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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

Co-ordination of the Nuclear Reaction Data Centers

Report on an IAEA Advisory Group Meeting

hosted by the NEA Data Bank

Paris, 25-27 April 1994

Edited by

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

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Abstract: This report summarizes the 1994 co-ordination meeting in Paris, France, of the national and regional nuclear reaction data centers, convened by the IAEA at regular intervals. The main topics are

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

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

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CONTENTS

LIST OF ACRONYMS

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

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

The Network of Nuclear Reaction Data Centers

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

The nuclear reaction data centers:

NNDC	-	US National Nuclear Data Center, Brookhaven, USA
NEA-DB	-	OECD/NEA Nuclear Data Bank, Saclay, France
NDS	-	IAEA Nuclear Data Section
CJD	-	Centr po Jadernym Dannym (= Nuclear Data Centre), Obninsk, Russia
CAJaD	-	Centr po Dannym o Stroenii Atomnogo Jadra i Jadernykh Reakcikh (= Nuclear Structure and Nuclear Reaction Data Centre), Moscow, Russia
CDFE	-	Centr Dannykh Fotojad. Eksp. (= Centre for Experimental Photonuclear Data), Moscow, Russia
CNDC	-	Chinese Nuclear Data Centre, Beijing, P.R. of China
ATOMKI	-	Nuclear Data Group of the ATOMKI Institute, Debrecen, Hungary
RIKEN	-	Nuclear Data Group, RIKEN Institute of Physical and Chemical Research, Wako-Shi, Japan
JCPRG	-	Japan Charged-Particle Nuclear Reaction Data Group, Sapporo, Japan
JAERI	-	Nuclear Data Center of the Japan Atomic Energy Research Institute, Tokai-Mura, Japan
(KACHAPAG)	-	(Karlsruhe Charged Particle Group, Karlsruhe, Germany. Discontinued in 1982, its responsibilities were taken over by CAJaD)

1. Neutron Nuclear Data

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

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

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

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

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

Online services by NNDC, NEA-DB and NDS

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

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

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

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

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

2.c Data Handbooks based on EXFOR published by NDS, CAJaD

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

2.e Evaluated data in ENDF format:
NNDC, NDS, CAJaD, ATOMKI

3. Photonuclear Data

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

3.b Bibiliography published by CDFE and JAERI

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

Past NRDC Meetings

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

Summary Report

Introduction

The purpose of this Advisory Group Meeting, which was one in a series of biennial meetings, is to review the status of the cooperation of the Nuclear Reaction Data Centers' (NRDC) Network for the previous two years and to plan for the coming two years. After detailed presentations on the activities of each of the cooperating data centres, the meeting separated into two parts, one involving the centre heads and a parallel session for discussion of technical aspects of the cooperation. The centre heads' discussion concentrated on the increasing fiscal restraints faced by all the centres and the need to present a more coherent view of the activities of each data centre. It was recommended to prepare a document defining the participating data centres and outlining the special responsibilities of each centre, in consultation with the network participants.

The technical parts of the agenda, which concentrated on the jointly operated computerised systems and data exchange routines (i.e. CINDA, EXFOR, ENDF, etc.), took place in separate sessions for the three specialized data centre networks for neutron reaction data, charged-particle reaction data, and photonuclear data.

C.L. Dunford acted as chairman of the plenary sessions and of the center heads' session. O. Schwerer acted as chairman of the technical sessions, and as the Scientific Secretary. H.D. Lemmel, who participated at no cost to the Agency, acted as chairman of the session on charged-particle reaction data and photonuclear data.

The meeting was attended by 20 participants from 11 Nuclear Reaction Data Centers in USA, Russia (3), Japan (3), China, Hungary, and the centers of NEA and IAEA. See Appendix 1 for the list of participants.

The agenda is attached as Appendix 2.

The network of Nuclear Reaction Data Centres which is coordinated by the IAEA is responsible for the collection and dissemination of nuclear reaction data essential to the development and maintenance of applied nuclear technologies. This cooperative activity organizes the international resources devoted to this task in order to avoid duplication and wasted effort while providing this essential service to nuclear technology research and application activities world-wide. This coordination has been carried out successfully for more than 25 years. Every year, technical experts from the data centres meet under IAEA auspices to exchange ideas, develop the standards for the cooperation and determine joint projects to be carried out. Every second year, the data centre heads join the meeting in order to assess the cooperation and to determine the future directions of the data centres and the network activities.

The first day of the meeting was devoted to presentation of progress reports from the participating centres and discussions of topic of common interest to both the centre heads and the technical staff. The second day of the meeting was devoted to parallel sessions of the centre heads and the technical staff representatives of the data centres. The third day was devoted to developing the conclusions and recommendations from the meeting.

Opening Session

Mr. Ph. Savelli of the OECD Nuclear Energy Agency gave the welcoming speech on behalf of the hosts, the NEA. He noted that the NEA had consolidated staff from three separate facilities in the new building in which we were meeting, the Data Bank formerly housed in facilities provided by the French Government in Saclay. He mention the Data bank priorities in the next two-year program, basic data, code certification and distribution, and evaluated data. The NEA Nuclear Science Committee initiated survey of nuclear data needs was completed. Response from some utilities and other users was encouraging. Special challenges are presented because of the present declining support for the nuclear power option. This speech was followed by the IAEA welcoming speech which was presented by C.L. Dunford. R. Meyer made a brief statement on behalf of the USDOE and urged closer contacts between the nuclear reaction data network and the nuclear structure data network.

The preliminary agenda was adopted after C.L. Dunford's selection as Chairman of the meeting and O. Schwerer as Scientific Secretary. Parallel sessions were chaired by C.L. Dunford (center heads), O. Schwerer (neutron data), and H.D. Lemmel (charged particle and photonuclear data).

H. Lemmel gave the NDS progress report. He mentioned the staffing changes which have occurred in the past two years and that there were no longer any staff vacancies. The budget reductions and staff reduction for 1995-1996 were described. The migration of computing activities from the IBM to the Section's VAX was discussed with completion projected within one year. New coordinated research programs (CRP) in nuclear model parameters, photon production cross sections and recommended activation data were presented.

N. Tubbs presented the NEA Data Bank report. He described the formation of the NEA Nuclear Science Committee and its role in overseeing the Data Bank. Some disruption in the Data Bank work occurred during the move to the new building because the facility could not accommodate the Data Bank's computer. Thus a smaller VAX was purchased. The use of their on-line data service is now expanding rapidly but remains at about 10% of the NNDC activity. The new version of the European evaluated nuclear data file JEF-3 in now being planned. The emphasis will be on advanced fuel cycles, Pu-burning and actinide burning requirements.

Y. Kikuchi discussed the JAERI Nuclear Data Centre. Japan is a member of the NEA Data Bank and therefore relies on it for most services. The data centre concentrates on the coordination and production of the Japanese Evaluated Nuclear Data file, JENDL. Version 3.2 of the JENDL General Purpose library will be released soon. Future work will concentrate on a high energy library, minor actinides and covariances. Work continues on an artificial intelligence approach to nuclear data evaluation wherein the past experiences as to code selection and input parameters are stored in a computer file. High energy data evaluations are being done in support of the Omega project. They are investigating on-line access to the centre's data. For this purpose, a workstation will be required.

M. Bhat gave the report for Brookhaven's NNDC. The NNDC has been reduced by 5 senior and 2 support staff in the past two years. The budget for the fiscal year 1995 beginning in October 1994 will be further reduced by about 40%. The VAX-cluster computer used by NNDC has been replaced by a DEC ALPHA-7100. While traditional requests for nuclear data have declined, the number of retrievals supplied via the on-line serviced is increasing rapidly. BNL is proposing to increase their nuclear reaction data activities with two new positions. M. Bhat is not sure how this can be accomplished within the proposed budget.

V. Manokhin of the Obninsk Nuclear Data Centre stated that FEI Obninsk had been designated as the Russian nuclear power centre. This designation has strengthened the centre's future prospects. The centre is interested in dosimetry data, activation libraries and covariances. They are working on improved evaluations for Fe, Ni and Cr in conjunction with the Chinese Nuclear Data Centre.

Zhuang Youxiang reported on the Chinese Nuclear Data Centre. The main activities of the CNDC include the Chinese evaluated nuclear data library CENDL (version 2.0 was completed in 1992, 2.1 will be finished in 1995). A Chinese Evaluated Nuclear Parameter Library (CENPL) has been preliminarily established. The centre is also active in the development of nuclear model codes as well as in the compilation and evaluation of charged particle and photonuclear data.

M. Chiba gave the report on the Japan Charged-Particle Nuclear Reaction Data Group on behalf of H. Tanaka. They maintain their NRDF database which has a wider scope than EXFOR. Other main activities of the group include the translation of the relevant parts of NRDF into EXFOR format, the development of a combined index database for NRDF and EXFOR, and, with increasing emphasis, customer services.

Y. Tendow described the work of the RIKEN Nuclear Data Group (Japan). This group is active in the compilation of certain charged-particle reactions in EXFOR (mainly data for medical purposes) and also in nuclear structure and decay data as a member of the Japanese ENSDF working group.

F.E. Chukreev discussed the CAJAD nuclear data centre (Kurchatov Institute, Moscow), the centre in charge of coordinating the CPND compilation in EXFOR. The emphasis of their compilations is radioisotope production (in particular for medical purposes), integral data needed for transmutuation of radioactive waste, and some data for thermonuclear fusion.

V.V. Varlamov reported on CDFE (at Moscow State University), the main data centre for photonuclear data. So far CDFE has compiled about 500 photonuclear data works in EXFOR. Other activities include the conversion of the photoneutron data file by E.G.Fuller (USA) into EXFOR format, photonculear data evaluation (evaluated photoneutron cross sections for O-16, Si-28, Pr-141, and Pb-208 were compiled recently in EXFOR), and the development of a new ENSDF search system for PC, NESSY.

F. Tárkányi summarized the work of the Debrecen Nuclear Data Group (at the ATOMKI Institute, Debrecen, Hungary). The group is active in measurements of excitation functions of charged-particle induced reactions, in particular of monitor reactions and isotope production for medical use, and is also studying new applications like the thin layer activation technique. Their first EXFOR compilations will be distributed in September.

The progress reports are reproduced in Appendix 8.

General Discussions

After the actions from the previous two meetings were reviewed, the meeting had a general discussion on customer services. One major problem faced by all centres was poorly defined requests asking for more information than could realistically be needed. It is important that each centre have someone technically qualified to assist the requester in defining a request more precisely. Data centres provide an important value added service by processing raw data into a form most useful for the requestor. All centres need post processing capability.

The meeting agreed that the centres should adopt common graphics software so that plotting and other codes requiring graphics can be exchanged. The on-line data services are important. NNDC and NDS will continue to cooperate in the development of their common system. NNDC and NDS have been ask to install this software on the new DEC ALPHA computer being installed by FEI Obninsk. Finally, the four neutron data centres agreed to explore how they could share the task of maintaining a current address list database.

Joint documents distribution

For many years there had been a cooperation between the International Nuclear Committee (INDC) and the Nuclear Data Committee of the NEA (NEANDC) on a joint distribution of nuclear data related reports such as annual progress reports, lab reports on important nuclear data activities, meeting proceedings, and others.

These reports used to serve as an important information medium on an international level among nuclear scientists. Some time ago, the NEANDC was discontinued, and the successor, the NEA Nuclear Science Committee (NSC) did not take up this reports distribution activity. Consultation will have to continue until the distribution of progress-reports compiled from NEA countries has been reorganized.

It will be essential that the centers coordinate their address files and, possibly, find a solution for a jointly maintained address file for the distribution of reports and other materials.

Evaluated data libraries

The status of the main evaluated neutron data libraries was briefly reviewed. For ENDF/B-6 some updates can be expected in 1995. The JEF library (current version is 2.2, dating from February 1992) will not be modified until the release of JEF-3 (not before 1997), although some special purpose files will be updated (but not released) earlier. The current version of BROND is still 2.1. Any further updates prior to the release of BROND-2.2 are for use for FENDL purposes only. The next version of CENDL will be released in 1995. The revision of JENDL (JENDL-3.2), now in ENDF/B-6 format, is almost completed (release was expected by June 1994).

Next NRDC meetings

The meeting envisaged the following possible dates for the next two NRDC meetings:

Next Technical NRDC meeting: Vienna, April or May 1995
Next full NRDC meeting: Brookhaven, April or May 1996

Centre Heads Discussions

R. Meyer from USDOE presented the US nuclear data program plans. The nuclear data budget for the US was 9.1 million dollars in 1993, is 7.0 million for 1994 and will be 6.0 million in 1995, a reduction of 1/3. The brunt of the reduction has been bourne by the measurement program and the nuclear data centre at BNL. The nuclear data program is managed from an organization which is oriented toward basic science. It is difficult for them to define and get support from the user community. J. Dairiki then gave a brief summary of the directions being taken by the nuclear structure portion of the nuclear data program, emphasizing the attempt to get new user communities involved and to make data available through user oriented PC software.

The importance of the archival functions of data centres is often overlooked. The longer term prospects for the NNDC and the US nuclear data program were of great concern The potential for loss of data and expertise was serious.

Most of the remaining time was devoted to a proposal from the NEA to reorganize the structure of the cooperation with the IAEA and the NEA having joint responsibility for the coordination of all nuclear data activities. The NEA proposal has four main points,

1) Joint NEA-IAEA sponsorship/coordination,
2) Adopt the existing infrastructure,
3) Define a broader scope of activities,
4) Recognize the specialized nature of each participating centre.

Many participants supported the desire to give a more formal framework to the cooperation. Only one or two bilateral agreements exist, those being quite old and probably not reflecting the breadth of the current cooperation. Such a document would be useful to give an official status to the participants and provide a basis for individual discussions with higher levels of management. Some expressed concern that more tasks would result but the budgets would not appreciate.

The proposal to replace the IAEA coordination with a joint NEA-IAEA umbrella was most widely discussed. Y. Kikuchi pointed out that the Japanese Government might worry about the decreased quality of the services from the NEA Data Bank if the special role of the US and Obninsk data centres were deemphasized. The US is a member of NEA but not the Data Bank as the NNDC serves the full service data centre role for the US. C.L. Dunford expressed concern for the practical implications of the joint NEA/IAEA coordination proposal. In particular, the NEA is a regional organization whereas the IAEA is truly international. NEA cannot deal officially with countries which are not members. The NEA has responsibility for coordinating nuclear data evaluation activities through a working party of its Nuclear Science Committee. It is not clear how the IAEA and the NEA could share responsibility for a Working Party of the NEA.

The meeting agreed on a text on the "Coordination of Activities within the International Nuclear Data Community", which is given on the following page. It includes a schedule for drafting a new agreement. There is an action on the NEA Data Bank and the IAEA Nuclear Data Section to complete a draft protocol by mid-September.

Coordination of Activities within the International Nuclear Data Community

The meeting recognised:

- that the only existing cooperative arrangement (from 1968) is outdated and does not describe the present broad scope of the cooperation in nuclear data,
- the need to formulate a new agreement, reflecting:
  - the widened scope of the present cooperative arrangement,
  - the existing well coordinated efforts,
  - the unique expertise of the various cooperating data centres.
- the difficulties caused by the continuous reduction of resources available to perform the vital work of the centres.
- the need to delineate what expertise individual national data centres provide as effective core activities of the international data effort.
- the urgent need for a clear and concise description of this cooperative activity for review by various administrative bodies.

The meeting recommended:

- that a document be prepared, reflecting the broad scope of current and future network activities,
- that the document include a concise definition of the objective of the nuclear data network and the means by which the cooperative activity will be carried out,
- that the participating centres and their responsibilities be clearly stated,
- that the document would be regularly reviewed and updated to reflect changes in the participating centres and their responsibilities.

The meeting adopted the following timetable for implementing these recommendations:

- comment and suggestions in writing from the participating centres to IAEA and NEA simultaneously by 15th July 1994,
- draft agreement prepared jointly by IAEA and NEA to be circulated to participating centres by 16th September 1994,
- IAEA should convene a meeting in Vienna during the month of October 1994, to prepare the final version of this document and to recommend its distribution and implementation.

Technical Discussions

On the second day of the meeting, technical discussions were held in parallel to the centre heads' discussions, dealing with the jointly operated computerized data systems (EXFOR, CINDA, common dictionary database). The joint operation of these systems is co-ordinated by the IAEA Nuclear Data Section; however, any changes and updates, e.g. to accomodate new data types, need approval at a data centres' meeting. The problems covered at this meeting included a major revision of the EXFOR/CINDA dictionary database, dictionary and manual updates, corrections of transmitted data, new media for data exchange, and many others. The technical discussions resulted in a list of more than 70 detailed technical conclusions and actions which is given in Appendix 3.

The information exchange and data file exchange between the centers is increasingly done by electronic media. A list of updated e-mail addresses is given in Appendix 4. An updated list of electronic media available at the centers is given in Appendix 5.

Photonuclear data

The compilation work of V. Varlamov, CDFE, Moscow, which is the only active center compiling photonuclear data, was much appreciated. It is most essential for the data centers network that this center finds continuing support. Some EXFOR compilation rules, which are specific to photonuclear data, were agreed at the meeting.

In addition to its data compilation activities, CDFE also produced bibliographic indexes which have been distributed as CDFE-reports or also as INDC-report, INDC(CCP)-348. More recently, also JAERI, Japan, has become interested in photonuclear data and produced a CINDA-type bibliography published as report JAERI-M-93-195. A cooperation between these two centers was agreed and a proposal for a CRP was formulated, see Appendix 6 which also includes a list of related actions.

Charged-particle nuclear reaction data (CPND)

CPND are compiled into the EXFOR database regularly by CAJaD, CNDC, and the two Japanese centers, whereas NNDC and IAEA-NDS compile such data only occasionally as manpower permits.

It was appreciated that ATOMKI, Hungary, has joined the CPND network, specifically with the goal of producing an evaluated CPND database for applications in beam monitoring and radioisotope production. It is planned to support this work by a CRP. First EXFOR entries compiled by ATOMKI will be transmitted soon.

It is hoped and encouraged that also the NEA Data Bank would start to compile medium energy CPND into the EXFOR system.

The main workload of the EXFOR compilation of CPND continues to be done by CAJaD, Moscow (F.E. Chukreev). Specifically recognized was the recent compilation by F.E. Chukreev of the many-years work done at the Nuclear Physics Institute of the Kazakhstan Academy of Sciences under V.N. Levkovski, where 542 nuclear activitation reactions induced by medium energy protons and alpha particles (E = 10-50 MeV) have been measured.

It was confirmed that CAJaD continues to have the main coordinative function among the charged particle nuclear data centers. Consequently, it will be vital for the network that this center continues to be funded by its authorities.

Whereas most of the centers are primarily interested in integral CPND, JCPRG continues to cover also differential CPND. The Japanese Nuclear Reaction Data File, NRDF, which contains all types of charged-particle induced reaction data including differential CPND, continues to be maintained. Those data which are EXFOR compatible, are machine converted to EXFOR format and transmitted to the other centers. The continuation of this activity was appreciated and encouraged.

The conclusions and actions agreed among the CPND centers are included in Appendix 3. The main goal of establishing an evaluated data file for selected CPND, was confirmed. A summary of data evaluation activities of the CPND centers and their topics of interest is given in Appendix 7.

The main goal of the work of the CPND centers remains the creation of an internationally recommended data file of evaluated CPND cross-sections for

- beam monitoring,
- production of medical radioisotopes, and
- activation of structural materials, possibly extending to higher energy ranges of intermediate energy applications.

It was strongly recommended that the IAEA should support this activity by means of a CRP to measure, compile and evaluate the required CPND.

This recommendation, coincides with the findings of the IAEA Specialists' Meeting on "Charged-Particle and Photonuclear Data Evaluations for FENDL", Smolenice, Slovakia, 18-21 April 1994. This meeting also issued a recommendation on the thermonuclear reactions of hydrogen and helium isotopes, which are taken care of by another network of institutes not represented in the CPND network of the present meeting.

Appendices

1. List of participants
2. Agenda
3. Conclusions and Actions resulting from the Technical Sessions
4. E-Mail Addresses
5. Media for data exchange between Centers
6. Draft proposal: CRP on Photonuclear Data
7. Data evaluation activities of the CPND centers
8. Progress reports
9. Working Papers

IAEA Advisory Group Meeting
on the Coordination of the Nuclear Reaction Data Centres
Paris, France, 25-27 April 1994 (Monday-Wednesday)

hosted by the OECD Nuclear Energy Agency

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Appendix 2

IAEA Advisory Group Meeting
on the Coordination of the Nuclear Reaction Data Centres
Paris, France, 25-27 April 1994 (Monday-Wednesday)

hosted by the OECD Nuclear Energy Agency

AGENDA

Plenary session

P.1 Opening, election of chairmain
P.2 Adoption of the agenda
P.3 Brief status reports of the centres
P.4 Review of general actions from
the last Technical NRDC meeting (INDC(NDS)-279, p. 7) and
the last Center Heads' Meeting (INDC(NDS)-262, p. 13)
P.5 Customer services
P.6 Documents distribution
P.7 Online systems and other new technologies
P.8 Evaluated data libraries
P.9 Next NRDC meetings
- Technical meeting 1995
- AGM in 1996

Centre heads session, neutron data centres

- general situation, manpower
- customers and role of the centers, future developments

Centre heads session, all data centres

similar as for neutron data centers

Technical session (all data types)

T.1 New transmission format for EXFOR/CINDA dictionaries
T.2 Media for data exchange between centres (tapes, diskettes, e-mail, FTP)
T.3 Review of actions on EXFOR from last Technical NRDC meeting, INDC(NDS)-279, pp. 8-10
T.4 Pending EXFOR matters (dictionary and manual updates, coding rules)
T.5 TRANS tapes transmitted since last meeting
T.6 Distribution of TRANS tapes
T.7 Common graphics software

Technical session (Photonuclear Data)

TP.1 Data compilation and evaluation
TP.2 Bibliography: CDFE + JAERI cooperation?

Technical session (CPND)
TC.1 Review of data needs for applications
TC.2 Compilation and evaluation

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

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

IAEA Advisory Group Meeting on the
Co-ordination of the Nuclear Reaction Data Centres
Paris, France, 25-27 April 1994

CONCLUSIONS and ACTIONS
resulting from the Technical Sessions

E-mail and data file exchange between centres

1)	Concl.	The updated list of e-mail addresses as compiled at this meeting is noted (see Appendix 4)
2)	Concl.	The list of accepted/preferred media for data exchange between the centres as compiled at this meeting (see Appendix 5, WP 6 as updated at this meeting) is noted and will be applied for the exchange of CINDA batches, EXFOR TRANS tapes and CP/4C-memos.

EXFOR/CINDA Dictionaries

3)	Concl.	A new "super-dictionary" based on the existing DANIEL internal dictionary system already used at NNDC and NDS, and including free text information as given in the current EXFOR/CINDA dictionaries, will be developed. This will be the Master dictionary, from which it will still be possible to produce dictionary transmission tapes in the traditional (IBM) format.
4)	Act. NDS	Make sure that all information necessary to produce EXFOR dictionaries is present in the new Master file.
5)	Act. McLane	Write the program needed to produce new EXFOR/CINDA dictionaries in the traditional format from the new Master file.
6)	Act. NDS	Continue sending dictionaries in traditional format to all centres that need them.
7)	Act. McLane	Send EXFOR checking codes (executables only) plus the accompanying dictionaries (in DANIEL format) to NEA.
8)	Concl.	Upper and lower case should be allowed for expansions in dictionary columns 12 to 66.
9)	Act. NDS	Add the code 0-G-0 to dictionary 36.

EXFOR, general

10) Concl.	Status of Dubna institute is "International".
11) Act. CJD	To inform NDS whenever an institute name is changed.
12) Act. McLane	To update and submit dictionary 36 entries on photonuclear quantities (with expansions) and to make appropriate changes in LEXFOR entry. (See memo CP-C/200 and reply in CP-D/219)
13) Act. McLane	To provide Lexfor entry for energy spectra of particle pairs and PAR,SIG,P/T
14) Act. NDS	Following item (11), to update dictionary 36 accordingly, possibly introducing longer expansions for these quantities.
15) Act. McLane	If staffing permits, update the EXFOR manual.
16) Act. NNDC	Send the remaining entries from EXFOR files 6,7,8 to the other neutron data centres.
17) Act. All	Go through these entries and decide which entries need conversion to EXFOR.
18) Act. All	Retransmit those entries listed in V. Mclane's list of pending retransmissions.
19) Act. NNDC	To update the EXFOR manual Chapter 7 (dictionaries) on dictionary 6: how to invent report codes for annual reports without a report code on the cover. Accepted procedure is A-(3-digit labcode from dict.3, e.g. A-ALB-.).
20) Concl.	Proposed codes for Dict. 36, IND,ZP and CUM,ZP (Memo 4C-4/55) are rejected, based on the reasons given in Memo CP-D/245.
21) Act. CJD	Retransmit the entry (referenced in Memo 4C-4/55) with modified codes.
22) Act. NEA-DB	Review entry 22206 in TRANS 2132 to check whether either an error has been made in the reaction coding, or whether it is a new data type needing new coding.
23) Act. Manokhin	Circulate the latest memo regarding the conference code 93DUBNSP

24) Concl. General structure of the BIB section: - if both coded information and free text are given for a keyword, it is legal and often necessary to start with free text and give the code(s) only in one of the following lines.

25) Act. McLane Clarify wording on free text in the EXFOR manual.

26) Act. McLane Add a note in the EXFOR manual on the possibility of retransmission of entries belonging to a centre which is no longer active in a this type of data.

27) Act. CAJaD Correct and retransmit Munzel data (see Memo CP-A/65).

28) Act. CDFE Correct and retransmit L series entries (see Memo CP-A/65).

29) Act. NDS Correct the explanations for the codes BRA and BRS in Dict. 34, and add the reference MSU- INP- to Dict.6 (see Memo CP-M/15).

30) Act. Chiba Retransmit TRANS tapes E010 and E011 with the corrections requested by NDS.

31) Act. All Note common errors in EXFOR entries pointed out by O. Schwerer.

32) Act. NNDC Submit a dictionary 6 code for CRR.

33) Act. NDS Provide NEA-DB with an expanded list of errors in old entries from area 2 needing retransmission.

34) Act. NDS Retransmit entry 22242 with an EXFOR G-series number.

35) Concl. NDS will compile EXFOR entries from Chinese works published in English in the Chinese Journal of Nuclear Physics. All other works will continue to be compiled by CNDC.

36) Act. NDS NDS will periodically send CNDC supplementary EXFOR data in the form of LB***.TLB and RED.LB* files to update their EXFOR master library.

37) Concl. The distribution of EXFOR TRANS tapes is revised according to the following scheme:

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

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

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

NNDC:	all data types
NEA-DB:	all data types
CJD:	(only receives neutron data)
CAJaD:	CPND only
CDFE:	PhotoND only
CNDC:	all data types
RIKEN:	none
Sapporo:	CPND only
Debrecen:	CPND only

Fission-product yield data

38) Act. NNDC and NDS — EXFOR retrievals by fission-product nuclides should be possible. While the NDS EXFOR index provides this possibility, it is not yet possible in the VAX EXFOR retrieval system, which should be updated accordingly.

39) Act. Lammer — To revise the LEXFOR entry on FP yields.

40) Act. CJD — To send the ASIYAD-MIFI FPY library with brief documentation to NDS (for distribution).

41) Act. Lammer — Submit a proposal on the coding of mass yields as a CP memo with information on corresponding measurements.

CINDA

42) Act. NEA-DB and NNDC — To update the CINDA manual and the EXFOR manual with information about using diskettes (which format and density etc.) for EXFOR/CINDA transmissions.

43) Act. NEA-DB — Update CINDA manual to show that blank E-MIN field is now permitted.

44) Act. Lammer and McLane — Review memo 4C-3/374 once more and submit jointly a new wording for the proposed CINDA manual update.

Evaluated Data Libraries

45) Act. All — When preparing evaluated data libraries, characteristic values (thermal cross sections, resonance integrals, etc.) should be quoted in the text or in accompanying documents together with their uncertainties; however, these values (and uncertainties) would be better usable if they were in a computer-readable file.

46) Act. All — To collect lists of known faults in the evaluated data libraries, communicate these lists to the other originators data centres, possibly to include such lists in a forthcoming issue of NNDEN.

47) Act. Liang — To submit memo CNDC-025/04/94-001 on format changes in ENDF/B to R. Roussin (RSIC) who is in charge of the format-and-procedures subcommittee. As any format change requires a series of programming changes, it is essential that a proposal for a format change is supported by a convincing justification, demonstrating the deficiency in the present format and the advantages of the proposed format.

48) Act. NDS — NDS will send CNDC updated versions of the main evaluated libraries.

Charged-Particle Nuclear Data

49) Concl. — The responsibility for the coordination of the compilation of experimental CPND in EXFOR remains with CAJaD as laid down in the conclusions of the previous meetings, with the following additions:

- Debrecen compiles data measured in Hungary and in Jülich; and old data needed for evaluation.
- the NEA Data Bank has started compilation of which the list of papers was communicated to CAJaD.

50) Concl. — The following centers are now involved in CPND evaluation: (see table in Appendix 7)

51) Concl. — Coordination of the evaluation activities must be organized, by mutual information, and through IAEA/NDS.

52) Act. NDS — IAEA should give high priority to a CPND CRP for which proposals have been worked out (to be appended to the Minutes). The proposals will be reviewed by the INDC in early 1995. Depending on financial resources the CRP could start in 1995/96.

53) Concl.	Further CPND coordination should be done at the Technical NRDC Meeting April/May 1995.
54) Concl.	Attention was drawn to the newly published CPND compilations in Landolt-Börnstein, New Series, vol. 13, and in the NUCLEX (or similar name) database to be presented end of May in Paris. It is believed that both are by the same Russian group of authors.
55) Act. NDS	To contact the authors of the Landolt-Börnstein CPND compilation to obtain a computer file of this database for free distribution, and to find out whether and how this group can contribute to the network in future.
56) Concl.	An evaluated CPND file in ENDF-6 format shall be started for CPND applications. The first entry on p+Fe has been completed by CNDC.
57) Act. CNDC	To send this file to NDS.
58) Act. Debrecen and CNDC	Evaluations at Debrecen have been completed. They should be put in ENDF-6 format in cooperation with CNDC.
59) Concl.	The work by CAJaD (Chukreev) to compile the Levkovski data (i.e., more than 500 subentries) was highly appreciated. Grateful comments by data users have been received.
60) Act. Mclane	Try to find time to compile and distribute, after consultation with F. Chukreev, the EXFOR converted CPND file of R. White (Livermore) on light-element neutron-producing reactions.
61) Act. NDS	Contact Arzamas to obtain the quasi-EXFOR file of experimental data underlying the Arzamas evaluation.
62) Act. CAJaD, CNDC, RIKEN, ATOMKI	Inform other centres of plans for evaluation and compilation of monitor reactions and of medical radioisotope production reactions, through regular consultation.
63) Act. Dunford	Produce a "Short guide to ENDF" for evaluators of integral charged particle data and send it to Dr. Chukreev.
64) Act. CAJaD	Send a list of references of publications needed but not available, to NDS who will try to deliver copies of those publications.
65) Act. CAJaD	Request assistance from other centres in case of difficulties in contacting authors.

66) Concl. The centres involved in CPND work should concentrate on the compilation and evaluation of old /existing data.

67) Concl. Current data most commonly exists in the form of books. The data centres need this data in computational and graphical format.

68) Concl. The centres will continue to compile data from their own geographical regions (China, Japan, Russia), as agreed previously. For other countries it is important to find agreements which avoid parallel efforts or replication of work.

Photonuclear data

69) Act. NEA-DB Find out whether NEA, NDS, NNDC can obtain the data file containing the bibliographic data on photonuclear data.

70) Act. CDFE, JAERI, CNDC, CJD See Appendix 6 for a work program in support of the proposed CRP on Photonuclear Data.

Next NRDC meetings

71) Concl. The meeting envisaged the following possible dates for the next two NRDC meetings:

Next Technical NRDC meeting: Vienna, April or May 1995
Next full NRDC meeting: Brookhaven, April or May 1996

72) Act. All To propose topics for the next Technical NRDC Meeting, e.g.,

- meeting of programmers for the online system?
- common graphics systems (would require beforehand the exchange of experiences with graphics systems)?
- CPND workshop for an evaluated data file?

E-Mail Addresses

NEA:

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BITNET	Konieczn@FRNEAB51
X-400 (Atlas)	C=FR, A=ATLAS, P=NEA, S=name
X25 (Transpac)	(208) 092 160 775 1

(or any other staff member name in place of Konieczny)

NDS:

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Working Paper 6: Media for data exchange between Centres

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

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

	NNDC	NEA-DB	NDS	CJD	CAJaD	CDFE	CNDC	RIKEN	Sapporo	Debrecen
Cinda batch	I, F	I, F, D3, D5, (B, T)	(B), **I**, (F, D3, D5)	B (D3, D5)	-	-	T	-	-	-
Interim Dict. update	I, F	any	-	(H, D3, D5) *)	**D3, D5**, T, I	D3, D5	D5	H, I, B, T, D3, D5	B, I, F, H	-
EXFOR TRANS	I, **F**, (T), D5, D3	I, **F**, D3, D5, (T)	T, F, D3, D5	T, D3, D5	**D3, D5**, T	D3, D5	T	T, D3, D5 F	**T**, F, (D3)	D3, D5, T
CP-Memos and 4C-Memos	**I**, all	H, B, **I**	H, B, I	H, B	H, **I**	B, I (soon) H	H, D5	H, I, B	**H**, I, B	H, B, I

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

*) To be confirmed by CJD

DRAFT PROPOSAL

Coordination Research Program

Photonuclear Data : Compilation and Evaluation

(Y. Kikuchi, V. Varlamov, Zhuang Youxiang)

Photo-induced reaction data is required for various fields including both basic and applied research.

