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Modeling Background Rejection with the Liquid Argon Optical Instrumentation in LEGEND

Thursday, 23 October 2025 14:00 (20 minutes)

LEGEND-200 is a low-background experiment searching for neutrinoless double beta decay in Ge-76 \[arXiv:2505.10440\]. Situated deep underground at LNGS, the experiment is designed to operate 200 kg of enriched high-purity germanium detectors immersed in a liquid argon (LAr) cryostat. Background suppression is enhanced by an optical instrumentation system that detects scintillation light produced by interactions of ionizing radiation in the LAr. In this talk, I will introduce remage \[DOI:10.5281/zenodo.11115662\], a new Monte Carlo simulation framework under development within the collaboration. Designed for simulating particle radiation transport in low-background experiments, remage includes dedicated tools for modeling the transport of optical photons in noble liquids. I will discuss these capabilities in detail and present results from simulations of the LEGEND-200 LAr instrumentation. The results demonstrate notable innovations over previous efforts in predecessor experiments and will be compared with calibration data from LEGEND-200. Finally, I will outline how these simulations lay the groundwork for improved background modeling and the development of new background mitigation strategies within the LEGEND experimental program.

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