

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

Mini-CSEWG 2023

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April 24, 2023



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

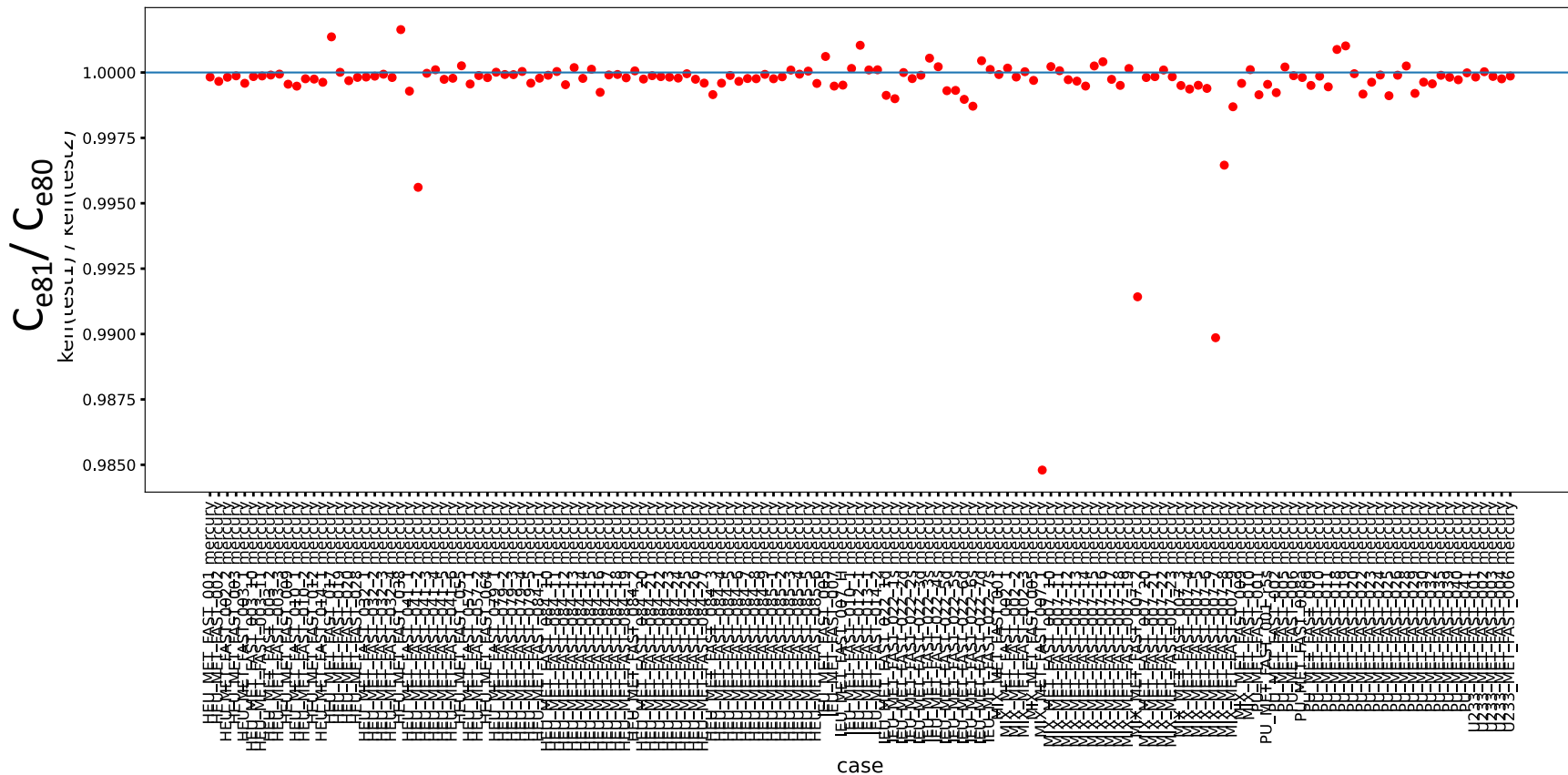
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- 558 isotopes
- Continuous energy, T=293.6K
- URR Probability Tables except for
  - ENDF/B-VIII.0 timeout: 17; fail: Sn112, Pt192
  - ENDF/B-VIII.1.beta1, long processing time Pa231, Pa 233, Eu; no fail
- TNSL processed, not tested at this time
-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

