

Benchmarking of Fe at BNL

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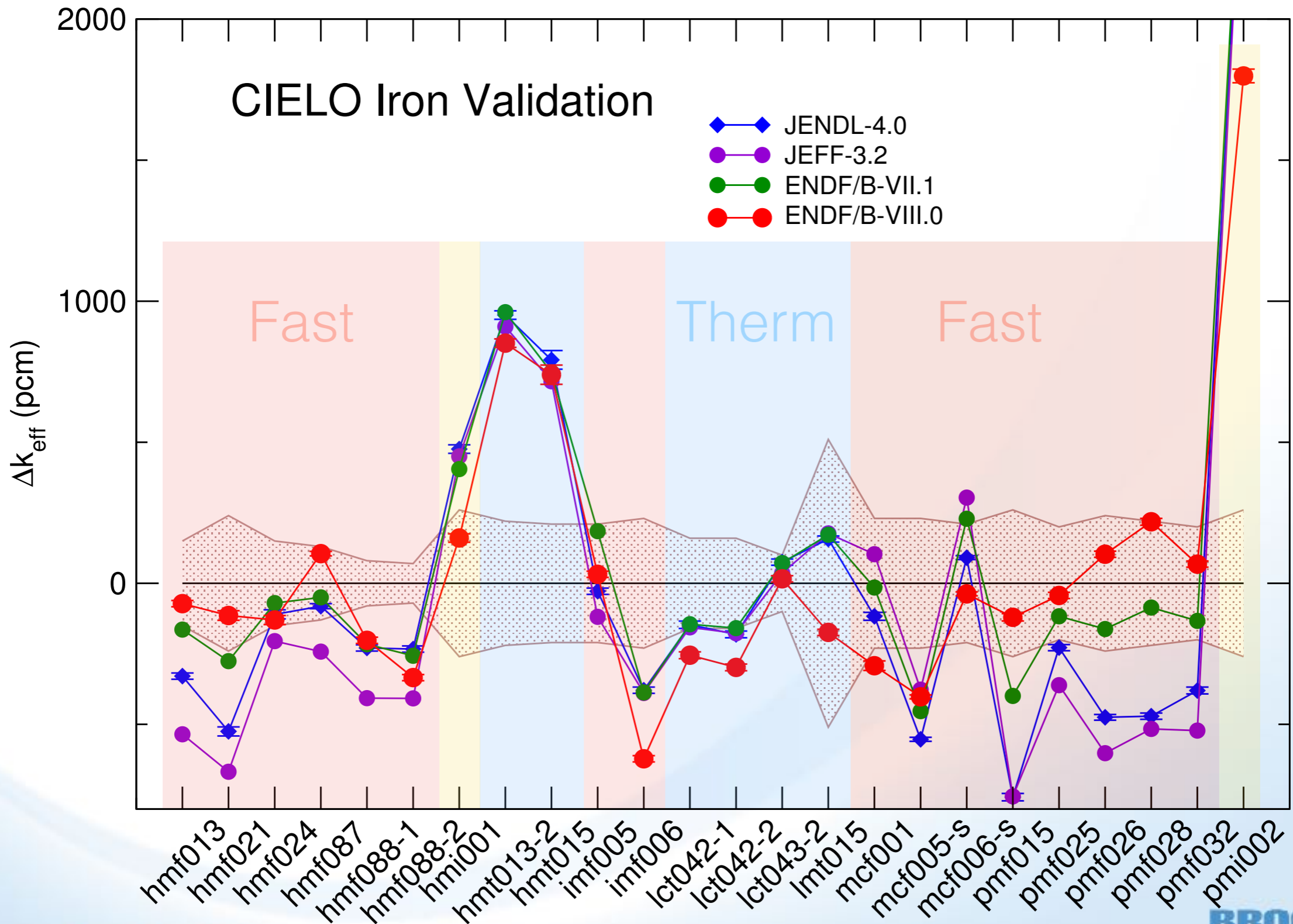


