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Status and Progress of GERDA

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The study of neutrinoless double beta decay (DBD) is the most powerful approach to the fundamental question if the neutrino is a Majorana particle, i.e. its own anti-particle. The observation of neutrinoless DBD would not only establish the Majorana nature of the neutrino but also represent a determination of its effective mass if the nuclear matrix element is given. So far, the most sensitive results have been obtained with Ge-76, and the group of Klapdor-Kleingrothaus has made a claim of discovery. Future experiments have to reduce radioactive backgrounds to increase the sensitivity. The GERmanium Detector Array "GERDA" [1] is a new double beta-decay experiment which is currently under construction in the INFN Gran Sasso National Laboratory, Italy. It is implementing a new shielding concept by operating bare Ge diodes—enriched in Ge-76—in high purity liquid argon supplemented by a water shield. The aim of "GERDA" is to verify or refute the recent claim of discovery, and, in a second phase, to achieve a two orders of magnitude lower background index than recent experiments. The paper will discuss design, physics reach, and status of construction of "GERDA," and present results from various R&D efforts including long term stability of bare Ge diodes in cryogenic liquids, material screening, cryostat performance, design and production of enriched Ge diodes, cryogenic precision electronics, safety aspects, and Monte Carlo simulations.

[1] http://www.mpi-hd.mpg.de/GERDA/

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