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Advances in Qubit-Based Single-Photon Detection for Future Dark Matter Searches

RAKSHYA KHATIWADA, Illinois Institute of Technology and Fermilab

A large parameter space for Dark Matter is occupied by Ultralight Dark Matter, including axions and hidden photons, all of which have enjoyed significant interest in recent years. Despite many existing direct and indirect experimental efforts probing the sub-eV region for these particles, much of the parameter space remains unexplored. This talk focuses on searches for microwave to mid-IR frequency Dark Matter, which have been inhibited by limited detection technologies; these limitations come mainly from a lack of methods with demonstrated single-photon resolution and sufficiently low dark-count rates to observe elusive single-photon Dark Matter signals. In this context, qubit-based single-photon detectors with low dark counts have emerged as a promising approach. We will discuss contemporary advances in developing these detectors, and report a recent proof-of-principle result obtained with one such technology.