^{181}Ta Evaluation in the Unresolved Resonance Region

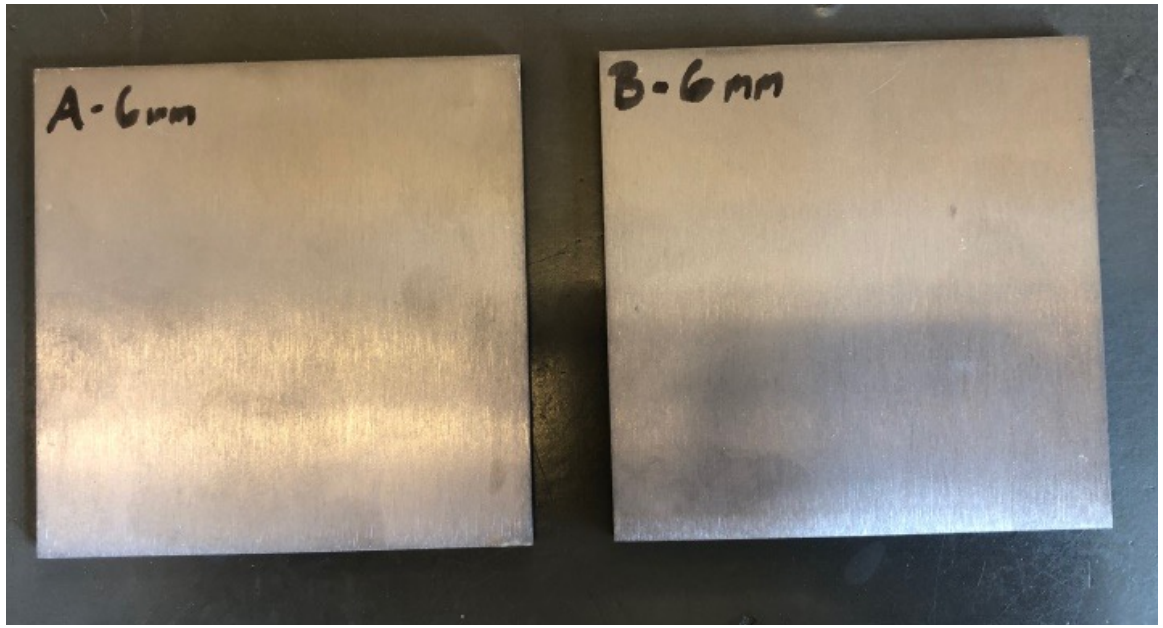
Jesse Brown[†], Marco Pigni[†]

