LA-UR-20-23375

WPEC Subgroup Proposal: Subgroup on developing an automatically readable, comprehensive and curated experimental reaction database

Monitor:

Arjan Koning, IAEA-NDS, Austria (JEFF)

Coordinators:

Amanda Lewis, UC Berkeley, USA (ENDF)

Denise Neudecker, LANL, USA (ENDF)

Berkeley
UNIVERSITY OF CALIFORNIA

32nd WPEC meeting

May 15, 2020

Potential Participants

- CENDL
  - Z. Ge (CNDC), **X. Ruirui** (CNDC), J. Wang (CNDC)
- ENDF
  - **D. Brown** (BNL), **Y. Danon** (RPI), **M. Grosskopf** (LANL), **M. Herman** (LANL), **C. Mattoon** (LLNL), **B. Pritychenko** (BNL), **V. Sobes** (UTK), A. Sonzogni (BNL), **P. Talou** (LANL), **K. Wendt** (LLNL), M. White (LANL)
- IAEA-NDS
  - **R. Capote**, S. Okamura, **N. Otuska**, **G. Schnabel**, J.-C. Sublet, **V. Zerkin**
- JEFF
  - **O. Cabellos** (UPM), C. De Saint Jean (CEA), E. Dupont (CEA), **M. Fleming** (NEA), M. Gilbert (UKAEA), **L. Leal** (IRSN), D. Leichtle (KIT), G. Noguere (CEA), A. Plompen (JRC-Geel), Dimitri A. Rochman (PSI), **P. Schillebeeckx** (JRC-Geel), **H. Sjoestrand** (UU), N. Soppera (NEA), O. Vilkhivskaya (UKAEA)
- JENDL
  - **Satoshi Chiba** (Tokyo Tech), Osamu Iwamoto (JAEA), A. Kimura (JAEA), Shoji Nakamura (JAEA), T. Sanami (KEK), N. Shigyo (Kyushu Univ.)

Justification

- EXFOR is often the source of experimental data for evaluations

- The data is vetted and sometimes adjusted, but this information is not stored anywhere
  - Expert judgement is lost and this analysis process is redone every time the data set is used
  - An EXFOR correction system does exist, but does not seem to be widely known or used

- The format of EXFOR does not allow for large-scale automatic parsing of files (in a way that includes metadata)
  - This will improve reproducibility of evaluations
  - Automatic parsing will enable more automated testing and use of machine learning techniques

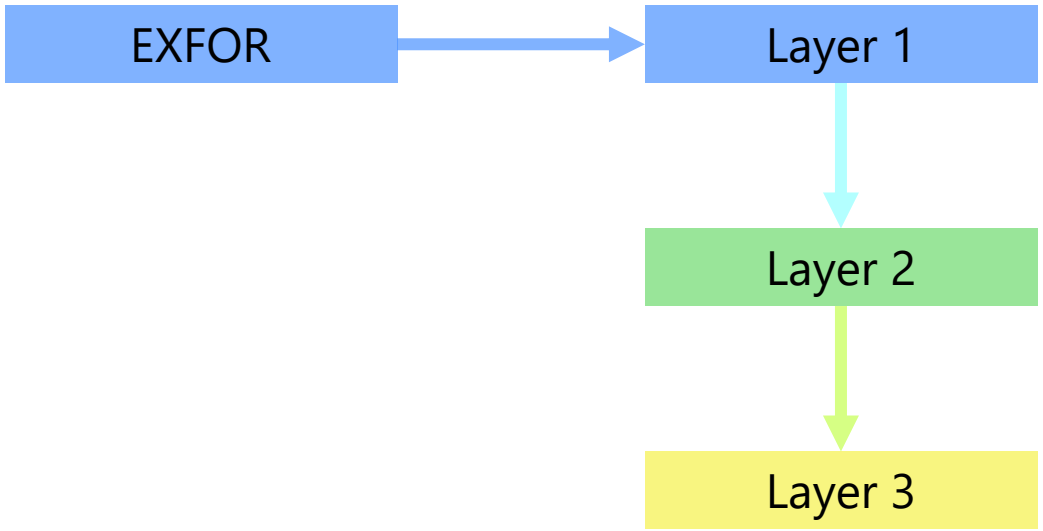
- A database that contains machine-readable and vetted data sets will speed up evaluations

> "EXFOR is a **compilation of the author's original published experimental data**.
>
> While the format allows the inclusion of data renormalized to up-to-date standard values… this task is normally left to data evaluators…"
>
> – Principles of EXFOR

Proposed Activities

- Create a format for a 3-layer experimental reaction database, based on and parallel to EXFOR

- After defining the database structure and formats for each layer, produce example files for each layer and publish conversion codes



Automatically readable format

"Objective" Corrections – updating standards, flagging missing uncertainty sources and outliers

"Subjective" Corrections – including expert judgement, updating uncertainties, expanding on the current correction system

Deliverables

- 2021 – 2022
  - Produce document with naming conventions for experimental attributes, deviations from the EXFOR format, and the type of database that will be used
  - Decide which part of the EXFOR database will be the test ground
  - Start prototype of the code to produce layer 1 files from EXFOR files

- 2022- 2023
  - Use code to convert files from the test ground section of EXFOR
  - Test layer 1 format with ML programs
  - Finalize layer 1 conversion code
  - Develop prototype format for layer 2
  - Start developing code to produce layer 2 files

- 2023 – 2024
  - Deliver a test set of layer 2 files for testing and review
  - Use feedback to refine layer 2 format and finalize code to produce layer 2 files
  - Extend formats and codes to develop layer 3, and give a few examples