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Detecting Dark Matter with a Qubit

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To perform experimental searches for low mass bosonic dark matter such as the hidden photon or axion, our group works to employ dielectric photonic bandgap cavities with a high quality factor to coherently accumulate the axion signal for readout using qubit-based single photon detectors. The advantage of the qubit-based detector is in overcoming the standard quantum noise limit through repeated quantum non-demolition measurements [1]. Other techniques being studied include preparing the dielectric cavity in a higher photon-number (n) Fock state to enhance the dark matter signal amplitude by a factor of $(n+1)$. Given the large parameter space still unexplored by current dark matter searches, methods of tuning a resonant cavity by electronically controlling the magnetic field seen by a loop of two Josephson junctions is currently being studied.

[1] Dixit et al., Phys. Rev. Lett. 126, 141302 (2021)

In-person or Virtual?

In-person

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