# Criticality: comparison to ENDF/B-VIII.0

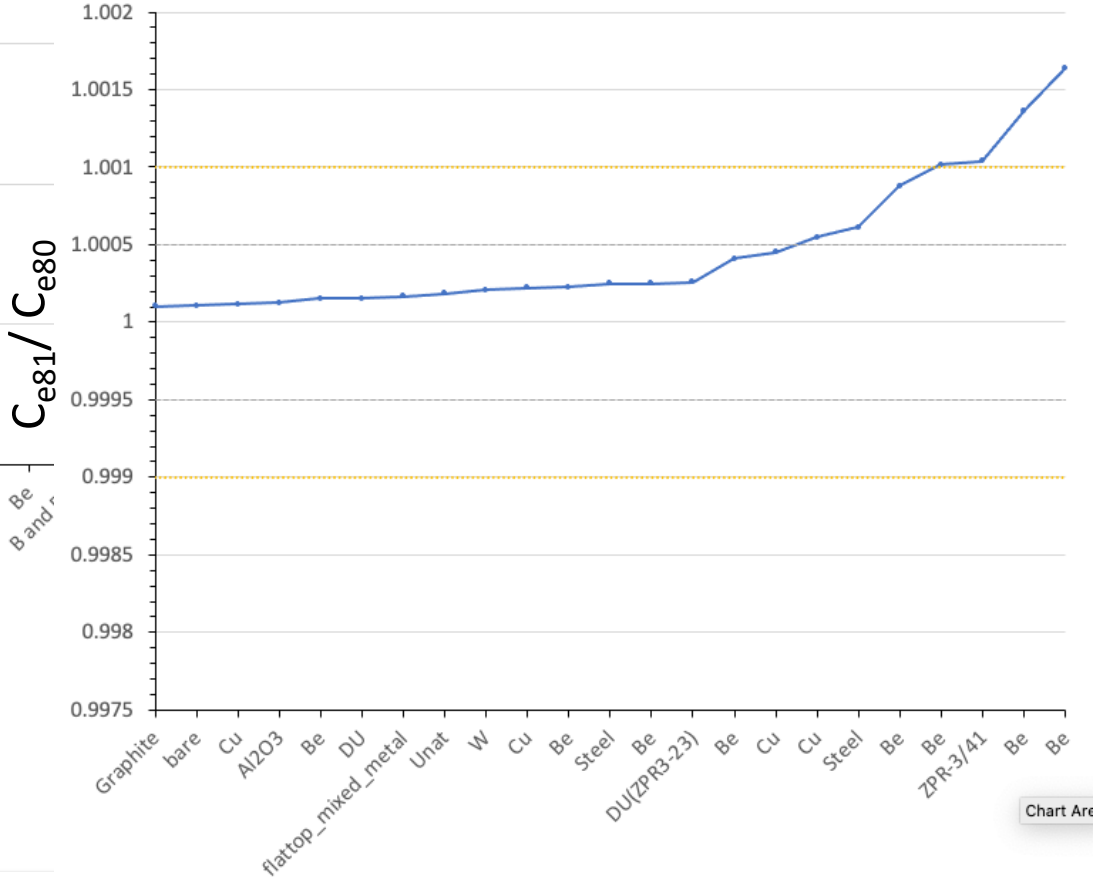
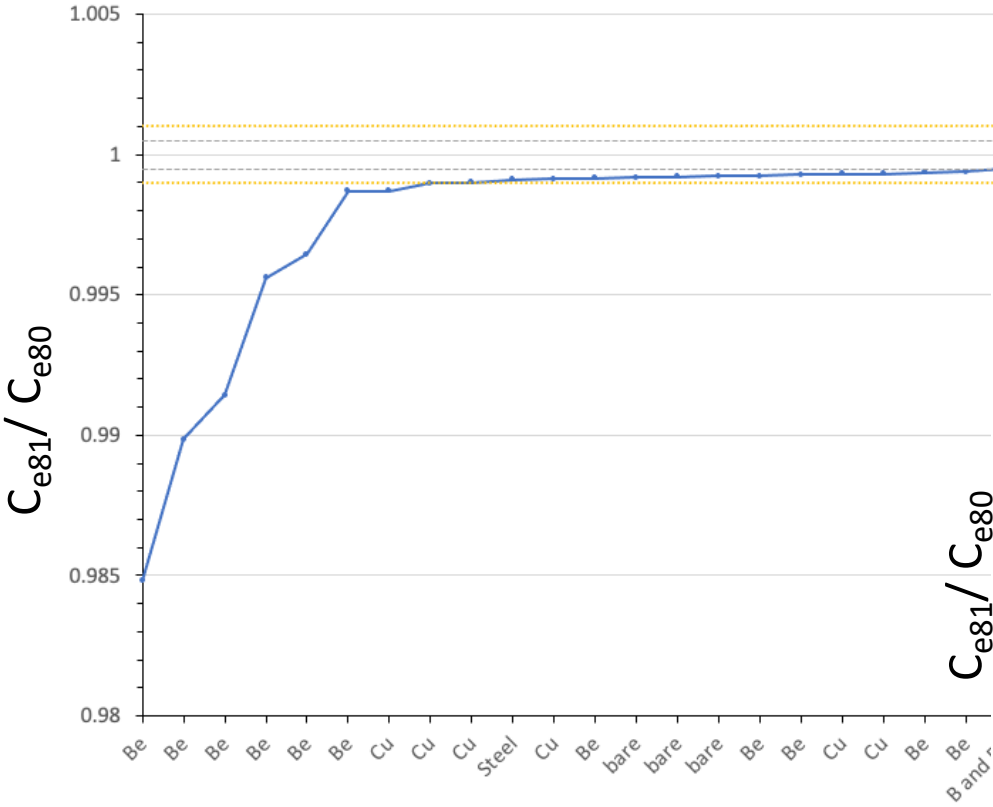
$$C_{e81}/C_{e80}$$

Criticality  
keff(test1) / keff(test2) results  
test1 = ../run\_inputs/e81beta1\_20230412\_real/mercury/Criticality  
test2 = ../run\_inputs/e80wURR\_20230412\_URR\_noTNSL/mercury/Criticality



