The GERmanium Detector Array (GERDA) is a new experiment to search for the neutrinoless double beta decay ($0\nu\beta\beta$) of $^{76}\text{Ge}$. This very rare weakly interacting process is predicted to occur if the neutrino exhibits a mass and is a Majorana particle; i.e. it is its own antiparticle. Although the $2\nu\beta\beta$ decay has been found in several nuclei, there is at this moment only a part of the Heidelberg-Moscow Collaboration claiming to have observed the neutrinoless double beta decay.

The best limit for the half-life is $T_{1/2} > 1.6 \times 10^{25}$ y. GERDA’s 1$^\text{st}$ phase will expose about 15 kg$\cdot$y of enriched germanium detectors from the Heidelberg-Moscow and IGEX crystals. In this phase, we will be able to test the claim due to reduced background by a factor 10.

In a 2$^\text{nd}$ phase about 100 kg$\cdot$y of data will be accumulated, leading to $T_{1/2} > 2 \times 10^{26}$ y.

At the moment the experiment is build up at the LNGS. Water tank, cryostat and cleanroom are installed (see right) and tested and now the muon veto is constructed on site.

To optimize the efficiency of the muon veto, extensive simulations have been performed. In a first step a spectrum of dangerous muons (i.e. energy deposition around $Q_{\beta\beta}=2039$ keV) was created.

For these muons, Cherenkov photon intensity maps for several surfaces, e.g. the hull of the water tank, have been simulated (shown on the right) to find a first hint for the final distribution. Thereafter simulations of different positions and numbers of PMTs lead to the final distribution.

Recent simulations show, that an efficiency of more than 99 % can easily be achieved, reducing the muon induced background to a level of $10^{-5}$ events/(keV$\cdot$y).

A spectrum of the energy deposition in the germanium crystals is shown on the left.

To increase the efficiency of the muon veto, the surface of the water tank was covered with VM2000, a highly reflecting and wave-length shifting foil from 3M. It will act as an active Cherenkov veto. Six more PMTs just below the cryostat (pillbox) will complete the GERDA muon veto.

The DAQ will use SIS3301 FlashADCs from Struck systems. The trigger will require four PMTs in four different FADCs, or one of the plastic veto FADCs to fire.

For calibration, two systems will be implemented. The first feeds LED light pulses to each individual PMT, while the second one will use diffusor balls in the tank, to illuminate it for geometry dependent calibration.

At first, the water tank wall had to be covered with VM2000. For this, two mobile hoisting platforms were used. The photomultipliers on the wall were mounted, using the same platforms. The PMTs are fixed with two studs welded to the wall of the tank. Their cables are led upwards and over a cable tray through a chimney in the ceiling of the tank.

After that, the optical fibres of the 1$^\text{st}$ calibration system and diffusor balls of the 2$^\text{nd}$ system were installed. Also the pillbox was lined with VM2000 and its PMTs were mounted (see below).

Finally the cryostat and the bottom of the water tank were covered with VM2000 and the PMTs on the bottom were installed.

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