

Thermal Neutron Total Cross Section Measurements for Improvement of Criticality Calculations and Propagation of Scattering Kernel Uncertainties

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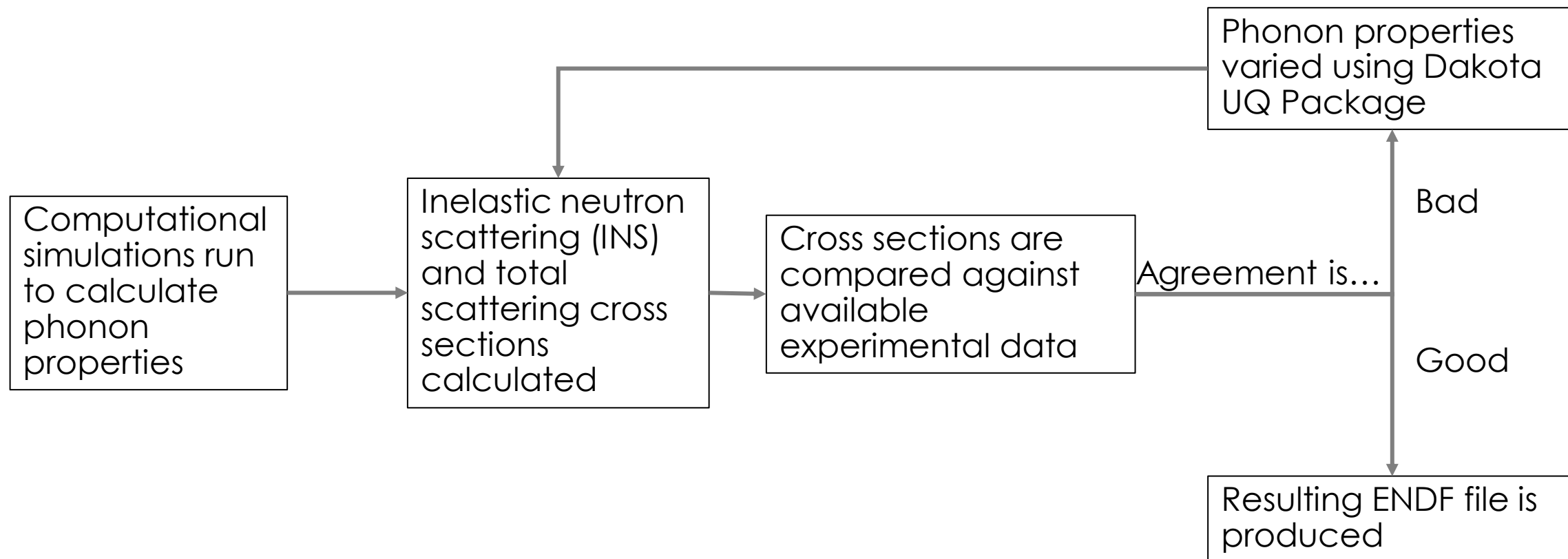
Oak Ridge National Laboratory

NCSP Technical Program Review – 22 February 2024

Overview

- Transmission measurements of several thermal moderators carried out at RPI LINAC
- Measurements have been discussed at previous TPR meetings
 - 2022 TPR: “Thermal Neutron Cross Section Measurements at RPI LINAC”
- Focus here is analysis of transmission data
 - Previously discussed in 2023 TPR talks by Chapman and Ramić
- Analysis work summarized in ORNL Technical Report (<https://www.osti.gov/biblio/2217715>)

