Some comments on the discrepancies between libraries for the nuclei of the first list

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^{87}Br large uncertainty (17 %) on energy release

The data retained in JEFF-3.1 are taken from UKPADD-6.4 where $E_\beta = 1577 \pm 36$ keV and $E_\gamma = 3089 \pm 771$ keV (also adopted in UKPADD-6.5). JENDL3 gives $E_\beta = 1520$ 36 keV and $E_\gamma = 3340$ keV with no uncertainties.

Conclusion

Why this 10 % difference on E_γ between JEFF3 and JENDL3? E_β uncertainty in JEFF3 (2 %) is "standard" whereas the 25 % uncertainty on E_γ is more difficult to understand even if the decay scheme is somewhat complicated. Is there any clerical error somewhere? This seems to be a UKPADD problem.

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^{92}Rb large difference JEFF3/JENDL3 (energy release, 5U th fission)

^{92}Rb	JEFF-3.1 Ensdf 1994	JENDL-3.2 Ensdf 1994 + GBT	δ
Q_β	8105	8100	
E_β	2875	3499	+ 22 %
E_γ	1750	520	high
δQ	0.27 %		

In both Ensdf 1994 and Ensdf 2003 the decay scheme is that proposed by 1972OL03, as modified by 1980AL08. E_x / $Q_\beta = 0.91$ and $Q_\beta = 8105$ keV (1994) or 8100 keV (2003).

Conclusion

The Q_β value is large but the E_x / Q_β is also large, thus the potential pandemonium effect should be rather small. The JENDL3 E_γ-value seems abnormally small, to be checked.

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^{89}Sr large uncertainty (40 %) on energy release

The JEFF3 evaluation comes from Saclay (LNHB), mean energies are given: $E_\beta = 585 \pm 234$ keV, E_γ close to 0. The uncertainty on E_β is wrong, it should be close to 1 keV.

Conclusion

This is a LNHB/BRC problem which will be corrected pretty soon.

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^{96}Sr JEFF3 evaluation from NUBASE

It was my fault if this nucleus was put in the list. I thaught the JEFF3 evaluation was coming from NUBASE. In fact this data set is a conversion from ENSDF 1993 which gives a very satisfactory energy balance, $\delta Q = 0.083$ %.

Conclusion

Sorry!

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^{97}Sr — no uncertainty on energy release

The JEFF3 evaluation is coming from NUBASE and thus the E_β and E_γ-values are very approximate ($Q_\beta/3$) with no associated uncertainties ($E_\beta = E_\gamma = 2456$ keV).

The corresponding experimental Rudstam's values are [1990Ru] $E_\beta = 2500 \pm 420$ keV, $E_\gamma = 2450 \pm 60$ keV.

Conclusion

Adopt the Rudstam's uncertainties? The Rudstam's values are very close to the JEFF3 estimate, so we can imagine in this case to adopt the Rudstam values as well?

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^{96}Y — large difference JEFF3/JENDL3 (energy release, 5U th fission)

^{96}Y		JEFF-3.1 Ensdf 1998	JENDL-3.2 Ensdf 1993 + GBT	δ
	Q_β	7100	7100	
	E_β	3205	2657	- 20 %
	E_γ	80	1206	high
	δQ	0.0056%		
	Note: 95.5 % β^- to the g.s.!			

The 1998 Ensdf evaluation is mostly based on the 1990Ma03 reference and gives a 95.5 % β-transition to the ground-state. This intensity is compatible with the low E_γ-value in JEFF but not with the high value in JENDL. The E_x / Q_β-value is rather large (0.88).

Conclusion

Check the Ensdf β intensity to the ground-state or revise the JENDL3 evaluation.

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^{98}Nb — large difference JEFF3/JENDL3 (energy release, 5U th fission)

^{98}Nb		JEFF-3.1 Ensdf 1998	JENDL-3.2 Ensdf 1993 + GBT	δ
	Q_β	4586	4586	
	E_β	1965	1628	- 17 %
	E_γ	325	856	high
	δQ	0.25%		

Conclusion

Why such large discrepancies whereas both evaluations are based on Ensdf? Is this difference entirely coming from the GBT component?

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^{102}Tc large difference JEFF3/JENDL3 (energy release, 5U th fission)

^{102}Tc		JEFF-3.1 Ensdf 1998	JENDL-3.2 Ensdf 1991 + GBT	δ
	Q_β	4526	4530	
	E_β	1945	1420	- 27 %
	E_γ	808	1193	+ 48 %
	δQ	0.066%		

Conclusion
Why such large discrepancies whereas both evaluations are based on Ensdf 1998? Is this difference entirely coming from the GBT component?

