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Multi-isotope Experimental Validation of Calorimetric Electron Capture Spectral Theory

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Using microcalorimeters, a high statistics, high resolution calorimetric spectrum of electron capture in ^{163}Ho can be used to determine the neutrino mass. The spectral shape can be calculated from first principles with various assumptions and approximations. To determine the validity of these choices, the theoretical calculations must be compared to data from multiple isotopes. New calorimetric data for a ^{193}Pt-in-Pt absorber measured with a transition edge sensor (TES) are presented and compared to theoretical calculations. In order to create this ^{193}Pt-in-Pt absorber, a ^{192}Pt-enriched Pt foil was irradiated at a nuclear reactor to produce ^{193}Pt in situ. A small piece of this foil was cut off from the bulk foil and attached to an absorber pad thermally coupled to a TES. In this absorber, the radioactive isotope of interest has no elemental interfaces with the absorber material since both absorber and source are Pt, it is uniformly distributed throughout the absorber, and the absorber material is a pure metal. Data from this absorber is useful for understanding the electron capture theoretical shape without the complications of embedding ^{163}Ho in a Au absorber matrix. Calorimetric data from the literature for ^{55}Fe and ^{163}Ho are also compared to theoretical calculations.

Less than 5 years of experience since completion of Ph.D

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