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Transition Edge Sensors for HOLMES

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HOLMES is an experiment with the goal of performing a direct measurement of the neutrino mass from the electron capture spectrum of 163Ho. In order to reach its goal sensitivity of 2 eV it is necessary to gather as many as 10e13 events in the three years projected live time of the experiment. To do so, HOLMES will deploy an array of 1000 low temperature calorimeters composed by a Transition Edge Sensor (TES) thermometer coupled to a gold absorber, where 163Ho will be embedded, via a custom ion implanter. With a target activity of 300 Bq for each absorber, pile-up will be the main limiting factor in the sensitivity for the neutrino mass. In order to keep the pile-up fraction at 1e-4 it is crucial to have signals with an exponential rising edge of ~10 us sampled at a proper rate (500 kHz) so that pile-up resolving algorithms may be applied. Besides, an energy resolution of the order of few eV is needed not to spoil the neutrino mass measurement.

In this contribution I will describe the detectors used in HOLMES, their performance and the RF-SQUID based multiplexed readout system which will allow us to simultaneously operate 1000 detectors at 100 mK and collect the necessary data to reach the 2 eV target sensitivity of the neutrino mass.

Less than 5 years of experience since completion of Ph.D

Y

Student (Ph.D., M.Sc. or B.Sc.)

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