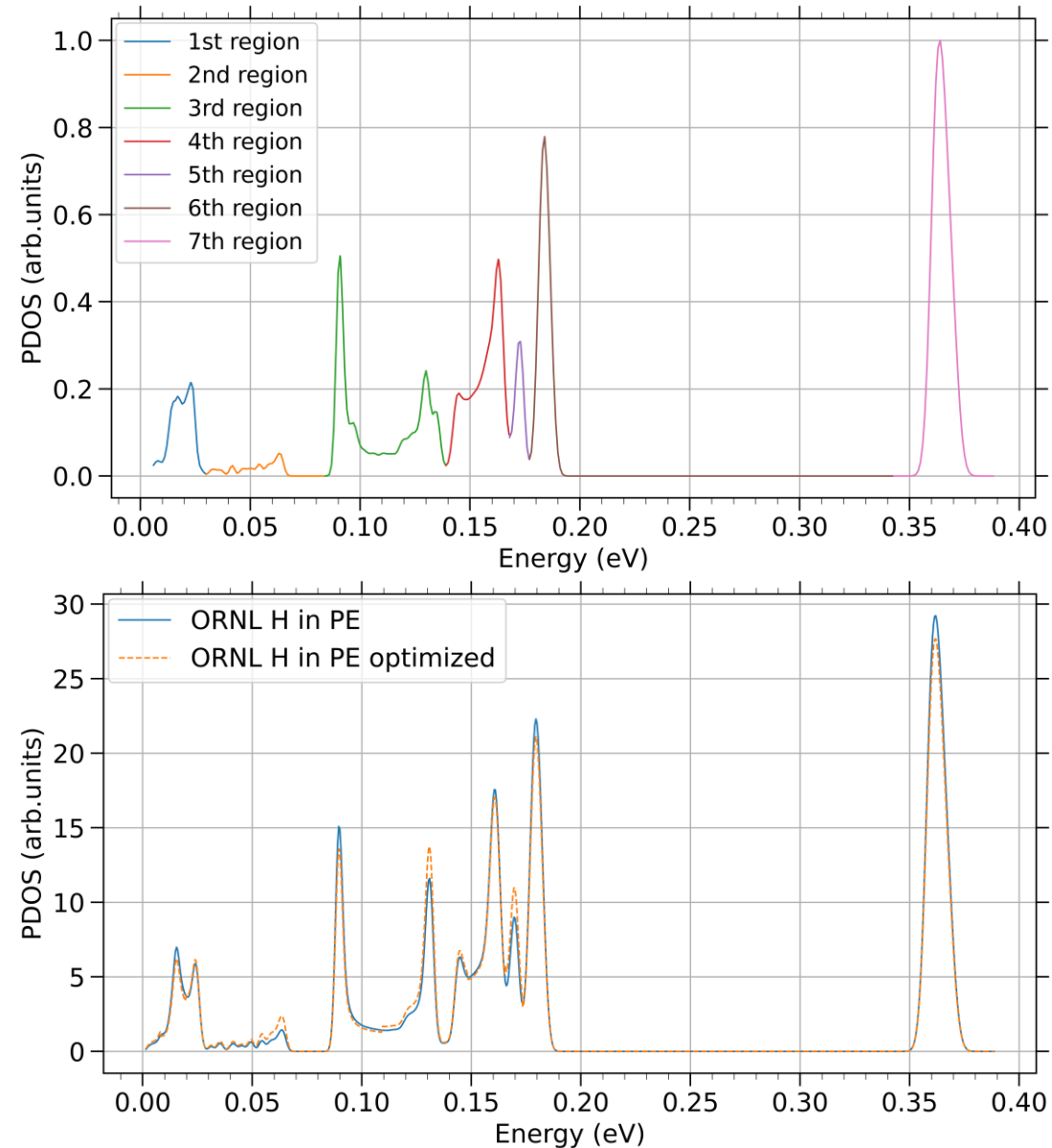
Procedure



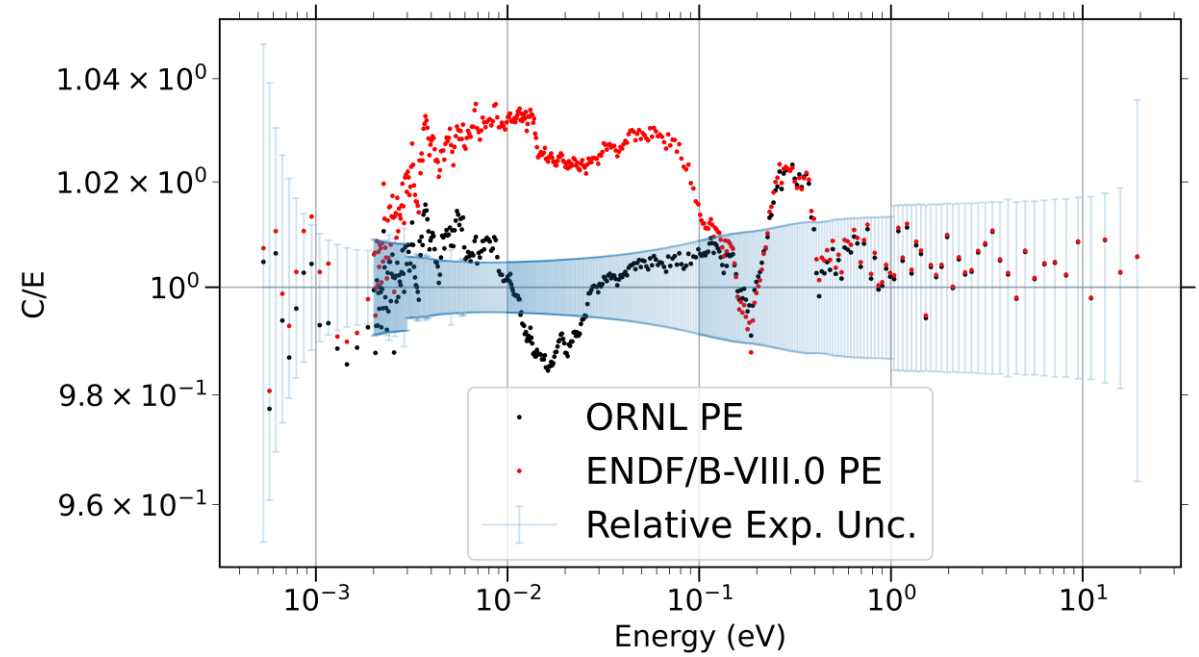
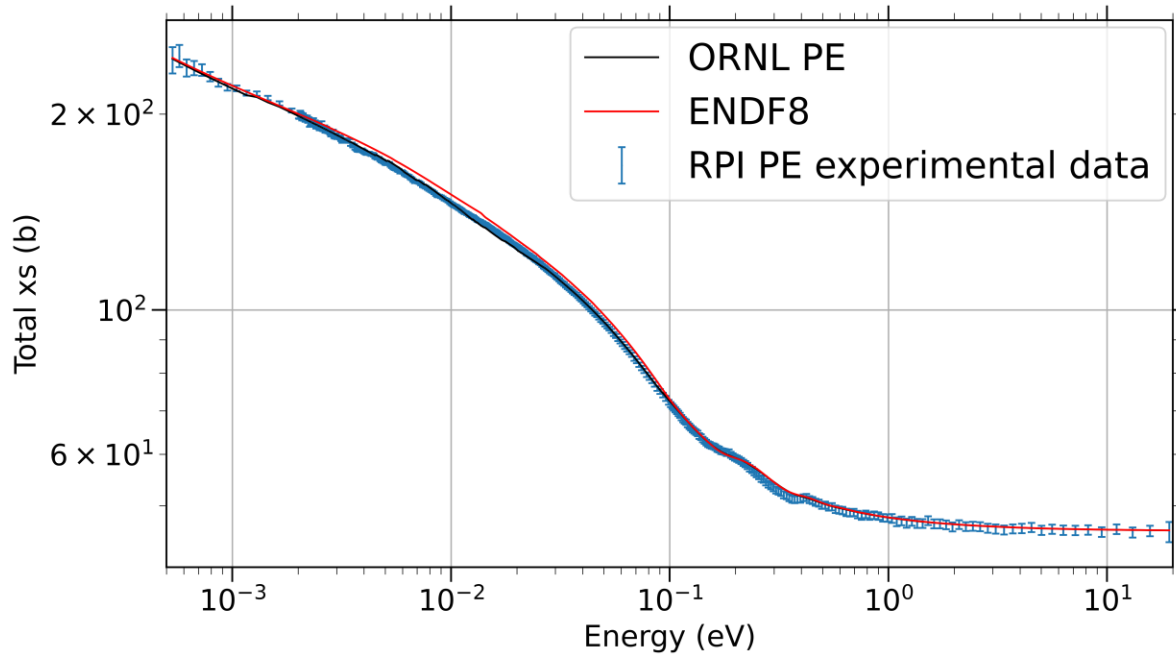
Materials Analyzed

Material	Samples Measured	Fit performed?
Polyethylene (PE)	2	Yes
Polystyrene (PS)	2	Yes
Lucite (Plexiglas/PMMA)	1 (two different forms of Plexiglas)	Yes
YH _{1.68}	2	No*
YH _{1.85}	2	No*

