Modeling Fission Product Yields and Correlations

A.E. Lovell, Los Alamos National Laboratory

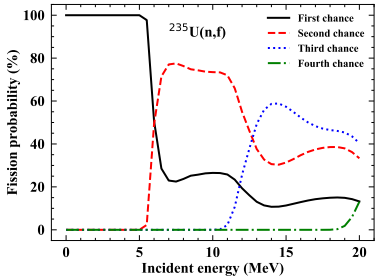
WANDA, February 11, 2026

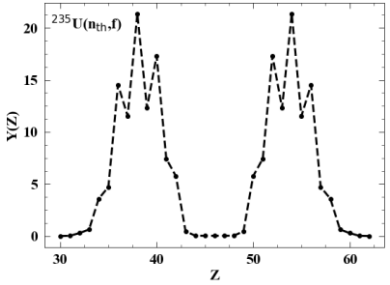
LA-UR-26-20837

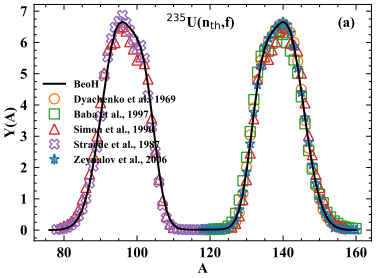
State-of-the-art modeling can produce prompt fission observables consistently

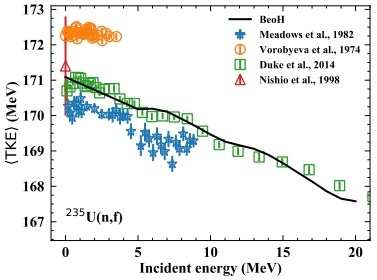
Y(A,Z,TKE,J,π)

Codes:
BeoH
CGMF
FREYA
FIFRELIN
FETA
GEF

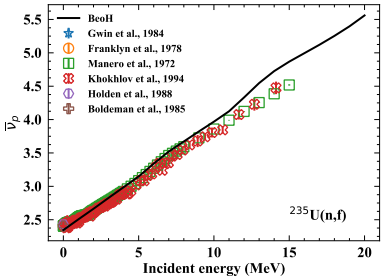


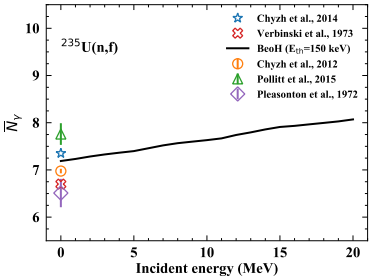


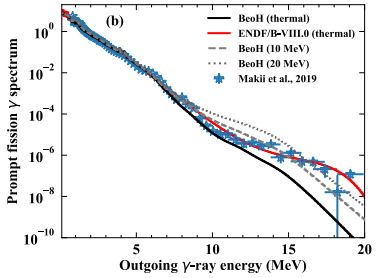


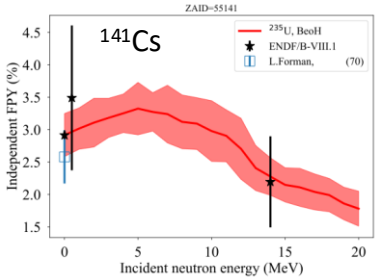


Fission fragment initial conditions are [often] parametrized, sampled or constructed explicitly, then allowed to decay; delayed observables are connected through decay data.



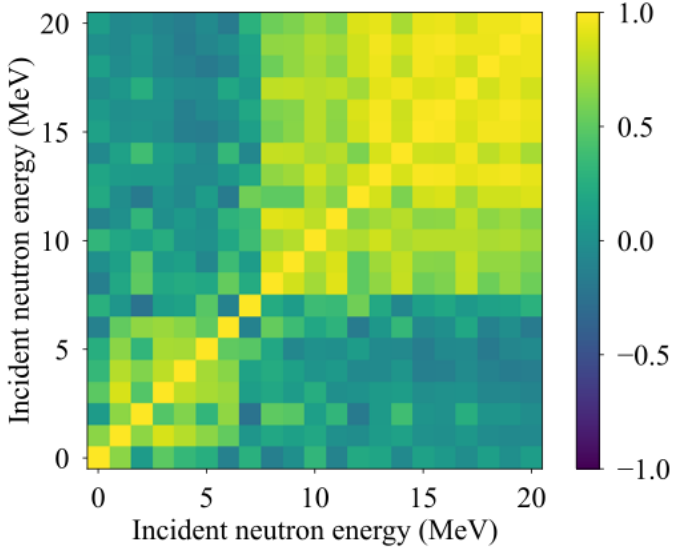




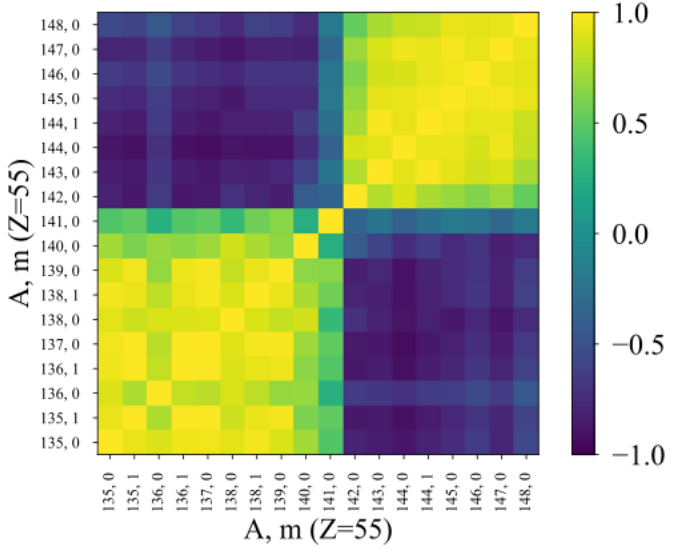


Correlations among all observables are accessible, even if nuclear data file formats (e.g. ENDF/B) do not exist

Correlations across energy (^{141}Cs)



Correlations across FPY (thermal)



Could also construct correlations for:
Independent-
cumulative
FPY-nubar
FPY-γ
…

Independent fission produce yields (same correlations have also been computed for cumulative FPYs)

Summary and needs

- Fission modeling is improving, but there are a significant number of inputs required (many of which cannot be measured directly):
  - Fission fragment properties before neutron/γ emission (mass, charge, energy, spin, parity)
  - Properties of the compound nucleus (multi-chance fission probabilities)
  - Neutron-target interactions (optical models for neutron-rich nuclei)
  - Nuclear levels (energies, spins, parities) and level densities

- Prompt γ-ray measurements are few compared to neutrons and independent fission products are rarely measured compared to cumulative ones.
- Formats, processing, integration into downstream applications needed to take advantage of correlations (see A. Lewis talk next)