Criticality benchmarks

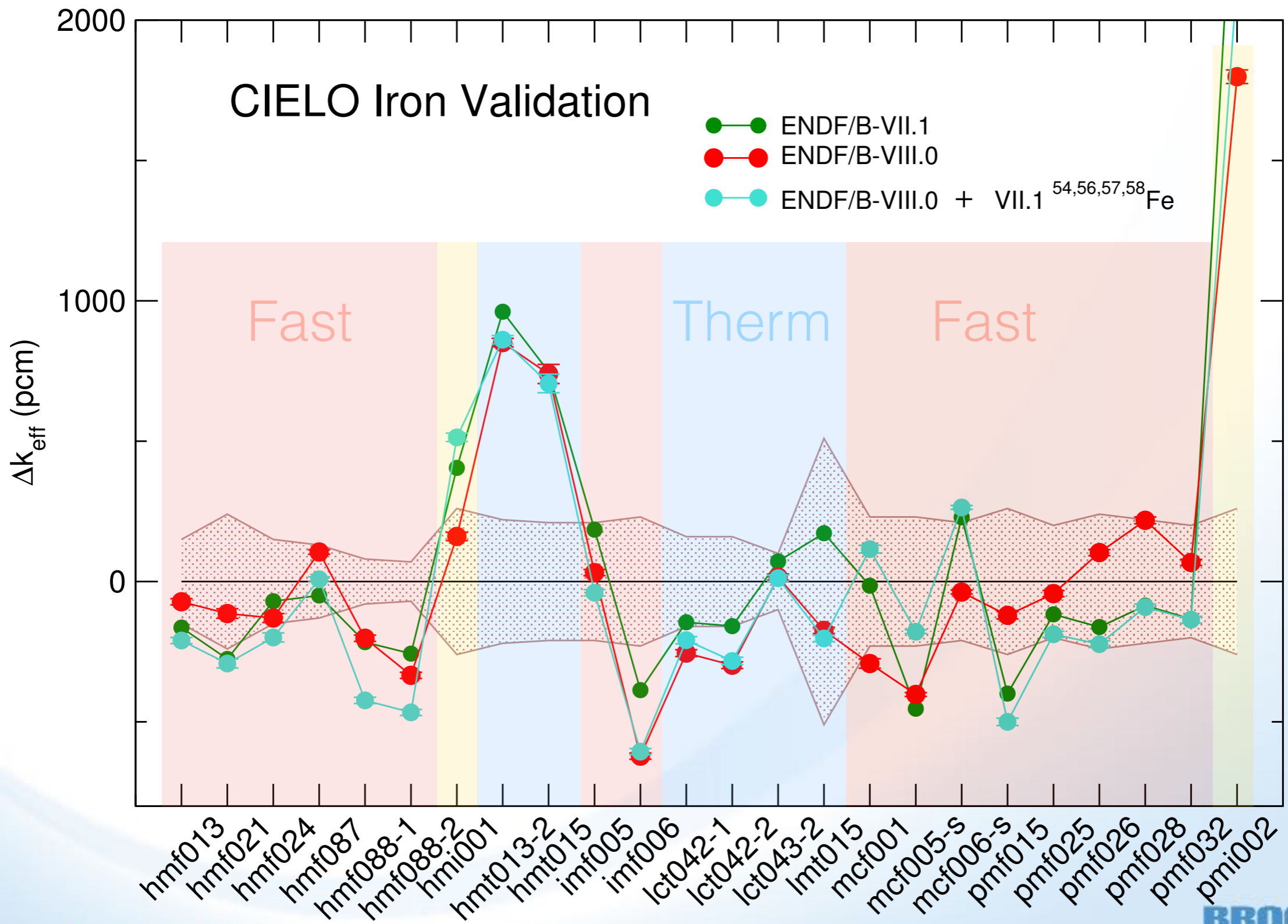
ICSBEP name	Common name
1 HEU-MET-FAST-013	VNIITF-CTF-SS-13
2 HEU-MET-FAST-021	VNIITF-CTF-SS-21
3 HEU-MET-FAST-024	VNIITF-CTF-SS-24
4 HEU-MET-FAST-087	VNIITF-CTF-Fe
5 HEU-MET-FAST-088	hmf088-1
6 HEU-MET-FAST-088	hmf088-2
7 HEU-MET-INTER-001	ZPR-9/34
8 HEU-MET-THERM-013	hmt013-2
9 HEU-MET-THERM-015	hmt015
10 IEU-MET-FAST-005	VNIITF-CTF-SS-5
11 IEU-MET-FAST-006	VNIITF-CTF-SS-6
12 LEU-COMP-THERM-042	lct042-1
13 LEU-COMP-THERM-042	lct042-2
14 LEU-COMP-THERM-043	IPEN/MB-01
15 LEU-MET-THERM-015	lmt015
16 MIX-COMP-FAST-001	ZPR-6/7
17 MIX-COMP-FAST-005	ZPR-9/31
18 MIX-COMP-FAST-006	ZPPR-2
19 PU-MET-FAST-015	BR-1-3
20 PU-MET-FAST-025	pmf025
21 PU-MET-FAST-026	pmf026
22 PU-MET-FAST-028	pmf028
23 PU-MET-FAST-032	pmf032
24 PU-MET-INTER-002	ZPR-6/10