[†]Nuclear Data Group, Oak Ridge National Laboratory

Technical Program Review – NCSP: Feb. 15-17, 2022

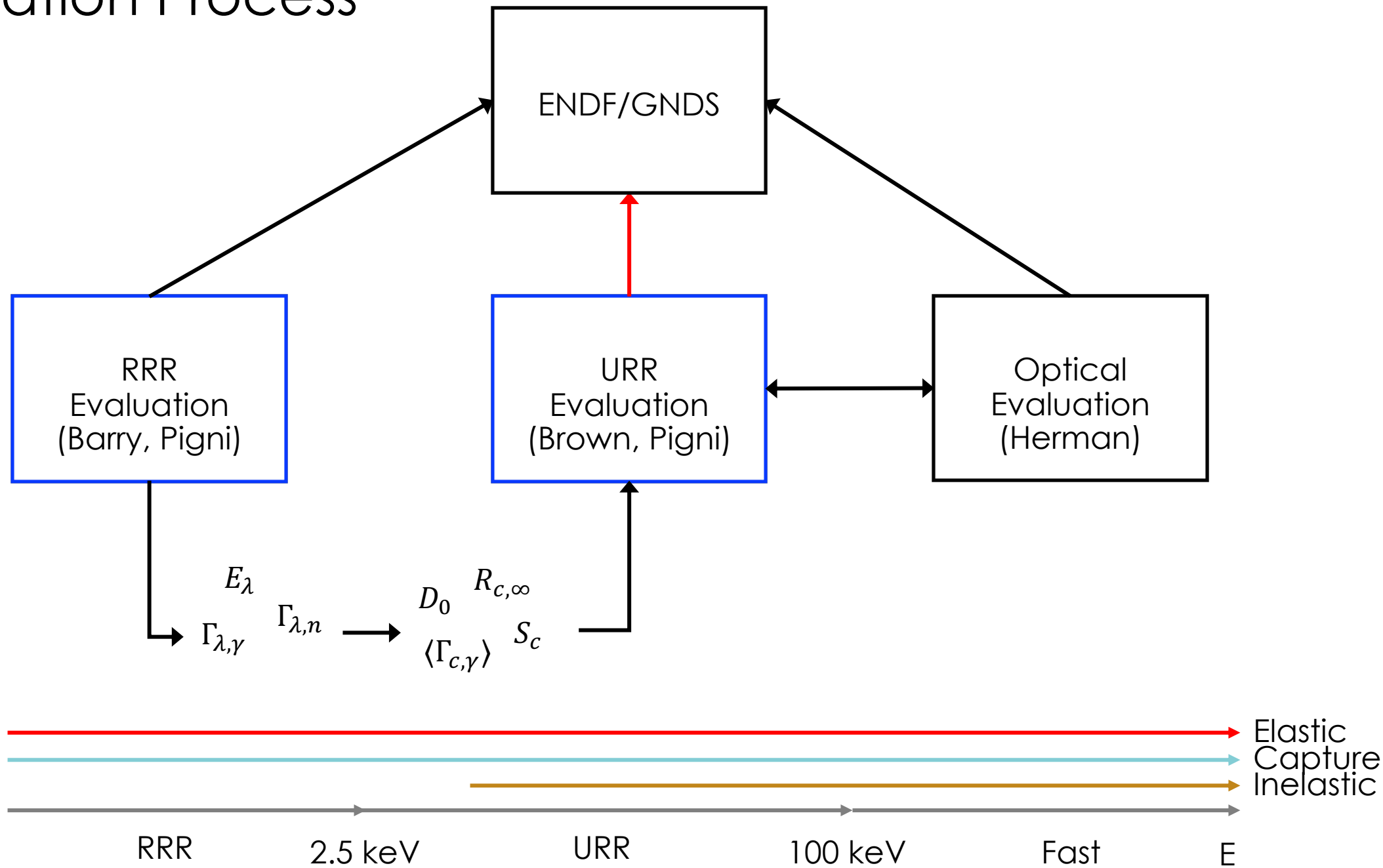
Motivation and Introduction

- ^{181}Ta is a refractory metal with several nuclear applications:
  - Neutron production targets
  - Reactors
  - Tools for molten actinides



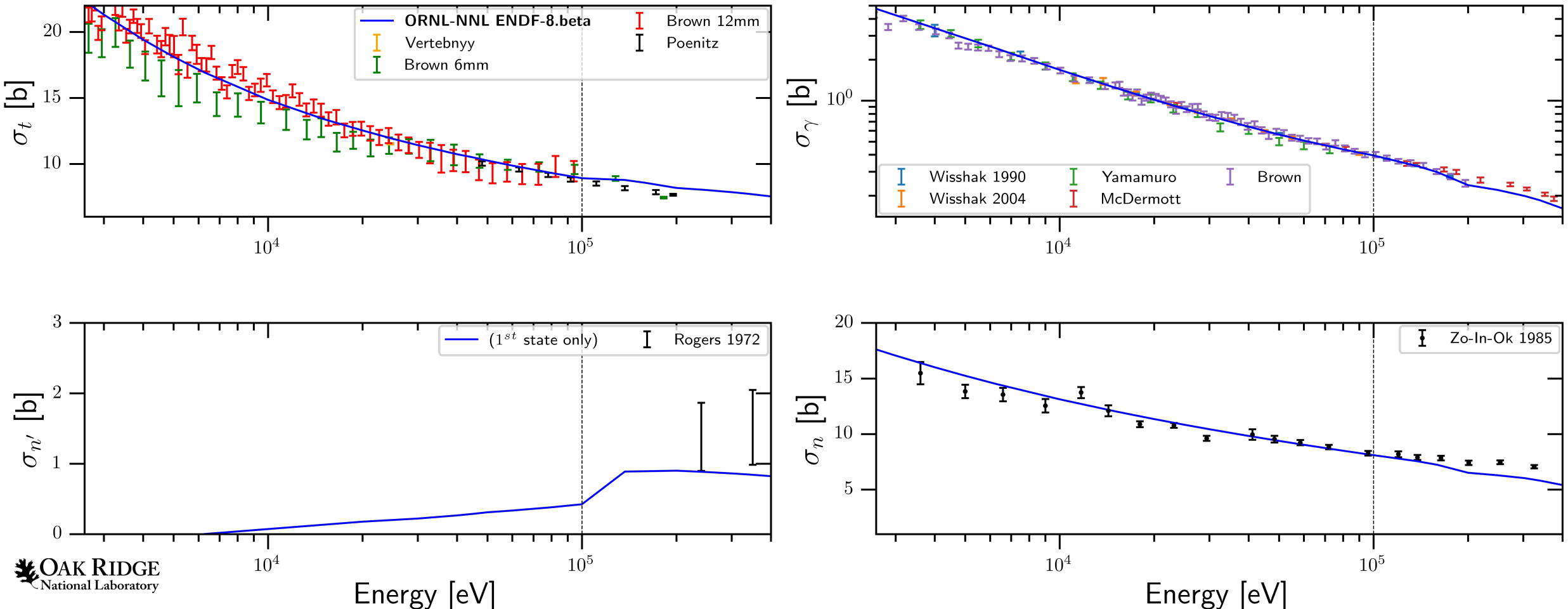
- Updated evaluation includes:
  - New measured data
  - RRR extended up to 2.5 keV (ENDF/B-8.0 upper range is 330 eV)
  - URR extended to 100 keV (ENDF/B-8.0 upper range is 5 keV)
  - Consistently merging URR with fast neutron region (Herman)
    - First inelastic channel included in URR