Many laboratories use gamma rays for performing activation analysis of minerals, ores, coal, and other bulk materials for industrial applications using different sources of gamma radiation. Other areas where accurate photonuclear data are needed, are reactor in-core dosimetry, radiation damage estimates in reactor structural materials, and safeguards. Photonuclear data are also important for thermonuclear reactors, because they have implications for plasma diagnostics, structural integrity, and personal safety.

Primarily, evaluated data on photonuclear reaction cross sections for the majority of natural isotopes (C, N, O, Al, Si, Ge, Ti, Fe, Ni, Cu, Ta, Pb, W, Bi, etc for constructing, shielding, medicine, electronics, etc), some transuranic nuclei (Th, U, Pu, Np, Am, etc for nuclear fuel, nuclear waste, etc) and several fission products are needed.

Unfortunately, specialists working in these fields are using "raw" photonuclear data, primarily, reaction cross section data from different (and often discrepant) measurements because of the absence of evaluated data sets.

It is difficult to produce the complete photonuclear data file on the basis of the evaluation of measured cross sections only:

- there are not sufficient experimental data necessary for the evaluation in a number of interesting cases;

- much experimental photonuclear data is obtained by different kinds of photon sources and significant systematic uncertainties are presented.

Therefore, a coordinated research program (CRP) with the purpose of the development of the evaluated photonuclear data library is very desirable.

Large scale evaluations of this kind are going on now in the Centre for Photonuclear Experiments Data (CDFE) of MSU INP and in the Centre of Nuclear Data (CJD) Photonuclear Working Group in Russia, in the Japanese Nuclear Data Committee Photonuclear Data Working Group, and in the Chinese Nuclear Data Centre.

This CRP should be supported by the following work program of the data centers.

1.	CDFE, JAERI	The creation of an international photonuclear data index, perhaps, based on the indicies currently produced in JAERI and CDFE.
2.	CDFE	The compilation of experimental photonuclear data, primarily photoneutron reaction cross section data, using the EXFOR system.
3.	CDFE, JAERI	Detailed comparison of the experimental methods using different photon beams (bremsstrahlung, quasimonoenergetical, tagged, etc.)
4.	CDFE	The improvement of the methods for evaluation of photonuclear data obtained in experiments of various kinds.
5.	JAERI, CNDC, CJD	The improvement of theoretical models for calculation of photonuclear data.
6.	CDFE, JAERI	Identification of disturbing disagreements between experimental data and submission of such cases to the CRP to perform new measurements.
7.	JAERI, CJD	The development of files of evaluated photonuclear data using the EXFOR and ENDF systems.
8.	CDFE	Updating of old versions of photonuclear data files.

The main participants of this CRP should be:

1 The Centre for Photonuclear Experiments Data (CDFE) of the MSU INP, Moscow, Russia, Dr. V. Varlamov.

2. The JAERI Nuclear Data Centre in coordination with the Photonuclear Data Evaluation Working Group of the Japanese Nuclear Data Committee, Drs. Y. Kikuchi, N. Kishida.

3. The Chinese Nuclear Data Centre (CNDC), Beijing, China, Dr. Zhuang Youxiang.

4. The Nuclear Data Centre (CJD) Photonuclear Data Working Group, Obninsk, Russia, Dr. A. Blokhin.

Additionally, the following specialists (experts) could be invited to participate this CRP:

1. Drs. S.I. Warshaw, R.M. White, R.A. Alvarez
Lawrence Livermore National Laboratory, P.O. Box 808 Livermore, California 94550, USA

2. Prof. E. Hayward
   National Institute of Standards and Technology, Washington, D.C. 20234, USA

3. Prof. D.J.S. Findlay
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4. Prof. J. Ahrens
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5. R. Van de Vyver
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6. M.N. Thompson
   School of Physics, University of Melbourne, Parkville, 3052, Victoria, Australia.

7. E. Wolynec
   Instituto de Fisica, Universidade de Sao Paulo, Caixa Postal 20516, Sao Paulo, 01498, SP, Brasil

Data evaluation activities of the CPND centers

	CAJaD	CNDC	Debrecen	Hokkaido	IAEA NDS	JAERI	NEA DB	RIKEN
light c.p. fusion reactions	compile (Gu-Zhovski	X	exp.		FENDL coop.			
reactions for beam monitoring	X	X	X					compile
reactions for medical radioisotopes	X	X	X		some compilation			compile
thin layer activation (TLA)			X					
higher energy data for transmutation	X	X	partly up to 100 MeV			1.) up to 50 MeV 2.) higher up	compile, code comparison	
in-beam data for use of accelerators			future					
(α,n)	X *)					X		
differential CPND				NRDF to EXFOR conversion				

*) (α,n): PC code and evaluated data file available at CAJaD for detecting actinides in soil (Chernobyl); in Russian, could be issued in English.

Progress Reports

R1 NNDC status report

R2 OECD NEA Data Bank status report

R3 IAEA NDS progress report

R4 The CJD status report
V.N. Manokhin

R5 CNDC status report
Zhang Jingshang, Zhao Zhixiang, Zhuang Youxiang, Liang Qichang

R6 Status report of JAERI/JNDC and JNDC
Y. Kikuchi

R7 Japan charged-particle nuclear reaction data group status report
H. Tanaka

R8 Status report of the RIKEN nuclear data group
Y. Tendow

R9 Charged particle reaction data compilation and evaluation (CAJaD)
F.E. Chukreev

R10 The MSU INP CDFE activities in photonuclear data compilation and evaluation and in EXFOR, ENSDF, and NSR
I.N. Boboshin, V.V. Varlamov, N.G. Efimkin, V.V. Sapunenko, M.E. Stepanov

R11 Status of the Debrecen nuclear data group

R1

NATIONAL NUCLEAR DATA CENTER

Status Report
to the
Advisory Group Meeting
on the Co-ordination
of the Nuclear Reaction Data Centers
25 - 27 April 1994

General

Since the last meeting of the Nuclear Reaction Data Centers in October 1991, our staff has been decreased by five scientific/professional and two support positions (there are currently 6 FTE scientific/professional and 4 support staff). C.L. Dunford is on a two-year leave of absence; Mulki Bhat has been named acting head of the NNDC.

Computer Facilities

In the past two years the NNDC has upgraded its computer facilities to reduce the necessary system support. The NNDC VAX cluster has been replaced with a VAX Alpha Model 7610. Because several minor applications have not yet been transferred to the new Alpha, the VAX 11/780 has been retained. It is expected that the VAX 11/780 will be shut down within six months.

Bibliographies

The NSR activity has continued. The publication of ***Recent References*** has been reduced to one issue per year in the December issue of **Nuclear Data Sheets.**

The CINDA compilation activity continues with respect to those references associated with the experimental data compiled at the Center.

Data Libraries

In the period from October 1991 through March 1994, 12 neutron data transmission tapes (TRANS 1245-1256) were sent containing new and corrected entries.

Evaluated Nuclear Reaction Data

NNDC continues to coordinate the work of the Cross Section Evaluation Working Group. ENDF/B-VI, Release 2, was distributed in June, 1993, and includes updates to the neutron, neutron fission product yield, decay data, and spontaneous fission product yields sublibraries. Also included are additions to the high energy neutron and proton sublibraries.
Version 6.9 of the ENDF Utility codes was distributed in November, 1993.

The Symposium on Nuclear Evaluation Methodology was held at Brookhaven in September 1992. The proceedings have been published by World Scientific Publishing Co.

Nuclear Structure Data

NNDC continues to publish the ***Nuclear Data Sheets***. As of March, 1994, issues through Volume 71, #1 have been sent to Academic Press.

Customer Services

Since October 1, 1991, use of the online data service has steadily increased. There are now more than 1000 customer accounts with more than 1400 users. There have more than 5000 retrievals per month for the past several months. A chart of Online Data Service retrievals is attached.

Publications

The DOE compilation of requests for nuclear data was done at Oak Ridge and published as report ORNL/TM-12291.

CSISRS Library Statistics

March 28, 1994

Area	# subentries	# data points	Last tape added
Neutron			
1	17 302	1 725 736	1255
2	14 619	1 182 412	2132
3	5 122	56 204	3090
4	7 151	176 186	4094
Charged Particle			
A	3 520	64 969	A028
B	1 538	16 845	B011
C	1 472	25 933	C013
D	388	8 815	D017
E	1 116	19 074	E009
P	708	11 619	P001
R	346	5 098	R007
S	313	4 134	S006
Photonuclear			
G	29	455	G007
L	651	32 772	L004
M	2 453	64 430	M015
Q			
Evaluation			
V	618	36 380	V025
Total			

CSISRS LIBRARY STATISTICS FOR AREA 1 LISTED BY REFERENCE March 28, 1994

Year	# Subentries	# Data points	Last Transmission 1255
1988	117	99475	
1989	118	10068	
1990	74	55345	
1991	90	18221	
1992	32	56590	
1993	31	8129	
Total	462	247,828	

CSISRS LIBRARY STATISTICS FOR AREA 2 LISTED BY REFERENCE

Year	# Subentries	# Data points	Last Transmission 2132
1988	500	15628	
1989	268	14984	
1990	315	15764	
1991	71	3481	
1992	2	1152	
Total	1,156	51,009	

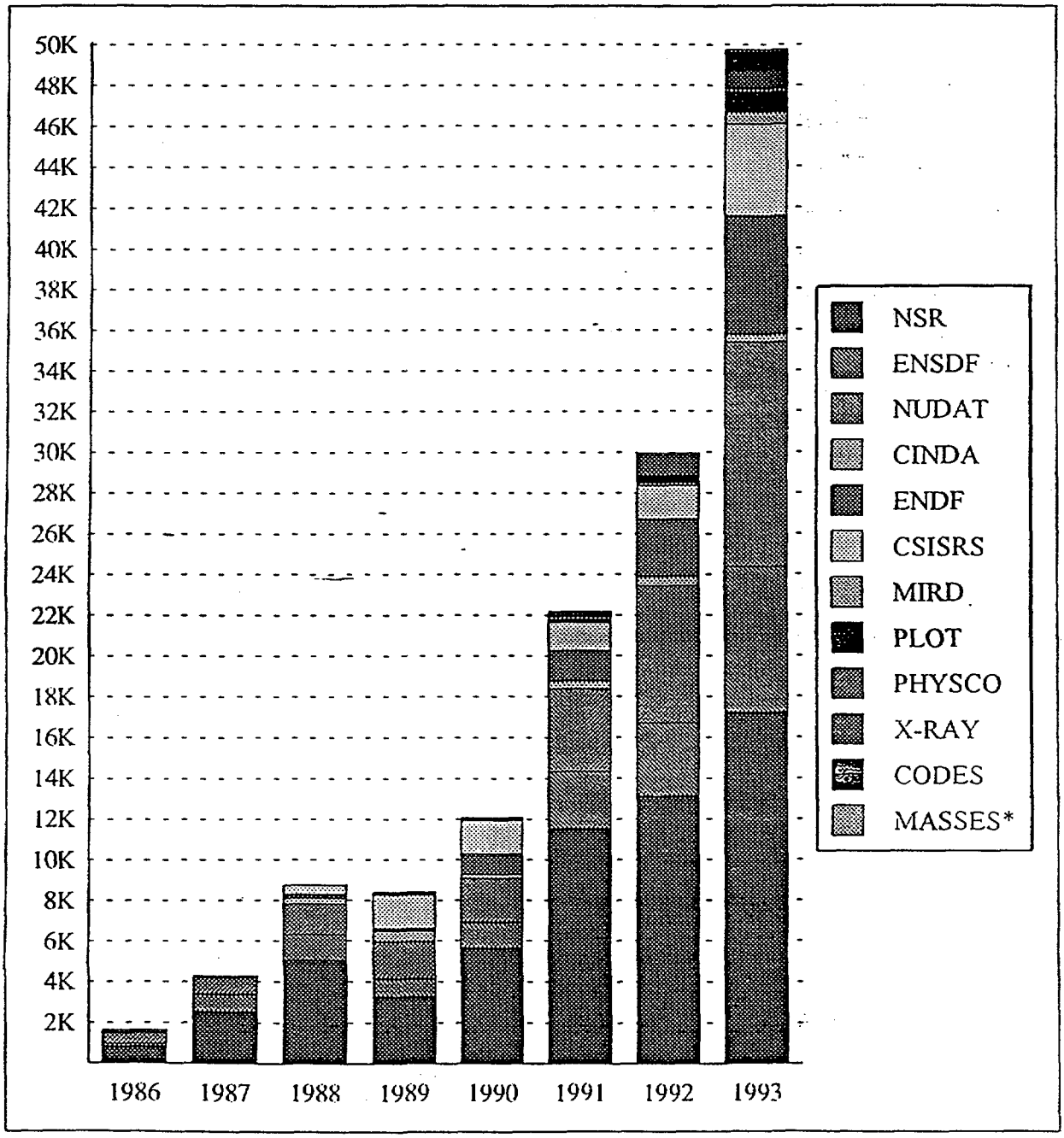
CSISRS LIBRARY STATISTICS FOR AREA 3 LISTED BY REFERENCE

Year	# Subentries	# Data points	Last Transmission 3090
1988	111	1191	
1989	193	1568	
1990	74	499	
1991	107	654	
1992	55	599	
1993	22	598	
Total	562	5,109	

CSISRS LIBRARY STATISTICS FOR AREA 4 LISTED BY REFERENCE

Year	# Subentries	# Data points	Last Transmission 4094
1988	188	3961	
1989	99	3224	
1990	219	1800	
1991	39	1701	
1992	76	1596	
1993	30	487	
Total	551	11,256	

NNDC On-Line Data Service Retrievals 1986-1993



** Added November, 1993*

NNDC On-Line Data Retrievals 1986 - 1993

	1986	1987	1988	1989	1990	1991	1992	1993	**Totals**
NSR	814	2521	5022	3253	5613	11517	13050	17170	**58960**
ENSDF	142	863	1303	850	1256	2807	3626	7161	**18008**
NUDAT	536	815	1492	1841	2204	4021	6710	10984	**28603**
CINDA	129	60	285	522	187	371	458	373	**2385**
ENDF		4	187	150	1019	1525	2846	5818	**11549**
CSISRS			459	1649	1623	1384	1613	4482	**11210**
Other:									
MIRD				121	53	40	141	586	**941**
MASSES*								144	**144**
PLOT				11	39	69	218	988	**1325**
PHYSCO				9	65	172	96	189	**531**
X-RAY						277	1169	933	**2379**
CODES								873	**873**
Totals	**1621**	**4263**	**8748**	**8406**	**12059**	**22183**	**29927**	**49701**	**136908**

* Added November 1993

R2

OECD NEA Data Bank

Status Report to the

Advisory Group Meeting on the Co-ordination

of the Nuclear Reaction Data Centres

April 1994

General

Since the last NRDC Meeting held in Obninsk in October 1991, the Data Bank has moved from Saclay to join the rest of the NEA at new premises at Issy-les-Moulineaux. Johnny Rosen retired after nearly thirty years as Deputy Director of Science, Computing and Development, and has been succeeded by Philippe Savelli, formerly of CEA.

Overall staff levels remain largely unchanged, but available manpower has been affected by delays in filling vacated posts, and by an increased workload caused by the addition of new projects.

Computer Facilities

At the time of the move to Issy-les-Moulineaux the Data Bank computer was upgraded to a VAX 6000-510, providing an 3x increase in CPU power, and a total of 19 Giga-bytes of disk space. This has now been complemented by a network of seven workstations, including a UNIX machine, and most recently, a VAX Alpha. Office automation is carried out on a MicroVAX 4000, shared with the rest of the agency.

Distribution media include, VAX magnetic tapes, TK70 cartridges, 8mm video tape, UNIX cassettes, and PC diskettes. Facilities for writing Compact Discs and 4mm DAT tape are currently being implemented.

Since the move to Issy-les-Moulineaux, the Data Bank has been connected to the high-capacity French Internet circuits, RERIF (Ile de France) and RENATER (International). Network access to the Data Bank is now possible via INTERNET, BITNET, X-400 and TRANSPAC. DECNET access has been discontinued.

To complement the possibilities of improved interactive access and file transmission, the NEA On-Line Service has been extensively modified. A new user-friendly interface has been implemented, facilities for guest sessions and on-line sign-on have been added, and a new service offering electronic-mail retrievable files (Mailserver) has been introduced. In addition to the databases traditionally offered (EXFOR, CINDA, EVA, TDB, NSR, ENSDF, NUDAT,

ABSTRACTS), documents from other NEA divisions have been made available online for consultation or electronic retrieval in a number of formats. This service is being extended to include controlled self-service retrieval of smaller programs, and a part of the corresponding documentation (70,000 pages out of a total of 400,000) is being scanned for inclusion in image form in the information available for retrieval.

The total number of user sessions rose to 3000 in 1993, with 200 registered users at the end of the year. It is expected that the number of users will double to 400 by the end of 1995.

In view of the age of the present data base programs and the limited future of DEC DBMS, the decision has been taken to move to a multi-platform relational system. ORACLE has been chosen. A trial in-house conversion of the EXFOR data base is under test, and a design study has been carried out on the much larger EVA data base.

Data Services

The number of online accesses to the various nuclear data databases has steadily increased since 1991. In 1992 the total number of data requests were 967, of which approximately 800 were by online retrieval. In 1993, the number of manual requests remained approximately constant at around 150, but the number of online retrievals increases to 1400 as a result of the improved online access and new online system.

For requests answered manually, there has been a notable increase in the number of requests for data dispatched by FTP and Unix TAR format.

EXFOR

Compilation of EXFOR entries has been carried out by consultants from universities in OECD Member countries. This arrangement has served to compensate for the limited resources at the Data Bank, and stimulate interest in nuclear data at an academic level. Fifty-five new EXFOR entries have been compiled since the last NRDC meeting in 1992. A further 40 to 50 new entries are expected to be compiled in 1994.

CINDA

Following a 6 month break in 1991, due to a vacant post, CINDA compilation was resumed in 1992. The backlog was cleared and compilation continued until April 1993. Since then, manpower shortages have meant that CINDA coverage has been seriously affected, with the notable exception of scanning work performed by JAERI, Japan. It is hoped to use external consultants to clear the backlog and maintain coverage, in future.

JEF

The JEF-2.2 General Purpose library was released in January 1992, followed by the Radioactive Decay Data and Fission Product Yield sub-libraries in the summer of 1993.

Benchmark testing of the JEF-2.2 General Purpose data for a variety of applications continued, and has revealed a number of areas where work is needed in order to achieve the goal of an evaluated data library suitable for differing applications without adjustment. However, several nuclear utilities in Member countries have already indicated their intention of adopting the JEF file as their standard reference library.

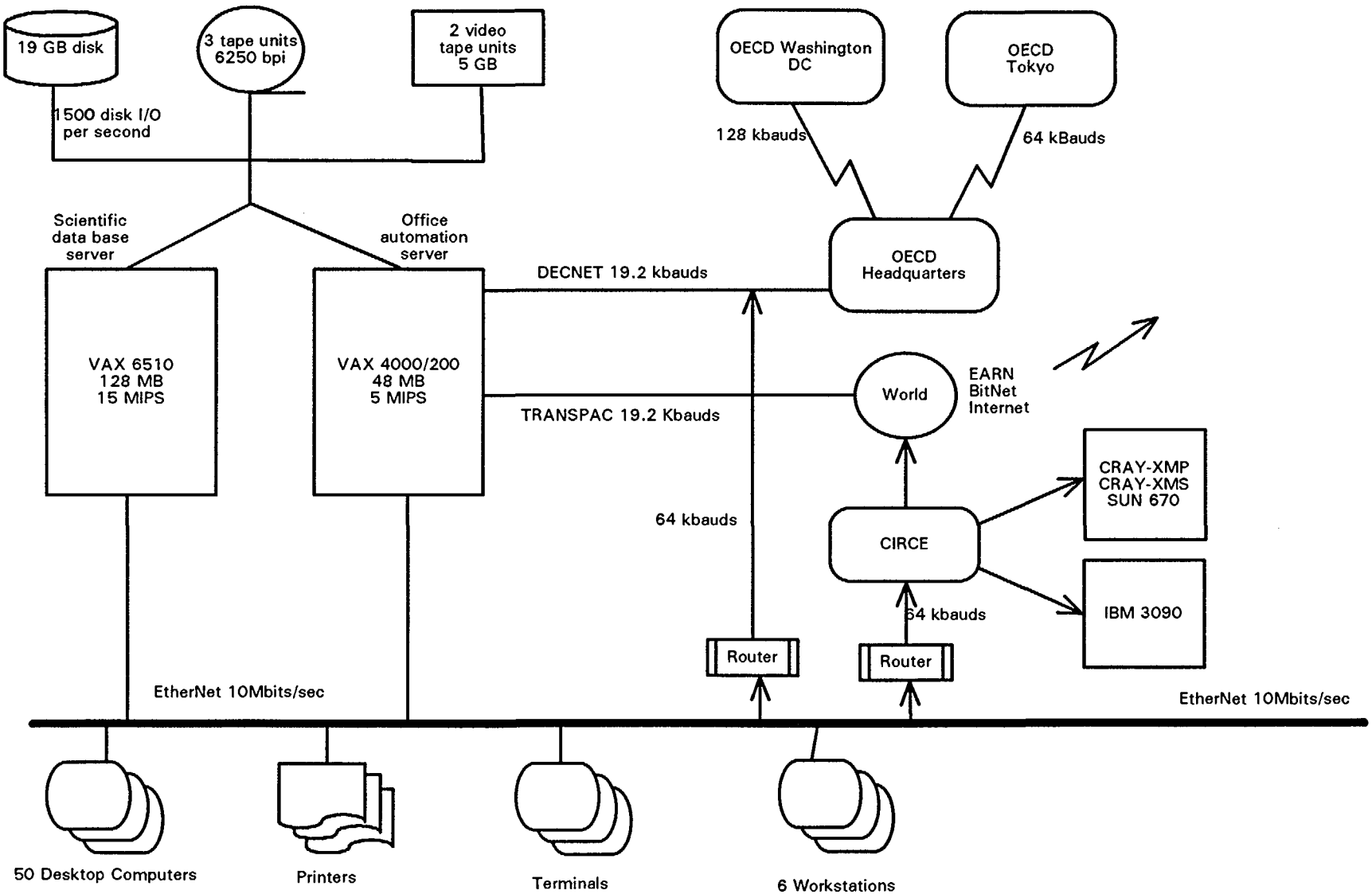
At the JEF Scientific Coordination Group meeting in December 1993, it was decided that the current JEF-2.2 file would remain unchanged at the level at which it has been tested, with no further updates in the near term. Future work will be oriented towards long-term improvements leading to a validated JEF-3 library by 1997. The close cooperation between the JEF and EFF projects will continue, and a joint JEF-EFF library, based on JEF-3 and EFF-3 , is still envisaged.

Following a recommendation of the JEF Scientific Coordination Group, it was decided at the November 1992 meeting of the Nuclear Science Committee, that the JEF-2.2 General Purpose Library was suitable for distribution to scientists outside the OECD area, especially in view of the extension of the NEANSC International Evaluation Cooperation to include non-OECD economies.

In order to make JEF data available to a wider range of data users, and in particular to users in non-energy applications who have no experience with the ENDF-6 format, a PC program for displaying JEF decay, fission yield, and cross section data has been developed in collaboration with Birmingham University (UK) and Orsay University (France). This package will become available in June 1994. An earlier version containing only JEF decay data has been available since July 1993.

VAX Configuration NEA DB (Issy)

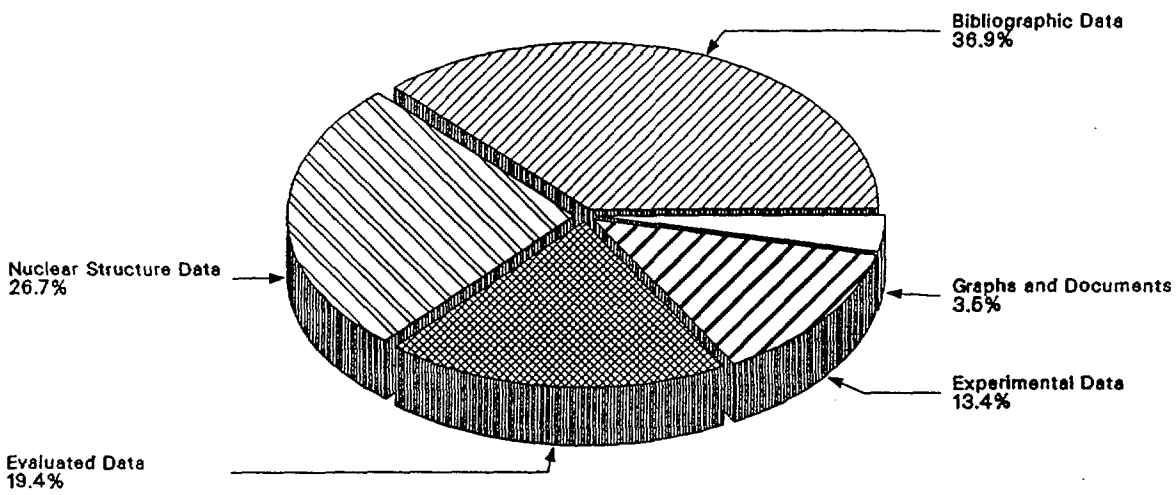
Monday, 7 June, 1993



1992

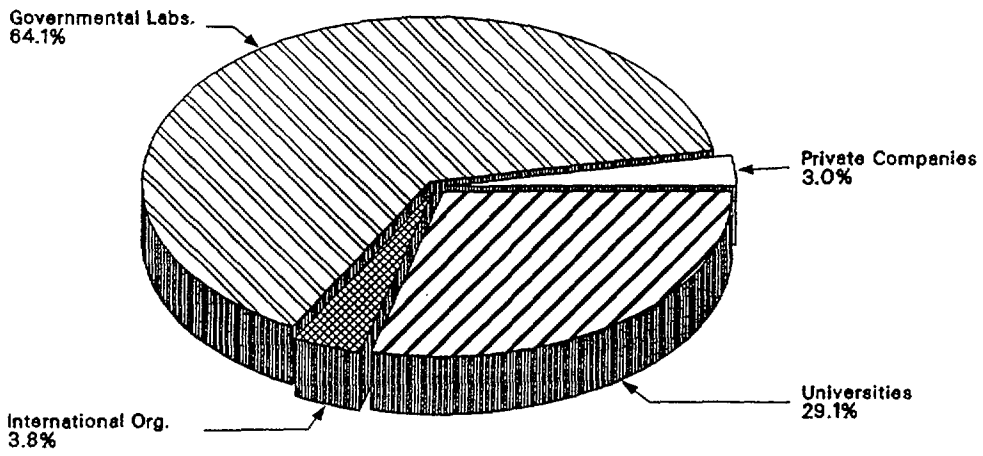
Nuclear Data Requests by Subject Category

Total number is 967

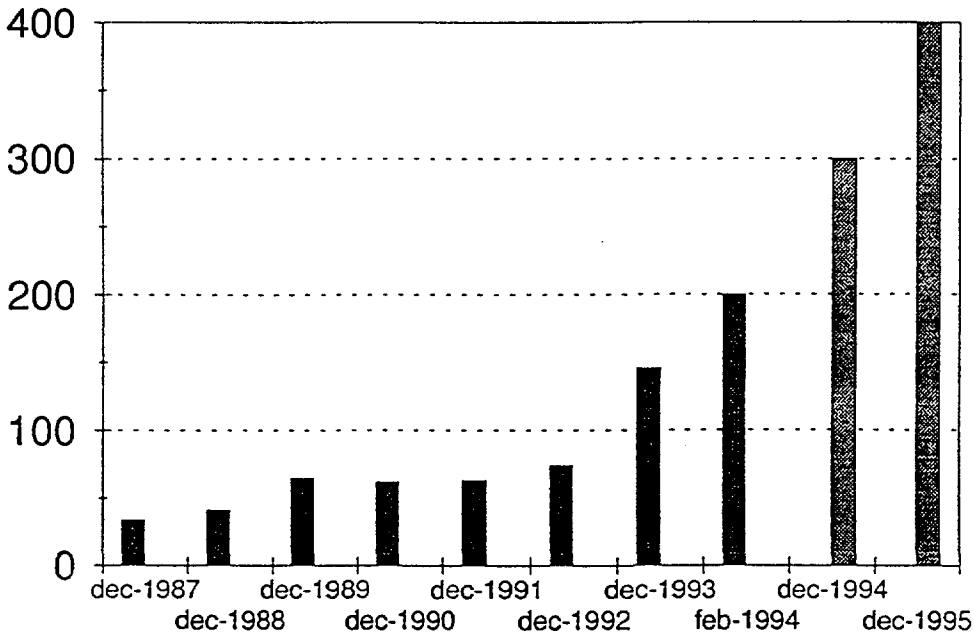


Nuclear Data Requests by Requester Category

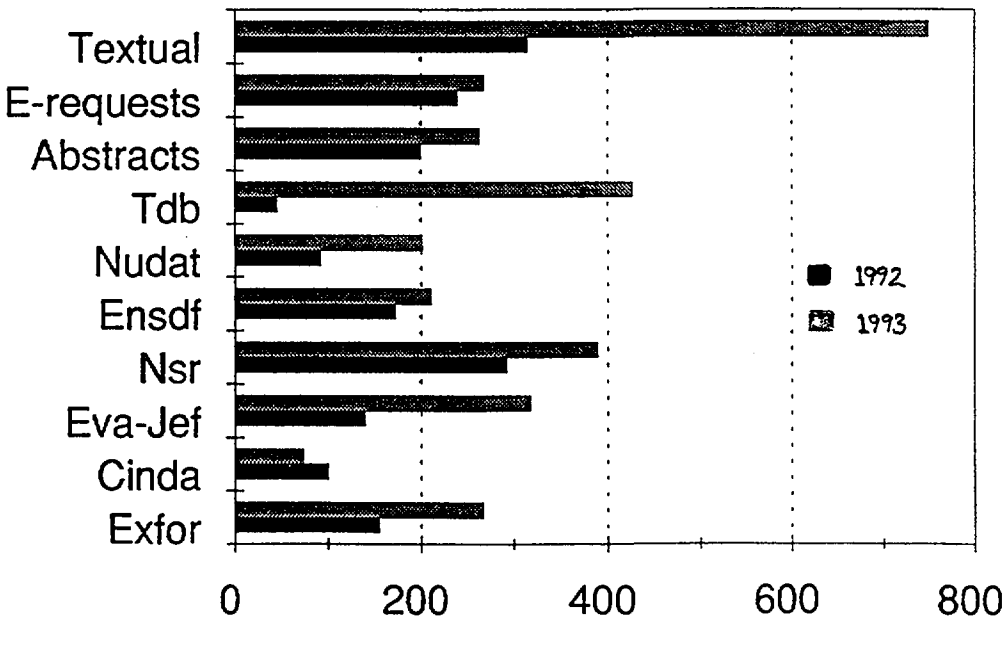
Total number is 967



Number of Online users



1993 usage by service



IAEA Nuclear Data Section

PROGRESS REPORT

April 1994

I. Staff

Since the last NRDC Meeting held in Obninsk in October 1991, Josef Schmidt retired as head of the Nuclear Data Section after more than twenty years in that position. The position was unfilled for more than one year until Charles Dunford arrived in July 1993. Douglas Muir, the Section's Deputy Head has returned to Los Alamos National Laboratory. After a vacancy of about one year, Pavel Oblozinsky from the Slovak Academy of Sciences, Bratislava, Slovakia was hired to fill that position. During this period, first Valentin Konshin and then Hans Lemmel served as acting Section Head. At the beginning of 1994, Wang Dahai from PR China retired. He had been handling many of the Technical Cooperation projects assigned to NDS. His post will not be filled.

During the next two year period, S. Ganesan will be leaving the Section at the end of his five year appointment and Nikolai Kocherov will be retiring. Neither position will be filled due to the Section's budget being reduced by about 15% in the 1995-1996 period. Sometime in 1995, it is planned to shift one post from the Atomic and Molecular Unit into nuclear data to complete the implementation of the budget reduction. As a result of these cuts, the Section's nuclear data processing activity will be terminated and the nuclear data assessment activity reduced.

Budgeting and planning have been complicated by the failure of IAEA Member States to pay their assessment on time. As a result, each year 10-12% of the Section's program has been deferred. When the deferred money is released at unforseen times, deferred activities have to be carried out on short notice. Sometimes priorities have changed. At the present time NDS is spending deferred program money from 1992 and 1993.

II. CINDA

After a period of thorough testing of the CINDA programs, we have loaded the NDS CINDA master file from the IBM onto the VAX in December 1993. Rejected entries have been corrected and transmitted to other centres. As of January 1994, all NDS CINDA operations go through our VAX.

Also, the whole CINDA book (i.e. text pages plus entries) will be produced from the VAX. This again requires substantial changes in the book production programs, and we may have to envisage delays in the schedule. This change is the second within a short period; the first change was needed to adapt the book production programs to a new Laser printer.

CINDA 92 was published as a supplement to CINDA 91. However, CINDA 93 was and CINDA 94 will be published again in the form of a cumulative issue.

III. EXFOR

We believe that the neutron data compilation in EXFOR is sufficiently complete for area 3. A backlog that resulted from a vacant post in 1992, has been eliminated. Exfor TRANS tapes have been sent to the other centers in our normal rate of 5 tapes per year.

Since the last NRDC meeting, September 1992, 83 EXFOR entries have been compiled and 157 revised, containing totalling 393 new data-sets.

Due to the changeover from the IBM to the VAX computer, EXFOR check programs have not been updated for several years.

