ENDF/B.VIII.1.β1 in GNDS format testing

Mini-CSEWG 2023

Marie-Anne Descalle, Gregory Patel, Caleb Mattoon,
Godfree Gert, Bret Beck

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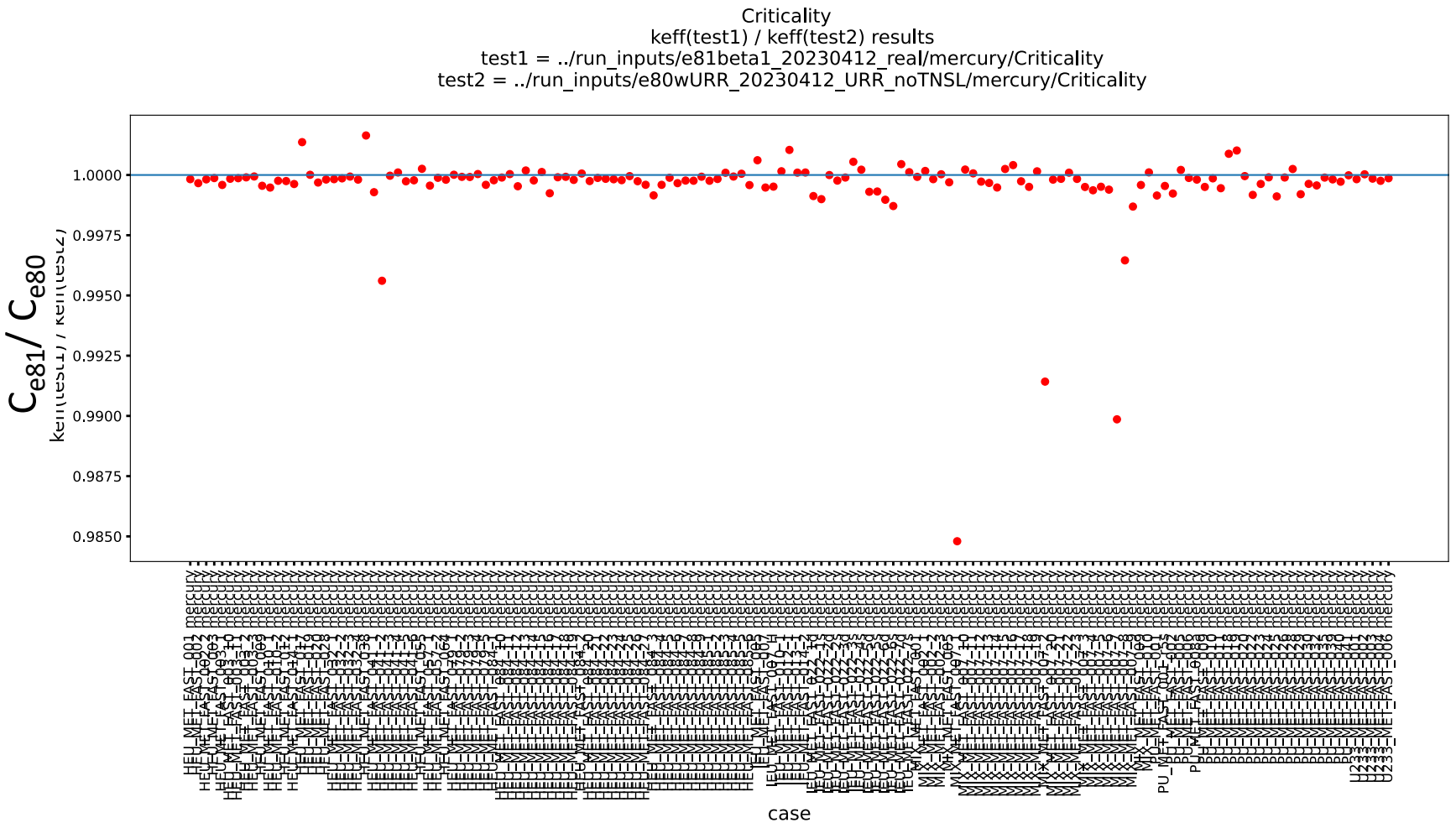
Lawrence Livermore National Laboratory

