Benchmarking ENDF/B-VII beta1

- Processing: problems encountered
- Criticality safety (ICSBEP)
- Shielding (IAEA, Sinbad)
- β_{eff} for delayed neutron data

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Checks and Processing

Processed by NJOY-99.90 (Alfred Hogenbirk & SvdM)
Neutronics by MCNP-4C3 (including extras for β_{eff})
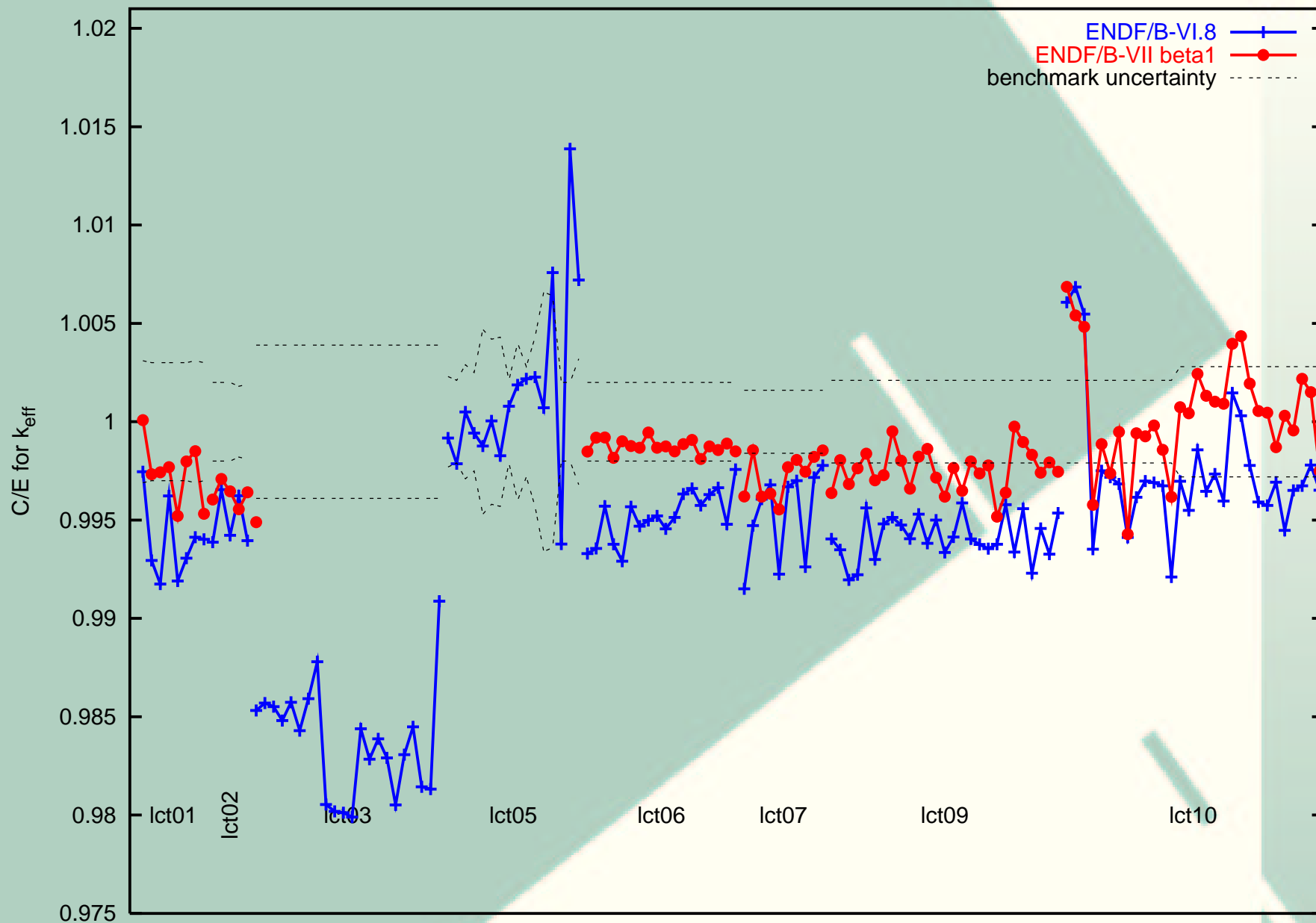
Problems:

- Erroneous mat id in 3 lines in Kr-84

- Errors in MF1 MT451 directory for: Ge-70,73, As-74,75, Mo-95, Ru-101, Rh-103, Sn-113, Gd-155,156,157.

