Energy Dependent Fission Product Yields for the User Community

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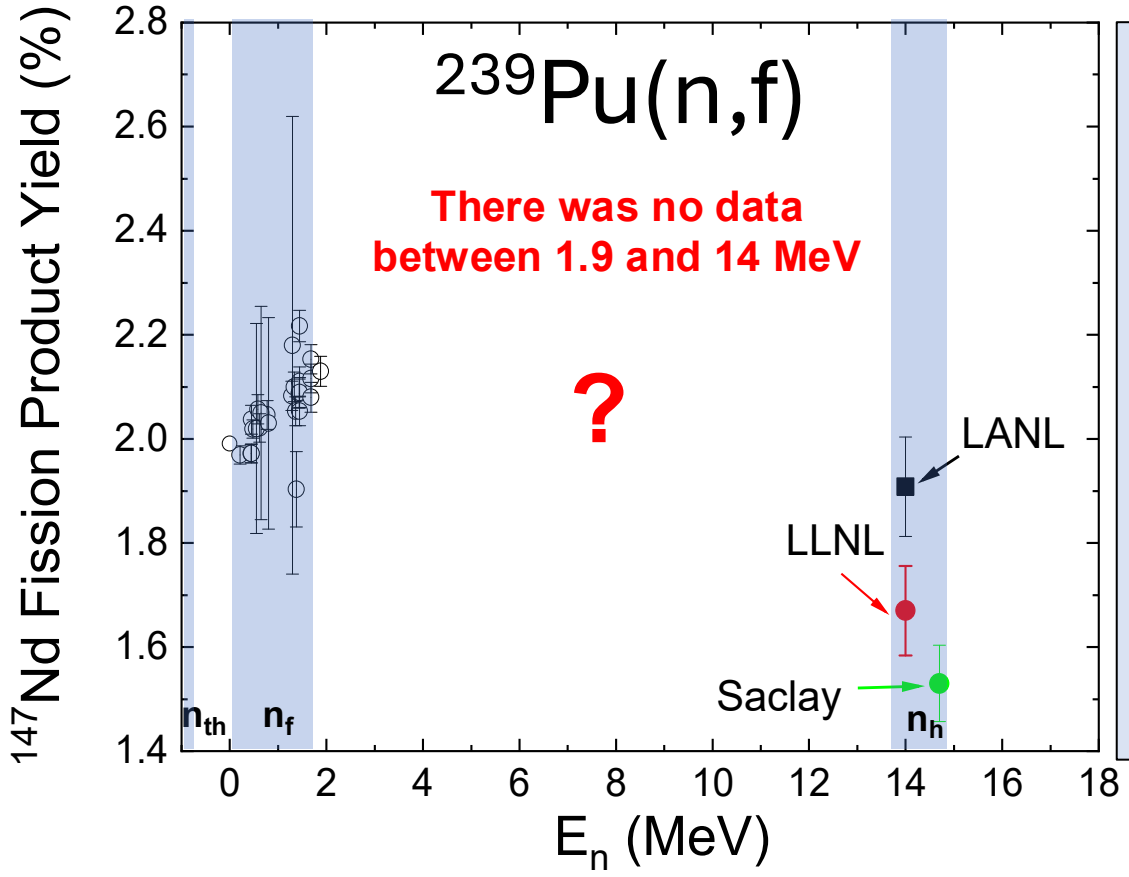
On behalf of the LLNL-LANL-TUNL collaboration

Prepared by LLNL under Contract DE-AC52-07NA27344.

