



Transition-edge sensor arrays of microcalorimeters with Ho-163 for direct neutrino mass measurements with HOLMES

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Measuring the neutrino mass is one of the major challenges in today's particle physics and astrophysics. There are several methods to determine the neutrino mass: cosmological observations, neutrinoless double beta decay and beta or electron capture spectrum end-point study. The latter is currently the only one capable of providing a model independent measurement of the absolute scale of neutrino mass.

The HOLMES experiment will provide an important step forward in direct neutrino mass measurements with a calorimetric approach as an alternative to spectrometry. HOLMES will deploy a large array of transition-edge sensor (TES) microcalorimeters with implanted Ho-163 nuclei. The resulting mass sensitivity will be as low as 0.4 eV and it will also establish the potential of this approach to extend the sensitivity down to 0.1 eV and lower.

The detectors used for HOLMES will be Mo/Cu TES on SiN membranes with bismuth absorbers. The TES microcalorimeters will be fabricated in a two step process. The first steps will be carried out at NIST, then the devices will be further processed at the Genova INFN laboratory to implant the Ho-163 source. We describe our progress in fabricating, testing and optimizing the first devices, as well as the progress made in engineering the final 1000-pixels array to achieve the specified performances.