



Fission Products, Decay Data, and Delayed Neutrons

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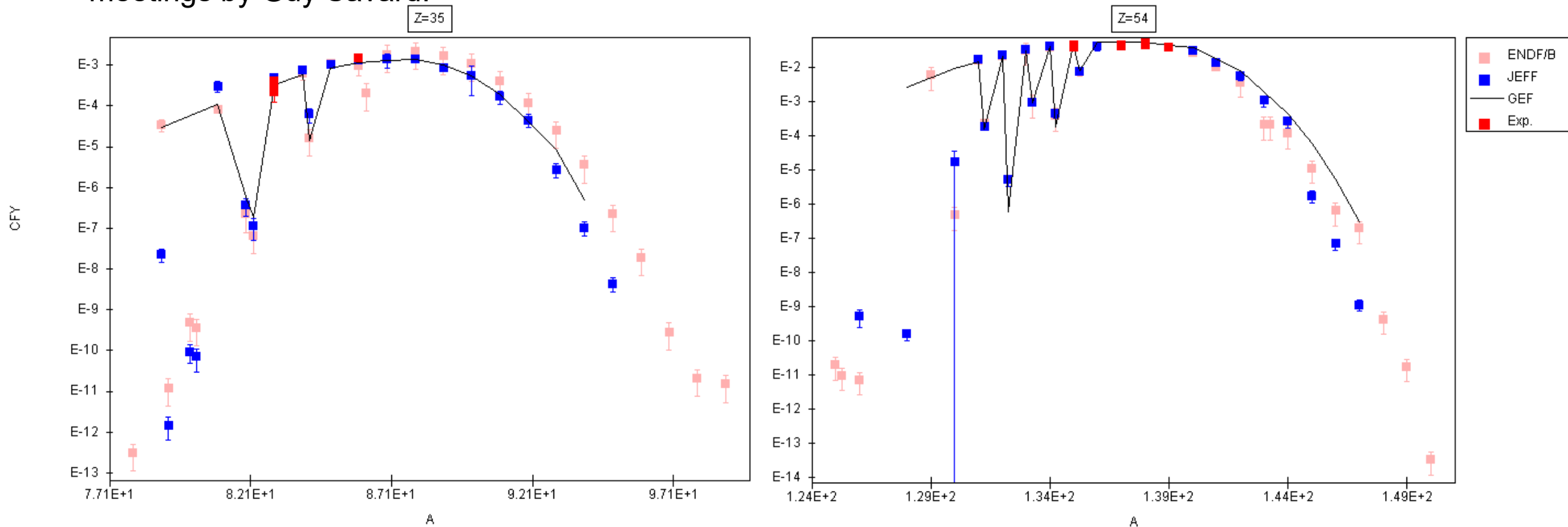


