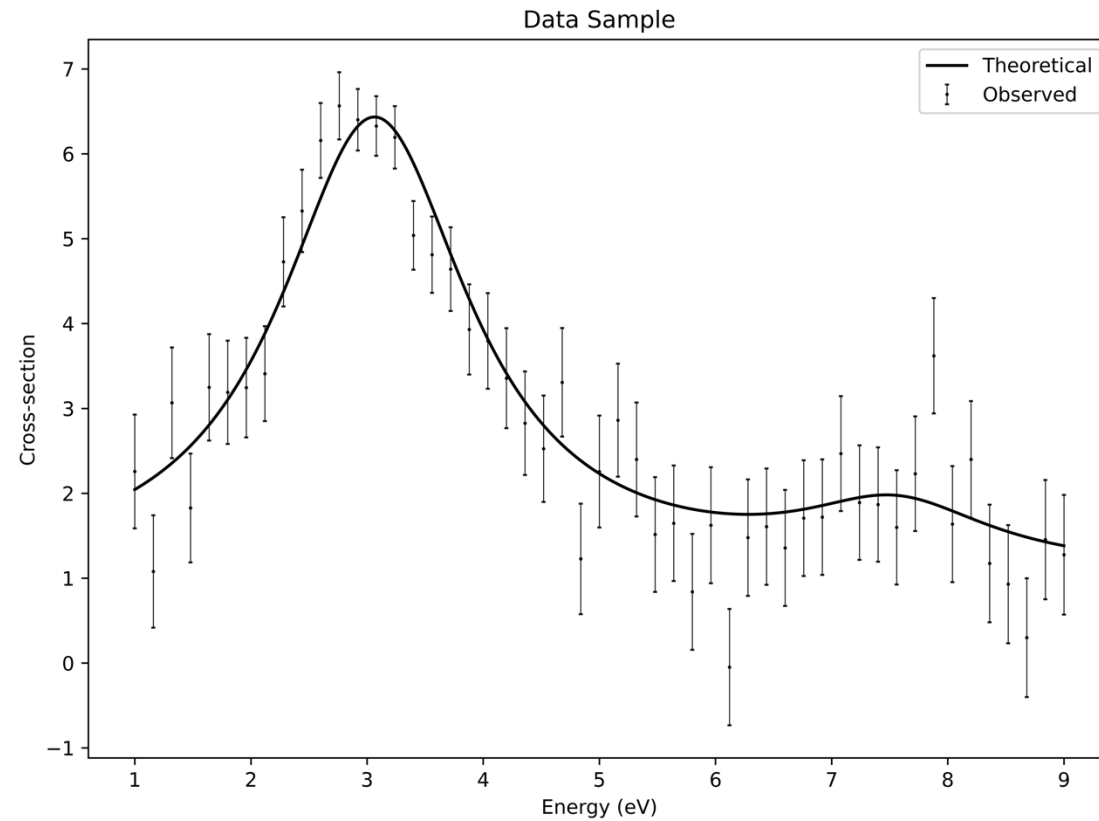# Verifiable Covariance Estimation

Vladimir Sobes, Noah