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Multiphonon Processes in Spin-Dependent Dark-Matter Scattering

Monday 13 May 2024 17:00 (15 minutes)

As nuclear recoil direct detection experiments carve out more and more dark matter parameter space in the WIMP mass range, the need for searches probing lower masses has become evident. Since lower dark matter masses lead to smaller momentum transfers, we can look to the low momentum limit of nuclear recoils: phonon excitations in crystals. Single phonon experiments promise to eventually probe dark matter masses lower than 1 MeV. However the slightly higher mass range of 10-100 MeV can be probed via multiphonon interactions and importantly, do not require as low of experimental thresholds to make a detection. In this work, we analyze dark matter interacting via a pseudoscalar mediator, which leads to spin-dependent scattering into multiphonon excitations. We consider several likely EFT operators and describe the future prospects of experiments for finding dark matter via this method. Our results are implemented in the python package *DarkELF* and can be straightforwardly generalized to other spin dependent EFT operators.

Mini Symposia (Invited Talks Only)

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