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IAEA
International Atomic Energy Agency

INDC
INTERNATIONAL NUCLEAR DATA COMMITTEE

Summary Report of the Technical Meeting on

International Network of Nuclear Reaction Data Centres

IAEA Headquarters, Vienna, Austria

14 – 17 May 2024

Prepared by

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and

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August 2024

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Abstract

This report summarizes the IAEA Technical Meeting on the International Network of Nuclear Reaction Data Centres held at the IAEA Headquarters in Vienna, Austria from 14 to 17 May 2024. The meeting was attended by 26 participants representing 13 cooperative Centres from eight Member States (China, Hungary, India, Japan, Korea, Russia, Ukraine and USA) and two International Organisations (NEA, IAEA). A summary of the meeting is given in this report along with the conclusions and actions.

Technical Meeting on International Network of Nuclear Reaction Data Centres
IAEA Headquarters, Vienna, Austria, 14 – 17 May 2024

From the left

Viktor Zerkin, Ukraine
Jimin Wang, China
Nengchuan Shu, China
Sandor Takács, Hungary
Otto Schwerer, Austria
Kosuke Nomura, Japan
Olena Gritzay, Ukraine
Boris Pritychenko, USA
Naohiko Otsuka, IAEA
Arjan Koning, IAEA
Atsushi Kimura, Japan
Vidya Devi, India
Julia Sprenger, OECD
Sung Chul Yang, Korea

Remote participants (from the top)

Svetlana Dunaeva, Russia
Vladimir Varlamov, Russia
Sophiya Taova and Galina Pikulina, Russia
Marina Mikhailiukova, Russia

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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 National Laboratory, Upton, USA
NEA DB	OECD NEA Data Bank, Boulogne-Billancourt, France
NDS	IAEA Nuclear Data Section, Vienna, Austria
CJD	Russian Nuclear Data Centre, Institute of Physics and Power Engineering, Obninsk, Russia
CNDC	China Nuclear Data Centre, China Institute of Atomic Energy, Beijing, China
ATOMKI	Charged-Particle Nuclear Reaction Data Group, Institute for Nuclear Research (ATOMKI), Debrecen, Hungary
NDPCI	Nuclear Data Physics Centre of India, Bhabha Atomic Research Centre, Trombay, Mumbai, India
JAEA/NDC	Nuclear Data Center, Japan Atomic Energy Agency, Tokai-mura, Japan
JCPRG	Nuclear Reaction Data Centre, Hokkaido University, Sapporo, Japan
KNDC	Nuclear Data Center, Korea Atomic Energy Research Institute, Daejeon, Republic of Korea
CDFE	Centre for Photonuclear Experiments Data, Moscow State University, Moscow, Russia
CNPD	Centre of Nuclear Physics Data, Institute of Nuclear and Radiation Physics, Russian Federal Nuclear Center –All-Russia Research Institute of Experimental Physics, Sarov, Russia
UkrNDC	Ukrainian Nuclear Data Centre, Institute for Nuclear Research, Kyiv, Ukraine

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.6), "International Network of Nuclear Reaction Data Centres".

PREVIOUS NRDC MEETINGS

Vienna, 14-17 May 2024	Technical	INDC(NDS)-0902
Vienna, 9-12 May 2023	Centre Heads + Technical	INDC(NDS)-0879
Vienna, 14-17 June 2022	Technical	INDC(NDS)-0857
Virtual, 4-7 May 2021	Technical	INDC(NDS)-0829
Vienna, 9-12 April 2019	Technical	INDC(NDS)-0792
Bahadurgarh, 1-4 May 2018	Centre Heads + Technical	INDC(NDS)-0762
Vienna, 23-26 May 2017	Technical	INDC(NDS)-0736
Beijing, 7-10 June 2016	Centre Heads + Technical	INDC(NDS)-0718
Vienna, 21-23 April 2015	Technical	INDC(NDS)-0686
Smolenice, 6-9 May 2014	Centre Heads + Technical	INDC(NDS)-0661
Vienna, 23-25 April 2013	Technical	INDC(NDS)-0633
Paris, 16-19 April 2012	Centre Heads + Technical	INDC(NDS)-0618
Vienna, 23-24 May 2011	Technical	INDC(NDS)-0593
Sapporo, 20-23 April 2010	Centre Heads + Technical	INDC(NDS)-0573
Vienna, 25-26 May 2009	Technical	INDC(NDS)-0558
Obninsk+Moscow 22-25 Sept. 2008	Centre Heads + Technical	INDC(NDS)-0536
Vienna, 8-10 October 2007	Technical	INDC(NDS)-0519
Vienna, 25-28 September 2006	Centre Heads + Technical	INDC(NDS)-0503
Vienna, 12-14 October 2005	Technical	INDC(NDS)-0480
Brookhaven, 4-7 October 2004	Centre Heads + Technical	INDC(NDS)-464
Vienna, 17-19 June 2003	Technical	INDC(NDS)-446
Paris, 27-30 May 2002	Centre Heads + Technical	INDC(NDS)-434
Vienna, 28-30 May 2001	Technical	INDC(NDS)-427
Obninsk, 15-19 May 2000	Centre Heads + Technical	INDC(NDS)-418
Vienna, 18-20 May 1999	Technical	INDC(NDS)-407
Vienna, 11-15 May 1998	Centre Heads + Technical	INDC(NDS)-383
Vienna, 26-28 May 1997	Technical	INDC(NDS)-374
Brookhaven, 3-7 June 1996	Center Heads + Technical	INDC(NDS)-360
Vienna, 2-4 May 1995	Technical	INDC(NDS)-343
Paris, 25-27 April 1994	Center Heads + Technical	INDC(NDS)-308
Vienna, 1-3 Sept 1992	Technical	INDC(NDS)-279
Obninsk, 7-11 Oct 1991	Center Heads + Technical	INDC(NDS)-0262
Vienna, 13-15 Nov 1990	Technical	Memo CP-D/210
Vienna, 2-4 Oct 1989	Centre Heads + Technical	Memo CP-D/200
Vienna, 4-6 Oct 1988	Technical	Memo CP-D/190
Brookhaven, 27-29 Oct 1987	Center Heads + Technical	INDC(NDS)-204
Vienna, 7-9 Oct 1986	Technical	Memo CP-D/159
Saclay, 9-11 Oct 1985	Center Heads + Technical = 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	INDC(NDS)-99
Kiev, 11-16 April 1977	2nd NRDC Meeting = 3rd CPND + 13th 4-C	INDC(NDS)-90
Vienna, 28-30 April 1976	2nd CPND Meeting	INDC(NDS)-77
Vienna, 26-27 April 1976	12th 4C-Meeting	INDC(NDS)-78
Vienna, 8-12 Sept 1975	CPND Meeting	INDC(NDS)-69+71
Brookhaven, 10-14 March 1975	11th 4C-Meeting	INDC(NDS)-68
Paris, 6-10 May 1974	10th 4C Meeting	INDC(NDS)-58
Vienna, 24-26 April 1974	CPND + PhotoND	INDC(NDS)-59+61
Moscow/Obninsk, 4-8 June 1973	9th 4C Meeting	INDC(NDS)-54
Vienna, 16-20 Oct 1972	8th 4C Meeting	INDC(NDS)-51
Brookhaven, 25-29 Oct 1971	7th 4C Meeting	INDC(NDS)-41
Paris, 5-9 Oct 1970	6th 4C Meeting	INDC(NDS)-28
Moscow, 17-21 Nov 1969	5th 4C Meeting	INDC(NDS)-16

LIST OF ACRONYMS

ATOMKI	Nuclear Research Institute, Debrecen, Hungary
BARC	Bhabha Atomic Research Centre, Trombay, Mumbai, India
C4	Computational format for EXFOR data
C5	Extended computational format for EXFOR data using ENDF MF.MT classification
CDFE	Centr Dannykh Fotojad. Eksp., Moscow State University, Russia
CENDL	Chinese Evaluated Neutron reaction Data Library
CHEX	EXFOR check program (originating from NNDC)
CIAE	Chinese Institute of Atomic Energy, Beijing, China
CINDA	Computer Index of Nuclear Reaction Data
CJD	Russian Nuclear Data Centre, IPPE, Obninsk, Russia
CNDC	China Nuclear Data Centre, CIAE, Beijing, China
CNPD	Centre of Nuclear Physics Data, Russian Federal Nuclear Centre, 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
ENDF-6	International format for evaluated data exchange, version 6
ENDF/B	US Evaluated Nuclear Data File/B
ENSDF	Evaluated Nuclear Structure Data File
EXFOR	Format for the international exchange of nuclear reaction data
GSYS	Data digitizing system by JCPRG
IAEA	International Atomic Energy Agency, Vienna, Austria
IBANDL	Ion Beam Analysis Nuclear Data Library, maintained at IAEA
INDC	International Nuclear Data Committee
IPPE	Institute of Physics and Power Engineering, Obninsk, Russia
IRDFF	International Reactor Dosimetry and Fusion File, maintained by the IAEA-NDS
JAEA	Japan Atomic Energy Agency
JANIS	Java Nuclear Information System of NEA-DB
JCPRG	Nuclear Reaction Data Centre, Hokkaido University, Sapporo, Japan
JEFF	Joint Evaluated Fission and Fusion File, coordinated by NEA-DB

JENDL	Japanese Evaluated Nuclear Data Library
KNDC	Nuclear Data Center, Korea Atomic Energy Research Institute Daejeon, Korea
LEXFOR	Part of the EXFOR manual containing physics information for compilers
NDS	IAEA Nuclear Data Section, Vienna, Austria
NEA	OECD Nuclear Energy Agency, Boulogne-Billancourt, France
NNDC	National Nuclear Data Center, Brookhaven National Laboratory, USA
NRDC	International Network of Nuclear Reaction Data Centres
NRDF	Japanese Nuclear Reaction Data File
NSDD	International Network of Nuclear Structure and Decay Data Evaluators
NSR	Nuclear Science References, a bibliographic system
ORDER	EXFOR program for addition of record identification
PhND	Photonuclear data
RIKEN	Institute of Physics and Chemistry Research, Wako-Shi, Saitama, Japan
TRANS	Name of transmission tapes for data exchange in the EXFOR system
UKRNDC	Ukraine Nuclear Data Centre, Kyiv Institute of Nuclear Research, Ukraine
WPEC	Working Party on International Nuclear Data Evaluation Co-operation
XTRACT	EXFOR indexing program
X4PRO	X4Pro Universal, fully relational EXFOR database (professional edition)
X4TOC4	Conversion program from EXFOR to computational format “C4”
X5	JSON format for extended presentation of EXFOR data in original and computational form together with dictionaries and data for automatic renormalization
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

This report summarizes the IAEA Technical Meeting on the International Network of Nuclear Reaction Data Centres held at the IAEA Headquarters in Vienna, Austria from 14 to 17 May 2024. The meeting was attended by 26 participants representing 13 cooperative Centres from eight Member States (China, Hungary, India, Japan, Korea, Russia, Ukraine and USA) and two International Organisations (NEA, IAEA) (see **Appendix A**). Meetings of this network are held annually, with full meetings involving Centre Heads and technical staff every two years. (The last full meeting was held in May 2023 at the IAEA Headquarters.)

Main topics of the present meeting were various statistics, manuals and dictionaries, compilation needs, quality control, coding rules as well as software and dissemination (see **Appendix B**). The participants summarized the results of the discussions in 50 conclusions and 77 actions (see **Appendix C**).

2. Brief Summary

2.1 Opening

A. Koning welcomed the participants. **B. Pritychenko** was elected as the chairperson, and the agenda was adopted.

2.2 Progress Reports

Progress reports from 13 attending Centres were presented by **K. Nomura**, **A. Koning, O. Gritzay**, **S. Taova**, **N.C. Shu**, **V. Devi**, **V. Varlamov**, **M. Mikhailiukova, D.H. Kim, A. Kimura**, **J. Sprenger B. Pritychenko** and **S. Takács**, who highlighted the staffing, compilation, dissemination, and other nuclear data related activities of interest to the network. See progress reports P2024-01 to P2024-10 (**Appendix F**) for further details.

2.3 EXFOR General

L. Marian introduced the statements on the license and DOI assignment for NRDC products approved by the IAEA Office of Legal Affair, and they were accepted by the participants (c.f. Conclusions 4 and 5).

2.4 EXFOR Statics and Coverage

V. Devi presented the transmission statistics showing that the network submitted 448 new entries and 1195 revised entries between the NRDC 2023 and NRDC 2024 meetings, and there are 1466 articles waiting additional compilation. She also reported that time needed between preliminary and final transmissions for tapes finalized between the NRDC 2023 and NRDC 2024 meeting strongly depends on the originating centre (average time interval per centre ranges from 47 to 183 days).

2.5 Manuals and Dictionaries

N. Otsuka introduced the EXFOR/CINDA Dictionary in JSON. He reported that this JSON dictionary was created as an intermediate file for conversion from the Archive Dictionary to the Trans Dictionary, but it could be also useful for end users. He also proposed change in the structure of the Trans Dictionary in the relation with its inclusion in the EXFOR Master File, and it was approved.

V. Devi suggested revision of LEXFOR "Partial reactions" for compilation of production cross sections for prompt gammas originated from a cascade bypassing a quasi-metastable state and a cascade originating from decay of a quasi-metastable state, and it was approved.

2.6 CINDA

V. Zerkin reported that NSR is available for the CINDA database updates since the NRDC 2023 meeting though regular updates are not yet officially restarted. He also reported that import to CINDA from EXFOR was performed twice in September 2023 and April 2024.

2.7 EXFOR Compilation Needs

N. Otsuka reported data needs for space radiation protection. He performed EXFOR completeness checking against two lists of experiments specialized to space application (GSI-ESA-NASA database and NASA NUCDATA collection), and estimated that the EXFOR coverage is 47% for the GSI database (103 articles in total) and is 68% for the NASA collection (398 articles in total). He concluded the EXFOR coverage is good considering the majority of the experiments belong to a category for compilation on a voluntary basis ("Category B").

2.8 EXFOR Quality Control

V. Devi shared her experience on author proof of about 40 EXFOR entries made by her. She reported several advantages to have communication with the authors for the proof, for example (1) replacement of data digitized by her with data tabulated by the author, (2) addition of a special remark on the normalization issue to be published as an erratum later, and (3) correction of compilation mistakes originating from typos in the source article.

2.9 EXFOR Coding Rule

M. Mikhailiukova reported her analysis on zero values coded for the quantity measured (e.g., DATA) and its uncertainty (e.g., DATA-ERR). The participants found that blanks in the original EXFOR entries were sometimes overwritten by zeros during revision for cancellation of Vector Common formalism. She concluded that zeros coded under the headings PARITY, ERR-T and DATA-ERR must be investigated further.

L. Vrapcenjak presented progress in collection of the primary references of EXFOR entries. She reported that the list of articles for collection is shortened after decision on collection of English translation instead original publication, but there are still many articles for collection, especially for the theses and reports. She also asked (1) addition of an INDC report as an alias when possible, and (2). omission of the volume number field of conference articles when the article can be identified without it.

N. Otsuka presented a problem for use of pointers for BIB/BIB link. Such pointers cannot be together with another set of pointers (e.g., pointers for the multiple reaction formalism). A

typical use of BIB/BIB link is for connection of the titles and authors when there are several references and the compiler want to provide the title and author of the secondary reference. He suggested (1) abolishment of the BIB/BIB link, and (2) introduction of new free text identifiers #title and #author, and they were approved.

2.10 Tools for Compilation and Dissemination

N. Otsuka reported the process to produce the EXFOR Master Files Ver. 2015 to 2023 as his response to Action 91 from the NRDC 2023 meeting. He presented (1) the newly developed Python scripts DIRINI, DIRUPD and MAKLIB (publicly available from the NRDC Software website) can reproduce the EXFOR Backup Files Ver. 2025-03-16 and Ver. 2023-10-27) by choosing Ver. 2015-03-11 as the starter file with some exceptions due to certain reasons, (2) EXFOR Master Files Ver. 2015 to 2022 were produced by these tools and released on 24 December 2023, and (3) EXFOR Master File Ver. 2023 was released on 31 December 2023. He mentioned that annual production of the EXFOR Master File could be sufficient for many users, but distribution of more frequently updated EXFOR files could be also useful for some advanced users. He proposed (1) distribution of EXFOR Master File on an annual basis with dedicated a landing page and DOI for each version, and (2) distribution of a complete set of EXFOR entry files synchronized with the NDS EXFOR web retrieval system database, and they were approved.

V. Zerkin presented (1) java code "trans2master" for local maintenance of EXFOR Master file based on initial Master and current TRANS files, (2) EXFOR offline distribution on public GitHub: (a) EXFOR-Archive since 2005 with scripts including one reconstructing Master file at any time in history, (b) EXFOR-C5 – six versions of full EXFOR translated to C5 with various option including automatic renormalization to modern standards and decay data, (c) X5json with examples including renormalization and plotting, (3) current status of X4Pro - relational/multi-model database extending EXFOR-Relational and distributed as standalone SQLite data file with 35 example-programs in Python and Fortran, (4) Web-API for EXFOR, ENDF, IBANDL – Applications Programming Interface provides access to central databases for lightweight users' applications which can find/retrieve data and impose server calculations - for example, presenting angular distributions $d\sigma/d\Omega$ from ENDF-MF4/MF34 as $\{y,\Delta y\}$, calculate data for inverse kinematics from IBANDL and SigmaCalc presenting them in R33/JSON formats and plot, etc., (5) overview, structure and status of software: ZCHEX – EXFOR checking code, EXFOR Java package and translators (to C5, X4+, XML, JSON), EXFOR Database maintenance system, standalone Web retrieval system and production of X4Pro.

D. Neudecker introduced the activites of the WPEC Subgroup 50 (Developing an Automatically Readable, Comprehensive and Curated Experimental Reaction Database). She informed the participants that (1) addition of the description on the experiment and uncertainty listed in the CSWEG templates would make the EXFOR entry even more useful for evaluators, (2) description of corrections undertaken and not undertaken by the experimentalist under CORRECTION would be very helpful for evaluators, and (3) the subgroup could provide the Network a requirement document with use cases and needs from the nuclear data evaluation community for information purposes.