- Selection guided by sensitivities in DICE (Trkov, Zerovnik)
- Energy
 - 16 fast
 - 6 thermal
 - 2 intermediate energy
- Material
 - 15 uranium
 - 6 plutonium
 - 3 mix

Critical assemblies



Critical assemblies (cont.)



Critical assemblies (cont.)

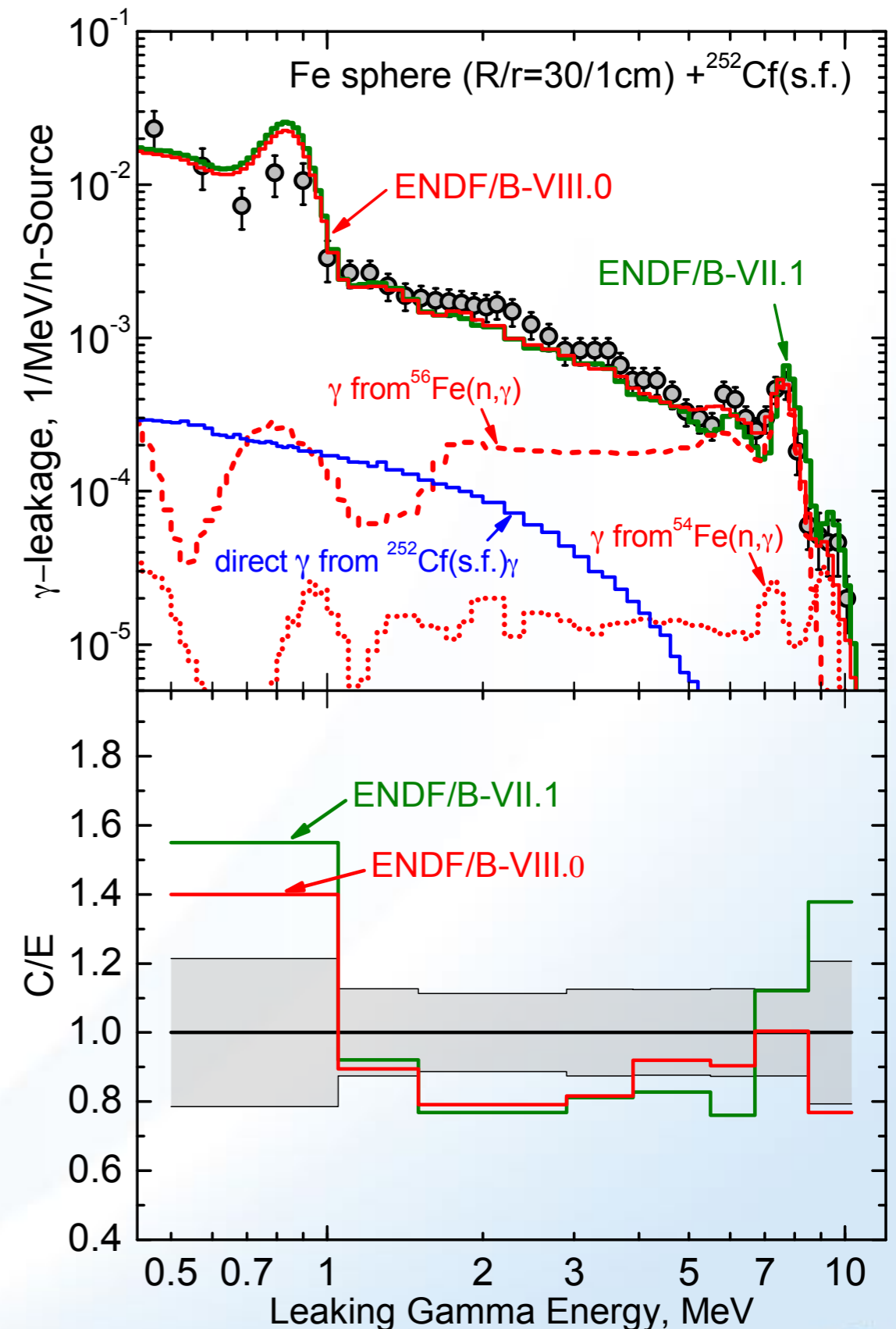
- Compared to ENDF/B-VII.1 irons, the new iron evaluations coupled to the ENDF/B- VIII.0 library:
 - improve performance of **13** benchmarks
 - maintain the performance for **8**.
 - worsen the agreement for **3** benchmarks