Walton, Amanda Lewis, Oleksii Zivenko, Jacob Forbes, Cole Fritsch, Aaron Clark
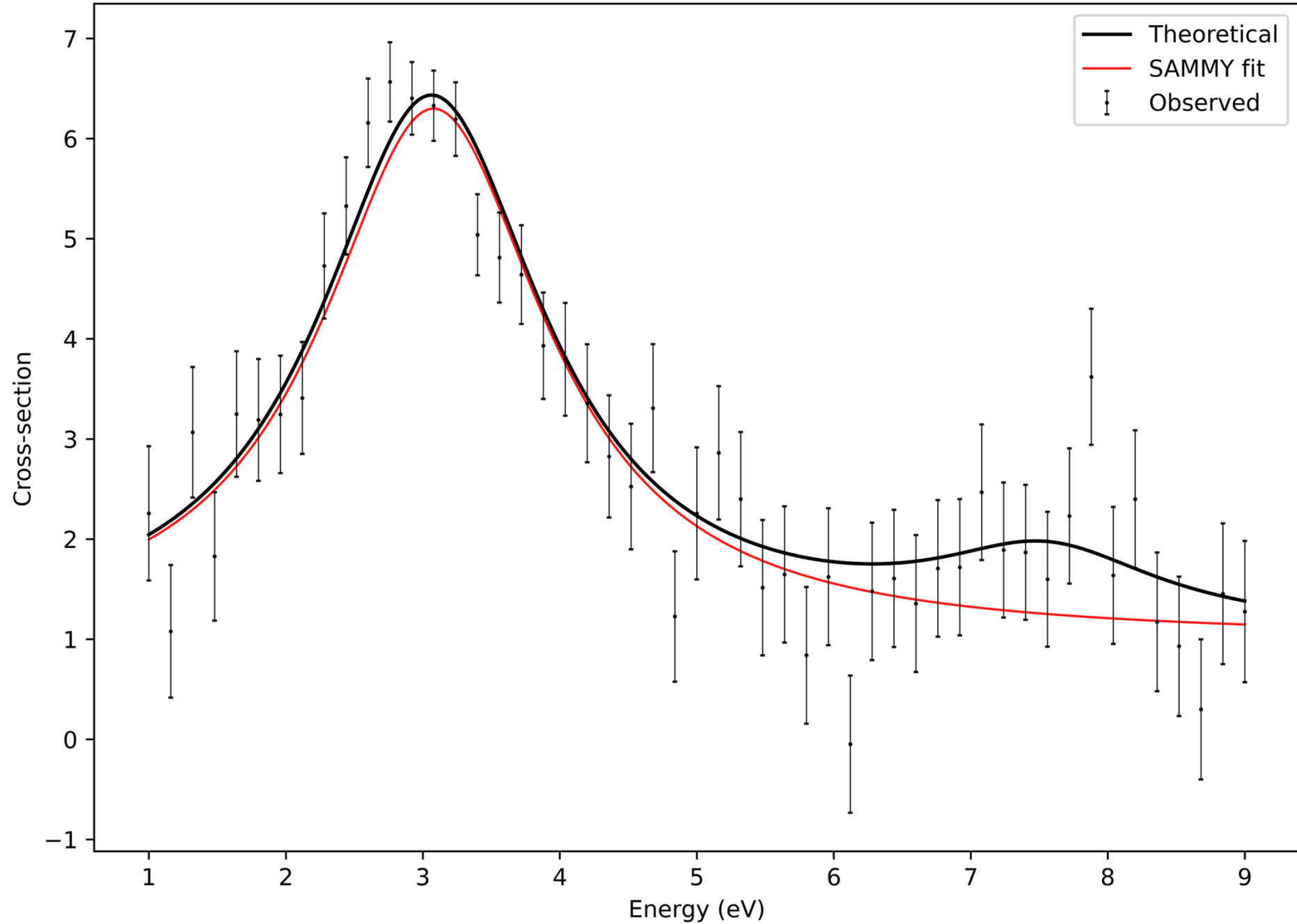
