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Comments on jeff-33t1 library

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COMMENTS ON JEFF-3.3T1 LIBRARY

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JEFF-3.3T1 checking with GALILÉE-1 system

- File 1
- File 2
- File 3
- File 4
- File 5
- File 6
- File 8
- Files 12, 13, 15

Comparison between mass taken from NUBASE 2003 and mass taken from the evaluation

■ Absolute discrepancy greater than 1MeV for 13 nuclei

■ 48-Cd-113

■ 58-Ce-141

■ 63-Eu-155

■ 2-He-3

■ 53-I-135

■ 57-La-139

■ 41-Nb-93

■ 61-Pm-148

■ 44-Ru-103, 44-Ru-104, 44-Ru-105

■ 90-Th-230

■ 54-Xe-134

$$|\Delta| \leq 4.6196 \text{ MeV}$$

Spin value for compound nucleus ($J = L + S$)

■ Wrong spin value for 5 nuclei

- 98-Cf-251
- 93-Np-238
- 61-Pm-148
- 94-Pu-243
- 92-U-241

Comparison between threshold taken from the evaluation (QM) and threshold calculated from NUBASE 2003 masses

■ Absolute discrepancy greater than 500 keV for **33 nuclei**

■ MT 22

■ MT 28

■ MT 32

■ MT 41

■ MT 103

■ MT 104

■ MT 105

■ MT 106

■ MT 107

■ MT 108

■ MT 111

■ MT 112

$$|\Delta| \leq 100\%$$

Negative angular distributions due to Legendre Polynomial truncation

■ 20 nuclei

- MT 2, MT 51 -> 86
- Legendre order truncation: 8, 14, 20, 36, 64

Wrong normalization for angular distributions given in (mu, p(mu))

■ 82-Pb-208

- MT 2
- $1 < Norm \leq 1.060579$

Sum of outgoing neutron energies > available energy

- Absolute discrepancy greater than 1 MeV for **5 nuclei**
 - 48-Cd-108 (MT 17)
 - 48-Cd-110 (MT 17)
 - 48-Cd-112 (MT 17)
 - 48-Cd-114 (MT 17)
 - 48-Cd-116 (MT 17)

$$|\Delta| \leq 1.9112 \text{ MeV}$$

Various problems

- Gamma yield < 1 (10^{-4}) for inelastic scattering (exception: inelastic scattering to metastable state)
 - 66 nuclei

- Gamma production for discrete inelastic described in File 6 (MT < 91)
 - 70 nuclei

**Correlation in inelastic gamma cascade (MT<91) lost when described in file 6
(ex: 13-AI-27, MT 52))**

Better to use MF 12 to keep the correlations

Various problems

- Kinematics data not available at the threshold of the reaction (MF 3) : (50 keV)
 - 17-CI-37 (MT 658)
 - 8-O-16 (MT 749)
 - 72-Hf-174 (MT 91)
 - 72-Hf-176 (MT 91)

Example

- $n + {}^{16}_8\text{O} \rightarrow {}^{14}_7\text{N} + {}^3_1\text{H}$
- Threshold 22.86444 MeV
- In File 6 ${}^{14}_7\text{N}$ produced above 23.86138 MeV

Various problems

- Total gamma energy less than threshold energy for inelastic scattering
 - 327 nuclei

- Gamma emission probability sum (continuous + discrete) not equal to 1 ($|\Delta| > 10^{-4}$)
 - 26-Fe-56 (MT 649)
 - 14-Si-29 (MT 91)
 - 50-Sn-116 (MT102)
 - 50-Sn-118 (MT102)
 - 50-Sn-120 (MT102)

Various problems

- Excited states with excited level (LFS) = 0 (found in FUDGE)
 - 84 nuclei

- Inconsistency between excited level in File 8 and in DD (LFS \neq LIS)
 - JEFF-3.1.1 DD: 100 nuclei
 - JEFF-3.2 DD: 94 nuclei
 - ENDSF : 29 nuclei

- Inconsistency between excited state energy in File 8 and in DD ($|\Delta| > 50$ keV)
 - JEFF-3.1.1 DD: 6 nuclei
 - JEFF-3.2 DD: 6 nuclei
 - ENDSF : 5 nuclei

Gamma production

- File 15: Gamma distribution goes up higher than the available energy (Tolerance 5%)
 - 9 nuclei
- File 15: Total gamma energy goes up higher than the available energy (Tolerance 5% and $|\Delta| > 500$ keV)
 - 27 nuclei
- File 12/13 and 15 + File 5: Sum of neutron and gamma energies differ from available energy (Tolerance 5% and $|\Delta| > 500$ keV)
 - 13 nuclei
- File 12: Gamma production are not well normalized ($|\Delta| > 1.E-4$)
 - 91-Pa-231
- No gamma production given for radiative capture (no MF 6, 12 or 13)
 - 64 nuclei

**SUMMARY FOR:
JENDL40, ENDFB7R1, JEFF32, JEFF33T1**

JENDL-4.0 : 406 nuclei
 ENDF/B-VII.1 : 423 nuclei
 JEFF-3.2 : 472 nuclei
 JEFF-33T1 : 559 nuclei

Pb	JENDL40	ENDFB7R1	JEFF32	JEFF33T1
MF1 Mass/Nubase2003	4	27	24	13
MF2 Spin Value $J=L+S$	0	3	9	5
MF3 Q_{reac} /Nubase 2003	5	92	53	33
MF4 Negative distribution (Legendre Polynomials)	5	39	35	20
MF4 Wrong normalization.	0	0	0	1

Pb	JENDL40	ENDFB7R1	JEFF32	JEFF33T1
MF5 $E_n > E_{\text{available}}$	1	6	5	5
MF6 Inelastic Scattering : Gamma yield < 1	129	63	205	66
MF6 Discrete Inelastic scattering (MT<91)	193	85	38	70
MF3/MF6 Threshold discrepancy	0	5	69	4
MF6 $E_{\text{gam}} < \text{Threshold}$ (inelastic)	10	31	188	327
MF6 Prob (cont + disc) $\neq 1$	8	7	3	5

JENDL-4.0 : 3 / 406 nuclei

ENDF/B-VII.1 : 41 / 423 nuclei

JEFF-3.2 : 169 / 472 nuclei

JEFF-33T1 : 322 / 559 nuclei

Pb	JENDL40	ENDFB7R1	JEFF32	JEFF33T1
MF8 Exc >0 for LFS=0	0	0	0	84
MF8 LFS ≠ LIS (JEFF-311/DD)	1	14	41	100
MF8 LFS ≠ LIS (JEFF-32/DD)	2	16	39	94
MF8 LFS ≠ LIS (ENSDF)	1	12	7	29
MF8 ΔExc (JEFF-3.11/DD)	0	0	1	6
MF8 ΔExc (JEFF-3.2/DD)	0	0	1	6
MF8 ΔExc (ENSDF)	0	0	0	5

Pb	JENDL40	ENDFB7R1	JEFF32	JEFF33T1
MF15 $\text{Max}(E_{\text{gamma}}) > E_{\text{available}}$	17	20	15	9
MF15 $\text{Sum } E_{\text{gamma}} > E_{\text{available}}$	5	39	30	27
MF12,13,15,5 $E_n + E_{\text{gamma}} > E_{\text{available}}$	28	35	23	13
No gamma for MT102 *	139	138	104	64

* : MF6, MF12, MF13