

Máster Interuniversitario en Física Nuclear

UNIVERSIDAD DE SEVILLA



PROPAGATION OF ERRORS IN NUCLEAR DATA TO REACTOR PARAMETERS

Additional information

CIEMAT

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Master thesis

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A Values of k_{eff} , β_{eff} and their uncertainties.

Table A.1: Multiplication factor k_{eff} and total uncertainties for each reactor.

Benchmark	k_{eff}^{exp}	$k_{eff}^{MCNP} \pm$ Stat. Unc.	Unc. to Data \pm Stat. Unc.		
			JEFF-3.3	JENDL-4.0u	ENDF/B-VIII.0
HEU-MET	0.997	1.01018	0.018268	0.00935	0.013770
-INTER-	\pm	\pm	\pm	\pm	\pm
001	0.003	0.00002	0.000019	0.00005	0.000011
MIX-COMP	0.9913	0.99255	0.009689	0.008910	0.006152
-FAST-	\pm	\pm	\pm	\pm	\pm
005	0.0023	0.00001	0.000011	0.000015	0.000006
PU-MET	0.9878	1.00259	0.01309	0.00806	0.005552
-INTER-	\pm	\pm	\pm	\pm	\pm
002	0.0023	0.00002	0.00011	0.00004	0.000022
PU-MET	0.9723	0.97378	0.009692	0.006823	0.006380
-INTER-	\pm	\pm	\pm	\pm	\pm
004	0.0025	0.00002	0.000011	0.000015	0.000020
IEU-MET	0.9954	0.99735	0.018810	0.01437	0.006380
-FAST-	\pm	\pm	\pm	\pm	\pm
010	0.0024	0.00002	0.000021	0.00003	0.000020
IEU-MET	1.002	1.00562	0.015714	0.008200	0.010980
-FAST-	\pm	\pm	\pm	\pm	\pm
020	0.0013	0.00001	0.000008	0.000012	0.000004
IEU-MET	1.00839	1.01149	0.016834	0.010713	0.012207
-FAST-	\pm	\pm	\pm	\pm	\pm
021	0.00145	0.00001	0.000009	0.000019	0.000011
IEU-MET	1.00077	1.00233	0.016435	0.007472	0.011107
-FAST-	\pm	\pm	\pm	\pm	\pm
022	0.00134	0.00001	0.000007	0.000010	0.000003
LEU-COMP	1.0000	1.00072	0.008652	0.007082	0.0091990
-THERM-	\pm	\pm	\pm	\pm	\pm
006	0.0025	0.00001	0.000004	0.000003	0.0000011
LEU-COMP	1.0005	1.00163	0.00907	0.00771	0.01007
-THERM-	\pm	\pm	\pm	\pm	\pm
067	0.0005	0.00004	0.00008	0.00009	0.00006
PU-MET	1.0002	0.99929	0.006881	0.0073271	0.013770
-FAST-	\pm	\pm	\pm	\pm	\pm
001	0.0037	0.00001	0.000004	0.0000019	0.000011
IEU-MET	1.0045	1.00493	0.018049	0.013764	0.011716
-FAST-	\pm	\pm	\pm	\pm	\pm
007	0.0007	0.00001	0.000010	0.000017	0.000006
PU-MET	1.000	1.00335	0.009819	0.008137	0.007409
-FAST-	\pm	\pm	\pm	\pm	\pm
006	0.003	0.00002	0.000011	0.000009	0.000009

Table A.2: Multiplication factor k_{eff} and total uncertainties for each reactor.

Benchmark	k_{eff}^{exp}	$k_{eff}^{MCNP} \pm$ Stat. Unc.	Unc. to Data \pm Stat. Unc.		
			JEFF-3.3	JENDL-4.0u	ENDF/B-VIII.0
U233-MET	1.0000	1.00337	0.010679	0.011407	0.011621
-FAST-	\pm	\pm	\pm	\pm	\pm
006	0.0014	0.00002	0.000008	0.000007	0.000006
HEU-MET	1.000	1.00013	0.013189	0.010413	0.012084
-FAST-	\pm	\pm	\pm	\pm	\pm
001	0.001	0.00001	0.000010	0.000012	0.000003
HEU-MET	1.000	1.00412	0.014152	0.008806	0.012332
-FAST-	\pm	\pm	\pm	\pm	\pm
028	0.003	0.00001	0.000009	0.000011	0.000006
FCA		1.00761	0.014593	0.008627	0.013061
-XIX-	-	\pm	\pm	\pm	\pm
1		0.00002	0.000007	0.000009	0.000004
FCA		1.21884	0.008631	0.007346	0.005784
-XIX-	-	\pm	\pm	\pm	\pm
2		0.00002	0.000009	0.000013	0.000008
FCA		0.99441	0.007109	0.00669	0.005306
-XIX-	-	\pm	\pm	\pm	\pm
3		0.00002	0.000013	0.00003	0.000022
		1.0095	0.008618	0.007185	0.005619
SNEAK-7A	-	\pm	\pm	\pm	\pm
		0.00002	0.000010	0.000015	0.000008
		1.00488	0.010033	0.009633	0.006579
SNEAK-7B	-	\pm	\pm	\pm	\pm
		0.00001	0.000011	0.000019	0.000007
MASUR-		0.99246	0.01658	0.00703	0.01207
CA_	-	\pm	\pm	\pm	\pm
R2		0.00002	0.00011	0.00008	0.00008
MASUR-		1.00309	0.00813	0.00689	0.00522
CA_	-	\pm	\pm	\pm	\pm
ZONA2		0.00002	0.00009	0.00007	0.00005
HEU-MET	0.9987	1.00338	0.013792	0.008211	0.011923
-FAST-	\pm	\pm	\pm	\pm	\pm
062	0.001	0.00002	0.000012	0.000013	0.000008
HEU-MET	1.0026	1.00412	0.013210	0.010373	0.012097
-FAST-	\pm	\pm	\pm	\pm	\pm
100	0.0007	0.00001	0.000010	0.000012	0.000004

Table A.3: Delayed neutron fraction β_{eff} and total uncertainties for each reactor. In the top of each row, the β_{eff} and uncertainty calculated by Bretscher's method are found, and in the bottom, by Chiba's method.

Benchmark	β_{eff}^{exp} (pcm)	$\beta_{eff}^{eval} \pm$ Stat. Unc. (pcm)	Unc. to Data \pm Stat. Unc. (pcm)		
			JEFF-3.3	JENDL-4.0u	ENDF/B-VIII.0
HEU-MET -INTER- 001	659 ± 13	682 ± 3	32	27	34.7
			\pm	\pm	\pm
			6	5	1.9
		684.20 ± 0.10	4.47	18.22	31.208
			\pm	\pm	\pm
MIX-COMP -FAST- 005	381 ± 8	387.9 ± 1.4	0.12	0.04	0.021
			9.3	15.9	8
			\pm	\pm	\pm
		375.60 ± 0.10	1.9	2.2	3
			5.1	10.86	4.34
PU-MET -INTER- 002	222 ± 4	234 ± 3	\pm	\pm	\pm
			4	8	4
		233.10 ± 0.10	1.79	11.32	1.35
			\pm	\pm	\pm
			0.15	0.07	0.22
PU-MET -INTER- 004	223 ± 10	250 ± 3	10.7	14.2	15
			\pm	\pm	\pm
			1.8	1.7	4
		248.60 ± 0.10	1.88	10.386	1.35
			\pm	\pm	\pm
IEU-MET -FAST- 010	725 ± 15	738 ± 3	0.10	0.017	0.09
			11	21	22.1
			\pm	\pm	\pm
		713.60 ± 0.20	3	3	2.4
			6.06	18.21	19.95
			\pm	\pm	\pm
			0.21	0.07	0.03

Table A.4: Delayed neutron fraction β_{eff} and total uncertainties for each reactor. In the top of each row, the β_{eff} and uncertainty calculated by Bretscher's method are found, and in the bottom, by Chiba's method.

Benchmark	β_{eff}^{exp} (pcm)	$\beta_{eff}^{eval} \pm$ Stat. Unc. (pcm)	Unc. to Data \pm Stat. Unc. (pcm)		
			JEFF-3.3	JENDL-4.0u	ENDF/B-VIII.0
IEU-MET -FAST- 020	$(7.7 \pm 0.5) \cdot 10^1$	746.8 ± 1.4	7.8	22.4	23.4
			\pm	\pm	\pm
			1.5	1.9	1.0
		728.20 ± 0.10	5.02	18.04	22.954
			\pm	\pm	\pm
			0.07	0.03	0.012
IEU-MET -FAST- 021	$(7.7 \pm 0.5) \cdot 10^1$	750.3 ± 1.4	6.7	21.0	22.6
			\pm	\pm	\pm
			1.4	2.0	0.4
		732.20 ± 0.10	5.54	18.53	21.977
			\pm	\pm	\pm
			0.08	0.05	0.011
IEU-MET -FAST- 022	$(7.7 \pm 0.5) \cdot 10^1$	750.3 ± 1.4	9.0	19.7	23.8
			\pm	\pm	\pm
			2.0	1.2	0.3
		728.40 ± 0.10	5.15	17.66	23.768
			\pm	\pm	\pm
			0.07	0.03	0.012
LEU-COMP -THERM- 006	771 ± 19	795.4 ± 1.4	5.3	22.24	30.15
			\pm	\pm	\pm
			0.7	0.16	0.06
		787.60 ± 0.10	4.96	21.928	30.021
			\pm	\pm	\pm
			0.04	0.009	0.009
LEU-COMP -THERM- 067	750 ± 19	774.7 ± 4.4	6	23	31
			\pm	\pm	\pm
			6	5	11
		767.3 ± 0.3	4.6	22.13	30.47
			\pm	\pm	\pm
			0.3	0.19	0.19

Table A.5: Delayed neutron fraction β_{eff} and total uncertainties for each reactor. In the top of each row, the β_{eff} and uncertainty calculated by Bretscher's method are found, and in the bottom, by Chiba's method.

Benchmark	β_{eff}^{exp} (pcm)	$\beta_{eff}^{eval} \pm$ Stat. Unc. (pcm)	Unc. to Data \pm Stat. Unc. (pcm)		
			JEFF-3.3	JENDL-4.0u	ENDF/B-VIII.0
PU-MET -FAST- 001	194 \pm 10	188.1 \pm 1.4	1.8	4.58	1.14
			\pm	\pm	\pm
			0.4	0.07	0.12
		188.50 \pm 0.10	1.53	4.529	1.150
			\pm	\pm	\pm
IEU-MET -FAST- 007	720 \pm 7	739.4 \pm 1.4	0.04	0.004	0.007
			6.9	21	20.5
			\pm	\pm	\pm
		714.90 \pm 0.10	2.0	3	0.5
			5.69	18.21	20.058
PU-MET- -FAST- 006	276 \pm 7	287 \pm 3	\pm	\pm	\pm
			1.6	1.5	0.7
			3.15	7.74	2.02
		284.10 \pm 0.10	\pm	\pm	\pm
			0.07	0.06	0.04
U233-MET -FAST- 006	360 \pm 14	376 \pm 3	25.6	21.6	20.5
			\pm	\pm	\pm
			0.6	0.6	0.3
		374.30 \pm 0.10	24.853	20.94	19.965
			\pm	\pm	\pm
HEU-MET -FAST- 001	659 \pm 10	650.9 \pm 1.4	0.018	0.03	0.016
			8.9	19.2	29.46
			\pm	\pm	\pm
		648.00 \pm 0.10	1.4	0.8	0.07
			9.14	19.02	29.748
			\pm	\pm	\pm
			0.09	0.03	0.014

Table A.6: Delayed neutron fraction β_{eff} and total uncertainties for each reactor. In the top of each row, the β_{eff} and uncertainty calculated by Bretscher's method are found, and in the bottom, by Chiba's method.

Benchmark	β_{eff}^{exp} (pcm)	$\beta_{eff}^{eval} \pm$ Stat. Unc. (pcm)	Unc. to Data \pm Stat. Unc. (pcm)		
			JEFF-3.3	JENDL-4.0u	ENDF/B-VIII.0
HEU-MET -FAST- 028	675 \pm 13	692.1 \pm 1.4	9.4	22.2	27.1
			\pm	\pm	\pm
			1.8	1.7	0.3
		687.20 \pm 0.10	6.99	18.41	27.353
			\pm	\pm	\pm
			0.07	0.03	0.013
FCA -XIX- 1	742 \pm 24	764.2 \pm 2.8	14.4	22.3	34.1
			\pm	\pm	\pm
			2.3	1.7	0.5
		760.10 \pm 0.20	4.45	18.591	32.760
			\pm	\pm	\pm
			0.05	0.021	0.022
FCA -XIX- 2	364 \pm 9	362.6 \pm 2.3	13	16	11
			\pm	\pm	\pm
			3	4	3
		357.10 \pm 0.10	3.83	8.72	3.79
			\pm	\pm	\pm
			0.13	0.06	0.04
FCA -XIX- 3	251 \pm 4	256 \pm 3	17	16	9
			\pm	\pm	\pm
			4	4	3
		257.80 \pm 0.10	1.69	7.05	1.67
			\pm	\pm	\pm
			0.12	0.06	0.08
SNEAK-7A	(40 \pm 3) \cdot 10	387 \pm 3	7	16	8.3
			\pm	\pm	\pm
			3	4	1.9
		372.40 \pm 0.10	5.46	10.84	3.80
			\pm	\pm	\pm
			0.14	0.08	0.05

Table A.7: Delayed neutron fraction β_{eff} and total uncertainties for each reactor. In the top of each row, the β_{eff} and uncertainty calculated by Bretscher's method are found, and in the bottom, by Chiba's method.

Benchmark	β_{eff}^{exp} (pcm)	$\beta_{eff}^{eval} \pm$ Stat. Unc. (pcm)	Unc. to Data \pm Stat. Unc. (pcm)		
			JEFF-3.3	JENDL-4.0u	ENDF/B-VIII.0
SNEAK-7B	$(44.0 \pm 3.4) \cdot 10$	437.9 ± 1.4	10.0	19	8.6
			\pm	\pm	\pm
			2.1	4	2.3
		417.60 ± 0.10	5.53	11.95	5.14
			\pm	\pm	\pm
MASURCA R2	721 ± 11	740 ± 3	0.15	0.10	0.05
			\pm	\pm	\pm
			14	25	28
		727.20 ± 0.20	\pm	\pm	\pm
			11	10	8
MASURCA ZONA2	349 ± 6	352.9 ± 2.8	4.5	17.7	26.4
			\pm	\pm	\pm
			12	10	8
		345.40 ± 0.10	4.1	9.13	3.2
			\pm	\pm	\pm
HEU-MET -FAST- 062	663 ± 17	$7'00 \pm 3$	0.6	0.18	0.7
			\pm	\pm	\pm
			12.7	19.5	27.31
		687.50 ± 0.20	2.5	1.1	0.13
			\pm	\pm	\pm
HEU-MET -FAST- 100	657 ± 9	646.3 ± 1.4	6.71	18.36	27.295
			\pm	\pm	\pm
			11.0	18.9	29.41
		648.60 ± 0.10	2.0	0.6	0.07
			\pm	\pm	\pm
			9.00	18.98	29.710
			\pm	\pm	\pm
			0.09	0.03	0.013

B Results of Chiba analysis

B.1 MIX-COMP-FAST-005

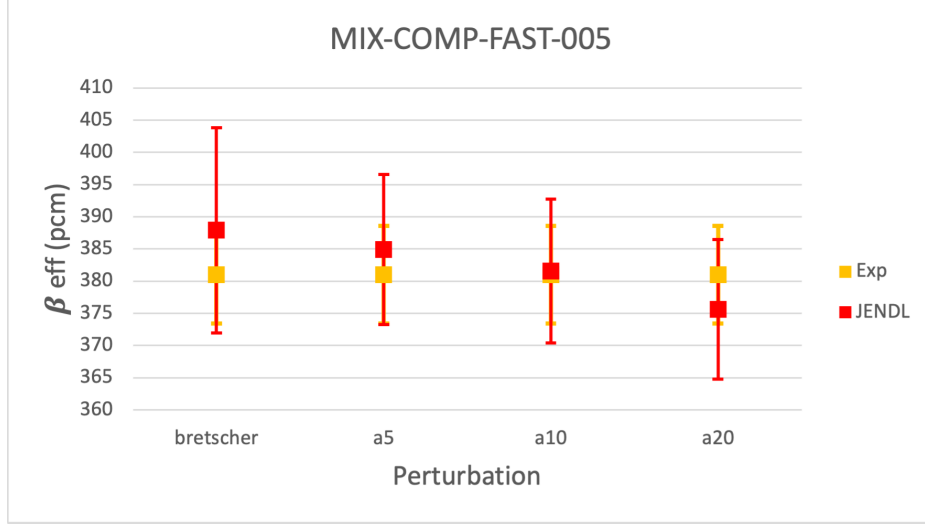


Figure B.1.1: Experimental and Chiba's method β_{eff} for different values of the perturbation.