2.11 Other Business

N. Otsuka presented the newly created distribution lists for submission of memos and technical announcements implemented by two global IAEA email addresses.

2.11 Closing

N. Otsuka proposed the places and dates for the next Centre Head meeting (Vienna or Madrid, 17-20 June 2025) and for the next Vienna EXFOR workshop (Vienna, 3-6 December 2024), and they were approved.

B. Pritychenko called an adjournment of the meeting.

Appendix A

LIST OF PARTICIPANTS

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Appendix B

AGENDA
Tuesday, 14 May 2024

9:30 – 13:00 (CET)

1	**Opening Items**			
1.1	Welcome address	10 min		A. Koning
1.2	Announcement	5 min		S. Elias
1.3	Election of chairperson, adoption of the agenda, announcements	5 min		N. Otsuka
2	**Progress Reports**			
2.1	JCPRG	10 min	P2024-01	K. Nomura
2.2	NDS	10 min	P2024-02	A. Koning
2.3	UkrNDC	10 min	P2024-03	O. Gritzay
2.4	CNPD	10 min	P2024-04	S. Taova
2.5	CNDC	10 min	P2024-05	N.C. Shu
2.6	NDPCI	10 min	P2024-06	V. Devi
2.7	CDFE	10 min	P2024-07	V. Varlamov
2.8	CJD	10 min	P2024-08	M. Mikhailiukova
2.9	KNDC	10 min	P2024-09	D.H. Kim
2.10	JAEA	10 min	P2024-10	A. Kimura
2.11	ATOMKI	10 min		S. Takács
2.12	NEA DB	10 min		J. Sprenger
2.13	NNDC	10 min		D. Brown

150 min

14:00 – 17:00 (CET)

3.	**General, EXFOR General**			
3.1	DOI assignment (A2)	10 min		L. Marian
3.2	Other actions (A1, A3-A4)	10 min		Chairperson
4	**EXFOR Statistics and Coverage**			
4.1	Transmission statistics since the last NRDC meeting	10 min	WP2024-02	V. Devi
4.2	Status of new article compilation (A5)	10 min	WP2024-03	N. Otsuka
4.3	Time interval between submission of preliminary and final tapes	10 min	WP2024-04	V. Devi
4.4	New publications scanned by NDS and other centres	10 min	WP2024-05	V. Devi
4.5	Progress in correction of items on Feedback List (A6)	10 min	WP2024-06	V. Devi
5	**Manual and Dictionary**			

5.1	CINDA report code UCRL-TR coded in EXFOR 13996 and 13997 (CP-D/1083)	10 min	WP2024-07	N. Otsuka
5.2	EXFOR/CINDA Dictionary in JSON (CP-D/1090)	10 min	WP2024-08	N. Otsuka
5.3	Structure of Transmission dictionary (CP-D/1092Rev.)	10 min	WP2024-09	N. Otsuka
5.4	Exclusion of full stop from data headings and units (CP-D/1105)	10 min	WP2024-10	N. Otsuka
5.5	Numbering scheme for compound codes (CP-D/1109, A8)	10 min	WP2024-11	N. Otsuka
5.6	Proposal on revisions in Formats and Dictionary Manuals (CP-D/1110)	20 min	WP2024-12	N. Otsuka
5.7	LEXFOR "Partial reactions" (CP-D/1111 Rev., A16)	10 min	WP2024-13	V. Devi
5.8	Other actions (A7, A9-A15)	10 min	WP2024-01	Chairperson
		130 min		

Wednesday, 15 May 2022

9:00 – 13:00 (CET)

6	**CINDA**			
6.1	Status of CINDA database + X4PDF database (A17)	10 min	WP2024-14	V. Zerkin
6.2	Other actions (A18)	5 min	WP2024-01	Chairperson
7	**EXFOR Compilation Needs**			
7.1	Compilation of articles with priority (A19-A24)	10 min	WP2024-15	N. Otsuka
7.2	Compilation of articles from completeness checking (A25-A29)	10 min	WP2024-16	N. Otsuka
7.3	EXFOR completeness for cross section data for space radiation protection (CP-D/1095)	20 min	WP2024-17	N. Otsuka
7.4	Other actions (A30-A32)	10 min	WP2024-01	Chairperson
8	**EXFOR Quality Control**			
8.1	Duplication (A33)	10 min	WP2024-18	N. Otsuka
8.2	Pending corrections (A34-A49)	10 min	WP2024-19	N. Otsuka
8.3	Auchampaugh et al's superseded (n,2n) datasets in EXFOR 12936 (CP-D/1091)	20 min	WP2024-20	J.M. Wang
8.4	Experience and importance of proof-read of EXFOR entry via author	20 min		V. Devi
8.5	Cross sections below threshold energy in EXFOR (CP-D/1101)	30 min	WP2024-21	N. Otsuka
8.6	Other actions (A50-A55)	10 min	WP2023-01	Chairperson
		165 min		

14:00 – 17:00 (CET)

9	**EXFOR Coding Rule**			
9.1	Incident energy expression – uncertainty or resolution?	10 min		S. Harissopulos
9.2	Zero values in EXFOR data base (4C-4/0239)	30 min	WP2024-22	M. Mikhailiukova
9.3	Dictionary 236 (Quantities): L-,SIG and L-,SIG,,SFC (CP-D/1087)	10 min	WP2024-23	S. Dunaeva
9.4	Definition of TRANS N2 (date) and time stamp on NDS open area (CP-D/1089)	10 min	WP2024-24	N. Otsuka
9.5	Article collection and improvement of primary reference coding	10 min	WP2024-25	L. Vrapcenjak
9.6	Dictionary 236 (Quantities) - M+,SIG,,RAB and question on RAB (CP-D/1100)	10 min	WP2024-26	S.C. Yang
9.7	BIB/BIB link by pointer (CP-D/1106)	20 min	WP2024-27	N. Otsuka
9.8	Other actions (A56-A59)	10 min	WP2024-01	Chairperson
		100 min		

19:00-
Social event ("Ufertaverne", An der oberen alten Donau 186, 1220 Wien. U1 Alte Donau or 20 min walk from VIC)

Thursday, 16 May 2024

9:00 – 13:00 (CET)

10	**Tools for Compilation and Dissemination**			
10.1	STATUS - Use of new format and tool for conversion (CP-D/1088)	10 min	WP2024-28	N. Otsuka
10.2	Python spell checker for free text in EXFOR (CP-D/1107)	10 min	WP2024-29	N. Otsuka
10.3	Reproduction of EXFOR backups with new utility codes (CP-D/1093, A91)	20 min	WP2024-30	N. Otsuka
10.4	Retroactive production of EXFOR Masters (CP-D/1094, A91, A92)	20 min	WP2024-31	N. Otsuka
10.5	Java program for local maintenance of EXFOR Master file (CP-D/1096, A91)	20 min	WP2024-32	V. Zerkin

10.6	EXFOR offline distribution (Archive, X5, C5: concept and options)	20 min		V. Zerkin
10.7	EXFOR software	15 min		V. Zerkin
		115 min		

14:00 – 17:00 (CET)

10	**Tools for Compilation and Dissemination (cont.)**			
10.8	Progress in development of "EXFOR/ENDF/IBANDL" databases, retrieval systems and tools	60 min		V. Zerkin
10.9	How templates of expected measurement uncertainties and WPEC SG-50 might be helpful for EXFOR	40 min		D. Neudecker
	Other actions (A60-A90, A93-A95)	10 min	WP2023-01	Chairperson
		110 min		

Friday, 17 May 2024

9:00 – 12:00 (CET)

11.	**Other Business**			
11.1	NRDC distribution lists	10 min	WP2024-33	N. Otsuka
12.	**Closing**			
11.1	Dates and places of next meetings	10 min		N. Otsuka
11.2	Review of Conclusions and Actions	60 min		Chairperson
		90 min		

Appendix C

CONCLUSIONS AND ACTIONS

Conclusions

General

C1 The next NRDC Centre Head meeting will be held in Madrid, Spain from 17 to 20 June 2025.

C2 The next NRDC technical meeting will be held in Vienna, Austria in the second quarter of 2026.

C3 The next EXFOR compilation workshop will be held in Vienna, Austria from 3 to 6 December 2024.

EXFOR General

C4 The Network will add the following Copyright Statement on the NRDC Website together with the CC BY 4.0 DEED (Attribution 4.0 International) license for NRDC products:
"The data and resources available on this site are provided to the IAEA by the NRDC Network, which is a network under the auspices of the IAEA. As agreed by the NRDC Network, the IAEA has the role of publication and dissemination for all the data and resources provided to it by the NRDC Network.",
(as approved by the IAEA Legal Office on 15 May 2024.)

C5 The Network recognises the NRDC Website hosted by the IAEA as the primary publication and dissemination platform for all the products of the Network. Thus, the NRDC grants the IAEA authorship rights for the purpose of assigning Digital Object Identifiers (DOIs). As the designated author, the IAEA will coordinate the assignment of DOIs with the DOI provider (CrossRef), oversee the accuracy and consistency of the shared metadata (title, creator, URL, etc.) and serve as the primary point of contact for all matters pertaining to publication and dissemination of the NRDC's data and resources (as approved by the IAEA Legal Office on 15 May 2024.)

C6 An entry of an area will be transmitted in an exchange file labelled by the same area except for area P and T entries which will be transmitted in area C exchange files. (c.f. WP2024-30).

EXFOR Statistics and Coverage

C7 The Network released 448 new entries since the NRDC 2023 meeting (about 12 months) as reported in WP2024-02.

Manuals and Dictionary

C8 The report code UCRL-TR- may be used not only in CINDA but also in EXFOR. Its expansion should be “Lawrence Livermore National Laboratory Reports” rather than “Lawrence Radiation Laboratory translation series” as proposed in WP2024-07.

C9 The new procedure for creation of the Transmission Dictionary from the Archive Dictionaries with the JSON dictionary as an intermediate file proposed in WP2024-08 was approved.

C10 The new structure of the Transmission Dictionary with the new system identifiers SUBDICT and ENDSUBDICT proposed in WP2024-09 was approved.

C11 A full stop cannot be used in data heading and unit codes as proposed in WP2024-10.

C12 The revisions of the internal numerical equivalent and revision of the EXFOR/CINDA Dictionary Manual for Dictionary 209 proposed in WP2024-11 were approved. The compound flag * at Column 114 is not necessary. A new field (I7) will be added for 10000Z+10*A (e.g., 390890 for yttrium compound, 400000 for zirconium compound).

C13 The revisions of the EXFOR Formats Manual, LEXFOR and EXFOR/CINDA Dictionary Manuals proposed in WP2024-12 were approved.

C14 Addition of the paragraph “Gamma production following quasi-metastable state production” to LEXFOR “Partial reactions” proposed in WP2024-13 was approved.

C15 System identifiers N1 and N2 presently unused will be zero rather than a blank as proposed in WP2024-30.

C16 NOSUBENT N2 will be the date of last update rather than a blank as proposed in WP2024-30.

C17 The new system identifiers MASTER and ENDMASTER proposed in WP2024-31 were approved.

EXFOR Compilation Needs

C18 NNDC will be responsible for scanning Physical Review Letters.

EXFOR Quality Control

C19 The network was informed by an author of EXFOR 12936 (Veeser) that the (n,2n) cross sections compiled in this EXFOR entry (other than ^{9}Be) may be used but with caution above ~18 MeV as explained in WP2024-20.

C20 Compilers are encouraged to send their EXFOR entry drafts to the authors for proofreading and approval. It could improve the quality of the EXFOR entries (e.g., replacement of digitized data with tabulated data) and awareness of the data centre activity in the community.

C21 Cross section below the threshold energy in the literature could be caused by various reasons, for example, overestimation of the actual initial charged particle beam energy, presence of an interference gamma line originated from a nuclide coproduced due to presence of sample impurity or oxidation.

C22 Addition of the target thickness description under the keyword SAMPLE is essential for charged-particle capture cross sections.

EXFOR Coding Rule

C23 The compiler should treat the dataset received from the author with caution if it contains a zero in the uncertainty (WP2024-22).

C24 Compilers should check if the numerical data received from the authors are preserved in the EXFOR entry without unexpected changes. We are aware that blanks in authors' table are sometimes replaced by zeros during cancellation of vector common as introduced in WP2024-22.

C25 The quantity codes for quantities excluding quasi-metastable state production) proposed in WP2024-23 (L-,SIG and L-,SIG,,SFC) were approved.

C26 The change in the definition of the TRANS N2 field proposed in WP2024-24 was approved. The date in this field may be updated by the NRDC coordinator before uploading to the NDS open area.

C27 When an INDC report number exists as an alias of the report number coded under REFERENCE, the INDC report number must be coded as proposed in WP2024-25.

C28 The volume number under REFERENCE is preferably omitted unless they are essential to identify the article as proposed in WP2024-25.

C29 The new quantity code M+,SIG,,RAB proposed in WP2024-26 was approved. The new modifier OTH proposed in the same working paper was not approved.

C30 The compiler should ask for the elemental cross section when the cross section published in the source article is the elemental cross section divided by a natural abundance of a target isotope but the contribution of another target isotope is not negligible. Compilation of the published cross section is optional when the elemental cross section is not available from the author.

C31 Pointers are no longer used to link pieces of BIB information (BIB/BIB links) as proposed in WP2024-27.

C32 The keywords TITLE and AUTHOR will always provide the title and author list of the primary reference. When the compiler considers the title and/or author list of a secondary reference must be provided, they may be given in free text following #author: and #title: as proposed in WP2024-27.

C33 The Vector Common Formalism is no longer seen in any EXFOR entries.

C34 The ^{209}Bi(p,x)^{211}At cross sections in EXFOR listed in CP-D/1072=WP2023-29 will be kept with the following statement under the keyword CRITIQUE:
"Production of ^{211}At observed in this experiment is solely due to interaction of secondary alpha particles with ^{209}Bi.".

Tools for Compilation and Dissemination

C35 Java and Python tools generating next Master File using previous Master File and TRANS file are now publicly available with their source files as described in WP2024-30 and WP2024-32.

C36 The format specification of the EXFOR Master and Backup Files summarized in WP2024-31 were approved.

C37 ZORDER automatically replaces the blank in ENTRY and SUBENT records N2 with the date of processing.

C38 Eight EXFOR Master Files (EXFOR-2015 to EXFOR-2022) were retroactively produced following the procedure described in WP2024-32. These eight files as well as the new EXFOR Master File (EXFOR-2023) are publicly available from their landing web pages.

C39 Documentation and archiving of private communication are essential for maintenance of an EXFOR entry compiled from the private communication.

C40 The Network encourages each centre to engage with the regional nuclear physics community to gather feedback on the utilization of EXFOR, preferred data formats (such as X4 interpreted, JSON, XML), and dissemination platforms like web interfaces (e.g., EE-view, ZV-view, Data Explorer), web APIs, GitHub, etc.

C41 NNDC commits to providing updated NSR databases to NDS regularly for integration into EXFOR, CINDA web retrieval systems, myENSDF, etc. This could be done monthly.

C42 NNDC supports to open the source codes of the EXFOR software (e.g., ZCHEX, ZORDER) transferred from NNDC to NDS.

C43 Development of software conversion tools between the EXFOR exchange and JSON format (e.g., X5) could be useful. A one-to-one and reversible translation of the information stored in the EXFOR format to the JSON format (e.g., X5) and from the JSON format to the EXFOR format could be useful for development of EXFOR editors and potentially lower the entrance barrier for new members and compilers of the NRDC network to efficiently participate in technical work, in particular data compilation.

C44 NDS can host the delayed beta and gamma spectra measured by Dickens et al. (ORNL/NUREG-14 etc. for ^{235}U thermal neutron fission) in the CoNDERC database.

C45 The EXFOR Master File should include not only the Transmission Dictionary but also the Archive and DANIEL Backup Dictionaries.

C46 Addition of the description on the experiment and uncertainty listed in the CSWEG templates in EXFOR (by interacting with the author when it is missing in the source article) would make the EXFOR entry even more useful for evaluators.

C47 Description of corrections undertaken and not undertaken by the experimentalist under CORRECTION would be very helpful for evaluators.

C48 WPEC SG-50 could provide the Network a requirement document with use cases and needs from the nuclear data evaluation community for information purposes.

C49 The Network recognizes the needs of knowledge transfer when retirement or separation of a Network member is foreseen to ensure smooth continuation of the network operation as mentioned in WP2024-25.

C50 The Network will (1) produce the EXFOR Master File annually and distribution it from a landing page and DOI dedicated to each version, and (2) distribute a complete set of EXFOR entry files synchronized with the NDS EXFOR web retrieval system.

Actions

General

A1	Koning Raj	Send to Otsuka revised description of the centre in the Network Document (INDC(NDS)-0401).

EXFOR Statistics and Coverage

A2	All	(Standing action) Give the highest priority to compilation of new articles.

A3 All (Standing action) Correct erroneous entries listed on the EXFOR Feedback List according to the indicated priorities. All urgent corrections must be done by the next meeting.

Manuals and Dictionaries

A4 Otsuka (Continuing action) Update Dictionaries every six months.