Fission Products

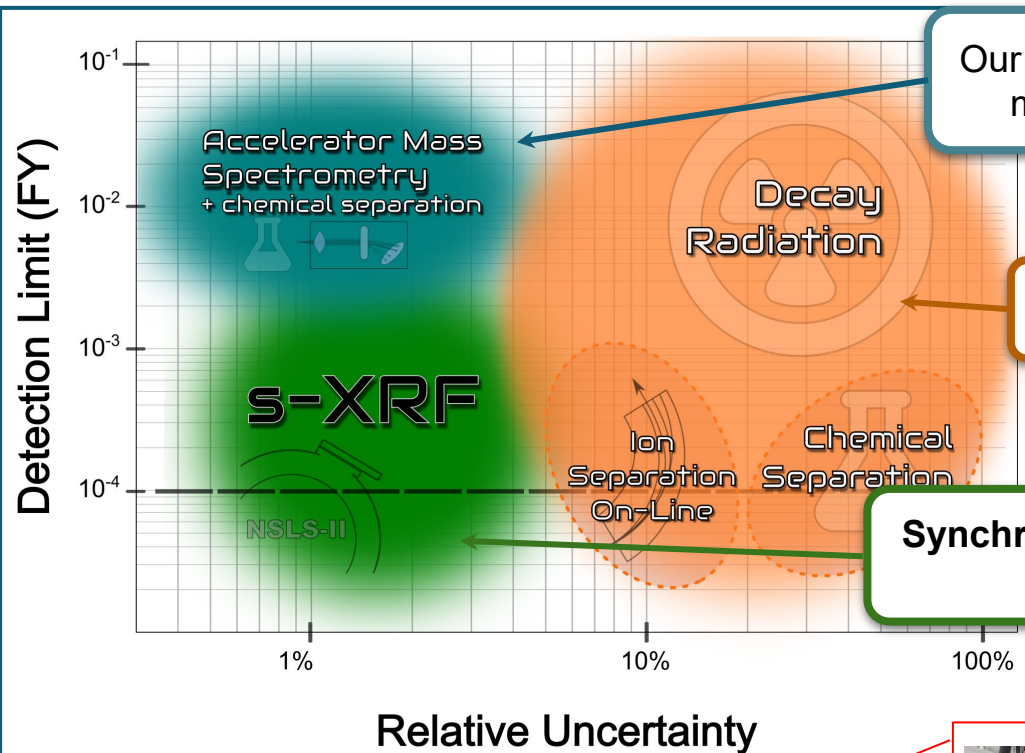
- NA-22 funded, LANL (lead) – BNL – LLNL collaboration. Last meeting January 2024 (BNL), next meeting to be decided.
- BNL has made corrections to some outstanding ENDF/B issues, see Mattera's presentation in last CSEWG. Also, produced a list of curated experimental yields for $^{235,238}\text{U}$, $^{239,241}\text{Pu}$. Working now on ^{252}Cf .
- IAEA Coordinated Research Project, next meeting December 2-6, 2024.
- JEFF has released a preliminary version of yields with covariance matrix.
- Looking forward to experimental results in the next few years (one slide from BNL).

Fission Products

Significant differences between ENDF/B and JEFF yields for neutron rich products in ^{252}Cf Spontaneous Fission. GEF seems to favor JEFF. This was discussed before in WANDA meetings by Guy Savard.



Precise fission yield measurements at NSLS-II using X-ray fluorescence, A. Mattera & M. Topsakal



Our recommended fission yields are based on Atomic Mass Spectrometry (AMS) measurements from the 1970s never published in a peer-reviewed journal.

Activation methods rely on nuclear data which introduce additional uncertainty to the yield determination.

Synchrotron-based x-ray fluorescence can achieve similar precision to AMS but much lower detection limit thanks to NSLS-II brightness.

National Synchrotron Light Source - II @ BNL



Two-year LDRD project, taking advantage of the bright X-ray beams and advanced detectors at NSLS-II to precisely measure charge yields of long-lived fission products from neutron-induced fission of $^{235,238}\text{U}$ and $^{239,241}\text{Pu}$ using synchrotron-based X-ray Fluorescence (s-XRF).

