Updates to the ENDF/B Decay Data Sub-library

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a passion for discovery



<u>Updates to the decay data sub-library</u>

Beta intensities from TAGS experiments were used for the following nuclides: 91Rb, 92Rb, 93Rb, 94Rb, 95Sr, 140Cs,141Cs, 95Y, 143La, 144La, 145La, 143Ba.

Beta intensities from beta spectra measurements were used for: 82As, 88Br, 89Br, 90Br, 95Rb, 96Rb, 98Y, 99Y, 134Sb, 138I.

Additionally, the files for the following nuclides were modified. 82Ge, 83Ge, 91Br, 90Kr, 98mY, 86As.



Total Absorption Gamma Spectroscopy

It has been known that Total Absorption Gamma Spectroscopy (TAGS) data in the average gamma and beta energies helps solve the Pandemonium effect.



²³⁵U Decay Heat



²³⁹Pu Decay Heat



Much improved agreement for times larger than 10 seconds



TAGS effect on electron and antineutrino spectra

It has been recently shown by Fallot and collaborators that TAGS data can also change the electron / antineutrino spectra following fission.

M. Fallot et al., Phys. Rev. Lett. 109, 202504 (2012).

Calculations are performed using the summation method.

P. Vogel et al. Phys. Rev. C 24, 1543 (1981).



Summation Method

The spectrum for an equilibrated fissioning system is calculated as: $S(E) = \sum CFY_i S_i(E)$

where CFY_i is the cumulative fission yield and

 $S_i(E)$ is the spectrum from a β -minus decaying level:

$$S_i(E) = \sum I \beta_{lki} S_{lki} (Q\beta_i - E_{lki}, X, E)$$

 $S_{lki}(Q\beta_i - E_{lki}, X, E)$ is the spectrum generated in the decay to the level E_{lk} with intensity $I\beta_{lki}$

$$S_{lki}(Q\beta_i - E_{lki}, X, E) = Np(W - W_0)^2 F(Z, W) C_{Exp.} C_{Momentum} C_{Screening} C_{Radiative}$$

Where *N* is a normalization factor; *p*, *W* and W_0 and the relativistic momentum, energy and end point energy; F(Z, W) is the Fermi function including finite size effects, and the remaining factors are experimental shape, angular momentum, screening and radiative corrections. Weak magnetism corrections are not included.



Comparison with Exp. Data (ILL)





Comparison with Exp. Data (ILL)



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<u>Comparison with Exp. Data (ILL)</u>





Conclusions and future work

- Most of our recent work has centered around the short-lived fission products that are relevant in reactor antineutrinos.
- We plan to use McGill Univ. data for beta spectrum (lafigliola thesis)
- There are new ENSDF evaluations for 241Pu and 227Th that will be incorporated.

