Scattering and Capture Experiments vs ENDF/B-VIII.0b4

Y. Danon, E. Blain

Rensselaer Polytechnic Institute, Troy, NY, 12180

and

D. Barry, R. Block, J. Burke, **A. Daskalakis**, B. Epping, G. Leinweber, **B. McDermott**, M. Rapp

Naval Nuclear Laboratory, KAPL, P.O. Box 1072, Schenectady, NY 12301

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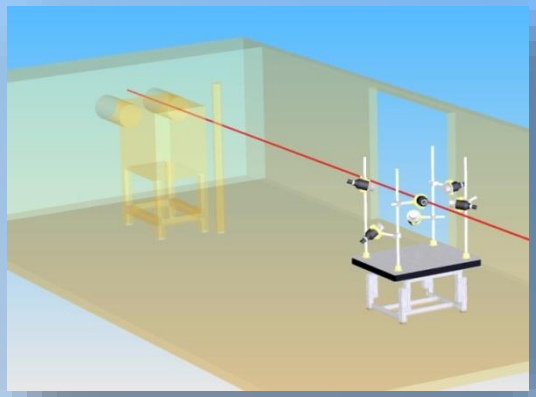
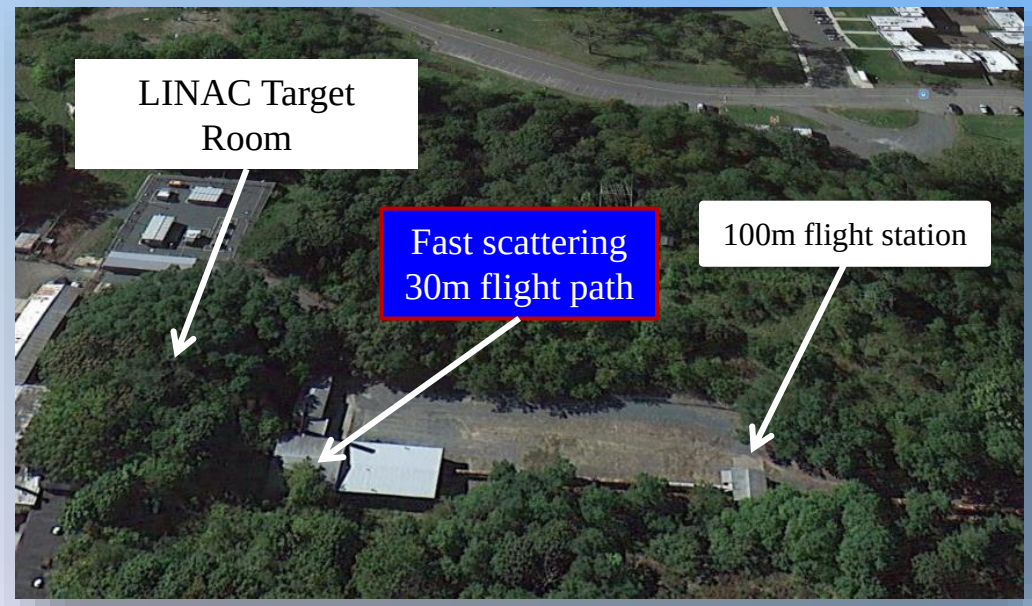
Outline

- Neutron Scattering Benchmarks
  - ^{238}U
  - Fe
  - C
  - ^{235}U (preliminary)
- Neutron Capture
  - ^{nat}Fe and ^{56}Fe

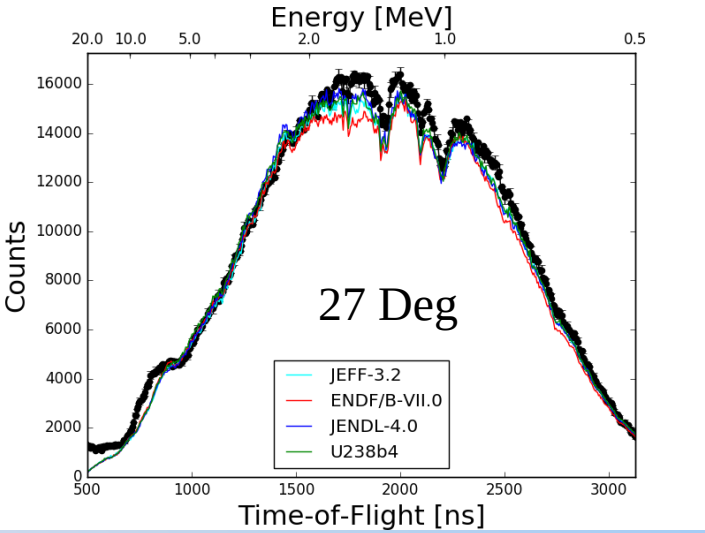


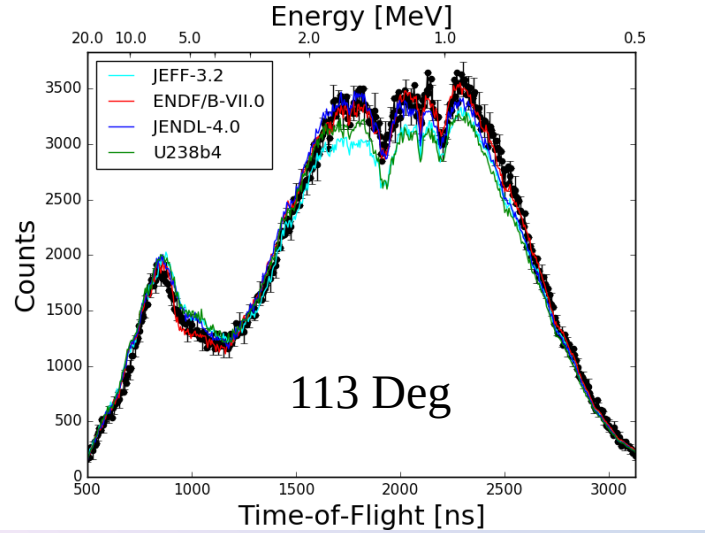
Neutron scattering benchmark of ^{238}U and Fe

Quasi-differential neutron scattering and angular distributions.



