

Abstract Submitted
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Measuring Ionization and Athermal Phonons: Detectors of the Cryogenic Dark Matter Search¹ KYLE SUNDQVIST, University of California, Berkeley, FOR THE CDMS COLLABORATION — The Cryogenic Dark Matter Search (CDMS) is a search for weakly-interacting massive particles (WIMPs) in the halo of our galaxy. WIMPs are a favored solution to the dark matter problem in cosmology and particle physics. We will describe how CDMS measures simultaneously the number of charge carriers and the energy in athermal phonons created by particle interactions in Ge and Si crystals at a temperature of 50 mK. Together these distinct signals create a signature response for each event, allowing candidate WIMP interactions with nuclei to be discriminated from electromagnetic radioactive background which interacts with electrons. Combining this method with additional information contained in the athermal phonon signal shape, CDMS has achieved a sensitivity roughly ten times better than any other experiment in the world. These techniques introduce a number of unique challenges. Bias levels must remain at only a few volts, else the secondary phonons emitted by the drifted carriers dominate the original phonon signal. The neutralization of charge-trapping sites, even at concentrations of only $\sim 10^{10} \text{ cm}^{-3}$, is of primary importance to the performance of charge collection. We present the methods of crystal neutralization, subsequent characterization, and representative phenomena encountered in practice.

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