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# INDC International Nuclear Data Committee

Summary Report on

IAEA Technical Meeting on the

## International Network of Nuclear Reaction Data Centres

IAEA Headquarters, Vienna, Austria

23 – 24 May 2011

Prepared by

Naohiko Otsuka
IAEA Nuclear Data Section, Vienna, Austria

July 2011

**IAEA Nuclear Data Section, Vienna International Centre, A-1400 Vienna, Austria**

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## Abstract

This report summarizes the IAEA Technical Meeting of the International Network of Nuclear Reaction Data Centres, held at the IAEA Headquarters in Vienna, Austria from 23 - 24 May 2011. The meeting was attended by 25 participants from 13 cooperating data centres of nine Member States and two International Organizations. The report contains a summary of the meeting, the conclusions and actions, the lists of working papers and presentations presented at the meeting.

July 2011

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## THE INTERNATIONAL NETWORK OF NUCLEAR REACTION DATA CENTRES

National, regional and specialized nuclear reaction data centres, coordinated by the International Atomic Energy Agency, cooperate in the compilation, exchange and dissemination of nuclear reaction data in order to meet the requirements of nuclear data users in all countries. At present, the following data centres participate in the network:

| | |
|---|---|
| NNDC | US National Nuclear Data Center, Brookhaven, USA |
| NEA-DB | OECD/NEA Nuclear Data Bank, Issy-les-Moulineaux, France |
| NDS | IAEA Nuclear Data Section |
| CJD | Centr Jadernykh Dannykh (= Nuclear Data Centre), Obninsk, Russia |
| CAJAD | Russian Nuclear Structure and Reaction Data Centre, Moscow, Russia |
| CDFE | Centr Dannykh Fotojadernykh Eksperimentov (= Centre for Photonuclear Experiments Data), Moscow, Russia |
| CNDC | China Nuclear Data Center, Beijing, China |
| JAEA | Nuclear Data Center of the Japan Atomic Energy Agency (formerly Japan Atomic Energy Research Institute, JAERI), Tokai-Mura, Japan |
| JCPRG | Japan Nuclear Reaction Data Centre, Hokkaido University, Sapporo, Japan |
| ATOMKI | ATOMKI Charged-Particle Nuclear Reaction Data Group, Debrecen, Hungary |
| UKRNDC | Ukrainian Nuclear Data Center, Institute for Nuclear Research, Kyiv, Ukraine |
| CNPD | Center of Nuclear Physics Data, Russian Federal Nuclear Center, RFNC-VNIIEF, Sarov, Russia |
| KAERI/NDEL | Nuclear Data Evaluation Laboratory, Korea Atomic Energy Research Institute, Yuseong, Daejeon, Republic of Korea |
| BARC | Bhabha Atomic Research Centre, Trombay, Mumbai, India |

A detailed description of the objectives of the network and the contributions of each Centre to these activities are given in INDC(NDS)-401 (Rev.5), "International Network of Nuclear Reaction Data Centres".

## PREVIOUS NRDC MEETINGS

| | | |
|---|---|---|
| Vienna, 23-24 May 2011 | Technical | INDC(NDS)-0593 |
| Sapporo, 20-23 April 2010 | Centre Heads + Tech. | INDC(NDS)-0573 |
| Vienna, 25-26 May 2009 | Technical | INDC(NDS)-0558 |
| Obninsk+Moscow 22-25 Sept. 2008 | Centre Heads + Tech. | INDC(NDS)-0536 |
| Vienna, 8-10 October 2007 | Technical | INDC(NDS)-0519 |
| Vienna, 25-28 September 2006 | Centre Heads + Tech. | INDC(NDS)-0503 |
| Vienna, 12-14 October 2005 | Technical | INDC(NDS)-0480 |
| Brookhaven, 4-7 October 2004 | Centre Heads + Tech. | INDC(NDS)-464 |
| Vienna, 17-19 June 2003 | Technical | INDC(NDS)-446 |
| Paris, 27-30 May 2002 | Centre Heads + Tech. | INDC(NDS)-434 |
| Vienna, 28-30 May 2001 | Technical | INDC(NDS)-427 |
| Obninsk, 15-19 May 2000 | Centre Heads + Tech. | INDC(NDS)-418 |
| Vienna, 18-20 May 1999 | Technical | INDC(NDS)-407 |
| Vienna, 11-15 May 1998 | Centre Heads + Tech. | INDC(NDS)-383 |
| Vienna, 26-28 May 1997 | Technical | INDC(NDS)-374 |
| Brookhaven, 3-7 June 1996 | Center Heads + Tech. | INDC(NDS)-360 |
| Vienna, 2-4 May 1995 | Technical | INDC(NDS)-343 |
| Paris, 25-27 April 1994 | Center Heads + Tech. | INDC(NDS)-308 |
| Vienna, 1-3 Sept 1992 | Technical | INDC(NDS)-279 |
| Obninsk, 7-11 Oct 1991 | Center Heads + Tech. | INDC(NDS)-0262 |
| Vienna, 13-15 Nov 1990 | Technical | Memo CP-D/210 |
| Vienna, 2-4 Oct 1989 | Centre Heads + Tech. | Memo CP-D/200 |
| Vienna, 4-6 Oct 1988 | Technical | Memo CP-D/190 |
| Brookhaven, 27-29 Oct 1987 | Center Heads + Tech. | INDC(NDS)-204 |
| Vienna, 7-9 Oct 1986 | Technical | Memo CP-D/159 |
| Saclay, 9-11 Oct 1985 | Center Heads + Tech.<br>= 8$^{th}$ NRDC Meeting | INDC(NDS)-178 |
| Vienna, 19-21 Sept 1984 | Technical | Memo CP-D/131 |
| Obninsk+Moscow, 17-21 Oct 1983 | 7$^{th}$ NRDC Meeting | INDC(NDS)-154 |
| Vienna, 3-7 May 1982 | 6$^{th}$ NRDC Meeting | INDC(NDS)-141 |
| Brookhaven, 29.9 - 2.10.1980 | 5$^{th}$ NRDC Meeting | INDC(NDS)-125 |
| Karlsruhe, 8-13 Oct 1979 | 4$^{th}$ NRDC Meeting | INDC(NDS)-110 |
| Paris, 19-23 June 1978 | 3$^{rd}$ NRDC Meeting | INDC(NDS)-99 |
| Kiev, 11-16 April 1977 | 2$^{nd}$ NRDC Meeting<br>= 3$^{rd}$ CPND + 13th 4-C | INDC(NDS)-90 |
| Vienna, 28-30 April 1976 | 2$^{nd}$ CPND Meeting | INDC(NDS)-77 |
| Vienna, 26-27 April 1976 | 12$^{th}$ 4C-Meeting | INDC(NDS)-78 |
| Vienna, 8-12 Sept 1975 | CPND Meeting | INDC(NDS)-69+71 |
| Brookhaven, 10-14 March 1975 | 11$^{th}$ 4C-Meeting | INDC(NDS)-68 |
| Paris, 6-10 May 1974 | 10$^{th}$ 4C Meeting | INDC(NDS)-58 |
| Vienna, 24-26 April 1974 | CPND + PhotoND | INDC(NDS)-59+61 |
| Moscow/Obninsk, 4-8 June 1973 | 9$^{th}$ 4C Meeting | INDC(NDS)-54 |
| Vienna, 16-20 Oct 1972 | 8$^{th}$ 4C Meeting | INDC(NDS)-51 |
| Brookhaven, 25-29 Oct 1971 | 7$^{th}$ 4C Meeting | INDC(NDS)-41 |
| Paris, 5-9 Oct 1970 | 6$^{th}$ 4C Meeting | INDC(NDS)-28 |
| Moscow, 17-21 Nov 1969 | 5$^{th}$ 4C Meeting | INDC(NDS)-16 |

