



Contribution ID: 324

Type: **Parallel talk**

LEGEND-1000: A Ton-Scale Search for Neutrinoless Double-Beta Decay in Ge-76

Wednesday, August 30, 2023 2:45 PM (15 minutes)

Next-generation neutrinoless double-beta decay searches seek 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. This approach has achieved the lowest background levels and the best energy resolution at the decay Q value as established by the GERDA and MAJORANA DEMONSTRATOR experiments. 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.

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.

Submitted on behalf of a Collaboration?

Yes

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Session Classification: Neutrino physics and astrophysics

Track Classification: Neutrino physics and astrophysics