WANDA 2026, February 10, Arlington, VA

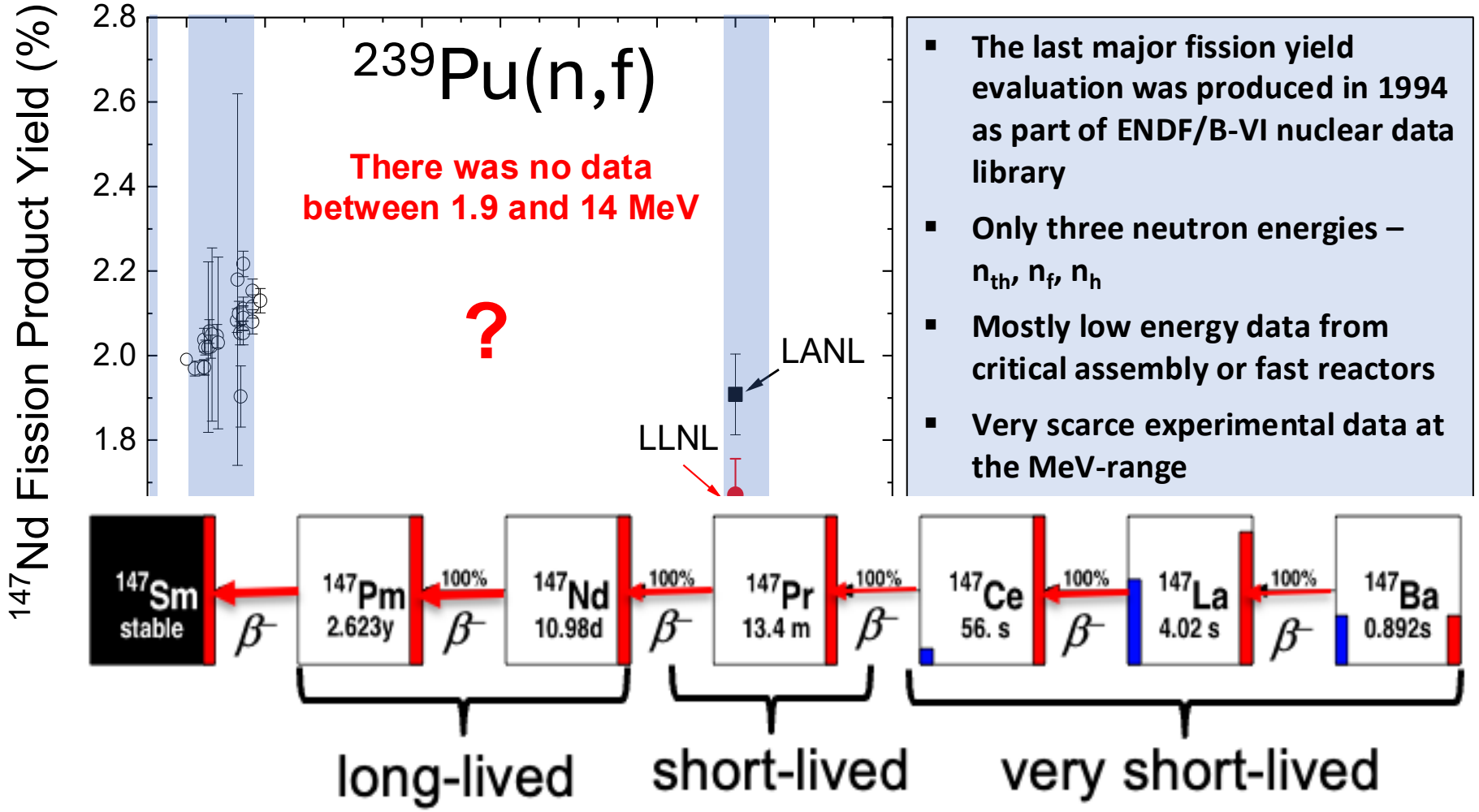
Motivation: Energy Dependent Cumulative FPYs



- The last major fission yield evaluation was produced in 1994 as part of ENDF/B-VI nuclear data library
- Only three neutron energies – n_{th}, n_f, n_h
- Mostly low energy data from critical assembly or fast reactors
- Very scarce experimental data at the MeV-range
- Large discrepancy (~35%) at 14 MeV

M.B. Chadwick *et al.* Nuclear Data Sheets **111,** 2923 (2010)
I. Thompson *et al.* Nucl. Sci. Eng. **171**, 85 (2012)