The dictionaries were updated regularly (latest dictionary transmission: TRANS 9067, April 1994). Among the more important items were codes for the new countries in East Europe as well as a number of new codes and/or expansions for renamed journals.

IV. Evaluated Data

The following evaluated data libraries have been produced by NDS in the reporting period:

- Update of the International Reactor Dosimetry File IRDF;

- JONACS (joint neutron activation cross-sections), a comprehensive data library for 11 000 neutron activation reactions with 636 target nuclides in the incident neutron energy range up to 20 MeV; (this was produced for fusion applications ("FENDL/A") but is, of course, also useful for other applications);

- FENDL (evaluated nuclear data library for fusion applications), a processed neutron reaction data library including materials selected from available general-purpose libraries available in pointwise and processed form.

The recent release of JEF-2.2 is gratefully acknowledged. For the other 4 main evaluated data libraries updates and additional sublibraries have been received. All were checked and documented in the IAEA-NDS-... documentation series. A new comprehensive index IAEA-NDS-107 has been issued.

NDS staff worked mainly on the nuclear data libraries for the FENDL project. This work is not only essential for fusion neutronics calculations but also for fission reactor and other applications. A most important by-product of this work was the code validation done by S. Ganesan which led to a number of improvements in the NJOY code system.

V. VAX Computer and On-line Data Service

Significant progress has been made on the migration of the NDS computing activity to its VAX computer. Deferred equipment money from 1992 was used to purchase computer

terminals for all the staff members. This includes 5 X-window terminals for the most intensive computer users. The disk storage has been increased by 2 gigabytes to 7 gigabytes and the fast memory doubled to 64 megabytes, the maximum allowed on the MicroVax 4000 system. A 4mm audio-digital data tape unit was added for backup purposes and large scale data transmission to users with compatible units. Two HP-LaserJet Printers with augmented paper trays have been installed to handle the increased output from the VAX. The present computer configuration is attached.

We have also installed new software. With the installation of the MULTINET TCP/IP software we are now able to access the INTERNET directly instead of through a DEC UNIX gateway. File transmission difficulties were resolved and user access to the on-line service simplified. We have also purchased DISKKEEPER software to manage our disk usage and FLINT for Fortran source code checking.

Our current priority is to discontinue use of the IAEA IBM mainframe for our center's work by the end of 1994. The use of NNDC database software has helped us immensely. Our major remaining tasks are related to migrate administrative programs.

The on-line data service is identical to the NNDC system. Very close cooperation between NNDC and NDS is maintained so that problems are solved expeditiously and new features introduced while continuing to use identical software. In the past nine months, the NDS service has added access to a number of computer codes for processing ENDF and ENSDF formatted data files. Significant improvements in the video version of the user interface have also been made. Multiple file transmission within a single SEND command using a new multiple-selection menu is now possible. The NSR data base program allows a wildcard search of retrievable parameter values which significantly enhances the power of the program. Complete data libraries can be downloaded from the service. Currently available are the IRDF files and the 1993 Audi-Wapstra mass evaluations.

The NDS on-line data service is now beginning to show steadily increasing usage. The direct link to INTERNET, advertising of the service and the growing access to electronic computer networks within our service area account for the growth. In 1993, 590 retrievals were performed by NDS on-line service customers; already in the first four months of 1994, 866 retrievals have been made.

VI. Request Statistics

Due to staff fluctuations the definition of requests and subrequests has varied slightly. The present practice is:

- a request is an incoming letter (or telephone call);
- if this letter requests documents and evaluated data and EXFOR data, then this is three subrequests;
- if a subrequest contains requests for, e.g. the entire JEF library and one specific threshold reaction from IRDF, then this is two detailed subrequests.

Attached is a statistical table for subrequests and detailed subrequests in 1993.

The total figure of 559 subrequests is low compared to figures between 600 and 800 in the past years. This can be attributed to normal fluctuations which much depend on the release of important data libraries; and also to vacant posts in 1992/1993 which were the reason why there was no Nuclear Data Newsletter issued between Sept. 1992 and Nov. 1993. The Newsletter is the main connection between the data center and its customers.

Attached is also the list of 81 countries that have requested nuclear data information in the period 1989 to 1992. Few additional countries should be added to this list since then.

The on-line service is gradually expanding. As shown on the attached table we have now 127 users on 113 active accounts, from 31 countries. The main users (with more than 6 users) are not only from the neighbourhood (Austria, Czechia, Poland, Hungary) but also from remote countries like Australia, Brazil, Israel, South Korea.

VII. Meetings

The detailed meeting and consultant schedule for 1994 is attached.

In 1995 the NDS will organize the following meetings:

1) International Nuclear Data Committee Meeting
2) NRDC Technical Consultants Meeting
3) FENDL-2 Development Advisory Group Meeting
4) 2nd Photon Production Research Coordination Meeting
5) Final Long-Lived Activation Cross Sections Research Coordination Meeting
6) Reactor Decommissioning Data Advisory Group Meeting
7) First Charged-Particle Nuclear Data Research Coordination Meeting

In 1996 the NDS will organize the following meetings:

1) Nuclear Reaction Data Centres Advisory Group Meeting
2) Nuclear Structure and Decay Data Advisory Group Meeting
3) 2nd Nuclear Model Parameters Research Coordination Meeting
4) FENDL-2 Processing Advisory Group Meeting
5) Final Fission Product Yield Research Coordination Meeting
6) INDC Nuclear Standards Data File Consultants' Meeting
7) First Charged Particle Fusion Reaction Research Coordination Meeting
8) Workshop on Nuclear Data for Applications in Nuclear Technology

VIII. Publications

a) Data center services

The main printed materials supporting the data center services are the Newsletter and the IAEA-NDS-... documents.

The IAEA Nuclear Data Newsletter is published once a year advertising the availability of new or updated data libraries and printed materials such as neutron data related meeting proceedings, INDC reports, data processing codes, and others.

Originally, this Newsletter was distributed primarily to scientists in the NDS service area ("area 3"). But meanwhile we have received numerous requests from scientists in all areas to be put on the distribution list primarily for INDC reports or certain rare data libraries which are distributed not by all of the service centers. Therefore, the distribution is now worldwide, however still with emphasis on area 3. The Newsletter now presents the addresses of all nuclear data service centers. (Total distribution: 4000, about ½ in area 3 and ½ outside area 3.)

IAEA-NDS-documents are not reports in the normal sense. They are sent out only together with data libraries; no data library is sent out without an IAEA-NDS-document containing at least brief information on contents, format and origin of the data library.

Special issues are:

IAEA-NDS-0:	index to the IAEA-NDS-documents
IAEA-NDS-7:	index to the available nuclear data libraries
IAEA-NDS-107:	joint index to BROND, CENDL, JEF, JENDL, and ENDF/B, IRDF
IAEA-NDS-150:	User's Manual of the NNDC/NDS Online Nuclear Data Service

b) *INDC reports and others*

INDC reports continue to be published and distributed. They are either NDS produced or submitted by member states or national and international institutes. They may contain nuclear data information of the following categories:

- progress reports by countries or institutes;
- original scientific work of interest;
- minutes and proceedings of meetings;
- work by participants of co-ordinated research projects;
- translations of Russian (and other) originals.

A list of recent INDC reports is attached. It contains about 50 reports per year with a distribution between 50 and 500.

IAEA Nuclear Data Section

PROGRESS REPORT

April 1994

ATTACHMENTS

V. VAX Computer and On-line Data Service

- IAEA configuration

VI. Request Statistics

- Subrequests 1993
- Country Statistics 1989 - 1992
- On-line service users by country

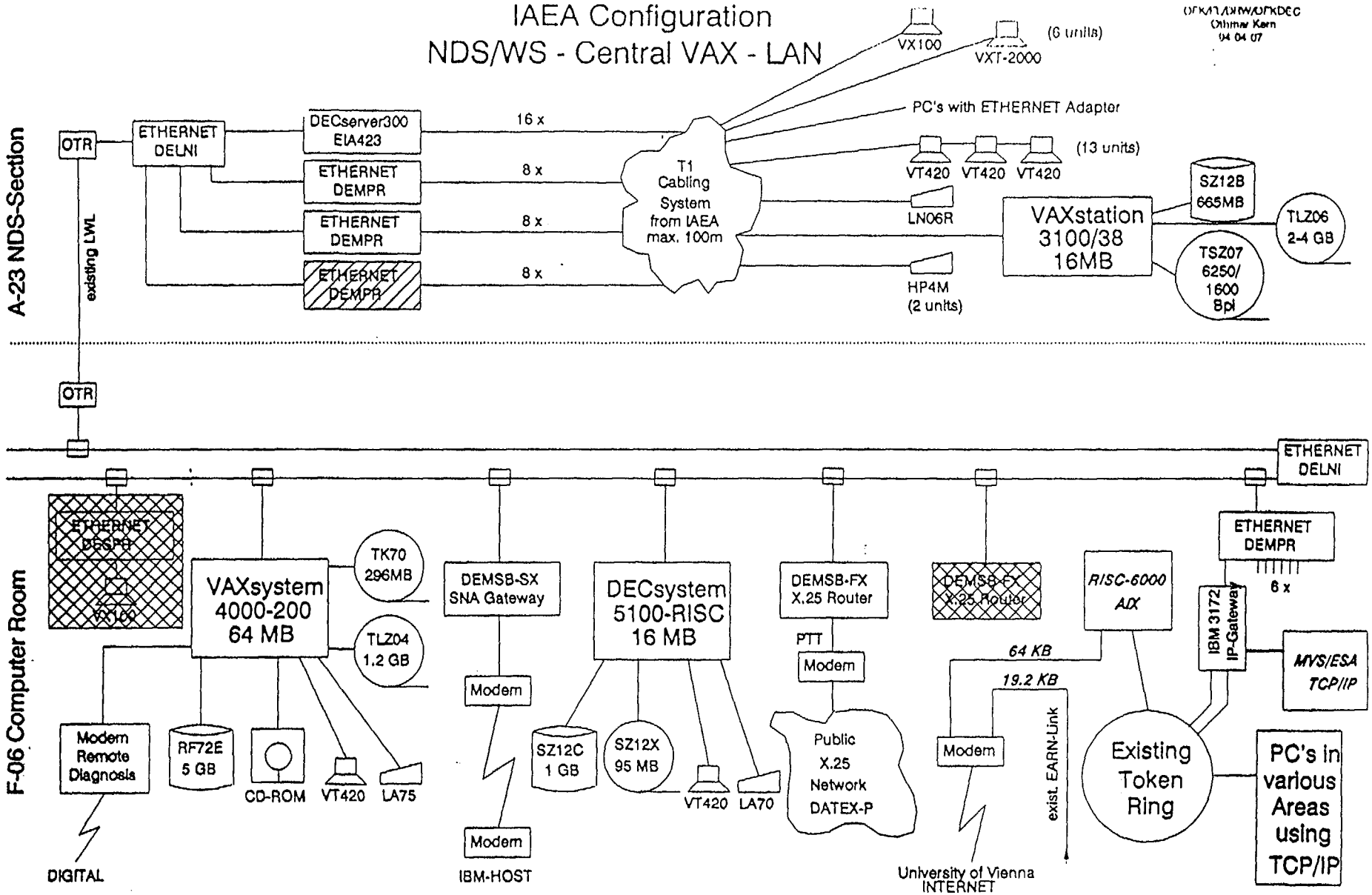
VII. Meetings

- NDS Meetings 1994

VIII. Publications

- INDC report index end 1992 - March 1994

IAEA Configuration
NDS/WS - Central VAX - LAN



Subrequests 1993

MONTH / MINOR FREQUENCY	Biblio Data	Codes	Doc's	Eval Data	Expt Data	4	TOTAL
JANUARY	0	4	32	14	1	0	51
FEBRUARY	0	4	38	19	1	0	62
MARCH	0	6	22	22	4	0	54
APRIL	0	5	40	13	0	0	58
MAY	0	29	23	27	1	0	80
JUNE	0	1	16	13	2	0	32
JULY	0	1	26	7	4	0	38
AUGUST	0	3	16	5	2	0	26
SEPTEMBER	0	2	29	22	2	0	55
OCTOBER	0	13	16	30	1	0	60
NOVEMBER	0	3	17	6	0	0	26
DECEMBER	0	2	17	5	0	0	24
TOTAL	0	73	292	183	18	0	566

Detailed Subrequests 1993

MONTH / MINOR FREQUENCY	Biblio Data	Codes	Doc's	Eval Data	Expt Data	4	TOTAL
JANUARY	0	5	85	26	1	0	117
FEBRUARY	0	8	102	37	1	0	148
MARCH	0	8	90	31	4	0	133
APRIL	0	7	78	30	0	0	115
MAY	0	38	101	39	1	0	179
JUNE	0	1	27	31	2	0	61
JULY	0	2	39	11	6	0	58
AUGUST	0	4	59	8	2	0	73
SEPTEMBER	0	3	106	26	2	0	137
OCTOBER	0	15	33	31	1	0	80
NOVEMBER	0	4	37	8	0	0	49
DECEMBER	0	5	37	9	0	0	51
TOTAL	0	100	794	287	20	0	1201

119 magnetic tapes
6 cartidges
367 diskettes

have been used in 1993 for request answering. (Georgina).

(Tapes and diskettes for center-to-center data exchange not counted.)

Table D.5.c.: REQUESTS 1989 - 1992

COUNTRY STATISTICS

COUNTRY	TOTAL	BIBL.	CODES	DOCUM.	EVAL.	EXPT.
India	309	0	28	196	76	9
China	270	3	20	166	51	30
USA	205	1	10	148	44	2
Soviet Union	173	1	16	72	75	9
Hungary	143	1	13	84	37	8
Japan	131	0	1	115	15	0
Germany	128	0	2	97	29	0
Brazil	121	1	12	66	40	2
Poland	116	0	14	71	27	4
Czechoslovakia	108	0	7	62	34	5
Romania	87	0	7	56	23	1
Argentina	60	0	10	35	14	1
Austria	57	1	2	29	11	14
United Kingdom	57	1	2	46	7	1
German Dem. Rep.	56	0	3	41	12	0
Egypt	54	0	7	33	13	1
Yugoslavia	53	0	8	30	14	1
Pakistan	50	2	9	27	7	5
Korea	40	0	7	26	7	0
Algeria	39	0	2	26	9	2
Bulgaria	36	0	3	20	11	2
South Africa	36	0	2	22	12	0
Indonesia	35	1	1	23	8	2
Iran	35	0	1	22	11	1
Italy	34	0	1	28	5	0
Vietnam	32	1	3	15	13	0
Israel	31	0	1	20	10	0
Cuba	28	0	7	8	9	4
Thailand	27	0	3	16	8	0
Bangladesh	25	0	4	13	7	1
France	25	0	1	21	3	0
Mexico	25	0	3	13	9	0
Saudi Arabia	25	0	5	15	5	0
Australia	24	1	1	9	13	0
Belgium	24	0	0	23	1	0
Nigeria	24	0	3	16	5	0
Libya	23	0	1	14	8	0
Malaysia	22	0	2	17	3	0
Canada	20	0	1	19	0	0
Taiwan	19	0	4	9	6	0
Netherlands	16	0	0	9	7	0
Burma	17	0	1	13	3	0
Albania	14	0	2	8	4	0
Morocco	14	0	1	8	2	3
Sweden	14	0	1	12	1	0
Peru	13	0	0	6	7	0
Zaire	12	0	2	10	0	0
Kenya	11	0	1	9	1	0
Switzerland	11	0	1	4	5	1
Turkey	11	0	0	9	1	1
Finland	9	0	3	3	3	0
Sri Lanka	9	0	1	1	5	2
Zambia	9	0	2	5	2	0
Iraq	8	0	1	7	0	0
Venezuela	8	0	2	4	2	0
Bolivia	7	0	0	7	0	0
Philippines	7	0	1	5	1	0
Russia	6	0	1	3	2	0
Spain	5	0	0	5	0	0
Syria	5	0	0	4	1	0
Ghana	4	0	0	2	2	0
Portugal	4	0	0	2	2	0
Sudan	4	0	0	3	1	0
Chile	3	0	0	3	0	0
Denmark	3	0	0	3	0	0
Uruguay	3	0	1	1	1	0
Ecuador	2	0	0	2	0	0
Jordan	2	0	0	2	0	0
New Zealand	2	0	0	0	2	0
Costa Rica	1	0	0	1	0	0
Cyprus	1	0	1	0	0	0
Ivory Coast	1	0	0	1	0	0
Kuwait	1	0	0	1	0	0
Madagascar	1	0	0	1	0	0
Norway	1	0	0	1	0	0
Senegal	1	0	0	1	0	0
Swaziland	1	0	0	1	0	0
Tunisia	1	0	0	1	0	0
Uganda	1	0	0	1	0	0
United Arab Emirates	1	0	0	1	0	0
Zimbabwe	1	0	0	1	0	0

81 countries served between 1989 and 1992

ONLINE SERVICE USERS BY COUNTRY

Country	Active Accounts	Users ("Names")
Argentina	0	1
Australia	13	15
Austria	12	16
Brazil	8	9
Canada	2	2
Chile	1	1
Croatia	2	2
Czech Republic	10	10
France	4	5
Germany	3	3
Hungary	6	8
India	0	1
Israel	6	6
Italy	3	3
Latvia	1	1
Mexico	1	1
Netherlands	1	1
New Zealand	1	1
Poland	9	9
Romania	3	4
Russia	3	4
Slovakia	2	2
South Africa	2	2
South Korea	6	6
Spain	1	1
Switzerland	2	2
Taiwan	1	1
Thailand	1	1
United Kingdom	2	2
U.S.A.	5	5
Venezuela	2	2

31	countries
113	active accounts
127	users

NDS MEETINGS 1994

Month/ Duration	Responsible Officer	Type/Title of Meeting	Location
April			
18 - 21	Pashchenko	**SPM** "Charged-Particle and Photonuclear Data Evaluations for FENDL"	Smolenice, Slovakia
11/4 - 6/5	Ganesan	Workshop on Nuclear Data Processing and Reactor Physics Calculations for Applications in Nuclear Technology	Trieste, Italy
25 - 27	Lemmel/Schwerer	**AGM** "13th Nuclear Reaction Data Centres"	Paris, France
May			
4 - 6	Obložinský	NEANSC Working Party on Evaluation Cooperation	Oak Ridge, USA
9 - 13	Ganesan	Workshop on Nuclear Data Processing and Reactor Physics Calculations for Applications in Nuclear Technology	Bologna, Italy

Month/ Duration	Responsible Officer	Type/Title of Meeting	Location
May (contd.)			
9 - 13	Dunford	International Conference on Nuclear Data for Science and Technology	Gatlinburg, USA
16 - 20	Lemmel/Dunford	Coordination of the Nuclear Structure and Decay Data Evaluators Network	Berkeley, CA USA
September			
5 - 6	Janev	**TC** "8th Meeting of the IFRC A+M Subcommittee"	Vienna
7 - 9	Janev	**AGM** "Atomic, Molecular and Particle-Surface Interaction Data for Divertor Physics Design Studies"	Vienna
7 - 9	Pashchenko	**SPM** "Comparison of Activation Cross Section Measurements and Experimental Techniques"	St. Petersburg, Russia
12 - 16	Ganesan	**AGM** "Improved Evaluations and Integral Data Testing for FENDL"	Garching, Germany
19 - 23	Obložinský	**RCM** "Development of Reference Input Parameter Library for Nuclear Model Calculations of Nuclear Data"	Ravenna, Italy

Month/ Duration	Responsible Officer	Type/Title of Meeting	Location
September (cont'd)			
26 - 30	Langley	**RCM** "Thermomechanical Properties of Plasma Facing Materials"	Vienna
October			
4 - 7	Pashchenko	**RCM** "Establishment of an International Reference Data Library of Nuclear Activation Cross Sections" (1st RCM)	Debrecen, Hungary
10 - 12	Janev	**RCM** "Radiative Cooling Rates of Fusion Plasma Impurities"	Vienna
17 - 20	Lammer	**RCM** "Compilation and Evaluation of Fission Yield Nuclear Data"	Vienna
24 - 28	Lemmel	Development of an International Chart of the Nuclides	Vienna
November			
1 - 4	Pashchenko	**RCM** "Improvement of Neutron-Induced He Production Cross Sections" (2nd RCM)	Beijing, China

Month/ Duration	Responsible Officer	Type/Title of Meeting	Location
7 - 11	Kocherov	**CM** "Nuclear Data for Fission Reactor Decommissioning"	Vienna
14 - 17	Obložinský	**RCM** "Measurement, Calculation and Evaluation of Photon Production Data"	Bologna, Italy

INDC DOCUMENT DESIGNATOR	DATE OF DISTRIB.	ORIGINAL DOCUMENT ID.	DOCUMENT TITLE, AUTHOR, OTHER IDENTIFICATION NUMBERS, ETC...	ACC.NO
INDC(NDS)-264/G	SEP 92		SUMMARY REPORT OF THE IAEA ADVISORY GROUP MEETING ON "NUCLEAR DATA FOR NEUTRON MULTIPLICATION IN FUSION-REACTOR FIRST-WALL AND BLANKET MATERIALS" HOSTED BY THE CHINA SOUTHWEST INSTITUTE OF NUCLEAR PHYSICS AND CHEMISTRY (SWINPC) AT CHENGDU, CHINA, 19-21 NOVMEBER 1990 PREPARED BY D.W. MUIR AND A.B. PASHCHENKO IAEA NUCLEAR DATA SECTION, VIENNA, AUSTRIA SEPTEMBER 1992 36 PAGES	1894
INDC(CCP)-349/G	JAN 92		NUCLEAR CONSTANTS NO. 1 (1992) (IN RUSSIAN) 82 PAGES	1895
INDC(CPR)-026/G	OCT 92		SEVERAL STUDIES ON MEDIUM ENERGY NUCLEAR DATA CALCULATION AND EVALUATION QING-BIAO SHEN INSTITUTE OF ATOMIC ENERGY, BEIJING, CHINA OCTOBER 1992 22 PAGES	1896
INDC(NDS)-265/G	OCT 92		TOTAL NEUTRON CROSS-SECTION OF U-238 AS MEASURED WITH FILTERED NEUTRONS OF 55 KEV AND 144 KEV PHAM ZUY HEIN, ET. AL. DALAT NUCLEAR RESEARCH INSTITUTE, DALAT, VIETNAM OCTOBER 1992 8 PAGES	1897
INDC(GER)-035/L	APR 92	NEANDC-307/U KFK-5062	PROCEEDINGS OF A TOPICAL CONFERENCE ON NUCLEAR DATA FOR FUSION REACTOR TECHNOLOGY KERNFORSCHUNGSZENTRUM KARLSRUHE, FRG, 91-10-23 EDITED BY S. CIERJACKS APRIL 1992 119 PAGES	1898
INDC(GER)-036/L	JUL 92	NEA/NSC/DOC(92)5 KFK-5079	PROGRESS REPORT ON NUCLEAR DATA RESEARCH IN THE FEDERAL REPUBLIC OF GERMANY FOR THE PERIOD APRIL 1, 1991 TO MARCH 31, 1992 EDITED BY S. CIERJACKS KERNFORSCHUNGSZENTRUM KARLSRUHE, FRG JULY 1992 76 PAGES	1899
INDC(CCP)-348/G	JUL 92		PHOTONUCLEAR DATA INDEX 1986-1990 V.A. VARLAMOV, M.E. STEPANOV, V.V. SAPUNENKO MOSCOW STATE UNIVERSITY INSTITUTE OF NUCLEAR PHYSICS CENTRE FOR PHOTONUCLEAR EXPERIMENTAL DATA JULY 1992 76 PAGES	1900
INDC(JPN)-162/U	AUG 92		PROGRESS REPORT (JULY 1991 TO JUNE 1992 INCLUSIVE) EDITOR S. KIKUCHI, JAPANESE NUCLEAR DATA COMMITTEE JAERI AUGUST 1992 147 PAGES	1901
INDC(NDS)-263/G+SP	JUL 92		ACTIVATION CROSS SECTIONS FOR THE GENERATION OF LONG-LIVED RADIONUCLIDES OF IMPORTANCE IN FUSION REACTOR TECHNOLOGY TEXTS OF PAPERS PRESENTED AT THE FIRST MEETING OF A CO-ORDINATED RESEARCH PROGRAMME ORGANIZED BY THE IAEA AND HELD IN VIENNA, 11-12 NOVEMBER 1991 COMPILED BY WANG DAHAI, IAEA NUCLEAR DATA SECTION JULY 1992 159 PAGES	1902
INDC(NDS)-271/G+NY	JAN 93		MASS DISTRIBUTION IN 8.3 MEV NEUTRON-INDUCED FISSION OF U-238 LI ZE, ET AT. CHINA INSTITUTE OF ATOMIC ENERGY P.O. BOX 275, BEIJING, CHINA JANUARY 1993 12 PAGES	1903
INDC(CCP)-350/G	JUL 92		NUCLEAR CONSTANTS NO. 2 (1992) (IN RUSSIAN) 97 PAGES	1904
INDC(NDS)-268/G	JAN 93		SUMMARY REPORT OF THE IAEA CONSULTANTS' MEETING ON "CHARGED-PARTICLE AND PHOTONUCLEAR DATA LIBRARIES FOR FENDL" HOSTED BY THE U.S. NATIONAL NUCLEAR DATA CENTERAT THE BROOKHAVEN NATIONAL LABORATORY, UPTON, U.S.A. PREPARED BY A.B. PASHCHENKO, IAEA, VIENNA, AUSTRIA JANUARY 1993 26 PAGES	1905
INDC(NDS)-266/G	JAN 93		REFERENCE NUCLEAR PARAMETER LIBRARY FOR NUCLEAR DATA COMPUTATION SUMMARY REPORT OF A CONSULTANTS' MEETING ORGANIZED BY THE IAEA AND HELD IN VIENNA, AUSTRIA, 13-15 NOVEMBER 1991 PREPARED BY G. REFFO, O. BERSILLON, D.W. MUIR AND A.B. PASHCHENKO JANUARY 1993 22 PAGES	1906
INDC(NDS)-269/L	JAN 93		NUCLEAR DATA REQUIREMENTS FOR FISSION REACTOR DECOMMISSIONING PROCEEDINGS OF THE ADVISORY GROUP MEETING ORGANISED BY THE IAEA VIENNA, 7-11 SEPTEMBER 1992 EDITED BY N.P. KOCHEROV, IAEA JANUARY 1993 122 PAGES	1907

INDC DOCUMENT DESIGNATOR	DATE OF DISTRIB.	ORIGINAL DOCUMENT ID.	DOCUMENT TITLE, AUTHOR, OTHER IDENTIFICATION NUMBERS, ETC...	ACC.NO
INDC(NDS)-273/G	MAR 93		SUMMARY REPORT OF THE FIRST IAEA RESEARCH CO-ORDINATION MEETING ON "IMPROVEMENT OF MEASUREMENTS, THEORETICAL COMPUTATIONS AND EVALUATIONS OF NEUTRON INDUCED HELIUM PRODUCTION CROSS SECTIONS" HOSTED BY THE INSTITUTE OF EXPERIMENTAL PHYSICS OF KOSSUTH LAJOS UNIVERSITY AT DEBRECEN, HUNGARY, 17-19 NOVEMBER 1992 PREPARED BY A.B. PASHCHENKO, IAEA MARCH 1993 21 PAGES	1908
INDC(CCP)-351/G	JUL 93		THE TALK PRESENTED AT INTERNATIONAL WORKSHOP "FUSION NEUTRONICS EXPERIMENTS (FRASCATI, ITALY, 21-22 SEPTEMBER 1992) 14 MEV FACILITY AND RESEARCH IN IPPE S.P. SIMAKOV, ET. AL., INSTITUTE OF PHYSICS AND POWER ENGINEERING, OBNINSK, RUSSIA O.YU. CHUVILIN, ET. AL., INSTITUTE OF ATOMIC ENERGY, MOSCOW, RUSSIA JULY 1993 32 PAGES	1909
INDC(CCP)-352/G	JUL 93		NUCLEAR DATA FOR SCIENCE AND TECHNOLOGY FIVE PAPERS FROM U.S.S.R. AUTHORS A.B. PASHCHENKO AND H.D. LEMMEL (EDITORS) JULY 1993 28 PAGES	1910
INDC(SLK)-001/G	MAR 93		PEGAS, PRE-EQUILIBRIUM-EQUILIBRIUM GAMMA-AND-SPIN CODE (PC VERSION) E. BETAK AND P. OBLOZINSKY INSTITUTE OF PHYSICS, SLOVAK ACADEMY OF SCIENCES, DUBRAVSKA CESTA 9, 84228 BRATISLAVA, SLOVAK REP. MARCH 1993 21 PAGES	1911
INDC(SEC)-101	92	NEANDC-311/U	NUCLEAR DATA STANDARDS FOR NUCLEAR MEASUREMENTS 1991 NEANDC/INDC NUCLEAR STANDARDS FILE EDITOR H. CONDE, UPPSALA UNIVERSITY, UPPSALA, SWEDEN 131 PAGES 1992	1912
INDC(BZL)-035/G	MAR 93		A COMPARATIVE STUDY OF FEW-GROUP CROSS-SECTIONS FOR THERMAL REACTOR FUEL CELLS LUIZ ENRIQUE CLARO AND AIRTON PRATI MINISTRY OF AERONAUTICS DEPARTMENT OF RESEARCH AND DEVELOPMENT INSTITUTE OF ADVANCED STUDIES SAO JOSE DOS CAMPOS, SP, BRAZIL TRANSLATED BY THE IAEA MARCH 1993 15 PAGES	1913
INDC(BZL)-036/G	MAR 93		ICAROG: A PROGRAM FOR CONVERSION OF A DATA LIBRARY IN THE WIMSD/4 FORMAT FROM THE BCD TO THE BINARY CODE AND VICE VERSA ALEXANDRE D. CALDEIRA MINISTRY OF AERONAUTICS INSTITUTE OF ADVANCED STUDIES SAO JOSE DOS CAMPOS, SP, BRAZIL TRANSLATED BY THE IAEA MARCH 1993 5 PAGES	1914
INDC(CPR)-029/L	DEC 92	CNIC-00706 CNDC-0011	COMMUNICATION OF NUCLEAR DATA PROGRESS NO. 8 (1992) CHINA NUCLEAR INFORMATION CENTER CHINESE NUCLEAR DATA CENTER ATOMIC ENERGY PRESS BEIJING DECEMBER 1992 79 PAGES	1915
INDC(JPN)-164/GR	MAR 93		ACCURACY VERIFICATION FOR CALCULATION OF INVENTORY IN JPDR DUE TO NEUTRON ACTIVATION TAKENORI SUKEGAWA, NOBUO SASAMOTO AND KAZUO FUJIKI JAPAN ATOMIC ENERGY RESEARCH INSTITUTE TOKAI-MURA, NAKA-GUN, IBARAKI-KEN, 319-11, JAPAN MARCH 1993 38 PAGES	1916
INDC(NDS)-272/G+SP	MAR 93		CO-ORDINATED RESEARCH PROGRAMME ON MEASUREMENT AND ANALYSIS FOR 14 MEV NEUTRON-INDUCED DOUBLE-DIFFERENTIAL NEUTRON EMISSION CROSS SECTIONS NEEDED FOR FISSION AND FUSION REACTOR TECHNOLOGY SUMMARY REPORT OF THE 3RD AND FINAL RCM ORGANIZED BY THE IAEA AND HELD AT CHIANG MAI, THAILAND, 31 MARCH-2 APRIL 92, PREPARED BY WANG DAHAI, IAEA MARCH 1993 161 PAGES	1917
INDC(NDS)-281/SP L	FEB 93		NUCLEAR DATA FOR NEUTRON MULTIPLICATION IN FUSION-REACTOR FIRST-WALL AND BLANKET MATERIALS TEXTS OF PAPERS PRESENTED AT THE AGM ORGANIZED BY THE IAEA IN COOPERATION WITH SOUTHWEST INSTITUTE OF NUCLEAR PHYSICS AND CHEMISTRY (SWINPC) AND HELD IN CHENGDU, CHINA, 19-21 NOVEMBER 1990 COMPILED BY A.B. PASHCHENKO AND D.W. MUIR, IAEA FEBRUARY 1993 128 PAGES	1918
INDC(CCP)-344/G	APR 93		GRUKON - A PACKAGE OF APPLIED COMPUTERPROGRAMS SYSTEM INPUT AND OPERATING PROCEDURES OF FUNCTIONAL MODULES V.V. SINITSA AND A.A. RINEISKIJ INSTITUTE OF PHYSICS AND POWER ENGINEERING OBNINSK, THE RUSSIAN FEDERATION TRANSLATED BY DR. A. LORENZ FOR THE IAEA APRIL 1993 76 PAGES	1919

