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Measurement and characterization of low-energy ionization signals from Compton scattering with a Silicon CCD

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We report results of low-energy Compton scattering calibration studies in Silicon undertaken under the umbrella of the DAMIC (Dark Matter in CCDs) experiment. We expose a calibration detector at the University of Chicago to Co-57 and Am-241 gamma-ray sources and measure and characterize the resultant spectrum. We identify several theoretically motivated, but heretofore unobserved in the literature, structural features of these spectra and validate these results with an MCNP simulation. We further report an energy detection threshold of 60 eVee. These studies provide relevant information on low-energy ionization signals from electrons Compton scattered by radiogenic gamma-rays, often a dominant background for low-mass WIMP (Weakly Interacting Massive Particle) searches.

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