## LIST OF ACRONYMS

| | |
|---|---|
| ATOMKI | Nuclear Research Institute, Debrecen, Hungary |
| BARC | Bhabha Atomic Research Centre, Mumbai, India |
| BibTeX | Program for formatting reference lists for LaTeX |
| BNL | Brookhaven National Laboratory, Upton, New York, USA |
| BROND | Russian evaluated neutron reaction data library |
| C4 | Computational format for EXFOR data |
| CAJAD | Centre for Nuclear Structure and Reaction Data, Kurchatov Institute, Moscow, Russia |
| CDFE | Centr Dannykh Fotojad. Eksp., Moscow State University, Russia |
| CENDL-3 | Chinese Evaluated Neutron reaction Data Library, version 3 |
| CHEX | EXFOR check program (originating from NNDC) |
| CINDA | A specialized bibliography and data index on nuclear reaction data operated by NRDC |
| CJD | Russian Nuclear Data Centre at FEI, Obninsk, Russia |
| CNDC | China Nuclear Data Centre, Beijing, China |
| CNPD | Centre of Nuclear Physics Data at RFNC-VNIIEF, Sarov, Russia |
| CP... | Numbering code for memos exchanged within the NRDC |
| CPND | Charged-particle nuclear reaction data |
| CRP | Coordinated Research Project (of the IAEA Nuclear Data Section) |
| CSEWG | US Cross Section Evaluation Working Group |
| DOI | Digital Object Identifier, e.g. for bibliographic references |
| EFF | European evaluated nuclear data File for Fusion applications |
| EMPIRE | A code system for nuclear reaction model calculations |
| ENDF-6 | International format for evaluated data exchange, version 6 |
| ENDF/B-VII | US Evaluated Nuclear Data File/B, version 7 |
| ENDVER | ENDF File Verification support package |
| ENSDF | Evaluated Nuclear Structure Data File |
| EVA | Retrieval interface for evaluated data used at NEA-DB |
| 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 – Fusion Evaluated Nuclear Data Library |
| GSYS | Data digitizing system by JCPRG |

| | |
|---|---|
| IAEA | International Atomic Energy Agency |
| IBANDL | Ion Beam Analysis Nuclear Data Library maintained at IAEA |
| INDC | International Nuclear Data Committee |
| IPPE | Institute of Physics and Power Engineering, Obninsk, Russia |
| IRDF | International Reactor Dosimetry File, maintained by the IAEA-NDS |
| JAEA | Japan Atomic Energy Agency (from 1 October 2005) |
| JAERI | Japan Atomic Energy Research Institute (until 30 September 2005) |
| JANIS | Java Nuclear Information System of NEA-DB |
| JCPRG | Japan Nuclear Reaction Data Centre (formerly Japan Charged-Particle Nuclear Reaction Data Group), Sapporo, Japan |
| JEF | Joint Evaluated File of neutron data, a collaboration of European NEA member countries and Japan |
| JEFF | Joint Evaluated Fission and Fusion Project coordinated by NEA-DB |
| JENDL | Japanese Evaluated Nuclear Data Library |
| KAERI/NDEL | Korea Atomic Energy Research Institute, Nuclear Data Evaluation Laboratory |
| KINR | Kiev Institute of Nuclear Research |
| LEXFOR | Part of the EXFOR manual containing physics information for compilers |
| MIRD | Medical Internal Radiation Dose, a database derived from ENSDF |
| NDS | IAEA Nuclear Data Section, Vienna, Austria |
| NDS | Nuclear Data Sheets |
| NEA | Nuclear Energy Agency of the OECD, Issy-les-Moulineaux, France |
| NEA-DB | NEA Data Bank, Issy-les-Moulineaux, France |
| NEANDC | NEA Nuclear Data Committee |
| NNDC | National Nuclear Data Center, Brookhaven National Laboratory, USA |
| NRDC | Nuclear Reaction Data Centres |
| 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 |
| ORDER | EXFOR program for addition of record identification and bookkeeping information |
| PGAA | IAEA database for Prompt Gamma Activation Analysis |
| PhND | Photonuclear data |
| RIKEN | Institute of Physics and Chemistry Research, Wako-Shi, Saitama, Japan |
| RIPL | IAEA Reference Input Parameter Library for reaction calculations |

