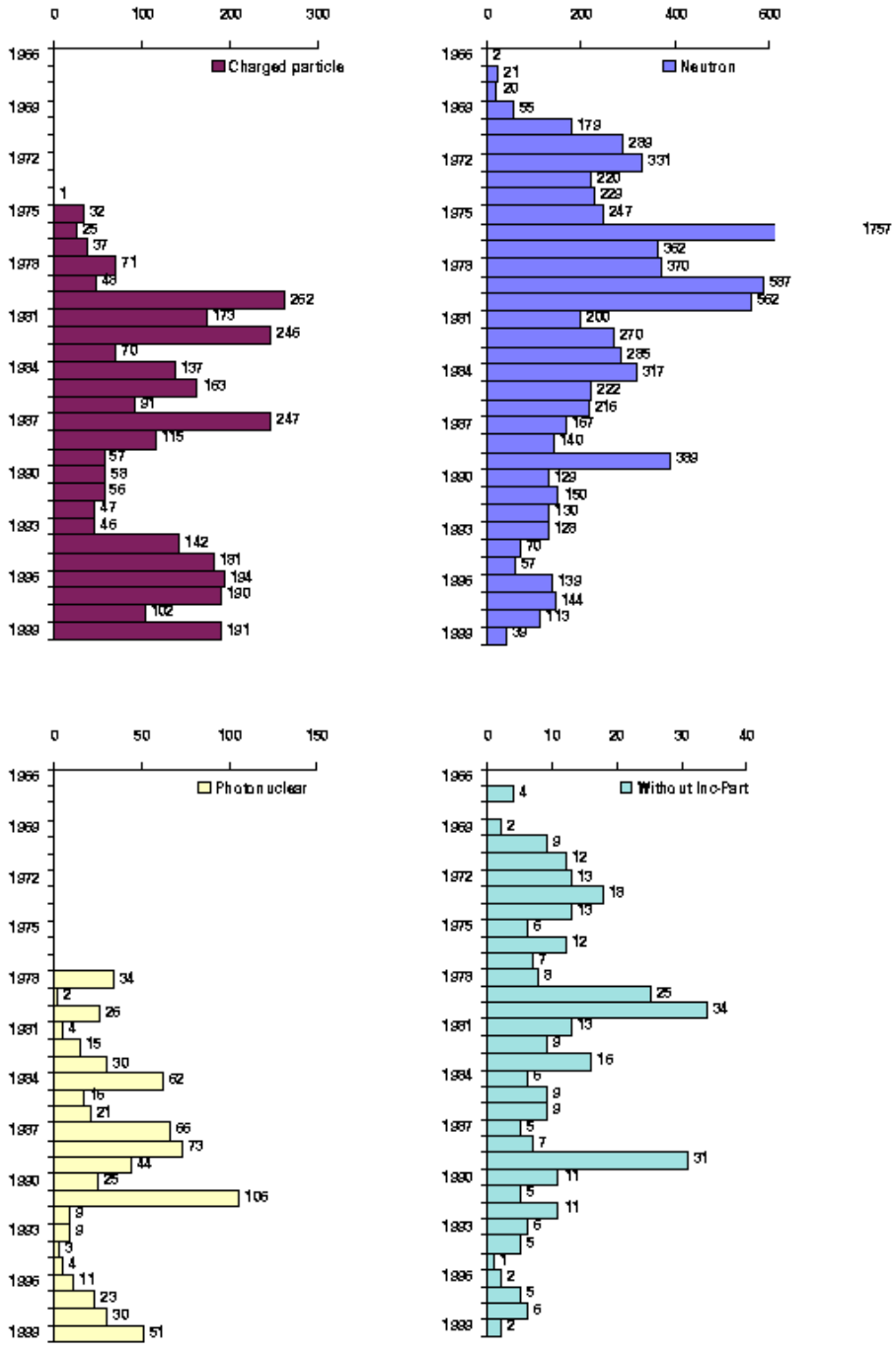
Year	*g,e:Ent*	*g,e:Sub*	*N:Ent*	*N:Sub*	*Z:Ent*	*Z:Sub*	*0:Ent*	*0:Sub*	*Tot:Ent*	*Tot:Sub*
1961			1	2					**1**	**2**
1966			2	9					**2**	**9**
1967			21	137			4	8	**22**	**145**
1968			20	303					**20**	**303**
1969			55	325			2	2	**56**	**327**
1970			179	1,246			9	47	**180**	**1,293**
1971			289	1,811			12	44	**293**	**1,853**
1972			331	2,261			13	49	**332**	**2,305**
1973			220	1,840			18	50	**223**	**1,889**
1974			229	1,457	1	9	13	33	**239**	**1,499**
1975			247	1,542	32	346	6	31	**283**	**1,919**
1976			1,757	10,624	25	238	12	38	**1,787**	**10,899**
1977			362	1,907	37	366	7	14	**403**	**2,287**
1978	34	425	370	2,077	71	278	8	18	**479**	**2,788**
1979	2	51	587	3,615	48	326	25	72	**642**	**4,062**
1980	26	117	562	3,117	262	1,104	34	144	**868**	**4,474**
1981	4	45	200	1,073	173	584	13	41	**383**	**1,743**
1982	15	118	270	1,282	246	1,213	9	18	**537**	**2,630**
1983	30	185	285	1,478	70	884	16	37	**396**	**2,577**
1984	62	373	317	1,792	137	679	6	19	**518**	**2,861**
1985	16	89	222	980	163	839	9	22	**406**	**1,922**
1986	21	101	216	1,101	91	387	9	21	**335**	**1,610**
1987	66	471	167	959	247	1,414	5	15	**481**	**2,853**
1988	73	442	140	1,227	115	847	7	19	**332**	**2,519**
1989	44	406	389	1,403	57	325	31	59	**515**	**2,188**
1990	25	193	129	755	58	541	11	26	**222**	**1,515**
1991	106	407	150	589	56	484	5	10	**315**	**1,490**
1992	9	36	131	528	47	266	11	33	**195**	**860**
1993	9	33	128	566	46	1,169	6	21	**188**	**1,789**
1994	3	49	70	274	142	2,260	5	17	**219**	**2,600**
1995	4	22	57	330	181	3,136	1	2	**243**	**3,490**
1996	11	56	139	686	194	3,240	2	4	**346**	**3,986**
1997	23	119	144	830	190	2,111	5	12	**361**	**3,072**
1998	30	213	113	887	102	905	6	26	**251**	**2,031**
1999	51	246	40	220	191	912	2	5	**284**	**1,383**
Total:	**664**	**4,197**	**8,539**	**49,233**	**2,982**	**24,863**	**322**	**957**	**12,357**	**79,173**

