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Development and commissioning of the ion implanter for the HOLMES experiment.

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The HOLMES experiment aims to directly measure the ν mass studying the ^{163}Ho electron capture decay spectrum, developing arrays of TES-based micro-calorimeters implanted with O(10^2 Bq/detector) Ho atoms. The embedding of the source inside detectors is a crucial step of the experiment. Because ^{163}Ho is produced by neutron irradiation of a ^{162}Er sample, the source must be separated from a lot of contaminants. A chemical process removes every species other than Ho, but it is not sufficient to remove all background sources: in particular, $^{166\mathrm{m}}$Ho beta decay can produce fake signal in the region of interest. For this reason a dedicated implantation / beam analysis system has been set up and commissioned in Genoa's laboratory. It is designed to achieve more than 5σ separation @163/166 a.m.u. simultaneously allowing an efficient Ho atoms embedding inside microcalorimeter absorbers. Its main components are a 50 kV sputter-based ion source, a magnetic dipole and a target chamber. A specially designed co-evaporation system has been designed in such a way to "grow"the gold microcalorimeter absorber during the implantation process, increasing the maximum achievable activity which can be embedded. The machine performances in terms of achievable current, beam profile and mass separation have been evaluated by means of calibration runs using Cu, Mo, Au and ^{165}Ho beams. A special care has been given to the study of the more effective way to populate source plasma with Ho ions obtained from different Ho compounds, testing different target production techniques. In this work, the machine development and commissioning will be described.

Collaboration

HOLMES collaboration

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