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LEGEND experiment and other terrestrial searches in the context of cosmological constraints on the neutrinoless double beta decay

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The Large Enriched Germanium Experiment for Neutrinoless Double Beta Decay (LEGEND) has been designed to answer one of the highest priority questions in fundamental physics: is the neutrino a Majorana or Dirac particle, is the lepton number conserved, and what is the neutrino mass?

The first phase of the project, the LEGEND-200 detector, is currently running at the Laboratori Nazionali del Gran Sasso (LNGS) in Italy. Up to 200 kg of bare high purity germanium (HPGe) detectors isotopically enriched up to 90% in Ge-76 are deployed in liquid argon (LAr). The LAr serves as a cooling medium for the detectors, as well as a passive and active shield. The LAr instrumentation is composed of wavelength shifting (WLS) fibers connected to silicon photomultipliers detecting scintillation light of argon.In the GERDA experiment, the LAr veto was a very powerful tool for background rejection and minimization. By combining the lowest background levels with the best energy resolution in the field, LEGEND-200 will perform a quasi-background-free search for 0νββ decay. After collecting about 1 ton-year of data, it can make a discovery of neutrinoless double beta decay with just a handful of counts for a Ge-76 half-life of about 10^(27) years.

In the talk, the present status of LEGEND-200 will be discussed, as well as the prospects for construction of the full-scale detector based on 1000 kg of Ge-76. LEGEND-1000 is designed to probe the neutrinoless double beta decay with a discovery sensitivity for the Ge-76 half-life of about 10^(28) years, corresponding to an effective Majorana mass upper limit in the range of 9-21 meV to cover the inverted-ordering neutrino mass scale with 10 years of live time.

The LEGEND program will be discussed in the context of the current cosmological constraints.

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