

# First results from Phase II of the neutrinoless double beta decay experiment GERDA

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The search for neutrinoless double beta decay ( $0\nu\beta\beta$ ) might be the only window to observe lepton number violation. Its observation would have many implications in neutrino physics (Majorana nature, mass scale and ordering, etc) and beyond.

The GERmanium Detector Array (GERDA) experiment, located at the Laboratori Nazionali del Gran Sasso, has been constructed to search for this rare decay in  $^{76}\text{Ge}$  atoms. GERDA operates high purity germanium detectors submersed barely in liquid argon (LAr).

Phase I of the experiment was completed in 2013 reaching an exposure of about 21 kg·yr with an unprecedented low background of  $10^{-2}$  counts/(keV·kg·yr) in the region of interest. No signal was observed, a half-life limit of  $T_{1/2}^{0\nu} > 2.1 \times 10^{25}$  yr was achieved.

In Phase II, which started in December 2015, 35 kg of germanium detectors enriched in  $^{76}\text{Ge}$  have been deployed. The goal is to increment the exposure by factor 5, to further reduce the background level by one order of magnitude and thus to reach a half-life sensitivity of  $\mathcal{O}(10^{26})$  yr. The Phase II setup comprises 30 newly produced Broad Energy Germanium (BEGe) detectors. Compared to former detector designs, these detectors allow for an improved energy resolution and active background rejection via an enhanced pulse shape performance. To achieve the necessary background reduction, the experimental infrastructure was complemented with an active LAr scintillation light veto.

The present talk reviews the upgrades implemented in the GERDA Phase II setup and discusses the results from the first data release of Phase II.

## Summary

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