Table B.1.1: Experimental and evaluated delayed neutron fraction of MIX-COMP-FAST-005 obtained for different cases. Uncertainty for the JENDL-4.0u library. (*) Experimental uncertainty

Case	MIX-COMP-FAST-005	
	$\beta_{eff} \pm \text{Stat. Unc. (pcm)}$	Unc. due to Data $\pm \text{Stat. Unc. (pcm)}$
Experimental	$381 \pm 2^*$	-
Brestcher	387.9 ± 1.4	15.9 ± 2.2
$a = 5$	384.9 ± 0.3	11.6 ± 0.3
$a = 10$	381.60 ± 0.20	11.16 ± 0.14
$a = 20$	375.60 ± 0.10	10.86 ± 0.07

Table B.1.2: Evaluated reaction uncertainties due to nuclear data (and statistical error) of delayed neutron fraction of MIX-COMP-FAST-005 obtained for different cases. Uncertainty for the JENDL-4.0u library.

Case	MIX-COMP-FAST-005 uncertainties (%)			
	$^{238}\text{U} (n,n')$	$^{238}\text{U} \bar{\nu}_d$	$^{56}\text{Fe} (n,n)$	$^{239}\text{Pu} \bar{\nu}_d$
Bretscher	2 ± 3	1.895 ± 0.005	1.7 ± 2.4	1.5127 ± 0.0024
$a = 5$	1.32 ± 0.19	1.849 ± 0.003	-	1.5242 ± 0.0021
$a = 10$	1.14 ± 0.11	1.820 ± 0.003	-	1.5391 ± 0.0018
$a = 20$	1.16 ± 0.04	1.7689 ± 0.0022	-	1.5671 ± 0.0017

B.2 HEU-MET-INTER-001

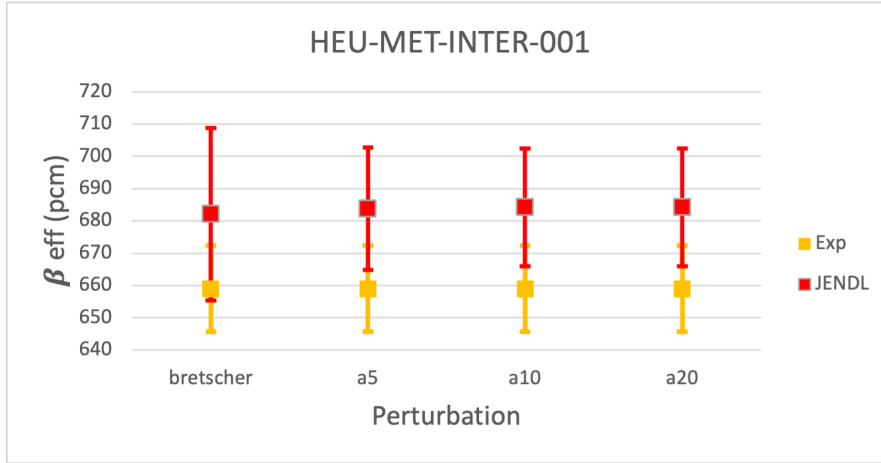


Figure B.2.1: Experimental and Chiba's method β_{eff} for different values of the perturbation.

Table B.2.1: Experimental and evaluated delayed neutron fraction of HEU-MET-INTER-001 obtained for different cases. Uncertainty for the JENDL-4.0u library. (*) Experimental uncertainty

Case	HEU-MET-INTER-001	
	$\beta_{eff} \pm \text{Stat. Unc. (pcm)}$	Unc. due to Data $\pm \text{Stat. Unc. (pcm)}$
Experimental	659 \pm 13.34*	-
Brestcher	682.1 \pm 2.8	27 \pm 5
$a = 5$	683.8 \pm 0.6	19.0 \pm 0.5
$a = 10$	684.2 \pm 0.3	18.30 \pm 0.10
$a = 20$	684.2 \pm 0.1	18.22 \pm 0.04

Table B.2.2: Evaluated reaction uncertainties due to nuclear data (and statistical error) of delayed neutron fraction of HEU-MET-INTER-001 obtained for different cases. Uncertainty for the JENDL-4.0u library.

Case	HEU-MET-INTER-001 uncertainties (%)	
	$^{235}\text{U } \bar{\nu}_d$	$^{56}\text{Fe (n,n)}$
Bretscher	2.627 \pm 0.004	2 \pm 7
$a = 5$	2.621 \pm 0.003	0.8 \pm 1.0
$a = 10$	2.6240 \pm 0.0022	0.3 \pm 0.7
$a = 20$	2.6274 \pm 0.0019	-

B.3 IEU-MET-FAST-007

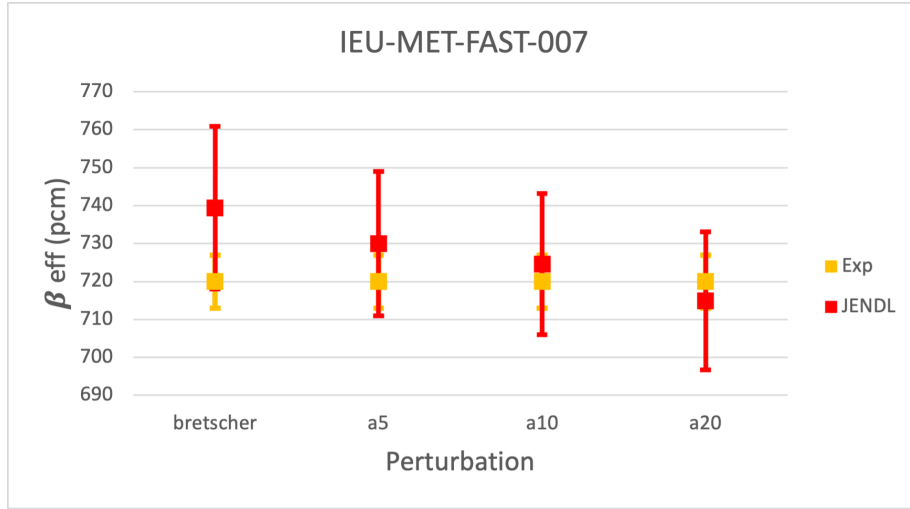


Figure B.3.1: Experimental and Chiba's method β_{eff} for different values of the perturbation.

Table B.3.1: Experimental and evaluated delayed neutron fraction of IEU-MET-FAST-007 obtained for different cases. Uncertainty for the JENDL-4.0u library. (*) Experimental uncertainty

Case	IEU-MET-FAST-007	
	$\beta_{eff} \pm \text{Stat. Unc. (pcm)}$	Unc. due to Data $\pm \text{Stat. Unc. (pcm)}$
Experimental	720 \pm 7*	-
Brestcher	739.4 \pm 1.4	21 \pm 3
$a = 5$	730 \pm 0.3	19.00 \pm 0.17
$a = 10$	724.6 \pm 0.1	18.59 \pm 0.09
$a = 20$	714.9 \pm 0.1	18.21 \pm 0.04

Table B.3.2: Evaluated reaction uncertainties due to nuclear data (and statistical error) of delayed neutron fraction of IEU-MET-FAST-007 obtained for different cases. Uncertainty for the JENDL-4.0u library.

Case	IEU-MET-FAST-007 uncertainties (%)		
	$^{235}\text{U } \bar{\nu}_d$	$^{238}\text{U } \bar{\nu}_d$	$^{238}\text{U (n,n)}$
Bretscher	1.8640 \pm 0.0018	1.4815 \pm 0.0023	1.3 \pm 0.7
$a = 5$	1.8964 \pm 0.0015	1.4271 \pm 0.0018	-
$a = 10$	1.9258 \pm 0.0013	1.3866 \pm 0.0015	-
$a = 20$	1.9739 \pm 0.0012	1.3102 \pm 0.0012	-

B.4 IEU-MET-FAST-010

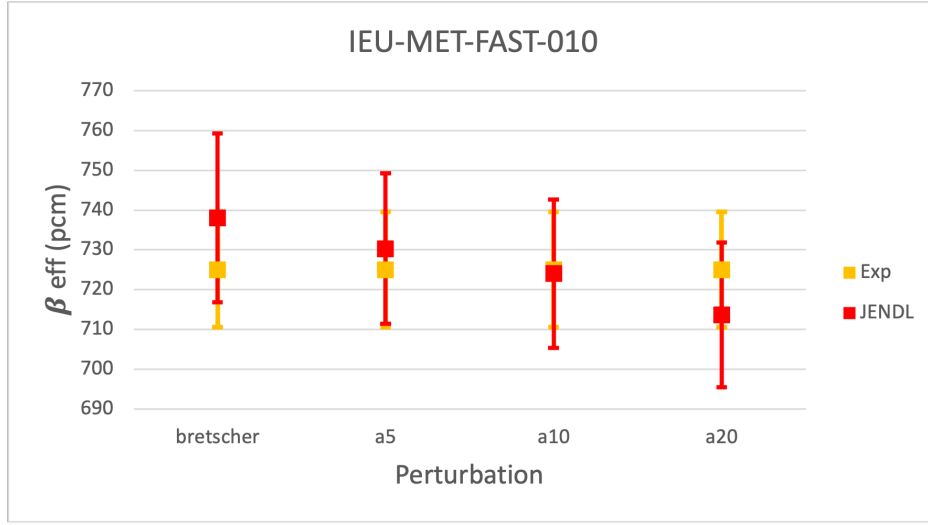


Figure B.4.1: Experimental and Chiba's method β_{eff} for different values of the perturbation.

Table B.4.1: Experimental and evaluated delayed neutron fraction of IEU-MET-FAST-010 obtained for different cases. Uncertainty for the JENDL-4.0u library. (*) Experimental uncertainty

Case	IEU-MET-FAST-010	
	$\beta_{eff} \pm \text{Stat. Unc. (pcm)}$	Unc. due to Data $\pm \text{Stat. Unc. (pcm)}$
Experimental	$725 \pm 2^*$	-
Brestcher	738 ± 2.8	21 ± 3
$a = 5$	730.3 ± 0.6	18.9 ± 0.3
$a = 10$	724 ± 0.3	18.62 ± 0.16
$a = 20$	713.6 ± 0.2	18.21 ± 0.07

Table B.4.2: Evaluated reaction uncertainties due to nuclear data (and statistical error) of delayed neutron fraction of IEU-MET-FAST-010 obtained for different cases. Uncertainty for the JENDL-4.0u library.

Case	IEU-MET-FAST-010 uncertainties (%)		
	$^{235}\text{U } \bar{\nu}_d$	$^{238}\text{U } \bar{\nu}_d$	$^{238}\text{U (n,n)}$
Bretscher	1.852 ± 0.004	1.504 ± 0.004	1 ± 4
$a = 5$	1.885 ± 0.003	1.448 ± 0.003	-
$a = 10$	1.9106 ± 0.0024	1.4031 ± 0.0025	-
$a = 20$	1.9601 ± 0.0021	1.3291 ± 0.0020	-

C Integrated sensitivity profiles and nuclear data uncertainties for each benchmark reactor.

C.1 PU-MET-FAST-001

Table C.1.1: ISCs for the multiplication factor of PU-MET-FAST-001.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{239}\text{Pu } \bar{\nu}$	0.96530 ± 0.00009
$^{239}\text{Pu } \bar{\nu}_p$	0.96351 ± 0.00009
$^{239}\text{Pu (n,f)}$	0.72813 ± 0.00010
$^{239}\text{Pu } \chi$	$(-0.15 \pm 8.7) \times 10^{-5}$

Table C.1.2: ISCs for the delayed neutron fraction.

Quantity	ISCs for the delayed neutron fraction of PU-MET-FAST-001.		
	Bretscher	Chiba	Kodeli, [1]
$^{239}\text{Pu } \bar{\nu}_d$	0.945 ± 0.003	0.9483 ± 0.0007	0.9480
$^{239}\text{Pu } \bar{\nu}_p$	-0.95 ± 0.07	-0.946 ± 0.004	-0.9470
$^{239}\text{Pu } \chi$	0.00 ± 0.07	0.000 ± 0.006	-

Table C.1.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of PU-MET-FAST-001. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (98.8%)	
$^{239}\text{Pu } \chi/^{239}\text{Pu } \chi$	0.45134 ± 0.00013
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.40951 ± 0.00005
$^{239}\text{Pu (n,f)}/^{239}\text{Pu (n,f)}$	0.30293 ± 0.00005
JENDL-4.0u (82.5%)	
$^{239}\text{Pu (n,f)}/^{239}\text{Pu (n,f)}$	0.43710 ± 0.00007
$^{239}\text{Pu } \bar{\nu}/^{239}\text{Pu } \bar{\nu}_p$	0.3 ± 0.4
$^{239}\text{Pu } \chi/^{239}\text{Pu } \chi$	0.28993 ± 0.00005
ENDF/B-VIII.0 (99.9%)	
$^{239}\text{Pu } \bar{\nu}/^{239}\text{Pu } \bar{\nu}$	0.31960 ± 0.00004
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.31903 ± 0.00004
$^{239}\text{Pu } \chi/^{239}\text{Pu } \chi$	0.19112 ± 0.00005

Table C.1.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of PU-MET-FAST-001. All the reactions showed explain an 85% of the total uncertainty at least. The library used in [1] is JENDL-4.0m

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)		
	Bretscher	Chiba	Kodeli, [1]
JEFF-3.3			
239Pu χ /239Pu χ	0.8 ± 0.3	0.699 ± 0.007	-
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.36 ± 0.07	0.367 ± 0.003	-
JENDL-4.0u			
239Pu $\bar{\nu}_d$ /239Pu $\bar{\nu}_d$	2.296 ± 0.008	2.2735 ± 0.0006	2.274
ENDF/B-VIII.0			
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.47 ± 0.04	0.4753 ± 0.0018	-
239Pu χ /239Pu χ	0.30 ± 0.10	0.286 ± 0.003	-

C.2 PU-MET-FAST-006

Table C.2.1: ISCs for the multiplication factor of PU-MET-FAST-006.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
239Pu $\bar{n}u$	0.88307 ± 0.00024
239Pu $\bar{n}u_p$	0.88141 ± 0.00024
239Pu (n,f)	0.63230 ± 0.00025
239Pu χ	$(0.0 \pm 2.2) \times 10^{-4}$
238U (n,n')	0.06563 ± 0.00017
238U (n,f)	0.05628 ± 0.00007
238U (n,n)	0.1383 ± 0.0004

Table C.2.2: ISCs for the delayed neutron fraction of [name reactor].

