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SuperNemo Demonstrator Current Status and Time Characterization of the Calorimeter

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Abstract:

SuperNEMO is an experiment aiming to search for the hypothetical neutrinoless double beta decay using a Tracker-Calorimeter Technique. A first module, called Demonstrator, is under construction and testing at the Laboratoire Souterrain de Modane (LSM) at 4800 m.w.e. depth. The Demonstrator aims to reach a sensitivity on the neutrinoless double beta decay half-life of T > 6.5 * 1024 y corresponding to <mν> < (260 – 500) meV with 17.5 kg.y exposure of 82Se, another goal is to demonstrate that a SuperNEMO module can reach its ultra-low background specifications. The Demonstrator tracker started recently taking data and is under commissioning, the magnetic coils are installed, too and to be commissioned. Anti-Radon tent, gamma and neutron shields are yet to be installed. The tracker gas is expected to have high radio-purity in 222Rn, with an activity of 0.15 mBq/m3. The Demonstrator calorimeter is already commissioned with 712 optical modules of which 440 with energy resolution of 8% at FWHM at 1MeV, it is aimed to detect individual particles energies and measure their time-of-flight. Time alignment and calibration of the optical modules was done using a Cobalt 60 where the 2 emitted gammas were detected in coincidence, resulting in a precise alignment to reject backgrounds using time-of-flight measurements and a primarily time resolution of ~ 600 ps for ɣs @ 1 MeV. More precise characterization of the timing of the calorimeter for electrons are expected with the full demonstrator installed and commissioned and with an electron source. An overview of the current status of the SuperNEMO Demonstrator is presented along with the methods used to perform time calibrations and get the time resolution.

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