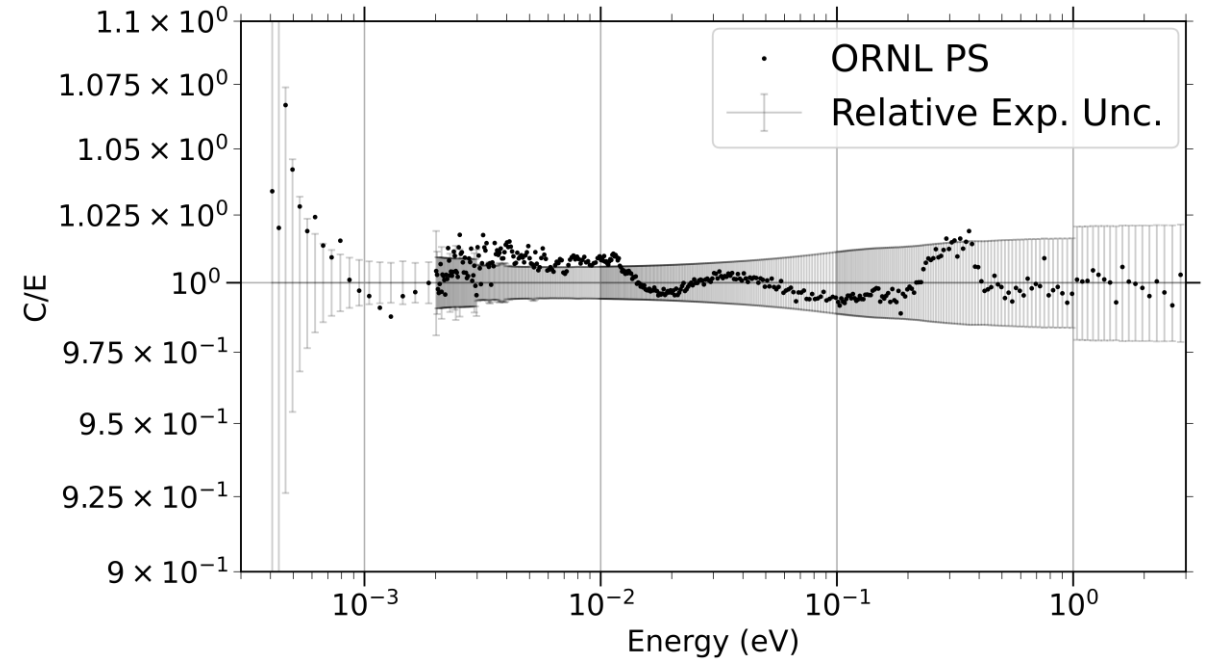
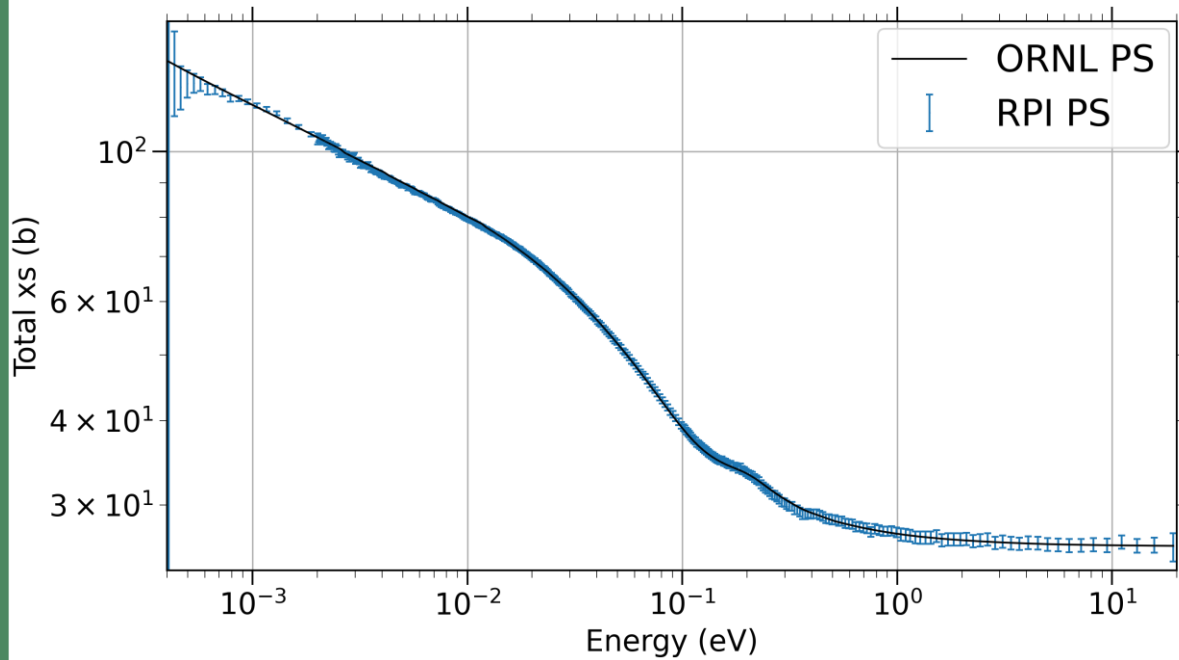
Fitting procedure – Example with Polyethylene