A5 Otsuka Revise EXFOR Formats Manual for

1) CP-D/1053 = WP2023-23 (STATUS)
2) CP-D/1056 = WP2023-25 (Multiple reaction formalism)
3) CP-D/1069 = WP2023-27 (DECAY-DATA and FLAG)
4) CP-D/1071 = WP2023-28 (ASSUMED and MONITOR)
5) CP-D/1110 (Rev.) = WP2024-12 (General structure, ASSUMED, DECAY-DATA, INSTITUTE, LEVEL-PROP, REFERENCE)
6) CP-D/1089 = WP2024-24 (System identifiers)
7) CP-D/1098 = WP2024-25 (REFERENCE)
8) CP-D/1093 = WP2024-30 (System identifiers)
9) CP-D/1094 = WP2024-31 (System identifiers))
10) CP-D/1106 = WP2024-27 (BIB/BIB link)

A6 Otsuka Revise LEXFOR for

1) 4C-3/0421 = WP2023-08 (Scattering)
2) 4C-4/0233 = WP2023-31 (Fitting coefficients)
3) CP-D/1038 = WP2023-24 (Error)
4) CP-D/1055(Rev.) = WP2023-23 (Status)
5) CP-D/1072 = WP2023-29 (Production and emission cross sections)
6) CP-D/1076 = WP2023-30 (Activation)
7) CP-D/1110 (Rev.) = WP2024-12 (Fission yields)
8) CP-D/1111 (Rev.) = WP2024-13 (Partial reactions)

A7 Otsuka Revise EXFOR/CINDA Dictionary Manual according to

1) CP-D/1067 = WP2023-09 (Dictionary 227)
2) CP-D/1081 = WP2023-11 (full review)
3) CP-D/1092(Rev.) = WP2024-09 (Transmission dictionary)
4) CP-D/1105 = WP2024-10 (exclusion of full stop in headings and units)
5) CP-D/1109 = WP2024-11 (Internal numerical equivalent for Dict. 227, additional I7 field for 1000Z*A.)
6) CP-D/1110 (Rev.) = WP2024-12 (Dict. 25 and 227)

A8 Otsuka Revise the expansion of UCRL-TR- in Dictionary 6 (Reports) as proposed in CP-D/1083 = WP2024-07.

A9 Pritychenko Inform Otsuka which report codes starting from UCRL is also used for Lawrence Livermore National Laboratory reports.

A10	Otsuka	Revise the internal numerical equivalent of Dictionary 209 (Compounds) as proposed in CP-D/1109 = WP2024-11.
A11	Otsuka	Add M+,SIG,,RAB in Dictionary 236 as proposed in CP-D/1110 = WP2024-26.

CINDA

A12	NDS	Export the EXFOR and NSR to the CINDA database, and distribute it to other Centres.
A13	NNDC	(Continuing action) Create meta schema for bibliographic data encompassing CINDA, EXFOR, NSR, Atlas and ENSDF. Report to NRDC for next actions.

EXFOR Compilation Needs
(Underlined items are registered in the Article Allocation List.)

A14	Pritychenko, Sprenger	Compile with priority the articles listed in WP2024-15 to respond to the individual requests from EXFOR users.
A15	Pritychenko	(Continuing action) Compile with priority the neutron source spectra listed in CP-D/0700 (Rev.3).
A16	Pritychenko	(Continuing action) Compile with priority R.G.Lanier+,R,UCAR-10062-89,71,1989 listed in CP-D/0725 Rev. (~WP2012-19).
A17	Pritychenko Nomura Taova	(Continuing action) Compile with priority the light charged-particle induced isotope production cross sections listed in CP-D/0757 = WP2013-12.
A18	Pritychenko	(Continuing action) Compile with priority T.Mo+,J,NP/A,198,153,1972 listed in CP-D/0832 Rev.
A19	Pritychenko	(Continuing action) Compile with priority W.G. Alberts+,R,NUREG/CP-0029,433,1982 in CP-D/0838 = WP2014-21.
A20	Pritychenko	(Continuing action) Compile A.R.Musgrove+,P,AAEC/PR-43-PD,39,1977=P,INDC(AUL)-27,39,1977 in 4C-3/0395 = WP2014-19.
A21	Pritychenko	(Continuing action) Compile F. Bischoff,R,RPI-328-87,146,1966 listed in 4C-3/0404 = WP2016-19.
A22	Pritychenko	(Continuing action) Compile P.L.Reeder+,J,PR/C,15,2108,1977 listed in 4C-3/0410 = WP2018-20.

A23	Pritychenko	(Continuing action) Compile deuteron-induced reaction data compiled by the Frascati group and listed in CP-D/0758.
A24	Pritychenko Sprenger	(Continuing action) Compile articles reporting experimental fission product yields and listed in CP-C/464, 465, 466 and CP-D/0979. Inform Devi if an article in the lists is not for EXFOR compilation. Transmit EXFOR entries relevant to these lists separately from other EXFOR entries.
A25	Gritzay	(Continuing action) Compile data measured with filtered neutrons measured at the KINR research reactor with numerical neutron spectra.
A26	Pritychenko	(Continuing action) Monitor availability of P.E. Koehler's time-of-flight spectra on DVDs received from ORELA in 2015 for EXFOR compilation.
A27	Pritychenko Brown	(Continuing action) Perform EXFOR completeness checking for the list of articles (4C-3/0401, articles cited in S. Mughabghab's "Atlas of Neutron Resonances") to identify articles missing in EXFOR, and assign responsibility of compilation of the identified articles to centres by a memo.

EXFOR Quality Control
(Underlined items are registered in the EXFOR Feedback List.)

A28	Nomura Pritychenko Sprenger Taova	Resolve the duplications listed in WP2024-19.
A29	Pritychenko	(Continuing action) Revise the datasets of neutron elastic scattering including inelastic scattering contribution as proposed in 4C-3/0420(Rev2).
A30	Pritychenko	(Continuing action) Replace REACTION SF3=A with EL in C0753.002 (CP-D/0960 = WP2019-31).
A31	Pritychenko	(Continuing action) Revise entries involving several variable atomic and/or mass numbers listed in CP-D/0984 in WP2021-31.
A32	Pritychenko	(Continuing action) Revise DECAY-DATA and DECAY-MON records including EC (electron capture) listed in CP-D/0989 = WP2021-07.
A33	Pritychenko	(Continuing action) Replace EL and INL in REACTION SF3 of 12373.008 with SCT (Memo CP-D/0991 = WP2021-26).

A34	Nomura	(Continuing action) Revise entries involving isomers of Nb-102, Tc-102, Rh-108, Sb-128 and Sb-132 according to Appendix of Memo CP-D/1009 (Rev.) = WP2021-28.
A35	Pritychenko Nomura	(Continuing action) Revise REACTION SF3 and SF7 listed in Appendices 1, 2 and 3 of CP-D/1014 = WP2021-10 (Combination of particle codes and their order in REACTION SF7).
A36	Pritychenko	(Continuing action) Replace X with an appropriate code or code combination REACTION SF3 of entries listed in CP-D/1017 = WP2022-24.
A37	Pritychenko	(Continuing action) Replace TABLE with SCSRS or update the free text unless the numerical data are published in source articles as listed in CP-D/1041 = WP2022-27.
A38	Pritychenko Nomura	(Continuing action) Revise entries relevant to assessment of suspicious E-LVL values as listed in CP-D/1043 = WP2022-26.
A39	Pritychenko Nomura	(Continuing action) Correct the isomeric flags in REACTION and DECAY-DATA listed in CP-D/1052Rev. = WP2023-19.
A40	Pritychenko Sprenger	(Continuing action) Resolve with priority the repetition of data headings listed in CP-D/1070 = WP2023-20.
A41	Pritychenko	(Continuing action) Replace NO-DIM with the correct unit for the absolute eta values listed in CP-D/1082(Rev.) = WP2023-22.
A42	Sprenger Pritychenko	(Continuing action) Consider addition of numerical data which are not superseded (SPSDD) and suitable for digitization, but still unobtainable (UNOBT) for neutron-induced reaction data published in old literature.
A43	Sprenger	(Continuing action) Provide a report on mistakes in bibliographies and spells on each preliminary tape.
A44	Pritychenko	(Continuing action) Revise EXFOR entries compiling data sets from ORELA 40 m flight station listed in the Appendix of 4C-3/407 = WP2017-30 by addition of 1) the corrigendum under REFERENCE of the common subentry, 2) STATUS=OUTDT to each data subentry with the correction factor in free text.
A45	Soppera	(Continuing action) Provide JANIS Import Log created from the EXFOR Master File to Otsuka on a regular basis.

A46	Otsuka	(Continuing action) Assess the JANIS Import Log provided by Soppera as above and register important errors to the EXFOR Feedback System.
A47	Mikhailiukova Zerkin	Analyse the zero values coded under the headings PARITY, ERR-T and DATA-ERR in the EXFOR library as proposed in WP2024-22 (e.g., by X4Pro) under support of Zerkin.

EXFOR Coding Rule

A48	Varlamov Otsuka	(Continuing action) Review the usage of (G,TOT), (G,ABS), (G,SCT) and (G,N) for the cross sections declared as "absorption cross sections" or "total cross sections" by the authors.

Tools for Compilation and Dissemination

A49	Sprenger	(Continuing action) Make available on the NEA Data Bank web site the EANDC and NEANDC reports compiled in EXFOR and not available as INDC reports.
A50	Pikulina	(Continuing action) Continue development and testing of the EXFOR-Editor and InpGraph in cooperation with NDS and other data Centres.
A51	All	(Continuing action) Provide Pikulina feedback on EXFOR-Editor and InpGraph.
A52	Suzuki	(Continuing action) Continue development and testing of GSYS in cooperation with NDS and other centres.
A53	All	(Continuing action) Provide Suzuki feedback on GSYS.
A54	Soppera	(Continuing action) Continue development and testing of the JANIS TRANS Checker in cooperation with NDS and the other centres.
A55	All	(Continuing action) Provide Soppera feedback on JANIS TRANS Checker.
A56	Otsuka	(Continuing action) Provide EXFOR News every month and consider updates to the NRDC website.
A57	Otsuka	(Continuing action) Support update of the Japanese editor (HENDEL) as time permits.
A58	Zerkin	(Continuing action) Update ZCHEX based on comments from compilers.

A59	All	(Continuing action) Provide feedback to NDS on the existing ZCHEX version (on bugs as well as desired additions.). Bugs must be reported with sample entries which are checked and not checked properly by ZCHEX.
A60	Zerkin	(Continuing action) Develop and distribute the program package including a standalone platform independent program to generate X4+ from a standalone EXFOR entry.
A61	All	(Continuing action) Consider using the X4+ format for author approval, and also send feedback to Zerkin.
A62	Otsuka	(Continuing action) Produce: extended Dictionary 236, and X4Map after every database update.
A63	Prtychenko	(Continuing action) Continue development of the additional database encompassing correction factors and relevant comments for suspect/erroneous data (X4-evaluated) presented in WP2010-19; keep NRDC informed about results, impact and usage statistics of the database.
A64	Otsuka	Continue update of the X4Pro database.
A65	Jin Suzuki Pikulina Zerkin	(Continuing action) Study problems in 2D calibration of original pictures, and process of approval of results of digitizing using plotting facilities.
A66	Pritychenko Sprenger	(Continuing action) Finalize and submit EXFOR entries including covariance data provided by Zerkin (WP2017-Z3).
A67	Pritychenko	(Standing action) Provide NSR database to Dimitriou with the name aliases to improve the search of EXFOR entries by the author name (WP2014-53).
A68	Vrapcenjak Pritychenko	(Continuing action) Maintain and extend (as needed) the EXFOR-NSR PDF database.
A69	Vrapcenjak	(Continuing action) Collect articles coded under REFERNECE of newly submitted preliminary tapes but missing in the NDS article collection.
A70	All	(Continuing action) Collaborate with Vrapcenjak for collection of articles coded under REFERENCE and private communication relevant to newly submitted preliminary tapes but missing in the NDS article collection.
A71	All	(Continuing action) Analyse X5 structure/hierarchy and contents, contact Zerkin with questions and proposals.

A72	Zerkin	(Continuing action) Take into account proposals on structure of X4Pro and X5.
A73	Otsuka	(Continuing action) Prepare EXFOR Master landing page(s). Landing page should include data license, corresponding EXFOR Dictionaries and links to documentation.
A74	Otsuka Vrapcenjak	Assign DOI to the landing page of the EXFOR Master File of the NRDC website for each version.
A75	Otsuka	Setup a website for distribution of a complete set EXFOR entry files synchronized with the NDS EXFOR web retrieval system.
A76	All	Consider ways of distribution of up-to-date EXFOR entry files through Git-based systems for discussion.
A77	Pritychenko	Explore attending the American Physical Society Division of Nuclear Physics Meeting in October 2024, Boston to gather feedback on the utilization of EXFOR, preferred data formats and dissemination platforms.

Appendix D

LIST OF WORKING PAPERS

Number	Title	Presented by
WP2024-01	Conclusions and action of the 2023 NRDC Meeting	
WP2024-02	Transmission statistics since the last NRDC meeting	V.Devi
WP2024-03	Status of new article compilation (A5)	N.Otsuka
WP2024-04	Time interval between submission of preliminary and final tapes	V.Devi
WP2024-05	New publications scanned by NDS and other centres	V.Devi
WP2024-06	Progress in correction of items on Feedback List (A6)	V.Devi
WP2024-07	CINDA report code UCRL-TR coded in EXFOR 13996 and 13997 (CP-D/1083)	N.Otsuka
WP2024-08	EXFOR/CINDA Dictionary in JSON (CP-D/1090)	N.Otsuka
WP2024-09	Structure of Transmission dictionary (CP-D/1092(Rev.))	N.Otsuka
WP2024-10	Exclusion of full stop from data headings and units (CP-D/1105)	N.Otsuka
WP2024-11	Numbering scheme for compound codes (CP-D/1109, A8)	N.Otsuka
WP2024-12	Proposal on revisions in manuals (CP-D/1110(Rev.)))	N.Otsuka
WP2024-13	Revision of LEXFOR "Partial reactions" (CP-D/1111(Rev.),A16)	V.Devi
WP2024-14	Status of CINDA database	V.Zerkin
WP2024-15	Compilation of articles with priority (A19-A24)	N.Otsuka
WP2024-16	Compilation of articles from completeness checking (A25-A29)	N.Otsuka
WP2024-17	EXFOR completeness for cross section data for space radiation protection (CP-D/1095)	N.Otsuka
WP2024-18	Pending duplications	N.Otsuka
WP2024-19	Pending corrections (A34-A49)	N.Otsuka
WP2024-20	Auchampaugh et al's superseded (n,2n) datasets in EXFOR 12936 (CP-D/1091)	J.M.Wang

WP2024-21	Cross sections below threshold energy in EXFOR (CP-D/1101)	N.Otsuka
WP2024-22	Zero values in EXFOR database (4C-4/0239)	M.Mikhailiukova
WP2024-23	Dictionary 236 (Quantities): L-,SIG and L-,SIG,,SFC (CP-D/1087)	S.Dunaeva
WP2024-24	Definition of TRANS N2 (date) and time stamp on NDS open area (CP-D/1089)	N.Otsuka
WP2024-25	Article collection and improvement of primary reference coding	L.Vrapcenjak
WP2024-26	Dictionary 236 (Quantities) - M+,SIG,,RAB and question on RAB (CP-D/1100)	S.C.Yang
WP2024-27	BIB/BIB link by pointer (CP-D/1106)	N.Otsuka
WP2024-28	STATUS - Use of new format and tool for conversion (CP-D/1088)	N.Otsuka
WP2024-29	Python spell checker for free text in EXFOR (CP-D/1107)	N.Otsuka
WP2024-30	Reproduction of EXFOR backups with new utility codes (CP-D/1093, A91)	N.Otsuka
WP2024-31	Retroactive production of EXFOR Masters (CP-D/1094, A91+A92)	N.Otsuka
WP2024-32	Java program for local maintenance of EXFOR Master file (CP-D/1096, A91)	V.Zerkin
WP2024-33	NRDC distribution lists	N.Otsuka

Note: These working papers are available online: http://nds.iaea.org/nrdc/nrdc_2024/.

Appendix E

LIST OF PRESENTATIONS

TITLE	Presented by
Center of Nuclear Physics Data	S. Taova
JCPRG progress report	K.Nomura
Nuclear Data Section	A.Koning
Ukrainian Nuclear Data Centre:Progress Report 2023/24	O.Gritzay
Center of Nuclear Physics Data	S.Taova
2023/24 Status report of China Nuclear Data Center	N.C.Shu
Indian EXFOR Compilation Progress Report	V.Devi
CDFE photonuclear data processing and evaluation activity, 2023/2024	V.Varlamov
Progress Report Technical Meeting NRDC2024 14-17 May 2024 held by NDS, IAEA	M.Mikhailiukova
Korea Nuclear Data Center progress report for 2022-2023	D.H.Kim, S.C.Yang
Progress report of Nuclear Data Center of Japan Atomic Energy Agency for FY 2023	A.Kimura
Exfor updates	J.Sprenger
The Area #1 EXFOR project, and an update on the new SG50	B.Pritychenko
Progress Report for NRDC Meeting 2024	S.Takacs
NDS - DOIs and licenses	L.Marian
EXFOR completeness for cross section data for space radiation protection	N.Otsuka
Experience and importance of proof-read of EXFOR entry via author	V.Devi
Memo CP-D/1100 (Dictionary 236 (Quantities))	S.C.Yang
Extended EXFOR dissemination systems for professional users, data developers and modern applications	V.Zerkin
EXFOR offline distribution	V.Zerkin

EXFOR software	V.Zerkin
Progress in EXFOR/ENDF/IBANDL databases, retrieval systems and tools	V.Zerkin
How templates of expected measurement uncertainties and WPEC SG-50 might be helpful for EXFOR	D.Neudecker

Note: These presentations are available online: http://nds.iaea.org/nrdc/nrdc_2024/.

