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Background rejection by Pulse Shape Discrimination in the LEGEND experiment

Wednesday 27 August 2025 18:00 (2 hours)

The LEGEND (Large Enriched Germanium Detector for Neutrinoless $\beta\beta$ Decay) collaboration aims to detect neutrinoless double-beta ($0\nu\beta\beta$) decay in ^{76}Ge using enriched high-purity germanium (HPGe) detectors. In its first phase, LEGEND-200 successfully acquired physics data for over a year using 140 kg of HPGe detectors deployed in a liquid argon cryostat. LEGEND-200 has a background goal of less than 2×10^{-4} cts/(keV kg yr). This requires excellent background mitigation capabilities, both passive and active.
The sources of background (contributing in the region of interest) include the alphas and betas originating from the detector surface and gamma rays that undergo Compton scattering in the detector bulk. In contrast, $0\nu\beta\beta$ events are expected to be bulk, single-site events.
Pulse Shape Discrimination (PSD) is a powerful set of techniques used by LEGEND-200 to reject event populations with background-like topologies, using information from the shapes of signals produced by HPGe detectors. PSD techniques take advantage of the properties of point-contact detector geometries used by the experiment.
The poster will describe the techniques developed for the different detector geometries in LEGEND and how to evaluate the signal acceptance efficiency and systematics at the $0\nu\beta\beta$ energy.

Collaboration you are representing

LEGEND

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