THE UNIVERSITY OF
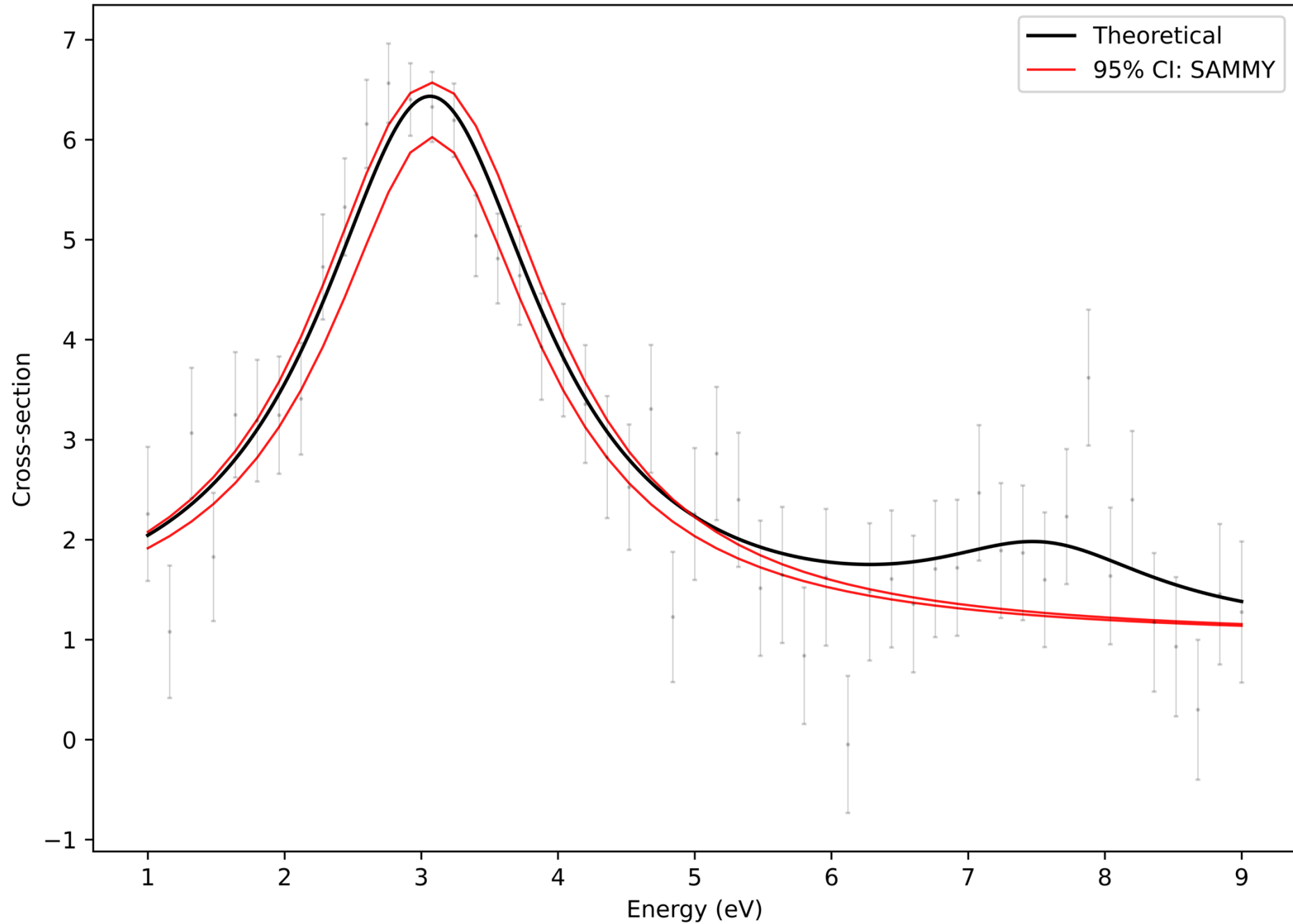TENNESSEE
KNOXVILLE