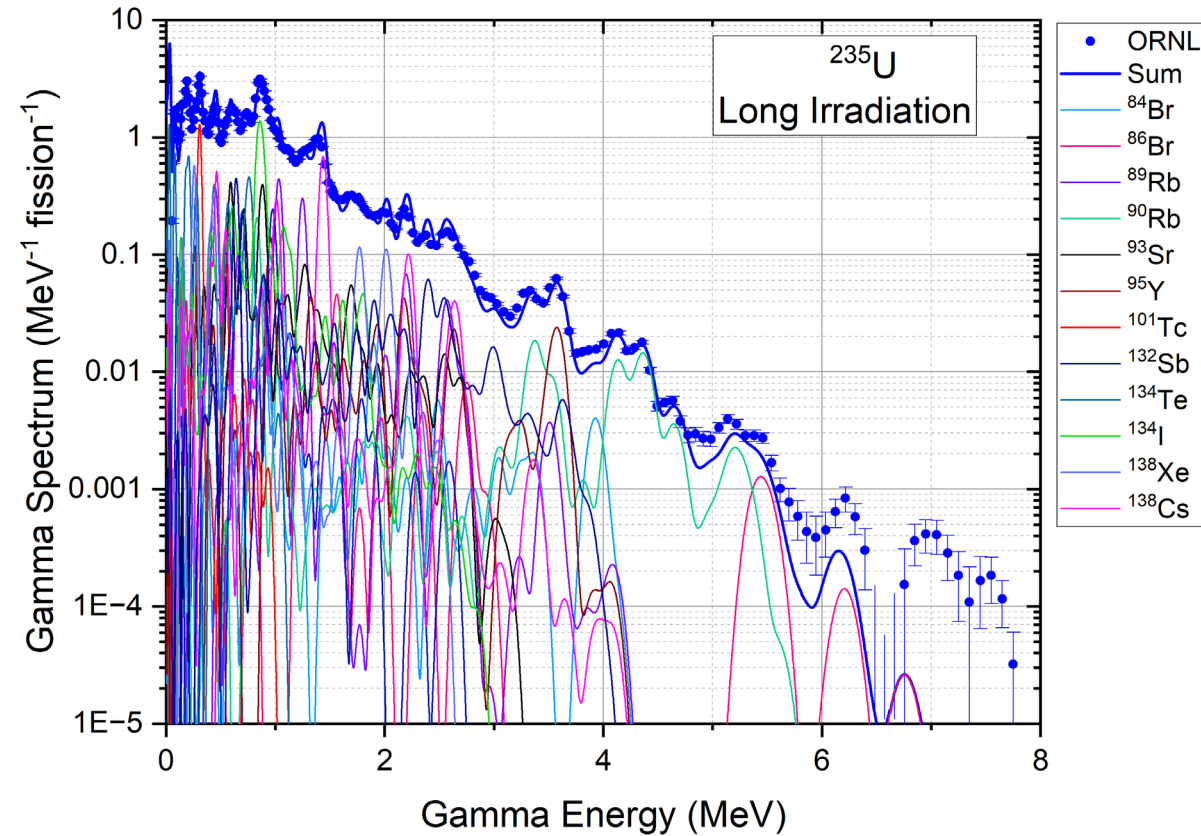
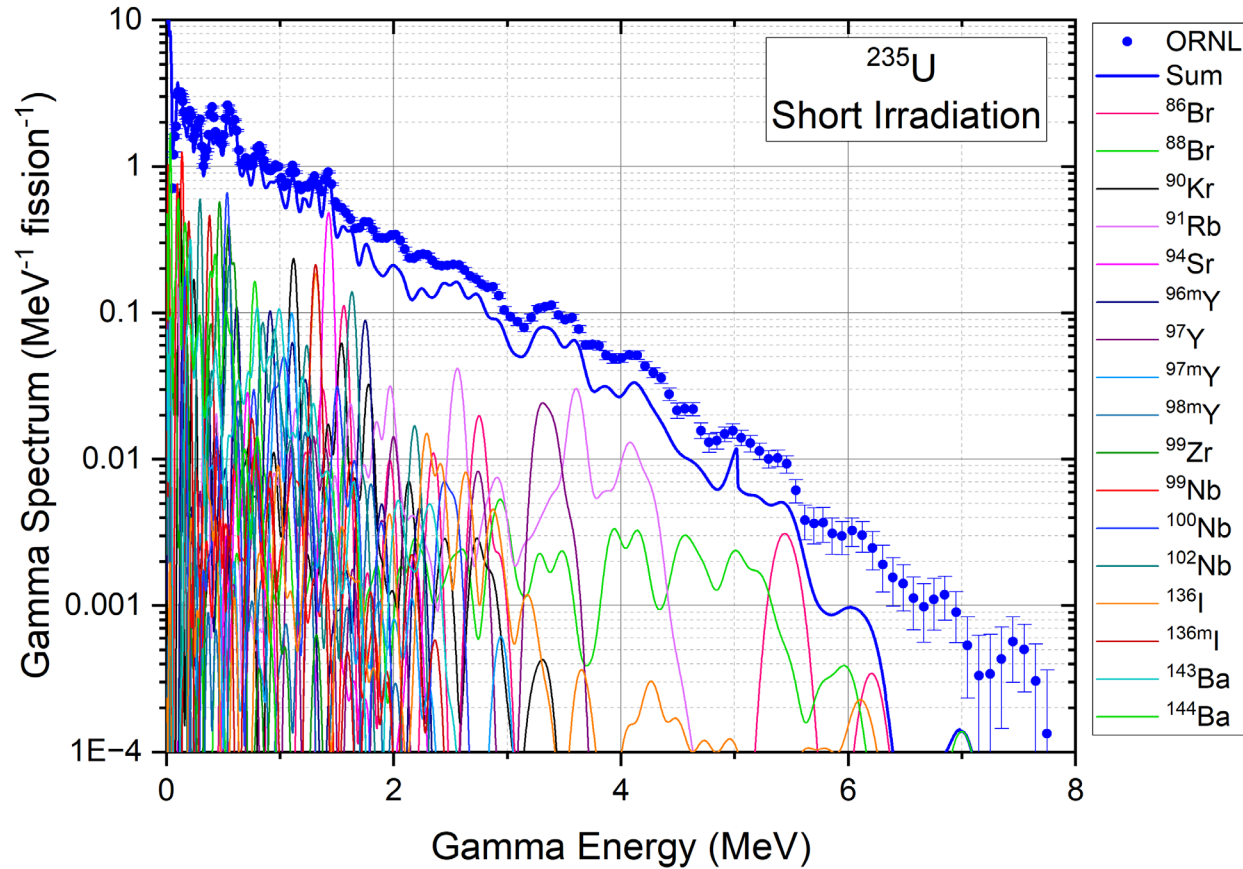
Proof of concept:
Transmutation of Rh into Pd following neutron capture.