The ENDF/B-VIII.0 evaluations were processed with FUDGE 6.1.0 in GNDS 2.0 format

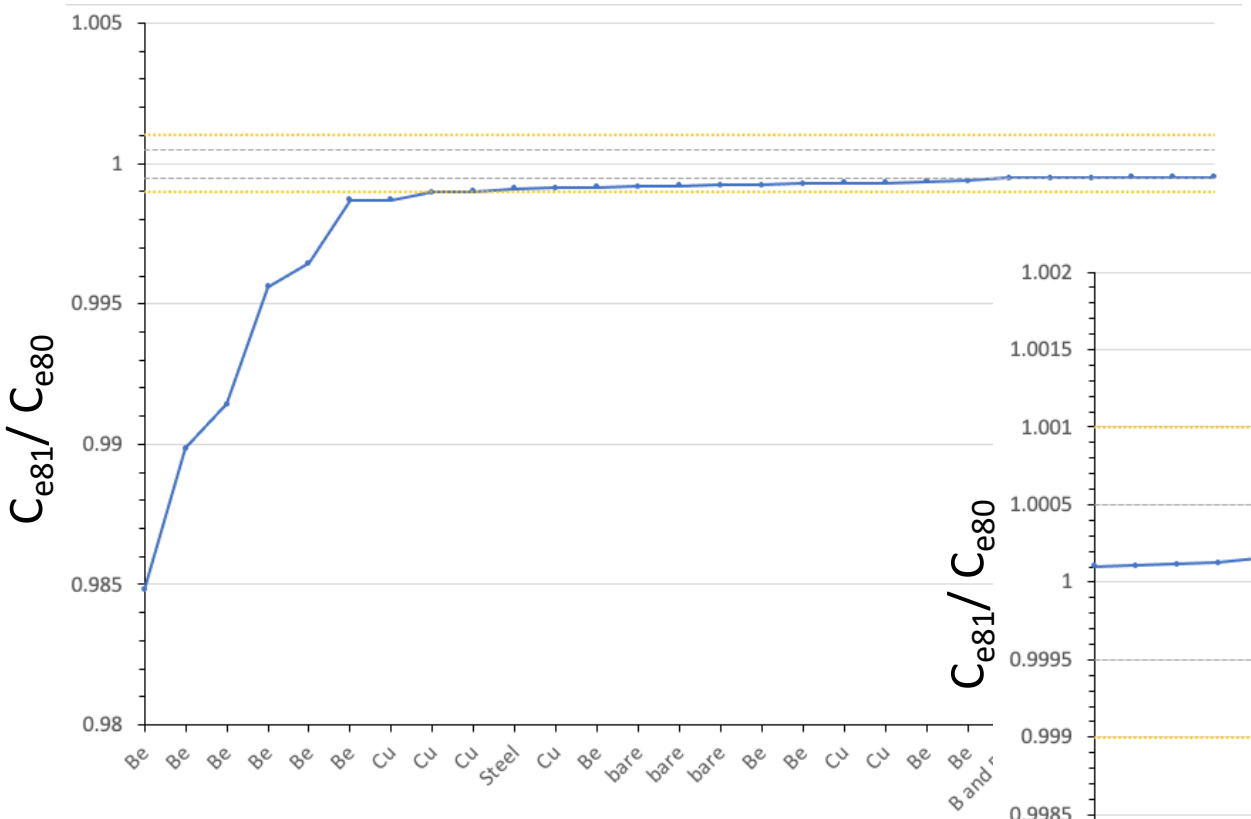
- 558 isotopes
- Continuous energy, T=293.6K
- URR Probability Tables except for
  - ENDF/B-VIII.0 timeout: 17; fail: Sn112, Pt192
  - ENDF/B-VIII.1.beta1, long processing time Pa231, Pa 233, Eu; no fail
- TNSL processed, not tested at this time
- 149 Fast Critical Assemblies
- Mercury MC transport code
  - Version: 5.32.1
  - GIDI+: 3.25.6

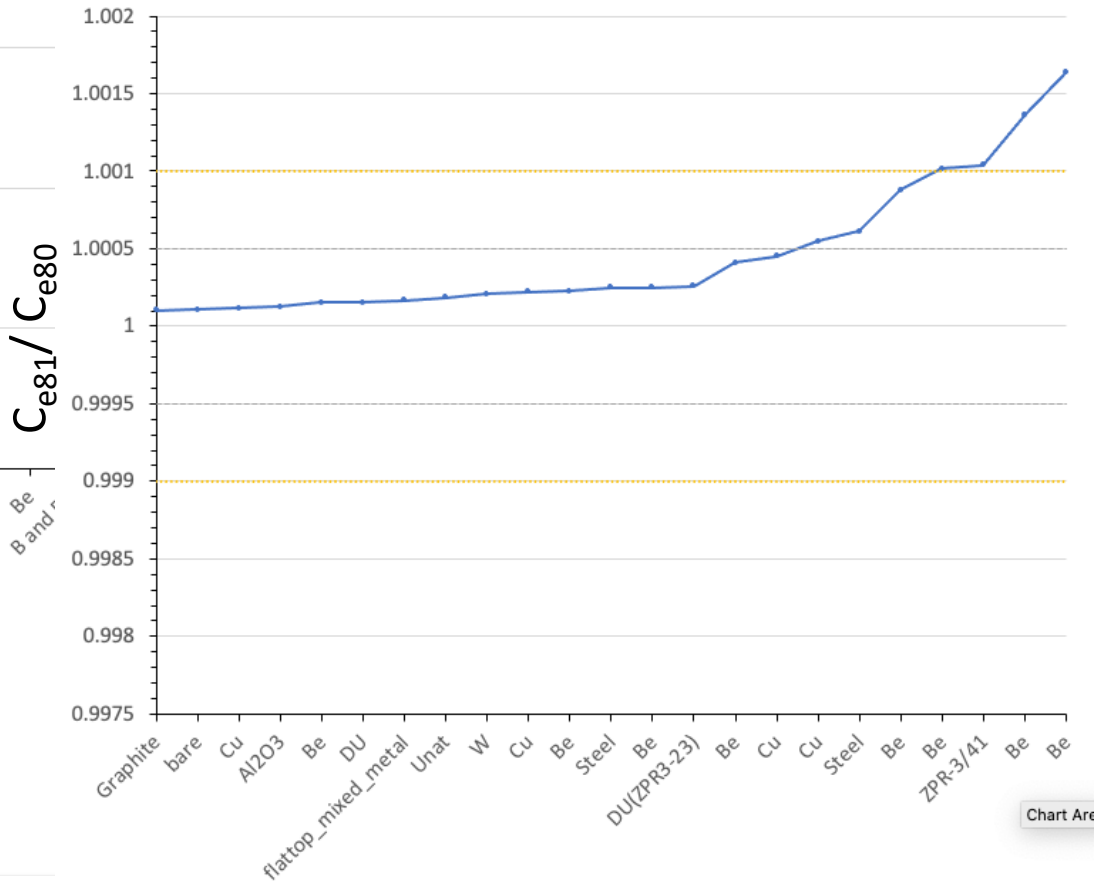
Criticality: comparison to ENDF/B-VIII.0
C_{e81}/C_{e80}



