Data Testing for ENDF/B-VII.1beta2

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Abstract
Calculations have been performed for 395 critical assemblies from the International Handbook of Evaluated Criticality Safety Benchmark Experiments using the beta2 release of ENDF/B-VII.1. The results are compared to previous results for ENDF/B-VII. Cases that changed significantly between the two versions are highlighted, and the results are discussed.

Introduction

The Cross Section Evaluation Working Group (CSEWG) is working on a new release of the ENDF/B-VII library of evaluated nuclear data, and the "beta2" set of files was recently made available by the National Nuclear Data Center (NNDC). A set of about 850 input files for the MCNP Monte Carlo code to run critical assemblies from the International Handbook of Evaluated Criticality Safety Benchmark Experiments was available from our previous data testing work for ENDF/B-VII.0. We have now run 395 of those cases using data based on the beta2 files, and those results will be presented below.

The ENDF files were downloaded from the NNDC to a Mac workstation. They were then processed using NJOY10 into ACE format files for use in the MCNP Monte Carlo code. The processing was limited to materials needed for the data testing work at this point. The existing MCNP input decks were used. No checking was done to see if any of the benchmarks had been updated since the ENDF/B-VII testing was finished. Most runs used 50 million histories in order to get Monte Carlo statistical uncertainties down the 0.01% range.

Comparisons

The following list shows the calculated k-eff values for each case using ENDF/B-VII and ENDF/B-VII.1beta2. The model k-eff value and its assigned uncertainty are also shown. For the ENDF/B-VII.1 results, we have calculated the C/E ratio to demonstrate the quality of the agreement between calculation and experiment. For the MCNP values, we have put the statistical uncertainty in the last two digits in parenthesis. That is, a value quoted as 1.00000(20) would have an uncertainly of .00020. The same method is used to give the uncertainties in the model values.

The assembly names are condensed. For example, HMF stands for High-Enriched Metal Fast. The "Info" column gives a short explanation of the main characteristics of each assembly.

Assembly	Model-k	VII-k	VII.1-k	.1 C/E	Info
--fast HEU cases					
HMF001-2	1.0000(10)	0.99970(11)	0.99978(11)	0.99978	Godiva
HMF002-2	1.0000(30)	1.00236(09)	1.00202(09)	1.00202	NU refl (Topsy)
-3	1.0000(30)	1.00046(09)	1.00044(09)	1.00044	NU refl
-4	1.0000(30)	0.99976(09)	0.99974(09)	0.99974	NU refl
-5	1.0000(30)	0.99999(09)	1.00004(09)	1.00004	NU refl
HMF003-01	1.0000(50)	0.99505(10)	0.99489(10)	0.99489	NU (2in) refl
-02	1.0000(50)	0.99439(10)	0.99455(10)	0.99455	NU (3in) refl
-03	1.0000(50)	0.99931(10)	0.99913(10)	0.99913	NU (4in) refl
-04	1.0000(30)	0.99749(10)	0.99723(10)	0.99723	NU (5in) refl
-05	1.0000(30)	1.00123(11)	1.00165(11)	1.00165	NU (7in) refl
-06	1.0000(30)	1.00174(11)	1.00166(11)	1.00166	NU (8in) refl
-07	1.0000(30)	1.00226(10)	1.00210(11)	1.00210	NU (11in) refl
HMF003-08	1.0000(50)	1.00838(11)	1.00134(10)	1.00134	WC (1.9in) refl
-09	1.0000(50)	1.00919(11)	1.00161(10)	1.00161	WC (2.9in) refl
-10	1.0000(50)	1.01283(11)	1.00525(11)	1.00525	WC (4.5in) refl
-11	1.0000(50)	1.01685(10)	1.01000(11)	1.01000	WC (6.5in) refl
HMF003-12	1.0000(50)	1.00866(11)	1.00746(10)	1.00747	Ni (8in) refl
HMF004	0.9985	1.00024(09)	1.00077(09)	1.00227	water refl
HMF007-01	0.9950(24)	0.99318(09)	0.99308(09)	0.99807	Poly moderator
-02	0.9964(14)	0.99883(07)	0.99865(07)	1.00226	"
-03	0.9990(13)	1.00002(07)	1.00014(07)	1.00114	"
HMF008	0.9989(16)	0.99589(10)	0.99560(10)	0.99670	bare
HMF009-1	0.9992(15)	0.99514(13)	0.99750(13)	0.99830	Be refl
HMF009-2	0.9992(15)	0.99538(11)	0.99695(11)	0.99775	BeO refl
HMF010-1	0.9992(15)	0.99688(11)	0.99841(10)	0.99921	B+Be refl
-2	0.9992(15)	0.99741(11)	0.99788(11)	0.99868	B+BeO refl
HMF011	0.9989(15)	0.99913(11)	0.99911(11)	1.00021	Poly refl
HMF012	0.9992(18)	0.99840(13)	0.99824(12)	0.99904	Al refl
HMF013	0.9990(15)	0.99757(10)	0.99760(10)	0.99860	Steel refl
HMF014	0.9989(17)	0.99760(10)	0.99769(10)	0.99879	DU refl
HMF015	0.9996(17)	0.99466(10)	0.99466(09)	0.99506	bare