^{238}U Scattering

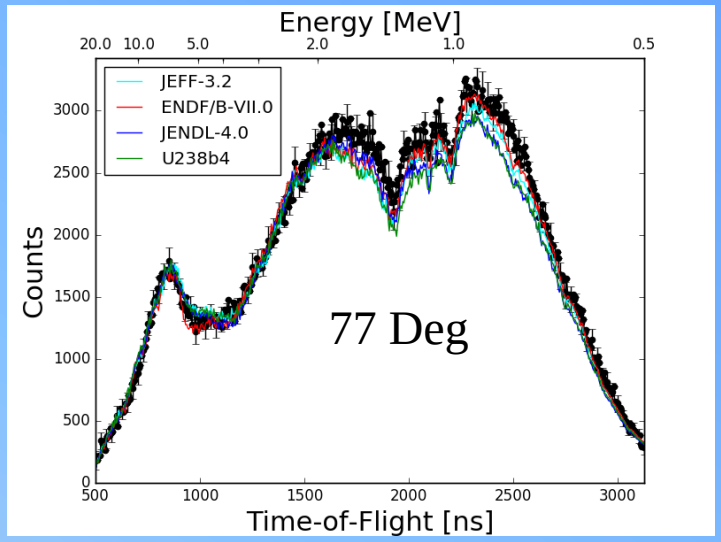


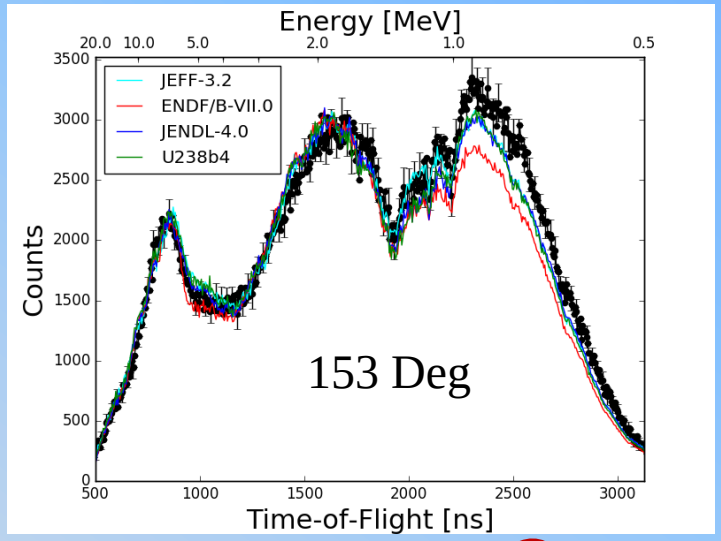


ENDF/B-VIIIb4 preforms best at forward and back angles

The large disagreement at back angles near 0.9 MeV was reduced

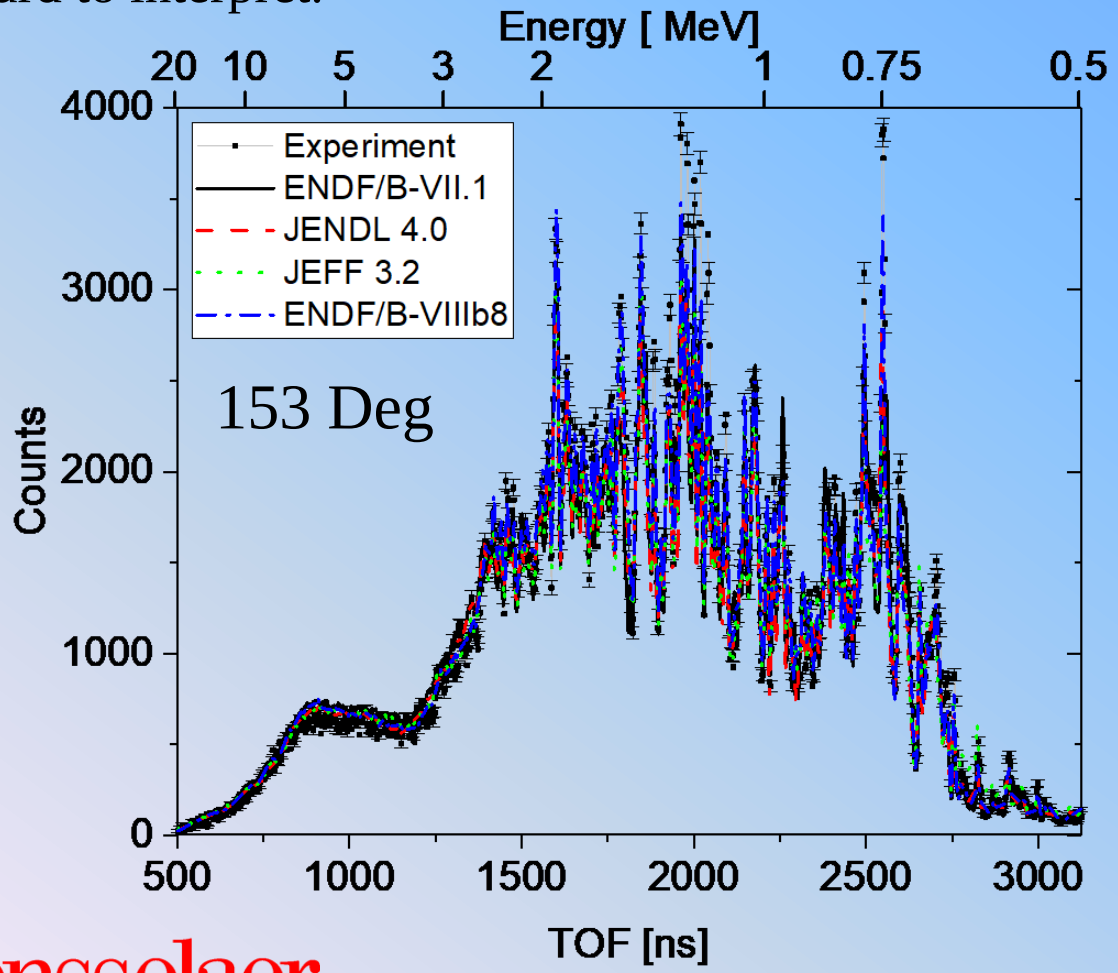
JENDL 4.0 seems to have better agreement with the experiment





