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The Ton-Scale Search for Neutrinoless Double-Beta Decay in Germanium with LEGEND-1000

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Next-generation neutrinoless double-beta decay searches seek to elucidate the Majorana nature of neutrinos and the existence of a lepton number violating process. The LEGEND-1000 experiment represents the ton-scale phase of the LEGEND program's search for neutrinoless double-beta decay of ^{76}Ge, following the current intermediate-stage LEGEND-200 experiment at LNGS in Italy. The LEGEND-1000 design is based on a 1000-kg mass of p-type, inverted-coaxial, point-contact germanium detectors operated within a liquid argon active shield. The LEGEND-1000 experiment's technical design, energy resolution, material selection, and background suppression techniques combine to project a quasi-background-free search for neutrinoless double-beta decay in ^{76}Ge at a half-life beyond 10^{28} yr and a discovery sensitivity spanning the inverted-ordering neutrino mass scale. The innovation behind the LEGEND-1000 design, its technical readiness, and discovery potential is presented.

Alternate track

1. Beyond the Standard Model

I read the instructions above

Yes

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