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Searching for the neutrinoless double beta decay with GERDA

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Neutrinoless double beta decay is a lepton-number violating process predicted by many extensions of the SM. It could be the key to understand the nature of the neutrino: it would prove its Majorana nature and the half-life of the decay would be a measure of the neutrino-mass absolute scale. The GERmanium Detector Array (GERDA) experiment at the INFN, Gran Sasso Laboratory, Italy, is searching for the double-beta-decay of the isotope 76Ge. Germanium crystals enriched in 76Ge are the source and the detector simultaneously. They are deployed into liquid argon. Data from the first phase of GERDA (Phase I) gave no indication of neutrinoless double beta decay of 76Ge, thus disfavoring the long-standing observation claim based on the same isotope in a model-independent way. The measured half-life lower limit for neutrinoless double beta decay of 76Ge is T1/2 > 2.1x10^25 (90% C.L.); the background level achieved was a factor 10 smaller with respect to previous experiments. The second Phase of the experiment is presently being prepared, aiming to an increase of the sensitivity on the half-life by a factor 10: this will be achieved by collecting a larger exposure and by further suppressing the background through the use of newly developed BEGe-type detectors and the detection of scintillation light from the liquid argon. This presentation will summarize the basic concept of the GERDA design; the physics results from Phase I; the status and perspectives from Phase II.

Primary author: BRUGNERA, Riccardo (Universita' di Padova and INFN Padova)

Presenter: BRUGNERA, Riccardo (Universita' di Padova and INFN Padova)

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