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Testing quantum photosensors for the BREAD experiment

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The BREAD Experiment [1] aims to use novel ultralow noise photosensors for detecting axions. The earliest stages of this experiment, expected to take first data in 2023, will involve a superconducting nanowire single-photon detector (SNSPD) to run pilot axion and dark photon searches using an existing cryostat previously used by ADMX. In preparation for this, we are working with the Berggren group at MIT on testing infrared optimized SNSPD sensors at 500mK at Fermilab to characterize the response over broadband frequency ranges, the angle dependence, and the polarization response of the sensors to support the BREAD conceptual design. We propose SNSPDs for this experiment given their very low dark count rates of better than 10^{-4} Hz [2], a measurement which we will also attempt to replicate. This talk presents the status and future plans of this work, including upgrading the experimental setup to test other state-of-the-art quantum photosensor technologies that are optimized to a wide range of frequencies in order to maximize the sensitivity to new physics signals.

[1] <https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.128.131801>

[2] <https://arxiv.org/abs/1903.05101>

In-person participation

Yes

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