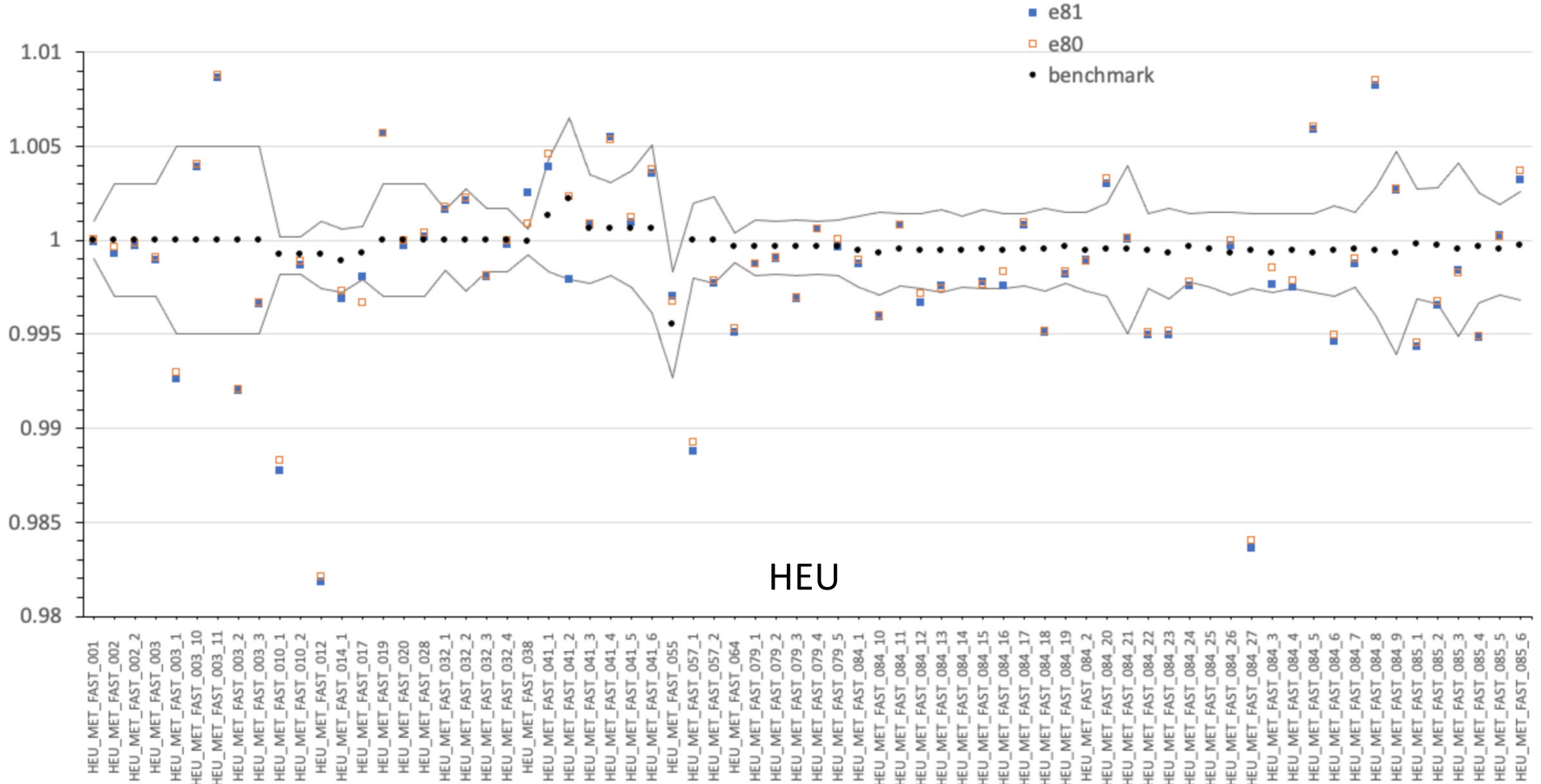
For 113/149 cases, k effective of ENDF/B-VIII.1beta1 < ENDF/B-VIII.0