INDC DOCUMENT DESIGNATOR	DATE OF DISTRIB.	ORIGINAL DOCUMENT ID.	DOCUMENT TITLE, AUTHOR, OTHER IDENTIFICATION NUMBERS, ETC...	ACC.NO
INDC(CCP)-353/G	APR 93		LECTURES PRESENTED AT THE INTERREGIONAL TRAINING COURSE ON APPLICATION OF NUCLEAR DATA AND MEASUREMENT TECHNIQUES IN NUCLEAR REACTOR AND PERSONAL NEUTRON DOSIMETRY OBNINSK, THE RUSSIAN FEDERATION 15 JUNE TO 10 JULY 1992 APRIL 1993 58 PAGES	1920
INDC(NDS)-277/SP	MAR 93		IAEA TECHNICAL COMMITTEE MEETING ON "ATOMIC AND MOLECULAR DATA FOR FUSION REACTOR TECHNOLOGY" 12-16 OCTOBER 1992, CADARACHE, FRANCE SUMMARY REPORT PREPARED BY R.K. JANEV MARCH 1993 70 PAGES	1921
INDC(ARG)-012/G	MAY 93		INTEGRAL ACTIVATION CROSS SECTION RATIOS OF TI(N,X)SC-46, TI(N,X)SC-47, TI-48(N,P)SC-48, TI-50(N,ALPHA)CA-47 RELATIVE TO A1-27(N,ALPHA)NA-24 IN THE NEUTRON SPECTRUM PRODUCED BY 23.2 MEV DEUTERONS INCIDENT ON A THICK BE METAL TARGET M.D. BOVISIO DE RICABARRA, ET. AL., ARGETINE NATIONAL ATOMIC ENERGY COMMISSION MAY 1993 7 PAGES	1922
INDC(IND)-045/G	93	BARC/1993/E/005	PROGRESS REPORT ON NUCLEAR DATA ACTIVITIES IN INDIA FOR THE PERIOD JULY 1990 TO JUNE 1992 COMPILED BY P.D. KRISHNANI THEORETICAL PHYSICS DIVISION BHABHA ATOMIC RESEARCH CENTRE, INDIA 1993 68 PAGES	1923
INDC(JPN)-163/L	MAR 93	JAERI-M-93-046 NEA/NSC/DOC(93)2	PROCEEDINGS OF THE 1992 SYPMPOSIUM ON NUCLEAR DATA NOVEMBER 26-27, 1992, JEARI, TOKAI, JAPAN (EDS.) MAMORU BABA AND TSUNEO NAKAGAWA MARCH 1993 379 PAGES	1924
INDC(NDS)-279/G, N	FEB 93		REPORT ON THE CONSULTANTS' MEETING ON TECHNICAL ASPECTS OF THE CO-OPERATION OF NUCLEAR REACTION DATA CENTERS IAEA HEADQUARTERS, VIENNA, AUSTRIA 1-3 SEPTEMBER 1992 EDITED BY H.D. LEMMEL, O. SCHWERER, H. WIENKE FEBRUARY 1993 81 PAGES	1925
INDC(CCP)-354/G	91		EVALUATION OF EXCITATION FUNCTIONS FOR ISOMERIC LEVELS IN NEUTRON REACTIONS O.T. GRUDZEVICH, ET. AL. POWER PHYSICS INSTITUTE OBNINSK, RUSSIA 1991 20 PAGES	1926
INDC(CCP)-355/G	91		INELASTIC SCATTERING OF 1-2.5 MEV NEUTRONS BY 235U AND 238U NUCLEI N.V. KORNILOV, ET. AL. POWER PHYSICS INSTITUTE OBNINSK, RUSSIA 1991 22 PAGES	1927
INDC(CCP)-356/G	93		SELF-CONSISTENT DESCRIPTION OF ISOMER YIELDS IN NEUTRON REACTIONS O.T. GRUDZEVICH, ET. AL. INSTITUTE OF PHYSICS AND POWER ENGINEERING OBNINSK, RUSSIA 1993 20 PAGES	1928
INDC(CCP)-357/G	93		NEUTRON REACTIONS WITH NUCLEI IN ISOMERIC STATES O.T. GRUDZEVICH, ET. AL. INSTITUTE OF PHYSICS AND POWER ENGINEERING OBNINSK, RUSSIA 1993 11 PAGES	1929
INDC(CPR)-030/L	JUN 93	CNIC-00750 CNDC-0012	COMMUNICATION OF NUCLEAR DATA PROGRESS NO. 9 (1993) CHINA NUCLEAR INFORMATION CENTER CHINESE NUCLEAR DATA CENTER ATOMIC ENERGY PRESS BEIJING JUNE 1993 113 PAGES	1930
INDC(JPN)-165/U	JUN 93	JAERI-M-93-124	MEASUREMENT OF FORMATION CROSS SECTIONS OF SHORT-LIVED NUCLEI BY 14 MEV NEUTRONS - RU, PD, CD, SN YOSHIMI KASUGAI, ET. AL. JAPAN ATOMIC ENERGY RESEARCH INSTITUTE JUNE 1993 41 PAGES	1931
INDC(USA)-105/L	MAY 92	BNL-NCS-47947 DOE/NDC-59 NEANDC(US)-230	REPORTS TO THE DOE NUCLEAR DATA COMMITTEE COMPILED BY THE NATIONAL NUCLEAR DATA CENTER U.S. DEPARTMENT OF ENERGY, NUCLEAR DATA COMMITTEE MAY 1992 113 PAGES	1932
INDC(CCP)-358/G	JUL 93		NUCLEAR CONSTANTS NO. 3-4 (1992) (IN RUSSIAN) 122 PAGES	1933

INDC DOCUMENT DESIGNATOR	DATE OF DISTRIB.	ORIGINAL DOCUMENT ID.	DOCUMENT TITLE, AUTHOR, OTHER IDENTIFICATION NUMBERS, ETC...	ACC.NO
INDC(GER)-037/LN	JUL 93	NEA/NSC/DOC(93)17 JUEL-2803	PROGRESS REPORT ON NUCLEAR DATA RESEARCH IN THE FEDERAL REPUBLIC OF GERMANY FOR THE PERIOD APRIL 1, 1992 TO MARCH 31, 1993 EDITED BY S.M. QAIM, FORSCHUNGSZENTRUM JUELICH, INSTITUT FUER NUKLEARCHEMIE, JUELICH, GERMANY JULY 1993 86 PAGES	1934
INDC(GER)-038/G	JUN 93		ANALYTIC NUMBER THEORY AND THE NUCLEAR LEVEL DENSITY A. ANZALDO MENESES JUNE 1993 131 PAGES	1935
INDC(NDS)-285/G	AUG 93		COMPARISON OF THE EVALUATIONS OF THE CROSS SECTIONS FOR THE NEUTRON DOSIMETRY REACTIONS 197AU(N,2N)196AU, 59CO(N,2N)58CO AND 93NB(N,2N)92MNB JOSE MARTINEZ-RICO AUGUST 1993 14 PAGES	1936
INDC(NDS)-282/G	SEP 93		STANDARD INPUT DATA SETS FOR NUCLEAR MODEL COMPUTATIONS OF NUCLEAR DATA SUMMARY REPORT OF THE IAEA CONSULTANTS' MEETING HOSTED BY THE CENTRO DI CALCOLO DEL E.N.E.A., BOLOGNA, ITALY AND HELD AT SIROLO (ANCONA), ITALY, FROM 21 TO 25 JUNE 1993 A.B. PASHCHENKO, ET. AL. SEPTEMBER 1993 18 PAGES	1937
INDC(CCP)-359/G	NOV 93		PREPARATION OF EVALUATED DATA FOR A FISSION BARRIER PARAMETER LIBRARY FOR ISOTOPES WITH Z = 82-98, WITH CONSIDERATION OF THE LEVEL DENSITY MODELS USED G.N. SMIRENKIN INSTITUTE OF PHYSICS AND POWER ENGINEERING OBNINSK, KALUGA REGION, RUSSIA TRANSLATED BY THE IAEA NOVEMBER 1993 31 PAGES	1938
INDC(CCP)-360/G	NOV 93		EVALUATION OF THE 46TI(N,2N)46TI AND 54FE(N,2N)53M+GFE REACTION CROSS SECTIONS FOR NEUTRON DOSIMETRY IN FUSION FACILITIES A PAPER PRESENTED AT THE INTERNATIONAL WORKSHOP ON NUCLEAR DATA FOR FUSION REACTOR TECHNOLOGY DEL MAR, CALIFORNIA, USA, 3-6 MAY 1993 S.A. BADIKOV, A.V. IGNATYUK, K.I. ZOLOTAREV, A.B. PASHCHENKO NOVEMBER 1993 23 PAGES	1939
INDC(EUR)-027/G	JUN 93	NEA/NSC/DOC(93)11	ANNUAL PROGRESS REPORT ON NUCLEAR DATA 1992 CENTRAL BUREAU FOR NUCLEAR MEASUREMENTS GEEL (BELGIUM) JUNE 1993 60 PAGES	1940
INDC(JPN)-168/U	AUG 93		PROGRESS REPORT (JULY 1992 TO JUNE 1993 INCLUSIVE) EDITOR Y. NAKAJIMA JAPANESE NUCLEAR DATA COMMITTEE JAPAN ATOMIC ENERGY RESEARCH INSTITUTE AUGUST 1993 98 PAGES	1941
INDC(JPN)-167/L	OCT 93	JAERI-M-93-195	BIBLIOGRAPHIC INDEX TO PHOTONUCLEAR REACTION DATA (1955-1992) TETSUO ASAMI AND TSUNEO NAKAGAWA OCTOBER 1993 200 PAGES	1942
INDC(NDS)-286/L	NOV 93		ACTIVATION CROSS SECTIONS FOR THE GENERATION OF LONG-LIVED RADIONUCLIDES OF IMPORTANCE IN FUSION REACTOR TECHNOLOGY TEXTS OF PAPERS PRESENTED AT THE SECOND RESEARCH CO-ORDINATION MEETING ORGANIZED BY THE IAEA IN CO-OPERATION WITH TSI RESEARCH AND WESTINGHOUSE HANFORD COMPANY AND HELD IN DEL MAR, CALIFORNIA, USA, 29-30 APRIL 1993, COMPILED BY A.B. PASHCHENKO NOVEMBER 1993 155 PAGES	1943
INDC(NDS)-288/L	NOV 93		ACTIVATION CROSS SECTIONS FOR THE GENERATION OF LONG-LIVED RADIONUCLIDES OF IMPORTANCE IN FUSION REACTOR TECHNOLOGY SUMMARY REPORT OF THE SECOND IAEA RESEARCH COORDINATED MEETING HOSTED BY TSI RESEARCH, DEL MAR, CALIFORNIA, USA, 29-30 APRIL 1993 EDITED BY A.B. PASHCHENKO, IAEA NOVEMBER 1993 24 PAGES	1944
INDC(PAK)-008/L	NOV 93		THE GLOBAL OPTICAL POTENTIALS AND NEUTRON-NUCLEUS SCATTERING DATA I.E. QURESHI AND Q.H. KHAN RADIATION PHYSICS DIVISION, PINSTECH, P.O. NILORE, ISLAMABAD, PAKISTAN NOVEMBER 1993 13 PAGES	1945
INDC(SWD)-024/L+P	NOV 93		ABSOLUTE GAMMA BRANCHING RATIOS FOR FISSION PRODUCTS IN THE MASS RANGE 74-165 G. RUDSTAM THE STUDSVIK NEUTRON RESEARCH LABORATORY S-61182 NYKOEPING, SWEDEN NOVEMBER 1993 63 PAGES	1946

INDC DOCUMENT DESIGNATOR	DATE OF DISTRIB.	ORIGINAL DOCUMENT ID.	DOCUMENT TITLE, AUTHOR, OTHER IDENTIFICATION NUMBERS, ETC...	ACC.NO
INDC(BLR)-001/L	DEC 93		EVALUATED NEUTRON DATA FOR URANIUM-233 L.A. BAKHANOVIC, ET. AL. NUCLEAR POWER INSTITUTE, MINSK TRANSLATED BY DR. A. LORENZ FOR THE IAEA FROM RUSSIAN PREPRINT IYAEH-2(25) [1992] DECEMBER 1993 74 PAGES	1947
INDC(NDS)-267	DEC 93		ATOMIC COLLISION DATABASE FOR LI BEAM INTERACTION WITH FUSION PLASMAS R.K. JANEV, J.J. SMITH, IAEA, VIENNA, AUSTRIA F. AUMAYR, ET. AL., TECHNISCHE UNIVERSITAET, VIENNA, AUSTRIA J. SCHWEINZER, MAX-PLANCK INSTITUT F. PLASMA PHYSIK, GARCHING, GERMANY DECEMBER 1993 87 PAGES	1948
INDC(NDS)-290/G+CW	DEC 93		UPDATE OF THE WIMS-D4 NUCLEAR DATA LIBRARY STATUS REPORT OF THE IAEA WIMS LIBRARY UPDATE PROJECT COMPILED BY S. GANESAN DECEMBER 1993 188 PAGES	1949
INDC(SEC)-104/U+G	DEC 93		WRENDA 93/94 WORLD REQUEST LIST FOR NUCLEAR DATA COMPILED AND EDITED BY N. KOCHEROV AND P.K. MCLAUGHLIN, IAEA, VIENNA, AUSTRIA PUBLISHED ON BEHALF OF NNDC, BROOKHAVEN, USA; NEA DATA BANK, SACLAY, FRANCE; NUCLEAR DATA SECTION, VIENNA, AUSTRIA; NUCLEAR DATA CENTER, OBNINSK, RUSSIA DECEMBER 1993 136 PAGES	1950
INDC(SEC)-105/U+G	FEB 94		REQUESTS FOR FISSION YIELD MEASUREMENTS A SUPPLEMENT TO WRENDA 93/94 (PUBLISHED AS INDC(SEC)-104) ISSUED BY PARTICIPANTS OF THE IAEA CO-ORDINATED RESEARCH PROGRAMME ON THE COMPILATION AND EVALUATION OF FISSION YIELD NUCLEAR DATA COMPILED AND EDITED BY M. LAMMER, IAEA, VIENNA FEBRUARY 1994 24 PAGES	1951
INDC(ARG)-011/G	MAR 93		NUCLEAR DATA IN ARGENTINA (1992-1993) PREPARED BY G.H. RICABARRA COMISION NACIONAL DE ENERGIA ATOMICA BUENOS AIRES, ARGENTINA MARCH 1993 9 PAGES	1952
INDC(CCP)-361/L	JAN 94		SELECTION OF RADIATION SOURCES FOR CALIBRATION OF GAMMA-RAY SPECTROMETERS F.E. CHUKREEV I.V. KURCHATOV INSTITUTE OF ATOMIC ENERGY MOSCOW, RUSSIA JANUARY 1994 9 PAGES	1953
INDC(NDS)-280/G	FEB 93		REPORT OF THE IAEA NUCLEAR DATA SECTION TO THE INTERNATIONAL NUCLEAR DATA COMMITTEE JULY 1990 - DECEMBER 1992 R. JANEV, N. KOCHEROV, H.D. LEMMEL (EDITORS) FEBRUARY 1993 66 PAGES	1954
INDC(BUL)-014/L	FEB 94		AVERAGE GROUP DATA FOR 241PU IN THE 0.1-21.5 KEV ENERGY REGION N.T. KOYUMDZHIEVA AND N.B. YANEVA NUCLEAR RESEARCH AND POWER INSTITUTE, SOFIA, BULGARIA (TRANSLATED FROM A RUSSIAN ORIGINAL PUBLISHED IN YADERNYE KONSTANTY 4/1990) TRANSLATION EDITOR: DR. ALEX LORENZ FEBRUARY 1994 15 PAGES	1955
INDC(CCP)-362/L+N	FEB 94		ANALYSIS OF EXISTING DATA AND SPECIFICATION OF AN EXPERIMENT TO DETERMINE THE 252CF HALF-LIFE TO THE REQUIRED DEGREE OF ACCURACY I.A. KHARITONOV (TRANSLATED FROM A RUSSIAN ORIGINAL PUBLISHED IN YADERNYE KONSTANTY 4/1987) TRANSLATION EDITOR: DR. ALEX LORENZ FEBRUARY 1994 15 PAGES	1956
INDC(CCP)-363/L+N	FEB 94		IDENTIFICATION OF HIGH-SPIN STATES IN 235U V.E. MAKARENKO, F.E. CHUKREEV (TRANSLATION FROM A RUSSIAN ORIGINAL PUBLISHED IN JADERNYE KONSTANTY 4/1988) TRANSLATION EDITOR: DR. A. LORENZ FEBRUARY 1994 11 PAGES	1957
INDC(CCP)-364/G	FEB 94		SELECTED PAPERS ON NUCLEAR DATA ANALYSIS (TRANSLATION OF RUSSIAN PAPERS PUBLISHED IN YADERNYE KONSTANTY 1/1989) TRANSLATION EDITOR: DR. A. LORENZ FEBRUARY 1994 38 PAGES	1958
INDC(CCP)-365/L	FEB 94		MEASUREMENTS OF NEUTRON NUCLEAR DATA OF ACTINIDES (TRANSLATION OF SELECTED RUSSIAN PAPERS PUBLISHED IN YADERNYE KONSTANTY 1987-1991) TRANSLATION EDITOR: DR. A. LORENZ FEBRUARY 1994 37 PAGES	1959

INDC DOCUMENT DESIGNATOR	DATE OF DISTRIB.	ORIGINAL DOCUMENT ID.	DOCUMENT TITLE, AUTHOR, OTHER IDENTIFICATION NUMBERS, ETC...	ACC.NO
INDC(CCP)-366/L	FEB 94		EVALUATION OF NEUTRON NUCLEAR DATA OF ACTINIDES (TRANSLATIONS OF SELECTED RUSSIAN PAPERS PUBLISHED IN YADERNYE KONSTANTY 1987-1991) TRANSLATION EDITOR: DR. A. LORENZ FEBRUARY 1994 66 PAGES	1960
INDC(CCP)-367/L	FEB 94		INTEGRAL TESTS OF NEUTRON NUCLEAR DATA OF ACTINIDES (TRANSLATIONS OF SELECTED RUSSIAN PAPERS PUBLISHED IN YADERNYE KONSTANTY 1987-1991) TANSLATION EDITOR: DR. A. LORENZ FEBRUARY 1994 92 PAGES	1961
INDC(CCP)-368/L	FEB 94		ABSOLUTE MEASUREMENT OF THE CHROMIUM NEUTRON CAPTURE CROSS-SECTION IN THE 1 KEV TO 20 KEV ENERGY RANGE M.A. VOSKANYAN, ET. AL., I.V. KURCHATOV INSTITUTE FOR NUCLEAR ENERGY, MOSCOW B.V. ZHURAVLEV, L.E. KAZAKOV, INSTITUTE OF PHYSICS AND POWER ENGINEERING, OBNINSK (TRANSLATED FROM A RUSSIAN ORIGINAL PUBLISHED IN YADERNYE KONSTANTY 4/1991) TRANSL. ED.: A. LORENZ FEBRUARY 1994, 6 PAGES	1962
INDC(CCP)-369/L	FEB 94		SECONDARY NEUTRON EMISSION SPECTRA FROM SPHERICAL AND HEMISPHERICAL SAMPLES OF MATERIALS OBTAINED AT 14 MEV NEUTRON ENERGY A.I. SAUKOV, B.I. SUKHANOV, A.M. RYABININ ALL-UNION SCIENTIFIC RESEARCH INSTITUTE OF ENGINEERING PHYSICS, CHELYABINSK, RUSSIA (TRANSLATED FROM A RUSSIAN ORIGINAL PUBLISHED IN YADERNYE KONSTANTY 4/1991) TRANSLATION EDITOR: DR. A. LORENZ FEBRUARY 1994, 27 PAGES	1963
INDC(NOS)-296/G,ND	DEC 93		CO-ORDINATION OF THE INTERNATIONAL NETWORK OF NUCLEAR STRUCTURE AND DECAY DATA EVALUATION SUMMARY REPORT OF AN IAEA ADVISORY GROUP MEETING HOSTED BY THE CEC CENTRAL BUREAU FOR NUCLEAR MEASUREMENTS IN GEEL, BELGIUM, 9-13 NOVEMBER 1992 EDITED BY H.D. LEMMEL DECEMBER 1993 17 PAGES	1964
INDC(NDS)-300/L	FEB 94		REPORT ON THE SECOND INTERNATIONAL ACTIVATION CALCULATION BENCHMARK COMPARISON STUDY E.T. CHENG, TSI RESEARCH, INC., SOLANA BEACH, USA R.A. FORREST, CULHAM LABORATORY, CULHAM, UK A.B. PASHCHENKO, IAEA NUCLEAR DATA SECTION, VIENNA FEBRUARY 1994 23 PAGES	1965
INDC(NOS)-299/L+F+	MAR 94		PREPARATION OF PROCESSED NUCLEAR DATA LIBRARIES FOR THERMAL, FAST AND FUSION RESEARCH AND POWER REACTOR APPLICATIONS SUMMARY REPORT OF THE IAEA CONSULTANTS'S MEETING ORGANIZED BY THE IAEA AND HELD AT THE IAEA HEADQUARTERS, VIENNA, AUSTRIA, 8-10 DECEMBER 1993 PREPARED BY S. GANESAN, IAEA NUCLEAR DATA SECTION MARCH 1994 18 PAGES	1966
INDC(NDS)-297/L+F	MAR 94		REVIEW OF UNCERTAINTY FILES AND IMPROVED MULTIGROUP CROSS SECTION FILES FOR FENDL SUMMARY REPORT OF THE IAEA ADVISORY GROUP MEETING ORGANIZED BY THE IAEA IN COOPERATION WITH JAERI HELD AT THE TOKAI RESEARCH ESTABLISHMENT, JAERI, JAPAN, 8-12 NOVEMBER 1993 PREPARED BY S. GANESAN, IAEA, NUCLEAR DATA SECTION MARCH 1994 39 PAGES	1967
INDC(NDS)-298/L+F	MAR 94		PREPARATION OF FUSION BENCHMARKS IN ELECTRONIC FORMAT FOR NUCLEAR DATA VALIDATION STUDIES SUMMARY REPORT OF THE IAEA CONSULTANTS' MEETING ORGANIZED BY THE IAEA AND HELD AT THE IAEA HEADQUARTERS, VIENNA, AUSTRIA, 13-16 DECEMBER 1993 PREPARED BY S. GANESAN, IAEA, NUCLEAR DATA SECTION MARCH 1994 19 PAGES	1968
INDC(NDS)-303/G	MAR 94		STATUS OF IMPORTANT NUCLEAR DATA REQUIRED FOR ITER A PAPER PRESENTED AT THE INTERNATIONAL WORKSHOP ON NUCLEAR DATA FOR FUSION REACTOR TECHNOLOGY OEL MAR, CALIFORNIA, USA, 3-6 MAY 1993 S. GANESAN, N. KOCHEROV, A. PASHCHENKO, J.J. SCHMIDT, AND H. VONACH MARCH 1994 174 PAGES	1969
INDC(NOS)-304/G,P	94		PROGRESS IN FISSION PRODUCT NUCLEAR DATA INFORMATION ABOUT ACTIVITIES AND REQUIREMENTS IN THE FIELD OF MEASUREMENTS AND COMPILATIONS/ EVALUATIONS OF FISSION PRODUCT NUCLEAR DATA (FPND) NO. 14 COLLECTED BY M. LAMMER, IAEA, NUCLEAR DATA SECTION 1994 119 PAGES	1970
INDC(CPR)-031/L	DEC 93	CNIC-00810 CNDC-0013	COMMUNICATION OF NUCLEAR DATA PROGRESS NO. 10 (1993) CHINA NUCLEAR INFORMATION CENTER CHINESE NUCLEAR DATA CENTER ATOMIC ENERGY PRESS BEIJING DECEMBER 1993 150 PAGES	1971

R4

THE CJD PROGRESS REPORT.

V.N.Manokhin

CINDA. 510 entries from the works published in 1992-1993 were compiled. A total number of lines is 1839.

EXFOR. The compiling into EXFOR is continued on a steady level. During 1992-1993 TRANS 4086-4094 with 193 entries (71 new and 122 corrected) were transmitted. A total number of subentries is 1723,from which 696 are new.

EVALUATED DATA.The CJD evaluation activity is as follows:

1.The systematics of (n,2n) and (n,3n) cross sections were developed. Many (n,2n) reactions needed for dosimetry and activation were evaluated using the systematics.

2.The Russian Dosimetry File(RDF-94) was formed.It contains 46 reactions,from which 36 ones were evaluated in the CJD. At the present time the File is in process of checking and testing.

3. The files of ^{nat}Zr and its isotopes, ^{nat}Sn, ^{93}Nb from BROND-2 were corrected and improved for FENDL project. A cooperation of the CJD and Dr. R.McFarlaine helped very much to find misunderstanding in format presentation of data and process these files by NJOY-91.

4. The CJD and CNDC have compared the data files for Cr, Fe and Ni from BROND-2 and CENDL-2. The reasons of available discrepancies are under study.

5. The evaluation of neutron data of Zn isotopes was made for BROND-2 library. The data were written in ENDF-6 format.

6. The work on adding new data photo-neutron data library BOFOD is in progress.

7. The gas production library is created. The evaluated cross sections for separate isotopes will be included.

COMPUTER MATTERS. New computer system ALPHA APX 3600S with OPEN VMS 1.5 and VAX DBMS 4.3 is installed in the CJD. A local network on the base of this system and several PC 486 DX will be created. It is supposed to adopt the NNDC online system.

R5

Chinese Nuclear Data Center (CNDC)

Status Report

Zhang Jingshang Zhao Zhixiang
Zhuang Youxiang Liang Qichang

1. General Situation

The major event at the CNDC in 1992 has been the accomplishment of CENDL-2.0 (Chinese Evaluated Nuclear Data Library, versin 2.0).

A new working station of SUN-10 with 64 MB main memories, 1.05 GB system memories and 2*2.0 GB disks has been put into operation at the velocity of 90 mips. Three sets of PC mode 486 have been supplemented at CNDC.

On the basis of the researches on nuclear reaction theory, a complete set of model code system for nuclear data calculation has been set up. It includes the codes UNF series and MUP series as well as RCA, CCOM and DWUCK, in which DWUCK is introduced from abroad.

Chinese Evaluated Nuclear Parameter Library (CENPL) has been preliminarily established. The CENPL contains six sublibraries and has been provided for chinese users. They are as follows:

(1) Atomic messes and characteristic constants for nuclear ground states (CENPL-MCC);
(2) Discrete level schemes and branch ratios of gamma decay (CENPL-DLD);
(3) Level density parameters (CENPL-LDL);
(4) Giant dipole resonance parameters for gamma ray strength functions (CENPL-GDR);
(5) Fission barrier parameters (CENPL-FBP);
(6) Optical model parameters (CENPL-OMP).

This project is supported by the IAEA.

2. Future work, manpower and priorities

Future work

The advanced CENDL-2.1 based on CENDL-2.0 will be accomplished in 1995. Much improvements will be made in four principal aspects:

(1) to supplement and update evaluations of some nuclides;
(2) to do re-evaluations for some nuclides;
(3) to add some files (for example, photon production data and covariance matrix) to evaluations of some nuclides;
(4) to make international comparison of evaluated nuclear data, discover problems and solve them.

Staff

There are 18 senior scientists at CNDC. They are engaged in various work:

Nuclear theory 4;
Neutron data evaluation 5;
Charged particle and photonuclear data 1;
Nuclear structure and decay data 1;
Fission product yield 1;
Atomic and molecular data 1;
Parameter library 1;
EXFOR, CINDA, Data format 1;
Data service, Library management 1;
Group constant generating 1;
Benchmark testing 1.

Priorities

Due to the requirement of the international exchanges and financial limit, CNDC would like to enhance the cooperations on neutron, charged particle and photonuclear data with other centers.

This is a top priority for CNDC.

Status Report of JAERI/NDC and JNDC

Yasuyuki KIKUCHI

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Japan Atomic Energy Research Institute,
Tokai-mura, Naka-gun, Ibaraki-ken, 319-11 Japan

1. JAERI/NDC Activity

Nuclear Data Center of Japan Atomic Energy Research Institute (JAERI/NDC) plays a role of national nuclear data center in Japan besides research activities. Its resent activities are reviewed.

The most important activity is the evaluation and compilation of Japanese Evaluated Nuclear Data Library (JENDL) in cooperation with Japanese Nuclear Data Committee (JNDC). The revision 2 of JENDL-3 General Purpose File will be released soon as JENDL-3.2. The evaluation is going on for various JENDL Special Purpose Files such as JENDL High Energy File, JENDL Fusion File, Minor Actinoid File, Covariance File, Activation Cross Section File, Dosimetry File, PKA Spectrum File, (α,n) Reaction Data File, Photo Reaction Data File.

Integrated Nuclear Data Evaluation System (INDES) is being developed, in order to keep experiences accumulated in JENDL-3, to store basic data of nuclear physics used for the JENDL-3 evaluation, and to support new evaluations. Roughly classified, INDES functions are of three categories; to select the most suitable set of theoretical calculation codes by applying knowledge engineering technology, to retrieve basic data described above, and to set up input data of theoretical calculation codes automatically.

Recently data needs for the high energy nuclear data increase. A code to calculate the cross section up to a few GeV is being developed on the basis of the quantum molecular dynamics in cooperation with a group in the Advanced Science Research Center in JAERI.

The nuclear structure and decay data are evaluated under the international network of ENSDF. Japan is in charge of the mass numbers from 118 to 129.

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

Atomic and molecular data for fusion reactor applications are also evaluated and compiled in international format by JAERI/NDC.

One of JAERI/NDC functions as the national center is collection and service of databases for experimental and evaluated nuclear data. As to the experimental database, the retrieval systems of NESTOR2 for neutron incident reactions, and of CHESTOR for charged particles and gamma-ray incident reactions have been developed. The international collaborations and data exchange are made basically through JAERI/NDC. JAERI/NDC also serves as the secretariat of JNDC.

2. JNDC Activity

Japanese Nuclear Data Committee (JNDC) has about 150 members in Atomic Energy Society of Japan and JAERI. JNDC consists of three subcommittees, which are on nuclear data, on reactor constants and on fuel cycle, six standing groups, steering and counseling committees. JAERI/NDC serves as the secretariat. The schematic diagram is attached. Recent activities on the subcommittees and standing groups of JNDC are reported below.

2.1 Subcommittee on Nuclear Data

Subcommittee on nuclear data has 11 working groups (WGs).

(1) High Energy Nuclear Data Evaluation WG

Methods of the intermediate nuclear data evaluation are discussed and the evaluation work for JENDL High Energy File is mainly performed by this WG. Actual work is separated into two energy region of up to 50 MeV and of up to a few GeV. Comparison of several theoretical codes was done for this work.

(2) Covariance Data Evaluation WG

This WG was organized to evaluate error data for JENDL. Different evaluation methods of covariance matrices proposed by Japan, the United States and Europe were compared and it was concluded to adopt Japanese method, which evaluates them from physical parameters of calculations.

(3) Evaluation and Calculation System WG

Integrated Nuclear Data Evaluation System (INDES) is under development with knowledge engineering technology. INDES keeps data and experience of JENDL-3 evaluation work and economize the evaluation in future. Two temperature Madland-Nix model was developed to calculate fission neutron spectra.

(4) Fission Product Nuclear Data WG

The evaluations and benchmark tests for JENDL-3 FP Data File were done by this WG. The revision works for JENDL-3.2 were also performed.

(5) Activation-Cross-Section Data WG

The preliminary version of JENDL Activation Cross Section File was produced and benchmark testing is now planned.

(6) PKA Spectrum WG

ESPERANT code, which creates the PKA/KERMA file from the evaluated nuclear data file, was developed. This WG will also evaluate the intermediate energy neutron nuclear data up to 50 MeV for lighter nuclei.

(7) Charged Particle Nuclear Data WG

The data related (α,n) and fusion reactions were researched. The experimental data of thick target neutron and proton yields for proton and alpha-particle induced reactions on several elements were collected and stored in EXFOR format.

(8) Photo-Reaction Data WG

The photo reaction data were evaluated at the incident gamma-ray energy up to 140 MeV for 31 nuclei as a phase I evaluation.

(9) WG on Revision of JENDL-3 Neutron Data

The revision work for JENDL-3.2 was performed except for the γ-ray production data.

(10) WG on Revision of JENDL-3 Gamma-ray Production Data

The problems of JENDL-3.1 about gamma-ray data were made clear and re-evaluation for the important nuclei such as Fe and Ni was done.

2.2 Subcommittee on Reactor Constants

(1) Fission Reactor Integral Test WG

The benchmark tests for the thermal and fast reactors were performed with the various group constants and calculating codes.

(2) Shielding Integral Test WG

Various shielding benchmark tests were performed and its final report (JAERI-1330) is under printing. The benchmark test for secondary gamma-ray is in progress. The research of group constants and benchmark tests for intermediate energy nuclear data related to the accelerator applications has been started.

(3) Dosimetry Integral Test WG

The JENDL Dosimetry File was produced and JAERI-1325 was published.

(4) Fusion Neutronics Integral Test WG

The benchmark tests related to the fusion neutronics are being performed.

(5) Standard Group Constants WG

The system of the standard group constants, which is called JSSTDL and consists of neutron and gamma-ray cross sections made from JENDL-3, was improved. The utility codes were developed.

2.3 Subcommittee on Fuel Cycle

(1) Decay Heat Evaluation WG

The JNDC Decay Data Library has been finished. In order to expand the functions, the preliminary research work for spectrum calculation of beta-ray heating and calculation of delayed neutrons were performed.

(2) WG on Evaluation of Nuclide Generation and Depletion

The isotope yield data of spent fuel were collected and published as JAERI-M 93-061. The data book, JAERI-1324, on neutron yields and its spectra caused by (α,n) reaction and spontaneous fission was published.

2.4 Standing Groups

(1) JENDL Compilation Group

The compilation works for JENDL general and special purpose files are performed.

(2) CINDA Group

The bibliographic data of neutron nuclear data published in Japan are collected and sent to NEA Data Bank.

(3) WRENDA Group

The experimental request data of Japan are collected and sent to IAEA.

(4) ENSDF Group

The evaluations of nuclear structure data for nuclei whose mass numbers are from 118 to 129 are performed. The data except for mass numbers of 120 and 124 have been revised until 1992.

