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Revisiting the nuclear beta decay input in the reactor anomaly

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The study of nuclear beta decay has continually been at the forefront in exposing the properties of the electroweak interaction, and forms a sensitive probe in searching for Beyond Standard Model hints. It is an essential ingredient in the analysis of the so-called reactor antineutrino anomaly, and current results are obtained through the application of extensive averaging and basic approximations concerning nuclear structure. Considering the importance of a possibly positive result, it is clear that uncertainties stemming from aforementioned approximations must be well understood and, where possible, improved. Recently the description of the the allowed beta spectrum shape was reviewed and extended, and treated in an analytical fashion [1]. Additional work was performed on the evaluation of the weak magnetism contribution by taking into account nuclear deformation effects [2]. Excellent agreement was found when comparing to experimental mirror nuclei results, capitalizing on the importance of said deformations. Mean field models show strongly deformed shapes in the fission fragment region which must be addressed. Through a combination of these efforts steps are taken in improving the reliability and uncertainties of the anomaly analysis.

[1] L. Hayen, N. Severijns, K. Bodek, D. Rozpedik, X. Mougeot, Invited by Reviews of Modern Physics, To be published

[2] N. Severijns, L. Hayen, et al., In preparation

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