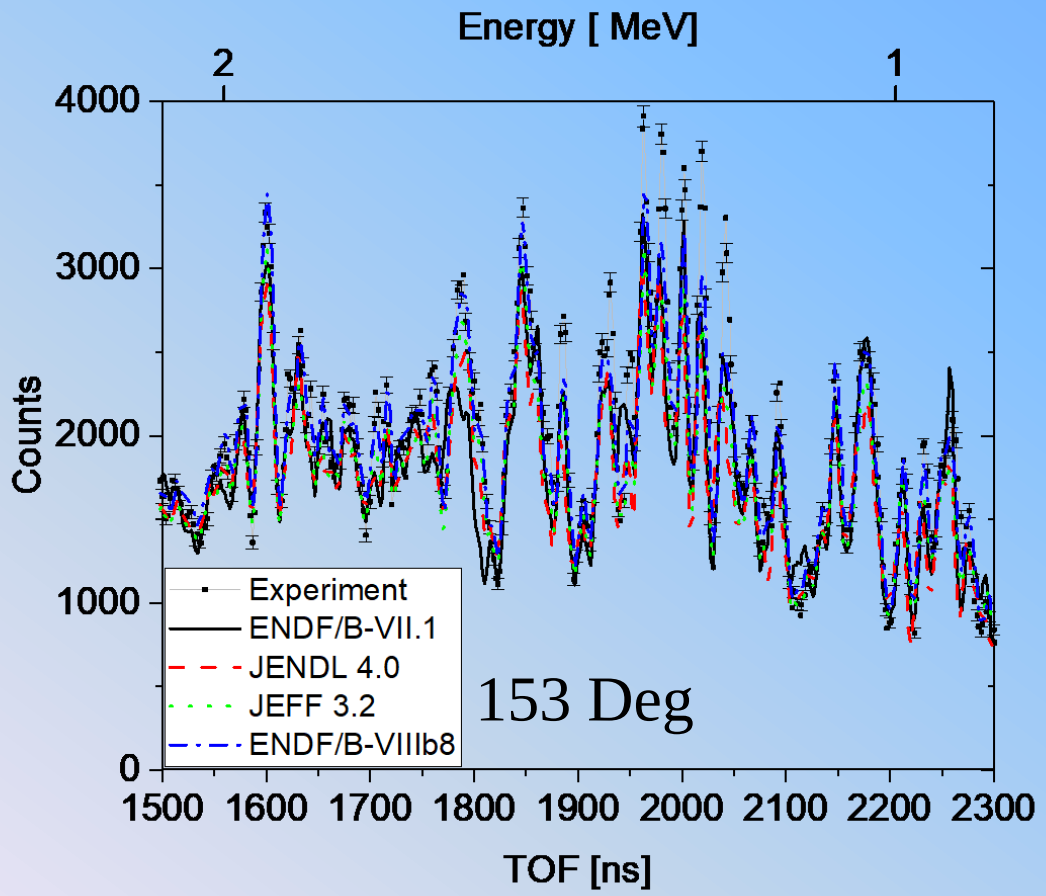
Fe Scattering

- Because of the resonance structure a plot of the raw data and simulation is hard to interpret.



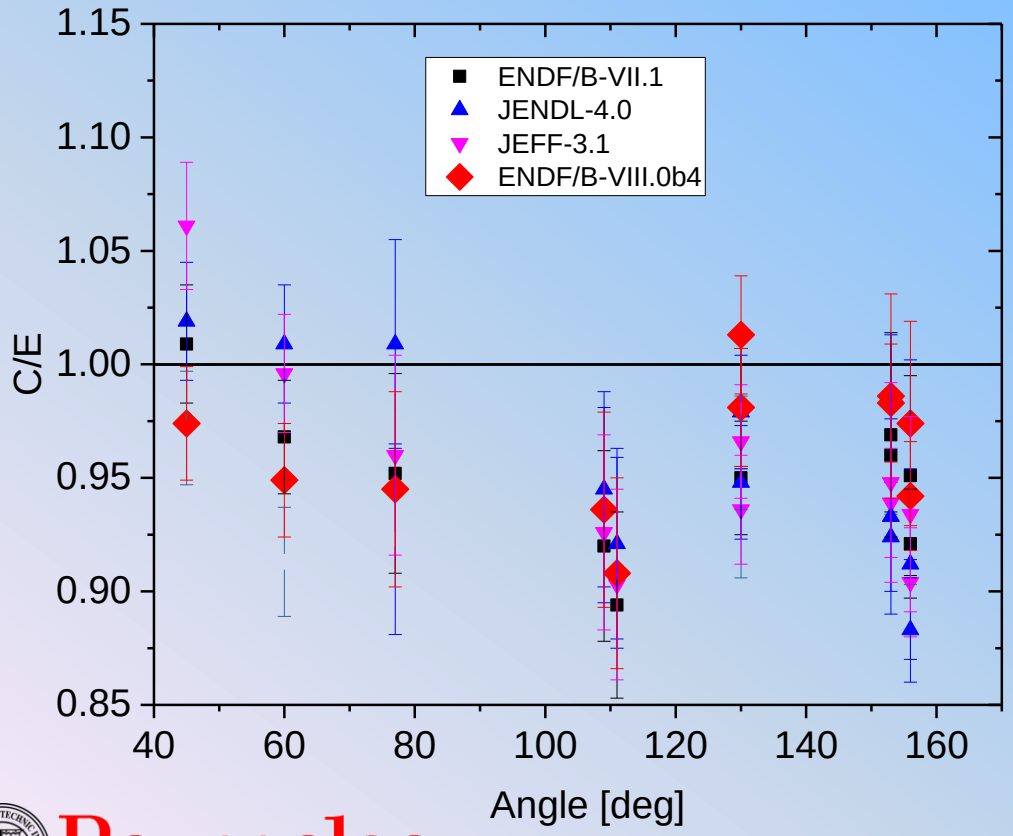
Fe – zoomed 153 Deg

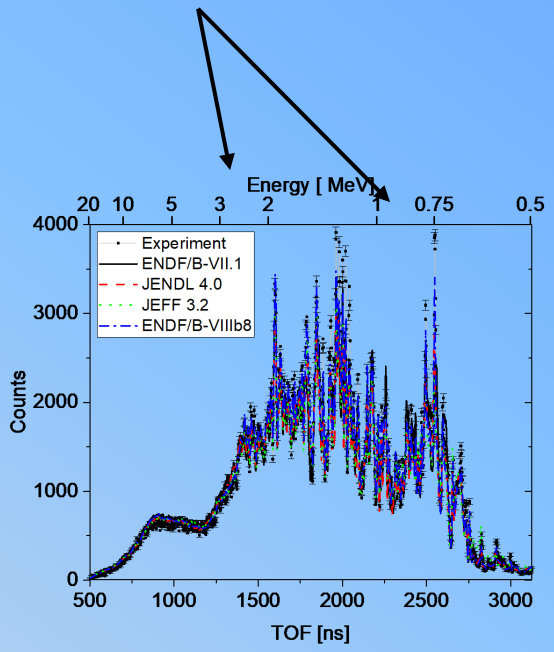
- Zoomed plot also reveals more
- Choose to use C/E to look at integral quantities as a function of angle and energy



C/E as a function of scattering angle

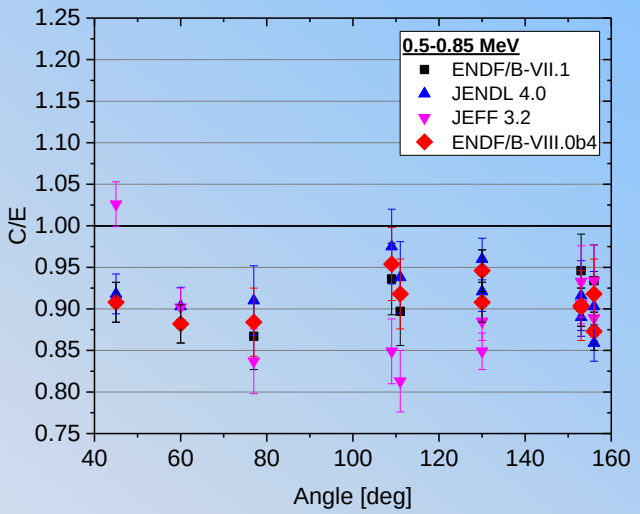
- C/E = ratio of sum of counts for a given angle
- ENDF/B-VIIIb4 shows some improvement at back angles
- At forward angle still low compared to the simulation
- The energy integral is weighted by TOF (energy) region with high count rate





