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Status and results of the GERDA experiment

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The study of neutrinoless double beta decay ($0\nu\beta\beta$) is a powerful approach to investigate fundamental properties of neutrinos. The observation of $0\nu\beta\beta$ would demonstrate lepton number violation in nature and prove that neutrinos have a Majorana component. It will also give an access to the neutrino mass hierarchy and to the information on the absolute values of the neutrino masses. The {\sc Gerda} experiment [1] is an low background experiment aimed to search for the $0\nu\beta\beta$ of ^{76}Ge. The aim of {\sc Gerda} is to test the claim of discovery by part of Heidelberg-Moscow Collaboration [2], and, in a second phase, to achieve much better sensitivity than recent experiments. The main concept of {\sc Gerda} is the operation of naked HPGe detectors made from enriched ^{76}Ge, which are immersed in liquid argon (LAr). A cryostat with 64˜m^3 liquid argon is located inside a steel tank containing 590˜m^3 pure water. Presently in Phase˜I, eight detectors of coaxial type made from material enriched in ^{76}Ge are deployed. Detectors are mounted on low mass holders and read out by custom made, low radioactive amplifiers located close to the diodes. A background index of about 2×10^{-2} cts/(keV·kg·yr) is reached near the region of $0\nu\beta\beta$ search. Obtained half-life of two-neutrino double beta decay of ^{76}Ge is $(1.84$
$substack{+}0.14-0.10)\times10^{21}$ yr [3]. Currently an exposure more than 20 kg·yr has been accumulated in {\sc Gerda} experiment since November 2011. In June 2013 it is planning to stop data taking and open narrow blinded region of the expected $0\nu\beta\beta$ peak location. \\
At the same time preparations towards the second phase of {\sc Gerda} are ongoing. New enriched BEGe detectors with total mass of about 20 kg were successfully produced and tested. They show good resolution and pulse shape discrimination capability. Operations for the deployment of these detectors together with LAr light scintillation veto in {\sc Gerda} is planned to start just after the finishing of the Phase I data taking. We are expecting that such improvements allow us to suppress backgrounds in {\sc Gerda} to the level of 1×10^{-3} cts/(keV·kg·yr) in the region of interest.

[1] H.-K.Ackermann et al., Eur. Phys. J. C 73 (2013) 2330.
[2] H.V. Klapdor-Kleingrothaus et al., Phys. Lett. B586, 198 (2004).
[3] M.Agostini et al., J. Phys. G: Nucl. Part. Phys. 40 (2013) 035110.

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