

The 22nd international workshop on Next Generation Nucleon Decay and Neutrino Detectors (NNN23)



UNIVERSITÀ DEGLI STUDI DI NAPOLI
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Neutrinoless double-beta decay search with the LEGEND experiment

Thursday, October 12, 2023 4:50 PM (30 minutes)

Neutrinoless double-beta decay is a nuclear decay, given as $(A,Z) \rightarrow (A,Z+2)+2e^-$, that violates total lepton number conservation by two units. Its observation would have deep consequences in the understanding of our Universe. It would prove that neutrinos have a Majorana component, it would help to understand the origin of the neutrino mass and constrain its absolute mass and help to understand the matter-antimatter asymmetry in the Universe. Due to this very reach scientific harvest, a strong experimental program is underway to search for this transition with many proposed experiments using different technologies.

In the talk the LEGEND experiment, which uses ^{76}Ge as the isotope of interest, will be described. We will start describing its first stage, LEGEND-200, which is now taking data at the Laboratori Nazionali del Gran Sasso of INFN in Italy, and then the status of the future final step, LEGEND-1000.

The goal of LEGEND-200 is to reach a sensitivity in the half-life of the neutrinoless double-beta decay of ^{76}Ge of about 10^{27} yr in terms of both setting a 90% C.L. limit and achieving a 50% chance to make a 3 sigma discovery, thanks to a projected background index of 0.6 cts/(FWHMtyr) and an exposure of 1 tyr. *LEGEND-1000 aims for a sensitivity of beyond 1028 yr by operating 1 tonne of enriched germanium detectors for an exposure of more than 10 tyr at a background index of about 0.025 cts/(FWHMtyr).* Thanks to this sensitivity LEGEND-1000 will be able to explore the entire inverted mass ordering region

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