Conclusions and Actions of the NRDC 2024 Meeting

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 ⁹Be) 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 ²⁰⁹Bi(p,x)²¹¹At cross sections in EXFOR listed in CP-D/1072=WP2023-29 will be kept with the following statement under the keyword CRITIQUE: "Production of ²¹¹At observed in this experiment is solely due to interaction of secondary alpha particles with ²⁰⁹Bi.".

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 ²³⁵U 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

A1Koning
RajSend 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 = WP2024-27 (BIB/BIB link)
A6	Otsuka	 Revise LEXFOR for 4C-3/0421 = WP2023-08 (Scattering) 4C-4/0233 = WP2023-31 (Fitting coefficients) CP-D/1038 = WP2023-24 (Error) CP-D/1055(Rev.) = WP2023-23 (Status) CP-D/1072 = WP2023-29 (Production and emission cross sections) CP-D/1076 = WP2023-30 (Activation) CP-D/1110 (Rev.) = WP2024-12 (Fission yields) CP-D/1111 (Rev.) = WP2024-13 (Partial reactions)
A7	Otsuka	 Revise EXFOR/CINDA Dictionary Manual according to CP-D/1067 = WP2023-09 (Dictionary 227) CP-D/1081 = WP2023-11 (full review) CP-D/1092(Rev.) = WP2024-09 (Transmission dictionary) CP-D/1105 = WP2024-10 (exclusion of full stop in headings and units) CP-D/1109 = WP2024-11 (Internal numerical equivalent for Dict. 227, additional I7 field for 1000Z*A.) 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.)

<u>A14</u>	Pritychenko, Sprenger	Compile with priority the articles listed in WP2024-15 to respond to the individual requests from EXFOR users.
<u>A15</u>	Pritychenko	(Continuing action) Compile with priority the neutron source spectra listed in CP-D/0700 (Rev.3).
<u>A16</u>	Pritychenko	(Continuing action) Compile with priority R.G.Lanier+,R,UCAR-10062-89,71,1989 listed in CP-D/0725 Rev. (~WP2012-19).
<u>A17</u>	Pritychenko Nomura Taova	(Continuing action) Compile with priority the light charged-particle induced isotope production cross sections listed in CP-D/0757 = WP2013-12.
<u>A18</u>	Pritychenko	(Continuing action) Compile with priority T.Mo+,J,NP/A,198,153,1972 listed in CP-D/0832 Rev.
<u>A19</u>	Pritychenko	(Continuing action) Compile with priority W.G. Alberts+,R,NUREG/CP-0029,433,1982 in CP-D/0838 = WP2014-21.
<u>A20</u>	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.
<u>A21</u>	Pritychenko	(Continuing action) Compile F. Bischoff,R,RPI-328-87,146,1966 listed in 4C-3/0404 = WP2016-19.
<u>A22</u>	Pritychenko	(Continuing action) Compile P.L.Reeder+,J,PR/C,15,2108,1977 listed in 4C-3/0410 = WP2018-20.
<u>A23</u>	Pritychenko	(Continuing action) Compile deuteron-induced reaction data compiled by the Frascati group and listed in CP-D/0758.
<u>A24</u>	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.)

<u>A28</u>	Nomura Pritychenko Sprenger Taova	Resolve the duplications listed in WP2024-19.
<u>A29</u>	Pritychenko	(Continuing action) Revise the datasets of neutron elastic scattering including inelastic scattering contribution as proposed in $4C-3/0420(\text{Rev2})$.
<u>A30</u>	Pritychenko	(Continuing action) Replace REACTION SF3=A with EL in $C0753.002$ (CP-D/0960 = WP2019-31).
<u>A31</u>	Pritychenko	(Continuing action) Revise entries involving several variable atomic and/or mass numbers listed in CP-D/0984 in WP2021-31.
<u>A32</u>	Pritychenko	(Continuing action) Revise DECAY-DATA and DECAY-MON records including EC (electron capture) listed in CP-D/0989 = WP2021-07.
<u>A33</u>	Pritychenko	(Continuing action) Replace EL and INL in REACTION SF3 of 12373.008 with SCT (Memo CP-D/0991 = WP2021-26).
<u>A34</u>	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.
<u>A35</u>	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).

<u>A36</u>	Pritychenko	(Continuing action) Replace X with an appropriate code or code combination REACTION SF3 of entries listed in CP-D/1017 = WP2022-24.
<u>A37</u>	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.
<u>A38</u>	Pritychenko Nomura	(Continuing action) Revise entries relevant to assessment of suspicious E-LVL values as listed in CP-D/1043 = WP2022-26.
<u>A39</u>	Pritychenko Nomura	(Continuing action) Correct the isomeric flags in REACTION and DECAY-DATA listed in CP-D/1052Rev. = WP2023-19.
<u>A40</u>	Pritychenko Sprenger	(Continuing action) Resolve with priority the repetition of data headings listed in CP-D/1070 = WP2023-20.
<u>A41</u>	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 the corrigendum under REFERENCE of the common subentry, 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	(Continuing action) Review the usage of (G,TOT), (G,ABS),
	Otsuka	(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.