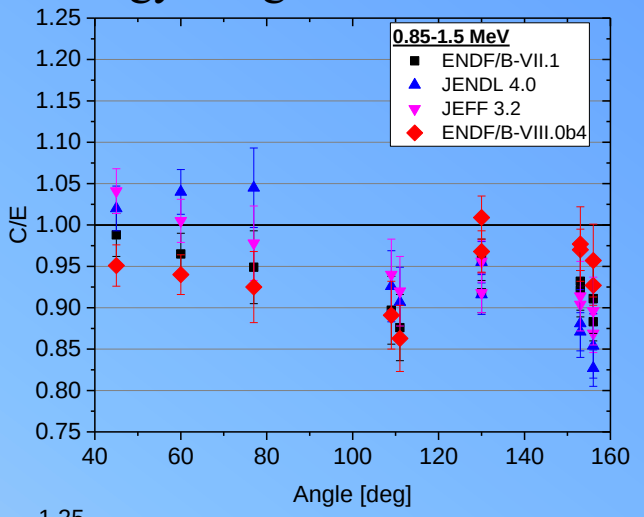
C/E energy dependence

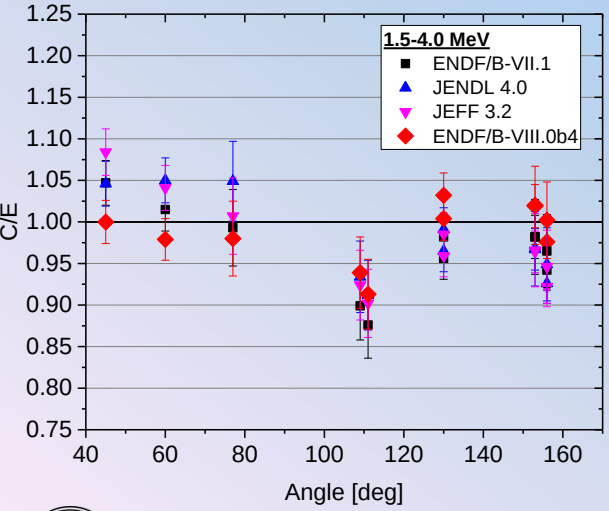
- Ratio of the sum of counts for a given "incident neutron" energy range

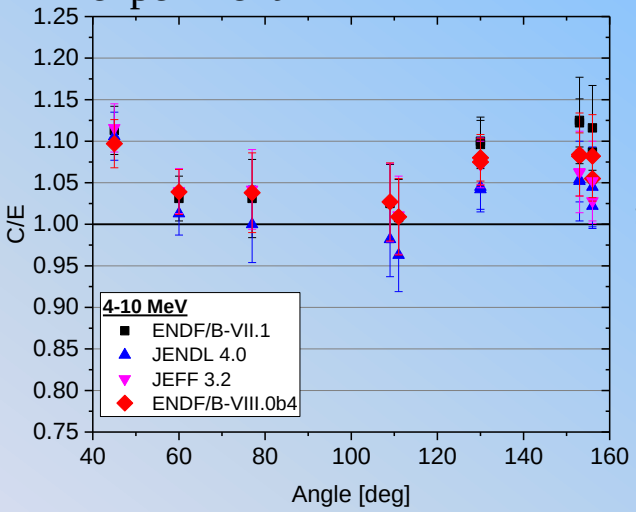


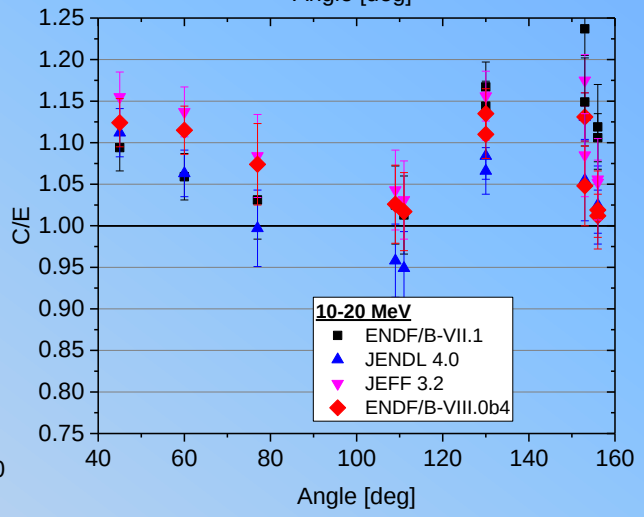
C/E of the new evaluations are closer to 1 compared with ENDF/B-VII.1

For some energy regions (4-10 MeV and 10-20 MeV) JENDL 4.0 is in better agreement with the experiment









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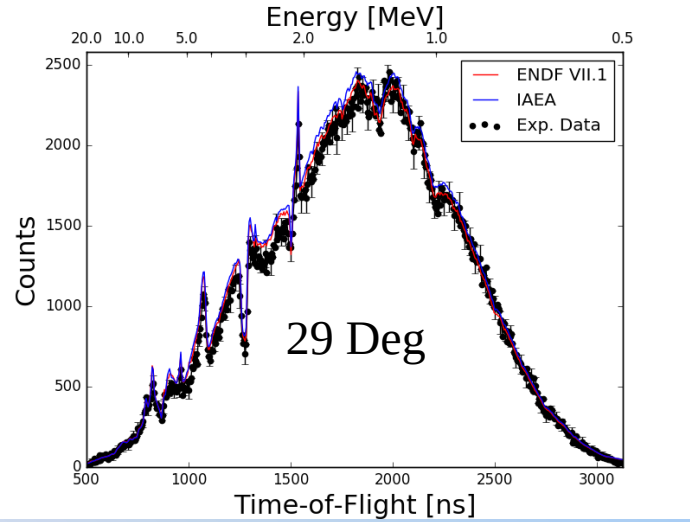
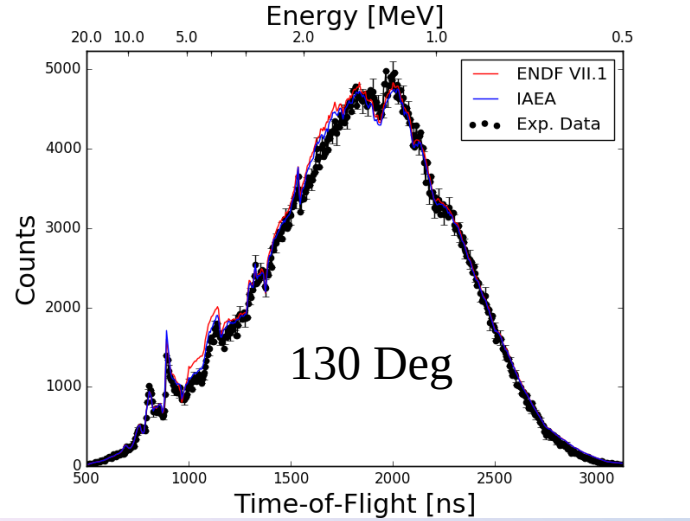
Graphite Scattering