Motivation: Energy Dependent Cumulative FPYs



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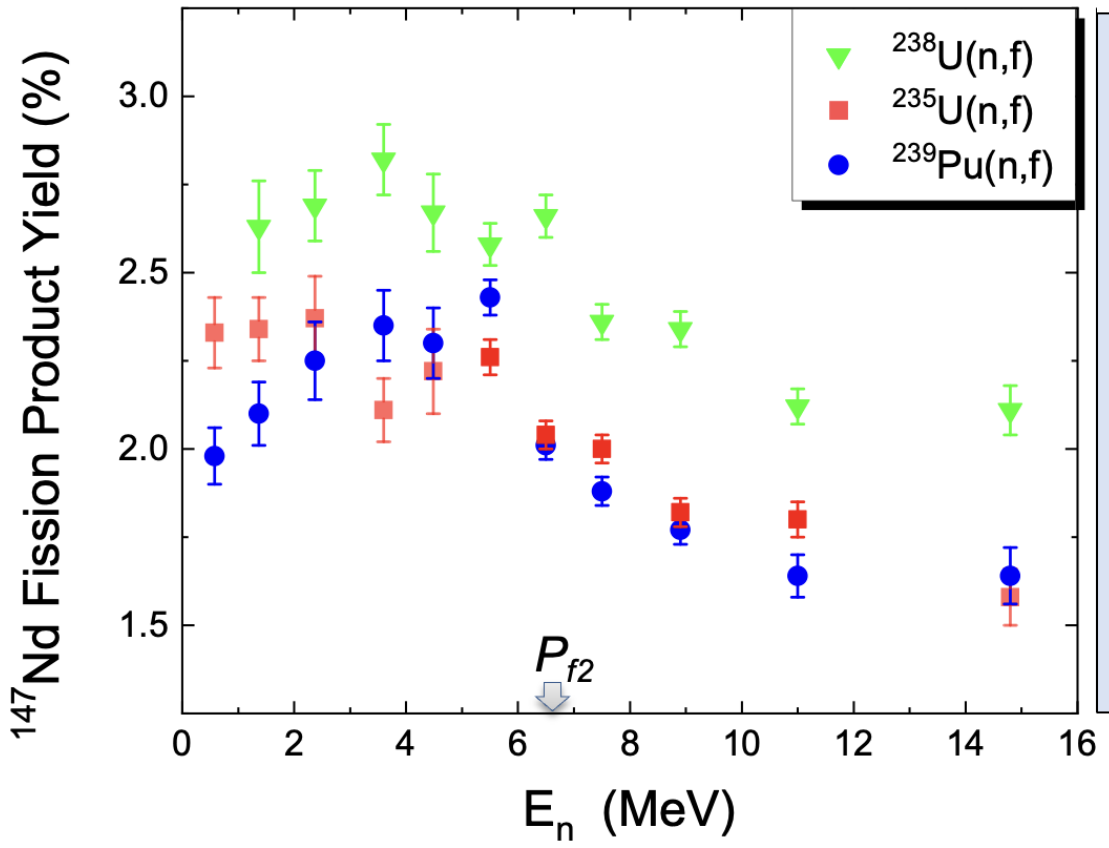
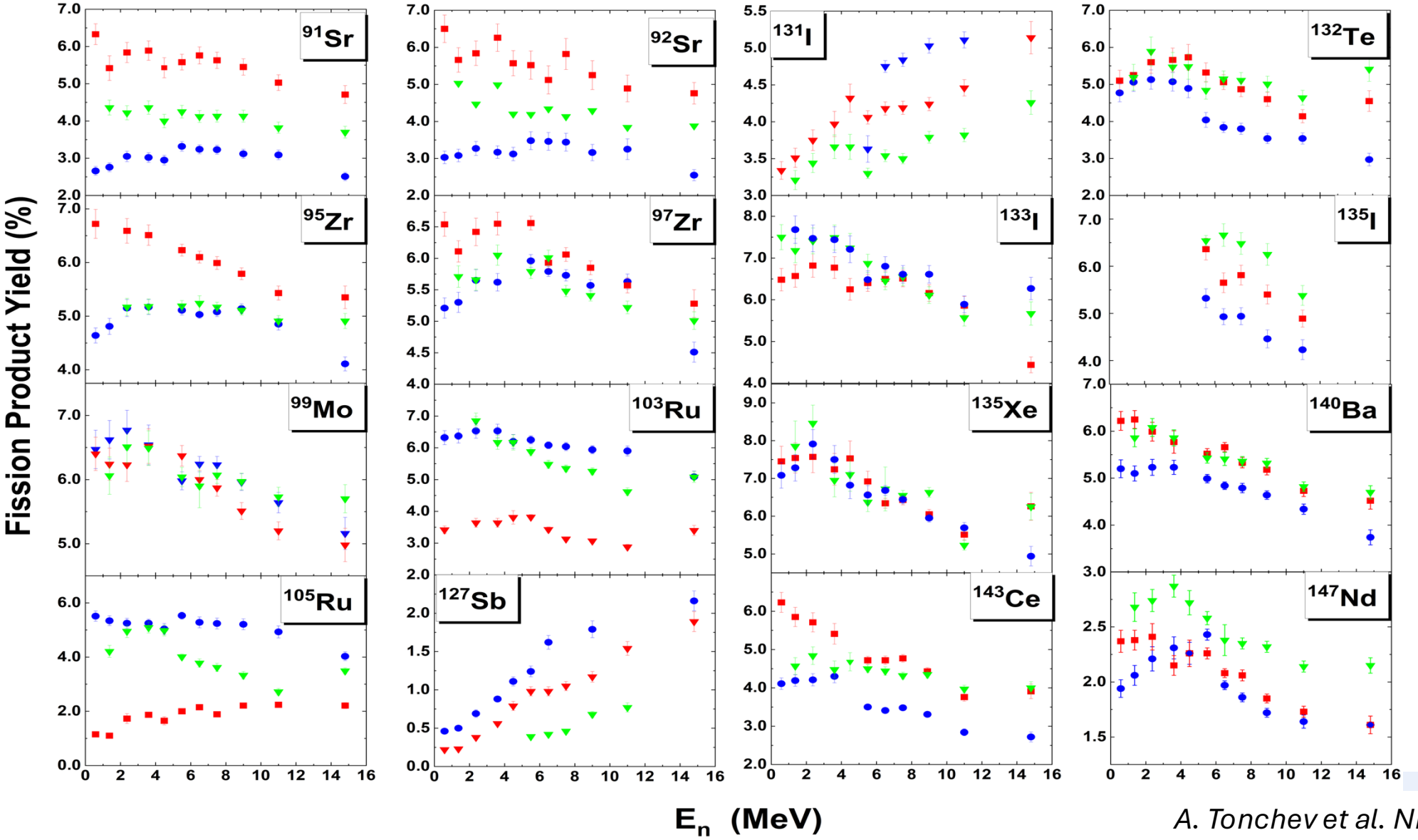
Energy Dependent FPYs Results: ^{147}Nd



