Low Radioactivity Techniques (LRT2024)



Contribution ID: 49 Type: Talk

Radioassays for the LEGEND 76Ge neutrinoless double beta decay experiment

Friday, 4 October 2024 11:30 (20 minutes)

The LEGEND experiment searches for neutrinoless double beta decay in 76 Ge-enriched high-purity germanium detectors operating in liquid argon, whose scintillation acts as an active veto against external background events. Using specialized detector geometries, pulse shape discrimination is performed to further veto background events. LEGEND-200 has completed about one year of stable physics data-taking at Laboratori Nazionali del Gran Sasso (LNGS) in Italy, with the first data recently unblinded. With a planned ultimate exposure of 1 ton yr and a target background index of 2×10^{-4} cts/(keV·kg·yr) at $Q_{\beta\beta}$ = 2039 keV, LEGEND-200 is expected to reach a 3σ discovery sensitivity of 10^{27} years half-life. The next generation experiment, LEGEND-1000, will operate 1000 kg of detectors and reach an expected discovery sensitivity of 10^{28} years half-life, covering the inverted neutrino mass hierarchy. To reach the required low background, LEGEND uses an extensive radioassay program, which will be discussed with highlights on recent measurements.

This work is supported by the U.S. DOE and the NSF, the LANL, ORNL and LBNL LDRD programs; the European ERC and Horizon programs; the German DFG, BMBF, and MPG; the Italian INFN; the Polish NCN and MNiSW; the Czech MEYS; the Slovak RDA; the Swiss SNF; the UK STFC; the Russian RFBR; the Canadian NSERC and CFI; the LNGS and SURF facilities.

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Session Classification: Experiments Background, Models & Simulations