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Diamond Detectors for Direct Detection of Sub-GeV Dark Matter

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We propose to use high-purity lab-grown diamond for the detection of sub-GeV dark matter. Diamond targets can be sensitive to both nuclear and electron recoils from dark matter scattering in the MeV and above mass range, as well as to absorption processes of dark matter with masses between sub-eV to 10's of eV. Compared to other proposed semiconducting targets such as germanium and silicon, diamond detectors can probe lower dark matter masses via nuclear recoils due to the lightness of the carbon nucleus. The expected reach for electron recoils is comparable to that of germanium and silicon, with the advantage that dark counts are expected to be under better control. Via absorption processes, unconstrained QCD axion parameter space can be successfully probed in diamond for masses of order 10 eV, further demonstrating the power of our approach.

Less than 5 years of experience since completion of Ph.D

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Student (Ph.D., M.Sc. or B.Sc.)

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