Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Detectors of the Cyrogenic Dark Matter Search: Charge Transport in the Zero-Point Regime KYLE SUNDQVIST, University of California, Berkeley, CDMS COLLABORATION — The Cryogenic Dark Matter Search (CDMS) seeks to detect weakly-interacting massive particles (WIMPs) in the halo of our galaxy. WIMPs are predicted under supersymmetric particle theory, and are a favored solution to the dark matter problem in cosmology. We will describe how the CDMS experiment measures both the ionized charge and the energy in athermal phonons created by particle interactions in Ge and Si crystals at a temperature of 40 mK. Performing simultaneous measurements in this way creates a signature response for each event. The result offers an unsurpassed ability to discriminate candidate WIMP-nucleon interactions from those of radioactive background. Of particular interest to condensed matter physics is a consideration of experimental challenges that arise. Charge collection potentials must remain at only a few volts, else emitted phonons from drifted carriers will dominate the phonons of the original interaction. Also, at this low lattice temperature, we operate in a charge transport regime rarely encountered for low-bias levels; carrier scattering is dominated by the zero-point fluctuations of the lattice ions. We apply this understanding to charge-related phenomena seen in our detectors.

Kyle Sundqvist
University of California, Berkeley

Date submitted: 21 Nov 2006 Electronic form version 1.4