γ transmission ^{252}Cf

by S. Simakov

- 60 cm iron sphere with 2 cm hole in the middle
- ^{252}Cf neutron source
- VIII.0 under-calculates γ -leakage between 1-4 MeV and over-calculates below 1 MeV still better than VII.1
- major players: inelastic, capture, ^{252}Cf source

VIII.0 performs better than VII.1

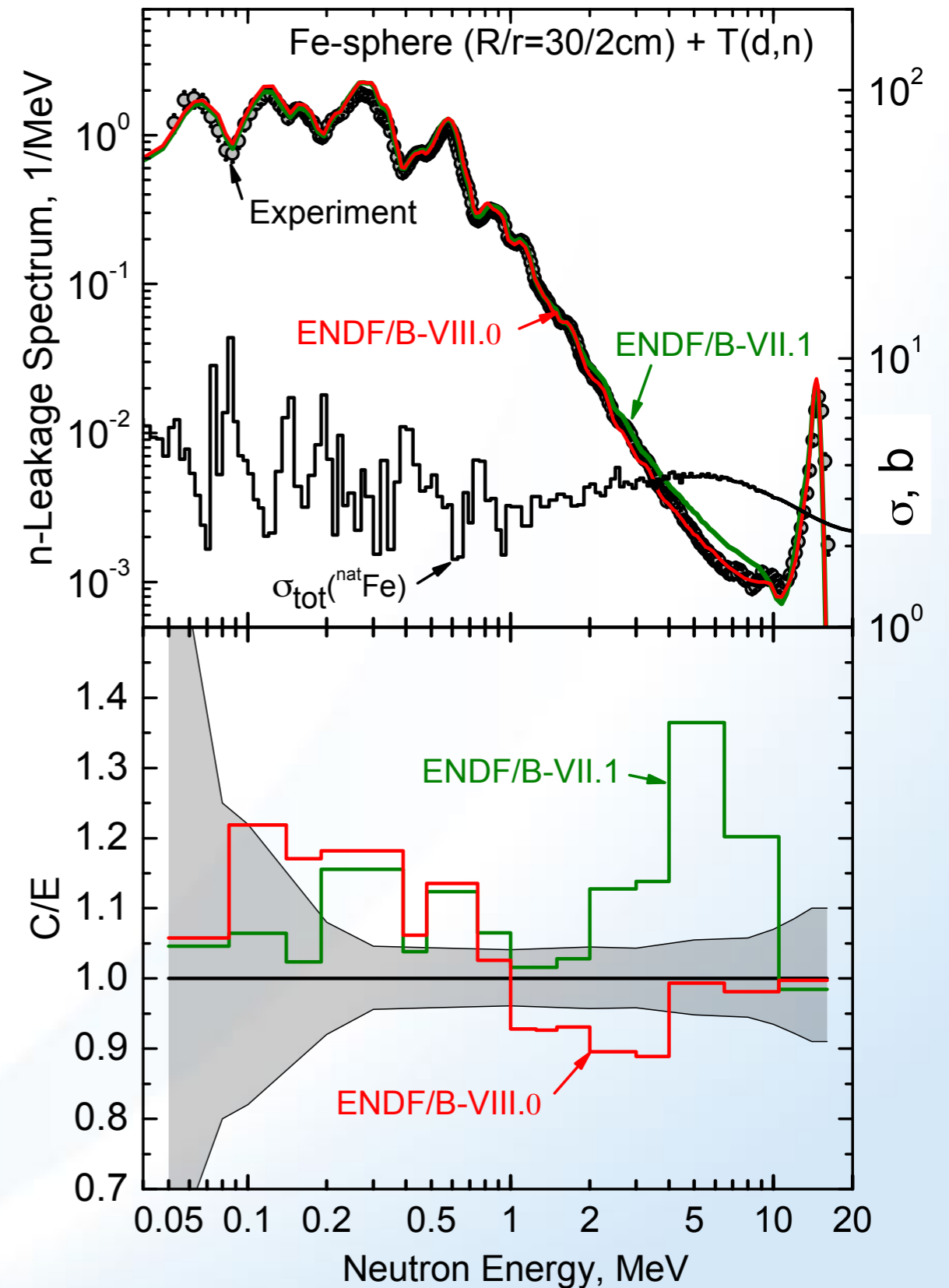


n transmission $T(d,n)$

by S. Simakov

- 60 cm iron sphere with 2 cm hole in the middle
- $T(d,n)$ neutron source
- VIII.0 under-calculates n-leakage between 1-4 MeV
- major player: inelastic