- At lower energies (0.5 to 5 MeV), there is a slight positive slope for ^{238}U, and constant for ^{235}U
- At higher energies (~5.0 to 14.8 MeV), the slope of ^{147}Nd is negative for all three fissile actinides
- The overturn, occurring around 5 MeV, take place below the second-chance fission threshold

Energy Dependent FPYs Results



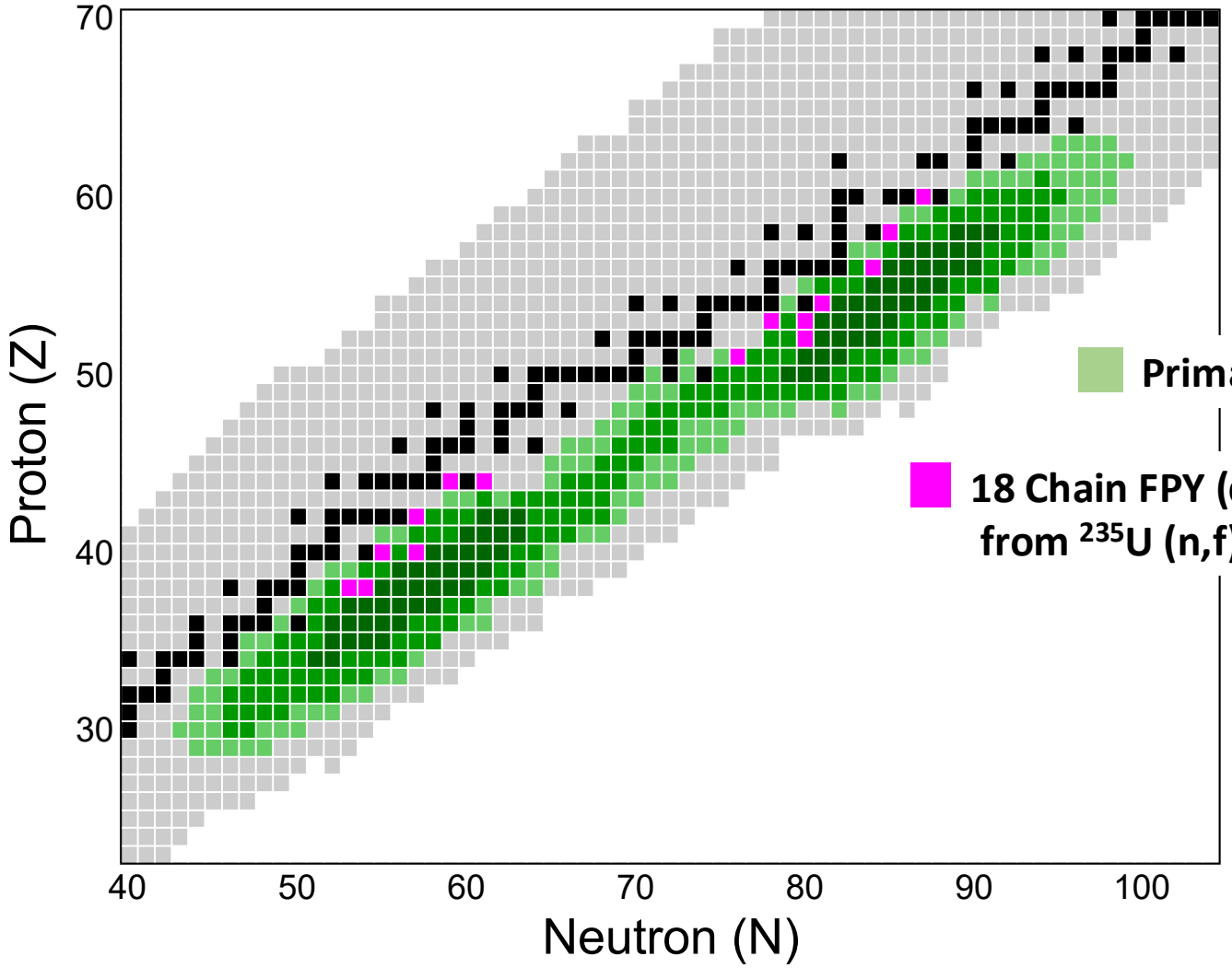
^{235}U(n,f) [■]

^{238}U(n,f) [▼]

^{239}Pu(n,f) [●]