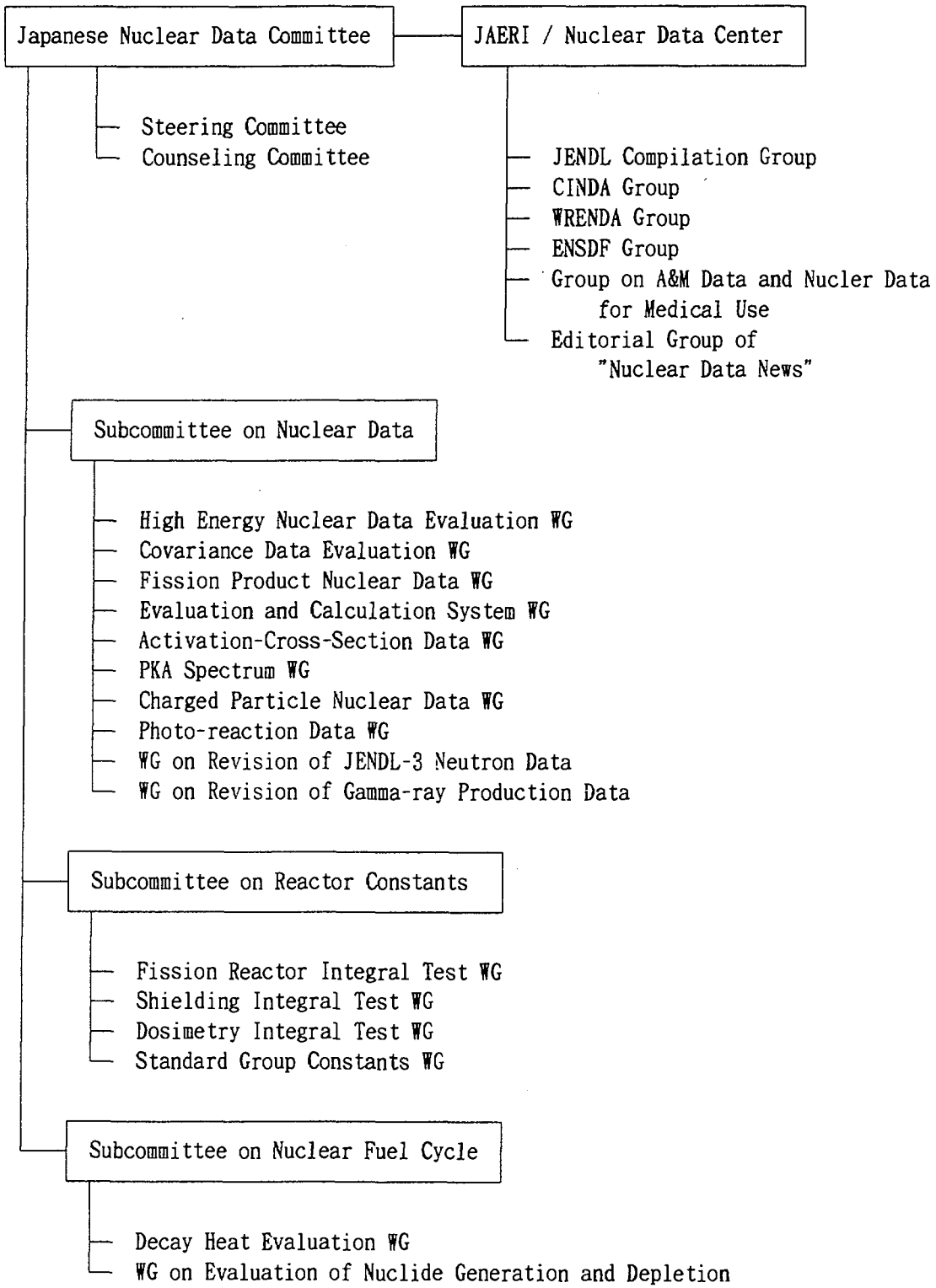
(5) Group on Atomic, Molecular and Nuclear Data for Medical Use

This is newly re-organized group in 1993. Data needs from medical use are surveyed.

(6) Editorial Group of "Nuclear Data News"

This group publishes three issues of "Nuclear Data News" in Japanese in a year.

Japanese Nuclear Data Committee (May 1994)



WG : Working Group

Japan Charged-Particle Nuclear Reaction Data Group

Hajime TANAKA
Chairman of the Executive Committee

Status Report to the Advisory Group Meeting on the Co-ordination of the Nuclear Reaction Data Centres From 25 to 27 April 1994

1. Characteristics of NRDF and specific applications

At first, we will give some characteristics of the NRDF database and the activity of the Japan Charged-Particle Nuclear Reaction Data Group (JCPRG). This database is intended to dedicate not only for a technical usage but also for academic usage. The data compiling format of NRDF is designed to compile various kind of data types which increase with the advancement of research work of this field.

The scope of the objects to be compiled in NRDF is not limited to that of one or some particular current applications. It includes all physical quantities measured in one experiment published. For example, NRDF contains recent data of high-energy beam and unstable-nuclei beam experiments more than ordinary angular distribution or cross section data. Therefore the scope of data compiling objects seems wider than EXFOR.

For a specific application, a certain corresponding retrieval system deals with the NRDF database. The NRDF database may be used by various applications with their own retrieval systems. The translation into the EXFOR system is one of such applications of the NRDF database. The Index Database, which will be mentioned later, is another such application. Therefore an application oriented usage will be dealt with a certain retrieval system of the NRDF database. We are compiling all physical quantities of CPND with the NRDF format for the reason.

The activity of JCPRG is supported by the Ministry of Education. In this point, JCPRG differs from other two activities of Japan, which are supported by the Ministry of Science and Technology. The NRDF database is also approved by the Society of Nuclear Physics including experimental and theoretical physicists in Japan.

Japan Charged-Particle Nuclear Reaction Data Group places four duties upon itself:

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

(2) Translating data in NRDF into EXFOR format;

(3) Making a combined index database for the CPND in both of NRDF and

(4) EXFOR for the convenience of the customers in Japan;

(5) Distributing CPND and Promoting utilization within Japan.

2. Organization and members of JCPRG

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

Advisory committee:

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

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

Hidetugu IKEGAMI (Research Center for Nuclear Physics, Osaka Univ.)
Hajime OHNUMA (Tokyo Institute of Technology)
Hikonojo ORIHARA (Cyclotron and Radioisotope Center, Tohoku Univ.)
Mituji KAWAI (Kyushu Univ.)
Yasuyuki KIKUCHI (Japan Atomic Energy Research Institute)
Teijiro SAITHO (Tohoku Univ.)
Fumihiko SAKATA (Institute for Nuclear Study, Tokyo Univ.)
Khoji NAKAI (National Institute for High Energy Physics)
Akira HASHIZUME (Institute of Physical and Chemical Research)
Hiroshi YOSHIDA (Tokyo Institute of Technology)

Executive committee:

Hajime TANAKA (Chairman, Sapporo-Gakuin Univ.)
Kiyoshi KATO (Vice-Chairman, Hokkaido Univ.)
Akira OHNISHI(Hokkaido Univ.)
Shigeto OKABE (Hokkaido Univ.)
Toshiyuki KATAYAMA(Hokusei-Gakuen Univ.)
Hiroyasu NAGATA (Hirosaki Univ.)
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Takahisa KOIKE(Hokkaido Univ.)
Yuka AOKI(Tohoku Univ.)
Yasushi NARA(Hokkaido Univ.)

NRDF System Maintenance:

Shigeo MUKAI(Hokkaido Univ.)

Chiba who is a member of the executive committee has a responsibility for translating NRDF data into the EXFOR format, and keeping EXFOR data received and user servicing. Katayama who is also a member of the executive committee is now investigating possibilities and methodology for evaluation of CPND.

3. Recent progress

(1) Compiling CPND produced in Japan

We have been compiling CPND produced in Japan with the NRDF format since 1987 constantly. In 1992 and 1993, we have newly added 65 and 55 entries in the NRDF library respectively. These newly added entries are the ones that were all produced by accelerators in Japan. Main institutes are Tohoku univ., Tsukuba univ., KEK, JAERI, RIKEN, INS, Tokyo-Ins. Tech., RCNP and Kyushu univ.. Almost all CPND produced from these institutes have been stored in NRDF. By March 1994, amount of the data compiled have reached more than 1200 entries (1258) about 57 MB.

(2) EXFOR translation

In 1992 we submitted to NDS TRANS E010. It contains 29 entries, which were converted out from the NRDF library compiled in 1991. In March 1994 we submitted TRANS E011. The TRANS E011 contains 26 entries. These entries were converted out from the NRDF library compiled in 1992. Now, these two TRANS are requested error corrections.

As mentioned above, the NRDF database is including many kind of data, therefore it is not possible to translate all of NRDF data into the EXFOR format. We have been translating only the parts of NRDF data which can be translated.

(3) Index information system of CPND

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

The received CPND in the EXFOR format from IAEA have been accumulated to the amount of 30 MB, consisting of about 1500 entries. It may be a part of our responsibility to prepare an access path of utilizing the data as a valuable resource for the research activities in Japan.

So, the index information retrieval system was developed to find EXFOR entries or subentries having specified features. This installation is a trial version to the system on NACSIS-IR (Information Retrieval service of the National Center for Science Information System). In the near future, the system developed will be available on NACSIS-IR in order to be of use to all potential researchers in Japan.

(4) Customer service

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

Picking up some topics from the recent reports, compilation of hypernuclear data is discussed in "NRDF ANNUAL REPORT 91", "Production of nuclear experimental data" and "proton induced reaction data in NRDF" are surveyed in the 92 Report so as to perform evaluation.

4. Computer Facility

We utilize the Hokkaido University Computing Center for the storage and retrieval of NRDF and EXFOR information. The Hokkaido University Computing Center installs with

Hitachi M-880H and S-820/80 computers. These computers are running by MVS or UNIX compatible operating systems.[1] They are also connected to the National Academic Information Network. Thereforeresearchers of the universities or institutes in Japan can access our NRDF or EXFOR information through the Network.

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

5. Future of activities

Major tasks that we have a responsibility to do are compiling and storing CPND produced in Japan, and supplying with data service to home users through international data exchange. The activity and organization of JPCRG is based on Nuclear Research Laboratory, Department of Physics, Hokkaido University, which is supported with the regular working budget and administered by the Ministry of Education and Hokkaido University. The organization of JPCRG has got acknowledgment of the Nuclear Research Community in Japan. We are also getting supports from many researches. Therefore our activity will be going forward steadily. We are making effort to perform the matters in hand mensioned below.

(1) CPND Compiling

We estimate the amount of data produced in Japan per year to be about 3 MB. Although almost all CPND produced ever year in Japan are compiled, it is not yet complete. Especially, recent data of unstable nuclear beems at RIKEN and of high-energy experiments at KEK should completely be stored in NRDF.

(2) EXFOR translation

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

(3) Information system of CPND

The current version of the Index Information system include only EXFOR index information. We are also planning to add NRDF index information to this system. The NACSIS-IR is currently not able to accept other than index database. We are intending to install CPND customer service on NACSIS-IR in future when NACSIS will also be able to accept numerical databases.

(4) Customer service

We are developing a new service through National Center for Science Information Systems (NCSIS): Index Information Retrieval System for CPND in both NRDF and EXFOR formats.

(5) Others

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

1) What physical quantities really exist?;

2) In the case of choosing Total-Cross-Section, is it feasible to evaluate?, are there sufficient data or energy range?;

3) As NRDF data includes also optical potential, ares there any data evaluation model, simulation method or code?

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

[1] IP Address: "133.50.16.16"; Domain Address: "osf.cc.hokudai.ac.jp"

STATUS REPORT OF THE RIKEN NUCLEAR DATA GROUP

to

The IAEA Advisory Group Meeting
On the Coordination of the Nuclear Reaction Data Centers
Paris, 25 - 27 April 1994

Y. Tendow

EXFOR

We continue to collect and compile the production cross section data for the 20 medical isotopes as well as some other extended varieties of isotopes. We had collected over 70 works not included in the EXFOR, and started in the compilation of them. We have transmitted the trans R008 (and its revision R009) to NDS, which includes 11 works, 56 subentries with 63 excitation functions.

(d, x) reactions	35 (curves)
(^{3}He, x) reactions	19
(α, x) reactions	7
(p, x) reactions	2

ENSDF

We continue the mass-chain evaluation as a member of the Japanese ENSDF working group. Re-evaluation or update for A = 129 mass chain has been completed and is in author post-review at the moment. Update evaluation for A = 120 mass chain is now in progress coming to a completion before long.

NSR

NSR file compilation for secondary sources (annual reports) of Japanese origin published in 1993 has completed and transmitted to NNDC.

RIKEN Acc. Prog. Rep.	41 (reports)
JAERI TV Annual Rep.	18
OULNS Annual Rep. (Osaka Univ.)	23
RCNP Annual Rep. (Osaka Univ.)	20
INS Annual Rep. (Tokyo Univ.)	14
UTTAC Annual Rep. (Univ. Tsukuba)	9
CYRIC Annual Rep. (Tohoku Univ.)	8

We are working on the compilation for 1994 secondary sources.

Computers

The central mainframe computer in RIKEN has been downsized from two FACOM M1800 / 20, (256 MB main memories) to one FACOM M1800 / 10, (64 MB main memories) which is also supposed to be disused by the end of this year. We are changing to a new system with a super computer and workstation networks. Nuclear data group is using several PC's for primary input and processing the data. Some of the PC's are as follows:

DECpc 466d2 MTE, 8MB memories, 525 MB HD,
NEC PC-9801, 7 MB, 120 MB HD,
IBM PS / 5530 (equivalent to PS / 2), 6MB, 40 MB HD,
Macintosh IIci, 20 MB, 100 MB HD.

We also have a VAX network system (VAX-6610, VAX station 4000-60, micro VAX II etc.) in the RIKEN Accelerator Facility area, linked to the central mainframe computer. At present we are not extensively using them for data compilation works but we shall have to transfer to the VAX system due to the upcoming disuse of the central mainframe computer.

Staff

There are no improvement in man-power condition since previous time. The schedule of the continuous compilation jobs is rather tight for the staff of our scale. Efforts to simplify and routinize the compilation works as well as to enhance man-power are being continued.

Regular member, proper	1	(EXFOR, ENSDF, NSR)
Regular member, part-time	1	(computer)
Non-regular member, part-time	2	(EXFOR, ENSDF)
Non-regular member, assistant	1	(file and copy management)

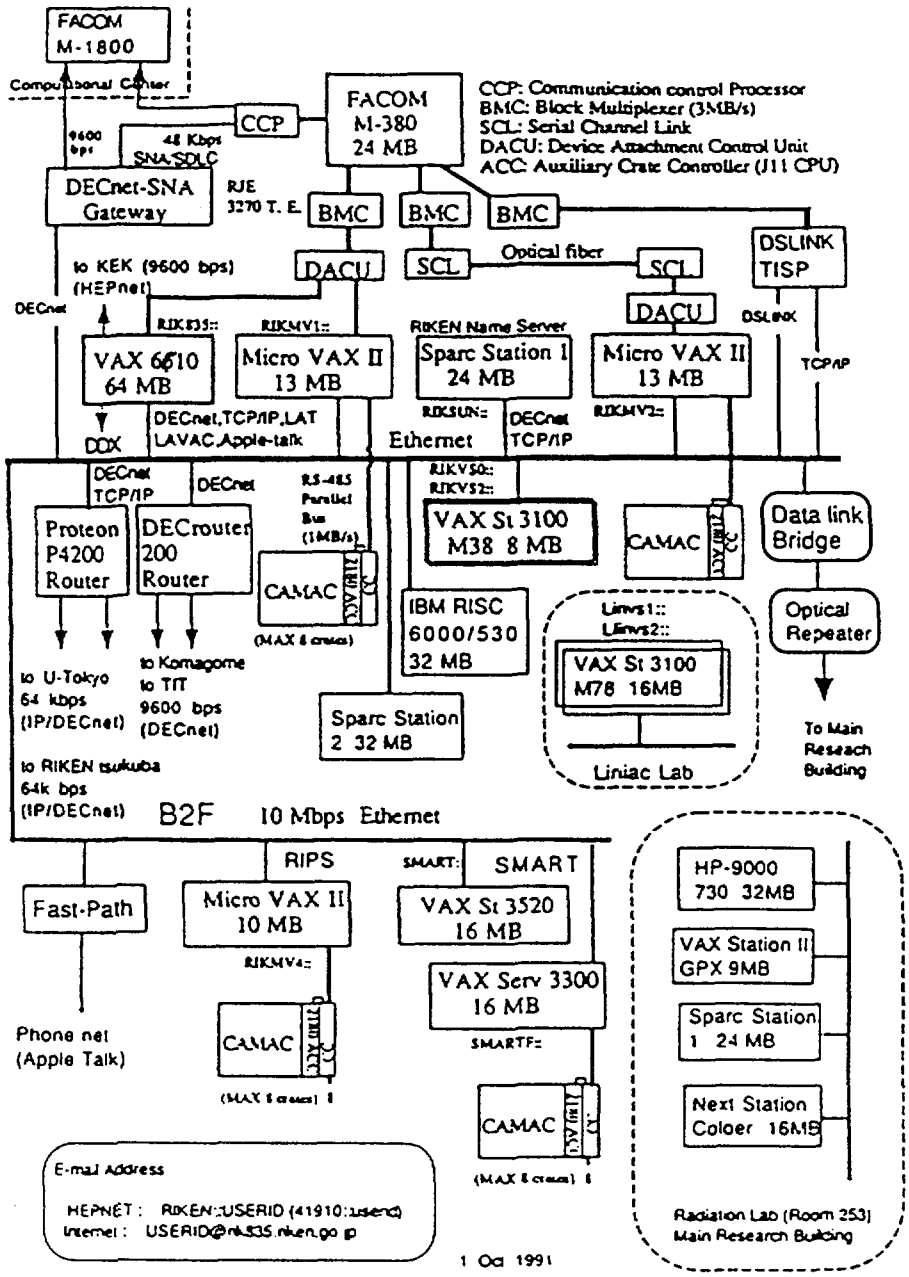

Fig. 1. Overview of the data acquisition system at the RIKEN Ring Cyclotron.

Charged Particle Reaction Data Compilation and Evaluation.

F.E.Chukreev

After our last Meeting (1991) we have prepared three TRANS which contain integral cross sections for radioactive isotopes production. I would like to distinguish our compilation of Levkovskij's book [1] as ENTRY A0510. This ENTRY contains 542 Subentries.

We have been forced this big work, as we had wish to inform science community about the results of several years unpublished investigations. We have believed that low circulation and russian language of this book does not promote for the knowledge of these data.

After our meeting at Obninsk we prepared the code to calculate alpha-particle induced neutron yield from homogeneous mixed elements. We have an experience to compare our calculations with Chernobyl's data for neutron yield from melted materials and good results have been observed.

We have plan to continue our compilations for medical radioisotope production and integral data which are needed for transmutation of radioactive wastes of nuclear power stations. Our plan includes the compilations of some investigations for thermonuclear fusion which were not available at last time.

Besides we would like to decrease our contribution for "Pending EXFOR retransmissions" of Dr. O. Schwerer. We have plan to evaluate some data to monitor of He-3 beams.

CAJAD would like to use our meeting to discuss some problems future compilations and use of its.

Why we compile experimental data?

Different groups have different answers on this question, probably.

Our answer is:

1. To present science information as computer reading form.
2. To distinguish the major result and peculiarities of experiments without any "philosophy".
3. To conserve for science community the opinions of the scientists which used these data.

The execution for first item have not any principal hardnesses, although I can not say that all problems are decided. The execution of second and third items has some hardnesses.

First, I would like to take your attention for item 2 . If you have studied EXFOR entries attentively, you could see some events when you do not understand of the subject of this investigation. There are some curious things and obvious misunderstanding by the compiler.

For example, CAJAD have missed a defect of a printing-office and our checking code did not find this error. Our attention for this error have been taken by Dr. O. Schwerer and we thank Dr. Schwerer.

But similar curious things are not "the privilege" of CAJAD only.

These errors have been created by an inattention of the compilers and senior physicists, which must check a compilation.

Now I would like to go over to third item. Active rules of EXFOR are hindered to correct curious things and to conserve the opinions of another scientists.

Active rule: "Alterations to EXFOR entries are transmitted only by the originating center and are included in the regular EXFOR transmissions." forbids to include any changes in B-Library,

which has been prepared by Prof. H. Munzel group. B-Library has very much deviation from active rules and these deviations make difficult computer search in this library.

We have taken your attention by MEMO-A/65 for another cases when the corrections are obligatory(!).

Who must do needed corrections? Our Meeting must find anybody who could prepared a consideration on this subject. After this consideration will be created we must discuss it by usual MEMO exchange and to accept new rule during to next Meeting. If we will not do it, then big labor, which have been invested to create EXFOR-Library, will be depreciated or be lost.

We understand that refuse from this rule must be accompanied by check information "who, when, why" included this correction. Else EXFOR users become involved.

I would repeat that the refusal from this rule is needed!

Checking codes and EXFOR Manual.

As I know, three checking codes have been created

1. by NNDC USA.
2. by NDS.
3. by CAJAD.

As our experience show each checking code has some peculiarities.

These peculiarities had been created by the difference of compilation objects and the wish to exclude the most frequent errors.

During to last years we include in our checking code some essential changes to exclude founded bugs and to include additional checks.

But we must say that our checking code find some errors which could not be founded by NDS checking code and vica versa.
Is it bad or good? My opinion - this is good.

We are not convinced that checking code which will have ability for to exclude all errors is possible. This opinion is created by differences for EXFOR rules interpretation.

I could advise NDS, which have responsibility for EXFOR MANUAL, to increase the requirement for text formalist of EXFOR. The number of the phrase as "...if one heading is to be defined, the coded information may be omitted" must be decreased, because a request for coded information will intensify compiler attention.

Compiler attention could be improved by using of the stencil. The examples similar stencils could be found in CAJAD practice and AMPEX code (V.Osorio, NDS).

CAJAD activity for CPND EXFOR coordination.

During to our last Meeting at Paris I had the request to coordinate CPND EXFOR compilation.

I had believed that my colleges will give work for me very much. But I have the requests a little. I intend that our CPND library has some duplicated ENTRY and I hope to make special check on this subject, when I shall have time for this control.

Reference

[1] V.N.Levkovsij, Activation cross section nuclei of average masses (A=40-100) by protons and alpha-particles with average energies (E=10-50 MeV).

The MSU INP CDFE Activities in Photonuclear Data Compilation and Evaluation and in EXFOR, ENSDF, and NSR.

I.N.Boboshin, V.V.Varlamov, N.G.Efimkin, V.V.Sapunenko, M.E.Stepanov

CDFE, Institute of Nuclear Physics, Moscow State University, Moscow 119899, Russia

The CDFE Progress Report to the
12-th Consultants' Meeting of the Nuclear
Reaction Data Centres
25 - 27 April 1994 Paris

GENERAL

This report contains the review of the works carried out by he CDFE after the Technical NRDC meting (Vienna, 1 - 3 September, 1992).

EXFOR

The production of the EXFOR files of experimental photonuclear data remains the main direction of CDFE activity till now.

The work on correction of CDFE EXFOR TRANS M016 was carried out in accordance with IAEA NDS (Dr. O.Schwerer) comments. The result was processed in IAEA NDS as TRANS M017.

The new CDFE TRANS M018 was prepared. It includes the data from 19 papers have been published in various countries. This TRANS was prepared on diskette as the supplement to this Progress Report.

The total number of CDFE-made M0-ENTRIES now is about 500 (M0001-M0500 with several blanks). The CDFE photonuclear data EXFOR fund includes also the last version of the total USA LLNL (Prof.B.L.Berman) EXFOR library (L0001-L0059) of photonuclear reaction cross sections obtained using quasimonoenergetic photon beams has been reprocessed in accordance with the new requirements of EXFOR format for photonuclear data.

Additionally the CDFE has processed the almost complete total photoneutron reaction cross section data library (EXFOR DATA section-like format) for nuclei from H-2 to Pu-239 based on the data have been digitised earlier in the USA NIST (photonuclear data group of Prof. E.G.Fuller) and presented to the CDFE for continuation of this kind of photonuclear data activity. Some of these data have been converted into the real EXFOR format and included into CDFE M018 TRANS. This work will be continued.

PHOTONUCLEAR DATA EVALUATION

Sticking the photonuclear data evaluation program and using the method of reduction, independent on nuclear models, a priori information, and any regularization as the tool for photonuclear reaction cross section evaluation /1-3/ the CDFE has analysed and evaluated the total photoneutron reaction cross sections for the energy range of giant dipole resonance (E = 10 - 50 MeV) for the number of nuclei (C-12, O-16, Si-28, Ca-40, Cu-63,65, Pr-141, Pb-208 etc.). Some of these data /2/ have been processed as EXFOR ENTRY M0345 and other are now in processing.

Now the CDFE is working on the photonuclear data evaluation program based on the Draft Proposals of Photonuclear Data Cooperation Project between MSU INP CDFE and USA BNL NNDC with participation of scientists of USA LLNL /4/.

ENSDF

The CDFE has continued the activity in the field of using the other international computer files, first of all the ENSDF, for both basic research /5/ and processing of requests of scientists, specialists, and experts first of all from Russia universities and institutes for nuclear structure information.

The main field of activity in this direction was the work on development of the new Personal Computer version of the relation nuclear spectroscopy data base. The universal relation nuclear structure and decay data base NESSY (New ENSDF Search SYstem) has been developed for IBM/PC and compatible PC on the base of the ENSDF and the data base management system (DBMS) PARADOX 3.5. The choice of the DBMS PARADOX was determined by two principal factors. At first, this DBMS is known to be quite fast for great data volumes (at present time the version 4.0 is declared to be the most fast in this class). At second, the PARADOX has an advanced interface and a powerful query language named QBE (Query By Example).

The essence of the work carried out was that the ENSDF was changed from its present eighty-column-card-image format to a table format that is needed for the DBMS PARADOX. To conserve the specific ENSDF hierarchy the special key system was developed: all records of each table were numbered and assigned by "own" record key.

The NESSY gives to one the possibility for high efficiency processing (the search and retrieve of any kind physical data) of the information from ENSDF.

Because of very positive results of using of DBMS PARADOX for the ENSDF information processing on IBM/PC the CDFE has carried out the appropriate reorganisation of the EXFOR fund and began the similar work for NSR.

Note added by NDS:

A related paper, "The Relation IBM/PC Nuclear Structure and Decay Data Base" by I.N. Boboshin, V.V. Varlamov and S.K. Trukhanov, is being published as INDC(CCP)-370.

INFORMATIONAL ACTIVITY

Sticking the program of photonuclear data information publication the CDFE continues the series of Photonuclear Data Bulletins and Indexes /6/ which contain the systematised information about the experimental works on photo- and electronuclear reactions and inverse reactions of radiative capture. Now the bulletins for 1991 - 1993 are in preparation.

COMPUTER FACILITY

Now the CDFE utilise the IBM/PC local network has been realised on the base of 4 computers:

Computers:	PC IBM AT/386DX-33	MHz-RAM 8 Mb-HDD 700 Mb;
	PC IBM AT/386DX-40	MHz-RAM 5 Mb-HDD 170 Mb;
	PC IBM AT/386SX-33	MHz-RAM 4 Mb-HDD 80 Mb;
	PC IBM XT/V20 -15	MHz-RAM 640 kb-HDD 20 Mb.

Network: Net Ware Lite; ETHERNET Adapters.

COMMUNICATION

To contact CDFE now one must use the following addresses:

MAIL: 119899 Moscow, Vorob'evy Gory, Moscow State University, Institute of Nuclear Physics, CDFE
TEL.: (095) 939-3483
FAX: (095) 939-0896
TELEX: 411483 MGU SU
E-MAIL: VARLAMOV@COMPNET.MSU.SU

REQUEST SITUATION

Because of the strong changing of political and economical situation in the former SU the total number of requests decreased noticeably.

COOPERATION

The CDFE is working in close cooperation with Russian Nuclear Data Centres (CAJaD in Moscow and CJD in Obninsk), IAEA NDS, USA BNL NNDC in the field of photonuclear data compilation, and with Nuclear Data Group of USA LLNL (the Draft Proposals of Photonuclear Data Cooperation Project between MSU INP CDFE and USA BNL NDC with participation of scientists of USA LLNL /4/) in the field of data

compilation and evaluation. In addition in 1991 an mutual understanding about coordination of photonuclear data evaluation activity between the CDFE and the JAERI (Japan) was achieved.

Unfortunately, the CDFE has no any financial support for these works absolutely and in hard financial situation of last years in Russia this produces a lot of obstacles for their normal continuation.

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3. V.V.Varlamov, N.G.Efimkin, B.S.Ishkhanov. Photonuclear Experiment Resolution Improvement and Intermediate Structure of the Giant Dipole Resonance. Proceeding of the 8-th Seminar on Electromagnetic Interactions of Nuclei at Low and Medium Energies, INR, Moscow, 1992, p. 284.

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5. I.N.Boboshin, V.V.Varlamov, E.V.Nartova. Neutron Subshells of Ti, Cr, and Fe. Izvestiya RAN, Seriya Fizicheskaya, 56 (1992) 93.

6. V.V.Varlamov, M.E.Stepanov, V.V.Sapunenko. Photonuclear Data Index 1986 - 1990. INDC(CCP)-348. IAEA. Vienna. 1992.

STATUS OF THE DEBRECEN NUCLEAR DATA GROUP

IAEA Advisory Group Meeting on the
Co-ordination of the Nuclear Reaction Data Centers
Paris 1994

EXFOR

In 1992 installation of the PC version of the computer codes for EXFOR software (edition, retrieval) and for EXFOR based data evaluation (numerical format, plotting) have been started and the first experiences done. Unfortunately because of the complete failure of the computer used the programs and the files was lost, and work was started again from the beginning. After installing the software again the compilation of the absent data measured by our group has been started as the first step .

We made EXFOR files using the ANDEX PC software. The software we have is an early version of ANDEX 1.01, therefore some part of it does not work properly which make the work slow. Regarding, that this compilation work is the first for us the checking of compiled file is in progress.

We have already compiled 15 sets of data file and other 10 are under compilation, mainly data measured in Debrecen and Jülich. The compiled data will be sent to The IAEA till September 1994.

COMPILATION AND EVALUATION OF SELECTED REACTIONS

We have started and partly completed the compilation and the critical comparison of several selected reactions used for production of medically important radioisotopes, for monitoring charged particle beams and for wear measurements. Compilation and evaluation of cross sections for production of ^{67}Ga and ^{111}In and p, d, alpha and ^{3}He induced monitor reactions on Cu, Ti, Ni and Fe are already published or to be published separately.

For data evaluation and for comparison of the measured cross sections with theory installation of several model codes (STAPRE, EXIFON) are completed, and were used to calculate excitation functions of Zn, Ar and Fe.

NEW CROSS SECTION DATA

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

Monitor reactions

Measurement and data evaluation for *proton induced reactions* (have started earlier) on ^{nat}Ni and ^{nat}Ti have been completed and published. Experimental investigation of proton induced nuclear reactions have been started on an alloy containing Cr, Fe, Co, Mo and W among other elements and on pure iron foils for monitoring of charged particle beams and for application of thin layer activation technique. Irradiations have ben performed up to 18 MeV at the Debrecen MGC 20 cyclotron.

We have started our measurement to determine excitation functions *of deuteron induced reactions* on chemically resistant materials, that is on natural Ni and Ti. The first few irradiations already have been done up to 14 MeV.

Experimental part of investigation of *^{3}He and α induced nuclear reactions on natural Ti and Cu* for monitoring have been mostly completed. One part of the results has been published. The data evaluation and critical comparison with earlier results are under development. The experimental results show that in few cases additional irradiations were needed for checking the reproducibility of the measurement, taking into account the very contradicting results in the literature.

New experiments were done with a modified irradiation setup to measure the excitation functions of alpha and ^{3}He induced monitor reactions on ^{nat}Cu, ^{nat}Ni and ^{nat}Ti. Data evaluation of the new measurements has been started.

Reactions for isotope production

Excitation functions for production of the isotopes of ^{66}Ga, ^{67}Ga, ^{111}In, ^{122}I, ^{123}I, ^{124}I, ^{75}Br, ^{77}Br, ^{82}Sr(^{82}Rb), ^{82m}Rb, ^{81}Rb(^{81}Kr), ^{38}K for medical use and ^{43}K for ecological use have been measured.

Reaction for Thin Layer Activation technique

Excitation function of ^{nat}Fe(p,x)^{56}Co nuclear reaction has been measured for application in Thin Layer Application technique. Investigation of proton, deuteron and ^{3}He induced reactions on light elements (Be, B, C, N ...) has been started for production of ^{7}Be used in TLA.

NEW METHODS AND APPLICATIONS

The thin layer activation technique offers a basis for the routine study of very low levels of wear and corrosion. Determination of the wear is based by measuring the activity of the collected wear debris or the residual activity in comparing it with the calibration curve usually obtained experimentally. We have reproduced the calibration curve via calculation using well measured evaluated excitation functions on Fe. The comparisons with the measured calibration curves show that the excitation functions could be effectively used for determination of the calibration curves.

Using gas targets it is important to check the shape of the beam and the density distribution of the gas in the cells. To improve the applied methods for monitoring charged

particle beams during cross section and thick target yield measurement on gas targets an optical method was applied for studying the beam broadening effect and the asymmetry of the beam on horizontal and vertical beam lines. The first experiments show that expanded beam shape can seriously influence the result of nuclear data measurement.
Additional experiments were done on vertical and horizontal beam lines to study the dependence of the pressure of the target gas, stopping power and range as a function of bombarding beam intensities and time. The results were presented at Fifth International Workshop on Targetry and Target Chemistry in Brookhaven, 1993.

For extended use of monitor reactions we decided to develop a computer code which allows a more accurate determinations of effective bombarding energies and fluxes in the samples of irradiated stacks. The computer code is under development, for quick and automatic flux and energy determinations. The first experience shows that in practice only iterative and interactive approximation can be used to determine the correct flux and energy values because of the fact that the measured excitation functions are not an exact mathematical functions, and usually contain different systematical errors.