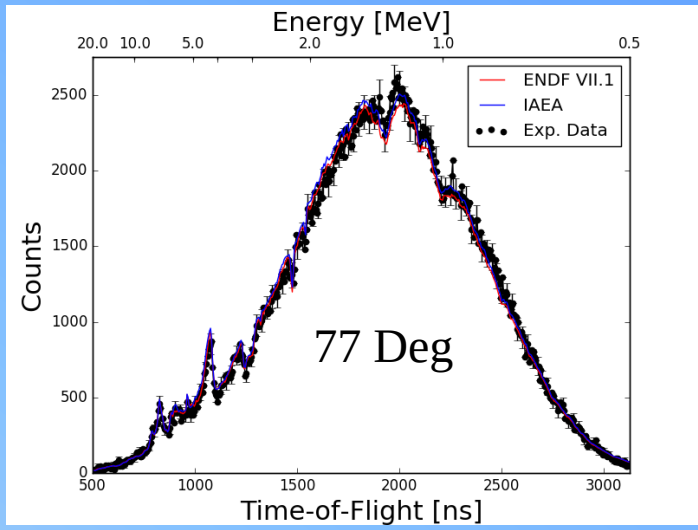


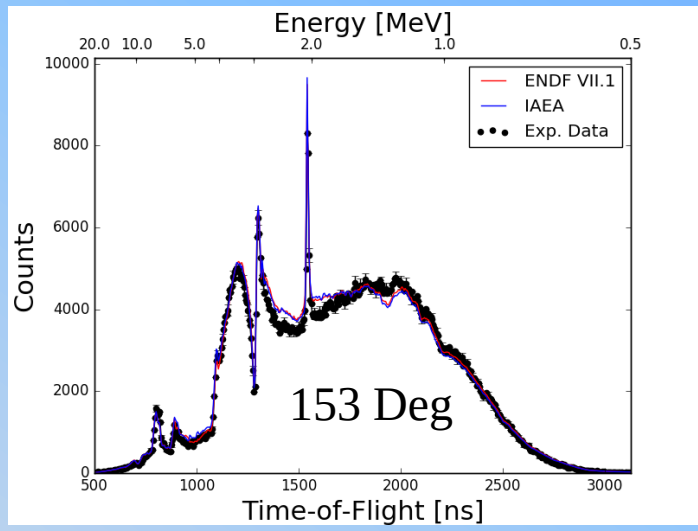
IAEA=ENDF/B-VIIIb4

The differences between the evaluations is small

Both show good agreement with the experiment with some exceptions

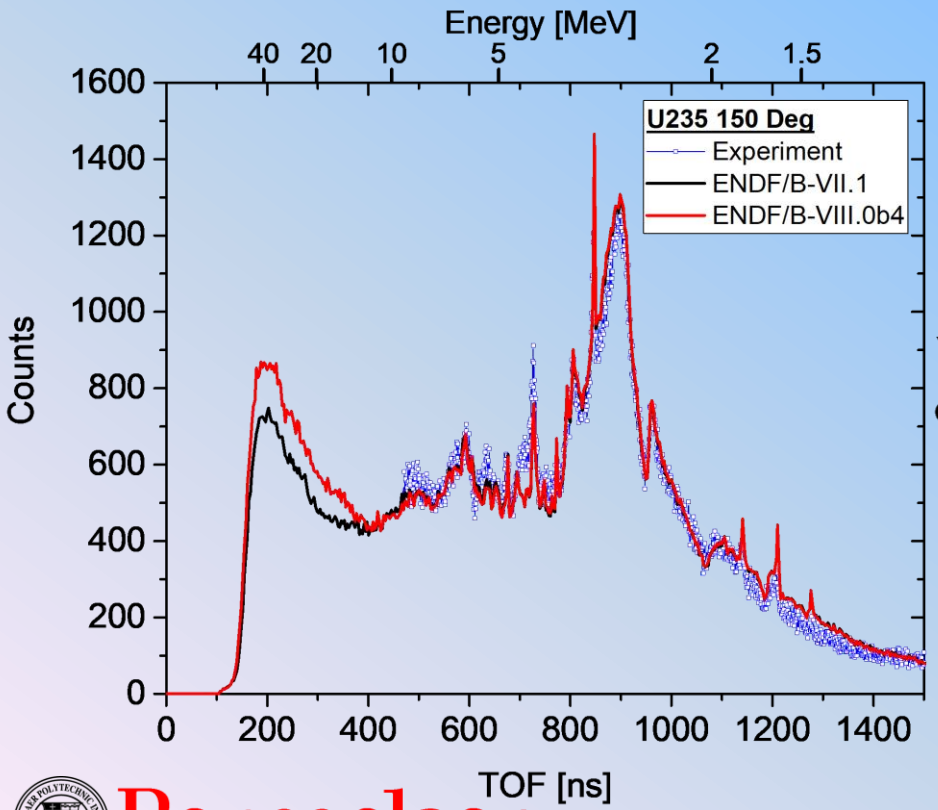
Some difference could be also due to processing of the file

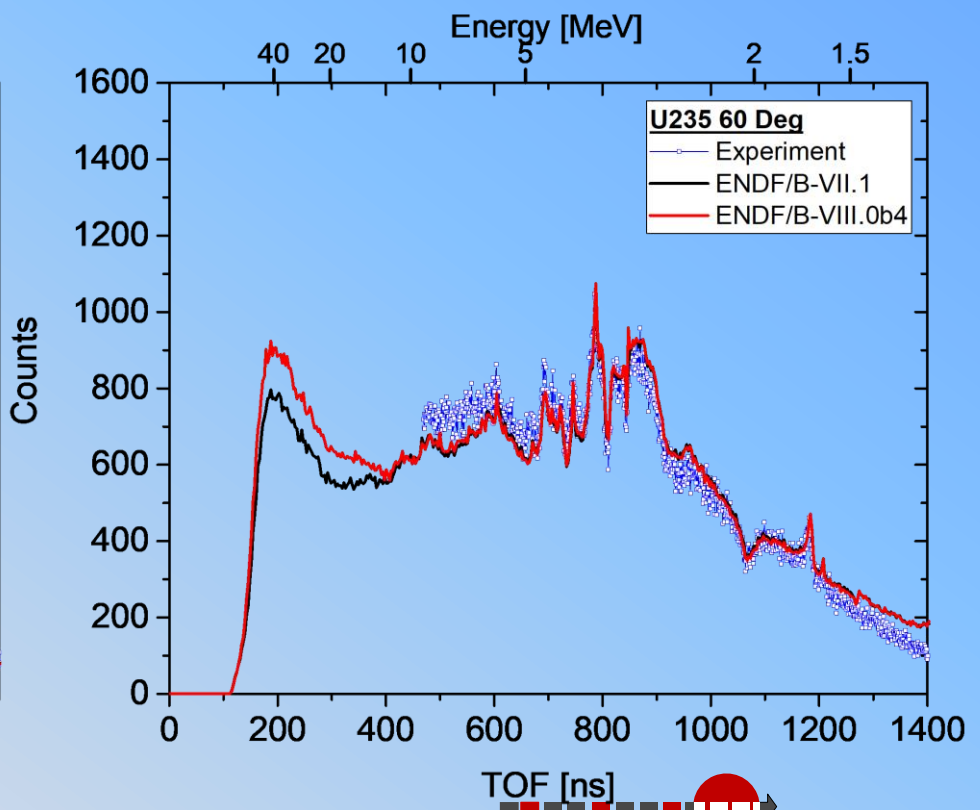




Preliminary Results – ^{235}U Yield ("scattering")