Friday, May 05, 2000

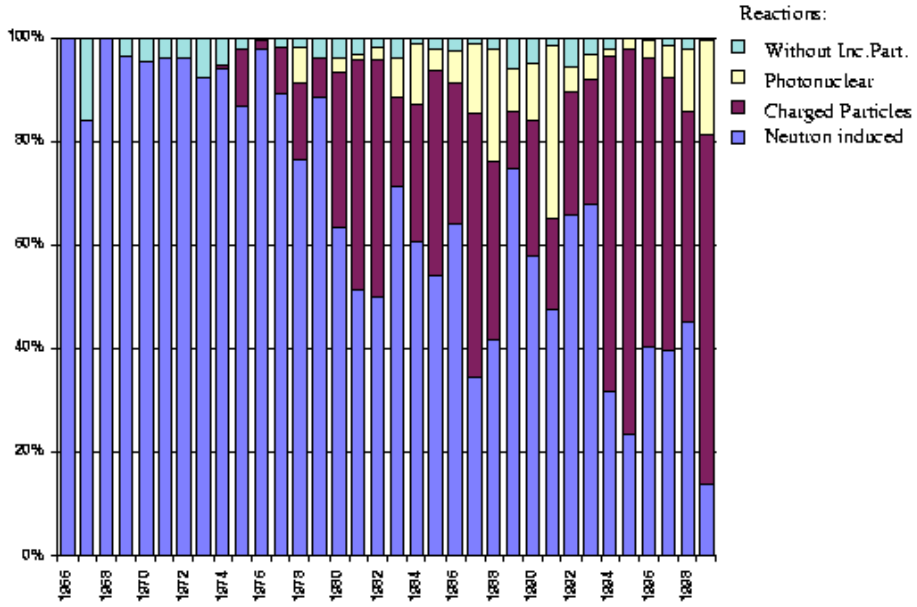
EXFOR contents: % of Entries with different type of reactions



