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Generalized spin-independent WIMP-nucleus scattering from chiral effective field theory

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We present a formalism based on chiral effective field theory that incorporates all coherent responses relevant for the analysis of direct-detection dark-matter searches. The nuclear response functions are derived, including contributions from one- and two-body nuclear currents as well as interference terms between the different channels. The corresponding structure factors for the isotopes currently used in direct-detection experiments are evaluated using state-of-the-art nuclear structure calculations. We present first results for extended analyses of direct-detection experiments based on a minimal set of coherently enhanced responses beyond the standard spin-independent analysis.

Primary authors: KLOS, Philipp (Technische Universität Darmstadt); HOFERICHTER, MARTIN (University of Washington); MENENDEZ, Javier; Prof. SCHWENK, Achim (TU Darmstadt)

Presenter: KLOS, Philipp (Technische Universität Darmstadt)

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