Estimate the Evaluation Uncertainty Verify with Synthetic Data

SAMMY Fit with Underspecified Model
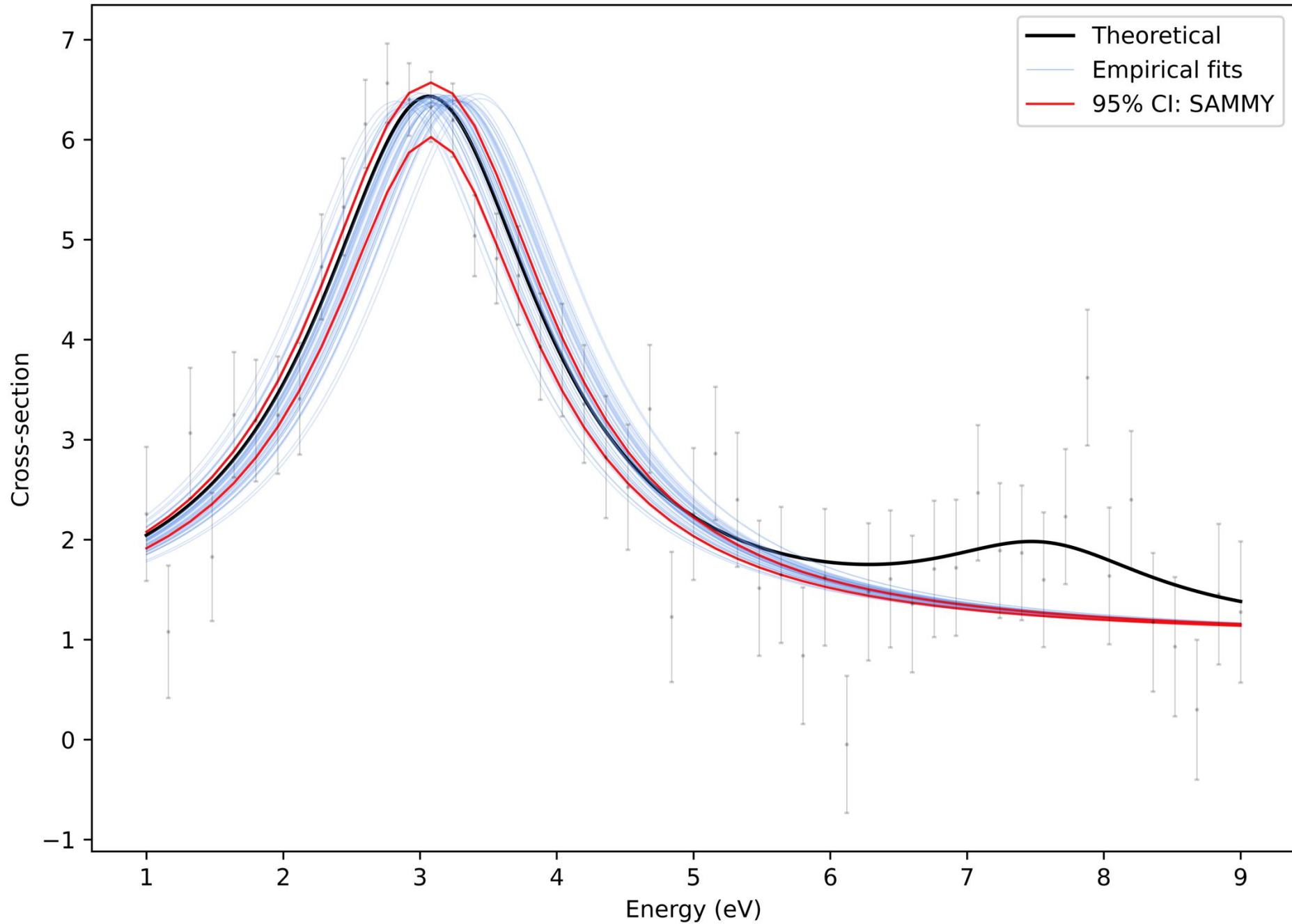
UQ with Underspecified Model

- Establish a systematic uncertainty evaluation methodology
- Frequentist interpretation*

