RPI Quasi-Differential Neutron Scattering Measurements

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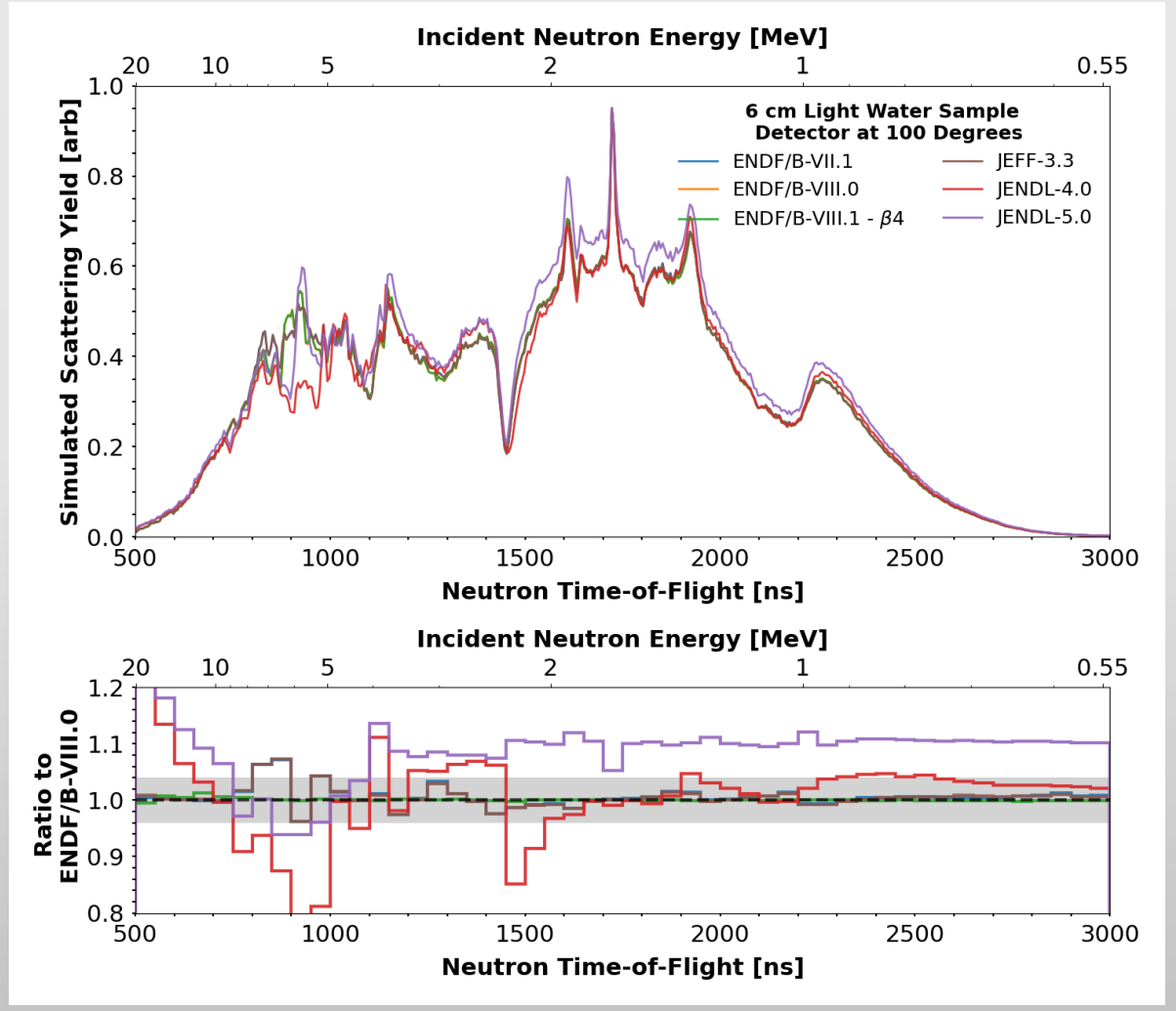
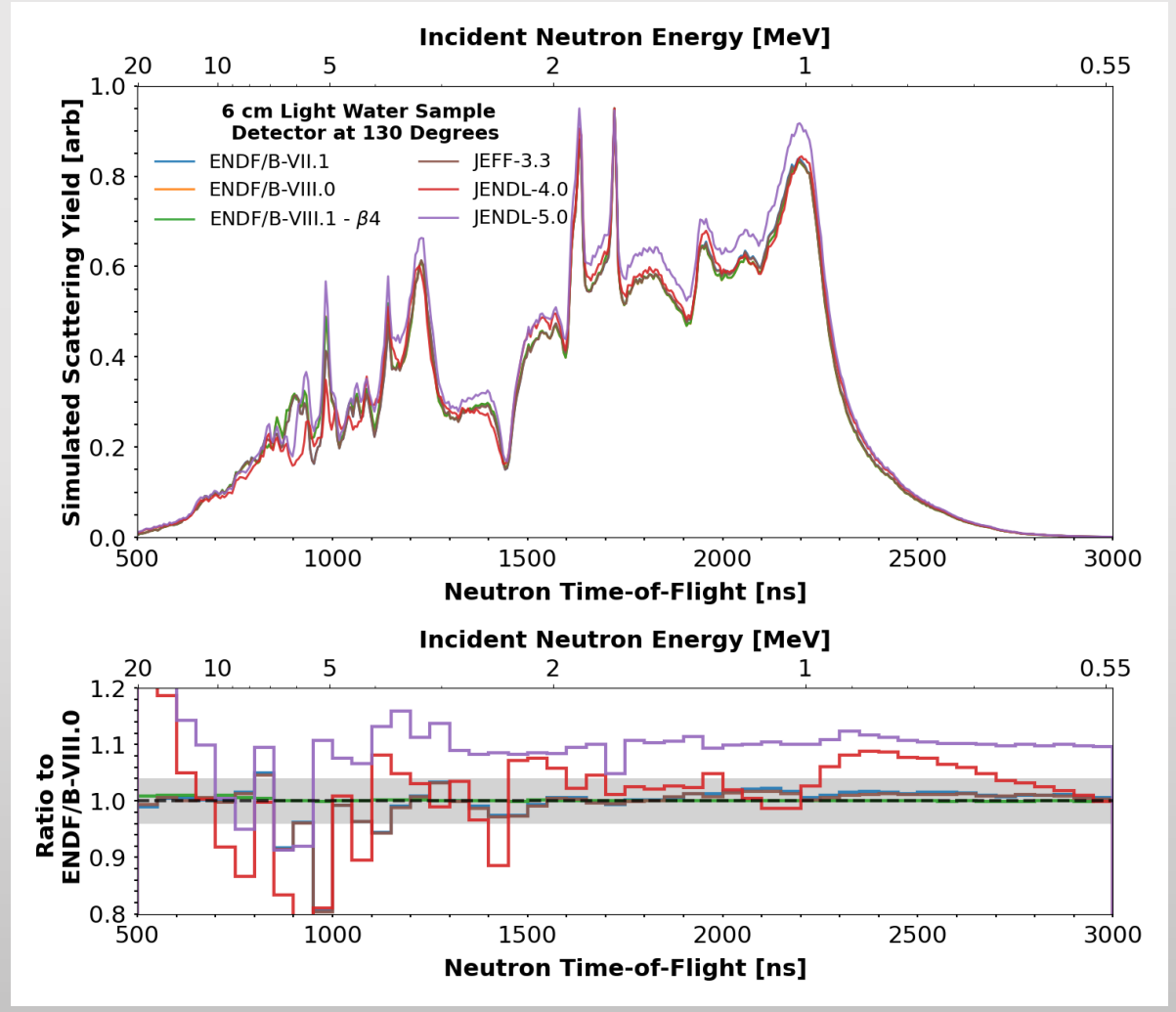
RPI Fast Neutron Scattering System