STAFF and COMPUTERS

Two persons are working on the project in part-time. Hopefully, the man-power will be increased by an other person by the end of this year.

Computers: Fujitech PC-AT 486 (IBM compatible)
processor 50 Mhz
RAM 4MB
hard disk 210 MB
floppies 3.5" and 5.25"
Exabyte tape unit 5GB
AVR 3000 scanner

Indy Silicon Graphics workstation termial connected to a Silicon Graphics Power Challenge trough network.
4 processors
RAM 256MB
hard disk 8GB
DAT
CD

REFERENCES FROM 1991

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Working papers

		WP #	Title
	*	1	Conclusions and actions of the 1992 NRDC meeting
		2	Pending EXFOR items
		3	List of TRANS tapes by 1 April 1994
		4	Disturbing mistakes in TRANS tapes
		5	Pending EXFOR retransmissions
(see Appendix 5)		6	Media for data exchange between centers
		7	CINDA manual revision: coding of (2n,f), (n,n'f) and (n,2nf) reactions (memo 4C-3/374 rev.)
		8	Documents distribution
	*	9	CPND needs expressed in an IAEA meeting (memo CP-D/246)
	*	10	Conclusions and actions of the 1991 NRDC meeting
		11	Need for a new dictionary transmission format for EXFOR/CINDA dictionaries
	*	12	Photonuclear Data (Smolenice meeting 18-21 April 1994)
	*	13	CPND (Smolenice meeting 18-21 April 1994)
		14	Information about Russian evaluated data
	*	15	Memo CP-M/15: Dictionary correction and additions
		16	Present status of JENDL project
		17	Status report of JENDL charged particle data
		18	Present status of photonuclear data evaluation at JAERI
		19	Activities on neutron reaction data at CNDC
		20	Charged-particle and photonuclear data activities at CNDC
		21	Memo CNDC-25/04/94
	*	22	Memo CP-A/65: Some remarks on old and not correct data in B-, L-TRANS tapes
		23	The current status of CENDL-2

* These papers are not reproduced here because they are distributed either as a CP memo or as part of another report.

Scientific papers distributed at the meeting *)

S1	Evaluation of (n,2n) reaction cross section on In-115 and In-113 (V.Manokhin)
S2	Systematics of the (n,2n) and (n,3n) reaction excitation functions (V.Manokhin)
S3	Reference input library on nuclear parameters for model computations - Evaluated nuclear parameter library (ENPL) (Su Zongdi et al.)
S4	The evaluations and calculations of intermediate energy nuclear data for Fe-56, Cu-63 and Cu-65(p,n) monitor reactions (Zhuang Youxiang)
S5	The calculations of photonuclear data (Zhang Jingshang et al.)

*) These papers are not reproduced in the present report.
Copies may be requested from the Scientific Secretary of the meeting.

Working Paper 2: Pending EXFOR items (dictionary codes, coding rules)

O.Schwerer

1. Proposed codes for dict.36 IND,ZP and CUM,ZP
   Memo 4C-4/55 (attached)
   Reply: CP-D/245 (attached)

2. Bremsstrahlung cross section in entry 22206 of TRANS 2132 (listing attached)
   see Memo 4C-3/368 (attached)
   (No new codes proposed yet)

3. Conference code 93DUBNSP
   As mentioned in memo CP-D/244 of 7 March 1994, entries A0514 and A0515 of TRANS A029 contain a new conference code, 93DUBNSP, of which the expansion has not yet been received.

4. General structure of BIB section:
   If both coded information and free text are given for a keyword, is it legal to start with free text and give the code(s) only in one of the following lines?
   There are cases where this could make sense, and it is not explicitly forbidden in the Exfor Manual. It seems, however, that this was not originally foreseen and is not accepted by some check programs. Should it be explicitly forbidden?
   There are some (probably not many) cases existing in the master file. The following is an example where it could make sense:

ERR-ANALYS	GENERAL INFORMATION ON ERROR ANALYSIS
	(ERR-1)EXPLANATION OF FIRST SYSTEMATIC ERROR
	(ERR-2)EXPLANATION OF SECOND SYSTEMATIC ERROR

   The problem applies in theory to all BIB keywords having coded information. Real examples may exist for METHOD, DETECTOR and possibly others.

MEMO 4C - 4 / 55

Centr po Jadernym Dannym - CJD
Nuclear Data Centre, Obninsk, Russia

Institute of Physics and Power Engineering
249020 Obninsk, Kaluga region
Russia

DATE : February 17, 1994
To: Distribution
From: S. Mayev

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

Diction 27:

For nuclide 77-IR-192 we propose introduce code "1" in the field FLAGS, col. 13, for this nuclide might be used in the REACTION SF1. This nuclide then would look like

77-IR-192 (1 3 C 2)

REFERENCE: (J,AE,72,(2),164,9208)
EXFOR ENTRY 41124

- - - - - -

For nuclide 23-V-50 we propose introduce code "4" in the field FLAGS, col. 16, for this nuclide might be used in the REACTION SF1 when SF2=0. This nuclide then would look like

23-V-50 (1 34 C)

REFERENCE: (J,YK,,(1),27,92)
EXFOR ENTRY 41118

- -

Diction 36:

For coding and correction EXFOR entries we propose to introduce new codes for coding fission product yields:

IND,ZP - most probable value of Fission Fragment charge for INDEPENDENT fission yield

CUM,ZP - most probable value of Fission Fragment charge for CUMULATIVE fission yield

REFERENCE:
"RADIOKHIMIYA"(RAK), vol. 4, # 11 page 587, 1962, USSR;
"SOV.RADIOCHEM."(SRA),vol.4, p. 515, 1962.
Exfor ENTRY 41072.
"RADIOKHIMIYA"(RAK), vol. 4, # 12 page 711, 1962, USSR;
"SOV.RADIOCHEM."(SRA),vol.4, p. 631, 1962.
Exfor ENTRY 41073.

Stanislav A. Mayev

Clearance: Vassiliy N. Manokhin.

Distribution:

V.McLane	S.Pearlstein	N.Tubbs
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J.J.Schmidt	F.Chukreev	

Memo CP-D/245

April 12, 1994

To: Distribution

From: O. Schwerer + M. Lammer

Subject: **1. Dictionary update**
2. Proposed codes IND,ZP and CUM,ZP

1. We are sending out the dictionary transmission tape 9067 containing the changes/additions requested in memos 4C-4/54, 55, CP-C/206, 207 and others.

In addition, the following new codes are introduced:

Dict. 3 (Institutes)

3MAKMAK	Macedonia
3SN SN	Senegal

Dict. 5 (Journals)

AJSE	Arab.J.Sci.Eng.
BJE	Bezp.Jad.Energ.
JAE	Jadernaja Energetika
RJP	Romanian J. Phys.

Dict. 6 (Reports)

CNEA-CAB-IT-	Bariloche Internal Reports

A complete list of the update is attached.

Distribution:

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NDS: R. Arcilla
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2. RE: Memo 4C-4/55: proposed codes IND,ZP and CUM,ZP

The proposal should be rejected. Reason:

ZP is a parameter of the charge distribution for a given fragment mass, for which independent and cumulative yields are defined. In practice, independent and/or cumulative yields are measured, and ZP is derived. However, the charge distribution for a given mass is the same for independent and cumulative yields, and hence the parameter ZP is also the same (i.e. independent of the type of yield measured). Therefore "IND" and/or "CUM" are superfluous. See LEXFOR, Fission Yields, page 3.

Background:

1) a) IND and CUM (SF5) stand for measured independent and cumulative yields.
   b) ZP is a derived quantity, i.e. a parameter of an empirically assumed and fitted distribution.
   c) "fractional", as in LEXFOR, stands for a normalized distribution (integral ≡ 1)

2) It is a semi-empirical assumption that independent yields of fragments with different charge and the same mass have a Gaussian distribution (apart from "odd-even effects"). The parameters of that (normalised) distibution are the most probable charge ZP (location of maximum) and the width.

   When several inedependent yields of a given mass are measured, a Gaussian can be fitted to them, and ZP can be derived.

   The cumulative yield of a fragment, Yc(Z,A), is defined as the sum of it's own independent yield Yi(Z,A) and those of it's (beta-decaying) precursors Yi(Z-x,A), x=1,2,... (apart from delayed neutron emission):

$$Yc(Z,A) = Yi(Z,A) + Yi(Z-1,A) + Yi(Z-2,A) + ...$$

   Hence the cumulative yields are assumed to be distributed as the integral of the Gaussian distribution for the independent yields. Measured cumulative yields can therefore be fitted to that integral Gaussian, and ZP can be derived. But the Gaussian and therefore ZP are identical for independent and cumulative yields. There is no independent or cumulative ZP!

3) Coding in EXFOR:

   ZP is a deduced quantity, obtained from measured independent or cumulative yields. Therfore:

   a) The measured independent or cumulative yields should be given in another subentry.

   b) ZP should be coded without any code in SF5. The STATUS code should be "dependent" with the SE number given where the measured yields are coded in the data table.

```
ALTER                                                    MEMO 4C-4/54,55,CP-C/206,207 ET AL.
1CANQU      (QUEEN'S UNIV., KINGSTON, ONTARIO)                                3000000300020I
1CANUWO     (UNIV.OF WESTERN ONTARIO, LONDON, ONTARIO)                        3000000300025I
3MAKMAK     (MACEDONIA)                                                       3000000300919I
3SN SN      (SENEGAL)                                                         3000000301015I
4RUSEPA     (EXPERIMENTAL PHYSICS INST., ARZAMAS)                             3000000301175I
4RUSTPC     (TECHNICAL PHYSICS INST., CHELYABINSK)                            3000000301228I
AJSE        (ARAB.J.SCI.ENG.)                                              3SAR3000000500064I
             ARABIAN JOURNAL FOR SCIENCE AND ENGINEERING                       30000005     2
BJE         (BEZP.JAD.ENERG.) BEZPECNOST JADERNE ENERGIE                   3CZR3000000500147I
              (SAFETY OF NUCLEAR ENERGY). CONTINUATION OF JE                   30000005     2
            JOINT CZECH-SLOVAK J., PRINTED IN PRAGUE, STARTED 1993             30000005     3
JAE         (JADERNAJA ENERGETIKA)                                         4RUS3000000500339I
JE          (JAD.ENERG. (PRAGUE))  JADERNA ENERGIE                         3CSR3000000500346X
            ==CONTINUED FROM 1993 AS BJE                                      3000000500346I
            ===NOTE: THE CINDA CODE IS  JPAL                                  3000000500391I
            ===NOTE: THE CINDA CODE IS  JPGL                                  3000000500402I
            ===NOTE: THE CINDA CODE IS  JPRA                                  3000000500414I
            ===NOTE: THE CINDA CODE IS  JPRC                                  3000000500417I
            ===NOTE: THE CINDA CODE IS  JPRL                                  3000000500421I
            ===NOTE: THE CINDA CODE IS  JPRS                                  3000000500425I
RJP         (ROMANIAN J.PHYS.) ROMANIAN JOURNAL OF PHYSICS                 3RUM3000000500711I
             CONTINUATION OF RRP, STARTING WITH VOL.37(7),1992                30000005     2
RRP         (REV.ROUM.PHYS.)                                               3RUM3000000500724X
            ===CONTINUED AS ROMANIAN J.OF PHYSICS  (RJP)                      3000000500727I
               FROM VOL. 37 (7), 1992                                         30000005     2
ENDF-       EVALUATED NUCLEAR DATA FILE (ENDF) REPORTS                  1USAUSA3000000600223I
CNEA-CAB-ITCENTRO ATOMICO BARILOCHE, INTERNAL REPORTS                   3ARGCNE3000000600442I
            CINDA INDEX AND LIST OF PARTIC.PUBL.IN NEANDC-312                 3000000701341I
              SELECTED PAPERS PUBL. IN IZV 56 (11), 57 (1)                    3000000701349C
92BNL       (INT.SYMP.ON NUCL.DATA EVAL.METHODOLOGY, BNL, OCT.1992)           3000000701352I
            (INT.SYMP.ON NUCL.DATA EVALUATION METHODOLOGY,                    30000007     2
            BROOKHAVEN NATIONAL LABORATORY, USA, 12-16 OCT.1992)              30000007     3
            PROCEEDINGS PUBL.BY WORLD SCIENTIFIC, SINGAPORE                   30000007     4
23-V-50     (1 34      CS  )                                                  3000002700209C
56-BA-133   (1 3       C  1)                                                  3000002700942C
66-DY-159   (  3       C   )                                                  3000002701140C
77-IR-192   (1 3       C  2)                                                  3000002701366C
ENDALTER
```

Memo 4C-3/368

18 May 1993

To: Distribution

From: H. Wienke and O. Schwerer

Subject: **1. Bremsstrahlung cross section in entry 22206**
2. Comments on TRANS 2132

1. Bremsstrahlung cross section in entry 22206

In entry 22206 of TRANS 2132 Bremsstrahlung cross sections for the n-p reaction are compiled, using REACTION codes 1-H-1(N,G+N), 1-H-1(N,G+P), 1-H-1(N,INL), which do not conform to present compilation rules for light particle reactions.

We believe that this is a new data type, and - if such data are to be compiled in Exfor - a new way of coding should be proposed.

Distribution:

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NDS: R. Arcilla
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```
TRANS              3000      940412                                          0000000000000
ENTRY             22206      930329                                          2220600000001
SUBENT         22206001      930329                                          2220600100001
BIB                  16          49                                          2220600100002
REFERENCE     (J,NP/A,481,424,88)                                            2220600100003
TITLE         -THE HARD NEUTRON-PROTON BREMSSTRAHLUNG AT 76 MEV.             2220600100004
AUTHOR        (C.DUPONT,C.DEOM,P.LELEUX,P.LIPNIK,P.MACQ,A.NINANE,            2220600100005
               J.PESTIEAU,S.P.KITWANGA,P.WAUTERS)                            2220600100006
INSTITUTE     (2BLGLVN)                                                      2220600100007
FACILITY      (CYCLO)                                                        2220600100008
INC-SOURCE    .AN 80 MEV 10 MICROAMP PROTON BEAM BOMBARDED A                 2220600100009
               1 CM THICK NATURAL LITHIUM TARGET. NEUTRONS PRODUCED          2220600100010
               AT 0 DEGREES WERE SELECTED BY A 1.6 M LONG CONICAL            2220600100011
               IRON COLLIMATOR OF 11 - 20 MM ENTRANCE - EXIT DIAME-          2220600100012
               TER. IN ADDITION, THERE WERE TWO HALO COLLIMATORS, 20         2220600100013
               CM LONG AND 25 AND 28 MM IN DIAMETER. THE NEUTRON IN-         2220600100014
               TENSITY AT 2.6 M FROM TARGET WAS ABOUT 6E+6 PER SEC.          2220600100015
METHOD        (TOF  ) THE ENERGIES OF THE NEUTRONS WERE DETERMINED           2220600100016
               WITH TIME-OF-FLIGHT.                                          2220600100017
              (COINC) A SCINTILLATOR TELESCOPE WAS USED TO DETECT            2220600100018
               THE PROTONS.                                                  2220600100019
DETECTOR      (SCIN ) A THIN 0.1 MM SCINTILLATOR OF 3 CM DIAMETER UP-        2220600100020
               STREAM TO THE SAMPLE VETOED ON CHARGED PARTICLES IN           2220600100021
               THE NEUTRON BEAM. 27 CM BEYOND THE TARGET A 12 CM DIA-        2220600100022
               METER BY 0.2 MM THICK SCINTILLATOR, WITH A 34 MM DIA-         2220600100023
               METER HOLE TO PROVIDE PASSAGE FOR THE NEUTRON BEAM,           2220600100024
               FIRED ON CHARGED PARTICLES. 1.25 M FROM THE HYDROGEN          2220600100025
               TARGET A 40 X 40 CM2 SCINTILLATOR OF 1 CM THICKNESS           2220600100026
               ACTED AS A PROTON ENERGY DETECTOR. PROTONS OF ENERGY          2220600100027
               LARGER THAN 33 MEV WERE VETOED BY ANOTHER 40 X 40 CM2         2220600100028
               SCINTILLATOR OF 0.5 CM THICKNESS, PLACED IMMEDIATELY          2220600100029
               AFTER THE E DETECTOR. THE NEUTRON DETECTOR WAS A              2220600100030
               40 X 40 CM2 PIECE OF SCINTILLATOR OF 5 CM THICKNESS.          2220600100031
               A 56 MM HOLE WAS CUT IN EACH DETECTOR FOR THE PASSAGE         2220600100032
               OF THE NEUTRON BEAM.                                          2220600100033
MONITOR       (1-H-1(N,G)1-H-2,,SIG)                                         2220600100034
SAMPLE        .A LIQUID HYDROGEN TARGET WITH A VOLUME OF 35 MM DIA-          2220600100035
               METER AND 5 MM THICKNESS WAS PLACED 2.6 M FROM THE            2220600100036
               NEUTRON SOURCE. THE TARGET VOLUME WAS LIMITED BY 6            2220600100037
               MICROMETER THICK ALUMINIZED MYLAR WINDOWS.                    2220600100038
CORRECTION    .CORRECTIONS WERE APPLIED FOR NEUTRON REACTIONS IN THE         2220600100039
               PROTON DETECTORS AND FOR THE FINITE EFFICIENCY OF THE         2220600100040
               NEUTRON DETECTOR.                                             2220600100041
ERR-ANALYS    (DATA-ERR)                                                     2220600100042
ANALYSIS      .THE ACCEPTANCE OF THE DETECTOR SYSTEM AND THE EFFICI-         2220600100043
               ENCY OF THE NEUTRON DETECTOR WERE CALCULATED WITH MON-        2220600100044
               TE CARLO CODES.                                               2220600100045
COMMENT       .ALSO DIFFERENTIAL DATA, WITH RESPECT TO THE AZIMUTHAL         2220600100046
               ANGLE BETWEEN THE NEUTRON AND THE PROTON WERE TAKEN,          2220600100047
               AND IS PRESENTED IN A FIGURE.                                 2220600100048
STATUS        .DATA TAKEN FROM MAIN REF.                                     2220600100049
HISTORY       (921213C) N.O.                                                 2220600100050
              (930329E)                                                      2220600100051
ENDBIB               49           0                                          2220600100052
COMMON                2           3                                          2220600100053
MONIT         MONIT-ERR                                                      2220600100054
MICRO-B       MICRO-B                                                        2220600100055
 1.4200E+01 2.0000E-01                                                       2220600100056
ENDCOMMON             3           0                                          2220600100057
ENDSUBENT            56           0                                          2220600199999
SUBENT         22206002      930329                                          2220600200001
BIB                   3           4                                          2220600200002
REACTION      (1-H-1(N,G+N)1-H-1,,DE,N)                                      2220600200003
```