$$P\{\sigma_{fit} - 2\delta_{\sigma} < \sigma_{true} < \sigma_{fit} + 2\delta_{\sigma}\} = 95\%$$
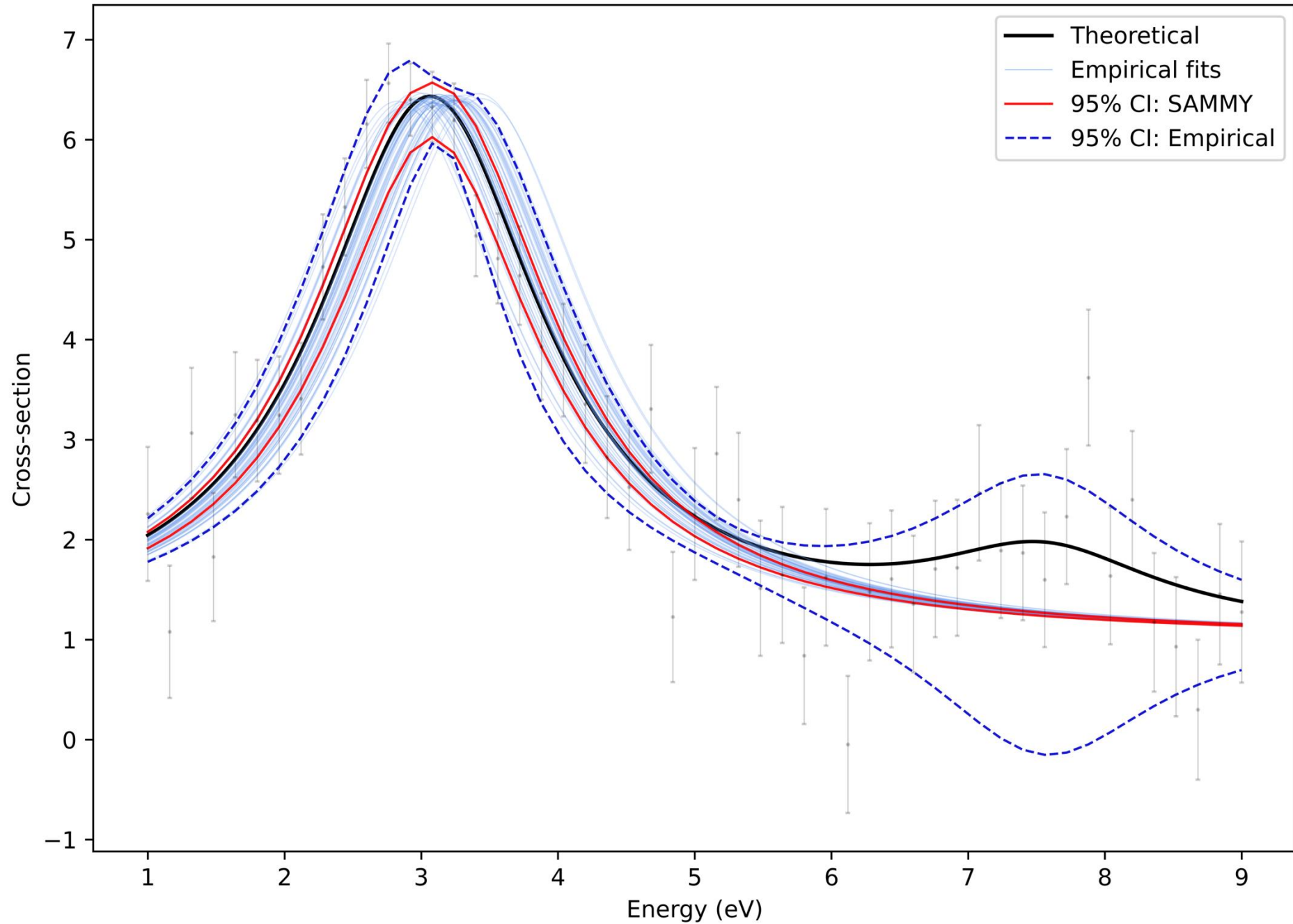
- Test with with synthetic data