- RPI provides a validation platform for fast neutron evaluations with quasi-differential neutron scattering measurements
- Most recently elemental Ta and Teflon (^{19}F) were measured to 3.9% and 3.4% accuracy for validation of evaluations in ENDF/B-VIII.1
- Previous measurements have been used to validate/inform several evaluations including: ^{238}U[1] and Pb[2]

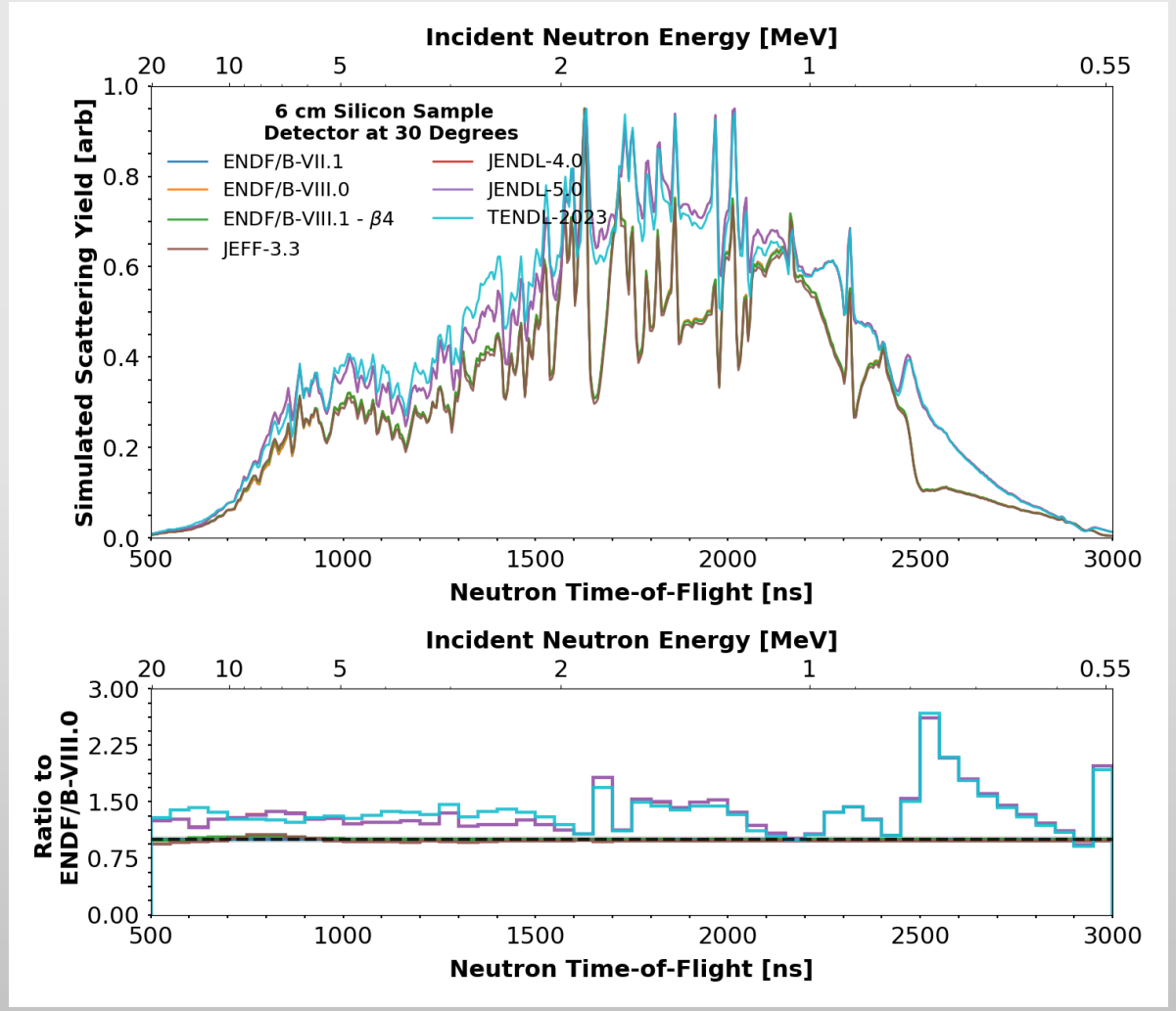
1. R. Capote, et al. *IAEA CIELO Evaluation of Neutron-induced Reactions on 235U and 238U Targets*, Nucl. Data Sheets, **148,** (2018)
2. P. Brain, et al. *Resolved Resonance Region Evaluations of n+206,207,208Pb for Fast Spectrum Applications*, Ann. Nucl. Eng. ***202**, (2024)*

