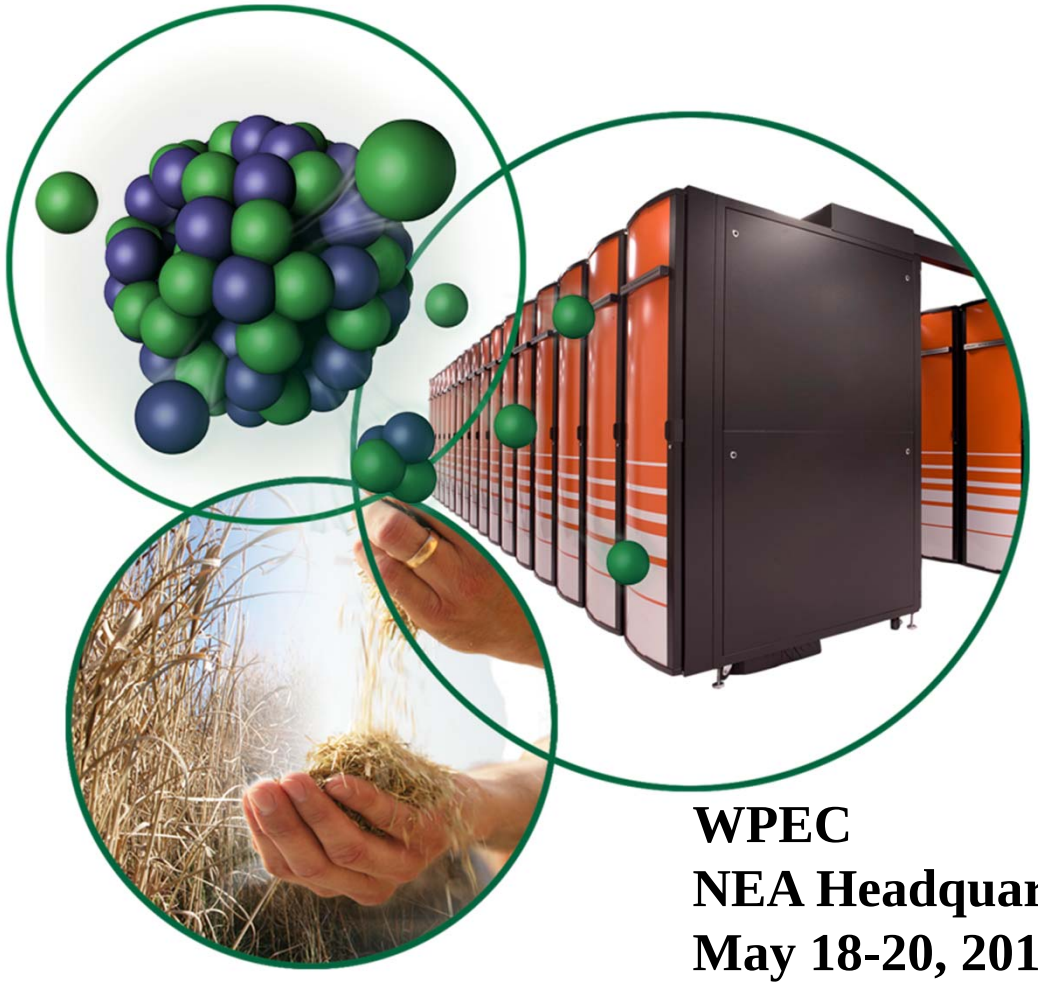
Resonance Evaluations of ^{235}U for the CIELO Project



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^{235}U Issues and Resolutions:

Issues:

Overestimation of ^{235}U capture cross-section in the resonance region range (0.1 to 2.5 keV).