VIII.0 performs better than VII.1

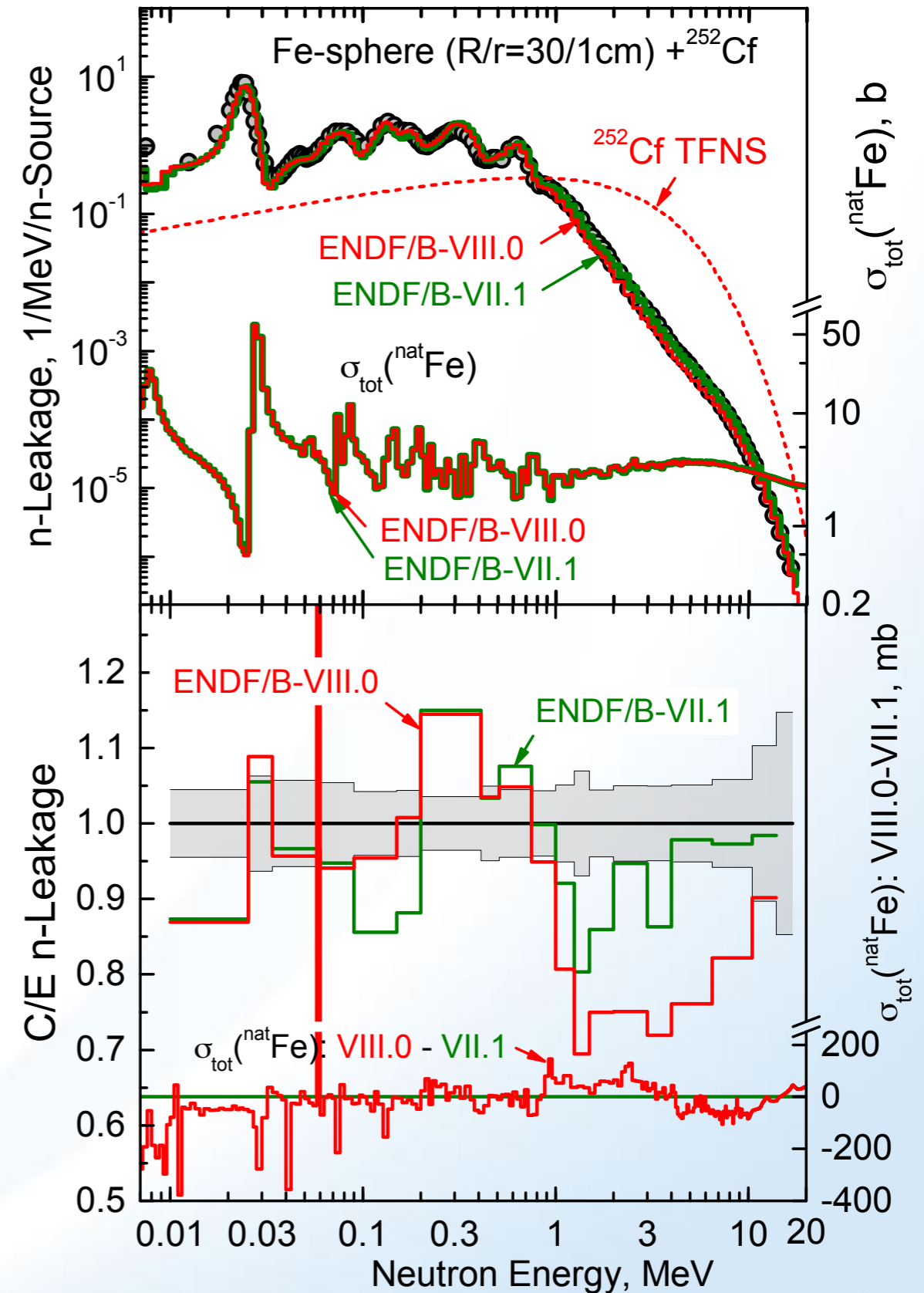


n transmission ^{252}Cf

by S. Simakov

- 60 cm iron sphere with 2 cm hole in the middle
- ^{252}Cf neutron source
- VIII.0 under-calculates leakage between 1-10 MeV

