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IAEA Nuclear Data Section: Progress Report, 2002/03

to the Technical Meeting
on the Co-ordination of the Network of Nuclear Reaction Data Centres,
IAEA, Vienna, 17 - 19 June 2003

Work done in the field of nuclear data by staff in the IAEA Nuclear Data Section is summarised for the period 1 June 2002 – 31 May 2003.

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1. Staff

The authorized staff level of the Nuclear Data Section remained at a total of 18 professional and support staff. The vacant position in the Atomic and Molecular Data Unit was filled by Denis Humbert in October 2002. Three staff members left NDS in 2003, and it is hoped that these positions will be filled later in the year: Mike Herman left at the end of February 2003 for a similar post at NNDC, BNL; Meinhart Lammer retired at the end of March 2003, while P. Kevin McLaughlin retired at the end of May 2003.

2. Data compilations

2.1 CINDA

As a contribution to the new format and file 'CINDA-2001', the necessary platform-independent software was developed as described under item 4 below, and was extensively tested. Furthermore, the old CINDA file was converted to CINDA-2001 format and the resulting data base checked. In particular, the conversion and coding of references and the new reaction-quantity codes were checked, and new proposals for coding have been made for discussion at the meeting.

Currently, NDS staff are scanning about 40 journal titles received regularly and about 25 titles from indexing journals. These include 9 journals originating from area 1 countries, 16 from area 2 and 6 translation series; the rest originate from area 3 countries.

Since the last NRDC meeting, NDS staff have prepared and transmitted 4 CINDA batches (NDS038-041) containing altogether 3569 CINDA entries (1733 area 3 entries in exchange format and 1836 in reader format for processing by other centers).

CINDA 2002 was published as a cumulative issue, including literature published and data files compiled/updated between 1988 and 2002. A new book page format has been developed to make full use of the space provided with the new A4 book format. The text pages in the Introduction

and Annex of the book have been completely revised. A copy of the CD-CINDA 2002, produced and supplied cost-free by the NEA-DB, was inserted in a special pocket of the CINDA 2002 book and was distributed with the book.

2.2 EXFOR and Dictionaries

Since last year's meeting, four neutron TRANS files (3111-3114) were distributed containing 17 new and 37 revised entries. 19 new charged-particle transmissions were received from ATOMKI, checked and finalized at NDS and, together with some NDS revisions of earlier entries, transmitted on two area D TRANS files (D025, D026).

Altogether 42 TRANS files from the network were received, checked and processed at NDS, containing 711 neutron entries (357 new, 354 revised), 396 charged-particle entries (355 new, 41 revised) and 26 photonuclear entries (10 new, 17 revised).

Since the previous meeting, NDS produced and distributed three transmissions of the EXFOR/CINDA dictionaries (9080-9082) in EXFOR, DANIEL and archive format.

2.3 Evaluated data libraries, files and data processing codes

New evaluated data libraries, files and data processing codes were checked and advertised for distribution to the NDS customers through the Web or on CD-ROM. Some of these products were obtained from the network of co-operating centres, while others comprise the results of IAEA/NDS CRPs and data development projects. They include:

- JEFF-3.0 General Purpose Library;
- JENDL-3.3, Japanese Evaluated Nuclear Data Library;
- Minsk Library of Actinides, with documentation;
- Data for Prompt Gamma 2002 (on CD-ROM only);
- DROSG 2000 Neutron Source Reactions, Version 2.2;
- EXFOR+CINDA/Java on Web (test version at development machine);
- EXFOR+CINDA/Java2 on CD-ROM;
- RIPL-2 Reference Input Parameter Library;
- EMPIRE-II, Modular System of Codes for Nuclear Reaction Calculations, Version 2.18;
- ENDF Utility Codes, Release 6.13;
- PREPRO2002 ENDF/B Pre-Processing Codes;
- ENDVER Verification Codes, updates of November 2002.

3. Services

On-line data services continue to be provided by NDS staff through the Alpha system. However, new and more cost-effective platforms are being developed to serve the various nuclear databases (see Section 4). The Web interface to the EXFOR and CINDA databases has been adopted to Alpha/VMS. NDS can now use the new software on the VMS-platform, and this system can be installed on the Linux-platform in other nuclear data centres.