It is recommended:

i) New measurements of capture and fission cross-section in the keV region;

ii) Perform new resonance analysis in the 0.1 to 2.5 keV region;

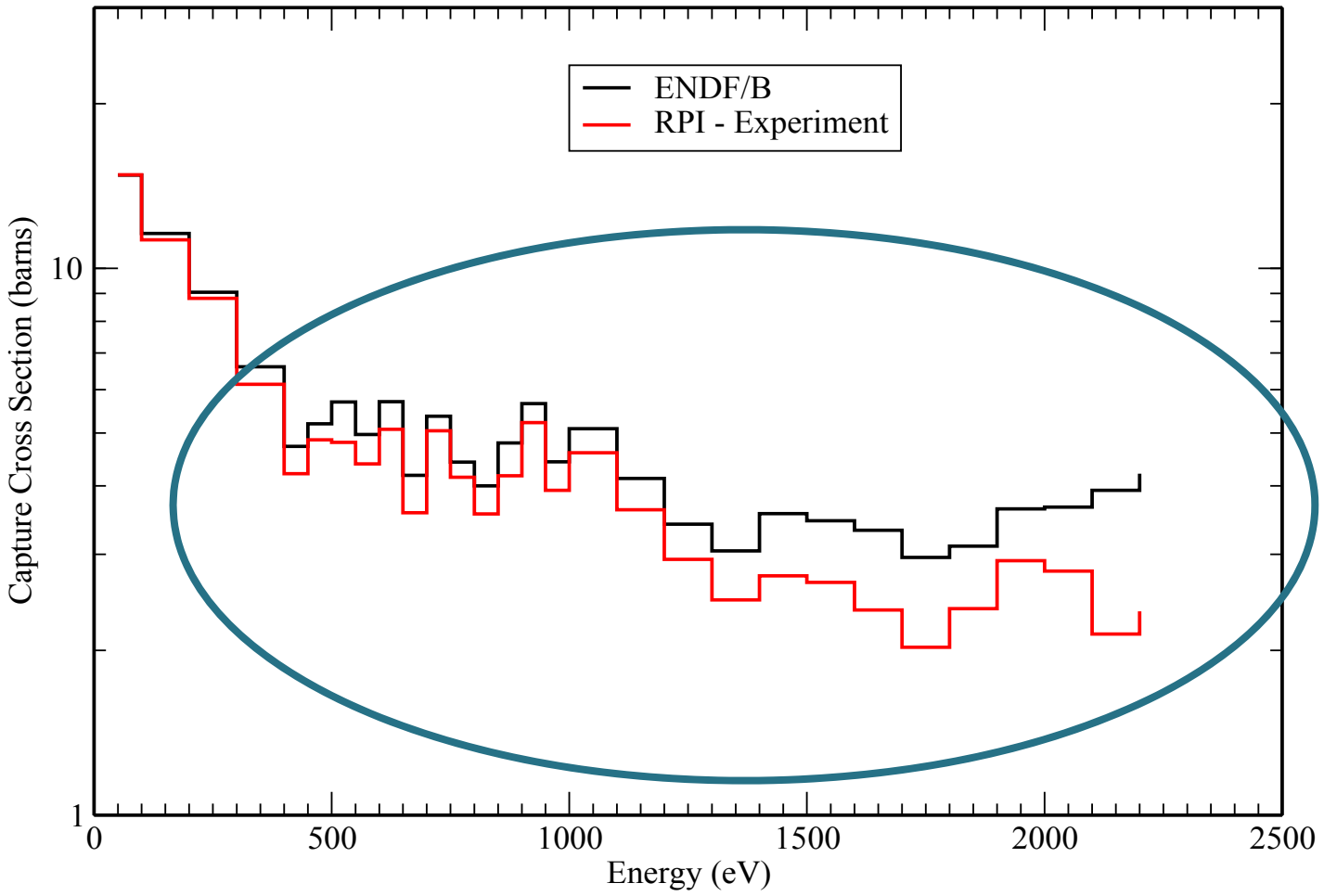
iii) Investigate the reason for the overestimation of criticalities for some benchmarks.