Evaluation Process



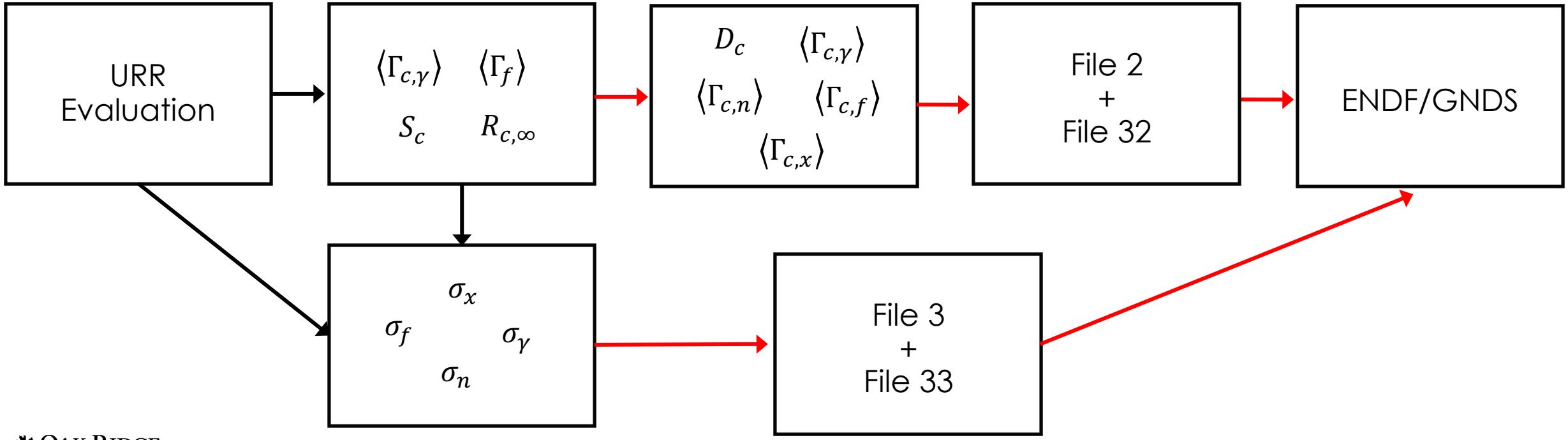
URR Cross Sections

- Averaged posterior NNL RRR parameters used as Bayesian prior
- Evaluated from 2.5 -> 100 keV
- $\sigma_{n'}$:
  - Only 1st state is energetically available (E_n > 6.7 keV)
  - no data < 200 keV