A. Tonchev et al. NDS, ***202****, 12 (2025)*

Energy Dependent Cumulative FPYs Results



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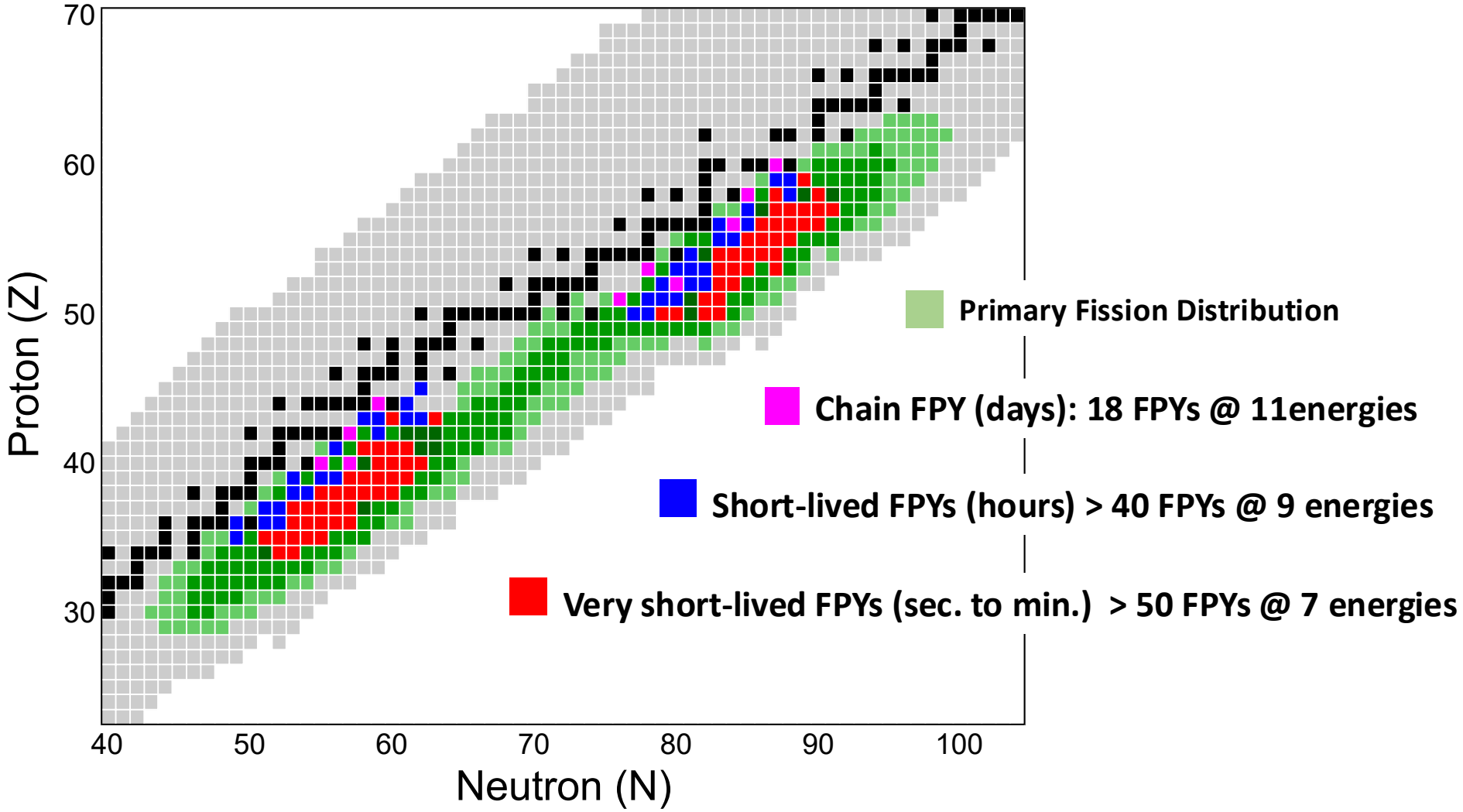
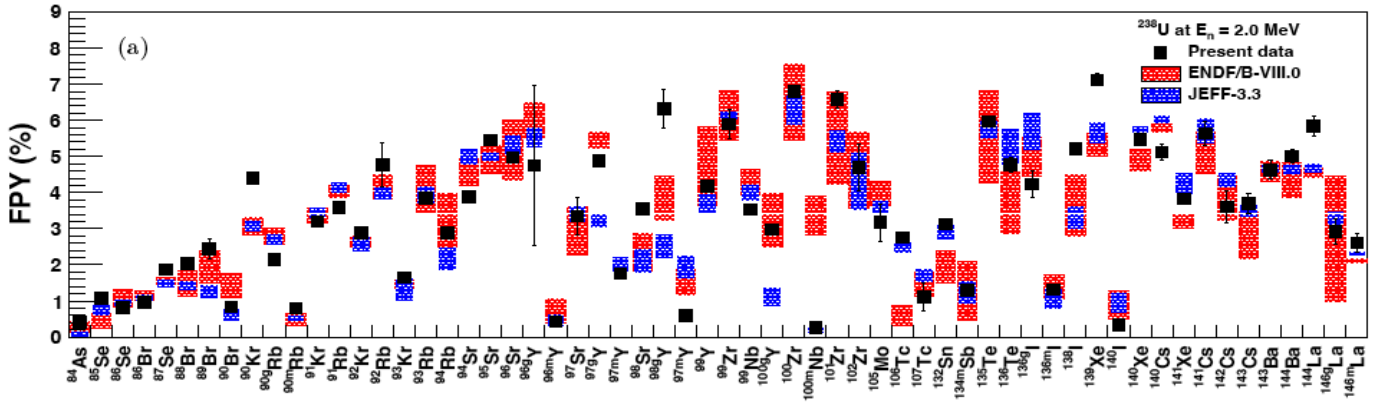
Short and Very Short-Lived FPYs Measurements