Quantity	ISCs for the delayed neutron fraction.		
	Bretscher	Chiba	Kodeli, [1]
238U (n,n)	-0.16 ± 0.20	0.12 ± 0.03	0.1030
238U (n,n')	-0.15 ± 0.09	-0.159 ± 0.007	-0.1700
238U (n,f)	0.29 ± 0.04	0.246 ± 0.004	0.2610
238U $\bar{\nu}_d$	0.3709 ± 0.0021	0.3516 ± 0.0011	0.3610
238U $\bar{\nu}$	0.29 ± 0.04	0.256 ± 0.004	0.278
239Pu (n,f)	-0.32 ± 0.13	-0.286 ± 0.012	-0.3050
239Pu $\bar{\nu}_d$	0.5779 ± 0.0020	0.5790 ± 0.0012	0.5880
239Pu $\bar{\nu}_p$	-0.86 ± 0.12	-0.848 ± 0.009	-0.8790
239Pu $\bar{\nu}$	-0.29 ± 0.12	-0.269 ± 0.012	-0.2920
238U χ	0.00 ± 0.03	0.000 ± 0.003	-
239Pu χ	0.00 ± 0.11	0.000 ± 0.008	-
238U (n, γ)	-0.044 ± 0.013	-0.04971 ± 0.00011	-
235U $\bar{\nu}_d$	0.01919 ± 0.00011	0.0204 ± 0.0003	-
238U $\bar{\nu}_p$	-0.08 ± 0.03	-0.09538 ± 0.00008	-

Table C.2.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of PU-MET-FAST-006. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (78.9%)	
$^{239}\text{Pu } \chi / ^{239}\text{Pu } \chi$	0.4879 ± 0.0004
$^{238}\text{U } (n,n') / ^{238}\text{U } (n,n')$	0.4609 ± 0.0015
$^{239}\text{Pu } \bar{\nu}_p / ^{239}\text{Pu } \bar{\nu}_p$	0.38213 ± 0.00012
JENDL-4.0u (80.4%)	
$^{238}\text{U } (n,n') / ^{238}\text{U } (n,n')$	0.4141 ± 0.0019
$^{238}\text{U } (n,f) / ^{238}\text{U } (n,f)$	0.37220 ± 0.00017
$^{238}\text{U } (n,n) / ^{238}\text{U } (n,n)$	0.3401 ± 0.0018
ENDF/B-VIII.0 (78.8%)	
$^{238}\text{U } (n,n) / ^{238}\text{U } (n,n')$	0.4 ± 0.5
$^{238}\text{U } (n,n) / ^{238}\text{U } (n,n)$	0.3412 ± 0.0011
$^{239}\text{Pu } \bar{\nu} / ^{239}\text{Pu } 0.26931 \pm 0.00009$	

Table C.2.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of PU-MET-FAST-006. All the reactions showed explain an 85% of the total uncertainty at least. The library used in [1] is JENDL-4.0m

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)		
	Bretscher	Chiba	Kodeli, [1]
JEFF-3.3			
238U (n,n')/238U (n,f)	-1.0 ± 1.4	-0.9 ± -1.3	-
238U (n,n')/238U (n,n')	0.9 ± 1.5	1.03 ± 0.06	-
238U (n,f)/238U (n,f)	0.76 ± 0.12	0.628 ± 0.007	-
238U χ /238U χ	0.60 ± 0.10	0.399 ± 0.003	-
239Pu χ /239Pu χ	0.6 ± 0.3	-	-
238U (n,n)/238U (n,n')	-	-0.7 ± 0.9	-
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.35 ± 0.12	0.341 ± 0.005	-
238U (n,n)/238U (n,f)	-	0.5 ± 0.7	-
238U (n,f)/238U (n, γ)	-	0.3 ± 0.4	-
JENDL-4.0u			
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	0.0637 ± 0.0004	0.0684 ± 0.0003	0.066
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	1.241 ± 0.007	1.1760 ± 0.0019	1.191
238U (n,n')/238U (n,n')	2.3 ± 0.8	1.80 ± 0.03	1.712
239Pu $\bar{\nu}_d$ /239Pu $\bar{\nu}_d$	1.340 ± 0.005	1.3439 ± 0.0010	1.347
ENDF/B-VIII.0			
238U (n,n)/238U (n,n')	1.0 ± 1.5	-0.7 ± 1.0	-
238U (n,n')/238U (n,n')	0.7 ± 1.0	0.45 ± 0.03	-
238U (n,n')/238U (n,f)	-0.6 ± 0.9	-0.6 ± 0.9	-
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	0.481 ± 0.003	0.4562 ± 0.0007	-
238U χ /238U χ	0.48 ± 0.07	0.369 ± 0.003	-
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.39 ± 0.06	0.365 ± 0.003	-
238U $\bar{\nu}$ /238U $\bar{\nu}$	0.36 ± 0.05	0.318 ± 0.003	-
239Pu χ /239Pu χ	-	0.303 ± 0.006	-
238U (n,f)/238U (n,f)	0.35 ± 0.05	0.301 ± 0.003	-
238U $\bar{\nu}$ /238U $\bar{\nu}_p$	-0.3 ± 0.4	0.318 ± 0.003	-
238U (n,n)/238U (n,n)	-	0.4 ± 2.0	-
238U (n,n')/238U (n, γ)	-	0.3 ± 0.4	-
239Pu $\bar{\nu}$ /239Pu $\bar{\nu}$	0.26 ± 0.07	0.233 ± 0.003	-

C.3 HEU-MET-FAST-028

Table C.3.1: ISCs for the multiplication factor of HEU-MET-FAST-028.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.91737 ± 0.00024
235U $\bar{\nu}_p$	0.91160 ± 0.00024
235U (n,f)	0.5745 ± 0.0003
235U (n,n')	0.03372 ± 0.00017
235U (n, γ)	-0.052022 ± 0.000023
238U (n,n')	0.06309 ± 0.00018
238U (n,n)	0.1454 ± 0.0004

Table C.3.2: ISCs for the delayed neutron fraction of HEU-MET-FAST-028.

Quantity	ISCs for the delayed neutron fraction.		
	Bretscher	Chiba	Kodeli, [1]
235U $\bar{\nu}_d$	0.8269 ± 0.0007	0.8405 ± 0.0015	0.8360
235U $\bar{\nu}_p$	-0.85 ± 0.05	-0.8403 ± 0.0024	-0.8430
238U $\bar{\nu}_d$	0.1601 ± 0.0003	0.1391 ± 0.0004	0.1530
238U $\bar{\nu}_p$	-0.130 ± 0.013	-0.1329608 ± 0.0000019	-0.1400
235U χ	0.00 ± 0.05	0.000 ± 0.006	-
235U (n,f)	-0.09 ± 0.05	-0.053 ± 0.007	-
238U (n,n)	0.17 ± 0.09	0.040 ± 0.014	-

Table C.3.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of HEU-MET-FAST-028. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (71.8%)	
235U (n,f)/235U (n,f)	0.7117 ± 0.0006
235U (n,n')/235U (n,f)	0.5 ± 0.8
235U (n, γ)/235U (n, γ)	0.47924 ± 0.00022
JENDL-4.0u (72.7%)	
238U (n,n')/238U (n,n')	0.4041 ± 0.0023
238U (n,n)/238U (n,n)	0.3642 ± 0.0020
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.3 ± 0.5
ENDF/B-VIII.0 (74.1%)	
235U (n,f)/235U (n,f)	0.6917 ± 0.0004
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.5 ± 0.7
238U (n,n)/238U (n,n')	0.4 ± 0.6

Table C.3.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of HEU-MET-FAST-028. All the reactions showed explain an 85% of the total uncertainty at least. The library used in [1] is JENDL-4.0m

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)		
	Bretscher	Chiba	Kodeli, [1]
JEFF-3.3			
235U χ /235U χ	0.91 ± 0.13	0.455 ± 0.005	-
235U (n,f)/235U (n,f)	0.59 ± 0.13	0.659 ± 0.006	-
238U (n,n)/238U (n,n)	0.58 ± 0.22	-	-
235U $\bar{\nu}_p$ /235U $\bar{\nu}_p$	0.42 ± 0.04	0.4185 ± 0.0022	-
JENDL-4.0u			
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	2.3856 ± 0.0022	2.4829 ± 0.0014	2.403
238U (n,n)/238U (n,n)	1.6 ± 0.4	-	-
ENDF/B-VIII.0			
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	3.886 ± 0.004	3.9504 ± 0.0022	-

C.4 U233-MET-FAST-006

Table C.4.1: ISCs for the multiplication factor of U233-MET-FAST-006.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
233U $\bar{\nu}$	0.91126 ± 0.00025
233U $\bar{\nu}_p$	0.90864 ± 0.00024
233U (n,f)	0.5910 ± 0.0003
235U (n,f)	0.006918 ± 0.000023
238U (n,n')	0.07156 ± 0.00017
238U (n,n)	0.1317 ± 0.0004

Table C.4.2: ISCs for the delayed neutron fraction of U233-MET-FAST-006.

Quantity	ISCs for the delayed neutron fraction.		
	Bretscher	Chiba	Kodeli, [1]
233U (n,f)	-0.20 ± 0.10	-0.228 ± 0.011	-0.2310
233U $\bar{\nu}_d$	0.6972 ± 0.0019	0.6919 ± 0.0014	0.7000
233U $\bar{\nu}_p$	-0.88 ± 0.09	-0.868 ± 0.006	-0.8850
233U $\bar{\nu}$	-0.19 ± 0.09	-0.176 ± 0.010	-0.1850
238U (n,n')	-0.19 ± 0.06	-0.119 ± 0.005	-0.1290
238U (n,f)	0.16 ± 0.03	0.163 ± 0.003	0.1670
238U $\bar{\nu}_d$	0.2886 ± 0.0013	0.2666 ± 0.0008	0.2740
238U $\bar{\nu}_p$	-0.136 ± 0.025	-0.103651 ± 0.000016	-0.1040

Table C.4.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of U233-MET-FAST-006. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (77.0%)	
235U (n,f)/235U (n,f)	0.5632 ± 0.0003
238U (n,n')/238U (n,n')	0.5028 ± 0.0015
238U (n,n)/238U (n,n')	0.3 ± 0.4
JENDL-4.0u (78.5%)	
233U $\bar{\nu}$ /233U $\bar{\nu}_p$	0.6 ± 0.9
238U (n,n')/238U (n,n')	0.4518 ± 0.0018
233U $\bar{\nu}$ /233U $\bar{\nu}$	0.44474 ± 0.00016
ENDF/B-VIII.0 (76.7%)	
233U $\bar{\nu}$ /233U $\bar{\nu}_p$	0.6 ± 0.9
233U $\bar{\nu}$ /233U $\bar{\nu}$	0.44474 ± 0.00016
233U $\bar{\nu}_p$ /233U $\bar{\nu}_p$	0.44431 ± 0.00016

Table C.4.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of U233-MET-FAST-006. All the reactions showed explain an 85% of the total uncertainty at least. The library used in [1] is JENDL-4.0m

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)		
	Bretscher	Chiba	Kodeli, [1]
JEFF-3.3			
233U $\bar{\nu}_d$ /233U $\bar{\nu}_d$	6.597 ± 0.019	6.576 ± 0.004	-
JENDL-4.0u			
233U $\bar{\nu}_d$ /233U $\bar{\nu}_d$	5.213 ± 0.015	5.201 ± 0.004	5.097
ENDF/B-VIII.0			
233U $\bar{\nu}_d$ /233U $\bar{\nu}_d$	5.213 ± 0.015	5.201 ± 0.004	-

C.5 IEU-MET-FAST-007

Table C.5.1: ISCs for the multiplication factor of IEU-MET-FAST-007.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.75371 ± 0.00020
235U $\bar{\nu}_p$	0.74966 ± 0.00020
235U (n,f)	0.50260 ± 0.00022
235U χ	0.00000 ± 0.00020
238U (n, γ)	-0.23059 ± 0.00007
238U (n,n')	-0.0862 ± 0.0004
238U (n,n)	0.1104 ± 0.0009

Table C.5.2: ISCs for the delayed neutron fraction of IEU-MET-FAST-007.

Quantity	ISCs for the delayed neutron fraction.		
	Bretscher	Chiba	Kodeli, [1]
$^{235}\text{U } \bar{\nu}_d$	0.54272 ± 0.00048	0.5678 ± 0.0011	0.548
$^{235}\text{U } \bar{\nu}_p$	-0.51 ± 0.04	-0.5301 ± 0.0009	-0.516
$^{238}\text{U } \bar{\nu}_d$	0.4420 ± 0.0006	0.3907 ± 0.0007	0.443
$^{238}\text{U } \bar{\nu}_p$	-0.478 ± 0.022	-0.426344 ± 0.000004	-0.473
$^{238}\text{U } (\text{n}, \text{n}')$	-0.07 ± 0.07	-0.040 ± 0.006	-
$^{235}\text{U } (\text{n}, \text{f})$	0.04 ± 0.04	0.017 ± 0.006	-
$^{235}\text{U } \chi$	0.00 ± 0.04	0.000 ± 0.004	-

Table C.5.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of IEU-MET-FAST-007. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (83.8%)	
$^{235}\text{U } (\text{n}, \text{f})/^{235}\text{U } (\text{n}, \text{f})$	1.0732 ± 0.0006
$^{235}\text{U } \chi/^{235}\text{U } \chi$	0.8595 ± 0.0005
$^{238}\text{U } (\text{n}, \gamma)/^{238}\text{U } (\text{n}, \gamma)$	0.61137 ± 0.00014
JENDL-4.0u (88.5%)	
$^{238}\text{U } (\text{n}, \text{n}')/^{238}\text{U } (\text{n}, \text{n}')$	1.0055 ± 0.0025
$^{235}\text{U } \chi/^{235}\text{U } \chi$	0.53849 ± 0.00007
$^{238}\text{U } (\text{n}, \gamma)/^{238}\text{U } (\text{n}, \gamma)$	0.40847 ± 0.00016
ENDF/B-VIII.0 (51.7%)	
$^{235}\text{U } (\text{n}, \text{f})/^{235}\text{U } (\text{n}, \text{f})$	0.6073 ± 0.0003
$^{238}\text{U } (\text{n}, \text{n})/^{238}\text{U } (\text{n}, \text{n}')$	-0.4 ± 0.6
$^{235}\text{U } \bar{\nu}/^{235}\text{U } \bar{\nu}_p$	0.4 ± 0.6

Table C.5.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of IEU-MET-FAST-007. All the reactions showed explain an 85% of the total uncertainty at least. The library used in [1] is JENDL-4.0m

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)		
	Bretscher	Chiba	Kodeli, [1]
JEFF-3.3			
238U (n,n')/238U (n,n')	0.5 ± 1.9	0.31 ± 0.06	-
238U $\bar{\nu}_p$ /238U $\bar{\nu}_p$	0.447 ± 0.023	0.4051 ± 0.0013	-
235U (n,f)/235U (n,f)	0.39 ± 0.14	0.316 ± 0.007	-
235U $\bar{\nu}_p$ /238U $\bar{\nu}_p$	0.27 ± 0.03	-	-
235U χ /235U χ	-	0.406 ± 0.008	-
JENDL-4.0u			
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	1.8640 ± 0.0018	1.9739 ± 0.0012	1.8570
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	1.4815 ± 0.0023	1.3102 ± 0.0012	-
238U (n,n)/238U (n,n)	1.3 ± 0.7	-	-
ENDF/B-VIII.0			
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	2.5508 ± 0.0025	2.6686 ± 0.0017	-

C.6 HEU-MET-INTER-001

Table C.6.1: ISCs for the multiplication factor of HEU-MET-INTER-001.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.9971 ± 0.0004
235U $\bar{\nu}_p$	0.9903 ± 0.0004
235U (n,f)	0.5177 ± 0.0004
56Fe (n,n)	0.1106 ± 0.0024
235U (n, γ)	-0.15041 ± 0.00004
56Fe (n, γ)	-0.06314 ± 0.00004

Table C.6.2: ISCs for the delayed neutron fraction of HEU-MET-INTER-001.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
235U $\bar{\nu}_d$	0.9904 ± 0.0012	0.988 ± 0.003
235U $\bar{\nu}_p$	-0.99 ± 0.07	0.986 ± 0.000
57Fe (n,n)	0.04 ± 0.12	0.006 ± 0.016
56Fe (n,n)	0.4 ± 0.5	-0.04 ± 0.04
54Fe (n,n)	0.01 ± 0.18	0.013 ± 0.024
235U χ	0.000 ± 0.071	0.000 ± 0.003

Table C.6.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of HEU-MET-INTER-001. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (86.1%)	
235U (n,f)/235U (n,f)	1.0352 ± 0.0008
235U (n, γ)/235U (n, γ)	0.90187 ± 0.00016
235U (n,f)/235U (n, γ)	0.7 ± 1.0
JENDL-4.0u (80.5%)	0.6582 ± 0.0015
56Fe (n,n)/56Fe (n,n)	0.478 ± 0.019
56Fe (n, γ)/56Fe (n, γ)	0.4398 ± 0.0003
235U (n,f)/235U (n,f) $\bar{\nu}_p$	0.3653 ± 0.0005
ENDF/B-VIII.0 (76.5%)	
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.7 ± 1.0
235U (n, γ)/235U (n, γ)	0.57459 ± 0.00010
235U (n,f)/235U (n,f)	0.5302 ± 0.0004

Table C.6.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of HEU-MET-INTER-001. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
57Fe (n,n)/57Fe (n,n)	1.8 ± 1.0	-
56Fe (n,n)/56Fe (n,n)	1.7 ± 1.2	-
54Fe (n,n)/54Fe (n,n)	1.2 ± 0.4	-
235U $\bar{\nu}_p$ /235U $\bar{\nu}_p$	0.54 ± 0.04	0.543 ± 0.003
235U χ /235U χ	-	0.1782 ± 0.0003
JENDL-4.0u		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	2.627 ± 0.004	2.6274 ± 0.0019
56Fe (n,n)/56Fe (n,n)	2 ± 7	-
ENDF/B-VIII.0		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	4.549 ± 0.006	4.536 ± 0.003

