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Nuclear Physics of Dark Matter Detection

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Effective theory provides an attractive interface between nuclear theory and results from direct detection dark matter searches, on one hand, and candidate ultraviolet theories for describing dark matter on a more fundamental level, on the other. I describe a recently developed nucleon-level effective theory of dark matter particle interactions and its embedding in a nucleus, to determine the most general form of the nuclear response for dark matter elastic scattering. This leads to the conclusion that a great deal can be learned about dark matter particle properties if the requisite number of independent nuclear experiments are done. I will describe some of the associated nuclear physics, including shell model calculations of the relevant response functions.

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