| | |
|---|---|
| RNAL | IAEA Reference Neutron Activation Library |
| R33 | Format used by ion beam analysis community for storing experimental cross-sections |
| TRANS | Name of transmission tapes for data exchange in the EXFOR system |
| UKRNDC | Ukraine Nuclear Data Centre at KINR, Kyiv, Ukraine |
| VNIIEF | Russian Federal Nuclear Centre, Sarov, Russia |
| WPEC | Working Party on international nuclear data Evaluation Cooperation |
| WPEC-SG30 | WPEC Subgroup 30 on "Improvement of accessibility and quality of the EXFOR database" |
| XTRACT | EXFOR indexing program |
| X4TOC4 | Conversion program from EXFOR to computational format "C4" |
| ZCHEX | Current version of CHEX, updated and maintained by NDS |
| 4C... | Numbering code of memos exchanged among the four Neutron Data Centres |

# MEETING SUMMARY

## 1. INTRODUCTION

The IAEA Technical Meeting on the International Network of Nuclear Reaction Data Centres was held at the IAEA Headquarters, Vienna, Austria from 23 to 24 May 2011. 25 participants representing 13 cooperating data centres in China, Hungary, India, Japan, Korea, Russia, Ukraine, USA, NEA and IAEA attended the meeting (see Appendix B). Meetings of this network are held annually, with full meetings, involving Centre heads and technical staff, every two years (last full meeting was held in April 2010 in Hokkaido University, Sapporo, Japan).

Main topics of the present meeting were EXFOR transmission statistics, EXFOR coverage and quality control, needs of EXFOR users, manuals, EXFOR/CINDA dictionaries, revision of the EXFOR Formats, new quantity codes as well as improved web tools and software (see Appendix A).

43 working papers were presented at the meeting. The results of the discussions were summarized in 19 Conclusions and 56 Actions (see Appendix C).

## 2. BRIEF SUMMARY

### 2.1 Opening and Progress Report

R.A. Forrest, Head of the IAEA Nuclear Data Section, opened the meeting on behalf of the Agency. O. Schwerer was elected chairman, and the agenda was adopted without change. Progress reports from all 13 attending centres were presented, highlighting the overall as well as the staffing situation of the centres, their compilation activities, data services, other nuclear data activities of interest to the network, and relevant publications. Further details can be found in progress reports P2011-01 to P2011-12. Apology for absence was received from T. Fukahori (JAEA Nuclear Data Center).

### 2.2 EXFOR (General)

V.M. Semkova presented the statistics of transmission, preliminary tape checking, new article compilation and old entry retransmission. She reported the delay in compilation (=time of transmission – time of publication) for the weighted average of eight selected journals published in 2010 to be 6.0 months, and it has been successfully unchanged from the previous year. She also concluded that the delay could be further reduced by scanning of articles in press by the centres.

M. Mikhaylyukova proposed revisions (e.g., addition of the first author name to the system) to the EXFOR Compilation Control System. After discussion, the participants concluded to form a small working group to continue the discussion.

N. Otsuka reported on recommendations from the IAEA Technical Meeting on Neutron Cross Section Covariances (September 2011) on behalf of R. Capote. The main recommendations are 1) The EXFOR formats should be flexible enough to accommodate information as provided by the experimenters. The EXFOR format should be extended to accommodate the full explicit covariance matrix, if provided by the authors or, alternatively, data required by a recipe for constructing covariance matrices based on providing partial error and correlation components; 2) The NRDC compilers should be instructed that it is mandatory to seek and compile uncertainty components and covariance information in computer-retrievable form; 3) There is a need to search and assess systematic uncertainties for existing entries in the EXFOR database and enter them into the database in computer-retrievable form. The first step is to check the consistency of usage of

keywords for partial components, second to code the information available in free text, third to scan the original literature for information that was provided but not coded, and fourth to take remedial action when sufficient information is not available. He also asked neutron data centres to update PFNS entries as soon as possible to meet the needs of the IAEA Coordinated Research Project on Prompt Fission Neutron Spectra (PFNS).

S.P. Simakov reported a summary of the IAEA Consultant Meeting on Neutron Source Spectra for EXFOR (April 2011) as well as data needs for nuclear resonance fluorescence (NRF). Participants agreed that the articles listed for these applications must be compiled into the EXFOR library.

N. Otsuka presented the status of the EXFOR Feedback List and the lists prepared by E. Dupont and A. Koning as a part the WPEC SG30 activity. He reported that a considerable improvement is seen in the EXFOR entries maintained by NEA Data Bank. He also mentioned that about 30 entries listed by the WPEC SG30 activity are still remaining for checking and asked the centres to respond as soon as possible.

N. Soppera reported the follow-up of WPEC SG30 activities on quality improvement of the EXFOR library on behalf of E. Dupont. He reported that SG30 was successfully closed in June 2010, but it is only the "end of the beginning" and SG30-like activities should be continued. He also introduced a new statistical approach being developed by NEA Data Bank. N. Soppera also briefly summarized coding mistakes seen in the JANIS Import Log.

**2.3 Manuals and Dictionary**

S. Hlavač proposed a possible improvement in the dictionary 25 (Units). He proposed modification of `-SQ` (squared) to `2`, and also `MICRO-` and `MU-` (micro) to `MU` in unit codes. The participants decided to leave final decision to NDS after further consultation with S. Hlavač.

**2.4 EXFOR (Technical)**

O. Gritzay reported on an extension of the EXFOR Formats for accumulation of neutron source spectra. It was concluded that the proposal will be revised based on discussion during the meeting.

S. Babykina presented a list of English translations for articles published in Atomnaya Energiya and proposed addition of them to the relevant EXFOR entries. Her proposals for the creation of similar lists for other Russian journals (e.g., Yadernaya Fizika, Izvestiya Rossiiskoi Akademii Nauk) were welcomed by the participants.