HMF016-1	0.9996(17)	0.99880(11)	1.00162(11)	1.00202	Be refl
HMF016-2	0.9996(18)	1.00134(11)	1.00289(11)	1.00329	BeO refl
HMF017	0.9993(14)	0.99715(11)	1.00051(11)	1.00121	Be refl and moderator
HMF018	1.0000(14)	1.00053(10)	1.00016(10)	1.00016	bare
HMF019	1.0000(28)	1.00698(10)	1.00727(10)	1.00727	Graphite refl
HMF020	1.0000(28)	1.00106(11)	1.00090(11)	1.00090	Poly refl
HMF021	1.0000(24)	0.99754(10)	0.99729(10)	0.99729	Steel refl
HMF022	1.0000(19)	0.99759(10)	0.99744(10)	0.99744	Al refl
HMF024	0.9990(15)	0.99882(12)	0.99871(12)	0.99910	Poly & steel refl
HMF027	1.0000(25)	1.00079(10)	1.00069(10)	1.00069	Pb refl
HMF028	1.0000(30)	1.00277(10)	1.00290(10)	1.00290	NU refl (Flattop-25)
HMF029	1.0000(20)	1.00579(10)	1.00576(10)	1.00576	DU (4.7cm) refl
HMF030	1.0000(09)	0.99931(11)	1.00191(11)	1.00191	DU refl, Be moderator
HMF031	1.0000(59)	1.00490(13)	1.00497(13)	1.00497	Poly refl and mod
HMF032-1	1.0000(16)	1.00436(11)	1.00408(10)	1.00408	NU (9.98cm) refl
-2	1.0000(27)	1.00485(11)	1.00479(10)	1.00479	" (8.94cm)
-3	1.0000(17)	1.00003(10)	1.00030(10)	1.00030	" (4.42cm)
-4	1.0000(17)	1.00088(10)	1.00086(10)	1.00086	" (1.73cm)
HMF033-1	0.9991(14)	0.99907(11)	0.99903(11)	0.99993	Poly & steel
HMF033-2	0.9991(14)	0.99747(12)	0.99740(12)	0.99830	Poly & steel
HMF034-1	0.9990(12)	0.99958(11)	0.99705(11)	0.99805	Poly & Ti
-2	0.9990(12)	0.99866(11)	0.99861(11)	0.99961	Poly & Al
-3	0.9990(12)	0.99749(11)	0.99751(11)	0.99851	Poly & steel
HMF036-1	0.9993(15)	0.99887(11)	0.99907(11)	0.99977	Poly & DU
-2	0.9993(13)	0.99836(10)	0.99847(10)	0.99917	"
HMF037-1	0.9997(11)	1.00238(11)	1.00234(11)	1.00264	Poly & DU
HMF038-1	0.9999(07)	1.00032(10)	1.00289(10)	1.00299	DU refl, Be mod
-2	0.9999(09)	1.00046(10)	1.00160(10)	1.00170	DU refl, BeO mod
HMF041-3	1.0006(29)	1.00259(09)	1.00252(09)	1.00192	Graphite refl
-4	1.0006(25)	1.00713(09)	1.00706(09)	1.00646	"
-5	1.0006(31)	1.00287(10)	1.00298(10)	1.00238	"
-6	1.0006(45)	1.00440(10)	1.00430(10)	1.00370	"
HMF047s	1.0007(37)	1.00166(11)	1.00213(11)	1.00143	Zeus/Nb-Zr/poly, bare
HMF051-01	0.9971(05)	0.99538(10)	0.99544(10)	0.99834	bare
HMF055s	0.9955(28)	0.99876(10)	0.99832(10)	1.00283	U-Al/U (ZPR3-23 simp)
HMF057-1	1.0000(20)	0.98992(10)	0.98984(10)	0.98984	Pb refl
HMF058-1	1.0000(26)	0.99976(11)	1.00474(11)	1.00474	Be refl 20.3cm
-2	1.0000(35)	1.00003(10)	1.00498(10)	1.00498	" (9.27cm)
-3	1.0000(27)	0.99838(10)	1.00284(10)	1.00284	" (5.44cm)
-4	1.0000(21)	0.99844(09)	1.00186(09)	1.00186	" (3.26cm)
-5	1.0000(29)	0.99825(09)	1.00091(09)	1.00091	" (2.22cm)
HMF060s	0.9955(24)	1.01563(11)	1.00268(11)	1.00721	U/W-Al ZPR-9/4
HMF061s	0.9998(25)	1.00618(12)	1.00502(11)	1.00956	U/graphite (ZPPR-21f)
HMF064-1	0.9996(08)	0.99525(11)	0.99507(10)	0.99547	Pb refl
HMF065	0.9995(13)	0.99804(10)	0.99797(10)	0.99847	bare
HMF066-1	1.0030(33)	0.99810(12)	1.00355(12)	1.00055	Be refl
-2	1.0023(29)	0.99656(11)	1.00163(12)	0.99933	"
-3	1.0023(26)	1.00012(11)	1.00444(11)	1.00214	"
-4	1.0043(43)	0.99935(13)	1.00521(13)	1.00091	"
-5	1.0030(33)	0.99841(12)	1.00418(12)	1.00118	"
-6	1.0028(30)	0.99793(12)	1.00339(11)	1.00039	"
-7	1.0048(39)	0.99921(12)	1.00537(12)	1.00057	"
-8	1.0039(40)	0.99856(13)	1.00458(13)	1.00158	"
-9	1.0027(36)	0.99654(12)	1.00257(12)	0.99987	"
-av(sd)				1.00072(85)	was 0.99509
HMF067-1s	0.9959(24)	1.00936(11)	1.00291(11)	1.00704	W-C-Al/Al (ZPR-9/5s)
HMF073	1.0004(16)	1.01148(14)	1.01134(14)	1.09094	Cu refl (Zeus
HMF077-1	1.0001(31)	0.99529(12)	1.00028(12)	1.00018	Be refl
-2	0.9995(27)	0.99579(10)	1.00068(10)	1.00118	"
-3	0.9995(40)	0.99289(11)	0.99821(11)	0.99871	"
-4	0.9998(32)	0.99312(10)	0.99862(10)	0.99882	"

-5	0.9994(27)	0.99487(10)	0.99976(10)	1.00036	"
-6	0.9996(33)	0.99418(10)	0.99976(10)	1.00016	"
-7	0.9994(56)	0.99583(09)	1.00059(10)	1.00119	"
-8	0.9994(35)	0.99256(10)	0.99850(10)	0.99910	"
-av(sd)				0.99996(99)	was 0.99464
HMF078-01	0.9995(18)	0.99460(11)	0.99468(11)	0.99518	15" cyl, H2O refl
HMF079-1	0.9996(15)	1.00119(09)	0.99990(09)	1.00030	Ti refl
-2	0.9996(14)	1.00125(09)	0.99916(09)	0.99956	"
-3	0.9996(15)	1.00336(09)	1.00018(09)	1.00058	"
-4	0.9996(14)	1.00497(09)	1.00074(09)	1.00114	"
-5	0.9996(15)	1.00422(09)	0.99980(09)	1.00020	"
-av(sd)				1.00036(57)	was 1.00311
HMM001	0.9995(13)	1.00493(23)	1.00210(24)	1.00260	Ti/poly
HMM015	0.9996(08)	0.99934(25)	0.99725(26)	0.99765	Ti/poly
--fast Pu cases					
PMF001	1.0000(20)	1.00006(10)	0.99985(10)	0.99985	Jezebel
PMF002	1.0000(20)	1.00011(11)	0.99995(12)	0.99995	Jezebel-240
PMF005	1.0000(13)	1.00947(10)	1.00067(10)	1.00067	W refl
PMF006	1.0000(30)	1.00105(10)	1.00097(10)	1.00097	NU refl (Flattop)
PMF008c	1.0000(06)	0.99795(11)	0.99766(10)	0.99766	Th refl (cyl Thor)
PMF008s	1.0000(06)	0.99848(09)	0.99837(09)	0.99837	spherical Thor
PMF009	1.0000(27)	1.00498(10)	1.00510(10)	1.00510	Al refl
PMF010	1.0000(18)	0.99947(11)	0.99943(11)	0.99943	NU refl
PMF011	1.0000(18)	1.00021(11)	1.00092(11)	1.00092	water refl
PMF018	1.0000(30)	0.99639(11)	0.99933(11)	0.99933	Be refl
PMF019	0.9992(15)	0.99807(11)	1.00096(11)	1.00176	Be refl
PMF020	0.9993(17)	0.99806(10)	0.99800(10)	0.99870	DU refl
PMF021-1	1.0000(26)	0.99161(11)	0.99329(11)	0.99259	Be refl
PMF021-2	1.0000(26)	0.99284(09)	0.99389(09)	0.99389	BeO refl
PMF022	1.0000(21)	0.99846(10)	0.99877(25)	0.99877	bare
PMF023	1.0000(23)	0.99994(10)	0.99985(10)	0.99985	Graphite refl
PMF024	1.0000(20)	1.00168(11)	1.00185(11)	1.00185	Poly refl
PMF025	1.0000(20)	0.99873(10)	0.99888(10)	0.99888	Steel refl
PMF026	1.0000(24)	0.99875(10)	0.99858(10)	0.99858	Steel refl
PMF027	1.0000(22)	1.00306(13)	1.00319(13)	1.00319	Poly refl
PMF028	1.0000(22)	0.99900(10)	0.99890(11)	0.99890	Steel refl
PMF029	1.0000(20)	0.99566(09)	0.99546(10)	0.99546	bare
PMF030	1.0000(21)	1.00293(10)	1.00283(10)	1.00283	Graphite refl
PMF031	1.0000(21)	1.00444(12)	1.00454(12)	1.00454	Poly refl
PMF032	1.0000(20)	0.99871(10)	0.99874(10)	0.99874	Steel refl
PMF033s	0.9967(26)	0.99843(14)	0.99681(14)	1.00011	Pu/grph (ZPPR-21A si)
PMF035	1.0000(16)	0.99773(10)	0.99780(08)	0.99780	Pb refl
--fast mixed HEU and Pu cases					
MMF001	1.0000(16)	0.99955(10)	0.99943(10)	0.99943	Pu/HEU
MMF003	0.9993(16)	1.00063(09)	1.00051(09)	1.00133	Pu/HEU
MMF007-01	1.0000(45)	1.00033(11)	1.00420(11)	1.00420	Pu/HEU with Be refl
-02	1.0000(23)	1.00479(11)	1.00840(11)	1.00840	" (16.2 cm)
-03	1.0000(28)	1.00272(10)	1.00654(10)	1.00654	" (8.67 cm)
-04	1.0000(28)	1.00206(10)	1.00544(10)	1.00544	" (5.60 cm)
-05	1.0000(32)	1.00042(09)	1.00271(09)	1.00271	" (3.37 cm)
-06	1.0000(35)	0.99986(09)	1.00157(09)	1.00157	" (1.36 cm)
-07	1.0000(32)	1.00337(11)	1.00684(11)	1.00684	" (17.3 cm)
-08	1.0000(30)	1.00170(11)	1.00556(11)	1.00556	" (13.2 cm)
-09	1.0000(28)	1.00199(11)	1.00555(10)	1.00555	" (10.8 cm)
-10	1.0000(27)	1.00192(10)	1.00512(10)	1.00512	" (6.10 cm)
-11	1.0000(26)	1.00076(09)	1.00375(10)	1.00375	" (3.88 cm)
-12	1.0000(30)	1.00101(09)	1.00296(09)	1.00296	" (1.77 cm)
-13	1.0000(33)	1.00039(09)	1.00107(09)	1.00107	" (0.67 cm)
-14	1.0000(32)	1.00487(10)	1.00832(10)	1.00832	" (10.2 cm)
MMF009	1.0000(10)	1.00035(10)	1.00037(09)	1.00037	Pu/HEU
MMF010	1.0000(09)	0.99987(10)	1.00002(10)	1.00002	Pu/HEU