For 113/149 cases, k effective of ENDF/B-VIII.1beta1 < ENDF/B-VIII.0

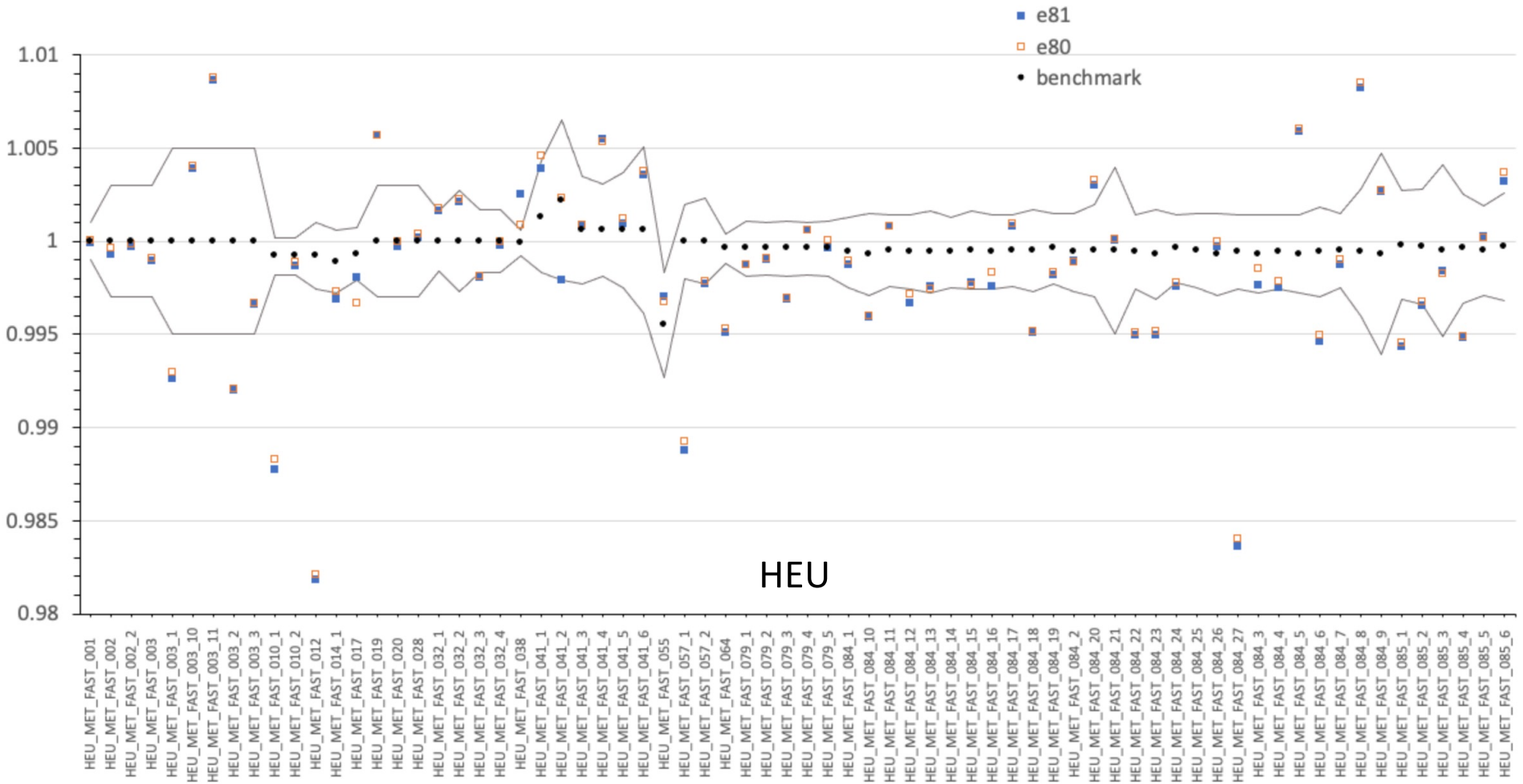
Criticality: C_{e81}/C_{e80}



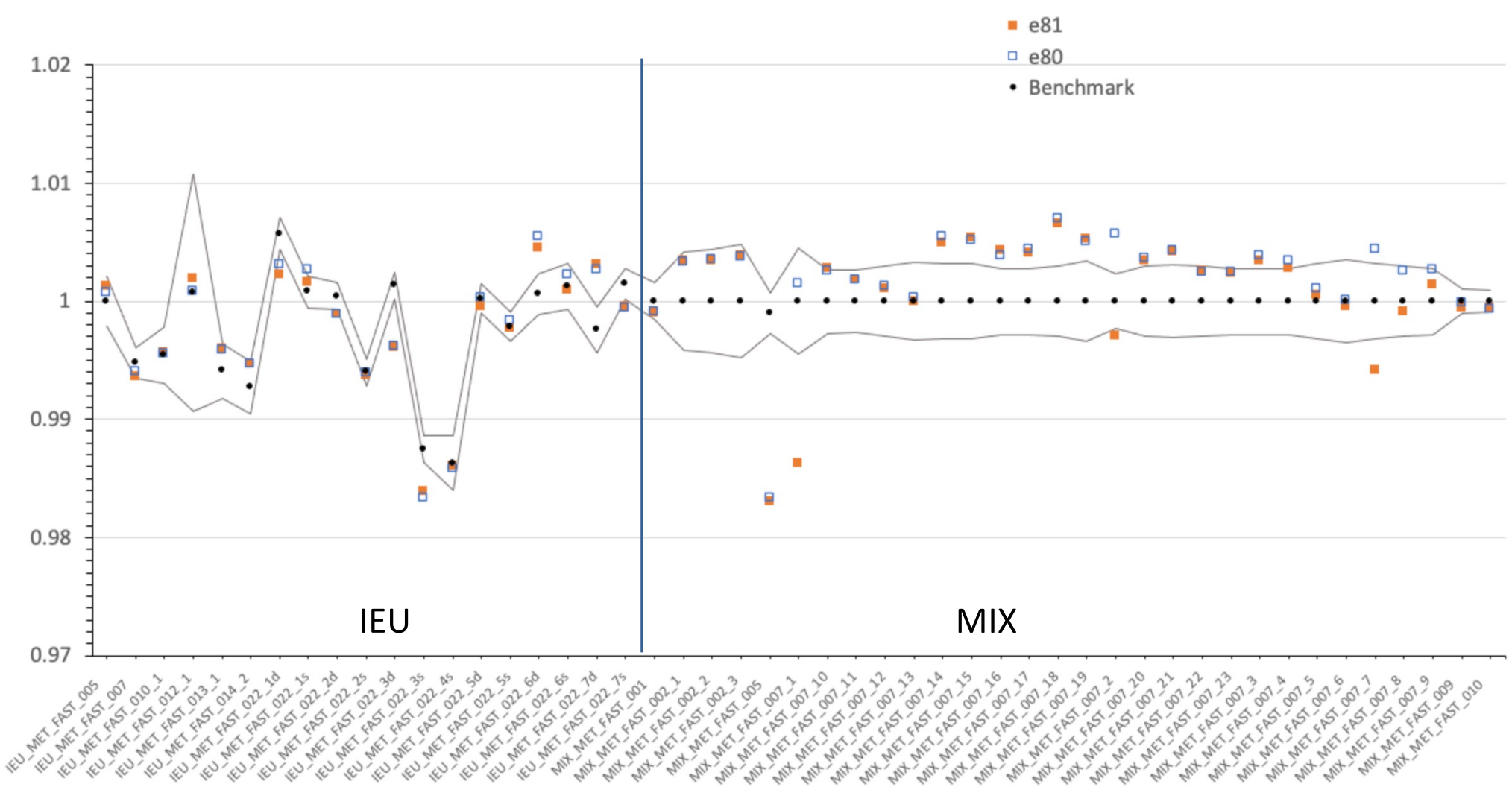