N. Soppera presented a method being developed by NEA Data Bank to detect mistakes in author field coding by checking against information available on publisher's web sites. A sample list of mistakes detected in author field as well as in title and reference fields was presented; NEA Data Bank will send a more complete list to the network.

N. Otsuka proposed revision of the EXFOR Formats to fulfil the requirements from the IAEA Technical Meeting on Neutron Cross Section Covariances. He mentioned that the new formats should be able to include all information on partial uncertainties and covariances to construct the full covariance matrix as efficiently as possible. He also stressed that the coded information should be computer readable and also redundancy must be avoided to make data exchange easier.

V. Zerkin presented an additional proposal on the new EXFOR Formats for the covariance information from the view of a software developer. He also introduced a new web tool for constructing a covariance matrix from uncertainties available in the EXFOR database.

### 2.5 Database and Software

N. Soppera reported the current status of the JANIS TRANS Checker. He introduced various ways of checking transmission tapes (Dummy Import, Automatic TRANS Checker, Command line version). He reported recent developments (e.g., implementation of wild cards in the dictionary 236) and future plans.

V. Zerkin recommended compilers to submit BibTeX files together with preliminary or final transmission tape to improve the bibliographic part of the EXFOR database. In his presentation he noted that his EXFOR Web retrieval system has been extended to display pdf files of publications referenced in the EXFOR library which can be provided to NRDC compilers (and possibly to evaluators) using password protection if the other centres agree.

G. Pikulina introduced a new version of their EXFOR editor. She reported the new version has been developed based on feedbacks from the users, decisions of the 2010 NRDC Meeting as well as changes in the manuals. She also explained special dialog windows newly developed for input and editing of several keywords.

### 2.6 Closing

N. Otsuka proposed the schedule of the next Technical Meeting (full meeting to be held at the OECD NEA, Issy-les-Molineux, France from 16 to 19 April 2012, and it was approved.

## 3. HIGHLIGHTS OF CONCLUSIONS

From the 19 conclusions, the following are highlighted:

1. The next Technical Meeting (full meeting) of the NRDC will be held in Paris, France, 16 - 19 April 2012.
2. Articles in press should be scanned and compiled by responsible centres to reduce delay in compilation.
3. Centres are encouraged to compile newly published and other representative super-heavy element production cross sections.
4. NRDC recognizes the importance of compilation of neutron source spectra to utilize experimental spectrum averaged cross sections.
5. NRDC appreciates development of X4 uploading system developed by Viktor Zerkin.

**Appendix A**

# AGENDA

## Monday, 23 May 2011

**Plenary: 9:00 – 13:00**

| | | | | |
|---|---|---|---|---|
| **1.** | **Opening Items** | | | |
| 1.1 | Welcome address | 10 min | | R. Forrest |
| 1.2 | Election of chairperson, adoption of the agenda, announcements | 5 min | | N. Otsuka |
| **2.** | **Progress Reports** | | | |
| 2.1 | Brief status report | 2.5 hours<br>*165 min* | | |

**Plenary: 14:00 – 18:00**

**3. EXFOR General**

| | | | | |
|---|---|---|---|---|
| **3.1** | **Transmission Status** | | | |
| 3.1.1 | Transmission statistics | 5 min | WP2011-02 | V. Semkova |
| 3.1.2 | Preliminary tape checking statistics | 5 min | WP2011-03 | V. Semkova |
| 3.1.3 | Status of new article compilation (A4) | 5 min | WP2011-04 | V. Semkova |
| 3.1.4 | Status of old entry retransmission (A13) | 5 min | WP2011-05 | V. Semkova |
| 3.1.5 | Duplication in area 1, C and L (A26) | 5 min | WP2011-06 | V. Semkova |
| 3.1.6 | Scanning of new publications (A11) | 5 min | WP2011-07 | V. Semkova |
| 3.1.7 | Suggestion to EXFOR Compilation Control Database | 10 min | WP2011-08 | M. Mikhaylyukova |
| 3.1.8 | ND2010 Conf. Proc. publication (A6) | 5 min | WP2011-09 | N. Otsuka<br>M. Mikhaylyukova |
| 3.1.9 | Other actions (A5, A12) | | WP2011-01 | |
| **3.2** | **Data Needs** | | | |
| 3.2.1 | Report from Technical Meeting on Neutron Cross Section Covariances (27-30 September 2010) | 10 min | WP2011-10 | N. Otsuka<br>(on behalf of Roberto Capote) |
| 3.2.2 | Prompt fission neutron spectra | 10 min | WP2011-11 | N. Otsuka |
| 3.2.3 | Super-heavy element production cross section | 10 min | WP2011-12 | N. Otsuka |
| 3.2.4 | Report from Consultant Meeting on Neutron Source Spectra for EXFOR (13-15 April 2011) | 10 min | WP2011-13 | S. Simakov |

| | | | | |
|---|---|---|---|---|
| 3.2.5 | Data needs for nuclear resonance florescence | 10 min | WP2011-14 | S. Simakov |
| 3.2.6 | Compilation of experimental data for standard cross section evaluation | 10 min | WP2011-15 | V. Semkova |
| | *Coffee break* | 20 min | | |
| **3.3** | **Quality Control** | | | |
| 3.3.1 | Review of feedback list with new flags (A7, A41, A49) | 10 min | WP2011-16 | N. Otsuka |
| 3.3.2 | Report from WPEC SG30 (A23) | 10 min | WP2011-17 | E. Dupont |
| 3.3.3 | JANIS Import Log (A24) | 10 min | WP2011-18 | N. Soppera |
| 3.3.4 | EXFOR DB error report (A18) | 5 min | WP2011-19 | V. Zerkin |
| 3.3.5 | Other actions (A8, A19, A45) | | WP2011-01 | |
| **4.** | **Manuals and Dictionary** | | | |
| 4.1 | Updated Manuals | 10 min | WP2011-20 | N. Otsuka |
| 4.2 | Consistency of unit codes (A27) | 10 min | WP2011-21 | S. Hlavač |
| 4.3 | Other actions (A1-A3, A16, A38, A44, A47, A50, A52,A56) | | WP2011-01 | |
| | | *190 min* | | |