MMF013s	0.9999(26)	1.00058(09)	1.00073(09)	1.00083	Pu core, HEU shells
--fast U233 cases					
UMF001	1.0000(10)	0.99970(11)	0.99975(12)	0.99975	Jezebel23
UMF004-1	1.0000(07)	1.00483(11)	0.99890(11)	0.99890	W refl
UMF004-2	1.0000(08)	1.00508(11)	0.99603(11)	0.99603	W refl
UMF005-1	1.0000(30)	0.99441(11)	0.99645(11)	0.99645	Be refl
UMF005-2	1.0000(30)	0.99244(11)	0.99576(11)	0.99576	Be refl
UMF006	1.0000(14)	0.99937(09)	0.99917(10)	0.99917	NU refl (Flattop)
--softer fast cases					
IMF007s	1.0045(07)	1.00445(10)	1.00440(10)	0.99990	(Bigten, simplified)
IMF007h	0.9948(13)	0.99485(07)	0.99502(07)	1.00022	Bigten-2d
IMF010s	0.9954(24)	0.99647(10)	0.99622(09)	1.00082	U9 (ZPR-6/9 simp)
IMF012s	1.0007(27)	1.00348(10)	1.00301(10)	1.00231	U16 (ZPR-3/41 simp)
IMF013s	0.9941(23)	0.99721(10)	0.99725(10)	1.00317	U11/Al (ZPR-9/1 simp)
ICF001s	0.9939(23)	0.99319(10)	0.98975(10)	0.99582	U/U (ZPR6-6A)
MCF001s	0.9866(23)	0.98781(10)	0.98563(10)	0.99902	Pu/U (ZPR6-7)
--intermediate cases					
HMI001s	0.9966(26)	1.00802(13)	1.00135(13)	1.00477	U/Fe (ZPR-9/34 simp)
PMI002d	1.0016(13)	1.02699(15)	1.01551(14)	1.01389	Pu/C/SSt (ZPR-6/10)
HMI006-1	0.9977(08)	0.99295(11)	0.99316(11)	0.99545	U/graph/Cu (Zeus)
-2	1.0001(08)	0.99712(10)	0.99697(11)	0.99687	"
-3	1.0015(08)	1.00082(11)	1.00079(11)	0.99929	"
-4	1.0016(08)	1.00737(10)	1.00721(10)	1.00560	"
USI001-01	1.0000(83)	0.98457(15)	0.98640(15)	0.98640	U233/Be refl
-02	1.0000(85)	0.98014(15)	0.98227(15)	0.98227	"
-03	1.0000(66)	0.98143(16)	0.98327(16)	0.98327	"
-05	1.0000(82)	0.98480(16)	0.98661(16)	0.98661	"
-av(sd)				0.98464(220) was 0.98274	
USI001-08	1.0000(56)	0.98195(15)	0.98365(15)	0.98365	U233/Poly refl
-16	1.0000(28)	0.98186(15)	0.98280(15)	0.98280	"
-20	1.0000(56)	0.98099(16)	0.98250(16)	0.98250	"
-23	1.0000(47)	0.99051(17)	0.99260(17)	0.99260	"
--HEU thermal cases					
HST001-01	1.0004(60)	0.99829(10)	0.99860(11)	0.99820	HEU/water solutions
-02	1.0021(72)	0.99588(11)	0.99633(11)	0.99424	
-03	1.0003(35)	1.00139(11)	1.00233(10)	1.00203	
-04	1.0008(53)	0.99831(11)	0.99898(11)	0.99818	
-05	1.0001(49)	0.99850(09)	0.99920(09)	0.99910	
-06	1.0002(46)	1.00214(09)	1.00237(09)	1.00217	
-07	1.0008(40)	0.99796(10)	0.99865(10)	0.99785	
-08	0.9998(38)	0.99790(11)	0.99866(10)	0.99886	
-av(sd)				0.99883(252) was 0.99858	
HST006-01	0.9973(50)	0.98258(14)	0.98249(15)	0.98515	
-02	0.9986(54)	0.98686(14)	0.98684(14)	0.98822	
-03	1.0000(65)	0.99850(13)	0.99840(13)	0.99840	
-04	1.0000(78)	1.00097(13)	1.00060(12)	1.00060	
-05	1.0000(91)	1.00790(12)	1.00756(12)	1.00756	
-06	1.0000(87)	0.99927(12)	0.99873(11)	0.99873	
-07	1.0000(88)	1.00075(11)	1.00059(11)	1.00059	
-08	0.9973(50)	0.98178(14)	0.98188(14)	0.98454	
-09	0.9986(54)	0.98652(13)	0.98641(13)	0.98779	
-10	1.0000(65)	0.99785(13)	0.99788(13)	0.99788	
-11	1.0000(88)	1.00096(11)	1.00062(11)	1.00062	
-12	0.9973(50)	0.98122(15)	0.98133(14)	0.98399	
-13	0.9986(54)	0.98505(13)	0.98477(14)	0.98615	
-14	1.0000(78)	0.99924(12)	0.99910(12)	0.99910	
-15	1.0000(91)	1.00681(12)	1.00670(12)	1.00670	
-16	1.0000(87)	0.99914(11)	0.99844(11)	0.99844	
-17	1.0000(88)	1.00089(11)	1.00038(11)	1.00038	
-18	1.0000(78)	0.99957(13)	0.99943(11)	0.99943	
-19	1.0000(91)	1.00747(12)	1.00717(12)	1.00717	