Cases with MMF7(Be) & IMF22(Cu) reflectors show largest differences; 2 steel reflected & 3 bare Pu assemblies (PMF2, 22, 29)

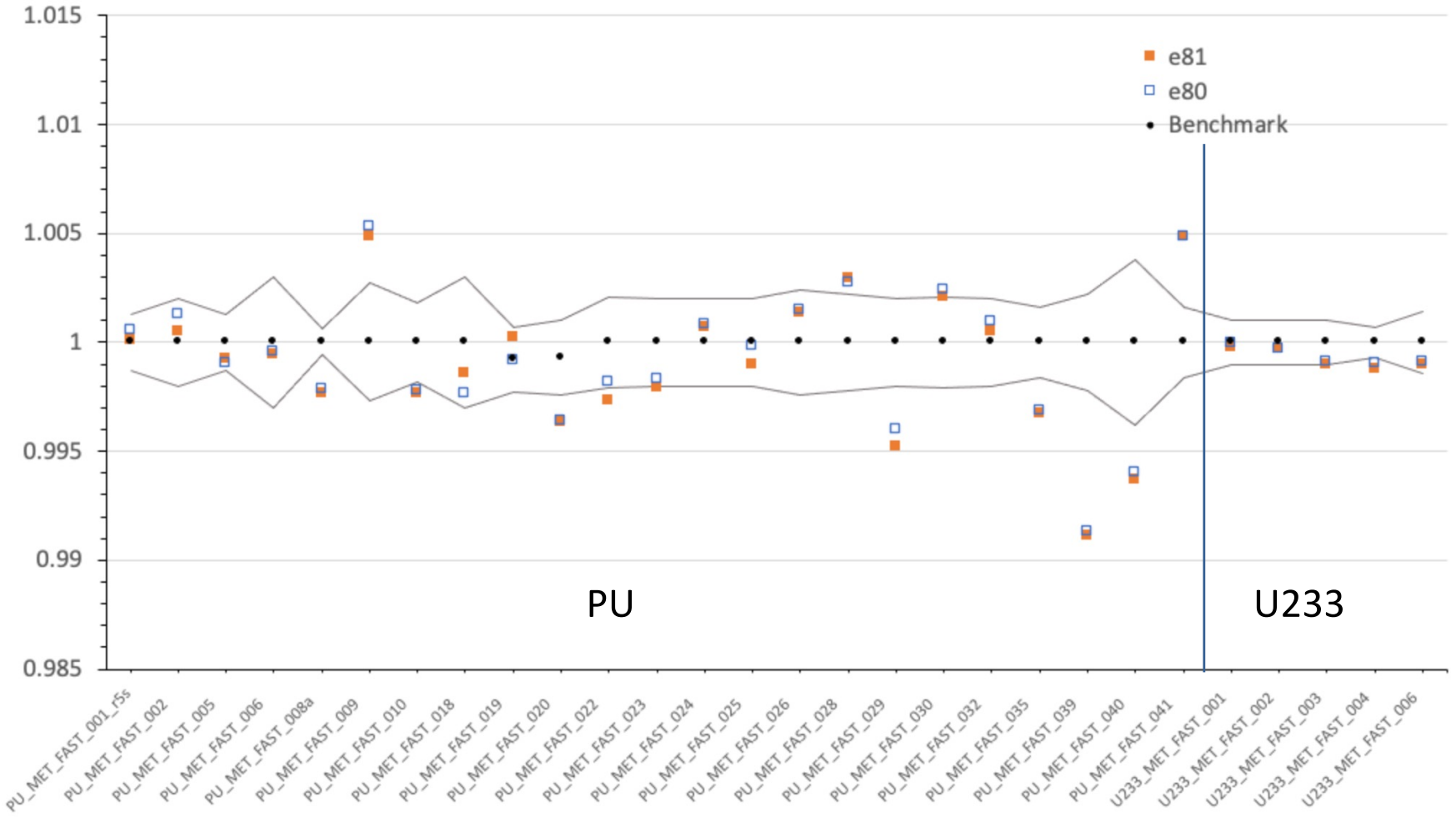
Criticality: comparison to ENDF/B-VIII.0