The number of Web-retrievals by Member State users from the main Agency nuclear databases continues to increase mainly due to the opening of access to new libraries, files, programs and documents. Individual users also requested 1108 CD-ROMs containing the desired nuclear data and related documentation, and the number of requests for off-line retrievals remains at an approximately constant level of around 2500. Statistics are shown in Fig. 1 for accesses and retrievals from NDS and IPEN-mirror Web sites, including the geographical distribution of users.

A new scheme is in operation for NDS document and product distribution, which is based on a "wish list" as selected by the customers from a list of the NDS activities and modes of distribution. The addresses from the ADLIST database will be merged with the common IAEA addresses database, and options supported by the IAEA central documents distribution facility. However, NDS will still keep control of the addresses of their customers.

Biannual Nuclear Data Newsletters advertising new NDS products and services were published and distributed as hardcopies and electronically. Twenty-two INDC-NDS and countries' reports were prepared and published as hardcopy and electronically, including two complete Nuclear Constants journals translated from Russian to English.

4. Development of New Generation of Nuclear Databases and Services

A key task to create a fully platform-independent nuclear database has been successfully completed: a trial version of the nuclear reaction database has been developed and tested that combines bibliographic (CINDA) and experimental (EXFOR) data, and can be run on any platform supporting SQL and Java.

During the past year the following items were developed:

- CINDA loading software was created.
- CINDA Web retrieval system using Java-Servlet technology was created on Linux and tested with MySQL (NDS) and SyBase (NNDC).
- EXFOR+CINDA CD-ROM with a retrieval system based on Java2 for Windows and Linux was developed. The system has replaced EXFOR/Access CD-ROM for Windows. Integrates CINDA, does not need any installation, can work on several platforms with local and remote database, and has extended functionality.
- New EXFOR regular database maintenance has begun at NDS and NNDC.
- Web interface to EXFOR and CINDA was adopted to VMS with Apache Web-server using Tomcat and Java in full scale, including plotting (ZVView). Now available through NDS main page with addresses:
  http://ndsalpha.iaea.org:8008/exfor2/index.html (EXFOR)
  http://ndsalpha.iaea.org:8008/exfor2/cinda.htm (CINDA).

Tasks for the next year:

- begin ENDF-Relational project development: loading utilities, Web interface,
- create CINDA compiler's tool to input data to database,
- continue development of EXFOR and CINDA-Relational: utilities, documentation, etc.

5. Nuclear data development

Although nuclear data development is outside the immediate nuclear data centre's operations, we give a brief summary of recent developments below.

Nuclear data standards and evaluation methods:
First RCM of CRP on *"Improvement of the Standard Cross Sections for Light Elements"* included a detailed analysis of all problems to be faced in this reaction standards evaluation, agreed benchmarking of the codes to be employed, and the formulation of an appropriate work plan. The primary aim is to prepare these extremely important standards over the next 2 to 3 years according to the specifications and requirements of Member States.
Final RCM on *"Update of X- and Gamma-Ray Decay Data Standards for Detector Calibration and Other Applications"* was held in Vienna on 21-24 October 2002. The database resulting from this CRP is being assembled and documentation will be completed by the end of 2003.
Agreed modifications to the CRP library *on "Nuclear Model Parameter Testing for Nuclear Data Evaluation (Reference Input Parameter Library: Phase II)"* were implemented and tested during 2002, and the data work programme is close to completion. Detailed documentation is now being prepared, and will be ready for publication by the end of 2003.
An extension was approved for CRP on *"Fission Product Yield Data Required for Transmutation of Minor Actinide Nuclear Waste"*, and fourth RCM was held in Vienna, 25-29 November 2002.The database and documentation will be prepared in late 2003.

Nuclear data for radiotherapy using radioisotopes or external radiation sources:
A Consultants' Meeting on "Nuclear Data for Production of Therapeutic Radioisotopes" was held in Vienna, 27 February - 1 March 2002, at which the creation of a co-ordinated research project on this topic was strongly advocated. Thus, proposals for participation have been solicited, and the first RCM will be held on 25-27 June 2003.