- No fission neutrons produced for Am-242g, Am-242gm, Cm-243

- 19 neutrons per fission produced for Cf-249

- Th-232 needs a patch (therefore not all benchmark cases could be calculated)
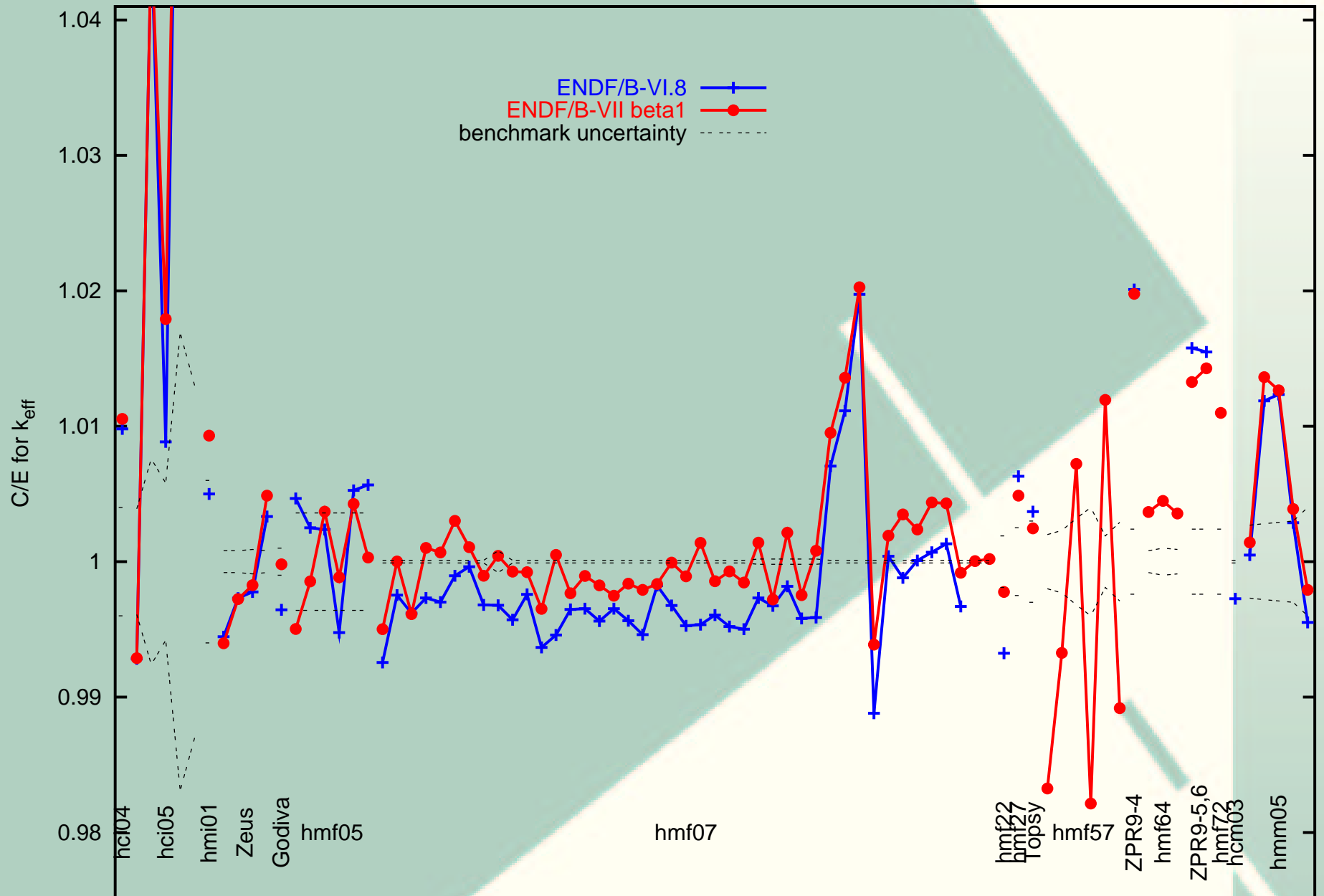
Number of ICSBEP benchmarks