# Criticality: $C_{e81}/C_{e80}$



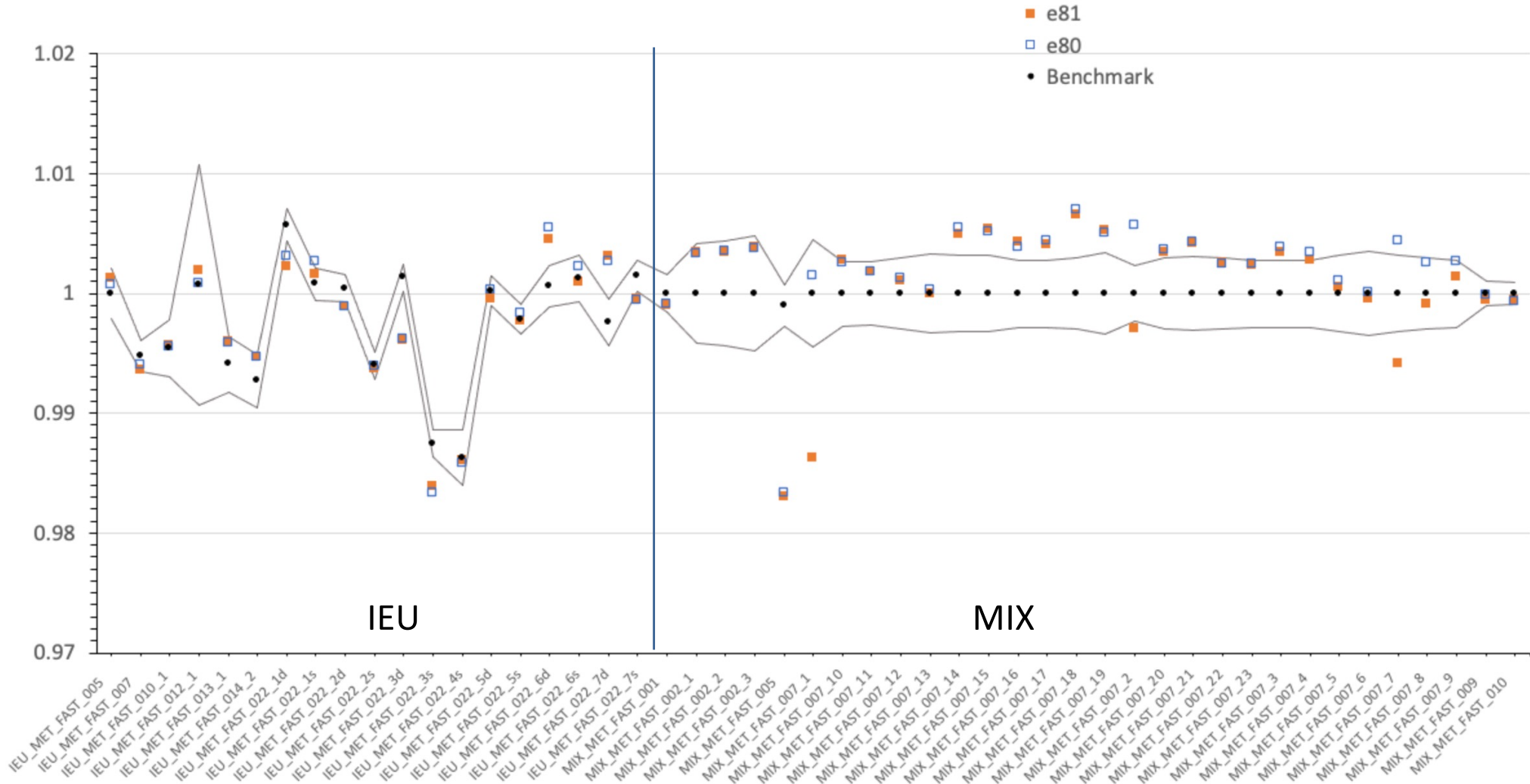
Cases with MMF7(Be) & IMF22(Cu) reflectors show largest differences; 2 steel reflected & 3 bare Pu assemblies (PMF2, 22, 29)