^{235}U Issues and Resolutions:

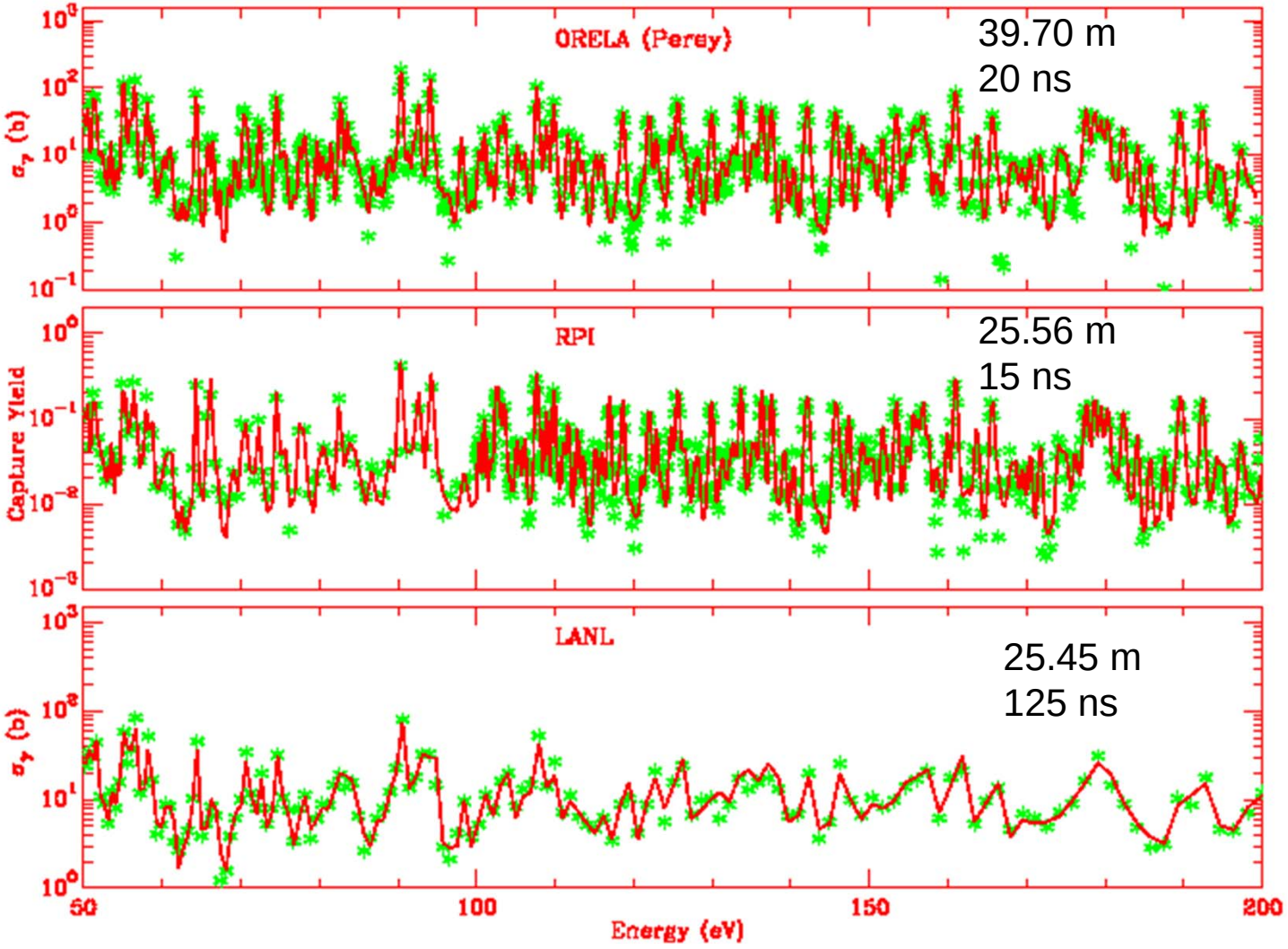
Resolution:

- ✓ New data measurements from RPI (capture and fission yields) (kind of alpha measurements);
- ✓ New capture data from LANL;
- ✓ Use SAMMY code for fitting the new data;
- ✓ Test the new evaluation in benchmark calculations: ZEUS benchmarks (FCA not available);
- ✓ Use JENDL4 as the template;
- ✓ Benchmark Calculations done with MCNP with everything else from ENDF/B-VII.1;

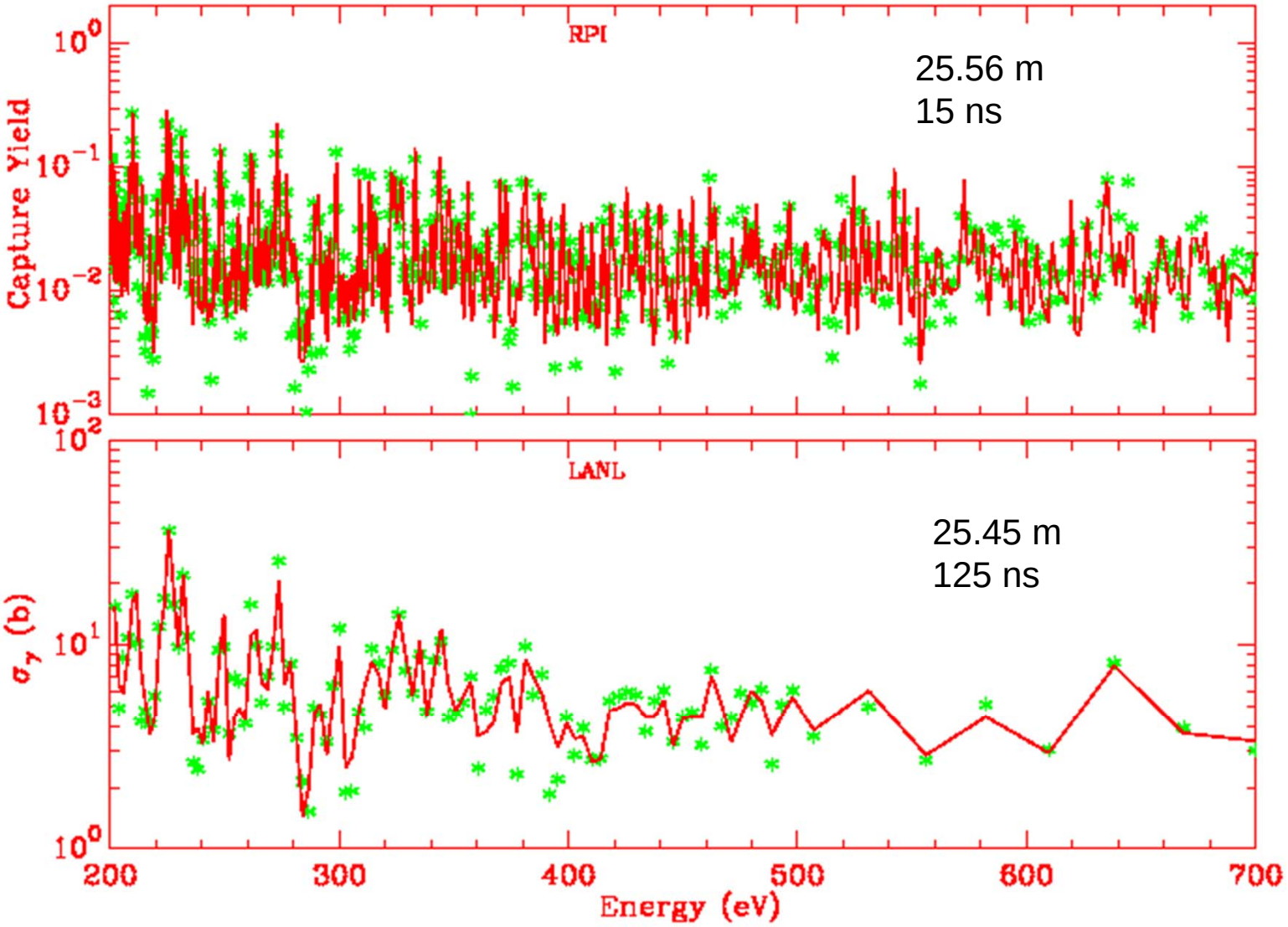
RPI capture data and ENDF evaluation (sg29 prediction confirmed)