C.7 PU-MET-INTER-002

Table C.7.1: ISCs for the multiplication factor of PU-MET-INTER-002.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{239}\text{Pu } \bar{\nu}$	0.9891 ± 0.0004
$^{239}\text{Pu } \bar{\nu}_p$	0.9868 ± 0.0004
$^{239}\text{Pu (n,f)}$	0.5811 ± 0.0004
$^{239}\text{Pu (n,}\gamma)$	-0.18717 ± 0.00007
$^{56}\text{Fe (n,n)}$	0.0948 ± 0.0019
$^{56}\text{Fe (n,}\gamma)$	-0.04259 ± 0.00004
$^{52}\text{Cr(n,n)}$	0.0320 ± 0.0008

Table C.7.2: ISCs for the delayed neutron fraction of PU-MET-INTER-002.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{56}\text{Fe (n,n)}$	1.6 ± 1.1	-0.13 ± 0.09
$^{239}\text{Pu } \bar{\nu}_d$	0.972 ± 0.003	0.976 ± 0.004
$^{58}\text{Ni (n,n)}$	-1.5 ± 0.5	0.07 ± 0.10
$^{239}\text{Pu } \bar{\nu}_p$	-1.0 ± 0.2	-1.0 ± 0.0
$^{57}\text{Fe (n,n)}$	0.0 ± 0.2	-0.013 ± 0.013
$^{54}\text{Fe (n,n)}$	0.2 ± 0.4	0.02 ± 0.03
$^{239}\text{Pu (n,}\gamma)$	-0.03 ± 0.04	-0.0462 ± 0.0002
$^{52}\text{Cr(n,n)}$	0.2 ± 0.5	0.04 ± 0.09
$^{55}\text{Mn(n,n)}$	-0.2 ± 0.4	0.00 ± 0.03

Table C.7.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of PU-MET-INTER-002. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (92.2%)	
$^{239}\text{Pu (n,}\gamma)/^{239}\text{Pu (n,}\gamma)$	0.8499 ± 0.0005
$^{239}\text{Pu (n,f)}/^{239}\text{Pu (n,f)}$	0.7168 ± 0.0008
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.46022 ± 0.00017
JENDL-4.0u (76.2%)	
$^{56}\text{Fe (n,n)}/^{56}\text{Fe (n,n)}$	0.392 ± 0.012
$^{56}\text{Fe (n,}\gamma)/^{56}\text{Fe (n,}\gamma)$	0.3447 ± 0.0003
$^{239}\text{Pu (n,}\gamma)/^{239}\text{Pu (n,}\gamma)$	0.32108 ± 0.00006
ENDF/B-VIII.0 (78.2%)	
$^{239}\text{Pu } \bar{\nu}/^{239}\text{Pu } \bar{\nu}$	0.26807 ± 0.00011
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.26745 ± 0.00011
$^{52}\text{Cr(n,n)}/^{52}\text{Cr(n,n)}$	0.211 ± 0.006

Table C.7.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of PU-MET-INTER-002. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{56}\text{Fe}(\text{n,n})/^{56}\text{Fe}(\text{n,n})$	5 ± 14	0.4 ± 0.5
$^{57}\text{Fe}(\text{n,n})/^{57}\text{Fe}(\text{n,n})$	4.7 ± 1.8	-
$^{58}\text{Ni}(\text{n,n})/^{58}\text{Ni}(\text{n,n})$	4 ± 3	-
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.44 ± 0.17	0.451 ± 0.006
$^{54}\text{Fe}(\text{n,n})/^{54}\text{Fe}(\text{n,n})$	-	0.2 ± 0.3
$^{239}\text{Pu}(\text{n},\gamma)/^{239}\text{Pu}(\text{n},\gamma)$	-	0.228 ± 0.018
JENDL-4.0u		
$^{56}\text{Fe}(\text{n,n})/^{56}\text{Fe}(\text{n,n})$	9 ± 16	-
$^{239}\text{Pu } \bar{\nu}_d/^{239}\text{Pu } \bar{\nu}_d$	4.737 ± 0.014	4.789 ± 0.004
$^{52}\text{Cr}(\text{n,n})/^{52}\text{Cr}(\text{n,n})$	3.1 ± 2.3	-
ENDF/B-VIII.0		
$^{58}\text{Ni}(\text{n,n})/^{58}\text{Ni}(\text{n,n})$	5 ± 4	0.29 ± 0.16
$^{56}\text{Fe}(\text{n,n})/^{56}\text{Fe}(\text{n,n})$	3.1 ± 2.2	0.26 ± 0.10
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.28 ± 0.09	0.262 ± 0.003
$^{55}\text{Mn}(\text{n,n})/^{55}\text{Mn}(\text{n,n})$	3 ± 4	-
$^{52}\text{Cr}(\text{n,n})/^{52}\text{Cr}(\text{n,n})$	-	0.2 ± 0.3

C.8 PU-MET-INTER-004

Table C.8.1: ISCs for the multiplication factor of PU-MET-INTER-004.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{239}\text{Pu } \bar{\nu}$	0.9830 ± 0.0004
$^{239}\text{Pu } \bar{\nu}_p$	0.9806 ± 0.0004
$^{239}\text{Pu}(\text{n,f})$	0.5766 ± 0.0004
$^{239}\text{Pu}(\text{n},\gamma)$	-0.15062 ± 0.00007
$^{208}\text{Pb}(\text{n,n})$	0.1514 ± 0.0010

Table C.8.2: ISCs for the delayed neutron fraction of
PU-MET-INTER-004.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
207Pb (n,n)	1.0 ± 0.4	-0.03 ± 0.04
239Pu $\bar{\nu}_d$	0.964 ± 0.003	0.968 ± 0.004
206Pb (n,n)	-0.6 ± 0.4	0.00 ± 0.05
239Pu $\bar{\nu}_p$	-0.97 ± 0.21	-0.96938 ± 0.00005
56Fe (n,n)	-0.3 ± 0.4	-0.0015 ± 0.0024
54Fe (n,n)	-0.15 ± 0.15	0.000 ± 0.016
57Fe (n,n)	0.06 ± 0.09	0.001 ± 0.011
239Pu χ	0.00 ± 0.20	0.000 ± 0.011
58Ni (n,n)	-0.33 ± 0.18	0.02 ± 0.03
206Pb (n,n)	-0.6 ± 0.4	0.00 ± 0.05
239Pu (n, γ)	-0.10 ± 0.04	-0.06826 ± 0.00006
239Pu (n,n)	-0.4 ± 0.3	0.02 ± 0.04
52Cr (n,n)	0.06 ± 0.17	-0.027 ± 0.009

Table C.8.3: Reaction contribution to multiplication factor uncertainty due
to nuclear data of PU-MET-INTER-004. In brackets, % of the uncertainty
explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (88.3%)	
239Pu (n, γ)/239Pu (n, γ)	0.5815 ± 0.0004
239Pu (n,f)/239Pu (n,f)	0.4796 ± 0.0007
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.45104 ± 0.00019
JENDL-4.0u (79.9%)	
208Pb (n,n)/208Pb (n,n)	0.339 ± 0.003
239Pu (n, γ)/239Pu (n, γ)	0.33351 ± 0.00007
239Pu (n,f)/239Pu (n,f)	0.29564 ± 0.00022
ENDF/B-VIII.0 (79.2%)	
208Pb (n,n)/208Pb (n,n)	0.359 ± 0.003
239Pu $\bar{\nu}$ /239Pu $\bar{\nu}$	0.26492 ± 0.00011
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.26427 ± 0.00011

Table C.8.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of PU-MET-INTER-004. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
56Fe (n,n)/56Fe (n,n)	3 ± 5	-
54Fe (n,n)/54Fe (n,n)	1.6 ± 1.0	-
57Fe (n,n)/57Fe (n,n)	1.4 ± 0.7	-
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.43 ± 0.16	0.435 ± 0.007
239Pu χ /239Pu χ	-	0.4274 ± 0.0022
58Ni (n,n)/58Ni (n,n)	0.9 ± 1.0	-
207Pb (n,n)/207Pb (n,n)	1.2 ± 0.8	-
206Pb (n,n)/206Pb (n,n)	0.9 ± 0.9	-
239Pu (n, γ)/239Pu (n, γ)	-	0.282 ± 0.014
JENDL-4.0u		
239Pu $\bar{\nu}_d$ /239Pu $\bar{\nu}_d$	4.054 ± 0.012	4.133 ± 0.004
56Fe (n,n)/56Fe (n,n)	2 ± 9	-
239Pu (n,n)/239Pu (n,n)	1.3 ± 2.3	-
207Pb (n,n)/207Pb (n,n)	1.2 ± 0.8	-
ENDF/B-VIII.0		
207Pb (n,n)/207Pb (n,n)	5 ± 3	0.16 ± 0.20
206Pb (n,n)/206Pb (n,n)	3 ± 4	-
239Pu χ /239Pu χ	1.0 ± 0.3	0.326 ± 0.013
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.28 ± 0.09	0.270 ± 0.004
52Cr (n,n)/52Cr (n,n)	-	0.16 ± 0.07

C.9 LEU-COMP-THERM-006

Table C.9.1: ISCs for the multiplication factor of LEU-COMP-THERM-006.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.94195 ± 0.00010
235U $\bar{\nu}_p$	0.93508 ± 0.00010
235U (n,f)	0.33033 ± 0.00017
1H (n, γ)	-0.13192 ± 0.00004
235U χ	0.00000 ± 0.00016

Table C.9.2: ISCs for the delayed neutron fraction of LEU-COMP-THERM-006.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{235}\text{U } \bar{\nu}_d$	0.8590 ± 0.0012	0.8656 ± 0.0007
$^{235}\text{U } \bar{\nu}_p$	-0.884 ± 0.019	-0.875 ± 0.000
$^{235}\text{U } \chi$	0.000 ± 0.028	0.0000 ± 0.0033

Table C.9.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of LEU-COMP-THERM-006. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (81.1%)	
$^{235}\text{U } \bar{\nu}_p/^{235}\text{U } \bar{\nu}_p$	0.52475 ± 0.00015
$1\text{H } (n,\gamma)/1\text{H } (n,\gamma)$	0.33685 ± 0.00010
$^{235}\text{U } \chi/^{235}\text{U } \chi$	0.32030 ± 0.00005
JENDL-4.0u (79.3%)	
$^{235}\text{U } \bar{\nu}/^{235}\text{U } \bar{\nu}_p$	0.4 ± 0.6
$^{235}\text{U } \bar{\nu}/^{235}\text{U } \bar{\nu}$	0.28127 ± 0.00005
$^{235}\text{U } \bar{\nu}_p/^{235}\text{U } \bar{\nu}_p$	0.28039 ± 0.00005
ENDF/B-VIII.0 (94.3%)	
$^{235}\text{U } \bar{\nu}/^{235}\text{U } \bar{\nu}_p$	0.6 ± 0.9
$^{235}\text{U } \bar{\nu}/^{235}\text{U } \bar{\nu}$	0.43411 ± 0.00011
$^{235}\text{U } \bar{\nu}_p/^{235}\text{U } \bar{\nu}_p$	0.43300 ± 0.00011

Table C.9.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of LEU-COMP-THERM-006. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{235}\text{U } \bar{\nu}_p/^{235}\text{U } \bar{\nu}_p$	0.50 ± 0.03	0.4907 ± 0.0015
$^{235}\text{U } \chi/^{235}\text{U } \chi$	0.28 ± 0.03	0.2734 ± 0.0003
JENDL-4.0u		
$^{235}\text{U } \bar{\nu}_d/^{235}\text{U } \bar{\nu}_d$	2.701 ± 0.004	2.7234 ± 0.0015
ENDF/B-VIII.0		
$^{235}\text{U } \bar{\nu}_d/^{235}\text{U } \bar{\nu}_d$	3.753 ± 0.006	3.7840 ± 0.0017

C.10 LEU-COMP-THERM-067

Table C.10.1: ISCs for the multiplication factor of LEU-COMP-THERM-067.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.9611 ± 0.0004
235U $\bar{\nu}_p$	0.9541 ± 0.0004
235U (n,f)	0.3652 ± 0.0005
235U χ	0.0000 ± 0.0005
1H (n, γ)	-0.11617 ± 0.00006

Table C.10.2: ISCs for the delayed neutron fraction of LEU-COMP-THERM-067.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
235U $\bar{\nu}_d$	0.897 ± 0.004	0.9043 ± 0.0010
235U $\bar{\nu}_p$	-0.89 ± 0.06	-0.91 ± 0.00
56Fe (n,n)	0.08 ± 0.08	-0.006 ± 0.012
16O (n,n)	-0.13 ± 0.16	-0.034 ± 0.016
238U (n,n)	-0.17 ± 0.09	0.006 ± 0.019
1H (n,n)	-0.3 ± 0.3	-0.12 ± 0.03
235U χ	0.00 ± 0.07	0.000 ± 0.008

Table C.10.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of LEU-COMP-THERM-067. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (79.0%)	
235U $\bar{\nu}_p$ /235U $\bar{\nu}_p$	0.53539 ± 0.00022
235U χ /235U χ	0.365 ± 0.003
1H (n, γ)/1H (n, γ)	0.3032 ± 0.0003
JENDL-4.0u (74.3%)	
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.40384 ± 0.00012
235U $\bar{\nu}$ /235U $\bar{\nu}$	0.28635 ± 0.00012
235U $\bar{\nu}_p$ /235U $\bar{\nu}_p$	0.28544 ± 0.00012
ENDF/B-VIII.0 (87.8%)	
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.62436 ± 0.00018
235U $\bar{\nu}$ /235U $\bar{\nu}$	0.44249 ± 0.00018
235U $\bar{\nu}_p$ /235U $\bar{\nu}_p$	0.44137 ± 0.00018

Table C.10.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of LEU-COMP-THERM-067. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{235}\text{U } \bar{\nu}_p / ^{235}\text{U } \bar{\nu}_p$	0.50 ± 0.03	0.51 ± 0.00
$^{56}\text{Fe (n,n)} / ^{56}\text{Fe (n,n)}$	0.25 ± 0.12	-
$^{16}\text{O (n,n)} / ^{16}\text{O (n,n)}$	0.2 ± 0.3	-
$^{238}\text{U (n,n)} / ^{238}\text{U (n,n)}$	0.22 ± 0.13	-
$^1\text{H (n,n)} / ^1\text{H (n,n)}$	0.18 ± 0.14	-
$^{235}\text{U } \chi / ^{235}\text{U } \chi$	0.2 ± 0.4	-
JENDL-4.0u		
$^{235}\text{U } \bar{\nu}_d / ^{235}\text{U } \bar{\nu}_d$	2.822 ± 0.013	2.8475 ± 0.0013
ENDF/B-VIII.0		
$^{235}\text{U } \bar{\nu}_d / ^{235}\text{U } \bar{\nu}_d$	3.911 ± 0.018	3.9462 ± 0.0018

C.11 HEU-MET-FAST-001

Table C.11.1: ISCs for the multiplication factor of HEU-MET-FAST-001.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{235}\text{U } \bar{\nu}$	0.98291 ± 0.00025
$^{235}\text{U } \bar{\nu}_p$	0.97665 ± 0.00025
$^{235}\text{U (n,f)}$	0.6523 ± 0.0003
$^{235}\text{U (n,n')}$	0.08179 ± 0.00017
$^{235}\text{U (n,n)}$	0.1091 ± 0.0003

Table C.11.2: ISCs for the delayed neutron fraction of HEU-MET-FAST-001.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{235}\text{U } \bar{\nu}_d$	0.9544 ± 0.0009	0.9698 ± 0.0016
$^{235}\text{U } \bar{\nu}_p$	-0.95 ± 0.06	-0.966 ± 0.004
$^{235}\text{U (n,f)}$	-0.07 ± 0.06	-0.054 ± 0.007
$^{235}\text{U } \chi$	0.00 ± 0.05	0.000 ± 0.005
$^{235}\text{U (n,n')}$	0.02 ± 0.04	-0.008 ± 0.003

Table C.11.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of HEU-MET-FAST-001. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (90.0%)	
235U (n,n')/235U (n,n')	0.6995 ± 0.0018
235U (n,n')/235U (n,f)	0.7 ± 1.0
235U (n,f)/235U (n,f)	0.6577 ± 0.0005
JENDL-4.0u (84.6%)	
235U (n,n')/235U (n,n')	0.6582 ± 0.0016
235U (n,n)/235U (n,n)	0.4425 ± 0.0017
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.4 ± 0.5
ENDF/B-VIII.0 (86.6%)	
235U (n,f)/235U (n,f)	0.7855 ± 0.0004
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.6 ± 0.8
235U $\bar{\nu}$ /235U $\bar{\nu}$	0.39965 ± 0.00012

