Technology & Instrumentation in Particle Physics (TIPP2023)



Contribution ID: 129

Type: Oral Presentations

## LEGEND: Background-free hunt for the neutrinoless double-beta decay

Thursday, 7 September 2023 16:20 (20 minutes)

The discovery that neutrinos are Majorana fermions would have profound implications for particle physics and cosmology. The Majorana character of neutrinos would make neutrinoless double-beta  $(0\nu\beta\beta)$  decay, a mattercreating process without the balancing emission of antimatter, possible. The LEGEND Collaboration pursues a phased, <sup>76</sup>Ge-based double-beta decay experimental program. The first phase, LEGEND-200, deploys up to 200 kg of germanium detectors enriched in <sup>76</sup>Ge. A background index of  $2 \cdot 10^{-4}$  counts/(keV kg yr) will be achieved. With that background index, when integrated over the exposure, less than one background event in the region around the expected peak position of the  $0\nu\beta\beta$  decay will be accumulated. It constitutes a quasibackground-free operation of LEGEND-200, enabling a potential discovery of the  $0\nu\beta\beta$  decay at a half-life of at least  $10^{27}$  years. The second phase, LEGEND-1000, will deploy 1000 kg of enriched germanium and reach a discovery potential above  $10^{28}$  years. This talk will portray how LEGEND utilizes high-purity materials, novel sub-detector systems, and sophisticated analysis tools to obtain a quasi-background-free energy spectrum. Furthermore, first results from the currently ongoing data-taking period of LEGEND-200 are presented.

Primary author: KRAUSE, Patrick (Technical University of Munich)Presenter: KRAUSE, Patrick (Technical University of Munich)Session Classification: G4