ORNL, RPI and LANL Capture Data



RPI and LANL Capture Data



Selected Measurements ^{235}U

- **Four transmission measurements, eight fission cross section measurements and four capture cross section measurements were used in the evaluation;**
- **Evaluation performed up 2250 eV with 3197 resonances with 3168 in the energy range analyzed and 29 external resonances;**
- **Evaluation done using SAMMY with the Reich-Moore formalism;**
- **Fitted also integral data such as K1, Westcott factor, capture resonance integral;**

Selected Measurements

Author	Energy (eV)	Data
De Saussure (RPI/1967)	0.01 - 2250.0	Fission and Capture at 25.2 meters
Perez (ORNL/1972)	0.01 - 200.0	Fission and Capture at 39.7 meters
Weston (ORNL/1984)	14.0 - 2250.0	Fission at 18.9 meters
Gwin (ORNL/1984)	0.01 - 20.0	Fission at 25.6 meters
Spencer (ORNL/1984)	0.01 - 1.0	Transmission at 18 meters and sample thickness of 0.001468 atom/barn
Harvey (ORNL/1986)	0.4 - 68.0	Transmission at 18 meters and sample thickness of 0.03269 atom/barn

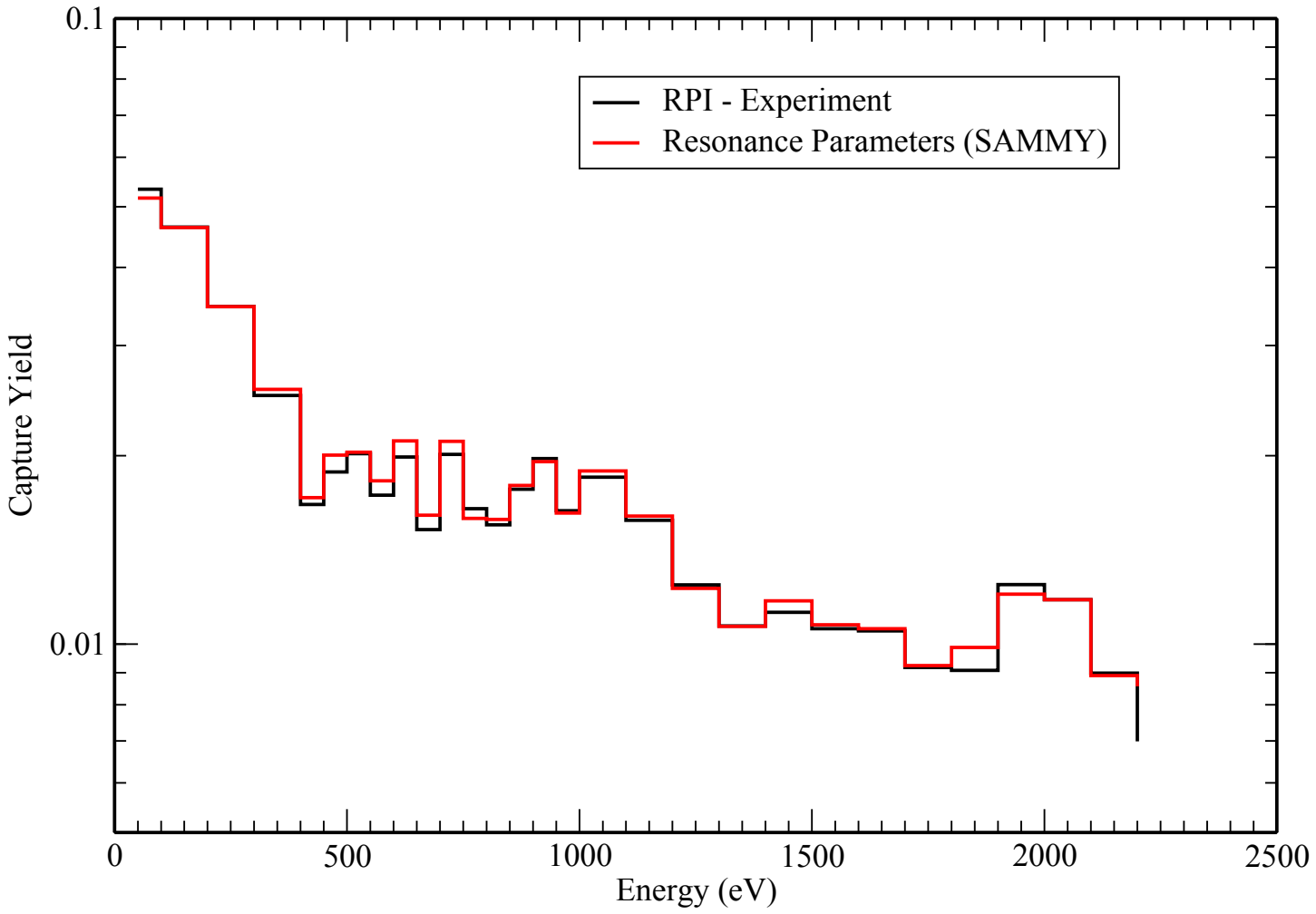
Selected Measurements

Author	Energy (eV)	Data
Harvey (ORNL/1986)	4.0 - 2250.0	Transmission at 80 meters and sample thickness of 0.00233 atom/barn cooled to 77 K
Harvey (ORNL/1986)	4.0 - 2250.0	Transmission at 80 meters and sample thickness of 0.03269 atom/barn cooled to 77 K
Wartena (Geel/1987)	0.0018 - 1.0	Eta at 8 meters
Wagemans (Geel/1988)	0.001 – 0.4	Fission at 18 meters
Schrack (RPI/1988)	0.02 - 20.0	Fission at 8.4 meters
Weigman (ILL/1990)	0.0015 – 0.15	Eta (Chopper)