Table C.11.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of HEU-MET-FAST-001. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
235U (n,f)/235U (n,f)	0.81 ± 0.09	0.839 ± 0.005
235U χ /235U χ	0.66 ± 0.14	0.918 ± 0.003
235U (n,n')/235U (n,f)	0.8 ± 1.1	-
JENDL-4.0u		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	2.626 ± 0.003	2.7300 ± 0.0014
ENDF/B-VIII.0		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	4.486 ± 0.005	4.5580 ± 0.0025

C.12 MIX-COMP-FAST-005

Table C.12.1: ISCs for the multiplication factor of MIX-COMP-FAST-005.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
239Pu $\bar{\nu}$	0.7896 ± 0.0003
239Pu $\bar{\nu}_p$	0.7881 ± 0.0003
239Pu (n,f)	0.5703 ± 0.0003
239Pu χ	(0.0000 ± 0.0003)
238U (n,n')	-0.0554 ± 0.0003
238U (n, γ)	-0.21390 ± 0.00006
238U $\bar{\nu}$	0.15585 ± 0.00010
238U $\bar{\nu}_p$	0.15366 ± 0.00010

Table C.12.2: ISCs for the delayed neutron fraction of MIX-COMP-FAST-005.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{238}\text{U } \bar{\nu}_d$	0.5640 ± 0.0014	0.5265 ± 0.0012
$^{239}\text{Pu } \bar{\nu}_d$	$\pm 0.3756 \pm 0.0005$	0.3816 ± 0.0012
$^{239}\text{Pu } \bar{\nu}_p$	-0.58 ± 0.10	-0.62597 ± 0.00007
$^{56}\text{Fe (n,n)}$	-0.36 ± 0.23	0.00 ± 0.03
$^{238}\text{U } \bar{\nu}_p$	-0.34 ± 0.04	-0.278600 ± 0.000006
$^{238}\text{U (n,n)}$	0.2 ± 0.4	-0.02 ± 0.03
$^{238}\text{U (n,n')}$	-0.27 ± 0.12	-0.105 ± 0.005
$^{238}\text{U (n,f)}$	0.27 ± 0.04	0.289 ± 0.005
$^{57}\text{Fe (n,n)}$	-0.05 ± 0.05	0.004 ± 0.005
$^{239}\text{Pu } \chi$	0.00 ± 0.09	0.000 ± 0.008
$^{240}\text{Pu (n,n')}$	-0.025 ± 0.013	0.0000 ± 0.0013
$^{238}\text{U } \chi$	0.00 ± 0.03	0.000 ± 0.004
$^{23}\text{Na (n,n)}$	0.00 ± 0.23	-0.01 ± 0.03
$^{58}\text{Ni (n,n)}$	-0.16 ± 0.10	-0.002 ± 0.013
$^{238}\text{U } \bar{\nu}$	0.22 ± 0.04	0.2479 ± 0.0044

Table C.12.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of MIX-COMP-FAST-005. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (74.9%)	
$^{239}\text{Pu } \chi/^{239}\text{Pu } \chi$	0.5245 ± 0.0004
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.36367 ± 0.00015
$^{238}\text{U (n,n')}/^{238}\text{U (n,n')}$	0.357 ± 0.004
JENDL-4.0u (80.1%)	
$^{238}\text{U (n,n')}/^{238}\text{U (n,n')}$	0.5074 ± 0.0022
$^{239}\text{Pu } \chi/^{239}\text{Pu } \chi$	0.36121 ± 0.00011
$^{238}\text{U (n,\gamma)}/^{238}\text{U (n,\gamma)}$	0.35855 ± 0.00011
ENDF/B-VIII.0 (73.7%)	
$^{238}\text{U (n,\gamma)}/^{238}\text{U (n,\gamma)}$	0.28142 ± 0.00007
$^{238}\text{U } \bar{\nu}/^{238}\text{U } \bar{\nu}_p$	0.3 ± 0.4
$^{239}\text{Pu } \chi/^{239}\text{Pu } \chi$	0.23717 ± 0.00014

Table C.12.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of MIX-COMP-FAST-005. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
238U (n,n)/238U (n,n')	-2 ± 3	-
238U (n,n')/238U (n,n')	1.7 ± 1.9	0.70 ± 0.08
238U (n,n')/238U (n,f)	-1.2 ± 1.7	-0.8 ± 1.2
56Fe (n,n)/56Fe (n,n)	1.1 ± 1.7	-
238U (n,n)/238U (n,f)	1.1 ± 1.6	-
238U (n,n)/238U (n,n)	1.1 ± 1.9	-
57Fe (n,n)/57Fe (n,n)	0.9 ± 0.4	-
238U (n,f)/238U (n,f)	0.66 ± 0.13	0.701 ± 0.008
239Pu χ /239Pu χ	0.64 ± 0.20	0.966 ± 0.007
240Pu(n,n')/240Pu(n,n')	0.5 ± 0.5	-
JENDL-4.0u		
238U (n,n')/238U (n,n')	2 ± 3	1.16 ± 0.04
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	1.895 ± 0.005	1.7689 ± 0.0022
56Fe (n,n)/56Fe (n,n)	1.7 ± 2.4	-
239Pu $\bar{\nu}_d$ /239Pu $\bar{\nu}_d$	1.5127 ± 0.0024	1.5671 ± 0.0017
ENDF/B-VIII.0		
238U (n,n)/238U (n,n')	-1.5 ± 2.1	-
23Na (n,n)/23Na (n,n)	1 ± 4	-
238U (n,n)/238U (n,n)	1.0 ± 1.5	-
238U (n,n')/238U (n,f)	-0.9 ± 1.2	-0.6 ± 0.8
238U (n,n')/238U (n,n')	1 ± 3	-
58Ni (n,n)/58Ni (n,n)	0.8 ± 1.0	-
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	0.7315 ± 0.0019	0.6826 ± 0.0009
56Fe (n,n)/56Fe (n,n)	0.7 ± 0.8	-
239Pu χ /239Pu χ	0.59 ± 0.07	0.605 ± 0.004
238U χ /238U χ	0.51 ± 0.07	0.521 ± 0.004
238U $\bar{\nu}$ /238U $\bar{\nu}_p$	-0.5 ± 0.7	-0.5 ± 0.7
238U (n,f)/238U (n,f)	0.33 ± 0.06	0.354 ± 0.003
238U $\bar{\nu}_p$ /238U $\bar{\nu}_p$	0.43 ± 0.05	0.346 ± 0.003
238U $\bar{\nu}$ /238U $\bar{\nu}$	0.29 ± 0.05	0.318 ± 0.003

C.13 IEU-MET-FAST-010

Table C.13.1: ISCs for the multiplication factor of IEU-MET-FAST-010.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.7513 ± 0.0004
235U $\bar{\nu}_p$	0.7473 ± 0.0004
235U (n,f)	0.5110 ± 0.0004
235U χ	0.0000 ± 0.0004
238U (n,n')	-0.1102 ± 0.0007
238U (n, γ)	-0.26595 ± 0.00012

Table C.13.2: ISCs for the delayed neutron fraction of IEU-MET-FAST-010.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
235U $\bar{\nu}_d$	0.5362 ± 0.0009	0.5627 ± 0.0019
238U $\bar{\nu}_d$	0.4483 ± 0.0012	0.3960 ± 0.0011
235U $\bar{\nu}_p$	-0.56 ± 0.07	-0.5247 ± 0.0012
238U $\bar{\nu}_p$	-0.42 ± 0.04	-0.43221 ± 0.0000021
235U χ	0.00 ± 0.07	0.000 ± 0.007
56Fe (n,n)	0.04 ± 0.09	-0.007 ± 0.007
238U (n,n')	0.05 ± 0.13	-0.048 ± 0.003
235U (n,f)	-0.03 ± 0.07	0.022 ± 0.012
238U (n,f)	0.11 ± 0.04	0.043 ± 0.003
238U (n,n)	0.3 ± 0.3	-0.02 ± 0.03

Table C.13.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of IEU-MET-FAST-010. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (83.9%)	
235U (n,f)/235U (n,f)	1.1542 ± 0.0011
235U χ /235U χ	0.8491 ± 0.0008
238U (n,n')/238U (n,n')	0.674 ± 0.008
JENDL-4.0u (90.7%)	
238U (n,n')/238U (n,n')	1.092 ± 0.004
235U χ /235U χ	0.54247 ± 0.00012
238U (n, γ)/238U (n, γ)	0.4715 ± 0.0003
ENDF/B-VIII.0 (73.0%)	
235U (n,f)/235U (n,f)	0.6174 ± 0.0005
238U (n, γ)/238U (n, γ)	0.44343 ± 0.00019
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.4 ± 0.6

Table C.13.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of IEU-MET-FAST-010. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{235}\text{U } \chi / ^{235}\text{U } \chi$	0.9 ± 0.3	0.436 ± 0.012
$^{56}\text{Fe (n,n)}/^{56}\text{Fe (n,n)}$	0.6 ± 0.5	-
$^{238}\text{U (n,n')}/^{238}\text{U (n,n')}$	0 ± 5	-
$^{238}\text{U } \bar{\nu}_p / ^{238}\text{U } \bar{\nu}_p$	0.41 ± 0.04	0.4120 ± 0.0022
$^{238}\text{U (n,n')}/^{238}\text{U (n,f)}$	0.4 ± 0.5	-
$^{235}\text{U } \bar{\nu}_p / ^{235}\text{U } \bar{\nu}_p$	0.30 ± 0.05	0.281 ± 0.003
$^{235}\text{U (n,f)}/^{235}\text{U (n,f)}$	0.2 ± 0.6	0.279 ± 0.015
JENDL-4.0u		
$^{235}\text{U } \bar{\nu}_d / ^{235}\text{U } \bar{\nu}_d$	1.852 ± 0.004	1.9601 ± 0.0021
$^{238}\text{U } \bar{\nu}_d / ^{238}\text{U } \bar{\nu}_d$	1.504 ± 0.004	1.3291 ± 0.0020
$^{238}\text{U (n,n)}/^{238}\text{U (n,n)}$	1 ± 4	-
ENDF/B-VIII.0		
$^{235}\text{U } \bar{\nu}_d / ^{235}\text{U } \bar{\nu}_d$	2.520 ± 0.005	2.644 ± 0.003
$^{238}\text{U (n,n)}/^{238}\text{U (n,n)}$	1.0 ± 1.8	-

C.14 IEU-MET-FAST-020

Table C.14.1: ISCs for the multiplication factor of IEU-MET-FAST-020.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{235}\text{U } \bar{\nu}$	0.82055 ± 0.00022
$^{235}\text{U } \bar{\nu}_p$	0.81576 ± 0.00021
$^{235}\text{U (n,f)}$	0.51909 ± 0.00023
$^{235}\text{U } \chi$	0.00000 ± 0.00021
$^{235}\text{U (n,}\gamma)$	-0.061807 ± 0.000021
$^{238}\text{U (n,n')}$	-0.0121 ± 0.0003

Table C.14.2: ISCs for the delayed neutron fraction of
IEU-MET-FAST-020.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
235U $\bar{\nu}_d$	0.6364 ± 0.0005	0.6569 ± 0.0012
238U $\bar{\nu}_d$	0.3498 ± 0.0005	0.3074 ± 0.0005
235U $\bar{\nu}_p$	-0.68 ± 0.04	-0.6513 ± 0.0003
238U $\bar{\nu}_p$	-0.346 ± 0.015	-0.310 ± 0.003
238U (n,n)	0.28 ± 0.12	0.016 ± 0.017
238U (n,n')	-0.07 ± 0.05	-0.042 ± 0.003
235U χ	0.00 ± 0.04	0.000 ± 0.003
235U (n,f)	-0.02 ± 0.04	-0.015 ± 0.007
65Cu (n,n)	-0.07 ± 0.07	-0.004 ± 0.009

Table C.14.3: Reaction contribution to multiplication factor uncertainty
due to nuclear data of IEU-MET-FAST-020. In brackets, % of the
uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (83.8%)	
235U (n,f)/235U (n,f)	1.0083 ± 0.0006
235U χ /235U χ	0.6366 ± 0.0004
235U (n, γ)/235U (n, γ)	0.54196 ± 0.00019
JENDL-4.0u (77.8%)	
238U (n,n')/238U (n,n')	0.4221 ± 0.0023
235U χ /235U χ	0.38773 ± 0.00008
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.3 ± 0.4
ENDF/B-VIII.0 (76.4%)	
235U (n,f)/235U (n,f)	0.6240 ± 0.0003
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.5 ± 0.7
235U (n, γ)/235U (n, γ)	0.36823 ± 0.00012

Table C.14.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of IEU-MET-FAST-020. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n')$	-0.7 ± 1.0	-
$^{238}\text{U} (n,n')/^{238}\text{U} (n,n')$	0.7 ± 0.9	0.31 ± 0.04
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n)$	0.5 ± 0.4	-
$^{235}\text{U} \chi/^{235}\text{U} \chi$	0.46 ± 0.11	-
$^{235}\text{U} (n,f)/^{235}\text{U} (n,f)$	0.37 ± 0.14	0.318 ± 0.008
$^{65}\text{Cu} (n,n)/^{65}\text{Cu} (n,n)$	0 ± 3	-
$^{235}\text{U} \bar{\nu}_p/^{235}\text{U} \bar{\nu}_p$	0.33 ± 0.03	0.3434 ± 0.0016
$^{238}\text{U} \bar{\nu}_p/^{238}\text{U} \bar{\nu}_p$	0.331 ± 0.016	0.2955 ± 0.0008
JENDL-4.0u		
$^{235}\text{U} \bar{\nu}_d/^{235}\text{U} \bar{\nu}_d$	2.0427 ± 0.0019	2.1378 ± 0.0012
$^{238}\text{U} (n,n')/^{238}\text{U} (n,n')$	1.5 ± 0.5	-
$^{238}\text{U} \bar{\nu}_d/^{238}\text{U} \bar{\nu}_d$	1.1732 ± 0.0018	1.0312 ± 0.0009
ENDF/B-VIII.0		
$^{235}\text{U} \bar{\nu}_d/^{235}\text{U} \bar{\nu}_d$	2.990 ± 0.003	3.0862 ± 0.0018

C.15 IEU-MET-FAST-021

Table C.15.1: ISCs for the multiplication factor of IEU-MET-FAST-021.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{235}\text{U} \bar{\nu}$	0.79288 ± 0.00022
$^{235}\text{U} \bar{\nu}_p$	0.78835 ± 0.00021
$^{235}\text{U} (n,f)$	0.50595 ± 0.00023
$^{235}\text{U} \chi$	0.00000 ± 0.00020
$^{235}\text{U} (n,\gamma)$	-0.056125 ± 0.000020
$^{238}\text{U} (n,n')$	0.0068 ± 0.0003
$^{238}\text{U} (n,n)$	0.1663 ± 0.0007

Table C.15.2: ISCs for the delayed neutron fraction of IEU-MET-FAST-021.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{235}\text{U} \bar{\nu}_d$	0.5967 ± 0.0005	0.6202 ± 0.0011
$^{238}\text{U} \bar{\nu}_d$	0.3891 ± 0.0005	0.3417 ± 0.0005
$^{235}\text{U} \bar{\nu}_p$	-0.59 ± 0.04	-0.6003 ± 0.0010
$^{238}\text{U} \bar{\nu}_p$	-0.391 ± 0.017	-0.358922 ± 0.0000019
$^{238}\text{U} (n,n')$	-0.02 ± 0.06	-0.061 ± 0.004
$^{235}\text{U} (n,n')$	0.029 ± 0.025	-0.0073 ± 0.0014
$^{235}\text{U} (n,f)$	-0.03 ± 0.04	-0.007 ± 0.006

Table C.15.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of IEU-MET-FAST-021. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (79.2%)	
235U (n,f)/235U (n,f)	0.9753 ± 0.0006
235U χ /235U χ	0.7287 ± 0.0004
235U (n, γ)/235U (n, γ)	0.50639 ± 0.00019
JENDL-4.0u (82.5%)	
238U (n,n')/238U (n,n')	0.619 ± 0.003
235U χ /235U χ	0.44377 ± 0.00007
238U (n,n)/238U (n,n)	0.428 ± 0.004
ENDF/B-VIII.0 (71.4%)	
235U (n,f)/235U (n,f)	0.6108 ± 0.0003
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.5 ± 0.6
238U (n,n)/238U (n,n)	0.3974 ± 0.0021

