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Searching for the Majorana neutrino with LEGEND

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Content :

The search for the neutrinoless double beta ($0\nu\beta\beta$) decay is considered the most promising way to prove the Majorana nature of neutrinos and to give an indication of the mass hierarchy and of the absolute mass scale of neutrinos. Moreover, being the $0\nu\beta\beta$ decay a lepton number violating process, its potential discovery would offer an explanation for the observed matter-antimatter asymmetry in the Universe, opening the door for new physics beyond the Standard Model.

The LEGEND (Large Enriched Germanium Detector for Neutrinoless $\beta\beta$ Decay) collaboration aims at building a 76Ge-based $0\nu\beta\beta$ experiment with a sensitivity on the decay half-life beyond 10^{28} years, to fully span the inverted neutrino mass ordering region.
Combining the efforts of previous GERDA and MAJORANA experiments, the LEGEND project will proceed in two steps: in the first phase, 200 kg of enriched germanium detectors will be deployed in the already existing GERDA facility at Laboratori Nazionali del Gran Sasso (LNGS) in Italy.
With an exposure of 1 t yr and a background index of 0.5 cts/(FWHM t yr), LEGEND-200 will reach a sensitivity of 10^{27} yr at 90% C.L. In the second phase, 1 ton of enriched germanium detectors will be deployed into a cryostat filled with underground liquid argon. With an exposure of 10 t yr and a background index of 0.025 cts/(FWHM t yr), LEGEND-1000 will reach a 3σ half-life discovery sensitivity of 1.3×10^{28} yr, improving the final GERDA result by a factor 100.
In this contribution, an overview of the LEGEND project and its $0\nu\beta\beta$ decay search will be presented.

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