**19:00 - Social Event (Brandauers Schlossbräu, Am Platz 5, 1130 Wien)**

**Tuesday, 24 May 2011**

**Plenary: 9:00 – 13:00**

**5. EXFOR Technical**

| | | | | |
|---|---|---|---|---|
| 5.1 | Storage of numerical neutron source spectra (A25) | 20 min | WP2011-22 | O. Gritzay |
| 5.2 | Length of EXFOR transmission records | 10 min | WP2011-23 | O. Schwerer |
| 5.3 | Incorrect authors' name (A53) | 10 min | WP2011-24 | N. Soppera |
| 5.4 | Spelling of nuclides and mathematical expression in free text (A54) | 10 min | WP2011-25 | N. Soppera |
| 5.5 | Addition of English translation (Atomnaya Energiya) | 10 min | WP2011-26 | S. Babykina |
| 5.6 | LEXFOR entry for TOF covariance (A51) | 10 min | WP2011-27 | N. Otsuka |
| | *Coffee Break* | 20 min | | |

| | | | | |
|---|---|---|---|---|
| 5.7 | Short nuclide code for SF7 | 10 min | WP2011-28 | N. Otsuka |
| 5.8 | New branch code ISP | 10 min | WP2011-29 | N. Otsuka |
| 5.9 | Characteristic energy for prompt fission neutron spectrum | 10 min | WP2011-30 | N. Otsuka |
| 5.10 | Fission quantity correlated with kinetic energy | 10 min | WP2011-31 | N. Otsuka |
| 5.11 | Coding of uncertainty and covariance | 20 min | WP2011-32 | N. Otsuka |
| 5.12 | Coding of covariance data convenient for software | 10 min | | V. Zerkin |
| 5.13 | Other actions (A37, A42-A43, A46, A51, A55) | | | |
| 6. | **CINDA Technical** | | | |
| 6.1 | Status of CINDA database in NEA-DB | 10 min | | N. Soppera |
| 6.2 | Status of CINDA database in IAEA-NDS | 10 min | | V. Zerkin |
| | | *180 min* | | |

**Plenary: 14:00 – 18:00**

**7 Dissemination**

| | | | | |
|---|---|---|---|---|
| **7.1** | **Database** | | | |
| 7.1.1 | EXFOR News | 10 min | WP2011-33 | N. Otsuka |
| 7.1.2 | DOI number creation (A9) | 10 min | WP2011-34 | N. Otsuka |
| 7.1.3 | Automatic addition of DOI to EXFOR entries (A10) | 10 min | WP2011-35 | V. Zerkin |
| 7.1.4 | Web-page EXFOR updates | 5 min | | V. Zerkin |
| **7.2** | **Software** | | | |
| 7.2.1 | EXFOR uploading system | 15 min | | V. Zerkin |
| 7.2.2 | Comment on CHEX code | 10 min | WP2011-36 | M. Mikhaylyukova<br>S. Babykina |
| 7.2.3 | Report on JANIS-TRANS Checker (A62) | 10 min | WP2011-37 | N. Soppera |
| 7.2.4 | Update version of EXFOR-Editor, new possibilities (A60) | 10 min | WP2011-38 | G. Pikulina |
| 7.2.5 | Experience of software development cooperation and proposals on its facilitating | 10 min | WP2011-39 | G. Pikulina |
| 7.3 | Other action (A14-A15, A17,A20-A22, A43, A48, A61) | | WP2011-01 | |
| | *Coffee break* | 20 min | | |

| | | | |
|---|---|---|---|
| **8** | **Evaluated Data Libraries** | | |
| 8.1 | New evaluated libraries in the IAEA-NDS | 10 min | V. Zerkin |
| 8.2 | Other action (A63) | | |
| | | | |
| **9** | **Closing** | | |
| 9.1 | Other business | | |
| 9.2 | Dates and places of next meetings | 10 min | N. Otsuka |
| 9.3 | Review of actions and conclusions | 1 hour | Chairperson |
| | | *190 min* | |

**Appendix B**

## LIST OF PARTICIPANTS


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**Appendix C**

# CONCLUSIONS AND ACTIONS

## Conclusions

### General

C1 The next full NRDC meeting will be held in Paris, France, 16-19 April 2012.

### EXFOR, General

C2 Efforts should be made to reduce delay in submission of the final transmission tapes. (WP2011-03)
C3 Articles in press should be scanned and compiled by responsible centres to reduce delay in compilation. (WP2011-04)
C4 NRDC appreciates the recommendations on compilation of experimental uncertainties and covariances by the "Technical Meeting on Neutron Cross Section Covariances (27-30 September 2010)". (WP2011-10)
C5 Centres are encouraged to compile newly published and other representative super-heavy element production cross sections. (WP2011-12)
C6 NRDC appreciates WPEC SG30 systematic assessment of the EXFOR contents and identification of compilation mistakes. (WP2011-17)
C7 NRDC appreciates the efforts of participants of Consultant Meeting on Neutron Source Spectra for EXFOR (13-15 April 2011) and other experimentalists who provided numerical neutron spectra for inclusion to the EXFOR library.
C8 NRDC recognizes the importance of compilation of neutron source spectra to utilize experimental spectrum averaged cross sections.

