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Atmospheric Argon Instrumentation for LEGEND-1000 at LNGS

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LEGEND-1000 is a next-generation ton-scale experiment searching for neutrinoless double beta decay of 76 Ge using p-type, high-purity germanium detectors. The experiment is planned for 1000 kg of Ge detectors enriched to more than 90% in 76 Ge.

The experiment is going to be installed at LNGS (3800 mwe) to reduce direct and induced backgrounds from cosmic rays.

While standard analysis techniques are very effective in removing prompt backgrounds, muon-induced events, associated with the production of long-lived isotopes in Ge detectors, require the application of delayed coincidence cuts between muon veto, liquid argon veto and the Ge detectors.

We present the design principles for the new active veto for LEGEND-1000 at LNGS. The goal is to instrument the atmospheric liquid argon volume and enhance the delayed coincidence cut efficiency by identifying neutron captures in argon via de-excitation gammas. We will discuss the various readout options considered and their performance, estimated through Geant4 simulations.

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Poster prize

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