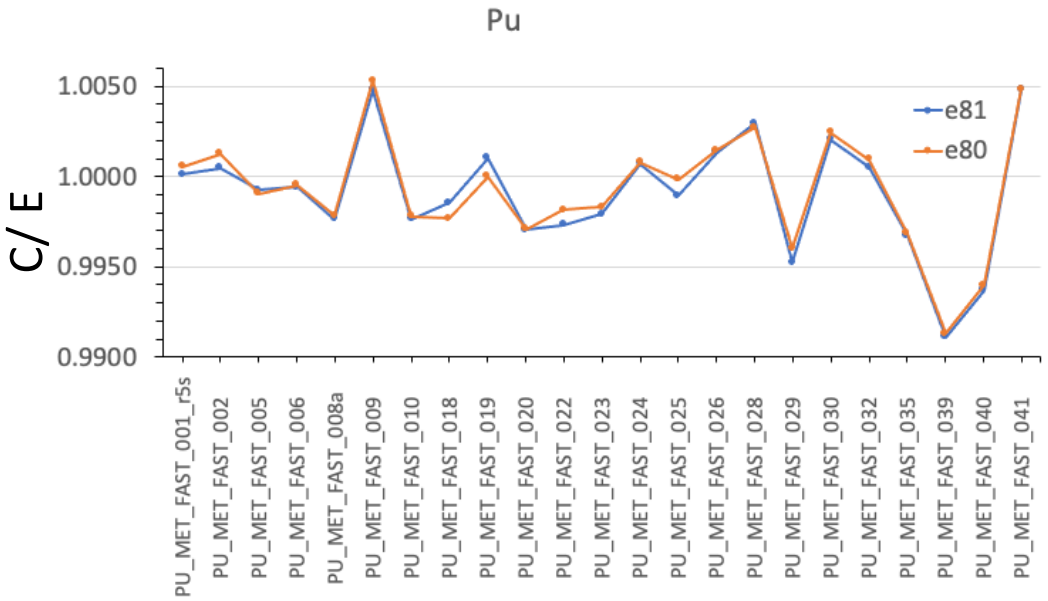
Criticality: comparison to ENDF/B-VIII.0

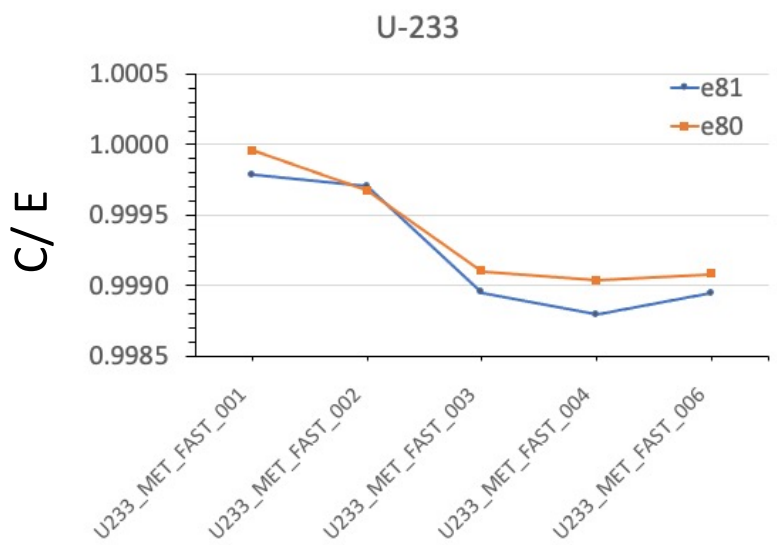


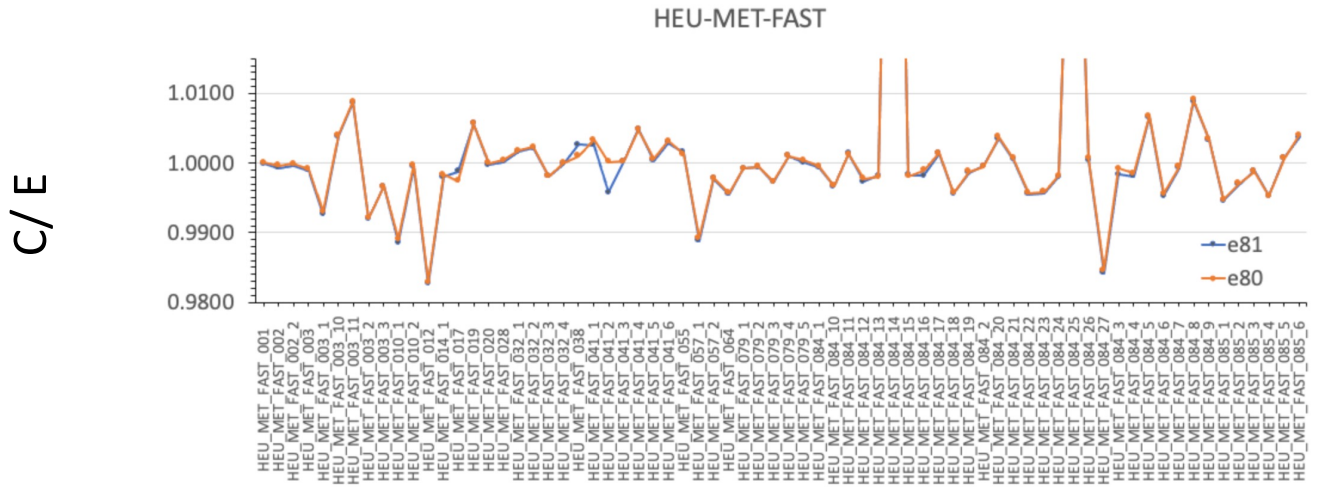
Criticality: comparison to ENDF/B-VIII.0