Decay Data

- ENSDF, the only source of decay data worldwide, is undergoing a much-needed format change, from 80-character to JSON.
- All the software needed to produce the ENDF/B decay data from ENSDF will have to be re-written.
- We would also like expand the ENDF-6 format, and/or, develop a new one in JSON.
- Note, JEFF decay data has not been updated much since 2005.
- We are updating the ENDF/B decay sub-library regularly, but very short on personnel, concerns about expertise fading away in a few years.

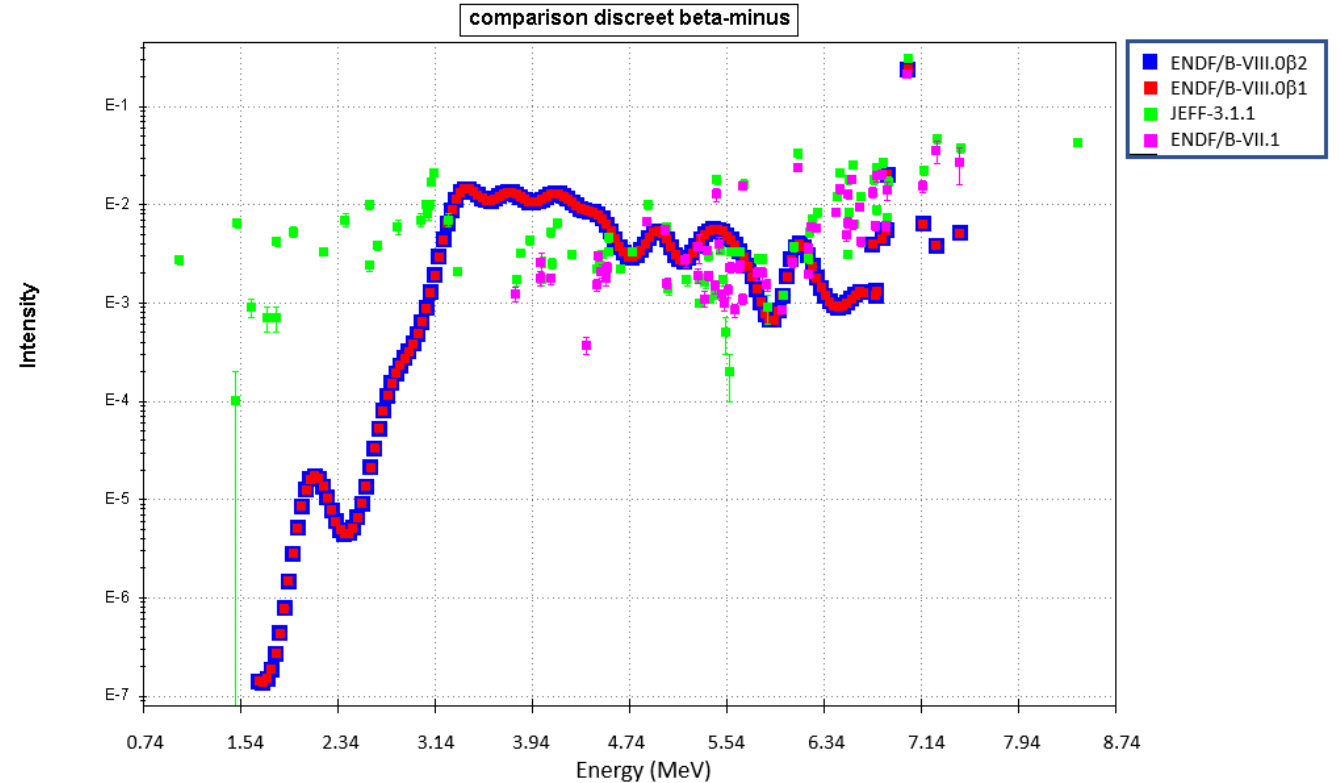
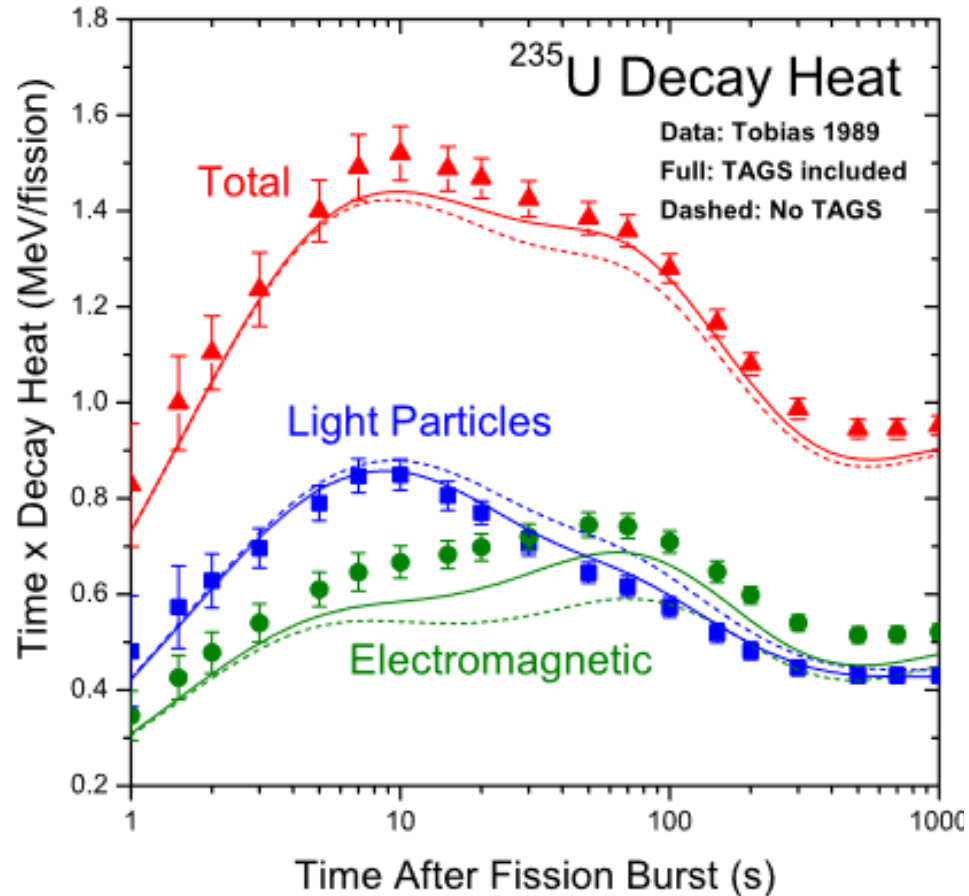
Decay Data

We can't reproduce the delayed gamma data (Dickens et al.) at short times due to incomplete level schemes.



Decay Data

TAGS data has been included in EEM, ELP, and beta intensity values, resulting in a much better decay heat and antineutrino spectrum prediction.



We need to modify the format so that single, no-summing gamma spectrum from TAGS experiments can coexist with discrete data from Germanium detectors.

Delayed Neutrons

- Delayed neutron data in ENDF/B need to be updated.
- An IAEA CRP, with plenty of USNDP work, has produced most of the relevant data.
- P_n and $T_{1/2}$ values have been already incorporated in the decay data sub-library.
- Concerns about expertise fading away in a few years.

