



Validation of the pre-ENDF/B-VII libraries with ANL codes

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Processing tools

- **ETOE2-2: rearrangement of data, MCC²-2 format, screening of resonances, etc.**
- **MCC²-2: group cross sections**
- **VIM (Monte Carlo)**
- **TWODANT (deterministic)**



Results: GODIVA, JEZEBELS

Benchmark	Library	MC ² -2	VIM
GODIVA (HEU-MET-FAST-001)	ENDF/B-V.2	0.99824	0.99800 ± 0.0002
	ENDF/B-VI.5	1.00009	0.99756 ± 0.0007
	ENDF/B-VII	1.00370	1.00104±0.0006
JEZEBEL (PU –MET-FAST-001)	ENDF/B-V.2	0.99922	0.99740 ± 0.0002
	ENDF/B-VI.5	1.00022	0.99840±0.0007
	ENDF/B-VII	1.00438	1.00117±0.0007
JEZEBEL-U233 (U233-MET-FAST-001)	ENDF/B-V.2	0.99337	0.99350 ± 0.0002
	ENDF/B-VI.5	0.99346	0.99324± 0.0002
	ENDF/B-VII	1.00207	1.00085± 0.0002
JEZEBEL-PU240 (PU-MET-FAST-002)	ENDF/B-V.2	1.00051	0.99910 ± 0.0002
	ENDF/B-VI.5	1.00068	0.99854± 0.0002
	ENDF/B-VII	1.00438	1.00097± 0.0003

Results: ZPR

Benchmark	Library	MC2-2 (230 grp)	VIM
ZPR-6/6A (ENDF-202)	ENDF/B-V.2	0.98436	0.98050 ± 0.0003
	ENDF/B-VI.5	0.99883	0.99643 ± 0.0003
	ENDF/B-VII	0.99907	0.99498 ± 0.0004
ZPR-6/7 (ENDF-202)	ENDF/B-V.2	0.98218	0.97860 ± 0.0003
	ENDF/B-VI.5	0.99130	0.99096 ± 0.0002
	ENDF/B-VII	0.98514	0.98465 ± 0.0002

Results: FLATTOPs, THOR, BIGTEN

Benchmark	Library	MC2-2 (230 grp)	VIM
FLATTOP-25 (HEU-MET-FAST-028)	ENDF/B-V.2	1.00550	1.00450 ± 0.0003
	ENDF/B-VI.5	1.00472	1.00259 ± 0.0003
	ENDF/B-VII	1.00579	1.00450 ± 0.0003
FLATTOP-PU (PU-MET-FAST-006)	ENDF/B-V.2	1.00500	1.00330 ± 0.0003
	ENDF/B-VI.5	1.00511	1.00365 ± 0.0003
	ENDF/B-VII	1.00490	1.00267 ± 0.0003
FLATTOP-23 (U233-MET-FAST-001)	ENDF/B-V.2	1.00220	1.00070 ± 0.0003
	ENDF/B-VI.5	-	1.00086 ± 0.0003
	ENDF/B-VII	1.00027	0.99985 ± 0.0003
THOR (PU-MET-FAST-008)	ENDF/B-V.2	1.006630	1.00560 ± 0.0003
	ENDF/B-VI.5	1.00920	1.00710 ± 0.0007
	ENDF/B-VII	1.01270	1.00988 ± 0.0008
BIGTEN (HEU-MET-FAST-007)	ENDF/B-V.2	1.00290	1.00800 ± 0.0003
	ENDF/B-VI.5	1.00520	1.00931 ± 0.0003
	ENDF/B-VII	0.98491	0.99694 ± 0.0003

Results: Differences between calculation and experiment

Benchmark	MCC²-2 vs VIM, pcm		MCC²-2 vs 1 (experiment), pcm		VIM vs 1 (experiment), pcm	
	ENDF6	ENDF7	ENDF6	ENDF7	ENDF6	ENDF7
GODIVA	253.60	267.72	9.00	371.61	-244.60± 70	103.89± 60
JEZEBEL	182.15	319.23	22.00	436.09	-160.16± 70	116.86± 70
JEZEBEL-U233	22.30	121.64	-658.31	206.57	-680.60± 20	84.93± 20
JEZEBEL-PU240	214.17	339.18	67.95	436.09	-146.21± 20	96.91± 30
ZPR-6/6A	241.14	411.45	-117.14	-93.09	-358.28± 30	-504.53± 40
ZPR-6/7	34.61	50.51	-877.64	-1508.42	-912.25± 20	-1558.93± 20
FLATTOP-25	211.45	127.68	469.78	575.67	258.33± 30	447.98± 30
FLATTOP-PU	144.73	221.32	508.40	487.61	363.67± 30	266.29± 30
FLATTOP-23	-	41.99	-	26.99	85.93± 30	-15.00± 30
THOR	206.62	275.74	911.61	1254.07	704.99± 70	978.33± 80
BIGTEN	-405.10	-382.79	517.31	-689.72	922.41± 30	-306.94± 30

Other benchmarks

- Other, less ‘popular’ benchmarks with non-negligible absorption in structure, Be or Pb materials (J. B. Briggs)

Structure materials benchmarks

Benchmark	Absorption, %			ENDF5	ENDF5 (actinides) + ENDF6(structure)	ENDF6	ENDF7
	Fe	Ni	Cr				
PU-MET-INTER-002 (ZPR-6/10)	7.7	3.3	2.6	0.9862	1.0256	1.0424	1.0401
HEU-MET-INTER-001 (ZPR-9/34)	12.8	0.6	0.8	0.9883	1.0024	1.0056	1.0063
HEU-COMP-INTER-005 (KBR-7)	1.4	0.5	39.1	0.9571	0.9971	0.9912	0.9894
HEU-COMP-INTER-005 (KBR-9)	18.8	7.2	6.7	0.9822	1.0386	1.0474	1.0444
HEU-COMP-INTER-005 (KBR-15)	2.9	32.3	1.0	0.8713	1.1099	1.1103	1.1047

Other benchmarks

Pb benchmarks

Benchmark	ENDF5	ENDF5 (actinides) + ENDF6 (lead)	ENDF6	ENDF7
HEU-MET-FAST-057 (sphere 1)	1.0080	1.0024	1.0022	1.0065
HEU-MET-FAST-057 (cylinder 5)	1.0346	1.0410	1.0295	1.0323

Be benchmarks

Benchmark	ENDF5	ENDF6	ENDF7
HEU-MET-FAST-017 (VNIITF ROMB)	1.0043	1.0094	1.0126
HEU-MET-FAST-058 (NIMBUS)	1.0085	1.0121	1.0145

Conclusions

- **We do not see many differences between VIM and MCC²-2 results when switched to pre-ENDFB/VII**
- **Structure, Be, Pb cross sections?**