Appendix F

PROGRESS REPORTS

Number	Title	Presented by
P2024-01	Japan Nuclear Reaction Data Centre (JCPRG) progress report	K. Nomura
P2024-02	IAEA Nuclear Data Section: Progress report for period 2023-2024	A. Koning
P2024-03	Ukrainian Nuclear Data Center: Progress report for period 2023-2024	O. Gritzay
P2024-04	Center of Nuclear Physics Data (CNPD), RFNC-VNIIEF progress report to the NRDC meeting	S. Taova
P2024-05	2023/24 status report of China Nuclear Data Center	N.C. Shu
P2024-06	Indian EXFOR compilation progress report for period 2023-2024	V. Devi
P2024-07	CDFE photonuclear data processing and evaluation activity, 2023/2024	V. Varlamov
P2024-08	Progress report for NRDC2024	M. Mikhailiukova
P2024-09	Korea Nuclear Data Center (KNDC) progress report for period 2023-2024	D.H. Kim
P2024-10	Progress report of Nuclear Data Center of Japan Atomic Energy Agency for April 2023 – March 2024	A. Kimura

Japan Nuclear Reaction Data Centre (JCPRG)
Progress Report

Nuclear Reaction Data Centre (JCPRG),
Faculty of Science, Hokkaido University
http://www.jcprg.org
IAEA's Technical Meeting on the
"International Network of Nuclear Reaction Data Centres"
May 14-17, 2024

0. General

The Japan Nuclear Reaction Data Centre (JCPRG) is a research center for nuclear data activities in Hokkaido University, Sapporo. The main objectives of JCPRG are as follows:

a) Compilation of nuclear reaction data for two databases, NRDF and EXFOR
b) Evaluation of nuclear reaction data
c) Development of software and systems for compilation and evaluation
d) Education of the graduate school students

1. Compilation

1.1 NRDF

The NRDF database is the original nuclear reaction database of JCPRG. Our initial EXFOR entries were provided by converting the NRDF format to the EXFOR format. Nowadays, both NRDF and EXFOR formats are generated simultaneously using the database creation editor HENDEL. From May 2023 to April 2024, we have compiled 33 new papers of charged-particle-induced reaction data.

1.2 EXFOR

Since the last NRDC meeting, we have transmitted 33 new and 50 revised entries as 7 trans and prelim files (E137-E142 and K022) to the NDS open area. Our transmissions are summarized in Table 1.

Table 1. EXFOR E- and K-entries transmitted from JCPRG to NDS IAEA in 2023-2024.

TRANS	TRANS Status	ENTRY Tot.	ENTRY New	ENTRY Rev.
E137	Final (2023/6/30)	12	2	10
E138	Final (2023/10/4)	9	9	0
E139	Final (2023/11/9)	8	6	2
E140	Final (2023/11/14)	16	1	15
E141	Final (2024/3/16)	23	6	17
E142	Prelim (2024/3/16)	9	9	0
K022	Final (2024/3/7)	6	0	6

2. System Development

2.1 Data Retrieval System

We have 3 data retrieval systems mentioned below.

- NRDF (http://www.jcprg.org/nrdf/)
- NRDF/A (http://www.jcprg.org/nrdfa/)
- EXFOR/ENDF (http://www.jcprg.org/exfor/)

The relational database management system MySQL has been adopted for the databases to search and retrieve NRDF, EXFOR and ENDF data. For EXFOR, new trans files are copied from the NDS open area, and the MySQL database is updated periodically.

2.2 Coding Software

We have a coding editor and digitizing software applicable for the coding purpose.

- Coding editor "HENDEL" (https://www.jcprg.org/manuals/hendel/)
- Digitization software "GSYS" (https://www.jcprg.org/gsys/2.4/)

IAEA Nuclear Data Section: Progress Report for period 2023-2024

Summary of Nuclear Data Activity by Staff of the IAEA Nuclear Data Section

May 2023 – April 2024

IAEA Technical Meeting, 14-17 May 2024
Vienna, Austria

Web: https://nds.iaea.org/
E-mail: nds.contact-point@iaea.org

1. Staff Changes

The authorized staff level of the Nuclear Data Section (NDS) consists of a total of 16 professionals and support staff. The latest staff changes include:

- Monfero Charisse (Team Assistant) relocated to the Section office in October 2023.
- Elias Szende (Team Assistant) joined in October 2023.
- Viktor Zerkin (Software Engineer) retired in October 2023.
- Jean-Christophe Sublet (NDSU – Unit Head) retired in November 2023.

2. Compilations

2.1 EXFOR transmission

During the reporting period, the following final tapes have been transmitted:

- 5 neutron final TRANS tapes (3209-3212, V042) containing 58 new entries and 87 revised entries;
- 6 CPND final TRANS tapes (B035, D138-D142) containing 110 new entries and 148 revised entries;
- 3 PhND final TRANS tapes (G050-G052) containing 11 new entries and 0 revised entries.

These include contributions from NDS, five other centres (ATOMKI, CNDC, KNDC, NDPCI, UkrNDC) as well as two individual regular compilers (Myagmarjav Odsuren, Timur Zholdybayev).

Myagmarjav Odsuren (National Univ. of Mongolia, Ulaanbaatar) is compiling heavy-ion induced reaction data measured in the area 2 countries (e.g., Germany, Italy) for area D.

Timur Zholdybayev (Institute of Nuclear Physics, Almaty) is compiling charged-particle induced reaction data measured by his group and some other groups in Kazakhstan for area D.

Two regular transmissions of the EXFOR/CINDA dictionaries (TRANS.9128–9129) were done in TRANS, DANIEL (backup) and archive format.

Table. Number of new entries transmitted by final tapes since the NRDC 2023 meeting
(TZ: Timur Zholdybayev+Feruzjon Ergashev, MO: Myagmarjav Odsuren)

	NDS	ATOMKI	CNDC	KNDC	NDPCI	UkrNDC	TZ	MO	Sum
Neutron	6		31	5	16	0			**58**
CPND	24	9	*	5	35	10	10	17	**110**
PhND	6			0	2	3			**11**
Sum	**36**	**9**	**31**	**10**	**53**	**13**	**10**	**17**	**179**

***** Area S entries are transmitted by CNDC and therefore not included in these statistics.

2.2 EXFOR quality control

During the reporting period, **68 preliminary tapes** (PRELIM) uploaded to the NDS open area for checking by NDS and other centres. Both ZCHEX and JANIS TRANS Checker are regularly used. The finalized tapes are also checked against comments from centres before uploading to the NDS open area. NDS also registers comments on EXFOR entries from users and centres to the **EXFOR Feedback List** (https://nds.iaea.org/nrdc/error/) and monitors the correction process by checking each preliminary tape against the feedback list.

Additionally, Lidija Vrapcenjak is checking the code strings for the primary reference systematically to improve connection between the EXFOR database and pdf database (c.f. CP-D/1098).

2.3 EXFOR coverage control

Under the EXFOR compilation control system, 18 **journal titles** are regularly scanned by NDS and registered to the EXFOR Compilation Control System (X4CoCoS), and they are listed in the **Article Allocation List** (https:/nds.iaea.org/nrdc/alloc/). Additional 19 journal titles were scanned until by December 2023 but stopped due to separation of Vidya Devi. This list also includes the scanning records of 19 journal titles (including 2 titles scanned by both CNPD and NDS) received from other centres. The newly published articles are also listed on https://nds.iaea.org/exfor-master/x4compil/. EXFOR statistics for compilers was extended by indicating waiting time for PRELIM files.

2.4 CINDA

Regular automatic updates using the EXFOR and NSR databases have been resumed after freezing period.

2.5 Evaluated data libraries, files and programs

Various new and revised evaluated data libraries, files and programs for data checking, processing and graphical presentation were added, developed and distributed via the NDS Web site (see below).

3. Services

3.1 Web Services

Further improvements have been implemented in the Web EXFOR-CINDA-ENDF-IBANDL database retrieval systems and Web-Tools for nuclear data compilers and evaluators since the last NRDC meeting:

- ENDF (Evaluated Nuclear Data Files):
  - new and updated evaluated libraries in the ENDF database:
    - TENDL-2023 TALYS-based Evaluated Nuclear Data Library
    - INDEN- Aug2023 evaluations produced by International Nuclear Data Evaluators Network (coordinated by the IAEA)
    - Updated JENDL-5 Japanese evaluated nuclear data library (2021)
- EXFOR:
  - establishing procedures for regular maintenance and distribution on GitHub:
    - EXFOR-Archive - all Entries from official TRANS files starting from 2005
    - EXFOR-X5json - all EXFOR Entries translated to X5-JSON, includes Python codes for indexing, reading, plotting and renormalizing data
    - EXFOR-C5 - all EXFOR Entries translated to computational format C5, six versions with and without automatic renormalization and automatically generated correlation matrices (include Python codes)
  - X5, C5 – extension, testing, debugging, improving
- EXFOR-ENDF:
  - plotting fission product yield from EXFOR and ENDF as a function of energy
- EXFOR-NSR PDF database:
  - updates: 42, added 2,208 PDF files
  - database content (PDF files):
    - total: +2,208 => 227,581
    - EXFOR-PDF: +763 => 28,519 (78% of 36,087)
    - NSR-PDF: +1,445 => 191,562 (~79% of 243,751)
- IBANDL:
  - 4 database updates (total: 4,537 Datasets)
  - Web-interface extended by CSV output for individual dataset
  - IBANDL-Archive on GitHub: trial version

- Web-Tools for EXFOR compilers, ENDF and ENSDF evaluators:
  - MyExfor: 3 updates by new versions of ZCHEX and new Dictionaries
  - MyEnsdf: upgraded code JAVA_NDS

3.2 Packages and databases for Web downloading

- "X4Pro" - universal, fully relational EXFOR database (professional ed.). Two releases.
- EXFOR-C5 – full EXFOR library translated to computational format C5 separated by Entries. Five versions with different options: converting C.M. to Lab. Rutherford-Ratio to B/SR, replaced Q-Value by E-Level, set MT51-90, …, MT801-849 by MT+iLevel for partial reactions, auto-renormalized using modern monitor CS data, etc. Two releases.

3.3 Document Services

Nuclear Data Services Unit (NDSU) continued supporting the Member States by disseminating IAEA-NDS and INDC reports series as well as data libraries.

The documents produced by the Nuclear Data Section are shared via links to our webpage http://nds.iaea.org/.

Number of reports published between May 2023 and April 2024.

Report code	Country of origin	Reports
IAEA-NDS	Nuclear Data Section	6
INDC(EUR)	European Commission	1
INDC(GER)	Germany	1
INDC(JPN)	Japan	2
INDC(SPN)	Spain	1
INDC(NDS)	Nuclear Data Section	23

Nuclear Data Packages including pilot projects under development are available for download from our webpage https://nds.iaea.org/cdroms/.

3.4 Nuclear Data Newsletters

The Nuclear Data Newsletter is published twice a year (February and August) to inform the scientific community about actual NDS work, meetings held, projects, computer codes developed and new data libraries. During the reporting period, we published two issues of the Newsletter 75 and 76). Next one, No 77 is in preparation and will be published in August 2024. We currently have 73 recipients of hardcopies and 1178 recipients of electronic version.

4. Visits and Inter-centre Cooperation

- N. Otsuka (NDS) visited CNDC from 18 to 22 September 2023 to discuss finalization of EXFOR entries compiling data measured in China.
- N. Otsuka (NDS) visited JCPRG from 22 to 26 January 2024 to extend the web-based EXFOR editor (HENDEL) to support the new STATUS format.

5. Training Activities (Schools, Workshops)

- Joint ICTP-IAEA Workshop on "Simulation of Nuclear Reaction Data with the TALYS Code", 16-20 October 2023, Trieste, Italy.

6. Nuclear Data Journal Publications (2023-2024)

The IAEA electronic stopping power database: Modernization, review, and analysis of the existing experimental data

C.C. Montanari, P. Dimitriou, L. Marian, A.M.P Mendez, J.P. Peralta, F. Bivort-Haiek, *Nucl. Instrum. Methods Phys. Res. B* **551** (2024) 165336.

Evaluated and recommended cross-section data for production of radionuclides with emerging interest in nuclear medicine imaging. Part 1: Positron emission tomography (PET)

A. Hermanne, F.T. Tárkányi, A.V. Ignatyuk, S. Takács, R. Capote, *Nucl. Instrum. Methods Phys. Res. B* **535** (2023) pp. 149-192.

Normalization of ToF (n,f) Measurements in Fissile Targets: Microscopic cross-section integrals

I. Duran, R. Capote and P. Cabanelas, *Nucl. Data Sheets* **193** (2024) pp. 95-104.

Evaluated and recommended cross section data for production of radionuclides with emerging interest in nuclear medicine imaging. Part 2: Single photon emission computed tomography (SPECT)

A. Hermanne, F.T. Tarkanyi, A.V. Ignatyuk, S. Takacs and R. Capote, *Nucl. Instrum. Methods Phys. Res. B* **544** (2023) 165119.

Optical potentials for the rare-isotope beam era

C. Hebborn, J.W. Holt, F.M. Nunes, M.C. Atkinson, G. Potel, W.H. Dickhoff, R.B. Baker, G. Blanchon, M. Burrows, C. Barbieri, R. Capote, P. Danielewicz, M. Dupuis, Ch. Elster. J.E. Escher, L. Hlophe, A. Idini, H. Jayatissa. B.P. Kay, K. Kravvaris, J.J. Manfredi, A. Mercenne, B. Morillon, G. Perdikakis, G.H. Sargsyan, C.D. Pruitt, I.J. Thompson, M. Vorabbi, T.R. Whitehead, *J. Phys. G: Nucl. Part. Phys.* **50** (2023) 060501.

Benchmarking of Stainless Steel Cube Neutron Leakage in Research Center Rez

Michal Kostal, Zdenek Matej, Martin Schulc, Evzen Losa, Jan Simon, Evzen Novak, Frantisek Cvachovec, Vaclav Prenosil, Filip Mravec, Tomas Czakoj, Vojtech Rypar, Andrej Trkov, Roberto Capote, *Nucl. Sci. Eng.* **198** (2024) pp. 399-410.

Dispersive optical model analysis of nucleon scattering on ^{90}Zr

X. Zhao, W. Du, R. Capote, E.Sh. Soukhovitskii, *Phys. Rev. C* **107** (2023) 064606.

Progress in the Evaluation and Validation of n+^{56,57}Fe Cross Sections

A. Trkov, R. Capote, D. Bernard, R. Beyer, Y. Danon, A. Daskalakis, A. Junghans, M. Kostal, P. Leconte, M. Schulc, S. Simakov, *EPJ Web of Conferences* **284** (2023) 12002.

Measurement of partial (n, n'gamma) reaction cross-sections on highly radioactive nuclei of interest for energy production

Francois Claeys, Philippe Dessagne, Maelle Kerveno, Cyrille De Saint Jean, Catalin Borcea, Marian Boromiza, Roberto Capote, Nicolas Dari Bako, Marc Dupuis, Greg Henning, Stephane Hilaire, Alexandru Negret, Gilles Noguere, Markus Nyman, Adina Olacel, Arjan Plompen, *EPJ Web of Conferences* **284** (2023) 01014.

GRAPhEME: performances, achievements (@EC-JRC/GELINA) and future (@GANIL/SPIRAL2/NFS)

Maelle Kerveno, Catalin Borcea, Marian Boromiza, Roberto Capote, Francois Claeys, Nicolas Dari Bako, Cyrille De Saint Jean, Philippe Dessagne, Jean Claude Drohe, Marc Dupuis, Greg Henning, Stephane Hilaire, Toshihiko Kawano, Alexandru Negret, Markus Nyman, Adina Olacel, Carlos Paradela, Arjan Plompen, Ruud Wynants, *EPJ Web of Conferences* **284** 92023) 01005.

Measurement of ^{183}W(n, n'gamma) and (n, 2ngamma) cross-sections (preliminary)

Greg Henning, Kerveno Maelle, Philippe Dessagne, Francois Claeys, Nicolas Dari Bako, Marc Dupuis, Stephane Hilaire, Pascal Romain, Cyrille de Saint Jean, Roberto Capote, Marian Boromiza, Adina Olacel, Alexandru Negret, Catalin Borcea, Arjan Plompen, Carlos Paradela Dobarro, Markus Nyman, Jean-Claude Drohe, Ruud Wynants, *EPJ Web of Conferences* **284** (2023) 01046.

Using the Monte-Carlo method to analyze experimental data and produce uncertainties and covariances.

Greg Henning, Maelle Kerveno, Philippe Dessagne, Francois Claeys, Nicolas Dari Bako, Marc Dupuis, Stephane Hilaire, Pascal Romain, Cyrille de Saint Jean, Roberto Capote, Marian Boromiza, Adina Olacel, Alexandru Negret, Catalin Borcea, Arjan Plompen, Carlos Paradela Dobarro, Markus Nyman, Jean-Claude Drohe, Ruud Wynants, *EPJ Web of Conferences* **284** (2023) 01045.

Database work for the new cross section standards evaluation

A. Carlson, R. Capote, D. Neudecker, V. Pronyaev, G. Schnabel, *EPJ Web of Conferences* **284** (2023) 14006.

From ^{232}Th(n, n'gamma) cross sections to level production and total neutron inelastic scattering cross sections

Nicolas Dari Bako, Maelle Kerveno, Philippe Dessagne, Catalin Borcea, Marian Boromiza, Roberto Capote, Francois Claeys, Marc Dupuis, Greg Henning, Alexandru Negret, Markus Nyman, Adina Olacel, Eliot Party, Arjan Plompen, *EPJ Web of Conferences* **284** (2023) 08005.

Spectral averaged cross sections as a probe to a high energy tail of ^{235}U PFNS

Martin Schulc, Michal Kostal, Roberto Capote, Jan Simon, Tomas Czakoj, Evzen Novak, *EPJ Web of Conferences* **284** (2023) 04021.

On the need for precise nuclear structure data for high quality (n, n'$_{gamma}$) cross section measurements

Greg Henning, Maelle Kerveno, Philippe Dessagne, Francois Claeys, Nicolas Dari Bako, Marc Dupuis, Stephane Hilaire, Pascal Romain, Cyrille de Saint Jean, Roberto Capote, Marian Boromiza, Adina Olacel, Alexandru Negret, Catalin Borcea, Arjan Plompen, Carlos Paradela Dobarro, Markus Nyman, *EPJ Web of Conferences* **284** (2023) 01022.

Experimental spectrum averaged cross sections (SACS) in ^{252}Cf(sf) neutron field and its impact on the evaluation of neutron standards

R. Capote, G. Schnabel, A.D. Carlson, V.G. Pronyaev, G. Noguere, D. Neudecker, *EPJ Web of Conferences* **281** (2023) 00027.