*Can be extended to covariance data
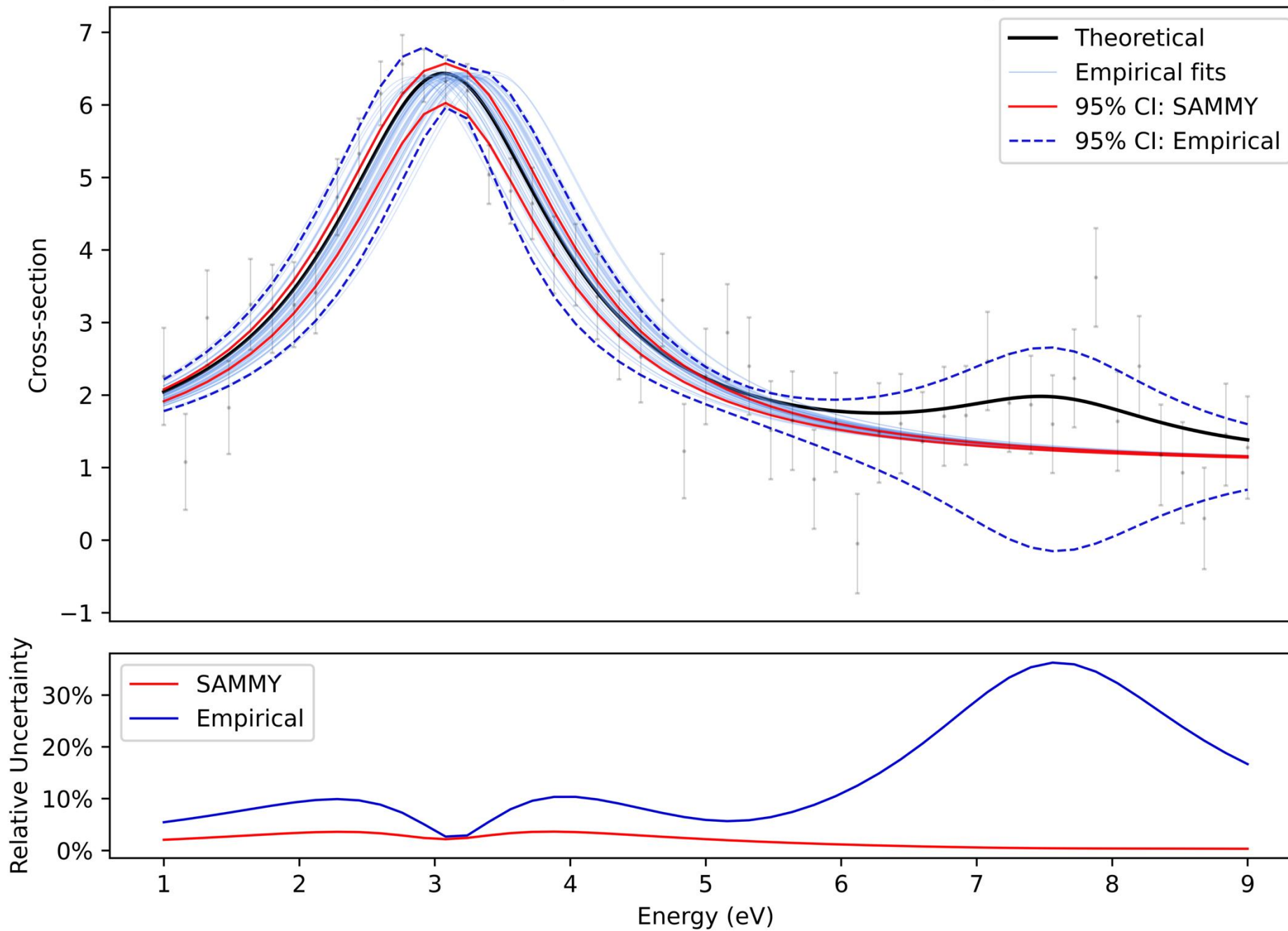
THE UNIVERSITY OF TENNESSEE KNOXVILLE
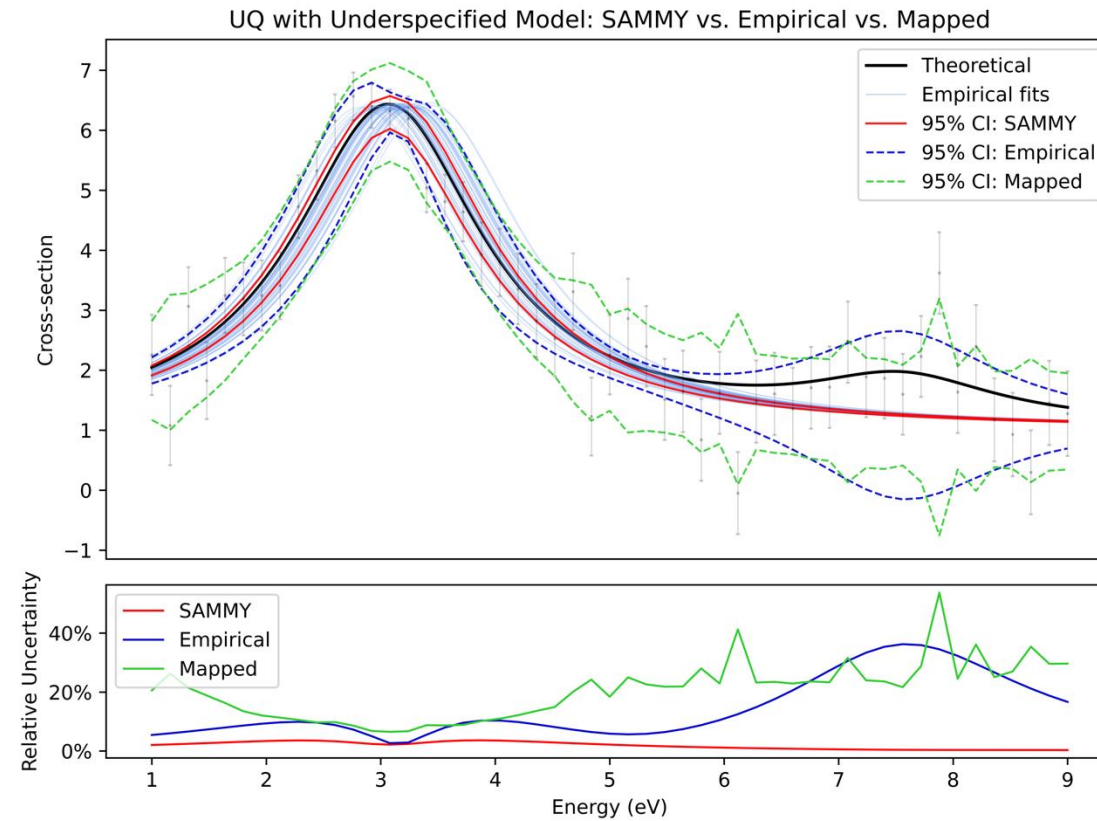
UQ with Underspecified Model