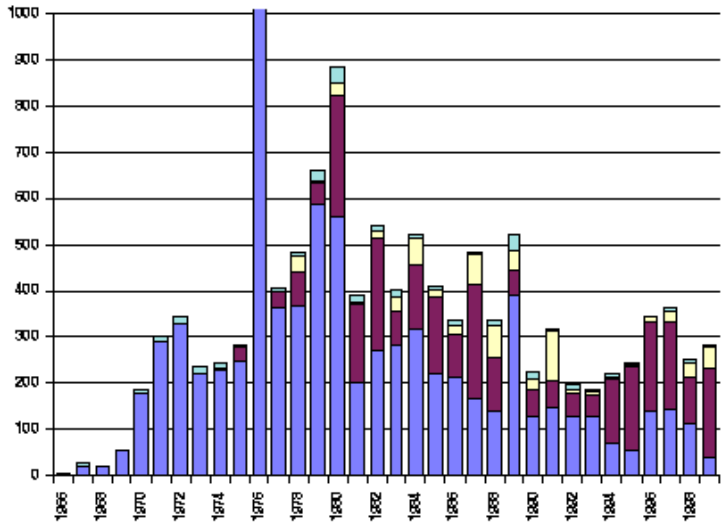
EXFOR contents: number of Entries with different type of reactions



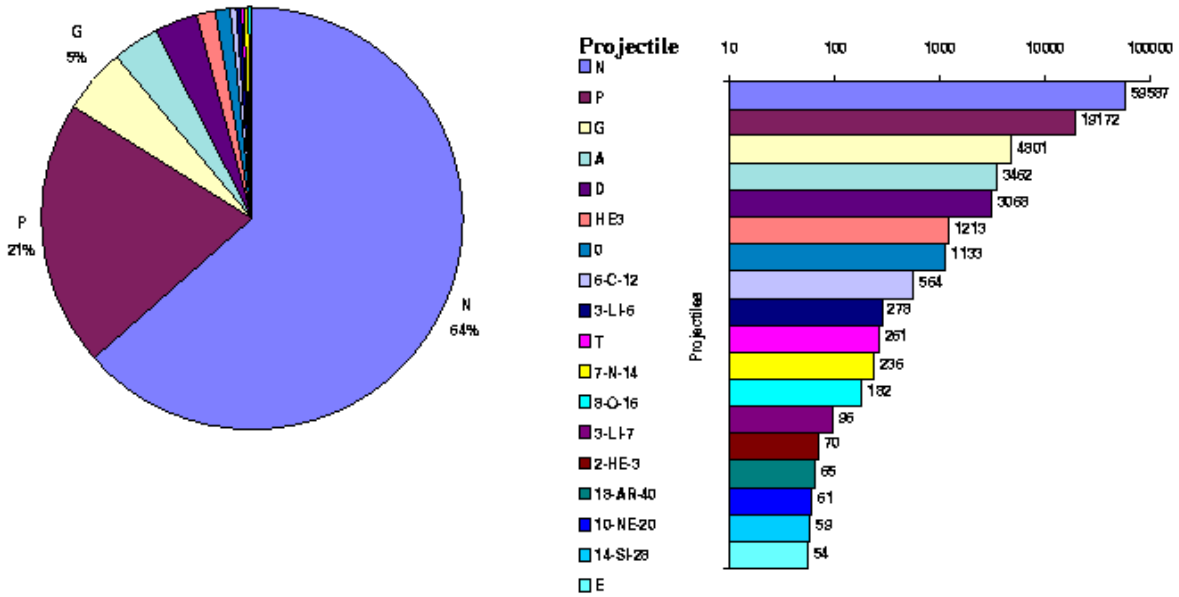
EXFOR input: number of Entries for different type of reactions