Cassini-oval description of the multidimensional potential energy surface for ^{236}U: Role of octupole deformation and calculation of the most probable fission path

K. Okada, T. Wada, R. Capote, N. Carjan, *Phys. Rev. C* **107** (2023) 034608.

Manhattan Project 1940s research on the prompt fission neutron spectrum

M.B. Chadwick, R. Capote, *Front. Phys.* **11** (2023) 1105593.

TENDL-based evaluation and adjustment of p+^{111}Cd between 1 and 100 MeV,

E. Alhassan D. Rochman, A. Vasiliev, A.J. Koning, H. Ferroukhi, *Appl. Radiat. Isot.* **198** (2023) 110832.

FENDL: A library for fusion research and applications

G.Schnabel, D.L. Aldama, T. Bohm, U. Fischer, S. Kunieda, A. Trkov, C. Konno, R. Capote, A.J. Koning, S. Breidokaite, T. Eade, M. Fabbri, D. Flammini, L. Isolan, I. Kodeli, M. Kostal, S. Kwon, D. Laghi, D. Leichtle, S. Nakayama, M. Ohta, L.W. Packer, Y. Qiu, S. Sato, M. Sawan, M. Schulc, G. Stankunas, M. Sumini, A. Valentine, R. Villari, A. Zohar, *Nucl. Data Sheets* **193** (2024) pp.1-78.

Global comparison between experimentally measured isomeric yield ratios and nuclear model calculations

S. Cannarozzo, S. Pomp, A. Al-Adili, A. Gook, A. Solders, A. Koning, *Eur. J. Phys.* **A59** No. 12 (2023) 295.

Templates of Expected Measurement Uncertainties for (n,xn) Cross Sections

Jeffrey R. Vanhoy, Robert C. Haight, Sally F. Hicks, Michal Herman, Arjan Koning, Keegan J. Kelly, Matthew Devlin, Ian Thompson , *EPJ Nucl. Sci. Technol.* **9** (2023) 31.

Templates of Expected Measurement Uncertainties

Denise Neudecker, Amanda M. Lewis, Eric F. Matthews, Jeffrey Vanhoy, Robert C. Haight, Donald L. Smith, Patrick Talou, Stephen Croft, Allan D. Carlson, Bruce Pierson, Anton Wallner, Ali Al-Adili, Lee Bernstein, Roberto Capote, Matthew Devlin, Manfred Drosg, Dana L. Duke, Sean Finch, Michal W. Herman, Keegan J. Kelly, Arjan Koning, Amy E. Lovell, Paola Marini, Kristina Montoya, Gustavo P.A. Nobre, Mark Paris, Boris Pritychenko, Henrik Sjöstrand, Lucas Snyder, Vladimir Sobes, Andreas Solders, *EPJ Nucl. Sci. Technol.* **9** (2023) 35.

TALYS: modeling of nuclear reactions

Arjan Koning, Stephane Hilaire and Stephane Goriely, *Eur. J. of Phys.* **A59** (2023) 131.

STEK: A potential fast spectrum benchmark for fission product cross sections

Steven van der Marck, Arjan Koning, *Front. Energy Res.* **11** (2023) 1085857.

Templates of expected measurement uncertainties for neutron-induced capture and charged-particle production cross section observables

Amanda M. Lewis, Denise Neudecker, Allan D. Carlson, Donald L. Smith, Ian Thompson, Anton Wallner, Devin P. Barry, Lee A. Bernstein, Robert C. Block, Stephen Croft, Yaron Danon, Manfred Drosg, Robert C. Haight, Michal W. Herman, Hye Young Lee, Naohiko Otuka, Henrik Sjöstrand, Vladimir Sobes, *EPJ Nuclear Sci. Technol.* **9** (2023) 33

Templates of expected measurement uncertainties for total neutron cross-section observables

Amanda M. Lewis, Allan D. Carlson, Donald L. Smith, Devin P. Barry, Robert C. Block, Stephen Croft, Yaron Danon, Manfred Drosg, Michal W. Herman, Denise Neudecker, Naohiko Otuka, Henrik Sjöstrand, Vladimir Sobes, *EPJ Nuclear Sci. Technol.* **9** (2023) 34

Characterization of a HPGe detector response for activation cross section measurements: regression method versus Monte Carlo method

Valentina Semkova, Naohiko Otuka, Arjan J. M. Plompen, *J. Nucl. Sci. Technol.* **61** (2024) pp. 151-160.

Nuclear physics midterm plan at Legnaro National Laboratories (LNL)

M. Ballan, A. Koning, et al., *Eur. Physical J. Plus* **138** (2023) 709.

EXFOR-based simultaneous evaluation for fast neutron-induced fission cross section of thorium-232

Vidya Devi, Naohiko Otuka, S. Ganesan, *J. Nucl. Sci. Technol.* **61** (2024) pp. 44-56.

EXFOR-based simultaneous evaluation for neutron-induced fission cross section of plutonium-242

Riko Okuyama, Naohiko Otuka, Go Chiba, Osamu Iwamoto, *J. Nucl. Sci. Technol.* **61** (2024) pp. 57-67.

The difference between charge polarizations of fission fragments deduced by the static theoretical model and in the current data library

S. Ebata, S. Okumura, C. Ishizuka and S. Chiba, *Int. J. Mod. Phys. E* **32** (2023) 2350030.

Charge polarization calculated with a microscopic model for the fission fragments of U-236

S. Ebata, S. Okumura, C. Ishizuka and S. Chiba, *EPJ Web of Conferences* **284** (2023) 04008.

Consideration of memory of spin and parity in the fissioning compound nucleus by applying the Hauser-Feshbach fission fragment decay model to photonuclear reactions

T. Kawano, A. E. Lovell, S. Okumura, H. Sasaki, I. Stetcu, and P. Talou, *Phys. Rev. C* **107** (2023) 044608.

TALYS calculations of prompt fission observables and independent fission product yields for the neutron-induced fission of ^{235}U

K.Fujio, A.Al-Adili, F.Nordstrom, J.-F.Lemaitre, S.Okumura, S.Chiba, A.Koning, *Eur. Phys. J. A* **59** (2023) 178.

Compilation of isomeric ratios of light particle induced nuclear reactions

A. Rodrigo, N. Otuka, S. Takács, A.J. Koning, *At. Data Nucl. Data Tables* **153** (2023) 101583.

Simultaneous evaluation of uranium and plutonium fast neutron fission cross sections up to 200 MeV for JENDL-5 and its updates

N. Otuka, O. Iwamoto, *EPJ Web Conf.* **284** (2023) 08011.

Overview of the dissemination of n_TOF experimental data and resonance parameters

E. Dupont, N. Otuka, D. Rochman, G. Noguère, O. Aberle, V. Alcayne, S. Altieri, S. Amaducci, J. Andrzejewski et al., *EPJ Web Conf.* **284** (2023) 18001.

TENDL-based evaluation and adjustment of p+^{111}Cd between 1 and 100 MeV,

E. Alhassan D. Rochman, A. Vasiliev, A.J. Koning, H. Ferroukhi, *Appl. Radiat. Isot.* **198** (2023) 110832.

Ukrainian Nuclear Data Center: Progress Report for period 2023-2024. Summary of Nuclear Data Activity by Staff of the Ukrainian Nuclear Data Center June 2023 – May 2024

O. Gritzay, O. Kalchenko

IAEA Technical Meeting, 14-17 May 2024
Vienna, Austria

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Ukrainian Nuclear Data Centre (UkrNDC) is subdivision within the Neutron Physics Laboratory at the Institute for Nuclear Research of the National Academy of Sciences of Ukraine.

Compilation

We continue collection and compilation of experimental neutron, charged particle and photonuclear data. Numbers of the new/renew EXFOR's entries sent to the NDS IAEA by UkrNDC are the following:

- for charged particle data – 2 new entries (D5079, D5196 (16 subentries));
- for photonuclear data – 7 new entries (G4102÷G4108 (30 subentries)) and 1 updated entry (G4094).

We realize review of compilation scope in home journals:

- Nuclear Physics and Atomic Energy;
- Ukrainian Journal of Physics;
- Problems of Atomic Science and Technology, Series Nuclear Physics Investigations;
- East European Journal of Physics.

Collaboration

We continue our collaboration with the Nuclear Physics Department of Taras Shevchenko National University of Kyiv.

The teaching course "Nuclear Data for Science and Technology and modern computer codes for nuclear data processing" (42 hours) was lectured in 2023-2024 for the fifth-course students of the NPD KNU. This course includes the following items: ENDF/B libraries, EXROR system, ENSDF library, the use of the PREPRO codes in work with the ENDF/B libraries, the introduction to NJOY code system, the Network of Nuclear Reaction Data Centers and the use of the on-line services.

We continue our activity within the framework of educational and scientific program of the Institute for Nuclear Research of the National Academy of Sciences of Ukraine on the preparation of a doctor of philosophy in specialty 01.04.16 (physics of the nucleus, elementary particles and high energies).

- The teaching course “Modern codes and nuclear data” (26 hours) was lectured in September-October 2023 for post-graduate students in the 2-nd year of study.
- The teaching course “Experimental methods of nuclear power engineering” (26 hours) was lectured in January-February 2024 for post-graduate students in the 1-st year of study.

Customer Services

The UkrNDC site is operating. Ukrainian customers, especially students and those physicists, who wish to prepare the point-wise and multi-group cross sections self-dependently, but do not have a good experience in it, use this site very often. Address of the UkrNDC site: http://ukrndc.kinr.kiev.ua.

Experimental and Computational Activity

Calculations for improvement of the interference neutron filters with the average energies 2 keV – 150 keV are fulfilled.

Through Russian war, the Kyiv research reactor does not operate, so experimental investigation did not fulfilled.

Acknowledgement

We are very thankful to Naohiko Otsuka and all colleagues for comments in preparation of the final versions of the UkrNDC entries.

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

Progress Report to the NRDC Meeting, IAEA, May 14-17, 2024

S. Taova

Russian Federal Nuclear Center-VNIIEF
Russia, 607188, Sarov, Nizhny Novgorod region, Mira Ave., 37

Compilation activity

Eight final files TRANS.F095, TRANS.F096, TRANS.A0104, TRANS.A105, TRANS.A106, TRANS.A107, TRANS.A108 and TRANS.A109 have been submitted for the EXFOR data library within the expired period. Files with letter "A" include the revised entries only. Files with letter "F" include both new and the revised entries.

As before, particular attention has been paid to the compilation of new articles. When compiling entries for the Exfor library, a close cooperation with the authors was provided. For the most new entries in TRANS.F095 author's approval was received. In general 17 new entries were prepared for the Exfor.

Software

EXFOR-Editor

Development of the EXFOR-Editor has been continued. Changes due to the introduction of the new format for the keyword STATUS have been made in the program code. To input information on the keyword STATUS a standard dialog window modified in accordance with the new rules is used. To include the STATUS record into all Subentries simultaneously the button «STATUS to each SUBENT» placed on the Toolbar of the main window is used.

While creating the TRANS file the possibility of Entry sorting in ascending order was provided. For this purpose the window «New Exchange File» was modified.

Update of Dictionaries and checking codes (CHEX and JANIS TRANS Checker) is being carried out on continuing basis.

To incorporate new versions of Dictionaries into the EXFOR-Editor V. Zerkin has designed a special code. It performs conversion of Dictionaries from original format to MS-Access. We have already used this software to update Dictionaries in EXFOR-Editor.

General

Technical paper "EXFOR-Editor package for entering, processing and representing nuclear reaction data in the Exfor format" (G. Pikulina and S. Taova) was published in a special issue of the «Journal of Nuclear Science and Technology», V. 61, iss.1, p. 146, 2024. The possibilities of the software package in terms of ensuring the correctness and reliability of data input were considered in the article.

Scanning of journals “Izvestiya Akademii Nauk” and “Yadernaya Fizika” is being performed regularly to reveal articles relevant to be compiled to Exfor library. The reports on scanning results are submitted to the NDS, IAEA.

2023/24 Status Report of China Nuclear Data Center

Shu Nengchuan, Wang Jimin, Xu Ruirui, Tian Yuan

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General Information of China Nuclear Data Center

China Nuclear Data Center (CNDC) was established in 1975 and has been participating in the International Atomic Energy Agency's nuclear data activities as the National Nuclear Data Center of China since 1984. As a window, CNDC has been open to the world since 1978 and has established good cooperative relationships with the International Atomic Energy Agency, OECD/National Energy Agency, as well as major nuclear data centers and institutions around the world.

1.1 The current main task of CNDC

1) Management of domestic nuclear data activities.
2) Nuclear data evaluations, libraries and relevant methodology studies.
3) Nuclear data measurements and methodology studies
4) Exchange of nuclear data activities with IAEA, foreign nuclear data centers and agencies.
5) Services for domestic and foreign nuclear data application users.

1.2 Main Tasks of CNDC in 2023/2024

1) Five-Year-Plan (2021-2025) for nuclear data (CENDL Project).
2) Data evaluation for next CENDL version and sub-library.
3) Methodology studies of nuclear data evaluation (incl. theoretical and experimental for fission process…).
4) Nuclear data measurements and related methodology studies.
5) Compilations for EXFOR.
6) Nuclear data services.

Nuclear Data Evaluation

2.1 CENDL Photonuclear Data file: CENDL-3.2/PD-beta

The Chinese Evaluated Photonuclear Data Library - Test Version (CENDL/PD-beta1) includes a total of 266 isotopes within the nuclear region from Beryllium-9 (^{9}Be) to Bismuth-209 (^{209}Bi) (see Table 1). The photon incident energy covers a range from neutron separation energy to 200 MeV, of which 15 isotopes (marked with an asterisk in Table 1 have been included in the IAEA/PD-2019 database by the International Atomic Energy Agency (IAEA).

Table 1. Nuclides List of CENDL-3.2/PD-beta

4-Be-9*, 5-B-10, 5-B-11, 6-C-12*, 7-N-14*, 8-O-16*, 11-Na-23, 12-Mg-24 ,12-Mg-25, 12-Mg-26, 13-Al-27*, 14-Si-28, 14-Si-29, 14-Si-30, 15-P-31, 16-S-32, 16-S-33, 16-S-34, 16-S-36, 17-Cl-35, 17-Cl-37, 18-Ar-36, 18-Ar-38, 18-Ar-40, 19-K-39, 19-K-40, 19-K-41, 20-Ca-40, 20-Ca-42, 20-Ca-43, 20-Ca-44, 20-Ca-46, 21-Sc-45, 22-Ti-46, 22-Ti-47, 22-Ti-48, 22-Ti-49, 22-Ti-50, 23-V-50, 23-V-51, 24-Cr-50*, 24-Cr-52, 24-Cr-53*, 24-Cr-54*, 25-Mn-55, 26-Fe-54, 26-Fe-56, 26-Fe-57, 26-Fe-58, 27-Co-59, 28-Ni-58, 28-Ni-

60, 28-Ni-61, 28-Ni-62, 28-Ni-64,29-Cu-63, 29-Cu-65, 30-Zn-64, 30-Zn-66, 30-Zn-67, 30-Zn-68, 30-Zn-70, 31-Ga-69, 31-Ga-71, 32-Ge-70, 32-Ge-72, 32-Ge-73, 32-Ge-74, 32-Ge-76, 33-As-75, 34-Se-74, 34-Se-76, 34-Se-77, 34-Se-78, 34-Se-80, 34-Se-82, 35-Br-79, 35-Br-81, 36-Kr-78, 36-Kr-80, 36-Kr-82, 36-Kr-83, 36-Kr-84, 36-Kr-86, 37-Rb-85, 37-Rb-87, 38-Sr-84, 38-Sr-86, 38-Sr-87, 38-Sr-88, 39-Y-89, 40-Zr-90*, 40-Zr-91, 40-Zr-92, 40-Zr-94, 40-Zr-96, 41-Nb-93, 42-Mo-92, 42-Mo-94,42-Mo-95,42-Mo-96,42-Mo-97,42-Mo-98,42-Mo-100,44-Ru-96,44-Ru-98,44-Ru-99,44-Ru-100,44-Ru-101,44-Ru-102,44-Ru-104,45-Rh-103, 46-Pd-102,46-Pd-104,46-Pd-105,46-Pd-106,46-Pd-108,46-Pd-110,47-Ag-107,47-Ag-109,48-Cd-106,48-Cd-108,48-Cd-110,48-Cd-111,48-Cd-112,48-Cd-113,48-Cd-114, 48-Cd-116,49-In-113,49-In-115,50-Sn-112,50-Sn-114,50-Sn-115,50-Sn-116,50-Sn-117,50-Sn-118*,50-Sn-119,50-Sn-120,50-Sn-122,50-Sn-124,51-Sb-121,51-Sb-123,52-Te-120,52-Te-122, 52-Te-123,52-Te-125,52-Te-126,52-Te-128,52-Te-130,53-I-127,54-Xe-124,54-Xe-126,54-Xe-128,54-Xe-129,54-Xe-130,54-Xe-131,54-Xe-132,54-Xe-134,54-Xe-136,55-Cs-133,56-Ba-130,56-Ba-132,56-Ba-134,56-Ba-135,56-Ba-136,56-Ba-137,56-Ba-138,57-La-138,57-La-139, 58-Ce-136,58-Ce-138,58-Ce-140,58-Ce-142,59-Pr-141,60-Nd-142,60-Nd-143,60-Nd-144,60-Nd-145,60-Nd-146,60-Nd-148,60-Nd-150,62-Sm-144,62-Sm-147,62-Sm-148,62-Sm-149,62-Sm-150,62-Sm-152,62-Sm-154,63-Eu-151,63-Eu-153,64-Gd-152,64-Gd-154,64-Gd-155,64-Gd-156,64-Gd-157,64-Gd-158,64-Gd-160,65-Tb-159,66-Dy-156,66-Dy-158,66-Dy-160,66-Dy-161,66-Dy-162,66-Dy-163,66-Dy-164,67-Ho-165,68-Er-162,68-Er-164,68-Er-166,68-Er-167,68-Er-168,68-Er-170,69-Tm-169,70-Yb-168,70-Yb-170,70-Yb-171,70-Yb-172,70-Yb-173,70-Yb-174,70-Yb-176,71-Lu-175,71-Lu-176,72-Hf-174,72-Hf-176,72-Hf-177,72-Hf-178, 72-Hf-179,72-Hf-180,73-Ta-180,73-Ta-181,74-W-180*,74-W-182*,74-W-183*,74-W-184*,74-W-186*,75-Re-185,75-Re-187,76-Os-184,76-Os-186,76-Os-187,76-Os-188,76-Os-189,76-Os-190,77-Ir-191,77-Ir-193,78-Pt-190,78-Pt-192,78-Pt-194,78-Pt-195,78-Pt-196,78-Pt-198,79-Au-197,80-Hg-196,80-Hg-198,80-Hg-199,80-Hg-200,80-Hg-201,80-Hg-202,80-Hg-204,81-Tl-203, 81-Tl-205,82-Pb-204,82-Pb-206,82-Pb-207,82-Pb-208,83-Bi-209

2.2 Fission yield evaluation with Zp model and machine learning

An evaluation platform (named ZpFit) based on the Zp model has been developed to evaluate the independent and cumulative yields simultaneously, which decay branching data is from CENDL/DDP. NDPLOT is used to retrieved the experimental data from EXFOR library. Fig. 2 shows the evaluation result of products of A = 140 for nth + ^{235}U fission, where the increasing lines stand for the cumulative yields, and decreasing lines from ^{140}Xe stands for the independent yields. Fig. 3 is the yields correlation coefficient of the above products.