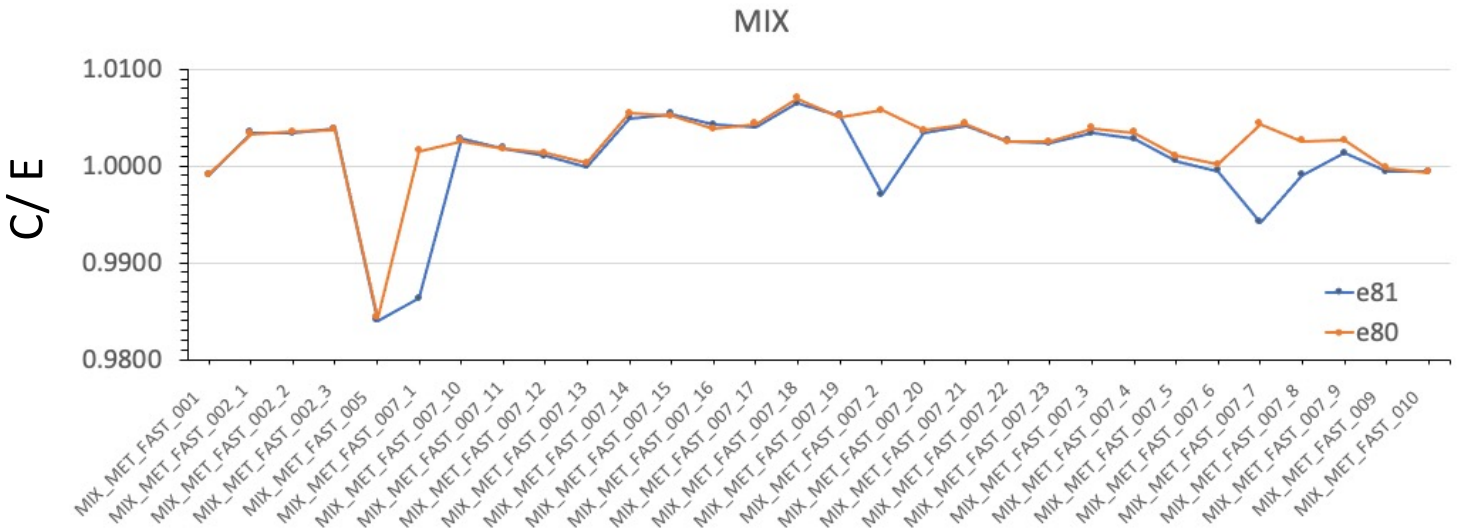
Criticality: PU, HEU, U233

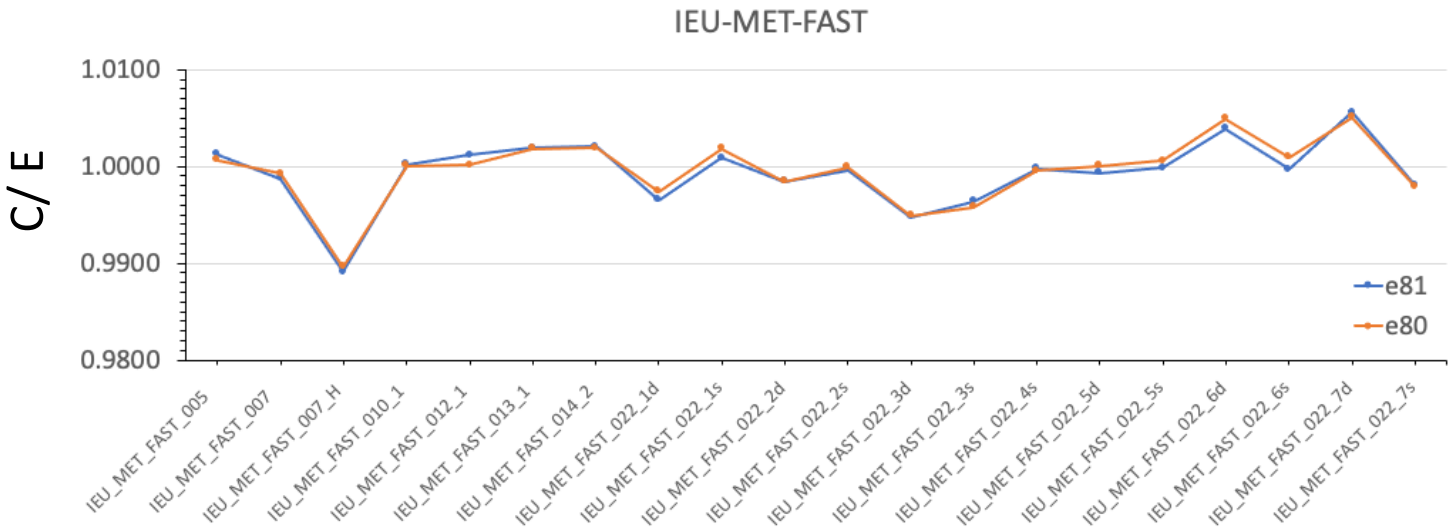






Criticality: MIX, IEU





Fission Ratios

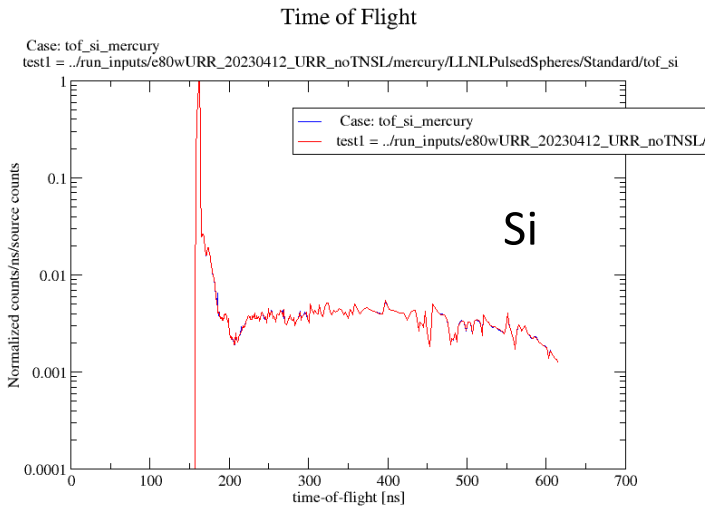
- Mercury/GNDS – MCNP6.2/ACE * Brown et al. NDS 148 (2018)
- Reaction rates are normalized by ^{235}U(n,f)

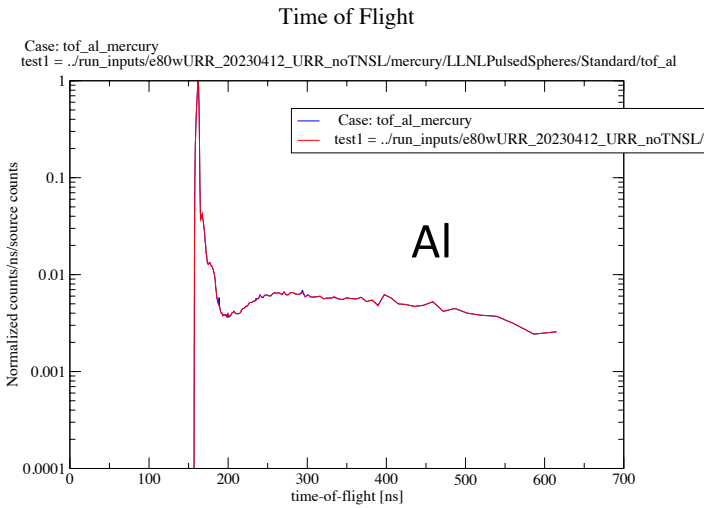
Benchmark	Reaction Ratio	238U(n,f)	237Np(n,f)	233U(n,f)	239Pu(n,f)
Godiva	Mercury e81	0.1580	0.8301	1.5795	1.3830
	Mercury e80	0.1583	0.8315	1.5796	1.3846
	MCNP e80 *	0.1583	0.8318	1.5793	1.3846
	Mercury e81/e80	0.9981	0.9983	0.9999	0.9988
Jezebel	Mercury e81	0.2110	0.9719	1.5662	1.4246
	Mercury e80	0.2107	0.9768	1.5661	1.4271
	MCNP e80 *	*0.2121*	0.9770	1.5660	1.4273
	Mercury e81/e80	1.0013	0.9949	1.0001	0.9982
Flattop25	Mercury e81	0.1447	0.7728	1.5779	1.3608
	Mercury e80	0.1451	0.7732	1.5779	1.3621
	MCNP e80 *	0.1451	0.7735	*1.5664*	1.3622
	Mercury e81/e80	0.9972	0.9995	1.0000	0.9990