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      -20  1.0000(87)  0.99896(11)  0.99877(12)  0.99877
      -21  1.0000(88)  1.00089(11)  1.00054(11)  1.00054
      -22  1.0000(65)  0.99881(13)  0.99878(13)  0.99878
      -23  1.0000(78)  1.00087(13)  1.00071(12)  1.00071
      -24  1.0000(91)  1.00791(12)  1.00764(11)  1.00764
      -av(sd)                                   0.99741(741) was 0.99762
HST009-1   0.9990(43)  1.00208(14)  1.00351(14)  1.00451
      -2   1.0000(39)  1.00251(13)  1.00370(13)  1.00370
      -3   1.0000(36)  1.00191(14)  1.00307(14)  1.00307
      -4   0.9986(35)  0.99635(14)  0.99704(13)  0.99844
      -av(sd)                                   1.00243(272) was 1.00131
HST010-1   1.0000(29)  1.00122(13)  1.00169(13)  1.00169
HST011-1   1.0000(23)  1.00475(12)  1.00517(11)  1.00517
HST011-2   1.0000(23)  1.00069(11)  1.00122(11)  1.00122
HST012     0.9999(58)  1.00075(08)  1.00094(08)  1.00104
HST032     1.0015(26)  0.99945(05)  0.99901(05)  0.99751
HST042-01  0.9957(39)  0.99667(09)  0.99657(09)  1.00087
      -02  0.9965(36)  0.99678(09)  0.99638(09)  0.99988
      -03  0.9994(28)  1.00080(08)  1.00009(07)  1.00069
      -04  1.0000(34)  1.00234(05)  1.00168(05)  1.00168
      -05  1.0000(34)  1.00019(04)  0.99949(04)  0.99949
      -06  1.0000(37)  1.00076(04)  0.99986(05)  0.99986
      -07  1.0000(36)  1.00143(04)  1.00072(04)  1.00072
      -08  1.0000(35)  1.00219(03)  1.00146(03)  1.00146
      -av(sd)                                   1.00058(78) was 1.00083
HST043-1   0.9986(31)  0.99509(15)  0.99518(14)  0.99658
      -2   0.9995(26)  1.00548(10)  1.00557(09)  1.00607
      -3   0.9990(25)  1.00101(08)  1.00106(08)  1.00206
HST050-01  0.9953(86)  1.00764(15)  1.00890(15)  1.01366
      -02  0.9987(83)  1.00290(15)  1.00428(15)  1.00559
      -03  0.9984(79)  1.00473(15)  1.00665(15)  1.00826
      -04  0.9987(84)  1.00442(15)  1.00570(15)  1.00701
      -05  0.9985(85)  1.00111(15)  1.00201(15)  1.00352
      -06  0.9985(81)  1.00897(15)  1.01060(15)  1.01212
      -07  0.9978(78)  0.99811(15)  0.99964(15)  1.00184
      -08  0.9975(84)  0.99765(15)  0.99935(15)  1.00185
      -09  0.9966(82)  0.99693(14)  0.99898(15)  1.00239
      -10  0.9960(90)  0.98044(15)  0.98126(15)  0.98520
      -11  0.9964(89)  0.99135(15)  0.99227(15)  0.99586
      -av                                       1.00339(79) was 1.00199
--LEU thermal lattice cases
LCT001-1   0.9998(31)  0.99959(09)  0.99955(09)  0.99975  UO2/waterr lattice
      -2   0.9998(31)  0.99886(09)  0.99884(09)  0.99904
      -3   0.9998(31)  0.99856(09)  0.99842(09)  0.99862
      -4   0.9998(31)  0.99917(09)  0.99911(09)  0.99931
      -5   0.9998(30)  0.99685(09)  0.99677(09)  0.99697
      -6   0.9998(30)  0.99874(09)  0.99848(09)  0.99868
      -7   0.9998(30)  0.99821(09)  0.99791(09)  0.99811
      -8   0.9998(30)  0.99721(09)  0.99699(09)  0.99719
      -av(sd)                                   0.99846(98) vs 0.99860
LCT006-01  1.0000(20)  0.99995(10)  0.99990(10)  0.99990  UO2/water lattice
      -02  1.0000(20)  1.00052(10)  1.00051(10)  1.00051
      -03  1.0000(20)  1.00036(10)  1.00021(10)  1.00021
      -04  1.0000(20)  0.99988(10)  0.99971(10)  0.99971
      -05  1.0000(20)  0.99979(10)  0.99941(10)  0.99941
      -06  1.0000(20)  1.00033(10)  1.00028(10)  1.00028
      -07  1.0000(20)  1.00013(10)  0.99999(10)  0.99999
      -08  1.0000(20)  1.00033(10)  0.99991(10)  0.99991
      -09  1.0000(20)  0.99993(10)  0.99979(10)  0.99979
      -10  1.0000(20)  0.99991(10)  0.99980(10)  0.99980
      -11  1.0000(20)  1.00008(10)  1.00012(10)  1.00012
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      -12  1.0000(20)  0.99992(10)  0.99953(10)  0.99953
      -13  1.0000(20)  0.99964(10)  0.99939(14)  0.99939
      -14  1.0000(20)  0.99985(10)  0.99952(10)  0.99952
      -15  1.0000(20)  0.99973(10)  0.99966(10)  0.99966
      -16  1.0000(20)  0.99958(10)  0.99969(10)  0.99969
      -17  1.0000(20)  0.99946(10)  0.99932(10)  0.99932
      -18  1.0000(20)  0.99969(10)  0.99945(07)  0.99945
      -av(sd)                                   0.99979(34) was 0.99993
LCT007-1   1.0000(16)  0.99889(11)  0.99899(11)  0.99899  Valduc lattice
      -2   1.0000(16)  0.99980(11)  0.99994(11)  0.99994
      -3   1.0000(16)  0.99867(10)  0.99876(10)  0.99876
      -4   1.0000(16)  0.99891(09)  0.99895(09)  0.99895
      -5   1.0000(16)  0.99780(11)  0.99786(11)  0.99786
      -6   1.0000(16)  0.99920(11)  0.99934(11)  0.99934
      -7   1.0000(16)  0.99831(12)  0.99799(11)  0.99799
      -8   1.0000(16)  0.99837(12)  0.99861(11)  0.99861
      -av(sd)                                   0.99881(68) vs 0.99874
LCT039-01  1.0000(14)  0.99784(11)  0.99808(11)  0.99808  Valduc lattice
      -02  1.0000(14)  0.99922(11)  0.99928(11)  0.99928
      -03  1.0000(14)  0.99857(11)  0.99851(11)  0.99851
      -04  1.0000(14)  0.99782(11)  0.99776(11)  0.99776
      -av                                       0.99841(66) was 0.99836
--LEU thermal cases
LST007-1   0.9961(09)  0.99479(10)  0.99490(10)  0.99880  LEU/water solutions
      -2   0.9973(09)  0.99727(09)  0.99687(09)  0.99957
      -3   0.9985(10)  0.99583(09)  0.99595(09)  0.99745
      -4   0.9988(11)  0.99864(09)  0.99843(09)  0.99963
LST020-1   0.9995(10)  0.99983(08)  0.99948(08)  0.99998
      -2   0.9996(10)  0.99961(08)  0.99909(08)  0.99949
      -3   0.9997(12)  0.99880(07)  0.99844(07)  0.99874
      -4   0.9998(09)  1.00009(07)  0.99972(07)  0.99992
LST021-1   0.9983(09)  0.99776(09)  0.99739(09)  0.99909
      -2   0.9985(10)  0.99822(08)  0.99801(09)  0.99942
      -3   0.9989(11)  0.99757(08)  0.99705(07)  0.99814
      -4   0.9993(12)  0.99959(07)  0.99903(07)  0.99973
LST7,20,21 av(sd)                               0.99916(76) vs 0.99995
--Pu thermal cases
PST004-01  1.0000(47)  1.00389(11)  1.00444(11)  1.00444
      -02  1.0000(47)  0.99868(11)  0.99920(11)  0.99920
      -03  1.0000(47)  1.00100(11)  1.00136(11)  1.00136
      -04  1.0000(47)  0.99878(11)  0.99930(11)  0.99930
      -05  1.0000(47)  0.99976(11)  1.00020(11)  1.00020
      -06  1.0000(47)  1.00149(11)  1.00205(11)  1.00205
      -07  1.0000(47)  1.00536(11)  1.00599(11)  1.00599
      -08  1.0000(47)  1.00153(11)  1.00182(11)  1.00182
      -09  1.0000(47)  1.00048(11)  1.00085(11)  1.00085
      -10  1.0000(47)  1.00215(11)  1.00277(11)  1.00277
      -11  1.0000(47)  1.00049(12)  1.00112(12)  1.00112
      -12  1.0000(47)  1.00286(11)  1.00330(11)  1.00330
      -13  1.0000(47)  1.00027(11)  1.00096(12)  1.00096
      -av(sd)                                   1.00180(195) was 1.00129
PST005-1   1.0000(47)  1.00232(11)  1.00248(11)  1.00248
      -2   1.0000(47)  1.00298(11)  1.00348(11)  1.00348
      -3   1.0000(47)  1.00342(11)  1.00394(11)  1.00394