### Manuals and Dictionaries

C9 Revised EXFOR Formats Manual (IAEA-NDS-207 Rev.2011/01) and LEXFOR (IAEA-NDS-208 Rev.2011/01) have been approved. (WP2011-13)

### EXFOR, Technical

C10 TITLE must be coded as closely as possible to the title printed in the article. When English translation of the title is provided by the author or publisher, it must be adopted. (WP2011-25)
C11 NRDC does not recommend any rule to spell nuclides and mathematical expressions in free text. (WP2011-25)
C12 The LEXFOR entry for TOF covariance proposed in WP2011-27 was approved.
C13 The short nuclide codes for SF7 proposed in WP2011-28 were approved.
C14 A new branch code ISP (partial for intermediate state) in WP2011-29 was approved.
C15 Use of the specific spectrum temperatures (kT) for prompt fission neutron spectrum averaged cross sections proposed in WP2011-30 was approved.
C16 The proposal on consistency of unit codes (2 instead of –SQ, MU instead of MICRO- and MU-) was approved.
C17 Centres are recommended to submit BibTeX with each transmission tape. (WP2011-35)

### EXFOR Software

C18 NRDC appreciates development of X4 uploading system developed by Viktor Zerkin.
C19 NRDC recommends NDS to organize a workshop for EXFOR users.

## Actions

### EXFOR General

| | | |
|---|---|---|
| A1 | All | Correct erroneous entries listed on the EXFOR Feedback List on the NRDC web page according to indicated priorities. |
| A2 | Babykina<br>Mikhaylyukova<br>Semkova<br>Zerkin | Summarize and report recommendations on the EXFOR Compilation Control System by a memo with the EXFOR Workshop participants. (WP2011-08) |
| A3 | NDS | Assess the possibility of organizing a working group with the final goal to prepare a new experimental data library format |
| A4 | Otsuka | Provide EXFOR News when the EXFOR Master is updated. |
| A5 | Zerkin<br>Semkova | Make the following revisions on the EXFOR Compilation Control System and Webpage: (1) Addition of the first author field (trial for 1 year); (2) Removal of articles compiled in EXFOR from the web page; (3) Exclusion of transmission number from the compiler name field; (4) Rename of "Subject" and "Compiler" fields to "Projectile" and "Centre". |
| A6 | All | (Continuing action) Give high priority to compilation of papers from the ND2010 (Jeju, Korea) conference. (WP2011-09) |
| A7 | All | (Standing Action) Give highest priority to compiling new publications. |
| A8 | NDS | (Standing Action) Develop sensible means of communication of numerical data between authors and NRDC for the major journals. |

### Manuals and Dictionaries

| | | |
|---|---|---|
| A9 | Otsuka<br>Hlavač | Summarize proposals on change in dictionary 25 based on the Conclusion xx, and submit it as a memo. |
| A10 | Otsuka | Revise LEXFOR for TOF covariance (WP2011-27), new branch code ISP (WP2011-29), specific temperatures for prompt fission neutron spectrum averaged quantities (WP2011-30), and compilation of prompt fission neutron quantities (WP2011-31). |
| A11 | Otsuka | Revise EXFOR Formats Manual for short nuclide codes in SF7 (WP2011-28). |
| A12 | Otsuka | Consider distribution of preliminary dictionaries to suppress unnecessary error messages from checking programs. |

### CINDA

| | | |
|---|---|---|
| A13 | Dupont | (Continuing Action) Search for experimental and mixed entries in which the target is coded by MNY, and replace with individual isotope/compound entries as outlined in WP2008-36. |

| | | |
|---|---|---|
| A14 | Dupont | (Continuing Action) Correct errors detected during CINDA loading procedure, as described in WP2008-36. |
| A15 | Dupont | (Continuing Action) Correct all CINDA lines, as described in WP2009-30. |
| A16 | Zerkin | (Continuing Action) Regular export from EXFOR DB to CINDA. |
| A17 | Zerkin | (Continuing Action) Regular export from NSR to CINDA. |
| A18 | Zerkin | (Continuing Action) Periodically update the CINDA master file and distribute it to other Centres. |

**EXFOR Technical**

| | | |
|---|---|---|
| A19 | All | (Continuing Action) Revise remaining upper case entries with other necessary corrections as time permits. (WP2011-05) |
| A20 | Hlavač<br>Schwerer | (Continuing Action) Delete duplication from area 1, C and L (C1665, C1676, C1679, C1719, C1724 and L0144) according to the third proposal in the WP2010-14. (WP2011-06) |
| A21 | Schwerer<br>Dupont<br>Mikhaylyukova | Revise prompt fission neutron spectra (PFNS) entries listed in WP2011-11 before the next IAEA CRP (December 2011) on this subject. Highest priority must be given to U-235 and Pu-239 PFNS. |
| A22 | Babykina<br>Makinaga | Replace element symbols of asterisk in REACTION SF4 with approved ones for elements Z≤112 (Entry A0054, E2054). (WP2011-12) |
| A23 | Hlavač<br>Dupont<br>Semkova<br>Taova<br>Makinaga | Compile neutron source spectra listed in WP2011-13. |
| A24 | Hlavač<br>Otsuka<br>Varlamov | Compile nuclear resonance fluorescence data listed in WP2011-14 and other relevant data. |
| A25 | Hlavač<br>Dupont<br>Semkova<br>Mikhaylyukova | Assess neutron cross section data useful for standard evaluation listed in WP2011-15 and compile them when appropriate. |
| A26 | Schwerer<br>Dupont<br>Babykina<br>Taova<br>Varlamov | Revised entries listed by the WPEC SG30 (http://www-nds.iaea.org/nrdc/error/exfor_err3.html) in areas 1, 2, A, C, F and M as soon as possible. (WP2011-16) |
| A27 | Dupont | Provide NDS lists of erroneous and suspicious outliers by using the new statistical approach being developed when available. (WP2011-17) |
| A28 | Otsuka | Assess the JANIS Import Log provided by N. Soppera (WP2011-18) and register relevant mistakes to the EXFOR Feedback List. |
| A29 | Gritzay<br>Otsuka<br>Simakov<br>Semkova<br>Zerkin | Finalize discussion on compilation of neutron spectra (WP2011-22) with other centres and submit summary of discussion as a memo by November 2011. |

