

Characterization of a large CdZnTe coplanar quad-grid semiconductor detector

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The COBRA collaboration aims to search for the neutrinoless double beta-decay of ^{116}Cd . For this purpose, it operates a demonstrator setup with 64 CdZnTe detectors, each with a volume of 1cm^3 , at the LNGS underground laboratory in Italy.

Double beta-decays are associated with half-lives of more than 10^{25} years. To be sensitive to those half-lives, a high detection efficiency and especially an ultra low-background setup are, among other aspects, important requirements.

The usage of larger detectors is expected to be an improvement of the sensitivity. Detectors with a larger volume have a higher detection efficiency than the smaller ones. Due to the lower surface-to-volume ratio and the higher mass and thus, the usage of fewer detectors, the background can be reduced.

A large $(2 \times 2 \times 1.5)\text{cm}^3$ CdZnTe detector with a new coplanar-grid design is characterized for applications in γ -ray spectroscopy and low-background operation. The four coplanar-grids on the anode side offer the possibility of separating the detector in four single sectors.

The electric properties as well as the spectrometric performance, like energy response and resolution, are investigated in several measurements. Furthermore, studies concerning the operational stability and the possibility to identify multiple-scattered photons, are conducted.

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