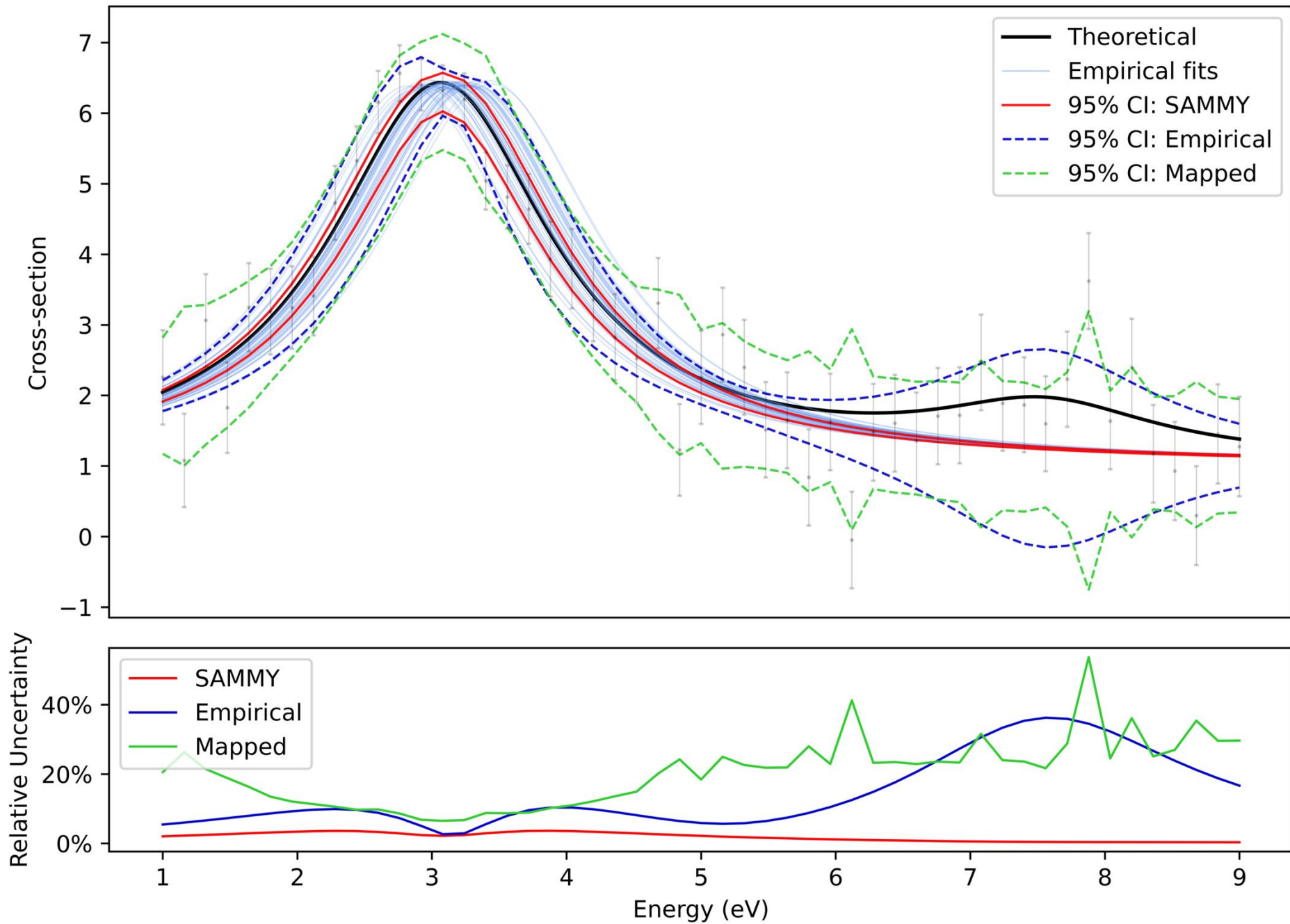UQ with Underspecified Model: SAMMY vs. Empirical

