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Measurement of low-energy Compton and neutron scattering in Si CCDs with single-electron resolution

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DAMIC-M employs skipper charged-coupled devices (CCDs) with detection threshold of just a few ionization charges to search for low-mass dark matter candidates. An important component of the background comes from small-angle Compton scatters of environmental gamma-rays which must thus be characterized down to $O(10\text{ eV})$ energy. We used an Am-241 source to measure gamma-ray scattering on silicon atomic shell electrons in a skipper CCD with single-electron resolution. The measurement found notable differences between data and theoretical expectations in the L-shell energy region ($<150\text{ eV}$). We also present preliminary data on a nuclear recoil ionization efficiency measurement in Si down to few ionization charges, obtained with a skipper CCD exposed to low-energy neutrons ($<24\text{ keV}$) from a SbBe photoneutron source. Lastly, we report on a novel method under exploration to identify nuclear recoils through the associated production of lattice defects in the silicon.

Submitted on behalf of a Collaboration?

Yes

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