

Model-Independent Analyses of Dark Matter Particle Interactions

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Recently Galilean-invariant effective field theory has been used to determine the general low-energy forms of both the WIMP-nucleon interaction and the elastic WIMP-nucleus interaction. This construction shows that the standard spin-independent/spin-dependent analysis of dark-matter scattering experiments can be quite misleading: by neglecting four of the six allowed elastic response functions, the standard analysis often misrepresents the strength and sometimes even the leading multipolarity of candidate WIMP-matter interactions. I will describe the physics behind this result, stressing its implications for experiment – namely that we can avoid confusion while learning more about dark matter if we do the necessary set of elastic-scattering experiments. I describe a Mathematica script for experimental analysis that we have constructed to help the experimental community make the connections between candidate ultra-violet theories, input nuclear physics, and experimental data.

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