

Universal behavior in the scattering of heavy, weakly interacting dark matter on nuclear targets

Particles that are heavy compared to the electroweak scale ($M \gg m_W$), and that are charged under electroweak SU(2) gauge interactions display universal properties such as a characteristic fine structure in the mass spectrum induced by electroweak symmetry breaking, and an approximately universal cross section for scattering on nuclear targets. The heavy particle effective theory framework is developed to compute these properties. As illustration, the spin independent cross section for low-velocity scattering on a nucleon is evaluated in the limit $M \gg m_W$, including complete leading-order matching onto quark and gluon operators, renormalization analysis, and systematic treatment of perturbative and hadronic-input uncertainties.

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