Amount



EXFOR Contents: number of Reactions with different Projectiles



Summary of the meeting held at the NEA to discuss Sigmabase

Present: Ali Nouri (NEA), Mark Kellett (NEA), Meinhart Lammer (IAEA), Ian Vickridge (Jussieu Uni.), Gabor Battistig (Budapest Uni.)

Aim: To discuss the future of Sigmabase and see whether the needs of its users could be fulfilled by it being incorporated into the NRDC network.

A brief summary of Sigmabase

Sigmabase is a database of experimental data from the Ion Beam Analysis community, which is available online at "http://www.physics.isu.edu/sigmabase/", a Web site currently hosted by Idaho State University, USA. A mirror site exists at "http://www.mfa.kfki.hu/sigmabase/" at the Research Institute for Technical Physics and Materials Science, Budapest, Hungary.

The collation of experimental data has been underway for a number of years and it is thought that most of the relevant data are currently included, however much of the data have been produced from digitizing figures in papers and so some concern is expressed at the accuracy of these data.

The data are stored in ascii text files, known as r33 format, which is relatively similar to the more complex EXFOR format. However this format is used by a number of codes that are used within this community, so to some extent must be maintained.

Summary of the discussions

The discussions focussed around two main points of view;

1) the hosting of the existing database at the NEA and associated centres, or
2) taking the existing data in the r33 format and producing E2FOR files for loading into the standard EXFOR database.

After discussion it was suggested that the best way forward for all concerned was if the r33 formatted data could be converted to the EXFOR format and loaded into the existing database, which is already hosted by the NRDCs. Ian Vickridge has previously been supplied with details of the EXFOR format and has agreed to write a small program to convert the r33 files into EXFOR files. These new EXFOR files will contain only a subset of the keywords from EXFOR that are required for the r33 data, however, this should still produce a "legal" EXFOR file. The NEA will liaise with Ian on this and undertake to test load converted files to check for consistency and correctness.

At this stage the question of the quality of the r33 files was discussed and it was felt that before the loading of the files was carried out, and in fact before the conversion of all was done, some checking and quality assurance for the data should be undertaken. A number of possibilities exist for this, but in the main it will require some kind of funding to be available. Both the NEA and the IAEA agreed to look at the possibility of supplying a small amount of funding for this purpose.

Conclusions

It was concluded that Ian Vickridge would write a small code to convert some of the existing r33 files and that the NEA would test load these into the EXFOR database to assess the compatibility. This would be completed by May 2000, so that the proposal to include such data into the EXFOR system could be discussed at the scheduled NRDC meeting. It should be noted that no decision on the inclusion of such data into the EXFOR system can be made by the NEA alone, but must be agreed upon by the members of the NRDC network, specifically; the NEA Databank, the Nuclear Data Section of the IAEA in Vienna, the National Nuclear Data Center at BNL in the USA and the Russian Nuclear Data Centre at Obninsk in Russia.

In order to allow the EXFOR files to be translated back to r33 format, Ian's code should be capable of accepting the nominal subset of EXFOR keywords required for the r33 file conversions. These reconstructed r33 files can then be used in the currently existing IBA codes.

