



MSU status report for FY25

Jun Chen

2025 USNDP annual meeting, 28-31 October 2025

@ZOOM, BNL



MICHIGAN STATE
UNIVERSITY



U.S. DEPARTMENT OF
ENERGY

Office of
Science

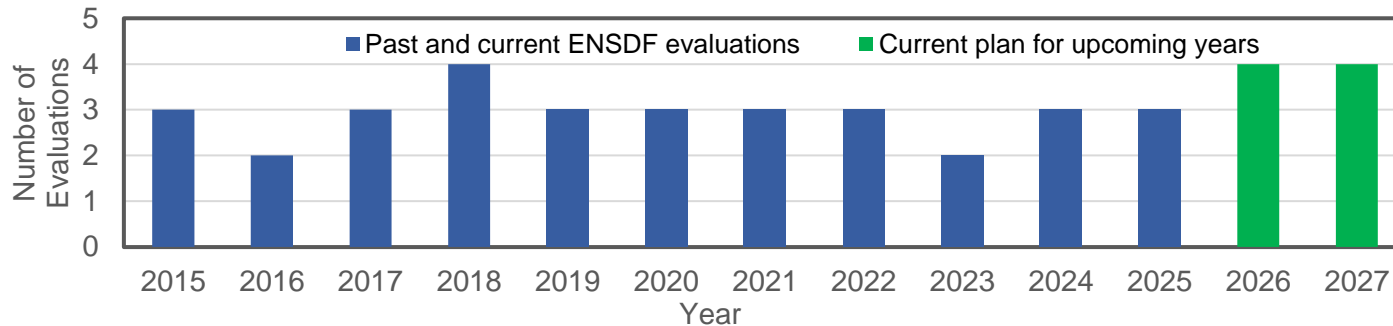
Overview

- Grant status: funded by DOE since 2017 (supplemental awarded in 2024)
- Data personnel (2.0 FTE)
 - Lijie Sun (staff, 1.0 FTE since 02/2025), Jun Chen (1.0 FTE)
 - Two undergraduate students for XUNDL compilation and ENSDF codes (supported by MSU and course credit)
- Major Responsibilities:
 - ENSDF evaluation: A=31-44, 60-80 (except 62,67-70); currently 30 mass chains in total
 - Data review and XUNDL compilation for PRC and EPJA manuscripts
 - Development and Maintenance of ENSDF codes
 - Development of AI/ML assisted workflow for ENSDF evaluation
 - Data support to FRIB users via the FRIENDS (FRIB Integral Experimental Nuclear Data Services) project



ENSDF evaluation at FRIB

- Current MSU/FRIB responsibilities (30 mass chains): A=31-44, 60-80 except 62,67-70
 - Completed for FY25: A=35, 74, 151
 - Planned for FY26 (2 evaluators): A=34, 36, 78, (and 37 if time allows)
- Also work on other mass chains in the past (mostly in collaboration with Balraj Singh)
 - Completed: A=48, 50, 85, 98, 100, 123, 138, 149, 151, 165, 167, 190, 194, since 2014, (also 64, 71, 73 with Balraj)
- Current goal settings starting FY26: 3-4 mass-chains per year (2 evaluators)



Number of ENSDF evaluations each year at MSU, including collaboration work (1-2 per year) with Balraj Singh till 2024

Total 3-4 mass chains/year after additional evaluator (1.0 FTE) is hired starting from FY25

- Completed in FY25 (full-evaluation of all available data “from scratch”)

Mass	#Nuclides	#Datasets	#Lines	#Levels	#Gammas	Evaluators	status
A=35	11	98	15,248 <i>(old 11,324)</i>	671	1,313	L.J. Sun and J. Chen	Submitted
A=74	13	109	23,875 <i>(old 12,099)</i>	890	1,628	J. Chen	Submitted
A=151	18	119	39,114 <i>(old 24,932)</i>	1,695	3,183	B. Singh, J. Chen	In-review