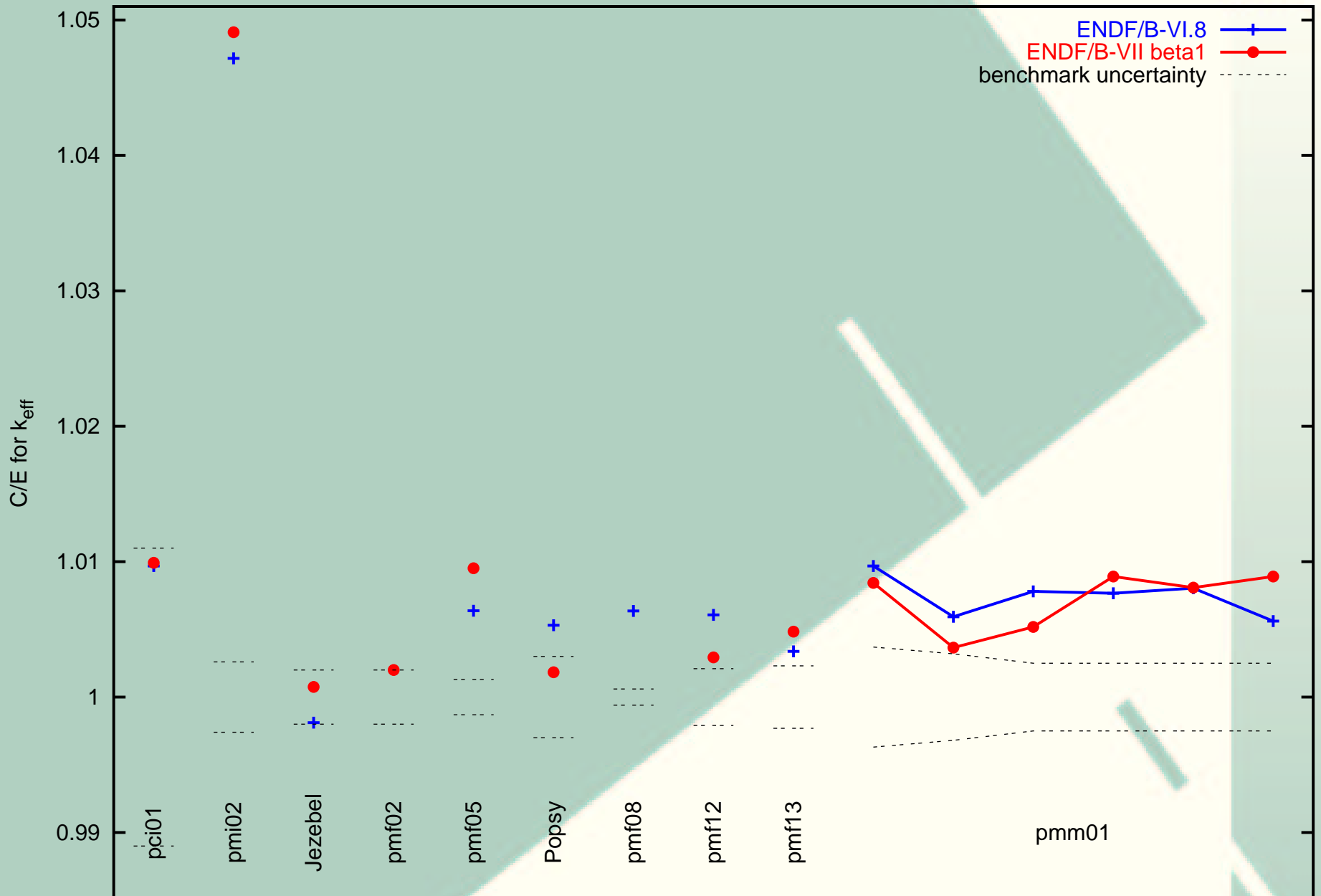|	COMP therm / inter / fast			MET therm / inter / fast / mix				SOL therm	total
LEU	200 /			1 /				49	250
IEU	4 /					16 /			20
HEU		5 /		37 /	5 /	66 /	5	81	199
MIX	34 /		1			4 /			39
PU		1 /			1 /	6 /	6	105	119
U233	1 /					4 /			5
total	239 /	6 /	1	38 /	6 /	96 /	11	235	632

LEU-COMP-THERM results

HEU-.-FAST results

PU-.-FAST results

Averages for ENDF/B-VII beta1

Average of calculated − benchmark value (in pcm)