```
 STATUS      .DATA TAKEN FROM MAIN REF.                                    2220600200004
 HISTORY     (921213C) N.O.                                                2220600200005
             (930329E)                                                     2220600200006
 ENDBIB                 4           0                                     2220600200007
 NOCOMMON               0           0                                     2220600200008
 DATA                   4          12                                     2220600200009
 EN          E           DATA        DATA-ERR                             2220600200010
 MEV         MEV         MU-B/MEV    MU-B/MEV                             2220600200011
  7.6500E+01 1.1000E+01 3.0400E-02 6.0000E-03                            2220600200012
  7.6500E+01 1.3000E+01 2.7100E-02 6.0000E-03                            2220600200013
  7.6500E+01 1.5000E+01 4.8900E-02 6.4000E-03                            2220600200014
  7.6500E+01 1.7000E+01 4.5100E-02 5.8000E-03                            2220600200015
  7.6500E+01 1.9000E+01 5.0200E-02 6.0000E-03                            2220600200016
  7.6500E+01 2.1000E+01 3.2800E-02 4.9000E-03                            2220600200017
  7.6500E+01 2.3000E+01 1.9800E-02 3.8000E-03                            2220600200018
  7.6500E+01 2.5000E+01 1.6100E-02 3.3000E-03                            2220600200019
  7.6500E+01 2.7000E+01 1.3900E-02 3.1000E-03                            2220600200020
  7.6500E+01 2.9000E+01 6.2000E-03 2.0000E-03                            2220600200021
  7.6500E+01 3.1000E+01 6.2000E-03 2.2000E-03                            2220600200022
  7.6500E+01 3.3000E+01 4.6000E-03 2.0000E-03                            2220600200023
 ENDDATA               14           0                                     2220600200024
 ENDSUBENT             23           0                                     2220600299999
 SUBENT          22206003      930329                                     2220600300001
 BIB                    3           4                                     2220600300002
 REACTION    (1-H-1(N,G+P)0-NN-1,,DE,P)                                    2220600300003
 STATUS      .DATA TAKEN FROM MAIN REF.                                    2220600300004
 HISTORY     (921213C) N.O.                                                2220600300005
             (930329E)                                                     2220600300006
 ENDBIB                 4           0                                     2220600300007
 NOCOMMON               0           0                                     2220600300008
 DATA                   4           9                                     2220600300009
 EN          E           DATA        DATA-ERR                             2220600300010
 MEV         MEV         MU-B/MEV    MU-B/MEV                             2220600300011
  7.6500E+01 1.5000E+01 3.4300E-02 5.1000E-03                            2220600300012
  7.6500E+01 1.7000E+01 5.5900E-02 6.2000E-03                            2220600300013
  7.6500E+01 1.9000E+01 6.2100E-02 6.0000E-03                            2220600300014
  7.6500E+01 2.1000E+01 6.0100E-02 6.9000E-03                            2220600300015
  7.6500E+01 2.3000E+01 3.5400E-02 6.0000E-03                            2220600300016
  7.6500E+01 2.5000E+01 1.5600E-02 5.1000E-03                            2220600300017
  7.6500E+01 2.7000E+01 2.4900E-02 4.6000E-03                            2220600300018
  7.6500E+01 2.9000E+01 1.0300E-02 3.3000E-03                            2220600300019
  7.6500E+01 3.1000E+01 2.2000E-03 2.9000E-03                            2220600300020
 ENDDATA               11           0                                     2220600300021
 ENDSUBENT             20           0                                     2220600399999
 SUBENT          22206004      930329                                     2220600400001
 BIB                    3           4                                     2220600400002
 REACTION    (1-H-1(N,INL),,SIG)                                           2220600400003
 STATUS      .DATA TAKEN FROM MAIN REF.                                    2220600400004
 HISTORY     (921213C) N.O.                                                2220600400005
             (930329E)                                                     2220600400006
 ENDBIB                 4           0                                     2220600400007
 NOCOMMON               0           0                                     2220600400008
 DATA                   3           1                                     2220600400009
 EN          DATA        DATA-ERR                                         2220600400010
 MEV         NB          NB                                               2220600400011
  7.6500E+01 6.0210E+02 3.2800E+01                                       2220600400012
 ENDDATA                3           0                                     2220600400013
 ENDSUBENT             12           0                                     2220600499999
 ENDENTRY               4                                                 2220699999999
 ENDTRANS               1                                                 9999999999999
```

Working Paper 3:

List of last TRANS tapes by 1 April 1994

(update of memo CP-D/243 of 17 December 1993)

		last tape	
series	coming from	number	dated
1	NNDC	1256	94-02-16
2	NEA-DB	2133	94-03-07
3	NDS	3091	94-03-01
4	CJD	4094	93-11-03
V	NDS	V025	92-07-29
A	CAJaD	A029	93-12-10
C	NNDC	C012	88-12-27
D	NDS	D018	93-09-30
E	Sapporo	E011 *)	94-03-11
R	RIKEN	R008	93-07-23
S	IAE-CP	S007	93-09-30
G	NDS	G007	92-02-14
L	NNDC	L004	91-06-13
M	CDFE	M017	93-03-25

*) TRANS E010 and E011 were not yet added to the NDS master file because of pending corrections. The last processed TRANS tape from Sapporo was E009 dated 91-09-11.

Working Paper 4: Disturbing mistakes in TRANS tapes

O.Schwerer

The following is a selection of some typical mistakes. Many others are mentioned in memos 4C-1/215-219, 4C-3/366,368,369,372, and CP-D/233,234,236,241,244.

- Missing incident particle energy

- Redundant incident particle energy (e.g. EN-MIN, EN-MAX in COMMON section and EN in DATA section)

- Secondary energy given only in free text (in particular for ground state)

- PAR given in REACTION SF5 when integral cross section was measured

- Inconsistency between the information given (or missing) under the BIB keyword INC-SPECT, the data headings (EN vs. EN-MEAN etc.), and modifiers in REACTION SF8 (MXW, SPA, AV and others)

- a number of special problems with fission-product yield measurements was outlined by M.Lammer in memo 4C-3/369

- For E-format data, the experiments must be rigt-adjusted within the data field

Working Paper 5: Pending EXFOR retransmissions

O.Schwerer, 8 April 1994

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

When mistakes are found in TRANS tapes, retransmission is requested for those cases where the correction to be done is not obvious. It is appreciated that many requested corrections were retransmitted since the last meeting. However, a number of requests for retransmission remained without response (sometimes for several years) for the EXFOR entries listed. May we ask each center to review this list, update the listed entries and retransmit them.

In fulfillment of Action 37 of the 1992 NRDC meeting, the reason for the oldest pending requests for retransmission was reviewed for Areas 1, 2 and 4. The entries concerned were checked and as a consequence, some of the requests were deleted because either the subentry had been deleted meanwhile, or because no obvious error could be located. In the remaining cases, the mistakes still in the file are briefly summarized in the list given below (only for those very old entries; details on the more recent ones can be found in the respective 4C- or CP-memos).

LIST OF PENDING RETRANSMISSIONS

I. Some very old entries which were checked once more

TRANS	ACCESSION #	Comments
1101	12627002	DATA section mixed up from line 69
1119	11281010	EN values (exponent?) wrong from line 21
1136	12355002	wrong REF code CRR-. Probably CRP- or CRRP-
1136	12355006	"
1136	12355007	"
2081	20775003	multiple monitor, repeat REACTION
2089	20742005	ASSUM3: empty data column
2100	21904002	secondary energy missing
2100	21904003	"
2100	21904004	PAR in SF5 and secondary energy missing
2100	21904005	"
2100	21914003	numbers in DATA section mixed up
2102	21944002	DA in SF6 probably wrong
2110	21993002	wrong units and indep. variable not monotonic
2110	22000all	KT (replacing EN) must not be given in DEG-K
2110	22001021	EN-MEAN requires modifier in SF8 and BIB def.
2110	22001022	"
4043	40580002	several wrong REACTION codes
4053	40577001	INSTITUTE code
4055	40792001	"
4055	40793001	"
4056	40576003	DECAY-DATA inappropriate
4060	40528009	REACTION wrong, Common section wrong
4060	40611003	EN given twice
4060	40611004	"
4060	40611005	"
4060	40611006	"

II. More recent cases (see respective memos for requested corrections)

TRANS	ACCESSION #	TRANS	ACCESSION #
1217	10142002	2117	22027005
1229	13119002	2117	22031151
1230	12991002	2117	22031152
1230	12991003	2117	22031153
1232	11010001	2117	22031154
1232	13132001	2117	22031155
1232	13156001	2117	22031156
1233	13066003	2117	22031157
1233	13066004	2117	22031158
1233	13073002	2117	22031159
1233	13092002	2118	22050001
1233	13092003	2118	22039002
1242	13195002	2122	22032002
1242	13195003	2122	22032003

TRANS	ACCESSION #
2122	22052004
2122	22057003
2128	22156015
2128	22157055
2128	22157057
2128	22157073
2128	22157087
2129	21928001
2129	22116002
2129	22116003
2129	22116004
2129	22129001
2129	22130001
2129	22143002
2129	22143003
2129	22161002
2132	22200003
2132	22205002
2132	22205003
2132	22205004
2132	22218002
2132	22218003
2132	22218004
2132	22218005
2132	22223002
2132	22225002
2132	22225003
2132	22225004
2132	22228002
2133	22228002
2133	22228003
2133	22228004
2133	22228005
2133	22228006
2133	22228007
2133	22228008
2133	22232002
2133	22233002
2133	22234001
2133	22234002
2133	22234003
2133	22234004
2133	22234005
2133	22234006
2133	22234007
2133	22238001
2133	22238002
2133	22238003
2133	22238004
2133	22238005
2133	22238006
2133	22238007
2133	22238002
2133	22239002
2133	22239003
2133	22241002
2133	22241003
2133	22241004
2133	22241005
2133	22241006
2133	22241007
2133	22241008
2133	22241009
2133	22245002
2133	22245003
2133	22245004
2133	22245005
2133	22245006
2133	22245007
2133	22245008
2133	22246002
2133	22246003
2133	22246004
2133	22246005
2133	22246006
2133	22247002
2133	22247003
2133	22249002
2133	22250002
2133	22250003
2133	22250004
2133	22250005
2133	22250006
2133	22250007
2133	22251002
2133	22251003
2133	22251004
2133	22251005
2133	22251006
2133	22251007
2133	22251008
2133	22251009
2133	22251010
2133	22252002
2133	22252003
3061	30755010
3071	30932003
3078	30016002
3078	30218002
3084	30610001
3084	30711003
3084	30986005
3084	30991002
3084	30991003
3084	30991004
3087	30739004
3087	30739005
3087	30739006
3087	30808003
3088	30904004
3088	30939012
3088	32591001
3088	32591002
3088	32591003
3088	32591004
3088	32592001
3088	32593001
3089	30735006
3089	30735007
3089	30974002

TRANS	ACCESSION #	TRANS	ACCESSION #
4066	40915003	4088	41088014
4069	40930001	4088	41089002
4075	40965001	4089	40551001
4075	40974003	4089	40551002
4082	40541001	4089	40551004
4084	40776002	4089	40551006
4084	40877002	4089	40602002
4084	40877003	4089	40655002
4084	40877004	4089	40655003
4084	40877005	4089	40667007
4084	40877006	4089	40667008
4084	40894002	4089	40667009
4084	40894003	4089	40728005
4084	40894005	4089	40728006
4085	40083002	4089	40728007
4085	40083003	4089	40728008
4085	40083006	4089	40728009
4085	40083007	4089	40728010
4085	40083009	4089	40728014
4085	40145003	4089	40891002
4085	40173008	4089	41095002
4085	40173014	4090	40329003
4085	41055002	4090	40329004
4085	41055003	4090	40420003
4085	41055004	4090	40420004
4085	41055005	4090	40420008
4085	41055006	4090	40420009
4085	41055007	4090	40420047
4085	41056003	4090	40489003
4085	41059003	4090	40489004
4086	41072002	4090	40916002
4086	41073002	4090	41047001
4086	41073003	4090	41085002
4087	41086002	4090	41085003
4087	41086003	4090	41087002
4087	41086004	4090	41087003
4087	41086005	4090	41087004
4087	41086006	4090	41100004
4087	41086007	4090	41100005
4087	41086008	4090	41100006
4087	41086009	4090	41100007
4087	41086010	4091	40938001
4087	41086011	4091	40944001
4087	41086012	4091	40956007
4087	41086013	4091	41084001
4088	40245007	4091	41084002
4088	40346013	4091	41084003
4088	40346014	4091	41084004
4088	40346018	4091	41084005
4088	40449002	4091	41084006
4088	40539001	4091	41084007
4088	40936001	4091	41101002
4088	41063002	4091	41104002
4088	41065003	4091	41104003
4088	41067002	4091	41104004
4088	41067003	4092	40199002
4088	41067004	4092	40199005
4088	41074002	4092	40389003
4088	41077002	4092	40389004
4088	41088009	4092	40389007
4088	41088011	4092	40389009

TRANS	ACCESSION #
4092	40389010
4092	40389013
4092	40389016
4092	40389017
4092	40389018
4092	40389019
4092	40420001
4092	40963002
4092	40972002
4092	41042002
4092	41042004
4092	41042006
4092	41042007
4092	41042008
4092	41110001
4094	41103001
4094	41103007
4094	41109002
4094	41109003
4094	41109004
4094	41109005
4094	41109006
4094	41109008
4094	41109009
4094	41109010
4094	41120002
4094	41120003
4094	41120004
A017	A0229004
A017	A0317004
A017	A0329002
A018	A0320002
A019	A0178001
A019	A0198001
A019	A0202002
A019	A0202003
A019	A0202004
A019	A0345003
A019	A0345010
A020	A0319023
A020	A0319030
A020	A0322005
A020	A0347004
A020	A0352004
A020	A0363001
A020	A0364001
A020	A0365001
A021	A0387007
A021	A0388001
A021	A0393002
A021	A0393004
A022	A0399001
A027	A0366001
A027	A0497008
A029	A0340006

TRANS	ACCESSION #
C007	C0295001
C010	C0328007
C011	C0306004
C011	C0316002
C011	C0333002
C011	C0345001
C011	C0412012
C013	C0373001
C013	C0399001
L003	L0006010
L003	L0011002
L004	L0052005
L004	L0052006
M011	M0028006
M011	M0028007
M011	M0035020
M011	M0046002
M011	M0046003
M012	M0080001
M012	M0098002
M012	M0140011
M012	M0140012
M013	M0152006
M013	M0244002
M013	M0291002
M013	M0291003
M013	M0293002
M013	M0293003
M014	M0327016
M014	M0333001
M014	M0340001
R008	R0049002
R008	R0049003
R008	R0049004

Working Paper 7:

Memo 4C-3/374 (Rev. 2)

21 April 1994

To: Distribution

From: M. Lammer

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

CINDA Action No. 59 from 1992 NRDC meeting: Coding hints for reactions (2n,f) and (n,n'f): Proposed manual revision for pages II.2.8 (hints for coding such cases) and II.2.17 (note under the heading "fission quantities").

Page II.2.8:

(2n,f) reaction

In this process, 2 neutrons are captured almost simultaneously before the compound nucleus undergoes fission. Cross sections for this process are entered under the target nucleus with an appropriate comment, e.g.: "(2N,F)" or "(2N,F) REAC".

For other fission quantities like NU, SFN, NFY, FRS, etc., the compound nucleus after capture of 2 neutrons (Z,A+2) is essential. This is the same as after (n,f) reaction for the target nucleus (Z,A+1). Therefore, CINDA entries should be made for a "target nucleus" (Z,A+1) with the corresponding quantity (NU, NFY, etc.). The comment should contain the real target nucleus and "(2N,F)" or "(2N,F) REAC" or "YLD FROM U235 (2N,F)" etc.

(n,n'f) reaction

The **(n,n'f)** reaction consists actually of 2 consecutive processes: inelastic scattering to an excited level of the residual (= target) nucleus followed by fission from that excited level. 2 cases have to be distinguished:

In the case of instant fission from a level with negligible lifetime (second chance fission), all quantities should be entered for the target nucleus as for (n,f) reactions.

If the (n,n') reaction leads to the formation of a spontaneously fissioning (shape) isomer, that isomer has to be considered separately, and the coding depends on the quantities measured:

Distribution:

M.R. Bhat, NNDC
N. Tubbs, NEA-DB
V.N. Manokhin, CJD
V. McLane, NNDC

NDS: R. Arcilla
S. Ganesan
M. Lammer
H.D. Lemmel
P. Oblozinsky
A. Pashchenko
O. Schwerer
H. Wienke
3 spare copies

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

Other fission quantities concern only the spontaneously fissioning isomer. Entries should be made for that isomer (in CINDA the same as the target nucleus), the quantity measured and "SPON" for the energy. An appropriate comment is required, e.g.: "SPONT FISS ISOMER" or "FROM ISOMER AFTER (N,N')" or "FROM U235(N,N')U235M(SF)" or "FROM (N,N'F)". If no information on the (n,n') reaction is given, no corresponding entry for DIN should be made.

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

(n,2nf) reaction

In the (n,2nf) reaction, 2 neutrons are emitted before fission occurs (third chance fission). The considerations of the processes and coding rules for CINDA follow those of the (n,n'f) reaction.

Page II.2.17 (at top of page before NF):

Fission quantities

(2n,f) reaction: cross sections are entered for the target nucleus with appropriate comments. Other quantities like NU, SFN, NFY etc. are entered for a "target nucleus" (Z,A+1) with appropriate comments containing the real target nucleus (Z,A). See page II.2.8 for details.
(n,n'f) reactions with formation of a spontaneously fissioning isomer: cross sections are entered with NF or RIF and DIN for the target nucleus. All other quantities are entered for the spontaneously fissioning isomer. If a spontaneously fissioning isomer is not formed, all quantities are entered for the target nucleus as for (n,f) reactions. Information on the reaction has to be given in the comments. See page II.2.8 for details and coding hints.
The coding of **(n,2nf) reactions** corresponds to that of (n,n'f).

Additional revision of Page II.2.11:

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

Examples of use:

.
.

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

Working Paper 8:

Documents Distribution

The topic of distribution of nuclear data related documents had been a matter of INDC/NEANDC. Since NEANDC was discontinued, INDC referred the topic to be discussed between NDS and NEA/DB, but it also concerns some more of the centers present at the NRDC Meeting.

Recently, the most active contributors of documents for distribution as INDC reports were Japan, China and Russia. We wish to appreciate this. For further documents kindly note the number of copies required for the different distribution schemes, as given in the attached table.

The number of reports received from US/Canada or from Europe/area 2 has decreased significantly.

Within the community of nuclear reaction data scientists, the free distribution of certain report literature had been an essential part of scientific communication. It should be reviewed whether and how this should be continued.

Topics of such reports were

- annual progress reports (as submitted to DOE, to NEANDC/INDC, etc);
- lab reports on certain experimental or data evaluation activities;
- reports describing contents and/or format of a nuclear data library;
- meeting proceedings;
- certain newsletters;
- and others.

Traditionally, such reports received a code such as INDC(USA)-123 with a distribution code character behind. While it is useful to recognize, by this report code, what distribution is received, it is also possible to distribute reports without an INDC code printed on the cover, in order to avoid that a document carries too many different report codes.

We have a "G" distribution which goes essentially to INDC members and data center heads; and an "L" distribution which goes to selected scientists in the major countries. We can also establish special distributions such as "scientists interested in fission-products".

When submitting reports to NDS for distribution, kindly give clear indication what distribution is wanted, in order to avoid duplicate distribution.

Example: In the case of a US report: L distribution to all countries except USA; or L distribution to areas 3 and 4 only (assuming that area 2 distribution is done by NEA).

In the case of a Chinese report: L distribution except China.

Etc.

See the attached list, how many copies are required for which distribution.

Working Paper 11:

Need for a new transmission format for EXFOR/CINDA dictionaries

O.Schwerer

I. Background

Some years ago, NNDC developed an internal dictionary system ('DANIEL') specifically taylored to the NNDC EXFOR/CSISRS system as implemented in the VAX/VMS environment. (Since this was an internal system not affecting the other centres, no agreement was required.)

For updating the DANIEL database, the dictionary transmission tapes distributed by NDS are used. However, since DANIEL is only partly compatible with the originally agreed dictionary formats, the updating can at present only partly be done by a computer program. The person in charge has to do some non-trivial manual editing every time the database is updated; this concerns not only the modifications of the current update, but to a large extent some unchanged parts of the dictionaries which are treated differently in the 2 systems.

After NDS has taken over the NNDC EXFOR system in 1992, NDS is faced with the same problem. At the 1992 NRDC meeting, NDS volunteered to design a new dictionary transmission format fulfilling the needs of both the agreed IBM system and DANIEL. It turned out, however, that it is not sufficient to design a new transmission format, because neither of the 2 dictionary systems contains the complete information needed: the IBM dictionaries don't contain e.g. the numerical quantity equivalents introduced in DANIEL, whereas DANIEL is lacking all the free text information given in the IBM dictionaries.

Therefore it will probably be necessary to design a new "super-dictionary" system containing all the information required, from which the dictionary files for both systems can be extracted. This, a rather different task from the one originally anticipated, is not yet done because we underestimated both the complexity of the problem and the time it would take NDS to become fluent in all its VAX operations.

II. What is needed?

- Who needs the dictionary TRANSmission tapes in the traditional (IBM) format?

- How is the update done at NEA-DB?

- How are the CPND and Photonuclear centres dealing with dictionary updates?

- Can we simplify the update procedure for those (2?) centres using DANIEL, to minimize any duplication of efforts?

- One of the most important technical questions: The free text information contained in many dictionaries in the IBM version is very important information for the Exfor compilers and must be kept in some way. Other cases where the IBM dictionaries contain more information than DANIEL are dictionaries 7 and 36, where in the IBM dictionaries expansions longer than 1 line exist.

Comparison of the VAX dictionary database (DANIEL) with the original IBM dictionary format

Notes:
- All DANIEL dictionaries contain 2 additional internal codes:
  - STATUS (one of the following: CIN, EXT, INT, OBS, PRE, PRO, TRA)
  - date of entry or last update
- Most IBM dictionaries contain some free text explanations (important information for the EXFOR/CINDA compilers) which is missing in DANIEL.
- Sorting within dictionaries: in DANIEL codes are always sorted alphabetically. In the IBM system, codes are sorted by various criteria depending on the contents of the particular dictionaries, and group headings in free text may be given.

Dict.#	VAX	IBM
1	SYSTEM IDENTIFIERS Additional keywords Missing: essential free text (definition of N1,N2,..)	SYSTEM-IDENTIFIERS
2	INFORMATION IDENTIFIERS Additional: internal num.equivalent Missing: elaborate free text explanations	INFORMATION IDENTIFIER KEYWORDS
3	INSTITUTE CODES Lower case expansions (Area 1 only)	INSTITUTES (SORTED BY CODE)
4	REFERENCE TYPE	TYPE OF REFERENCE
5	JOURNAL CODES Missing: important free text	JOURNALS (SORTED BY CODE)
6	REPORT CODES Missing: important free text	REPORTS (SORTED BY INSTITUTE)
7	BOOK AND CONFERENCE CODES Missing: long expansions Missing: important free text	BOOKS AND CONFERENCES

8	ELEMENTS	ELEMENTS
9	This dictionary does not exist in DANIEL. Compounds are included in dict.27 (Nuclides AND COMPOUNDS)	COMPOUNDS
10	STANDARD REACTIONS (CSISRS) There is no comparable dictionary in the IBM system.	(old dict.10 deleted)
11	FORBIDDEN REACTIONS (CINDA) There is no comparable dictionary in the IBM system.	(old dict.11 deleted)
12	CINDA QUANTITIES This is dict.42 in the IBM system. Missing: free text explanations	(old dict.12 deleted)
13	REACTION TYPE (for Dictionary 36) Same dictionary number used for different type of information. There is no comparable dictionary in the IBM system.	PARTICLES
14	REACTION DIMENSIONS (for Dictionary 36) There is no comparable dictionary in the IBM system.	(old dict.14 deleted)
15	HISTORY CODES	HISTORY
16	STATUS CODES Additional: internal num.equivalent Missing: elaborate free text explan.	STATUS
17	RELATED REFERENCE CODES Missing: free text explanation	REL-REF SUBFIELD 1
18	FACILITY The structuring of information in this and some of the following dictionaries	FACILITY

	was transmitted as approved at the 1992 NRDC meeting, but is not preserved in DANIEL.	
19	INCIDENT SOURCE	SOURCE OF INCIDENT PARTICLES
20	ADDITIONAL INFORMATION Missing: free text explanation	ADDITIONAL RESULTS
21	METHOD Missing: free text explanations	METHOD
22	DETECTOR Missing: free text explanations	DETECTORS
23	ANALYSIS	ANALYSIS
24	DATA HEADINGS Additional: 3 internal flags Missing: free text explanations	DATA-HEADING KEYWORDS
25	DATA UNITS	DATA-UNIT KEYWORDS
27	NUCLIDES AND COMPOUNDS Additional: CINDA code; internal num.equivalent; spin; abundance/atomic weight; includes compounds (dict.9 in IBM system)	NUCLIDES
28	This dictionary does not exist in DANIEL. All particle information is combined in dict.33.	INCIDENT PARTICLES (REACTION SF2)
29	This dictionary does not exist in DANIEL. All particle information is combined in dict.33.	PRODUCT PARTICLES (REACTION SF3)
30	PROCESS CODE Additional: internal num.equivalent	PROCESS (REACTION SF3)

31	BRANCH CODES Additional: internal num.equivalent Missing: free text explanations	BRANCH (REACTION SF5)
32	PARAMETER CODES Additional: internal num.equivalent Missing: free text explanations	PARAMETER (REACTION SF6)
33	PARTICLES Additional: 3 internal flags Replaces all IBM particle dictionaries	PARTICLES CONSIDERED (REACTION SF7)
34	MODIFIERS Additional: int.num.equiv.,int.flag Missing: elaborate free text explan.	MODIFIERS (REACTION SF8)
35	DATA TYPE	DATA-TYPE (REACTION SF9)
36	QUANTITIES Additional: 5 internal flags Missing: expansions longer than 1 line (desirable for some complicated quantities); free text explanations and group titles	QUANTITIES (REACTION SF5-SF8)
37	RESULT Missing: free text explanations	RESULT
42	This dictionary does not exist in DANIEL. CINDA quantities are given in dict.12.	CINDA-QUANTITIES
43	(Not needed for EXFOR/CINDA)	NLIB CODES FOR ENDF-6
50	(Not needed for EXFOR/CINDA)	LIST OF DICTIONARIES

WP14

INFORMATION ABOUT RUSSIAN EVALUATED DATA.

1.BOFOD. Evaluated photo-neutron data library. It includes the (γ,n),(γ,n) and $(\gamma,fiss)$,(γ,abs),(γ,tot) cross section for 27 important elements. On the base of BOFOD the group constant system is created.

Reference: Blokhin A.I. et al. Formation and application of evaluated photo-neutron data library. In:VANT,Ser.YK,1992,N3-4,p.3.

2.MENDL. The cross section library for study of transmutation and activation of materials irradiated by neutrons and protons with energy up to 100 MeV. It contains neutron and proton reaction cross sections for more than 500 stable and nonstable nuclei at the energies from 1 to 100 MeV. Majorites of the data have been obtained by means of geometry dependent hybrid exciton model taking into account preequilibrium α-particle emission.

Reference: Konobeev A.Yu., Korovin Yu.A., Lunev V.P., Masterov V.S., Shubin Yu.N.The cross section library for study of transmutation and activation of materials irradiated by neutrons and protons with energy until 100 Mev. In: VANT, Ser.YK, 1992, N 3-4,p.55.

3.ADL-3. Activation Data Library, version 3. The library contains 20049 excitation functions of reactions on stable and unstable targets including isomer states. Cross sections for all threshold reactions were calculated by statistical theory of nuclear reactions in the framework of Hauser-Feshbach formalism with contribution of non-statistical mechanism. Normalization of cross-sections experimental data was used.

Reference: Grudzevich O.T., Zelenetsky A.V., Ignatyuk A.V., Pashchenko A.B. "Catalog of ADL-3 library" In: VANT, Ser.YK, 1993, N 3-4.

4.RDF-94. The Russian Dosimetry File (RDF-94) It includes 46 reactions used in dosimetry and in measurements as standards. 11 reactions are taken from IRDF-90, 36 reactions evaluated in the

CJD. Some evaluations were made using a generalized least squares method. Covariance matrices were calculated and included into the files. Other evaluations were made using the excitation functions systematics and calculations on theoretical models. In this case the uncertainties in several appropriate energy intervals are given.

The list of the CJD evaluations, included into RDF-94.

19-F(n,2n)	51-V(n,α)	63-Cu(n,γ)
23-Na(n,γ)	52-Cr(n,2n)	65-Cu(n,2n)
24-Mg(n,p)	55-Mn(n,2n)	89-Y(n,2n)
45-Sc(n,2n)	55-Mn(n,γ)	90-Zr(n,2n)
45-Sc(n,2n)m	54-Fe(n,2n)	93-Nb(n,n')m
45-Sc(n,2n)g	54-Fe(n,p)	93-Nb(n,2n)m
46-Ti(n,p)	56-Fe(n,p)	115-In(n,2n)
46-Ti(n,2n)	59-Co(n,2n)	127-I(n,2n)
47-Ti(n,x)	58-Ni(n,2n)	139-La(n,γ)
48-Ti(n,x)	58-Ni(n,p)	141-Pr(n,2n)
48-Ti(n,p)	60-Ni(n,p)	181-Ta(n,γ)
49-Ti(n,x)	63-Cu(n,2n)	197-Au(n,2n)

Reference:Manokhin V.N. et al.Russian Dosimetry File(RDF-94). To be published in VANT,Ser.YK,1994.

5. Atlas of photon energy-angular distributions produced in neutron interactions. It contains 353 graphs for absorbtion and radiative capture processes. The EXFOR data for 52 elements and some their isotopes were used in these publications.The comparison of experimental and evaluation data from BROND-2, ENDF/B-VI was performed in some cases.

Reference: Blokhin A.I. et.al.Atlas of photon energy-angular distributions produced in neutron interactions. In: VANT, Ser.YK, 1993,N 2,p.

6. Belanova T.S.Evaluation of thermal neutron cross sections and resonance integrals for isotopes of protactinium, americium, curium and berklium. In: VANT, Ser.YK, 1993, N 1, p.22.

Memo CP-M/15

Date: 03.03.94

From: CDFE

Subject: Dictionary Correction and Additions.

To: Distribution

I would like to propose two changes in EXFOR Dictionary:

1) with the aid to correct the clear incidental technical mistake the explanations for two codes BRA and BRS in the Dictionary 34 must be rearranged;

2) because of the beginning ~~in~~ 1988 of the regular publication of Preprints (Reports) of the Moscow State University Institute of Nuclear Physics (which the CDFE uses for publication of various materials concerned the photonuclear data evaluation) I support the appropriate addition to the Dictionary 6.

Attachments: Dictionary Correction and Additions-page 2.

Clearance: V.V.Varlamov

Distribution:

C.Dunford,	IAEA NDS	N.Tubbs,	NEA-DB
H.Lemmel,	IAEA NDS	T.Tendow,	RIKEN
O.Schwerer,	IAEA NDS	M.Chiba,	JCPRG
V.Mclane,	NNDC	Zhuang Youxiang,	CNDC
F.E.Chukreev,	CAJAD	Y.Kikuchi,	JAERI
V.N.Manokhin,	CJD	R.White,	USA LLNL NDG

The following corrections should be made:

DICTIONARY 34

BRA (BREMSSTRAHLUNG SPECTRUM AVERAGE) FOR PHOTONUCLEAR DATA

BRS (AVERAGE OVER PART OF BREMSSTRAHLUNG SPECTRUM) FOR PHOTONUCLEAR DATA

The following addition should be made:

DICTIONARY 6

MSU-INP- MOSCOW STATE UNIVERSITY INSTITUTE OF NUCLEAR 4RUSMOS PHYSICS. REPORTS

WP16

Present Status of JENDL Project

Yasuyuki Kikuchi
Nuclear Data Center
Japan Atomic Energy Research Institute

1. JENDL-3 revision 2 (JENDL-3.2)

The revision work of JENDL-3 has been almost completed. By adding new evaluation for 16 nuclei, the evaluated data are given for 340 nuclei in JENDL-3.2. The γ-ray production data are stored for 66 nuclei. About 180 nuclei out of 340 have a new or revised data. Table 1 lists the nuclei and MAT numbers in JENDL-3.2. Table 2 summarizes main modifications for JENDL-3.2.

For the natural elements, many parts of data were constructed from the data of their isotopes. In the case where the resonance energy region are different from each other, the resonance regions are different even in the natural element data. In many cases, the data of natural element data are not consistent with those of isotopes. Since the natural elements have many experimental data than isotopes, the data constructed from isotopes were modified on the basis of those experimental data. Therefore, the users are recommended to use the data of natural elements instead of those of isotopes.

The ENDF-6 format is adopted for JENDL-3.2. So their MAT numbers are changed to the definition in the ENDF-6 format. In JENDL-3.1, data of some fission product nuclei are stored twice with different MAT numbers. It caused a confusion to the users. In JENDL-3.2, double entries of data exist no longer. The double-differential data (DDX) are important for fusion neutronics. However, JENDL-3.2 in the ENDF-6 format adopts the conventional MF4-MF5 representation of emitted neutron data instead of the MF6 format. We are preparing a special purpose file, JENDL Fusion File, which provides the DDX data in the MF6 format for fusion neutronics.

For the convenience of users, the ENDF-5 format version will be available on request, and pointwise data files will be provided, which are calculated at 0 K with RECENT or RESENDD.

So far the middle of April 1994, re-evaluation of data for ^{19}F, ^{150}Sm, ^{152}Sm and ^{154}Sm had not been finished. As to the γ-ray production data, Ca and Pb were under re-evaluation. JENDL-3.2 will be released May or June 1994.

Preliminary benchmark calculations have been made for important data. It has been confirmed that the revised data of Fe are in very good agreement with measured integral data. Data for main actinoids give better C/E values for fast and thermal reactor characteristics.

2. Future Subjects for JENDL

JENDL-3.2 gives much better evaluated data than JENDL-3.1. However, the following problems are still existing:

Covariance matrix

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 for study of evaluation method of the covariance matrices.

Energy Distributions

Energy distribution data in JENDL-3.2 should be reexamined. In particular, new representation method proposed in the ENDF-6 format has not been adopted in JENDL-3.2. So the energy balance is not always correct.

3. JENDL Special Purpose Files

The following evaluated data files other than JENDL-3.2 are being developed in Japan. Their status is given below. No progress has been made for the (α,n) data file and the decay data file.

JENDL Fusion File

JENDL Fusion File is made to provide precise double-differential neutron and charged particle emission data by using MF6 representation of the ENDF-6 format. The evaluation has been finished for the data of ^{27}Al, Si, Ca, Ti, Cr, ^{55}Mn, Fe, ^{59}Co, Ni, Cu, ^{75}As, Zr, ^{93}Nb, Mo, Sb, W, Pb and ^{209}Bi, and is under way for ^{19}F, Ge, Sn. SINCROS-II which consists of GNASH, DWUCK, CASTHY and several auxiliary programs is used for the theoretical calculation. Those results are examined by comparing with DDX measured at Tohoku and Osaka university. The data for JENDL Fusion File have been adopted in JENDL-3.2 after approximately changing the MF6 representation to MF4-MF5 representation.

JENDL Actinoid File

This file will provide 89 nuclei mainly in the range above Z=90. The data for 57 nuclei will be taken from JENDL-3.2. For the other nuclei, we need new evaluation. In the last year, the evaluation of ^{237}Pu and ^{244}Pu was made. At present, Dr. Konshin is investigating the parameters for fission cross section calculation for other nuclei. By adopting his results, new calculation will be made for other nuclides, and if needed the data taken from JENDL-3.2 for some minor actinoids will be updated.

JENDL Dosimetry File

The first version of JENDL Dosimetry File was released in 1991 with the data for 61 reactions. In the last year, re-evaluation of several cross sections was made by members of Dosimetry Integral Test Working Group of JNDC. New dosimetry reactions to be added to the 61 reactions are also investigated. In the first version of JENDL Dosimetry File, the covariance matrices were taken from other files such as IRDF-85. The evaluation of own covariance matrices is also the subjects to this working group.

JENDL Activation Cross Section File

The preliminary file has been compiled and its validation test started with integral data measured at JAERI/FNS. The test shows that JENDL Activation Cross Section File gives the most preferable results among libraries tested. The test and revision of the preliminary file is in progress.

JENDL High Energy Files

The evaluation of data for high energy neutrons and charged particles have been initiated in JNDC. They will make data files for neutrons and protons up to 50 MeV and about 1.5 GeV. The former files will be used for the ESNIT project promoted in JAERI. The evaluation of neutron data up to 50 MeV has been made for several structural materials. However, the compilation of data files has not yet completed. The latter files will be used for design of transmutation systems of high-level waste. The evaluation of data for Al, Pb and Bi was made for proton induced reactions up to 1 GeV. The proton-induced reaction data of Cr, Fe, Ni and Cu isotopes were also evaluated up to 15 MeV.

JENDL PKA/KERMA File

This file will store the spectra of primary knock-on atoms (PKA) and KERMA factors. The data to be stored are created from the data files up to 50 MeV made for the ESNIT project. A couple of codes to create the file have been developed and tested. However, the data compilation work has not yet started.

JENDL Photonuclear Data File

The evaluation has been almost finished for C, N, O, Al, Cu, Bi and U in the γ-ray energy range up to 140 MeV. Their compilation in the ENDF-6 format is in progress. The evaluation for Ti, Fe, Ta, W and Pb is also in progress.

A bibliographic index to the photonuclear data was published as JAERI-M 93-195.

