JEF2 VALIDATION WORK IN CADARACHE - December 1992

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FAST RANGE

Using a multi temperature 1968 g library JECCOLIB2 (1968 g) based on the JEF2.2 library, 57 integral data (keff, spectral indices) have been recalculated with the European Cell Code ECCO and the ERANOS code system. Sensitivities have been calculated for them in the fast 33 gr scheme and collapsed into the 15 group scheme chosen for the adjustment procedure. Of course, this 15 group scheme is consistent with the 1968 g, 172 g and 33 g schemes.

These 57 data belong to 3 different programs: LOS ALAMOS spheres, MASURCA experiments (major, minor actinides, structural materials), RB2 experiment (U5, B10, structural materials, oxygen) (this last program has been analysed by BOLOGNA people in CADARACHE) which have been analysed separately first to check the presence of systematic bias in the data and to modify the experimental uncertainties accordingly.

7 experimental data have been discarded from argument of consistency (χ^2 test). Some teachings have been obtained from systematic studies performed using the sample of 50 fast integral data, for which a χ^2/N value of 1.52 has been obtained.

- In addition to the χ^2 parameter additional parameters have to be considered in the adjustment procedure.

- Keff and spectral indices show some inconsistency.

- In this situation of inconsistency the correlations involved in the a priori evaluated covariances play little role, in other words, the uncertainty information could be reduced to standard deviations.

The statistical adjustment suggests modifications to :

^{239}Pu	-	Inelastic cross section	: E > 180 KeV : decrease 7-8 %
^{238}U	-	Inelastic cross section	: E > 6 MeV : increase ~ 20 %
	-	Capture cross section	: 2 KeV < E < 10 KeV : decrease ~ 2 %
^{235}U	-	Fission cross section	: 70 KeV < E < 1 MeV : decrease ~ 1.7 %
	-	Capture cross section	: 70 KeV < E < 6 MeV : decrease ~ 5 % : 500 eV < E < 10 KeV : increase ~ 6 %
^{58}Ni	-	Absorption cross section	: 500 eV < E < 20 MeV : decrease ~ 20 %
^{23}Na	-	Inelastic cross section	: 2 MeV < E < 20 MeV : increase ~ 28 %
^{16}O	-	Elastic (cross section angular distribution)	: E < 500 KeV : decrease ~ 15 %

THERMAL RANGE

40 experiments have been analysed so far, using the APOLIB2 library (172 g) and the cell code APOLLO2. They represent Keff and spectral indices data, implying the major actinides in addition to H_2O and O.

Although the analysis is not complete, some experiments have been rejected (VVER experiments) because of inconsistency. For 26 experiments a χ^2/N value of 0.40 is obtained suggesting an overestimation of the uncertainties in the spectral indices.

The general feature of the cross section adjustment is that it confirms the thermal data. A special mention should be made about ^{235}U : there is an inconsistency of data at the boundary of 0.15 eV : (below 0.15 eV the data are those of JEF2.0, above they are the data of JEF2.2). The adjustment suggests the JEF2.0 data are better.

MERGING OF FAST (action sheet 1 and 2) AND THERMAL (action sheet 3) INFORMATION

The information obtained in the thermal and the fast range is perfectly consistent. For the system of 76 integral data (50 fast + 26 thermal) a χ^2/N value of 1.25 is obtained. Compared to the adjustments performed by considering the thermal or the fast systems solely the modifications are extremely minor [illegible] concerning [illegible] the integral data (modifications of the order of 20 - 50 pcm on Keff or 0.2 % - 0.3 % on Spectral Indices).

CONCLUSION

The thermal data look in good shape.

For the resonance range more integral information is needed.

In the fast range improvements are needed, which can be obtained by local modification or complete reevaluation.

The adjusted data set has already acceptable performances which are summarized in the following table :

Fast systems uncertainty				Thermal systems uncertainty			
Before		After		Before		After	
Keff (pcm)	SI (%)	Keff (pcm)	SI (%)	Keff (pcm)	SI (%)	Keff (pcm)	SI (%)
350	2	235	1.8	341	3.1	81	1.2

For the systems considered the adjustment is more profitable for the thermal systems than for the fast ones.

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Integral Data included in the generalized adjustment

FAST

KEFF R390
KEFF R190
KEFF OA10
KEFF ON10
KEFF Z260
KEFF Z390
KEFF ZONA2
KEFF ZONA3
KEFF MAS1AP
KEFF MAS1B
KEFF ZONA1POA
KEFF OP10
KEFF RB276AC3
KEFF RB276AC5
KEFF RB276FE4
KEFF RB276FE5
KEFF RB276FE8
KEFF RB278AC3
KEFF RB278FE4
KEFF RB281AC6
KEFF RB281FE6
KEFF RB281FE8
INDICE_F8/F5 GODIVA
INDICE_F9/F5 GODIVA
INDICE_F8/F5 JEZEBEL
INDICE_F9/F5 JEZEBEL
INDICE_F8/F5 JEZEBEL.PU
INDICE_F8/F5 SCHERZO
INDICE_C8/F5 SCHERZO
C8/F5 U02E740
F8/F5 U02E740
F8/F5 R290
C8/F5 R290
INDICE_F8/F5 OP10
INDICE_C8/F5 OP10
INDICE_F49/F5 OP10
INDICE_F41/F5 OP10
INDICE_F42/F5 OP10
INDICE_F8/F5 OP11
INDICE_F49/F5 OP11
INDICE_F40/F5 OP11
INDICE_F41/F5 OP11
INDICE_F42/F5 OP11

THERMAL

ROW	1	KEFF V1360080
ROW	2	KEFF V1360030
ROW	3	KEFF V1364080
ROW	4	KEFF V1364030
ROW	5	KEFF V1440020
ROW	6	KEFF EPICU-UH12
ROW	7	KEFF TRX1
ROW	8	KEFF TRX2
ROW	9	KEFF ERASMES
ROW	10	KEFF ERASMER
ROW	11	KEFF ERASMELP
ROW	12	KEFF ERASMELG
ROW	13	KEFF JAP555
ROW	14	KEFF JAP424
ROW	15	KEFF JAP298
ROW	16	IS_ERASME/R RF8F5
ROW	17	IS_ERASME/R RC8F5
ROW	18	IS_ERASME/R RF9F5
ROW	19	IS_ERASME/R RF0F9
ROW	20	IS_ERASME/R RF1F9
ROW	21	IS_ERASME/R RF2F9
ROW	22	IS_ERASME/LG LGF8F5
ROW	23	IS_ERASME/LG LGF9F5
ROW	24	IS_ERASME/LG LGF0F9
ROW	25	IS_ERASMELG LGF1F9
ROW	26	IS_ERASME/LG LGF2F9