      -4   1.0000(47)  1.00500(12)  1.00549(11)  1.00549
      -5   1.0000(47)  1.00626(12)  1.00685(11)  1.00685
      -6   1.0000(47)  1.00529(11)  1.00566(11)  1.00566
      -7   1.0000(47)  1.00395(12)  1.00472(12)  1.00472
      -8   1.0000(47)  0.99910(11)  0.99993(11)  0.99993
      -9   1.0000(47)  1.00202(12)  1.00251(11)  1.00251
      -av(sd)                                   1.00390(209) was 1.00337
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PST006-1   1.0000(35)  1.00035(11)  1.00093(11)  1.00093
      -2   1.0000(35)  1.00179(11)  1.00257(11)  1.00257
      -3   1.0000(35)  1.00172(11)  1.00174(11)  1.00174
      -av(sd)                                   1.00202(48) was 1.00129
PST007-02  1.0000(47)  1.00917(13)  1.00973(13)  1.00973
      -03  1.0000(47)  1.00361(13)  1.00416(13)  1.00416
      -05  1.0000(47)  1.00929(12)  1.00980(13)  1.00980
      -06  1.0000(47)  1.00322(13)  1.00370(13)  1.00370
      -07  1.0000(47)  1.00494(13)  1.00582(13)  1.00582
      -08  1.0000(47)  0.99899(13)  0.99909(13)  0.99909
      -09  1.0000(47)  0.99711(13)  0.99798(13)  0.99798
      -10  1.0000(47)  1.00099(13)  1.00150(12)  1.00150
      -av(sd)                                   1.00397(442) was 1.00342
--U233 thermal cases
UST001-1   1.0000(31)  1.00135(11)  1.00121(11)  1.00121  bare
      -2   1.0005(33)  1.00111(12)  1.00145(11)  1.00145    "
      -3   1.0006(33)  1.00069(11)  1.00070(12)  1.00070    "
      -4   0.9998(33)  1.00088(12)  1.00066(12)  1.00086    "
      -av(sd)                                   1.00106(34) was 1.00078
UST005-1   1.0000(40)  1.00222(13)  1.00246(13)  1.00246  Water refl
      -2   1.0000(49)  1.00531(12)  1.00557(12)  1.00557    "
UST008     1.0006(29)  1.00158(08)  1.00093(07)  1.00033  bare
UST009-1   0.9966(44)  0.99609(06)  0.99581(06)  0.99921  bare
      -2   0.9981(40)  0.99914(06)  0.99884(06)  1.00074    "
      -3   0.9989(38)  1.00051(05)  1.00025(05)  1.00135    "
      -4   0.9998(38)  0.99939(04)  0.99861(04)  0.99881    "
      -av(sd)                                   1.00003(121) was 1.00043
UST012-1d  1.0000(28)  1.00118(15)  1.00168(15)  1.00168  Water refl
      -2d  1.0000(25)  0.99997(15)  1.00106(15)  1.00106   "
      -3d  1.0000(23)  1.00979(15)  1.01053(15)  1.01053   "
      -4d  1.0000(15)  1.00284(14)  1.00379(14)  1.00379   "
      -5d  1.0000(71)  1.00486(14)  1.00579(14)  1.00579   "
      -6d  1.0000(10)  1.00605(14)  1.00674(14)  1.00674   "
      -7d  1.0000(38)  1.00198(12)  1.00267(12)  1.00267   "
      -8d  1.0000(48)  0.99935(12)  0.99957(12)  0.99957   "
      -av(sd)                                   1.00398(356) was 1.00325
UST013-01  0.9992(73)  1.00533(16)  1.00596(16)  1.00677  bare
      -02  0.9992(70)  1.00586(16)  1.00631(16)  1.00712   "
      -05  0.9992(67)  1.00727(16)  1.00799(16)  1.00880   "
      -06  0.9992(50)  1.00630(16)  1.00727(16)  1.00808   "
      -07  0.9992(54)  1.00648(16)  1.00705(16)  1.00786   "
      -08  0.9992(50)  1.00733(15)  1.00770(16)  1.00851   "
      -16  0.9996(69)  0.99355(15)  0.99437(15)  0.99477   "
      -17  0.9996(52)  0.99697(15)  0.99722(15)  0.99762   "
      -18  0.9996(20)  1.00072(15)  1.00084(15)  1.00124   "
      -19  0.9996(89)  0.99658(15)  0.99696(15)  0.99736   "
      -20  0.9996(56)  0.99984(14)  1.00051(14)  1.00091   "
      -av(sd)                                   1.00355(527) was 1.00302
UST016-01  0.9987(37)  1.00367(16)  1.00431(16)  1.00562  bare
      -02  0.9983(44)  1.00502(16)  1.00535(16)  1.00706    "
      -03  0.9992(36)  1.00472(16)  1.00526(16)  1.00606    "
      -06  0.9993(34)  0.99625(16)  0.99691(16)  0.99761    "
      -07  1.0008(34)  0.99669(16)  0.99775(16)  0.99775    "
      -08  1.0011(28)  0.99637(17)  0.99710(16)  0.99710    "
      -15  1.0000(27)  1.00690(16)  1.00737(16)  1.00737    "
      -16  0.9994(31)  1.01031(16)  1.01026(15)  1.01087    "
      -17  1.0000(28)  0.99557(16)  0.99600(16)  0.99660    "
      -18  0.9988(36)  0.99621(16)  0.99636(16)  0.99756    "
      -19  1.0000(35)  0.99587(16)  0.99617(16)  0.99617    "
      -av(sd)                                   1.00134(539) was 1.00109
UST017-1   0.9997(32)  1.00355(14)  1.00424(14)  1.00454  Water refl
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      -2   1.0000(25)  1.00216(15)  1.00282(15)  1.00282   "
      -3   1.0001(35)  1.00370(14)  1.00475(15)  1.00465   "
      -4   0.9994(40)  1.00472(14)  1.00535(14)  1.00595   "
      -5   1.0000(29)  1.00204(14)  1.00245(14)  1.00245   "
      -6   1.0000(29)  1.00072(12)  1.00121(12)  1.00121   "
      -7   1.0000(37)  1.00004(12)  1.00065(12)  1.00065   "
      -av(sd)                                   1.00318(194) was 1.00253
UST015-01  1.0000(75)  0.99005(16)  0.99135(15)  0.99135  Be refl (Falstaff)
      -02  1.0000(70)  0.98534(15)  0.98668(15)  0.98668       "
      -03  1.0000(68)  0.98634(16)  0.98790(16)  0.98790       "
      -05  1.0000(55)  0.98628(16)  0.98783(16)  0.98783       "
      -06  1.0000(99)  0.97699(16)  0.97851(16)  0.97851       "
      -av(sd)                                   0.98645(477) was 0.98500
--U233 lattices
UCT001-1   1.0006(27)  1.00177(14)  1.00196(14)  1.00136
      -2   1.0015(25)  1.00420(15)  1.00492(15)  1.00341
      -3   1.0000(24)  1.00382(14)  1.00434(14)  1.00434
      -4   1.0007(25)  1.00230(12)  1.00251(12)  1.00181
      -5   1.0015(26)  1.00174(11)  1.00216(11)  1.00026
      -6   1.0015(28)  0.99999(13)  1.00035(13)  0.99885
      -8   1.0004(28)  1.00140(13)  1.00160(13)  1.00120
      -av(sd)                                   1.00160(184) was 1.00118
--heavy-water solutions
HST004-1   1.0000(65)  0.98577(13)  0.98720(13)  0.98720
      -2   1.0000(71)  0.98126(13)  0.98273(13)  0.98273
      -3   1.0000(78)  0.98803(13)  0.98983(13)  0.98983
      -4   1.0000(91)  0.99051(14)  0.99246(13)  0.99246
      -5   1.0000(104) 0.98887(14)  0.99098(14)  0.99098
      -6   1.0000(117) 0.98580(14)  0.98785(14)  0.98785
      -av(sd)                                   0.98851(343) was 0.98671
HST020-1   0.9966(116) 0.99104(15)  0.99294(15)  0.99633
      -2   0.9956(93)  0.99669(16)  0.99825(16)  1.00266
      -3   0.9957(79)  1.00510(16)  1.00705(16)  1.01140
      -4   0.9955(78)  1.00448(16)  1.00639(17)  1.01094
      -5   0.9959(77)  1.01297(16)  1.01495(16)  1.01913
--heavy-water lattices
LMT002-1   1.0000(141) 1.01386(11)  1.01457(10)  1.01457
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For some of the experiments giving multiple results, averages and standard deviations are given. The averages are also compared to the results for ENDF/B-VII.0. These comparisons make it easier to see the shifts from VII.0 to VII.1, but they can be misleading if there is a bias with spectrum or other configuration differences.