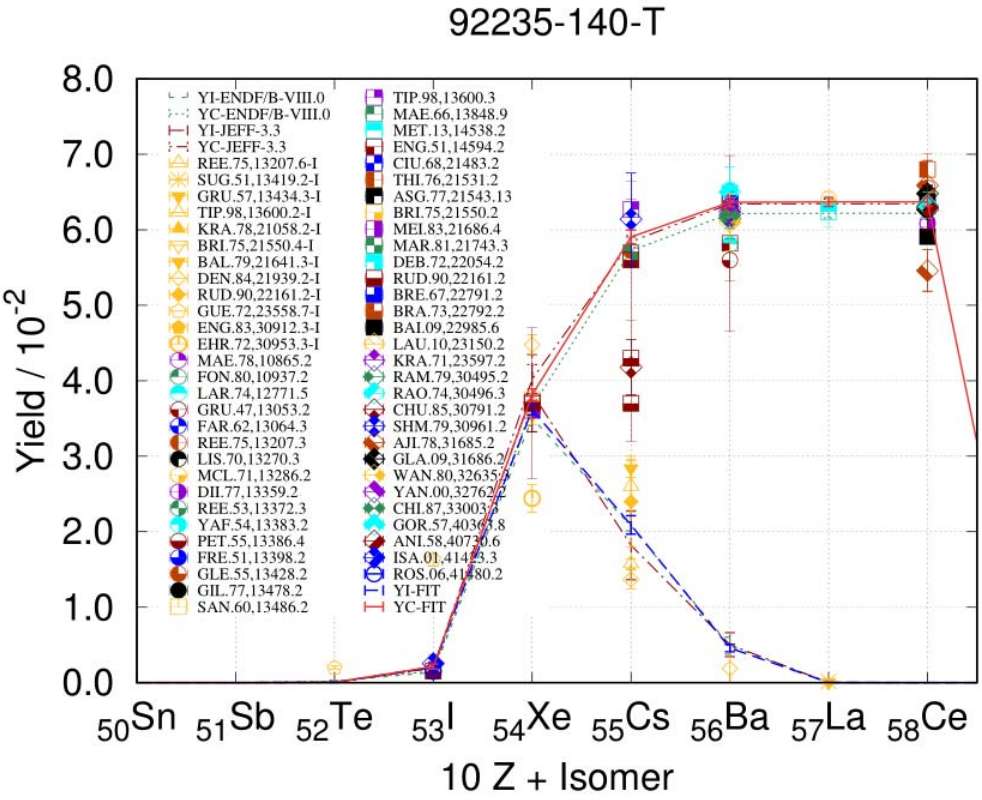

Fig. 1 Yield evaluation for nth + ^{235}U, A = 140

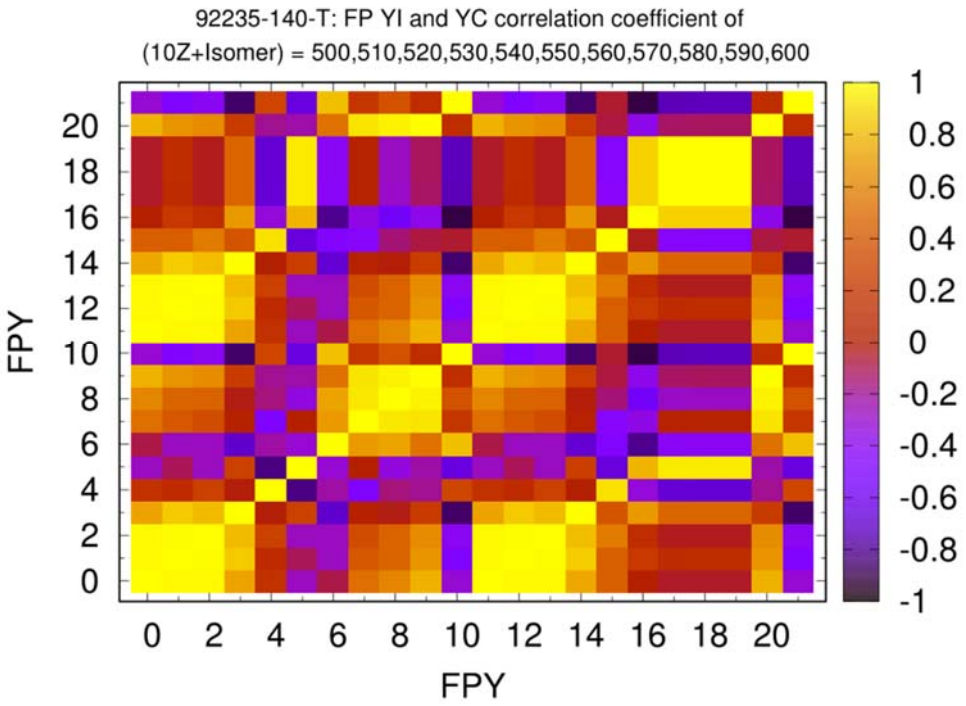

Fig. 2 The yields correlation coefficient of the products of A =140 for nth + ^{235}U fission

The Gaussian Process Regression (GPR) model is used to learn from experimental data on the neutron-induced fission yield of ^{235}U. The results show that the machine learning prediction are consistent well with the with experimental data.

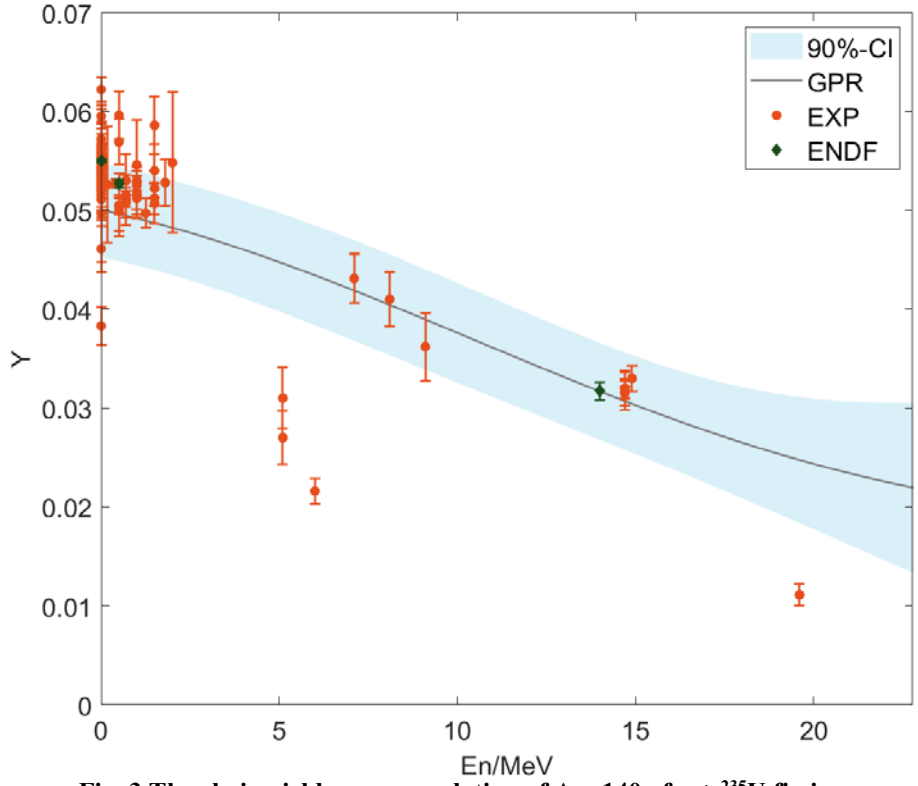

Fig. 3 The chain yield - energy relation of A = 140 of n + ^{235}U fission

Progress of nuclear structure theory

Study of U-isotope ground state properties with covariant

We have systematically analyzed the ground state of uranium isotopes from 225 to 240. By comparison with experimental data and Hartree-Fock-Bogoliubov calculations with Gogny D1S, the ground state of the uranium isotopes is always preferred to reflection-asymmetric deformation with our calculation. Fig.4 are the results of the binding energies.

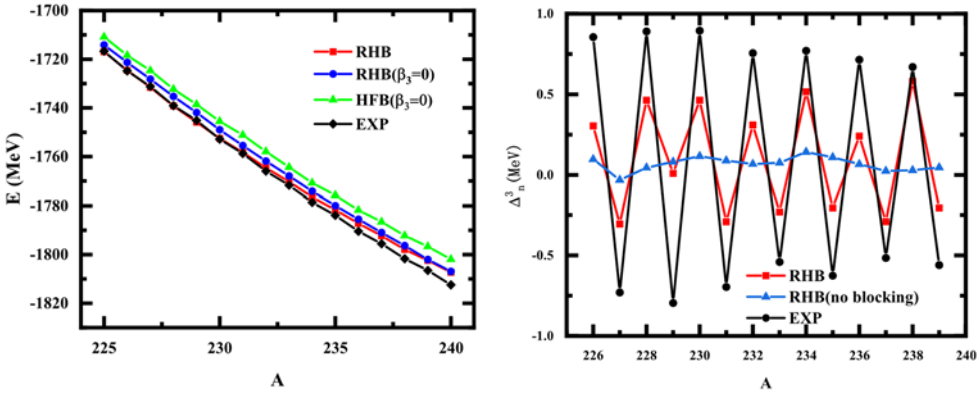

Fig. 4 (Left) Comparison of ground state binding energies of U-isotopes. A represents the mass number of uranium. The red curve is the result of the RHB calculation including the octupole deformation, the blue curve is the result of the RHB calculation considering only the symmetric cases, the green curve is the result of the non-relativistic Hartree-Fock-Bogoliubov calculation, and the black curve represents the experimental values. (Right) Comparison of three-point pairing energy of U-isotopes. The red curve is the result of the RHB calculation with blocking, the blue curve is the result of the RHB calculation without blocking, and the black curve represents the experimental values.

EXFOR activities and nuclear data services

4.1. Compilation and Scanning

Since the last NRDC meeting, we have compiled 35 new entries (summarized in Table 2), 31 neutron entries of which are contained in 2 final TRANS tapes (3209 and 3210), 4 CNPD entries of which are contained in final TRANS S033. The 3209 and 3210 have been transmitted by NDS, and S033 has been transmitted by CNDC.

Currently CNDC is responsible for scanning of 8 journals of China, namely ASI, CNPR, CNST, CPH/C, CPL, CST, HFH and NTC. The ASI is semimonthly, the HFH is bimonthly, the CNPR is quarterly and others are monthly. The scanning results are transmitted to NDS every month.

Table 2 New entries since the last NRDC meeting

No.	Entry No.	1st author	Reference	Status
1	32857	S. Q. Yan	J,AJ,919,84,2021	TRANS 3209
2	32860	Luocheng Yang	J,ANE,165,108780,2022	TRANS 3209
3	32862	Zengqi Cui	J,EPJ/A,57,310,2021	TRANS 3209
4	32868	Zhang Jiang-Lin	J,ASI,71,052901,2022	TRANS 3209
5	32869	Wang De-Xin	J,ASI,71,072901,2022	TRANS 3209
6	32870	Jie Ren	J,CPH/C,46,044002,2022	TRANS 3209
7	32873	Yu.M.Gledenov	J,EPJ/A,58,86,2022	TRANS 3209
8	32886	Zhizhou Ren	J,EPJ/A,59,5,2023	TRANS 3209
9	32810	X. X. Li	J,PR/C,106,065804,2022	TRANS 3210
10	32814	Yong Li	J,CPH/C,44,124001,2020	TRANS 3210
11	32819	Group	J,CST,2,1,1960	TRANS 3210
12	32820	Huang Shengnian	J,CST,3,585,1961	TRANS 3210
13	32822	Liang Qichang	J,CST,3,199,1961	TRANS 3210
14	32824	Li Guanhua	J,CST,3,106,1961	TRANS 3210

15	32825	Hu Ji'an	J,CST,6,554,1964	TRANS 3210
16	32826	Hu Xuanwen	J,CST,6,368,1964	TRANS 3210
17	32827	Ye Chuntang	J,CST,6,349,1964	TRANS 3210
18	32828	Yuan Harong	J,CST,6,127,1964	TRANS 3210
19	32832	Wang Yusheng	J,CST,6,1,1964	TRANS 3210
20	32833	Ruan Jinghui	J,CST,7,108,1965	TRANS 3210
21	32834	Group	J,CST,9,285,1975	TRANS 3210
22	32835	Chen Ying	J,CST,10,146,1976	TRANS 3210
23	32837	Ruan Jinghui	J,CST,11,335,1977	TRANS 3210
24	32840	Li Ze	J,CST,14,98,1980	TRANS 3210
25	32841	Ma Weiyi	J,CST,16,4,1982	TRANS 3210
26	32844	Huang Ruiliang	J,CST,31,55,1997	TRANS 3210
27	32845	Yuan Junqian	J,CTNP,11,65,1994	TRANS 3210
28	32861	X. X. Li	J,PR/C,104,054302,2021	TRANS 3210
29	32887	Yonghao Chen	J,PL/B,839,137832,2023	TRANS 3210
30	32888	Chao Liu	J,NIM/A,1041,167319,2022	TRANS 3210
31	32889	Ren	J,CNST,34,115,2023	TRANS 3210
32	S0239	Chen Zhiqiang	J,CNPR,19,387,2002	TRANS S033
33	S0240	Li Gongping	J,CNPR,19,39,2002	TRANS S033
34	S0247	Yang Lei	J,CNPR,30,117,2013	TRANS S033
35	S0259	Wu Meizhen	J,CST,3,701,1961	TRANS S033

2. Visits and Cooperation

Nengchuan SHU, Jimin WANG and Xi TAO visited IAEA from 9 to 12 May 2023 to attend the NRDC 2023 meeting. Naohiko OTSUKA visited CNDC from 18 to 22 September 2023 to discuss finalization of EXFOR entries compiling data measured in China.

Indian EXFOR Compilation Progress Report for period 2023-2024

IAEA Technical Meeting, 14-17 May 2024
Vienna, Austria

India continues to compile data on neutrons, charged particles, and photonuclear-induced reactions. This report details all EXFOR entries compiled and transmitted to the IAEA-NDS since the NRDC-2023 meeting.

EXFOR Compilation Team:

- Vidya Devi: Responsible for regular compilation activities.
- Devesh Raj: Organizes workshops for EXFOR compilation every two years.
- Gayatri Mohanto: Handles numerical data collection at BARC.

Software utilized for EXFOR Compilation activity:

The software tools used for the EXFOR compilation are: -

- Russian EXFOR editor [http://wwwnds.iaea.org/nrdc/nrdc_sft/] for compilation.
- GSYS [https://www.jcprg.org/gsys/2.4/] for digitization
- JCPRG EXFOR tool [https://www.jcprg.org/exfor/tool/] for checking purpose:

Coordination by DAE-BRNS:

The DAE-BRNS coordinates EXFOR compilation in India with support from IAEA-NDS through:

- offering project and funding opportunities to university faculties in partnership with different DAE units.
- hosting EXFOR theme meetings and workshops.
- encouraging and engaging voluntary compilers, including young researchers and article authors.

9th DAE-BRNS EXFOR – 2023 workshop:

9th DAE-BRNS EXFOR-2023 workshop was held at the Department of Physics, Bharathiar University, Coimbatore.

EXFOR entries compiled during the workshop:

- CPND =20 entries (Trans.D141)
- Neutron = 6 entries (Trans.3212)
- PhND = 1 entry (Trans.G052)

Total= 27

Transmission Statistics since NRDC 2019 Meeting:
The table represents the Indian Centre's contribution to EXFOR compilation activities since NRDC 2019 meeting**.**

	New Entries (India)	Fraction to New Entries (NRDC)
NRDC2023 – NRDC2024	**53**	**12%**
NRDC2022 – NRDC2023	19	5%
NRDC2021 – NRDC2022	55	10%
NRDC2019 – NRDC2021	110	9%

Acknowledgement:
Our sincere thanks to M. Balasubramaniam and his university for hosting the EXFOR workshop, and to the experimentalists for their valuable data contributions. Special thanks to Naohiko for his insightful discussions and thorough review.

CDFE photonuclear data processing and evaluation activity, 2023/2024.

