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Pulse Shape Discrimination for HPGe Detectors in Search for Dark Matter DONGMING MEI, ANDREW HIME, STEVE ELLIOTT, Los Alamos National Laboratory — In the detection of WIMP-induced nuclear recoil with a high-purity germanium detector, the main background source is electron recoil produced by natural and cosmogenic radioactivity. The capability of discriminating a nuclear recoil from an electron recoil is crucial to reduce the background and to reach good sensitivity for the detection of WIMPs. Digital pulse shape analysis is an encouraging approach to the discrimination of nuclear recoils from electron recoils. The sensitivity of pulse shape is essentially governed by two effects: (1) the drift time of the charge carriers that move along the electric field lines towards the corresponding electrode; (2) the density of electron-hole pairs along the track of the particle. A high density of charge carriers along the ionization track forms a plasma-like cloud of charge that shields the interior from the influence of the electric field and eventually results in a longer drift time. Both effects govern the pulse rise time associated with charge collection. Nuclear recoils induced by neutrons in a segmented Ge detector lead to a study of pulse rise time differences between these two classes of events and we provide a preliminary result on the potential of this technique.

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