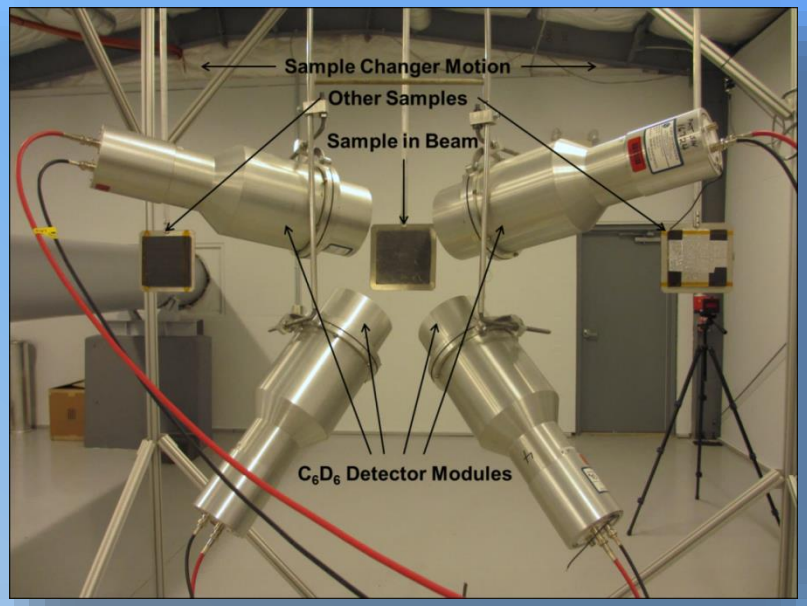
- Experiments done using Chi-Nu at LANL
- 35g of U enriched to 93% ^{235}U
- Includes contribution from plastic laminate (C and H)
- **Unexpected deviation of the two evaluations above about 15 MeV**





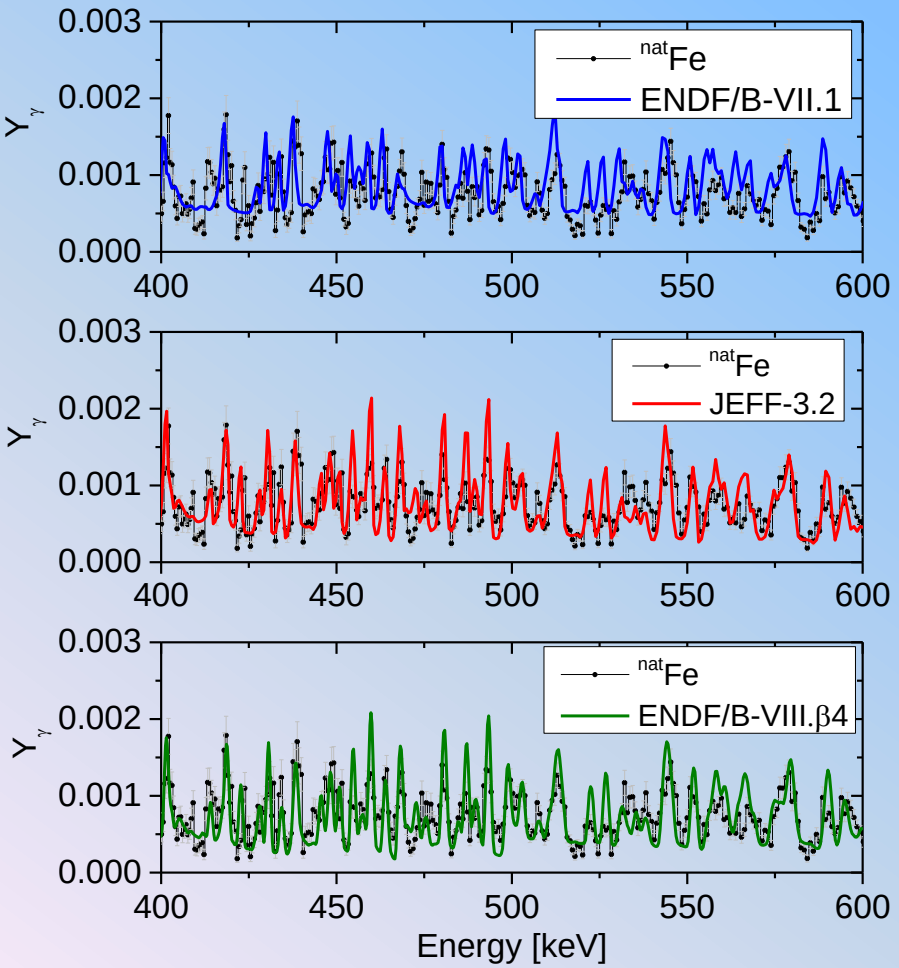
Mid-Energy Capture Detector System Overview

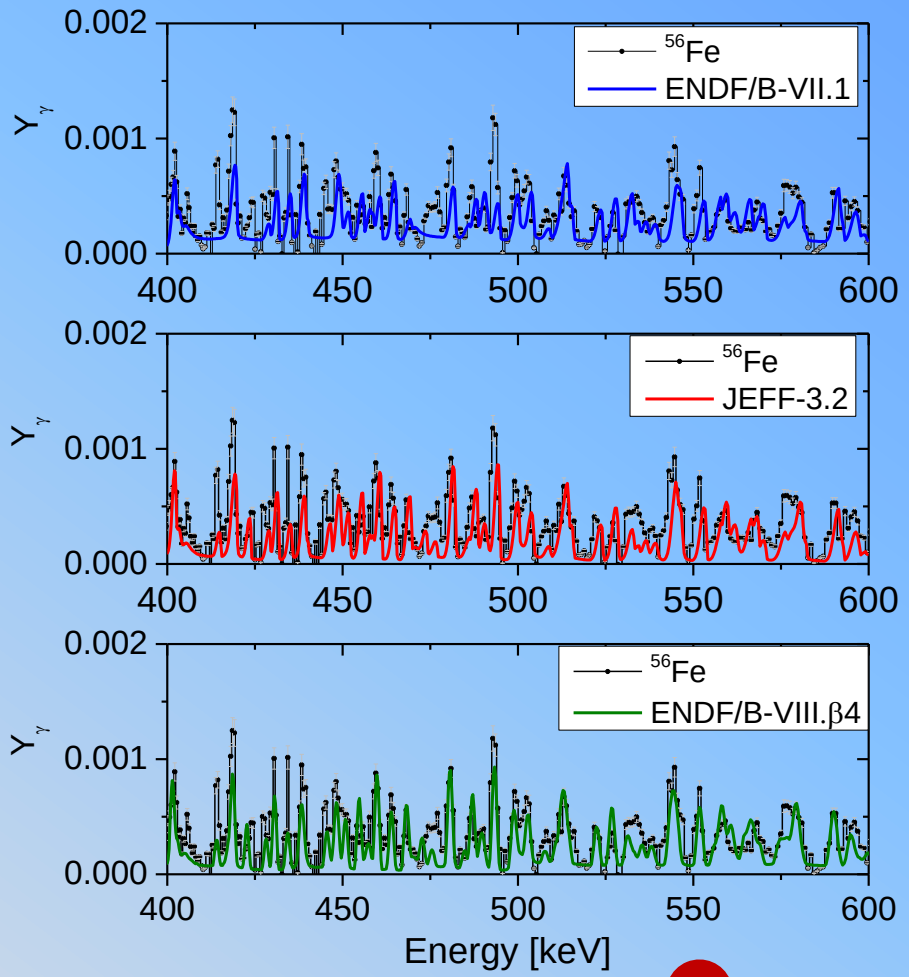
- 4 C_6D_6 detector modules manufactured by Eljen Technology
- **Low mass, low neutron sensitivity design**
- Located at 45m flight path in newly constructed flight station
- Measurements made from 1 eV to 1 MeV