| | | |
|---|---|---|
| A30 | Otsuka | Assess the report on incorrect authors' name reported by M. Bossant (WP2011-24), and add relevant mistakes to the EXFOR Feedback List. |
| A31 | Bossant | (Continuing Action) Send list of incorrect authors' names and titles to NRDC participants (WP2011-24). |
| A32 | Dupont<br>Otsuka<br>Mikhaylyukova<br>Babykina<br>Taova<br>Varlamov | Add English translation information of Atomnaya Energiya under REFERENCE as listed in WP2011-26. |
| A33 | Babykina | Provide a list of English translation information of Russian journals (e.g., YF, IZV). (WP2011-26) |
| A34 | NDS | Prepare a consolidated solution on the EXFOR format for covariance data coded under the keyword COVARIANCE (WP2011-32rev and 40). |
| A35 | Mikhaylyukova | Include the Actions 45 and 46 of the 2010 NRDC Meeting summary in the Guide for EXFOR Compilers. |
| A36 | All | (Continuing Action) Make corrections of entries for averaged kinetic energy and most probable kinetic energy, mass and charge listed in WP2010-31 as time permits. |
| A37 | Dupont | (Continuing Action) Distribute JANIS–TRANS Checker Log list on every preliminary TRANS-file. |
| A38 | Otsuka | (Continuing Action) Review the various types of gamma spectra in EXFOR, as well as the related quantities and units. |
| A39 | Otsuka | (Continuing Action) Update Dictionaries every four months. |
| A40 | Zerkin | (Continuing Action) Further develop EXFOR+ (interpreted/extended EXFOR format). |
| A41 | Zerkin | (Continuing Action) Every four months produce an EXFOR distribution with (a) full Dictionary distribution; (b) EXFOR in C4 and XC4 format; (c) Dictionaries in MS Access; (d) X4Map and X4Archive. |
| A42 | Zerkin | (Continuing Action) Generate and distribute list of errors to NRDC after every new EXFOR Master File creation. |
| A43 | Zerkin | (Continuing Action) Include DOI in EXFOR DB as defined in WP2009-25. |
| A44 | Zerkin | (Continuing Action) Development of a new database encompassing correction factors and relevant comments for suspect/erroneous data (X4-evaluated) presented in WP2010-19; keep NRDC informed about conclusions of discussions on new database. |
| A45 | Zerkin | (Continuing Action) Add hyperlink on the main EXFOR page to the EXFOR User Manual. |
| A46 | All | (Standing Action) When report codes in Dictionary 6, which differ significantly from what is shown on the report cover are found, then submit additional explanation to NDS for inclusion. |

**EXFOR software**

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|---|---|---|
| A47 | NDS | Assess potential problems (copyright) caused by opening an authorized access to the NDS collection of pdf articles proposed in |

| | | |
|---|---|---|
| | | WP2011-35. |
| A48 | JCPRG | Continue development and testing of the digitizing software GSYS in cooperation with NDS and other centres. |
| A49 | NEA DB | Continue development and testing of the JANIS –TRANS Checker in cooperation with NDS and the other centres. |
| A50 | Pikulina<br>Taova<br>Zerkin | Propose revision of "EXFOR processing and retrieval codes" in the NRDC Protocol for future co-operation in software development between centres. |
| A51 | Pikulina<br>Zerkin | Study the possibility of including X4+ converter code into the EXFOR-Editor in a form of independent executable module. |
| A52 | Zerkin | Develop the program to generate X4+ from a standalone EXFOR entry. |
| A53 | Zerkin | Update ZCHEX based on comments from compilers (e.g., WP2011-36) as time permits. |
| A54 | Zerkin | Continue development of the EXFOR upload web tool. |
| A55 | All | (Continuing Action) Provide feedback to NDS on the existing CHEX version (on bugs as well as desired additions). |
| A56 | CNPD | (Continuing Action) Continue development and testing of the EXFOR-Editor in cooperation with NDS and other data Centres, taking into account compilers' remarks. |

**Appendix D**

## LIST OF PROGRESS REPORTS

| Number | Title | Presented by |
|---|---|---|
| P2011-01 | Status Report of JAEA Nuclear Data Center | T. Fukahori |
| P2011-02 | Activity of CAJaD | S. Babykina |
| P2011-03 | Ukrainian Nuclear Data Centre Progress Report, 2010/11: Summary of Nuclear Data Studies by Staff of the Ukrainian Nuclear Data Centre | O. Gritzay |
| P2011-04 | MSU SINP CDFE 2010/2011 progress report | V. Varlamov |
| P2011-05 | CJD Progress Report | M. Mikhaylyukova |
| P2011-06 | IAEA Nuclear Data Section: Progress Report, 2010/11: Summary of Nuclear Data Activity by Staff of the IAEA Nuclear Data Section April 2010 – May 2011 | S.P. Simakov |
| P2011-07 | Japan Nuclear Reaction Data Centre (JCPRG) Progress Report | K. Kato |
| P2011-08 | Progress Report: Nuclear Reaction Data Group at ATOMKI | S. Takacs |
| P2011-09 | Center of Nuclear Physics Data (CNPD), RFNC-VNIIEF | S. Taova |
| P2011-10 | NEA Data Bank Progress Report 2010-2011 | N. Soppera |
| P2011-11 | 2010/11 Status Report of China Nuclear Data Center | Ge Zhigang |
| P2011-12 | Nuclear Data Evaluation Lab. (NDEL) of Korea Atomic Energy Research Institute (KAERI) | S.C. Yang |

Note: These progress reports are available online: http://www-nds.iaea.org/nrdc/nrdc_2011/.