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^{104}Tc missing decay heat

The JEFF3 evaluation comes from Ensdf 2000 with a good energy balance (-0.23 %). Mean energies are given: $E_\beta = 1595 \pm 75$ keV, $E_\gamma = 1890 \pm 31$ keV.

Conclusion
What else is needed?

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^{105}Tc missing decay heat

The JEFF3 evaluation comes from Ensdf 1993 with a satisfactory energy balance (-0.68 %). Mean energies are given: $E_\beta = 1310 \pm 173$ keV, $E_\gamma = 668 \pm 19$ keV.

Conclusion
What else is needed?

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^{135}Te large difference JEFF3/JENDL3 (energy release, 5U th fission)

^{135}Te		JEFF-3.1 Ensdf 1998	JENDL-3.2 Ensdf 1988 + GBT	δ
	Q_β	5960	5960	
	E_β	2442	2084	- 15 %
	E_γ	384	1478	high
	δQ	0.3%		

Conclusion
Why such large discrepancies whereas both evaluations are based on Ensdf 1998? Is this difference entirely coming from the GBT component?

^{142}Cs large difference JEFF3/JENDL3 (energy release, 5U th fission)

^{142}Cs	JEFF-3.1 Ensdf 1991	JENDL-3.2 Ensdf 1999 + GBT	δ
Q_β	7317	7307	
E_β	2899	2449	- 18 %
E_γ	675	1787	high
δQ	- 1.1 %		

The main change between the two ENSDF evaluations (1991 and 1999) is the Q_β value which is decreased by 10 keV and now in good agreement with the Audi mass table.

The relatively poor energy balance (-1.14 %, 84 keV) is mainly explained by the fact that in Ensdf the sum of the β-transition intensities is 99.19 %. Renormalizing this total intensity to 100 % leads to a better energy balance (-0.34 %, 25 keV). This renormalization is not applied in JEFF-3.1.

Conclusion

Despite the fact that all experimental results are about 20 years old, the decay scheme seems to be rather well know. The pandemonium effect should not be so large (E_x/Q_β = 0.72). So, may be the Japanese evaluation has to be reconsidered. The JEFF3 library must be updated by using Ensdf 2000 instead of Ensdf 1991 (no large difference expected).

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^{145}Ba large impact of Greenwood's data

^{145}Ba	JEFF-3.1 Nubase	JENDL-3.2 Ensdf 1993 + GBT	δ
Q_β	5580	4923	
E_β	1860	1870	+ 0.5 %
E_γ	1860	1159	- 38 %
δQ			

In Ensdf 1998, the energy balance is very poor (-42 %) mainly due to the fact that the total β feeding is 56 % instead of 100 %.

Conclusion

The Nubase values are only estimates. A new evaluation (at least of the β feeding) is needed. Back to the ENSDF evaluator.

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^{143}La large uncertainty (53 %) on energy release

The JEFF3 evaluation comes from Ensdf 1991 with a bad energy balance (15 %). Mean energies are given: $E_\beta = 1237 \pm 800$ keV, $E_\gamma = 252.3 \pm 2.7$ keV (very close to the ones given in JENDL3). The large uncertainty on E_β is due to the fact that the three β-transitions leading to the ground- and the first two excited levels (18.9 and 42.3 keV) have large intensities and also large uncertainties: 16 ± 16, 42 ± 42, 42 ± 42 %, respectively. The sum of the 27 other low beta-intensities gives 15.88 %, so the total β intensity is 116 % (which explains the 15 % energy balance default).

Conclusion

Back to the ENSDF evaluator or new experiments are needed?

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^{145}La large impact of Greenwood's data

^{145}La	JEFF-3.1 Ensdf 1993	JENDL-3.2 Ensdf 1993 + GBT	δ
Q_β	4120	4108	
E_β	1499	998	- 33 %
E_γ	624	1729	high
δQ	1.3 %		

Conclusion

Why such large discrepancies whereas both evaluations are based on Ensdf 1993? Is this difference entirely coming from the GBT component?

References

1990Ru G. Rudstam et al., *Beta and Gamma Spectra of Short-Lived Fission Products*, ADNDT 45 (1990) 239.

Acronyms

BRC Bruyères-le-Châtel (France)
GBT Gross Beta Theory
LNHB Laboratoire National Henri Becquerel (Saclay, France)