Developments of IAEA Nuclear Reaction Data Portal

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The IAEA Nuclear Data Section plans to develop a Nuclear Reaction Data Portal to streamline access to experimental and evaluated nuclear data. Designed as a centralized Data Lake, it will integrate official datasets and user submissions while addressing limitations of legacy formats like EXFOR and ENDF-6. By providing an intuitive interface, the portal aligns with FAIR principles, enhancing accessibility, interoperability, and usability for scientists, and all levels of users.

Keywords: EXFOR, ENDF-6, FAIR Principles, Data Lake, Data Portal

1. Introduction

Background and Challenges: The EXFOR and ENDF-6 formats have been foundational for managing nuclear data for decades. However, their origins in FORTRAN punch card technology impose significant limitations, such as a steep learning curve and the necessity of specialized expertise for data interpretation and processing.

Motivation for Modernization: To overcome these challenges and align with the FAIR principles (Findable, Accessible, Interoperable, Reusable), the IAEA is creating the Nuclear Reaction Data Portal. This system aims to provide a modern, streamlined approach to accessing, analyzing, and sharing nuclear data.

2. Objectives and Approach

Centralized Data Lake: The portal will consolidate a broad spectrum of nuclear data formats—extending beyond EXFOR and ENDF-6—into a centralized Data Lake. Comprehensive metadata will ensure easy discoverability and usability.

User-Generated Contributions: In addition to officially released datasets, the Data Lake will include user-contributed content such as recommended values, reanalyzed results, theoretical predictions, and curated datasets.

Separation of Presentation and Data Layers: By decoupling the user interface from the underlying data formats and processing mechanisms, the portal will provide an intuitive, user-friendly platform that meets the diverse needs of the nuclear data community.

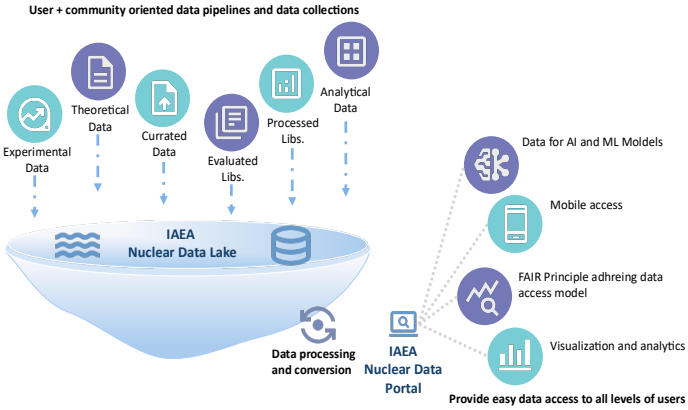

Figure 1 Schematic view of IAEA Nuclear Reaction Data Lake

3. Current Progress and Next Step

Since 2021, the IAEA Nuclear Data Section has developed the Nuclear Reaction Data Explorer and its RESTful APIs, available via the IAEA website [1]. These tools integrate ENDF-6 datasets processed with specialized code and EXFOR data converted through the EXFOR parser [2]. Building on this foundation, the project will expand to include additional data formats, comprehensive metadata, and processing capabilities.

User Interface: The portal will feature a modern, user-friendly interface (Data Portal) designed to facilitate data exploration, analysis, and download without requiring specialized expertise.

Enhanced Accessibility: By simplifying access to nuclear data, the portal will enable scientists, evaluators, and users at all levels to work more efficiently and effectively.

4. Conclusion

This presentation will outline the architecture of the portal, the process for integrating EXFOR and ENDF-6 datasets, and the planned features to benefit the nuclear data community. Feedback from the community will be gathered to refine and optimize the system.

References

[1] IAEA Nuclear Data Section (2021-2024) IAEA Nuclear Reaction Data Explorer, https://nds.iaea.org/dataexplorer/
[2] S. Okumura et al. Developing a new web service for experimental nuclear reaction database (EXFOR) using Restful API and JSON. EPJ Web Conf., 292:12003, 2024.