V.V.Varlamov, A.I.Davydov, I.A.Mostakov, V.N.Orlin

Progress report for the Technical Meeting of the International Network of Nuclear Reaction Data Centres, 14 - 17 May 2024 for the period of time from the previous Meeting (the IAEA's Headquarters, Vienna, Austria, 9 - 12 May 2023).

The report shortly describes the main activity of the Centre for Photonuclear Experiments Data (Centr Dannykh Fotoyadernykh Eksperimentov - CDFE) of the Russia Lomonosov Moscow State University Skobeltsyn Institute of Nuclear Physics in photonuclear data processing, compilation and evaluation.

EXFOR Compilation

7 CDFE EXFOR final TRANSes **trans.m123 – trans.m129** and 2 preliminary ***prelim.m130*** **and** ***prelim.m131*** have been produced and transmitted to the IAEA Nuclear Data Section.

CDFE TRANSes contain **81** ENTRYs – **10** new ones compiled in accordance with the contents of the NRDC Network Memos, the NDS database "Articles for compilation" (https://www-nds.iaea.org/nrdc/alloc/ and *71 old ones* corrected in accordance with the new EXFOR format rules and the comments and recommendations of the NRDC experts, first of all, Naohiko Otsuka, Daniela Foligno, and Svetlana Dunaeva.

New and *Old* trans.m* and ***prelim.m**** contents

TRANS	Numbers of ENTRYs		
	Old	**New**	Total (SUBENTs)
m123	*7*	1	8 (80)
m124	*4*	0	4 (12)
m125	*10*	**2**	12 (41)
m126	*1*	**4**	5 (52)
m127	*9*	**1**	10 (67)
m128	8	**2**	10 (41)
m129	9	**0**	9 (79)
prelim.m130	*11*	***0***	*11 (68)*
prelim.m131	*12*	***0***	*12 (64)*
Common	71	**10**	81 (504)

Photonuclear Data Evaluation

The CDFE program of analysis of reliability of photonuclear reaction cross sections obtained in various experiments using objective physical criteria of data reliability and of evaluation of newly such kind data satisfied those criteria using the experimental-theoretical method was continued.

It was found before that in cases of about 50 nuclei from 51V to 209Bi investigated using beams of quasimonoenergetic annihilation photons cross sections of partial photoneutron reactions (γ,1n) and (γ,2n) do not satisfy physical criteria because of significant systematic uncertainties of the experimental method for photoneutron multiplicity sorting. Therefore, the reliability of data obtained for several nuclei using quite different method on the beams of bremsstrahlung was investigated. It was found out that in cases of relatively light nuclei 51V, 59Co, 58,60Ni, unlike medium and heavy nuclei 112,114,119Sn, 127I, 165Ho, and 181Ta, partial photoneutron reaction cross sections obtained using statistical model corrections to neutron yield cross sections $\sigma(\gamma,Sn) = \sigma(\gamma,1n)+2\sigma(\gamma,2n)+3\sigma(\gamma,3n)+\ldots$ also are not reliable because of some shortcomings of such procedure. Using comparisons in detail of experimental cross sections and ones evaluated using experimental-theoretical method for nuclei 51V, 52Cr, and 90Zr in addition to 58,60Ni it was found that the main source of such method systematic uncertainties is that the contributions of (γ,1n1p) reaction were not taken into account.

New Experimental Methods

In the same time it was found out before that photoneutron cross sections obtained using alternative methods of direct photoneutron multiplicity determination, for example activation method and the suitable method realized on the beams of new laser Compton scattering photons, give to one possibility to obtain reliable data. Because of that the relevant partial reaction cross sections were obtained using activation method for Se, Nb, Mo and the discussions of new laser Compton scattering photons facility project was started.

Main publications

1. V.V.Varlamov, A.I.Davydov. Reliability of ^{159}Tb partial photoneutron reaction cross sections obtained in various experiments. Phys. Atom. Nucl., 85, N6 (2023) 361–371.
2. V.V.Varlamov, A.I.Davydov, I.A.Mostakov, V.N.Orlin. Cross sections of partial photoneutron reactions on 59Co in experiments with bremsstrahlung. Phys. Atom. Nucl., 86, N5 (2023) 600–612.
3. P.D.Remizov, M.V.Zheltonozhskaya, A.P.Chernyaev, V.V.Varlamov. Measurements of flux-weighted yields for (γ, αXn) reactions on molybdenum and niobium. Eur. Phys. J. A, 59 (2023) 141.
4. V.V.Varlamov, A.I.Davydov, V.N.Orlin. Similarities and differences in processes of 58,60Ni photodisintegration. Bull. Rus. Acad. Sci. Phys., 87, №8 (2023), 1179–1187.
5. V.V.Varlamov, A.I.Davydov, V.N.Orlin. Cross sections of partial photoneutron reactions in experiments on beams of bremsstrahlung γ- radiation. Bull. Rus. Acad. Sci. Phys., 87, №8 (2023) 1188–1195.
6. S.S.Belyshev, V.V.Varlamov, L.Z.Dzhilavyan, A.A.Kuznetsov, A.M.Lapik, A.L.Polonski, A.V.Rusakov, V.I.Shvedunov. On monitoring on the under-development source based on backward Compton scattering for photonuclear research at $E\gamma \leq 40$ MeV. Mos. Univ. Phys. Bull., 78, N 3 (2023) 278–283.

7. S.S.Belyshev, V.V.Varlamov, L.Z.Dzhilavyan, A.A.Kuznetsov, A.M.Lapik, A.L.Polonski, A.V.Rusakov, V.I.Shvedunov. On the program of photonuclear research using the backward Compton quasi-monochromatic γ quanta with tunable energy Eγ ≤ 40 MeV. Mos. Univ. Phys. Bull., 78, N 3 (2023) 284–290.
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9. V.V.Varlamov, A.I.Davydov, V.N. Orlin. Status of experimental photonuclear results. Mos. Univ. Phys. Bull., 78, N. 3 (2023) 303–315.
10. V.V.Varlamov, A.I.Davydov, I.A.Mostakov. Reliability of 51V photoneutron reaction cross sections obtained using bremsstrahlung. Eur. Phys. J. A., 60 (2024) 44.
11. V.V.Varlamov, A.I.Davydov. Photonuclear experiments: from the bremsstrahlung to the Compton backward scattering photons. Mos. Univ. Phys. Bull., V. 79, N. 2 (2024), in print.
12. V.V.Varlamov, A.I.Davydov, I.A.Mostakov, V.N.Orlin. Photoneutron reaction cross sections for 90Zr in different experiments. Phys. Atom. Nucl., 87, N5 (2024), in print.
13. V.V.Varlamov, A.I.Davydov, I.A.Mostakov, V.N.Orlin. Photoneutron reaction cross sections for light and medium-heavy nuclei in experiments on the beams of bremsstrahlung. Bull. Rus. Acad. Sci. Phys. (2024), in print.
14. V.V.Varlamov, A.I.Davydov, I.A.Mostakov. Reliability of cross sections of photoneutron reactions on 51V and 59Co in experiments with bremsstrahlung. Bull. Rus. Acad. Sci. Phys. (2024), in print.

Short-term 2024/20245 Program

The main items of CDFE 2024/2025 program, main priorities and most important tasks are traditional and the following:

- continuation of new photonuclear data compilation using EXFOR format, production of new TRANSes (trans.m132, trans.m133, etc.);
- correction of old ENTRYs in accordance with new EXFOR coding rules and the NRDC Network expert's comments and recommendations;
- continuation of analysis and evaluation using objective physical criteria of total and partial photonuclear reaction cross sections obtained in various experiments, carried out using different sources of photons (quasimonoenergetic annihilation photons, laser Compton backscattering photons, bremsstrahlung photons);
- continuation of development of methods for direct photoneutron multiplicity determination.

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Progress Report for NRDC2024 Technical Meeting (14-17 May 2024)

1. EXFOR activity.

EXFOR compilation statistics

Trans	Status	Date	Entries total	Entries new	Entries revised	Subents total	Subents New	Subents Revised	NOSubent
4212	Final	2023-04-18	21	0	21	130	0	123	7
4213	Final	2023-09-08	14	2	12	141	12	125	4
4214	Final	2023-11-09	36	11	25	245	43	178	24
4215	Final	2024-02-02	36	2	34	300	27	259	14
4216	Final	2024-03-29	88	0	88	620	36	557	27
	Final		**195**	**15**	**180**	**1436**	**118**	**1242**	**76**
4217	Prelim	In preparation		3					

2. Journal YK - https://vant.ippe.ru/

The journal “Yadernye Konstanty” (YK) is continued to be published in IPPE as the online journal “Yadernye and Reaktornye Konstanty” ("Problems of Atomic Science and Technology. Series: Nuclear and Reactor Constants").

Four regular issues during 2023 year and one issue at 2024 year were published.

3. Proposals for EXFOR activity

-239 2024-04- Zero values in EXFOR data base

-240 2024-04- CJD (aliases RNDC) status information

4. NRDC2023 Actions.

A1 – done - memo 4C-4/240 was sent

A5-A6 – continue as usual

A49 – finished

A62 – feedback for InpGraph was sent.

A64, A66 – Feedbacks were not sent – no questions for GSYS and JANIS TRANS checker.

A70, A72 – Feedbacks were not sent – no questions for ZCHEX and X4+ format.

A83 – A message about lab. reports was sent 21 June 2021. I have not received a letter with a list of reports (A91, V.Zerkin).

A88 – several requests were sent to Lidija Vrapcenjak for English translations.

A89 – feedback was not sent –no questions and proposals for X5 structure/hierarchy and contents,

5. Acknowledgments
- Naohiko Otsuka for detailed checking of preliminary transes and productive discussions,
- Lidija Vrapcenjak (IAEA) for providing pdf-files of articles,
- Daniela Foligno, Manuel Bossant, Julia Sprenger for useful comments of preliminary trances.

Korea Nuclear Data Center (KNDC)

Progress Report for period 2023-2024

Technical Meeting on the International Network of Nuclear Reaction Data Centers (NRDC 2024)
14 - 17 May, 2024

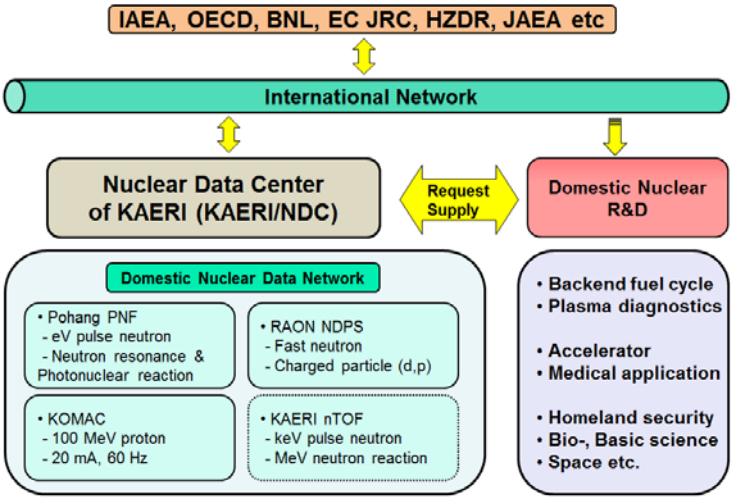
Korea Atomic Energy Research Institute
Daejeon, Korea
Web: http://atom.kaeri.re.kr/
E-mail: kimdh@kaeri.re.kr

1. General

Korea Nuclear Data Center (KNDC, formerly 'Nuclear Data Evaluation Lab.') was established in 1997 to start research on nuclear data in Korea and joined the International Network of Nuclear Reaction Data Centers (NRDC) in 2000. KNDC at Korea Atomic Energy Research Institute (KAERI) performs the following main tasks:

- Evaluation and method development for nuclear reaction data
- Establishment of processing and validation system of nuclear reaction/covariance data
- Measurement of nuclear reaction data and establishment of measurement facility
- Production and validation of atomic/molecular collision data

The mission of our center includes disseminating the outcomes of cooperation with international networks as well as promoting nuclear data research activities and supporting nuclear/radiation R&Ds in Korea. KNDC is also coordinating the measurement activities using domestic accelerators for producing various nuclear reaction data.



KNDC continues to cooperate with the international nuclear data network as follows:

- Participating in IAEA CRP, TM, and CM on nuclear data evaluation, nuclear data processing and validation, atomic/molecular data network, etc.
- Collecting nuclear reaction measurement data in Korea for EXFOR compilation under the gui dance of IAEA/NDS
- Participating in the JEFF and WPEC subgroups of OECD/NEA
- Conducting joint research on evaluation, measurement, and validation of nuclear data with for eign research institutes

As of 2024, KNDC consists of 8 regular staffs, 2 post-retirement researchers, 2 post-doctoral researchers, and 3 Ph.D. students. The latest staff changes include:

- Dr. Dalho MOON joined as a post-doctoral researcher in August 2023.
- Mr. Dongwan KIM and Ms. Sakshi PATWAL joined as a Ph.D. student in March 2024.

They are working in the following fields:

- Nuclear data evaluation: 2 regular staffs
- Nuclear data measurement: 2 regular staffs, a post-retirement researcher, and a post-doctoral r esearcher
- Nuclear data processing/validation/application: 2 regular staffs, a post-retirement researcher, a nd a Ph.D. student
- Atomic/molecular data production: 2 regular staffs, a post-doctoral researcher, and 2 Ph.D. stu dents

2. EXFOR Activity

We are continuing data compilation for nuclear reaction data obtained in Korea under the guidance of IAEA/NDS. Since the last meeting, 10 Entries have been entered into the EXFOR database and 2 entries have been compiled as listed in Table 1.

Table 1. Compilation statistics of KNDC

No.	TRANS	ENTRY	SUBJECT	STATUS
1	D138	D7039	Proton	EXFOR
2	D138	D7040	Proton	EXFOR
3	D138	D7041	Proton	EXFOR
4	D138	D7042	Proton	EXFOR
5	D139	D7043	Proton	EXFOR

6	3210	30851	Neutron	EXFOR
7	3210	30852	Neutron	EXFOR
8	3210	30853	Neutron	EXFOR
9	3210	30854	Neutron	EXFOR
10	3210	30855	Neutron	EXFOR
11		30856	Neutron	Compiled
12		30857	Neutron	Compiled

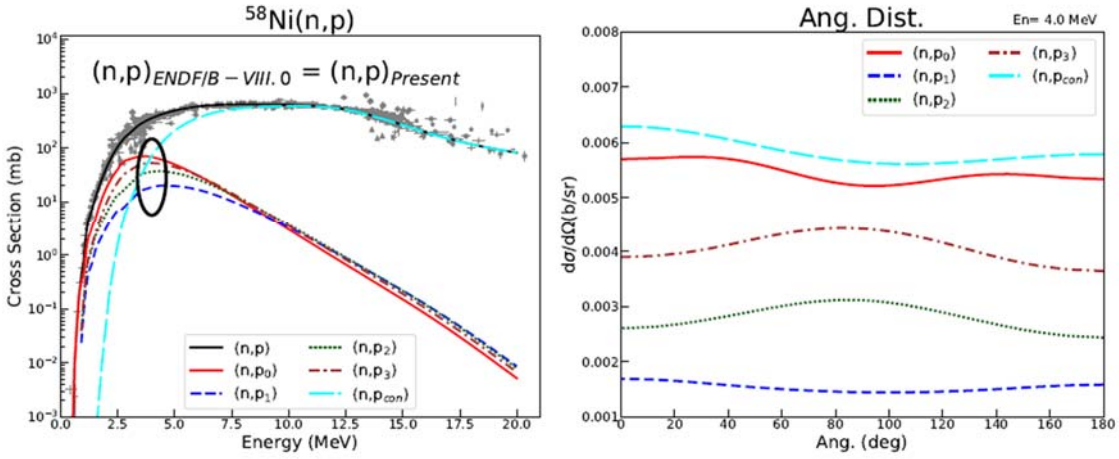
- **Checking Code**

The draft was checked through a tool of JCPRG. (http://www.jcprg.org/exfor/tool/)

3. Nuclear Data Activities

3.1 Evaluation

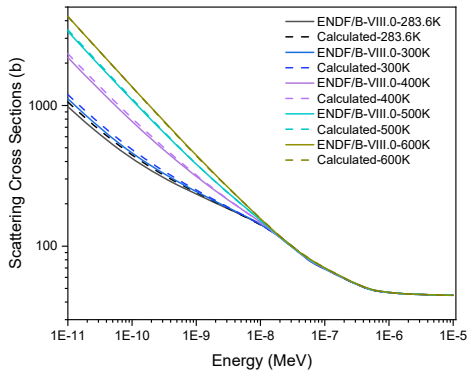
To complete missing angular distributions and energy spectra of secondary particles in the ENDF/B-VIII.0 library, a statistical Hauser-Feshbach code, CoH_3, was used for calculating angular distributions for neutron-induced charged particle reactions including (n,p), (n,a), (n,d), (n,t) and (n,^{3}He) through the collaborative project with Los Alamos National Laboratory (LANL). For instance, the total (n,p) cross section for ^{58}Ni is exactly the same as that given in ENDF/B-VIII.0, along with four newly decomposed cross sections of the discrete levels and the continuum part as shown in the left panel of below figure. The additional angular distributions for these levels in the laboratory system are calculated and shown in the right panel of below figure at the neutron incident energy of 4.0 MeV, which corresponds to the black circle in the left panel.



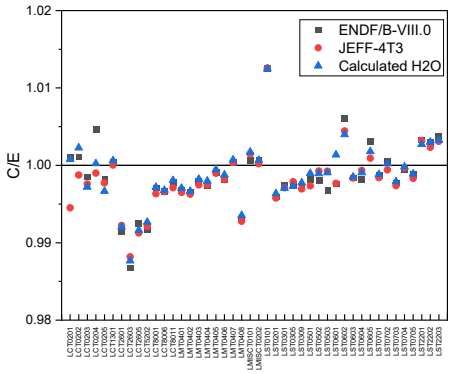
^{58}Ni(n,p) cross sections and angular distributions

A total of 52 nuclides were updated for missing angular distributions and energy spectra of secondary particles including photon production, created in the EDNF-6 format and submitted to National Nuclear Data Center (NNDC) for upcoming ENDF/B-VIII.1 release.