Differences

In order to highlight the differences between ENDF/B-VII and ENDF/B-VII.1beta2, the follow list shows the cases where the calculated values differ by more than 0.10% (100 pcm).

Assembly	Model-k	VII-k	VII.1-k	.1 C/E	Info
--fast HEU cases					
HMF003-08	1.0000(50)	1.00838(11)	1.00134(10)	1.00134	WC (1.9in) refl
-09	1.0000(50)	1.00919(11)	1.00161(10)	1.00161	WC (2.9in) refl
-10	1.0000(50)	1.01283(11)	1.00525(11)	1.00525	WC (4.5in) refl
-11	1.0000(50)	1.01685(10)	1.01000(11)	1.01000	WC (6.5in) refl
HMF009-1	0.9992(15)	0.99514(13)	0.99750(13)	0.99830	Be refl
HMF009-2	0.9992(15)	0.99538(11)	0.99695(11)	0.99775	BeO refl
HMF010-1	0.9992(15)	0.99688(11)	0.99841(10)	0.99921	B+Be refl
HMF016-1	0.9996(17)	0.99880(11)	1.00162(11)	1.00202	Be refl
HMF016-2	0.9996(18)	1.00134(11)	1.00289(11)	1.00329	BeO refl
HMF017	0.9993(14)	0.99715(11)	1.00051(11)	1.00121	Be refl and moderator
HMF030	1.0000(09)	0.99931(11)	1.00191(11)	1.00191	DU refl, Be moderator
HMF034-1	0.9990(12)	0.99958(11)	0.99705(11)	0.99805	Poly & Ti
HMF038-1	0.9999(07)	1.00032(10)	1.00289(10)	1.00299	DU refl, Be mod
-2	0.9999(09)	1.00046(10)	1.00160(10)	1.00170	DU refl, BeO mod
HMF058-1	1.0000(26)	0.99976(11)	1.00474(11)	1.00474	Be refl 20.3cm
-2	1.0000(35)	1.00003(10)	1.00498(10)	1.00498	" (9.27cm)
-3	1.0000(27)	0.99838(10)	1.00284(10)	1.00284	" (5.44cm)
-4	1.0000(21)	0.99844(09)	1.00186(09)	1.00186	" (3.26cm)
-5	1.0000(29)	0.99825(09)	1.00091(09)	1.00091	" (2.22cm)
HMF060s	0.9955(24)	1.01563(11)	1.00268(11)	1.00721	U/W-Al ZPR-9/4
HMF061s	0.9998(25)	1.00618(12)	1.00502(11)	1.00956	U/graphite (ZPPR-21f)
HMF066-1	1.0030(33)	0.99810(12)	1.00355(12)	1.00055	Be refl
-2	1.0023(29)	0.99656(11)	1.00163(12)	0.99933	"
-3	1.0023(26)	1.00012(11)	1.00444(11)	1.00214	"
-4	1.0043(43)	0.99935(13)	1.00521(13)	1.00091	"
-5	1.0030(33)	0.99841(12)	1.00418(12)	1.00118	"
-6	1.0028(30)	0.99793(12)	1.00339(11)	1.00039	"
-7	1.0048(39)	0.99921(12)	1.00537(12)	1.00057	"
-8	1.0039(40)	0.99856(13)	1.00458(13)	1.00158	
-9	1.0027(36)	0.99654(12)	1.00257(12)	0.99987	"
HMF067-1s	0.9959(24)	1.00936(11)	1.00291(11)	1.00704	W-C-Al/Al (ZPR-9/5s)
HMF077-1	1.0001(31)	0.99529(12)	1.00028(12)	1.00018	Be refl
-2	0.9995(27)	0.99579(10)	1.00068(10)	1.00118	"
-3	0.9995(40)	0.99289(11)	0.99821(11)	0.99871	"
-4	0.9998(32)	0.99312(10)	0.99862(10)	0.99882	"
-5	0.9994(27)	0.99487(10)	0.99976(10)	1.00036	"
-6	0.9996(33)	0.99418(10)	0.99976(10)	1.00016	"
-7	0.9994(56)	0.99583(09)	1.00059(10)	1.00119	"
-8	0.9994(35)	0.99256(10)	0.99850(10)	0.99910	"
HMF079-3	0.9996(15)	1.00336(09)	1.00018(09)	1.00058	"
-4	0.9996(14)	1.00497(09)	1.00074(09)	1.00114	"
-5	0.9996(15)	1.00422(09)	0.99980(09)	1.00020	"
HMF079-1	0.9996(15)	1.00119(09)	0.99990(09)	1.00030	Ti refl
-2	0.9996(14)	1.00125(09)	0.99916(09)	0.99956	"
-3	0.9996(15)	1.00336(09)	1.00018(09)	1.00058	"
-4	0.9996(14)	1.00497(09)	1.00074(09)	1.00114	"
-5	0.9996(15)	1.00422(09)	0.99980(09)	1.00020	"
HMM001	0.9995(13)	1.00493(23)	1.00210(24)	1.00260	Ti/poly
HMM015	0.9996(08)	0.99934(25)	0.99725(26)	0.99765	Ti/poly
--fast Pu cases					
PMF005	1.0000(13)	1.00947(10)	1.00067(10)	1.00067	W refl
PMF018	1.0000(30)	0.99639(11)	0.99933(11)	0.99933	Be refl
PMF019	0.9992(15)	0.99807(11)	1.00096(11)	1.00176	Be refl
PMF021-1	1.0000(26)	0.99161(11)	0.99329(11)	0.99259	Be refl
PMF021-2	1.0000(26)	0.99284(09)	0.99389(09)	0.99389	BeO refl
PMF033s	0.9967(26)	0.99843(14)	0.99681(14)	1.00011	Pu/grph (ZPPR-21A si)
--fast mixed HEU and Pu cases					
MMF007-01	1.0000(45)	1.00033(11)	1.00420(11)	1.00420	Pu/HEU with Be refl
-02	1.0000(23)	1.00479(11)	1.00840(11)	1.00840	" (16.2 cm)