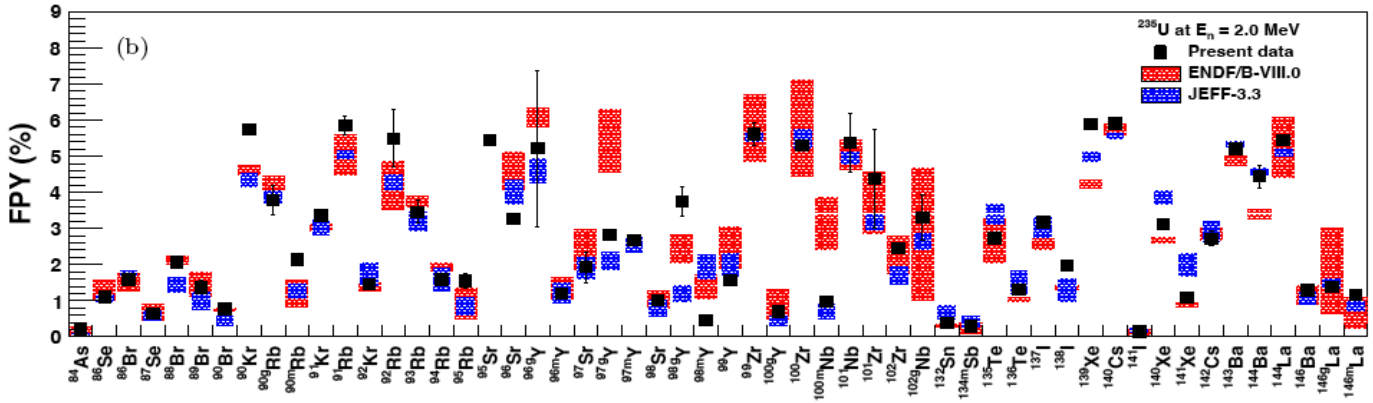


Very Short-Lived FPY to support Reactor Anti-Neutrino Anomaly

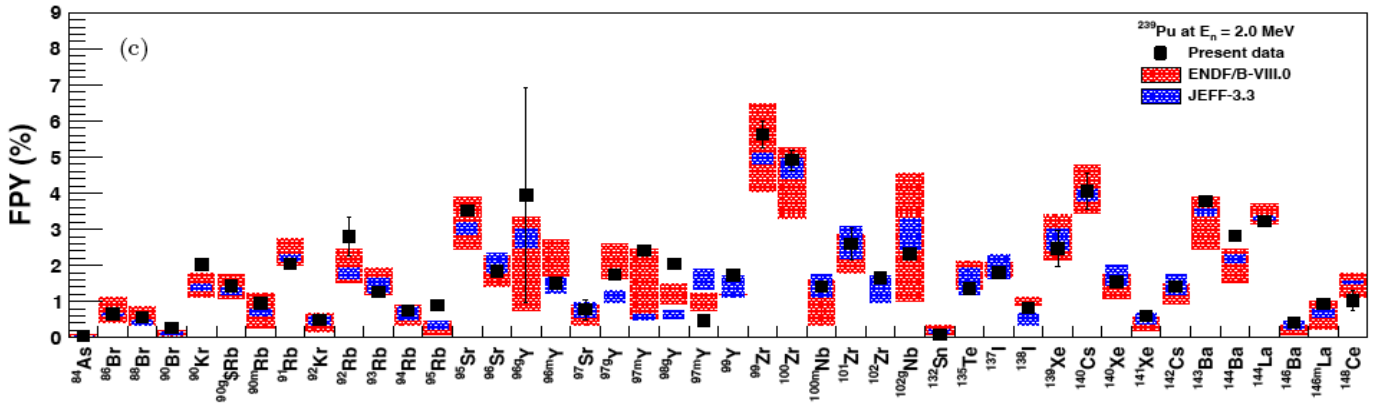
^{238}U(n,f)
E_n= 2 MeV



^{235}U(n,f)
E_n= 2 MeV

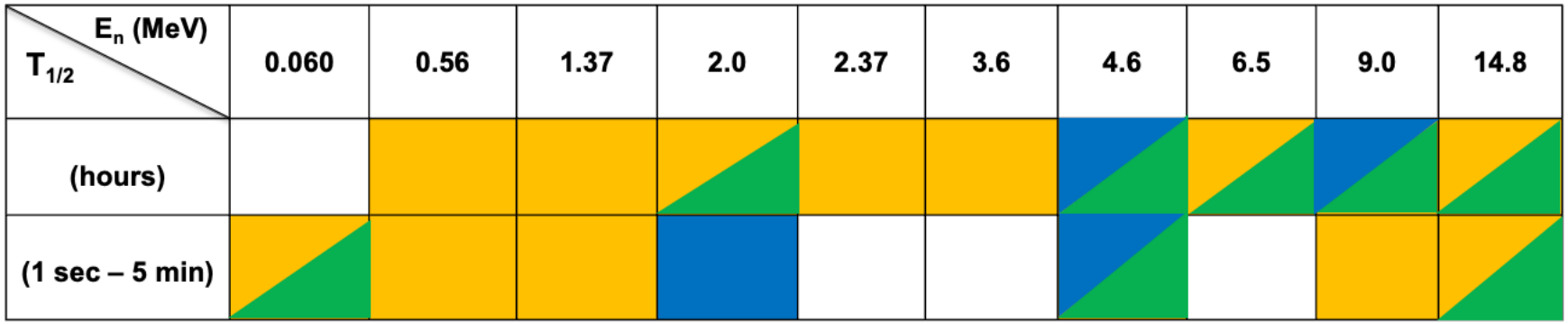


^{239}Pu(n,f)
E_n= 2 MeV



W. Tornow *et al.*
submitted for publication

Summary of all short-lived FPY measurements at TUNL on ^{235}U, ^{238}U, and ^{239}Pu



Data collected

Data analyzed

Data published

- More than 5000 hours of beam time supported by the NNSA and SSAP
- Supported by NA-113 from 2019 – 2021
- **The problem: not all FPY data fully analyzed or published**

The nuclear data community will greatly benefit from the modern LLNL-LANL-TUNL fission product yield effort

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