

## Revised Network Document (A11-A12)

(N. Otsuka, 2014-04-23)

There have been the following two actions from the NRDC 2013 Meeting:

*A11 Centre Heads (Continuing action): Send comments on the Network document to Otsuka by the end of December 2013 to prepare the next update to be reviewed and signed at the NRDC 2014 Meeting.*

*A12 Otsuka (Continuing action) Update the Network document following the comments from Centre Heads.*

I received comments from Centre Heads, and revised the Network Document accordingly. This working paper gives an extraction from the revised draft. The table of contents, Centre's address (Annex 1) and activity (Annex 2) are not in this working paper, but the full version will be circulated during this meeting for review, corrections and signature by Centre Heads.

# International Network of Nuclear Reaction Data Centres

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## Abstract

The activities of **thirteen** nuclear data centres are summarized, and their cooperation under the auspices of the International Atomic Energy Agency is described. Each of the centres provides coverage for different geographical zones and/or specific types of nuclear data, thus together providing a complete service for users worldwide. The International Network of Nuclear Reaction Data Centres (NRDC) was established with the objective of providing nuclear physics databases that are required for nuclear technology (encompassing energy and non-energy applications) by coordinating the collection, compilation and dissemination of nuclear data on an international scale.

## Preface

The objectives, goals and working arrangements of the International Network of Nuclear Reaction Data Centres (NRDC) are summarized, according to the conclusions of the IAEA Technical Meeting on the International Network of Nuclear Reaction Data Centres, **6-9 May 2014, Smolenice, Slovakia**.

The purpose and mission of the Network are described in the introductory pages.

Contact addresses of the centres are given in Annex 1.

Lists of the complete activities of each centre are described in Annex 2. Note: only a part of each centre's overall work relates directly to their NRDC Network contribution.

Details of the working arrangements are given in Annex 3.

The contents of this "living" document will be revised as necessary:

**I**ntroductory material will be reviewed biennially at each Network meeting;

Annex 1 (Addresses) will be updated by the IAEA Nuclear Data Section (NDS) as required;

Overall activities of each centre are described in Annex 2, and will be revised on the initiative of the data centres, after review by the Network;

Annex 3 will be reviewed annually.

The first version of this document was drafted at an IAEA Consultants' Meeting dedicated to this purpose from 31 October - 1 November 1994, approved at the Technical Meeting of the Nuclear Reaction Data Centres, Vienna, 2-4 May 1995, and printed as report INDC(NDS)-324 in August 1995.

# International Network of Nuclear Reaction Data Centres

## 1. Introduction

The International Network of Nuclear Reaction Data Centres (NRDC) constitutes a worldwide cooperation of nuclear data centres under the auspices of the International Atomic Energy Agency. The NRDC Network was established to coordinate the world-wide collection, compilation and dissemination of nuclear reaction data. This document has been produced jointly by the Heads of the cooperating Data Centres to describe the overall activities of each Centre and their commitments to the NRDC Network. The contents will be amended as necessary by the Data Centre Heads at their regular biennial meetings.

## 2. Nuclear Data

Nuclear data are essential to the development and application of all nuclear sciences and technologies. These data are conventionally separated into two types, namely properties of a nucleus interacting with radiation or another nucleus called *nuclear reaction data*, and properties of single nuclei called *nuclear structure and radioactive decay data*. As defined, the term “nuclear data” includes numerical and related bibliographic data, along with descriptive documentation.

Two international nuclear data networks operate under the auspices of the IAEA: the International Network of Nuclear Reaction Data Centres (NRDC), as described in the present document, and the International Network of Nuclear Structure and Decay Data (NSDD) Evaluators, see IAEA report INDC(NDS)-421.

The scope of the International Network of Nuclear Reaction Data Centres includes nuclear data required for both energy and non-energy applications, as well as for basic nuclear science. Applications of these nuclear data are numerous, and include nuclear energy development (both fission and fusion), nuclear medicine, process control in manufacturing, material identification using activation analysis, accelerator design and shielding, environmental monitoring, nuclear waste management, nuclear material disposal, space radiation shielding, **basic science**, and design of detectors and physics experiments.

## 3. The NRDC Network

Nuclear data centres provide the essential link between the producers and users of nuclear data. The International Network of Nuclear Reaction Data Centres (NRDC) has been established to organize these important preparative and communication activities on an international scale, with the objective of providing the desired nuclear data to users in a convenient and readily-available form. Customer services represent the cornerstone of this Network, which organizes the tasks of collecting, compiling, standardizing, storing, assessing and distributing the vast amounts of nuclear data that exist already and **that** will be produced and needed in the future. Only through the international cooperation of interested groups of scientists in different countries and organizations can the provision of recommended high-quality nuclear data be realized, avoiding duplication of effort and maximizing the use of specialized expertise at each of the cooperating centres.