-03	1.0000(28)	1.00272(10)	1.00654(10)	1.00654	" (8.67 cm)
-04	1.0000(28)	1.00206(10)	1.00544(10)	1.00544	" (5.60 cm)
-05	1.0000(32)	1.00042(09)	1.00271(09)	1.00271	" (3.37 cm)
-06	1.0000(35)	0.99986(09)	1.00157(09)	1.00157	" (1.36 cm)
-07	1.0000(32)	1.00337(11)	1.00684(11)	1.00684	" (17.3 cm)
-08	1.0000(30)	1.00170(11)	1.00556(11)	1.00556	" (13.2 cm)
-09	1.0000(28)	1.00199(11)	1.00555(10)	1.00555	" (10.8 cm)
-10	1.0000(27)	1.00192(10)	1.00512(10)	1.00512	" (6.10 cm)
-11	1.0000(26)	1.00076(09)	1.00375(10)	1.00375	" (3.88 cm)
-12	1.0000(30)	1.00101(09)	1.00296(09)	1.00296	" (1.77 cm)
-13	1.0000(33)	1.00039(09)	1.00107(09)	1.00107	" (0.67 cm)
-14	1.0000(32)	1.00487(10)	1.00832(10)	1.00832	" (10.2 cm)
--fast U233 cases					
UMF004-1	1.0000(07)	1.00483(11)	0.99890(11)	0.99890	W refl
UMF004-2	1.0000(08)	1.00508(11)	0.99603(11)	0.99603	W refl
UMF005-1	1.0000(30)	0.99441(11)	0.99645(11)	0.99645	Be refl
UMF005-2	1.0000(30)	0.99244(11)	0.99576(11)	0.99576	Be refl
--softer fast cases					
ICF001s	0.9939(23)	0.99319(10)	0.98975(10)	0.99582	U/U (ZPR6-6A)
MCF001s	0.9866(23)	0.98781(10)	0.98563(10)	0.99902	Pu/U (ZPR6-7)
--intermediate cases					
HMI001s	0.9966(26)	1.00802(13)	1.00135(13)	1.00477	U/Fe (ZPR-9/34 simp)
PMI002d	1.0016(13)	1.02699(15)	1.01551(14)	1.01389	Pu/C/SSt (ZPR-6/10)
USI001-01	1.0000(83)	0.98457(15)	0.98640(15)	0.98640	U233/Be refl
-02	1.0000(85)	0.98014(15)	0.98227(15)	0.98227	"
-03	1.0000(66)	0.98143(16)	0.98327(16)	0.98327	"
-05	1.0000(82)	0.98480(16)	0.98661(16)	0.98661	"
USI001-08	1.0000(56)	0.98195(15)	0.98365(15)	0.98365	U233/Poly refl
-16	1.0000(28)	0.98186(15)	0.98280(15)	0.98280	"
-20	1.0000(56)	0.98099(16)	0.98250(16)	0.98250	"
-23	1.0000(47)	0.99051(17)	0.99260(17)	0.99260	"
--HEU thermal cases					
HST009-1	0.9990(43)	1.00208(14)	1.00351(14)	1.00451	
-2	1.0000(39)	1.00251(13)	1.00370(13)	1.00370	
-3	1.0000(36)	1.00191(14)	1.00307(14)	1.00307	
-4	0.9986(35)	0.99635(14)	0.99704(13)	0.99844	
HST050-01	0.9953(86)	1.00764(15)	1.00890(15)	1.01366	
-02	0.9987(83)	1.00290(15)	1.00428(15)	1.00559	
-03	0.9984(79)	1.00473(15)	1.00665(15)	1.00826	
-04	0.9987(84)	1.00442(15)	1.00570(15)	1.00701	
-05	0.9985(85)	1.00111(15)	1.00201(15)	1.00352	
-06	0.9985(81)	1.00897(15)	1.01060(15)	1.01212	
-07	0.9978(78)	0.99811(15)	0.99964(15)	1.00184	
-08	0.9975(84)	0.99765(15)	0.99935(15)	1.00185	
-09	0.9966(82)	0.99693(14)	0.99898(15)	1.00239	
-10	0.9960(90)	0.98044(15)	0.98126(15)	0.98520	
-11	0.9964(89)	0.99135(15)	0.99227(15)	0.99586	
--U233 thermal cases					
UST012-1d	1.0000(28)	1.00118(15)	1.00168(15)	1.00168	Water refl
-2d	1.0000(25)	0.99997(15)	1.00106(15)	1.00106	"
-3d	1.0000(23)	1.00979(15)	1.01053(15)	1.01053	"
-4d	1.0000(15)	1.00284(14)	1.00379(14)	1.00379	"
-5d	1.0000(71)	1.00486(14)	1.00579(14)	1.00579	"
-6d	1.0000(10)	1.00605(14)	1.00674(14)	1.00674	"
-7d	1.0000(38)	1.00198(12)	1.00267(12)	1.00267	"
UST017-1	0.9997(32)	1.00355(14)	1.00424(14)	1.00454	Water refl
-2	1.0000(25)	1.00216(15)	1.00282(15)	1.00282	"
-3	1.0001(35)	1.00370(14)	1.00475(15)	1.00465	"
UST015-01	1.0000(75)	0.99005(16)	0.99135(15)	0.99135	Be refl (Falstaff)
-02	1.0000(70)	0.98534(15)	0.98668(15)	0.98668	"
-03	1.0000(68)	0.98634(16)	0.98790(16)	0.98790	"

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      -05  1.0000(55)  0.98628(16)  0.98783(16)  0.98783       "
      -06  1.0000(99)  0.97699(16)  0.97851(16)  0.97851       "
--heavy-water solutions
HST004-1   1.0000(65)  0.98577(13)  0.98720(13)  0.98720
      -2   1.0000(71)  0.98126(13)  0.98273(13)  0.98273
      -3   1.0000(78)  0.98803(13)  0.98983(13)  0.98983
      -4   1.0000(91)  0.99051(14)  0.99246(13)  0.99246
      -5   1.0000(104) 0.98887(14)  0.99098(14)  0.99098
      -6   1.0000(117) 0.98580(14)  0.98785(14)  0.98785
HST020-1   0.9966(116) 0.99104(15)  0.99294(15)  0.99633
      -2   0.9956(93)  0.99669(16)  0.99825(16)  1.00206
      -3   0.9957(79)  1.00510(16)  1.00705(16)  1.01140
      -4   0.9955(78)  1.00448(16)  1.00639(17)  1.01094
      -5   0.9959(77)  1.01297(16)  1.01495(16)  1.01913
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Analysis

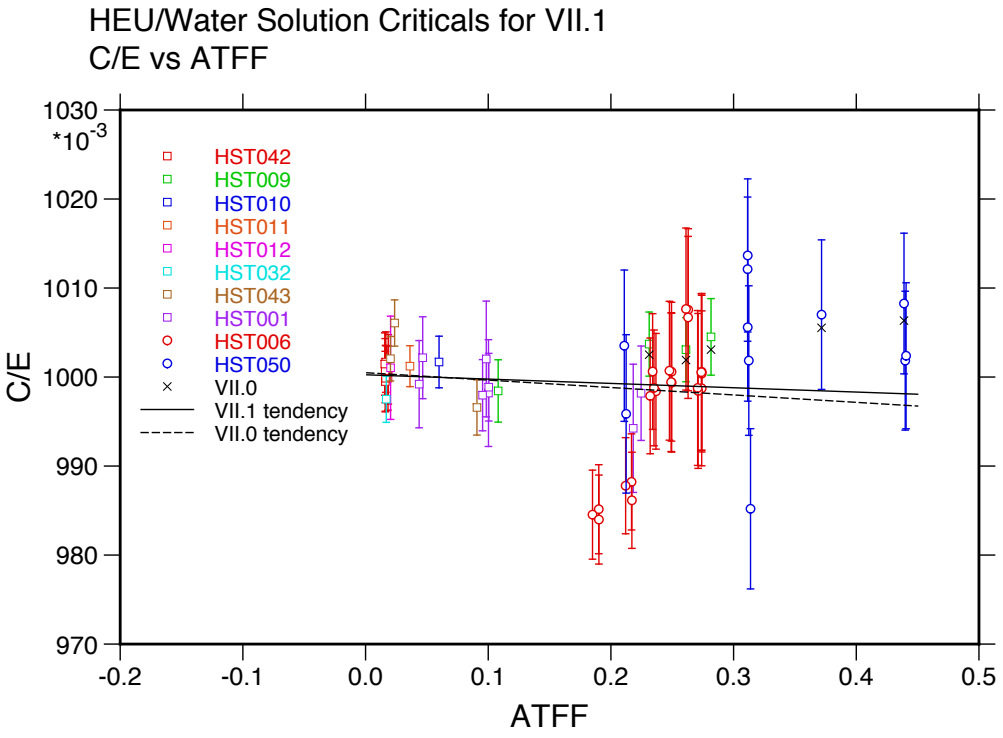
One big improvement comes from the new evaluation for tungsten (W). Note especially PMF005 and UMF004-1. The ZPR assemblies HMF060s and HMF067-1s also go in the right direction, although they remain a bit high.