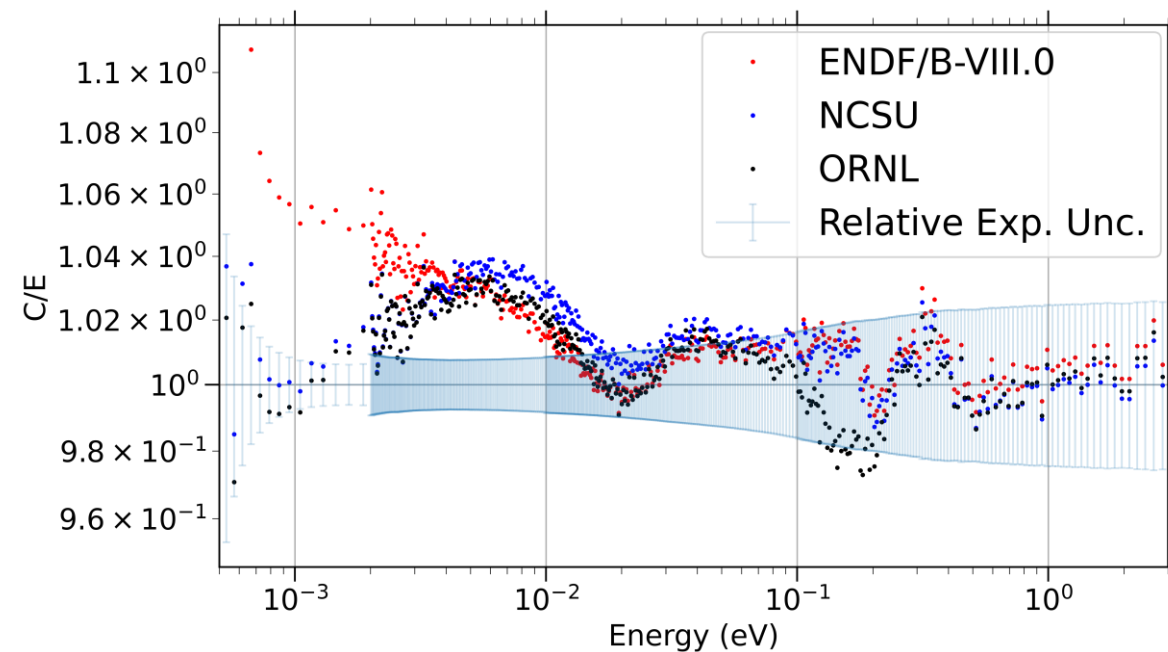
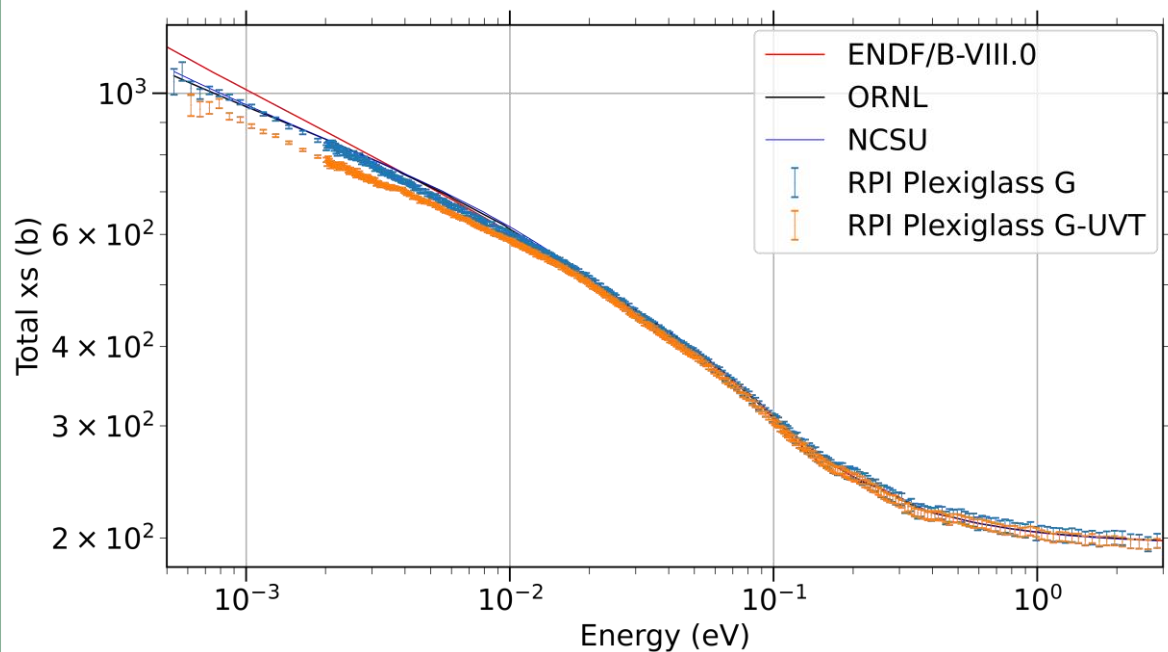
Results – Polyethylene



