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First results from LEGEND-200: searching for neutrinoless double beta decay in ^{76}Ge

Neutrinoless double beta decay ($0\nu\beta\beta$) is a rare process which could take place if neutrinos are Majorana fermions. Its discovery would not only shed light on the nature of neutrinos, but would also provide unambiguous evidence for the existence of new Physics Beyond the Standard Model, as it entails a two unit lepton number violation.

The LEGEND Experiment (Large Enriched Germanium Experiment for Neutrinoless $\beta\beta$ Decay) searches for $0\nu\beta\beta$ employing active HPGe detectors enriched beyond 86% in ^{76}Ge. LEGEND's experimental program is articulated in two phases: LEGEND-200, currently ongoing, and LEGEND-1000, the next generation development.
LEGEND-200 started operating in 2023 at Laboratori Nazionali del Gran Sasso (LNGS) and ran in a stable physics data taking regime for about one year with 142 kg of detectors installed. With a target background index of $2 \cdot 10^{-4}$ counts/(keV kg yr) at $Q_{\beta\beta}$ = 2039 keV and a final exposure of 1 ton·yr, LEGEND-200 aims to reach a 3σ discovery sensitivity for a $0\nu\beta\beta$ half-life of 10^{27} yr.

In this contribution, the LEGEND-200 experiment will be presented, with a focus on its current status and on the results obtained with the first year of data.
In particular, the employed analysis routines will be introduced, the signal identification and background suppression performance will be discussed, and the background appearing in the region of interest around $Q_{\beta\beta}$ will be analyzed. Finally, a first LEGEND-200 $0\nu\beta\beta$ half life estimate will be presented, together with a joint GERDA + MJD + LEGEND-200 result.

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Secondary track

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