The titanium (Ti) evaluation is also new for 1beta2. Note the big improvement in the bias with reflector thickness shown by the HMF079 series. The other titanium cases got a little worse.

There are also fairly large effects due to the new beryllium (Be) evaluation. In some cases, the fast-spectrum cases improve nicely. In others, the results get worse. The thermal and intermediate-spectrum results remain somewhat low.

Assemblies with lots of stainless steel showed decreases due to changes in chromium, manganese, and nickel. The ZPR cases that were high come down somewhat, but not always far enough. The ZPR-6/6a case now comes out quite low.

Oxygen was also changed for VII.1beta2. We did a large number of cases to try to quantify its effects. The fast water-reflected criticals increased k-eff slightly. For thermal uranium solution cases, there was little change for the large low-leakage assemblies, but k-eff increased for the cases with higher leakage. To get a good picture of that, we made a plot of the HST C/E values against the Above Thermal Fission Fraction (ATFF), which provides a measure of the hardness of the spectrum.

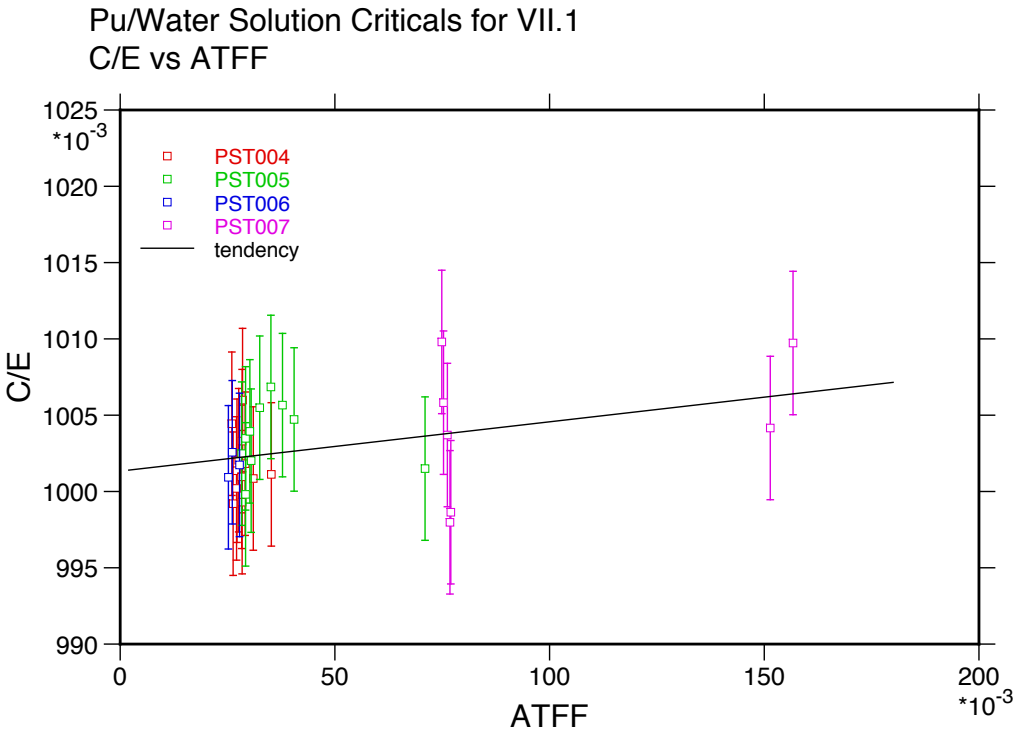


The tendency lines shown were obtained by making least-squares fits. For the ENDF/B-VII.1 curve, the intercept is 1.00025+/-.00091 and the slightly negative slope is -.00446+/-.00592. The chi-sq test for the fit is 1.088. For the ENDF/B-VII curve, the intercept is 1.00048+/-.00090, and the negative slope is -.00832+/-.00588, with a chi-sq test of 1.074. If the three 2σ outliers near ATFF=.19 are removed, the slope for VII.1 is very close to zero.1

The effects of the new oxygen are also small for the UO_2 thermal lattices, as shown in the first listing. They don't show up in the listing of differences greater than 100 pcm.

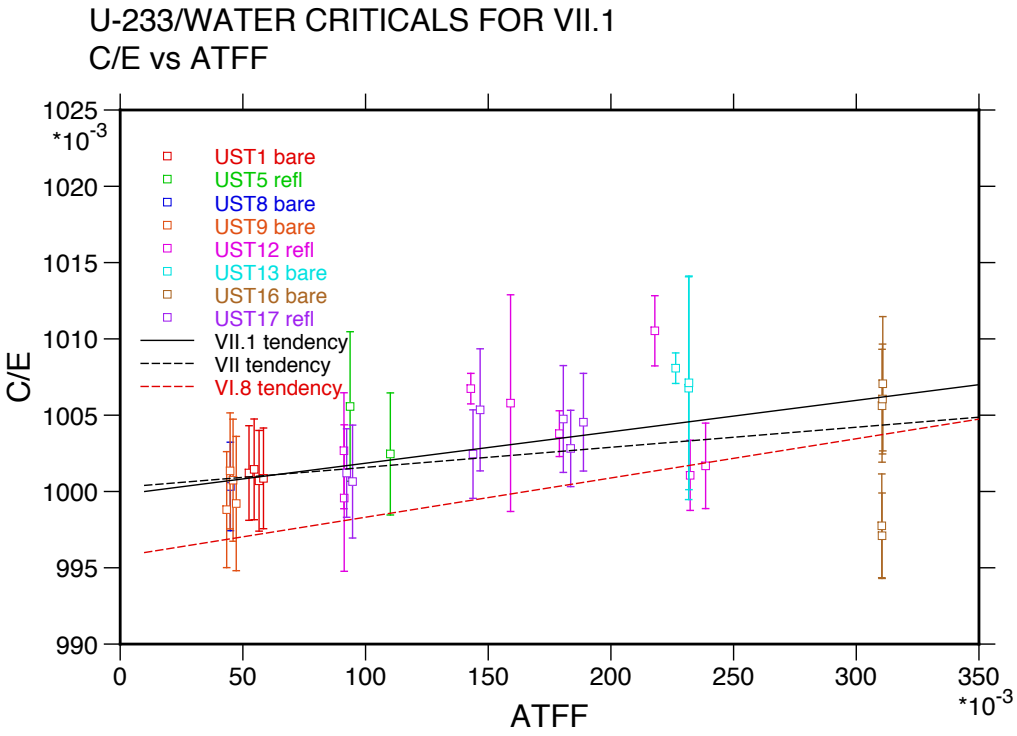
We have also checked on the effect of the new oxygen evaluation for plutonium solution cases. In this case, we only ran a subset of the PST decks. The scatter in these experiments is quite large. The following graph seems to show some evidence of a positive slope vs ATFF, but it is weak

evidence. The conclusion might change with a larger population of experiments.



The intercept here is 1.00141+/-.00082, and the slope is .0323+/-.0145. The chi-sq test is .583.

We also tested the effect of the oxygen evaluation on U-233 solution criticals. This is a fairly complete set of cases. The tendency lines in this plot were assigned by eye rather than by formal fits. We had previous tendency lines from VI-8 and VII.0, so we can see the history of the changes for these thermal systems. The scatter in the experimental values is large. There seems to be some evidence for a positive slope vs ATFF. The limiting value of the VII.0 and VII.1 results for very large assemblies (ATFF=0) is quite good, implying that the thermal cross sections are reasonable. There is a slight increase in the slope for VII.1 coming from the oxygen changes.



It appears that the effects of the new oxygen evaluation are fairly small, and that the critical experiments don't give any statistically valid guidance on whether the new evaluations is better or worse than the previous one.

Conclusions

The results of this study show that the change from ENDF/B-VII to ENDF/B-VII.1 has small effects for many of the assemblies, but there are noticeable changes for assemblies containing significant amounts of W, Ti, Be, and the components of stainless steel. In many cases, these changes are in favorable directions, but some results look worse with VII.1.