Table C.15.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of IEU-MET-FAST-021. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
238U (n,n')/238U (n,n')	0.4 ± 1.4	0.44 ± 0.04
238U $\bar{\nu}_p$ /238U $\bar{\nu}_p$	0.374 ± 0.018	0.3416 ± 0.0010
235U (n,n')/235U (n,f)	0.4 ± 0.5	-
235U $\bar{\nu}_p$ /235U $\bar{\nu}_p$	0.31 ± 0.03	0.3149 ± 0.0015
235U (n,f)/235U (n,f)	0.31 ± 0.13	0.345 ± 0.008
JENDL-4.0u		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	1.9651 ± 0.0019	2.0725 ± 0.0012
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	1.3050 ± 0.0019	1.1463 ± 0.0010
238U (n,n')/238U (n,n')	1.2 ± 0.6	-
ENDF/B-VIII.0		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	2.805 ± 0.003	2.9148 ± 0.0017

C.16 IEU-MET-FAST-022

Table C.16.1: ISCs for the multiplication factor of IEU-MET-FAST-022.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.83795 ± 0.00022
235U $\bar{\nu}_p$	0.83295 ± 0.00022
235U (n,f)	0.52239 ± 0.00023
235U (n, γ)	-0.075864 ± 0.000019
235U χ	0.00000 ± 0.00021
238U (n,n')	-0.0131 ± 0.0003

Table C.16.2: ISCs for the delayed neutron fraction of IEU-MET-FAST-022.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
235U $\bar{\nu}_d$	0.6601 ± 0.0005	0.6824 ± 0.0013
238U $\bar{\nu}_d$	0.3215 ± 0.0005	0.2835 ± 0.0005
235U $\bar{\nu}_p$	-0.67 ± 0.04	-0.682292 ± 0.000007
238U $\bar{\nu}_p$	-0.31 ± 0.05	$-0.28106570000 \pm 0.00000000009$
65Cu (n,n)	0.01 ± 0.07	-0.014 ± 0.006
235U (n,n')	-0.048 ± 0.022	-0.0061 ± 0.0010
238U (n,n')	-0.08 ± 0.05	-0.0399 ± 0.0014
235U (n,f)	-0.01 ± 0.04	-0.019 ± 0.008
235U χ	0.00 ± 0.04	0.000 ± 0.003

Table C.16.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of IEU-MET-FAST-022. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (85.7%)	
235U (n,f)/235U (n,f)	1.0932 ± 0.0006
235U (n, γ)/235U (n, γ)	0.62791 ± 0.00015
235U (n,f)/235U (n, γ)	0.6 ± 0.9
JENDL-4.0u (72.8%)	
235U χ /235U χ	0.34582 ± 0.00009
238U (n,n')/238U (n,n')	0.3187 ± 0.0019
235U (n,f)/235U (n,f)	0.27067 ± 0.00015
ENDF/B-VIII.0 (81.9%)	
235U (n,f)/235U (n,f)	0.6236 ± 0.0003
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.5 ± 0.7
235U (n, γ)/235U (n, γ)	0.41486 ± 0.00010

Table C.16.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of IEU-MET-FAST-022. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{65}\text{Cu} (n,n)/^{65}\text{Cu} (n,n)$	0.6 ± 2.2	-
$^{235}\text{U} (n,n')/^{235}\text{U} (n,n')$	0.6 ± 0.4	-
$^{238}\text{U} (n,n')/^{238}\text{U} (n,n')$	0.5 ± 0.8	0.28 ± 0.03
$^{235}\text{U} \bar{\nu}_p/^{235}\text{U} \bar{\nu}_p$	0.35 ± 0.03	0.3632 ± 0.0015
$^{235}\text{U} (n,f)/^{235}\text{U} (n,f)$	0.36 ± 0.18	0.285 ± 0.008
$^{235}\text{U} \chi/^{235}\text{U} \chi$	-	0.285 ± 0.006
JENDL-4.0u		
$^{235}\text{U} \bar{\nu}_d/^{235}\text{U} \bar{\nu}_d$	2.0330 ± 0.0019	2.1247 ± 0.0012
$^{238}\text{U} \bar{\nu}_d/^{238}\text{U} \bar{\nu}_d$	1.0797 ± 0.0017	0.9521 ± 0.0009
ENDF/B-VIII.0		
$^{235}\text{U} \bar{\nu}_d/^{235}\text{U} \bar{\nu}_d$	3.101 ± 0.003	3.2059 ± 0.0018

C.17 FCA-XIX-1

Table C.17.1: ISCs for the multiplication factor of FCA-XIX-1.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{235}\text{U} \bar{\nu}$	0.9760 ± 0.0004
$^{235}\text{U} \bar{\nu}_p$	0.9688 ± 0.0004
$^{235}\text{U} (n,f)$	0.4579 ± 0.0004
$^{235}\text{U} (n,\gamma)$	-0.17544 ± 0.00005
$^{235}\text{U} \chi$	0.0000 ± 0.0004

Table C.17.2: ISCs for the delayed neutron fraction of FCA-XIX-1.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{235}\text{U} \bar{\nu}_d$	0.9370 ± 0.0010	0.942 ± 0.003
$^{16}\text{O} (n,n)$	-1.0 ± 0.3	-0.05 ± 0.05
$^{235}\text{U} \bar{\nu}_p$	-0.95 ± 0.07	-0.94 ± 0.00
$^{235}\text{U} \chi$	0.00 ± 0.07	0.000 ± 0.006
$^{55}\text{Mn} (n,n)$	0.09 ± 0.04	-0.003 ± 0.003
$^{56}\text{Fe} (n,n)$	-0.04 ± 0.13	-0.008 ± 0.011
$^{54}\text{Fe} (n,n)$	0.08 ± 0.05	-0.002 ± 0.006
$^{235}\text{U} (n,n)$	-0.12 ± 0.09	0.002 ± 0.010

Table C.17.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of FCA-XIX-1. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (90.7%)	
235U (n, γ)/235U (n, γ)	0.86065 ± 0.00016
235U (n,f)/235U (n,f)	0.7891 ± 0.0008
235U (n,f)/235U (n, γ)	0.6 ± 0.9
JENDL-4.0u (85.1%)	
235U (n, γ)/235U (n, γ)	0.48213 ± 0.00020
235U (n,f)/235U (n,f)	0.4770 ± 0.0008
235U χ /235U χ	0.2656 ± 0.0005
ENDF/B-VIII.0 (88.5%)	
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.8 ± 1.1
235U $\bar{\nu}$ /235U $\bar{\nu}$	0.5741 ± 0.0003
235U $\bar{\nu}_p$ /235U $\bar{\nu}_p$	0.5729 ± 0.0003

Table C.17.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of FCA-XIX-1. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
235U χ /235U χ	1.018 ± 0.022	-
55Mn (n,n)/55Mn (n,n)	0.8 ± 0.5	-
56Fe (n,n)/56Fe (n,n)	0.6 ± 1.0	-
235U $\bar{\nu}_p$ /235U $\bar{\nu}_p$	0.52 ± 0.04	0.5124 ± 0.0023
0C (n,n)/0C (n,n)	0.49 ± 0.23	-
54Fe (n,n)/54Fe (n,n)	0.5 ± 0.5	-
JENDL-4.0u		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	2.352 ± 0.003	2.3983 ± 0.0018
235U (n,n)/235U (n,n)	0.8 ± 2.0	-
ENDF/B-VIII.0		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	4.261 ± 0.005	4.283 ± 0.003

C.18 FCA-XIX-2

Table C.18.1: ISCs for the multiplication factor of FCA-XIX-2.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{239}\text{Pu } \bar{\nu}$	0.7968 ± 0.0003
$^{239}\text{Pu } \bar{\nu}_p$	0.7952 ± 0.0003
$^{239}\text{Pu (n,f)}$	0.5043 ± 0.0003
$^{239}\text{Pu } \chi$	0.0000 ± 0.0003
$^{239}\text{Pu (n,}\gamma\text{)}$	-0.053534 ± 0.000025
$^{238}\text{U (n,}\gamma\text{)}$	-0.14009 ± 0.00004

Table C.18.2: ISCs for the delayed neutron fraction of FCA-XIX-2.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{238}\text{U (n,n)}$	0.6 ± 0.3	-0.047 ± 0.007
$^{239}\text{Pu } \bar{\nu}_d$	0.4391 ± 0.0008	0.4400 ± 0.0014
$^{238}\text{U } \bar{\nu}_d$	0.3989 ± 0.0016	0.3718 ± 0.0009
$^{239}\text{Pu } \bar{\nu}_p$	-0.71 ± 0.11	-0.71381 ± 0.00019
$^{239}\text{Pu } \chi$	0.00 ± 0.10	0.000 ± 0.009
$^{56}\text{Fe (n,n)}$	0.1 ± 0.3	-0.038 ± 0.019
$^{57}\text{Fe (n,n)}$	0.04 ± 0.06	0.002 ± 0.007
$^{27}\text{Al (n,n)}$	-0.13 ± 0.20	0.002 ± 0.023
$^{238}\text{U (n,n')}$	0.06 ± 0.12	-0.084 ± 0.006
$^{238}\text{U (n,f)}$	0.25 ± 0.03	0.229 ± 0.003
$^{52}\text{Cr (n,n)}$	-0.26 ± 0.13	0.009 ± 0.017
$^{58}\text{Ni (n,n)}$	-0.07 ± 0.12	-0.005 ± 0.012
$^{235}\text{U } \bar{\nu}_d$	0.1385 ± 0.0004	0.1415 ± 0.0011
$^{238}\text{U } \bar{\nu}$	0.22 ± 0.03	0.198 ± 0.003
$^{238}\text{U } \bar{\nu}_p$	-0.18 ± 0.03	-0.17388 ± 0.00003

Table C.18.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of FCA-XIX-2. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (75.1%)	
$^{239}\text{Pu } \bar{\nu}_p / ^{239}\text{Pu } \bar{\nu}_p$	0.36529 ± 0.00015
$^{239}\text{Pu (n,f)} / ^{239}\text{Pu (n,f)}$	0.27771 ± 0.00021
$^{239}\text{Pu } \chi / ^{239}\text{Pu } \chi$	0.2692 ± 0.0003
JENDL-4.0u (71.2%)	
$^{239}\text{Pu (n,f)} / ^{239}\text{Pu (n,f)}$	0.27318 ± 0.00017
$^{239}\text{Pu (n,\gamma)} / ^{239}\text{Pu (n,\gamma)}$	0.23993 ± 0.00006
$^{238}\text{U (n,\gamma)} / ^{238}\text{U (n,\gamma)}$	0.22751 ± 0.00008
ENDF/B-VIII.0 (75.6%)	
$^{239}\text{Pu } \bar{\nu} / ^{239}\text{Pu } \bar{\nu}$	0.21612 ± 0.00009
$^{239}\text{Pu } \bar{\nu}_p / ^{239}\text{Pu } \bar{\nu}_p$	0.21569 ± 0.00009
$^{238}\text{U (n,\gamma)} / ^{238}\text{U (n,\gamma)}$	0.18848 ± 0.00005

Table C.18.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of FCA-XIX-2. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{239}\text{Pu } \chi / ^{239}\text{Pu } \chi$	1.66 ± 0.13	0.687 ± 0.006
$^{56}\text{Fe (n,n)} / ^{56}\text{Fe (n,n)}$	1.5 ± 2.0	-
$^{238}\text{U (n,n)} / ^{238}\text{U (n,n)}$	1.1 ± 0.7	-
$^{238}\text{U (n,n)} / ^{238}\text{U (n,f)}$	1.1 ± 1.5	-
$^{57}\text{Fe (n,n)} / ^{57}\text{Fe (n,n)}$	1.1 ± 0.5	-
$^{238}\text{U (n,n)} / ^{238}\text{U (n,n')} $	1.0 ± 1.4	-
$^{27}\text{Al (n,n)} / ^{27}\text{Al (n,n)}$	0.8 ± 1.3	-
$^{238}\text{U (n,n')} / ^{238}\text{U (n,f)}$	-	-0.6 ± 0.9
$^{238}\text{U (n,n')} / ^{238}\text{U (n,n')} $	-	0.56 ± 0.08
$^{238}\text{U (n,f)} / ^{238}\text{U (n,f)}$	0.63 ± 0.09	0.558 ± 0.005
$^{239}\text{Pu } \bar{\nu}_p / ^{239}\text{Pu } \bar{\nu}_p$	0.32 ± 0.07	0.320 ± 0.004
JENDL-4.0u		
$^{238}\text{U (n,n)} / ^{238}\text{U (n,n)}$	2.9 ± 1.4	-
$^{239}\text{Pu } \bar{\nu}_d / ^{239}\text{Pu } \bar{\nu}_d$	1.585 ± 0.004	1.6233 ± 0.0018
$^{238}\text{U } \bar{\nu}_d / ^{238}\text{U } \bar{\nu}_d$	1.341 ± 0.005	1.2499 ± 0.0018
$^{239}\text{Pu } \chi / ^{239}\text{Pu } \chi$	1.13 ± 0.10	-
$^{56}\text{Fe (n,n)} / ^{56}\text{Fe (n,n)}$	1 ± 4	-
$^{238}\text{U (n,n')} / ^{238}\text{U (n,n')} $	-	0.8967 ± 0.0011
ENDF/B-VIII.0		
$^{52}\text{Cr (n,n)} / ^{52}\text{Cr (n,n)}$	1.5 ± 1.5	-
$^{238}\text{U (n,n)} / ^{238}\text{U (n,n)}$	1.2 ± 1.0	-
$^{27}\text{Al (n,n)} / ^{27}\text{Al (n,n)}$	1 ± 3	-
$^{56}\text{Fe (n,n)} / ^{56}\text{Fe (n,n)}$	0.8 ± 0.6	-
$^{239}\text{Pu } \chi / ^{239}\text{Pu } \chi$	0.78 ± 0.09	0.432 ± 0.004
$^{58}\text{Ni (n,n)} / ^{58}\text{Ni (n,n)}$	0.8 ± 1.1	-
$^{235}\text{U } \bar{\nu}_d / ^{235}\text{U } \bar{\nu}_d$	0.6497 ± 0.0019	0.6639 ± 0.0013
$^{238}\text{U } \bar{\nu}_d / ^{238}\text{U } \bar{\nu}_d$	0.5176 ± 0.0021	0.4822 ± 0.0007
$^{238}\text{U (n,n')} / ^{238}\text{U (n,f)}$	-	-0.4 ± 0.6
$^{238}\text{U } \bar{\nu} / ^{238}\text{U } \bar{\nu}_p$	-0.4 ± 0.5	-0.3 ± 0.5
$^{238}\text{U (n,f)} / ^{238}\text{U (n,f)}$	0.31 ± 0.04	0.2805 ± 0.0024
$^{238}\text{U } \bar{\nu} / ^{238}\text{U } \bar{\nu}$	0.27 ± 0.04	0.2536 ± 0.0022
$^{238}\text{U (n,n')} / ^{238}\text{U (n,n')} $	-	0.24 ± 0.04
$^{238}\text{U (n,n)} / ^{238}\text{U (n,n')} $	-	0.2 ± 0.3

C.19 FCA-XIX-3

Table C.19.1: ISCs for the multiplication factor of FCA-XIX-3.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{239}\text{Pu } \bar{\nu}$	0.9160 ± 0.0003
$^{239}\text{Pu } \bar{\nu}_p$	0.9140 ± 0.0003
$^{239}\text{Pu (n,f)}$	0.6030 ± 0.0003
$^{56}\text{Fe (n,n)}$	0.0798 ± 0.0013
$^{239}\text{Pu (n,}\gamma\text{)}$	-0.06421 ± 0.00003
$^{52}\text{Cr (n,n)}$	0.0343 ± 0.0007

Table C.19.2: ISCs for the delayed neutron fraction of FCA-XIX-3.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{239}\text{Pu } \bar{\nu}_d$	0.774 ± 0.003	0.7669 ± 0.0025
$^{52}\text{Cr (n,n)}$	0.3 ± 0.4	0.00 ± 0.03
$^{239}\text{Pu } \bar{\nu}_p$	-0.96 ± 0.18	-0.8995 ± 0.0005
$^{54}\text{Fe (n,n)}$	-0.54 ± 0.25	-0.007 ± 0.022
$^{56}\text{Fe (n,n)}$	-0.4 ± 0.7	0.06 ± 0.11
$^{57}\text{Fe (n,n)}$	0.30 ± 0.16	-0.011 ± 0.013
$^{239}\text{Pu } \chi$	0.00 ± 0.18	0.000 ± 0.017
$^{238}\text{U (n,n')}$	0.03 ± 0.09	-0.028 ± 0.003
$^{238}\text{U (n,f)}$	0.120 ± 0.024	0.066 ± 0.003
$^{53}\text{Cr (n,n)}$	0.14 ± 0.23	-0.005 ± 0.012
$^{58}\text{Ni (n,n)}$	0.2 ± 0.3	-0.049 ± 0.019
$^{235}\text{U } \bar{\nu}_d$	0.1009 ± 0.0005	0.1008 ± 0.0013