# Criticality: comparison to ENDF/B-VIII.0

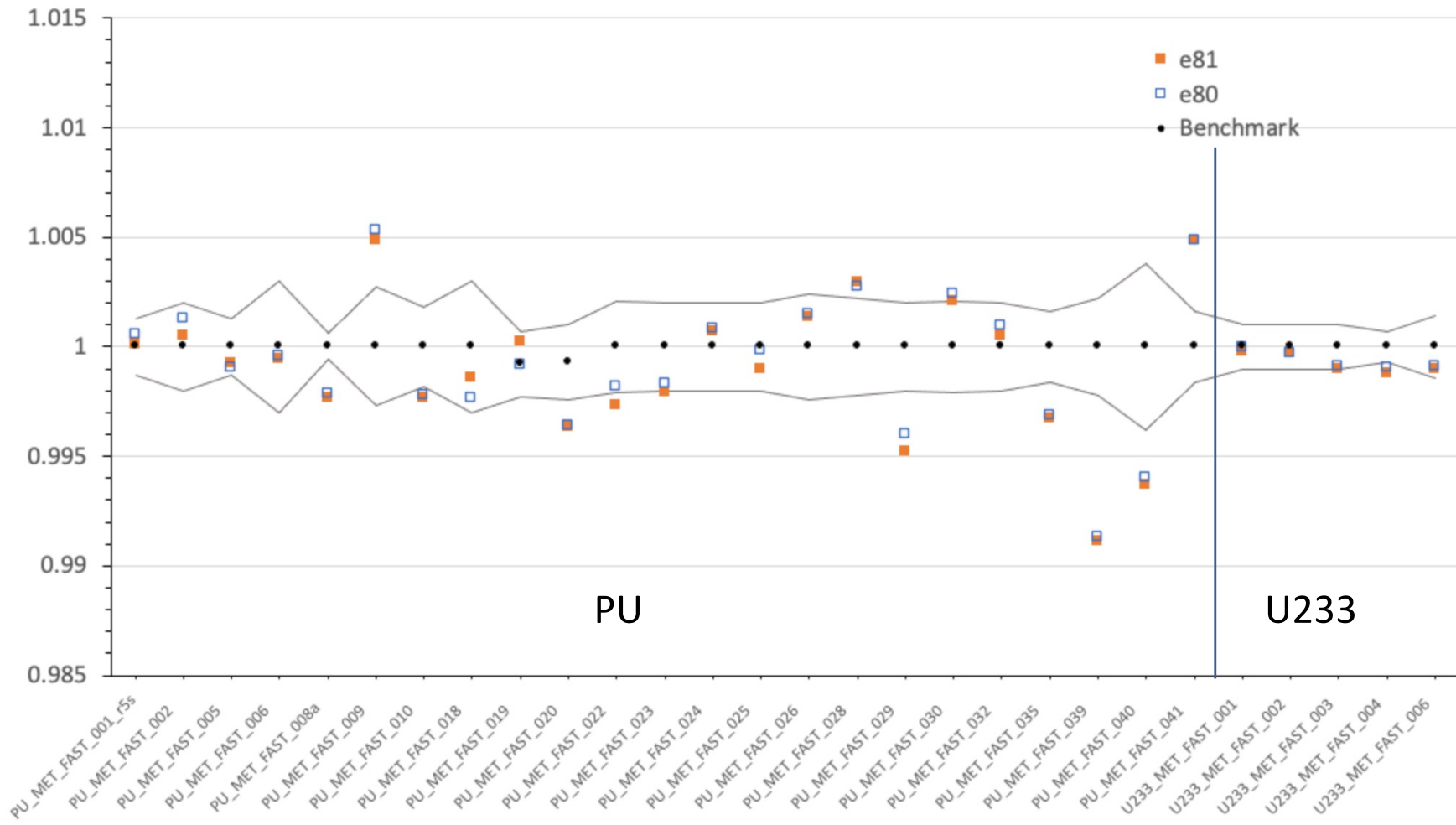




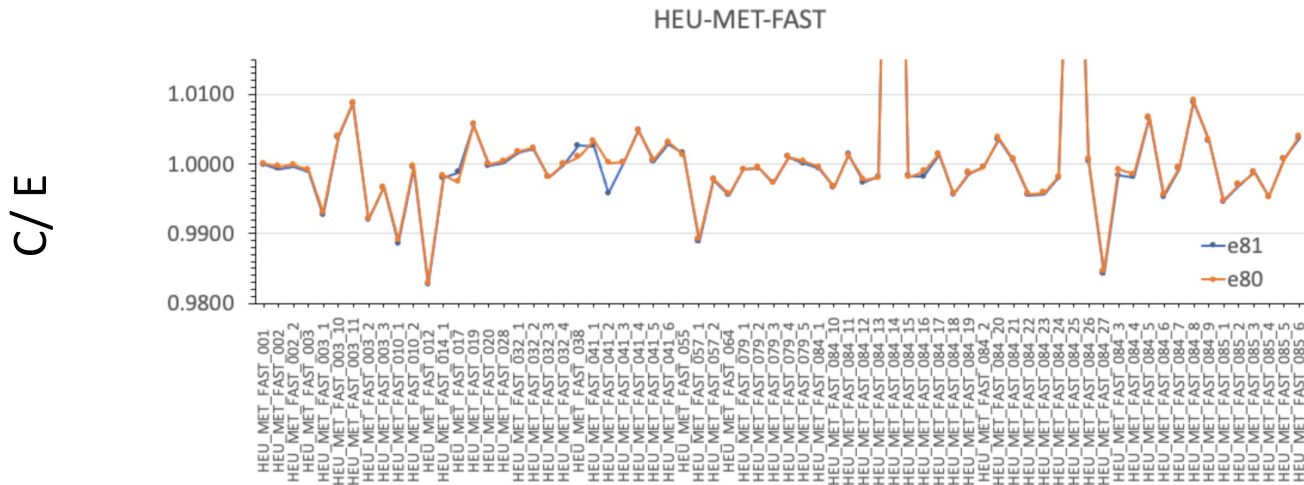
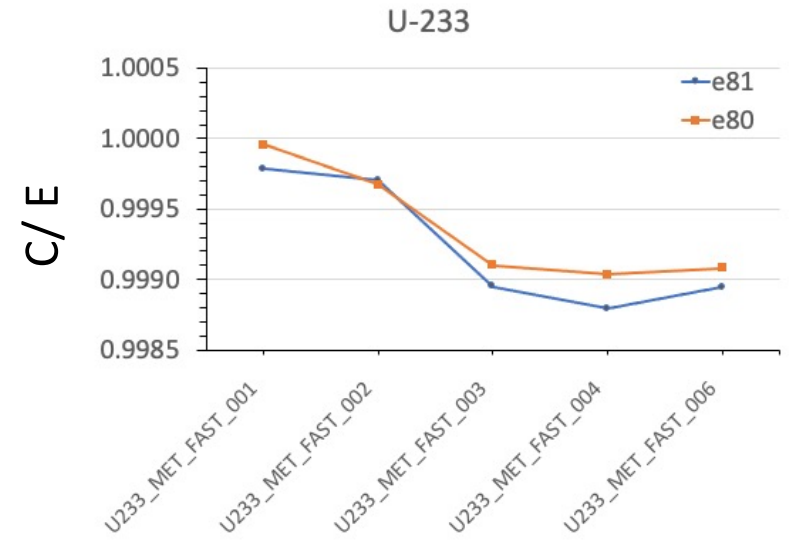
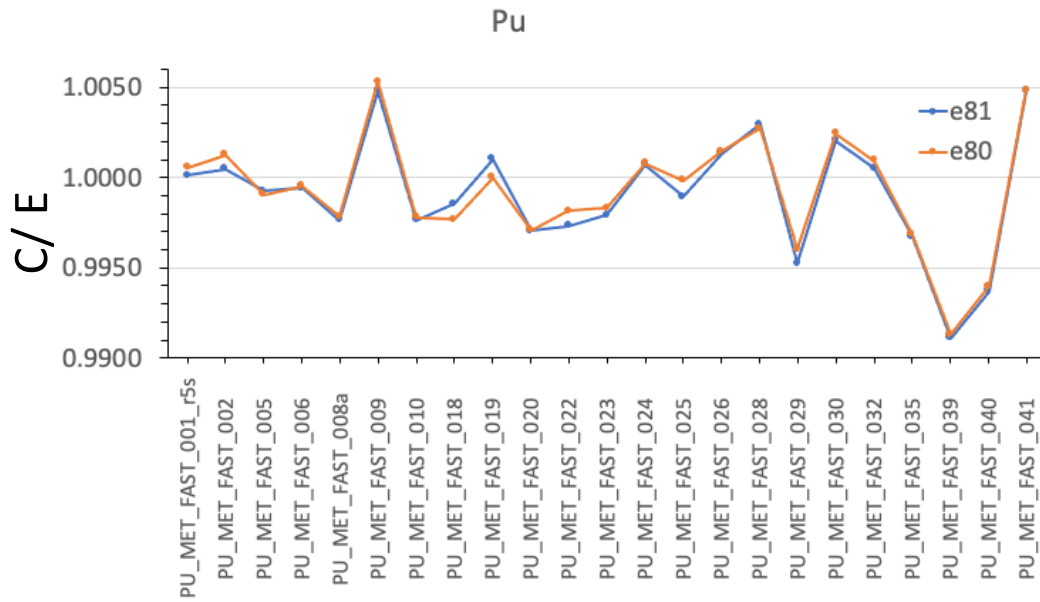
# Criticality: comparison to ENDF/B-VIII.0