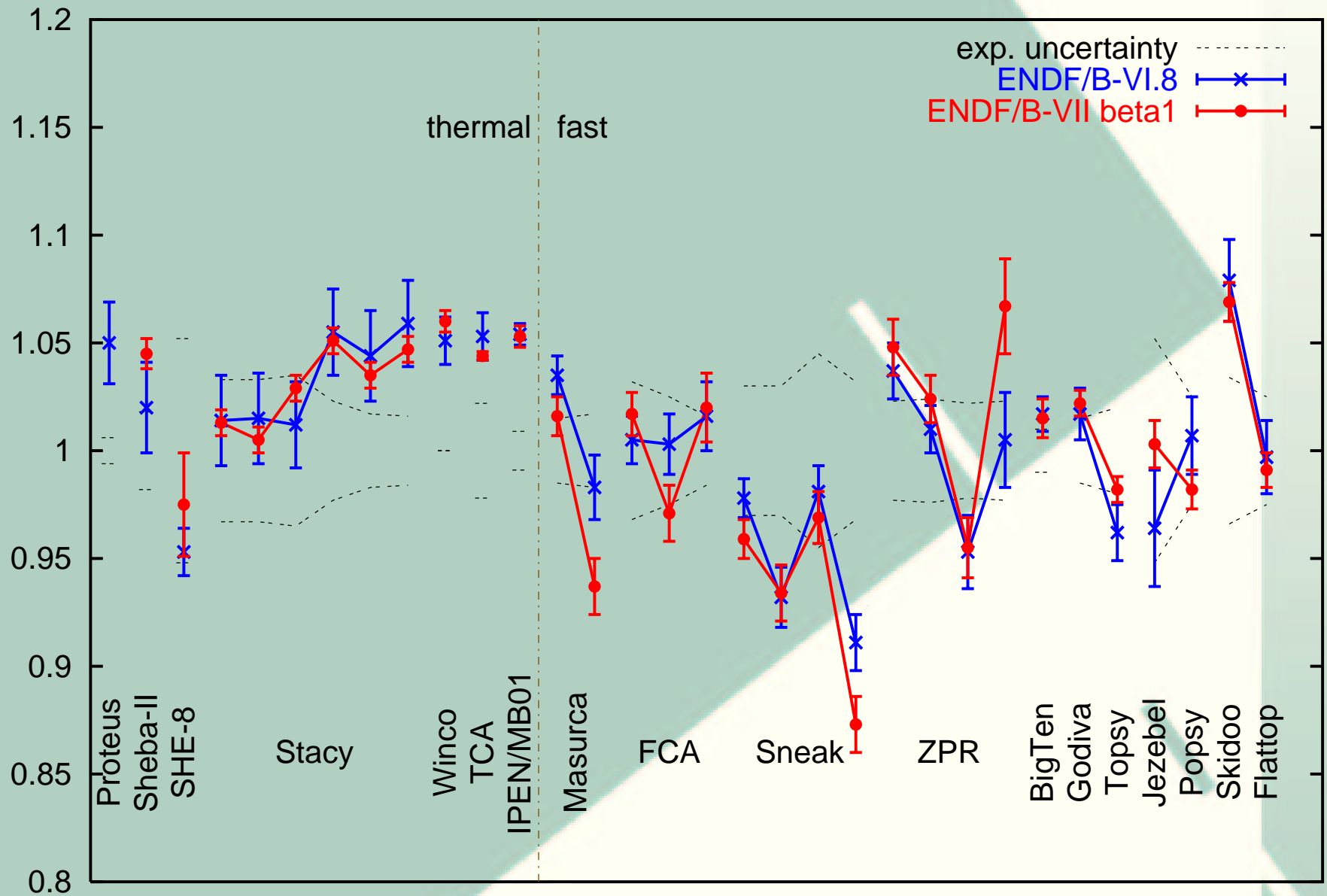|	COMP			MET				SOL
	therm / inter / fast			therm / inter / fast / mix				therm
LEU	−182 /			−217 /				64
IEU	−82 /				/ 261 /			
HEU		/ 3045 /		−316 /	73 /	105 /	590	−184
MIX	448 /		19		/ 203 /			
PU		/ 991 /			/ 4846 /	365 /	719	508
U233	79 /				/ −93 /			

(Fusion) shielding

- **Oktavian**
  Al, Co, Cr, Cu, LiF, Mn, Mo, Si, Ti, W, Zr

- **FNS**
  Be, C, N, O, Fe, Pb
  slab thicknesses 5, 20, 40, 60 cm

- **LLNL pulsed spheres**
  concrete

- **NIST**
  water spheres + Cd

FNS shielding: Pb, 20cm

$\beta_{\mathbf{eff}}$ **results (C/E)**

Conclusions

- Some improvements in data format needed for several isotopes

- Underprediction of k_{eff} now on average -182 pcm for leu-comp-therm

- Also improvements for 'Big Ten' and related benchmarks

- … (more time needed to study results)