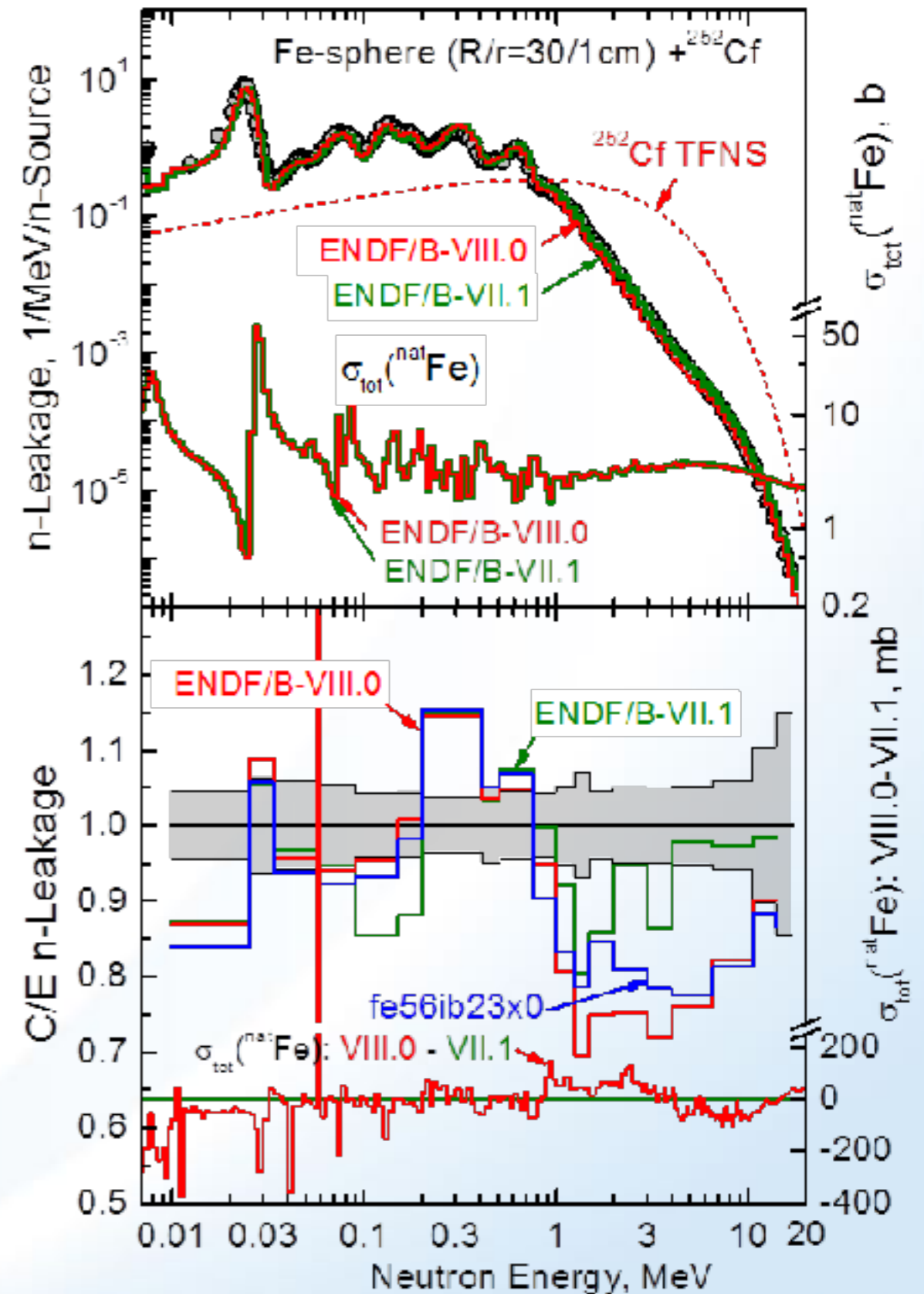
VIII.0 performs worse than VII.1



n transmission ^{252}Cf

by S. Simakov

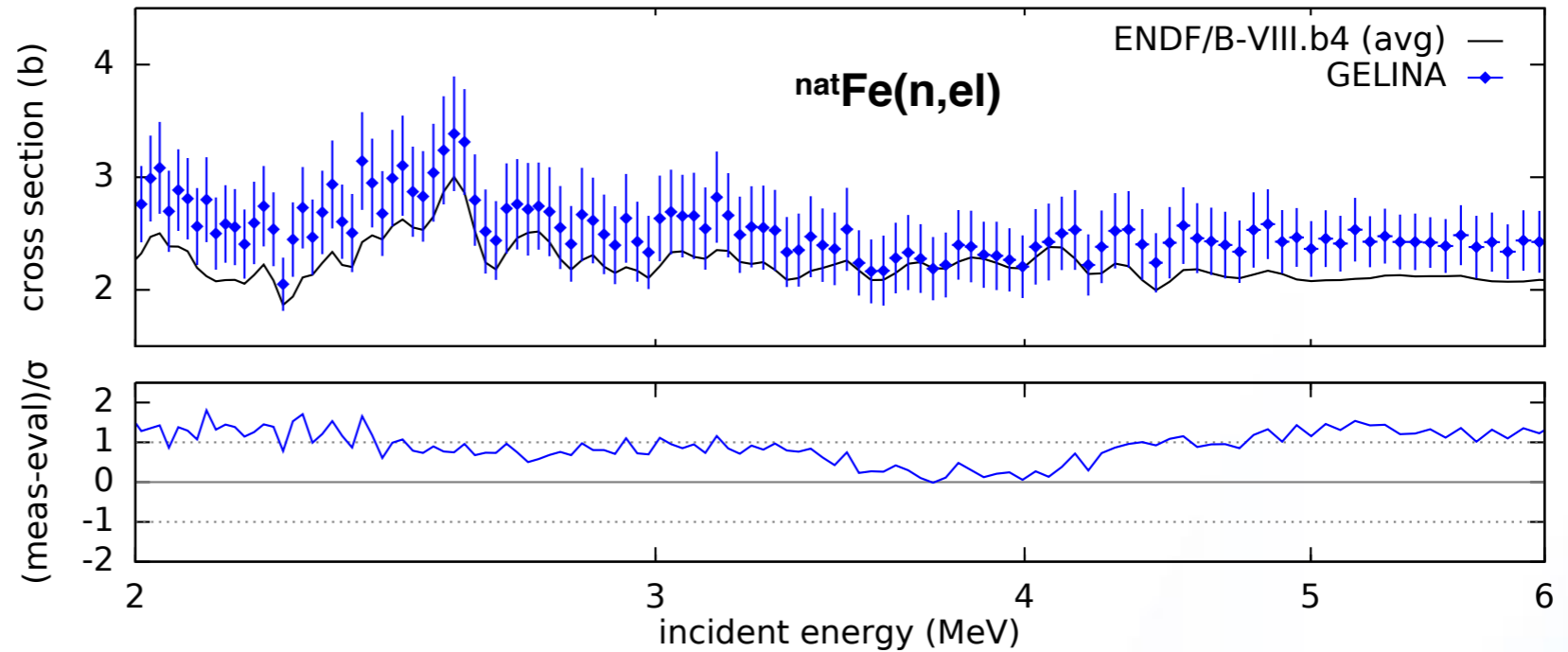
- 60 cm iron sphere with 2 cm hole in the middle
- ^{252}Cf neutron source
- VIII.0 under-calculates leakage between 1-10 MeV
- major player: elastic
- **Beyond VIII.0** - CC elastic angular distributions above RR (change between 846 keV and 4 MeV) - step in the right direction