UQ with Underspecified Model: SAMMY vs. Empirical

# "Learn" a Better Covariance Estimations

UQ with Underspecified Model: SAMMY vs. Empirical vs. Mapped

Limitation and Corrections

- Limited by the "utility" of the synthetic data
  - How close is the synthetic data to representing reality
- "Interpretable" learned mapping?
- Testing of hypothetical situations. E.g.:
  - Misreported data uncertainty
  - Missing resonances
  - Truncated spin groups
  - Reich-Moore approximation versus full R-Matrix

Synthetic Data

Real Data
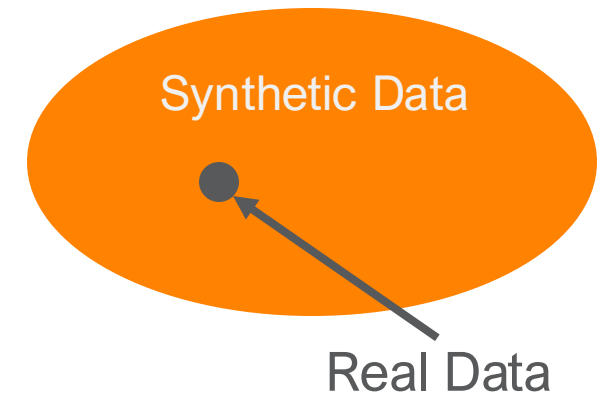
Storage and formats

- In the RRR, missing resonances will (likely) require File 33

- Current ranked options (opinion):
  1. File 32 + File 33
  2. Random files
  3. Coarse grid File 33
  4. Fine grid, eigen-decomposed File 33 (GNDS)