

# Detecting Axion Dark Matter with Superconducting Qubits

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The Axion Dark Matter eXperiment (ADMX) aims to detect dark matter axions converting to single photons in a resonant cavity bathed in a uniform magnetic field. A qubit (two level system) operating as a single microwave photon detector is a viable readout system for ADMX and may offer advantages over the quantum limited amplifiers currently used. When weakly coupled to the detection cavity, the qubit transition frequency is shifted by an amount proportional to the cavity photon number. Through spectroscopy of the qubit, the frequency shift is measured and the cavity occupation number is extracted. At low enough temperatures, this would allow sensitivities exceeding that of the standard quantum limit.

## Summary

I will describe the development of the microwave cavity structure that is designed to transfer energy from the axion dark matter field and interact with a transmon qubit. I will present the progress in fabricating transmon qubits and the various challenges encountered. I would like to have an open discussion about the measurement protocol (pulse sequence) and identify possible sources of noise (false positives from spuriously excited qubit, ...).

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