

Abstract Submitted
for the APR18 Meeting of
The American Physical Society

Axion Dark Matter Detection using Superconducting Qubits¹

ANKUR AGRAWAL, AKASH DIXIT, SRIVATSAN CHAKRAM, RAVI NAIK, JONAH KUDLER-FLAM, AARON CHOU, DAVID I. SCHUSTER, Univ of Chicago, ADMX COLLABORATION — A transmon qubit can be operated in a resonant cavity as a sensor of a single microwave photon produced by the interaction between axion dark matter and a laboratory magnetic field. The axion is an extremely attractive dark matter candidate postulated to solve the strong CP problem in QCD. The interaction of axion field with applied magnetic field sources a current in the cavity which can be harnessed to drive a resonant cavity to single photon occupation. When weakly coupled to the detection cavity through a dipole interaction, the qubit transition frequency shift is used to measure the cavity photon number. The use of a direct dispersive quantum non-demolition measurement of the photon number decouples the measurement induced back action from the experimental uncertainties.

¹Supported by U.S. DOE: Grants DE-SC0009723, DESC0010296, DE-SC0010280, DEFG02-97ER41029, DE-FG02-96ER40956, DEAC52-07NA27344, DE-AC03-76SF00098 and DE-AC02-07CH11359. Additional support by Heising-Simons Foundation and Fermilab, LLNL, and PNNL LDRD.

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Date submitted: 12 Jan 2018

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