Abstract Submitted
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Study of High Voltage Noise in Germanium SuperCDMS Prototype Detector[1] PRAMOD ACHARYA, Univ of South Dakota, MATTHEW FRITTS, NICHOLAS MAST, DEREK SINCAVAGE, ZACHARY WILLIAMS, University of Minnesota, DONGMING MEI, Univ of South Dakota — We studied the resolution of a germanium high voltage SuperCDMS prototype detector, 100 mm diameter and 33 mm thickness. To investigate the sources of noise, the detector was run in three different high voltage bias modes: first, with standard biasing of a grid on the detector surface; second, with an external bias electrode and vacuum gap of about 0.5 mm; and third, with the external electrode and with the metal grid removed. We calculated the total absorbed phonon energy at the transition edge sensors (TES) for events in the 13.95 keV peak from an Am-241 source placed near the detector, using measured characteristics of the sensors and applying corrections for nonlinear TES response. We calculated the effective Luke gain to estimate the detector bias and compared to estimates based on the electrode bias corrected by the potential difference across the gap and the buildup of charge on the detector surface while biased. For positive biases the two methods agree, with approximately (2-5) % fluctuation at lower bias and to about 10% at higher bias. At 0V we measured an unexpected non-zero Luke gain, indicating some residual charges on the surface of detector. At negative electrode bias the Luke gain was much lower than expected for reasons not yet understood.

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