Table C.19.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of FCA-XIX-3. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (82.1%)	
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.42018 ± 0.00019
$^{239}\text{Pu (n,f)}/^{239}\text{Pu (n,f)}$	0.3263 ± 0.0003
$^{56}\text{Fe (n,n)}/^{56}\text{Fe (n,n)}$	0.248 ± 0.004
JENDL-4.0u (80.1%)	
$^{56}\text{Fe (n,n)}/^{56}\text{Fe (n,n)}$	0.349 ± 0.008
$^{239}\text{Pu (n,f)}/^{239}\text{Pu (n,f)}$	0.32553 ± 0.00021
$^{239}\text{Pu (n,}\gamma\text{)}/^{239}\text{Pu (n,}\gamma\text{)}$	0.25056 ± 0.00007
ENDF/B-VIII.0 (78.8%)	
$^{239}\text{Pu } \bar{\nu}/^{239}\text{Pu } \bar{\nu}$	0.24739 ± 0.00011
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.24685 ± 0.00011
$^{52}\text{Cr (n,n)}/^{52}\text{Cr (n,n)}$	0.234 ± 0.006

Table C.19.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of FCA-XIX-3. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
56Fe (n,n)/56Fe (n,n)	5 ± 4	0.27 ± 0.24
54Fe (n,n)/54Fe (n,n)	2.6 ± 1.8	-
57Fe (n,n)/57Fe (n,n)	2.4 ± 1.5	-
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.44 ± 0.14	0.405 ± 0.006
239Pu χ /239Pu χ	-	0.20 ± 0.05
238U (n,n')/238U (n,f)	-	-0.189 ± 0.006
238U (n,n')/238U (n,n')	-	0.189 ± 0.016
238U (n,f)/238U (n,f)	0.29 ± 0.08	0.156 ± 0.003
54Fe (n,n)/54Fe (n,n)	-	0.150 ± 0.010
JENDL-4.0u		
56Fe (n,n)/56Fe (n,n)	5 ± 9	-
239Pu $\bar{\nu}_d$ /239Pu $\bar{\nu}_d$	2.608 ± 0.009	2.630 ± 0.003
ENDF/B-VIII.0		
56Fe (n,n)/56Fe (n,n)	2.4 ± 2.2	-
53Cr (n,n)/53Cr (n,n)	1.2 ± 1.9	-
52Cr (n,n)/52Cr (n,n)	1 ± 20	-
58Ni (n,n)/58Ni (n,n)	1 ± 4	0.18 ± 0.13
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	0.4721 ± 0.0024	0.4714 ± 0.0016
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.27 ± 0.08	0.247 ± 0.004

C.20 SNEAK-7A

Table C.20.1: ISCs for the multiplication factor of SNEAK-7A.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)	
	MCNP	Kodeli, [1]
239Pu (n,f)	0.5485 ± 0.0003	0.54
239Pu $\bar{\nu}_p$	0.7955 ± 0.0003	0.779
238U $\bar{\nu}_p$	0.13257 ± 0.00009	0.137
239Pu $\bar{\nu}$	0.7971 ± 0.0003	-
239Pu χ	0.0000 ± 0.0003	-
238U (n, γ)	-0.16411 ± 0.00006	-
238U $\bar{\nu}$	0.13450 ± 0.00009	-

Table C.20.2: ISCs for the delayed neutron fraction of SNEAK-7A.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)		
	Bretscher	Chiba	Kodeli, [1]
^{238}U (n,n')	-0.06 ± 0.12	-0.1548 ± 0.0017	-0.151
^{238}U (n,f)	0.27 ± 0.04	0.261 ± 0.004	0.276
^{239}Pu (n,f)	-0.21 ± 0.11	-0.224 ± 0.014	-0.252
^{238}U $\bar{\nu}_d$	0.4967 ± 0.0021	0.4683 ± 0.0012	0.488
^{239}Pu $\bar{\nu}_d$	0.4023 ± 0.0008	0.4117 ± 0.0014	0.402
^{238}U $\bar{\nu}_p$	-0.25 ± 0.03	$-0.236308500 \pm 0.000000020$	-0.233
^{239}Pu $\bar{\nu}_p$	-0.66 ± 0.10	-0.66953 ± 0.00003	-0.7
^{238}U $\bar{\nu}$	0.25 ± 0.03	0.232 ± 0.004	0.255
^{239}Pu $\bar{\nu}$	-0.26 ± 0.10	-0.258 ± 0.016	-0.298
^{238}U (n,n)	-0.5 ± 0.3	0.00 ± 0.03	-
^{57}Fe (n,n)	0.06 ± 0.04	0.000 ± 0.004	-
^{56}Fe (n,n)	0.12 ± 0.17	-0.017 ± 0.017	-
^{238}U χ	0.00 ± 0.03	0.000 ± 0.003	-
^{239}Pu (n,n)	-0.14 ± 0.13	-0.006 ± 0.011	-
^{240}Pu (n,n)	0.07 ± 0.04	-0.0006 ± 0.0008	-
^{240}Pu (n,n')	0.014 ± 0.013	-0.0020 ± 0.0005	-
^{235}U $\bar{\nu}_d$	0.05651 ± 0.00019	0.0594 ± 0.0006	-
^{239}Pu χ	0.0 ± 0.1	0.000 ± 0.008	-

Table C.20.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of SNEAK-7A. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (73.8%)	
^{239}Pu χ / ^{239}Pu χ	0.4055 ± 0.0004
^{239}Pu $\bar{\nu}_p$ / ^{239}Pu $\bar{\nu}_p$	0.36448 ± 0.00015
^{239}Pu (n,f)/ ^{239}Pu (n,f)	0.31548 ± 0.00022
JENDL-4.0u (68.2%)	
^{239}Pu (n,f)/ ^{239}Pu (n,f)	0.29512 ± 0.00017
^{238}U (n, γ)/ ^{238}U (n, γ)	0.27470 ± 0.00013
^{239}Pu χ / ^{239}Pu χ	0.27083 ± 0.00012
ENDF/B-VIII.0 (69.5%)	
^{238}U $\bar{\nu}$ / ^{238}U $\bar{\nu}_p$	0.2 ± 0.3
^{238}U (n, γ)/ ^{238}U (n, γ)	0.22080 ± 0.00008
^{239}Pu $\bar{\nu}$ / ^{239}Pu $\bar{\nu}$	0.21631 ± 0.00009

Table C.20.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of SNEAK-7A. All the reactions showed explain an 85% of the total uncertainty at least. The library used in [1] is JENDL-4.0m

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)		
	Bretscher	Chiba	Kodeli, [1]
JEFF-3.3			
238U (n,n)/238U (n,n)	1.2 ± 1.3	-	-
238U (n,n)/238U (n,f)	-1.2 ± 1.7	-	-
57Fe (n,n)/57Fe (n,n)	0.9 ± 0.3	-	-
238U (n,f)/238U (n,f)	0.70 ± 0.11	0.634 ± 0.007	-
56Fe (n,n)/56Fe (n,n)	0.7 ± 1.1	-	-
238U (n,n)/238U (n,n')	0.6 ± 0.9	-	-
238U (n,n')/238U (n,f)	-0.4 ± 0.6	-	-
238U χ /238U χ	0.39 ± 0.07	-	-
239Pu (n,n)/239Pu (n,n)	0.3 ± 0.3	-	-
239Pu $\bar{\nu}_p$ /239Pu $\bar{\nu}_p$	0.29 ± 0.08	0.296 ± 0.004	-
240Pu (n,n)/240Pu (n,n')	0.3 ± 0.4	-	-
238U (n,n')/238U (n,n')	-	1.04 ± 0.07	-
239Pu χ /239Pu χ	-	0.941 ± 0.006	-
JENDL-4.0u			
238U (n,n')/238U (n,n')	1.5 ± 1.6	1.48 ± 0.04	1.425
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	0.1529 ± 0.0006	0.1614 ± 0.0004	0.218
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	1.668 ± 0.008	1.5729 ± 0.0021	1.61
239Pu $\bar{\nu}_d$ /239Pu $\bar{\nu}_d$	1.561 ± 0.004	1.6389 ± 0.0018	1.529
238U (n,n)/238U (n,n)	2.4 ± 2.3	-	-
ENDF/B-VIII.0			
238U (n,n)/238U (n,n')	1.3 ± 1.9	-	-
238U (n,n)/238U (n,n)	1.1 ± 1.8	-	-
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	0.644 ± 0.003	0.6075 ± 0.0008	-
238U (n,n')/238U (n,n')	0.6 ± 1.6	0.45 ± 0.04	-
238U (n,n')/238U (n,f)	-	-0.6 ± 0.9	-
239Pu χ /239Pu χ	-	0.550 ± 0.004	-
238U $\bar{\nu}$ /238U $\bar{\nu}_p$	-0.4 ± 0.6	-0.4 ± 0.6	-
238U χ /238U χ	-	0.403 ± 0.003	-
238U (n,f)/238U (n,f)	0.33 ± 0.05	0.319 ± 0.003	-
238U $\bar{\nu}$ /238U $\bar{\nu}$	0.31 ± 0.05	0.299 ± 0.003	-

C.21 SNEAK-7B

Table C.21.1: ISCs for the multiplication factor of SNEAK-7B.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{239}\text{Pu } \chi$	0.0000 ± 0.0003
$^{238}\text{U (n,n')}$	-0.0173 ± 0.0003
$^{238}\text{U (n,}\gamma)$	-0.16411 ± 0.00006
$^{238}\text{U } \bar{\nu}$	0.13450 ± 0.00009
$^{238}\text{U (n,n)}$	0.1032 ± 0.0009
$^{238}\text{U } \bar{\nu}_p$	0.13257 ± 0.00009
$^{238}\text{U (n,f)}$	0.08529 ± 0.00010

Table C.21.2: ISCs for the delayed neutron fraction of SNEAK-7B.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)		
	Bretscher	Chiba	Kodeli, [1]
$^{238}\text{U (n,n')}$	-0.17 ± 0.12	-0.130 ± 0.005	-0.164
$^{238}\text{U (n,f)}$	0.27 ± 0.04	0.251 ± 0.005	0.267
$^{239}\text{Pu (n,f)}$	-0.23 ± 0.08	-0.217 ± 0.007	-0.233
$^{238}\text{U } \bar{\nu}_d$	0.5618 ± 0.0012	0.5270 ± 0.0011	0.564
$^{239}\text{Pu } \bar{\nu}_d$	0.3002 ± 0.0004	0.3091 ± 0.0010	0.3
$^{238}\text{U } \bar{\nu}_p$	-0.36 ± 0.04	-0.320129 ± 0.000006	-0.334
$^{239}\text{Pu } \bar{\nu}_p$	-0.55 ± 0.08	-0.5613 ± 0.0003	-0.579
$^{238}\text{U } \bar{\nu}$	0.20 ± 0.04	0.207 ± 0.004	0.23
$^{239}\text{Pu } \bar{\nu}$	-0.25 ± 0.08	-0.252 ± 0.008	-0.28
$^{56}\text{Fe (n,n)}$	-0.07 ± 0.16	-0.002 ± 0.017	-
$^{239}\text{Pu } \chi$	0.00 ± 0.08	0.000 ± 0.007	-
$^{238}\text{U } \chi$	0.00 ± 0.03	0.000 ± 0.004	-
$^{238}\text{U (n,2n)}$	-0.019 ± 0.007	-0.002 ± 0.000	-
$^{238}\text{U (n,}\gamma)$	-0.095 ± 0.021	-0.0114 ± 0.0007	-
$^{235}\text{U } \bar{\nu}_d$	0.09964 ± 0.00021	0.1044 ± 0.0007	-
$^{27}\text{Al (n,n)}$	0.02 ± 0.05	-0.001 ± 0.005	-
$^{52}\text{Cr (n,n)}$	0.02 ± 0.08	-0.002 ± 0.004	-

Table C.21.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of SNEAK-7B. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (52.5%)	
$^{239}\text{Pu } \chi / ^{239}\text{Pu } \chi$	0.5081 ± 0.0004
$^{238}\text{U } (n,n') / ^{238}\text{U } (n,n')$	0.410 ± 0.004
$^{238}\text{U } (n,n') / ^{238}\text{U } (n,f)$	-0.4 ± 0.6
JENDL-4.0u (82.7%)	
$^{238}\text{U } (n,n') / ^{238}\text{U } (n,n')$	0.603 ± 0.003
$^{238}\text{U } (n,\gamma) / ^{238}\text{U } (n,\gamma)$	0.38189 ± 0.00014
$^{239}\text{Pu } \chi / ^{239}\text{Pu } \chi$	0.34515 ± 0.00009
ENDF/B-VIII.0 (49.2%)	
$^{238}\text{U } \bar{\nu} / ^{238}\text{U } \bar{\nu}_p$	0.3 ± 0.4
$^{238}\text{U } (n,\gamma) / ^{238}\text{U } (n,\gamma)$	0.30785 ± 0.00009
$^{238}\text{U } (n,n) / ^{238}\text{U } (n,n')$	-0.3 ± 0.4

Table C.21.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of SNEAK-7B. All the reactions showed explain an 85% of the total uncertainty at least. The library used in [1] is JENDL-4.0m

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)		
	Bretscher	Chiba	Kodeli, [1]
JEFF-3.3			
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n')$	-1.5 ± 2.2	-	-
$^{238}\text{U} (n,n')/^{238}\text{U} (n,n')$	1.5 ± 1.7	0.86 ± 0.08	-
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n)$	1.2 ± 1.3	-	-
$^{238}\text{U} (n,n)/^{238}\text{U} (n,f)$	1.2 ± 1.6	-	-
$^{238}\text{U} (n,n')/^{238}\text{U} (n,f)$	-0.8 ± 1.2	-0.8 ± 1.2	-
$^{238}\text{U} (n,n')/^{238}\text{U} (n,2n)$	0.7 ± 1.0	-	-
$^{238}\text{U} (n,n')/^{238}\text{U} (n,\gamma)$	0.7 ± 1.0	-	-
$^{238}\text{U} (n,f)/^{238}\text{U} (n,f)$	0.68 ± 0.14	0.609 ± 0.008	-
$^{56}\text{Fe} (n,n)/^{56}\text{Fe} (n,n)$	0.7 ± 0.8	-	-
$^{239}\text{Pu} \chi/^{239}\text{Pu} \chi$	-	0.780 ± 0.007	-
$^{238}\text{U} \chi/^{238}\text{U} \chi$	-	0.4484 ± 0.0025	-
JENDL-4.0u			
$^{238}\text{U} (n,n')/^{238}\text{U} (n,n')$	2.4 ± 1.4	1.48 ± 0.04	1.701
$^{235}\text{U} \bar{\nu}_d/^{235}\text{U} \bar{\nu}_d$	0.2890 ± 0.0007	0.3047 ± 0.0006	0.329
$^{238}\text{U} \bar{\nu}_d/^{238}\text{U} \bar{\nu}_d$	1.886 ± 0.004	1.7697 ± 0.0021	1.848
$^{239}\text{Pu} \bar{\nu}_d/^{239}\text{Pu} \bar{\nu}_d$	1.2004 ± 0.0019	1.2660 ± 0.0014	1.162
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n)$	2.3 ± 1.5	-	-
ENDF/B-VIII.0			
$^{238}\text{U} (n,n')/^{238}\text{U} (n,n')$	1.3 ± 1.2	-	-
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n')$	-1.2 ± 1.6	0.4 ± 0.5	-
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n) \chi$	1.0 ± 1.2	-	-
$^{238}\text{U} (n,n')/^{238}\text{U} (n,f)$	-0.7 ± 1.0	-0.6 ± 0.8	-
$^{238}\text{U} \bar{\nu}_d/^{238}\text{U} \bar{\nu}_d$	0.7288 ± 0.0017	0.6836 ± 0.0008	-
$^{238}\text{U} \chi/^{238}\text{U} \chi$	0.70 ± 0.04	0.540 ± 0.003	-
$^{238}\text{U} \bar{\nu}/^{238}\text{U} \bar{\nu}_p$	-0.5 ± 0.7	-0.5 ± 0.6	-
$^{235}\text{U} \bar{\nu}_d/^{235}\text{U} \bar{\nu}_d$	0.4682 ± 0.0011	0.4904 ± 0.0009	-
$^{27}\text{Al} (n,n)/^{27}\text{Al} (n,n)$	0.5 ± 0.7	-	-
$^{238}\text{U} \bar{\nu}_p/^{238}\text{U} \bar{\nu}_p$	0.45 ± 0.05	0.396 ± 0.003	-
$^{52}\text{Cr} (n,n)/^{52}\text{Cr} (n,n)$	0.4 ± 1.9	-	-
$^{239}\text{Pu} \chi/^{239}\text{Pu} \chi$	-	0.518 ± 0.003	-

