

Corrective Factors Dependence from Cross Sections Data Set

Giuseppe Palmiotti

November 29, 2010

www.inl.gov



Issue

- At last meeting it was mentioned that corrective factors could have some dependence (i. e. provide different values) if different cross sections were used in computing them.
- Reminder: corrective factors are calculated for each individual integral parameter as a ratio between two corresponding Monte Carlo and deterministic calculations.
- In order to test if a dependence exists, two data sets were compared: ENDF/B-VI and ENDF/B-VII
- Corrective factors were recalculated for: JEZEBEL Pu-239, JEZEBEL Pu-240, FLATTOP Pu-239, and ZPR-6 Assembly 7 (Pu239 and high content of Pu240).

JEZEBEL Pu239 Corrective Factors

Parameters	Monte Carlo		Deterministic		Corrective Factors		
	ENDF/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	Diff.
K_{eff}	0.99986	0.99738	1.00538	1.00265	0.99451	0.99474	-23 pcm
F28/F25	0.2084	0.2086	0.2032	0.2031	1.0256	1.0271	-0.3 %
F37/F25	0.9707	0.9557	0.9620	0.9465	1.0090	1.0097	-0.1 %
F49/F25	1.4248	1.4248	1.4220	1.4224	1.0020	1.0017	-

JEZEBEL Pu240 Corrective Factors

Parameters	Monte Carlo		Deterministic		Corrective Factors		
	ENDF/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	Diff.
K_{eff}	0.99981	0.99783	1.00459	1.00239	0.99527	0.99545	-18 pcm

FLATTOP Pu239 Corrective Factors

Parameters	Monte Carlo		Deterministic		Corrective Factors		
	ENDF/B-VII	ENDF/B-VI	ENDE/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	Diff.
K_{eff}	1.00097	1.00276	0.99962	1.00011	1.00135	1.00265	-130 pcm
F28/F25	0.1767	0.1780	0.1715	0.1726	1.0303	1.0313	-0.1 %
F37/F25	0.8523	0.8475	0.8452	0.8397	1.0084	1.0093	-0.1 %

ZPR-6 Assembly 7 Corrective Factors

Parameters	Monte Carlo		Deterministic		Corrective Factors		
	ENDF/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	Diff.
K_{eff}	1.00094	1.00578	0.98915	0.99327	1.01192	1.01259	-67 pcm
F49/F25	0.9093	0.9072	0.9232	0.9272	0.9849	0.9784	0.6 %
F28/F25	0.0224	0.0232	0.0218	0.0226	1.0275	1.0265	0.1 %
C28/F25	0.1336	0.1329	0.1387	0.1384	0.9632	0.9603	0.3 %

ZPR-6 Assembly 7 High Pu240 Corrective Factors

Parameters	Monte Carlo		Deterministic		Corrective Factors		
	ENDF/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	ENDF/B-VII	ENDF/B-VI	Diff.
K_{eff}	1.00017	1.00527	0.98781	0.99221	1.01251	1.01317	-66 pcm

Conclusions

- **Corrective factors using ENDF/B-VII and ENDF/B-VI data are relatively consistent:**
 - **Difference of less than 100 pcm for K_{eff} except one case (to be investigated)**
 - **Difference of less than 1% for spectral indices**
- **These values could be added (if needed) as extra uncertainty on the C/E values.**

Calculated and Experimental Values

Experiment	C ± σ	E ± σ	Experiment	C ± σ	E ± σ
JEZEBEL_Pu239 Keff	0.99986 ± 9pcm	1.00000 ± 0.001	ZPR6-7 Pu239 F49/F25	0.9093 ± 0.0065	0.9414 ± 0.022
JEZEBEL_Pu239 F28/F25	0.2084 ± 0.0009	0.214 ± 0.002	ZPR6-7 Pu239 C28/F25	0.1336 ± 0.0008	0.1323 ± 0.003
JEZEBEL_Pu239 F49/F25	1.4248 ± 0.0018	1.448 ± 0.029	ZPR6-7 Pu240 Keff	1.00017 ± 11pcm	1.00080 ± 0.001
JEZEBEL_Pu239 F37/F25	0.9707 ± 0.0013	0.962 ± 0.016	ZPPR9 Keff	0.99604 ± 4pcm	1.00080 ± 0.00154
JEZEBEL_Pu240 Keff	0.99981 ± 9pcm	1.00000 ± 0.001	ZPPR9 F28/F25	0.02107 ± 0.00018	0.02210 ± 0.00061
FLATTOP Keff	1.00097 ± 0.001	1.00000 ± 0.001	ZPPR9 F49/F25	0.9077 ± 0.0044	0.9295 ± 0.0185
FLATTOP F28/F25	0.1767 ± 0.0013	0.1799 ± 0.0024	ZPPR9 C28/F25	0.1394 ± 0.0009	0.1379 ± 0.0026
FLATTOP F37/F25	0.8523 ± 0.0013	0.8561 ± 0.012	ZPPR9 Na Void Step 3	30.42 ± 1.85	29.39 ± 0.36
ZPR6-7 Pu239 Keff	1.00094 ± 7pcm	1.00051 ± 0.001	ZPPR9 Na Void Step 5	29.65 ± 1.83	31.68 ± 0.36
ZPR6-7 Pu239 F28/F25	0.0224 ± 0.0002	0.0233 ± 0.007	JOYO Keff	0.98675 ± 14pcm	1.00105 ± 0.0180