Data for the Th-U-fuel cycle:
CRP on "Data for the Th-U Fuel Cycle" has formally begun: two research contracts and three research agreements have been awarded, and the first RCM is scheduled for 25-29 August 2003.
Work to establish an international database on the properties of irradiated graphite has continued as an extra-budgetary project. Fourth meeting of the Steering Committee was held 16, 17 October 2002 at IAEA Vienna, with the introduction of a new member (the Netherlands). Work continues to expand the database and improve the interface communications.

Nuclear data for reactor dosimetry:
The Agency organised a technical meeting on "International Reactor Dosimetry File (IRDF-2002)" in Vienna on 27-29 August 2002. Problems with existing data were identified, and corrective actions were discussed and assigned to participants or other experts in the field, subject to their approval to address these issues. The bulk of the work should be completed by the end of 2003.

6. Publications

- Herman, M., Parameters for Nuclear Reaction Calculations, Workshop on Astrophysics, Symmetries and Applied Physics at Spallation Neutron Source, 11-13 March 2002, Oak Ridge, Tennessee, USA.

- Herman, M., EMPIRE-II: Application to Radiative Neutron Capture, 11th Int. Symp. Capture Gamma-ray Spectroscopy and Related Topics, 2-6 Sept 2002, Pruhonice near Prague, Czech Republic.

- Jacimovic, R., Maucec, M., Trkov, A., Verification of Monte Carlo Calculations of the Neutron Flux in the Carousel Channels of the TRIGA Mark II Reactor - Ljubljana, Int. Conf.

Nuclear Energy for New Europe, 9-12 Sept 2002, Kranjska Gora, Slovenia; to be published in symposium proceedings.

- Paviotti-Corcuera, R., Zerkin, V., Zsolnay, E.M., Zolotarev, K.I., Mannhart, W., Greenwood, L.R., Griffin, P.J., International Reactor Dosimetry File: IRDF-2002, 11th Int. Symp. Reactor Dosimetry, 18-23 Aug 2002, Brussels, Belgium; to be published in symposium proceedings.

- Schwerer, O., IAEA Nuclear Databases for Applications, XXV Reuniao de Trabalho sobre Fisica Nuclear no Brasil, 31 Aug - 4 Sept 2002, Sao Pedro, Brazil; to be published in special issue Brazilian Journal of Physics.

- Trkov, A., Kurincic, B., Validation of the IAEA-WIMSD Library for the LOADF Code on Operation Transients at the Krsko Power Plant, Int. Conf. Nuclear Energy for New Europe, 9-12 Sept 2002, Kranjska Gora, Slovenia; to be published in symposium proceedings.

- Zagar, T., Ravnik, M., Trkov, A., Isothermal Temperature Reactivity Coefficient Measurement in TRIGA Reactor, Int. Conf. Nuclear Energy for New Europe, 9-12 Sept 2002, Kranjska Gora, Slovenia; to be published in symposium proceedings.

7. Workshops 2002/2003

- Nuclear Reaction Data and Nuclear Reactors: Physics, Design and Safety, 28 Feb - 29 March 2002, ICTP Trieste, Italy.

- Nuclear Structure and Decay Data Evaluation, 18-22 Nov 2002, IAEA Vienna, Austria.

- Nuclear Data for Science and Technology: Materials Analysis, 19-30 May 2003, ICTP Trieste, Italy.

- Atomic and Molecular Data for Fusion Energy Research, 8-12 Sept 2003, ICTP Trieste, Italy.

- Nuclear Structure and Decay Data: Theory and Data Evaluation, 17-28 Nov 2003, ICTP Trieste, Italy.

- Relational Databases for Nuclear Data Development, Dissemination and Processing, 1-5 December 2003, IAEA Vienna, Austria.

8. Visits and inter-centres co-operation

The following visits have taken place and contributed towards data centre co-operation:

- D. Winchell (NNDC) to NDS, 3 - 7 June 2002: Relational NSR,
- V. Zerkin (IAEA/NDS) to BNL/NNDC, 14-25 October 2002: Develop Software for the Management and Dissemination of Shared Nuclear Reaction Database (CINDA and

EXFOR-Relational),

- V. Zerkin (IAEA/NDS) to BNL/NNDC, 10-21 March 2003: Develop Software for the Management and Dissemination of Shared Databases (EXFOR, CINDA and ENDF),
- N. Ohtsuka (JCPRG, Sapporo, Japan) to NDS, 18 March 2003: EXFOR compilation questions,
- V. McLane (NNDC) to NDS, 12 -16 June 2003: Relational EXFOR and dictionaries.

