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Interactions of accelerated dark matter with nuclei and implications for DUNE

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Halo dark matter particles with sub-GeV masses do not possess sufficient kinetic energy to induce detectable recoils of heavy nuclei, direct detection experiments, hence, loose sensitivity to such light dark matter. Dark matter particles can be, however, accelerated by different mechanisms and even light dark matter can then provide observable signatures. These signatures include not only coherent dark matter-nucleus scattering, but also scattering off individual nucleons or deep inelastic scattering. The latter processes can be detected by neutrino experiments and we demonstrate their importance on the example of dark matter accelerated by scattering with galactic cosmic rays that might be observed by the DUNE experiment.

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