Contribution ID: **329** Type: **Poster**

Modeling the collective motion of charge carriers in Ge semiconductor detectors

In high purity germanium detectors, the signal evolution carries informations on the topology of the energy deposition. This feature is exploited in the search for neutrinoless double-beta decay of ^{76}Ge to discriminate between single- (typical of sought-after signal) and multiple-energy depositions (typical of background events), in the GERDA, MJD and LEGEND experiments. In the effort to enlarge the detector dimensions, new geometries have been recently proposed, such as the inverted coaxial, in which the charge carriers' drift paths are substantially longer than for the previous generation detectors. This lead to the observation of previously unnoticed effects on the signal evolution, due to the self-interactions of the carriers during the drift. Monte-Carlo simulations and pulse shape simulations have been used to test the impact of such effects on the discrimination capabilities for the next generation experiments with ^{76}Ge.

Mini-abstract

Collective motion of carriers impacts signal profile in germanium detectors

Experiment/Collaboration

LEGEND

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Session Classification: Poster session 4