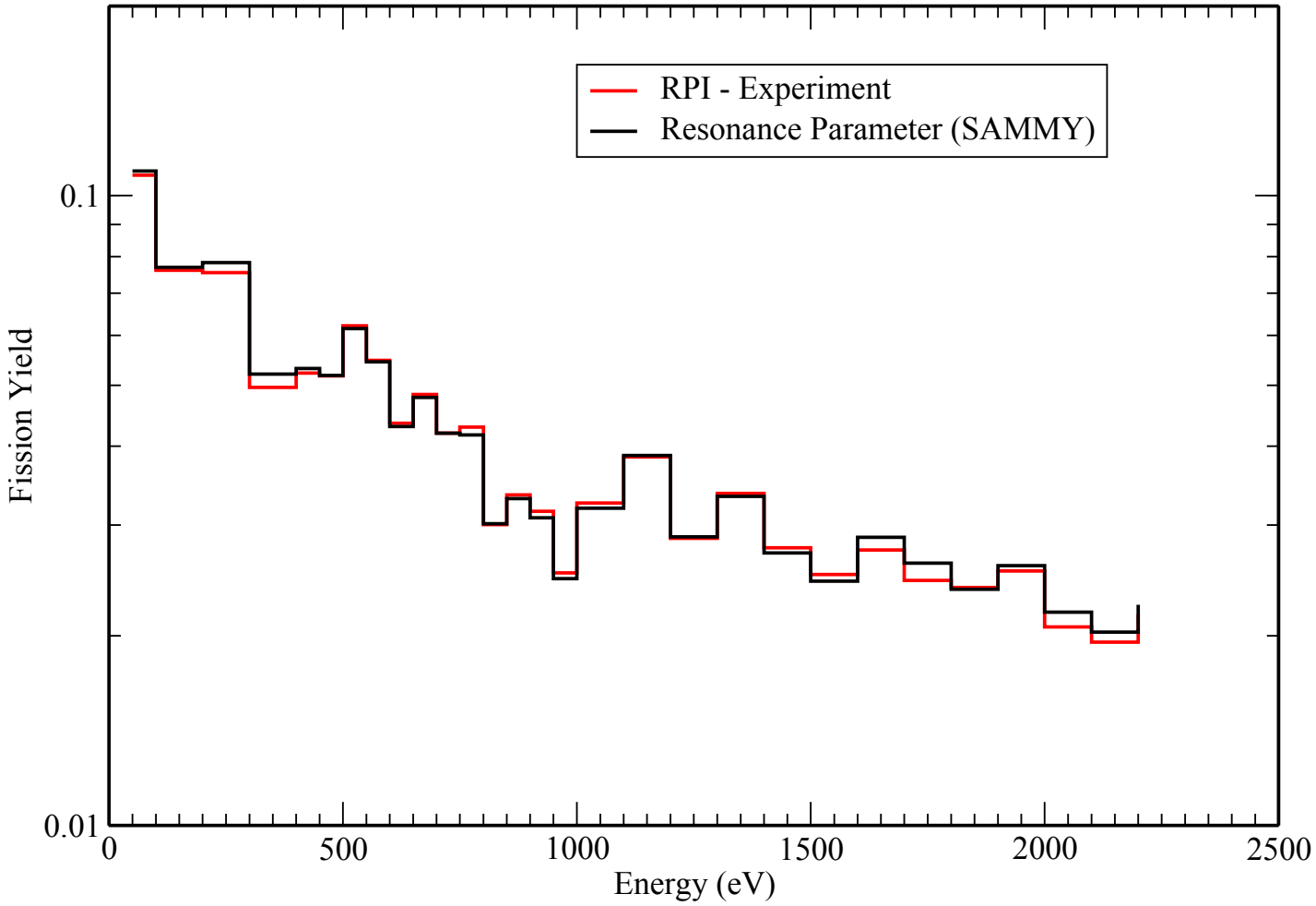
Selected Measurements

Author	Energy (eV)	Data
Weston (ORNL/1992)	100.0 - 2000.0	Fission at 86.5 meters
Moxon (ORNL/1992)	0.01 - 50.0	Fission Yield
Gwin (ORNL/1996)	0.01 - 4.0	Absorption and fission at 21.68 meters
Danon (RPI/2012)	100.0 – 5000	Fission and capture yield at 25.56 meters (burst 15 ns)
Jandel (LANL/2012)	100.0 - 5000	Capture at 25.45 meters (burst 125 ns)
N_TOF		Fission

Fit of the RPI Capture Data



Fit of the RPI Fission data



Improvement of the integral 7.8 eV to 11.0 eV using new fission data

Quantity	Standard	This Work
7.8 eV – 11 eV	246.396 ± 1.244	245.420
σ_f	584.326 ± 1.022	584.910

Benchmark results will be presented in the next talks!!

Conclusions

- ✓ **Perform further benchmark testing;**
- ✓ **Temperature effects?**
- ✓ **Na-void reactivity of BFS and FCA;**
- ✓ **Investigate other parameters such as PFNS and nubar: any need for improvements?**
- ✓ **Continue work under the CIELO project;**