WP2000-26

Center of Nuclear-Physics Data
RFNC - VNIIEF
Technical paper for IAEA Meeting, May 15-19, 2000
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Russian Federal Nuclear Center - VNIIEF
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The **SaBa** database is a program product including the library of evaluated and experimental data itself as well as a set of procedures making it possible to perform the sufficient processing of data. Currently there are presented in the base the data on 83 reactions:

1. 1-H-2(D,G)2-HE-4
2. 1-H-2(D,N)2-HE-3
3. 1-H-2(D,N+P)1-H-2
4. 1-H-2(D,P)1-H-3
5. 1-H-2(P,G)2-HE-3
6. 1-H-2(P,N+P)1-H-1
7. 1-H-3(D,G)2-HE-5
8. 1-H-3(D,N)2-HE-4
9. 1-H-3(D,X)
10. 1-H-3(HE-3,G)3-LI-6
11. 1-H-3(HE-3,X)
12. 1-H-3(P,G)2-HE-4
13. 1-H-3(P,N)2-HE-3
14. 1-H-3(T,2N)2-HE-4
15. 2-HE-3(D,G)3-LI-5
16. 2-HE-3(D,N+P)2-HE-3
17. 2-HE-3(D,P)2-HE-4
18. 2-HE-3(HE-3,2P)2-HE-4
19. 2-HE-3(HE-3,G)4-BE-6
20. 2-HE-3(T,D)2-HE-4
21. 2-HE-4(D,G)3-LI-6
22. 2-HE-4(HE-3,G)4-BE-7
23. 2-HE-4(T,G)3-LI-7
24. 3-LI-6(D,A)2-HE-4
25. 3-LI-6(D,N)4-BE-7
26. 3-LI-6(D,P)3-LI-7
27. 3-LI-6(D,P+T)2-HE-4
28. 3-LI-6(HE-3,D)4-BE-7
29. 3-LI-6(HE-3,N)5-B-8
30. 3-LI-6(HE-3,P)4-BE-8
31. 3-LI-6(P,A)2-HE-3
32. 3-LI-6(P,G)4-BE-7
33. 3-LI-6(P,X)

34. 3-LI-6(T,D)3-LI-7
35. 3-LI-6(T,2N)4-BE-7
36. 3-LI-6(T,P)3-LI-8
37. 3-LI-6(T,X)
38. 3-LI-7(A,N)5-B-10
39. 3-LI-7(D,P)3-LI-8
40. 3-LI-7(D,T)3-LI-6
41. 3-LI-7(D,X)
42. 3-LI-7(HE-3,A)3-LI-6
43. 3-LI-7(HE-3,D)4-BE-8
44. 3-LI-7(HE-3,P)4-BE-9
45. 3-LI-7(HE-3,T)4-BE-7
46. 3-LI-7(P,A)2-HE-4
47. 3-LI-7(P,G)4-BE-8
48. 3-LI-7(T,A)2-HE-6
49. 3-LI-7(T,D)3-LI-8
50. 3-LI-7(T,P)3-LI-9
51. 3-LI-7(T,X)
52. 4-BE-9(A,N)6-C-12
53. 4-BE-9(D,A)3-LI-7
54. 4-BE-9(D,G)5-B-11
55. 4-BE-9(D,N)5-B-10
56. 4-BE-9(D,P)4-BE-10
57. 4-BE-9(D,T)4-BE-8
58. 4-BE-9(D,X)
59. 4-BE-9(HE-3,P)5-B-11
60. 4-BE-9(HE-3,X)
61. 4-BE-9(P,A)3-LI-6
62. 4-BE-9(P,D)4-BE-8
63. 4-BE-9(P,G)5-B-10
64. 4-BE-9(P,N)5-B-9
65. 4-BE-9(P,X)
66. 4-BE-9(T,N)5-B-11
67. 5-B-10(D,A)4-BE-8
68. 5-B-10(D,N)6-C-11
69. 5-B-10(D,P)5-B-11
70. 5-B-10(P,A)4-BE-7
71. 5-B-10(P,G)6-C-11
72. 5-B-11(A,G)7-N-15
73. 5-B-11(A,P)6-C-14
74. 5-B-11(D,A)4-BE-9
75. 5-B-11(D,G)6-C-13
76. 5-B-11(D,N)6-C-12
77. 5-B-11(D,P)5-B-12
78. 5-B-11(P,A)4-BE-8
79. 5-B-11(P,G)6-C-12

80. 5-B-11(P,N)6-C-11
81. 6-C-12(P,G)7-N-13
82. 6-C-13(P,G)7-N-14
83. 7-N-14(P,G)8-O-15

The possibility of getting our own evaluated data along with presenting complete reference information on the specific isotope and every reaction under study makes it possible to consider the given program product as an efficient enough instrument applied to prepare and use the data in
different thermonuclear applications.