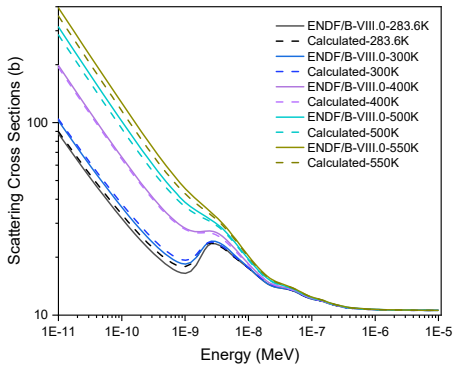
A research on producing thermal neutron scattering data based on molecular dynamics and ab-initio code simulations has been conducted since 2022. Temperature-dependent TSL data of H_2O and D_2O were produced using the frequency spectrum and/or Sköld correction factor obtained by GROMACS code simulations with TIP4P/2005f water models. In addition, TSL data of crystalline graphite was produced based on VASP code simulation. The TSL data were validated to show comparable performances to ENDF/B-VIII.0 through criticality benchmark calculations.



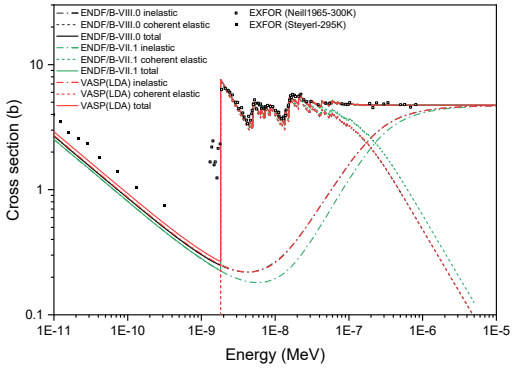
Scattering Cross Sections of H_2O



Criticality Benchmark (LEU) Results for H_2O TSL Data



Scattering Cross Sections of D_2O

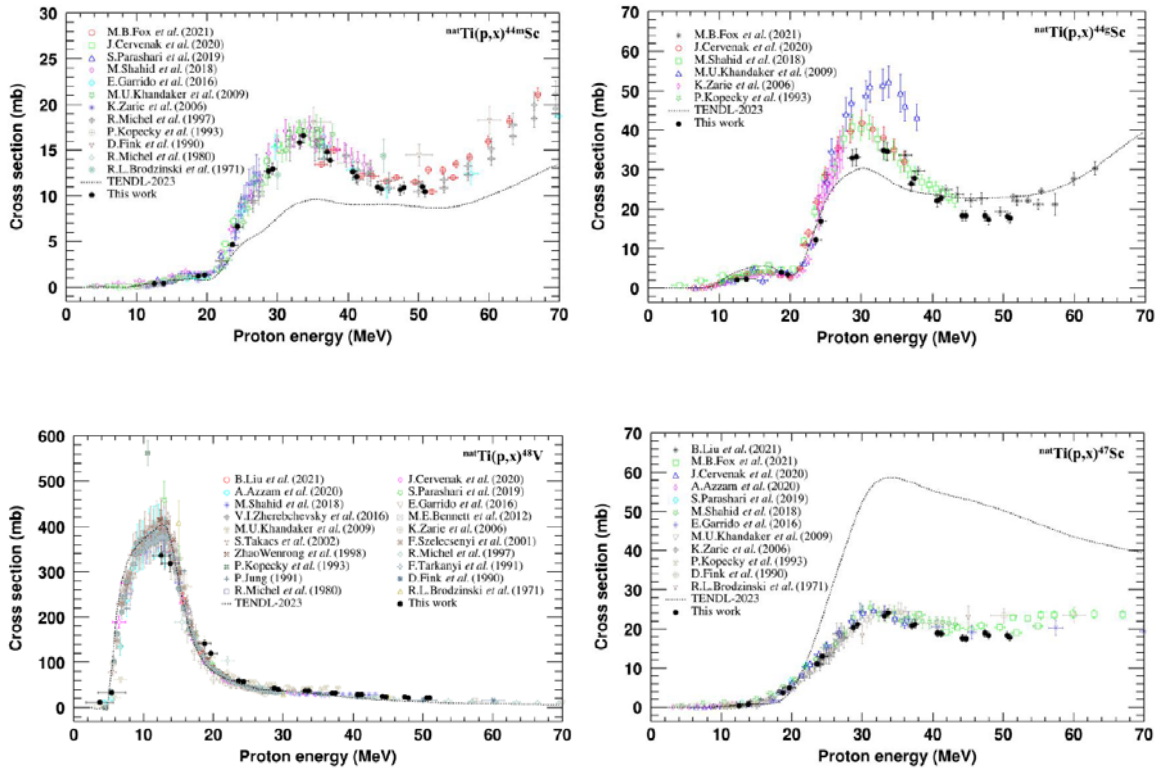


Scattering Cross Sections of Crystalline Graphite

3.2 Measurement

The production cross sections of ^{nat}Ti(p,x) reactions were measured using off-line γ-ray spectrometry and a stacked-foil activation technique. The activation experiment was performed using

a proton energy of 57 MeV at the Korea multi-purpose accelerator complex (KOMAC). The measured cross sections were compared with the experimental data of the literature and the data from the TENDL-2023 library. The production cross section for ^{44,47}Sc produced through the ^{nat}Ti(p,x) reactions can be used as medical isotopes, while ^{nat}Ti(p,x)^{48}V reaction can be utilized for proton monitoring reaction.



3.3 Cooperation

We continue to cooperate with the following experimental groups for nuclear data production in Korea:

- Kyungpook National University (KNU)
- Sungkyunkwan University (SKKU)
- Institute for Basic Science (IBS)

Since the last meeting, an event has been held in cooperation with KNDC.

- The "4th Reactor Physics Asia Conference (RPHA 2023)" was held in Gyeongju, Korea from October 24 to 26, 2023. This conference was hosted by the Reactor Physics and Computational Science Division of the Korean Nuclear Society, cosponsored by the counterpart divisions of the Chinese Nuclear Society and the Atomic Energy Society of Japan. In the nuclear data fi

eld, a total of 14 papers were presented in two sessions. (The total number of submitted paper s was 67.)

Session Schedule 1st Day(24th)

schedule	begin	end	Detail	
08:30~09:10	8:30	9:10	Registration	
09:10~09:20	9:10	9:20	Opening Remarks (or Welcome Address)	
09:20~09:50	9:20	9:50	Chinese Plenary Session Presentation	
09:50~10:20	9:50	10:20	Japanese Plenary Session Presentation	
10:20~10:50	10:20	10:50	Korean Plenary Session Presentation	
10:50~11:00	10:50	11:00	Break Time	
11:00~11:20	11:00	11:20	(A-1) Nuclear Data & Multi-group Cross Section (Room201)	(B-1) Radiation Shielding (Lounge meeting room)
11:20~11:40	11:20	11:40		
11:40~12:00	11:40	12:00		
12:00~12:20	12:00	12:20		
12:20~12:40	12:20	12:40		
12:40~14:00	12:40	14:00	Lunch Time	
14:00~14:20	14:00	14:20	(A-2) Monte Carlo Method & Codes (Room201)	(B-2) Data Measurement & Reactor Analysis (Lounge meeting room)
14:20~14:40	14:20	14:40		
14:40~15:00	14:40	15:00		
15:00~15:20	15:00	15:20		
15:20~15:40	15:20	15:40	Break Time	
15:40~16:00	15:40	16:00	(A-2) Monte Carlo Method & Codes (Room201)	(B-2) Data Measurement & Reactor Analysis (Lounge meeting room)
16:00~16:20	16:00	16:20		
16:20~16:40	16:20	16:40		
16:40~17:00	16:40	17:00		
17:00~17:20	17:00	17:20		
17:20~17:40	17:20	17:40		

Session Schedule 2nd Day(25th)

schedule	begin	end	Detail	
09:20~09:40	9:20	9:40	(C-1) Reactor Analysis Methods (Room 201)	(A-3) Nuclear Data &Experiment (Lounge meeting room)
09:40~10:00	9:40	10:00		
10:00~10:20	10:00	10:20		
10:20~10:40	10:20	10:40		
10:40~11:00	10:40	11:00	Break Time	
11:00~11:20	11:00	11:20	(C-1) Reactor Analysis Methods (Room 201)	(A-3) Nuclear Data &Experiment (Lounge meeting room)
11:20~11:40	11:20	11:40		
11:40~12:00	11:40	12:00		
12:00~12:20	12:00	12:20		
12:20~12:40	12:20	12:40		
12:40~14:00	12:40	14:00	Lunch Time	
14:00~14:20	14:00	14:20	(C-2) Computational Methods &Reactor Analysis (Room201)	(A-4) Advanced Reactor Core Design (Lounge meeting room)
14:20~14:40	14:20	14:40		
14:40~15:00	14:40	15:00		
15:00~15:20	15:00	15:20		
15:20~15:40	15:20	15:40		
15:40~16:00	15:40	16:00	Break Time	
16:00~16:20	16:00	16:20	(C-2) Computational Methods &Reactor Analysis (Room201)	(A-4) Advanced Reactor Core Design (Lounge meeting room)
16:20~16:40	16:20	16:40		
16:40~17:00	16:40	17:00		
17:00~17:20	17:00	17:20		
17:20~17:40	17:20	17:40		

Meal place	
2023.10.24 (Tue) Lunch	300C
2023.10.24 (Tue) Dinner	300C
2023.10.25(Wed) Lunch	4th floor Cafeteria

3.4 Web Service

KNDC provides the following three main web services. These websites are constantly being updated.

- Nuclear Data Chart (http://atom.kaeri.re.kr/nuchart/): nuclide information, nuclear reaction da ta, cross section data plot and comparison
- Application Library (http://atom.kaeri.re.kr/NDVG/): processed nuclear data library for Mont e Carlo (ACE) and deterministic (MATXS) neutron transport codes, processed covariance dat a (COVFIL), fission product yield and decay data for SCALE
- Atomic Data (http://pearl.kaeri.re.kr/pearl/): atomic database including photoionization cross section, electron impact ionization (EII) rate coefficient, and dielectronic recombination (DR) rate coefficient

3.5 Support for Nuclear/Radiation R&Ds

KNDC supports domestic and foreign nuclear/radiation R&Ds by providing nuclear data related information, how to process nuclear data, working libraries for application, etc. The main support details for 2023 were as follows:

- Advice on the use of thermal neutron reaction cross section of Xe-133m (Hanyang Univ.)
- Support for dose distribution analysis using the latest nuclear data for cyclotron-based neutron irradiation tests of semiconductors (KAERI)
- Advisory on the use of cumulative fission product yield data of U-235 in JEFF-3.1 (Ministry of Food and Drug Safety)

Progress Report of Nuclear Data Center of Japan Atomic Energy Agency for April 2023 – March 2024

A. Kimura
Nuclear Data Center
Nuclear Science and Engineering Center
Japan Atomic Energy Agency

1. General

Nuclear Data Center of Japan Atomic Energy Agency (JAEA/NDC) is working on evaluation and measurement of nuclear data for Japanese Evaluated Nuclear Data Library JENDL. The experiments were mainly performed using Accurate Neutron-Nucleus Reaction measurement Instrument (ANNRI) installed in Material and Life Science Experimental Facility at J-PARC. The evaluation and related works are performed in the cooperation with Universities, Research Organizations, and Companies in Japan through Japanese Nuclear Data Committee. The number of Nuclear Data Center members consists of 7 regular staffs, 1 postdoc and 1 secretary as of April 1, 2024, and the center leader is Dr. Osamu IWAMOTO.

2. Nuclear Data Evaluation

The latest version of general purpose nuclear data library JENDL-5.0 was released in Dec. 2021. Previously released special purpose files such as neutron activation cross sections and charged-particle/photon-induced reactions were incorporated into JENDL-5 with updating the data. The 13 files fixing problems found in JENDL-5.0 have been released as JENDL-5.0 Updated Files until now. Evaluations of nuclear data for the next version of JENDL are in progress.

3. Nuclear Data Measurement

Neutron capture and total cross sections have been conducted for ^{181}Ta, ^{139}La, ^{185}Re, and $^{155\text{ and }157}$ Gd at the J-PARC/MLF/ANNRI. Thermal capture cross sections of ^{93}Nb and ^{204}Pd have been deduced with the activation method.

4. EXFOR compilation

JAEA started to compile the data from 2019. We are responsible for compiling neutron-induced experimental data measured in JAEA facilities or cooperation with the JAEA Nuclear Data Center. In 2023, we have compiled 8 entries.

Table 1 Compilation statistics of JAEA in 2023 JFY.

Entry	**Reference**	**Reaction**	**Facility**	**Date**	Status
23604	JNST,59,1388,2022	Np-237(n,g)	KUR	20230623	In EXFOR
23606	JNST,60,489,2023	Am-241(n,g)	J-PARC	20230628	In EXFOR
23607	J,NST,60,678,2023	Gd-155,157(n,g)	J-PARC	20231208	In EXFOR
23608	J,PR/C,97,034622,2018	La-139 RP	J-PARC	20231110	In EXFOR
23609	J,PR/C,107,054602,2023	Xe-131 RP	J-PARC	20231110	In EXFOR
23610	J,NST,60,1133,2023	Nb-93 (n,g)	KUR	20231211	Compiled
23611	J,NST,60,1361,2023	Pb-204 (n,g)	JRR-3	20231213	Compiled
23612	J,PRL,132,023402,2024	V Scattering length	J-PARC	20240209	Compiled
23613	J,EPJ/A,59,288,2023	La-139(n,g), (n,tot)	J-PARC	On going	
23614	J,NSE,198,786,2024	Ta-181(n,g), (n,tot)	J-PARC	On going	

5. Other Services

The data in JENDL are available at web site (https://wwwndc.jaea.go.jp/index.html). The monthly downloaded data size in April 2023 to Febrary 2024 is shown in Fig.1. The share by the country in the same period is shown in Fig.2.

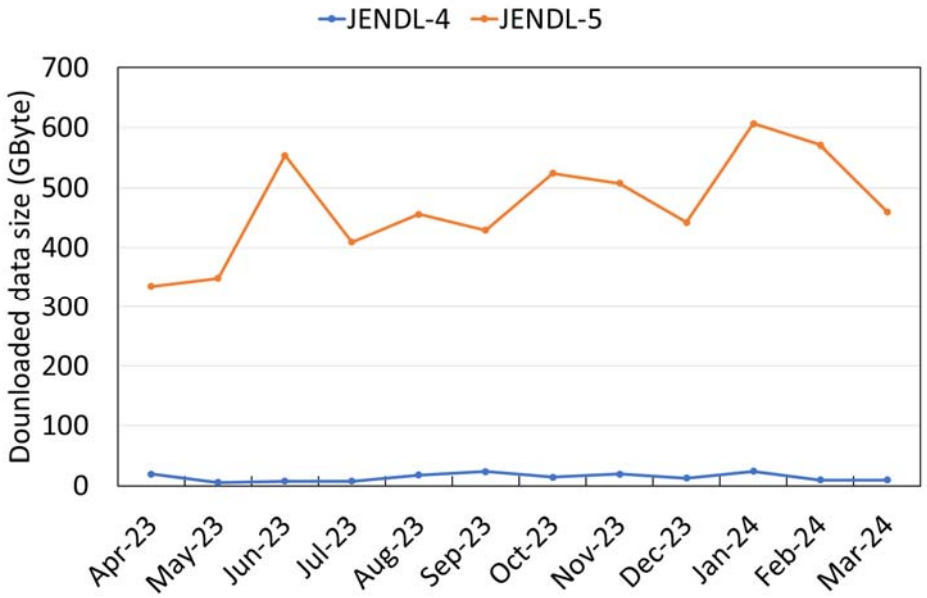


Fig.1 Downloaded data size in period of April 2023 to March 2024.

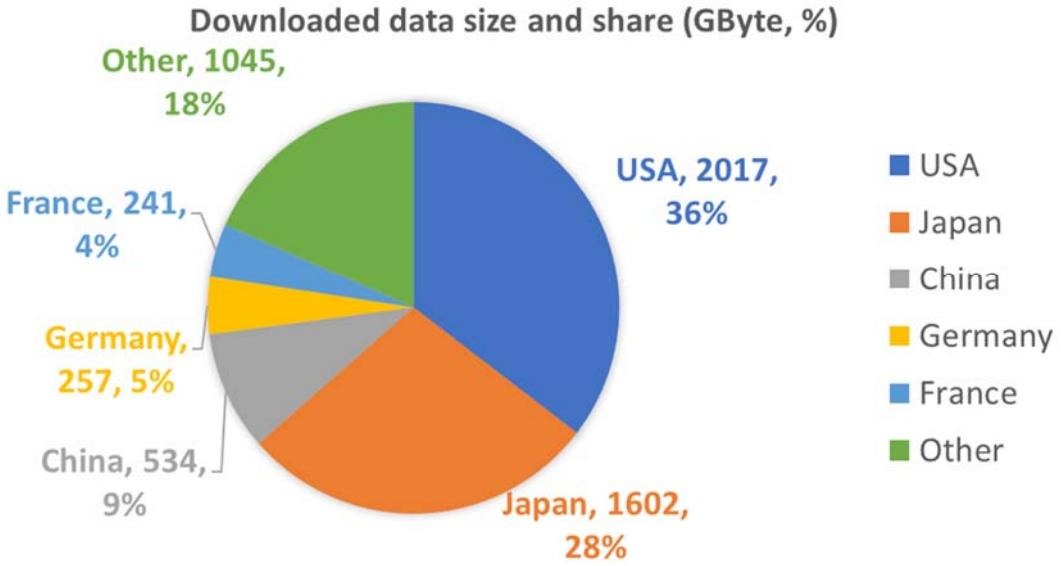


Fig. 2 Downloaded data size by countries for JENDL-5.0.

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