Other: reviewed 1 mass-chain evaluation



Data Review and XUNDL Compilation at FRIB

■ Completed in FY25:

- » XUNDL compilations (including data reviews): 45 datasets from 30 papers
 - including compilation of 7 papers by two undergraduate students
- » Data reviews (by L.J. Sun and J. Chen): 23 PRC manuscripts (total 38 datasets)

■ Training MSU students for XUNDL compilation (since 2018)

- » Since 2018, 1-2 top undergraduates from Honors College of MSU have been recruited and trained each year (except 2021)
- » A total of **72** datasets from **51** papers have been compiled by 8 students so far
- » Beginning 10/2025, one new student from MSU Honors College: [Mathew Borlace](#) joined in this activity, supported by course credits of MSU/FRIB Honors Research Seminars.



Amani Ahnuar
2018-2019



Pranjal Dangwal
2019-2020



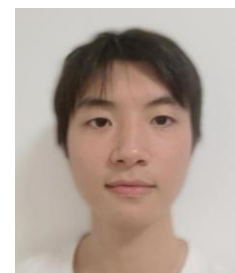
Dave Lempke
2019-2020
Current PhD student
at FRIB



Luke Hixson
2022-2023
B.S. degree in <3y
Compiled 11 papers



Rylie DuBois
2023-2024
Compiled 10 papers



Hang Su
2023-2024
Compiled 8 papers



Parameswar Rejesh
2024-2025

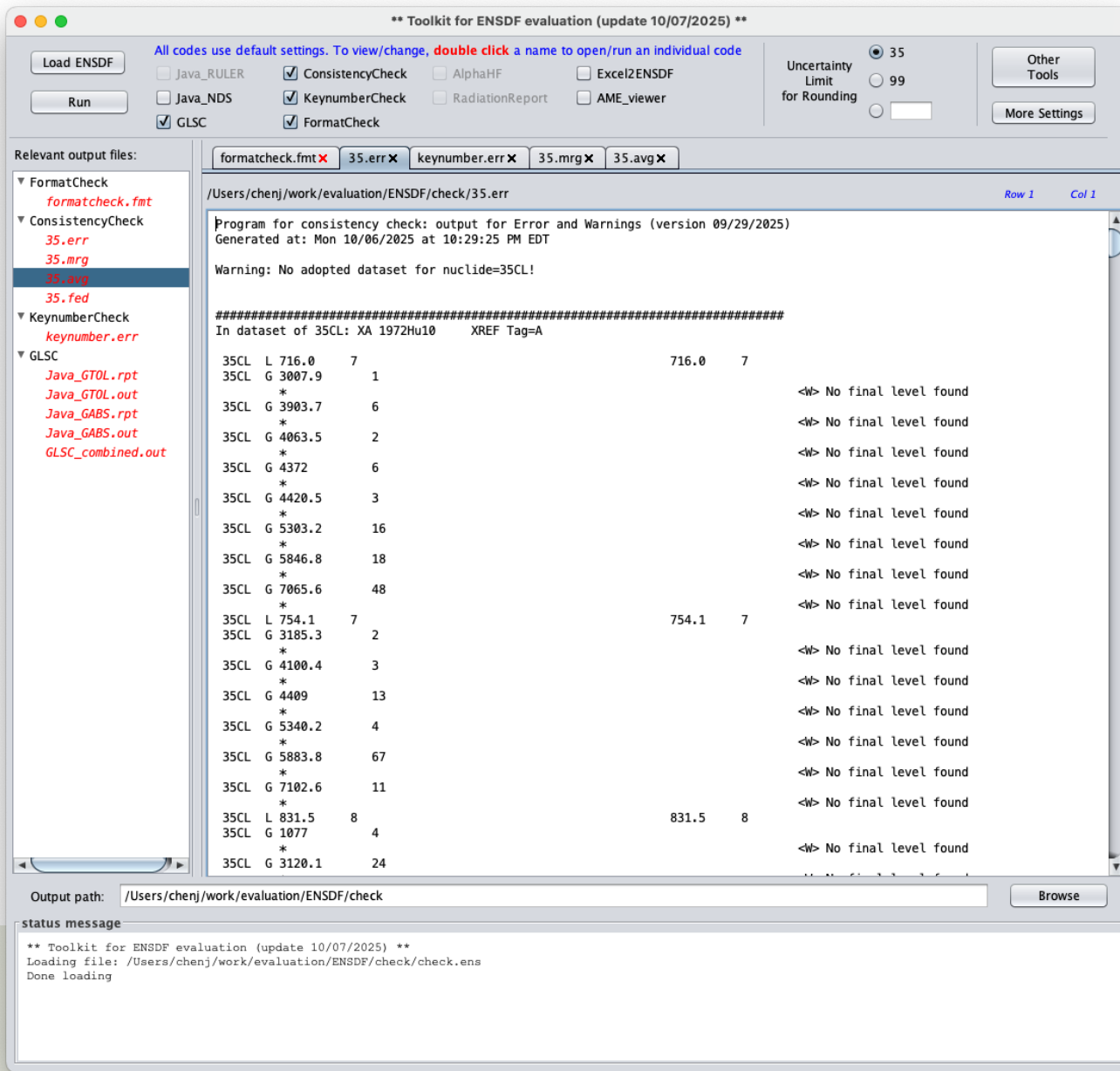


Evan Sternberg
2024-2026
Continue on
ENSDF codes



Mathew Borlace
10/2025-2026
new student

ENSDF code development and maintenance at FRIB