C.22 MASURCA_R2

Table C.22.1: ISCs for the multiplication factor of MASURCA_R2.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.8884 ± 0.0003
235U $\bar{\nu}_p$	0.8828 ± 0.0003
235U (n,f)	0.5289 ± 0.0003
235U (n, γ)	-0.09421 ± 0.00003
238U (n, γ)	-0.15225 ± 0.00005

Table C.22.2: ISCs for the delayed neutron fraction of MASURCA_R2.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
235U $\bar{\nu}_d$	0.7500058 ± 0.0010	0.7646934 ± 0.0020
235U $\bar{\nu}_p$	-0.77 ± 0.06	-0.774411 ± 0.000006
238U (n,n')	-0.16 ± 0.06	-0.025 ± 0.004
235U χ	0.00 ± 0.06	0.000 ± 0.005
56Fe (n,n)	-0.09 ± 0.13	0.014 ± 0.023
238U (n,n)	0.14 ± 0.17	0.007 ± 0.022
57Fe (n,n)	-0.03 ± 0.03	0.002 ± 0.003
235U (n,f)	0.00 ± 0.06	-0.033 ± 0.011
238U $\bar{\nu}_p$	-0.220 ± 0.016	$-0.199411900 \pm 0.000000021$

Table C.22.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of MASURCA_R2. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (87.6%)	
235U (n,f)/235U (n,f)	1.0841 ± 0.0008
235U (n, γ)/235U (n, γ)	0.71167 ± 0.00018
235U (n,f)/235U (n, γ)	0.6773 ± 0.0004
JENDL-4.0u (66.0%)	
235U (n,f)/235U (n,f)	0.28555 ± 0.00025
238U (n, γ)/238U (n, γ)	0.26321 ± 0.00008
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.26017 ± 0.00007
ENDF/B-VIII.0 (78.2%)	
235U (n,f)/235U (n,f)	0.6094 ± 0.0004
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.56080 ± 0.00015
235U (n, γ)/235U (n, γ)	0.46672 ± 0.00012

Table C.22.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of MASURCA_R2. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{238}\text{U} (n,n')/^{238}\text{U} (n,n')$	1.1 ± 0.4	-
$^{235}\text{U} \chi/^{235}\text{U} \chi$	0.7 ± 0.4	0.216 ± 0.012
$^{56}\text{Fe} (n,n)/^{56}\text{Fe} (n,n)$	0.6 ± 0.3	-
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n')$	0.4 ± 0.8	-
$^{57}\text{Fe} (n,n)/^{57}\text{Fe} (n,n)$	0.44 ± 0.20	-
$^{235}\text{U} \bar{\nu}_p/^{235}\text{U} \bar{\nu}_p$	0.41 ± 0.03	0.415557 ± 0.000003
$^{235}\text{U} (n,f)/^{235}\text{U} (n,f)$	0.37 ± 0.14	0.231 ± 0.008
$^{238}\text{U} \bar{\nu}_p/^{238}\text{U} \bar{\nu}_p$	0.211 ± 0.016	$0.193774540 \pm 0.000000024$
JENDL-4.0u		
$^{235}\text{U} \bar{\nu}_d/^{235}\text{U} \bar{\nu}_d$	2.197 ± 0.003	2.2621 ± 0.0016
$^{238}\text{U} (n,n)/^{238}\text{U} (n,n)$	1.5 ± 0.8	-
$^{238}\text{U} (n,n')/^{238}\text{U} (n,n')$	1.3 ± 0.4	-
ENDF/B-VIII.0		
$^{235}\text{U} \bar{\nu}_d/^{235}\text{U} \bar{\nu}_d$	3.519 ± 0.005	3.5881 ± 0.0023

C.23 MASURCA_ZONA2

Table C.23.1: ISCs for the multiplication factor of MASURCA_ZONA2.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{239}\text{Pu} \bar{\nu}$	0.7852 ± 0.0003
$^{239}\text{Pu} \bar{\nu}_p$	0.7837 ± 0.0003
$^{239}\text{Pu} (n,f)$	0.5518 ± 0.0003
$^{240}\text{Pu} (n,f)$	0.037236 ± 0.000025
$^{239}\text{Pu} \chi$	0.0000 ± 0.0003
$^{238}\text{U} (n,\gamma)$	-0.13807 ± 0.00005
$^{238}\text{U} \bar{\nu}$	0.11530 ± 0.00008
$^{238}\text{U} \bar{\nu}_p$	0.11362 ± 0.00008

Table C.23.2: ISCs for the delayed neutron fraction of
MASURCA_ZONA2.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{238}\text{U } \bar{\nu}_d$	0.5640 ± 0.0014	0.4422 ± 0.0011
$^{239}\text{Pu } \bar{\nu}_d$	0.3756 ± 0.0005	0.4295 ± 0.0014
$^{56}\text{Fe (n,n)}$	-0.36 ± 0.23	-0.023 ± 0.018
$^{238}\text{U } \bar{\nu}_p$	-0.34 ± 0.04	-0.211133 ± 0.000025
$^{238}\text{U (n,n)}$	0.3 ± 0.3	-0.01 ± 0.03
$^{54}\text{Fe (n,n)}$	-0.13 ± 0.07	0.000 ± 0.009
$^{238}\text{U (n,f)}$	0.26 ± 0.03	0.261 ± 0.004
$^{238}\text{U (n,n')}^*$	0.01 ± 0.11	-0.078 ± 0.007
$^{239}\text{Pu } \chi$	0.00 ± 0.10	0.000 ± 0.009
$^{52}\text{Cr (n,n)}$	0.08 ± 0.09	-0.001 ± 0.010
$^{23}\text{Na (n,n)}$	-0.1 ± 0.3	-0.01 ± 0.03
$^{28}\text{Si (n,n)}$	0.26 ± 0.10	-0.002 ± 0.010
$^{238}\text{U } \bar{\nu}$	0.24 ± 0.03	0.231 ± 0.004
$^{238}\text{U } \chi$	0.00 ± 0.03	0.000 ± 0.003

Table C.23.3: Reaction contribution to multiplication factor uncertainty
due to nuclear data of MASURCA_ZONA2. In brackets, % of the
uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (77.1%)	
$^{239}\text{Pu } \chi/^{239}\text{Pu } \chi$	0.3763 ± 0.0016
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.35897 ± 0.00013
$^{240}\text{Pu (n,f)}/^{240}\text{Pu (n,f)}$	0.34593 ± 0.00023
JENDL-4.0u (67.5%)	
$^{239}\text{Pu (n,f)}/^{239}\text{Pu (n,f)}$	0.29623 ± 0.00015
$^{239}\text{Pu } \chi/^{239}\text{Pu } \chi$	0.2690 ± 0.0010
$^{238}\text{U (n,}\gamma)/^{238}\text{U (n,}\gamma)$	0.23429 ± 0.00007
ENDF/B-VIII.0 (69.6%)	
$^{239}\text{Pu } \bar{\nu}/^{239}\text{Pu } \bar{\nu}$	0.21339 ± 0.00007
$^{239}\text{Pu } \bar{\nu}_p/^{239}\text{Pu } \bar{\nu}_p$	0.21298 ± 0.00007
$^{238}\text{U } \bar{\nu}/^{238}\text{U } \bar{\nu}_p$	0.20014 ± 0.00010

Table C.23.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of MASURCA_ZONA2. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
56Fe (n,n)/56Fe (n,n)	1.5 ± 0.6	-
238U (n,n)/238U (n,f)	0.9 ± 0.5	-
54Fe (n,n)/54Fe (n,n)	0.8 ± 0.3	-
238U (n,n)/238U (n,n)	0.7 ± 0.7	-
238U (n,f)/238U (n,f)	0.66 ± 0.09	0.641 ± 0.005
238U (n,n')/238U (n,n')	0.6 ± 0.5	-
239Pu χ /239Pu χ	-	0.91 ± 0.03
238U (n,n')/238U (n,f)	-	-0.665 ± 0.010
JENDL-4.0u		
238U (n,n)/238U (n,n)	2.0 ± 1.5	-
238U (n,n')/238U (n,n')	1.8 ± 1.1	0.925 ± 0.006
239Pu $\bar{\nu}_d$ /239Pu $\bar{\nu}_d$	1.600 ± 0.004	1.6550 ± 0.0016
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	1.593 ± 0.008	1.4864 ± 0.0017
56Fe (n,n)/56Fe (n,n)	1.5 ± 0.8	-
ENDF/B-VIII.0		
52Cr (n,n)/52Cr (n,n)	1.2 ± 0.6	-
23Na (n,n)/23Na (n,n)	1.2 ± 0.9	-
28Si (n,n)/28Si (n,n)	1.0 ± 0.5	-
238U (n,n')/238U (n,n')	1.0 ± 0.7	-
238U (n,n)/238U (n,n')	-0.7 ± 0.6	-
238U (n,n)/238U (n,n)	0.6 ± 0.5	-
239Pu χ /239Pu χ	0.63 ± 0.19	0.538 ± 0.009
238U $\bar{\nu}_d$ /238U $\bar{\nu}_d$	0.615 ± 0.003	0.5737 ± 0.0007
238U (n,n')/238U (n,f)	-	-0.449 ± 0.010
238U $\bar{\nu}$ /238U $\bar{\nu}_p$	-0.42 ± 0.04	-0.3927 ± 0.0015
238U χ /238U χ	-	0.354 ± 0.004
238U (n,f)/238U (n,f)	0.32 ± 0.04	0.3194 ± 0.0023
238U $\bar{\nu}$ /238U $\bar{\nu}$	0.30 ± 0.04	0.2958 ± 0.0022
238U $\bar{\nu}_p$ /238U $\bar{\nu}_p$	0.29 ± 0.04	$0.26280292 \pm 0.00000006$

C.24 HEU-MET-FAST-062

Table C.24.1: ISCs for the multiplication factor of HEU-MET-FAST-062.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
235U $\bar{\nu}$	0.9185 ± 0.0003
235U $\bar{\nu}_p$	0.9127 ± 0.0003
235U (n,f)	0.5754 ± 0.0003
235U (n,n')	0.03221 ± 0.00022
235U (n, γ)	-0.05259 ± 0.00003
238U (n,n)	0.1288 ± 0.0006
238U (n,n')	0.04981 ± 0.00025

Table C.24.2: ISCs for the delayed neutron fraction of HEU-MET-FAST-062.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
235U $\bar{\nu}_d$	0.8175 ± 0.0012	0.8387 ± 0.0019
235U $\bar{\nu}_p$	-0.84 ± 0.07	-0.842 ± 0.003
235U χ	0.00 ± 0.06	0.000 ± 0.008
235U (n,f)	-0.08 ± 0.07	-0.056 ± 0.010
235U (n,n')	0.03 ± 0.04	-0.011 ± 0.004

Table C.24.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of HEU-MET-FAST-062. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (71.4%)
JEFF-3.3 (74.4%)	
235U (n,f)/235U (n,f)	0.7261 ± 0.0008
235U (n,n')/235U (n,f)	0.5 ± 0.8
235U (n, γ)/235U (n, γ)	0.4835 ± 0.0003
JENDL-4.0u (67.8%)	
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.3 ± 0.5
238U (n,n)/238U (n,n)	0.320 ± 0.003
238U (n,n')/238U (n,n')	0.310 ± 0.003
ENDF/B-VIII.0 (79.7%)	
235U (n,f)/235U (n,f)	0.6927 ± 0.0005
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.5 ± 0.7
235U $\bar{\nu}$ /235U $\bar{\nu}$	0.37376 ± 0.00015

Table C.24.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of HEU-MET-FAST-062. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
$^{235}\text{U } \chi / ^{235}\text{U } \chi$	1.32 ± 0.15	0.460 ± 0.006
$^{235}\text{U (n,f)} / ^{235}\text{U (n,f)}$	0.78 ± 0.14	0.626 ± 0.008
$^{235}\text{U (n,n')} / ^{235}\text{U (n,f)}$	0.7 ± 1.1	-
$^{235}\text{U } \bar{\nu}_p / ^{235}\text{U } \bar{\nu}_p$	0.41 ± 0.06	0.420 ± 0.003
JENDL-4.0u		
$^{235}\text{U } \bar{\nu}_d / ^{235}\text{U } \bar{\nu}_d$	2.363 ± 0.004	2.4802 ± 0.0018
$^{235}\text{U } \chi / ^{235}\text{U } \chi$	0.71 ± 0.05	-
ENDF/B-VIII.0		
$^{235}\text{U } \bar{\nu}_d / ^{235}\text{U } \bar{\nu}_d$	3.842 ± 0.006	3.942 ± 0.003

C.25 HEU-MET-FAST-100

Table C.25.1: ISCs for the multiplication factor of HEU-MET-FAST-100.

Quantity	Integrated Sensitivity Coefficients for k_{eff} (%/%)
$^{235}\text{U } \bar{\nu}$	0.98181 ± 0.00025
$^{235}\text{U } \bar{\nu}_p$	0.97556 ± 0.00025
$^{235}\text{U (n,f)}$	0.6496 ± 0.0003
$^{235}\text{U (n,n')}$	0.08067 ± 0.00017
$^{235}\text{U (n,n)}$	0.1084 ± 0.0003

Table C.25.2: ISCs for the delayed neutron fraction of HEU-MET-FAST-100.

Quantity	Integrated Sensitivity Coefficients for β_{eff} (%/%)	
	Bretscher	Chiba
$^{235}\text{U } \bar{\nu}_d$	0.9600 ± 0.0009	0.9676 ± 0.0015
$^{235}\text{U } \bar{\nu}_p$	-0.96 ± 0.05	-0.964 ± 0.004
$^{235}\text{U } \chi$	0.00 ± 0.05	0.000 ± 0.006
$^{235}\text{U (n,f)}$	-0.04 ± 0.06	-0.054 ± 0.007

Table C.25.3: Reaction contribution to multiplication factor uncertainty due to nuclear data of HEU-MET-FAST-100. In brackets, % of the uncertainty explained by the showed reactions.

Quantity	$\Delta k_{eff}/k_{eff}$ (%)
JEFF-3.3 (89.9%)	
235U (n,n')/235U (n,f)	0.7 ± 1.0
235U (n,n')/235U (n,n')	0.6911 ± 0.0018
235U (n,f)/235U (n,f)	0.6587 ± 0.0005
JENDL-4.0u (84.3%)	
235U (n,n')/235U (n,n')	0.6472 ± 0.0016
235U (n,n)/235U (n,n)	0.4413 ± 0.0018
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.4 ± 0.5
ENDF/B-VIII.0 (86.6%)	
235U (n,f)/235U (n,f)	0.7823 ± 0.0004
235U $\bar{\nu}$ /235U $\bar{\nu}_p$	0.6 ± 0.8
235U $\bar{\nu}$ /235U $\bar{\nu}$	0.39920 ± 0.00012

Table C.25.4: Reaction contribution to delayed neutron fraction uncertainty due to nuclear data of HEU-MET-FAST-100. All the reactions showed explain an 85% of the total uncertainty at least.

Quantity	$\Delta\beta_{eff}/\beta_{eff}$ (%)	
	Bretscher	Chiba
JEFF-3.3		
235U χ /235U χ	1.37 ± 0.11	0.882 ± 0.003
235U (n,f)/235U (n,f)	0.94 ± 0.09	0.829 ± 0.005
JENDL-4.0u		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	2.644 ± 0.003	2.7271 ± 0.0014
ENDF/B-VIII.0		
235U $\bar{\nu}_d$ /235U $\bar{\nu}_d$	4.512 ± 0.005	4.5477 ± 0.0024

References

- [1] I. Kodeli. “Sensitivity and uncertainty in the effective delayed neutron fraction (β_{eff})”. In: *Nuclear Instruments and Methods in Physics Research A* 715 (2013), pp. 70–78.