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Dark Matter at High Nuclear Recoil

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There exist well motivated models of particle dark matter which predominantly scatter inelas- tically off nuclei in direct detection experiments. This inelastic transition causes the dark matter to up-scatter in terrestrial experiments into an excited state up to 550 keV heavier than the dark matter itself. An inelastic transition of this size is highly suppressed by both kinematics and nuclear form factors. In this paper, we extend previous studies of inelastic dark matter to deter- mine the present bounds on the scattering cross section, and the prospects for improvements in sensitivity. Three scenarios provide illustrative examples: nearly pure Higgsino supersymmetric dark matter; magnetic inelastic dark matter; and inelastic models with dark photon exchange.

Presentation type

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