# Criticality: comparison to ENDF/B-VIII.0

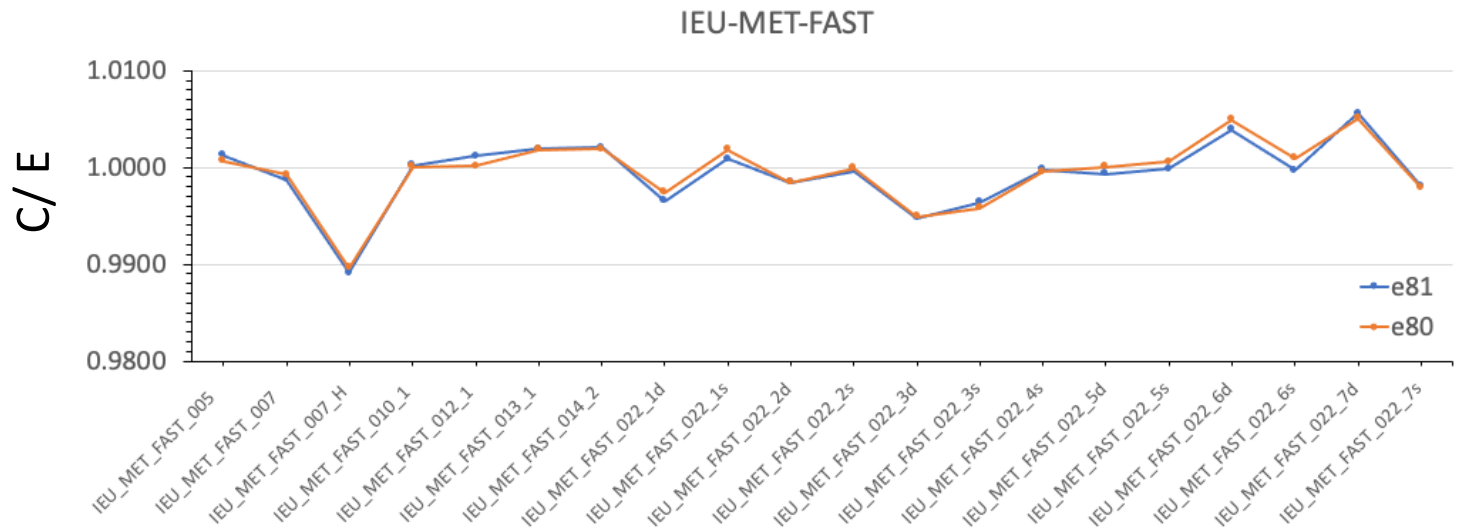
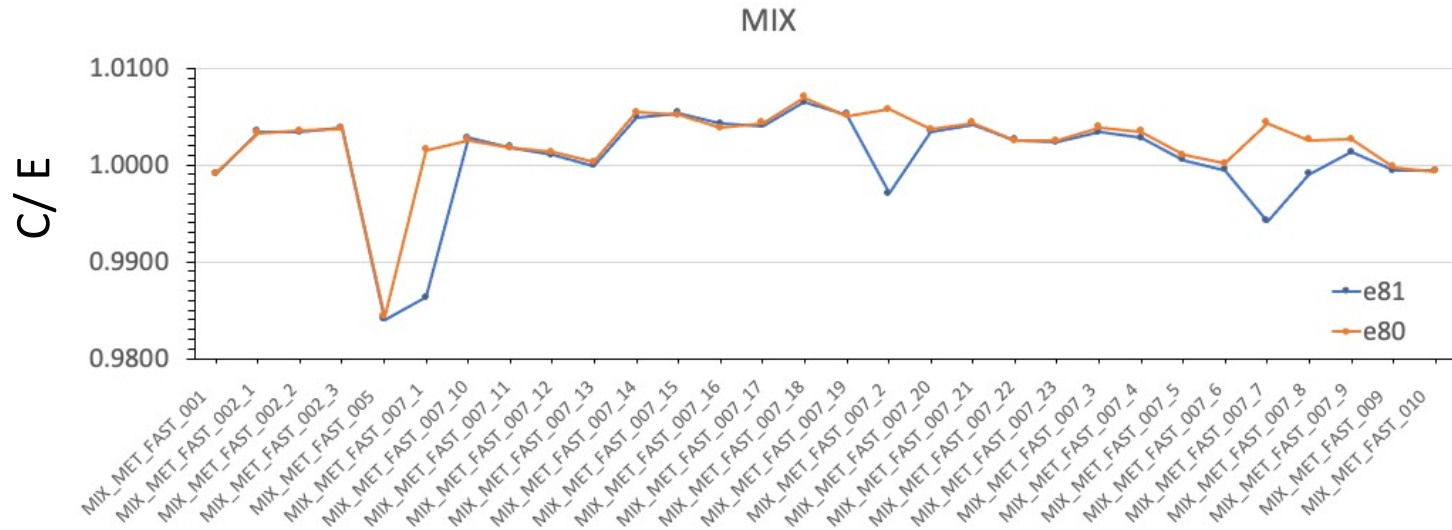