**Appendix E**

## LIST OF WORKING PAPERS

| Number | Title | Presented by |
|---|---|---|
| WP2011-01 | Conclusions and action of the 2010 NRDC Meeting | |
| WP2011-02 | New and revised entries/subentries since the 2010 NRDC Meeting | V. Semkova |
| WP2011-03 | Statistics of checking the preliminary files | V. Semkova |
| WP2011-04 | Status of new articles compilation (A4) | V. Semkova |
| WP2011-05 | Status: Retransmission of old entries (A13) | V. Semkova |
| WP2011-06 | Duplication in area 1, C and L (A26) | V. Semkova |
| WP2011-07 | Status of scanned journals (A11) | V. Semkova |
| WP2011-08 | Suggestion to EXFOR Compilation Control Database (4C-4/187) | M. Mikhaylyukova |
| WP2011-09 | ND2010 Conf. Proc. Publication (A6, CP-D/702, 4C-4/190) | N. Otsuka<br>M. Mikhaylyukova |
| WP2011-10 | Report from Technical Meeting on Neutron Cross Section Covariances | N. Otsuka |
| WP2011-11 | Correction of prompt fission neutron spectrum entries (CP-D/701 Rev.) | N. Otsuka |
| WP2011-12 | Super-heavy element production cross section | N. Otsuka |
| WP2011-13 | Compilation of Light-Ion Induced Neutron Spectra for Application (CP-D/700) | S. Simakov |
| WP2011-14 | Data needs for nuclear resonance florescence (CP-D/703) | S. Simakov |
| WP2011-15 | Compilation of experimental data for standard cross section evaluation (CP-D/699) | V. Semkova |
| WP2011-16 | Review of feedback list with new flags (A7, A41,A49, CP-D/697) | N. Otsuka |
| WP2011-17 | Follow-up of WPEC Subgroup 30 activities on quality improvement of the EXFOR database (A23) | E. Dupont |
| WP2011-18 | JANIS Import Log (A24) | N. Soppera |
| WP2011-19 | EXFOR DB error report (A18) | V. Zerkin |
| WP2011-20 | Updated manuals | N. Otsuka |
| WP2011-21 | (Number not assigned) | |

| | | |
|---|---|---|
| WP2011-22 (Rev.2) | Storage of numerical neutron source spectra (A25) | O. Grizay |
| WP2011-23 | Length of EXFOR transmission records (CP-D/645) | O. Schwerer |
| WP2011-24 | Incorrect authors' name (A53) | M. Bossant |
| WP2011-25 | Spelling of nuclides and mathematical expression in free text (A54) | M. Bossant |
| WP2011-26 | Addition of English translation (Atomnaya Energiya) | S. Babykina |
| WP2011-27 | LEXFOR entry for covariances in the AGS Format (A51, CP-D/680) | N. Otsuka |
| WP2011-28 | Short nuclide code for SF7 (CP-D/648) | N. Otsuka |
| WP2011-29 | Reaction products unstable against prompt particle decay (CP-D/646) | N. Otsuka |
| WP2011-30 | Characteristic energy for prompt fission neutron spectrum (CP-D/675) | N. Otsuka |
| WP2011-31 | Fission quantity correlated with kinetic energy | N. Otsuka |
| WP2011-32 (Rev.) | Coding of partial uncertainties and correlation matrices | N. Otsuka |
| WP2011-33 | EXFOR News | N. Otsuka |
| WP2011-34 | Automatic DOI number creation (A9, CP-D/698) | N. Otsuka |
| WP2011-35 | Automatic addition DOI to EXFOR entries: to do or not to do? Collection of PDF and BibTeX for papers referenced in EXFOR. (A10) | V. Zerkin |
| WP2011-36 | Comments on CHEX (4C-4/189, CP-A/172) | M. Mikhaylyukova S. Babykina |
| WP2011-37 | Report on JANIS-TRANS Checker (A62) | N. Soppera |
| WP2011-38 | Development of software for input and editing of experimental data in EXFOR format - New version of the EXFOR Editor (A60) | G. Pikulina |
| WP2011-39 | Experience of software development cooperation and proposals on its facilitation | G. Pikulina |
| WP2011-40 | Coding of covariance data in EXFOR convenient for software | V. Zerkin |
| WP2011-41 | Web tool for constructing a covariance matrix from EXFOR uncertainties | V. Zerkin |
| WP2011-42 | Status of CINDA database in the IAEA-NDS | V. Zerkin |
| WP2011-43 | EXFOR database updates | V. Zerkin |

Note: These working papers are available online: http://www-nds.iaea.org/nrdc/nrdc_2011/ .

**Appendix F**

## LIST OF PRESENTATIONS

| TITLE | Presented by |
|---|---|
| NNDC Report to NRDC on EXFOR Activities | S. Hlavač |
| NEA Data Bank Progress Report 2010 – 2011 | N. Soppera |
| Russian Nuclear Data Center (CJD IPPE, Obninsk ) | M. Mikhaylyukova |
| 2010/11 Status Report of China Nuclear Data Center | Ge Zhigang |
| Progress Report, NRDC Meeting 23-24 May 2011, Vienna | S.M. Takacs |
| EXFOR compilations under the auspices of the newly formed Nuclear Data Physics Centre of India (NDPCI) | S. Ganesan |
| Center of Nuclear Physics Data | S. Taova |
| Ukrainian Nuclear Data Centre Progress Report | O. Gritzay |
| Report from WPEC SG30 (A23) | N. Soppera |
| Storage of numerical neutron source spectra (Action 25) | O. Gritzay |
| EXFOR Dictionary 25 – units | S. Hlavač |
| EXFOR Formats for Partial Uncertainties and Covariances | N. Otsuka |
| EXFOR-EDITOR Development | G. Pikulina |
| Experience of Software Development Cooperation and Proposals on its facilitating | G. Pikulina |
| Status of the EXFOR Entry transmission 2010/2011 | V.M. Semkova |
| Compilation of Experimental Data for Standard Cross Sections Evaluation | V.M. Semkova |
| Report on Consultancy Meeting (CM) "Neutron Sources Spectra for EXFOR" | S.P. Simakov |
| Compilation of Nuclear Resonance Fluorescence (NRF) Data | S.P. Simakov |
| JANIS Import Log | N. Soppera |

Note: These presentations are available online: http://www-nds.iaea.org/nrdc/nrdc_2011/ .

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