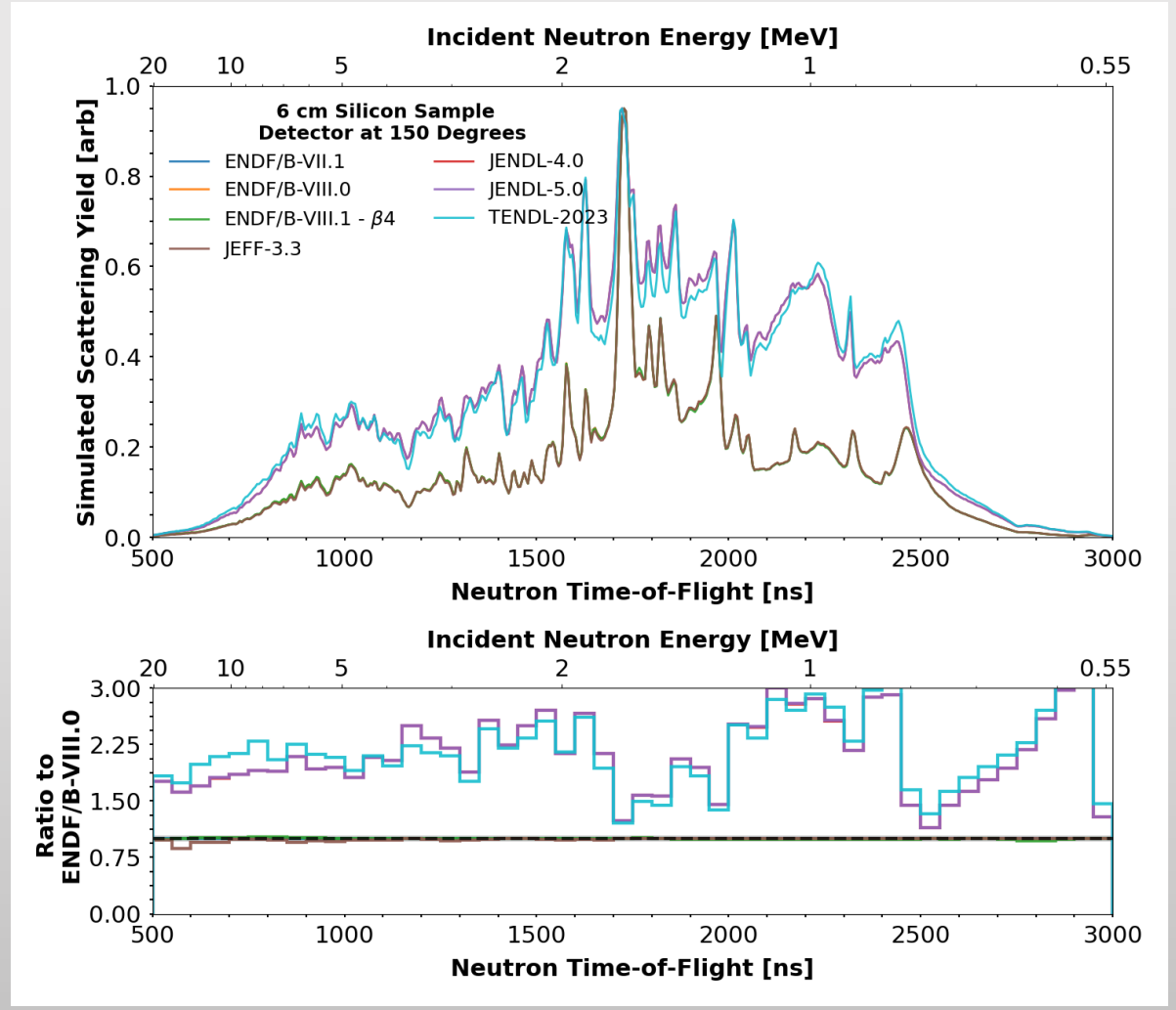
Light Water


Incident Neutron Energy [MeV]
20
10
5
2
1
0.55
Simulated Scattering Yield [arb]
6 cm Light Water Sample
Detector at 100 Degrees
ENDF/B-VII.1
ENDF/B-VIII.0
ENDF/B-VIII.1 - β4
JEFF-3.3
JENDL-4.0
JENDL-5.0
Neutron Time-of-Flight [ns]
Ratio to ENDF/B-VIII.0


Incident Neutron Energy [MeV]
20
10
5
2
1
0.55
Simulated Scattering Yield [arb]
6 cm Light Water Sample
Detector at 130 Degrees
ENDF/B-VII.1
ENDF/B-VIII.0
ENDF/B-VIII.1 - β4
JEFF-3.3
JENDL-4.0
JENDL-5.0
Neutron Time-of-Flight [ns]
Ratio to ENDF/B-VIII.0

