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Status of the HOLMES experiment: commissioning of the ion implanter

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The neutrino mass determination is an open issue in particle physics. The study of the endpoint of beta decay is the best experimental way to provide a model-independent mea- surement. The HOLMES experiment aims to measure directly the neutrino mass with a calorimetric approach studying the 163Ho electron-capture decay. The very low Q-value (2.8 keV), the half-life (4570 y) and the proximity of the endpoint to M1 resonance make the 163Ho decay a very good choice. However, there are two critical steps to be considered for the realization of the experiment. The first step is embedding of the source isotope inside the cryogenic microcalorimeters so that the energy released in the decay process is entirely contained within the detectors, except for the fraction taken away by the neutrino. The second one is the rejection of 166Ho radioactive isotope that could produce false signal in the region of interest. Taking into account these two requirements, a dedicated implanter with a sputter ion source, an acceleration section (up to 50 keV) and a magnetic dipole (for ion selection and beam focusing) has been designed and developed. The implanter calibra- tion and performance have been evaluated using 63Cu/65Cu and 197Au beams. Currently, different holmium compounds are being tested to find the candidate with the best efficiency in the sputter process. This work will show the status of the machine development and commissioning.

Working group

WG5

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