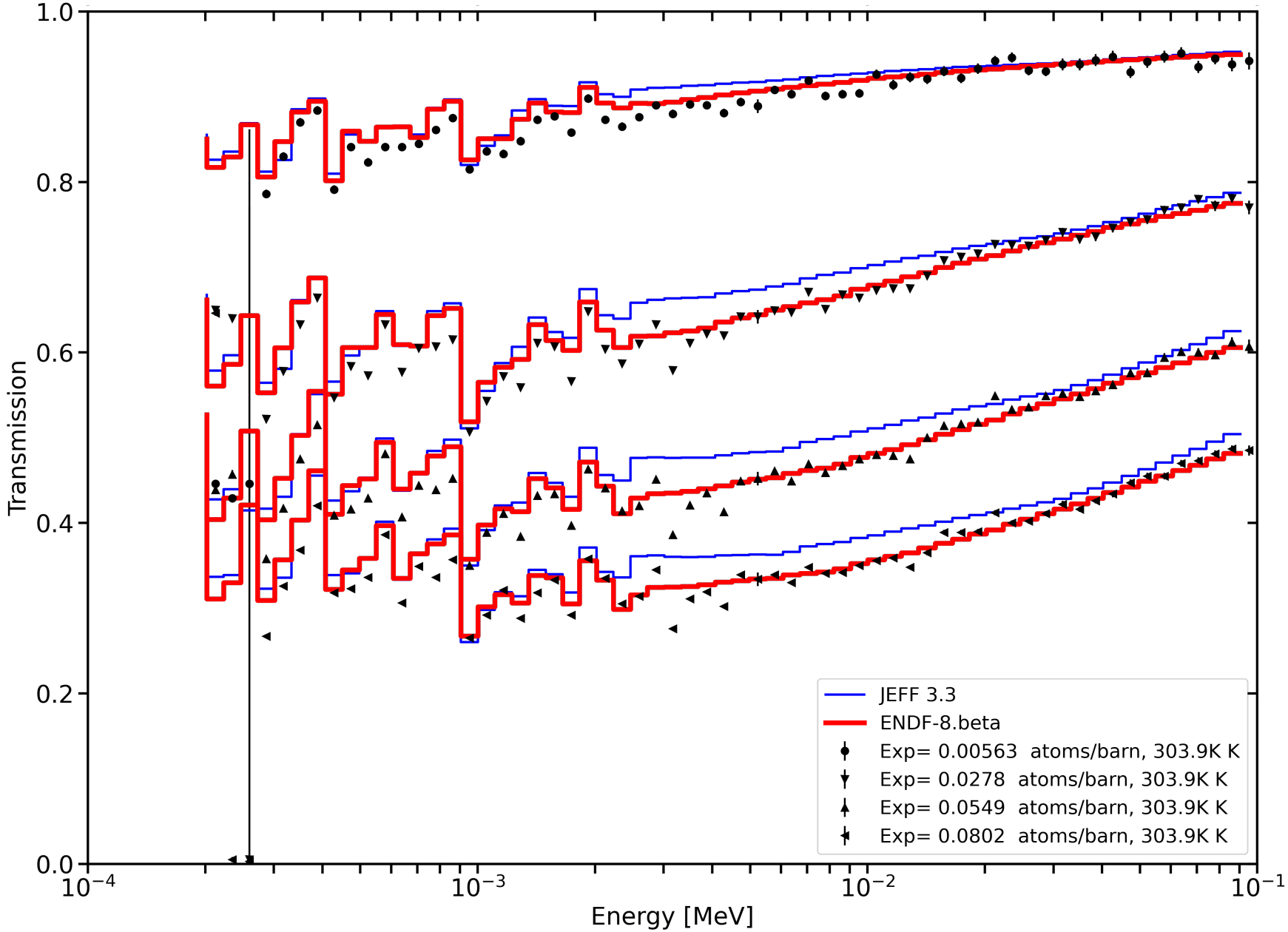


Loss of Information and Reproducibility

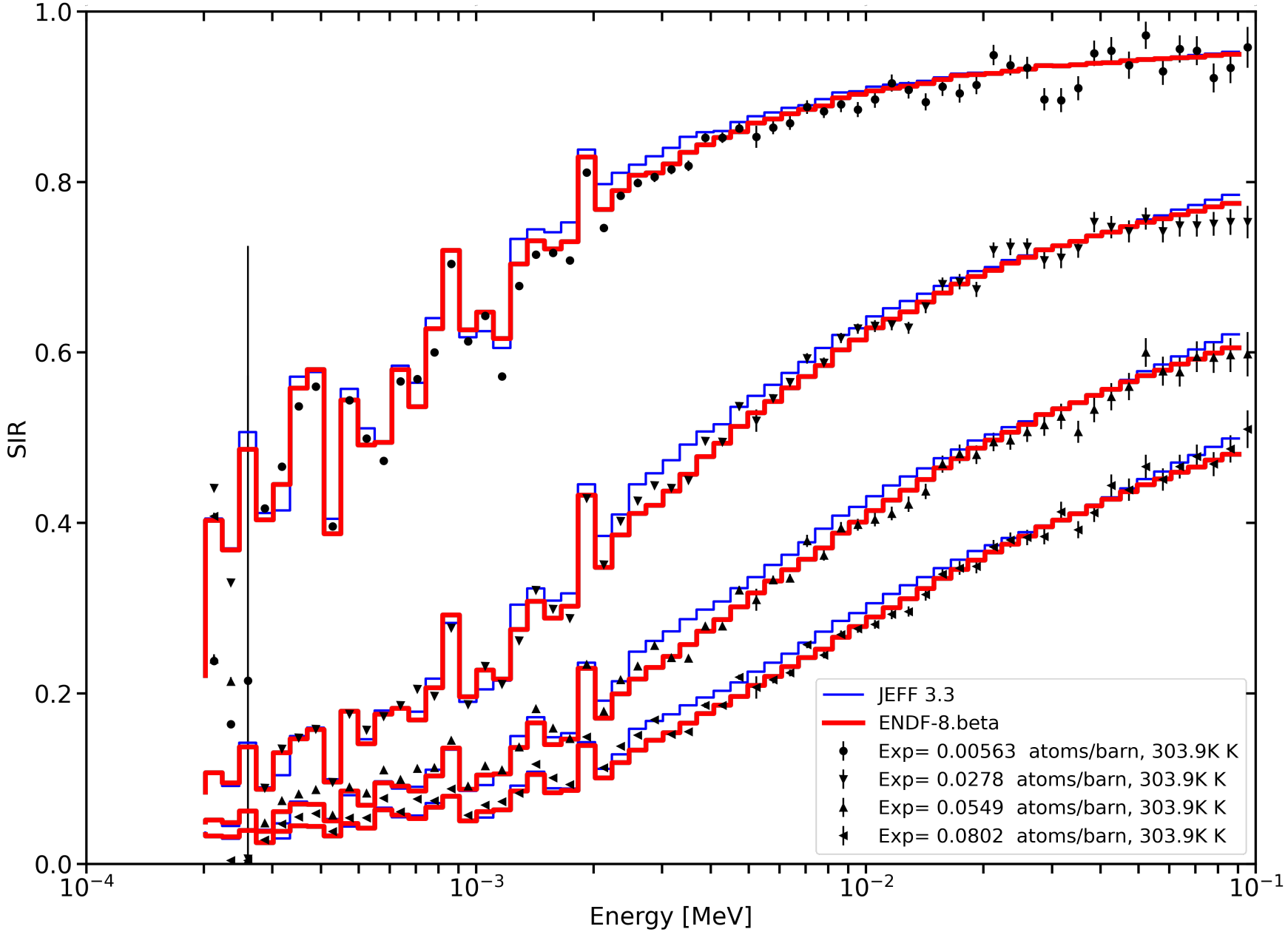
- Lose information
  - when translating to SLBW average parameters
  - Making File 32 with only one E-region
  - Transforming to cross section and covariance
  - Inelastic XS in the URR
- Actual posteriors never stored in ENDF/B
- We chose to make File 3 & 33 (along with File 2) to preserve energy dependent covariance
- We plan to address this with CSEWG community



Testing: Transmission

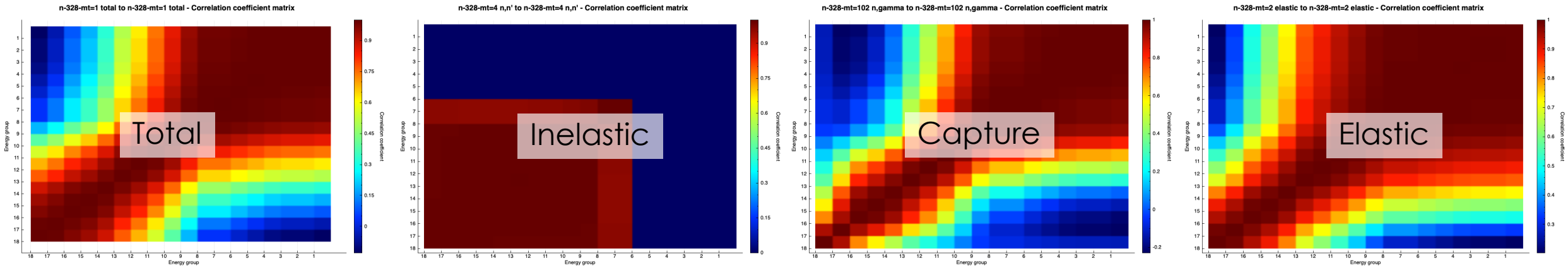


Testing: Self-Indication Ratio



Summary

- Posterior parameters with covariances completed
- New evaluation outperforms existing evaluations for differential data (σ_t and σ_γ sensitive)
- Working to produce best-case ENDF file
- All cross sections at 100 keV should smoothly transition to fast neutron region



Acknowledgments

This work was supported by the Nuclear Criticality Safety Program, funded and managed by the National Nuclear Security Administration for the Department of Energy.

Special thanks to our collaborators at NNL: Devin Barry and Amanda Lewis and to Doro Wiarda

Additional Slides