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A p-type point-contact germanium detector with amorphous semiconductor surface JING LIU, DONGMING MEI, University of South Dakota — The p-type point-contact high purity germanium detector is a well-accepted technology in rare-event search experiments due to its ultra-low energy threshold and excellent single/multiple-site event discrimination power. However, there is an about 1 mm thick transient layer below the lithium-diffused n+ outer surface on a traditional p-type germanium detector, where only part of the charges created by an interaction can be collected. Background events located in this layer have their energies misidentified and may contaminate signal regions in rare-event search experiments. In this work, we discuss the possibility to replace the lithium-diffused surface with a 0.1 micron thick amorphous semiconductor one to eliminate the partial-charge-collection layer. Surface and low energy events can be identified by their fully deposited energies together with rise times of their electronic pulses. In addition, the thin surface has the following two advantages over the traditional lithium-diffused one. At first, it maximizes the sensitive volume of the detector. Secondly, it can be segmented easily, providing rich information regarding the interaction topology, which is crucial for background identification in rare-event searches.

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