STUDY OF THE INNER BREMSSTRAHLUNG FOLLOWING THE ELECTRON-CAPTURE DECAY OF ^{193}Pt

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We are measuring the inner bremsstrahlung photons emitted in some of the electron-capture decays of ^{193}Pt (IBEC). Due to its low Q-value (61 keV) ^{193}Pt does not undergo K-capture (from $1s_{1/2}$ shell). While the overall agreement between theory and experiment is about 5 to 10% for this kind of experiment, ^{193}Pt shows an anomaly, where a hydrogenoid-type calculation is the only one to produce good agreement, apparently fortuitous. This work is an effort to improve the quality of the experimental data available in order to investigate the origin of this anomaly and to improve the limit of the electron-neutrino mass.

The source was prepared with 0.87 g of 99.999% pure Pt in metal form, shaped as a 5-cm long wire, 1 mm in diameter. It was irradiated with neutrons at a flux of 10^{13} cm^{-2}s^{-1} for 52 days and let to cool down for eight months. The remaining activities were 100 μCi of ^{193}Pt (half-life 50 yr) and 15 μCi of ^{192}Ir (half-life 74 d), the latter coming from (n,γ) reactions on a small content ($\sim$0.4 ppm) of Ir. We have used a radiochemistry method to reduce the Ir contents of the source by two orders of magnitude. The resulting Pt compound will be dissolved in a plastic scintillator 3-mm thick and 53 mm in diameter. Since about 95% of the photons coming from the ^{192}Ir decay are in coincidence with a fast electron, the signal of the latter in the plastic will be used in anti-coincidence with the signal of the IBEC photons, caught in a Ge x-ray detector. We have performed simulations of the efficiency and absorption effects in the detection geometry and the absolute efficiency calculated is about 6% in the energy range of interest.