# Criticality: PU, HEU, U233





# Criticality: MIX, IEU



# Fission Ratios

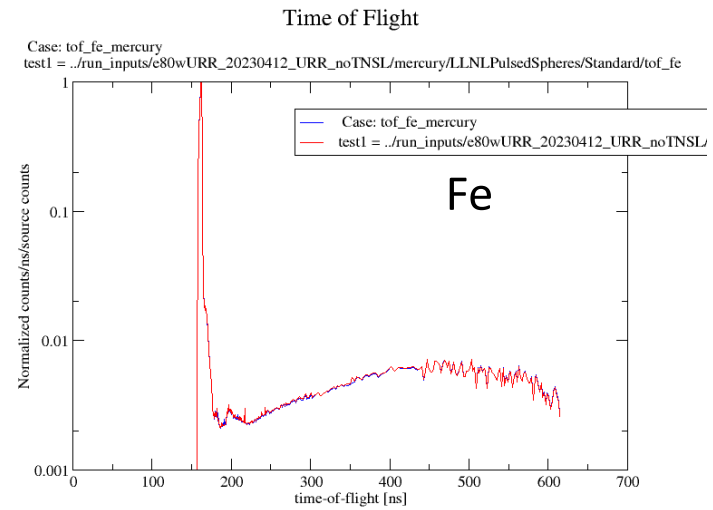
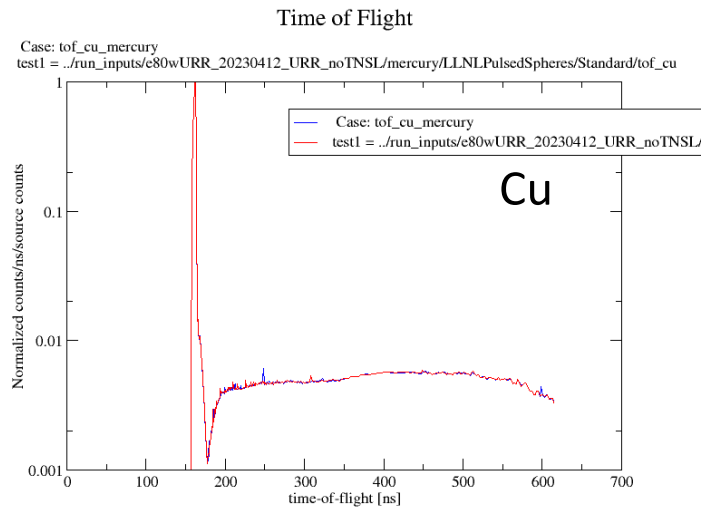
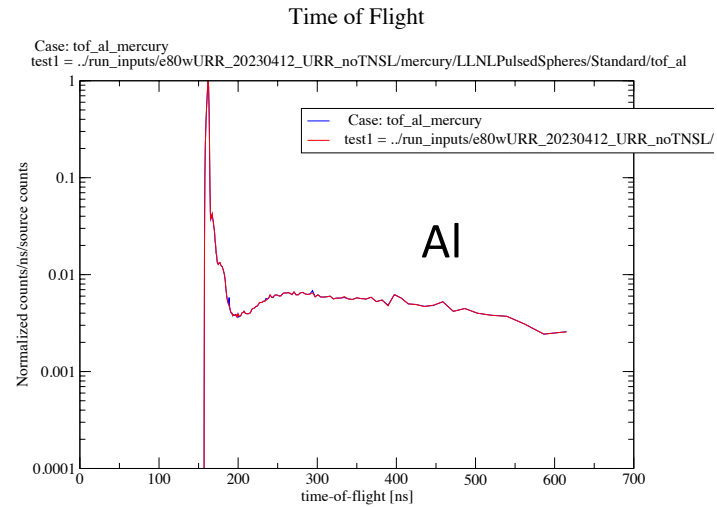
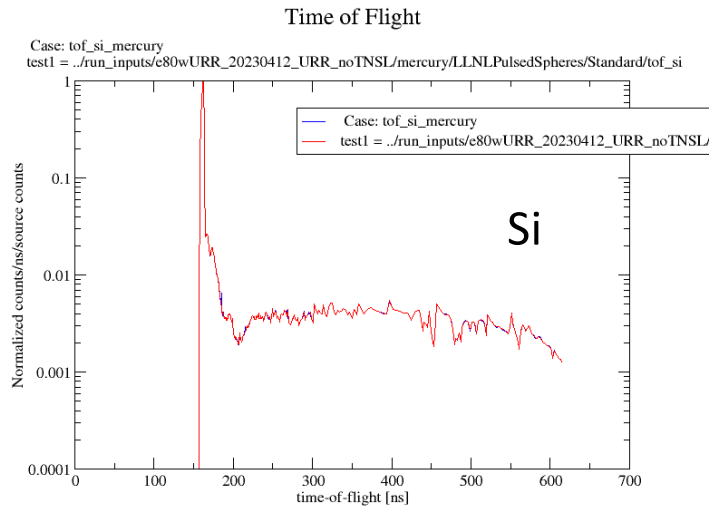
- Mercury/GNDS – MCNP6.2/ACE \* Brown et al. NDS 148 (2018)
- Reaction rates are normalized by  $^{235}\text{U}(n,f)$

