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Background characterization for the GERDA experiment

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The GERDA experiment at LNGS searches for the neutrinoless double beta (0nubb) decay of Ge-76. HPGe detectors made from germanium enriched in Ge-76 are directly immersed in liquid argon, serving as shield against external radiation and as a cooling medium simultaneously. A significant reduction of the background compared to previous experiments is achieved in the first phase of the experiment. An analysis of the first 13.7 kg*yr of Phase I data resulted in a good understanding of the individual background components in the background energy spectrum. A dedicated analysis for the measurement of the half-life of the two-neutrino double beta (2nubb) decay of Ge-76 showed that the 2nubb decay of Ge-76 is the dominating source in the 600 keV - 1800 keV region, with a signal-to-background ratio of 4:1.

The background in a 160 keV energy region around the Q-value of Ge-76 double beta decay Qbb = 2039 keV, i.e., from 1939 keV to 2139 keV excluding the central 40 keV blinded window, has been identified to be mainly due to beta- and/or gamma-induced events originating from Bi-214 (U-238 series), Tl-208 (Th-232 series), K-42 (progeny of Ar-42) and alpha-induced events coming from the alpha emitting radioisotopes in the Ra-226 decay chain. A background decomposition around the Qbb will be presented with special emphasis on the contribution from alpha-induced events.

Primary author: Mrs BECERICI-SCHMIDT, Neslihan (MSc. Physics)

Presenter: Mrs BECERICI-SCHMIDT, Neslihan (MSc. Physics)

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