Moreover, available analytical presentation for the evaluated curve makes convenient adaptation of presented data for the using in the other software products. Just for this purpose there was chosen a polynomial presentation for approximation of excitation functions (cubic splines). It
allows to combine the evaluated curves with other descriptions presented in the analytical form.

Theoretical models are used in cases when the experimental data don't allow to define univocally a shape of the excitation function for cross-sections of some reactions. The spline is built according to the theoretical curve normalized by weight-average experimental values.

When the experimental material does not allow to uniquelycharacterize the relative course of initiation function for the cross-section of this or that reaction, to the estimation there are applied
theoretical calculations on the models, and the spline is constructed on the basis of the theoretical curve normalized by weighted mean experimental values.

In the SaBa database along with presenting the data in the form of cross-sections there are widely used their presentation in the form of S-factor. The possibility of S-factor easy extrapolation in future to the sphere of low energies is of additional interest as to the use of the obtained data to for the needs of astrophysics and other nuclear applications.

The SaBa database presents the user the following possibilities.

1. Getting the information on isotopes and reactions. The given mode makes it possible for the user to get reference data associated with the selected isotope and reaction. The data on the isotope includes the list of physics and chemical properties. The data on the reaction includes its description as well as the information on the sources of experimental data.

2. Output of the list of all reactions. This possibility (output of the list of reactions under study to the display and printer as well as its writing to file) makes it more convenient for the user to work with the base.

3. Review and output of tables and plots. This mode is intended to work with evaluated and experimental data. The data are, as an option, presented both in tables and plots. There exists the possibility of performing comparative analysis of available data with the data from ECPL library. The availability of data editing means makes it possible to effectively arrange the process of preparation and creation of materials for scientific reports and articles.

4. Creation of files in ENDF format. In this case the user has the possibility of writing the available newly obtained evaluated data in ENDF/B-VI format that is widely used for evaluated data exchange.

5. Editing and evaluating of data. The given mode makes it possible for the user to edit the experimental data, to enter the spline from the file, to delete data sets and to create his own evaluated curve - i.e. to construct a new spline. The developed graphic interface considerably simplifies and accelerates the work with the data at this stage. The database of evaluated and experimental data on charged particles SaBa is first oriented to scientific associates specialized in getting nuclear data for the needs of thermonuclear engineering, astrophysics, medicine. It can also be useful for the scientists occupied with the researches in the field of nucleear physics.

Further development of SaBa database is provided. It is assumed that a set of nuclei under study will be expanded to oxygen inclusive. It is planned to complete some evaluated data with the calculations in nuclear physics models so that the extrapolation to the range of low energies is implemented. It is planned to introduce into the base the data on nuclear reactions rates, whose values will be presented in the form of two-dimensional splines. There will be continued the works on performing comparative analysis between evaluated data from SaBa and the data from other libraries.

The users will be presented the possibility of creating and storing its own databases with the evaluations obtained in the course of activities.

The CDFE
Relational Nuclear Spectroscopy Data Base NESSY in Internet

I.N.Boboshin, V.V.Varlamov, E.M.Ivanov

The several directions of special software development have been described before for convenient search for the ENSDF information:

- the USA NNDC programs provided the output information from the ENSDF in a form similar to that of the Nuclear Data Sheets, on-line retrieval system, special programs MEDLIST and RADLIST for medical applications;
- the Sweden Lund University and Institute of Technology nuclear radioactive decay γ-radiation characteristics database;
- the Russia CDFE data library based on the ENSDF /1/ as the bank of more than 15 programs for the ENSDF operation;
- the USA LBL Electronic Table of Isotopes for the personal computer (announcement).

It must be pointed out that there is the one general restriction of the all programs mentioned above. Each of them is searching for the only a given the ENSDF file information subset.