Benchmark	Reaction Ratio	$^{238}\text{U}(n,f)$	$^{237}\text{Np}(n,f)$	$^{233}\text{U}(n,f)$	$^{239}\text{Pu}(n,f)$
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
Flatop25	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

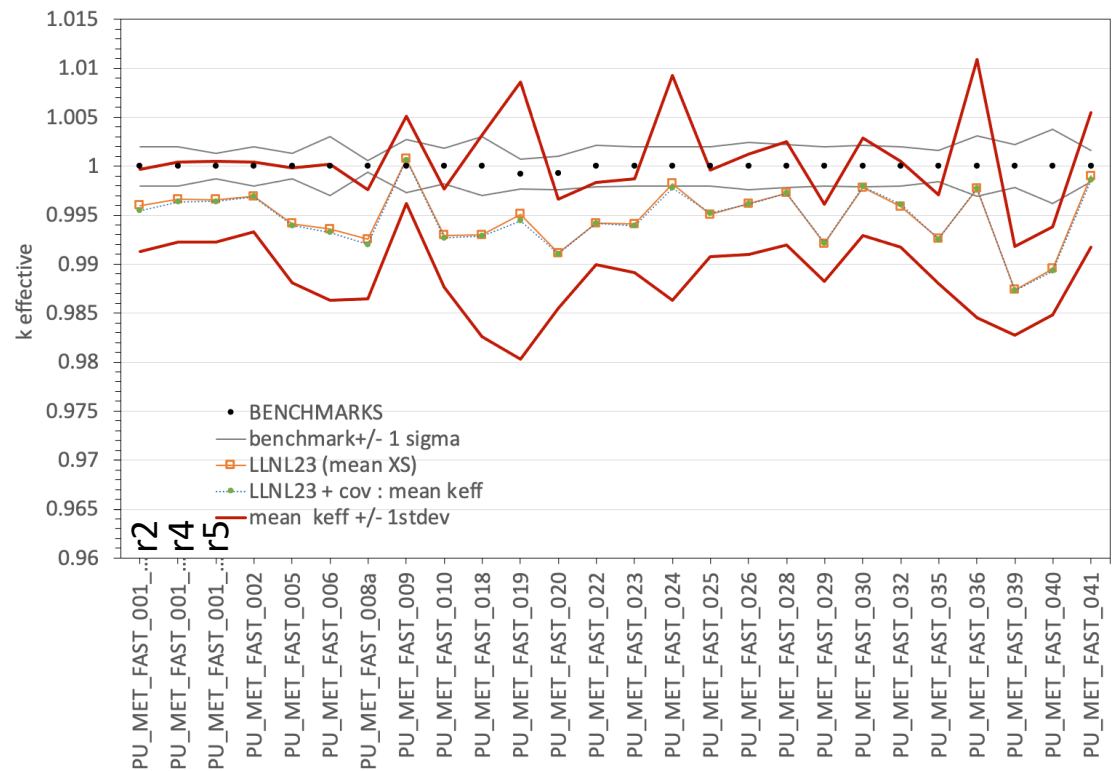
Assembly	Quantity	U238f/U235f	Np237f/U235f	U233f/U235f	Pu239f/U235f
Godiva (HMF001)	Calc	0.1580	0.8301	1.5795	1.3830
	Exp-B	0.1643±0.0018	0.8516±0.012	*	1.4152±0.014
	Exp-A	0.1642±0.0018	0.8370±0.013	1.5900±0.03	1.4020±0.025
	<b>Calc/Exp</b>	<b>0.9614</b>	<b>0.9748</b>	<b>0.9934</b>	<b>0.9772</b>
Jezebel (PMF001)	Calc	0.2110	0.9719	1.5661	1.4246
	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
	<b>Calc/Exp</b>	<b>0.9891</b>	<b>0.9882</b>	<b>0.9925</b>	<b>0.9752</b>
Jezebel-23 (UMF001)	Calc	0.2116	0.9854		
	Exp-B	0.2131±0.0026	0.997±0.015		
	Exp-A	0.2131±0.0023	0.977±0.016		
	<b>Calc/Exp</b>	<b>0.9928</b>	<b>0.9884</b>		
Flatop-25 (HMF028)	Calc	0.1447	0.7728	1.5779	1.3608
	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
	<b>Calc/Exp</b>	<b>0.9700</b>	<b>0.9903</b>	<b>0.9813</b>	<b>0.9828</b>
Flatop-Pu (PMF006)	Calc	0.1780	0.8510		
	Exp-B	0.1799±0.002	0.8561±0.012		
	Exp-A	0.1800±0.003	0.84±0.01		
	<b>Calc/Exp</b>	<b>0.9895</b>	<b>0.9941</b>		
Flatop-23 (UMF006)	Calc	0.1878	0.9007		
	Exp-B	0.1916±0.0021	0.9103±0.013		
	Exp-A	0.1910±0.003	0.8900±0.01		
	<b>Calc/Exp</b>	<b>0.9802</b>	<b>0.9895</b>		

# LLNL pulsed spheres (1mfp)



# First tests of $^{239}\text{Pu}$ EMU-generated covariance matrices

- Fast Pu criticality benchmarks
- LLNL23  $^{239}\text{Pu}$  evaluation (unadjusted)
- LLNL  $^{239}\text{Pu}$  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.1 $\beta$ 1)



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





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