Poster session 1 - Monday 4 July

P1.047 **Development of transition edge sensors with rf-SQUID based multiplexing system for the HOLMES experiment**

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Measuring the neutrino mass is one the most compelling issues in particle physics. HOLMES is an experiment funded by the European Research Council for a direct measurement of neutrino mass. HOLMES will perform a precise measurement of the end point of the Electron Capture decay spectrum of ^{163}Ho in order to extract information on neutrino mass with a sensitivity as low as 1 eV.

HOLMES, in its final configuration will deploy a 1000 pixel array of low temperature microcalorimeters: each calorimeter consists of an absorber, where the Ho atoms will be implanted, coupled to a Transition Edge Sensor thermometer. The detectors will be kept at the working temperature of ~70 mK using a dilution refrigerator. In order to gather the required $3*10^{13}$ events in a three year long data taking with a pile up fraction as low as 10^{-4}, detectors must fulfill rather high speed and resolution requirements, i.e. 1 μs rise time and 4 eV resolution.

To maintain such performances with an efficient read out technique for very large detectors array kept at low temperature inside a cryostat is no trivial matter: at the moment, the most appealing read out technique applicable to large arrays of Transition Edge Sensors is rf-SQUID multiplexing. It is based on the use of rf-SQUIDs as input devices with flux ramp modulation for linearisation purposes; the rf-SQUID is then coupled to a super-conductive $\lambda/4$-wave resonator in the GHz range, and the modulated signal is finally read out using the homodyne technique.

In our contribution we outline the performance and special features of the multiplexing system and readout methods chosen for HOLMES and we present the last results on the performances of the HOLMES-like detectors tested with the rf-based set up at the Cryogenic Laboratory of the Physics Department of Milano-Bicocca University, where HOLMES is hosted.


NEUTRINO 2016
SOUTH KENSINGTON, LONDON
XXVII INTERNATIONAL CONFERENCE ON NEUTRINO PHYSICS AND ASTROPHYSICS
4–9 JULY 2016