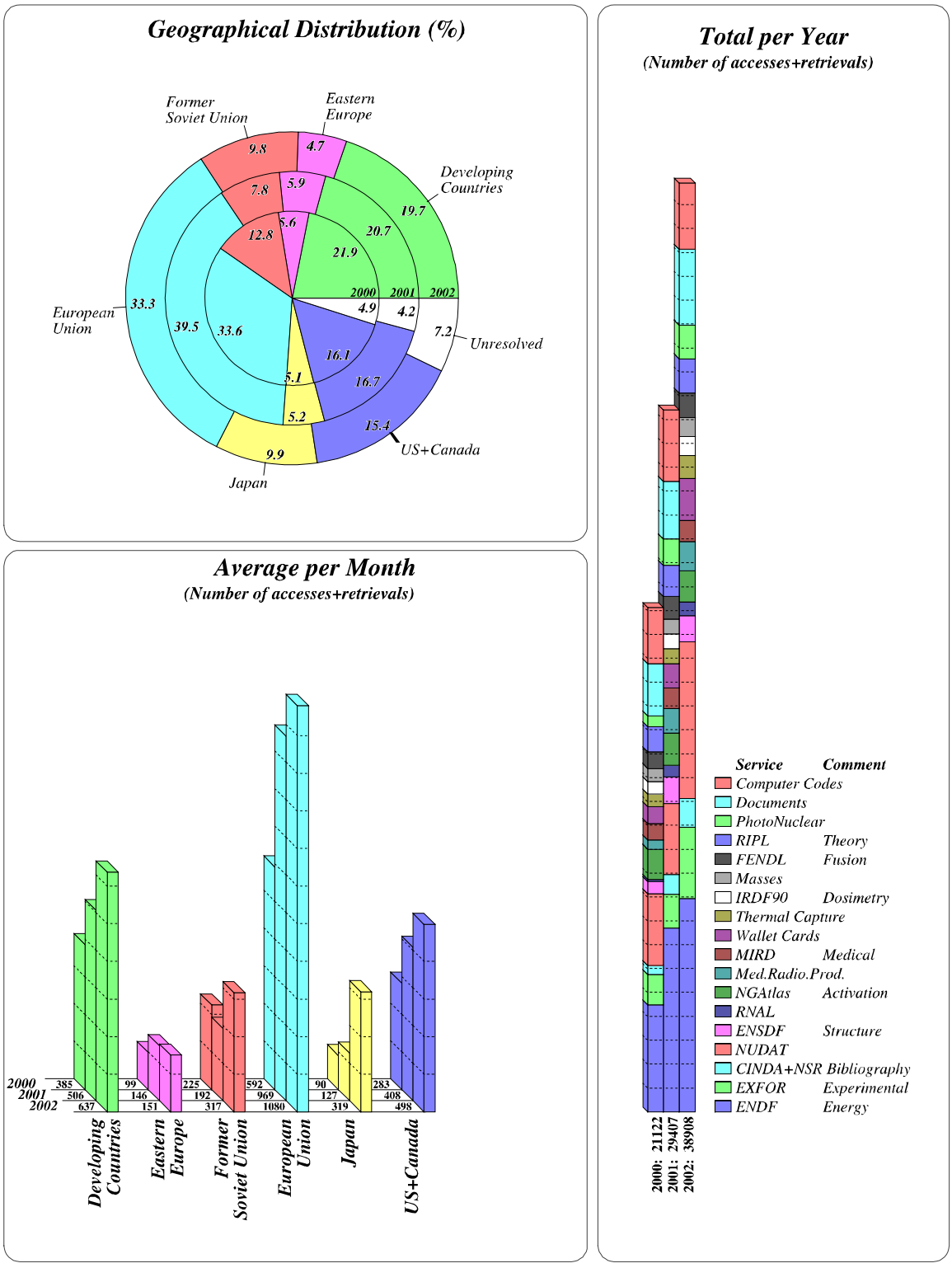

Fig. 1. Statistics of accesses and retrievals from NDS and IPEN (NDS-mirror in Latin America) Web sites.