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SuperCDMS HVeV Detectors Analysis

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As part of the Dark Matter search by SuperCDMS at SNOLAB, HVeV detectors are used to provide a mechanism of detecting eV-scale energies. HVeV detectors are typically made of high-purity silicon operating with a high bias voltage at sub-K temperatures. An excitation to the silicon generates electron/hole pairs that drift due to the bias voltage. The phonons produced by the drift are expected to be quantized to the fixed voltage and distance traveled by the electron/hole pair. However, statistical randomness and impurities in the silicon add additional artifacts that need to be considered. These include detector resolution and probabilities for impact ionization and charge trapping. Additionally, LED calibrations introduce additional artifacts such as non-quantized heating. We look at some of the potential explanations for this heating, and how they may affect previous and future runs at SNOLAB.

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