^{nat}Fe, ^{56}Fe Experimental vs Evaluation 400-600 eV

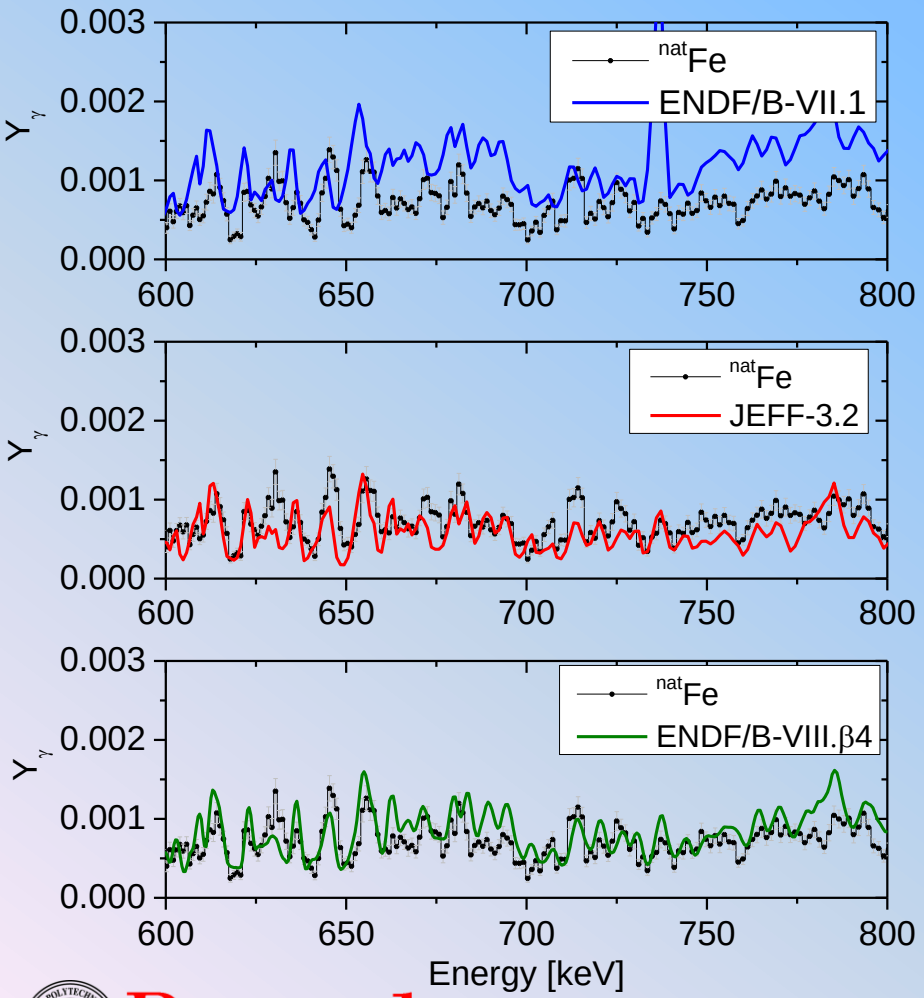
ENDF/B-VIII.0b4 is similar to JEFF 3.1 and in better agreement than ENDF/B-VII.1