The NRDC Network is coordinated through regular meetings organized by the IAEA Nuclear Data Section and through direct communication among the centres. Rules and procedures for the compilation and exchange of data files and agreements on work sharing, amongst the centres associated with data acquisition and services to customers, are determined during these Network meetings.

The centres' activities and responsibilities are described in the various annexes. Each centre has agreed to assume responsibility for one or more tasks within the Network for which they have both unique expertise and resources. Information collected or produced in any participating centre will be available without restriction to any of the other centres that are party to the agreement. This information will be available cost-free to all customers of each centre in the Network.

#### **4. Objectives and Tasks**

The primary goal of the Network is the dissemination of nuclear reaction data and associated documentation to users. The following specific tasks must be carried out in order to accomplish this important aim:

- compilation of relevant bibliographic information;
- compilation of experimental nuclear reaction data;
- collection of evaluated nuclear reaction data;
- exchange of nuclear reaction data of all types;
- promotion of the development of special purpose evaluated data files;
- development of common formats for computerized exchange of nuclear data;
- coordinated development of computer software for managing and disseminating nuclear data;
- coordination of the development and dissemination of end-user software for both on-line and local access to nuclear data;
- documentation of current and future data needs in order to be able to meet changing user demands.

#### **5. Data Evaluations**

All members of the NRDC Network recognize the importance of separately coordinated nuclear data evaluation activities. Furthermore, the availability of evaluated nuclear data files is essential in order to fulfil the responsibilities of the Network to the world-wide user community. The Network members appreciate the efforts of the Working Party on International Nuclear Data Evaluation Co-operation (WPEC), a working group - hosted by the OECD Nuclear Energy Agency - involved in the coordination of many national and regional evaluation projects, whose activity is complementary to the Network's tasks on evaluated data as outlined above ([Section 4](#)).

#### **6. Nuclear Reaction Data Centres**

##### **6.1 Core Centres**

The resulting arrangements recognize the special status of the "Core" Centres:

- National Nuclear Data Center (NNDC), Brookhaven National Laboratory, Upton, USA (see Annex 2.1);
- OECD Nuclear Energy Agency Data Bank (NEA DB), Paris, France (see Annex 2.2);
- International Atomic Energy Agency Nuclear Data Section (NDS), Vienna, Austria (see Annex 2.3);
- Russia Nuclear Data Centre (CJD), Institute of Physics and Power Engineering, Obninsk, Russian Federation (see Annex 2.4);

that provide coordinated, world-wide customer services covering the entire range of nuclear data described herein. These Core Centres also provide comprehensive compilations of experimental neutron reaction data and related bibliographic information.

## 6.2 Regional, National and Specialized Centres

Regional, national and specialized centres:

- MSU SINP Centre for Photonuclear Experiments Data (CDFE), Moscow, Russian Federation (see Annex 2.5);
- China Nuclear Data Centre (CNDC), China Institute of Atomic Energy, Beijing, China (See Annex 2.6);
- Hokkaido University Nuclear Reaction Data Centre (JCPRG), Hokkaido University, Sapporo, Japan (see Annex 2.7);
- JAEA Nuclear Data Center (**JAEA/NDC**), Japan Atomic Energy Agency, Tokai-mura, Japan (see Annex 2.8);
- ATOMKI Charged-Particle Nuclear Reaction Data Group, Institute for Nuclear Research, Hungarian Academy of Science, Debrecen, Hungary (see Annex 2.9);
- Ukraine Nuclear Data Centre (UkrNDC), Institute for Nuclear Research, Kyiv, Ukraine (see Annex 2.10);
- Centre of Nuclear Physics Data (CNPD), RFNC-VNIIEF, Sarov, Russian Federation (see Annex 2.11);
- KAERI Nuclear Data Center (KNDC), Korea Atomic Energy Research Institute, Daejeon, Korea (see Annex 2.12);
- Nuclear Data Physics Centre of India (NDPCI), India (see Annex 2.13)

provide essential complementary functions to the Core Centres by assuming particular responsibility for the collection and dissemination of data of a specialized type or application.

## 7. Working Arrangements

The working arrangements for the compilation and exchange of nuclear reaction data are summarized in **Annex 3 (Summary of NRDC Protocol)**. As agreed in May 2002, the NDS assumes responsibility for the coordination of the NRDC Network compilation activities. Thus, the NDS will

- (a) assign clear responsibilities for the creation and correction of data compilations, and drive these activities forward,
- (b) ensure implementation of compilation rules,
- (c) decide on all issues relating to dictionary codes,
- (d) be responsible for CINDA and EXFOR distribution to the other data centres,
- (e) be responsible for central EXFOR Web Service and EXFOR Master file central storage.