The relational nuclear spectroscopy data base NESSY (New ENSDF Search SYstem) has been developed before /2/ for using on PC and compatible computers. This is a very powerful tool for scientific research which use the nuclear spectroscopy information because it has an evident advantages in comparison of other software for database operation with the ENSDF mentioned above:

- configuration on both search conditions and output information is not limited;
  - automating formation of tables containing the search parameters can be included in the common query configuration:
  - Query_1 (ENSDF) $\Rightarrow$ Result_1,
  - Query_2 (Result_1) $\Rightarrow$ Result_2,
  - and so on;
- requests are posed by means of both values and the relations between them;
- performing arithmetic and other operations over searched values is possible.

The following are the only three of many examples of information combined from the several ENSDF subsets search tasks of great importance for the number of applications:

- for ecology needs to follow the decay chains till the stable isotope appearance of every radioactive isotope requested (about 250 nuclides) and indicate decay mode, final nucleus, half-life, and branching ratios for every decay (since the final nucleus of the majority of decays is the parent nucleus for the nest decay, the “query chain” scheme is needed);
- for nuclear waste utilisation needs to indicate all levels with known γ-decays and renormalize the data obtained so that the sum of intensities for every level is equal to 1; to find and indicate all metastable states; to determine if radioactive decays of the

nucleus exist (both for ground and excited states) and, if so, indicate their modes, half-life times, and the average excitation of the final nuclei;
- for an activation analysis needs to find the levels in number of nuclei requested having the energies equal to the energies of absorbed and radiated γ-quanta with the nucleus recoil taking into account.

It is clear that these requests practically can not be processed by systems mentioned above. The NESSY can do that very simply.

Now NESSY is put partially upon the CDFE Web-site (http://depni.npi.msu.su/cdfe) using the MySQL data base management system.

This gives to all people who have Web-browser the possibilities for:
- solve all the tasks that can be solved on existing search systems on ENSDF in the world and additionally a number tasks that can be solved on the NESSY only;
- receive the rapid access to any data from the ENSDF;
- do the search job with simplicity and clearness because NESSY's user interface is very friendly: CUI (Common User Interface) standard is keeping out.

References

1. *I.N.Boboshin, V.V.Varlamov.* **The International Evaluated Nuclear Structure Data File (ENSDF) in Fundamental and Applied Photonuclear Research. INDC(CCP)- 297/GE, IAEA NDS, Vienna, Austria, 1989, pp. 1 - 8.**
2. *I.N.Boboshin, V.V.Varlamov***. The New ENSDF Search System NESSY: IBM/PC Nuclear Spectroscopy Data Base. Nucl.Instr. and Meth., A369 (1996) 113.**

WP2000-28

The Oracle Design for EXFOR and CINDA

Mark A. Kellett, NEA Data Bank

The Data Bank does not have any specific design documentation relating to the EXFOR and CINDA databases. However shown in this document are the "Tables" required for producing the database structure as used at the Data Bank.

The database for the two (CINDA and EXFOR) is run as a single incidence of Oracle known as EXFOR. The cross links between the two can be seen in the following two figures.

Currently the EXFOR files are loaded through a set of FORTRAN and PRO-FORTRAN codes, but a PERL version is currently under development. The CINDA files are already loaded through PERL.

An interface to the EXFOR database (used for dictionary updates, special retrievals, etc.) is available via the Oracle FORMs software. This is generated again using FORTRAN and PRO-FORTRAN coding.

The Data Bank has now detailed checking codes for EXFOR file loading, although basic checks are carried out during the loading process and relevant indexing information is loaded into the required "Tables" by this process through extracting the information from the file.

The BNL checking code has been received by the Data Bank, but it needs to be significantly altered to allow it to use the standard dictionary, rather than the DANIEL format ones in use on VMS systems. It is hoped that this can be incorporated into this year's work programme.