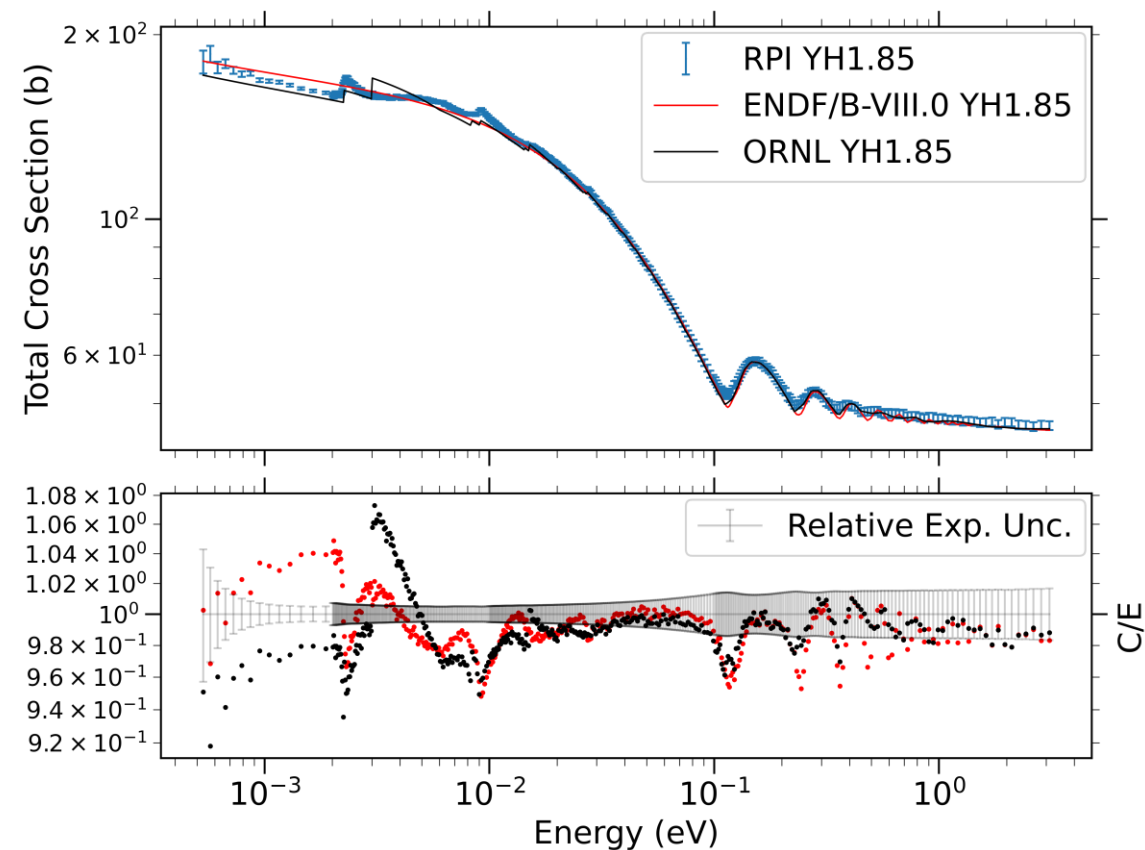
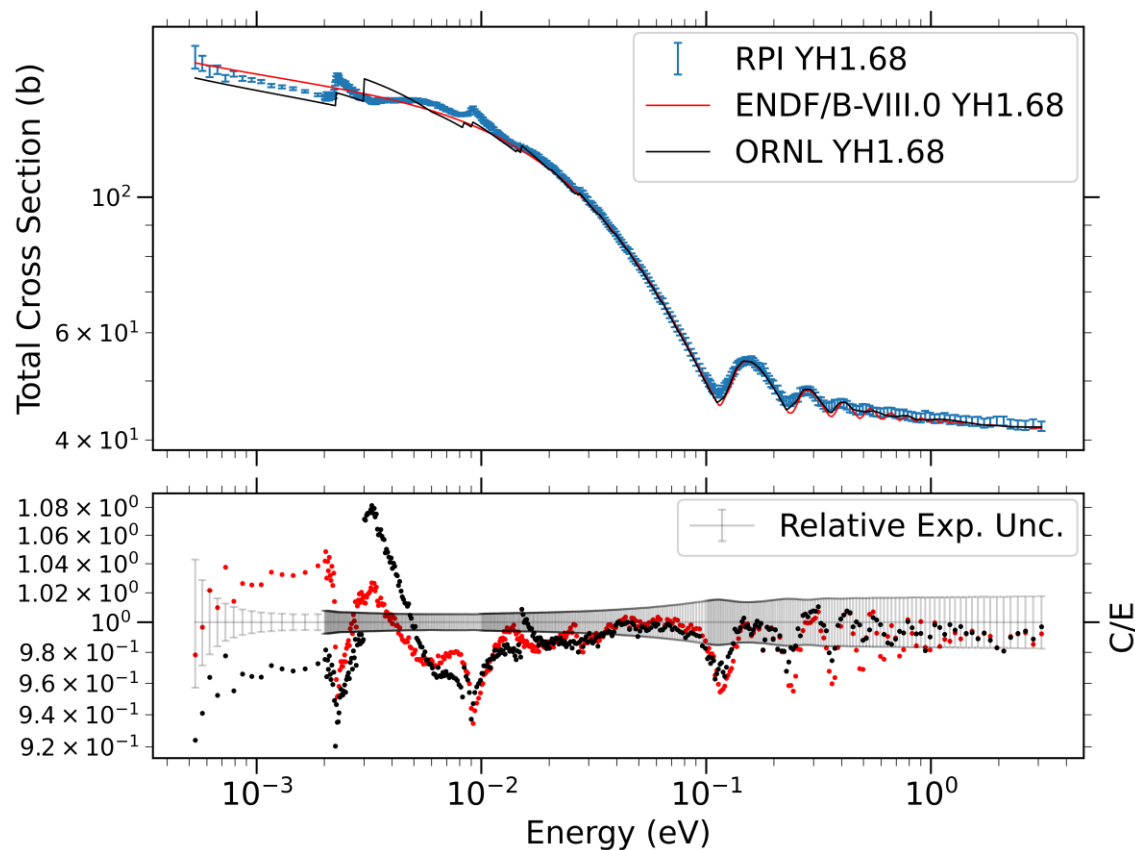
Results – Polystyrene



Results – Lucite



Results – Yttrium Hydride



- Analysis of differential scattering & total cross sections ongoing
- High-temperature anharmonicities (not shown) need to be accounted

Conclusions

- Previous work was summarized into a technical report
 - <https://www.osti.gov/biblio/2217715>
- Polyethylene, Lucite, and Polystyrene files finalized and submitted to NNDC
- Yttrium Hydride work ongoing to account for high temperature anharmonicities

Acknowledgements

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Questions?