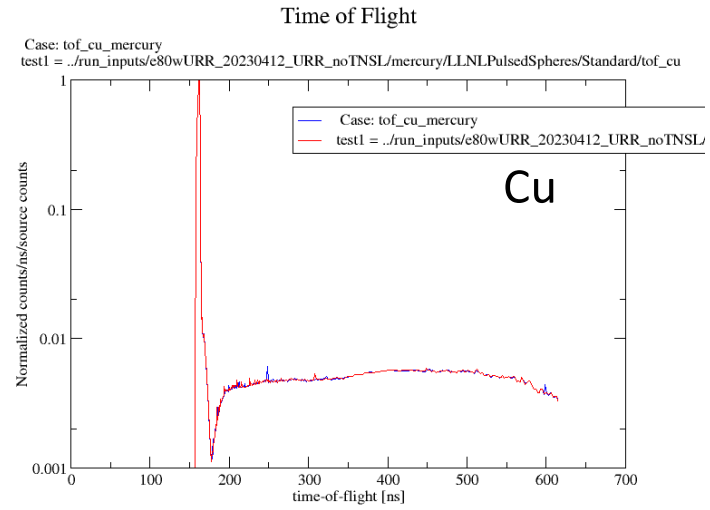
Fission Ratios C/E

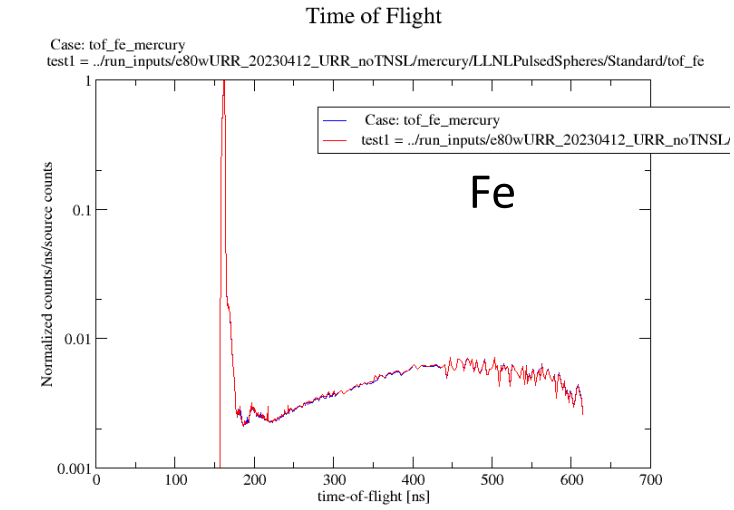
Assembly	Quantity	U238f/U235f	Np237f/U235f	U233f/U235f	Pu239f/U235f
Godiva	Calc	0.1580	0.8301	1.5795	1.3830
(HMF001)	Exp-B	0.1643 ±0.0018	0.8516 ±0.012	*	1.4152 ±0.014
	Exp-A	0.1642 ±0.0018	0.8370 ±0.013	1.5900 ±0.03	1.4020 ±0.025
	Calc/Exp	***0.9614***	***0.9748***	***0.9934***	***0.9772***
Jezebel	Calc	0.2110	0.9719	1.5661	1.4246
(PMF001)	Exp-B	0.2133 ±0.0023	0.9835 ±0.014	*	1.4609 ±0.013
	Exp-A	0.2137 ±0.0023	0.9620 ±0.016	1.578 ±0.027	1.448 ±0.029
	Calc/Exp	***0.9891***	***0.9882***	***0.9925***	***0.9752***
Jezebel-23	Calc	0.2116	0.9854		
(UMF001)	Exp-B	0.2131 ±0.0026	0.997 ±0.015		
	Exp-A	0.2131 ±0.0023	0.977 ±0.016		
	Calc/Exp	***0.9928***	***0.9884***		
Flattop-25	Calc	0.1447	0.7728	1.5779	1.3608
(HMF028)	Exp-B	0.1492 ±0.0016	0.7804 ±0.01	1.608 ±0.003	1.3847 ±0.012
	Exp-A	0.1490 ±0.002	0.7600 ±0.01	1.600 ±0.003	1.3700 ±0.02
	Calc/Exp	***0.9700***	***0.9903***	***0.9813***	***0.9828***
Flattop-Pu	Calc	0.1780	0.8510		
(PMF006)	Exp-B	0.1799 ±0.002	0.8561 ±0.012		
	Exp-A	0.1800 ±0.003	0.84 ±0.01		
	Calc/Exp	***0.9895***	***0.9941***		
Flattop-23	Calc	0.1878	0.9007		
(UMF006)	Exp-B	0.1916 ±0.0021	0.9103 ±0.013		
	Exp-A	0.1910 ±0.003	0.8900 ±0.01		
	Calc/Exp	***0.9802***	***0.9895***		

LLNL pulsed spheres (1mfp)



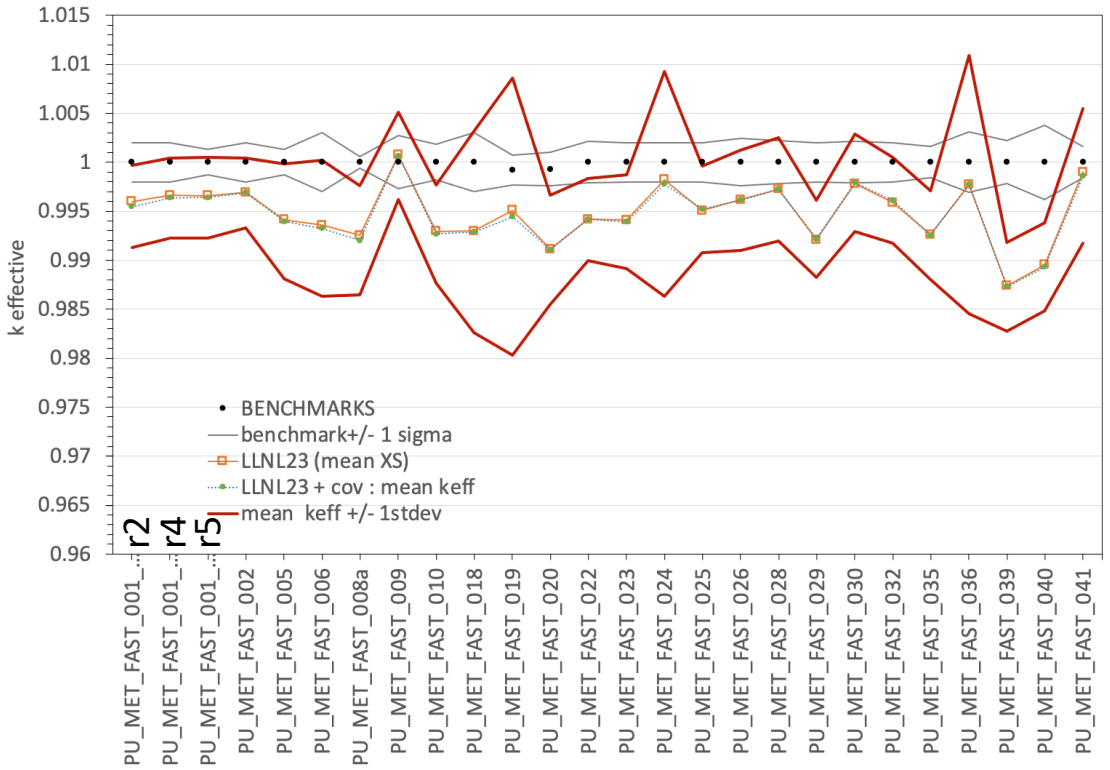






First tests of ^{239}Pu EMU-generated covariance matrices

- Fast Pu criticality benchmarks
- LLNL23 ^{239}Pu evaluation (unadjusted)
- LLNL ^{239}Pu RC + ENDF/B-VIII.0 for other isotopes
- Sensitivity to CWEG adopted changes: softer PFNS, angular distributions, RRR
- 600 cross-section realizations generated with EMU
- covariances submitted to CSEWG (release candidate for ENDF/B-VIII.1β1)



Ongoing: a new set of EMU-enabled ^{239}Pu covariance matrices is being generated

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