Table 1 Nuclides and MAT numbers stored in JENDL-3.2

H - 1	125	H - 2	128	He- 3	225	He- 4	228
Li- 6	325	Li- 7	328	Be- 9	425	B - 10	525
B - 11	528	C - 12	625	N - 14	725	N - 15	728
O - 16	825	F - 19	925	Na- 23	1125	Mg- 0	1200
Mg- 24	1225	Mg- 25	1228	Mg- 26	1231	Al- 27	1325
Si- 0	1400	Si- 28	1425	Si- 29	1428	Si- 30	1431
P - 31	1525	S - 0	1600	S - 32	1625	S - 33	1628
S - 34	1631	S - 36	1637	Cl- 0	1700	Cl- 35	1725
Cl- 37	1731	Ar- 40	1837	K - 0	1900	K - 39	1925
K - 40	1928	K - 41	1931	Ca- 0	2000	Ca- 40	2025
Ca- 42	2031	Ca- 43	2034	Ca- 44	2037	Ca- 46	2043
Ca- 48	2049	Sc- 45	2125	Ti- 0	2200	Ti- 46	2225
Ti- 47	2228	Ti- 48	2231	Ti- 49	2234	Ti- 50	2237
V - 51	2328	Cr- 0	2400	Cr- 50	2425	Cr- 52	2431
Cr- 53	2434	Cr- 54	2437	Mn- 55	2525	Fe- 0	2600
Fe- 54	2625	Fe- 56	2631	Fe- 57	2634	Fe- 58	2637
Co- 59	2725	Ni- 0	2800	Ni- 58	2825	Ni- 60	2831
Ni- 61	2834	Ni- 62	2837	Ni- 64	2843	Cu- 0	2900
Cu- 63	2925	Cu- 65	2931	Ga- 0	3100	Ga- 69	3125
Ga- 71	3131	Ge- 0	3200	Ge- 70	3225	Ge- 72	3231
Ge- 73	3234	Ge- 74	3237	Ge- 76	3243	As- 75	3325
Se- 74	3425	Se- 76	3431	Se- 77	3434	Se- 78	3437
Se- 79	3440	Se- 80	3443	Se- 82	3449	Br- 79	3525
Br- 81	3531	Kr- 78	3625	Kr- 80	3631	Kr- 82	3637
Kr- 83	3640	Kr- 84	3643	Kr- 85	3646	Kr- 86	3649
Rb- 85	3725	Rb- 87	3731	Sr- 86	3831	Sr- 87	3834
Sr- 88	3837	Sr- 89	3840	Sr- 90	3843	Y - 89	3925
Y - 91	3931	Zr- 0	4000	Zr- 90	4025	Zr- 91	4028
Zr- 92	4031	Zr- 93	4034	Zr- 94	4037	Zr- 95	4040
Zr- 96	4043	Nb- 93	4125	Nb- 94	4128	Nb- 95	4131
Mo- 0	4200	Mo- 92	4225	Mo- 94	4231	Mo- 95	4234
Mo- 96	4237	Mo- 97	4240	Mo- 98	4243	Mo- 99	4246
Mo-100	4249	Tc- 99	4331	Ru- 96	4425	Ru- 98	4431
Ru- 99	4434	Ru-100	4437	Ru-101	4440	Ru-102	4443
Ru-103	4446	Ru-104	4449	Ru-106	4455	Rh-103	4525
Rh-105	4531	Pd-102	4625	Pd-104	4631	Pd-105	4634
Pd-106	4637	Pd-107	4640	Pd-108	4643	Pd-110	4649
Ag- 0	4700	Ag-107	4725	Ag-109	4731	Ag-110m	4735
Cd- 0	4800	Cd-106	4825	Cd-108	4831	Cd-110	4837
Cd-111	4840	Cd-112	4843	Cd-113	4846	Cd-114	4849
Cd-116	4855	In-113	4925	In-115	4931	Sn-112	5025
Sn-114	5031	Sn-115	5034	Sn-116	5037	Sn-117	5040
Sn-118	5043	Sn-119	5046	Sn-120	5049	Sn-122	5055
Sn-123	5058	Sn-124	5061	Sn-126	5067	Sb- 0	5100
Sb-121	5125	Sb-123	5131	Sb-124	5134	Sb-125	5137

Te-120	5225	Te-122	5231	Te-123	5234	Te-124	5237
Te-125	5240	Te-126	5243	Te-127m	5247	Te-128	5249
Te-129m	5253	Te-130	5255	I -127	5325	I -129	5331
I -131	5337	Xe-124	5425	Xe-126	5431	Xe-128	5437
Xe-129	5440	Xe-130	5443	Xe-131	5446	Xe-132	5449
Xe-133	5452	Xe-134	5455	Xe-135	5458	Xe-136	5461
Cs-133	5525	Cs-134	5528	Cs-135	5531	Cs-136	5534
Cs-137	5537	Ba-130	5625	Ba-132	5631	Ba-134	5637
Ba-135	5640	Ba-136	5643	Ba-137	5646	Ba-138	5649
Ba-140	5655	La-138	5725	La-139	5728	Ce-140	5837
Ce-141	5840	Ce-142	5843	Ce-144	5849	Pr-141	5925
Pr-143	5931	Nd-142	6025	Nd-143	6028	Nd-144	6031
Nd-145	6034	Nd-146	6037	Nd-147	6040	Nd-148	6043
Nd-150	6049	Pm-147	6149	Pm-148	6152	Pm-148m	6153
Pm-149	6155	Sm-144	6225	Sm-147	6234	Sm-148	6237
Sm-149	6240	Sm-150	6243	Sm-151	6246	Sm-152	6249
Sm-153	6252	Sm-154	6255	Eu- 0	6300	Eu-151	6325
Eu-152	6328	Eu-153	6331	Eu-154	6334	Eu-155	6337
Eu-156	6340	Gd-152	6425	Gd-154	6431	Gd-155	6434
Gd-156	6437	Gd-157	6440	Gd-158	6443	Gd-160	6449
Tb-159	6525	Hf- 0	7200	Hf-174	7225	Hf-176	7231
Hf-177	7234	Hf-178	7237	Hf-179	7240	Hf-180	7243
Ta-181	7328	W - 0	7400	W -182	7431	W -183	7434
W -184	7437	W -186	7443	Pb- 0	8200	Pb-204	8225
Pb-206	8231	Pb-207	8234	Pb-208	8237	Bi-209	8325
Ra-223	8825	Ra-224	8828	Ra-225	8831	Ra-226	8834
Ac-225	8925	Ac-226	8928	Ac-227	8931	Th-227	9025
Th-228	9028	Th-229	9031	Th-230	9034	Th-232	9040
Th-233	9043	Th-234	9046	Pa-231	9131	Pa-232	9134
Pa-233	9137	U -232	9219	U -233	9222	U -234	9225
U -235	9228	U -236	9231	U -237	9234	U -238	9237
Np-236	9343	Np-237	9346	Np-238	9349	Np-239	9352
Pu-236	9428	Pu-238	9434	Pu-239	9437	Pu-240	9440
Pu-241	9443	Pu-242	9446	Am-241	9543	Am-242	9546
Am-242m	9547	Am-243	9549	Am-244	9552	Am-244m	9553
Cm-241	9628	Cm-242	9631	Cm-243	9634	Cm-244	9637
Cm-245	9640	Cm-246	9643	Cm-247	9646	Cm-248	9649
Cm-249	9652	Cm-250	9655	Bk-249	9752	Bk-250	9755
Cf-249	9852	Cf-250	9855	Cf-251	9858	Cf-252	9861
Cf-254	9867	Es-254	9914	Es-255	9915	Fm-255	9936

Table 2 Main modifications for JENDL-3.2

C-12	capture cross section in 100 eV to 5 MeV, total above 8 MeV, some inelastic scattering cross sections
N-14	total cross section in 5 to 10 MeV, inelastic scattering cross sections
O	capture and inelastic scattering cross sections
Na-23	total cross section above 1 MeV
Al-27	inelastic scattering above 5.6 MeV, angular and energy distributions
Si	angular and energy distributions, small modification to inelastic scattering cross sections
P-31	total cross section above 544 keV
S	All cross sections above resonance region
K	total cross sections above 200 keV
Ca, Ti, V-51	almost all cross sections, angular and energy distributions, γ production data
Cr	total cross section in 300 keV to 4 MeV, angular and energy distributions of neutrons
Mn-55	part of inelastic scattering, angular and energy distributions
Fe	total cross section in 350 keV to 12 MeV, inelastic scattering cross section, angular and energy distributions, γ production data
Co-59	capture, inelastic scattering cross sections, angular and energy distributions, γ production data
Ni	total cross section in 557 keV to 5 MeV, angular and energy distributions, γ production data
Cu	cross sections in 50 to 153 keV, angular and energy distributions, γ production data
Zr	Almost all data
Nb-93	resonance parameters, inelastic scattering, angular and energy distributions
Mo	inelastic scattering, angular and energy distributions
Cd	resonance parameters, inelastic and capture cross sections
Sb	almost all cross sections, angular and energy distributions
Other Fission Products	resonance parameters, inelastic scattering and capture cross sections
W	almost all cross sections, angular and energy distributions
Pb	resonance parameters, almost all cross sections, angular and energy distributions
U-233	resonance parameters, fission, inelastic scattering, (n,2n) reaction cross sections, fission spectrum
U-235	resolved and unresolved resonance parameters, fission spectrum, ν_p
U-238	resolved and unresolved resonance parameters, inelastic scattering cross section
Pu-239	resolved resonance parameters, fission spectrum
Pu-241	resolved resonance parameters

Status Report of JENDL Charged Particle Data

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1. Experimental Database

In order to use in the evaluation work of the charged particle and gamma-ray induced nuclear data, the charged particles and gamma-ray induced experimental data storage and retrieval system (CHESTOR) has been developed by converting from EXFOR data. The considered charged particles were proton, deuteron, triton, He-3 and alpha as well as gamma-ray.

The experimental data of thick target neutron and proton yields for proton and alpha-particle induced reactions on several elements were collected and stored in EXFOR format. The considered elements were C, Al, Fe, Cu, W, Pb and U.

2. Evaluation of Data

The nuclear data of charged particle induced reactions were originally considered for the JENDL High Energy File as well as neutron induced reactions. The lower energy data are also evaluated, since JENDL does not have the charged particle induced data. Though the charged particle spectra are not included in JENDL-3 General Purpose File, this problem is solved in JENDL Fusion File.

The JENDL High Energy File considers only proton induced reactions as charged particle reactions at this time. The results of proton-induced isotope production cross sections calculated by several codes were compared with each other as well as experimental data. The considered codes were EGNASH, EXIFON, ALICE-F, ALICE/85, MCEXCITON, NUCLEUS and HETC/3-STEP. It was found that the codes using statistical theory with preeguilibrium correction could reproduce the experimental data of isotope production cross sections better than the others.

The proton nuclear data have been evaluated for Cr-50,52,53,54, Fe-54,56,57,58, Ni-58,60,61,62,64, and Cu-63,65 up to 15 MeV mainly by using EGNASH-2 code. For the proton optical potential parameter, Perey's and Walter-Guss's potential parameters were combined. The (p,n) reaction is a main part of reaction, because of incident proton energy. The evaluated results are almost in good agreement with the experimental data. The incident energy will be expanded up to 50 MeV by using similar method.

The proton incident nuclear data up to 1 GeV have been calculated for Al, Pb and Bi isotopes by using the ALICE-F code. These data are now under reviewing to be final evaluated results.

3. Others

The primary knock-on atom (PKA) is produced through various nuclear reactions. Estimation of PKA spectra is necessary to the KERMA factor calculation and the material design applications, especially for the fusion application. ESPERANT code, which creates the PKA/KERMA file from the evaluated nuclear data file, was developed. For the lighter

nuclei, it is difficult to create the PKA/KERMA file by using ESPERANT because of its approximating limitation. Consequently, the SCINFUL/DDX code, which is modified from the detector response function calculation code, SCINFUL, is under development so as to calculate both nuclear data and PKA spectra, simultaneously.

The calculation methods of charged particle stopping power were compared to estimate its transportation in the actual materials and to calculate thick target yields. The preliminary version of code calculating thick target yields of neutron emission from the evaluated nuclear data files was developed.

The (α,n) reaction data for several nuclei have been evaluated to check the criticality and heating safety of storing spent fuel. The data related to fusion reactions were researched. The reaction channels and reaction rates for nuclear fusion are investigating to perform an plasma analysis with measuring the fusion products.

PRESENT STATUS OF PHOTONUCLEAR DATA EVALUATION AT JAERI

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Photonuclear cross sections are required in several areas, e.g., electron accelerator shielding, radiation therapy and nuclear transmutation of radio active wastes. A Photo-Reaction Data Working Group was organized as one of working groups of the Japanese Nuclear Data Committee (JNDC) in 1989 in order to evaluate photonuclear reaction cross sections. Various kinds of photonuclear cross sections have been being evaluated. Photonuclear data of all natural isotopes, several transuranic nuclides and some fission products will be evaluated to the end of 1990's. We do not have sufficient experimental data necessary for the evaluation and hence we are proceeding the evaluation work with the help of theoretical calculation based on the statistical nuclear reaction models.

Untill now we have evaluated the photonuclear data for D, ^{12}C, ^{14}N, ^{16}O, ^{23}Na, ^{24,25,26}Mg, ^{27}Al, ^{28,29,30}Si, ^{40,48}Ca, ^{46,48}Ti, ^{52}Cr, ^{54}Mn, ^{59}Co, ^{58,60}Ni, ^{63,65}Cu, ^{90}Zr, ^{92,94,96,98,100}Mo, ^{181}Ta, ^{197}Au, ^{206,207,208}Pb, ^{209}Bi and ^{235,238}U. The following photonuclear cross sections are evaluated: photonuclear absorption cross sections not to include elastic cross sections, photoneutron cross sections, photoproton cross sections, yield cross sections for photoneutrons, photoprotons, photodeuterons, phototritons, photo-^{3}He-particles and photo-alpha-particles, single neutron emission cross sections, double neutron emission cross sections, energy spectra, angular distributions and DDX for photoneutrons and photoprotons, and nuclide production cross sections. The maximum energy of incident photons is 140 MeV because the evaluation work becomes very hard once the pion production channel opens. The evaluated photonuclear data file is constructed using ENDF–6 format. **The first version of the evaluated file will have been completed by next April.**

Joint evaluation work between JAERI JNDC and MSU INP CDFE (Moscow State University, Institute of Nuclear Physics, Centre for Photonuclear Experiments Data) may be carried out within the following limits. First, CDFE evaluates the experimental photoabsorption and photoneutron crosss sections using the data reduction method developed by CDFE. On the other, JNDC performs theoretical evaluation for particle emission cross sections, nuclide production cross sections, particle energy spectra, etc. based upon the photonuclear cross sections evaluated by CDFE and makes the evaluated photonuclear data file.

WP19

The Activities On Neutron Reaction Data At CNDC

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1. EXFOR

In the period from May 1992 through December 1993, CNDC has compiled 61 entries for neutron reaction data measured in China, besides, another 4 entries have been corrected, all of these have been sent to IAEA/NDS with diskettes as follows:

No. of transmission diskette	number of entries contained	date of transmission
TRANS 3002	7	18-05-92
TRANS 3003	22	14-08-92
TRANS 3004	13	08-06-93
TRANS 3005	7	08-06-93
TRANS 3006	7	06-08-93
TRANS 3007	5	07-12-93
RE-TRANS 3001	4	07-12-93

The EXFOR master libray from NDS and related codes for EXFOR data processing and checking as well as the database storage and retrieval system from NNDC were operated on micro-VAX-2, and the EXFOR data can be accessed on computer directly.

The ERES code for EXFOR data compilation completed by ourselves recently and ANDEX code for the same purpose from NDS have been put into operation on PC-386.

2. EVALUATED NEUTRON REACTION DATA

(1). CENDL-2

A lot of efforts was spent in order to complete the CENDL-2 in past two years, it was finally completed and released in the early of 1993. 53 nuclides in total contained in the library were checked by the ENDF utility codes.

The description of evaluations in CENDL-2 were published in INDC (CPR)-025/L(1991) and INDC(CPR)-028/L(1992).

(2). Related Codes For Library Management

In order to manage the evaluated nuclear data library, the utility codes,version 6.8, and the data base storage and retrieval system from NNDC were put into operation on micro-VAX-2.

Now some of the main libraries for evaluated neutron reaction data including CENDL-2, ENDF/B-6, JENDL-3 and BROND-2 have been loaded in disks of micro-VAX-2 and can be accessed on computer directly.

3. MODEL THEORY CODES FOR NUCLEAR DATA CALCULATION

In recent two years, several model theory codes have been developed perfected and replanted by CNDC and its coordination network.

FMT (Zhang Jingshang)
Based on the unified Hauser-Feshbach and exciton model, the FMT code, a special version of UNF, for calculation of neutron induced reaction on fissile nuclides at incident energy up to 20 MeV has been developed and used in the evaluation of U-238.

RAC92 (Chen Zhenpeng et al.)
A comprehensive R-matrix analysis code based on multi-channel and multi-level R-matrix theory has been developed and used to analyse the n+B-10 system.

CFUP1 (Cai Chonghai and Shen Qingbiao)
A code for calculation of charged particle as well as neutron induced reaction on fissile nuclei at energy region up to 35 MeV, including 1-5 particles emission has been developed and used to calculate p+Am-241 and p+U-235 systems,the incident energy from 4 to 35 MeV.

SPEC (Shen Qingbiao and Zhang Jingshang)
SPEC is a code for calculating cross section and spectra of neutron or charged particles(p,d,t,He-3,alpha) induced reactions on medium-heavy nuclei in incident energy up to 60 MeV.

DDCS (Shen Qingbiao)
DDCS is a code for calculating nucleon and composite double differential cross section of the neutron or charged particles(p,d,t,He-3, alpha) induced reactions in energy region up to 50-100 MeV.

Besides, some useful codes,such as ECIS79, SAMMY, DWUCK, ALICE and GNASH etc., obtained from abroad have been or are being transplanted on our computer, some of them have been used in evaluation.

4. CODES FOR NUCLEAR DATA PROCESSING AND PLOTTING

In the past two years, several codes for nuclear data processing and plotting have been completed by CNDC.

DDXB1 (Zhang Jin and Liu Tong)
This code can be used to produce n, p and alpha particles total emission spectra integrated over angles in c.m. system or total spectra at given angle in lab. system from MF6 in ENDF/B format.

MAINPLT (Liu Tong and Zhao Zhixiang)
This code can be used to process and plot the evaluated cross sections data(MF3) and angular distribution data(MF4) in ENDF/B format and EXFOR data.

CODE SYSTEM FOR INTERCOMPARISON (Liu Tingjin and Sun Zhengjun)
This code system can automatically retrieve and plot the evaluated data and EXFOR data in batches mode. this code system can deal with the comparison of cross section, DA, DE and DDX data among several evaluated data and experimental data.

5. WORK IN PROGRESS

We are now preparing the CENDL-2.1, it will contain correction to known errors such as the modification of energy spectra etc., some renewal evaluations and a few new evaluations, about 68 nuclides will be contained in this version.

The main changes in this version are as follows:

(1). Benchmark Testing

Benchmark calculation for CENDL-2 has been begun. This work was delayed by lack of manpower and appropriate computer, now a SUN-10 work station has been installed in CNDC and connected with micro-VAX-2, so some preliminary results are expected in the near future.

(2). Re-evaluation For BE-9, CA-nat, U-238

The re-evaluation of neutron data for Be-9, Ca-nat and U-238 are carrying out by using new model theory codes, in addition to the cross sections, angular distributions will be re-evaluated, the double differential cross section, gamma production data, as well as covariance data will be added in the data files.

Besides, most of the evaluations in CENDL-2 will be supplemented with the gamma production data file.

(3). New Evaluations For Some Nuclides

A. The new evaluations for Ag-nat, Al-27, Co-59, Fe-nat,54,57,58 Mn-55, Cr-nat,50,52,53,54, Cu-nat,63,65 and Nb-93 will be contained in CENDL-2.1, they are the joint Chinese/Japanese evaluations completed in JAERI/NDC in 1992, among them, the Fe-54,57,58, Cr-50,52,53,54 and Cu-63,65 are new evaluations for CENDL-2.1, and the others will supersed the old one in CENDL-2 due to the consistent reasons for natural Ag, Fe, Cr and Cu or more complete data files(including gamma production data) are given for Al-27, Co-59, Mn-55 and Nb-93.

B. The new evaluations for Fe-56, Mg, Tl, Lu, Ga and Cl have been basically completed by using UNF code in CNDC and its coordination network recently, these evaluations contain the data of MF1-6 and MF12-15, for the Fe-56, the uncertainty files for cross sections, angular distribution and double differential cross section are also given.

WP20

Charged-Particle and Photonuclear Data Activities at CNDC

Zhuang Youxiang Liang Qichang

1. Compilation

During 1993-1994 the 14 entries of S0010, S0026-S0038 measured in China have been compiled and sent to the IAEA. The other 12 data sets measured in China are being compiled and will be submit to the IAEA.

2. Evaluation and Calculation

The evaluations and calculations of intermediate energy nuclear data for Fe-56, Cu-63 and Cu-65(p,n) monitor reactions have been carried out in incident energies up to 1200 MeV, 11500 MeV and 1820 MeV, respactively. It is supported by the IAEA.

The evaluations and calculations of photonuclear data induced on Al-27, Fe-54 and Bi-209 have been accomplished. They were calculated by means of theoretical code GUNF.

3. Theoretical code

The code GUNF established by ourselves can calculate photonuclear data in ENDF/B-6 format of files 3, 4 and 6 with the approximate incident energies up to 30 MeV, including the scattering, absorption and particle productions.

We would like to make more contributions to the IAEA with CRP or RCP according to the data needs for application.

WP21

Memo CNDC-25/04/94-002

To: Participants
From: Liang Qichang

Subject: A matters on Chinese EXFOR neutron data compilation

CNDC has taken over the responsibility of compiling Chinese EXFOR data under a research contract in the past several years due to the vacancy of post for EXFOR compilation in NDS. Since then we have compiled 70 EXFOR entries in which almost all recent neutron reaction data measured in China were included.

Now, the EXFOR compilation in NDS has been continued when Dr. H.Wienke was hired. So my questions on this subject are:

1. Does CNDC continue responsible for Chinese EXFOR neutron data compilation, since there are some duplicate compilation in NDS and CNDC in the past two years.

2. If so, CNDC would like to continue responsible for this matter. Is CNDC responsible for EXFOR compilation for literatures in both Chinese and English language or only for Chinese language literature.

Memo CNDC-25/04/94-003

To: Participants
From: Liang Qichang

Subject: Proposal to IAEA for EXFOR data and ENDF data transmisson

Since CNDC has adopted the NNDC VAX EXFOR and ENDF data base system, the EXFOR master library from NDS and the main libraries for evaluated neutron reaction data have been loaded in disks of micro-AVX-2 and can be accessed on computer directly, so my proposal to IAEA are:

1. IAEA send CNDC the supplement EXFOR data periodically, for example, IAEA has sent CNDC the EXFOR master library in the middle of 1992, it is expected that IAEA send CNDC the supplement EXFOR data(new entries entered into Vienna master library from 30 June 1992 to 1 July 1994) in the mode of LB***.TLB and RED.LB*

2. IAEA send CNDC in time the update version of the main libraries for evaluated neutron reaction data, for example we want to have the JEF-2, ENDF/B-6.2, BROND-2.1 and IRDF(90) recently.

Memo CNDC-25/04/94-001

To: Participants

From: Zhang Jingshang Zhao Zhixiang

Subject: A problem on the double differential cross sections (DDX) represented by using Legendre coefficients in laboratory system in ENDF/B-6 format.

For more detial please to see separate article: Zhang Jingshang Zhao Zhixiang, The forbidden angular region of secondary particle emission in the laboratory system, INDC(CPR)-030/L, p.17(1993).

From: SMTP%"@sequent.kiae.su,@cajad.uucp:chukreev@cajad.kiae.su" 23-MAR-1994 14:15:24.55
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CC:
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MEMO CP-A/65

To: Distribution
From: F.E.Chukreev, V.V.Varlamov
Subject: Some remarks on old and not correct data in B-, L-TRANSes.

There are well known problem of needs of recompilation of the old and not correct data.

We would like to discuss two examples of situation that can not be estimated as normal:

1. "The Munzel data-situation"

Let us see B0002007. The code "SUM" have been used for keyword REACTION. This code is obsolete now. Who must correct this SUBENT? This correction is needed because searching codes do not "know" SUM. Similar examples are numerous.

2. The problem of not correct SUBENT records for some photonuclear reaction channels when several reactions could occure in the same energy region.

Let us discuss one example only for which we selected L0039037 subentry. This SUBENT has REACTION:

(20-CA-40(G,N)20-CA-39,,SIG)

These data were measured for 15.37 - 29.47 energy region, where not only (G,N) but (G,N+P) reaction is possible also.

The data from L0039037 are very similar to ones from Forkman and Peterssen review (see p.676 of Handbook on Nuclear Activation Data), where REACTION is:

(G,N)+(G,PN).

Authors of L0039037 have measured the summed (G,N)+(G,PN) cross section certainly but this curcumstance does not reflected by SUBENT records!

We could continue similar examples.

Therefore we would like to discuss this problem during to nearest NRDC Meeting. The main questions on this subject are:

1. Is the problem of recompilation of such kind of data actual now?

2. Who could be responsible for such job?

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WP23

THE CURRENT STATUS OF CENDL–2

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ABSTRACT

The Version 2 of Chinese Evaluated Nuclear Data Library (CENDL–2) was completed and worldwide released in 1992 [1,2]. It contains evaluated neutron reaction data of 54 elements or isotopes from 1–H–1 to 98–Cf–249 in the neutron energy range from 10^{-5} eV to 20 MeV in ENDF/B–6 format. Most of elements or isotopes have files 1–5, some important isotopes have double differential cross section (file 6), γ–production data (files 12–15) and covariance data (file 33). For use of this library a set of computer codes have been established, which are available on magnetic tapes from IAEA. Based on the requirement and the feedback information, the working plan on improvement and development to CENDL–2 has been worked out. Herein the further development of CENDL–2 and the current status are presented.

I. Intercomparison and Benchmark Test

To appraise CENDL–2, the intercomparisons with "Large Evaluated Files" such as ENDF/B–6, JENDL–3 and BROND–2 and some benchmark tests have been performed.

1) The cross sections of 38 elements or isotopes from CENDL–2 have been compared with those of ENDF/B–6, JENDL–3 and BROND–2. It was found that about two third of elements or isotopes in CENDL–2 have better evaluated cross sections data than others since more new experimental data were used during CENDL–2 evaluation period, meanwhile the analysis processing and the parameter adjustment in the calculation were performed more carefully. An example is shown in Fig.1 for the cross section of ^{7}Li inelastic scattering to the second level (4.63 MeV). However, surveying CENDL–2, it can be seen that the files and elements in the library are still not more enough to practical application, it needs to add more elements or isotopes and more files (γ–production data, double differential cross section and uncertainties).

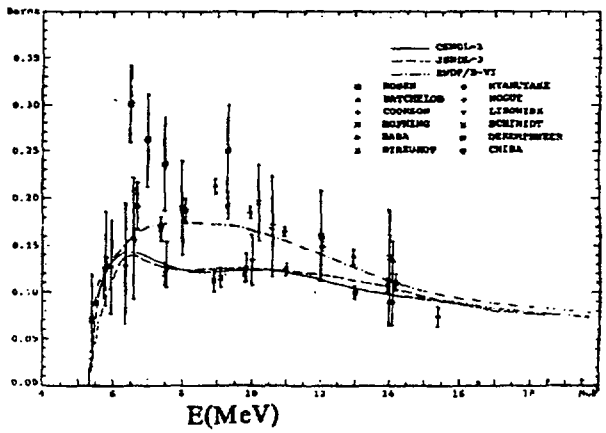

Fig.1 Cross section of ^{7}Li inelastic scattering to 4.63 MeV

2) With the Cooperation of Russian Nucle-

ar Data Center, the intercomparison of CENDL–2 with BROND–2 as well as JENDL–3, ENDF / B–6 for Fe, Ni, Cr neutron reaction data have been done [3]. The results indicate that

① There are considerable discrepancies for some threshold reaction cross sections, an example is shown in Fig.2 for the cross section of Ni(n,α) reaction.

② There are systematical deviations in the secondary neutron emission spectra of (n,n′), (n,2n), (n,n′p), (n,n′α), etc. and their total neutron emission spectra: the low energy neutrons (less than several keV) have higher values in ENDF / B–6, then that in JENDL–3, BROND–2, while are missed in CENDL–2. An example is shown in Fig. 3.

③ For total cross sections, the high resolution data are given in ENDF / B–6, JENDL–3 (modified recently), but the data in CENDL–2 and BROND–2 is lower and the " smooth region" is too wide.

④ The shapes of the elastic differential cross section are quite different for some incident neutron energies.

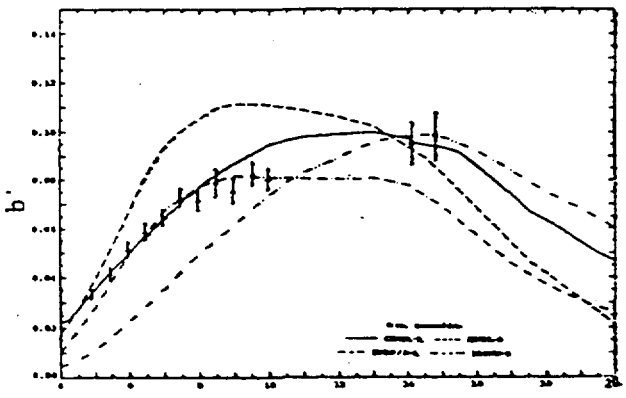

Fig.2 Ni(n,α) cross section

3) To meet the needs of users and benchmark test, more elements or isotopes need to be supplemented in CENDL–2. For this purpose, in the first stage the data from ENDF / B–6, JENDL–3 and BROND–2 of 41 isotopes were intercompared, most of which are fission products. It was found that the better data are 25 from JENDL–3, 13 from ENDF / B–6 and 3 from BROND–2 (to see table 1). However, ^{103}Rh, ^{145}Nd data of all libraries are not in agreement with experimental data and ^{164}Dy, ^{176}Lu data only existed in ENDF / B–6 and are very old (taken from ENDF / B–3). As an example, the total cross section of ^{103}Rh is shown in Fig.4 . The large discrepancies have been found in the three libraries for some threshold reactions and for capture cross sections of many elements, which are have not any experimental data.

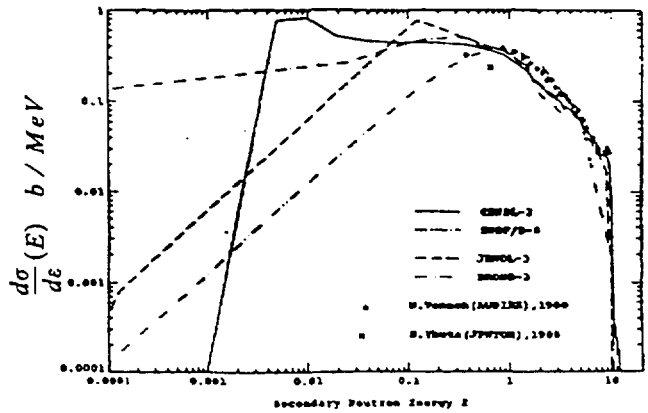

Fig.3 Secondary neutron spectrum of Ni at 14.1 MeV

Table 1 The intercompared isotopes and the libraries with better data

Library	Isotopes
JENDL–3	^{233,234}U, ^{243}Cm, ^{83}Kr, ^{103,105}Rh, ^{131,135}Xe, ^{133,134,135}Cs, ^{143}Nd, ^{147,148,148m}Pm, ^{147,149,150,151,152}Sm, ^{154,155,156,157,158}Gd,
ENDF / B–6	^{238,241,242}Pu, ^{236}U, ^{182}W, ^{63,65}Cu, ^{145}Nd, ^{153,154,155}Eu, ^{164}Dy, ^{176}Lu
BROND–2	^{242}Cm, ^{242m,243}Am

4) Using code system NSLINK for multigroup constant generation, which were obtained from NEA Data Bank and installed on working station MIPS at CIAE, and code system PASC–1 for reactor physics calculation, which was modified, the group constants were generated and some integral quantities for some fast, thermal benchmark assemblies were calculated by using the microscopic data from CENDL–2, and for comparison purpose, also from ENDF/B–6, JENDL–3 and JEF–1. Some primary results have been obtained, which guide the improvement of CENDL–2.

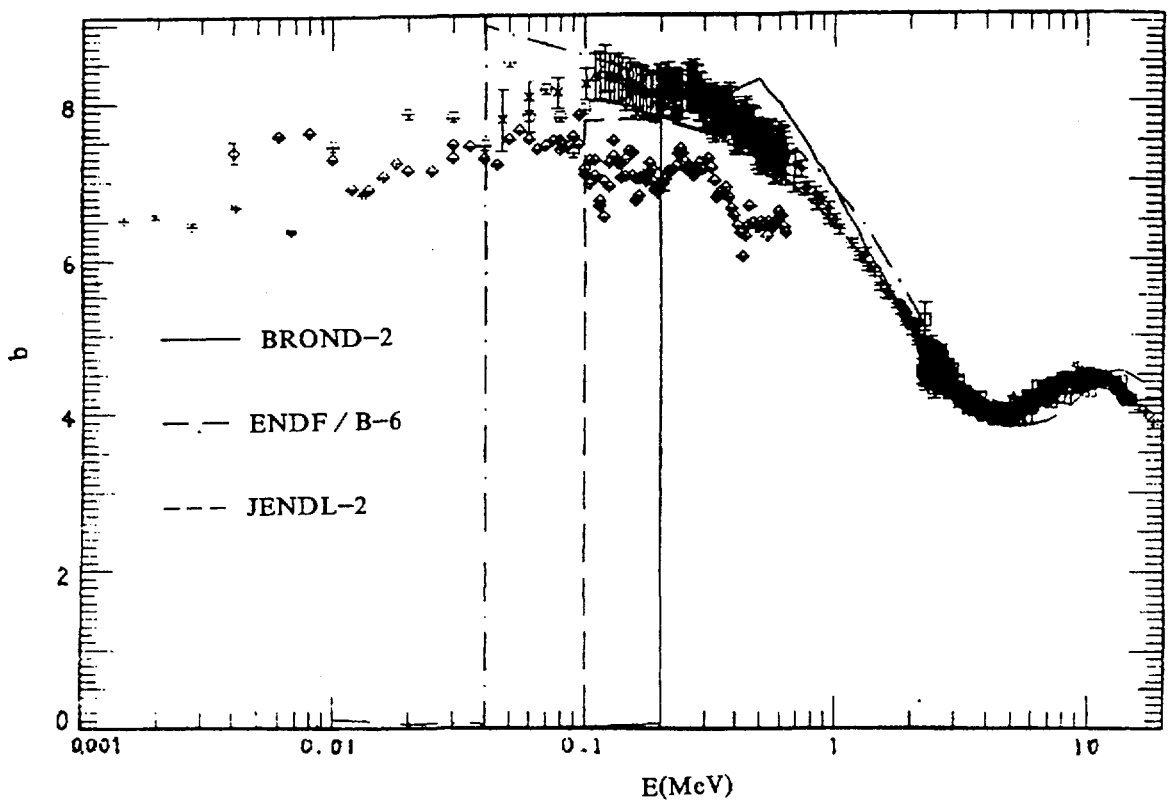

Fig.4 Total cross section of ^{103}Rh

II. The Development of CENDL–2

Based on the intercomparison, benchmark test mentioned above, and the feedback information by users, CENDL–2 has been and is being improved.

1) Re–evaluation and updating

The neutron reaction data of ^{238}U, ^{9}Be, and Ca have been re–evaluated based on more new experimental data and new calculation by using FMT, UNF [4] codes developed at CNDC for fission nucleus and structural materials, respectively. Taking ^{238}U data as an example, the data are much improved[5] : Files 6, 12 – 15 are supplemented; the cross sections of total and discrete level inelastic scattering were re–evalu-

ated. The contributions from direct inelastic scattering were calculated by using coupled–channel optical model code CCOM for low levels, and code DWUCK for high levels.

In addition, the evaluations for elements Ag, Al, Fe, Cr, Cu, Co were completed by Chinese scientist at JNDC cooperated with Japanese partner. The comparisons of these data with those in CENDL–2 have been done. They will be adopted in CENDL–2.

2) New evaluation and supplement

The data of ^{56}Fe, Hg, Tl, Lu, Ga and Cl have been evaluated at CNDC and CNDN (Chinese Nuclear Data Network). The purpose of the evaluation of ^{56}Fe is not only to provide high quality evaluated data but also to test UNF code. Obvious improvement are obtained. As an example the DDX of (n,xα) is shown in Fig. 5. There are no or only very old data for other 5 elements in ENDF/B–6, JENDL–3 and BROND–2 libraries, so it should be updated or supplemented. So far the data of 15 elements or isotopes have been evaluated and will be supplemented in CENDL–2.

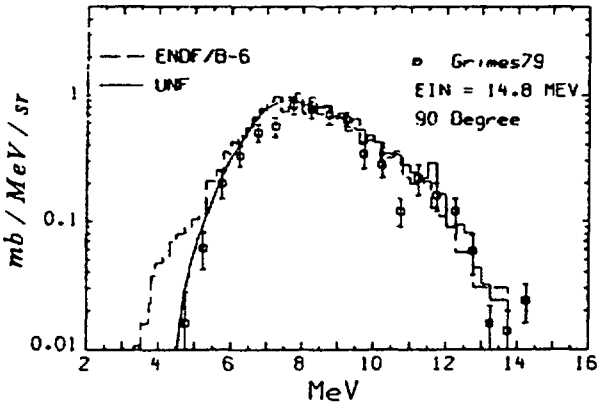

Fig.5 DDX of ^{56}Fe(n,xα) at 90 °

3) Modification and improvement

To solve the problems found through the intercomparison described above, some modifications for CENDL–2 are being performed.

① Neutron spectrum modification

As mentioned above, the secondary neutron spectra in low energy less than several keV calculated with code MUP–2 are missed. This is probably caused by the technical reason in the code. It is very difficult to re–calculate the spectra again. A method is being studied, and will be used to modified these neutron spectra in CENDL–2.

② Total cross section updating

Through the intercomparison, it is found that many structures in the total cross sections of some structural material are missed, and the energy points are too rare. These data will be replaced by high resolution experimental data or other high quality evaluated data.

③ Adding γ–production data

A feasible semi–empirical method is being studied to calculate γ–production and will be used to add γ–production data to CENDL–2 for some element or isotopes, which are important for application.

4) Further improvement of CENDL–2: Evaluation

More evaluations have been arranged, and are being performed at CNDC and CNDN.

① The neutron reaction data for natural Ni and its isotopes (^{58,60,61,62,64}Ni) are being evaluated. To improve CENDL–2 and meet the needs of the international fusion research, the evaluated data will include double differential cross sections and be consistent between natural one and it's isotopes.

② The evaluations and calculations of neutron data for fission products are being studied. Especially, the ^{145}Nd, ^{164}Dy, ^{176}Lu data are being evaluated, since for these isotopes the existing data in the current large evaluated libraries are discrepant with new experimental data or are very old.

③ With the cooperation of Russian Nucle-

ar Data Center, the threshold reaction cross sections of natural Fe, Cr, Ni and their isotopes are being evaluated or re–evaluated. The best one would be recommended.

5) Further improvement of CENDL–2: Measurement

To solve the severe discrepancies, some measurements have been and are being performed.

① DDX on Li, Be, B, C, Bi at 14 MeV and 6–13 MeV by means of TOF method on Cockcroft Walton and Tandum accelerators[6] at CIAE;

② (n,x) reaction cross sections, angular distributions including $^{40}Ca(n,\alpha)$, $^{58}Ni(n,\alpha)$[7] at neutron energy 4–6 MeV with gridded–ionization chamber on Van de Graff at Beijing University, and $^{93}Nb(n,\alpha p)$ (also DDX) at 14.6 MeV with nultitelescope system on Cockcroft Walton accelerator[8] at China Sci. and Tech. University (Fe, Cr, Ni(n,p), (n,xα) in future).

③ The activation cross sections of many isotopes, especially those leading to long–lived radio–nucleus, have been measured at CIAE[9], Lanzhou[10], Sichuan[11] and Beijing Universities[12] with Cockcroft Walton. Van de Graff and Tandum.

④ When CENDL–2.1 is finished, the macroscopic quantities for some fast, thermal benchmark assemblies and also for "broomstick" experiments will be calculated again for the integral testing. Some macroscopic measurements on Cockroft Walton accelerator at CIAE are being prepared. At first, the transmutation spectra of neutrons through structural material sphere or slab will be measured.

III . Methodology and Codes for Improvement of CENDL–2

The improvement of CENDL–2 is closely related to the progress on methodology and code developing. In recent two years the researches on evaluation methodology and codes for nuclear data calculation, plotting and processing have been carried out.

1) Evaluation methodology

For the evaluations of averaged resonance parameters, especially the average level spacing, a method based on Bayesian approach for correcting the energy level missing has been established. The covariance files also are studied. A simple method to evaluate covariance file for DDX has been developed and applied to ^{56}Fe evaluation. Impacts of negative and distant level on resonance cross sections have been studied and analysis codes developed. A simultaneous evaluation method for correlated data are developed and used to the cross sections of $^{239}Pu(n,f)$, $^{238}U(n,f)$, $^{238}U(n,\gamma)$, $\sigma_f(^{239}Pu) / \sigma_f(^{235}U)$, $\sigma_f(^{238}U) / \sigma_f(^{235}U)$ and $\sigma_\gamma(^{238}U) / \sigma_f(^{238}U)$.

2) Codes for calculating nuclear reaction data

In recent two years, several theoretical model codes have been developed, perfected and replanted for nuclear data calculations. UNF is developed for structural materials, FMT is used for fission nucleus, RAC92 is a comprehensive R–matrix analysis code based on multi–channel and multi–level R–matrix theory, CFUP1 is for calculating charged particle as well as neutron induced reaction of fission nuclei at energy region up to 35 MeV, SPEC is a code for calculating cross sections and spectra of neutron or charged particle induced reactions with in incident energy up to 60 MeV, DDCS is for calculating nucleon and composite double differential cross sections of the neutron or charged particles(p, d, t, ^3He, α) induced reactions in energy region up to 50–100 MeV.

3) Codes for Nuclear Data Processing and Plotting

DDXB1 is used to produce n, p and α particle total emission spectra in c.m.s or total spectra at given angle in Lab. system from File 6 in

ENDF / B format, MAINPLT is used to process and plot the evaluated cross section and angular distribution in ENDF / B format and EXFOR data. Intercomparison code system ICPL can retrieve evaluated data and EXFOR data and process them for plotting out the figure to show the comparison among several evaluated and measured data in batches. EXFOR Library and Related Software: for making evaluation more convenient, the EXFOR data master library has been installed in hard-disk of MICRO VAX-II computer at CNDC. Related storage and retrieval system are replanted and provided to users.

4) Chinese Evaluated Nuclear Parameters Library (CENPL)

To provide evaluators input data for nuclear data calculation and make evaluation more convenient, the CENPL is being established. The CENPL consists of data files and retrieval code system. So far six sub-libraries are included in CENPL-1: MCC (Atomic masses and characteristic constants for nuclear ground states); DLS (Discrete level schemes and branch ratios of γ decay); LDL (Level density parameters); GDP (Giant dipole resonance parameters for γ-ray strength function); FBP (Fission barrier parameters); OMP (Optical model parameters).

IV. Conclusion Remarks

The most of works on the evaluation and measurements mentioned above have been or are being done. Exactly, the items 1)—3) will be finished in this year, the item 4) will be finished in one or two years and the item 5) will be continuously done to get new results.

After finishing items 1)—3), CENDL-2.1 will be established and will be released by the end of this year. CENDL-2.1 will include evaluated neutron reaction data of 68 elements or isotopes, of which 15 isotopes are new evaluated and added, 9 isotopes are re-evaluated and updated, most of other data will be modified and improved. Furthermore, more γ-production data, double differential cross sections and covariance data are included.

Since CENDL-2 was finished, great efforts have been made at CNDC and CNDN to improve CENDL-2. The development of CENDL-2 have been made in three aspects : increasing the number of nuclides, extending files and improving quality. After CENDL-2.1 is completed, the further evaluations and measurements will be continuously going on to develop reaction nuclear data.

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