Contribution ID: **522** Type: **Oral**

Modelling of HPGe Detectors for the LEGEND Experiment and Low-Background Research

Wednesday 27 August 2025 18:00 (20 minutes)

The LEGEND experiment is a phased programme designed to search for neutrino-less double beta decay with unprecedented sensitivity, targeting a half-life of up to 10^28 years, corresponding to a Majorana neutrino mass range of 9–21 meV. Its first phase, LEGEND-200, is currently taking data at the Gran Sasso Underground Laboratory and aims to reach a sensitivity of 10^27 years (28–66 meV).

LEGEND employs high-purity germanium (HPGe) detectors enriched in 76Ge, operated in liquid argon. Accurate modelling of the detector response and background contributions is essential for maximising discovery potential and informing detector design and analysis strategies. In this talk, we describe a Geant4-based simulation framework developed for LEGEND, including geometry modelling, signal generation, charge transport, and detector response. We also introduce the validation of the simulation framework and its application for LEGEND background modelling and material screening in ultra-low background experiments.

Collaboration you are representing

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Session Classification: Underground Laboratories

Track Classification: Underground Laboratories – Technology