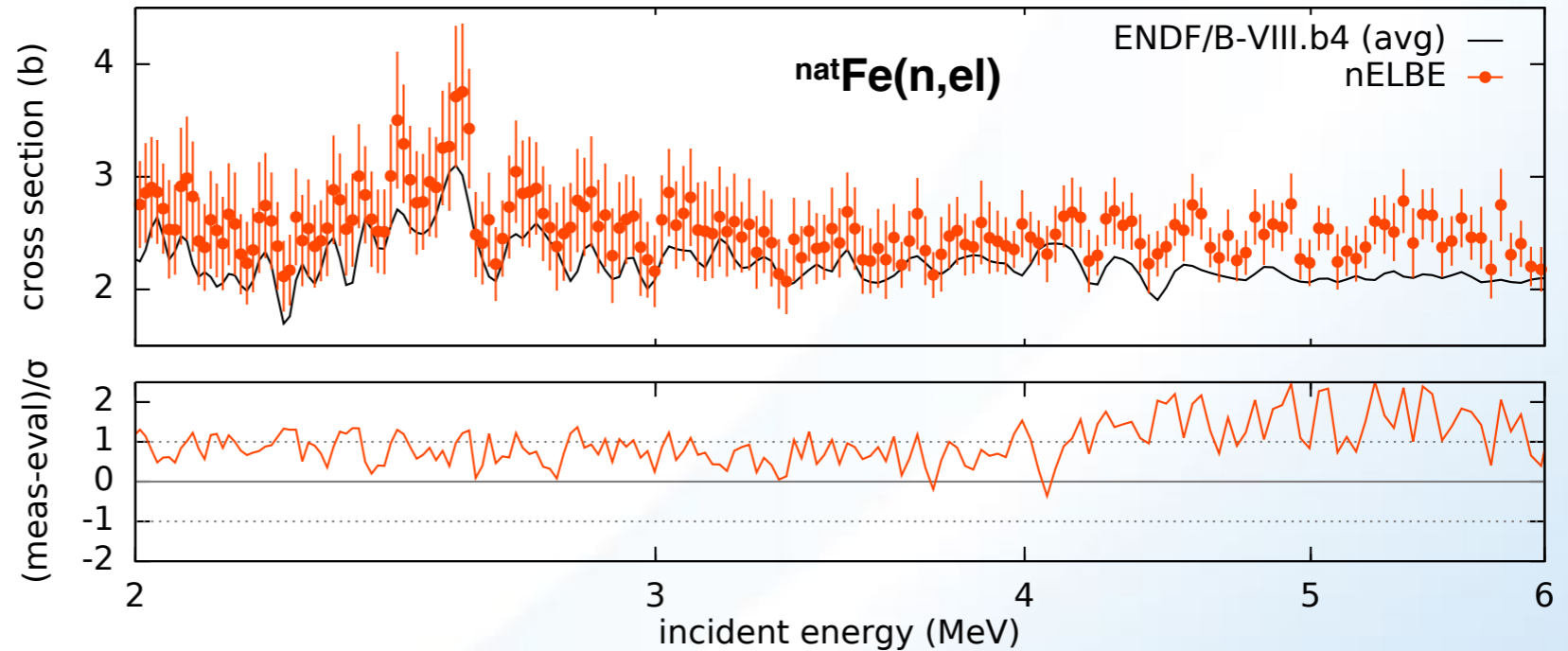
**Neutron scattering
cross section measurements
with a new scintillator array**

Elisa Pirovano

Beyond VIII.0 - new measurements of elastic at GELINA & nELBE indicate that VIII.0 is too low => inelastic is too high.



(a) Comparison with the GELINA dataset.



(b) Comparison with the nELBE dataset.

<https://www-nds.iaea.org/publications/indc/indc-blg-0002/>

Conclusions

- Overall, VIII.0 improves criticality results
- Gamma leakage from iron spheres gets better
- Neutron leakage from iron spheres
 - results for the d-T source are improved
 - results for the ^{252}Cf source get worse
- Possible improvements
 - elastic angular distributions
 - elastic to inelastic ratio

OMNIA MUTANTUR, NIHIL INTERIT
(everything evolves, nothing is lost)

OMNIA DICTA FORTIORA SI DICTA LATINA
(everything is stronger if said in Latin)