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Analysis techniques for the signal processing of the HOLMES detectors

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The HOLMES experiment is a large-scale experiment for the electron neutrino mass determination. It will perform a calorimetric measurement of the energy released in the electron capture decay of 163Ho. In its final stage, HOLMES will employ 1000 microcalorimeters with Transition Edge Sensors (TES). These detectors are being used more and more frequently in physics and astronomy experiments, due to their energy resolution and their multiplexing capability. However, their excellent intrinsic energy resolution cannot be preserved without an accurate analysis procedure.
Each of the HOLMES detector will be implanted with an activity of 300 Hz. The events will be recorded with a sampling frequency of 500 kHz, corresponding to 1024 points acquired in 200 microseconds. The purpose of signal processing is to extract as many information as possible from those events.
This contribution will provide an overview of our algorithms used for pulse processing, from the evaluation of pulses energy to pile-up rejection. With the HOLMES high decay rates, reliable identification of nearly-coincident events is crucial to suppress what is expected to be the leading source of background and systematic errors. We report here the time resolution obtained with the combination of Wiener Filter and a processing method that exploits singular value decomposition.

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

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

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