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Dark matter direct detection with pseudoscalar mediators

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Due to its highly suppressed cross section (fermionic) dark matter interacting with the Standard Model via pseudoscalar mediators is expected to be essentially unobservable in direct detection experiments. We consider both a simplified model and a more realistic model based on an extended two Higgs doublet model and compute the leading one-loop contribution to the effective dark matter- nucleon interaction. This higher order correction dominates the scattering rate completely and can naturally, i.e. for couplings of order one, lead to a direct detection cross section in the vicinity of the neutrino floor. Taking the observed relic density and constraints from low-energy observables into account we analyze the direct detection prospects in detail and find regions of parameter space that are within reach of upcoming direct detection experiments such as XENONnT, LZ, and DARWIN.

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