EvaluationToolkit is a Java toolkit combining all ENSDF Java codes to streamline ENSDF evaluation procedure

- ❑ Provides easy access to all codes in a single app
- ❑ Automatically determines which codes to run based on the type and data of the input dataset
- ❑ Runs all applicable codes in one single click
- ❑ Lists generated output files in one place
- ❑ In-app tabbed viewer for quick view of all generated output files

Eliminate the hassle of figuring out what codes to run for each dataset, executing them one-by-one, and tracking down their buried outputs.

Note: all codes are run with default settings. If customized settings are needed, double click the name of a code to change the settings and run it individually

AI-assisted workflow for ENSDF evaluation: initial stage

Toggle AI assistant window

AI assistant window

An AI-assisted ENSDF formatting tool with VS Code has been developed and been used in an early stage in ENSDF evaluation. It is actively under continuous development and improvement.

VS code seamlessly integrates with all popular AI assistants (free and paid versions)

Selection of AI mode and model

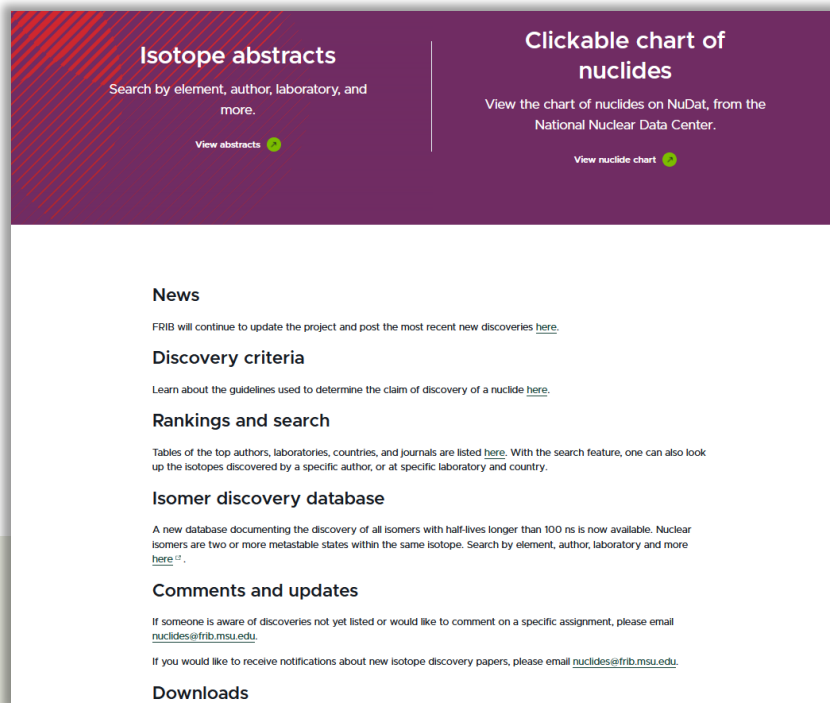
See L.J. Sun's talk for more details



Facility for Rare Isotope Beams
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frib.msu.edu