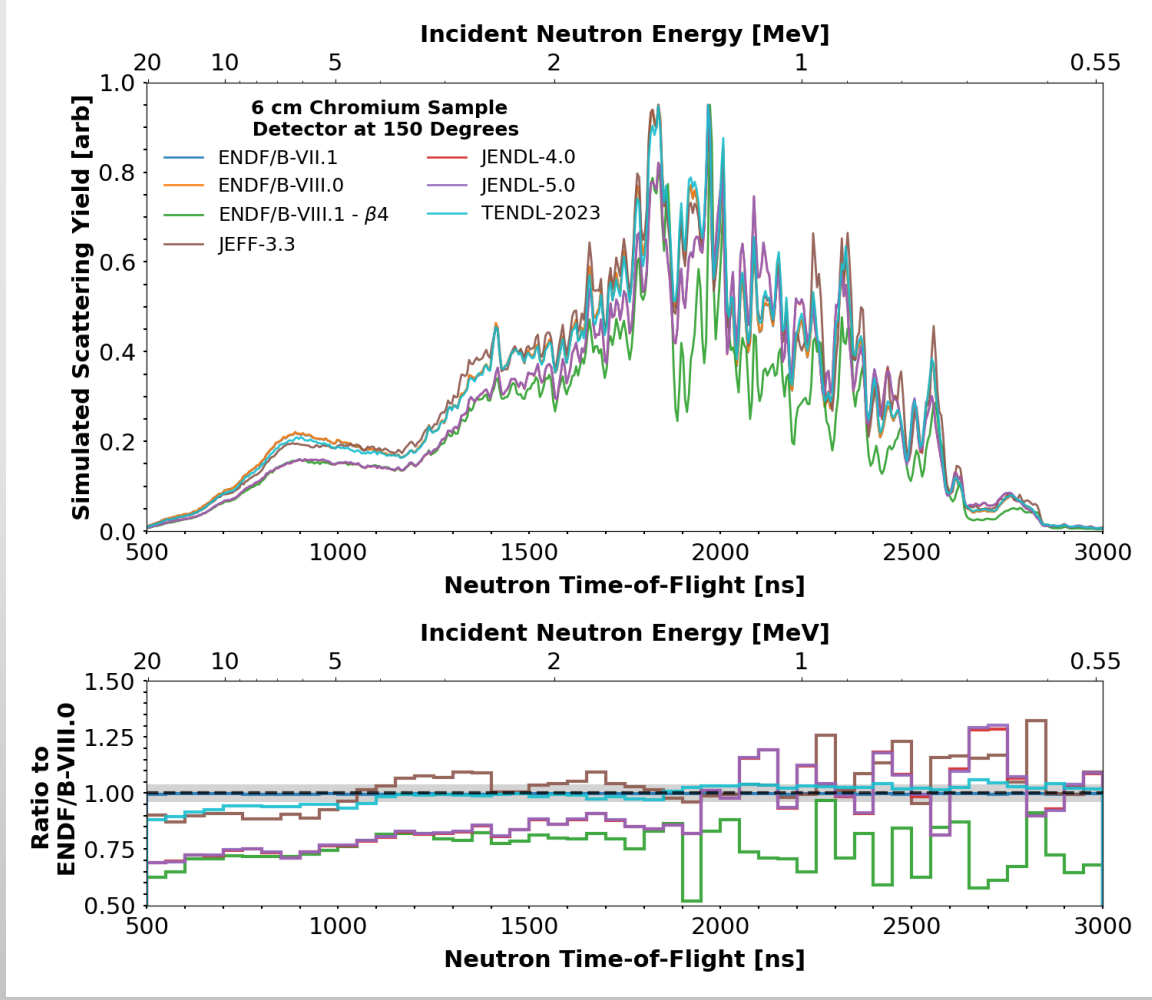
Silicon – U_3Si_2 Fuels, SiC, etc.





Conclusions and More Experiments at RPI

- Conflicting evaluated nuclear data for water (oxygen) and silicon can be resolved with RPI quasi-differential fast neutron scattering experiment
- Several conflicting materials identified and will be discussed in upcoming *Fusion Science and Technology* journal publication
  - ^{6,7}Li, B, N, O, Na, Mg, Al, Si, Cl, Ti, V, Ni, Mn, Nb, Cr, Y, Ba, Sn, Hf, W
- What other materials does NCSP need validation for?



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