

Contribution ID: 395

Type: Parallel

LEGEND-1000: A Ton-Scale Search for Neutrinoless Double-Beta Decay with Germanium Detectors

Friday 11 July 2025 08:45 (15 minutes)

LEGEND-1000 is a next-generation experiment designed to search for the neutrinoless double-beta $(0\nu\beta\beta)$ decay. The observation of $0\nu\beta\beta$ decay of 76 Ge isotope would establish the Majorana nature of neutrinos, providing insight into the mechanism of neutrino mass generation and the matter-antimatter asymmetry of the universe.

To achieve an unprecedented discovery sensitivity to $0\nu\beta\beta$ half-lives beyond 10^{28} years, the LEGEND Collaboration will deploy 1000 kg of high-purity germanium detectors enriched to over 90% in ⁷⁶Ge, operated in an instrumented liquid argon active shield at a deep underground facility, with a reference design at Laboratori Nazionali del Gran Sasso in Italy. The experiment will probe an effective Majorana neutrino mass in the range of 9–24 meV, covering the inverted neutrino mass ordering. LEGEND-1000 builds on technologies from GERDA, the Majorana Demonstrator, and the ongoing LEGEND-200 deployment, incorporating innovations such as pulse shape analysis, multi-detector segmentation, and LAr scintillation detection. These techniques enable exceptional background suppression, with a targeted rate below 1×10^{-5} cts/(keV·kg·yr), enabling a quasi-background-free search where even a few observed events could establish discovery.

Secondary track

T09 - Beyond the Standard Model

Author: HARANCZYK, Malgorzata (Jagiellonian University)
Presenter: HARANCZYK, Malgorzata (Jagiellonian University)
Session Classification: T03

Track Classification: T03 - Neutrino Physics