Other Data Activities at FRIB

- Data support to FRIB users and researchers in the FRIENDS framework since 2021
- The lifetimes and branching ratios apparatus (LIBRA) (led by Lijie in his previous role at FRIB)
<https://journals.aps.org/prc/abstract/10.1103/PhysRevC.111.055806>
- FRIB Nuclide and Isomer Discovery Data project since 2023 (with Michael Thoennessen)
 - » *New (in addition to isotope discovery):* Convert all isomer discovery data including abstracts into a single JSON file
 - » Develop a viewer/editor Java program to view and add/edit isomer discovery data
 - » Build webpages to host and display the isomer discovery data (tables) and to provide customized search to users



Isotope abstracts
Search by element, author, laboratory, and more.
[View abstracts](#)

Clickable chart of nuclides
View the chart of nuclides on NuDat, from the National Nuclear Data Center.
[View nuclide chart](#)

News
FRIB will continue to update the project and post the most recent new discoveries [here](#).

Discovery criteria
Learn about the guidelines used to determine the claim of discovery of a nuclide [here](#).

Rankings and search
Tables of the top authors, laboratories, countries, and journals are listed [here](#). With the search feature, one can also look up the isotopes discovered by a specific author, or at specific laboratory and country.

Isomer discovery database
A new database documenting the discovery of all isomers with half-lives longer than 100 ns is now available. Nuclear isomers are two or more metastable states within the same isotope. Search by element, author, laboratory and more [here](#).

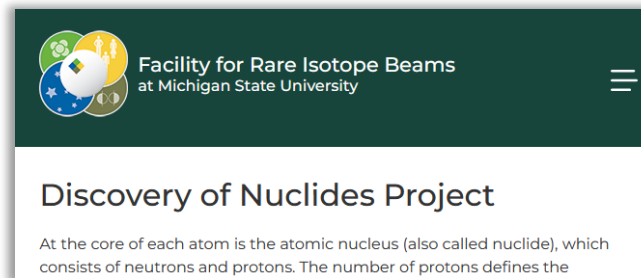
Comments and updates
If someone is aware of discoveries not yet listed or would like to comment on a specific assignment, please email nuclides@frib.msu.edu.
If you would like to receive notifications about new isotope discovery papers, please email nuclides@frib.msu.edu.

Downloads

The new FRIB webpages of the nuclide discovery project are officially online in March 2024: <https://frib.msu.edu/public/nuclides>

For isotope discovery: data file, retrieval and search pages are at <https://people.frib.msu.edu/~chenj/isotope-discovery/search.html>

For isomer discovery: data file, retrieval and search pages are at <https://people.frib.msu.edu/~chenj/isotope-discovery/isomers/search.html>



Facility for Rare Isotope Beams
at Michigan State University

Discovery of Nuclides Project

At the core of each atom is the atomic nucleus (also called nuclide), which consists of neutrons and protons. The number of protons defines the

Search discoveries by:

Author	<input type="text"/>
Country	<input type="text"/>
Laboratory	<input type="text"/>
Element	<input type="text"/>
Year	<input type="text"/>
NSR keyno (?)	<input type="text"/>

Discovery of nuclear isomers, M. Thoennessen, J. Chen, At Data Nucl Data Tables 2025, in press
Nuclear Isomer Discovery Database Released, M. Thoennessen, J. Chen, Nature Comm 2025, in press

J. Chen, 2025 USNDP, 28-31 October 2025, Slide 7