BATCH_TRAN

batch_ind	A1
batch_date	D
batch_time	I5

LOAD_TRAN

filename	A70
test_ind	A1
restart	A5

TRANSM

tran_no	A4 *
tran_date	D
load_date	D

TRAN_CONV

tran_no	A4
tran_ch	A4

EXFOR_REFS

work_no	A5 *
ref_no	I2 *
reference	A55
ref_type	A1
ref_code	A30
ref_vol	A10
author	A30

HEADER

heading	A10 *
hea_col	A1
hea_exp	A55
hea_uni	A1
hea_ang	A1
hea_cov	A1

UNITS

unit	A10 *
uni_conv	R
uni_exp	A32
uni_kep	A1
uni_code	A1

SUBB_RECNO

rec_no	A5
user_id	I3

RET_FIELDS

field_name	A20
field_value	A20
user_id	I3

WORKS_SELECTED

w_no	A5
s_no	A3
user_id	I3

CHARX4

trans_letter	A2 *
acc_dig	A2

REAC_TEMP

reac_line	A66 *
reac_no	I2

SUBWORKS

work_no	A5 *
subwork_no	I3 *
reaction_code	A30 *
z_no	A3 *
a_no	A3 *
emin	R
emax	R
part_code	A10 @
proc_code	A20
reac_proc_code	A20
branch_code	A20
param_code	A20
part_cons_code	A20
mod_code	A20
datatype_code	A5
cinda_code	A3 @
lab	A3 @
ref_date	A2
tran_no	A4

S_WORKS

T_WORKS

REACTIONS

reaction_code	A30 *
cinda_code	A3 @
reaction_exp	A40
new_reac	A1

X4

PARTICLES

part_code	A10 *
part_name	A20
part_date	D

PROCESS

proc_code	A20 *
proc_name	A55
proc_date	D

REAC_PROCESS

reac_proc_code	A20 *

BRANCH

branch_code	A19 *
branch_exp	A60

PARAMETERS

param_code	A10 *
param_name	A60

PART_CONS

part_cons_code	A20 *
part_cons_name	A55

MODIFIERS

mod_code	A20 *
mod_name	A200
mod_exp	A55
mod_date	D

DATATYPE

datatype_code	A5 *
datatype_name	A55

Cinda

REFTYPES

reftype	A1 *
reftype_exp	A50

JOURNALS

jcode	A6 *
jcode_cinda	A4
jdesc	A1024
country	A3 F
obsolete	A1

REPORTS

rcode	A11 *
rdesc	A1024
country	A3 F
obsolete	A1

BOOKS

bcode	A10 *
bdesc	A1024
obsolete	A1

REFBASE

base_root	A4
base_mask	A10

AREAS

area	A1 *

COUNTRIES

country	A3 *
country_name	A50
area	A1 [0]
obsolete	A1 [ ]

LABS

lab	A3 *
country	A3 *
lab_name	A55
moreinfo	A1024 []
obsolete	A1 [ ]

CINDA

cinda_code	A3 *
cinda_name	A200
cinda_exp	A70
sortorder	I [0]
obsolete	A1 [ ]

CINDARECS

cin_seq	I *
serial_no	I
z_no	I F
z	A2
a	A3
q	A3 F
lab	A3 F1
country	A3 F2
block_no	I
flag	A1
worktype	A1
e_min	A5
e_max	A5
hierarchy	A1
reftype	A1 F
ref_root	A4
ref_volume	A4
ref_end	A6
ref_date	I
author_flag	A1
comments	A36
reader_symbol	A1
mod_date	D

ELEMENTS

z_no	I3 *
atosym	A2
z_exp	A20

ISOTOPES

z_no	I3 *
iso_no	I3 *
flags	A13 [ ]
sortcode	I [0]
obsolete	A1 [ ]

COMPOUNDS

compound	A3 *
comp_exp	A50
z_no	I [0] F
moreinfo	A55 []
obsolete	A1 [ ]

LAST_UPDATE

Batch_id	A6
area	A1 F
load_date	D
last_serial	I

COVERAGE

batch_id	A6
reftype	A1
rcode	A10
info	A60

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RIPL for FTP file transfer of RIPL;
NDSONL for FTP access to files sent to NDIS "open" area.
Web: http://www-nds.iaea.or.at