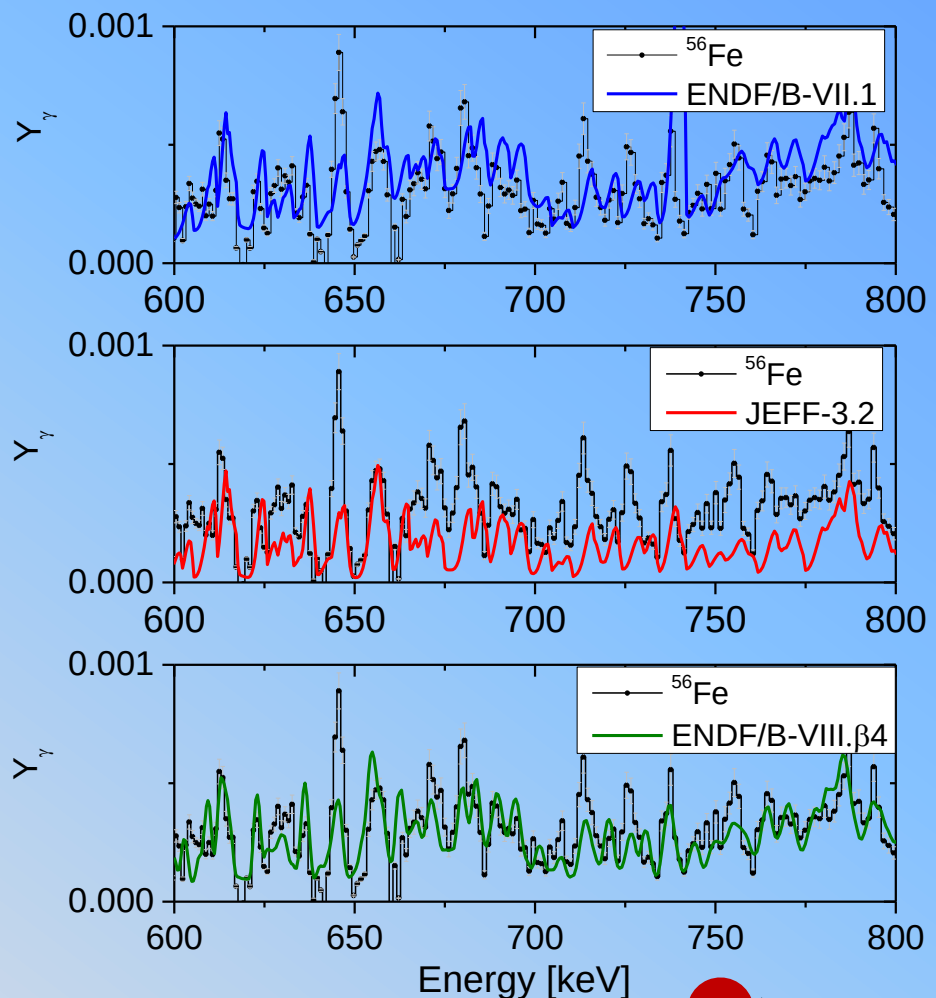




^{nat}Fe, ^{56}Fe Experimental vs Evaluation 600-800 eV

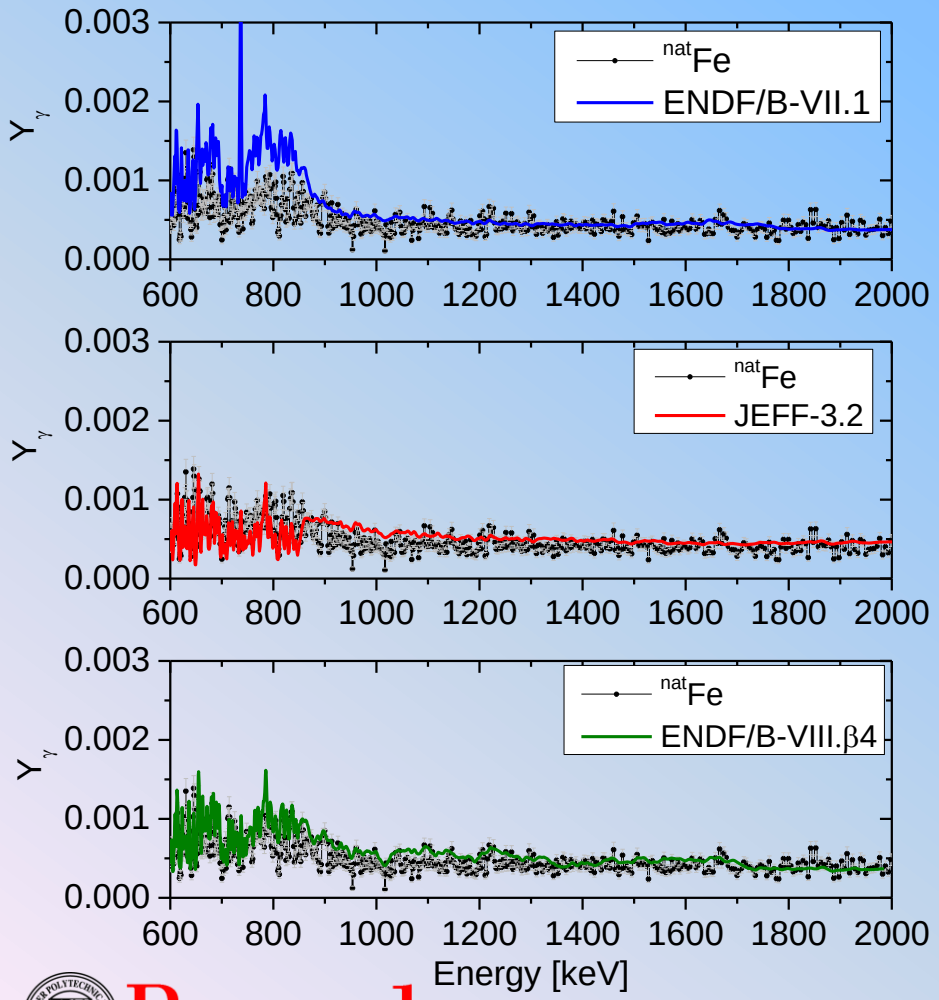
ENDF/B-VIII.0b4 is improving ^{56}Fe and also other Fe isotopes

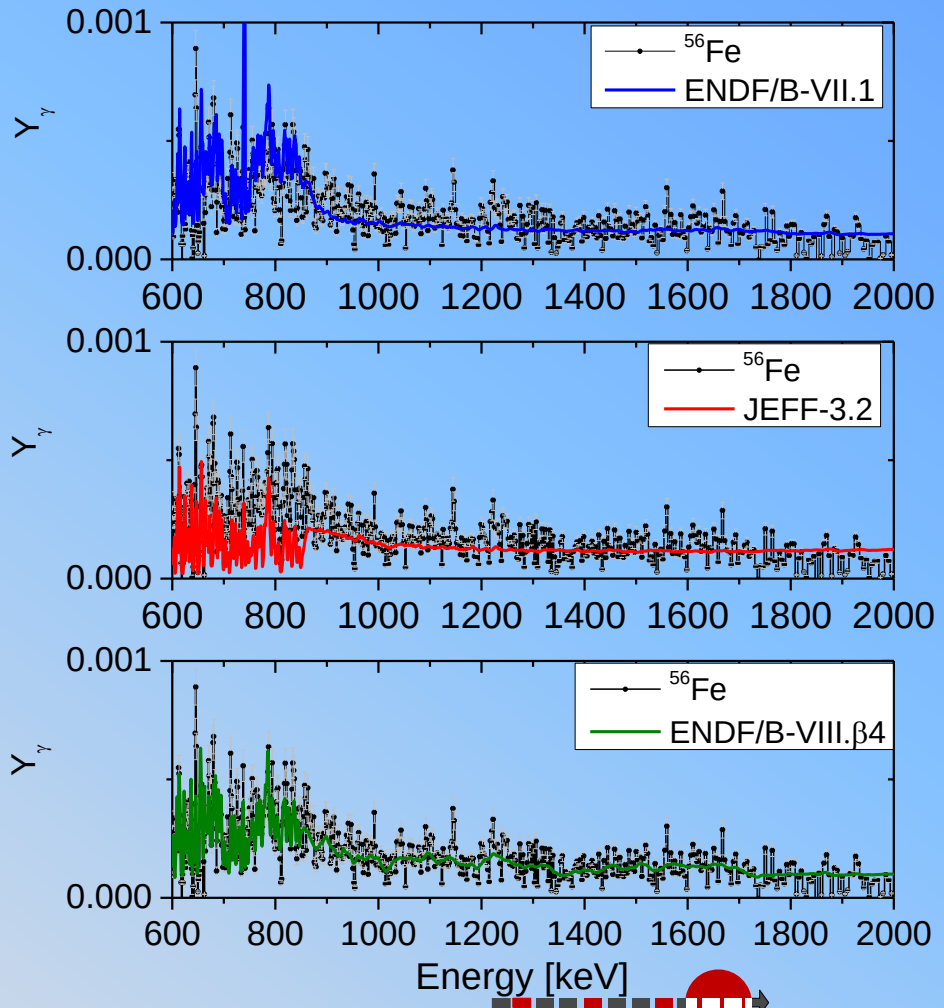




^{nat}Fe, ^{56}Fe Experimental vs Evaluation 600-2000 eV

- ENDF/B-VIII.0b4 is improving ^{56}Fe
- Contribution from other Fe isotopes seems slightly high





That's it….???