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The GERDA Experiment and the Search for Neutrinoless Double Beta Decay

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Solid evidence for non-zero neutrino masses has been established by oscillation experiments but their absolute scale remains unknown. The neutrino mass can be composed of Dirac and Majorana mass terms. A Majorana mass term would result in total lepton number violation and have fundamental implications for cosmology. The only feasible experimental approach to investigate the Majorana nature of neutrinos is neutrinoless double beta decay ($0\nu\beta\beta$). The rate of the $0\nu\beta\beta$ decay is connected with the effective neutrino mass and aids in the determination of the absolute neutrino mass scale.
The Gerda experiment (GERmanium Detector Array) investigates $0\nu\beta\beta$ in 76Ge and
is among the leading experiments that aim to probe the degenerated mass hierarchy. The experiment is planned in two phases; the data taking of Phase I ended last summer after ≈ 21 kg ·yr exposure with a background level of 2e−2 cts/(kg ·yr ·keV) before pulse shape discrimination. A lower $0\nu\beta\beta$ half-life limit T1/2 > 2.1e25 yr was established. The transition to Phase II with major upgrades and additional target mass is currently ongoing. The goal for Phase II is a background level of 1e−3 cts/(kg ·yr ·keV). With an exposure of 100 kg ·yr a final sensitivity up to 2e26 yr half-life can be expected.
This talk will introduce the Gerda experiment with a focus on the recent results of Phase I data along with their implications with respect to the controversial claim of $0\nu\beta\beta$ observation by a subgroup of the Heidelberg-Moscow experiment.

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