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Superconducting Nanowire Single Photon Detectors for sub-GeV Dark Matter Searches

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Superconducting Nanowire Single Photon Detectors (SNSPDs) have rapidly emerged as a leading detector type for time-correlated single photon counting from the UV to the near-infrared. Due to their unique combination of low energy thresholds and low intrinsic dark count rates, SNSPDs have become attractive as sensors in novel experiments that seek to probe the poorly explored sub-GeV dark matter (DM) parameter space. One novel detection scheme sensitive to electron recoils from interacting MeV-scale DM uses n-type GaAs as a scintillating target and large-area SNSPDs as sensors to read out scintillation photons. We will highlight recent optical excitation experiments on milligram-scale targets read out with state-of-the-art 1 mm² SNSPD arrays. We will also discuss pathways to scale this system to larger target volumes, and, in particular, how this is driving the development of cm²-scale active area SNSPDs.

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