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Status of the HOLMES detector development

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HOLMES is a new experiment to directly measure the neutrino mass with a sensitivity as low as 0.4 eV. HOLMES will perform a calorimetric measurement of the energy released in the electron capture decay of ^{163}Ho.
The calorimetric measurement eliminates systematic uncertainties arising from the use of external beta sources, as in experiments with beta spectrometers.
HOLMES will deploy a large array of low temperature microcalorimeters with implanted ^{163}Ho nuclei.
The detectors used for the HOLMES experiment will be Mo/Cu superconducting Transition Edge Sensors (TES) on SiN_x membrane with bismuth absorbers. The detectors require a special two step fabrication process to allow the ^{163}Ho nuclei embedding. The signals from the microcalorimeter array will be read-out with a microwave multiplexing system combined with an FPGA based digital acquisition system which implements a Software Designed Radio.
HOLMES baseline detector is an array of 1000 microcalorimeters each with an implanted ^{163}Ho activity of about 300 Bq, an energy resolution FWHM of about 1 eV at the spectrum end-point ($Q \approx 2.5$\,keV), and a time resolution of about 1\,μs.
Matching these performances requires a careful optimization of all components, from the microcalorimeters to the signal processing algorithms.
We outline here the project technical challenges and the present status of the development.
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Collaboration

The HOLMES collaboration

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