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An EFT approach to light dark matter detection with 4He

We employ the recently developed effective theories for superfluids to describe the interaction between the helium-4 phonon and a dark matter particle. In this language we compute the rate and differential distributions for the process of emission of one or two phonons by the passing dark matter. Such information are key to the possible design of new detectors to search for sub-GeV dark matter using helium-4. In particular, the process of emission of a single phonon is highly anisotropic and could allow for directional detection.

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