## **Annex 3**

### **Summary of NRDC Protocol (2014)**

Approved at 2002 NRDC Meeting held at NEA DB, Paris, 27-30 May 2002.

Reviewed and amended at the 2003 NRDC Meeting held at Vienna, 17-19 June 2003.

Reviewed and amended at the 2010 NRDC Meeting held at Sapporo, 20-23 April 2010.

Reviewed and amended at the 2014 NRDC Meeting held at Smolenice, 6-9 May 2014.

The Nuclear Data Section (NDS) will assume a more pro-active role coordinating all Nuclear Reaction Data Centres (NRDC). NDS staff will be responsible in this extended role for ensuring that data compilations are undertaken and completed in an efficient, productive and timely manner. Thus, the role of NDS will be as follows:

- (a) assign clear responsibilities for the creation and correction of data compilations, and drive these activities forward;
- (b) ensure implementation of compilation rules;
- (c) decide on all issues relating to dictionary codes;
- (d) be responsible for CINDA and EXFOR distribution to the other data centres;
- (e) be responsible for central EXFOR Web Service and EXFOR Master file central storage.

#### **1. Compilation responsibilities**

NDS will assign areas of responsibility for data compilation. If a centre assigned a particular area of compilation (e.g., neutron data from a country or countries)<sup>1</sup> does not **carry** out their responsibilities (i.e., compile all new data for that area in a timely manner), the NDS coordinator will re-assign all or part of those responsibilities to another volunteer centre.

A centre responsible for an area of compilation may agree with another network centre to share the compilation work for that area on a regular basis. However, the responsibility for coverage and quality of the compilation remains with the responsible centre.

Compilation responsibilities as assigned by NDS are given in NRDC Protocol, **Appendix C** (IAEA-NDS-215 Rev.2014/05, May 2014).

#### **2. Decisions concerning compilation rules and new quantities**

Final decisions on proposals concerning compilation rules and new quantities can be made with Core Centre<sup>2</sup> agreement after discussions among all centres. NDS will be the final arbiter in case the Core Centres are unable to reach a decision.

#### **3. Decisions concerning dictionary codes**

NDS will be the final arbiter for all decisions concerning dictionary codes (see also Section 2, above).

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<sup>1</sup> An area may be defined in terms of a given projectile or set of projectiles, for a given country or group of countries, for a given data type or data types, or for any combination of these.

<sup>2</sup> Core centres will be defined by NDS, based on contributions to the network and user service capabilities.

#### **4. EXFOR/CINDA transmissions**

All preliminary and final EXFOR and CINDA transmissions will be sent to NDS, who will be responsible for distributing all final transmissions.

#### **5. Corrections to EXFOR/CINDA entries**

NDS may correct or assign volunteers to correct preliminary transmissions, that have not been corrected and resubmitted as final transmissions in a timely manner.

#### **6. Urgent compilation needs**

If a centre requires a particular data set to be compiled immediately, the centre should send a request to the responsible centre with a copy to NDS. If the responsible centre cannot compile the data to the timetable requested, the requesting centre may compile the data as an area Z entry. This entry will be sent to both the original responsible centre and NDS. If the responsible centre does not intend entering the data in a timely fashion, the NDS may transmit the new Z entry to all centres. The responsible centre can subsequently delete the Z entry, if they are able to replace the earlier compilation with their own entry for their area.

#### **7. Corrections to entries compiled at another centre**

Notification of errors found in entries originating from another centre should be communicated to all centres. The NDS should make sure corrections are undertaken in a timely manner. If they are not, the coordinator will request one of the other centres to submit the corrected entries.

#### **8. Maintenance of the Master File**

NDS will maintain and distribute the EXFOR and CINDA Master file.

#### **9. Problematic entries**

Problematic entries which had to be removed from a preliminary transmission can be put into a special subdirectory of the NDS open area. These entries will be reviewed by the other centres and can be finalized at the next NRDC meeting.

#### **10. NDS staff**

Naohiko Otsuka (NDS) has been appointed coordinator of the NRDC Network.

#### **Notes**

a) As a consequence of the above, the link between the geographical area of the Institute and the accession number, which has been in place for all neutron data, is no longer obligatory and may be lifted in certain cases. Similarly, for corrections to entries of another centre according to Section 7 above, entries of different accession number areas can be transmitted on the same TRANS file.

b) This protocol will be reviewed at each NRDC meeting.